

Monson Source Water Protection Plan

March 2006

Prepared by:



Prepared for:

Town of Monson
Water and Sewer Department

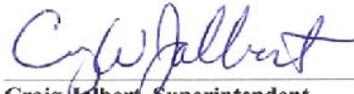
"There shall be no man or woman dare to wash any unclean linen, wash clothes,...nor rinse or make clean any kettle, pot, or pan or any suchlike vessel within twenty feet of the old well or new pump. Nor shall anyone aforesaid, within less than a quarter mile of the fort, dare to do the necessities of nature, since by these unmanly, slothful, and loathsome immodesties, the whole fort may be choked and poisoned."

--Governor Gage of Virginia, Proclamation for Jamestown, Va. (1610)

-Monson Source Water Protection Plan

Town of Monson Water and Sewer Department Monson, MA

Adopted by the Source Water Protection Committee:



Craig Jalbert, Superintendent

2/24/2006

Date



Leslie Duthie, Conservation Commission

2/1/2006

Date



Paul Hatch, Planning Board

2/27/06

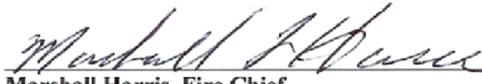
Date



Kathleen Norbut, Select Board

3/2/06

Date



Marshall Harris, Fire Chief

3/3/06

Date

Review Annually and Update Every 3 Years

Date Reviewed	Reviewer	Changes or Comments

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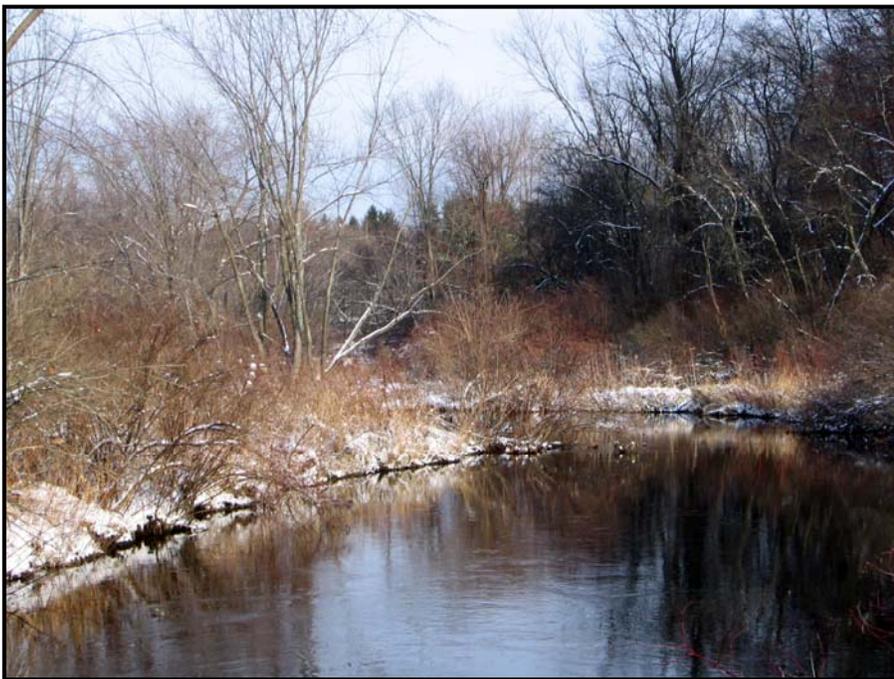
Acknowledgements

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MassRWA wishes to thank all the individuals and organizations that contributed to this effort, including the system operator, Mr. Craig Jalbert, who provided helpful information regarding the history and site characteristics of the Monson Wellfield's and the Zone II. Local officials and concerned citizens cheerfully attended monthly meetings to help formulate this plan and expertly presented their water protection goals and methods at the Source Water Protection Workshop on November 30, 2005.

The Source Water Assessment and Protection Report (SWAP) prepared by Catherine Skiba of the Massachusetts Department of Environmental Protection (western division) provided an excellent resource for beginning this planning process. A number of other plans also contributed to this effort including the Zone II delineation for the Monson Wellfield by Tighe & Bond and the Monson Master Plan

The Source Water Protection Steering Committee for the Town of Monson's Source Water Protection Plan (SWPP) included Craig Jalbert, the superintendent of the Monson Water Department, Leslie Duthie – Conservation Commission, Paul Hatch – Planning Board, Marshall Harris – Monson Fire Chief, and Kathleen Norbut – Select Board.



Chicopee Brook - Bunyan Road, Monson, MA.

Source Water Protection Plan Steering Committee

The Source Water Protection Plan Steering Committee provided background information about Monson's water supply and its watershed, and assisted in the development of protection strategies. Members of the Advisory Committee include:

Craig Jalbert, Monson Water and Sewer Department Superintendent
Leslie Duthie, Conservation Commission
Marshall Harris, Monson Fire Chief
Paul Hatch, Planning Board
Kathleen Norbut, Select Board

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Introduction

Source Water Protection Plan

A Source Water Protection Plan (SWPP) identifies water system vulnerabilities to contamination and describes techniques to manage potentially contaminating land uses. The Monson Source Water Protection Plan has been developed by the Monson Source Water Protection Steering Committee and MassRWA to aid in the protection of the public water system (PWS) for Monson's Wellfields.

Public water suppliers around the state of Massachusetts and across the nation are increasingly finding that proactive planning and prevention are essential to both the long-term integrity of their water systems and limitation of their costs and liabilities. Despite our best efforts, accidental spills of hazardous chemicals are all too common and bacterial outbreaks still occur unexpectedly, sometimes with dangerous consequences. These types of events may result in costly treatment, remediation and/or litigation, and in worst-case scenario could permanently destroy a water source or injure/kill a water customer.

According to the National Center for Small Communities (2000), successful planning and prevention requires six basic steps:

1. Source protection area (SPA) delineation;
2. Identification of sources of contamination within SPA's;
3. Assessment of the risks to drinking water posed by contaminant sources;
4. Publication of the risk assessment results'
5. Implementation of measures to manage contaminant sources; and
6. Contingency planning for response to contamination incidents.

Source protection planning has numerous benefits including:

- Increasing consumer confidence that their drinking water source will continue to be protected and reliable;
- Reducing the likelihood that contamination incidents will occur with costly and/or potentially harmful results;
- Relationships with regulatory agencies, employees and the public are often enhanced through source protection
- Source Protection Plan's provide strong support to requests for financial assistance.

Source Water Assessment and Protection Reports

As a first step toward drinking water protection planning on a statewide basis, the Massachusetts Department of Environmental Protection (DEP) recently completed Source Water Assessment Program (SWAP) reports for most of Massachusetts Public Water Systems (PWSs). The SWAP reports include descriptions of SPA delineation and land uses which may potentially contaminate water sources, as well as recommendations for managing those land uses. Consequently, the reports provide water supplier with an important tool for initiating or improving source water protection in their area. (Please see Appendix A for a copy of the Monson Water Department SWAP report completed May 10, 2002.)

Monson Water Department SWAP Report

The SWAP report for the Monson Water Department determined that the overall ranking of source susceptibility for Monson's Wellfields are "**High**" based land uses in the associated Source Protection Area (SPA). Since the completion of the SWAP Report in May of 2002, the Monson Water and Sewer Department has implemented many of the recommendations including the establishment of a Zone II Protection District, a Water Supply Protection Overlay District and a Floor Drain Regulation through the Board of Health.

The Key issues identified by the SWAP report include:

1. A non-conforming Zone I.
2. Residential land uses posing potential threats to the system including septic systems and business uses that may use hazardous materials.
3. The proximity of the transportation corridors and utilities right-of-way that increase the threat of hazardous waste spills within the Zone II recharge area.
4. The storage of hazardous materials and use within the Zone II and Zone III recharge areas.
5. Oil or hazardous material contamination sites.
6. Agricultural and gravel industry activities posing potential threats to the public water supply.
7. The presence of railroad tracks that run through the Zone I and II of the wellfield.

Specific protection strategies and recommendations by the SWAP report and the Source Water Protection Planning Committee will be addressed in detail throughout the Monson Source Water Protection Plan.

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.

Goals and Objectives of the Monson SWPP Steering Committee

The Monson SWPP Committee determined that the following goals and objectives were important to the success of the Monson Source Water Protection Plan:

1. Ensure that Monson continue to have a high quality source of water for the next 100 years or more.
2. Secure best management practice (bmp's) with the management of the railroad concerning spraying procedures within Monson's Zone I and II. These will be written agreements and require non-toxic chemicals within sensitive recharge areas. The spraying agreement will be attached to the Conservation Commissions annual spraying procedures for wetlands near the R.R and a map of the Zone II will be provided.
3. A public education and outreach program for residents and businesses in the Monson Wellfield's Zone II to inform residents of the potential threats to quality drinking water.
4. A letter to residents using septic systems within the Zone II to inform them that septic systems that are not cared for properly are a potential source of contamination to public drinking water supplies.
5. Homeowners with septic systems within the Zone II will be encouraged to pump their system at least every three years. Group rates with a local maintenance company will be investigated to act as an incentive.
6. MassHighway will be contacted to secure a low-salt application agreement for the portions of Rt. 32 that are within the Zone II. The Monson Water Department recommends an alternative chemical application, such as calcium chloride. Low-Salt signs will be erected at the perimeter of Rt. 32 as a reminder to MassHighway employees.
7. Monson schools within the Zone II will be contacted and asked to use calcium chloride instead of salt on their parking lots.
8. Residents are encouraged to report beaver activity within the Zone II. Beaver control will be pursued each spring.
9. Gravel pit operations within the Zone II will require a special permit renewal process every three years. The gravel pit operations will be required to follow a spill emergency plan and its procedures. Monitoring wells will be required at gravel operations and will require annual inspection. Gravel operations will be allowed to excavate to a depth of no less than eight feet of the high water table if the parcel is to be used as a site for future housing development.
10. A hazardous materials and floor drain inspection program will continue to be implemented.
11. Strategies for controlling high-risk land use and development within Monson's Zone II's will continue to be a priority in the future.
12. Priority parcels identified as important wellfield recharge areas are to be designated for acquisition by the Town when considering open space purchases.

Action Plan

ACTION	WHO	WHEN
1. Acquire available funds for land purchase and all other implementation strategies using the Monson Source Water Protection Plan as water resource management tool required by the Commonwealth Capital funding process.	Monson Water & Sewer Department (MWSD), Planning Board (PB), Select Board (SB)	When available.
2. Obtain Low-Spray Agreement with the RR through Monson's Zone II and especially in the wellfield's Zone I.	MWSD, Conservation Commission (CC), SB	Spring 2006
3. Conduct educational outreach to businesses and residents in Monson's Zone II to inform them of the contamination threats to public water supplies.	MWSD	2006
4. Conduct educational outreach to septic system users in the Zone II to inform them about proper septic maintenance.	MWSD, Board of Health (BOH)	2006
5. Inform septic system users on how to obtain group rates for pumping residential septic systems.	MWSD, BOH	2006
6. Obtain Low-Salt signs and agreements with MassHighway along the Rt. 32 corridor.	MWSD, SB	2006
7. Require schools to use alternatives to salt in their parking lots.	MWSD, SB, CC, School Committee	2006
8. Encourage residents to report increased beaver activity in the Zone II.	MWSD	2006
9. Monitor existing and future gravel operations for safety/emergency spill response.	Building Inspector	2006
10. Continue to negotiate buying or protecting priority parcels within the Zone II.	MWSD, CC, PB, SB	2006
11. Adopt "Right of first refusal" bylaws in order to purchase all the Zone I lands. Encourage Conservation Restrictions if this is not feasible.	WWD, PB, Conservation Commission (CC)	

Description of Water Supply

Monson Water and Sewer Department

The Town of Monson’s population in 2000 was 8,359 people, an increase of 583 persons, or 7.5%, from 1990. The Town is located south of the Quabbin Reservoir in the foothills of the central highlands and is bisected north and south by Route 32. Monson has a long history as a mill town utilizing the Chicopee Brook as a main power source for its industries. Today, the Town of Monson is primarily a residential community that is experiencing moderately high housing growth.

In 2004, the Town of Monson took important steps to protect its drinking water supply. The town adopted the Water Supply Protection District Bylaw, the Water Supply Overlay Protection District Map, and the Board of Health Floor Drain Regulation. The adoption of the new bylaws has resulted in Monson’s compliance with the DEP drinking water program making Monson a model for other towns within the Commonwealth.

All of these wells are considered to be a “**High**” risk for susceptibility to contamination by the existing land uses within the primary recharge area of the Zone II’s.

Table 1: Monson Water Department Water Sources

<i>Well Name</i>	<i>Source ID#</i>	<i>MA GIS Zone II ID Number</i>	<i>Source Susceptibility</i>
Bethany Road Well	1191000-03G	# 558	High
Lower Palmer Road Well	1191000-04G	# 558	High
Bunyan Road Well	1191000-05G	# 558	High

Source: Massachusetts DEP SWAP Report, 2002

Description of the Watershed

Portions of three watersheds are found within the Town of Monson. About 12,400 years ago the water had receded from Glacial Lake Quaboag forming the Chicopee River Basin. A significant portion of the Town of Monson is located in the Chicopee Watershed. Chicopee Brook runs south to north through the center of Monson to the Quaboag River. The Quaboag River forms the northern border between Monson and Palmer. The Quaboag River then joins water from the Swift and Ware Rivers and continues to flow into the Chicopee River, a principal tributary of the Connecticut River.

Southeast Monson is located in the Quinebaug Watershed and Temple Brook in southwest Monson is within the Connecticut River Watershed.

Distribution and Supply

The Town’s water supply currently consists of three groundwater wells: the Bunyan Road, the Palmer Road, and the Bethany Road wells (See **Map 1: Monson Wells and Zone II**) The wells are located along Chicopee Brook.

The water system has one water storage tank with a capacity of 1,000,000 gallons and the distribution system consists of about 30 miles of pipe. The majority of the distribution system consists of unlined cast iron pipe that is 100 years old in some places. According to the Water Supply, Distribution and Storage Study prepared in 1998 by the Board of Water Commissioners with Tighe & Bond, the Town provides water to about 44% of the population. The Monson Open Space Plan for 2006 estimates that 47% of the population is now served by Town water. The remaining residents obtain their water from individual on-site wells.

Distribution System

The Monson water delivery system consists of pipes ranging in size from 2 inches to 16 inches in diameter. The majority of the pipes in the system are unlined cast iron pipes. Generally, the distribution system is adequate to meet the daily needs of the community. However, the Tighe & Bond report *Monson Master Plan Page 60 Municipal Services and Infrastructure* recommends several upgrades to provide adequate water flows for fire suppression. Consideration should be given to primary distribution system improvements in the following areas:

- Palmer Road (Rt.32) from Bunyan Road to Hospital Road
- Margaret Street from High Street to Monson High School
- Upper Palmer Road and Margaret Street from Hospital Road to Monson High School
- Bethany Road from Chestnut Street to State Street
- On State and Gates Street from Main to Cushman Streets
- On Stafford Road from Wales Road to the end of the existing main
- Install a booster pump system at the chlorinator building on Wales Road to increase water pressure in the area.

In addition, consideration should be given to conducting a leak detection survey on the entire distribution system.

Water Storage Facilities

Water storage facilities provide additional water supply to meet peak demands during well shutdowns, drought conditions, or fire emergencies. The Town has a single one million gallon storage tank located on Ely Road. The Town plans to construct an additional water storage tank in the near future to increase storage capacity and add redundancy to the system.

Sewer System

The Town's sewer system is approximately 25 years old. The sewer system generally follows the location of the municipal water system with the exception of the Paradise Lake area, which has public sewerage but not public water. The system includes one pump station located on Hospital Road. The Town's wastewater is not treated in Monson but is transferred to the Palmer wastewater system for treatment and disposal.

The central portion of Monson is serviced by 27.5 miles of municipal sewer lines, with 3437 people or 48% of the population being served. The Town's wastewater pumping station handles on average 115 million gallons a year (2000-2004) or 316,000 gallons per day. With a design capacity of 1.4 million gallons per day average and 2.2 million gallons per day peak flow there is ample room for additional wastewater flow but Monson's topography creates severe limitations on future expansions to the existing system into the uplands. Slopes over 15% and exposed surface bedrock make this expansion extremely costly. Because of this fact the Town is currently not considering any significant sewer system expansions.

The Source Water Protection Committee recommends an annual review of the water and sewer rate structure to insure funds are available to maintain the existing water and sewer systems..

Future Water Supply

Future expansion of the water system is possible with ample aquifer supply being found at the northern boundary of Monson, although continued upgrades to the aging piping infrastructure would be required. As shown in **Table 2: Monson's Municipal Water Supply, 2000 – 2020**, the maximum daily water demand in 2000 was approximately 0.91 million gallons per day (mgd). The projected maximum daily demand is expected to increase to approximately 1.0 mgd by the year 2020; however, it should be noted that future projections are difficult to make because a single large industrial water user could account for at least as much new demand as all new residential development over the next 15 years. Despite experiencing significant residential growth in the public water system, residential water usage has actually remained relatively consistent for the last five years whereas commercial/industrial use has declined. This could have been caused by a more aggressive water rate taking effect in January of 2004 which in turn might have influenced our customers to conserve. Regardless, the current available municipal supply sources have sufficient safe yield to meet the current and projected maximum day demands, assuming that all well sources are functional. Typical water works practice for supply planning is to analyze the system with one major supply off-line. If the Bunyan Road well is off-line for maintenance purposes, the Town must use the Palmer Road well and the Bethany Road well. The *Monson Master Plan (Page 59): Municipal Services and Infrastructure* combined yields from these two wells can comfortably meet the 2020 maximum day demand of 1.0 mgd.

Table 2: Monson’s Municipal Water Supply, 2000 – 2020

Year	Population Serviced by Water System	Average Daily Consumption (gpd)	Maximum Daily Consumption (gpd)	Existing Supply Capacity (gpd safe yield)
2000	3,700	484,384	910,641	1,973,800
2010	3,862	511,873	962,321	1,973,800
2020	4,024	533,328	1,002,657	1,973,800

Source: Data developed from MISER Population Projections for Massachusetts, 2000-2020, Stefan Rayer, Ph.D., Massachusetts Institute for Social and Economic Research, 128 Thompson Hall, University of Massachusetts, Amherst, MA 01003, July 17, 2003; and from Monson Water Department total pumping data for years 1978 through 2005.

Capacity/Yield

Together, Monson’s Wells supply an average of 180.9 million gallons a year (2000-2005) to the Town.

Table 3: Monson Well Capacity

Well	Permitted Capacity	Actual Present Day Pumping Capacity	Future Pumping Capacity (date)
Bethany Rd	310 gpm avg 446,000 GPD	310 gpm (diesel drive only) 446,000 GPD	310 gpm /electric (unknown)
Palmer Rd	812 gpm avg 1,169,000 GPD	470 gpm 676,800 GPD	812 gpm (unknown)
Bunyan Rd	591 gpm avg 851,000 GPD	591 gpm 851,000 GPD	591 gpm 851,000 GPD

Source: Monson Water Department’s 2004 DEP Annual Statistical Report

Bunyan Road Well

The Bunyan Road well field is the primary water source for the town. Two new wells were installed in 2005 utilizing a USDA Rural Development grant and are in the northern part of town west of Route 32 along the wetland area of Chicopee Brook.

The new wells, Replacement Well #1 & #2, are smaller in size than the original Bunyan Road Well and are constructed to a depth of 60 feet for #1 and 62 feet for #2. Together they can supply over 600 gpm to our water system.



USDA Sign at the Bunyan Road Well.

The original well was installed in 1969 but, after being redeveloped and cleaned on four previous occasions in an attempt to regain lost capacity, was decommissioned in 2005 due to plugging of the gravel pack and well screen.

Lower Palmer Road Well

The Bethany Road and Palmer Road wells are located about 500 feet apart, north of the center of town, east of Route 32. Each well has a Zone I of 400 feet. All three of the Town's wells are located within the same buried valley aquifer along the Chicopee Brook and the Zone II, recharge area was delineated for all three wells as part of the SWAP program.

The Palmer Road facility is scheduled for an upgrade in 2006 which will increase its pumping capacity to the DEP permitted allowance. The existing Palmer Road well, installed in 1965, is a 16x24-inch, 78-foot deep, gravel-packed well that is used as a back-up source to the Bunyan Road wells. Records indicate a 16x36-inch diameter gravel developed well was installed adjacent to the existing Palmer Road well but has not been used. In March and April of 1965, a 10-day pumping test was conducted on the finished well that was installed at Palmer Rd. The Department of Public Health reviewed the pumping test data and indicated in a letter dated April 21, 1965 that drawdown in the well reached stabilization. Based on pumping test results, DEP has established an approved yield of 812 gpm or 1,169,000 gpd for the Palmer Road Well.



Drinking Water Supply Sign near the Palmer Road Well on Rt.32 Monson, MA.

The Palmer Road well was utilized as the primary source for the Town of Monson while the Bunyan Road Replacement Wells were being constructed in 2005.

Bethany Road Well

The Bethany Road well is a 16x24-inch diameter, 54-foot deep, gravel-packed well installed in 1950. The Bethany Road well can only be operated using a diesel engine at this time, though an electric line does exist at the site, no upgrades have been made at the time of this plan. The Bethany Road Well is presently only used to add water to our system during periods of high demand. The Water Department continues to maintain this well and fulfill all DEP mandated sampling requirements. The Town does not own the entire Zone I of this well, as required by MA DEP regulations. The Source Water Protection Plan recognizes that acquiring or controlling as much of the Zone I land as possible is a priority.



Bethany Road Well.

Protection Zones

Monson's Wellfields have a Zone I and II delineation. The Zone I is the most protected area around a groundwater source and extends in a 400-foot radial area around each of the wellheads. The radii of the Zone I and II for the wells are based on estimated yields of the wells as determined from pumping tests conducted on each well. Monson's Wellfields were delineated by Tighe & Bond in 2001. The delineation of the Zone II was funded through the Massachusetts Department of Environmental Protection's (DEP) Source Water Assessment Program (SWAP) Zone II delineation project. The Monson Wellfield's were selected for inclusion in this project based on a comparison to the following set of criteria: 1) real or threatened impacts to water quality, 2) the absence of a regulatory vehicle for requiring the water supplier to delineate Zone II and 3) recommendations from DEP regional offices.

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.

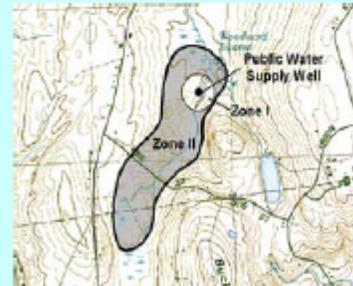
A source's susceptibility to contamination does *not* imply poor water quality.

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.

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.

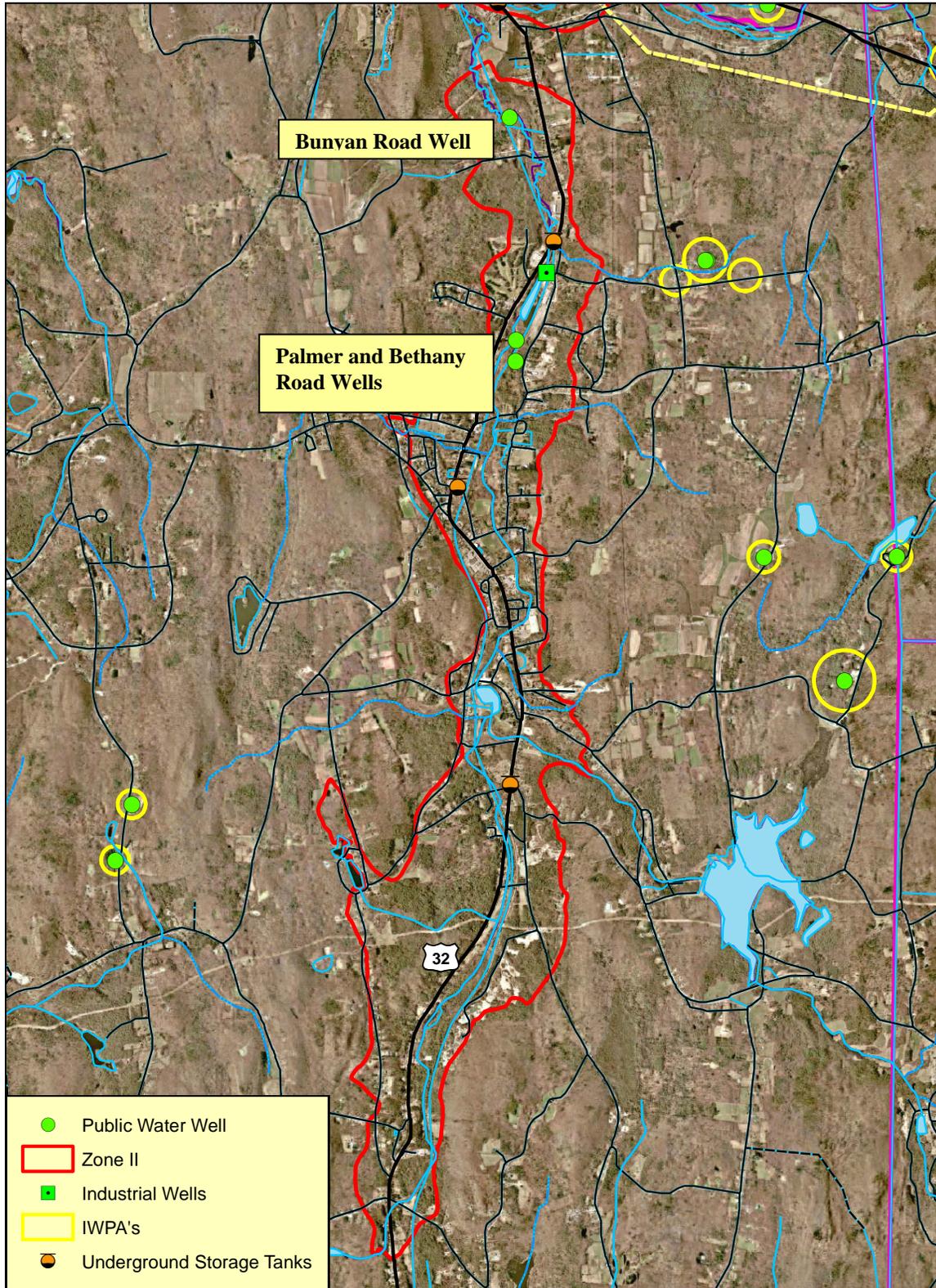


The Zone II's for the Bunyan Road Well (PWS ID 1191000-05G), the Palmer Road Well (PWS ID 1191000-04G) and the Bethany Road Well (PWS ID 1191000-03G) were delineated by the Tighe & Bond report using conceptual modeling methods including:

- A review of existing mapping to determine hydrogeologic features such as aquifer boundaries and regional groundwater flow.
- An analysis of available pumping test records or well logs to estimated aquifer hydraulic properties. Pumping rates (well yields) were based on records provided by the MA DEP.

