AECOM
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April 12, 2018

Mr. Robert Lee
DTE Electric Company
One Energy Plaza
Detroit, MI 48226

RE: CCR Impoundment Inflow Design Flood Control System Plan: Inactive Bottom Ash Impoundment (Area 15), Monroe Power Plant, DTE Energy, Monroe, Michigan

The purpose of this Inflow Design Flood Control System Plan is to document how the inflow design flood control system has been designed and constructed to meet the requirements of 40 C.F.R. § 257.82 for the Monroe Power Plant Inactive Bottom Ash Impoundment (Area 15). The hydrologic and hydraulic (H&H) analysis must assess if the basin storage capacity and hydraulic outlet structures are sufficient to pass the Inflow Design Flood Event, in a safe and non-erosive manner without overtopping the embankment.

1.0 DESIGN INPUTS

Inputs for H&H analysis include:

- Design storm based on the CCR Hazard Classification
- Basin configurations
- Basin outlet conditions
- Basin hydrology; and
- Basin stage-storage.

2.0 METHODOLOGY

H&H modeling and supporting calculations were conducted using accepted practices and models. An evaluation was made of the hydraulic capacity of the outlet structures. H&H calculations for the analysis were performed using methodologies presented in:

- SCS Unit Hydrograph Method, (TR-20);
- “Urban Hydrology of Small Watersheds: Technical Release No. 55” (TR-55);
- “Earth Dams and Reservoirs: Technical Release No. 60” (TR-60); and
- NOAA Atlas 14 Point Precipitation Frequency Estimates.

The computer program HydroCAD (Version 10.0) was used to perform the H&H calculations. The existing conditions for the basin were obtained from best available reports and topographic data.

3.0 BASIN CONFIGURATION

Area 15 is an inactive CCR surface impoundment as defined by 40 CFR §257.53. It consists of a bottom ash impoundment bordered by Lake Erie to the east and the Plant cooling water discharge channel to the west, which discharges cooling water from the Monroe coal power plant to the lake. The impoundment is separated from the cooling water discharge channel and Lake Erie by a perimeter dike. The southern boundary of the ash pond is formed by an earthen divider berm constructed of aggregate material, which separates the ash pond from the process waste and stormwater basin to the south. The two basins are hydraulically connected via two 36 inch diameter

corrugated plastic pipes (shielded by a boom curtain) and a low section of the berm to serve as an auxiliary spillway. The normal water surface elevation of Area 15 is approximately 574.40 ft (Plant Datum) and normal/average annual high water surface elevation of Lake Erie/the cooling water discharge channel is 571.76 ft (Plant Datum). Industrial process water and storm water discharge from Area 15 into the cooling water discharge channel via an overflow weir. The overflow weir consists of a 203 foot long sharp crested weir which discharges onto a riprap apron and then into the cooling water discharge channel.

The following table provides information on the existing conditions for the basin.

Existing Basin Conditions

Basin Characteristic	Basin
Dike Crest Elevation (ft)	576.00
Basin Surface Area (acres)	104.48
Initial Pool Elevation (ft)	574.40
Contributing Watershed Area (acres)	313.43
Est. Curve Number (CN)	90
Time of Concentration (min)	35.2
Spillway Characteristic	
Length (ft)	203
Material	Steel
Elevation (ft)	574.31
Outlet Type	Weir
Basin Discharge Receiving Waterbody/Watershed	cooling water discharge channel (Lake Erie)

Note: Elevations presented in table above are based on Plant Datum. Add 0.84 to convert elevations from Plant Datum to NAVD88.

4.0 BASIN STAGE-STORAGE

The available storage for the basin was calculated from the assumed initial water elevations to the dike crest. The storage was calculated using the irregular volume calculation method with elevation, surface area, and perimeter input data. The storage volumes were calculated from available topographic data for the basin.

5.0 INFLOW DESIGN STORM EVENT

Area 15 has a Hazard Potential Classification of Significant. Therefore, the minimum Inflow Design Flood Event for this basin is the 1,000-year event.

6.0 CONCLUSION

The hydrologic and hydraulic analysis and modeling indicate the basin storage capacity and hydraulic outlet structure are sufficient to pass the Inflow Design Flood Event, in a safe and non-erosive manner without overtopping the embankment. The calculated results for the H&H model are as follows:

Results	Area 15
Maximum Water Elevation (ft)	575.23
Dike Crest Elevation (ft)	576.00

The model results are provided as an attachment. Values presented for Contributing Watershed Area and Est. Curve Number have been separated for informational purposes.

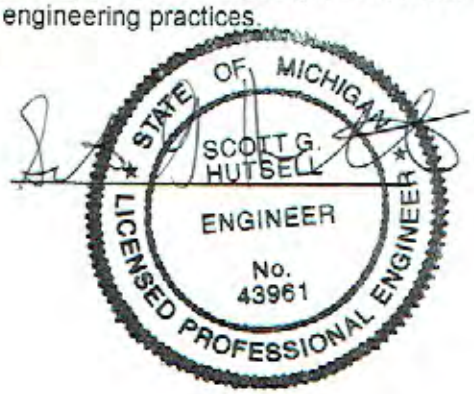
7.0 AMENDMENTS TO THE PLAN

The owner or operator of the CCR unit may amend the written inflow design flood control system plan at any time provided the revised plan at any time provided the revised plan is placed in the facility's operating record as required by §257.105(g)(4). The owner or operator must amend the written inflow design flood control plan whenever there is a change in conditions that would substantially affect the written plan in effect.

AECOM

Professional Engineer Certification

I, Scott G. Hutsell, being a Registered Professional Engineer, in accordance with the Michigan Professional Engineer's Registration, do hereby certify to the best of my knowledge, information and belief, that this Inflow Design Flood Control Plan, dated April 12, 2018, meets the requirements of 40 C.F.R. § 257.82, is true and correct, and has been prepared in accordance with generally accepted good engineering practices.

