Software Tools for the Changing Environment
RUNOFF REDUCTION ANALYSIS MADE EASY

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VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) PERMIT REGULATIONS
CHAPTER 60, Virginia Administrative Code

- **Implementation date: July 1, 2014 for Parts II A & II B: General Administrative & Technical Criteria for Regulated Land-Disturbing Activities**
- **Part II C Technical Criteria for Grandfathered Projects until June 30. 2019 (Section 4VAC50-60-48)**

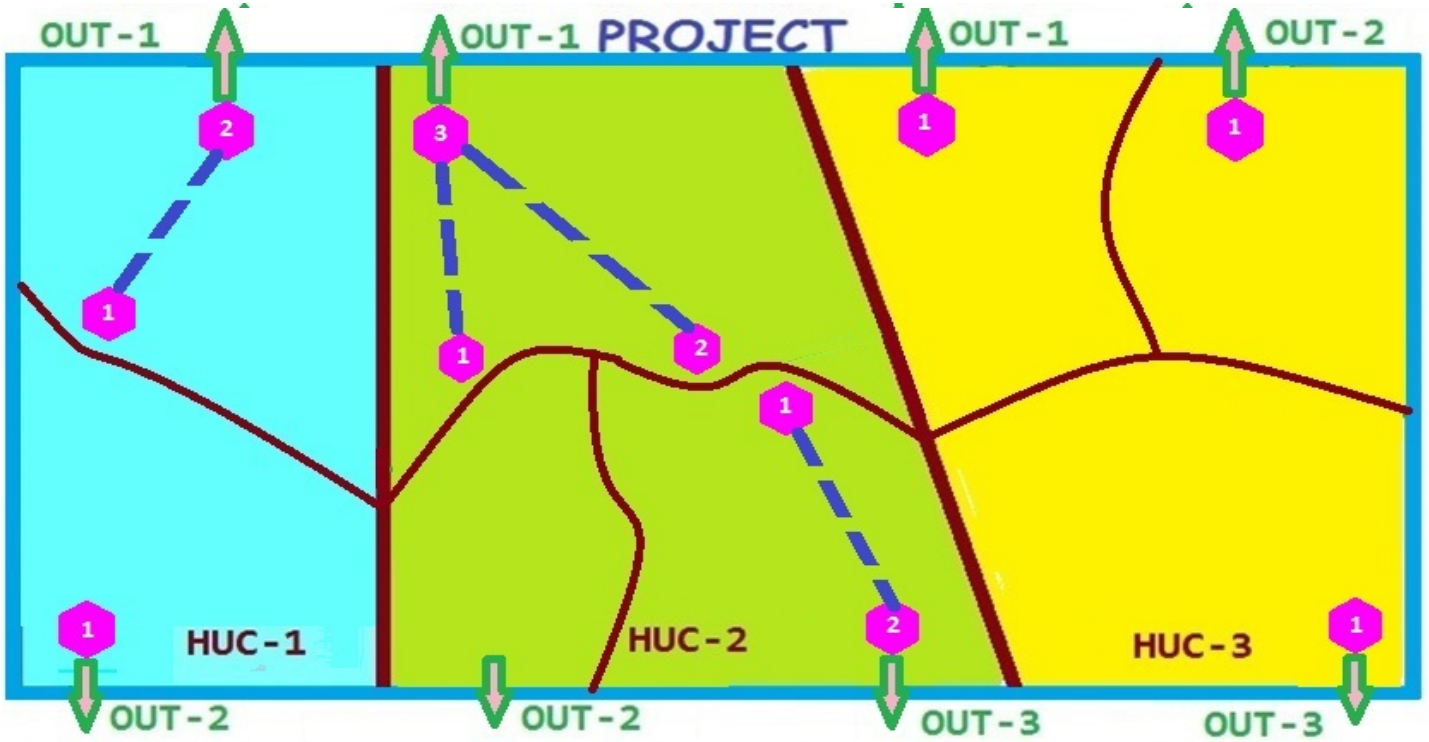
All Land Disturbance one Acre or more

- **WATER QUALITY COMPLIANCE for each Hydrologic Unit Code (HUC)**
- **RECEIVING CHANNEL PROTECTION (Energy Balance) for each Outfall**
- **OVERBANK FLOODING PROTECTION for each Outfall**

Exceptions

- **2,500 Sq.Ft. of Land Disturbance in Special Protection Areas**
- **“One Percent Rule” for Quantity Compliance for Outfalls**

