

Project Name: **Wawa - Parham and Three Chopt**  
 Date: **7/5/2018**  
 Linear Development Project?  No

**CLEAR ALL**  
 (Ctrl+Del) (F4)  
 data input cells  
 constant values  
 calculation cells  
 final results

**Site Information**

**Post-Development Project (Treatment Volume and Loads)**

Enter Total Disturbed Area (acres) → **2.65**  
 Maximum reduction required: **20%**  
 The site's net increase in impervious cover (acres) is: **0.87**  
 Post-Development TP Load Reduction for Site (lb/yr): **2.20**

Check:  
 BMP Design Specifications List: 2013 Draft Stds & Specs  
 Linear project?  No  
 Land cover areas entered correctly?  **✓**  
 Total disturbed area entered?  **✓**

**Pre-Development Land Cover (acres)**

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested				1.43	1.43
Managed Turf (acres) -- disturbed, graded for yards or other turf to be				0.39	0.39
Impervious Cover (acres)				0.83	0.83
<b>Totals</b>					<b>2.65</b>

**Post-Development Land Cover (acres)**

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested				0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be				0.95	0.95
Impervious Cover (acres)				1.70	1.70
<b>Totals</b>					<b>2.65</b>

**Constants**

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
PJ (unitless correction factor)	0.90

**Runoff Coefficients (Rv)**

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

**LAND COVER SUMMARY -- PRE-REDEVELOPMENT**

Pre-Development	Listed	Adjusted <sup>1</sup>
Forest/Open Space (acres)	1.43	0.56
Weighted Rv(forest)	0.05	0.05
% Forest	54%	31%
Managed Turf (acres)	0.39	0.39
Weighted Rv(turf)	0.25	0.25
% Managed Turf	15%	27%
Impervious Cover (acres)	0.83	0.83
Rv(impervious)	0.95	0.95
% Impervious	31%	47%
<b>Total Site Area (acres)</b>	<b>2.65</b>	<b>1.78</b>
Site Rv	0.36	0.51

**LAND COVER SUMMARY -- POST DEVELOPMENT**

Post-Development	Final Post-Development	Post-Development New Impervious
Forest/Open Space (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf (acres)	0.35	0.35
Weighted Rv (turf)	0.25	0.25
% Managed Turf	36%	53%
Impervious Cover (acres)	1.70	1.70
Rv(impervious)	0.95	0.95
% Impervious	64%	47%
<b>Total ReDev. Site Area (acres)</b>	<b>2.65</b>	<b>1.78</b>
ReDev Site Rv	0.70	0.58

**Treatment Volume and Nutrient Load**

Pre-Development	Adjusted
Pre-Development Treatment Volume (acre-ft)	0.0798
Pre-Development Treatment Volume (cubic feet)	3,476
Pre-Development TP Load (lb/yr)	2.18
Pre-Development TP Load per acre (lb/acre/yr)	0.81
Baseline TP Load (lb/yr) (0.41 lb/acre/yr applied to pre-development area excluding previous land covered for new impervious cover)	0.73

**Treatment Volume and Nutrient Load**

Final Post-Development	Post-Development	Post-Development New Impervious
Final Post-Development Treatment Volume (acre-ft)	0.1544	0.0889
Final Post-Development Treatment Volume (cubic feet)	6,725	3,900
Final Post-Development TP Load (lb/yr)	4.23	1.89
Final Post-Development TP Load per acre (lb/acre/yr)	1.59	1.06
Max. Reduction Required (Below Pre-Development Load)	36%	36%

<sup>1</sup>Adjusted Land Cover Summary:  
 Pre-Development land cover minus previous total cover (forest/open space or managed turf) acreage proposed for new impervious cover.  
 Adjusted total acreage is consistent with Post-Development minus acreage of new impervious cover.  
 Column 1 shows load reduction treatment for new impervious cover and new development load. Dotted acreage.

**Post-Development Requirement for Site Area**

TP Load Reduction Required (lb/yr) **2.20**

**Nitrogen Loads (Informational Purposes Only)**

Pre-Development TN Load (lb/yr)	15.62	Final Post-Development TN Load (Post-Development & New Impervious) (lb/yr)	30.23
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**DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0**

BMP Design Specifications List: 2013 Draft Stds & Specs

Update Summary Sheet

**Site Summary**

Total Rainfall (in):	43
Total Disturbed Acreage:	2.65

**Site Land Cover Summary**

**Pre-Development Land Cover (acres)**

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	1.43	1.43	54
Managed Turf (acres)	0.00	0.00	0.00	0.39	0.39	15
Impervious Cover (acres)	0.00	0.00	0.00	0.83	0.83	31
<b>Totals</b>					<b>2.65</b>	<b>100</b>

**Post-Development Land Cover (acres)**

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.95	0.95	36
Impervious Cover (acres)	0.00	0.00	0.00	1.70	1.70	64
<b>Totals</b>					<b>2.65</b>	<b>100</b>

**Site Tv and Land Cover Nutrient Loads**

	Final Post-Development (Post-Development & New Impervious)	Post-Development (New Impervious)	Adjusted Pre-Development
Site Rv	0.70	0.58	0.51
Treatment Volume (ft <sup>3</sup> )	6,725	3,724	3,318
TP Load (lb/yr)	4.23	2.34	2.08

Pre-Development TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-Development TP Load per acre (lb/acre/yr)
1.17	1.59	1.31

Total TP Load Reduction Required (lb/yr)	2.20	0.67	1.53
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	Final Post-Development Load (Post-Development & New Impervious)	Pre-Development
TN Load (lb/yr)	30.23	15.62

**Site Compliance Summary**

Maximum % Reduction Required Below Pre-Development Load **20%**

Total Runoff Volume Reduction (ft <sup>3</sup> )	0
Total TP Load Reduction Achieved (lb/yr)	0.00
Total TN Load Reduction Achieved (lb/yr)	0.00
Remaining Post Development TP Load (lb/yr)	4.23
Remaining TP Load Reduction Required (lb/yr)	2.20

**Drainage Area Summary**

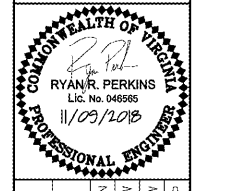
	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.95	0.00	0.00	0.00	0.00	0.95
Impervious Cover (acres)	1.70	0.00	0.00	0.00	0.00	1.70
<b>Total Area (acres)</b>	<b>2.65</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>2.65</b>

**Drainage Area Compliance Summary**

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00
TN Load Reduced (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00

No.	REVISIONS	DATE	BY
1	OIL WATER SEPARATOR REVISIONS	11/07/18	RRP
2	OIL WATER SEPARATOR REVISIONS	07/02/19	RRP
3	UNDERGROUND PIPE CONNECTION REVISIONS	01/03/19	RRP
4	PHASE II EAS REVISIONS	01/14/19	RRP
5	BID SET REVISIONS	01/17/19	RRP

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KHA PROJECT	113160005
DATE	11/09/2018
SCALE	AS SHOWN
DESIGNED BY	KRW
DRAWN BY	KRW
CHECKED BY	RRP

**WATER QUALITY CALCULATIONS**

**WAWA AT PARHAM AND THREE CHOPT**  
 PREPARED FOR **REBKEE CO.**  
 HENRICO COUNTY VIRGINIA