SIGNATURE 

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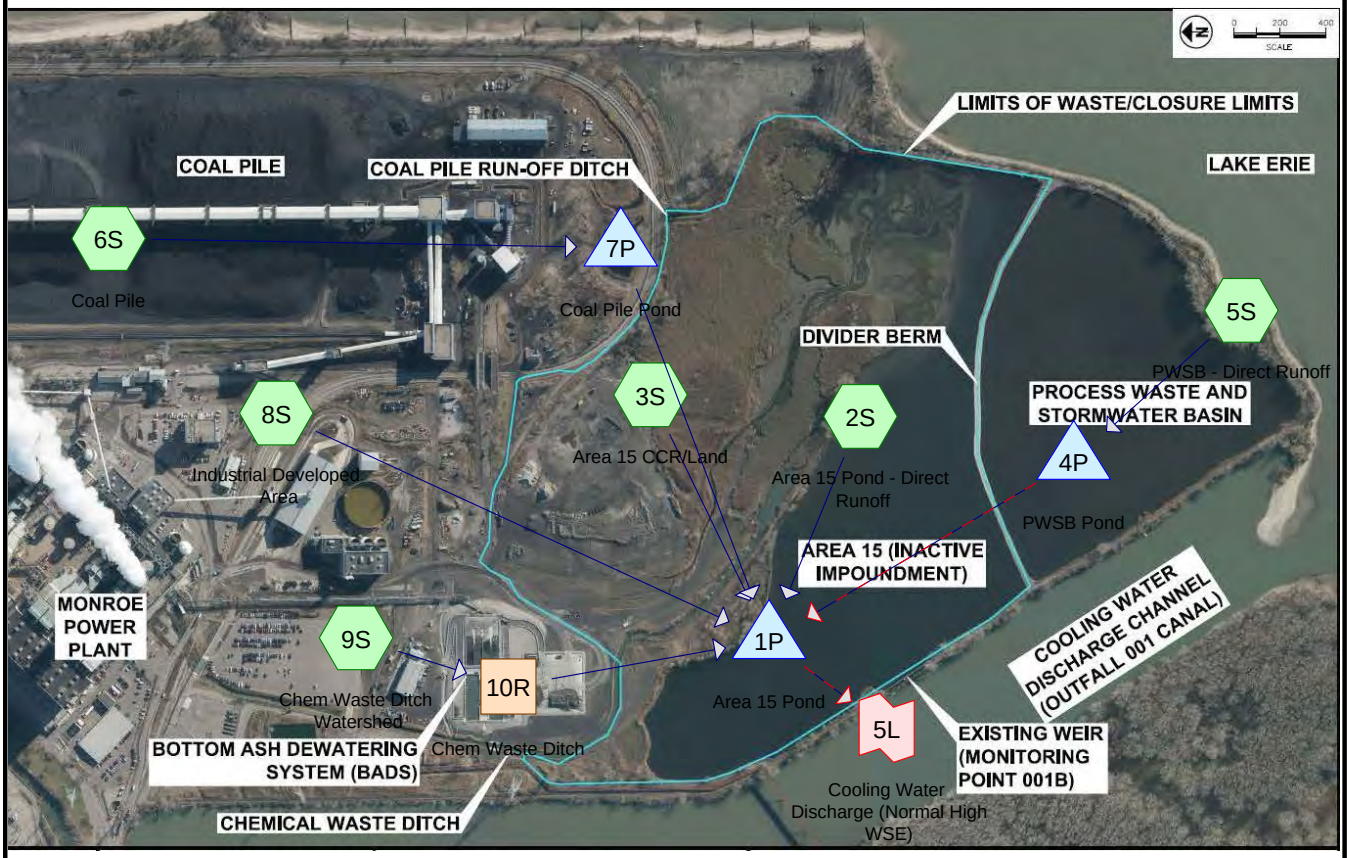


Subcat Reach Pond Link

Routing Diagram for DTE MONPP Area 15 Closure - Existing
Prepared by AECOM, Printed 3/29/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
16.137	84	50-75% Grass cover, Fair, HSG D (6S)
27.140	80	Bottom Ash (3S)
80.685	86	Coal (6S)
10.400	96	Gravel surface, HSG D (2S, 3S)
27.140	71	Meadow, non-grazed, HSG C (3S)
25.190	98	Paved parking, HSG A (9S)
28.680	98	Unconnected pavement, HSG A (8S)
10.758	98	Unconnected roofs, HSG A (6S)
87.300	98	Water Surface, HSG A (2S, 5S)
313.430	**90**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 2S: Area 15 Pond - Direct Runoff Area=53.300 ac 94.18% Impervious Runoff Depth=7.25"
Flow Length=2,392' Tc=2.2 min CN=98 Runoff=640.28 cfs 32.204 af

Subcatchment 3S: Area 15 CCR/Land Runoff Area=61.580 ac 0.00% Impervious Runoff Depth=4.92"
Flow Length=2,500' Slope=0.0400 '/' Tc=35.2 min CN=78 Runoff=236.07 cfs 25.256 af

Subcatchment 5S: PWSB - Direct Runoff Runoff Area=37.100 ac 100.00% Impervious Runoff Depth=7.25"
Flow Length=1,650' Tc=2.6 min CN=98 Runoff=440.91 cfs 22.416 af

Subcatchment 6S: Coal Pile Runoff Area=107.580 ac 10.00% Impervious Runoff Depth=5.84"
Flow Length=4,600' Tc=19.0 min UI Adjusted CN=86 Runoff=695.11 cfs 52.337 af

Subcatchment 8S: Industrial Developed Runoff Area=28.680 ac 100.00% Impervious Runoff Depth=7.25"
Flow Length=1,892' Slope=0.0100 '/' Tc=25.1 min CN=98 Runoff=178.06 cfs 17.329 af

Subcatchment 9S: Chem Waste Ditch Runoff Area=25.190 ac 100.00% Impervious Runoff Depth=7.25"
Flow Length=2,147' Slope=0.0100 '/' Tc=27.7 min CN=98 Runoff=147.37 cfs 15.220 af

Reach 10R: Chem Waste Ditch Avg. Flow Depth=3.26' Max Vel=2.32 fps Inflow=165.46 cfs 86.997 af
n=0.025 L=2,800.0' S=0.0005 '/' Capacity=425.28 cfs Outflow=124.70 cfs 86.105 af

Pond 1P: Area 15 Pond Peak Elev=575.23' Storage=17,066,417 cf Inflow=1,200.99 cfs 235.646 af
Primary=600.47 cfs 235.628 af Secondary=0.00 cfs 0.000 af Outflow=600.47 cfs 235.628 af

Pond 4P: PWSB Pond Peak Elev=574.93' Storage=4,926,172 cf Inflow=440.91 cfs 22.416 af
Primary=22.69 cfs 22.407 af Secondary=0.00 cfs 0.000 af Outflow=22.69 cfs 22.407 af

Pond 7P: Coal Pile Pond Peak Elev=579.28' Storage=317,582 cf Inflow=695.11 cfs 52.337 af
Outflow=682.90 cfs 52.345 af

Link 5L: Cooling Water Discharge (Normal High WSE) Inflow=600.47 cfs 235.628 af
Primary=600.47 cfs 235.628 af

Total Runoff Area = 313.430 ac Runoff Volume = 164.763 af Average Runoff Depth = 6.31"
51.53% Pervious = 161.502 ac 48.47% Impervious = 151.928 ac

