



## SOURCE WATER PROTECTION PLAN FOR THE TOWN OF BOW, NH



December 2005

### **Primary Contacts:**

Robbin G. Leigh, Chair  
12 Kelso Drive  
Bow, NH 03304  
Phone: (603) 225-1716  
e-mail: [raleigh@fcgnetworks.net](mailto:raleigh@fcgnetworks.net)

Bill Klubben  
Bow Planning and Economic  
Development  
10 Grandview Road  
Bow, NH 03304  
(603) 225-3008  
[commdevel@bow-nh.gov](mailto:commdevel@bow-nh.gov)

Jennifer Palmiotto  
Source Water Specialist  
Granite State Rural Water Association  
322 Village St.  
Penacook, NH 03303  
Phone: (603) 753-4055  
E-Mail: [jpalmiotto@gsrwa.com](mailto:jpalmiotto@gsrwa.com)

***Review Annually and Update Every 3 Years***

Date Reviewed	Reviewer	Changes or Comments

The thirty-two public water supplies covered in this plan:

PWSID	NAME
0266220	501 SOUTH STREET
0262030	BELA BROOK WATER
0266020	BOVIE SCREEN PROCESS PRINTING
0269020	BOW COMMUNITY BUILDING
0265020	BOW ELEMENTARY SCHOOL
0265030	BOW HIGH SCHOOL
0268040	BOW IRVING
0265010	BOW MEMORIAL SCHOOL
0269030	BOW MILLS UNITED METHODIST CHR
0269010	BOW MUNICIPAL BUILDING
0268030	CHEN YANG LI RESTAURANT
0266170	COMMUNITY BRIDGES BLDG
0266210	CONCORD GROUP /NH CLAIMS DIV
0266150	CONCORD GROUP INFORMATION SVS
0262040	COTTAGES AT THE WIND CHIMES
0262010	EVERGREEN DRIVE WATER CO
0266180	GRANITE ST GYMNASTICS CENTER
0266120	GRAPPONE COLLISION CENTER
0266050	GRAPPONE FORD COMPLEX
0266040	GRAPPONE HONDA
0266200	GRAPPONE TOYOTA
0268120	HAMPTON INN
0265040	JOYFUL NOISE KEARNING CTR
0266070	KELLER PRODUCTS INC
0268020	MARY AND JOES TRUCK STOP
0268130	NANCYS FAMOUS BOW DEPOT
0262050	PEU/WHITE ROCK SENIOR LIVING
0266090	PITCO WEST
0266010	PSNH /MERRIMACK STATION
0266230	RIVER ROAD BUSINESS BAY
0266130	RUGGLES III OFFICE BLDG
0262020	WHITE ROCK WATER CO

Source Water Protection Plan for the Town of Bow, NH

Adopted by the Bow Drinking Water Protection Committee:

\_\_\_\_\_  
Robbin G. Leigh, Chairman

\_\_\_\_\_  
Date

\_\_\_\_\_  
Sandy Crystall, Vice Chairman and  
Member of Planning Board

\_\_\_\_\_  
Date

\_\_\_\_\_  
Bill Klubben, Secretary

\_\_\_\_\_  
Date

\_\_\_\_\_  
Pansy Bloomfield, School Board

\_\_\_\_\_  
Date

\_\_\_\_\_  
Bob Grappone, Bow Business Development Commission

\_\_\_\_\_  
Date

\_\_\_\_\_  
Bill Houser, Granite State Analytical

\_\_\_\_\_  
Date

\_\_\_\_\_  
Harry Judd, Selectman

\_\_\_\_\_  
Date

\_\_\_\_\_  
Ken Kroh, Merrimack Station PSNH

\_\_\_\_\_  
Date

\_\_\_\_\_  
Kitty Lane, Bow Conservation Commission

\_\_\_\_\_  
Date

\_\_\_\_\_  
Bernie Rousseau, Pennichuck Water Service Corp

\_\_\_\_\_  
Date



**Bow Drinking Water Drinking Protection Committee:** (from left to right) Rob Leigh, Bill Houser, Bill Klubbin, Kenn Kroh, Bernie Rousseau, Harry Judd, Kitty Lane, Sandy Crystall, and Pansy Bloomfield. Missing: Bob Grappone.

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## I. INTRODUCTION

### 1.1 Background and Purpose

Although more than 70 percent of the Earth's surface is covered by oceans, lakes, rivers, and other bodies of water, only a small fraction (2.4 percent) is fresh water. And of this small percentage of fresh water, nearly 90 percent is tied up in glaciers, ice caps, and snowfields. This means that of the fraction which is fresh water, only approximately 0.24 percent of the Earth's water is in fresh liquid form and thus available for human use. Preserving the purity of these fresh water resources has long been recognized as a worthwhile goal. Fresh water is often vulnerable to both natural and anthropogenic contamination. It is therefore critical that these resources be managed wisely for the benefit of present and future generations.

With this understanding of the limited nature of fresh water, this source water protection plan aims to increase the understanding of the drinking water resources within the Town of Bow, and to provide a meaningful foundation for decision-making. This source water protection plan was developed to protect the quality and quantity of drinking water sources in Bow, NH. The objective of this plan is to identify potential contamination sources to drinking water resources and to provide specific recommendations to manage these potential threats in order to maintain quality drinking water. This plan covers a total of thirty-two public water systems in the Town of Bow and provides recommendations which will benefit both public and private systems alike.

A source water protection plan consists of the following basic elements:

- A description of the water system(s)
- An inventory of potential contamination sources (PCS's);
- An assessment of risks posed by these PCS's;
- A management plan to minimize risks to the water source(s); and
- A contingency plan for responding to emergency loss of the water supply.

This plan was prepared by the Bow Drinking Water Protection Committee with assistance from Granite State Rural Water Association. Following a public workshop on drinking water protection held at the Bow Town Hall on May 4, 2005, the Board of Selectmen appointed interested people to the Drinking Water Protection Committee. Granite State Rural Water staff provided educational materials to the committee, facilitated meetings, and worked to incorporate Committee recommendations into this source water protection plan. From May to December 2005, the Committee met monthly, conducted site visits to several public water systems, and developed an inventory of potential contamination sources. After identifying source water protection priorities, the committee developed specific recommendations to address potential risks. This planning process concluded in December 2005.

This plan is a working document that will be reviewed at least annually and updated every three years to remain current, active, and viable. A carefully researched and thoughtfully drafted source water protection plan is an important first step because it identifies actions to protect water resources. Actions taken by water system management, surrounding landowners, and the larger community are key to achieving comprehensive protection.

## 1.2 Description of Drinking Water Resources in Bow

The Town of Bow is a rapidly growing suburban community located along a major growth corridor and two interstate highways. Residences and business within the Town are served by a combination of individual wells and water systems that are classified as public water systems. Regular monitoring of wells which serve individual homes is not required by state or federal law. It is up to the homeowner to assess water quality on a regular basis. Unlike individual residential wells, there are monitoring and reporting requirements for public water systems.

There are thirty-two active public water systems in the Town of Bow. These water systems provide water for three schools, two municipally-managed systems, 21 businesses, one church, and five residential communities (Table 1.1). A municipal drinking water system which will serve Bow's business development area is in the process of being developed.

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).

Public water systems are further classified into three types: community water systems, non-community non-transient systems, and non-community transient systems.

- **Community water systems** serve at least 25 residents on a year round basis. Examples include municipal water systems, and systems at mobile home parks, condominiums, and single family housing developments.
- **Non-community non-transient systems** serve at least 25 people, for at least 6 months per year. These systems typically serve daycare facilities, schools, and commercial properties.
- **Non-community transient systems** serve at least 25 people, for at least 60 days per year. These water systems serve restaurants, campgrounds, motels, recreational areas and services stations.

There are five community water systems, eighteen non-community non-transient water systems and nine non-community transient systems. All of these systems develop their water from groundwater. There are also seven inactive systems in Bow whose water systems were previously classified as active public water systems.

Bow has ten potential unconsolidated aquifer areas with a combined safe yield of at least 1.7 million gallons per day (SEA, 1987). These aquifers are located in the northwestern, southwestern, and eastern regions of the Town. The water quality in some areas is expected to be good. In other areas, naturally-occurring contaminants in the unconsolidated aquifers include iron and manganese, elements which can be treated economically. In many of the bedrock aquifers naturally-occurring contaminants such as arsenic and radon are a concern and treatment is more expensive. In the past, several private wells in the eastern part of Bow, near the Merrimack River and along Logging Hill Road were contaminated (SEA, 1987).

Due to the connection between surface water and groundwater, water resources management benefits all types of systems, whether they are public or private, or develop their water from groundwater or surface water. Source protection efforts help to minimize the likelihood that contaminated water will enter a drinking water system. NH DES recommends that source protection plans be implemented for all public drinking water supplies. These plans should include a variety of management activities such as

public education and land protection. One of the goals of this drinking water protection plan is to reduce the risk of contamination from entering drinking water systems in the Town of Bow.

Table 1.1 Public Water Systems and Sources in Bow, New Hampshire.

PWSID	SOURCE	NAME	SYSTEM STATUS	SYSTEM TYPE	POPULATION SERVED	SOURCE STATUS	WELL TYPE	DEPTH	YIELD
0262030	001	BELA BROOK WATER	ACTIVE	COMMUNITY	50	ACTIVE	BEDROCK WELL	270	12.00
0262040	001	COTTAGES AT THE WIND CHIMES	ACTIVE	COMMUNITY	75	ACTIVE	BEDROCK WELL	460	20.00
0262010	003	EVERGREEN DRIVE WATER CO	ACTIVE	COMMUNITY	80	ACTIVE	GRAVEL PACKED WELL	43	8.00
0262010	001	EVERGREEN DRIVE WATER CO	ACTIVE	COMMUNITY	80	ACTIVE	BEDROCK WELL	1000	4.00
0262010	002	EVERGREEN DRIVE WATER CO	ACTIVE	COMMUNITY	80	ACTIVE	BEDROCK WELL	805	1.50
0262050	001	PEU/ WHITE ROCK SENIOR LIVING	ACTIVE	COMMUNITY	216	ACTIVE	BEDROCK WELL	420	19.50
0262050	002	PEU/ WHITE ROCK SENIOR LIVING	ACTIVE	COMMUNITY	216	ACTIVE	BEDROCK WELL	360	19.50
0262020	001	WHITE ROCK WATER CO	ACTIVE	COMMUNITY	240	ACTIVE	BEDROCK WELL	1080	8.00
0262020	002	WHITE ROCK WATER CO	ACTIVE	COMMUNITY	240	ACTIVE	BEDROCK WELL	900	14.00
0262020	003	WHITE ROCK WATER CO	ACTIVE	COMMUNITY	240	ACTIVE	BEDROCK WELL	1045	35.00
0269020	001	BOW COMMUNITY BUILDING	ACTIVE	NON-COMMUNITY TRANSIENT	25	ACTIVE	BEDROCK WELL	190	50.00
0268040	001	BOW IRVING	ACTIVE	NON-COMMUNITY TRANSIENT	900	ACTIVE	BEDROCK WELL	300	10.10
0269030	001	BOW MILLS UNITED METHODIST CHR	ACTIVE	NON-COMMUNITY TRANSIENT	160	ACTIVE	BEDROCK WELL	218	0.00
0269010	001	BOW MUNICIPAL BUILDING	ACTIVE	NON-COMMUNITY TRANSIENT	25	ACTIVE	BEDROCK WELL	443	10.00
0268020	001	MARY AND JOES TRUCK STOP	ACTIVE	NON-COMMUNITY TRANSIENT	150	INACTIVE	BEDROCK WELL	209	30.00

