

**Town of Raymond, New Hampshire
Sourcewater Protection Plan**



Photo of Lamprey River taken from Pecker Bridge

**Prepared by the Southern New Hampshire Planning Commission
For the Town of Raymond**

Funding provided by the NH DES Sourcewater Protection Program

Acknowledgements

Funding for this project was provided by the New Hampshire Department of Environmental Services (NH DES). As requested by the Town of Raymond Planning Board, the NH DES awarded a Local Source Water Protection grant to the Southern New Hampshire Planning Commission (SNHPC) in 2008 to prepare this Source Water Protection Plan.

TABLE OF CONTENTS

Acknowledgements	1
I. INTRODUCTION	5
A. BACKGROUND AND PURPOSE	5
B. PLAN APPROVAL AND IMPLEMENTATION	5
C. PAST PROTECTION – WELLHEAD PROTECTION PLAN (1992)	6
D. GOALS	7
II. PLANNING APPROACH AND METHODOLOGY	7
III. DESCRIPTION OF WATER SYSTEMS	9
A. PUBLIC WATER SYSTEMS	9
B. WELLHEAD PROTECTION AREAS	11
IV. GROUNDWATER RESOURCES	13
A. SURFACE WATER	13
B. WATERSHEDS	14
C. AQUIFIERS	15
V. GROUNDWATER CONTAMINATION	15
A. BACKGROUND	15
B. MOTTOLO PIG FARM SUPERFUND SITE	17
C. POTENTIAL AND KNOWN CONTAMINATION SOURCES	19
VI. VULNERABILITY ASSESSMENT	21
A. SUMMARY	21
B. INVENTORY OF THREATS TO WELLHEAD PROTECTION AREAS	22
VII. THE NEED FOR AQUIFIER PROTECTION	24
VIII. PROTECTION STRATEGIES	25
A. MAINTAINING BEST MANAGEMENT PRACTICES (BMP)	25
B. LOCAL LAND MANAGEMENT AND DRINKING WATER SOURCES PROTECTION PROGRAM	27
D. STORMWATER MANAGEMENT: LOW IMPACT DEVELOPMENT	27
E. STATE RECLASSIFICATION PROGRAM	28
IX. MASTER PLAN ANALYSIS	28
X. ZONING ORDINANCE ANALYSIS	29

APPENDICES

APPENDIX A - MAP 1, 2a, 2b, 2c, 3, 4, 5 and 6

APPENDIX B - SOURCE WATER ASSESSMENT REPORT

APPENDIX C - WELLHEAD SUMMARY REPORT

APPENDIX D: RECOMMENDED AMENDMENTS TO SITE PLAN AND
SUBDIVISION REGULATIONS

APPENDIX E: SUMMARY OF AQUIFER ELECTROMAGNETIC SURVEY
RESULTS

APPENDIX F: SUMMARY OF NH DES LIST OF KNOWN CONTAMINATION
SOURCES IN RAYMOND

INTRODUCTION

A. BACKGROUND AND PURPOSE

A source water protection plan (here after referred to as “the plan”) identifies all of the public water systems (here after referred to as “systems”) within a community, identifies contaminating land uses and threats to those systems, and suggests techniques to manage and prevent the threats from contaminating the drinking water supply. This plan is prepared specifically for the Town of Raymond, New Hampshire and identifies all the current designated public water systems within the community. A public water system is defined as:

A system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year (Chapter Env-ws 300 NH Drinking Water Rules).

The public water systems in Raymond utilize groundwater as the source of drinking water supply. Groundwater is one of the most valuable natural resources within a community and contamination can limit its use and value as a source of drinking water. Contaminants can also affect human health. The purposes of this plan are to (1) identify and study the potential threats to groundwater in Raymond within designated wellhead protection areas, (2) summarize how the town is currently working to protect drinking water, and (3) recommend changes to better protect it.

The plan contains the following components:

- An overview and inventory of the active public water systems in Raymond.
- A delineation of wellhead protection areas (WHPAs) in Raymond.
- An inventory of potential contamination sources (PCSs).
- An assessment of risks posed by the PCSs.
- The development of a management and protection program to address these threats, primarily consisting of recommendations for improvements to the town’s land use regulations to enhance source water protection.

B. PLAN APPROVAL, IMPLEMENTATION AND UPDATE

The Director of Public Works and the Town of Raymond’s Technical Review Committee (TRC) have overseen the development of this plan and have recommended that the TRC be responsible in guiding the implementation of the plan as well as future plan updates and amendments. The Town of Raymond Planning Board should be responsible for overall plan adoption and developing and implementing the recommended land use regulations contained within this plan. This also includes drafting necessary warrant article(s) for Town Meeting consideration.

In approving this plan, the Raymond Planning Board should hold a public hearing to seek public input and comment. After the public hearing and upon review of public

comments, the plan should be recommended for adoption by the Planning Board as an element of the Town of Raymond's updated Master Plan.

Lastly, it should be the responsibility of the Technical Review Committee to update this Plan every three years. To assist the town in updating the Plan, an annual review checklist is provided at the front of this document. The SNHPC is also available to assist in the update process.

C. PAST PROTECTION – WELLHEAD PROTECTION PLAN (1992)

In 1992, the Southern NH Planning Commission prepared a Wellhead Protection Plan for the Town of Raymond. The purpose of that plan was to develop and implement a local wellhead protection program to prevent or minimize the potential for contamination of the Town of Raymond's municipal water supply.

The 1992 plan included a delineation of the Wellhead Protection area and a delineation of the Lamprey River Aquifer which extends beyond the wellhead protection area. The wellhead protection area and the aquifer were then overlaid with tax property maps.

A list of parcels was compiled to identify every parcel contained wholly or partially within each of these boundaries. The list was further refined to identify potential contamination sources. These potential contamination sites were then verified in the field. A total of thirty-five (35) parcels were identified as potential contamination sources in the 1992 plan. On-site inspections were then conducted. Eleven of the original sites were dropped from the list because it was determined that they did not qualify as potential contamination sources and three (3) additional sites, which were not on the preliminary inventory, were picked up in the field. As a result, the list was reduced to a total of twenty-seven (27) potential contamination sources located within or immediately adjacent to the delineated wellhead protection area.

The 1992 plan recommended that the Town's existing Groundwater Protection zoning district be amended to reflect the revised aquifer boundary and that specific changes be made to the ordinance to bring it in line with the NH DES new groundwater protection model at that time. Also, the plan recommended specific changes to the Town's site plan/subdivision regulations.

Today, this wellhead protection program is implemented by the Public Works Director and has been incorporated as part of the Town of Raymond's Zoning Ordinance (Article III, Section 3.340) since 1992. In addition, groundwater reclassification amendments have been requested and implemented and the original 1992 wellhead protection area boundary has been recently updated. The new wellhead protection boundary is reflected on the maps contained within this plan.

D. GOALS

While the 1992 Wellhead Protection Plan prepared for the Town of Raymond is still valid and provides adequate measures for protecting the town's groundwater public drinking water supply wells, changes in aquifer protection mapping have occurred, and a new groundwater protection model ordinance has been published by the NH DES (see Revised April 2010 edition). In addition there have been changes in land use within the community and new community water supply systems have been established since 1992. All of these changes and new information necessitate the need for this source water protection plan.

The overall goal of this plan is to protect drinking water supplies and to recommend additional protections within Raymond's applicable planning documents and regulations. This plan also identifies and prioritizes actions needed to strengthen the town's current policies for protecting source water. The plan establishes priorities for both regulatory and non-regulatory actions to better protect the town's groundwater (aquifers) and existing public water supplies from contamination. The plan also provides the Town of Raymond with data, maps, guidance and should serve as an educational tool for town officials, developers, and residents. Also contained within this plan is a summary of all the current active and known public water systems within the community (see Appendix B Wellhead Summary Report). In addition, the plan stresses the importance of groundwater protection as a source of the town's drinking water supply

Specifically the plan identifies existing and potential contamination sources occurring within the areas that contribute water (recharge) to public water supplies and offers recommendations to manage land use and reduce the risk of a spill or other accident that could contaminate the source of drinking water. The plan should be used as a foundation for a comprehensive approach to ensuring Raymond's ground water resources remain free of contamination and available as drinking water for future residents.

II. PLANNING APPROACH AND METHODOLOGY

A carefully researched and documented Source Water Protection Plan is an important step in source water protection to provide guidance, priorities and implementation actions necessary to protect public drinking water sources and groundwater (aquifers) from contamination. Actions taken by water system owners, managers, surrounding landowners, and the municipality are all important in achieving source water protection within the community. A **Source Water Protection Plan** consists of the following elements:

1. An inventory of active public water systems in the community;
2. A delineation of wellhead protection areas (WHPAs);
3. An inventory of potential contamination sources (PCSs);
4. An assessment of risks posed by PCSs; and
5. A land use management program to minimize risks to the water source(s).

These elements can be grouped and completed in the following sequence:

Step One: Source Inventory and Delineation which includes:

- **Wellhead Summary Report**. This is an inventory of all the known active public water systems existing within the community (see Appendix C). The Wellhead Summary Report is compiled utilizing local knowledge and the Source Water Assessment Report (see Appendix B) prepared by NH DES for each municipality within the state.

In the Town of Raymond, a total of 20 active public water systems have been identified and addressed in this plan (see Appendix C).