A field survey of land uses and potential contamination sources (PCSs) was carried out by Tighe & Bond once the Zone II boundaries were established. The Monson Source Water Protection Plan updates the 2001 PCS survey to reflect the state of potential contamination sources present in 2005-2006. A detailed description of potential contamination sources is addressed in the section titled: **Potential Sources of Contamination in Zones I and II.**

Map 1: Monson's Wells and Zone II Bunyan Road Well



Water Quality

Monson 2004 Water Quality Test Results

The table below lists all the drinking water contaminants that Monson detected during the 2004 calendar year. Unless otherwise noted, the presence of contaminants does not necessarily indicate that the water poses a health risk. The water quality information presented in the table is from the most recent round of testing done in accordance with the regulations. All data shown were collected during the last calendar year unless otherwise noted in the table. Below the table are the terms, abbreviations and definitions used in the table. See the section titled - **Resources** for a complete copy of Monson's 2004 Consumer Confidence Report.

Table 4: Monson's Water Quality Test Results

Substance of Contaminant	Level Detected	MCL	MCLG	Sample Date	Violation Yes/No	Likely Source
Nitrate	2.00 ppm	10 ppm	10 ppm	5/27/04	No	Erosion of natural deposits
Barium	.0064 ppm	2 ppm	2 ppm	06/08/04	No	Discharge from drilling wastes & metal refineries, erosion of natural deposits
Sodium	48.1 ppm	none	none	05/27/04	No	Erosion of natural deposits
Sulfate	12.0 ppm	none	none	05/27/04	No	Erosion of natural deposits
Contaminant	Action Level	90 Percentile	Sites Sampled	Sites Exceeding Action Level	Sample Date	Likely Source
Copper	1.3 mg/L	.283 mg/L	21	0	10/24/02	Household plumbing
Lead	.015 mg/L	.003 mg/L	21	1	10/24/02	Household plumbing

Action Level (AL): The concentration of contaminant which, if exceeded, triggers treatment or other requirements which a water system must implement.

Maximum Contaminant Level Goal (MCLG): The level of contaminant in drinking water below which there is no known or expected risk to health.

Maximum Contaminant Level (MCL): The highest level of contaminant that is allowed in drinking water.

Department of Environmental Protection (DEP): State ~ **Environmental Protection Agency (EPA):** Federal ~ **n/a:** not applicable ~ **nd:** not detectable at testing limit ~ **ppb:** parts per billion ~ **ppm:** parts per million ~ **mg/L:** milligrams per liter ~ **90 percentile:** for every 10 sites tested 9 are at or below the action level

Geology and Soils

Monson's geologic terrain conforms to a Y-Shaped valley. The valley is bordered by two prominent ridges running north and south on the east and west sides of town. The western ridge and hills are granite intrusions which were formed by a bubble of molten rock which pushed its way to the surface but did not break through, approximately 450 million years ago. This is known as the Bronson Hill volcanic belt. It is composed of Monson gneiss, Ammonoosuc volcanic rocks, and Clough quartzite and runs from central Connecticut to New Hampshire. This belt was near the center of the collision between Gondwanan and Laurentian continents. As these igneous intrusions cooled, they formed the western granitic hills that separate Monson from Wilbraham.

According to the USGS Geological Quadrangle Map GQ-1374, the majority of Monson's Zone II is underlain by Monson Gneiss, which is the oldest sequence (middle Ordovician in age) of the Bronson Hill Anticlinorium. The Bronson Hill Anticlinorium is described as being "a series of non-enchelon gneiss domes and mantling strata that extends from northern New Hampshire southward to Long Island Sound".

The Monson Gneiss is described as texturally diverse, layered and massive, plagioclase-quartz-biotite-(hornblende)-(potassium feldspar)-(magnetite) gneiss interlayered with hornblende-plagioclase amphibolite. This layered gneiss probably originated as volcanic sediment or "shallow sills that were emplaced during volcanism".

The three wells are located within a glacially deepened, bedrock valley along the Chicopee Brook. The stagnant, receding (melting) glacier deposited the overburden materials that filled the bedrock valley some 10,000 years ago. The deposits are a complex series of coarse and fine-grained material referred to as outwash deposits. A temporary glacial lake left thick clay deposits in some areas, while fast moving meltwater left sinuous, coarse gravel deposits (eskers) or flat topped delta or terrace features amid the fine-grained deposits. Recent stream waters have reworked the deposits and deposited alluvium throughout the area. The Bethany and Bunyan Road wells are located within a coarse gravel, esker deposit. In addition, swamp deposits are mapped in the Bunyan Road Well area. The Palmer Road well is located in an area with finer grained outwash deposits and has sand, silt and minor gravel deposited by modern alluvial streams.

Lithologic information collected from soil borings advanced in Monson's Zone II is consistent with the surficial mapping available for this region. Based on information provided in the boring log/well completion reports, surficial materials generally consist of sand, silt, gravel and clay deposits to depths between 50 feet and 100 feet below grade.

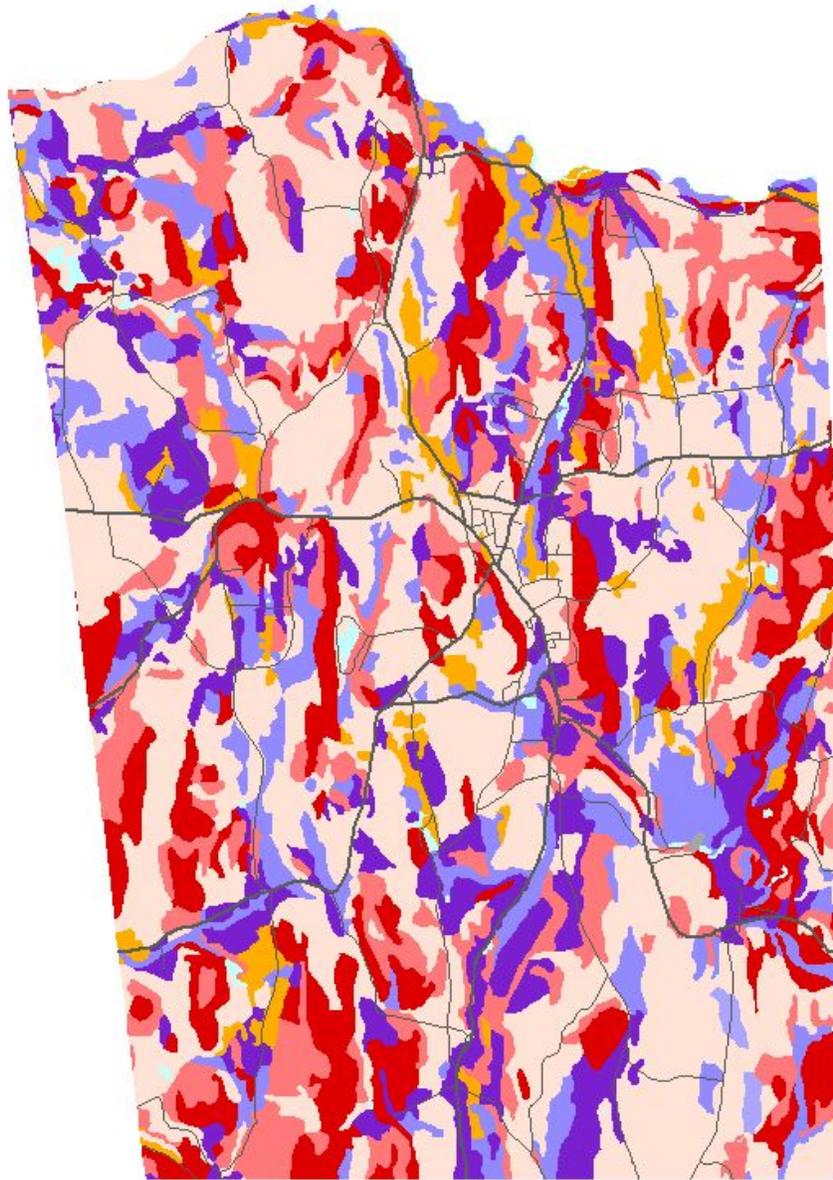
The soils of Monson relate directly to the geologic forms and slope of the landscape. The composition of the lowland and eastern ridge soils are characteristic of the glacial deposits which were left in the outwash plain of the Monson valley. The western upland soils and their composition represent glacial deposits and erosion of the igneous landform. The valley floor is made up of different deposits of Hinkley-Merrimack-Windsor soils. These soils are found on nearly level to steep slopes and are very deep.

The Hinkley-Merrimack-Windsor soils drain excessively, having formed in sandy and gravely outwash plains, and often overlie aquifers. Development on top of these soils can be hazardous since there is a diminished ability to filter pollution, which may drain directly into the aquifer. The uplands of Monson are comprised of Scituate-Montauk-Charlton soils. These soils are found on level to very steep slopes and are well-to-moderately drained. They occur in areas of loamy and sandy glacial till and are subject to a seasonal high water table after prolonged rains in the spring and winter.

There is no evidence of a continuous, protective clay layer through the Zone II. Wells located in this type of aquifer are considered to have a high vulnerability to potential contamination from the surface due to the absence of hydrogeologic barriers (i.e. clay) that can prevent contaminant migration.

(Information for the Monson's Wellfields was gathered from the Town of Monson's Master Plan Draft, DEP's SWAP Report, Tighe & Bonds Zone II delineation report and the USGS Geological Quadrangle Map GQ-1374.)

Map 2: Monson Soils



Development Limitations Related to Soils and Geologic Features



0 1 Miles

Severe Limitations

Slope Greater Than 25% and Rocky Outcrops

Moderate Limitations

Slope 15% to 25%
 High Water Table
 Excessive Drainage

Minimal Limitations

Minimal Limitations
 Prime Agricultural Soils

Figure 4-3
Required Map 2

Source: Monson Open Space Plan

Wetlands

Wetlands have values for humans and wildlife that are important to protect. These values include: Protection of public and private water supply, protection of ground water supply, flood control, storm damage prevention, prevention of pollution, protection of land containing shellfish, protection of fisheries, and protection of wildlife habitat.



Wetland in Monson, MA. (Picture courtesy of Leslie Duthie.)

Wetlands play a major role in the landscape by providing unique habitat for a wide variety of flora and fauna. They can be thought of as “biological supermarkets” because of the extensive food chain and rich biodiversity that they support. On a global scale, wetlands have been termed “carbon-dioxide sinks” and climate stabilizers. The Monson Conservation Commission is responsible for protecting the values that our wetlands provide by applying the regulations set forth by the Wetlands Protection Act.

Monson’s soil is largely composed of glacial till, a heterogeneous mixture of clay, silt, sand and gravel deposited by glacial ice. Wetlands occur frequently on this unsorted soil mixture as it is not very permeable. The soils and ample water supplies also support numerous vernal pools found throughout the town. Vernal pools are unique and important landscape features that provide wildlife habitat, aid in flood prevention, and aquifer recharge.

Aquifer Recharge Areas

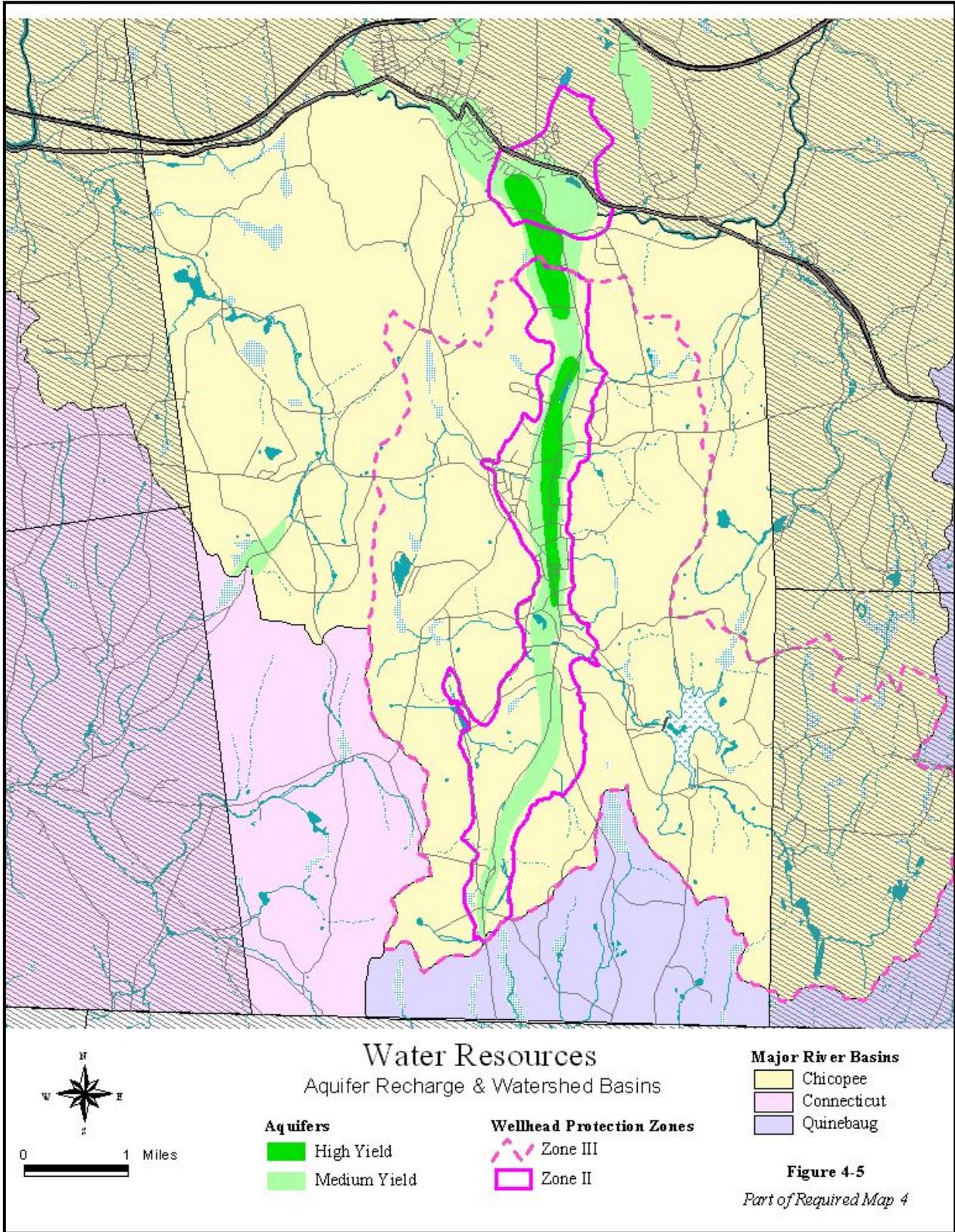
The main aquifer recharge area in Monson lies beneath the central valley and the Hickley Merrimack-Windsor soils. Monson’s town wells are currently located in this area. Should the current water system be expanded, there is an excellent aquifer recharge area in this central valley near the Palmer border. This site is in close proximity to existing water lines. An addition to the existing water system would be feasible. A secondary aquifer recharge area has been denoted on the aquifer recharge map (See Map 3: **Monson**



Chicopee Brook Waterfall – Monson, MA.

Water Resources) along the western border of the town. This area, however, is not close to any of the existing piping used for the town’s current water supply.

Map 3: Monson's Water Resources



Source: Monson Open Space Plan

Protected Open Space

The Town of Monson’s Zone II contains very little protected open space. The Town does own and control much of the parcels surrounding the Bunyan Road Wells, but does not own or control much of the land around the Palmer Road and Bethany Road Wells. This should be a priority in future land acquisition by the Town.

Lands of three conservation organizations make up a large part of Monson's protected open space. These include the State Division of Conservation Resources (Brimfield State Forest), the Norcross Wildlife Foundation (Norcross Wildlife Sanctuary), and the Trustees of Reservations (Peaked Mountain Reservation). Much of this land, including Brimfield State Forest, and the Norcross Wildlife Sanctuary (www.norcrossws.org), is located on Monson's eastern border and is shared by the towns of Brimfield and Wales. The Peaked Mountain Reservation (www.thetrustees.org), including Monson's highest point, is located in the southwest corner of the town. These open spaces provide important recreational opportunities to the people of the town.

There are two additional conservation organizations that do not have large land holdings in Monson but are significant potential resources for open space planning in town. Both organizations operate at a regional level. The Opacum Land Trust (www.opacumlt.org), formed in 2000, is a thirteen - town land trust in the region covering communities in both Hampden and Worcester Counties. The Hampden Conservation District, formed by the Massachusetts State Legislature, develops programs that serve the environmental needs of residents of Hampden County and assists in protecting the natural resources of Hampden County

Protected Land

In Monson only 14% of the town’s land is permanently protected. Approximately 66% of the land could still be developed. Some of the programs or tools that property owners can use to preserve the scenic beauty, natural resources, natural areas, the value of timber products, and agricultural lands, as well as protect wildlife are listed below.

For more information on protecting land see the section on **Land Protection Strategies**.

CHAPTER 61 “Chapter Lands”

Current approximate acreage in Monson:

Ch. 61 – Forest lands	2218.725
Ch. 61A – Agriculture	2809.869
Ch 61B – Recreation	1308.413

Total	6337.007	22% of the town
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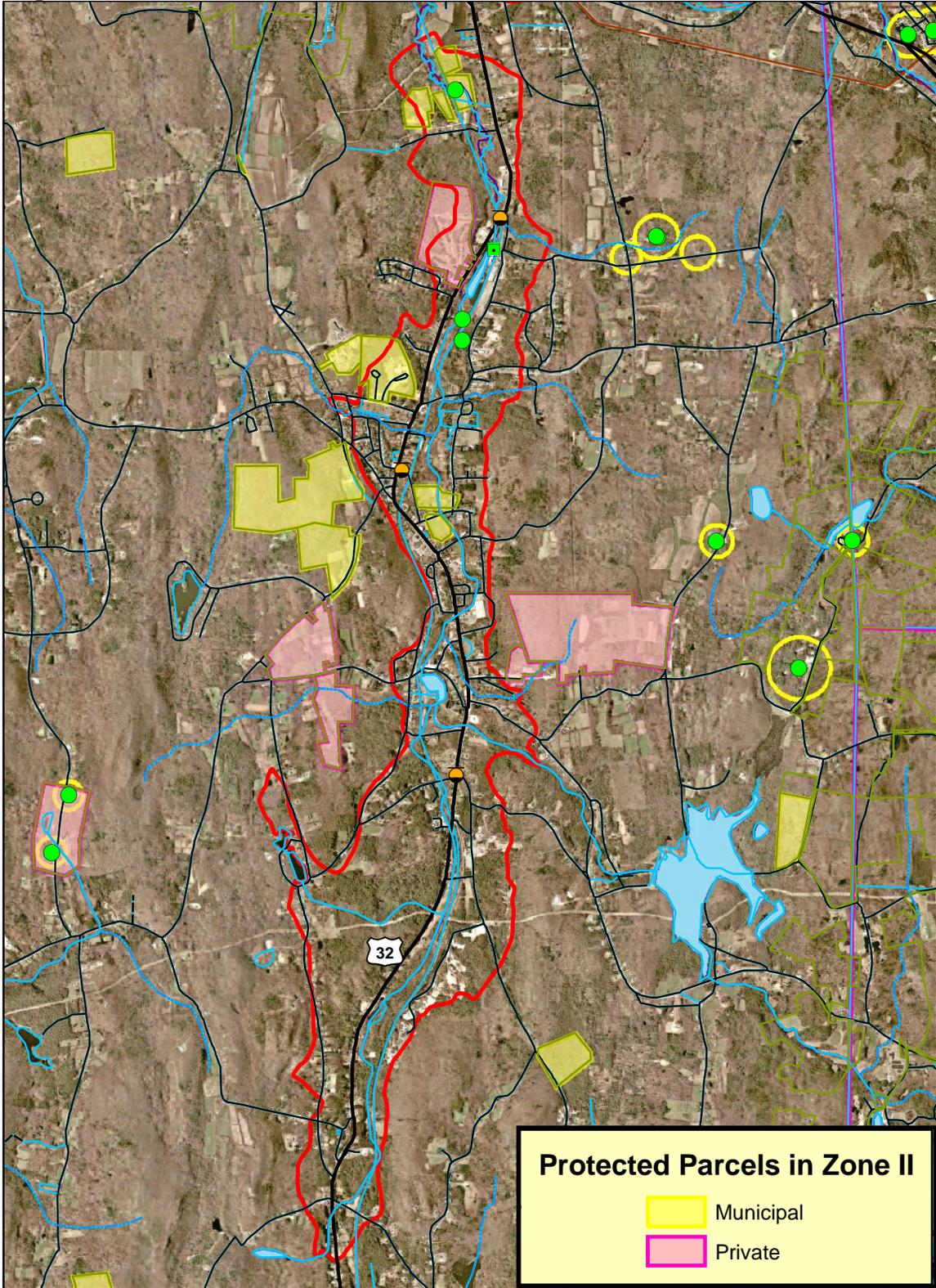
AGRICULTURAL PRESERVATION RESTRICTION (APR)

There are 4 properties in Monson currently enrolled in the APR program.

LAND PRESERVATION AGREEMENT

Also known as a Conservation Easement (CE, CR)

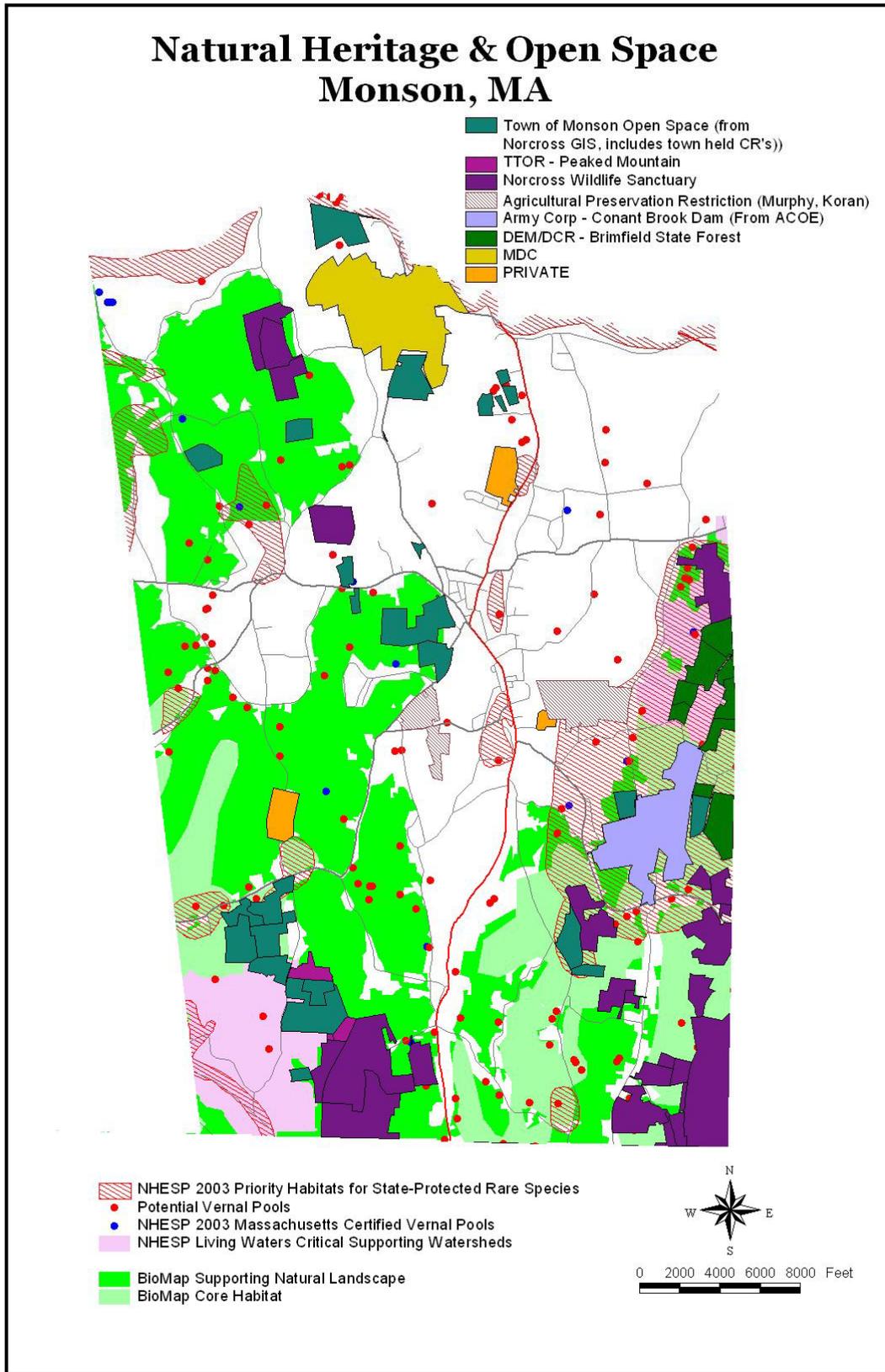
Map 4: Monson's Protected Parcels in Zone II



0 0.5 1 2 Mile



Map 5: National Heritage and Open Space Plan Map



Source: Monson Open Space Plan

Zoning

The Town of Monson has adopted a Water Supply Protection District and the overlay map of the Zone II delineation is on file at the Town Hall. The Water Supply Protection District is intended to protect lands within the primary recharge area of groundwater aquifers and the watershed areas of reservoirs which now or may in the future provide public water supply. To protect surface and groundwater resources, the overlay district prohibits many noxious uses such as solid waste disposal facilities, disposal of liquid or leachable wastes, and storage of petroleum products. Commercial or industrial uses that are allowed in the underlying district may be allowed by Special Permit. (See Appendix A: Monson Zoning.)



Welcome Sign - Northend of Route 32 – Monson, MA.

The long-term development patterns of Monson will be determined by the current zoning and zoning bylaws. These regulations influence development, both in its type and location. Development can be excluded or highly regulated in certain areas such as Reserved Lands, Water Supply Protection Districts, Scenic Districts, and Flood Plains. Unless recommendations made in the master plan are developed, development trends will continue to be determined by current zoning.

