INITIAL HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

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Possum Point Power Station CCR Surface Impoundment: Pond E

Submitted To: Possum Point Power Station
19000 Possum Point Road
Dumfries, VA 22026

Submitted By: Golder Associates Inc.
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Richmond, VA 23227

April 2018 **Project No. 16-62150**

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1.0 CERTIFICATION

This Initial Hazard Potential Classification Assessment for the Possum Point Power Station's Pond E was prepared by Golder Associates Inc. (Golder). The document and Certification/Statement of Professional Opinion are based on and limited to information that Golder has relied on from Dominion Energy and others, but not independently verified, as well as work products produced by Golder.

On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia that this document has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, at the same time, and in the same locale. It is my professional opinion that the document was prepared consistent with the requirements in §257.73(a)(2) of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015, with an effective date of October 19, 2015 [40 CFR §257.73(a)(2)], as well as with the requirements in §257.100 resulting from the EPA's "Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Extension of Compliance Deadlines for Certain Inactive Surface Impoundments; Response to Partial Vacatur" published in the Federal Register on August 5, 2016 with an effective date of October 4, 2016 (40 CFR §257.100).

The use of the word "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion, and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

Daniel McGrath — Associate and Senior Consultant
Print Name — Title

Daniel McGrath — 4/13/18
Signature — Date

Golder Associates

2.0 INTRODUCTION

This analysis details the purpose, data sources, method of analysis, and development of a map showing the inundation level expected downstream during a breach event of Pond E at the Possum Point Power Station (Station). The inundation areas were compared with various map sources to determine what, if any, effect on downstream structures could be expected from a breach of the impounding structure. The results of this analysis show a breach of this impounding structure during a storm event has no downstream impacts to manmade structures. No loss of life is expected due to a failure of the structure. A *CCR Rule* hazard potential classification of **SIGNIFICANT** is recommended due to the potential environmental impacts of a failure.

3.0 PURPOSE

The purpose of this analysis is to recommend a hazard potential classification under the CCR rule for the Pond E dam at the Possum Point Power Station. Pursuant to 40 CFR §257.73, a CCR unit is classified as a Significant Hazard Potential where failure or mis-operation of the dam results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. The potential inundation zone downstream of the Pond E dam does not contain occupied structures, nor is it regularly occupied by plant personnel.

Sources of data used in the analysis included:

1) United States Geological Survey (USGS) topographical map (Quantico quad sheet 2013);
2) Statistical rainfall data from NOAA Atlas 14 (NOAA's Precipitation Frequency Data Server);
3) Maps and aerial photos of area roads and structures from the Google Earth Pro;
4) Aerial survey of Pond E, dated April 2017;
5) Flood map information from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community Panel # 51153C0316E dated 08/03/2015 (Accessed through FEMA's National Flood Hazard Layer mapping system);
6) Web Soil Survey 2.1, Natural Resources Conservation Service (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm);
7) Hurricane Storm Surge Map, Virginia Department of Emergency Management (https://vdemgis.maps.arcgis.com/apps/PublicInformation/index.html?appid=3f72cc77421448ceb84312413a9e7dd0)

3.1 Description of the Impounding Structure

Pond E is located in Dumfries, Virginia as a part of Dominion Energy's Possum Point Power Station. It is located on the north side of Possum Point Road, adjacent to Quantico Creek. The Pond E embankment is approximately 16 feet wide at the top, and has a top elevation of approximately 40 feet above mean sea level (AMSL). Pond E does not typically maintain standing water due to construction dewatering and evaporation. The upstream and downstream sideslopes are approximately 2:1. The downstream toe is approximately at elevation 8, giving an effective embankment height of 32 feet. The toe of the embankment is located at the limit of the 100-year floodplain. There are no occupied structures downstream of the dam.

This study has been developed based on the existing Pond E topography as of April 2017. The primary outlet structure is a 6-ft by 6-ft square riser, fitted with stoplogs, that discharges through a 72-inch corrugated metal pipe (CMP) into an unnamed tributary of Quantico Creek. There currently is no auxiliary spillway.

This report has been prepared with the hydraulic models depicting the existing grading and outlet pipe as described in this section.

