Cider Mill Village

Concept Plan

Bolton, Connecticut

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation & Development Area, Inc.

Cider Mill Village Concept Plan
Bolton, Connecticut

Environmental Review Team Report

Prepared by the
Eastern Connecticut Environmental Review Team
Of the
Eastern Connecticut
Resource Conservation and Development Area, Inc.

For the

Conservation Commission
Bolton, Connecticut

Report #620

September 2008

Acknowledgments

This report is an outgrowth of a request from the Bolton Conservation Commission to the North Central Conservation District (NCCD) and the Eastern Connecticut Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The Eastern Connecticut Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on Thursday, May 22, 2008.

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I would also like to thank Rod Parlee, chair, conservation commission, Ron Beaudoin, conservation commission, Michael Taylor, landowner, Andrew Bushnell, Holmes & Henry, engineers, Katie Driscoll, CONNDOT, Harold Fitzgerald, neighbor, Ed Soper, Manchester Water and Sewer Department, for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and aerial photos. During the field reviews Team members received additional information, reports and maps. Following the reviews, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the town and landowner. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in reviewing the proposed mixed use commercial development.

If you require additional information please contact:

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Introduction

Introduction

The Bolton Conservation Commission has requested Environmental Review Team (ERT) assistance in reviewing preliminary plans for a mixed use commercial development. There was no application pending at the time of the ERT review.

The +29 acre parcel is bordered by Cider Mill Road on the east, Route 44 to the south, the Bolton/Manchester town line to the west and privately owned land to the north. There is an area of wetlands located in the southwest corner of the property along Route 44. A large kettle hole is located in the south central portion of the property and steep slopes occur in the western and southwestern portions of the property. Approximately two thirds of the site is zoned General Business with the remainder zoned R-2 Residential. The proposed project is in the watershed of Lydall Reservoir #2 of the Manchester Reservoir System, an active source of public drinking water supply for the Town of Manchester Water Department. It is also in the Level B Aquifer Protection Area of the New Bolton Road Well Field. The well field is not currently used as an active water source, but it is classified as a future potential supply source.

Preliminary concept plans that were given to ERT members show approximately 160,000 square feet of commercial space in 10 buildings with parking for 724 cars and 78 senior residential units in one, two and three story configurations. It is the landowner's intention to have the site served with public sewer and water from the Town of Manchester.

Objectives of the ERT Study

The Bolton Conservation Commission is requesting ERT assistance in conducting a natural resource inventory and evaluating its significance to the proposed development plans. Specific areas of concern and information requested include: topography, geology, soils, hydrology, aquifer protection, water quality, stormwater management, low impact development techniques, site design, traffic and access.

Given the wide range of perspectives of the Team members involved in the review there were some differences in opinion as to whether the proposed concept design is consistent with the State Plan of Conservation and Development. *(The Conservation and Development Policies Plan for Connecticut, 2005-2010 (C&D Plan) is comprised of two separate, yet equally important, components – the Plan text and the Locational Guide Map. Both components include policies that guide the planning and decision-making processes of state government relative to: (1) addressing human resource needs and development; (2) balancing economic growth with environmental protection and resource conservation concerns; and (3) coordinating the functional planning activities of state agencies to accomplish long-term effectiveness and economies in the expenditure of public funds.* http://www.ct.gov/opm/cwp/view.*)*

All Team members do agree that any proposal for this site will require a high level of scrutiny with regard to its impact on surface and groundwater resources.

The ERT Process

Through the efforts of the Bolton Conservation Commission this environmental review and report was prepared for the Town of Bolton.

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the town. Team members were able to review maps, plans and supporting documentation provided by the applicant.

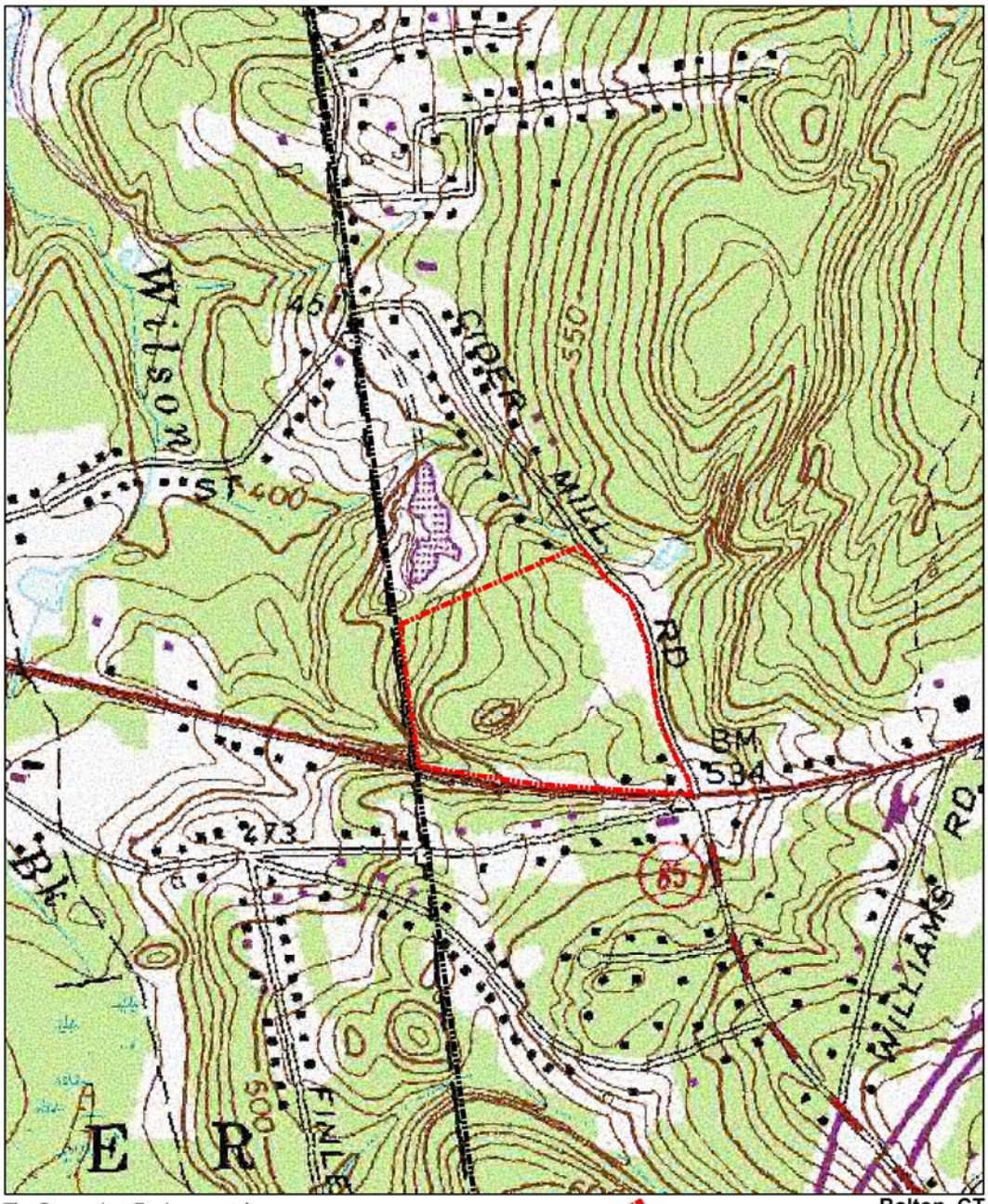
The review process consisted of four phases:

1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted Thursday, May 22, 2008. Some Team members made separate and/or additional site visits. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

Cider Mill Village Site Map



The Connecticut Environmental Review Team

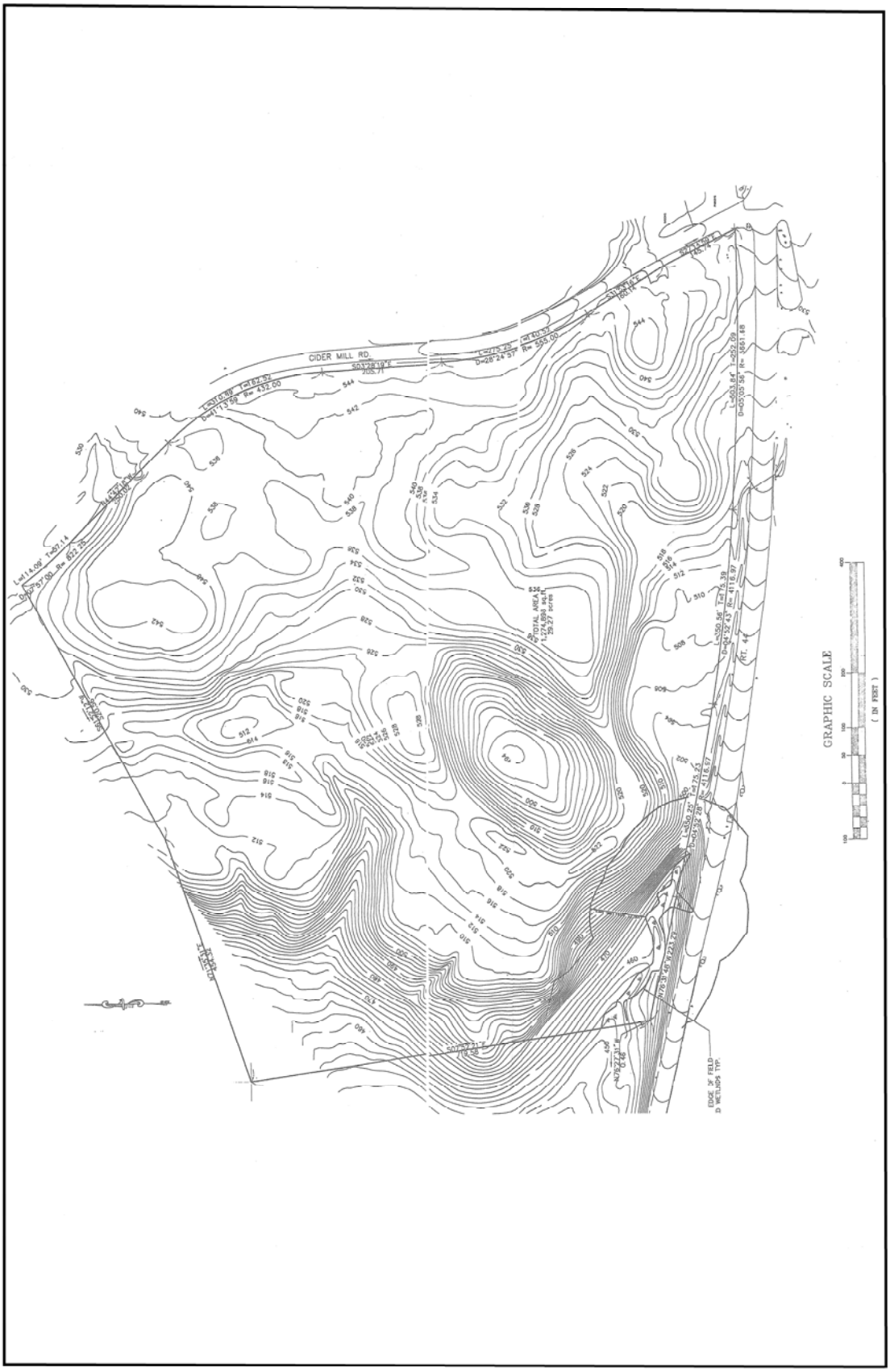
This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team.
This map is for educational use only.
It contains no authoritative data.
September 2008.

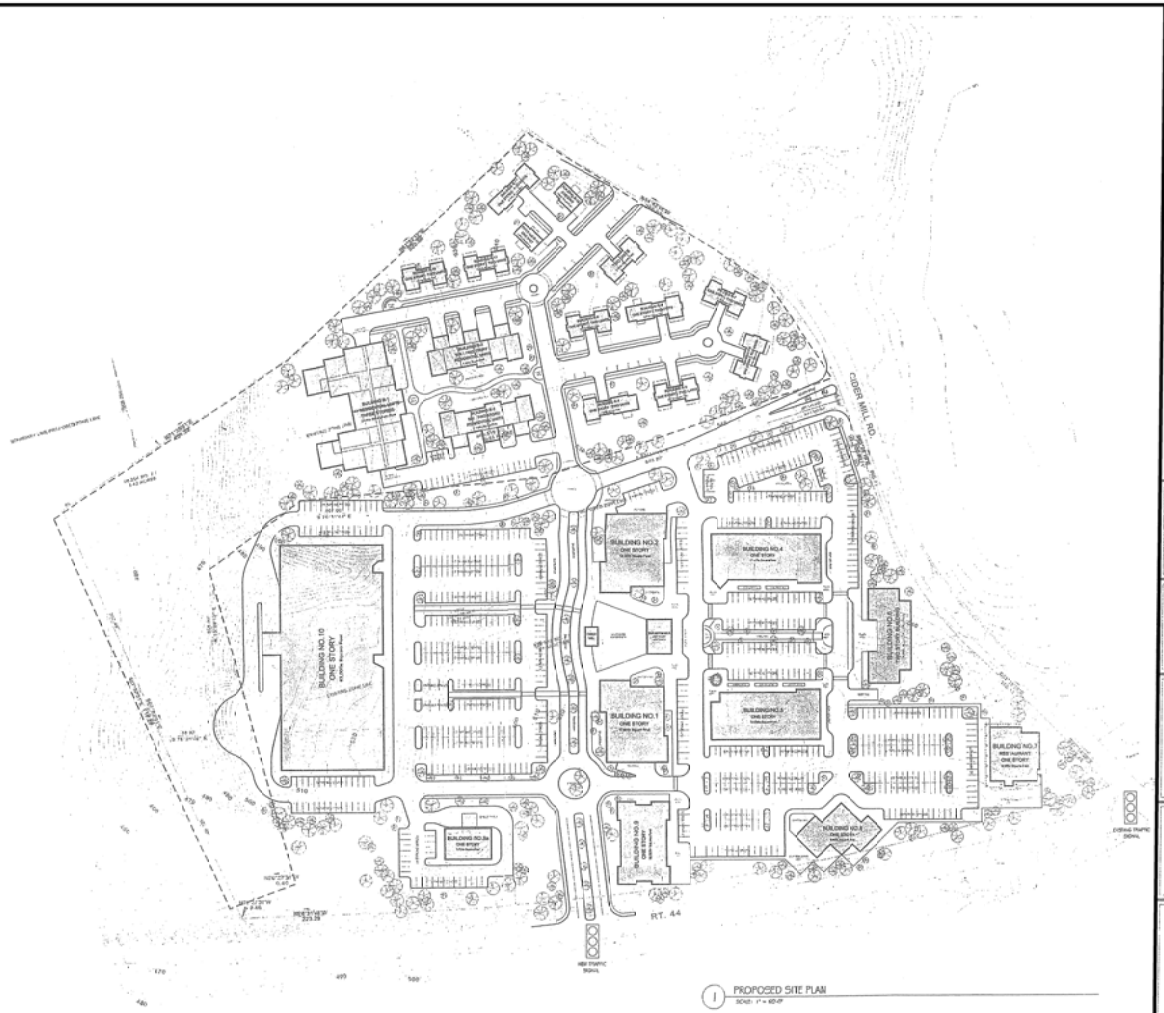
Bolton, CT

Approximate Site Boundary

0 0.05 0.1 0.2 0.3 Miles

Cider Mill Village Aerial Map


CIDER MILL RD.
GRAPHIC SCALE
(IN FEET)



1 PROPOSED SITE PLAN

SCALE: 1" = 60'-0"

CIDER MILL VILLAGE

Boston Turnpike
Bolton, CT

CIDER MILL PARTNERS LLC

F. A. Henkels & Associates, Inc

TectonArchitects| inc

Holmes & Henry
2179 Boston Turnpike
Coventry, CT 06238

PROJECT NO: TAY1801
DATE: 11-15-07
DRAWN BY: JJW
CHECKED BY: DF
SCALE: 1"=60'-0"
REV: ZONING - 3-12-08
REV:
REV:

PROPOSED SITE PLAN

L2.1

Topography and Geology

Topography

The 29+ acre parcel sits atop a hummocky (Figure 1) although relatively flat-topped westerly-sloping terrace that drops off steeply at its western margin (Figure 2). The terrace top has a gently rolling surface with a small and a large depression (see topographic map on page 11. The larger depression (Figure 3) covers about 2 acres and is 25-30 feet deep. It is a prominent feature on the aerial photos and on the topographic map. The smaller depression is only a few feet deep and is more likened to a slightly deeper part of the valley in which it is found. Both are kettles (see next section).

The terrace drops of dramatically to the west. Slopes are relatively steep and continue off the western edge of the parcel. The terrace-top is about 520' in elevation at the top of the slope and around 450' at the base. The slope has an angle of 25-30^{o}, which is about the angle of repose for fine-grained sand.

Geology

Bedrock does not crop out on the parcel. Glastonbury Gneiss, however, underlies the area (Rodgers, 1985). The gneiss is light colored and granitic in composition. It has a weak foliation in this area. The nearest outcrops are on the east side of Cider Mill Road just north of the parcel. Ledge will probably not be encountered during construction on this parcel.

The gneiss is covered by deposits of sand and gravel left (Figure 4) by a glacial meltwater stream. The meltwater stream deposited a delta-like terrace into a pond of meltwater backed up against the hills to the east and left-over ice to the west. The sand and gravel is fine- to medium-grained and silty. Some of it is "dead-sand". It was quarried for a time on property just to the north of the parcel (Figure 5). Apparently it was not that useful because much material is left in the quarry.

Not only did left-over ice form a dam to contain the water, several chunks were left behind to be covered by the sand and gravel. Later when the left-over chunks melted, the sediment collapsed into the void and the surface collapsed into a depression. Such collapse depressions are referred to as kettles. The deposit is at least 70' thick along the western third of the parcel, but may thin to the east. Test borings conducted by Levine and Fricke penetrated 30-45 feet without hitting ledge in the south central; and south-eastern portion of the parcel.

The sand and gravel constitutes a shallow aquifer and the Town of Manchester has a well field on an abutting property to the west. The topography of the area suggests that groundwater in the aquifer moves generally westward toward that well field. The parcel on which Cider Mill Village is proposed is part of the recharge area for this aquifer. By virtue of this fact, the parcel is already developed to some extent and thus it could be

argued that the parcel as it stands is not underdeveloped. The density proposed, indeed, may constitute over-development for a protected aquifer. It would seem prudent that extra precautions be taken to protect the quality and quantity of groundwater in that aquifer.

References

Colton, R. B., 1974, Surficial geologic map of the Rockville Quadrangle, CT: State Geol. Natural History Survey of Connecticut, file map.

Rodgers, John, 1985, Bedrock Geological Map of Connecticut. State Geological and Natural History Survey of Connecticut, Nat'l. Resource Atlas Series, 1:125,000, 2 sheets.

Stone, J.R., Schafer, J.P., London, E.H., DiGiacomo-Cohen, M.L., Lewis, R.S., and Thompson, W.B., 2005, Quaternary Geologic Map of Connecticut and Long Island Sound Basin (1:125,000). U.S. Geol. Surv. Sci. Invest. Map # 2784.

Figure 1. Hummocky nature of terrace top. Surface is gently rolling with small hills and depressions (see Figure 4).

Figure 2. Slope drops of steeply to south and west. Top shows south-facing slope. Notice that slope is 20-30^{o,} which is near the angle of repose for sand. Bottom shows west-facing slope.

