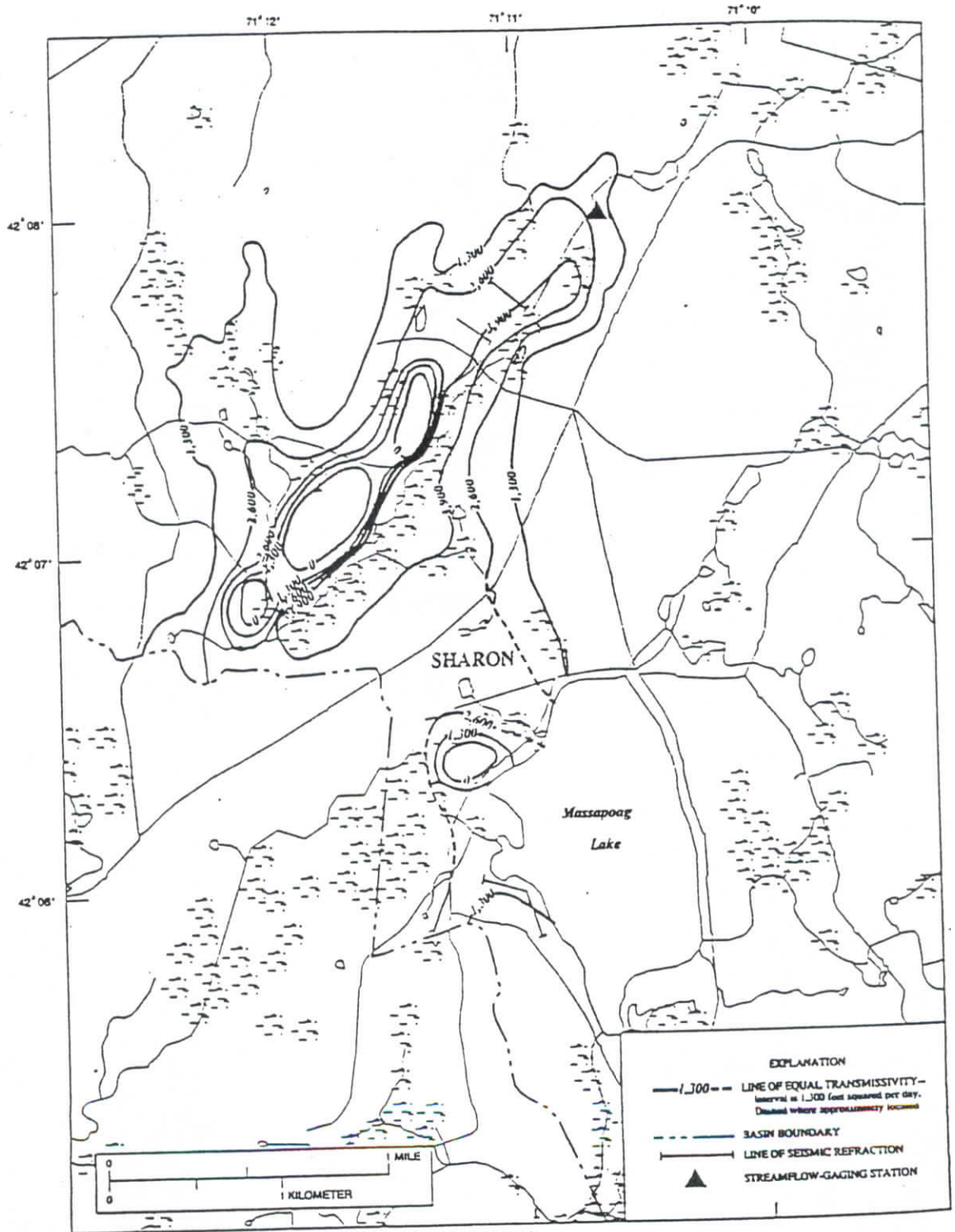
Estimated Short-Term Yields of and Quality of Ground Water in Stratified-Drift Aquifer Areas in the Neponset River Basin, Massachusetts

U.S. Geological Survey
Water-Resources Investigations Report 93-4142

Prepared in cooperation with the
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT,
OFFICE OF WATER RESOURCES



Base from U.S. Geological Survey digital line graphs, 1:25,000, 1988
Universal Transverse Mercator projection, Zone 19

3*K*. Beaver Brook aquifer area.

Figure 3.—*Continued.*

FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

September 24, 1997

Trudy Coxe, Secretary
Executive Office of Environmental Affairs
MEPA Office
100 Cambridge Street
Boston, MA 02202

Attn.: Mr. William Gage

RE: ENF Sharon's Proposed Well #8
MEPA Project #11239

Dear Secretary Coxe;

The Town of Sharon lies at the head of two major water basins, the Neponset and Taunton Rivers. Consequently, no surface water flows into Sharon and thus, assumedly only precipitation falling within the municipal borders is available for recharge to Sharon's groundwater aquifers.

The Town has several thousand acres of protected open space and has incorporated comprehensive land use regulations over time to mitigate development impacts. Although current regulations require retention and/or detention of post development runoff, the cumulative result of past and on-going construction has assuredly increased stream flows during storm events. Of course, once precipitation runoff reaches the Town's surface water streams, little is available for groundwater recharge before flowing out of Sharon.

In addition, past mosquito control projects (Cedar Swamp, etc.) may have contributed to the lowering of groundwater regimes in various wetland and recharge areas in the Town. Lake Massapoag, which has been carried at higher maximum levels in the past (1987-92), is now maintained approximately 8" below maximum historical levels. This level was implemented in 1992 to decrease the significant shore erosion associated with the higher levels, as well as, the likelihood of hydraulic connection with on-shore leaching systems.

Because of Sharon's geographic elevation, changes in the Town's drainage characteristics and the increasing water supply demand placed on the capacity of its aquifers, recharge of available precipitation and runoff is an increasingly crucial and limiting factor in maintaining the quantity and quality of our water resources. The Commission is concerned that groundwater reserves are now impacted.

We offer these additional comments:

1. Based upon available Town and other public hydrogeological studies and reports, the aquifers, within which are located Sharon's existing wells, are unconfined and subject to lateral leakage. The general recharge rate for fine sandy aquifers is approximately 17 inches per year with an average precipitation in Sharon of approximately 40 inches.

2. Due to lack of groundwater monitoring wells within the adjacent Zone II's and III's of Sharon's pumping stations, subbasin groundwater flow, levels and aquifer boundaries at any given time can not be accurately determined. Nor can the full extent of groundwater draw down by existing wells be measured.

3. Despite precipitation of ±60 inches last year (approximately 20 inches above normal) the Commission witnessed, by early June, an abnormal drop in surface water levels and flows and abnormally dry conditions in various wetland communities within the upgradient recharge areas of the Town wells.

Of particular concern was the significant and/or total loss of surface water in the major tributaries to Lake Massapoag, starting in early June. The lake itself, (350 acres) lost 18-1/2 inches of water level by the end of August. In addition, the Commission witnessed the increasingly dry condition of the Great Cedar Swamp. This occurrence has been progressing for several years with facultative plant species becoming more prominent.

4. Further, more extensive, site investigations discovered drops in the levels of various groundwater connected ponds and streams in the Zone II's and III's and once open wetland areas, historically containing standing water, were now invaded by saplings and facultative woody vegetation.

In order to address our concerns regarding these circumstances, the Commission retained one of the Town's water consultants (Weston and Sampson Engineers, Inc.) to prepare a proposed scope of work to evaluate the causes. Since our first scoping meeting with a principal and hydrogeologist of the firm on July 10, 1997, the Commission now believes that a comprehensive study of the hydrogeological conditions of the Town is warranted. We continue to believe that a well designed system of surface and groundwater monitoring wells throughout the recharge zones and aquifers of the Town's pumping stations and around Lake Massapoag is advisable.

5. The Zone II's of Well #5 and #7 encompass a major portion of the Great Cedar Swamp. This important resource area serves as an Estimated Habitat for Wetland Wildlife; designated by the State Natural Heritage and Endangered Species Program. The proposed well site lies in the Canoe River Aquifer ACEC.

6. The Commission is increasingly concerned by the per capita water consumption by its residents between the months of May and August and the stress this places on the aquifers and their recharge capabilities. In May of this year, DEP modified the Town's Water Management Permit, imposing a maximum daily pumping limit per well. In order to come into compliance with this requirement, the Town, for the first time, implemented a weekend watering band in addition to the traditional odd-even restriction.

Despite the additional conservation measures, and a concerted enforcement effort by the Water Division, water consumption in June and July was historically high.

7. After investigating the Town's water distribution patterns, the Commission would like to note that much of the water withdrawn from the Town's producing aquifers is transferred for consumption outside the known boundaries of these very same aquifers. Water from the septic and irrigation systems of these outlying users, therefore, is recharged into sub-basins and aquifers not directly associated with our pumping stations.

8. Considering the above conditions, the extent of the Town's understanding of groundwater parameters and the location of Sharon's proposed Well #8 in relation to existing wells and sensitive surface and wetland resources, review of this project should be deliberative and exhaustive. We believe an EIR is needed, requiring a submittal of a numerical aquifer model based on data collected from surface and groundwater monitoring wells. The prolonged pump test plan should include full instrumentation.

The Commission ultimately believes that insufficient data exists to determine current groundwater parameters in the Zone II's and III's of the Town's existing wells. Considering the emerging problems associated with Lake Massapoag, the Great Cedar Swamp and evidence of induced surface water infiltration in the Beaver Brook well field and perhaps Gavins Pond/Billings Brook, the Commission is encouraging the Town to establish a comprehensive monitoring program throughout the well supply recharge areas. This should be done regardless of the decision by MEPA on the need for an EIR. Although the Town's existing well supplies are not of adequate capacity to meet demand under certain circumstances (firm capacity 2.37 mgd), siting of a well at the proposed site without the most extensive environmental impact analysis would be ill-advised.

The Commission is grateful for the interest and concern being given this project and we look forward to any insight gained as a result of a comprehensive EIR.

For the Commission,

Margaret D. Arguimbau

Margaret D. Arguimbau
Chairman

MA/dm

cc: Board of Selectmen
Benjamin Puritz, Town Administrator
Jack Sulik, Supt. of Public Works
Neponset River Watershed Assoc.
Water Management Committee
Jack Hamm, DEP Southeast Region

NEPONSET RIVER WATERSHED ASSOCIATION

2438 Washington Street • Canton, MA 02021
voice 781/575-0354 • fax 781/575/9971

September 26, 1997

Secretary Trudy Coxe
Executive Office of Environmental Affairs, Attention: MEPA Unit
100 Cambridge Street – 20th Floor
Boston, MA 02202

RE: EOEA #11239

ATTN: William Gage

Dear Secretary Coxe,

Please accept these comments with regard to the Islamic Site Well, Sharon on behalf of the Neponset River Watershed Association. NepRWA strongly supports the completion of an EIR to address the potential impacts to groundwater supplies, surface waters, wetlands, adjacent municipal wells, the Canoe River ACEC and the Fowl Meadow ACEC.

The ENF summary describes a project with the "eventual" construction of a new groundwater supply production well but the responses focus on the development of an 8 inch pump test well which would pump between 0.72 mgd and 1.01 mgd for 5 days. The proponent states that a request will be made to DEP to construct the 24 inch production well following the favorable completion of the pump test. Based on this information, I assume this is the only MEPA review, therefore, the need for an Environmental Impact Report must be stressed. The proponent considers the additional drinking water supply well as a long term positive impact but does not address the potential negative impacts on the groundwater supply, surface waters, surrounding wetlands and adjacent municipal wells.

Responses with respect to water quality and quantity are obscure considering this project will result in the development of a public drinking water supply. The proponent advises there will not be any significant changes in the drainage patterns, however, there is little understanding about the drainage in this area. A summary of Boston Harbor Drainage Basin Projects by the USGS states that; "Streamflow in many of the subbasins is affected by ground-water pumpage...Unlike most other basins in the State, ground-water divides do not always correspond with surface-water divides in the Neponset, Weymouth and Weir basins. One example of this occurs along parts of the southern boundary of the Neponset basin, where ground water flows north from the Taunton River basin into the East Branch Neponset River basin."
In a meeting with the proponent and DEP–Lakeville, the proponent connoted the well will supply approximately 1 mgd at full production. USGS Hydrologic Investigations Atlas HA-460, Sheet 2 of 3 shows that the available groundwater in the unconsolidated deposit is less than 430,000 gallons per day.

This leads to the following questions. Which watershed will be impacted? Neponset? Taunton? Both? To what degree? Will this impact the Canoe River Area of Critical Environmental Concern and/or the Fowl Meadow ACEC? What is the relationship between well #8 and wells #2, 3, 4, 5, 6, 7 and the Foxboro wells # 7, 8, 9 and 10? What will be the relation between well # 8 and Lake Massapoag? The adjacent wetlands? If significant supply is not available from the groundwater source where will it come from? I believe it would be in the best interest of the proponent to conduct a full evaluation of this area. Decisions about a 1 mgd municipal well should not be made without detailed hydrological data including multiple scenario modeling. Unless we know where the water is coming from, informed water supply management and planning cannot take place.

The proponent also states that there will be no introduction of pollutants into the surface fresh water or ground water. With such limited understanding of the hydrology in this area, the proponent can not know this to be true. Wastewater in the town of Sharon is primarily disposed through on-site septic systems. Questions arise about nearby septic systems. The surficial geology of the region is highly permeable Pleistocene sands and gravels. Where is the Islamic Center's septic system relative to the proposed well site? Have any nitrate studies been conducted for this area? This is an important issue in light of the elevated nitrogen levels found in Sharon's well #4.

Although this project is not in the watershed of any surface water drinking supply, it is in the Zone II of Sharon wells #5, #7 and Foxboro wells #7, #8, #9 and #10. Questions remain about Sharon wells #2, #3 and #4 for which the zone IIs have been redeliniated but have not been reviewed by DEP.

In the ENF, the proponent states that the new well will not result in any water consumption increase. During June 1997, the town exceeded their permitted withdrawal for 17 days for well #4. According to the Water Master Plan Update (Amory, 1997) the current operating rate for well #4 is 1.21 mgd although the permitted rate is 1 mgd. Additionally Wells #3, #6 and #7 are also reported to exceed water withdrawal permits limits. Permit totals are 3.12 mgd and the current operating total is 3.58 mgd. The Amory Update states, "...With a new well on line (Well No. 8), Sharon's permits presumably would be increased to allow maximum-day usage to meet maximum-day demand. Should Sharon's permitted maximum-day usage not be increased, further conservation measures will be required to restrict summertime use of water." How can two consultants for the same town have such opposing points of view?

In Sharon's Water Management Act permits #9P-4-19-266.01 & #9P-4-25-266.01, DEP has issued Special Conditions. Many of the conditions are in the process of being met, but others have not been addressed. NepRWA would like to be assured these conditions are being met in good faith. With respect to conservation, the town of Sharon should meet the conditions outlined in the WMA permit before pursuing an additional supply and total increase in withdrawal.
As far as the pump test goes, more detailed information should be provided. For example, when the water is pumped out of the ground where is it discharged? Does it recharge the well or is it discharged further off site. If so, where, an adjacent wetland?

The ambiguity of the information provided in the ENF, the contradictions between the ENF and the Water Master Plan Update and the past lack of compliance by the Town accentuates the need for an EIR. This well is planned for an area for which there is a limited understanding of the surface water / groundwater interaction, the actual watershed boundary and the current impact of existing wells. In 1991, DEM reported to the Water Resources Commission that the Neponset Basin is hydrologically stressed. The scope for this EIR must be broad and should include a full modeling of the surface water and groundwater hydrology for the entire area which will be impacted, the East Branch subwatershed in the Neponset Basin, the Canoe River subwatershed in the Taunton and the Foxboro and Sharon wells. The model must be run under a variety of scenarios including at a pump rate exceeding 1 mgd during low flows periods when demand is high.

MEPA is the only step in the permitting process that can require a true evaluation of alternatives and the regional impacts. If an EIR is not required, as was the case with Canton's well #9, there will be no such evaluation of alternatives and substantive discussion of these issues. This summer, water supply issues in the town of Sharon came to a head. Water levels in Lake Massapoag, a Great Pond, began to drop dramatically. Lake managers were at loss as to the cause. The most obvious solution was to limit the amount of water flow out of the pond and down Massapoag Brook. However, these attempts did little to increase lake level. As of the beginning of September , the Lake had dropped 18 inches below the desired level of 10.5 feet. Many hypothesis were made. 'Excessive pumping of the municipal wells had drawn water from the lake.' 'Excessive pumping had intercepted groundwater supply which recharges the Lake.' 'The conservation agent was allowing too much water out of the lake in an attempt to flush it.' After attending numerous meetings one thing has become clear, the data needed to assess what was occurring at Lake Massapoag, the contributing streams and the adjacent wetlands does not exist. Until the necessary data is collected and interpreted, we do not know what is the impact of the existing wells or the potential impact of the proposed well.

Although it is beyond MEPA to deal with the cumulative effects of water withdrawals, it has become apparent that this information must be collected. For example, in the East Branch of the Neponset Basin, an area of 27 square miles, there are 11 active wells and 4 wells currently proposed or in the permitting process. No single proponent can be required to address questions of this magnitude. There appears to be no attempt by the Commonwealth to establish a mechanisms to address these issues. NepRWA recommends the development of a GEIR or other report which would provide a comprehensive planning tool.

Thank you for your consideration.

Sincerely,

Michele Cobban Barden
Water Policy Director

COMPARISON REPORT 9/10/97

MAY

YEAR	STATION # 2	3	4	5	6	7	TOTALS	YEAR
1988	5868	6375	16558	11699	5419	0	45919	198
1989	11022	0	18797	17222	10732	0	57773	198
1990	2606	7460	23110	0	9901	0	43077	199
1991	0	9170	21745	15364	9576	8913	64768	199
1992	3108	6492	20557	10254	4443	6026	50880	199
1993	5058	3648	21107	11099	5969	6337	53218	199
1994	9584	2414	14821	13741	6466	6591	53617	199
1995	6685	5143	11258	11658	5827	10889	51460	199
1996	7289	5145	13173	9843	968	11372	47790	199
1997	4579	5770	22281	1296	0	11552	45478	199

JULY

YEAR	STATION # 2	3	4	5	6	7	TOTALS	YEAR
1988	10078	8585	24058	11642	8863	0	63226	198
1989	11216	11108	18576	19126	11321	0	71347	198
1990	7178	11777	22495	14331	10966	0	66747	199
1991	0	10172	24147	10047	9089	10276	53731	199
1992	10359	7695	15747	9979	6814	7528	58122	199
1993	14683	6608	25437	11716	7830	11455	77729	199
1994	10815	7210	25808	12294	8212	13956	78295	199
1995	9995	9372	28203	9904	9084	13560	80118	199
1996	4623	4908	20535	9799	9778	11806	61449	199
1997	12376	10025	28811	12550	7903	12646	84311	199

	JUNE	JULY	AUGUST	TOTAL
1995	68926	80118	73345	222389
1996	62301	61449	58115	181865
1997	77167	84311	61912	223390

Weston & Sampson
ENGINEERS, INC.

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July 9, 1997

Town of Sharon
Proposal

Mr. Greg Meister,
Conservation Commission
217 So. Main Street, Rear
Sharon, Massachusetts 02067

Re: Proposal for Groundwater Analysis
around Massapoag Lake

Dear Mr. Meister:

In accordance with our discussions, Weston & Sampson Engineers, Inc. (W&S) is pleased to submit this proposal for the referenced services. We believe that this proposal addresses your request for the evaluation of groundwater conditions around Lake Massapoag in Sharon.

The evaluation of groundwater conditions around the Lake may be best accomplished as a phased approach as follows:

- Phase I consists of data review and attendance at a Conservation Commission meeting.
- Phase II will consider the project requirements and the geology/hydrogeology of the basin, as well as the potential causes of water level declines in the basin.
- Phase III is not defined as of yet.

The attached proposal provides a cost and scope of work for Phases I as described. The details and costs of Phases II and III cannot be provided until the initial phase of work is completed. Consequently, we will provide you the additional costs once we can be specific as to the details.

SCHEDULE

We will attend the Conservation Commission meeting on 7/10/97 and will provide an additional scope of work and budget once your needs are clear.

BUDGET

We recommend that you establish a $520.00 not to exceed budget for Phase I of this work.

We look forward to providing the town with services on this challenging project. We propose to conduct this contract under our Standard Terms and Conditions, attached and made a part hereto. Please transmit a notice to proceed to authorize this work.

If you have any questions regarding this proposal, please contact me or Paul M. Williams at your convenience.

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.

Paul G. Sutton, L.S.P.
Vice President

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WESTON & SAMPSON GENERAL TERMS AND CONDITIONS

1. It is understood that this Proposal is valid for a period of ninety (90) days. Upon the expiration of that period of time or the delay or suspension of the services, WESTON & SAMPSON reserves the right to review the proposed basis of payment and fees, to allow for changing costs as well as to adjust the period of performance to conform to work loads. References herein to WESTON & SAMPSON are understood to refer to WESTON & SAMPSON ENGINEERS, INC.

2. Invoices will be submitted periodically (customarily on a monthly basis), and terms are net cash, due and payable upon receipt of invoice. If OWNER fails to make any payment due to WESTON & SAMPSON for services and expenses within thirty (30) days after receipt of WESTON & SAMPSON'S statement therefor, the amounts due WESTON & SAMPSON will be increased at the rate of 1.5% per month from said thirtieth day, and in addition, WESTON & SAMPSON may, after giving seven (7) days' written notice to OWNER, suspend services under this Agreement. Unless payment is received by WESTON & SAMPSON within seven (7) days of the date of the notice, the suspension shall take effect without further notice. In the event of a suspension of services, WESTON & SAMPSON shall have no responsibility to OWNER for delay or damage caused OWNER because of such suspension of services.

3. WESTON & SAMPSON will serve as the professional representative of OWNER as defined by the Proposal or under any Agreement and will provide advice, consultation and services to OWNER in accordance with generally accepted professional practice. Therefore, estimates of cost, approvals, recommendations, opinions, and decisions by WESTON & SAMPSON are made on the basis of WESTON & SAMPSON'S experience, qualifications and professional judgement. WESTON & SAMPSON makes no warranty or guarantee, express or implied, regarding the services or work to be provided under this Proposal or any related Agreement. Notwithstanding any other provision of these General Terms and Conditions, and unless otherwise subject to a greater limitation, WESTON & SAMPSON'S liability to OWNER for any loss or damage, including, but not limited to, special and consequential damages arising out of or in connection with this Proposal or any related Agreement from any cause including WESTON & SAMPSON's professional negligence, errors or omissions shall not exceed the greater of $50,000 or the total compensation received by WESTON & SAMPSON hereunder and OWNER hereby releases WESTON & SAMPSON from any liability above such amount.