Summary for Subcatchment 2S: Area 15 Pond - Direct Runoff

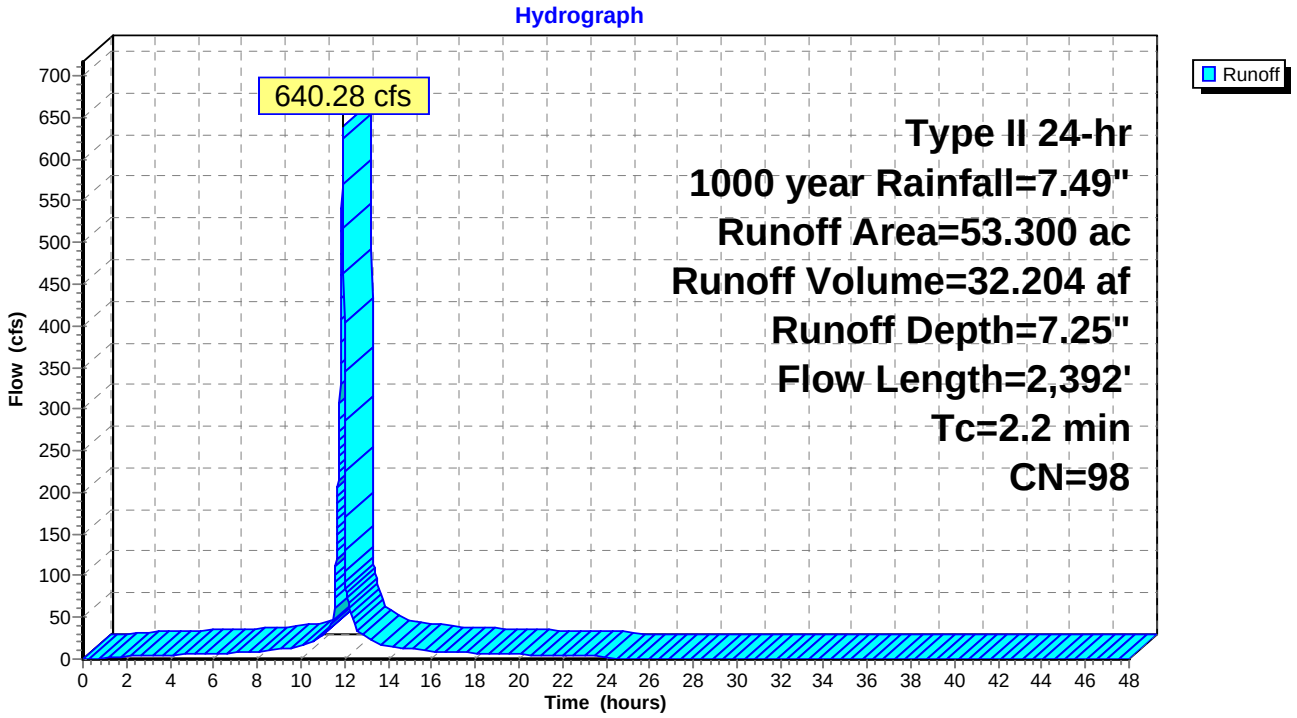
Runoff = 640.28 cfs @ 11.92 hrs, Volume= 32.204 af, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1000 year Rainfall=7.49"

Area (ac)	CN	Description
50.200	98	Water Surface, HSG A
3.100	96	Gravel surface, HSG D
53.300	98	Weighted Average
3.100		5.82% Pervious Area
50.200		94.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	2,392		17.94		**Lake or Reservoir, Lake** Mean Depth= 10.00'

Subcatchment 2S: Area 15 Pond - Direct Runoff



Summary for Subcatchment 3S: Area 15 CCR/Land

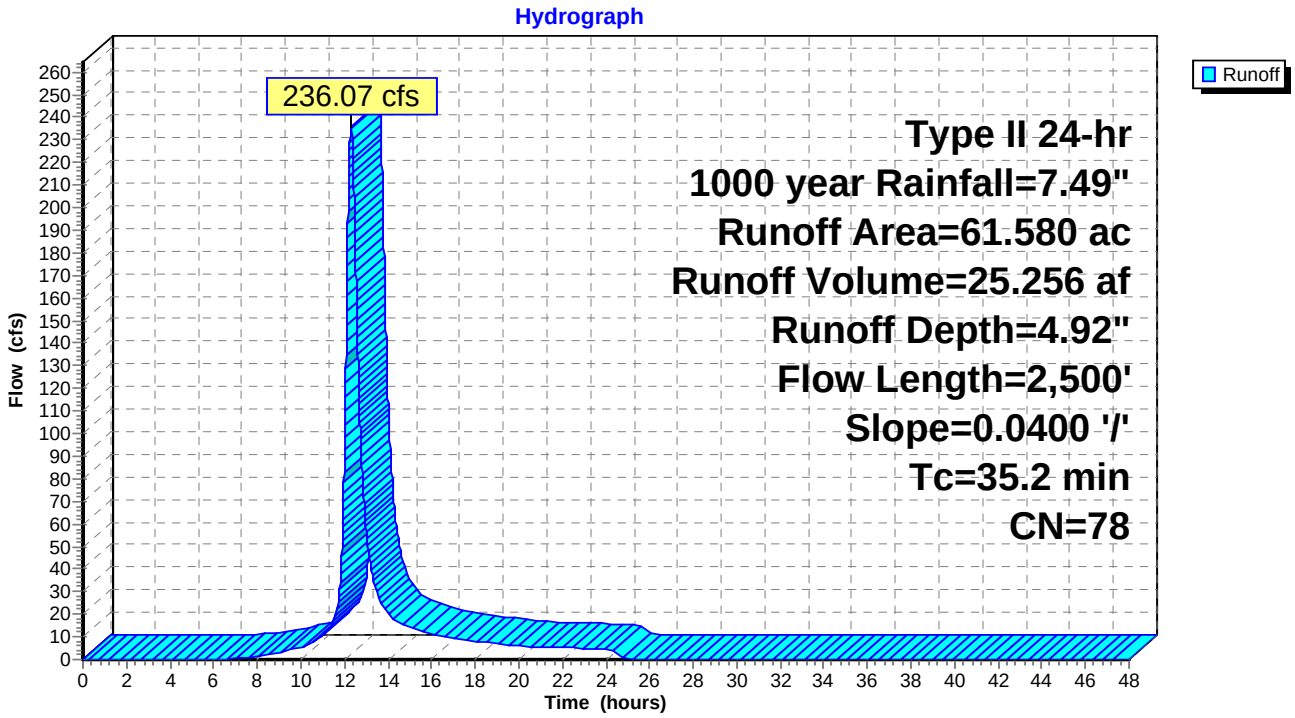
Runoff = 236.07 cfs @ 12.31 hrs, Volume= 25.256 af, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1000 year Rainfall=7.49"

	Area (ac)	CN	Description
	27.140	71	Meadow, non-grazed, HSG C
*	27.140	80	Bottom Ash
	7.300	96	Gravel surface, HSG D
	61.580	78	Weighted Average
	61.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	2,500	0.0400	1.19		**Lag/CN Method,**