Figure 3. Slope to left drops off into kettle (only partially shown in this photo). Slopes into the kettle are as steep as the west- and south- facing slopes shown in Figure 2.

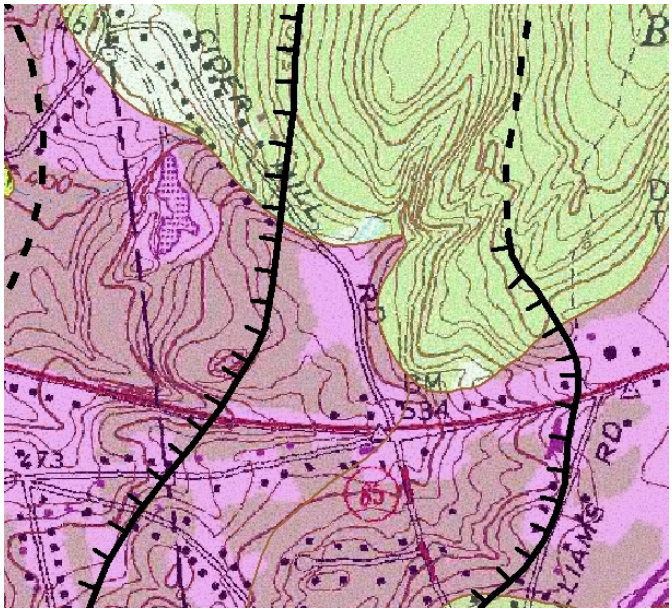


Figure 4. Surficial geologic map showing area (colored magenta) that is underlain by sand and gravel deposited by meltwater streams into an ice dammed impoundment at the edge of the melting glacier. Areas colored green are covered by glacial till. Hachured lines indicate inferred edges of glacier as it melted. The overall meltback direction was toward the north, but locally it could vary. Here the edge of the glacial ice receded westward as it melted. Hence, the eastern line marks an older position of the ice margin; the western line is slightly younger. (Map from Stone and others, 2005)

Figure 5. Abandoned gravel pit on abutting parcel to north. The material in the pit is mostly fine to medium-grained pebbly-sand that is generally unsuitable for most construction purposes.

Conservation District Review

The site is bordered on the south by Route 6/44 and on the west by Cider Mill Road. The entire 29 acre parcel is located within the Manchester Water Company's New Bolton Wellfield, an Aquifer Protection Area. A mixed-use development is proposed for the site. The proposed development encompasses most of the parcel, except for a 60 to 100 foot corridor along the eastern property boundary. Comments are based on the proposed site plan dated 11/12/08 and revised 3/12/08.

Soils

The upland is comprised mostly of Haven and Enfield soils on 0-3% slopes, Hartford sandy loam on 0-8% slopes, Manchester gravelly sandy loam on 3-15% slopes, and Penwood loamy sand on 3 to 8 % slopes. The drainage classes of these soils range from well drained to excessively drained. Historically, Enfield soils were described as having a high erosion hazard and the coarser Hartford, Manchester, and Penwood soils were described as having a low to medium erosion hazard.

Soil series details are provided in the attached document titled "Custom Soil Resource Report for State of Connecticut Cider Mill ERT" (Please see Appendix A). This document was prepared utilizing the Web Soil Survey published by the United States Department of Agriculture, Natural Resources Conservation Service.

Wetlands

The only wetlands on the property are associated with a watercourse located along the western third of the southern property boundary. The watercourse originates at an outlet that carries runoff from the drainage area south of Route 6/44 and road drainage from Route 6/44. The watercourse is located at the base of a very steep slope that runs at a 40% grade for about 100 feet along the stream. The total length of stream on the parcel is approximately 320 feet. The watercourse drains to a wooded wetland west of the parcel.

Recommendations

- Proposed development should be kept back from the top of the steep slope that is located adjacent to the watercourse to reduce potential erosion and sedimentation.
- Stormwater from future development should be conveyed to the base of the slope before being discharged to the wetlands.

Erosion Control

The eastern portion of the site has steep escarpment slopes. The terrain is more moderate on the western portion of the site. The proposed development consists of residential units, commercial/office units, and a single large commercial unit, all with parking associated. The conceptual plan showed a relatively flat build out. Development of the

site, as shown, will require extensive cuts and fills, particularly in the eastern portion of the site. Soil erosion and sediment control will be critical.

Disturbance of five or more total acres of land area requires compliance with the State of Connecticut "General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities". Compliance requires preparation of stormwater pollution control and erosion and sedimentation control plans.

Recommendations

- Phased erosion and sedimentation control plans should be developed in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. These plans approved by town staff, and reviewed with contractors prior to any soil disturbance.
- The "Principles of Site Planning for Erosion and Sediment Control", Section 3-7 in 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, recommends that site plans be developed to utilize existing topography. Examples to consider include using a portion of the bowl shaped area for an amphitheatre or arraying smaller buildings along a slope, rather than leveling the entire site.

Stormwater Management

The site is located within the aquifer protection area for wells belonging to the Manchester Water Company. Specific issues relating to the quality and quantity of post development infiltration to groundwater will be addressed by others in this report.

Recommendations

- Stormwater pollution control plans should be developed in accordance with the 2004 Connecticut Stormwater Quality Manual. Since the site is within a drinking water watershed, the goal of these plans should be to utilize treatment trains to exceed minimum standards.
- Land use and/or occupant restrictions should be implemented in accordance with best recommendations available for aquifer protection.

DEP's Review of

Groundwater Resources, Aquifer Resources, Water Quality and Water Supply

Groundwater/Aquifer Resources

The site consists of stratified drift deposits of sand and gravel that are limited in extent and saturated thickness. These geologic conditions are favorable for storing and transmitting moderate to low quantities of groundwater (See Figure 1.). The existing Manchester Water Department's New Bolton Road Well Field taps into this stratified drift deposit where water is limited. The well field consists of three wells with a Connecticut Department of Environmental (DEP) water diversion registration of .86 million gallons per day. Considering the high water diversion registration amount, there is not much potential for additional community supply well fields beyond the existing well field in this area.

The Cider Mill Village Property is located adjacent to and immediately uphill from Manchester Water Department's New Bolton Road Well Field and is located in the Level B (preliminary) mapping of the New Bolton Road Well field Aquifer Protection Area (APA) (See Figures 2 and 2a.) This map has been completed and provided to the Town of Bolton. The Level B mapping delineates a preliminary aquifer protection area, providing an estimate of the land area from which the wells draws its water. The well field is currently inactive but the Manchester Water Department has it available for future use. The Manchester Water Department has indicated to the Department of Environmental Protection (DEP) that they intend to conduct Level A (final) mapping of the New Bolton Road Well Field APA and refurbish the well field. The Level A mapping will delineate the final Aquifer Protection Area, which becomes the regulatory boundary for land use controls designed to protect the well from contamination. Once the Level A mapping is completed by the water department and approved by DEP, the Town of Bolton will be notified to begin local implementation of the Aquifer Protection Area Program. This means Bolton must adopt the map and state land use control regulations for the area.

Ground Water Quality

The site is classified by CT DEP as Class GAA groundwater quality indicating an area of existing or potential public water supply. (See Figure 3.) (See Attachment 1, Appendix B.) The map on Figure 3 also shows additional information, including registered underground storage tanks (USTs), active and inactive leachate and wastewater permits, subregional watershed basin boundaries, and surface water supply reservoirs and water quality. Groundwater quality conditions are assumed to be good and suitable for drinking without treatment. Industrial and other non-domestic wastewater discharges to the ground

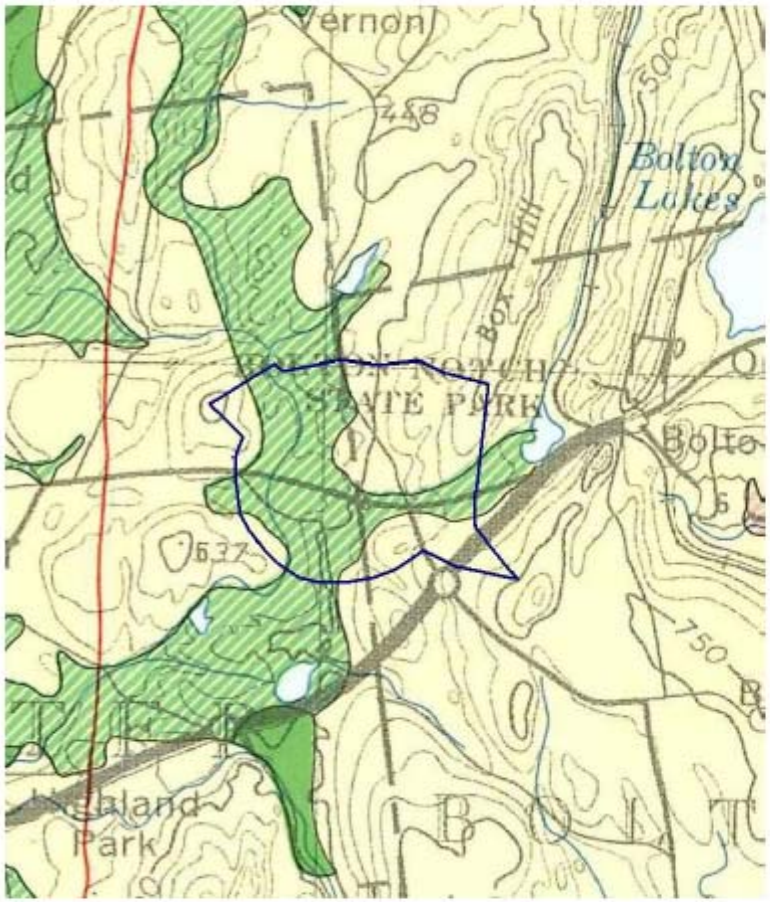
are prohibited. There is a small area of the site classified as GAA* (may be impaired) in the far southeast corner of the site indicating potential water quality threats from adjacent sources. According to the information submitted as part of the ERT, an environmental site assessment of the site was performed regarding potential on-site and off-site areas of concern. Although it concluded there is no indication of a release at the site, the site could still be considered a risk to encounter contaminated soils or groundwater during construction activity. If this should occur, CT DEP's Spills and Emergency Response Unit should be called at (860) 424-3338 or CT DEP's Remediation Division at (860) 424-3705.

Aquifer Protection

Based on available information, the Cider Mill Village Property will almost definitely be located inside the final Level A mapped APA and will be regulated under the program sometime in the future. All land use activities on this property should be consistent with the state Aquifer Protection Area Regulations (Regulations of Connecticut State Agencies (RCSA) Section 22a-354i-1 through 10). These land use activities are listed in Attachment 6. The regulations restrict development of certain new land use activities that use, store, handle or dispose of hazardous materials and require existing regulated land uses to register and follow best management practices. Residential development, including densely populated housing units, is not a regulated land use activity under the APA program.

The DEP has developed Best Management Practices (BMPs) for sensitive aquifer protection areas such as this site in the Town of Bolton. The BMPs provide guidance to reduce the potential for contamination of the existing drinking water well fields and potential ground water resources. The BMPs are applicable to certain land use activities, including construction operations, commercial uses and parking areas, and should be implemented as appropriate. (See Attachments 2, 3, 4, & 5, Appendix B.)

Figure 1 - Groundwater Availability Map
ERT Report, Bolton, CT



AREAS UNDERLAIN BY DEPOSITS KNOWN OR INFERRED TO BE CAPABLE OF YIELDING MODERATE TO VERY LARGE AMOUNTS OF WATER (50 - 2000 GALLONS PER MINUTE (3.15 - 126.18 LITERS PER SECOND)) TO INDIVIDUAL WELLS.

COARSE-GRAINED STRATIFIED DRIFT - composed dominantly of sand or sand and gravel. These deposits have a water saturated thickness of 10 feet (3.05 meters) or greater. Light green areas are thought to be coarse-grained but hydrogeologic data are incomplete and verification requires further investigation.

COARSE - GRAINED STRATIFIED DRIFT OVERLAIN BY FINE-GRAINED STRATIFIED DRIFT - composed dominantly of sand or sand and gravel overlain by fine to very fine sand, silt and clay. These deposits have a water saturated thickness of 10 feet (3.05 meters) or greater. In many areas data are insufficient to identify this unit and it may occur in more localities than shown.

AREAS UNDERLAIN BY DEPOSITS KNOWN TO BE CAPABLE OF YIELDING MODERATE TO LARGE AMOUNTS OF WATER (50 - 500 GALLONS PER MINUTE (3.15 - 31.55 LITERS PER SECOND)) TO INDIVIDUAL WELLS.

COARSE - GRAINED STRATIFIED DRIFT OVERLYING FINE-GRAINED STRATIFIED DRIFT - composed dominantly of sand or sand and gravel underlain by fine to very fine sand, silt and clay. These deposits have a water saturated thickness of 10 feet (3.05 meters) or greater. In many areas data are insufficient to identify this unit and it may occur in more localities than shown.

AREAS UNDERLAIN BY DEPOSITS KNOWN OR INFERRED TO BE CAPABLE OF YIELDING SMALL TO MODERATE AMOUNTS OF WATER (1 - 100 GALLONS PER MINUTE (0.06 - 6.31 LITERS PER SECOND)) TO INDIVIDUAL WELLS.

FINE-GRAINED STRATIFIED DRIFT - composed dominantly of fine to very fine sand, silt and clay. These deposits have a water saturated thickness of 10 feet (3.05 meters) or greater. Orange areas are thought to be fine-grained but hydrogeologic data are incomplete and verification requires further investigation.

TILL AND STRATIFIED DRIFT - composed of mixtures of gravel, sand, silt, and clay. This unit includes all areas of stratified drift that have a water saturated thickness of less than 10 feet (3.05 meters) and areas of exposed bedrock.

New Bolton Road Wellfield Aquifer Protection Area

State of Connecticut Department of Environmental Protection Water Protection and Land Reuse

July 15, 2008

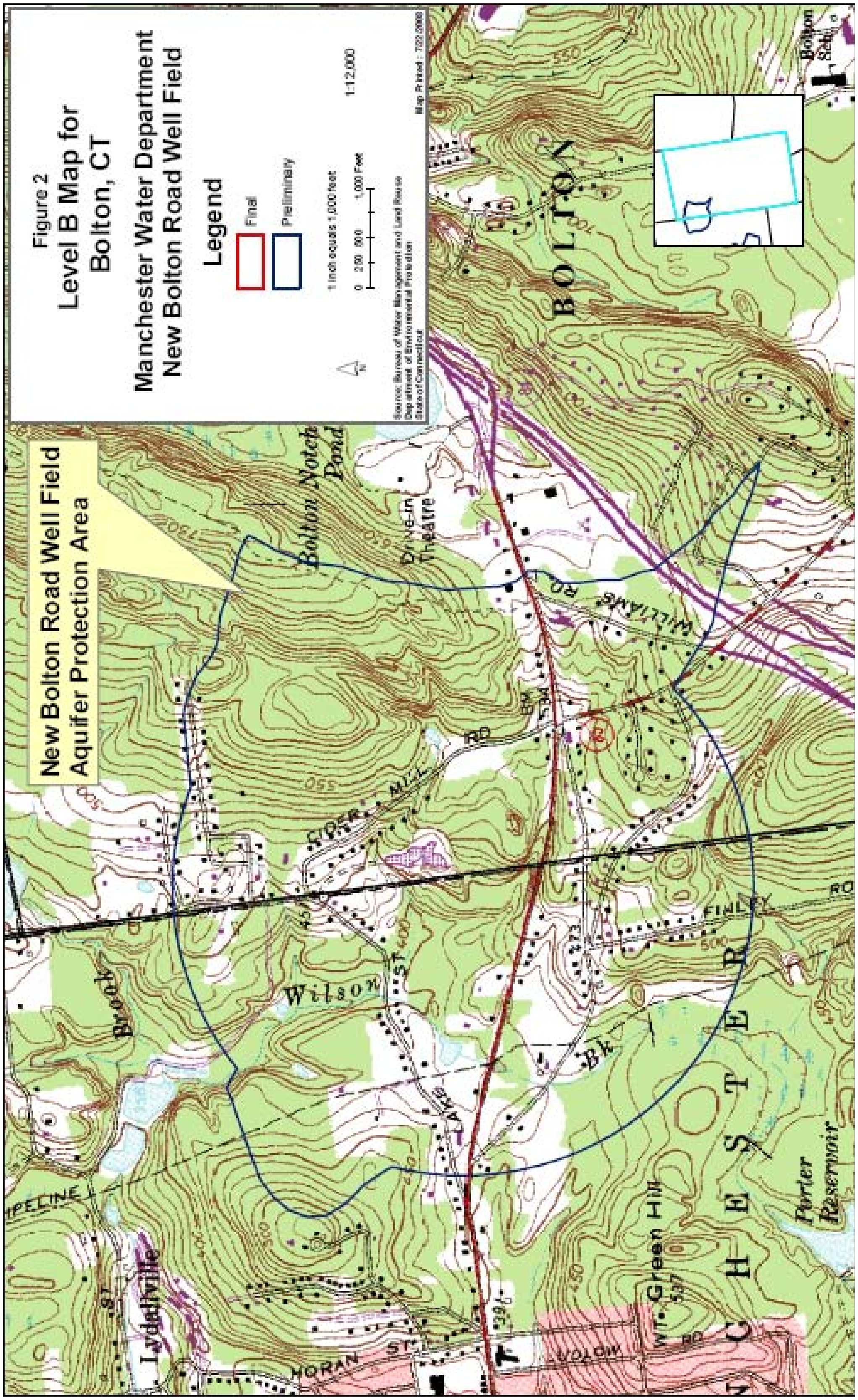


Figure 2
Level B Map for
Bolton, CT
Manchester Water Department
New Bolton Road Well Field
Legend
Final
Preliminary
1 inch equals 1,000 feet
1:12,000
New Bolton Road Well Field
Aquifer Protection Area
Bolton Notch Pond
Drive-in Theatre
Wilson
Brook
Green Hill
Porter Reservoir
BOLTON
MANCHESTER

