

NORTH SAGAMORE WATER DISTRICT



SOURCE WATER PROTECTION PLAN

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EXECUTIVE SUMMARY

The North Sagamore Water District Source Water Protection Plan (2026) outlines proactive strategies to safeguard groundwater sources for approximately 4,700 residents in Sagamore Beach, North Sagamore, and Bournedale from key contamination risks.

Developed with support from Mass Rural Water Association and aligned with MassDEP SWAP reports, it covers three wells (Beach Well, Black Pond Well, Church Lane Well) drawing from the Plymouth Carver Aquifer, with defined Zone I (400-ft radii) and Zone II areas totaling ~285 acres.

Key Protection Areas

The Beach Well Zone II (155 acres, most developed) faces the most serious threats to well contamination. The Zone II includes dense residential development, commercial businesses (along Old Plymouth Road/State Road), and heavy use MassDOT highway areas. Environmentally sensitive areas include flood prone wetlands in the eastern section, and the Herring River Watershed ACEC in the western section.

Black Pond (26 acres) and Church Lane (84 acres) Zones II are mostly forested and District-owned. Residences along Herring Pond, neighborhood roads, sections of powerlines, and areas of permeable soils heighten vulnerability, but there are no major highways, commercial buildings, or densely developed residential areas within these Zone II Wellhead Protection Areas.

Priority Risks and Strategies

- **Onsite Septic Systems:** All Zone II properties rely on septic systems; pursue voluntary inspections, zero/low-interest replacement loans, and education via Board of Health partnerships.
- **Deicing Agents:** Elevated sodium (>30 mg/L); formalize low-salt zones, install signage, snow dumping policies, BMP training (e.g., Green SnowPro), and DPW salt reduction plan.
- **Household Hazardous Waste (HHW):** Promote collection events, prescription drug drop-offs, and website updates targeting Zone II residents.
- **Safety/Security:** Update ERP/Vulnerability Assessments annually, add signage/video surveillance, strengthen MaWARN partnerships.
- **Zone II Businesses:** Enhance outreach, improve stormwater measures, spill kits/emergency response spill recovery, and training.

ACKNOWLEDGEMENTS

Funding for this process and development of a plan was provided to the Mass Rural Water Association through the Grassroots Source Water Protection Program developed by the National Rural Water Association (NRWA). The NRWA is a nonprofit organization dedicated to providing technical assistance, training, and support to water and wastewater professionals serving small and rural communities across the United States. Grassroots Source Water Protection Program funding was allocated to the National Rural Water Association by the United States Department of Agriculture's Farm Service Agency.

The Grassroots Source Water Protection Program is designed to support small water utilities in developing plans and implementing strategies to protect drinking water sources. This program is a statewide, community-based initiative that ensures environmentally progressive land use and educational decisions. This initiative empowers individuals who benefit from environmental protection to take responsibility for achieving it, ensuring its success, and mitigating local controversy.

The Mass Rural Water Association is grateful to the individuals and organizations that provided information essential for the development of this plan, especially the United States Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP).

Special thanks to Drew Buckley, Superintendent of the North Sagamore Water District, and the staff and board members of the North Sagamore Water District for their exceptional efforts in providing clean, safe drinking water and protecting the North Sagamore Public Water System's Wellhead Protection Areas.

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INTRODUCTION

Despite our best efforts to protect drinking water sources, accidental releases of hazardous chemicals are common; bacterial outbreaks occur unexpectedly; and everyday human activities, intentional or unintentional, generate complex problems that impact our water resources. These contamination events may result in costly treatment and remediation or could permanently destroy a drinking water source. In worst-case scenarios, drinking water contamination may injure or kill citizens in our communities.

Proactive planning, to protect our water resources, can provide numerous and diverse benefits, including increased consumer confidence; a reduced likelihood of contamination incidents with costly, potentially harmful consequences; stable relationships among water suppliers, regulatory agencies, and the public; and enhanced data and support for federal, state, and local financial assistance programs.

To help protect Public Water Systems, such as the North Sagamore Water District Public Water System, the Federal Safe Drinking Water Act (SDWA) Amendments of 1996 require each state to conduct a Source Water Assessment Program (SWAP) report for Public Water Systems. The SWAP reports were completed in Massachusetts in 2003 and helped characterize the susceptibility of public drinking water sources to contamination by summarizing information on activities and land uses within source-water recharge areas. The goal of the SWAP was to use proactive planning to emphasize the importance of source water protection as a pollution prevention tool.

As part of the SWAP program, the Massachusetts Department of Environmental Protection (MassDEP) assisted in the delineation of Wellhead Protection Areas (areas important for protecting groundwater recharge areas) for Public Water Systems in Massachusetts and identified various land uses and activities that may be Potential Sources of Contamination (PSOC) within those areas.

The delineated Wellhead Protection Areas in Massachusetts are categorized as Zone I Wellhead Protection Areas and Zone II Wellhead Protection Areas.

The Zone I Wellhead Protection Area, or initial protective buffer around a Public Water System, is either calculated using a formula based on the pumping rate, in gallons per day, or defers to a default radius on systems with approved yields of 100,000 gallons per day or greater, tubular wellfields, and specific systems without a metered rate of withdrawal or no approved pumping rate.

Zone II Wellhead Protection Areas are defined in the Massachusetts drinking water regulations (MGL 310 CMR 22.02) as: “the area of an aquifer which contributes water to

a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation).” Zone II delineations, to be approved in Massachusetts, require analyses of land use, topography, hydrology, hydrogeology, and stratigraphy.

Upon completion of delineating Wellhead Protection Areas (Zone I and Zone II) and the initial identification of Potential Sources of Contamination in these areas, MassDEP encourages all Public Water Systems to build upon the SWAP and develop a Source Water Protection Plan.

A Source Water Protection Plan is a proactive planning tool developed to help Public Water Systems identify additional water system vulnerabilities, beyond the recommendations in the SWAP, and to create specific techniques and actions to manage land uses and Potential Sources of Contamination at or near drinking water sources. Management techniques and source water protection actions implemented by water system managers, landowners, and community partners, ultimately become the key to achieving long-term, comprehensive source water protection.

The purpose of this Source Water Protection Plan is to identify additional vulnerabilities and Potential Sources of Contamination that may threaten the Wellhead Protection Areas of the North Sagamore Water District's Public Water System and to provide specific recommendations and guidance to the North Sagamore Water District, homeowners, and community members to protect and maintain their high-quality drinking water.

This Source Water Protection Plan builds on information from the Massachusetts Department of Environmental Protection SWAP reports, other primacy agency directives, and available land-use and source-water protection information about the North Sagamore Water District Public Water System.

This Plan provides an overview of the Public Water System, Potential Sources of Contamination, management strategies to reduce immediate and long-term threats, an action plan, and maps of the Wellhead Protection Areas of the North Sagamore Water District Public Water System.

This plan is a working document intended to be reviewed annually by the North Sagamore Water District and updated every five years to ensure it remains current, active, and viable.

SYSTEM DESCRIPTION

The North Sagamore Water District is located in the Town of Bourne, Massachusetts. Bourne is located approximately 60 miles southeast of Boston, Massachusetts, and 55 miles east of Providence, Rhode Island. It is comprised of a total area of 52.82 square miles and a total land area of 40.90 square miles, which includes 15 square miles located in the Joint Base Cape Cod (JBCC) and the National Cemetery.

The Town of Bourne is a medium-sized rural community rich in cultural and natural resources, home to the Cape Cod Canal, widely known as the “Gateway to Cape Cod,” and consists of ten villages: Buzzards Bay, Bournedale, North Sagamore, Sagamore Beach, Sagamore, Bourne Village, Gray Gables, Monument Beach, Cataumet, and Pocasset are the villages of Bourne.

Residents of Bourne identified maintaining water quality as the highest priority issue in the town. This was reflected in both the planning workshops and the community survey conducted in preparation for the Town of Bourne Comprehensive Plan.

In Bourne, nearly 98% of the residents receive drinking water from three Water Districts: Buzzards Bay Water District, Bourne Water District, and North Sagamore Water District.

The North Sagamore Water District is located on the north side of the Cape Cod Canal and provides drinking water to residents in the northeastern section of Bourne (villagers in Sagamore Beach, North Sagamore, and Bournedale). The North Sagamore Water District serves approximately 4,700 people (~23% of the population) and is currently supplied by three active gravel-packed wells.

The three North Sagamore Water District wells: Beach Well (Well #1-installed in 1958), Black Pond Well (Well #2-installed in 1979) and Church Lane Well (Well #3-installed in 2001) are also located on the north side of the Cape Cod Canal. The North Sagamore Water District pumps approximately 160 million gallons of water per year from these three sources. The wells tap into the high-yield Plymouth Carver Aquifer. The Plymouth Carver Aquifer is one of the largest in the state, with a potential yield of 300 gallons per minute per well and a total storage capacity of 540 billion gallons of water.

After being pumped from the aquifer, drinking in the North Sagamore Water District is treated with potassium permanganate (for iron and manganese), sodium hydroxide (for Ph adjustment), and sodium hypochlorite (for disinfection) at the James A. Morgan Water Treatment Plant located on Church Lane. The water is then distributed into a distribution system that includes:

- 1,974 service connections (all connections are metered)
 - 1905 Residential Connections
 - 60 Commercial connections
 - 9 Municipal connections
- Three water storage tanks (1.8 million-gallon total capacity).
- Forty-five miles of water main with four pressure zones
- Two booster pump stations.
- 32 cross connection devices

The North Sagamore Water District is overseen by an elected Board of Water Commissioners, comprised of three members. One member is elected each year to serve a three-year term. The Water Commissioners have exclusive charge and control of the North Sagamore Water District and Public Water System, subject to federal, state, and local regulations.

The North Sagamore Water District Public Water System is classified as a Community Public Water System by the Massachusetts Department of Environmental Protection because it regularly serves at least twenty-five year-round residents. The distribution system is rated as Class II-D because it serves a population of 1,501 to 15,000. The treatment facility is rated as Class 2-T under the Massachusetts Code of Regulations for Drinking Water, 310 CMR 22.11B(4)(a).

ZONE I AND ZONE II SOURCE WATER PROTECTION AREAS

Zone I

The wells in the North Sagamore Water District are highly vulnerable to contamination due to permeable soils and the absence of hydrogeologic barriers (such as clay) that can prevent contaminant movement into aquifer recharge areas.

To protect these drinking water sources, all three of the North Sagamore Water District's water supply wells (Beach Well, Black Pond Well and Church Lane Well) have a MassDEP approved and protected 400-foot radius surrounding them, known as Zone 1 Wellhead Protection Area.

The Department of Environmental Protection requires Public Water Systems to own or control the Zone I Wellhead Protection Areas and to limit activities in Zone I to those directly related to the provision of the water supply or to activities that will have no significant adverse impact on water quality.