PWSID	SOURCE	NAME	SYSTEM STATUS	SYSTEM TYPE	POPULATION SERVED	SOURCE STATUS	WELL TYPE	DEPTH	YIELD
0268020	002	MARY AND JOES TRUCK STOP	ACTIVE	NON-COMMUNITY TRANSIENT	150	INACTIVE	BEDROCK WELL	380	4.00
0268020	003	MARY AND JOES TRUCK STOP	ACTIVE	NON-COMMUNITY TRANSIENT	150	ACTIVE	BEDROCK WELL	460	12.00
0268030	001	CHEN YANG LI RESTAURANT	ACTIVE	NON-COMMUNITY TRANSIENT	300	ACTIVE	BEDROCK WELL	800	4.00
0268030	002	CHEN YANG LI RESTAURANT	ACTIVE	NON-COMMUNITY TRANSIENT	300	ACTIVE	BEDROCK WELL	342	1.00
0266180	001	GRANITE ST GYMNASIICS CENTER	ACTIVE	NON-COMMUNITY TRANSIENT	25	ACTIVE	BEDROCK WELL	504	1.00
0268120	001	HAMPTON INN	ACTIVE	NON-COMMUNITY TRANSIENT	228	ACTIVE	BEDROCK WELL	755	25.00
0268130	001	NANCYS FAMOUS BOW DEPOT	ACTIVE	NON-COMMUNITY TRANSIENT	500	ACTIVE	BEDROCK WELL	1006	6.00
0266220	001	501 SOUTH STREET	ACTIVE	NON-COMMUNITY NON-TRANSIENT	25	ACTIVE	BEDROCK WELL	561	50.00
0266020	001	BOVIE SCREEN PROCESS PRINTING	ACTIVE	NON-COMMUNITY NON-TRANSIENT	36	ACTIVE	BEDROCK WELL	400	8.00
0265020	001	BOW ELEMENTARY SCHOOL	ACTIVE	NON-COMMUNITY NON-TRANSIENT	720	INACTIVE	BEDROCK WELL	800	20.00
0265020	002	BOW ELEMENTARY SCHOOL	ACTIVE	NON-COMMUNITY NON-TRANSIENT	720	ACTIVE	BEDROCK WELL	800	20.00
0265030	001	BOW HIGH SCHOOL	ACTIVE	NON-COMMUNITY NON-TRANSIENT	450	ACTIVE	BEDROCK WELL	410	25.00
0265010	001	BOW MEMORIAL SCHOOL	ACTIVE	NON-COMMUNITY NON-TRANSIENT	575	ACTIVE	BEDROCK WELL	140	40.00
0266170	001	COMMUNITY BRIDGES BLDG	ACTIVE	NON-COMMUNITY NON-TRANSIENT	60	ACTIVE	BEDROCK WELL	0	0.00
0266210	001	CONCORD GROUP /NH CLAIMS DIV	ACTIVE	NON-COMMUNITY NON-TRANSIENT	29	ACTIVE	BEDROCK WELL	355	0.00
0266150	001	CONCORD GROUP INFORMATION SVS	ACTIVE	NON-COMMUNITY NON-TRANSIENT	28	ACTIVE	BEDROCK WELL	263	0.00

PWSID	SOURCE	NAME	SYSTEM STATUS	SYSTEM TYPE	POPULATION SERVED	SOURCE STATUS	WELL TYPE	DEPTH	YIELD
0266120	001	GRAPPONE COLLISION CENTER	ACTIVE	NON-COMMUNITY NON-TRANSIENT	40	ACTIVE	BEDROCK WELL	269	10.00
0266050	001	GRAPPONE FORD COMPLEX	ACTIVE	NON-COMMUNITY NON-TRANSIENT	120	INACTIVE	BEDROCK WELL	180	20.00
0266050	002	GRAPPONE FORD COMPLEX	ACTIVE	NON-COMMUNITY NON-TRANSIENT	120	ACTIVE	BEDROCK WELL	400	18.00
0266240	001	GRAPPONE HONDA	ACTIVE	NON-COMMUNITY NON-TRANSIENT	40	ACTIVE	BEDROCK WELL	1,000	15.00
0266200	001	GRAPPONE TOYOTA	ACTIVE	NON-COMMUNITY NON-TRANSIENT	90	ACTIVE	BEDROCK WELL	255	11.00
0265040	001	JOYFUL NOISE LEARNING CENTER	ACTIVE	NON-COMMUNITY NON-TRANSIENT	48	ACTIVE	BEDROCK WELL	UN-KNOWN	UN-KNOWN
0266070	003	KELLER PRODUCTS	ACTIVE	NON-COMMUNITY NON-TRANSIENT	100	ACTIVE	GRAVEL PACKED WELL	130	43.00
0266070	002	KELLER PRODUCTS	ACTIVE	NON-COMMUNITY NON-TRANSIENT	100	ACTIVE	GRAVEL PACKED WELL	133	60.00
0266070	001	KELLER PRODUCTS	ACTIVE	NON-COMMUNITY NON-TRANSIENT	100	ACTIVE	GRAVEL PACKED WELL	144	61.00
0266070	004	KELLER PRODUCTS	ACTIVE	NON-COMMUNITY NON-TRANSIENT	100	ACTIVE	GRAVEL PACKED WELL	125	22.00
0266090	001	PITCO WEST	ACTIVE	NON-COMMUNITY NON-TRANSIENT	240	ACTIVE	BEDROCK WELL	440	25.00
0266010	002	PSNH /MERRIMACK STATION	ACTIVE	NON-COMMUNITY NON-TRANSIENT	122	ACTIVE	GRAVEL PACKED WELL	70	205.00
0266010	001	PSNH /MERRIMACK STATION	ACTIVE	NON-COMMUNITY NON-TRANSIENT	122	ACTIVE	GRAVEL PACKED WELL	45	200.00
0266230	001	RIVER ROAD BUSINESS BAY	ACTIVE	NON-COMMUNITY NON-TRANSIENT	35	ACTIVE	BEDROCK WELL	263	40.00
0266130	001	RUGGLES III OFFICE BLDG	ACTIVE	NON-COMMUNITY NON-TRANSIENT	35	ACTIVE	BEDROCK WELL	305	70.00

**II. SOURCE PROTECTION AREAS**

There are several different types of protective areas associated with drinking water sources. For example, watersheds are delineated to protect surface water supplies. A watershed can be defined as the entire area that drains into a waterbody either through channelized flow or surface runoff.

The area under which groundwater flows to a producing well is known as the Wellhead Protection Area (WHPA). For bedrock wells, the WHPA is a circle whose radius is calculated based on the maximum daily amount of water withdrawn from the well. For till and gravel wells, the WHPA is calculated based on existing hydrogeologic information.

Another type of protected area is a groundwater source’s Sanitary Protective Radius. The Sanitary Protective Radius is a 75 - 400 foot radius around a well, which under current law *must* be controlled by the water supplier through ownership or easement. The size of the Sanitary Protective Radius depends on the permitted production volume for the well (Table 2). To facilitate protection of the drinking water source, it is necessary to know the delineation of the Sanitary Protective Radius and its boundaries on the ground. Within the Sanitary Protective Radius only activities that are both directly related to the water system and non-threatening to water quality should occur. Regular inspections of the Sanitary Protective Radius help to identify any potentially threatening land use activities.

Table 2. Sanitary Protective Radii

Permitted Production Volume (gallons per day)	Radius (feet)
< 14,400	150
14,401-28,800	175
28,801-57,600	200
57,601-86,400	250
86,401-115,200	300
115,201-144,000	350
> 144,000	400

Source: Env-Ws 378.06 Sanitary Protective Area

Within any of the aforementioned protected areas, land uses and/or naturally occurring materials may cause a public water system to be vulnerable to contamination. While naturally occurring contaminants can usually be controlled by treatment methods, potentially contaminating land uses can be managed by activities outlined in a source water protection plan. A source water protection plan identifies water system vulnerabilities and enumerates techniques to manage potentially contaminating land uses. The next chapter describes public drinking water systems managed by the Bow School Department and the Town of Bow.

### **III. PUBLIC WATER SYSTEMS MAINTAINED BY THE TOWN OF BOW OR THE BOW SCHOOL SYSTEM**

#### **3.1 Introduction**

The Drinking Water Protection Committee reviewed school-managed and municipally- managed water systems to ensure that these systems are operated properly and can serve as models for other water systems in the town. School-managed systems include:

- Bow Elementary School
- Bow Memorial School
- Bow High School

Municipally-managed systems include:

- Bow Municipal Building
- Community Building/Fire Station
- Public Works/Police Building
- Old Town Hall
- Baker Free Library

This chapter provides a general description of each system and describes potential contamination sources within each of the wellhead protection areas. Potential contamination sources are those activities that have the potential to negatively impact drinking water resources. Recommendations to address potential contamination concerns are described in Chapter V.

An inventory of potential contamination sources is a list of land use activities that have the potential to cause harm to a water system. A combination of methods was used to develop the PCS inventories for these systems. On June 21, 2005 the Drinking Water Protection Committee made site visits to inspect the wells and wellhead protection areas for Bow Elementary School, Bow Memorial School, and Bow High School water systems. In November, Granite State Rural Water staff, Jack Shields, prepared inventories of potential contamination sources for the school systems mentioned above and also five municipally managed systems. Granite State is in the process of creating wellhead protection plans for these eight systems. Data supplied by NHDES from the OneStop Data Retrieval web site (<http://www.des.state.nh.us/OneStop.htm>) and from GIS data were used to further develop these inventories. Through planning, education, and outreach most potential sources of contamination can be effectively managed.

Because of the Committee's interest in protecting drinking water resources throughout the town, the committee also conducted an inventory of potential sources of contamination on a town-wide basis. Findings from the town-wide inventory are presented in Chapter IV.

### **3.2 Water System Descriptions, Water Quality Issues, and Potential Sources of Contamination**

#### *Bow Elementary School*

Bow Elementary School obtains its water from a single bedrock well known as Bedrock Well #2. Well# 2 serves approximately 720 students and staff, is 800 feet deep and produces 20 gallons per minute. The wellhead protection area for this water system is a circle around the well with a radius of 1,300 feet (Figure 3.1). All public water supply system wells are required to have a sanitary protective radius which is under the control of the well owner, within which no buildings, septic tanks, leach fields, oil, debris, or other hazardous materials may be located or stored. The sanitary protective radius for this source has a radius of 150 feet and is under the control of the School. However, there is a 5,000 gallon underground storage tank within 100 feet of the well, vehicles park within 20 feet of the well and there is an access road for the oil tank that is within 25 feet of the well. An oil or gasoline spill in the sanitary protection area is likely to impact the well.

There are no outstanding water quality issues at this time. There is one issue to consider for the future, however. A federal drinking water standard of 300 pCi/L for radon has been proposed by the U.S. Environmental Protection Agency. Water analysis records for the Bow Elementary School indicate that this system, like many public systems served by bedrock wells in New Hampshire will exceed this new proposed standard. It is likely that radon treatment will be required for this system at some time in the future. Options for radon treatment are currently being investigated by the School Department.

#### *Bow Memorial School*

The Bow Memorial School obtains its water from a single bedrock well known as Bedrock Well #1. Well #1 serves approximately 575 students and staff, is 140 feet deep and yields 40 gallons per minute. The wellhead protection area for the school water system is a circle around the well with a radius of 1,300 feet (Figure 3.2). The sanitary protective radius for this source is 150 feet and is under the control of the School. There are, however, several potential sources of contamination in close proximity to the well. For example, there is a 5,000-gallon underground oil tank (installed in 1989) less than 80 feet from the well. According to NH DES OneStop Database both monitor/sensor testing and corrosion testing for the tank are “immediately due”. The oil tank is made of steel and corrosion protected, however, it is old and of single wall construction. Likely, it is only a matter of time before this tank leaks and potentially impacts the well. There is also an oil-cooled electrical transformer less than 25 feet from the well, a dumpster containing cafeteria waste less than 15 feet from the well and the school building itself is less than 15 feet away. In addition, there is a playground that is also used by service vehicles as an access road. This area is less than 10 feet from the well.

There are no outstanding water quality issues at this time. Radon abatement treatment has been installed at this system.

#### *Bow High School*

Bow High School obtains its water from a single bedrock well known as Bedrock Well #1. Well #1 serves over 600 students and staff, is 410 feet deep and yields 25 gallons per minute. The wellhead protection area for the high school water system is a circle around the well with a radius of 1,300 feet (Figure 3.3). The sanitary protective

radius for this source is 150 feet, is under the control of the School, located in a wooded area, and has no known potential contamination sources. There are no outstanding water quality issues at this time.

