ENVIRONMENTAL NOTIFICATION FORM

Pompositticut/Center Elementary School

403 Great Road
Stow, MA 01775

APPLICANT

Stow Elementary School Building Committee
c/o William Wrigley, Town Administrator
380 Great Road
Stow, MA 01775

PREPARED BY

SMMA
Symmes Maini & McKee Associates
Cambridge, Massachusetts

MARCH 2010

SMMA NO. 09020.00

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SECTION 1 ENF APPLICATION

Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs

■ MEPA Office

ENF Environmental Notification Form

For Office Use Only *Executive Office of Energy & Environmental Affairs*
EEA No.: MEPA Analyst: Phone: 617-626-

The information requested on this form must be completed to begin MEPA Review in accordance with the provisions of the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: **Pompositticut/Center Elementary School**		
Street: **403 Great Road Stow, MA 01775**		
Municipality: **Stow**	Watershed: **Sudbury-Assabet-Concord**	
Universal Tranverse Mercator Coordinates: **E 293665.1 N 4701371.4**	Latitude: **N 42 26 14** Longitude: **W 71 30 31**	
Estimated commencement date: **June 2010**	Estimated completion date: **October 2012**	
Approximate cost: **$38 M**	Status of project design: **80 % complete**	
Proponent: **Stow Elementary School Building Committee**		
Street: **380 Great Road**		
Municipality: **Stow**	State: **MA**	Zip Code: **01775**
Name of Contact Person From Whom Copies of this ENF May Be Obtained: **James Warren**		
Firm/Agency: **Symmes, Maini & McKee Associates**	Street: **1000 Massachusetts Avenue**	
Municipality: **Cambridge**	State: **MA**	Zip Code: **02138**
Phone: **(617) 520-9253**	Fax: **(617) 354-5758**	E-mail: **jwarren@smma.com**

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☐Yes ☒No

Has this project been filed with MEPA before?
☐Yes (EOEA No._____) ☒No

Has any project on this site been filed with MEPA before?
☐Yes (EOEA No._____) ☒No

Is this an Expanded ENF (see 301 CMR 11.05(7)) requesting:

a Single EIR? (see 301 CMR 11.06(8))	☐Yes	☒No
a Special Review Procedure? (see 301CMR 11.09)	☐Yes	☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11)	☐Yes	☒No
a Phase I Waiver? (see 301 CMR 11.11)	☐Yes	☒No

Identify any financial assistance or land transfer from an agency of the Commonwealth, including the agency name and the amount of funding or land area (in acres): **The Project will receive funding of approximately $18M from the Massachusetts School Building Authority.**

Are you requesting coordinated review with any other federal, state, regional, or local agency?
☐Yes(Specify_____) ☒No

List Local or Federal Permits and Approvals: **Stow Conservation Commission-Order of Conditions, Stow Planning Board-Site Plan Approval/Special Permits, Stow Board of Appeals-Variances, NPDES Permit for Construction Activities, Stow Board of Health Disposal Works Construction Permit and Variance, BWRP New Source Approval.**

Which ENF or EIR review threshold(s) does the project meet or exceed (see 301 CMR 11.03):

- ☐ Land
- ☐ Water
- ☐ Energy
- ☐ ACEC
- ☐ Rare Species
- ☒ Wastewater
- ☐ Air
- ☐ Regulations
- ☐ Wetlands, Waterways, & Tidelands
- ☐ Transportation
- ☐ Solid & Hazardous Waste
- ☐ Historical & Archaeological Resources

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	17		
New acres of land altered		2.5	
Acres of impervious area	2.2	+2.6	4.6
Square feet of new bordering vegetated wetlands alteration		0	
Square feet of new other wetland alteration		0	
Acres of new non-water dependent use of tidelands or waterways		0	
STRUCTURES			
Gross square footage	27,482	+ 70,548	98,030
Number of housing units	0	0	0
Maximum height (in feet)	32' +/-	34'	34'
TRANSPORTATION			
Vehicle trips per day	246	+214	460
Parking spaces	40	+60	100
WATER/WASTEWATER			
Gallons/day (GPD) of water use	2,184 (permitted)	+5,170	6,320
GPD water withdrawal	2,184 (permitted)	+5,170	6,320
GPD wastewater generation/ treatment	2,400* *Title V Design Flow	+3,920	6,320* *Title V Design Flow
Length of water/sewer mains (in miles)	0.01	+0.41	0.42

State Permits & Approvals

- ☒ Order of Conditions
- ☐ Superseding Order of Conditions
- ☐ Chapter 91 License
- ☐ 401 Water Quality Certification
- ☐ MHD or MDC Access Permit
- ☐ Water Management Act Permit
- ☒ New Source Approval
- ☐ DEP or MWRA Sewer Connection/ Extension Permit
- ☐ Other Permits (*including Legislative Approvals*) – Specify:

CONSERVATION LAND: Will the project involve the conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97?

☐Yes (Specify_____) ☒No

Will it involve the release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction?

☐Yes (Specify_____) ☒No

RARE SPECIES: Does the project site include Estimated Habitat of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities?

☐Yes (Specify_____) ☒No

HISTORICAL /ARCHAEOLOGICAL RESOURCES: Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☒Yes (Specify: **The Stone Building (Larsen Apple Barn) is included on the State Inventory of Historic Assets with a property name of Center School Grounds (Inventory No. STW 180).**) ☐No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources?

☒Yes (Specify: **Demolition of the Stone Building. However the MHC determined that due to the historic alterations of the structure and its setting within the school site that it does not meet the criteria of eligibility for listing in the National Register (See Appendix 1)** ☐No

AREAS OF CRITICAL ENVIRONMENTAL CONCERN: Is the project in or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify_____) ☒No

PROJECT DESCRIPTION: The project description should include **(a)** a description of the project site, **(b)** a description of both on-site and off-site alternatives and the impacts associated with each alternative, and **(c)** potential on-site and off-site mitigation measures for each alternative (*You may attach one additional page, if necessary.*)

a) **The project site is located at 403 Great Road and site measures approximately 15 acres. It is bordered to the south and west by residential properties, to the east by the Town of Stow Fire Department and to the north by the Hale Middle School. The Project includes development of approximately 2 acres of the Stow Fire Department property to the east, adjacent to Hartley Road. The site consists of the existing school, multiple accessory buildings, two multi-purpose ballfields, a playground and two tennis courts. A perimeter wetland is located along the north and west edges of the site. The Fire Department land consists, primarily, of undeveloped wooded upland and was formally turned over to the school department for the Project. Utilities serving the building include a water supply well, located in the basement of the school, a subsurface wastewater disposal system and natural gas and electricity served from Great Road**

b) **The Project consists of partial demolition of the existing Center School and construction of a new 70,548 gsf addition to combine the educational programs of the Pompositticut Elementary School (grades K-2), the Center Elementary School, (grades 3-5) and the Stow Pre-K program into a single facility at the Center School site. The addition will consist of a 2-story classroom wing and single-story, high bay community spaces that include a gymnasium, cafeteria, mechanical and administration spaces. The remaining portion of the existing Center School (approximately 27,482 gsf) will be renovated and will house the kindergarten and Pre-K programs. In total the new school will be approximately 98,030 gsf. Site improvements include parking for 100 vehicles, a new multi-purpose ballfield, two playground areas, a dedicated fire lane and detailed landscaping improvements. Site utilities include a new water supply well, new wastewater disposal system and substantial stormwater management improvements.**

Project alternatives included multiple options for placement and location of the combined elementary school program. Alternatives included new construction, renovation & addition and multiple combinations at both the Center School site and the Pompositticut School site. Alternatives that were considered include:

1. **New Center School for Grades 2nd to 5th; Renovated Pompositticut School for Grades Pre-K to 1st.**
2. **New Center School for Grades Pre-K to 5th; Decommission Pompositticut School.**
3. **Addition & Renovation to Center School for Grades 2nd to 5th; Renovate**

Pompositticut School for Grades Pre-K to 1st.

4. Addition & Renovation to Center School for Grades Pre-K to 5th; Decommission Pompositticut School.

Based on land disturbance, site circulation, available playfields, construction phasing, school operations, and construction costs the Fourth Alternative was selected.

c) On-site mitigation for the Project will include detailed improvements to the stormwater management system, construction of a new water supply well and construction of new wastewater disposal system that includes enhanced nitrogen removal. No off-site mitigation is required to support the Project.

As noted above alternatives to the Project were considered including the potential on-site and off-site mitigation required for each. Significant mitigation would be required due to the lack of available land area to support the educational and site program of the Project

The Project requires the preparation of an Environmental Notification Form because the Town will receive funding assistance from the Massachusetts School Building Authority and exceeds the following threshold:

301 CMR 11.03 (5)(b) 4.c.IV. – Discharge to groundwater of any amount of sewage requiring approval by the Department of Environmental Protection of a variance from the Title V of the State Environmental Code for New Construction.

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1)
___ Yes **X** No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings	**0.9**	**+1.0**	**1.9**
Roadways, parking, and other paved areas	**1.3**	**+1.6**	**2.9**
Other altered areas (describe)*			
**Lawn, ballfields & playgrounds*	**7.8**	**0.0**	**7.8**
Undeveloped areas	**7.0**	**-2.6**	**4.4**

B. Has any part of the project site been in active agricultural use in the last three years?
___ Yes **X** No; if yes, how many acres of land in agricultural use (with agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use?
___ Yes **X** No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a DEM-approved forest management plan:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes **X** No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction? ___ Yes **X** No; if yes, does the project involve the release or modification of such restriction? ___ Yes ___ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes **X** No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ No **X** ; if yes, describe:

H. Describe the project's stormwater impacts and, if applicable, measures that the project will take to comply with the standards found in DEP's Stormwater Management Policy: **The Project will result in a significant improvement over existing conditions. The Project will meet or exceed the 10 Standards of the DEP Stormwater Policy be implementing the following BMP's: Deep sump catch basins, water quality units (Stormceptor® or equal) and groundwater infiltration areas. The Project will also mitigate the proposed increase in stormwater runoff peak and *volume* as required by the Stow Zoning ByLaw Requirements.**

I. Is the project site currently being regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? Yes___ No **X** ; if yes, what is the Release Tracking Number (RTN)?

J. If the project is site is within the Chicopee or Nashua watershed, is it within the Quabbin, Ware, or
Wachusett subwatershed? ___ Yes **X** No; if yes, is the project site subject to regulation under the Watershed Protection Act? ___ Yes ___ No

K. Describe the project's other impacts on land: **None**

III.. Consistency

A. Identify the current municipal comprehensive land use plan and the open space plan and describe the consistency of the project and its impacts with that plan(s): **The Town of Stow Master Plan includes land use and open space policies. The proposed addition & renovation of the existing school for reuse as a new school is consistent with the policies of the Master Plan.**

B. Identify the current Regional Policy Plan of the applicable Regional Planning Agency and describe the consistency of the project and its impacts with that plan: **The regional planning agency for Stow is the Metropolitan Area Planning Council (MAPC). The current Regional Policy Plan is MetroFuture. MetroFuture includes the following goals; Sustainable Growth, Housing Choices, Healthy Communities, Regional Prosperity, Transportation Choices and Healthy Environment. The Project will contribute to these goals by improving educational opportunities, increasing community use/spaces, and by protecting the environment through significant stormwater, wastewater and drinking water improvements.**

C. Will the project require any approvals under the local zoning by-law or ordinance (i.e. text or map amendment, special permit, or variance)? Yes **X** No___ ; if yes, describe:
The Project will require the following local approvals: Special Permits (Erosion Control & Lighting; Variances (Parking Quantity, Noise, Landscaping & Signage)

D. Will the project require local site plan or project impact review?
X Yes ___ No; if yes, describe:
Project will require Site Plan Review by the Stow Planning Board.

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **rare species or habitat**? ___ Yes **X** No

C. If you answered "No" to both questions A and B, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes ___ No. If yes,

1. Which rare species are known to occur within the Priority or Estimated Habitat (contact: Environmental Review, Natural Heritage and Endangered Species Program, Route 135, Westborough, MA 01581, allowing 30 days for receipt of information):
2. Have you surveyed the site for rare species? ___ Yes ___ No; if yes, please include the results of your survey.
3. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, describe:

C. Will the project alter "significant habitat" as designated by the Massachusetts Division of Fisheries and Wildlife in accordance with M.G.L. c.131A (see also 321 CMR 10.30)? ___ Yes ___ No; if yes, describe:

D. Describe the project's other impacts on rare species including indirect impacts (for example, stormwater runoff into a wetland known to contain rare species or lighting impacts on rare moth habitat):

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? **X** Yes ___ No; if yes, specify which permit: **Order of Conditions**

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Describe any wetland resource areas currently existing on the project site and indicate them on the site plan: **On-site resource areas include Bank (associated with an intermittent stream), Land Under Water (associated with the on-site pond), and Bordering Vegetated Wetlands. The delineated extent of the on-site resource areas are shown on the Existing Conditions Plan.**

B. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	Area (in square feet)		Length (in linear feet)
Land Under the Ocean		N/A	
Designated Port Areas		N/A	
Coastal Beaches		N/A	
Coastal Dunes		N/A	
Barrier Beaches		N/A	
Coastal Banks		N/A	
Rocky Intertidal Shores		N/A	
Salt Marshes		N/A	
Land Under Salt Ponds		N/A	
Land Containing Shellfish		N/A	
Fish Runs		N/A	
Land Subject to Coastal Storm Flowage		N/A	
Inland Wetlands			
Bank		0	
Bordering Vegetated Wetlands		0	
Land under Water		0	
Isolated Land Subject to Flooding		N/A	
Bordering Land Subject to Flooding		N/A	
Riverfront Area		N/A	

C. Is any part of the project

1. a limited project? ___ Yes **X** No
2. the construction or alteration of a dam? ___ Yes **X** No; if yes, describe:
3. fill or structure in a velocity zone or regulatory floodway? ___ Yes **X** No
4. dredging or disposal of dredged material? ___ Yes **X** No; if yes, describe the volume of dredged material and the proposed disposal site:
5. a discharge to Outstanding Resource Waters? ___ Yes **X** No
6. subject to a wetlands restriction order? ___ Yes **X** No; if yes, identify the area (in square feet):

D. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? **X** Yes ___ No; if yes, has a Notice of Intent been filed or a local Order of Conditions issued? **X** Yes ___ No; if yes, list the date and DEP file number: **File No: 299-0516** Was the Order of Conditions appealed? ___Yes **X*** No. Will the project require a variance from the Wetlands regulations? ___Yes **X** No.
***An Order of Conditions has not been issued.**

E. Will the project:
1. be subject to a local wetlands ordinance or bylaw? **X** Yes ___ No
2. alter any federally-protected wetlands not regulated under state or local law? ___ Yes **X** No; if yes, what is the area (in s.f.)?

F. Describe the project's other impacts on wetlands (including new shading of wetland areas or removal of tree canopy from forested wetlands): **The Project will have minimal impact on adjacent wetlands and does not include removal of tree canopy from forested wetlands.**

III. Waterways and Tidelands Impacts and Permits

A. Is any part of the project site waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? ___ Yes **X** No; if yes, is there a current Chapter 91 license or permit affecting the project site? ___ Yes ___ No; if yes, list the date and number:

B. Does the project require a new or modified license under M.G.L.c.91? ___ Yes _**X**_ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water dependent use?
Current ___ Change ___ Total ___

C. Is any part of the project
1. a roadway, bridge, or utility line to or on a barrier beach? ___ Yes ___**X**__ No; if yes, describe:
2. dredging or disposal of dredged material? ___ Yes _**X**_ No; if yes, volume of dredged material _____
3. a solid fill, pile-supported, or bottom-anchored structure in flowed tidelands or other waterways? ___ Yes _**X**_ No; if yes, what is the base area? _____
4. within a Designated Port Area? ___ Yes _**X**_ No

D. Describe the project's other impacts on waterways and tidelands: **None**

IV. Consistency:

A. Is the project located within the Coastal Zone? ___ Yes **X** No; if yes, describe the project's consistency with policies of the Office of Coastal Zone Management:

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes **X** No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? **X** Yes ___No; if yes, specify which permit: **BRP WS 34 - New Source Approval (<70 gpm)**

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Withdrawal from groundwater	**2,184***	**+4,136**	**6,320**
Withdrawal from surface water	**0**	**0**	**0**
Interbasin transfer	**0**	**0**	**0**
Municipal or regional water supply	**0**	**0**	**0**

Permitted withdrawal rate

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes __ No **N/A**

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source,

1. have you submitted a permit application? **X** Yes ___ No; if yes, attach the application
2. have you conducted a pump test? ___ Yes **X*** No; if yes, attach the pump test report

Pump test will be performed on 3/17/10

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons/day)? **2,184 GPD** Will the project require an increase in that withdrawal? **X** Yes ___ No

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? **X** Yes ___ No. If yes, describe existing and proposed water supply facilities at the project site:

	Existing	Change	Total
Water supply well(s) (capacity, in gpd)	2,184	+4,136	6,320
Drinking water treatment plant (capacity, in gpd)	0	0	0
Water mains (length, in miles)	0	0.5*	0.5

Project includes construction of an exterior water main for future connection to municipal water, if available.

F. If the project involves any interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed? **N/A**

G. Does the project involve

1. new water service by a state agency to a municipality or water district? ___ Yes **X** No
2. a Watershed Protection Act variance? ___ Yes **X** No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes **X** No

H. Describe the project's other impacts (including indirect impacts) on water resources, quality, facilities and services: **The Project will result in an improvement to water resource & quality by implementing a detailed stormwater management plan including significant increase to groundwater recharge. The proposed wastewater disposal system will be designed for enhanced nitrogen removal which represents an improvement over the existing conventional Title V system.**

III. Consistency -- Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services: **The new building will be constructed in accordance with the Massachusetts Collaborative for High Performance School (MassCHPS) and will include multiple water conservation measures including low-flow fixtures, installation of drought tolerant/native landscaping and no irrigation.**

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? **X** Yes ___ No; if yes, specify, in quantitative terms: **The project will require a variance from Title 5 of the State Environmental Code for new construction.**

B. Does the project require any state permits related to **wastewater**? **X** Yes ___ No; if yes, specify which permit: **Title V: DEP Approval of Variance Granted by Board of Health (no reserve area), Variance for Schools (use of historical water data); Installation of Alternative Systems**

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00):

	Existing	Change	Total
Discharge to groundwater (Title 5)	**2,400**	**3,920**	**6,320**
Discharge to groundwater (non-Title 5)	0	0	0
Discharge to outstanding resource water	0	0	0
Discharge to surface water	0	0	0
Municipal or regional wastewater facility	0	0	0
TOTAL	**2,400**	**3,920**	**6,320**

B. Is there sufficient capacity in the existing collection system to accommodate the project?
___ Yes **X** No; if no, describe where capacity will be found:
A new subsurface wastewater disposal system will be constructed for the Project

C. Is there sufficient existing capacity at the proposed wastewater disposal facility? **X** Yes ___ No; if no, describe how capacity will be increased:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? **_X_** Yes ___ No. If yes, describe as follows:

	Existing	Change	Total
Wastewater treatment plant (capacity, in gpd)	N/A	N/A	N/A
Sewer mains (length, in miles)	N/A	N/A	N/A
Title 5 systems (capacity, in gpd)	**2,400**	**3,920**	**6,320**

E. If the project involves any interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed? **N/A**

F. Does the project involve new sewer service by an Agency of the Commonwealth to a municipality or sewer district? ___ Yes **X** No

G. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, or other sewage residual materials? ___ Yes **X** No; if yes, what is the capacity (in tons per day):

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposa	_____	_____	_____

H. Describe the project's other impacts (including indirect impacts) on wastewater generation and treatment facilities: **The Project will improve effluent quality and include enhanced nitrogen removal by use of a recirculating sand filter.**

III. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to wastewater management: **See Narrative**

A. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes **X** No; if yes, indicate the EOEA number for the plan and describe the relationship of the project to the plan

TRANSPORTATION -- TRAFFIC GENERATION SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes **X** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	_____	_____	_____
Number of vehicle trips per day	_____	_____	_____

ITE Land Use Code(s):

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____

C. Describe how the project will affect transit, pedestrian and bicycle transportation facilities and services:

III. Consistency -- Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

ROADWAYS AND OTHER TRANSPORTATION FACILITIES SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**? ___ Yes **X** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities at the project site:

	Existing	Change	Total
Length (in linear feet) of new or widened roadway	_____	_____	_____
Width (in feet) of new or widened roadway	_____	_____	_____

Other transportation facilities:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? _____
2. Cutting of living public shade trees (number)? _____
3. Elimination of stone wall (in linear feet)? _____

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))?
___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes **X** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are

1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way?___ Yes ___ No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency -- Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes **X** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)?___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes **X** No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ___ Yes **X** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____

Combustion	_____	_____	_____
Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Recycling	_____	_____	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos? ___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency--Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? **X** Yes ___ No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? **X** Yes ___ No; if yes, please describe: **The Stone Building is included on the State Inventory of Historic Assets with a property name of Center School Grounds (Inventory No. STW 180).**

B. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes **X** No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

C. If you answered "No" to all parts of both questions A and B, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

D. Have you consulted with the Massachusetts Historical Commission? **X** Yes ___ No; if yes, attach correspondence **(See Appendix 1)**

E. Describe and assess the project's other impacts, direct and indirect, on listed or inventoried historical and archaeological resources: **None.**

II. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources: **The Proponent will continue to work with the Stow Historical Commission to memorialize the Stone Building and coordinate relocation of the Blacksmith Shop building (unlisted) to another suitable site.**

ATTACHMENTS:

1. Plan, at an appropriate scale, of existing conditions of the project site and its immediate context, showing all known structures, roadways and parking lots, rail rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities.
2. Plan of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase).
3. **Original** U.S.G.S. map or good quality **color** copy (8-½ x 11 inches or larger) indicating the project location and boundaries
4. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2).
5. Other:

CERTIFICATIONS:

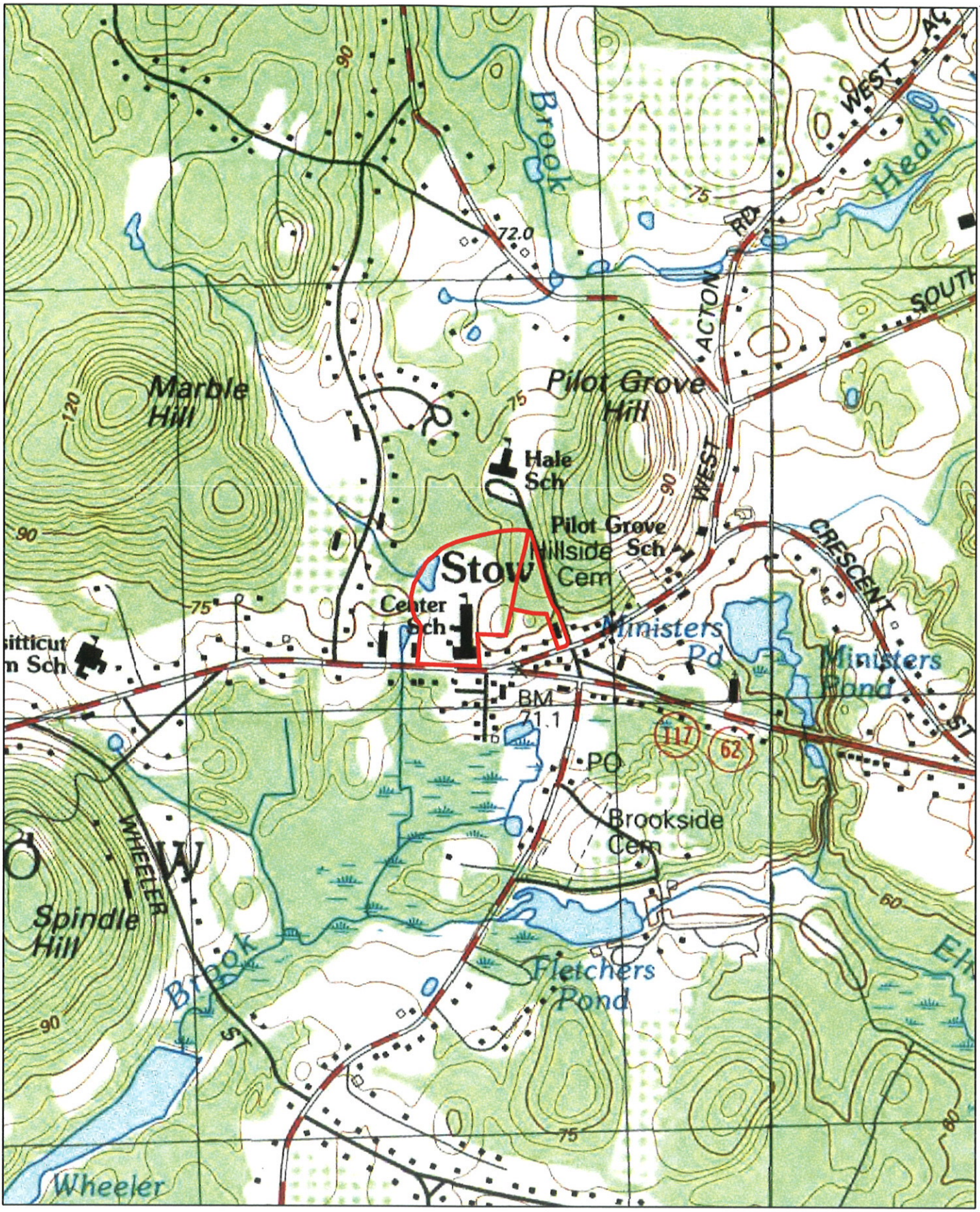
1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

(Name)	(Date)
The Metrowest Daily News	**March 23, 2010**

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Date	Signature of Responsible Officer or Proponent	Date	Signature of person preparing ENF (if different from above)
3/15/2010	William Wrigley	3/15/10	James Warren

William Wrigley, Town Administrator	**James Warren**
Name (print or type)	Name (print or type)
Stow Elementary School Building Committee	**Symmes, Maini & McKee Associates**
Firm/Agency	Firm/Agency
380 Great Road	**1000 Massachusetts Avenue**
Street	Street
Stow, MA 01775	**Cambridge, MA 02138**
Municipality/State/Zip	Municipality/State/Zip
(978) 897-4514	**(617) 547-5400**
Phone	Phone



SMMA SYMMES MAINI & MCKEE ASSOCIATES 1000 Massachusetts Avenue Cambridge, MA 02138	LOCUS MAP	DATE 3/15/2010 SCALE 1"=1000'		FIG.1
	Pompositticut/Center Elementary School 403 Great Road, Stow, MA 01775	DR. BY JW	CK. BY JAH	JOB NO. 09020.00

DISTRIBUTION LIST

Two Copies of the ENF and additional copies of the first two pages have been sent to:

Secretary Ian A. Bowles
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114
Attention: MEPA Office

One copy of the ENF has been sent to each of the following:

Department of Environmental Protection
One Winter Street
Boston, MA 02108
Attention: Commissioner's Office

DEP Central Regional Office
627 Main Street
Worcester, MA 01608
Attention: MEPA Coordinator

DEP Central Regional Office
627 Main Street
Division of Wetlands and Waterways
Worcester, MA 01608
Attention: MEPA Coordinator

DEP Central Regional Office
627 Main Street
Drinking Water Program
Worcester, MA 01608
Attention: MEPA Coordinator

DEP Central Regional Office
627 Main Street
Division of Water Pollution Control
Worcester, MA 01608
Attention: MEPA Coordinator

Massachusetts Highway Department
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116

Massachusetts Highway Department District 3
403 Belmont Street
Worcester, MA 01064
Attention: MEPA Coordinator

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Metropolitan Area Planning Council
60 Temple Place, 6th Floor
Boston, MA 02111
Attention: MEPA Coordinator

Stow Board of Selectmen
Town Hall
380 Great Road
Stow, MA 01775-2127

Stow Planning Board
Town Hall
380 Great Road
Stow, MA 01775-2127

Stow Conservation Commission
Town Hall
380 Great Road
Stow, MA 01775-2127

Stow Board of Health
Town Hall
380 Great Road
Stow, MA 01775-2127

Department of Public Health
Director of Environmental Health
Charlestown Navy Yard
250 Washington Street
Boston, MA 02115

PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

PROJECT: Pompositticut/Center Elementary School

LOCATION: 403 Great Road Stow, MA 01775

PROPONENT: Stow Elementary School Building Committee
380 Great Road Stow, MA 01775

The undersigned is submitting an Environmental Notification Form ("ENF") to the Secretary of Energy & Environmental Affairs on or before March 15, 2010

This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA", M.G.L. c. 30, s.s. 61-62I). Copies of the ENF may be obtained from:
James Warren
Symmes, Maini & McKee Associates
1000 Massachusetts Avenue
Cambridge, MA 02138
(617) 547-5400

Copies of the ENF are also being sent to the Conservation Commission and Planning Board of Stow where they may be inspected.

The Secretary of Energy & Environmental Affairs will publish notice of the ENF in the Environmental Monitor, will receive public comments on the project for 20 days, and will then decide, within ten days, if an environmental Impact Report is needed. A site visit and consultation session on the project may also be scheduled. All persons wishing to comment on the project, or to be notified of a site visit or consultation session, should write to the Secretary of Energy & Environmental Affairs, 100 Cambridge St., Suite 900, Boston, Massachusetts 02114, Attention: MEPA Office, referencing the above project.

By SMMA on behalf of the Stow Elementary School Building Committee

SECTION 2 PROJECT NARRATIVE

SECTION 2 PROJECT NARRATIVE

2.1 EXISTING CONDITIONS

The existing Center School site is located at 403 Great Road and measures approximately 15 acres. It is bordered to the south and west by residential properties, to the east by the Town of Stow Fire Department and to the north by the Hale Middle School. The Project site also includes approximately 2 acres of the Stow Fire Department property to the east. This portion of the Fire Department property consists, primarily, of undeveloped wooded upland and was formally turned over to the school department for the Project. In total the project site (the "Site") measures approximately 17 acres.

The Center School property consists of the existing school building (built in 1954 with additions in 1956 and 1958), an existing stone building, known as the Larsen Apple Barn, a wood framed Blacksmith Shop that was moved to the site in 1914 and three, small storage sheds. The Stone Building is listed on the State Inventory of Historical Assets of the Commonwealth (Inventory No. STW-180). As noted in Appendix 1, the MHC recently determined that due to the historic alterations of the structure and its setting within the school site that it does not meet the criteria of eligibility for listing in the National Register.

The site is currently accessed from Great Road and includes parking for approximately 40 vehicles. The remaining portion of the site consists of two multi-purpose ballfields, a playground and two tennis courts located north of the existing building (see Figure 2). Topography across the site varies significantly. The existing school and parking area are generally level at approximately elevation 236. The ballfields and tennis courts to the north are approximately four feet higher at elevation 240. Topography along the eastern edge of the property rises approximately 20 feet to meet existing grades along Hartley Road (elevation 260).

The existing school includes a water supply well, located in the basement mechanical room that provides domestic water to the building. The school also includes a subsurface wastewater disposal system consisting of a septic tank and pump station adjacent to the existing building and disposal field located along Hartley Road. Additional utilities serving the building include natural gas provided by NSTAR and electricity provided by Hudson Light and Power, both originating in Great Road. Electricity to the site is provided by a series of on-site overhead poles connected to the existing overhead system in Great Road.

An Order of Resource Area Delineation (ORAD) was issued for the Project on November 3, 2009 formally defining the limits of on-site resource areas subject to protection under the Massachusetts Wetlands Protection Act and the Stow Wetlands Protection Bylaw (see Appendix 2). On-site resource areas include Bank (associated

with an intermittent stream), Land Under Water (associated with the on-site pond), and Bordering Vegetated Wetlands. The delineated extent of the on-site resource areas and associated buffer zones are shown on the Existing Conditions Plan - C1.01.

According to the USDA Soil Survey of Middlesex County, on-site soils consist of Paxton Urban Land Complex, associated with the developed portions of the site, and Ridgebury and Woodbridge Fine Sandy Loam, associated with the ballfields and undeveloped portions of the Fire Department property. A detailed geotechnical investigation of the site was performed by Sanborn Head and Associates. In general the results indicated that the lowland areas of the site consist of topsoil and subsoil overlying loose silty sand and dense sand and gravel. The upland areas, closer to Hartley Road consist of topsoil and subsoil overlying very dense glacial till.

According to the Flood Insurance Rate Map (FIRM) for the Town of Stow (Community Panel Number 250216 0005 B, August 1, 1979), the site is located within Zone C, an area with minimal flooding.

The Massachusetts Natural Heritage Atlas lists no Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife and Certified Vernal Pools at or near the project site.

2.2 PROJECT DESCRIPTION

The Project includes construction of a new addition and comprehensive renovations to the existing Center Elementary School to combine the educational programs of the Pompositticut Elementary School (grades K-2), the Center Elementary School, (grades 3-5) and the Stow Pre-K program into a single facility at the Center School site.

The Project consists of partial demolition of the existing Center School building and construction of a new 70,548 gsf addition with a footprint of approximately 57,000 sf. The addition will consist of a 2-story classroom wing and single-story, high bay community spaces that include a gymnasium, cafeteria, mechanical and administration spaces. The remaining portion of the existing Center School (approximately 27,482 gsf) will be renovated and will house the kindergarten and Pre-K programs. In total the new school will be approximately 98,030 gsf.

Site improvements include parking for 100 vehicles, a new multi-purpose ballfield, two playground areas, a dedicated fire lane and detailed landscaping improvements (see Figure 3). The building has been situated to maximize use of the available upland area and to allow adequate room for construction while the remaining portion of the existing building remains in use. It has also been sited to take advantage of day-lighting and to improve parking, access and site circulation throughout the site. Its location is sensitive to the surrounding wetland resource areas and adjacent neighbors.

The proposed site plan includes separate parent and bus driveways accessed from Great Road and Hartley Road, respectively. Due to the increased student population a clear separation of parent and bus drop-off/pick-up operations was necessary to ensure safety. The primary entrance to the site, for parents and visitors, will continue to be accessed from Great Road. The secondary driveway, from Hartley Road, will be used for bus drop-off/pick-up and staff parking.

The Project will be constructed in two primary phases to ensure the continued use of the site.

Phase 1 will generally consist of:

- Preparation of the site and installation of erosion control measures for the construction of the building addition;
- Demolition of a portion of the existing building;
- Construction of the new school addition;
- Installation of all utilities to serve the new school addition;
- Construction of the staff parking and bus loop from Hartley Road;
- Reconstruction of the ballfields.
- Construction of the new playground area.

Phase 2 will generally consist of:

- Abatement and renovation of the remaining portion of the existing Center School;
- Demolition of the remaining outbuildings;
- Reconstruction of the parent drop-off/visitor parking area off Great Road.
- Construction of the Pre-K/K playground;

The Project will begin construction in June 2010 and will be completed by October 2012.

2.3 ALTERNATIVES ANALYSIS

SMMA conducted an extensive elementary school master plan and site alternatives analysis for the Stow School Building Task Force (SBTF) in 2007. Our evaluation included the school population requirements, educational needs, condition of the existing buildings and environmental

constraints of each site. The analysis included 4 alternatives that would satisfy the Town's educational needs and a no build alternative for comparison. Each of these alternatives is summarized below:

No Build

The Center School is a traditionally designed elementary school built in 1954 with additions made in 1964, and serves grades 3rd to 5th. The Pompositticut School is an open-plan elementary school built in 1971, and serves grades K to 2nd.

Based on existing student enrollments, both schools are crowded as compared to educational guidelines. The projected growth of the Stow enrollment for the next 15 years will exacerbate the current overcrowding. The open-plan educational format of the Pompositticut is now out-dated, thus the current facility does not adequately support the current education needs. In addition, the Pompositticut ball fields are adjacent to a large wetland that floods the fields during the spring. Both schools currently require significant upgrades to their infrastructure for continued usage.

First Alternative: New Center School & Renovate Pompositticut

The First Alternative considered the construction of a new school on the Center School site for grades 2nd to 5th and the renovation of the Pompositticut School for grades Pre-K to 1st. This alternative was rejected for three reasons:

1. The cost of building a new school and renovating an existing school.

2. A new school on the Center School site would lead to significant additional land disturbance.

3. The construction phasing required to shift classes between existing, new and renovated schools was costly and negatively impacted educational goals.

Second Alternative: New Center School & Decommission Pompositticut

The Second Alternative considered decommissioning the Pompositticut School and constructing a new school for grades Pre-K to 5th at the Center School site. The decommissioning of the Pompositticut School was considered advantageous because the cost of renovating the open-plan school to current educational standards plus the cost of phasing exceeded the cost of building new educational spaces. The Pompositicutt School building could be used for other town uses with less renovation.

This alternative was deemed more cost and time effective as compared to the First Alternative, and provided a single building which would improve operational efficiencies. When compared to all four alternatives it was rejected for the following two reasons:

1. The cost of building a new school for six grades.
2. A new school on the Center School site would lead to more land disturbance.

Third Alternative: Add/Renovate Center & Renovate Pompositticut

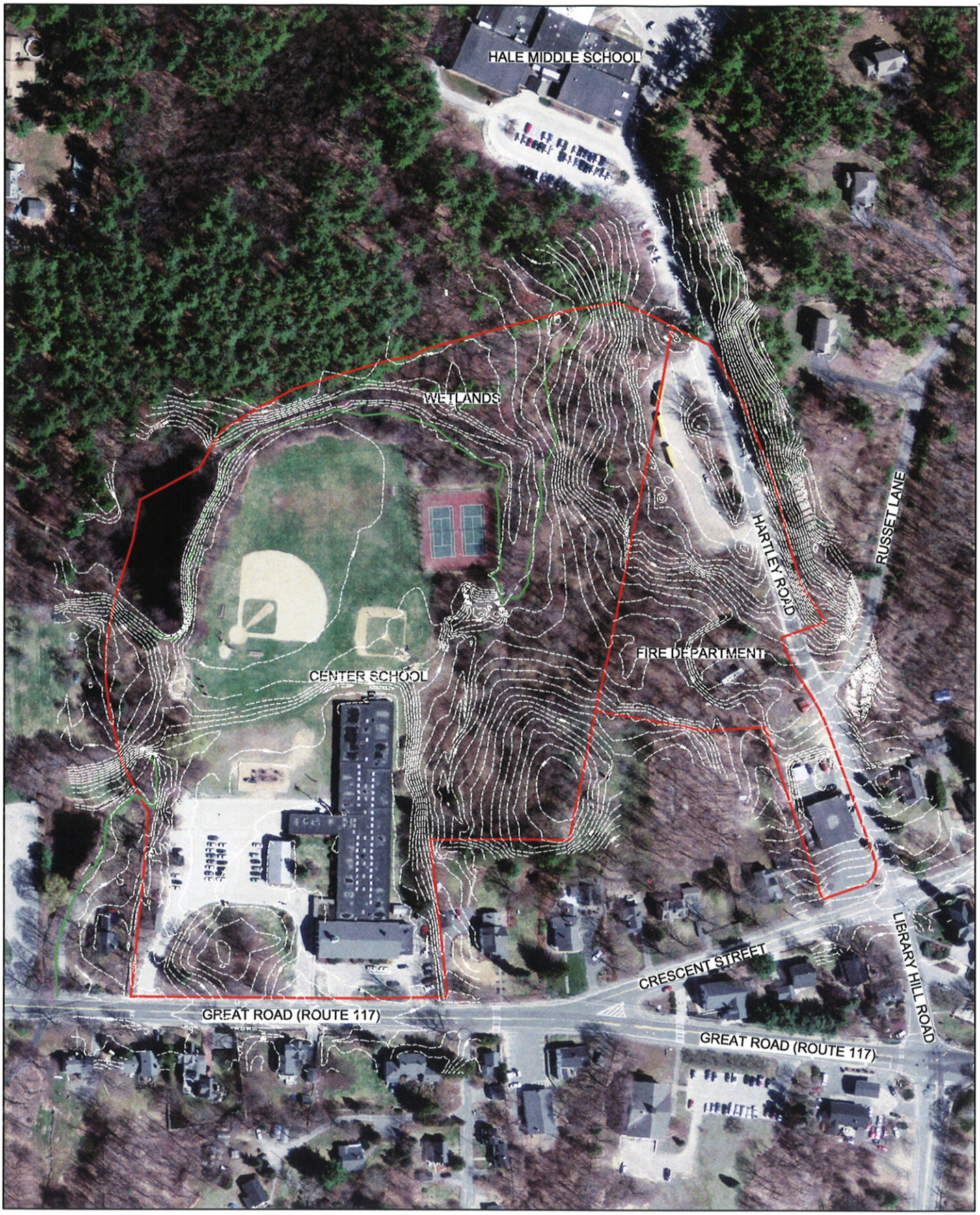
The Third Alternative sought to reduce construction land disturbance to the Center School site and reduce total project cost. This alternative considered an addition and renovation for the Center School to serve grades 2nd to 5th, and the renovation of the Pompositticut School for grades Pre-K to 1st. The primary disadvantage of this alternative was the construction phasing and class shifting, similar to the First Alternative.

Fourth Alternative: Add/Renovate Center & Decommission Pompositticut

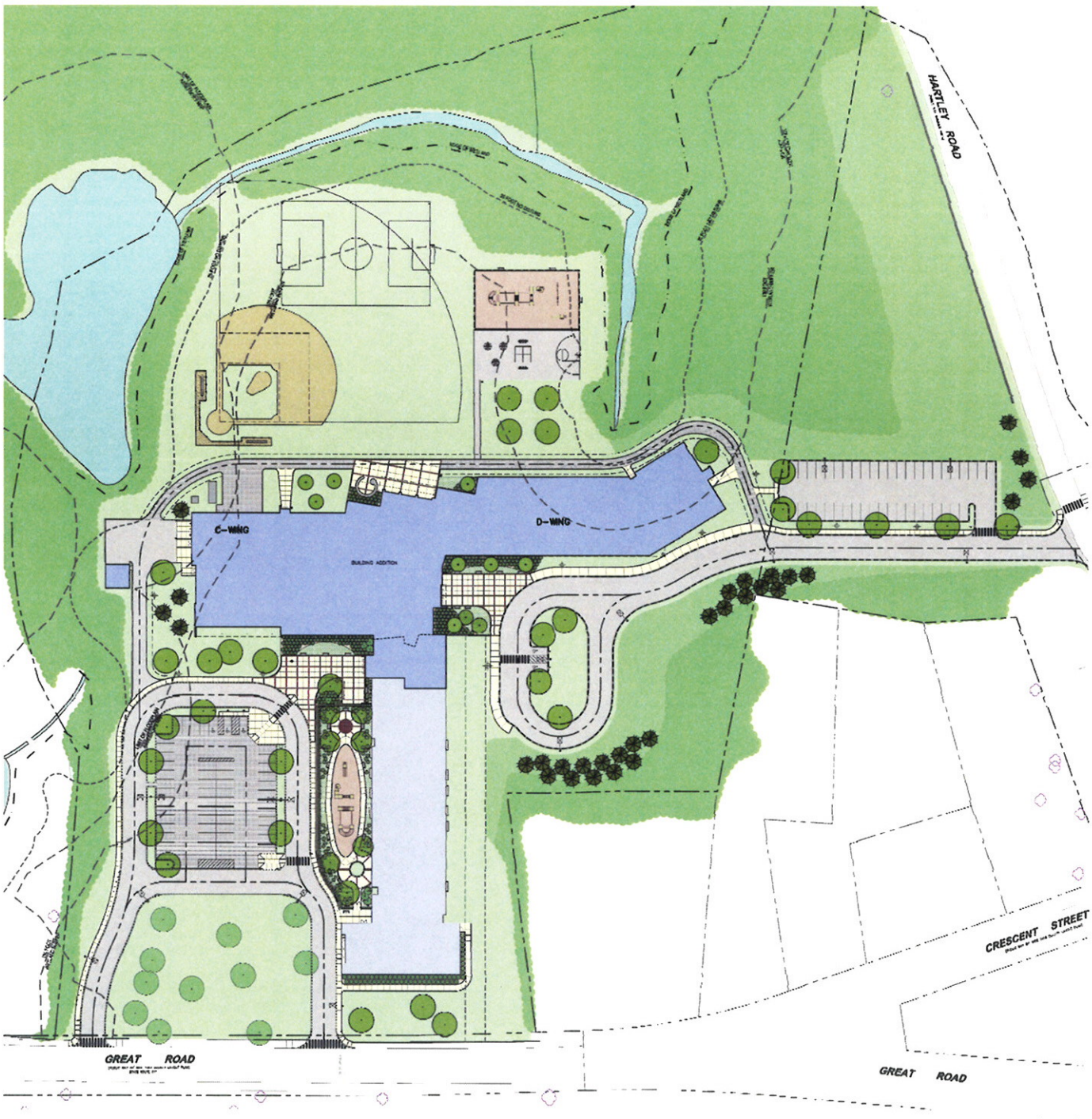
The Fourth Alternative realized the phasing and operational advantages of the Second Alternative and the reduced land disturbance of the Third Alternative. This alternative considered addition and renovation for the Center School to serve grades Pre-K to 5th and the decommissioning of the Pompositticut School.

When compared to all four alternatives, this alternative was selected for the following five reasons:

1. Construction cost was the least, while providing equivalent educational opportunities.
2. Moderate land disturbance during construction at the Center School site.
3. Simplified construction phasing resulted in a shorter total construction period.
4. Improved education and physical plant operations with one elementary school, instead of two.
5. Provided the Pompositticut building to the Town. This allows the Town to provide additional services in the future without the construction of a new building, which would result in new environmental impacts.



SMMA SYMMES MAINI & MCKEE ASSOCIATES 1000 Massachusetts Avenue Cambridge, MA 02138	EXISTING CONDITIONS PLAN	DATE 3/15/2010 SCALE 1"=200'		FIG.2
	Pompositticut/Center Elementary School 403 Great Road, Stow, MA 01775	DR. BY JW	CK. BY	JOB NO. 09020.00



SMMA SYMMES MAINI & MCKEE ASSOCIATES 1000 Massachusetts Avenue Cambridge, MA 02138	PROPOSED SITE PLAN	DATE 3/15/2010 SCALE N.T.S.		FIG.3
	Pompositticut/Center Elementary School 403 Great Road, Stow, MA 01775	DR. BY JW	CK. BY	JOB NO. 09020.00

SECTION 3 STORMWATER MANAGEMENT SYSTEM

SECTION 3 STORMWATER MANAGEMENT SYSTEM

3.1 INTRODUCTION

The proposed stormwater management system for the Project was designed in conformance with the DEP Stormwater Handbook as well as Section 3.8.1.9 of the Stow Zoning Bylaw, which requires mitigation of the proposed increase in stormwater volume as well as rate. Therefore, the stormwater management controls will exceed the requirements of the DEP Stormwater Handbook.

