Preliminary Stormwater Management Study

Colton's Crossing
Prepared for Hamblen Road Project, LLC
705 B Melody Lane
Lee's Summit, MO 64063

City of Lee's Summit Project No. PL2022217
HG Consult Project No. 21.018

Prepared by Richard Michael
May 27, 2022

HG Consult Inc engineers planners

I. Table of Contents

II. General Information 2

A. Description of Existing Site, Location, and Proposed Use 2

B. General Overview of Drainage Patterns 3

C. FEMA Classification / Floodplain Issues 3

D. Wetland and USACE Issues 4

E. Soil Classification 4

III. Methodology 5

A. Unit Hydrograph Modeling Methods 5

B. Computation Methods for Runoff Determinations 5

C. Design Storm Events Used and Source of Rainfall Data 5

IV. Existing Conditions Analysis 5

A. Summary of Comprehensive Control Requirements 5

B. Existing Drainage Area Map 6

C. Description of Each Drainage Area 6

D. Table Summarizing Input Data 7

E. Table Summarizing Peak Runoff Rates 7

F. Table Summarizing "Allowable Release Rate" 7

V. Proposed Conditions Analysis 8

A. Proposed Drainage Area Map 8

B. Narrative Description of All Proposed Drainage Areas 8

C. Table Summarizing Input Data 9

D. Table Summarizing Peak Runoff Rates 9

E. Table Summarizing Allowable and Proposed Release Rates 10

F. Tables Summarizing Detention/Retention Input Data and Results 11

G. Undetained Drainage Areas 12

H. Water Quality Requirements 12

I. Water Quality Summary 13

VI. Conclusions and Recommendations 14

A. Overview of the Report 14

B. List of Requested Waivers 14

VII. Appendix - Figures / Maps / Exhibits / Supporting Calculations 14

II. General Information

A. Description of Existing Site, Location, and Proposed Use

The Colton's Crossing Subdivision will consist of the development of a parcel, currently zoned AG, located along SE Hamblen Road directly Northeast of Shamrock Hills Golf Club. The site is currently vacant and being used as farmland.

The proposed use of the site will be Single Family residences. The site will also include a clubhouse, swimming pool, and a parking lot to access these amenities.

Figure I.A.1 – 2021 Aerial Photo of the project site

Figure I.A.2 – 2021 Aerial Photo of the project site

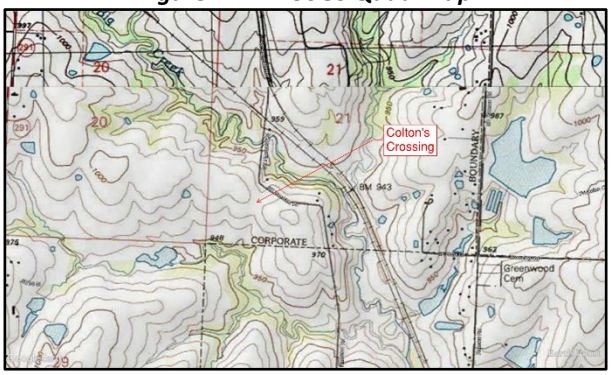
B. General Overview of Drainage Patterns

The project site is divided into several drainage areas due to an existing ridge that divides the property and the existing alignment of SE Hamblen Road.

Water that is North of the ridge is collected in several creeks/ravines and routed approximately 600 feet to a box culvert at SE Hamblen Road. The box culvert allows Big Creek to carry water under SE Hamblen Road.

Water that is South of the ridge is collected in several creeks/ravines and routed to a small tributary immediately South of the property line. From there the water is carried in the tributary South and East to Big Creek (for 1.0 mile).

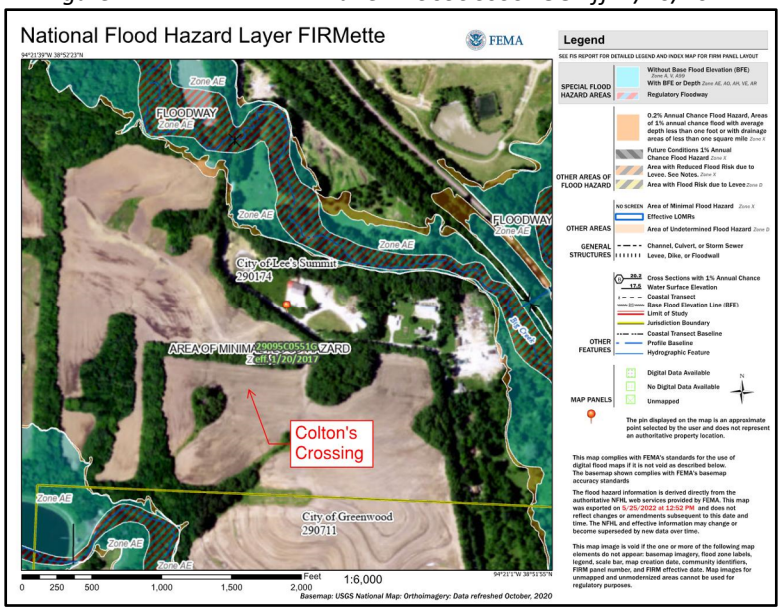
Figure I.B.1 – USGS Quad Map



C. FEMA Classification / Floodplain Issues

The Site is located within a Zone X meaning there is minimal risk of flooding and flood insurance is not required. There are no floodplain boundaries being altered and therefore a Flood Study is not required. See Figure I.D.1 for Firm Panel.

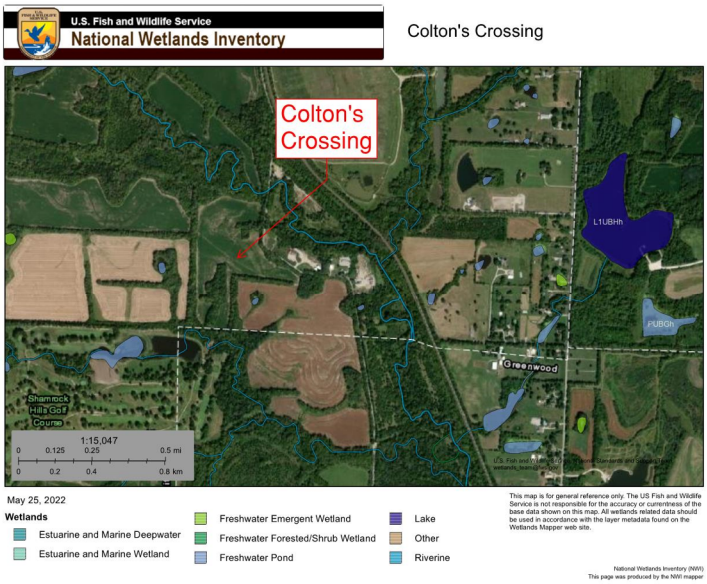
Figure I.D.1 – FEMA FIRM Panel #29095C0551GG Eff. 1/20/2017



D. Wetland and USACE Issues

There are no wetlands or Waters of the US being disturbed by this project and therefore no permits are required by the Corps of Engineers for the development of this site. See figure I.E.1 for US Fish and Wildlife Wetland Inventory Map.

Figure I.E.1 – US Fish and Wildlife National Wetland Inventory



E. Soil Classification

NRCS Web Soil Survey categorizes the soils for this project below. See appendix for additional information.

Table I.F.1 – Soil Classification

Symbol	Name	Slopes	HSG
10000	Arisburg silt loam	1-5%	C
10113	Oska silty clay loam	5-9%	D
10116	Sampsel silty clay loam	2-5%	C/D
10117	Sampsel silty clay loam	5-9%	C/D
10142	Snead-Rock outcrop	5-14%	D
13629	Colo silt loam	1-4%	C/D
30080	Greenton silty clay loam	5-9%	C/D

For this analysis, Soil group C was considered for the project as a precaution. Curve Numbers were used in accordance with APWA Section 5602.3.

III. Methodology

A. Unit Hydrograph Modeling Methods

The method for evaluating Colton's Crossing was with the use of PondPack V8i. Both Pre-Development and Post-Development conditions were considered. The unit hydrograph method used was SCS TR-55.

B. Computation Methods for Runoff Determinations

The computation methods used for runoff determinations are as follows:

- AMC II Soil Moisture conditions
- 24-Hour SCS Type II Rainfall Distribution
- SCS Runoff Curve Numbers per TR-55
- Time of Concentration developed per TR-55

C. Design Storm Events Used and Source of Rainfall Data

The design storms that were considered include the 2, 10, 100, and subsequent 100-Year storms. The rainfall data was gathered from NRCS utilizing curves for a Type II 24-hour rainfall.

Table I.2 – Methodology and Rainfall Data

Methods and Rainfall Data	
Pond Routing	Pondpack using SCS Method
Existing CN	74, Group C soils
T_C	5 minutes
Water Quality, Type II, 24-hr	1.4 inch
2-yr rainfall, Type II, 24-hr	3.5 inch
10-yr rainfall, Type II, 24-hr	5.3 inch
100-yr rainfall, Type II, 24-hr	7.7 inch

IV. Existing Conditions Analysis

A. Summary of Comprehensive Control Requirements

As mentioned previously the soils on-site consist of primarily Arisburg silt loam and Sampsel silty clay with a hydrologic group of C. The site has steep grades around the boundary, tree lines, and existing ravine areas with moderate grades everywhere else. Cover is low as its current use is farmland. The APWA default strategy was used to provide comprehensive protection. The APWA default strategy reads as follow:

> *"Under this strategy, peak runoff control is provided for the 1%, 10% and 50% chance storms and volumetric and/or extended detention control of the 90% mean annual event storm for broad protection of the receiving system, including channel erosion protection and flood peak reductions over a range of return periods. This strategy shall be the default strategy unless otherwise designated or approved by the local authority. Performance standards and sizing criteria are provided in Section 5608."*

B. Existing Drainage Area Map

See appendix (Pre-Developed Drainage Area Map) for all drainage areas and outfall location. See Table III.B.1 for summary of On-Site/Off-Site Areas.

Table III.B.1 – Pre-Developed Drainage Areas

Drainage Area	Total Area (acres)
E-1A	0.74
E-1B	5.55
E-1C	12.10
E-2A	14.82
E-2B	11.78
E-2C	9.85
E-2D	0.80
E-3	1.44
E-4	5.22
E-5	3.97
E-6	4.81

C. Description of Each Drainage Area

E-1 (A-C): These areas all occur on the North side of the site with slopes ranging from 2-15%. These areas drain North in natural ravines/creeks and then routed approximately 600 feet into Big Creek.

E-2 (A-D): These areas all occur on the South side of the site with slopes ranging from 2-20%. These areas drain South in natural ravines/creeks and then routed to a small tributary immediately South of the property line. From there the water is carried in the tributary South and East to Big Creek (for 1.0 mile).

E-3: A small area located in the SE quadrant of the site with slopes ranging from 3-10%. This area drains East towards SE Hamblen Road to the POI (18" CMP). After leaving the 18" CMP the water flows East to Big Creek (for 0.09 mile).

E-4: An area located on the Eastern boundary of the site with slopes ranging from 2-15%. Most of this area drains East to a small pond (area of standing water). As the water level rises in the pond, it is then released and flows East towards SE Hamblen Road to the POI (18" RCP). After leaving the 18" RCP the water flows East to Big Creek (for 0.07 mile).

E-5: An area located on the Eastern boundary of the site with SE Hamblen Road as the Northern boundary. The slopes in this area range from 1-10%. This area drains East towards SE Hamblen Road to the POI (24" CMP). After leaving the 24" CMP the water flows East to Big Creek (for 0.11 mile).

E-6: An area located in the center of the site with slopes ranging from 2-20%. This area drains North towards SE Hamblen Road to the POI (28"x42" CMP). After leaving the 28"x42" CMP the water flows North into a small pond. The pond discharges Northeast to Big Creek (for 0.05 mile).

D. Table Summarizing Input Data

Table III.D.1 – Pre-Developed Input Area Data

Sub-Area Name	Area	CN	TOC (min)
E-1A	0.74	74	5
E-1B	5.55	74	5
E-1C	12.10	74	5
E-2A	14.82	74	5
E-2B	11.78	74	5
E-2C	9.85	74	5
E-2D	0.80	74	5
E-3	1.44	74	5
E-4	5.22	74	5
E-5	3.97	74	5
E-6	4.81	74	5

E. Table Summarizing Peak Runoff Rates

Table III.E.1 – Pre-Developed Peak Runoff Rate

Sub-Area Name	Q (cfs)
E-1A	5.40
E-1B	40.54
E-1C	88.37
E-2A	108.24
E-2B	86.04
E-2C	71.94
E-2D	5.84
E-3	10.52
E-4	38.13
E-5	29.00
E-6	35.13

F. Table Summarizing "Allowable Release Rate"

Table III.F.1 – Pre-Developed Allowable Peak Runoff Rate

Sub-Area Name	2-Year (cfs)	10-Year (cfs)	100-Year (cfs)
E-1 Total (E-1A+E-1B+E-1C)	9.20	36.78	55.17
E-2 Total (E-2A+E-2B+E-2C+E-2D)	18.63	74.50	111.75
E-3	0.72	2.88	4.32
E-4	2.61	10.44	15.66
E-5	1.99	7.94	11.91
E-6	2.41	9.62	14.43

Comprehensive values utilizing 0.5 cfs (2-YR), 2 cfs (10-YR), and 3 cfs (100-YR) per site acre

V. Proposed Conditions Analysis

A. Proposed Drainage Area Map

See appendix (Post-Developed Drainage Area Map) for all on-site and off-site areas and outfall locations for each drainage area. See Table IV.A.1 for more detailed information.

Table IV.A.1 – Post-Developed Drainage Areas

Drainage Area	Total Area (acres)
P-1A	12.96
P-1B	1.59
P-2A	43.37
P-2B	4.86
P-3	1.22
P-4	2.63
P-5	3.66
P-6	4.01

B. Narrative Description of All Proposed Drainage Areas

P-1 (A-B): A large area containing most of the developed site North of the Hook Road re-alignment. This area decreased from the existing condition of 18.39 acres (E-1A, E-1B, and E-1C) to the proposed condition of 14.55 acres (P-1A and P-1B). This area is divided into two sub-areas. Sub-area P-1A drains into the North pond which is designed to limit the developed flows to the comprehensive value of 0.5, 2, and 3 cfs per developed drainage acre (2, 10, & 100-Year values respectively). The pond also meets the freeboard requirements for APWA. Sub-area P-1B is undetained due to elevation and grading constraints. The CN value increased from 74 to 82 for single family areas per APWA 5602.3.

P-2 (A-B): A large area containing most of the developed site South of the Hook Road re-alignment. This area increased from the existing condition of 37.25 acres (E-2A, E-2B, E-2C, and E-2D) to the proposed condition of 48.23 acres (P-2A and P-2B). This area is divided into two sub-areas. Sub-area P-2A drains into the South pond which is designed to limit the developed flows to the comprehensive value of 0.5, 2, and 3 cfs per developed drainage acre (2, 10, & 100-Year values respectively). The pond also meets the freeboard requirements for APWA. Sub-area P-2B is undetained due to elevation and grading constraints. The CN value increased from 74 to 82 for single family areas per APWA 5602.3.