Subcatchment 3S: Area 15 CCR/Land



Summary for Subcatchment 5S: PWSB - Direct Runoff

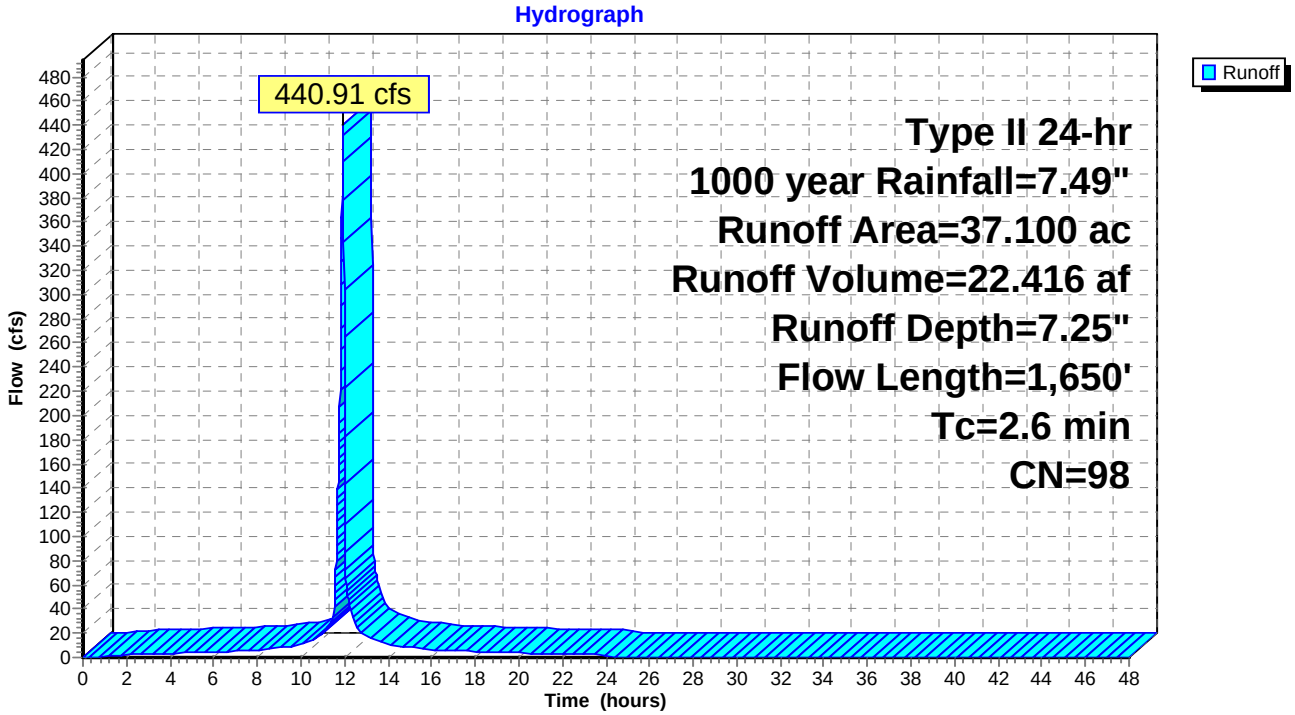
Runoff = 440.91 cfs @ 11.93 hrs, Volume= 22.416 af, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1000 year Rainfall=7.49"

Area (ac)	CN	Description
37.100	98	Water Surface, HSG A
37.100		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	1,650		10.46		**Lake or Reservoir, Lake** Mean Depth= 3.40'

Subcatchment 5S: PWSB - Direct Runoff



Summary for Subcatchment 6S: Coal Pile

Time of concentration was calculated conservatively for the coal pile due to lack of topography for the area and information about the drainage ditches.

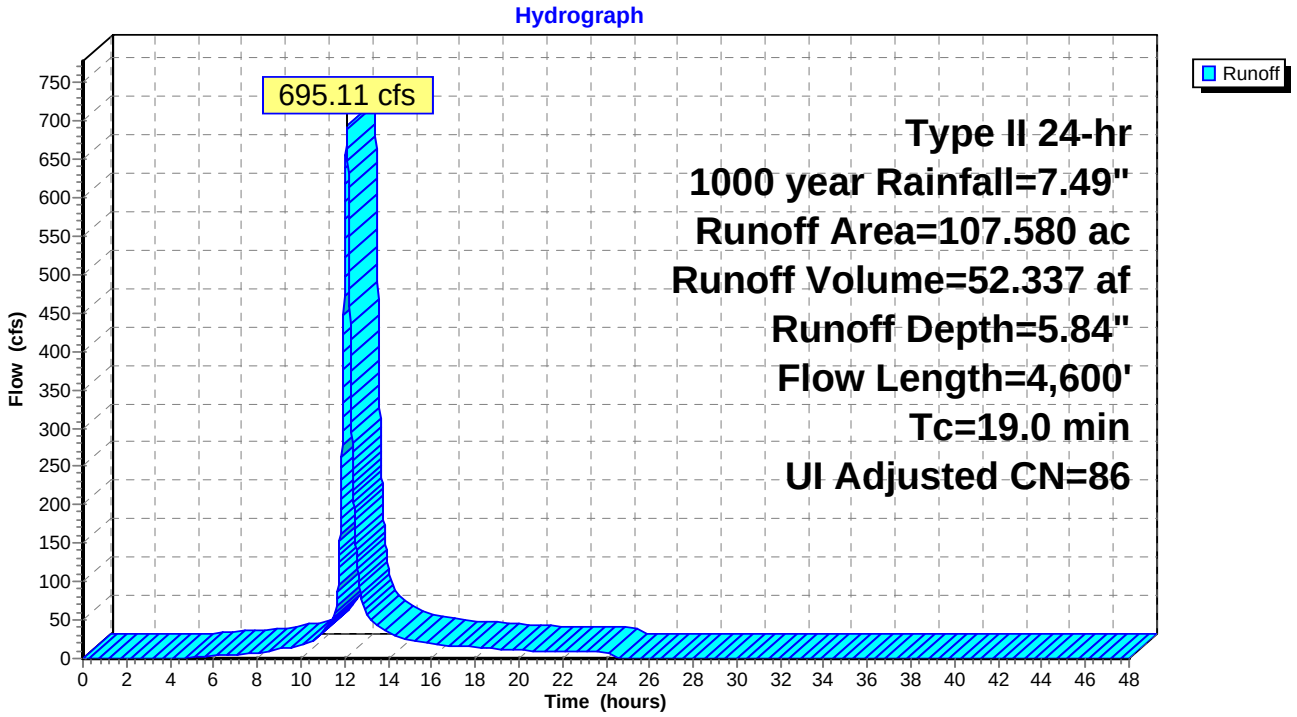
Runoff = 695.11 cfs @ 12.10 hrs, Volume= 52.337 af, Depth= 5.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1000 year Rainfall=7.49"

	Area (ac)	CN	Adj	Description
*	80.685	86		Coal
	10.758	98		Unconnected roofs, HSG A
	16.137	84		50-75% Grass cover, Fair, HSG D
	107.580	87	86	Weighted Average, UI Adjusted
	96.822			90.00% Pervious Area
	10.758			10.00% Impervious Area
	10.758			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	4,000	0.0010	7.25	543.56	**Channel Flow,** Area= 75.0 sf Perim= 12.0' r= 6.25' n= 0.022 Earth, clean & straight
6.0	100	0.1000	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.35"
3.8	500	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.0	4,600	Total			

