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Consulting
Engineers and
Scientists

Run-on and Run-off Control Plan

We Energies Presque Isle Power Plant Ash Landfill #3
Marquette, Michigan

Submitted to:
We Energies
333 W. Everett Street, A231
Milwaukee, Wisconsin 53203

Submitted by:
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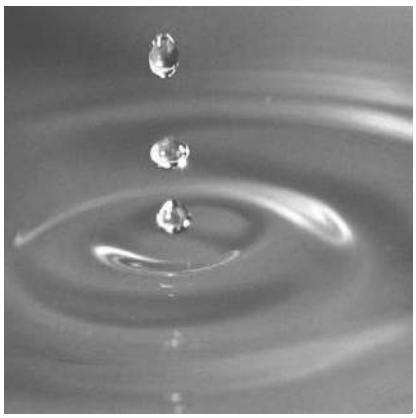
October 2021, Rev 2
Project 1610536



John M. Trast, P.E., D.GE.
Vice President

William S. Reybrock, P.E.
Project Professional

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Tables

Appendices

Revision Schedule

Revision 0 October 2016
Revision 1 December 2019. Update of the original Run-on and Run-off Control Plan. The landfill is closed and in long-term care as of October 21, 2019 with the construction documentation report approval from the Michigan Department of Environment, Great Lakes, and Energy.
Revision 2 October 2021: This plan was updated in accordance with § 257.81(c)(4) which required the owner or operator of the CCR unit to prepare periodic run-on and run-off control system plans every five years. Updated the existing site conditions and engineering calculations.

BAF:cah
K:\WEC Energy Group\1610536_We Energies PIPP LF Engineering Assistance\In_Progress\CCR Runon and Runoff Control Plan\Revision 1 Dec_2019\R1610536_Runon Runoff Mgmt Plan_December 2021v2.docx

1. Introduction

We Energies owns a solid waste disposal facility located approximately 4 miles west of the Presque Isle Power Plant (PIPP). The landfill is in the N 1/2 of the SE 1/4 of Section 6, Township 48 North, Range 25 West, Marquette County, Michigan. The landfill is regulated as a Type III landfill by the Michigan Department of Environment, Great Lakes and Energy (EGLE) in accordance with Part 115, Solid Waste Management of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The design, operation, closure, and post-closure care requirements are specified in the EGLE approved Construction Permit dated February 27, 2002, and current Operating License. Cell 1 was constructed in 2003 and placed into service on October 8, 2005. Cell 2 was constructed in 2007 and placed into service on October 10, 2008. In 2019, We Energies permanently closed the facility. The landfill began the 30-year long-term care period with the issuance of the Cell 2 Construction Documentation Report approval from the Michigan Department of Environment, Great Lakes, and Energy dated October 21, 2019.

In addition to the state regulations, the landfill is also required to comply with 40 CFR Part 257 Subpart D – *Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments* and is defined as a CCR unit and existing CCR landfill in accordance with § 257.53.

This report fulfills the requirements of § 257.81 - *Run-on and run-off controls for CCR landfills* for the PIPP Ash Landfill #3, Cells 1 and 2 which specifies that the owner or operator must complete the assessments required by these sections every five years. In accordance with 257.81(c)(1) this report describes how the run-on and run-off control systems have been designed and constructed to meet the applicable requirements and supported by appropriate engineering calculations. This report has been updated to reflect the final closure of PIPP Ash Landfill #3.

This run-off and run-on system control plan includes the following sections:

Section 1 – Introduction

Section 2 – Storm and Stormwater Volume Determination

Section 3 – Run-on Control System

Section 4 – Run-off Control System

Section 5 – Conclusion and Certification

Section 6 – References

2. Storm and Stormwater Volume Determination

§ 257.81 *Run-on and run-off controls for CCR landfills* requires that 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 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 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.

Cells 1 and 2 of the PIPP Ash Landfill #3 are approximately 12.2 acres in total. At the date of this report, all 12.2 acres have received final cover. Therefore, no active portions of the landfill exist and any precipitation that falls on the final cover system is directed away from the closed landfill. There is approximately 2.14 acres of land outside the covered waste needing drainage, bringing the total to 14.34 acres of run-off. This report documents the adequacy of the closed landfill stormwater management system to properly collect and control run-off flows. Drawing C-4 – Presque Isle Power Plant Landfill #3 Ash Landfill Final Cover Grades, located in Appendix A, shows the documented final landfill grades as of October 11, 2019.

The rainfall depth estimate for a 24-hour, 25-year storm for the PIPP Ash Landfill was determined following the procedures outlined in Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 8, Version 2: Michigan. For the PIPP Ash Landfill #3, a 24-hour, 25-year storm will result in 3.94 inches of rainfall. Calculations for determining the 24-hour, 25-year storm event are included in Appendix B: NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume.

Table 2-1 summarizes the storm recurrence interval, rainfall depth, lined area of the CCR landfill, and minimum stormwater volume required to be managed within Landfill No.3.

Table 2-1 Summary of Rainfall Precipitation and Run-off Volume Data

Storm Recurrence Interval	Rainfall Depth (inches)	Extents of Run-off (acres)	Run-off Volume (acre-ft)
24-hour, 25-year	3.94	14.34	4.70

3. Run-on Control System

§ 257.81 (a)(1) requires a run-on control system to prevent flow onto the active portions of the CCR unit during the peak discharge from a 24-hour, 25-year storm. The federal rule defines "Run-on" as "*any rainwater, leachate, or other liquid that drains over land onto any part of a CCR landfill*."

Run-on control systems for PIPP Ash Landfill #3 are not applicable to preventing flow onto active portions of the CCR unit during a 24-hour, 25-year storm, since there are no active portions of the landfill. In 2019 the landfill received final cover in accordance with the approved Construction Permit and is vegetated and in post-closure care. The landfill and the associated stormwater management system are not located in the flow path of any upgradient areas. Perimeter berms of Landfill #3 are several feet higher than the surrounding areas on all sides of the landfill, and drainage features outside the landfill footprint convey any surrounding stormwater away from the landfill. These features prevent run-on to the landfill system, so a numerical stormwater model was not completed to confirm that the current run-on control system for the closed landfill adequately manages a 24-hour, 25-year precipitation event. No active landfill surface is exposed to the atmosphere; therefore, contact stormwater cannot be generated.

4. Run-off Control System

§ 257.81 (a)(2) requires a run-off control system to 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. The federal rule defines "Run-off" as "*any rainwater, leachate, or other liquid that drains overland from any part of a CCR landfill*."

A stormwater model was completed to confirm that the current run-off control system for the operation of PIPP Ash Landfill #3 can adequately manage a 24-hour, 25-year precipitation event of 3.94 inches. Stormwater flow was modeled using HydroCAD 10.0 to evaluate the landfill in its post-closure condition. The stormwater model details and run-off calculations are included in Attachment C – Stormwater Run-off Calculations.

The stormwater run-off model for the landfill represents stormwater flow across and away from the final cover surface. The model divided the landfill into 3 sub-catchments: the existing east and north final cover and the new southern final cover. Flow from the east catchment consists of sheet flow until it is collected by a conveyance channel at the toe of the slope. In general, the conveyance channel along the toe of the slope cell is a minimum of 2 feet deep and has a 3H:1V exterior slope and 4H:1V interior side slope. The stormwater is then conveyed to a catch basin on northeast corner of the landfill where the flow enters an 18-inch diameter HDPE pipe and is discharged to the perimeter ditch on the exterior of the north perimeter berm and directed to the east, away from the landfill. Stormwater from the north sub-catchment sheet flows off the final cover, over the perimeter berm and away from the landfill. Stormwater from the southern catchment consists of sheet flow and shallow concentrated flow across the final cover until it is routed into the borrow area identified on drawing C-4 in Appendix A - Drawings. From the borrow area the water is allowed to infiltrate.

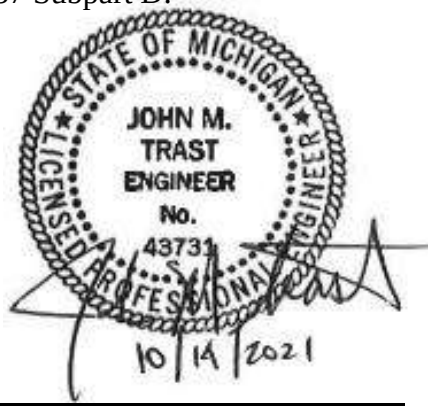
Based on stormwater run-off analysis the current run-off control system for PIPP Landfill #3 is able to handle the 24-hour, 25-year precipitation event without allowing any runoff to escape the permitted limits of the landfill. The east collector ditch has an estimated peak water level of 0.52 feet. The borrow area has a minimum crest elevation of approximately El. +840.00 feet and the estimated water level associated with the stormwater from Landfill #3 is El. +830.99 feet. Both the conveyance channels and the borrow area are capable of handling the run-off from associated with the 24-hour, 25-year precipitation event.

