Massachusetts Department of Environmental Protection
Source Water Assessment and Protection (SWAP) Report
for

Bernardston Fire & Water District

What is SWAP?

The Source Water Assessment Program (SWAP), established under the federal Safe Drinking Water Act, requires every state to:

- inventory land uses within the recharge areas of all public water supply sources;
- assess the susceptibility of drinking water sources to contamination from these land uses; and
- publicize the results to provide support for improved protection.

Susceptibility and Water Quality

Susceptibility is a measure of a water supply's potential to become contaminated due to land uses and activities within its recharge area.

A source's susceptibility to contamination does *not* imply poor water quality.

Water suppliers protect drinking water by monitoring for more than 100 chemicals, disinfecting, filtering, or treating water supplies, and using source protection measures to ensure that safe water is delivered to the tap.

Actual water quality is best reflected by the results of regular water tests. To learn more about your water quality, refer to your water supplier's annual Consumer Confidence Reports.

Table 1: Public Water System Information

PWS Name	Bernardston Fire & Water District
PWS Address	259 Bald Mountain Road
City/Town	Bernardston
PWS ID Number	1029000
Local Contact	Mr. Russell Dean
Phone Number	413-648-9088 or 413-648-9656

Introduction

We are all concerned about the quality of the water we drink. Drinking water wells may be threatened by many potential contaminant sources, including storm runoff, road salting, and improper disposal of hazardous materials. Citizens and local officials can work together to better protect these drinking water sources.

Purpose of this report:
This report is a planning tool to support local and state efforts to improve water supply protection. By identifying land uses within water supply protection areas that may be potential sources of contamination, the assessment helps focus protection efforts on appropriate best management practices (BMPs) and drinking water source protection measures.

Refer to Table 3 for Recommendations to address potential sources of contamination. Department of Environmental Protection (DEP) staff are available to provide information about funding and other resources that may be available to your community.

This report includes the following sections:

1. Description of the Water System
2. Land Uses within Protection Areas
3. Source Water Protection
4. Appendices

Glossary

Aquifer: An underground water-bearing layer of permeable material that will yield water in a usable quantity to a well.

Hydrogeologic Barrier: An underground layer of impermeable material (i.e. clay) that resists penetration by water.

Recharge Area: The surface area that contributes water to a well.

Zone I: The area closest to a well; a 100 to 400 foot radius proportional to the well's pumping rate. This area should be owned or controlled by the water supplier and limited to water supply activities.

Zone II: The primary recharge area for the aquifer. This area is defined by hydrogeologic studies that must be approved by DEP. Refer to the attached map to determine the land within your Zone II.

Section 1: Description of the Water System

***Zone II #:* 443**	***Susceptibility:* High**
Well Names: Barton Road Wells	
Well #2—New drilled well	1029000-02G
***Zone II #:* 444**	***Susceptibility:* High**
Sugarhouse Well	1029000-03G

Bernardston is a small, rural community in western Massachusetts along the Vermont border. The town is predominately hilly, with a portion of the south central and south eastern portions of town within a valley area and a narrow valley along the Fall River. As with most hilltowns, the town center and developed areas are located primarily along the valley floors. There are two wells serving the Bernardston Fire and Water District; one additional well, (1029000-01G) is severed from the system and designated as an emergency source. Although the emergency well (01G) is not discussed further in this report, 01G is physically adjacent to and within the same aquifer as Well #2 (02G). Well #2 (1029000-02G) is located within the Deerfield River Basin in the southern edge of town, west of Greenfield Road off Barton Road near the baseball diamond. Well #2 is an eight-inch diameter, 87-foot deep well, has an approved pumping rate of 50 gallons per minute (GPM) and a Zone I protective radius of 379-feet. Well #3, the Sugarhouse Well (1029000-03G) is located within the Connecticut River Basin, south of Burke Flat Road between Route 5 and Interstate 91. Well #3 is an 18 x 24-inch gravel packed well, 88 feet deep, has an approved pumping rate of 430 GPM (0.62 MGD), and a 400-foot Zone I radius. The Zone II, primary recharge areas, were delineated for well #2 and #3 based upon their approved pumping rates. The Zone IIs were delineated through the SWAP program utilizing data develop during long duration pumping tests, geologic mapping and analytical modeling.