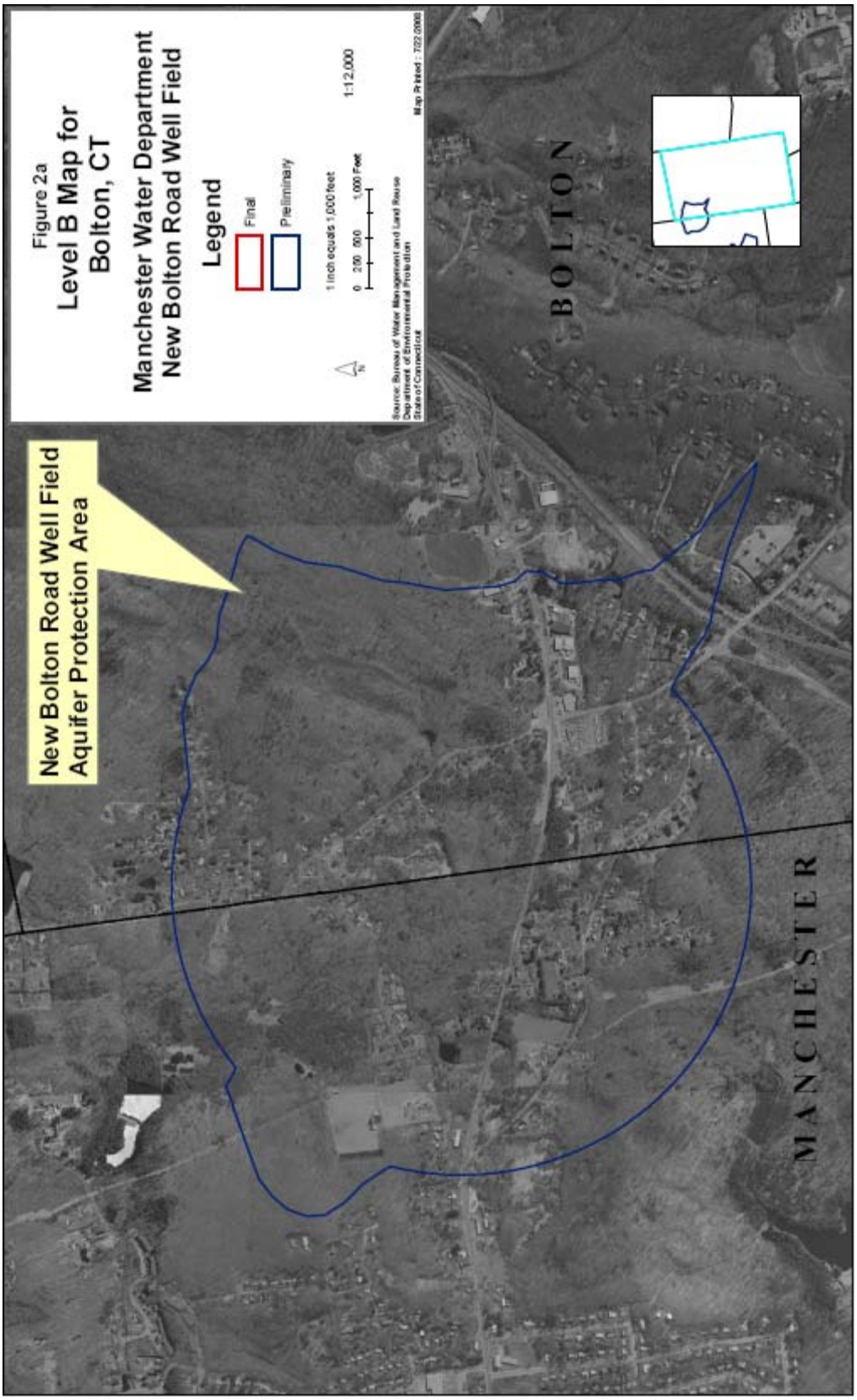


Figure 2a
Level B Map for
Bolton, CT
Manchester Water Department
New Bolton Road Well Field
Legend
Final
Preliminary
1 inch equals 1,000 feet
0 250 500 1,000 Feet
1:12,000
N
Source: Bureau of Water Management and Land Reuse
Department of Environmental Protection
State of Connecticut
Map Printed : 7/22/2008
New Bolton Road Well Field
Aquifer Protection Area
BOLTON
MANCHESTER

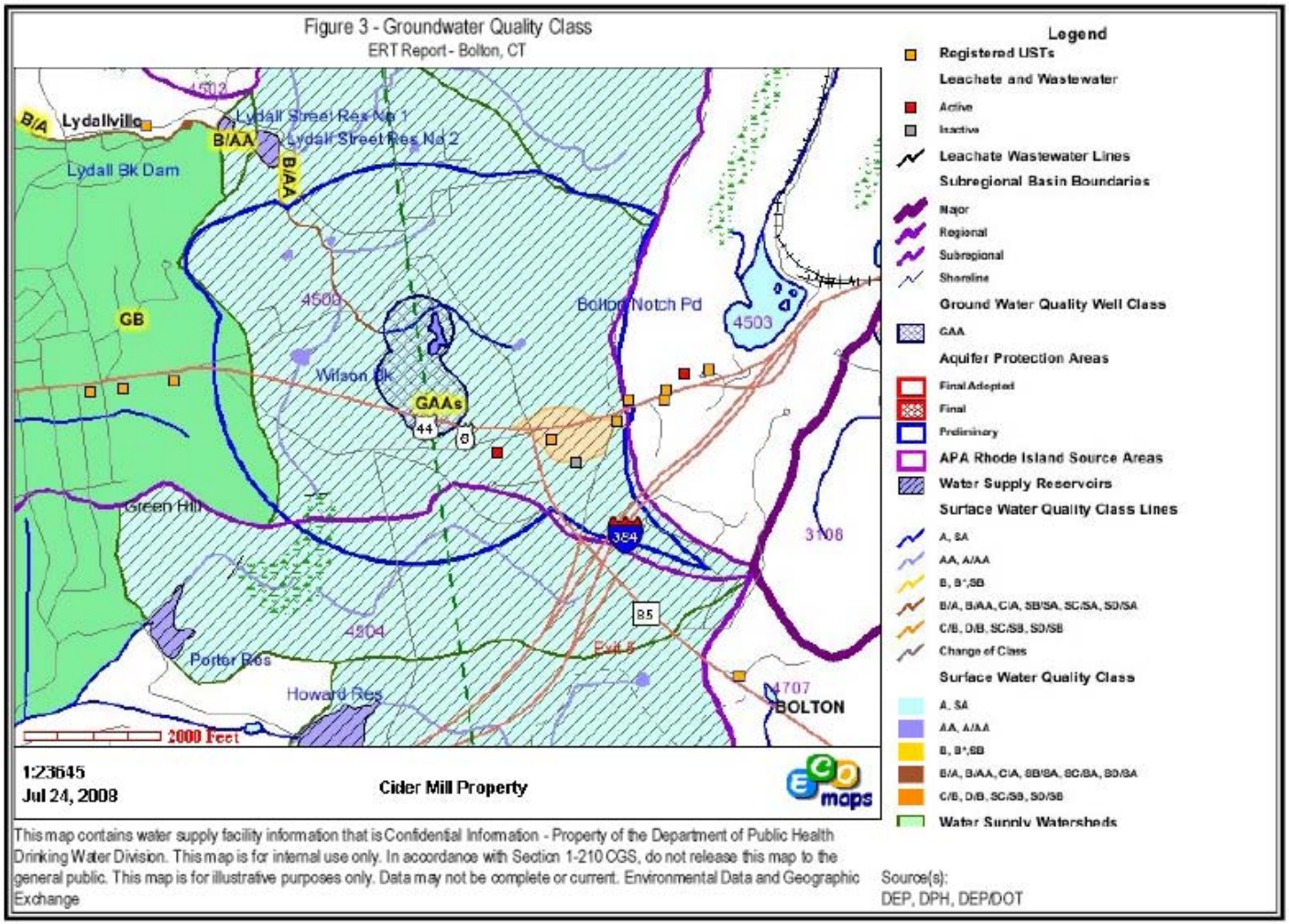


Figure 3 - Groundwater Quality Class
ERT Report - Bolton, CT
Lydallville
Lydall Street Res No 1
Lydall Street Res No 2
Lydall Bk Dam
B/A
B/AA
GB
GAAs
Wilson Bk
Bolton Notch Rd
Green Hill
Porter Res
Howard Res
Exit 5
BOLTON
2000 Feet
1:23645
Jul 24, 2008
Cider Mill Property
Legend
Registered USTs
Leachate and Wastewater
Active
Inactive
Leachate Wastewater Lines
Subregional Basin Boundaries
Major
Regional
Subregional
Shoreline
Ground Water Quality Well Class
GAA
Aquifer Protection Areas
Final Adopted
Final
Preliminary
APA Rhode Island Source Areas
Water Supply Reservoirs
Surface Water Quality Class Lines
A, SA
AA, A/AA
B, B*,SB
B/A, B/AA, C/A, SB/SA, SC/SA, SD/SA
C/B, D/B, SC/SB, SD/SB
Change of Class
Surface Water Quality Class
A, SA
AA, A/AA
B, B*,SB
B/A, B/AA, C/A, SB/SA, SC/SA, SD/SA
C/B, D/B, SC/SB, SD/SB
Water Supply Watersheds
This map contains water supply facility information that is Confidential Information - Property of the Department of Public Health Drinking Water Division. This map is for internal use only. In accordance with Section 1-210 CGS, do not release this map to the general public. This map is for illustrative purposes only. Data may not be complete or current. Environmental Data and Geographic Exchange
Source(s):
DEP, DPH, DEP/DOT

DOH Public Drinking Water Supply Section Review

This ERT Team member has reviewed the May 5, 2008 ERT packet and additional information submitted June 17, 2008 regarding the proposed Cider Village Mill Concept Plan in Bolton, Connecticut with respect to impacts on public drinking water sources. The Cider Mill Village Concept Plan as presented would consist of several commercial buildings totaling 160,000 square feet, a senior housing development, and +700 parking spaces.

The proposed project area is in the watershed of Lydall Reservoir #2 of the Manchester Reservoir System, an active source of public drinking water supply for the Town of Manchester Water Department, as well as in the Level B Aquifer Protection Area (APA) of the New Bolton Road Well Field. While the New Bolton Road Well Field is not currently used as an active source, the most recently approved Town of Manchester Water Supply Plan classifies this wellfield as a future potential source of supply. (Please see Town of Manchester letter to Mr. Taylor dated July 17, 2008 regarding water and sewer extension following.)

The project is also in close proximity to the public water supply wells that serve the Bolton Mobil (CT0120074) and the Three J's Café (CT 0120354) which are classified as transient water supply wells.

Since this project is in an active public water supply watershed area, intensive development and the connection to public water and sewer to this parcel are inconsistent with the *2005-2010 State of Connecticut Plan of Conservation and Development* which classifies this parcel as a Conservation Area. The Department of Public Health Drinking Water Section is concerned with projects in public drinking water source areas that increase density, pervious surfaces, and runoff which can potentially degrade water quality and negatively impact sources through point and non-point source pollution and by impacting water quantity.

In addition to being inconsistent with state policies, any use of this parcel with the potential to impact drinking water sources would need coordination with all the nearby water systems. The contact information for the three public water systems are as follows:
Manchester Water Department: Edward Soper, 860-647-3115
Bolton Mobil: Gary Jackopsic, 860-647-0689
Three J's Café: Christopher Morianos 860-649-4684

All of these potential issues with respect to drinking water sources would need to be investigated on a state and local level prior to this proposal moving forward.

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Town of Manchester

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July 17, 2008

Mr. Michael Taylor, Trustee
Taylor Management Corporation
P.O. Box 476
Storrs, CT 06268

RE: Water and Sewer Extension
98 Boston Turnpike
Bolton, CT

Dear Mr. Taylor,

I have met with General Manager Shanley and various members of the Town staff to review your letter dated June 3, 2008 requesting that the Town of Manchester consider allowing the extension of its water and sanitary sewer facilities to the above referenced property. As you are aware, any such extension must be approved by the Town of Manchester Board of Directors. At the present time there are numerous unanswered questions concerning the specifics of the extension(s) and details relative to the proposed project. It was the consensus of those attending the meeting that in order to be able to make a comprehensive presentation to the Board, many of the unanswered questions and details much be resolved in advance. I have listed the various issues below:

GENERAL

1. In the event that the Town of Manchester approves an extension of its sanitary sewer system to serve the subject property and the Connecticut Office of Policy and Management (OPM) determines that a revision/amendment to the "Conservation and Development Policies Plan for Connecticut 2004-2009 Locational Guide Map by OPM" is necessary to construct any portion of the extension within the geographical boundaries of the Town of Manchester, then Taylor Management Corporation (the developer) shall be obligated, independently and at no cost to the Town to initiate and complete the process required by OPM.

2. Any and all applications, permits and regulatory requirements, local, state and/or federal, shall be the responsibility of the developer. Any and all associated costs

shall be the responsibility of the developer. Please provide a list of all required permits.

WATER

1. The Town of Manchester is currently completing its Level A mapping for the New Bolton Road Well Field. Preliminary indications are that the subject property will lie within areas that will be regulated by aquifer protection regulations. Please discuss this issue with the Town of Bolton, determine Bolton's plan to address this particular subject and advise the Town of Manchester of your findings. Manchester would like to be apprised of any discussions between the developer, the Town of Bolton and the State of Connecticut Department of Public Health concerning this subject. Please provide as much detail as possible with respect to the process and schedule.

2. As you are aware, the subject property is currently in the franchise area of the Connecticut Water Company (CWC). It is my understanding that CWC is open to the prospect of the Town of Manchester selling water to the CWC at the Bolton/Manchester town line. This will require the negotiation of an agreement between the Town of Manchester and the CWC. Any costs incurred by the Town of Manchester associated with any aspect of the extension of the Town of Manchester's water distribution system shall be the responsibility of the developer. Again, the issue of the ownership, operation and maintenance of the water main in any public right-of-way needs to be clarified.

SANITARY SEWER

1. There are several questions relating to the portion of the sanitary sewer extension that lies within the geographical boundaries of the Town of Bolton. They are listed below:

    a) A portion of the subject property is designated to be served by the current inter-town agreement between the Town of Manchester and the Bolton Lakes WPCA. What is the proposal for servicing that area? Is it still intended to flow through the proposed metering station associated with the above referenced agreement? What is Bolton's position on this issue?

    b) A portion of the subject property is **prohibited** by the Bolton Lakes WPCA and the State of Connecticut Department of Environmental Protection from being served by the facilities covered by the current inter-town agreement between the Town of Manchester and the Bolton Lakes WPCA. What is Bolton's position with respect to administrative, operational and maintenance oversight by Bolton of any facilities servicing the restricted property described herein paragraph b)?

c) A portion of the extension of the sanitary sewer will be located within the geographical boundaries of Bolton in what is known as New Bolton Road. New Bolton Road is a state road. What is the state's position relative to the sanitary sewer in New Bolton Road being owned, operated and maintained by a private developer?

As I indicated, the Town needs the issues identified above to be addressed in as much detail as possible prior to making our presentation to the Board of Directors. Please feel free to contact me at your convenience if you have any questions or would like to meet with us to discuss the issues in more detail. I can be reached at 860-647-3252, Monday through Friday between the hours of 8:00 am and 4:30 pm.

Sincerely,

Richard A. Staye
Utility Engineer

RAS: rwt

C: Scott Shanley, General Manager
Ed Soper, Water and Sewer Administrator
Tim O'Neil, Assistant Town Attorney
Peter Henry, Holmes and Henry Associates
File

Considerations Related to Ground Water Conditions

The comments and recommendations for consideration in this section are based on a review of site related information provided by the Connecticut Environmental Review Team (ERT), discussions at a meeting in Bolton with the ERT, members of the Bolton Conservation Commission, Mr. Michael Taylor and a representative of the engineering firm working for the applicant; a tour of the site; discussion with the Town of Manchester Engineering Department and correspondence with the Connecticut Department of Environmental Protection (DEP) concerning the aquifer protection zone and disposition of the nearby Manchester wells; and a review of information from the DEP website regarding the aquifer protection zone, bedrock and the surficial geology of the site. The focus of this section is on ground water conditions at the site.

The proposed development overlies a sand and gravel aquifer and is within a DEP designated aquifer protection zone surrounding the Manchester wells. Although the aquifer has been impacted by gasoline related contamination likely stemming from the nearby service station, the levels detected are below State regulatory limits. Some other pertinent site features include: the high topographic relief, the presence of sand and gravel at the surface, the very shallow depth to the water table in places, and the current wooded character of the property. Although Manchester has no plans on using the current wells nearby, the aquifer beneath the site is a potential future water supply that could accommodate additional development in the area. Also, the aquifer could be a backup supply for the town of Bolton. Sale of water from the aquifer could also be a source of income for the town. As such, consideration should be given to minimizing potential impacts of development on the quantity and quality of ground water beneath the site.

As this reviewer understands it, the proposed development will be using water and sewer extending from Manchester. Consideration might be given to double walled piping of sewer lines within the development to minimize potential impacts from sewer leakage. One might also institute a monitoring program to assure leak detection and repair in a timely fashion.

The high topographic relief on site will likely require extensive surface modification. Consideration should be given to minimizing impacts of cut and fill operations on aquifer recharge and quality.

The development plans indicate a high percentage of land surface in the development will be made impermeable owing to the construction of buildings and parking lots. How to deal with the increased stormwater may be the most pressing issue for the site development. Increased stormwater will result in decreased aquifer recharge. This might be offset by preserving more green areas, using permeable pavement, developing rain

gardens to handle roof and parking lot runoff, or directing stormwater to infiltration ponds. A major issue here is impact to water quality. Assuming the development will exclude high risk facilities that handle large quantities of hazardous materials, stormwater from developed areas may contain metals and gasoline and oil related constituents washing off parking lots. It also may contain nitrate from the use of fertilizers on grass or ornamental plant areas and pesticides and herbicides. Furthermore, in the winter months, road salting will generate salt-laden stormwater. Consideration might be given to treatment of stormwater prior to discharging it into facilities that facilitate infiltration or off-site discharge (see the following reference for ideas http://www.des.state.nh.us/wmb/was/manual).

It is recommended that consideration be given to the implementation of a best management practice program to train site maintenance personnel in procedures that minimize possible impacts to ground water quality.

It is recommended that consideration be given to implementing a predevelopment ground water quality monitoring program to obtain background ground water flow and quality data. This would aid in demonstrating the effectiveness of measures to prevent aquifer degradation.

To help avoid impacts to surrounding domestic wells, it is suggested that a study be conducted. Elements of the study should include the development of maps showing the location of wells in relation to ground water flow conditions on the site. Tables of well characteristics should be developed that include information on whether the wells are dug or drilled, their depth, depth to rock, tested yields, and water quality information. This reviewer would also suggest implementing a water quality sampling program to periodically test the wells as development proceeds.

(***Note from reviewer***: The water resources research faculty at the University of Connecticut, if Mr. Taylor is so inclined, could implement a research program at the site that would help address the issues cited above. The site could be used in applying for research grants related to implementing smart growth concepts to deal with stormwater related issues.)

Stormwater Management

The current concept plan is for a mix of retail and residential properties on 29 acres at the intersection of Cider Mill Road and Route 44 in Bolton, CT. Because this project is only in the concept phase, a specific site development plan has not been prepared. This review is based on the "Proposed Site Plan L2.1" dated 11/12/07, and the "Plan Prepared for Michael Taylor Trustee" dated 3/3/08.

The Site

The site is bordered by Cider Mill Road to the east and north, Route 44 to the south, and the Bolton/Manchester town line to the west. An area of wetlands is located at the southwest corner of the property. Steep slopes occur in the western and southwestern portions of the site. A kettle hole with approximately 26 ft high slopes exists in the south central portion of the property.

The groundwater classification for the property is GAA and the site is within a Level B aquifer protection area indicating that the groundwater is or can be used as a drinking water supply.

It appears that the development and future operation of the facilities on the property will require, respectively, two DEP stormwater permits: the *General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities* and the *General Permit for the Discharge of Stormwater Associated with Commercial Activity*. These are discussed below.

DEP Stormwater Permitting – Construction

As the site construction will involve the disturbance of over one acre, the project must comply with the requirements of Connecticut*'s General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities* (construction stormwater general permit). A registration for the construction stormwater general permit must be submitted to the Department of Environmental Protection (CTDEP) *at least* thirty days before the start of construction activities. If 10 or more acres of land will be disturbed, regardless of phasing, a Stormwater Pollution Control Plan (the "Plan") must also be submitted with the registration. The construction stormwater general permit requires that the Plan comply with the Connecticut Guidelines for Soil Erosion and Sediment Control (the "Guidelines"). Also, the Plan must be flexible to account for adjustment of controls as necessary to meet field conditions. Please note that many erosion, sediment control, and stormwater detention issues must be dealt with on a local level before being included in the Plan.