**Figure 3.1 Bow Elementary School (WSID# 0265020)**



**Legend**

- Storm Drain
  - Well
  - ▲ Underground Storage Tank
  - ★ Resource Conservation and Recovery Act Site
- Potential Contamination Sources
- 1 - Underground Storage Tank
  - 2 - Parking / Access Road
  - 3 - Transportation Corridors
  - 4 - RCRA Site / Underground Storage Tank
  - 5 - Storm Drain
- The orthophoto is from 1998.



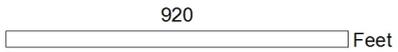
910 Feet

**Figure 3.2 Bow Memorial School (WSID# 0265010)**



**Legend**

- Storm Drain
  - Well
  - ▲ Underground Storage Tank
  - ★ Resource Conservation and Recovery Act Site
- Potential Contamination Sources
- 1 - Underground Storage Tank / RCRA Site
  - 2 - Storm Drain
  - 3 - Transportation Corridors
  - 4 - Underground Storage Tank
- The orthophoto is from 1998.



**Figure 3.3 Bow High School (WSID# 0265030)**



**Legend**

Potential Contamination Sources  
1 - Resource Conservation and Recovery Act Site  
2 - Transportation Corridors

● Well  
★ Resource Conservation and Recovery Act Site

Orthophoto is from 1998.



920 Feet

*Bow Municipal Building*

The Bow Municipal Building obtains its water from a single bedrock well known as Bedrock Well #1. Well #1 serves approximately 25 people, is 443 feet deep and yields ten gallons per minute. The well for the Municipal Building is located in the building beneath a meeting room floor (Figure 3.4). Within the sanitary protective radius there is the Municipal Building, its parking lot, a road and a playground.

There are no outstanding water quality issues at this time except for the possible need to treat for radon in the future.

*Community Building/Fire Station*

The Bow Community Building/Fire Station obtains its water from a single bedrock well known as Bedrock Well #1. Well #1 serves approximately 25 people, is 190 feet deep and yields 50 gallons per minute. Within the sanitary protective radius and in close proximity to this source are two transportation corridors (Figure 3.5). The well is in a pit with a good cap. Floor drains managed by the Fire Department are connected to an oil separator and there are no septic systems with the radius. In the building there are several emergency vehicles with approximately 500 gallons of fuel aboard and there is a 330-gallon single wall aboveground diesel tank for the emergency generator.

There are no outstanding water quality issues at this time except that radon treatment will likely be required for this system at some time in the future. Options for radon treatment should be researched and anticipated for this source.

*Public Works/Police Building, Old Town Hall, and Baker Free Library*

Although not currently managed as public water systems, it appears that the water systems for the Public Works/Police Building, Old Town Hall and Baker Free Library are technically public water systems. Based upon usage the Public Works/Police Building appears to be a non-community non-transient system and the Old Town Hall and Bow Library are likely non-community transient systems.

**Figure 3.4 Bow Municipal Building (WSID# 0269010)**

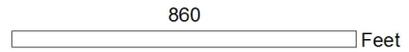


**Legend**

- Storm Drain
- ▲ Underground Storage Tank
- ★ Resource Conservation and Recovery Act Site

Potential Contamination Sources  
1 - Building, Parking Lot and Playground  
2 - Transportation Corridor

Orthophoto is from 1998.



**Figure 3.5 Bow Community Building / Fire Station  
(WSID# 0269020)**



**Legend** Potential Contamination Sources  
● Well  
1 - Building, Emergency Vehicles, Aboveground Storage Tank  
2 - Transportation Corridors  
Orthophoto is from 1998.



870 Feet

## **IV. POTENTIAL SOURCES OF CONTAMINATION IN THE TOWN OF BOW**

### **4.1 Introduction**

An inventory of potential contamination sources was developed and analyzed on a town-wide basis because of the large number of public water systems located throughout the town. A combination of methods was used to develop the town-wide inventory. Information was gathered from a NH DES Drinking Water Resources and Potential Contamination Sources report dated March 16, 2005, NH DES Source Water Assessment Reports (SWAP), NH DES GIS data, and data from the NH DES One-Stop web-based retrieval database (<http://www.des.state.nh.us/OneStop.htm>).

The Drinking Water Resources and Potential Contamination Sources report contains information about permitted activities such as underground storage tanks, aboveground storage tanks, and hazardous waste generator facilities. A map of facility locations accompanies this water resources report. The Bow Drinking Water Protection Committee will provide the Board of Selectmen, Planning Board, Conservation Commission, and Zoning Board of Adjustment with copies of this report and map.

The NH DES Source Water Assessment Reports provide information about potential sources of contamination for each individual public water system. Categories of Potential Contamination Sources were ranked by NH DES as having a “Low”, “Medium”, or “High” risk. For this reason, the Committee did not perform an evaluation of risk for the inventory presented below, but relied on the evaluation by NH DES. Information from these sources was reviewed by the Drinking Water Protection Committee for accuracy and in some cases was ground-truthed by Granite State Rural Water Association.

This process yielded five general categories of potential sources of contamination which are described below. These categories include: residential development, transportation corridors, commercial, industrial and municipal land use, lack of water resources protection, and stormwater runoff. These concerns are not listed in order of priority.

### **4.2 Town-Wide Potential Contamination Sources**

#### *Residential Development*

Residential land use poses threats to drinking water resources from several sources. For example, potential contamination sources include residential fuel storage, household hazardous waste, lawn care and septic systems. These concerns related to residential development are described below.

#### *Residential Heating Fuel Storage*

Residential heating fuel tanks are potential sources of contamination because they are prone to leaks due to line breakage, corrosion, and fitting and filter leaks (Freill, 2004). Over-filling of tanks is also a concern. The primary pollutants associated with residential heating fuel are volatile organic chemicals which can have negative impacts on fisheries and human health.

The location of residential heating fuel tanks is significant. For example, residential heating fuel tanks consist of aboveground storage tanks which are located outside and inside tank installations which are usually located in a basement. There are two common problems associated with outside tanks. Aboveground storage tanks should

be located on an impermeable surface to prevent leaching of fuel spills into the groundwater and the tank themselves should be protected from harsh weather conditions. Tanks may tip over or become damaged due to ice and snow. Often tanks are not located on an impermeable surface and do not have weather protective structures. Inside tanks are typically located in finished or unfinished basements. Finished basements provide some spill or leak containment. In contrast, unfinished basements do not have a physical barrier which helps to contain spills. Finished basements may also have sump pumps to alleviate wet conditions. Although useful for removing water, sump pumps can accidentally pump fuel or fuel-contaminated water into groundwater resources or directly into surface water.

#### Household Hazardous Waste

Improper disposal of household hazardous wastes can lead to the contamination of both ground and surface drinking water sources. While homeowners do not typically intend to pollute, improperly disposed substances from auto repair activities, furniture stripping, for example, can find their way into water resources. Proper storage, use, and disposal can reduce the possibility of water resources contamination. Annual community household hazardous waste collection days help to minimize the release of these hazardous materials. Every other year, Bow holds a household hazardous waste collection day which is well publicized within the community.

#### Lawn Care

Nutrients and pesticides are common pollutants associated with lawn care and gardening activities. Pesticides are sources of synthetic organic chemicals. These chemicals can be washed from lawns during a rain event and transported to groundwater and surface water. Once these chemicals enter the drinking water supply they can pose potential health risks. Fertilizers are a source of nutrients such as nitrogen and phosphorus. Excess additions of these nutrients to surface waterbodies can result in increased frequency and mass of algal blooms. Use of low maintenance grasses and implementation of homeowner education programs can help to limit pollution from lawn care activities.

#### Septic Systems

Everything that goes down the drain, into the toilet, dishwasher, and clothes washing machine goes to some type of wastewater disposal system. In Bow there are two general categories of wastewater disposal systems: a system associated with an individual home and a municipal sewer system. The majority of households in the town dispose of their wastewater using individual systems which include septic systems, cesspools, and holding tanks. Of these three types of disposal systems, septic systems are the most common.

When wastewater disposal systems fail they can be sources of bacteria, viruses, and protozoa which can cause gastrointestinal illness. They can also be sources of pollutants from improper disposal of household hazardous waste. Both sewers and individual wastewater disposal systems are capable of failure. Municipal sewer systems are typically managed by professional staff. Individual systems, on the other hand, often receive less attention after they have been installed. The homeowner is responsible for ensuring proper system operation and maintenance of septic systems. Ideally, septic systems should be maintained by pumping out wastes approximately every 3-5 years.

When septic systems function properly they can process household organic waste

and destroy disease-producing bacteria. The most commonly approved system consists of a septic tank connected to a leach field. Wastewater first flows to the septic tank where heavy solids sink to the bottom. Grease, oils, and lighter solids rise to the top where they form a layer of scum. Beneficial bacteria, which are naturally present in materials that are flushed into the system, decompose the biodegradable waste. Liquids flow from the tank to the leach field where unhealthful bacteria, viruses, and some phosphorus are removed. Eventually the filtered water flows to the water table (CRJC, 1994). A failed system jeopardizes public health, is a neighborhood nuisance, and negatively impacts water quality.

It is difficult to assess current levels of septic system maintenance in the Town of Bow. Information on the status and maintenance of septic systems is not available. There are no septic system maintenance ordinances, tracking programs, or municipal septic system programs in the town. The purpose of septic system ordinances is to promote inspection and periodic pump-outs to prevent system failure. A tracking program is a non-regulatory way to ensure that septic systems are functioning. The program typically requires registration of all systems and encourages routine system inspections and pumpings. Under a municipally managed tracking program the municipality typically assumes responsibility for maintenance and repair of septic systems. Homeowners are charged an annual fee for this service.

The Town of Bow does not have a hardship fund for septic system repair/replacement. Other communities in New Hampshire, such as the Town of Meredith have established such a fund.

#### *Transportation Corridors*

Transportation corridors include roads, highways, and railroad rights-of-way. Roadways serve as potential sources of contamination because these impervious surfaces accumulate de-icing materials and chemicals from automobiles. Stormwater runoff carries these pollutants to nearby waterways and groundwater. The Town of Bow has approximately 110 miles of roads and has already adopted a reduced salt policy which is intended to balance ecological considerations and safety. A sand to salt ratio of 4:1 is used for all areas of town. When conditions require, more or less salt is mixed. Calcium chloride is added when the temperature is too cold for untreated salt to be effective.

Railroad rights-of-way are potential sources of contamination because of the risk of train accidents. The Boston and Maine railroad line passes directly over the community's largest aquifer.

#### *Commercial, Industrial, and Municipal Land Uses*

Commercial, industrial, and municipal activities that require a state permit were considered to be potential sources of contamination for this inventory. As mentioned previously, information about these sources was collected from NH DES Drinking Water Resources and Potential Contamination Sources report dated March 16, 2005 and NH DES One-Stop web-based retrieval database (<http://www.des.state.nh.us/OneStop.htm>). Categories of potential contamination sources include: aboveground storage tanks (AST), underground storage tanks (UST), leaking underground storage tanks (LUST), Resource Conservation and Recovery Act sites (RCRA), nonpoint source pollution sites, and underground injection control sites (UIC). Information on each of these categories is presented on the following pages with associated summary tables.

Aboveground and underground storage tanks are considered a risk to water resources due to the potential for leaks, spills, and vapor leaks. Petroleum leaks and spills are sources of volatile organic chemicals. This review found five sites with aboveground storage tanks (Table 4.1). There are eleven sites with active underground storage tanks and two sites with leaking underground storage tanks which are considered “active” by NHDES. An “active” LUST site means that activities such as water quality sampling or site remediation are ongoing.

The Mobil LUST site has a risk classification of “Drinking Water supply within 1000 feet or site in Source Water Protection Area.” There are five public water systems within 1,000 feet of this site. These include the groundwater sources for the Mobil Station, Chen Yang Li Restaurant, Hampton Inn, Bovie Screen Process Printing, and Concord Group/NH Claims Division. In 1990 a fuel oil and waste oil underground storage tank and 17 cubic yards of impacted soil were removed from the Mobil station property (GES 2005). In 1991 groundwater impacts at the site were found to contain concentrations of chemicals such as benzene, toluene, and methyl tert butyl ether (MTBE). Groundwater monitoring is ongoing at this site.