Well #2 utilizes water from a buried valley, sand and gravel aquifer adjacent to the Mill Brook. Although there is some evidence of fine sand and silt, the aquifer is unconfined. The bedrock underlying the well site is mapped as the Sugarloaf Formation, a Triassic age red or gray arkose that laterally and vertically grades into a coarse arkose conglomerate.

As noted previously Well #2 and Well #3 are located in different watersheds and therefore distinct aquifers. Well #3 is located in the buried valley, sand and gravel, unconfined aquifer adjacent to the Fall River. There is no evidence of a potentially confining (protective) clay layer. The bedrock mapped in the vicinity of well #3 is the Bernardston Formation, a fine-grained phyllite with interbeds of thin quartzite. Both wells are located in unconfined aquifers. Wells located in these geological conditions are considered to have a high vulnerability to contamination due to the absence of hydrogeologic barriers that can prevent contaminant migration from the surface.

Water from both sources is treated with potassium hydroxide as pH adjustment for corrosion control. For current information on monitoring results and treatment, please contact the Public Water System contact person listed above in Table 1 for a copy of the most recent Consumer Confidence Report.

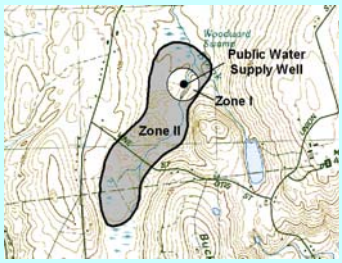
Section 2: Land Uses in the Protection Areas

Although the wells are within two distinct Zone IIs, there are similar some land use activities that area common within both Zone IIs. The Zone II for Bernardston is a mixture of residential, agricultural, forested, and minimal industrial/commercial land uses (refer to attached map for details). Land uses and activities that are potential sources

of contamination are listed in Table 2, with further detail provided in the Table of Regulated Facilities and Table of Underground Storage Tanks in Appendix B.

What is a Protection Area?

A well's water supply protection area is the land around the well where protection activities should be focused. Each well has a Zone I protective radius and a Zone II protection area.



Key Land Uses and Protection Issues include:

1. Nonconforming activities in Zone I
2. Residential land uses
3. Transportation corridors
4. Hazardous materials storage and use
5. Comprehensive wellhead protection planning
6. Agricultural activities

The overall ranking of susceptibility to contamination for well #2 is moderate, while well #3 (Sugar House Well) has a high ranking, based on the threatening land uses within the water supply protection areas, as seen in Table 2.

1. Nonconforming Activities in Zone Is – Massachusetts drinking water regulations (310 CMR 22.00 Drinking Water) requires public water suppliers to own the Zone I, or control the Zone I through a conservation restriction. Only water supply activities are allowed in the Zone I. However, many public water supplies were developed prior to the Department's regulations and the Zone I may contain non-water supply activities such as homes and public roads. The District does not own or control all of the Zone I for either well. Passive recreation at the baseball field, associated parking and a commercial, light manufacturing facility are located within the Zone I of Well #2. Cornfield and derelict farming facilities associated with the annual maple sugaring activities are located within the Zone I of Well #3.

Zone I Recommendations:

- ✓ To the extent possible, remove all non-water supply activities and debris from the Zone Is to comply with DEP's Zone I requirements.
- ✓ Use BMPs for the storage, use, and disposal of hazardous materials such as water supply chemicals and maintenance chemicals.
- ✓ Do not use or store pesticides, fertilizers or road salt within the Zone I.
- ✓ Keep any new non-water supply activities out of the Zone I.
- ✓ Monitor all activities and proximal to the Zone I.
- ✓ Investigate the potential of acquiring the remaining land in Zone I or entering into conservation restrictions or an agreement of Right of First refusal for the land.

2. Residential Land Uses – Approximately 16% of the Zone II areas consist of residential areas. None of the areas have public sewers, and so all use septic systems. If managed improperly, activities associated with residential areas can contribute to drinking water contamination. Common potential sources of contamination include:

- **Septic Systems** – Improper disposal of household hazardous chemicals to septic systems is a potential source of contamination to the groundwater because septic systems lead to the ground. If septic systems fail or are not properly maintained they can be a potential source of microbial contamination.
- **Household Hazardous Materials** - Hazardous materials may include automotive wastes, paints, solvents, pesticides, fertilizers, and other substances. Improper use, storage, and disposal of chemical products used in homes are potential sources of contamination.
- **Heating Oil Storage** - If managed improperly, Underground and Aboveground Storage Tanks (UST and AST) can be potential sources of contamination due to leaks or spills of the fuel oil they store.