5. Conclusion and Certification

We Energies owns the PIPP Landfill #3 in the N 1/2 of the SE 1/4 of Section 6, Township 48 North, Range 25 West, Marquette County, Michigan. The landfill is regulated as a Type III landfill by EGLE in accordance with Part 115, Solid Waste Management of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The landfill is also required to comply with 40 CFR Part 257 Subpart D – *Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments*. The rule specifies that existing CCR landfill must develop plans to meet certain meet operating criteria designated by October 17, 2016. This report documents that the PIPP landfill has an established run-on and run-off control system design capable of controlling the peak discharge from a 24-hour, 25-year storm event and complies with § 257.81 *Run-on and run-off controls for CCR landfills*. All leachate that is collected at the PIPP Landfill #3 is hauled to the City of Marquette, Michigan wastewater treatment facility for disposal.

The rule specifies that the plan must be reviewed and updated every five (5) years maximum based on the completion date of this plan. In addition, the written plan must be amended whenever there is a change in conditions that would substantially affect the current written plan. This revision is due to the closure of the landfill. The revised plan must be placed in the facility's operating record as required by §257.105(g). The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

This Run-on and Run-off Control Plan was completed under the direction of John, M. Trast, P.E. I am a licensed professional engineer in the State of Michigan in accordance with Article 20 of the Occupational Code, Public Act 299 of 1980, as amended. This document has been prepared in accordance with the Michigan Administrative Rules, Department of Licensing and Regulatory Affairs, Professional Engineers – General Rules, Part 3 – Standards of Practice and Professional Conduct; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in 40 CFR Part 257 Subpart D.



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Licensed Professional Engineer No. 43731
Vice President/Senior Waste Management Leader
GEI Consultants, Inc.

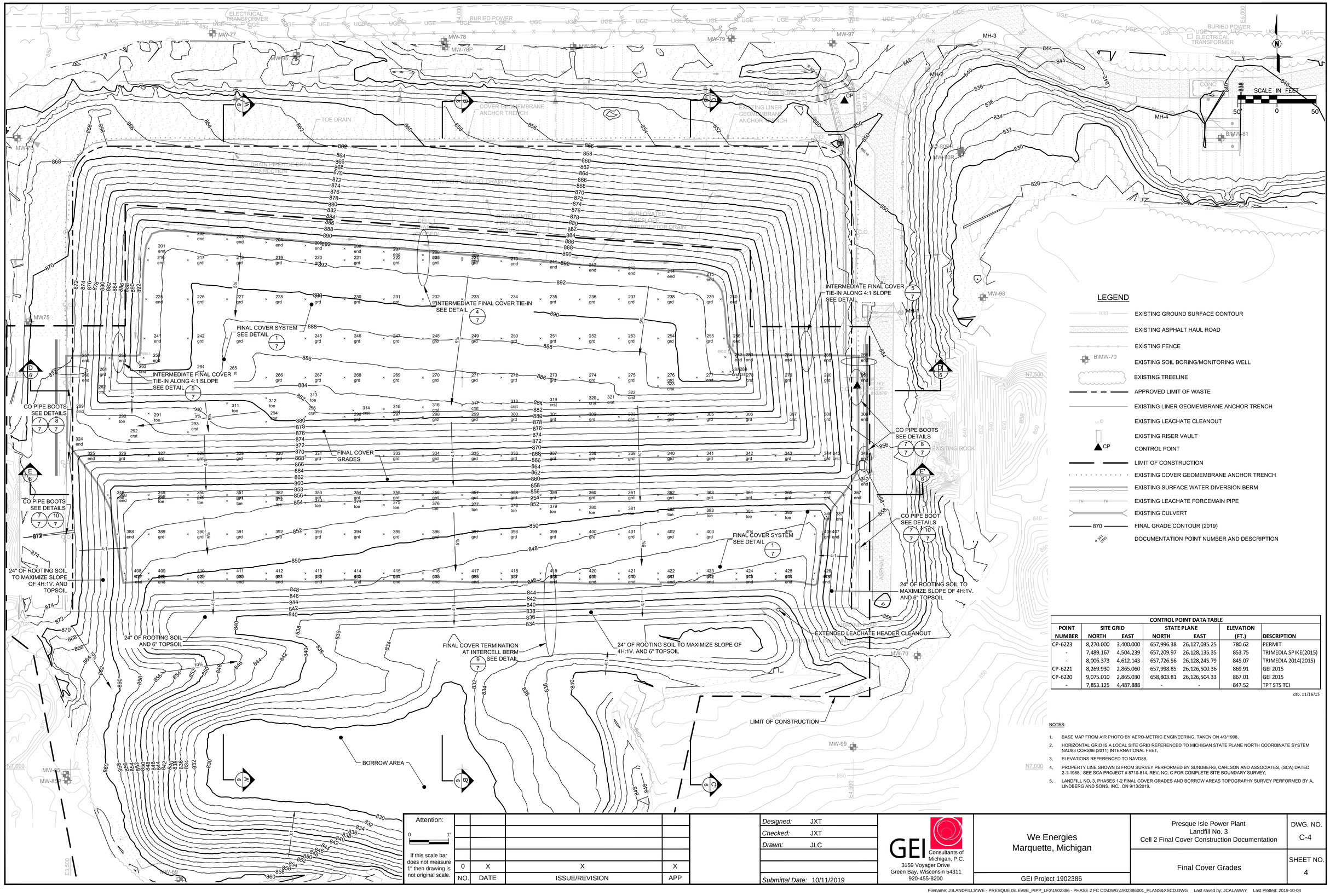
6. References

Perica, S., D. Martin, S. Pavlovic, I. Roy, M. St. Laurent, C. Trypaluk, D. Unruh, M. Yekta, G. Bonnin (2013). NOAA Atlas 14 Volume 8 Version 2.0, *Precipitation-Frequency Atlas of the United States, Midwestern States*. National Oceanic and Atmospheric Administration, National Weather Service, Silver Spring, Maryland.

US Department of Commerce. National Oceanic and Atmospheric Administration, National Weather Service. (2016). Precipitation Frequency Data Server (PFDS). http://hdsc.nws.noaa.gov/hdsc/pdfs/.

Appendix A

Drawing C-4 – Presque Isle Power Plant Landfill #3 Ash Landfill Final Cover Grades



CONTROL POINT DATA TABLE						
POINT NUMBER	SITE GRID NORTH	SITE GRID EAST	STATE PLANE NORTH	STATE PLANE EAST	ELEVATION (FT.)	DESCRIPTION
CP-6223	8,270.000	3,400.000	657,996.38	26,127,035.25	780.62	PERMIT
-	7,489.167	4,504.239	657,209.97	26,128,135.35	853.75	TRIMEDIA SPIKE(2015)
-	8,006.373	4,612.143	657,726.56	26,128,245.79	845.07	TRIMEDIA 2014(2015)
CP-6221	8,269.930	2,865.060	657,998.85	26,126,500.36	869.91	GEI 2015
CP-6220	9,075.010	2,865.030	658,803.81	26,126,504.33	867.01	GEI 2015
-	7,853.125	4,487.888	-	-	847.52	TPT STS TCI

dtb, 11/16/15

NOTES:

1. BASE MAP FROM AIR PHOTO BY AERO-METRIC ENGINEERING, TAKEN ON 4/3/1998.
2. HORIZONTAL GRID IS A LOCAL SITE GRID REFERENCED TO MICHIGAN STATE PLANE NORTH COORDINATE SYSTEM NAD83 CORS96 (2011) INTERNATIONAL FEET.
3. ELEVATIONS REFERENCED TO NAVD88.
4. PROPERTY LINE SHOWN IS FROM SURVEY PERFORMED BY SUNDBERG, CARLSON AND ASSOCIATES, (SCA) DATED 2-1-1988. SEE SCA PROJECT # 8710-814, REV. NO. C FOR COMPLETE SITE BOUNDARY SURVEY.
5. LANDFILL NO. 3, PHASES 1-2 FINAL COVER GRADES AND BORROW AREAS TOPOGRAPHY SURVEY PERFORMED BY A. LINDBERG AND SONS, INC., ON 9/13/2019.

NO.	DATE	ISSUE/REVISION	APP
0	X	X	X

Attention:

0 1"

If this scale bar does not measure 1" then drawing is not original scale.

