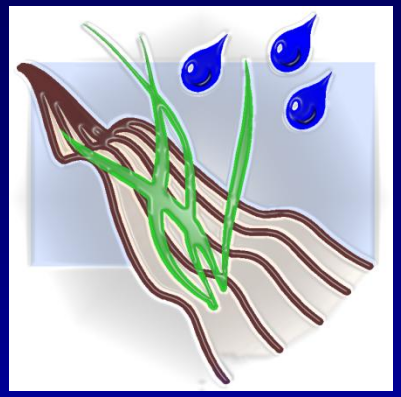


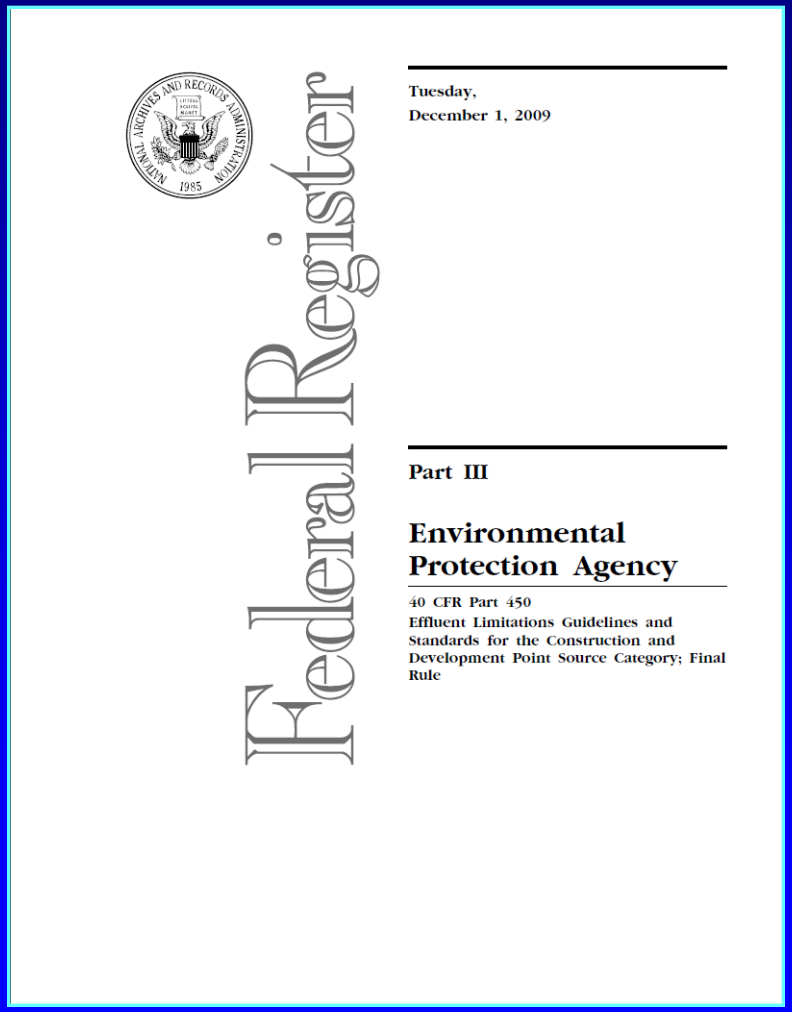
Revisions to the Delaware Sediment & Stormwater Regulations

Technical Subcommittee Meeting
September 15, 2011

Proposed Revisions to Delaware Sediment & Stormwater Regulations

Regulatory Language Update

ELGs for Construction & Development Industry



Federal Register

Tuesday,
December 1, 2009

Part III

Environmental Protection Agency

40 CFR Part 450
Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category; Final Rule

4.0 Construction Site SWM

- Federal Rule (Feb. 1, 2010)
  - Effective on or about August 1, 2011, Numerical Effluent Limit of 280 ntu applies to all construction sites with greater than 20 acres disturbed for all storms less than the 2-YR frequency
  - 20 acre disturbance threshold will roll back to 10 acres effective Feb. 1, 2014

4.0 Construction Site SWM

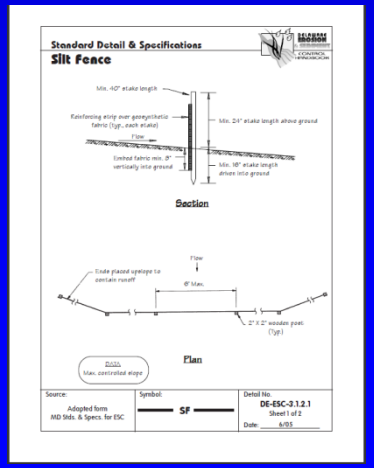
- Federal Rule (Feb. 1, 2010)
  - Effective on or about August 1, 2011, Numerical Effluent Limit of ??? ntu applies to all construction sites with greater than 20 acres disturbed for all storms less than the 2-YR frequency
  - 20 acre disturbance threshold will roll back to 10 acres effective Feb. 1, 2014

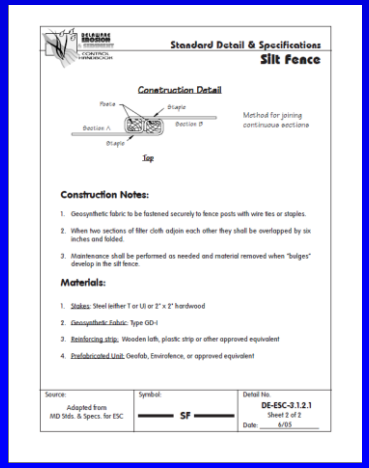
4.0 Construction Site SWM

- Federal Rule (Feb. 1, 2012)
  - Effective on or about August 1, 2011, Numerical Effluent Limit of ??? ntu applies to all construction sites with greater than 20 acres disturbed for storms less than the 2-YR frequency
  - 20 acre disturbance threshold will roll back to 10 acres effective Feb. 2, 2014

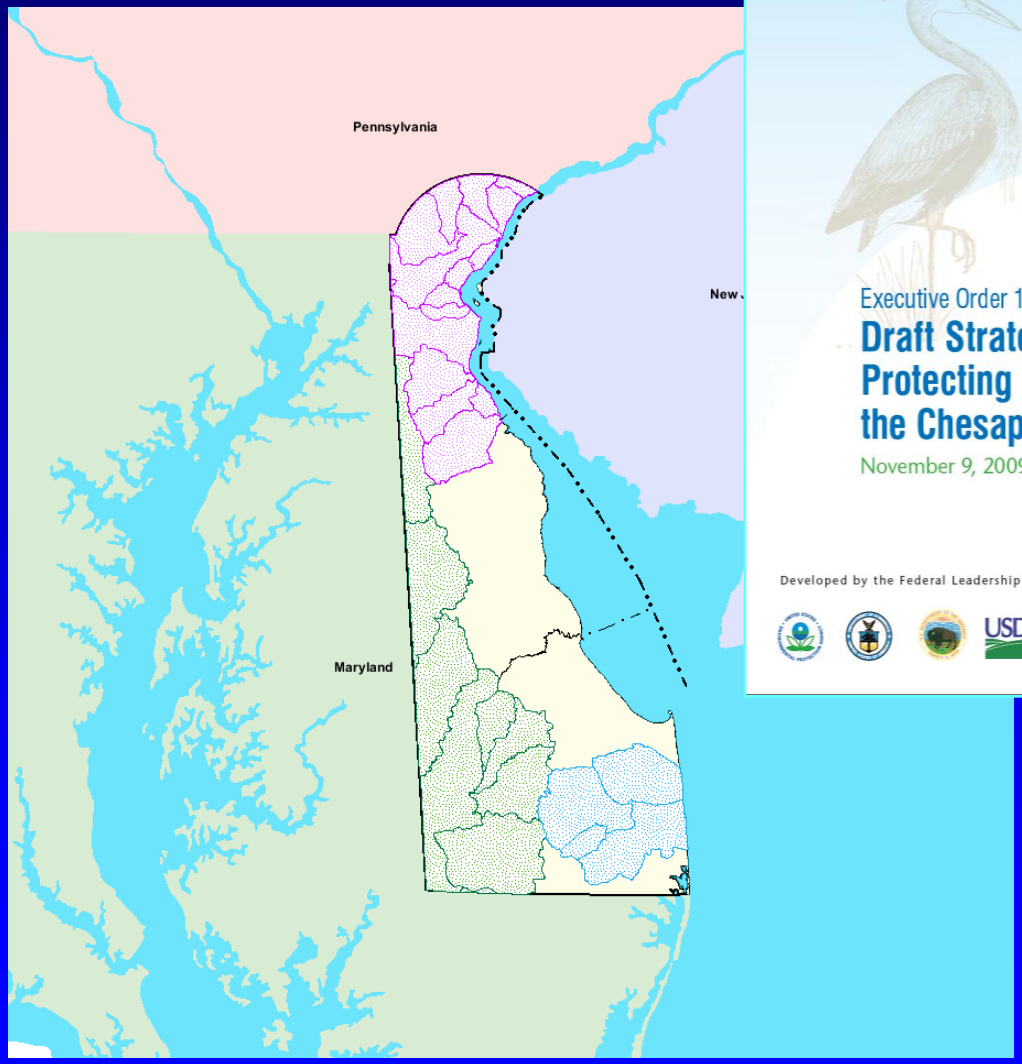
4.4 Limits on Land Disturbance

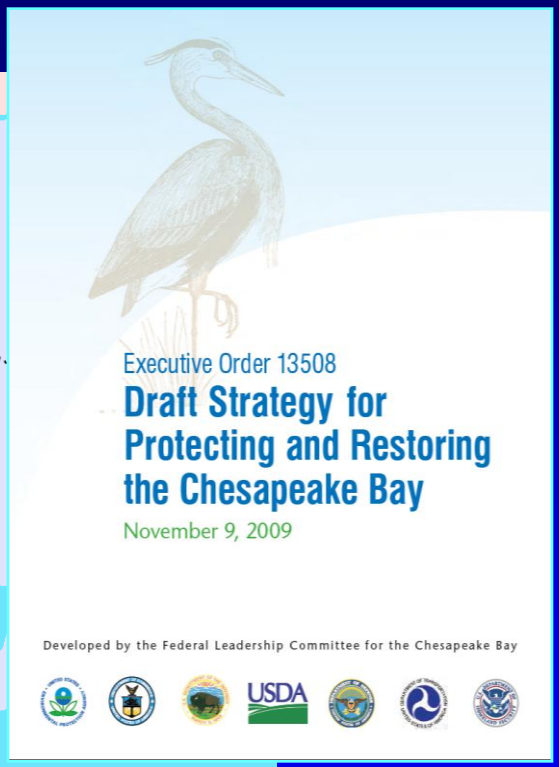
- ≤20 acres drainage = Standard Details
- >20 acres drainage = Engineered Design (2-yr rainfall, “newly graded area” CNs)
- 20 acre max disturbed area to a common discharge point


Standard Detail & Specifications
Silt Fence
Section
Plan
Source: Adopted from MD Stds. & Specs. for ESC
Symbol: SF
Detail No. DE-ESC-3.1.2.1 Sheet 1 of 2
Date: 6/05

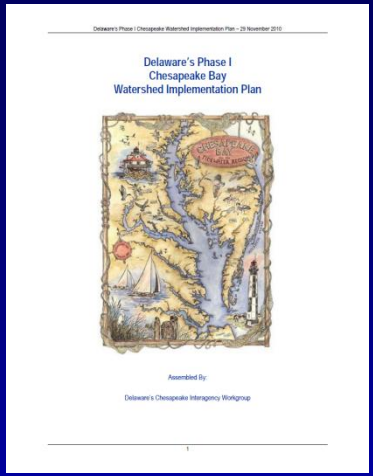

Standard Detail & Specifications
Silt Fence
Construction Detail
Top
Construction Notes:
1. Geosynthetic fabric to be fastened securely to fence posts with wire ties or staples.
2. When two sections of filter cloth adjoin each other they shall be overlapped by six inches and folded.
3. Maintenance shall be performed as needed and material removed when “bulges” develop in the silt fence.
Materials:
1. Stakes: Steel either T or Ui or 2” x 2” hardwood
2. Geosynthetic Fabric: Type GD-I
3. Reinforcing strip: Wooden lath, plastic strip or other approved equivalent
4. Prefabricated Unit: Geofab, Envirofence, or approved equivalent
Source: Adopted from MD Stds. & Specs. for ESC
Symbol: SF
Detail No. DE-ESC-3.1.2.1 Sheet 2 of 2
Date: 6/05

TMDLs


Pennsylvania
New
Maryland

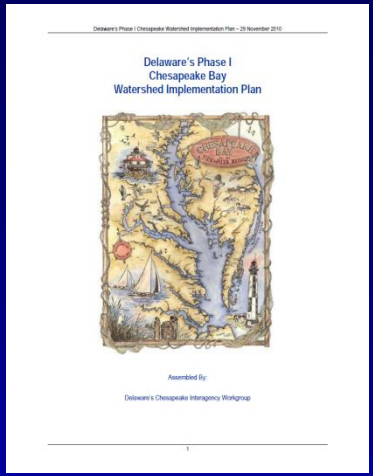

Executive Order 13508
Draft Strategy for Protecting and Restoring the Chesapeake Bay
November 9, 2009
Developed by the Federal Leadership Committee for the Chesapeake Bay
USDA

Chesapeake WIP
Delaware Stormwater Phase I
High Level Commitments
for Urban Sector



- Promulgate new statewide stormwater rules with performance standards for new and redevelopment
- Develop a system for tracking inspections and compliance information
- Implement voluntary programs or regulatory tools to limit turfgrass fertilizer use

Chesapeake WIP
Delaware Stormwater Phase I
High Level Commitments
for Urban Sector



- Promulgate new statewide stormwater rules with performance standards for new and redevelopment
- Develop a system for tracking inspections and compliance information
- Implement voluntary programs or regulatory tools to limit turfgrass fertilizer use

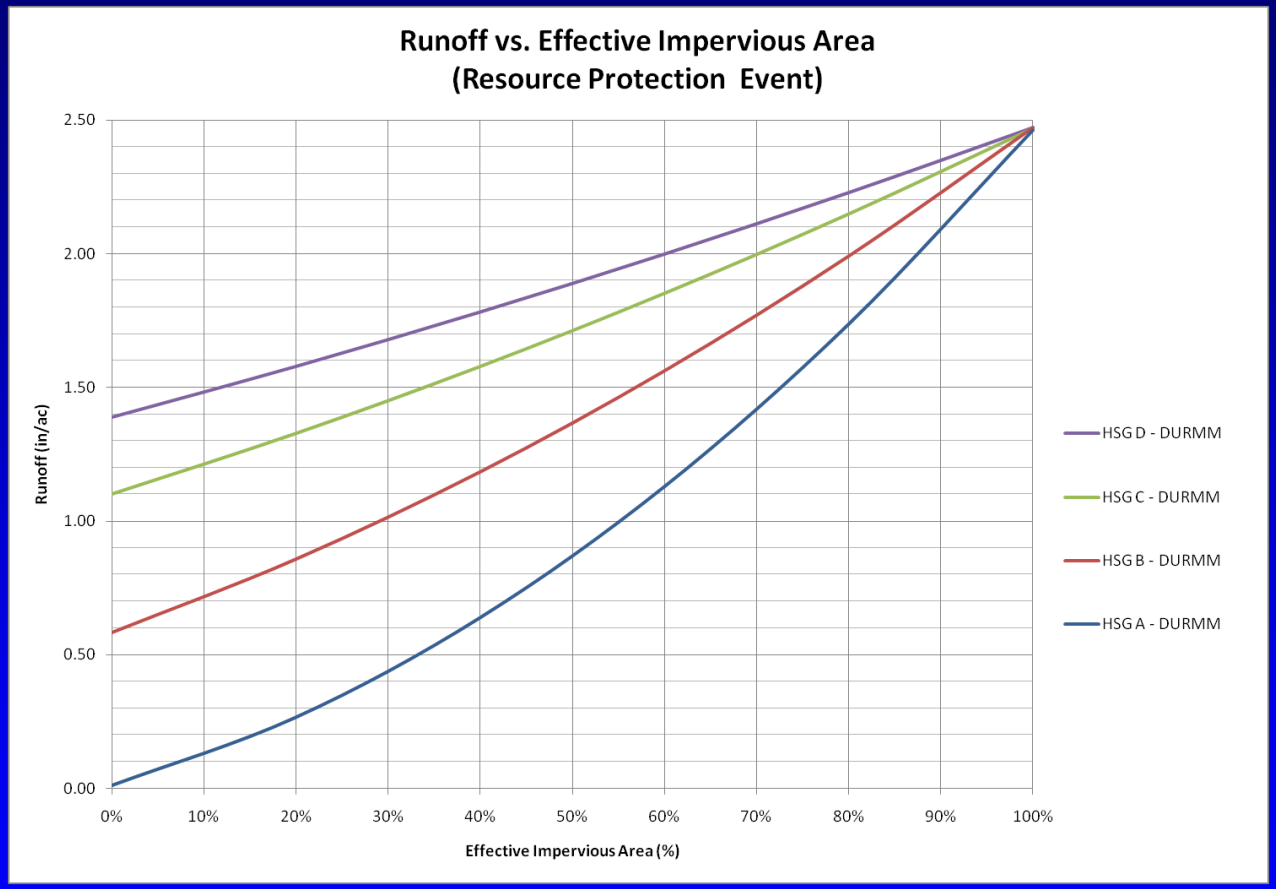
Section 5.0

Performance Criteria for Post-Construction Stormwater Management

5.2 Resource Protection Event Criteria

- *Section 5.2.3.1: Runoff from disturbed areas that were wooded or meadow in the pre-developed condition shall be reduced using runoff reduction practices to an equivalent wooded condition.*
- *Section 5.2.3.2: All remaining disturbed areas shall employ runoff reduction practices to achieve an equivalent 0% effective imperviousness.*