What is a Zone III?

A Zone III (the secondary recharge area) is the land beyond the Zone II from which surface and ground water drain to the Zone II and is often coincident with a watershed boundary.

The Zone III is defined as a secondary recharge area for one or both of the following reasons:

1. The low permeability of underground water bearing materials in this area significantly reduces the rate of groundwater and potential contaminant flow.

2. The groundwater in this area discharges to a surface water feature such as a river, rather than discharging directly into the aquifer.

- **Stormwater** – Catch basins transport stormwater from roadways and adjacent properties to the ground. As flowing stormwater travels, it picks up debris and contaminants from streets and lawns. Common potential contaminants include lawn chemicals, pet waste, and contaminants from automotive leaks, maintenance, washing, or accidents.

Residential Land Use Recommendations:

- ✓ Educate residents on best management practices (BMPs) for protecting water supplies. Distribute the fact sheet "Residents Protect Drinking Water" available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMPs for common residential issues.
- ✓ Work with planners to control new residential developments in the water supply protection areas.
- ✓ Promote BMPs for stormwater management and pollution controls.

What are "BMPs?"

Best Management Practices (BMPs) are measures that are used to protect and improve surface water and groundwater quality. BMPs can be structural, such as oil & grease trap catch basins, nonstructural, such as hazardous waste collection days or managerial, such as employee training on proper disposal procedures.

3. Transportation Corridors – Within the Zone II areas, 13% of the land is used for transportation corridors. Interstate 91 runs through the entire Zone II #444, and local roads are common throughout both Zone IIs. Roadway construction, maintenance, and typical highway use can all be potential sources of contamination. Accidents can lead to spills of gasoline and other potentially dangerous transported chemicals. Roadways are frequent sites for illegal dumping of hazardous or other potentially harmful wastes. De-icing salt, automotive chemicals and other debris on roads are picked up by stormwater and wash in to catchbasins.

Transportation Corridor Recommendations:

- ✓ Identify stormwater drains and the drainage system along transportation corridors. Wherever possible, ensure that drains discharge stormwater outside of the Zone II.
- ✓ Work with the Town and State to have catch basins inspected, maintained, and cleaned on a regular schedule. Street sweeping reduces the amount of potential contaminants in runoff.
- ✓ Work with local emergency response teams to ensure that any spills within the Zone II can be effectively contained.
- ✓ If storm drainage maps are available, review the maps with emergency response teams. If maps aren't yet available, work with town officials to investigate mapping options such as the upcoming Phase II Stormwater Rule requiring some communities to complete stormwater mapping.
- ✓ Provide a map of the Zone II area to MA Highway Department to ensure they are aware of the location of Bernardston's wells. Consider requesting the areas be designated low salt application areas.

4. Hazardous Materials Storage and Use – One percent of the land area within the Zone II is commercial or industrial land uses. Many small businesses and industries use hazardous materials, produce hazardous waste products, and/or store large quantities of hazardous materials in UST/AST. If hazardous materials are improperly stored, used, or disposed, they become potential sources of contamination. Hazardous materials should never be disposed of to a septic system or floor drain leading directly to the ground.

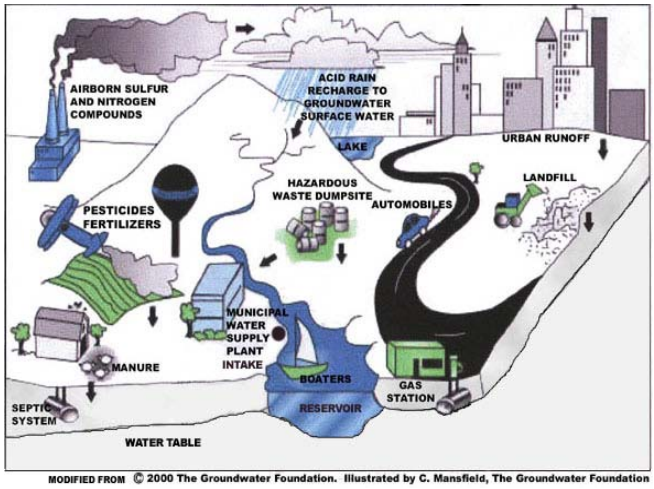


Figure 1: Sample watershed with examples of potential sources of contamination

Hazardous Materials Storage and Use Recommendations:

- ✓ Educate local businesses on best management practices for protecting water supplies. Distribute the fact sheet "Businesses Protect Drinking Water" available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMP's for common business issues.
- ✓ Work with local businesses to register those facilities that are unregistered generators of hazardous waste or waste oil. Partnerships between businesses, water suppliers, and communities enhance successful public drinking water protection

Table 2: Land Use in the Watershed

For more information, refer to Appendix B: Regulated Facilities within the Water Supply Protection Area

Land Uses	Quantity	Threat	Zone II	Potential Contaminant Sources*
Agricultural				
Dairy Farms	1	M	444	Manure (microbial contaminants): improper handling
Livestock Operations	1	M	444	Manure (microbial contaminants): improper handling
Manure Storage or Spread-	1	H	444	Manure (microbial contaminants): improper handling
Commercial				
Service Stations/ Auto Repair	1	H	444	Automotive fluids and solvents: spills, leaks, or improper handling
Residential	**85.3 acres total**			
Fuel Oil Storage (at resi-	Numerous	M	Both	Fuel oil: spills, leaks, or improper handling
Lawn Care / Gardening	Numerous	M	Both	Pesticides: over-application or improper storage and disposal
Septic Systems / Cess-	Numerous	M	Both	Hazardous chemicals: microbial contaminants, and improper disposal
Miscellaneous				
Stormwater Drains/ Retention Basins	Numerous	L	Both	Debris, pet waste, and chemicals in stormwater from roads, parking lots, and lawns
Transportation Corridors	66.7 acres	M	Both	Fuels and other hazardous materials: accidental leaks or spills; pesticides: over-application or improper handling

Notes:

1. When specific potential contaminants are not known, typical potential contaminants or activities for that type of land use are listed. Facilities within the watershed may not contain all of these potential contaminant sources, may contain other potential contaminant sources, or may use Best Management Practices to prevent contaminants from reaching drinking water supplies.
2. For more information on regulated facilities, refer to Appendix B: Regulated Facilities within the Water Supply Protection Area information about these potential sources of contamination.
3. For information about Oil or Hazardous Materials Sites in your protection areas, refer to Appendix C: Tier Classified Oil and/or Hazardous Material Sites.

*** THREAT RANKING** - The rankings (high, moderate or low) represent the relative threat of each land use compared to other PSCs. The ranking of a particular PSC is based on a number of factors, including: the type and quantity of chemicals typically used or generated by the PSC; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.

practices.

- ✓ Work with the Board of Health to inspect and educate local businesses with respect to Massachusetts floordrain requirements and hazardous materials handling (iincluding houshold type hazardous materials). See brochure "Industrial Floor Drains" for more information.

5. Agricultural Activites – Within both Zone II areas, a total of 44% of the land is used as crop or pasture land. Pesticides and fertilizers have the potential to contaminate a drinking water source if improperly stored, applied, or disposed. If not contained or applied properly, animal waste from barnyards, manure pits and field application are potential sources of contamination to ground and surface water.

Agricultural Activities Recommendation:

- ✓ Work with farmers in your protection areas to make them aware of your water supply and to encourage the use of a US Natural Resources Conservation Service farm plan to protect water supplies.
- ✓ Provide a map of the protection areas to ensure the farmers have accurate information about the protection areas.

Potential Source of Contamination vs. Actual Contamination

The activities listed in Table 2 are those that typically use, produce, or store contaminants of concern, which, if managed improperly, are potential sources of contamination (PSC).

It is important to understand that a release may never occur from the potential source of contamination provided facilities are using best management practices (BMPs). If BMPs are in place, the actual risk may be lower than the threat ranking identified in Table 2. Many potential sources of contamination are regulated at the federal, state and/or local levels, to further reduce the risk.

Top 5 Reasons to Develop a Local Wellhead Protection Plan

❶ Reduces Risk to Human Health

❷ Cost Effective! Reduces or Eliminates Costs Associated With:

- Increased groundwater monitoring and treatment
- Water supply clean up and remediation
- Replacing a water supply
- Purchasing water

❸ Supports municipal bylaws, making them less likely to be challenged

❹ Ensures clean drinking water supplies for future generations

❺ Enhances real estate values – clean drinking water is a local amenity. A community known for its great drinking water in a place people want to live and businesses want to locate.

