Bolton Long Range Planning Committee
663 Main Street
Bolton, Massachusetts 01740

Water and Sewer Task Group

Task 1 Report Summary

March 2002

Affordable Housing Task Group:

Wayne Wetzel (Chair)
Bill Keysor
Barry Gerken
John Dunn
Kevin O'Brien

Long Range Planning Committee
Report of the Water and Sewer Task Group

Summary

Objective

To identify current problem areas for Bolton water supply or wastewater treatment, if any, and issues to consider during the build-out of the Town. The Group:

- analyzed data for existing wells and septic systems,
- reviewed local and state regulations for water supply and wastewater treatment and discharge, and
- contacted individuals familiar with these issues in Bolton and elsewhere.

Key Assumption

Zoning remains generally unchanged through build-out.

Conclusions

1. A town-wide municipal water supply is not needed currently, nor likely to be needed at build-out.
2. A town-wide municipal wastewater treatment system is not needed currently, nor likely to be needed at build-out.
3. The area of town most likely to experience future wastewater disposal problems is on Main Street roughly between Interstate 495 and Harvard Road, including Manor Road and the Sawyer and Emerson Schools.
4. Implementing water supply and/or wastewater treatment systems for large areas, or town-wide, would remove one of the current limiters to development.
5. What seems unlikely today may be harsh reality in the future; the town should plan for the contingency of water and wastewater treatment systems town-wide.

Recommendations

1. Acquire (if necessary) and protect land for a soil absorption system for wastewater treatment for the central area of town (Main Street between Interstate 495 and Harvard Road, including Manor Road and the Sawyer and Emerson schools).
2. Acquire (if necessary) and protect land and/or rights to drill wells providing a town-wide water supply.
3. Acquire (if necessary) and protect land sufficient for a town-wide wastewater treatment soil absorption system.
4. Retain experienced engineering support to guide all future efforts for water supply and wastewater management.
5. Develop and publish guidelines for the operation of lawn irrigation systems.
6. Maintain and systematically monitor water and sewer data in the GIS.

Background and Assumptions

Every developed property in Bolton today has its own water supply and wastewater treatment system – wells, septic tanks, cesspools, leaching fields. Local, state, and federal authorities (principally the Bolton Board of Health and the Massachusetts Department of Environmental Protection) regulate the placement, design, construction, and maintenance of wells and wastewater treatment. The regulations are comprehensive and complex, with the ultimate objective of protecting water supplies from depletion and pollution. As part of this process, for example, state permits are required for withdrawing more than 100,000 gallons of water per day from any water source, or for discharging more than 10,000 (or 15,000 with variances) gallons of wastewater per day.

Although the Task Group assumed that zoning would remain generally unchanged through build-out, it recognizes that exceptions will require case-by-case solutions.

Conclusions and Rationale

Wastewater Treatment

1. Of 433 sewage systems tested during the prior six years (roughly 30% of all properties), 55 failed, or about 13%. All failed systems were brought back into compliance. Thus, a widespread septic problem is not apparent.
2. No area of town seems to be experiencing more failures than any other. (Attachments 1 and 2)
3. Most new sewage system installations have not involved unusual technology or cost.
4. The area of town most vulnerable to future problems appears to be on Main Street roughly between Interstate 495 and Harvard Road, including Manor Road and Sawyer and Emerson schools. This area has: (1) relatively dense development; (2) well clearances that severely limit placement of soil absorption systems for wastewater effluent; (3) wetlands that limit placement of soil absorption systems.

   The following estimates (Attachment 4) are based on standards from DEP regulation 310 CMR (Attachment 3). Today this area would generate about 60,000 gallons of wastewater effluent per day, about 25% for schools, 30% for commercial properties, and 40% for residential properties. Doubling school enrollment and municipal and commercial building space, with no other additional development, would increase the flow to 90,000 gallons, about 30% for schools, 40% for commercial, and 25% for residential properties. Municipal and institutional buildings (churches) are 4% of the total in either case.