P-3: A small area located in the SE quadrant of the site. This area decreased from the existing condition to the proposed condition. Although not designed yet, the anticipated design of this area would force water to flow to the same outlet as the existing condition. The CN value increased from 74 to 82 for single family areas per APWA 5602.3.

P-4: An area located on the Eastern boundary of the site where the new cul-de-sac of Hamblen Court will be constructed. This area decreased from the existing condition to the proposed condition. Although not designed yet, the anticipated design of this area would force water to flow near the same outlet as the existing condition. The CN value increased from 74 to 82 for single family areas per APWA 5602.3.

P-5: An area located on the Eastern boundary of the site where the new alignment of Hamblen Court will be constructed. This area decreased from the existing condition to the proposed condition. Although not designed yet, the antici-

pated design of this area would force water to flow near the same outlet as the existing condition. The CN value increased from 74 to 82 for single family areas per APWA 5602.3.

P-6: An area located in the center of the site that accounts for the future underground storm system for the re-aligned Hook Road. This area decreased from the existing condition to the proposed condition. Although not designed yet, the anticipated design of this area would force water to flow near the same outlet as the existing condition. The CN value increased from 74 to 82 for single family areas per APWA 5602.3.

C. Table Summarizing Input Data

Table IV.C.1 – Post-Developed Input Area Data

Sub-Area Name	Area	CN	TOC (min)
P-1A	12.96	82	5
P-1B	1.59	82	5
P-2A	43.37	82	5
P-2B	4.86	82	5
P-3	1.22	82	5
P-4	2.63	82	5
P-5	3.66	82	5
P-6	4.01	82	5

D. Table Summarizing Peak Runoff Rates

Table IV.D.1 – Post-Developed Peak Runoff Rate

Sub-Area Name	**Q (cfs)**
P-1A (Pond In)	110.75
P-1A (Pond Out)	37.18
P-1B	13.59
P-1 Total (P-1A+P-1B)	50.77
P-2A (Pond In)	370.63
P-2A (Pond Out)	99.66
P-2B	41.53
P-2 Total (P-2A+P-2B)	141.19
P-3	10.43
P-4	22.48
P-5	31.28
P-6	34.27

E. Table Summarizing Allowable and Proposed Release Rates

Table IV.3 – Post-Developed Allowable Peak Runoff Rate

Sub-Area Name	2-Year (cfs)	10-Year (cfs)	100-Year (cfs)
P-1 Total Allowable	9.20	36.78	55.17
P-1 Total Proposed	9.88	31.89	50.77
P-1 Total Difference	**0.68**	**4.89**	**4.44**
P-2 Total Allowable	18.63	74.50	111.75
P-2 Total Proposed	33.07	95.88	141.19
P-2 Total Difference	**14.44**	**21.38**	**29.44**
P-3 Allowable	0.61	2.44	3.66
P-3 Proposed	3.42	6.38	10.43
P-3 Difference	**2.81**	**3.94**	**6.77**
P-4 Allowable	1.32	5.26	7.89
P-4 Proposed	7.38	13.76	22.48
P-4 Difference	**6.06**	**8.50**	**14.59**
P-5 Allowable	1.83	7.32	10.98
P-5 Proposed	10.27	19.15	31.28
P-5 Difference	**8.44**	**11.83**	**20.30**
P-6 Allowable	2.00	8.02	12.03
P-6 Proposed	11.25	20.98	34.27
P-6 Difference	**9.25**	**12.96**	**22.24**

F. Tables Summarizing Detention/Retention Input Data and Results

Table IV.F.1 –North Pond Input Data

	ELEV
30" Culvert (Upstream Invert)	949.40
(3) 1" Orifices (WQ)	949.50
.4'x2' Orifice (2-Year)	951.60
.7'x5' Orifice (10-Year)	953.50
.4'x2' Orifice (100-Year)	954.60
5'x5' Riser (100-Year*)	956.40
Top of Pond	959.00

Table IV.F.2 – North Pond Results

	2-Year	10-Year	100-Year	100-Year*
Allowable Discharge (cfs) P-1 Total	9.20	36.78	55.17	
Pond Discharge (cfs) P-1A	5.42	23.57	37.18	71.38
P-1B Discharge (cfs)	4.46	8.32	13.59	
Total Discharge (P-1A+P-1B)	9.88	31.89	50.77	
Difference	**1.06**	**2.35**	**1.70**	
Pond WSE	953.48	954.55	955.90	957.84
Top of Pond	959.00	959.00	959.00	959.00
Freeboard	**5.52**	**4.45**	**3.10**	**1.16**

*Assumes zero flow through primary outlet with subsequent 1% storm event

Table IV.F.3 –South Pond Input Data

	ELEV
48" Culvert (Upstream Invert)	948.40
(4) 1.5" Orifices (WQ)	948.50
.5'x6' Orifice (2-Year)	951.10
(2) 1.1'x5' Orifice (10-Year & 100-Year)	952.90
6'x5' Riser (100-Year*)	955.88
Top of Pond	958.00

Table IV.F.4 – South Pond Results

	2-Year	10-Year	100-Year	100-Year*
Allowable Discharge (cfs) P-2 Total	18.63	74.50	111.75	
Pond Discharge (cfs) P-2A	19.44	70.45	99.66	74.91
P-2B Dishcarge (cfs)	13.63	25.43	41.53	
Total Discharge (P-2A+P-2B)	33.07	95.88	141.19	
Difference	**2.25**	**16.29**	**30.45**	
Pond WSE	952.85	953.92	955.38	956.96
Top of Pond	958.00	958.00	958.00	958.00
Freeboard	**5.15**	**4.08**	**2.62**	**1.04**

*Assumes zero flow through primary outlet with subsequent 1% storm event

G. Undetained Drainage Areas

There are six areas within this development which are undetained. Explanations of each are below:

P-1 B: Sub-area P-1B is undetained due to elevation and grading constraints. When looking at the entirety of E-1 vs. P-1 the total acreage has been reduced. The total peak flows for these areas have also been reduced from 134.31 cfs in the existing condition to 50.77 cfs in the proposed condition. We would like to request a waiver from DCM for this fringe area.

P-2B: Sub-area P-2B is undetained due to elevation and grading constraints. When looking at the entirety of E-2 vs. P-2 the total acreage has been increased, however, the total peak flows for these areas have been reduced from 272.06 cfs in the existing condition to 141.19 cfs in the proposed condition. We would like to request a waiver from DCM for this fringe area.

P-3: This area is undetained due to elevation and grading constraints. This area also accounts for a portion of the future Hook Road alignment storm system which will not be the responsibility of this development to detain. This area decreased from the existing condition to the proposed condition. The anticipated peak flows have increased by 0.09 cfs because of a higher CN value but there are no concerns with downstream effects. We would like to request a waiver from DCM for this fringe area.

P-4: This area is undetained due to elevation, grading, and location constraints. This area also accounts for portions of the future Hook Road & Hamblen Court alignment storm systems which will not be the responsibility of this development to detain. This area decreased from the existing condition to the proposed condition. The anticipated peak flows have decreased and there are no concerns with downstream effects.

P-5: This area is undetained due to elevation, grading, and location constraints. This area also accounts for portions of the future Hook Road & Hamblen Court alignment storm systems which will not be the responsibility of this development to detain. This area decreased from the existing condition to the proposed condition. The anticipated peak flows have increased by 2.28 cfs because of a higher CN value but there are no concerns with downstream effects.

P-6: This area is undetained because it accounts for the future Hook Road alignment storm system which will not be the responsibility of this development to detain. This area decreased from the existing condition to the proposed condition. The anticipated peak flows have decreased and there are no concerns with downstream effects.

H. Water Quality Requirements

The proposed development is providing stormwater treatment per APWA 5608.4 and Chapter 6 of the MARC/APWA BMP Manual. As indicated in this study the proposed stormwater treatment is extended dry detention with a 1.37" storm release over a 40-hour period.

I. Water Quality Summary

Figure IV.J.1 – North Pond WQ Results

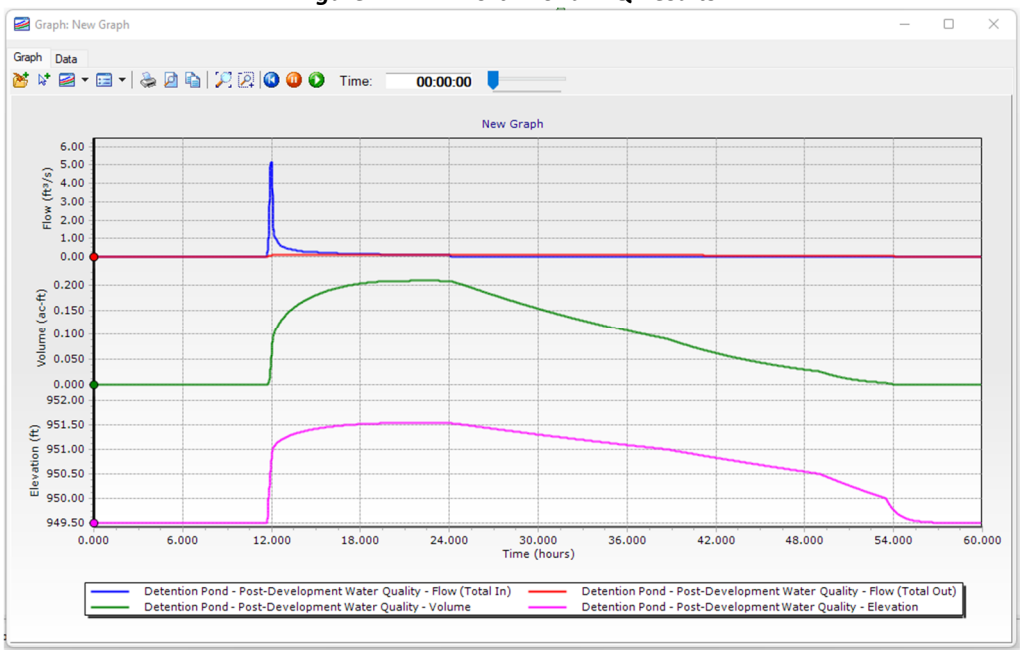
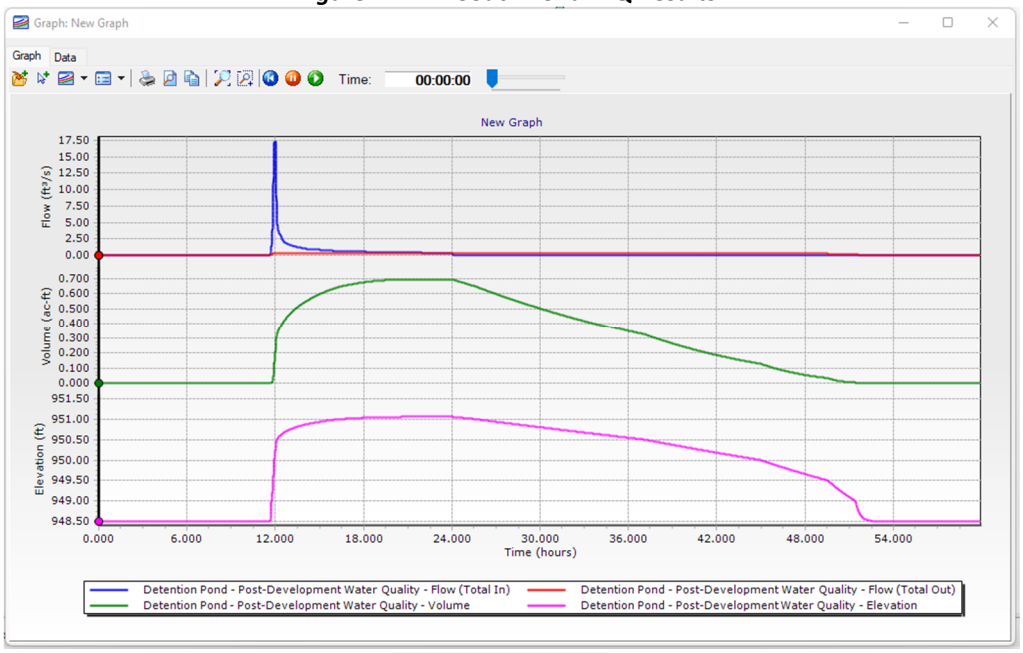


Figure IV.J.2 – South Pond WQ Results



VI. Conclusions and Recommendations

A. Overview of the Report

As indicated in the report the project has 8 POI's. Within the developed area there are 2 dry ponds being proposed to provide comprehensive control on-site. These ponds will treat WQ, 2, 10, 100, and subsequent 100-Year events. There are 6 fringe areas which pose difficulty in providing comprehensive control. Four of those areas encompass the new alignments of Hook Road and Hamblen Court future storm systems and we do not feel this development is responsible for detaining those areas. We would like to request a waiver for the remaining 2 areas.

B. List of Requested Waivers

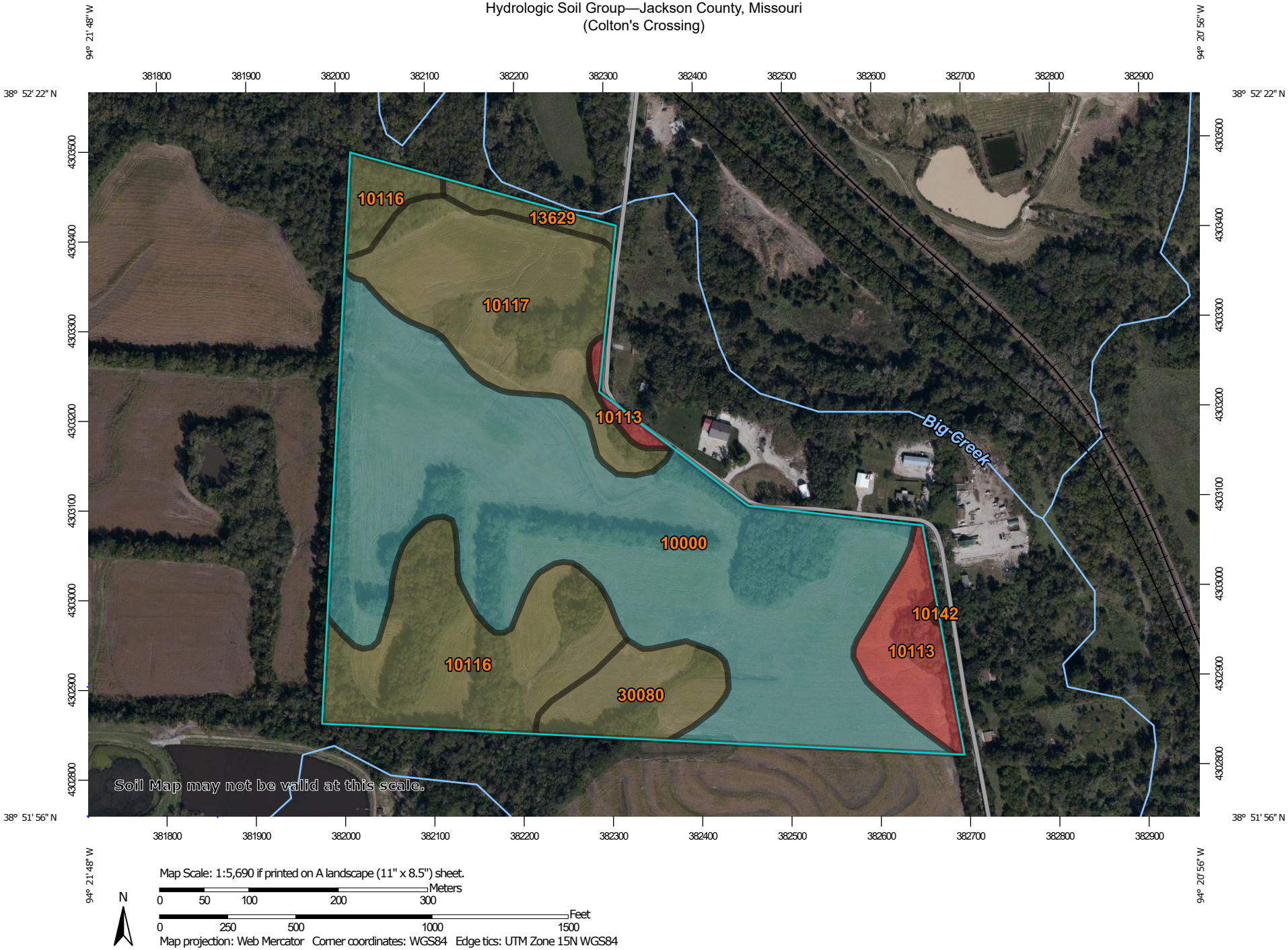
P-1B – Waiver for undetained fringe area
P-2B – Waiver for undetained fringe area
P-3, P-4, P-5, and P-6 – Waiver not assumed