4. Where the Services include subsurface exploration, the OWNER acknowledges that the use of exploration equipment may alter or damage the terrain, vegetation, structures, improvements, or the other property at the Site and accepts the risk. Provided WESTON & SAMPSON uses reasonable care, WESTON & SAMPSON shall not be liable for such alteration or damage or for damage to or interference with any subterranean structure, pipe, tank, cable, or other element or condition whose nature and location are not called to WESTON & SAMPSON'S attention in writing before exploration begins.

5. WESTON & SAMPSON and its consultants shall have no responsibility for the discovery, presence, handling, removal or disposal of, or exposure of persons to hazardous waste in any form at the site. Accordingly, OWNER agrees to assert no claims against WESTON & SAMPSON, its agents, servants, officers, directors, employees and subconsultants, if such claim is based, in whole or in part, upon the negligence, breach of contract, breach of warranty, indemnity or other alleged obligation of WESTON & SAMPSON or its subconsultants, and arises out of or in connection with the detection, assessment, abatement, identification or remediation of hazardous materials, pollutants or asbestos at, in, under or in the vicinity of the project site identified in the Proposal. OWNER shall defend, indemnify and hold harmless WESTON & SAMPSON, its agents, servants, employees, directors, officers and subconsultants and each of them, harmless from and against any and all costs, liability, claims, damages or expenses, including reasonable attorneys' fees, with respect to any such claim or claims described in the preceding sentence, whether asserted by OWNER or any other person or entity.

6. WESTON & SAMPSON agrees to purchase at its own expense, Worker's Compensation insurance, Comprehensive General Liability insurance, and Engineer's Professional Liability insurance and will, upon request, furnish insurance certificates to OWNER. WESTON & SAMPSON agrees to purchase whatever additional insurance is requested by OWNER (presuming such insurance is available, from carriers acceptable to WESTON & SAMPSON) provided the premiums for additional insurance are reimbursed by OWNER.

7. As a part of this Agreement, OWNER agrees to do the following:

   a. Designate in writing a person to act as OWNER'S representative with respect to work to be performed under this Agreement, such person to have complete authority to transmit instructions, receive information, interpret and define OWNER'S policies and decisions with respect to materials, equipment elements and systems pertinent to the work covered by the Agreement.

   b. Through its officials and other employees who have knowledge of pertinent conditions, confer with WESTON & SAMPSON regarding both general and special considerations relating to the Project.

   c. Assist WESTON & SAMPSON by placing at the disposal of WESTON & SAMPSON, all available information pertinent to the Project including previous reports and other data relative to design or construction of Project.

   d. Furnish or cause to be furnished to WESTON & SAMPSON all documents and information known to

OWNER that relate to the identity, location, quantity, nature or characteristics of any hazardous waste at, on or under the site. In addition, OWNER will furnish or cause to be furnished such other reports, data, studies, plans, specifications, documents and other information on surface and subsurface site conditions required by WESTON & SAMPSON for proper performance of its services. WESTON & SAMPSON shall be entitled to rely upon OWNER-provided documents and information in performing the services required under this Agreement; however, WESTON & SAMPSON assumes no responsibility or liability for their accuracy or completeness. OWNER-provided documents will remain the property of OWNER.

e. Pay for all sales taxes for professional services and all costs associated with approvals and permits for all governmental authorities having jurisdiction over the Project and such approvals and consents from others as may be necessary for completion of the Project.

f. Arrange for and make all provisions for WESTON & SAMPSON and its agents to enter upon public and private lands as required for WESTON & SAMPSON to perform its work under this Agreement.

g. Furnish WESTON & SAMPSON with all necessary topographic, property boundary and right-of-way maps.

h. Cooperate with and assist WESTON & SAMPSON in all additional work that is mutually agreed upon.

i. Pay WESTON & SAMPSON for work performed in accordance with terms specified herein.

8. The obligation to provide further services under this Agreement may be terminated by either party upon thirty day's written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof through no fault of the terminating party. If the Project is suspended or abandoned in whole or in part for more than three (3) months, WESTON & SAMPSON shall be compensated for all services performed prior to receipt of written notice from OWNER of such suspension or abandonment, together with the other direct costs then due. If the Project is resumed after being suspended for more than three (3) months, WESTON & SAMPSON'S compensation shall be equitably adjusted.

9. The OWNER and WESTON & SAMPSON waive all rights against each other and against the contractors, consultants, agents and employees of the other for damages, but only to the extent covered by any property or other insurance in effect whether during or after the project. The OWNER and WESTON & SAMPSON shall each require similar waivers from their contractors, consultants and agents.

10. All documents, including Drawings, Specifications, estimates, field notes and other data, prepared or furnished by WESTON & SAMPSON (and WESTON & SAMPSON independent subconsultants) pursuant to this Agreement are instruments of services in respect of the Project and WESTON & SAMPSON shall retain an ownership and property interest therein whether or not the Project is completed. OWNER may make and retain copies for information and reference in connection with the use and occupancy of the Project by the OWNER and others; however, such documents are not intended or represented to be suitable for reuse by OWNER or others on extensions of the Project or on any other Projects. Any reuse without written verification or adaptation by WESTON & SAMPSON for the specific purpose intended will be at OWNER'S sole risk and without liability or legal exposure to WESTON & SAMPSON or to WESTON & SAMPSON subconsultants, and OWNER shall indemnify and hold harmless WESTON & SAMPSON and WESTON & SAMPSON subconsultants from all claims, damages, losses, and expenses, including attorneys' fees arising out of or resulting therefrom. Any such verification or adaptation will entitle WESTON & SAMPSON to further compensation at rates to be agreed upon by OWNER and WESTON & SAMPSON.

11. To the extent they are inconsistent or contradictory, express terms of this Proposal take precedence over these General Terms and Condition. It is understood and agreed that the services or work performed under this Proposal or any Agreement are not subject to any provision of any Uniform Commercial Code. Any terms and conditions set forth in OWNER'S purchase order, requisition, or other notice or authorization to proceed are inapplicable to the services under this Proposal or any related Agreement, except when specifically provided for in full on the face of such purchase order, requisition or notice or authorization and specifically accepted in writing by WESTON & SAMPSON. WESTON & SAMPSON'S acknowledgement of receipt of any purchase order requisition, notice or authorization or WESTON & SAMPSON'S performance of work subsequent to receipt thereof does not constitute acceptance of any terms or conditions other than those set forth herein.

12. If any provision of this Agreement shall be finally determined to be invalid or unenforceable in whole or in part, the remaining provisions hereof shall remain in full force and effect, and be binding upon the parties hereto. The parties agree to reform or re-execute this Agreement to replace any such invalid or unenforceable provision with a valid and enforceable provision that comes as close as possible to the intention of the stricken provision.

18.9 Conservation Commission Act (G.L. Ch. 40 §8C; Acts of 1996, Ch. 258 §15)

Chapter 40

§8C Conservation commission; establishment; powers and duties. A city or town which accepts this section may establish a conservation commission, hereinafter called the commission, for the promotion and development of the natural resources and for the protection of watershed resources of said city or town. Such commission shall conduct researches into its local land areas and shall seek to coordinate the activities of unofficial bodies organized for similar purposes, and may advertise, prepare, print and distribute books, maps, charts, plans and pamphlets which in its judgment it deems necessary for its work. Among such plans may be a conservation and passive outdoor recreation plan which shall be, as far as possible, consistent with the town master plan and with any regional plans relating to the area. The commission may, from time to time, amend such plan. Such plan shall show open areas including marsh land, swamps and other wetlands, and shall show which areas are subject to restrictions or wetland zoning provisions and any other matters which may be shown on a plan index under section thirty-three of chapter one hundred and eighty-four. Acquisitions of interests in land under this section and other municipal open lands shall be shown thereon as well as lands owned by other entities kept open through any legal requirement. Such plan shall show other areas which public necessity requires to be retained for conservation and passive recreation use. It shall keep accurate records of its meetings and actions and shall file an annual report which shall be printed in the case of towns in the annual town report. The commission may appoint a director, clerks, consultants and other employees, and may contract for materials and services within available funds insofar as the same are not supplied by other departments. The commission shall consist of not less than three nor more than seven members. In cities the members shall be appointed by the mayor, subject to the provisions of the city charter, except that in cities having or operating under a Plan D or Plan E form of city charter, said appointments shall be by the city manager, subject to the provisions of the charter; and in towns they shall be appointed by the board of selectmen, excepting towns having a manager form of government, in which towns appointments shall be made by the town manager, subject to the approval of the board of selectmen. When a commission is first established, the terms of the members shall be for one, two or three years, and so arranged that the terms of approximately one third of the members will expire each year, and their successors shall be appointed for terms of three years each. Any member of a commission so appointed may, after a public hearing, if requested, be removed for cause by the appointing authority. A vacancy occurring otherwise than by expiration of a term shall in a city or town be filled for the unexpired term in the same manner as an original appointment. Said commission may receive gifts, bequests or devises of personal property or interests in real property of the kinds mentioned below in the name of the city or town, subject to the approval of the city council in a city or of the board of selectmen in a town. It may purchase interests in such land with sums available to it. If insufficient funds are available or other reasons so require, a city council or a town meeting may raise or transfer funds so that the commission may acquire in the name of the city or town by option, purchase, lease or otherwise the fee in such land or water rights, conservation restrictions, easements or other contractual rights including conveyances on conditions or with limitations or reversions, as may be necessary to acquire, maintain, improve, protect, limit the future use of or otherwise conserve and properly utilize open spaces in land and water areas within its city or town, and it shall manage and control the same. For the purposes of this section a city or town may, upon the written request of the commission, take by eminent domain under chapter seventy-nine, the fee or any lesser interest in any land or waters located in such city or town, provided such taking has first been approved by a two-thirds vote of the city council or a two-thirds vote of an annual or special town meeting, which land and waters shall thereupon be under the jurisdiction and control of the commission. Upon a like vote, a city or town may expend monies in the fund, if any, established under the provisions of this section for the purpose of paying, in whole or in part, any damages for which such city or town may be liable by reason of any such taking. The commission may adopt rules and regulations governing the use of land and waters under its control, and prescribe penalties, not exceeding a fine of one hundred dollars, for any violation thereof. No action taken under this section shall affect the powers and duties of the state reclamation board or any mosquito control or other project operating under or authorized by chapter two hundred and fifty-two, or restrict any established public access. Lands used for farming or agriculture, as defined in section one A of chapter one hundred and twenty-eight, shall not be taken by eminent domain under the authority of this section.

A city or town may appropriate money in any year to a conservation fund of which the treasurer shall be the custodian. He may deposit or invest the proceeds of said fund in savings banks, trust companies incorporated under the laws of the commonwealth, banking companies incorporated under the laws of the commonwealth which are members of the Federal Deposit Insurance Corporation, or national banks, or invest it in paid up shares and accounts of and in cooperative banks or in shares of savings and loan associations or in shares of federal savings and loan associations doing business in the commonwealth, and any income therefrom shall be credited to the fund. Money in said fund may be expended by said commission for any purpose authorized by this section; provided, however, that no expenditure for a taking by eminent domain shall be made unless such expenditure has been approved in accordance with this section.

WHAT IS MEANT BY "CONSERVATION OF NATURAL RESOURCES" UNDER CHAPTER 40 SECTION 8C?

The Conservation Act includes specifically" promotion and development of natural resources and...the protection of watershed resources.." Conservation of natural resources includes at least seven specific functions of commissions.
A synopsis of the seven functions are:

1. The Productive or Economic Function, represented by agriculture, forestry and fishing. These activities deal with the utilization of the land's renewable resources to develop products of economic value. Farm and forest lands provide open land, use diversity and scenic beauty to the community, as well as meaningful employment. It is the duty of the Commission to research and publicize the facts about the hidden costs of development which invariably show that new school, fire, police, road maintenance, water, sewer and traffic demands outweigh the tax benefits derived from further development of dwellings. Homes next to or close to guaranteed open space constantly increase in value as our living areas become more crowded.

2. The Water Management Function, a serious concern to commissions, since demands on potable water supplies and the dangers from flooding are constantly increasing. Water supply itself is a specifically designated commisssion function under Ch. 131 S.40. The protection of watertable/recharge areas may comprise a substantial portion of an open space master plan.

3. The Recreation Function, inherent in the "promotion and development of natural resources". The most understood use of open spaces, whether they are wooded, open fields, lands bordering streams and ponds, or the sea, is recreational, either passive or active.

4. The Preservation Function, involving the protection of natural features of the local environment which nature has arranged beyond man's ability to improve. A commission should consider the acquisition of land for view, such as ledge, hilltops. waterfront, or even the view of the town itself.

5. The Design Function, a major concern to the commission. An open space conservation plan should strive to shape the residential, business and industrial development patterns of a municipality so that the greatest benefit is derived from the natural resources of the land.

6. The Regulatory Function, the most time consuming reponsibility. Under the 1972 Hatch-Jones Wetland Protection Act, the commission is responsible for regulating the alteration of wetlands. The issuance of these regulatory orders has a direct impact on the development of the community. Natural water in tidelands, ponds, rivers, lakes, streams and in wetlands as they are recognized under Ch. 131 S. 40 is a public amenity, and the

interference with its flow, the expediting of its flow, or its pollution are all to be taken into account under the Wetlands Protection Act.

7. The Coordination Function, essential to assure that all bodies of the municipality, both official and unofficial, whose activities affect the environment, are acting toward a common goal. The Conservation Act charges the commission to "...seek to organize the activities of unofficial bodies organized for similiar purposes...." as well as with "....the promotion and development of the natural resources.

Source: Environmental Handbook for Massachusetts Conservation Commissioners, MACC, Inc., Medford, MA, 1985 Edition

Weston & Sampson
ENGINEERS, INC.

Five Centennial Drive
Peabody, Massachusetts 01960-7985
Tel (508) 532-1900 Fax (508) 977-0100

Environmental Consultants since 1899

November 28, 1995

Mr. David DeLorenzo
Massachusetts Department of Environmental Protection
20 Riverside Drive
Lakeville, Massachusetts 02347

Re: 95032 Sharon Conceptual Zone II Report for Wells 2, 3, 4, 6, & 7

Dear Mr. DeLorenzo:

Weston & Sampson Engineers Inc. (WSE) is transmitting this letter to update you on the status of the investigations into the nitrate nitrogen concentrations which have been detected in Sharon's Beaver Brook production wells 2, 3, & 4. These issues impact on the completion of the conceptual Zone II report. The nitrate investigation and the conceptual Zone II evaluation are, at this time, tied somewhat together as will be explained. The town is moving forward on this work and this letter is intended to provide DEP with an update of this investigation. In addition, I am providing some of the backup discussed in the September 21, 1995 meeting.

Pumping Rates

A DEP internal memo from Sarah Crockett recommended that the following pumping rates be approved for the wells in Sharon:

#2 - .47 mgd	171.55	M.G.Y.
#3 - .26 mgd	138.7	M.G.Y.
#4 - 1.00 mgd	365	M.G.Y.
#5 - none proposed		
#6 - .35 mgd	127.75	M.G.Y.
#7 - .45 mgd.	164.25	M.G.Y.

why??

As the town indicated in our meeting on September 21, all of these rates are acceptable to the town with the exception of the proposed Well 3 rate. That well has historically been used at pumping rates of up to .377 mgd (July 1990), .363 mgd (June 1990), and .344 mgd (June 1991). The town believes that the approved rate for Well 3 should be corrected to .38 mgd. The town will provide additional documentation of this data should you require it.

Also included with this letter are revised downgradient stagnation point calculations. These calculations have been revised based on the approved pumping rates. These calculated stagnation points are subject to significant interpretation of the highly variable water table gradients that exist near each of the wells. These calculations were based on the flattest gradients measured and are therefore quite conservative.

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Water Resources Division
28 Lord Road, Suite 280
Marlborough, MA 01752
508-485-6360

August 14, 1998

Margaret D. Arguimbau, Chairman
and Gregory Meister, Conservation Agent
Conservation Commission
Town of Sharon
90 South Main Street
Sharon, MA 02067

Ms. Arguimbau and Mr. Meister,

Per your request during our meeting of June 9, the USGS has prepared a proposal for a cooperative investigation with the town of Sharon to assess current hydrologic conditions and ground-water development impacts within the town and adjacent areas of the Neponset and Taunton River Basins. The proposal builds on some of the ideas that were discussed in my letter to you of October 20, 1997, and would address several of the questions that were raised in your letter to me of May 18, 1998. The proposal does not address the questions in your letter concerning the relation between releases from Lake Massapoag and temperatures in the lake. These questions would be better addressed in a separate investigation that focused only on the relation between lake discharges and lake temperatures.

The proposed investigation would consist of two primary components: definition of current ground-water and surface-water conditions within the stratified-drift aquifers of the town and development of a ground-water flow and particle-tracking model to evaluate ground-water development impacts on water resources of the town and neighboring communities. The proposal currently does not include a budget. We anticipate that the proposed investigation would require three years from the beginning of field work through publication of the final report. For planning purposes, multi-year projects similar to the one proposed here typically cost from 300 to 400 thousand dollars. The USGS may be able to contribute part of the cost of the investigation, depending on the amount of cooperative funding made available by Congress. This office would not be able to begin a cooperative study with the town until October 1 of this year.

I would be glad to discuss the proposed work with you at your convenience. At this point, it might be advantageous to have a meeting with other town officials and Departments, as well as the Neponset River Watershed Association, who might have an interest in the proposed investigation. My direct number is (508) 490-5070 and Mike Norris' number is (508) 490-5010.

Sincerely,

Paul Barlow

Paul Barlow, Hydrologist

cc: Michele Barden, Neponset River Watershed Association
Michael Norris, Associate District Chief, USGS, Marlborough, MA

CURRENT HYDROLOGIC CONDITIONS AND GROUND-WATER DEVELOPMENT IMPACTS, TOWN OF SHARON, NEPONSET AND TAUNTON RIVER BASINS, MASSACHUSETTS

U.S. Geological Survey
August 14, 1998

Problem:

The town of Sharon, Massachusetts, is typical of many New England communities that rely on ground water to meet their water-supply needs, in that ground-water development can have impacts on other water and environmental resources, such as streams, ponds, and wetlands. Ground-water development in Sharon has implications to water-resource management beyond town boundaries, because the town overlies parts of both the Neponset and Taunton River Basins. Current ground-water and surface-water interactions; long-term sustainability of water supplies; and impacts of ground-water development on ground-water levels, pond levels, wetlands, and streamflow are poorly understood (Sharon Conservation Commission, written commun., May 1998). In particular, hydrogeologic conditions near Lake Massapoag, a large recreational lake in the town, and the interaction of the ground-water system with the lake, are not well defined. Transmissivity and ground-water favorability maps for the town and surrounding areas published in Klinger (1996), IEP (1987), and Brackley and others (1973) suggest continuity of stratified-drift aquifer materials beneath the lake. In addition, a report by Haley and Aldrich (1987) shows ground-water-flow directions from the area just west of the lake near Beach Street toward town well number 3, which is adjacent to Beaver Brook; this ground-water level information also suggests a hydrologic connection between the lake and the underlying aquifer. Additional data are required, however, to evaluate the extent of aquifer-lake interaction.

Management of water resources in the upper reaches of the Neponset and Taunton River Basins, including the town of Sharon, entails several integrated components: (1) a fundamental understanding of the hydrologic system and of the interaction between the hydrologic system and water withdrawals and return flows; (2) accurate accounting of water withdrawal, use, and return flow to the hydrologic system; and (3) evaluation of the impacts of ground-water-development alternatives.

Objective:

A cooperative investigation between the U.S. Geological Survey (USGS) and the town of Sharon, Massachusetts, is proposed to assess current hydrologic conditions and ground-water development impacts in the area surrounding and including the town of Sharon, Neponset and Taunton River Basins, Massachusetts. The proposed investigation has two primary objectives: (1) to define current ground-water and surface-water conditions within the stratified-drift aquifers underlying most of the town, and (2) to evaluate ground-water development impacts on the water resources of the town and neighboring communities through the development and application of a ground-water flow and particle-tracking model.

Benefits:

The proposed investigation would provide an understanding of current hydrologic conditions within parts of the Neponset and Taunton River Basins that will be of benefit to the several parties involved with water-resource development and management in the town of Sharon and in the Neponset and Taunton River Basins. Data collected during the investigation would provide information on:

- Water levels within the aquifers, beneath and within streams, at ponds and lakes (particularly Lake Massapoag), and within wetlands;
- Ground-water subbasin boundaries;
- Hydraulic gradients and flow directions between the aquifers and overlying streams, ponds, and lakes;
- Ground-water flow directions; and
- Locations of ground-water discharge along streams and of stream leakage to underlying aquifers.

The proposed flow model would be useful for the evaluation of several water-resource management issues, including:

- Cumulative effects of existing and proposed new supply wells on (1) ground-water-level declines; (2) streamflow depletions and induced infiltration; and (3) declines in water levels and decreases in ground-water discharge rates to ponds and wetlands;
- Contributing areas and the source of water to supply wells;
- Effects of sewering and of intrabasin and interbasin transfers of pumped water on the ground-water flow system; and
- Contaminant flowpaths and traveltimes through the ground-water flow system.

Approach:

Area of Study: Because the town of Sharon overlies both the Neponset and Taunton River Basins, it will be necessary to include parts of stratified-drift aquifers in both of these basins. The aquifers to be included are: 1. Beaver Brook aquifer to area just north of Sawmill Pond; 2. Aquifer underlying Massapoag Lake and Massapoag Brook to ground-water divide east of Massapoag Brook near Sharon/Stoughton line; 3. Billings Brook/Gavins Pond aquifer extending southward into Foxborough; and 4. Upper Canoe River aquifer extending southward into Foxborough.

Current Hydrologic Conditions: The first component of the investigation will be to define the current ground-water and surface-water conditions within the study area. This will require developing water-level and streamflow networks that will be monitored for a one-year period. Data collected from these networks will provide information on water levels within the aquifers, beneath and within streams, at ponds and lakes, and within wetlands. Ground-water-level measurements will be used to develop water-table maps of the study area, which show hydraulic gradients and ground-water flow directions in the aquifers; boundaries between ground-water subbasins; and hydraulic gradients and interactions with overlying streams, ponds, and lakes. The water-level and streamflow networks established during this investigation could then be used by the town to monitor future changes in water-level and streamflow conditions throughout the study area. A recent example of the use of water-level and streamflow networks for definition of the water table and evaluation of stream-aquifer interaction is given for the Hunt River Basin of Rhode Island (Dickerman and Barlow, 1997).