The Mr. Mike’s site is classified as “Drinking Water supply impacted.” In 1989, petroleum impacted soil was discovered at the Breakaway Truck Stop property originating from a leaky fitting from a product line near the former gas dispenser islands (GeoInsight, 2005). The leak was repaired in December 1989 and impacted soil was removed from the area in October 1992. Remaining impacted soil and groundwater were treated using air sparging/soil vapor extraction technologies in 1994 and 1995. In the Spring of 1999, five USTs were removed and additional low level petroleum-impacted soil was removed. Groundwater and drinking water monitoring are ongoing.

Table 4.1 List of facilities with aboveground storage tanks, underground storage tanks or leaking underground storage tanks in Bow, NH. “\*” indicates under remediation.

Type	MASTER ID	FACILITY ID	FACILITY	ADDRESS	# of Tanks
Aboveground Storage Tank	438	960514A	PUBLIC WORKS FACILITY	12 ROBINSON RD	2
Aboveground Storage Tank	432	980614A	R S AUDLEY INC	609 RTE 3A	2
Aboveground Storage Tank	15838	870905A, 9811064	PSNH	97 RIVER RD	20
Aboveground Storage Tank	15838	870905A, 9811064	PSNH	97 RIVER RD	20
Aboveground Storage Tank	58346	0000168	PERSONS CONCRETE	75 RIVER RD	1
Underground Storage Tank	429	0110762	MR MIKES CITGO	728 RTE 3A	4
Underground Storage Tank	435	0110515	STRUCTURES UNLIMITED INC	38 RIVER RD	5
Underground Storage Tank	432	0111580	R S AUDLEY INC	609 RTE 3A	3
Underground Storage Tank	416	0113866	BOW MEMORIAL / ELEMENTARY SCHOOL	20 BOW CENTER ROAD	1
Underground Storage Tank	416	0113866	BOW MEMORIAL / ELEMENTARY SCHOOL	20 BOW CENTER ROAD	1
Underground Storage Tank	428	0112082	MOBIL 10571	519 SOUTH ST	4
Underground Storage Tank	414	0111321	BLUE SEAL FEEDS INC	HALL ST	2
Underground Storage Tank	415	0114658	IRVING OIL CORP	500 RTE 3A	4
Leaking Underground Storage Tank*	5834	199102011	MOBIL 10571	519 SOUTH ST	
Leaking Underground Storage Tank*	1763	198910035	MR MIKES CITGO	728 RTE 3A	

There are fifty-three active Resource Conservation and Recovery Act sites (Table 4.2). These facilities are classified as hazardous waste handlers which store, manage, or generate hazardous substances which are, for example, ignitable, corrosive, or toxic. The majority of these sites are located along the Route 3A corridor, over Bow's largest aquifer.

Table 4.2 List of Resource Conservation and Recovery Act Sites in Bow, NH.

MASTER ID	FACILITY ID	FACILITY	ADDRESS
54004	NHD510162852	A 1 STARTER & ALTERNATOR	85 RIVER RD
40274	NHD500013222	ADVANCED SITEWORKS	54 RIVER RD
54499	NHD510166739	ANTIFREEZE TECHNOLOGY SYSTEMS	85 RIVER RD
51383	NHD510161938	ARCH EQUIPMENT & TRUCKING INC	11 DUNKLEE RD
40252	NHD986487080	AUTOBAHN MOTORS	3 GARVINS FALLS RD
54644	NHD510167471	AUTOLOGIC LLC	7 GORDON RD
40269	NHD033369232	AUTOMOTIVE CONSULTANTS & TRNSP	65 RIVER RD
51626	NHD510160260	BOBS BODY WORKS	714 RTE 3A
15834	NHD981068232	BOVIE SCREEN PRINTING CO	4 NORTHEAST AVE
40291	NHD510121635	BOW AUTO SERVICE INC	663 RTE 3A
438	NHD986466076	BOW BUS GARAGE TOWN OF	12 ROBINSON RD
40315	NHD500004015	BOW SCHOOL DISTRICT	WHITE ROCK HILL RD
416	NHD500020326	BOW SCHOOL DISTRICT SAU 67	20 BOW CENTER RD
40271	NHD982746596	BUMPER TO BUMPER AUTO BODY	65 RIVER RD
55883	NHD510158942	CAPITAL CONSTRUCTION EQUIPMENT & SUPPLY	54 RIVER RD
40236	NHD510127418	CASCO FOOD EQUIPMENT	10 DUNKLEE RD
40237	NHD500015011	CLEAN HARBORS ENV SVCS INC	20 DUNKLEE RD
40278	NHD510071749	COMMERCIAL TECH SERVICES	85 RIVER RD
40310	NHD500023502	CONCORD AWNING & CANVAS INC	1 TALLWOOD DR
40309	NHD500015060	CRONHARDT B & HEADINGS B D M D	514 SOUTH ST
40253	NH5986485142	DANTRA EQUIPMENT	8 GORDON RD
15829	NHD510015928	DICKS SERVICE CENTER	521 SOUTH ST
40289	NHD986473932	DONS SWEDISH IMPORTS LLC	714 RTE 3A
40296	NHD981209901	EXTERIOR AUTO WORKS	687 RTE 3A
40275	NHD510120272	GODDARD'S AUTOMOTIVE REPAIR	65 RIVER RD
439	NHD099357972	GRAPHIC PACKAGING	510 HALL ST
423	NHD981071301	GRAPPONE COLLISION CENTER	RTE 3A
40304	NHD018900936	GRAPPONE FORD	RTE 3A
421	NHD981072069	GRAPPONE HONDA	RTE 3A
422	NHD981072085	GRAPPONE MAZDA VW	RTE 3A
15827	NHD981072531	GRAPPONE TOYOTA INC	RTE 3A
40297	NHD500012844	H & D TRUCK SERVICE	561 RTE 3A
40306	NHD510013535	HEWS COMPANY INC	2 RYAN RD
40228	NHD510158157	IMAGE CONTROL INC	20A DUNKLEE RD
415	NHD510005929	IRVING OIL CORP	500 RTE 3A
51516	NHD510160120	J W FLEET & EQUIPMENT INC	621 RTE 3 A
18409	NHD000791541	KALWALL CORP FLAT SHEET DIV	40 RIVER RD
15830	NHD083396812	KELLER PRODUCTS INC	RIVER RD
40240	NHD510152606	LAKES FUEL INJECTION INC	42 DUNKLEE RD
40248	NHD510130560	MIKES PERFORMANCE CYCLE	10 DUNKLEE RD
429	NHD510021678	MR MIKES CITGO	728 RTE 3A

MASTER ID	FACILITY ID	FACILITY	ADDRESS
40267	NHD500021795	NH DOT DISTRICT 5	670 RTE 3A
15835	NHD986486223	NH PETERBILT	734 RTE 3A
40244	NHD510004906	NOVA AUTO BODY	10 DUNKLEE RD
40311	NHD510021439	PATSFIELD EXCAVATION INC	5 TALLWOOD DR
40259	NHD510053812	PERINI CORP	JOHNSON RD
15837	NHD980668719	PITCO FRIALATOR INC	509 RTE 3A
15840	NHD980667778	PSNH	RTE 3A
48279	NHD000791509	PSNH	97 RIVER RD
431	NHD510174287	PSNH	28 JOHNSON RD
18217	NHD510158298	QUALITY WOOD PRIMING INC	34 DUNKLEE RD
433	NHD510129422	REED MINERALS	97 RIVER RD
40227	NHD500022645	RIMCON INC	134A RIVER RD
15845	NHD510128135	SARA LEE COFFEE & TEA FOODSERVICE	560 RTE 3A
418	NHD986474310	SATURN OF CONCORD	RTE 3A
40282	NHD986486637	SCANADA INTERNATIONAL INC	8 ROBINSON RD
40280	NHD500011663	SCOTT LAWSON GROUP INC	29 RIVER RD
40258	NHD500021746	STEEVES AUTO SALES	629 HWY RTE 3A
435	NHD000791558	STRUCTURES UNLIMITED INC	40 RIVER RD
40250	NHD510131782	TRANS POLE	10 DUNKLEE RD
40233	NHD982203838	Z TECH DIVISION	8 DOW RD

There are thirteen known potential sources of contamination classified by NH DES as nonpoint sources of pollution (Table 4.3). These sources include eight storm drains, two covered sand/salt pile storage facilities, and three sand and gravel mines. In addition, there are three landfills in Bow. The Bow Town landfills are unlined and the PSNH Landfill is lined.

Table 4.3 Non-point sources of potential contamination. (Source: NH DES GIS data).

SITE ID	TYPE	SITE NAME
150-28	STORM DRAIN	GRAPPONE TOYOTA
150-29	STORM DRAIN	GRAPPONE TOYOTA
150-30	STORM DRAIN	
150-31	STORM DRAIN	BOW MEMORIAL SCHOOL
150-32	STORM DRAIN	BOW MEMORIAL SCHOOL
150-33	COVERED SALT/SAND PILE	BOW TOWN GARAGE
151-19	STORM DRAIN	BOW TECHNOLOGIES
151-20	COVERED SALT/SAND PILE	STATE HIGHWAY GARAGE
151-21	STORM DRAIN	
165-01	MINE, SAND AND GRAVEL	
151-27	MINE, SAND AND GRAVEL	
151-28	MINE, SAND AND GRAVEL	
151-29	STORM DRAIN	

There are nine active underground injection control (UIC) Sites (Table 4.4). UICs are defined as the “subsurface emplacement of fluids through a bored, drilled, driven or dug well where the depth of the well is greater than the largest surface dimension” (Env-Ws 1500 Groundwater Discharge Permit and Registration). Examples of UICs include floor drains and subsurface wastewater disposal systems. UICs are considered potential contamination sources because they can create a connection between the land’s surface and groundwater. Six of these sites are within 1000 feet of a source or are in a source water protection area.

Table 4.4 List of underground injection control sites in Bow, NH.

FACILITY ID	FACILITY	ADDRESS	RISK
200302028	RUGGLES III OFFICE BLDG	553 RTE 3A	DRINKING WATER SUPPLY WITHIN 1000'
200208073	WIND CHIMES	10 ALBIN RD	DRINKING WATER SUPPLY WITHIN 1000'
199606010	FOR SALE	ROUTE 3A #560	NO SOURCES/ NO
200308089	Z TECH LLC	8 DOW RD	DRINKING WATER SUPPLY WITHIN 1000'
199110027	KELLER PRODUCTS	RIVER RD	DRINKING WATER SUPPLY WITHIN 1000'
198400065	PSNH	97 RIVER RD	
198910035	MR MIKES CITGO	728 RTE 3A	DRINKING WATER SUPPLY WITHIN 1000'
199310013	NEW HAMPSHIRE PETERBILT	RTE 3A	NOT DETERMINED YET

### *Water Resources Protection*

Bow needs to protect drinking water resources to meet both current and future demand. These needs can be addressed by adopting local regulations for water resource protection, through land ownership, and by developing a needs assessment of future water needs.

Local regulations can help protect water quality by directing development away from ecologically sensitive areas, guiding the location of construction and development projects, and prohibiting high risk land uses in specific areas. Local regulations include zoning bylaws and ordinances, subdivision and site plan regulations, and local health ordinances. Bow currently has an aquifer overlay district, however, updating this ordinance could improve the protection of drinking water resources. Specifically Bow should identify lists of approved and prohibited land uses for specific zones within the Aquifer Protection District. A discussion of how the provisions would relate to other conventional zones in the community should be included. Specific recommendations for site design criteria should also be identified. During the Committee's discussion of the Aquifer Protection District two issues were raised: potential negative impacts from large groundwater withdrawals and the negative effects of impervious cover. These two issues should be addressed by the Aquifer Protection District ordinance.