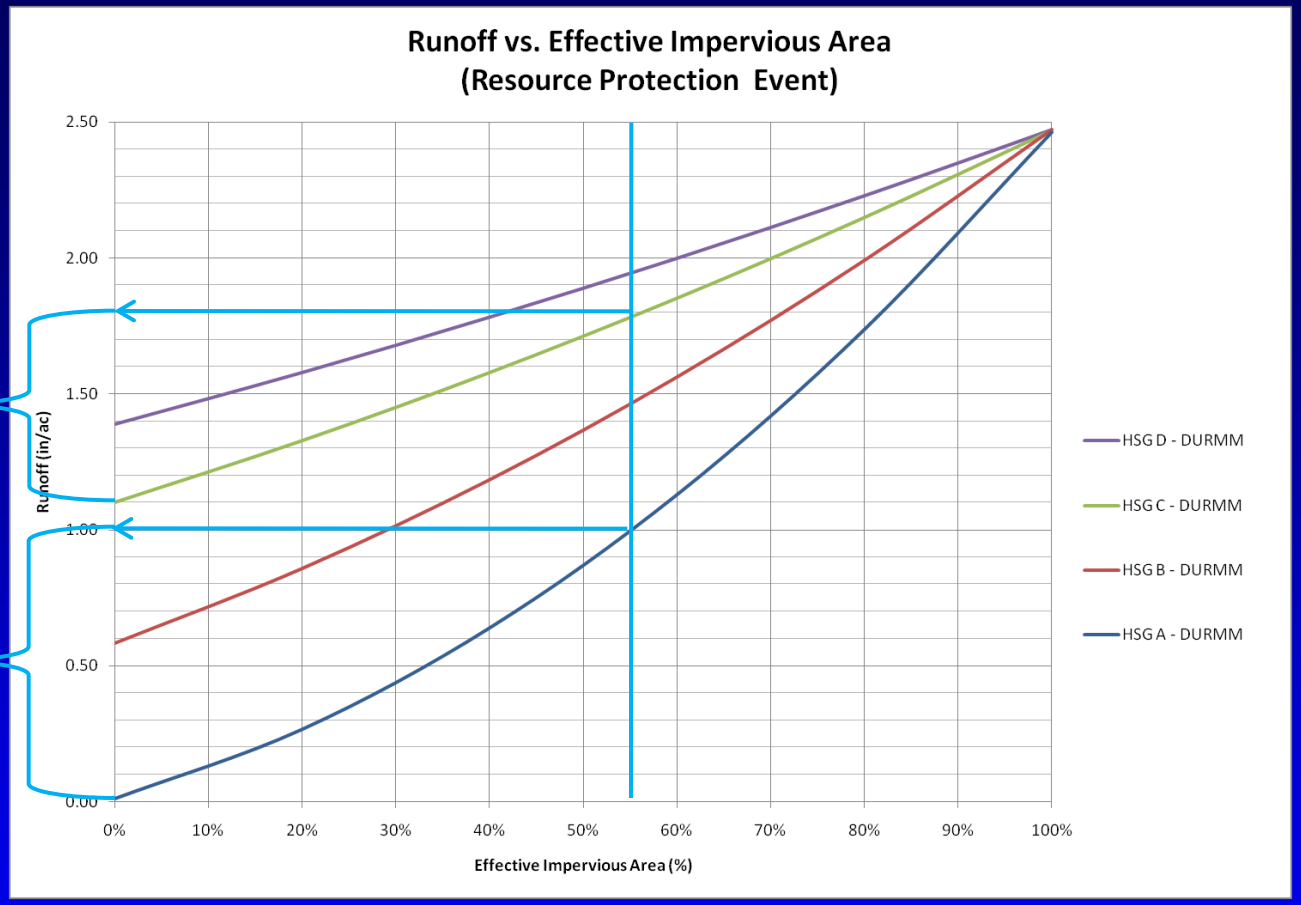
Proposed Minimum RR for New Development



Equivalent 0% Effective Imperviousness in LOD

Site 2

Site 1



Site 1: 55% Impervious, HSG A Soil

Runoff = 1.0”

Minimum RR = 1.0” – 0” = 1.0” (100% Reduction)

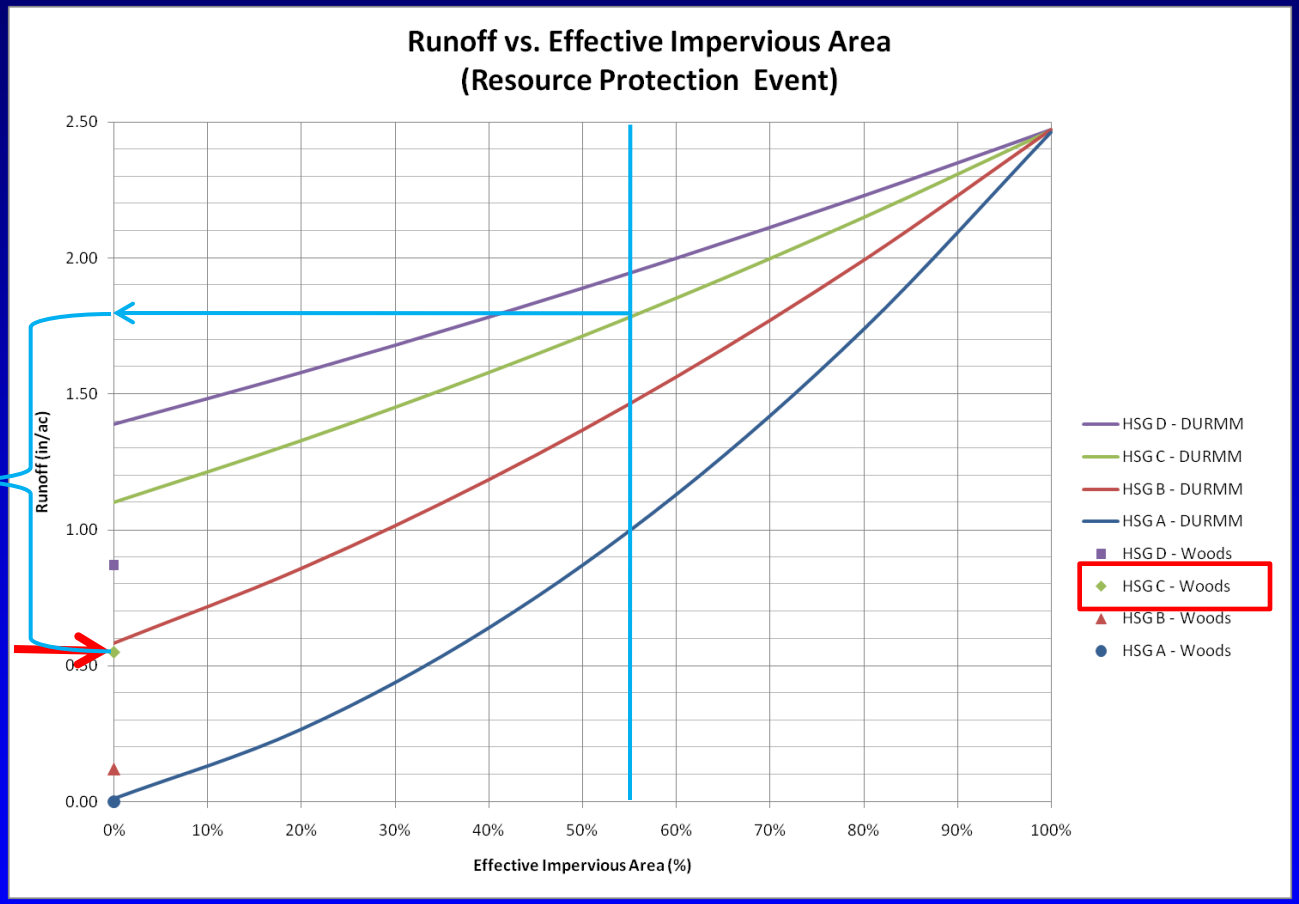
Site 2: 55% Impervious, HSG C Soil

Runoff 1.8”

Minimum RR = 1.8” – 1.1” = 0.7” (38% Reduction)

Existing Woods/Meadow in LOD

Site 2



Site 2: 55% Impervious, HSG C Soil

Runoff 1.8”

Minimum RR = 1.8” – 0.55” = 1.25” (70% Reduction)

5.2 Resource Protection Event Criteria

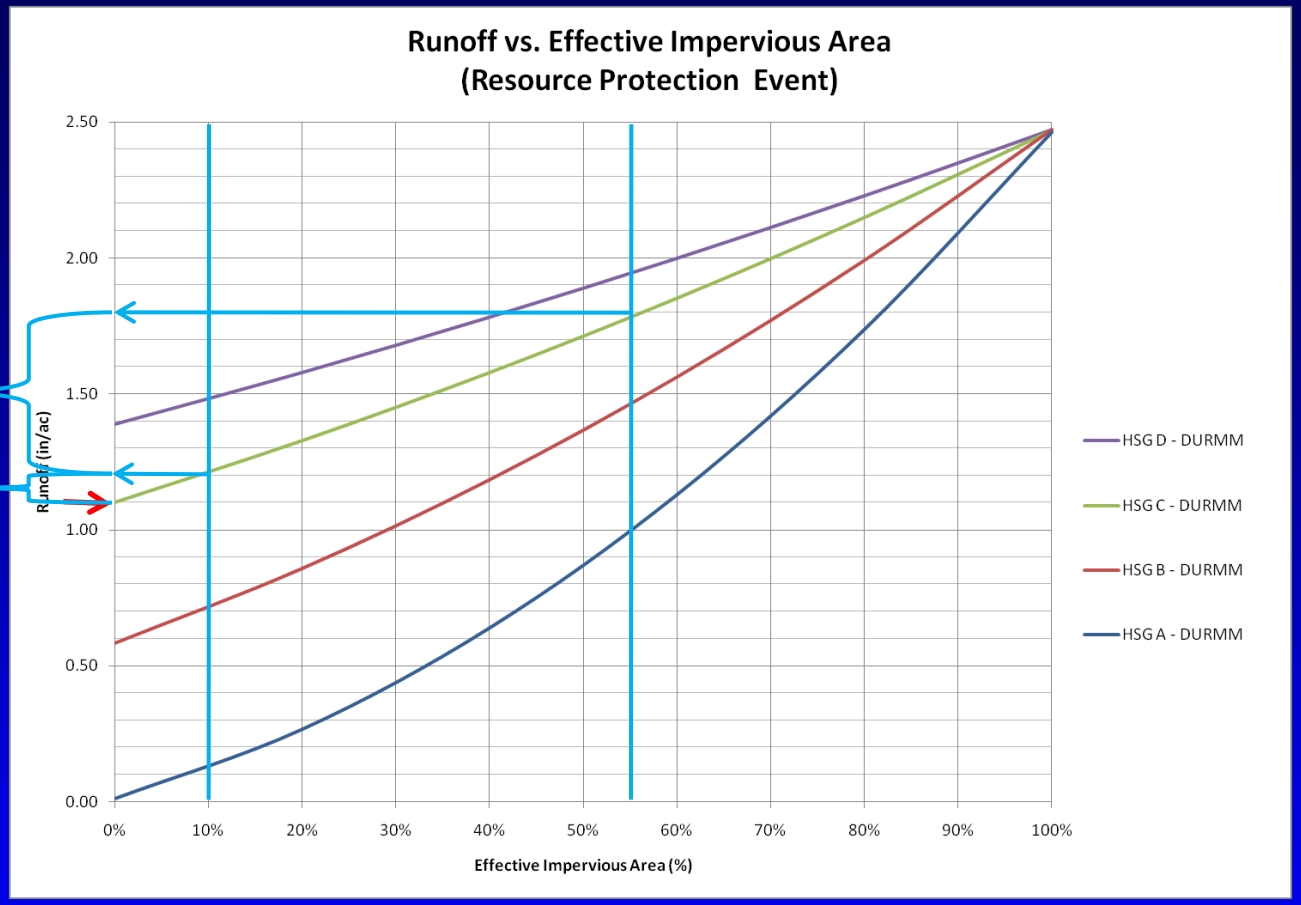
- *5.2.3.2.2 An offset shall be provided for the portion of the RPv that does not meet the minimum runoff reduction requirements.*

Proposed Revisions to Delaware Sediment & Stormwater Regulations: Fee-In-Lieu

- Equivalent to cost to treat runoff volume not managed
- Based on land acquisition, construction, and maintenance costs for bioretention
- Analysis was performed by Center for Watershed Protection using regional data
- Fee = **$23/cu.ft.** runoff volume

Site 3
RR

Offset



Site 3: 55% Impervious, HSG C Soil

Runoff = 1.8”

Minimum RR = 1.8” – 1.1” = 0.7” (38% Reduction)

Actual RR = 1.8” – 1.2” = 0.6” (33% Reduction)

Offset Volume = 1.2” – 1.1” = 0.1” = 0.1 ac-in/ac = 363 cf/ac

Offset Fee = $23/cf x 363 cf/ac = $8,349/ac

5.2 Resource Protection Event Criteria

- *5.2.3.3 Additional water quality treatment BMPs shall be provided if the runoff reduction requirements of this section are not sufficient to meet Total Maximum Daily Load (TMDL) requirements for the receiving water. An offset shall be provided for any portion of the RPv that does not meet TMDL requirements.*

Proposed Revisions to Delaware Sediment & Stormwater Regulations: Fee-In-Lieu Option

- RPv offset fee-in-lieu may be further reduced by implementing additional water quality treatment practices
- Offset fee-in-lieu reduction shall be equivalent to the combined **TN** removal for those practices

Treatment BMP Removal Efficiencies*

4.3.3 Dry Extended Detention Ponds

General Application Stormwater BMP

Description: A surface storage basin or facility designed to provide water quantity control through detention of stormwater runoff. A dry extended detention pond can be used for water quality treatment purposes as well as for flood control.

KEY CONSIDERATIONS

DESIGN GUIDELINES:

- Maximum contributing drainage area of 75 acres.
- A sediment forebay or equivalent upstream pretreatment must be provided.
- Minimum flow length to width ratio for the pond is 1.5:1. The pond shall be sized to detain the volume of runoff to be treated for a minimum of 24 hours.
- Side slopes to the pond shall not exceed 3:1 (h:v) on one side of the pond to facilitate access. Slopes as steep as 2:1 will be allowed for other areas, with proper stabilization.

ADVANTAGES / BENEFITS:

- Moderate removal rate of urban pollutants.
- High community acceptance.
- Useful for water quality treatment and flood control.

DISADVANTAGES / LIMITATIONS:

- Potential for thermal impacts/downstream warming.
- Dam height restrictions for high relief areas.
- Pond drainage can be problematic for low relief terrain.

MAINTENANCE REQUIREMENTS:

- Remove debris from inlet and outlet structures.
- Maintain side slopes and outlet structure.
- Remove invasive vegetation.
- Monitor sediment accumulation and remove periodically.

OTHER CONSIDERATIONS:

- Outlet clogging
- Safety bench
- Landscaping

STORMWATER MANAGEMENT SUITABILITY

- ☑ Water Quality
- ☑ Channel/Flood Protection
- ☑ Overbank Flood Protection
- ☑ Extreme Flood Protection

Accepts runoff from SPAP land uses: *Yes*

FEASIBILITY CONSIDERATIONS

- M-H Land Requirement
- L Capital Cost
- L Maintenance Burden

Residential/Subdivision Use: *Yes*

High Density/Ultra-Urban: *No*

Drainage Area: *75 acres max.*

POLLUTANT REMOVAL

- M **Total Suspended Solids**
- L **Nutrients**: Total Phosphorus / Total Nitrogen
- L **Metals**: Cadmium, Copper, Lead, and Zinc
- No Data **Pathogens**: Coliform, Streptococci, E.Coli