VII. Appendix - Figures / Maps / Exhibits / Supporting Calculations

Figure A – Web Soil Survey
Figure B – Pre-Developed Drainage Area Map
Figure C – Post-Developed Drainage Area Map
Figure D – Elevation-Area-Volume Curves
Figure E – Inflow Hydrographs
Figure F – Stage-Discharge Rating Curves & Input Data Per Basin Outlet
Figure G – Routing Curves for all Design Storms
Figure H – Pondpack Master Summary

Figure A - Web Soil Survey

Hydrologic Soil Group—Jackson County, Missouri
(Colton's Crossing)



Map Scale: 1:5,690 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 23, Sep 1, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	C	37.9	52.2%
10113	Oska silty clay loam, 5 to 9 percent slopes, eroded	D	4.3	6.0%
10116	Sampsel silty clay loam, 2 to 5 percent slopes	C/D	13.3	18.3%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	C/D	11.8	16.2%
10142	Snead-Rock outcrop complex, 5 to 14 percent slopes	D	0.0	0.1%
13629	Colo silt loam, 1 to 4 percent slopes, occasionally flooded	C/D	1.1	1.5%
30080	Greenton silty clay loam, 5 to 9 percent slopes	C/D	4.1	5.7%
Totals for Area of Interest			**72.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FIGURE B

NOTE:
E-1A + E-1B + E-1C = E-1 POI

E-1A
0.74 ACRES
CN=74

E-1B
5.55 ACRES
CN=74

E-1C
12.10 ACRES
CN=74

E-1A POI

E-1B POI

E-1C POI

E-6
4.81 ACRES
CN=74

E-6 POI

E-2A
14.82 ACRES
CN=74

E-2B
11.78 ACRES
CN=74

E-2C
9.85 ACRES
CN=74

E-2D
0.80 ACRES
CN=74

E-5
3.97 ACRES
CN=74

E-5 POI

E-4
5.22 ACRES
CN=74

E-4 POI

E-3
1.44 ACRES
CN=74

E-3 POI

E-2A POI

E-2B POI

E-2C POI

E-2D POI

NOTE:
E-2A + E-2B + E-2C + E-2D = E-2 POI

SE HAMBLEN RD

SAN

FLATTERY
DOC.#2001I0015224

RAINBOW RIDGE ADDITION

LOT 1

LOT 2

LOT 3

LOT 4

LOT 5

LOT 6

LOT 7

LOT 8

LOT 9

OHU

0 100' 150' 200'
SCALE: 1" = 100'

DATE	REVISION	NO.	BY	CK/APP

IF THIS IS NOT A BLUE INK SEAL AND THE SIGNATURE IN BLUE INK, THE PLAN IS A COPY AND MAY CONTAIN UNAUTHORIZED ALTERATIONS. THE CERTIFICATION CONTAINED ON THIS DOCUMENT SHALL NOT APPLY TO ANY COPIES

R. KEVIN STERRETT, KS E-21889
MO E-26440

Consult Inc engineers planners
1533 Locust Street, Kansas City, Missouri 64108
CORPORATE LICENSE No. E2010000573 (MO.) / E-1736 (KS.) / LS 2019005467

PRELIMINARY PLAT
PRE-DEVELOPED DRAINAGE AREA MAP

COLTON'S CORSSING
LOTS 1 THRU 186 AND TRACTS A THRU E
CITY OF LEE'S SUMMIT JACKSON COUNTY, MISSOURI

X-REF NO.
21-018 Base

DRAWING NO.
21-018 Preliminary Plat

DATE
May 27, 2022

JOB NO.
21-018

SHEET 1 OF 2

F:\LDI LOCATION\CURR ENRPROJ\PROJECTS\2021\21-018 HAMBLEN ROAD (MULTI-FAMILY RESIDENTIAL)\PARK\EXHIBITS\21-018 LONGDEN EXHIBIT FOR DESIGN MAP\21-018 EXHIBIT FOR DESIGN.DWG
PLOT DATE: 5/27/2022 12:18 PM by RICHARD MICHAEL

FIGURE C

NOTE:
P-1A + P-1B = P-1 POI

P-1A POI

P-1B POI

P-1B
1.59 ACRES
CN=82

P-1A
12.96 ACRES
CN=82

P-6
4.01 ACRES
CN=82

P-6 POI

P-2A
43.37 ACRES
CN=82

P-2B
4.86 ACRES
CN=82

P-2B POI

P-2A POI

NOTE:
P-2A + P-2B = P-2 POI

P-5
3.66 ACRES
CN=82

P-5 POI

P-4
2.63 ACRES
CN=82

P-4 POI

P-3
1.22 ACRES
CN=82

P-3 POI

FLATTERY
DOC.#2001I0015224

RAINBOW RIDGE ADDITION

BAXTER LANE
BENNET LANE
HOOK ROAD
COLTONS CROSSING DRIVE
BENDEL LANE
KAREN'S DRIVE
JARED DRIVE
SEAN DRIVE
STEPHENS LANE
HAMBLEN BOURNY
CLUBHOUSE
POOL

SCALE: 1" = 100'

DATE	REVISION	NO.	BY	CK/APP

IF THIS IS NOT A BLUE INK SEAL AND THE SIGNATURE IN BLUE INK, THE PLAN IS A COPY AND MAY CONTAIN UNAUTHORIZED ALTERATIONS. THE CERTIFICATION CONTAINED ON THIS DOCUMENT SHALL NOT APPLY TO ANY COPIES

R. KEVIN STERRETT, KS E-21889
MO E-26440

Consult engineers planners Inc
1533 Locust Street, Kansas City, Missouri 64108
CORPORATE LICENSE No. E2010005573 (MO.) / E-1736 (KS.) / LS 2019005467