3.2 Drainage Area and Hazard Analysis Area Descriptions

The drainage area for Pond E consists of the pond area (assumed bare earth) and the surrounding wooded areas, which are presumed to be in good condition for purposes of determining a Runoff Curve Number (CN) as defined by the Natural Resource Conservation Service (NRCS). The soils in the drainage area are primarily Hydrologic Soil Group B. Table 1 below outlines the drainage areas and NRCS curve numbers used in this analysis.

Table 1: Pond E Contributing Drainage Areas

Area Description	Area, Acres	Weighted CN
Pond E Ex	43.9	82
Pond E DA	50.7	60
Total Drainage Area	94.6	

3.3 Method of Analysis

To model the inflows into and out of the impoundment, a numerical model was created using the Hydraulic Engineering Center's Hydrologic Modeling System (HEC-HMS) Version 4.2.1 to generate the anticipated runoff hydrograph from the 24-hour, 1,000-year storm event. Table 2 outlines the resulting inflow and outflow for the non-breach scenario analysis.

Table 2: 1,000-Yr Storm Event and Flows

Storm Event	Rainfall (in)	Peak Inflow (cfs)	Peak Outflow (cfs)	Max water elevation (ft)	Inflow volume (ac-ft)
24-hr, 1,000-Yr	13.6	778.4	0.0	13.2	76.9

For the impounding structure failure analysis, the dam breach routine within HEC-HMS was used to model the failure event and produce the resulting outflow hydrograph. Input values were provided for the embankment geometry, stage-storage relationship, development time, and trigger elevation. The storm-related failure was triggered when the water level in the pond was at its peak.

Due to the simple downstream geometry, numerical modeling of the breach outflow was not performed. Instead, a general discharge map was generated. Due to the basin's proximity to Quantico Creek, the area downstream of the pond is subject to flooding from the 1% annual chance event (100-Yr event) and is classified as Zone AE on the Flood Insurance Rate Map (FIRM) (reference 6). The elevation given on the FIRM in the area of the basin (8 feet AMSL) indicates floodwater levels in Quantico Creek would not overtop the embankment. This is important to note since the storm event chosen for the spillway design flood (SDF) is of much larger magnitude than the 1% annual chance event that would likely cause this flooding in the proximity of the basin. The FIRM is included as Figure 2 of this report. A breach of the basin is not anticipated to impact the Station.

3.4 Failure Analysis Scenarios

A breach simulation during the 1,000-year event was conducted to examine the potential downstream impacts of a possible impounding structure failure. In this, the peak outflow in cubic feet per second (cfs) and the maximum high water level downstream was estimated. The breach failure at the 1,000-year event assumed a piping failure through the embankment instead of overtopping. The breach location was chosen to be in the southern embankment near Possum Point Road.

A “sunny day” breach is assumed to be due to piping of soils through the embankment when the water level in the reservoir is at its normal pool elevation; however, the typical normal pool is below the embankment toe, so this evaluation was not performed. A seismic analysis was not performed, nor were other sudden failure type scenarios considered as this evaluation is for the potential downstream impacts due to an embankment breach during the design storm event (1,000-yr event).

3.5 Hydraulic Modeling Results

The downstream flood models for the failure scenarios are presented in Table 3. Due to the small magnitude and short flow path for the breach events, detailed hydraulic modeling of the breach outflow was not performed.

Table 3: Summary of Peak Discharges, 1,000-yr Event

Scenario	Peak Discharge (cfs)	Outflow Volume (ac-ft)
No breach	0.0	0.0
Breach event	1587.3	72.9

3.6 Downstream Consequences

The modeled embankment failure scenario is unlikely to damage the adjacent sections of Possum Point Road, as the road would be completely flooded during the 1,000-year storm event. As shown in the FIRM in Appendix A, the 100-year flood would raise the water level in Quantico creek to the elevation of the road embankment. Based on the 100-year flood elevations, the culverts draining the unnamed tributary into Quantico creek would likely be flowing from Quantico Creek back into the tributary. The effect of the inflow into Quantico Creek is anticipated to be minimal, due to the short duration of the flow event, the expected water elevation in the creek, and the relatively small volume of the breach flow in comparison to the normal volume of flow in the creek.