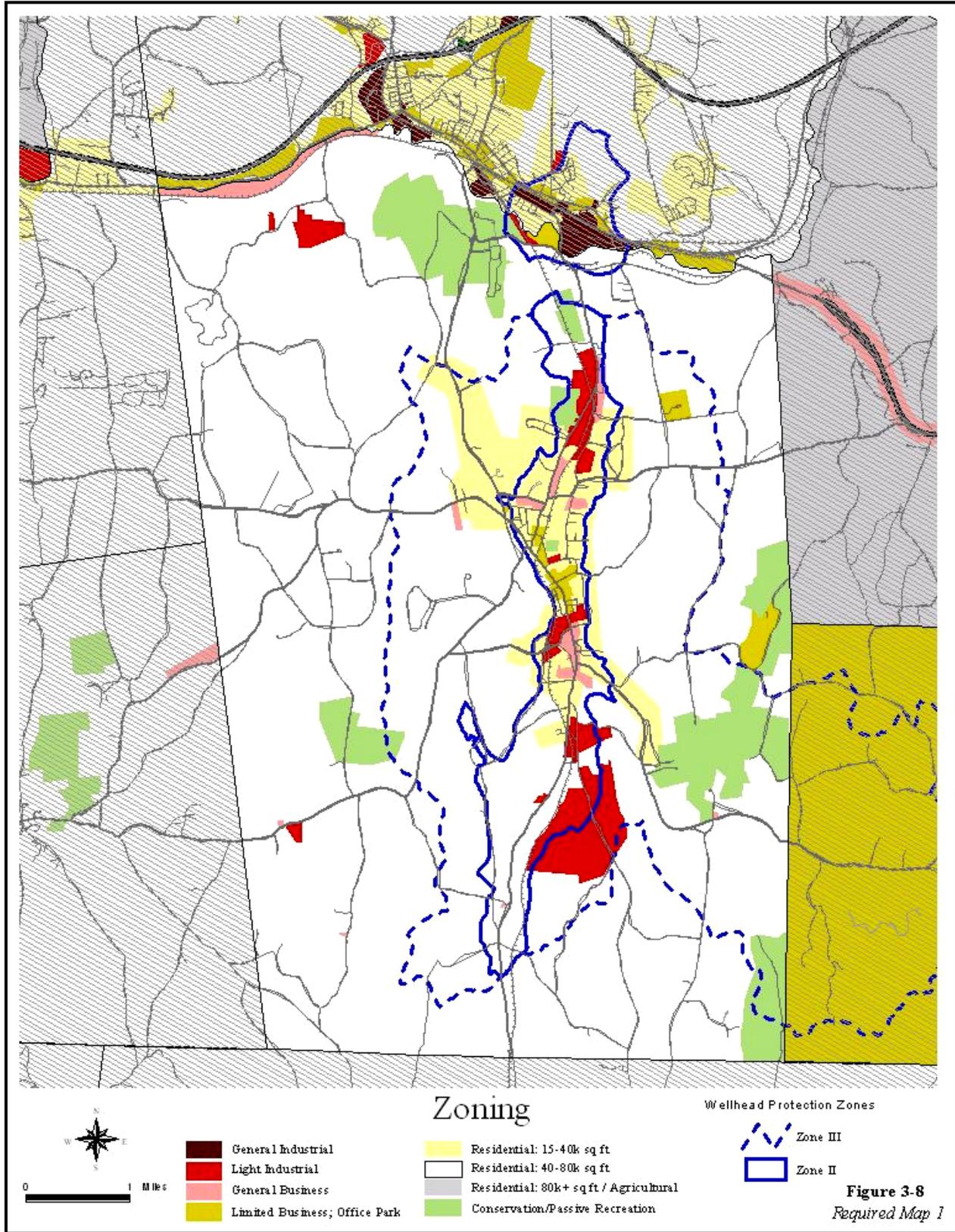
The overall purpose of the zoning by-law for the town of Monson as stated is to promote the health, safety, convenience and general welfare of the inhabitants of the Town of Monson, and to provide the town with the protection authorized by the Massachusetts General Laws, Chapter 40A. In general, this by-law intends to separate possible conflicting land uses.

Water Supply Protection District

The Town of Monson modified their existing Water Supply Protection District overlay on January 26, 2004 to incorporate the newly delineated Zone II lands.

Please refer to **Map 6: Monson Zoning**

Map 6: Monson Zoning



Source: Monson Open Space Plan

Development Impact

The current development trend for Monson is single family detached housing, built in a linear fashion, along road frontages. This trend leads to increasing roads and road maintenance, in addition to changing the character of Monson visually. The impact of building more homes in the upland and steep areas will causes an increase in run-off and erosion, due to increased impervious surfaces, vegetation removal and infringement on fragile plant communities which have helped to keep soils stable in these areas prior to development. In the upland areas, since sewer service is impossible, increased development may potentially threaten groundwater quality since more septic systems will be built at a greater density. Drinking water in many of the upland areas comes from private wells.

Ground and Surface Water Pollution

The quality of the Quaboag River has improved since the 1960's and 1970's largely because of the abandonment of the industries and factories along the river and construction and improvement of municipal wastewater treatment facilities. The February 1999 Department of Environmental Protection, Division of Watershed Management final report under section 303(d) of the Federal Clean Water Act identifies no pollutants of stressors in Quaboag River to the Palmer Road (route 32) bridge. The report identifies pollutants and stressors from that point to the confluence with the Ware River as pathogens.

Surface and groundwater pollution occurs due to runoff from road salt, agricultural fertilizers, and some industries along the Chicopee Brook.

Monson zoning bylaws currently incorporate a Water Supply Protection District, which prohibits and restricts potentially polluting land uses. Maintaining groundwater quality is an important issue in Monson due to underlying aquifers in the central valley and to the presence of many private wells in the uplands where sewer service is not possible.

Hazardous Waste Sites

The town of Monson has 9 active sites listed on the Bureau of Waste Site Cleanup Site lists as of December 20, 2004. These sites and their locations are listed below:

Table 5: Hazardous Waste Sites

Registered Sites	Address
Former site of Church Seat, Co.	132 Bethany Road
Omega Processing	21 Bliss Street
Private Residence	39 Crest Road
Westview Farm	111 East Hill Road
Private Residence	33 Green Street
Private Residence	31 Lakeshore Drive
Bazley Tire pile	Moulton Hill Road
Former Wesson Facility	293 South Main Street
Labonte's Towing	250 Wilbraham Street (route 20)

Table 6: Land Uses in the Water Supply Protection Areas

Land Uses	Quantity	Threat*	Potential Contaminant Sources
Agriculture			
Pesticide Storage or Use	3	H	Pesticides: leaks, spills, improper handling, or over-application
Fertilizer Storage or Use	2	M	Fertilizers: leaks, spills, improper handling, or over-application
Livestock Operations (Non-commercial)	1	M	Improper handling of manure, pesticides, petroleum products
Forestry Operation	1	L	Pesticides, petroleum products from farm equipment
Commercial			
Gas Stations	3	H	Automotive fluids and fuels: spills, leaks, or improper handling or storage: Underground Storage Tanks (ust)
Service Stations/ Auto Repair Shops	8	H	Automotive fluids and solvents: spills, leaks, or improper handling
Railroad Tracks and Yards	Through Zone I and II.	H	Herbicides: over-application or improper handling; fuel storage, transported chemicals, and maintenance chemicals: leaks or spills
Bus and Truck Terminals	5	H	Fuels and maintenance chemicals: spills, leaks, or improper handling
Repair Shops (Engine, Appliances, Ect.)	1	H	Engine fluids, lubricants, and solvents: spills, leaks, or improper handling or storage
Cemeteries	6	M	Over-application of pesticides: leaks, spills, improper handling; historic embalming fluids
Golf Course	1	M	Fertilizers or pesticides: over-application or improper handling
Medical Facilities	1	M	Biological, chemical, and radioactive wastes: spills, leaks, or improper handling or storage (sewered)
Sand and Gravel Mining/Washing	1	M	Heavy equipment, fuel storage, clandestine dumping: spills or leaks
Car/Truck/Bus Washes	1	L	Vehicle wash water, soaps, oils, greases, metals, and salts: improper management (sewered)
Funeral Homes	1	L	Hazardous chemicals: spills, leaks, or improper handling
Laundromats	1	L	Wash water: improper management (sewered)
Industrial			
Fuel Oil Distributors	1	H	Fuel oil: spills, leaks, or improper handling or storage
Machine Shops	3	H	Solvents and metal tailings: spills, leaks, or improper handling
RCRA TSDF Facilities	1	H	Hazardous wastes: spills, leaks, or improper handling or storage
Residential			
Fuel Oil Storage (at residences)	Numerous	M/H	Fuel oil: spills, leaks or improper handling
Septic Systems/Cesspools	Numerous	M/H	Hazardous chemicals: microbial contaminants, and improper disposal
Lawn Care/Gardening/Hay	Numerous	M	Pesticides: over-application or improper storage and disposal

Miscellaneous			
Underground Storage Tanks	Numerous	H	Stored materials: spills, leaks, or improper handling
Aboveground Storage Tanks	Numerous	M	Materials stored in tanks: spills, leaks, or improper handling
Pipeline: Gas and Sewer	2	M	Natural Gas or Sewage: spills or leaks
Road And Maintenance Depots	1	M	Deicing materials, automotive fluids, fuel storage, and other chemicals: spills, leaks, or improper handling or storage
Schools	2	M	Fuel oil, laboratory, art, photographic, machine shop, and other chemicals: spills, leaks, or improper handling or storage (sewered)
Transportation Corridors	Numerous	M	Fuels and other hazardous materials: accidental leaks or spills; pesticides: over-application or improper handling
Transmission Line Rights-of-Way - Type: Railroad, Natural Gas	2	L	Corridor maintenance pesticides: over-application or improper handling; construction
Aquatic Wildlife	Numerous	L	Microbial contaminants
Fishing/Boating	Numerous	L	Fuel and other chemical spills, microbial contaminants (mainly canoes)
Stormwater Drains/ Retention Basins	Numerous	L	Debris, pet waste, and chemicals in stormwater from roads, parking lots, and lawns

Source: Monson Water Department SWAP Report, DEP, 2003

***THREAT RANKING** - Where there are two rankings, the first is for surface water, the second for groundwater sources. 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; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.

Potential Sources of Contamination in Zones I and II

By their very nature, certain land uses are threatening to water supplies. There are some potential sources of contamination within the Monson Water Department's Wellfields Zone I and II including:

1. **A Non-conforming Zone I**
2. **Railroad Tracks**
3. **Residential/Commercial Land Uses**
4. **Proximity of Transportation Corridors**
5. **Hazardous Materials Storage and Use**
6. **Agricultural Activities**
7. **Oil or Hazardous Material Contamination Sites**

The following is a discussion of these potential sources of contamination and recommendations for their effective management. The primary recommendations were outlined by the DEP's 2003 SWAP Report for the Monson Water Department. These recommendations are presented along with the protection strategies discussed by the Monson Source Water Protection Committee.

Non-conforming Zone I

1. Non-conforming Zone I – The Zone I for the wells is a 400-foot radial area around each of the wellheads. Massachusetts drinking water regulation (310 CMR 22.00 Drinking Water) requires public water suppliers to own the Zone I, or control the Zone I through a conservation restriction. Activities other than those directly related to the public water supply are prohibited within the Zone I. However, many public water supply sources were developed prior to promulgation of the Department's regulation and contain non-water supply activities such as homes and public roads.

The Monson Water and Sewer Department does not own the entire Zone I's for the Bethany Road and Palmer Road Wells. The Zone I for the Bethany Road Well contains a Town road and two residences.

The railroad transects the Zone I of all of Monson's wells. Recommendations for the railroad will be addressed in detail in the following section.



Railroad Track near the Bunyan Road Well within the Zone II.

Recommendations:

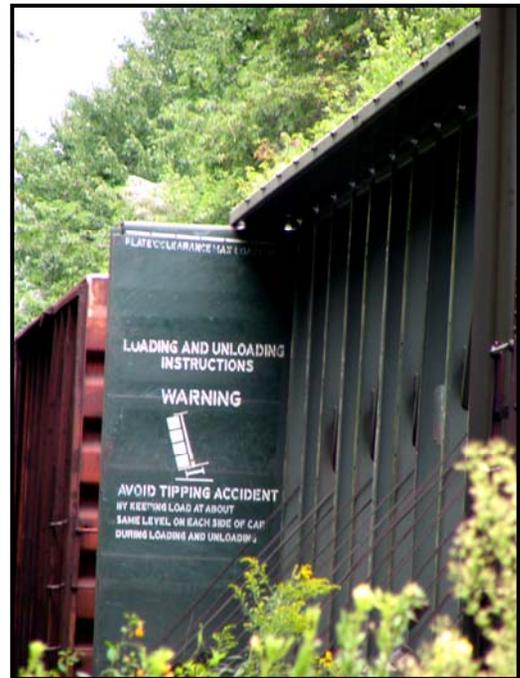
1. To the extent feasible, remove all non-water supply activities from the Zone I to comply with DEP's Zone I requirements. Prohibit new non-water supply activities in the Zone I.
2. Ensure that Monson residents are using best management practices (BMPs) with respect to household hazardous materials and lawn chemicals.
3. Do not use or store pesticides, fertilizers or road salt within the Zone I.
4. Periodically inspect the stormwater runoff in the vicinity of the sources to ensure the runoff is directed away from the sources.
5. Create Agreement Options – Obtain a Memorandum of Understanding and/or Right of First Refusal between the landowners in the Zone I and the Monson Water Department to control threatening activities.

Railroad Tracks

The New England Central Railroad runs south to north through the town connecting New Haven, Connecticut to St. Albans, Vermont. Railroad tracks run directly adjacent to all Monson's wells within the Zone I, as well as through the Zone II of Monson's wellfields. Rail corridors serving passenger or freight trains are potential sources of contamination due to chemicals released during normal use, track maintenance, and accidents. Accidents can release spills of train engine fluids and commercially transported chemicals. Work with local officials during their review of the railroad and other utility right-of-way Yearly Operating Plans (YOP) to ensure that water supplies are protected during vegetation control or maintenance of the utility.

The MA DEP Pesticide Bureau prohibits Railroads from using certain hazardous chemicals within the Zone I and II.

The Monson Water and Sewer Department will work with the Monson Conservation Commission in approving the Railroads Yearly Spraying Plan. A map depicting Monson's wetland locations and Zone I locations will indicate where the railroad must comply with low spraying applications of herbicides.



Rail Cars parked on the Tracks within Bunyan Roads Zone I.

Recommendations:

- 1. Review the railroad right-of-way Yearly Operating Plan to ensure Best Management Practices (BMP's) are implemented with regard to vegetation control in the Zone II and that the utility has accurate information regarding the locations of the wells and the Zone I. Review the maps the utility uses and supply them with an accurate map as appropriate.**
- 2. Work with you local fire department to review Emergency Response Plans. Updates to this plan should include the railroad right-of-way including coordination with the owner/operator of the track and trains using the right-of-way. Request emergency response teams to coordinate emergency response drills and practice containment of potential contaminants from train accidents with the Zone II, which should attempt to include representatives from the owner/operator of the trains utilizing the right-of-way.**

Hazardous Spills

The following recommendations are important to address potential hazardous waste spills in transportation corridors and in both railroad and power-line right-of-ways.

1. Be sure that Emergency Response (ER) teams for the highway, fire and police departments and the railway company are aware of the water supply protection areas in Monson. Provide them with an updated map, if necessary.
2. Work with the municipality or MassHighway to have catch basins inspected, maintained, and cleaned on a regular schedule. Regular street sweeping reduces the amount of potential contaminants in runoff.
3. Consider working with local watershed groups to institute a Storm Drain Stenciling Program, if there is not a local program. For more information on how to develop a storm drain stenciling program go to <http://www.earthwaterstencils.com>.
4. 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 NPDES Phase II Stormwater Rule requiring some communities to complete stormwater outfall mapping. For additional information, refer to the Stormwater Management Information at <http://www.state.ma.us/dep/brp/ww/wwpubs.htm#storm>.
5. Review potential USDA funding for mitigation and prevention of runoff pollution through the Environmental Quality Incentives Program (EQIP). The USDA web site is www.ruraldev.usda.gov or call the local office in Hadley at 413-585-1000.

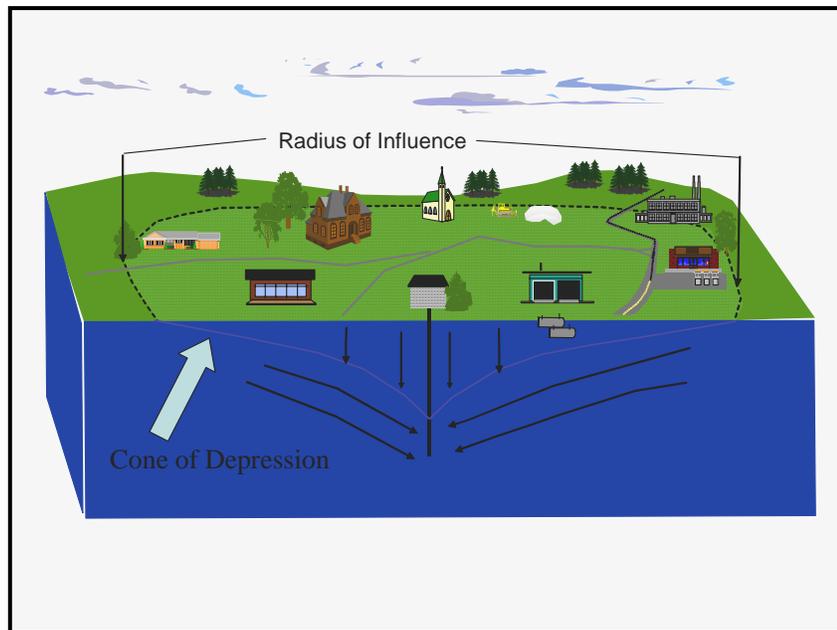
6. Review the fact sheet available on line and call the local office of the NRCS for assistance <http://www.nrcs.usda.gov/programs/farmland/2002/pdf/EQIPFct.pdf>.
7. Visit DEP's Nonpoint Source Pollution web site for additional information and assistance at <http://www.state.ma.us/dep/brp/wm/nonpoint.htm>.

Recommendations:

1. Regularly inspect Zone II's for illegal dumping and spills.
2. Continue working with local emergency response teams to ensure that any spills within the protection areas can be effectively contained.
3. Promote BMPs for stormwater management and pollution controls.
4. Partner with local businesses in the Zone II and the Zone III areas to ensure the proper storage, handling, and disposal of hazardous materials and to include the Water Department in their Emergency Response Plans.
5. Take steps to secure a Low Spray Plan for the transportation/utility corridor abutting the all of the Zone I's in Monson's Water Supply Protectio District.

Residential/Commercial Land Uses

Residential and commercial land uses are known to pose threats to drinking water resources. Sources of residential land use pollutants include household hazardous waste, septic systems, landscape care products, a home heating oil fuel storage. In Monson, septic systems, heating fuel storage tanks, and landscape care are the primary potential threats to the aquifer. The accompanying graphic depicts the cone of depression or the distance from which wells draw groundwater from the surrounding area. Land uses within the radius of influence can have direct impacts on the quality of well water supplies.

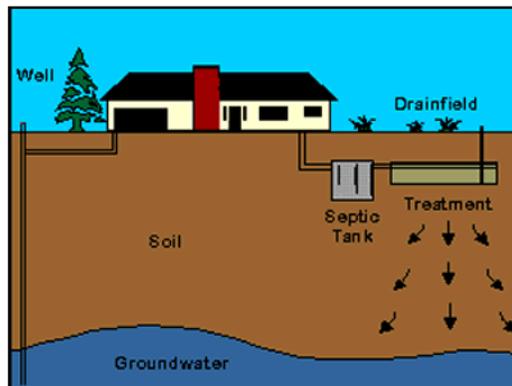


Radius of influence" means the radial distance from the center of a well bore to the point where there is no lowering of the water table or potentiometric surface (the edge of the well's cone of depression).

Residential Septic Systems

The Town of Monson's Bunyan Road Wellfield has several residential septic systems within the Zone II. The residential properties near the Palmer Road and Bethany Road Wells are served by the town sewer.

Septic tanks contaminate 1% of the nations usable aquifers. Septic tanks are enclosures that store and process wastes where no sewer system exists, such as in rural areas or on boats. Treatment of waste in septic tanks occurs by bacterial decomposition. The resulting material is called sludge. Large portions of the population are still served by septic systems as opposed to public waste treatment facilities. Contamination of water from septic tanks occurs under various conditions:



Septic System Model

Poor placement of septic leachfields can feed partially treated waste water into a drinking water source. Leachfields are part of the septic system for land based tanks and include an area where waste water percolates through soil as part of the treatment process.

Badly constructed percolation systems may allow water to escape without proper treatment.

System failure can result in clogging and overflow to land or surface water.

High density placement of tanks, as in suburban areas, can result in regions containing very high concentrations of waste water. This water may seep to the land surface, run-off into surface water or flow directly into the water table.

There are also site specific environmental factors around the tank and leachfield such as soil properties, water table location, subsurface geology, climate, and vegetation which may affect the quality and quantity of released waste water.

Recommendations:

- 1. Conduct outreach to owners with septic systems in Zone I and II of the wellhead area.**
- 2. Strongly encourage septic system maintenance for all residential septic systems in Zone I and II. Encourage residents to pursue group rates with their neighbors for septic pumping.**
- 3. Adopt regulations for the Water Supply Protection District that specifically prohibit septic system cleaners which contain toxic chemicals such as methylene chloride and 1-1-1 trichlorethan, and other hazardous wastes;**

Commercial Water Use

Commercial, Industrial and business establishments in the Town of Monson that have traditionally used large amounts of water have significantly reduced their water use in the last few years. The Water and Sewer Department implemented a Water Conservation Plan that raised rates to better reflect treatment, distribution and maintenance costs. Due to the implementation of the Water Conservation Plan Monson factories began to reuse water and installed their own water conservation practices to reduce costs.

Chemical Application of fertilizer to Residential Lawns (Chem Lawn)

The Town of Monson would like to conduct outreach to homeowners to reduce the amount of fertilizers and pesticides applied to lawns in the Water Supply Protection District.

Underground Storage Tanks (USTs)

A survey of residential and commercial establishments should also be conducted to determine if there is any unreported underground storage tanks (UST) within the Zone II recharge area. Removal of unauthorized UST's is an important part of protecting the groundwater from any future contamination plumes from aged and leaking tanks.

There are UST's along Palmer Road (Rt. 32) The UST's are located at several gas stations and a local oil distributor. MTBE was detected due to leaking tanks at the Getty Station on Rt. 32, though the amount detected was below the DEP threshold the Monson Water and Sewer Department took action to have the leak fixed. The gas station replaced the tanks and MTBE has not been detected for over three years. All of the businesses with UST's within the Zone II of Monson's Wellfields have been required to upgrade their tanks and install a leak detection alarm system.

The Quabog Country Club also has an underground gasoline tank. The Town of Monson will require a leak detector and will conduct annual inspections of the tank on the property.

Residential Fuel Tanks

Many residents in Monson use oil or gas to heat their homes. The tanks that hold household fuel in older homes may be old and subject to leakage. Fuel tanks should be inspected visually on an annual basis and properly seated on spill pads to prevent accidental spills or leaks from reaching groundwater through cracks or drains in the basement floor.

When Tighe & Bond completed the Zone II delineation for Monson's Barnes Street Wells in 2001, there were only two recent (1994-2000) documented residential 21E (hazardous waste) spills within the Zone II area for the wellfield. Since 2000, there have been four more residential oil spills near the wellfield. Two of the more recent spills are within the Zone II in the



Inspect and maintain home fuel tanks

residential neighborhood to the east of the wells. One spill is within the Zone III and a final spill is just outside of the Zone III, but within the same residential neighborhood. It is very important that the residents located near the Barnes Street Wellfield be alerted to the dangers and consequences of aging fuel tanks. An outreach program and survey to this area is especially recommended.

A full table documenting the Town of Monson's 21E sites can be found in Appendix B: Hazardous Waste Spills in the Town of Monson.

Recommendation:

- 1. Aging residential fuel tanks are a potential source of contamination within Monson's Zone II. An outreach program and survey aimed at residents within the Zone II recharge areas are a priority to determine the age and leak potential of the tanks. Prevention of future oil spills is paramount.**
- 2. Survey and remove any UST's within the Zone II recharge area.**
- 3. Monitor progress on any ongoing remedial action conducted for the known oil or contamination sites.**

Transportation Corridors

Roadways

There are numerous roadways within the Zone II recharge areas of Monson's Wells including the major north/south transportation route 32. Catch basins transport stormwater from roadways and adjacent properties to the ground, streams, rivers or reservoir. As flowing stormwater travels, it picks up de-icing materials, petroleum chemicals and other debris on roads and contaminants from streets and lawns. Common potential contaminants in stormwater originate from automotive leaks, automobile maintenance and car washing, or accidental spills. Clandestine dumping is identified as a significant threat to the water supplies and roadways; remote roadways in particular, are frequent sites for illegal dumping of hazardous or other potentially harmful wastes. Right-of-way maintenance can also be a source of contamination. Water suppliers should ensure that the utility managers are using accurate maps of source protection areas.

Over Salt Application to Roadways

A growing problem in Massachusetts is sodium contamination of drinking water supplies from the over application of road salt in the winter months. There is presently no maximum contaminant load for sodium for public drinking water sources, though there have been actions by communities to decommission wells near major transportation routes due to sodium concentrations.

Example of a Massachusetts Community Well affected by Road Salt.

The Massachusetts Highway Department (MassHighway) instituted a low-salt zone along portions of Route 9 in 1983 at the request of Pioneer Valley Planning Commission and the Town of Cummington due to the contamination of nearby wells from road salt. One of these zones is a one-mile section from the Dudley Manor Bridge in the east to the western entrance of Main Street. This section of road is posted with 'Low-Salt Zone' signs at each end. (Personal Interview, R. Longton, MHD, 8/13/03) The Cummington Section of Route 9 was one of the four model reduced road salt areas initially designated in the Pioneer Valley region. This program was so successful that it led to a statewide policy on reduced road salting in water supply areas.

The Monson Water Department has determined that the sodium levels are elevated for two of the wells along Route 32. The procedures for demonstrating that the wells have concentrations of sodium due to road salt are:

1. Test for sodium levels and demonstrate high peak times, (such as spring runoff).
2. Test quarterly and have a least 2 years worth of data.
3. Utilizing documented evidence that the sodium levels are elevated request that the MassHighway maintenance ensure low-salt application near public wells.
4. Apply for and erect Low-Salt Signs from MassHighway.

MassHighway Salt Application Procedures

Each year, the MassHighway Board of Commissioners votes to renew the low-salt zones throughout the Commonwealth. The application policies and salt to sand ratios vary between zones. Along most state Routes, such as Route 32, the application rate is based on a mixture of a commercial Premix and sand. Premix is a mixture of sodium chloride and calcium chloride at a 4:1 ratio. The sand and salt mixture spread is generally one part Premix to three or four parts sand, depending on weather conditions, at an application rate of 240 pounds per lane mile. One lane mile is 12 feet wide by one mile long.

The application rate of 240 pounds per lane mile is programmed into a computerized spreader on the plow trucks. The drivers have the ability to override the computer and increase the application if extreme weather conditions necessitate. Any one section of road can receive multiple applications throughout the life of a storm. MassHighway has recently begun pre-wetting with liquid calcium chloride to break up the ice bond with roads before making low-salt applications. This makes the low-salt treatment more effective reducing the need to override the computerized spreader and increase the salt ratio.

MassHighway acknowledges that low-salt applications are not always adhered to in low-salt zones due to staff turnovers and general oversight. If a Monson resident suspects that their well has been contaminated by road salt contact the Monson BOH for more information. MassHighway has a policy that if a homeowner has a medical condition that is exacerbated by sodium, and can prove that the high sodium content is the result of road salt, the agency will financially aid the homeowner with remediation. Possible actions may include water treatment or siting a new well away from the road.

Recommendation:

The Monson Water and Sewer Department, Board of Health and Board of Selectmen should submit a joint letter to MassHighway requesting compliance with the low-salt zone application rates and procedures along Route 32 in Monson's Water Supply Protection District.

Agriculture

Potential threats to the quality of water associated with agriculture include animal manure, pesticides, fertilizers, herbicides, and waste oil and fluids generated by farm equipment.

It is also recommended to the extent possible, that all new permanent manure pits and new animal feed lots shall be designed to restrict infiltration, run-off or other movement of animal wastes or manure to the any aquifer or surface water. Although grazing cattle do not



Farm at the Northern End of Monson's Zone II.

constitute a feed lot or manure pit, similar considerations should be given to the proximity of groundwater, surface water and the flow of runoff. In particular, private wells near large-scale farming activities may be especially vulnerable to contamination.

Encourage farmers and property managers to ensure that pesticides and fertilizers are being stored within a structure designed to prevent runoff. The USDA has various funding sources for government agencies, non-government organizations and agricultural facilities through programs such as those listed on the USDA web site:

<http://search.sc.egov.usda.gov/>.