Under existing conditions there is little to no pretreatment of stormwater runoff from the site. Stormwater runoff either flows overland to the perimeter wetland system or is collected in a series of shallow catch basins located around the perimeter of the building that discharges directly to a small off-site pond.

The proposed stormwater management system will result in a significant improvement over existing conditions by complying with the ten standards of the DEP Handbook and Section 3.8.1.9 of the Zoning By-law.

In summary the proposed stormwater management system will improve stormwater quality and mitigate the increase in stormwater runoff from the Project by implementing the following Best Management Practices:

- Street sweeping & vacuuming program
- Deep sump hooded catch basins
- Water Quality Units (Stormceptor® or equal)
- Porous Pavement
- Green Roof
- Subsurface Infiltration Areas

3.2 COMPLIANCE WITH DEP STORMWATER MANAGEMENT POLICY

Standard 1 – Untreated Stormwater

There will be no new stormwater conveyances discharging untreated stormwater to any wetlands or waters of the Commonwealth. The Project is designed to utilize the existing on-site drainage outfalls and drainage swales and will closely match the existing drainage characteristics of the site. Further, all stormwater from the Project will be pre-treated in conformance with Standard 7. Therefore the Project complies with Standard 1.

Standard 2 – Post Development Peak Discharge Rates & Volumes

In order to show compliance with both the Handbook and the By-law the site was analyzed under both the existing and proposed conditions to compare the pre and post development peak discharge rates and volumes for the 2-year, 10-year and 100-year design storms using HydroCAD software.

The existing hydrological analysis divides the site into six primary subcatchments with two critical design points (See Figure 4 in Appendix 3). The first Design Point is Clay Pond, located in the northwest corner of the site. Clay Pond receives the majority of overland flow that is tributary to the "finger" wetland that extends into the site and behind the tennis courts.

The second Design Point is the existing 24-inch drainage outfall that discharges to a small off-site pond, located on the abutting property to the west. The discharge point receives the majority of runoff from the developed portions of the site. The four remaining subcatchments were analyzed to show that there will be no increase in stormwater runoff to the applicable discharge points of these subcatchments.

The proposed hydrological analysis was developed to be consistent with the planned phasing of the Project. Because the Project includes an occupied addition/renovation to the existing building that will be constructed in two phases, the proposed stormwater management system must also be constructed and operational in two distinct phases.

The proposed hydrological analysis divides the site into multiple subcatchments (see Figure 5 in Appendix 3) to model the individual drainage areas that are tributary to the various stormwater mitigation structures. Through the implementation of three large infiltration areas, porous pavement and low impact development measures the Project will result in no increase in post development runoff rates and volumes as shown on Table 1.

Table 1: Existing and Proposed Peak Discharge Rate Comparison

Existing Conditions						
Subcatchment	2-Year (3.2")		10 Year (4.5")		100 Year (6.5")	
	Q (cfs)	Vol (af)	Q (cfs)	Vol (af)	Q (cfs)	Vol (af)
1	10.38	0.886	19.11	1.612	33.54	2.852
2	9.36	0.782	16.13	1.351	26.96	2.295
3	0.98	0.065	1.64	0.109	2.69	0.182
4	2.60	0.173	4.19	0.282	6.62	0.457
5	0.70	0.047	1.34	0.089	2.40	0.160
6	2.60	0.174	4.13	0.280	6.46	0.449
Proposed Conditions						
Subcatchment	2-Year (3.2")		10 Year (4.5")		100 Year (6.5")	
	Q (cfs)	Vol (af)	Q (cfs)	Vol (af)	Q (cfs)	Vol (af)
1	9.70	0.751	17.82	1.367	31.25	2.419
2	9.12	0.677	14.78	1.161	24.21	2.288
3	0.56	0.037	0.94	0.063	1.54	0.104
4	1.59	0.105	2.63	0.175	4.24	0.289
5	0.22	0.015	0.41	0.027	0.73	0.049
6	2.60	0.174	4.13	0.280	6.46	0.449

A detailed summary of the hydrological analysis for the Project is included in Appendix 3.

Standard 3 – Recharge to Groundwater

As described in Section 2 the majority of on-site soils consist of Paxton Urban Land Complex, Ridgebury Fine Sandy Loam and Woodbridge Fine Sandy Loam; all classified as Hydrologic Soil Group C. The Project will result in an increase in total impervious surface for the site (excluding Hartley Road and the Fire Department) of approximately 2.6 acres.

The Required Recharge Volume for the Project is calculated based on the total impervious area for the site. Because of the local requirement to mitigate any increase in stormwater runoff volume the Required Recharge Volume for the Project is easily met by the volume included in the two large subsurface infiltration areas.

Standard 4 – Removal of 80% Total Suspended Solids (TSS)

Removal of Total Suspended Solids (TSS) is proposed for the all of the impervious areas of the site. 80% TSS removal will be accomplished by the combination of the following structural and non-structural BMPs:

- Street Sweeping & Vacuuming
- Deep Sump Catch Basins (including scheduled cleaning)

- Porous Pavement
- Water Quality Units (Stormceptors® or equal) sized for 77% TSS removal)
- Infiltration Systems (Rooftop Runoff and overland flow only)

Standard 5 – Land Uses with Higher Potential Pollutant Loads

The project use is not a Land Use with Higher Potential Pollutant Loads. Therefore, Standard 5 is not applicable to this project.

Standard 6 – Critical Areas

A portion of the site will be located within the IWPA of the proposed well. Based on an anticipated yield of 5 gpm (similar to the existing on-site well) the IWPA radius will be approximately 560 feet. The IWPA radius will extend over the proposed addition and two main infiltration areas (see plan C4.01). As previously discussed the two main infiltration areas will receive clean rooftop runoff only.

The firelane, located within the IWPA, is currently proposed as porous pavement. We recognize that in general porous pavement within a Critical Area is not recommended however; the firelane will be gated and used for emergency situations only. It will receive little to no vehicular traffic.

Standard 7 - Redevelopment

The Project will result in an increase in impervious surface and therefore does not qualify as a Redevelopment. Therefore this Standard does not apply.

Standard 8 – Erosion and Sedimentation Controls

A detailed Stormwater Pollution Prevention Plan for the Project has been developed and includes detailed measures for mitigation stormwater runoff during construction as well as post-construction (See Appendix 3) .

Standard 9 – Operation and Maintenance Plans

A long-term operation and maintenance plan has been developed and includes detailed measures for the operation & maintenance of the BMPs listed above (See Appendix X??)

Standard 10 – Illicit Discharges to Drainage System

There are no known or suspected illicit discharges to the stormwater management system at the project site.

SECTION 4 WASTEWATER DISPOSAL SYSTEM

SECTION 4 WASTEWATER DISPOSAL SYSTEM

4.1 EXISTING CONDITIONS

The existing Center school includes an on-site sewage disposal system consisting of a septic tank and pump station located on the east side of the existing building and a disposal field located on the Fire Department property adjacent to Hartley Road (see Plan C1.01). According to record plans the system was constructed in the 1950s and consists of a 13,000 gallon septic tank and lift station that pump effluent to a concrete dosing chamber located adjacent to Hartley Road. Effluent from the dosing chamber then flows by gravity to a series of disposal trenches located beneath the existing gravel parking area.

A Title 5 Inspection of the Center School was performed by Wind River Environmental on October 1, 2009. The Inspection did not identify that the system had failed.

4.2 TEST PITS & PERCOLATION TESTS

A series of test pits and percolation tests were performed by representatives of Sanborn Head & Associates (SHA) and Symmes, Maini & McKee Associates (SMMA) between August 2009 and December 2009. Additionally, soil probes to determine potential bedrock elevation were done on February 22, 2010 (see Appendix 4). A representative of the Stow Board of Health observed test pits and percolation test that were conducted on November 9th and 10th by SHA and December 3rd and 4th by SMMA.

Based on the test pit observations, the area along Hartley Road consists of varying soil types, depths to groundwater, depths to refusal and percolation rates. This is the area where the existing effluent disposal trenches are located. Testing determined that this area was also of suitable size and condition to be utilized for the construction of the soil absorption system to serve the expanded facility.

4.3 PROPOSED SYSTEM

The proposed subsurface wastewater dispersal system has a design flow of 6,320 gallons per day (gpd), calculated based on a projected student/staff population of 690 people and a Title V design flow of 8 gpd/person for an Elementary School with cafeteria but no gymnasium with showers, with allowance for a future expansion that would add capacity for another 100 students, for a total design population of 790.

The Project will include construction of a new subsurface sewage disposal system to serve the anticipated increase in student population at the Central School. The

existing septic system, which consists of a septic tank and pump chamber adjacent to the school and a remote leaching field along Hartley Road, will be replaced.

Due to the adjacency of the proposed on-site water supply well, the new subsurface sewage disposal system will include enhanced nitrogen removal technology in accordance with Title V regulations. The proposed subsurface sewage disposal system will include a new septic tank, grease trap, recirculating sand filter (RSF) and soil absorption system with pressure dosing to meet the minimum nitrogen removal requirements. The proposed subsurface sewage disposal system design has been submitted to the Stow Board of Health and the DEP for review and approval

The existing soil absorption system along Hartley Road will be removed and replaced with a new system sized to accommodate the anticipated flow from the Project plus the future 100 student expansion. The soil absorption system will be constructed in approximately the same location as the existing field. However, due to current Title V siting and construction requirements for clearance to groundwater and mounding analysis, the new field will be significantly elevated above existing grades. The project will include a retaining wall along Hartley Road to provide break-out protection in accordance with Title V requirements. However, the soil absorption system will be located entirely within the existing developed area along Hartley Road and is located entirely outside the 100-foot buffer zone of the nearby BVW.

SEPTIC TANK: The proposed septic tank will be a 19,000 gallon two-compartment tank.

ENHANCED NITROGEN REMOVAL: The proposed system will be located within the Interim Wellhead Protection Area (IWPA) of the proposed water supply well for the Project (see plan C4.01). Title V requires that on-site sewage disposal systems located within a WPA include nitrogen reduction. The proposed system includes a Recirculating Sand Filter (RSF) designed in accordance with 310 CMR 15.217 and the DEP Title V RSF Design Guidance document to accomplish the required nitrogen reduction.

In addition to enhanced Nitrogen removal, the Recirculating Sand Filter will also reduce Biological Oxygen Demand (BOD) and Total Dissolved Solids (TSS). DEP expects that a subsurface sewage disposal system with RSF will meet the following criteria:

- BOD: 30 mg/ml.
- TSS: 30 mg/ml.
- Total Nitrogen: 25 mg/ml

The proposed RSF will consist of:

- Flow equalization/recirculation tank
- Sand filter with pressure distribution piping and a gravity under-drain collection system.
- Effluent is continually filtered/recycled through the sand filter.
- The RSF treated effluent is disposed of in a Title V soil absorption system utilizing pressure distribution disposal.

GREASE TRAP: The proposed system includes a 6,000 gallon grease trap, sized according to recommended sizing criteria established by the RSF manufacturer. The minimum grease trap size, according to Title V design criteria is approximately 3,000 gallons based on 15 gpd/seat and a 200 seat cafeteria.

SOIL ABSOROPTION SYSTEM: The soil absorption system was designed based on the results of the test pits and percolation tests included in Appendix 4. The design criteria for the disposal field utilized a percolation rate of 25 min/inch in Type II soils with a corresponding effluent loading rate of 0.44 gpd/sq.ft. for systems with pressure distribution. The total leaching area required for the Project is 12,545 sf based on 6,320 gpd/0.44 gpd/sf. The proposed soil absorption system consists of a leaching field of approximately 14,400 sf, constructed and dosed in two equal sections.

PRESSURE DOSING SYSTEM: A pressure distribution system has been designed based on the requirements of Title V and the Pressure Distribution Guidance document.

SETBACKS: Setbacks are all in accordance with Title V requirements. A retaining wall is required along Hartley Road to meet break-out protection offsets.

MOUNDING ANALYSIS: A groundwater mounding analysis was completed by SHA to identify the expected mound created by the proposed disposal system. The disposal system is designed to provide the minimum four feet separation between the mounded groundwater elevation and the bottom of the system.

4.4 DIVISION AND AGGREGATION OF FACILITIES

The Project will include construction of a new subsurface sewage disposal system to serve the anticipated increase in student population and flow at the Center School. The existing septic system, which consists of a septic tank and pump chamber adjacent to the school and a remote leaching field along Hartley Road, will be replaced, requiring that a Disposal System Construction Permit be obtained.

15.010: Division and Aggregation of Facilities of Title V states:

(1) Ownership of a facility and the design flow of the facility shall be determined whenever application is made for a Disposal System Construction Permit.

And further:

(4) Whenever the Department or the local Approving Authority determines, based upon consideration of one or more of the factors in 310 CMR 15.011, that facilities asserted to be in separate ownership or control shall be regulated as a single facility, the Department or the local Approving Authority, based on the total design flow from the single facility, may order the single facility to comply with the requirements of 310 CMR 15.202 (Recirculating Sand Filters) or the Department may order the single facility to comply with the requirements of 314 CMR 5.00 and 6.00 by obtaining a groundwater discharge permit.

Representatives of the design team met with DEP Central Regional staff to review the determination of aggregation. As noted previously, the Project directly abuts the Stow Fire Department property as well as the Hale Middle School to the north. It was agreed that these three properties needed to be considered regarding aggregation.

Existing and proposed flows were also discussed with DEP, in order to determine what level of sewage treatment is required for the aggregated facilities.

SMMA presented water use information for the Hale School (2,884 gpd) based upon days in use, using twice daily observed flow for design, and Title 5 design flow information for the Fire Station (385 gpd). The proposed flow for the Center School (6,320 gpd) is based upon the Title V design flow of 8 gal/day per student. The proposed student population is 790. Since latest technology water saving devices will be utilized in the proposed school, it was agreed that the 8 gpd/student is conservative.

The sewage flow analysis described above results in a proposed daily design flow of 9,589 gallons per day for the three aggregated facilities. This is less than the 10,000 gpd threshold, above which advanced wastewater treatment and a groundwater discharge permit would be considered.

Before concluding consideration of aggregation, we discussed the current subsurface disposal systems serving the Hale School and Fire Station and their potential impact on groundwater quality.

The Hale School is served by a recently constructed Title V subsurface sewage disposal system, which is over 400 feet from the Zone 2 of the Hale School well and over 750 feet from the Interim Wellhead Protection Area (IWPA) of the proposed Center School well. The Fire Station subsurface sewage disposal system is a small Title V system outside of any well Zone 2 or IWPA.

Since the abutting properties owned by the Town have suitable Title V systems that do not threaten groundwater quality, and the aggregated flow is less than 10,000 gpd, it was agreed that it would be appropriate to design the proposed subsurface sewage disposal system for the Center School in accordance with the requirements of Title V, and including a recirculating sand filter for nitrogen reduction, since part of the proposed subsurface absorption system is within the anticipated IWPA of the proposed Center School non-community groundwater well.

4.5 REQUESTS FOR VARIANCES

310 CMR15.416: Variances for Schools

Under Section 4.4 DIVISION AND AGGREGATION OF FACILITIES, above, the daily design flow for the Hale School takes advantage of 15.416: Variances for Schools, by calculating the design flow based upon 200 % of the average daily water meter readings when school is in session, per 310 CMR 15.416 (3).

Although the Disposal System Construction Permit for the proposed Center School subsurface sewage disposal facility is designed on the basis of the Title V design flow of 8 gpd/person, a variance is requested under 15.416 (3) as it pertains to aggregation of facilities under 310 CMR 15.010.

The Variance requested under15.416: Variances for Schools is issued by DEP.

310 CMR 15.248: Reserve Area

310 15.248: Reserve Area states:

> *(1) Systems for new construction or increased flow designed and approved in accordance with 310 CMR 15.000 shall include a reserve area sufficient to replace the primary soil absorption system. The area required for the reserve area shall be calculated in accordance with 310 CMR 15.242 (effluent loading rates), based on the percolation rate in the reserve area.*

A variance to allow approval of the proposed subsurface disposal facility without a Reserve area is requested in light of the information discussed below.

(1) An exhaustive analysis of soils, percolation rates and groundwater levels was completed in order to attempt to locate e reserve disposal area. An area suitable for a reserve disposal area could not be identified.

(2) The primary disposal area is located in an area with soils and groundwater conditions which comply with Title V.

(3) The primary disposal area is constructed on the same location as the existing soil absorption system, which has been functioning without failure for over 50 years, disposing of ordinary septic tank effluent.

(4) The proposed subsurface wastewater disposal system will have the further benefit of reduced TSS, BOD and Nitrogen, as a result of the recirculating sand filter. The RSF design also includes a filter on the discharge of the septic tank.

(5) The history of disposal systems for treated wastes with proven hydraulic conductivity indicate failure is highly unlikely.

(6) Should the unlikely failure of the subsurface absorption system occur, it would be economical and efficient to replace the system in-place during the summer off-season.

(7) The proposed subsurface wastewater disposal facility, with recirculating sand filter is designed in accordance with Title V and provides the same level of protection required by Title V.

(8) The proposed dispersal system will be pressure dosed, which DEP has determined contributes to long-lasting dispersal areas.

(9) Considering the above, it would be manifestly unjust to not allow the variance, as the proposed school expansion, needed by the community, could not proceed.

This variance to 310 15.248: Reserve Area must be first approved by the Stow Board of Health; then submitted to DEP for review and approval.

SECTION 5 WATER SUPPLY

SECTION 5 WATER SUPPLY

The Project will include construction of a new water supply well permitted through the DEP Bureau of Resource Protection Source Approval process. The new well will be a bedrock well with a permitted withdrawal rate of approximately 6,320 gpd, matching the proposed Title V flow for the Project. The well will have a Zone I radius of approximately 220 feet and will replace the existing on-site well that is currently located in the basement of the existing school.

The Applicant filed an Application for New Source Approval with DEP in January 2010, specifically requesting a Site Examination, Land Use Survey and Approval to Conduct a Pumping Test. DEP issued an approval for Site Source and Conducting of Pump Test on February 16, 2010 (see Appendix 5).

The Applicant recently completed the installation of the test well and will perform the required pump tests on March 17, 2010. Results of the pump test and water quality analyses will be forwarded to DEP as the Applicant continues the necessary requirements to permit the proposed water supply well for the Project.

A copy of the Application is included in Appendix 5 as required on the ENF form.

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SECTION 6 TRAFFIC

SECTION 6 TRAFFIC

A Traffic Impact Analysis (TIA) was conducted by Bryant Associates, Inc. The report includes an analysis of adjacent roadways and intersections, existing and proposed traffic generation and evaluates transportation impacts in the vicinity of the site as a result of the proposed Project. A supplement to the report was prepared on March 9, 2010 to reflect the current Project. The supplement indicates that the current Project is consistent with the original recommendations included in the TIA. Both documents are included in Appendix 6.

The report found that no traffic mitigation measures are required for the project and includes the following conclusions:

- There will be no change in the level of service of at the intersections of Great Road & Crescent Street and Crescent Street/Hartley Road/Library Hill Road.
- The proposed school exit-only driveway will operate at LOS D during the school A.M. peak hour and LOS E during the school P.M. peak hour in both 2012 and 2017.
- The proposed Hartley Road driveway will operate at excellent levels of service during the school A.M. and school P.M. peak hours in both 2012 and 2017.
- The geometric configuration of existing roadways will provide adequate safe stopping sight distances for traffic passing and/or utilizing the site.
- There are no existing unsafe conditions in the vicinity of the development that may be worsened by the proposed Project.

Traffic operations on the surrounding roadways and intersections will remain virtually unchanged by the proposed Project.

SECTION 7 HISTORICAL & ARCHAEOLOGICAL

SECTION 7 HISTORICAL & ARCHAEOLOGICAL

The site, historically known as the Center School Grounds, is included in the Massachusetts Historical Commission's Inventory of Historic and Archeological Assets of the Commonwealth (see MHC #STW 180). The inventory form specifically denotes a vernacular one-story fieldstone building with a gable roof, previously referred to as the Stone Building in this document.

The proponent filed a Project Notification Form with the MHC in November 2009 requesting MHC review of the historical significance of the Stone Building, which is planned for demolition to allow construction of the Project.

As noted in Appendix 1, the MHC determined that due to the historic alterations of the structure and its setting within the school site that it does not meet the criteria of eligibility for listing in the National Register (see January 28, 2010 correspondence).

The MHC also determined that the existing Center School building does not qualify for review as a historical structure since it is not listed on the Inventory (see March 5, 2010 correspondence).

Based on review of the Inventory of Archaeological Assets of the Commonwealth, base map no. 64, there are no Pre-Historical Archaeological Assets of the Commonwealth mapped in our project site location.

APPENDIX 1 MHC DOCUMENTATION

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

January 28, 2010

William Wrigley
Town Administrator / Stow Elementary School Building Committee
Town of Stow, Massachusetts
Stow Town Building
380 Great Road
Stow, MA 01775

RE: Pompositticut / Center Elementary School, 403 Great Road, Stow, MA;
MHC# RC.47391

Dear Mr. Wrigley:

The Massachusetts Historical Commission (MHC) has reviewed the additional information submitted, received January 19, 2010, concerning the proposed project referenced above. As you are aware, the subject property at 403 Great Road, historically known as the Center School grounds (MHC# STW.180), is included in MHC's Inventory of Historic and Archaeological Assets of the Commonwealth. The Inventory form specifically denotes a vernacular one-story fieldstone building with a gable roof. After a review of the additional information submitted, MHC staff have the following comments.

The requested current original photographs and historical information provided by Symmes Maini & McKee Associates and Commonweal Collaborative indicate that the fieldstone building, which was once used for an apple storage/barn, was highly altered in 1954 when the building was converted to school use for the Town of Stow. Large doors were infilled and new windows were added on the exterior and new walls and suspended ceilings were added on the interior. Through these and other changes, the fieldstone building unfortunately no longer retains historic integrity architecturally and its setting and relationship have been severely compromised, disassociating itself from its former agrarian heritage when the Town purchased the land from Andrew L. Larsen in 1953. Former agricultural site features such as a farmhouse that was moved, two barns that were demolished, and other landscape features also have no longer remained since the early 1950s. Therefore, it is the opinion of the MHC that the subject property does not meet the criteria of eligibility for listing in the National Register of Historic Places because the subject property does not retain sufficient integrity (36 CFR 60).

The proposed project consisting of the construction of a new addition and renovations to the existing Center Elementary School as well as partial demolition of the existing Center School

building and the demolition of the fieldstone building is described in the Project Notification Form that was submitted to this office, received November 13, 2009.

After review of MHC files and the materials submitted, MHC staff have determined that the proposed project will not affect any significant historic or archaeological resources. No further review by this office is required.

The MHC encourages the project proponent—the Town of Stow—to continue to consult with the Stow Historical Commission and other interested members of the public to address their concerns. The MHC understands from the submitted information that the Stow Historical Commission and other interested members of the public are interested in documentation and memorialization of the fieldstone building and the former blacksmith shop in a manner that is engaging and meaningful to the citizens of Stow and also the elementary school students who utilize the subject property.

These comments are offered to assist in compliance with M.G.L., Chapter 9, Sec. 26-27c, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00), and MEPA (301 CMR 11). Please do not hesitate to contact Ryan Maciej of my staff if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: James Warren, Symmes Maini & McKee Associates
Katherine Craven, MSBA
Susan Flanagan-Cahill and George Driscoll, MSBA
Secretary Ian A. Bowles, EOEEA; ATTN: MEPA Unit
DEP—CERO
Linda Stokes, Stow Historical Commission
Michelle P. Barker, Preservation Massachusetts / National Trust for Historic Preservation
Dianne Siergiej, Commonweal Collaborative

March 5, 2010

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

Susan McLaughlin
Stow Historical Commission
Stow Town Building
380 Great Rd.
Stow, MA 01775

RE: Pompositticut / Center Elementary School, 403 Great Road, Stow, MA;
MHC# RC.47391

Dear Ms. McLaughlin and Members of the Stow Historical Commission:

The Massachusetts Historical Commission (MHC) has reviewed the additional information you submitted, received on February 2, 2010, concerning the proposed project referenced above. In addition, the MHC has reviewed the materials submitted by Donna Jacobs to the MEPA Unit on February 17, 2010.

As you are aware, the subject property at 403 Great Road, historically known as the Center School Grounds (MHC# STW.180), is included in MHC's Inventory of Historic and Archaeological Assets of the Commonwealth. The Inventory form only describes a one-story fieldstone building with a gable roof. No other buildings are noted or described on the Inventory form. It appears that the Inventory Form is called the Center School Grounds specifically to exclude the school, but to include the fieldstone barn that is located on the grounds, since no other buildings are mentioned.

In addition, the Center School building is not included on the Inventory form for the Great Road Area (STW.B), as it is located outside the boundaries of that area.

Because the proposed project involves the proposed demolition of a building included in MHC's Inventory, the MHC provides comments in relation the MEPA regulations (301 CMR 11). MHC's comments have been limited to only the fieldstone barn building, since that is the only building mentioned on the Center School Grounds Inventory Form. Because the Center School building is not included in the Inventory, the MHC evaluated the potential significance and integrity of the fieldstone barn building only, for the purpose of compliance with the MEPA (301 CMR 11.03(10)) threshold, which is limited only to buildings that are included in MHC's Inventory.

It is the MHC's opinion that the fieldstone barn building does not retain sufficient integrity of its own design and workmanship, its original setting, and association with other Larson Farm buildings (no longer extant), for the reasons specified in our January 28th letter.

While the MHC understands the history of the Center School and the modifications made to the fieldstone barn for educational purposes in the second half of the 20th century, the Center School building is not included in the MHC's Inventory and, in MHC's opinion, is therefore not subject to the MEPA threshold regarding buildings in the MHC's Inventory (301 CMR 11.03(10)).

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

As stated in our January 28th letter, we encourage the town to document and memorialize the fieldstone barn in a meaningful way.

These comments are offered to assist in compliance with M.G.L., Chapter 9, Sec. 26-27c, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00), and MEPA (301 CMR 11). Please feel free to contact Ryan Maciej of my staff if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: William Wrigley, Town Administrator / Stow Elementary School Building Committee
James Warren, Symmes Maini & McKee Associates
Katherine Craven, MSBA
Susan Flanagan-Cahill and George Driscoll, MSBA
Secretary Ian A. Bowles, EOEEA; ATTN: MEPA Unit
DEP—CERO
Linda Stokes, Stow Historical Commission
Michelle P. Barker, Preservation Massachusetts / National Trust for Historic Preservation
Donna Jacobs
Senator James Eldridge

APPENDIX 2 ORDER OF RESOURCE AREA DELINEATION

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

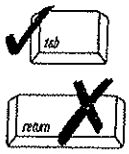
Provided by MassDEP:
299-0512
MassDEP File Number

Document Transaction Number

Stow
City/Town

A. General Information

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



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

From: Stow Conservation Commission
1. Conservation Commission

2. This Issuance is for (check one):

a. ☒ Order of Resource Area Delineation

b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

William
a. First Name

Wrigley
b. Last Name

Stow Elementary School Building Committee
c. Organization

380 Great Road
d. Mailing Address

Stow
e. City/Town

MA
f. State

01775
g. Zip Code

4. Property Owner (if different from applicant):

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

5. Project Location:

403 Great Road
a. Street Address

Stow
b. City/Town

01775
c. Zip Code

U-9
c. Assessors Map/Plat Number

44
d. Parcel/Lot Number

Latitude and Longitude:

e. Latitude

f. Longitude

6. Dates:

October 6, 2009
a. Date ANRAD filed

November 3, 2009
b. Date Public Hearing Closed

November 3, 2009
c. Date of Issuance

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

Existing Conditions Plan
a. Title

11/03/09
b. Date

c. Title

d. Date

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable):

a. ☐ **Accurate**: The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a. _____

b. ☒ **Modified**: The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☒ Bordering Vegetated Wetlands

2. ☒ Other resource area(s), specifically:

a. Bank, Land Under Water (associated with the ponds). No determination made for Land Under Water associated with the intermittent stream at this time. The Floodplain/Wetland District line does not depict area subject to jurisdiction by the Stow Conservation Commission and is shown for information purposes only.

c. ☐ **Inaccurate**: The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a. _____

3. ☐ The boundaries were determined to be inaccurate because:

a. _____

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see http://www.mass.gov/dep/about/region/findyour.htm).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
299-0512
MassDEP File Number

Document Transaction Number
Stow
City/Town

E. Signatures

November 3, 2009
Date of Issuance

Please indicate the number of members who will sign this form.

5
1. Number of Signers

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on unless extended in writing by the issuing authority.

This Order is issued to the applicant and the property owner (if different) as follows:

2. ☐ By hand delivery on

a. Date

3. ☒ By certified mail, return receipt requested on

11/04/09 mp
a. Date

APPENDIX 3 STORMWATER MANAGEMENT CALCULATIONS

HYDROLOGY SUMMARY

In order to show compliance with both the Handbook and the By-law the site was analyzed under both the existing and proposed conditions to compare the pre and post development peak discharge rates and volumes for the 2-year, 10-year and 100-year design storms using HydroCAD software.

The hydrological analysis divides the existing site into six primary subcatchments with two critical design points. The first Design Point is Clay Pond, located in the northwest corner of the site. Clay Pond receives the majority of overland flow that is tributary to the "finger" wetland that extends into the site and behind the tennis courts.

The second Design Point is the existing 24-inch drainage outfall that discharges to a small off-site pond, located on the abutting property to the west. The discharge point receives the majority of runoff from the developed portions of the site. The four remaining subcatchments were analyzed to show that there will be no increase in stormwater runoff to the applicable discharge points of these subcatchments.

The following is a detailed description of both the existing conditions hydrology and proposed conditions hydrology. Each individual subcatchment is described in both the existing and proposed condition with a description of the measures that will be implemented in order to mitigate the increase stormwater runoff from the Project

Existing Conditions Hydrology

Subcatchment 1 measures approximately 9.1 acres. It includes a portion of Hartley Road, the gravel bus parking area, the existing tennis courts and undeveloped areas in the northern-most portion of the site. Stormwater runoff from this subcatchment flows overland to the perimeter wetland system and then through an intermittent stream that eventually discharges to Clay Pond (Design Point 1).

Clay Pond includes a concrete weir box culvert with a 30" diameter outlet that flows in a southerly direction toward the school. Although not shown on the survey plan Clay Pond connects to the existing on-site drainage system and ultimately discharges through the 24-inch outfall to the small off-site pond. For the purposes of this drainage study we have examined each pond individually to show that under proposed conditions there will be no increase in stormwater runoff to either pond.

Subcatchment 2 is approximately 6.6 acres in size and includes the majority of the existing building and developed areas around the building. Stormwater runoff from the building, ballfields and undeveloped areas to the east flows into a series of shallow catch basins located around the perimeter of the building. This drainage system discharges to a small off-site pond (Design Point 2) via a 24" reinforced concrete pipe. Stormwater runoff from the parking area flows overland, directly to the off-site pond with no pretreatment. The off-site pond eventually discharges to an existing culvert located underneath Great Road.

Subcatchment 3 is approximately 0.5 acres and is located in the southwest corner of the site. It consists of a portion of the exit driveway to Great Road, the Blacksmith Shop building and a portion of the undeveloped area between Great Road and the school parking lot. Stormwater runoff from this subcatchment flows overland directly to Great Road.

Subcatchment 4 is approximately 1.2 acres in size and includes a portion of the existing building (Great Hall), the existing parking area immediately in front of the school, the lawn area to the east of the existing school and a portion of the entrance driveway. The majority of stormwater runoff from this subcatchment flows overland directly to Great Road. Rooftop runoff from the Great Hall discharges to a series of drywells located around the perimeter of the building.

Subcatchment 5 is approximately 0.5 acres and is located immediately north of the Fire Department building. Stormwater runoff from this subcatchment flows overland to the residential property immediately west of the Fire Department.

Subcatchment 6 is approximately 1.1 acres and is located in the south east corner of the site. It consists of the existing fire department building and parking, a portion of Hartley Road and the surrounding landscape areas. Stormwater runoff from this subcatchment flows overland to the existing drainage system in Crescent Street.

Proposed Conditions Hydrology

The proposed hydrological analysis was developed to be consistent with the planned phasing of the Project (see Section 2.3). Because the Project includes an occupied addition/renovation to the existing building that will be constructed in two phases, the proposed stormwater management system must also be constructed and operational in two distinct phases.

As described in Section 2.3, Phase I consists of the construction of the new building addition, the bus driveway from Hartley Road and reconstruction/relocation of the existing ballfields and play areas. Phase II consists of the abatement and renovation of the existing building and reconstruction of the existing parking area and driveways to Great Road.

The majority of both phases of construction occur within portions of existing Subcatchments 1 and 2 and impact stormwater discharges to Clay Pond (Design Point 1) and the small off-site pond (Design Point 2).

The following is a detailed summary of the proposed conditions hydrology including the mitigation measures implemented to reduce the increase in stormwater runoff and volume from the Project. Following the proposed hydrology summary is a detailed comparison of the existing and proposed stormwater runoff rates and volumes showing that the requirements of the Handbook and Bylaw will be met.

Subcatchment 1, under proposed conditions, is reduced in size from 9.1 acres to 7.7 acres due to construction of the proposed bus driveway, staff parking area and building addition which are ultimately routed to Design Point 2. Stormwater runoff from the remaining portions of Subcatchment 1 continues to flow overland to the perimeter wetland system and ultimately discharges to Clay Pond.

Clay Pond was initially reviewed as a potential discharge point for the proposed Phase I drainage system however due to the existing elevation of the pond (233.6) and potential for increase in the standing water elevation (assumed at the BVW elevation of 237) it was determined that the potential water elevation was too high for a feasible discharge point. Since there is a net reduction in the overall size of the drainage area tributary to Clay Pond there will be a net reduction in stormwater runoff and volume to Design Point 1.

As mentioned above, portions of existing Subcatchment 1 will be developed in Phase I and include the building addition (Subcatchment 1-1), the porous pavement firelane (Subcatchments 1-2A & 1-2B) the reconstructed ballfields and play areas (Subcatchment 1-3) and the bus driveway and staff parking (Subcatchment 1-4). Even though these subcatchments ultimately discharge or overflow to Design Point 2 they were designated as 1-# to indicate the phase under which they will be constructed.

Subcatchment 1-1 (Proposed Building) consists of the majority of the proposed addition and measures approximately 1.3 acres. A small portion of the roof (4,675sf) will be constructed as a Green Roof and is modeled with a CN value of 86. Stormwater runoff from the proposed addition will discharge to a large subsurface infiltration area designed to mitigate approximately 95% of the stormwater runoff from the building.

The infiltration area (Pond IA-1) consists of a series of modular molded plastic recharge structures that provide a minimum 94% void volume (see plans). The infiltration area will include an overflow pipe that connects to the proposed drainage system that discharges to Design Point 2.

Subcatchments 1-2A and 1-2B represent the proposed porous pavement firelane. The porous pavement hydrology model was developed consistent with the University of New Hampshire methodology adopted by DEP. As shown the infiltration and storage capabilities of the porous pavement cross section result in no discharge in the 2-year storm and minor discharges in the 10-year and 100-year storms.

Subcatchment 1-3 (Field & Plaza) is approximately 1.2 acres and includes the southern portion of the ballfield area and the outdoor classroom plaza. Stormwater runoff from this subcatchment flows overland to the proposed drainage system and is routed through Infiltration Area -1 after pretreatment through deep sump catch basins.

Subcatchment 1-4 (Bus Drive & Staff Parking) is approximately 2.5 acres and includes the proposed bus driveway from Hartley Road, the staff parking lot and surrounding landscape and slope areas. Stormwater runoff from this subcatchment is collected in the Phase I drainage system that runs under the proposed addition and connects directly to the 24" RCP line that discharges to Design Point 2.

As discussed in Standard 7 stormwater runoff from this subcatchment is pre-treated through deep sump catch basins and a water quality unit prior to discharging to Design Point 2. Because the majority of stormwater runoff from the Project is mitigated through either porous pavement or the three large infiltration areas, stormwater runoff from Subcatchment 1-4 can discharge directly to Design Point 2 without any peak rate or volume mitigation.

Subcatchment 1-5 (East Side of Existing Building) is approximately 0.42 acres and includes the existing lawn area just east of the existing building. Through discussions with the school department there has been evidence of historical flooding and standing water along the east side of the existing school. Therefore, the Project includes construction of additional drainage structures and Infiltration Area 3 to improve the drainage in this area. The infiltration system will be designed to infiltrate tributary runoff from Subcatchment 4 and will be equipped with an emergency overflow that connects to the Phase I drainage system.

Subcatchment 2-1 is approximately 0.6 acres and includes the undeveloped areas immediately west of the Project. Stormwater runoff from this subcatchment will continue to flow overland directly to the off-site pond.

Subcatchment 2-2 (Porous Parking Lot) is approximately 0.4 acres and represents the Phase II visitor parking lot that will be constructed of porous pavement. The porous pavement was modeled similar to the proposed firelane and will have no discharge in the 2-year and 10-year storms and a minor discharge of 0.06 cfs in the 100 year storm event.

Subcatchment 2-3 is approximately 1.6 acres and includes the proposed entrance driveway, plazas, sidewalks and service area. Stormwater runoff from this subcatchment connects, after treatment, directly to the existing 24" RCP drain line. Stormwater runoff from this subcatchment can connect directly to the 24" outfall without mitigation because of the substantial reduction in runoff that is achieved by installation of the porous pavement parking lot.

Subcatchment 2-4 measures approximately 0.5 acres and includes the majority of the existing single-story classroom wing with a small portion of the proposed addition. Stormwater runoff from this subcatchment will discharge to Infiltration Area 2 consisting of similar modular molded plastic recharge structures. The system will include an overflow pipe that connects to the 24" RCP drain.

Subcatchment 3, in the proposed condition, is approximately 0.3 acres and includes the exit driveway and sidewalk to Great Road. Stormwater runoff from this

area flows overland to Great Road, similar to existing conditions. Because there is a net reduction in area that discharges to Great Road there will be no increase in stormwater runoff associated with this subcatchment.

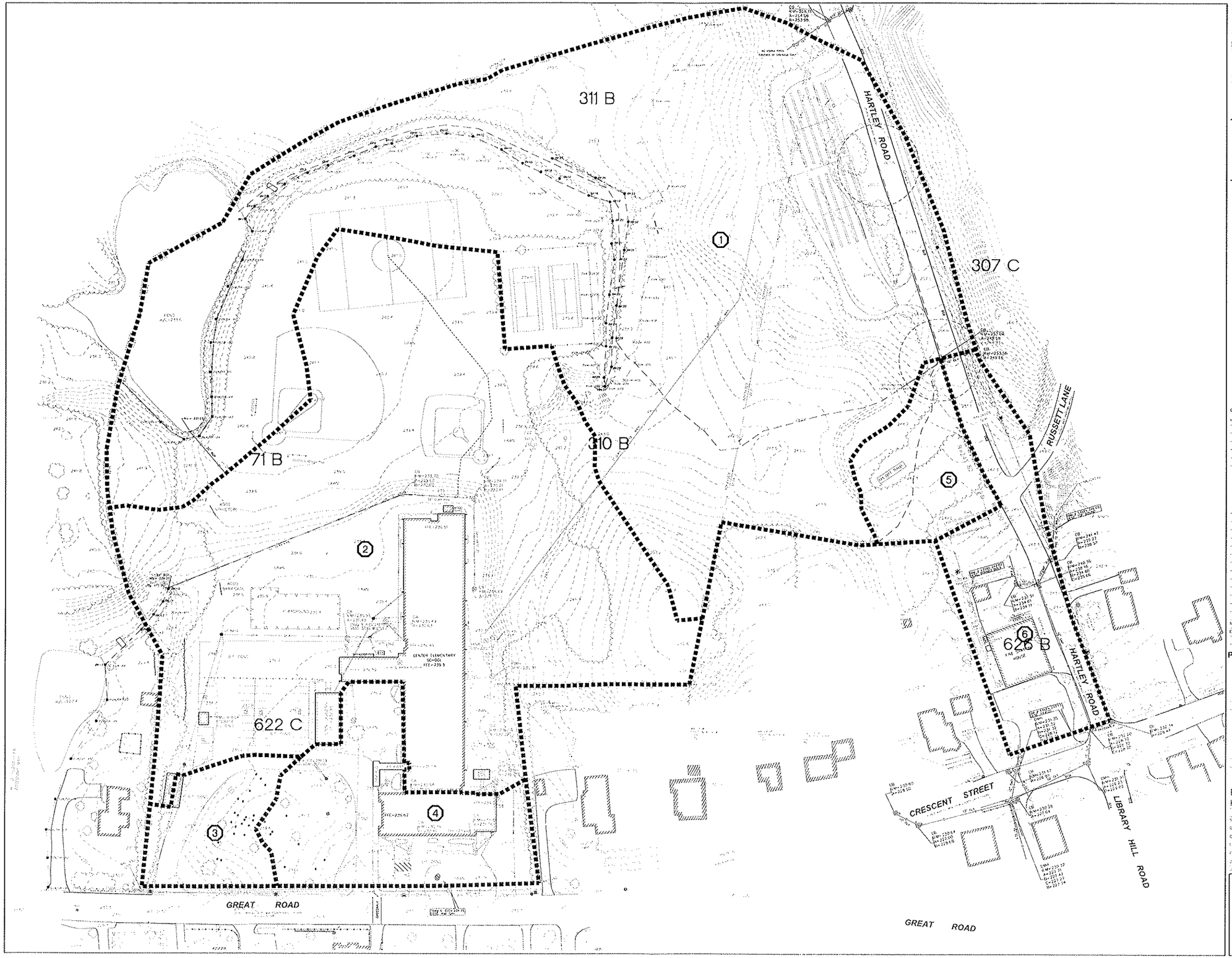
Subcatchment 4, under proposed conditions, is approximately 0.7 acres and consists of the new entrance driveway, developed areas adjacent to Great Road and the lawn areas immediately south of the existing building. Although there is an increase in overall area from existing conditions there will be a reduction in the quantity of runoff from this subcatchment in the proposed condition. This is due to the reduction in impervious surface associated with the removal of the parking area in front of the school and demolition of a portion of the existing building.

Subcatchment 5, under proposed conditions, is reduced to approximately 0.2 acres. Stormwater runoff from unaffected areas of this subcatchment will continue to flow south toward the residential abutter. Because there is a net reduction in area of the subcatchment there will be no increase in stormwater runoff.

Subcatchment 6 remains unchanged in the proposed condition and includes the existing Fire Department site and portions of Hartley Road. Stormwater runoff from this subcatchment will continue to flow into the existing drainage system in Crescent Street.

Summary

In order to mitigate the resultant increase in stormwater runoff the Project will implement multiple best management practices including porous pavement for the firelane and visitor parking lot, a green roof, and three large subsurface infiltration areas. As shown on Table 1 the implementation of these best management practices will result in no increase in post development runoff rates and volumes.