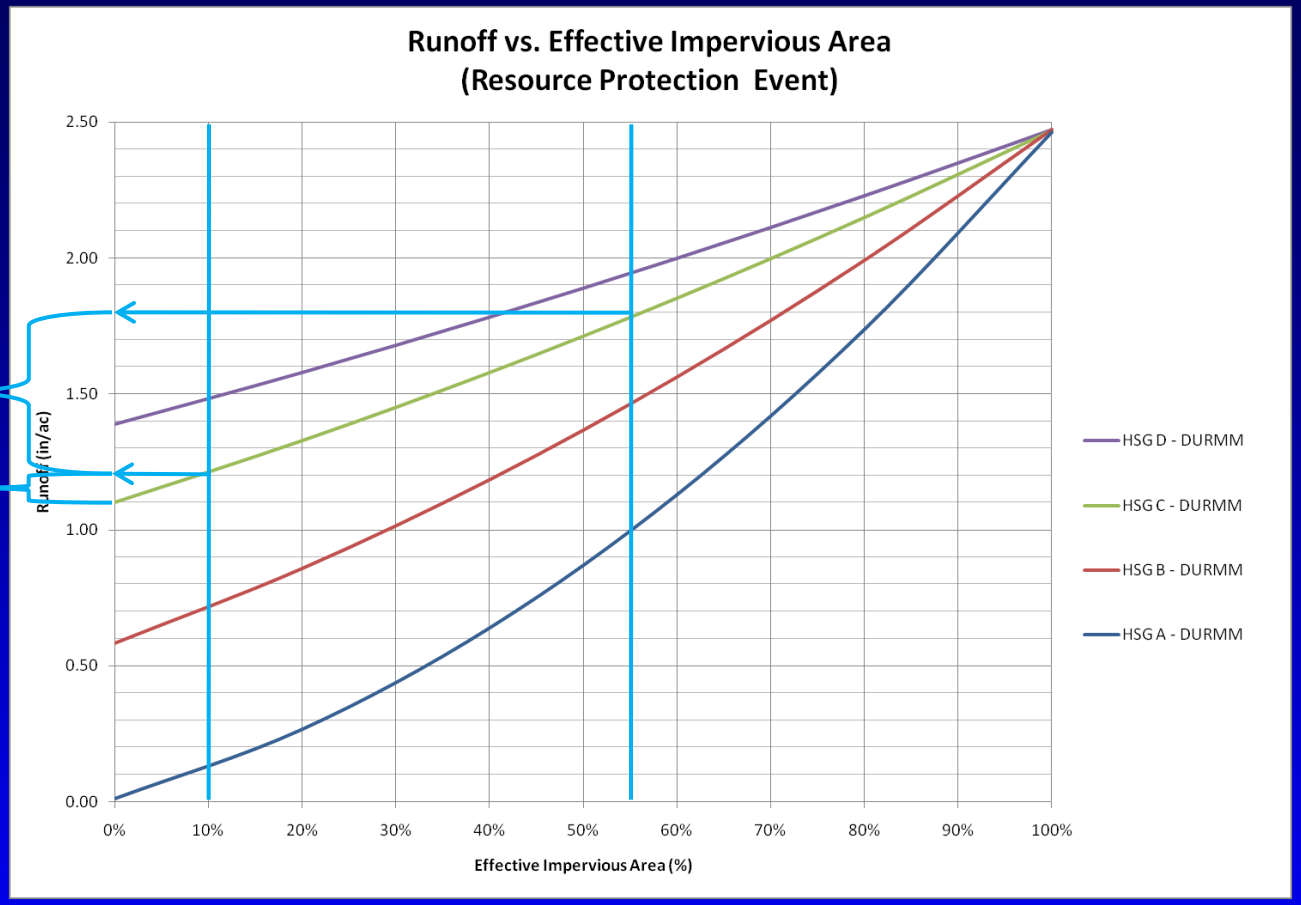
L=Low M=Moderate H=High

- **TN: 20%**
- TP: 20%
- TSS: 60%

**EPA CBP Scenario Builder Documentation*

Site 3 RR

Offset



Original Offset Fee = $23/cf x 363 cf/ac = $8,349/ac

Offset Fee w/Dry Extended Detention Treatment BMP

Removal Efficiency for TN = 20%

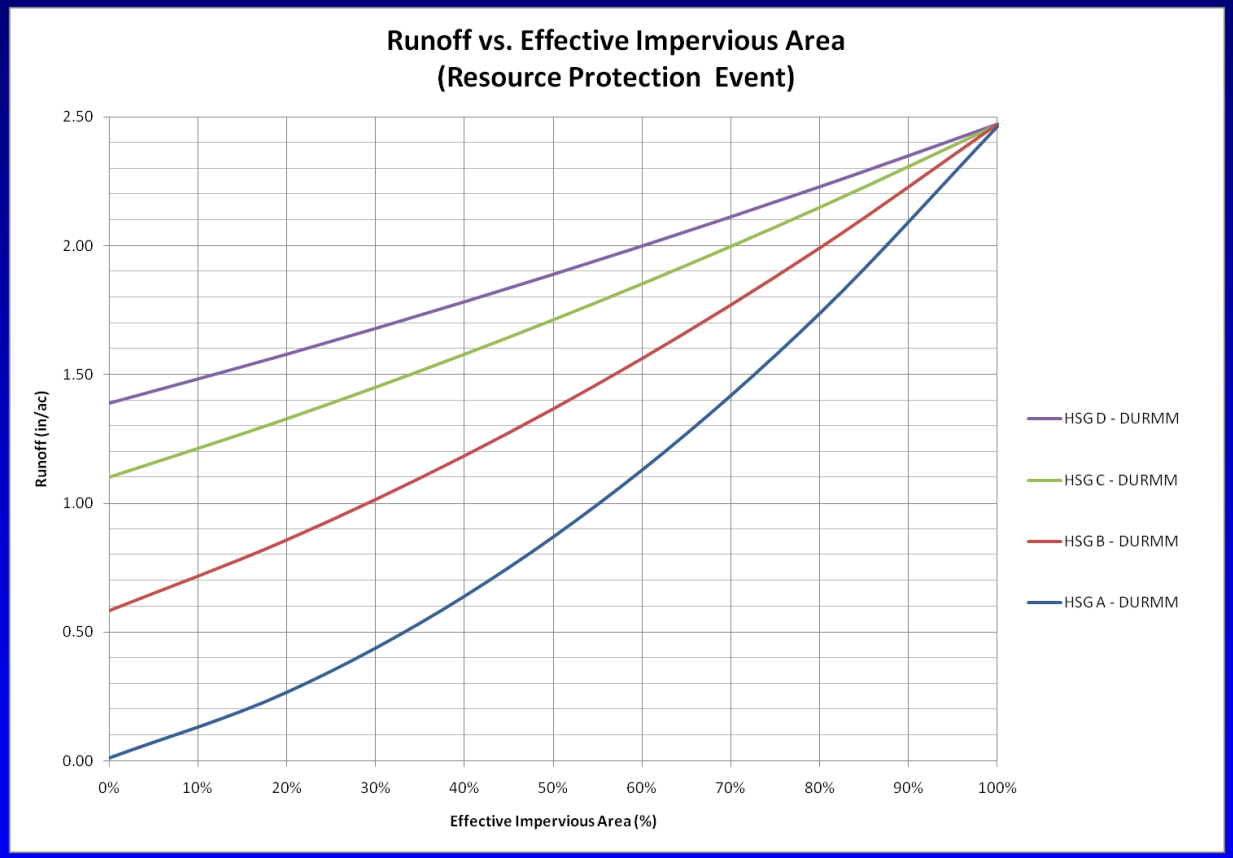
Fee Adjustment = 0.20 x $8,349 = $1,670

Adjusted Fee = $8,349 – $1,670 = $6,679/ac

5.6 Redevelopment Criteria

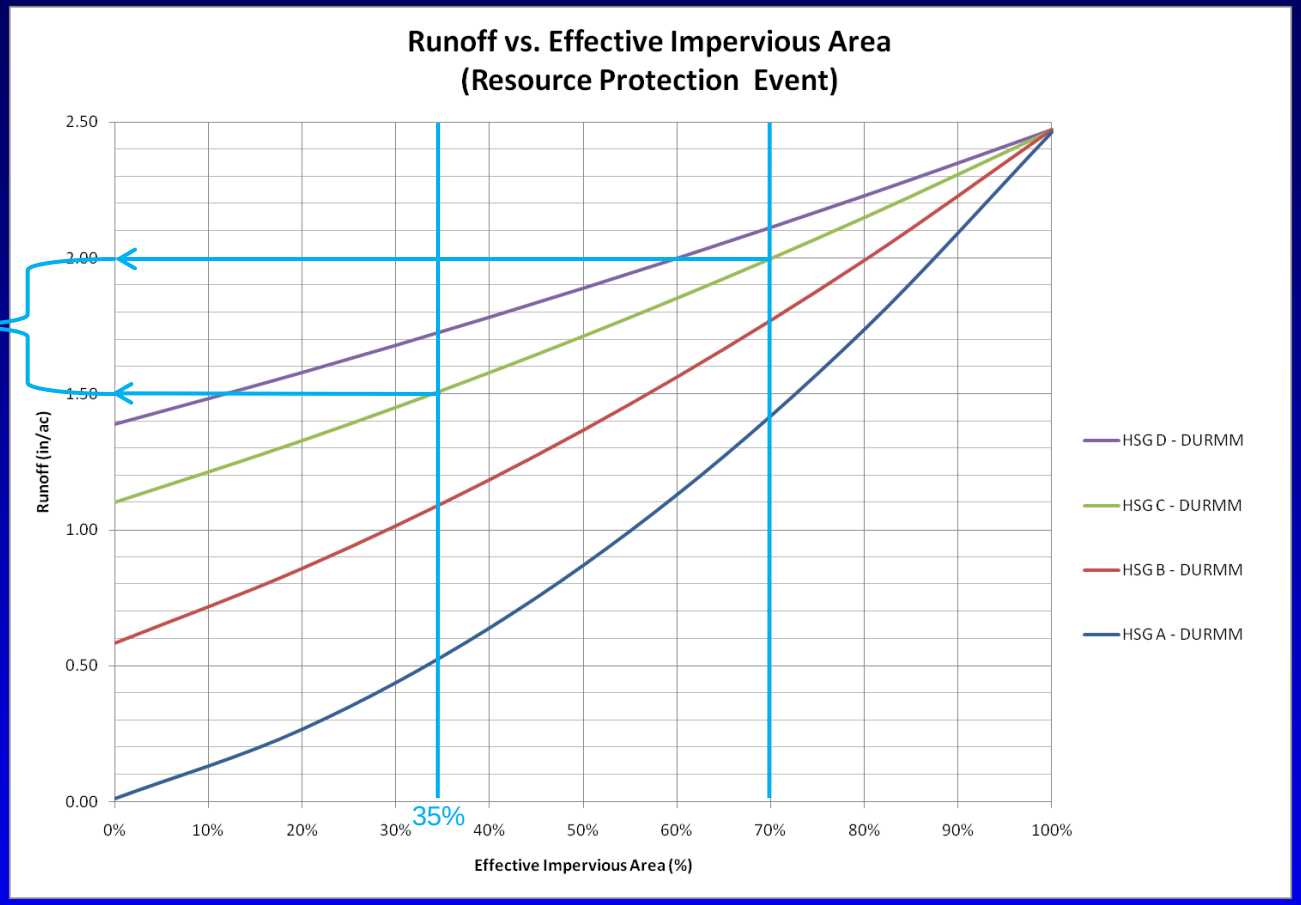
- *Section 5.6.3.1: Runoff from redeveloped areas within the project limit of disturbance that were wooded or meadow in the existing condition shall be reduced to an equivalent wooded condition using runoff reduction practices.*
- *Section 5.6.3.2: All remaining redeveloped areas within the project limit of disturbance shall employ runoff reduction practices to achieve a 50% reduction in the effective imperviousness based on the existing condition.*

Proposed Minimum RR for Redevelopment



50% Reduction in **Existing Effective** Imperviousness

Redev. Site RR



Redevelopment Site: 70% Ex. & Prop. Imperviousness, HSG C Soil

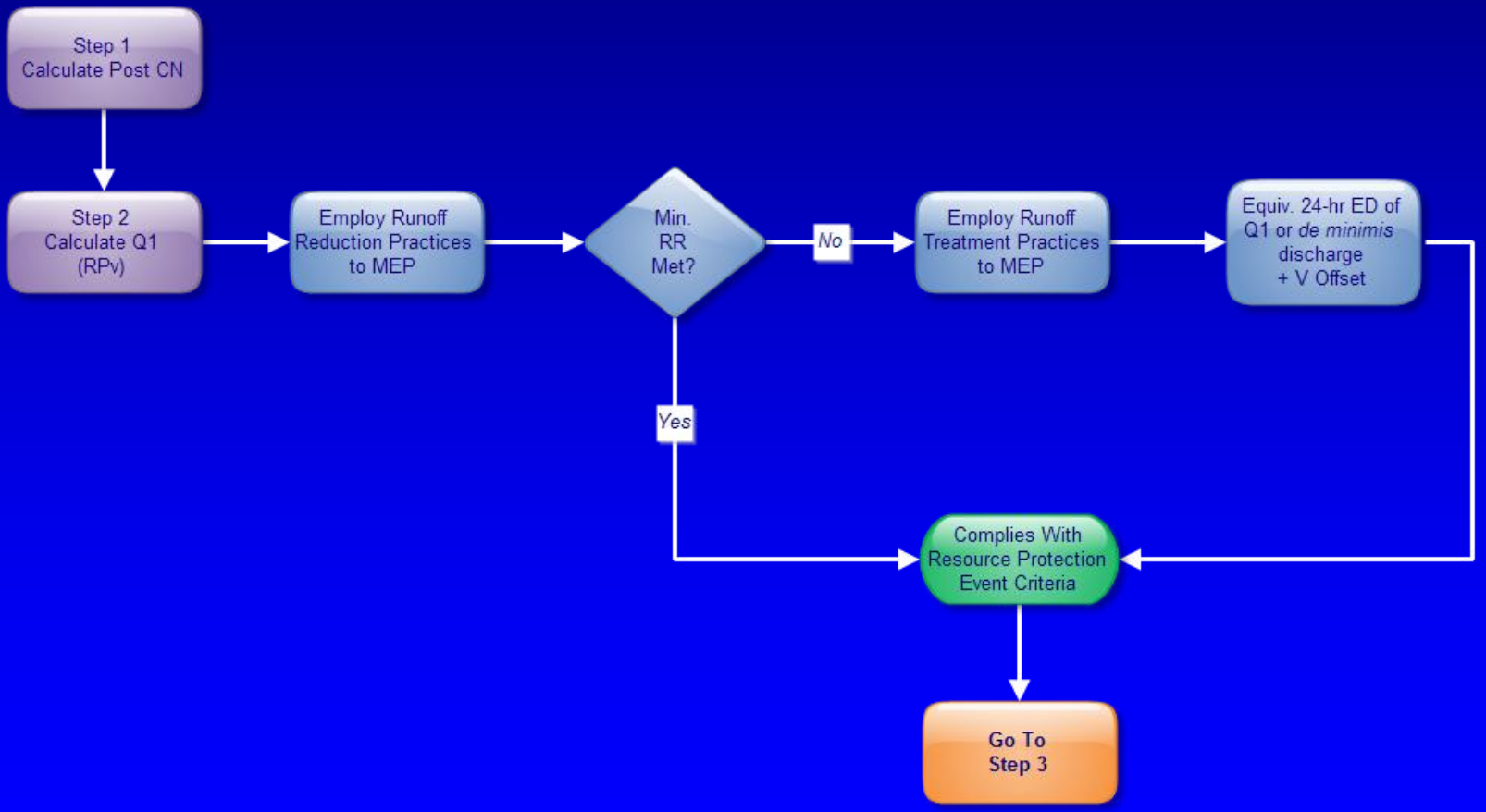
Runoff = 2.0”

Redeveloped Effective Imperviousness = 0.5 (70%) = 35%

Maximum Allowable Runoff for Compliance = 1.50”

(**NOTE**: New impervious areas that exceed the existing condition are treated the same as new development.)

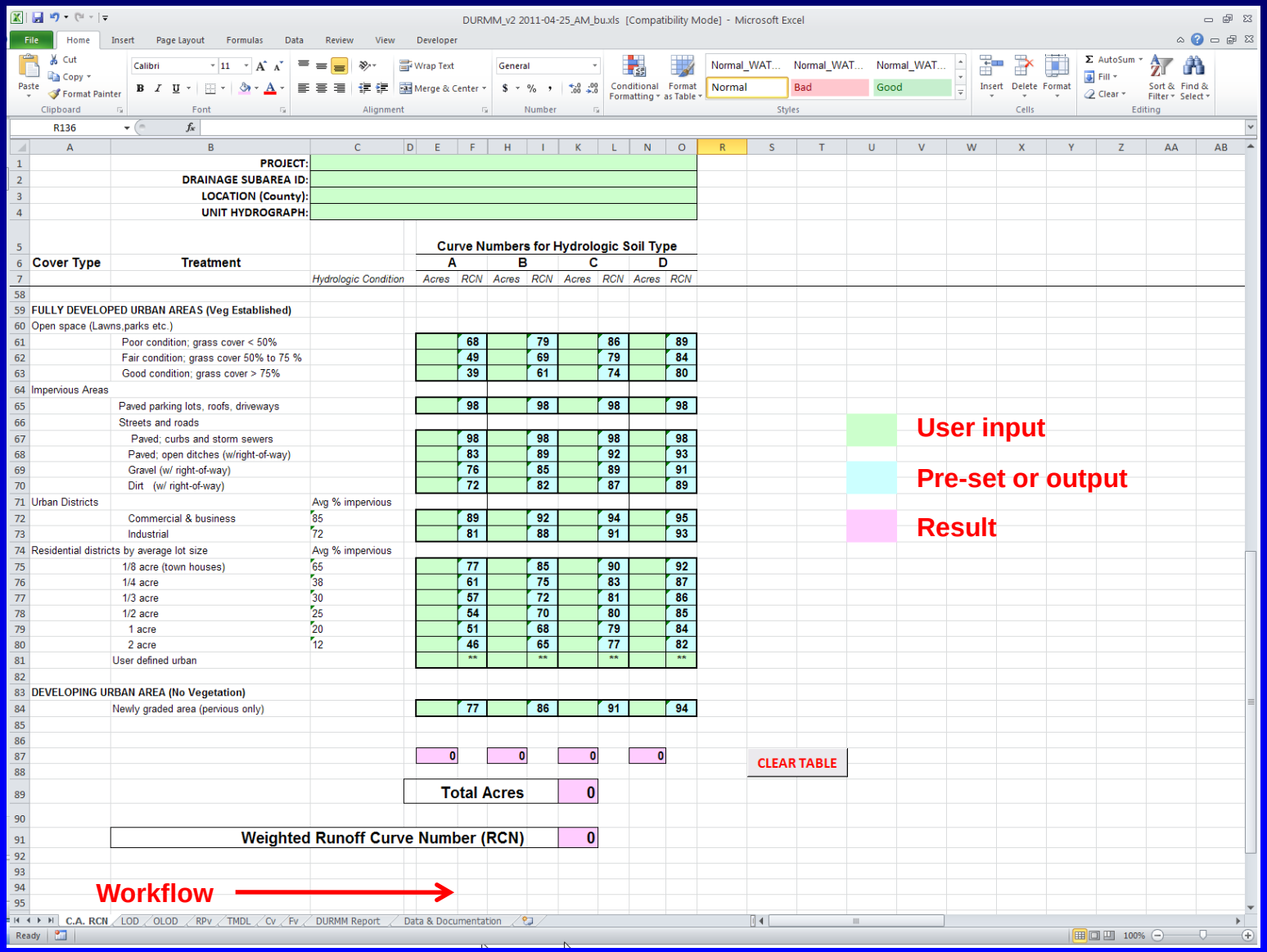
5.2 Resource Protection Event Criteria



Proposed Revisions to Delaware Sediment & Stormwater Regulations

Technical Document Update

DURMM v.2



DURMM_v2 2011-04-25_AM_bu.xls [Compatibility Mode] - Microsoft Excel

	PROJECT:												
	DRAINAGE SUBAREA ID:												
	LOCATION (County):												
	UNIT HYDROGRAPH:												
			Curve Numbers for Hydrologic Soil Type										
Cover Type	Treatment		A		B		C		D				
		Hydrologic Condition	Acres	RCN	Acres	RCN	Acres	RCN	Acres	RCN			
FULLY DEVELOPED URBAN AREAS (Veg Established)													
Open space (Lawns,parks etc.)													
	Poor condition; grass cover < 50%			68		79		86		89			
	Fair condition; grass cover 50% to 75 %			49		69		79		84			
	Good condition; grass cover > 75%			39		61		74		80			
Impervious Areas													
	Paved parking lots, roofs, driveways			98		98		98		98			
	Streets and roads												
	Paved; curbs and storm sewers			98		98		98		98			
	Paved; open ditches (w/right-of-way)			83		89		92		93			
	Gravel (w/ right-of-way)			76		85		89		91			
	Dirt (w/ right-of-way)			72		82		87		89			
Urban Districts		Avg % impervious											
	Commercial & business	85		89		92		94		95			
	Industrial	72		81		88		91		93			
Residential districts by average lot size		Avg % impervious											
	1/8 acre (town houses)	65		77		85		90		92			
	1/4 acre	38		61		75		83		87			
	1/3 acre	30		57		72		81		86			
	1/2 acre	25		54		70		80		85			
	1 acre	20		51		68		79		84			
	2 acre	12		46		65		77		82			
	User defined urban			**		**		**		**			
DEVELOPING URBAN AREA (No Vegetation)													
	Newly graded area (pervious only)			77		86		91		94			
			0		0		0		0				
			Total Acres				0						
	Weighted Runoff Curve Number (RCN)						0						