- **Delineation of Wellhead Protection Area (WHPA)**¹. A WHPA delineation is typically based on hydrogeological studies that identify the *surface area* around the public water well(s) systems(s) that contribute groundwater to the well.²

In Raymond there are currently a total of 18 WHPAs recognized by NH DES among the 20 active public water systems within the community. Some of the active public water systems have more than one well, thus many of the 18 WHPAs overlap as shown on Map 1 and Maps 2A and 2B. All 18 WHPAs, excluding the Town of Raymond's WHPA have been delineated and mapped as concentric circles surrounding each well. The circles vary from 1,000 to 4,000 feet in diameter. In Raymond the size of the circles is based upon the production (pumping) volume of the wells as approved or reported to NH DES. The Town of Raymond's WHPA is delineated based on hydrogeologic studies conducted in accordance with state rules.

Step Two: PCS Inventory and Threat Assessment which includes:

- **Potential Contaminant Source Inventory**. This inventory identifies all the potential contaminant sources (PCS) within and around the wellhead protection areas that could pose a threat to drinking water.³
- **Threat/Vulnerability Analysis**. This analysis determines how susceptible the groundwater or aquifer is to contamination. A vulnerability ranking of "low", "moderate" or "high" has been assigned by the SNHPC based on the hydrogeologic setting and the apparent visible physical risk of the potential contaminant source to pollute the groundwater. Because this grant project does not evaluate specific groundwater quality data which may or may not be available

¹ See page 11 in this document for a definition of a Wellhead Protection Area

² There are a number of methods for delineating WHPAs for public water supply wells. The methods range from simple and inexpensive to complex and costly. Grant funds through NH DES are available for refining delineations. Only the WHPAs mapped by NH DES are accounted for in this plan.

³ See page 19 in this document for a definition of a PCS

for each of the identified public water wells in Raymond, the vulnerability analysis employed in this plan is based upon SNHPC's best field judgment including as applicable consideration of the number of vulnerability rankings found within the NH DES Source Water Assessment Report prepared for Raymond (see Appendix B).

Step Three: Management and Protection Program which includes:

- **Management Program.** This is best developed by a local Source Water Protection Advisory Committee consisting of the regional planning commission, the municipality, and interested and knowledgeable parties and consultants. In Raymond, the Technical Advisory Committee served as the town's source water protection advisory committee in the development of this plan. A Management Program explains how a community's drinking water source(s) will be protected using strategies to address the most significant existing or potential threats. These strategies can include:
 - Education/public participation
 - Land use controls (zoning ordinances, site plan regulations, etc.)
 - Health ordinance and groundwater reclassification
 - BMP management (public or private actions)
 - Land conservation (public or private actions)

It must be noted here that this Source Water Protection Plan does not address existing and/or potential hazardous waste sites and issues within Raymond nor does it address existing and potential brownfields sites. These sites and issues are addressed through other federal and state regulations. Information about the Mottolo Pig Farm Superfund site is included in this plan for information purposes only, but it provides a good example of why source water protection and most notably reasonable and effective land use regulations to protect groundwater are needed at the community level.

III. DESCRIPTION OF WATER SYSTEMS

A. PUBLIC WATER SYSTEMS

As previously noted this plan identifies and describes 20 known active public water systems located within the Town of Raymond each having at least one public water supply well (see Wellhead Summary Report in Appendix C). There may be other systems located within Raymond which are not identified or included in this plan. The SNHPC obtained many of the names of the public water systems from the members of the Raymond Technical Review Committee as well as the NH DES Source Water Assessment Report (Appendix B). In addition, several of the systems identified in this plan may utilize more than one well on site, i.e. multiple wells on the property that serve

as drinking water sources. This is the case for the Town of Raymond's public water supply system which currently relies on a total of three groundwater wells.

In developing this plan, each property owner of the water system was contacted to make them aware of the purpose of the plan and to collect basic data about each well. In addition, the area immediately surrounding each well was visually reviewed and photographed, as feasible. Photos and addresses can be found in the Wellhead Summary Report contained within Appendix C. Learning more about each well, who it serves, and the area surrounding it provides greater awareness of the need for source water protection.

The 20 known public water supply systems currently existing within the Town of Raymond are identified in Appendix A – Map 1. The names of all 20 systems are listed below:

1. Branch River Apartments
2. Hill Top Mobile Home Park
3. Leisure Village
4. Onway Lake Family Resort
5. Pawtuckaway Farms
6. Pennichuck Water Works Inc./Clearwater Estates
7. Pennichuck Water Works Inc. /Green Hills Estates
8. Pennichuck Water Works Inc./Liberty Tree Acres
9. Raymond High School
10. Raymond Water Department
11. Riverview Manor Condominiums
12. The Pines Seafood House
13. Westgate Estates
14. Zions Camp
15. Tanglewood Trailer Park
16. Eaglebrook Church
17. New Life Assembly of God
18. Raymond's Sportsman's Club
19. Win-Lin Trailer Park
20. Pine Acres RV Park

Within the State of New Hampshire, there are three classifications of public water supply systems based upon the number of connections to the system, how many people the system serves, and for how long the system is open to the public and operates over the course of a year. These classifications include::

1. Community System: a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents;

2. Non-Transient/Non-Community System: a public water system designed to serve at least 25 people, for at least 6 months per year. Examples include day care, schools, and commercial property: and
3. Non-Community/Transient System: a public water system designed to serve at least 25 people, for at least 60 days per year. Examples include restaurants, campgrounds, motels, recreational areas and service stations.

The NH DES's official list of public water systems existing within the Town of Raymond and how each system is classified according to the three categories described above is provided as part of Source Water Assessment Report in Appendix B.

B. WELLHEAD PROTECTION AREAS

A Wellhead Protection Area (WHPA), as defined by the United States Environmental Protection Agency (US EPA), is:

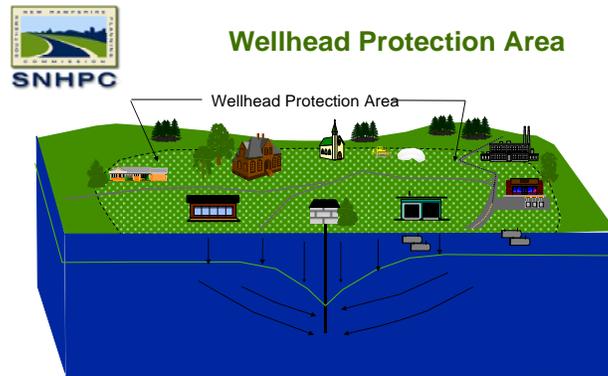
The surface or subsurface area surrounding a water well or well field supplying a public water system, through which contaminants are reasonably likely to move toward and reach such well or well field. (US EPA, 1987)

In short, a WHPA is the contributing area to a public water supply well from which water and contaminants are likely to reach the well (see following NH DES figure). WHPAs are delineated by water system owners/operators and approved by NH DES to protect public water supplies from potential impacts. NH DES recognizes WHPAs for all active Community Public Water Systems and all Non-Transient, Non-Community Systems.

As required by NH DES (Env-Ws 379.20), most public water system owners/operators with WHPA Protection Programs are required to identify Potential Contamination Sources (PCS) and notify PCS owners that their property uses could have adverse affects to the public supply well if mismanaged. Non-community systems (such as transient and non-transient) do not have to conduct surveys or send educational materials, although they are recommended to do so by NH DES. Other than this notification, there are very few regulations which apply specifically to WHPAs, except as related to specific known contaminated sources such as regulated substances, hazardous waste, landfills and contaminated soils, etc. These contamination sources are regulated in New Hampshire through primarily the NH DES Waste Management Division, Hazardous and Solid Waste Management Bureaus, and through the NH DES Brownfields Program. In addition there are very few if any restrictions on gravel operations within WHPAs, except BMPs specifically for fueling, maintenance and storage of earth moving equipment (see NH DES Fact Sheet Env-Wq 401) and specific BMPs for mining operations (see NH DES Fact Sheet Rock Blasting and Water Quality Measures That Can Be Taken to Protect Water Quality and Mitigate Impacts – Publications WD-10-12).⁴

⁴ BMPs (related to Env-Wq 401) are found at:
<http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-22-6.pdf>.

Based upon this overall environmental framework, groundwater/drinking water protection within a designated WHPA is basically the responsibility of the water system operator/owner and/or the municipality. WHPA delineation methods vary depending upon the type of public water system – either bedrock or aquifer wells as well as the production volume of the well. Bedrock wells may have a maximum of 4,000 foot radius while a water supply well in overburden (stratified drift aquifer) are more specifically defined by a hydrologic study conducted according to NH DES rules.



Source: NH DES

It is important to distinguish here the differences between a WHPA and a **Protective Sanitary Area**. Under NH DES rules, all public and private wells used for drinking water are required to have in place a **Protective Sanitary Area** or well radius a minimum of 75 feet in diameter around the well. The sanitary protective area is basically the “first line of defense” against contamination from human activities and actions which could pollute the drinking water supply well. Prohibited uses within a sanitary protective area include septic systems, the use and application of fertilizer, and the storage of hazardous materials.

Human activities and use of land within both the Protective Sanitary Area and a WHPA must be properly managed to minimize the discharge of contaminants to groundwater and thus the drinking water supply to the well. Establishing the 75 foot sanitary protective well radius is the overall responsibility of the property owner that owns and/or operates the well and if the protective radius extends beyond the property line, a protective easement must be obtained and recorded with the property deed describing the human activities and uses which are prohibited.

