

FINAL STORM REPORT

ADDENDUM

Cobey Creek, Phase 1

Mixed Use Development Lee's

Summit, MO

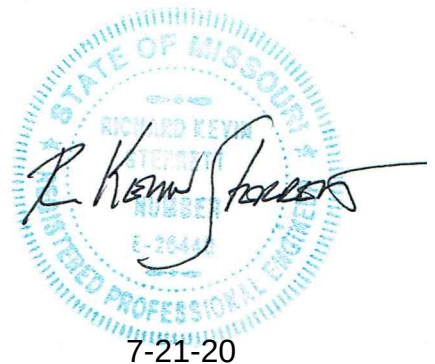
PREPARED FOR

JCM DEVELOPMENT, LLC

PREPARED BY

HG CONSULT, INC.

July 21, 2020



7-21-20

This addendum to the final storm report for Cobey Creek, Phase 1, it is prepared to convert the P3 drainage basin (North Detention Pond) outlet structure from two 6' diameter manholes to a single 5' x 15' cast-in-place box and the single 6' diameter manhole to a 6'x6' square concrete box at the South detention Pond. The change is being driven based on constructability of the 6' diameter manholes by the contractor's casting company.

At the north pond outlet structure, we are proposing revising the small WQ orifice holes (4-1" and 2-2") to a larger single 5" orifice. This will allow better operation and maintenance associated with trash and debris. Additionally the 4-21" orifices (2 and 10-year events) will be converted into a single rectangular 1'x8' orifice. The top will remain relatively unchanged with 2-42" domes. These changes will assist with constructability, maintenance and operation of the basin. The tables below contained the hydraulic information associated with these changes.

The outlet structure at the south pond requires no update to the discharge calculations as all orifice sizes and elevations remain the same as the original approved structure.

1. Post-Development Conditions

This section of the drainage study has been prepared to evaluate the Post-Development Conditions related to stormwater runoff. The following table compares the allowable, previously approved, and proposed discharges for the 2, 10, and 100 Year events. Refer to the Design Calculations for details regarding the analysis.

Discharges

Name	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)
Allowable	66.73	200.16	311.70
Previous Approved 6' Dia. Manholes	65.08	194.74	278.44
Proposed 5' x 15' Box	62.59	188.53	266.25

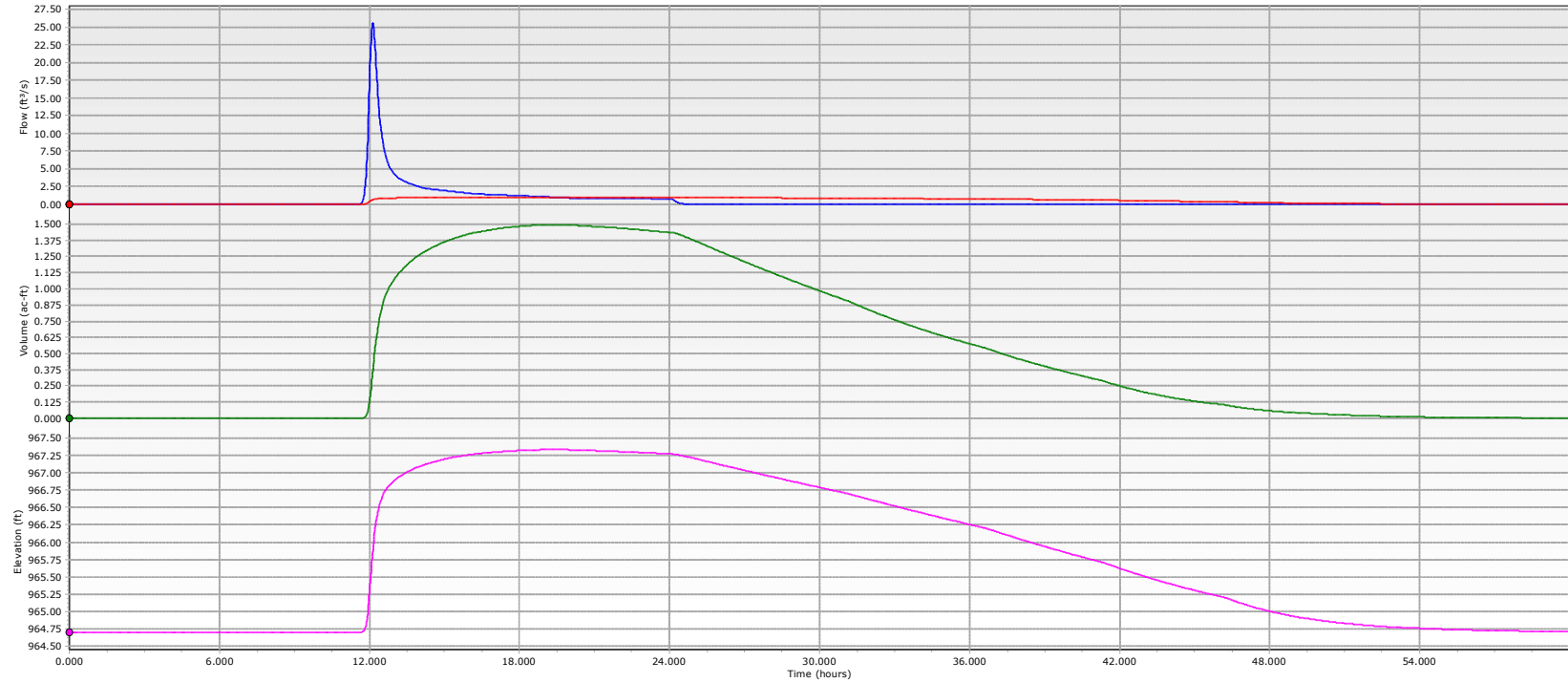
APWA 5608.4 also requires a 40-hour extended release of the water quality storm event (1.37"/24-hour rainfall) per Section 8.10 of the BMP Manual. The detention facility will release the water quality event over a 40-hour period. The riser structure was designed with a single 5" orifice at elevation 964.70 at the base elevation of the detention pond to achieve the 40-hour extended detention. The 5" orifice allows the water quality event to have an extended release of 40 hours. The orifice is being designed to also be used in conjunction with a skimmer during construction. The Time vs. Volume graph is located in the Design Calculations Section.