SMMA
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HORIUCHI SOLIEN
LANDSCAPE ARCHITECTS

BOARD REVIEW

NAME	DATE

NO.	DATE	DESCRIPTION

ISSUE LOG
PROGRESS CHANGE

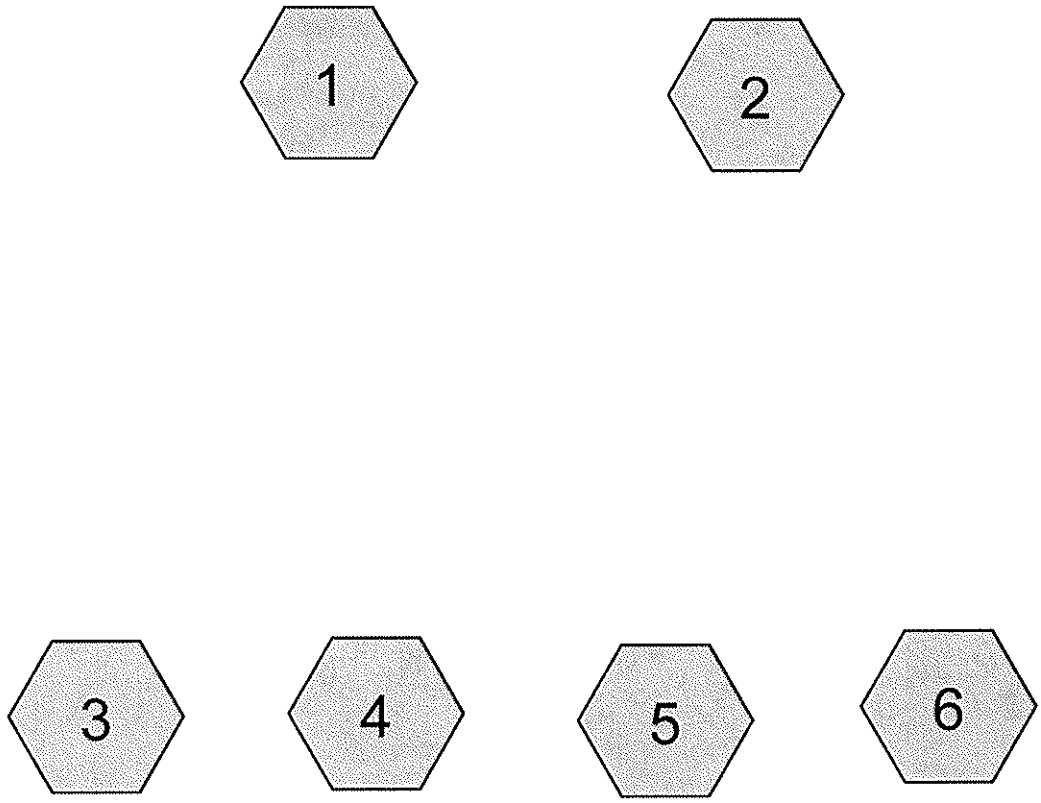
Pompositticut / Center Elementary School

493 Great Road
Stow, MA 01775

EXISTING HYDROLOGY

SCALE	1"=40'
DRAWN BY	NSC
CHECKED BY	
SUBMITTED/REVISED	JAM
PROJ. MGR.	LEH
JOB NO.	09.029.00

FIG.4



Subcat Reach Pond Link

Drainage Diagram for Stow Center School-existing
Prepared by SMMA

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=396,423 sf Runoff Depth>1.17"
Flow Length=1,442' Tc=13.4 min CN=78 Runoff=10.38 cfs 0.886 af

Subcatchment 2: Runoff Area=287,194 sf Runoff Depth>1.42"
Flow Length=765' Tc=12.9 min CN=82 Runoff=9.36 cfs 0.782 af

Subcatchment 3: Runoff Area=21,674 sf Runoff Depth>1.57"
Tc=5.0 min CN=84 Runoff=0.98 cfs 0.065 af

Subcatchment 4: Runoff Area=50,602 sf Runoff Depth>1.79"
Tc=5.0 min CN=87 Runoff=2.60 cfs 0.173 af

Subcatchment 5: Runoff Area=23,488 sf Runoff Depth>1.06"
Flow Length=247' Tc=5.3 min CN=76 Runoff=0.70 cfs 0.047 af

Subcatchment 6: Runoff Area=48,572 sf Runoff Depth>1.87"
Tc=5.0 min CN=88 Runoff=2.60 cfs 0.174 af

Subcatchment 1:

Runoff = 10.38 cfs @ 12.20 hrs, Volume= 0.886 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
243,172	73	Woods
3,259	87	Infield
20,194	98	Pond
14,965	89	Gravel
26,090	98	Paved area
88,743	79	Lawn
396,423	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	200	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	80	0.0200	7.6	5.95	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.3	430	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	682	0.0060	3.5	59.52	**Channel Flow,** Area= 17.0 sf Perim= 19.5' r= 0.87' n= 0.030 Earth, grassed & winding
13.4	1,442	Total			

Subcatchment 2:

Runoff = 9.36 cfs @ 12.18 hrs, Volume= 0.782 af, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
49,884	73	Woods
13,890	87	Infield
30,130	98	Building
24,596	98	Paved areas
2,740	87	Playground
165,954	79	Lawn
287,194	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
5.8	300	0.0150	0.9		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.2000	3.1		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	88	0.0050	3.2	2.52	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Clay tile
0.9	307	0.0170	5.9	4.65	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Clay tile
12.9	765	Total			

Subcatchment 3:

Runoff = 0.98 cfs @ 12.08 hrs, Volume= 0.065 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
1,041	73	Woods
394	98	Building
5,958	98	Paved areas
14,281	79	Lawn
21,674	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4:

Runoff = 2.60 cfs @ 12.08 hrs, Volume= 0.173 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
7,330	98	Building
13,453	98	Paved areas
29,819	79	Lawn
50,602	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5:

Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.047 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
13,572	73	Woods
9,916	79	Lawn
23,488	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0440	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	197	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.3	247	Total			

Subcatchment 6:

Runoff = 2.60 cfs @ 12.08 hrs, Volume= 0.174 af, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
4,257	98	Building
19,670	98	Paved areas
24,645	79	Lawn
48,572	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=396,423 sf Runoff Depth>2.13"
Flow Length=1,442' Tc=13.4 min CN=78 Runoff=19.11 cfs 1.612 af

Subcatchment 2: Runoff Area=287,194 sf Runoff Depth>2.46"
Flow Length=765' Tc=12.9 min CN=82 Runoff=16.13 cfs 1.351 af

Subcatchment 3: Runoff Area=21,674 sf Runoff Depth>2.64"
Tc=5.0 min CN=84 Runoff=1.64 cfs 0.109 af

Subcatchment 4: Runoff Area=50,602 sf Runoff Depth>2.92"
Tc=5.0 min CN=87 Runoff=4.19 cfs 0.282 af

Subcatchment 5: Runoff Area=23,488 sf Runoff Depth>1.97"
Flow Length=247' Tc=5.3 min CN=76 Runoff=1.34 cfs 0.089 af

Subcatchment 6: Runoff Area=48,572 sf Runoff Depth>3.01"
Tc=5.0 min CN=88 Runoff=4.13 cfs 0.280 af

Subcatchment 1:

Runoff = 19.11 cfs @ 12.19 hrs, Volume= 1.612 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
243,172	73	Woods
3,259	87	Infield
20,194	98	Pond
14,965	89	Gravel
26,090	98	Paved area
88,743	79	Lawn
396,423	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	200	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	80	0.0200	7.6	5.95	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.3	430	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	682	0.0060	3.5	59.52	**Channel Flow,** Area= 17.0 sf Perim= 19.5' r= 0.87' n= 0.030 Earth, grassed & winding
13.4	1,442	Total			

Subcatchment 2:

Runoff = 16.13 cfs @ 12.18 hrs, Volume= 1.351 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
49,884	73	Woods
13,890	87	Infield
30,130	98	Building
24,596	98	Paved areas
2,740	87	Playground
165,954	79	Lawn
287,194	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
5.8	300	0.0150	0.9		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.2000	3.1		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	88	0.0050	3.2	2.52	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Clay tile
0.9	307	0.0170	5.9	4.65	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Clay tile
12.9	765	Total			

Subcatchment 3:

Runoff = 1.64 cfs @ 12.08 hrs, Volume= 0.109 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
1,041	73	Woods
394	98	Building
5,958	98	Paved areas
14,281	79	Lawn
21,674	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4:

Runoff = 4.19 cfs @ 12.07 hrs, Volume= 0.282 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
7,330	98	Building
13,453	98	Paved areas
29,819	79	Lawn
50,602	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5:

Runoff = 1.34 cfs @ 12.09 hrs, Volume= 0.089 af, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
13,572	73	Woods
9,916	79	Lawn
23,488	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0440	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	197	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.3	247	Total			

Subcatchment 6:

Runoff = 4.13 cfs @ 12.07 hrs, Volume= 0.280 af, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
4,257	98	Building
19,670	98	Paved areas
24,645	79	Lawn
48,572	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=396,423 sf Runoff Depth>3.76"
Flow Length=1,442' Tc=13.4 min CN=78 Runoff=33.54 cfs 2.852 af

Subcatchment 2: Runoff Area=287,194 sf Runoff Depth>4.18"
Flow Length=765' Tc=12.9 min CN=82 Runoff=26.96 cfs 2.295 af

Subcatchment 3: Runoff Area=21,674 sf Runoff Depth>4.40"
Tc=5.0 min CN=84 Runoff=2.69 cfs 0.182 af

Subcatchment 4: Runoff Area=50,602 sf Runoff Depth>4.72"
Tc=5.0 min CN=87 Runoff=6.62 cfs 0.457 af

Subcatchment 5: Runoff Area=23,488 sf Runoff Depth>3.57"
Flow Length=247' Tc=5.3 min CN=76 Runoff=2.40 cfs 0.160 af

Subcatchment 6: Runoff Area=48,572 sf Runoff Depth>4.83"
Tc=5.0 min CN=88 Runoff=6.46 cfs 0.449 af

Subcatchment 1:

Runoff = 33.54 cfs @ 12.19 hrs, Volume= 2.852 af, Depth> 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
243,172	73	Woods
3,259	87	Infield
20,194	98	Pond
14,965	89	Gravel
26,090	98	Paved area
88,743	79	Lawn
396,423	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	200	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	80	0.0200	7.6	5.95	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.3	430	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	682	0.0060	3.5	59.52	**Channel Flow,** Area= 17.0 sf Perim= 19.5' r= 0.87' n= 0.030 Earth, grassed & winding
13.4	1,442	Total			

Subcatchment 2:

Runoff = 26.96 cfs @ 12.18 hrs, Volume= 2.295 af, Depth> 4.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
49,884	73	Woods
13,890	87	Infield
30,130	98	Building
24,596	98	Paved areas
2,740	87	Playground
165,954	79	Lawn
287,194	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
5.8	300	0.0150	0.9		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.2000	3.1		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	88	0.0050	3.2	2.52	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Clay tile
0.9	307	0.0170	5.9	4.65	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Clay tile
12.9	765	Total			

Subcatchment 3:

Runoff = 2.69 cfs @ 12.07 hrs, Volume= 0.182 af, Depth> 4.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
1,041	73	Woods
394	98	Building
5,958	98	Paved areas
14,281	79	Lawn
21,674	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4:

Runoff = 6.62 cfs @ 12.07 hrs, Volume= 0.457 af, Depth> 4.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
7,330	98	Building
13,453	98	Paved areas
29,819	79	Lawn
50,602	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5:

Runoff = 2.40 cfs @ 12.08 hrs, Volume= 0.160 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
13,572	73	Woods
9,916	79	Lawn
23,488	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0440	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	197	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.3	247	Total			

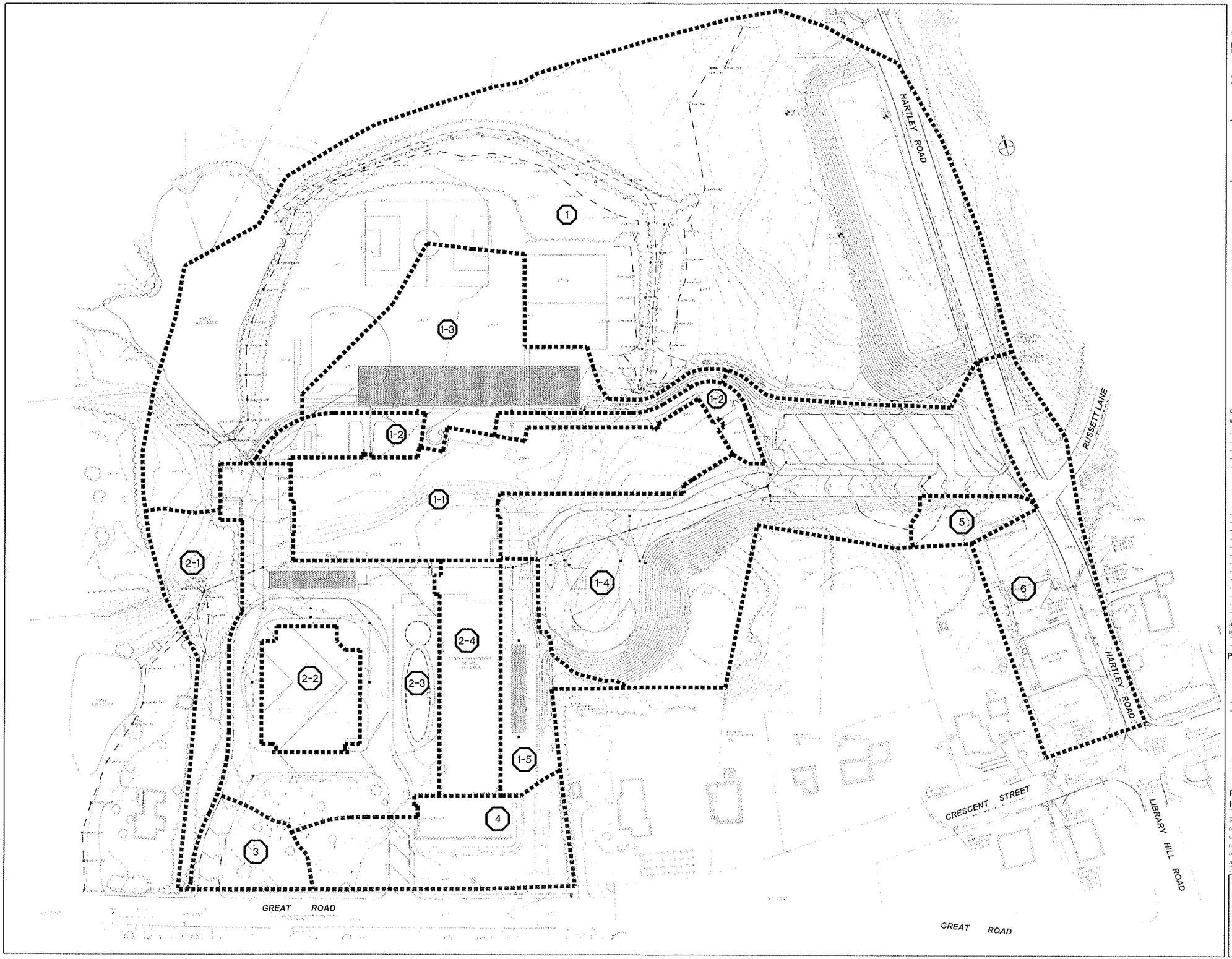
Subcatchment 6:

Runoff = 6.46 cfs @ 12.07 hrs, Volume= 0.449 af, Depth> 4.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
4,257	98	Building
19,670	98	Paved areas
24,645	79	Lawn
48,572	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**



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HORIUCHI SOLIEN
LANDSCAPE ARCHITECTS

OWNER REVIEW

NAME DATE

NO. DATE DESCRIPTION

ISSUE LOG

Δ = CLOUDED CHANGE

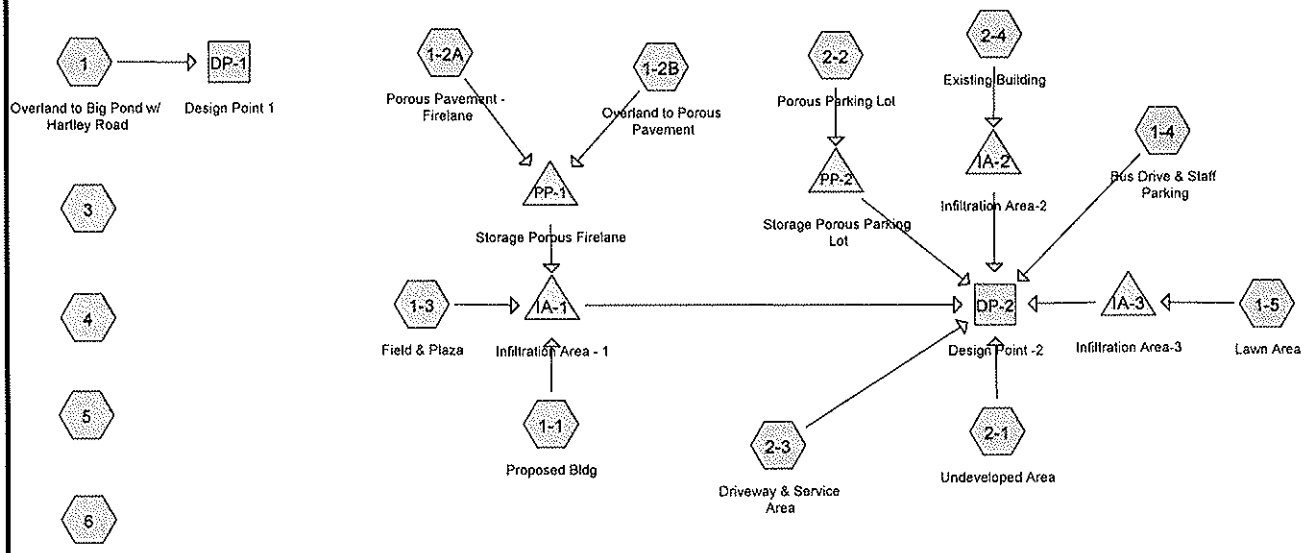
Pompositticut / Center Elementary School

493 Great Road
Stow, MA 01775

PROPOSED HYDROLOGY

SCALE 1"=40'
DRAWN BY MJC
CHECK BY
PROJECT MGR. JSH
JOB NO. 09010.10

FIG.5



Subcat Reach Pond Link

Drainage Diagram for Stow Center School-proposed-rev_030910

Prepared by SMMA

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Overland to Big Pond w/ Hartley Road Runoff Area=335,882 sf Runoff Depth>1.17"
Flow Length=1,322' Tc=10.1 min CN=78 Runoff=9.70 cfs 0.751 af

Subcatchment 1-1: Proposed Bldg Runoff Area=55,875 sf Runoff Depth>2.77"
Tc=5.0 min CN=98 Runoff=4.01 cfs 0.296 af

Subcatchment 1-2A: Porous Pavement - Firelane Runoff Area=8,140 sf Runoff Depth>2.26"
Tc=340.0 min CN=98 Runoff=0.07 cfs 0.035 af

Subcatchment 1-2B: Overland to Porous Pavement Runoff Area=10,805 sf Runoff Depth>0.99"
Tc=340.0 min CN=81 Runoff=0.05 cfs 0.020 af

Subcatchment 1-3: Field & Plaza Runoff Area=51,878 sf Runoff Depth>1.36"
Flow Length=250' Tc=9.5 min CN=81 Runoff=1.78 cfs 0.135 af

Subcatchment 1-4: Bus Drive & Staff Parking Runoff Area=110,728 sf Runoff Depth>1.71"
Flow Length=895' Tc=9.3 min CN=86 Runoff=4.80 cfs 0.363 af

Subcatchment 1-5: Lawn Area Runoff Area=18,126 sf Runoff Depth>1.23"
Flow Length=100' Tc=8.6 min CN=79 Runoff=0.57 cfs 0.043 af

Subcatchment 2-1: Undeveloped Area Runoff Area=25,274 sf Runoff Depth>1.00"
Flow Length=151' Tc=4.7 min CN=75 Runoff=0.72 cfs 0.048 af

Subcatchment 2-2: Porous Parking Lot Runoff Area=17,055 sf Runoff Depth>2.26"
Tc=340.0 min CN=98 Runoff=0.15 cfs 0.074 af

Subcatchment 2-3: Driveway & Service Area Runoff Area=70,841 sf Runoff Depth>1.95"
Tc=5.0 min CN=89 Runoff=3.96 cfs 0.265 af

Subcatchment 2-4: Existing Building Runoff Area=21,620 sf Runoff Depth>2.77"
Tc=5.0 min CN=98 Runoff=1.55 cfs 0.115 af

Subcatchment 3: Runoff Area=12,395 sf Runoff Depth>1.57"
Tc=5.0 min CN=84 Runoff=0.56 cfs 0.037 af

Subcatchment 4: Runoff Area=33,574 sf Runoff Depth>1.64"
Tc=5.0 min CN=85 Runoff=1.59 cfs 0.105 af

Subcatchment 5: Runoff Area=0.160 ac Runoff Depth>1.11"
Flow Length=65' Tc=5.2 min CN=77 Runoff=0.22 cfs 0.015 af

Subcatchment 6: Runoff Area=1.116 ac Runoff Depth>1.87"
Tc=5.0 min CN=88 Runoff=2.60 cfs 0.174 af

Reach DP-1: Design Point 1 Inflow=9.70 cfs 0.751 af
Outflow=9.70 cfs 0.751 af

Reach DP-2: Design Point -2 Inflow=9.12 cfs 0.677 af
Outflow=9.12 cfs 0.677 af

Pond IA-1: Infiltration Area - 1 Peak Elev=233.23' Storage=14,940 cf Inflow=5.50 cfs 0.431 af
Discarded=0.08 cfs 0.088 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.088 af

Pond IA-2: Infiltration Area-2 Peak Elev=231.04' Storage=4,229 cf Inflow=1.55 cfs 0.115 af
Discarded=0.01 cfs 0.016 af Primary=0.01 cfs 0.001 af Outflow=0.02 cfs 0.018 af

Pond IA-3: Infiltration Area-3 Peak Elev=230.30' Storage=1,471 cf Inflow=0.57 cfs 0.043 af
Discarded=0.01 cfs 0.009 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.009 af

Pond PP-1: Storage Porous Firelane Peak Elev=235.93' Storage=1,048 cf Inflow=0.12 cfs 0.056 af
Discarded=0.05 cfs 0.031 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.031 af

Pond PP-2: Storage Porous Parking Lot Peak Elev=231.61' Storage=560 cf Inflow=0.15 cfs 0.074 af
Discarded=0.11 cfs 0.063 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.063 af

Subcatchment 1: Overland to Big Pond w/ Hartley Road

Runoff = 9.70 cfs @ 12.15 hrs, Volume= 0.751 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
160,132	73	Woods
5,362	87	Infield
20,194	98	Pond
127,428	79	Lawn
6,121	87	Playground
5,400	98	Walkways
11,245	98	Pavement
335,882	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow, Hartley Road** Smooth surfaces n= 0.011 P2= 3.20"
0.8	200	0.0400	4.1		**Shallow Concentrated Flow, Hartley Road** Paved Kv= 20.3 fps
0.2	80	0.0200	6.4	5.04	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
5.0	310	0.0220	1.0		**Shallow Concentrated Flow, Grass-lined swale behind parking** Short Grass Pasture Kv= 7.0 fps
3.2	682	0.0060	3.5	59.52	**Channel Flow, Drainage Swale behind Tennis Courts** Area= 17.0 sf Perim= 19.5' r= 0.87' n= 0.030 Earth, grassed & winding
10.1	1,322	Total			

Subcatchment 1-1: Proposed Bldg

Runoff = 4.01 cfs @ 12.07 hrs, Volume= 0.296 af, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
51,200	98	Conventional Roof
4,675	98	Green Roof (Assume Conv. for future expansion)
55,875	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1-2A: Porous Pavement - Firelane

Runoff = 0.07 cfs @ 16.25 hrs, Volume= 0.035 af, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
8,140	98	Firelane Porous Pavement

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry,**

Subcatchment 1-2B: Overland to Porous Pavement

Runoff = 0.05 cfs @ 16.66 hrs, Volume= 0.020 af, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
1,050	98	Walkways
9,755	79	50-75% Grass cover, Fair, HSG C
10,805	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry,**

Subcatchment 1-3: Field & Plaza

Runoff = 1.78 cfs @ 12.14 hrs, Volume= 0.135 af, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
43,241	79	50-75% Grass cover, Fair, HSG C
5,362	87	Infield
3,275	98	Walkways
51,878	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.9	200	0.0150	0.9		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	250	Total			

Subcatchment 1-4: Bus Drive & Staff Parking

Runoff = 4.80 cfs @ 12.13 hrs, Volume= 0.363 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
15,900	73	Woods
37,787	98	Paved areas
7,880	98	Walkway
49,161	79	Lawn
110,728	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	30	0.1300	1.8		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	100	0.0350	2.8		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	190	0.0050	3.7	4.57	**Circular Channel (pipe),** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.8	450	0.0050	4.2	7.43	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.1	75	0.0100	9.9	48.47	**Circular Channel (pipe),** Diam= 30.0" Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.011 Concrete pipe, straight & clean
9.3	895	Total			

Subcatchment 1-5: Lawn Area

Runoff = 0.57 cfs @ 12.13 hrs, Volume= 0.043 af, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
18,126	79	Lawn

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	50	0.0100	0.7		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.6	100	Total			

Subcatchment 2-1: Undeveloped Area

Runoff = 0.72 cfs @ 12.08 hrs, Volume= 0.048 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
15,571	73	Woods
9,703	79	Lawn
25,274	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0560	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.0	101	0.0120	1.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.7	151	Total			

Subcatchment 2-2: Porous Parking Lot

Runoff = 0.15 cfs @ 16.25 hrs, Volume= 0.074 af, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
17,055	98	Porous Pavement

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry, Proportional to UNH data (18" Base)**

Subcatchment 2-3: Driveway & Service Area

Runoff = 3.96 cfs @ 12.07 hrs, Volume= 0.265 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
23,825	98	Paved areas
12,570	98	Walkway
576	98	Maintenance Building
33,870	79	50-75% Grass cover, Fair, HSG C
70,841	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2-4: Existing Building

Runoff = 1.55 cfs @ 12.07 hrs, Volume= 0.115 af, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
21,620	98	Ex & New Building

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3:

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.037 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
2,775	98	Pavement
735	98	Walkways
8,885	79	50-75% Grass cover, Fair, HSG C
12,395	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4:

Runoff = 1.59 cfs @ 12.08 hrs, Volume= 0.105 af, Depth> 1.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
765	73	Woods
22,721	79	Lawn
2,115	98	Paved areas
1,765	98	Walkway
6,208	98	Building
33,574	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5:

Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.015 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (ac)	CN	Description
0.066	73	Woods
0.094	79	Lawn
0.160	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	15	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	65	Total			

Subcatchment 6:

Runoff = 2.60 cfs @ 12.08 hrs, Volume= 0.174 af, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (ac)	CN	Description
0.098	98	Fire Station Bldg
0.452	98	Paved areas
0.566	79	Lawn
1.116	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach DP-1: Design Point 1

Inflow Area = 7.711 ac, Inflow Depth > 1.17" for 2 YEAR event
Inflow = 9.70 cfs @ 12.15 hrs, Volume= 0.751 af
Outflow = 9.70 cfs @ 12.15 hrs, Volume= 0.751 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point -2

Inflow Area = 8.961 ac, Inflow Depth > 0.91" for 2 YEAR event
Inflow = 9.12 cfs @ 12.10 hrs, Volume= 0.677 af
Outflow = 9.12 cfs @ 12.10 hrs, Volume= 0.677 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond IA-1: Infiltration Area - 1

Inflow Area = 2.909 ac, Inflow Depth > 1.78" for 2 YEAR event
Inflow = 5.50 cfs @ 12.09 hrs, Volume= 0.431 af
Outflow = 0.08 cfs @ 8.70 hrs, Volume= 0.088 af, Atten= 99%, Lag= 0.0 min
Discarded = 0.08 cfs @ 8.70 hrs, Volume= 0.088 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 233.23' @ 20.00 hrs Surf.Area= 12,960 sf Storage= 14,940 cf
Plug-Flow detention time= 215.1 min calculated for 0.088 af (20% of inflow)
Center-of-Mass det. time= 44.6 min (803.0 - 758.5)

Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	36,547 cf	**48.00'W x 270.00'L x 3.00'H Prismatoid** 38,880 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	234.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.08 cfs @ 8.70 hrs HW=232.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=232.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond IA-2: Infiltration Area-2

Inflow Area = 0.496 ac, Inflow Depth > 2.77" for 2 YEAR event
Inflow = 1.55 cfs @ 12.07 hrs, Volume= 0.115 af
Outflow = 0.02 cfs @ 19.90 hrs, Volume= 0.018 af, Atten= 99%, Lag= 469.5 min
Discarded = 0.01 cfs @ 6.65 hrs, Volume= 0.016 af
Primary = 0.01 cfs @ 19.90 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 231.04' @ 19.90 hrs Surf.Area= 2,205 sf Storage= 4,229 cf
Plug-Flow detention time= 286.6 min calculated for 0.018 af (15% of inflow)
Center-of-Mass det. time= 61.3 min (799.1 - 737.8)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	6,218 cf	**21.00'W x 105.00'L x 3.00'H Prismatoid** 6,615 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	231.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 6.65 hrs HW=229.03' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 19.90 hrs HW=231.04' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.7 fps)

Pond IA-3: Infiltration Area-3

Inflow Area = 0.416 ac, Inflow Depth > 1.23" for 2 YEAR event
Inflow = 0.57 cfs @ 12.13 hrs, Volume= 0.043 af
Outflow = 0.01 cfs @ 11.70 hrs, Volume= 0.009 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.70 hrs, Volume= 0.009 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 230.30' @ 20.00 hrs Surf.Area= 1,944 sf Storage= 1,471 cf
Plug-Flow detention time= 228.1 min calculated for 0.009 af (21% of inflow)
Center-of-Mass det. time= 126.0 min (934.2 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	229.50'	5,482 cf	**18.00'W x 108.00'L x 3.00'H Prismatoid** 5,832 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	232.50'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 11.70 hrs HW=229.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=229.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond PP-1: Storage Porous Firelane

Inflow Area = 0.435 ac, Inflow Depth > 1.53" for 2 YEAR event
Inflow = 0.12 cfs @ 16.27 hrs, Volume= 0.056 af
Outflow = 0.05 cfs @ 14.20 hrs, Volume= 0.031 af, Atten= 58%, Lag= 0.0 min
Discarded = 0.05 cfs @ 14.20 hrs, Volume= 0.031 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 235.93' @ 20.00 hrs Surf.Area= 8,140 sf Storage= 1,048 cf
Plug-Flow detention time=76.7 min calculated for 0.031 af (56% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	235.50'	6,675 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.50	8,140	35.0	0	0
236.08	8,140	30.0	1,416	1,416
236.33	8,140	25.0	509	1,925
237.33	8,140	40.0	3,256	5,181
237.66	8,140	35.0	940	6,121
238.00	8,140	20.0	554	6,675

Device	Routing	Invert	Outlet Devices
#1	Primary	236.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 14.20 hrs HW=235.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=235.50' (Free Discharge)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)

Pond PP-2: Storage Porous Parking Lot

Inflow Area = 0.392 ac, Inflow Depth > 2.26" for 2 YEAR event
Inflow = 0.15 cfs @ 16.25 hrs, Volume= 0.074 af
Outflow = 0.11 cfs @ 14.85 hrs, Volume= 0.063 af, Atten= 31%, Lag= 0.0 min
Discarded = 0.11 cfs @ 14.85 hrs, Volume= 0.063 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 231.61' @ 18.51 hrs Surf.Area= 17,055 sf Storage= 560 cf
Plug-Flow detention time=45.0 min calculated for 0.063 af (86% of inflow)
Center-of-Mass det. time= 12.1 min (967.9 - 955.8)

Volume	Invert	Avail.Storage	Storage Description
#1	231.50'	13,985 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
231.50	17,055	35.0	0	0
232.08	17,055	30.0	2,968	2,968
232.33	17,055	25.0	1,066	4,034
233.33	17,055	40.0	6,822	10,856
233.66	17,055	35.0	1,970	12,825
234.00	17,055	20.0	1,160	13,985

Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#2	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 14.85 hrs HW=231.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=231.50' (Free Discharge)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Overland to Big Pond w/ Hartley Road Runoff Area=335,882 sf Runoff Depth>2.13"
Flow Length=1,322' Tc=10.1 min CN=78 Runoff=17.82 cfs 1.367 af

Subcatchment 1-1: Proposed Bldg Runoff Area=55,875 sf Runoff Depth>3.96"
Tc=5.0 min CN=98 Runoff=5.68 cfs 0.424 af

Subcatchment 1-2A: Porous Pavement - Firelane Runoff Area=8,140 sf Runoff Depth>3.26"
Tc=340.0 min CN=98 Runoff=0.10 cfs 0.051 af

Subcatchment 1-2B: Overland to Porous Pavement Runoff Area=10,805 sf Runoff Depth>1.77"
Tc=340.0 min CN=81 Runoff=0.09 cfs 0.037 af

Subcatchment 1-3: Field & Plaza Runoff Area=51,878 sf Runoff Depth>2.38"
Flow Length=250' Tc=9.5 min CN=81 Runoff=3.11 cfs 0.236 af

Subcatchment 1-4: Bus Drive & Staff Parking Runoff Area=110,728 sf Runoff Depth>2.82"
Flow Length=895' Tc=9.3 min CN=86 Runoff=7.79 cfs 0.597 af

Subcatchment 1-5: Lawn Area Runoff Area=18,126 sf Runoff Depth>2.21"
Flow Length=100' Tc=8.6 min CN=79 Runoff=1.04 cfs 0.077 af

Subcatchment 2-1: Undeveloped Area Runoff Area=25,274 sf Runoff Depth>1.90"
Flow Length=151' Tc=4.7 min CN=75 Runoff=1.41 cfs 0.092 af

Subcatchment 2-2: Porous Parking Lot Runoff Area=17,055 sf Runoff Depth>3.26"
Tc=340.0 min CN=98 Runoff=0.22 cfs 0.106 af

Subcatchment 2-3: Driveway & Service Area Runoff Area=70,841 sf Runoff Depth>3.11"
Tc=5.0 min CN=89 Runoff=6.18 cfs 0.421 af

Subcatchment 2-4: Existing Building Runoff Area=21,620 sf Runoff Depth>3.96"
Tc=5.0 min CN=98 Runoff=2.20 cfs 0.164 af

Subcatchment 3: Runoff Area=12,395 sf Runoff Depth>2.64"
Tc=5.0 min CN=84 Runoff=0.94 cfs 0.063 af

Subcatchment 4: Runoff Area=33,574 sf Runoff Depth>2.73"
Tc=5.0 min CN=85 Runoff=2.63 cfs 0.175 af

Subcatchment 5: Runoff Area=0.160 ac Runoff Depth>2.05"
Flow Length=65' Tc=5.2 min CN=77 Runoff=0.41 cfs 0.027 af

Subcatchment 6: Runoff Area=1.116 ac Runoff Depth>3.01"
Tc=5.0 min CN=88 Runoff=4.13 cfs 0.280 af

Reach DP-1: Design Point 1 Inflow=17.82 cfs 1.367 af
Outflow=17.82 cfs 1.367 af

Reach DP-2: Design Point -2 Inflow=14.78 cfs 1.161 af
Outflow=14.78 cfs 1.161 af

Pond IA-1: Infiltration Area - 1 Peak Elev=234.07' Storage=25,265 cf Inflow=8.36 cfs 0.675 af
Discarded=0.08 cfs 0.093 af Primary=0.02 cfs 0.002 af Outflow=0.11 cfs 0.095 af

Pond IA-2: Infiltration Area-2 Peak Elev=231.23' Storage=4,621 cf Inflow=2.20 cfs 0.164 af
Discarded=0.01 cfs 0.017 af Primary=0.22 cfs 0.049 af Outflow=0.24 cfs 0.066 af

Pond IA-3: Infiltration Area-3 Peak Elev=231.09' Storage=2,898 cf Inflow=1.04 cfs 0.077 af
Discarded=0.01 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.010 af

Pond PP-1: Storage Porous Firelane Peak Elev=236.20' Storage=1,657 cf Inflow=0.19 cfs 0.087 af
Discarded=0.05 cfs 0.035 af Primary=0.08 cfs 0.016 af Outflow=0.13 cfs 0.051 af

Pond PP-2: Storage Porous Parking Lot Peak Elev=231.80' Storage=1,552 cf Inflow=0.22 cfs 0.106 af
Discarded=0.11 cfs 0.071 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.071 af

Subcatchment 1: Overland to Big Pond w/ Hartley Road

Runoff = 17.82 cfs @ 12.15 hrs, Volume= 1.367 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
160,132	73	Woods
5,362	87	Infield
20,194	98	Pond
127,428	79	Lawn
6,121	87	Playground
5,400	98	Walkways
11,245	98	Pavement
335,882	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow, Hartley Road** Smooth surfaces n= 0.011 P2= 3.20"
0.8	200	0.0400	4.1		**Shallow Concentrated Flow, Hartley Road** Paved Kv= 20.3 fps
0.2	80	0.0200	6.4	5.04	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
5.0	310	0.0220	1.0		**Shallow Concentrated Flow, Grass-lined swale behind parking** Short Grass Pasture Kv= 7.0 fps
3.2	682	0.0060	3.5	59.52	**Channel Flow, Drainage Swale behind Tennis Courts** Area= 17.0 sf Perim= 19.5' r= 0.87' n= 0.030 Earth, grassed & winding
10.1	1,322	Total			

Subcatchment 1-1: Proposed Bldg

Runoff = 5.68 cfs @ 12.07 hrs, Volume= 0.424 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
51,200	98	Conventional Roof
4,675	98	Green Roof (Assume Conv. for future expansion)
55,875	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1-2A: Porous Pavement - Firelane

Runoff = 0.10 cfs @ 16.24 hrs, Volume= 0.051 af, Depth> 3.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
8,140	98	Firelane Porous Pavement

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry,**

Subcatchment 1-2B: Overland to Porous Pavement

Runoff = 0.09 cfs @ 16.60 hrs, Volume= 0.037 af, Depth> 1.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
1,050	98	Walkways
9,755	79	50-75% Grass cover, Fair, HSG C
10,805	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry,**

Subcatchment 1-3: Field & Plaza

Runoff = 3.11 cfs @ 12.14 hrs, Volume= 0.236 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
43,241	79	50-75% Grass cover, Fair, HSG C
5,362	87	Infield
3,275	98	Walkways
51,878	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.9	200	0.0150	0.9		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	250	Total			

Subcatchment 1-4: Bus Drive & Staff Parking

Runoff = 7.79 cfs @ 12.13 hrs, Volume= 0.597 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
15,900	73	Woods
37,787	98	Paved areas
7,880	98	Walkway
49,161	79	Lawn
110,728	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	30	0.1300	1.8		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	100	0.0350	2.8		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	190	0.0050	3.7	4.57	**Circular Channel (pipe),** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.8	450	0.0050	4.2	7.43	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.1	75	0.0100	9.9	48.47	**Circular Channel (pipe),** Diam= 30.0" Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.011 Concrete pipe, straight & clean
9.3	895	Total			

Subcatchment 1-5: Lawn Area

Runoff = 1.04 cfs @ 12.12 hrs, Volume= 0.077 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
18,126	79	Lawn

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	50	0.0100	0.7		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.6	100	Total			

Subcatchment 2-1: Undeveloped Area

Runoff = 1.41 cfs @ 12.07 hrs, Volume= 0.092 af, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
15,571	73	Woods
9,703	79	Lawn
25,274	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0560	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.0	101	0.0120	1.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.7	151	Total			

Subcatchment 2-2: Porous Parking Lot

Runoff = 0.22 cfs @ 16.24 hrs, Volume= 0.106 af, Depth> 3.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
17,055	98	Porous Pavement

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry, Proportional to UNH data (18" Base)**

Subcatchment 2-3: Driveway & Service Area

Runoff = 6.18 cfs @ 12.07 hrs, Volume= 0.421 af, Depth> 3.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
23,825	98	Paved areas
12,570	98	Walkway
576	98	Maintenance Building
33,870	79	50-75% Grass cover, Fair, HSG C
70,841	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2-4: Existing Building

Runoff = 2.20 cfs @ 12.07 hrs, Volume= 0.164 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
21,620	98	Ex & New Building

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3:

Runoff = 0.94 cfs @ 12.08 hrs, Volume= 0.063 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
2,775	98	Pavement
735	98	Walkways
8,885	79	50-75% Grass cover, Fair, HSG C
12,395	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4:

Runoff = 2.63 cfs @ 12.07 hrs, Volume= 0.175 af, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (sf)	CN	Description
765	73	Woods
22,721	79	Lawn
2,115	98	Paved areas
1,765	98	Walkway
6,208	98	Building
33,574	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5:

Runoff = 0.41 cfs @ 12.08 hrs, Volume= 0.027 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (ac)	CN	Description
0.066	73	Woods
0.094	79	Lawn
0.160	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	15	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	65	Total			

Subcatchment 6:

Runoff = 4.13 cfs @ 12.07 hrs, Volume= 0.280 af, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.50"

Area (ac)	CN	Description
0.098	98	Fire Station Bldg
0.452	98	Paved areas
0.566	79	Lawn
1.116	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach DP-1: Design Point 1

Inflow Area = 7.711 ac, Inflow Depth > 2.13" for 10 YEAR event
Inflow = 17.82 cfs @ 12.15 hrs, Volume= 1.367 af
Outflow = 17.82 cfs @ 12.15 hrs, Volume= 1.367 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point -2

Inflow Area = 8.961 ac, Inflow Depth > 1.55" for 10 YEAR event
Inflow = 14.78 cfs @ 12.10 hrs, Volume= 1.161 af
Outflow = 14.78 cfs @ 12.10 hrs, Volume= 1.161 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond IA-1: Infiltration Area - 1

Inflow Area = 2.909 ac, Inflow Depth > 2.78" for 10 YEAR event
Inflow = 8.36 cfs @ 12.09 hrs, Volume= 0.675 af
Outflow = 0.11 cfs @ 20.00 hrs, Volume= 0.095 af, Atten= 99%, Lag= 474.6 min
Discarded = 0.08 cfs @ 7.45 hrs, Volume= 0.093 af
Primary = 0.02 cfs @ 20.00 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 234.07' @ 20.00 hrs Surf.Area= 12,960 sf Storage= 25,265 cf
Plug-Flow detention time= 247.5 min calculated for 0.095 af (14% of inflow)
Center-of-Mass det. time= 25.4 min (789.0 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	36,547 cf	**48.00'W x 270.00'L x 3.00'H Prismatoid** 38,880 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	234.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.08 cfs @ 7.45 hrs HW=232.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.02 cfs @ 20.00 hrs HW=234.07' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 0.9 fps)

Pond IA-2: Infiltration Area-2

Inflow Area = 0.496 ac, Inflow Depth > 3.96" for 10 YEAR event
Inflow = 2.20 cfs @ 12.07 hrs, Volume= 0.164 af
Outflow = 0.24 cfs @ 12.73 hrs, Volume= 0.066 af, Atten= 89%, Lag= 39.6 min
Discarded = 0.01 cfs @ 5.90 hrs, Volume= 0.017 af
Primary = 0.22 cfs @ 12.73 hrs, Volume= 0.049 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 231.23' @ 12.73 hrs Surf.Area= 2,205 sf Storage= 4,621 cf
Plug-Flow detention time= 232.7 min calculated for 0.066 af (40% of inflow)
Center-of-Mass det. time= 115.9 min (850.9 - 735.0)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	6,218 cf	**21.00'W x 105.00'L x 3.00'H Prismatoid** 6,615 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	231.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 5.90 hrs HW=229.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.22 cfs @ 12.73 hrs HW=231.23' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.22 cfs @ 1.6 fps)

Pond IA-3: Infiltration Area-3

Inflow Area = 0.416 ac, Inflow Depth > 2.21" for 10 YEAR event
Inflow = 1.04 cfs @ 12.12 hrs, Volume= 0.077 af
Outflow = 0.01 cfs @ 10.75 hrs, Volume= 0.010 af, Atten= 99%, Lag= 0.0 min
Discarded = 0.01 cfs @ 10.75 hrs, Volume= 0.010 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 231.09' @ 20.00 hrs Surf.Area= 1,944 sf Storage= 2,898 cf
Plug-Flow detention time= 230.0 min calculated for 0.010 af (13% of inflow)
Center-of-Mass det. time= 104.1 min (899.1 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1	229.50'	5,482 cf	**18.00'W x 108.00'L x 3.00'H Prismatoid** 5,832 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	232.50'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 10.75 hrs HW=229.54' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=229.50' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond PP-1: Storage Porous Firelane

Inflow Area = 0.435 ac, Inflow Depth > 2.41" for 10 YEAR event
Inflow = 0.19 cfs @ 16.26 hrs, Volume= 0.087 af
Outflow = 0.13 cfs @ 18.67 hrs, Volume= 0.051 af, Atten= 30%, Lag= 144.4 min
Discarded = 0.05 cfs @ 13.55 hrs, Volume= 0.035 af
Primary = 0.08 cfs @ 18.67 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 236.20' @ 18.67 hrs Surf.Area= 8,140 sf Storage= 1,657 cf
Plug-Flow detention time= 109.2 min calculated for 0.051 af (58% of inflow)
Center-of-Mass det. time= 20.0 min (992.7 - 972.6)

Volume	Invert	Avail.Storage	Storage Description
#1	235.50'	6,675 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.50	8,140	35.0	0	0
236.08	8,140	30.0	1,416	1,416
236.33	8,140	25.0	509	1,925
237.33	8,140	40.0	3,256	5,181
237.66	8,140	35.0	940	6,121
238.00	8,140	20.0	554	6,675

Device	Routing	Invert	Outlet Devices
#1	Primary	236.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 13.55 hrs HW=235.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.08 cfs @ 18.67 hrs HW=236.20' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.08 cfs @ 1.5 fps)

Pond PP-2: Storage Porous Parking Lot

Inflow Area =	0.392 ac,	Inflow Depth >	3.26"	for	10 YEAR event
Inflow =	0.22 cfs @	16.24 hrs,	Volume=	0.106 af	
Outflow =	0.11 cfs @	14.15 hrs,	Volume=	0.071 af,	Atten= 52%, Lag= 0.0 min
Discarded =	0.11 cfs @	14.15 hrs,	Volume=	0.071 af	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 231.80' @ 19.79 hrs Surf.Area= 17,055 sf Storage= 1,552 cf
Plug-Flow detention time= 68.2 min calculated for 0.071 af (67% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	231.50'	13,985 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
231.50	17,055	35.0	0	0
232.08	17,055	30.0	2,968	2,968
232.33	17,055	25.0	1,066	4,034
233.33	17,055	40.0	6,822	10,856
233.66	17,055	35.0	1,970	12,825
234.00	17,055	20.0	1,160	13,985

Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#2	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 14.15 hrs HW=231.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=231.50' (Free Discharge)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Overland to Big Pond w/ Hartley Road Runoff Area=335,882 sf Runoff Depth>3.76"
Flow Length=1,322' Tc=10.1 min CN=78 Runoff=31.25 cfs 2.419 af

Subcatchment 1-1: Proposed Bldg Runoff Area=55,875 sf Runoff Depth>5.78"
Tc=5.0 min CN=98 Runoff=8.23 cfs 0.618 af

Subcatchment 1-2A: Porous Pavement - Firelane Runoff Area=8,140 sf Runoff Depth>4.80"
Tc=340.0 min CN=98 Runoff=0.15 cfs 0.075 af

Subcatchment 1-2B: Overland to Porous Pavement Runoff Area=10,805 sf Runoff Depth>3.10"
Tc=340.0 min CN=81 Runoff=0.15 cfs 0.064 af

Subcatchment 1-3: Field & Plaza Runoff Area=51,878 sf Runoff Depth>4.08"
Flow Length=250' Tc=9.5 min CN=81 Runoff=5.25 cfs 0.404 af

Subcatchment 1-4: Bus Drive & Staff Parking Runoff Area=110,728 sf Runoff Depth>4.61"
Flow Length=895' Tc=9.3 min CN=86 Runoff=12.44 cfs 0.976 af

Subcatchment 1-5: Lawn Area Runoff Area=18,126 sf Runoff Depth>3.87"
Flow Length=100' Tc=8.6 min CN=79 Runoff=1.81 cfs 0.134 af

Subcatchment 2-1: Undeveloped Area Runoff Area=25,274 sf Runoff Depth>3.47"
Flow Length=151' Tc=4.7 min CN=75 Runoff=2.57 cfs 0.168 af

Subcatchment 2-2: Porous Parking Lot Runoff Area=17,055 sf Runoff Depth>4.80"
Tc=340.0 min CN=98 Runoff=0.32 cfs 0.157 af

Subcatchment 2-3: Driveway & Service Area Runoff Area=70,841 sf Runoff Depth>4.94"
Tc=5.0 min CN=89 Runoff=9.56 cfs 0.669 af

Subcatchment 2-4: Existing Building Runoff Area=21,620 sf Runoff Depth>5.78"
Tc=5.0 min CN=98 Runoff=3.18 cfs 0.239 af

Subcatchment 3: Runoff Area=12,395 sf Runoff Depth>4.40"
Tc=5.0 min CN=84 Runoff=1.54 cfs 0.104 af

Subcatchment 4: Runoff Area=33,574 sf Runoff Depth>4.51"
Tc=5.0 min CN=85 Runoff=4.24 cfs 0.289 af

Subcatchment 5: Runoff Area=0.160 ac Runoff Depth>3.67"
Flow Length=65' Tc=5.2 min CN=77 Runoff=0.73 cfs 0.049 af

Subcatchment 6: Runoff Area=1.116 ac Runoff Depth>4.83"
Tc=5.0 min CN=88 Runoff=6.46 cfs 0.449 af