User input

Pre-set or output

Result

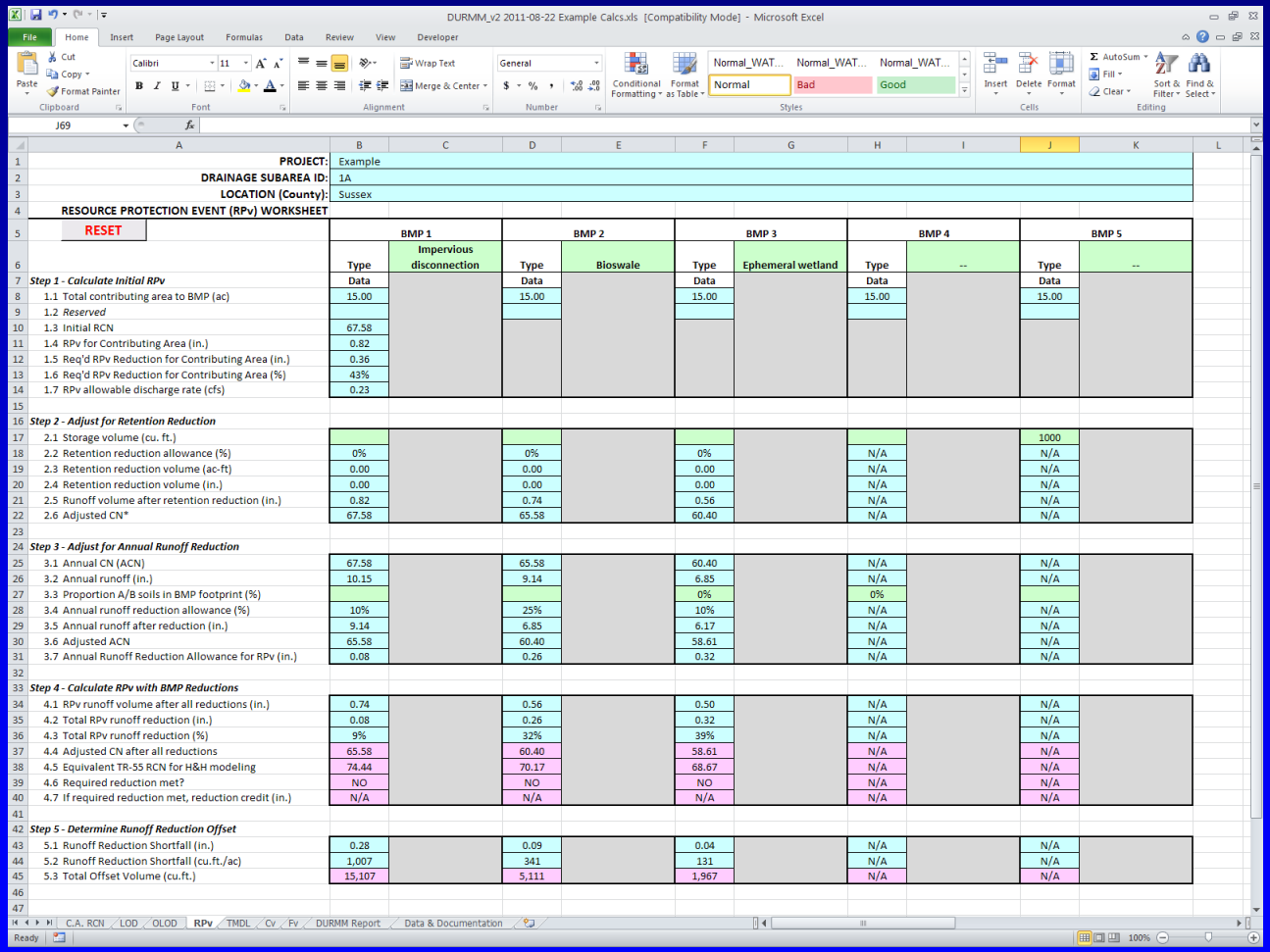
CLEAR TABLE

Workflow →

C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

Ready

DURMM v.2
Distributed vs. Sequential BMPs



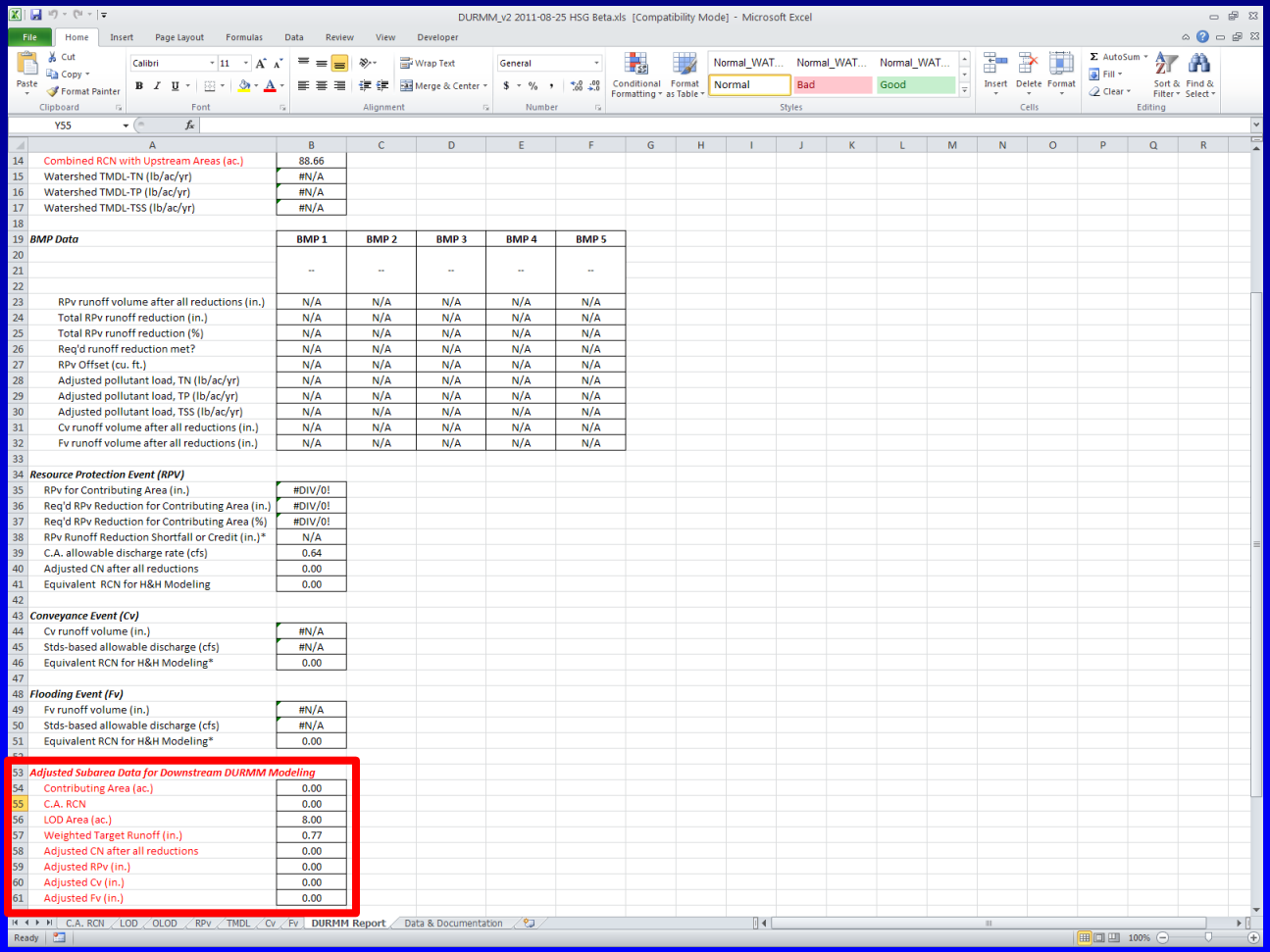
DURMM_v2 2011-08-22 Example Calcs.xls [Compatibility Mode] - Microsoft Excel

	PROJECT:	Example									
	DRAINAGE SUBAREA ID:	1A									
	LOCATION (County):	Sussex									
	RESOURCE PROTECTION EVENT (RPv) WORKSHEET										
	RESET	BMP 1		BMP 2		BMP 3		BMP 4		BMP 5	
		Type	Impervious disconnection	Type	Bioswale	Type	Ephemeral wetland	Type	--	Type	--
	Step 1 - Calculate Initial RPv	Data		Data		Data		Data		Data	
	1.1 Total contributing area to BMP (ac)	15.00		15.00		15.00		15.00		15.00	
	1.2 *Reserved*										
	1.3 Initial RCN	67.58									
	1.4 RPv for Contributing Area (in.)	0.82									
	1.5 Req'd RPv Reduction for Contributing Area (in.)	0.36									
	1.6 Req'd RPv Reduction for Contributing Area (%)	43%									
	1.7 RPv allowable discharge rate (cfs)	0.23									
	Step 2 - Adjust for Retention Reduction										
	2.1 Storage volume (cu. ft.)									1000	
	2.2 Retention reduction allowance (%)	0%		0%		0%		N/A		N/A	
	2.3 Retention reduction volume (ac-ft)	0.00		0.00		0.00		N/A		N/A	
	2.4 Retention reduction volume (in.)	0.00		0.00		0.00		N/A		N/A	
	2.5 Runoff volume after retention reduction (in.)	0.82		0.74		0.56		N/A		N/A	
	2.6 Adjusted CN*	67.58		65.58		60.40		N/A		N/A	
	Step 3 - Adjust for Annual Runoff Reduction										
	3.1 Annual CN (ACN)	67.58		65.58		60.40		N/A		N/A	
	3.2 Annual runoff (in.)	10.15		9.14		6.85		N/A		N/A	
	3.3 Proportion A/B soils in BMP footprint (%)					0%		0%			
	3.4 Annual runoff reduction allowance (%)	10%		25%		10%		N/A		N/A	
	3.5 Annual runoff after reduction (in.)	9.14		6.85		6.17		N/A		N/A	
	3.6 Adjusted ACN	65.58		60.40		58.61		N/A		N/A	
	3.7 Annual Runoff Reduction Allowance for RPv (in.)	0.08		0.26		0.32		N/A		N/A	
	Step 4 - Calculate RPv with BMP Reductions										
	4.1 RPv runoff volume after all reductions (in.)	0.74		0.56		0.50		N/A		N/A	
	4.2 Total RPv runoff reduction (in.)	0.08		0.26		0.32		N/A		N/A	
	4.3 Total RPv runoff reduction (%)	9%		32%		39%		N/A		N/A	
	4.4 Adjusted CN after all reductions	65.58		60.40		58.61		N/A		N/A	
	4.5 Equivalent TR-55 RCN for H&H modeling	74.44		70.17		68.67		N/A		N/A	
	4.6 Required reduction met?	NO		NO		NO		N/A		N/A	
	4.7 If required reduction met, reduction credit (in.)	N/A		N/A		N/A		N/A		N/A	
	Step 5 - Determine Runoff Reduction Offset										
	5.1 Runoff Reduction Shortfall (in.)	0.28		0.09		0.04		N/A		N/A	
	5.2 Runoff Reduction Shortfall (cu.ft./ac)	1,007		341		131		N/A		N/A	
	5.3 Total Offset Volume (cu.ft.)	15,107		5,111		1,967		N/A		N/A	

C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

Ready

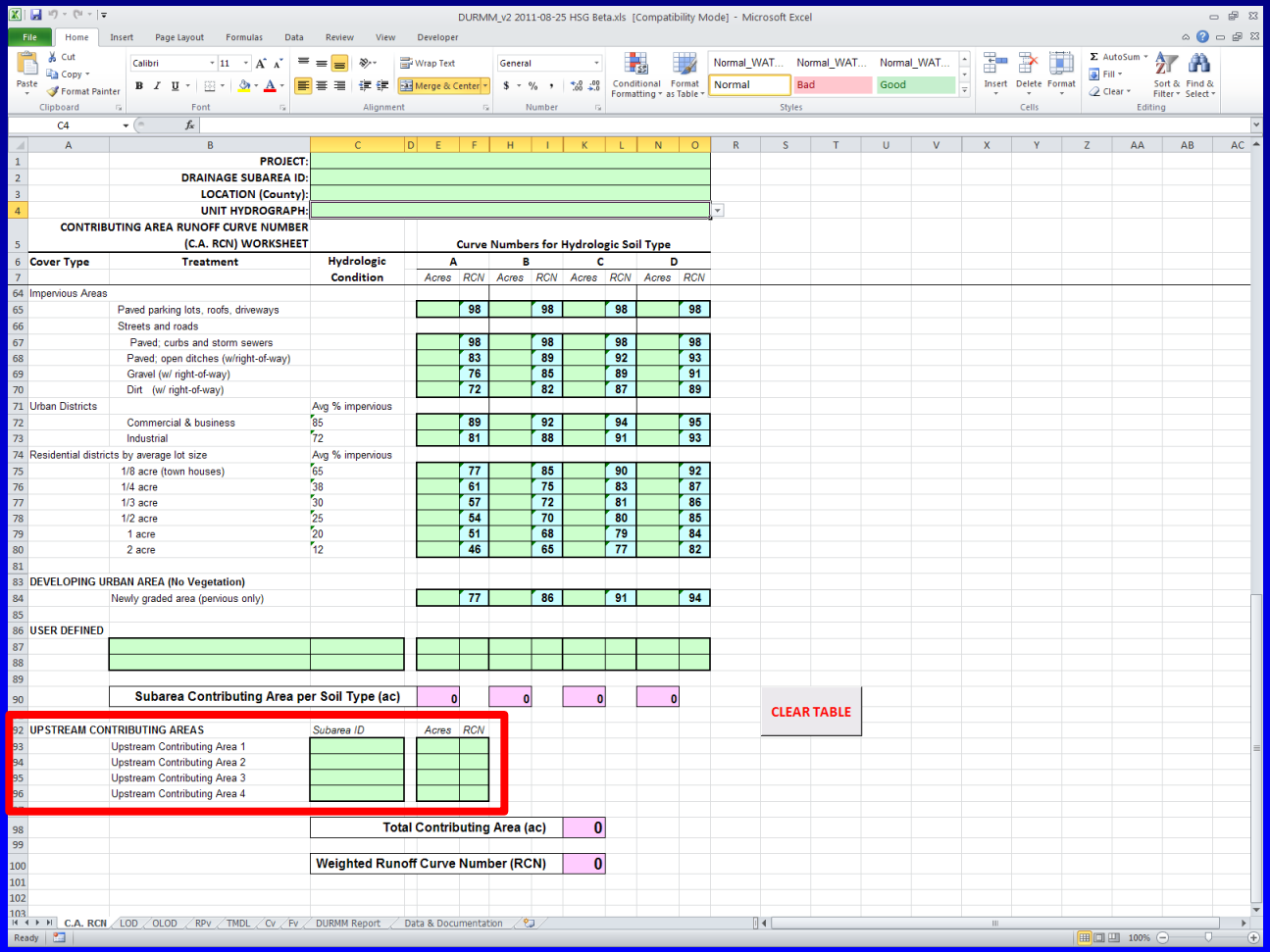
DURMM v.2
Upstream Areas – DURMM Report



DURMM_v2 2011-08-25 HSG Beta.xls [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	F
14	Combined RCN with Upstream Areas (ac.)	88.66				
15	Watershed TMDL-TN (lb/ac/yr)	#N/A				
16	Watershed TMDL-TP (lb/ac/yr)	#N/A				
17	Watershed TMDL-TSS (lb/ac/yr)	#N/A				
18						
19	***BMP Data***	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 4**	**BMP 5**
20						
21		--	--	--	--	--
22						
23	RPv runoff volume after all reductions (in.)	N/A	N/A	N/A	N/A	N/A
24	Total RPv runoff reduction (in.)	N/A	N/A	N/A	N/A	N/A
25	Total RPv runoff reduction (%)	N/A	N/A	N/A	N/A	N/A
26	Req'd runoff reduction met?	N/A	N/A	N/A	N/A	N/A
27	RPv Offset (cu. ft.)	N/A	N/A	N/A	N/A	N/A
28	Adjusted pollutant load, TN (lb/ac/yr)	N/A	N/A	N/A	N/A	N/A
29	Adjusted pollutant load, TP (lb/ac/yr)	N/A	N/A	N/A	N/A	N/A
30	Adjusted pollutant load, TSS (lb/ac/yr)	N/A	N/A	N/A	N/A	N/A
31	Cv runoff volume after all reductions (in.)	N/A	N/A	N/A	N/A	N/A
32	Fv runoff volume after all reductions (in.)	N/A	N/A	N/A	N/A	N/A
33						
34	***Resource Protection Event (RPV)***					
35	RPv for Contributing Area (in.)	#DIV/0!				
36	Req'd RPv Reduction for Contributing Area (in.)	#DIV/0!				
37	Req'd RPv Reduction for Contributing Area (%)	#DIV/0!				
38	RPv Runoff Reduction Shortfall or Credit (in.)*	N/A				
39	C.A. allowable discharge rate (cfs)	0.64				
40	Adjusted CN after all reductions	0.00				
41	Equivalent RCN for H&H Modeling	0.00				
42						
43	***Conveyance Event (Cv)***					
44	Cv runoff volume (in.)	#N/A				
45	Stds-based allowable discharge (cfs)	#N/A				
46	Equivalent RCN for H&H Modeling*	0.00				
47						
48	***Flooding Event (Fv)***					
49	Fv runoff volume (in.)	#N/A				
50	Stds-based allowable discharge (cfs)	#N/A				
51	Equivalent RCN for H&H Modeling*	0.00				
53	***Adjusted Subarea Data for Downstream DURMM Modeling***					
54	Contributing Area (ac.)	0.00				
55	C.A. RCN	0.00				
56	LOD Area (ac.)	8.00				
57	Weighted Target Runoff (in.)	0.77				
58	Adjusted CN after all reductions	0.00				
59	Adjusted RPv (in.)	0.00				
60	Adjusted Cv (in.)	0.00				
61	Adjusted Fv (in.)	0.00				

DURMM v.2
Upstream Areas – C.A. RCN Sheet



DURMM_v2 2011-08-25 HSG Beta.xls [Compatibility Mode] - Microsoft Excel

PROJECT:
DRAINAGE SUBAREA ID:
LOCATION (County):
UNIT HYDROGRAPH:

CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET

Curve Numbers for Hydrologic Soil Type

Cover Type	Treatment	Hydrologic Condition	A Acres	A RCN	B Acres	B RCN	C Acres	C RCN	D Acres	D RCN
Impervious Areas										
	Paved parking lots, roofs, driveways			98		98		98		98
	Streets and roads									
	Paved; curbs and storm sewers			98		98		98		98
	Paved; open ditches (w/right-of-way)			83		89		92		93
	Gravel (w/ right-of-way)			76		85		89		91
	Dirt (w/ right-of-way)			72		82		87		89
Urban Districts		Avg % impervious								
	Commercial & business	85		89		92		94		95
	Industrial	72		81		88		91		93
Residential districts by average lot size		Avg % impervious								
	1/8 acre (town houses)	65		77		85		90		92
	1/4 acre	38		61		75		83		87
	1/3 acre	30		57		72		81		86
	1/2 acre	25		54		70		80		85
	1 acre	20		51		68		79		84
	2 acre	12		46		65		77		82
DEVELOPING URBAN AREA (No Vegetation)										
	Newly graded area (pervious only)			77		86		91		94
USER DEFINED										
	Subarea Contributing Area per Soil Type (ac)		0		0		0		0	