HIERARCHY OF DESIGN PROCESS

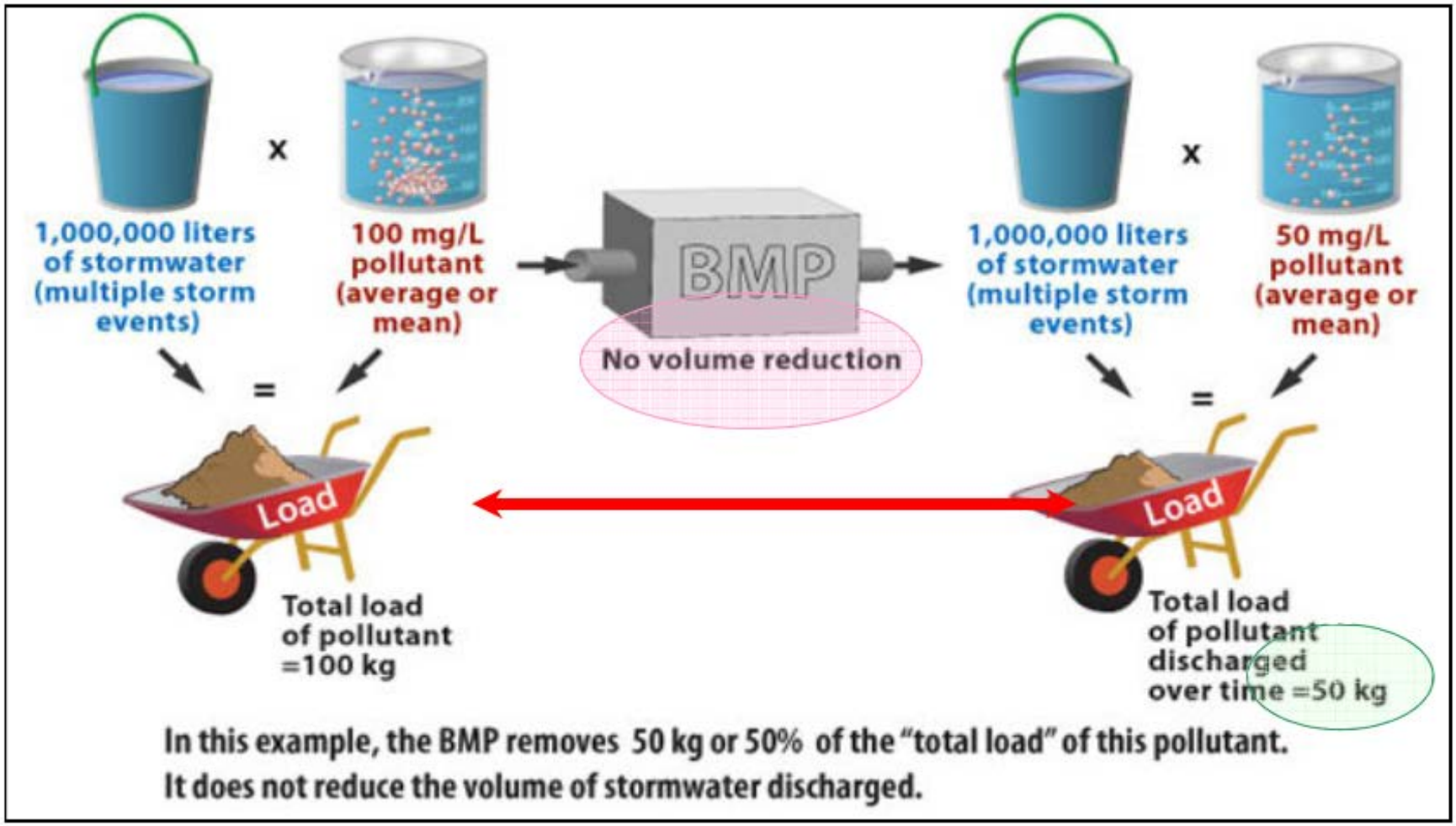


CHECK EACH HUC FOR WATER QUALITY COMPLIANCE

CHECK EACH OUTFALL FOR CHANNEL & FLOOD PROTECTION

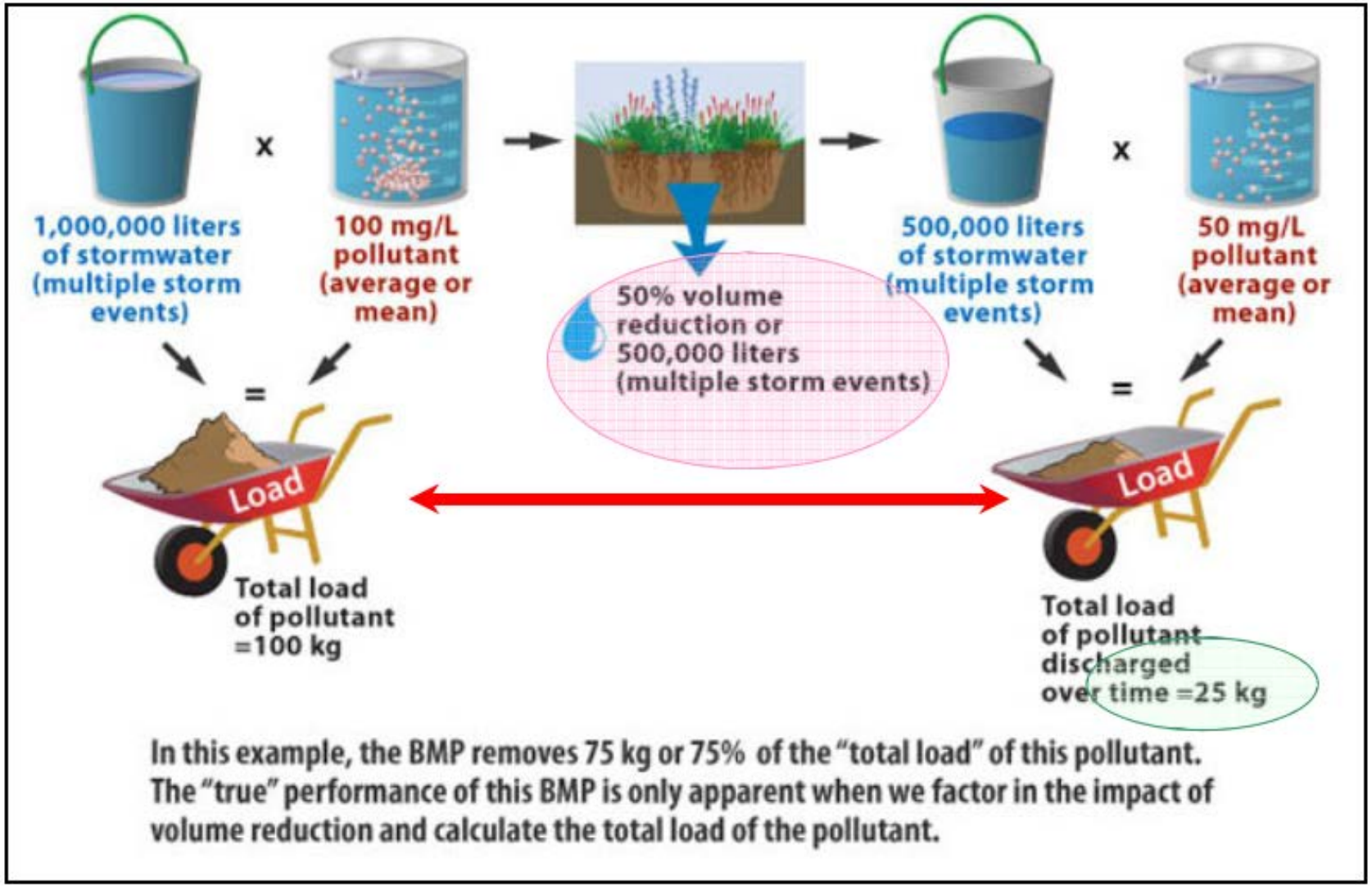