MassDEP also requires that all Zone I activities be limited to those directly related to the water supply or have no significant impact on water quality. The North Sagamore Water District does not currently meet the Zone I requirement-the Beach Well and Black Pond Well each have a road (Pilgrim Road and Black Pond Road, respectively) passing through the associated Zone I. Therefore, the North Sagamore Water District must notify MassDEP if it plans to modify, increase water use, expand its source, or replace any wells. At the time of such notification of a proposed modification, expansion, or replacement, MassDEP may require the North Sagamore Water District to comply with the Zone I requirement.

Zone II

The three wells also have Zone II Wellhead Protection Areas as defined in the Massachusetts drinking water regulations (MGL 310 CMR 22.02): "the area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation)." Zone II delineations, to be approved in Massachusetts, require analyses of land use, topography, hydrology, hydrogeology, and stratigraphy.

Together the three Zone II Wellhead Protection Areas cover approximately 0.4 square miles (285 acres). Each of the Zone II's were delineated using conceptual modeling techniques. This included an analysis of available pump test records to estimate aquifer hydraulic properties and a review of existing maps to identify hydrogeologic features, such as aquifer boundaries and regional groundwater flow patterns.

Beach Well (Well #1) Zone I and Zone II

The Beach Well Zone I is a 400 foot radius around the well. Most of the Zone I is forested. The outermost portion of the Zone I, 300-400 feet from the well, on the southern and western edges, contains a section of Pilgrim Road and small sections of ten different residential parcels (off Pilgrim Road and Williston Road).

The Beach Well Zone II Wellhead Protection Area is the largest, and most developed, Zone II in the North Sagamore Water District. The Zone II is a long, thin section of residential and commercially developed land, approximately 155 acres in size, which bisects the northeastern section of the Town of Bourne in a general east/west direction.

The far western section of the Beach Well Zone II is in the Town of Plymouth. The western portion of the Zone II is heavily forested, with a few residences along Herring Pond, and includes a section of the South Coast Creations excavating yard. The western portion is bisected by an Eversource powerline corridor. The central section of the Beach Well Zone II mostly consists of a highway, major thruways, and businesses. The eastern section is covered in densely developed residential areas, and the far eastern section of the Beach Well Zone II, the area close to the Cape Cod Bay, is comprised of a large wetland area that is also classified as AE flood zone on the FEMA map. AE flood zones are areas that present a 1% annual chance of flooding.

The Beach Well Zone II is approximately two miles in length and is narrow, averaging around 200 feet in width. Ninety percent (139 acres) of the Beach Well Zone II Wellhead Protection Area is in the Town of Bourne, and ten percent (16 acres) is in the Town of Plymouth. There are approximately 145 structures in the Zone II, and the land is divided into 201 individual parcels. There are 187 parcels in North Sagamore and 14 in the Town of Plymouth. Eight different parcels are classified as permanently protected land and comprise approximately 43 of the 155 acres (28% of the Zone II). One of the permanently protected parcels, in the eastern portion, is the Clark Road Playground, which includes ballfields, tennis courts and a playground. Additionally, 38 acres, in the western portion of the Zone II, in both Bourne and Plymouth, are within the Massachusetts Department of Conservation and Recreation (DCS) designated Herring River Watershed Area of Critical Environmental Concern.

Areas of Critical Environmental Concern (ACECs) are places in Massachusetts that receive special recognition because of the quality, uniqueness, and significance of their natural and cultural resources. The purpose of the Areas of Critical Environmental Concern (ACEC) Program is to preserve, restore, and enhance critical environmental resources and resource areas of the Commonwealth of Massachusetts. The goals of the program are to identify and designate these ecological areas, to increase the level of protection for ACECs, and to facilitate and support the stewardship of ACECs.

The Herring River Watershed ACEC totals 4,450± acres within the Towns of Bourne and Plymouth and was designated as an ACEC on November 5, 1991. Within the Town of Bourne, it contains three ponds, freshwater wetlands, cranberry bogs, and protected open space. It is home to a significant anadromous fish run, with Great Herring Pond supporting a regionally important recreational fishery. Additionally, this ACEC lies within the Plymouth Carver Sole Source Aquifer, and is therefore critical to public water supply. Several of the state-listed species previously discussed, including eastern box turtle, are also present. In addition to these natural resources, the Herring River Watershed ACEC is also believed to be the core habitation area for a Wampanoag settlement.

There are approximately seven and a half (7.5) miles of roads in the Beach Well Zone II. The Pilgrim's Highway (the part of Route 3 that stretches from the intersection with US 6 in Bourne to the junction with Interstate 93 in Braintree) bisects the Beach Well Zone II in the central section, and is a MassDOT managed four lane freeway. Other major roadways (all located in the central section) include Old Plymouth Road and State Road. This area also includes several businesses including: a towing and transport company, automotive repair, training facility, law offices, power, and equipment company, disposal services, autobody restoration services, electrical shop, plumbing and heating, garbage collection services, custom woodworking shop, mulch and stone yard, tire company, landscaping company, marine dealer, and boat restoration, and more.

Currently, there are no MassDEP Oil and/or Hazardous Material Sites with Activity and Use limitations, no MassDEP Tier Classified Chapter 21E Sites, and no underground storage tanks registered with MassDEP.

Black Pond Well (Well #2) Zone I and Zone II

The Black Pond Well Zone I is a 400 foot radius around the well that includes approximately one-half of Black Pond; the remainder of the Zone I is forested, except a small section of the Eversource powerline corridor located in the in the outer area (350-400 feet) of the northwest section.

The Zone II Wellhead Protection Area for the Black Pond Well is the smallest Zone II in the North Sagamore Water District. The Black Pond Well Zone II is a circular area of undeveloped forest, approximately 26 acres in size, located south of the far western section of the Beach Well Zone II Wellhead Protection Area. The entire Black Pond Zone II is in the Town of Bourne. The western section of the Zone II abuts Great Herring Pond, and the well is located at the northern tip of Black Pond.

The Zone II is approximately twelve hundred feet (east to west) and one thousand feet (north to south). There are seven residential structures in the Zone II along Great Herring Pond. The land is divided into twelve individual parcels. The largest parcel, making up

approximately one half of the Zone II is owned by the North Sagamore Water District, and is classified as permanently protected land. The entire Zone II is in the Herring River Watershed Area of Critical Environmental Concern.

There is approximately one mile of roadway in the Black Pond Well Zone II. Currently, there are no MassDEP Oil and/or Hazardous Material Sites with Activity and Use limitations, no MassDEP Tier Classified Chapter 21E Sites, and no underground storage tanks registered with MassDEP.

Church Lane Well (Well #3) Zone I and Zone II

The Church Lane Well Zone I is a 400 foot radius around the well that is 95% forested. A solar array connected to the James A. Morgan Water Treatment Plant is within the southeast section of the Zone I.

The Church Lane Zone II Wellhead Protection Area is the second largest, and least developed, Zone II in the North Sagamore Water District. The Church Lane Well Zone II is an ovular section of land that is mostly undeveloped, approximately 84 acres in size, directly abutting the north side of the Black Pond Zone II and south of the western section of the Beach Well Zone II. The far western section of the Church Lane Well Zone II is in the Town of Plymouth. The well is in the far eastern section of the Zone II at the end of Church Lane (next to the James A. Morgan Water Treatment Plant).

The Church Lane Zone II is approximately seventeen hundred feet (east to west) and fifteen hundred feet (north to south). There are seven structures in the western section of the Zone II along Great Herring Pond, and the land is divided into fifteen individual parcels (seven in Bourne and 8 in the Town of Plymouth). Most of the land, making up approximately ninety percent of the Zone II is forested and owned by the North Sagamore Water District; the land is classified as permanently protected land. The entire Zone II is in the Herring River Watershed Area of Critical Environmental Concern.

There are approximately 1.27 miles of roadways in the Church Lane Well Zone II. Currently, there are no MassDEP Oil and/or Hazardous Material Sites with Activity and Use limitations, no MassDEP Tier Classified Chapter 21E Sites, and no underground storage tanks registered with MassDEP.

POTENTIAL SOURCES OF CONTAMINATION

The Environmental Protection Agency (EPA) promulgates a list of Regulated Drinking Water Contaminants, which is a list of approximately ninety federally regulated drinking water contaminants, their Maximum Contaminant Levels (legal threshold limit on the amount of substance that is allowed in Public Water Systems), their likely sources, and their potential health effects from acute or long-term exposure.

As a condition of primacy, the Massachusetts Department of Environmental Protection (MassDEP) can create stricter Maximum Contaminant Levels and add contaminants to the list for Public Water Systems in the Commonwealth of Massachusetts.

The listed contaminants can be found throughout most watersheds in the United States and originate from various sources, including Household Hazardous Waste, deicing agents, wastewater, stormwater, and agricultural products such as fertilizers, pesticides, fungicides, and herbicides.

These contaminants, or Potential Sources of Contamination (PSOCs), can be odorless, tasteless, and colorless. Often, the only way to detect these contaminants is through water quality testing. Individually, these Potential Sources of Contamination may appear insignificant, but, cumulatively, over time, they can pose a serious risk to the long-term quality of our drinking water. If detected, contaminants can be challenging and expensive to remediate. A contaminated water source may be too costly to rehabilitate or may never be suitable for drinking again. Reducing Potential Sources of Contamination through proactive planning is essential for the long-term protection of our sources.

Planning for the protection of the North Sagamore Water District's drinking water source, within the Zone I and Zone II Wellhead Protection Areas, involved analyzing and understanding the social, political, and economic climate, as well as reviewing regulations, policies, procedures, and the built and natural environments. The process revealed numerous threats to drinking water throughout this entire diverse and complex watershed.

The Potential Sources of Contamination listed in this plan are by no means the only threats to the drinking water source within the Zone I and Zone II Wellhead Protection Areas. However, based on their potential threat to the three wells, and the goal of implementing realistic and achievable management strategies for the North Sagamore Water District, the following five Potential Sources of Contamination have been selected for this plan.

PSOC #1 ONSITE SEWAGE DISPOSAL SYSTEMS

The Massachusetts Department of Environmental Protection (MassDEP) reports that the percentage of homes in Massachusetts with septic systems is much higher than the national average, and the failure rate, often due to the age of the system, is also significantly higher than the national average. Failure can lead to fecal bacterial contamination, which is a leading source of water-quality impairment in the United States, particularly affecting groundwater, and drinking-water wells in rural and suburban areas. Bacterial contamination is usually caused by failing systems that discharge untreated wastewater containing pathogens (e.g., *E. coli*), nutrients, and other harmful substances directly into the groundwater or onto the ground, ultimately entering surface waters.

Common issues that cause septic system failure include aging infrastructure, improper design, overloading, and inadequate maintenance. However, professionally designed, well-maintained, and properly functioning systems also fail because they cannot properly treat modern-day cleaners, chemicals, and other Household Hazardous Waste.

Unfortunately, it is incredibly challenging to identify improperly functioning or failing septic systems, and such failures are often detected only after a contamination event. Regular septic system inspections are the easiest way to determine whether a system is functioning correctly. Maintaining an appropriately functioning septic system is crucial for the health and safety of both the community and the environment. According to the Environmental Protection Agency, a septic tank should be inspected every 1 to 3 years and pumped every 3 to 5 years. The frequency of pumping the septic tank depends on the tank size, the number of people in the household, water-use habits, and the amount of solids accumulated in the tank. Some alternative systems, which are more complex, may require more frequent inspections or pumping.