Typically, the WHPA extends beyond the boundaries of the Protective Sanitary Area and may include several different land owners and properties depending upon the size of the tracts of land. Protective easements are not required for WHPA’s which cross property

BMPs specific to other mining operations may be found in Rock Blasting and Water Quality Measures That Can Be Taken To Protect Water Quality and Mitigate Impacts (Publications WD-10-12) <http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-10-12.pdf>

boundaries and protecting the groundwater/drinking water supply in a WHPA is essentially the responsibility of the well owner/operator and/or the municipality. Generally the later is preferred in order to ensure consistency and enforcement.

The location of the 18 WHPAs recognized by NH DES within the Town of Raymond, including the Town of Raymond's public water supply system are shown on Maps 2a – 2c.

Because a WHPA provides a measurable distance and a clear boundary on a map, added safety measures and best management practices for groundwater protection within WHPAs is legally possible. Establishing basic land use controls within WHPA's is currently a local decision and one of the goals of this plan.

GROUNDWATER RESOURCES⁵

A. SURFACE WATER

The Master Plan for the Town of Raymond identifies a number of major lakes and ponds within the community. Onway Lake and Governors Lake are the two largest lakes in Raymond and could some day provide a source of drinking water for the community. Therefore, it is important that the watersheds feeding these lakes and the water quality of the lakes be protected. This could be achieved through a watershed management plan and appropriate land use measures, such as a maximum impervious surface coverage.

Stormwater and the use of fertilizers are often major water quality issues. According to the Town's Master Plan, increases in phosphorus concentrations have been observed in both lakes over the past 5-7 years. The concentrations of phosphorus have been found to be higher than the state median in the hypolimnion (the bottom layer of the lake).

Currently, the primary water supply for the Town of Raymond is located off of Cider Ferry Road in three gravel wells. The Town of Raymond pumps approximately 300,000 gallons of water per day. Raymond's three gravel wells have the capacity to provide up to 500,000 gallons per day. This leaves about 200,000 gallons of water left before these drinking water sources reach their capacity. Currently, the town has the capacity to meet the community's existing water supply demand. However, in the future there will be a need for additional water supply sources.

Potential future groundwater sources have been identified to exist on the Thibeault property near the Raymond town line and in addition there is the surface water from Onway Lake. In order to protect these potential sources, the Raymond Planning Board should consider developing a watershed management plan to protect the surface water of Onway Lake as well as the groundwater which feeds the lake.

⁵ Raymond Master Plan 2009

In the future, the Town of Raymond may need to draw from other additional groundwater sources within the watershed to provide drinking water to its residents. These groundwater options include tapping into the underground aquifer that runs along the Raymond and Candia town line as well as treating the surface water from Onway Lake.

While some standards are currently in place to help protect these potential future drinking water sources such as Raymond's existing groundwater protection zoning district (for the aquifer located along the Candia town line) and the State of New Hampshire's Comprehensive Shoreland Protection Act for Onway Lake, these standards do not take a watershed management planning approach. More information on the town's drinking water sources and protection standards can be found within the town master plan and zoning ordinances.

B. WATERSHEDS

Two major watersheds are located within the Town of Raymond; the Lamprey River and Exeter River. Within these watersheds, twelve smaller sub-watersheds also exist. A major tributary of the Exeter River is Fordway Brook. All of the watersheds that feed these river systems are important for both water quantity and water quality reasons.

Managing land use and other activities within the community's watersheds which can cause spills and contamination is equally as important as protecting the town's groundwater. Currently, erosion, invasive species, and sedimentation are among the problems severely impacting the Exeter River. Because of these problems, a group of concerned citizens formed the Exeter River Local Advisory Committee (ERLAC) in order to help manage and protect the river.

The ERLAC works directly with Conservation Commissions and holds educational events for municipalities within the watershed. Currently, a Watershed Restoration Plan is in the process of being prepared by NH DES and a consulting firm to protect the watershed. A vulnerability analysis was just completed as the first phase of the plan. Sections of the Exeter River most impacted by development were identified. Restoration projects and management planning are part of phase two of the plan. Fordway Brook in Raymond was identified as a priority site for a restoration project and management planning.

The Lamprey River is 47 miles long and runs through 13 municipalities including the Town of Raymond. It serves as the largest tributary in the Great Bay Estuary. The upper reaches of the Lamprey River are currently being nominated under the New Hampshire Rivers Management and Protection Program. The lack of adequate regulations along the Lamprey River are one of the main issues of concern for the future of the Great Bay. The lower Lamprey River has been designated a federal "National Wild and Scenic River" and portions of the river in Lee and Durham are part of the New Hampshire Rivers Management and Protection Program.

State and Federal designations of the lower Lamprey River indicate that protection of the upper parts of the river is necessary to continue to maintain stream quality downstream. Stormwater Management is increasingly becoming an important part of water resources protection. If stormwater management techniques are properly implemented, flash flooding, erosion and pollution to water bodies can be prevented or minimized. When stormwater washes over a developed landscape or impervious surface, pesticides, oil, fertilizer and other harmful chemicals can enter rivers and lakes.

In 2004, the University of New Hampshire Stormwater Center was established as a resource for public officials to protect water quality by developing stormwater management programs. Utilizing the expertise of the UNH Stormwater Center in developing stormwater management standards should be an essential element of a watershed management plan for the Lamprey and Exeter Rivers, along with Onway Lake in the Town of Raymond.

C. AQUIFIERS

Aquifers are one of New Hampshire's most critical and important natural and economic resources. This is especially important in the Town of Raymond because all residents and businesses rely upon groundwater (aquifers) as their primary source of drinking water.

The main aquifers found in Raymond are fractured bedrock or unconsolidated glacial deposits commonly referred to as stratified drift aquifers. Stratified drift aquifers are composed of coarse to fine unconsolidated glacial melt water deposits and are typically found adjacent to or within the basins of major streams and rivers.

Several extensive potential high-yield stratified drift aquifers have been identified within the Town of Raymond by the U.S. Geological Survey (see Appendix A- Map 3). One of the largest aquifers is located within the northwest corner of Raymond and it has projected to yield as much as 1.7 mgal/day. The West Epping and Newmarket Plains are Raymond's other two large aquifers.

Glacial formations such as eskers and kames make up the balance of Raymond's aquifers. These formations can be found east of Routes 102 and 107, north of Prescott Road, and along the North Branch of the Lamprey River.

V. GROUNDWATER CONTAMINATION

A. BACKGROUND

The New Hampshire Department of Environmental Services (NH DES) has estimated that 70 to 75 million gallons of groundwater are used for drinking water in New Hampshire per day and that approximately 60 percent of the residents in the state rely on

groundwater for their drinking water.⁶ In addition, groundwater provides an estimated 40 percent of the total flow in New Hampshire's rivers, which in turn feed the state's lakes, reservoirs, and estuaries.⁷

In New Hampshire, natural contaminants such as arsenic and radionuclides (radon, uranium, radium and gross alpha), are known to occur in a significant percentage of wells at concentrations that exceed health-based maximum contaminant limits (MCLs), particularly in bedrock wells under certain geologic conditions.⁸ Because New Hampshire's groundwater can be somewhat corrosive, lead and copper from older plumbing are also detected in tap water. Anthropogenic (human caused) contaminants are also frequently detected in some areas, typically associated with certain land uses or previous contamination events.

The most common causes of groundwater contamination in New Hampshire are leaking underground storage tanks, mishandling of industrial chemicals, and urban runoff.⁹ In addition, new health studies indicate that some natural contaminants (such as arsenic and manganese) may produce human health effects at concentrations at or below current health-based guidelines and criteria.

Contaminants can be found in stormwater runoff or can be associated with road salt application near wells, leaking or malfunctioning septic systems, gas tanks/fluid transfers, vehicle washing/discharging, and hazardous waste transport and disposal. Groundwater can be contaminated when chemicals are spilled or discharged onto or into the ground. Liquids can flow through the ground into groundwater, and both solids and liquids can be flushed downward by rain and snowmelt. Once contaminants reach groundwater, they often move along with the flow of the groundwater that may reach private or public water supply wells.

Health based standards for drinking water are defined under the state and federal Safe Drinking Water Acts. Many of the chemicals in use at businesses or homes contain contaminants that may be odorless, tasteless, and colorless. The only way to identify their presence is to have the water tested. Exposure to contaminants in water from private or public wells is a public health issue for a significant percentage of private and often public well users.¹⁰ The list of contaminants that DES recommends private wells owners test for is found online on NH DES's website.¹¹

⁶ Model Groundwater Protection Ordinance, New Hampshire Department of Environmental Services and Office of Energy & Planning, February 1999, Revised June 2006, pg. 1.

⁷ Ibid., pg. 1.

⁸ NH DES Drinking Water Protection Program, Private Well Working Group White Paper, February 15, 2008.

⁹ Model Groundwater Protection Ordinance, New Hampshire Department of Environmental Services and Office of Energy & Planning, February 1999, Revised June 2006, pg. 1.

¹⁰ Ibid., pg.1.

¹¹ NH DES Private Well Testing Program:

http://des.nh.gov/organization/divisions/water/dwgb/well_testing/index.htm

The significance of groundwater contamination is growing in New Hampshire, as private and public water supply wells now serve a greater percentage of the state's population than they did in the past and this trend is likely to continue with more diffuse development patterns.¹² Locally, with the Town of Raymond, the groundwater (drinking water) impacts resulting from the Mottolo Pig Farm Superfund Site demonstrates the reasons why source water protection is so important.