Subcatchment 6S: Coal Pile



Summary for Subcatchment 8S: Industrial Developed Area

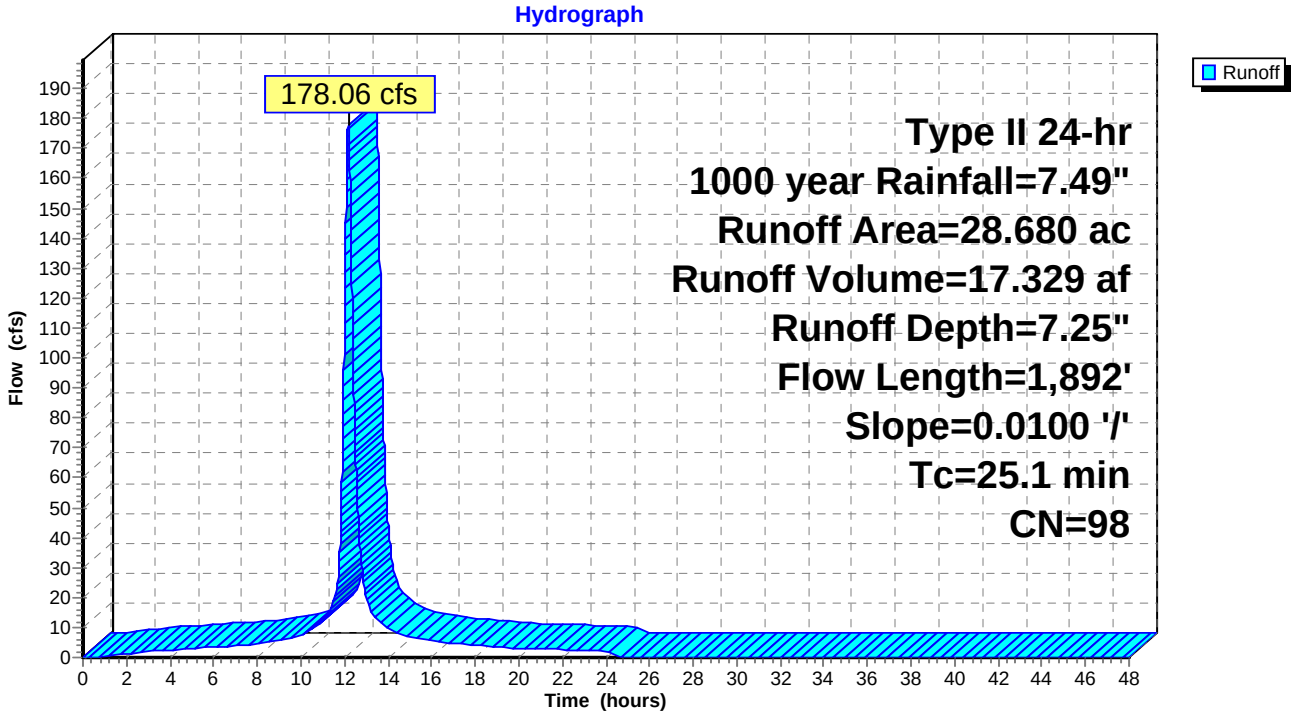
Runoff = 178.06 cfs @ 12.18 hrs, Volume= 17.329 af, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1000 year Rainfall=7.49"

Area (ac)	CN	Description
28.680	98	Unconnected pavement, HSG A
28.680		100.00% Impervious Area
28.680		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.1	1,892	0.0100	1.26		**Lag/CN Method,**

Subcatchment 8S: Industrial Developed Area



Summary for Subcatchment 9S: Chem Waste Ditch Watershed

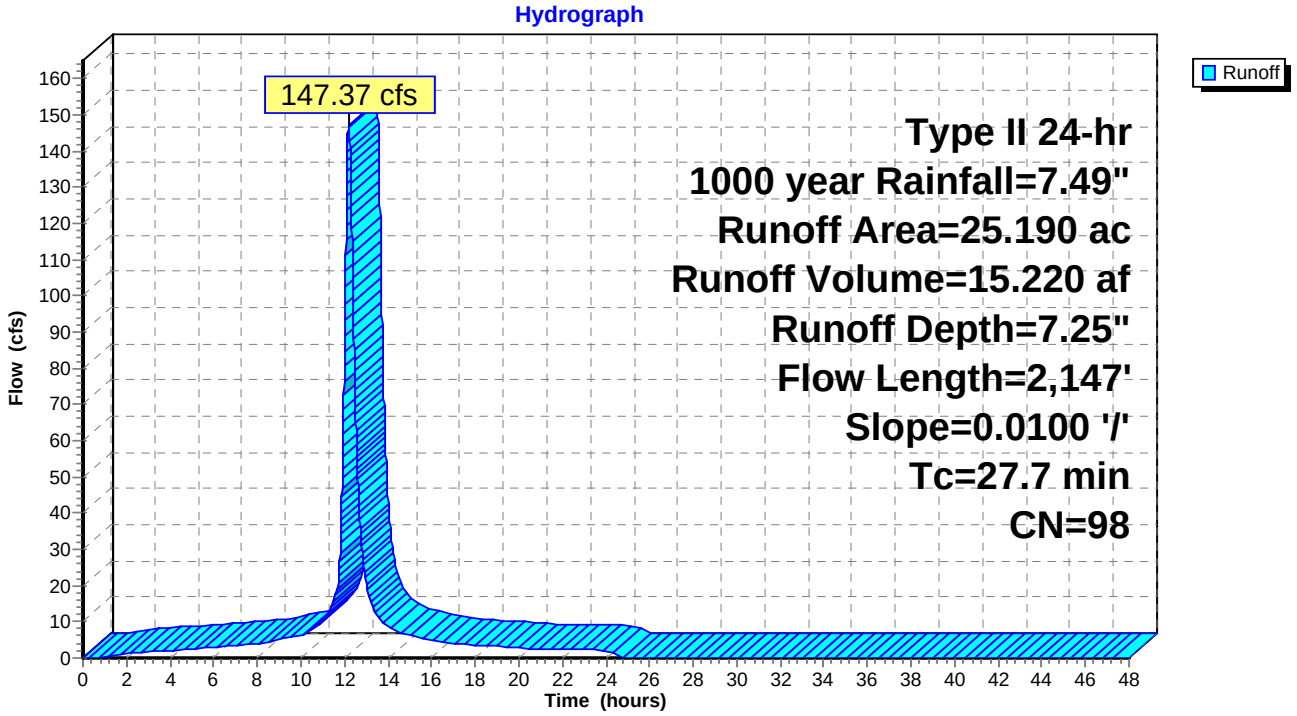
Runoff = 147.37 cfs @ 12.20 hrs, Volume= 15.220 af, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 1000 year Rainfall=7.49"

Area (ac)	CN	Description
25.190	98	Paved parking, HSG A
25.190		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.7	2,147	0.0100	1.29		**Lag/CN Method,**

Subcatchment 9S: Chem Waste Ditch Watershed



Summary for Reach 10R: Chem Waste Ditch

Baseflow is 9.32 cfs plus maximum oil/water separator storm event flow of 8.77 cfs.

