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725
 Westmoreland

STORM WATER QUALITY CALCULATIONS

Project: Napoleon Elementary School
 Project No.

Date: 12/14/13
 Calculated By: JHR

<u>Site Information</u>		
Drainage/Basin Description:	New wet pond	
Contributing Drainage Area =	1,799,740 sf	41.32 ac
Impervious Area =	469,894 sf	10.79 ac
% Impervious =	0.26	
Runoff Coefficient, c =	0.38	
Detention Volume Req'd. =	63,805 cf	
Detention Volume Provided =	72,414	
High Water Elev for Detention =	673.75	
<u>Sediment Settling Pond (Construction)</u>		
	N/A	
Contributing Drainage Area	1,799,740 sf	41.32 ac
Dewatering Zone = 1800 cf/acre	74,369 cf	
Sediment Storage Zone = 1000 cf/acre	41,316 cf	
Total Volume Req'd.	115,686 cf	
Principal Spillway Elevation		
<u>Water Quality (Post-Construction)</u>		
<u>Water Quality Volume</u>		
WQv = Water quality volume		
= C*P*A/12		
P = Rainfall depth (inches) = 0.75		
A = Contributing Drainage Area =	41.32 ac	
C = Runoff Coefficient		
= $0.858i^3 - 0.78i^2 + 0.774i + 0.04$ =	0.20	
or use Table 1 =	0.8	
i = percent impervious =	0.26	
	WQv =	0.527 ac-ft 22,967 cf
	WQv+20% =	27,561 cf
<u>Quality Volume Provided</u>		
First flush elevation =	672.75	
A = Water surface area at first flush vol =	40,872	
V = Volume provided =	29,550	
<u>Outlet Structure</u>		
a = Orifice Opening (sq. ft.)		
a = $2(A) / [(C)(T)(2g)^{0.5}] \times (h1-h2)^{0.5}$		
A = Surface area at the first flush vol. elev	40,872 sf	
C = Orifice coefficient =	0.60	
T = Drawdown Time =	24 hrs	86,400 sec
h1 = Water surface elev at first flush volume	672.75	
h2 = Water surface elevation at pond outlet	672	
	a =	0.170 sf

$(0.2) \times (2.6) \times (41.32)$
 $= 21.49 \text{ cfs}$

Detail:
 6.77 TG
 12" OUT

Plus
 6.76 TG
 18" OUT

6.40 - OUTLET ELEV

STORM WATER DETENTION CALCULATIONS FOR NAPOLEON, OHIO (25 YR STORM)

Calculated By: JHR 12/14/2013 Project: Napoleon Elementary School

1. Gross Area sq.ft. = 1,799,740 acres = 41.31634527

2. C(wt.) = 0.383

3. Q average outflow (cfs) = 21.484

4. Detention Volume MINIMUM VOLUME REQUIRED (FT3) = 63,805

tc(min)	i25 in/hr	Q(in)cfs	Q(out)cfs	Volume (c.f.)	Depth (in)
20.00	4.40	69.583	21.484	57718.455	1.80205922
30.00	3.60	56.932	21.484	63804.995	1.992090388
40.00	3.00	47.443	21.484	62300.639	1.945122075
50.00	2.60	41.117	21.484	58898.559	1.838903892 <==
60.00	2.30	36.373	21.484	53598.755	1.673435838
70.00	2.10	33.210	21.484	49247.813	1.53759272
80.00	1.90	30.047	21.484	41101.424	1.283249862
90.00	1.70	26.884	21.484	29159.586	0.910407263
100.00	1.60	25.303	21.484	22910.920	0.715314274
110.00	1.50	23.722	21.484	14764.530	0.460971416
120.00	1.40	22.140	21.484	4720.417	0.147378687
130.00	1.30	20.559	21.484	-7221.421	-0.22546391
140.00	1.20	18.977	21.484	-21060.983	-0.65755638
150.00	1.15	18.187	21.484	-29681.804	-0.92671171
160.00	1.10	17.396	21.484	-39251.487	-1.22549197
170.00	1.05	16.605	21.484	-49770.031	-1.55389716
180.00	1	15.814	21.484	-61237.438	-1.9119273
240.00	0.78	12.335	21.484	-131749.830	-4.11343297
300.00	0.67	10.596	21.484	-195999.733	-6.11941407
360.00	0.57	9.014	21.484	-269358.711	-8.40979454
420.00	0.5	7.907	21.484	-342148.372	-10.6824001
480.00	0.45	7.116	21.484	-413799.398	-12.9194557
540.00	0.42	6.642	21.484	-480895.887	-15.0143116
600.00	0.38	6.009	21.484	-557101.451	-17.3935668
660.00	0.35	5.535	21.484	-631599.064	-19.7194972
720.00	0.33	5.219	21.484	-702680.773	-21.9387779
780.00	0.31	4.902	21.484	-776039.751	-24.2291583
840.00	0.29	4.586	21.484	-851675.998	-26.5906387
900.00	0.27	4.270	21.484	-929589.513	-29.0232188
960.00	0.26	4.112	21.484	-1000671.222	-31.2424995
1020.00	0.25	3.954	21.484	-1072891.566	-33.49733
1080.00	0.23	3.637	21.484	-1156498.254	-36.1076598
1200.00	0.22	3.479	21.484	-1296384.403	-40.4751212
1320.00	0.21	3.321	21.484	-1438547.822	-44.9136825
1440.00	0.19	3.005	21.484	-1596652.122	-49.8499427

Max. Vol cu. ft. = 63,805

**NAPOLEON ELEMENTARY SCHOOL
12/14/2013**

Detention Basin Summary

Normal Water Elevation = 672.00

Detention Summary

25 yr. High Water Elevation = 673.75

25 yr. Storage Volume Required = 63,805 cf

25 yr Storage Volume Provided = 72,414 cf at elev 673.75

Water Quality Summary

First Flush Water Elevation = 672.75

WQ Storage Volume Required = 27,561 cf

WQ Storage Volume Provided = 29,550 cf at elev 672.75