   These estimates for the Sawyer and Emerson schools assume the worst case standard of 20 gallons per person per day, although the flow can be as little as 5 gallons per day depending on actual usage of the school (Attachment 3). The current occupancy may be pushing the 10,000 total gallon per day limit, beyond which a special variance and/or a wastewater treatment system is required, so the distinction between elementary and middle-school usage, and whether cafeterias, gymnasiums, and

showers are in use, is important. Using standards of 10 gallons per day for current K-5 and 20 for 6-8 enrollments, the requirement is about 8700 gallons per day, not including staff headcounts. The 1922 and 1952 sections of Emerson currently have wastewater treatment system failure, but rerouting this wastewater into the system constructed for the 1972 section, which was apparently over-sized in anticipation of possible failures in the 1922/1952 sections, will apparently correct this otherwise major problem.

Attachment 5 is a report drafted in 1997-1998 by Ducharme and Wheeler, Inc. related to wastewater treatment for senior housing and other facilities in the central area of town. Using the flow estimates above and leaching area parameters from the report, a very rough estimate is that three to five acres of suitable land is needed for effluent soil absorption for the central part of town at build-out. The so-called Sheep Field is one of the few likely pieces of land for this in the area. Recent testing indicates that it is perhaps 40% ledge and 60% suitable for soil absorption. Also, at least part of it appears to be in a well-protection area. If existing soil absorption systems can be made part of a larger solution, the current Emerson and Sawyer systems would, according to the report, together handle nearly 50,000 gallons per day, a major portion of the estimated ultimate 90,000 gallon requirement.

These estimates are intended merely to indicate the order-of-magnitude of needs. Wastewater management is a complex discipline, and qualified professionals should be engaged for any future work.

5. There is a strong relationship between wastewater treatment solutions and water supply sources. Any water supply must have a protection area free from wastewater disposal (and other water quality threats) within a specific radius. The primary protection area around a public water supply well is called Zone I, for which a 100 to 400 foot radius, depending on well yield, must be owned or controlled by the water supplier through conservation restrictions. The area of an aquifer that contributes to a well under the most severe pumping and recharge conditions is called Zone II. Until the DEP approves a Zone II, it applies an Interim Wellhead Protection Area (IWPA), which may be up to a one-half mile radius depending on the well's approved daily volume. Attachment 12a, from MassGIS maps, shows well and aquifer protection areas within Bolton, including what is apparently aquifer protection for Lancaster's public wells. Attachment 12b enlarges the Main Street area between Interstate 495 and Harvard Road, showing that well protection areas and wetlands leave little area for locating wastewater treatment disposal. Providing an alternative water source for some or all of this area might in turn alleviate wastewater disposal problems, or, conversely, providing wastewater disposal for this area might alleviate any problems with well placement.

Water Supply

1. Three well failures have been reported in the town during the past five years. New wells with sufficient flow rates were drilled for all three properties.

2. Drillers file reports for every new well with the town and with the state. A sample of 50 such reports shows the following (Attachments 6-11):
   - The average and median depth is about 300 feet, with an average and median flow rate of 15 gallons/minute (gpm).
   - The best flow rate is 50 gpm and the worst 1.5 gpm. The most shallow well is 39 feet and the deepest is 610 feet. Shallower wells usually have better flow rates than deeper ones.
   - Wells with flows less than 10 gpm are found throughout town, though several cluster on Kettle Hole Road. Wells with greater flows can also be found throughout town, with several in the 30 gpm range clustered on Autumn Lane and nearby Still River Road. The Kettle Hole Road wells are some of the deepest in town, and the Autumn Lane some of the most shallow. Interestingly, these best and worst wells are within perhaps a half mile of each other.
3. Mike Sullivan, who has drilled perhaps 75% of the wells in town drilled during the last 15 years, says that he has never failed to find a sufficient residential water supply on a property, and drilling more than one hole in doing so is very unusual. If flow rates begin to drop over time, they can be restored through hydro-fracturing or by deepening the well. Well flows and water quality vary substantially, even when near one another, depending on the subsurface structures the drill happens to open. Iron, manganese, and minerals creating "hard water" are commonly found in wells throughout town. Quality problems can often be fixed by sealing off portions of the well shaft and/or by deepening, though many residents have installed water softener and other treatment systems to solve these problems. Well quality and flows are generally better in Bolton than in surrounding towns. The area of town with lowest flow rates is toward the outer edge of the hill Kettle Hole crosses, although moving inward a bit, to Fox Run, for example, produces larger flows.