DETERMINE RUNOFF AND POLLUTANT LOAD REDUCTION FOR EACH BMP.

DESIGN PHILOSOPHY



Source: VA DEQ

DESIGN PHILOSOPHY



Source: VA DEQ

DESIGN APPROACH

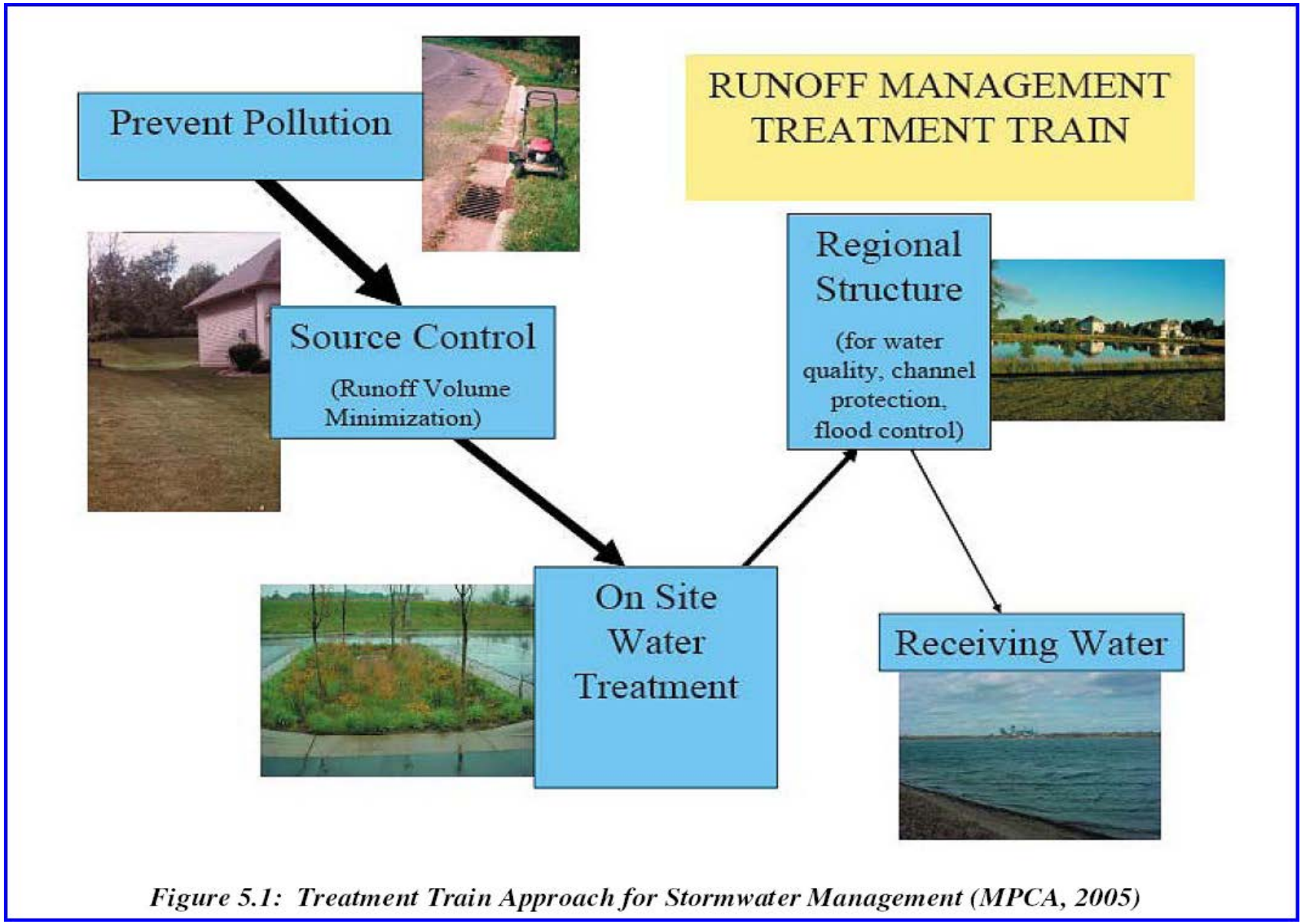
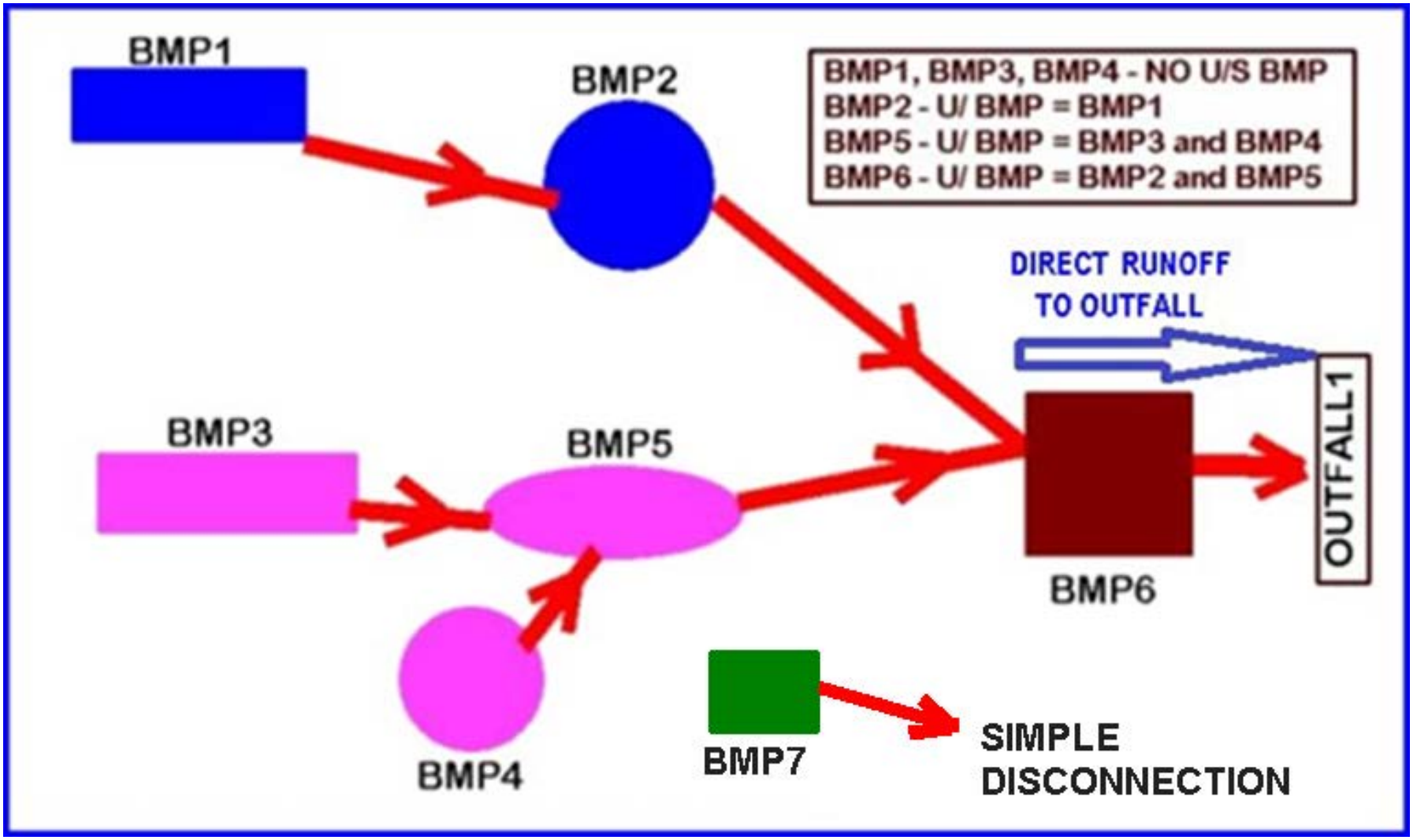