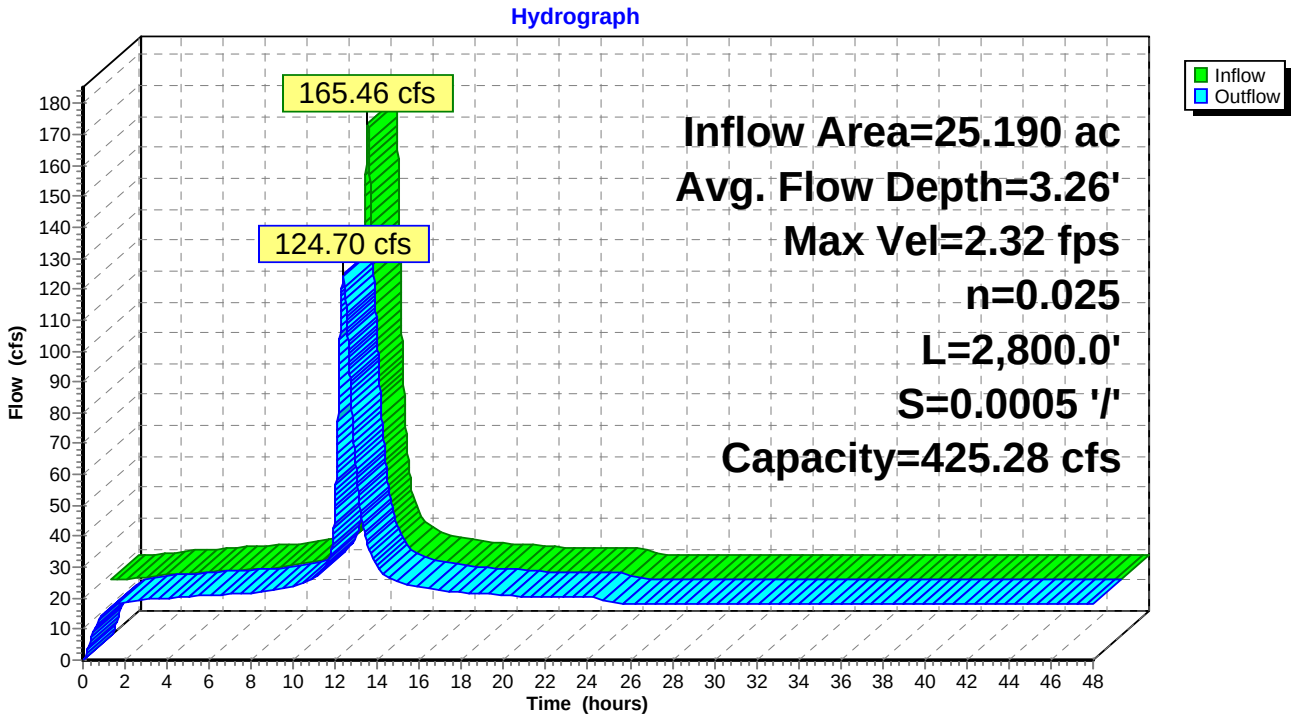
Inflow Area = 25.190 ac,100.00% Impervious, Inflow Depth > 41.44" for 1000 year event
Inflow = 165.46 cfs @ 12.20 hrs, Volume= 86.997 af, Incl. 18.09 cfs Base Flow
Outflow = 124.70 cfs @ 12.38 hrs, Volume= 86.105 af, Atten= 25%, Lag= 10.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 2.32 fps, Min. Travel Time= 20.1 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 34.4 min

Peak Storage= 150,538 cf @ 12.38 hrs
Average Depth at Peak Storage= 3.26'
Bank-Full Depth= 6.00' Flow Area= 132.0 sf, Capacity= 425.28 cfs

10.00' x 6.00' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 2.0 '/' Top Width= 34.00'
Length= 2,800.0' Slope= 0.0005 '/'
Inlet Invert= 574.50', Outlet Invert= 573.00'

Reach 10R: Chem Waste Ditch



Summary for Pond 1P: Area 15 Pond

Storage between 576 and 577 is artificial. Should not allow water level to rise above 576, as dike will begin overtopping near the existing weir.

All model elevations are in Plant Datum. Add 0.84 to convert from Plant Datum to NAVD88.

Weir dimensions/elevation based on historical drawing 6C695-270 (weir #2). Although the drawing indicates the invert to be 574.00', this was conservatively adjusted to 574.31' to calibrate with the surveyed water elevation of 574.40' and average base flow rate of 18.09 cfs.

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[62] Hint: Exceeded Reach 10R OUTLET depth by 1.39' @ 0.00 hrs
[80] Warning: Exceeded Pond 4P by 0.36' @ 12.46 hrs (31.50 cfs 4.654 af)
[80] Warning: Exceeded Pond 4P by 0.36' @ 12.46 hrs (54.38 cfs 2.666 af)
[80] Warning: Exceeded Pond 7P by 0.03' @ 3.89 hrs (3.92 cfs 0.767 af)

Inflow Area = 313.430 ac, 48.47% Impervious, Inflow Depth > 9.02" for 1000 year event
Inflow = 1,200.99 cfs @ 12.16 hrs, Volume= 235.646 af
Outflow = 600.47 cfs @ 12.49 hrs, Volume= 235.628 af, Atten= 50%, Lag= 20.0 min
Primary = 600.47 cfs @ 12.49 hrs, Volume= 235.628 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 574.40' Surf.Area= 1,866,358 sf Storage= 15,337,583 cf
Peak Elev= 575.23' @ 12.49 hrs Surf.Area= 2,293,761 sf Storage= 17,066,417 cf (1,728,834 cf above start)
Flood Elev= 576.00' Surf.Area= 2,756,436 sf Storage= 18,997,118 cf (3,659,535 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 46.8 min (1,082.5 - 1,035.8)

Volume	Invert	Avail.Storage	Storage Description
#1	555.00'	21,753,554 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