3.7 Spillway Adequacy

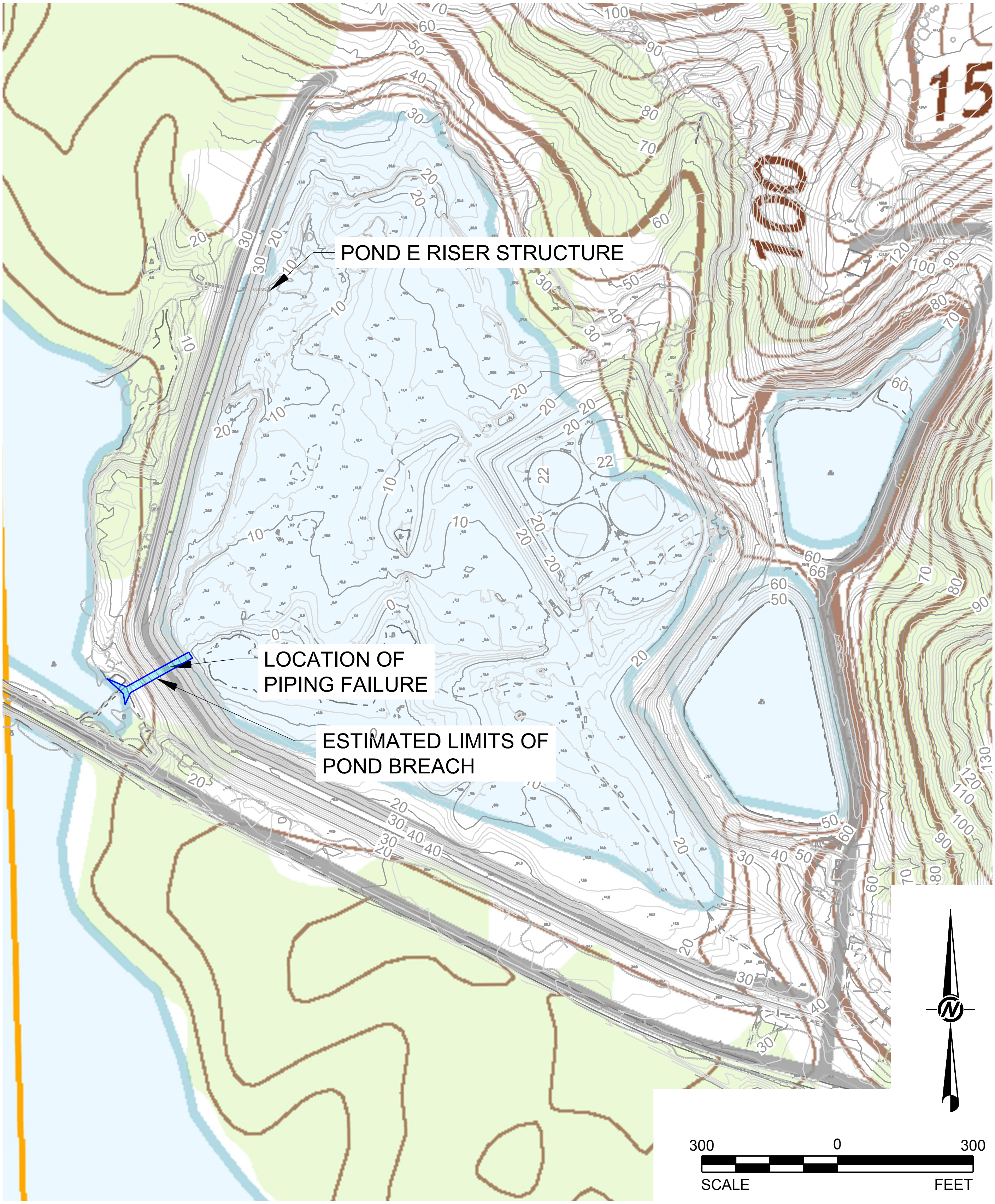
If a structural embankment failure does not occur, the existing structure will contain the 1,000-yr event without discharge. At its peak storage during the 1,000-year event, the basin has approximately 26.6 feet of freeboard.

4.0 CONCLUSIONS AND RECOMMENDATION

Pond E is an inactive CCR surface impoundment under the *Disposal of Coal Combustion Residuals from Electric Utilities* final rule (CCR rule). Pursuant to 40 CFR §257.73, a CCR unit is classified as a Significant Hazard Potential where failure or mis-operation of the dam results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. As determined in this Study, failure or mis-operation of the dam would be unlikely to result in loss of human life. A hazard classification potential of **SIGNIFICANT** is assigned.