The Plan must include a site map as described in Section 6(b)(6) of the permit, a description of the erosion and sediment controls that will be used during each phase of

construction, details of each control used, details of all outlet structures and velocity dissipation controls, a description of procedures to maintain all erosion and sediment control measures, and a description of post-construction stormwater management. The locations of all stockpiled materials must be shown along with necessary erosion control measures. The Plan will need to show the locations of any needed retaining walls, and specific slope treatments to control erosion during construction as well as to provide for long term stabilization. The construction stormwater general permit requires that areas to be graded with slopes steeper than 3:1 (horiz:vert) and higher than 15 feet shall be grade with appropriate slope benches in accordance with the Guidelines. The construction stormwater general permit and the Guidelines highly recommend phasing of the construction as much as possible to avoid disturbing more than 5 acres at one time. Stabilizing one area of disturbance prior to opening up the next phase minimizes the potential for erosion and sediment loss.

The permit requires inspections by qualified personnel provided by the permittee at least once every seven calendar days and after every storm of 0.1 inches or greater. In addition, monthly inspections of stabilized areas must be conducted for at least three months *following* stabilization. The plan should note the qualifications of personnel doing the inspections and must allow for the inspector to require additional erosion and sediment control measures as necessary.

The permittee shall provide a copy of the Stormwater Pollution Control Plan to all contractors or developers conducting activities that may affect stormwater runoff. These additional contractors and developers must sign the contractor certification (Section 6(b)(6)(E)).

The Stormwater Pollution Control Plan must be maintained on site during construction and updated as necessary.

Comments Regarding Site Development

- The site is within ½ mile of Natural Diversity Database areas. Coordination with the DEP Wildlife division early in the planning process is recommended.

- Because of the shallow groundwater table known to exist in the area, dewatering of site excavations is to be expected. The Stormwater Pollution Control Plan must include specific provisions for dewatering to prevent the discharge of sediment to wetlands or waterbodies. Section 6(b)(6)(C)(ii) of the construction stormwater general permit recommends that dewatering wastewater be infiltrated into the ground where feasible, but if the discharge must be directed to a surface water then measures must be taken to minimize discoloration of the receiving stream. Chapter 5 of the Guidelines contains recommendations for controlling runoff and retaining sediment from dewatering operations.

- Particular care in preparing for and maintaining erosion and sediment controls will be needed in the areas of steep slopes in the west and southwest portions of the site, and near the delineated wetlands. Temporary diversion swales should be used to direct stormwater runoff away from steep slopes and into sediment traps/basins or other sediment control measures. Where possible, stormwater runoff from undisturbed areas within and around the property should be diverted away from disturbed soils. It is recommended that as much natural buffer as possible be maintained between construction activities and the wetlands.

- It is recommended that fueling of vehicles be performed off-site or that an impervious, covered fueling area be created at the site to protect groundwater resources. In addition, the Plan should address specific activities, as well as the storage and handling of materials used during construction with the potential to contaminate groundwater supplies (i.e., paints, solvents, concrete washout, truck rinsing, etc), and include specific spill prevention and control measures. Equipment and construction vehicles should be inspected regularly for leaks.

- The Plan must include a discussion of how the kettle hole will be incorporated into the project. Specifically, how much fill will need to be brought onto the site, if and how such material might need to be stockpiled, if a separate construction entrance might be needed, street sweeping, etc.

- A discussion of Low Impact Development (LID) techniques, stormwater management, and resource materials has been provided by other DEP staff. The applicability of those techniques, as well as other stormwater management methods such as detention basins, will need to be evaluated in light of the location of the site on a GAA Level B aquifer protection area and the shallow ground water table.

Post-Construction Stormwater Permitting – Commercial Activity

Commercial activities with 5 acres or more of contiguous impervious surface, i.e., all paved and roof areas, requires registration under Connecticut's *General Permit for the Discharge of Stormwater Associated with Commercial Activity* ("commercial general permit"). In addition to the submittal of the registration, conditions of the commercial general permit include the preparation of a site-specific, post-construction Stormwater Management Plan that addresses outside storage, sweeping of paved areas, catch basin clean-out, spill prevention and control procedures, inspection and maintenance of stormwater management structures and record keeping.

Low Impact Development and Water Quality

Introduction

These recommendations to the Town of Bolton are given from the perspective of improving or maintaining water quality and supporting designated uses of the waters of the State in accordance with Connecticut's Water Quality Standards[1]. These recommendations also reflect the Department of Environmental Protection's (DEP) growing commitment to address water quality concerns from a watershed perspective, taking into account the cumulative impact of numerous activities within a given watershed that may affect water quality.

Watersheds are natural drainage divides that may vary in size from the small drainage of a backyard pond to the drainage of headwaters streams and tributaries of lakes and rivers. It can be an easily identifiable landscape unit that ties together terrestrial, aquatic, geologic, and atmospheric processes. Land use planning at the watershed scale is an effective way to guide future development so as to minimize impact on both water quality and natural resources; direct available technical and financial resources to restoration and enhancement needs; facilitate partnerships to promote land and water resource stewardship; and develop actions to measure progress. Management decisions involving river resources must be made comprehensively and from an overall basin perspective. Integrated water use, water quality, land use data, and the in-stream biotic resource and habitat needs must be considered in river management decisions.[2]

As an additional consideration, choosing innovative approaches which minimize land disturbance and preserve natural buffers and open space (like cluster housing)can not only minimize nonpoint source pollution and protect the environment, but also reduce infrastructure costs while affording neighborhoods the opportunity to stay connected with their environment. As we look to the new building ideals and practices of "Smart Growth", greenways, environmental equity, and better land use planning, it is important for all towns to consider and address all of the impacts, current and future that are associated with new development.

Proposed Project

[1] State of Connecticut, Department of Environmental Protection. Effective 1996 & 2002. Water Quality Standards. Bureau of Water Management – Planning and Standards Division. Hartford, CT.

[2] State of Connecticut, Office of Policy and Management. 2005. Conservation and Development Policies Plan for Connecticut 2005-2010. Intergovernmental Policy Division. Hartford, CT.

The proposed mixed use commercial development on 29 acres at 98 Boston Turnpike (Route 44) and Cider Mill Road, Bolton, Connecticut, consists of 724 parking spaces and approximately 160,000 square feet of retail space as shown on the Proposed Site Plan L2.1 for Cider Mill Village provided at the ERT meeting on May 22, 2008. Most of the property is now zoned as General Business Zone (zone change 3-12-2008) with a smaller portion zoned R-2(zone change 3-12-2008). It lies within the Level B (Preliminary) Aquifer Protection Area for the towns of Bolton and Manchester. The Town of Manchester owns well fields on property to the West of the project site. To the North, the property is bordered by residential development, to the East by Cider Mill Road and to the south by Boston Turnpike (Rt. 44). A portion of the site, equal to the previous commercial zone, is within the Bolton Lakes Regional Water Pollution Control Authority's Sewer Service Area.

Brief Site Description

The property of concern is located within the watershed of the Hockanum River Regional Basin and its tributaries of Lydall Brook and Wilson's Brook. The soils on the property are stratified drift deposits of sandy loam complexes that are classified as well to excessively well-drained. The property is undulating in nature with a general slope from the East to the West with an overall elevation change of 90ft (544' to 454') over approximately 1200ft distance. There are steep slopes along the Southwest, West, and Northwest portions of the property. There is also a kettle located just to the southwest of the center of the property. The trees on the site are mostly conifers with some deciduous. There are wetlands along the Southwest corner of the property and are associated with a stormwater drainage channel that runs along the southern portion of the property along Rt.44. This drainage runs into Wilson's Brook. A concrete structure was discovered adjacent to the drainage stream at the base of the steep slope while on the site visit that is not shown in the 2002 Environmental Site Assessment Report compiled by Levine Fricke Inc. of Hartford, CT. It was thought during the ERT field visit that it might be an old well house.

Water Quality Classification

Water Quality Classifications, based on the adopted Water Quality Standards, establish designated uses for surface and ground waters and identify the criteria necessary to support those uses. The designated use and criteria serve to focus the department's water quality management activities, including establishment of water quality based treatment controls and strategies required by the federal Clean Water Act[3]. Wilson's Brook is an AA classified stream. AA classified surface waters are designated for: existing or

[3] State of Connecticut, Department of Environmental Protection. Effective 1996 & 2002. Water Quality Standards. Bureau of Water Management – Planning and Standards Division. Hartford, CT.

proposed drinking water supplies; habitat for fish and other aquatic life and wildlife; recreation; and water supply for industry and agriculture. Wilson's Brook joins to Lydall Brook, a B/AA and B/A classified stream. Surface waters classified as A are designated for: habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture. Lydall Brook joins the Hockanum River at Union Pond. The property is currently located in a level B Aquifer Protection Area and has a groundwater quality goal of Class GAA with the following designated uses: existing or potential public supply of water suitable for drinking without treatment; baseflow for hydraulically-connected surface water bodies. For more information regarding the water quality classifications for surface and ground water, please refer to the Water Quality Standards document found at: http://www.ct.gov/dep/lib/dep/water/water_quality_standardsl/wqs.pdf

Leachate and Wastewater Discharge Inventory

There are no known wastewater discharges or leachate sources (LWW) included in the Connecticut DEP databases for this property. There is an active LWW discharge record (4500054) for an area across Rt. 44 associated with a former gas station.

Contamination or Potential Contamination Sites

The Department maintains a database of "Hazardous Waste Facilities" as defined in Section 22a-134f of the Connecticut General Statutes. A review of the listings within the Town of Bolton does not indicate any sites within or proximate to this proposed development site.

Registered Underground Storage Tanks (USTs)

There are registered USTs in the CTDEP database in the immediate area of this parcel associated with the Mobil station.

Consumptive Water Diversions

The Department maintains a database of registered and permitted water diversions. There are three registered diversion records (4500-025-PWS-GR, 4500-025-PWS-GR, and 4500-027-PWS-GR) that are associated with the three Manchester water supply wells located on the adjacent property. While currently inactive, these wells could be used for public water supply and are down-gradient from this parcel.

Aquifer Protection

Since the project site is currently located within a Level B Aquifer Protection Area and could be listed as a Level A APA pending receipt of final documentation, all business will be regulated and be required to register with the DEP if any of the 28 regulated activities will be on their property. See: http://www.ct.gov/dep/lib/dep/aquifer_protection/tablereglanduses.pdf for a list of regulated activities. This aquifer is undergoing evaluation for Level A status with results due to the town within the next few months. Should this property fall in the Level A area, all regulated activities will become prohibited. Please refer to the Aquifer protection section of this report for more information regarding activities in Aquifer Protection Areas.

Because the surface and ground waters are designated as high quality, and the property is in an Aquifer Protection Area with adjacent wells, any proposed development merits further consideration of available, practical measures which can be taken to ensure the protection of these resources from development-related impacts and nonpoint source pollution.

Sewer Service Area

A portion of the property equal to the extent of the previous GB Zoning (300 feet) before the recent zone change is encompassed by the Bolton Lakes Regional Water Pollution Control Authority's Sewer Service Area. Any buildings constructed wholly within this zone will have access to the sanitary sewer that is scheduled to be constructed in the Route 44 area. As written in the Environmental Impact Evaluation prepared by DEP and distributed for public comment, building activities within that sewer service area must comply with the zoning laws that were in effect at the time the BLRWPCA was created. The remaining portion of the property will be required to have on site treatment of waste.

Project Impact Summary

As no official project has been proposed to the Town of Bolton, the Proposed Site Plan L2.1 received on May 22nd at the ERT meeting will be used to provide comments regarding the use of Low Impact Development techniques on this site to minimize stormwater runoff impacts.

Stormwater Management

Runoff from construction and post-construction activities has the potential to pollute wetlands and watercourses downstream of stormwater discharge locations. During the period of construction, the discharge of sediment, particularly during significant storm events, could occur even when non-structural and structural erosion and sediment

controls are installed. Post-construction, the increase in the quantity and peak flow of stormwater runoff could contribute to downstream flooding and erosion problems, as well as transport pollutants such as suspended solids, oil, grease and leaking automotive fluids as well as nutrients and pesticides from the application of lawn care maintenance products.

With the increase in impervious areas, new sources of stormwater pollutants are introduced, with pollutants accumulating between storm events. Rain and snowmelt picks up these pollutants and contaminants (including heat from the pavement, known as "thermal" loading), and is subsequently collected by traditional stormwater conveyance systems (e.g. catch basins and storm sewers) and quickly discharged to receiving waters. This causes environmental pollution and adverse impacts to fish and wildlife and their habitats. Impervious surfaces such as roadways, rooftops, paved driveways, and sidewalks, also decrease the amount of precipitation that percolates through the ground to recharge aquifers which would otherwise be slowly released as base flow to streams during seasonally low-flow periods. In undeveloped areas, natural processes such as infiltration, interception, depressional storage, filtration by vegetation, and evaporation, reduce the quantity of stormwater runoff and act to remove pollutants. The increased volume and velocity of stormwater runoff often exceeds the physical ability of the receiving water body to handle such flows, thereby causing flooding, erosion and sedimentation, and physically altering the aquatic habitat.

The discharge of stormwater runoff to a river can have a deleterious effect on the riverine system well beyond the point of discharge. These effects include:

- Increased runoff volume (as a result of less infiltration) and velocity
    - increased bank erosion and sedimentation of the river or stream channel
- Increased peak discharges (relating to the timing and magnitude of the runoff occurring from a specific storm event)
- Reduced groundwater recharge
    - reduced stream baseflow
- Increased frequency of bankfull and overbank floods
    - channel scour, widening, and downcutting of the receiving stream
    - streambank erosion and increased sediment loads
    - loss of pool/riffle structure within streams (important habitat areas)
- Destruction of wetlands, riparian buffers and springs, and burying of stream substrate
    - settling of suspended sediments carried or eroded by stormwater discharges which can destroy benthic habitat, thereby impacting the food chain for fish and wildlife
- Reduction in the diversity, richness, and abundance of the stream community (aquatic insects, fish, amphibians)
    - discharge of excess nutrients from lawn fertilizers, detergents, grass clippings, leaves, pet wastes, and atmospheric deposition of air-borne pollutants which can cause excessive algal growth, depleting oxygen from the water and stressing or suffocating aquatic life

  - discharge of other contaminants such as automobile oils and fluids, vehicle and tire wear, pesticides, and atmospheric deposition of air-borne pollutants which can adversely affect the aquatic ecosystem
  - impacts to the aquatic biota due to stress caused by the increased temperature of stormwater runoff
- Exacerbation of the general cumulative effect of stormwater discharges basin-wide which can alter stream morphology and dynamics, leading to increased flooding, erosion, and degraded riverine systems.

From this perspective, treating and reducing runoff from all developed sites and reducing the amount of impervious surfaces, where feasible, will help to minimize surface water pollution and flooding problems caused by storm events. This is where Low Impact Development techniques become a valuable tool in the initial site planning and design of any development project.

Low Impact Development

Low Impact Development (LID) incorporates various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs while allowing land to be developed in a cost-effective manner that helps mitigate potential environmental impacts. The goal of LID is to prevent any measurable harm to streams, lakes, wetlands, and other aquatic systems from residential, commercial, or industrial development projects through the use of various storm water management techniques that store, infiltrate, evaporate, and detain runoff in order to mimic the predevelopment hydrologic characteristics of the development site. The use of these techniques can reduce off-site runoff and ensure adequate groundwater recharge. There are several different categories of Low Impact Development practices and any number or combination can be used in new construction or redevelopments projects and include Conservation Designs, Infiltration Practices, Runoff Storage, Runoff Conveyance, Filtration and Low Impact Landscaping techniques.

The incorporation of Low Impact Development techniques into a development project can serve several purposes including the preservation of open space and minimizing land disturbance. The first step to including LID in a development is to identify the important natural resources on the site that require protection. Once these are identified, a design can be created that will accomplish the goals of the development as well as the protection of the natural resources on the site. There are several items of concern associated with development activities on this site. These are the stream and associated wetlands located along the southwest corner of the property and the adjacent steep slopes along with the overall rolling and hilly nature of the site, in particular the large glacial kettle hole located almost in the center of the property. In addition, the site borders Town of Manchester well fields and is located in an aquifer protection area. It will be important to know what hydrological impacts to the well supply may happen were development to take place, as well as to the wetlands on the southwest corner of the property. Many of the LID practices mentioned above could be incorporated into a future design for this property in

order to reduce the overall impact of stormwater runoff to the site and surrounding areas. The well drained to excessively well drained soil conditions will be an important consideration for the design and construction of any infiltration devices on the property in order to be sure that pollutants do not get into the groundwater.

The exclusion of any construction activities within the 100-foot riparian buffer area can reduce impacts to the wetlands on the property. The steep slopes of the property are also an area of concern. By limiting activity in these areas, there will be less chance for erosion and sedimentation problems. Because the site is located in an aquifer protection area, ground water recharge is an important consideration for any proposed development on this property. There are also special Best Management Practices that the DEP has for parking lots that are in Aquifer Protection Areas. This document is provided at the end of this report (see Appendix). The minimization or elimination of stormwater runoff from this site can be addressed through several different strategies. The first is through the incorporation of bio-retention areas and grassed swales to collect stormwater runoff from roofs and the parking lots and allow it to infiltrate into the ground. Bioretention is a practice of managing and treating stormwater runoff by using a specially designed planting soil bed and planting materials to filter runoff that is stored in a shallow depression (Prince George's County, Maryland, 1999). Bioretention areas are composed of a mix of functional elements, each designed to perform different functions in the removal of pollutants and the attenuation of stormwater runoff. Bioretention removes stormwater pollutants through physical and biological processes, including adsorption, filtration, plant uptake, microbial activity, decomposition, sedimentation, and volatilization (U.S. EPA, 2000). These areas can be landscaped with low maintenance perennials or shrubs appropriate for the soil and moisture conditions. As previously mentioned, the soils on the site are well drained. This is useful when designing runoff structures designed to infiltrate into the ground. Swale systems require dry soils with good drainage and high infiltration rates for better pollutant removal (Yousef et al., 1985).

Similarly, smaller bioretention areas or "rain gardens" can be used as a functional landscape element that can be incorporated into street median strips, roadway shoulder rights-of-way, and under roof downspouts. The soil absorbs and stores the rainwater and nourishes the garden vegetation. Rain gardens are an effective, low cost method for reducing runoff volume, recharging groundwater, and removing pollutants. These bioretention facilities are most effective if they receive runoff as close as possible to the source and are incorporated throughout the site (Pennsylvania Association of Conservation Districts et al., 1998). A demonstration of these bioretention practices can be viewed at the Glen Brook Green Subdivision, located in the Jordan Brook subwatershed in Waterford, CT. Additionally, the UCONN - Cooperative Extension System's NEMO (Nonpoint Education for Municipal Officials) website at: http://nemo.uconn.edu has a searchable database of LID projects from around the state.