PRELIMINARY PLAT
POST-DEVELOPED DRAINAGE AREA MAP

COLTON'S CORSSING
LOTS 1 THRU 186 AND TRACTS A THRU E
CITY OF LEE'S SUMMIT JACKSON COUNTY, MISSOURI

X-REF NO.
21-018 Base

DRAWING NO.
21-018 Preliminary Plat

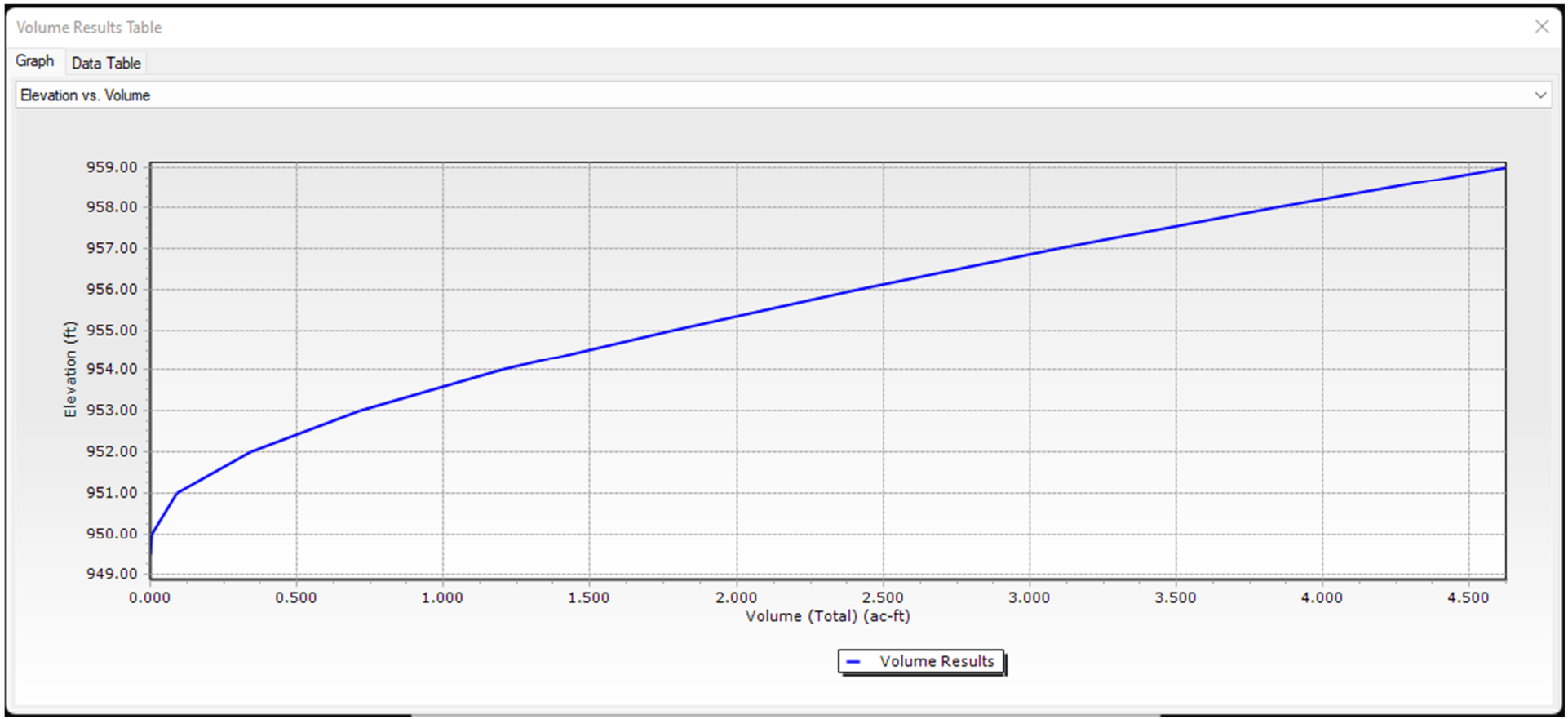
DATE
May 27, 2022

JOB NO.
21-018

SHEET 2 OF 2

Figure D –
Elevation-Area-Volume Curves

North Detention Pond Elevation Area Volume Curve



South Detention Pond Elevation Area Volume Curve

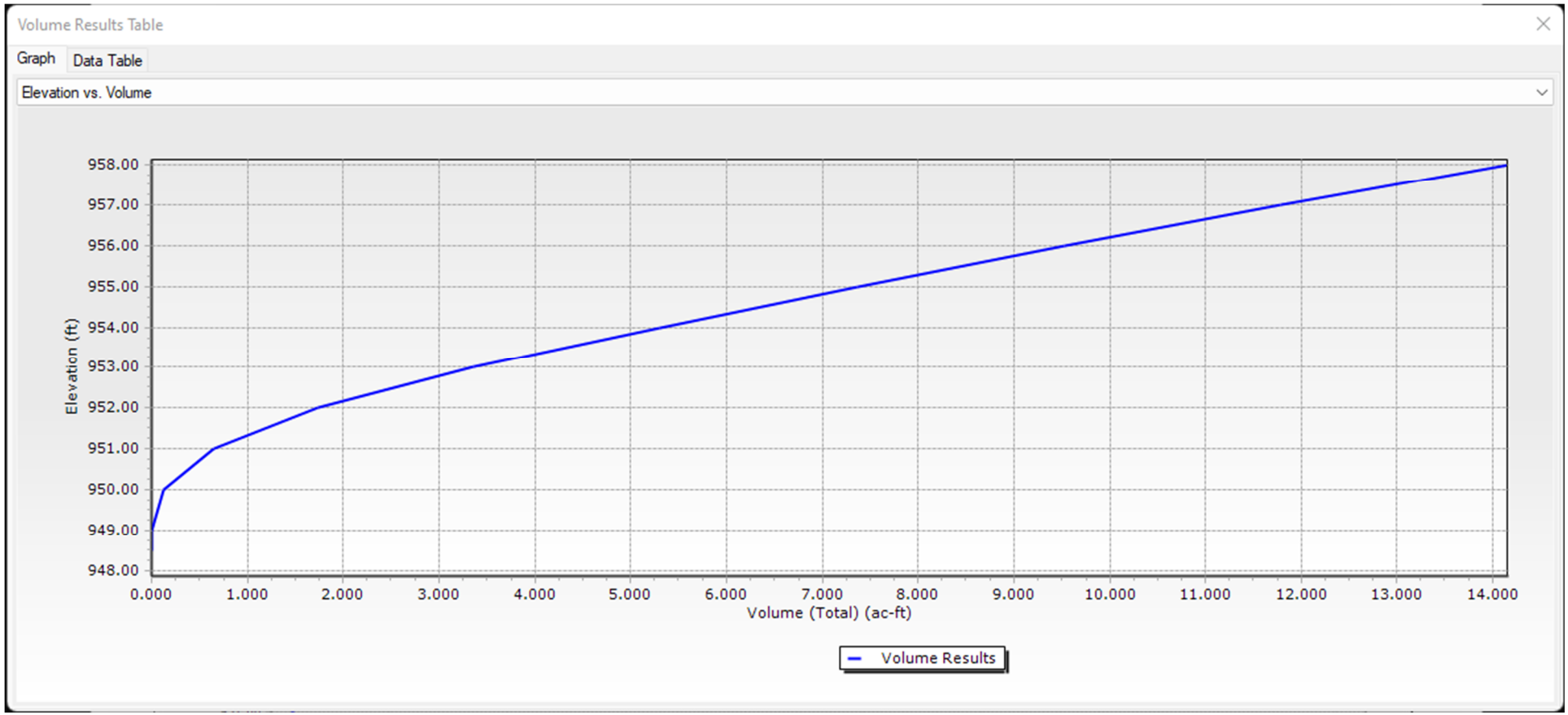
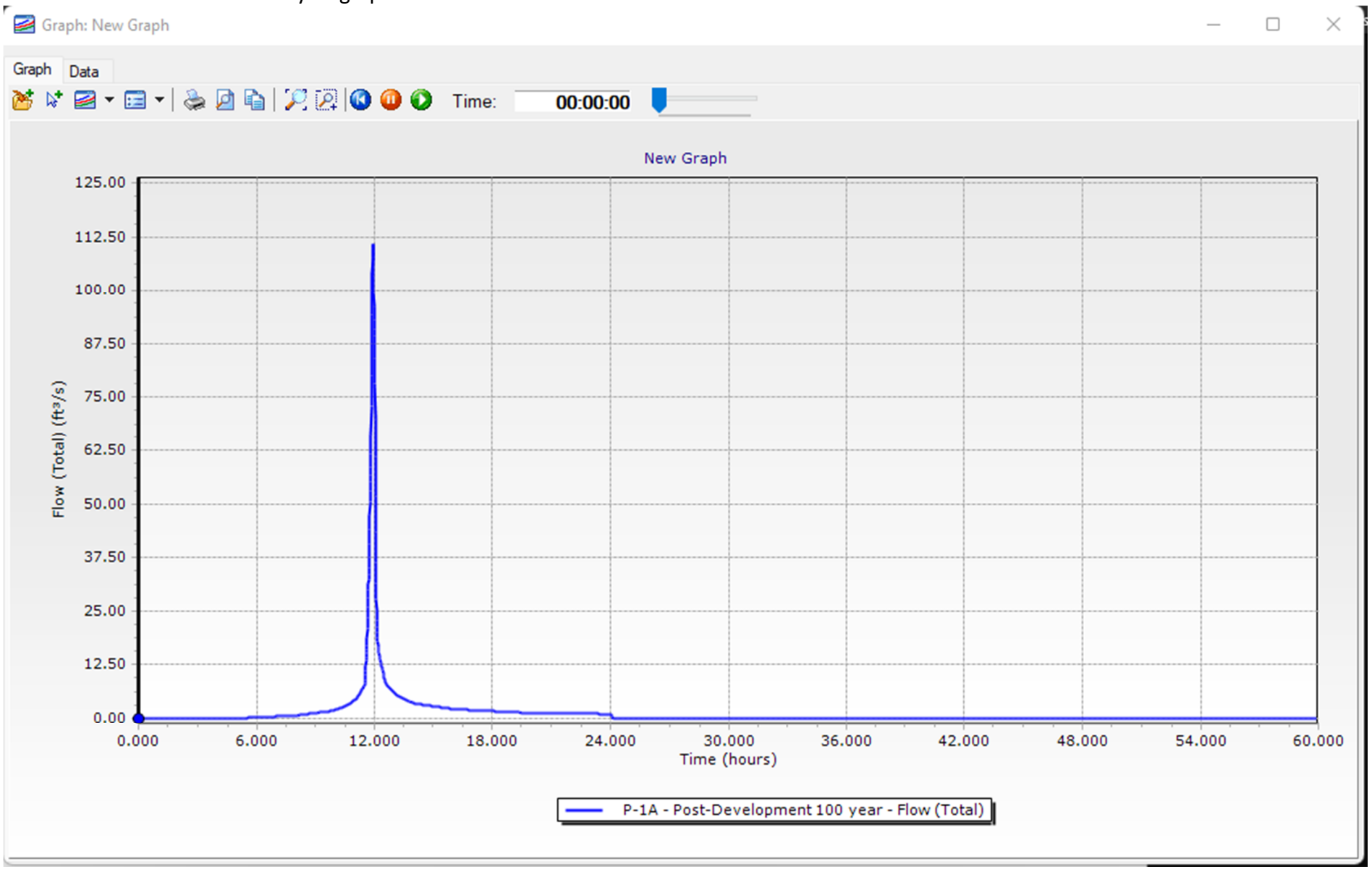


Figure E –
Inflow Hydrographs

North Detention Pond Inflow Hydrograph



South Detention Pond Inflow Hydrograph

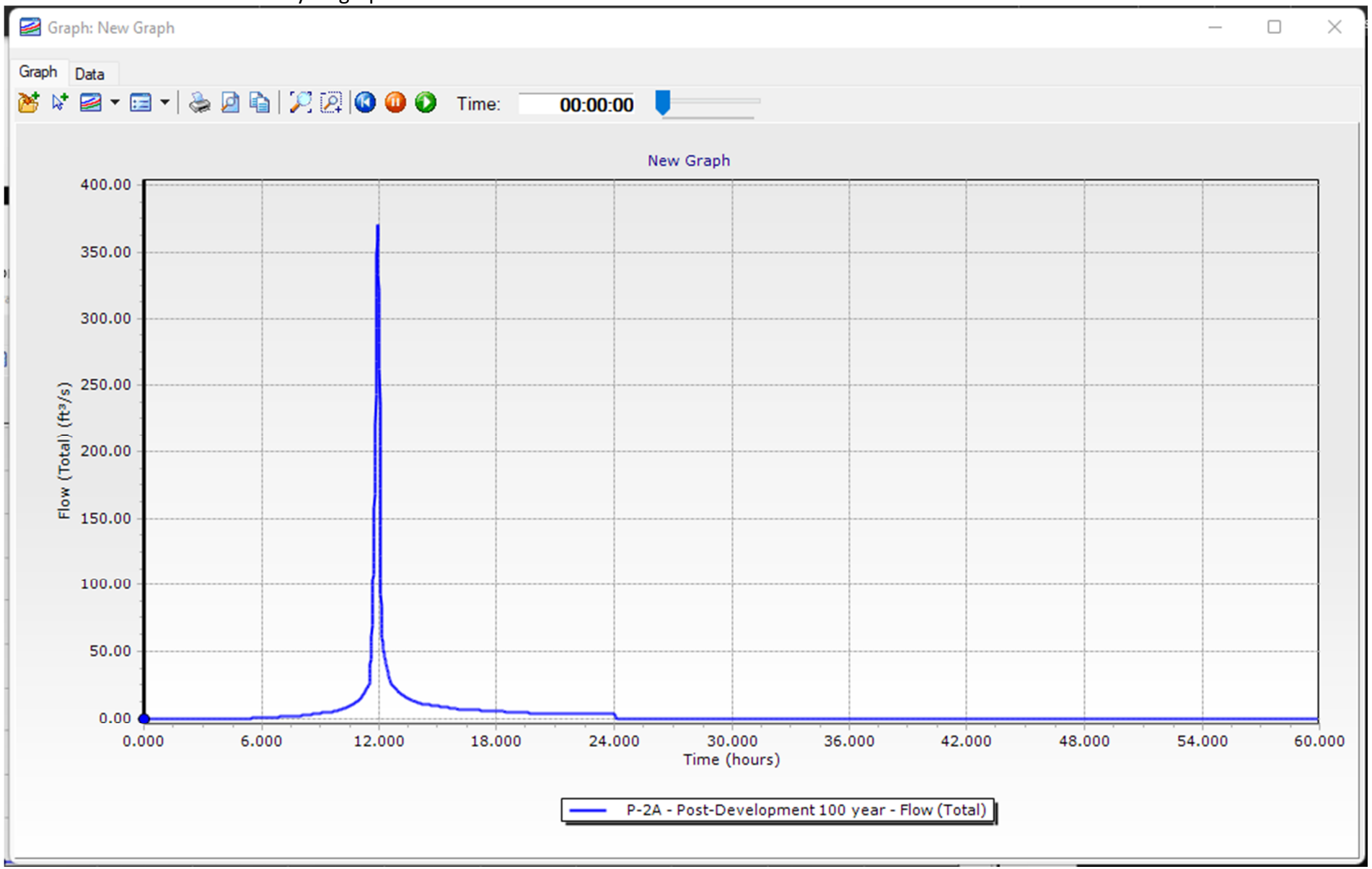


Figure F –
Stage-Discharge Rating Curves &
Input Data Per Basin Outlet

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Element Details			
Label	Composite Outlet Structure	Notes	

Headwater Range			
Headwater Type	Use Pond for Headwater Range	Maximum (Headwater)	959.00 ft
Pond	Detention Pond	Increment (Headwater)	0.50 ft
Minimum (Headwater)	949.50 ft		

SpotElevation (ft)

Tailwater Setup	
Tailwater Type	Free Outfall

Tailwater Tolerances			
Maximum Iterations	30	Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft	Flow Tolerance (Minimum)	0.001 ft³/s
Headwater Tolerance (Maximum)	0.50 ft	Flow Tolerance (Maximum)	10.000 ft³/s
Tailwater Tolerance (Minimum)	0.01 ft		

Outlet Structure			
Outlet Structure Type	Culvert	Culvert Type	Circular

Outlet Structure (IDs and Direction)			
Outlet ID	Culvert -1	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

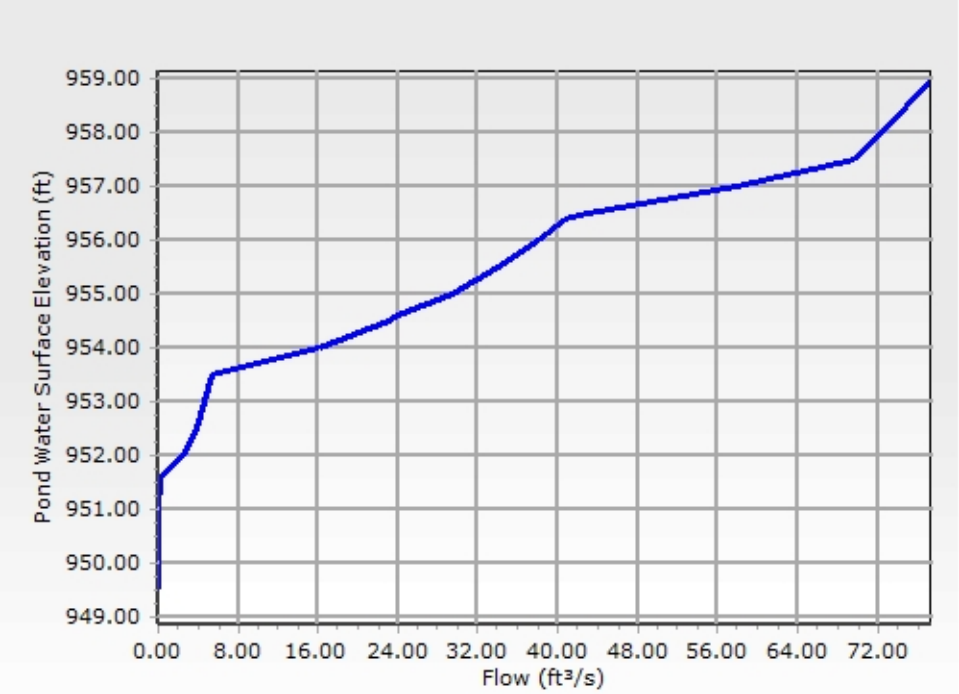
Culvert Data			
Number of Barrels	1	Downstream Invert	948.40 ft
Length	56.09 ft	Diameter	30.0 in
Upstream Invert	949.40 ft		

Unsubmerged->Submerged			
Specify Transitions	False	Compute Inlet Control Only	False

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Culvert Coefficients			
Inlet Description	Concrete - Groove end projecting	C	0.0317
Chart	Chart 1	Y	0.6900
Nomograph	Nomograph 3	Manning's n	0.010
Equation Form	Form 1	Ke	0.200
K	0.0045	Kr	0.000
M	2.0000	Slope Correction Factor	-0.500

Culvert (Advanced)			
Convergence Tolerance	0.00 ft	Specify Number of Backwater Sections	False



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 76.58 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Orifice - 4, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 76.58 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Orifice - 4, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
949.50	0.00	0.00	0.00	Free Outfall
950.00	0.05	949.50	Free Outfall	Free Outfall
950.50	0.07	0.00	Free Outfall	Free Outfall
951.00	0.08	0.00	Free Outfall	Free Outfall
951.50	0.11	949.55	Free Outfall	Free Outfall
951.60	0.11	949.55	Free Outfall	Free Outfall
952.00	2.54	950.14	Free Outfall	Free Outfall
952.50	3.78	950.31	Free Outfall	Free Outfall
953.00	4.68	950.42	Free Outfall	Free Outfall
953.50	5.44	950.50	Free Outfall	Free Outfall
954.00	16.15	951.41	Free Outfall	Free Outfall
954.50	23.16	951.90	Free Outfall	Free Outfall
954.60	24.04	951.96	Free Outfall	Free Outfall
955.00	29.48	952.32	Free Outfall	Free Outfall
955.50	34.12	952.63	Free Outfall	Free Outfall
956.00	37.98	953.00	Free Outfall	Free Outfall
956.40	40.75	953.29	Free Outfall	Free Outfall
956.50	43.02	953.54	Free Outfall	Free Outfall
957.00	57.89	955.51	Free Outfall	Free Outfall
957.50	69.73	957.50	Free Outfall	Free Outfall
958.00	72.41	958.00	Free Outfall	Free Outfall
958.50	74.98	958.50	Free Outfall	Free Outfall
959.00	77.47	959.00	Free Outfall	Free Outfall

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.02	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 76.58 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Orifice - 4, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.02	(N/A)	0.00
0.00	0.02	(N/A)	0.00
0.00	0.01	(N/A)	0.00
0.00	0.02	(N/A)	0.00
0.00	0.04	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.04	(N/A)	0.00
0.00	0.04	(N/A)	0.00
0.00	49.02	(N/A)	0.00
0.00	99.39	(N/A)	0.00
0.00	116.55	(N/A)	0.00

Message
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .025ft Dcr= .074ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .028ft Dcr= .084ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .031ft Dcr= .093ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .036ft Dcr= .106ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .036ft Dcr= .107ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .182ft Dcr= .521ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .227ft Dcr= .638ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .256ft Dcr= .713ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .547ft Dcr= 1.358ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .717ft Dcr= 1.638ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .740ft Dcr= 1.670ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .889ft Dcr= 1.851ft CRIT.DEPTH Hev= .00ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 76.58 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Orifice - 4, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
INLET CONTROL... Submerged: HW =3.23
INLET CONTROL... Submerged: HW =3.60
INLET CONTROL... Submerged: HW =3.89
INLET CONTROL... Submerged: HW =4.14
INLET CONTROL... Submerged: HW =6.11
INLET CONTROL... Submerged: HW =8.10
INLET CONTROL... Submerged: HW =8.60
INLET CONTROL... Submerged: HW =9.10
INLET CONTROL... Submerged: HW =9.60

Outlet Structure	
Outlet Structure Type	Riser

Outlet Structure (IDs and Direction)			
Outlet ID	Riser - 3	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