To meet the APWA allowable peak flow requirements stated above in Table 6.5, the riser was designed with a rectangular orifice measuring 8' wide by 1' high at an elevation of 970.50 and the top of the riser was set at an elevation of 972.90. The top of the 15'x5' riser will be fitted with two 42" dome openings with debris screening that serves as an orifice to route flow into the outlet pipes. This will allow the structure to meet the APWA allowable peak flow rates stated above. For more information, Pondpack calculations can be seen in the Design Calculations Section.

2. Post-Development 100-year Emergency Spillway

The previous approved spillway is being left unchanged due to the 100-Year water surface elevation being 976.47 (Previously 976.49). As previously stated the spillway is sized for the 100-year event, assuming 100% clogging of the primary outlet works and zero available storage in the detention pond. The emergency spillway was set at an elevation of 977.0 and was sized to provide 1-foot of freeboard. The emergency spillway will be 165-feet in length located further north of the outlet.

Graph - 1



Detention Pond - Post-Development Water Quality - Flow (Total In)	Detention Pond - Post-Development Water Quality - Flow (Total Out)	Detention Pond - Post-Development Water Quality - Volume
Detention Pond - Post-Development Water Quality - Elevation		

COBEY CREEK

Project Summary

Title	COBEY CREEK
Engineer	Matthew Castor
Company	Hg Consult, Inc
Date	7/17/2020

Notes

Table of Contents

Master Network Summary

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COBEY CREEK

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
P3	Post-Development 2 year	2	13.945	12.090	169.63
P3	Post-Development 10 year	10	25.862	12.090	314.25
P3	Post-Development 100 year	100	42.704	12.090	511.44
P1	Post-Development 2 year	2	1.756	11.980	29.29
P1	Post-Development 10 year	10	3.215	11.970	52.87
P1	Post-Development 100 year	100	5.265	11.970	84.76
P2	Post-Development 2 year	2	0.097	11.950	1.73
P2	Post-Development 10 year	10	0.184	11.940	3.27
P2	Post-Development 100 year	100	0.309	11.940	5.40
P4	Post-Development 2 year	2	0.654	11.990	10.77
P4	Post-Development 10 year	10	1.228	11.990	20.01
P4	Post-Development 100 year	100	2.044	11.970	32.66

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
O-3	Post-Development 2 year	2	13.945	12.430	62.59
O-3	Post-Development 10 year	10	25.862	12.290	188.53
O-3	Post-Development 100 year	100	42.704	12.320	266.25
O-1	Post-Development 2 year	2	1.756	11.980	29.29
O-1	Post-Development 10 year	10	3.215	11.970	52.87
O-1	Post-Development 100 year	100	5.265	11.970	84.76
O-2	Post-Development 2 year	2	0.097	11.950	1.73
O-2	Post-Development 10 year	10	0.184	11.940	3.27

COBEY CREEK

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
O-2	Post-Development 100 year	100	0.309	11.940	5.40
O-4	Post-Development 2 year	2	0.654	11.990	10.77
O-4	Post-Development 10 year	10	1.228	11.990	20.01
O-4	Post-Development 100 year	100	2.044	11.970	32.66

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Detention Pond (IN)	Post-Development 2 year	2	13.945	12.090	169.63	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 2 year	2	13.945	12.430	62.59	972.93	4.873
Detention Pond (IN)	Post-Development 10 year	10	25.862	12.090	314.25	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 10 year	10	25.862	12.290	188.53	974.44	7.680
Detention Pond (IN)	Post-Development 100 year	100	42.704	12.090	511.44	(N/A)	(N/A)
Detention Pond (OUT)	Post-Development 100 year	100	42.704	12.320	266.25	976.47	11.955