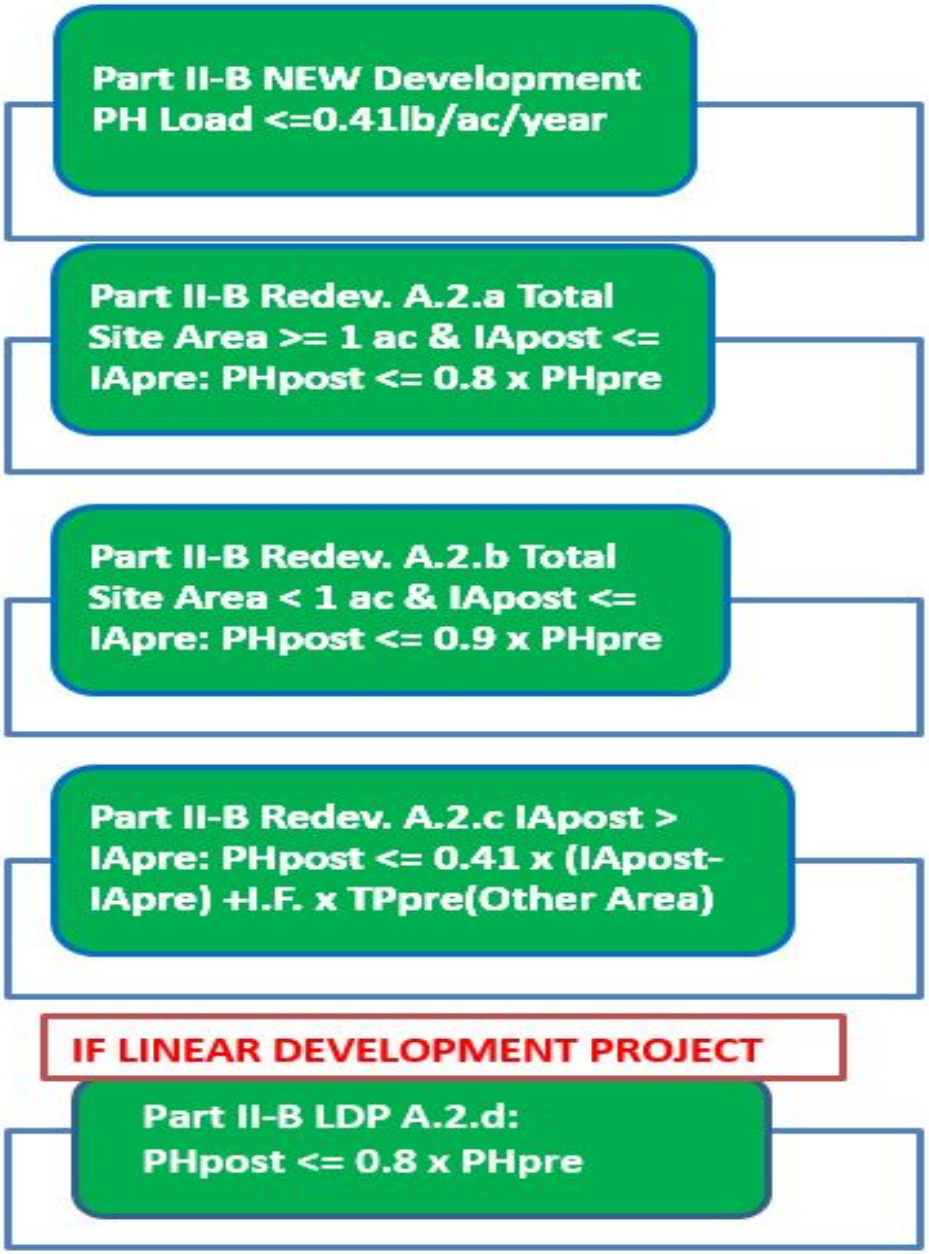
Figure 5.1: Treatment Train Approach for Stormwater Management (MPCA, 2005)

Source: VA DEQ

TREATMENT TRAIN



QUALITY CONTROL



OUTFALL ANALYSIS (QUANTITY CONTROL)

CHANNEL PROTECTION VOLUME

$$Q1Developed \leq Site\ Improvement\ Factor \times \frac{(Q_1 Pre\text{-}developed \times RV_1 Pre\text{-}developed)}{RV_1 Developed}$$

$$\leq Q_1 Pre\text{-}developed$$

$$> \frac{(Q_1 Forest \times RV_1 Forest)}{RV_1 Developed}$$

FLOOD PROTECTION VOLUME

A. $$Q_{10}Developed \leq \frac{(Q_{10} Pre\text{-}developed \times RV_{10} Pre\text{-}Developed)}{RV_{10} Developed}$$

B. $$Q_{10}Developed \leq Q_{10} Pre\text{-}developed$$

RUNOFF REDUCTION (RR) ANALYSIS

1. • **Determine Pre-project Q1, Q2 & Q10 for the Total Site Area at each Outfall for the Existing Land Uses Using TR-55 Method**
2. • **Determine Post-project Q1, Q2 & Q10 for the Total Site Area at each Outfall for the post-development Land Uses Using TR-55 Method**
3. • **Determine the Runoff Volume (RV) reduced as a result of Curve Number and Tc Adjustment, Reservoir Storage and Simple Disconnection (Train Treatment)**
4. • **Determine Post-project Q1, Q2 & Q10 with RR for the Total Site Area at each Outfall for the Reduced RV Using TR-55 Method**

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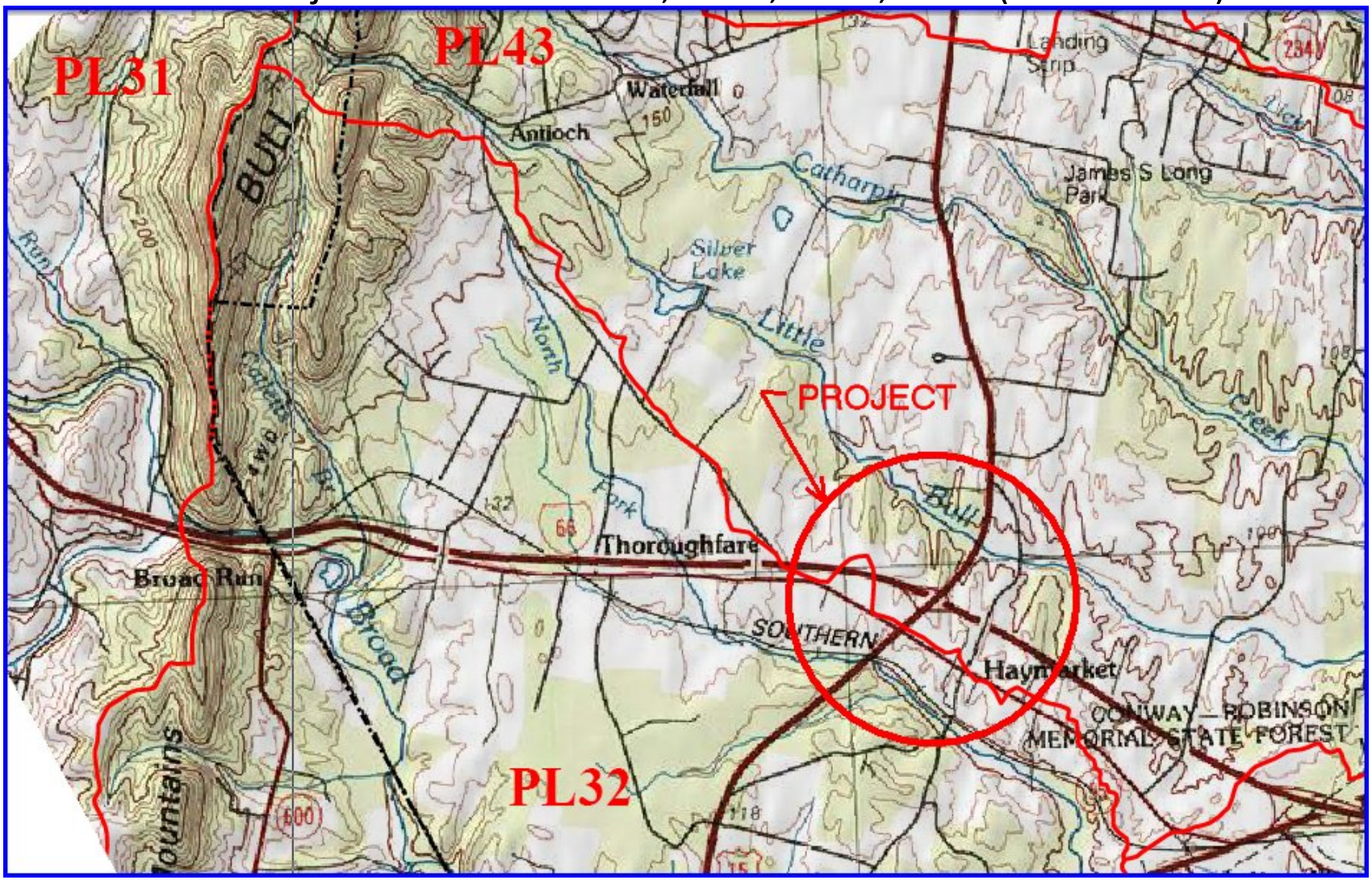
- ✓ Runoff Reduction Computations
- ✓ Grandfathered Projects
- ✓ Pollutant Load Reduction Computations
- ✓ Discharge Analysis (TR-55)
- ✓ Energy Balance Equations
- ✓ BMP Selection Criteria
- ✓ Design Of Structural And Non-structural BMPs
- ✓ Reservoir Routing (Storage-indication Method)
- ✓ Water Balance Analysis

CASE HISTORY
I-66/Route 15 Interchange Reconstruction
Prince William County, VA
VDOT Project # 0066-076-074, P101, R201, C501 (UPC100566)