According to the Site Plan, buildings 1, 2, 6, 7, 8, and 9 currently show areas where rain gardens could be incorporated into the landscaping design to capture roof runoff. Rain gardens in close proximity to the building can effectively disconnect downspouts from

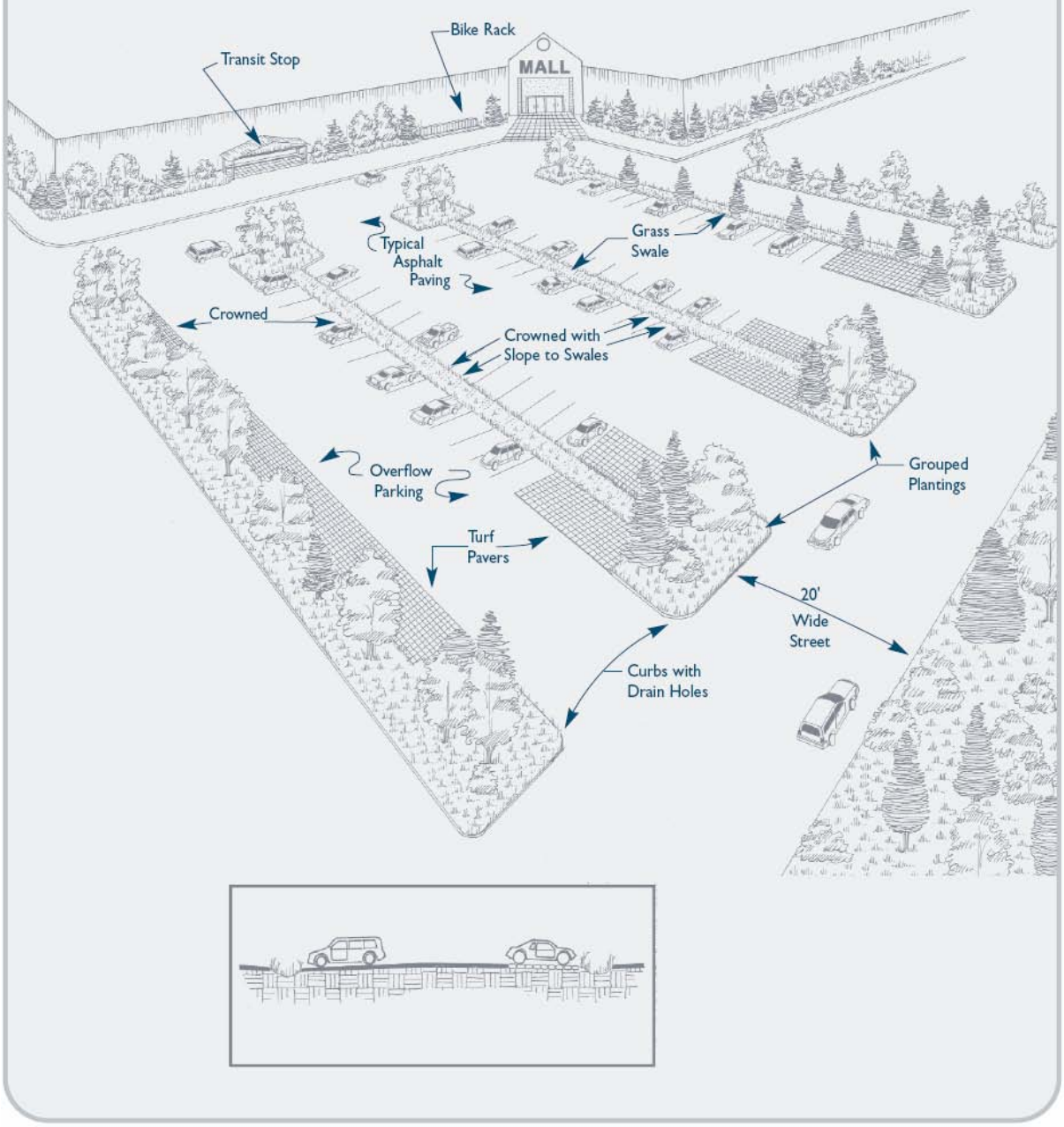
adjacent impervious areas. The remaining buildings, particularly building 10 do not appear to have adequate areas reserved to allow for close proximity infiltration. This large anchor store will have a roof area approximately the size of a football field. A greenroof could be incorporated into the design of the building in order to intercept rainfall and thereby limit the amount of runoff to downspouts. There are a number of greenroof projects throughout the state and some local companies are beginning to specialize in greenroof installations. Additionally, and ideally, the roof drains should be directed to rain gardens or bio-retention areas to further decrease the amount of runoff.

Runoff from the parking areas must also be considered in addition to loading zone "hot spots" which can have higher pollutant levels than the surrounding pavement. Several options can be considered to address this including bio-retention, swales and tree box filters. Instead of using traditional road curbing which is designed to collect and direct stormwater runoff, road sands and pollutants to the storm drainage collection system, it would be less expensive and more prudent to use sheet flow and vegetated drainage swales to promote groundwater infiltration; thereby replenishing groundwater supplies and reducing maintenance, such as seasonal sweeping, catch basin cleaning, and maintenance of the infiltration basin.

The proposed site plan shows several acres of paved surfaces. Increasing impervious surfaces leads to more runoff and transport of more pollutants. Paved areas such as roads and parking lots should be reduced as much as possible. Parking areas generate rapid stormwater runoff and carry along with it all of the pollutants from automobiles. Multiple options exist to combat the impacts of runoff from the proposed parking areas. There are several types of permeable pavement, including porous asphalt and concrete, concrete block pavers and structural grass that allow for infiltration of precipitation and can reduce or eliminate the need for structural stormwater controls. These products provide an excellent means of infiltration and can provide removal of several pollutants, including suspended solids, metals, phosphorus and petroleum hydrocarbons (University of New Hampshire Stormwater Center). Permeable pavement could also be used within the parking areas only while the travel lanes are paved with the traditional asphalt system. In a porous pavement system, roof drains from adjacent buildings can be linked to the underlying gravel layers of the system, which would allow that runoff to infiltrate into the ground. A curb less design for the parking lots in conjunction with bio-retention areas and grassed swales can intercept and filter runoff and associated pollutants. A curbed design with the addition of curb cuts to allow runoff to filter into the swales and bio-retention areas is another option that could be considered.

Shown below is figure 4-4 from the 2004 CT Stormwater Quality Manual. It illustrates an alternative design for a parking lot that incorporates many Low Impact Development features such as narrower streets, permeable pavers and infiltration swales. These concepts should be considered when designing the parking area for any development plan on this property. Also, roof drains can be connected to the sub-base material underlying the permeable pavement system in areas where a rain garden may not be able to handle the runoff volume. Traditionally, porous pavement has had limited application in cold climates such as Connecticut due to the potential for clogging as a result of sand application, although porous pavement has been successfully used for some parking lot

Figure 4-4 Alternative Parking Lot Design Schematic



Source: Metropolitan Council, 2001 (adapted from Robert W. Droll, ASLA, in Wells 1994).

applications in New England where the underlying soils are sufficiently permeable. An effective property management plan for post development maintenance should have provisions for no application of sand in the winter. For additional information regarding porous pavements, view UCONN - Cooperative Extension System's NEMO (Nonpoint Education for Municipal Officials) website at: http://nemo.uconn.edu as well as The University of New Hampshire Stormwater Center at: UNH Stormwater Center :: Environmental Research Group :: University of New Hampshire.

Additionally, tree filter boxes such as those shown at left could be incorporated into the proposed islands located throughout the parking areas in combination with swales and bio-retention areas. Tree box filters typically have an under drain system and therefore are used in conjunction with a traditional stormwater conveyance system as the primary receiving area. An overflow is included with the design in case of large storm events. The Town of Killingly is considering the use of tree filter boxes as part of its stormwater retrofit project located within its downtown area. The use of lawn areas is less desired for use as a filtering area as they are less permeable than areas with natural vegetative ground cover and mulched areas. Providing more areas of mixed vegetation (groups of ground cover, shrub and over story) decreases lawn areas, and provides all of the other benefits of vegetated landscapes.

Note that infiltration may not always be practical or feasible. For example, infiltration practices should not be placed over fill materials and should be located at least 75 feet away from wells, septic systems, surface water bodies, and building foundations (at least 100 feet up gradient and at least 25 feet down gradient from building foundations), although stormwater runoff from rooftops may be directed to the ground, provided that the discharge is located away from the septic system (consult a professional civil engineer, the USDA Natural Resources Conservation Service, or the North Central Conservation District).

There are a variety of ways to retain stormwater close to the source on this site and thereby save on conveyance structures (pipes and catch basins), and reduce the size of end of system detention basins. Retaining stormwater upslope can assist with minimizing overall site disturbance. This can be accomplished by eliminating the curbing on parking areas and roads and using grass filter strips, grass lined swales and bio-retention areas to accommodate runoff. Swales and similar measures should be used in conjunction with (reduced size) detention basins. In rectangular parking areas narrow (linear) vegetated stormwater retention structures can be used instead of raised vegetative strips as typically used in parking areas.

The use of best management practices to reduce the amount of impervious surfaces, disconnect flow paths (i.e., downspouts connected to storm sewers), and treat storm water at its source all help minimize the impacts to local hydrology. Attainment of these goals can lead to the protection of water quality, reduction of impervious surfaces, increased open space, protection of trees, reduced land disturbance, decrease in infrastructure costs, and reduced homeowner energy bills (HUD, 2003). The use of Low Impact

Development techniques on this property can be a valuable tool in the management of stormwater and recharge of ground water on the site. This property also has the added advantage of its close proximity to The University of Connecticut campus where several LID projects are underway. It may be advantageous for the developer/owner and the Town to partner with the University to implement many of the LID practices suggested here and become a model for development for the entire state.

Stormwater Treatment

Stormwater treatment practices remove pollutants from stormwater through various physical, chemical, and biological mechanisms. Since many pollutants in stormwater runoff are attached to solid particles, treatment practices designed to remove suspended solids from runoff will remove other pollutants as well. Exceptions to this rule include nutrients, which are often in a dissolved form, soluble metals and organics, and extremely fine particulates that can only be removed by treatment practices other than traditional separation methods. By promoting infiltration, the volume is reduced and impacts to water quality and quantity are minimized. Thus, stormwater must be addressed with appropriate Best Management Practices.

Stormwater Quality Manual

DEP's new guidance document, the 2004 Connecticut Stormwater Quality Manual[4], provides guidance on the measures necessary to protect the waters of the state from the adverse impacts of post-construction stormwater runoff. The manual focuses on site planning, source control and pollution prevention, and stormwater treatment practices, and is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management. It also includes innovative and emerging technologies as secondary treatment practices.

The manual describes both primary treatment practices, which provide demonstrated, acceptable levels of water quality treatment, and secondary treatment practices that are not suitable as stand-alone treatment facilities but can be used for pretreatment or as supplemental practices. The five major categories of primary stormwater treatment practices are:

- Stormwater ponds
- Stormwater wetlands
- Infiltration practices
- Filtering practices
- Water quality swales

[4] Connecticut Department of Environmental Protection. 2004. 2004 Connecticut Stormwater Quality Manual. Hartford, CT.

Examples of secondary stormwater treatment practices described include traditional practices such as dry detention ponds, vegetated filter strips and level spreaders, oil/particle separators, and deep sump catch basins. All stormwater treatment practices should be designed, installed and maintained in accordance with the guidelines specified in the manual. For more information on how to control stormwater, this manual is now available at: http://www.dep.state.ct.us/wtr/stormwater/strmwtrman.htm.

Stormwater Construction General Permit

In addition to any local permits that would be required by the Town of Bolton, as well as site plan reviews, the proposed development would be subject to the DEP's General Permit for the Discharge of Stormwater and Dewatering Wastewater Associated with Construction Activities (see http://www.dep.state.ct.us/pao/download/watrdown/Const_GP.pdf). In addition, because the proposed project would result in the disturbance of ten or more acres of land (regardless of phasing) the owner or developer must register the site with the DEP thirty days prior to the commencement of construction activity **AND** file a Pollution Control Plan ("PCP") in accordance with Section 6(b)3(C) of the General Permit. Registrants that are required to submit a PCP must pay an additional plan review fee of $500.00 besides the $500.00 registration fee. Additional stormwater control information will be covered elsewhere in this report.

Buffers

DEP supports and recommends the use of buffers to protect surface water resources from environmental impacts. Leaving a vegetated strip helps protect surface and groundwater quality, and fish and wildlife habitats from nonpoint source pollution. Buffers can trap road sands, contaminants and other pollutants contained in stormwater runoff generated from roadways, parking lots, roof tops, and other impervious surfaces, as well as eroded sediments occurring from natural scour or land moving activities such as site development and other soil disturbances, including farming activities. In addition to the benefits described above, riparian buffers also help moderate the temperature of stormwater runoff before it enters the watercourse, thereby reducing thermal impacts on aquatic wildlife. The riparian corridor is the area immediately adjacent to a watercourse that typically contains wetlands and acts as a buffer to the watercourse. Riparian wetlands may additionally provide valuable wildlife habitat, flood attenuation, water quality renovation, and groundwater recharge, so it is important to protect these areas from degradation. A 50 foot vegetated buffer is typical, but widths can vary depending on such factors as topography, the erosivity of the soil, and the value or sensitivity of the water resource.

To protect riparian buffers from noise, human encroachment, and other development impacts, including stormwater runoff, the CT DEP Fisheries Division recommends a 100-

foot buffer along perennial streams, and a 50-foot buffer zone along intermittent streams[5] measured from the upland boundary of the regulated area, including any riparian wetlands. DEP Fisheries further recommends that this buffer zone remain in a naturally vegetated and undisturbed condition.

To help ensure the protection of water quality in the watershed, maintaining the riparian corridor is essential. Although the applicant has shown the 100' buffer on the concept plan, this alone may not fully protect the natural resources. Often existing beyond riparian corridors are wildlife corridors. These are typically wide, linear tracts of land that allow wildlife to move freely between natural habitats containing both wetlands and uplands. The 100' buffer will certainly assist in this goal, but roadways can often segment these corridors resulting in wildlife habitat fragmentation, especially for smaller wildlife like amphibians and reptiles. (For example, ordinary road curbing can obstruct passage, while Cape Cod–style curbing is more traversable.) It may be appropriate to consider preserving forested uplands beyond the 100' buffer as open space. Efforts to preserve open space help to maintain these corridors and can provide valuable "edge" habitat for wildlife.

Recommendations

The conceptual development plan depicts a heavily built site with large amounts of impervious surface on land that will require extensive grading. A comprehensive and detailed approach to managing stormwater and minimizing environmental impacts should be provided with any proposed development. Notwithstanding, every reasonable opportunity to protect and improve water quality should be employed. One of the most effective means is to maintain vegetative buffers *in their natural state.*

In order to minimize the pollution potential from stormwater, the following is a list of recommended management measures:

- Establish setback or buffer areas (50 feet, minimally, to 100 feet, preferably) within upland areas that are adjacent to wetlands or watercourses.
- Minimize site disturbance by limiting construction activities to areas that will contain buildings or roads. Identify special features that should be preserved (i.e. large, old trees).
- Promote sheet flow over land to the maximum extent possible by: eliminating curbs, utilizing pervious pavement, installing and maximizing the use of vegetative swales, employing level spreaders, increasing and lengthening drainage flow paths, and lengthening and flattening slopes, bearing in mind the goal of minimizing land grading and disturbance.

[5] CT DEP Fisheries Division. 1991. Policy Statement – Riparian Corridor Protection; Position Statement – Utilization of 100-Foot Buffer Zones to Protect Riparian Areas in Connecticut.

- Infiltrate stormwater discharges to the maximum extent possible to promote groundwater recharge and lessen the quantity of runoff needing treatment.
- Install structural stormwater management measures to treat stormwater runoff during construction. Such measures include, but are not limited to, earthen dikes/ diversions, sediment traps, check dams, level spreaders, gabions, temporary or permanent sediment basins and structures.
- Prepare a stormwater management plan, which considers both quantity and quality of runoff for the entire development site, rather than piecemeal during development of each lot.

If proposed, the use of a pre-fabricated stormwater treatment unit can typically remove grit, contaminated sediments, metals, hydrocarbons and other floatable materials from surface waters. However, for the price of a designed, constructed and properly installed stormwater treatment unit (which are effective with sediment and some nutrient/metals pollutant removal from stormwater), the applicant/town may be able to install a properly installed detention basin that addresses clean water issues and peak flow retention, reducing the impacts on the stream corridor.

Although stormwater basins are designed to control stormwater runoff and reduce peak flows, they offer limited water quality benefits. Various other treatment methods for renovating stormwater runoff include: nutrient uptake by hydrophytic vegetation, biodegradation of pollutants by microbial activity, and sediment trapping and filtration by organic or synthetic materials and vegetation. As a pre-treatment practice, it cannot be emphasized enough that infiltration should be utilized to the greatest practical extent to reduce water quantity and improve water quality.

Additional Considerations

A final thought concerns the economic feasibility of the proposed development. While the Route 44 Plan[6] did identify this area of Bolton as a commercial development area, it is inconsistent with the State's Plan of Conservation and Development. In regard to the residential area, what activities will be available to them in this area? Will there be hiking trails, bike paths, etc. that they will be able to use? Residents that will be living in the proposed development will need some connection to activities. Otherwise, they may create their own trails in the undeveloped portion of the property just as the trespassers using ATV's on this property. As stated in the Planning Study Report on page 8: "Although there is an ample supply of valued natural and cultural resources which enrich the lives of both residents and visitors in the corridor, generally the only way to get from one to another is by car. While there are two greenways or off-road trails for bicyclists and pedestrians in the corridor, they travel north/south and then westerly from Bolton

[6] Fitzgerald & Halliday, Inc. In association with TPA Design Group, Inc., URS Corp., and The Louis Berger Group, March, 2008. Route 44/Bolton, Connecticut Strategic Corridor Plan. Online at: http://www.boltonplanningstudy.org/documents/final_draft/Final%20draft%20Rte%2044%20Bolton%203-25-08drh.pdf

Notch to Manchester. Currently, there are no trails, sidewalks, or bicycle lanes connecting the western Bolton Notch area and eastern ends of the corridor."

Additionally, as concerns the economic viability of projects in the area, the report goes on to say that "the market study found that there is a saturation of large-scale retailers within easy driving distance of the corridor. Bolton as a business location cannot compete with this. Pass-through travelers can also stop conveniently in Manchester for services and goods such as banking or coffee. However, residents of Bolton must drive out of the community for these same retail options and services. Nonetheless, the market analysis suggests that the corridor could support development incorporating a variety of uses (residential, office, retail, and public space) that would serve the needs and desires of residents as well as capture some pass-through travelers and capitalize on the recreational assets within and adjacent to the corridor." There were several key concerns noted through the public involvement activities for the Planning study that included:

- Route 44 is not safe for bicyclists or pedestrians – there are no safe pedestrian crossings
- There is a need to change the configuration of the I-384 interchange, particularly the intersection with Notch Road
- There are excessive speeds along Route 44
- There is a need for bicycle and pedestrian linkages between Bolton Notch and the rest of the corridor
- There is a need for better linkages for cars as well as bicyclist and pedestrians between Route 44 and the village center including schools and the library

(1) Do not use direct infiltration structures (galleries, drywells, trenches) as these do not allow for attenuation of salt or other soluble compounds that may be contained in parking lot runoff.

(2) Non-structural measures to dissipate and treat runoff are encouraged, including sheetflow from uncurbed pavement and vegetated swales/basins. These provide an opportunity for volatilization of volatile organic compounds to the extent possible before the stormwater can infiltrate into the ground.

(3) If a stormwater collection system must be installed, it should discharge to an above-ground outlet point (swales, detention/retention basins or surface waters).

   (a) Any catch basins installed should have deep sumps to trap sediments and hoods to trap oil and grease.