Each state has its own set of regulations and code requirements regarding septic systems. In Massachusetts, the Title 5 septic system regulations do not require a pumping schedule and only require septic system inspections for the following:

- Within two years before the sale of a home. If weather conditions prevent inspection during a sale, the inspection must occur within six months afterward.
- When a proposed change to a facility requires a building or occupancy permit.
- Any change in a building's footprint ensures that new building construction will not take place on top of any system components or the system's reserve area.
- For large systems with a design flow of 10,000 to 15,000 gallons per day or more at full build-out, on the basin schedule shown in 310 CMR 15.301(6), and every five years thereafter.
- Every three years for shared systems.

- When the property is divided, or ownership of two or more properties is combined.
- When MassDEP or the local Board of Health orders an inspection.

In the North Sagamore Water District, all the residences and businesses in the Zone II Wellhead Protection Areas rely on septic systems to treat their waste. The condition, maintenance, and performance of these septic systems are generally unknown, many are likely approaching or have already reached the end of their life cycle.

Since Massachusetts does not require regular pumping of systems or septic system inspections, local inspection programs, guidance on proper maintenance, and educational efforts are crucial and are the most effective and cost-efficient methods to prevent contamination of our drinking water supplies.

MANAGEMENT STRATEGIES PSOC #1 ONSITE SEWAGE DISPOSAL SYSTEMS

Codevelop a Voluntary Septic System Inspection Program

It is recommended that the North Sagamore Water District collaborate with the Town of Bourne Board of Health to develop a voluntary septic system inspection program for residents within the Zone II Wellhead Protection Area. The Massachusetts Community Septic Management Program provides low-cost loans to communities to devise small, local septic system inspection and management plans. Local inspection plans are designed to protect environmentally sensitive areas from contamination and to identify areas that require monitoring and maintenance. The communities, in turn, may receive state funding for system upgrades and funding for low-interest/no-interest betterment loans for eligible homeowners through their local Boards of Health.

Collaborate With the Board of Health on the Community Septic Loan Program

The North Sagamore Water District should work with the Town of Bourne to establish a Community Septic Loan Program, a fund that provides low-interest/no-interest loans to residents with failed septic systems, helping to bring these systems into compliance through the Board of Health. Local, low-interest, or zero-interest loans offer a financial partnership between a homeowner and the community. The agreement outlines the rights and responsibilities of the community and the homeowner regarding the repair, replacement, or upgrade of the homeowner's on-site system. This is a highly successful program that many Massachusetts cities and towns offer to their residents.

Provide Guidance on State and Federal Financial Assistance Opportunities

It is recommended that the North Sagamore Water District collaborate with the Board of Health to help property owners understand and access information on financial incentives and assistance for septic system repairs and upgrades. Examples of septic system financial assistance and incentive programs include:

- The Commonwealth of Massachusetts Homeowner Septic Loan Program, which offers a bank loan program for homeowners whose systems have failed Title 5 inspection; participating banks offer low interest rates to eligible homeowners through the MassHousing Program.
- The Commonwealth of Massachusetts septic system tax credit. Massachusetts offers a Title 5 Septic System Tax Credit for homeowners needing to repair, replace, or upgrade a failed septic system or connect to sewer, providing 40% of eligible costs up to \$15,000, for a maximum credit of \$6,000, claimable over four years at \$1,500 annually, applicable to owner-occupied primary residences

- The Federal Farmers Home Administration (FHA) offers low-cost financing for septic system repairs and upgrades.

Distribute Educational Pamphlets to Key Stakeholders

It is recommended that the North Sagamore Water District collaborate with the Town of Bourne Board of Health and other boards and committees to inform septic system owners in the Zone II Wellhead Protection Area of how a septic system works, how to care for it, what not to put in the system, and the connection between septic systems and drinking water. The North Sagamore Water District should annually send septic system educational flyers to homeowners within the Zone II Wellhead Protection Area.

The Mass.gov website on Septic Systems and Title 5 has excellent information on septic system maintenance, upgrades, repairs, additives, and financial options. A link to the Mass.gov website should be added to the North Sagamore Water District and Town of Bourne Board of Health web pages.

PSOC #2 DEICING AGENTS

Snowfall events in Massachusetts, combined with the need for commuting and overland travel, necessitates the use of plows and the spreading of de-icing agents to quickly remove snow and ice buildup and keep roadways safe during the winter.

Deicing agents come in many forms. Common chloride road salts are inexpensive and relatively easy to procure; these include sodium chloride, magnesium chloride, calcium chloride, and potassium chloride. Salt-free deicing agents such as calcium magnesium acetate (CMA), potassium acetate, and sodium formate are more expensive and typically more challenging to obtain in large quantities. Salt-free deicing agents are generally less impactful to water sources and our drinking water. More innovative and environmentally sensitive products have recently been developed and evaluated on roads throughout the Commonwealth; these include bio-based products such as beet juice and various types of glycerol that reduce water's freezing point by disrupting ice formation through hydrogen bonding.

All these agents, salt-based, salt-free, or environmentally sensitive, can be purchased in bulk in granular form, brine, or a combination (pretreated). Whatever a town decides to purchase and apply on their roads, deicing agents are necessary to reduce snow adhesion to the pavement, prevent ice formation, and keep the snow in a "mealy" condition to permit removal of snow and ice by plowing.

Rock salt (sodium chloride), typically referred to as "road salt," has a long history of use in effectively treating roadways during winter in Massachusetts. Road salt is highly effective at melting snow and ice and is inexpensive. The unrealized cost of using road salt is the issue – in large quantities, it can harm wildlife, contribute to soil erosion, severely corrode infrastructure and vehicles, and contaminate drinking water supplies.

According to the National Research Council's study, "Environmental Impacts of Road Salt and Other Deicing Chemicals," due to severe winter conditions, Massachusetts tops the list of states with the highest road salt use, at 19.94 tons per lane mile each year, surpassing New York, which uses 16.6 tons per lane mile. Nearly 500,000 tons of road salt are used annually in Massachusetts alone for snow and ice control.

The winters in the Town of Bourne are very cold, snowy, and windy. The town averages around 10 to 30 inches of snow annually, with amounts significantly varying year to year due to the moderating influence of the Atlantic Ocean, though some winters bring heavier, localized "ocean-effect" snow. The town is also a busy residential town with a relatively high volume of traffic. According to the U.S. Census Bureau, approximately 90% of residents in Bourne drive to work, which is 28% higher than the average percentage of commuters in Massachusetts towns. Additionally, Census Bureau statistics show that 79% of Bourne commuters drive alone, and only 11% percent carpool.

Based on the cold, snowy and windy winter weather conditions, and the busy traffic patterns, the Bourne Department of Public Works diligently clears and manages the roadways twenty four hours by plowing and treating with road salt (sodium chloride) to provide safe driving conditions for residents and visitors.

The Bourne Department of Public Works ensures the roads are safe and continually strives to improve practices to protect drinking water and the Wellhead Protection Areas. This is achieved by reducing unnecessary salt usage, utilizing new technologies, and implementing strategies outlined in the Town of Bourne Stormwater Pollution Prevention Plan. Unfortunately, even cautious, and prepared Public Works Departments cannot prevent impervious roadway surfaces from transporting stormwater laden with de-icing materials, petroleum-based chemicals, and other contaminants from roads to wetlands, streams, rivers, and groundwater sources.

Water and drinking water contamination from road salt is a serious concern. According to North Sagamore Water District Consumer Confidence Reports, sodium levels in drinking water have been above the Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (MassDEP) advisory levels (over 30 mg/L) for over a decade. Excess road salt deposited in the Zone II Wellhead Protection Area could raise the levels of sodium and chloride, which could affect the taste, odor, and color of drinking water, and pose a health concern for individuals on salt-restricted diets and those undergoing treatment for certain heart conditions, circulatory or kidney diseases, or cirrhosis of the liver.

A Framework for Assessing the Impacts of Road Salt on Groundwater Supplies in Massachusetts, conducted by the Worcester Polytechnic Institute, concluded the following:

- Many groundwater sources in Massachusetts currently have sodium concentrations above the USEPA recommendation of 20 mg/L. For each year of the project's six-year duration (2010-2015), more than half of the sources with water test records in the MassDEP databases did not meet the USEPA guideline for dissolved sodium, 20 mg/L.
- Sodium concentrations of groundwater wells throughout Massachusetts have been consistently increasing.

In response to the significant amount of salt and de-icing contamination in Massachusetts, the Massachusetts Department of Transportation (MassDOT) conducted a three-year study (2013-2016) to evaluate its Snow and Ice Control Program, identify measures that would improve the efficiency and effectiveness of deicer material usage, and reduce material costs for municipalities.

The study focused on five key areas:

- Material usage reporting procedures by route and event.
- Employee and contractor training
- Equipment calibration
- Route optimization.
- Equipment and technology upgrades.

Specific recommendations included:

- Increasing the use of GPS/AVL-enabled closed-loop controllers.
- Installing wireless data transfer stations.
- Reducing or eliminating salt and sand use in Reduced Salt Zone areas.
- Enhancing training and coordination with state police personnel.
- Utilizing route optimization software to eliminate route overlaps and redundant treatment applications.

According to the study, fully integrating the recommended measures could result in substantial cost savings for communities and significantly reduce the annual use of de-icing materials.

Below are recommendations that could reduce costs and deicing material usage while decreasing sodium and chloride levels within the Zone II Wellhead Protection Area of the North Sagamore Water District. The recommendations are based on the National Research Council, the University of New Hampshire, MassDEP Guidelines, and the MassDOT Snow and Ice Control Program, and the Department of Conservation and Recreation Watershed System Salt Reduction Program.

MANGEMENT STRATEGIES PSOC #2 DEICING AGENTS

Develop a Town of Bourne Road Salt Reduction Plan with the Department of Public Works and the Mass Rural Water Association

A road salt reduction plan aims to minimize the amount of road salt used during winter weather. The plan focuses on reducing sodium levels and mitigating environmental damage caused by excessive chloride levels in waterways while maintaining safe driving conditions by preventing ice formation on roads. This is achieved by implementing strategies such as targeted application techniques, alternative de-icing materials, advanced assessment and application procedures, modern plow, and deicing technology improvements, and educating road crews on best practices for salt usage. Additionally, a road salt reduction plan can include outreach to private landowners and businesses in the Zone II Wellhead Protection Areas in the Town of Bourne.

Formalize Low Salt/Salt Reduction Areas in the Zone II Wellhead Protection Areas

Currently, with the use of road salt as the deicing agent, the only way to prevent sodium and chloride from reaching groundwater is to reduce the amount applied to the roadways, parking lots, and sidewalks in the Zone II Wellhead Protection Areas. When road salt dissolves in water, the chloride and sodium molecules not retained by the soil are carried away by the water. Molecules not removed by chemical reactions, evaporation, or vegetative uptake will eventually end up in groundwater supplies.