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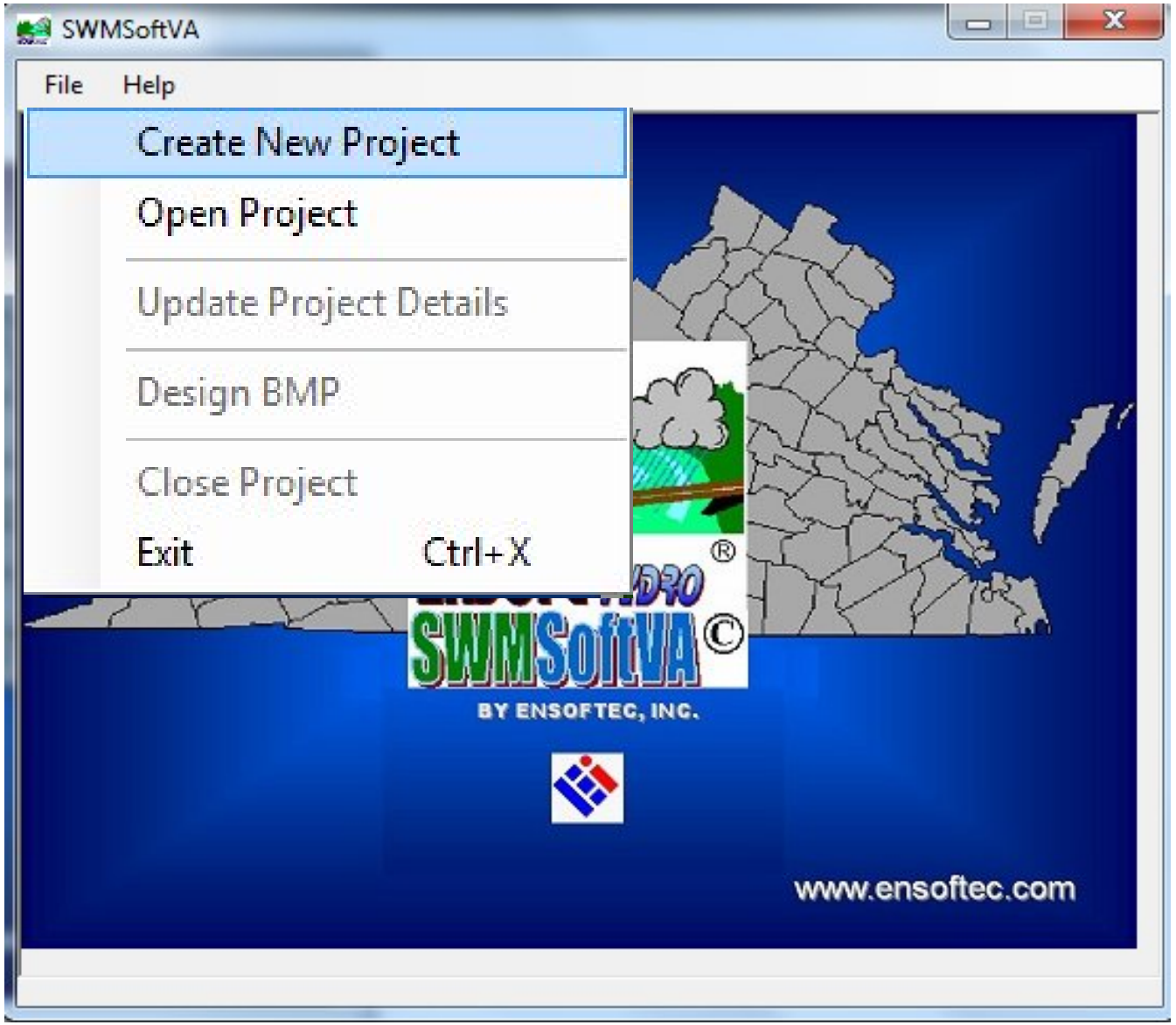
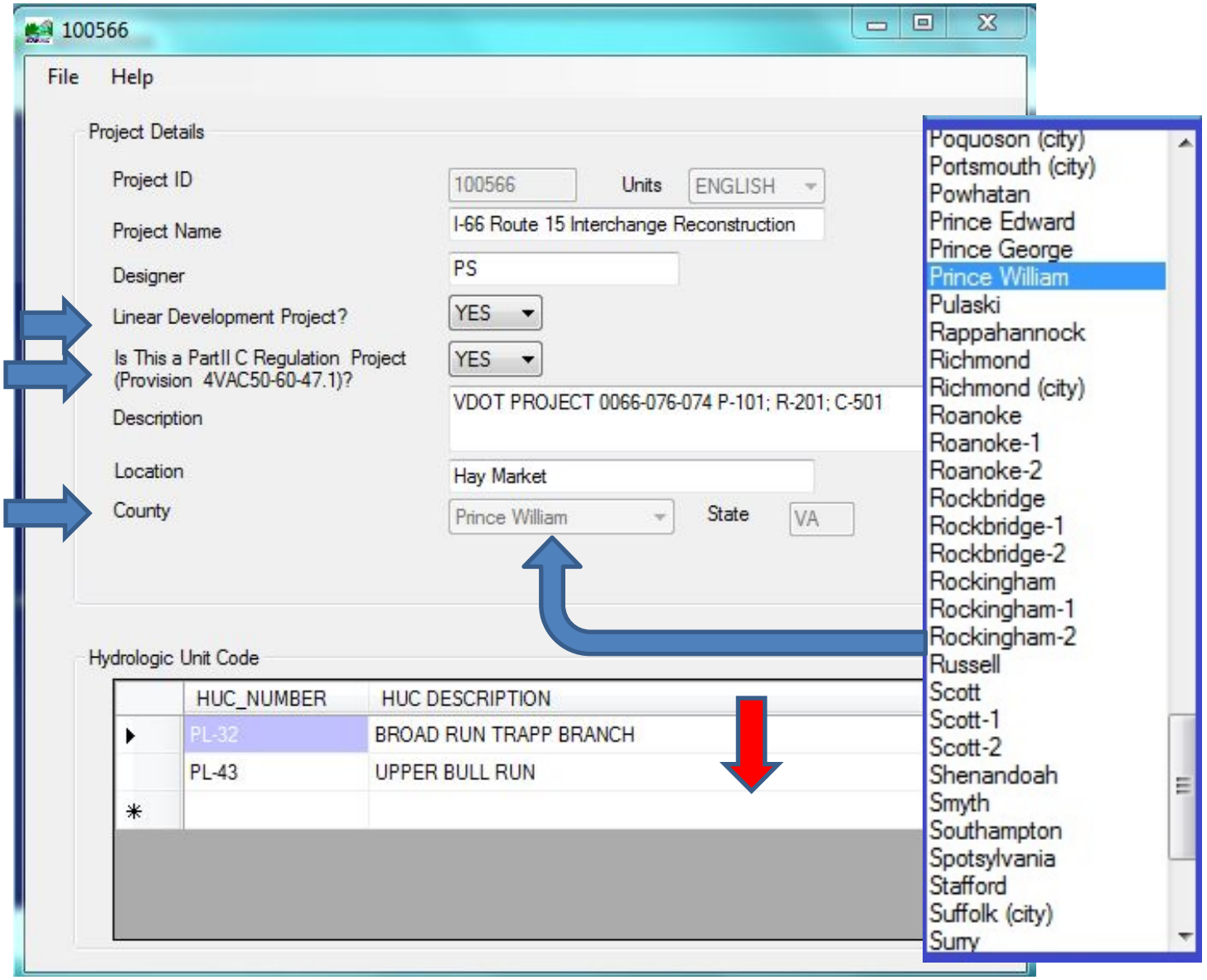
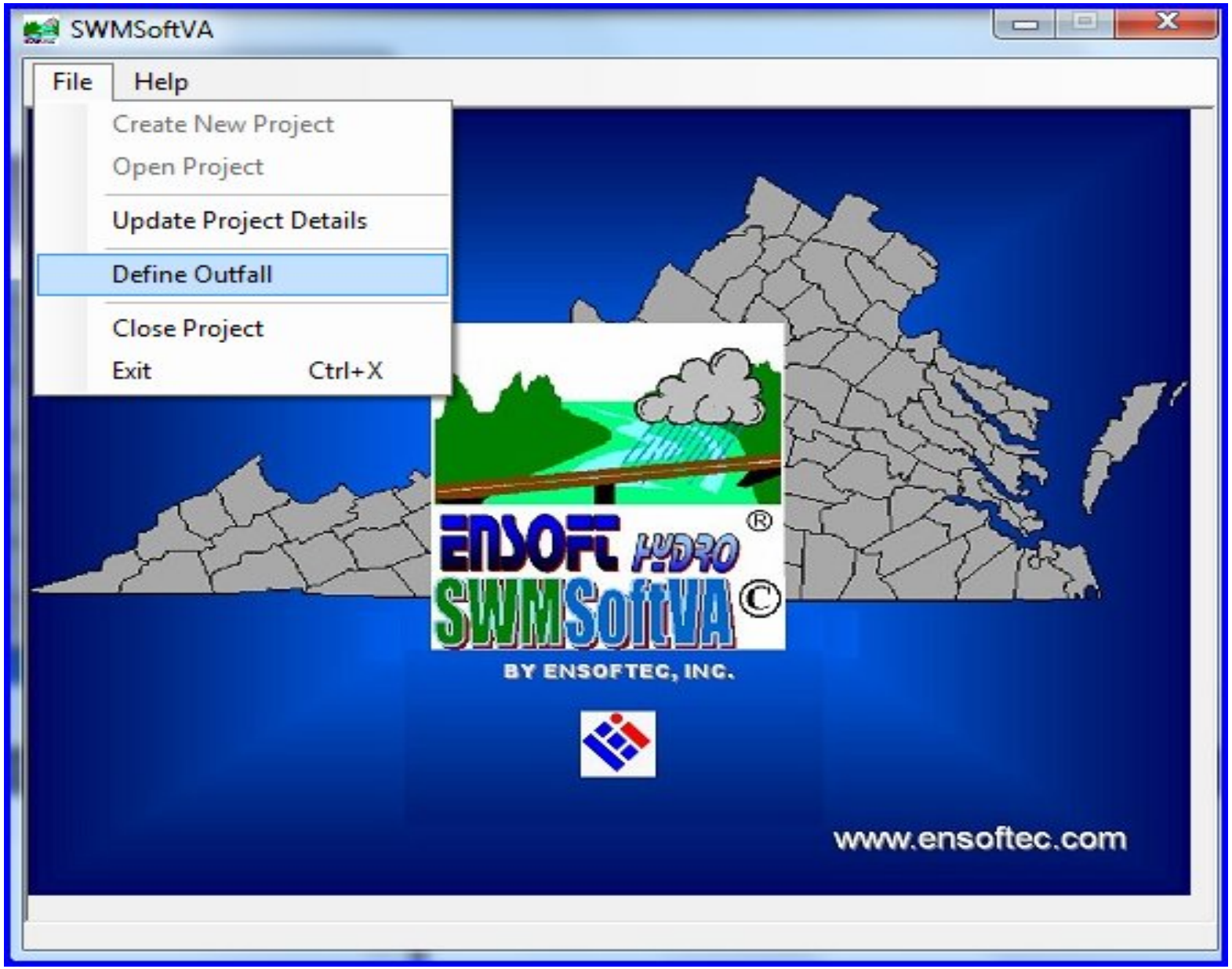
CREATE NEW PROJECT



