

# *Storm Drainage Report*

For  
**The Victor School**  
**380 Massachusetts Ave**  
*Acton, MA*



Prepared for: The Victor School  
June 21, 2011



By: *Peter Gammie, P.E.*  
*Columbia Design Group, LLC*  
*14 Upham Avenue*  
*Boston, MA 02125*



## *INTRODUCTION*

The Victor School is located at 380 Massachusetts Avenue in Acton, Massachusetts. The proposed work includes:

- Construction of a 4,900 square foot gymnasium building addition to the existing school
- Removal of an existing shed and relocation of maintenance items into a portion of the new building addition
- Reconstruction of existing paved parking areas
- Upgrading of existing storm drainage systems and construction of underground stormwater infiltration systems.

The purpose of this report is to describe and document the pre- and post- storm drainage conditions and to demonstrate compliance with the Department of Environmental Protection (DEP) storm water regulations.

Because of a surplus of existing parking, there will be a decrease in paved parking areas. In addition, approximately 5,000 SF of existing paved parking area will be converted to building area, replacing parking lot runoff with clean roof runoff.

It will be shown that the proposed development complies with the requirements of the Stormwater Management Standards and improves existing conditions.

### Existing Drainage

The proposed work encompasses approximately 0.85 acres of an overall 9 acre parcel. The majority of the site is developed with existing school building, office building, parking, landscaping and an existing detention basin. The subject 0.85 acre area of work is largely independent of the drainage area contributing to the existing detention basin. There are no existing land uses with higher potential pollutant loads

The site borders Massachusetts Avenue to the North at around elevation 183 and slopes down toward the South to elevation 172 in its developed area and down to elevation 169 at the wetlands. Toward the west the site is bound by bordering vegetated wetlands. The project area is bound by parking and another building (the remainder of the 9 acre lot) toward the east. The site is located within the watershed of the adjacent 100-year flood zone (Elev. 171). No work is proposed in the flood plain or wetlands.

The site is serviced by public water, sewer and gas.

Work is proposed in two separate parking lots of the above mentioned 0.85 acre project area. The upper lot located at the front or north end of the site is approximately 7,600 SF and currently is serviced by a closed drainage system consisting of two catch basins. This lot is proposed to be reconstructed with minor grading and layout changes. Other than cleaning the existing catch basins, there are no proposed changes to the drainage system.

The lower parking lot, toward the rear of the site, is approximately 27,000 SF and sheetflows down, away from the existing building, toward the wetlands. There are two existing catch basins that appear to be leaching basins and do not function well. The basins appear to be clogged and are not located at low points. The bulk of stormwater runoff bypasses the existing catch basins and sheet flows to the broken edges of curbing resulting in direct runoff to the adjacent wetlands.

### Proposed Conditions

The existing *upper* parking lot will be essentially reconstructed in place in order to more clearly demark parking spaces, replace the deteriorated pavement, and provide better accommodation for ADA parking and access. Existing catch basins will be cleaned and inspected. Existing drainage patterns will be maintained.

The *lower* parking lot will be affected more than the upper lot. The lower parking area will be reconstructed by removing approximately 7,000 sf of asphalt and constructing the new building addition which includes a gymnasium and storage areas. The perimeter of the new building will be sidewalk and landscaping. Additionally, approximately 2,800 SF of paved parking area will be removed and replaced with loam and seed. Combined, there is a net decrease of 1,600 SF of impervious surfaces on site.

The new gymnasium roof runoff will be collected and piped to a proposed underground detention/retention/infiltration system along the western edge of the building. The system of PVC chambers is designed to fully contain 1" of runoff across the entire building area, approximately 425 CF, not including any exfiltration. For high volume storm events, the system will eventually become saturated and water will meet the crushed stone surface and then sheet flow toward the wetlands.

The remainder of the lower lot parking will be reconstructed with new positive drainage, curbing and catch basins. New grading, although closely matching existing grades, will direct all surface runoff to two new deep sump, hooded catch basins. The two catch basins will be connected to a proposed underground infiltration bed of 8" perforated pipes encased in crushed stone. The underground infiltration bed, not including any exfiltration, is designed to store the entire 1" of runoff with a storage volume of 1,600 CF. For high volume storm events, the system will eventually become saturated and overflow toward the west end of the system existing thru the crushed stone and rip rap discharge area. The discharge in this area is similar to existing conditions discharge except that water quality is dramatically improved thru the use of the catch basins and underground infiltration. Runoff peak flow and volume in this area will be decreased due to the infiltration system as well as the net decrease from 27,200 SF to 19,500 SF (28% decrease) of paved contributing surface.

### Soil Conditions

The site is primarily filled land due to it's developed nature. Seasonal high ground water elevation is estimated at approximately elevation 169 based on the elevation of the adjacent wetlands.

## Analysis & Calculations

For redevelopment projects DEP requires compliance with the Stormwater Management Standards to the maximum extent practicable. This project yields a net decrease in impervious surface, with a subsequent improvement to runoff quality and quantity. There is no development proposed in any previously undeveloped area.

### Design:

#### Existing

- Limited and/or poor on-site stormwater systems
- Potential for erosion and flooding on-site

#### Proposed design:

- Maintain and clean existing functioning systems
- Install new BMPs: Pretreatment with new deep sump hooded catch basins
- Decrease overall impervious area by approximately 1,600 SF
- On site storage volume of 425 CF of roof runoff
- On site storage volume of 1,600 CF of parking lot runoff.
- Implement new O & M
- Design exceeds all DEP storm water regulations

## Documenting Compliance

This Stormwater Report is submitted in compliance with the Wetlands Protection Act Regulations, 310 CMR 10.00, and or the 401 Water Quality Certification Regulations. This report was prepared under the direction of Peter Gammie, a Registered Professional Engineer (RPE) licensed to do business in the Commonwealth pursuant to MGL Chapter 112 Section 81R.