It is recommended that the North Sagamore Water District continue to collaborate with the Bourne Highway Department to identify reduced or low-salt areas for town-maintained roads within the Zone II Wellhead Protection Areas.

An example of a successful salt reduction program is the Cambridge Water District Watershed Division in Cambridge, Massachusetts. After concentrations of chloride in samples from the Cambridge drinking-water source area exceeded aquatic-life guidelines for chloride, and the Massachusetts Department of Environmental Protection drinking water guideline for sodium, the Cambridge Water District began working with the United States Geological Survey (USGS) to collect and analyze water quality data to characterize better and understand their deicing material impacts in the water supply protection areas. The District used the data to identify low-salt areas and develop salt reduction strategies, which have significantly reduced the amount of de-icing materials in their watershed. Ultimately, they have drastically reduced the sodium and chloride levels in their drinking water. Cambridge is continuing to build on its success by improving their public education strategies and providing recommendations on salt-reduction strategies for other watershed stakeholders.

Improve Road Signage Near Wells and Within Zone II Wellhead Protection Areas

The Mass Department of Transportation (MassDOT) study on Operational Factors that Affect Road Salt Usage and the Effectiveness and Efficiency of Salt Spreading Operations and Equipment stated that, according to a survey of 174 MassDOT snow and ice removal personnel, 82% indicated that they believed reduced salt message signs would be helpful in modifying driving behavior.

Road signage is a straightforward educational strategy that will reduce contamination in the Zone II Wellhead Protection Area in the North Sagamore Water District in the Town of Bourne. The installation of signage in the critical areas of the Zone II Wellhead Protection Area could drastically reduce salt contamination and improve driver behavior while also providing accessible emergency contact information in the event of a spill or acute contamination incident.

Formalize Snow Dumping Locations to be Located Outside of Zone II Wellhead Protection Areas

It is recommended that the North Sagamore Water District work with the Town of Bourne Department of Public Works and local businesses to remove snow dumping areas within the Zone II Wellhead Protection Area and/or develop formal Snow Dumping Policies in the Zone II Wellhead Protection Area. Snow dumping in areas that drain into surface waters is regulated through the Massachusetts Small MS4 General Permit. However, the permit does not address the long-term protection of groundwater in Zone II Wellhead Protection Areas.

MassDEP has developed guidance for communities on snow disposal. The key to selecting effective snow disposal sites is to locate them on or adjacent to pervious surfaces in upland areas, away from water resources and wells. At these locations, the snowmelt water can filter into the soil, leaving behind sand and debris that can be removed in the spring. The following areas should be avoided:

- Avoid dumping snow into any waterbody, including rivers, reservoirs, ponds, or wetlands.
- Do not dump snow within a Zone II of a public water supply well or within seventy-five feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow on designated high and medium-yield aquifers, where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snowmelt water will create more contaminated leachate in landfills, posing a greater risk to groundwater. In gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris can block a

storm drainage system, leading to localized flooding. A high volume of sand, sediment, and litter released from melting snow may also be quickly transported through the system into surface water.

In addition to carefully selecting disposal sites before winter begins, it is essential to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- To filter pollutants out of the meltwater, a 50-foot vegetative buffer strip should be maintained during the growth season between the disposal site and adjacent water bodies.
- Debris should be cleared from the site before using the site for snow disposal.
- Debris should be cleared from the site and properly disposed of at the end of the snow season.

Implement Innovative Best Management Practices/Training

It is recommended that the North Sagamore Water District continue working with the Town of Bourne Department of Public Works to research and implement innovative Best Management Practices, training, and salt-reduction strategies to protect the Zone II Wellhead Protection Areas. Simple improvements, such as upgrading to live-edge plows (Spring loaded carbide cutting edges that feature lateral floating motion that engage as users plow over surface variations), and prewetting rock salt prior to application, are inexpensive examples of strategies that can have a drastic effect on sodium and chloride levels in drinking water.

Driver training, including training for contract employees, can also significantly reduce the amount of de-icing materials applied in Zone II Wellhead Protection Areas.

Training should include understanding advancements in de-icing technology, such as plow truck GIS-based spreaders, pavement temperature monitoring systems, live-edge plow systems, pre-wetting, brine solutions, and alternative deicing solutions.

It is recommended that all employees participate in the New Hampshire Department of Environmental Services (NHDES) Green SnowPro Program training, offered through the University of New Hampshire. This program includes snow and ice training and certification in state-of-the-art salt-reduction practices that prioritize public safety while minimizing salt use. The trainings are designed to help reduce budgets, track winter maintenance costs, improve the efficiency and effectiveness of maintenance activities, and protect natural resources. NHDES also provides free access to its publication library, which includes current Best Management Practices manuals on topics such as salt application, anti-icing, brine production, hydraulic-run spreader calibration, pre-wetting, material storage, and related subjects.

PSOC #3

HOUSEHOLD HAZARDOUS WASTE

Hazardous products and chemicals are used in the home every day. When discarded or flushed into wastewater and septic systems, these products become Household Hazardous Waste (HHW). HHWs are discarded materials and products that are ignitable, corrosive, reactive, toxic, or otherwise listed as hazardous by the U.S. Environmental Protection Agency (EPA).

The EPA estimates that the average American household generates approximately 20 pounds of HHW each year, and products used and disposed of by a typical household may contain more than 100 hazardous substances. These chemicals can contaminate soil and drinking water sources. Education is a key factor in reducing the potential contamination of drinking water sources.

An example of potentially toxic products that many consumers are unaware of, and qualify as Household Hazardous Waste, is cosmetics (beauty products). Cosmetics and other personal care products are subject to less government oversight than other consumer products. According to the California Department of Public Health Safe Cosmetics Program, from 2009 to 2019, 595 cosmetics manufacturers reported using eighty-eight chemicals in more than 73,000 products that have been linked to cancer, congenital disabilities, or reproductive harm.

Numerous other household items also qualify as Household Hazardous Waste; examples include household cleaners, prescription drugs, oil and automotive supplies, paints, thinners, stains, and varnishes, fuels, and pesticides, herbicides, rodenticides, fertilizers.

Improper disposal of these everyday items is a common occurrence. Improper disposal includes pouring down the household drains, onto the ground, into storm drains, or, in some cases, disposing them with the regular trash. The dangers of such disposal methods may not be immediately apparent, but spills and improper disposal of these wastes can go unnoticed and pollute the environment, posing a threat to drinking water and human health.

Prescription drugs are another example of Household Hazardous Waste that is a part of daily life for most people in the United States.

Unused prescription drugs are often flushed into municipal and local wastewater systems. Septic systems and many wastewater systems are unable to process and break down prescription drugs. Once discharged, simple prescription drugs can become sources of dangerous pharmaceutical compounds in surface water and groundwater.

Due to their bioactive and chemically stable nature, similar to that exhibited by persistent organic pollutants, pharmaceuticals may cause long-term adverse effects in aquatic ecosystems, even at very low concentrations (trace concentrations). The continuous release of medical products into the water cycle raises concerns about bioaccumulation and biomagnification in the human body.

According to a 2019 USGS study, "Hormones and Pharmaceuticals in Groundwater Used as a Source of Drinking Water Across the United States," traces of pharmaceuticals, typically at levels ranging from nanograms to low micrograms per liter, have been reported throughout the entire United States. Their presence in water, even at these exceptionally low concentrations, has raised concerns among drinking water regulators, governments, water suppliers, and the public regarding potential risks to human health from exposure.

According to the Centers for Disease Control and Prevention's study, *Prescription Drug Use in the Household 2015-2016*: 48.9 percent of people used at least one prescription drug in the past 30 days; 23 percent of people used three or more prescription drugs in the past 30 days; and 12 percent of people used five or more prescription drugs in the past 30 days.

The study states that older adults are more likely than their younger counterparts to be taking medications and/or multiple prescription medications. Additionally, a 2019 Kaiser Family Foundation Health Tracking Poll states that more than half of adults sixty-five and older (54%), one-third of adults 50-64 years old (32%), and about one in ten adults 30-49 (13%) report taking four or more prescription drugs per day.

Over 20% of the population in Bourne is over the age of sixty-five, and the median age is 51.7, according to the U.S. Census Bureau, which is 1.3 times higher than the median age in Massachusetts. Furthermore, the U.S. Census Bureau states that the proportion of Massachusetts's population aged 60 and older is growing more rapidly than all other age groups.

Now is the time to ensure residents are appropriately educated and instructed on proper Household Hazardous Waste disposal methods. Proper disposal is vital to prevent damage to the drinking water sources in the Town of Bourne. It should be noted that outreach and education are the key strategies to achieving a sustainable future. One easy example is a survey that was conducted by the Journal of the American Pharmacists Association, titled, "Encouraging Safe Medication Disposal through Student Pharmacist Intervention." The survey found that fewer than one-third of medical patients received information on proper medication disposal but revealed that a few moments of counseling on appropriate disposal methods significantly increased the likelihood that patients would properly dispose of or return medications to a pharmacy rather than flush them.

MANAGEMENT STRATEGIES PSOC #3

HOUSEHOLD HAZARDOUS WASTE

Cohost Household Hazardous Waste Collection Day

The Bourne Integrated Solid Waste Management Department hosts Household Hazardous Waste collection events each year. The events are open to all residents in the Town of Bourne and are held four times per year. The first event is held in the Town of Sandwich (April), second in the Town of Falmouth (June), third in the Town of Mashpee (August), and the final event is in the Town of Bourne (October). It is recommended that the North Sagamore Water District work with the Bourne Integrated Solid Waste Management Department to co-host the fourth Household Hazardous Waste collection event held in the Town of Bourne in October. The North Sagamore Water District should target its HHW outreach to residents within the Zone II Wellhead Protection Areas, especially those residents closest to the wells.

Cohost Annual Prescription Drug Collection Event

The North Sagamore Police Department currently offers a secure prescription drug drop-off bin located outside the Police Department entrance. Drop-off bins are a convenient, accessible way to properly dispose of prescription drugs. Not only do these sites reduce overdoses, overdose deaths, and drug-related violence, but they also keep these dangerous products from entering water sources and drinking water.

It is recommended that the North Sagamore Water District establish a link on its website to inform customers of the risks associated with improper prescription drug disposal and provide information on the secure drop-off bin located at the Town of Bourne Police Station.

It is also recommended that the North Sagamore Water District work with the Town of Bourne Board of Health and the Town of Bourne Police Department to co-host an annual prescription drug and medication collection event. The North Sagamore Water District should focus its outreach on residents in the Zone II Wellhead Protection Areas, especially residences close to the wells.

The annual event should be coordinated with the U.S. Department of Justice National Prescription Drug Take Back Day. The U.S. Department of Justice Drug Take Back Day website provides information on home disposal methods, collection sites, and partnership toolboxes with posters, handouts, and other promotional materials.

