Table 2.1
Elevation Storage Discharge - John Street Gravity Pond Option 1
John Street Feasibility Design Analysis Report

Contour Elevation NAVD 1988	Depth	Contour Area	Incremental Volume	Incremental Volume	Cumulative Volume	1st Row of Ports Discharge	2nd Row of Ports Discharge	3rd Row of Ports Discharge	4th Row of Ports Discharge	Principal Spillway Grate Discharge	Principal Spillway Outfall Pipe Discharge	Total Principal Spillway / Outfall Pipe Discharge	Emergency Spillway Discharge	Total Discharge Rating Curve	Comment
		Orfice Diameter (inches)				6" x 8"	6	6	0	3'-8" x 3'-8"	12				
		Number of Openings				3	6	6	0	1	1				
(ft)		(sq ft)	(cu ft)	(ac-ft)	(ac-ft)	(cfs)	(cfs)	(cfs)		(cfs)		(cfs)	(cfs)	(cfs)	
(d)						(a)	(a)	(a)	(a)	(a)	(a,b)	(e)	(c)		
4941.00	0	50	0	0.0000	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Principal Spillway Invert/Pond Invert/1st row of ports
4941.50	0.5	3266	829	0.0190	0.02	3.3	0.0	0.0	0.0	0.0	1.3	1.3	0.0	1.3	
4942.00	1.0	6481	2437	0.0559	0.07	4.7	0.0	0.0	0.0	0.0	2.5	2.5	0.0	2.5	2nd row of ports
4943.00	2.0	10612	8547	0.1962	0.27	6.7	5.6	0.0	0.0	0.0	4.6	4.6	0.0	4.6	
4944.00	3.0	15467	13040	0.2993	0.57	8.2	7.9	0.0	0.0	0.0	5.9	5.9	0.0	5.9	
4945.00	4.0	20730	18099	0.4155	0.99	9.5	9.7	0.0	0.0	0.0	7.0	7.0	0.0	7.0	3rd row of ports
4946.00	5.0	23604	22167	0.5089	1.49	10.6	11.2	5.6	0.0	0.0	7.9	7.9	0.0	7.9	
4947.00	6.0	26543	25074	0.5756	2.07	11.6	12.5	7.9	0.0	0.0	8.7	8.7	0.0	8.7	Top of Principal Spillway Grate
4948.00	7.0	29559	28051	0.6440	2.71	12.5	13.7	9.7	0.0	63.8	9.5	9.5	0.0	9.5	
4949.00	8.0	32639	31099	0.7139	3.43	13.4	14.8	11.2	0.0	90.2	10.2	10.2	0.0	10.2	
4950.00	9.0	35789	34214	0.7854	4.21	14.2	15.8	12.5	0.0	110.5	10.8	10.8	0.0	10.8	
4951.00	10.0	38995	37392	0.8584	5.07	15.0	16.7	13.7	0.0	127.5	11.5	11.5	0.0	11.5	
4952.00	11.0	42252	40624	0.9326	6.00	15.7	17.6	14.8	0.0	142.6	12.0	12.0	0.0	12.0	
4953.00	12.0	45581	43917	1.0082	7.01	16.4	18.5	15.8	0.0	156.2	12.6	12.6	0.0	12.6	
4954.00	13.0	48967	47274	1.0853	8.10	17.1	19.3	16.7	0.0	168.7	13.1	13.1	0.0	13.1	
4955.00	14.0	52416	50692	1.1637	9.26	17.7	20.1	17.6	0.0	180.4	13.7	13.7	0.0	13.7	
4956.00	15.0	55893	54155	1.2432	10.51	18.3	20.9	18.5	0.0	191.3	14.2	14.2	0.0	14.2	Emergency Spillway
4956.20	15.2	56598	11249	0.2582	10.76	18.5	21.0	18.7	0.0	193.4	14.3	14.3	15.1	29.4	
4956.40	15.4	57303	11390	0.2615	11.02	18.6	21.2	18.8	0.0	195.5	14.4	14.4	42.8	57.1	
4956.60	15.6	58007	11531	0.2647	11.29	18.7	21.3	19.0	0.0	197.6	14.5	14.5	78.5	93.0	
4956.80	15.8	58712	11672	0.2680	11.56	18.8	21.5	19.2	0.0	199.6	14.5	14.5	120.9	135.5	
4957.00	16.0	59417	11813	0.2712	11.83	18.9	21.6	19.3	0.0	201.7	14.6	14.6	169.0	183.6	Top of Pond (artificial)

NOTES:

(a) Orifice equation and coefficient were obtained from Equation 4-10 and Table 4-3 from "Handbook of Hydraulics" Sixth Edition, by Brater & King, 1976.

$\boxed{Q = Ca\sqrt{2gh}}$ C = 0.590 g=32.2 ft/sec^2, a=area (sq ft) h=head (ft)

Weir equation and "C" coefficients were obtained from Equation 5-10 and Table 5-3 from "Handbook of Hydraulics" Sixth Edition, by Brater & King, 1976.