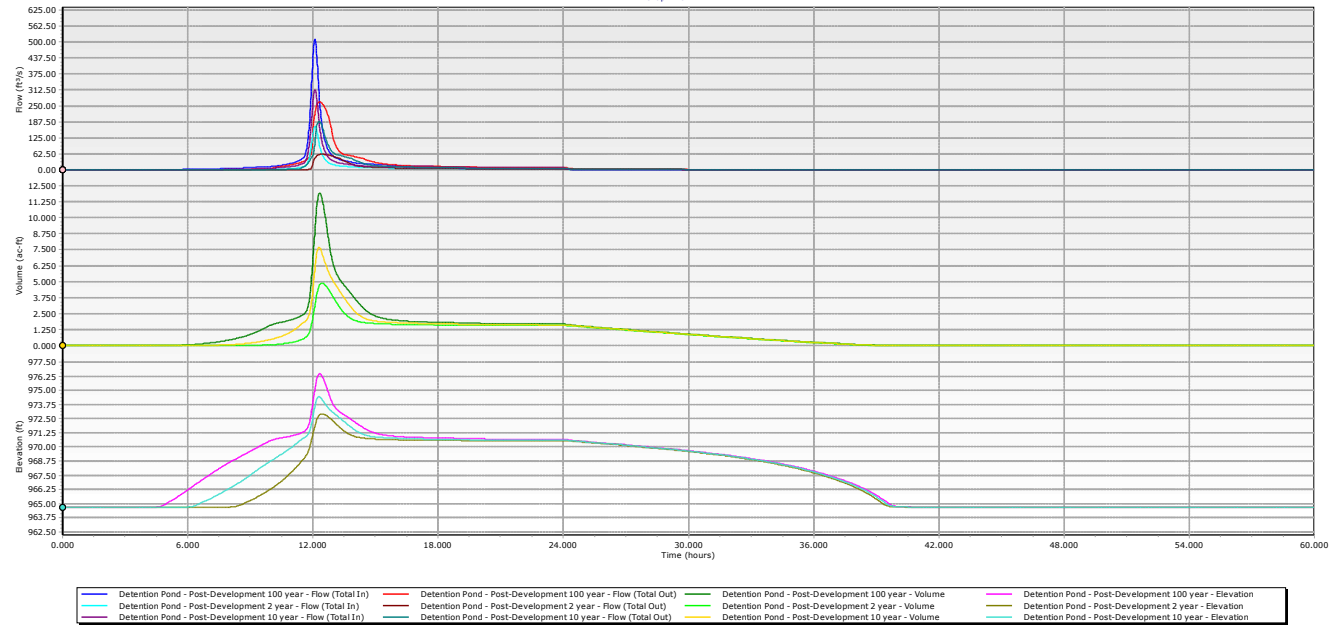
COBEY CREEK

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Graph - 3

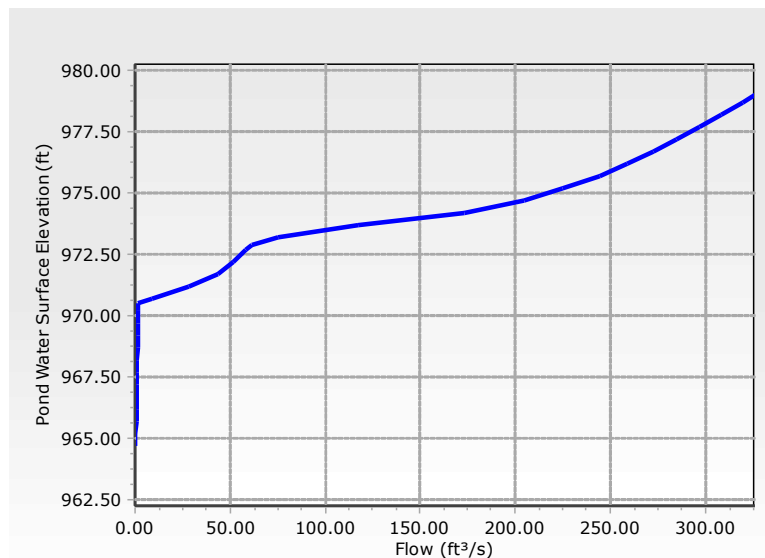


Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Element Details			
Label	Composite Outlet Structure - 2	Notes	
Headwater Range			
Headwater Type	Use Pond for Headwater Range	Maximum (Headwater)	979.00 ft
Pond	Detention Pond	Increment (Headwater)	0.50 ft
Minimum (Headwater)	964.70 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 and Reverse Flow	Notes	
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft
Culvert Data			
Number of Barrels	2	Downstream Invert	964.20 ft
Length	102.32 ft	Diameter	48.0 in
Upstream Invert	964.70 ft		
Unsubmerged->Submerged			
Specify Transitions	False	Compute Inlet Control Only	False

