

### **3.9 Drainage Calculations**

## **Drainage Analysis Summary**

## **Stormwater Management**

The site is located at 263-265 Great Road in Acton Massachusetts and is approximately 5.47 acres. The site currently contains two single family dwellings. The project proposes to rebuild the existing dwellings and construct 24 additional buildings for a total of 26 residential units. Low Impact Development (LID) techniques have been utilized to minimize impacts by drainage structures and to control and treat stormwater runoff associated with the proposed project.

According to the Natural Resources Conservation Service (N.R.C.S.) soil survey indicated the presences of Hinckley loamy sand and Merrimac Urban land complex. The soil group rates as Hydrologic Group A.

### Pre-Development

The site currently consist two single family dwelling, one located in the western portion of the site and one in the eastern portion. The lot coverage is comprised of mostly open lawn areas with impervious surfaces and minimal wooded areas along the edges of the property. The site generally slopes from the west to the east, towards Great Road. Runoff leaves the site in four locations; to the west towards Great Road (Subcatchment 1), to the north (Subcatchment 2), to an isolated wetland pocket to the north (Subcatchment 3), and to the south ( Subcatchments 4 & 5 combined).

### Post-Development

The project proposes twenty-six residential units with a single driveway running up the middle of the site from Great Road. Runoff from Subcatchments 1A through 3A is controlled and treated. Runoff from subcatchments 1 through 3 is uncontrolled. Runoff from Subcatchment 1A and 2A is captured by deep sump and hooded catch basins and directed to a diversion manhole where the 1<sup>st</sup> flush volume (1" of runoff over impervious areas) is directed to a clay lined retention basin. The remaining runoff is diverted to a sub-surface infiltration bed. Runoff from Subcatchment 3A is captured by deep sump and hooded catch basins and directed to a Contech CDS Inline manhole for 1<sup>st</sup> Flush treatment and continues on to a subsurface infiltration bed for recharge. Additionally, all roof runoff will be collected and infiltrated with drywells or a drip edge. Runoff from portions of the individual unit driveways located in Subcatchment 3 will be captured by area drains and directed to an infiltration bed. The same four analysis points used in the pre-development have been used for the post-development analysis.

### Compliance with MA DEP Stormwater Management Standards

The project is a residential development with no areas subject to regulation under the Wetland Protection Act. There is an Isolated Wetland which is subject to the Acton Wetland Protection Bylaw Rules and Regulations. The Acton Board of Appeals' Rules and Regulations for Comprehensive Permits require attenuation of peak runoff rates. The

project has generally been designed to the Stormwater Management Standards. The proposed project complies with the Stormwater Management Standards as follows:

**Standard 1: No Untreated Discharges**

No untreated discharges are proposed. A combination of retention basin/proprietary separator, subsurface infiltration beds, and drywells will treat and control runoff.

**Standard 2: Peak Rate Attenuation**

The post-development peak discharge rates must not be increased from pre-development rates for the 2-year and 10-year storm events. Also, offsite flood impact from the 100-year storm must not be increased. With a combination of retention and infiltration, the peak runoff rate has been decreased as summarized in the following table. Runoff leaves the site in 4 separate locations.

**Discharge Summary Table**

	2-year Storm		10-year Storm		100-year Storm	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
To Great Rd	0.057	0.00	0.254	0.004	0.636	0.620
To the North	0.001	0.00	0.025	0.002	0.262	0.041
To Iso. Wetland	0.003	0.00	0.063	0.012	0.895	0.216
To the South	0.001	0.001	0.035	0.022	0.335	0.183
Total	0.057	0.001	0.716	0.028	1.878	1.019

**Standard 3: Stormwater Recharge**

The Comprehensive Permit regulations require that an annual hydrologic water balance be prepared and included in the drainage calculations. The recharge required from the Comprehensive Permit regulations is greater than the 0.6 inches of runoff from the increase in impervious area for NRCS Hydrologic Soil Type A as outlined in the Massachusetts Stormwater Handbook. A detailed calculation is included as part of this Stormwater Management Report indicating that annual recharge rates are balanced on the post development site with that of the pre development site.

**Standard 4: Water Quality**

Runoff will be treated to greater than 80% TSS (Total suspended solids) removal. The TSS removal will be achieved with a combination of deep sump/hooded catchbasins and infiltration beds or proprietary separator with infiltration bed combinations. Calculations showing treatment levels are attached.

**Standard 5: Land Uses with Higher Potential Pollutant Loads**

The site is will not contain "land uses with higher potential pollutant loads."

**Standard 6: Critical Areas**

The site does not discharge runoff to critical areas.

**Standard 7: Redevelopment**

While the proposed project is a mix of new development and redevelopment, stormwater management will meet the applicable requirements for new development which are more stringent than those required for redevelopment.

**Standard 8: Construction Period Controls**

Erosion controls will include siltation barriers along the limit of work, a stabilized construction entrance, erosion controls mats, and slope stabilization. All disturbed areas will be loamed and seeded. A Stormwater Pollution Prevention Plan will be prepared prior to construction in accordance with the EPA Construction General Permit under the NPDES program.

**Standard 9: Operation and Maintenance Plan**

An Operation and Maintenance Plan has been prepared and is shown on the plan set.

**Standard 10: Illicit Discharges to Drainage System**

No known Illicit Discharges exist and none are proposed.

## Design Basis

1. The rational method ( $Q=CIA$ ) was used as a basis for sizing pipes. Runoff Coefficients:  $C=0.15$  for woods,  $0.20$  for grass/landscaped areas,  $0.76$  for gravel, and  $0.90$  for impervious surfaces.
2. The 100-year storm was used for sizing pipes. Rainfall intensity values were taken from the U.S. Weather Bureau Technical Paper 40.
3. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine offsite rates of runoff.
4. The twenty-four hour rainfall, taken from N.R.C.S. publications, is 6.4 inches for the 100-year storm, 4.5 inches for the 10-year storm, and 3.1 inches for the 2-year storm event.
5. The hydrologic calculations were performed using the computer program: "Hydraflow Hydrographs 2007" by Intelisolve.
6. The soil types of the site were taken from the N.R.C.S. Soil Survey Map from [nesoil.com](http://nesoil.com).
7. Soil conditions and estimated seasonal high groundwater table were based on on-site soil evaluations.
8. The Hantoush Method was used for Mouning analysis.