During the latest Prescription Drug Take Back Day, held in October 2025, 4,263 law enforcement participants at 4,317 collection sites across the country collected a total weight of 571,054 pounds, equivalent to 286 tons of prescription drugs. This brings the

total weight collected to 20.4 million pounds, or nearly 10,200 tons, of prescription drugs collected since the kickoff of the program in 2010.

Update Webpage for North Sagamore Water District

It is recommended that the North Sagamore Water District update its webpage to include general information on Household Hazardous Waste identification and disposal, prescription drug disposal, and the connection between these potential contaminants and drinking water. The webpage should also include information on prescription drug and Household Hazardous Waste disposal areas, as well as prescription drug and Household Hazardous Waste collection events.

The Town of Boxford, MA, Recycling Committee webpage, “How do I dispose of...?” is an excellent example of a navigable site for Household Hazardous Waste disposal options, collection days, and collection network events.

<https://www.boxfordma.gov/395/How-to-Do-I-Dispose-of>

The North Sagamore Water District website should also link to the Mass.gov Recycling and Reuse page. The site offers a Household Hazardous Product Search, where visitors can enter the name of a waste item to find information on how to recycle or dispose of it. The Mass.gov site also provides a list of programs and events in communities, collection facilities near your location, disposal guidelines for prescription drugs, and other pertinent information for the proper disposal of Household Hazardous Waste.

PSOC #4 SAFETY AND SECURITY

Beyond the required vulnerability assessments, cybersecurity reviews, and emergency response plans, physical and electronic security have become integral to water system security. Given the changing, interactive nature of security and emergency preparedness, these additional measures are crucial for maintaining system continuity, protecting water quality, ensuring sufficient water quantity, and safeguarding public health and safety.

Effective physical and electronic protection systems typically balance four elements: deterrence, detection, delay, and response.

Deterrence

Security measures, such as lighting, fencing, exterior alarms, or a visible facility without visual obstructions, may deter an adversary from attacking the facility. Deterrence is not typically considered part of a physical protection system with a predictable level of effectiveness; however, it can help reduce the occurrence of crime or low-level vandalism.

Detection

Security measures, such as video surveillance and sensors, are designed to detect the presence of an intruder. An effective detection system should include electronic features, such as sensors and cameras, or visual observation, to assess the validity of alarms. Depending on the types of sensors used, a detection system may include lighting systems, motion detectors, surveillance cameras, access control equipment, or other devices.

Delay

Security features, such as physical barriers, are designed to delay an adversary until a response force can intervene and disrupt the adversary's actions. Delay features primarily consist of physical hardening devices, often employed in multiple layers, to provide depth of protection. Delay features are only practical when placed within a detection layer.

Response

Response refers to actions taken to interrupt the adversary's task. Utility staff, the utility's security response force, or law enforcement may conduct the response, with the appropriate responder depending on the threat and the utility's policy.

MANAGEMENT STRATEGIES PSOC #4 SAFETY AND SECURITY

Continue to develop, update, and maintain the Vulnerability Assessment and Emergency Response Plans.

The America's Water Infrastructure Act (AWIA) (S.3021) amends the Safe Drinking Water Act, explicitly addressing community water system risk and resilience. It requires community water systems serving populations of over 3,330 people to prepare new Vulnerability Assessments and update their Emergency Response Plans. For smaller systems, the EPA suggests conducting a small water system risk and resilience assessment (RRA), which can help systematically assess threats from malevolent acts and natural hazards that could threaten water service.

It is recommended that the North Sagamore Water District review the Small System RRA Checklist for Drinking Water Utilities with the Board of Commissioners.

The North Sagamore Water District has completed and recently (12/22/2025) updated its Emergency Response Plan. The North Sagamore Water District evaluated the documents for training and planning purposes during an Emergency Response Tabletop Training Exercise with the Mass Rural Water Association. It is recommended that the North Sagamore Water District continue emergency response training, and review, update, and assess the emergency response documents annually.

Maintain and Improve Water Supply Protection Area Signage

Signage is essential in deterring trespassing and protecting drinking water in the Zone II Wellhead Protection Areas in the Town of Bourne. The strategic installation and maintenance of Water Supply Protection Area signage, along with emergency contact information, could significantly reduce the risk of isolated contamination events, trespassing, and vandalism. Signage will also provide easily accessible emergency contact information in the event of a spill, emergency, contamination incident, or security breach.



Install Exterior Video Surveillance

The wells and treatment building are protected by fencing but easily accessible. The interior of the buildings are protected with alarms, however, for early detection and,

where appropriate, to prosecute trespassers, vandals, and other threats, the well buildings should be protected by an exterior cloud-based video surveillance system that can be accessed remotely. This is a high-priority recommendation.

Continue to Develop Zone II Wellhead Protection Area Partnerships

The Town of Bourne has collaborated with numerous partners on various projects that either directly or indirectly contribute to the protection of the Zone II Wellhead Protection Areas within the Town of Bourne. Planning for an entire watershed is challenging; watershed partners help protect resources, identify issues and often are the first to report problems.

It is recommended that the North Sagamore Water District continue to foster these relationships and involve these partners, as well as others, in project development and planning. Some existing partners include:

- Buzzards Bay Coalition: Works to protect and restore the Buzzards Bay ecosystem, a major feature of Bourne's geography, and involves many local partners.
- North and South Rivers Watershed Association (NSRWA): Serves as a fiscal agent for the WAA and works on watershed protection in the region, including areas near Bourne, engaging landowners and communities in conservation.
- Watershed Action Alliance (WAA): A network of watershed groups in southeastern Massachusetts, including the Eel River and Monponsett Watershed Associations, which collaborate on regional efforts.
- Bourne Conservation Commission: The local municipal body responsible for wetlands protection and local environmental regulations, collaborating with residents and businesses on watershed health.
- Cape Cod Cooperative Extension: the education department for Barnstable County. CCCE educates the public on topics as diverse as household hazardous waste, aquaculture and much, much more. CCCE is part of national educational system, developed to convey research-based knowledge from Land Grant Universities (in CCCE's case, UMASS Amherst), to the general public.

PSOC #5

BUSINESSES ALONG OLD PLYMOUTH ROAD AND STATE ROAD

Groundwater contamination is usually the result of human activity. In areas with intensive land use, such as commercial and industrial zones, groundwater is especially vulnerable. In areas directly surrounding wells and upgradient of wells, the potential for contamination increases as water pumped out of the ground creates a suction, which develops into a “cone of depression.” The “cone of depression” is described as a depression in the groundwater table that has the shape of an inverted cone and develops around a well from which water is being withdrawn. The higher the pump rate, the larger the “cone.” The slopes of the cone become increasingly steep as they approach the well. Areas with the steepest slopes are more likely to transport contaminants into the drinking water system.

Drinking water must be protected from direct contamination in areas, especially developed areas, upgradient and in the vicinity of the well. The commercial and industrial businesses in the Zone II Wellhead Protection Areas, along Old Plymouth Road and State Road, are in the central section of the Zone II (not directly adjacent to the well), but are in the highest elevation of the Zone II, and are in complex land mosaics of altered and overdeveloped landscapes. Businesses located along Old Plymouth Road and State Road include: a towing and transport company, automotive repair, training facility, law offices, power, and equipment company, autobody restoration services, electrical shop, plumbing and heating, garbage collection services, custom woodworking shop, mulch and stone yard, tire company, landscaping company, marine dealer, and boat restoration, and more.

There is potential for these areas to receive substantial pollution from a variety of sources, including commercial septic systems; deicing agents; herbicides, pesticides, and fertilizers; spills; vehicles; Household Hazardous Waste; and polluted stormwater runoff.

Groundwater pollution is a significant threat in this section of the Beach Well Zone II Wellhead Protection Area. Treatment, after the fact, may remove some contaminants from groundwater, but maintaining the quality of the water drawn into these wells before treatment remains vital. A high-quality source can help eliminate or reduce the risk of delivering potentially contaminated drinking water to the public. Additionally, maintaining the quality of the source water becomes an economic issue because removing contaminants from groundwater is expensive and can be extremely complicated.

Focusing educational and outreach efforts, reducing septic system failure, deicing agent applications, and stormwater overflows is extremely important in this vulnerable area of the Wellhead Protection Areas. Additionally, these efforts will not only minimize potential contamination but also enhance community involvement and long-term protection.

MANAGEMENT STRATEGIES PSOC #5 BUSINESSES ALONG OLD PLYMOUTH ROAD AND STATE ROAD

Increase Notification and Educational Materials to Businesses in the Beach Well Zone II Wellhead Protection Area to Twice a Year

It is recommended that the North Sagamore Water District notify businesses in this vulnerable section of the Wellhead Protection Areas twice a year and provide information on watershed protection, conservation, and local decision-making for nonpoint pollution management. The North Sagamore Water District should also include local officials, Department of Public Works, police, fire, and emergency response teams.

Partner With the Department of Public Works to Continue to Improve Stormwater Pollution Prevention Measures

It is recommended that the North Sagamore Water District work with the Bourne Department of Public Works to ensure sediment traps and stormwater systems are frequently inspected and maintained in this vulnerable area of the Zone II. Additionally, more frequent street sweeping should occur in this area to reduce suspended solids loading and heavy metal and phosphorus contamination.

If possible, this area should also be prioritized for the installation of storm drain markers. Storm drain marking involves labeling storm drains with plaques, tiles, or painted or precast messages that remind citizens that the drains connect to local water bodies and that dumping will pollute those waters. This is often a project that can include local students.

Safety Training and Storage of Spill Response Materials at the Water District Office

Chemical spills and chemical safety management are complex challenges that require specialized knowledge and expertise. Through safety training, developing a thorough response plan, and access to response materials, personnel can minimize the potential danger posed by chemical spills by knowing what to do and being ready to respond.

Depending on the material and situation, first responders, in this case, trained Water District personnel, can respond, identify the material, and properly report it, while confining the spilled material to a small area using absorbent materials, containment, or neutralizers. It is recommended that Water District assign an employee to attend training on identifying potential contaminants, spill reporting, and first-responder actions to prevent contaminants from polluting drinking water sources during spill events.

It is recommended that the North Sagamore Water District store and maintain personal protective equipment and first responder spill response materials at the water district office to stop a spill from spreading and minimize the risk of source contamination.

Include Businesses Along Old Plymouth Road and State Road in the Town of Bourne Salt Reduction Plan

A road salt reduction plan should include the businesses within the Zone II Wellhead Protection Areas. The plan should aim to minimize the amount of salt used on business parking areas during winter weather. The plan should focus on reducing sodium levels and environmental damage caused by excessive chloride levels while still maintaining safe driving conditions by preventing ice formation on roads and parking areas; this will be achieved by implementing strategies like targeted application techniques, using alternative deicing materials, and educating road crews on best practices for salt usage. The road salt reduction should include private landowners and businesses in the Wellhead Protection Areas for the North Sagamore Water District.