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Culvert Coefficients			
Inlet Description	Concrete - Groove end projecting	C	0.0317
Chart	Chart 1	Y	0.6900
Nomograph	Nomograph 3	Manning's n	0.013
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: 108.01 ft³/s

Upstream ID = Riser - 2, Orifice - Water Quality, Riser - 1, Orifice - 2 Year

Downstream ID = Tailwater (Pond Outfall)

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)
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Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 108.01 ft³/s

Upstream ID = Riser - 2, Orifice - Water Quality, Riser - 1, Orifice - 2 Year

Downstream ID = Tailwater (Pond Outfall)

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)
964.70	0.00	0.00	0.00	Free Outfall
965.20	0.35	964.87	Free Outfall	Free Outfall
965.70	0.57	964.92	Free Outfall	Free Outfall
966.20	0.75	964.95	Free Outfall	Free Outfall
966.70	0.87	964.96	Free Outfall	Free Outfall
967.20	1.00	964.98	Free Outfall	Free Outfall
967.70	1.11	965.00	Free Outfall	Free Outfall
968.20	1.21	965.01	Free Outfall	Free Outfall
968.70	1.26	965.02	Free Outfall	Free Outfall
969.20	1.34	965.03	Free Outfall	Free Outfall
969.70	1.45	965.04	Free Outfall	Free Outfall
970.20	1.52	965.05	Free Outfall	Free Outfall
970.50	1.54	965.05	Free Outfall	Free Outfall
970.70	9.26	965.58	Free Outfall	Free Outfall
971.20	28.43	966.28	Free Outfall	Free Outfall
971.70	43.63	966.68	Free Outfall	Free Outfall
972.20	51.68	966.87	Free Outfall	Free Outfall
972.70	58.64	967.03	Free Outfall	Free Outfall
972.90	61.19	967.08	Free Outfall	Free Outfall
973.20	75.62	967.38	Free Outfall	Free Outfall
973.70	117.65	968.15	Free Outfall	Free Outfall
974.20	173.32	969.08	Free Outfall	Free Outfall
974.70	204.66	969.59	Free Outfall	Free Outfall
975.20	225.45	970.00	Free Outfall	Free Outfall
975.70	244.28	970.44	Free Outfall	Free Outfall
976.20	259.11	970.82	Free Outfall	Free Outfall
976.70	272.56	971.18	Free Outfall	Free Outfall
977.20	285.24	971.53	Free Outfall	Free Outfall
977.70	297.31	971.89	Free Outfall	Free Outfall
978.20	308.85	972.24	Free Outfall	Free Outfall
978.70	319.86	972.59	Free Outfall	Free Outfall
979.00	326.30	972.79	Free Outfall	Free Outfall
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	

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 108.01 ft³/s

Upstream ID = Riser - 2, Orifice - Water Quality, Riser - 1, Orifice - 2 Year

Downstream ID = Tailwater (Pond Outfall)

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	0.02	(N/A)	0.00
0.00	0.03	(N/A)	0.00
0.00	0.03	(N/A)	0.00
0.00	0.04	(N/A)	0.00
0.00	0.07	(N/A)	0.00
0.00	0.00	(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	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
0.00	0.01	(N/A)	0.00
0.00	0.00	(N/A)	0.00

Message

WS below an invert; no flow.
 BACKWATER CONTROL.. Vh= .035ft
 hwDi= .126ft Lbw= 102.3ft
 Hev= .00ft
 FLOW PRECEDENCE SET TO
 UPSTREAM CONTROLLING
 STRUCTURE

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 108.01 ft³/s

Upstream ID = Riser - 2, Orifice - Water Quality, Riser - 1, Orifice - 2 Year

Downstream ID = Tailwater (Pond Outfall)

Message
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .063ft Dcr= .188ft H.JUMP IN PIPE Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .077ft Dcr= .227ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .079ft Dcr= .234ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .504ft Dcr= 1.377ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .557ft Dcr= 1.503ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .601ft Dcr= 1.605ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .617ft Dcr= 1.641ft CRIT.DEPTH Hev= .00ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 108.01 ft³/s