Designed: JXT
Checked: JXT
Drawn: JLC
Submittal Date: 10/11/2019

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We Energies
Marquette, Michigan

GEI Project 1902386

Presque Isle Power Plant
Landfill No. 3
Cell 2 Final Cover Construction Documentation

DWG. NO. C-4

Final Cover Grades

SHEET NO. 4

Appendix B

NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume

GEI Consultants	**Client**	We Energies			**Page**	1 of 4
	Project	PIPP LF Run-on and Run-off Control Plan			**Rev.**	0
	By	C. Fritsch	**Chk.**	J. Trast	**App.**	J. Trast
	Date	10/03/2016	**Date**	10/7/2016	**Date**	10/7/2016
GEI Project No.	1610536	**Document No.**	N/A			
Subject	NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume					

Purpose:

The purpose of this calculation is to estimate the 24-hr, 25-yr precipitation event at Presque Isle Power Plant (PIPPP) landfill. The 24-hr, 25-yr precipitation event is required for the run-on and run-off control system plan for the landfill.

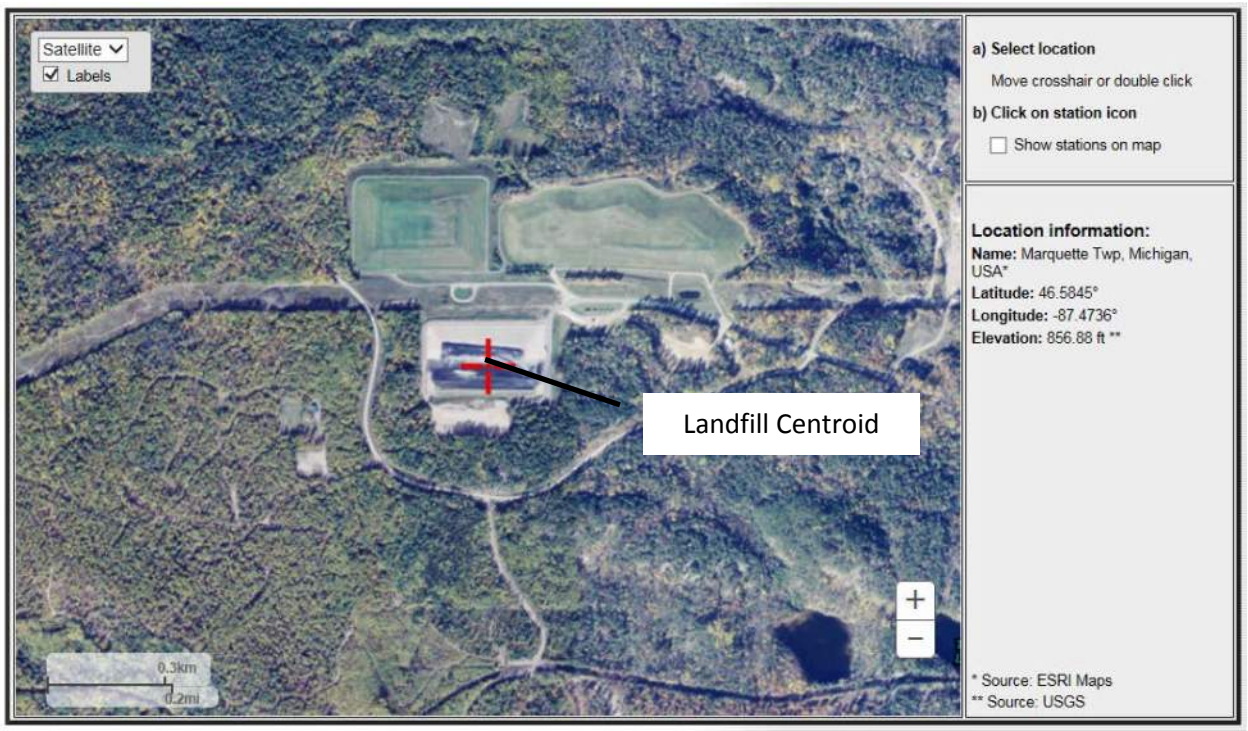
Procedure:

The rainfall depth estimation follows the procedures outlined in Precipitation-Frequency (PF) Atlas of the United States (Atlas 14, Volume 8, Version 2: Michigan).

As instructed in Atlas 14, the user is referred to the NOAA Precipitation Frequency Data Server (PFDS) http://hdsc.nws.noaa.gov/hdsc/pfds/index.html. The approximate center of the landfill was input into the PFDS and the PF estimates were returned.

Landfill Centroid Coordinates

46°35'4.20"N	46.5845°
87°28'24.96"W	-87.4736°



Tabular Output from the PFDS:

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

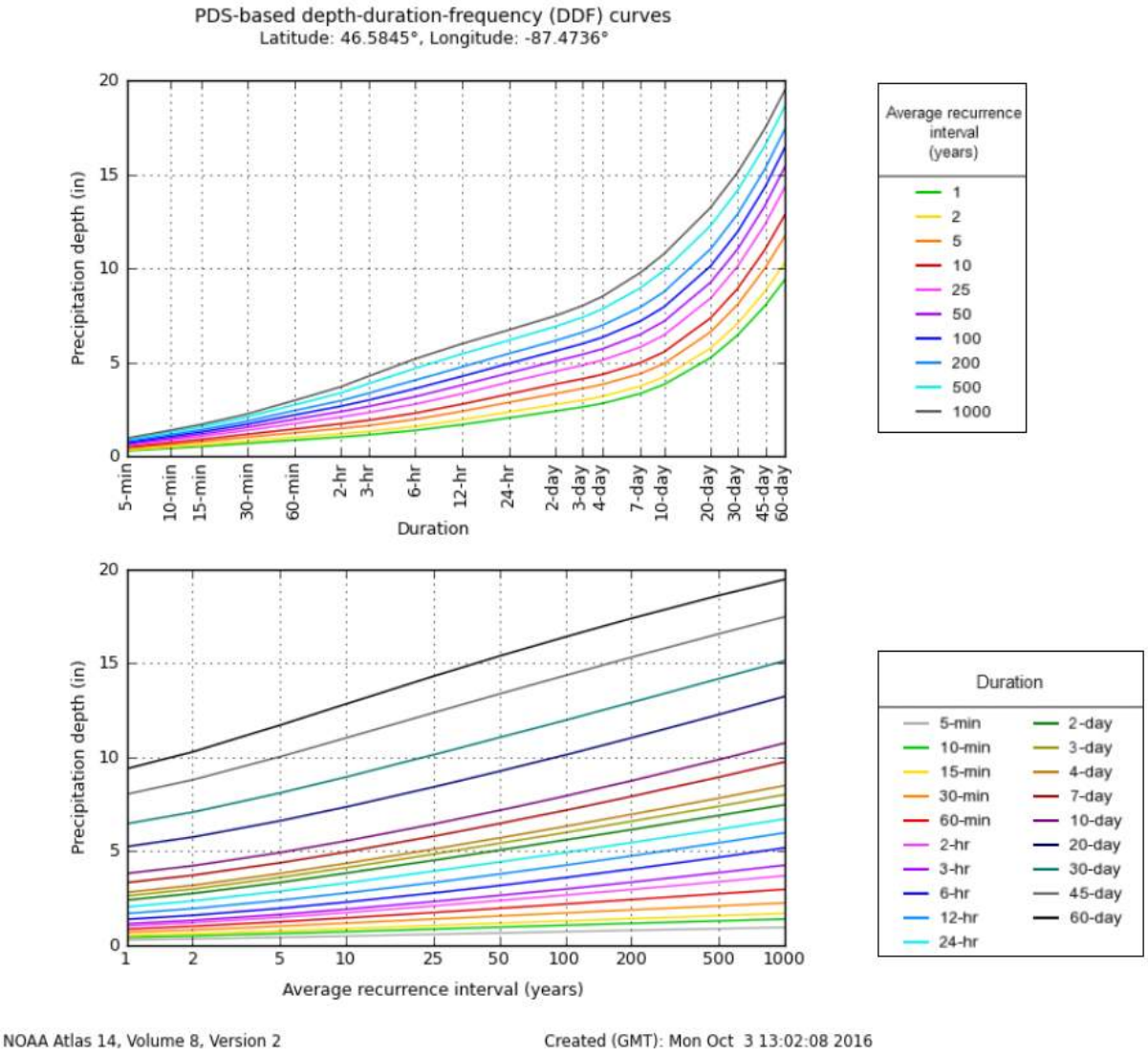
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.293** (0.248–0.351)	**0.344** (0.291–0.413)	**0.427** (0.360–0.513)	**0.495** (0.415–0.597)	**0.587** (0.474–0.724)	**0.657** (0.518–0.819)	**0.727** (0.552–0.924)	**0.796** (0.579–1.03)	**0.886** (0.619–1.18)	**0.953** (0.649–1.29)
10-min	**0.429** (0.364–0.514)	**0.504** (0.427–0.605)	**0.626** (0.528–0.752)	**0.725** (0.608–0.874)	**0.860** (0.694–1.06)	**0.963** (0.759–1.20)	**1.06** (0.809–1.35)	**1.17** (0.848–1.51)	**1.30** (0.907–1.72)	**1.40** (0.951–1.88)
15-min	**0.524** (0.444–0.627)	**0.615** (0.521–0.737)	**0.763** (0.643–0.917)	**0.884** (0.741–1.07)	**1.05** (0.846–1.29)	**1.17** (0.925–1.46)	**1.30** (0.987–1.65)	**1.42** (1.03–1.85)	**1.58** (1.11–2.10)	**1.70** (1.16–2.30)
30-min	**0.689** (0.584–0.826)	**0.813** (0.688–0.975)	**1.01** (0.854–1.22)	**1.18** (0.986–1.42)	**1.40** (1.13–1.72)	**1.56** (1.23–1.95)	**1.73** (1.31–2.19)	**1.89** (1.37–2.45)	**2.10** (1.47–2.79)	**2.25** (1.54–3.04)
60-min	**0.857** (0.726–1.03)	**1.01** (0.851–1.21)	**1.25** (1.06–1.50)	**1.46** (1.22–1.76)	**1.75** (1.41–2.16)	**1.97** (1.56–2.46)	**2.20** (1.67–2.80)	**2.43** (1.77–3.16)	**2.74** (1.92–3.65)	**2.98** (2.03–4.02)
2-hr	**1.03** (0.873–1.22)	**1.20** (1.02–1.43)	**1.49** (1.26–1.78)	**1.74** (1.47–2.08)	**2.09** (1.71–2.58)	**2.38** (1.89–2.96)	**2.67** (2.05–3.39)	**2.97** (2.18–3.85)	**3.38** (2.39–4.48)	**3.70** (2.54–4.96)
3-hr	**1.14** (0.975–1.35)	**1.33** (1.13–1.57)	**1.64** (1.40–1.95)	**1.92** (1.62–2.29)	**2.32** (1.91–2.86)	**2.65** (2.12–3.30)	**2.99** (2.31–3.80)	**3.36** (2.48–4.35)	**3.86** (2.74–5.11)	**4.26** (2.93–5.69)
6-hr	**1.38** (1.19–1.63)	**1.60** (1.37–1.88)	**1.97** (1.68–2.32)	**2.30** (1.95–2.72)	**2.78** (2.30–3.41)	**3.18** (2.56–3.93)	**3.60** (2.80–4.54)	**4.05** (3.01–5.22)	**4.68** (3.34–6.16)	**5.18** (3.59–6.87)
12-hr	**1.70** (1.47–1.98)	**1.95** (1.69–2.28)	**2.39** (2.06–2.80)	**2.78** (2.38–3.26)	**3.34** (2.77–4.05)	**3.79** (3.07–4.64)	**4.26** (3.33–5.32)	**4.76** (3.56–6.07)	**5.44** (3.91–7.10)	**5.99** (4.18–7.88)
24-hr	**2.05** (1.78–2.37)	**2.36** (2.05–2.73)	**2.87** (2.49–3.34)	**3.31** (2.85–3.86)	**3.94** (3.28–4.72)	**4.43** (3.60–5.37)	**4.94** (3.87–6.10)	**5.46** (4.11–6.90)	**6.17** (4.46–7.97)	**6.72** (4.72–8.78)
2-day	**2.40** (2.10–2.76)	**2.76** (2.41–3.17)	**3.34** (2.91–3.85)	**3.83** (3.32–4.44)	**4.52** (3.78–5.37)	**5.06** (4.13–6.07)	**5.60** (4.42–6.86)	**6.16** (4.66–7.71)	**6.90** (5.02–8.85)	**7.48** (5.29–9.71)
3-day	**2.62** (2.30–3.00)	**2.99** (2.62–3.43)	**3.61** (3.15–4.14)	**4.12** (3.58–4.75)	**4.85** (4.07–5.74)	**5.42** (4.45–6.48)	**6.00** (4.75–7.32)	**6.60** (5.01–8.23)	**7.40** (5.40–9.44)	**8.02** (5.70–10.4)
4-day	**2.81** (2.48–3.21)	**3.19** (2.80–3.64)	**3.82** (3.34–4.37)	**4.35** (3.79–5.00)	**5.11** (4.31–6.03)	**5.71** (4.70–6.81)	**6.32** (5.03–7.70)	**6.96** (5.31–8.67)	**7.83** (5.74–9.97)	**8.50** (6.06–11.0)
7-day	**3.33** (2.95–3.78)	**3.72** (3.29–4.22)	**4.39** (3.86–4.99)	**4.96** (4.34–5.66)	**5.80** (4.92–6.82)	**6.47** (5.37–7.69)	**7.18** (5.75–8.70)	**7.92** (6.08–9.82)	**8.94** (6.60–11.3)	**9.75** (7.00–12.5)
10-day	**3.82** (3.38–4.31)	**4.23** (3.74–4.78)	**4.93** (4.35–5.58)	**5.55** (4.87–6.30)	**6.44** (5.49–7.55)	**7.17** (5.97–8.50)	**7.94** (6.38–9.59)	**8.75** (6.74–10.8)	**9.87** (7.32–12.5)	**10.8** (7.75–13.7)
20-day	**5.24** (4.67–5.88)	**5.76** (5.12–6.45)	**6.62** (5.87–7.44)	**7.36** (6.49–8.30)	**8.41** (7.20–9.75)	**9.26** (7.74–10.8)	**10.1** (8.18–12.1)	**11.0** (8.55–13.5)	**12.3** (9.15–15.4)	**13.2** (9.60–16.8)
30-day	**6.46** (5.78–7.21)	**7.08** (6.33–7.91)	**8.10** (7.21–9.06)	**8.95** (7.92–10.0)	**10.1** (8.68–11.6)	**11.0** (9.26–12.9)	**12.0** (9.70–14.2)	**12.9** (10.0–15.7)	**14.2** (10.6–17.6)	**15.1** (11.0–19.1)
45-day	**8.03** (7.21–8.92)	**8.80** (7.89–9.78)	**10.0** (8.96–11.2)	**11.0** (9.80–12.3)	**12.4** (10.6–14.1)	**13.4** (11.2–15.4)	**14.3** (11.6–16.9)	**15.3** (11.9–18.5)	**16.6** (12.4–20.5)	**17.5** (12.8–22.0)
60-day	**9.39** (8.45–10.4)	**10.3** (9.25–11.4)	**11.7** (10.5–13.0)	**12.8** (11.4–14.3)	**14.3** (12.3–16.2)	**15.4** (12.9–17.7)	**16.4** (13.3–19.2)	**17.4** (13.6–20.9)	**18.6** (14.0–22.9)	**19.5** (14.3–24.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Graphical Output from the PFDS:



GEI Consultants	Client	We Energies			Page	4 of 4
	Project	PIPP LF Run-on and Run-off Control Plan			Rev.	0
	By	C. Fritsch	Chk.	J. Trast	App.	J. Trast
	Date	10/03/2016	Date	10/7/2016	Date	10/7/2016
GEI Project No.	1610536	Document No.	N/A			
Subject	NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume					

Regulations:

The Presque Isle Landfill is regulated under 40 CFR Part 257 Subpart D – Standards for Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments as an existing landfill. The regulations specify that landfill must have the following plans in place:

- 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.
- 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.

Conclusion:

The 24-hour, 25-year storm for the PIPP Landfill is 3.94 inches. This value will be utilized in the stormwater run-off model (under a separate calculation package).

Appendix C

Stormwater Run-off Calculations

GEI Consultants	**Client**	We Energies			**Page**	1 of 1
	Project	PIPP LF #3 Run-on and Run-off Control Plan			**Rev.**	0
	By	W. Reybrock	**Chk.**	J. Trast	**App.**	J. Trast
	Date	12/11/2019	**Date**	12/15/2019	**Date**	12/17/2019
GEI Project No.	1610536	**Document No.**	N/A			
Subject	Stormwater Run-off Calculations					

Purpose:

The purpose of this calculation is to model the stormwater run-off associated with 24-hr, 25-yr precipitation event at Presque Isle Power Plant (PIPP) Landfill #3 from active areas of Cells 1 and 2.