Land conservation is one of the most effective ways to protect water resources. There are two ways this is typically accomplished: fee simple land ownership and purchase of conservation easements. Fee simple ownership refers to complete ownership of all the "bundle of rights" associated with a property. In contrast a conservation easement is a permanent legal agreement between a landowner and a public agency or private nonprofit conservation organization which limits or restricts how land can be used. By placing a conservation easement on a property, the landowner transfers some of the development rights to a responsible third party, such as a land trust. The land trust is then responsible for ensuring that the easement restrictions are met.

And lastly it is important to assess future water demand in order to ensure that these resources will be available as the Town of Bow continues to grow.

### *Stormwater Runoff*

Stormwater runoff occurs when the capacity of soils and vegetation to absorb water from precipitation is exceeded and water flows across the land's surface. In developed areas, natural vegetation and permeable soils are replaced by impervious surfaces such as roads, parking lots, rooftops, driveways, sidewalks, and compacted fill. Because water cannot penetrate these impervious surfaces, it runs off into gutters and storm drains picking up toxins and suspended solids along the way. In undeveloped areas, water infiltrates the soil where some pollutants can be treated by natural processes. In contrast, in developed areas, the rate of stormwater runoff increases allowing for less time for natural pollutant treatment and increasing the volume of water flow.

According to the U.S. Environmental Protection Agency, contaminated stormwater discharges are responsible for the impairment of one-third of all assessed waters in the United States. Common stormwater pollutants include sediments, toxic chemicals (e.g. cyanide, phenolics, and trichloroethylene), metals, oxygen depleting chemicals, fecal coliform, oil, grease, pesticides, fertilizers, and trash (Ballesterio et al., 2005).

Little is known about the quality and location of stormwater runoff in Bow. Information about the quality of stormwater and the identification and location of stormwater management structures is not available.

## V. MANAGEMENT OF RISK

After reviewing the inventory of potential contamination sources the Drinking Water Protection Committee developed a list of eleven priority areas of concern. These concerns include: implementation of this source protection plan, source protection for municipally-owned and school-managed water systems, septic systems and waste water management, lawn care, residential fuel storage, transportation corridors, commercial, industrial, and municipal land uses, water resource protection, stormwater management, water conservation, and future drinking water supplies and services. For each concern the Committee developed specific action-oriented recommendations to address these risks. Recommendations include education and outreach, partnerships with local agencies, land conservation and adoption of local regulatory controls. These recommendations are discussed in more detail in the narrative and Table 5.1 below. Concerns are not listed in order of priority.

### 5.1 Source Water Protection Recommendations

#### **Concern #1: Implement this source water protection plan.**

During its nine month existence, the Drinking Water Protection Committee has accomplished its goal of drafting a source water protection plan for the Town of Bow. In order for this plan to be successfully received and put to use, the Committee requests that the Board of Selectmen re-appoint the Committee for another year of service. During its second year the Committee's goal will be to help shepherd implementation of this source water protection plan.

#### **Concern #2: Municipally-Owned and School-Managed water systems.**

Water systems managed by the Town of Bow and the Bow Schools should serve as models of source water protection. There are six recommendations which will help meet this goal. Individual wellhead protection plans should be developed for the following systems: Bow Municipal Building, Community Building/Fire Department, Public Works Department/Police Building, Old Town Hall, Baker Free Library, Bow Memorial School, Bow Elementary School, and Bow High School. The Town of Bow and School Department have already requested assistance from Granite State Rural Water Association to draft these plans. The wellhead protection plans will be completed early in 2006. These wellhead protection plans should be updated every three years.

Currently the water systems for the Public Works/Police Building, Old Town Hall, and Baker Free Library are not operated as public water systems. It appears that the use of these water systems meets the definition of a "public water system". The status of these supplies should be investigated in order to determine if they should be operated as public systems. Their water quality should be assessed as part of this process.

To safeguard water quality of the Old Town Hall water system, a septic system maintenance program should be established for this facility.

There are a number of potential contamination sources present in the sanitary protective radius for both the Bow Elementary School water system and the Bow Memorial School water system. A feasibility study should be conducted to determine whether it is more effective and efficient to remove potential contamination sources or establish new groundwater sources in alternative sites.

Lastly, a new municipal water supply is in the process of being developed. A

wellhead protection plan for this new system is being written by Wright-Pierce as part of this process. The recommendations in this wellhead protection plan should be implemented in order to safeguard this important source of supply.

### **Concern #3: Septic Systems and Wastewater Management.**

Improved septic system operation/maintenance and wastewater management can be achieved through a two-pronged approach using education and local regulation. Homeowners and business owners should be educated about the use and maintenance of their septic systems. For example, NH DES factsheets can be distributed with the Annual Town Report, articles can be written for the Bow Times, and information can be posted on the Town's website. A workshop about septic system maintenance and operation could be held for residents and business owners.

The Committee also recommends adoption of a phased-in septic system maintenance ordinance. Through adoption of a septic system maintenance ordinance, homeowners would be required to show proof of proper septic system functioning and periodic maintenance. Lastly, the site regulations and subdivision regulations should require that new developments construct sewage collection systems in anticipation of connection to sewer lines.

### **Concern #4: Lawn Care**

To prevent nonpoint source pollution from lawn care activities, the Committee recommends that the Conservation Commission educate residents and businesses about the correct use of lawn care chemicals and fertilizers, and methods to minimize water use for landscaping purposes.

### **Concern #5: Residential Fuel Storage**

Unlike commercial and industrial fuel storage there is minimal regulation of residential heating fuel storage tanks. The Committee recommends collaboration with fuel oil distributors and oil burner service companies in order to promote better storage and maintenance of residential fuel tanks. Activities could include education and outreach to consumers and development of a free tank inspection program.

### **Concern #6: Transportation Corridors.**

The Town of Bow should continue to implement its policy of reduced salt use while maintaining public road safety. Because transportation corridors can be sources of potential contamination as a result of accidents, the Bow Emergency Planning Team should be informed of the locations of public water supplies and be provided with a list of emergency contacts. This information should be included in the Emergency Operations Plan. Granite State Rural Water Association has made maps for this purpose and worked with the Bow Community Development Department to develop a list of emergency contacts. Maps of Bow's public water systems for the Emergency Operations Plan are presented in Appendix 1.

### **Concern #7: Commercial, Industrial, and Municipal Land Uses**

The Committee recommends implementation of a best management practices survey program. The purpose of this program is to protect water resources through a proactive and collaborative approach. The Town of Bow should conduct a survey of commercial and industrial businesses to identify potential sources of contamination, provide information about source water protection and ensure that best management

practices are employed. Working together, the Bow Community Development Department, Bow Drinking Water Protection Committee and Fire Department could carry out this program. An agent of the Town, such as a representative of the Fire Department could carry out this onsite survey. Survey completion by businesses is optional. NH DES is available to train staff on how to implement the survey program.

### **Concern #8: Water Resource Protection**

Drinking water resources protection can be achieved through local regulatory controls and land conservation. The current Aquifer Protection District zoning ordinance should be improved by including lists of approved and prohibited activities, limiting large groundwater withdrawals, and limiting the amount of impervious cover in the District. A discussion of how the provisions would relate to other conventional zones in the community should be provided. Specific recommendations for site design criteria should also be identified. The ordinance adopted by the Town of Pembroke could serve as an example (Appendix 2).

Land conservation is the most effective way to protect water resources. The Town of Bow, Conservation Commission and Bow Open Spaces should work together to identify key parcels for the protection of current and future drinking water supplies. Together these partners can work to acquire these properties.

### **Concern #9: Stormwater Management**

To better understand the stormwater runoff conditions in the Town of Bow, stormwater management structures such as catch basins, cross culverts, treatment and detention facilities, and outlets should be mapped using Global Positioning Systems and Geographic Information Systems. This information can be used to help develop a comprehensive stormwater management program. The Town of Bow has submitted a grant application in November to the NH DES Source Water Protection Grant Program to meet this objective.

### **Concern #10: Water Conservation**

The Committee recommends that the Town of Bow adopt regulations and a rate structure for the new municipal system which promotes water conservation. In addition, the town should consider implementation of a town-wide conservation ordinance for public water systems which can be invoked during times of drought.

### **Concern #11: Future Drinking Water Supplies and Services**

Four recommendations were identified to promote protection of future water supplies and services. These recommendations include:

- Assess and plan for future drinking water needs in the town.
- Extend water service to areas in Bow where groundwater contamination is present or where source water protection is not practical.
- Adopt specifications for small public water systems to facilitate eventual connection to the municipal system.
- Protect the stratified drift aquifer located in the vicinity of Bow Bog and Allen Roads, as a future source of supply.

Table 5.1 List of Management Activities for Source Protection in Bow, NH.

Concern	Action	Potential Lead Agencies and Partners	Funding Source	Date Completed
1. Implement the Source Water Protection Plan for the Town of Bow.	a. Re-appoint members of the Bow Drinking Water Protection Committee for an additional year. The goal of this committee during its second year will be to shepherd the implementation of the source water protection plan.	<ul style="list-style-type: none"> <li>• Board of Selectmen</li> <li>• Drinking Water Protection Committee</li> </ul>		
2. Municipally-Owned and School-Managed Water Systems.	<p>a. Prepare individual wellhead protection plans for the Municipal Building, Community Building/Fire Department, Public Works Department/Police Building, Old Town Hall, Baker Free Library, Bow Memorial School, Bow Elementary School, and Bow High School.</p> <p>b. The aforementioned wellhead protection plan should be reviewed and updated every three years.</p> <p>c. Implement the recommendations in the wellhead protection plan to be completed by Wright-Pierce for the proposed municipal water supply.</p> <p>d. Investigate the status of the water systems for the Public Works/Police Building, Old Town Hall, and Bow Library. Assess water quality of these systems and determine if these systems should be operated as public water supplies.</p> <p>e. Implement a septic system maintenance program for the Old Town Hall.</p>	<ul style="list-style-type: none"> <li>• Town of Bow</li> <li>• Bow Schools</li> <li>• Granite State Rural Water Association</li>   <li>• Town of Bow</li> <li>• Bow Schools</li>   <li>• Town of Bow</li>   <li>• Town of Bow</li>   <li>• Town of Bow</li> </ul>		In progress

Concern	Action	Potential Lead Agencies and Partners	Funding Source	Date Completed
2. Municipally-Owned and School-Managed Water Systems (Continued)	f. Conduct a feasibility study to determine whether the potential sources of contamination within the sanitary protective radii for the Bow Elementary and the Bow Memorial schools should be addressed or if new groundwater sources should be established at alternative sites.	<ul style="list-style-type: none"> <li>• Bow Schools</li> </ul>	NH Department of Education Building Aid Program  NH DES Source Water Protection Grant	
3. Septic Systems and Wastewater Management	a. Implement an education/outreach program which provides residents and businesses with information regarding the operation and maintenance of septic systems. For example, NH DES factsheets could be distributed with the Annual Town Report and through the Bow Times, post a link with septic system education on the town's website, provide a web link to NH DES information, and write articles for the Bow Times.  b. Hold a community workshop about septic system maintenance and operation for residents and business owners.	<ul style="list-style-type: none"> <li>• Bow Drinking Water Protection Committee</li> <li>• Septic System Contractors</li> <li>• Bow Times</li>   <li>• Bow Drinking Water Protection Committee</li> <li>• NH DES</li> </ul>	NH DES Small Education and Outreach Grants for Nonpoint Source Pollution  NH DES Small Education and Outreach Grants for Nonpoint Source Pollution	
3. Septic Systems and Wastewater Management	c. Prepare a septic system ordinance for adoption at the 2007 Town Meeting. Requirements of the ordinance should be phased in.	<ul style="list-style-type: none"> <li>• Board of Selectmen</li> <li>• Bow Drinking</li> </ul>		