The town of Sharon has already begun an inventory of observation wells that could be used as part of this network. Several sites will be identified at which streamflow measurements will be made. Staff gages will be installed at each of these sites from which stage-discharge relations can be determined (that is, the relation between stream depth and streamflow). Water-level and streamflow measurements will be made monthly at a few sites during the data-collection phase to determine typical water-level and streamflow fluctuations in the study area over a one-year cycle. One to three synoptic measurements of water levels and streamflow at all of the data-collection points will be made to determine ground-water and surface-water conditions and interactions during selected intervals in the hydrologic cycle. These synoptic measurements also will provide data on seepage of ground-water and streamflow at the stream-aquifer boundary (referred to as streamflow seepage measurements).

Ground-water and lake levels at Lake Massapoag will be used to determine hydraulic connection, hydraulic gradients, and flow directions between the lake and aquifer. In addition, geophysical techniques such as marine seismic reflection and ground-penetrating radar, in conjunction with limited aquifer drilling, could be used to determine sediment types at the lake-aquifer boundary and to better define aquifer lithology and saturated thickness near the lake.

Ground-Water Development Impacts: The second component of the investigation will be to evaluate ground-water development impacts on the hydrologic system within the study area. This will be accomplished by development of steady-state and transient, finite-difference ground-water flow and particle-tracking models of the stratified-drift deposits within the study area (till- and bedrock-upland areas will not be simulated). The computer programs MODFLOW (McDonald and Harbaugh, 1988; Harbaugh and McDonald, 1996) and MODPATH (Pollock, 1994) will be used for the flow and particle-tracking models, respectively. The MODFLOW computer program (model code) can simulate ground-water and surface-water (streams, ponds, and lakes) interactions.

Simulations of ground-water withdrawals will provide information on ground-water level declines, streamflow depletions and induced infiltration, intrabasin movements of water, and cumulative impacts of ground-water development on the water resources of the study area. The source of water to the wells, including any contributions from Lake Massapoag, also will be identified for average (steady-state) and transient hydrologic conditions. Alternative ground-water development strategies will be evaluated to determine which strategies have the least effects on wetlands, streamflows, and pond levels. Contributing areas to supply wells will be identified for steady-state pumping and recharge conditions. The flow models also will provide hydrologic budgets for the study area for average and transient hydrologic conditions.

The model will require the following information:

1. Calibration data: Calibration of the flow model will be made to water levels and streamflows measured in the study area during the investigation.

2. Recharge rates: Recharge rates from precipitation and wastewater return flow (see item 4 below) will be estimated from available information. Because recharge rates can be difficult to define accurately, a sensitivity analysis will be done to determine how ground-water levels and flow rates are affected by changes in simulated recharge rates.

3. Aquifer and streambed hydraulic properties: For the most part, existing information on aquifer transmissivity, hydraulic conductivity, and saturated thickness available in Brackley and others (1973), Williams and others (1973), Lapham (1988), Klinger (1996), consulting engineers' reports, and USGS files will be used in the model development. Saturated thickness of the aquifer will be

updated on the basis of ground-water level data collected during the investigation. In addition, limited drilling and geophysical techniques may be necessary in selected parts of the town to better define the vertical extent of the stratified-drift deposits, particularly near Lake Massapoag. Streambed hydraulic properties will be estimated from available lithologic information and results of the streamflow seepage measurements.

4. Current and proposed water withdrawals, return flows, and intra- and interbasin transfers: An accounting will be made of the distribution and timing of current ground- and surface-water withdrawals, return flows from septic systems and wastewater-treatment facilities, and intra- and interbasin transfers of water. Intrabasin transfers are those that occur within the study area from one ground-water or surface-water subbasin to another. Estimates also will be made (or provided by the town) of proposed future withdrawals, return flows, and transfers, for selected model simulations.

References:

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McDonald, M.G., and Harbaugh, A.W., 1988, A modular three-dimensional finite-difference ground-water flow model: U.S. Geological Survey Techniques of Water-Resources Investigations, book 6, chap. A1, 586 p.

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FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

September 25, 1998

Ian Cooke, Executive Director
Michele Cobban Barden, Water Policy Director
Neponset River Watershed Association
2438 Washington Street
Canton, MA 02021

Dear Ian and Michele:

Once again, NEPRWA has exerted the considerable effort necessary to identify an important issue which any basin community, the least bit interested in ensuring the long-term sustainability of its water resources, should take seriously. Although some associates in the Town of Sharon may question the validity of your overall conclusions and recommendations based upon the body of data collected and methodologies utilized for analysis, the report has provided more than sufficient evidence that a problem exists.

By simply undertaking this study, you have demonstrated that there is an inconsistent body of data, town to town, available for analysis. You have exposed areas where needed data is lacking. Foremost, however, you have suggested that each basin community contributes in specific ways to "The Problem" as identified in your report and could begin to take recommended actions to investigate and mitigate the progressive impacts within the basin.

Diminished summertime stream flows, or "the stream flow squeeze", as you refer to the problem, should serve as an abrupt wake-up call to all involved. This "problem" is indicative of hydrologic conditions which are out of balance; where ground water recharge rates are running at a deficit. If such symptoms become evident within the recharge zones of producing wellfields, then municipal response should be heightened. In the past, documentation of stream flow deficiencies within the Town of Sharon has been presented. It appears that more conclusive evidence is required to convince Town officials that: 1. "The Problem" also exists here; 2. that evidence of stream flow and surface water level deficiencies presented thus far, may be caused by factors other than simple climatic conditions; and 3. that water resources may be, or are being negatively impacted.

The Commission is therefore appreciative of NEPRWA's proposed stream flow monitoring and threshold methodology study. A properly designed program of stream flow measurement year round would begin to provide conclusive evidence of any seasonal stream flow deficiencies from which the causes could then be investigated. The Commission understands that diminishing seasonal stream flow is both a problem in itself, and can represent a symptom of more serious problems depending on the identified causes. By virtue of this correspondence, you should consider the Commission committed to recruiting the volunteers required to perform the scheduled stream flow measurements within the Town upon commencement of this proposed study.

As you have correctly acknowledged, Sharon is the least densely populated municipality within the study area. The Town possesses a vast land base of permanently protected open space, has promulgated strict environmental and zoning statutes, relies nearly exclusively upon on-site septic systems for waste disposal, and has a comparative lack of large volume industrial/commercial water users. It is reasonable to assume that the Town's comparative and cumulative effect upon basin-wide stream flow levels is consequently lower than many other municipalities in the basin, particularly those with higher density and higher inflow and infiltration rates. Eric Hooper addresses this stance well in his comments relative to the study. We believe this is important to acknowledge when comparing data.

Your final document hopefully will focus and guide Sharon's efforts in the following areas:

- The high summertime consumptive water use associated with lawn irrigation.
- The need for a more focused investigation of current surface and groundwater conditions and relationships.
- The effects and/or impacts of interbasin, intersub-basin water transfers associated with water withdrawal and distribution.
- The need to investigate the potential cumulative impact to stream flow levels resulting from well fields located in close proximity.
- The need to diversify aquifer utilization and investigate any remaining areas in Town where water of sufficient volume and quality exists.

Town leaders acknowledge that Sharon's summertime water consumption is excessive in some regards and have begun to address this issue. However, the Commission believes there should be stronger concern relative to any potential impacts associated with water usage and/or distribution. Data assembled by a scientific, reliable and reputable source will add support in this regard. The Commission, therefore, has taken your advice and requested that the United States Geological Survey (U.S.G.S.)

prepare a study proposal, sufficient in scope, to answer the questions which the Sharon Conservation Commission considers necessary to protect the long-term sustainability of our water resources (enclosed). The resulting proposal will be timely in combination with efforts by your organization to address and establish stream flow methodology in conjunction with the overall issues of water use within the Town.

In closing, we look forward to receiving the final draft of the "Neponset Basin Water Use Efficiency Report". Whereas, we encourage your careful consideration of any submitted comments, the Commission sees no justification for an indefinite delay in preparing the final document. The report's timely release will provide basin communities with the opportunity to further investigate the issues identified and to take recommended mitigative actions, were they so inclined.

Thank you for your continued efforts and for the opportunity to comment.

Sincerely,

Gregory Meister
Conservation Officer

and For the Commission,

Margaret D. Arguimbau
Chairman

GM/dm
enc.
cc: Board of Selectmen
Benjamin Puritz, Town Administrator
J. Sulik, Sup't Sharon DPW
Eric Hooper, Sharon Town Engineer
Trudy Coxe, Secy of Exec Office of Environmental Affairs
Jack Hamm, DEP, SERO
Paul Barlow, USGS
Board of Health
Fred Clay, Chair, WMAC

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Paul Barlow, USGS
Board of Health
Fred Clay, Chair, WMAC

Haley & Aldrich, Inc.

Consulting
Geotechnical Engineers,
Geologists and
Hydrogeologists

30 April 1987
File No. 627800

Town of Sharon
Town Office Building
90 South Main Street
Sharon, Massachusetts 02067

Attention: Mr. Benjamin Puritz
Executive Secretary - Board of Selectmen

Subject: Groundwater Impact Assessment
Proposed On-site Septic System
Former Sacred Heart School Property
Sharon, Massachusetts

Gentlemen:

The following letter report summarizes the results of a groundwater impact assessment conducted in connection with the proposed development of an on-site septic system at the former Sacred Heart School property in Sharon, Massachusetts. The groundwater assessment included evaluation of the potential impacts of the proposed on-site leaching field on Municipal Well #3 and the impacts that would occur should the abandoned leaching field, operated by the former Sacred Heart School, be reopened. The impact on the water supply pumped from Municipal Well #3 has been expressed as a daily incremental increase over reported background levels. Reduction in impact due to dilution as a result of precipitation and through the use of a package treatment plant were also investigated. This report was prepared in accordance with our proposal dated 12 February 1987. The location of the subject site is shown on Figure 1, Project Locus.

Introduction

The subject site is comprised of approximately 2.2 acres on which the abandoned Sacred Heart School is located. We understand that the site is owned by the Town of Sharon and is for sale, and that at least one proposed use of the site includes plans for 33 one-bedroom condominiums which would generate approximately 4000 gpd of domestic sewage. Given that no on-site sewer or septic systems exist, the Town is interested in the suitability of the site for on-site domestic sewage disposal via a conventional septic system. The purpose of this study was to assess the suitability of the site for on-site sewage disposal, and the potential impacts of that disposal on Lake Massapoag, located approximately 1500 ft. southeast of the site, and the Town of Sharon Municipal Well #3, located approximately 2400 ft. northwest of the subject site. Further the study also assessed the impact due to additional nutrient loading should the sewage from some of the homes on Lake Massapoag be transferred to the existing Sacred Heart School leaching field located approximately 1900 ft. east of Municipal Well #3. The town was also interested in the potential benefit of installing a package treatment plant for renovation of effluent.

This assessment is based upon a review of readily available information including previous aquifer and site studies conducted by IEP, Inc. (1), and GHR Environmental, Inc. (2), supplemented by reconnaissance-level surveys of the site, and a limited subsurface exploration program.

Site Conditions

The 2.2-acre parcel is located near the intersection of Cedar Street and East Foxboro Street, approximately 1500 ft. northwest of Lake Massapoag, as shown on Figure 1. The site is currently occupied by two abandoned buildings which in part, comprised the Sacred Heart School. Nearby, on adjacent Town property are tennis courts and a small pond which reportedly is not used for any recreational purposes (3). The site is located on level terrain ranging in elevation from approximately 260 to 265 ft. mean sea level, which slopes gently down to the southeast towards the wetlands adjacent to Lake Massapoag. The area appears to be an outwash plain formed by sands and gravels deposited by glacial meltwater streams. The topography of the site area appears to form a surface drainage divide which separates southeast-oriented flow towards

Lake Massapoag, from northwesterly flow towards Beaver Brook. The small pond to the east of the site appears to be an isolated, body of water with no inflow or outflow streams and appears to be directly connected to the groundwater flow system.

Subsurface Explorations

A total of 4 test borings were completed at the site by Carr-Dee Corporation of Medford, Massachusetts on 6 and 9 March 1987. Observation wells were installed in all of the completed borings. Six observation wells were installed by GHR, Inc. in 1982 as part of a previous study. The boring logs are included in Appendix A.

The borings were completed using 3-3/4-inch inside diameter hollow-stem augers. Soil sampling was performed at 5-ft. intervals from ground surface to borehole completion using a split-spoon sampler driven by a 140-pound hammer. The conduct of the test borings, the soil sampling, and the installation of the observation wells were observed by a Haley & Aldrich, Inc. hydrogeologist. The logs of the test borings are included as Appendix B. Approximate locations of all test borings are shown on Figure 2, Subsurface Exploration Location Plan.

Observation wells are installed in all of the completed test borings. The wells were constructed of 2-inch inside diameter, flush-joint, threaded PVC riser pipes and machine-slotted well screens with 0.01-inch width openings. Each well screen was surrounded by a fine-sand pack extending to at least the top of the screen. A bentonite seal was installed above the top of the sand pack and a cement seal was installed at ground surface at each well. Each well was equipped with a locked standpipe to protect the PVC riser. Water levels were measured periodically in the observation wells using a 100-ft. tape and plunker. Well installation details and groundwater monitoring reports are included in Appendix C. The ground surface elevation of each well was surveyed by Town personnel.

The boring locations were chosen to provide a distributed data base for information on soils and water levels, and to allow a reasonable estimate of groundwater flow directions using the observation wells and existing town monitoring wells shown on Figure 3, Groundwater Level Contour Map.

Subsurface Conditions

The results of the subsurface exploration program indicate that the area is generally underlain by the following materials:

- Fill materials consisting of medium dense to very dense brown coarse to medium sand with varying amounts of cobbles and gravel.

- Glacial outwash deposits consisting of medium dense brown to gray silty fine sand and fine sandy silt with varying amounts of gravel and coarse to medium sand.

Based on the borings undertaken for this investigation and test pits from prior investigations (2) it appears that the soils are suitable for domestic effluent disposal.

Published information indicates the site is underlain by the Sharon Syenite and the Dedham granodiorite formations (4). Depth to bedrock at the site is uncertain; however, no bedrock outcrops were observed during the investigation and the borings were drilled to depths of 17 to 27 ft. without encountering indications of bedrock. GHR borings logs do not indicate evidence of bedrock for borings drilled to depths of 17 to 37 ft.

Hydrology

Groundwater was encountered in the vicinity of subject site in the glacial outwash deposits at depths ranging from approximately 6 to 30 ft. below ground surface (approximately El. 258 to 230 ft. mean sea level). Groundwater was encountered on-site at a depth of approximately 13 ft. Water levels were observed in the site observation wells and in monitoring wells which were installed in the site vicinity during the GHR study. Based on these water levels, groundwater flow appears to be northwest from the site towards Beaver Brook, which is probably a regional groundwater discharge point. The velocity of groundwater flow beneath the subject site was calculated using the hydraulic gradient (defined as the change in groundwater elevation over a lateral distance) of 0.02 derived from the flow contours shown in Figure 3, a hydraulic conductivity (permeability) value of 100 $ft^2/ft/day$ and a porosity value of 0.4, both based on typical values reported in the literature for fine-sand aquifers (5). A

regional flow velocity of 5.0 ft. per day was determined, which implies that groundwater flowing from the subject site would take approximately 1.6 years to reach Beaver Brook which is 2900 ft. away.

The Town of Sharon draws its water supply from a series of municipal wells including Municipal Well #3, which is the well closest to the subject site, located approximately 2400 ft. to the northwest and adjacent to Beaver Brook. The average pumping rate for this gravel packed well was 204,140 gpd in 1986. The radius of influence, which is defined as the area over which a well draws its water under pumping conditions, was evaluated by IEP (1) for Municipal Well #3. Under water stressed conditions (pumping at two times the average rate and assuming no recharge) the radius of influence of the well is about 2000 ft. Although the subject site is outside the radius of influence of Municipal Well #3 under these worst case pumping conditions, the topographic setting of the site and the groundwater flow directions indicate that the site is located within the regional recharge area of the well and will be analyzed as such for this report.

To assess the impact of the recharging effluent on the ambient groundwater flow the height of the groundwater mound beneath the leaching field was predicted using the Hantush analytical solution (6). It is necessary that a sufficient thickness of unsaturated soil exists along the projected effluent pathway to prevent saturation of the field and flow of effluent onto the ground surface. The Hantush solution is conservative in that it assumes that recharge occurs uniformly and continuously beneath the leaching field. Aquifer properties obtained from the literature included a specific yield of 0.25 and a transmissivity of 14,955 gal/day/ft. The application rate, 1 gal/day/ft. calculated over long term conditions, 180 days, resulted in a mound height of 0.16 ft. in the center of the field. On the center edges of the field (63.2 ft. by 63.2 ft.), the mound would be 0.15 ft. In the spring of the year, the groundwater elevation is at or near maximum levels. With at least 10 feet of unsaturated soil, a rise in the water table of up to 5 feet could be permitted, thus allowing at least 4 feet between the water table and the leaching area as required by Title 5.

Septic System Impacts

In order to assess the impacts of an on-site septic system servicing the proposed 33 one-bedroom condominiums at the subject site, a computer model which estimates the attenuation of contaminants in groundwater with distance from a given waste source was utilized. The model is the Vertical and Horizontal Spread (VHS) Model which was developed by the Environmental Protection Agency (EPA) and is based on research by P.A. Domenico and V.V. Pakiauskas (7). The model was developed out of a need in solid waste management to predict potential impacts of contaminant-sources on down-gradient receptors, such as water-supply wells and reservoirs, via groundwater-solute transport.

The VHS model determines attenuation of pollutants in groundwater by the process of geometrical spreading, or dispersion. Assuming that the pollutants maintain a constant concentration and are introduced as a continuous source, the model predicts the decline in concentration with distance from the source based on vertical dispersion within the saturated thickness of the aquifer and transverse dispersion perpendicular to the direction of groundwater flow. The model is very conservative (predicts worst-case conditions) in that it assumes a constant source-concentration over time, the receptor is on a direct line emanating from the center of the waste source, no dispersion is considered in the longitudinal direction parallel to the direction of groundwater flow, and no retardation or dilution by recharge are considered. In addition the model ignores other natural attenuation mechanisms such as soil adsorption, biodegradation, oxidation-reduction reactions, and longitudinal dispersion which are difficult and often impossible to quantify.

An initial nitrogen concentration of 40 mg/l was used to model the migration of contaminants in the groundwater (8,9). Nitrogen, in the form of nitrate, nitrite, and ammonia, is considered the most stable element in sewage effluent and therefore a conservative groundwater tracer. For the purpose of this study all of the nitrogen was assumed to be nitrate nitrogen. Chemical and physical processes such as adsorption, filtration, and precipitation retard the movement of other solutes such as phosphates and bacteria. According to the EPA no satisfactory techniques have been developed to accurately measure phosphorous flux from septic tanks (10) to lakes or other receptors. It is difficult to predict the flux of

phosphorous and other solutes because of the considerable affects of soil retention which are site specific and time dependent. Percolation of effluent through 5 ft. of moderately permeable soil may reduce nitrogen by up to 85% and phosphorous by up to 95% of initial concentrations even before reaching the groundwater table (11).

The input parameters for the model and sources of information are listed in Table I. Based on Massachusetts State Environmental Code, Title 5 requirements the proposed condominium complex would produce nearly 4,000 gpd of sewage requiring an area of 63.2-ft. wide x 63.2-ft. long (12). Transverse and vertical dispersivity (6.56 ft. and 0.66 ft.) values correspond to the EPA definition of a minimally acceptable drinking water aquifer (13). A "minimally acceptable" aquifer has a very low transmissivity and therefore small dispersivity values. Dispersivity is defined as a characteristic of the porous material which "spreads out" or dilutes a tracer front along the flow path. The smaller the dispersivity value the less the tracer is diluted and the more conservative the estimate.

A sensitivity analysis was conducted on the model to see if variation in any one parameter dramatically affected the resulting concentrations (Table II). The most important variable appears to be the saturated thickness of the aquifer. Once the contaminant reaches the bottom of the aquifer vertical dispersion can be neglected. A minimum aquifer thickness of 20 ft. was assumed based on boring logs completed in the area. The size of the leaching field itself also affected the results. A square leaching field has been assumed for all of the calculations. None of the variables appeared to be so sensitive that minor changes resulted in much higher or lower concentrations at the receptor.

The results of the model predicted the total nitrogen (as nitrate) concentration of the effluent as it approaches Well #3 to be 0.8 mg/l, assuming an initial effluent concentration of 40 mg/l. The average background nitrate concentration (as measured in Well #3) for the years 1983 to 1987 is 2.4 mg/l (15), therefore the cumulative concentration in groundwater would be approximately 3.2 mg/l in this worst case situation. This value remains well below the EPA Primary Drinking Water Regulation of 10 mg/l (14).

The most conservative evaluation assumes no renovation of the effluent (initial concentration equal to 40 mg/l of nitrogen as nitrate) and all effluent (4000 gpd) is intercepted by the well. The maximum potential impact of the effluent on the water withdrawn from the well would increase the nitrate concentrations by approximately 33% over the reported background. This estimation also assumes an average well yield of 204,140 gpd (for 1986) and an average background nitrate concentration of 2.4 mg/l using the following equations:

$$C_f = (V_p\ C_o + V_E\ C_E)/V_p \qquad (1)$$

$$\% \text{ Increase} = (C_f - C_o)/C_o \qquad (2)$$

Where,

C_f = Final Nitrate Concentration
C_o = Background Nitrate Concentration
C_E = Effluent Nitrate Concentration
V_p = Volume Pumped by Supply Well
V_E = Volume Effluent Discharged

According to reported literature values, nitrate concentrations may be reduced within the vadose zone up to 95% (9,11). Therefore, if we conservatively assume a 75% reduction of the initial effluent concentration of 40 mg/l due to renovation as it moves through soil profile, the resulting 10 mg/l in the groundwater immediately beneath the leaching field could increase the nitrate concentration in Well #3 by 0.2 mg/l. This represents an 8% increase over the average background level of 2.4 mg/l of nitrogen, as nitrate, which was reported for the years 1983-1987. Table III illustrates the impact of varying the effluent concentration due to renovation. The final nitrate nitrogen concentration in groundwater at Well #3 was well below the EPA Primary Drinking Water Regulation of 10 mg/l despite the level of renovation and the percentage increase in nitrate nitrogen over background levels.

The model was also used to predict the additional impact of effluent produced from re-opening the abandoned Sacred Heart School leaching field to service some of the homes on Lake Massapoag. According to GHR this leaching field was capable of supporting 25,000 gpd of sewage effluent. The leaching field, located near the intersection of East Foxboro and Gunhouse

Streets, is about 1,900 ft. from Municipal Well #3. If it is assumed that both leaching fields were utilized to full capacity and are directly up-gradient from the well, the cumulative total nitrogen concentration in groundwater approaching the well, due to both leaching fields, is predicted to be 6.1 mg/l. The potential impact on the water withdrawn from the well would be an increase of approximately 238% over reported background nitrate concentrations. Figure 4, where cumulative total nitrogen concentrations were predicted versus distance, indicates elevated nitrogen levels, however, they do not exceed the EPA Primary Drinking Water Regulation of 10 mg/l assuming all the nitrogen is in the form of nitrate. The second peak in the cumulative concentration curve represents the introduction of the second and larger contaminant source.