$\boxed{a = \pi D^2/4}$ (full area formula of a circle)

	k	Material	"n"	Slope (ft/ft)
(b) Manning's Equation Parameters	1.486	Concrete	0.013	0.005

Manning's Equation (equation 19.12(b)) and "k" value (page 19-4) were obtained from from "PE Civil Reference Manual" 16th edition, by Michael R. Lindeburg P.E, 2019
Flow depth increments, wetted perimeter and flow area of pipe were computed using Bentley FlowMaster.

(c)Emergency Spillway flows were computed based on the following data used in the weir equation
Q = CLH^ 1.5 C = discharge coefficient, L = spillway length perp. to flow (ft), H = head (ft)

Emergency Spillway C = 2.60 L = 65 Emergency Spillway Elevation = 4956.00

Length assumed along top of pond embankment and elevations extended above emergency spillway to allow for rating curve to function if flow spills over top of emergency spillway.

(d) Data Source : Contours generated from DEMs provided by 2018 MRCOG.
(e) The combined discharge of the reverse incline ports and the grate (A), will govern the discharge until the principal spillway outfall pipe becomes fully submerged. When the sum of (A)s is greater than outfall pipe capacity then outfall pipe capacity governs the discharge.
grey box means must input data

Table 2.2

Elevation Storage Discharge - John Street Pump Station Pond Option 1

John Street Feasibility Design Analysis Report

Contour Elevation NAVD 1988	Depth	Contour Area	Incremental Volume	Incremental Volume	Cumulative Volume	Principal Spillway Outfall Pipe Discharge	Total Principal Spillway / Outfall Pipe Discharge	Emergency Spillway Discharge	Total Discharge Rating Curve	Comment
		Principal Spillway Diameter (inches)				48				
		Number of Openings				1				
(ft)		(sq ft)	(cu ft)	(ac-ft)	(ac-ft)		(cfs)	(cfs)	(cfs)	
(d)						(a,b)	(e)	(c)		
4931.00	0	0	0	0.0000	0.00	0.0	0.0	0.0	0.0	Wet Well Invert
4932.00	1.0	8422	4211	0.0967	0.10	16.7	16.7	0.0	16.7	Invert of Storm Drain Inlet
4933.00	2.0	9871	9147	0.2100	0.31	61.1	61.1	0.0	61.1	
4934.00	3.0	10599	10235	0.2350	0.54	84.1	84.1	0.0	84.1	
4935.00	4.0	11342	10971	0.2518	0.79	103.1	103.1	0.0	103.1	
4936.00	5.0	12102	11722	0.2691	1.06	119.0	119.0	0.0	119.0	
4937.00	6.0	12878	12490	0.2867	1.35	133.0	133.0	0.0	133.0	
4938.00	7.0	13670	13274	0.3047	1.65	145.7	145.7	0.0	145.7	
4939.00	8.0	14478	14074	0.3231	1.98	157.4	157.4	0.0	157.4	
4940.00	9.0	15302	14890	0.3418	2.32	168.3	168.3	0.0	168.3	
4941.00	10.0	16142	15722	0.3609	2.68	178.5	178.5	0.0	178.5	
4942.00	11.0	16999	16571	0.3804	3.06	188.2	188.2	0.0	188.2	
4943.00	12.0	17871	17435	0.4003	3.46	197.3	197.3	0.0	197.3	
4944.00	13.0	18760	18316	0.4205	3.88	206.1	206.1	0.0	206.1	
4945.00	14.0	19663	19212	0.4410	4.32	214.5	214.5	0.0	214.5	
4946.00	15.0	20582	20123	0.4619	4.78	222.6	222.6	0.0	222.6	Top of Wet Well

NOTES:

(a) Orifice equation and coefficient were obtained from Equation 4-10 and Table 4-3 from "Handbook of Hydraulics" Sixth Edition, by Brater & King, 1976.

$Q = Ca\sqrt{2gh}$ C = 0.590 g=32.2 ft/sec^2, a=area (sq ft) h=head (ft)

Weir equation and "C" coefficients were obtained from Equation 5-10 and Table 5-3 from "Handbook of Hydraulics" Sixth Edition, by Brater & King, 1976.

$a = \pi D^2 / 4$ (full area formula of a circle)

	k	Material	"n"	Slope (ft/ft)
(b) Manning's Equation Parameters	1.486	PVC	0.010	0.004

Manning's Equation (equation 19.12(b)) and "k" value (page 19-4) were obtained from from "PE Civil Reference Manual" 16th edition, by Michael R. Lindeburg P.E, 2019

Flow depth increments, wetted perimeter and flow area of pipe were computed using Bentley FlowMaster.

(c)Emergency Spillway flows were computed based on the following data used in the weir equation

Q = CLH^ 1.5 C = discharge coefficient, L = spillway length perp. to flow (ft), H = head (ft)

Emergency Spillway C = 2.60 L = 0 Emergency Spillway Elevation =

Length assumed along top of pond embankment and elevations extended above emergency spillway to allow for rating curve to function if flow spills over top of emergency spillway.

(d) Data Source : Contours generated from DEMs provided by MRCOG 2018.

(e) The combined discharge of the reverse incline ports and the grate (A), will govern the discharge until the principal spillway outfall pipe becomes fully submerged. When the sum of (A)s is greater than outfall pipe capacity then outfall pipe capacity governs the discharge.

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