This Stormwater Report includes the computations required to document compliance with the following Standards. The required computations include the following:

- Standard 1 - Computations to show that discharge does not cause scour or erosion.
- Standard 2 - Peak Rate Attenuation.
- Standard 3 - Recharge
- Standard 4 - Required Water Quality Volume.
- Standard 5 – 6: Computations used to demonstrate compliance with Standard 4.
- Standard 7: Computations demonstrating that peak rate attenuation, recharge, and water quality treatment is provided to maximum extent practicable
- Standard 8: Computations related to sizing of erosion and sediment controls
- Standard 9: Operation And Maintenance Plan
- Standard 10: Illicit Discharges to Drainage System

REQUIRED DOCUMENTATION INCLUDING COMPUTATIONS FOR EACH  
STORMWATER STANDARD

**STANDARD 1. NO UNTREATED DISCHARGES OR EROSION TO WETLANDS**

There are no new untreated discharges. Roof runoff is directed into the infiltration system located under the new sidewalk. Parking lot runoff is collected in catch basins and directed to a bed of underground 8" perforated pipes in crushed stone. Both systems are designed to contain the 1" storm for both water quality and quantity control. Both systems have sheet flow overflow outlets, supplemented with rip rap as needed to prevent erosion.

**STANDARD 2. PEAK RATE ATTENUATION**

Because the project will yield a net decrease in impervious surfaces and due to the implementation of subsurface infiltration, post-development peak discharge rates will be less than pre-development peak discharge rates.

**STANDARD 3. STORMWATER RECHARGE**

Under existing conditions, the only recharge to groundwater is the runoff leaving the parking lot by topping the existing broken up curbing at the lower end of the site, adjacent to the wetlands, and running overland. Under proposed conditions, both the reduction in impervious areas and the infiltration of the roof runoff and the parking lot runoff (downstream of the new catch basins for pretreatment) constitutes an increase in the annual recharge to groundwater and an improvement over existing conditions.

Impervious Area: (Areas based on area of proposed work only)

Existing surfaces:	34,200	SF Pavement
	<u>600</u>	SF Walkways
	34,800	SF Total
Proposed Surfaces:	25,650	SF Pavement
	4,900	SF Building Area
	<u>2,670</u>	SF Walkways
	33,220	SF Total

The proposed development decreases impervious surfaces by 1,580 SF. No recharge is required, however subsurface infiltration is proposed as follows.

Existing Soils Evaluation

An evaluation has been undertaken to classify the Hydrologic Soil Groups (HSG) soils on site using classification methodologies developed by U.S. Natural Resources Conservation Service (NRCS). See accompanying figure/map and soils descriptions. The surrounding soils are classified as Udorthents, closely aligned with HSG C for Silty Loam. For calculating required *recharge volume*, the target depth factor for silty loam is 0.25 inches. For calculating *drawdown*, the associated Rawls rate is 0.27 inches per hour.

Required Recharge Volume

$$Rv = F \times \text{impervious area}$$

*Rv* = Required Recharge Volume, expressed in Ft<sup>3</sup>, cubic yards, or acre-feet

*F* = Target Depth Factor associated with each Hydrologic Soil Group

*Impervious Area* = pavement and rooftop area on site

$$Rv = 0.25 \times 33,220/12 = \underline{692 \text{ CF}} \quad \text{Required Recharge}$$

NRCS HYDROLOGIC SOIL TYPE	APPROX. SOIL TEXTURE	TARGET DEPTH FACTOR (F)
A	sand	0.6-inch
B	loam	0.35-inch
C	silty loam	0.25-inch
D	clay	0.1-inch

*Recharge Target Depth by Hydrologic Soil Group*

*Evaluate Where Recharge Is Directed*

The infiltration BMP will **not** alter a Wetland Resource Area or cause changes to the hydrologic regime. Water budgeting analysis is not required, since the recharge is directed to the same subwatershed where the impervious surfaces are proposed.

Proposed Recharge Volume

The proposed recharge volume, based solely on the volume of underground infiltration system storage and not accounting for any exfiltration, is the sum of the PVC chambers for the roof runoff and the 8” perforated pipe system for the parking lot:

Roof runoff, PVC Chambers:	425 CF	
Parking lot, 8” perforated pipes:	<u>1,600 CF</u>	
Total	<u>2,025 CF</u>	<b>Proposed Recharge</b>

The proposed recharge volume is greater than the required recharge volume.

Drawdown within 72 hours

To determine the systems ability to drawdown within 72 hours, we are using an infiltration rate of 0.27 in/hr (Rawls Rates) and the storage volume of each system:

For infiltration BMPs using the "Static" method, the following formula is used:

PVC Chambers:

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)} = \frac{425}{(0.27)(280)} = \frac{425CF}{(0.27in.hr)(1ft/12in)(280SF)} = 70hrs$$

8" Perforated Pipe System:

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)} = \frac{1,600}{(0.27)(1,200)} = \frac{1,600\ CF}{(0.27\ in/hr)(1ft/12\ in)(1200\ SF)} = 59hrs$$

Where:

*Rv* = Storage Volume

*K* = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). Bottom Area = Bottom Area of Recharge Structure<sup>1</sup>

Both systems will drain down in less than the required 72 hour maximum.

**Table 2.3.3. 1982 Rawls Rates**

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

**STANDARD 4. WATER QUALITY**

The upper parking lot is serviced by two existing catch basins. These basins will be cleaned and inspected and any necessary repairs will be implemented. Under existing conditions the lower lot stormwater runoff largely runs directly off the pavement into the adjacent wetlands with little to no water quality control. The stormwater runoff from the lower parking lot will be substantially increased in quality due to the conversion of 4,900 SF from parking area to roof area. The portion that will remain as parking will be enhanced with a new BMP consisting of two new deep sump hood catch basins draining to underground infiltration.