   (b) If more than 1 acre of pavement drains to a common discharge point, a gross particle separator should also be installed. Advanced designs for gross particle separators have been developed, such as Vortechnics, Downstream Defender and Stormceptor, that the Department believes are very effective in retaining medium to coarse grained sediments as well as floatables. The last type of separator is designed to treat runoff from areas up to approximately 1 acre in size, while the former two can be sized to accommodate flow from larger areas. It is recommended that the appropriate variety of this or similar type of unit with a cyclonic design be installed in conjunction with each outfall, depending on the size of the drainage area.

(4) Provisions should be made for the periodic maintenance that will be required to insure continued effectiveness of these control measures.

For more information regarding the design of stormwater collection systems, contact Chris Stone of the Permitting Enforcement & Remediation Division at (860) 424-3850.

The Natural Diversity Data Base

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information, there are records for State Special Concern *Clemmys insculpta* (wood turtle) and State Special Concern *Terrapene Carolina Carolina* (eastern box turtle) from the vicinity of this project site.

Eastern box turtles require old field and deciduous forest habitats, which can include power lines and logged woodlands. They are often found near small streams and ponds, the adults are completely terrestrial but the young may be semiaquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year. This species is dormant from November 1 to April 1. It has been negatively impacted by the loss of suitable habitat.

Wood turtles require riparian habitats bordered by floodplain, woodland or meadows. Their summer habitat includes pastures, old fields, woodlands, powerline cuts and railroad beds bordering or adjacent to streams and rivers. This species has been negatively impacted by the loss of suitable habitat.

If this work will be conducted in any Eastern box turtle or wood turtle habitat, the Wildlife Division recommends that a herpetologist familiar with the habitat requirements of these reptiles conduct surveys. A report summarizing the results of such surveys should include habitat descriptions, reptile species list and a statement/resume giving the herpetologist' qualifications. The DEP doesn't maintain a list of qualified herpetologists. The results of this investigation can be forwarded to the Wildlife Division and, after evaluation, recommendations for additional surveys, if any, will be made.

Please be advised that the Wildlife Division has not made a field inspection of the project nor have we seen detailed timetables for work to be done. Consultation with the Wildlife Division should not be substituted for site-specific surveys that may be required for environmental assessments. The time of year when this work will take place will affect this species if they are present on the site when the work is scheduled. Please be advised that should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the DEP Wildlife Division should be requested. If the proposed project has not been initiated within 6 months of this review, contact the NDDB for an updated review. If you have any additional questions, please feel free to contact Julie.Victoria@ct.gov, please reference the NDDB #16156.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Environmental Protection's Geological and Natural History Survey and cooperating units of DEP, private

conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Eastern Box Turtle

(Terrapene c. carolina)

IDENTIFICATION: A medium-size turtle readily distinguished by its high domed shell, and hinged plastron, with moveable front and rear lobes that enable the turtle to completely enclose itself within its shell. The carapace coloration is highly variable, with a pattern of yellow or orange on a brown to black background. New England box turtles are quite large when compared to those found further south, adult carapace length 125-175 mm.

Connecticut is near the northeastern range limit of this species. Box turtles are restricted to the low-lying sections of the state, and rarely are found above 700 feet (Klemens, 1993). Deciduous woodland and overgrown old fields where turtles have ample cover and sunlight are favored. Although a terrestrial turtle, it is still wetland-dependent, returning to water to drink, and to escape heat and drought. Box turtles are often encountered near the edges of wetlands and, in many areas, box turtles retreat into low-lying wet woodland to hibernate. This is a long-lived species and

animals over 100 years old have been reported (Klemens, 1993). Box turtles take well over a decade to reach maturity and have low egg outputs. Therefore, the increase in adult mortality is a critical issue affecting sustainability of turtle population. Whether this loss occurs through road mortality, collection, or even such seemingly benign activities as "rescuing" a turtle crossing the road and releasing it a few miles away, the steady erosion of the viability of many populations in Connecticut is evident. The low-lying sections of the state also have been subject to the most intense development, further challenging the survival of this species. Connecticut law limits possession of box turtles to a single animal (Conn. Code Sec. 26-55-3-D), however box turtles cannot be collected from the wild within Connecticut (Conn. Code Sec. 26-66-14-A). Box turtles are a Connecticut "Special Concern" species, and in 1994 were placed under international trade regulatory protection administered by CITES. The box turtle is of conservation concern in all the states where it occurs at its northeastern range limit, which includes southern New England and southeastern New York.

Wood Turtle

(Clemmys insculpta)

IDENTIFICATION: A medium-sized turtle, readily distinguished by its sculptured, rough, moderately-domed carapace, black head, orange-red wash on its under limbs, and a yellow plastron with black squares along the edges. Adults 150-200 mm carapace length.

In contrast to Connecticut's other turtle species, the wood turtle is an animal of the northern forest biome, from the Great Lakes eastward through New England and northeastern Canada. Its southern range limit lies near Washington, DC. In Connecticut, the strongholds of wood turtle distribution are the eastern and western uplands. Although once quite common in the Central Connecticut Lowland, many populations have been reduced or even eliminated by habitat fragmentation. This species was never common in the coastal zone of the state. Wood turtles have extensive landscape-scale habitat requirements, requiring clean rivers and large streams with deeply undercut banks for hibernation, as well as extensive areas of floodplain, forest, and fields for summer foraging. Because of their extensive

overland movements, they are very susceptible to road mortality. They take over a decade to reach sexual maturity, and have a low egg output, and limited juvenile survivorship. Loss of adults from breeding populations, whether from increased road mortality or by collection for the wildlife trade, is a major problem affecting the sustainability of wood turtle populations in Connecticut. Possession of any wood turtle is prohibited (Conn. Code Sec. 26-55-3-C) in Connecticut without regard to its origin, and collection within Connecticut is prohibited (Conn. Code Sec. 26-66-14-A). The wood turtle is a "Special Concern" species in Connecticut. International commerce in wood turtles posed such a threat that in 1992 this species was placed under international trade regulatory protection administered by CITES (Convention on International Trade in Endangered Species of Flora and Fauna). The wood turtle is of conservation concern throughout most of its range. Most states and provinces where it occurs afford it special status and/or some form of statutory protection.

Community Planner Review

The proposed Cider Mill Village development presents an opportunity for the Town of Bolton to realize goals and objectives established in its recent Route 44 Planning Study. The proposal is generally consistent with state, regional and local plans; however, its feasibility hinges on the developer's willingness to extend sewer service out of Manchester directly to the site. In addition, the Town and developer must be willing to work together to craft new regulations to truly achieve the vision of compact, mixed-use development they both desire: development that is easily navigated by cars and pedestrians alike, and fosters connections to other areas of town, including the civic center.

State Plan Consistency

While the State Plan of Conservation and Development locates the parcel in "Conservation" and "Aquifer Protection" areas, those designations do not necessarily preclude development. They do, however, indicate that care must be exercised in land uses and development design so that natural resources are protected to the greatest extent possible. Groundwater is the primary natural resource of concern on the Cider Mill Site, therefore, uses such as those identified as regulated uses in the model municipal aquifer protection regulations promulgated by the CT DEP, should be avoided.

The proposed residential and commercial development on the Cider Mill property is consistent with the following growth management principles laid out in the *Connecticut Conservation and Development Policies Plan, 2005-2010*:

Redevelop and Revitalize Regional Centers and Areas with Existing or Currently Planned Physical Infrastructure – A portion of the Cider Mill property is slated to receive sewer service in the first phase of the Bolton Lakes Regional Water Pollution Control's planned sewer line extension out of Manchester. Phase One is expected to start construction this fall, and be completed within a year. The site is also well-situated to take advantage of existing transportation infrastructure, as described below.

Expand Housing Opportunities and Design Choices to Accommodate a Variety of Household Types and Needs – As currently proposed the project would include a variety of housing units for the elderly, from multi-family buildings containing six to more than forty units, to duplexes and/or attached town homes, to some single-family units. This variety is important to the overall development concept, as it not only helps to accommodate a variety of needs for elderly residents in the near future, but also facilitates adaptation of units to future housing needs for other segments of the population.

Concentrate Development Around Transportation Nodes and Along Major Transportation Corridors to Support the Viability of Transportation Options – The Cider Mill site is well-situated to take advantage of a variety of transportation options, provided

it is designed to connect to existing infrastructure. The site is located on Route 44 a major east-west thoroughfare with limited bus service currently available. It is also near the terminus of Interstate 384, and Route 6. Finally, the Charter Oak Greenway, a multi-use paved path that will extend from Hartford east to Bolton and the Hop River Linear Trail, is planned to expand along I-384 to Bolton Notch. The developer should consider how to make safe pedestrian connections from Cider Mill Village to the Greenway using Bolton Center Road or Route 44, and collaborate with the Town on making those links.

Provided the development proposal follows best management practices, and the recommendations of this environmental review, it will also be consistent with another growth management principle to: *Protect and Ensure the Integrity of Environmental Assets Critical to Public Health and Safety*.

Regional Plan Consistency

The proposed development is in harmony with similar goals and policies found in the Capitol Region Plan of Conservation and Development, namely, to locate development in areas with existing or planned infrastructure, provide a range of housing types, and a range of viable transportation options. The site is located in an area designated as "development constrained" in the regional land use policy map because of the aquifer protection area. Again, groundwater can be protected by avoiding certain uses and employing best management practices to handle stormwater run-off. Adherence to DEP recommendations regarding aquifer protection will ensure the consistency of the development with regional objectives.

Local Plan Consistency

The Town of Bolton recently completed a plan for the Route 44 corridor, in advance of sewer extension along Route 44 out to Bolton Lake and Vernon. The front portion of the Cider Mill property will have access to the Bolton Lakes Regional Sewer service, once it is constructed. Sewer service will be limited to a band along Rt. 44 frontage, thereby promoting strip development, which the Town has stated it does not want. In order to make use of the entire parcel, and protect groundwater quality, the developer must be willing to take on the financial burden of extending a sewer line out of Manchester specifically for the Cider Mill site. The Town cannot extend its service area beyond that shown in the attached map without jeopardizing state funding for the entire sewer line project.

The developer and his representative indicated that they had had already begun discussions with Manchester Water Pollution Control about the possibility of bringing a line specifically to the Cider Mill property. If the developer is willing and able to extend sewer service to the entire parcel, the type of mixed-use, non-linear development envisioned by both the Town and the developer is feasible.

The Route 44 Plan expresses the Town's desire to focus new development along the Route 44 corridor, in order take advantage of existing and planned infrastructure, as well

as protect rural areas and the Town Center. The Plan emphasizes the need for non-linear or strip development along Route 44 by identifying nodes for preservation and nodes for development at various intensities. The Plan specifically identifies the Cider Mill property as a high-intensity development site that:

> should be [an] area[s] of higher density mixed-use residential and commercial activities with pocket parks and plazas used to create public spaces. Scale should be one- to three-story structures with some medium-box buildings such as a local grocery store; could include a village configuration; emphasis should be on retaining and enhancing existing businesses while also accommodating new uses/infill.

The Plan further elaborates on what is meant by a village configuration as follows:

> A village or neighborhood center can take many forms, depending on location and whether there is existing development nearby. Generally, a village configuration consists of a cluster of development with:
> - narrow streets
> - buildings at one to three stories high
> - a variety of land uses
> - buildings with similar architecture located at the street line
> - parking tucked away in the rear
> - sidewalks, on-street parking, and
> - public gathering spaces such as a neighborhood green or pocket sized parks

The Plan makes several recommendations on steps the Town can take to achieve its vision for the corridor, such as developing new zoning districts and regulations and creating design guidelines. Because the Town just adopted the Route 44 Plan in May it has not had a chance to complete any of its recommendations. The timing of this development proposal requires the developer to work with the local planning and zoning commission to develop appropriate new regulations to satisfy their common interests.

Some of the design issues that are of concern with the conceptual site plan reviewed on the ERT site visit are partially the result of current zoning and regulations. Again, they would best be addressed through cooperation between the Town and developer on creating new regulations and/or zones. For example, the conceptual site plan has mixed uses; however, residential uses are only in the back portion (which is zoned residential), and commercial uses are in the business zone fronting on Route 44. A village configuration would have more fully integrated mixing of uses such as buildings with groundfloor business and commercial, and second and third-story residential. In addition, the conceptual site plan proposed an anchor store with a large parking lot in front of it, and smaller office/commercial buildings on the east side of the property oriented to parking lots. This also fails to meet the standards of a village configuration as described above. Buildings should be clustered together, preferably along a streetline on a pedestrian-friendly narrow street, with parking areas located behind buildings or

elsewhere to reduce pedestrian-auto conflicts, and to encourage walking. The site plan should also better consider pedestrian access from along Route 44, and foster connections to the Charter Oak Greenway and other areas of Town through sidewalks or paths. The site plan should also make accommodations for bus service and possible CT Transit stops within the development, or along Route 44. Finally, the site should strive to include small public open spaces, plazas, etc. where people can gather within the developed area to foster a New England village character.

Transportation Planning Considerations

The Department of Transportation (Department) understands that the project plans shown to the ERT are not finalized. The Department would like to review detailed traffic information before making any final recommendations.

Pertinent issues that should be considered:

General

- State Traffic Commission (STC) major Traffic generator site review will need to be submitted.
- Sufficient turn lanes should be investigated for access points to the "Village" so that traffic flow is not impeded on either Cider Mill Road or Route 44.
- Due to the significant topographic features of the road network in the vicinity of the proposed site; site lines, stopping sight distances and other safety concerns should be thoroughly investigated for all ingress and egress points.
- Due to site line issues, and other topographical challenges, construction equipment and materials should not be "off-loaded" on the roadway.
- The Route 44 Corridor Planning Study for the Town of Bolton should be reviewed. This study can be found on the Town of Bolton's website.

Route 44

- Road widening along Route 44 to provide turning lanes with sufficient storage capacity should also be investigated so as not to hinder thru movement traffic.
- Consideration should be given to locate Route 44 access point opposite Hillcrest Road which terminates west of the RV sales business, signal warrant assessment should also be investigated.
- Review of accident data for all intersections near the proposed site including the Cider Mill/Bolton center Road and Route 44 should be investigated.
- An investigation should be made into providing crosswalks at the intersection of Cider Mill/Bolton Center Road and Route 44.
- Signal timing at the intersection of Route 44 and Cider Mill/Bolton Center Road should be reviewed using forecasted traffic volumes for the proposed project.

Cider Mill Road

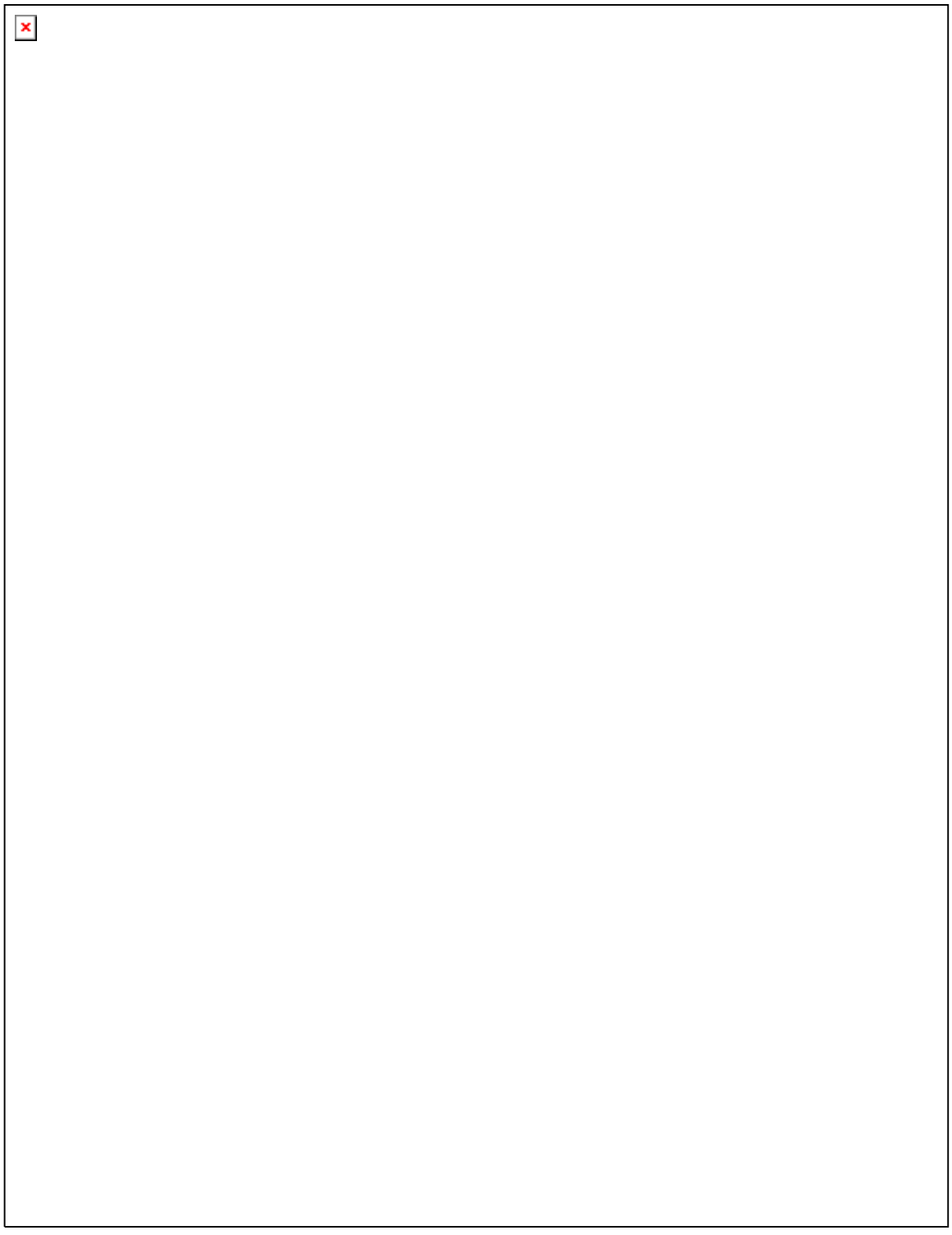
- Widening along Cider Mill Road should provide shoulder and turning lanes, with sufficient storage capacity, where necessary.
- Sight line issues should be thoroughly investigated from Bolton Center Road through Cider Mill Road past the area affected by the second residential egress.

Bike/Pedestrian

- Bike and Pedestrian access should be considered in the scope of the project.
- Given the aims of the town (Route 44 Planning Study) effort should be made to accommodate a bus turn-off and pedestrian access to and from the retail and residential portions of this development.
- Within the development attention to pedestrian access is noted and appreciated. Special care should be given to pedestrian access with regard to potential needs of older residents; sidewalks should be navigable with walker or wheel chair.