B. MOTTOLO PIG FARM SUPERFUND SITE¹³

The 50-acre Mottolo Pig Farm Superfund Site is an abandoned pig farm located in an undeveloped wooded lot in Raymond. From 1975 to 1979, the owner of the property disposed of chemical manufacturing wastes from two companies in a 1/4-acre fill area adjacent to the piggery buildings. During this 4-year period, over 1,600 drums and pails of wastes, including organic compounds such as toluene, xylene, and methyl ethyl ketone, were disposed of at the site.

Between November 1980 and January 1982, the Environmental Protection Agency (EPA) excavated and removed the drums and pails found at the Site, along with 160 tons of contaminated soil. The Site was subsequently added to the National Priorities List of sites eligible for cleanup under the Superfund program in July 1987.

In 1991, EPA selected groundwater, surface water, and soil cleanup remedies which included installing a groundwater interceptor trench; installing and operating a vacuum extraction system to remove volatile organic compounds (VOCs) from the soils; installing a security fence to limit access to contaminated areas; monitoring the natural attenuation of contaminants in groundwater; and institutional controls, which restrict the use of contaminated groundwater and prevent disturbance of cleanup activities.

Construction of the vacuum extraction system was completed in 1993 and the system operated until December 1996 when soil cleanup levels were attained, as determined by EPA. In September of 2003, the responsibility for operating and maintaining the remedy was officially transferred from EPA to the State.

In 2003, the Department of Environmental Services (DES) instituted a residential well sampling program to monitor the residential wells directly abutting the southern border of the Site. Residential well sampling in this area has been on-going since 2003 with analysis showing no exceedences of drinking water quality standards until 2009.

Every five years, following implementation of the selected remedies (1993, for the Mottolo Site), EPA conducts a review of the Site to determine the protectiveness of the remedy. Although the first two five-year reviews (in 1998 and 2003) found contaminant concentrations in groundwater declining, the third five-year review in 2008 found that the

¹² The term "private well" refers to a water supply well that does not serve a public water system. This plan only focuses on public water supply wells, but the issue of contamination is often similar.

¹³ Mottolo Pig Farm data source:

<http://des.nh.gov/organization/divisions/waste/hwrb/fss/superfund/summaries/mottolo.htm>

estimated cleanup times had not been achieved and called into question the effectiveness of the remedy. This determination was primarily due to the persistent and slightly increasing concentrations of several contaminants in groundwater in some on-site monitoring wells and increasing residential development pressure to the west of the Site.

Residential development around the site continues with increasing use of the groundwater resources. At the time of site discovery, there were approximately 200 single family residences that depended on groundwater for a drinking water supply located within one mile of the site. Homes abutted the site on three sides at that time. Today there are now over 300 homes within a mile of the site and the site is surrounded by homes on all sides.

The third five-year review recommended: improving on-site monitoring, expanding off-site monitoring of residential wells, investigating on-site subsurface soils for residual contamination, and finalizing site institutional controls to fully assess and ensure protectiveness.

To address the issues raised in EPA's review, NH DES implemented a site-wide groundwater sampling event during the summer of 2009 and expanded the residential sampling program to include all residences in the immediate vicinity of the site. In June 2009, analyses for VOCs and arsenic were performed on 27 water supply wells in the immediate vicinity of the site.

On July 15, 2009, sampling results revealed that five residential wells (located mostly west of the site) had elevated concentrations of arsenic and four residential wells had detectable concentrations of VOCs. One of the affected residential wells had a concentration of trichloroethylene (a volatile organic compound) slightly above the drinking water standard of 5 micrograms per liter. A second home had a concentration of trichloroethylene just below the drinking water standard. This sampling provided sufficient data to initiate the design and installation of point-of-entry water treatment systems to remove VOCs from the water at these two homes.

Based on the results of the June sampling event, the water supplies for seven additional homes (located further west of the Site) were analyzed for VOCs and arsenic in July. Arsenic is a naturally occurring metal that exceeds the drinking water quality standard of 10 micrograms per liter in approximately 20 percent of the bedrock wells in New Hampshire. However, review of the data from these seven wells showed that the elevated concentrations of arsenic in these homes could not be disassociated from contamination at the site.

On September 1, NH DES met with EPA to present analytical history of recent residential well sampling program and review options for providing an alternate water supply to the affected area. These options include: (1) extending the municipal water system; (2) constructing a community water supply and distribution system; and (3) providing point-of-entry or point-of-use treatment systems. EPA was receptive to the proposals and agreed to investigate the feasibility of implementing each of the various options.

On September 15, NH DES held a public meeting in Raymond to present a brief site history, an update of recent and planned on-site and off-site sampling and a discussion of possible future actions at the site. A majority of residents and town officials expressed a clear preference for EPA to extend the municipal water system to the area.

A \$2.5 million bond article to extend town water to the area was rejected at the March 9, 2010 town meeting. A development of 35-home subdivision of Blueberry Hill Road has also been stalled until the contaminated water issues are resolved.

Additional response actions scheduled for the fall of 2009 included conducting a subsurface investigation to identify possible residual sources of arsenic and VOCs, installing and sampling on-site deep bedrock wells and conducting additional sampling of approximately 70 residential wells. NH DES's contractor presented a summary of the findings from these investigations in a 2009 Data Evaluation Report which included recommendations for follow-up monitoring and remedial actions.

Recently the New Hampshire Union Leader (July 31, 2010) reported that US Senator Jeanne Shaheen announced that the EPA has agreed to pay to extend the Town of Raymond's public water lines to affected homeowners south and west of the site. Public meetings on the proposed water line extensions will be held at Raymond High School in September 2010 to complete details for the water line installation and home owner connections.

C. POTENTIAL AND KNOWN CONTAMINATION SOURCES (PCS & KCS)

While the Mottolo Pig Farm story is a very real story and consequence of the improper disposal of hazardous waste, there are many other land use activities that pose threats to a community's groundwater. These sources can best be identified through a survey of potential and known contamination sources. A potential contamination source (PCS), as defined by ENV-Wq 401, is:

Human activities of operations upon the land surface pose a foreseeable risk of introducing regulated substances into the environment in such quantities as to degrade the natural groundwater quality.

The New Hampshire Groundwater Protection Act (RSA 485-C) defines underground and aboveground storage tanks (USTs/ASTs) as PCSs, and as such, these properties must be inventoried within the WHPAs. PCSs also include regulated substances such as a chemical or other similar products as petroleum, lubricants, paint and paint thinners. Table 1 provides a list of land uses identified by the NH DES which are defined as a PCS under RSA 485-C. Many of these PCSs may use regulated substances if released to the ground (through a spill or leak) could potentially contaminate the groundwater and ultimately the drinking water of public water supply systems.

Many of the land uses identified in Table 1 also represent various commercial entities and operators, such as manufacturing facilities that use gasoline, solvents, de-greasers or

other types of regulated substances. Auto body repair shops and gas stations are also a common PCS as well as septic systems; transportation corridors due to salt applications; livestock and the use of agricultural chemicals; and the fueling and maintenance of earth moving equipment.

Table 1
NH DES List of Potential Contamination Sources

Potential Contamination Sources (PCS)		
Vehicle Service and Repair shops	General Service and Repair shops	Metal Working Shops
Salt Storage and Use	Snow Dumps	Storm Water infiltration ponds or leaching catch basins
Manufacturing Facilities	Underground or above ground Storage Tanks	Cleaning Services
Waste and Scrap Processing and storage	Food Processing Plants	Transportation Corridors
Septic Systems (at Commercial and Industrial Facilities)	Laboratories and certain professional offices (medical, dental, veterinary)	Use of Agricultural Chemicals
Fueling and Maintenance of Earth moving equipment	Concrete, asphalt, and tar manufacture	Cemeteries
Hazardous Waste Facilities	Livestock	Heavy salting of roadways

(Source: NH DES WD-WSEB-12-3 NH Drinking Water Source Assessment Program Plan, May 1999, Appendix G.)

In addition to the PCS, the NH DES maintains a list of all known contamination sources (or KCS) within a community. These KCS sources include sites with where potential ground water contamination has occurred; hazardous waste generators; and above and below ground storage tanks. A summary of NH DES’s list of all KCS located within the Town of Raymond is provided in Appendix F.

In conducting the PCS inventory for this plan within the 18 wellhead protection areas recognized for the Town of Raymond, the SNHPC obtained an existing GIS PCS data file from NH DES and then conducted a “windshield survey” (i.e. visiting each PCS). The windshield survey confirms whether existing PCS information is accurate and if new PCS information needs to be added to the list.

The windshield surveys conducted for this plan primarily focused on the 20 public water systems and the 18 identified WHPAs identified within Raymond. No windshield or PCS inventory was conducted specifically within the Town of Raymond’s Wellhead Protection Area as part of this plan because a PCS survey and inventory is regularly conducted by the Town Public Works Department and these survey results are forwarded directly to the NH DES.

All the PCSs identified in the windshield survey were assigned a threat level rating of either low, medium, or high. This rating system provides a general indication of how

vulnerable the public water supply wells are to contamination from the PCS and nearby land use activities. Overall threat levels were determined primarily according to the proximity of the PCS to the well as well as general site conditions within the WHPA. The proximity of a PCS to a well provides a good indicator of the threat level because the closer to the well, the easier it is for a spill or contamination source to be drawn into the well. The general size and condition of a property also provides an good indicator for obvious reasons; the larger the amount of regulated substances on a property the more potential for a spill.

Regulated substances contained within storage tanks that are in poor physical condition and/or are not maintained regularly will be more likely to break down or be prone to leaks. Improper handling of regulated substances can also cause a spill, however the purpose of this assessment was not to evaluate the ability of the property owner's implementation of best management practices to contain or control spills, but rather to identify the number of PCS sources and to evaluate the level of threat they pose within each WHPA to the drinking water supply source.