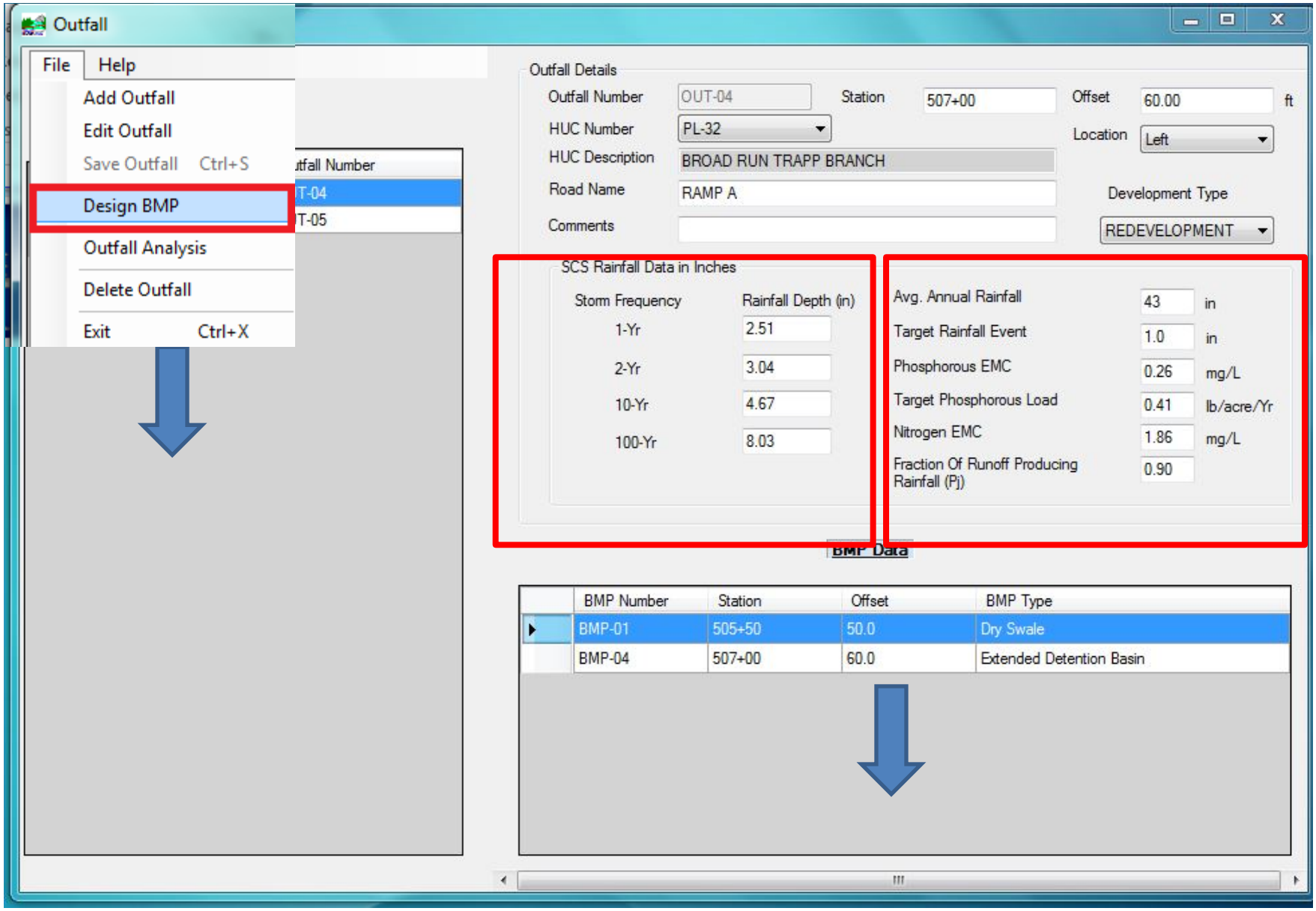
PROJECT SETUP



ADD OUTFALLS



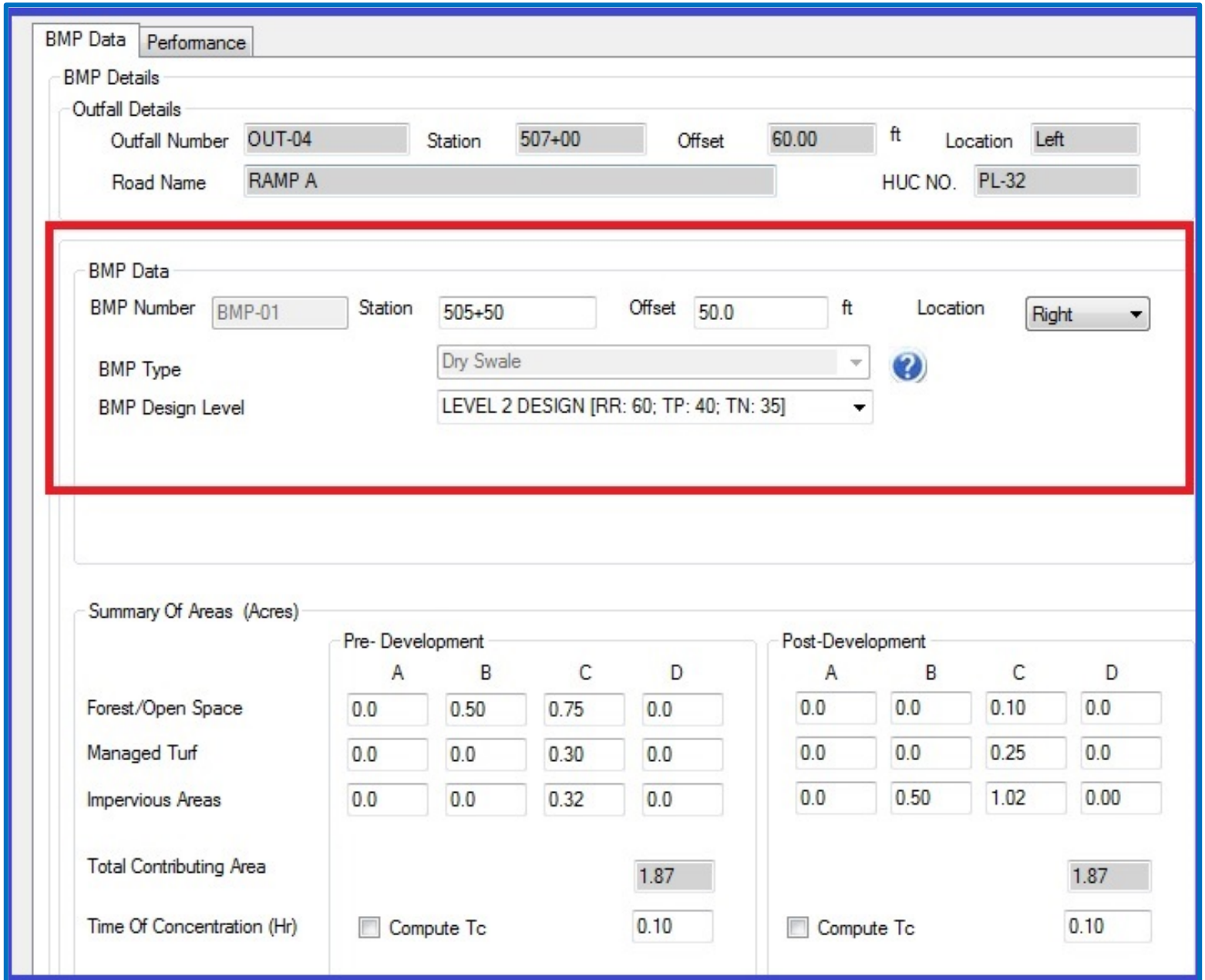
ADD OUTFALL DETAILS



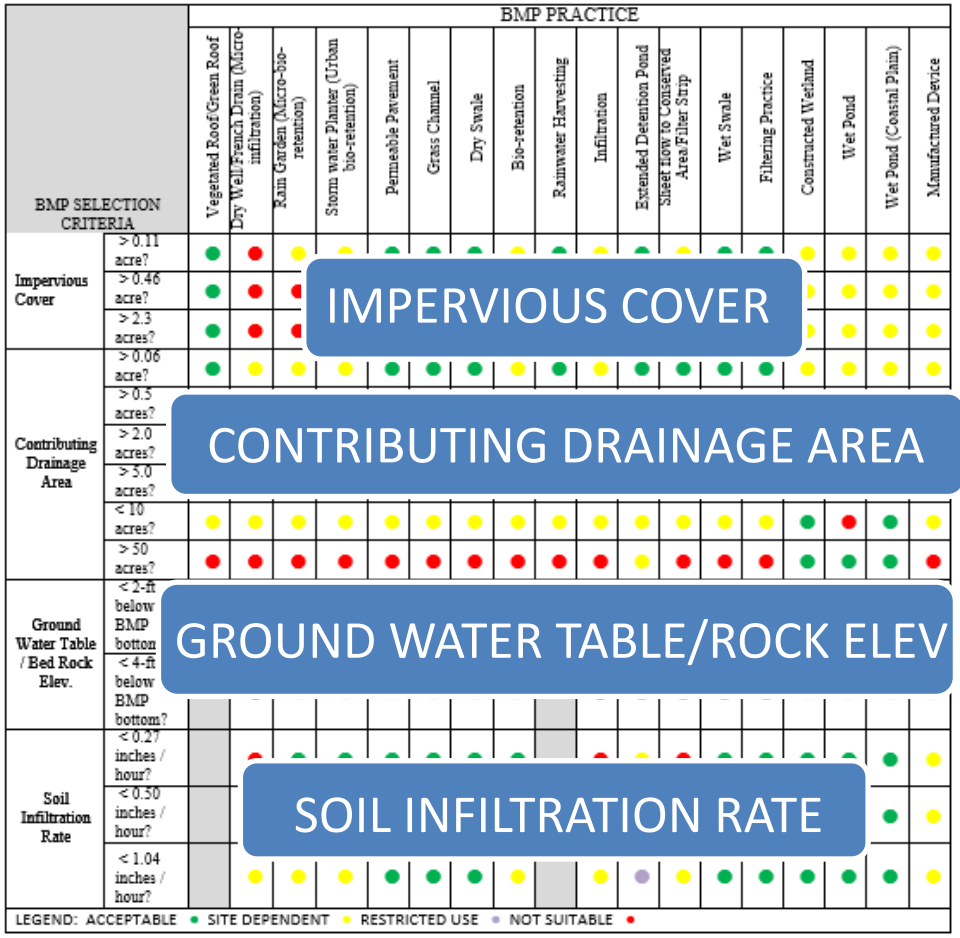
STORMWATER TREATMENT PRACTICES

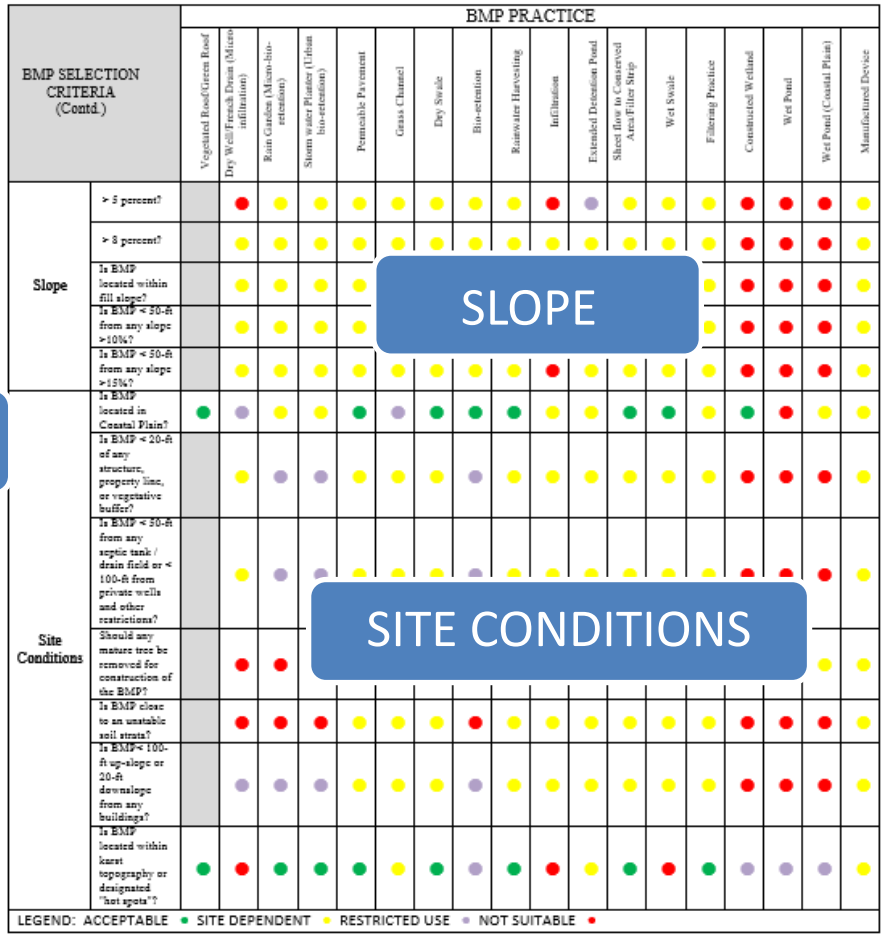
Low Impact BMPs (ESD)	Structural BMPs
Simple disconnection	Extended detention basin
Sheet flow to conservation area/veg. filter strip	Wet pond (Coastal / Non-Coastal)
Soil amended filter path	Infiltration basin
Vegetated roof (Green roof)	Bio-retention basin
Urban bio-retention (Stormwater planter)	Constructed wetlands
Dry Well or French drain (Micro-infiltration)	Filtering practice (Sand filter)
Rain garden (Micro bio-retention)	Manufactured devices
Permeable pavement	Dry swale
Grass channel (with or without compost amended)	Wet swale
Rainwater harvesting (Cisterns, tanks, etc.)	