Appendix A

Custom Soil Resource Report



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

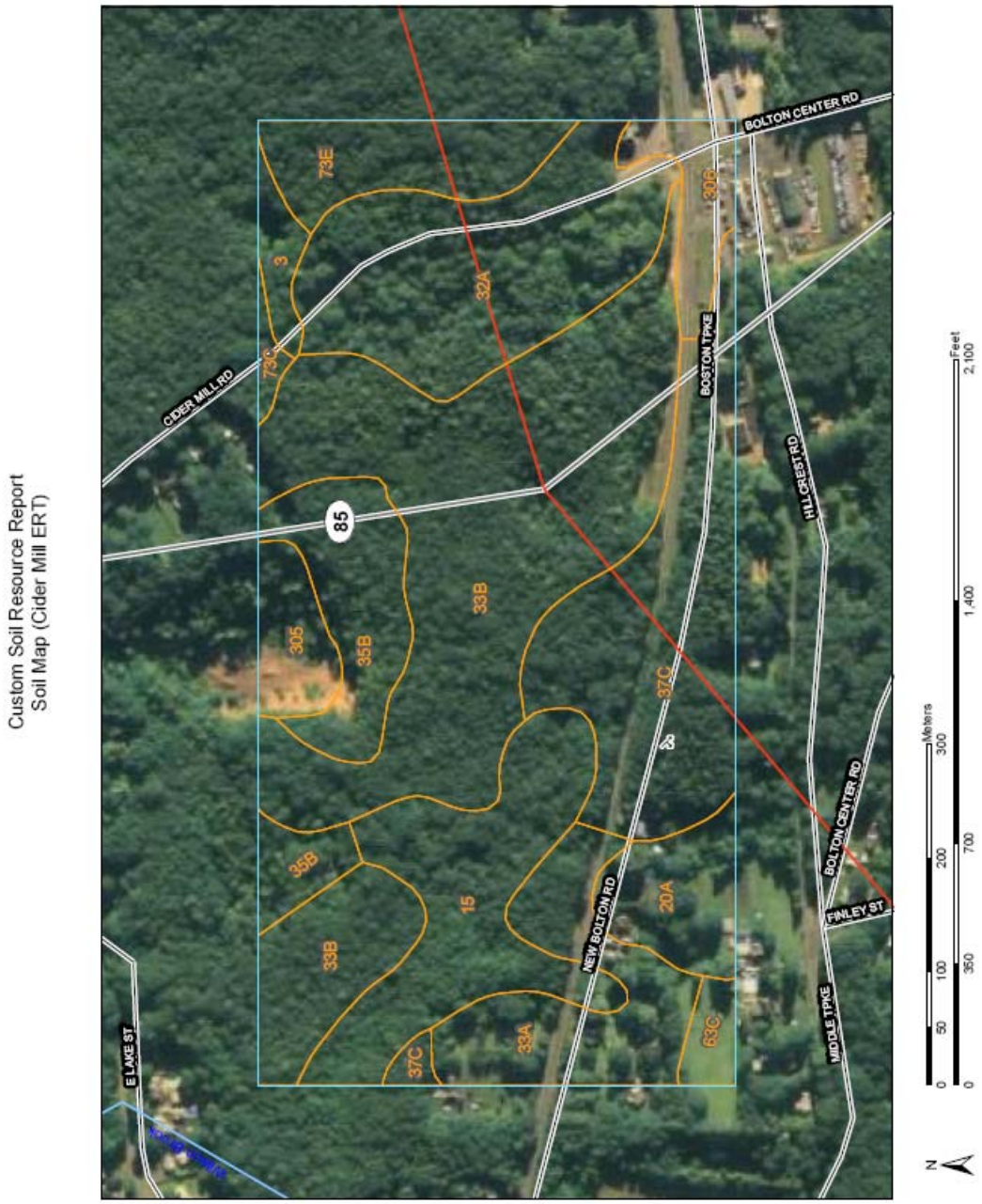
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

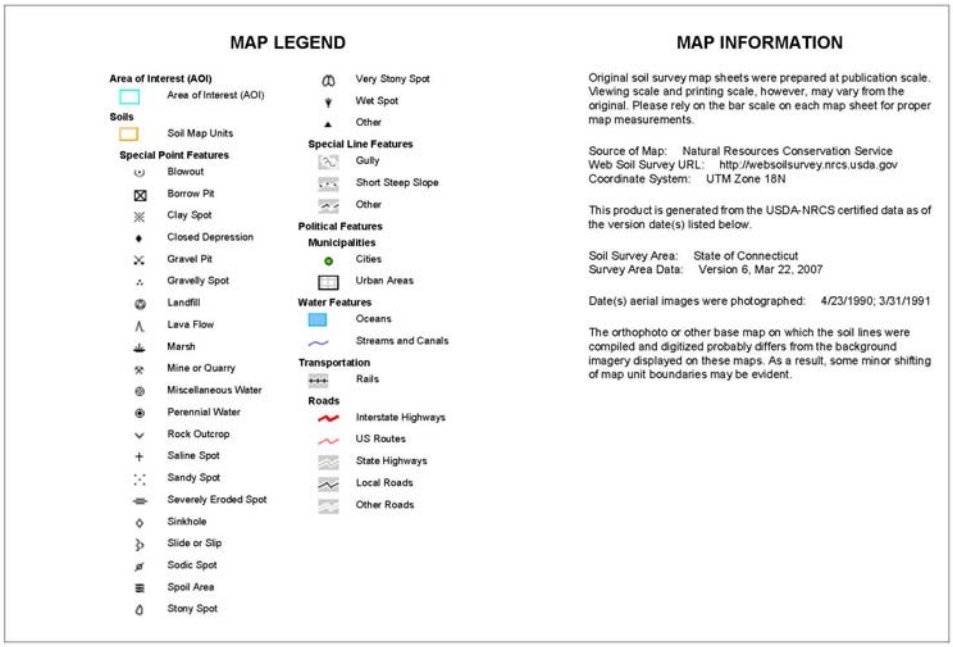
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


Custom Soil Resource Report
Soil Map (Cider Mill ERT)
BOLTON CENTER RD
CIDER MILL RD
85
BOSTON TPKE
HILLCREST RD
NEW BOLTON RD
BOLTON CENTER RD
FINLEY ST
MIDDLE TPKE
E LAKE ST
73E
3
73C
32A
306
305
35B
33B
37C
15
20A
63C
33A
Meters
0
50
100
200
300
Feet
0
350
700
1,400
2,100
N

Custom Soil Resource Report
Legend (Cider Mill ERT)



Map Unit Legend (Cider Mill ERT)

State of Connecticut (CT600)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, extremely stony	1.1	1.3%
15	Scarboro muck	9.2	10.4%
20A	Ellington silt loam, 0 to 5 percent slopes	3.4	3.8%
32A	Haven and Enfield soils, 0 to 3 percent slopes	11.9	13.4%
33A	Hartford sandy loam, 0 to 3 percent slopes	6.7	7.5%
33B	Hartford sandy loam, 3 to 8 percent slopes	27.1	30.6%
35B	Penwood loamy sand, 3 to 8 percent slopes	6.3	7.1%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	12.6	14.2%
63C	Cheshire fine sandy loam, 8 to 15 percent slopes	1.0	1.1%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	0.5	0.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	4.3	4.8%
305	Udorthents-Pits complex, gravelly	2.2	2.5%
306	Udorthents-Urban land complex	2.4	2.7%
Totals for Area of Interest (AOI)		88.6	100.0%

Map Unit Descriptions (Cider Mill ERT)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic

classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar

interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

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3—Ridgebury, Leicester, and Whitman soils, extremely stony

Map Unit Setting

Elevation: 0 to 1,200 feet
Mean annual precipitation: 37 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition

Ridgebury and similar soils: 40 percent
Leicester and similar soils: 35 percent
Whitman and similar soils: 15 percent
Minor components: 10 percent

Description of Ridgebury

Setting

Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from granite and/or schist and/or gneiss

Properties and qualities

Slope: 0 to 5 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 30 inches to dense material
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.6 inches)

Interpretive groups

Land capability (nonirrigated): 7s

Typical profile

0 to 5 inches: Fine sandy loam
5 to 14 inches: Fine sandy loam
14 to 21 inches: Fine sandy loam
21 to 60 inches: Sandy loam

Description of Leicester

Setting

Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Properties and qualities

Slope: 0 to 5 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.9 inches)

Interpretive groups

Land capability (nonirrigated): 7s

Typical profile

0 to 1 inches: Moderately decomposed plant material
1 to 7 inches: Fine sandy loam
7 to 10 inches: Fine sandy loam
10 to 18 inches: Fine sandy loam
18 to 24 inches: Fine sandy loam
24 to 43 inches: Gravelly fine sandy loam
43 to 65 inches: Gravelly fine sandy loam

Description of Whitman

Setting

Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from granite and/or schist and/or gneiss

Properties and qualities

Slope: 0 to 2 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 12 to 20 inches to dense material
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Land capability (nonirrigated): 7s

Typical profile

0 to 1 inches: Slightly decomposed plant material
1 to 9 inches: Fine sandy loam
9 to 16 inches: Fine sandy loam
16 to 22 inches: Fine sandy loam
22 to 60 inches: Fine sandy loam

Minor Components

Sutton
Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Woodbridge
Percent of map unit: 2 percent
Landform: Drumlins, hills
Down-slope shape: Concave
Across-slope shape: Linear

Unnamed, frequently flooded
Percent of map unit: 2 percent
Landform: Drainageways

Unnamed, steep slopes
Percent of map unit: 2 percent

Unnamed, silt loam surface
Percent of map unit: 1 percent

Unnamed, nonstony
Percent of map unit: 1 percent

15—Scarboro muck

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Scarboro and similar soils: 80 percent
Minor components: 20 percent

Description of Scarboro

Setting
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Occasional

Available water capacity: Low (about 4.2 inches)

Interpretive groups
Land capability (nonirrigated): 5w

Typical profile
0 to 12 inches: Muck
12 to 17 inches: Loamy sand
17 to 31 inches: Stratified sand to loamy fine sand
31 to 72 inches: Stratified very gravelly coarse sand to loamy fine sand

Minor Components

Walpole
Percent of map unit: 3 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave

Raypol
Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Natchaug
Percent of map unit: 3 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Catden
Percent of map unit: 3 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Windsor
Percent of map unit: 2 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Sudbury
Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear

Timakwa
Percent of map unit: 2 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Unnamed, silt loam surface
Percent of map unit: 1 percent

Unnamed, sandy loam surface
Percent of map unit: 1 percent

20A—Ellington silt loam, 0 to 5 percent slopes

Map Unit Setting

Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition

Ellington and similar soils: 80 percent
Minor components: 20 percent

Description of Ellington

Setting

Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability (nonirrigated): 2w

Typical profile

0 to 8 inches: Silt loam
8 to 18 inches: Silt loam
18 to 26 inches: Very fine sandy loam
26 to 65 inches: Stratified loamy fine sand to very gravelly coarse sand

Minor Components

Branford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Raypol

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Raynham
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Unnamed, fine sandy loam surface
Percent of map unit: 5 percent

32A—Haven and Enfield soils, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Haven and similar soils: 60 percent
Enfield and similar soils: 25 percent
Minor components: 15 percent

Description of Haven

Setting
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.1 inches)

Interpretive groups
Land capability (nonirrigated): 1

Typical profile
0 to 7 inches: Silt loam
7 to 14 inches: Silt loam
14 to 20 inches: Silt loam
20 to 24 inches: Fine sandy loam
24 to 60 inches: Stratified very gravelly sand to gravelly fine sand

Description of Enfield

Setting

Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability (nonirrigated): 1

Typical profile

0 to 3 inches: Slightly decomposed plant material
3 to 4 inches: Moderately decomposed plant material
4 to 12 inches: Silt loam
12 to 20 inches: Silt loam
20 to 26 inches: Silt loam
26 to 30 inches: Silt loam
30 to 37 inches: Stratified coarse sand to very gravelly loamy sand
37 to 65 inches: Stratified very gravelly coarse sand to loamy sand

Minor Components

Agawam

Percent of map unit: 4 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Branford

Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ninigret

Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave

Tisbury

Percent of map unit: 2 percent
Landform: Outwash plains, terraces

Down-slope shape: Concave
Across-slope shape: Linear

Raypol
Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Unnamed, gravelly surface
Percent of map unit: 2 percent

33A—Hartford sandy loam, 0 to 3 percent slopes

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Hartford and similar soils: 80 percent
Minor components: 20 percent

Description of Hartford

Setting
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits derived from sandstone and/or basalt

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups
Land capability (nonirrigated): 1

Typical profile
0 to 8 inches: Sandy loam
8 to 20 inches: Sandy loam
20 to 26 inches: Loamy sand
26 to 65 inches: Stratified very gravelly coarse sand to loamy fine sand

Minor Components

Manchester
Percent of map unit: 5 percent

Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Penwood
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear

Branford
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ellington
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

33B—Hartford sandy loam, 3 to 8 percent slopes

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Hartford and similar soils: 80 percent
Minor components: 20 percent

Description of Hartford

Setting
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits derived from sandstone and/or basalt

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups
Land capability (nonirrigated): 2e

Typical profile
0 to 8 inches: Sandy loam
8 to 20 inches: Sandy loam
20 to 26 inches: Loamy sand
26 to 65 inches: Stratified very gravelly coarse sand to loamy fine sand

Minor Components

Manchester
Percent of map unit: 5 percent
Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Penwood
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear

Branford
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ellington
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

35B—Penwood loamy sand, 3 to 8 percent slopes

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Penwood and similar soils: 80 percent
Minor components: 20 percent

Description of Penwood

Setting
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits derived from sandstone and shale

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.62 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.8 inches)

Interpretive groups
Land capability (nonirrigated): 2s

Typical profile
0 to 8 inches: Loamy sand
8 to 18 inches: Loamy sand
18 to 30 inches: Sand
30 to 60 inches: Sand

Minor Components

Manchester
Percent of map unit: 5 percent
Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Hartford
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Branford
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ellington
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Unnamed, gravelly substratum
Percent of map unit: 2 percent

37C—Manchester gravelly sandy loam, 3 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Manchester and similar soils: 80 percent
Minor components: 20 percent

Description of Manchester

Setting

Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 9 inches: Gravelly sandy loam
9 to 18 inches: Gravelly loamy sand
18 to 65 inches: Stratified extremely gravelly coarse sand to very gravelly loamy sand

Minor Components

Penwood

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear

Hartford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Branford

Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ellington

Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Unnamed, nongravelly surface

Percent of map unit: 2 percent

Unnamed, gravelly loamy sand surface
Percent of map unit: 2 percent

63C—Cheshire fine sandy loam, 8 to 15 percent slopes

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Cheshire and similar soils: 80 percent
Minor components: 20 percent

Description of Cheshire

Setting
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from basalt and/or sandstone and shale

Properties and qualities
Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 8 inches: Fine sandy loam
8 to 16 inches: Fine sandy loam
16 to 26 inches: Fine sandy loam
26 to 65 inches: Gravelly sandy loam

Minor Components

Wilbraham
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Wethersfield
Percent of map unit: 5 percent
Landform: Drumlins, hills
Down-slope shape: Linear

Across-slope shape: Convex

Yalesville
Percent of map unit: 5 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear

Watchaug
Percent of map unit: 3 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave

Menlo
Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

73C—Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent

Description of Charlton

Setting
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Properties and qualities
Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups
Land capability (nonirrigated): 6s

Typical profile
0 to 4 inches: Fine sandy loam
4 to 7 inches: Fine sandy loam
7 to 19 inches: Fine sandy loam
19 to 27 inches: Gravelly fine sandy loam
27 to 65 inches: Gravelly fine sandy loam

Description of Chatfield

Setting
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Properties and qualities
Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.3 inches)

Interpretive groups
Land capability (nonirrigated): 6s

Typical profile
0 to 1 inches: Highly decomposed plant material
1 to 6 inches: Gravelly fine sandy loam
6 to 15 inches: Gravelly fine sandy loam
15 to 29 inches: Gravelly fine sandy loam
29 to 80 inches: Unweathered bedrock

Minor Components

Rock outcrop
Percent of map unit: 6 percent

Sutton
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Leicester
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave

Hollis
Percent of map unit: 5 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed, red parent material
Percent of map unit: 2 percent

Unnamed, sandy subsoil
Percent of map unit: 2 percent

73E—Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky

Map Unit Setting
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days

Map Unit Composition
Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent

Description of Charlton

Setting
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Properties and qualities
Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups
Land capability (nonirrigated): 7s

Typical profile
0 to 4 inches: Fine sandy loam
4 to 7 inches: Fine sandy loam
7 to 19 inches: Fine sandy loam
19 to 27 inches: Gravelly fine sandy loam
27 to 65 inches: Gravelly fine sandy loam

Description of Chatfield

Setting

Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.3 inches)

Interpretive groups

Land capability (nonirrigated): 7s

Typical profile

0 to 1 inches: Highly decomposed plant material
1 to 6 inches: Gravelly fine sandy loam
6 to 15 inches: Gravelly fine sandy loam
15 to 29 inches: Gravelly fine sandy loam
29 to 80 inches: Unweathered bedrock

Minor Components

Rock outcrop

Percent of map unit: 10 percent

Sutton

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Leicester

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave

Hollis

Percent of map unit: 3 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed, red parent material

Percent of map unit: 1 percent

Unnamed, sandy subsoil
Percent of map unit: 1 percent

305—Udorthents-Pits complex, gravelly

Map Unit Setting
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days

Map Unit Composition
Udorthents and similar soils: 65 percent
Pits: 25 percent
Minor components: 10 percent

Description of Udorthents

Setting
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Gravelly outwash

Properties and qualities
Slope: 0 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 24 to 54 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 5 inches: Loam
5 to 21 inches: Gravelly loam
21 to 80 inches: Very gravelly sandy loam

Description of Pits

Interpretive groups
Land capability (nonirrigated): 8

Typical profile
0 to 65 inches: Very gravelly sand

Minor Components

Hinckley
Percent of map unit: 2 percent
Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Windsor
Percent of map unit: 2 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Merrimac
Percent of map unit: 2 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Gloucester
Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex

Ninigret
Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave

Sudbury
Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear

306—Udorthents-Urban land complex

Map Unit Setting
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days

Map Unit Composition
Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent

Description of Udorthents

Setting
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Properties and qualities
Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)

Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile
0 to 5 inches: Loam
5 to 21 inches: Gravelly loam
21 to 80 inches: Very gravelly sandy loam

Description of Urban Land

Interpretive groups
Land capability (nonirrigated): 8

Typical profile
0 to 6 inches: Material

Minor Components

Unnamed, undisturbed soils
Percent of map unit: 8 percent

Udorthents, wet substratum
Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear

Rock outcrop
Percent of map unit: 2 percent

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Appendix B

1) **Ground Water Quality**
2) **BMP's – Aquifer Protection Areas**
3) **BMP's – Recreational Areas**
4) **BMP's – Construction Operations**

Attachment 1 - Ground Water Quality

Class	General Condition	Designated Use	Resource Type	Allowable Wastewater Discharges
GAA	Natural quality, or suitable for drinking	Existing or potential public supply, stream base flow, industrial & misc .	Public drinking water supply well recharge (GAA), Public drinking water supply reservoir watershed (GAAs)	Domestic sewage, agriculture, water treatment, clean water discharges
GA	Natural quality, or suitable for drinking	Existing private supply, potential private or public supply, stream base flow, industrial & misc	Area of private drinking water supply wells	Same as the above & certain waste of natural origin
GB	Assumed to have some degradation and not suitable for drinking without treatment	Industrial & misc., non- drinking supply, stream base flow.	Groundwater in urbanized areas, not used for drinking water supply	Same as above & certain other biodegradable and soil treatable wastewaters
GC	Quality altered by wastewater discharges	Areas of permitted waste disposal (i.e. landfill), not suitable for drinking.	Ground waters within waste disposal areas	Same as above & certain permitted waste facilities.
GA* & GAA*	Water quality is threatened, or may be impaired	Groundwater quality goal and designated use is Class GA or GAA, however there may be a known or potential impairment sources.		

