



CALCULATIONS

Prepared by LL
Checked by AE

Project Name	Rice Group - Holt Pit
Project No.	11139891
Subject	Settlement Pond Sizing - Stage 3 (POND C)

Site Area: 4.86 ha
PP Unit Volume: 185 m³/ha
AS Unit Volume: 125 m³/ha

Depth Increment (m)	0.05	Elevation (m)	Depth (m)	Surface Area (m ²)	Incr. Area (m ²)	W (m) x L (m)
Permanent Pool Elevation (m)	259.20	257.00	0	144	10.8	6 x 24
Bottom of Pond (m)	257.00	258.00	1.0	360	14.4	12 x 30
Max. Pond Elevation (m)	260.00	259.00	2.0	648	18.0	18 x 36
Perm. Pool Vol. Req'd (m ³)	900	260.00	3.0	1008	18.0	24 x 42
Permanent Pool Vol. (m ³)	893					
Active Storage Req'd (m ³)	608					
Max Active Storage (m ³)	641					

Elevation (m)	Depth (m)	Area (m ²)	Incr. Volume (m ³)	Cum. Volume (m ³)	Active Storage (m ³)
257.00	0.00	144	0	0	0
257.05	0.05	155	7	7	0
257.10	0.10	166	8	15	0
257.15	0.15	176	9	24	0
257.20	0.20	187	9	33	0
257.25	0.25	198	10	43	0
257.30	0.30	209	10	53	0
257.35	0.35	220	11	64	0
257.40	0.40	230	11	75	0
257.45	0.45	241	12	87	0
257.50	0.50	252	12	99	0
257.55	0.55	263	13	112	0
257.60	0.60	274	13	125	0
257.65	0.65	284	14	139	0
257.70	0.70	295	14	154	0
257.75	0.75	306	15	169	0
257.80	0.80	317	16	184	0
257.85	0.85	328	16	200	0
257.90	0.90	338	17	217	0
257.95	0.95	349	17	234	0
258.00	1.00	360	18	252	0
258.05	1.05	374	18	270	0
258.10	1.10	389	19	289	0
258.15	1.15	403	20	309	0
258.20	1.20	418	21	330	0
258.25	1.25	432	21	351	0
258.30	1.30	446	22	373	0
258.35	1.35	461	23	396	0
258.40	1.40	475	23	419	0
258.45	1.45	490	24	443	0

Date: 8/7/2019

File Location: C:\Users\lll\Documents\Sediment Pond Size and Hickenbottom Size-rice3.xlsx[StageStorage]



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258.50	1.50	504	25	468	0
258.55	1.55	518	26	494	0
258.60	1.60	533	26	520	0
258.65	1.65	547	27	547	0
258.70	1.70	562	28	575	0
258.75	1.75	576	28	603	0
258.80	1.80	590	29	632	0
258.85	1.85	605	30	662	0
258.90	1.90	619	31	693	0
258.95	1.95	634	31	724	0
259.00	2.00	648	32	756	0
259.05	2.05	666	33	789	0
259.10	2.10	684	34	823	0
259.15	2.15	702	35	857	0
259.20	2.20	720	36	893	0
259.25	2.25	738	36	929	36
259.30	2.30	756	37	967	74
259.35	2.35	774	38	1005	112
259.40	2.40	792	39	1044	151
259.45	2.45	810	40	1084	191
259.50	2.50	828	41	1125	232
259.55	2.55	846	42	1167	274
259.60	2.60	864	43	1210	317
259.65	2.65	882	44	1253	360
259.70	2.70	900	45	1298	405
259.75	2.75	918	45	1343	450
259.80	2.80	936	46	1390	497
259.85	2.85	954	47	1437	544
259.90	2.90	972	48	1485	592
259.95	2.95	990	49	1534	641
260.00	3.00	1008	50	1584	691
260.05	3.05	1026	51	1635	0
260.10	3.10	1044	52	1687	0
260.15	3.15	1062	53	1739	0
260.20	3.20	1080	54	1793	0
260.25	3.25	1098	54	1847	0
260.30	3.30	1116	55	1903	0
260.35	3.35	1134	56	1959	0
260.40	3.40	1152	57	2016	0
260.45	3.45	1170	58	2074	0
260.50	3.50	1188	59	2133	0
260.55	3.55	1206	60	2193	0
260.60	3.60	1224	61	2254	0
260.65	3.65	1242	62	2315	0
260.70	3.70	1260	63	2378	0
260.75	3.75	1278	63	2441	0
260.80	3.80	1296	64	2506	0
260.85	3.85	1314	65	2571	0