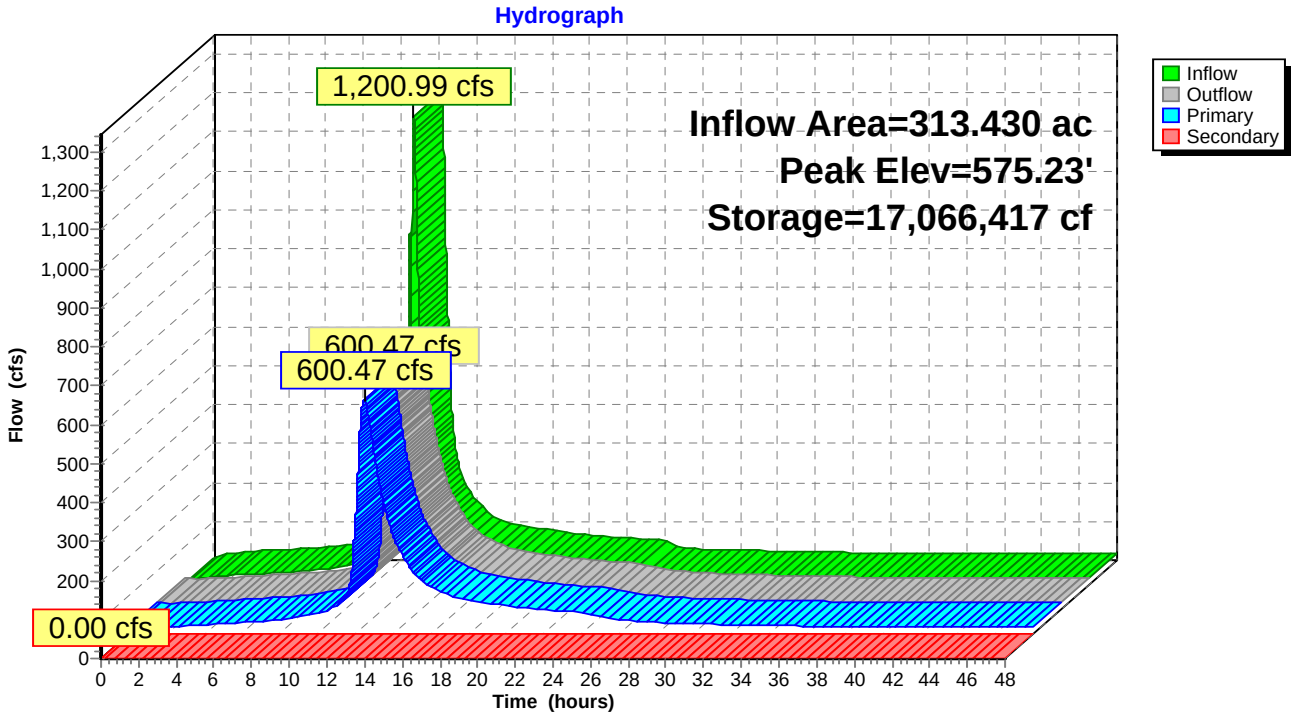
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
555.00	77,623	1,651.3	0	0	77,623
556.00	177,260	1,877.2	124,061	124,061	141,078
557.00	230,132	2,314.1	203,122	327,183	286,813
558.00	321,306	3,197.8	274,454	601,637	674,434
559.00	464,061	4,003.1	390,503	992,140	1,135,909
560.00	545,591	4,074.9	504,276	1,496,417	1,182,240
561.00	595,521	4,154.9	570,374	2,066,790	1,234,794
562.00	637,571	4,217.1	616,426	2,683,217	1,276,444
563.00	674,537	4,282.6	655,967	3,339,184	1,320,951
564.00	710,097	4,354.8	692,241	4,031,425	1,370,765
565.00	747,174	4,428.2	728,557	4,759,982	1,422,254
566.00	790,902	4,569.0	768,934	5,528,916	1,523,163
567.00	844,886	4,408.8	817,745	6,346,662	1,637,703
568.00	879,663	4,506.1	862,216	7,208,878	1,706,874
569.00	915,793	4,610.7	897,667	8,106,545	1,782,897
570.00	970,583	4,701.2	943,055	9,049,600	1,850,120
571.00	1,078,279	5,020.2	1,023,959	10,073,559	2,096,948
572.00	1,557,607	7,568.3	1,310,618	11,384,178	4,649,543
573.00	1,624,363	7,481.1	1,590,868	12,975,046	4,754,244
574.00	1,682,124	7,570.5	1,653,159	14,628,205	4,861,589
575.00	2,160,656	12,380.1	1,916,405	16,544,610	12,497,404
576.00	2,756,436	17,581.0	2,452,508	18,997,118	24,897,548
577.00	2,756,436	17,581.0	2,756,436	21,753,554	24,915,129

Device	Routing	Invert	Outlet Devices
#1	Primary	574.31'	**203.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 6.0' Crest Height
#2	Secondary	576.00'	**Uncontrolled Overtopping Dike, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.00 Width (feet) 100.00 460.00

Primary OutFlow Max=600.46 cfs @ 12.49 hrs HW=575.23' TW=571.76' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 600.46 cfs @ 3.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=574.40' TW=571.76' (Dynamic Tailwater)
2=Uncontrolled Overtopping Dike (Controls 0.00 cfs)

Pond 1P: Area 15 Pond



Summary for Pond 4P: PWSB Pond

Hydraulically connected to Area 15 Pond.

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 37.100 ac,100.00% Impervious, Inflow Depth = 7.25" for 1000 year event
Inflow = 440.91 cfs @ 11.93 hrs, Volume= 22.416 af
Outflow = 22.69 cfs @ 16.06 hrs, Volume= 22.407 af, Atten= 95%, Lag= 247.7 min
Primary = 22.69 cfs @ 16.06 hrs, Volume= 22.407 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 574.40' Surf.Area= 1,448,059 sf Storage= 4,159,426 cf
Peak Elev= 574.93' @ 13.83 hrs Surf.Area= 1,460,108 sf Storage= 4,926,172 cf (766,746 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 533.3 min (1,268.0 - 734.7)

Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	9,495,902 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

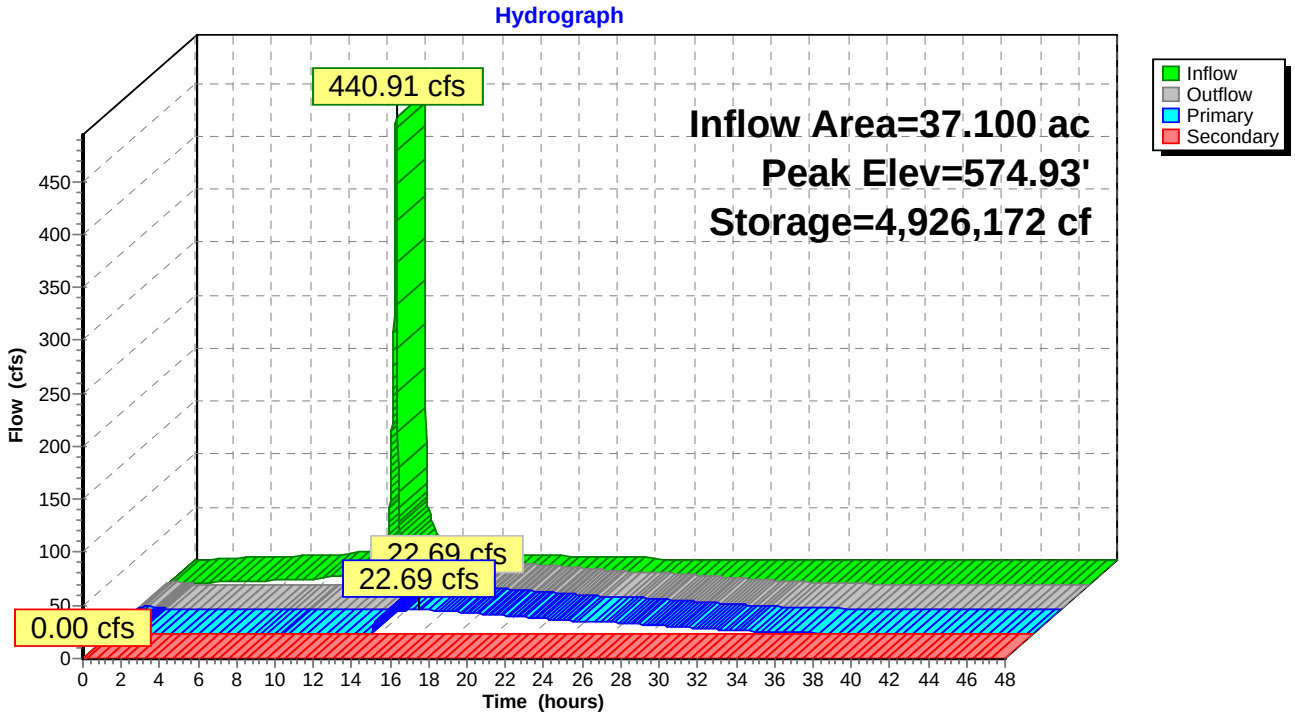
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
571.00	455,392	5,928.0	0	0	455,392
572.00	1,284,243	4,716.0	834,793	834,793	1,481,997
573.00	1,386,039	4,883.0	1,334,817	2,169,611	1,609,653
574.00	1,438,953	4,846.0	1,412,413	3,582,024	1,638,709
575.00	1,461,773	4,832.0	1,450,348	5,032,372	1,650,527
576.00	1,475,756	4,875.0	1,468,759	6,501,131	1,684,095
577.00	1,504,611	4,986.0	1,490,160	7,991,291	1,771,338
578.00	1,504,611	4,986.0	1,504,611	9,495,902	1,776,324