From this data and experience, there seems little reason to expect future well water supply problems throughout the town. It is, of course, possible for problems to occur where relatively large numbers of wells are drilled or high volumes are pumped in relatively small areas. Specific engineering studies should be completed prior to development approval where such problems are a concern.

If the town were to experience major failures or shortages with individual wells, there appear to be adequate water supplies within the town to solve such problems. According to MassGIS maps (Attachment 12), a "high yield" aquifer exists along most of the western edge of town, just east of Bolton Flats and down to the corner boundary with Clinton and Lancaster, both of which share this aquifer. (One might expect part of this aquifer to be under Bolton Flats instead of mostly east, raising some question about the map overlay accuracy. Interestingly, Ed Sterling reported that a 1989 State Hydrologic Study Report Number 27 shows a well with a flow measured at 1230 gpm in 1956 at what is now The International, which is over the aquifer. The same report indicates that test wells drilled west of Autumn Lane, again in or near the aquifer, averaged 60 gpm each.)

A smaller "high yield" aquifer exists in the northeastern corner of town, near the corner boundary with Boxborough and Stow. Smaller "medium yield" aquifers exist out from the edges of these "high yield" aquifers, and in three other locations – on both sides of 117, on the north in the Burnham Road area, and on the south between Route 85 and Long Hill Road; in the vicinity north and south of the South Cemetery and Farm Road; and south of Wataquadock Hill Road at the south edge of town.

As a rough estimate, if the town ultimately has 3000 houses using 440 gallons per day each (the wastewater design maximum), wells producing an average of about 900 gallons/minute would be needed. This should be small relative to the capacity of "high yield" aquifers. Note, however, that this does not include irrigation or high-volume commercial uses.

Residential properties currently comprise most water use in the town. Many properties, especially newer ones, use irrigation systems for their lawns and landscaping. This requires about 6,000 gallons per 10,000 square feet of area to apply 1" of water, which can be several times that required for household use. Most of this water evaporates, that is, does not replenish the aquifer. Thus any future planning for municipal water supplies should consider the use for irrigation.

Provision for the Future

The need for future town-wide water supply and/or wastewater treatment seems unlikely today. However, situations change in unforeseen and unexpected ways. The town may be developed to much higher population and building densities than currently expected. Parts of the underlying water supply may become polluted. Sections of town may be pumped dry. What is considered safe and effective wastewater treatment today may not be so in the future. Many other Massachusetts towns have water and wastewater treatment for all or major portions of their residents, and these presumably came about for good reasons. If for any reason Bolton needs to develop these in the future, having sites and rights for doing so will be essential. Obtaining such sites and rights for this future contingency today is likely to be much simpler and less costly than waiting until the need is critical. Such contingency planning seems prudent given the possible consequences of not doing it.

Recommendations

1. That the town acquire (and/or reserve if it already owns) and protect one or more parcels of land suitable for municipal wastewater treatment effluent absorption at build-out for the area of town on Main Street roughly between Interstate 495 and Harvard Road, including Manor Road and Sawyer and Emerson schools. That as a first step in this action, it commission an engineering study to: (a) estimate the volume of wastewater treatment discharge at build-out; (b) identify locations within the area that are likely to provide adequate soil absorption capacity; and (c) conduct tests to verify adequate capacity. The town should then acquire land if necessary, and protect it for such possible future use. (For example, zoning or other restrictions

might be needed to prevent new wells from being drilled too close to sites reserved for wastewater discharge. Although permanent structures cannot be built on such land, other uses may be possible.)