Design Criteria and Assumptions:

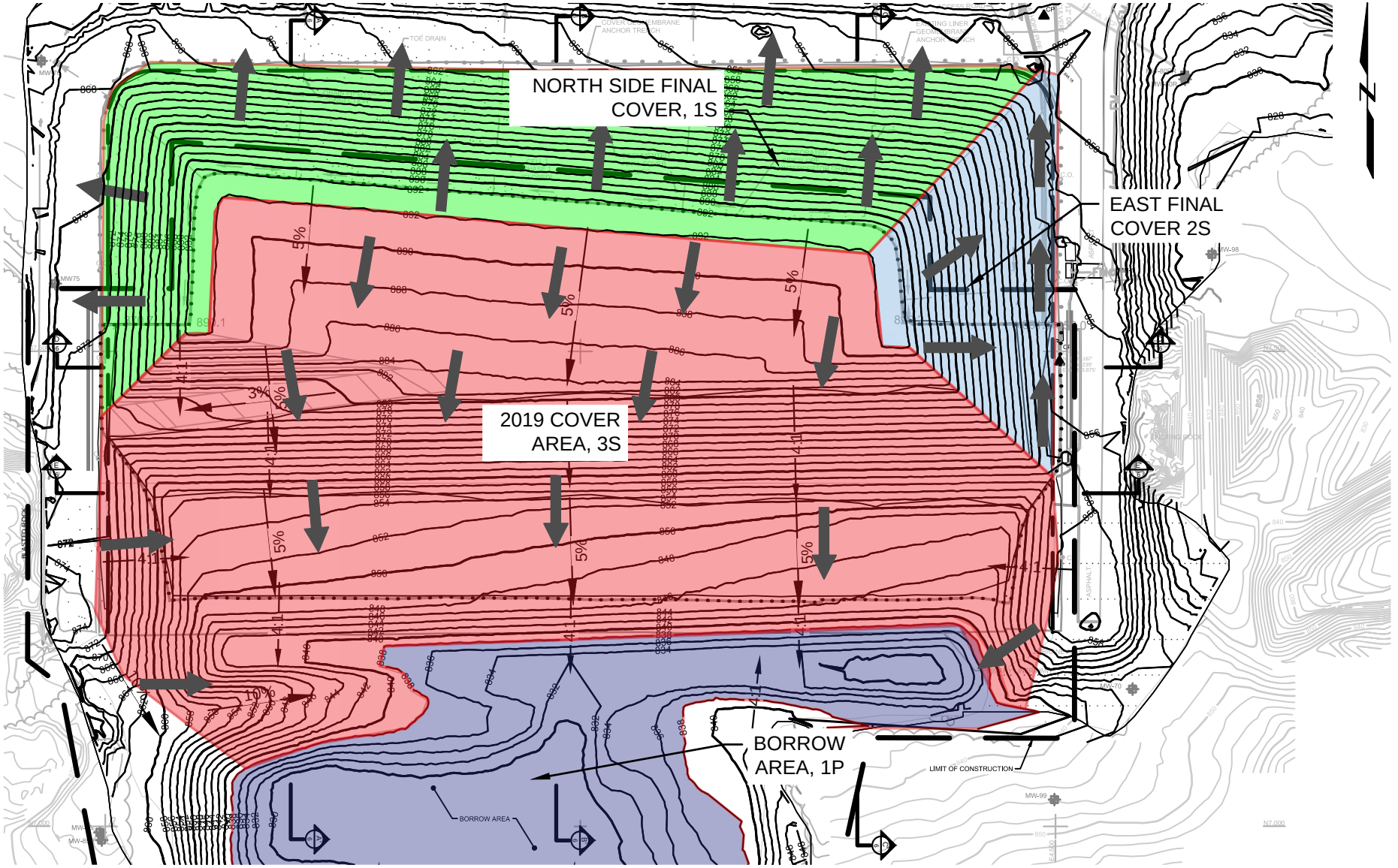
1. The rainfall depth estimation for the 24-hr, 25-yr event was determined to be 3.94 inches (included under a separated calculation package). The rainfall depth was determined by following procedures outlined in Precipitation-Frequency (PF) Atlas of the United States (Atlas 14, Volume 8, Version 2: Michigan).
2. HydroCAD 10.0 was used to model the stormwater associated with Cell 1 and 2 of the PIPP landfill.
3. The stormwater model is representative of the worst case after final cover construction. The active filling area is divided into three (3) subcatchments: North side, east side, and new final cover/grading placed in 2019. Stormwater for the subcatchments is routed as either sheet flow or shallow concentrated flow directly into the borrow area on the south of the landfill, or as sheet flow until the water is intercepted by a temporary containment ditch. Water is conveyed from the containment ditch to the north by an 18-inch culvert. In the borrow area the run-off water is allowed to infiltrate into the ground. Stormwater flowlines, subcatchments, and the intercell stormwater surge area are shown on Figure 1.
4. Subcatchment, reach, and detention parameters are included in the attached HydroCAD Report.

Results:

The attached HydroCAD report includes input and output for the stormwater run-off model developed for the PIPP Landfill No. 3. Based on stormwater run-off analysis the current run-off control system for PIPP Landfill No. 3 will be able to handle the 24-hr, 25yr precipitation event without overflowing any stormwater containment. The estimated peak water level in the east intermediate cover temporary v-notch ditch is 0.52-feet-deep. The stormwater surge area has a minimum crest elevation of approximately El. +840 feet, and the estimated water level associated with the stormwater from Cell 1 and 2 is El. +830.99 feet. Both the conveyance channels and the pond area are capable of handling the run-off from PIPP No. 3 associated with the 24-hr, 25-yr precipitation event.

Attachments:

- Figure 1 – Stormwater Flow Diagram
- HydroCAD Summary Report



SOURCE:

1. PLAN BASED ON DWG C-4, PRESQUE ELSE POWER PLANT LANDFILL #3, ASH LANDFILL FINAL GRADES

Run-on and Run-off Control Plan
Presque Isle Power Plant Ash Landfill No. 3
Marquette, Michigan

We Energies
Milwaukee, Wisconsin

GEI Consultants

Stormwater Flow Diagram

Project 1803049 | November 2019 | Fig. 1

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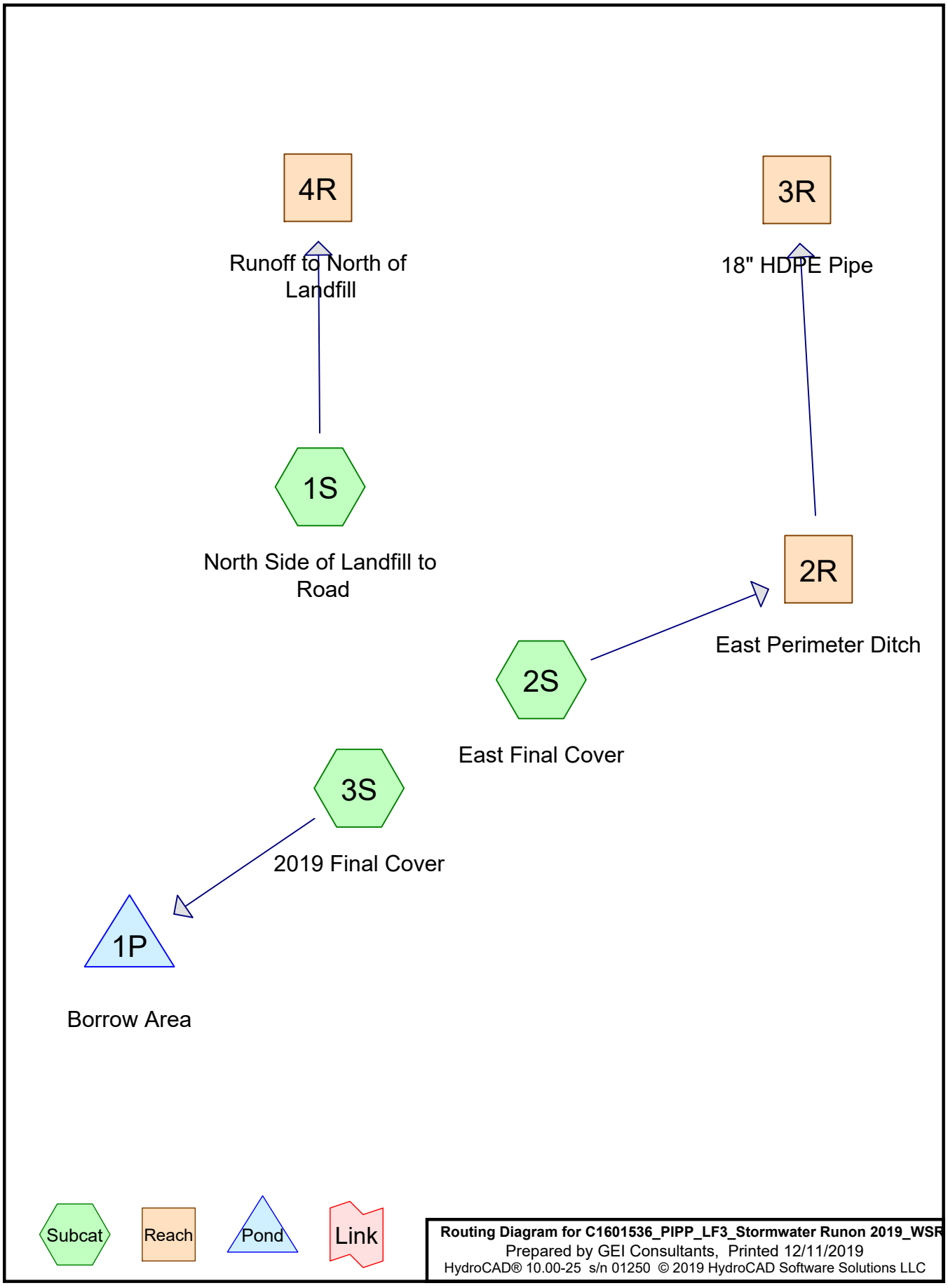