Reach DP-1: Design Point 1 Inflow=31.25 cfs 2.419 af
Outflow=31.25 cfs 2.419 af

Reach DP-2: Design Point -2 Inflow=24.21 cfs 2.288 af
Outflow=24.21 cfs 2.288 af

Pond IA-1: Infiltration Area - 1 Peak Elev=234.46' Storage=29,956 cf Inflow=12.86 cfs 1.080 af
Discarded=0.08 cfs 0.096 af Primary=0.81 cfs 0.344 af Outflow=0.89 cfs 0.440 af

Pond IA-2: Infiltration Area-2 Peak Elev=231.61' Storage=5,412 cf Inflow=3.18 cfs 0.239 af
Discarded=0.01 cfs 0.017 af Primary=1.34 cfs 0.123 af Outflow=1.35 cfs 0.140 af

Pond IA-3: Infiltration Area-3 Peak Elev=232.42' Storage=5,340 cf Inflow=1.81 cfs 0.134 af
Discarded=0.01 cfs 0.012 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.012 af

Pond PP-1: Storage Porous Firelane Peak Elev=236.38' Storage=2,089 cf Inflow=0.30 cfs 0.139 af
Discarded=0.05 cfs 0.040 af Primary=0.19 cfs 0.057 af Outflow=0.24 cfs 0.097 af

Pond PP-2: Storage Porous Parking Lot Peak Elev=232.09' Storage=3,021 cf Inflow=0.32 cfs 0.157 af
Discarded=0.11 cfs 0.080 af Primary=0.06 cfs 0.008 af Outflow=0.17 cfs 0.088 af

Subcatchment 1: Overland to Big Pond w/ Hartley Road

Runoff = 31.25 cfs @ 12.14 hrs, Volume= 2.419 af, Depth> 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
160,132	73	Woods
5,362	87	Infield
20,194	98	Pond
127,428	79	Lawn
6,121	87	Playground
5,400	98	Walkways
11,245	98	Pavement
335,882	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow, Hartley Road** Smooth surfaces n= 0.011 P2= 3.20"
0.8	200	0.0400	4.1		**Shallow Concentrated Flow, Hartley Road** Paved Kv= 20.3 fps
0.2	80	0.0200	6.4	5.04	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
5.0	310	0.0220	1.0		**Shallow Concentrated Flow, Grass-lined swale behind parking** Short Grass Pasture Kv= 7.0 fps
3.2	682	0.0060	3.5	59.52	**Channel Flow, Drainage Swale behind Tennis Courts** Area= 17.0 sf Perim= 19.5' r= 0.87' n= 0.030 Earth, grassed & winding
10.1	1,322	Total			

Subcatchment 1-1: Proposed Bldg

Runoff = 8.23 cfs @ 12.07 hrs, Volume= 0.618 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
51,200	98	Conventional Roof
4,675	98	Green Roof (Assume Conv. for future expansion)
55,875	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1-2A: Porous Pavement - Firelane

Runoff = 0.15 cfs @ 16.24 hrs, Volume= 0.075 af, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
8,140	98	Firelane Porous Pavement

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry,**

Subcatchment 1-2B: Overland to Porous Pavement

Runoff = 0.15 cfs @ 16.27 hrs, Volume= 0.064 af, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
1,050	98	Walkways
9,755	79	50-75% Grass cover, Fair, HSG C
10,805	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry,**

Subcatchment 1-3: Field & Plaza

Runoff = 5.25 cfs @ 12.13 hrs, Volume= 0.404 af, Depth> 4.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
43,241	79	50-75% Grass cover, Fair, HSG C
5,362	87	Infield
3,275	98	Walkways
51,878	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.9	200	0.0150	0.9		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.5	250	Total			

Subcatchment 1-4: Bus Drive & Staff Parking

Runoff = 12.44 cfs @ 12.13 hrs, Volume= 0.976 af, Depth> 4.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
15,900	73	Woods
37,787	98	Paved areas
7,880	98	Walkway
49,161	79	Lawn
110,728	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	30	0.1300	1.8		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	100	0.0350	2.8		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	190	0.0050	3.7	4.57	**Circular Channel (pipe),** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.8	450	0.0050	4.2	7.43	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.1	75	0.0100	9.9	48.47	**Circular Channel (pipe),** Diam= 30.0" Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.011 Concrete pipe, straight & clean
9.3	895	Total			

Subcatchment 1-5: Lawn Area

Runoff = 1.81 cfs @ 12.12 hrs, Volume= 0.134 af, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
18,126	79	Lawn

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.2	50	0.0100	0.7		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.6	100	Total			

Subcatchment 2-1: Undeveloped Area

Runoff = 2.57 cfs @ 12.07 hrs, Volume= 0.168 af, Depth> 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
15,571	73	Woods
9,703	79	Lawn
25,274	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0560	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
1.0	101	0.0120	1.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.7	151	Total			

Subcatchment 2-2: Porous Parking Lot

Runoff = 0.32 cfs @ 16.24 hrs, Volume= 0.157 af, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
17,055	98	Porous Pavement

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
340.0					**Direct Entry, Proportional to UNH data (18" Base)**

Subcatchment 2-3: Driveway & Service Area

Runoff = 9.56 cfs @ 12.07 hrs, Volume= 0.669 af, Depth> 4.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
23,825	98	Paved areas
12,570	98	Walkway
576	98	Maintenance Building
33,870	79	50-75% Grass cover, Fair, HSG C
70,841	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2-4: Existing Building

Runoff = 3.18 cfs @ 12.07 hrs, Volume= 0.239 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
21,620	98	Ex & New Building

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3:

Runoff = 1.54 cfs @ 12.07 hrs, Volume= 0.104 af, Depth> 4.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
2,775	98	Pavement
735	98	Walkways
8,885	79	50-75% Grass cover, Fair, HSG C
12,395	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4:

Runoff = 4.24 cfs @ 12.07 hrs, Volume= 0.289 af, Depth> 4.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (sf)	CN	Description
765	73	Woods
22,721	79	Lawn
2,115	98	Paved areas
1,765	98	Walkway
6,208	98	Building
33,574	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5:

Runoff = 0.73 cfs @ 12.08 hrs, Volume= 0.049 af, Depth> 3.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (ac)	CN	Description
0.066	73	Woods
0.094	79	Lawn
0.160	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	15	0.0310	2.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.2	65	Total			

Subcatchment 6:

Runoff = 6.46 cfs @ 12.07 hrs, Volume= 0.449 af, Depth> 4.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=6.50"

Area (ac)	CN	Description
0.098	98	Fire Station Bldg
0.452	98	Paved areas
0.566	79	Lawn
1.116	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach DP-1: Design Point 1

Inflow Area = 7.711 ac, Inflow Depth > 3.76" for 100 YEAR event
Inflow = 31.25 cfs @ 12.14 hrs, Volume= 2.419 af
Outflow = 31.25 cfs @ 12.14 hrs, Volume= 2.419 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point -2

Inflow Area = 8.961 ac, Inflow Depth > 3.06" for 100 YEAR event
Inflow = 24.21 cfs @ 12.10 hrs, Volume= 2.288 af
Outflow = 24.21 cfs @ 12.10 hrs, Volume= 2.288 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond IA-1: Infiltration Area - 1

Inflow Area = 2.909 ac, Inflow Depth > 4.46" for 100 YEAR event
Inflow = 12.86 cfs @ 12.09 hrs, Volume= 1.080 af
Outflow = 0.89 cfs @ 13.72 hrs, Volume= 0.440 af, Atten= 93%, Lag= 98.0 min
Discarded = 0.08 cfs @ 6.45 hrs, Volume= 0.096 af
Primary = 0.81 cfs @ 13.72 hrs, Volume= 0.344 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 234.46' @ 13.72 hrs Surf.Area= 12,960 sf Storage= 29,956 cf
Plug-Flow detention time= 257.8 min calculated for 0.438 af (41% of inflow)
Center-of-Mass det. time= 138.0 min (906.7 - 768.7)

Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	36,547 cf	**48.00'W x 270.00'L x 3.00'H Prismatoid** 38,880 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	234.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.08 cfs @ 6.45 hrs HW=232.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.81 cfs @ 13.72 hrs HW=234.46' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.81 cfs @ 2.3 fps)

Pond IA-2: Infiltration Area-2

Inflow Area = 0.496 ac, Inflow Depth > 5.78" for 100 YEAR event
Inflow = 3.18 cfs @ 12.07 hrs, Volume= 0.239 af
Outflow = 1.35 cfs @ 12.26 hrs, Volume= 0.140 af, Atten= 58%, Lag= 11.4 min
Discarded = 0.01 cfs @ 5.50 hrs, Volume= 0.017 af
Primary = 1.34 cfs @ 12.26 hrs, Volume= 0.123 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 231.61' @ 12.26 hrs Surf.Area= 2,205 sf Storage= 5,412 cf
Plug-Flow detention time= 169.1 min calculated for 0.140 af (58% of inflow)
Center-of-Mass det. time= 85.5 min (818.5 - 733.1)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	6,218 cf	**21.00'W x 105.00'L x 3.00'H Prismatoid** 6,615 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	231.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 5.50 hrs HW=229.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.33 cfs @ 12.26 hrs HW=231.61' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 1.33 cfs @ 2.7 fps)

Pond IA-3: Infiltration Area-3

Inflow Area = 0.416 ac, Inflow Depth > 3.87" for 100 YEAR event
Inflow = 1.81 cfs @ 12.12 hrs, Volume= 0.134 af
Outflow = 0.01 cfs @ 9.40 hrs, Volume= 0.012 af, Atten= 99%, Lag= 0.0 min
Discarded = 0.01 cfs @ 9.40 hrs, Volume= 0.012 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 232.42' @ 20.00 hrs Surf.Area= 1,944 sf Storage= 5,340 cf
Plug-Flow detention time= 251.9 min calculated for 0.011 af (9% of inflow)
Center-of-Mass det. time= 74.2 min (856.3 - 782.1)

Volume	Invert	Avail.Storage	Storage Description
#1	229.50'	5,482 cf	**18.00'W x 108.00'L x 3.00'H Prismatoid** 5,832 cf Overall x 94.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	232.50'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.01 cfs @ 9.40 hrs HW=229.54' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=229.50' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond PP-1: Storage Porous Firelane

Inflow Area = 0.435 ac, Inflow Depth > 3.83" for 100 YEAR event
Inflow = 0.30 cfs @ 16.26 hrs, Volume= 0.139 af
Outflow = 0.24 cfs @ 17.99 hrs, Volume= 0.097 af, Atten= 19%, Lag= 104.0 min
Discarded = 0.05 cfs @ 12.85 hrs, Volume= 0.040 af
Primary = 0.19 cfs @ 17.99 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 236.38' @ 17.99 hrs Surf.Area= 8,140 sf Storage= 2,089 cf
Plug-Flow detention time= 104.7 min calculated for 0.097 af (70% of inflow)
Center-of-Mass det. time= 40.1 min (1,008.4 - 968.2)

Volume	Invert	Avail.Storage	Storage Description
#1	235.50'	6,675 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.50	8,140	35.0	0	0
236.08	8,140	30.0	1,416	1,416
236.33	8,140	25.0	509	1,925
237.33	8,140	40.0	3,256	5,181
237.66	8,140	35.0	940	6,121
238.00	8,140	20.0	554	6,675

Device	Routing	Invert	Outlet Devices
#1	Primary	236.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.85 hrs HW=235.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.19 cfs @ 17.99 hrs HW=236.38' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.19 cfs @ 2.2 fps)

Pond PP-2: Storage Porous Parking Lot

Inflow Area = 0.392 ac, Inflow Depth > 4.80" for 100 YEAR event
Inflow = 0.32 cfs @ 16.24 hrs, Volume= 0.157 af
Outflow = 0.17 cfs @ 19.46 hrs, Volume= 0.088 af, Atten= 47%, Lag= 193.3 min
Discarded = 0.11 cfs @ 13.50 hrs, Volume= 0.080 af
Primary = 0.06 cfs @ 19.46 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 232.09' @ 19.46 hrs Surf.Area= 17,055 sf Storage= 3,021 cf
Plug-Flow detention time= 91.6 min calculated for 0.087 af (56% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	231.50'	13,985 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
231.50	17,055	35.0	0	0
232.08	17,055	30.0	2,968	2,968
232.33	17,055	25.0	1,066	4,034
233.33	17,055	40.0	6,822	10,856
233.66	17,055	35.0	1,970	12,825
234.00	17,055	20.0	1,160	13,985

Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#2	Discarded	0.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 13.50 hrs HW=231.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.06 cfs @ 19.46 hrs HW=232.09' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.0 fps)

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Fire Lane

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Porous Pavement	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

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

Project: Pompositticut/Center Elementary School
Prepared By: SMMA
Date: February, 2010

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Porous Parking Lot-1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Porous Pavement	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

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

Project:	Pompositticut/Center Elementary School
Prepared By:	SMMA
Date:	February, 2010

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Bus Drop-off, Parking Lot-2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Deep Sump and Hooded Catch Basin	0.25	0.95	0.24	0.71
Proprietary Treatment Practice	0.77	0.71	0.55	0.16
	0.00	0.16	0.00	0.16
	0.00	0.16	0.00	0.16

Total TSS Removal = 84%

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

Project: Pompositticut/Center Elementary School
Prepared By: SMMA
Date: February, 2010

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Parent Drop-off

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Deep Sump and Hooded Catch Basin	0.25	0.95	0.24	0.71
Proprietary Treatment Practice	0.77	0.71	0.55	0.16
	0.00	0.16	0.00	0.16
	0.00	0.16	0.00	0.16

Total TSS Removal = 84%

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

Project: Pompositticut/Center Elementary School
Prepared By: SMMA
Date: February, 2010

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Pompositticut/Center Elementary School, Stow, MA
SMMA Job No. 09020
RECHARGE VOLUME CALCULATIONS
Calc by: JAH
Ck by: JW

Subcatchment Areas		Impervious Area	Soil Type	Target Depth Factor	Required Rv	Rawls Rate	Impervious Area Tributary to Infiltration
1-1	Building Roof	1.28 ac	C	0.25 inch	0.027 ac-ft	0.27 inches/hour	Yes
1-2A	Firelane - Porous Pavement	0.19 ac	C	0.25 inch	0.004 ac-ft	0.27 inches/hour	Yes
1-2B	Firelane - Porous Pavement	0.02 ac	C	0.25 inch	0.000 ac-ft	0.27 inches/hour	Yes
1-3	Ballfield & Outdoor Classroom (plaza)	0.08 ac	C	0.25 inch	0.002 ac-ft	0.27 inches/hour	Yes
1-4	Bus Driveway, Staff Parking & Plaza	1.05 ac	C	0.25 inch	0.022 ac-ft	0.27 inches/hour	No
2-2	Visitor Parking Lot - Porous Pavement	0.39 ac	C	0.25 inch	0.008 ac-ft	0.27 inches/hour	No
2-3	Main driveway, service area & plaza	0.85 ac	C	0.25 inch	0.018 ac-ft	0.27 inches/hour	No
2-4	Existing Building	0.50 ac	C	0.25 inch	0.010 ac-ft	0.27 inches/hour	Yes
3	Exit drive to Great Road	0.08 ac	C	0.25 inch	0.002 ac-ft	0.27 inches/hour	No
4	Entry drive & lawn at Great Road	0.23 ac	C	0.25 inch	0.005 ac-ft	0.27 inches/hour	No
	Total Impervious Area	4.67 ac	C		0.10 ac-ft		
				ReV	4238 cf		

Recharge Volume Adjustment

Total Impervious Area	4.67 ac
Impervious Area to Infiltration	2.07 ac
Volume Adjustment	2.26
Volume Adjusted Required Recharge Volume	9561 cf

Pompositticut/Center Elementary School, Stow, MA
SMMA Job No. 09020
RECHARGE VOLUME CALCULATIONS
Calc by: JAH
Ck by: JW

	Required Rv	Rv Provided	Surface Area
Inf. Area 1	8,537 cf	36,547 cf	12,960 sf
Inf. Area 2	1,024 cf	6,218 cf	2,205 sf
Total Required RV	**9,561 cf**	**42,765 cf**	

Infiltration Area 1 Dimensions: 48 ft x 270 ft x 3 ft (94% Void)
Infiltration Area 2 Dimensions: 21 ft x 105 ft x 3 ft (94% Void)

Verify Drawdown within 72 hours
Time=Rv/(K)(Bottom Area)
K= Rawls Rate

	Rawls Rate	Time for Drawdown
1-1	0.27 in/hr	29 hrs
1-2A	0.27 in/hr	21 hrs

Pompositticut/Center Elementary School, Stow, MA
SMMA Job No. 09020
WATER QUALITY VOLUME CALCULATIONS
Calc by: JAH
Ck by: JW

REQUIRED WATER QUALITY VOLUME

Site is located within the IWPA of the proposed drinking water well therefore is a critical area

WQV=1"x Impervious Area

WQV	16,952	cf
Volume Provided in Infiltration Areas	42,765	cf

AQUIFER TEST FORUM

Mound (Rectangle)

Sponsored by HydroSOLVE, Inc.

Groundwater Mound Beneath Rectangular Recharge Area

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)\nu t S^*(0.5A/(4\nu t)^{1/2}, 0.5B/(4\nu t)^{1/2}) \ldots\ldots (1)$$

$$\nu = K\bar{b}/\varepsilon \ldots\ldots (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \ldots\ldots (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; $\bar{b}$ is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \ldots\ldots (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\bar{b}$	h_m*	% Change
1	8	8.49823854239692	6.22798177996153
2	8.24911927119846	8.50189777454082	4.30587129985227E-02
3	8.25094888727041	8.50192402243264	3.08729797837692E-04
4	8.25096201121632	8.50192421067808	2.21415112910961E-06

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
0.25	0.16	8	105	21	0.0225	72	8.50192421067808

maximum water-table rise (h_m - h_i) at time t = 72 is 0.501924210678084

decay of mound computed after time t = 21

Return to Groundwater Mounding Calculator

Calculations since January 21, 2006:
2 4 4 0 6

Groundwater Mounding Calculator developed by Glenn M. Duffield, HydroSOLVE, Inc.
Support for this page provided by Todd Engineers.

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV Pro.

AQUIFER TEST FORUM

Mound (Rectangle)

Sponsored by HydroSOLVE, Inc.

Groundwater Mound Beneath Rectangular Recharge Area

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)\nu t S^*(0.5A/(4\nu t)^{1/2}, 0.5B/(4\nu t)^{1/2}) \ldots\ldots (1)$$

$$\nu = K\bar{b}/\varepsilon \ldots\ldots (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \ldots\ldots (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; b is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \ldots\ldots (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\bar{b}$	h_m*	% Change
1	8	9.74965616302769	21.8707020378461
2	8.87482808151384	9.84417231324317	0.96943059975696
3	8.92208615662158	9.84909458485125	5.00018838705207E-02
4	8.92454729242563	9.84935044023403	2.59775536297635E-03
5	8.92467522011702	9.8493637380513	1.35012124347078E-04
6	8.92468186902565	9.84936442918794	7.01706892591858E-06

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
0.25	0.16	8	270	48	0.0225	72	9.84936442918794

maximum water-table rise ($h_m - h_i$) at time t = 72 is 1.84936442918794

decay of mound computed after time t = 29

Return to Groundwater Mounding Calculator

Groundwater Mounding Calculator developed by Glenn M. Duffield, HydroSOLVE, Inc.
Support for this page provided by Todd Engineers.

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV Pro.

POMPOSITTICUT/CENTER ELEMENTARY SCHOOL
OPERATION AND MAINTENANCE PLAN
January 2010*
(Revised: March 2010)

Responsible Party

The Stow Elementary School Building Committee shall be the party responsible for adherence to the DEP Stormwater Management Policy prior to completion of construction and until a Certificate of Compliance is issued by the Conservation Committee. The Nashoba Regional School District shall designate a Site Supervisor who shall assume responsibility for this maintenance plan, post construction, after a Certificate of Compliance has been issued.

Maintenance Activities

The following site maintenance activities are required to maintain optimal pollutant attenuation by the drainage system. A maintenance schedule follows in the next section.

- Periodic inspection of all catch basins and area drains including grates, sumps, oil separation hoods and outlets.
- Periodic inspection of the Water Quality Units (Stormceptors® or approved equal).
- Porous pavement vacuuming and standard pavement sweeping a minimum of two times annually to minimize the introduction of pollutants into the drainage system.
- Periodic inspection of porous pavement areas.
- Periodic inspection of infiltration systems.
- Semi-annual inspection of all drainage outfalls on the site.

Post Construction - Long Term Maintenance Procedures

January through March (ongoing as appropriate)

Maintenance activities during the winter months are primarily limited to snow removal activities and removal of debris and trash throughout the site.

Snow removal operations will adhere to *the Massachusetts Department of Environmental Protection – Bureau of Resource Protection Guidelines (dated March 8, 2001).* Snow will be stockpiled as far away from resource areas as possible and removed as necessary under larger snow events. Stockpiling snow in this manner will allow meltwater to enter the drainage system and thereby receive pretreatment prior to discharging to receiving resource areas. Snow and ice that has accumulated around catch basin grates will be removed at this time.

Minimize the use of salt and sand on porous pavement areas (one parking lot and fire lane). Only use when sever icing of the pavement causes a safety hazard.

April 1 - April 30

1. Inspect all drainage outfalls for structural damage, cracks or obstructions:

   - Obstructions shall be removed within 48 hours, or immediately if they present the potential for local flooding or short-circuiting of drainage structures.

   - Structural abnormalities or damage to drainage outfalls, etc. shall be reported immediately to the Site Supervisor.

   Vacuum and/or sweep paved areas after the final snow melt. Paved areas shall also be vacuumed as necessary during the summer months. Do not use a street sweeper on porous pavement areas (one parking lot and fire lane).

2. Remove all accumulated trash, litter and discarded materials from the site. No disposal of materials will be permitted within any resource area. This prohibition includes, but is not limited to, fill material; construction debris, grass clippings, collected leaves and cut branches from landscaped areas.

May 1 – May 30

1. Inspect all catchbasins, area drains, oil water separators and Water Quality Units (Stormceptors® or approved equal), for depth of sediment, obstructions, structural damage or other indication of malfunction.

2. Clean all sumps if they are more than 1/2 full with sediment.

3. Clean Water Quality Units (Stormceptors® or approved equal)if approximately 10-inches of material have accumulated in the sump.

4. Remove all accumulated trash, litter and discarded materials from the site.

5. Inspect porous pavement areas (one parking lot and fire lane) after large rainstorms. Check for localized ponding and clogging; jet wash clogged locations. Continue throughout summer as necessary.

6. Inspect porous pavement for deterioration, spalling or persistent ponding. Do not reseal or repave with impermeable materials. Contact a Professional Engineer for further investigation.

7. Inspect infiltration systems (three systems) after large rainstorms and 72 hours afterwards. If infiltration system does not completely drain within 72 hours contact a Professional Engineer for further investigation. Continue throughout summer following rainstorms greater than 1" in 24 hours.

June through September (monthly tasks)

1. Remove all accumulated trash, litter and discarded materials from the site.

2. Inspect all catch basins, area drains, and Water Quality Units (Stormceptor® or equal), for obstructions, structural damage or other indication of malfunction.

3. Inspect porous pavement areas (one parking lot and fire lane) after large rainstorms. Check for localized ponding and clogging; jet wash clogged locations.

October through December

1. Inspect all drainage outfalls for structural damage, cracks or obstructions:

    - Obstructions shall be removed within 48 hours, or immediately if they present the potential for local flooding or short-circuiting of drainage structures.

    - Structural abnormalities or damage to drainage outfalls, etc. shall be reported to the Site Supervisor.

2. After leaf-fall but before frozen ground conditions:

    - Inspect all catchbasins, area drains, and Water Quality Units (Stormceptors® or approved equal), for depth of sediment, obstructions, structural damage or other indication of malfunction.

    - Clean all sumps if they are 1/2 full with sediment.

    - Clean Water Quality Units (Stormceptors® or approved equal) if approximately 10-inches of material have accumulated in the sump.

    - Remove any accumulated trash, litter and discarded materials from the site.

3. Sweep and/or vacuum paved areas after the last leaf-fall. Do not use a street sweeper on porous pavement areas (two parking lots and fire lane).

4. After all snow fall events:

    - Plow and stockpile snow outside of all resource areas. Remove in accordance with DEP guidelines noted above.

    - Clear all drainage grates of snow and ice.

Reporting & Documentation

The Site Supervisor for the elementary school shall be responsible for maintaining an accurate Site Maintenance Log. The Site Maintenance Log shall be located on-site and made available to the Stow Conservation Commission upon request.

The Site Maintenance Log shall:

- Document the completion of planned maintenance tasks.
- Identify the person responsible for the completion of tasks.
- Identify any outstanding problems, malfunctions or inconsistencies identified during the course of routine maintenance.

The Site Supervisor shall be responsible for ensuring that the scheduled tasks are appropriately completed as described in this plan and the Site Maintenance Log accurately represents activities carried out as described in this plan.

Site Maintenance Log

A Site Maintenance Log shall be completed as described above, and shall, at a minimum include the following items:

- Date of activity performed.
- Specific maintenance task.
- Structural components maintained, as identified on the Project Plans.
- Staff person or contractor performing activity on behalf of the school.
- Supervisor verification of maintenance activity.
- Recommended additional maintenance task.
- Means to document identified areas of concern, erosion or systems discrepancies requiring attention.

SITE MAINTENANCE LOG
Pompositticut/Center Elementary School
Stow, Massachusetts

Dates of Inspection: _____

Inspector(s): _____

_____

_____

Goal of Inspection: Ensure the integrity and function of the stormwater management system to maintain optimal pollutant attenuation. Please refer to the attached Operations and Maintenance Plan for specific information regarding inspection requirements.

Annual Inspection Schedule

Weekly Tasks – Winter Months

Maintenance activities during the winter months are primarily limited to snow removal activities and removal of debris and trash throughout the site.

____ Verify that snow stockpile locations are situated as far away from wetland resource areas possible.

____ Remove snow and ice that has accumulated around drainage grates.

____ Remove all accumulated trash, litter and discarded materials from throughout the site.

____ Paved areas shall be swept after final snow melt.

Comments, Remedial Actions Taken and Recommendations:

Weekly Tasks – Spring, Summer and Fall Months

____ Remove all accumulated trash, litter and discarded materials from throughout the site.

Comments, Remedial Actions Taken and Recommendations:

Monthly Tasks

____ Inspect all catch basins, area drains, oil/water separators and Water Quality Units (Stormceptors® or approved equal) for depth of sediment, obstructions, structural damage or other indication of malfunction.

____ Remove all accumulated trash, litter and discarded materials from throughout the site.

Comments, Remedial Actions Taken and Recommendations:

Quarterly Tasks

____ Clean Water Quality Units (Stormceptors® or approved equal) if approximately 10-inches of material has accumulated in the sump.

____ Clean all catch basin sumps if they are 1/2 full (approximately 2-feet below outlet pipe) with sediment or debris. Document amount of sediment observed (inches below outlet pipe) in comment section below. All material shall be trucked off-site and disposed of in accordance with applicable regulations.

____ Paved areas shall be swept a minimum of two times per year. Initially paved areas shall be swept in the spring after final snow melt and again in the fall after the final leaf fall. Sweeping shall occur as necessary during the summer months.

Comments, Remedial Actions Taken and Recommendations:

Pompositticut/Center Elementary School
403 Great Road
Stow, Massachusetts

Stormwater Pollution Prevention Plan for Construction Activities

Prepared by:
Symmes, Maini & McKee Associates, Inc.
1000 Massachusetts Avenue
Cambridge, MA 02138

SMMA #09020.00 March 2010

STORMWATER POLLUTION PREVENTION PLAN

Development, implementation, and maintenance of the SWPPP will provide the general contractor with the framework for reducing soil erosion and minimizing pollutants in storm water during construction of the new Pompositticut/Center Elementary School project at 403 Great Road, Stow Massachusetts. The SWPPP will:

- Define the characteristics of the site and the type of construction which will be occurring;
- Describe the site plan for the development to be constructed and discuss the proposed construction sequence;
- Describe the practices that will be implemented to control erosion and the release of pollutants in storm water;
- Create an implementation schedule to ensure that the practices described in this SWPPP are implemented and to evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in storm water discharged from the site; and
- Describe the final stabilization/termination design to minimize erosion and prevent storm water impacts after construction is complete.

SWPPP Content

This SWPPP includes the following:

- Identification of the SWPPP coordinator's duties;
- Description of the existing site conditions including existing land use for the site (i.e., wooded areas, open grassed areas, pavement, buildings, etc.), soil types at the site, as well as the location of surface waters which are located on or next to the site (wetlands, streams, rivers, lakes, ponds, etc.);
- Identification of the body of water(s) which will receive runoff from the construction site;
- Identification of drainage areas and potential storm water contaminants;
- Description of storm water management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment and pollutants in storm water discharge;
- Description of the project's monitoring plan and how controls will be coordinated with construction activities; and a
- Description of the implementation schedule and provisions for amendment of the plan.

SWPPP Coordinator and Duties

The SWPP coordinator's duties include the following:

- Implement the SWPPP plan;
- Oversee maintenance practices identified as BMPs in the SWPPP;
- Implement and oversee employee training;
- Conduct or provide for inspection and monitoring activities;
- Identify other potential pollutant sources and make sure they are added to the plan;
- Identify any deficiencies in the SWPPP and make sure they are corrected; and
- Ensure that any changes in construction plans are addressed in the SWPPP.

To aid in the implementation of the SWPPP plan, one or two individuals will be assigned as SWPPP Coordinator(s). They will ensure that all housekeeping and monitoring procedures are implemented as well as ensuring the integrity of the structural BMPs. Best management practices (BMP) for erosion and sedimentation control include catch basin filters, hydroseeding, and sequenced development. Construction BMPs must be maintained throughout construction.

In developing the proposed project certain measures will be implemented to minimize the impacts erosion and sedimentation could have on the surrounding resource areas. This section addresses items that involve proper construction techniques, close surveillance of workmanship, and immediate response to emergency situations. The owner and contractor must be prepared to provide whatever reasonable measures are necessary to protect the environment during construction and to stabilize all disturbed areas as soon as construction ends.

SITE DESCRIPTION

Existing Conditions

This Stormwater Pollution Prevention Plan is a comprehensive plan for mitigating and controlling construction impacts associated with the renovation and addition to the existing Center School at 403 Great Road, Stow MA.

The project site is approximately 15 acres and is shown as Stow Assessor's Map U-9, Parcel 44. The site is bordered to the south and west by residential properties, to the east by the Town of Stow Fire Department and to the north by the Hale Middle School. The site consists of the existing school building with associated parking and circulation accessed from Great Road. The remaining portion of the site consists of existing ballfields, a playground and two tennis courts north of the existing building. A perimeter wetland is located along the north and west edges of the property and includes a small "finger" wetland that extends into the middle of the site behind the existing tennis courts. The perimeter wetland system feeds into an existing large pond (known locally as Clay Pond) in the northwest corner of the site.

The Project also includes the development of a portion of the Stow Fire Department property to the east (approximately 3 acres) for secondary access to the site, staff parking and the wastewater leaching field. The Fire Department property consists primarily of undeveloped wooded upland and will be turned over to the school department.

Stormwater runoff from the site either flows overland to the perimeter wetland system or is collected in a series of shallow catch basins located around the perimeter of the building. This drainage system discharges directly to a small off-site pond.

The parcel does not contain any Estimated Habitats of Rare Wildlife or Certified Vernal Pools, or any Priority Habitats of Rare Species according to the Massachusetts Natural Heritage Atlas.

Planned Construction Activities

The Project includes construction of a new addition and comprehensive renovations to the existing Center Elementary School. The new building will combine the educational program of the Pompositticut Elementary School (grades K-2) and the Center Elementary School, (grades 3-5) into a single 98,030 sf facility at the Center School site.

The Project includes new building construction; abatement and demolition of portions of the existing building; comprehensive renovation of the existing Center School; and construction of access drives, parking for approximately 100 vehicles, playfields and associated site work. The project will be designed in accordance with Massachusetts Collaborative for High Performance School (MassCHPS).

Sequence of Construction Activities

The project will consist of two phases in order to ensure the continued use of the site.

Phase 1 will generally consist of:

1. Installation of erosion control devices;
2. Installation of temporary stormwater management features to control construction related runoff;
3. Demolition of a portion of the existing building;
4. General preparation of the site for the construction of the building addition;
5. Construction of the new school building;
6. Construction of the new septic system and soil absorption system;
7. Construction of the water supply well;
8. Construction of drainage systems including Infiltration Area-1 and Infiltration Area-2;
9. Installation of all utilities to serve the new school addition;
10. Construction of the staff parking and bus loop from Hartley Road;
11. Reconstruction of the ballfields.
12. Construction of the new playground area – relocation of existing equipment will occur during the summer vacation between Phases 1 and 2.

Phase 2 will generally consist of:

1. Renovation of the remaining portion of the existing Center School;
2. Construction of the Pre-K/K playground;
3. Reconstruction of the parent drop-off/visitor parking area off Great Road.
4. Construct plazas, paving, landscape and remaining site work.

5. When all construction activity is complete and the site is stabilized, remove accumulated sediment from all catchbasins and water quality structures and remove erosion and sediment control barriers throughout site.

CONTROL MEASURES

Erosion and Sedimentation Controls: Stabilization Measures

The following construction measures will be taken to minimize on-site erosion and sedimentation of adjacent property during construction.

- The smallest area of land practicable shall be exposed at any one time by phasing the construction.
- Wherever feasible, existing vegetation shall be retained and protected.
- Disturbed areas shall be protected from stormwater runoff. Runoff shall be diverted from flowing over disturbed areas by means of temporary diversion swales.
- No construction activities shall occur down gradient of the downslope siltation barrier.
- Erosion and sedimentation control measures must be in place at least 48 hours prior to the commencement of any sitework or earth work operations, and must be maintained during construction, and remain in place until all sitework is complete and groundcover is established.
- Stabilize stock piles and exposed soil in areas where construction activities will cease for 21 days, within 14 days from last activity. Stabilize with rye grass applied at the rate of 120 pounds per acre or other acceptable method.
- All erosion control measures must be routinely inspected, cleaned and repaired or replaced as necessary throughout all phases of construction.
- Erosion control measures must be inspected prior to any forecasted storm event and repaired as necessary.
- Erosion control measures must be inspected after any storm event and repaired as necessary.
- Earthwork activity on the site shall be done in a manner such that runoff is directed to the existing drainage system.
- Dewatering required during construction shall discharge into a temporary sedimentation basin and be directed to treatment in accordance with the U.S. EPA Remediation General Permit.

Other Control Measures

In addition to the previously described controls, construction shall conform to all specifications as designated on the site plan, and in any other document or permits issued in association with this project. Additional measures will include the following:

- Sanitary wastes generated on-site will be treated and/or disposed of in accordance with applicable state and local requirements.

- Construction site waste materials will be properly contained on-site and disposed of at an off-site location in accordance with the Project's Waste Management Plan.
- All on-site drainage and adjacent roadway drainage shall be maintained in proper working condition during and after construction.
- The Contractor will provide a list of proposed materials, including manufacturers' product data and test reports that verify conformance with practices established herein.
- The Contractor will attend a pre-construction meeting to discuss the erosion and sedimentation control plan and how it relates to his intended construction schedule.
- Sediment will be removed from structures when they accumulate to a depth of 1/3 of the structure's height or as recommended by the manufacturer. Structures will be repaired or replaced as needed.

Spill Prevention

A spill contingency plan will be implemented during construction, including the following provisions:

- Equipment necessary to quickly attend to inadvertent spills or leaks will be stored on-site in a secure but accessible location. Such equipment shall include safety goggles, chemically resistant gloves and overshoe boots, water and chemical fire extinguishers, sand and shovels, suitable absorbent materials, hydrocarbon sorbent bats, storage containers and first aid equipment.
- Spills or leaks will be treated properly according to material type, volume of spillage, and location of the spill. Mitigation will include preventing further spillage, containing the spilled material in a safe and environmentally sound manner, and remediating any damage done to the environment.
- For spills of < 10 gallons of material, proceed with source control and containment, and clean up with absorbent materials or other applicable means, unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.
- For spills of > 10 gallons of material, immediately contact the MA DEP Emergency Response Section at 888/304-1133. Provide information on the type of material spilled, the location of the spill, the quantity of the spill and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so directed.
- If there is a Reportable Quantity (RQ) release during the construction period, immediately contact the MA DEP Emergency Response Section at 888/304-1133; within 14 days a report will be submitted to the EPA regional office describing the release, the date and circumstances of the release, and the steps taken to prevent another release. This Storm Water Prevention Plan must be updated to reflect any such steps or actions taken.
- Provide a 55-gallon spill containment kit and maintain on site throughout the construction period.
- In the event of a hydrocarbon or other hazardous material spill, the building management personnel will be required to notify the Department of Environmental Protection at 888/304-1133.

MAINTENANCE / INSPECTION PROCEDURES

In order to meet the above provisions during construction, the following maintenance measures shall be taken:

- Siltation barriers and other erosion and sedimentation control devices shall not be removed and shall be maintained until final stabilization (at least 70% vegetative cover or equivalent) of all upgradient areas has occurred.

The following inspection activities will be completed by the qualified, designated site monitor:

- Erosion control, sedimentation prevention and stormwater management measures shall be inspected at least once per week throughout the site construction period.
- All potential problem areas shall also be inspected within 24 hours of any storm exceeding 0.5 inches of precipitation.
- A log of all inspection results shall be maintained on-site.
- All needed repairs or modifications shall be reported to the contractors to permit the timely implementation of required actions. Necessary repairs or modifications shall be implemented within 7 days of the inspection.
- This Storm Water Pollution Prevention Plan will be modified within 7 calendar days to reflect any modifications to the pollution prevention measures required as a result of inspection.
- Weekly reports of all maintenance and inspection activities will be maintained on-site.
- Inspection and weekly reporting will continue until final site stabilization (70% vegetative cover, or equivalent physical stabilization) is achieved.

NON-STORMWATER DISCHARGES

There will be no non-permitted non-stormwater discharges associated with this project. Specifically prohibited are the discharges of process waters, non-contact cooling water and sanitary wastewater via the stormwater drainage system. Naturally occurring waters on the site may be routed off-site via the stormwater drainage system, and that system may also carry waters from fire fighting activities, irrigation, water flushings, uncontaminated groundwater, air conditioning condensate and routine building and paving washdown waters containing no detergent or hazardous materials, provided these uses are incorporated into this plan.

Water Source	Planned Discharge*	Estimated Volume Per Day*
Streams/springs	NO	
Fire Fighting	EMERGENCY ONLY	
Irrigation	NO	
Waterlines	NO	
Groundwater	NO	
Air conditioning condensate	NO	
Building/pavement washdown	NO	

De-watering Plan

If groundwater discharge is necessary, water will be pumped through a filter sack prior to discharge to the storm drain system.

POST-CONSTRUCTION STORMWATER MANAGEMENT

The System Owners or their Assignee will implement this Maintenance Plan in perpetuity. The following procedures will be implemented continually:

1. Hydrocarbon releases will be removed from catchbasin sumps immediately following detection and will be disposed off-site by a licensed hauler.
2. Catchbasins, Area Drains and Water Quality Units: The sumps shall be inspected on a monthly basis for the first year, then on a quarterly basis thereafter. Sediment shall be removed once sediment reaches a level of 12" to ensure the satisfactory functioning of the system.
2. Infiltration Areas: Structures will be inspected on a quarterly basis to monitor the functionality of the system and to determine if sediment has accumulated in the system.
3. Pavement Sweeping: Parking lots and driveways shall be swept a minimum of twice a year – once during the late spring, the period immediately following winter snowmelt, and once in late autumn, the period immediately following leaf fall.
4. Snow storage areas:
    - Shall drain to a catchbasin.
    - Snow storage areas located on vegetation shall be maintained during the growing season.
    - All remaining snow and debris shall be cleared from the snow storage areas at the end of the snow season and no later than May 15.

COMPLIANCE WITH FEDERAL, STATE & LOCAL REGULATIONS

The project will comply with all applicable Federal, State and Local regulations and Sections 404 and 401 of the Federal Clean Water Act.

CONTRACTORS

Contractor	Responsibility
Name: Address: Telephone:	The contractor is responsible for the completion of all planned construction activities, including the installation and maintenance of control measures as outlined in this plan

CONTRACTORS CERTIFICATION

Contractor

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the stormwater discharges associated with industrial activity from the construction site identified as part of this certification.

Signature_____ Date_____

Printed Name_____

Representing_____

(Note: Additional copies of this form may be attached in cases where more than one contractor has responsibility for compliance)

OWNER

Owner	Responsibility
Name: Attn: Address: Date:	The owner is responsible for the conduct of all construction activities, and ultimate compliance with all provisions of the Storm Water Pollution Prevention Plan.

