

Stormwater Modeling

Computer models are used for simulation of stormwater runoff, pollutant loading and design of stormwater management structures and pollutant removal practices. Village of Ardsley stormwater runoff is regulated by our NYS DEC State Pollution Discharge and Elimination System (SPDES) permit.

According to SPDES General Permit No. GP-0-10-002 for MS4's:

“By January 8, 2013, *covered entities* must assess potential sources of discharge of stormwater *POC(s)*, identify potential stormwater pollutant reduction measures, and evaluate their progress in addressing the *POC(S)*...Covered entities must evaluate their *SWMP* with respect to the MS4's effectiveness in ensuring there is no net increase discharge of stormwater *POC(s)* to the impaired waters for *storm sewersheds* that have undergone non-negligible changes such as changes to land use and impervious cover greater than one acre, or stormwater management practices during the time the MS4 has been covered by this *SPDES general permit*... **The assessment shall be done using Department supported modeling of pollutant loading.**”

The Watershed Treatment Model (WTM), designed by the Center for Watershed Protection (CWP), was chosen for evaluation of the watershed areas in Ardsley. Data sources for the evaluations included Village of Ardsley Engineering Consultant, Building Inspector and Highway Departments, Town of Greenburgh Assessor's Office, Westchester County Planning Department, NYS DEC Region 3 White Plains Sub-office, Center for Watershed Protection (D. Caraco, NY Office), United States Geological Survey (USGS), US Environmental Protection Agency (EPA), and National Oceanic and Atmospheric Administration (NOAA).

Some of the data used to generate the watershed models is presented below:

Watershed	Saw Mill River	Bronx River
Size (acres)	437	317
Land Use (acres)		
Residential Low Density (< 1 unit/acre)	31.2	76
Medium Density (1-4 units/acre)	87.4	81.7
High Density (> 4 units/acre)	109	48.6
Multifamily	10.6	0
Commercial (business & institutional/school)	84	9
Roadway	58.7	20.5
Industrial	1.5	0
Forest	10.3	35
Rural (open field & parkland fields)	37.9	43
Open Water		
2012 Annual Rainfall (inches)	15.1	15.1
Stream bank (miles)	1.4	1.2
Sanitary sewer lines (miles)	10.7	6.1
Stormwater Treatment		
Stream bank restored (feet)	309	597
Street Sweeping (total acres = streets + parking lots)	23.9	42.7
Detention Pond drainage area (acres)	2.2	
Bioretention drainage area (acres)	7.5	
Permeable Pavement drainage area (acres)		0.5

These data and other information, including soil characteristics, groundwater levels, outreach techniques and Highway Department municipal housekeeping methods, were used to generate Existing Load calculations.

Tables are shown below:

Existing Loads to Surface Waters: Saw Mill River					
	TN lb/year	TP lb/year	TSS lb/year	Fecal Coliform billion/year	Runoff Volume (acre-feet/year)
Urban Land	1,978	415.98	31,917	54,519	221
Active Construction	1	0	764	-	1
SSOs	67	11	448	50,819	-
CSOs	-	-	-	-	-
Channel Erosion	17	14	13,758	-	-
Road Sanding	-	-	-	-	-
Forest	26	2	1,029	123	0
Rural Land	174	27	3,793	1,479	1
Livestock	-	-	-	-	-
Illicit Connections	-	-	-	-	-
Marinas	-	-	-	-	-
Point Sources	-	-	-	-	-
Septic Systems	-	-	-	-	-
Open Water	51	2	612	-	-
Total Storm Load	2,179	458	51,614	81,531	223
Total Non-Storm Load	134	14	706	25,410	-
Total Load to Surface Waters	2,313	472	52,321	106,940	223

Existing Loads to Groundwater (Contributed from Urbanization). Note. Model does not deliver to receiving surface waters.			
	TN lb/year	TP lb/year	Fecal Coliform billion/year
Urban Land	10,427	49	78
Septic Systems	-	-	-
Total	10,427	49	78

Existing Loads to Surface Waters: Bronx River					
	TN lb/year	TP lb/year	TSS lb/year	Fecal Coliform billion/year	Runoff Volume (acre-feet/year)
Urban Land	1,250	296.85	15,564	26,359	107
Active Construction	-	-	-	-	-
SSOs	38	6	255	28,910	-
CSOs	-	-	-	-	-
Channel Erosion	9	8	7,795	-	-
Road Sanding	-	-	-	-	-
Forest	87	7	3,498	420	1
Rural Land	198	30	4,296	1,675	1
Livestock	-	-	-	-	-
Illicit Connections	-	-	-	-	-
Marinas	-	-	-	-	-
Point Sources	-	-	-	-	-
Septic Systems	-	-	-	-	-
Open Water	36	1	440	-	-
Total Storm Load	1,457	335	30,941	42,909	108
Total Non-Storm Load	162	14	907	14,455	-
Total Load to Surface Waters	1,619	349	31,848	57,364	108

Existing Loads to Groundwater (Contributed from Urbanization). Note. Model does not deliver to receiving surface waters.			
	TN lb/year	TP lb/year	Fecal Coliform billion/year
Urban Land	8,371	39	1
Septic Systems	-	-	-
Total	8,371	39	1

TN (Total Nitrogen): ammonium N (toxic to aquatic organisms)

organic nitrogen N, nitrite/nitrate N - from fertilizer, organic waste, fixation by algae leads to eutrophication cycle resulting in decreased dissolved oxygen

TP (Total Phosphorus): inorganic P (P_i , phosphate ion), organic P (bound to compounds like glycerol, nucleic acid in plant and animal tissue) – from fertilizer, pesticides, detergents (now prohibited by law), leads to eutrophication

TSS (Total Suspended Solids): from stream bank erosion and sediment washed over impervious surfaces - causes turbidity which reduces light penetration into water, light reflected from particles causes water to heat up, sediment sinking to the stream bed smothers benthic stream dwellers, sediment carries other pollutants into the waterbody

Fecal Coliform: Coliform bacteria which includes *Escherichia coli* (E. coli) – indicates possible sanitary sewage contamination, other sources are domestic (dogs, cats) and wildlife (especially geese) animals

As more stormwater management improvements are made in the Village, WTM will periodically be recalculated.