One program in particular, the Environmental Quality Incentives Program (EQIP) may be utilized in a variety of projects from DPW stormwater management to farm nutrient management designed to protect surface and groundwater. Review the fact sheet available online and call the local office of the NRCS for assistance:

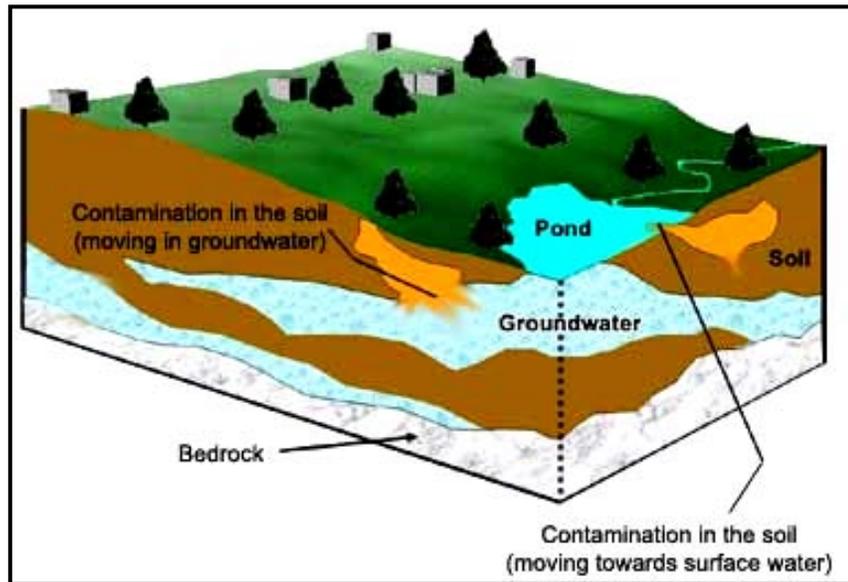
<http://www.nrcs.usda.gov/programs/farmland/2002/pdf/EQIPFct.pdf>.

Recommendations:

1. **Conduct outreach to area farmers to inform them of the relationship of their lands to the public and private drinking water supply and provide information about agricultural best management practices. Especially concentrating on manure, pesticide, herbicide, and fertilizer use and storage.**
2. **Enforce the Town's abandoned vehicle by-law. Remove vehicles from property.**
3. **Inform farmers about local waste oil and automotive fluid collection centers and services.**

Gravel/Sand Pit Operations

Gravel and sand pit operations pose particular contamination threats to unconfined aquifers such as Monson's Zone II recharge area. The dangers are where gravel deposits transect the water table, exposing the porous subsurface layers to heavy machinery and industrial equipment creates the opportunity for a spill that would pollute the groundwater in the area.



That gravel deposits are often critical recharge areas for aquifers and public drinking water supplies is a point that those responsible for approving extraction operations should be very mindful of. The contamination risks that these operations pose to public drinking water supplies are important factors when permitting these industries.

Operational pits have unavoidable local impacts such as the clearing of vegetation and increased susceptibility to erosion resulting from soil disturbance. The 'working face' of the pit (the exposed gravel to be mined) can be several feet tall, and its instability must be routinely countered with controlled slides. The sorting and washing that prepares the aggregate for use leads to the introduction of fine particulate matter (silt and clay sized granules) that can enter the watershed impacting water quality and stream habitat (Speigelman, 2000).

A minimum of excavation to within 8-10 feet of the high water table is recommended ensure that any hazardous spills that could occur have an adequate safety buffer of material to protect Monson's public drinking water supply.

This amount of unconsolidated material will also ensure that if the land is developed for residential or commercial use it will have an adequate amount of dry surface material to site a basement foundation or septic system that passes Massachusetts guidelines.

It is recommended that the zoning enforcement official for the Town of Monson visit Gravel/Sand Pit Operations in the Zone II recharge area to assess compliance with any special permit recommendations and determine if the pit operation is nearing completion after 5 years of excavation. Annual visits thereafter will ensure that the operation remain within the special permit limits.



Typical Massachusetts Gravel Pit Operation.

It is also recommended that future gravel operations granted by special permit be limited or prohibited entirely in the recharge area (Zone II) by strengthening the overlay district accordingly. If a prohibited use is not feasible then gravel/sand excavations should be limited to within 8-10 feet of the historical high groundwater in the Zone II.

Recommendations:

- 1. Conduct annual site visits to the gravel operations located within the Zone II and III of the recharge area - to assess Special Permit compliance.**
- 2. Revise the Zone II Ground Water Protection Bylaw to prohibit Gravel/ Sand Operations in Zone II recharge areas or revise to allow the removal of topsoil to no less than 8-10 feet from highest level of historical groundwater level.**
- 3. Prohibit future gravel operations in Zone II recharge area to reduce contamination threat to public drinking water supply.**

Potential Sources of Contamination/ Sanitary Survey

The following information is from Tighe&Bonds Conceptual Zone II Delineation for the Bethany, Palmer and Bunyan Road Wells. **Table 7: Potential Sources of Contamination** has been updated by the Monson Source Water Protection Committee. (Potential Sources of Contamination – PSCs)

The Zone II occupies an estimated four square mile area in Monson along Chicopee Brook. USGS mapping indicates that wetland areas are located within the Zone II. The area within the Zone II is used for residential, commercial and agricultural purposes. Public sanitary sewer service is available to properties within the northern half of the Zone II. The sewer line terminates in the vicinity of Wales Road and Maple Street. Developed properties to the south are connected to private septic systems.

To facilitate the field survey, data were collected in advance from numerous sources. Tighe&Bonds approach was to obtain existing information about land use activities that are likely to threaten groundwater wells and use that information in guiding the field survey. The existing information was used to prepare preliminary maps and listings of potential threats within the Zone II. During the field survey, changes were made on the preliminary copies, as required. The changes were entered into the appropriate GIS data layer and flagged as “new”, “deleted”, “moved” or “changed”. Other notations were made in the data layer, such as the use of global positioning system to capture the new or moved point location.

Requests for data were made to several organizations and available data were returned. The data were collected from the following sources: 1) Massachusetts DEP, 2) EPA Region I, 3) Massachusetts Executive Office of Environmental Affairs MassGIS data files and 4) privately developed business data from Claritas, Inc.

Based on information data obtained from electronic databases, Monson Water and Sewer Department personnel and a field survey conducted on May 12, 2000, an original total of 44 PCS locations were identified within the Zone II. This list has been updated by the Monson Source Water Protection Committee. A list of PCSs and the related DEP Risk Categories are provided in **Table 7: Potential Sources of Contamination (updated by the Monson Source Water Protection Committee 2006)** and the PCS locations are depicted on **Map 7: Potential Sources of Contamination**. The PCSs were ranked in accordance with the updated DEP land use risk category listing.

The gasoline additive methyl tertiary-butyl ether (MTBE) has been detected in water samples collected from the Bethany Road Well and Palmer Road Well. The windshield survey identified three gasoline service stations that are located upstream relative to the production wells. DEP records indicate that gasoline releases have occurred at a Getty Service Station located approximately 1,250 feet from the Bethany Road Well and Palmer Road Well. The most recent release was reported to DEP in July 1999. According to MWSD personnel, gasoline-contaminated soils were excavated from the property in December 1999 and a remediation system has been installed at the property to treat contaminated groundwater. See **Appendix B: Hazardous Waste Spills Town of Monson 1987- 2005** for a complete and updated list.

Table 7: Potential Sources of Contamination for Bethany, Palmer and Bunyan Road Wells – Monson, MA (Updated by Monson Source Water Protection Committee 2006)

Site Number ¹	Name	Description	DEP Risk Category ²
1	Sunco	Gas stations, USTs	H
2	CNC Specialists	Machine shop/metal working/assembly	H
3	Irla's Auto Repair	Service stations/ auto repair shop	H
4	Massachusetts Electric Company	UST ID #7361, utility substation transformers, RCRA ID MAD980731756 Removed UST Oct. 2005	H
5	Soft Touch – Auto Clinic, Car Wash and Lube Center	Service stations/auto repair, car wash	H
6	Monson Small Animal Clinic	Medical facilities	M
7	Lamcotec	Industry	H
8	Diversified Metals, Inc.	Machine shop/metal working	H
9	R. J. Levesque Trucking Co.	Industry/ aboveground fuel tank/heavy machinery	H
10	Tassinari	Industry	H
11	Ace Molding Co., Inc.	Industry, molded plastics	H
12	Double A Plastics	Industry, molded plastics	H
13	Bethany Cemetery	Cemeteries	M
14	O'Sheas Farm (no longer in existence)	Agricultural-related activities	M
15	Wing Medical Center	Medical facilities	M
16	APW	Industry/metal fabrication	H
17	C.R Lavec	Industry/Trucking Co. Has floor separator for oil.	H
18	APW	Industry/metal fabrication	H
19	Former Wesson Arms (and former South Main Street School) Town-owned brown field site – to be cleaned up by grant funding.	Former industry	NA
20	Laidlaw School Bus Depot no longer at this site. The garage is still in use by a construction company.	Bus and truck terminals, oil release with RTN 1-11017	H
21	Sand/Gravel Quarry	Sand and gravel mining/washing, UST, aboveground fuel tank	H
22	Sand/Gravel Quarry	Sand and gravel mining/washing/ not currently an active mining site	M
23	Former Mill #1	Former industry, has been cleaned up.	NA
24	Sand/Gravel Quarry	Sand and gravel mining/washing	M
25	Cemetery	Cemeteries	M
Site Number ¹	Name	Description	DEP Risk Category ²
26	Former Omega Metal Processing, Inc.	Former industry - the inside of the tanks have been cleaned, still	NA

		need to clean out the outside tanks.	
27	Dentist office (Dr. Piecuch)	Medical facilities	M
28	Scrubboard Laundromat (facility is no longer at this site)	Laundromat	L
29	Mobile Service Station	Gas stations, USTs	H
30	Monson Town Highway Garage	Gasoline and diesel fuel USTs The facility has installed all new tanks.	H
31	Town Laundromat	Laundromat	L
32	Cemetery	Cemeteries	M
33	Cemetery	Cemeteries	M
34	Hillside School	Schools, UST	H
35	Monson Junior-Senior High School	Schools, UST	H
36	Sand/Gravel Quarry (no longer in operation at this site)	Sand and gravel mining/washing	M
37	H. M. Murry (trucking)	Junk and salvage yards	H
38	Getty Service Station	Gas stations, USTs, oil release with RTN 1-13024 Compliance date 01-Apr-02	H
39	Squier Oil	Fuel oil distributors	H
40	Robbins Trucking Co.	Bus and truck terminals	H
41	Valhalla Country Club and Golf Course	Golf course, UST just recently installed	H
42	Montac Plastics	Industry, polymer injection molding	H
43	Lombard Funeral Home	Funeral homes	L
44	Walker Machine Co.	Machine shop/metal working	H

1 = Location depicted on Map 7: Potential Sources of Contamination – Monson, MA

2 = High (H), medium (M) or low (L) threat to groundwater.

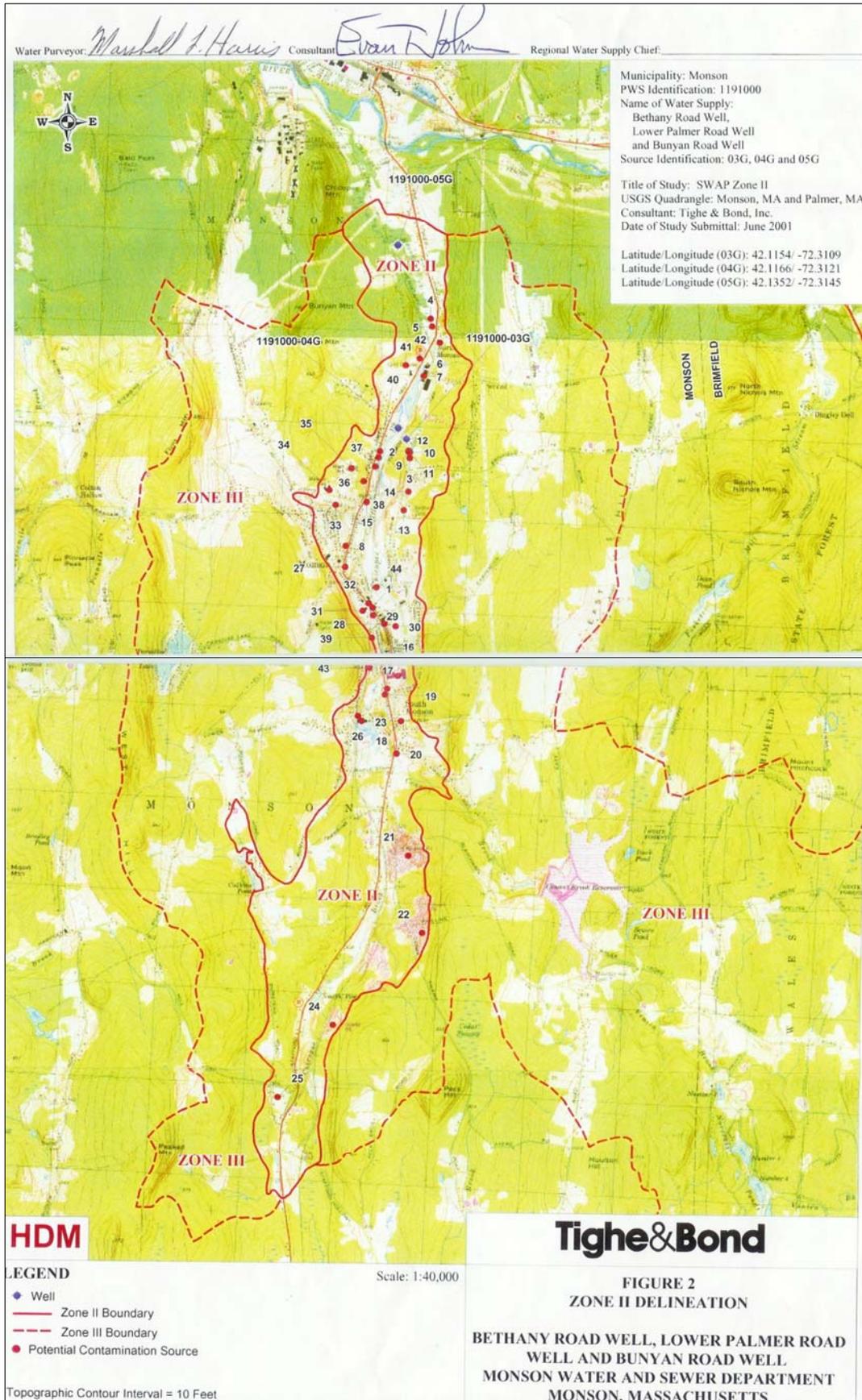
NA = Not assigned a risk category, although the sites are included in the table based on former industrial activities.

RCRA = Resource Conservation Recovery Act (IDs for hazardous waste generators)

RTN = Release Tracking Number

UST = Underground Storage Tank

Map 7: Potential Sources of Contamination – Monson, MA



Protection and Management of the Wellhead Protection Area

Regulatory Strategies

Water Supply Protection District

Monson has adopted a Water Supply Protection District (WSPD) Bylaw for the Zone II recharge area. The complete bylaw can be found in Appendix A: Monson's Bylaws.

Floor Drain Regulation

The Town of Monson has adopted a Floor Drain Regulation Bylaw. The complete bylaw can be found in Appendix A: Monson's Bylaws.

Non-Regulatory Strategies

Septic System Inspection and Outreach Program

Improperly functioning or failing septic systems can contribute viruses, bacteria, nitrates, and chemical compounds to groundwater. Proper maintenance will prevent costly problems in the future and prevent contamination of nearby drinking water supplies as well as other water resources such as rivers, ponds, and wetlands.

Some communities have implemented Septic System Inspection and Outreach Programs through their Water Department or Board of Health to reduce the threat an improperly functioning septic system poses to groundwater. Such a program involves voluntary participation by the landowner. To encourage participation, it is important to establish at the outset that the goal of the program is not to penalize or fine property owners, but to work cooperatively to ensure the protection of our water supply.

Recommendations:

- 1. Enlist voluntary homeowner participation in septic system inspection program.**
- 2. Assist homeowners in getting financial assistance for failing septic systems.**
- 3. Conduct public education and outreach about septic system care and maintenance.**
- 4. Encourage residents to pursue group rates for pumping or enlist the Board of Health in creating group rate structures with local technicians.**

How to Establish a Septic System Inspection and Outreach Program:

1. Inspect Septic Systems Regularly

The Water Department, or Board of Health, generates a list of all properties and landowners within the WSPD that have septic systems. Landowners are contacted by mail or telephone to request their voluntary participation in a quarterly (or some other regular interval) inspection program. Upon the first inspection, the inspector meets with the property owner to map the location of the septic system for future inspections.

A visual inspection for odor, seepage or lush green growth is performed. If any of the symptoms of an improperly functioning septic system are present, the inspector recommends that the homeowner consult a licensed wastewater disposal engineer for a more in depth evaluation of the problem.

Because the program is purely voluntary, some property owners may opt not to participate fearing financial repercussions. The town should contact local septic system pumping contractors to request that they notify the Board of Health if any of the above described symptoms are observed so that the town can get involved.

2. Town Assists in Procuring Financial Assistance for Homeowner Septic System Repair

The town provides assistance to property owners in contacting appropriate sources of financial assistance for septic system repair. The Commonwealth of Massachusetts has developed programs to assist homeowners with wastewater management problems.

The following financial assistance information was provided by the Department of Environmental Protection's Bureau of Resource Protection.

A. Massachusetts Housing Finance Agency (MHFA) Homeowner Septic Repair Program

Homeowners of low and moderate income are eligible. Approval is dependent on good credit and stable income. While income guidelines are geographically indexed, households of one or two with annual income of up to \$46,000 and households of three or more with annual income of up to \$57,000 generally are eligible. Homeowner Septic Repair Loans are available to eligible homeowners as low interest rates of 0%, 3%, and 5%, depending on income, for loans ranging in size from \$1,000 to a maximum of \$25,000.

More information about this financial assistance can be obtained from MFHA at One Beacon Street, Boston, MA 02108, (617) 854-1020.

B. Tax Credit

The Septic Tax Credit is a credit equal to 40% of the actual costs incurred in the repair or replacement of a failed septic system. The expenses are the lesser of the taxpayer’s actual costs paid to repair or replace the system, or \$15,000. The maximum credit amount that can be claimed in any tax year is \$1,500. Any excess credit amount may be used in the five tax years following the year in which the credit was initially claimed. The total amount of credit that may be claimed by the owner for a residential property is \$6,000. Schedule SC (Septic Credit) Forms are available from the Department of Revenue. This information is based on 2001 Department of Revenue Septic Credit Program.

3. Conduct Public Education and Outreach

Some objectives of the outreach are to inform septic system owners of how a septic system works, how to care for it, what not to put in it, and the connection between septic systems and groundwater. If these objectives are achieved, the Town’s drinking water supply is much less likely to be contaminated by wastewater.

Public education and outreach about septic systems should be conducted at regular intervals throughout the year. Once the list of all septic system owners within the Zone II and IWPA’s is generated, a mailing containing information about the Town’s voluntary septic system program and an educational flier published by the National Small Flows Clearinghouse (NSFC) entitled *Groundwater Protection and Your Septic System* can be sent to homeowners.

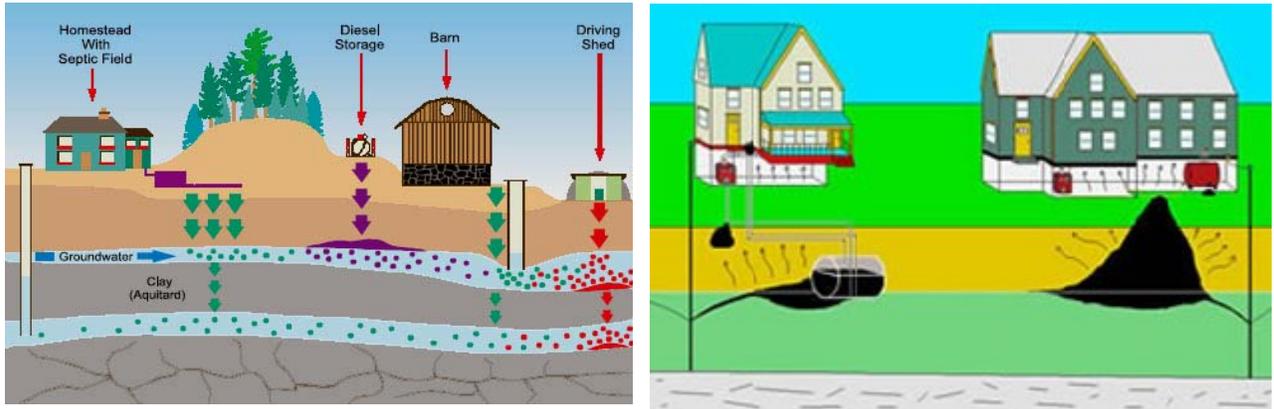
This information should also be made available at public buildings and storefronts around town. Periodically change the literature available in public locations and/or insert new fliers with the water bills. The NSFC also produces a video called *Your Septic System: A Reference Guide for Homeowners* that can be shown on local cable access television. The video can also be made available at the public library. Literature should also be provided to homeowners during inspections.

Table 6: Septic System Outreach Materials

Source	Materials
National Small Flows Clearinghouse West Virginia University P.O.Box 6064 Morgantown, WV 26506-6064 (800) 624-8301 (304) 293-4191 www.nsfrc.wvu.edu	Groundwater Protection and Your Septic System Item #WWBRPE21 pamphlets The Care and Feeding of Your Septic System Item #WWBRPE18 pamphlets Your Septic System: A Reference Guide to Homeowners Pamphlet and Video

Hazardous Materials and Floor Drain Inspection Program

Some businesses and municipal operations that use hazardous materials, produce hazardous waste products, and/or store large quantities of hazardous materials. It is also very likely that many homeowners fall within one of these categories as well. Home heating oil is a classified hazardous waste. Floor drains can act as a direct conduit to the aquifer for hazardous waste that is improperly stored or disposed of. Abandoned wells, often left boarded over but not sealed, can also act as a conduit to the aquifer.



Common contamination sources of public and private water supplies.

Automotive Waste Oil

The proper disposal of automotive waste oil generated by homeowners and small businesses within the WSPD and for private wells is very important. Used motor oil should always be recycled - never thrown in the trash, dumped on the ground, or poured into the sewer or down the drain. Used oil contains heavy metals, which can contaminate water supplies and harm the environment. It doesn't take much to do a lot of damage. One gallon of used oil can pollute one million gallons of drinking water. One pint can produce an oil slick the size of a football field.



Under Massachusetts law, automotive stores must accept containers of used motor oil that they sell to individual customers if accompanied by a receipt. Sears Automotive, some Mobil and Exxon stations, and Valvoline Instant Oil Change will accept used oil without a receipt. The DEP Used Oil Hotline can provide the location of the nearest drop off location at (617) 556-1022 or visit the car oil recycling website at www.recycleoil.org. The Mobile and Sunoco full service stations in downtown Monson accept used motor oil.

Recommendation:

- 1. Inform public about appropriate methods and locations for disposal of automotive waste oil with the use of a flier and displays around town.**
- 2. Educate residents and business owners about potential contamination issues associated with floor drains.**

Sample Homeowner Survey

As part of the Town of Monson's ongoing efforts to protect our public and private water supply and ensure safe, clean drinking water for our community, we are conducting a survey about common structures that you may or may not have on your property. This information will help us better understand what direction our water supply protection and planning efforts should take. If you have questions please call the Board of Health at (413)-238-5578. Please return in the enclosed self-addressed and stamped envelope by June 1, 2005.

1.) Do you use oil to heat your home? Yes ___ No ___
If you answered yes, please include the following information about your heating oil storage tank: age or date installed _____ size of tank _____
model or manufacturer _____ material made of _____
location _____
condition new ___ good ___ fair ___ poor ___
Would you be interested in financial assistance to replace or update your tank?
Yes ___ No ___

2.) Do you have any wells on your property that are no longer in use? Yes ___ No ___
Have they been sealed or capped? Yes ___ No ___
With what materials?

3.) Do you have floor drains in your basement, garage, barn, or other building on your property?
Yes ___ No ___
If yes, please explain the location, design of the drain, and to where the drain empties.

Once the survey is complete, the Town should have a better understanding of whether home heating oil storage, floor drains, and abandoned wells pose a tangible threat to any of Monson's aquifers. Based on the results, the Town will seek an appropriate course of action to reduce or eliminate the threat to the aquifer. Possible actions include, capping abandoned wells, replacing deteriorating heating oil storage tanks, and sealing illegal floor drains.

Recommendations:

- 1. Survey landowners about home heating oil storage, abandoned wells, and residential floor drains.**
- 2. Based on results of survey, contact landowners about removing threats to the aquifer.**

Emergency Response/ Contingency Planning

Current Plans

The Monson Water and Sewer Department has an Emergency Spill Response Plan. The Emergency Response Plan, required by the MA DEP prepares the Town of Monson for immediate action in the case of a hazardous spill that could potentially contaminate or harm the public drinking water supply. Immediate response and concerted efforts to contain the spill by the Monson Water, Fire and Police Departments, and the Department of Environmental Protections Spill Response Team, is the objective of the Emergency Spill Response Plan.

Alternative Supply/ Contingency Planning Evaluation

In the event of a water supply emergency, alternative supplies need to be established in order to provide the community with adequate water. The alternative supply sources that were evaluated include emergency interconnections, bottled water and civil defense water provisions.

Potential emergencies include mechanical failure of the distribution system or contamination at the water supply source. The Town has 1.0 million gallon water storage tank, which in the case of an emergency could supply customers for approximately 3 days under current delivery conditions. In the event of an emergency the Water Department will use media contacts to notify the public that water conservation is a priority and notify the water users that the Water Restriction Bylaw is in full effect.

The Monson Water Department has an agreement and interconnection with the Town of Palmer, a neighboring water system, to supply water in the case of an emergency. However, if the emergency were extended, additional measures would be required to meet system demands. These measures include either purchasing bottled water and distributing to consumers accordingly or contacting the civil defense for the utilization of water wagons. Poland Springs, a local water supplier will be contacted for additional resources if needed.

The Emergency Management Director, Craig Jalbert, would also contact the Massachusetts Emergency Management Authority (MEMA) if necessary. MEMA can notify the National Guard or give names of other bulk water suppliers. The National Guard has potable water bladder units that could be transported to the site.

Drought and Emergency Procedures/Planning

The Town of Monson has a Water Use Restriction Bylaw (implemented May 14, 2001). See **Appendix A: Monson's Bylaws**

Emergency Chlorine Feed Systems

Monson has the capability to implement an emergency chlorine feed system at the Bunyan Road and Palmer Road wells.

Land Protection Strategies

Residential and commercial developments, with all of its associated land uses, are the biggest threats to a drinking water supply. Their contamination is slow and insidious, often overlooked until a crisis is thrust upon the community, usually requiring a lot of money that no one has to fix. As is expressed in Monson's Master Plan (2004), residents of Monson value the areas of their town that are rural. Rural landscape provides many benefits including wildlife habitat, aquifer recharge, farmland, and aesthetic beauty. It is critically important that town officials discuss alternatives to development with landowners to preserve open space in Monson. **Table 8: Strategies for Protection Open Space** provides a list of programs used to protect open space and how they operate.