Upstream ID = Riser - 2, Orifice - Water Quality, Riser - 1, Orifice - 2 Year

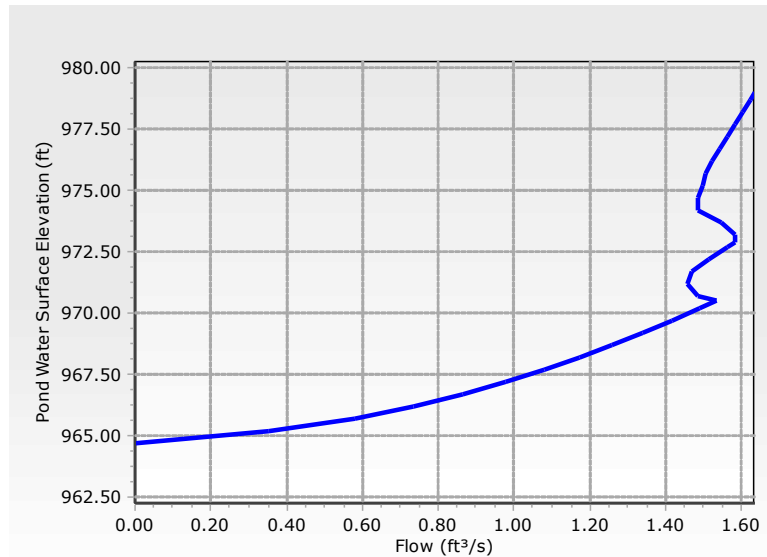
Downstream ID = Tailwater (Pond Outfall)

Message			
CRIT.DEPTH CONTROL Vh= .704ft Dcr= 1.833ft CRIT.DEPTH Hev= .00ft			
CRIT.DEPTH CONTROL Vh= .951ft Dcr= 2.310ft CRIT.DEPTH Hev= .00ft			
BACKWATER CONTROL.. Vh= 1.259ft hwDi= 2.864ft Lbw= 102.3ft Hev= .00ft			
BACKWATER CONTROL.. Vh= 1.328ft hwDi= 3.294ft Lbw= 102.3ft Hev= .00ft			
INLET CONTROL... Submerged: HW =5.30			
INLET CONTROL... Submerged: HW =5.74			
INLET CONTROL... Submerged: HW =6.12			
INLET CONTROL... Submerged: HW =6.48			
INLET CONTROL... Submerged: HW =6.83			
INLET CONTROL... Submerged: HW =7.19			
INLET CONTROL... Submerged: HW =7.54			
INLET CONTROL... Submerged: HW =7.88			
INLET CONTROL... Submerged: HW =8.09			

Outlet Structure			
Outlet Structure Type		Orifice	
Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - Water Quality	Downstream ID	Culvert - 1
Flow Direction	Forward and Reverse Flow	Notes	
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Outlet Structure (Orifice)			
Orifice	Circular Orifice	Orifice Coefficient	0.600
Number of Openings	1	Orifice Diameter	5.0 in
Outlet Structure (Common)			
Elevation	964.70 ft		



RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Orifice - Water Quality (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)
964.70	0.00	0.00	0.00	0.00
965.20	0.35	965.20	964.87	964.87
965.70	0.58	965.70	964.92	964.92
966.20	0.73	966.20	964.95	964.95
966.70	0.86	966.70	964.96	964.96
967.20	0.98	967.20	964.98	964.98
967.70	1.08	967.70	965.00	965.00

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Orifice - Water Quality (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)
968.20	1.17	968.20	965.01	965.01
968.70	1.26	968.70	965.02	965.02
969.20	1.34	969.20	965.03	965.03
969.70	1.42	969.70	965.04	965.04
970.20	1.49	970.20	965.05	965.05
970.50	1.53	970.50	965.05	965.05
970.70	1.48	970.70	965.58	965.58
971.20	1.46	971.20	966.28	966.28
971.70	1.47	971.70	966.68	966.68
972.20	1.51	972.20	966.87	966.87
972.70	1.56	972.70	967.03	967.03
972.90	1.58	972.90	967.08	967.08
973.20	1.58	973.20	967.38	967.38
973.70	1.55	973.70	968.15	968.15
974.20	1.49	974.20	969.08	969.08
974.70	1.48	974.70	969.59	969.59
975.20	1.50	975.20	970.00	970.00
975.70	1.50	975.70	970.44	970.44
976.20	1.52	976.20	970.82	970.82
976.70	1.54	976.70	971.18	971.18
977.20	1.56	977.20	971.53	971.53
977.70	1.58	977.70	971.89	971.89
978.20	1.60	978.20	972.24	972.24
978.70	1.62	978.70	972.58	972.59
979.00	1.63	979.00	972.79	972.79
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	

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Orifice - Water Quality (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
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.

H =.29
H =.78
H =1.25
H =1.74
H =2.22
H =2.70
H =3.19
H =3.68
H =4.17
H =4.66
H =5.15
H =5.45
H =5.12
H =4.92
H =5.02
H =5.33