APPENDIX A - Figures

Figure 1 –1,000-Yr Event Breach Flow
Figure 2 – 100-Yr Flood Map (FIRM)



CLIENT
DOMINION ENERGY
POSSUM POINT POWER STATION

PROJECT
INACTIVE POND CCR DEMONSTRATION
HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-02-01
DESIGNED	KAL
PREPARED	KAL
REVIEWED	DPM
APPROVED	

TITLE
POND E BREACH STUDY
1,000-YEAR, 24-HOUR STORM

PROJECT NO. 16-62150
REV.
FIG 1

National Flood Hazard Layer FIRMette

FEMA

38°33'18.25"N

77°17'51.53"W

77°17'12.57"W

38°32'48.98"N

Feet

0 250 500 1,000 1,500 2,000

1:6,241.13

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/7/2018 at 11:29:13 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 2

APPENDIX B

Hydraulic Modeling Analysis

CALCULATIONS

Date:	February 7, 2018	**Made by:**	KAL
Project No.:	16-62150	**Checked by:**	SDRM
Subject:	PPPS Pond E Breach Analysis	**Reviewed by:**	DPM

Project: **POSSUM POINT POWER STATION POND E – EXISTING CONDITION**

This purpose of this evaluation is to determine the hydraulic performance of the existing Pond E CCR impoundment at the Possum Point Power Station (PPPS) during the 1,000-year storm and an associated embankment breach event. This evaluation is in support of the "Significant" hazard potential classification as defined in §257.53 of the *CCR Rule*.

1.0 CALCULATIONS

1.1 Pond Storage Volume

The Pond E storage volume was computed based on the existing conditions as surveyed in April 2017 as excavated of CCR material. The maximum available storage in the pond is approximately 892.8 acre-feet at elevation 40.0. Attachment 1 contains the stage-storage rating table used in the HMS model.

1.2 Outlet Design and Capacity

The existing Pond E outfall structure consists of a rectangular riser box fitted with stoplogs to adjust the pond's permanent pool. The riser discharges through a 72-inch corrugated metal pipe (CMP) into Quantico Creek. For this analysis, the pond was conservatively evaluated with a permanent pool at elevation 0.0 ft (approximately 3.0 ft of water).

1.3 Storm Routing Calculations

Analysis of the Pond E stormwater system was performed using the US Army Corps of Engineers Hydrologic Engineering Center's Hydraulic Modeling System (HEC-HMS) software package (ref #1). The direct drainage area to the pond is 94.6 acres. The predominant soil types in the area are Hydrologic Soil Group (HSG) B soils.

Per §257.82(a)(3)(ii), the impoundment is required to adequately manage flow resulting from the 1,000-Yr storm event. The 24-hour, 1,000-Yr storm event precipitation amount was obtained from the Precipitation Frequency Data Server (PFDS, ref #2) for Dumfries, Virginia, as 13.6 inches.

Modeling of the existing Pond E for the 1,000-year event during a non-breach scenario shows the calculated high water elevation to be 13.2 feet, which indicates the pond does not overtop the embankment. As such, the breach event was modeled as a piping-type failure. The breach location was chosen to be in the southern embankment near the outfall structure. From this location, the released water will flow directly into Quantico Creek.

The embankment breach subroutine within HEC-HMS was used to simulate an embankment breach and calculate the resulting outflow. Parameters for embankment geometry, material properties, breach geometry, and development time were established, and the breach event was set to occur when the pond was near its maximum pool elevation (el. 12.9 feet).

Figure 1 illustrates the connectivity of the stormwater elements and the data inputs as modeled in HEC-HMS.

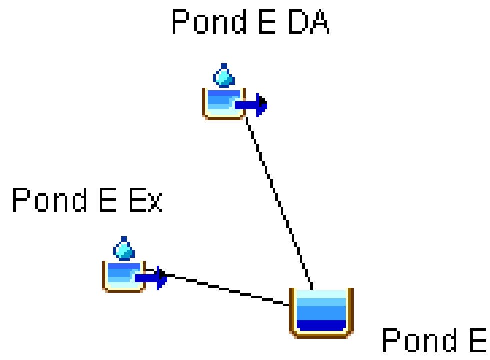


Figure 1 – PPPS Pond E HEC-HMS Model

The following table summarizes the results of the HEC-HMS analysis for the 1,000-Yr storm event.