Land Protection Tools

The Constitution of the Commonwealth of Massachusetts, Article 97:

The people shall have the right to clean air and water, freedom from excessive and unnecessary noise, and the natural, scenic, historic, and esthetic qualities of their environment;

In Monson only 14% of the town's land is permanently protected. Approximately 66% of the land could still be developed. If we work towards preserving important land areas now we will be able to ensure that we have protected the rural character of our town for our children and our grandchildren. It is this rural character and hometown atmosphere that brought most of us to Monson in the first place. Some of the programs or tools that property owners can use to preserve the scenic beauty, natural resources, natural areas, the value of timber products, and agricultural lands, as well as protect wildlife are listed below.

A. Outright Acquisition

Outright acquisition provides the highest amount of protection for a piece of property. In addition, the group that purchases the property is able to control how it is used or managed. However, outright acquisition is usually the most expensive technique, as well. Funding mechanisms for outright acquisition include:

1. Town funding from a one-time appropriation, an annual contribution to a land protection fund, or the Community Preservation Act (see below).
2. Grant funding: for example, the Town recently used the state's Self-Help program administered through the Division of Conservation Services to help purchase two open space parcels.
3. Private conservation organization such as the Trustees of Reservations, the Opacum Land Trust, or the Norcross Foundation.
4. Donations or "bargain sales" from landowners seeking to conserve their land or gain income tax benefits.

B. Restrictions and Easements

Restrictions and easements limit the future use of land by restricting or prohibiting development. However, the land continues to be owned and operated by a private owner. If the restriction on development is in perpetuity, this mechanism provides as much protection for land as outright acquisition. In addition, it can cost less than outright acquisition and offers more flexibility to meet the needs of the landowner. For example, a restriction could be negotiated that allows a landowner to continue to farm or log the land, live on the land, or even build another house on the property.

Funding can come from the same mechanisms as for outright acquisition. In addition, grant funding is available from various state programs including the Agricultural Preservation Restriction program, which purchases easements from farmers to restrict future development (see below).

C. Temporary Protections

The state's Chapter 61, 61A, and 61B programs offer tax incentives for landowners to keep their property in active forestry, agricultural, and recreation use, respectively. However, these programs offer no long-term protection for land. See Section 4.1.2 for additional discussion of these programs.

D. Other Tools

Other land conservation tools take advantage of the economics of land development to protect open space as part of new development projects (usually residential). As long as the open space is protected with a suitable conservation restriction, this form of open space protection is as good as outright acquisition. These tools include:

1. **Open Space Communities:** See Section 8.3.3 for recommendations on improving Monson's Open Space Communities Bylaw so that developers will be more inclined to use it.
2. **Other Zoning Tools:** Estate Lot provisions (Section 8.3.5), and a Density of Development Bylaw (Section 8.3.3) are other zoning policies to increase the amount of open space in new developments, even if the overall development density remains the same.
3. **Limited Development:** In a limited development project, a conservation group (usually a nonprofit but sometimes a government body) first purchases a piece of land they would like to conserve as open space. Then, a portion of the site that is least important for conservation purposes is carved off and sold as high-end real estate such as a "country estate." The proceeds from this sale, which can sometimes equal 50% of the purchase price or more, are used to repay money borrowed for the land purchase or used to fund future conservation efforts.

CHAPTER 61 "Chapter Lands"

This is a tax relief program that is designed to give favorable treatment to land owners that are willing to manage their land for:

- Timber products: Chapter 61, lands taxed at only 5% of fair market value.
- Agriculture or Horticulture: Chapter 61A, for working or family farms. Tax rate determined by the Farmland Valuation Advisory Committee.
- Natural Resources and Recreation: Chapter 61B, lands taxed at 25% of fair market value.

There is a minimum acreage requirement for each program. Land must be registered each year at the Assessors office and you must agree to leave the land in the program for a certain number of years.

There are financial penalties for sudden withdrawal from the program, but no penalties for allowing this tax status to expire. Chapter lands are not permanently protected.

Current approximate acreage in Monson:

Ch. 61 – Forest lands 2218.725

Ch. 61A – Agriculture 2809.869

Ch 61B – Recreation 1308.413

Total 6337.007 22% of the town

AGRICULTURAL PRESERVATION RESTRICTION (APR)

This is a state funded program used to protect the states prime and important agricultural lands.

It provides permanent protection to working farms and orchards. It is a voluntary program, but the application process is slow and requires a patient land owner. The state pays the difference between the fair market value and the agricultural value of the land. The landowner agrees to a permanent deed restriction that protects the land from uses that would have a negative impact on it's use for agricultural purposes.

There are 4 properties in Monson currently enrolled in the APR program.

LAND PRESERVATION AGREEMENT

Also known as a Conservation Easement (CE, CR)

Although a little complex, **this is a powerful tool for all land owners** who wish to permanently protect all or part of their property. The terms of the agreement are determined by the landowner.

- It is a voluntary agreement in which a landowner limits uses (e.g. development) while retaining private ownership.
- Landowners use land preservation agreements to protect a property's natural and scenic features.
- Significant federal income and estate tax benefits as well as local real estate tax benefits can result from granting a land preservation agreement.
- A qualified appraisal must be done on the land to determine the amount of the deduction and the value of the agreement.
- Land owners can sell or give away the property after the agreement has been placed on the land.
- All future owners are bound by the terms of the agreement.
- Every agreement is unique, tailored to a particular land owner's goals and land.
- Land preservation agreements can be donated or sold to a non-profit entity such as a local land trust, conservation commission, or a federally recognized charity under IRS Code Section 501(c)(3).
- The recipient who accepts the agreement is legally bound by to enforce the terms of the restriction in perpetuity. In order for the owner to qualify for a tax deduction, the agreement must be perpetual.
- The public does not automatically have access to property protected by a land preservation agreement.
- The agreement holder monitors the property, generally once a year, to assure that the terms are being upheld. Some agreement holders may request an endowment be made to ensure long-term monitoring and enforcement of the restriction.

- To accomplish the donation or sale of a land preservation agreement, the landowner needs to work closely with the organization or government entity that will hold the agreement. That may include:
 - Consulting with legal and tax counsel
 - Tour of the property to evaluate and discuss the easement
 - Approval from the holder's Board of Directors
 - Preparing baseline documentation of the property for monitoring purposes
 - Title search
 - Obtaining a mortgage subordination from the lender if there is an existing lien
 - Negotiating the agreement and drafting the document
 - Obtaining a qualified appraisal
 - Signing and recording the final restriction and legal documents

Community Preservation Act

Community Preservation Act (M.G.L. Ch. 44B) provides Massachusetts cities and towns with a mechanism to protect open space, preserve historic buildings and sites, and create affordable housing. Towns may establish by local referendum a property tax surcharge of up to 3% to help fund these activities. Funds raised locally through the Community Preservation Act (CPA) will be supplemented by state matching funds. At least 10% of CPA funds must be spent on each of the following three activities: open space protection, historic preservation and affordable housing. The remaining 70% may be used for any one or more of these three purposes in accordance with the community's priorities.

Monson should consider adopting the CPA to provide a steady source of income for open space protection, historic preservation and affordable housing activities. There are two methods available to Monson to adopt the CPA. First, Town Meeting can vote to place the question of adopting the CPA before the voters as a referendum. Second, if Town Meeting does not adopt the CPA language at least 90 days before a regular town election or 120 days before a state election, then a petition signed by 5% of the registered voters in Monson can be filed to place the question on the ballot. The CPA will be adopted if the referendum passes by a majority vote. If Monson adopts the CPA, the Town may choose to exempt \$100,000 of value for each taxable parcel and/or the full value of residential property owned by low income persons or low and moderate income senior citizens. In addition, the CPA does not affect any other real estate tax exemptions or abatements authorized under M.G.L. Ch. 59 or any other state law.

Upon adoption of the CPA, a community must appoint a Community Preservation Committee consisting of between five and nine members, including one member from each of the following: Conservation Commission, Historic Commission, Planning Board, Board of Park Commissioners, and Housing Authority.

The Committee makes recommendations to Town Meeting for the use of money in the local Community Preservation Fund. In addition, communities may issue bonds in anticipation of Community Preservation Fund receipts. These funds may be used for:

- **Open Space:** Community Preservation funds may be used to purchase land, easements or restrictions to protect existing and future water supply areas, agricultural and forest land, coastal lands, frontage to inland water bodies, wildlife habitat, nature preserves, and scenic vistas. If the community is only spending 10% of its funds on open space, the open space cannot be purchased for recreational use.
- **Recreation:** Land can also be purchased for active and passive recreational uses including land for community gardens, trails, non-commercial youth and adult sports, and parks, playgrounds or athletic fields.
- **Historic Preservation:** Funds may be used to purchase, restore and rehabilitate historic structures and landscapes that have been determined by the local Historical Commission to be significant in the history, archeology, architecture or culture of a city or town, or that are listed or eligible for listing on the State Register of Historic Places.
- **Affordable Housing:** Funds may be used to create and preserve housing for low and moderate income individuals and families, including low and moderate income senior housing. The Act requires the Committee to recommend, wherever possible, the adaptive reuse of existing buildings or construction of new buildings on previously developed sites.

Recommendations:

1. **Conduct outreach to landowners about options for protecting open space within the Zone II.**
2. **Town may take proactive steps to acquire land through the adoption of the Community Preservation Act.**
3. **Acquire available funds for land purchase through the Commonwealth Capital funding process.**

Table 8: Strategies for Protecting Open Space

	CHAPTER 61	CHAPTER 61A	CHAPTER 61B
<i>PURPOSE</i>	Tax incentive for long-term management of woodland for wood production.	Tax incentive for active agricultural or horticultural uses.	Tax incentive for land in natural, wild, open or landscaped use; or an approved recreational use.
<i>ELIGIBILITY</i>	Minimum of 10 contiguous acres. A continuous commitment to improving the ‘quality and quantity’ of timber crops on woodlands. Forest management plan approved by state forester.	Minimum of 5 acres “actively devoted” to agricultural and/or horticultural uses at least 2 years prior to classification. Minimum annual gross sales of \$500. Additional contiguous land may also qualify.	Minimum of 5 acres in open space or recreational uses.
<i>TAX ASSESSMENT</i>	Assessed at 5% fair market value, at commercial rate, plus 8% stumpage value of products harvested in prior year.	Assessed at agricultural/horticultural “use” value, at commercial rate. Values assigned by Board of Assessors and may change annually.	Assessed at maximum value of 25% fair market value, at commercial rate.
<i>HOW TO ENROLL</i>	Application package filed with State Forester by June 30. Approved application package submitted to Board of Assessors by August 31. Application good for 10 years.	Annual application filed with Board of Assessors by October 1.	
<i>ENROLLMENT PERIOD</i>	Enrolled until withdrawn from classification and withdrawal penalty paid. Forest management plan updated every 10 years.	Enrolled until sold for or converted to another use, and either conveyance tax or roll-back tax paid. Annual filing with Board of Assessors. Forest management plan updated every 10 years on acres classified as “productive woodlands”.	Enrolled until sold for or converted to another use, and either conveyance tax or roll-back tax paid. Annual filing with Board of Assessors.
<i>WITHDRAWAL OR CHANGE OF USE PENALTY</i>	Penalty payment depends on number of years in the program, and is difference between taxes paid under Chapter 61 and what would have been paid if not classified, plus interest. Annual forest products tax credit may or may not be applied to withdrawal penalty,	Conveyance or roll-back tax imposed, but not both. Conveyance tax rate applied when land sold for a non-qualifying use, decreasing from 10% to 1% over first 10 years of ownership. Roll-back tax is difference between taxes paid under Chapter 61A and what would have been paid if not classified, with no interest. Roll-back tax imposed for 5 prior years.	Conveyance or roll-back tax imposed, but not both. Conveyance tax rate applied when land sold for a non-qualifying use, and is 10% for first five years of ownership and 5% for second 5 years. Roll-back tax is difference between taxes paid under Chapter 61B and what would have been paid if not classified, plus interest. Roll-back tax imposed for 10 prior years.
<i>TOWN'S RIGHT OF FIRST REFUSAL</i>	Town has first right of refusal when land sold or converted to residential, commercial, or industrial use. Option lasts for 120 days unless waived. Exception allowed for residential use by family member.		

	CONSERVATION EASEMENT	AGRICULTURAL PRESERVATION RESTRICTION	ESTATE PLANNING
<i>PURPOSE</i>	To limit the use of land in order to protect specified conservation values including the natural, scenic, or open condition of the land.	To permanently protect farmland by paying landowners the difference between “fair market value” and the “agricultural value” of their land in exchange for a permanent deed restriction which precludes any use of the land that will have a negative impact on its agricultural viability.	To protect your land in a way that makes good financial sense for you and your family.
<i>ELIGIBILITY</i>	Conservation Restriction must demonstrate public benefit	Farm must be at least five acres in size; devoted to agriculture for the two immediately preceding tax years; at least \$500 gross sales per year; soil suitability for agriculture; degree of threat to the continuation of agriculture; potential economic viability of agriculture at that site; and, proximity to other APR lands.	Decisions to protect land require careful consideration of the special features of your property, your land conservation goals, your financial situation, and your family’s needs and wishes.
<i>TAX ASSESSMENT</i>	Tax assessment varies by town and by the type of restriction. Call the Town Assessor for details on tax abatement.	The land is eligible for farmland tax assessment under Chapter 61A, and under the APR program, it will continue to be eligible as long as it is “actively devoted” to agriculture. The landowner should apply to the local assessor each year prior to October 1 and the tax will be based on the current farm use. Dwellings and their lots and farm buildings will continue to be taxed as other real estate.	Federal estate taxes can be as high as 55% of a property’s fair market value. The following options provide tax relief: outright land donation, donation of undivided partial interests, donation of land by will, donation of remainder interest in land with reserved life estate, bargain sale of land to a land trust or conservation agency, lease, and mutual covenant. Conservation restrictions are also appropriate estate planning tools.
<i>HOW TO ENROLL</i>	Conservation restrictions must be submitted according to the written procedures of and approved by the Secretary of Environmental Affairs.	Once a completed application is received by the Dept. of Food and Agriculture, it is reviewed and a field inspection is completed within 1 to 2 months. Applications reviewed on a rolling basis. Priorities are established based upon above eligibility requirements. Timing of acquisition depends on availability of funds.	Because land conservation is a technical area of the law and because your decisions can have significant consequences, it is important to seek out advisors who are experienced in this field. Consult one of the listed resources below, a local land trust, tax accountant, or lawyer with appropriate experience.
<i>ENROLLMENT PERIOD</i>	Allowed for a period of years written into the restriction or in perpetuity. Less than perpetual restrictions will be approved only where demonstrated critical public interest exists.	In perpetuity	N/A

	CONSERVATION RESTRICTION	AGRICULTURAL PRESERVATION RESTRICTION	ESTATE PLANNING
<i>WITHDRAWAL OR CHANGE OF USE PENALTY</i>	Withdrawal or change of use is very difficult. Conservation Restrictions should only be considered if they are to be in perpetuity or for a designated term written into the easement. There can be serious tax penalties for withdrawal from a conservation restriction.	Releasing an APR is very difficult and requires three steps: the Commissioner of the Dept. of Food and Agriculture must determine the land is no longer fit for agriculture, a 2/3 vote of the state legislature must approve the release (MGL Article 97), and landowner must reimburse the State for the value of the APR at today's value. A change in use other than stated in the APR also requires a 2/3 vote of the state legislature.	N/A
<i>TOWN'S RIGHT OF FIRST REFUSAL</i>	N/A	N/A	N/A
<i>FOR MORE INFORMATION</i>	MA Executive Office of Environmental Affairs Division of Conservation Services 617-626-1012	MA Dept. of Food and Agriculture 617-626-1700	Valley Land Fund 413-585-8513; Preserving Family Lands by Stephen J. Small available from Landowner Planning Center, PO Box 4508, Boston, MA 02101-4508

Public Education and Outreach

Public education and outreach are some of the most important actions a community can take to protect their water supply. Much of the information presented throughout this report is not simply known by all homeowners. This information needs to be passed on to the public so that they can engage in best management practices for protecting Monson’s public and private water supplies. The sources of potential contamination to Monson’s drinking water supplies, as well as public education and outreach recommendations, were presented at a Source Protection Workshop on November 30, 2005.



Craig Jalbert speaking to Monson school children about Monson’s Public Drinking Water Supply.

The Monson Water and Sewer Department, in conjunction with Rebekah McDermott of the Mass Rural Water Association, also conducted an educational outreach program with grades 4 through 7 in the Monson School System during the month of November 2005.

Please also note the **Resources** section included at the back of the Monson Source Water Protection Plan for addition education resources.

Table 8: Internet Reference Sites for Educational Material

State of Massachusetts Community Recycling Information-Earth 911	http://massachusetts.earth911.org
Household Hazardous Waste Links Massachusetts	www.state.ma.us/dep/recycle/hazards/hhwhome.htm
EPA Recycling and Waste Homepage	http://www.epa.gov/epaoswer/osw/
Hazardous Waste Publications	http://www.epa.gov/epaoswer/non-hw/muncpl/hhwpubs.htm
Car Oil Recycling	www.recycleoil.org
Disposal and Management of Leftover Paint	http://www.paint.org/con_info/leftover.cfm
Non-Toxic Cleaning in the Home	http://www.ns-products.com/nontox.htm
Recycling Grass Clippings and Composting	http://www.state.ma.us/dep/consumer

References

Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Drinking Water Program. May 10,2002. *Source Water Assessment and Protection (SWAP) Report for Monson Water Department.*

Massachusetts Department of Environmental Protection, December 1997, *Making Wellhead Protection Work in Massachusetts.*

Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup. Assessed 2006. Hazardous waste spills, Monson, MA. Available at: <http://mass.gov/dep/bwsc/sites/report.htm>

Massachusetts Geographic Information System. Assessed 2006. Executive Office of Environmental Affairs, Commonwealth of Massachusetts.

Monson Master Plan and Zoning Bylaw Committee: with assistance from Daylor Consulting Group, Inc. in association with LandUse, Inc. and Mark Bobrowski, Esq. January 2004. *Monson Master Plan - Final Report*

Monson Open Space Committee. 2005-2006. *Monson Open Space Plan - Draft*

Jonah Spiegelman, GRA PACE Group, SDRI Version 2, 2000. *The Aggregate Industry in the Georgia Basin: A Working Paper (Information regarding Gravel Pit Operations.)*

Tighe & Bond. June 2001, *Conceptual Zone II Delineation Bethany Road Well, Palmer Road Well, and Bunyan Road Well.* Monson, Massachusetts.

Town of Monson. *2005 Drinking Water Quality Report.* Monson Water and Sewer Department

Town of Monson. *Water Supply Protection District Bylaw.* Town of Monson By-laws and Regulations.

Town of Monson.. *Floor Drain Regulation.* Town of Monson By-laws and Regulations.

APPENDICES

Appendix A: Monson's Bylaws

4.1 WATER SUPPLY PROTECTION DISTRICT

4.10 PURPOSE OF DISTRICT

The purpose of this Water Supply Protection District is to:

- a. promote the health, safety, and general welfare of the community by ensuring an adequate quality and quantity of drinking water for the residents, institutions, and businesses of the Town of Monson.
- b. preserve and protect existing and potential sources of drinking water supplies;
- c. conserve the natural resources of the town; and
- d. prevent temporary and permanent contamination of the environment.

4.12 SCOPE OF AUTHORITY

The Water Supply Protection District is an overlay district superimposed on the zoning districts. This overlay district shall apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. Applicable activities/ uses in a portion of one of the underlying zoning districts which fall within the Water Supply Protection District must additionally comply with the requirements of this district. Uses prohibited in the underlying zoning districts shall not be permitted in the Water Supply Protection District.

4.13 DEFINITIONS

For the purposes of this section, the following terms are defined below:

Aquifer: Geologic formation composed of rock, sand or gravel that contains significant amounts of potentially recoverable water.

Water Supply Protection District: The zoning district defined to overlay other zoning districts in the Town of Monson. The Water Supply Protection District may include specifically designated recharge areas.

Impervious Surface: Material or structure on, above, or below the ground that does not allow precipitation or surface water to penetrate directly into the soil.

Mining: The removal or relocation of geologic materials such as topsoil, sand, gravel, metallic ores, or bedrock.

Potential Drinking Water Sources Areas which could provide significant potable water in the future.

Recharge Areas: Areas that collect precipitation or surface water and carry it to aquifers. Recharge areas may include areas designated as Zone I, Zone II, or Zone III.

Toxic or Hazardous Material: Any substance or mixture of physical, chemical, or infectious characteristics posing a significant, actual, or potential hazard to water supplies or other hazards to human health if such substance or mixture were discharged to land or water in the Town of Monson. Toxic or hazardous materials include, without limitation; synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious wastes, acids and alkalis, and all substances defined as Toxic or Hazardous under Massachusetts General Laws (M.G.L.) Chapter(c.) 21C and 21E and 310 CMR 30.00, and also include such products as solvents and thinners in quantities greater than normal household use.

**4.14
ESTABLISHMENT
AND
DELINEATION
OF
GROUNDWATER
PROTECTION
DISTRICT**

For the purposes of this district, there are hereby established within the town certain groundwater protection areas, consisting of aquifers or recharge areas which are delineated on a map. This map is at a scale of 1 inch to 12,000 feet and is entitled "Zone II Map, Bethany, Palmer & Bunyan Road Wells, Town of Monson," dated October 2001. This map is hereby made a part of the town zoning bylaw and is on file in the Office of the Town Clerk.

**4.15 DISTRICT
BOUNDARY
DISPUTES**

If the location of the District boundary in relation to a particular parcel is in doubt, resolution of boundary disputes shall be through a Special Permit application to the Special Permit Granting Authority (SPGA). Any application for a special permit for this purpose shall be accompanied by adequate documentation.

The burden of proof shall be upon the owner(s) of the land to show where the bounds should be located. At the request of the owner(s), the town may engage a professional engineer, hydrologist, geologist, or soil scientist to determine more accurately the boundaries of the district with respect to individual parcels of land, and may charge the owner(s) for the cost of the investigation.

In the Water Supply Protection District the following regulations shall apply:

**4.16 USE
REGULATIONS**

A. PERMITTED USES

The following uses are permitted within the Water Supply Protection District, provided that all necessary permits, orders, or approvals required by local, state, or federal law are also obtained:

- i. conservation of soil, water, plants, and wildlife;
- ii. outdoor recreation, nature study, boating, fishing, and hunting where otherwise legally permitted;
- iii. foot, bicycle and/or horse paths, and bridges;
- iv. normal operation and maintenance of existing water bodies and dams, splash boards, and other water control, supply and conservation devices;
- v. maintenance, repair, and enlargement of any existing structure, subject to Section B (prohibited uses) and Section C (special permitted uses);
- vi. residential development, subject to Section B (prohibited uses) and Section C (special permitted uses);

vii. farming, gardening, nursery, conservation, forestry, harvesting, and grazing, subject to Section B (prohibited uses) and Section C (special permitted uses);

viii. construction, maintenance, repair, and enlargement of drinking water supply related facilities such as, but not limited to, wells, pipelines, aqueducts, and tunnels.

Underground storage tanks related to these activities are not categorically permitted.

B. Prohibited Uses

The following uses are prohibited:

- i. landfills and open dumps as defined in 310 CMR 19.006;
- ii. automobile graveyards and junkyards, as defined in M.G.L.c. 140B, §1;
- iii. landfills receiving only wastewater and/or septage residuals including those approved by the Department pursuant to M.G.L.c. 21, §26 through 53; M.G.L.c. 111, §17; M.G.L.c. 83, §6 and 7, and regulations promulgated thereunder;
- iv. facilities that generate, treat, store, or dispose of hazardous waste that are subject to M.G.L.c. 21C and 310 CMR 30.00, except for the following:
 - a) very small quantity generators as defined under 310 CMR 30.000;
 - b) household hazardous waste centers and events under 310 CMR 30.390;
 - c. waste oil retention facilities required by M.G.L.c. 21, § 52A;
 - d) water remediation treatment works approved by DEP for the treatment of contaminated ground or surface waters;
- v. petroleum, fuel oil, and heating oil bulk stations and terminals including, but not limited to, those listed under Standard Industrial Classification (SIC) Codes 5171 and 5983. SIC Codes are established by the US Office of Management and Budget and may be determined by referring to the publication, Standard Industrial Classification Manual, and any other subsequent amendments;
- vi. storage of liquid hazardous materials, as defined in M.G.L.c. 21E, and/or liquid petroleum products unless such storage is:
 - a) above ground level, and;
 - b) on an impervious surface, and
 - c) either
 - (i) in container(s) or above ground tank(s) within a building, or;
 - (ii) outdoors in covered container(s) or above ground tank(s) in an area that has a containment system designed and operated to hold either 10% of the total possible storage capacity of all containers, or 110% of the largest container's storage capacity, whichever is greater;
- vii. storage of sludge and septage, unless such storage is in compliance with 310 CMR 32.30 and 310 CMR 32.31;
- viii. storage of deicing chemicals unless such storage, including loading areas, is within a structure designed to prevent the generation and escape of contaminated runoff or leachate;
- ix. storage of animal manure unless covered or contained in accordance

with the specifications of the Natural Resource Conservation Service;

x. earth removal, consisting of the removal of soil, loam, sand, gravel, or any other earth material (including mining activities) to within 4 feet of historical high groundwater as determined from monitoring wells and historical water table fluctuation data compiled by the United States Geological Survey, except for excavations for building foundations, roads, or utility works;

It is recommended that the removal of gravels and other earth materials be limited to no less than 8-10 feet to the historical high groundwater. This will ensure that the unconfined aquifer that the Town of Monson depends upon for its drinking water supply is adequately buffered from potential contaminants and hazardous spills within the recharge area.

xi. discharge to the ground of non-sanitary wastewater including industrial and commercial process waste water, except:

a) the replacement or repair of an existing treatment works that will not result in a design capacity greater than the design capacity of the existing treatment works;

b) treatment works approved by the Department designed for the treatment of contaminated ground or surface water and operating in compliance with 314 CMR 5.05(3) or 5.05(13);

c) publicly owned treatment works;

xii. stockpiling and disposal of snow and ice containing deicing chemicals brought in from outside the district;

xiii. storage of commercial fertilizers, as defined in MGL Chapter 128, §64, unless such storage is within a structure designed to prevent the generation and escape of contaminated runoff or leachate.

C. USES AND ACTIVITIES REQUIRING A SPECIAL PERMIT

The following uses and activities are permitted only upon the issuance of a Special Permit by the Special Permit Granting Authority (SPGA) under such conditions as they may require:

- I. enlargement or alteration of existing uses that do not conform to the Water Supply Protection District;
- ii. those activities that involve the handling of toxic or hazardous materials in quantities greater than those associated with normal household use, permitted in the underlying zoning (except as prohibited under Section B). Such activities shall require a special permit to prevent contamination of groundwater;

Consider adding this to your bylaw to monitor the RR. From the Newburyport, MA Water Supply Protection District Ordinance.

Application of pesticides, herbicides, insecticides, fungicides, and rodenticides for non-domestic or nonagricultural uses in accordance with the state and federal standards. The special permit shall be granted if such standards are met. If applicable, the application shall provide documentation of compliance with a Yearly Operating Plan (YOP) for vegetation management operations under 333 CMR 11.00 or a Department of Food and Agriculture approved Pesticide Management Plan or Integrated Pest Management (IPM) program under 333 CMR 12.00.