Regulated substances must be stored over impervious surfaces such as concrete, metal or plastic and transferred from one container using appropriate equipment (e.g. funnels, etc.). The reason for this is so that if there is a spill during transfer, regulated substances will not be able to seep into the ground and thus easier to clean up.

State rules under Env-Wq 401, Best Management Practices for Groundwater Protection are applicable to all commercial uses of regulated substances in containers with a capacity to hold five or more gallons.

VI. VULNERABILITY ASSESSMENT

A. SUMMARY

As described previously in this plan, a vulnerability assessment of each PCS or KCS was conducted within the 18 recognized WHPAs in Raymond, excluding the Town of Raymond's primary water supply WHPA. A basic vulnerability assessment was also conducted considering each PCS or KCS to identify the current level of threat the PCS or KCS has to the drinking water source. This vulnerability assessment considered existing property conditions, condition of storage facilities, the proximity of the PCS/KCS to the wells, and the likelihood that a leak or spill to the groundwater could occur.

All of the PCS and level of threats found as a result of the inventory conducted for this plan are summarized in Table 2 below and shown on the Maps 1a – 1c in Appendix A. The threats identified within the WHPA of each public water system are ranked as either "low", "medium" or "high" based upon the criteria noted above and SNHPC's best field judgment. This rating system includes, as applicable, consideration of the vulnerability rankings found within the NH DES Source Water Assessment Report for Raymond (see Appendix B).

Table 2
Summary of Groundwater Threats Located Within Wellhead
Protection Areas, Town of Raymond, NH

Map Location	Type of Site	Identified By	Contamination Source	Threat Level	Use	In WHPA
1	Above Ground Tanks	SNHPC	Palmer Gas and Oil	Medium	Oil and Gas Company and Storage	Yes
2	Machinery Storage	SNHPC	Dave's Small Engine Repair	Medium	Power Equipment Storage	Yes
3	Auto Body Shop	SNHPC	Drownes Auto Body	Medium	Auto repair business	Yes
4	Heavy Equipment Storage	SNHPC	Vellano Brothers Inc.	Medium	Storage of heavy machinery and equipment	Yes
5	Machinery Repairs/Storage	SNHPC	RBG Inc	Medium	Storage and repair shop/facility for large machinery	Yes
6	Auto Repairs and Storage	SNHPC	Affordable Auto	Medium	Automobile storage and repair shop/facility	Yes

Source: Southern New Hampshire Planning Commission

The NH DES Source Water Assessment Report prepared for the Town of Raymond (see Appendix B) also includes susceptibility ranking criteria and vulnerability rankings that consider the existence, relative proximity, number and density of certain land uses including, lagoons, animals, agricultural and urban land cover, septic systems, pesticides, highways and railroad lines, and known chemical releases into the ground in relationship to the public water system.

The overall size and operation of the activity on the site and what impact the specific PCS and use could have within the WHPA as well as the character of the surrounding physical terrain (e.g. slope) was also considered by SNHPC in assigning the vulnerability ranking. Additional information was obtained through contact with landowners and operators of each active public water system.

B. INVENTORY OF THREATS TO WELLHEAD PROTECTION AREAS

The location and description of the threats identified within or near the 11 delineated WHPAs are described as follows (refer to Map 2c):

Threat 1: Palmer Gas and Oil, is located on Route 27. This site is located within the Pennichuck Water Works Inc./Clearwater Estates Clearwater Estates and Leisure Village WHPAs. This site is a large gas and oil business that has above ground storage tanks containing regulated substances. It appears to be a well maintained site. Impervious ground cover (pavement) was in good condition, storage containers looked to be in new condition and the whole area was secure with fencing. However, due to large amounts of regulated substances stored on site, and it's location within and near several WHPAs, this

site is ranked as a medium threat. The large capacity of regulated substances stored here has a higher risk of contaminating drinking water if a spill or leak occurred. It is important that the operator and owner of this facility ensure that the proper BMPs are implemented to prevent leaks and spills.

Threat 2: Dave's Small Engine Repair is located on Route 27. This site is within the Pennichuck Water Works Inc./Clearwater Estates and Leisure Village WHPAs. This site is a storage and sales facility for motorized machinery and equipment. It is considered a medium level PCS threat because the motorized machines stored on site have engines that require various petroleum products and other regulated substances such as lubricants. The risk of spills and leaks of regulated substances into the ground is higher because of the coming and going of the equipment that is being serviced or maintained. A large leak could enter groundwater threatening the wells within the WHPA that this site exists in. It is important that the operator and owner of the facility ensure that the proper BMPs are implemented to prevent leaks and spills.

Threat 3: Drowne's Auto Body, is located on Route 27 within the Leisure Village and Branch River Apartments WHPAs. An auto body shop typically stores regulated substances on site for daily business necessities. This site is a medium level threat because this type of business uses large amounts of regulated substances on a regular basis. Because the site is within a WHPA and has a close proximity to public wells the risk for a spill contaminating ground water is high, raising the potential contamination level to medium. It is important that the operator and owner of the facility ensure that the proper BMPs are implemented to prevent leaks and spills.

Threat 4: Vellano Brothers Inc is located on Route 27/Raymond Road. This medium threat level site is a storage and business location for heavy machinery. Because this equipment is kept on site there is also the presence of regulated substances. Given the amount of work performed at this site, it is a medium level threat because a leak or spill of a regulated substance could enter the groundwater. The site's close proximity to the Branch River Apartments wellhead also makes it a medium threat. It is important that the operator and owner of the facility ensure that the proper BMPs are implemented to prevent leaks and spills.

Threat 5: RGB Inc is located on Route 27/Raymond Road. This site is located within the Branch River Apartments WHPA and has the same GIS point as Affordable Auto Sales. RGB Inc. is a storage and repair facility for various types of motorized heavy machinery and other heavy equipment. This type of business frequently handles and uses regulated substances that could contaminate and pollute drinking water if allowed to leak into the groundwater and underground aquifers. Because these regulated substances exist on sight and are regularly used, this PCS has been assigned a medium level of threat for groundwater contamination. It is important that the operator and owner of the facility ensure that the proper BMPs are implemented to prevent leaks and spills.

Threat 6: Affordable Auto Sales and Repair is located on Route 27/Raymond Road. This site is located within the Branch River Apartment WHPA and has the same GIS

point as RGB. Affordable Auto Sales and Repair is a vehicle repair shops and sale lot located adjacent to RGB Inc. This business also frequently handles and utilizes regulated substances that could contaminate and pollute groundwater if leaks or spills occurred. Given the existence and regular use of these substances, the site has a medium level of threat for groundwater contamination. It is important that the operator and owner of the facility ensure that the proper BMPs are implemented to prevent leaks and spills.

VII. THE NEED FOR AQUIFER PROTECTION

A. EXISTING AQUIFIERS

Aquifers, much like wetlands, serve as a storage place for water. An aquifer can consist of surficial geologic deposits, such as sand and gravel, or it can be fractured bedrock, but it must be able to store and allow the movement of water (transmissivity). Map 5 in Appendix A shows the aquifer transmissivity for Raymond.

Because of their proximity to the land surface, stratified drift aquifers are more susceptible to contamination than bedrock aquifers. Typical contamination sources can include leaky septic systems, poorly maintained underground storage tanks, and improper disposal of oil, gas and other regulated substances and hazardous materials.

In 1990 and 1995, the U.S. Geological Survey (USGS) produced two significant stratified drift aquifer studies which are available at the following website: http://pubs.usgs.gov/wri/wrir_92-4192/html/pdf.html. These are:

“Geohydrology and Water Quality of Stratified-Drift Aquifers in the Exeter, Lamprey, and Oyster River Basins, Southeastern New Hampshire” (1990);

“Geohydrology and Water Quality of Stratified-Drift Aquifers in the Middle Merrimack River Basin, South-Central New Hampshire” (1995).

In addition to the USGS studies, the New Hampshire Geological Survey recently prepared enhanced stratified drift aquifer transmissivity maps for New Hampshire municipalities. The most recent transmissivity map prepared for the Town of Raymond is available on NH GRANIT and is shown as Map 5 provided in Appendix A. The transmissivity data for this map was automated from maps generated as part of a larger study of groundwater resources in the State and is based on a study conducted under a cooperative agreement between the U.S. Geological Survey, Pembroke, NH and the NH Department of Environmental Services, Water Resources Division.

As part of the development of this Source Water Protection Plan, an investigation of Raymond’s stratified drift aquifer boundary locations was conducted by Geosense, P.L.L.C. to determine which aquifer map – the USGS maps or the new NH Geological Survey map should be used for the basis of the town’s current aquifer protection zoning

(see Appendix A – Maps 4 and 5). The study, with assistance from New England Envirostrategies, Inc covered six areas in Raymond where tests to measure electromagnetic, density, grain size distribution and other soil properties were conducted. This testing was done as a follow up to the aquifer mapping performed by the United States Geological Survey (USGS) and the New Hampshire Geological Survey (NHGS) and it resulted the “Combined Aquifer Mapping and Surficial Geology” map provided in Appendix A – Map 4.

The study found that the stratified drift aquifer boundary locations identified in Raymond by USGS and the NHGS predominantly coincided although some inconsistencies existed between the two maps. In presenting the results of this study to the NH Geological Survey and the NH DES Drinking Water and Groundwater Bureau, it was concluded that a combination map showing the outer extents of both the USGS and the NHGS aquifer maps provided the best and most updated source of stratified drift aquifer mapping for Raymond. Therefore it has been recommended that this combination map “Map 4” should be used by the Town of Raymond as the basis for its aquifer protection zoning.