**WATER QUALITY TREATMENT VOLUME – Lower Parking**

$$V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} * 17,000 \text{ square feet/acre})$$

- $V_{WQ}$  = Required Water Quality Volume (in cubic feet)
- $D_{WQ}$  = Water Quality Depth: 1/2-inch
- $A_{IMP}$  = Impervious Area (in acres)

$$V_{WQ} = (0.5/12 \text{ inches/foot}) * (17,000 \text{ SF}) = \underline{708 \text{ CF}}$$

Location:

	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
<b>TSS Removal Calculation Worksheet</b>	Street Sweeping - 10%	0.10	1.00	0.10	0.90
	Deep Sump and Hooded Catch Basin	0.25	0.90	0.23	0.68
	Infiltration Trench	0.80	0.68	0.54	0.14
		0.00	0.14	0.00	0.14
		0.00	0.14	0.00	0.14

**Total TSS Removal =**

*Separate Form Needs to be Completed for Each Outlet or BMP Train*

Project:   
 Prepared By:   
 Date:

\*Equals remaining load from previous BMP (E) which enters the BMP

The proposed infiltration storage is **2,025 CF**, greater than the amount required.

Based on the pretreatment provided by street sweeping, catch basins and the infiltration, the proposed TSS removal is 87%.

**STANDARD 5. LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS**

This site does not conform to LUHPPL

**STANDARD 6. CRITICAL AREAS**

Standard 6 does **not** apply to this site as it does not discharge within Zone II, Interim Wellhead Protection Areas or near or to other Critical Areas: Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, and Cold-Water Fisheries .

**STANDARD 7. REDEVELOPMENT**

This is is 100% redevelopment and the proposed design meets The proposed development complies with the requirements of the Stormwater Management Standards and improves existing conditions.

**STANDARD 8. CONSTRUCTION PERIOD CONTROLS**

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

Hay bales with silt fence or the Siltsock equivalent will be placed on the down gradient side of the project, limiting any erosion and sediment from exiting the construction site. Proposed infiltration systems will be protected from site runoff until landscaped areas are fully established. Denuded surfaces will be stabilized as quickly as possible.

**STANDARD 9. OPERATION AND MAINTENANCE PLAN**

A stormwater operation and maintenance plan is included in Appendix A.

**STANDARD 10. ILLICIT DISCHARGES TO DRAINAGE SYSTEM**

There are no known illicit discharges to the stormwater management system. Based on the site conditions it is unlikely that any existing illicit discharges would go unnoticed.

## Appendix 'A'

*STORMWATER OPERATION AND MAINTENANCE PLAN/Long Term Pollution Prevention Plan  
for  
380 Massachusetts Avenue, Acton, MA  
Redevelopment*

Submitted by:  
Victor School

### *Introduction*

The following Stormwater Operation and Maintenance Plan for the owner and operator of the installed stormwater management system. The proposed stormwater management system includes deep sump catch basins with hoods and subsurface infiltration systems. These structures require maintenance and attention to maintain their optimum levels of service for treating stormwater flow on-site.

The pretreatment, storage, infiltration, and overflow components of the subsurface stormwater management system will provide the necessary levels of sediment and floatable pollutant removal to improve stormwater quality. This plan provides source reduction methods, schedules and procedures to minimize pollutant risks and maintain the desired operation level of the system, both during construction and post-development.

### *Basic Information*

**Property Owner:**

The Victor School

**Responsible Party:**

Current owners until such time as a property management company is retained to manage the property

### *Operation & Maintenance:*

After construction of the proposed facility and parking areas, the stormwater maintenance system will be inspected by the Owner or assigned Management Company on a semiannual basis. Maintenance tasks will be performed in the Spring and Fall of each year. Additional inspections of the system is required after significant rainstorm events of 2.0 inches of rain or greater, unless otherwise noted.

#### *Structural Approaches:*

**Inspections** - All drainage structure covers shall be removed semiannually and inspected for trash, debris and sediment. The inspector shall note the date of the inspection along with the condition of the structure and amount of trash, debris and/or sediment. Based upon the observed condition, the inspector shall make recommendations based on previously approved criteria for the cleaning of the structure

**Structure Cleaning** – The land owner shall remove sand, silt and debris from the hooded catch basins, and use the inspection ports to check underground infiltration systems. The land owner shall be careful not to damage the structures so as not to impact the effectiveness of the structures.

**Threshold Criteria\***

Catch Basins

½ the storage below the invert.

(\*Note: Land Owner to clean all structures if up to two structures require cleaning.)