Concern	Action	Potential Lead Agencies and Partners	Funding Source	Date Completed
(Continued)	<p>d. Extend sewer service in the Business Development Area which lies over Bow's largest aquifer. Adopt an ordinance which requires that developed properties connect to the sewer system.</p> <p>e. Update site regulations and subdivision regulations with provisions that require new developments to construct sewage collection systems in anticipation of connection to sewage lines.</p>	<p>Water Protection Committee</p> <ul style="list-style-type: none"> <li>• Board of Selectmen</li> <li>• Business Development Commission</li>   <li>• Planning Board</li> </ul>		
4. Lawn Care	a. Educate residents and businesses about the proper use of lawn care chemicals and fertilizers and methods to minimize water use especially for landscaping purposes.	<ul style="list-style-type: none"> <li>• Conservation Commission</li> </ul>	NH DES Small Education and Outreach Grants for Nonpoint Source Pollution	
5. Residential Fuel Storage	a. Collaborate with fuel oil distributors and oil burner service companies to promote better residential fuel storage and maintenance of tanks. Activities could include education and outreach to consumers and development of a free inspection program.	<ul style="list-style-type: none"> <li>• Bow Drinking Water Protection Committee</li> <li>• Fuel Distributors</li> <li>• Fire Department</li> </ul>		
6. Transportation Corridors	<p>a. Continue to implement a reduced salt application program for Bow roads that promotes minimal use of deicing materials while maintaining public safety.</p> <p>b. Coordinate with the Planning Team which is updating the Emergency Operations Plan. Maps depicting the location of public water supplies and a list of water system</p>	<ul style="list-style-type: none"> <li>• Public Works Department</li>   <li>• Bow Community Development</li> </ul>		In progress

Concern	Action	Potential Lead Agencies and Partners	Funding Source	Date Completed
	emergency contacts will be incorporated in the Emergency Operations Plan.	<ul style="list-style-type: none"> <li>• Granite State Rural Water</li> <li>• Fire Department</li> </ul>		
7. Commercial and Industrial Land Uses	a. Collaborate and facilitate protection of water quality with commercial and industrial businesses in the Town of Bow. To meet this objective, implement a best management practices survey program. The Planning Department will develop an inventory of businesses in the Town. The Fire Department will make on-site visits to businesses to ensure that best management practices are being used and to provide information and education about source water protection. To carry out this collaborative program, the Town of Bow will request training assistance from NH DES.	<ul style="list-style-type: none"> <li>• Planning Department</li> <li>• Fire Department</li> <li>• NH DES</li> <li>• Bow Drinking Water Protection Committee</li> </ul>		
8. Water Resource Protection  8. Water Resource Protection (Continued)	<p>a. Strengthen provisions of the current Aquifer Overlay District by, for example, prohibiting high risk land uses, limiting the amount of impervious cover in the District, and limiting large groundwater withdrawals.</p> <p>b. Acquire key parcels to protect current and future water supplies.</p>	<ul style="list-style-type: none"> <li>• Bow Drinking Water Protection Committee</li> <li>• Town of Bow</li> <li>• Conservation Commission</li> <li>• Bow Open Spaces</li> </ul>	NH DES Water Supply Land Grants Program	
9. Stormwater Management	a. Map the location of stormwater management structures (e.g. catch basins, cross culverts, treatment and detention facilities, and outlets).	<ul style="list-style-type: none"> <li>• Planning Department</li> <li>• Public Works Department</li> <li>• NH DES</li> <li>• Regional Planning</li> </ul>	NH DES Source Water Protection Grant	



Concern	Action	Potential Lead Agencies and Partners	Funding Source	Date Completed
	d. Protect the stratified drift aquifer located in the vicinity of Bow Bog and Allen Roads as a future source of supply.	Selectmen • Planning Board • Bow Drinking Water Protection Committee  • Conservation Commission • Planning Board		

## **5.2 Conclusion**

Many different individuals, groups and agencies were involved in the process of developing the recommendations in this source water protection plan. The next step is to share this plan with the town boards, citizens, and businesses in the Town of Bow with the goal of plan implementation. It is important that the Bow Drinking Water Protection Committee continue to exist for another year in order to shepherd implementation of these recommendations. As evidenced by this plan, the Committee has already played an important role in developing source protection awareness and identifying current concerns. By having a “shepherd”, the recommendations in this plan are more likely to be implemented.

This source water protection plan represents one step of a multiple stage process to protect water quality. As recommendations are implemented and goals and objectives are met, new ones will need to be developed and the plan will need to be amended to reflect these changes. This plan should be reviewed annually and updated every three years.

## VI. EMERGENCY RESPONSE PLANS

Emergency response plans describe the steps that would be taken if any or all of the sources from these public water systems become contaminated, declined in yield, or were lost for any reason. Emergency response plans have been completed for community water systems in the Town of Bow and are available for review at NH DES in Concord, NH.

## VII. REFERENCES

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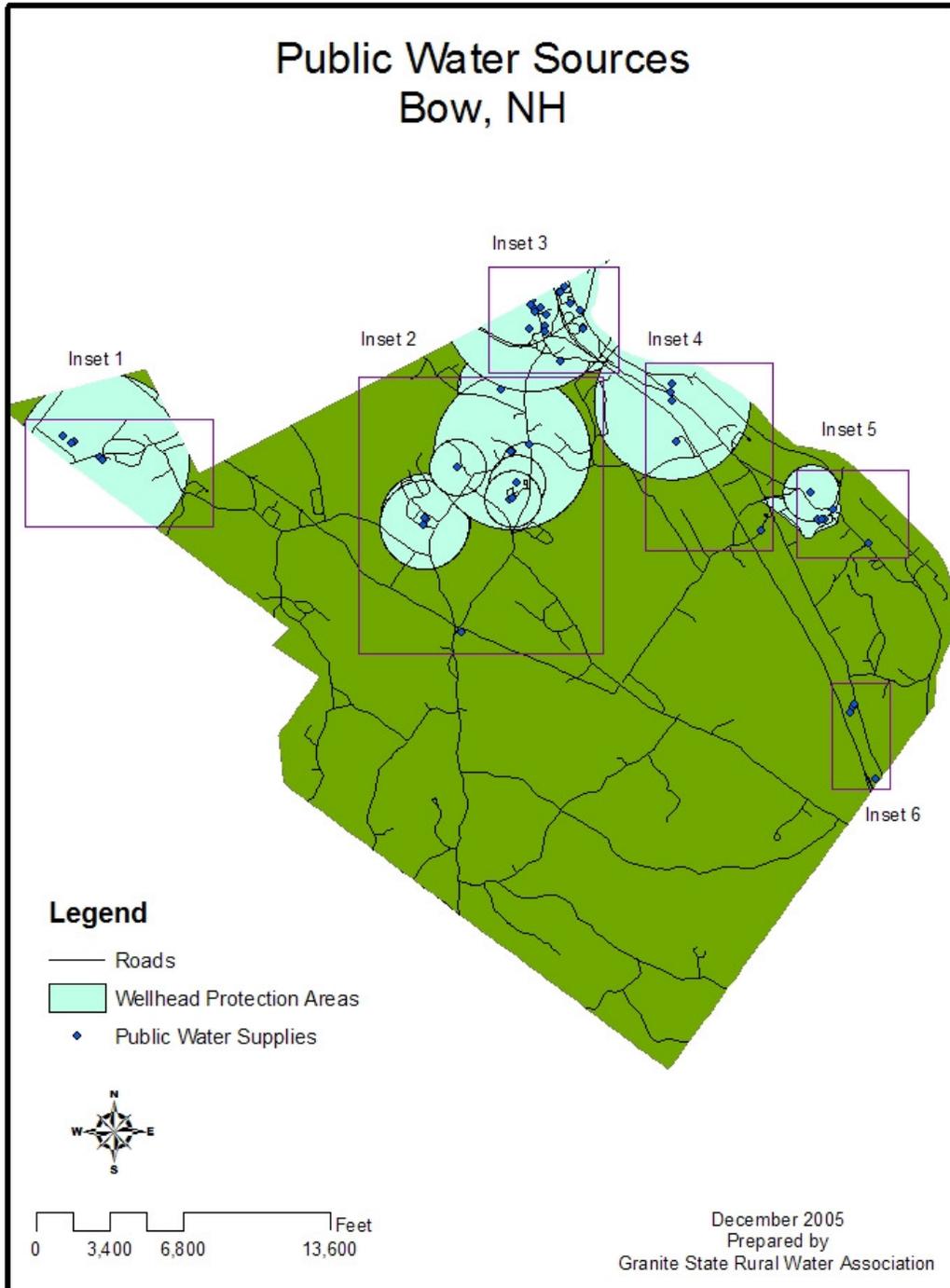
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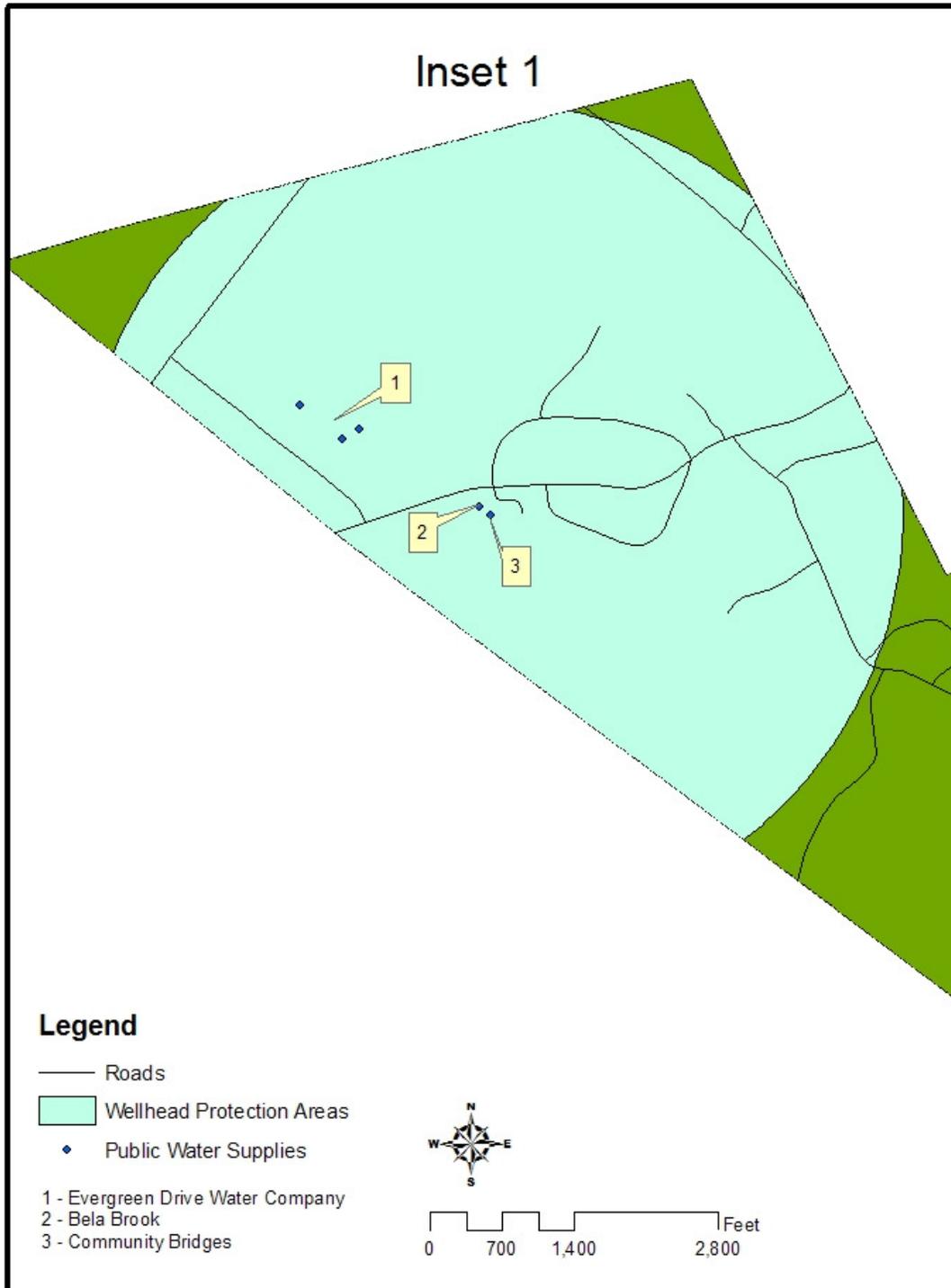
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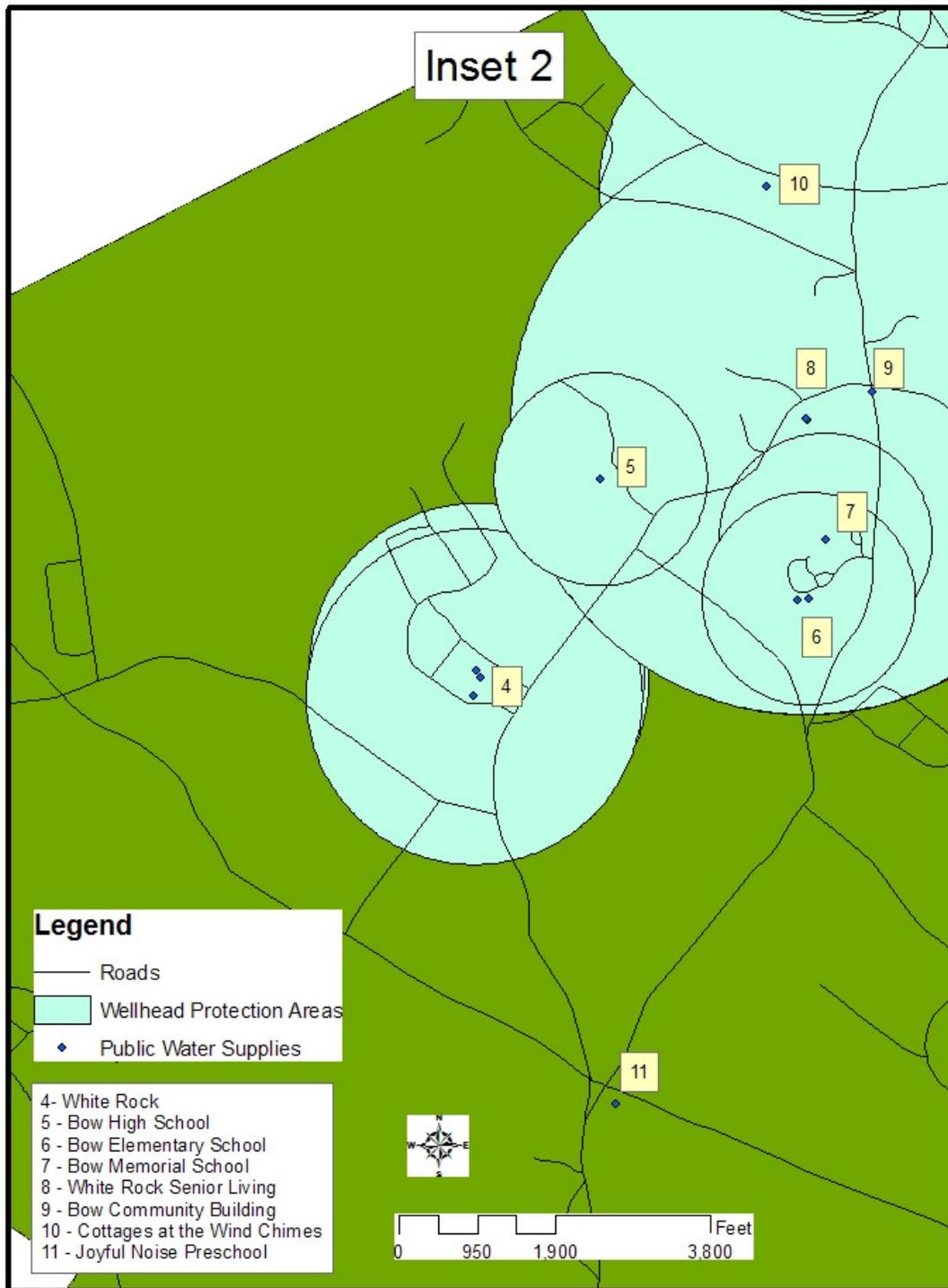
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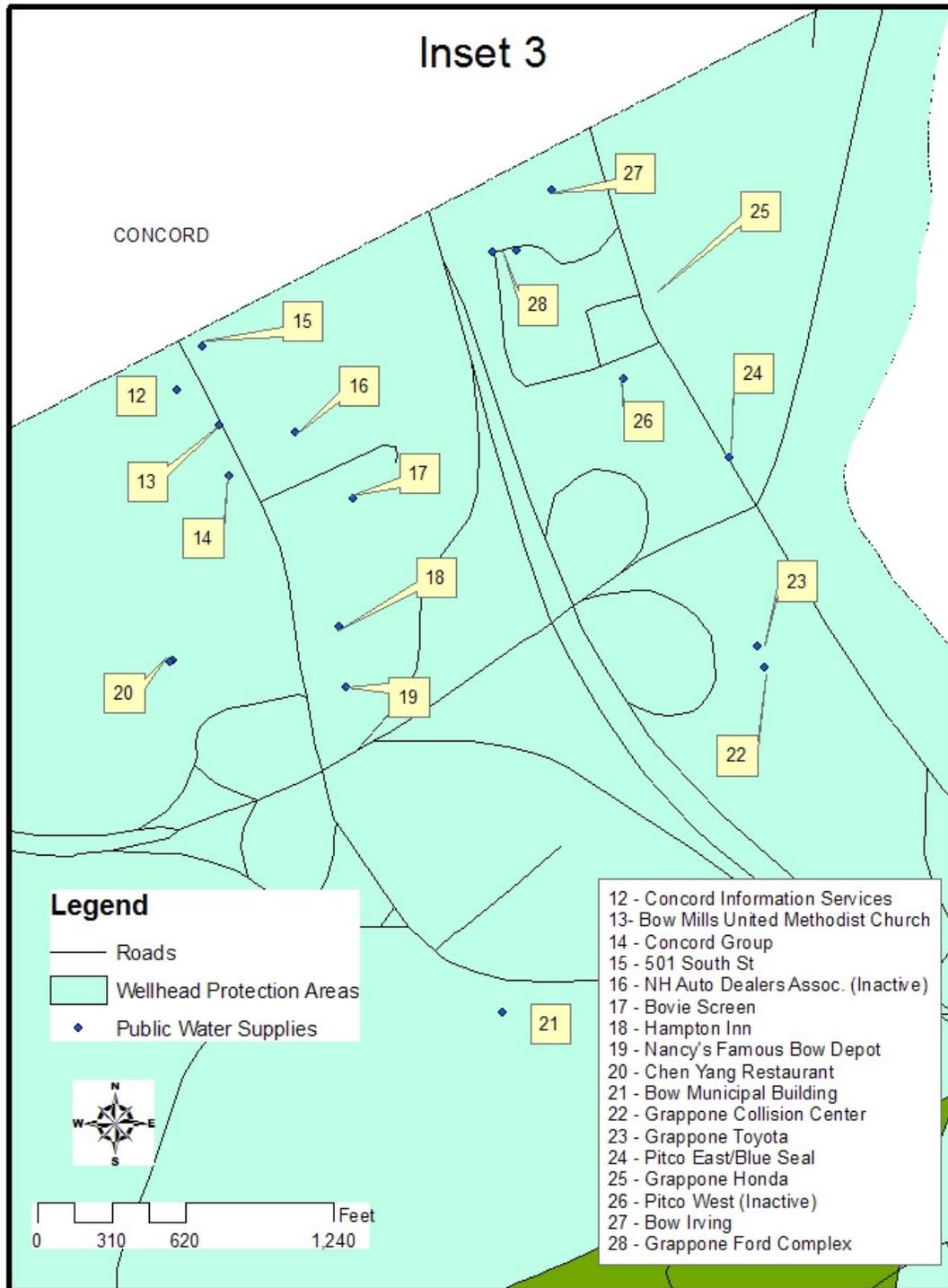
Appendix 1