Routing Diagram for C1601536_PIPP_LF3_Stormwater Runon 2019_WSR
Prepared by GEI Consultants, Printed 12/11/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
14.340	71	Meadow, non-grazed, HSG C (1S, 2S, 3S)
14.340	**71**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
14.340	HSG C	1S, 2S, 3S
0.000	HSG D	
0.000	Other	
14.340		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	14.340	0.000	0.000	14.340	Meadow, non-grazed	1S, 2S, 3S
0.000	**0.000**	**14.340**	**0.000**	**0.000**	**14.340**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3R	846.18	839.04	90.0	0.0793	0.010	18.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: North Side of Landfill to Runoff Area=3.610 ac 0.00% Impervious Runoff Depth=1.35"
Flow Length=1,015' Tc=11.2 min CN=71 Runoff=6.98 cfs 0.407 af

Subcatchment 2S: East Final Cover Runoff Area=1.150 ac 0.00% Impervious Runoff Depth=1.35"
Flow Length=170' Slope=0.2500 '/' Tc=5.7 min CN=71 Runoff=2.69 cfs 0.130 af

Subcatchment 3S: 2019 Final Cover Runoff Area=9.580 ac 0.00% Impervious Runoff Depth=1.35"
Flow Length=790' Tc=18.5 min CN=71 Runoff=14.40 cfs 1.080 af

Reach 2R: East Perimeter Ditch Avg. Flow Depth=0.52' Max Vel=2.78 fps Inflow=2.69 cfs 0.130 af
n=0.030 L=275.0' S=0.0200 '/' Capacity=95.49 cfs Outflow=2.48 cfs 0.130 af

Reach 3R: 18" HDPE Pipe Avg. Flow Depth=0.26' Max Vel=12.12 fps Inflow=2.48 cfs 0.130 af
18.0" Round Pipe n=0.010 L=90.0' S=0.0793 '/' Capacity=38.46 cfs Outflow=2.47 cfs 0.130 af

Reach 4R: Runoff to North of Landfill Inflow=6.98 cfs 0.407 af
Outflow=6.98 cfs 0.407 af

Pond 1P: Borrow Area Peak Elev=830.99' Storage=47,055 cf Inflow=14.40 cfs 1.080 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 14.340 ac Runoff Volume = 1.617 af Average Runoff Depth = 1.35"
100.00% Pervious = 14.340 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: North Side of Landfill to Road

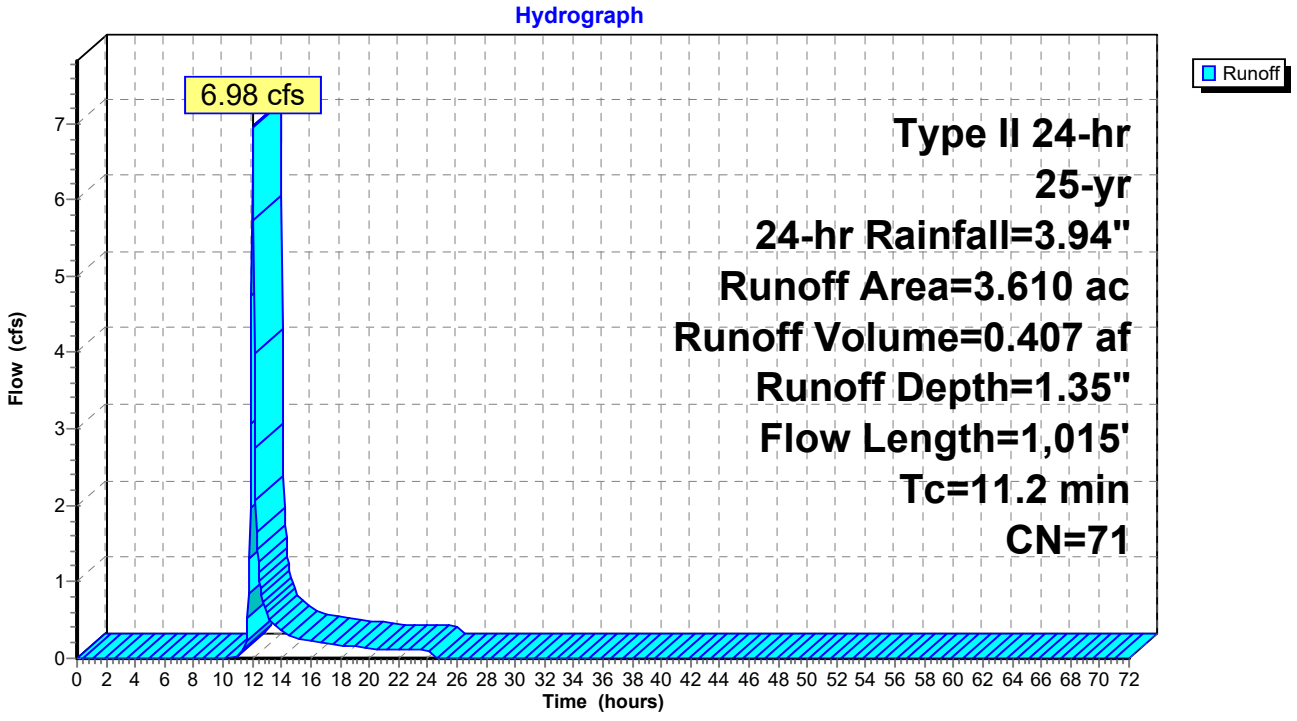
Runoff = 6.98 cfs @ 12.04 hrs, Volume= 0.407 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=3.94"

Area (ac)	CN	Description
3.610	71	Meadow, non-grazed, HSG C
3.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	140	0.2500	0.48		**Sheet Flow, Down Slope** Range n= 0.130 P2= 2.36"
6.4	875	0.0200	2.28		**Shallow Concentrated Flow, North Raod** Unpaved Kv= 16.1 fps
11.2	1,015	Total			

Subcatchment 1S: North Side of Landfill to Road



Summary for Subcatchment 2S: East Final Cover

[49] Hint: Tc<2dt may require smaller dt

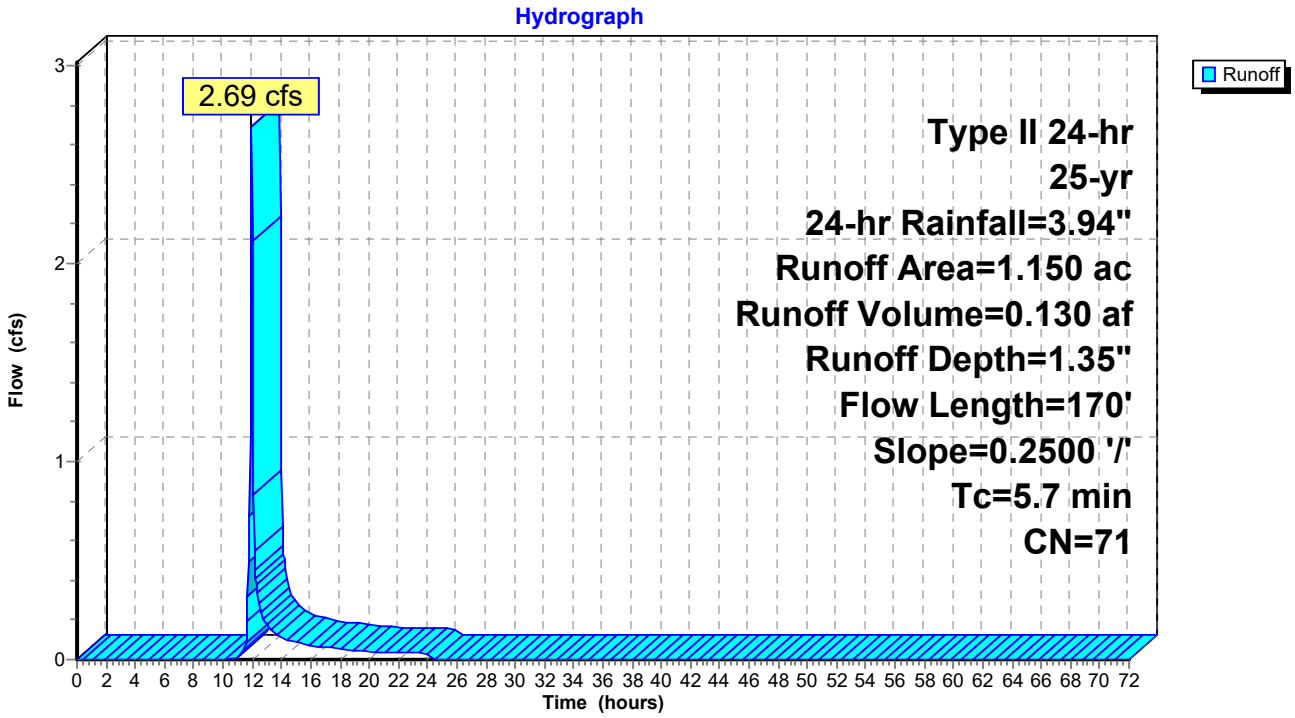
Runoff = 2.69 cfs @ 11.97 hrs, Volume= 0.130 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=3.94"