OWNER CERTIFICATION

Owner

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based upon my inquiry of the person or persons who manage the systems, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations

Signature_____ Date_____

Printed Name_____

Representing_____

(Note: Additional copies of this form may be attached in cases where more than one owner has responsibility for compliance)

APPENDIX 4 GEOTECHNICAL DATA

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-1

Ground Elevation: 236.0 ± feet
Datum:
Weather: Sunny, 70-75°F

Date: 08/07/09
Time Started: 09:45
Time Finished: 11:45

Logged By: J. Roche
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/09	10:15	No Groundwater Encountered		10.5'	10 minutes

Excavation Equipment

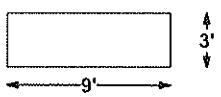
Contractor: AJP Contracting, Inc.
Operator: Mitchell
Reach: 14 ft

Make: CAT
Model: 305CR
Bucket Capacity: 1/10 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, some Silt, little Gravel, very few Root particles. Moist. TOPSOIL.	0			
		0.8	Brown, fine to medium SAND, little Silt, trace Gravel. SUBSOIL.	0.8			1) Performed perc test at 2 foot bgs.
2		1.5		1.5			
4			Brown, fine to coarse SAND, some Gravel, trace Silt, few Cobbles. Moist. Increasing Cobbles with depth from few to common. SAND & GRAVEL.		M	5% A	2) Collected bag sample from 4-8 feet.
6							
8			Excavation sidewalls begin to collapse at approximately 9 feet bgs.				
10		10.5	Excavation terminated at 10.5 feet. No refusal encountered.	10.5			
12							
14							
16							
18							
20							

Excavation Effort		Boulder Size Classification		Soil Description Minor Component Proportions	
E	Easy	12" - 24"	A	trace	0 - 10%
M	Moderate	24" - 36"	B	little	10 - 20%
D	Difficult	36" and larger	C	some	20 - 35%
				and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-2

Ground Elevation: 249.5 ± feet
Datum:
Weather: 70-75°F, Sunny

Date: 08/07/09
Time Started: 14:15
Time Finished: 14:45

Logged By: J. Roche
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/09	14:45	No Groundwater Encountered		13.5'	30 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Mitchell
Reach: 14 ft

Make: CAT
Model: 305CR
Bucket Capacity: 1/10 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, little Silt, little Gravel, very few Cobbles, very few Root fragments. Moist. TOPSOIL.	0	E		
		0.8	Brown, fine to coarse SAND, little Silt, little Gravel, few Cobbles. Moist. SUBSOIL.	0.8		5-10% A <5% B	1) Collected bag sample from 8-10 feet.
2		2.5	Gray, fine to coarse SAND, and Gravel, little Silt, common Cobbles. Moist. GLACIAL TILL.	2.5	M		2) Excavator damaged hose at 9.8 feet depth. Excavation continued on 8/10/09 to 13.5 feet with a CAT 320B excavator.
4							
6							
8							
10							
12							
14		13.5	Excavation terminated at 13.5 feet on apparent bedrock or large boulder.	13.5			
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

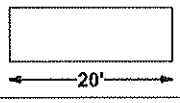
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-3

Ground Elevation: 237.0 ± feet
Datum:
Weather: 60-70°F, Sunny

Date: 08/07/09
Time Started: 09:00
Time Finished: 10:40

Logged By: J. Roche
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/09	10:00	No Groundwater Encountered		4'	20 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Mitchell
Reach: 14 ft

Make: CAT
Model: 305CR
Bucket Capacity: 1/10 CY

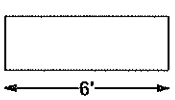
Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, little Silt, trace Gravel, very few Root particles. Moist. TOPSOIL.	0	E		
		0.7	Orange-brown, fine to medium SAND, little Silt, trace Gravel. Moist. SUBSOIL.	0.7	M	5% A 5% B 5-10% C	1) Perc test performed at 3.1 feet depth.
2		2	Gray-brown, fine to coarse SAND, little Gravel, little Silt, few Cobbles. Moist. GLACIAL TILL.	2			
4		4	Excavation terminated at 4 feet. No refusal encountered.	4			
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort
E Easy
M Moderate
D Difficult

Boulder Size Classification
12" - 24" A
24" - 36" B
36" and larger C

Soil Description
Minor Component Proportions
trace 0 - 10%
little 10 - 20%
some 20 - 35%
and 35 - 50%

Test Pit Plan



North Arrow

TEST PIT S:\WESDATA\3000\3048.001\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-4
Ground Elevation: Not Available

Weather:

Date:
Time Started:
Time Finished:

Logged By:
Checked By:

Groundwater Readings
Date Time Depth to Water Ref. Pt. Depth of Test Pit Stab. Time

Excavation Equipment

Contractor:
Operator:
Reach: ft

Make:
Model:
Bucket Capacity: CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0			SHTP-4 WAS NOT EXCAVATED.				
2							
4							
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort		Boulder Size Classification		Soil Description Minor Component Proportions	
E	Easy	12" - 24"	A	trace	0 - 10%
M	Moderate	24" - 36"	B	little	10 - 20%
D	Difficult	36" and larger	C	some	20 - 35%
				and	35 - 50%

Test Pit Plan

North Arrow

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-5

Ground Elevation: 234.5 ± feet
Datum:
Weather: 85°F, Sunny

Date: 08/10/09
Time Started: 14:30
Time Finished: 15:30

Logged By: J. Hewlett
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/10/09	15:15	8.5'	Ground Surface	13'	8 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Armand
Reach: 17 ft

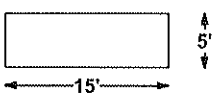
Make: CAT
Model: 320B
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Light brown, fine to medium SAND, little Silt, trace Gravel, trace Root fibers. TOPSOIL.	0			
		1	Tan/orange, fine to coarse SAND, trace Gravel, trace Silt. SUBSOIL.	1	E		
2		2		2			
						1 B	
4			Light gray, fine to coarse SAND, little Silt. Dry.				
						1 B	
6		6		6		1 B	
			Light gray, fine to coarse SAND, some Silt, trace Gravel.				
		7		7	M		1) Noted soil mottling at 7.5 feet.
8							2) Water seeping into test pit at 8.5 feet.
10			Dark gray, medium to coarse SAND, some Gravel, trace Silt. Wet.				
12							
		13	Excavation terminated at 13 feet. No refusal encountered.	13			
14							
16							
18							
20							

Excavation Effort		Boulder Size Classification	
E	Easy	12" - 24"	A
M	Moderate	24" - 36"	B
D	Difficult	36" and larger	C

Soil Description Minor Component Proportions	
trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-6

Ground Elevation: 235.0 ± feet
Datum:
Weather: 70-75°F, Sunny

Date: 08/07/09
Time Started: 10:45
Time Finished: 11:25

Logged By: J. Roche
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/09	11:00	8.4'	Ground Surface	9'	< 5 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Mitchell
Reach: 14 ft

Make: CAT
Model: 305CR
Bucket Capacity: 1/10 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0		0			
		0.5	Dark brown, fine to medium SAND, some Silt, little Gravel, very few Root fragments. Moist. TOPSOIL.	0.5	E		1) Collected bag sample from 0-0.5 feet, 5-7 feet.
2							
4					M	< 5% A	
			Gray-brown, fine to coarse GRAVEL, and Sand, trace Silt, few Cobbles. Moist. Silt fraction decreasing below 4 feet bgs.				
6							
			Excavation sidewalls began to collapse at approximately 7 feet bgs.				
8							
		9	Excavation terminated at 9 feet.	9			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

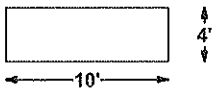
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

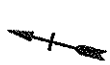
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



Sheet: 1 of 1

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-7

Ground Elevation: 240.0 ± feet
Datum:
Weather: 85°F, Sunny

Date: 08/10/09
Time Started: 12:45
Time Finished: 13:45

Logged By: J. Hewlett
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/10/09	13:40	11.5'	Ground Surface	15'	10 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Armand
Reach: 17 ft

Make: CAT
Model: 320B
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0		0	E		
		1	Brown, fine to medium SAND, some Silt, trace Gravel, trace Root fibers. Dry. TOPSOIL/FILL.	1			
2			Light gray, fine to coarse SAND, little Silt, little Gravel. TILL/FILL.		M	5-10% A	
4							
6							
		7.5		7.5			
8		8	Dark brown, fine to coarse SAND, little Silt, trace Gravel. Dry. BURIED TOPSOIL.	8			
			Tan/orange, fine to coarse SAND, some Silt, trace Gravel. BURIED SUBSOIL.				
10		10		10	E		1) Noted water seeping into pit at 11.5 feet.
12			Gray, SILT, and Sand. Moist to wet.				2) Noted mottling in pit at 10.5-11.5 feet.
14							
			Excavation terminated at 15 feet on apparent Till or large boulder.				
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

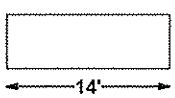
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT S:\WESDATA\3000\3048.00\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-8

Ground Elevation: 238.8 ± feet
Datum:
Weather: 85°F, Sunny

Date: 08/10/09
Time Started: 12:30
Time Finished: 13:30

Logged By: J. Hewlett
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/10/09	13:20	10.5'	Ground Surface	11'	5 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Armand
Reach: 17 ft

Make: CAT
Model: 320B
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, some Silt, trace Gravel, trace Root fibers. Dry. TOPSOIL/FILL.	0	E		
2							
		3.5	Dark brown, fine to coarse SAND, little Silt, trace Gravel. Dry. BURIED TOPSOIL.	3.5			
4		4	Tan/orange, fine to coarse SAND, some Silt, trace Gravel. BURIED SUBSOIL.	4	M	1 C	
		5		5		2 B	
6							
					D	1 B	
8			Light gray, fine to coarse SAND, some Silt, little Gravel. Moist. TILL.			1 B	
						2 B	
10		10	Light gray, fine to coarse SAND, some Gravel, little Silt. TILL.	10	M	1 B	1) Noted groundwater seeping into pit at 10.5 feet.
		11	Excavation terminated at 11 feet. No refusal encountered.	11			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

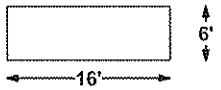
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

TEST PIT S:\WESDATA\3000\3048.00\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-9

Ground Elevation: 236.0 ± feet
Datum:
Weather: 70-75°F, Sunny

Date: 08/07/09
Time Started: 12:15
Time Finished: 13:00

Logged By: J. Roche
Checked By: V. Kokosa

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Mitchell
Reach: 14 ft

Make: CAT
Model: 305CR
Bucket Capacity: 1/10 CY

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/09	12:45	No Groundwater Encountered		6'	5 minutes

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0		0			
		0.5	Dark brown, fine to medium SAND, little Silt, trace Gravel, very few Root fragments. Moist. TOPSOIL.	0.5			
2			Brown, fine to coarse SAND, some Gravel, little Silt, few Cobbles. Moist. FILL.		M	< 5% A	
4		4		4			1) Encountered building footing along edge of pit. An approximately 1-foot thick footing bears on till at a depth of approximately 4 feet.
			Gray-brown, fine to coarse SAND, trace Gravel, little Silt, few Cobbles. Moist. GLACIAL TILL.		D	5-10% A	
6		6	Excavation terminated at 6 feet. No refusal encountered.	6			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

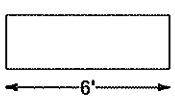
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-9A

Ground Elevation: 239.0 ± feet
Datum:
Weather: 70-75°F, Sunny

Date: 08/07/09
Time Started: 12:00
Time Finished: 13:45

Logged By: J. Roche
Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/09	13:25	No Groundwater Encountered		8.5'	< 5 minutes

Excavation Equipment

Contractor: AJP Contracting, Inc.
Operator: Mitchell
Reach: 14 ft

Make: CAT
Model: 305CR
Bucket Capacity: 1/10 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0		0	E		
			Dark brown, fine to medium SAND, little Silt, trace Gravel, common Root fragments. Moist. TOPSOIL.				1) Performed perc test at approximately 2.5 feet.
1		1		1		1 A	
			Orange-brown, fine to coarse SAND, trace Silt, trace Gravel. Moist. SUBSOIL.				2) Collected bag sample from 0-1, 1-2, 2-3 feet.
2		2		2			
							3) Redoximorphic features noted at 2 to 2.5 feet bgs.
4					M		
						5-10% A	
6			Gray, fine to coarse SAND, some Gravel, little Silt, few Cobbles. Moist. GLACIAL TILL.				
8							
		8.5	Excavation terminated at 8.5 feet. No refusal encountered.	8.5			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

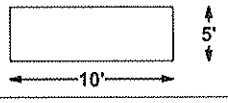
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-10

Ground Elevation: 253.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 10:00
Time Finished: 10:30

Logged By: J. Roche
Checked By: G. Mischel

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	10:30	No Groundwater Encountered		10'	5 minutes

Excavation Equipment

Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft

Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, little Silt, trace Gravel, common Root fragments. Moist. TOPSOIL.	0			
		1	Orange brown, fine to coarse SAND, some Gravel, little Silt, very few Root fragments. Moist. SUBSOIL.	1	M		
2		2	Light gray, fine to coarse SAND, and Gravel, trace Silt, frequent Cobbles, few Boulders. Moist. SAND & GRAVEL.	2		5-10% A <5% B	
4							
6					D		
		6.5	Gravel, Cobbles, Boulders (Very angular, fresh faces). WEATHERED BEDROCK.	6.5		30-40% A 10-20%B	
8							
10		10	Refusal at 10 feet on competent bedrock.	10			
12							
14							
16							
18							
20							

Excavation Effort
E Easy
M Moderate
D Difficult

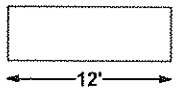
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-11

Ground Elevation: 245.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 11:05
Time Finished: 11:45

Logged By: J. Roche
Checked By: G. Mischel

Excavation Equipment
Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft
Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	11:45	No Groundwater Encountered		5'	10 minutes

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, some Silt, few Root fragments. Moist. TOPSOIL.	0	M		
		0.5	Orange brown, fine to coarse SAND, little Gravel, little Silt, very few Root fragments. Moist. SUBSOIL.	0.5			
2		2	Gray, fine to coarse SAND, little Gravel, little Silt, few Cobbles. Moist. GLACIAL TILL.	1	D		
4		4	WEATHERED BEDROCK.	2.5			
		5	Refusal at 5 feet on competent bedrock.				
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

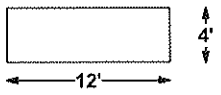
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-12

Ground Elevation: 239.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 13:45
Time Finished: 14:10

Logged By: J. Roche
Checked By: G. Mischel

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	14:00	11.5'	Ground Surface	11.5'	5 minutes

Excavation Equipment

Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft

Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

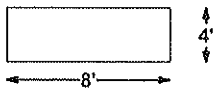
Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, some Silt, trace Gravel, common Root fragments. Moist. TOPSOIL.	0			
		1	Orange brown, fine to medium SAND, some Silt, little Gravel, very few Root fragments. Moist. SUBSOIL.	1			
2		2	Brown, fine to coarse SAND, little Gravel, little Silt. Moist. FILL.	2			
4		4	Brown, fine to coarse SAND, some Gravel, little Silt, few Cobbles. Moist. SAND & GRAVEL.	4	M		
6							
		7.5	Light brown, fine to medium SAND, trace Silt. Moist. SAND.	7.5			
8							
10							
		11.5	Excavation terminated at 11.5 feet. No refusal encountered.	11.5			
12							
14							
16							
18							
20							

Excavation Effort
E Easy
M Moderate
D Difficult

Boulder Size Classification
12" - 24" A
24" - 36" B
36" and larger C

Soil Description
Minor Component Proportions
trace 0 - 10%
little 10 - 20%
some 20 - 35%
and 35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

TEST PIT S:\WESDATA\3000\3048.00\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-13

Ground Elevation: 243.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 12:10
Time Finished: 12:45

Logged By: J. Roche
Checked By: G. Mischel

Excavation Equipment

Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft

Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	12:30	10'	Ground Surface	11'	5 minutes

Groundwater observed seeping into excavation at approximately 8.5 feet depth.

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, some Silt, trace Gravel, common Root fragments. Moist. TOPSOIL.	0	M		
		1	Orange brown, fine to medium SAND, little Silt, little Gravel, very few Root fragments. Moist. SUBSOIL.	1			
2		2.5		2.5	D	5-10% A	
4							
6			Gray, fine to coarse SAND, and Gravel, little Silt, few Cobbles, few Boulders. Moist. GLACIAL TILL.				
8							
10		10	WEATHERED BEDROCK.	10			
		11	Excavation terminated in Weathered Bedrock at 11 feet. No refusal encountered.	11			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

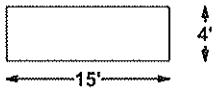
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-14

Ground Elevation: 244.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 08:20
Time Finished: 08:50

Logged By: J. Roche
Checked By: G. Mischel

Excavation Equipment
Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft
Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	08:40	10.5'	Ground Surface	11.5'	5 minutes

Groundwater observed rushing into excavation at approximately 10.5 feet depth.

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, some Silt, trace Gravel, common Root fragments. Moist. TOPSOIL.	0			
		1	Orange brown, fine SAND, and Silt, trace Gravel, very few Root fragments. Moist. SUBSOIL.	1	M		
2		2		2			
4							
6			Gray, fine to coarse SAND, some Gravel, little Silt, few to common Cobbles, few Boulders. Moist. GLACIAL TILL.		D	5-10% A <5% B	
8			Becomes coarser at approximately 9 feet bgs.				
10			Excavation sidewalls begin to collapse at 10 feet bgs.				
		11.5	Excavation terminated at 11.5 feet. No refusal encountered.	11.5			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

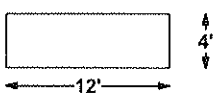
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-15

Ground Elevation: 247.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 09:10
Time Finished: 09:45

Logged By: J. Roche
Checked By: G. Mischel

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	09:30	10.5'	Ground Surface	11'	5 minutes

Excavation Equipment

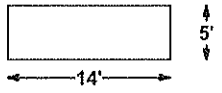
Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft

Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to medium SAND, some Silt, trace Gravel, common Root fragments. Moist. TOPSOIL.	0			
		1	Orange brown, fine to medium SAND, little Gravel, little Silt, very few Root fragments. Moist. SUBSOIL.	1			
2		2.2	Light gray, fine to coarse SAND, and Gravel, trace Silt, few Cobbles. Moist. SAND & GRAVEL.	2.2	M		
4							
				5			
		5.5	Light gray, fine to coarse SAND, and Gravel, little Silt, few Cobbles, very few Boulders. Moist. GLACIAL TILL.	5.5			
6							
8					D	5% A	
		9		9			
10		10.5	Refusal at 9 to 11 feet on apparent bedrock or large boulder.	11			
12							
14							
16							
18							
20							

Excavation Effort		Boulder Size Classification		Soil Description Minor Component Proportions	
E	Easy	12" - 24"	A	trace	0 - 10%
M	Moderate	24" - 36"	B	little	10 - 20%
D	Difficult	36" and larger	C	some	20 - 35%
				and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Test Pit No. SHTP-16

Ground Elevation: 244.0 ± feet
Datum:
Weather: 50-60°F, Overcast

Date: 11/10/09
Time Started: 07:50
Time Finished: 08:10

Logged By: J. Roche
Checked By: G. Mischel

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
11/10/09	08:00	No Groundwater Encountered		7'	5 minutes

Excavation Equipment

Contractor: Casaceli Trucking, Inc.
Operator: Dave
Reach: 18 ft

Make: Komatsu
Model: PC200
Bucket Capacity: 0.75 CY

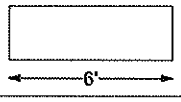
Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, some Silt, trace Gravel, few Root fragments. Moist. TOPSOIL.	0		10% A 20% B 5% C	
		1.4	Orange brown, fine to medium SAND, some Silt, trace Gravel, very few Root fragments, very few Cobbles. Moist. SUBSOIL.	1.4	M		
2							
		3	Mottling observed at 3.5 feet bgs.	3			
4			Gray, fine to coarse SAND, little Gravel, little Silt, few Cobbles, few Boulders. Moist. GLACIAL TILL.		D	5-10% A	
6							
		7	Excavation terminated at 7 feet on apparent bedrock or large boulder.	7			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort
E Easy
M Moderate
D Difficult

Boulder Size Classification
12" - 24" A
24" - 36" B
36" and larger C

Soil Description
Minor Component Proportions
trace 0 - 10%
little 10 - 20%
some 20 - 35%
and 35 - 50%

Test Pit Plan



North Arrow

TEST PIT S:\WESDATA\3000\3048.00\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring B-1

Ground Elevation: 236.5 ± feet
Datum:

Drilling Method: CME 850 ATV, 4 1/4" I.D. Hollow Stem Auger

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Geosearch, Inc.
Foreman: Rob
Date Started: 08/06/09 Date Finished: 08/06/09
Logged By: J. Roche Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
08/06/09	09:30	11'	Ground Surface	20'	20'	< 5 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	5 7 7 5	24/10			----0'----	S-1 (0 to 2'): Medium dense, brown, fine to medium SAND, little Silt, trace Gravel, trace Organics. Moist. TOPSOIL.	1) Boring backfilled with drill cuttings to 10 feet; filter sand to ground surface.
							TOPSOIL		
							----1'----		
2	S-2	2 - 4	2 2 1 2	24/17				S-2 (2 to 4'): Loose, brown, fine to medium SAND, some Silt, trace Gravel, trace Brick particles. Moist.	
4	S-3	4 - 6	4 2 3 2	24/5			FILL	S-3 (4 to 6'): Loose, brown, fine to coarse SAND, some Silt, little Gravel. Moist.	
6	S-4	6 - 8	2 1 1 5	24/19				S-4A (6 to 7.5'): Loose, dark brown, fine to coarse SAND, some Silt, little Gravel. Moist.	
							----7.5'----	S-4B (7.5 to 8'): Loose, brown, fine to coarse SAND, little Gravel, little Silt. Wet.	
8	S-5	8 - 10	10 20 22 26	24/17			SAND	S-5A (8 to 9'): Dense, brown, fine to coarse SAND, trace Gravel, trace Silt. Moist.	
							----9'----	S-5B (9 to 10'): Dense, gray, fine to medium SAND, some Gravel, little Silt. Moist.	
10	S-6	10 - 12	24 46 48 50	24/8				S-6 (10 to 12'): Very dense, gray-brown, fine to coarse SAND and Gravel, little Silt. Wet.	
12									
14									
	S-7	15 - 17	38 30 19 14	24/0			SAND & GRAVEL	S-7 (15 to 17'): No recovery. Gravel in tip of spoon.	
16									
18									
20	S-8	20 - 22	10 13 19 24	24/9				S-8 (20 to 22'): Dense, brown, fine to coarse SAND, trace Gravel, trace Silt. Wet.	
22							----22'----	Boring terminated at 22 feet.	
24									

BORING LOG S:\WESDATA\3000\3048.001\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring B-2

Ground Elevation: 234.5 ± feet
Datum:

Drilling Method: CME 850 ATV, 4 1/4" I.D. Hollow Stem Auger

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Geosearch, Inc.
Foreman: Rob
Date Started: 08/06/09 Date Finished: 08/06/09
Logged By: J. Roche Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
08/06/09	11:40	5'	Ground Surface	20'	20'	15 minutes

Hole collapsed while removing casing. Water level may be biased as a result.

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	2 10 19 21	24/15			----0'---- TOPSOIL ----0.5'----	S-1A (0 to 0.5'): Loose, dark brown, fine to medium SAND, little Gravel, little Silt, trace Organic particles. Moist. TOPSOIL.	1) Boring backfilled with drill cuttings to ground surface.
								S-1B (0.5 to 2'): Medium dense, brown, fine to coarse SAND, some Gravel, little Silt. Moist.	
2	S-2	2 - 4	20 25 23 35	24/14				S-2 (2 to 4'): Dense, brown, fine to coarse SAND and Gravel, trace Silt. Dry.	
4	S-3	4 - 6	35 36 40 37	24/16				S-3 (4 to 6'): Very dense, light brown, fine to coarse SAND, some Gravel, little Silt. Dry.	
6	S-4	6 - 8	40 33 17 15	24/19				S-4 (6 to 8'): Very dense, brown, fine to coarse SAND, little Gravel, trace Silt. Wet.	
8								Drill action indicates frequent boulders from 6-9 feet.	
10	S-5	10 - 12	5 6 8 7	24/12			SAND & GRAVEL	S-5 (10 to 12'): Medium dense, brown, fine to medium SAND, trace Gravel, trace Silt. Mottled. Wet at 10.5-10.7 feet.	
12								Drill action indicates cobbles and/or boulders at 12 feet.	
14									
	S-6	15 - 17	15 15 14 24	24/6				S-6 (15 to 17'): Medium dense, brown, fine to medium SAND, little Gravel, little Silt. Wet.	
16									
18									
20	S-7	20 - 21.4	16 47 100/4"	16/16			----20.5'---- GLACIAL TILL ----21.4'----	S-7A (20 to 20.5'): Medium dense, brown, fine to medium SAND, trace Gravel, trace Silt. Wet.	
								S-7B (20.5 to 21.4'): Very dense, gray-brown, fine to coarse SAND, some Gravel, little Silt. Moist.	
22								Boring terminated at 21.4 feet.	
24									

BORING LOG S:\WESDATA\3000\3048.00\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring B-3

Ground Elevation: 238.5 ± feet
Datum:

Drilling Method: CME 850 ATV, 4 1/4" I.D. Hollow Stem Auger

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Geosearch, Inc.
Foreman: Rob
Date Started: 08/06/09 Date Finished: 08/06/09
Logged By: J. Roche Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
08/06/09	14:00	14'	Ground Surface	20'	20'	5 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	2 2 4 6	24/17			----0'----	S-1 (0 to 2'): Loose, dark brown, fine to medium SAND, some Silt, trace Gravel, trace Root fragments. Moist. TOPSOIL.	1) Boring backfilled to 2 feet with drill cuttings; to ground surface with filter sand.
							TOPSOIL		
2	S-2	2 - 4	2 2 6 11	24/11			----2'----	S-2 (2 to 4'): Loose, brown, fine to coarse SAND, little Silt, trace Gravel. Moist.	
4	S-3	4 - 6	7 7 7 17	24/11				S-3 (4 to 6'): Medium dense, brown, fine to medium SAND, some Silt, trace Gravel. Stratified. Moist.	
6	S-4	6 - 8	24 31 41 41	24/20				S-4 (6 to 8'): Very dense, brown, fine to coarse SAND, little Gravel, little Silt. Moist. Drill action indicates numerous Cobbles from 5-8 feet.	
8	S-5	8 - 10	41 35 26 20	24/0				S-5 (8 to 10'): No recovery.	
10	S-6	10 - 12	8 7 10 16	24/17			SAND & GRAVEL	S-6 (10 to 12'): Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt. Moist. Becoming brown, fine to medium Sand, trace Gravel, trace Silt. Moist.	
12									
14									
16	S-7	15 - 17	9 12 14 30	24/18				S-7 (15 to 17'): Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt. Wet.	
18									
20	S-8	20 - 22	8 13 29 28	24/6			-----20'-----	S-8 (20 to 22'): Dense, gray-brown, fine to coarse SAND, little Gravel, little Silt. Moist.	
							GLACIAL TILL		
22							----22'----	Boring terminated at 22 feet.	
24									

BORING LOG S:\WESDATA\3000\3048.00\WORK\LOGS\BORING LOGS.GPJ 2008 SHA V2.GLB 2008 SHA V2.GDT 11/24/09

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Monitoring Well B-4 (W)

Ground Elevation: 239.3 ± feet
Datum:

Drilling Method: CME 850 ATV, 4 1/4" I.D. Hollow Stem Auger

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Geosearch, Inc.
Foreman: Rob
Date Started: 08/06/09 Date Finished: 08/06/09
Logged By: J. Roche Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
08/17/09	17:00	9.3'	Ground Surface	Well Installed	13'	11 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
0	S-1	0 - 2	2 3 2 2	24/11			0' TOPSOIL 0.5' SUBSOIL	S-1A (0 to 0.5'): Loose, dark brown, fine to medium SAND, some Silt, trace Gravel, trace Root particles. Moist.		6" Dia. Flushmounted Road Box Set in Concrete (0 to 1')
								S-1B (0.5 to 2'): Loose, brown, fine to medium SAND, some Silt, trace Gravel. Moist.		2" Dia. Sch. 40 PVC Riser (0.5 to 2.5')
2	S-2	2 - 4	6 13 18 28	24/17			2' SAND & GRAVEL	S-2 (2 to 4'): Dense, brown, fine to coarse SAND, little Gravel, trace Silt. Moist, increasing Silt fraction with depth.		Bentonite Chip Seal (1 to 2')
4	S-3	4 - 6	24 33 33 26	24/12			4'	S-3 (4 to 6'): Very dense, gray-brown, fine to coarse SAND, little Gravel, little Silt. Moist.		
6	S-4	6 - 8	15 16 16 21	24/16				S-4 (6 to 8'): Dense, gray-brown, fine to coarse SAND, some Silt, little Gravel. Moist.		Filter Sand (2 to 12.5')
8							TILL			2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (2.5 to 12.5')
								Drill action indicates Cobbles from 7-13 feet.		
10	S-5	10 - 12	17 16 15 13	24/16				S-5 (10 to 12'): No recovery (rock in tip of spoon).		
12										Native Material (12.5 to 13')
							13'	Boring terminated at 13 feet at auger refusal.		
14										
16										
18										
20										
22										
24										

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DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Client's Name: SMMA	Date: 8/11/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Avenue	Time:
or Lot #:		Address: Cambridge, MA	
Project #:	3048.00	Telephone:	Weather : 80's, Sunny

Deep Hole Number: WWTP-1 Location (Identify on site Plan): Near Hartley Rd.

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			

Additional Notes: A test pit was not completed in this area due to the presence of the existing leach field, a drainage pipe running in from Hartley Road, massive boulder fill and the presence of what appeared to be bedrock ledge or very large boulders at the ground surface.

Groundwater Observed: _____ No _____ Yes If yes: Depth Weeping from Pit Face: _____ Standing Water in the Hole: _____

Estimated Depth to Seasonal High Ground Water: _____

Logged By: Amy Carey

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Client's Name: SMMA	Date: 8/11/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Avenue	Time:
or Lot #:		Address: Cambridge, MA	
Project #:	3048.00	Telephone:	Weather : 80's, Sunny

Deep Hole Number: WWTP-2 Location (Identify on site Plan): Near Hartley Rd.

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-26	A	10YR3/3				sandy loam	5	5	Granular	loose	Boulder Fill
26-36	B	2.5Y6/4				loamy sand	10	5	massive	firm	
36-120	C	2.5Y6/3	40-50"	7.5YR6/6	3%	loamy sand	10%	5%	massive	firm	Glacial Till
120	Apparent ledge or large boulders										

Additional Notes:
Boulder pile near test pit, corner of current leach field exposed at edge of pit
Observed in A Layer were also bricks, metal and fabric.
Boulders throughout.

Groundwater Observed: X No ____ Yes If yes: Depth Weeping from Pit Face: ____ Standing Water in the Hole: ____

Estimated Depth to Seasonal High Ground Water: 40"
Logged By: Amy Carey

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Client's Name: SMMA	Date: 8/11/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Avenue	Time:
or Lot #:		Address: Cambridge, MA	
Project #:	3048.00	Telephone:	Weather : 80's, Sunny

Deep Hole Number: WWTP-3 Location (Identify on site Plan): Near Hartley Rd.

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-24	A	10YR3/3				silt loam	5	5	granular	loose	Boulder Fill
24-36	B	2.5Y6/4				silt loam	10	5	massive	firm	
36-84	C	2.5Y6/3	48-52"	7.5YR6/6	2%	loamy sand	10	5	massive	firm	Glacial Till
84	Apparent ledge or boulders										

Additional Notes:
Boulders throughout

Groundwater Observed: X No ____ Yes If yes: Depth Weeping from Pit Face: ____ Standing Water in the Hole: ____

Estimated Depth to Seasonal High Ground Water: 48"
Logged By: Amy Carey

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Client's Name: SMMA	Date: 8/11/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Avenue	Time:
or Lot #:		Address: Cambridge, MA	
Project #:	3048.00	Telephone:	Weather : 80's, Sunny

Deep Hole Number: WWTP-4 Location (Identify on site Plan): Near Hartley Rd.

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-48	A	2.5Y4/3				Silt loam			granular	loose	Boulder Fill
48-60	A buried	10YR2/2				Silt loam			granular	firm	
60-72	B	2.5Y6/4	66-72	7.5YR5/6	2	loamy f. sand			single grain	firm	
72-120	C1	2.5Y6/4	72-96	7.5YR5/6	5	sand			single grain	friable	
120-180	C2	2.5Y6/2				loamy sand	10	5	massive	firm	Glacial Till

Additional Notes:
Bricks and metal found in Fill.

Groundwater Observed: ____ No __X__ Yes If yes: Depth Weeping from Pit Face: 108" Standing Water in the Hole: No

Estimated Depth to Seasonal High Ground Water: No mottling observed
Logged By: Amy Carey

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Client's Name: SMMA	Date: 8/11/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Avenue	Time:
or Lot #:		Address: Cambridge, MA	
Project #:	3048.00	Telephone:	Weather : 80's, Sunny

Deep Hole Number: WWTP-5 Location (Identify on site Plan): Near Hartley Rd.

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-72	A	2.5Y4/3				Silt Loam			granular	loose	Boulder Fill
72-84	Ash										
84-102	A buried	10YR2/2				Silt loam			granular	firm	
102-108	C1	2.5Y6/4	102-108	7.5YR5/6	5	f. sandy loam			single grain	firm	
108-180	C2	2.5Y6/3	108-120	7.5YR5/6	5	sand			single grain	friable	

Additional Notes:

Groundwater Observed: ____ No ____X Yes If yes: Depth Weeping from Pit Face: 108" Standing Water in the Hole: 114"

Estimated Depth to Seasonal High Ground Water: 102"

Logged By: Amy Carey

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/9/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 9:30 AM
or Lot #:		Cambridge, MA	Weather : Sunny, 50 deg. F

Deep Hole Number: WWTP-6 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-8	A	10 YR 3/2				Fine Sany Loam	3	--	Granular	Very Friable	
8-18	B	10 YR 5/6				Fine Sandy Loam	5	3	Weak Sub-angular Blocky	Friable	
18-53	Cd	10 YR 5/3	46-53"	10 YR 4/6 2.5Y 6/2	5	Coarse Loamy Sand	20	10	Massive	Firm	

Additional Notes:
1. Bedrock refusal at 53"
2. No percolation test performed.

Groundwater Observed: x No _____ Yes If yes: Depth Weeping from Pit Face: No _____ Standing Water in the Hole: No _____

Estimated Depth to Seasonal High Ground Water: 46" based on Redox
Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/9/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 10:30 AM
or Lot #:		Cambridge, MA	Weather : Sunny, 50 deg. F

Deep Hole Number: WWTP-7 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-42	Fill	10 YR 5/4				Loamy Sand	10	--	Single Grai	Friable	

Additional Notes:
1. Bedding of existing leaching field encountered at 42 inches.
2. No percolation test performed.

Groundwater Observed: x No _____ Yes If yes: Depth Weeping from Pit Face: No _____ Standing Water in the Hole: No _____

Estimated Depth to Seasonal High Ground Water: NA

Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/9/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 11:00 AM
or Lot #:		Cambridge, MA	Weather : Sunny, 50 deg. F

Deep Hole Number: WWTP-8 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-12	A	10 YR 3/2				Fine Sandy Loam	3	--	Granular	Very Friable	
12-24	B	10 YR 5/6				Fine Sandy Loam	10	3	Weak Sub-angular Blocky	Friable	
24-120	Cd	10 YR 5/3	34-120"	10 YR 4/6	10	Coarse Loamy Sand	30	15	Massive	Firm	

Additional Notes:
1. Bedrock refusal encountered between 7 and 10 feet bgs across the test pit.
2. Percolation test performed, see Percolation Test Log for details.

Groundwater Observed: ____ No __X__ Yes If yes: Depth Weeping from Pit Face: 78" Standing Water in the Hole: 114"

Estimated Depth to Seasonal High Ground Water: 34" based on Redox
Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/9/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 8:30 AM
or Lot #:		Cambridge, MA	Weather : Clear, 45 deg. F

Deep Hole Number: WWTP-9 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-18	A	10 YR 3/2				Fine Sandy Loam	3	--	Granular	Very Friable	
18-33	B	10 YR 5/6				Fine Sandy Loam	5	3	Weak Sub-angular Blocky	Friable	
33-96	Cd	10 YR 5/3	60-96"	7.5 YR 4/6	5	Coarse Loamy Sand	25	10	Massive	Firm	

Additional Notes:
1. Bedrock refusal at 96".
2. Percolation test performed, see Percolation Test Log for details.

Groundwater Observed: X No _____ Yes If yes: Depth Weeping from Pit Face: No _____ Standing Water in the Hole: No _____

Estimated Depth to Seasonal High Ground Water: 60" based on Redox

Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/9/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 12:45 PM
or Lot #:		Cambridge, MA	Weather : Sunny, 50 deg. F

Deep Hole Number: WWTP-10 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-10	A	10 YR 3/2				Fine Sandy Loam	5	--	Granular	Very Friable	

Additional Notes:
1. Bedrock encountered at 10 inches.
2. No percolation test performed.

Groundwater Observed: x No _____ Yes If yes: Depth Weeping from Pit Face: No _____ Standing Water in the Hole: No _____

Estimated Depth to Seasonal High Ground Water: >10"
Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/10/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 3:00 PM
or Lot #:		Cambridge, MA	Weather : Clear, 50 deg. F

Deep Hole Number: WWTP-11 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-12	A	10 YR 3/2				Fine Sandy Loam	5	5	Granular	Friable	
12-60	Fill	10 YR 4/3				Loamy Sand	10	75	Single Grain	Firm	Blast rock layer
60-66	Ab	10 YR 3/2				Fine Sandy Loam	10	5	Granular	Friable	
66-144	Cd	10 YR 5/2	66"	2.5 Y 6/2 7.5 YR 5/6	30	Coarse Loamy Sand	20	10	Massive	Firm	

Additional Notes:
1. No refusal encountered.
2. Percolation test performed, see Percolation Test Log for details.

Groundwater Observed: X No _____ Yes If yes: Depth Weeping from Pit Face: No _____ Standing Water in the Hole: No _____

Estimated Depth to Seasonal High Ground Water: 66" based on Redox
Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/10/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 3:45 PM
or Lot #:		Cambridge, MA	Weather : Clear, 50 deg. F

Deep Hole Number: WWTP-12 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-8	A	10 YR 3/2				Fine Sandy Loam	5	5	Granular	Friable	
8-60	Fill	10 YR 4/3				Loamy Sand	10	75	Single Grain	Firm	Blast rock layer
60-66	Ab	10 YR 3/2				Fine Sandy Loam	10	5	Granular	Friable	
66-96	Cd	10 YR 5/2	66"	2.5 Y 6/2 7.5 YR 5/6	25	Coarse Loamy Sand	20	10	Massive	Firm	

Additional Notes:
1. No refusal encountered.
2. No percolation test performed.

Groundwater Observed: X No _____ Yes If yes: Depth Weeping from Pit Face: No _____ Standing Water in the Hole: No _____

Estimated Depth to Seasonal High Ground Water: 66" based on Redox

Logged By: Patrick Malone

DEEP OBSERVATION TEST HOLE LOG

Location Address:	Stow Center School	Owner's Name: SMMA	Date 11/9/2009
403 Great Road, Stow, MA		Address: 1000 Massachusetts Ave.	Time: 1:10 PM
or Lot #:		Cambridge, MA	Weather : Sunny, 60 deg. F

Deep Hole Number: WWTP-13 Location (Identify on site Plan) Near Hartley Road

Depth (inches)	Soil Horizon or Layer	Soil Matrix Color - Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles			
0-12	A	10 YR 3/2				Fine Sandy Loam	3	--	Granular	Very Friable	
12-23	FILL	10 YR 4/3				Sandy Loam	5	3	Massive	Friable	
23-35	Ab	10 YR 3/2				Fine Sandy Loam	3	--	Granular	Friable	
35-51	B	10 YR 5/6				Fine Sandy Loam	10	5	Weak Sub-angular Blocky	Friable	
51-60	C1	10 YR 4/4				Coarse Sand	50	10	Single Grain	Friable	
60-168	Cd	10 YR 5/3	60-164"	10 YR 4/6 2.5 Y 6/2	10	Sandy Loam	20	10	Massive	Firm	

Additional Notes:
1. No refusal encountered.
2. Percolation test performed, see Percolation Test Log for details.

Groundwater Observed: ____ No __X__ Yes If yes: Depth Weeping from Pit Face: 96" ____ Standing Water in the Hole: 168"

Estimated Depth to Seasonal High Ground Water: 60" based on Redox

Logged By: Patrick Malone

PERCOLATION TEST LOG

Location Address:	Center School, Stow, MA	Client's Name:	Symmes Maini & McKee Associates
	(off Hartley Road)	Address:	1000 Massachusetts Avenue
or Lot #:		Address:	Cambridge, MA 02138
Project #:	3048.00	Telephone:	(617) 547-5400

Percolation Test	**WWTP-8**	**Percolation Test**	**WWTP-9**	**Percolation Test**	**WWTP-11**	**Percolation Test**	**WWTP-13**
Depth to bottom of Perc hole	54"	Depth to bottom of Perc hole	54"	Depth to bottom of Perc hole	90"	Depth to bottom of Perc hole	78"
Start of Pre-soak	12:45	Start of Pre-soak	9:30	Start of Pre-soak	15:20	Start of Pre-soak	14:20
End of Pre-soak	13:00	End of Pre-soak	9:45	End of Pre-soak	15:35	End of Pre-soak	14:35
Time at 12"	13:00	Time at 12"	9:45	Time at 12"	15:35	Time at 12"	14:35
Time at 9"	13:40	Time at 9"	10:39	Time at 9"	16:32	Time at 9"	15:20 (11")
Time at 6"	14:32	Time at 6"	11:48	Time at 6"	16:52 (8.5")	Time at 6"	
Time (9"-6")	52 min	Time (9"-6")	69 min	Time (9"-6")		Time (9"-6")	
Rate - min./inch	17	Rate - min./inch	23	Rate - min./inch	See Note #1	Rate - min./inch	See Note #2

Date: 11/9/2009 SITE PASSED: X SITE FAILED:

Performed By: Patrick Malone Witnessed By: Jack Wallace - Stow BOH (part-time)

Notes:

1. Percolation test at WWTP-11 was terminated before completion of the test due to poor soil conditions and time constraints. Test was terminated when 20 minutes was required for 0.5 inch of drop in the interval from 9" down to 8.5".
2. Percolation test at WWTP-13 was terminated before completion of the test due to poor soil conditions and time constraints. Test was terminated when 45 minutes was required for 1.0 inch of drop in the interval from 12" down to 11".

SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring GP-1

Ground Elevation: 257.8 ± feet
Datum:

Drilling Method: Geoprobe® 6610DT Track Rig with 3¼" ID Casing

Sampling Method: 5' long by 2" O.D. MacroCore® Sampler

Drilling Company: New Hampshire Boring, Inc.
Foreman: C. Downing
Date Started: 02/26/10 Date Finished: 02/26/10
Logged By: R. Cook Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
02/26/10	---	No Reading Taken				

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen/ Rec (ft)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 5	5.0/ 2.3			-----0'----- FILL -----0.5'-----	S-1A (0 to 0.5'): Dark gray, fine to medium SAND & GRAVEL, little Silt. Moist. FILL.	
						SAND	S-1B (0.5 to 2.5'): Orange brown, fine to medium SAND, some Silt, little Gravel, few Roots. Wet. SUBSOIL.	
2						-----2.5'-----	S-1C (2.5 to 5'): Orange/tan, fine to medium SAND, some Silt, trace Gravel. Wet. TILL.	
4	S-2	5 - 7.4	2.4/ 2.2			TILL	S-2 (5 to 7.4'): Orange/tan, fine to medium SAND, some Silt, trace Gravel. Moist. TILL.	
6						-----7.4'-----	Refusal at 7.4', boring terminated	
8								
10								
12								
14								
16								
18								
20								

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring GP-2

Ground Elevation: 257.9 ± feet
Datum:

Drilling Method: Geoprobe® 6610DT Track Rig with 3¼" ID Casing

Sampling Method: 5' long by 2" O.D. MacroCore® Sampler

Drilling Company: New Hampshire Boring, Inc.
Foreman: C. Downing
Date Started: 02/26/10 Date Finished: 02/26/10
Logged By: R. Cook Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
02/26/10	---	No Reading Taken				

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen/ Rec (ft)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 5	5.0/ 3.0			-----0'-----	S-1A (0 to 0.5'): Dark gray, fine to coarse SAND & GRAVEL, trace Silt. Wet. FILL.	
							S-1B (0.5 to 2'): Dark brown, fine to coarse SAND & GRAVEL. Moist. FILL.	
2							S-1C (2 to 5'): Tan/brown, fine to medium SAND, some Silt, trace Gravel. Wet. FILL.	
						FILL		
4								
	S-2	5 - 10	5.0/ 3.1				S-2A (5 to 5.7'): Tan/brown, fine to medium SAND, some Silt, trace Gravel. Wet. FILL.	
6							S-2B (5.7 to 6.6'): Black, GRAVEL. Septic FILL.	
						-----6.6'-----	S-2C (6.6 to 10'): Gray, fine to medium SAND, little Gravel, little Silt. TILL.	
8						TILL		
10						-----10'-----	Boring terminated at 10 feet. No refusal encountered.	
12								
14								
16								
18								
20								

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring GP-3

Ground Elevation: 257.6 ± feet
Datum:

Drilling Method: Geoprobe® 6610DT Track Rig with 3¼" ID Casing

Sampling Method: 5' long by 2" O.D. MacroCore® Sampler

Drilling Company: New Hampshire Boring, Inc.
Foreman: C. Downing
Date Started: 02/26/10 Date Finished: 02/26/10
Logged By: R. Cook Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
02/26/10	---	No Reading Taken				

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen/ Rec (ft)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 5	5.0/ 2.8			-----0'----- FILL -----1'----- SAND -----2.5'-----	S-1A (0 to 1'): Dark gray, fine to coarse SAND & GRAVEL, little Silt, few brick pieces. Wet. FILL.	
2							S-1B (1 to 2.5'): Gray, fine to coarse SAND, little Gravel, little Silt. Moist.	
4							S-1C (2.5 to 5'): Tan, fine to medium SAND, little Silt, trace Gravel. Moist. TILL.	
6	S-2	5 - 10	5.0/ 4.2			TILL	S-2 (5 to 10'): Tan, fine to medium SAND, little Silt, trace Gravel, few Cobble. Moist. TILL.	
8								
10						-----10'-----	Boring terminated at 10 feet. No refusal encountered.	
12								
14								
16								
18								
20								

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring GP-4

Ground Elevation: 258.7 ± feet
Datum:

Drilling Method: Geoprobe® 6610DT Track Rig with 3¼" ID Casing

Sampling Method: 5' long by 2" O.D. MacroCore® Sampler

Drilling Company: New Hampshire Boring, Inc.
Foreman: C. Downing
Date Started: 02/26/10 Date Finished: 02/26/10
Logged By: R. Cook Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
02/26/10	---	No Reading Taken				

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen/ Rec (ft)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 5	5.0/ 2.7			-----0'-----		
						FILL	S-1A (0 to 0.6'): Asphalt, Gravel. FILL.	
						-----0.6'-----		
						SAND	S-1B (0.6 to 1.5'): Brown, fine to coarse SAND, some Gravel, little Silt. Moist.	
						-----1.5'-----		
2						COBBLE	S-1C (1.5 to 1.9'): Weathered Cobble.	
						-----1.9'-----	S-1D (1.9 to 5'): Brown, fine to coarse SAND, some Gravel, little Silt. Moist.	
4						SAND & GRAVEL		
	S-2	5 - 10	5.0/ 3.8				S-2A (5 to 5.6'): Brown, fine to coarse SAND and GRAVEL, little Silt. Moist.	
						-----5.6'-----		
6							S-2B (5.6 to 10'): Tan, fine to medium SAND, little Silt, trace Gravel. Moist. TILL.	
8						TILL		
10						-----10'-----		
							Boring terminated at 10 feet. No refusal encountered.	
12								
14								
16								
18								
20								

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring GP-5

Ground Elevation: 259.5 ± feet
Datum:

Drilling Method: Geoprobe® 6610DT Track Rig with 3¼" ID Casing

Sampling Method: 5' long by 2" O.D. MacroCore® Sampler

Drilling Company: New Hampshire Boring, Inc.
Foreman: C. Downing
Date Started: 02/26/10 Date Finished: 02/26/10
Logged By: R. Cook Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
02/26/10	---	No Reading Taken				

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen/ Rec (ft)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 5	5.0/ 3.2			-----0'-----	S-1A (0 to 1.7'): Dark brown, fine to coarse SAND, some Gravel, little Silt. Moist. TOPSOIL.	
						TOPSOIL		
2						-----1.7'-----	S-1B (1.7 to 5'): Orangy brown, fine to coarse SAND and GRAVEL, little Silt. Moist.	
						SAND & GRAVEL		
4	S-2	5 - 10	5.0/ 4.2				S-2A (5 to 5.6'): Orangy brown, fine to coarse SAND and GRAVEL, little Silt. Moist.	
						-----5.6'-----	S-2B (5.6 to 5.9'): Tan and orange, fine SAND, some Silt, trace Gravel. Moist. TILL.	
6							S-2C (5.9 to 10'): Tan to gray, fine to medium SAND, little Gravel, little Silt. Moist. TILL.	
						TILL		
8								
10						-----10'-----	Boring terminated at 10 feet. No refusal encountered.	
12								
14								
16								
18								
20								

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SHA
IMPROVING EARTH

Project: Stow Center Elementary School
Location: Stow, Massachusetts
SHA Project No.: 3048.00

Log of Boring GP-6

Ground Elevation: 259.9 ± feet
Datum:

Drilling Method: Geoprobe® 6610DT Track Rig with 3¼" ID Casing

Sampling Method: 5' long by 2" O.D. MacroCore® Sampler

Drilling Company: New Hampshire Boring, Inc.
Foreman: C. Downing
Date Started: 02/26/10 Date Finished: 02/26/10
Logged By: R. Cook Checked By: V. Kokosa

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
02/26/10	---	No Reading Taken				

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen/ Rec (ft)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 5	5.0/ 2.7			-----0'-----	S-1A (0 to 1'): Dark brown, fine to medium SAND and SILT, trace Gravel, few Roots. Moist. TOPSOIL.	
						TOPSOIL		
						-----1'-----	S-1B (1 to 1.7'): Tan, fine to medium SAND, little Silt, trace Gravel. Moist.	
2							S-1C (1.7 to 5'): Dark brown, fine to medium SAND, some Silt, trace Gravel. Moist.	
						SAND		
4								
	S-2	5 - 10	5.0/ 4.1			-----5.4'-----	S-2A (5 to 5.4'): Dark brown, fine to medium SAND, some Silt, trace Gravel. Moist.	
6							S-2B (5.4 to 10'): Tan, fine to medium SAND, some Silt, little Gravel. Moist. TILL.	
						TILL		
8								
						-----10'-----	Boring terminated at 10 feet. No refusal encountered.	
10								
12								
14								
16								
18								
20								

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APPENDIX 5 APPLICATION FOR NEW SOURCE APPROVAL

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Central Regional Office, 627 Main Street, Worcester, MA 01608

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

IAN A. BOWLES
Secretary

LAURIE BURT
Commissioner

February 16, 2010

Stow Elementary School Building Committee
Attn: Michael Wood, Superintendent of Schools
380 Great Road
Stow, MA 01775

Town: Stow
PWS Name: Stow Center School
PWS ID: 2286007
Permit: BRP WS 13
MassDEP Transmittal Number: X231549
Action: **Approved**

Dear Mr. Wood:

Please find attached the following information:

- An approval for Site Source and Conduct of Pumping Test – under 70 gallons per minute, BRP WS 13 for Well 2 at Stow Center School, Stow, MA.

Thank you, and if you should have any questions regarding this letter, please feel free to call Susan Connors of the Drinking Water Program at 508-767-2701 or me at 508-767-2827.