Dilution by Precipitation

In addition to chemical and biological processes which attenuate effluent concentrations, dilution of the effluent will occur in the groundwater as it leaves the site as a result of infiltration of precipitation. This dilution is estimated to further reduce the concentration of effluent based on our estimates of the amount of precipitation recharge between the site and Beaver Brook. Assuming conservatively that the only area available for recharge is a 2,400-ft. long x 200-ft. wide (480,000 sq. ft.) area between the site and the brook, approximately 4.2 million gallons of annual recharge is available for dilution of the flow from the site. This is based on a water budget which assumes that half of the annual 42 inches of precipitation is lost to evapotranspiration and that two-thirds of the remaining water is available for groundwater recharge (approximately 14 inches or 1.17 ft. per year).

Pretreatment

In instances where natural renovation of effluent is of concern, package treatment plants can be used to further reduce the initial concentration of the effluent. The installation of a package treatment plant would reportedly decrease total nitrogen concentrations in the leachate by 20 to 30% (16). Assuming an initial concentration of 30 mg/l instead of 40 mg/l as a result of treatment, in this case decreases the nitrates by 40%, from 0.8 mg/l to 0.5 mg/l as groundwater approaches Municipal Well #3. A package treatment plant is effective in decreasing effluent parameters released to the soil, however it

may not be cost effective for treating sewage of this small volume, and low solute concentration. In addition to the initial installation costs, a package treatment plant being a mechanical device subject to malfunction requires operation and maintenance. The use of leaching fields for renovation of domestic sewage is simple, reliable, and relatively maintenance free.

Reopening the former Sacred Heart School leaching field would service about 62 homes, each using 400 gpd. Transferring the individual septic systems of homes on the lake shore to this leaching field would reduce the total nitrogen loading to the lake by up to 1400 kg/yr and the phosphate loading by up to 900 kg/yr assuming no attenuation. However, while decreasing nutrient loading on the lake the effluent source would be moved to within the radius of influence of the well. The lake is used for recreational purposes it is not a primary drinking water source such as Municipal Well #3. Decreasing nitrogen and phosphate in the lake would probably be more efficiently accomplished by treatment rather than by moving the source to another groundwater basin. The use of a package treatment plant for the off-site system might prove to be beneficial considering the volume of effluent involved and the proximity to a municipal water supply well.

Conclusions

- Groundwater contours interpreted from Haley & Aldrich and GHR observation wells data do not indicate any substantial groundwater movement from the proposed on-site leaching field towards Lake Massapoag.

- The proposed on-site sewage-disposal system may increase nitrate concentrations by 0.8 mg/l as groundwater approaches Municipal Well #3 (2,400 ft. away). The potential impact of the effluent on the water withdrawn from the well would be to increase the nitrate concentrations by 33% over reported background levels of 2.4 mg/l. The assumption and model used to estimate effluent concentrations was very conservative ignoring biodegradation, adsorption, dilution by recharge, and longitudinal dispersion therefore 33% represents a maximum increase in effluent concentration near Municipal Well #3. Actual concentration levels may be as much as 95% lower than predicted. In either case the impact of operating a 4000 gpd septic system on the site as discussed is well below the EPA Primary Drinking Water

Regulation of 10 mg/l. Installation of a package treatment plant could further decrease initial concentrations by 20 to 30% however, this would probably not be cost effective considering the small volume of effluent and low solute concentrations produced by the proposed leaching field.

- Utilizing the full available capacity of the leaching field on the former Sacred Heart School property may result in an effluent nitrate concentration of 6.1 mg/l as groundwater approaches Well #3, assuming an additional application rate of 25,000 gpd. This corresponds to a predicted incremental increase in nitrate of 238% over background levels reported in Municipal Well #3, assuming no attenuation. There is no apparent groundwater seepage towards Lake Massapoag from this location. Decreasing nitrogen and phosphate in the lake would probably be more efficiently accomplished by lake side treatment rather than by moving the source to within the radius of influence of a municipal water supply well.

Limitations

This letter has been prepared for the exclusive use of the Town of Sharon in connection with a site presently under consideration for development in Sharon, Massachusetts.

The conclusions provided by Haley & Aldrich, Inc. are based solely on the scope of work conducted and the sources of information referenced in this report. Any additional information that becomes available concerning this site should be provided to Haley & Aldrich, Inc. so that our conclusions and recommendations may be revised and modified as necessary.

The work performed by Haley & Aldrich, Inc. is subject to the terms and conditions stated in our proposal to the Town of Sharon, Massachusetts, dated 12 February 1987 (Work Items 1-5). This work has been undertaken in accordance with generally accepted hydrogeological practices. No other warranty, express or implied, is made.

Thank you for inviting us to undertake this project. Please contact us if you have any questions or require any additional information concerning this project.

Sincerely yours,
HALEY & ALDRICH, INC.

Barbara J. Kickham
Assistant Hydrogeologist

Wesley E. Stimpson
Vice President

BJK:WES:rec/0354t
Enclosures:

- Sources of Information
- Table I - Input Parameters for EPA VHS Model
- Table II - Sensitivity Analyses for EPA VHS Model
- Table III - Changes in Nitrate Concentrations in Groundwater near Well #3
- Figure 1 - Project Locus
- Figure 2 - Subsurface Exploration Location Plan
- Figure 3 - Groundwater Level Contour Map
- Figure 4 - Concentration of Total Nitrogen vs. Distance from the Leaching Fields
- Appendix A - GHR, Inc. Test Boring Reports
- Appendix B - Haley & Aldrich, Inc. Test Boring Reports
- Appendix C - Groundwater Observation Well Reports and Groundwater Monitoring Reports

SOURCES OF INFORMATION

1. IEP, Inc., 1986, Unpublished Report of Soil Borings for the Town of Sharon.

2. GHR Environmental, Inc., 1982, Unpublished Environmental Impact Report on the Proposed Condominium Conversion in Sharon, Massachusetts.

3. Personal Communication, 1987, Sharon Department of Public Works, James Miller, Town Engineer.

4. Chute, N.E., 1966, "Geology of the Norwood Quadrangle Norfolk and Suffolk Counties, MA," Geological Survey Bulletin 1163-B.

5. Freeze, R.A., Cherry, J.A., 1979, Groundwater, Prentice-Hall, Inc., 604 pp.

6. Hantush, M.S., 1967, "Growth and Decay of Groundwater-Mounds in Response to Uniform Percolation," Water Resources Research, No. 1, pp. 227-234.

7. Domenico, P.A., Palciauskas, V.V., 1982, "Alternative Boundaries in Solid Waste Management," Ground Water, Vol. 20, No. 3, pp. 303-311.

8. Canter, L.W., Know, R.C., 1985, Septic Tank System Effects on Ground Water Quality, Lewis Publishers, Inc., 306 pp.

9. Winneberger, J.H.T., 1984, Septic-Tank Systems: A Consultant's Toolkit: Volume II, The Septic-Tank, Butterworth Publishers, 123 pp.

10. Quantitative Techniques for the Assessment of Lake Quality, 1979, U.S. Environmental Protection Agency, EPA-440/5-79-015.

11. Linsley, R.K., Kohlen, M.A., Paulhus, J.L.H., 1982, Hydrology for Engineers, McGraw-Hill Book Club Co., 508 pp.

12. Massachusetts State Environmental Code, Title 5: Minimum Requirements for the Subsurface Disposal of Sanitary Sewage, MA CMR 310, 15.03.

13. Federal Register, Vol. 50, No. 229, pp. 48899.

14. Environmental Protection Agency Drinking Water Regulations, 40 CFR, 132:0103.

15. Personal communication, 1987, Sharon Town Selectman, Benjamin Puritz and the Sharon Department of Public Works.

16. Process Design Manual for Nitrogen Control, 1975, U.S. Environmental Protection Agency Technology Transfer.

TABLE I

Input Parameters for EPA VHS Model

		Reference
Initial Concentration of Total Nitrogen	= 40 mg/l	8,9,11
Transverse Dispersivity	= 6.56 ft.	13
Vertical Dispersivity	= 0.66 ft.	13
Discharge Volume (110 gal per bedroom)	= 4,000 gpd	12
Bottom Area of Leaching Field	= 4,000 sq. ft.	12
Length = Width	= 63.2 ft.	
Percolation Rate	= 2 min/in	9
Aquifer Thickness	= 20 ft.	

Distance (feet)	Total Nitrogen (mg/l)
0	40
100	10.510
200	5.798
276	5.251
345	3.711
500	2.310
1000	1.333
1500	0.934
2400	0.789

TABLE II

Sensitivity Analyses for VHS Model

The sensitivity of the model for each of the input parameters was examined and compared to the standard case. The standard is as described in Table 1.

1.	Aquifer Thickness (ft):	15	20	25
	Concentration (mg/l) at 100 ft:	10.51	10.51	10.51
	Concentration (mg/l) at 2,400 ft:	1.404	0.789	0.369
2.	Initial Concentration (mg/l):	30	40	50
	Concentration (mg/l) at 100 ft:	7.882	10.510	13.137
	Concentration (mg/l) at 2,400 ft:	0.476	0.789	1.077
3.	Transverse Dispersivity (ft):	6.56	13.12	
	Vertical Dispersivity (ft):	0.66	1.31	
	Concentration (mg/l) at 100 ft:	10.510	7.925	
	Concentration (mg/l) at 2,400 ft:	0.789	0.862	
4.	a) Length (parallel to flow) = Width (perpendicular to flow = 141.4 ft.			
	Concentration (mg/l) at 100 ft:	22.746		
	Concentration (mg/l) at 2,400 ft:	5.545		
	b) Length = 200 ft. Width = 100 ft.			
	Concentration (mg/l) at 100 ft:	22.737		
	Concentration (mg/l) at 2,400 ft:	2.265		
	c) Length = 100 ft. Width = 200 ft.			
	Concentration (mg/l) at 100 ft:	20.644		
	Concentration (mg/l) at 2,400 ft:	11.444		

TABLE III

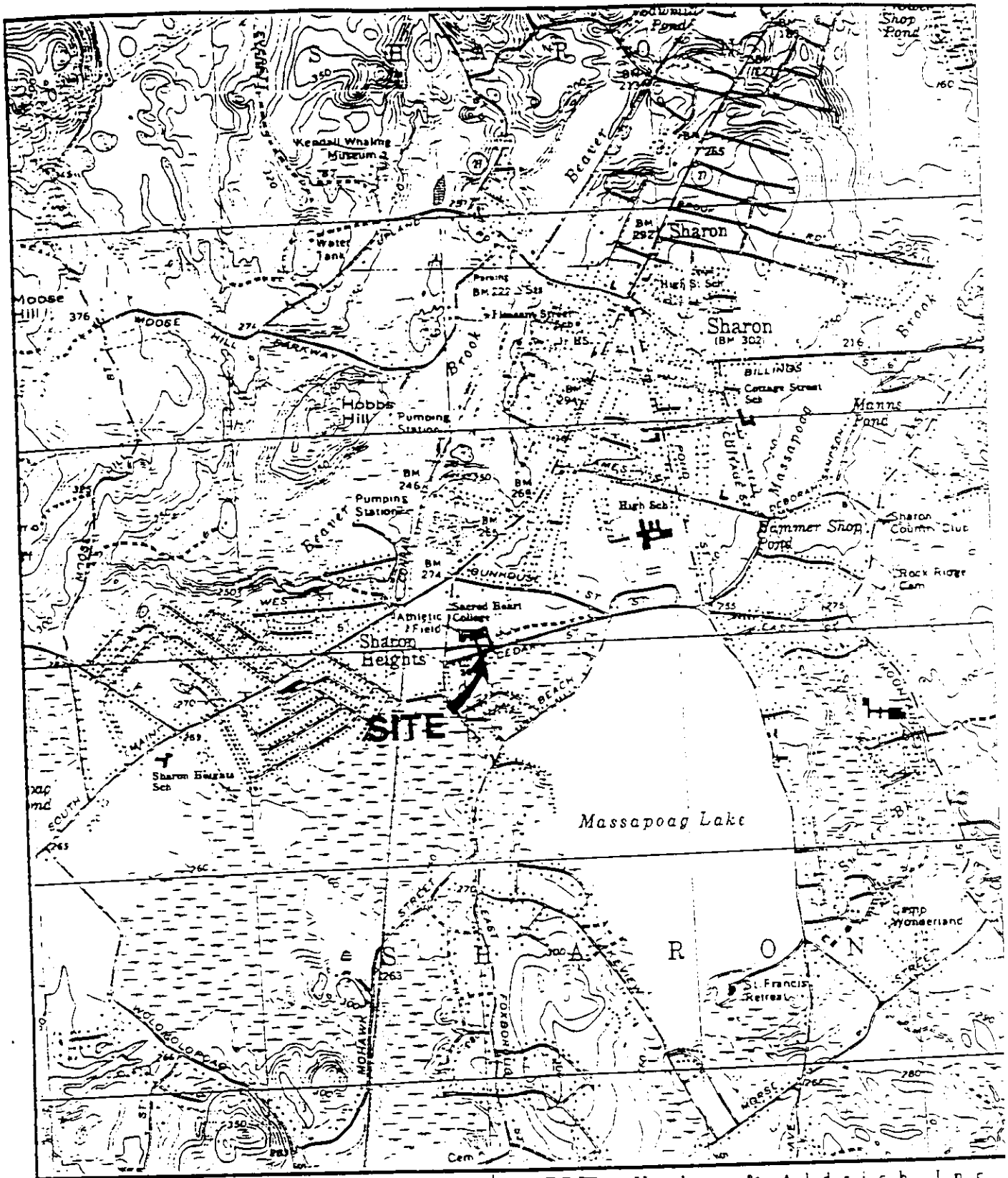
Changes in Nitrate Concentrations in Groundwater Near Well #3

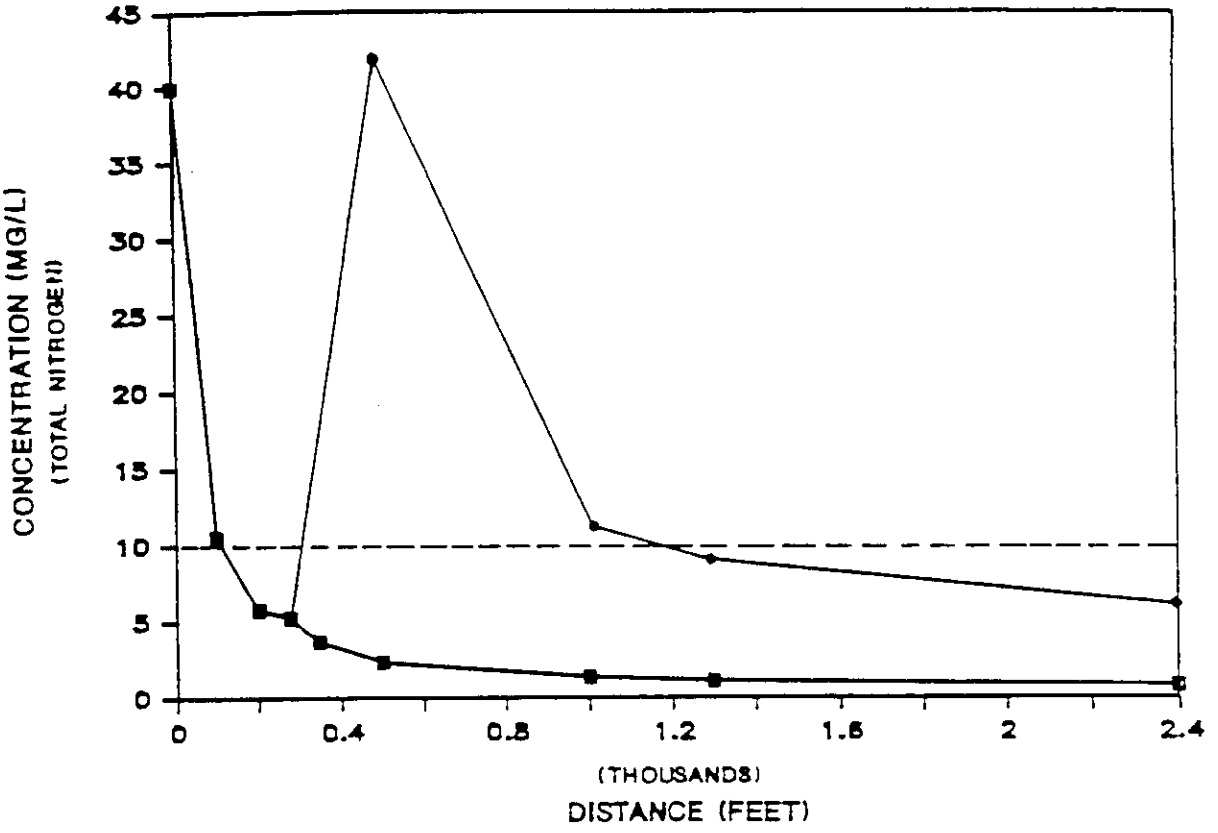
Initial Effluent Concentration (mg/l)	Percent Renovation (%)	Effluent Concentration (mg/l)	Increase in Nitrate Concentration (mg/l)	Final Groundwater Concentration (mg/l)	Increase over Background (%)
40	75	10	0.2	2.6	8
40	63	15	0.3	2.7	13
40	50	20	0.4	2.8	17
40	25	30	0.6	3.0	25
40	0	40	0.8	3.2	33

NOTE:

Calculations were made using equations 1,2, and the following assumptions.

Co = 2.4 mg/l (Background Nitrate Concentration)
Vp = 204140 gpd (Volume Pumped By Supply Well)
Ve = 4000 gpd (Volume Effluent Discharged)


SITE
Massapoag Lake
Sharon Heights
Hobbs Hill
Moose Hill
Sharon
Sharon Heights
Pumping Station
Sacred Heart College
Athletic Field
Hammer Shop Pond
Manns Pond
Beaver Brook
Massapoag Brook
Kendall Whaling Museum
Water Tank
Sharon Country Club
Rock Ridge Cem
Camp Wonderland
St. Francis Retreat
Sharon Heights Sch
Cottage Street Sch
High Sch
Cemetery
SITE COORDINATES: 42°06'33"N 71°11'13"W
U.S.G.S. QUADRANGLE: MANSFIELD, MA
APPROX. SCALE 1:25,000
Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists
GROUNDWATER IMPACT ASSESSMENT
EAST FOXBORO STREET
SHARON, MASSACHUSETTS
PROJECT LOCUS
MARCH 1987
FILE NO. 6278 A1
FIGURE



LEGEND:

PREDICTED NITROGEN CONCENTRATION FROM THE PROPOSED CONDOMINIUM LEACHING FIELD.

PREDICTED NITROGEN CONCENTRATION FROM BOTH THE PROPOSED CONDOMINIUM AND FORMER SACRED HEART SCHOOL LEACHING FIELDS (CUMULATIVE).

MAXIMUM NITRATE, AS NITROGEN, CONCENTRATION (10 mg/L) ALLOWED BY THE EPA PRIMARY DRINKING WATER REGULATION.

Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

GROUNDWATER IMPACT ASSESSMENT
EAST FOXBORO STREET
SHARON, MASSACHUSETTS

CONCENTRATION OF TOTAL NITROGEN
vs. DISTANCE FROM THE LEACHING FIELD

SCALE: AS SHOWN

MARCH 1987

FILE NO. 6278 A4

FIGURE 4

APPENDIX A

GHR, INC. TEST BORING REPORTS

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 1

DATE STARTED 10/1/82 COMPLETED 10/1/82 SURF. ELEV. 210.16

GROUND WATER 206.16 JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Black and brown, dry, SILT, coarse to fine GRAVEL, COBBLES and fine to coarse SAND
					4.0
		14-50/4	1	5'-5.9'	Light brown, wet, very dense to medium dense, medium to coarse SAND, some fine to coarse gravel, trace silt
		60-50	2	10'-12'	
		9-7			
		9-6	3	15'-17'	
		4-5			
20.0'					17.0
					BOTTOM OF BORING 17.0
					NOTE: Installed 15.5' of 2" PVC riser pipe in borehole; bottom 10' section is slotted.

TEST BORING LOG

CON-TEST, INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

HOLE NO. 2

LOCATION SHARON, MA.

DATE STARTED 10/5/82 COMPLETED 10/5/82

SURF. ELEV. 255.65

GROUND WATER PERCHED @ 19'; DEPTH ON COMPLETION - 30.2'

JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SPL NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					Brown, dry, coarse to fine GRAVEL, fine to coarse SAND
					4.0'
5.0'					
		5-6	1	5'-7'	Light brown, dry, medium-dense, fine to medium SAND
		7-9			
					9.0'
10.0'					
		6-7	2	10'-12'	Light brown, dry, medium-dense, fine SAND, trace silt in occasional 1/8" to ½" layers
		8-10			
15.0'					
		5-7	3	15'-17'	
		8-10			
					19.0'
20.0'					
		4-6	4	20'-22'	Light brown, wet, medium-dense, fine SAND and SILT
		6-5			
25.0'					
		3-6	5A	25'-26.5'	
		9-21	5B	26.5'-27'	26.5'
					Light brown, dry, dense, fine SAND, trace silt 28.0'
30.0'					
		7-7	6	30'-32'	Light brown, wet, medium-dense, fine SAND, little silt 36.0'
		8-9			
					Orange-brown, wet, medium-dense, fine SAND 37.0'
35.0'					
		3-3	7A	35'-36'	BOTTOM OF BORING 37.0'
		11-12	7B	36'-37'	NOTE: Installed 37' of 2" PVC riser pipe in borehole; bottom 14' section is slotted.
40.0'					

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 3

DATE STARTED 9/30/82 COMPLETED 10/1/82

SURF. ELEV. 275.30

GROUND WATER DEPTH ON COMPLETION 29.8'

JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1-2	1	0-2'	TOPSOIL .5'
		2-2			Light brown, dry, loose SILT 2.5'
5.0'					Coarse to fine GRAVEL, COBBLES and coarse to fine SAND 4.5'
		10-13	2	5'-7'	Light brown, dry, medium-dense, medium to coarse SAND, little fine to coarse gravel, cobbles
		13-21			
10.0'					
		6-9	3	10'-12'	
		11-17			
15.0'					
		10-23	4A	15'-16'	16.0'
		13-11	4B	16'-17'	Light brown, dry, medium-dense, fine SAND, trace fine gravel
20.0'					
		9-8	5	20'-22'	
		8-9			
25.0'					
		6-10	6	25'-27'	
		10-13			
30.0'					30.0'
		4-12	7	30'-32'	Light brown, wet, medium-dense, fine to medium SAND, trace fine gravel, trace silt
		11-12			
35.0'					37.0'
		4-6	8	35'-37'	
		9-9			
40.0'					BOTTOM OF BORING 37.0'

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 3

DATE STARTED 9/30/82 COMPLETED 10/1/82

SURF. ELEV.