CLEAR TABLE

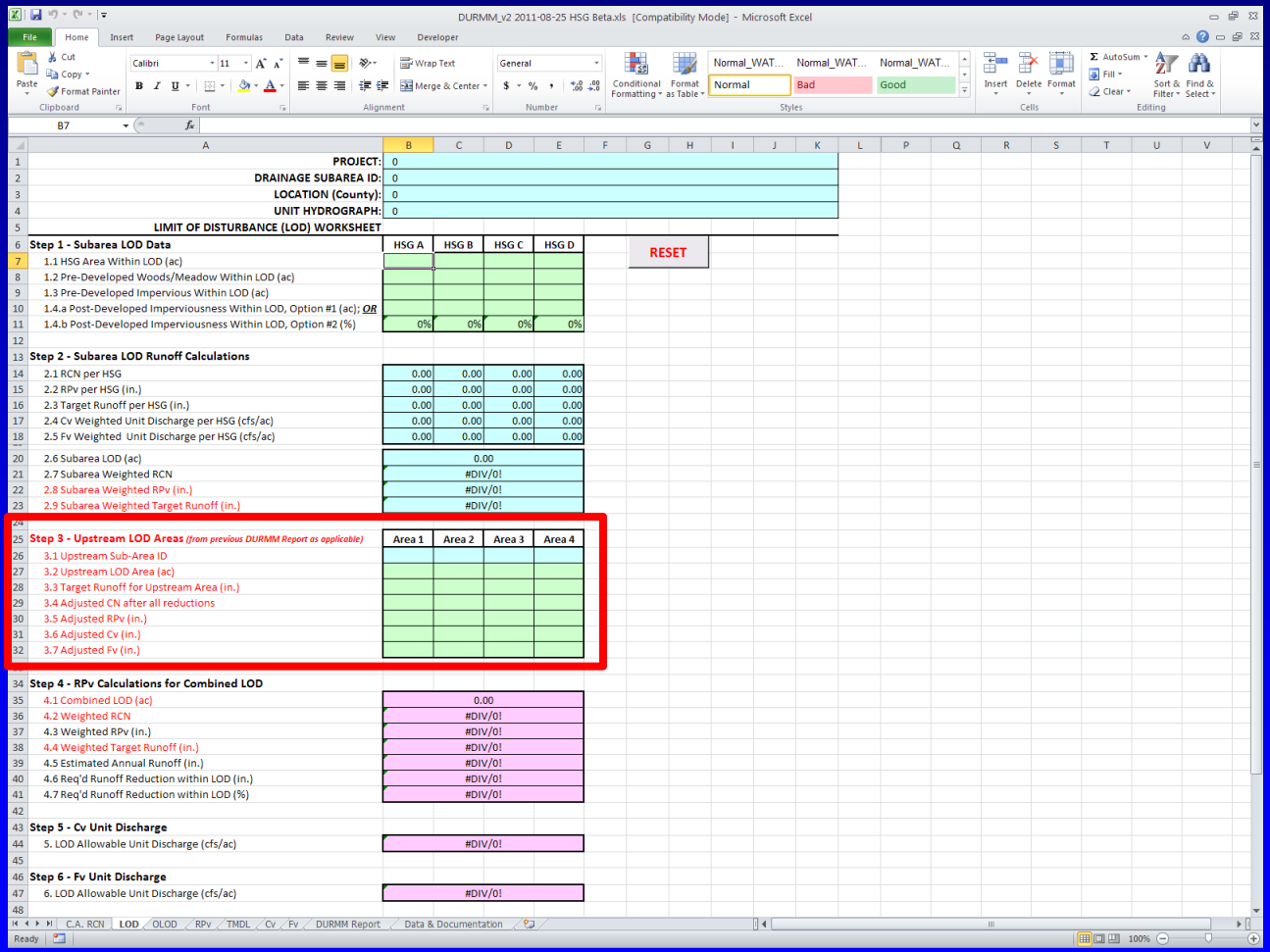
UPSTREAM CONTRIBUTING AREAS	Subarea ID	Acres	RCN
Upstream Contributing Area 1			
Upstream Contributing Area 2			
Upstream Contributing Area 3			
Upstream Contributing Area 4			

Total Contributing Area (ac) 0

Weighted Runoff Curve Number (RCN) 0

C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

DURMM v.2
Upstream Areas – LOD Sheet



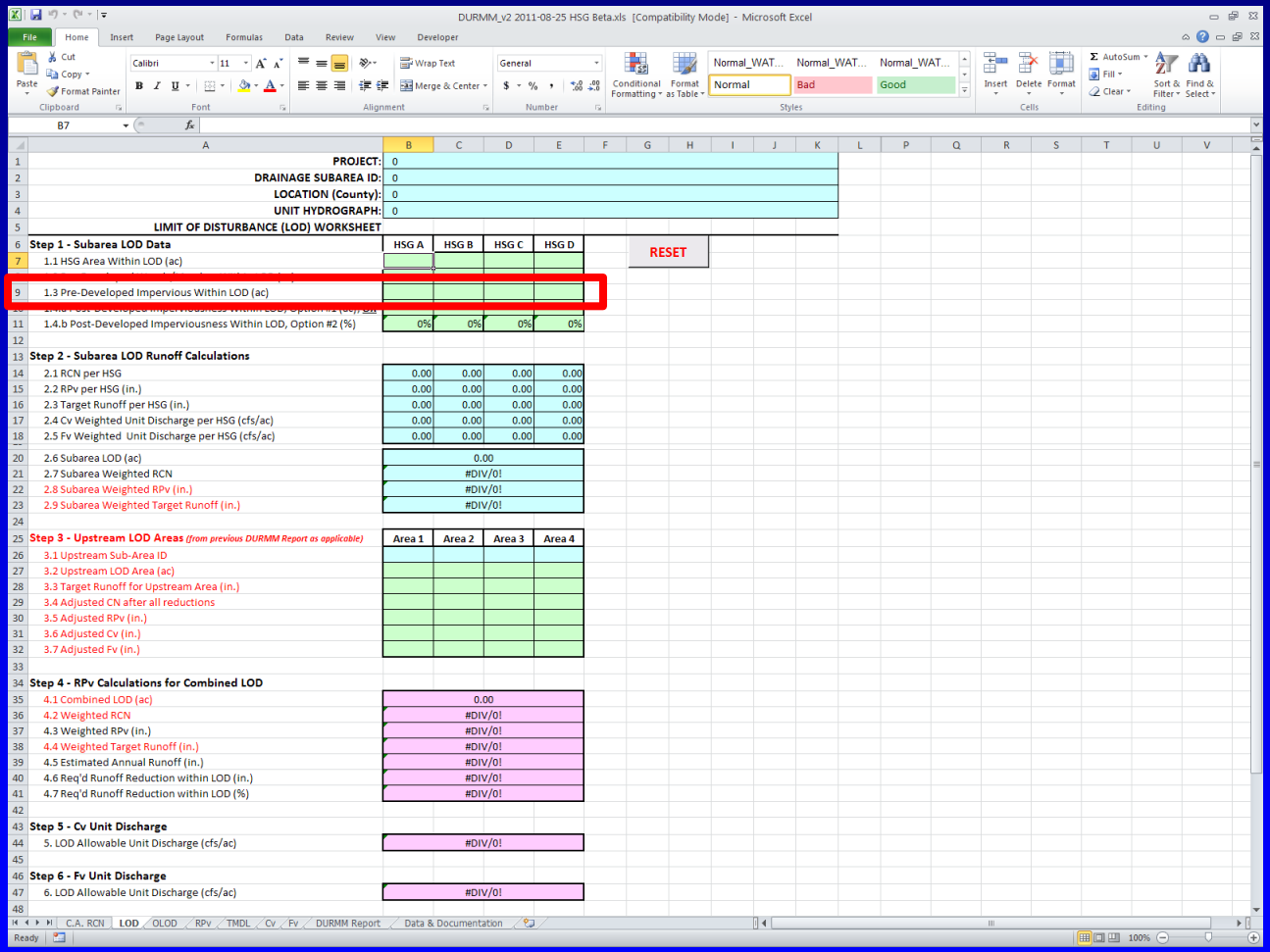
DURMM_v2 2011-08-25 HSG Beta.xls [Compatibility Mode] - Microsoft Excel

1	PROJECT:	0			
2	DRAINAGE SUBAREA ID:	0			
3	LOCATION (County):	0			
4	UNIT HYDROGRAPH:	0			
5	LIMIT OF DISTURBANCE (LOD) WORKSHEET				
6	**Step 1 - Subarea LOD Data**	HSG A	HSG B	HSG C	HSG D
7	1.1 HSG Area Within LOD (ac)				
8	1.2 Pre-Developed Woods/Meadow Within LOD (ac)				
9	1.3 Pre-Developed Impervious Within LOD (ac)				
10	1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR***				
11	1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%)	0%	0%	0%	0%
12					
13	**Step 2 - Subarea LOD Runoff Calculations**				
14	2.1 RCN per HSG	0.00	0.00	0.00	0.00
15	2.2 RPv per HSG (in.)	0.00	0.00	0.00	0.00
16	2.3 Target Runoff per HSG (in.)	0.00	0.00	0.00	0.00
17	2.4 Cv Weighted Unit Discharge per HSG (cfs/ac)	0.00	0.00	0.00	0.00
18	2.5 Fv Weighted Unit Discharge per HSG (cfs/ac)	0.00	0.00	0.00	0.00
20	2.6 Subarea LOD (ac)	0.00			
21	2.7 Subarea Weighted RCN	#DIV/0!			
22	2.8 Subarea Weighted RPv (in.)	#DIV/0!			
23	2.9 Subarea Weighted Target Runoff (in.)	#DIV/0!			
24					
25	**Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)*	Area 1	Area 2	Area 3	Area 4
26	3.1 Upstream Sub-Area ID				
27	3.2 Upstream LOD Area (ac)				
28	3.3 Target Runoff for Upstream Area (in.)				
29	3.4 Adjusted CN after all reductions				
30	3.5 Adjusted RPv (in.)				
31	3.6 Adjusted Cv (in.)				
32	3.7 Adjusted Fv (in.)				
34	**Step 4 - RPv Calculations for Combined LOD**				
35	4.1 Combined LOD (ac)	0.00			
36	4.2 Weighted RCN	#DIV/0!			
37	4.3 Weighted RPv (in.)	#DIV/0!			
38	4.4 Weighted Target Runoff (in.)	#DIV/0!			
39	4.5 Estimated Annual Runoff (in.)	#DIV/0!			
40	4.6 Req'd Runoff Reduction within LOD (in.)	#DIV/0!			
41	4.7 Req'd Runoff Reduction within LOD (%)	#DIV/0!			
42					
43	**Step 5 - Cv Unit Discharge**				
44	5. LOD Allowable Unit Discharge (cfs/ac)	#DIV/0!			
45					
46	**Step 6 - Fv Unit Discharge**				
47	6. LOD Allowable Unit Discharge (cfs/ac)	#DIV/0!			

RESET

C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

DURMM v.2
Redevelopment – LOD Sheet



DURMM_v2 2011-08-25 HSG Beta.xls [Compatibility Mode] - Microsoft Excel

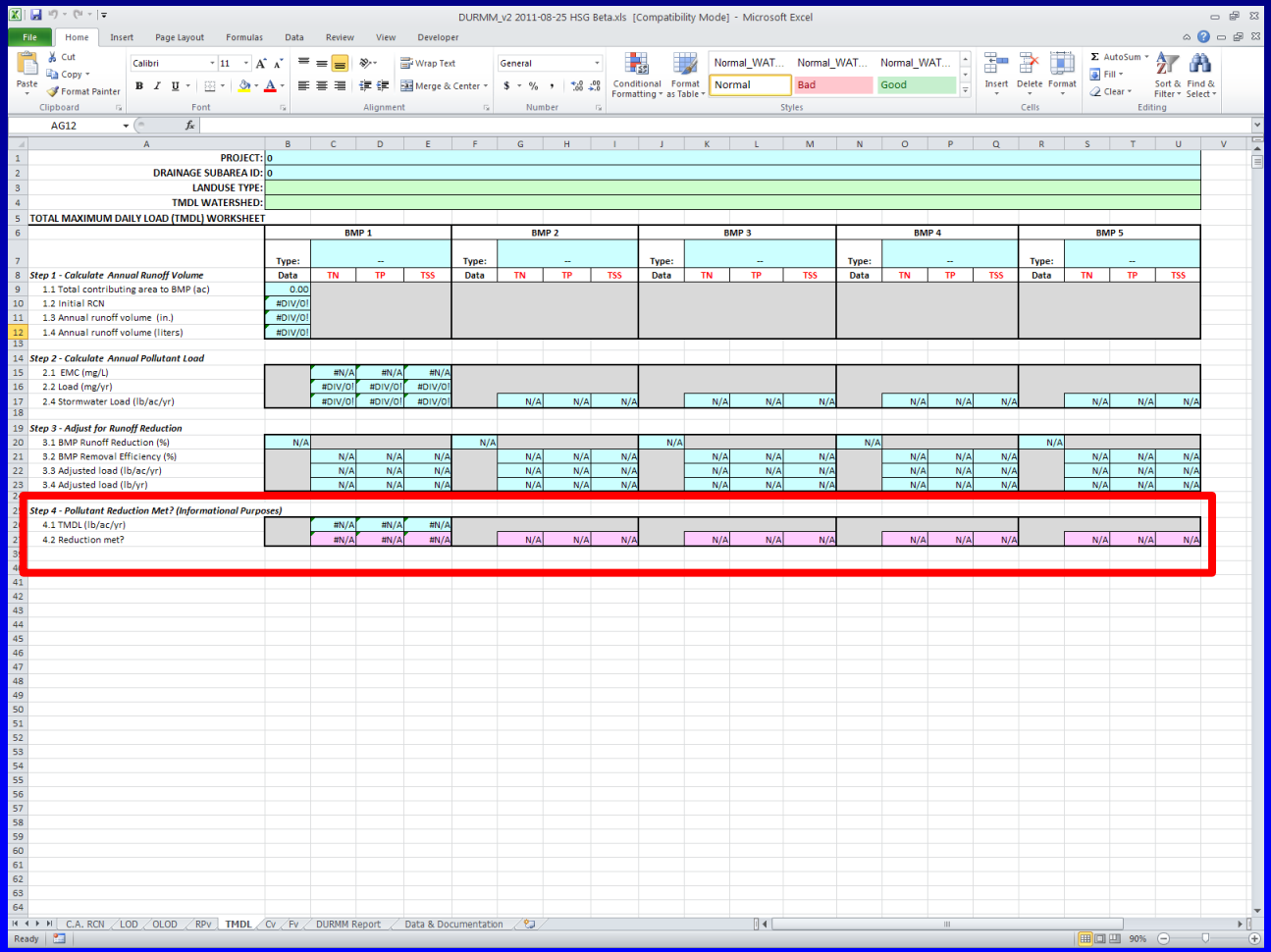
	A	B	C	D	E
1	PROJECT:	0			
2	DRAINAGE SUBAREA ID:	0			
3	LOCATION (County):	0			
4	UNIT HYDROGRAPH:	0			
5	LIMIT OF DISTURBANCE (LOD) WORKSHEET				
6	**Step 1 - Subarea LOD Data**	HSG A	HSG B	HSG C	HSG D
7	1.1 HSG Area Within LOD (ac)				
9	1.3 Pre-Developed Impervious Within LOD (ac)				
11	1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%)	0%	0%	0%	0%
13	**Step 2 - Subarea LOD Runoff Calculations**				
14	2.1 RCN per HSG	0.00	0.00	0.00	0.00
15	2.2 RPv per HSG (in.)	0.00	0.00	0.00	0.00
16	2.3 Target Runoff per HSG (in.)	0.00	0.00	0.00	0.00
17	2.4 Cv Weighted Unit Discharge per HSG (cfs/ac)	0.00	0.00	0.00	0.00
18	2.5 Fv Weighted Unit Discharge per HSG (cfs/ac)	0.00	0.00	0.00	0.00
20	2.6 Subarea LOD (ac)	0.00			
21	2.7 Subarea Weighted RCN	#DIV/0!			
22	2.8 Subarea Weighted RPv (in.)	#DIV/0!			
23	2.9 Subarea Weighted Target Runoff (in.)	#DIV/0!			
25	**Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)*	Area 1	Area 2	Area 3	Area 4
26	3.1 Upstream Sub-Area ID				
27	3.2 Upstream LOD Area (ac)				
28	3.3 Target Runoff for Upstream Area (in.)				
29	3.4 Adjusted CN after all reductions				
30	3.5 Adjusted RPv (in.)				
31	3.6 Adjusted Cv (in.)				
32	3.7 Adjusted Fv (in.)				
34	**Step 4 - RPv Calculations for Combined LOD**				
35	4.1 Combined LOD (ac)	0.00			
36	4.2 Weighted RCN	#DIV/0!			
37	4.3 Weighted RPv (in.)	#DIV/0!			
38	4.4 Weighted Target Runoff (in.)	#DIV/0!			
39	4.5 Estimated Annual Runoff (in.)	#DIV/0!			
40	4.6 Req'd Runoff Reduction within LOD (in.)	#DIV/0!			
41	4.7 Req'd Runoff Reduction within LOD (%)	#DIV/0!			
43	**Step 5 - Cv Unit Discharge**				
44	5. LOD Allowable Unit Discharge (cfs/ac)	#DIV/0!			
46	**Step 6 - Fv Unit Discharge**				
47	6. LOD Allowable Unit Discharge (cfs/ac)	#DIV/0!			