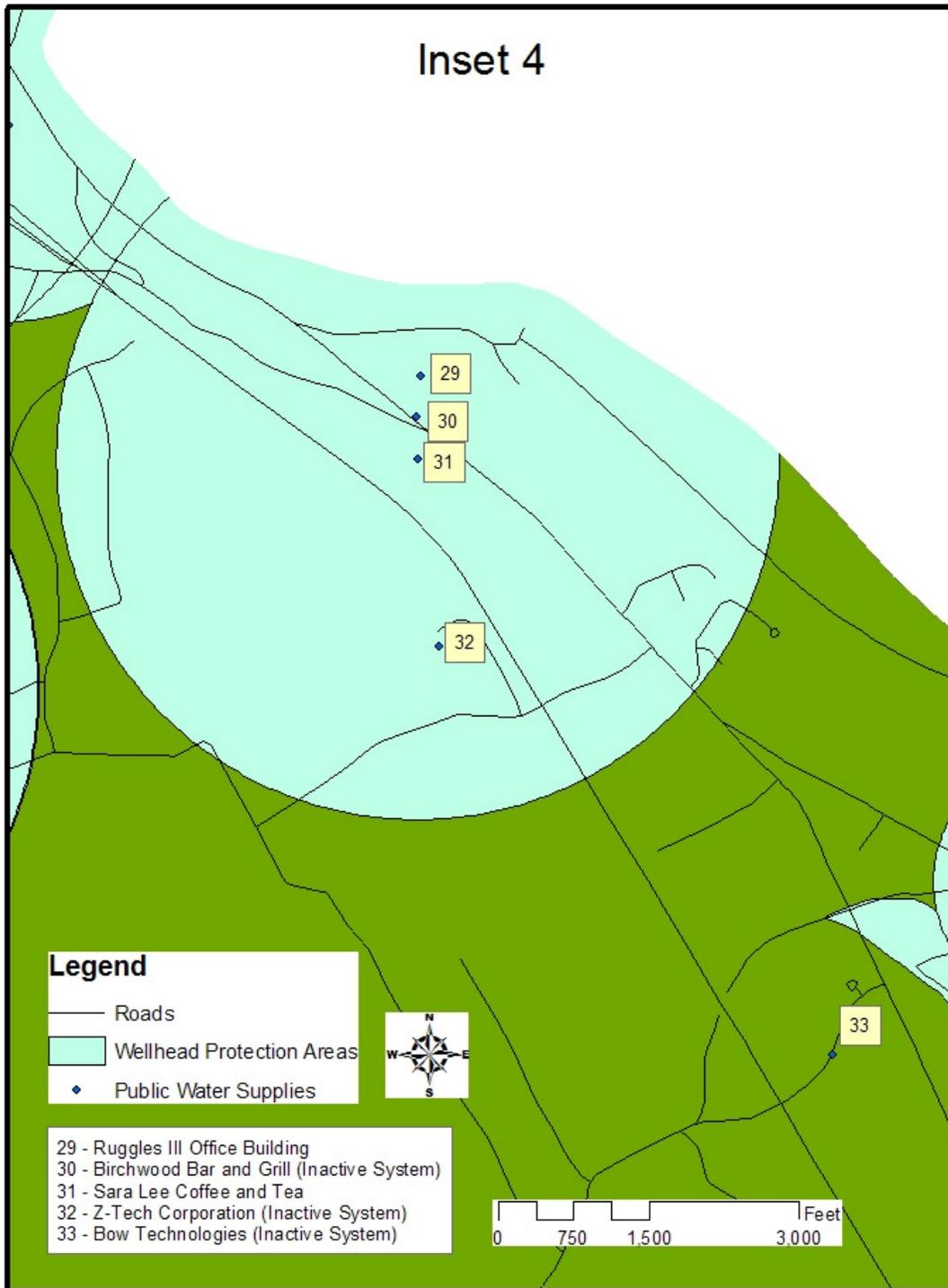
Maps for the Bow Emergency Operations Plan