BMP FACILITY SELECTION



BMP SELECTION CRITERIA





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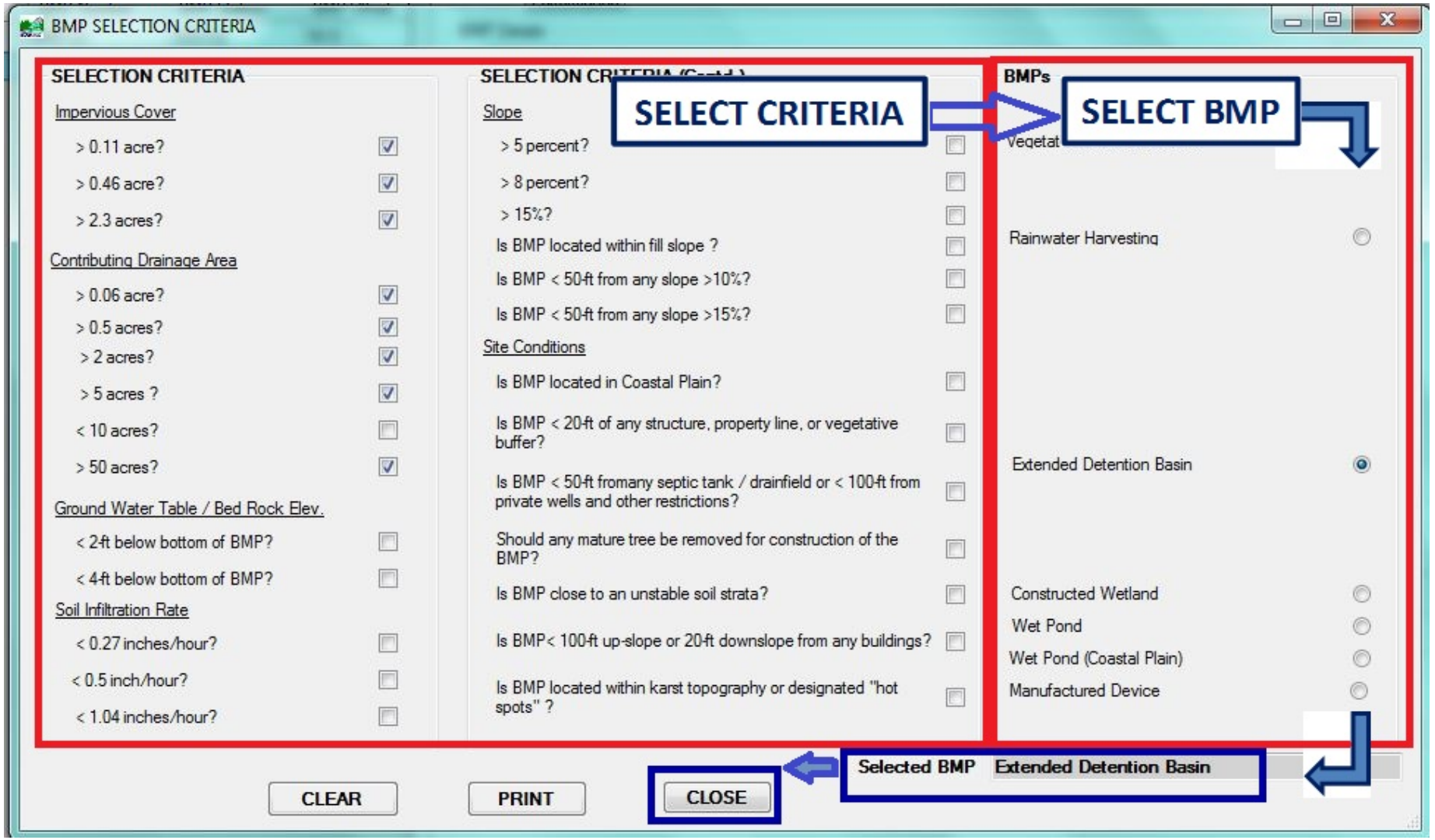
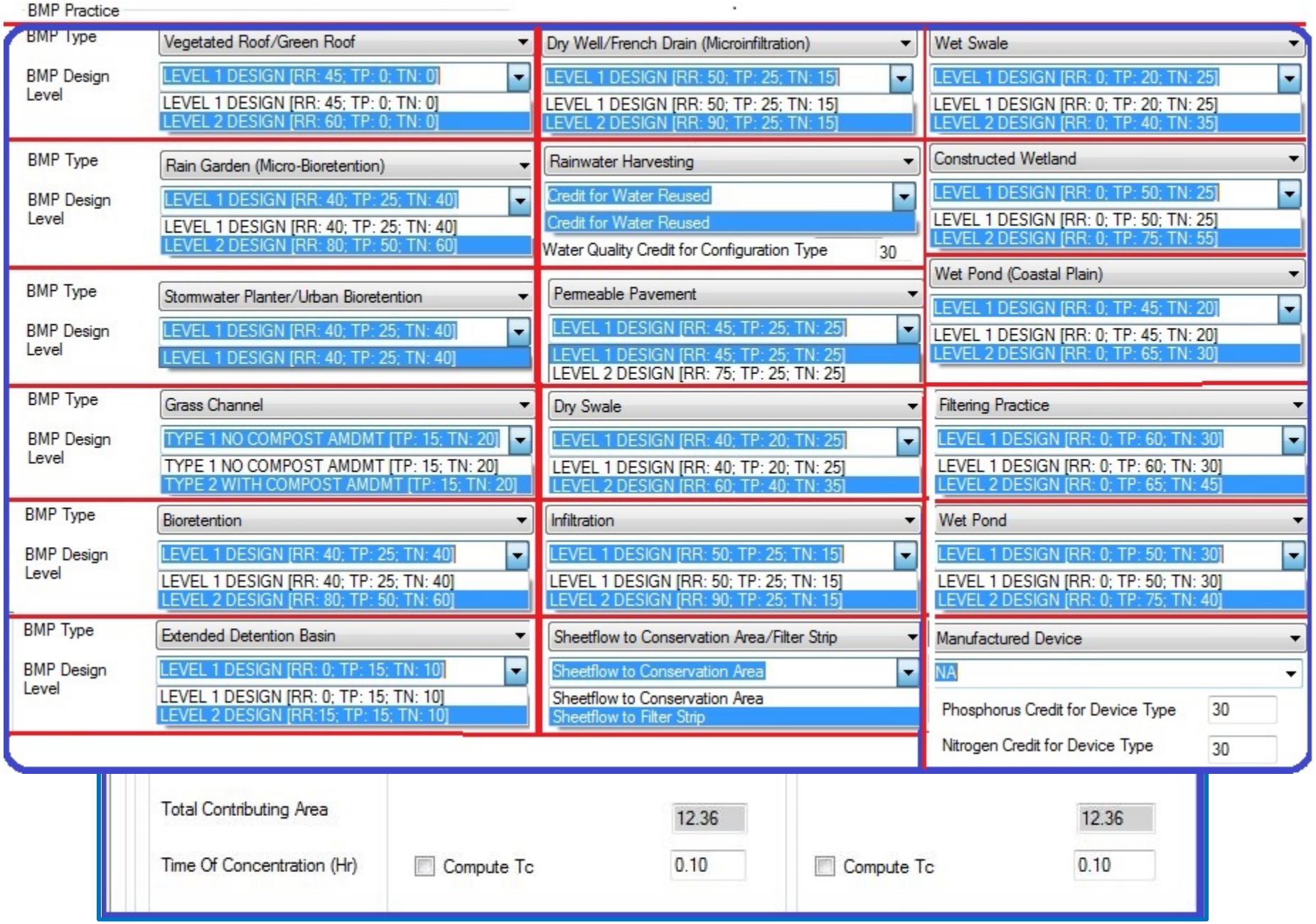
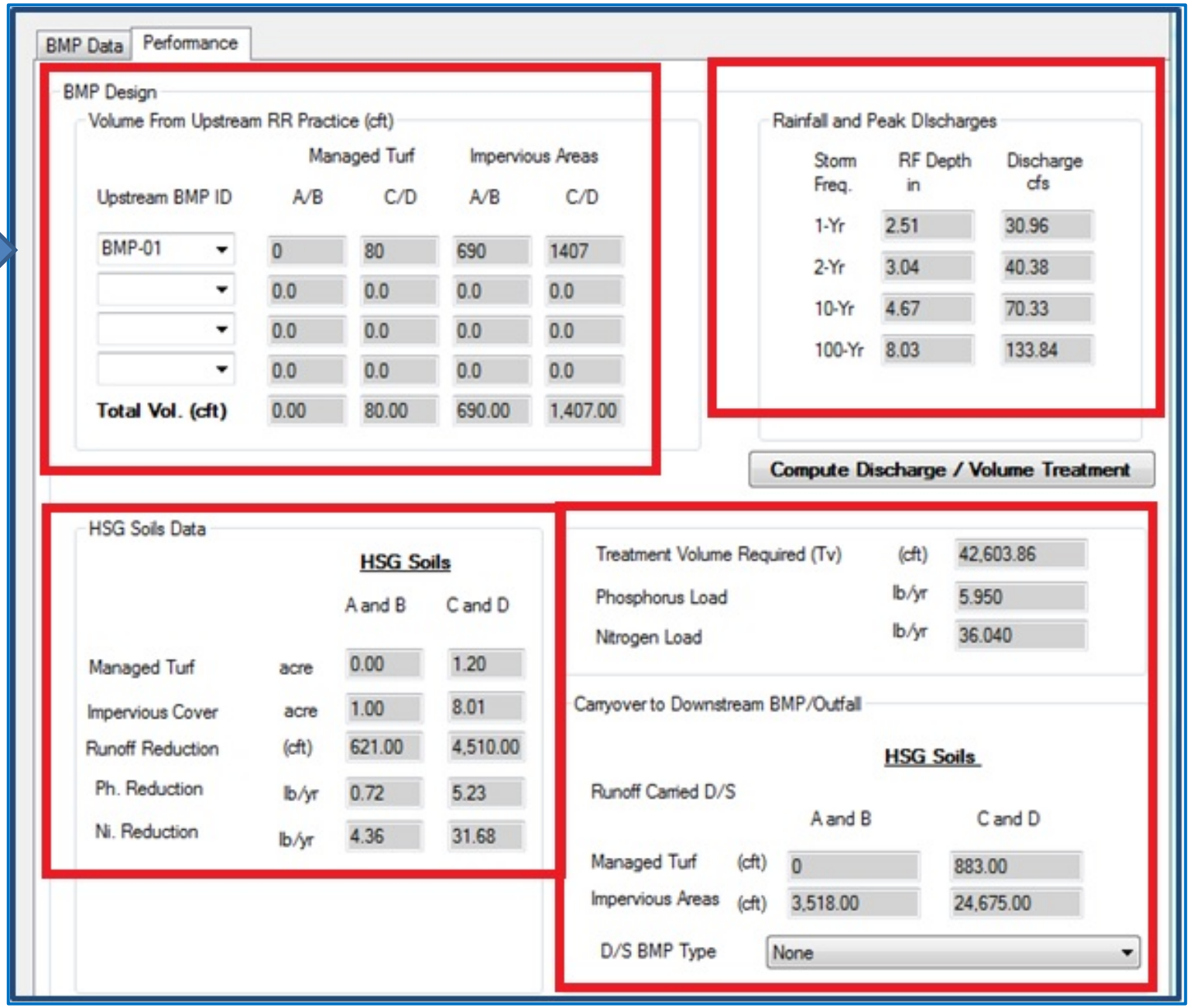


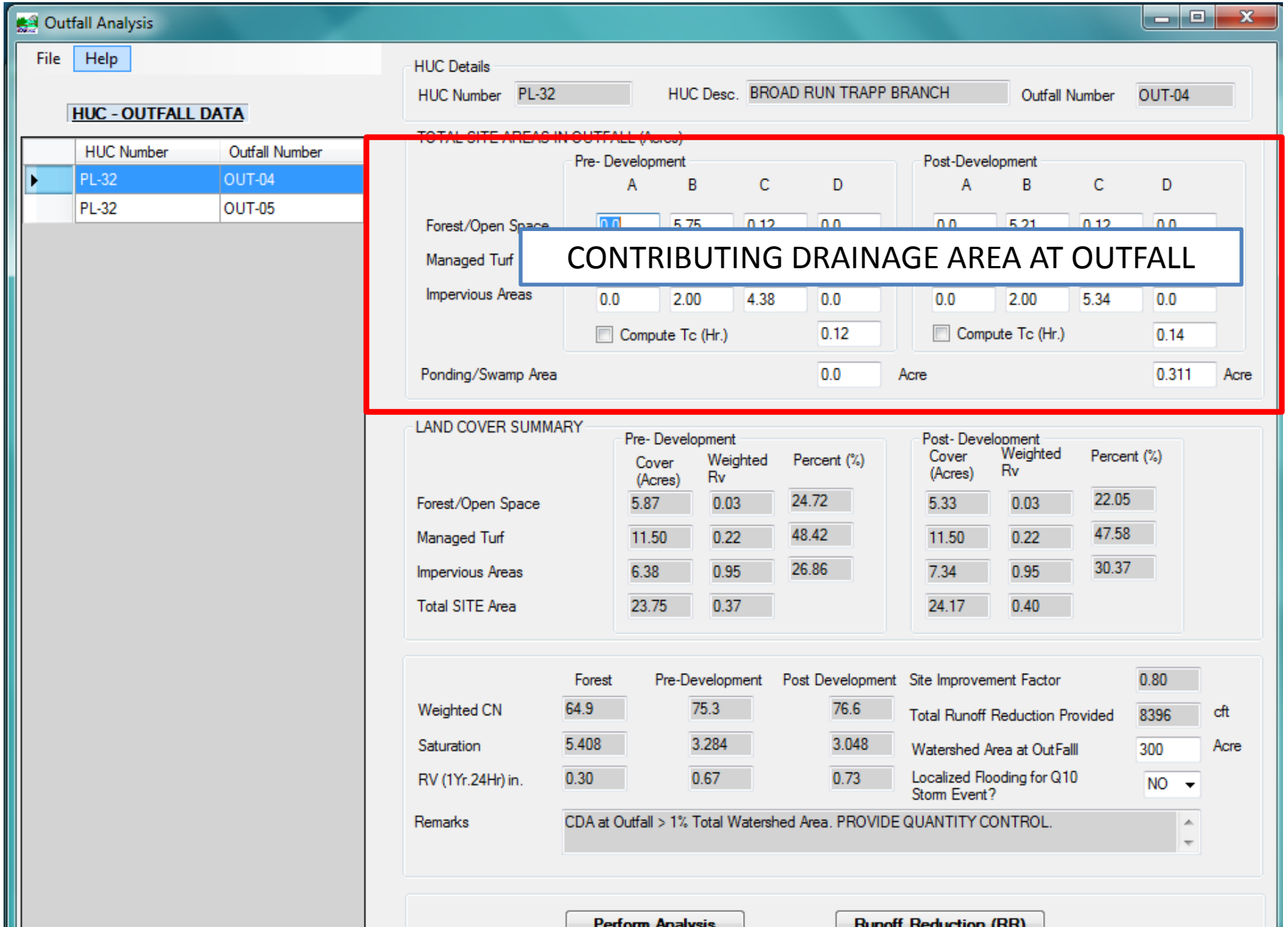
ADD BMP DETAILS (CONTD.)