Table 1: PPPS Pond E HEC-HMS Output

Scenario	Peak Inflow (cfs)	Peak Discharge (cfs)	Outflow Volume (ac-ft)
1,000-yr event, no breach	778.4	0.0	0.0
1,000-yr event, with breach	778.4	1587.3	72.9

2.0 OUTFLOW MODELING

Due to the simple breach geometry and relatively short downstream distance to the 100-yr floodplain, a detailed numerical model of the breach flow was not conducted. The extents of the outflow were estimated based on the anticipated breach geometry and the downstream topography.

3.0 REFERENCES

1) U.S. Army Corps of Engineers Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) release 4.2.1
2) Precipitation Frequency Data Server (NOAA Atlas 14) https://hdsc.nws.noaa.gov/hdsc/pfds/

4.0 ATTACHMENTS

1) Stage-Storage Table
2) Outlet Dicharge
3) HEC-HMS

Pond E Stage-Storage Table

Elevation	Area		Volume		Cumulative Volume		
(ft)	(sqft)	(acres)	(cuft)	(CY)	(CY)	(cuft)	(ac-ft)
40.00	1656480.0	*38.028*	*3287953.38*	*121776.05*	*1440415.08*	*38891207*	*892.82*
38.00	1631505.0	*37.454*	*3236438.74*	*119868.10*	*1318639.03*	*35603254*	*817.34*
36.00	1604970.0	*36.845*	*3179831.64*	*117771.54*	*1198770.93*	*32366815*	*743.04*
34.00	1574909.0	*36.155*	*3113602.06*	*115318.59*	*1080999.38*	*29186983*	*670.04*
32.00	1538763.0	*35.325*	*3041332.50*	*112641.94*	*965680.79*	*26073381*	*598.56*
30.00	1502641.0	*34.496*	*2960293.62*	*109640.50*	*853038.84*	*23032049*	*528.74*
28.00	1457766.0	*33.466*	*2856264.43*	*105787.57*	*743398.34*	*20071755*	*460.78*
26.00	1398702.0	*32.110*	*2743351.65*	*101605.62*	*637610.77*	*17215491*	*395.21*
24.00	1344826.0	*30.873*	*2618523.85*	*96982.36*	*536005.15*	*14472139*	*332.23*
22.00	1274017.0	*29.247*	*2466408.63*	*91348.47*	*439022.79*	*11853615*	*272.12*
20.00	1192837.0	*27.384*	*2113342.44*	*78271.94*	*347674.32*	*9387207*	*215.50*
18.00	926123.0	*21.261*	*1725850.10*	*63920.37*	*269402.38*	*7273864*	*166.98*
16.00	801234.0	*18.394*	*1492305.41*	*55270.57*	*205482.00*	*5548014*	*127.36*
14.00	692395.0	*15.895*	*1251074.27*	*46336.08*	*150211.43*	*4055709*	*93.11*
12.00	560982.0	*12.878*	*885038.08*	*32779.19*	*103875.35*	*2804634*	*64.39*
10.00	333827.0	*7.664*	*561417.09*	*20793.23*	*71096.16*	*1919596*	*44.07*
8.00	230753.0	*5.297*	*410592.97*	*15207.15*	*50302.93*	*1358179*	*31.18*
6.00	180852.0	*4.152*	*317532.34*	*11760.46*	*35095.79*	*947586*	*21.75*
4.00	137661.0	*3.160*	*248431.20*	*9201.16*	*23335.33*	*630054*	*14.46*
2.00	111239.0	*2.554*	*198584.65*	*7354.99*	*14134.17*	*381623*	*8.76*
0.00	87807.0	*2.016*	*140080.32*	*5188.16*	*6779.19*	*183038*	*4.20*
-2.00	53667.0	*1.232*	*42957.73*	*1591.03*	*1591.03*	*42958*	*0.99*
-3.00	33075.0	*0.759*	-	-	-	-	-