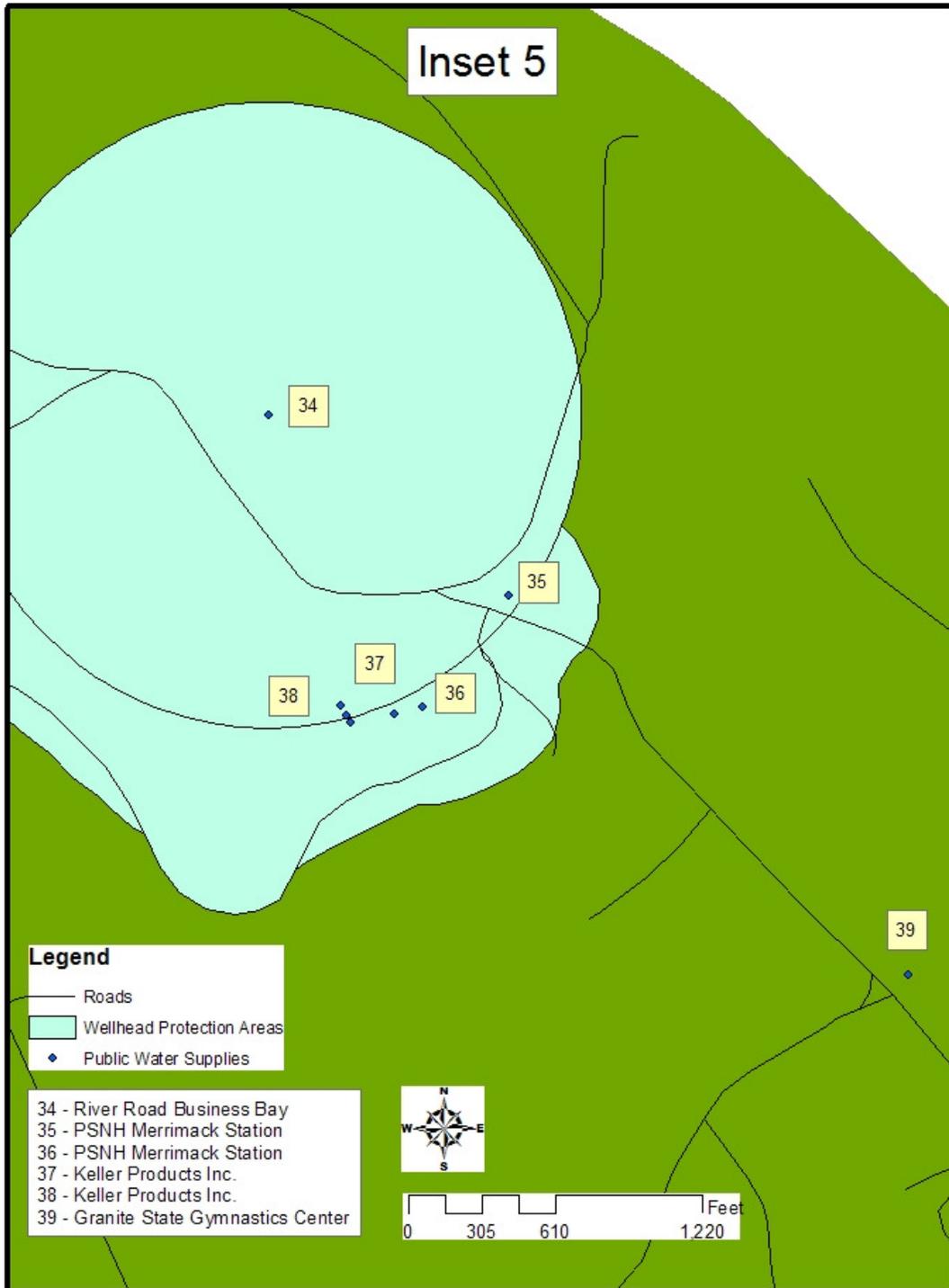


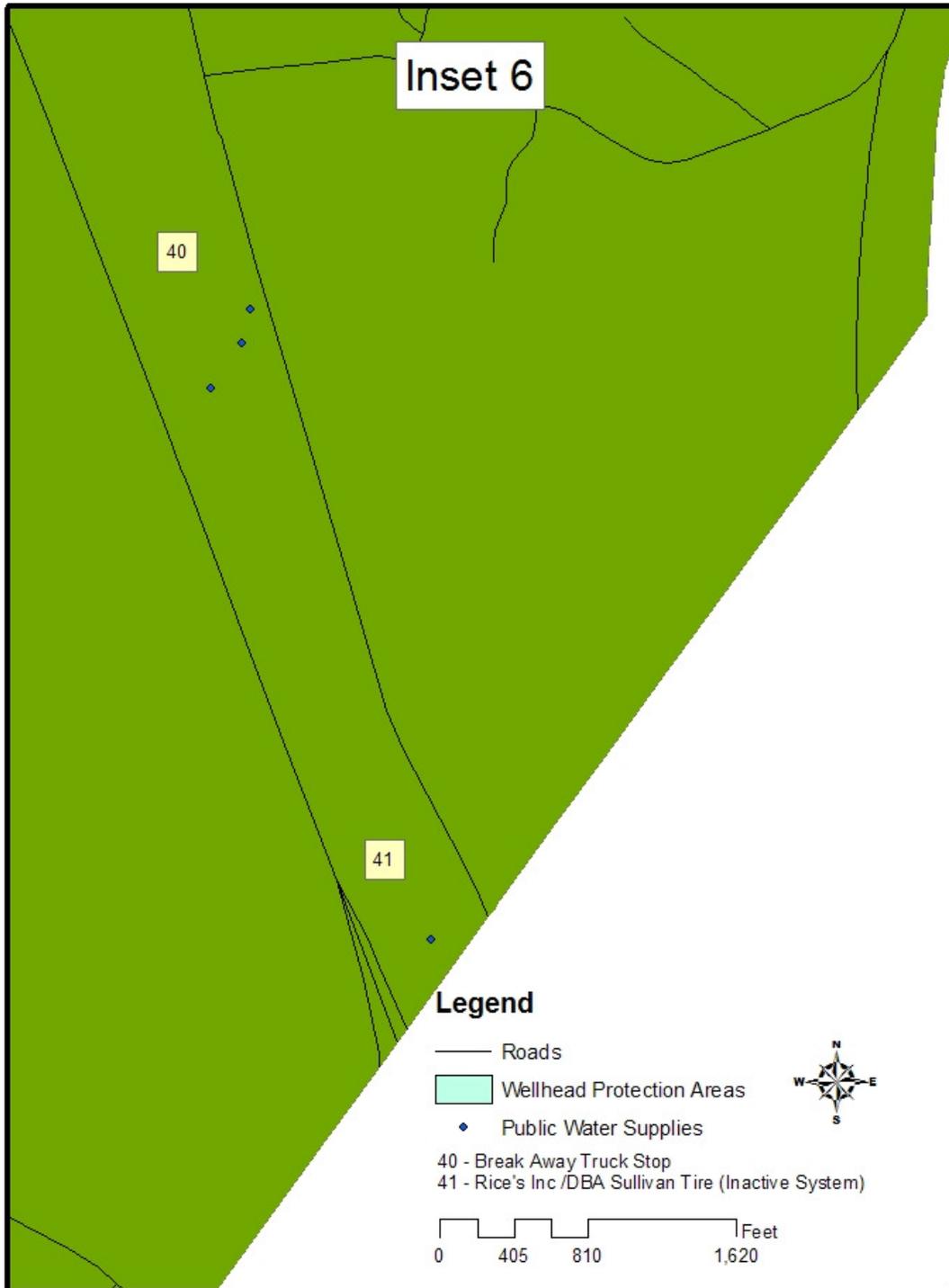












**Appendix 2**

**Aquifer Protection District Ordinance  
Town of Pembroke, NH**

§ 143-68. Aquifer Conservation (AC) District.

- A. Authority and purpose: Pursuant to authority granted under RSA 674:21, the Town of Pembroke hereby adopts the following regulations. The purpose of these regulations is, in the interest of public health, safety, and general welfare, to protect, preserve, and maintain existing and potential groundwater supply and groundwater recharge areas within known aquifers from adverse development, land use practices, or depletion.

This is to be accomplished by regulating land uses which would contribute polluted water to designated aquifers identified as being needed for present and future public and private water supply.

- B. District defined: The Aquifer Conservation District shall encompass these areas which have been designated as having high, medium, and low potential to yield groundwater and shown on the Town of Pembroke Aquifer Conservation District map which is on file with the Town Clerk. The basis for said map is the map titled "Availability of Ground Water in the Middle Merrimack River Basin Central and Southern New Hampshire" which was prepared by the U.S. Geological Survey in cooperation with the New Hampshire Water Resources Board and dated 1976.
- C. Incorrectly designated zones: When the actual boundary of the Aquifer Conservation District is disputed by any owner or abutter affected by said boundary, the Planning Board at the owner/abutter's expense and request, may engage the services of a professional geologist or hydrologist to determine more accurately the precise boundary of said District. The Planning Board shall have the authority to make the final determination as to the location of a disputed boundary.

D. Prohibited uses: The following uses shall not be permitted within the Aquifer Conservation District:

- (1) Disposal of solid waste;
- (2) Subsurface storage of petroleum and refined petroleum products and chemicals;
- (3) Disposal of liquid or leachable wastes except from residential commercial or industrial systems which discharge human sanitary wastes only;
- (4) Industrial uses which discharge contact type process waters on site. Non-contact cooling water discharge is permitted;
- (5) Outdoor unenclosed or uncovered storage of road salt;
- (6) Dumping of snow containing de-icing chemicals if the is brought in from outside the Aquifer Conservation District;
- (7) Commercial animal feedlots;
- (8) Excavation of sand or gravel except where the land owner can demonstrate through hydrogeological studies or otherwise that there will be no adverse effects on the aquifer;
- (9) Disposal processing or recycling of hazardous or toxic materials;
- (10) Automotive service or repair shops;
- (11) Junk and salvage yards; and
- (12) Bulk storage of toxic material for resale or distribution.

E. Special use permit: Any use permitted in the underlying district, except these which are expressly prohibited in section D, above, shall be reviewed by the Planning Board and the Health Officer, and shall conform to the provisions of this section. Special use permits may be granted by the Planning Board subject to the following additional limitations:

- (1) No more than 50% of any lot shall be rendered impervious by buildings and pavement;
- (2) Petroleum products, chemicals, road salt, and other materials which have the potential for contaminating groundwater shall be stored above ground level within a fully enclosed structure designed to contain any spill within the structure;
- (3) In the case of any sand or gravel excavation permitted in accordance with RSA 155-E, or with respect to any earth removal allowed as being incidental to any permitted use, such excavation or removal shall not be carried out within eight vertical feet of the seasonal high water table;
- (4) Storm drainage facilities shall be designed so that normal infiltration to groundwater is retained; and
- (5) One family and two-family homes are exempt from Special Use Permit review.

F. Special exceptions: For use which may be allowed by special exception in the underlying zoning district the Zoning Board of Adjustment must first find, in written findings of fact, that all of the following are true:

- (1) The proposed use will not have a detrimental effect on the quality of the groundwater contained in the aquifer by directly contributing to pollution or by increasing the long-term susceptibility of the aquifer to potential pollutants;
- (2) The proposed use will not cause a significant reduction in the long-term volume of water contained in the aquifer, or in the storage capacity of the aquifer;
- (3) The proposed use will discharge no wastewater on site other than that which is permitted under the provisions of this section; and
- (4) The proposed use complies with all other applicable sections of this section.

The Zoning Board of Adjustment may require that the applicant for a special exception provide data or reports prepared by a professional engineer or qualified groundwater consultant to assess any potential damage to the aquifer that may result from the proposed use. The Zoning Board of Adjustment may engage such professional assistance as it requires to adequately evaluate such reports and to evaluate, in general, the proposed use in light of the above criteria. Costs for any of the above-mentioned services shall be paid by the applicant.

Prior to rendering a decision on an application for a special exception, the Zoning Board of Adjustment shall request from the Planning Board, Conservation Commission, and the Health Officer, opinions as to whether the proposed use is consistent with the purpose of this section.

G. Non-conforming uses: Any non-conforming use may continue and may be maintained, repaired and improved, unless such use is determined to be an imminent hazard to public health and safety by the Selectmen or Health Officer.

H. Administration: The provisions of the Aquifer Conservation District shall be administered by the Planning Board and the Zoning Board of Adjustment. All development proposals, other than one or two-family residential construction not involving the subdivision of land, shall be subject to subdivision and/or site plan review and approval, and shall require a Special Use Permit if located within the Aquifer Conservation District, in accordance with Planning Board rules and regulations. Such review and approval shall precede the issuance of any building permit by the Town.