- ✓ Provide the attached information on BMPs for manure and pesticide management to land owners

6. Protection Planning – Currently, the Town does not have water supply protection controls that meet DEP's Wellhead Protection regulations 310 CMR 22.21(2). Protection planning protects drinking water by managing the land area that supplies water to a well. A Wellhead Protection Plan coordinates community efforts, identifies protection strategies, establishes a timeframe for implementation, and provides a forum for public participation. There are resources available to help communities develop a plan for protecting drinking water supply wells.

Protection Planning Recommendations:

- ✓ Develop a Wellhead Protection Plan. Establish a protection team, and refer them to http://mass.gov/dep/brp/dws/protect.htm for a copy of DEP's guidance, "Developing a Local Wellhead Protection Plan".
- ✓ Coordinate efforts with local officials to compare local wellhead protection controls with current MA Wellhead Protection Regulations 310 CMR 22.21 (2). Refer to recommendations in the SWAP Zone II report.
- ✓ Work with the Board of Health to adopt floordrain controls that meet 310 CMR 22.21(2).
- ✓ Recommend that the Planning Board and board of Health contact the Department if they require assistance with implementation of protection controls.

Other land uses and activities within the Zone II areas that are potential sources of contamination are included in Table 2. Refer to Appendix B for more information about these land uses. Identifying potential sources of contamination is an important initial step in protecting your drinking water sources. Further local investigation will provide more in-depth information and may identify new land uses and activities that are potential sources of contamination. Once potential sources of contamination are identified, specific recommendations like those below should be used to better protect your water supply.

Additional Information:

To help with source protection efforts, more information is available by request or online at www.state.ma.us/dep/brp/dws including:

1. Water Supply Protection Guidance Materials such as model regulations, Best Management Practice information, and general water supply protection information.
2. MA DEP SWAP Strategy
3. Land Use Pollution Potential Matrix
4. Draft Land/Associated Contaminants Matrix

Contact Catherine V. Skiba in DEP's Springfield Office at (413) 755-2119 for more information and assistance on improving current protection measures.

Copies of this report have been provided to the public water supplier, board of health, and the town.

Section 3: Source Water Protection Conclusions and Recommendations

Current Land Uses and Source Protection:
As with many water supply protection areas, the system Zone IIs contain potential sources of contamination. However, source protection measures reduce the risk of actual contamination, as illustrated in Figure 2. The water supplier is commended for taking an active role in promoting source protection measures in the Water Supply Protection Areas through:

- Utilizing tight tanks at the baseball diamond facility.

Source Protection Recommendations:
To better protect the sources for the future:

- ✓ Inspect the Zone I regularly, and when feasible, remove any non-water supply activities.
- ✓ Educate residents on ways they can help you to protect drinking water sources.
- ✓ Work with emergency response teams to ensure that they are aware of the stormwater drainage in your Zone II and to cooperate on responding to spills or accidents. Where possible, utilize deep sump pits for stormwater drainage management.
- ✓ Partner with local businesses to ensure the proper storage, handling, and disposal of hazardous materials.
- ✓ Encourage the use of Best Management Practices by farmers, residents, businesses, and industries.
- ✓ Monitor progress on any ongoing remedial action conducted for the known oil or contamination sites.
- ✓ Work with farmers in your protection areas to make them aware of your water supply and to encourage the use of a NRCS farm plan to protect water supplies.
- ✓ Develop and implement a Wellhead Protection Plan.
- ✓ Work with the Board of Health to develop and implement a floor drain regulation to further protect your water supply.

Conclusions:
These recommendations are only part of your ongoing local drinking water source protection. Additional source protection recommendations are listed in Table 3, the Key Issues above and Appendix A.

DEP staff, informational documents, and resources are available to help you build on this SWAP report as you continue to improve drinking water protection in your community. The Department's Wellhead Protection Grant Program and Source Protection Grant Program provide funds to assist public water suppliers in addressing water supply source protection through local projects. Protection recommendations discussed in this document may be eligible for funding under the Grant Program. Please note: each spring DEP posts a new Request for Response for the grant program (RFR).