Basin Elevations		
Invert	-3	ft
Embankment	40	ft

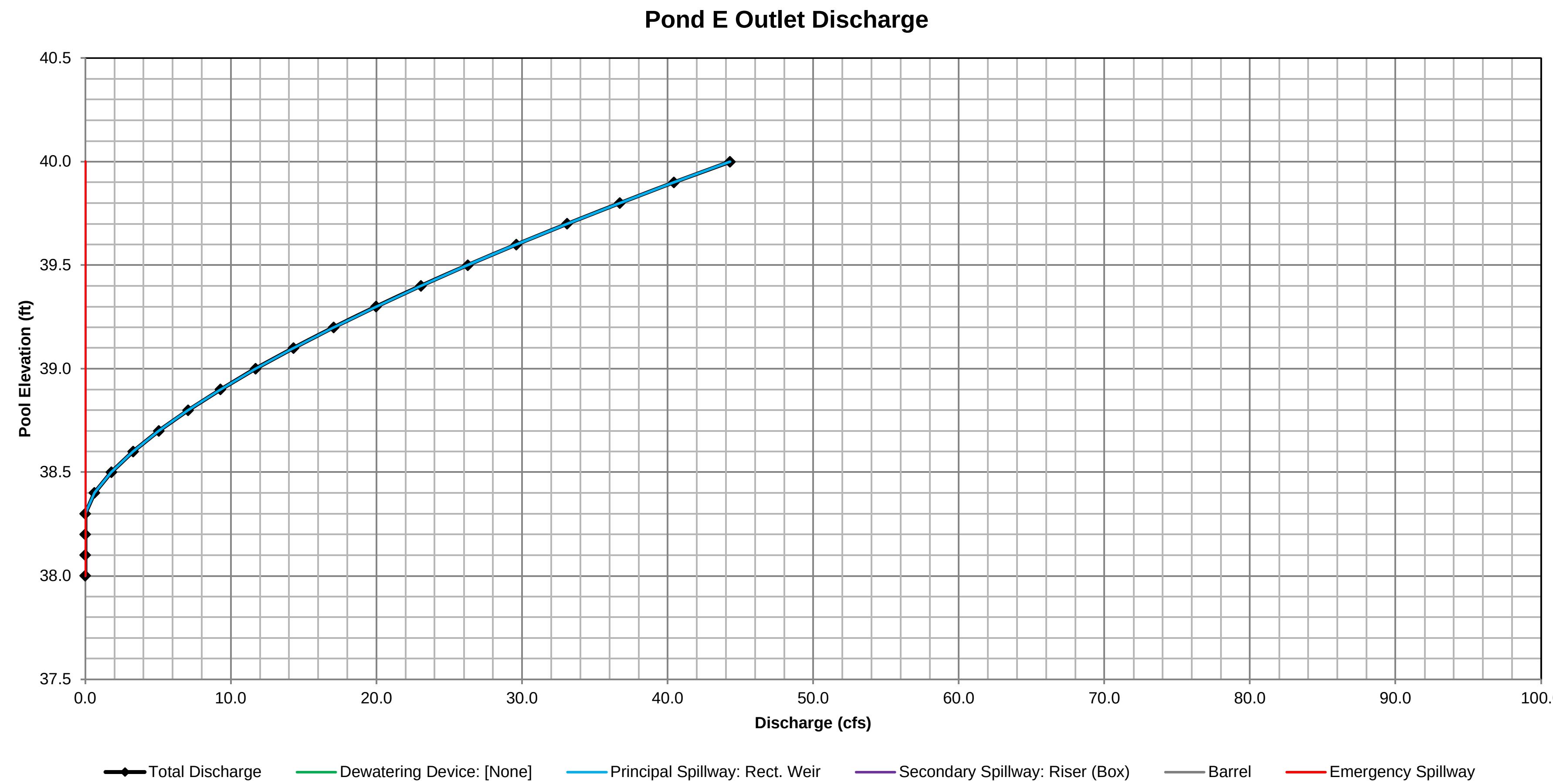
1. Dewatering Device		
Type:	[None]	
Invert		*ft*
Width		*in*
Cd (orifice)	0.6	
Cw (weir)	3.33	
Orifice Area	0.00	*ft2*
Multiple Rows? (Y or N)		N

2. Principal Spillway		
Type:	Rect. Weir	
Crest	38.3	*ft*
Width	72	*in*
Cd (orifice)	0.6	
Cw (weir)	3.33	
Orifice Area	27.00	*ft2*
Number of Spillways:		1

3. Secondary Spillway		
Type:	Riser (Box)	
Connect to PS?	Yes	
Crest	42.8	*ft*
Width	72	*in*
Cd (orifice)	0.6	
Cw (weir)	3.33	
Riser Area	36.00	*ft2*
Number of Spillways:		1

4. Discharge Pipe		
Invert	9.22	*ft/ft*
Diameter	72	*in*
Slope	0.0054	*ft/ft*
Length	140	*ft/ft*
Material	CMP	
Manning n	0.024	