The boundaries of Raymond’s current groundwater protection district is based on the 1990 USGS “Geohydrology and Water Quality of Stratified-Drift Aquifers in the Exeter, Lamprey, and Oyster River Basins, Southeastern New Hampshire” (1990).

B. WELL-YIELD PROBABILITY

The Well-Yield Probability map found in Appendix A – Map 3, prepared for the Town of Raymond is based upon the United States Geological Survey (USGS) study of Well-Yield Probability for the State of New Hampshire.

The parameters for this study are based upon estimates of obtaining 40 gallons per minute or more of water from a 400-foot deep bedrock well. The results of this study in Raymond indicate that while the North West area of the community has a very low well yield level probability of less than six units. However the majority of Raymond has a higher well-yield probability level ranging from 8.1 to 15 units. Areas around Onway Lake and the major rivers have the highest well-yield probability level of over 25.1 units. A unit represents how many gallons are obtained from a 400-foot bedrock well per minute.

While this well-yield probability data may be useful for community-wide planning purposes, it should not be used by the Town of Raymond as justification for groundwater or aquifer protection regulations.

VIII. PROTECTION STRATEGIES

A. MAINTAINING BEST MANAGEMENT PRACTICES (BMP)

To assure that all the PCS sites identified by this plan maintain a high standard and quality of maintenance, a PCS site owner can volunteer to have a best management (BMP) compliance survey conducted. While PCS owners/operators identified in this plan are not required to have BMP surveys performed, but by volunteering to do so, it can help prevent serious problems in the future and assure site owners that their operations are not contributing to contamination issues, if they exist.

If the PCS site owners decide to have BMP surveys conducted on site, the sites should be inspected on a routine basis to minimize and prevent additional or future groundwater contamination. The PCS site owners can also request and retain qualified consultants to conduct the surveys or request assistance from NH DES or SNHPC. Town officials, such as the Building Inspector/Health Officer and Code Enforcement Officer, could also be trained by NH DES to conduct BMP Compliance Surveys, and offer these services for a fee. Currently, however, the Town of Raymond does not have the capacity or staff levels necessary to be responsible for these surveys.

The BMP Compliance Survey reflects a set of standards describing how regulated substances, such as salt, fuel oil, fertilizers, etc., must be stored, transported, labeled, and protected in accordance with Env-Wq 401 (NH Administrative Rule). These standards help to minimize the release of regulated substances which can contaminate groundwater. If a site is not able to meet the standards within Env-Wq 401, the site owner or representative must correct the deficiency and make improvements. Examples of the NH DES BMP inspection form can be found online on the NH DES Best Management Practices to Prevent Groundwater Contamination page.¹⁴

It is the recommendation of this plan that the Town of Raymond consider or request that BMP Compliance Surveys be conducted on the sites identified with Medium to High levels of threat in Table 2 on a regular basis -- or at least once a year. These surveys would ensure that all regulated substances are safely stored, adequately labeled, and handling procedures are correct and safe. This recommendation would need to be an implementation action and decision of the Planning Board. The Raymond Technical Review Committee has recommended that the Town of Raymond not be responsible for conducting BMP surveys. However, the TRC would support funding to the SNHPC or to NH DES to conduct these surveys or support volunteer BMP surveys conducted and paid for by the community water system owners/operators.

Some of the water system wells within Raymond identified in this plan are currently monitored by outside companies. For example, Pennichuck Corporation operates the Clearwater Estates, Green Hills and Liberty Tree Acres water systems and maintains and monitors the water quality of these wells. Pennichuck also prepares Water Quality Reports to detect volatile organic contaminants, synthetic organic contaminants, inorganic contaminants, secondary, radiological, lead and copper and unregulated contaminants. More information on testing of these wells can be found online at: <http://www.pennichuck.com>.

¹⁴ NH DES BMP Inspection form:
<http://des.nh.gov/organization/divisions/water/dwgb/dwspp/bmps/index.htm>

B. LOCAL LAND MANAGEMENT AND DRINKING WATER SOURCES PROTECTION PROGRAM

There are a number of tools available to municipalities to protect groundwater including zoning, land acquisition, public education, state reclassification, Best Management Practices (BMP), and inspections. These tools have been grouped under five protection strategies: Education/Public Participation; Land Use Controls, Health Ordinance/Reclassification, BMP Management and Land Conservation. Most of these strategies require the adoption of local regulations (zoning, site plan, health ordinance, etc.) while others are entirely non-regulatory (such as education and land conservation). To ensure protection for the Town of Raymond, one of the main goals of this plan is to update the town's existing groundwater protection zoning ordinance, site plan and subdivision regulations to establish new local protections strategies for groundwater protection within the community.

All of these techniques are described in *The DES Guide to Groundwater Protection*, available from NH DES's Drinking Water Source Protection Program at (603) 271-7061. In deciding the best way to use these management/protection techniques, this section includes a review of the town's existing master plan, zoning and site plan regulations. This review will be helpful in identifying and assessing existing gaps in protection and include, as necessary, recommendations and specific ordinance revisions and language for improving the town's existing regulations.

NH DES recommends prohibiting a short list of high-risk land uses that use regulated substances (e.g. Gas, oil, etc.) and historically have been associated with groundwater contamination and managing these uses (via BMPs).

C. STORMWATER MANAGEMENT - LOW IMPACT DEVELOPMENT

Stormwater is regulated through the U.S. Environmental Protection Agency (EPA) under the Clean Water Act. Since March 2003, municipalities and developers have been subject to new requirements dealing with stormwater management. The requirements are called Phase II Stormwater Regulations. Phase I, passed in 1992, dealt with larger municipalities (none exist in New Hampshire), privately-owned industries, and construction sites of 5 acres or larger. The National Pollutant Discharge Elimination System (NPDES) program is also administered by EPA in New Hampshire.

The NH DES has developed the New Hampshire Stormwater Manual to help guide communities, developers, designers and members of regulatory boards, commissions, and agencies involved in stormwater programs as a planning and design tool. This manual is available at: <http://des.nh.gov/organization/divisions/water/stormwater/manual.htm> .

One of the key methods explained is Low Impact Development (LID). Low Impact Development (LID) is a method that minimizes the impacts development can have on water resources and infrastructure. As an innovative stormwater management approach,

the purpose of LID is to mimic the site's predevelopment hydrology. Runoff is filtered, infiltrated, stored, and evaporated on site to replicate predevelopment conditions. Implementation of LID techniques is done through small, cost effective landscape features at the lot level. Landscape features are the building blocks of LID and are called Integrated Management Practices (IMP). Components from the urban environment such as rooftops, parking lots, and sidewalks can serve as IMPs. For example, porous asphalt can serve as an IMP because it can effectively infiltrate and drain stormwater from a parking lot.

D. STATE RECLASSIFICATION PROGRAM

In 1991, the State passed legislation called the Groundwater Protection Act (RSA 485-C) to allow local entities (i.e. water suppliers, town boards) to reclassify their wellhead protection areas or other valuable groundwater resources to a class GAA or GA1 status. GAA and GA1 classes offer the highest protection for groundwater resources.

Groundwater reclassification is a process that involves both the local entity and the NH Department of Environmental Services. Through this process, a local entity can inventory and manage potential contamination sources through education and inspections. Reclassification also provides the local entity with the authority to enforce BMP rules in the protected area.

The Town of Raymond and NH DES have worked together to seek classification of the groundwater with the town's Wellhead Protection Area for quite some time. A reclassification request was submitted in 1994 to upgrade the "Wellhead Protection Area Boundary" defined in 1992 Wellhead Protection Program.

In 2009, a request to change the GAA boundary was made. The proposed new boundary is the same boundary as the Raymond Water Department water system outlined in Appendix A - Map 6. GAA ground water areas are the most productive class of ground water areas established to actively manage PCSs "via periodic inspections to ensure compliance with BMPs." While reclassification of the Town of Raymond's GAA ground water area provides the town with the statutory ability to implement a protection program and to prohibit certain land uses within the GAA area, similar protection is not afforded by the statute to other wellhead protection areas. The Town of Raymond does, however, have the ability to investigate and inspect properties with identified PCSs and is also afforded cease and desist authority for properties in violation of BMPs in classified areas.

IX. MASTER PLAN ANALYSIS

Before adopting or amending existing regulations, a municipality should address the need for groundwater protection in its master plan, typically within the natural resources section. Raymond's 2008 Master Plan Update has an extensive natural resources chapter that discusses Raymond's water resources. Surface waters, watersheds, stormwater

management, and ground water resources are the main topics covered. A summary of the Comprehensive Shoreline Protection Act (CSPA) and low impact design is also included in the chapter.

Groundwater protection may also be addressed in a document (generally incorporated by reference into the master plan) referred to as the *water resources management and protection plan*. Guidance on drafting such a plan is available from DES (271-0688) or the Office of Energy and Planning (271-2155). This document should inventory local water resources (i.e. wetlands, rivers, aquifers) and address a wide range of water resources management issues, including identifying the value and use of specific water resources, a summary of current threats, and an analytical approach to evaluating whether local land use controls will be needed to protect water resources now, and in the future.