Sincerely,

Marielle Stone
Section Chief
Drinking Water Program

cc: Stow Board of Health, P.O. Box 261, Stow, MA 01775
Vernon R. Kokosa, Sanborn, Head & Associates, Inc., 1 Technology Park Drive, Westford, MA 01886
Craig Martin, Stow Building Department, 380 Great Road, Stow, MA 01775

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COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Central Regional Office, 627 Main Street, Worcester, MA 01608

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Lieutenant Governor

IAN A. BOWLES
Secretary

LAURIE BURT
Commissioner

STOW, STOW CENTER SCHOOL
Approval to Site a Source and Conduct Pumping Test for Source less than 70 gpm
BRP WS 13

Permit Date: February 16, 2010

1. Applicant Information

Name of Applicant:	Stow Elementary School Building Committee
Mailing Address:	380 Great Road, Stow, MA 01775
Telephone:	978-897-2927
Transmittal Number:	X231549

2. Facility Information

Name of Facility:	Stow Center School
Facility Address:	403 Great Road, Stow, MA 01775
PWS Type:	Non-Transient Non-Community
PWS ID Number:	2286007

3. Facility Description

The Stow Center School is currently registered with MassDEP's Drinking Water Program as a Public Water System. The existing potable water supply for the school is from a bedrock well in the basement boiler room of the existing school building. A renovation project for the school includes the construction of a new well in the rear of the property and decommissioning of the existing well. The proposed withdrawal is based on a Title 5 design flow calculated for 780 students/staff at 8 gallons per day per person (6,240 GPD); however the proposed Title 5 design is for 680 students/staff at 8 gallons per day per person (5,440 GPD). The final approved rate will be based on the Board of Health approved Title 5 system.

4. Reviews and Approvals Affecting Current or Planned Operation

4.1 MEPA: Applicant is required to comply with all applicable requirements and filings of the Massachusetts Environmental Policy Act Office. No MEPA review is required by the MassDEP Drinking Water Program for this project.

4.2 Local: It is the Applicant's responsibility to comply with all applicable requirements and filings of the Town of Stow, including but not limited to, the Conservation Commission and Board of Health. A Notice of Intent has been filed with the Stow Conservation Commission and a hearing is scheduled for February 16, 2010.

5. Current Permit Application, Plans and Reports

Report: "Application for New Source Approval for Proposed Water Supply Well"
Dated: January 2010
Prepared by: Sanborn, Head & Associates, Inc.
Contact: Vernon R. Kokosa, P.E.
Telephone: 978-392-0900 ext 1009
Received by MassDEP-CERO: January 13, 2010
Start Date of Application: January 14, 2010

6. Current Project Description

A site examination was conducted on February 8, 2010 and attended by Susan Connors of MassDEP's Drinking Water Program, Vernon Kokosa of Sanborn, Head & Associates, and Craig Martin, Stow Building Commissioner. The proposed well site is within the 100 foot buffer zone of a wetlands resource area. A Notice of Intent has been filed with the Stow Conservation Commission and a hearing is scheduled for February 16, 2010. A drainage ditch approximately 50 feet from the proposed well location was frozen during the site exam. Sampling for microscopic particulate analysis (MPA) will not be required during the pumping test; however, a determination regarding sampling for MPA will be made when the sample schedule for the new well is issued. Bedrock wells for non-community systems are considered exempt if the well is 100 feet or more from a surface water feature. The Zone I radius will capture portions of the tennis courts and baseball and soccer fields. The existing wastewater disposal system constructed in the 1950's is located within the IWPA. A new system will be installed in the same location as part of the renovation and will be equipped with a recirculating sand filter.

The final Zone I radius and Interim Wellhead Protection Area (IWPA) radius will be determined based on the final approved rate. For 5,440 GPD, the Zone I would be 210 feet and the IWPA would be 521 feet. The Zone I radius will extend onto the adjacent Hale Middle School property that is owned by the Town of Stow.

According to a search of MassGIS data, there are five public water supplies (in addition to the existing well at Stow Center School) within a one-half mile radius of the proposed well location. There is one hazardous waste site (RTN 2-10438) approximately one-half mile from the proposed well location. The release was related to the removal of an underground storage tank at the Pompositticut Elementary School in 1994. A Response Action Outcome statement was issued for this site asserting that response actions were sufficient to achieve a level of no significant risk or at least ensure that all substantial hazards were eliminated.

Surface waters within a one-half mile radius include Elizabeth Brook, Fletchers Pond, Ministers Pond, unnamed tributaries and associated wetlands. The named streams are located outside of the proposed IWPA. An area designated as Priority Habitat for Rare Species is within a one-half mile radius, but is outside of the proposed IWPA and well outside of the subject property.

There are no solid waste facilities, landfills, Areas of Critical Environmental Concern or certified vernal pools within a one-half mile radius of the proposed well.

A step drawdown test is proposed to be conducted at 50, 100, 150 and 200% of the proposed designed well yield (approximately 5 gpm) in order to determine the appropriate pumping rate for the prolonged pumping test. Because of the low rate, the step test is optional for this project. The prolonged test should be conducted at a minimum 133 1/3% of the proposed approval rate if the step test is omitted. The discharge line is proposed to be located 200 feet from the well into the wetland or to the unnamed pond to the west.

Water quality sampling is described in the permit application in accordance with MassDEP's Guidelines with the exception of synthetic organic compound (SOC) analysis. SOCs shall be collected on the final day of the pumping test prior to shutdown.

7. Permit Review and Approval

This permit application complies with the requirements at 310 CMR 22.00 Drinking Water Program Regulations and MassDEP's Guidelines and Policies for Public Water Systems. MassDEP reviewed the permit application and supporting documentation, and hereby issues the permit/approval. In the event this permit conflicts with all or parts of prior approvals or permits, the terms and conditions of this permit shall supersede the conflicting provisions of prior permits and/or approvals. This permit does not convey property rights of any sort or any exclusive privilege. This permit is subject to the conditions set forth below.

8. General Permit Conditions

8.1 Compliance with Permit Approvals – The Applicant shall conduct activities in accordance with the approved plans, reports, and other submissions, except as may be modified by the conditions set forth in Section 8 (General Permit Conditions) and Section 9 (Special Permit Conditions). No material changes in the design or activities described in the approved documents shall be performed without prior written MassDEP approval.

8.2 Compliance with Other Approvals – The activities at this Public Water System shall be performed in compliance with all other applicable local, state and federal laws and regulations. This approval does not relieve the owner or operator of this Public Water System from complying with all other applicable local, state and federal requirements, licenses and permits.

8.3 Duty to Mitigate – The Applicant shall remedy and shall act to prevent all potential and actual adverse impacts to public health or the environment resulting from noncompliance with the terms or conditions of the permit or approval.

8.4 Duty to Provide Information – The Applicant shall furnish to MassDEP, within a reasonable time, any information MassDEP may request, and which is deemed by MassDEP to be relevant in determining compliance with permits, regulations, guidelines and policies.

9. Special Permit Conditions

9.1 Pumping Test Design – The pumping test shall be conducted for an adequate time period to meet the stabilization criteria set forth in MassDEP's Guidelines and Policies. The pumping test shall be conducted as described in the BRP WS13 application.

9.2 Procedures and Guidelines for Bedrock Wells – The Applicant shall follow the procedures, policies and guidelines that are relevant to the Source Approval Process for Bedrock Wells with Planned Yields less than 100,000 GPD.

9.3 Zone I Radius Ownership and Control – The Drinking Water Program Regulations at 310 CMR 22.21(3)(b) require that the Public Water System must have the ownership or control of the area within the Zone I radius of each of the proposed groundwater source wells to protect the water from contamination. The Applicant shall submit to MassDEP, as part of the BRP WS 15 Permit application, a surveyed plot plan of the Zone I area, clearly delineating the limits of Zone I property ownership. Current and future land uses within the Zone I shall be limited to those land uses directly related to the provision of public water system. Additionally the application of fertilizers or pesticides on the playing fields shall be prohibited.

9.4 Water Quality Sampling – All water quality sampling shall be conducted as stated in the BRP WS13 application and in accordance with the requirements of 310 CMR 22.00 and MassDEP's Guidelines and Policies for Public Water Systems including Appendix A. The Applicant shall conduct synthetic organic compound (SOC) sampling at the end of the pumping test.

9.5 Water Quality Analysis – All water quality analyses must be conducted by a Massachusetts certified laboratory, using approved methods and achieving the required method detection limits. Please report all water quality analytical data on MassDEP Forms, to enable efficient review of the water quality data.

9.6 Latitude/Longitude – The Applicant shall submit to MassDEP the latitude and longitude for the well.

9.7 Water Treatment Permit Application – It was proposed by the Applicant that a water softener will most likely be needed for the new water supply. The Applicant shall submit the appropriate application for Approval to Construct a Treatment Facility (BRP WS23A) for the water softener. If the water samples collected during the pumping test exhibit the need for any additional treatment (e.g. violations of MCLs), then that treatment shall be included in the BRP WS23A application.

Thank you, and if you should have any questions regarding this permit, please feel free to call Susan Connors of the Drinking Water Program at 508-767-2701 or me at 508-767-2827.

Sincerely,

Marielle Stone
Section Chief
Drinking Water Program

SHA
IMPROVING EARTH

SANBORN, HEAD & ASSOCIATES, INC.
1 Technology Park Drive ▪ Westford, MA 01886
P (978) 392-0900 ▪ F (978) 392-0987
www.sanbornhead.com

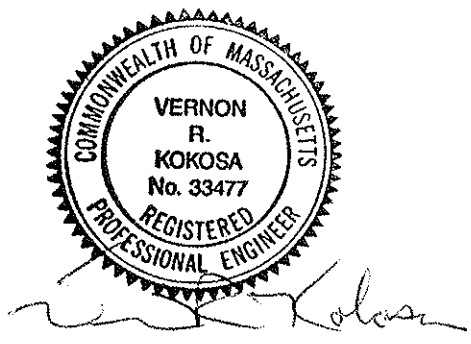
APPLICATION FOR NEW SOURCE APPROVAL FOR PROPOSED WATER SUPPLY WELL

Site Examination, Land Use Survey and Approval to Conduct Pumping Test
Stow Center Elementary School
Stow, Massachusetts

Prepared for
Symmes, Maini & McKee, Inc.

Prepared by
Sanborn, Head & Associates, Inc.

File 3048.02
January 2010



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January 11, 2010
File No. 3048.02

Ms. Barbara Kickham
Massachusetts Department of Environmental Protection
Central Regional Office – Drinking Water Program
627 Main Street
Worcester, Massachusetts 01608

Re: Application for New Source Approval for Proposed Water Supply Well
Site Examination, Land Use Survey, and Approval to Conduct Pumping Test
Stow Center Elementary School
Stow, Massachusetts

Dear Barbara:

Enclosed please find two (2) copies of our BRP WS 13 application for a new source approval for a proposed drinking water supply well for the Stow Center Elementary School located at 403 Great Road (Route 117) in Stow, Massachusetts. The new well is expected to be a bedrock well with a permitted withdrawal rate of approximately 7,000 gallons per day (gpd). The new well will be constructed as part of a school expansion project and will replace an existing well in the boiler room of the existing school.

If you have any questions during review of this application, please do not hesitate to call.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

Gregory A. Mischel, P.E.
Senior Project Manager

Vernon R. Kokosa, P.E.
Principal

COMMONWEALTH OF MASSACHUSETTS
VERNON R. KOKOSA
No. 33477
REGISTERED PROFESSIONAL ENGINEER

GRM/VRK:lmd

S:\WESDATA\3000\3048.02\Originals\20100111 Stow Well Cover Ltr.docx

Enter your transmittal number → X231549
Transmittal Number

Your unique Transmittal Number can be accessed online: http://mass.gov/dep/service/online/trasmfrm.shtml or call MassDEP's InfoLine at 617-338-2255 or 800-462-0444 (from 508, 781, and 978 area codes).

Massachusetts Department of Environmental Protection

Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: DEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application. **Copy 2** must accompany your fee payment. **Copy 3** should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA
02211

*** Note:**
For BWSC Permits, enter the LSP.

A. Permit Information

BRP WS 13
1. Permit Code: 7 or 8 character code from permit instructions

New Source Approval<70 gpm-Site Exam
2. Name of Permit Category

Elementary School Reconstruction
3. Type of Project or Activity

B. Applicant Information – Firm or Individual

Stow Elementary School Building Committee
1. Name of Firm - Or, if party needing this approval is an individual enter name below:

2. **Last Name** of Individual | 3. **First Name** of Individual | 4. MI

380 Great Road
5. Street Address

Stow	MA	01775	(978) 897-2927	
6. City/Town	7. State	8. Zip Code	9. Telephone #	10. Ext. #

Michael Wood, Superintendent of Schools
11. Contact Person

12. e-mail address (optional)

C. Facility, Site or Individual Requiring Approval

Center Elementary School
1. Name of Facility, Site Or Individual

403 Great Road
2. Street Address

Stow	MA	01775-1129	(978) 897-0290	
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

8. DEP Facility Number (if Known) | 9. Federal I.D. Number (if Known) | 10. BWSC Tracking # (if Known)

D. Application Prepared by (if different from Section B)*

Sanborn, Head & Associates, Inc.
1. Name of Firm Or Individual

1 Technology Park Drive
2. Address

Westford	MA	01886	(978) 392-0900	x1009
3. City/Town	4. State	5. Zip Code	6. Telephone #	7. Ext. #

Vernon R. Kokosa, P.E.
8. Contact Person

9. LSP Number (BWSC Permits only)

E. Permit - Project Coordination

1. Is this project subject to MEPA review? ☒ yes ☐ no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit: ENF not filed.
EOEA File Number

F. Amount Due

DEP Use Only

Permit No:

Rec'd Date:

Reviewer:

Special Provisions:

1. ☒ **Fee** Exempt (city, town or municipal housing authority)(state agency if fee is $100 or less).
There are no fee exemptions for BWSC permits, regardless of applicant status.
2. ☐ Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. ☐ Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. ☐ Homeowner (according to 310 CMR 4.02).

Check Number | Dollar Amount | Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Drinking Water Program

BRP WS Application

For Drinking Water Program (Water Supply) Permits or Approvals

X231549
Transmittal Number

Facility ID# (if known)

A. Application

1. Is this application for ☒ an Original or ☐ a Resubmittal?

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

2. Applicant:

Name			Address	
Stow Elementary School Building Committee			380 Great Road	
City	**State**	**Zip**	**Contact**	**Telephone**
Stow	MA	01775	William Wrigley	(978) 897-2927

3. Consultant:

Name			Address	
Sanborn, Head & Associates, Inc.			1 Technology Park Drive	
City	**State**	**Zip**	**Contact**	**Telephone**
Westford	MA	01886	Vernon Kokosa, P.E.	(978)-392-0900

B. Permit

Please check the permit or approval for which you are applying:

Zone II Determination for Existing Sources
- ☐ BRP WS 07 Approval to Conduct Pump Test for Zone II Delineation
- ☐ BRP WS 08 Approval of Zone II Delineation

New Technology
- ☐ BRP WS 11 Minor New Technology Approval; where no field test required
  - ☐ Drinking Water Additive
  - ☐ Cross Connection Device
  - ☐ Water Vending Machine
  - ☐ Other (specify):
- ☐ BRP WS 12 Major New Technology Approval: where field testing is required
- ☐ BRP WS 27 New Technology with Third-party Approval
- ☐ BRP WS 28 Vending Site/Source Prototype
- ☐ BRP WS 31 Vending and POU/POE Devices with Third-party Approval

New Source Approvals <70 gpm
- ☒ BRP WS 13 Exploratory Phase, Site Examination, Land Use Survey and Approval to Conduct Pumping Test
- ☐ BRP WS 15 Pumping Test Report Approval and Approval to Construct Source
- ☐ BRP WS 37 Approval of Transient Non-Community Source Less than 7 Gallons per Minute (combines BRP WS 13 and BRP WS 15 submittals)

New Source Approvals = or > 70 gpm
- ☐ BRP WS 17 Exploratory Phase, Site Examination, Land Use Survey, and Conduct Pumping Test
- ☐ BRP WS 19 Pumping Test Report Approval
- ☐ BRP WS 20 To Construct Source

Water Treatment Approvals
- ☐ BRP WS 21A To Conduct Pilot Study < 40,000 gpd
- ☐ BRP WS 21B To Conduct Pilot Study = or > 40,000 gpd and < 200,000 gpd
- ☐ BRP WS 21C To Conduct Pilot Study = or > 200,000 gpd and < 1 mgd
- ☐ BRP WS 21D To Conduct Pilot Study = or > 1 mgd
- ☐ BRP WS 22A Pilot Study Report < 40,000 gpd
- ☐ BRP WS 22B Pilot Study Report = or > 40,000 gpd and < 200,000 gpd
- ☐ BRP WS 22C Pilot Study Report = or > 200,000 gpd and < 1 mgd
- ☐ BRP WS 22D Pilot Study Report = or > 1 mgd
- ☐ BRP WS 23A To Construct Facility <40,000 gpd
- ☐ BRP WS 23B To Construct Facility = or > 40,000 gpd and < 200,000 gpd
- ☐ BRP WS 23C To Construct Facility = or > 200,000 gpd and < 1 mgd
- ☐ BRP WS 24 To Construct Facility = or > 1 mgd
- ☐ BRP WS 25 Treatment Facility Modification
- ☐ BRP WS 29 Water Treatment: Chemical Addition Retrofits of Water Systems > 3,300 people
- ☐ BRP WS 30A Vending Installation Approval
- ☐ BRP WS 30B POU/POE Installation Approval
- ☐ BRP WS 34 Water Treatment: Chemical Addition Retrofits of Water Systems = or < 3,300 people
- ☐ BRP WS 35A Multiple Vending Installation Approval
- ☐ BRP WS 35B Multiple POU/POE Installation Approval

Water Quality Assurance
- ☐ BRP WS 26 Sale or Acquisition of Land for Water Source
- ☐ BRP WS 36 Abandonment of Water Source

Distribution System Modifications
- ☐ BRP WS 32 Systems > 3,300 people
- ☐ BRP WS 33 Systems = or < 3,300 people

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Drinking Water Program

BRP WS Application

For Drinking Water Program (Water Supply) Permits or Approvals

X231549
Transmittal Number

Facility ID# (if known)

C. Certification

"I certify, under penalty of law, that this application and all attachments were prepared under my supervision, in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted in this application, the information submitted is, to the best of my knowledge and belief, true, accurate and complete."

Authorized Signature

1/11/10
Date

Vernon R. Kokosa
Print Name

Principal/Vice-President - Agent for Applicant
Position/Title

TABLE OF CONTENTS

FIGURES

APPENDIX

APPLICATION FOR NEW SOURCE APPROVAL
FOR PROPOSED WATER SUPPLY WELL
Stow Center Elementary School
Stow, Massachusetts

1.0 INTRODUCTION

This document is intended to support an application for a New Source Approval (BRP WS 13) for a proposed water supply well to be installed as part of the proposed building expansion for the Stow Center Elementary School in Stow, Massachusetts. The application is intended to satisfy the requirements of 310 CMR 22.00, the Massachusetts Drinking Water Regulations and the Massachusetts Department of Environmental Protection (DEP) Bureau of Resource Protection (BRP) Guidelines and Policies for Public Water Systems, Volumes I and II (Guidelines).

The Stow Center Elementary School is located on approximately 17.5 acres of land along Great Road (Route 117) in Stow, Massachusetts as shown on the Locus Plan on Figure 1. The site is bounded by private residences and a church to the west and south, a mix of residential, commercial and municipal buildings to the southeast, Hartley Road and the Stow Fire Department to the east, and wooded land and the Hale Middle School to the north.

The Site is currently occupied by the existing Center Elementary School, with parking and bus loading areas to the southwest, playing fields to the north, and a wastewater disposal field to the northeast, as shown on Figure 2. Wooded areas are located to the east and northeast of the existing school building and along the northern and western portions of the site. Vegetated wetlands are located in the northeastern portion of the site and along the northern and northwestern Site boundaries, and two ponds are located to the west and northwest of the site. Records indicate that the existing wastewater leaching field for the Center School was constructed during the 1950s. Numerous active utilities serve the Site.

Based on a site plan received from SMMA on October 30, 2009, SHA understands that the proposed construction includes a two story addition to the existing school building, employee parking and bus pick-up/drop-off areas, a new wastewater disposal system, subsurface stormwater infiltration galleries and a new public water supply well, as shown on Figure 3. SHA understands that the proposed work includes demolition of the stone building to the west of the existing school building, the western wing, and a portion of the northern wing of the existing school building.

The proposed addition is located north of the existing school building in an area currently occupied by playing fields and a heavily wooded slope. The building addition is proposed to include new classroom space, a gymnasium and a cafeteria. The building addition is anticipated to have a footprint of approximately 55,000 square feet (sf) with a finished floor elevation of 239.0 feet.

Potable water for the Stow Center School is currently obtained from a 260-foot deep bedrock well located within the basement boiler room of the existing school building. The existing well is believed to have been installed during the 1950's as part of the original school construction. We understand there is no driller's log available for the existing well.

The existing well serving the Elementary School will be abandoned in accordance with DEP Guidelines. The applicant is proposing to install a replacement bedrock well to supply potable water to the expanded Center Elementary School. The proposed well is anticipated to be a bedrock well with a permitted withdrawal rate of 7,000 gallons per day (gpd). The withdrawal rate was estimated using the anticipated school population following the construction of the addition (680 students/staff plus 100 future expansion = 780 students/staff), an assumed water use rate of 8 gpd per person based on Title V per capita wastewater generation rates, plus a 10 percent allowance for consumption.

The purpose of this submittal is to obtain the initial DEP approval for the first step in the new source approval process; namely, DEP approval of the proposed well location and approval of the procedures to be used to conduct the pumping test, the water quality sampling and analytical laboratory testing of the water samples. This application has been prepared by Sanborn, Head & Associates, Inc. (SHA) on behalf of the Stow Elementary School Building Committee (applicant) and the project architect, Symmes, Maini & McKee Associates, Inc. (SMMA) in accordance with the agreement between SHA and SMMA dated May 28, 2009 agreement and our contract Addendum No. 1, dated September 22, 2009.

2.0 SUPPORTING INFORMATION FOR SITE EXAMINATION

The following paragraphs provide supporting information for the site examination and the rationale that was used to select the proposed type of water supply well and its location. The supporting information includes a discussion of groundwater resources in the area, the proposed well location, a description of current land use in the area, and an evaluation of existing or potential sources of groundwater contamination.

2.1 Groundwater Resources and Exploration

Based on our review of available information regarding groundwater resources in the project area, a bedrock well is proposed to be installed for the following reasons:

- Municipal water is currently not available to the Stow Center Elementary School;
- A water supply well installed within the overburden soils may not yield sufficient water because the on-site soils generally consist of a relatively thin layer of sand and gravel overlying low permeability glacial till based on geotechnical and hydrogeologic studies completed by SHA[1]; and,

1 Geotechnical Engineering Report, Stow Pompositticut/Center School, Stow Massachusetts dated December 2009, prepared by SHA.

- The existing bedrock supply well at the School has a proven record of providing an adequate quantity of good quality water based on the prior use of the well for school operations.

2.2 Proposed Well Location

The proposed well location is in an area of athletic fields located to the north of the school building and to the west of Hartley Road as shown on Figure 3. This location was deemed to be the area of the school property with the least development where a well could be installed and a water line constructed to the Elementary School in a cost-effective manner with the least environmental impact.

2.3 Wellhead Protection Zone

The proposed withdrawal rate for the well is 7,000 gpd, or approximately 5 gpm. For this withdrawal rate, the Zone I radius would be approximately 227 feet using the procedures in Appendix D of the Guidelines. The Town of Stow controls ownership of the property within the proposed Zone I.

As shown on Figure 4, most of the area within the proposed Zone I consists of grass covered athletic fields and forested wetlands. Existing paved tennis courts are partially located within the proposed Zone I, but this paved area will be removed as part of the school expansion project. A small unnamed pond is located approximately 200 feet to the west of the proposed well location.

It is anticipated that electrical equipment and controls for the well will be located in the mechanical room of the school building. No pump house is proposed in the Zone I wellhead protection zone. An electrically powered submersible pump is proposed for the water supply well.

2.4 Characterization of Land Use

Figures 1, 2 and 4 illustrate the current land uses in the vicinity of the proposed well location.

2.4.1 Current Land Uses

Current land use within ½-mile of the proposed well location was established by conducting a limited windshield survey of existing properties from public right-of-ways, and reviewing recent aerial photographs from Google Earth and information from Mass GIS. The area within the ½-mile radius of the proposed well location is predominantly residential or wooded open space.

Neither public water nor sanitary sewers are currently available in the area of the Stow Center Elementary School. The Hale Middle School and the Stow Fire Station are located approximately 600 feet and 900 feet to the northeast and southeast, respectively, of the proposed well location.

2.4.2 *Existing Water Supply Wells*

Appendix A includes a copy of the Massachusetts DEP Bureau of Waste Site Cleanup Site Scoring Map dated July 1, 2009. The map identifies six public water supply wells within a ½-mile radius of the Center Elementary School. The map was obtained from a report entitled *Environmental Site Assessment, Center School, 403 Great Road, Stow Massachusetts* dated August 2009 (ESA report) prepared by ADS Environmental Engineering, LLC (ADS).

The elementary school property contains an existing Interim Wellhead Protection Area (IWPA) for the existing public water supply well that serves the school. Other IWPA locations are shown roughly 300 feet to the southeast, 1,000 feet to the northeast, and 2,300 feet to the west of the school property. A Zone II wellhead protection zone for the well serving the Hale Middle School is shown roughly 800 feet to the north of the elementary school property. Protected Open Spaces are shown to the north and southeast of the subject property.

The existing public water supply wells and their corresponding DEP well number are as follows:

Well Location	DEP Well Number
Stow Center Elementary School	2286007-01G
Hale Middle School	2286005-01G
Whitney Homestead Rest Home	2286002-01G
Not Available	2286018-01G
Not Available	2286018-02G
Not Available	2286022-01G

According to Mr. Jack Wallace of the Stow Board of Health, the Assabet Water Company operates a public water supply system that supplies water to areas east of the Town Center. Potable water for residential properties adjacent to the Center Elementary School is supplied by private wells. The locations of five residential water supply wells immediately adjacent to the Center Elementary School property are shown on Figures 2 and 3. The closest of the residential water supply wells is located approximately 670 feet to the south of the proposed water supply well.

2.4.3 *Zoning*

The area within a ½-mile radius of the proposed supply well location is primarily zoned "Residential" by the Town of Stow. One property identified on Stow Assessor's Map U-10, Parcel 60 located approximately 1,000 feet to the southeast of the Center Elementary School is zoned "Compact Business".

A Flood Insurance Rate Map dated August 1, 1979, Community Panel # 250216 0005 B was reviewed by ADS in the Building Department. The Center Elementary School property is not located within a designated flood zone according to this map.

2.4.4 *Nearby Surface Water Bodies*

This subsection includes an evaluation of surface water bodies within 1000 feet of the proposed well location for a potential hydraulic connection between the well withdrawal point and the surface water body. The site is located within the Assabet River Basin. The well is located within the 100 foot wetland buffer zone of a wetland associated with a small man-made ditch that is located to the north and east of the proposed well location. A small unnamed pond is located approximately 200 feet to the west of the proposed well location. Surface water flowing from the unnamed pond flows in a southerly direction through a second unnamed pond before flowing into a wetland associated with Elizabeth Brook approximately 2,900 feet to the south of the proposed well location. Elizabeth Brook flows out of Wheeler Pond in an easterly direction into the northeasterly flowing Assabet River.

Subsurface explorations for the building addition indicate that the low areas in the western portion of the site consist of sand and gravel overlying low permeability glacial till overlying bedrock. In the upland areas of the site, the sand and gravel is absent, and the overburden consists of glacial till that overlies bedrock. Since a bedrock well is proposed with the well casing sealed in competent bedrock, it is our opinion that the hydraulic connection is expected to be insignificant between the surface water pond and the proposed bedrock well.

2.4.5 *Existing and Potential Sources of Contamination*

SHA reviewed information contained in the ESA report prepared by ADS to obtain information regarding existing and potential sources of contamination in the vicinity of the Stow Center Elementary School.

2.4.5.1 Review of Environmental Databases

The ESA completed by ADS included a review of environmental databases maintained by State and Federal Agencies using a review service operated by FirstSearch Technology Corporation (FirstSeach). The Environmental FirstSearch Report provided in the ESA is dated June 15, 2009. FirstSearch uses approximate minimum search distances from the subject property boundary that meet the American Society of Testing and Materials (ASTM) standards for Phase I Environmental Assessments. These distances vary, but are typically ¼ to 1-mile and depend on the record being searched. When available, FirstSearch uses the Universal Traverse Mercator (UTM) horizontal position coordinates for a given site to determine if a site is within a given search radius of the study site; these sites are referred to as plottable. To identify additional unplottable sites, not listed with UTM horizontal position coordinates, FirstSearch also searches the databases using the zip code for the study Site.

The National Priority List (NPL), also known as the Superfund List, was reviewed by FirstSearch. The NPL lists those high priority hazardous waste sites currently being evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). No NPL sites were identified within a ½-mile radius of the Site.

The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database contains known or suspected hazardous waste sites currently being considered for evaluation under CERCLA. The CERCLIS database was reviewed by FirstSearch and no plottable site were identified within a ½-mile radius of the Site.

The Resource Conservation and Recovery Information System (RCRIS) was searched for information on corrective and non-corrective actions taken at facilities that treat, store or dispose of EPA regulated waste. The RCRIS database identified one RCRA Generator within one-quarter mile of the subject property, which was the Concord Fuels of Stow gasoline service station located at 368 Great Road, located approximately 1,000 feet southeast of the subject property. The Concord Oil Company, Inc. is registered as a Small Quantity Generator of waste oil (MA Haz Waste Generator ID MV9788970111). There was a listing of a spill in the 1990s at this address in the database search (Mobil Station, 368 great Road), however the spill is listed as closed.

The Emergency Response Notification System (ERNS) database was searched for emergency actions conducted by the EPA. No ERNS sites were identified during this search.

The FirstSearch database was utilized to search for properties located within a one quarter mile radius of the subject property with past or current USTs and Leaking Underground Storage Tanks (LUST). The Concord Oil Company, Inc., 368 Great Road, is also identified as having information on Underground Storage Tanks (UST). The report listed information on the removal of four underground tanks (10,000 gallon, 8,000 gallon and 5,000 gallon gasoline tanks, and one 550 gallon waste oil tank), and three in-use gasoline tanks with double walls and cathodic protection and in-tank monitors (an 8,000 gallon, 6,000 gallon, and 4,000 gallon), one 4,000 gallon diesel tank in-use with double walls and cathodic protection, and a 500 gallon waste oil tank in use, also double walled with cathodic protection. Again, there was no information on a release of oil or hazardous material found for this property.

The database search identified one State Site within one half mile of the subject property, the Pompositticut Elementary School, 511 Great Road, which is also listed in the LUST database (it is the only LUST listing). A release was identified from a former fuel oil tank used to heat the school. Remediation activities were completed, and the site has been closed out with the filing of a Class A-2 Response Action Outcome (RAO). Additional information on this release is provided in the DEP file review section of this report. This release located approximately one half mile to the west is not anticipated to affect the subject property.

The computer database search also provided information on hazardous material spills that occurred in the 1990s. The database search identified one spill site within a one-quarter mile radius of the subject property, at a Mobil Station at 368 Great Road, which is currently Concord Fuels of Stow. The spill was reported due to environmental impact to soil during a tank removal on January 30, 1990. Additional information was found at DEP regarding this situation, however the case is listed as "closed". This address is located approximately 1,000 feet to the southeast and based on measured groundwater flow direction at the site to the east/southeast, this site is not hydrologically upgradient from the subject property.

2.4.5.2 MADEP File Review

The ESA by ADS included a visit to the Central Regional office of the DEP in Worcester, Massachusetts to review files on releases of oil or hazardous materials in the vicinity of the Site. Files for two addresses were found for a ½-mile search radius; the former Mobil Station (currently Concord Fuels of Stow) at 368 Great Road, and the Pompositticut Elementary School, 511 Great Road. The findings of the ADS file review are summarized below.

Mobil Station, 368 Great Road, (DEP Spill ID C89-0417 & C90-0040)

On January 29, 1990, a spill report was completed by DEP when a representative from Mobil contacted the DEP. According to the summary report, three gasoline USTs, one waste oil UST and one fuel oil UST had been removed at the property, and contaminated soil was encountered. The contaminated soil was segregated and stockpiled on site. A copy of an environmental assessment prepared by Hydro-Environmental Technologies, Inc. for the site was provided. The summary letter reported minimal dissolved hydrocarbon contamination in the soil that was consistent with "normal background levels associated with service station operations and not indicative of a leak or spill." Groundwater sampling reportedly indicated non-detectable levels of hydrocarbons. Quarterly monitoring for 6 months was planned, after which, if the levels in the wells remained below detection, no further remedial response activities would be conducted. A plan showing groundwater flow direction to the east/southeast (away from the Center School Property) was provided.

A February 13, 1990 letter from Hydro-Environmental Technologies, Inc. to the DEP regarding a Bill of Lading was also found in the files. The letter summarized laboratory testing of soil from adjacent to well MW-4 which was found to the most contaminated well (located centrally on the property). The letter also states that approximately 150 yards of soil was stockpiled on site and will be transported to the North Adams Landfill. No further information was found in DEP files regarding this spill site which is not anticipated to affect the subject property.

Pompositticut Elementary School (DEP RTN 2-10438)

ADS reviewed a Response Action Outcome (RAO) Statement for this release site dated May 28, 1997. A 7,000 gallon #2 fuel oil tank had been removed from the site in August 1994, and fuel oil contaminated soil and groundwater in the immediate vicinity of the tank was encountered. The site was within the Zone II of the Whitney Homestead, Inc. rest home and the school's public drinking water supply wells. Other private wells are also located in the area. In the summer of 1996, a Release Abatement Measure was conducted to clean up the oil contaminated soil and groundwater. Excavated contaminated soil was removed from the site, and transported to Bardon Trimount's recycling facility in Shrewsbury, Massachusetts. Approximately 19,000 gallons of groundwater pumped from the excavation was transported off site for disposal, and approximately 40,000 gallons were treated via granular activated carbon and discharged into Elizabeth Brook under an EPA National Pollutant Discharge Elimination System (NPDES) permit. Excavation limit soil samples did not detect contaminants above Method 1 Risk Based

Standards. A fiberglass tank was re-installed in the excavation to store #2 fuel oil to heat the building.

Groundwater flow direction was measured and found to be to the west to southwest. A Method 3 Risk Characterization was conducted and the site was deemed to have achieved a Condition of No Significant Risk. This site is located approximately one half mile west of the subject property, and based on response actions taken, groundwater flow direction and distance from the site, this release site is not anticipated to affect the subject property.

2.4.5.3 On-Site Petroleum Fuel Storage Tanks

As part of the ESA, ADS conducted a review of files at the Stow Board of Health. Based on the review, SDA identified a plan that showed an underground tank at the Center School located 40 feet north of the Boiler Room, and 20 feet west of the school building wall to the east. Documentation obtained by ADS indicated this tank was removed in August 1992 and there was no indication of a leak from the tank according to a Fire Department letter. The Stow Center Elementary School building is currently heated by natural gas.

2.4.5.4 On-Site Soil Sampling and Analytical Testing

As part of the ESA, ADS collected soil samples for laboratory testing during subsurface explorations by Sanborn, Head and Associates, Inc. in August 2009. ADS collected two samples of fill soils for disposal characterization testing, and seven samples of surface and near surface soils for pesticide testing including arsenic and lead due to the past use of the land as an apple orchard.

Pesticides detected at the property included (4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) at concentrations well below the Reportable Concentrations of the MCP for the most conservative reporting category for soil at schools or residences (reporting category RCS-1). Lead concentrations were slightly elevated above background levels, but well below the RCS-1 Reportable Concentration of 300 mg/kg. Arsenic was identified at levels ranging from 16 mg/kg to 34 mg/kg within the school grounds, above the RCS-1 Reportable Concentration of 20 mg/kg. Arsenic in the proposed wastewater treatment area adjacent to Hartley Road, apparently outside the former orchard, ranged from 7.1 to 8.3 mg/kg. ADS concluded that the arsenic detected in soil is not a Reportable Condition under the MCP since pesticides were applied in accordance with manufacturer's labeling instructions. "Hot spots" indicative of a "release" of pesticides were not found, so ADS concluded the condition falls within the reporting exemption in 310 CMR 40.0317(8)(c).

Off-site disposal characterization testing of a coal ash layer in test pit WWTP-5 (WWTP-5/S- 3), and a composite sample of fill materials from test pits WWTP-2 and WWTP-5 (Comp WWTP-2 and WWTP-5) revealed that contaminants were primarily not detected. Low levels of petroleum related compounds (TPH and PAHs) were detected in Comp WWTP-2 and WWTP-5, however concentrations were well below the Reportable Concentrations of the MCP. Concentrations of metals were at levels that were well below MCP Reportable Concentrations.

2.5 Evaluation of Potential Sources of Contamination

Our review of this information indicates that to the best of our knowledge, there are no known areas of groundwater contamination in the area of the Stow Center Elementary School, or nearby releases to the soil and groundwater that would compromise water quality in the proposed water supply well. The land use in the area is predominantly residential and agricultural. Releases that have been reported to DEP for the area have involved petroleum products, however, these releases appear to have been remediated to achieve a Condition of No Significant Risk as defined in the MCP. There are no storage tanks within the proposed Zone I wellhead protection zone around the proposed well (anticipated to be a 227 foot radius around the well corresponding to an anticipated permitted withdrawal rate of 7,000 gpd). In addition, the geology of the site is conducive to protecting the bedrock aquifer from surface releases of petroleum products because the overburden soil above the bedrock consists of glacial till with a relatively low permeability. Furthermore, the water quality in the existing wells that supply drinking water to the school buildings is satisfactory. In summary, our review of information for the area indicates that the proposed well is expected to be a suitable source of potable drinking water.

3.0 PUMPING TEST PROPOSAL

The pumping test proposal consists of five phases of work:

- Well installation and construction;
- Pre-pumping test data collection;
- Pumping test execution and data collection;
- Water quality testing; and
- Data evaluation.

The data to be collected and the methods used to collect this data are described in the following sections.

3.1 Well Installation and Construction

The applicant proposes to install a bedrock water supply well that will be used as the production well for the expanded elementary school. A Massachusetts registered well driller will be engaged to install the bedrock well. It is anticipated that the well will be between 200 and 400 feet in depth, although the well depth may be modified based on actual conditions encountered. It is anticipated that percussion, or air rotary drilling methods will be utilized to advance the borehole through bedrock to install the supply well.

The supply well will consist of a six to eight inch diameter steel casing extending through the overburden soils and seated in the top of the competent bedrock. The remainder of the well will be advanced as an open hole through the rock. A temporary electric submersible pump with a foot valve, wiring, and controls will be installed in the well for use during the pumping test, then removed after completion of the pumping test.

3.2 Pre-Pumping Test Data Collection

Pre-pumping test data collection will be performed to gather information on the static water table elevation at the supply well location and to obtain precipitation and other weather data prior to the pumping test as required by the DEP Guidelines.

The ambient water table elevation will be monitored in the pumping well at least twice daily (minimum 8 hour increments) for a 10 day period prior to the start of the pumping test. This monitoring period will end no more than 5 days prior to the start of the pump test. The elevation of the wellhead will be surveyed within a tolerance of ± 0.01 feet and referenced to the elevation datum established for the site by the project surveyor.

Precipitation data will be collected from a rain gauge installed near the well location. Barometric pressure will be obtained from recording instruments at the nearest public airport where barometric data is recorded and made available to the public (Hanscom Field, Bedford, MA – 10 miles east). The barometric pressure data will be accurate to 0.01 inches of mercury and the precipitation gauge will also be accurate to 0.01 inches. These measurements will be recorded at the same time, and at the same frequency as the ambient water table monitoring described above (at least twice per day for ten days).

Water table elevations will be adjusted to account for fluctuations in the barometric pressure. Data collected from the precipitation gauge will be used to assess whether precipitation events that occur during the monitoring period have a noticeable impact on the ambient water table elevation.

Should a significant precipitation event occur during the monitoring period leading up to the pumping test, the DEP Central Regional Office will be contacted to discuss the schedule or possible postponement of the test.

Water level measurements will be made in the well proposed to be used for the potable water supply. No other observation wells are proposed. It is our opinion that it is unlikely the water levels in the residential wells on abutting property will be affected by the pumping test. We believe there is potential for operation of the existing public water supply wells at the Center Elementary School and the Hale Middle School to affect water levels in the pumping test well. If the pre-pumping test monitoring of water levels in the new bedrock well indicates influence from pumping at other nearby wells, we will record the timing of pump operation cycles at the Center Elementary School and Hale Middle School to identify the well that is influencing the pumping test well. We will then notify DEP of the findings, then work with school officials to attempt to reduce the operation of those wells to the extent practical during the pumping test.

3.3 Step-Drawdown Test

A step-drawdown test will be conducted prior to the 48-hour pumping test. The step-drawdown test will be conducted at four pumping rates for a minimum period of one hour each. In

accordance with the DEP's Guidelines, the step-drawdown pumping rates will be 50, 100, 150, and 200% of the proposed permitted withdrawal rate. The permitted withdrawal rate is anticipated to be 5 gpm. As such, SHA proposes to conduct the step-drawdown test at the following four rates: 2.5 gpm, 5 gpm, 7.5 gpm, and 10 gpm. The water level in the well will be allowed to recover to at least 95% of the initial static water level prior to initiating the next step of the step-drawdown test and prior to initiating the 48-hour pumping test.

We propose to measure barometric pressure and precipitation at the beginning and end of the step-drawdown test. A flow meter will be installed on the pump discharge line to measure the rate of flow over time. Flow meter readings and water level measurements in the well will be made each minute during the first five minutes of each step of the test and every five minutes thereafter. Data collected during the step drawdown test will be used to evaluate if the proposed pumping rate for the prolonged (48-hour) pumping test can be achieved.

3.4 Prolonged (48-Hour) Pumping Test

Major components of the pumping test and associated data collection include:

- Equipment Setup;
- Water Elevation Monitoring;
- Flow Rate Monitoring;
- Barometric Pressure and Precipitation Monitoring;
- Duration of Pumping Test and Stabilization Criteria;
- Supply Well Recovery Monitoring, and
- Water Quality Analytical Testing.

3.4.1 Equipment Setup

The temporary electric submersible pump to be used for the 48-hour pumping test will be equipped with a foot valve. Water pumped from the well during both the step-drawdown test and the 48-hour pumping test will be discharged to a temporary plywood splash pad approximately 200 feet from the well located at the edge of the wetland or the unnamed pond to the west. The plywood splash pad will be surrounded by hay bales to reduce the potential for erosion.

Water will be discharged at a sufficient distance from the pumping well to limit infiltration and recirculation of water through the well system. Prior to initiating the step-drawdown test or the pumping test, the discharge line will be filled with water to avoid variations in discharge head during startup. This will allow for a steadier pumping rate during the first few minutes of pumping. Water level measurements in the bedrock well will be collected and recorded using an electronic pressure transducer. Data will be downloaded to a laptop computer during the pumping test to monitor water levels and trends in real time.

3.4.2 *Water Elevation Monitoring*

The depth to groundwater will be measured in the proposed supply well at least once every 5 minutes for the first two hours and at least once per hour thereafter until the pumping test is terminated. As stated in Section 3.2, water levels will be measured in the bedrock well during the pumping test and no other observation wells are proposed.

3.4.3 *Flow Rate Monitoring*

In accordance with the Guidelines, the bedrock well will be pumped at 133% of the pumping rate for which approval is sought. Since the proposed permitted withdrawal rate is 7,000 gpd (approximately 4.9 gpm), the 48-hour pumping test will be performed at a pumping rate of 133% times 7,000 gpd, or 9,333 gpd, or approximately 6.5 gpm. The pumping rate will be monitored at least every two hours to ensure that the flow rate from the well does not significantly deviate from the proposed pumping rate. The Guidelines require that the pumping rate shall not fluctuate more than 10% during the final 36 hours of the pumping test and must not fluctuate more than 25% during the initial 12 hours of the test. If a pump shutdown occurs during the pumping test, the available data will be evaluated, and if necessary, the test will be rerun.

A flow meter capable of providing instantaneous flow measurements accurate to within 3% of the actual pumping rate will be used. Based on an anticipated flow rate of 5 gpm, the flow measuring device needs to be accurate to within +/- 0.15 gpm.

3.4.4 *Barometric Pressure and Precipitation Monitoring*

Barometric pressure and precipitation will be recorded during the pumping test. Precipitation will be monitored on-site at least twice per day for the 5 days immediately preceding the pumping test and will continue through the pumping test. Precipitation will be measured to the nearest one-hundredth (0.01) of an inch. If a significant precipitation event occurs during the pump test that results in water table fluctuations exceeding 2% of the total drawdown in the production well, the data will be evaluated with DEP personnel, and if necessary, the test will be rerun.

3.4.5 *Duration of Pumping Test and Stabilization Criteria*

The pumping test will be conducted until "stabilization" is achieved, but not less than 48 hours. If at the end of the 48 hour time period stabilization has not been achieved, the pumping test will continue until the stabilization criteria are achieved.

The production well pumping test will be considered stabilized when a semi-logarithmic plot of the time versus drawdown data derived from the prolonged pumping test (after a minimum of 48 hours) that is extrapolated over a 180-day period shows that at least 15 feet of water (or 10% of the water column) remains above the pump, and a minimum of 35 feet of borehole is maintained below the top of the pump.

3.4.6 Recovery Monitoring

After at least 48 hours of pumping, and after stabilization is achieved, the pump will be shut off and the rate that the water level in the well recovers will be monitored by measuring the depth to water in the well at least every 5 minutes for first two hours of recovery and at least once every 10 minutes for the next 100 minutes. After the initial 3 hour and 40 minute monitoring period, depth to water will be measured at least twice per day for a duration equal to that of the pumping test or until levels have recovered to 95% of the initial static water level, whichever occurs first.

3.5 Water Quality Testing

Water quality testing will be conducted as part of the pumping test as described below. The list of analytes has been modified slightly from the DEP Guidelines based on discussions with DEP staff during a pre-application meeting.

3.5.1 Field Testing Parameters

An SHA field engineer will collect measurements of pH, odor, specific conductance, carbon dioxide, and temperature on-site. The time and results of the measurements will be recorded and included in the pumping test report. These tests will be performed once at the beginning of the test, once 24 hours after the start of the test, and once at the end of the 48-hour test.