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

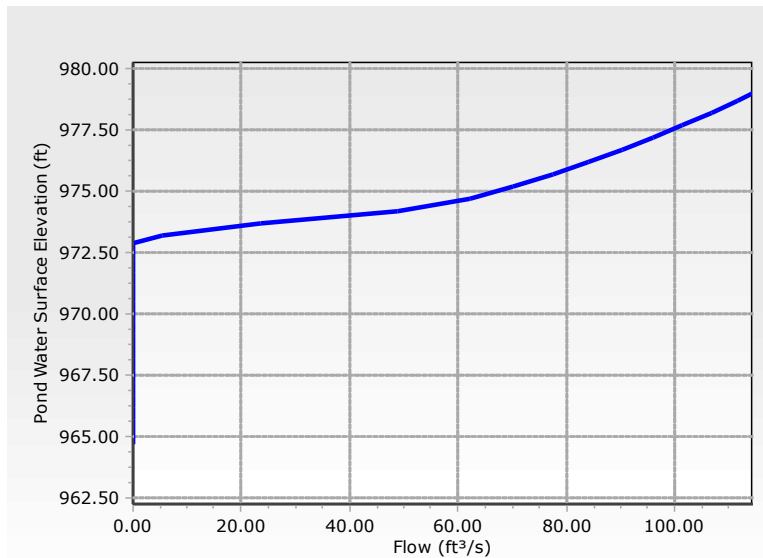
Structure ID = Orifice - Water Quality (Orifice-Circular)

Upstream ID = (Pond Water Surface)

Downstream ID = Culvert - 1 (Culvert-Circular)

Message			
H =5.67 H =5.82 H =5.82 H =5.55 H =5.12 H =5.11 H =5.20 H =5.26 H =5.38 H =5.52 H =5.67 H =5.81 H =5.96 H =6.12 H =6.21			
Outlet Structure			
Outlet Structure Type		Riser	
Outlet Structure (IDs and Direction)			
Outlet ID	Riser - 1	Downstream ID	Culvert - 1
Flow Direction	Forward and Reverse Flow	Notes	
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft
Outlet Structure (Riser)			
Riser	Stand Pipe	Transition Elevation	0.00 ft
Diameter	42.0 in	Transition Height	0.00 ft
Weir Coefficient	3.00 (ft^0.5)/s	K Reverse	1.000
Orifice Coefficient	0.600		
Outlet Structure (Common)			
Elevation	972.90 ft		
Outlet Structure (Riser, Advanced)			
Use Orifice Depth to Crest?	True	Use Submerged Weir Equation?	False

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2



RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Riser - 1 (Stand Pipe)

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)
964.70	0.00	0.00	0.00	0.00
965.20	0.00	0.00	0.00	964.87
965.70	0.00	0.00	0.00	964.92
966.20	0.00	0.00	0.00	964.95
966.70	0.00	0.00	0.00	964.96
967.20	0.00	0.00	0.00	964.98
967.70	0.00	0.00	0.00	965.00
968.20	0.00	0.00	0.00	965.01
968.70	0.00	0.00	0.00	965.02
969.20	0.00	0.00	0.00	965.03
969.70	0.00	0.00	0.00	965.04
970.20	0.00	0.00	0.00	965.05
970.50	0.00	0.00	0.00	965.05
970.70	0.00	0.00	0.00	965.58
971.20	0.00	0.00	0.00	966.28
971.70	0.00	0.00	0.00	966.68

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Riser - 1 (Stand Pipe)

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
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.
 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 =0.3ft
 Weir: H =0.8ft
 Weir: H =1.3ft
 Orifice: H =1.80; Riser orifice equation
 controlling.
 Orifice: H =2.30; Riser orifice equation
 controlling.

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)

Downstream ID = Culvert - 1 (Culvert-Circular)

Message			
Orifice: H =2.80; Riser orifice equation controlling.			
Orifice: H =3.30; Riser orifice equation controlling.			
Orifice: H =3.80; Riser orifice equation controlling.			
Orifice: H =4.30; Riser orifice equation controlling.			
Orifice: H =4.80; Riser orifice equation controlling.			
Orifice: H =5.30; Riser orifice equation controlling.			
Orifice: H =5.80; Riser orifice equation controlling.			
Orifice: H =6.10; Riser orifice equation controlling.			

Outlet Structure			
Outlet Structure Type		Orifice	

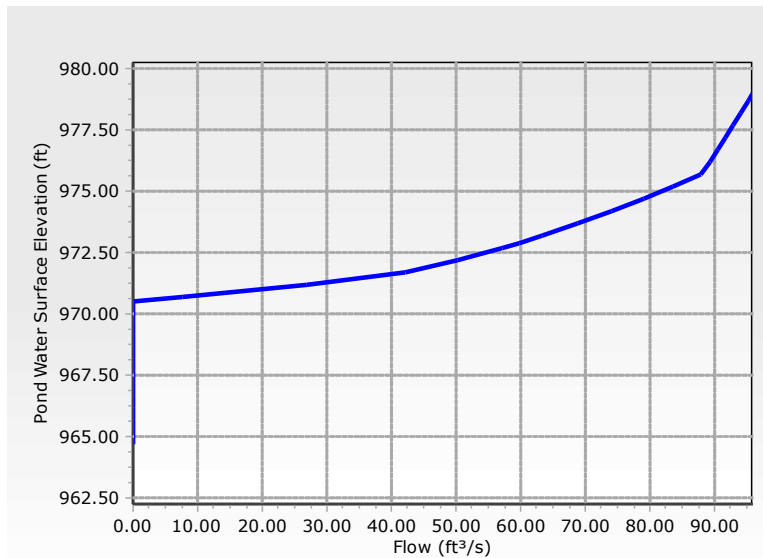
Outlet Structure (IDs and Direction)			
Outlet ID	Orifice - 2 Year	Downstream ID	Culvert - 1
Flow Direction	Forward and Reverse Flow	Notes	