*Non-Structural Approaches:*

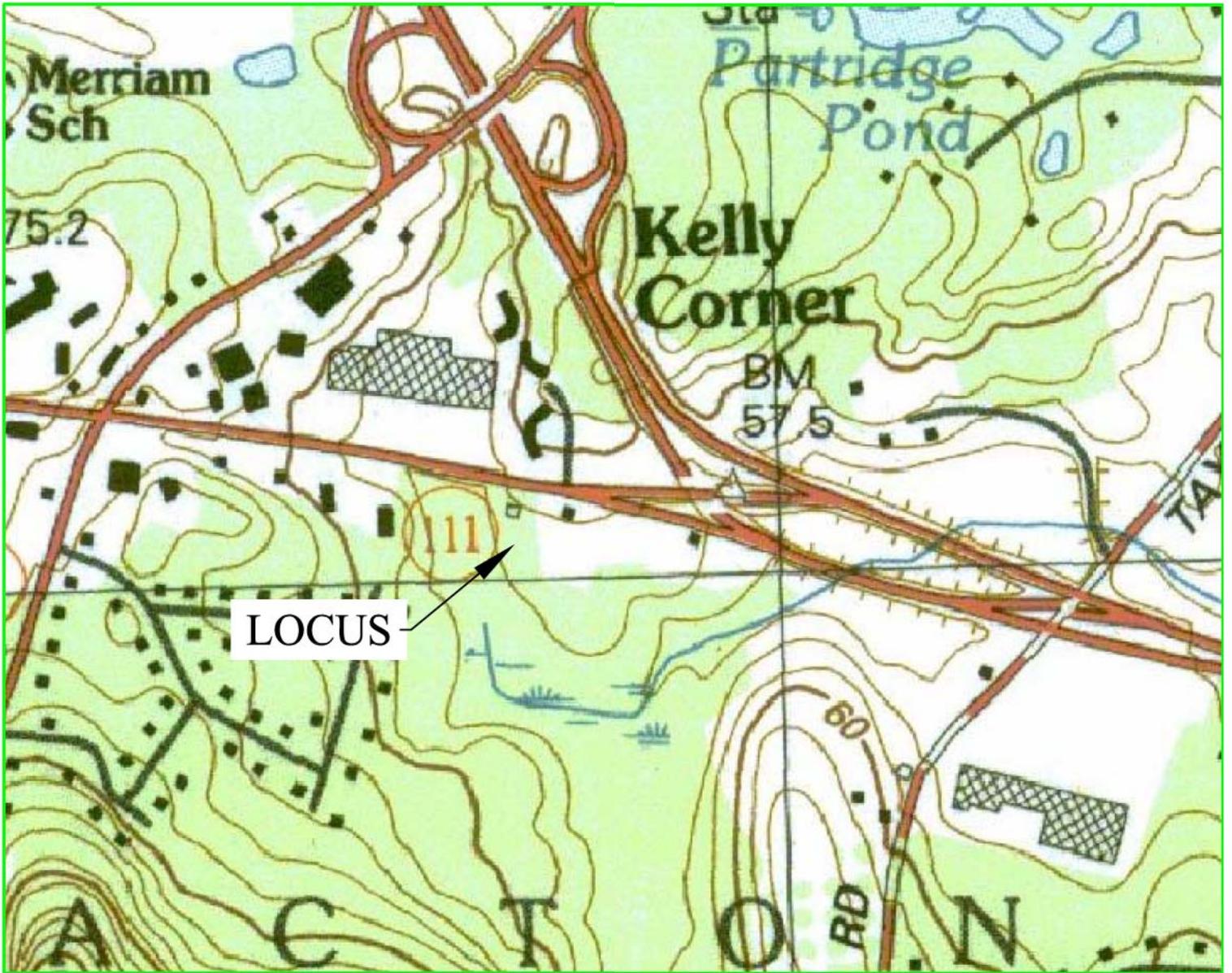
**Sweeping** – The land owner shall sweep project area a minimum of four times per year, and after major storm events. The owner shall take care in disposing of the sweepings off-site and in a legal manner.

**Snow Storage** - Proper snow management practices will be implemented to minimize shock and pollutant loading impacts. Plowed snow will be placed in surplus parking stalls where it can slowly melt into the catch basins without picking up additional pollutants. If snow removal is required, a licensed operator shall dispose of snow in accordance with local and state regulations.

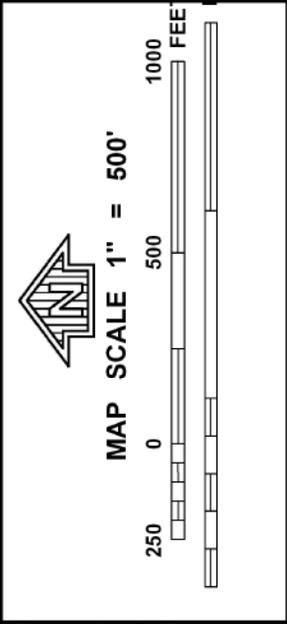
**Illicit Discharges** Property Management acknowledges that other than roof runoff and parking lot/landscaping runoff from rain/storm events, no other discharges are permitted to drain to the catch basins or underground infiltration systems. Yearly inspections will be made to assure no illicit connections exist.

*Appendix 'B'*

*Figures C1 thru C7*



C-1	USGS		COLUMBIA DESIGN GROUP, LLC
	380 Mass. Ave Acton, Ma	Date: 6/15/11	14 Upham Avenue, Boston, MA 02125 ph [617] 506 1474



**NFIP** NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0352E

**FIRM**  
FLOOD INSURANCE RATE MAP  
MIDDLESEX COUNTY,  
MASSACHUSETTS  
(ALL JURISDICTIONS)

PANEL 352 OF 656  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:  
COMMUNITY: ACTON, TOWN-OF  
NUMBER: 250176  
PREFIX: 0352  
SUFFIX: E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
25017C0352E