3.5.2 Water Sampling Frequency and Laboratory Analyses

The following list identifies the frequency that water samples will be collected during the pumping test and the laboratory analyses that will be completed to comply with Appendix A of the Guidelines and Policies for Public Water Systems, and the Massachusetts Drinking Water Regulations in 310 CMR 22.00. The water samples will be collected and placed in the proper sample containers with the appropriate preserving agents for the sample. Each sample container will be labeled, protected and placed in a cooler on ice under a Chain of Custody seal. The samples will be transported to a certified Massachusetts Drinking Water laboratory. The samples will be transported by either a laboratory courier (if available), hand delivered, or shipped via Federal Express priority overnight under Chain of Custody seal.

The required sample collection frequency is presented in the DEP Guidelines. For clarity, a tentative sampling schedule is presented assuming the well reaches stabilization within 48 hours.

Coliform Bacteria (2 samples) - Based on a 48 hour pumping test, one sample will be collected one hour into the pumping test and one sample will be collected at the end of the pumping test.

Radionuclides (1 sample) - One sample will be collected at the end of the pumping test and analyzed for gross alpha activity, radium 226 & 228, radon, and uranium.

Inorganic Chemicals (1 sample) - Samples for these analyses will be collected on a one-time basis at the end of the pumping test. The analyses will include the list of the compounds identified under the Inorganic Chemical heading in Appendix A of the DEP Guidelines.

Regulated Volatile Organic Compounds (1 sample) - One sample will be collected at the end of the pumping test. This analysis will include the list of compounds in 310 CMR 22.07(B)(1).

Unregulated Volatile Organic Compounds (1 sample) - One sample will be collected at the end of the pumping test. This analysis will include the list of the compounds in 310 CMR 22.07(C)(5).

Secondary Contaminants (2 samples) - These analyses will consist of the compounds listed under the Secondary Contaminants heading in Appendix A of the Guidelines. One sample will be collected one hour after starting the pumping test, every other day thereafter, and on the final day of the pumping test. Based on a 48 hour pumping test, one sample will be collected one hour into the pump test and one sample will be collected at the end of the pump test.

Synthetic Organic Compounds (No Samples) – Samples will not be analyzed for synthetic organic compounds.

Microscopic Particulate Analysis (No Samples) – We have assumed that since the well is a bedrock well, it will be exempt from the Surface Water Treatment Rule.

Nitrogen Ammonia (1 sample) - One sample will be collected at the end of the pump test and will be analyzed at the laboratory.

3.5.3 Certified Laboratory Selection

The groundwater samples collected during the pumping test will be analyzed by a Massachusetts certified laboratory. At this time, we propose to use Alpha Analytical, Inc. of Westborough, MA as the certified laboratory for the water quality analyses.

3.6 Required Permits, Registrations, and Notices to Conduct Pump Test

The school expansion project exceeds the review thresholds in the Massachusetts Environmental Policy Act (MEPA) and a MEPA Certificate will be required. At this time, an Environmental Notification Form (ENF) has not been filed.

A Notice of Intent (NOI) will need to be submitted to the Stow Conservation Commission for proposed work in the wetland buffer zone. As of this date, the NOI has not be submitted.

3.7 Pump Test Data Evaluation

The data collected during the pumping test report will be evaluated and presented in a Pumping Test Report. This report will be prepared in accordance with the requirements presented in the

DEP Guidelines. The permitted withdrawal rate shall be the withdrawal rate sought by the applicant (7,000 gpd), or the pumping rate at which the well reached stabilization times a safety factor of 0.75, whichever is less. The approved withdrawal rate shall be granted in units of gallons per day.

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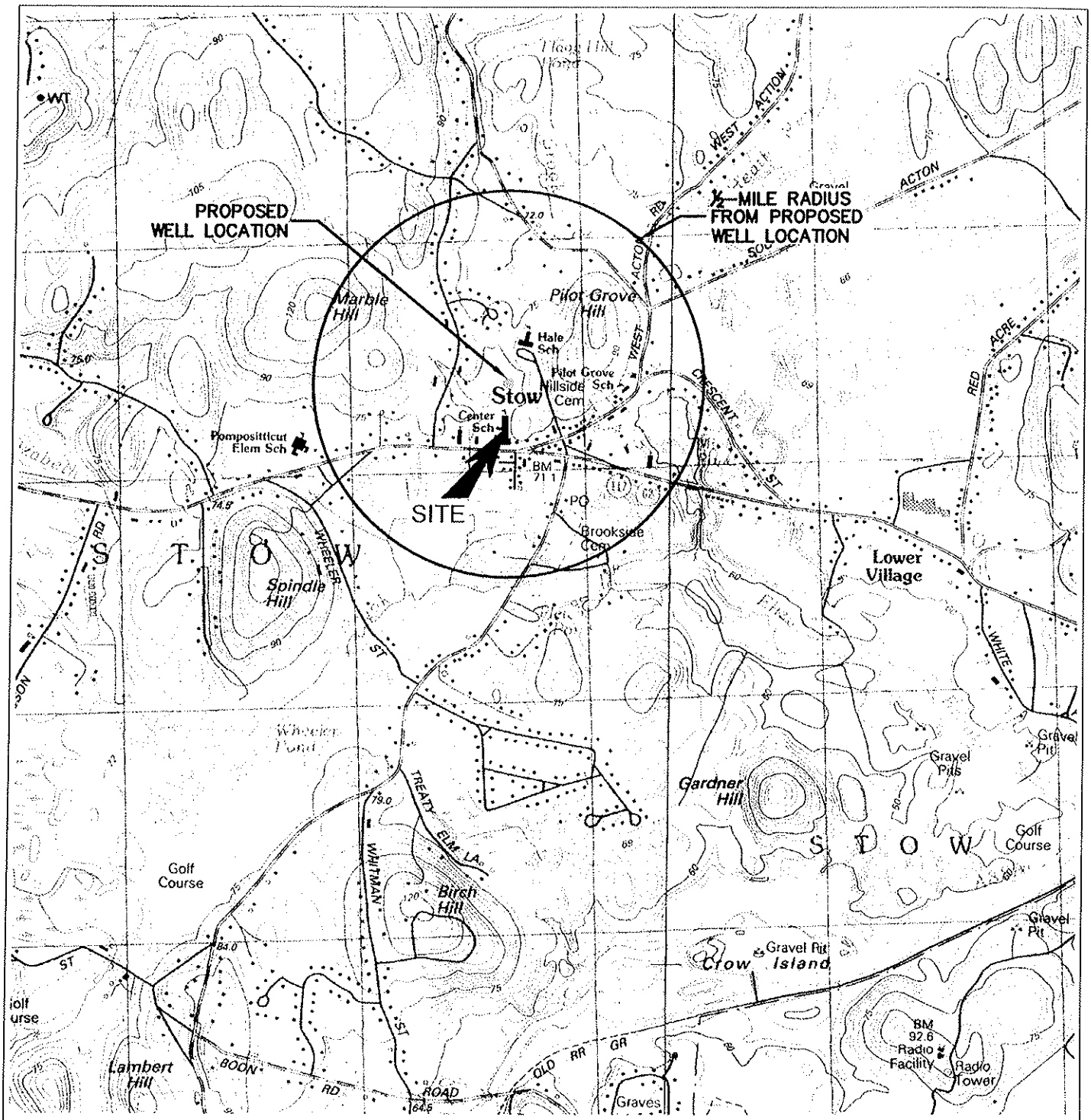
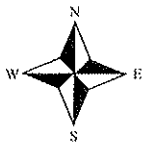
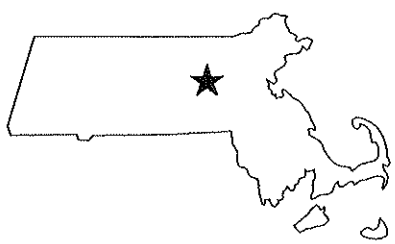
FIGURES



Notes:
Base map taken from "Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs"
7.5 minute USGS Quadrangle Maps:
Hudson, Massachusetts, Revised 1988





Scale: 1:25,000

Figure No. 1

LOCUS PLAN

APPLICATION FOR NEW SOURCE APPROVAL
STOW CENTER ELEMENTARY SCHOOL
STOW, MASSACHUSETTS

Drawn By: RWH
Designed By: JBH
Reviewed By: VRK
Date: JAN 10
JOB: 3048.02

FILE: Q:\WESTFORD\3048.02\Dwg\Reports\APPLCTN-SOURCE-RPRT-JAN10\20100111_LOCUS.dwg
PLOT DATE: 1-11-10

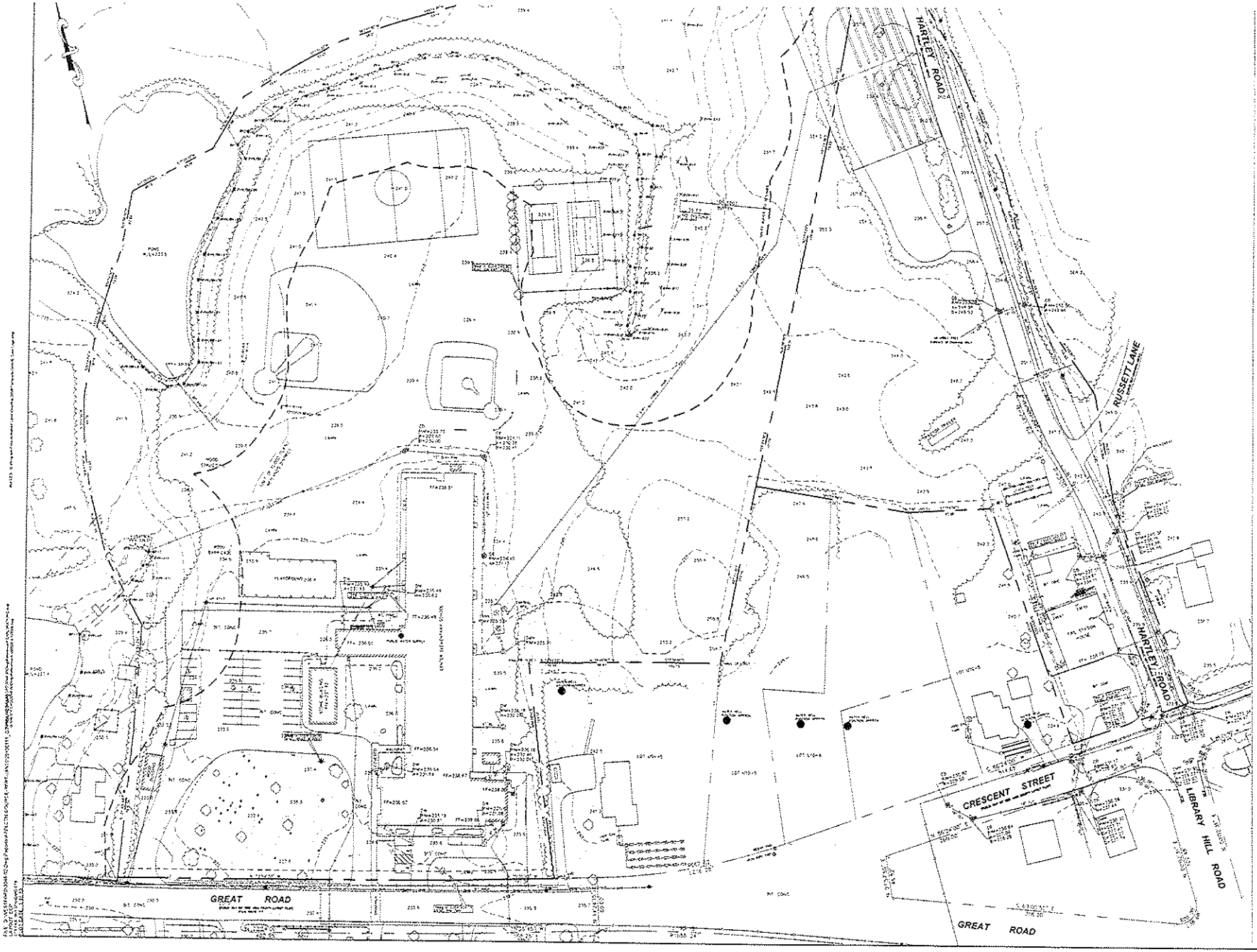


Figure No. 2

EXISTING CONDITIONS PLAI

APPLICATION FOR NEW SOURCE APPROVAL

STOW CENTER ELEMENTARY SCHC

STOW, MASSACHUSETTS

Drawn By: RWH
Designed By: JTR
Reviewed By: GAM
Date: JAN 10

Figure Narrative

The base map was obtained from a plan entitled, "Grading and Utilities Plan" prepared by Symmes, Maini & Mckee, Associates of Cambridge, Massachusetts received electronically on October 30, 2009. Original scale of 1" = 40'.

Legend

● Existing water supply well

PROJECT NO.: 3048.02

GRAPHICAL SCALE

0 50 100 150 FEET

SHA

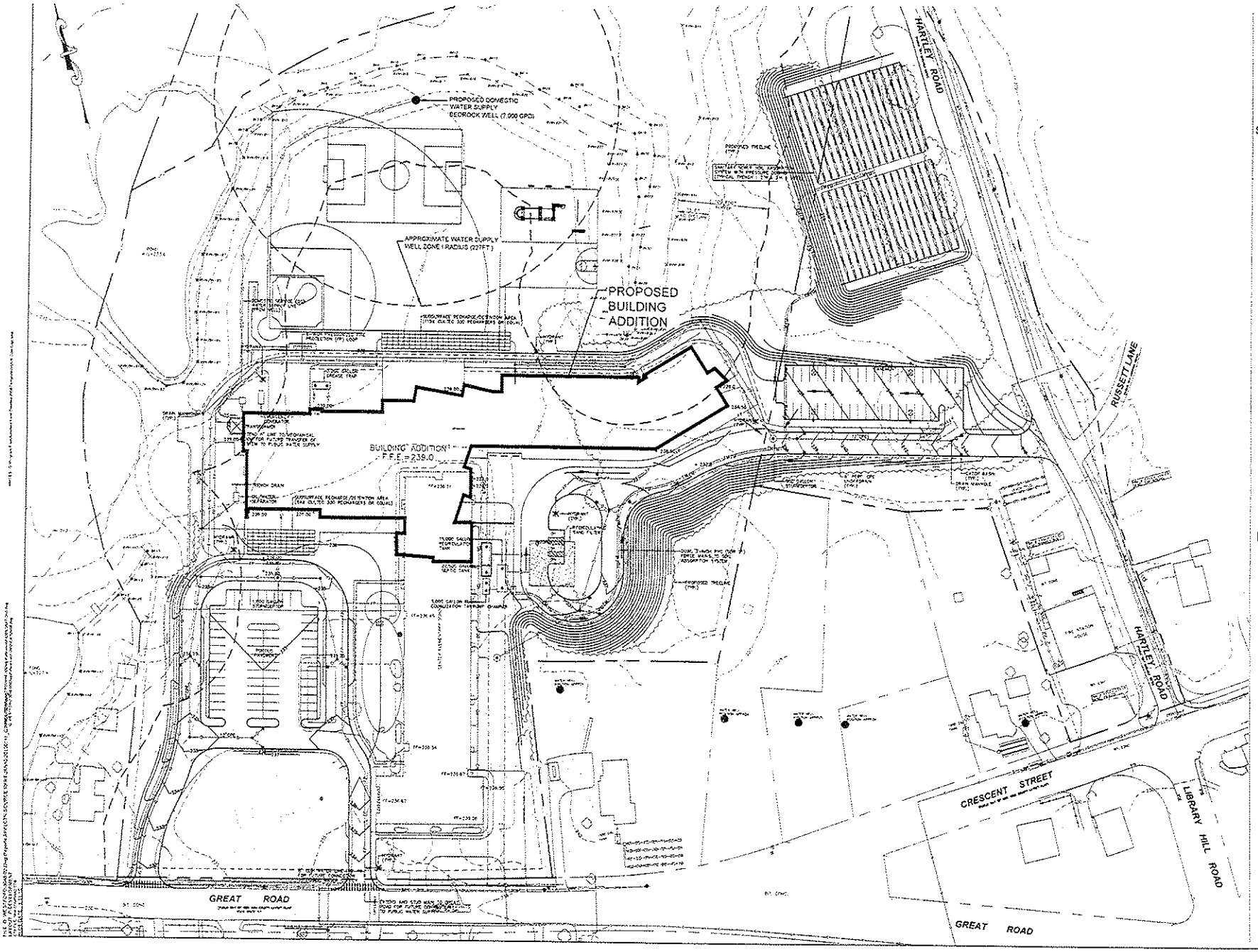


Figure No. 3

PROPOSED SITE PLAN

APPLICATION FOR NEW SOURCE APPROVAL

STOW CENTER ELEMENTARY SCHC

STOW, MASSACHUSETTS

Drawn By: RWH
Designed By: JTR
Reviewed By: GAM
Date: JAN 10

Figure Narrative

The base map was obtained from a plan entitle "Grading and Utilities Plan" prepared by Symm Maini & Mckee. Associates of Cambridge, Massachusetts received electronically on Octo 30, 2009. Original scale of 1" = 40'.

Legend

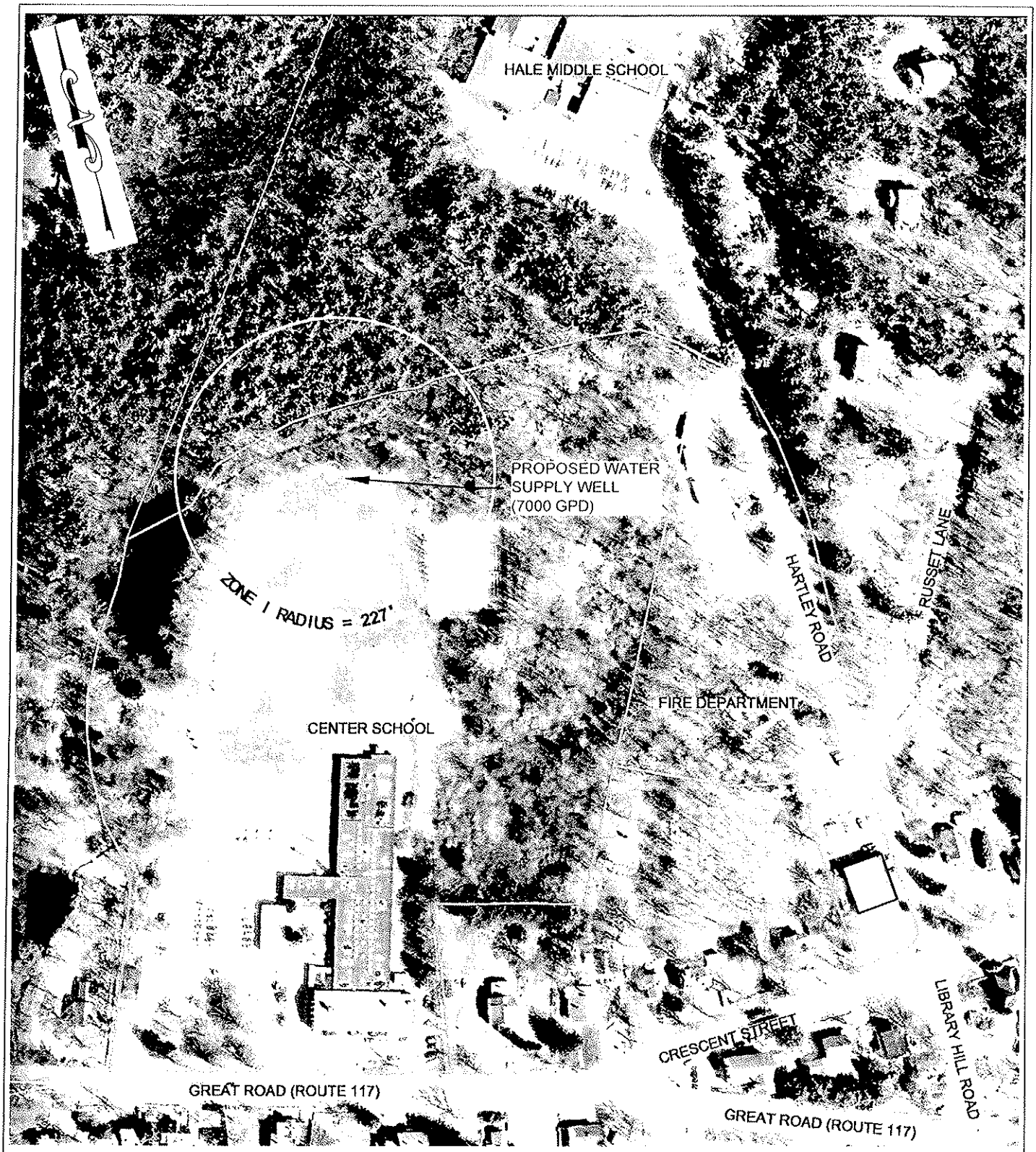
- Existing water supply well
- Proposed water supply well

PROJECT NO.: 3048.02

GRAPHICAL SCALE

0 50 100 150 FEET

SHA



Notes:
Base map taken from SYMMES MAINI & MCKEE, ASSOCIATES, INC. (SMMA) received electronically on October 14, 2009.

Legend

Proposed location of drinking water supply well

0 200'

Figure No. 4

WATER SUPPLY WELL PLAN

APPLICATION FOR NEW SOURCE APPROVAL
STOW CENTER ELEMENTARY SCHOOL
STOW, MASSACHUSETTS

Drawn By: RWH
Designed By: GAM
Reviewed By: VRK
Date: JAN 10
JOB: 3048.02

FILE: Q:\WESTFORD\3048.02\Dwg\Reports\APPLCTN-SOURCE-RPRT-JAN10\20100111_SITE-AERIAL.dwg
PLOT DATE: 1-11-10

APPENDIX A

ENVIRONMENTAL SITE ASSESSMENT INFORMATION

SHA
IMPROVING EARTH

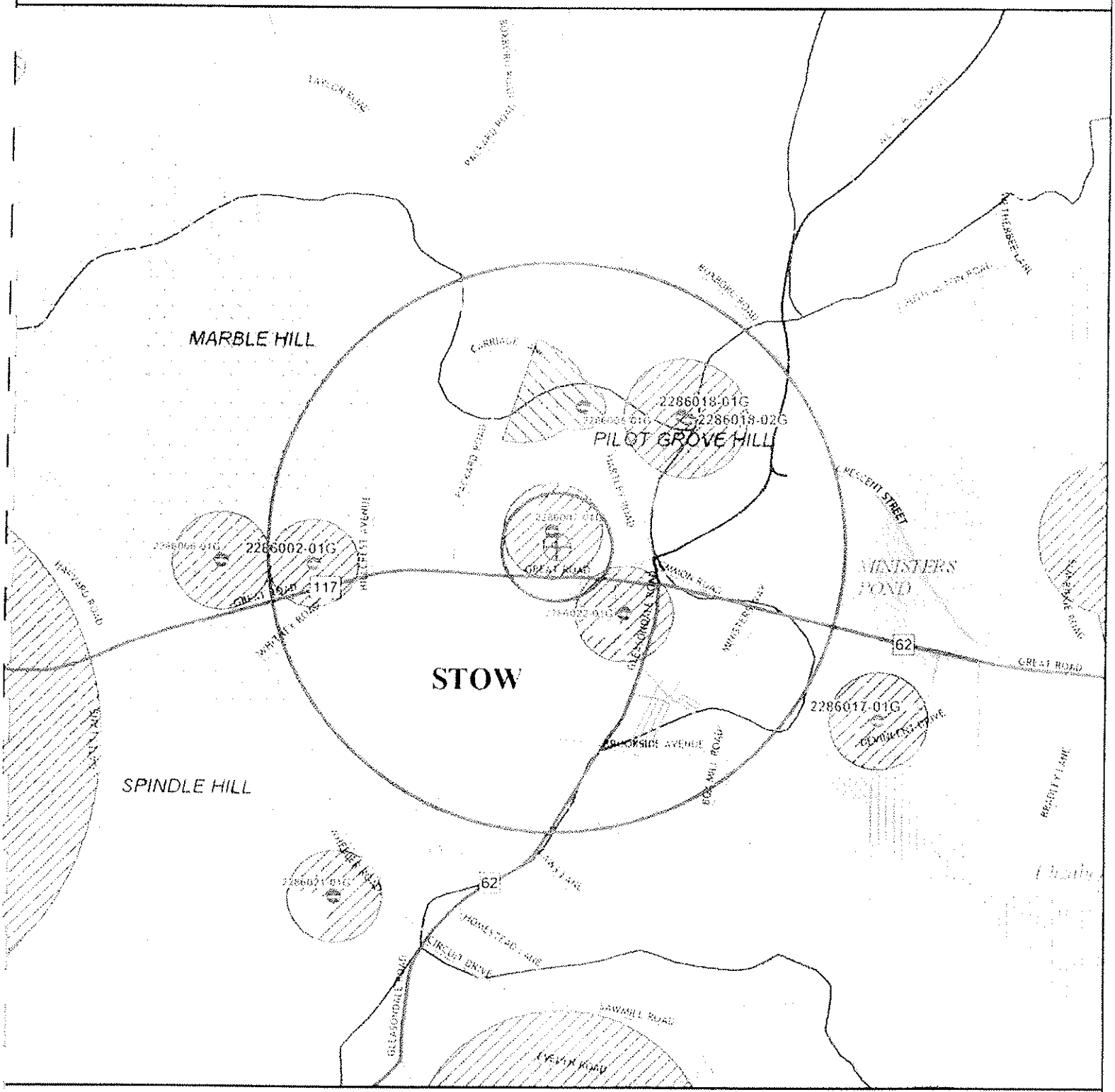
MA DEP - Bureau of Waste Site Cleanup

Site Scoring Map: 500 feet & 0.5 Mile Radii

SITE NAME:

Center School
403 Great Road
Stow, MA 01775
LL Coordinates 422615 713030

Site Location



Roads: Limited Access, Divided, Major Road, Connector, Street, Track, Trail

Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct

Basins: Major, Sub; Streams: Perennial, Intermittent, Man Made Shore, Dams

Potentially Productive Aquifers: Medium,High Yield .....

Non Potential Drinking Water Source Area: Medium,High Yield

EPA Sole Source Aquifer; FEMA 100-year floodplain .....

Public Water Supplies: Ground,Surface,Non Community

Approved Zone2; IWPA; Surface Water Supply Zone A

Hydrography: Open Water, Reservoir, Tidal Flat .....

Wetlands: Fresh,Salt,NHESP Wetlands Habitat .....

Cranberry Bog, Protected Open Space, ACEC .....

DEP Permitted Solid Waste Landfills, Certified Vernal Pools ..

N

W E

S

SCALE 1:15,000

0 0.4 0.8 Miles

0 0.4 0.8 Kilometers

July 1, 2009

APPENDIX 6 TRAFFIC IMPACT ANALYSIS

March 9, 2010
BAI #09029

BRYANT
ASSOCIATES
Engineers
Surveyors
Construction Managers

Ms. Lorraine Finnegan
Senior Associate/Project Management
Symmes Maini & McKee Associates, Inc.
1000 Massachusetts Avenue
Cambridge, MA 02138

REFERENCE: **Traffic Impact Analysis**
Center Elementary School Expansion
Stow, Massachusetts
Traffic Impact Analysis Supplement

Dear Ms. Finnegan:

Bryant Associates, Inc. has prepared this supplement to the traffic impact analysis (TIA), dated August 2009, for the proposed Center Elementary School expansion on Great Road (Route 117) in Stow, Massachusetts in response to the traffic related comments from Places Associates, Inc., dated February 23, 2010. The proposed school will include the 300 existing students at the Center Elementary School, the relocated 300 students from the Pompositticut Elementary School, as well as 30 Pre-K students.

The proposed site plan has been revised since the August 21, 2009 preliminary plan that was reviewed for the TIA. Access to the parcel will still be provided through entrance-only and exit-only driveways on Great Road and one driveway on Hartley Road. The current site plan indicates that there will be 100 total parking spaces for parents, visitors, and staff between the two parking lots.

Based on the revisions to the parking layout, a percentage of the proposed staff trips that were expected to use the Hartley Road driveway in the TIA were redistributed to the Great Road driveways. Eight trips were added to entering vehicles during the school A.M. peak hour and 8 trips were added to exiting vehicles during the school P.M. peak hour.

In addition to the revisions for the new parking layout, the trip generation for the Pre-K students was reviewed and revisions have been made. The Pre-K students will attend school from 8:45 A.M. to 2:15 P.M., which varies from the K-5 students, who attend from 8:35 A.M. to 3:05 P.M. Conservatively, it was assumed that the 30 proposed Pre-K students would generate 30 entering trips and 30 exiting trips during the school A.M. peak hour, which occurs between 8:00 and 9:00. This assumes that there will be no reduction for parents with multiple students at the school; no reduction for students that may arrive on Special Education buses; no reduction for students that may walk to the school; and no reduction for students that may arrive at the school after 9:00 A.M.

14 Breakneck Hill Road, Suite 200, Lincoln, RI 02865-3925 • Telephone: 401.722.7660 • Fax: 401.722.7530 • www.bryant-engrs.com
Boston, MA . Landover, MD . Lincoln, RI . Louisville, KY

No Pre-K trips were included during the school P.M. peak hour since the earlier dismissal time for Pre-K students means that parents picking up Pre-K students will exit the site before the school P.M. peak hour, which occurs between 2:45 and 3:45, when the K-5 parents arrive to pick up their students.

Revised unsignalized intersection capacity analysis for the intersections of Great Road and the proposed Center Elementary School driveways was undertaken using school A.M. and school P.M. peak hour traffic volumes under build conditions in 2012 and 2017. A summary of the level of service for these intersections is shown in Table Nos. 1 and 2 for the school A.M. and school P.M. peak hour, respectively.

Table No. 1
School A.M. Peak Hour - Level of Service Summary
Unsignalized Intersections

Intersection/ Critical Movement	Level of Service (Delay-Sec./Veh.)			
	2012 – No-Build	2012 – Build	2017 – No-Build	2017 – Build
Great Road/Existing Center Elementary School Western Exit-Only Driveway				
Southbound Approach	C (17.5)	N/A	C (18.5)	N/A
Great Road/Existing Center Elementary School Western Entrance-Only Driveway				
Eastbound Approach	A (0.7)	N/A	A (0.7)	N/A
Great Road/Existing Center Elementary School Eastern Exit-Only Driveway				
Southbound Approach	D (25.0)	N/A	D (28.2)	N/A
Great Road/Existing Center Elementary School Eastern Entrance-Only Driveway				
Eastbound Approach	A (1.9)	N/A	A (2.0)	N/A
Great Road/Proposed Center Elementary School Exit-Only Driveway				
Southbound Approach	N/A	E (36.3)	N/A	E (43.8)
Great Road/Proposed Center Elementary School Entrance-Only Driveway				
Eastbound Approach	N/A	A (2.7)	N/A	A (2.9)

The revised unsignalized intersection capacity analysis shows that the proposed Center Elementary School exit-only driveway will operate at LOS E during the school A.M. peak hour in 2012 and in 2017. It should be noted that these are conservative results since the Pre-K students will arrive ten minutes after the K-5 students and due to the conservative trip generation for the Pre-K students.

Table No. 2
School P.M. Peak Hour - Level of Service Summary
Unsignalized Intersections

Intersection/ Critical Movement	Level of Service (Delay-Sec./Veh.)			
	2012 – No-Build	2012 – Build	2017 – No-Build	2017 – Build
Great Road/Existing Center Elementary School Western Exit-Only Driveway				
Southbound Approach	D (27.0)	N/A	D (31.7)	N/A
Great Road/Existing Center Elementary School Western Entrance-Only Driveway				
Eastbound Approach	A (0.5)	N/A	A (0.6)	N/A
Great Road/Existing Center Elementary School Eastern Exit-Only Driveway				
Southbound Approach	E (49.3)	N/A	F (65.6)	N/A
Great Road/Existing Center Elementary School Eastern Entrance-Only Driveway				
Eastbound Approach	A (0.4)	N/A	A (0.4)	N/A
Great Road/Proposed Center Elementary School Exit-Only Driveway				
Southbound Approach	N/A	E (37.3)	N/A	E (48.6)
Great Road/Proposed Center Elementary School Entrance-Only Driveway				
Eastbound Approach	N/A	A (1.8)	N/A	A (1.9)

The proposed Center Elementary School exit-only driveway will operate at LOS E during the school P.M. peak hour in 2012 and in 2017.

The increase in the Pre-K trips and the redistribution of the staff trips will result in no change in the level of service at the intersections of Great Road and Crescent Street; Crescent Street, Hartley Road, and Library Hill Road; and Great Road, Library Hill Road, and Gleasondale Road during the school A.M. and school P.M. peak hours, as compared to build conditions in the TIA in 2012 and 2017.

The revised site plan has also been reviewed for traffic circulation. The front parking lot can be used by school administration, Pre-K teachers, volunteers, and other staff, as well as visitors. It is expected that this parking lot will be used by parents of the 30 Pre-K students when escorting their children into and out of the school. Typically, not all of these parents will be using the parking lot simultaneously. Up to half of the parents (15) may use these spaces at any one time, thus making 15 or more spaces available to other visitors/parents. In addition, since the hours of operation of the Pre-K portion of the school are staggered from the K-5 portion, additional opportunity for visitor parking is provided. The 30+ spaces available to visitors during the remainder of the day are sufficient.

The drop-off and pick-up of the K-5 students will occur on the right side of the front driveway adjacent to the curb. There is over 500 feet of queuing space available for drop-off/pick-up, and possibly more if the drop-off/pick-up area is extended further around the northwest corner of the loop, which would be possible if staff are present to assist the students, or if the left side of the roadway prior to the school front entrance were used to store queuing vehicles. The existing drop-off and pick-up occurs in the loop next to the gymnasium. During the morning drop-off, parents (guardians/caregivers) stop in the loop to allow their children to exit the vehicle and walk to the front entrance of the school. During the afternoon pick-up, parents park in the loop and along both sides of Great Road in order to meet their children at the gym. Parents then are responsible to walk the children back to their vehicles. The proposed queuing space is far in excess of the existing available queuing and should provide sufficient queuing for the typical anticipated demand. The proposed drop-off and pick-up area will also allow for the children to be escorted directly to their vehicles without the need to park. This will provide for a safer drop-off and pick-up of children, especially since parents will not need to walk their children along or across Great Road to access their vehicles. Buses will use the loop accessed from the Hartley Road driveway for drop-off and pick-up of students.

Based upon the analyses, traffic operations on the surrounding roadways and intersections will experience minimal change with the addition of the traffic generated by the proposed improvements. No reduction in safety will occur due to the development as proposed. The site layout will allow for the efficient operation of the morning drop-off and afternoon pick-up of students.

We are prepared to review the results of this study with you at your convenience. If you have any questions, please do not hesitate to call Todd E. Brayton, PE (Ext. 2202) or me (Ext. 2205).

Very truly yours,

BRYANT ASSOCIATES, INC.

Todd E Bry

for Michael W. Desmond, PE
VICE PRESIDENT
Regional Transportation Manager

MWD/DBC

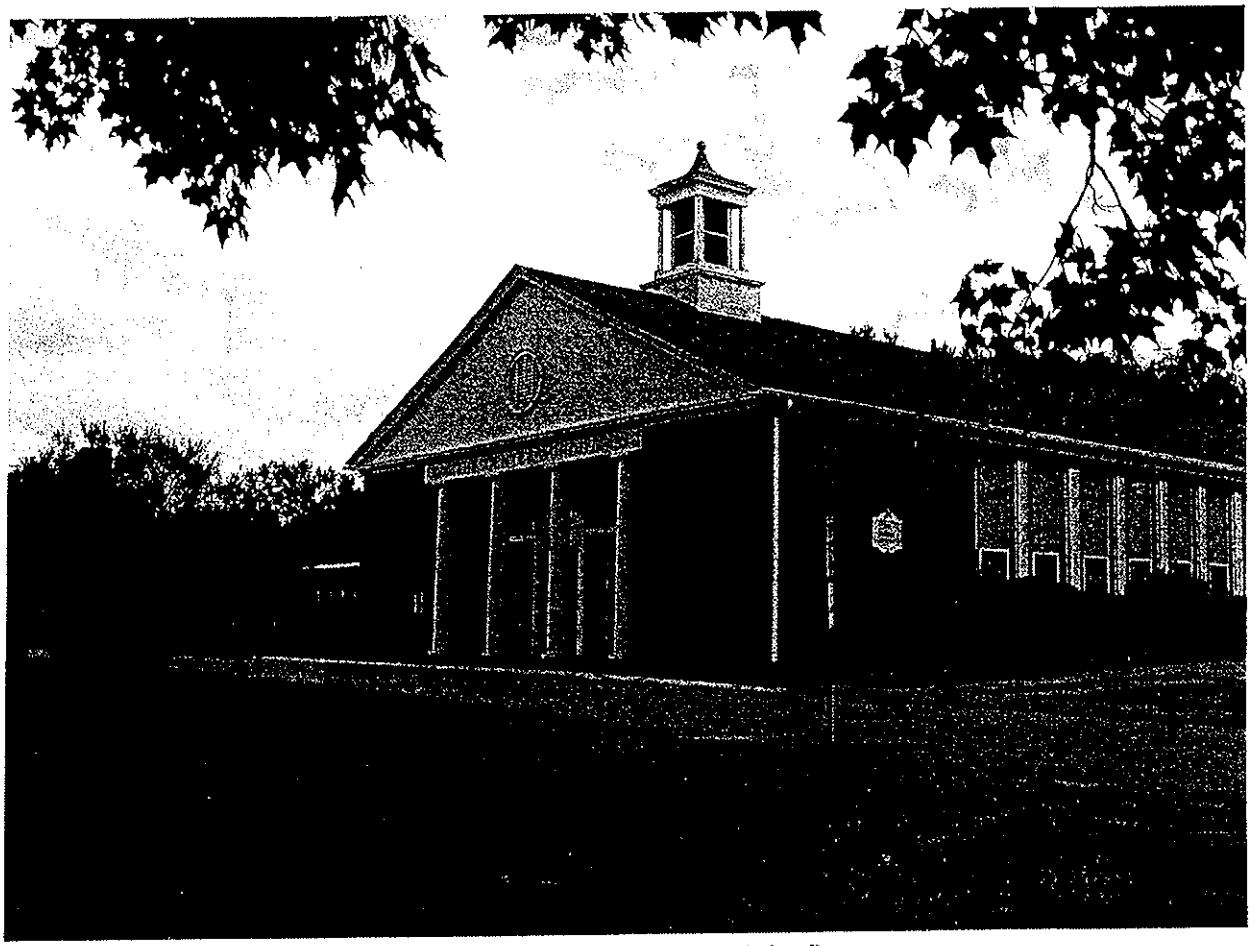
BRYANT ASSOCIATES

Symes Maini & McKee Associates, Inc.

Center Elementary School Expansion

Great Road (Route 117)
Stow, Massachusetts

TRAFFIC IMPACT ANALYSIS



(Existing Center Elementary School)

Submitted By:
BRYANT ASSOCIATES, INC.
Engineers – Surveyors – Construction Managers
14 Breakneck Hill Road, Suite 200
Lincoln, RI 02865

August 2009

1.0 INTRODUCTION

1.1 Purpose of Study

This traffic study was prepared at the request of Symmes Maini & McKee Associates, Inc. in connection with its study of proposed renovations and an addition to the Center Elementary School on Great Road (Route 117) in Stow, Massachusetts. For the benefit of the boards and the citizens of Stow, the traffic impacts of the proposed development have been evaluated. The study analyzes traffic use attributable to the proposed development of the site and discusses transportation impacts in the vicinity of the site.

1.2 Description of Project

The project site is located on the north side of Great Road and the west side of Hartley Road, as shown in Figure No. 1. The proposed expansion includes renovations and an addition to the existing Center Elementary School building and the reconfiguration of the existing site driveways. The proposed school will consist of grades K-5, which currently are split between the Center Elementary School and the Pompositticut Elementary School, as well as Pre-K. The proposed school is expected to have 630 students. Access to the parcel will be provided through entrance-only and exit-only driveways on Great Road for parent drop-off and visitor parking and one driveway on Hartley Road for bus drop-off and staff parking.

2.0 EXISTING CONDITIONS

2.1 Study Area

The project will primarily utilize Great Road and Hartley Road for access to and from the site. Traffic volumes are heavy on Great Road, which is classified as an Urban Principal Arterial, as presented in the online Road Inventory Interactive Map, which is based on the Year-End 2008 Road Inventory File maintained by the Massachusetts Office of Transportation Planning, and are light on Hartley Road, which is classified as a local road. By definition, an arterial highway emphasizes a high level of mobility for through traffic while providing access to local roadways. A local road primarily provides direct access to abutting land and offers the lowest level of travel mobility.

Great Road in the vicinity of the existing Center Elementary School is a two-lane, two-way bituminous roadway, approximately 34 feet in width, with 12-foot travel lanes, a 6-foot eastbound shoulder, and a 4-foot westbound shoulder. The speed limit is 35 mph, however, the school speed limit sign beacons located in both direction approaching the school reduce the speed limit to 20 mph when flashing. There is bituminous curb on both sides of the roadway and bituminous sidewalk on the north side of the roadway. There are utility poles located on the north side of the roadway. The existing Center Elementary School contains four driveways on Great Road. The western Center Elementary School exit-only and entrance-only driveways are approximately 22 feet in width. The eastern Center Elementary School exit-only driveway is approximately 17 feet in width and the eastern entrance-only driveway is approximately 18 feet in width. Land use in the area is residential, commercial, and institutional.

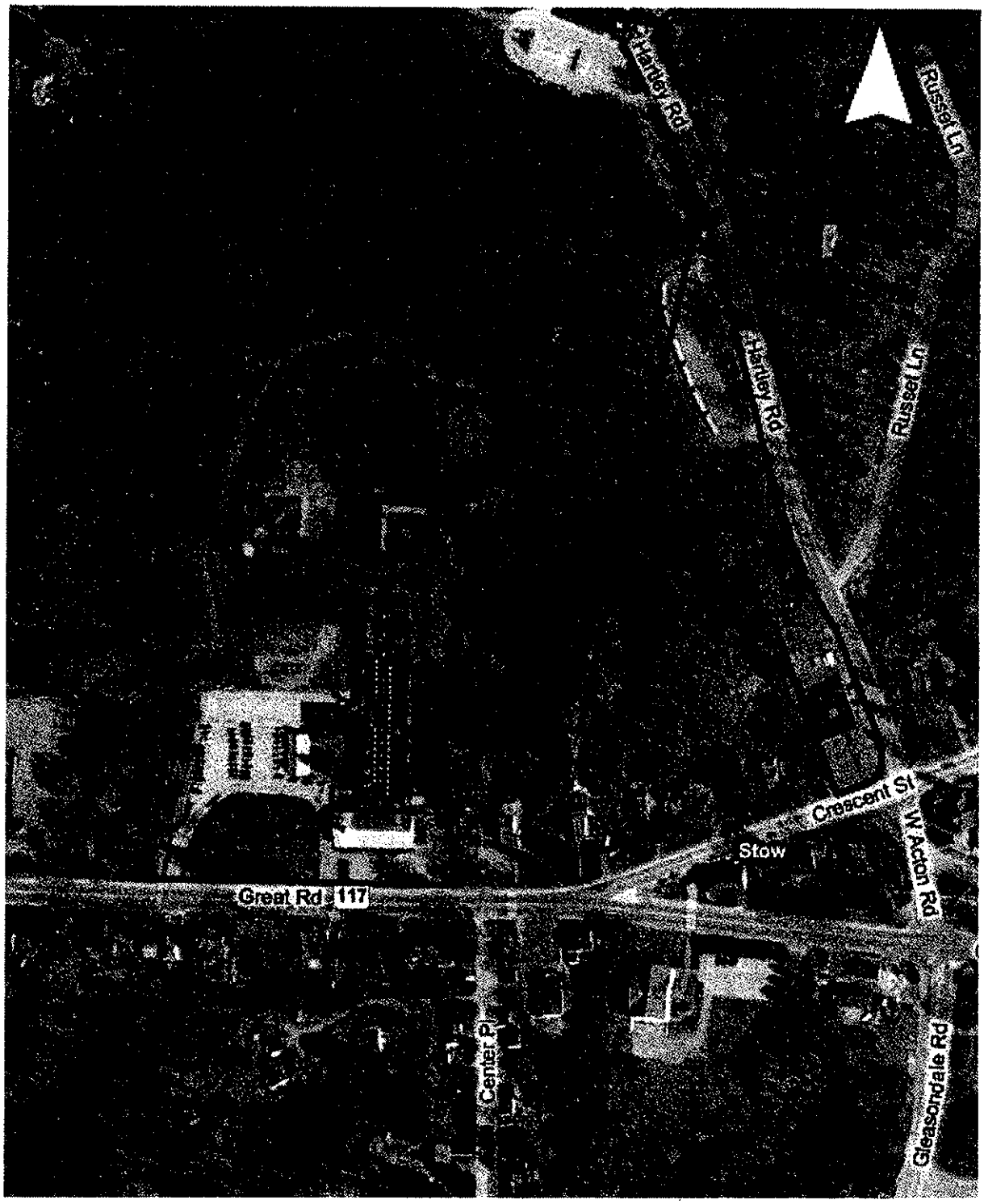


Figure 1

Location Map
Symes Maini & McKee Associates, Inc.
Center Elementary School Expansion
Great Road
Stow, Massachusetts

Hartley Road in the vicinity of the proposed Center Elementary School driveway is a two-lane, two-way bituminous roadway. There is bituminous curb on both sides of the roadway and there is bituminous sidewalk on the east side of the roadway. There are utility poles located on the east side of the roadway.

The intersection of Great Road and Crescent Street, to the east of the Center Elementary School, is a three-way unsignalized intersection, which is stop-controlled on Crescent Street. Crescent Street approaches Great Road at a skewed angle from the northeast. Great Road at its intersection with Crescent Street is a two-lane, two-way bituminous roadway. The eastbound approach of Great Road consists of a 14-foot travel lane and a 4-foot shoulder. There is bituminous curb and sidewalk on both sides of the roadway on the eastbound approach. The westbound approach of Great Road consists of a 14-foot travel lane and a 4-foot shoulder. There is a 25-foot channelized right turn lane from Great Road onto Crescent Street eastbound. There is bituminous curb and sidewalk on the south side of the roadway and granite curb on the north side of the roadway on the westbound approach. There are utility poles located on the north side of Great Road at its intersection with Crescent Street. Crescent Street at its intersection with Great Road is a two-lane, two-way bituminous roadway. The Crescent Street approach consists of an 11-foot travel lane and a 2-foot shoulder. The speed limit on Crescent Street is posted at 30 mph. There is granite curb on the south side of the roadway and bituminous curb and sidewalk on the north side of the roadway. There are utility poles located on the north side of Crescent Street.