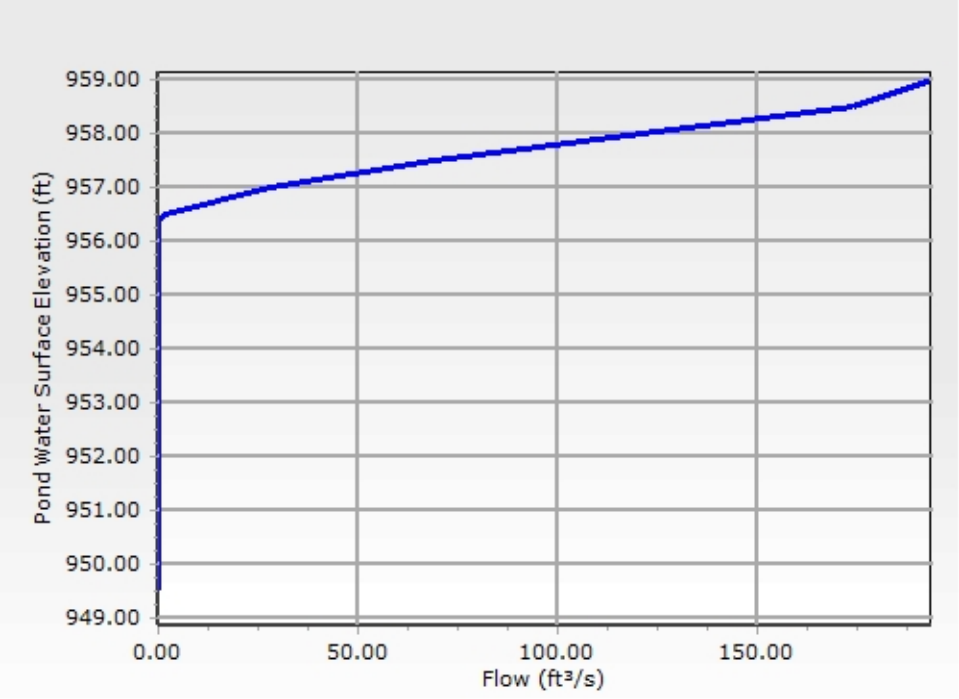
Outlet Structure (Riser)			
Riser	Inlet Box	Orifice Area	25.00 ft²
Weir Length	20.00 ft	Transition Elevation	0.00 ft
Weir Coefficient	3.00 (ft^0.5)/s	Transition Height	0.00 ft
Orifice Coefficient	0.600	K Reverse	1.000

Outlet Structure (Common)	
Elevation	956.40 ft

Outlet Structure (Riser, Advanced)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Riser, Advanced)			
Use Orifice Depth to Crest?	True	Use Submerged Weir Equation?	False



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 3 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
949.50	0.00	0.00	0.00	0.00
950.00	0.00	0.00	0.00	949.50
950.50	0.00	0.00	0.00	0.00
951.00	0.00	0.00	0.00	0.00
951.50	0.00	0.00	0.00	949.55
951.60	0.00	0.00	0.00	949.55
952.00	0.00	0.00	0.00	950.14
952.50	0.00	0.00	0.00	950.31
953.00	0.00	0.00	0.00	950.42
953.50	0.00	0.00	0.00	950.50
954.00	0.00	0.00	0.00	951.41

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 3 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
954.50	0.00	0.00	0.00	951.90
954.60	0.00	0.00	0.00	951.96
955.00	0.00	0.00	0.00	952.32
955.50	0.00	0.00	0.00	952.63
956.00	0.00	0.00	0.00	953.00
956.40	0.00	0.00	0.00	953.29
956.50	1.90	956.50	Free Outfall	953.54
957.00	27.89	957.00	Free Outfall	955.51
957.50	69.22	957.50	957.50	957.50
958.00	121.43	958.00	958.00	958.00
958.50	174.37	958.50	958.50	958.50
959.00	194.02	959.00	959.00	959.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Message

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 3 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.1ft
Weir: H =0.6ft
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.1ft
FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000
FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000
FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000

Outlet Structure	
Outlet Structure Type	Orifice

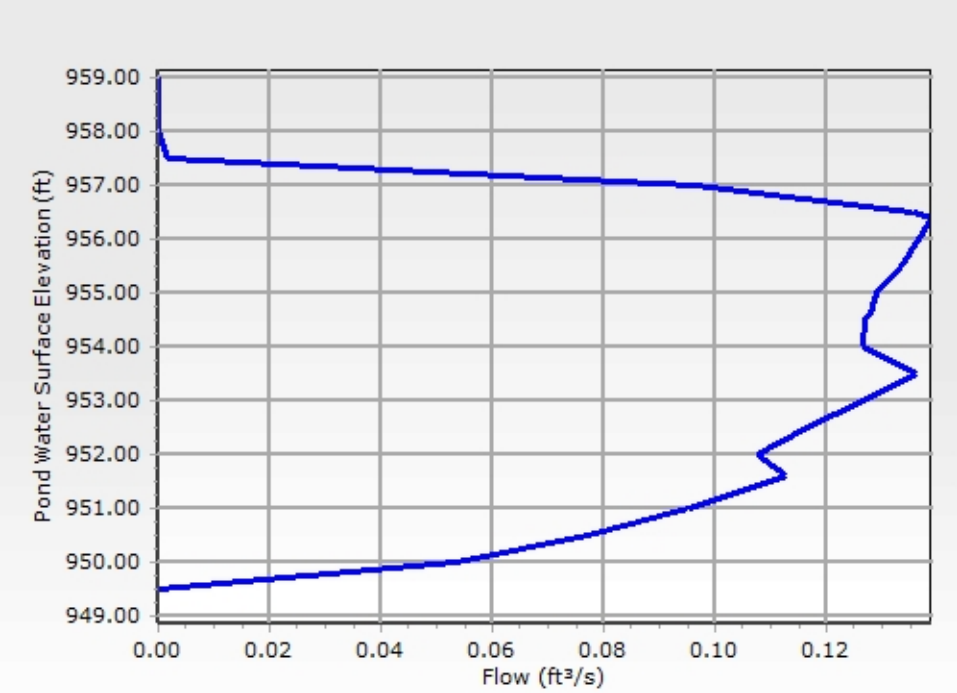
Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 1	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	3	Orifice Diameter	1.0 in

Outlet Structure (Common)	
Elevation	949.50 ft



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
949.50	0.00	0.00	0.00	0.00
950.00	0.05	950.00	949.50	949.50
950.50	0.08	950.50	949.52	0.00
951.00	0.10	951.00	949.53	0.00
951.50	0.11	951.50	949.55	949.55
951.60	0.11	951.60	949.55	949.55
952.00	0.11	952.00	950.14	950.14

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
952.50	0.12	952.50	950.31	950.31
953.00	0.13	953.00	950.42	950.42
953.50	0.14	953.50	950.50	950.50
954.00	0.13	954.00	951.41	951.41
954.50	0.13	954.50	951.90	951.90
954.60	0.13	954.60	951.96	951.96
955.00	0.13	955.00	952.32	952.32
955.50	0.13	955.50	952.63	952.63
956.00	0.14	956.00	953.00	953.00
956.40	0.14	956.40	953.29	953.29
956.50	0.14	956.50	953.54	953.54
957.00	0.10	957.00	955.51	955.51
957.50	0.00	957.50	957.50	957.50
958.00	0.00	958.00	958.00	958.00
958.50	0.00	958.50	958.50	958.50
959.00	0.00	959.00	959.00	959.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
H =.46
H =.96
H =1.46
H =1.95
H =2.05
H =1.86
H =2.19
H =2.58
H =3.00
H =2.59
H =2.60
H =2.64
H =2.68
H =2.87
H =3.00
H =3.11
H =2.96
H =1.49
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Outlet Structure	
Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)

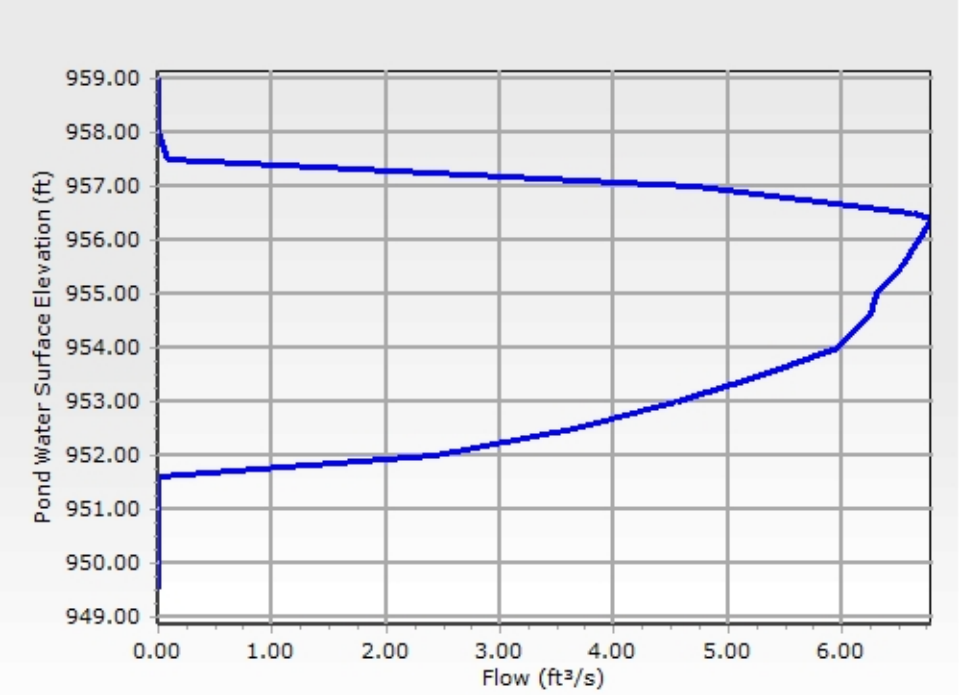
Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 2	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Area Orifice	Orifice Orientation	Perpendicular Orifice
Number of Openings	1	Datum Elevation	951.60 ft
Orifice Coefficient	0.600	Top Elevation	952.00 ft
Orifice Area	0.80 ft²		

Outlet Structure (Common)	
Elevation	951.60 ft



Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
949.50	0.00	0.00	0.00	0.00
950.00	0.00	0.00	0.00	949.50
950.50	0.00	0.00	0.00	0.00
951.00	0.00	0.00	0.00	0.00
951.50	0.00	0.00	0.00	949.55
951.60	0.00	0.00	0.00	949.55
952.00	2.44	952.00	Free Outfall	950.14
952.50	3.65	952.50	Free Outfall	950.31
953.00	4.56	953.00	Free Outfall	950.42
953.50	5.31	953.50	Free Outfall	950.50
954.00	5.97	954.00	Free Outfall	951.41
954.50	6.21	954.50	951.90	951.90
954.60	6.26	954.60	951.96	951.96
955.00	6.31	955.00	952.32	952.32
955.50	6.52	955.50	952.63	952.63
956.00	6.67	956.00	953.00	953.00
956.40	6.79	956.40	953.29	953.29
956.50	6.63	956.50	953.54	953.54
957.00	4.70	957.00	955.51	955.51
957.50	0.09	957.50	957.50	957.50
958.00	0.00	958.00	958.00	958.00
958.50	0.00	958.50	958.50	958.50
959.00	0.00	959.00	959.00	959.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	H =.40
0.00	0.00	(N/A)	0.00	H =.90
0.00	0.00	(N/A)	0.00	H =1.40
0.00	0.00	(N/A)	0.00	H =1.90
0.00	0.00	(N/A)	0.00	H =2.40
0.00	0.00	(N/A)	0.00	H =2.60
0.00	0.00	(N/A)	0.00	H =2.64
0.00	0.00	(N/A)	0.00	H =2.68
0.00	0.00	(N/A)	0.00	H =2.87
0.00	0.00	(N/A)	0.00	H =3.00
0.00	0.00	(N/A)	0.00	H =3.11
0.00	0.00	(N/A)	0.00	H =2.96
0.00	0.00	(N/A)	0.00	H =1.49
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Message
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Outlet Structure	
Outlet Structure Type	Orifice

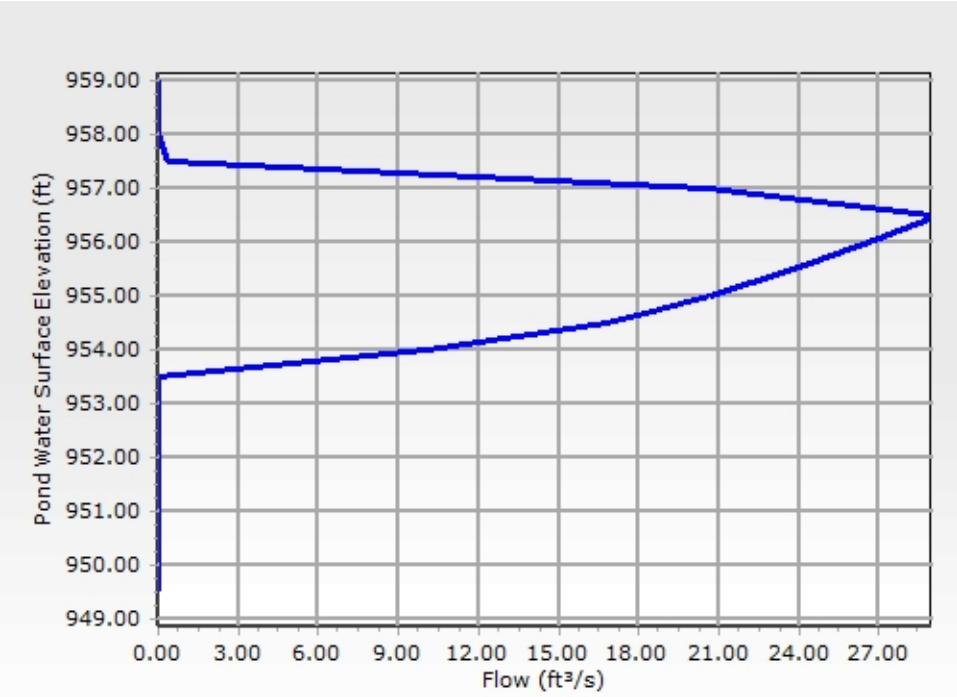
Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 3	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Area Orifice	Orifice Orientation	Perpendicular Orifice
Number of Openings	1	Datum Elevation	953.50 ft
Orifice Coefficient	0.600	Top Elevation	954.20 ft
Orifice Area	3.50 ft²		

Outlet Structure (Common)	
Elevation	953.50 ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
949.50	0.00	0.00	0.00	0.00
950.00	0.00	0.00	0.00	949.50
950.50	0.00	0.00	0.00	0.00
951.00	0.00	0.00	0.00	0.00
951.50	0.00	0.00	0.00	949.55
951.60	0.00	0.00	0.00	949.55
952.00	0.00	0.00	0.00	950.14
952.50	0.00	0.00	0.00	950.31
953.00	0.00	0.00	0.00	950.42
953.50	0.00	0.00	0.00	950.50
954.00	10.07	954.00	Free Outfall	951.41
954.50	16.85	954.50	Free Outfall	951.90
954.60	17.67	954.60	Free Outfall	951.96
955.00	20.63	955.00	Free Outfall	952.32
955.50	23.82	955.50	Free Outfall	952.63
956.00	26.64	956.00	Free Outfall	953.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
956.40	28.69	956.40	Free Outfall	953.29
956.50	28.99	956.50	953.54	953.54
957.00	20.55	957.00	955.51	955.51
957.50	0.37	957.50	957.50	957.50
958.00	0.00	958.00	958.00	958.00
958.50	0.00	958.50	958.50	958.50
959.00	0.00	959.00	959.00	959.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Hi=.50; Ht=.70; Qt=14.09
H =1.00
H =1.10
H =1.50
H =2.00
H =2.50
H =2.90
H =2.96
H =1.49
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Outlet Structure	
Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 4	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