**EFFECTIVE DATE**  
JUNE 4, 2010

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

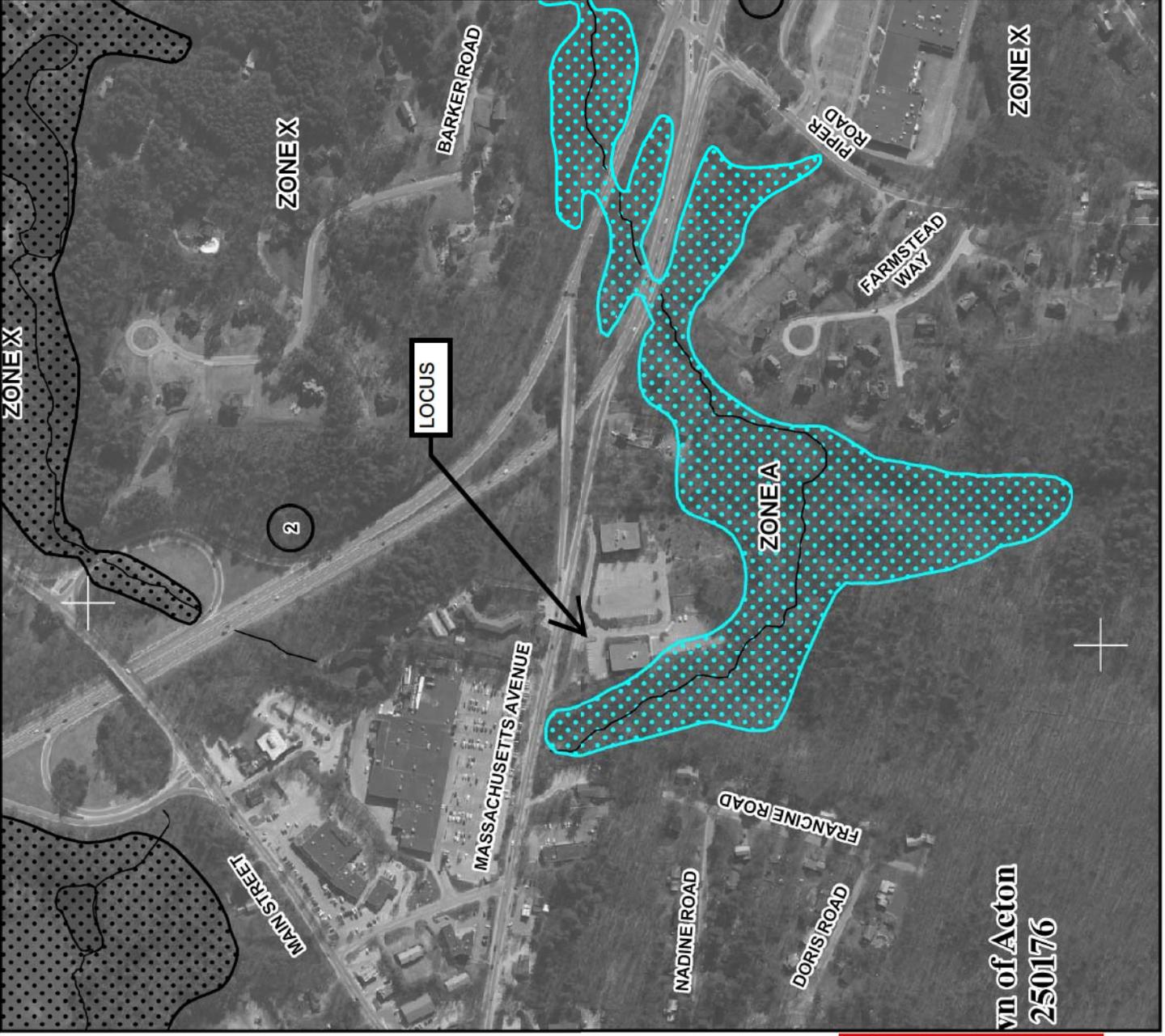


Figure C-2 FEMA Map



**TOWN OF ACTON**  
472 Main Street  
Acton, Massachusetts, 01720  
Telephone (978) 264-9636  
Fax (978) 264-9630

**Planning Department**

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September 9, 2008

Mr. Peter Gammie, P.E.  
Columbia Design Group  
14 Upham Avenue  
Boston, MA 02125

RE: Flood Plain Boundary  
380 Massachusetts Avenue

Dear Mr. Gammie:

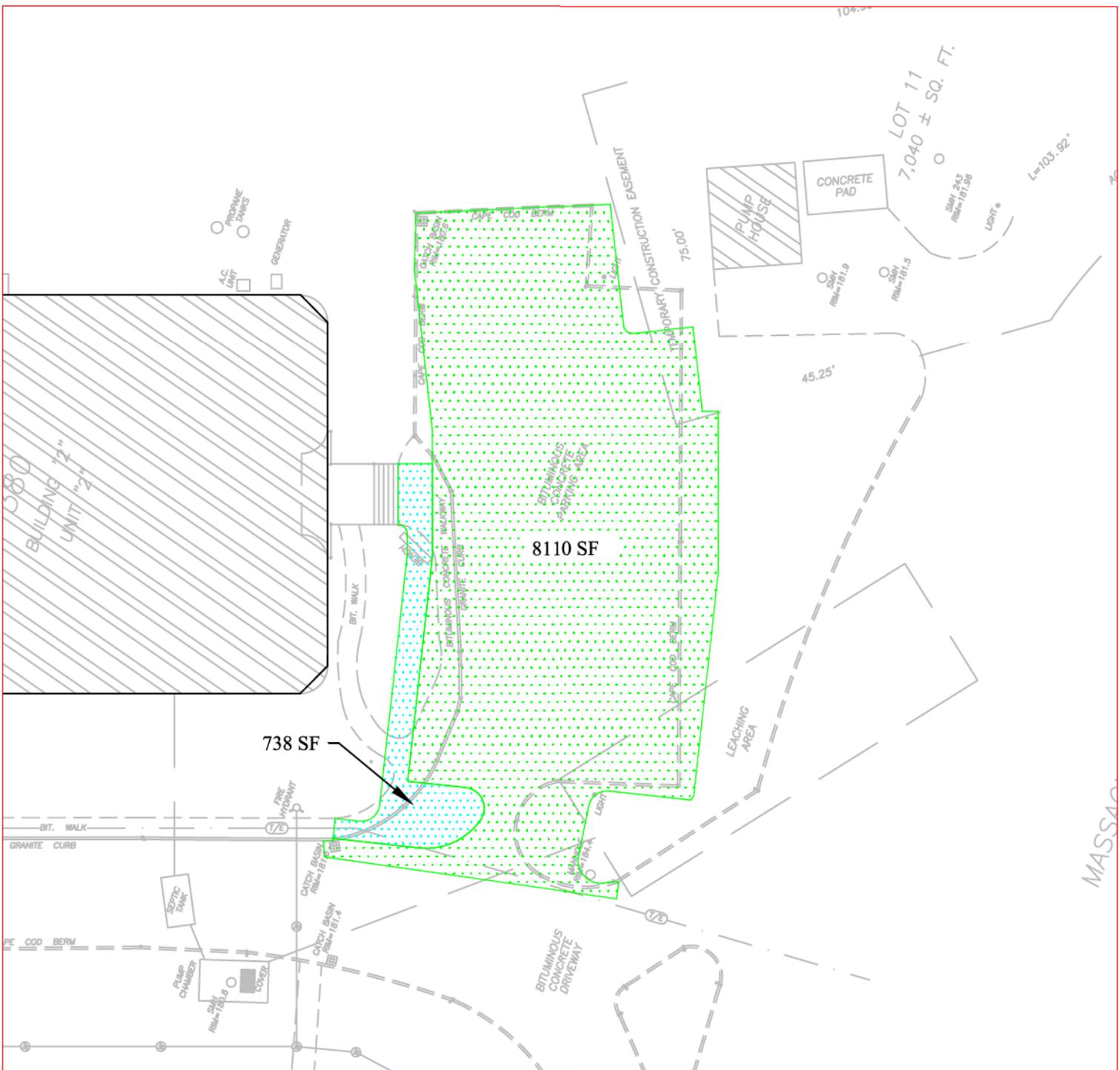
The Planning and Engineering Departments have completed review of your proposed flood plain elevation for the above referenced address. This letter shall act as confirmation, that after reviewing the Town of Acton's Flood Data, the 171 contour line elevation as proposed, is an acceptable flood plain elevation for the subject site.