5. Emergency Spillway		
B. Width	358	*ft*
Side Slope	10	*:1*
Invert	40	*ft*
Top Width	358	*ft*



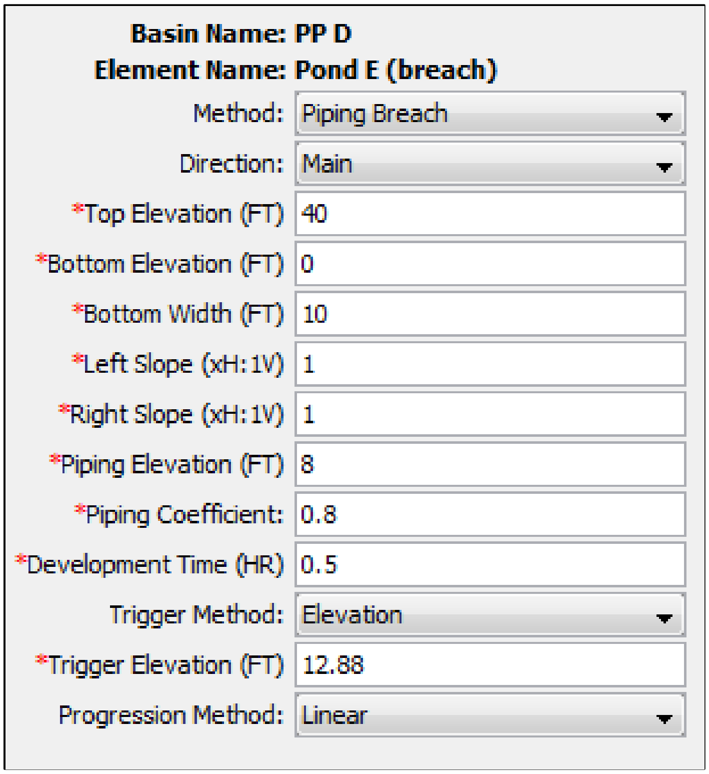
Min. Elev.	38	ft
Interval	0.1	ft

Water Elevation	Inlet-Controlled Discharge															Outlet-Controlled Discharge					Depth	Total Discharge
	Dewatering Device: [None]					Principal Spillway: Rect. Weir					Secondary Spillway: Riser (Box)					Barrel-Controlled Discharge	Controlling Condition	Actual Discharge	Emergency Spillway			
	Head	Discharge			Controlling Discharge	Head	Discharge		Controlling Condition	Controlling Discharge	Head	Discharge		Controlling Condition	Controlling Discharge				Head	Discharge		
		Skimmer	*Orifice*	*Weir*			*Orifice*	*Weir*				*Orifice*	*Weir*									
(ft)	*(ft)*	*(cfs)*	*(cfs)*	*(cfs)*	*(cfs)*	*(ft)*	*(cfs)*	*(cfs)*		*(cfs)*	*(ft)*	*(cfs)*	*(cfs)*		*(cfs)*	*(cfs)*		*(cfs)*	*(ft)*	*(cfs)*	*(ft)*	*(cfs)*
38.00					0.00					0.00					0.00	650.78	Inlet	0.00	0	0.00	**41.00**	**0.00**
38.10					0.00					0.00					0.00	652.13	Inlet	0.00	0	0.00	**41.10**	**0.00**
38.20					0.00					0.00					0.00	653.48	Inlet	0.00	0	0.00	**41.20**	**0.00**
38.30					0.00	0.00		0.00	Weir	0.00					0.00	654.91	Inlet	0.00	0	0.00	**41.30**	**0.00**
38.40					0.00	0.10		0.63	Weir	0.63					0.00	656.26	Inlet	0.63	0	0.00	**41.40**	**0.63**
38.50					0.00	0.20		1.79	Weir	1.79					0.00	657.61	Inlet	1.79	0	0.00	**41.50**	**1.79**
38.60					0.00	0.30		3.28	Weir	3.28					0.00	659.04	Inlet	3.28	0	0.00	**41.60**	**3.28**
38.70					0.00	0.40		5.05	Weir	5.05					0.00	660.39	Inlet	5.05	0	0.00	**41.70**	**5.05**
38.80					0.00	0.50		7.06	Weir	7.06					0.00	661.74	Inlet	7.06	0	0.00	**41.80**	**7.06**
38.90					0.00	0.60		9.29	Weir	9.29					0.00	663.09	Inlet	9.29	0	0.00	**41.90**	**9.29**
39.00					0.00	0.70		11.70	Weir	11.70					0.00	664.44	Inlet	11.70	0	0.00	**42.00**	**11.70**
39.10					0.00	0.80		14.30	Weir	14.30					0.00	665.78	Inlet	14.30	0	0.00	**42.10**	**14.30**
39.20					0.00	0.90		17.06	Weir	17.06					0.00	667.13	Inlet	17.06	0	0.00	**42.20**	**17.06**
39.30					0.00	1.00		19.98	Weir	19.98					0.00	668.48	Inlet	19.98	0	0.00	**42.30**	**19.98**
39.40					0.00	1.10		23.05	Weir	23.05					0.00	669.83	Inlet	23.05	0	0.00	**42.40**	**23.05**
39.50					0.00	1.20		26.26	Weir	26.26					0.00	671.18	Inlet	26.26	0	0.00	**42.50**	**26.26**
39.60					0.00	1.30		29.61	Weir	29.61					0.00	672.53	Inlet	29.61	0	0.00	**42.60**	**29.61**
39.70					0.00	1.40		33.10	Weir	33.10					0.00	673.88	Inlet	33.10	0	0.00	**42.70**	**33.10**
39.80					0.00	1.50		36.71	Weir	36.71					0.00	675.22	Inlet	36.71	0	0.00	**42.80**	**36.71**
39.90					0.00	1.60		40.44	Weir	40.44					0.00	676.49	Inlet	40.44	0	0.00	**42.90**	**40.44**
40.00					0.00	1.70		44.29	Weir	44.29					0.00	677.84	Inlet	44.29	0	0.00	**43.00**	**44.29**