The Raymond master plan addresses water resources within the Land Use and Natural Resources chapters. It references the *Raymond Water Resources Management and Protection Plan* as a measure to protect the town's water resources. As a result these chapters also review the town's watersheds, which has already been discussed in this plan. However the master plan does not go into the level of detail provided by this plan. Therefore, it is important that this plan be adopted and referenced as a part of the Town's Master Plan. This provides the basis for the town's groundwater protection land use and zoning ordinances.

X. ZONING ORDINANCE ANALYSIS

A. ANALYSIS

The Town of Raymond currently has in place a **Groundwater Protection District** (Article III, 3.340 of the town's Zoning Ordinance) which is an overlay district that is superimposed over the existing (underlying) zoning districts. The ordinance includes detailed performance standards in addition to permitted and prohibited uses. It is used to protect the general welfare and preserve groundwater so that in turn it offers protection to rivers and other surface waters.

Currently, the Groundwater Protection District (GWPD) does not apply to the entire town; it is based on an official groundwater protection district zoning map which identifies all the stratified drift aquifers and aquifer recharge areas within the community. It also references the town's 1992 Wellhead Protection Program and includes the WHPA.

There are basically three zoning approaches Raymond can consider in updating the town's existing Groundwater Protection District. These include:

1. Update the town's existing GWPD based on new updated stratified drift aquifer mapping and NH DES's most recent (Revised April 2010) model groundwater protection ordinance; and

2. Add the 18 Wellhead Protection Areas identified by this plan to the town's existing GWPD (the Town of Raymond's Wellhead Protection Area for its primary water supply is all ready part of the GWPD); or
3. Revise the GWPD to apply to the entire town. This would remove the stratified drift aquifer maps and WHPAs.

The advantage of having a groundwater protection district apply to the entire town is its simplicity, the removal of aquifer boundary disputes, and the high degree of protection that can be achieved, provided the ordinance includes the most effective protection measures possible.

The main drawbacks of relying exclusively on one groundwater or aquifer protection district apply to the entire town are that ordinance may be legally vulnerable to challenges and the purpose and extent of the district may be questionable.

While the stated purpose of Raymond's GWPD is to regulate those land uses that could contribute pollutants to the town's present and future public water supply, in this section the town's GWPD has been compared to the recently updated NH DES Model Groundwater Protection Ordinance (Revised, April 2010) to identify areas where the ordinance can be improved as well as identify additional protection measures that could be implemented by the planning board and the town to ensure a high level of protection.

B. RECOMMENDATIONS

It is the finding of this plan that the Town of Raymond currently has in place an effective Groundwater Conservation Overlay District – Zone I which also applies to the Wellhead Protection Area identified in the Town of Raymond's Wellhead Protection Program dated May 1992 and those areas currently identified as GAA, GA1 and GA2 as designated by NH DES (see Article III, Sections 3.340 and 3.341 and Article IV, Section 4.240 in the Town of Raymond's Zoning Ordinance). However, there are a number of updates that are needed.

The following proposed zoning ordinance amendment has been prepared to bring the Town of Raymond's Zone I –Groundwater Conservation District in line with the NH DES Model Groundwater Protection Ordinance and to include the latest stratified drift aquifer mapping recently prepared by NH DES and the USGS for the Town of Raymond, including revisions to the town's existing wellhead protection area boundaries (GAA boundary change) as recently proposed by NH DES.

It is recommended that the Raymond Planning Board consider and move the following Zoning Amendment - Groundwater Conservation District and the Combined Aquifer Mapping and Surficial Geology map forward to a public hearing as an official zoning warrant article for the 2011 Town Meeting. It is also recommended that amendments to the Planning Board's site plan and subdivision regulations be adopted as outlined in Appendix D of this plan. Recommended changes are identified by the bold italic print.

Zoning Amendment: Zone I - Groundwater Conservation District

Insert the following new language identified in bold italics into Article III, Sections 3.340 and 3.341 to read as follows:

ARTICLE III - ZONES

3.340 ZONE I - GROUNDWATER CONSERVATION DISTRICT (03/02)

01 AUTHORITY: The Town of Raymond hereby adopts this Ordinance pursuant to the authority granted *under RSA 674:16*, in particular RSA 674:16, II relative to innovative land use controls.

02 PURPOSE: The purpose of this Ordinance is, in the interest of public health, safety, and general welfare, to preserve, maintain, and protect from contamination existing and potential groundwater supply areas and to protect surface waters that are fed by groundwater.

The purpose is to be accomplished by regulating land uses which could contribute pollutants to designated wells and/or aquifers identified as being needed for present and/or future public water supply.

3.341 GROUNDWATER CONSERVATION DISTRICT

The Groundwater *Conservation* District is an Overlay District which is superimposed over the existing underlying zoning and includes within its boundaries the Wellhead Protection Areas identified in the Town's Wellhead Protection Program dated May, 1992 and the *Town's Source Water Protection Plan dated November, 2009* and as may be designated by NH Department of Environmental Services (*NH DES*), including those areas currently identified as GAA, GA1 and GA2 and the Stratified Drift Aquifer(s) shown on the map entitled "*Combined Stratified Drift Aquifer Mapping & Surficial Geology Map*" dated February, 2009 (Map 5) included in the Town of Raymond's Source Water Protection Plan dated November, 2009 and as may be amended from time to time by the Raymond Planning Board. *Copies of these reports and maps shall be kept on file with the Raymond Planning Department.*

ARTICLE IV – USES AND STANDARDS

4.241 DEFINITIONS

01 AQUIFER: A geologic formation composed of rock, sand or gravel that contains significant amounts of potentially recoverable water.

- 02 “GAA”:** Means “GAA” as defined in RSA 485-C:5,I, namely “groundwater in this class is within the wellhead protection area for wells which presently are used or well sites which have been identified for future use as drinking water supply for public water systems.”
- 03 “GA1”:** Means “GA1” as defined in RSA 485-C:5,I, namely “groundwater in a defined zone of high value for present or future drinking water supply.”
- 03 “GA2”:** Means “GA2” as defined in RSA 485-C:5,I, namely “groundwater within aquifers identified as highly productive for potential use as a public water supply by the U.S. Geological Survey regional groundwater studies, or other regional studies.”
- 05 *GASOLINE STATION:*** *Means that portion of a property where petroleum products are received by tank vessel, pipeline, tank car, or tank vehicle and distributed for the purposes of retail sale of gasoline.*
- 06 **GROUNDWATER:**** Subsurface water that occurs beneath the water table in soils and geologic formations.
- 07 *PETROLEUM BULK PLANT or TERMINAL:*** *Means that portion of the property where petroleum products are received by tank vessel, pipeline, tank car, or tank vessel, pipeline, tank car, or tank vehicle and distributed for the purpose of retail sale of gasoline.*
- 08 **IMPERVIOUS:**** *Not readily permitting the infiltration of water.*
- 09 **IMPERVIOUS SURFACE:**** A surface through which regulated substances cannot pass when spilled. Impervious surfaces include concrete unless unsealed cracks or holes are present. Asphalt; earthen, wooden, or gravel surfaces; or other surfaces which could react with or dissolve when in contact with the substances stored on them are not considered impervious.
- 10 **JUNKYARD:**** An establishment or place of business which is maintained, operated, or used for storing, keeping, buying, or selling junk, or for the maintenance or operation of an automotive recycling yard, and includes garbage dumps and sanitary landfills. The word does not include any motor vehicle dealers registered with the director of motor vehicles under RSA 261:104 and controlled under RSA 236:126.
- 11 *LOAM:*** *See NH Department of Transportation Section 641.*
- 12 **OUTDOOR STORAGE:**** Storage of materials where they are not protected from the elements by a roof, walls, and a floor with an impervious surface.

- 12 PUBLIC WATER SYSTEM:** A system for the provision to the public of piped water for human consumption, if such system has at least fifteen (15) service connections or regularly serves an average of at least twenty-five (25) individuals daily at least sixty (60) days out of the year.
- 13 REGULATED SUBSTANCE:** Petroleum, petroleum products, and substances listed under 40 CFR 302, 7-1-05 edition, excluding the following substances: (1) ammonia, (2) sodium hypochlorite, (3) sodium hydroxide, (4) acetic acid, (5) sulfuric acid, (6) potassium hydroxide, (7) potassium permanganate, and (8) propane and other liquefied fuels which exist as gases at normal atmospheric temperature and pressure.
- 14 SANITARY PROTECTIVE RADIUS:** The area around a well which must be maintained in its natural state as required by Env-Ws 378 or 379 (for community water systems) and Env-Ws 372.12 and Env-Ws 372.13 (for other public water systems).
- 15 SECONDARY CONTAINMENT:** A structure such as a berm or dike with an impervious surface which is adequate to hold at least one-hundred ten percent (110%) of the volume of the largest regulated-substances container that will be stored there.
- 16 SNOW DUMP:** For the purposes of this Ordinance, a location where snow which is cleared from roadways and/or motor vehicle parking areas is placed for disposal.
- 17 STRATIFIED DRIFT AQUIFER:** A geologic formation of predominantly well-sorted sediment deposited by or in bodies of glacial melt water, including gravel, sand, silt, or clay, which contains sufficient saturated permeable material to yield significant quantities of water to wells.
- 18 SURFACE WATER:** Streams, lakes, ponds and tidal waters, including marshes, water courses and other bodies of water, natural or artificial.
- 19 WELLHEAD PROTECTION AREA:** The surface and subsurface area surrounding a water-well or well field supplying a community public water system, through which contaminants are reasonably likely to move toward and reach such water-well or well field.

4.242 APPLICABILITY

This Ordinance applies to all uses in the Groundwater *Conservation* District, except for those uses exempt under Article XI of this Ordinance.