Should you have any further comments, questions, or concerns regarding this or any other matter, please do not hesitate to contact us immediately.

Sincerely,

Scott A. Mutch  
Assistant Town Planner

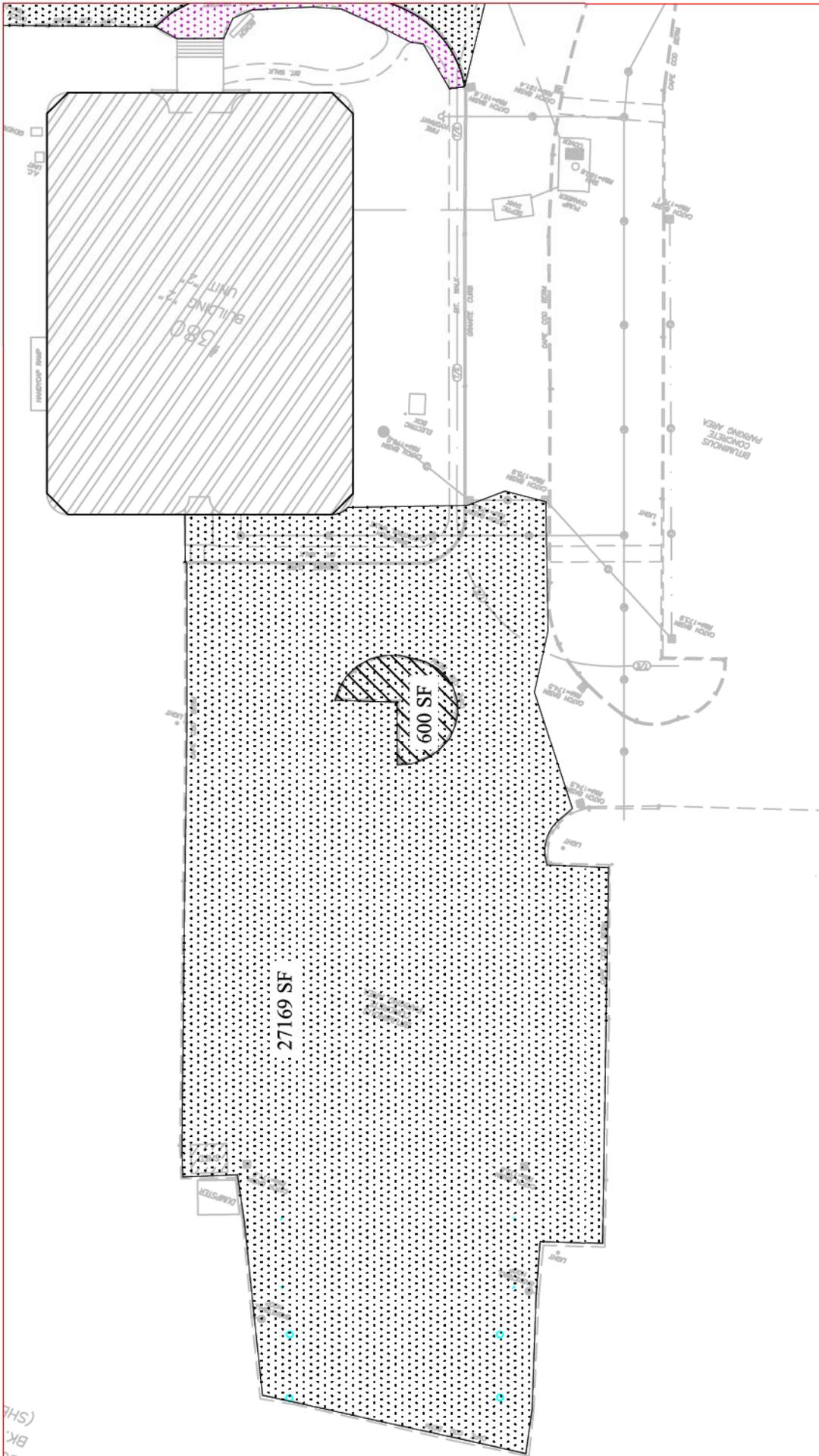




EXIST. vs PROP. AREAS	
PROP. IMPERVIOUS	
WALKWAY:	738 SF
PARKING:	8110 SF
<b>TOTAL:</b>	<b>8848 SF</b>

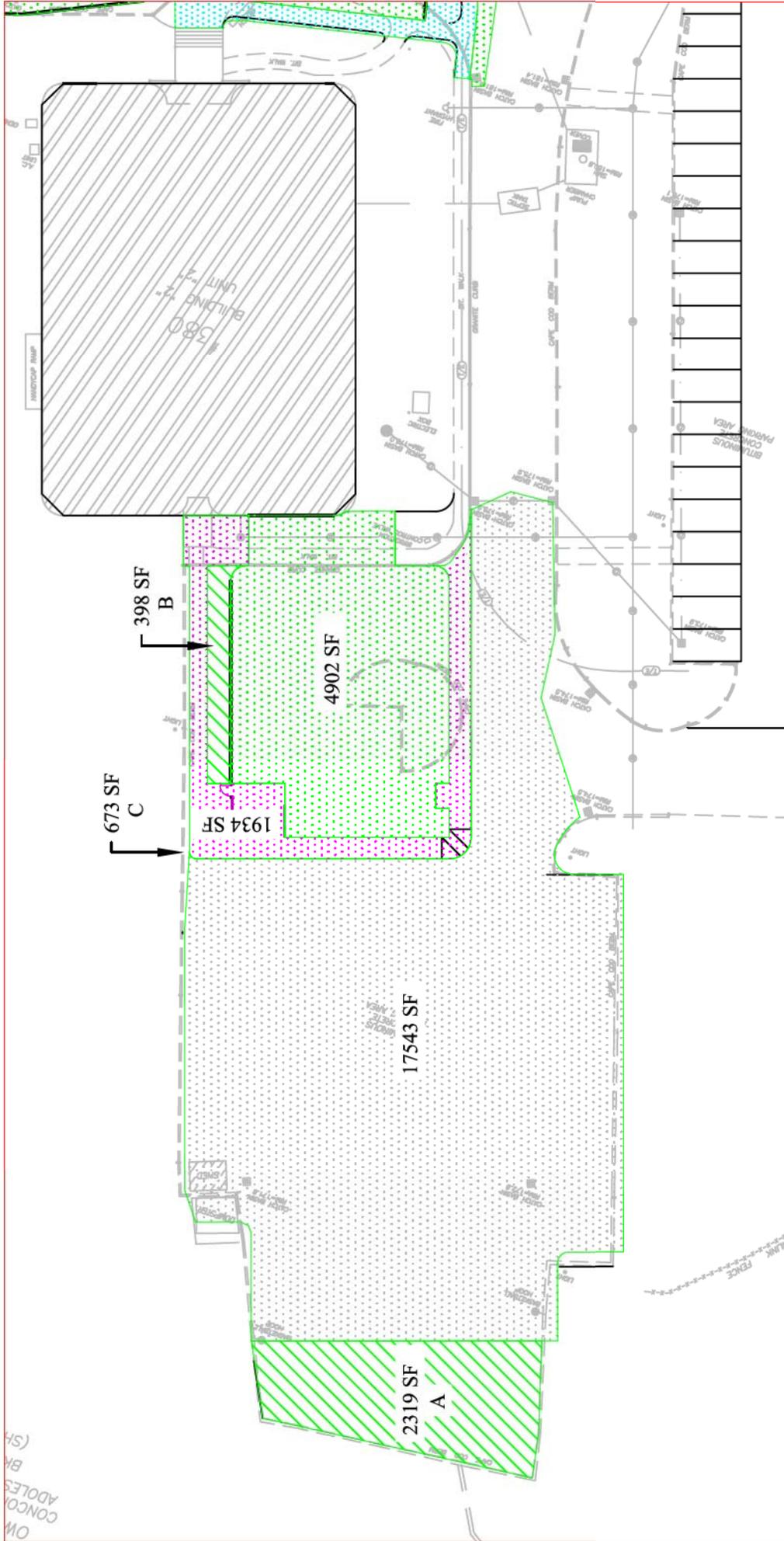
<b>C-4</b>	Prop. Impervious Areas -Upper	Scale: 1=30'	<b>COLUMBIA DESIGN GROUP, LLC</b> 14 Upham Avenue, Boston, MA 02125 ph [617] 506 1474
	380 Mass. Ave Acton, Ma	Date: 6/21/11	

CONCRETE ADDRESS BK. (SH)



IMPERV. vs PERV. AREAS	
EXIST. IMPERVIOUS	
PARKING: 27169 SF	
EXIST. PERVIOUS	
GRASS AREA: 600 SF	

C-5	Existing Drainage Areas- Lower	Scale: 1"=40'	COLUMBIA DESIGN GROUP, LLC
	380 Mass. Ave Acton, Ma	Date: 6/21/11	14 Upham Avenue, Boston, MA 02125 ph [617] 506 1474



**IMPERV. vs PERV. AREAS**

<b>PROP. IMPERVIOUS</b>	
PARKING:	17543 SF
BUILDING:	4902 SF
WALKWAY:	1934 SF
<b>TOTAL:</b>	<b>24379 SF</b>
<b>PROP. PERVIOUS</b>	
GRASS AREA 'A':	2319 SF
GRASS AREA 'B':	398 SF
GRASS AREA 'C':	673 SF
<b>TOTAL:</b>	<b>3390 SF</b>