GROUND WATER DEPTH ON COMPLETION 29.8'

JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					NOTE: Installed 39.3' of 2" PVC riser pipe in borehole; bottom 10' section is slotted.

TEST BORING LOG

CON–TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 4

DATE STARTED 10/4/82 COMPLETED 10/4/82 SURF. ELEV. 274.06

GROUND WATER DEPTH ON COMPLETION 24' JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					TOPSOIL .6'
					Light brown, dry SILT 2.5'
5.0'					Light brown, dry, very dense, coarse to fine GRAVEL and coarse to fine SAND 9.0'
		21-28	1	5'-6.5'	
		26			
10.0'					
		6-7	2	10'-12'	Light brown, dry, medium-dense, medium to fine SAND, little fine to medium gravel 15.0'
		8-10			
15.0'					
		5-4	3A	15'-16'	Light brown, dry, loose, medium to fine SAND 16.0'
		5-7	3B	16'-17'	
20.0'					Light brown, dry, medium to dense, fine SAND, trace silt in occasional ½" layers 24.0'
		3-5	4	20'-22'	
		7-7			
25.0'					
		4-5	5	25'-27'	Light brown, wet, medium-dense, fine SAND and SILT 27.5'
		6-6			
30.0'					Light brown, wet, medium-dense, fine SAND
		3-4	6	30'-32'	
		6-6			
35.0'					
		2-4	7	35'-37'	37.0'
		5-6			
					BOTTOM OF BORING 37.0'

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 4

DATE STARTED 10/4/82 COMPLETED 10/4/82

SURF. ELEV. 274.06

GROUND WATER DEPTH ON COMPLETION 24'

JOB NO. 8211

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 2 OF 2

BORING MADE WITH HOLLOW STEM AUGER CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					NOTE: Installed 35' of 2" PVC riser pipe in borehole; bottom 10' section is slotted.

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 5

DATE STARTED 10/5/82 COMPLETED 10/5/82

SURF. ELEV. 269.06

GROUND WATER DEPTH ON COMPLETION - 13.5'

JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

BORING MADE WITH HOLLOW STEM AUGER CASING AND 4" HW CASING

DEPTH	C.	N.	SPL NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
					TOPSOIL .5'
					Coarse to fine GRAVEL and fine to coarse SAND, trace silt 4.0'
5.0'		12-14	1	5'-7'	Light brown, dry, medium-dense, medium to fine SAND and fine to medium GRAVEL 9.0'
		14-12			
10.0'		5-5	2	10'-12'	Light brown, dry, medium-dense, fine to medium SAND, trace fine to medium gravel 12.0'
		5-6			
		3-3	3	13'-15'	Light brown, wet, loose, fine SAND and SILT (sample wet @ 13.5') 18.0'
15.0'		3-4			
		2-3	4	15'-17'	
		4-5			
20.0'					Light brown, wet, medium-dense, fine SAND, trace silt in occasional 1" layers 22.0'
		3-4	5	20'-22'	
		7-8			
25.0'					BOTTOM OF BORING 22.0'
					NOTE: Installed 21.5' of 2" PVC riser pipe in borehole; bottom 10' section is slotted.

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 6

DATE STARTED 9/30/82 COMPLETED 9/30/82

SURF. ELEV. 264.70

GROUND WATER DEPTH ON COMPLETION 9.8'

JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

BORING MADE WITH HOLLOW STEM AUGER CASING AND 4" HW CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		2-2	1	0-2'	TOPSOIL .5'
		5-5			Brown, dry, medium-dense, fine to coarse SAND and coarse to fine GRAVEL, COBBLES, trace silt 4.0'
5.0'					
		6-8	2	5'-7'	Light brown, dry, medium-dense, fine to medium SAND, trace fine to medium gravel
		8-9			grades to
					Light brown, wet, loose, fine SAND, little silt
10.0'					
		3-3	3	10'-12'	
		3-4			13.0'
15.0'					Light brown, wet, hard SILT 16.0'
		13-21	4A	15'-16'	Light brown, wet, dense, fine to coarse SAND and fine to coarse GRAVEL, COBBLES, little silt
		37-12	4B	16'-17'	
20.0'					22.0'
		46-27	5	20'-22'	BOTTOM OF BORING 22.0'
		11-10			NOTE: Installed 20' of 2" PVC riser pipe in borehole; bottom 13' section is slotted.
25.0'					

TEST BORING LOG

CON-TEC., INC.
P.O. BOX 1153
CONCORD, N.H. 03301
603-224-0020

PROJECT SEPTAGE STUDY

LOCATION SHARON, MA.

HOLE NO. 7

DATE STARTED 9/30/82 COMPLETED 9/30/82

SURF. ELEV. 265.61

GROUND WATER DEPTH ON COMPLETION 1'

JOB NO. 8245

N-NO OF BLOWS TO DRIVE 2" SAMPLER 6" W/140 LB. WEIGHT FALLING 30"

C-NO. OF BLOWS TO DRIVE CASING 12" W/300 LB. WEIGHT FALLING 24"

SHEET 1 OF 1

BORING MADE WITH HOLLOW STEM AUGER CASING AND 4" HW CASING

DEPTH	C.	N.	SPL. NO.	SAMPLE DEPTH	DESCRIPTION OF MATERIAL
		1-3	1	0-2'	TOPSOIL .5'
		8-12			Brown, dry, medium-dense, fine to coarse GRAVEL and fine to coarse SAND
5.0'					5.0'
		13-13	2	5'-7'	Light brown, dry, dense, medium to fine SAND, little fine to medium gravel 8.0'
		23-16			
10.0'					Light brown, wet, loose, fine SAND
		2-3	3	10'-12'	
		3-3			
					14.0'
15.0'					
		7-8	4	15'-17'	Light brown, wet, stiff SILT
		3-3			
					20.0'
20.0'					
					BOTTOM OF BORING 20.0'
					NOTE: Installed 21' of 2" PVC riser pipe in borehole; bottom 10' section is slotted.

APPENDIX B

HALEY & ALDRICH, INC. TEST BORING REPORTS

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1957 Job No 87189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft.

BORING 1

GROUND SURFACE

	FILL LOAMY SAND, GRAVEL	5 3 3 3	S#1, FROM G.S. TO 2'0" RECOVERED 6"
		5 45 53 51	S#2, FROM 5'0" TO 7'0" RECOVERED 8"
8'0"			
	MEDIUM DENSE FINE SAND, LITTLE GRAVEL	6 8 6 7	S#3, FROM 10'0" TO 12'0" RECOVERED 9"
13'6"			
	MEDIUM DENSE FINE SAND, TRACE OF INORGANIC SILT	6 9 10 11	S#4, FROM 15'0" TO 17'0" RECOVERED 9"
17'6"			
	DENSE FINE SAND, SOME INORGANIC SILT	14 15 17 20	S#5, FROM 20'0" TO 22'0" RECOVERED 21"
24'0"			

(CONTINUED ON SHEET NO. 2)

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1987 Job No 87189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft.

BORING 1 (CONTINUED)

24'0"		
	LOOSE FINE SAND, SOME INORGANIC SILT	3 4 5 6
27'0"		

S#6, FROM 25'0" TO 27'0"
RECOVERED 22"

WATER LEVEL 18'0"
SIZE OF AUGERS 3-3/4" I.D., LENGTH 25'0"
DRILLER: S. WOICULEVICZ INSPECTOR: B. KICKHAM
DATE STARTED & COMPLETED: 3-6-87

INSTALLED OBSERVATION WELL(2" PVC PIPE, 10'0" SLOTTED, 15' SOLID), 25'0" BELOW GROUND SURFACE, 2'6" STICK-OUT, INCLUDING PROTECTIVE CASING.

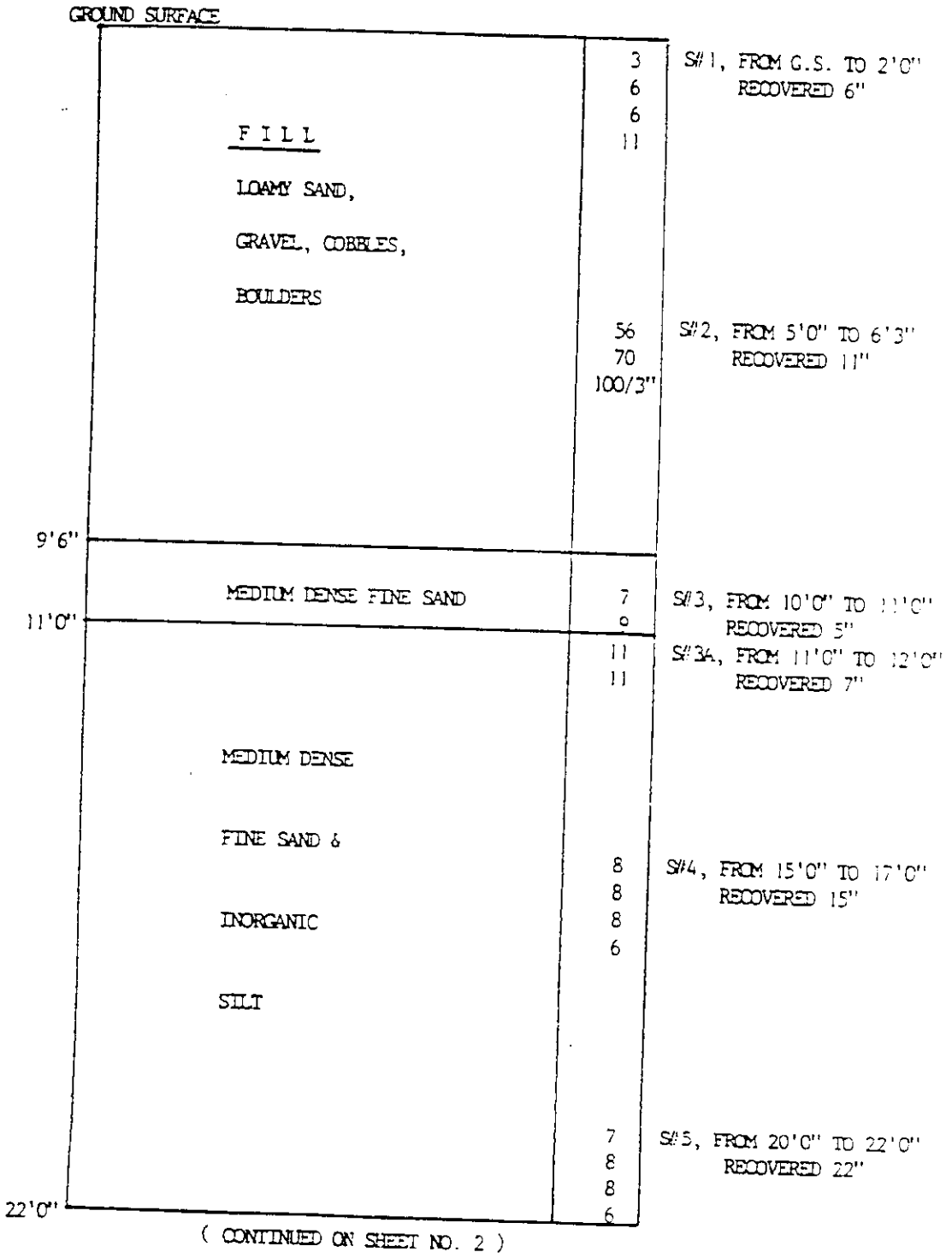
All samples have been visually classified by ___ . HJD ___ Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive two-inch split sampler 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1987 Job No 87189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft.

BORING 2



(CONTINUED ON SHEET NO. 2)

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1987 Job No 87189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft.

BORING 2 (CONTINUED)

WATER LEVEL 13'0"
SIZE OF AUGERS 3-3/4" I.D. LENGTH 20'0"
DRILLER: S. WOICULEVICZ, INSPECTOR: B. KICKAM
DATE STARTED & COMPLETED: 3-6-87

INSTALLED OBSERVATION WELL(2" PVC PIPE, 10'0" SLOTTED, 22'6" SOLID), 20'0" BELOW GROUND SURFACE.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive two-inch split sampler 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 3" [illegible] weight falling 24 inches ±.

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1987 Job No 67189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft.

BORING 3

GROUND SURFACE

	5 6 7 11	S#1, FROM G.S. TO 2'0" RECOVERED 10"
FILL MEDIUM SAND, GRAVEL, COBBLES	14 16 13 12	S#2, FROM 5'0" TO 7'0" RECOVERED 9"
9'0"		
	6 9 9 10	S#3, FROM 10'0" TO 12'0" RECOVERED 9"
MEDIUM DENSE DENSE FINE SAND & INORGANIC SILT	4 7 8 8	S#4, FROM 15'0" TO 17'0" RECOVERED 16"
	3 6 6 7	S#5, FROM 20'0" TO 22'0" RECOVERED 22"
25'0"		

(CONTINUED ON SHEET NO. 2)

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-450

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1987 Job No 87189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft

BORING 3 (CONTINUED)

25'0"

MEDIUM DENSE FINE SAND & INORGANIC SILT	5 7 7 6

27'0"

S/6, FROM 25'0" TO 27'0"
RECOVERED 22"

WATER LEVEL 13'0"
SIZE OF AUGERS 3-3/4" I.D. LENGTH 25'0"
DRILLER: S. WOICULEVICZ, INPSECTOR: B. KICKAM
DATE STARTED & COMPLETED: 3-9-87

INSTALLED OBSERVATION WELL(2" PVC PIPE, 15'0" SLOTTED, 7'6" SOLID), 22'6" BELOW GROUND SURFACE.

All samples have been visually classified by ___ RJD ___ Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive two-inch split sampler 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot using 300 lb. weight falling 24 inches ±.

37 LINDEN STREET P.O. BOX 67 MEDFORD, MA 02155-0001 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date MARCH 11, 1987 Job No 87189

Location CEDAR, GUNHOUSE, AND E. FOXBORO STREETS, SHARON, MA (H&A #6278) Scale 1" = 3 ft

BORING 4

GROUND SURFACE

FILL LOAM, SOME SAND, GRAVEL, COBBLES,	1 3 4 4	S#1, FROM G.S. TO 2'0" RECOVERED 6"
	16 24 18 18	S#2, FROM 5'0" TO 7'0" RECOVERED 12"
7'6"		
MEDIUM DENSE FINE SAND & INORGANIC SILT	7 7 6 7	S#3, FROM 10'0" TO 12'0" RECOVERED 21"
	2 6 6 8	S#4, FROM 15'0" TO 17'0" RECOVERED 17"
17'0"		

WATER LEVEL 6'0"
SIZE OF AUGERS 3-3/4" I.D. LENGTH 15'0"
DRILLER: S. WOICULEVICZ, INSPECTOR: B. KICKAM
DATE STARTED & COMPLETED: 3-9-87

INSTALLED OBSERVATION WELL(2" PVC PIPE, 10'0" SLOTTED, 7'6" SOLID), 15'0" BELOW GROUND SURFACE.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive two-inch split sampler 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CAMBRIDGE, MASSACHUSETTS

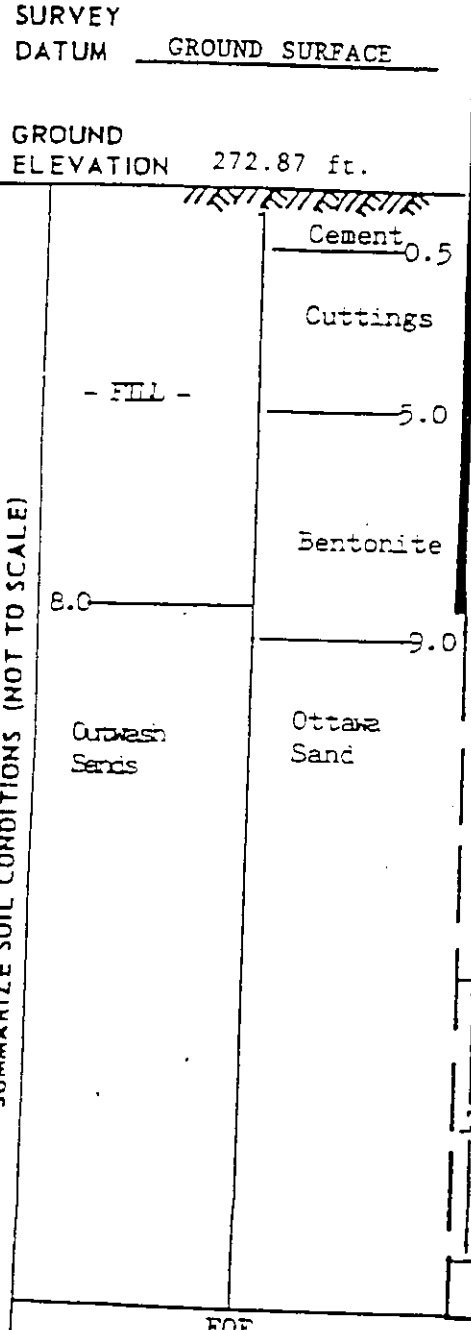
GROUND WATER OBSERVATION WELL REPORT

PROJECT: WATER LEVEL INVESTIGATION
LOCATION: SHARON, MASSACHUSETTS
CLIENT: TOWN OF SHARON
CONTRACTOR: CARR-DEE CORP.
DRILLER: STAN WOICULEVICZ INSPECTOR: B. KICKHAM
INSTALLATION DATE 6 MARCH 1987

FILE NO. 51627800
WELL NO. OW-B1
BORING NO. B1
LOCATION SEE PLAN
SHEET 1 OF 1

SURVEY DATUM GROUND SURFACE
GROUND ELEVATION 272.87 ft.

SUMMARIZE SOIL CONDITIONS (NOT TO SCALE)



~~ELEVATION OR~~ STICKUP ABOVE ~~BELOW~~ GROUND SURFACE OF CASING OR ROADWAY BOX	2.5 ft.
~~ELEVATION OR~~ STICKUP ABOVE ~~BELOW~~ GROUND SURFACE OF RISER PIPE.	0.1 ft.
THICKNESS OF SURFACE SEAL	0.5 ft.
TYPE OF SURFACE SEAL	Cement
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Standpipe
INSIDE DIAMETER OF CASING	3.0 in.
~~ELEVATION~~ DEPTH OF BOTTOM OF CASING	2.5 ft.
INSIDE DIAMETER OF RISER PIPE	1.5 in.
TYPE OF BACKFILL AROUND RISER	Cuttings
DIAMETER OF BOREHOLE	6.0 in.
~~ELEVATION~~ DEPTH OF BOTTOM OF RISER	14.9 ft.
TYPE OF POINT OR MANUFACTURER	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	0.010 in.
DIAMETER OF WELLPOINT	2.0 in.
TYPE OF BACKFILL AROUND POINT	Ottawa Sand
~~ELEVATION~~ DEPTH OF BOTTOM OF POINT	24.9 ft.
~~ELEVATION~~ DEPTH OF BOTTOM OF BOREHOLE	27.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

[5.0 ft. (LENGTH OF CASING L_3)] [15.0 ft. (LENGTH OF RISER PIPE (L_1)) + 10.0 ft. (LENGTH OF POINT (L_2)) = 25.0 ft. (PAY LENGTH)]

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: B1-OW

ELEVATION MINUEND 272.87 ft.

FILE NO 51-6278-00

PAGE NO. 7

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
6 March 87	1130		17.5 ft.	255.37 ft.	Not at equilibrium	EJK
16 March 87	0950		16.45 ft.	256.42 ft.		EJK
20 March 87	0810		16.48 ft.	256.39 ft.		

H & A FORM 39A JAN. 79

CAMBRIDGE, MASSACHUSETTS

GROUND WATER OBSERVATION WELL REPORT

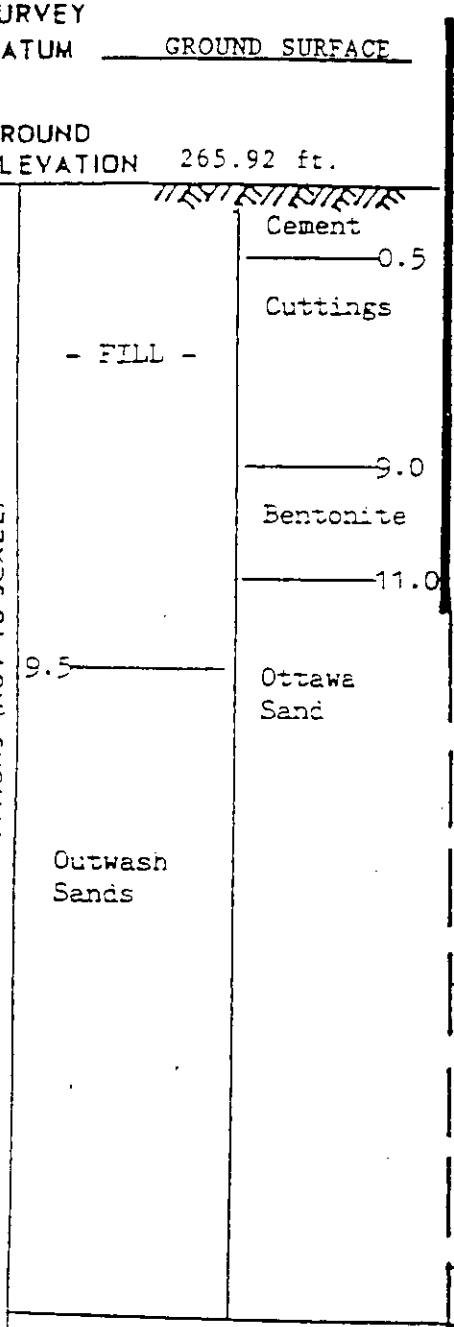
PROJECT: WATER LEVEL INVESTIGATION
LOCATION: SHARON, MASSACHUSETTS
CLIENT: TOWN OF SHARON
CONTRACTOR: CARR-DEE CORP.
DRILLER: STAN WOICULEVICZ INSPECTOR: B. KICKHAM
INSTALLATION DATE 6 MARCH 1987

FILE NO. 51627800
WELL NO. OW-B2
BORING NO. B2
LOCATION SEE PLAN
SHEET 1 OF 1

SURVEY DATUM GROUND SURFACE

GROUND ELEVATION 265.92 ft.