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	970.50 ft
Orifice Coefficient	0.600	Top Elevation	971.50 ft
Orifice Area	8.0 ft²		

Outlet Structure (Common)	
Elevation	970.50 ft

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2



RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Orifice - 2 Year (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)
964.70	0.00	0.00	0.00	0.00
965.20	0.00	0.00	0.00	964.87
965.70	0.00	0.00	0.00	964.92
966.20	0.00	0.00	0.00	964.95
966.70	0.00	0.00	0.00	964.96
967.20	0.00	0.00	0.00	964.98
967.70	0.00	0.00	0.00	965.00
968.20	0.00	0.00	0.00	965.01
968.70	0.00	0.00	0.00	965.02
969.20	0.00	0.00	0.00	965.03
969.70	0.00	0.00	0.00	965.04
970.20	0.00	0.00	0.00	965.05
970.50	0.00	0.00	0.00	965.05
970.70	7.70	970.70	Free Outfall	965.58
971.20	26.95	971.20	Free Outfall	966.28
971.70	42.18	971.70	Free Outfall	966.68

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Orifice - 2 Year (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
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.
 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.
 Hi=.20; Ht=1.00; Qt=38.50
 Hi=.70; Ht=1.00; Qt=38.50
 H =1.20
 H =1.70
 H =2.20
 H =2.40
 H =2.70
 H =3.20
 H =3.70
 H =4.20
 H =4.70
 H =5.20
 H =5.38

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

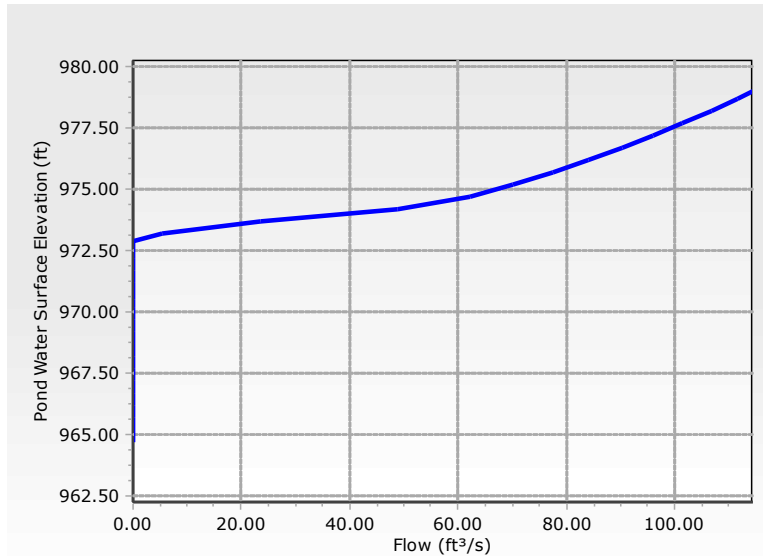
Structure ID = Orifice - 2 Year (Orifice-Area)

Upstream ID = (Pond Water Surface)

Downstream ID = Culvert - 1 (Culvert-Circular)

Message			
H =5.52			
H =5.67			
H =5.81			
H =5.96			
H =6.12			
H =6.21			
Outlet Structure			
Outlet Structure Type		Riser	
Outlet Structure (IDs and Direction)			
Outlet ID	Riser - 2	Downstream ID	Culvert - 1
Flow Direction	Forward and Reverse Flow	Notes	
Outlet Structure (Advanced)			
Elevation (On)	0.00 ft	Elevation (Off)	0.00 ft
Outlet Structure (Riser)			
Riser	Stand Pipe	Transition Elevation	0.00 ft
Diameter	42.0 in	Transition Height	0.00 ft
Weir Coefficient	3.00 (ft^0.5)/s	K Reverse	1.000
Orifice Coefficient	0.600		
Outlet Structure (Common)			
Elevation	972.90 ft		
Outlet Structure (Riser, Advanced)			
Use Orifice Depth to Crest?	True	Use Submerged Weir Equation?	False

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2



RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Riser - 2 (Stand Pipe)