<b>C-6</b>	<b>Prop. Drainage Areas - Lower</b>	<b>Scale: 1"=40'</b>	<b>COLUMBIA DESIGN GROUP, LLC</b>
	<b>380 Mass. Ave Acton, Ma</b>	<b>Date: 6/21/11</b>	<b>14 Upham Avenue, Boston, MA 02125 ph [617] 506 1474</b>

Soil Map—Middlesex County, Massachusetts  
(380 Mass Ave, Acton, MA)



Soil Map—Middlesex County, Massachusetts  
(380 Mass Ave, Acton, MA)

**MAP LEGEND**

**Area of Interest (AOI)**  
 Area of Interest (AOI)

**Soils**  
 Soil Map Units

- Special Point Features**
-  Blowout
  -  Borrow Pit
  -  Clay Spot
  -  Closed Depression
  -  Gravel Pit
  -  Gravelly Spot
  -  Landfill
  -  Lava Flow
  -  Marsh or swamp
  -  Mine or Quarry
  -  Miscellaneous Water
  -  Perennial Water
  -  Rock Outcrop
  -  Saline Spot
  -  Sandy Spot
  -  Severely Eroded Spot
  -  Sinkhole
  -  Slide or Slip
  -  Sodic Spot
  -  Spoil Area
  -  Stony Spot

-  Very Stony Spot
-  Wet Spot
-  Other

- Special Line Features**
-  Gully
  -  Short Steep Slope
  -  Other

- Political Features**
-  Cities

- Water Features**
-  Oceans
  -  Streams and Canals

- Transportation**
-  Rails
  -  Interstate Highways
  -  US Routes
  -  Major Roads
  -  Local Roads

**MAP INFORMATION**

Map Scale: 1:4,850 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:25,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts  
 Survey Area Data: Version 12, Feb 26, 2010

Date(s) aerial images were photographed: 7/28/2003; 8/14/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	7.5	8.6%
73B	Whitman fine sandy loam, 0 to 5 percent slopes, extremely stony	4.5	5.2%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	1.2	1.4%
307B	Paxton fine sandy loam, 3 to 8 percent slopes, extremely stony	0.4	0.4%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	3.2	3.7%
312B	Woodbridge fine sandy loam, 3 to 8 percent slopes, extremely stony	3.7	4.2%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	5.6	6.5%
416C	Narragansett silt loam, 8 to 15 percent slopes, very stony	7.3	8.5%
623C	Woodbridge-Urban land complex, 3 to 15 percent slopes	15.0	17.4%
656	Udorthents-Urban land complex	38.0	44.0%
<b>Totals for Area of Interest</b>		<b>86.3</b>	<b>100.0%</b>

## Middlesex County, Massachusetts

### 656—Udorthents-Urban land complex

#### Map Unit Setting

*Elevation:* 0 to 3,000 feet

*Mean annual precipitation:* 32 to 54 inches

*Mean annual air temperature:* 43 to 54 degrees F

*Frost-free period:* 110 to 240 days

#### Map Unit Composition

*Urban land:* 40 percent

*Udorthents and similar soils:* 40 percent

*Minor components:* 20 percent

#### Description of Urban Land

##### Setting

*Landform position (two-dimensional):* Footslope

*Landform position (three-dimensional):* Base slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Excavated and filled land

#### Description of Udorthents

##### Setting

*Parent material:* Loamy alluvium and/or sandy glaciofluvial deposits  
and/or loamy glaciolacustrine deposits and/or loamy marine  
deposits and/or loamy basal till and/or loamy lodgment till

##### Properties and qualities

*Slope:* 0 to 15 percent

*Depth to restrictive feature:* More than 80 inches

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

#### Minor Components

##### Canton

*Percent of map unit:* 10 percent

*Landform:* Hills

*Landform position (two-dimensional):* Backslope, toeslope

*Landform position (three-dimensional):* Side slope, base slope

*Down-slope shape:* Linear

*Across-slope shape:* Convex

##### Merrimac

*Percent of map unit:* 5 percent

*Landform:* Plains, terraces

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Tread, rise

*Down-slope shape:* Convex

*Across-slope shape:* Convex

**Paxton**

*Percent of map unit:* 5 percent

*Landform:* Hillslopes

*Landform position (two-dimensional):* Backslope, summit

*Landform position (three-dimensional):* Head slope, side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

## Data Source Information

Soil Survey Area: Middlesex County, Massachusetts

Survey Area Data: Version 12, Feb 26, 2010

*Appendix 'C'*

*DEP Checklist for Stormwater Report*



# Checklist for Stormwater Report

## A. Introduction

**Important:**  
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



# Checklist for Stormwater Report

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## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

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### Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

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Signature and Date

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### Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
  - Credit 1
  - Credit 2
  - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): \_\_\_\_\_

### Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - Static
  - Simple Dynamic
  - Dynamic Field<sup>1</sup>
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - is within the Zone II or Interim Wellhead Protection Area
    - is near or to other critical areas
    - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - involves runoff from land uses with higher potential pollutant loads.
  - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
  - The ½" or 1" Water Quality Volume or
  - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted *prior to* the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does *not* cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - Limited Project
  - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - Bike Path and/or Foot Path
  - Redevelopment Project
  - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has *not* been included in the Stormwater Report but will be submitted *before* land disturbance begins.
- The project is *not* covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - Name of the stormwater management system owners;
  - Party responsible for operation and maintenance;
  - Schedule for implementation of routine and non-routine maintenance tasks;
  - Plan showing the location of all stormwater BMPs maintenance access areas;
  - Description and delineation of public safety features;
  - Estimated operation and maintenance budget; and
  - Operation and Maintenance Log Form.
- The responsible party is *not* the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted *prior to* the discharge of any stormwater to post-construction BMPs.