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Project Name	Rice Group - Holt Pit
Project No.	11139891
Subject	Stage Storage (Pond C)

Calculation of Outflow Rate Required for Minimum Detention Time

$$Q = \frac{\text{Storage Volume}}{\text{Detention Time}}$$

Storage Volume = 641 m³
 Detention Time = 48 hrs

Q₁ = 0.0037 m³/s
 Q₁ = 3.7 L/s

Calculation of Orifice Size to allow required release rate.

$$Q = C A \sqrt{2gh}$$

$$A = \frac{\pi d^2}{4}$$

Flow Rate, Q₁ = 0.0037 m³/s
 Coefficient, C = 0.62
 head, h = Full storage - orifice elevation = 260.00 - 259.20 = 0.80 m

A₁ = 0.00151 m²

d₁ = 43.86 mm

Use 75mm diameter orifice

Calculation of Actual Release Rate.

d₁ = 75.00 mm
 A₁ = 0.004 m²
 Coefficient, C = 0.62
 head, h = Full storage - orifice elevation = 260.00 - 259.20 = 0.80 m

Flow Rate, Q₁ = 0.0109 m³/s

Drawdown time = 16.41 hours



Project Name	Rice Group - Holt Pit
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Subject	Perforated Pipe Design

PERFORATED PIPE DESIGN

$$\begin{aligned} \text{Orifice Diameter } (d_o) &= 75 \text{ mm} \\ \text{Percent Blockage} &= 50\% \\ \text{Orifice Area } (A_o) &= \pi d_o^2 / 4 \\ A_o &= 0.004 \text{ m}^2 \end{aligned}$$

The perforated pipe must provide an opening greater than the orifice area (A_o) assuming blockage.

$$\begin{aligned} \text{Perforated Pipe Opening } (A_p) &> A_o \times [100 / (100 - \text{Percent Blockage})] \\ A_p &> 0.009 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Diameter of Perforated Pipe } (d_p) &= 200 \text{ mm} \\ \text{Length of Pipe } (l) &= 0.80 \text{ m} \\ \text{Circumference of Pipe } (C) &= \pi d \\ C &= 0.63 \text{ m} \\ \text{Diameter of Holes } (d_h) &= 25 \text{ mm} \\ \text{Spacing between Holes } (S) &= 75 \text{ mm} \\ \text{Holes per row } (H/r) &= C / S \\ H/r &= 9 \text{ holes / row} \\ \text{Rows per length of pipe } (R) &= l / S \\ R &= 11 \text{ rows} \\ \text{Number of Holes} &= H/r \times R \\ &= 99 \text{ holes} \\ \text{Area per hole } (A_h) &= \pi d_h^2 / 4 \\ A_h &= 0.0005 \text{ m}^2 / \text{hole} \\ \text{Perforated Pipe Opening } (A_p) &= A_h \times \text{No. Holes} \\ A_p &= 0.049 \text{ m}^2 \end{aligned}$$

The perforated pipe opening is greater than the orifice opening, therefore the following perforated pipe

min. 200 mm diameter perforated pipe with
 25 mm diameter holes spaced
 75 mm centre to centre
 99 holes.
 11 rows,
 9 holes per row,