Area (ac)	CN	Description
1.150	71	Meadow, non-grazed, HSG C
1.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	170	0.2500	0.50		**Sheet Flow, East Slope Final Cover** Range n= 0.130 P2= 2.36"

Subcatchment 2S: East Final Cover



Summary for Subcatchment 3S: 2019 Final Cover

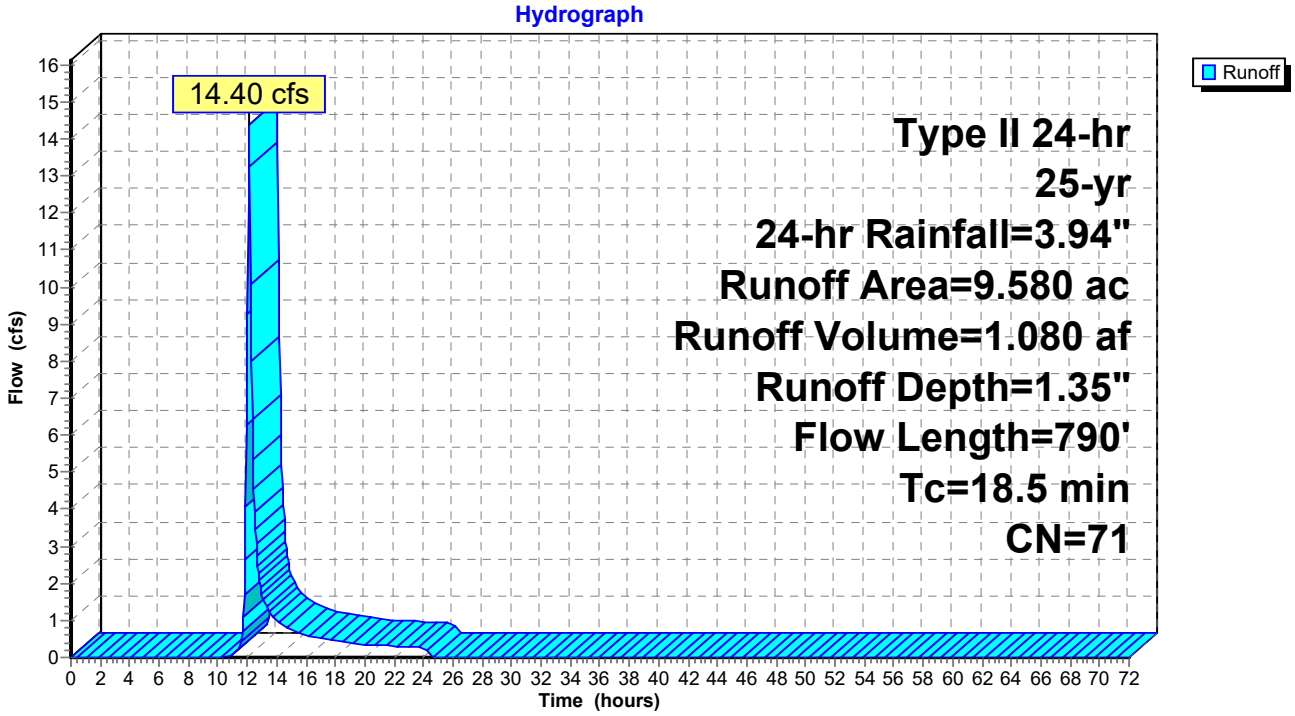
Runoff = 14.40 cfs @ 12.12 hrs, Volume= 1.080 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=3.94"

Area (ac)	CN	Description
9.580	71	Meadow, non-grazed, HSG C
9.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	230	0.0500	0.28		**Sheet Flow, 2019 Cover Slope** Range n= 0.130 P2= 2.36"
0.3	140	0.2500	7.50		**Shallow Concentrated Flow, Downslope** Grassed Waterway Kv= 15.0 fps
1.5	140	0.0500	1.57		**Shallow Concentrated Flow, 5% Slope** Short Grass Pasture Kv= 7.0 fps
3.0	280	0.0500	1.57		**Shallow Concentrated Flow, Southern slope** Short Grass Pasture Kv= 7.0 fps
18.5	790	Total			

Subcatchment 3S: 2019 Final Cover



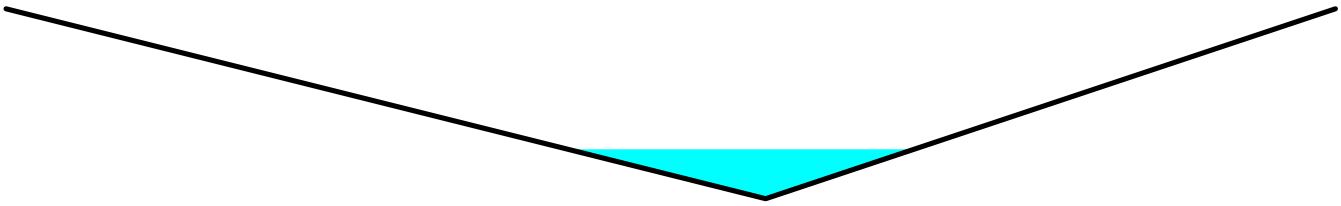
Summary for Reach 2R: East Perimeter Ditch

Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 1.35" for 25-yr, 24-hr event
Inflow = 2.69 cfs @ 11.97 hrs, Volume= 0.130 af
Outflow = 2.48 cfs @ 12.02 hrs, Volume= 0.130 af, Atten= 8%, Lag= 2.8 min

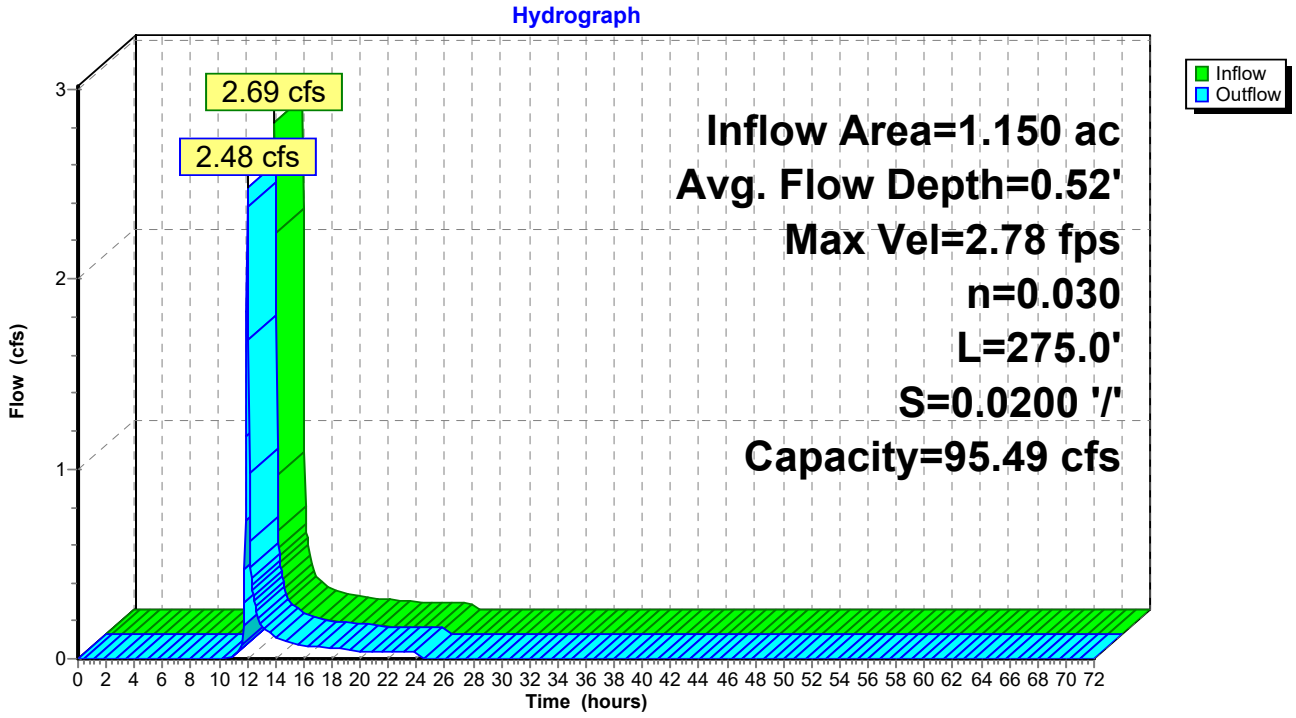
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.78 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 4.3 min