ACTION PLAN

ON-SITE SEWAGE DISPOSAL SYSTEMS		
ACTION	WHO	WHEN
Distribute Educational Pamphlets- High Priority-Low Cost	Water District, Board of Health	Annually
Codevelop on a Septic System Inspection Program- Medium Priority- Low Cost	Water District, Board of Health	2027-2029
Collaborate on a Septic System Loan Program- Low Priority- Low Cost	Water District, Board of Health	2027-2029
Collaborate on Financial Assistance Programs Low Priority-Low Cost	Water District, Board of Health	2027-2029
DEICING MATERIALS		
ACTION	WHO	WHEN
Develop a Road Salt Reduction Plan- High Priority-Low Cost	Water District, DPW	2026
Implement Innovative Deicing Reduction BMPs/Training High Priority-Medium Cost	Water District, DPW	2026-2027
Formalize Low Salt/Salt Reduction Areas- Medium Priority-Low Cost	Water District, DPW	2026-2028
Formalize Snow Dumping Locations- Medium Priority-Low Cost	Water District, DPW	2026-2028
Improve Signage in Wellhead Protection Areas- Low Priority-Low Cost	Water District, DPW	2026-2028
HOUSEHOLD HAZARDOUS WASTE		
ACTION	WHO	WHEN
Cohost Household Hazardous Waste Collection Event Low Priority-Low Cost	Water District, Integrated Solid Waste Management Department	2026-2028
Cohost Annual Prescription Drug Collection Event	Water District, Police Department, Board of Health	2026-2028
Update Webpages Low Priority-Low Cost	Water District, Board of Health	2026

SAFETY AND SECURITY		
ACTION	WHO	WHEN
Install Video Surveillance High Priority-Medium Cost	Water District	2026
Conduct a Risk and Resilience Assessment (RRA) and Update Emergency Response Plans and Participate in Vulnerability Assessments Medium Priority-Low Cost	Water District, Emergency Management Department	Annually
Maintain and Improve Signage Low Priority-Low Cost	Water District, DPW	2026-2028
Continue to Develop Partnerships Low Priority-Low Cost	Water District	Annually
BUSINESSES ALONG OLD PLYMOUTH ROAD AND STATE ROAD		
ACTION	WHO	WHEN
Increase Notification of Educational Materials to Businesses in Zone II High Priority-Low Cost	Water District	2026-2028
Partner with DPW to Improve Stormwater Pollution Prevention Measures Medium Priority-Low Cost	Water District, DPW	2026-2028
Safety Training and Storage of Spill Response Materials Low Priority- Medium Cost	Water District, DPW, Police, Fire, Emergency Management	2026-2029

EDUCATION AND OUTREACH

The North Sagamore Water District is subject to some of the world's most stringent drinking water regulations. It is a well-managed, highly functioning, open, and transparent water district. Managing a Public Water System is an immense responsibility. Public Water Systems must consistently deliver safe, high-quality drinking water to every customer connected to the system twenty-four hours a day. Public Water Systems must also continually manage customer relations, maintain system assets, and comply with all state and federal requirements, which can be complicated, involving extensive regulations, testing, and reporting.

In 2021, 2022, 2023, 2024, and 2025, the North Sagamore Water District won awards for being one of the top scoring drinking water systems in Massachusetts. The challenge for the North Sagamore Water District is to continue its exceptional management and day-to-day operations of the Public Water System, while reserving time and resources to develop and implement educational and outreach programs that effectively reach and influence landowners within the Zone II Wellhead Protection Areas.

Given the complex mingling of natural landscapes and developed areas within the North Sagamore Water District Zone II Wellhead Protection Areas, especially the Beach Well Zone II, it is recommended that the North Sagamore Water District begin by focusing its primary education and outreach strategies on residential areas near or adjacent to the wells, and to businesses along State Road and Old Plymouth Road.

It is also recommended that the North Sagamore Water District continue to send general educational mailings to all residents within the Zone II Wellhead Protection Area annually. Source water protection mailings are a cost-effective and straightforward way to remind residents that they are within the Wellhead Protection Area while providing important information about protecting Bourne's valuable drinking water resources. If distributed regularly, educational materials can drastically reduce the risk of contamination or contamination events. Contamination may result in costly treatment, loss of a source, or acute or long-term adverse health effects. Additionally, these simple educational efforts enable community members to help protect a valuable resource that future generations may enjoy.

It is recommended that the North Sagamore Water District continue to improve and update its website, conduct scheduled inspections of the source water protection areas, post and maintain custom water supply protection area signage, update and review the emergency response plan and emergency contact lists, and review its Source Water Protection Plan annually.

EMERGENCY RESPONSE

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Water Superintendent

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Emergency Response Plan

Public Water Systems are required to prepare and keep an emergency response plan (ERP) in an easily accessible place per Massachusetts Drinking Water Regulations 310 CMR 22.04 and the Massachusetts Drinking Water Guidelines and Policies for Public Water Supplies, Chapter 12-Emergency Response Planning Requirements Guidance, including Appendix O-Handbook for Water Supply Emergencies.

The North Sagamore Water District Emergency Response Plan was revised and updated in December 2025. The plan was reviewed during the 2024 Sanitary Survey conducted by MassDEP and meets all requirements of 310 CMR 22.04. The North Sagamore Water District staff recently reviewed the Emergency Response Plan during a tabletop exercise with the Mass Rural Water Association. Copies of the plan are located at the Main Office and the water treatment building. The plan should continue to be reviewed and updated annually.

Emergency Management and Hazard Mitigation Planning

The Bourne Emergency Management Department is a town agency responsible for coordinating federal, state, local, volunteer, and private resources during emergencies and disasters. Emergency Management is dedicated to protecting the community by coordinating and integrating all activities necessary to build, sustain, and enhance the capability to mitigate, prepare for, and respond to local emergencies and disasters. The Department has established a committee to address natural hazard mitigation.

Bournes's Natural Hazard Mitigation Planning Committee collaborated with the Cape Cod Commission to develop a Natural Hazard Mitigation Plan, aiming to reduce current and future natural hazards, risks, and impacts associated with climate change. When implemented, the planning and mitigation strategies enable the town to prepare for and recover from natural hazards, including flooding, snowstorms, high winds, and extreme temperatures.

The Planning Team worked collaboratively throughout the planning process, meeting in February, March, April, and May of 2017 to develop sections of the hazard plan. The plan has been reviewed and approved by the Massachusetts Emergency Management Agency and the Federal Emergency Management Agency. It is recommended that a North Sagamore Water District staff member or board member continue implementing

the plan and participating in the hazard mitigation planning process while identifying and emphasizing the importance of vulnerable areas within the Zone I and Zone II Wellhead Protection Areas.

MaWARN

Massachusetts water and wastewater utilities have developed a Massachusetts Water/Wastewater Agency Response Network (MaWARN). MaWARN is intended to facilitate a utilities-helping-utilities approach to aiding water and wastewater utilities during times of crisis. The MaWARN provides a method for water and wastewater utilities that have sustained damage from natural or man-made events to obtain emergency assistance, including personnel, equipment, materials, and other associated services, as necessary, from other utilities. The objective is to provide rapid, short-term deployment of emergency services to restore the affected utility's critical operations. The benefits of the MaWARN include:

- Minimal or no cost to participants.
- Provides access to resources when needed (like investing in a no-cost insurance policy).
- Increases emergency preparedness and coordination.
- Enhances access to specialized resources.
- Provides access to resources statewide through a single agreement.
- Expedites the arrival of aid.
- Contains indemnification and workers' compensation provisions to protect participating utilities.
- Provides reimbursement protocols.
- Meets FEMA requirements for reimbursement.

The North Sagamore Water District is currently a member of MaWARN. It is recommended that the North Sagamore Water District continue its membership and maintain its contract annually. MaWARN supports and promotes statewide emergency preparedness, disaster response, and mutual aid assistance for public and private water and wastewater utilities. A preexisting, well-drafted mutual aid, or assistance agreement, such as a WARN, is key to receiving FEMA reimbursement if such financial assistance is available.

BourneAlerts

The Town of Bourne uses the Smart911 platform for emergency notification for Bourne residents and visitors. BourneAlerts is a free service that keeps residents and travelers informed on potentially hazardous situations involving weather, traffic, and other emergencies.

BourneAlerts allows us to notify the public in real time. This service enables the town to send critical information to residents and provide them with the information they need to stay safe or take precautions during hazardous conditions or emergencies.

BourneAlerts allows residents and travelers in Bourne to sign up for free to receive timely and actionable emergency alerts via email, text, or voice message on their cell phones. They can also identify when and how they are alerted and communicated with before, during, and after emergencies.

Residents who sign up will receive notifications that will improve safety and help inform them of potentially lifesaving actions they may need to take in an emergency. The information sent out by BourneAlerts helps both residents and first responders stay better informed in an emergency.

When authorities have information about a situation, such as a storm or an emergency, they can help residents be better prepared by sending out vital information instantly through these notifications. All members of the community and their families are encouraged to sign up for BourneAlerts to be ready should an emergency occur.

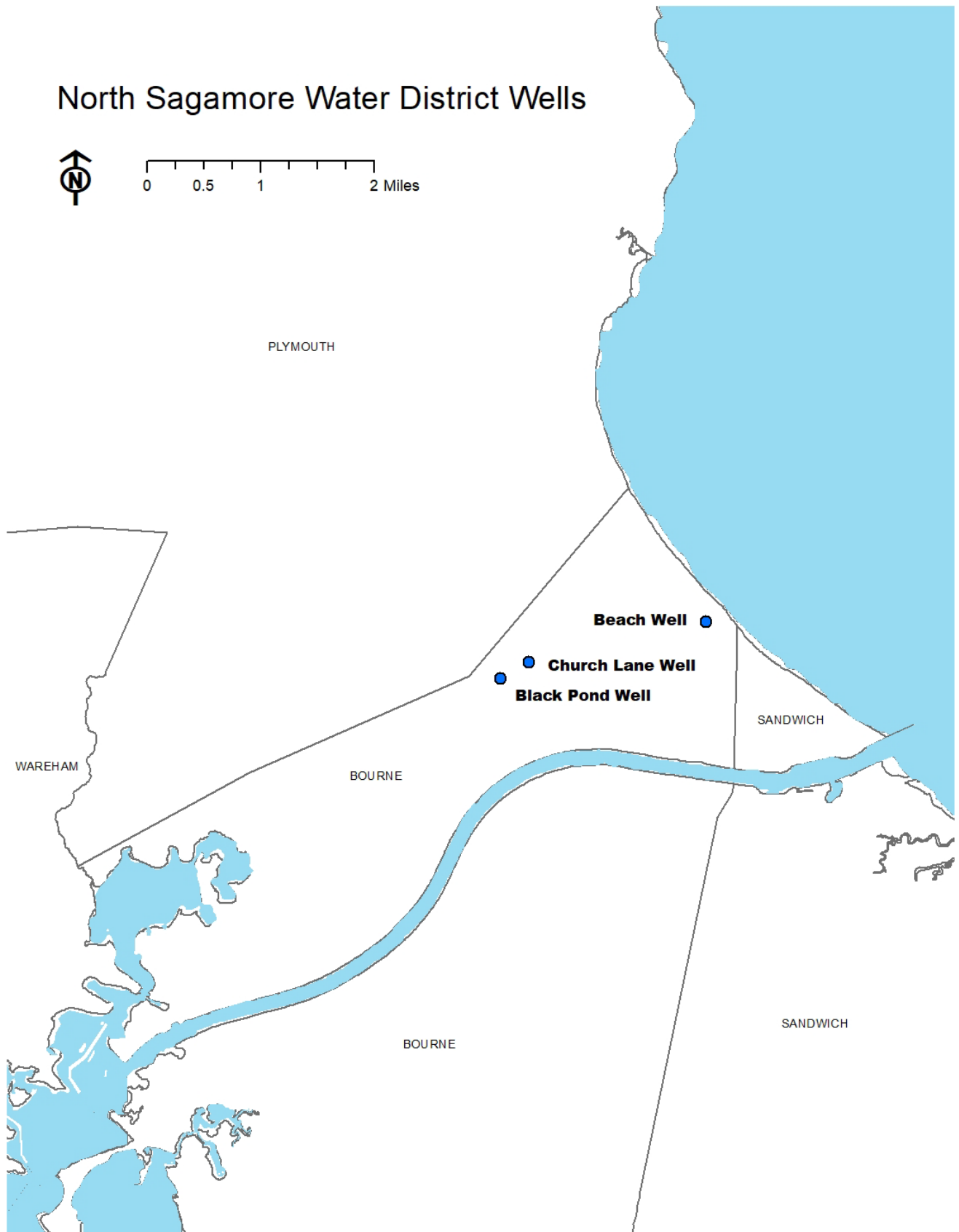
BourneAlerts is provided by Rave Mobile Safety and is trusted by thousands of institutions, including state and local authorities, businesses, and educational institutions. Rave Alert sends millions of messages daily and performs flawlessly in critical situations such as severe weather. Individuals receive notifications on how their community plans to prepare and act.