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)
964.70	0.00	0.00	0.00	0.00
965.20	0.00	0.00	0.00	964.87
965.70	0.00	0.00	0.00	964.92
966.20	0.00	0.00	0.00	964.95
966.70	0.00	0.00	0.00	964.96
967.20	0.00	0.00	0.00	964.98
967.70	0.00	0.00	0.00	965.00
968.20	0.00	0.00	0.00	965.01
968.70	0.00	0.00	0.00	965.02
969.20	0.00	0.00	0.00	965.03
969.70	0.00	0.00	0.00	965.04
970.20	0.00	0.00	0.00	965.05
970.50	0.00	0.00	0.00	965.05
970.70	0.00	0.00	0.00	965.58
971.20	0.00	0.00	0.00	966.28
971.70	0.00	0.00	0.00	966.68

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Riser - 2 (Stand Pipe)

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
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.
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 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 =0.3ft
 Weir: H =0.8ft
 Weir: H =1.3ft
 Orifice: H =1.80; Riser orifice equation
 controlling.
 Orifice: H =2.30; Riser orifice equation
 controlling.

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = Riser - 2 (Stand Pipe)

Upstream ID = (Pond Water Surface)

Downstream ID = Culvert - 1 (Culvert-Circular)

Message

Orifice: H =2.80; Riser orifice equation controlling.

Orifice: H =3.30; Riser orifice equation controlling.

Orifice: H =3.80; Riser orifice equation controlling.

Orifice: H =4.30; Riser orifice equation controlling.

Orifice: H =4.80; Riser orifice equation controlling.

Orifice: H =5.30; Riser orifice equation controlling.

Orifice: H =5.80; Riser orifice equation controlling.

Orifice: H =6.10; Riser orifice equation controlling.

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Composite Rating Table

Tailwater Elevation = Free Outfall (Composite Outlet Structure - 2)

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
964.70	0.00	(N/A)	0.00
965.20	0.35	(N/A)	0.00
965.70	0.58	(N/A)	0.00
966.20	0.73	(N/A)	0.00
966.70	0.87	(N/A)	0.00
967.20	0.98	(N/A)	0.00
967.70	1.08	(N/A)	0.00
968.20	1.17	(N/A)	0.00
968.70	1.26	(N/A)	0.00
969.20	1.34	(N/A)	0.00
969.70	1.42	(N/A)	0.00
970.20	1.49	(N/A)	0.00
970.50	1.53	(N/A)	0.00
970.70	9.19	(N/A)	0.00
971.20	28.41	(N/A)	0.00
971.70	43.63	(N/A)	0.00
972.20	51.68	(N/A)	0.00
972.70	58.64	(N/A)	0.00
972.90	61.19	(N/A)	0.00
973.20	75.62	(N/A)	0.00
973.70	117.63	(N/A)	0.00
974.20	173.33	(N/A)	0.00
974.70	204.65	(N/A)	0.00
975.20	225.43	(N/A)	0.00
975.70	244.28	(N/A)	0.00
976.20	259.08	(N/A)	0.00
976.70	272.56	(N/A)	0.00
977.20	285.25	(N/A)	0.00
977.70	297.32	(N/A)	0.00
978.20	308.84	(N/A)	0.00
978.70	319.87	(N/A)	0.00
979.00	326.30	(N/A)	0.00

Contributing Structures

(no Q: Riser - 2, Orifice - Water Quality, Riser - 1, Orifice - 2 Year, Culvert - 1)
 Orifice - Water Quality, Culvert - 1 (no Q: Riser - 2, Riser - 1, Orifice - 2 Year)
 Orifice - Water Quality, Culvert - 1 (no Q: Riser - 2, Riser - 1, Orifice - 2 Year)

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Composite Rating Table

Tailwater Elevation = Free Outfall (Composite Outlet Structure - 2)

Contributing Structures
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Culvert - 1 (no Q: Riser - 2,Riser - 1,Orifice - 2 Year)
Orifice - Water Quality,Orifice - 2 Year,Culvert - 1 (no Q: Riser - 2,Riser - 1)
Orifice - Water Quality,Orifice - 2 Year,Culvert - 1 (no Q: Riser - 2,Riser - 1)

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Composite Rating Table

Tailwater Elevation = Free Outfall (Composite Outlet Structure - 2)

Contributing Structures
Orifice - Water
Quality, Orifice - 2
Year, Culvert - 1 (no Q:
Riser - 2, Riser - 1)
Orifice - Water
Quality, Orifice - 2
Year, Culvert - 1 (no Q:
Riser - 2, Riser - 1)
Orifice - Water
Quality, Orifice - 2
Year, Culvert - 1 (no Q:
Riser - 2, Riser - 1)
Orifice - Water
Quality, Orifice - 2
Year, Culvert - 1 (no Q:
Riser - 2, Riser - 1)
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1
Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1

Composite Outlet Structure Detailed Report: Composite Outlet Structure - 2

Composite Rating Table

Tailwater Elevation = Free Outfall (Composite Outlet Structure - 2)

Contributing Structures

Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1

Riser - 2, Orifice - Water
Quality, Riser - 1, Orifice -
2 Year, Culvert - 1