Peak Storage= 260 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 95.49 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 3.0 '/' Top Width= 14.00'
Length= 275.0' Slope= 0.0200 '/'
Inlet Invert= 852.00', Outlet Invert= 846.50'



Reach 2R: East Perimeter Ditch



Summary for Reach 3R: 18" HDPE Pipe

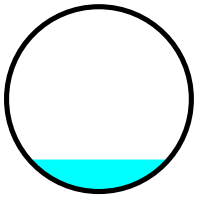
[52] Hint: Inlet/Outlet conditions not evaluated

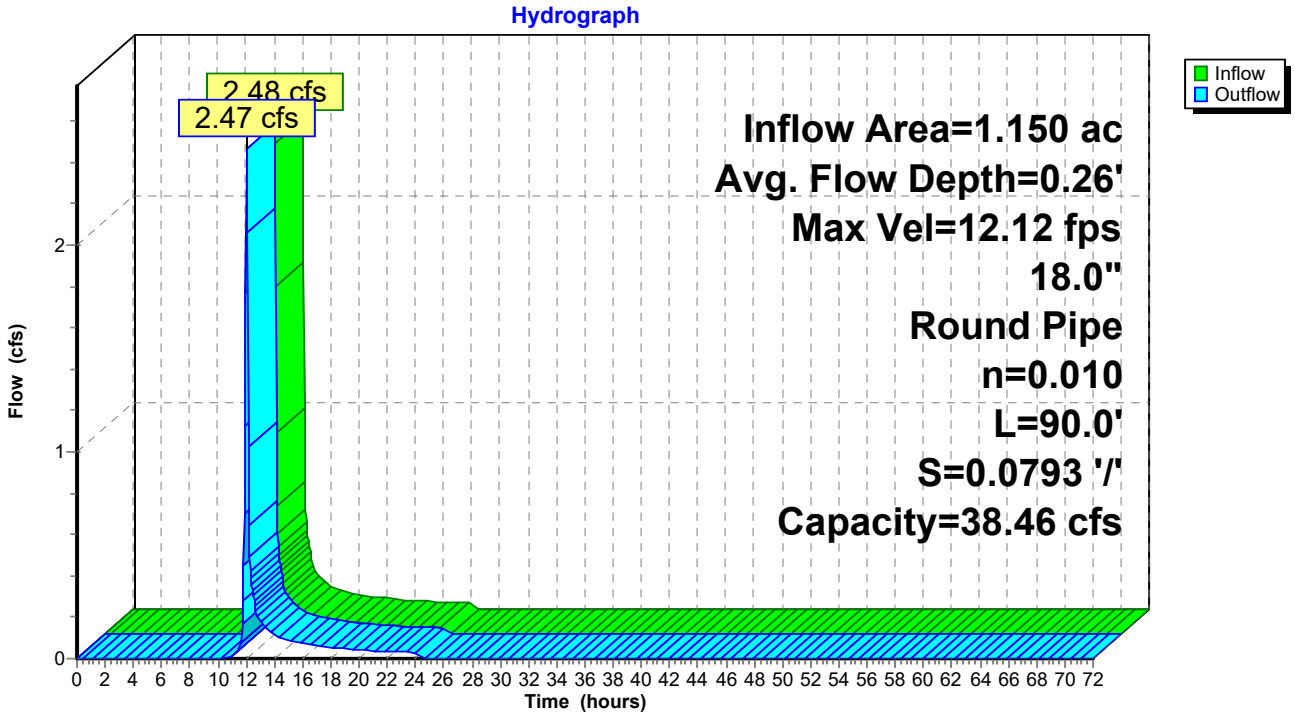
Inflow Area = 1.150 ac, 0.00% Impervious, Inflow Depth = 1.35" for 25-yr, 24-hr event
Inflow = 2.48 cfs @ 12.02 hrs, Volume= 0.130 af
Outflow = 2.47 cfs @ 12.03 hrs, Volume= 0.130 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.12 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.13 fps, Avg. Travel Time= 0.4 min

Peak Storage= 18 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 38.46 cfs

18.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 90.0' Slope= 0.0793 '/'
Inlet Invert= 846.18', Outlet Invert= 839.04'





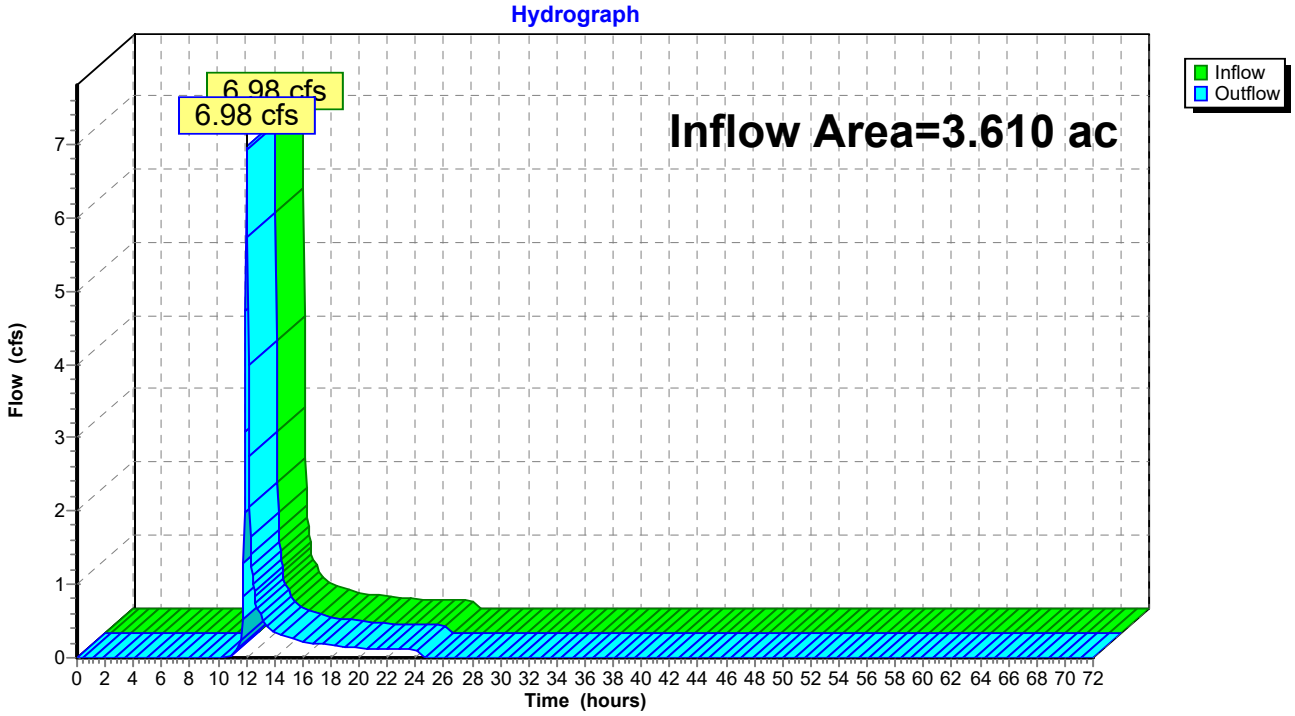
Summary for Reach 4R: Runoff to North of Landfill

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.610 ac, 0.00% Impervious, Inflow Depth = 1.35" for 25-yr, 24-hr event
Inflow = 6.98 cfs @ 12.04 hrs, Volume= 0.407 af
Outflow = 6.98 cfs @ 12.04 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 4R: Runoff to North of Landfill



Summary for Pond 1P: Borrow Area

Inflow Area = 9.580 ac, 0.00% Impervious, Inflow Depth = 1.35" for 25-yr, 24-hr event
Inflow = 14.40 cfs @ 12.12 hrs, Volume= 1.080 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 830.99' @ 25.10 hrs Surf.Area= 52,095 sf Storage= 47,055 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	830.00'	1,110,416 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
830.00	43,181	0	0
832.00	61,230	104,411	104,411
834.00	100,409	161,639	266,050
836.00	127,149	227,558	493,608
838.00	155,167	282,316	775,924
840.00	179,325	334,492	1,110,416

Pond 1P: Borrow Area