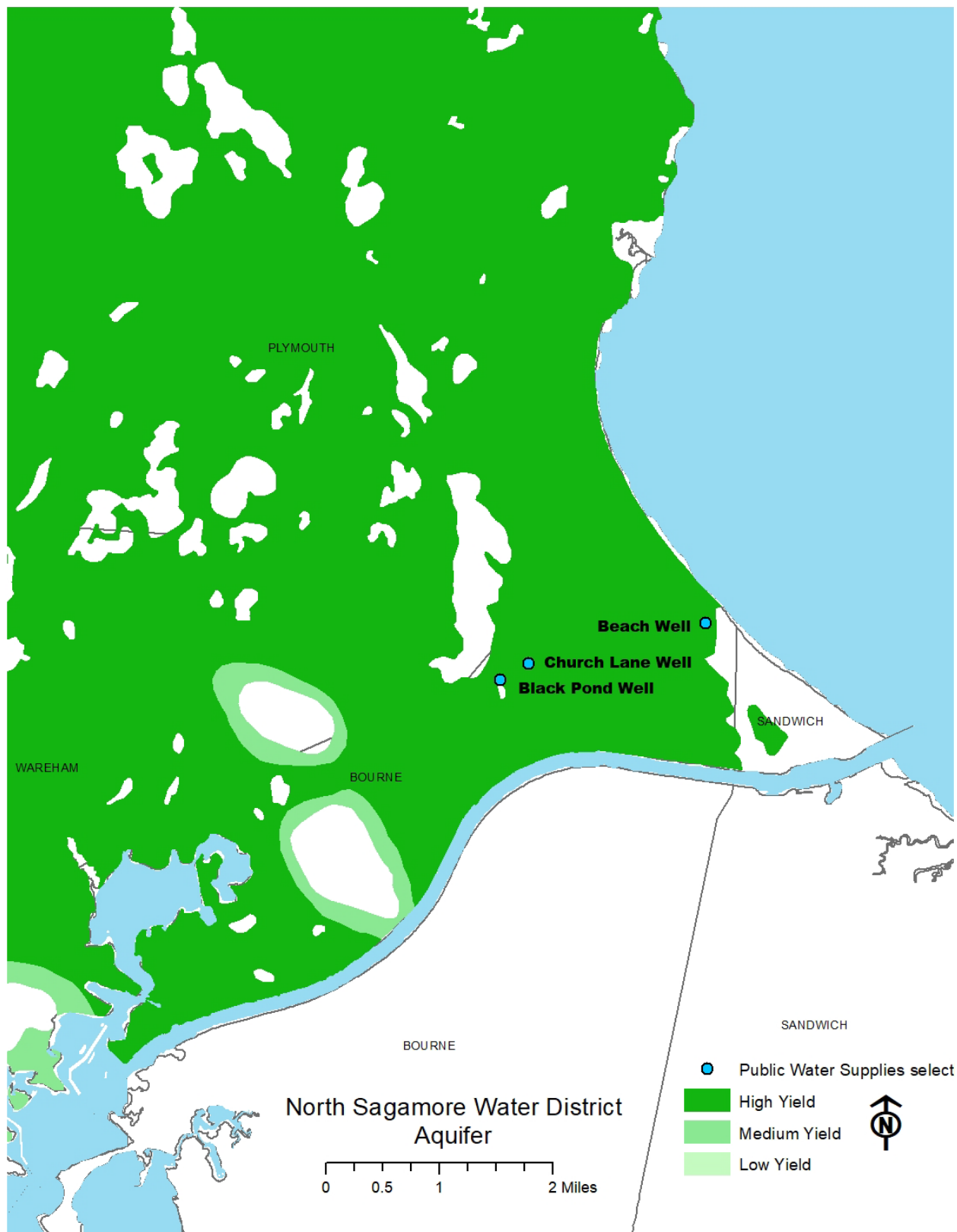
Residents are encouraged to sign up for BourneAlerts and input their information and notification preferences. They will immediately receive emergency notifications. BourneAlerts is private and secure, is used only for emergency responses, and is made available to the 9-1-1 system in the event of an emergency.