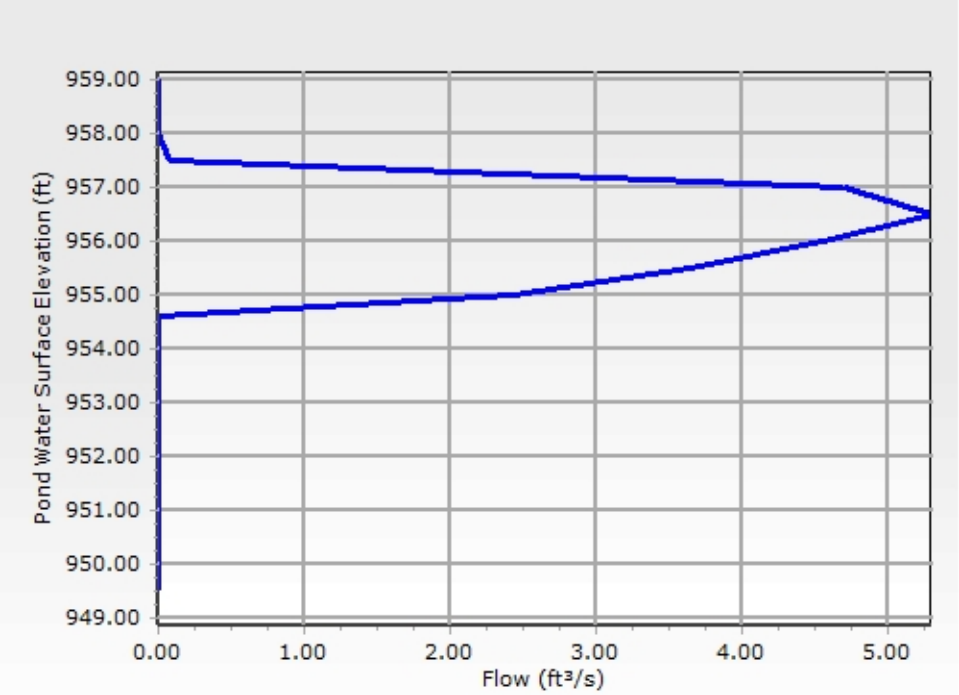
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Area Orifice	Orifice Orientation	Perpendicular Orifice

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Orifice)			
Number of Openings	1	Datum Elevation	954.60 ft
Orifice Coefficient	0.600	Top Elevation	955.00 ft
Orifice Area	0.80 ft²		

Outlet Structure (Common)	
Elevation	954.60 ft



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 4 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
949.50	0.00	0.00	0.00	0.00
950.00	0.00	0.00	0.00	949.50
950.50	0.00	0.00	0.00	0.00
951.00	0.00	0.00	0.00	0.00
951.50	0.00	0.00	0.00	949.55
951.60	0.00	0.00	0.00	949.55
952.00	0.00	0.00	0.00	950.14

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 4 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
952.50	0.00	0.00	0.00	950.31
953.00	0.00	0.00	0.00	950.42
953.50	0.00	0.00	0.00	950.50
954.00	0.00	0.00	0.00	951.41
954.50	0.00	0.00	0.00	951.90
954.60	0.00	0.00	0.00	951.96
955.00	2.44	955.00	Free Outfall	952.32
955.50	3.65	955.50	Free Outfall	952.63
956.00	4.56	956.00	Free Outfall	953.00
956.40	5.17	956.40	Free Outfall	953.29
956.50	5.31	956.50	Free Outfall	953.54
957.00	4.70	957.00	955.51	955.51
957.50	0.09	957.50	957.50	957.50
958.00	0.00	958.00	958.00	958.00
958.50	0.00	958.50	958.50	958.50
959.00	0.00	959.00	959.00	959.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 4 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				H =.40
				H =.90
				H =1.40
				H =1.80
				H =1.90
				H =1.49
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Composite Rating Table
Tailwater Elevation = Free Outfall (Composite Outlet Structure)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
949.50	0.00	(N/A)	0.00
950.00	0.05	(N/A)	0.00
950.50	0.07	(N/A)	0.00
951.00	0.08	(N/A)	0.00
951.50	0.11	(N/A)	0.00
951.60	0.11	(N/A)	0.00
952.00	2.54	(N/A)	0.00
952.50	3.77	(N/A)	0.00
953.00	4.68	(N/A)	0.00
953.50	5.44	(N/A)	0.00
954.00	16.15	(N/A)	0.00
954.50	23.16	(N/A)	0.00
954.60	24.04	(N/A)	0.00
955.00	29.48	(N/A)	0.00
955.50	34.12	(N/A)	0.00
956.00	37.98	(N/A)	0.00
956.40	40.75	(N/A)	0.00
956.50	42.96	(N/A)	0.00
957.00	57.89	(N/A)	0.00
957.50	69.73	(N/A)	0.00
958.00	72.41	(N/A)	0.00
958.50	74.98	(N/A)	0.00
959.00	77.47	(N/A)	0.00

Contributing Structures
(no Q: Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3,Orifice - 1,Culvert -1)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Orifice - 4,Riser - 3)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

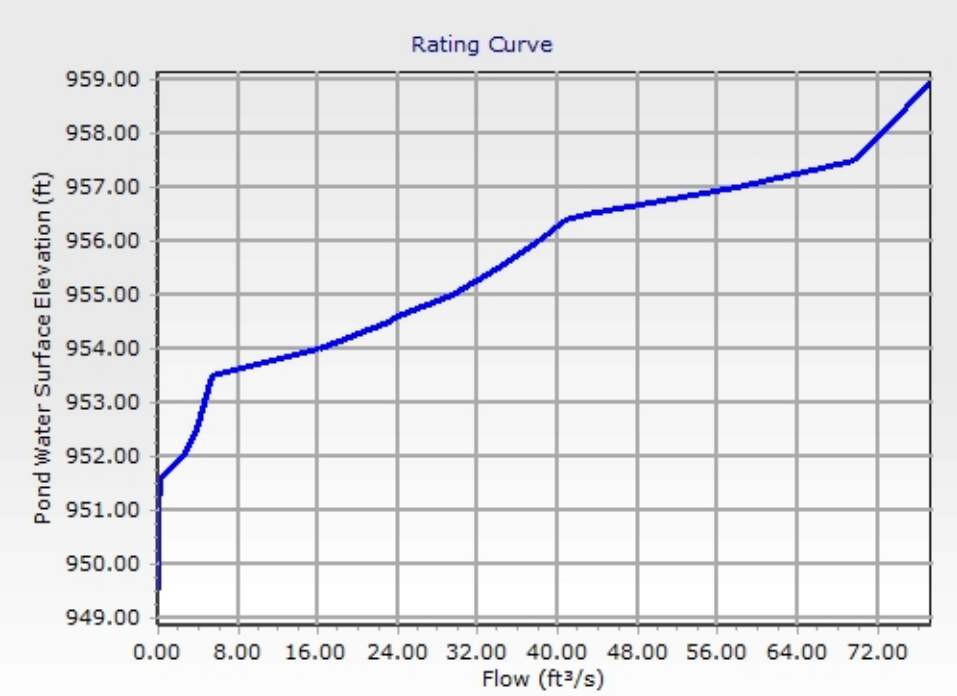
Composite Rating Table
Tailwater Elevation = Free Outfall (Composite Outlet Structure)

Contributing Structures
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Orifice - 4,Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3,Orifice - 1,Culvert -1
Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3,Orifice - 1,Culvert -1
Orifice - 2,Orifice - 3,Orifice - 4,Riser - 3,Orifice - 1,Culvert -1

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Composite Rating Table
Tailwater Elevation = Free Outfall (Composite Outlet Structure)

Contributing Structures
Riser - 3,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1)
Riser - 3,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1)
Riser - 3,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 4,Orifice - 1)



Composite Outlet Structure Detailed Report: Composite Outlet Structure

Element Details			
Label	Composite Outlet Structure	Notes	

Headwater Range			
Headwater Type	Use Pond for Headwater Range	Maximum (Headwater)	958.00 ft
Pond	Detention Pond	Increment (Headwater)	0.50 ft
Minimum (Headwater)	948.50 ft		

SpotElevation (ft)

Tailwater Setup	
Tailwater Type	Free Outfall

Tailwater Tolerances			
Maximum Iterations	30	Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft	Flow Tolerance (Minimum)	0.001 ft³/s
Headwater Tolerance (Maximum)	0.50 ft	Flow Tolerance (Maximum)	10.000 ft³/s
Tailwater Tolerance (Minimum)	0.01 ft		

Outlet Structure			
Outlet Structure Type	Culvert	Culvert Type	Circular

Outlet Structure (IDs and Direction)			
Outlet ID	Culvert -1	Downstream ID	Tailwater
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

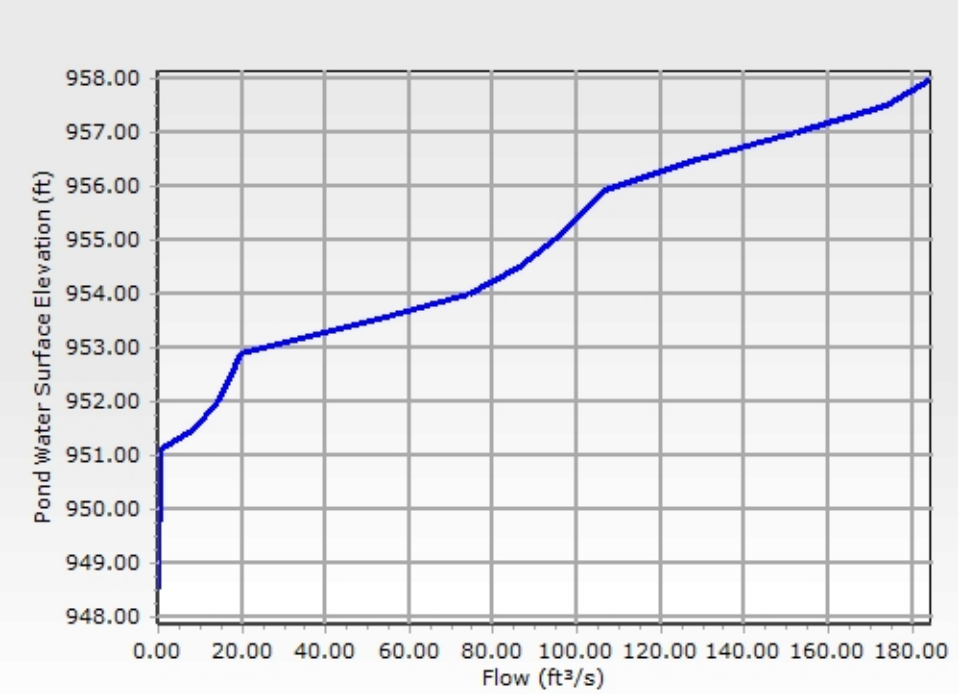
Culvert Data			
Number of Barrels	1	Downstream Invert	948.00 ft
Length	53.50 ft	Diameter	48.0 in
Upstream Invert	948.40 ft		

Unsubmerged->Submerged			
Specify Transitions	False	Compute Inlet Control Only	False

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Culvert Coefficients			
Inlet Description	Concrete - Groove end projecting	C	0.0317
Chart	Chart 1	Y	0.6900
Nomograph	Nomograph 3	Manning's n	0.010
Equation Form	Form 1	Ke	0.200
K	0.0045	Kr	0.200
M	2.0000	Slope Correction Factor	-0.500

Culvert (Advanced)			
Convergence Tolerance	0.00 ft	Specify Number of Backwater Sections	False



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 173.68 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 173.68 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
948.50	0.00	0.00	0.00	Free Outfall
949.00	0.15	0.00	Free Outfall	Free Outfall
949.50	0.22	948.59	Free Outfall	Free Outfall
950.00	0.29	948.61	Free Outfall	Free Outfall
950.50	0.32	948.63	Free Outfall	Free Outfall
951.00	0.36	948.64	Free Outfall	Free Outfall
951.10	0.37	948.64	Free Outfall	Free Outfall
951.50	8.49	949.60	Free Outfall	Free Outfall
952.00	14.03	949.97	Free Outfall	Free Outfall
952.50	17.43	950.16	Free Outfall	Free Outfall
952.90	19.75	950.28	Free Outfall	Free Outfall
953.00	25.32	950.55	Free Outfall	Free Outfall
953.50	50.69	951.56	Free Outfall	Free Outfall
954.00	74.20	952.37	Free Outfall	Free Outfall
954.50	86.21	952.77	Free Outfall	Free Outfall
955.00	94.65	953.04	Free Outfall	Free Outfall
955.50	101.21	953.26	Free Outfall	Free Outfall
955.88	106.07	953.42	Free Outfall	Free Outfall
956.00	109.05	953.53	Free Outfall	Free Outfall
956.50	128.70	954.47	Free Outfall	Free Outfall
957.00	152.33	955.80	Free Outfall	Free Outfall
957.50	173.59	957.19	Free Outfall	Free Outfall
958.00	184.80	958.00	Free Outfall	Free Outfall

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.01	(N/A)	0.00
0.00	0.01	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 173.68 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.02	(N/A)	0.00
0.00	0.04	(N/A)	0.00
0.00	0.08	(N/A)	0.00
0.00	0.05	(N/A)	0.00
0.00	0.01	(N/A)	0.00
0.00	0.01	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	18.93	(N/A)	0.00

Message
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .037ft Dcr= .111ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .045ft Dcr= .135ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .055ft Dcr= .163ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .058ft Dcr= .172ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .058ft Dcr= .174ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .297ft Dcr= .847ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .392ft Dcr= 1.096ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .443ft Dcr= 1.226ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .476ft Dcr= 1.308ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .550ft Dcr= 1.487ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .856ft Dcr= 2.137ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.138ft Dcr= 2.607ft CRIT.DEPTH Hev= .00ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert -1 (Culvert-Circular)

Mannings open channel maximum capacity: 173.68 ft³/s
Upstream ID = Orifice - 2, Orifice - 3, Riser - 3, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= 1.293ft Dcr= 2.815ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.411ft Dcr= 2.950ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.508ft Dcr= 3.048ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.584ft Dcr= 3.117ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =5.13
INLET CONTROL... Submerged: HW =6.07
INLET CONTROL... Submerged: HW =7.40
INLET CONTROL... Submerged: HW =8.79
INLET CONTROL... Submerged: HW =9.60

Outlet Structure

Outlet Structure Type	Riser

Outlet Structure (IDs and Direction)

Outlet ID	Riser - 3	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Riser)

Riser	Inlet Box	Orifice Area	30.00 ft²
Weir Length	22.00 ft	Transition Elevation	0.00 ft
Weir Coefficient	3.00 (ft^0.5)/s	Transition Height	0.00 ft
Orifice Coefficient	0.600	K Reverse	1.000