SUMMARIZE SOIL CONDITIONS (NOT TO SCALE)



STICKUP ABOVE GROUND SURFACE OF CASING OR ROADWAY BOX	2.3 ft.
STICKUP ABOVE GROUND SURFACE OF RISER PIPE.	1.8 ft.
THICKNESS OF SURFACE SEAL	0.5 ft.
TYPE OF SURFACE SEAL	Cement
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Standpipe
INSIDE DIAMETER OF CASING	5.0 in.
DEPTH OF BOTTOM OF CASING	2.5 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Cuttings
DIAMETER OF BOREHOLE	6.0 in.
DEPTH OF BOTTOM OF RISER	11.0 ft.
TYPE OF POINT OR MANUFACTURER	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	0.010 in.
DIAMETER OF WELLPOINT	2.0 in.
TYPE OF BACKFILL AROUND POINT	Ottawa Sand
DEPTH OF BOTTOM OF POINT	21.0 ft.
DEPTH OF BOTTOM OF BOREHOLE	22.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

[5.0 ft. (LENGTH OF CASING L_3)] [25.0 ft. (LENGTH OF RISER PIPE (L_1)) + 10.0 ft. (LENGTH OF POINT (L_2)) = 35.0 ft. (PAY LENGTH)]

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: B2-OW

ELEVATION MINUEND 265.92 ft.

FILE NO 51-6276-00
PAGE NO. 8

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
6 March 87	1400		13.0 ft.	252.92 ft.	Not at equilibrium	BJK
16 March 87	0940		10.73 ft.	255.19 ft.		BJK
20 March 87	0950		11.05 ft.	254.87 ft.		BJK

H&A FORM 59A

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: B3-OW

ELEVATION MINUEND 266.57 ft.

FILE NO 51-6278-00
PAGE NO. 9

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
9 March 87	1100		13.4 ft.	253.17 ft.		BJK
16 March 87	0955		13.01 ft.	253.56 ft.		BJK
20 March 87	1000		13.08 ft.	253.49 ft.		BJK

H&A FORM 59A JAN. 79

CAMBRIDGE, MASSACHUSETTS

GROUND WATER OBSERVATION WELL REPORT

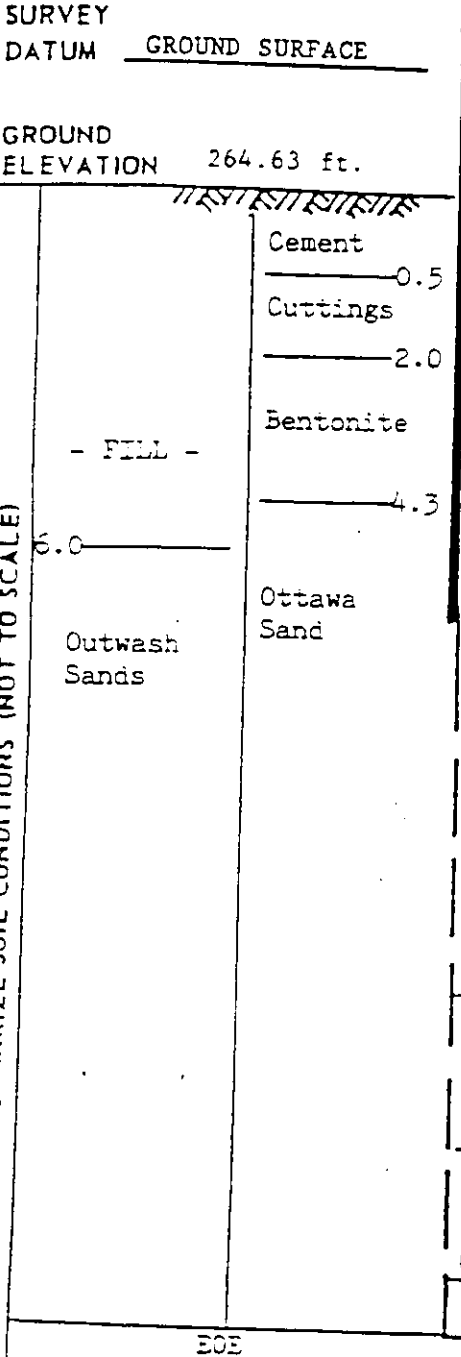
PROJECT: WATER LEVEL INVESTIGATION
LOCATION: SHARON, MASSACHUSETTS
CLIENT: TOWN OF SHARON
CONTRACTOR: CARR-DEE CORP.
DRILLER: STAN WOICULEVICZ INSPECTOR: B. KICKHAM
INSTALLATION DATE 9 MARCH 1987

FILE NO. 51627800
WELL NO. OW-B4
BORING NO. B4
LOCATION SEE PLAN
SHEET 1 OF 1

SURVEY DATUM GROUND SURFACE

GROUND ELEVATION 264.63 ft.

SUMMARIZE SOIL CONDITIONS (NOT TO SCALE)



~~ELEVATION~~ STICKUP ABOVE ~~GROUND~~ GROUND SURFACE OF CASING OR ROADWAY BOX	2.5 ft.
~~ELEVATION~~ STICKUP ABOVE ~~GROUND~~ GROUND SURFACE OF RISER PIPE.	2.5 ft.
THICKNESS OF SURFACE SEAL	0.5 ft.
TYPE OF SURFACE SEAL	Cement
[INDICATE ALL SEALS SHOWING DEPTH, THICKNESS AND TYPE]	
TYPE OF CASING	Standpipe
INSIDE DIAMETER OF CASING	3.5 in.
~~ELEVATION~~ DEPTH OF BOTTOM OF CASING	2.5 ft.
INSIDE DIAMETER OF RISER PIPE	2.0 in.
TYPE OF BACKFILL AROUND RISER	Cuttings
DIAMETER OF BOREHOLE	6.0 in.
~~ELEVATION~~ DEPTH OF BOTTOM OF RISER	5.0 ft.
TYPE OF POINT OR MANUFACTURER	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	0.010 in.
DIAMETER OF WELLPOINT	2.0 in.
TYPE OF BACKFILL AROUND POINT	Ottawa Sand
~~ELEVATION~~ DEPTH OF BOTTOM OF POINT	15.0 ft.
~~ELEVATION~~ DEPTH OF BOTTOM OF BOREHOLE	17.0 ft.

[FIGURES REFER TO: EL. ____ DEPTH X]

[5.0 ft. / LENGTH OF CASING L_3] [10.0 ft. / LENGTH OF RISER PIPE (L_1) + 10.0 ft. / LENGTH OF POINT (L_2)] = [20.0 ft. / PAY LENGTH]

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: B4-OW

ELEVATION MINUEND 264.63 ft.

FILE NO 51-6276-00
PAGE NO. 10

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
9 March 87	1300		6.0 ft.	258.63 ft.		BJK
16 March 87	1025		6.25 ft.	258.37 ft.		BJK
20 March 87	0800		6.34 ft.	258.29 ft.		BJK

H&A FORM 59A JAN. 78

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: GHR-2-OW

ELEVATION MINUEND 255.65 ft.

FILE NO 51-6276-00

PAGE NO. 1

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
9 March 87	1230		26.2 ft.	229.5 ft.		BJK
16 March 87	0930		25.9 ft.	229.8 ft.		BJK
20 March 87	0820		25.61 ft.	230.04 ft.		BJK

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: GHR-3-OW

ELEVATION MINUEND 275.30 ft.

FILE NO 51-6278-00
PAGE NO. 2

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
9 March 87	1200		30.5 ft.	244.8 ft.		BJK
16 March 87	0945		30.4 ft.	244.9 ft.		BJK
20 March 87	0940		29.92 ft.	245.38 ft.		BJK

H&A FORM 59A

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: GHR-4-OW

ELEVATION MINUEND 274.06 ft.

FILE NO 51-6278-00
PAGE NO. 3

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
9 March 87	1205		24.7 ft.	249.4 ft.		BJK
16 March 87	0950		23.3 ft.	250.8 ft.		BJK
20 March 87	0815		24.2 ft.	249.86 ft.		BJK

H & A FORM 59A

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: GHR-5-OW

ELEVATION MINUEND 269.06 ft.

FILE NO 51-5276-00

PAGE NO. 4

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
16 March 87	1015		14.4 ft.	254.7 ft.		BJK
20 March 87	1005		15.0 ft.	254.06 ft.		BJK

H & A FORM 59A

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: GHR-6-OW

ELEVATION MINUEND 264.70 ft.

FILE NO 51-6278-00

PAGE NO. 5

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
16 March 87	1020		9.7 ft.	255.86 ft.		BJK
20 March 87	1010		9.84 ft.	254.86 ft.		BJK

H&A FORM Jan. 79 59A

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

GROUND WATER MONITORING REPORT

OW/PZ NUMBER: GHR-7-OW | ELEVATION MINUEND 265.61 ft. | FILE NO 51-6278-00 | PAGE NO. 6

DATE	TIME	ELAPSED TIME	DEPTH OF WATER FROM G.S.	ELEVATION OF WATER	REMARKS	READ BY
9 March 87	1300		11.1 ft.	254.5 ft.		BJK
16 March 87	1020		10.1 ft.	255.5 ft.		BJK
20 March 87	0805		10.24 ft.	255.37 ft.		BJK

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Water Resources Division
28 Lord Road, Suite 280
Marlborough, MA 01752
508-485-6360

October 20, 1997

Gregory Meister
Conservation Administrator
Town of Sharon
90 South Main Street
Sharon, MA 02067

Mr. Meister,

I enjoyed meeting with you and members of the Lake Management Committee and Neponset River Watershed Association (NRWA) on October 2 to discuss water-resource issues in the Town of Sharon. This letter is a follow up to our conversation and is intended to provide a review based on published reports of some of the hydrogeologic characteristics of the area near Massapoag Lake and Beaver Brook.

Recent reports by IEP (1987) and Klinger (1996) provide maps of the distribution of aquifer transmissivity in the town of Sharon. The maps are similar to the ground-water favorability map published by Brackley and others (1973). A transmissivity map provided in Klinger's report shows a band of generally high transmissivity (1,300 to 3,900 feet squared per day) extending from the western shore of Massapoag Lake to Beaver Brook, which suggests continuity of the aquifer from the lake to the brook. The IEP report also includes estimated water-table maps for pre-pumping conditions in the Beaver Brook, Canoe River, and Billings Brook aquifers that were constructed from surface-water elevations (lakes and streams) from USGS topographic maps. Another report by Haley and Aldrich (1987) shows a map of ground-water levels in the vicinity of the former Sacred Heart School Property. On this map are shown arrows indicating ground-water-flow directions that are from the area just west of Massapoag Lake near Beach Street toward Well 3, which is adjacent to Beaver Brook. Although Massapoag Lake and Beaver Brook sub-basin watersheds are in adjacent surface-water drainage basins (as shown on plates in the IEP report) the data shown in the Haley and Aldrich report indicate that ground-water flow is across the drainage divide between the two watersheds. However, it should be noted that none of the data points shown on the Haley and Aldrich map extend to the lake and that ground-water-level conditions, including flow directions, in the immediate vicinity of the lake are unknown based on these data.

The town is within the drainage basins of the Neponset and Taunton Rivers. Transmissivity and ground-water-favorability maps indicate continuity of stratified-drift deposits across the surface-water drainage divide between the two basins in the town. Because of this continuity, there is the possibility that some of the water pumped from one of the river basins is actually

recharged in the other basin; in other words, that the ground-water and surface-water divides may not be coincident throughout the town.

It would be beneficial if there was a single map available showing ground- and surface-water-level conditions measured simultaneously throughout the town (including all three aquifers listed above) during the course of a few days for current pumping conditions, using surveyed ground-water and surface-water levels at observation wells and pond and stream staff gages. This map could be used to identify ground-water flow directions throughout the town, including the areas near Massapoag Lake and Beaver Brook. Because of the location of the town at the boundary of two adjacent river basins (Neponset and Taunton Rivers) and the preponderance of wetlands throughout the town, it is important to have several observation points at which accurate water-level measurements could be made. In addition, simultaneous measurements of streamflow and pond releases throughout the town would provide complementary information that could be used to understand ground-water and surface-water interactions in the town. Water-level measurement sites established to map ground- and surface-water levels could then be used to monitor future changes in water-level conditions throughout the town.

Based on available USGS and engineers' reports that you provided to me, there appears to be a need for better definition of water-level conditions throughout the town. This information could be collected for the Town of Sharon alone. However, as discussed during our meeting and reiterated by Michele Barden of the NRWA in a follow-up letter to me, it might be beneficial to initiate a study of the water-resource conditions of the entire East Branch Neponset River watershed. Watershed-scale studies that extend beyond town boundaries are very helpful for placing the water-resource systems and needs of one particular town within the context of the broader water-resource system of the entire watershed. The USGS has done many such studies and is currently involved in watershed-scale studies in the Ipswich River basin of Massachusetts and Hunt River basin of Rhode Island. Such a study would support and complement the work that is being proposed by the NWRA to manage the cumulative impact of interbasin transfers in the East Branch system. Funding for studies of this type has come from local and state agencies with some matching funds provided by the USGS through our Federal-State Cooperative Program. We can match up to 50 percent of the total cost of a study, depending on our allocation of funds by Congress. At this time, we cannot make any firm commitment of matching funds to a study in the Town of Sharon or East Branch Neponset River.

I hope this information is helpful to the Lake Management Committee. If the Committee, Town of Sharon, or NRWA would like to pursue a cooperative investigation of the water resources of the town or watershed, the next step would be for us to meet with you and other representatives of the town and watershed to discuss the development of a proposal for a hydrologic investigation. At that time, we could discuss specific data-collection and data-analysis approaches that might be undertaken to better understand the ground- and surface-water resources of the town and watershed and the costs of undertaking such a hydrologic investigation.

Please do not hesitate to contact me or Michael Norris for additional information. Our direct phone numbers are (508) 490-5070 (Paul) and (508) 490-5010 (Mike).

Sincerely,

Paul Barlow

Paul Barlow, Hydrologist

cc: Michele Barden, Neponset River Watershed Association

References:

Brackley, R.A., Fleck, W.B., and Meyer, W.R., 1973, Hydrology and water resources of the Neponset and Weymouth River basins, Massachusetts: U.S. Geological Survey Hydrologic Investigations Atlas 484, 3 plates.

Haley and Aldrich, Inc., 1987, Groundwater impact assessment, proposed on-site septic system, former Sacred Heart School Property, Sharon, Massachusetts: 12 pages and attachments.

IEP, Inc., 1987, Aquifer protection study, Town of Sharon, Massachusetts: Northborough, MA, 14 sections, various pagination.

Klinger, A.R., 1996, Estimated short-term yields of and quality of ground water in stratified-drift aquifer areas in the Neponset River Basin, Massachusetts: U.S. Geological Survey Water-Resources Investigations Report 93-4142, 30 p.

WELLHEAD WETLANDS INSPECTION REPORT

May 30 - November 15, 1997

Submitted by
Gregory Meister
Conservation Agent

Well #2

Description: Sampling plot is representative of an open shallow marsh bordering Beaver Brook. Finger like projections of open water are interspersed with and dominated by tussocks of wetland sedges, grasses and rushes. Prevalent on the margins of the open water is emergent broad leaf cattail (Typha Latifolia). Purple loose strife (lythrum) is increasing in density. Stunted Red Maple Saplings (Acer Rubrum L.) occur throughout the marsh atop the tussocks. No shrub layer of any consequence is present except at the margins of the marsh.

Initial Site Inspection, May 28, 1997 Sunny, clear conditions - no precipitation for over 72 hours. The sampling plot was easily located. Plot stakes were resprayed with orange fluorescent paint & photographed. Depth of water within the sample plot was approximately 15". There was no discernible change in vegetational species and/or relative distribution since 1992 when this plot was originally established.

As indicated in last year's wellhead wetland assessment, boards were added to the Beaver Brook weir downgradient of Wells 2 and 3 in May 1996. The purpose of this action was to increase, if possible, surface water recharge to the Beaver Brook aquifer. There was also the desire to see if this additional water volume would lower, by dilution, the nitrate levels experienced in the aquifer. By late fall of 1996, the Water Division indicated that nitrate levels showed no discernible change and that some discoloration of the well water had occurred. Increased recharge to the aquifer did not occur to any measurable degree according to the Superintendent of Public Works.

At this time it was agreed that a 4" board would be removed from the weir structure, thus reestablishing previous weir levels.

Subsequent Monitoring

It was not until toward the end of June 1997, when I again inspected Well #2 and the downgradient weir, that I discovered all of the boards still in place. Despite this, Brook water levels upgradient of the weir had dropped significantly (6"-8", at least), and flow had greatly diminished. In July, I ordered the Water Division to reset the boards to a position approximate to that prior to May 1996. This was done and they will remain in that position from now on.

The contiguous marsh is an exciting wildlife habitat with its varied microtopography, interspersion of open water, hummocks, bogmats and cedar and shrub margins, transitioning to wooded slops. Reptile(turtles), bird and amphibian populations are abundant. Permanent surface and groundwater monitoring would begin to provide the necessary comparative data required to determine seasonal drawdown characteristics and to what extent induced infiltration may be occurring.

Well #2 was taken off line on August 9th for pump repairs. Rehabilitation of the wellfield is scheduled to occur in the winter of 98. Well #2 is still off-line.

Well #3

Description: The sampling plot is representative of the same open shallow marsh associated with Well #. Well #3 is located on the south east side of Beaver Brook.

The major difference in the vegetational community at this site, is that Atlantic White Cedar (Chamaecyparis thyoides L.) is randomly represented along with a fringe bog mat to the north of the well, dominated by leather leaf.

Initial Site Inspection: May 30, 1997 Sunny, clear conditions. The sampling plot was easily located. The corner stakes were touched up with orange fluorescent paint. Well #3 was rehabed in November of 1996. (screens cleaned, etc.). Water depth at the sample location was approximately 10 - 11". The wetland community in or adjacent to the sample plot showed no change in species composition, density, relative abundance nor impact associated with operation of the well. The transition zone directly upgradient of the plot showed no discernible change in community characteristics.

Subsequent Site Monitoring
Further site inspections through June and into July showed loss of all visible surface water adjacent to the sampling plots. I can offer no comment as to the normalcy of this condition since I have not carried on site monitoring beyond the established post leaf out inspection.

I do, however, note observing a very rapid loss of water level in a gravel bottomed pond in the Zone II of the Beaver Brook wellfield (Well #3) between South Main Street and Gunhouse Street. This pond was dry by July 9th.

The Sacred Heart School pond, located further upgradient of the Gunhouse/South Main Street pond and between Well #3 and Lake Massapoag also showed significant water level decreases. Groundwater flow as determined in the 1987 Haley Aldrick, Inc. groundwater study is toward Well #3 all around this pond.

The Sacred Heart Pond is just outside of an estimated Zone II. I would suggest staff gauges be installed in both referenced ponds - and a groundwater monitoring grid throughout this triangle be established.

Well #4

Initial Site Inspection: May 30, 1997 Sunny, clear conditions. The sample plots were easily located and corner stakes touched up with orange fluorescent paint. I found no discernible change in the make-up of the wetland plant community within the sample plots and/or adjacent wetlands. Stream flow and surface water in the wetlands did not seem significantly different from that observed during past inspections.

Subsequent Site Monitoring

As the summer progressed stream flow greatly diminished. By August stream flow in Beaver Brook adjacent to Well #4 was imperceptible as the Brook traversed the adjacent marsh. The water volume, level and flow observed in the brook at the Route 27 culvert just prior to entering this small marsh was consistently much greater than what was leaving the wellhead area just down gradient of Well #4. The marsh, of course, must detain and soak up some of the water, but induced infiltration by the well pumping, also may play a role in the observed diminished stream flow. Beaver Brook is gravel bottomed in various stretches but of course I have been unable to find data which quantifies the degree of conductivity. I would suspect that the diminished flow of Beaver Brook down gradient of Well #4 effected water temperatures and was not favorable for the native Brook Trout population in the channel upgradient of Saw Mill Pond.

I did also note by August that the royal ferns and cinnamon ferns on the margin of sampling plot 4B were showing obvious signs of stress. i.e. browning and dying progressively along the left margins.

The installation of additional groundwater monitoring wells would begin to provide a better understanding of the depth and lateral extent of drawdown created by the Beaver Brook wells. I suggest that it is important to quantify to what degree Well #4 influences summer-time streamflow. The technology certainly exists to provide some insight.

Well #5

Description: Sampling plot is representative of a mature wooded swamp in the Billing Brook watershed.

Tree Layer - Dominated by Red Maple, shallow rooted White Pine (Pinus Strobus L.) and occasional Atlantic White Cedar.

Shrub Layer Limited - Dominated by scattered Spicebush (Lindera Benzoin L.), Highbush Blueberry (Vaccinium Corymbosum L.), Fetter-bush (leucothoe racemos) and an occasional Swamp Azalea (Rhododendron Canadense).

Herbacepis Layer Limited - Dominant species - Cinnamon Fern (Osmunda Cinnamon L). Occasional pockets of Skunk Cabbage in the lowest, most saturated areas.

Initial site visit: May 30, 1997 - Sunny, dry conditions - no precipitation within 72 hours of site visit.

Well #5 was taken off line on May 5th for rehabilitation and was put back into operation on June 7th. Shallow standing water was visible in pockets adjacent to the sample plot, as well as, clear evidence of saturated conditions in general. There was no discernible change in any aspects of the wetland community nor adjacent transition zone.

Subsequent Monitoring
Exeter Environmental Associates, Inc. of Exeter, N.H. provides quarterly reports and analysis of a grid of 37 ground and surface water monitoring locations in the vicinity of Well #5 under a DEP approved groundwater contamination remediation procedure (Shaw's Plaza Site - RTN #4-0414). Exeter's June 1997 monitoring report indicated that the drawdown from Well #5 had extended beneath Billings Brook. During a requested site visit in October with Steven Shope L.S.P. President of the company, he confirmed that Well #5 was causing induced infiltration of Billings Brook. He indicated this condition had occurred periodically in previous years, since establishment of the monitoring stations.

In subsequent site visits in July, August and September, I observed progressive and significant decreases in the streamflow of Billings Brook, particularly adjacent to Well #5 on downgradient. In addition, a fire pond within the Zone I of the pumping station, continued a rapid decline and virtually dried up by September. Turning Mill Brook which feeds into Billings Brook between Well #5 and #7, had only a trickle of flow in August and was bone dry by September. This brook is located in a Zone II. It has historically contained a native brook trout population. The condition of the fire pond and Turning Mill Brook, as observed this summer, was unprecedented, according to local sportsmen. I can offer no opinion since my previous inspections did not extend beyond the wellhead monitoring plots.

Well #6

Initial site visit: June 2, 1997 Clear, dry conditions. No significant precipitation 72 hours prior to site visit.

The sample plot was easily found and the corner stakes refurbished with orange fluorescent paint. Surface water in and surrounding the monitoring plot was approximately 10" deep. There was no discernible change in species composition, abundance, percent cover nor distribution within the wetland community or adjacent transition zone.

Well #6 was taken off line in August of 1996 due to less than desirable iron and manganese levels. It was rehabilitated during the winter and was placed back on line June 9,1997. On October 11 of this year, it was again taken off line.