2. That the town acquire and protect land and/or rights to drill and operate wells sufficient to provide a municipal water supply to the entire town at build-out. That as a first step in this action, it commission an engineering study to: (a) estimate the volume of water that would be required to meet the needs of the town at build-out; (b) identify several locations within the town that are likely to provide all or substantial portions of such volume. The town should then acquire rights and/or land as necessary, and protect it for future wells at these locations. (For example, the town might need to implement zoning or other restrictions to prevent new septic systems being built too close to possible future wells.) Among questions to consider are: (i) Can the town drill and/or pump from the Bolton Flats area managed by the Massachusetts Division of Fisheries and Wildlife? (ii) Can the town drill and operate wells on town-owned conservation lands? (iii) Can the town gain rights to underground water as part of the permitting process for new land development?
3. That the town acquire (and/or reserve if it already owns) one or more parcels of land suitable for municipal wastewater treatment effluent absorption for the entire town at build-out. That as a first step in this action, it commission an engineering study to: (a) estimate the volume of wastewater treatment discharge at build-out; (b) determine whether a single central treatment and soil absorption system or a number of smaller decentralized systems has obvious economic advantage, (c) estimate the land area and characteristics required to handle such discharge, (d) identify other uses that would be allowed for such land (for example, whether playing fields would be safe on it). The town should then acquire land if necessary, and protect it for such possible future use. (For example, zoning or other restrictions might be needed to prevent new wells from being drilled too close to sites reserved for wastewater discharge. Depending on what uses can be made of such land, it may simply become a part of other acquisitions for recreation or open space.)
4. That the town retain experienced engineering support to validate any prior work and guide any future efforts for water supply and wastewater management. (Developing wastewater management and public water supply systems involves exceedingly complex technologies and regulatory processes, which lay volunteers should not be expected to understand and navigate. The section of 310 CMR from which Attachment 3 is taken is a 100-page document. The DEP guide to planning for wastewater management is a 50-page document, part of which is Attachment 16; Figure 1 has a 22-step flowchart of the process. The draft report by Ducharme and Wheeler, Inc., Attachment 5, gives some idea of the engineering considerations involved in these undertakings.)
5. That the town develop and publish guidelines for the operation of lawn irrigation systems.
6. That the town develop and maintain, as part of its GIS, data for septic test failures and data for well depths and flow rates, and that this data be reviewed periodically for indications of problems that may be developing.

Task Group Members

John Dunn, Barry Gerken, Bill Keysor, Kevin O'Brien, Wayne Wetzel (Chair)

Sources

Board of Health log of septic inspections conducted between February 1995 and October 2001.

CD with *MassGIS Data Viewer for Town of Bolton*, December 14, 2001 (software plus roadway, USGS, and orthophoto maps with overlays for wetlands, aquifers, land uses, etc.)

Information and some attached source documents from www.state.ma.us/dep

310 CMR 15.000: The State Environmental Code, Title 5: Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage, Massachusetts Department of Environmental Protection, www.state.ma.us/dep/brp/files/310CMR15.pdf

Meetings and telephone conversations with:

- Bill Brookings, Nashoba Board of Health
- David Boyer, DEP Worcester office
- Harold Brown, Bolton DPW
- Larry Ducharme, Ducharme & Wheeler, Inc.
- Ron Lyberger, DEP Boston office
- Ed Sterling
- Mike Sullivan (has drilled perhaps 75% of wells in Bolton)
- Nancy Tavernier, former Acton selectman (sewer system development)

Attachments

1. Sewage Test Failures
2. Sewage Test Passes
3. 310CMR 15:203-211, System Sewage Flow Design Criteria
4. Sewage Design Flows, Bolton central area
5. *Site Suitability for Sewage Disposal of Property on Main Street in the Town of Bolton*
6. Well Flow versus Depth
7. Well Depths Greater than 400'
8. Well Depths 200'-400'
9. Well Depths Less than 200'
10. Well Flows Less than 10 gpm
11. Well Flows Greater than 10 gpm
12. Major Aquifers

12a Well and Aquifer Protection Zones

12b Well Protection Areas

13. Notes regarding Acton Sewer System
14. *Innovative and Alternative Subsurface Sewage Disposal Technologies Approved for Use in Massachusetts*, Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Watershed Permitting, Title 5
15. *The Massachusetts Water Management Act Program*
16. *Guide to Comprehensive Wastewater Management Planning*, Department of Environmental Protection, Bureau of Resource Protection, Division of Municipal Services, www.state.ma.us/dep/brp/mf/fpintro.htm
17. *Overview of the Massachusetts Source Water Assessment Program*, Massachusetts Department of Environmental Protection, www.state.ma.us/dep/brp/dws/files/swapover.htm
18. *Wellhead Protection Tips for Small Public Water Systems*, Division of Water Supply, Massachusetts Department of Environmental Protection