4.243 PERFORMANCE STANDARDS

The following Performance Standards apply to all uses in the Groundwater *Conservation* District unless exempt under Section 4.248:

- 01** For any use that will render impervious more than **15%** or more than 2,500 square feet of any lot, whichever is greater, a stormwater management plan shall be prepared which the Planning Board determines is consistent with Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, Rockingham County Conservation District, August 1992 and Best Management Practices for Urban Stormwater Runoff, NH Department of Environmental Services, January 1996.
- 02** *Conditional Uses, as defined under Section 4.247 of this Ordinance shall develop stormwater management and pollution prevention plans and include information consistent with Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices (US EPA, 1992). The plan shall demonstrate that the use will:*
- 1) Minimize, through a source control plan that identifies pollution prevention measures, the release of regulated substances into stormwater;*
 - 2) Demonstrate that recharge to groundwater will not result in violation of Ambient Groundwater Quality Standards (Env-Ws 410.05) at the property boundary;*
 - 3) Stipulate that expansion or redevelopment activities shall require an amended stormwater plan and may not infiltrate stormwater through areas containing contaminated soils without completing a Phase I Assessment in conformance with ASTM E 1527-05, also referred to as All Appropriate Inquiry (AAI).*
- 03** Animal manures, fertilizers, and compost must be stored in accordance with the Manual of Best Management Practices for Agriculture in New Hampshire, NH Department of Agriculture, Markets, and Food, August, 1998, and subsequent revisions.
- 04** All regulated substances stored in containers with a capacity of 5 gallons or more must be stored in product-tight containers on an impervious surface designed and maintained to prevent flow to exposed soils, floor drains, and outside drains.
- 05** Facilities where regulated substances are stored must be secured against unauthorized entry by means of a door(s) and/or gate(s) which are locked when authorized personnel are not present and must be inspected weekly by the facility owner.
- 06** Outdoor storage areas for regulated substances, *associated material or waste* must be protected from exposure to precipitation and must be located at least 75 feet from surface water or storm drains, wetlands, private wells and outside the sanitary protective radius of wells used by public water systems.

- 07 Secondary containment must be provided for outdoor storage of regulated substances if an aggregate of 275 gallons or more of regulated substances are stored outdoors on any particular property.
- 08 Containers in which regulated substances are stored must be clearly and visibly labeled and must be kept closed and sealed when material is not being transferred from one container to another.
- 09 *Prior to any land disturbing activities, all inactive wells on the property, not in use or properly maintained at the time the plan is submitted, shall be considered abandoned and must be sealed in accordance with We 604 of the New Hampshire Water Well Board Rules.*
- 10 All land cleared and graded for the purpose of establishing lawns must be finish graded with at least 4 inches of good quality loam or topsoil in order to reduce the demand for lawn irrigation.

4.2.44 SPILL PREVENTION, CONTROL AND COUNTERMEASURE (SPCC)

PLAN

Conditional uses, as described under Section 4.247 of this Ordinance, Subsection A, using regulated substances shall submit a spill control and countermeasure (SPCC) plan to the [Fire Chief, Health Officer or Emergency Management Director] who shall determine whether the plan will prevent, contain, and minimize releases from ordinary or catastrophic events such as spills, floods or fires that may cause large releases of regulated substances. It shall include:

- (1) A description of the physical layout and a facility diagram, including all surrounding surface waters and wellhead protection areas;*
- (2) Contact list and phone numbers for the facility response coordinator, cleanup contractors, and all appropriate federal, state, and local agencies who must be contacted in case of a release to the environment;*
- (3) A list of all regulated substances in use and locations of use and storage;*
- (4) A prediction of the direction, rate of flow, and total quantity of regulated substance that could be released where experience indicates a potential for equipment failure; and*
- (5) A description of containment and/or diversionary structures or equipment to prevent regulated substances from infiltrating into the ground.*

4.2.45 PERMITTED USES

All uses permitted by right or allowed by special exception in the underlying district are permitted in the Groundwater *Conservation* District unless they are Prohibited Uses or Conditional Uses. All uses must comply with the Performance Standards unless specifically exempt under Section 4.249.

4.2.46 PROHIBITED USES

The following uses are prohibited in the Groundwater *Conservation* District.

- 01 The siting or operation of a hazardous waste disposal facility as defined under RSA 147-A;
- 02 The siting or operation of a solid waste landfill;
- 03 The outdoor storage of road salt or other deicing chemicals in bulk;
- 04 The siting or operation of a junkyard;
- 05 The siting of a snow dump;
- 06 The siting or operation of a wastewater or septage lagoon;
- 07 *The siting or operation of a petroleum bulk plant or terminal;*
- 08 *The siting or operation of gasoline stations;*
- 09 *The siting or operation of a sludge monofill or sludge composting facility; and*
- 10 *The storage of commercial fertilizers, unless such storage is within a structure designed to prevent the generation and escape of runoff or leachate and is in compliance with the standards of Section 4.2.43, Subsections 03 through 08 of this Ordinance.*

4.2.47 CONDITIONAL USES

The issuance of a Conditional Use Permit is subject to Site Plan Approval by the Planning Board. The Planning Board may grant a Conditional Use Permit for a use that is otherwise permitted within the underlying district, if the permitted use is or is involved in one or more of the following:

- A. Storage, handling, and use of regulated substances in quantities exceeding 100 gallons or 800 pounds dry weight at any one time, provided that an adequate *spill prevention, control and countermeasure (SPCC) plan, in accordance with Section 4.2.44 of this Ordinance, is approved by the [Fire Department, Health Officer or Emergency Management Director]* to prevent, contain, and minimize releases from catastrophic events such as spills or fires which may cause large releases of regulated substances.

- B.** Any use that will render impervious more than 15% or 10,000 square feet of any lot, whichever is greater.

In granting such approval the Planning Board must first determine that the proposed use is not a prohibited use and will be in compliance with the Performance Standards as well as all applicable local, state and federal requirements. The Planning Board may, at its discretion, require a performance guarantee or bond, in an amount and with surety conditions satisfactory to the Board, to be posted to ensure completion of construction of any facilities required for compliance with the Performance Standards. The amount of this bond shall be in addition to any other bond required by the Board under either the subdivision or site plan regulations.

4.2.48 EXISTING NON-CONFORMING USES

Existing nonconforming uses may continue without expanding or changing to another nonconforming use, but must be in compliance with all applicable state and federal requirements, including Env-Ws 421, Best Management Practices Rules. However, under no circumstances will a nonconforming use be permitted when a continuance of that use presents a risk to public health and/or safety.

4.2.49 EXEMPTIONS

The following uses are exempt from the specified provisions of this ordinance as long as they are in compliance with all applicable local, state, and federal requirements:

- 01** Any private residence is exempt from all Performance Standards.
- 02** Any business or facility where regulated substances are not stored in containers with a capacity of five (5) gallons or more is exempt from Performance Standards 05 through 08.
- 03** Storage of heating fuels for on-site use or fuels for emergency electric generation, provided that storage tanks are indoors on a concrete floor or have corrosion control, leak detection, and secondary containment in place, is exempt from Performance Standard 05.
- 04** Storage of motor fuel in tanks attached to vehicles and fitted with permanent fuel lines to enable the fuel to be used by that vehicle is exempt from Performance Standards 05 through 08.
- 05** Storage and use of office supplies is exempt from Performance Standards 05 through 08.
- 06** Temporary storage of construction materials on a site where they are to be used is exempt from Performance Standards 05 through 08.
- 07** The sale, transportation, and use of pesticides as defined in RSA 430:29 XXVI are exempt from all provisions of this Ordinance.

08 Household hazardous waste collection projects regulated under NH Code of Administrative Rules Env-Wm 401.03(b)(1) and 501.01(b) are exempt from Performance Standards 05 through 08.

09 Underground storage tank systems and above ground storage tank systems that are in compliance with applicable state rules are exempt from inspections under *Section 4.250* of this ordinance.

4.250 RELATIONSHIP BETWEEN STATE AND LOCAL REQUIREMENTS

Where both the State and the municipality have existing requirements the more stringent shall govern.

4.251 MAINTENANCE AND INSPECTION

01 Uses requiring planning board approval for any reason, a narrative description of maintenance requirements for structures required to comply with Performance Standards shall be recorded so as to run with the land on which such structures are located, at the Registry of Deeds for Rockingham County. The description so prepared shall comply with the requirements of RSA 478:4-a.

02 Inspections may be required to verify compliance with Performance Standards. Such inspections shall be performed by the Code Enforcement Officer at reasonable times with prior notice to the landowner.

03 All properties within the Groundwater *Conservation* District known to the Code Enforcement Officer as using or storing regulated substances in containers with a capacity of 5 gallons or more, except for facilities where all regulated substances storage is exempt from this Ordinance under Section 4.2.49, shall be subject to inspections under this Section.

04 The Board of Selectmen may require a fee for compliance inspections. The fee shall be paid by the property owner. A fee schedule shall be established by the Board of Selectmen as provided for in RSA 41-9:a.

4.252 ENFORCEMENT PROCEDURES AND PENALTIES

Any violation of the requirements of this ordinance shall be subject to the enforcement procedures and penalties detailed in NH RSA 676.

4.253 SAVING CLAUSE

If any provision of this ordinance is found to be unenforceable, such provision shall be considered separable and shall not be construed to invalidate the remainder of the Ordinance.

4.254 EFFECTIVE DATE

This ordinance shall be effective upon adoption by the municipal governing body.

APPENDIX A: MAPS