Other grants and loans are available through the Drinking Water State Revolving Loan Fund, the

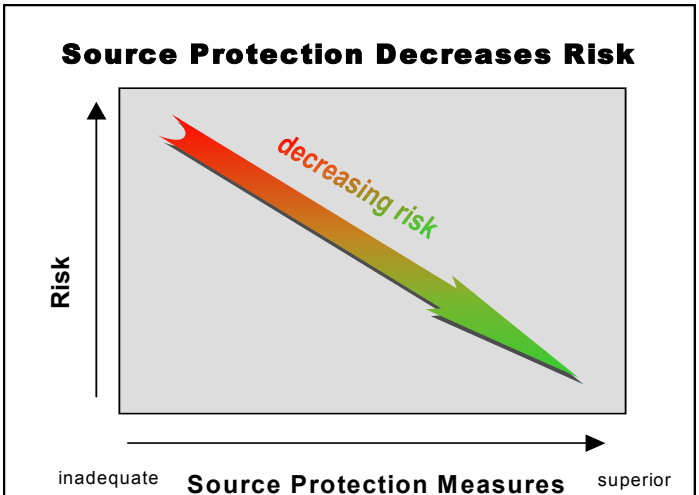


Figure 2: Risk of contamination decreases as source protection increases. This is true for public water systems of any susceptibility ranking, whether High, Moderate, or Low.

Table 3: Current Protection and Recommendations

Protection Measures	Status	Recommendations
Zone A		
Does the Public Water Supplier (PWS) own or control the entire Zone I?	**NO**	To the extent possible, remove non-water supply activities from each Zone I to comply with DEP's Zone I requirements. Investigate options for gaining ownership or control of the Zone I. Require nutrient management in cornfield and removal of junk near Sugar house well.
Are the Zone I areas posted with "Public Drinking Water Supply" Signs?	**YES**	Additional economical signs are available from the Northeast Rural Water Association (802) 660-4988.
Are the Zone 1 areas regularly inspected?	**YES**	Continue daily inspections of drinking water protection areas.
Are water supply-related activities the only activities within the Zone 1?	**NO**	Monitor non-water supply activities in Zone I and investigate options for removing these activities.
Municipal Controls (Zoning Bylaws, Health Regulations, and General Bylaws)		
Does the municipality have Wellhead Protection Controls that meet 310 CMR 22.21(2)	**YES**	Continue working with the Planning Board and the Board of Selectmen to maintain land use controls that meet 310 CMR 22.21(2). Refer to www.state.ma.us/dep/brp/dws/ for model bylaws and health regulations, and current regulations.
Do neighboring communities protect the water supply protection areas extending into their communities?	**NO**	Work with neighboring municipalities to include Zone IIs in their wellhead protection controls.
Planning		
Does the PWS have a local wellhead protection plan?	**NO**	Develop a wellhead protection plan. Follow "Developing a Local Wellhead Protection Plan" available at: www.state.ma.us/dep/brp/dws/.
Does the PWS have a formal "Emergency Response Plan" to deal with spills or other emergencies?	**YES**	Augment plan by developing a joint emergency response plan with fire department, Board of Health, DPW, and local and state emergency officials. Coordinate emergency response drills with local teams.
Does the municipality have a watershed and wellhead protection committee?	**NO**	Create committee; include representatives from citizens' groups, neighboring communities, and the business community.
Does the Board of Health conduct inspections of commercial and industrial activities?	**YES**	Work with the Board of Health to develop and implement a floor drain regulation to further protect your water supply. For more guidance see "Hazardous Materials Management: A Community's Guide" at www.state.ma.us/dep/brp/dws/files/hazmat.doc
Does the PWS provide watershed protection education?	**NO**	Increase residential outreach through bill stuffers, school programs, Drinking Water Week activities, and coordination with local groups. Aim additional efforts at commercial, industrial and municipal uses within the Zone II.

Clean Water State Revolving Fund, and other sources. For more information on grants and loans, visit the Bureau of Resource Protection's Municipal Services web site at: http://mass.gov/dep/brp/mf/mfpubs.htm.

The assessment and protection recommendations in this SWAP report are provided as a tool to encourage community discussion, support ongoing source protection efforts, and help set local drinking water protection priorities. Citizens and community officials should use this SWAP report to spur discussion of local drinking water protection measures. The water supplier should supplement this SWAP report with local information on potential sources of contamination and land uses. Local information should be maintained and updated periodically to reflect land use changes in the Zone II. Use this information to set priorities, target inspections, focus education efforts, and to develop a long-term drinking water source protection plan.

Section 4: Appendices

A. Protection Recommendations
B. Regulated Facilities within the Water Supply Protection Area
C. Table of Tier Classified Oil and/or Hazardous Material Sites within the Water Supply Protection Areas
D. Additional Documents on Source Protection