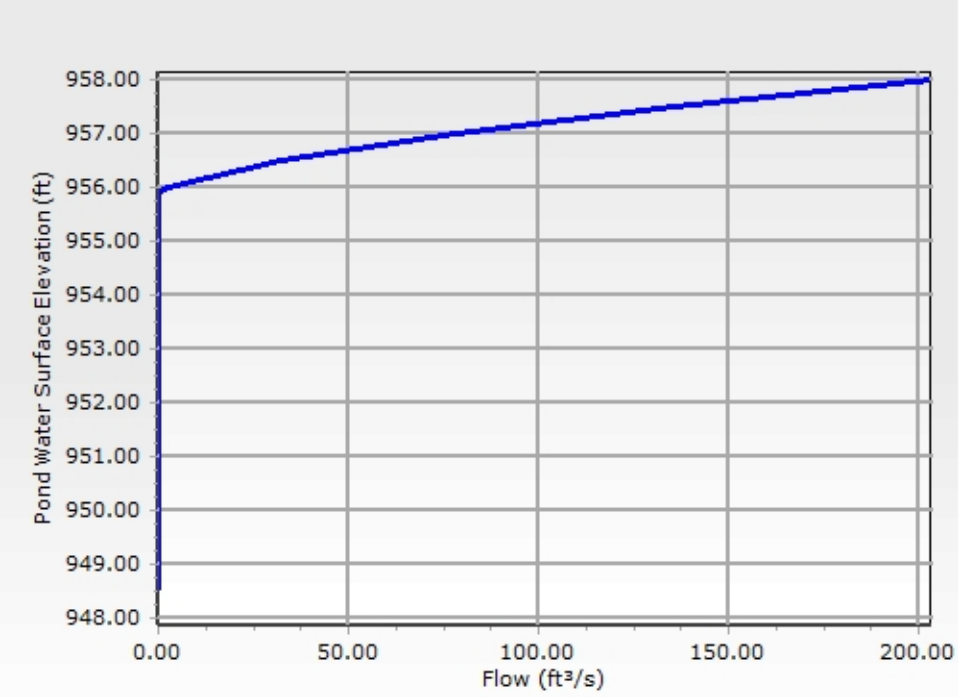
Outlet Structure (Common)

Elevation	955.88 ft

Outlet Structure (Riser, Advanced)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Riser, Advanced)			
Use Orifice Depth to Crest?	True	Use Submerged Weir Equation?	False



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 3 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
948.50	0.00	0.00	0.00	0.00
949.00	0.00	0.00	0.00	0.00
949.50	0.00	0.00	0.00	948.59
950.00	0.00	0.00	0.00	948.61
950.50	0.00	0.00	0.00	948.63
951.00	0.00	0.00	0.00	948.64
951.10	0.00	0.00	0.00	948.64
951.50	0.00	0.00	0.00	949.60
952.00	0.00	0.00	0.00	949.97
952.50	0.00	0.00	0.00	950.16
952.90	0.00	0.00	0.00	950.28

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 3 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
953.00	0.00	0.00	0.00	950.55
953.50	0.00	0.00	0.00	951.56
954.00	0.00	0.00	0.00	952.37
954.50	0.00	0.00	0.00	952.77
955.00	0.00	0.00	0.00	953.04
955.50	0.00	0.00	0.00	953.26
955.88	0.00	0.00	0.00	953.42
956.00	2.74	956.00	Free Outfall	953.53
956.50	32.22	956.50	Free Outfall	954.47
957.00	78.23	957.00	Free Outfall	955.80
957.50	136.09	957.50	957.19	957.19
958.00	203.73	958.00	958.00	958.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Message

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 3 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.12ft
Weir: H =0.62ft
Weir: H =1.12ft
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.62ft
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2.12ft

Outlet Structure	
Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 1	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

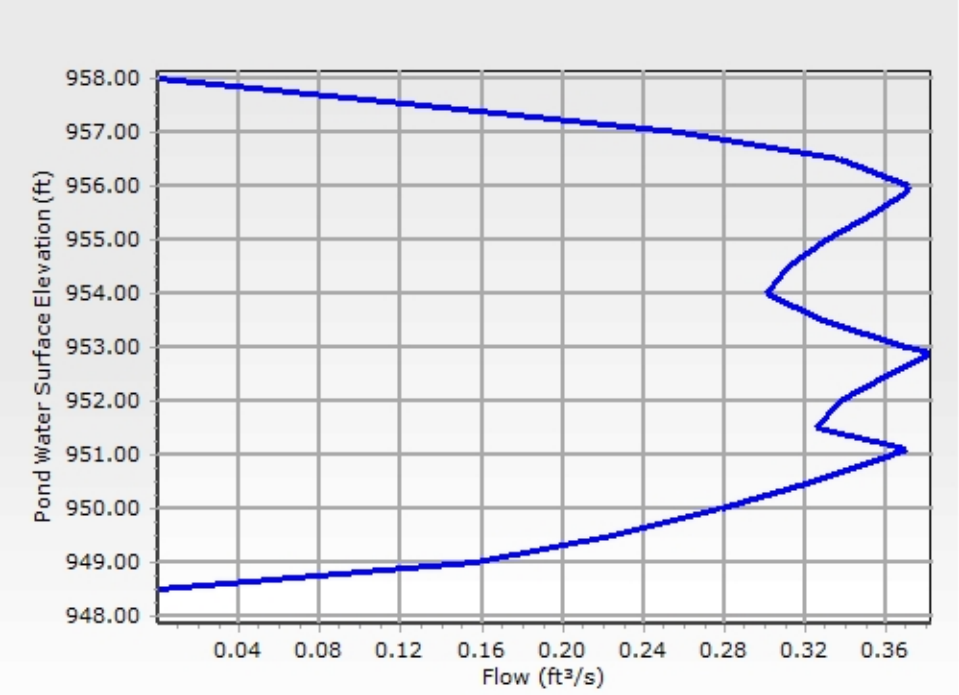
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	4	Orifice Diameter	1.5 in

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Orifice)	

Outlet Structure (Common)	
Elevation	948.50 ft



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
948.50	0.00	0.00	0.00	0.00
949.00	0.16	949.00	948.56	0.00
949.50	0.23	949.50	948.59	948.59
950.00	0.28	950.00	948.61	948.61
950.50	0.32	950.50	948.63	948.63
951.00	0.36	951.00	948.64	948.64
951.10	0.37	951.10	948.64	948.64
951.50	0.33	951.50	949.60	949.60
952.00	0.34	952.00	949.97	949.97
952.50	0.36	952.50	950.16	950.16

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
952.90	0.38	952.90	950.28	950.28
953.00	0.37	953.00	950.55	950.55
953.50	0.33	953.50	951.56	951.56
954.00	0.30	954.00	952.37	952.37
954.50	0.31	954.50	952.77	952.77
955.00	0.33	955.00	953.04	953.04
955.50	0.35	955.50	953.26	953.26
955.88	0.37	955.88	953.42	953.42
956.00	0.37	956.00	953.53	953.53
956.50	0.34	956.50	954.47	954.47
957.00	0.26	957.00	955.80	955.80
957.50	0.13	957.50	957.19	957.19
958.00	0.00	958.00	958.00	958.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Message
WS below an invert; no flow.
H =.44
H =.91
H =1.39
H =1.87
H =2.36
H =2.46
H =1.90
H =2.03
H =2.34
H =2.62
H =2.45
H =1.94
H =1.63
H =1.73
H =1.96
H =2.24
H =2.46
H =2.47
H =2.03
H =1.20
H =.31
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Outlet Structure	
Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 2	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

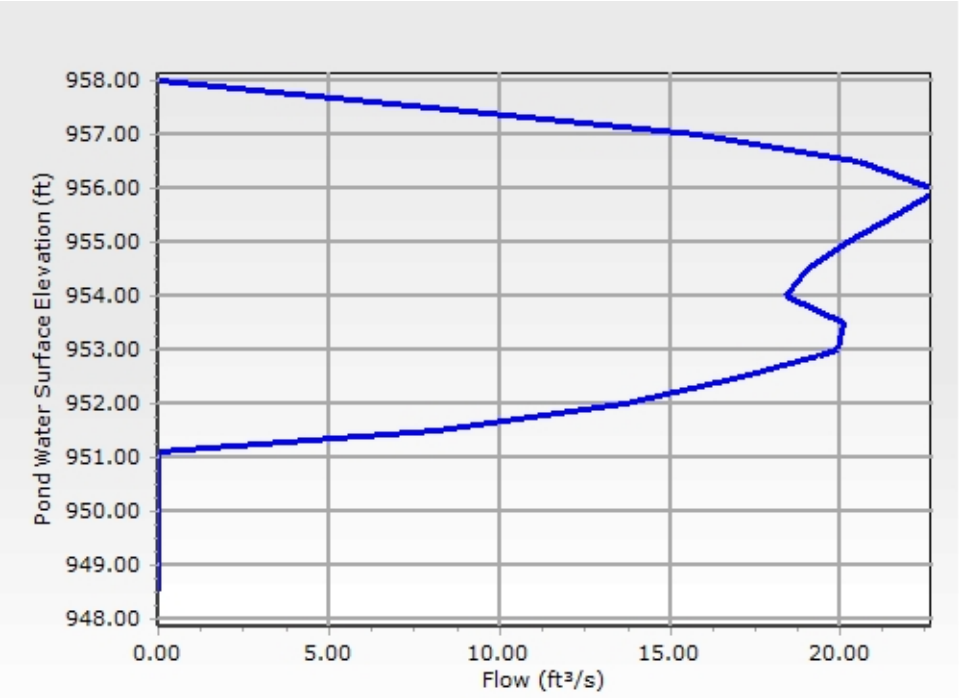
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Outlet Structure (Orifice)			
Orifice	Area Orifice	Orifice Orientation	Perpendicular Orifice
Number of Openings	1	Datum Elevation	951.10 ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Orifice)			
Orifice Coefficient	0.600	Top Elevation	951.60 ft
Orifice Area	3.00 ft²		

Outlet Structure (Common)	
Elevation	951.10 ft



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
948.50	0.00	0.00	0.00	0.00
949.00	0.00	0.00	0.00	0.00
949.50	0.00	0.00	0.00	948.59
950.00	0.00	0.00	0.00	948.61
950.50	0.00	0.00	0.00	948.63
951.00	0.00	0.00	0.00	948.64
951.10	0.00	0.00	0.00	948.64
951.50	8.17	951.50	Free Outfall	949.60

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
952.00	13.70	952.00	Free Outfall	949.97
952.50	17.08	952.50	Free Outfall	950.16
952.90	19.37	952.90	Free Outfall	950.28
953.00	19.90	953.00	Free Outfall	950.55
953.50	20.09	953.50	951.56	951.56
954.00	18.42	954.00	952.37	952.37
954.50	19.01	954.50	952.77	952.77
955.00	20.20	955.00	953.04	953.04
955.50	21.61	955.50	953.26	953.26
955.88	22.65	955.88	953.42	953.42
956.00	22.68	956.00	953.53	953.53
956.50	20.57	956.50	954.47	954.47
957.00	15.80	957.00	955.80	955.80
957.50	7.99	957.50	957.19	957.19
958.00	0.00	958.00	958.00	958.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Hi=.40; Ht=.50; Qt=10.21
H =.90
H =1.40
H =1.80
H =1.90
H =1.94
H =1.63
H =1.73
H =1.96
H =2.24
H =2.46
H =2.47
H =2.03
H =1.20
H =.31
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Outlet Structure

Outlet Structure Type	Orifice

Outlet Structure (IDs and Direction)

Outlet ID	Orifice - 3	Downstream ID	Culvert -1
Flow Direction	Forward Flow Only	Notes	

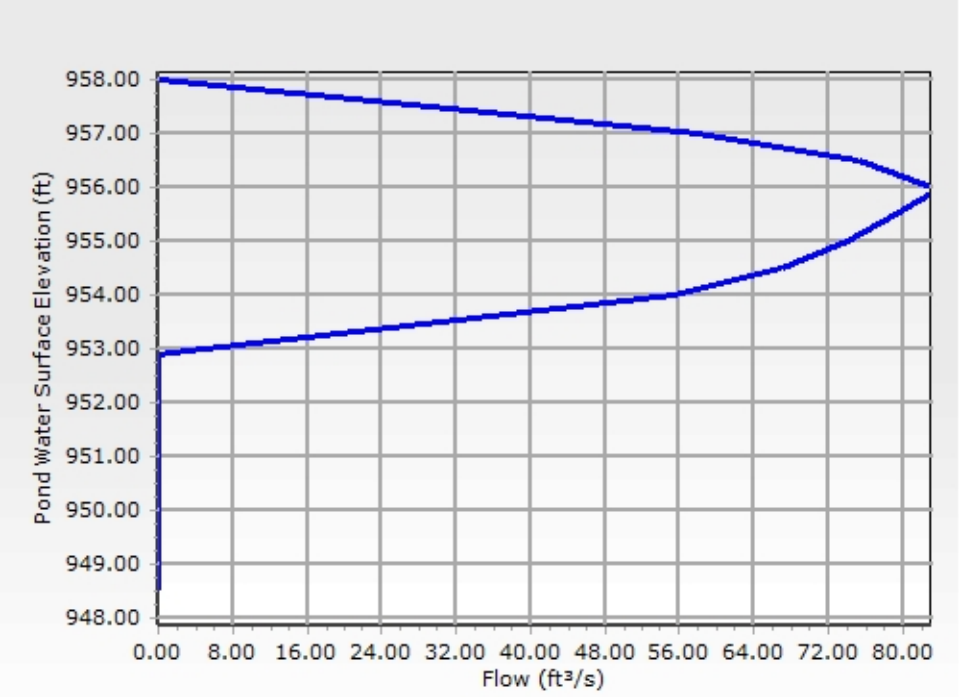
Outlet Structure (Advanced)

Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Outlet Structure (Orifice)			
Orifice	Area Orifice	Orifice Orientation	Perpendicular Orifice
Number of Openings	2	Datum Elevation	952.90 ft
Orifice Coefficient	0.600	Top Elevation	954.00 ft
Orifice Area	5.50 ft²		

Outlet Structure (Common)	
Elevation	952.90 ft



RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
948.50	0.00	0.00	0.00	0.00
949.00	0.00	0.00	0.00	0.00
949.50	0.00	0.00	0.00	948.59
950.00	0.00	0.00	0.00	948.61
950.50	0.00	0.00	0.00	948.63

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)
951.00	0.00	0.00	0.00	948.64
951.10	0.00	0.00	0.00	948.64
951.50	0.00	0.00	0.00	949.60
952.00	0.00	0.00	0.00	949.97
952.50	0.00	0.00	0.00	950.16
952.90	0.00	0.00	0.00	950.28
953.00	5.05	953.00	Free Outfall	950.55
953.50	30.29	953.50	Free Outfall	951.56
954.00	55.53	954.00	Free Outfall	952.37
954.50	66.97	954.50	Free Outfall	952.77
955.00	74.07	955.00	953.04	953.04
955.50	79.25	955.50	953.26	953.26
955.88	83.07	955.88	953.42	953.42
956.00	83.16	956.00	953.53	953.53
956.50	75.42	956.50	954.47	954.47
957.00	57.92	957.00	955.80	955.80
957.50	29.30	957.50	957.19	957.19
958.00	0.00	958.00	958.00	958.00