Pond E HEC-HMS (Dam Breach)

Drainage Area	Area (ac)	CN	Lag Time (min)
Pond E Ex	43.9	82	6.0
Pond E DA	50.7	60	30.1

Breach Parameters



Basin Name:	**PP D**
Element Name:	**Pond E (breach)**
Method:	Piping Breach
Direction:	Main
*Top Elevation (FT)	40
*Bottom Elevation (FT)	0
*Bottom Width (FT)	10
*Left Slope (xH:1V)	1
*Right Slope (xH:1V)	1
*Piping Elevation (FT)	8
*Piping Coefficient:	0.8
*Development Time (HR)	0.5
Trigger Method:	Elevation
*Trigger Elevation (FT)	12.88
Progression Method:	Linear

Project: PP D Pond   Simulation Run: 1000-Yr, 24-hour
Reservoir: Pond E (breach)

Start of Run:	17Apr2017, 00:00	Basin Model:	PP D
End of Run:	20Apr2017, 00:01	Meteorologic Model:	1000-Yr
Compute Time:	13Feb2018, 13:45:10	Control Specifications:	72-Hr

Volume Units: ○ IN ◉ AC-FT

Computed Results

Peak Inflow:	778.36 (CFS)	Date/Time of Peak Inflow:	17Apr2017, 11:59
Peak Discharge:	1587.34 (CFS)	Date/Time of Peak Discharge:	18Apr2017, 02:01
Inflow Volume:	76.93 (AC-FT)	Peak Storage:	72.82 (AC-FT)
Discharge Volume:	72.86 (AC-FT)	Peak Elevation:	12.88 (FT)

Project: PP D Pond   Simulation Run: 1000-Yr, 24-hour
Reservoir: Pond E (non-breach)

Start of Run:	17Apr2017, 00:00	Basin Model:	PP D
End of Run:	20Apr2017, 00:01	Meteorologic Model:	1000-Yr
Compute Time:	06Feb2018, 16:14:31	Control Specifications:	72-Hr

Volume Units: ○ IN ◉ AC-FT

Computed Results

Peak Inflow:	778.36 (CFS)	Date/Time of Peak Inflow:	17Apr2017, 11:59
Peak Discharge:	0.00 (CFS)	Date/Time of Peak Discharge:	17Apr2017, 00:00
Inflow Volume:	76.93 (AC-FT)	Peak Storage:	76.93 (AC-FT)
Discharge Volume:	0.00 (AC-FT)	Peak Elevation:	13.17 (FT)

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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