North Sagamore Water District Wells

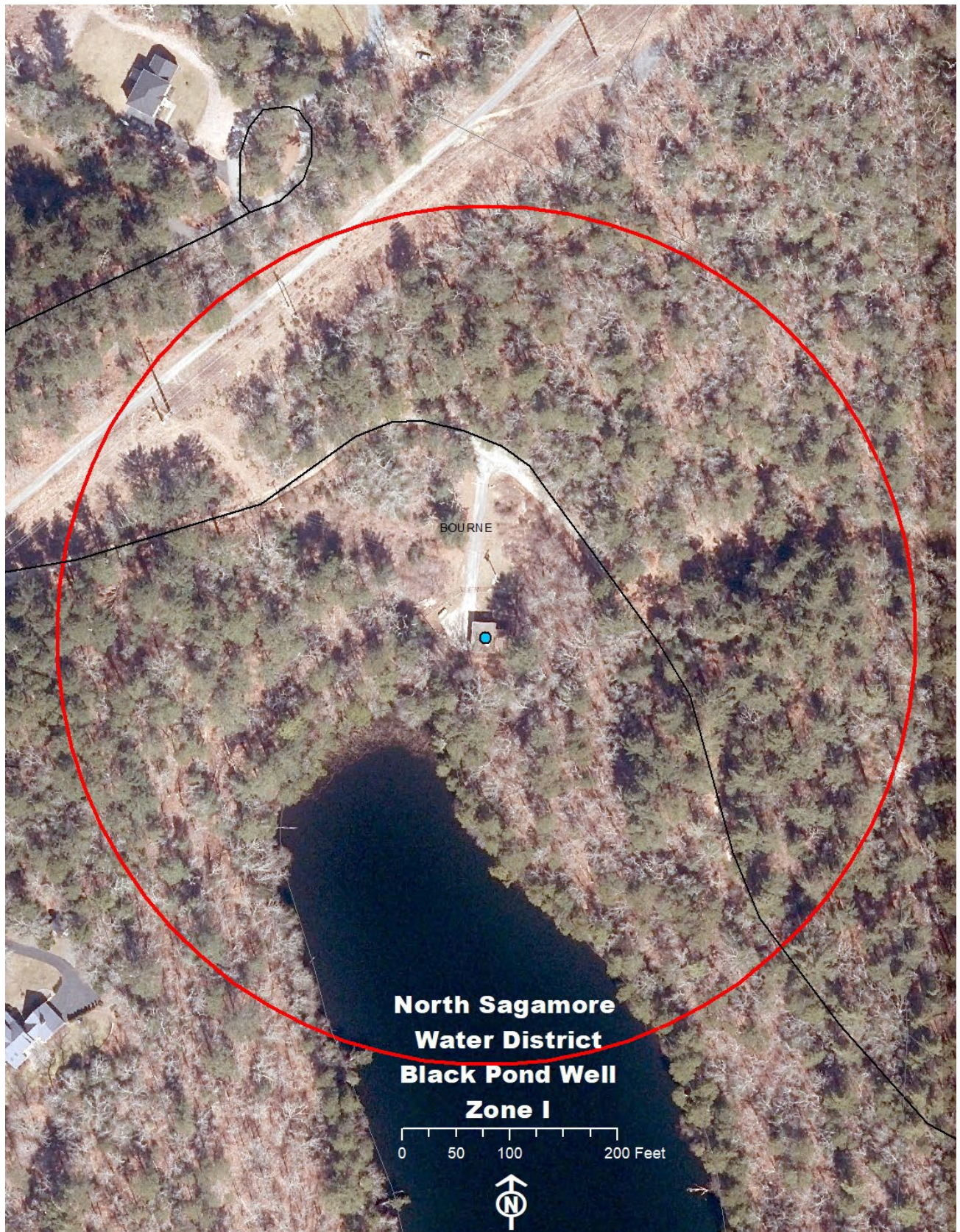


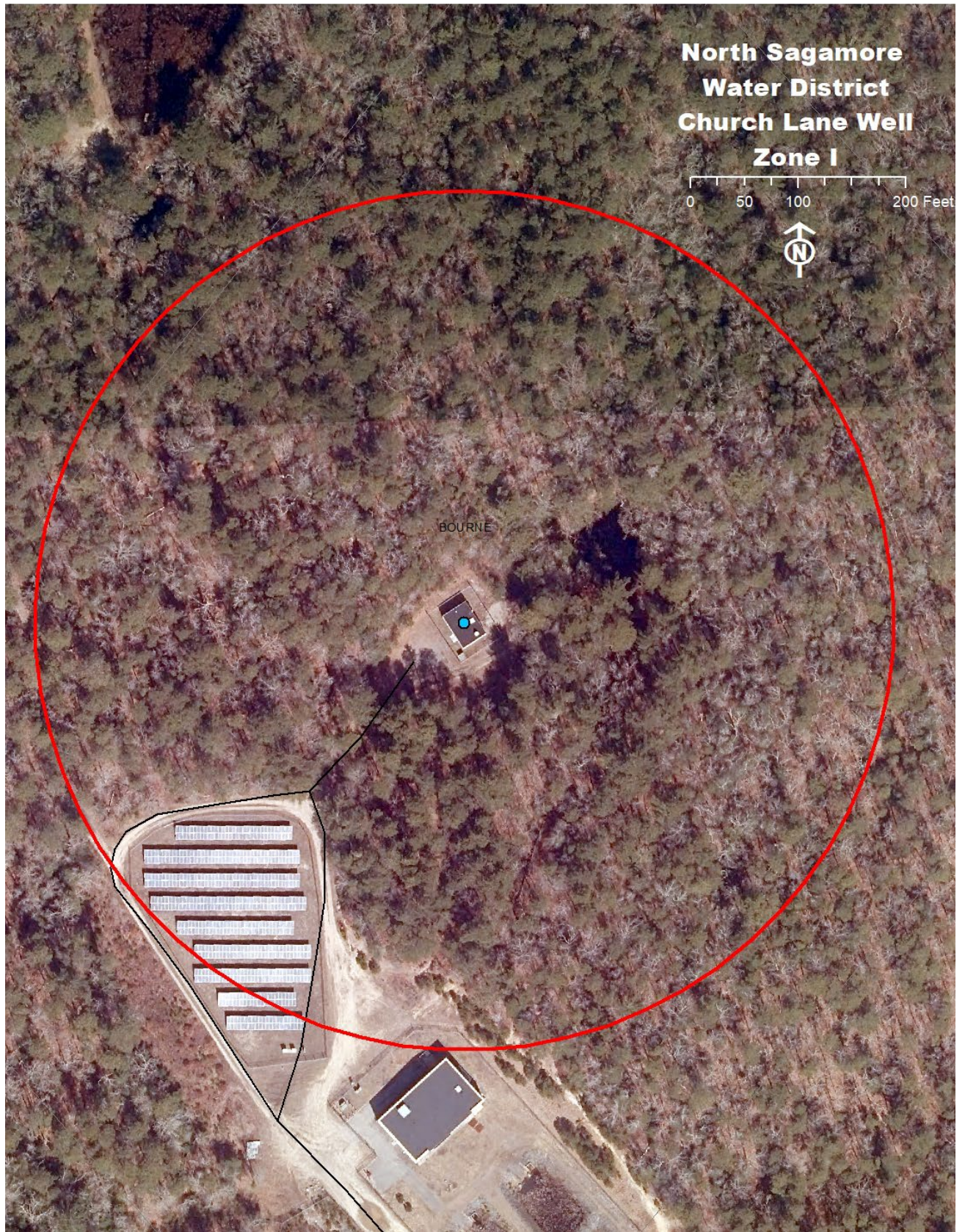
0 0.5 1 2 Miles







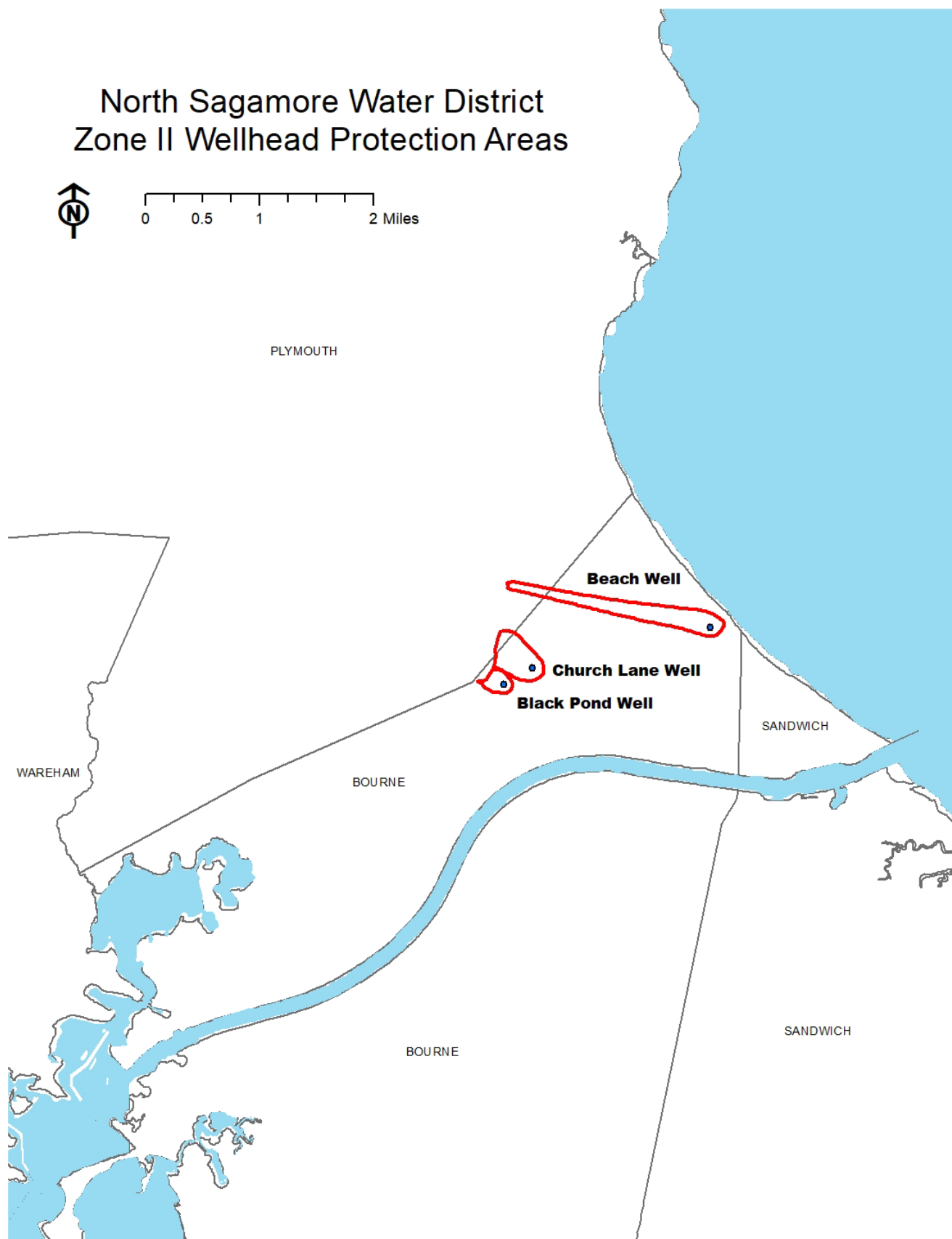




North Sagamore Water District Zone II Wellhead Protection Areas



0 0.5 1 2 Miles







RESOURCES

The Mass Rural Water Association Website <http://www.massrwa.org/>

The United States Department of Agriculture Farm Service Agency Source Water Protection Program
<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=swp>

The Official Website of the Massachusetts Department of Environmental Protection
<http://www.mass.gov/dep/>

The United States Environmental Protection Agency Ground Water and Drinking Water Website <http://water.epa.gov/drink/index.cfm>

The United States Environmental Protection Agency Safe Drinking Water Act (SDWA) Website <http://water.epa.gov/lawsregs/rulesregs/sdwa/>

Source Water Assessment Program (SWAP) Report for North Sagamore Water District, June 2003, prepared by the Massachusetts Department of Environmental Protection Bureau of Resource Protection, Drinking Water Program
<https://www.mass.gov/doc/north-sagamore-water-district-swap-report/download>

Sanitary Survey Report for North Sagamore Water District, May 14, 2024, prepared by the Massachusetts Department of Environmental Protection Bureau of Resource Protection, Drinking Water Program

The Massachusetts Department of Environmental Protection Water, Wastewater and Wetlands Regulations and Standards <http://www.mass.gov/dep/water/laws/regulati.htm>

The Environmental Protection Agency Contaminate Candidate List
<http://water.epa.gov/scitech/drinkingwater/dws/ccl/index.cfm>

310 CMR 22.00 Massachusetts Drinking Water Regulations
<http://www.mass.gov/eea/agencies/massdep/water/regulations/310-cmr-22-00-massachusetts-drinking-water-regulations.html>

The United States Environmental Protection Agency Household Hazardous Waste Website
<http://www.epa.gov/epawaste/conserve/materials/hhw.htm>

The United States Environmental Protection Agency Tanks and Containment Website
<http://www.epa.gov/agriculture/ttan.html>

A Homeowner's Guide to Septic Systems

http://wri.eas.cornell.edu/EPA_HomeownersGuide_SepticSmart.pdf

Massachusetts Department of Energy and Environmental Affairs Septic System Inspection Program

<http://www.mass.gov/eea/agencies/massdep/water/wastewater/septic-system-inspections.html>

Massachusetts Department of Energy and Environmental Affairs Title 5 and Septic System Financing Website

<http://www.mass.gov/eea/agencies/massdep/water/wastewater/title-5-and-septic-system-faqs-financing.html>

National Small Flows Clearinghouse Website <http://www.nesc.wvu.edu/wastewater.cfm>

National Research Council Website <http://www.nationalacademies.org/nrc/>

The Official Website of the Massachusetts Office of Geographical Information (MassGIS) <http://www.mass.gov/mgis/massgis.htm>

Massachusetts Department of Environmental Protection: Substitute list of less hazardous products for use in the home.

<http://www.mass.gov/eea/agencies/massdep/recycle/reduce/household-hazardous-waste.html>.

Massachusetts Department of Public Health - Health and Homeland Alert Network System <https://www.masshhan.org/hhan/home.do>

Town of Bourne, MA Official Website: <https://www.townofbourne.com/>

North Sagamore Water District Official Website

<https://www.northsagamorewaterdistrict.com/>

Town of Bourne Official Zoning Bylaws

https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/zoning_bylaw_for_w eb_5.6.24_1.pdf

Town of Bourne Emergency Management Website

<https://www.townofbourne.com/emergency-management>

Town of Bourne Stormwater Management Plan

https://www.townofbourne.com/sites/g/files/vyhlf12841/f/pages/bourne_2019_stormwater_management_plan.pdf

A Framework for Assessing Impacts of Road Salt on Groundwater Supplies in

Massachusetts <https://wp.wpi.edu/boston/projects/water-resources/salt/>

The University of New Hampshire Technology Transfer Center <https://t2.unh.edu/>

NHDES Publications on Best Management Practices for deicing

<https://www.des.nh.gov/resource-center/publications?keys=wasfacsh&purpose=&subcategory=>

NHDES Green SnoPro Certification Site <https://www.des.nh.gov/land/roads/road-salt-reduction/green-snowpro-certification>

California Department of Public Health, California Safe Cosmetics Program, Current Data Summary

<https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/CSCP/Pages/SummaryData.aspx>

Hormones and Pharmaceuticals in Groundwater Used as a Source of Drinking Water

Across the United States <https://pubs.acs.org/doi/10.1021/acs.est.8b05592>

KFF Health Tracking Poll – February 2019: Prescription Drugs

<https://www.kff.org/health-costs/poll-finding/kff-health-tracking-poll-february-2019-prescription-drugs/>

Encouraging safe medication disposal through student pharmacist intervention

<https://www.sciencedirect.com/science/article/abs/pii/S1544319115307950>