Subsequent Monitoring

By mid-July there was no water in the upper reaches of Canoe River at its crossings under Canoe River Road and King Philip Road. As the summer progressed I either witnessed or received reports of severe surface water problems extending down throughout the aquifer. Greeley's Pond on East Foxboro Street just over the Foxboro Town line consisted of mud flats in August. The Wading River was bone dry and Norton Reservoir was seriously depleted.

At a subsequent site visit in August, I observed no visible surface water nor saturated conditions within the shrub/bog community. Since in previous years I did not perform summer site visits, I can offer no comment as to whether the conditions, witnessed in August were abnormal.

This aquifer is Sole Source, loaded with wells, and stressed. The Zone II's of some neighboring Towns extend well into Sharon's portion of this aquifer. With no groundwater monitoring program in place, it is impossible to know the actual extent of drawdown created by Well #6 at any give time.. Also of importance, it is impossible to discern whether or to what extent neighboring Towns are influencing groundwater levels up the aquifer into Sharon.

Well #7 Although monitoring is not required by condition of the revised Water Management Act permit, I believe it is very important to continue.

Initial site visit - May 30, 1997 Sunny, dry conditions, no precipitation within 72 hours prior to inspection.

Both monitoring plots were easily relocated and the corner stakes were freshened up with fluorescent paint. There was no discernible change in the species composition, percent cover, relative abundance and/or distribution within the plots.

However, the bog mat, associated with Plot 7B, although saturated, did not exhibit the visible standing water that I have come to expect this time of year. Plot 7A also did not appear to contain the degree of saturation observed during past inspections. The water level of Gavins Pond seemed lower in my opinion. The flow of Billings Brook entering the pond was brisk and appeared normal, Upon inspecting the dam and weir structure at the lower end of the pond, which lies in the Town of Foxboro (reconstructed 3 or 4 years ago by Foxboro), I found no flashboards in place.. Someone had constructed a wall of rocks approximately 10" high in front of the weir slots which was probably holding the pond level 8" - 9" higher than it would be in light of the elevation of the concrete spillway (with no flashboards in place). Flow over and through the rock wall was brisk, none the less. I do not know the origin of the rock dam.

I have had various conversations over the past several years with my friend Dave Risch, Conservation Manager for the Town of Foxboro, who also controls the weir structure. It has become clear, that it is in Foxboro's best interest to maintain maximum flow (as determined by the spill elevation) from Gavins Pond in order to ensure recharge of the downstream ponds, wetlands and wellfields, just over the Town line.

Subsequent Monitoring

I have learned of Foxboro's concern about the effect of Sharon's well pumping)particularly Well #7) upon the Foxboro wells #7, #8, #9 and #10.

Around August 5, when driving down Gavins Pond Road on my way to a Commission site inspection, I noticed the extremely low level and stagnant flow of Billings Brook. I went down to Gavins Pond and was greatly disturbed by the water level. Upon inspecting the lower dam I discovered absolutely no flow emerging and the pond water level approximately 6" below the spillway. The downstream ponds over the Foxboro line were totally dry. Although greatly diminished, there was water flowing in Billings entering Gavins Pond just upgradient of Well #7, but again no flow emerging from the Pond into Foxboro. The pond area adjacent to Well #7 consisted of mudflats. The monitoring plots correspondingly dry

I am discussing mutual concerns with Dave Risch, he showed me pictures from August of 1993, 1995 and 1997 showing no flow emerging from Gavins Pond over the spillway into Foxboro. He shared additional pictures showing the downgradient ponds over the Foxboro line, completely dry. These conditions apparently also occurred in August 1994. It would appear that a pretty clear pattern is emerging during summers experiencing less than normal precipitation. These

conditions are not suitable from a fisheries and wildlife perspective nor in the view of the Conservation Commission of Sharon and Foxboro.

Of importance to note, the Quail Ridge/Cannon Forge subdivision is nearly completed. By condition of the Special Permit governing construction of the 220 three and four bedroom homes in Sharon, there are no associated on-site septic systems. These residences are sewered with the effluent pumped to the Mansfield Treatment Facility. Well #7 provides water to these households, but of course there is no aquifer recharge by septic effluent. Virtually all of the residences have automatic water sprinklers placing significant additional summer time stress on this aquifer.

It is clear to me, once again, that because Sharon lacks any comprehensive system of surface and groundwater monitoring in its aquifers and recharge zones, it becomes impossible to reasonably quantify Well #7's contribution to the observed impact.

wellinsp.doc

Of additional note, in October I discovered that virtually no water was being released to Billings Brook from the Morse Brothers cranberry operation, across South Main Street from Shaw's Plaza. Water was being impounded to flood the bogs in preparation for harvest.

Exeter's September and December monitoring reports indicated that the drawdown from Well #5 continued to extend beneath Billings Brook.

Recommendations: Considering the conditions I observed in this aquifer area during 1997, I suggest that it would benefit the Town to use appropriate means to quantify the degree to which Well #5 influences base stream flow in Billings Brook.

Note: Well #5 is left in operation virtually year round.

General Summary
1997 Wellhead/Wetland Assessment

Due to my observation of conditions in various wetlands and waterways within the Town, I have considered it important to secure a more comprehensive understanding of the characteristics of the Town's aquifers and recharge areas since submittal of my last Wellhead/Wetland Assessment in May of 1996.. Within my capabilities I have tried to investigate the known relationships between groundwater and surface water (including wetlands) within these areas in an attempt to more reasonably interpret any signs of environmental impact which could be influenced by municipal well operation. In this regard, I have assembled and studied all available data and studies I could lay my hands on and corresponded with various hydrogeologists, hydrologists and water supply professionals. Either in my wetland assessment role or on behalf of the Conservation Commission I have corresponded with among others, Sharon Water Division, Superintendent of Public Works, Weston and Sampson Engineers, Chairman of Lake Management Study Committee, the U.S. Geological Survey, DEP and DEM personnel, Neponset River Watershed Association, etc. In addition I have had discussions with water managers and conservation personnel in some of Sharon's neighboring communities.

I have secured historical rainfall data from neighboring town's and with the assistance of the Chairman of the Lake Study Committee, Town Administrator and Superintendent of Public Works, Sharon is now collecting its own precipitation readings. I attempted to physically investigate and monitor conditions in the wellhead wetlands and upgradient recharge areas throughout the summer and fall, as time permitted.

precipitation and runoff is an increasingly crucial and limiting factor in maintaining the quantity and quality of our water resources. Once precipitation/runoff reaches the Town's surface water streams, its availability for groundwater recharge is diminished as it flows quickly out of Sharon for good. The Town has no stream flow gauges installed nor monitored. However, by direct observation since 1989 I think it is apparent, that stream flow during storm events is increasing measurably, as development build out progresses. As the absorbing capacity of our vegetated landscape gives way to the impervious cover associated with development, surface water runoff will continue to increase. Additionally, one should note that no significant recharge can occur when the ground is frozen.

- Average precipitation in the vicinity of Sharon (Walpole/Foxboro data) is around 40" per year. Sharon received 60" of precipitation in the past year, 15" -20 above normal) "Recharge is typically 18" per year per 850,000 gallons per day per square mile (Weston & Sampson Engineers November 26, 1997 Pump Test Work Plan - Islamic Center)." Of course, some areas of Town are more significant to the recharge of our municipal wellfields than others. It is the condition of these recharge areas that now concerns me. By mid-May it was necessary for me to shut back the outflow to the Lake at night to the minimum rate (1.5 C.F.S) in order to maintain the water level at 10.5 on the flume house gauge. Beginning in the first week in June, Lake levels began an uncontrollable drop. Flow continued to be shut back at night to conserve water. By the end of August the Lake had dropped 18-1/2". On September 6th, I went back to

using the boards. On September 7th, I started using the one inch slotted board with the lake level at 9-1-6. By mid-October, the Lake had dropped a total of 22". The slotted board remained in place until January 15th 1998.

In June I began to ramble extensively through the Zone II's and III's. I discovered rapid drops in the levels of numerous gravel bottomed ponds. Various wetland communities, historically, containing standing water, were found invaded by saplings and facultative plant species.

The Great Cedar Swamp, straddling the Town's central recharge zone was much drier than when I had last inspected it to any great degree in 1991. Open flats within the swamp once containing standing water for much of the year (as recently as 10 years ago according to resident sportsmen) now were dry and being taken over by sapling and shrubs of facultative plant species. Much of the Cedar over-story was dead or dying and no cedar regeneration was visible. Some areas of Town had comparatively higher sustained stream flows, water levels and more normal hydric conditions in their associated wetlands. For example, Wolomolopoag Pond and the contiguous wetlands; the upper ponds and wetlands contributory to the Morse Brothers cranberry bogs on South Main Street; Devil's Brook and the Sharon Fish and Game ponds; and Massapoag Brook and the open marshes downgradient of its convergence with Devil's Brook, all were in much better condition than the previously described recharge areas. Those areas

exhibiting drier conditions were located either within the recharge zones of Sharon's and/or neighboring Town wells or the watershed of Lake Massapoag.

- With Sharon's wells located within the glacial valleys where ground water discharge and aquifer storage capacity are highest, I suspect that it would be some time before any measurable vegetative change in the wellhead wetland communities would occur. My wellhead site inspections revealed no apparent change in species composition, percent cover, relative abundance nor distribution. Evident impacts to portions of the Zone II's and III's cause me more immediate concern, and may be represent a harbinger of more serious water supply problems to come. I believe we may have a major groundwater problem in some of our principle aquifer recharge zones. In light of summer time water consumption, I would recommend that the Town determine in a timely fashion, whether I am correct in this assumption. Were we to wait until measurable changes progressed to the wellhead wetlands before acting, it would probably be years too late.

GENERAL CONCLUSIONS AND COMMENTS

1. Sharon's wells are located in the base of glacial valleys filled with varying depths of stratified drift. Each wellfield is on the edge of or directly adjacent to surface water and or wetland communities overlying the aquifers. (Weston & Sampson, November 26, 1997 Pump Test Work Plan - Islamic Center Site.)

Due to the wetland deposits and adjacent ponds and brooks associated with Sharon's wells, it now seems inadequate at best, to perform the yearly wellhead/wetland inspection in the Spring when streamflow and groundwater will assuredly be at their highest levels. This year, as time permitted, I chose to monitor conditions throughout the Spring, Summer and Fall and will do so in subsequent years.

2. Based upon the results of sporadic rounds of groundwater exploration, as well as existing reports, studies and data, it is impossible to derive (at least for me) a comprehensive picture of the hydrogeologic parameters of the Town's aquifers and recharge areas. There currently exists no reasonably linked network of groundwater observation wells nor an established program of groundwater monitoring. There exists no coordinated system of monitoring surface water flows and levels throughout Town. According to the U.S.G.S. "It would be beneficial if there was a single map available showing ground and surface water level conditions measured simultaneously throughout the Town during the course of a few days for current pumping conditions, using surveyed ground-water and surface water observation wells and pond and stream gauges." Having done many such studies, (currently that Ipswich River Basin, and Hunt River Basin) the U.S.G.S. believes that groundwater flow directions throughout Town can be identified and through simultaneous measurements of stream and pond releases throughout Town, a better understanding of the interaction between ground and surface water can be derived. Since early July, the Conservation Commission (through written and other

correspondence, has been advocating for a more comprehensive understanding of groundwater conditions and the relationship between groundwater, surface water and the Town wells. Obviously, were the monitoring grid established, measurements should continue on a permanent basis so we can begin to assemble the data, year to year, season to season, which will give us the comprehensive understanding of ground and surface water conditions to protect and manage our water resources in a sustainable fashion. From what I have observed this year, there is an urgent need to begin collecting groundwater, surface water, and precipitation data, cohesively. Technical qualified interpretation of the emerging data should be prioritized.

A groundwater monitoring grid has been proposed by the Town ("Pumping Test Work Plan - Islamic Center", submitted to DEP by Weston and Sampson Engineers; dated November 26, 1997) in order to secure state approval for a new pumping station (proposed Well #8). It is unclear whether the Town will utilize this grid, once established, for the type of long-term monitoring required.

3. Based upon my current knowledge of existing hydrogeological reports, the aquifers within which are located Sharon's existing wells, consist of unconfined stratified drift, subject to lateral leakage. "Transmisity and groundwater favorability maps indicate continuity of stratified drift deposits across the surface water drainage divide between the two basins in Town (U.S.G.S. October 20, 1997 letter to Gregory Meister)." According to the Summary of Boston Harbor Drainage Projects by the U.S.G.S." ... unlike most other

basins in the State. groundwater divides do not always correspond with surface water divides in the Neponset, Weymouth and Weir basins. One example of this occurs along the Southern boundary of the Neponset basin, where groundwater flows north from the Taunton River basin into the East Branch Neponset River Watershed Association, September 26, 1997)."

Therefore, I can not assume that sub-basin groundwater divides necessarily follow known surface-water divides based on elevation. Because of the continuity and transmissivity of the stratified drift upgradient of the wells and because of the absence of groundwater monitoring wells, it is also currently impossible to quantify a reasonably reliable groundwater recharge budget for each producing sub-basin aquifer.

4. According to U.S. Geological Survey Water Resources Investigations Report 93-4142, Estimated Short-Term Yields of and Quality of Groundwater in Stratified - Drift Aquifer Areas in the Neponset River Basin, Massachusetts, ..." Recharge of groundwater to the stratified-drift aquifers is primarily from infiltration of precipitation. Groundwater moves through the aquifer and discharges into streams, lakes and wetlands. Groundwater withdrawn from stratified-drift aquifers is derived from intercepted groundwater discharge, induced infiltration of surface water and aquifer storage." In U.S. Geological Survey, Water Resources Investigations Report 90-4144, (1992), Water Resources of Massachusetts, with regard to the Neponset Basin, ..." streamflow in many of the sub-basins is affected by groundwater pumpage,...". What this means to me is simply:

- Wells can intercept groundwater that would otherwise discharge to streams, waterbodies and wetlands.
- Wells can "draw" water from adjacent and even distant streams, waterbodies, and wetlands.
- Wells will "find" and pump water as long as it is available in the aquifer and from where it can most easily be withdrawn. Zones of contribution can expand particularly during periods of less than normal precipitation and high consumption.

Based upon my monitoring of the wellhead conditions this year, and information provided in available reports, I feel certain that well pumping surely played a role in the diminished flow of Beaver Brook by intercepting groundwater and inducing infiltration (particularly in the vicinity of Well #4). Additionally, it is not at all irresponsible to suggest that the operation of Well #'s 5 and 7 contributed in a significant way to the greatly diminished stream flow of Billings Brook and water level of Gavins Pond during the summer and fall. Evidence of Well #4's influence on Beaver brook has been deduced by Woodward and Curran Environmental Services in its "Assessment of Nitrates at Well No. 4 July 1997." Induced infiltration of surface water by Sharon's wells is referenced in Weston and Sampson, November 26, 1997 Pump Test Plan for Proposed Well #8." In addition to precipitation recharge, induced infiltration from surface-waterbodies provides another source of aquifer recharge for municipal wellfields. The degree to which induced infiltration occurs is a function of the conductivity of river bottom sediments and the hydraulic gradients created by aquifer pumping."

Exeter Environmental Associates, Inc. of Exeter, N.H. provides quarterly reports and analysis of 37 groundwater and surface water, monitoring locations in the vicinity of Well #5 under a DEP approved groundwater contamination remediation procedure (Shaw's Plaza Site - RTN - #4-0414). Exeter's July, September and December 1997 monitoring reports indicated that the drawdown from Well #5 had extended under Billings Brook. During a requested site visit in October with Steven Shope L.S.P. President of the Company, he confirmed that Well #5 was causing induced infiltration of Billings Brook. He also indicated that this has occurred periodically since the monitoring program was instituted. Exeter's September and December 1997 monitoring reports concluded that this condition persisted into the winter. The information provided by the monitoring and analysis of this well network is significant in terms of beginning to understand aquifer characteristics, year to year under varying conditions.

By the beginning of August, there was no stream flow leaving Gavins Pond. Although greatly diminished there was still flow coming into Gavins Pond from Billings Brook just upgradient of municipal Well #7 wellfield.

Once again however, we do not have the desirable network of streamflow and groundwater monitoring stations in place to help us determine the relative causes of decreased surface water flows and levels experienced this year. It is impossible, therefore,

to quantify the contributory impact of well pumping vs. decreased summer-time precipitation. I would suggest that it is important to do so as soon as possible.

5. In my opinion, Lake Massapoag, the Cedar Swamp and the interlying areas are critical water recharge reservoirs for Sharon's producing aquifers. Consider their position upgradient of Sharon's wells, and the extent, continuity and transmissivity of the interlying stratified-drift. The Cedar Swamp straddles the drift formation and is part of the Zone II of Wells # 5 and #7 (at a minimum). I now have little reason to doubt that the Lake is also part of and or interfaces with this same central unconfined aquifer formation.

Based on various reports, and more specifically, evidence provided by the U.S.G.S., there is strong evidence suggesting that this 353 acre lake is directly connected to the Town's aquifers and recharge zones, by stratified drift. This drift, which comprises and is contiguous to our producing aquifers, extends to portions of the south and west shoreline indicated in October 20,1997 letter from Paul Barlow, U.S.G.S., to Gregory Meister, referencing reports by government scientist, i.e. Brackley and others 1973; Klinger 1996 USGS Water Resources Investigations Report 93-4142). The 1987 Haley and Aldrich, Inc. report "Groundwater Impact Assessment, Proposed On-Site Septic System Former Sacred Heart School, Sharon, Massachusetts," and the "Canoe River Aquifer Study" by IEP, 1987 for the Canoe River Aquifer Advisory Committee, more specifically addresses the Lake's connection to the Beaver brook and Canoe River aquifers, respectively.

As Conservation Officer, I have been directly responsible for the day to day management of the Lake outflow for 4 years. Prior to being assigned this task I was responsible for enforcing the Commissions Order of Conditions permitting the implementation of a revised Lake Management Policy, prescribing parameters for lake levels and discharge rates (implemented in 1991). It has become increasingly difficult to maintain summer time lake levels for swimming, boating and fishing while providing adequate discharge to the downstream watershed.

By early June there was a total loss of surface water in 2 of the 3 remaining tributaries to Lake Massapoag. Into the 1970's, there were 12 surface water tributaries to this lake. By the mid 1980's, the IEP Lake Study referenced seven. Sucker Brook is, in most years, the only perennial stream left, providing surface water to the Lake. Sustained summertime flows are diminishing and becoming less and less of a factor in the lake's summer-time water budget.

There has been general agreement that groundwater discharge from the Lake's many subsurface springs is a significant contributor to the Lake's water budget. With the uncontrollable drop in Lake levels this years; I, among others, are questioning what may be happening to the ground water budget of the Lake watershed as well.

There are many easily offered theories and opinions put forward on a yearly basis to explain the causes of Lake level decreases. The Town is clearly capable of resolving the recurring controversy over the causes of diminishing summer-time Lake levels.

In light of the Lake's significance to regional recreational interests, to the viability of the Massapoag Brook Watershed and to aquifer recharge, I would recommend that the following questions be addressed:

- TO WHAT EXTENT is the current Lake Management Policy responsible for our difficulty in maintaining summertime Lake levels?

In 1991, under the advisement of the Town's Lake Management Study Committee and with the approval of the Conservation Commission and Board of Selectmen, a new Lake Management Policy was implemented. The maximum permitted level for Lake Massapoag was set 7"-9" lower than was the practice in the mid 1980's. This was done to diminish progressive bank erosion, lessen the likelihood that seasonal groundwater would interface with shoreline cesspools and leaching systems, and arrest the flooding of adjacent wetlands during winter storms and spring melt. The Conservation Commission, Lake Management Committee and a consulting academic from the University of Rhodes Island believe that the existing Lake management policy has had positive water quality benefits.

To what extent the lower maximum Lake level has affected adjacent annual groundwater levels is impossible to quantify at this time. To what extent this contributes to our difficulty in maintaining summer-time Lake levels, I don't know. Am I, in fact, discharging more water from the Lake during the winter and spring so as not to exceed the maximum allowed Lake level? Do the historical Lake discharge records dating back to 1981 indicate any significant increase in winter and spring discharge rates after implementation of the new policy? Do they indicate that progressively less water has been discharged on an annual basis even prior to the new policy implementation?? Is less water reaching the Lake over time? What happened to all the tributaries even prior to 1991? Why the precipitous drop in Lake levels this year? How does this year's precipitation patterns compare to other years with dry conditions for longer duration? Was last winter really so unusual in that we had no snow pack? How much precipitation did we get prior to frozen soil conditions? How does this compare to other years??

- Is it really unreasonable to suggest that Lake Massapoag is significant to the sustainability of Sharon's water supply? Is it not true that the Lake sits above the wellfields and is hydrologically connected to them by stratified drift? Is it wrong to assume that there is groundwater exchange at the points of aquifer interface? What conditions influence the groundwater flow at these points? Can one assume that the Lake exerts significant hydraulic pressure toward portions of the adjoining, unconfined drift aquifer. If groundwater levels drop during the summer in the adjoining aquifer, am I to assume that Lake Massapoag is a unique waterbody and can

indefinitely maintain a level above continuous groundwater levels? Or perhaps the Lake is not unique and will drop (leak) until it reaches equilibrium with adjoining down gradient groundwater levels.

How did our wells influence groundwater levels in our Zone II's this year? Is it not true that Zone II's can expand under conditions of less than normal precipitation in stratified drift aquifers? Did hydraulic gradients change? What was the lateral extent of well drawdown. Is it irresponsible to suggest that our municipal wells may exert some impact on Lake levels under certain conditions? Is it irresponsible to suggest that the Lake and the municipal wells compete for groundwater reserves?

CEDAR SWAMP

The Cedar Swamp, North of the AMTRAC rail line is "dying of thirst." The drainage ditch installed for the Town in the early 1960's has certainly been a major factor contributing to the worsening conditions in this important natural community. The Cedar Swamp more than likely straddles groundwater divides and is within an acknowledged Zone II. The drainage ditch and subsequent mosquito control projects continue to diminish this wetland community's capacity to detain precipitation and runoff and recharge the underlying and contiguous aquifer. What role the municipal wells may play in the Swamps decline, I am unable to conclude, because once again there is no program of groundwater monitoring established.

Because it is an increasingly rare wetland community, contains rare wetland wildlife, is in a state designated Area of Critical Environmental Concern, and is vital to aquifer recharge and water quality, the Conservation Commission has applied to the State Wetland Restoration and Banking Program (GRO-Wetlands grant) for the development of a plan (to be administered by the State) to intercept surface and groundwater before it reaches the drainage ditch and redirect it toward the interior of the Swamp where it will help restore recharge capabilities and water regimes.