- iii. any use that will render impervious more than 15% or 2500 square feet of any lot, whichever is greater. A system for groundwater recharge must be provided which does not degrade groundwater quality. For non-residential uses, recharge shall be by storm water infiltration basins or similar system covered with natural vegetation, and dry wells shall be used only where other methods are infeasible. For all non-residential uses, all such basins and wells shall be preceded by oil, grease, and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.

Changes of use or modification to existing underground storage tanks are not categorically permitted.

4.17 PROCEDURES FOR ISSUANCE OF SPECIAL PERMIT

A. The Special Permit Granting Authority (SPGA) under this bylaw shall be the Monson Planning Board. Such special permit shall be granted if the SPGA determines, in conjunction with the Board of Health, the Conservation Commission, and Town Water and Sewer Department that the intent of this bylaw, as well as its specific criteria, are met. The SPGA shall not grant a special permit under this section unless the petitioner's application materials include, in the SPGA's opinion, sufficiently detailed, definite, and credible information to support positive findings in relation to the standards given in this section. The SPGA shall document the basis for any departures from the recommendations of the other town boards or agencies in its decision.

B. Upon receipt of the special permit application, the SPGA shall transmit one copy to the Board of Health, the Conservation Commission, and Town Water and Sewer Department for their written recommendations. Failure to respond in writing within 35 days of receipt by the Board shall indicate approval or no desire to comment by said agency. The necessary number of copies of the application shall be furnished by the applicant.

C. The SPGA may grant the required special permit only upon finding that the proposed use meets the following standards, those specified in Section 4.16 of this bylaw, and any regulations or guidelines adopted by the SPGA. The proposed use must:

1. in no way, during construction or thereafter, adversely affect the existing or potential quality of quantity of water that is available in the Water Supply Protection District; and
2. be designed to avoid substantial disturbance of the soils, topography, drainage, vegetation, and other water-related natural characteristics of the site to be developed.

D. The SPGA may adopt regulations to govern design features of projects. Such regulations shall be consistent with subdivision regulations adopted by the municipality.

E. The applicant shall file six copies of a site plan and attachments. The site plan shall be drawn at a proper scale as determined by the SPGA and be stamped by a professional engineer. All additional submittals shall be prepared by qualified professionals. The site plan and its attachments shall at a minimum include the following information where pertinent:

1. a complete list of chemicals, pesticides, herbicides, fertilizers, fuels, and other potentially hazardous materials to be used or stored on the premises in quantities greater than those associated with normal household use;
2. for those activities using or storing such hazardous materials, a hazardous materials management plan shall be prepared and filed with the Hazardous Materials Coordinator, Fire Chief, and Board of Health. The plan shall include:

- a) provisions to protect against the discharge of hazardous materials or wastes to the environment due to spillage, accidental damage, corrosion, leakage, or vandalism, including spill containment and clean-up procedures;
 - b) provisions for indoor, secured storage of hazardous materials and wastes with impervious floor surfaces;
 - c) evidence of compliance with the Regulations of the Massachusetts Hazardous Waste Management Act 310 CMR 30, including obtaining an EPA identification number from the Massachusetts Department of Environmental Protection.
3. proposed down-gradient location(s) for groundwater monitoring well(s), should the SPGA deem the activity a potential groundwater threat.

F. The SPGA shall hold a hearing, in conformity with the provision of MGL Chapter 40A, Section 9, within 65 days after the filing of the application and after the review by the Town Boards, Departments, and Commissions. Notice of the public hearing shall be given by publication and posting and by first-class mailings to "parties of interest" as defined in MGL Chapter 40A, §11. The decision of the SPGA and any extension, modification, or renewal thereof shall be filed with the SPGA and Town Clerk within 90 days following the closing of the public hearing. Failure of the SPGA to act within 90 days shall be deemed as a granting of the permit. However, regardless of how the permit is approved, no work shall commence until a certification of the permit from the Town clerk is recorded as required in MGL 40A § 11

**4.18
SEVERABILITY**

G. Written notice of any violation of this Bylaw shall be given by the Zoning Enforcement Officer to the responsible person as soon as possible after detection of a violation or a continuing violation. Notice to the assessed owner of the property shall be deemed notice to the responsible person. Such notice shall specify the requirement or restriction violated and the nature of the violation, and may also identify the actions necessary to remove or remedy the violations and preventive measures required for avoiding future violations and a schedule of compliance. A copy of such notice shall be submitted to the Building Inspector, the Board of Health, Conservation Commission, and Water and Sewer Department. The cost of containment, clean-up, or other action of compliance shall be borne by the owner and operator of the premises.

A determination that any portion or provision of this overlay protection district is invalid shall not invalidate any other portion or provision thereof, nor shall it invalidate any special permit previously issued thereunder.

**MODEL FLOOR DRAIN REGULATION
MONSON BOARD OF HEALTH**

Monson, Massachusetts
Board of Health
January 20, 2000

NOTES:

1. This regulation has been designed to meet the requirements of the Massachusetts Department of Environmental Protection's Wellhead Protection "Source Approval" Regulations 310 CMR 2221(2) (a) 8 within designated Zone II areas

Section I. PURPOSE OF REGULATION

Whereas:

- Floor drains in industrial and commercial facilities are often tied to a system leading to a leaching structure (e.g. dry well, cesspool, leach field) or a septic system; and
- Poor management practices and accidental and/or intentional discharges may lead petroleum and other toxic or hazardous materials into these drainage systems in facilities managing these products; and
- Improper maintenance or inappropriate use of these systems may allow the passage of contaminants or pollutants entering the drain to discharge from the leaching structure or septic system to the ground; and
- Discharges of hazardous wastes and other pollutants to floor drains leading to leaching structures and septic systems have repeatedly threatened surface and ground water quality throughout Massachusetts; and
- Surface and ground water resources in the Town of Monson contribute to the town's drinking water supplies;

The Town of Monson adopts the following regulation, under its authority as specified in Section II, as a preventative measure for the purposes of:

- Preserving and protecting the Town of Monson's drinking water resources from discharges of pollutants to the ground via floor drains, and
- Minimizing the threat of economic losses to the Town due to such discharges.

Section II. SCOPE OF AUTHORITY

The Town of Monson Board of Health adopts the following regulation pursuant to authorization granted by M.G.L. c.111 s.31 and s.122. The regulation shall apply, as specified herein, to all applicable facilities, **existing and new**, within the Town of Monson.

Section III. DEFINITIONS

For the purposes of this regulation, the following words and phrases shall have the following meanings:

Commercial and Industrial Facility: A public or private establishment where the principal use is the supply, sale, and/or manufacture of services, products, or information, including but not limited to manufacturing, processing, or other industrial operations; service or retail establishments; printing or publishing establishments; research and development facilities; small or large quantity generators of hazardous waste; laboratories; hospitals; vehicle and equipment maintenance or repair facilities.

Department: The Massachusetts Department of Environmental Protection.

Discharge: The accidental or intentional disposal, deposit, injection, dumping, spilling, leaking, incineration, or placing of toxic or hazardous material or waste upon or into any land or water so that such hazardous waste or any constituent thereof may enter the land or waters of the Commonwealth. Discharge includes, without limitation; leakage of such materials from failed or discarded containers or storage systems and disposal of such materials into any on-site leaching structure or sewage disposal system.

Floor Drain: An intended drainage point on a floor constructed to be otherwise impervious which serves as the point of entry into any subsurface drainage, treatment, disposal, containment, or other plumbing system.

Leaching Structure: Any subsurface structure through which a fluid that is introduced will pass and enter the environment, including, but not limited to, dry wells, leaching catch basins, cesspools, leach fields, and oil/water separators that are not water-tight.

Oil/Water Separator: A device designed and installed so as to separate and retain petroleum based oil or grease, flammable wastes as well as sand and particles from normal wastes while permitting normal sewage or liquid wastes to discharge into the drainage system by gravity. Other common names for such systems include MDC traps, gasoline and sand traps, grit and oil separators, grease traps and interceptors.

Qualified Oil Recovery Company: State licensed toxic or hazardous waste removal company.

Toxic or Hazardous Material: Any substance or mixture of physical, chemical, or infectious characteristics posing a significant, actual, or potential hazard to water supplies or other hazards to human health if such substance or mixture were discharged to land or water of the Town of Monson. Toxic or hazardous materials include, without limitation, synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious wastes, acids and alkalis, and all substances defined as Toxic or Hazardous under Massachusetts General Laws (MGL) Chapter 21C and 21E or Massachusetts Hazardous Waste regulations (310 CMR 30.000), and also include such products as solvents, thinners, and pesticides in quantities greater than normal household use.

Use of Toxic or Hazardous Material: The handling, generation, treatment, storage, or management of toxic or hazardous materials.

Section IV. PROHIBITIONS

With the exception of discharges that have received (or have applied and will receive) a Department issued permit prior to the effective date of this regulation, no floor drain(s) shall be allowed to discharge, with or without pretreatment (such as an oil/water separator), to the ground, a leaching structure, or septic system in any industrial or commercial facility if such floor drain is located in either:

- A. an industrial or commercial process area,
- B. a petroleum, toxic, or hazardous materials and/or waste storage area, or
- C. a leased facility without either A or B of this section, but in which the potential for a change of use of the property to a use which does have either A or B is, in the opinion of the Board of Health or its agent, sufficient to warrant the elimination of the ground discharge at the present.

Section V. REQUIREMENTS FOR EXISTING FACILITIES

The owner of a facility in operation prior to the effective date of the regulation with a prohibited (as defined under Section IV) floor drain system shall:

disconnect and plug all applicable inlets to and outlets from (where possible) applicable leaching structures, oil/water separators, and/or septic systems;
remove all existing sludge in oil/water separators, septic systems, and where accessible, leaching structures. Any sludge determined to be a hazardous waste shall be disposed of in accordance with state hazardous waste regulations (310 CMR 30.000). Remedial activity involving any excavation and/or soil or groundwater sampling must be performed in accordance with appropriate Department policies;

Alter the floor drain system so that the floor drain shall be either:

connected to a holding tank that meets all applicable requirements of Department policies and regulation, with hauling records submitted to the Monson Board of Health at the time of hauling;

connected to a municipal sanitary sewer line, if available, with all applicable Department and local permits; or

permanently sealed. Any facility sealing a drain shall be required to submit for approval to the Board of Health a hazardous waste management plan detailing the means of collecting, storing, and disposing any hazardous waste generated by the facility, including any spill or other discharge of hazardous materials or wastes.

ANY OIL/WATER SEPARATOR REMAINING IN USE SHALL BE SELF MONITORED WEEKLY, INSPECTED YEARLY AND CLEANED AS NECESSARY BY A QUALIFIED OIL RECOVERY COMPANY, AND RESTORED TO PROPER CONDITIONS AFTER CLEANING SO AS TO ENSURE PROPER FUNCTIONING. RECORDS OF THE INSPECTION AND/OR HAULING OF THE REMOVED CONTENTS OF THE SEPARATOR SHALL BE SUBMITTED TO THE BOARD OF HEALTH ON A YEARLY BASIS BY JULY 1ST.

COMPLIANCE WITH ALL PROVISIONS OF THIS REGULATION MUST BE ACCOMPLISHED IN A MANNER CONSISTENT WITH MASSACHUSETTS PLUMBING, BUILDING, AND FIRE CODE REQUIREMENTS.

UPON COMPLYING WITH ONE OF THE OPTIONS LISTED UNDER SECTION V.A.3., THE OWNER/OPERATOR OF THE FACILITY SHALL NOTIFY THE DEPARTMENT OF THE CLOSURE OF SAID SYSTEM BY FILING THE DEPARTMENT'S UIC NOTIFICATION FORM { WHICH MAY BE OBTAINED BY CALLING 617/292-5770 } WITH THE DEPARTMENT, AND SENDING A COPY TO THE MONSON BOARD OF HEALTH.

Section VI. EFFECTIVE DATES FOR ALL FACILITIES

The effective date of this regulation is the date posted on the front page of the regulation, which shall be identical to the date of adoption of the regulation.

EXISTING FACILITIES:

Owners/Operators of a facility affected by this regulation shall comply with all of its provisions within {120} days of the effective date;

All applicable discharges to the leaching structures and septic systems shall be discontinued immediately through isolation or sealing of the floor drain.

NEW FACILITIES:

As of the effective date of the regulation, all new construction and/or applicable change of use within the Town of Monson shall comply with the provisions of this regulation.

Certification of conformance with the provisions of this regulation by the Board of Health shall be required prior to issuance of construction and occupancy permits.

The use of any new oil/water separator shall comply with the same requirements as for existing systems, as specified above in Section V.B.

Section VII. PENALTIES

Failure to comply with provisions of this regulation will result in the levy of fines of not less than \$200.00 but no more than \$1,000.00. Each day's failure to comply with the provisions of this regulation shall constitute a separate violation.

Note: Effective 1992, maximum fines for health violations increased. Under Chapter 111: Section 31 (violation of health regulation) maximum increased from \$500.00 to \$1,000.00 and Section 122 (violation of nuisance regulations) maximum increased from \$100.00 to \$1,000.00.

Section VIII. SEVERABILITY

Each provision of this regulation shall be constructed as separate to the end that, if any provision, or sentence, clause or phrase thereof, shall be held invalid for any reason, the remainder of that section and all other sections shall continue in full force and effect.

**WATER USE RESTIRCTION BYLAW
TOWN OF MONSON: MAY 14, 2001**

SECTION 1: AUTHORITY

This Bylaw is adopted by the Town under its police powers to protect public health and welfare and its powers under M.G.L.c.40 Sec. 21 and implements the Town's authority to regulate water use pursuant to M.G.L.c. 41 sec. 69B. This bylaw also implements the Town's authority under M.G.L. c. 40, sec. 41A, conditioned upon a declaration bf water supply emergency issued by the Department of environmental Protection.

SECTION 2: PURPOSE

The purpose of this bylaw is to protect, preserve and maintain the public health, safety and welfare whenever there is in force a State of Water Supply Conservation or State of Water Supply Emergency by providing for enforcement of any duly imposed restrictions, requirements, provisions or conditions imposed by the Town or by the Department of Environmental Protection.

SECTION 3: DEFINITIONS

Person shall mean any individual, corporation trust, partnership or association, or other entity.

State of Water Supply Emgency shall mean a State of Water Supply Emergency declared by the Department of Environmental Protection under M.G.L. c. 210, sec. 15-17.

State of Water Supply Conservation shall mean a State of Water Supply conservation declared by the Town pursuant to Section 4 of this bylaw.

Water Users or Water Consumers shall mean all public and private users of the Town's public water system, irrespective of any person's responsibility for billing purposes for water used at any particular facility.

**SECTION 4: DECLARATION OF A STATE OF WATER SUPPLY
CONSERVATION**

The Town, through its Board of Selectmen, may declare a State of Water Supply Conservation upon a determination by a majority vote of the Board that a shortage of water exists and conservation measures are appropriate to ensure an adequate supply of water to all water consumers. Public notice of a State of Water Conservation shall be given under section 6 of this bylaw before it may be enforced.

SECTION 5: RESTRICTED WATER USES

A declaration of a State of Water Supply Conservation shall include one or more of the following restrictions, conditions, or requirements limiting the use of water as necessary to protect the water supply. The applicable restrictions, conditions or requirements shall be included in the public notice required under section 6.

- a) Odd/Even Day Outdoor Watering Outdoor - watering by water users with odd numbered addresses is restricted to odd numbered days. Outdoor watering by water users with even numbered addresses is restricted to even numbered days.

Appendix B: Hazardous Waste Spills Town of Monson 1987- 2005

Release Tracking Number(RTN)	Town	Release Address	Site Name/Location Aid	Notification Date	Reporting Category	Compliance Status	Compliance Date	Phase	Tier Class	Chemical Type
1-0000248	MONSON	CUSHMAN ST	M & M CHEMICAL SALES	15-Jan-87	NONE	DEPNFA	02-Jul-87			Oil
1-0000311	MONSON	PALMER STREET RTE 32	GETTY PETROLEUM CORP	10-Jul-87	NONE	RAO	08-May-98	PHASE V	C	Oil
1-0000487	MONSON	92-96 MAIN ST	MAIN STREET PROPERTY	20-Jun-88	NONE	RAO	28-Jun-02	PHASE II	B1	Oil
1-0000479	MONSON	PALMER RD	THERMOTECH DIV PROPERTY	15-Oct-88	NONE	DEPNFA	23-Jul-93			
1-0000531	MONSON	TOBEY RD	TOBEY ROAD COMPLAINT	15-Jan-89	NONE	DEPNDS	01-Jun-04			
1-0000620	MONSON	6 STATE ST	STATE STREET PROPERTY	15-Jul-89	NONE	WCSPRM	17-Oct-96			
1-0000688	MONSON	SOUTH MAIN ST	PALMER MOTOR COACH	15-Jan-90	NONE	RAO	06-Mar-00	PHASE II	A3	Oil
1-0001030	MONSON	141 MAIN ST	MONSON SERVICE CENTER	15-Jul-93	NONE	PENNFA	20-Sep-93			
1-0001066	MONSON	TOBEY RD	ACE MOULDING	28-Sep-93	NONE	RAO	07-Dec-94		A2	
1-0010029	MONSON	TOBEY RD AKA BETHANY RD	ACE MOULDING CO EAST SIDE OF TOBEY RD	15-Oct-93	72 HR	RAO	07-Dec-94			Oil
1-0010054	MONSON	PALMER RD	MASS ELECTRIC	04-Nov-93	TWO HR	RAO	26-Nov-93			Oil

Release Tracking Number(RTN)	Town	Release Address	Site Name/Location Aid	Notification Date	Reporting Category	Compliance Status	Compliance Date	Phase	Tier Class	Chemical Type
1-0010314	MONSON	120 MOULTON HILL RD	LOBIK PROPERTY	30-Apr-94	TWO HR	RAO	01-Nov-96		A2	Oil
1-0010428	MONSON	16 CHESTNUT ST	ADJACENT TO CENTRAL VERMONT RR LINE	13-Jul-94	120 DY	RAO	08-Nov-94		A2	Oil
1-0010499	MONSON	201 HOVEY RD	BLUE MOBILE HOME	07-Sep-94	TWO HR	RAO	06-Jan-95		A1	Hazardous Material
1-0010577	MONSON	200 STATE ST	MONSON DEVELOPMENTAL CENTER	28-Oct-94	72 HR	RAO	07-Feb-95		A2	Oil
1-0010637	MONSON	PALMER RD	THERMOTECH	30-Nov-94	TWO HR	RAO	20-Jan-95		B1	Oil
1-0010674	MONSON	HAMPDEN AVENUE BRG	CHICOPEE BROOK	28-Dec-94	TWO HR	RAO	10-Jan-95			Oil
1-0010758	MONSON	39 PALMER RD	CHICOPEE BROOK	07-Mar-95	TWO HR	RAO	05-Apr-95		A1	Oil
1-0010928	MONSON	PALMER RD	GETTY FACILITY	21-Jun-95	120 DY	RAONR	23-Oct-95			Hazardous Material
1-0011017	MONSON	354 SOUTH MAIN ST	LAIDLAW	25-Aug-95	72 HR	RAONR	11-Nov-98			Oil
1-0011384	MONSON	32 CUSHMAN ST	M & M CHEMICAL	24-May-96	TWO HR	RAO	20-Feb-97		A1	Oil and Hazardous Material
1-0011594	MONSON	ADJACENT TO 16 HOMER DR	BROOK	12-Nov-96	TWO HR	RAO	19-Nov-97		A3	Oil
1-0011689	MONSON	HOVEY RD	S OF #70	27-Jan-97	TWO HR	RAO	08-Apr-97		A2	Oil
1-0011855	MONSON	200 REAR MAIN ST	MONSON DPW	04-Jun-97	72 HR	RAO	09-Oct-97		A2	Oil
1-0011955	MONSON	10 FLYNT AVE	RESIDENCE	13-Aug-97	72 HR	RAO	21-Aug-98		A3	Oil
1-0012147	MONSON	111 EAST HILL RD	WESTVIEW FARMS, INC.	23-Dec-97	TWO HR	REMOPS	31-Oct-03	PHASE V		Hazardous Material

Release Tracking Number(RTN)	Town	Release Address	Site Name/Location Aid	Notification Date	Reporting Category	Compliance Status	Compliance Date	Phase	Tier Class	Chemical Type
1-0012324	MONSON	MOULTON HILL RD	BAZLEY TIRE PILE	30-Apr-98	TWO HR	ADQREG	30-Apr-98			
1-0012584	MONSON	5 SQUIRE AVE	SQUIRE LUMBER INC	16-Sep-98	TWO HR	RAO	02-Aug-00	PHASE II	A3	Oil
1-0012700	MONSON	250 WILBRAHAM ST	LABONTE'S TOWING	24-Nov-98	72 HR	RAO	03-May-05		C	Oil
1-0012882	MONSON	229 HOVEY ST	THORPE RESIDENCE	06-Apr-99	TWO HR	RAO	06-Apr-00		A2	Oil
1-0013024	MONSON	PALMER RD	MONSON GETTY	16-Jul-99	72 HR	RAONR	01-Apr-02	PHASE III		Oil
1-0013123	MONSON	7 PINE ST	NO LOCATION AID	01-Oct-99	TWO HR	RAO	19-Nov-99		A1	Oil
1-0013239	MONSON	3 BRIDGE ST	FUNERAL HOME	13-Dec-99	TWO HR	RAO	15-Mar-00		A2	Oil
1-0013252	MONSON	31 LAKESHORE DR	RESIDENCE	27-Dec-99	72 HR	RAO	02-May-05	PHASE II	A2	Oil
1-0013404	MONSON	354 STAFFORD RD	RESIDENCE	18-Apr-00	TWO HR	RAO	06-Sep-00		A2	Oil
1-0013552	MONSON	HOVEY ROAD BRG	RAILROAD TRACKS	22-Jul-00	TWO HR	RAO	20-Jul-01		A2	Oil
1-0013715	MONSON	22 BLISS ST	FORMER MILL 1	11-Dec-00	120 DY	RAO	15-Feb-01		A2	Oil
1-0014202	MONSON	288 MAIN ST	NO LOCATION AID	19-Oct-01	120 DY	RAO	28-Oct-02		A2	Oil
1-0014186	MONSON	PALNER RD	GETTY GAS STATION	13-Nov-01	72 HR	RAONR	01-Apr-02			Oil
1-0014215	MONSON	39 CREST ST	PASCAL RESIDENCE	07-Dec-01	TWO HR	RAO	10-Jan-05	PHASE II	A2	Oil
1-0014292	MONSON	354 BOSTON RD W (RTE 20)	NO LOCATION AID	08-Feb-02	72 HR	RAO	17-Nov-03	PHASE IV	C	Hazardous Material
1-0014393	MONSON	293 SOUTH MAIN ST	NO LOCATION AID	07-May-02	120 DY	TIER1D	14-May-03			Hazardous Material

Release Tracking Number(RTN)	Town	Release Address	Site Name/Location Aid	Notification Date	Reporting Category	Compliance Status	Compliance Date	Phase	Tier Class	Chemical Type
1-0014801	MONSON	21 BLISS ST	OMEGA PROCESSING FACILITY	31-Mar-03	120 DY	TIER1D	07-Apr-04			Hazardous Material
1-0014873	MONSON	HIGHLAND AVE	ROADWAY	06-Jun-03	TWO HR	RAO	30-Jul-03		A2	Oil
1-0015093	MONSON	33 GREEN ST	OPPOSITE LOMBARD FUNERAL HOME	12-Nov-03	120 DY	RAO	17-Dec-04		A2	Oil
1-0015469	MONSON	72 STAFFORD ROAD ROUTE 32	NO LOCATION AID	21-Sep-04	TWO HR	RAO	26-Nov-04		A1	Oil
1-0015562	MONSON	132 BETHANY RD	FORMER UST AREA	24-Nov-04	120 DY	RAO	04-May-05		A2	Oil and Hazardous Material
1-0015584	MONSON	246-248 MAIN ST	FORMER EXXON STREET	17-Dec-04	120 DY	UNCLSS	17-Dec-04			Oil
1-0015643	MONSON	CORNER OF KING STREET AND BRIM	500-1000 YDS OF ROAD	31-Jan-05	TWO HR	RAO	31-Mar-05		A1	Oil

Source: DEP Bureau of Waste Site Cleanup

RAO – Response Action Outcome – A site/release where an RAO statement was submitted. An RAO statement asserts that response actions were sufficient to achieve a level of no significant risk or at least ensure that all substantial hazards were eliminated.

Note: Sites are usually Tier Classified using the Numerical Ranking System (NRS). The NRS scores sites on a point system based on a variety of factors. These include the site's complexity, the type of contamination, and the potential for human or environmental exposure to the contamination. In addition, some sites are automatically classified as Tier 1 sites if they pose an imminent hazard, affect public water supplies, or miss regulatory deadlines.

- **TIER 1A:** A site/release receiving a total NRS score equal to or greater than 550. These sites/releases require a permit and the person undertaking response actions must do so under direct DEP supervision.
- **TIER 1B:** A site/release receiving an NRS score of less than 550 and equal to or greater than 450. These sites/releases also require a permit, but response actions may be performed under the supervision of a Licensed Site Professional (LSP) without prior DEP approval.
- **TIER 1C:** A site/release receiving a total NRS score of less than 450 and equal to or greater than 350. A site/release receiving a total NRS score of less than 350, but which meets any of the Tier 1 Inclusionary Criteria specified in 310 CMR 40.0520(2)(a), is also classified a Tier 1C. These sites/releases also require a permit, but response actions may be performed under the supervision of an LSP without prior DEP approval.

- **TIER 2:** A site/release receiving a total NRS score of less than 350, unless the site meets any of the Tier 1 Inclusionary Criteria (see above). Permits are not required at Tier 2 sites/releases and response actions may be performed under the supervision of an LSP without prior DEP approval. All pre-1993 transition sites that have accepted waivers are categorically Tier 2 sites.
- **TIER 1D:** A site/release where the responsible party fails to provide a required submittal to DEP by a specified deadline. Note: formerly Default Tier 1B.
- **UNCLASSIFIED:** A release that has not reached its Tier Classification deadline (usually one year after it was reported), and where an RAO Statement, DPS Submittal, or Tier Classification Submittal has not been received by DEP.

Resources



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

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

<i>PWS Name</i>	Monson Water and Sewer Department
<i>PWS Address</i>	198 WD Main Street, P.O. Box 388
<i>City/Town</i>	Monson
<i>PWS ID Number</i>	1191000
<i>Local Contact</i>	Craig Jalbert
<i>Phone Number</i>	413-267-4130

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 Conclusions and Recommendations
4. Appendices

Section 1: Description of the Water System

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.



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.