RESET

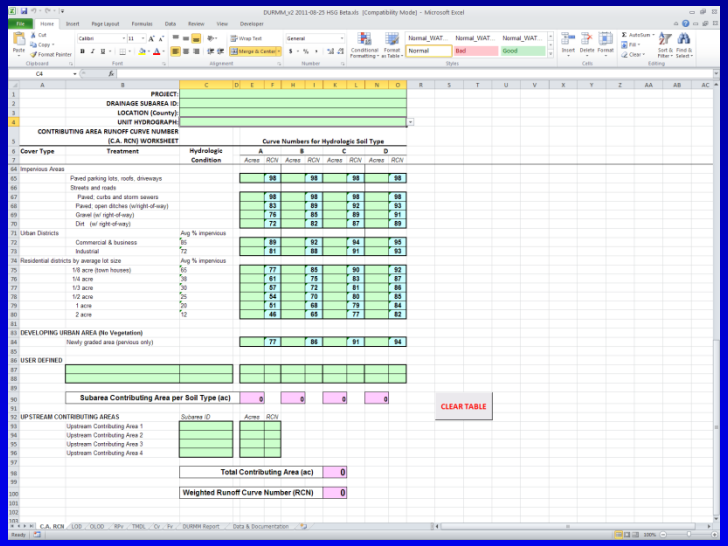
C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

Ready

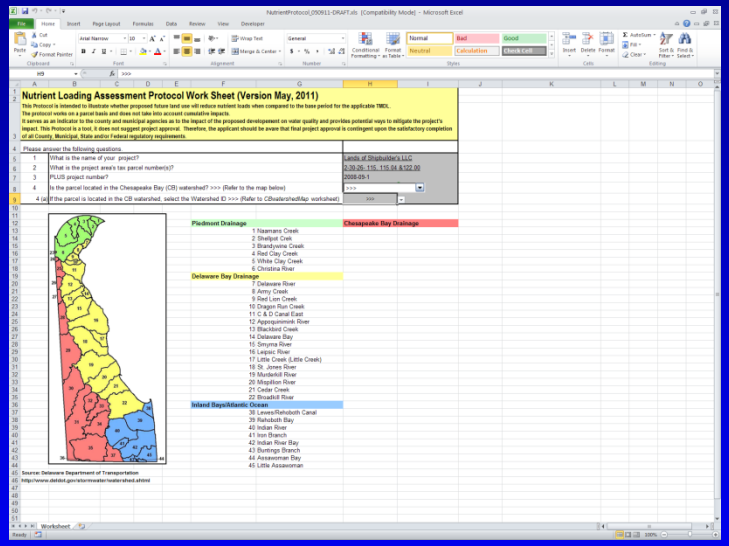
DURMM v.2
TMDL Sheet



DURMM v.2
& DNREC Nutrient Protocol

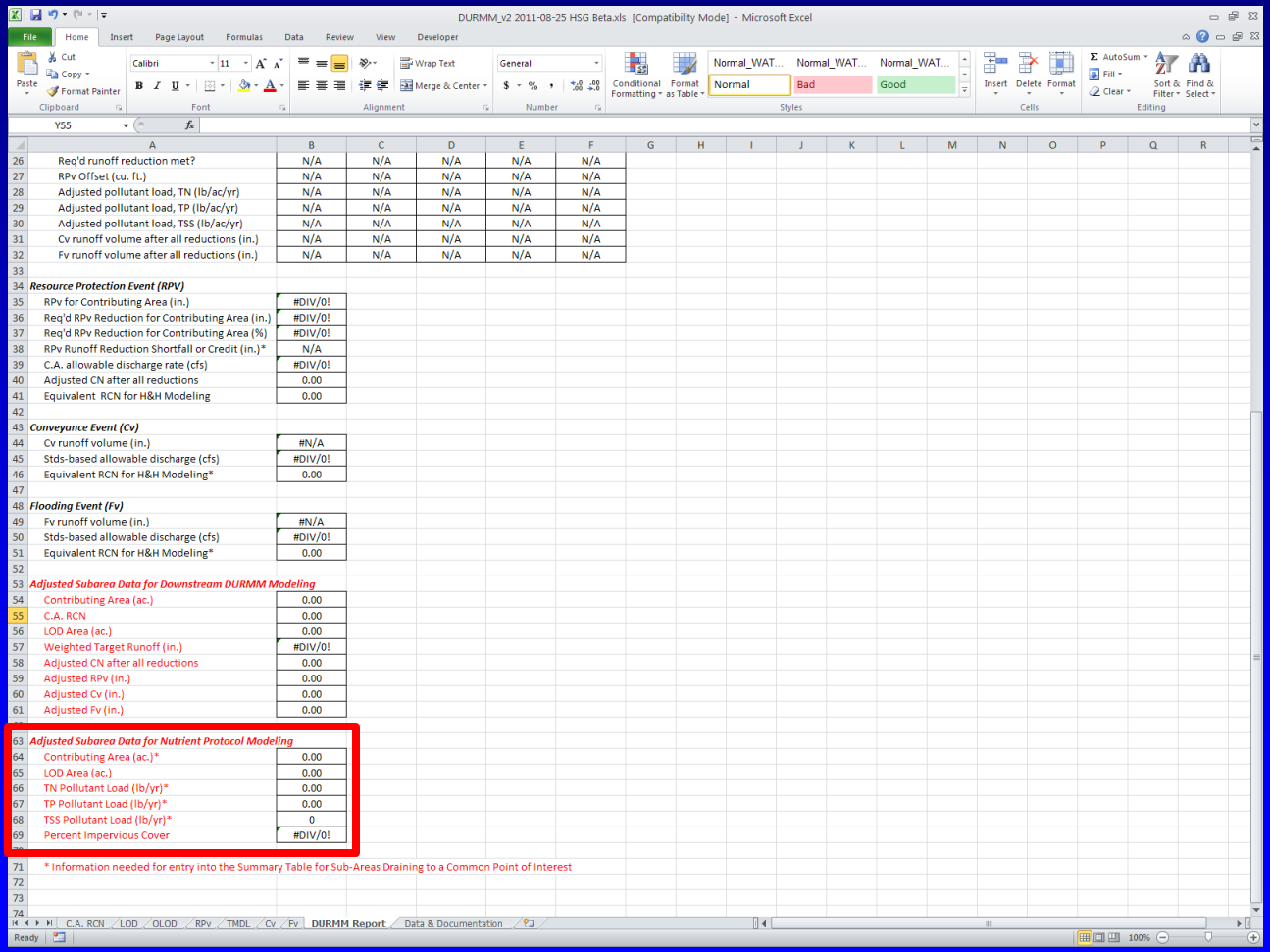


+



= “DURMMocol”

DURMM v.2
& DNREC Nutrient Protocol



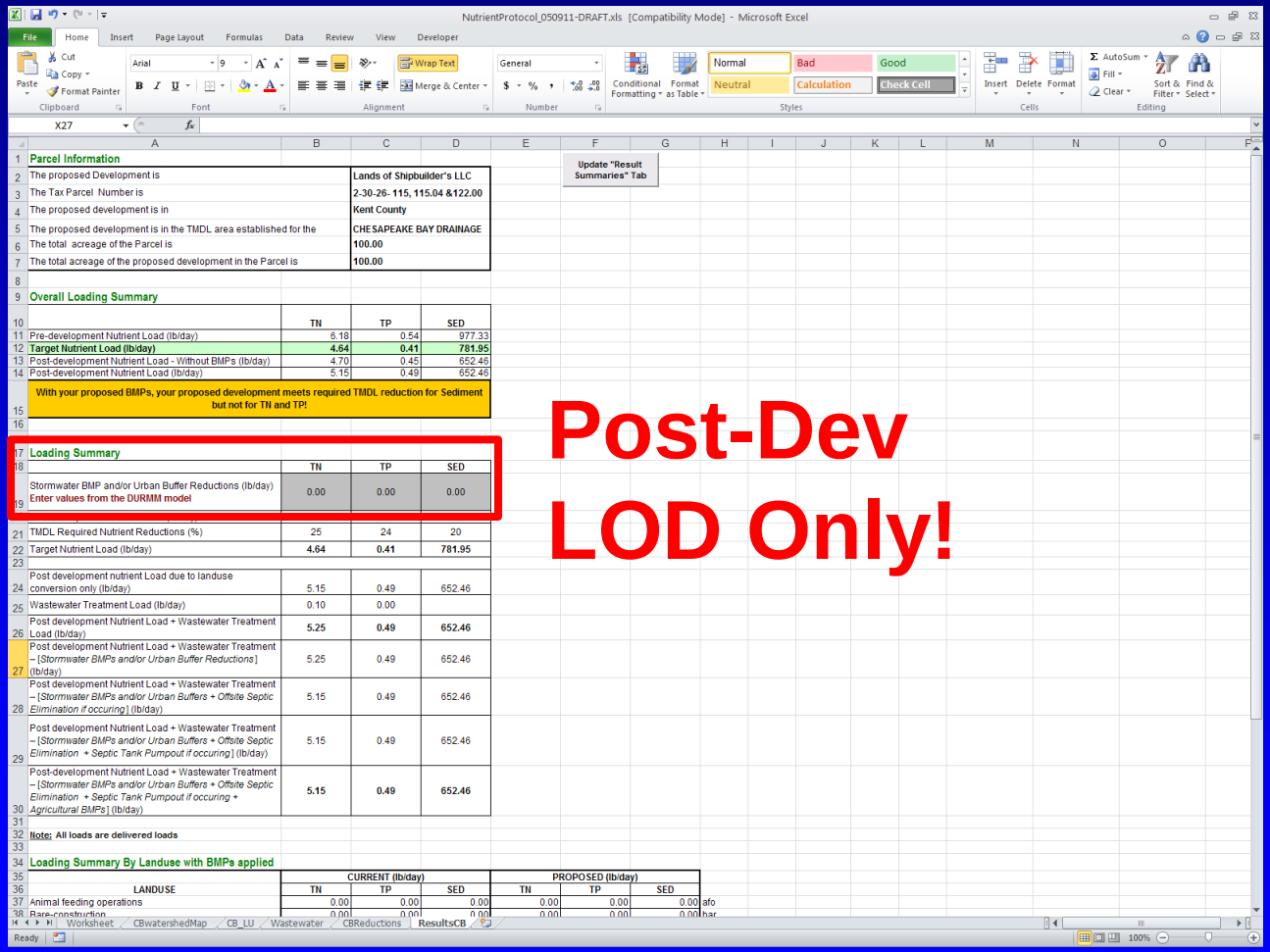
DURMM_v2 2011-08-25 HSG Beta.xls [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	F
26	Req'd runoff reduction met?	N/A	N/A	N/A	N/A	N/A
27	RPv Offset (cu. ft.)	N/A	N/A	N/A	N/A	N/A
28	Adjusted pollutant load, TN (lb/ac/yr)	N/A	N/A	N/A	N/A	N/A
29	Adjusted pollutant load, TP (lb/ac/yr)	N/A	N/A	N/A	N/A	N/A
30	Adjusted pollutant load, TSS (lb/ac/yr)	N/A	N/A	N/A	N/A	N/A
31	Cv runoff volume after all reductions (in.)	N/A	N/A	N/A	N/A	N/A
32	Fv runoff volume after all reductions (in.)	N/A	N/A	N/A	N/A	N/A
33						
34	***Resource Protection Event (RPV)***					
35	RPv for Contributing Area (in.)	#DIV/0!				
36	Req'd RPv Reduction for Contributing Area (in.)	#DIV/0!				
37	Req'd RPv Reduction for Contributing Area (%)	#DIV/0!				
38	RPv Runoff Reduction Shortfall or Credit (in.)*	N/A				
39	C.A. allowable discharge rate (cfs)	#DIV/0!				
40	Adjusted CN after all reductions	0.00				
41	Equivalent RCN for H&H Modeling	0.00				
42						
43	***Conveyance Event (Cv)***					
44	Cv runoff volume (in.)	#N/A				
45	Stds-based allowable discharge (cfs)	#DIV/0!				
46	Equivalent RCN for H&H Modeling*	0.00				
47						
48	***Flooding Event (Fv)***					
49	Fv runoff volume (in.)	#N/A				
50	Stds-based allowable discharge (cfs)	#DIV/0!				
51	Equivalent RCN for H&H Modeling*	0.00				
52						
53	***Adjusted Subarea Data for Downstream DURMM Modeling***					
54	Contributing Area (ac.)	0.00				
55	C.A. RCN	0.00				
56	LOD Area (ac.)	0.00				
57	Weighted Target Runoff (in.)	#DIV/0!				
58	Adjusted CN after all reductions	0.00				
59	Adjusted RPv (in.)	0.00				
60	Adjusted Cv (in.)	0.00				
61	Adjusted Fv (in.)	0.00				
62						
63	***Adjusted Subarea Data for Nutrient Protocol Modeling***					
64	Contributing Area (ac.)*	0.00				
65	LOD Area (ac.)	0.00				
66	TN Pollutant Load (lb/yr)*	0.00				
67	TP Pollutant Load (lb/yr)*	0.00				
68	TSS Pollutant Load (lb/yr)*	0				
69	Percent Impervious Cover	#DIV/0!				
70						
71	* Information needed for entry into the Summary Table for Sub-Areas Draining to a Common Point of Interest					
72						
73						
74						

C.A. RCN | LOD | OLOD | RPv | TMDL | Cv | Fv | DURMM Report | Data & Documentation

Ready

DURMM v.2
& DNREC Nutrient Protocol



NutrientProtocol_050911-DRAFT.xls [Compatibility Mode] - Microsoft Excel

Parcel Information

The proposed Development is	Lands of Shipbuilder's LLC
The Tax Parcel Number is	2-30-26- 115, 115.04 &122.00
The proposed development is in	Kent County
The proposed development is in the TMDL area established for the	CHESAPEAKE BAY DRAINAGE
The total acreage of the Parcel is	100.00
The total acreage of the proposed development in the Parcel is	100.00

Update "Result Summaries" Tab

Overall Loading Summary

	TN	TP	SED
Pre-development Nutrient Load (lb/day)	6.18	0.54	977.33
Target Nutrient Load (lb/day)	**4.64**	**0.41**	**781.95**
Post-development Nutrient Load - Without BMPs (lb/day)	4.70	0.45	652.46
Post-development Nutrient Load (lb/day)	5.15	0.49	652.46

With your proposed BMPs, your proposed development meets required TMDL reduction for Sediment but not for TN and TP!

Loading Summary

	TN	TP	SED
Stormwater BMP and/or Urban Buffer Reductions (lb/day) Enter values from the DURMM model	0.00	0.00	0.00
TMDL Required Nutrient Reductions (%)	25	24	20
Target Nutrient Load (lb/day)	**4.64**	**0.41**	**781.95**
Post development nutrient Load due to landuse conversion only (lb/day)	5.15	0.49	652.46
Wastewater Treatment Load (lb/day)	0.10	0.00	
Post development Nutrient Load + Wastewater Treatment Load (lb/day)	**5.25**	**0.49**	**652.46**
Post development Nutrient Load + Wastewater Treatment – [*Stormwater BMPs and/or Urban Buffer Reductions*] (lb/day)	5.25	0.49	652.46
Post development Nutrient Load + Wastewater Treatment – [*Stormwater BMPs and/or Urban Buffers + Offsite Septic Elimination if occuring*] (lb/day)	5.15	0.49	652.46
Post development Nutrient Load + Wastewater Treatment – [*Stormwater BMPs and/or Urban Buffers + Offsite Septic Elimination + Septic Tank Pumpout if occuring*] (lb/day)	5.15	0.49	652.46
Post-development Nutrient Load + Wastewater Treatment – [*Stormwater BMPs and/or Urban Buffers + Offsite Septic Elimination + Septic Tank Pumpout if occuring + Agricultural BMPs*] (lb/day)	**5.15**	**0.49**	**652.46**

Note: All loads are delivered loads

Loading Summary By Landuse with BMPs applied

LANDUSE	CURRENT (lb/day) TN	TP	SED	PROPOSED (lb/day) TN	TP	SED
Animal feeding operations	0.00	0.00	0.00	0.00	0.00	0.00
Bare-construction	0.00	0.00	0.00	0.00	0.00	0.00

Post-Dev LOD Only!

H&H Analyses for Preliminary S&S Plans

DRAFT – 2011-08-16

Procedure for Conducting Hydrologic & Hydraulic Analyses For Preliminary Sediment & Stormwater Plans

Background

The Hydrologic & Hydraulic (H&H) Analysis couples field collected data with desktop watershed modeling methodology to provide a tool for stormwater management agencies to help determine the most appropriate method to manage stormwater runoff from developing sites based on "No Adverse Impact" principles. The general approach is one of increasing level of detail and analysis depending on the complexity of the watershed. It is NOT intended to be a substitute for detailed Watershed Master Plans that have been endorsed by the Department. When such detailed plans are available, the peak discharge and/or volume management requirements from the Watershed Master Plan shall take precedence over the requirements of the Level 2 Analysis. Additionally, the methodologies used for this analysis are not considered to be precise enough to be applied at the site level.

Procedure

1. **Applicability**
   - 1.1. The H&H analysis will be required for all projects using the performance-based option and/or where a sump condition exists.
2. **Methodology**
   - 2.1. Level 1 Analysis
     - 2.1.1. The Level 1 Analysis combines field reconnaissance data with hydrologic modeling of the upstream watershed and site using latest soils, LULC, and terrain data. Hydrographs are then compared to check for coincidental peaking effects.
     - 2.1.2. Limit of study shall be the most-downstream junction of the site and the upstream contributing area.
     - 2.1.3. To comply at this level of analysis, hydrologic modeling must indicate no adverse impact due to coincidental peaking effects. For purposes of this policy, "no adverse impact" shall mean that the developed site hydrograph peak is less than, and the inflection point occurs before, the peak of the upstream hydrograph OR that it can be demonstrated that on-site detention would exacerbate downstream impacts. If compliance cannot be demonstrated, proceed to Level 2.
   - 2.2. Level 2 Analysis
     - 2.2.1. The Level 2 Analysis combines field measurement data with hydraulic modeling of structures, channels, etc. using an expanded hydrologic model.

H&H Analyses for Preliminary S&S Plans

Background

The Hydrologic & Hydraulic (H&H) Analysis couples field collected data with desktop watershed modeling methodology to provide a tool for stormwater management agencies to help determine the most appropriate method to manage stormwater runoff from developing sites based on “No Adverse Impact” principles. The general approach is one of increasing level of detail and analysis depending on the complexity of the watershed. It is NOT intended to be a substitute for detailed Watershed Master Plans that have been endorsed by the Department. When such detailed plans are available, the peak discharge and/or volume management requirements from the Watershed Master Plan shall take precedence over the requirements of the Level 2 Analysis. Additionally, the methodologies used for this analysis are not considered to be precise enough to be applied at the site level.