Consult the adopted WQS & Classifications Maps for further information. For information contact: Planning and Standards Division, Bureau of Water Protection and Land Reuse, Department of Environmental Protection, 79 Elm Street, Hartford, Connecticut, 06106-5127, (860) 424-3020. Copies of Classifications Maps are available at the DEP Publications Office. (6/2008)

Attachment 2 – Bolton ERT

BUREAU OF WATER PROTECTION AND LAND REUSE TECHNICAL GUIDANCE

Best Management Practices – Aquifer Protection Areas

Registered and permitted facilities in Aquifer Protection Areas must certify compliance with Best Management Practices (BMPs) in accordance with Section 22a-354i-9 of the Regulations of Connecticut State Agencies (RCSA). The requirements are outlined below, but please refer to the regulations for the full text.

(a) Every regulated activity shall be conducted in accordance with the following:

(1) hazardous materials may be stored above ground within an aquifer protection area only in accordance with the following conditions:

(A) hazardous material shall be stored in a building or under a roof that minimizes storm water entry to the hazardous material storage area, except that a roof is not required for a bulk storage facility as defined in Section 22a-354i-1(6) of the RCSA,

(B) floors within a building or under a roof where hazardous material may be stored shall be constructed or treated to protect the surface of the floor from deterioration due to spillage of any such material,

(C) a structure which may be used for storage or transfer of hazardous material shall be protected from storm water run-on, and ground water intrusion,

(D) hazardous material shall be stored within an impermeable containment area which is capable of containing at least the volume of the largest container of such hazardous material present in such area, or 10% of the total volume of all such containers in such area, whichever is larger, without overflow of released hazardous material from the containment area,

(E) hazardous material shall not be stored with other hazardous materials that are incompatible and may create a hazard of fire, explosion or generation of toxic substances,

(F) hazardous material shall be stored only in a container that has been certified by a state or federal agency or the American Society of Testing Materials as suitable for the transport or storage of such material,

(G) hazardous material shall be stored only in an area that is secured against un-authorized entry by the public, and

(H) the requirements of this subdivision are intended to supplement, and not

to supersede, any other applicable requirements of federal, state, or local law, including applicable requirements of the Resource Conservation and Recovery Act of 1976;

(2) no person shall increase the number of underground storage tanks used to store hazardous materials;

(3) an underground storage tank used to store hazardous materials shall not be replaced with a larger tank unless (A) there is no more than a 25% increase in volume of the larger replacement tank, and (B) the larger replacement tank is a double-walled tank with co-axial piping, both meeting new installation component standards pursuant to §22a-449(d)-1(e) and §22a-449(d)-102 of the Regulations of Connecticut State Agencies, and with interstitial monitoring;

(4) no person shall use, maintain or install floor drains, dry wells or other infiltration devices or appurtenances which allow the release of waste waters to the ground, unless such release is permitted by the Commissioner in accordance with §22a-430 or §22a-430b of the Connecticut General Statutes; and

(5) a materials management plan shall be developed and implemented in accordance with the following:

(A) a materials management plan shall contain, at a minimum, the following information with respect to the subject regulated activity:

(i) a pollution prevention assessment consisting of a detailed evaluation of alternatives to the use of hazardous materials or processes and practices that would reduce or eliminate the use of hazardous materials, and implementation of such alternatives where possible and feasible,

(ii) a description of any operations or practices which may pose a threat of pollution to the aquifer, which shall include the following:

(aa) a process flow diagram identifying where hazardous materials are stored, disposed and used, and where hazardous wastes are generated and subsequently stored and disposed,

(bb) an inventory of all hazardous materials which are likely to be or will be manufactured, produced, stored, utilized or otherwise handled, and

(cc) a description of waste, including waste waters generated, and a description of how such wastes are handled, stored and disposed,

(iii) the name, street address, mailing address, title and telephone number of the individual(s) responsible for implementing the materials management plan and the individual(s) who should be contacted in an emergency,

(iv) a record-keeping system to account for the types, quantities, and disposition of hazardous materials which are manufactured, produced, utilized, stored, or otherwise handled or which are discharged or emitted; such record-keeping system shall be maintained at the subject facility and shall be made available thereat for inspection during normal business hours by the Commissioner and the municipal aquifer protection agency, and

(v) an emergency response plan for responding to a release of hazardous materials. Such plan shall describe how each such release could result in pollution to the underlying aquifer and shall set forth the methods used or to be used to prevent and abate any such a release;

(B) when a materials management plan is required under either Section 22a-354i-7(d) or 22a-354i-8(c) of the RCSA, such materials management plan shall be completed and certified by a professional engineer or a certified hazardous materials manager, or, if the facility where the regulated activity is conducted has received and maintained an ISO 14001 environmental management system certification, then the registrant may complete and certify the materials management plan; and

(C) the materials management plan shall be maintained at the subject facility and shall be made available thereat for inspection during normal business hours by the Commissioner and the municipal aquifer protection agency.

(b) The development and implementation of a storm water management plan required for regulated activities in accordance with Section 22a-354i-7(d) or 22a-354i-8(c) of the RCSA, shall be as follows: A storm water management plan shall assure that storm water run-off generated by the subject regulated activity is (i) managed in a manner so as to prevent pollution of ground water, and (ii) shall comply with all of the requirements for the General Permit of the Discharge of Storm Water associated with a Commercial Activity issued pursuant to §22a-430b of the Connecticut General Statutes.

Attachment 3 – Bolton ERT

BUREAU OF WATER PROTECTION AND LAND REUSE TECHNICAL GUIDANCE

Best Management Practices (BMPs) for Recreational Areas

Including: Golf Courses, Athletic Fields, Country Clubs, Resorts, and Large Residential Housing Developments (Condominiums)

Recreational areas, such as golf courses, athletic fields, country clubs, resorts, and areas of large residential housing developments, all share in common lawn areas to be maintained. These areas and their associated lawn maintenance practices have the potential to contaminate groundwater in sensitive Aquifer Protection Areas. These practices often involve the mixing and storing of pesticide and fertilizer products, and the cleaning, repair, and maintenance of equipment necessary for lawn maintenance. Follow the Best Management Practices (BMPs) below to reduce the potential to contaminate the groundwater.

Turf Management - Nutrient and Integrated Pest Management (IPM) Plans

Integrated Pest Management (IPM) is defined as the use of all available pest control techniques including judicious use of pesticides, when warranted, to maintain a pest population at or below an acceptable level, while decreasing the use of pesticides. IPM includes the combined use of many techniques.

Some of these techniques include:

- Site scouting or monitoring
- Correct pest and damage identification
- Use of resistant turf cultivars and varieties
- Proper cultural practices (irrigation, mowing, soil aerification and thatch management)
- Soil and plant tissue testing
- Nutrient management
- Weather monitoring
- Physical controls
- Biological controls
- Identification of beneficial organisms
- Record keeping
- Equipment calibration and maintenance
- Good communication
- Precise timing and proper selection of pesticides

A nutrient management plan should be developed that addresses the timing and placement of fertilizers based on seasonal demand or usage of specific turf species, landscape position and weather. Areas of seasonally high water tables should be flagged during typically wet periods in spring and fall. Special care should then be taken in the timing of applications to these areas since they become surface runoff zones during storms.

A full discussion of IPM recommendations is beyond the scope of this fact sheet. Some specific BMPs related to water quality are listed below. For more information see "Integrated Pest Management for Golf Courses", available through the EPA, "Model Integrated Pest Management Plan for Connecticut State Agencies, Ornamental and Turf", available through CT DEP, "Best Management Practices for Golf Course Water Use" (2006), available through CT DEP, "Professional Guide for IPM in Turf for Massachusetts", available through UMass, or "University of Connecticut Turfgrass Nutrient and Integrated Pest Management Guide for Turfgrass" (December 2001) available through UCONN.

Specific BMPs for Turf Management

- Do not apply fertilizer to soggy areas until the water table is lowered enough for the turf to be able to absorb the nutrients. These areas are typically in converging and flatter areas in the landscape, which can be detected during wet periods such as late winter/early spring.
- Avoid spraying pesticides when the soil is saturated or when heavy rains are imminent or under any other conditions where surface runoff may result.
- Establish pesticide free zones around water bodies and near drinking water wells.
- Spray pesticides when the wind is calm. Be careful to avoid drifting of pesticides towards sensitive areas or water.
- Locate compost piles away from surface waters, wetlands and floodplains and not on steep slopes nor in areas with high water tables to reduce nutrient loads to waterways.

Equipment Maintenance, Fueling, Chemical Storage and Mixing Areas

Equipment maintenance, fueling, and chemical storage can impact water quality on and off-site, both during construction and during the maintenance of existing courses. To minimize these impacts follow BMPs for daily operations.

Specific BMPs for Daily Operations

- Store and maintain vehicles and equipment on covered, sealed impervious areas.
- Fueling facilities should be located on concrete paved areas (not asphalt), in paved, roofed areas and equipped with spill containment and recovery facilities.
- Floor drains must be eliminated unless they drain to storage tanks.

- Equipment washing areas must drain to an oil/water separator and from there to a sanitary sewer or holding tank.
- Keep containment booms and absorbent materials on hand for the clean up of spills.
- Employees should be familiar with the locations of all underground structures such as storage tanks, septic fields and storm drains.
- Provide secondary containment for all hazardous materials, including liquid fertilizer storage areas.
- Store all hazardous material in sealed, locked areas or buildings. Identify locations for these materials on the site plan. Register all materials with the fire marshal.
- Locate pesticide, fertilizer and hazardous material storage, mixing and loading areas at least 200 feet away from surface water resources or high water table areas and drinking water wells.
- Locate pesticide, fertilizer and hazardous material storage, mixing and loading areas in separate areas so that they cannot be confused with one another.
- Provide impervious surfaces in mixing areas.
- Dispose of hazardous materials in a manner consistent with the label and regulations.
- Buy fertilizers and pesticides in limited quantities and do not store large volumes of chemicals on site.
- Minimize the use of underground fuel storage and eliminate chemical storage tanks in drinking water ground water supply areas.
- Fueling should be carried out away from surface waters and drinking water wells. Fueling areas should be protected from surface runoff.

Spill Response

The goal of a spill response plan is to have a series of steps in place so employees can respond to an emergency spill safely and swiftly. The policy should be written, employees should be acquainted with it and it should be posted in an easily accessible place.

- Develop plans to be followed in case chemical materials are spilled. Tailor the plans to the specific potential hazards posed by each chemical used on site. The plan should identify all potential hazards, and include safe-handling measures and appropriate spill response procedures.

- Clearly identify the appropriate responding authorities – DEP, state police, or local emergency response. Maintain a list of people to notify in the event of a spill; including drinking water suppliers, if the site is on a public water supply water watershed.

Attachment 4 – Bolton ERT

Best Management Practices (BMPs) for Construction Operations in Aquifer Protection Areas

Issues and Concerns

Potential groundwater quality concerns include fuel and other maintenance chemicals associated with vehicles, machinery, and equipment.

Guidance/Recommendations

For the protection of ground water quality at construction operations in aquifer protection areas, DEP recommends the following:

- Significant storage of fuel and maintenance chemical fluids for excavation vehicles and equipment (as well as any other hazardous materials) should be off-site (out of the Aquifer Protection Area). Vehicle maintenance and refueling should be conducted outside the Aquifer Protection Area to the extent possible.

- If it is necessary to conduct refueling or minor maintenance activities on-site, precautions should be taken to prevent and contain any potential chemical or fuel spillage. All temporary storage tanks shall be above ground and have secondary containment. An impervious containment pad to conduct minor vehicle maintenance and refueling are recommended. A spill control plan should be in place and emergency containment materials should be available on-site.

- The site access should be adequately secured at all times to prohibit any unauthorized disposal of waste materials.

Spill Prevention and Response Procedures

The construction site must have a spill prevention and response plan. The plan may reference any Spill Prevention Countermeasure Control Plan or other Spill Plan that exists for tanks, fuel pumps, hazardous materials or Connecticut regulated materials. Ensure that any prepared or referenced plan includes the items below. Add to this list any procedures specific to locations or materials at the facility. The Plan must, at a minimum, include the following:

- Note where spill equipment is located and that all appropriate personnel are instructed in its use.

- The pollution prevention team leader or the spill coordinator will be advised immediately of all spills, regardless of quantity.

- The spill will be evaluated to determine the necessary response. If there is a health hazard or fire or explosion potential, 911 will be called. If the spill is large or threatens surface or groundwater water systems (including stormwater structures) the DEP Oil and Chemical Spills Unit will be called at 860-424-3338. Any questions on pollution potential of spilled materials should be directed to the DEP Waste Management Bureau at 860-424-3372. The water utility for which the aquifer supplies water shall also be informed.

- The spill will be contained as close to the source as possible with a dike of absorbent materials from the emergency spill kit (such as socks, pads, pillows or "pigs"). Additional dikes will be constructed to protect swales or other stormwater conveyances or streams. A cover or dike will protect any other stormwater structures such as catch basins.

- All waste material shall be disposed of properly, including used absorbent materials. The DEP will be called for any questions about proper disposal of hazardous or regulated wastes.

- Spill response kit(s) will be kept up to date and fully stocked at all times.

Attachment 5 – Bolton ERT

Best Management Practices for Controlling Stormwater in Aquifer Protection Areas

Issues and Concerns

Potential groundwater quality concerns include managing storm water runoff to prevent groundwater pollution.

Guidance/Recommendations

The basic stormwater principals for Aquifer Protection Areas (and other groundwater drinking supply areas) are to prevent inadvertent pollution discharges/releases to the ground, while encouraging recharge of stormwater where it does not endanger groundwater quality.

Management measures include:

- **prevent illicit discharges** to storm water, including fuel/chemical pollution releases to the ground;
- **provide necessary impervious pavement in high potential pollutant release areas**. These "storm water hot spots" include certain lands use types or storage and loading areas, fueling areas, intensive parking areas and roadways (See table below);
- **direct paved surface runoff to aboveground type land treatment structures-** sheet flow, surface swales, depressed grass islands, detention/retention and infiltration basins, and wet basins. These provide an opportunity for volatilization of volatile organic compounds to the extent possible before the stormwater can infiltrate into the ground;
- **only use subsurface recharge structures** such as dry wells, galleries, or leaching trenches, to directly infiltrate clean runoff such as rooftops, or other clean surfaces. These structures do not adequately allow for attenuation of salts, solvents, fuels or other soluble compounds in groundwater that may be contained in runoff; and
- **minimize pavement deicing chemicals**, or use an environmentally suitable substitute such as sand only, or alternative de-icing agents such as calcium chloride or calcium magnesium.

While the emphasis is to minimize groundwater quality impacts of the runoff, a plan should also the extent possible address water quantity changes between pre-development and post-development runoff rates and volumes where possible. Minimizing impervious coverage, disconnecting large impervious areas with natural or landscape areas, and other low impact development techniques should be considered, however direct infiltration of stormwater should be restricted under the following site conditions:

- ***Land Uses or Activities with Potential for Higher Pollutant Loads:*** Infiltration of stormwater from these land uses or activities (refer to Table 7-5 below), also referred to as stormwater "hotspots," can contaminate public and private groundwater supplies. Infiltration of stormwater from these land uses or activities may be allowed by the review authority with appropriate source controls or pretreatment. Pretreatment could consist of one or a combination of the primary or secondary treatment practices described in the Ct. Stormwater Quality Manual provided that the treatment practice is designed to remove the stormwater contaminants of concern.

- ***Subsurface Contamination:*** Infiltration of stormwater in areas with soil or groundwater contamination such as brownfield sites and urban redevelopment areas can mobilize contaminants.

- ***Groundwater Supply Well Field Areas:*** Infiltration of stormwater can potentially contaminate groundwater drinking water supplies in the immediate well field area.

Land Uses or Activities with Potential for Higher Pollutant Loads

Table 7-5 of the 2004 Stormwater Quality Manual

Land Use/Activities	
• Industrial facilities subject to the DEP Industrial Stormwater General Permit or the U.S. EPA National Pollution Discharge Elimination System (NPDES) Stormwater Permit Program • Vehicle salvage yards and recycling facilities • Vehicle fueling facilities (gas stations and other facilities with on-site vehicle fueling) • Vehicle service, maintenance, and equipment cleaning facilities • Fleet storage areas (cars, buses, trucks, public works) • Commercial parking lots with high intensity use (shopping malls, fast food restaurants, convenience stores, supermarkets, etc.) • Public works storage areas	• Road salt storage facilities (if exposed to rainfall) • Commercial nurseries • Flat metal rooftops of industrial facilities • Facilities with outdoor storage and loading/unloading of hazardous substances or materials, regardless of the primary land use of the facility or development • Facilities subject to chemical inventory reporting under Section 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), if materials or containers are exposed to rainfall • Marinas (service and maintenance) • Other land uses and activities as designated by the review authority

For further information regarding the design of stormwater collection systems, see the DEP 2004 Connecticut Stormwater Quality Manual, which is also available on the DEP's website at http://www.dep.state.ct.us/wtr/stormwater/strmwtrman.htm . Contact the Aquifer Protection Area Program at (860) 424-3020 for further questions or information.

Attachment 6 – Bolton ERT

CT DEP Aquifer Protection Area Regulations

Summary List of Regulated Activity (for full description and exceptions see Section 22a-354i-I(34) of R.C.S.A.)

Regulated Activity	
Underground storage or transmission of oil or petroleum	A
Oil or petroleum dispensing for the purpose of retail, wholesale or fleet use	B
On-site storage of hazardous materials (wholesale)	C
Repair or maintenance of vehicles or internal combustion engines of vehicles	D
Salvage operations of metal or vehicle parts	E
Wastewater discharges to ground water other than domestic sewage and stormwater	F
Production of refining of chemicals	H
Clothes or cloth cleaning service (dry cleaner)	I
Generation of electrical power by means of fossil fuels (power plants)	K
Production of electronic boards, electronic components, or other electrical equipment	L
Furniture stripping operations	N
Storage, treatment or disposal of hazardous waste under a RCRA permit (hazardous waste facility)	P
Pest control service	R
Production or fabrication of metal products	T
Printing, plate making, lithography, photoengraving, or gravure	U
Accumulation or storage of waste oil, anti-freeze or spent lead-acid batteries (recycling facility under a state DEP General Permit)	V
Production of rubber, resin cements, elastomers or plastic	*W*
Storage of de-icing chemicals	X
Accumulation, storage, handling, recycling, disposal, reduction, processing, burning, transfer or composting of solid waste (under a state DEP permit; a solid waste facility, landfill, transfer station, composting facility, processing center)	Y
Dying, coating or printing of textiles, or tanning or finishing of leather	Z
Production of wood veneer, plywood, reconstituted wood or pressure-treated wood	AA
Pulp production processes	BB

Regulated Activities allowed if connected to a public sewer system include:

Car or truck washing	G
Industrial laundry service	J
Embalming or crematory services	M
Furniture finishing operations	O
Biological or chemical testing, analysis or research	Q
Photographic finishing	S

About The Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are available as a public service at no cost to Connecticut towns.

Purpose of the Team

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, active adult, recreation/open space projects, watershed studies and resource inventories.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the project site and highlighting opportunities and limitations for the proposed land use.

Requesting a Review

Environmental reviews may be requested by the chief elected official of a municipality and/or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is reviewed by the local Conservation District and approved by the ERT Subcommittee, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 860-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438, e-mail: connecticutert@aol.com.