Zone II #: 558

Susceptibility: High

<i>Well Names</i>	<i>Source IDs</i>
Bethany Road Well	1191000-03G
Lower Palmer Road Well	1191000-04G
Bunyan Road Well	1191000-05G

Monson is a relatively small community of approximately 7,500 in western Massachusetts along the Connecticut border. The town originally developed as a textile center and later added other manufacturing. The community is primarily in the west central Massachusetts highlands with the town center and the majority of the development concentrated along the narrow Chicopee Brook valley that bisects the community running south to north. Monson Water and Sewer Department maintains three active groundwater sources supplying water to approximately half of the town of Monson's population. The Bunyan Road well, the primary source for the town, is in the northern part of town west of Route 32 along the wetland area of Chicopee Brook, and is an 18x24-inch diameter, 80-foot deep, gravel-packed well. The Bethany Road and Palmer Road wells are located about 500 feet apart, north of the center of town, east of Route 32. The Bethany Road well is a 16x24-inch diameter, 54-foot deep, gravel-packed well installed in 1950. The original Palmer Road well is a 16x24-inch, 78-foot deep, gravel-packed well that is used as a back-up source to the Bunyan Road well. Records indicate a 12-inch diameter gravel developed replacement well was installed adjacent to the original Palmer Road well. Each well has a Zone I of 400 feet. All three wells are located within the same buried valley aquifer along the Chicopee Brook and the Zone II, recharge area was delineated for all three wells as part of the SWAP program. The Water and Sewer Department does not own the entire Zone I for the wells. Please refer to the attached map for location details.

The three wells are located within a glacially deepened, bedrock valley along the Chicopee Brook. The stagnant, receding (melting) glacier deposited the overburden materials that filled the bedrock valley some 10,000 years ago. The deposits are a complex series of coarse and fine-grained material referred to as outwash deposits. A temporary glacial lake left thick clay deposits in some areas, while fast moving meltwater left sinuous, coarse gravel deposits (eskers) or flat topped delta or terrace features amid the fine-grained deposits. Recent stream waters have reworked the deposits and deposited alluvium throughout the area. The Bethany and Bunyan Road wells are located within a coarse gravel, esker deposit while the Palmer Road well is located within other, finer grained outwash deposits. There is no evidence of a continuous, protective clay layer through the Zone II. Wells located in this type of aquifer are considered to have a high vulnerability to potential contamination from the surface due to the absence of hydrogeologic barriers (i.e. clay) that can prevent contaminant migration. According to USGS mapping, the area is underlain by Monson Gneiss, a texturally mixed, layered plagioclase-quartz-biotite gneiss. There are also two wells and two surface water sources that are either abandoned or emergency sources, and are not addressed in this report. Please refer to the attached map to view the boundaries of the Zones I and II.

Soda ash is added to the water from the Bunyan Road well to control pH and alkalinity for corrosion control prior to distribution. The water from the other

wells does not require and is not treated at this time. 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

The Zone II for Monson Water and Sewer Department is a mixture of residential, commercial, agricultural, and light industrial 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. Please note that the GIS map show a solid waste disposal area on the northwest edge of the Zone II. The Department's Bureau of Waste Prevention conducted a site visit as part of this assessment. The Department did not find any evidence of a waste disposal site in the vicinity and intends to delete the site from the Department's database and map.

Key Land Uses and Protection Issues include:

1. Nonconforming Zone I
2. Residential land uses
3. Transportation corridors
4. Hazardous materials storage and use
5. Oil or hazardous material contamination sites
6. Comprehensive wellhead protection planning
7. Agricultural activities
8. Railroad Tracks

The overall ranking of susceptibility to contamination for the system is high, based on the presence of at least one high threat land use within the water supply protection areas, as seen in Table 2.

1. Nonconforming Zone Is – The Zone I for each of the wells is a 400-foot radius around the wellhead. 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 contain non-water supply activities such as homes and public roads. Monson Water and Sewer Department does not own the Zone Is for the Bethany Road and Palmer Road wells. The Zone I for the Bethany Road well contains roads and two residences.

Zone I Recommendations:

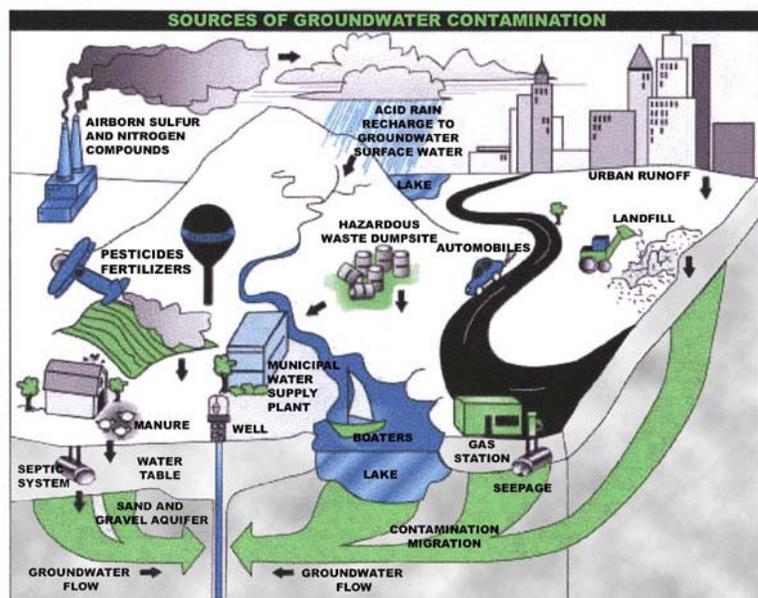
- ✓ To the extent possible, remove all non-water supply activities from the Zone Is to comply with DEP's Zone I requirements.
- ✓ Use BMPs for the storage, use, and disposal of hazardous materials such as water supply chemicals and maintenance chemicals.

Benefits of Source Protection

Source Protection helps protect public health and is also good for fiscal fitness:

- Protects drinking water quality at the source
- Reduces monitoring costs through the DEP Waiver Program
- Treatment can be reduced or avoided entirely, saving treatment costs
- Prevents costly contamination clean-up
- Preventing contamination saves costs on water purchases, and expensive new source development

Contact your regional DEP office for more information on Source Protection and the Waiver Program.



- ✓ 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.

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.

2. Residential Land Uses – Approximately 27% of the Zone II consists of residential areas. The town’s sewer services the northern half of the Zone II, where much of the residential area is located. Septic systems service residences and businesses located south of Cedar Swamp Road and Route 32, the southern half of the Zone II. 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.
- **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.

3. Transportation Corridors - Route 32 runs through the length of the Zone II, and local roads are common

throughout the Zone II. 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.

Source Protection Decreases Risk

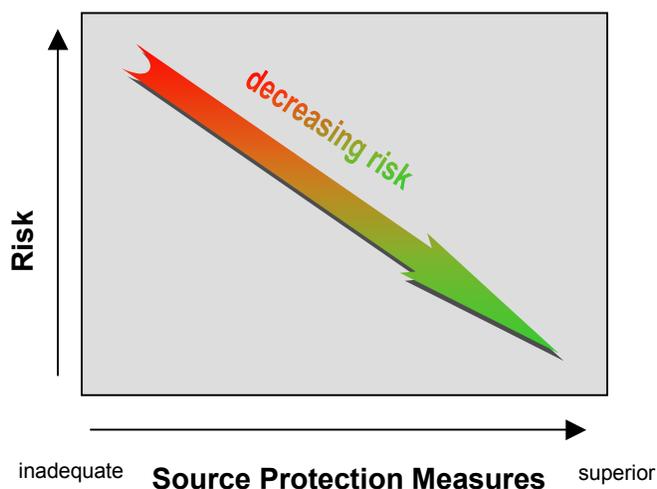


Figure 2: Risk of contamination decreases as source protection increases. This is true for public water systems of any susceptibility ranking, whether High, Moderate, or Low.

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.

Table 2: Land Use in the Protection Areas (Zones I and II)

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

Land Uses	Quantity	Threat	Potential Contaminant Sources*
Agricultural			
Fertilizer Storage or Use	2	M	Fertilizers: leaks, spills, improper handling, or over-application
Forestry Operation	1	L	Herbicides or pesticides, equipment maintenance materials: leaks, spills, or improper handling; road building
Livestock Operations	1	M	Manure (microbial contaminants): improper handling
Pesticide Storage or Use	3	H	Pesticides: leaks, spills, improper handling, or over-application
Commercial			
Car/Truck/Bus Washes	1	L	Vehicle wash water, soaps, oils, greases, metals, and salts: improper management (sewered)
Gas Stations	3	H	Automotive fluids and fuels: spills, leaks, or improper handling or storage
Service Stations/ Auto Repair Shops	8	H	Automotive fluids and solvents: spills, leaks, or improper handling
Bus and Truck Terminals	5	H	Fuels and maintenance chemicals: spills, leaks, or improper handling
Cemeteries	6	M	Over-application of pesticides: leaks, spills, improper handling; historic embalming fluids
Funeral Homes	1	L	Hazardous chemicals: spills, leaks, or improper handling
Golf Courses	1	M	Fertilizers or pesticides: over-application or improper handling
Laundromats	1	L	Wash water: improper management (sewered)
Medical Facilities	1	M	Biological, chemical, and radioactive wastes: spills, leaks, or improper handling or storage (sewered)
Railroad Tracks And Yards	Through Zones I & II	H	Herbicides: over-application or improper handling; fuel storage, transported chemicals, and maintenance chemicals: leaks or spills
Repair Shops (Engine, Appliances, Etc.)	1	H	Engine fluids, lubricants, and solvents: spills, leaks, or improper handling or storage
Sand And Gravel Mining/Washing	1	M	Heavy equipment, fuel storage, clandestine dumping: spills or leaks
Industrial			
Fuel Oil Distributors	1	H	Fuel oil: spills, leaks, or improper handling or storage
Machine Shops	3	H	Solvents and metal tailings: spills, leaks, or improper handling
RCRA TSDF Facilities	1	H	Hazardous wastes: spills, leaks, or improper handling or storage

Land Uses	Quantity	Threat	Potential Contaminant Sources*
Residential			
Fuel Oil Storage (at residences)	Numerous	M	Fuel oil: spills, leaks, or improper handling
Lawn Care / Gardening	Numerous	M	Pesticides: over-application or improper storage and disposal
Septic Systems / Cess-pools	Numerous	M	Hazardous chemicals: microbial contaminants, and improper disposal (sewered north of Robins St., Maple St.)
Miscellaneous			
Aboveground Storage Tanks	Numerous	M	Materials stored in tanks: spills, leaks, or improper handling
Aquatic Wildlife	Numerous	L	Microbial contaminants
Fishing/Boating	Numerous	L	Fuel and other chemical spills, microbial contaminants (mainly canoes)
Pipeline: Gas and Sewer	2	M	Natural Gas or Sewage: spills or leaks
Road And Maintenance Depots	1	M	Deicing materials, automotive fluids, fuel storage, and other chemicals: spills, leaks, or improper handling or storage
Schools	2	M	Fuel oil, laboratory, art, photographic, machine shop, and other chemicals: spills, leaks, or improper handling or storage (sewered)
Stormwater Drains/ Retention Basins	Numerous	L	Debris, pet waste, and chemicals in stormwater from roads, parking lots, and lawns
Transmission Line Rights-of-Way - Type: Railroad, Natural Gas	2	L	Corridor maintenance pesticides: over-application or improper handling; construction
Transportation Corridors	Numerous	M	Fuels and other hazardous materials: accidental leaks or spills; pesticides: over-application or improper handling
Underground Storage Tanks	Numerous	H	Stored materials: spills, leaks, 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.

- ✓ 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.

4. Hazardous Materials Storage and Use – Five 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.

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 through the Board of Health, 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 practices.
- ✓ Educate local businesses on Massachusetts floordrain requirements. See brochure “Industrial Floor Drains” for more information.

5. Presence of Oil or Hazardous Material Contamination Sites – The Zone II contains several DEP Tier Classified Oil and/or Hazardous Material Release Sites indicated on the map as Release Tracking Numbers 1-0011017, 1-0000487, and 1-0013024. Refer to the attached map and Appendix C for more information.

Oil or Hazardous Material Contamination Sites Recommendation:

- ✓ Monitor progress on any ongoing remedial action conducted for the known oil or contamination sites. Contact the Department’s Bureau of Waste Site Cleanup at 413-784-1100 for further information.

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 is a place people want to live and businesses want to locate.



6. Agricultural Activities – Six percent of the land use within the Zone II is agricultural as pasture or cropland. 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 commercial 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.
- ✓ Work with hobby farmers to encourage the use of valuable assistance from soil conservation districts regarding BMPs.

7. 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 competitive grant funding resources available to help communities develop a plan for protecting drinking water supply wells. Department staff is also

available to assist communities in developing local wellhead protection controls.

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). If there are no local controls or they do not meet the current regulations, adopt controls that meet 310 CMR 22.21(2). For more information on DEP land use controls see <http://mass.gov/dep/brp/dws/protect.htm>.
- ✓ If local controls do not regulate floordrains, be sure to include floordrain controls that meet 310 CMR 22.21(2).

8. Railroad Right-of-Way – The railroad runs through the entire Zone II, and transects the Zone I of all wells. Rail corridors that serve passenger and/or freight trains are a potential source of contaminants due to chemicals released during normal use, track maintenance, and accidents. Normal maintenance of a railroad right-of-way can introduce contaminants to a water supply through herbicide application for vegetation control. The over-application or improper handling of herbicides on railroad right-of-way is a potential source of contamination. Leaks or spills of transported chemicals or train/track

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.

maintenance chemicals are also potential sources of contamination to the water supply.

Railroad Right of Way Recommendations:

- ✓ Review the railroad right-of-way Yearly Operating Plan to ensure Best Management Practices are implemented with regard to vegetation control in the Zone II, and that the utility has accurate information regarding the locations of the wells and the Zone I. Review the maps the utility uses and supply them with an accurate map as appropriate.
- ✓ Work with your local fire department to review emergency response plans. Updates to this plan should include the railroad rights-of-way including coordination with the owner/operator of the track and trains using the right-of-way. Request emergency response teams to coordinate Emergency Response Drills and practice containment of potential contaminants from train accidents within the Zone II, which should attempt to include representatives from the owner/operator of the trains utilizing the right-of-way.

Other land uses and activities within the Zone II 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.

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.

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.
- ✓ Partner with local businesses to ensure the proper storage, handling, and disposal of hazardous materials.
- ✓ Monitor progress on any ongoing remedial action conducted for the known oil or contamination sites.
- ✓ Work with commercial 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.
- ✓ Supply information about BMPs for hobby farmers regarding pesticides, manure management.
- ✓ Develop and implement a Wellhead Protection Plan.

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 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

Additional Information

To help with source protection efforts, more information is available by request or online at mass.gov/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.

Table 3: Current Protection and Recommendations

Protection Measures	Status	Recommendations
Zone I		
Does the Public Water Supplier (PWS) own or control the entire Zone I?	NO	Follow Best Management Practices (BMP's) that focus on good housekeeping, spill prevention, and operational practices to reduce the use and release of hazardous materials.
Is the Zone I posted with "Public Drinking Water Supply" Signs?	YES	Additional economical signs are available from the Northeast Rural Water Association (802) 660-4988.
Is Zone I regularly inspected?	YES	Continue daily inspections of drinking water protection areas.
Are water supply-related activities the only activities within the Zone I?	NO	Continue monitoring non-water supply activities in Zone Is.
Municipal Controls (Zoning Bylaws, Health Regulations, and General Bylaws)		
Does the municipality have Wellhead Protection Controls that meet 310 CMR 22.21(2)?	NO	The Town "Aquifer Protection District" bylaw meets DEP's best efforts for wellhead protection. Refer to www.state.ma.us/dep/brp/dws/ for model bylaws and health regulations, and current regulations.
Do neighboring communities protect the Zone II areas extending into their communities?	N/A	
Planning		
Does the PWS have a 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 wellhead protection committee?	NO	Establish committee; include representatives from citizens' groups, neighboring communities, and the business community.
Does the Board of Health conduct inspections of commercial and industrial activities?	SOME	For guidance see "Hazardous Materials Management: A Community's Guide" at www.state.ma.us/dep/brp/dws/files/hazmat.doc
Does the PWS provide wellhead protection education?	NO	Include commercial, industrial and municipal uses within the Zone II. Utilize schools and public access channels.

Conventional Septic Systems

A septic system consists of a **septic tank**, a **distribution system** and a **drainfield**, all connected by pipes. The typical septic tank is a large buried rectangular concrete container.

Your septic system treats your household wastewater by temporarily holding it in the **septic tank** where heavy solids settle to the bottom and bacterial action partially decomposes them. Most of the lighter solids rise to the top and form a scum layer. The solids stored in the tank need to be removed by a professional septic tank pumper every three to five years.

The wastewater leaving the septic tank is a liquid called **effluent**. It has been partially treated but still contains disease-causing bacteria and other pollutants.

The effluent flows into the **distribution system**, which separates the effluent flow evenly into a network of **drainfield trenches**.

The drainfield is a network of perforated

pipes laid in gravel-filled trenches, or beds in the soil. Drainage holes at the bottom of each pipe allow the effluent to drain into the gravel trenches for temporary storage.

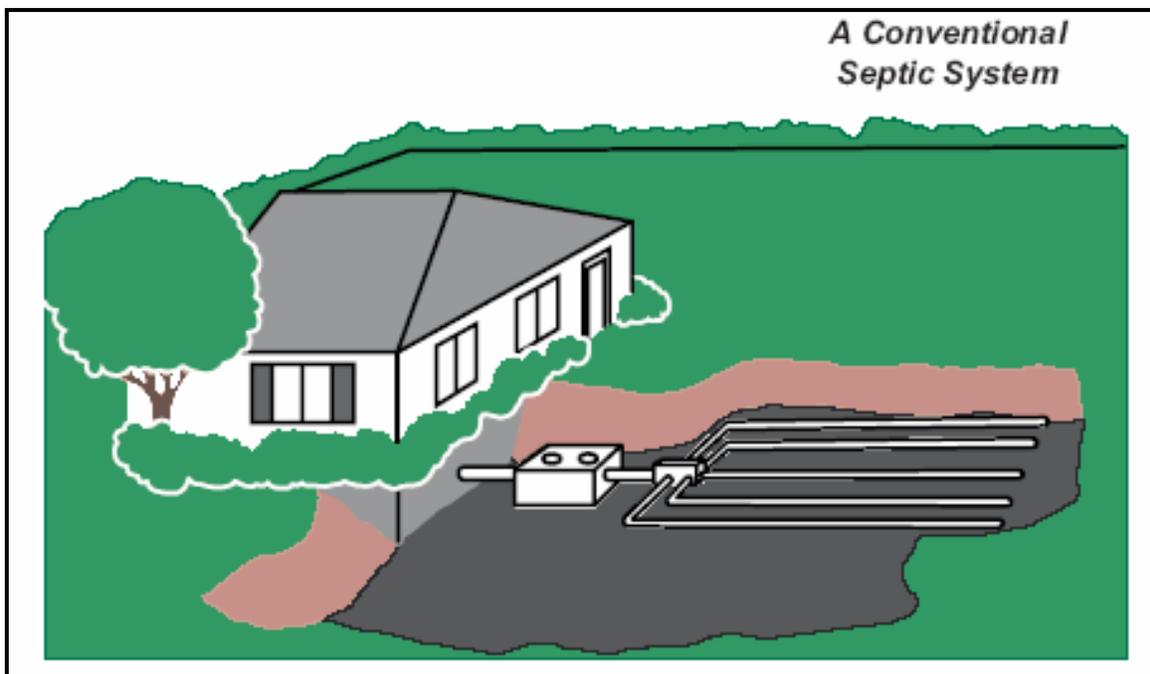
The effluent then slowly seeps into the soil where it is further treated and purified. Chemical and biological processes treat the effluent before it reaches groundwater. A properly functioning septic system does not pollute the **groundwater**.

Caring for Your Septic System

The accumulated solids in the bottom of the septic tank should be pumped out every three to five years to prolong the life of your system.

Neglect or abuse of your septic system can cause system failure. Failing systems can:

- reduce the value of your property,
- be very expensive to repair,
- cause a serious health threat to your family and neighbors,
- degrade the environment, especially groundwater, lakes and streams.



Septic Tank Additives

Many products on the market, such as solvents, yeast, bacteria, and enzymes claim to improve septic tank performance, or reduce the need for routine pumping. Do not use an additive unless it is specifically approved by the health department.

Some can cause solids to carry over to the drainfield, which results in early soil clogging and the need for a new drainfield.

Products containing organic solvents contribute to groundwater pollution.

System Failure

Warning signs of a failing system:

- surfacing sewage, or lush vegetation in the drainfield area,
- sewage back-ups in the house,
- slow draining toilets or drains,
- sewage odors.

If you notice any of these signs or if you suspect your septic tank system may be having problems - contact your local Board of Health

System Management

1. Keep accurate records.

Know where your septic tank system is and keep a diagram of its location. Records of its size and location may be available at Board of Health office.

Keep records of maintenance on the system. These records will be helpful if problems occur, and will be valuable to the next owner of your home.

2. Inspect your system once every three years.

Have the level of solids and scum in your septic tank checked to assure that the layer of solids and scum are not within the early warning levels.

The tank also should be checked to see if the baffles or tees are in good condition.

Periodically inspect the drainfield and downslope areas for odors, wet spots, or surfacing sewage.

3. Practice water conservation. The more waste water you produce, the more the soil must treat and dispose. By reducing your use, you can extend the life of the drainfield, decrease the possibility of system failure, and avoid costly repairs.

To reduce your water use:

- Use water-saving devices in faucets, showerheads and toilets.
- Repair dripping faucets and leaking toilets.
- Take shorter showers or baths with a partially-filled tub.
- Wash only full loads of dishes and laundry.

4. Pump out your septic tank every three to five years or as needed by a licensed septic contractor.

Don't wait until you have a problem. Routine pumping can prevent failures, such as clogging of the drainfield and sewage back-up into the home. Using a garbage disposal is not recommended because it will increase the amount of solids entering the septic tank and require more frequent pumping.

5. Never flush harmful materials into your septic tank.

Grease, cooking fats, newspaper, paper towels, rags, coffee grounds, sanitary napkins, disposable diapers, plastics and cigarettes cannot easily decompose in the tank.

6. Never flush harmful chemicals into your septic tank.

Chemicals such as gasoline, oil, paint, paint thinner, pesticides, antifreeze, etc. are harmful to the systems proper operation and can kill the beneficial bacteria that treat your wastewater.

7. Divert all runoff away from your system.

Water from surfaces such as roofs, driveways, or patios should be diverted away from the septic tank and drainfield area. Soil over your system should be slightly mounded to help surface water runoff.

8. Protect your system from damage.

Keep traffic such as vehicles, heavy equipment, or livestock off your drainfield or replacement area.

The pressure can compact the soil or damage pipes. Consult the health department before you construct a building, plant a garden, or install a pool or underground sprinkler system.

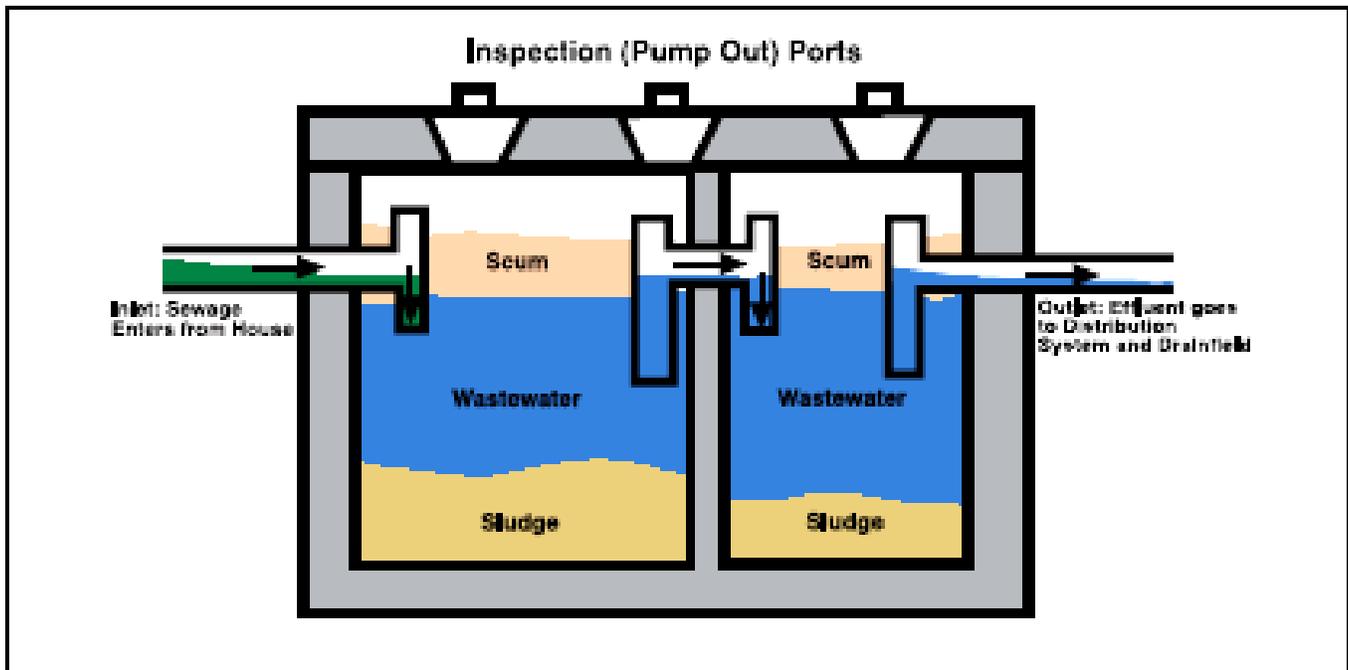
9. Landscape your system properly.

Grass is the best cover for your system. Do not place impermeable materials over your

drainfield or replacement area. Materials, such as concrete or plastic, reduce evaporation and the supply of oxygen to the soil for proper treatment. Roots from nearby trees or shrubs may clog and damage your drain lines.

10. Obtain the required health department permit before making system repairs.

Use professional licensed septic contractors when needed. Many problems can be corrected with a minimum amount of cost and effort if done properly.





Massachusetts
Department
of
ENVIRONMENTAL
PROTECTION

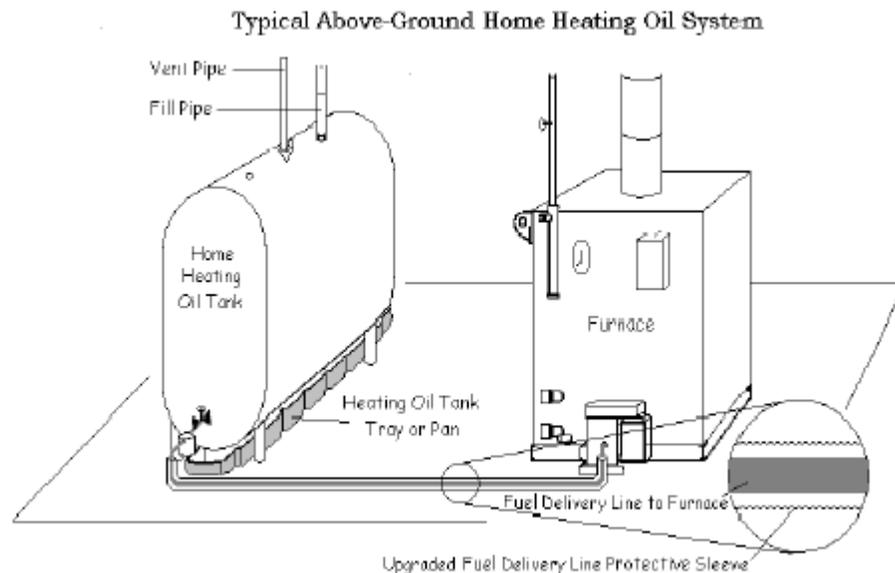
fact sheet

Tips For Maintaining Your Home Heating System: Prevent Heating Oil Leaks and Spills

Cleaning up oil leaks from home heating systems can be very expensive. The average cost can range between \$20,000 and \$50,000, with some cleanups costing significantly more. Here are some ways to save money, help prevent leaks and spills, and protect the environment.