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 3 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert -1 (Culvert-Circular)

Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				WS below an invert; no flow.
				Hi=.10; Ht=1.10; Qt=27.76
				Hi=.60; Ht=1.10; Qt=27.76
				H =1.10
				H =1.60
				H =1.96
				H =2.24
				H =2.46
				H =2.47
				H =2.03
				H =1.20
				H =.31
				FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Composite Rating Table
Tailwater Elevation = Free Outfall (Composite Outlet Structure)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
948.50	0.00	(N/A)	0.00
949.00	0.15	(N/A)	0.00
949.50	0.22	(N/A)	0.00
950.00	0.28	(N/A)	0.00
950.50	0.32	(N/A)	0.00
951.00	0.36	(N/A)	0.00
951.10	0.37	(N/A)	0.00
951.50	8.49	(N/A)	0.00
952.00	14.03	(N/A)	0.00
952.50	17.44	(N/A)	0.00
952.90	19.75	(N/A)	0.00
953.00	25.32	(N/A)	0.00
953.50	50.69	(N/A)	0.00
954.00	74.20	(N/A)	0.00
954.50	86.21	(N/A)	0.00
955.00	94.65	(N/A)	0.00
955.50	101.22	(N/A)	0.00
955.88	106.08	(N/A)	0.00
956.00	108.95	(N/A)	0.00
956.50	128.54	(N/A)	0.00
957.00	152.20	(N/A)	0.00
957.50	173.50	(N/A)	0.00
958.00	184.80	(N/A)	0.00

Contributing Structures
(no Q: Orifice - 2,Orifice - 3,Riser - 3,Orifice - 1,Culvert -1)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Riser - 3)
Orifice - 1,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Riser - 3)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

Composite Rating Table
Tailwater Elevation = Free Outfall (Composite Outlet Structure)

Contributing Structures
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Riser - 3)
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Riser - 3)
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Riser - 3)
Orifice - 2,Orifice - 1,Culvert -1 (no Q: Orifice - 3,Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Orifice - 1,Culvert -1 (no Q: Riser - 3)
Orifice - 2,Orifice - 3,Riser - 3,Orifice - 1,Culvert -1
Orifice - 2,Orifice - 3,Riser - 3,Orifice - 1,Culvert -1
Orifice - 2,Orifice - 3,Riser - 3,Orifice - 1,Culvert -1
Orifice - 2,Orifice - 3,Riser - 3,Orifice - 1,Culvert -1
Riser - 3,Culvert -1 (no Q: Orifice - 2,Orifice - 3,Orifice - 1)

Composite Outlet Structure Detailed Report: Composite Outlet Structure

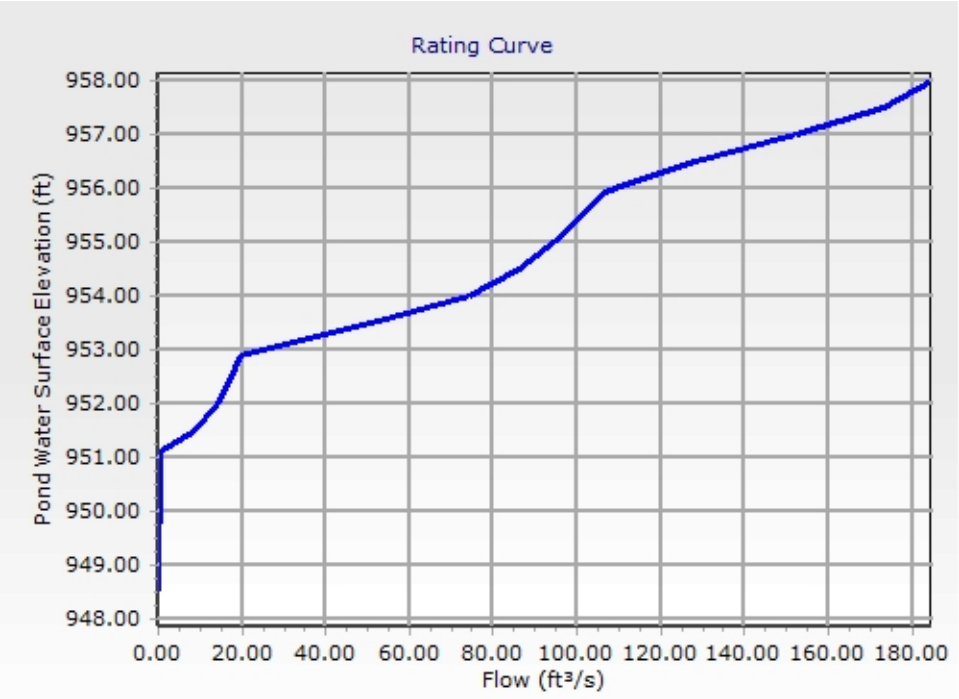
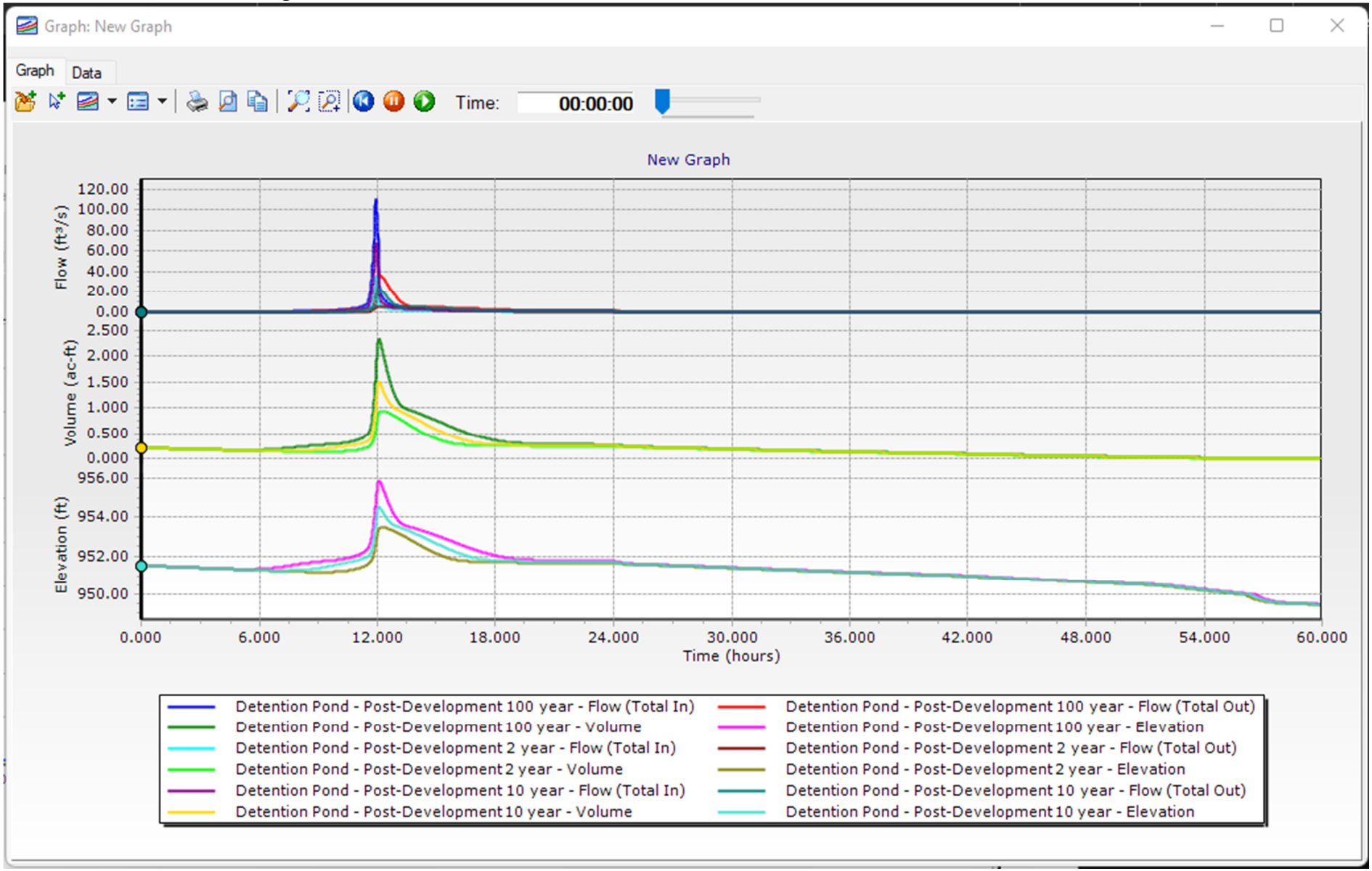


Figure G –
Routing Curves for all Design Storms

North Detention Pond Routing Curves



South Detention Pond Routing Curves

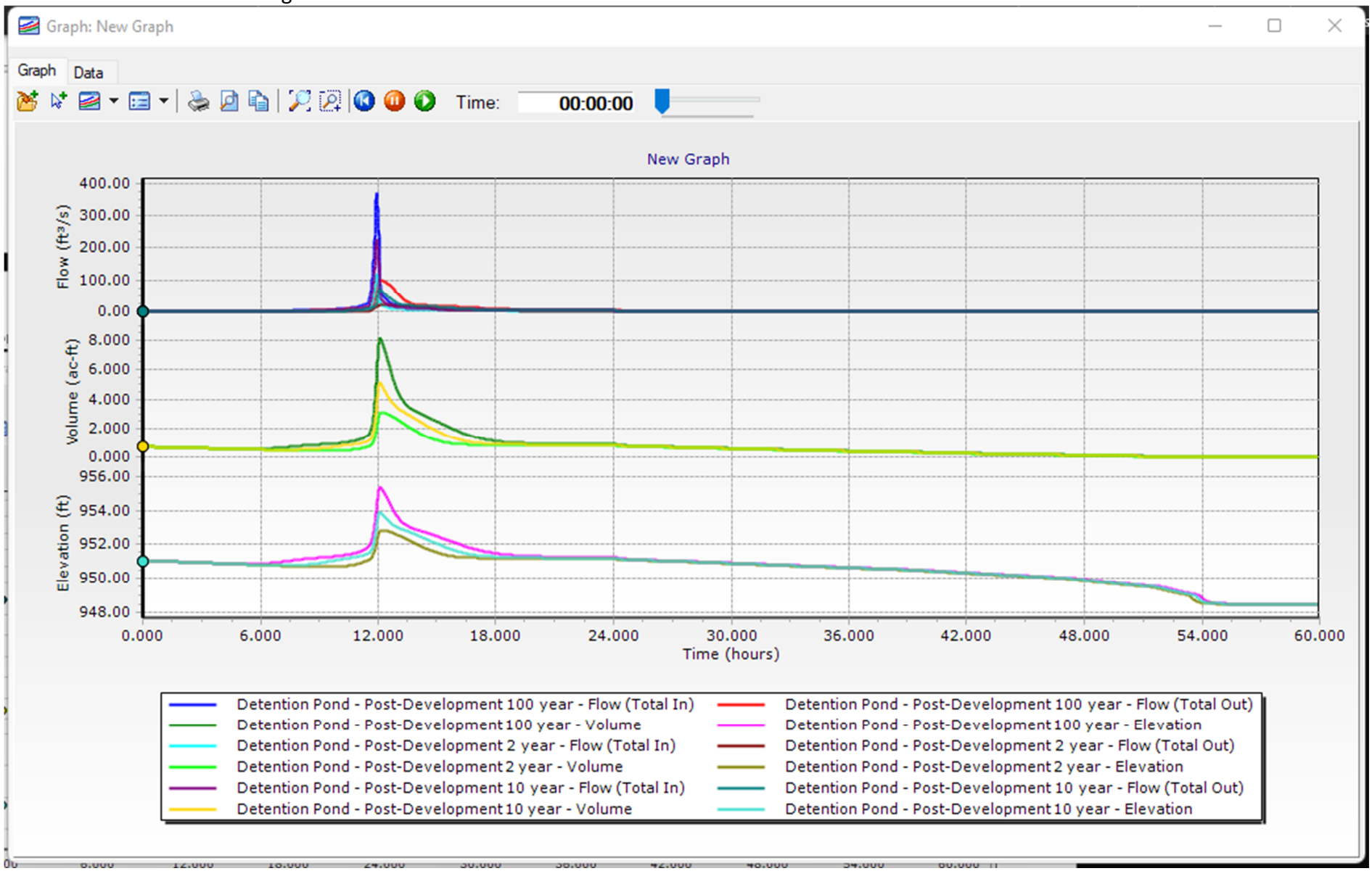


Figure H –
Pondpack Master Summary

Colton's Crossing North Pond

Project Summary	
Title	Colton's Crossing North Pond Post-Developed
Engineer	Richard Michael
Company	Hg Consult, Inc
Date	5/27/2022

Notes

Table of Contents

Master Network Summary 2

Colton's Crossing North Pond

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
P-1A	Post-Development 2 year	2	1.925	11.920	36.35
P-1A	Post-Development 10 year	10	3.617	11.920	67.82
P-1A	Post-Development 100 year	100	6.022	11.920	110.75

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
P-1A POI	Post-Development 2 year	2	2.132	12.240	5.42
P-1A POI	Post-Development 10 year	10	3.824	12.080	23.57
P-1A POI	Post-Development 100 year	100	6.228	12.080	37.18

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Detention Pond (IN)	Post-Development 2 year	2	1.925	11.920	36.35	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 2 year	2	2.132	12.240	5.42	953.48	0.938
Detention Pond (IN)	Post-Development 10 year	10	3.617	11.920	67.82	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 10 year	10	3.824	12.080	23.57	954.55	1.509
Detention Pond (IN)	Post-Development 100 year	100	6.022	11.920	110.75	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 100 year	100	6.228	12.080	37.18	955.90	2.343

Colton's Crossing North Pond

Index

M

Master Network Summary...2

Colton's Crossing South Pond

Project Summary	
Title	Colton's Crossing South Pond Post-Developed
Engineer	Richard Michael
Company	Hg Consult, Inc
Date	5/27/2022

Notes

Table of Contents

Master Network Summary 2

Colton's Crossing South Pond

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
P-2A	Post-Development 2 year	2	6.443	11.920	121.64
P-2A	Post-Development 10 year	10	12.103	11.920	226.95
P-2A	Post-Development 100 year	100	20.151	11.920	370.63

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
P-2A POI	Post-Development 2 year	2	7.138	12.200	19.44
P-2A POI	Post-Development 10 year	10	12.799	12.090	70.45
P-2A POI	Post-Development 100 year	100	20.846	12.090	99.66

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Detention Pond (IN)	Post-Development 2 year	2	6.443	11.920	121.64	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 2 year	2	7.138	12.200	19.44	952.85	3.079
Detention Pond (IN)	Post-Development 10 year	10	12.103	11.920	226.95	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 10 year	10	12.799	12.090	70.45	953.92	5.140
Detention Pond (IN)	Post-Development 100 year	100	20.151	11.920	370.63	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 100 year	100	20.846	12.090	99.66	955.38	8.168

Colton's Crossing South Pond

Index

M

Master Network Summary...2