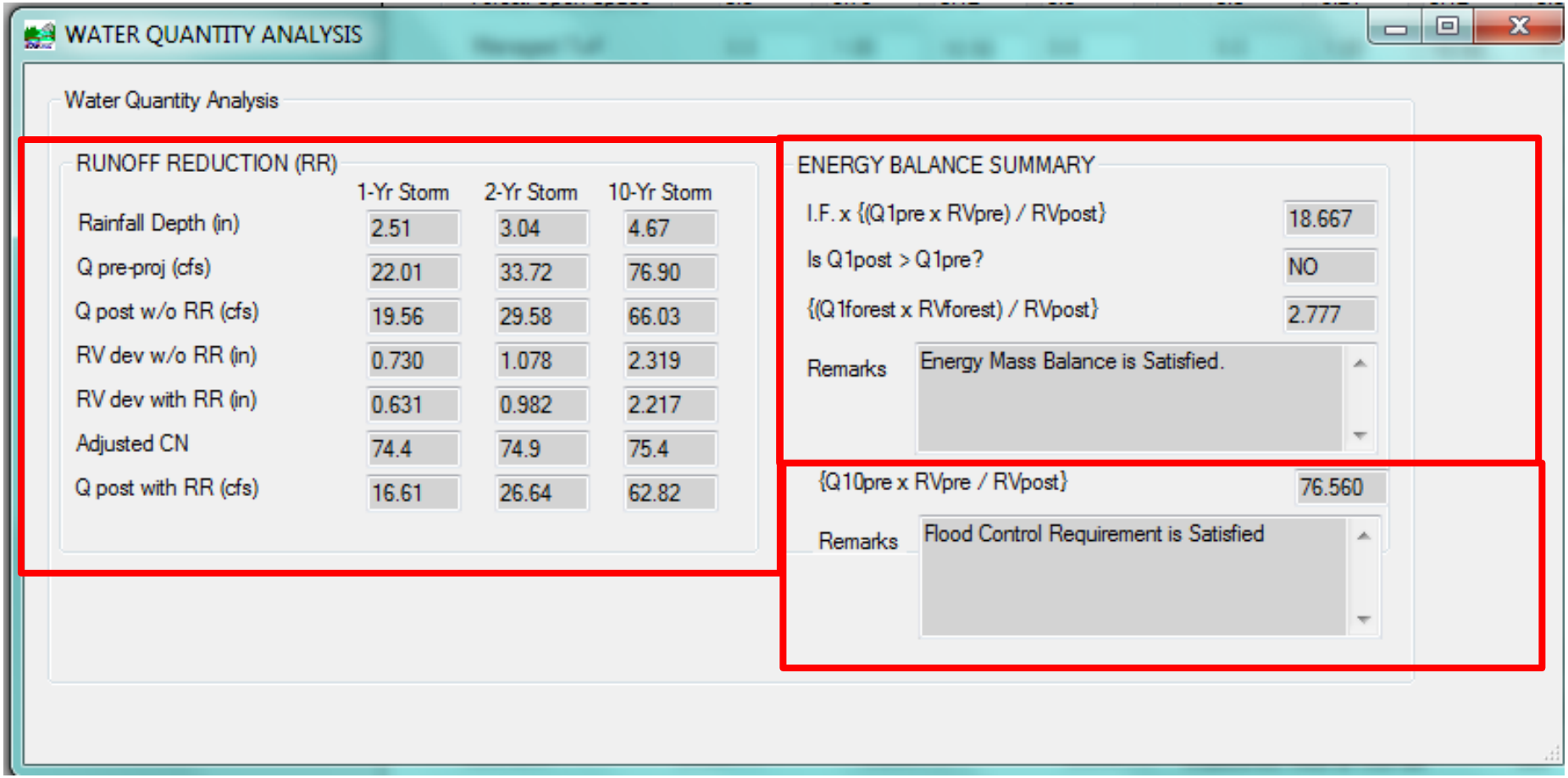
BMP FACILITY PERFORMANCE



OUTFALL ANALYSIS

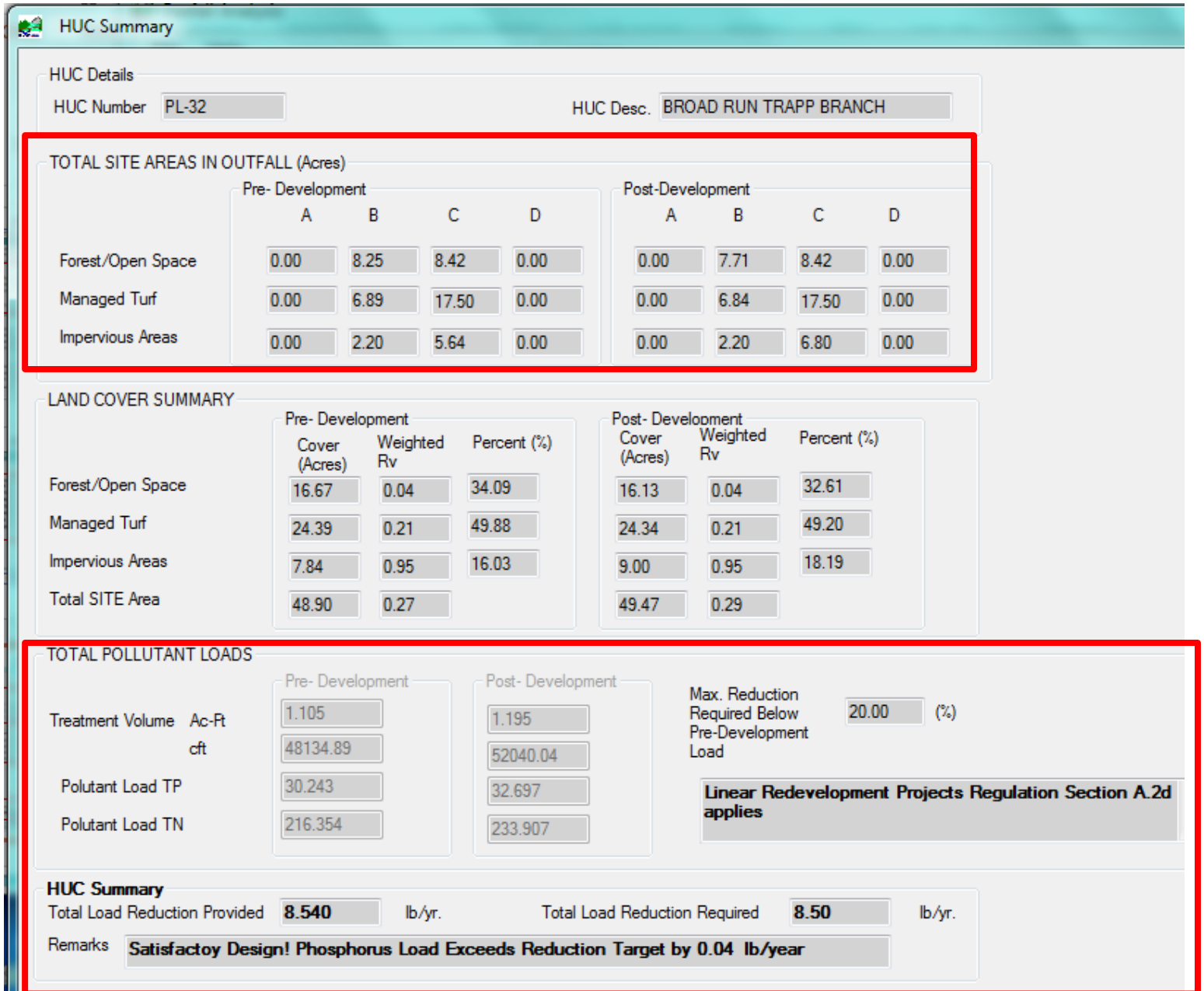


OUTFALL SUMMARY



ONE PERCENT RULE APPLIES

HUC SUMMARY



HUC Summary

HUC Details

HUC Number: PL-32

HUC Desc.: BROAD RUN TRAPP BRANCH

TOTAL SITE AREAS IN OUTFALL (Acres)

	Pre- Development				Post-Development			
	A	B	C	D	A	B	C	D
Forest/Open Space	0.00	8.25	8.42	0.00	0.00	7.71	8.42	0.00
Managed Turf	0.00	6.89	17.50	0.00	0.00	6.84	17.50	0.00
Impervious Areas	0.00	2.20	5.64	0.00	0.00	2.20	6.80	0.00

LAND COVER SUMMARY

	Pre- Development			Post- Development		
	Cover (Acres)	Weighted Rv	Percent (%)	Cover (Acres)	Weighted Rv	Percent (%)
Forest/Open Space	16.67	0.04	34.09	16.13	0.04	32.61
Managed Turf	24.39	0.21	49.88	24.34	0.21	49.20
Impervious Areas	7.84	0.95	16.03	9.00	0.95	18.19
Total SITE Area	48.90	0.27		49.47	0.29	

TOTAL POLLUTANT LOADS

		Pre- Development	Post- Development
Treatment Volume	Ac-Ft	1.105	1.195
	cft	48134.89	52040.04
Polutant Load TP		30.243	32.697
Polutant Load TN		216.354	233.907

Max. Reduction Required Below Pre-Development Load: 20.00 (%)

Linear Redevelopment Projects Regulation Section A.2d applies

HUC Summary

Total Load Reduction Provided: **8.540** lb/yr.

Total Load Reduction Required: **8.50** lb/yr.

Remarks: **Satisfactoy Design! Phosphorus Load Exceeds Reduction Target by 0.04 lb/year**

WHY SWMSOFTVA?

- BMP Selection Criteria
- Design of Structural and Non-Structural BMPs
- Discharge Analysis Included
- Reduced Design Time and Effort
- Standardized Design Procedures
- Easier Reviews and Checks
- Simplified Database Management
- Graphs and Reports in MS Excel Format
- User Friendly, GUI & Extensive HELP

For additional details, visit: www.Ensoftec.com

For Video Tutorials, visit: YouTube and search for "SWMSOFTVA"