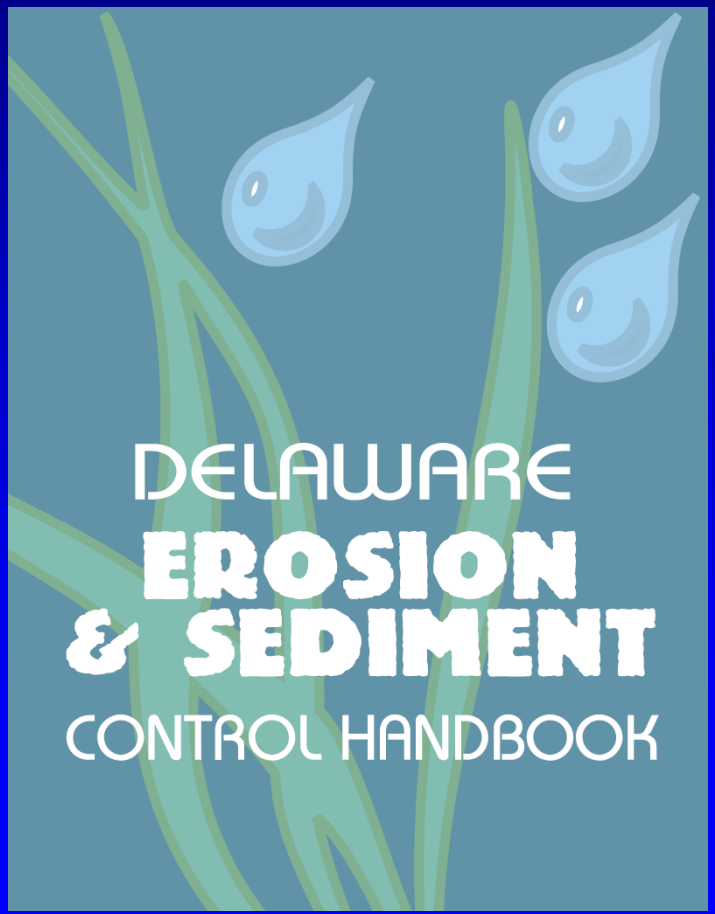
H&H Requirements
Level 2 Analysis

2.2.3. To comply at this level of analysis, the applicant must show that:

2.2.3.1. The runoff volume based on the NRCS Runoff Curve Number (RCN) and the rate of runoff based on the calculated peak discharge for the post-developed condition does not exceed that for the pre-developed condition, or;

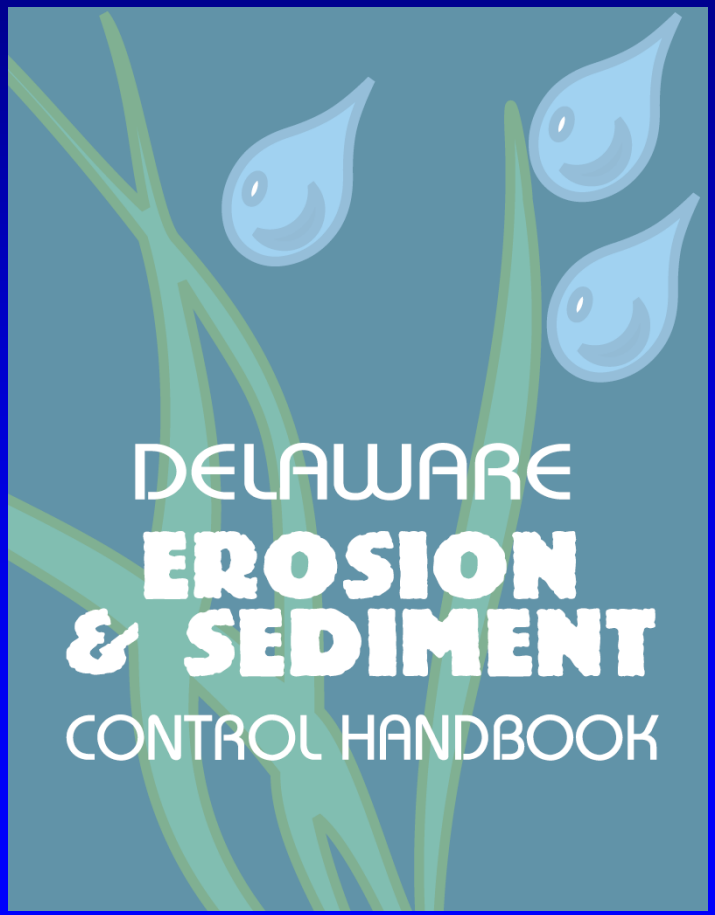
2.2.3.2. Steady flow hydraulic modeling must indicate no adverse impacts to headwater, water surface elevations and/or areas of inundation at designated POAs. For purposes of this policy, "no adverse impact" shall mean less than 0.05' increase in the calculated water surface elevations in channels and/or in headwater at hydraulic structures for all points of analysis. In addition, the area of inundation shall not encroach upon buildings or similar structures previously not impacted. If ~~significant impacts occur~~ the "no adverse impact" condition can not be met, a remedy must be provided in accordance with Section 3 of this policy. If impacts are uncertain, proceed to Level 3.

Delaware ESC Handbook Updates



- Revisions
  - Culvert Inlet Protection (delete Silt Fence option)
  - Inlet Protection (add Type-3 for curb opening)
  - Tree Protection (expand to Sensitive Area Protection)

Delaware ESC Handbook Updates



- New
  - Compost
    - Log
    - Blanket
    - Trap
  - Concrete Washout
  - Flocculants
  - Small Batch Plants
  - Stockpiles

GTBMP Stds & Specs
"New & Improved"

- Infiltration Practices
- Bioretention
- Permable Pavement
- Vegetated Roofs
- Rainwater Harvesting
- Dry Swales
- Impervious Disconnection
- Grass Channel
- Sheet Flow to Filter Strip or Open Space
- Detention Practices
- Filtering Practices
- Wetlands
- Stormwater Ponds
- Soil Amendments
- Proprietary Practices

GTBMP Stds & Specs
"New & Improved"

1.0 Stormwater Infiltration

Definition: Practices that capture and temporarily store the design storm volume before allowing it to infiltrate into the soil over a two day period. Design variants include:

- I-1 infiltration trench
- I-2 infiltration basin

Infiltration practices use temporary surface or underground storage to allow incoming stormwater runoff to exfiltrate into underlying soils. Runoff first passes through multiple pretreatment mechanisms to trap sediment and organic matter before it reaches the practice. As the stormwater penetrates the underlying soil, chemical and physical adsorption processes remove pollutants. Infiltration practices are suitable for use in residential and other urban areas where *measured* soil permeability rates exceed 1/2 inch per hour. To prevent possible groundwater contamination, infiltration should not be utilized at sites designated as stormwater hotspots. Extraordinary care shall be taken to assure that long-term infiltration rates are achieved through the use of performance bonds, post construction inspection and long-term maintenance.

1.1 Infiltration Stormwater Credit Calculations

Infiltration practices receive 100% retention volume credit (R_v) for the amount of storage volume (Sv) provided by the practice (**Table 1.1**). No additional pollutant removal credit is awarded.

Table 1.1 Infiltration Performance Credit

Calculation Method	Retention of RPv Event
Retention Credit (Rv)	100% of Sv
Annual Pollutant Removal Credits	
TN	$100\%*R_v/RP_v$
TP	$100\%*R_v/RP_v$
TSS	$100\%*R_v/Rp_v$

The practice must be sized using the guidance detailed in ***Section 1.5. Infiltration Design Criteria***

GTBMP Stds & Specs
"New & Improved"

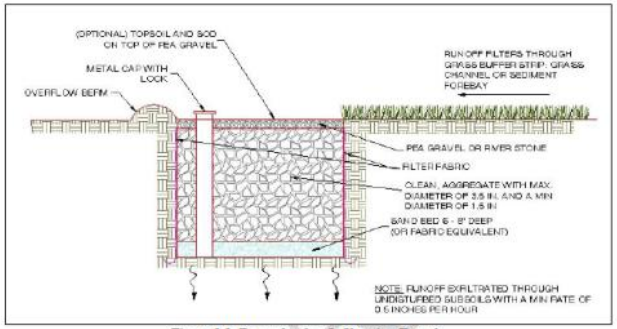


Figure 1.1. Example of an Infiltration Trench.

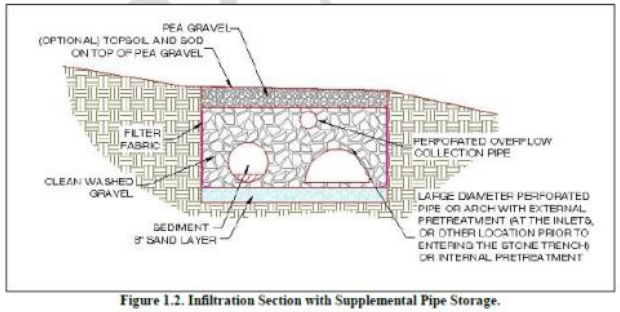


Figure 1.2. Infiltration Section with Supplemental Pipe Storage.

GTBMP Stds & Specs
"New & Improved"

1.2 Design Criteria and Materials Specifications

Table 1.2 summarizes design criteria for infiltration practices, and Table 1.3 summarizes the materials specifications for these practices. For more detail, consult Sections 1.3 through 1.7. Sections 1.8 describes practice construction and maintenance criteria.

Table 1.2 Infiltration Design Criteria

	Basins	Trenches
Feasibility (Section 1.3)	• Minimum soil infiltration of 1"/hr • Restrictions for treating hotspots, high loads, or dry weather flows • 2 foot separation from groundwater • Setbacks from wells, buildings and utilities • Typically used to treat small (<2 acre) CDA with high impervious cover	
Conveyance (Section 1.4)	• Can be designed off-line or on-line • Must safely convey the 10-year storm event.	
Pretreatment (Section 1.5)	• 25% to 50% of Sv in pretreatment, depending on soil infiltration rate. • All runoff must be treated. • Several pretreatment options may be used.	
Sizing (Maximum Depth) (Section 1.6)	$d_{max} = \frac{1}{2} i \times t_d$	$d_{max} = \frac{\frac{1}{2} i \times t_d}{\eta_r}$
	Maximum depth limits as well, based on practice size and CDA (See Table 1.4)	
Sizing (Surface Area) (Section 1.6)	$SA = Sv / (d + \frac{1}{2} i \times t_f)$	$SA = Sv / (\eta_r \times d + \frac{1}{2} i \times t_f)$
Variables:	t_d = maximum drawn down time (normally 1.5 to 2 days) (day) i = field-verified infiltration rate for the native soils (ft./day) η_r = available porosity of the stone reservoir (assume 0.35) Sv = Design Storage volume (Sv) treated by the practice d = Infiltration depth (ft.) t_f = Time to fill the infiltration facility (days – typically 2 hours, or 0.083 days)	
Geometry (Section 1.6)	• Flat trench or basin bottom. • 4:1 or flatter internal side slopes for basins • 2' or lower ponding depth for basins	• Wider than they are deep to avoid injection well status.
Landscaping (Section 1.7)	Maintain vegetation in the buffers and practice drainage area to minimize erosion and debris.	

GTBMP Stds & Specs
"New & Improved"

Table 1.3. Infiltration Material Specifications

Material	Specification	Notes
Surface Layer (optional)	Topsoil and grass layer	
Surface Stone	Install a 3-inch layer of river stone or pea gravel.	This provides an attractive surface cover that can suppress weed growth.
Stone Layer	Clean, aggregate with a maximum diameter of 3.5 inches and a minimum diameter of 1.5 inches.	
Observation Well	Install a vertical 6-inch Schedule 40 PVC perforated pipe, with a lockable cap and anchor plate.	Install one per 50 feet of length of infiltration practice.
Overflow collection pipe (optional)	Use 4-inch or 6-inch rigid schedule 40 PVC pipe, with 3/8" perforations at 6 inches on center, with each perforated underdrain installed at a slope of 1% for the length of the infiltration practice.	
Trench Bottom	Install a 6 to 8 inch sand layer (e.g., ASTM C 33, 0.02-0.04 inch)	
Filter Fabric (sides only)	Use non-woven polyprene geotextile with a flow rate of > 110 gallons/min./sq. ft. (e.g., Geotex 351 or equivalent).	
Buffer Vegetation	Keep adjacent vegetation from forming an overhead canopy above infiltration practices, in order to keep leaf litter, fruits and other vegetative material from clogging the stone.	

1.3 Infiltration Feasibility Criteria

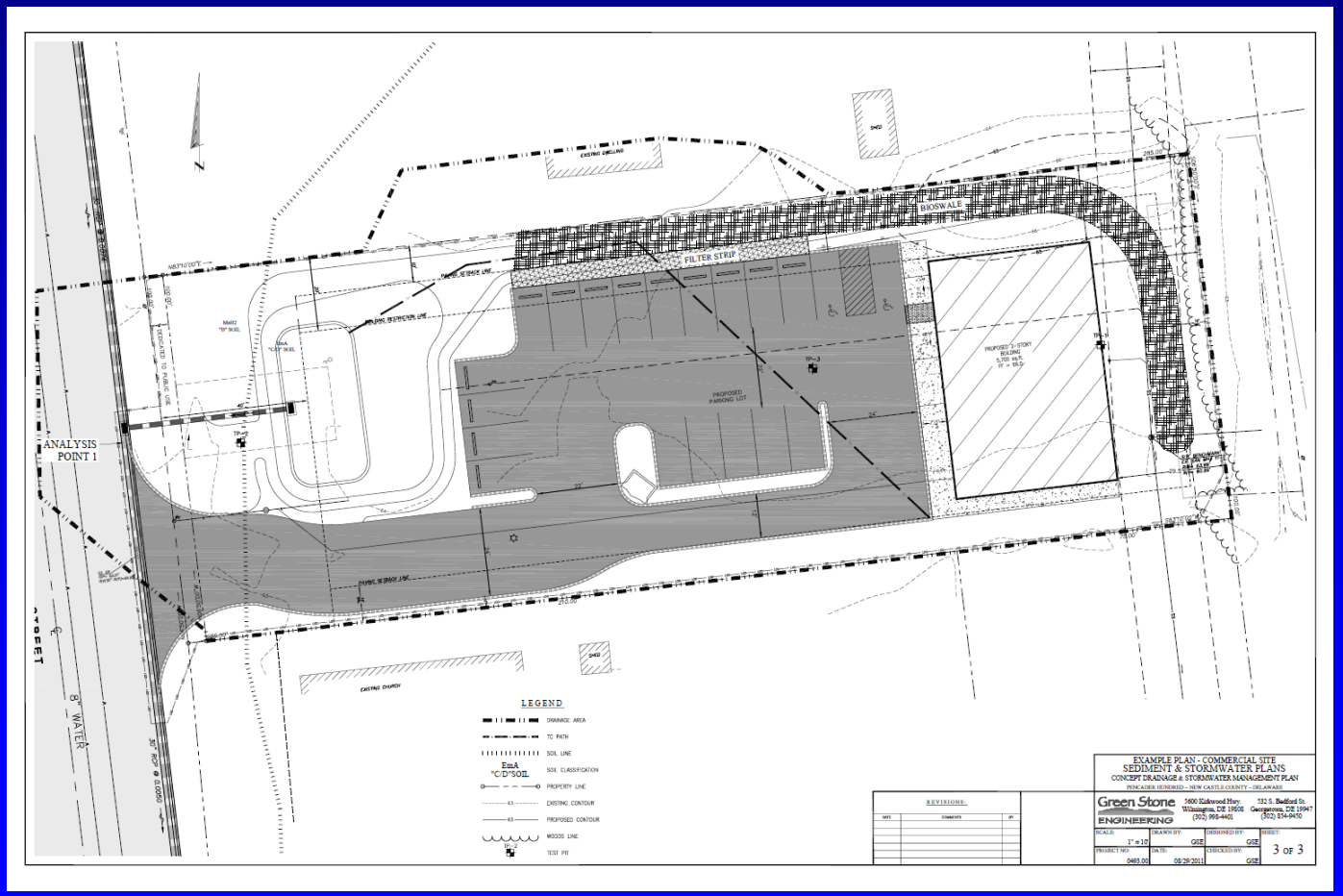
Infiltration practices have very high storage and retention capabilities when sited and designed appropriately. Designers should evaluate the range of soil properties during initial site layout and seek to configure the site to conserve and protect the soils with the greatest recharge and infiltration rates. In particular, areas of Hydrologic Soil Group A or B soils shown on NRCS soil surveys should be considered as primary locations for infiltration practices. Additional information about soil and infiltration are described in more detail later in this section. During initial design phases, designers should carefully identify and evaluate constraints on infiltration, as follows:

Underground Injection Control for Class V Wells. In order for an infiltration practice to avoid classification as a Class V well which is subject regulation under the Federal Underground Injection Control (UIC) program, the practice must generally be wider than the practice is deep. If an infiltration practice is "deeper than its widest surface dimension," or if it includes an underground distribution system then it will likely be considered a Class V injection well. Class V injection wells are subject to permit approval by EPA. For more information on Class V injection wells and stormwater management, designers should consult:
http://www.epa.gov/npdes/pubs/memo_gi_classvwells.pdf

Contributing Drainage Area. The maximum contributing drainage area (CDA) to an individual infiltration practice should be less than 2 acres and as close to 100% impervious as possible. The design, pretreatment and maintenance requirements will differ depending on the size of the infiltration

Example Preliminary Sediment & Stormwater Plans

Example Preliminary S&S Plan Commercial Site



DURMM v2
Example Plan – Commercial Site
Stormwater Management Report

For

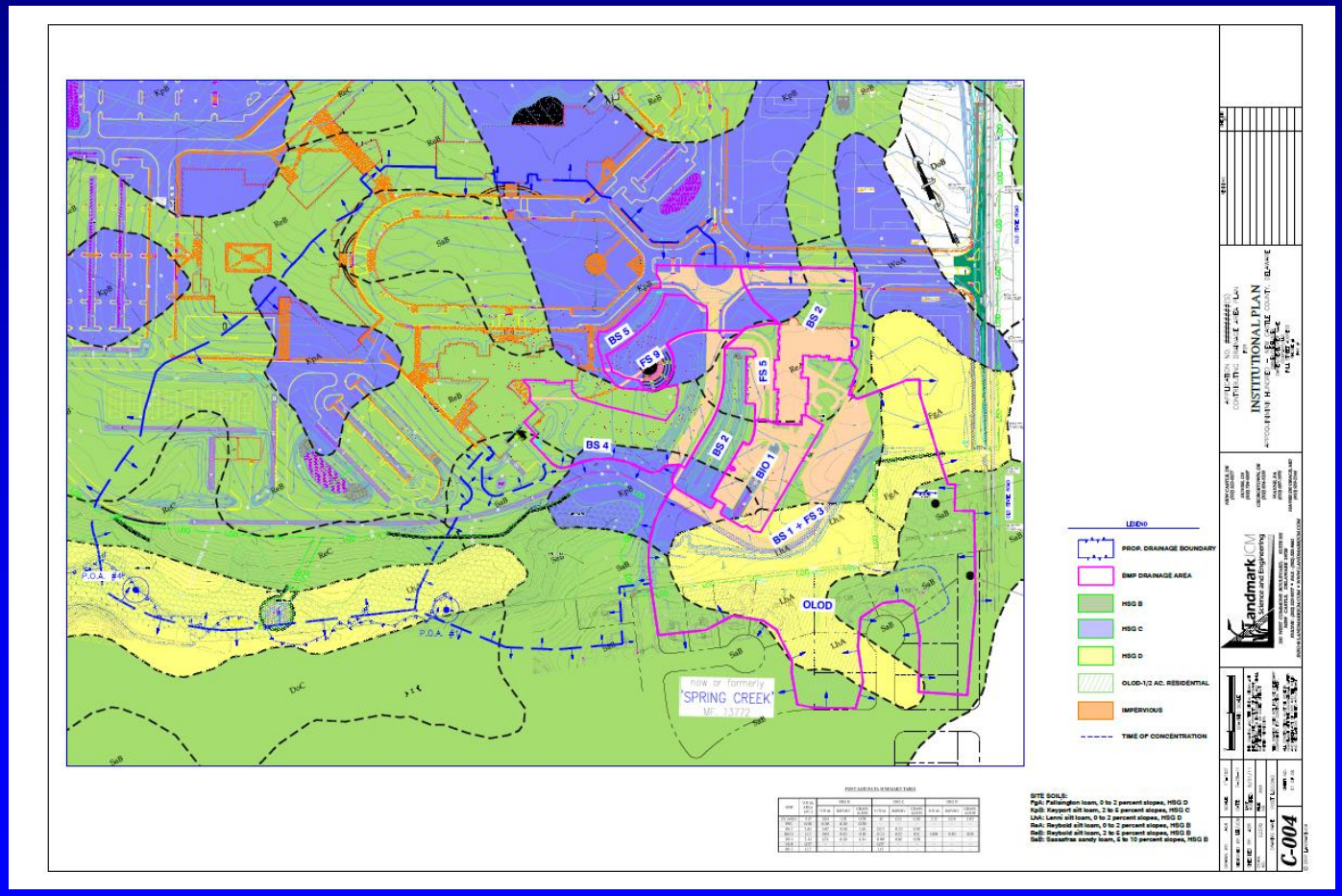
DNREC
Div. of Watershed Stewardship
Sediment and Stormwater Program