Device	Routing	Invert	Outlet Devices
#1	Primary	572.40'	**36.0" Round CPP_Round 36" X 2.00** L= 39.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 572.40' / 572.40' S= 0.0000 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 7.07 sf
#2	Secondary	575.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.00 Width (feet) 140.00 220.00

Primary OutFlow Max=22.69 cfs @ 16.06 hrs HW=574.87' TW=574.63' (Dynamic Tailwater)
└**1=CPP_Round 36"** (Outlet Controls 22.69 cfs @ 2.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=574.40' TW=574.40' (Dynamic Tailwater)
└**2=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 4P: PWSB Pond



Summary for Pond 7P: Coal Pile Pond

[58] Hint: Peaked 0.28' above defined flood level

Inflow Area = 107.580 ac, 10.00% Impervious, Inflow Depth = 5.84" for 1000 year event
Inflow = 695.11 cfs @ 12.10 hrs, Volume= 52.337 af
Outflow = 682.90 cfs @ 12.13 hrs, Volume= 52.345 af, Atten= 2%, Lag= 1.8 min
Primary = 682.90 cfs @ 12.13 hrs, Volume= 52.345 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 574.40' Surf.Area= 12,851 sf Storage= 2,570 cf
Peak Elev= 579.28' @ 12.13 hrs Surf.Area= 283,177 sf Storage= 317,582 cf (315,012 cf above start)
Flood Elev= 579.00' Surf.Area= 200,000 sf Storage= 250,600 cf (248,030 cf above start)

Plug-Flow detention time= 17.7 min calculated for 52.268 af (100% of inflow)
Center-of-Mass det. time= 16.3 min (815.1 - 798.8)

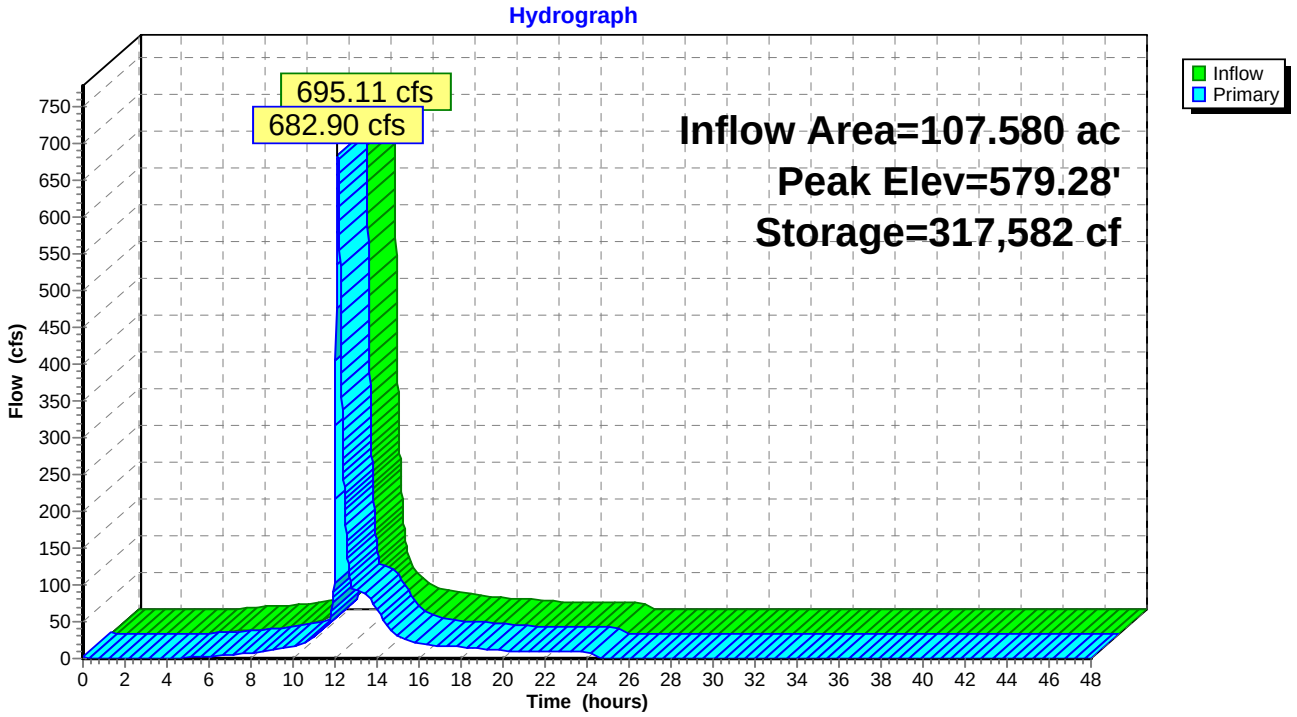
Volume	Invert	Avail.Storage	Storage Description
#1	574.00'	600,600 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
574.00	0	0	0
575.00	32,127	16,064	16,064
576.00	32,127	32,127	48,191
577.00	39,065	35,596	83,787
578.00	47,281	43,173	126,960
579.00	200,000	123,641	250,600
580.00	500,000	350,000	600,600

Device	Routing	Invert	Outlet Devices
#1	Primary	572.00'	**48.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 572.00' / 572.00' S= 0.0000 '/' Cc= 0.900 n= 0.021 Corrugated metal, Flow Area= 12.57 sf
#2	Primary	579.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.00 Width (feet) 1,000.00 3,000.00

Primary OutFlow Max=682.44 cfs @ 12.13 hrs HW=579.28' TW=575.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 98.74 cfs @ 7.86 fps)
└─**2=Custom Weir/Orifice** (Weir Controls 583.71 cfs @ 1.65 fps)

Pond 7P: Coal Pile Pond



Summary for Link 5L: Cooling Water Discharge (Normal High WSE)

Average annual high water surface elevation of Lake Erie (thus cooling water discharge also) per USGS' Circular 1311 (Lake-Level Variability and Water Availability in the Great Lakes, 2007)

Inflow Area = 313.430 ac, 48.47% Impervious, Inflow Depth > 9.02" for 1000 year event
Inflow = 600.47 cfs @ 12.49 hrs, Volume= 235.628 af
Primary = 600.47 cfs @ 12.49 hrs, Volume= 235.628 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Fixed water surface Elevation= 571.76'

Link 5L: Cooling Water Discharge (Normal High WSE)