For all heating oil systems:

- Annually:
 - Inspect for leaks. Look at the tank, fuel delivery line, valves, piping, and fittings.
 - Have your oil company:
 - Clean the furnace and repair or replace damaged parts. A well-maintained furnace means lower fuel bills and cleaner emissions.
 - Install an oil **safety valve** or replace the fuel delivery line with one encased in a **protective sleeve**. These are inexpensive upgrades. Contact the fire department to determine if a permit is required for this work.
 - Each fall, inspect the vent pipe to ensure that it is free of obstructions and that an audible signal (whistle) is on the vent. Oil company personnel listen for the whistle to help avoid overfills, a common source of spills.
- At least every 10 years, have the oil tank cleaned out. Over time, water (from condensation) and sludge can cause corrosion resulting in leaks.
- When appropriate:
 - Remove abandoned fill and vent pipes immediately.
 - Clearly mark the location of the tank's fill pipe.
 - Consider upgrading to a modern, fuel-efficient furnace.



- Determine if the underground storage tank is made of steel (common) or fiberglass (rare). Most steel underground storage tanks will last approximately 10 to 20 years. If the tank is older than that or the age is unknown, replace it with an above-ground storage tank. Locate your new tank under a shelter, or inside a basement or garage, to prevent rust, corrosion, or damage.

For outdoor above-ground tanks:

- Ask your oil company to inspect the stability of the above-ground tank. A full 275-gallon tank weighs more than 2,000 pounds! They have metal legs and should sit on a concrete pad. If the legs become loose or the pad cracks, the tank can fall over and rupture.
- Replace an outdoor above-ground storage tank that has been uncovered for 10 years or longer. These tanks rust from the inside out, so cleaning or painting the outside does not usually prolong their life.
- Protect the tank from the weather, such as falling snow and ice, and prevent ruptures by tree limbs.

For indoor above-ground tanks:

- Inspect indoor above-ground storage tanks for signs of pitting and corrosion, particularly at the bottom of the tank. Tanks primarily rust from the inside out, so if signs of aging are present, replace the tank. Indoor tanks do not last more than about 30 years, and often their lifespan is much shorter.
- Consider placing a plastic heating oil tray or pan under the tank. This makes it easier to keep the tank area clean and help identify and contain small leaks.

If your oil company offers to perform a “tightness test,” ask if this could cause a problem. Generally, these tests should NOT be performed on older residential heating oil systems. Because of the pressure used during a tightness test, older equipment can fail, causing a leak or spill. If you have a tank, fuel delivery line, valves, piping, and fittings on which it is inadvisable to perform a tightness test because of age or condition, then it is probably better to replace the equipment that is causing the concern.

Visit our web site: <http://www.mass.gov/dep/bwsc/facts.htm> to review related documents, including “Heating Oil Delivery Lines” (<http://www.mass.gov/dep/bwsc/files/deline.pdf>).

If you suspect an oil leak or spill, **immediately** contact your oil company and fire department for assistance. Leaks or spills of 10 gallons or more must be reported to DEP within 2 hours. To report a leak or spill, call DEP (within 2 hours) and the fire department.

DEP’s 24-hour statewide emergency response number is 888-304-1133.

Massachusetts Department of
Environmental Protection
One Winter Street
Boston, MA 02108-4746

Commonwealth of Massachusetts
Mitt Romney, Governor
Kerry Healey, Lt. Governor

Executive Office of
Environmental Affairs
Ellen Roy Herzfelder, Secretary

Department of
Environmental Protection
Robert W. Gollodge, Jr.,
Commissioner

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This information is available in
alternate format by calling our ADA
Coordinator at
(617) 292-5565.



Student Name: _____

Household Member Name: _____

Personal Water Use Chart

{ ----- To be filled in by student ----- }

Activity	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total Number of Times	Estimated Amount of Water Used (gallons)	Total Weekly Water Use (gallons)
Washing face or hands									1	
Taking a shower (standard shower head)									50	
Taking a shower (low flow shower head)									25	
Taking a bath									40	
Brushing teeth (water running)									2	
Brushing teeth (water turned off)									0.25	
Flushing the toilet (standard flow toilet)									5	
Flushing the toilet (low flow toilet)									1.5	
Shaving									2	
Getting a drink									0.25	
Cooking a meal									3	
Washing dishes by hand									10	
Running a dishwasher									15	
Doing a load of laundry									30	
Watering lawn									300	
Washing car									50	
Total Weekly Water Use by Household Member (gallons)										

The Water Cycle at Work

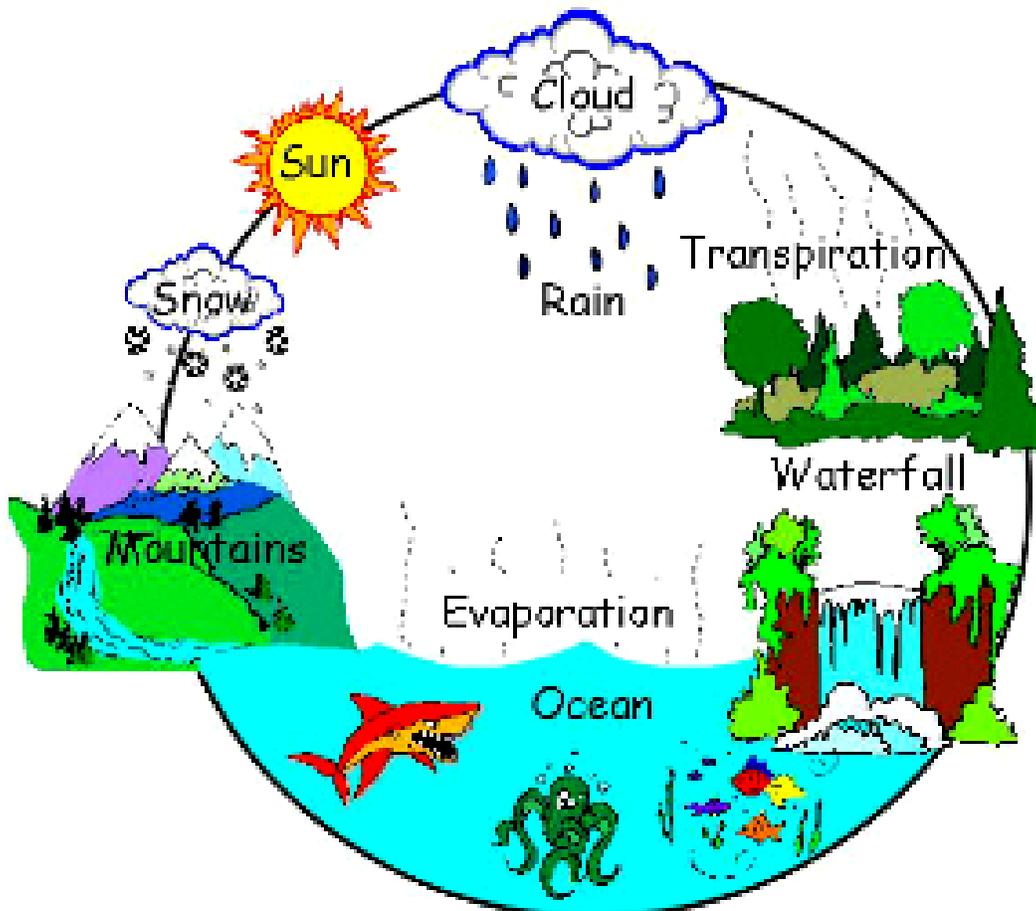
Water never stops moving.

Snow and rain fall to the earth from clouds.
The rain and melted snow
run downhill into rivers and lakes,
sometimes crashing over waterfalls.

Eventually, the water flows into the ocean.

During evaporation,
the water turns from liquid into gas,
and moves from oceans and lakes
into the atmosphere
where it forms clouds.

Then the cycle begins all over again.





How Much Water Do You Use?

DID YOU KNOW... that we all use water everyday in a variety of activities? Some activities use a little water, and some a lot. For example, every time you brush your teeth you use an average of 4 gallons of water... and watering your lawn for an hour can take up to 300 gallons!

(How much water is in a gallon...? Do you know those big plastic milk jugs? Those are a gallon. Imagine using 4 of those to brush your teeth with! Imagine pouring 300 of those on your yard!)

Here's how much water it takes to do some common everyday activities:

- Flushing the toilet = 5 gallons per flush
- Brushing your teeth = 4 gallons each time
- Taking a bath = 36 gallons each time
- Running the dishwasher = 15 gallons each time
- Washing your hands & face = 4 gallons each time
- Taking a shower = 25 gallons each time
- Washing a load of laundry = 45 gallons each time

Watering your lawn = 300 gallons each time

Blue Thumb Word Search

New Vocabulary Words:

water sources- bodies of water such as lakes, rivers, reservoirs, and underground aquifers from which we draw water for drinking.

aquifers- An underground, water-bearing layer of earth, porous rock, sand, or gravel, through which water can seep or be held in natural storage. Aquifers generally hold sufficient water to be used as a water supply.

treatment- a series of chemical and physical processes to remove dissolved and suspended solids from raw water to produce safe water to drink.

contaminate- to make unsafe for drinking.

pesticide- a chemical used to kill pests.

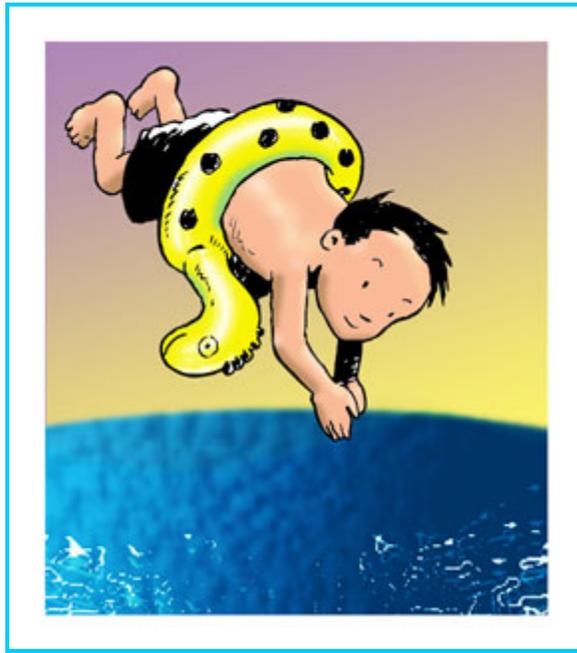
hazardous- dangerous or harmful

Most people in North America get their water from a **public water utility**. Public utilities are companies or government agencies that supply needs such as electricity, gas, or water to the public. Water utilities get their water from rivers, lakes, reservoirs, or underground aquifers. Often, the water must be treated to make it safe to drink.

We reuse the same water over and over and it can become polluted by people and industry. Even deep underground aquifers can be polluted from the surface. For example, many household items, such as car wax, spot remover, or floor polish, should not be poured down the drain or thrown out in the trash. Even lawn chemicals and other garden toxins used outdoors can contaminate water sources by running off the land into storm drains. And water can end up in lakes and rivers.

Let's take care of our water resources. Use your "Blue Thumb" to conserve water, protect it, and get involved.





Can You Find These Words?

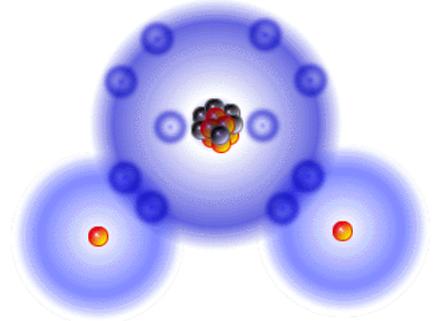
(circle each one)

nature
 recycle
 treatment
 drink
 pesticide
 leaks
 toxic
 oil
 tap
 fertilizer
 batteries
 pollute
 paint
 contaminate
 protect
 gasoline
 hazardous
 wells
 water sources
 safe
 clean

W	E	L	L	S	D	M	P	Q	S	V	F
L	A	B	O	T	P	O	L	L	U	T	E
H	Z	T	R	E	A	T	M	E	N	T	R
C	P	A	E	R	I	C	B	C	U	E	T
O	Y	P	C	R	F	E	N	L	K	D	I
N	A	H	Y	J	S	T	M	E	H	I	L
T	E	A	C	P	Z	O	C	A	L	C	I
A	F	Z	L	K	T	R	U	N	T	I	Z
M	A	A	E	D	O	P	E	R	B	T	E
I	S	R	I	X	X	N	W	G	C	S	R
N	M	D	P	A	I	N	T	S	L	E	V
A	B	O	I	L	C	F	S	M	O	P	S
T	F	U	O	D	R	I	N	K	T	E	S
E	D	S	L	M	O	H	J	L	A	M	R
P	A	T	B	A	T	T	E	R	I	E	S
G	K	U	E	F	N	A	T	U	R	E	L

WATER TRIVIA FACTS

Water Molecule



What is the most common substance found on earth?

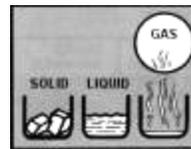
Water - It is composed of two elements, Hydrogen and Oxygen.

2 Hydrogen + 1 Oxygen =



Water is the only substance found on earth naturally in the three forms.

True (solid, liquid, and gas)



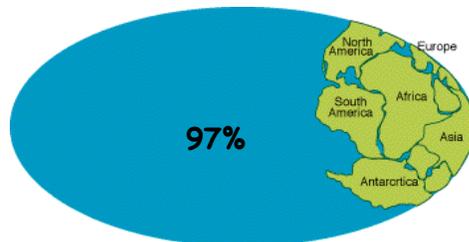
How much of the earth's surface is water?

80%



Of all the earth's water, how much is ocean or seas?

Nearly 97% of the world's water is salty or otherwise undrinkable.



www.mos.org/oceans/planet/

How much of the world's water is frozen and therefore unusable?

Another 2% is locked in ice caps and glaciers.



How much of the earth's water is suitable for drinking water?

Only 1% for all of humanity's needs — all its agricultural, residential, manufacturing, community, and personal needs.



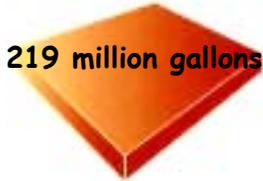
How much does one gallon of water weigh?

8.34 pounds



How many gallons of water would it take to cover one square mile with one foot of water?

219 million gallons



How much water is in one cubic foot?

7.48 gallons



How many gallons of water do you get per acre, when it rains one inch?



27,000 gallons per acre

At what temperature does water freeze?

32 degrees F, 0 degrees C



Water expands by 9% when it freezes. Frozen water (ice) is lighter than water, which is why ice floats in water.



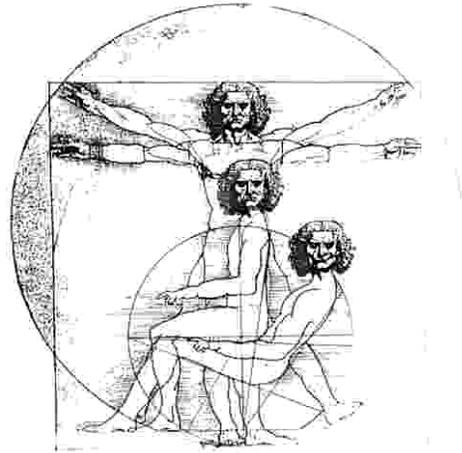
At what temperature does water vaporize?

212 degree F, 100 degrees C



How much of the human body is water? **66%**

Water also regulates the temperature of the human body, carries nutrients and oxygen to cells, cushions joints, protects organs and tissues, and removes wastes.



75% of the human brain is water.

How long can a person live without food?

More than a month



How long can a person live without water?

Approximately one week, depending upon conditions.



How much water must a person consume per day to maintain health?



2.5 quarts from all sources (i.e., water, food)



Does water regulate the earth's temperature?



Yes

Water regulates the Earth's temperature (it is a natural insulator).

How much water does a birch tree give off per day in evaporation?



70 gallons

75% of a living tree is water.

How much water does an acre of corn give off per day in evaporation? **4,000 gallons**



How much water does the average residence use during a year?

107,000 gallons

How much water does an individual use daily?



50 gallons

How much water is used to flush a toilet?

2-7 gallons



How much water is used in the average five-minute shower?



25-50 gallons

How much water is used to brush your teeth?

2 gallons



How much water is used on the average for an automatic dishwasher?

9-12 gallons



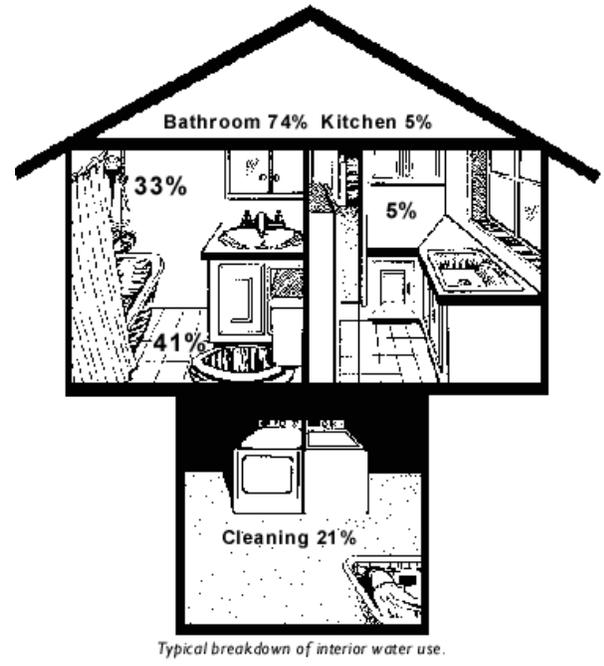
On the average, how much water is used to hand wash dishes?

20 gallons



What does a person pay for water on a daily basis?

National average is 25 cents



Is it possible for me to drink water that was part of the dinosaur era?



There is the same amount of water on Earth as there was when the Earth was formed. The water from your faucet could contain molecules that dinosaurs drank.

How much water does it take to process a quarter pound of hamburger?



Approximately one gallon.

How much water does it take to make four new tires?

2,072 gallons



What is the total amount of water used to manufacture a new car, including new tires?

39,090 gallons per car



How much water does it take to process one can of fruit or vegetables?

9.3 gallons



How much water does it take to make one board foot of lumber?

5.4 gallons



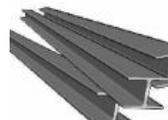
How much water does it take to refine one barrel of crude oil?

1,851 gallons



How much does it take to produce one ton of steel?

62,600 gallons



How much water does it take to process one ton of cane sugar to make processed sugar?

28,100 gallons



How many households use private wells for their water supply?



17,000,000 households

How many community public water systems are there in the United States?

56,000



What were the first water pipes made from in the US?



Fire charred bored logs

How many miles of pipeline and aqueducts are in the US and Canada?

**Approximately one million miles,
or enough to circle the earth 40 times**



How much water do these utilities process daily?



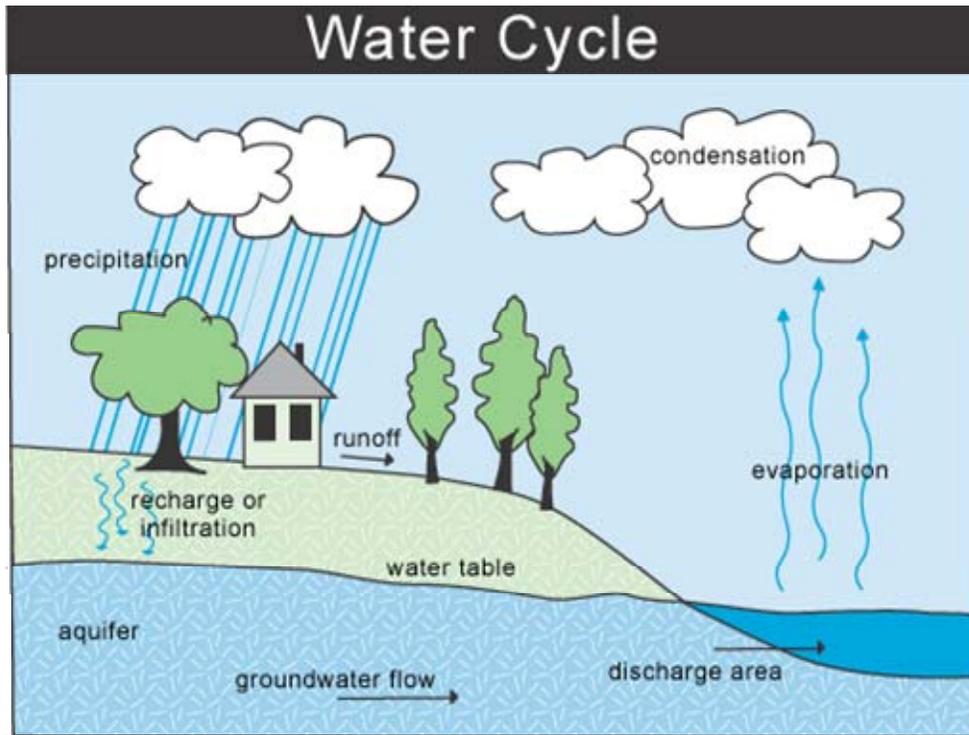
34 billion gallons

Water is part of a deeply interconnected system. What we pour on the ground ends up in our water, and what we spew into the sky ends up in our water.

If all community water systems had to be replaced, what would it cost?

In excess of \$175 billion





1. The process when water becomes a gas in the atmosphere is called _____.
2. The movement of water underground is called _____.
3. _____ is water that falls from clouds as rain or snow.
4. Water on the earth's surface which moves into a stream or lake without absorbing into the soil is called _____.
5. Groundwater is contained in layers of rock or sediment that is called a (an) _____.
6. _____ is the downward movement of water through the spaces of rock or soil; when surface water becomes groundwater.
7. The process when gas condenses to form clouds is called _____.
8. The top of the saturated zone is known as the _____.
9. The _____ is the area where groundwater enters a lake or stream.

(Answers on last page of handout.)

ANSWER KEY FOR WATER CYCLE FILL-IN

1. evaporation
2. groundwater flow
3. precipitation
4. runoff
5. aquifer
6. recharge or infiltration
7. condensation
8. water table
9. discharge area

testing might be warranted if your water has elevated nitrite/nitrate concentrations or significant amounts of pesticide have been applied near the well. These less-routine tests may not be performed at all state certified laboratories.

When To Test

DEP recommends that prospective homebuyers test the water in a home with a private well before purchase. Water quality in wells is generally stable, and if a change is going to occur, it occurs slowly. Thus the interval between water quality tests, once you've purchased the home, can generally be in terms of years (see chart) if a well is properly constructed and located in a safe area.

However, the following conditions would prompt more frequent testing:

- Heavily developed areas with land uses that handle hazardous chemicals.
- Recent well construction activities or repairs. DEP recommends taking a bacterial test after any well repair or pump or plumbing modification, but only after disinfection and substantial flushing of the water system.
- Contaminant concentrations above state or federal standards found in earlier testing.
- Noticeable variations in quality like a water quality change after a heavy rain, extended drought, or an unexplained change in a previously trouble-free well (i.e. funny taste, cloudy appearance, etc.).

When taking any sample, DEP recommends that it be taken after a heavy rain-storm. These events tend to highlight conditions of improper well construction or poor soil filtration.

What the Tests Tell You

Results will reveal the level at which any of the tested substances were found in your water sample. The mere presence of these contaminants in well water does not necessarily imply that there is a problem. However, when levels exceed state or federal health standards, you should take steps to correct the situation. Several methods are available from commercial contractors to treat contaminated water.

For More Information

As private wells in Massachusetts are regulated at the local level, you should first contact your local Board of Health for your town's private well testing requirements. For more information about private wells including additional water quality testing recommendations, you should refer to the *DEP Private Well Guidelines*, which are available on the Drinking Water Program's Publication web page. Other information such as the listing of state certified laboratories can also be accessed through the web page.

For additional assistance contact the DEP Drinking Water Program at:

**Massachusetts Department of
Environmental Protection Drinking Water Program**
1 Winter Street, 6th Floor
Boston, MA 02108
phone: 617-292-5770

www.mass.gov/dep

Protect Your Family

Test Your Well's Water Quality Today



A Guide to Water Quality Testing for Private Wells



Private Wells

If you have a private well, then water quality testing should be important to you and your family.

Some contaminants in drinking water have been linked to cancer and toxicity, posing a risk to human health. Many contaminants often have no taste, odor, or color. Their presence can only be determined by laboratory testing.

While there is no state requirement to have your well water tested (although there may be from your mortgage lender or local Board of Health), the Massachusetts Department of Environmental Protection (DEP) recommends that all homeowners with private wells do so, and use a state certified laboratory.

Contamination of Wells

Well water originates as rain and snow that then filters into the ground. As it soaks through the soil, the water can dissolve materials that are present on or in the ground, becoming contaminated.

Some contaminants are naturally occurring from features found in the rocks and soils of Massachusetts. These include substances like bacteria, radon, arsenic, uranium, and other minerals.

Other contaminants find their way onto the land from human activities. On a large scale, industrial/commercial activities, improper waste disposal, road salting, and fuel spills can introduce hazardous substances to the ground. However, even typical residential activities, such as the application of fertilizers and pesticides, fueling of lawn equipment, and disposal of household chemicals can contaminate

the ground when done improperly. Even an on-site residential septic system can pose a threat to your well. That is why taking measures to protect your well from contamination is so important.

Recommended Tests

The following tests provide only the most basic indicators of a well's water quality. These tests identify some of the common natural and man-made contaminants found in our state's well water. However, you should also consider nearby land uses to decide whether additional tests are appropriate for your well. *It is not necessary to do all of the tests at one time.*

💧 Standard Analysis

This basic analysis covers the most common contaminants. Some of these contaminants pose health-related concerns, while others only affect aesthetics (taste and odor).

💧 Radon

Radon can be a well water problem in Massachusetts, especially in bedrock wells. Presently, there are no federal or state standards for radon in drinking water, only suggested action levels. [Note: If Radon levels are elevated in your well water, you should also consider checking your indoor radon levels.]

💧 Gross Alpha Screen

Radioactive minerals, such as radium and uranium, may be dissolved in well water. A Gross Alpha Screen is a simple test to judge whether further testing for specific radioactive minerals such as radium or uranium might be needed.

Contaminants & Testing Frequency

Standard Analysis

Arsenic
Chloride
Copper
Fluoride
Hardness
Iron
Lead
Manganese
pH
Sodium

Testing Frequency

Monitor initially for all contaminants, and then at a minimum of once every ten years (except for bacteria and nitrate/nitrite which should be sampled yearly), or as otherwise required by the local Board of Health.

Coliform Bacteria
Nitrate/Nitrite
Radon
Gross Alpha Screen
(bedrock wells only)
VOCs

💧 Volatile Organic Compounds (VOCs)

The most common VOCs come from gasoline compounds (such as MtBE and benzene) and industrial solvents (such as TCE). MtBE can be found in well water even in remote areas.

💧 Additional Tests

Circumstances relative to your well may require additional testing not described here. For instance, DEP does not recommend frequent testing for things like pesticides, herbicides, or synthetic organic compounds, mainly because of the high cost. However, such (*cont. over*)