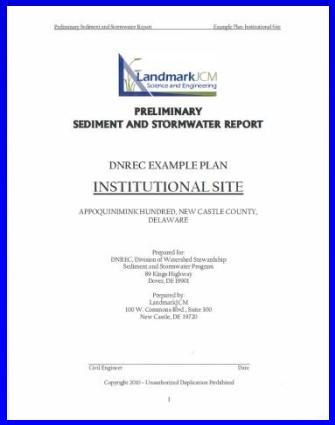
Prepared by:

Green Stone ENGINEERING
5600 Kirkwood Highway
Wilmington, DE 19808

August 2011

Example Preliminary S&S Plan Institutional Site



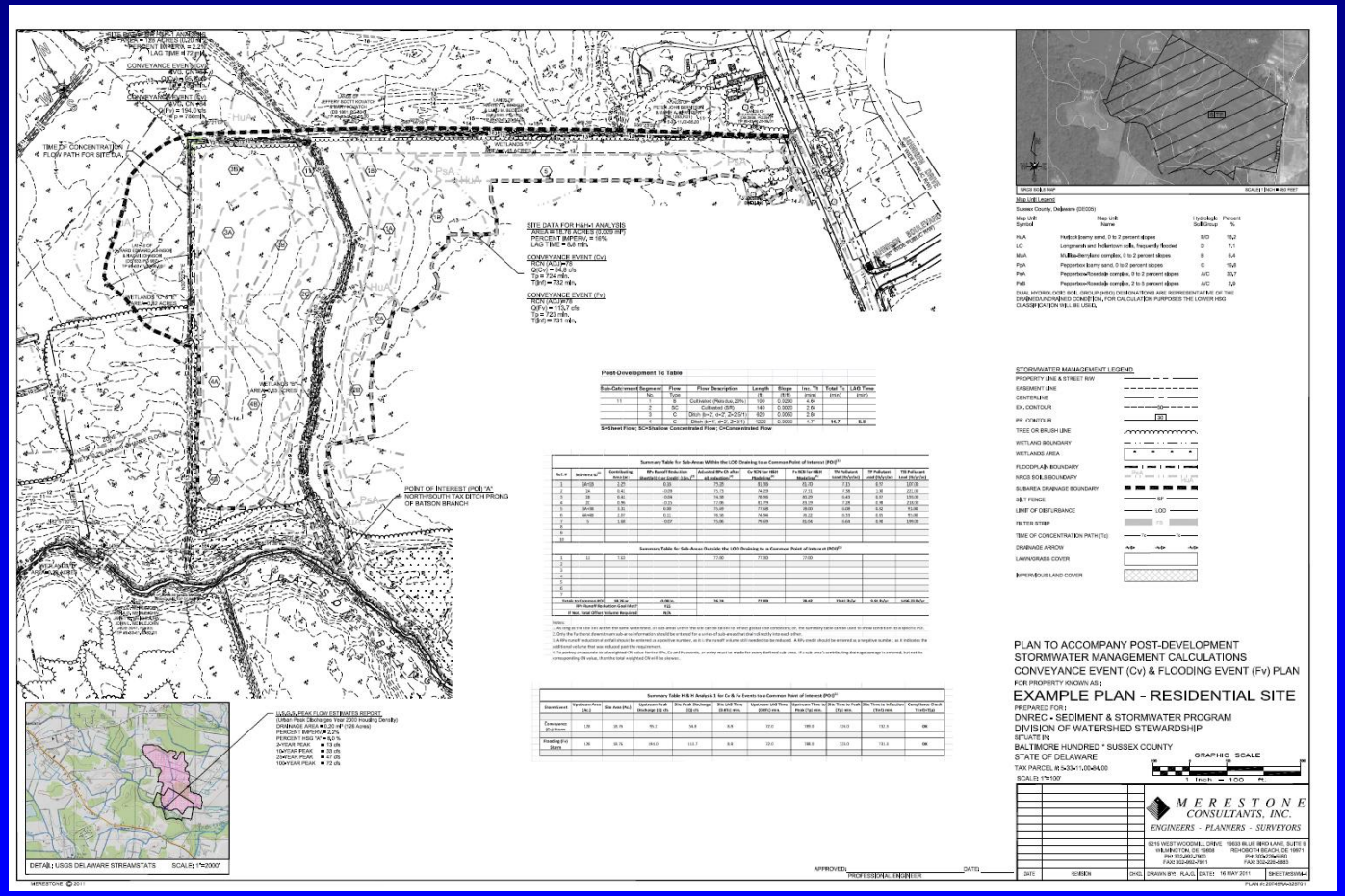

PRELIMINARY
SEDIMENT AND STORMWATER REPORT

DNREC EXAMPLE PLAN

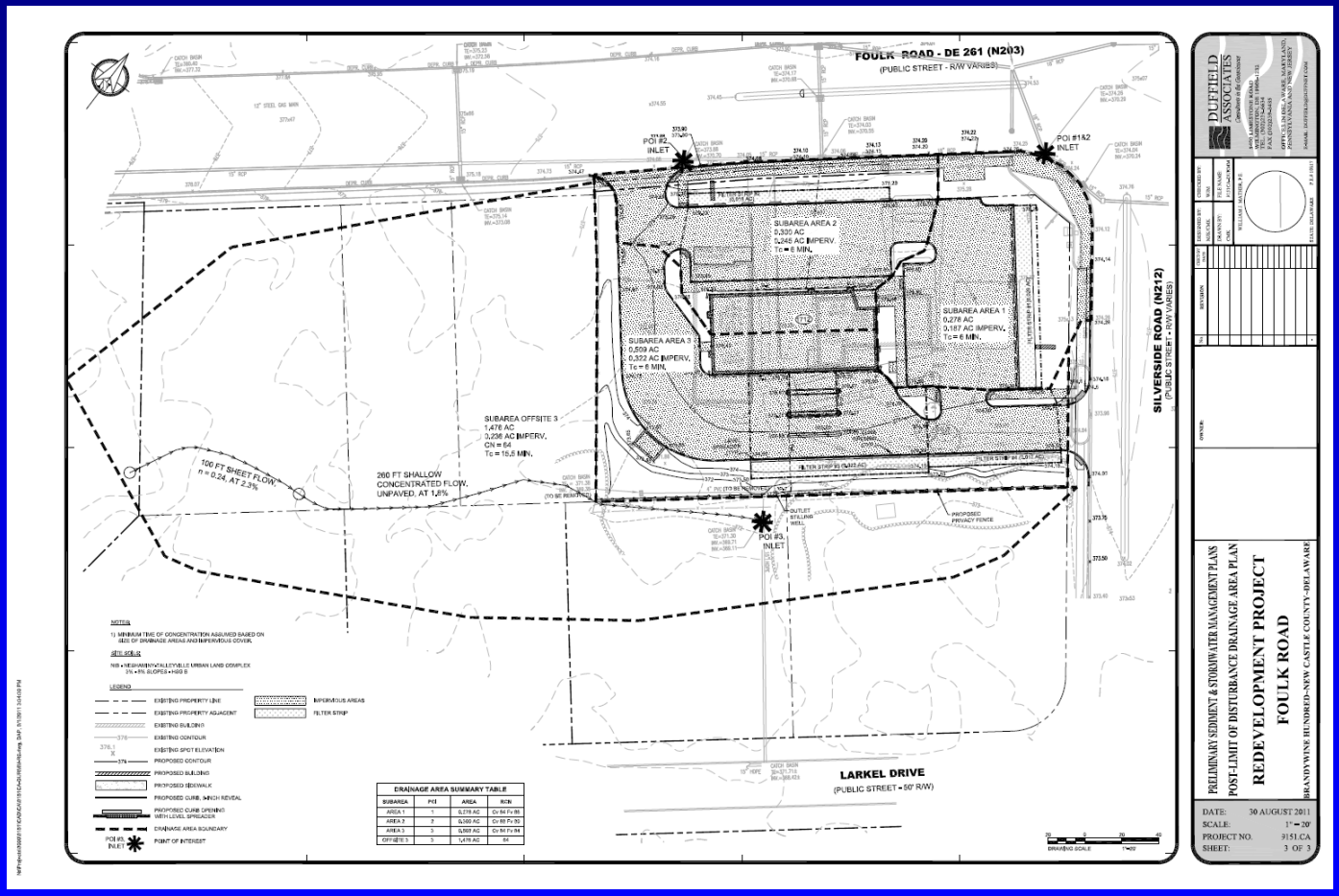
INSTITUTIONAL SITE

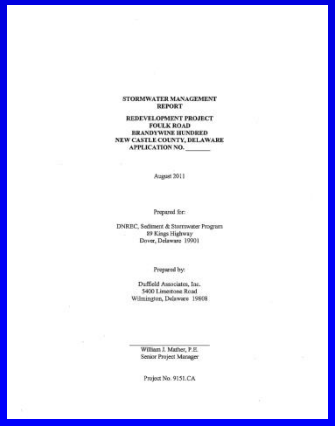
APPOQUINIMINK HUNDRED, NEW CASTLE COUNTY, DELAWARE

Example Preliminary S&S Plan Residential Site



Example Preliminary S&S Plan Redevelopment Site





STORMWATER MANAGEMENT REPORT

REDEVELOPMENT PROJECT
FOULK ROAD
BRANDYWINE HUNDRED
NEW CASTLE COUNTY, DELAWARE
APPLICATION NO. _____

August 2011

Prepared for:

DNREC, Sediment & Stormwater Program
89 Kings Highway
Dover, Delaware 19901

Prepared by:

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, Delaware 19808

William J. Mather, P.E.
Senior Project Manager

Project No. 9151.CA

Proposed Revisions to Delaware Sediment & Stormwater Regulations

What's Next?

Timeline Update

- Sept – Dec 2011: Technical Document
- Nov 2011: Technical Subcommittee
- Jan 2012: RAC Meeting
- Feb 2012: Public Hearing
- May 2012: Promulgation
- Aug 2012: Effective Date

Summer 2012

- Promulgation in May 2012
- Training throughout summer
  - DURMMv2
  - Standards & Specifications
- Effective in August 2012

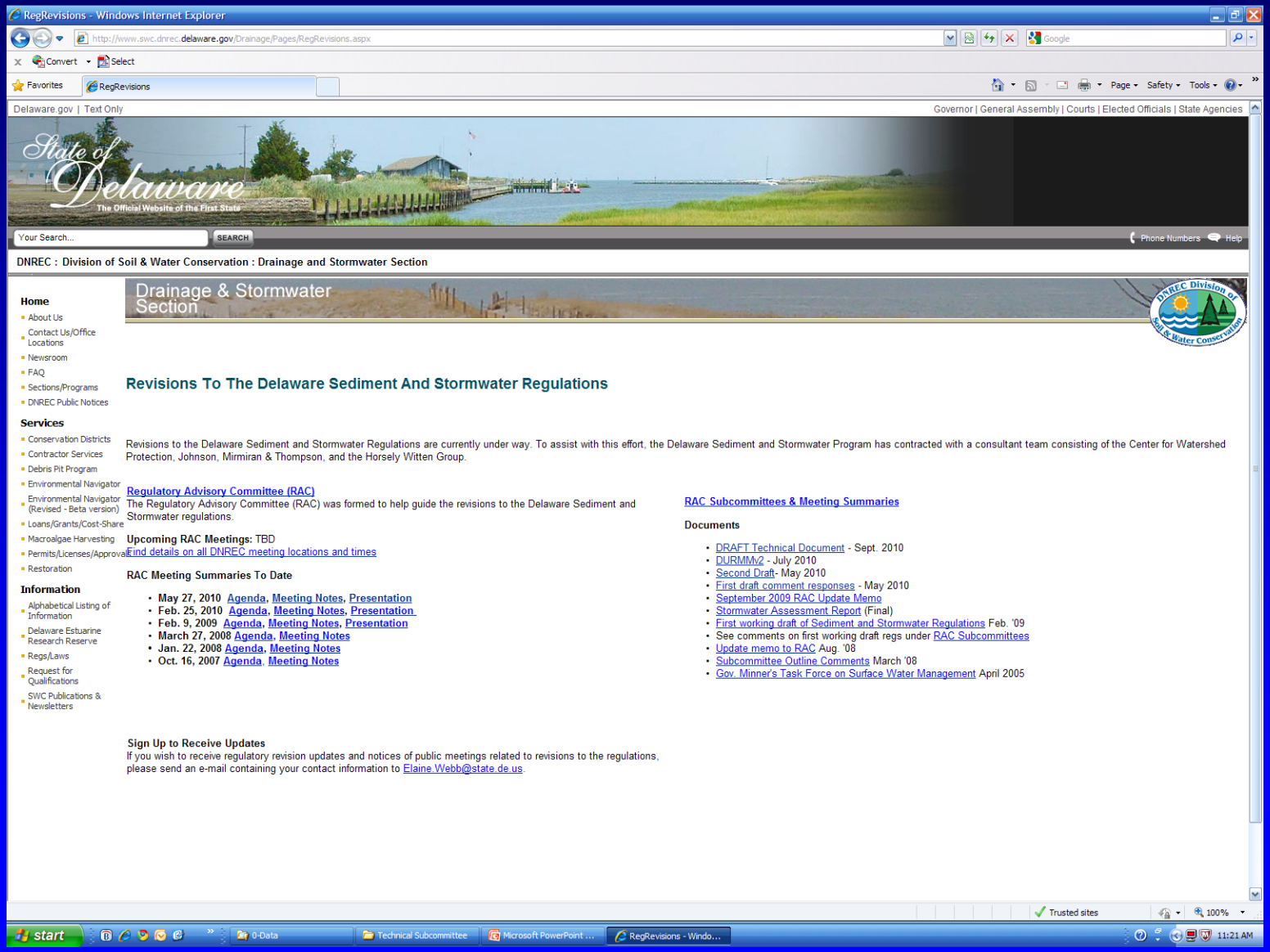
Grandfathering of Projects In the Review Process

- Will apply at August 2012 effective date
- Plans under review: 1 year to gain approval under previous regs
- Must meet grandfathering criteria of each delegated agency
  - Policy will be posted on website

Plans Approved Prior to Effective Date

- Valid for 3 years
- May be extended if construction commences
- Only phases with approved construction plans may be extended

Questions???


RegRevisions - Windows Internet Explorer
http://www.swc.dnrec.delaware.gov/Drainage/Pages/RegRevisions.aspx
Delaware.gov | Text Only
Governor | General Assembly | Courts | Elected Officials | State Agencies
State of Delaware
The Official Website of the First State
Your Search...
SEARCH
Phone Numbers
Help
DNREC : Division of Soil & Water Conservation : Drainage and Stormwater Section
Drainage & Stormwater Section
Home
About Us
Contact Us/Office Locations
Newsroom
FAQ
Sections/Programs
DNREC Public Notices
Services
Conservation Districts
Contractor Services
Debris Pit Program
Environmental Navigator
Environmental Navigator (Revised - Beta version)
Loans/Grants/Cost-Share
Macroalgae Harvesting
Permits/Licenses/Approval
Restoration
Information
Alphabetical Listing of Information
Delaware Estuarine Research Reserve
Regs/Laws
Request for Qualifications
SWC Publications & Newsletters
Revisions To The Delaware Sediment And Stormwater Regulations
Revisions to the Delaware Sediment and Stormwater Regulations are currently under way. To assist with this effort, the Delaware Sediment and Stormwater Program has contracted with a consultant team consisting of the Center for Watershed Protection, Johnson, Mirmiran & Thompson, and the Horsely Witten Group.
Regulatory Advisory Committee (RAC)
The Regulatory Advisory Committee (RAC) was formed to help guide the revisions to the Delaware Sediment and Stormwater regulations.
Upcoming RAC Meetings: TBD
Find details on all DNREC meeting locations and times
RAC Meeting Summaries To Date
May 27, 2010 Agenda, Meeting Notes, Presentation
Feb. 25, 2010 Agenda, Meeting Notes, Presentation
Feb. 9, 2009 Agenda, Meeting Notes, Presentation
March 27, 2008 Agenda, Meeting Notes
Jan. 22, 2008 Agenda, Meeting Notes
Oct. 16, 2007 Agenda, Meeting Notes
RAC Subcommittees & Meeting Summaries
Documents
DRAFT Technical Document - Sept. 2010
DURMMv2 - July 2010
Second Draft- May 2010
First draft comment responses - May 2010
September 2009 RAC Update Memo
Stormwater Assessment Report (Final)
First working draft of Sediment and Stormwater Regulations Feb. '09
See comments on first working draft regs under RAC Subcommittees
Update memo to RAC Aug. '08
Subcommittee Outline Comments March '08
Gov. Minner's Task Force on Surface Water Management April 2005
Sign Up to Receive Updates
If you wish to receive regulatory revision updates and notices of public meetings related to revisions to the regulations, please send an e-mail containing your contact information to Elaine.Webb@state.de.us.
Trusted sites
100%
start
0-Data
Technical Subcommittee
Microsoft PowerPoint ...
RegRevisions - Windo...
11:21 AM

Discussion