The intersection of Crescent Street, Hartley Road, and Library Hill Road is a four-way stop-controlled intersection. Hartley Road approaches Crescent Street from the north and Library Hill Road approaches Crescent Street from the south. Crescent Street at its intersection with Hartley Road and Library Hill Road is a two-lane, two-way bituminous roadway. The eastbound approach of Crescent Street consists of a 15-foot travel lane and a 3-foot shoulder. The Stow Fire Department driveway is located on the north side of the roadway and there is bituminous curb on the south side of the roadway. The westbound approach of Crescent Street consists of a 13-foot travel lane and a 4-foot shoulder. There is bituminous sidewalk with a grass strip on the north side of the roadway and bituminous curb on the south side of the roadway. There are utility poles located on the north side of Crescent Street. Hartley Road at its intersection with Crescent Street is a two-lane, two-way bituminous roadway, approximately 23 feet in width. There is bituminous curb on the west side of the roadway and bituminous curb and sidewalk on the east side of the roadway. There are utility poles located on the east side of Hartley Road. Library Hill Road at its intersection with Crescent Street is a two-lane, two-way bituminous roadway approximately 29 feet in width. There is bituminous curb on the west side of the roadway and granite curb and bituminous sidewalk on the east side of the roadway. There are utility poles located on the east side of Library Hill Road.

The intersection of Library Hill Road and Commons Road is a three-way unsignalized intersection. Library Hill Road at its intersection with Commons Road is a two-lane, two-way bituminous roadway, approximately 29 feet in width. There is bituminous curb on the west side of the roadway. There is granite curb and bituminous sidewalk on the east side of the roadway to the north of Commons Road and sloped face granite curb on the east side of the roadway to the south of Commons Road. There are utility poles located on the east side of Library Hill Road. Commons Road at its intersection with Library Hill Road is a two-lane, two-way bituminous roadway,

approximately 26 feet in width. There is granite curb on the north side of the roadway and bituminous curb on the south side of the roadway.

The intersection of Great Road, Library Hill Road, and Gleasondale Road is a four-way signalized intersection. Library Hill Road approaches Great Road from the north and Gleasondale Road approaches Great Road from the south. Great Road at its intersection with Library Hill Road and Gleasondale Road is a two-way bituminous roadway. The eastbound approach of Great Road at the intersection consists of a 10-foot shared left and through travel lane, a 10-foot right turn lane, and a 3-foot shoulder. The westbound approach of Great Road consists of a 10-foot shared right and through travel lane, a 10-foot left turn lane, and a 2-foot shoulder. There is sloped face granite curb on both sides of the roadway and bituminous sidewalk on the south side of the roadway to the east of the intersection. There are utility poles located on the north side of Great Road. Library Hill Road at its intersection with Great Road is a two-way, two-lane bituminous roadway. The Library Hill Road approach consists of a 25-foot travel lane and a 3-foot shoulder. There is sloped face granite curb on both sides of the roadway. There are utility poles located on the east side of Library Hill Road. Gleasondale Road at its intersection with Great Road is a two-way bituminous roadway. The Gleasondale Road approach consists of a 12-foot shared left turn and through travel lane, an 11-foot right turn lane, and a 1-foot shoulder. There is a small median separating the northbound and southbound directions of Gleasondale Road at the intersection. There is sloped face granite curb on both sides of the roadway and bituminous sidewalk on the east side of the roadway. There are utility poles located on the east side of Gleasondale Road.

2.2 Data Collection

Traffic turning movement counts were conducted at the intersections of Great Road and the existing Center Elementary School driveways; Great Road and the Pompositticut Elementary School driveway; Great Road and Crescent Street; Crescent Street, Hartley Road, and Library Hill Road; Library Hill Road and Commons Road; and Great Road, Library Hill Road, and Gleasondale Road between the hours of 6:00 and 10:00 A.M. and 2:00 and 6:00 P.M. on Tuesday, June 16, 2009. The traffic count data is shown in Appendix A.

The calculated school A.M. peak hour for the Center Elementary School is 8:00 – 9:00 and the school P.M. peak hour is 2:45 – 3:45. These peak hours were utilized for the analysis of all the study intersections since the school expansion is the focus of this report.

Pertinent field observations including existing stopping sight distance, location of existing utilities, posted speed limits, traffic control devices, etc. were made on July 8, 2009. Accident data (Appendix D) for the period January 1, 2006, through June 17, 2009, was obtained from the Stow Police Department. Continuous 24-hour traffic speed data (shown in Appendix E) was obtained using road tubes on Great Road to the east of Packard Road and on Hartley Road to the north of Crescent Street on Tuesday, June 16, 2009.

3.0 TRAFFIC FORECASTS

3.1 Traffic Volumes

Existing traffic volumes for the study area were developed from traffic data obtained by Transportation Data Corporation (TDC).

The total 24-hour two-way traffic volume (from the road tube counts) on Great Road in the vicinity of the proposed site is approximately 13,700 vehicles per day. The school hours for the Center Elementary School and the Pompositticut Elementary School are from 8:35 A.M. to 3:05 P.M. The school A.M. peak hour, as indicated in Section 2.2, occurred between 8:00 and 9:00, with two-way traffic volumes on Great Road and the Center Elementary School driveways of 1,234 vehicles and 179 vehicles, respectively. The school P.M. peak hour was measured between 2:45 and 3:45, with two-way traffic volumes on Great Road of 1,037 vehicles and the Center Elementary School driveways of 67 vehicles.

The two-way traffic volumes on Great Road and the Pompositticut Elementary School driveway were 1,201 vehicles and 110 vehicles, respectively. The two-way traffic volumes were 1,026 vehicles on Great Road and 95 vehicles on the Pompositticut Elementary School driveway.

The two-way traffic volumes on Great Road and Crescent Street were 1,218 vehicles and 223 vehicles, respectively, during the school A.M. peak hour. The two-way traffic volumes were 1,040 vehicles on Great Road and 184 vehicles on Crescent Street during the school P.M. peak hour.

The total 24-hour two-way traffic volume (from the road tube counts) on Hartley Road in the vicinity of the proposed site is approximately 500 vehicles per day. The two-way traffic volumes on Crescent Street, Hartley Road, and Library Hill Road were 477 vehicles, 28 vehicles, and 264 vehicles, respectively during the school A.M. peak hour. The two-way traffic volumes were 359 vehicles on Crescent Street, 68 vehicles on Hartley Road, and 231 vehicles on Library Hill Road during the school P.M. peak hour.

The two-way traffic volumes on Great Road, Library Hill Road, and Gleasondale Road were 1,485 vehicles, 246 vehicles, and 754 vehicles, respectively, during the school A.M. peak hour. The two-way traffic volumes were 1,154 vehicles on Great Road, 219 vehicles on Library Hill Road, and 592 vehicles on Gleasondale Road during the school P.M. peak hour.

The traffic anticipated to be generated by the development was added to the turning movement count volumes for use in determining levels of service (LOS).

3.2 Vehicle Trip Generation

To evaluate the traffic impacts of the proposed development, it is necessary to determine the amount of traffic expected to be generated by the proposed improvements. Typically, the trip generation calculations are based on data compiled in Trip Generation (8th edition), an informational report published by the Institute of Transportation Engineers (ITE). Trip Generation is a tool for planners,

transportation professionals, zoning boards, and others who are interested in estimating the number of vehicle trips generated by a proposed development or land use. This document is based on more than 4,800 trip generation studies submitted to the Institute by public agencies, developers, consulting firms, and associations. More specific information, however, from the traffic turning movement counts for the existing Center Elementary School and the Pompositticut Elementary School, has been used for the trip generation.

Currently, there are approximately 300 students at the existing Center Elementary School and approximately 300 students at the Pompositticut Elementary School. The proposed expansion will combine these two schools, as well as add facilities for Pre-K students, resulting in an anticipated population of 630 students. Therefore, trip generation was conducted for the increase in the student population (Pre-K students) for the proposed Center Elementary School expansion as compared to the existing elementary schools.

To estimate the number of trips anticipated to be generated by the additional 30 students, a ratio was developed between the number of existing trips that currently enter and exit the two schools and the increase of students for the proposed elementary school. The volumes anticipated to be generated by the proposed development during the school A.M. and school P.M. peak hours, can be found in Table No. 1.

Table No. 1
Trip Generation Summary
Proposed Expansion

Time Period	Direction	Generated Trips
School A.M. Peak Hour	Enter	6
	Exit	6
School P.M. Peak Hour	Enter	3
	Exit	3

The distribution of the anticipated new vehicle trips by direction was based upon the existing trip patterns observed in the traffic count data and the expected usage of the driveways for the school. These trips were added to the existing volumes that were counted for analysis of the build conditions.

The proposed preliminary site plan has separate areas for parents and buses to drop off students. Parents will access the proposed Center Elementary School through separate entrance-only and exit-only driveways on Great Road. Buses will utilize the drop-off area accessible by Hartley Road. In addition, staff will utilize the parking lot that is accessible by Hartley Road.

During the school A.M. peak hour, it was assumed that existing traffic patterns would be altered to follow the proposed parent, staff, and bus routes. Parent trips from the Center Elementary School and Pompositticut Elementary School were combined and moved to the proposed entrance-only and

exit-only driveways on Great Road. The staff and bus trips were moved to the driveway on Hartley Road. These assumptions were also used when redistributing the school P.M. peak hour trips.

The trip generation calculations and the distribution of the traffic anticipated to be generated by the development are shown in Appendix B.

4.0 CAPACITY ANALYSIS

4.1 General

Capacity analyses in this report focus on the peak hours of traffic volume for the school because they represent the most critical periods for operations. It is expected that there will be minimal impact from the school during the remaining hours of the day.

4.2 Intersections

The intersection capacity analysis was prepared using the Highway Capacity Manual, 2000 edition, published by the Transportation Research Board. The analysis utilizes the concept of Level of Service. The term "level of service" is defined as a qualitative measure describing operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. There are six levels of service utilized for the analysis. They are given letter designations from A to F, with Level of Service A representing the most favorable operating conditions and Level of Service F the least. The level of service criteria for unsignalized and signalized intersections are shown in Table No. 2.

The computer software, Synchro 6, was utilized to perform the capacity analysis for the study area.

Table No. 2
Level of Service Criteria for Unsignalized and Signalized Intersections
Source: Highway Capacity Manual, 2000

Level Of Service	Average Total Delay (Sec./Veh)	
	Unsignalized Intersection	Signalized Intersection
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

Unsignalized intersection capacity analysis for the intersections of Great Road and the existing Center Elementary School driveways was undertaken using school A.M. and school P.M. peak hour traffic volumes under no-build conditions. Unsignalized intersection capacity analysis for the intersections of Great Road and the proposed Center Elementary School driveways and Hartley Road and the proposed Center Elementary School driveway was undertaken using school A.M. and school P.M. peak hour traffic volumes under build conditions. Unsignalized intersection capacity analysis for the intersections of Great Road and Crescent Street and Crescent Street, Hartley Road, and Library Hill Road was undertaken using the school A.M. and school P.M. peak hour traffic volumes under no-build and build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 3 and 4 for the school A.M. and school P.M. peak hour, respectively.

Table No. 3
School A.M. Peak Hour - Level of Service Summary
Unsignalized Intersections

Intersection/ Critical Movement	Level of Service	
	2009 No-Build	2009 Build
Great Road/Existing Center Elementary School Western Exit-Only Driveway		
Southbound Approach	C (16.9)	N/A
Great Road/Existing Center Elementary School Western Entrance-Only Driveway		
Eastbound Approach	A (0.7)	N/A
Great Road/Existing Center Elementary School Eastern Exit-Only Driveway		
Southbound Approach	C (23.6)	N/A
Great Road/Existing Center Elementary School Eastern Entrance-Only Driveway		
Eastbound Approach	A (1.7)	N/A
Great Road/Proposed Center Elementary School Exit-Only Driveway		
Southbound Approach	N/A	D (27.0)
Great Road/Proposed Center Elementary School Entrance-Only Driveway		
Eastbound Approach	N/A	A (2.0)
Hartley Road/Proposed Center Elementary School Driveway		
Eastbound Approach Northbound Approach	N/A N/A	A (8.5) A (6.4)
Great Road/Crescent Street		
Eastbound Approach Southbound Approach	A (2.9) B (12.3)	A (3.5) B (12.0)
Crescent Street/Hartley Road/Library Hill Road		
Eastbound Approach Westbound Approach Northbound Approach Southbound Approach	A (8.6) B (10.5) A (8.2) A (8.1)	A (9.4) B (11.2) A (9.0) A (8.5)

Table No. 4
School P.M. Peak Hour - Level of Service Summary
Unsignalized Intersections

Intersection/ Critical Movement	Level of Service	
	2009 No-Build	2009 Build
Great Road/Existing Center Elementary School Western Exit-Only Driveway		
Southbound Approach	C (20.7)	N/A
Great Road/Existing Center Elementary School Western Entrance-Only Driveway		
Eastbound Approach	A (0.4)	N/A
Great Road/Existing Center Elementary School Eastern Exit-Only Driveway		
Southbound Approach	D (32.3)	N/A
Great Road/Existing Center Elementary School Eastern Entrance-Only Driveway		
Eastbound Approach	A (0.3)	N/A
Great Road/Proposed Center Elementary School Exit-Only Driveway		
Southbound Approach	N/A	D (31.1)
Great Road/Proposed Center Elementary School Entrance-Only Driveway		
Eastbound Approach	N/A	A (1.7)
Hartley Road/Proposed Center Elementary School Driveway		
Eastbound Approach	N/A	A (9.0)
Northbound Approach	N/A	A (1.2)
Great Road/Crescent Street		
Eastbound Approach	A (3.0)	A (3.3)
Southbound Approach	C (18.0)	C (20.9)
Crescent Street/Hartley Road/Library Hill Road		
Eastbound Approach	A (8.6)	A (9.1)
Westbound Approach	B (10.1)	B (10.9)
Northbound Approach	A (8.4)	A (8.9)
Southbound Approach	A (8.4)	A (9.6)

The unsignalized intersection capacity analysis shows that there will be no change in the level of service at the intersections of Great Road and Crescent Street and Crescent Street, Hartley Road, and Library Hill Road during the school A.M. and school P.M. peak hours. The proposed Center Elementary School exit-only driveway will operate at LOS D during the school A.M. and school P.M. peak hours. The proposed Center Elementary School driveway on Hartley Road will operate at excellent levels of service during the school A.M. and school P.M. peak hours.

Signalized intersection capacity analysis for the intersection of Great Road, Library Hill Road, and Gleasondale Road was undertaken using the A.M. and P.M. peak hour traffic volumes under no-build and build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 5 and 6 for the A.M. and P.M. peak hour, respectively. It should be noted that the Town of Stow does not have a traffic signal plan showing the current timings at this intersection. The most recent timings that they have available were used in the analysis.

Table No. 5
School A.M. Peak Hour - Level of Service Summary
Signalized Intersection

Intersection/ Critical Movement	Level of Service	
	2009 No-Build	2009 Build
Great Road/Library Hill Road/Gleasondale Road		
Overall Intersection	C (31.8)	C (31.4)
Eastbound Approach	D (36.7)	D (36.1)
Westbound Approach	B (19.9)	C (20.3)
Northbound Approach	C (29.7)	C (29.0)
Southbound Approach	D (53.0)	D (54.5)

Table No. 6
School P.M. Peak Hour - Level of Service Summary
Signalized Intersection

Intersection/ Critical Movement	Level of Service	
	2009 No-Build	2009 Build
Great Road/Library Hill Road/Gleasondale Road		
Overall Intersection	B (19.8)	C (23.2)
Eastbound Approach	B (14.6)	B (14.3)
Westbound Approach	B (18.9)	B (19.0)
Northbound Approach	B (19.2)	C (25.3)
Southbound Approach	D (39.4)	D (54.6)

The signalized intersection capacity analysis shows that there will be no change in the overall level of service at the intersection of Great Road, Library Hill Road, and Gleasondale Road during the school A.M. peak hour. The overall level of service will change, from LOS B to LOS C, with the addition of 3.4 seconds of delay per vehicle during the school P.M. peak hour. All of the approaches of the intersection of Great Road, Library Hill Road, and Gleasondale Road will continue to operate at acceptable levels of service.

5.0 SAFETY ANALYSIS

5.1 Geometrics

The geometric configurations of the intersections affected by traffic generated by the proposed development were examined with regard to safe stopping sight distance using principles presented in A Policy on Geometric Design of Highways and Streets, 2004, of the American Association of State Highway and Transportation Officials (AASHTO). AASHTO provides recommendations for necessary sight distance at intersections.

A conservative design speed of 45 mph was utilized for Great Road in the vicinity of the proposed Center Elementary School driveways based on the observed 85th percentile speed of 44 mph for both eastbound and westbound traffic, as shown in Appendix E. The minimum safe stopping distance for

roadways with a design speed of 45 mph is 360 feet, as required by AASHTO, Exhibit 3-1, Stopping Sight Distance, P. 112. The existing sight distance from both directions on Great Road exceeds the minimum safe stopping distance. It is recommended, however, that the shrubs on the north side of Great Road to the west of the driveway be trimmed to improve the sight distance.

A conservative design speed of 35 mph was utilized for Hartley Road in the vicinity of the proposed Center Elementary School driveway based on the observed 85th percentile speed of 31 mph for northbound traffic and 33 mph for southbound traffic, as shown in Appendix E. The minimum safe stopping distance for roadways with a design speed of 35 mph is 250 feet, as required by AASHTO, Exhibit 3-1, Stopping Sight Distance, P. 112. The existing sight distance from the south to the proposed site driveway is unrestricted from the intersection of Crescent Street, Hartley Road, and Library Hill Road. The sight distance from the north exceeds the minimum recommended sight distance. It is recommended, however, that the shrubs on the west side of Hartley Road to the north of the driveway be trimmed to improve the sight distance.

5.2 Accident History

Accident data for the study area was obtained from the Stow Police Department for the period from January 1, 2006 to June 17, 2009. A summary of the data received is contained in Appendix D. There were two accidents in the existing Center Elementary School parking lot, as shown in Table No. 7. Both of these accidents were sideswipes involving parked cars, the pavement condition was unknown for one accident, and there were no injuries reported.

The one accident at the intersection of Great Road and one of the Center Elementary School exit-only driveways was an accident involving a bicyclist. It occurred on dry pavement and one injury was reported.

There were three accidents at the intersection of Great Road and Packard Road, which is located to the west of the Center Elementary School. These accidents included one angle accident, one vehicle that struck an object, and one vehicle that backed into another vehicle. One of these accidents occurred on snowy pavement and two accidents resulted in injuries.

The six accidents on Great Road between Packard Road and Center Place, located just to the east of the Center Elementary School, included two rear end accidents, one angle accident, one sideswipe, one vehicle that struck an object, and one vehicle that backed into another vehicle. Two of these accidents occurred on wet or snowy pavement and there were no injuries reported.

There was one accident on Great Road between Center Place and Crescent Street. This accident involved a vehicle that struck a deer, it occurred on wet pavement, and there were no injuries reported.

The two accidents at the intersection of Great Road and Crescent Street included a rear end accident and a vehicle that backed into another vehicle. One accident occurred on wet pavement and there were no injuries reported.

Table No. 7
Summary of Accidents
Source: Stow Police Department

Accident Location	January 1, 2006 Through June 17, 2009
Existing Center Elementary School Parking Lot	2
Intersection of Great Road and Center Elementary School Exit-Only Driveway	1
Intersection of Great Road and Packard Road	3
Great Road between Packard Road and Center Place	6
Great Road between Center Place and Crescent Street	1
Intersection of Great Road and Crescent Street	2
Great Road between Crescent Street and Library Hill Road/Gleasondale Road	8
Intersection of Great Road, Library Hill Road, and Gleasondale Road	16
Intersection of Great Road and Commons Road	1
Great Road between Commons Road and Ministers Way	1
Intersection of Crescent Street, Library Hill Road, and Hartley Road	4
Library Hill Road	1
Intersection of Crescent Street and West Acton Road	2
TOTAL	48

There were eight accidents on Great Road between Crescent Street and Library Hill Road/Gleasondale Road. These accidents included four rear end accidents, three angle accidents, and one sideswipe. Two of these accidents occurred on wet pavement and one accident resulted in an injury.

The 16 accidents at the intersection of Great Road, Library Hill Road, and Gleasondale Road included six angle accidents, four sideswipes, four rear end accidents, and two vehicles that struck objects. Five of these accidents occurred on wet, snowy, or icy pavement and three accidents resulted in injuries.

There was one accident at the intersection of Great Road and Commons Road. This accident was a rear end accident, it occurred on wet pavement, and one injury was reported.

The one accident on Great Road between Commons Road and Ministers Way was a rear end accident, it occurred on wet pavement, and there were no injuries reported.

There were four accidents at the intersection of Crescent Street, Library Hill Road, and Hartley Road. These accidents included three angle accidents and one rear end accident. One accident occurred on wet pavement and one accident resulted in an injury.

The one accident on Library Hill Road between Great Road and Crescent Street involved a vehicle that backed into another vehicle, it occurred on dry pavement, and there were no injuries reported.

There were two accidents at the intersection of Crescent Street and West Acton Road, which is located to the east of Hartley Road/Library Hill Road. These accidents included an angle accident and a sideswipe. Both accidents occurred on dry pavement and there were no injuries reported.

The low number of accidents that occurred over this three-year plus period does not indicate the presence of unusual conditions that might be worsened by the addition of the traffic generated by the development.

5.3 Site Circulation

Once a proposed site layout plan for the proposed addition to the Center Elementary School is received, it will be reviewed with regard to layout and vehicular circulation. Pedestrian access and circulation will also be examined. The proposed site driveways on Great Road and Hartley Road, as well as the interior roadways, will be evaluated to ensure the design can safely accommodate the traffic that will be entering and exiting the site. The layout of the parking will be evaluated against requirements of the Town of Stow for the amount of parking spaces, parking space size, and aisle width. In addition, the proposed layout will be evaluated for the safe movement of emergency vehicles to and from the development.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This traffic impact analysis was conducted to evaluate the impacts on surrounding roadways and intersections due to the proposed renovations and addition to the Center Elementary School on Great Road in Stow, Massachusetts. There will be no change in the level of service at the intersections of Great Road and Crescent Street and Crescent Street, Hartley Road, and Library Hill Road during the school A.M. and school P.M. peak hours. The proposed Center Elementary School exit-only driveway will operate at LOS D during the school A.M. and school P.M. peak hours. The proposed Center Elementary School driveway on Hartley Road will operate at excellent levels of service during the school A.M. and school P.M. peak hours.

There will be no change in the overall level of service at the intersection of Great Road, Library Hill Road, and Gleasondale Road during the school A.M. peak hour. The overall level of service will change, from LOS B to LOS C, with the addition of 3.4 seconds of delay per vehicle during the school P.M. peak hour. All of the approaches of the intersection of Great Road, Library Hill Road, and Gleasondale Road will continue to operate at acceptable levels of service.

The geometric configuration of the existing roadways is such that adequate safe stopping sight distances exist for traffic passing and/or utilizing the site. There are no existing unsafe conditions in the vicinity of the development that might be worsened by the addition of the anticipated traffic.

Based upon the analyses, traffic operations on the surrounding roadways and intersections will remain virtually unchanged with the addition of the traffic generated by the proposed improvements. No reduction in safety will occur due to the development as proposed.

APPENDIX 7 SITE PLANS

GENERAL NOTES:

1. EXISTING CONDITIONS SHOWN HEREON TAKEN FROM A PLAN SET ENTITLED, "CENTER ELEMENTARY SCHOOL & FIRE STATION SURVEY, 403 GREAT ROAD, STOW MA, DATED AUGUST 15, 2009, PREPARED BY MORAN SURVEYING INC. 14 WILLIAM AVENUE, PEMBROKE, MA 02359

2. ACCORDING TO FLOOD INSURANCE RATE MAP COMMUNITY PANEL NUMBER 2502160005 B (EFFECTIVE DATE AUGUST 1, 1979) FOR THE CITY OF STOW AND THOSE PARCELS LYING WITHIN THE LOCUS, ARE ENTIRELY IN ZONE C AREAS OF MINIMAL FLOODING. LIMITS OF FLOOD PLAN FROM THE STOW ASSESSORS PARCEL MAPS ARE GRAPHICALLY DEPICTED ON THIS PLAN

3. EXISTING UTILITIES, WHERE SHOWN, ARE A COMBINATION OF FIELD LOCATED AND COMPILED FROM EXISTING PLANS PROVIDED TO MORAN SURVEY INC. UTILITIES SHOWN ON THIS PLAN ARE TO BE CONSIDERED APPROXIMATE. MORAN SURVEYING INC. DOES NOT GUARANTEE THE ACCURACY OF DEPICTED UNDERGROUND UTILITIES OR THAT ALL EXISTING UTILITIES AND/OR SUBSURFACE STRUCTURES ARE DEPICTED. BEFORE EXCAVATION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING THE PROPOSED ACTIVITY WITH THE APPLICABLE UTILITY COMPANIES AND MAINTAIN THE EXISTING SYSTEM IN SERVICE. DIG SAFE SHALL BE NOTIFIED PER MASSACHUSETTS GENERAL LAWS, CHAPTER 82, SECTION 40B. DIG SAFE MUST BE NOTIFIED AT 1 (800) 322-4844 ALONG WITH ALL OPERATING AUTHORITIES PRIOR TO POTENTIAL EXCAVATION

4. THE PROPERTY LINES DEPICTED HEREON ARE PLOTTED FROM DEEDS AND PLANS OF RECORD. BOUNDARY MONUMENTATION WHERE SHOWN HAS BEEN FIELD LOCATED AND RECONCILED WITH THE RECORDED INFORMATION

5. THE HORIZONTAL CONTROL FOR THIS SURVEY IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 AND IS GIVEN IN MASSACHUSETTS MAIN LAND STATE PLANE COORDINATES. THE VERTICAL CONTROL USED FOR THIS SURVEY IS REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929

6. THE WETLAND FLAGS DEPICTED ON THIS PLAN WERE ESTABLISHED BY AECOM INC. OF CONNECTICUT. FLAGS SHOWN DEPICT BORDERING VEGETATED WETLANDS AND FRESH WATER STREAM BANK

7. THE SEPTIC SYSTEMS AND WELL HEAD LOCATIONS DEPICTED HERE ON WERE PROVIDED TO MORAN SURVEYING INC. BY THE TOWN OF STOW HEALTH DEPARTMENT, BY MEANS OF RECORD AS-BUILT PLANS. MORAN SURVEYING WARRANTS ONLY THAT THE POSITIONS OF SAID STRUCTURES ARE APPROXIMATE AND WERE DRAFTED FROM PLAN PDS

8. AREA OF EXPOSED LEDGE. EXPOSURES VARY FROM 1/2 FOOT DIAMETER TO 5 FOOT DIAMETER GRANITE. AVERAGE SIZE IS APPROXIMATELY 3 FEET IN DIAMETER

9. WETLANDS SHOWN HEREON WHERE DELINEATED BY AECOM

LOCUS OWNERS
TOWN OF STOW, MASSACHUSETTS
BK 6193 PG 85
BK 10741 PG 403

ASSESSORS PARCELS
MAP U-9 PARCEL 44
MAP U-10 PARCEL 9

PLAN REFERENCES
1) PLAN OF LAND IN STOW, MASS. TO BE ACQUIRED BY TOWN FOR SCHOOL PURPOSES. JULY 10, 1964, SCALE 1"=60' PREPARED BY HARLAN E. TUTTLE PLS PLAN # 863 OF 1964.

2) PLAN OF HARTLEY ROAD IN STOW, MASS. DATED NOVEMBER 12, 1964. SCALE 1"=40'. PREPARED BY HARLAN E. TUTTLE PLS.

3) COUNTY ROAD LAYOUT PLAN CRESCENT STREET PLAN # 2. SCALE 1"=40' 1958 LAYOUT PLAN.

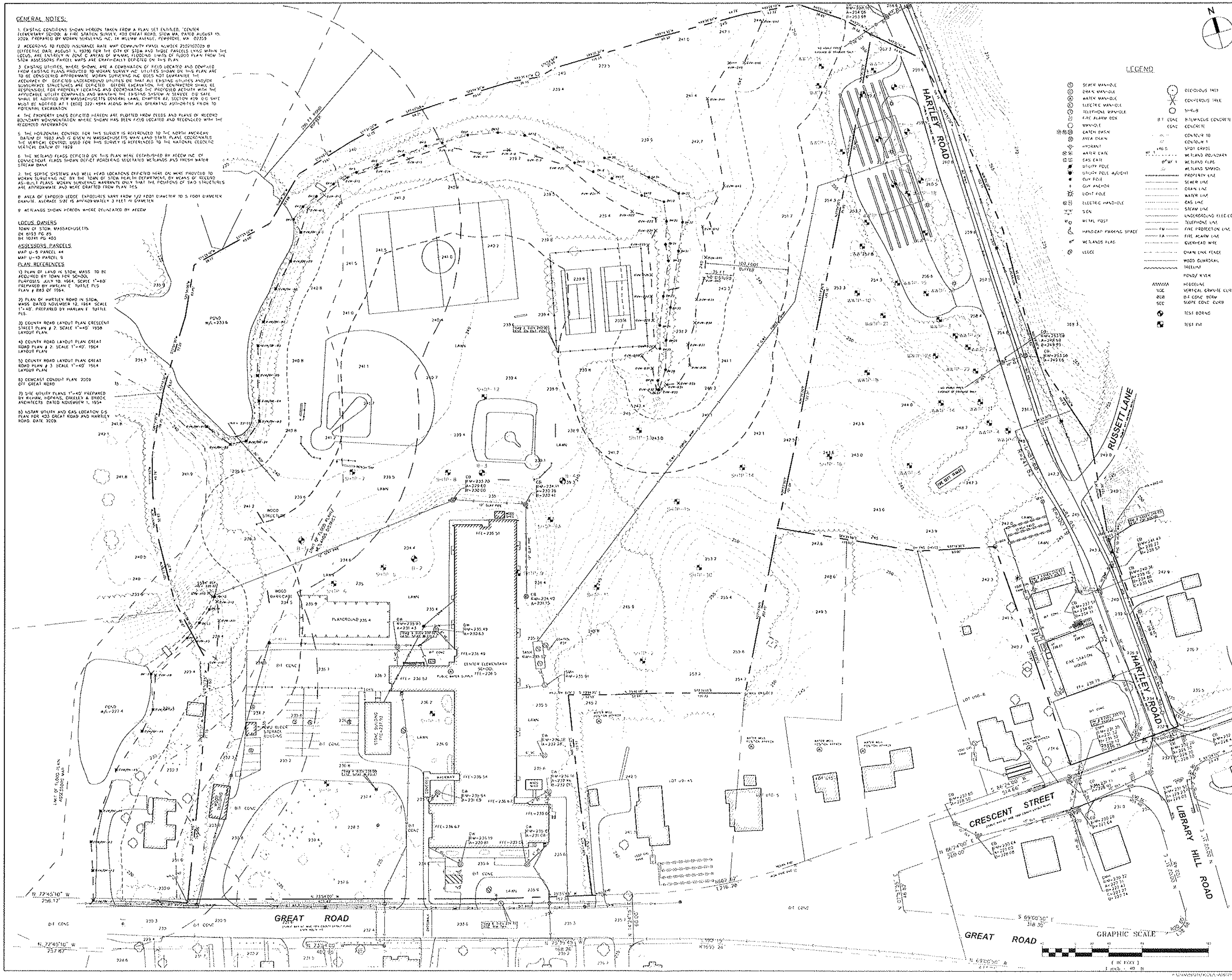
4) COUNTY ROAD LAYOUT PLAN GREAT ROAD PLAN # 2. SCALE 1"=40'. 1964 LAYOUT PLAN

5) COUNTY ROAD LAYOUT PLAN GREAT ROAD PLAN # 3. SCALE 1"=40'. 1964 LAYOUT PLAN

6) COMCAST CONDUIT PLAN. 2009 OFF GREAT ROAD

7) SITE UTILITY PLANS 1"=40' PREPARED BY KILHAM, HOPKINS, GREELEY & BRODIE ARCHITECTS. DATED NOVEMBER 1, 1954

8) NSTAR UTILITY AND GAS LOCATION GIS PLAN FOR 403 GREAT ROAD AND HARTLEY ROAD. DATE 2009.



N
LEGEND
SEWER MANHOLE
DRAIN MANHOLE
WATER MANHOLE
ELECTRIC MANHOLE
TELEPHONE MANHOLE
FIRE ALARM BOX
MANHOLE
CATCH BASIN
AREA DRAIN
HYDRANT
WATER GATE
GAS GATE
UTILITY POLE
GUY POLE
GUY ANCHOR
LIGHT POLE
ELECTRIC HANDHOLE
SIGN
METAL POST
HANDICAP PARKING SPACE
WETLANDS FLAG
LEDGE
DECIDUOUS TREE
CONIFEROUS TREE
SHRUB
BITUMINOUS CONCRETE
CONCRETE
CONTOUR 10
CONTOUR 1
SPOT GRADE
WETLAND BOUNDARY
WETLAND FLAG
WETLAND SYMBOL
PROPERTY LINE
SEWER LINE
DRAIN LINE
WATER LINE
GAS LINE
STREAM LINE
UNDERGROUND ELEC CONDUIT
TELEPHONE LINE
FIRE PROTECTION LINE
FIRE ALARM LINE
OVERHEAD WIRE
CHAIN LINK FENCE
WOOD GUARDRAIL
TREELINE
POND/ RIVER
HEDGELINE
VERTICAL GRANITE CURB
BIT CONC BERM
SLOPE CONC CURB
TEST BORING
TEST PIT
HARTLEY ROAD
RUSSETT LANE
CRESCENT STREET
LIBRARY HILL ROAD
GREAT ROAD
POND W/L=233.6
POND
PLAYGROUND
CENTER ELEMENTARY SCHOOL
FIRE STATION HOUSE
LAWN
BIT CONC
WOOD STRUCTURE
GRAPHIC SCALE

SMMA
SYMMES MAINI & MCKEE ASSOCIATES

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HORIUCHI SOLIEN
LANDSCAPE ARCHITECTS

OWNER REVIEW

NAME: DATE

NO.	DATE	DESCRIPTION
K	3/15/10	[illegible]
J	3/10/10	[illegible]
I	3/9/10	[illegible]
H	3/4/10	BOARD OF HEALTH APPLICATION
G	2/18/10	BOARD OF HEALTH APPLICATION
F	2/02/10	[illegible]
E	2/01/10	[illegible]
D	1/19/10	[illegible]
C	11/3/09	[illegible] REVISION
B	10/27/09	[illegible]
A	10/2/09	[illegible] APPLICATION

ISSUE LOG

△ = CLOUDED CHANGE

Pompositticut / Center Elementary School

403 Great Road
Stow, MA 01775

EXISTING CONDITIONS PLAN

SCALE	1"=40'
DRAWN BY	JW
CHECK BY	
PROJ. ARCH/ENGR.	JAH
PROJ. MNG.	LDF
JOB NO.	[illegible]

C1.01

LEGEND

- BOLLARD
- SIGN
- RETAINING WALL
- VERTICAL GRANITE CURB
- FLUSH GRANITE CURB
- PRECAST CONCRETE CURB
- CROSSWALK
- ASPHALT ACCESSIBLE CURB RAMP
- HANDICAP PARKING
- CONCRETE WALK
- POROUS PAVEMENT
- CHAIN LINK FENCE
- LIGHT POLES

NOTES:

1. ALL MEASUREMENTS ARE TAKEN FROM FACE OF CURB OR FOUNDATION WALL
2. PROVIDE HANDICAP SPACES WITH SIGNS INDICATING THAT THEY ARE RESERVED. THE SIGNS FOR VAN SPACES ARE TO CONTAIN THE WORDS "VAN ACCESSIBLE". SIGNS MUST BE ADA COMPLIANT
3. COORDINATE THE EXACT LOCATION OF THE TRANSFORMER AND GENERATOR PADS WITH THE ELECTRICAL PLANS
4. SEE ARCHITECTURAL PLANS FOR EXACT BUILDING DIMENSIONS AND LOCATIONS OF DOORS

PARKING AND TRAFFIC SIGNS

SIGN	SIGN NUMBER	SIGN OF SIGN WIDTH	SIGN OF SIGN HEIGHT	DESCRIPTION	MOUNT HEIGHT (TO CENTER)	MOUNT TYPE	QUANTITY
STOP	R1-1	30"	30"	WHITE ON RED	7'-0"	POST	3
DO NOT ENTER	R5-1	30"	30"	WHITE ON RED	7'-0"	POST	2
RESERVED PARKING	R7-8	12"	18"	BLUE & GREEN ON WHITE	5'-0"	POST	5
VAN ACCESSIBLE	R7-8P	18"	6"	BLUE ON WHITE	5'-0"	POST	2
ONE WAY	R6-1	36"	12"	BLACK ON WHITE	5'-0"	POST	2
RESERVED PARKING	S6-3	12"	18"	WHITE ON RED	7'-0"	POST	1
STAFF PARKING	S6-4	18"	18"	WHITE ON RED	7'-0"	POST	1

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HORIUCHI : SOLIEN
LANDSCAPE ARCHITECTS

OWNER REVIEW

NAME	CO.

NO.	DATE	DESCRIPTION
F	3/15/12	FOR APPROVAL
E	3/12/12	90% SD REVIEW
D	2/9/12	FOR REVIEW AND APPROVAL
C	2/23/12	90% SD REVIEW APPROVED
B	2/03/12	FOR SPECIAL PERMIT
A	1/13/12	FOR REVIEW CONSULTATION

ISSUE LOG

△ = CLARIFIED CHANGE

Pompositticut / Center Elementary School

403 Great Road
Stow, MA 01775

LAYOUT & MATERIALS PLAN

SCALE	1"=40'
DRAWN BY	JCV
CHECKED BY	
FIELD/ENVIRONMENTAL	JMH
PROJ. MNG.	JCV
JOB NO.	09022.05

C3.01

NOTES:

1 PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST VERIFY EXISTING UTILITY LOCATIONS AS SHOWN ON THE DRAWINGS. REPORT DISCREPANCIES TO THE ARCHITECT & OWNER'S PROJECT MANAGER

2 CONTRACTOR MUST PAY ALL FEES AND PERMITS (UNLESS OTHERWISE NOTED)

3 PIPE MATERIALS:
- STORM DRAIN: CORRUGATED POLYETHYLENE PIPE (CPEP) - SMOOTH INTERIOR
- WATER: CLASS 52 CEMENT LINED DUCTILE IRON
- SEWER: POLYVINYL CHLORIDE PIPE (PVC)

4 PROVIDE ADEQUATE BRACING AND SHORING OF ALL EXCAVATIONS IN ACCORDANCE WITH ALL GOVERNING CODES AND REGULATIONS

5 PROTECT ALL NEW AND EXISTING UTILITIES DURING CONSTRUCTION

6 CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE UTILITY COMPANIES

7 THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY AND "DIG SAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE EXCAVATOR MUST BE NOTIFIED OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION

8 THE CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL GRADES, JOINTS AND BATCH MARKS NECESSARY FOR THE CONSTRUCTION OF THE PROJECT

9 THE GAS, ELECTRIC AND TELEPHONE SERVICES SHOWN ARE APPROXIMATE COORDINATE ACTUAL LOCATIONS WITH THE APPROPRIATE SUBCONTRACTOR AND UTILITY COMPANY

10 PROVIDE CONCRETE THRUST BLOCKS AT ALL WATER & FORCE MAIN BENDS 22 1/2° AND >

11 PROPOSED HYDRANTS MUST MEET THE REQUIREMENTS OF THE TOWN OF STOW FIRE DEPARTMENT AND WATER DEPARTMENT.

12 FOR EXACT LOCATION OF WATER SERVICE ENTRANCE LOCATIONS SEE PLUMBING PLANS

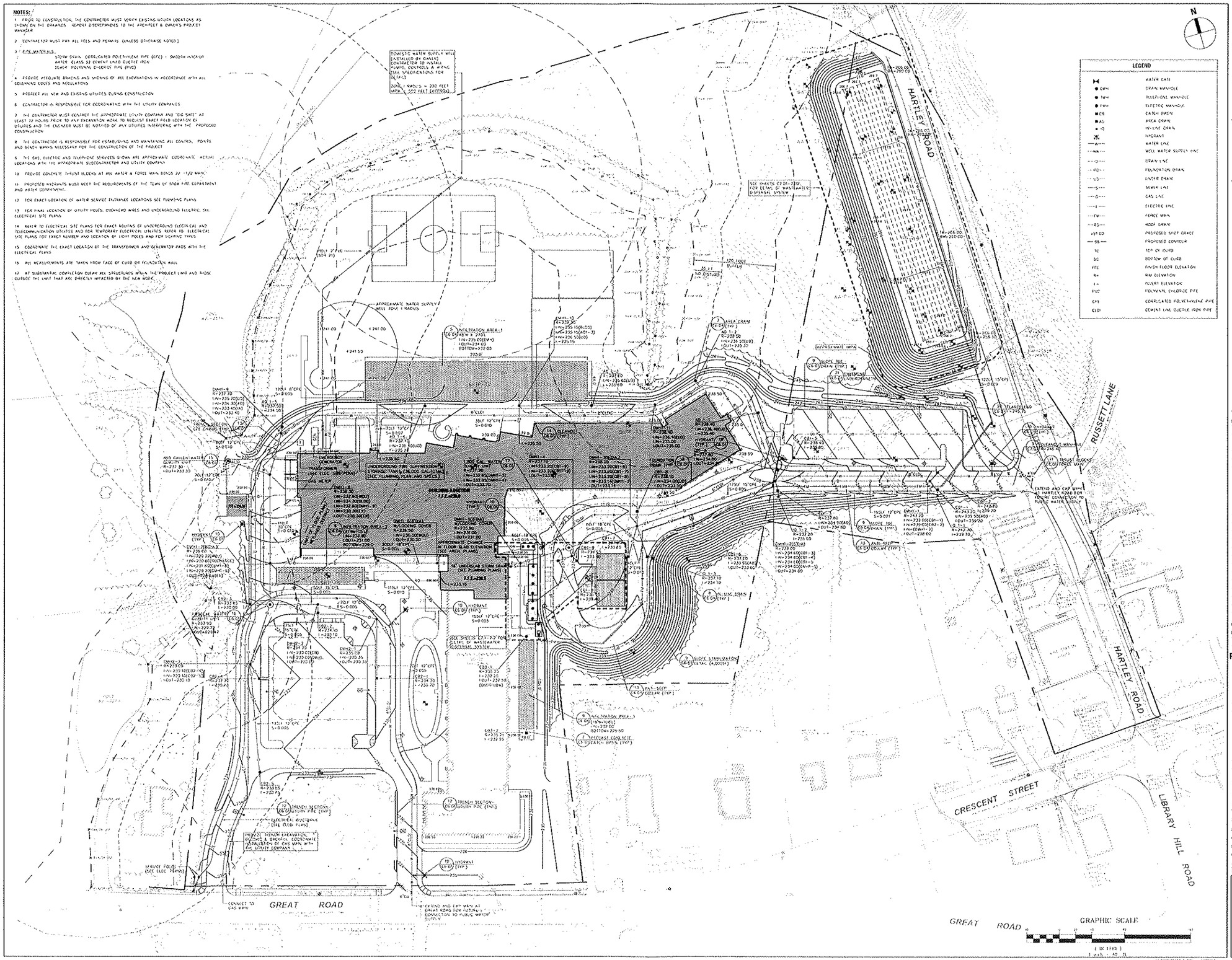
13 FOR FINAL LOCATION OF UTILITY POLES, OVERHEAD WIRES AND UNDERGROUND ELECTRIC, SEE ELECTRICAL SITE PLANS

14 REFER TO ELECTRICAL SITE PLANS FOR EXACT ROUTING OF UNDERGROUND ELECTRICAL AND TELECOMMUNICATION UTILITIES AND FOR TEMPORARY ELECTRICAL UTILITIES. REFER TO ELECTRICAL SITE PLANS FOR EXACT NUMBER AND LOCATION OF LIGHT POLES AND FOR LIGHTING TYPES

15 COORDINATE THE EXACT LOCATION OF THE TRANSFORMER AND GENERATOR PADS WITH THE ELECTRICAL PLANS

16 ALL MEASUREMENTS ARE TAKEN FROM FACE OF CURB OR FOUNDATION WALL

17 AT SUBSTANTIAL COMPLETION CLEAN ALL STRUCTURES WITHIN THE PROJECT LIMIT AND THOSE OUTSIDE THE LIMIT THAT ARE DIRECTLY IMPACTED BY THE NEW WORK



LEGEND

	WATER GATE
DMH	DRAIN MANHOLE
TMH	TELEPHONE MANHOLE
EMH	ELECTRIC MANHOLE
CB	CATCH BASIN
AD	AREA DRAIN
ID	IN-LINE DRAIN
	HYDRANT
W	WATER LINE
WW	WELL WATER SUPPLY LINE
D	DRAIN LINE
FD	FOUNDATION DRAIN
UD	ENTRY DRAIN
S	SEWER LINE
G	GAS LINE
E	ELECTRIC LINE
FM	FORCE MAIN
RD	ROOF DRAIN
237.50	PROPOSED SPOT GRADE
55	PROPOSED CONTOUR
TC	TOP OF CURB
BC	BOTTOM OF CURB
FFE	FINISH FLOOR ELEVATION
R=	RIM ELEVATION
I=	INVERT ELEVATION
PVC	POLYVINYL CHLORIDE PIPE
CPE	CORRUGATED POLYETHYLENE PIPE
CLDI	CEMENT LINE DUCTILE IRON PIPE

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HORIUCHI SOLIEN
LANDSCAPE ARCHITECTS

OWNER REVIEW

ISSUE	DATE

NO.	DATE	DESCRIPTION
N	3/15/12	NP APPLICATION
G	3/08/12	NO 1 SPA REVIEWS
F	3/29/12	ZBA PETITION FOR VARIANCE
E	3/24/12	BOARD OF HEALTH APPLICATION
D	3/16/12	BOARD OF HEALTH APPLICATION
C	3/03/12	NO 1 SPA FORMAL APPLICATION
B	2/03/12	ZBA SPECIAL PERMITS
A	1/09/12	PB PRELIM. CONSULTATION

ISSUE LOG

△ = ASSOCIATED CHANGE

Pompositticut / Center Elementary School

403 Great Road
Stow, MA 01775

GRADING & UTILITIES PLAN

SCALE	1"=40'
DRAWN BY	AS
CHECKED BY	
PROJECT MANAGER	JMH
PROJ. MGR.	LM
JOB NO.	6612.00

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C4.01