In my opinion, Lake Massapoag and the Cedar Swamp are critical water recharge reservoirs for our municipal wells. Because of their elevation in relation to the wells and their interface with the principal aquifers appropriate attention should be accorded to their vital role in sustaining our water supply and to their current condition. I believe the condition of these two resources may indicate a serious groundwater problem and a growing imbalance between precipitation and recharge. We need to more clearly determine the groundwater characteristics (levels, directional flows, etc.) in these recharges areas season to season, year to year. Once again, we need a permanent, comprehensive monitoring network installed, as soon as possible.

6. I strongly support the imposition of daily maximum withdrawal caps on each well as a condition of any Water Management Act permit. In order for the Town to come into compliance with its new daily caps (permits renewed on May 17, 1997), major water

management initiatives have become necessary in order to address water consumption and storage issues. For the first time a weekend watering band was imposed, in addition to the traditional odd-even restriction. A strong enforcement effort was executed and fines were levied. Despite general compliance with these restrictions, water consumption in June and July equaled and or exceeded historic levels. The drain that lawn irrigation is placing upon the water supply system and water resources needs to be addressed. The Town's Water Management Study Committee is investigating water conservation options and an increase in peak demand water rates. Whereas, water conservation education should be heightened, I frankly think that stronger mandatory restrictions will be required.

7. I would caution DEP that water permit conditions, such as maximum daily caps, can only be effective if they are strictly enforced. Whereas, compliance and greater emphasis on improving the management, operation and protection of Sharon's water supply is now a major priority for many individuals and boards in this Town, I would suggest that improvement in DEP's compliance oversight should be stepped up. With the increasing demands of municipalities for dwindling and shared water resources, impacts and conflicts are going to increase, as well. With Sharon being at the top of several, already stressed aquifers, more attention will be probably be directed toward our water consumption and management as time goes on. That is appropriate, but I would like to advise DEP that I am anything but confident that some of the neighboring Town's are complying with their daily caps! I have been involved in some recent discussions with

water managers and or conservation officers of neighboring towns. We have discussed the advisability of beginning to meet and work together to protect our shared water resources.

8. In light of the level of existing information, I am extremely concerned about the tenuous balance between aquifer recharge and yield. As stated previously, because of Sharon's geographic elevation and the central position of our utilized aquifers, recharge of available precipitation in the upper recharge zone becomes all the more critical. Due to cumulative development impacts, the consequent changes in natural drainage patterns and mosquito control and other wetland drainage projects, storm event stream flows have increased significantly, I am sure. We do not know more specifically, as I would suggest we should, how precipitation runoff patterns and base and peak stream flows have changed and what effect these changes are having on our recharge capability.

9. When considering the location of Sharon's producing wells and aquifers in relation to water supply distribution patterns, I am concerned about the impact of water basin and sub-basin transfers. For example, nearly 200 million gallons of water is withdrawn from the Beaver Brook aquifer during June, July and August each year. Much of this water is pumped out of and utilized in other drainage basins and sub-basin areas. The recharge from residential leaching and irrigation systems is not returned to the producing aquifer; I would suggest that this issue is a significant water supply issue

which should be investigated. I believe basin and sub-basin water budgets should be determined as soon as possible.

10. I suggest that the principal function of any municipal water supply system is: (1). to provide adequate quantities of safe drinking water, and (2). Ensure sufficient water pressure in the system for fire protection. No municipal water system, that I am aware of, was designed to provide the resources and storage capabilities to irrigate acres and acres of lawn area. The alarming increase in water consumption during the summer months is directly attributable to lawn irrigation and is placing undue stress on the capabilities of the water system to meet primary functions. This high consumption also threatens the very natural resources on which the system depends.

Obviously, problems and impacts are exacerbated when less than normal precipitation occurs during the period of peak demand. With only odd-even watering restrictions imposed, pressure in the system has, on various Sunday afternoons during the summer, fallen below adequate levels for fire protection. The pumping stations can not be throttled back or rested, because of the drain on existing storage tank levels.

Considering the rising numbers of pre-set automatic irrigation systems in use and water consumption patterns, I believe a more restrictive watering ban is required. Imposition of the weekend watering ban this year was an important step. However, it did not put a dent in daily water consumption rates when compared to previous summers.

What it did accomplish was to permit the Town to comply with the permitted daily withdrawal caps and lessened the strain on the water distribution system a bit. It helped diminish fluctuations in system water pressure and apparently reduced overall total consumption for the year..

Significant wetland resources under the Commission's jurisdiction are showing obvious signs of stress and impact. The simple fact is that the Town does not possess sufficient information to explain the causes. It is certainly in no position to assign anywhere approaching conclusive causative values to commonly offered explanations such as "it was dry" and "too much water was let out of Lake Massapoag". Correspondingly, the Town has no justification for concluding that the municipal wells are having no negative impact on wetland resources nor diminishing their capacity to fulfill acknowledged functional values, including but not limited to, protection of groundwater, public and private drinking water supplies.

Until the Town begins to provide convincing causative reasons for observed impact, I believe only once a week watering should be permitted.

11. The 1985, 1991, 1997 versions of the Water Master Plan prepared for the Town by Amory Engineers, Inc., have provided clear guidance and recommended construction schedules for required water system improvements. Identification, protection and development of new water sources has been a consistently prioritized recommendation, as

has been the need to plan for the replacement of various existing wells, which are nearing the end of their useful life.

If the Town were to lose Well #4, for whatever reason, the remaining pumping stations do not have the total capacity to meet current daily peak demand requirements. Belated progress has been made in the last year or so to identify areas for future water supply development. However, continued groundwater exploration apparently has been halted pending results of a pumping test on property owned by the Islamic Center of New England off of Chase Drive. The Town intends to construct Well #8 on this site if aquifer characteristics are favorable and upon receipt of required permits and approvals. The issuing authorities will base their decisions upon information provided by the Town.

Considering the location of this proposed well in relation to sensitive and significant wetland and water resources, the Conservation Commission should be greatly concerned. The Islamic Center property lies in the Town's central recharge zone, abuts the Great Cedar Swamp, is within an acknowledged Zone II and ACEC and is proximate to Lake Massapoag and its contributing watershed. Both the Cedar Swamp and Lake Massapoag serve as habitat for state listed rare and/or endangered wetland wildlife.

In light of what we currently know concerning the characteristics of our aquifers and recharge areas, or perhaps more importantly, what we currently do not know, the Town has a significant burden of proof relative to assembling convincing evidence that

operation of proposed Well #8 will have no negative impact on resource areas under the Commission's jurisdiction.

I would like to suggest that members of the Commission, as currently constituted, will face no more significant responsibility during their tenure than to ensure that a proper level of review for this well proposal takes place. I recommended that the Commission exercise its authority under the By-law to engage the services of a qualified consultant, paid for the by the applicant, to provide technical assistance and review guidance. I think it is advisable to have an independent analysis of the pump test plan and proposed groundwater monitoring grid to ensure their adequacy relative to the Commission's concerns.

There may very well be significant quantities of high quality water with aquifer characteristics favorable for well development at the Islamic Center site. I certainly hope there is lots of water in the underlying formation since it already contributes to the viability of some of our existing wells. It is obvious, however, that the Town is "a little behind" in the recommended schedule for new well construction. Considering peak demand, questions concerning future water fee revenue and competing capital borrowing requirements, there is heavy pressure to construct a large high production well as soon as possible.

It falls to this Commission not to obstruct development of this particular well (although that may be an increasingly common accusation) but rather to ensure that the most thorough review of this proposal is permitted to take place. The Commission is charged with protecting the quality of groundwater and existing and/or future public and private drinking water supplies. Considering its proposed location, a large production well developed off of Chase Drive could further threaten already stressed wetland and water resources which contribute to the long-term sustainability of Sharon's water supply. I hope the Town and the Commission proceed carefully.

In the meantime, it would seem to make sense to continue groundwater exploration in a very deliberate manner, to ensure that any potential area remaining undeveloped in Town, which may contain suitable characteristics for well development, are at last identified. Acquisition and/or protection, by other means, of the most promising areas should be planned for before it is too late.

FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

TO: John A. Sulik, Superintendent of Public Works

FROM: Greg Meister, Conservation Agent

DATE: Status Report/ Annual Wellhead Wetland Assessment

DATE: August 1, 1997

At your request I am submitting this memorandum to apprise you of the status of my annual assessment of the wetland monitoring plots. I began my field investigation on May 30. [illegible] weeks after leaf-out. As you are aware, I have had numerous discussions with you and other municipal officials since beginning this year's investigation. My interim comments are as follows:

1. The current water withdrawal permit requires once yearly submittal of the Town's wellhead wetland assessment (i.e. by December of each calendar year).

2. I believe that assessment of the wetland community and associated surface water during just the early spring months is inadequate.

3. As indicated in my 1996 wetland assessment it is difficult to truly assess the impact of well operation on the wetlands and surface water resources adjacent to well # 2, 3 and 7. Beaver Brook has a flashboard structure downgradiant of wells 2 and 3. Water levels and stream flow has been manipulated periodically by this structure. The water level of Gavins Pond is controlled to a great degree by manipulation of flashboards by the Town of Foxboro at the lower end of the pond.

4. In my capacity as Conservation Agent, I have instructed the Water Division to remove the flashboards installed last year in the Beaver Brook weir structure.

5. I have observed dried up brooks and wetlands in the upgradient recharge areas of various Town wellfields and Lake Massapoag. I am extremely concerned.

6. I will complete and submit my final assessment by November 30, 1997. I believe that the Town needs to seriously consider implementing a groundwater monitoring program. Assessment of the existing wellhead wetland monitoring plots is in my opinion an inadequate means to determine the actual long or short term impact of well pumping upon the wetlands and water bodies in the recharge area.

cc: Board of Selectmen
Conservation Commission

wllhdas.doc

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ack Hamm, Basin Coordinator
DEP - Southeast Region
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akeville, MA 02347

ear Mr. Hamm:

ttached, in accordance with Condition #7 of Sharon's Water Withdrawal Permit, is he 1997 wetlands monitoring report prepared by Greg Meister, Sharon Conservation gent.

n his report Mr. Meister notes that wetlands abutting Sharon's wells dried up over the ummer months. Our own observation of wetlands (not all) in Sharon far from any ell pumping influence has been that these have also dried up. 1997 was a dry year nd consequently no conclusions should be based on the attached.

The Town of Sharon has recognized the need for a comprehensive ground water monitoring program and we are in the process of developing such a program with the assistance of Weston & Sampson, our groundwater consultants.

f you have any questions please feel free to call.

Very truly yours,

John A. Sulik
Superintendent of Public Works

Office of Watershed Management, DEP
Board of Selectmen
Greg Meister

JAS/sab

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P.N. F147-001

November 22, 2000

Mr. Robert Durand, Secretary
Executive Office Of Environmental Affairs
Attn: MEPA Office, William Gage, EOEA NO. 11522
251 Causeway Street Suite 900
Boston, MA 02114

RE: Draft Environmental Impact Report, Islamic Site Production Well, Town of Sharon, Massachusetts

Dear Secretary Durand:

On behalf of the Sharon Conservation Commission and the Sharon Lake Management Study Committee, we have prepared the following comments regarding the *Draft Environmental Impact Report* (*Draft EIR*) for the proposed water supply well at the Islamic Site in the Town of Sharon. The *Draft EIR* was prepared by Weston and Sampson Engineers for the Town of Sharon following your review of the *Environmental Notification Form* submitted by the Town of Sharon in 1998.

The Town of Sharon has proposed to provide additional water supply capacity by installing an additional water supply well, Well 8, at a site referred to as the Islamic Site. The proposed well site is adjacent to the Great Cedar Swamp in the Town of Sharon. The *Draft EIR* states that operation of the proposed well would cause adverse environmental impacts to the wetlands of the Great Cedar Swamp and would reduce the amount of groundwater discharge to Massapaog Lake. There appear to be other water supply alternatives, which do not have those adverse environmental impacts, available to supply the water needed by the Town of Sharon.

The *Draft EIR* relies on a groundwater flow model to evaluate the potential hydraulic impacts of the proposed Well 8. The model was developed by Weston & Sampson, at the request of the Massachusetts Department of Environmental Protection (DEP). The model is based in part on data gathered during the water supply exploration and on an eight day pumping test performed at the site for proposed Well 8. The pumping test was done between August 12

and August 20, 1998 by the F. G. Sullivan Drilling Company for Weston and Sampson. These data and the groundwater flow model are presented in the report titled *New Source Approval for Proposed Well 8* (Weston & Sampson, 2000).

We have reviewed the pumping test data and the groundwater flow model evaluations that were done. During our review we identified certain limitations in each that may have led to an underestimation of the potential hydraulic impacts of the proposed well 8 to the Great Cedar Swamp and Massapoag Lake. These limitations and the potential consequences are discussed below.

Eight-day Pumping Test

An eight-day pumping test at the proposed well location was done between August 12 and August 20 1998. The description of the site conditions during the pumping test and the methodology used to analyze data collected during the test indicate that the future potential hydraulic effects of the proposed well were likely underestimated.

- Water pumped from the test well was conveyed through piping about 740 feet south and was discharged into low lying wetlands. Approximately 4.5 million gallons of water was discharged into the wetlands during the pumping test and water ponded in the wetland where it was discharged. Based on the water level measurements collected during the test, the discharge point was within the zone of influence of the pumping well. Well B-5 located about 1100 feet southeast of the test well and well B-6, which was located about 2300 feet northeast of the test well, exhibited drawdown in response to pumping. The discharge location for the pumped water was closer to the test well than wells B-5 and B-6. In addition, the limited drawdown in wells located closer to the pumping well discharge location compared to the drawdown in well 6-96 is evidence of a recharge boundary to the southeast. The pumping test analysis described in the *New Source Approval for Proposed Well 8* did not recognize this boundary effect.

  As a result of the groundwater recharge that occurred due to pumping well discharge water ponding within the zone of influence of the pumping well, the magnitude of drawdown and extent of the zone of influence of the proposed well has been underestimated. Ideally, the discharge location for the pumped water should have been beyond the zone of influence of the pumping well. At a minimum, the analysis of the pumping test should have recognized the consequence of this additional recharge during the pumping test on the estimates of the hydraulic impacts of long-term pumping of the proposed well.

- On August 17, 1998, the fifth day of the eight day pumping test, 2.91 inches of precipitation was recorded at the Town of Sharon Department of Public Works building. This was noted in Table 3 of *New Source Approval for Proposed Well 8* (Weston & Sampson, 2000). The hydrographs of wells 2-96, 3-96, 4-96, 5-96, 6-96, B-1, B-2, B-3, and B-5 show a rapid response to this precipitation event. In some wells there is a rise in water levels and in others a decrease in the rate of water level decline. The rapid response in water levels in these wells to the precipitation event indicates that the aquifer is hydraulically well connected to the surficial deposits. The suggestion in the *New Source Approval for Proposed Well 8* that there is a "poor connection between the shallow water system ... and the deeper groundwater" (Weston & Sampson, 2000, p 4-3) is inconsistent with the data collected during the pumping test. In addition, the noted difference in drawdown between well 1-96 and shallow piezometer PZ-1 (Weston & Sampson, 2000, p. 4-3) more likely reflects the hydraulic effects of a partially penetrating pumping well rather than a poor hydraulic connection between the shallow and deeper groundwater.

  The groundwater flow model that was constructed to evaluate the long-term hydraulic impacts of the proposed well assumed a limited hydraulic connection between the aquifer and the surficial deposits. This was done by specifying a relatively high vertical anisotropy in hydraulic conductivity. Consequently, the model will underestimate the effects of the proposed pumping well on nearby surface water resources.

- Despite the recharge caused by precipitation and Well 8 discharge of water to the wetland near the pumping well, drawdown was observed in piezometers PZ-1 and PZ-2, two shallow piezometers located in the wetland. Data from PZ-2 indicate that surface water was ponding in this area as a result of the Well 8 discharge to the wetland. The fact that water levels in PZ-1 and PZ-2 declined in response to the pumping of Well 8 indicates that long term pumping of Well 8 would cause a decline in the shallow water table which would likely adversely affect the wetlands.

- Despite the fact that there was significant rainfall during the pumping test, and despite the fact that the pumped water was discharged within the zone of influence of the pumping well, the water level in the pumping well was still declining after six days of pumping (Weston & Sampson, 2000, p. 3-2). To meet the DEP requirements regarding stabilization, the pumping rate was reduced from 402 gallons per minute (gpm) to 350 gpm on August 18, and the pumping test was continued for another 48 hours. While not explicitly stated in the report, we

assume that the DEP approved the pumping rate change. During the final 12 hour period of the pumping test, after the rate was decreased, the drawdown in wells 1-96, 2-96, 3-96, 4-96, and B-1 was still greater than 0.5 inches/day. The combination of the precipitation recharge, the local recharge caused by Well 8 discharge, and the change in pumping rate create a complicated pumping test, that cannot be analyzed by simple analytical methods.

- The data obtained from the surrounding monitoring wells that were screened in similar intervals as Well 8 were analyzed by Weston & Sampson using the Theis method for non-equilibrium radial flow in a confined aquifer and the Jacob Straight-Line Time-Drawdown method for non-equilibrium radial flow in a confined aquifer. These methods assume uniform horizontal flow through an infinite confined aquifer with no recharge and a constant pumping rate. The analyses were done for the purpose of calculating hydraulic properties of the aquifer and estimating long-term hydraulic impacts of the proposed well. The pumping test conditions do not meet the assumptions of the selected analysis methods. There was recharge from precipitation during the test, a recharge boundary was created by the discharge of the pumped water, the aquifer is unconfined, and the pumping rate was not constant throughout the test.

  The net effect of the differences between site conditions during the test and the required assumptions of the analysis methodology would be to overestimate the hydraulic characteristics of the aquifer, and consequently underestimate its effect on the nearby surface water resources. The pumping test analysis should have given better consideration to these important differences. There are analysis methods that are used for unconfined aquifer conditions and recharge boundaries.

Groundwater flow model:

The groundwater flow model developed for this project was the principal tool used to evaluate the long-term hydraulic impacts of the proposed pumping well. The model results are dependent upon the conceptual model used to create the numerical model and the input parameters used in the model. We have not had opportunity to review the model directly, but based on our general experience with groundwater flow modeling, we have identified certain model conditions which seem inconsistent with site conditions, and which would cause the model to underestimate the hydraulic effects of the proposed well on nearby surface water resources. These qualitative observations are discussed below:

- Groundwater recharge rate. The model assumes an annual average areal recharge rate from precipitation of approximately 18 inches per year (Weston & Sampson, 2000, p. 5-4). An areal recharge rate of 18 inches per year is a relatively high number, generally representative of sandy material with good infiltration capacity. This model input parameter could also represent infiltration from a surface water body, such as the ponded discharge water. The model calculations are based on a recharge rate of 18 inches per year, but the conclusions one would reach would be different if the source of that recharge were precipitation or infiltration from surface water. If all the recharge were from precipitation, then one would conclude little impact on nearby surface water resources because of the large amount of precipitation recharge. If on the other hand, the groundwater system were recharged by induced infiltration of surface water and the model assumed it was from precipitation, then model calculations of future hydraulic impacts would be underestimated. The descriptions of the pumping test evaluation and model analysis indicates that the induced infiltration of the ponded discharge water was not properly considered.

- Hydraulic conductivity. This model parameter affects the rate of groundwater flow as well as identifying preferred regions of groundwater flow. For the site model hydraulic conductivities are specified for the riparian/wetland soils that overlie the principal aquifer deposits and for the underlying till and bedrock. There were no site specific data for these hydrogeologic units. The hydraulic conductivity value used by Weston & Sampson for the riparian soils is based on estimates made along the Concord River and not based on local testing in the wetlands at the Well 8 site. The source of hydraulic conductivities of the till and bedrock is not indicated in the *New Source Approval for Proposed Well 8* (Weston & Sampson).

Given the environmental concern regarding the effect of pumping on the nearby wetlands and Massapoag Lake, it would be preferred to have site-specific hydraulic conductivity data for the riparian/wetland soils. If the hydraulic conductivity value used in the model were less than the actual value, then the model would underestimate the hydraulic impact of the proposed pumping on the wetlands and the lake. If the hydraulic conductivity value used in the model were greater than the actual value, then the model would overestimate the hydraulic impact of the proposed pumping on the wetlands and the lake. Due to the lack of site-specific data, the usefulness of the model to evaluate the likely hydraulic impacts of the proposed pumping are not known.

- Horizontal to vertical hydraulic conductivity ratio. This ratio affects the ability of water to move in the horizontal and vertical directions. The ratio used in the Weston & Sampson model for aquifer type material appears to be about 150:1. This is an extraordinarily high number. This hydraulic parameter strongly influences the hydraulic effects of the proposed pumping on the wetlands and Massapaog Lake. There are no site specific data to evaluate how well the model represents the actual site conditions. If the ratio used in the model, however, is too high for site conditions, then the model would underestimate the hydraulic impact of pumping from Well 8 on the wetland and the lake. Given the environmental concerns raised regarding the wetland and Massapaog Lake, it seems important to determine how well the model represents this condition.

It is stated in the *Draft EIR* that under long-term average conditions, proposed Well 8 is likely to cause groundwater drawdown of greater than one foot beneath an estimated 100 +/- acres of Great Cedar Swamp and reduce the amount of groundwater discharge to Massapaog Lake by 3 to 5 percent. The *Draft EIR* also states that this long-term drawdown of greater than one foot may result in a change of shallow hydrologic conditions that may subsequently lead to additional conversion in the vegetative character of the Great Cedar Swamp from a cedar swamp to a red maple swamp. Our review of the water supply exploration, Well 8 pumping test, and groundwater model indicate that the model-calculated effects of the proposed pumping from well 8 likely underestimate the hydraulic impacts to the Great Cedar Swamp and Massapoag Lake.

Other Water Supply Alternatives:

Other alternatives to supply water to the Town of Sharon, which do not have adverse environmental impacts to Great Cedar Swamp and Massapaog Lake, exist. Weston & Sampson conducted an evaluation of water supply alternatives for the Town of Sharon as requested by the Secretary in the Certificate on the *Environmental Notification Form*. The alternatives evaluation is summarized in the *Draft EIR* and presented in detail in the *Water Supply Alternatives Evaluation Report* (Weston & Sampson, 2000). Six basic alternatives were evaluated. They are:

- Alternative 1: No-Build
- Alternative 2: Construction of a New Well No. 8
- Alternative 3: 5 In-Town Wells
- Alternative 4: Interconnections with surrounding towns
- Alternative 5: Massachusetts Water Resources Authority (MWRA) Water Supply Through Canton
- Alternative 6: Bluestone Energy Water Supply Through Easton

In the evaluation report, Weston & Sampson recommended Alternative 2, the construction of Well 8. Alternatives 1 and 4 were characterized as not applicable. Alternatives 3 and 6 were not recommended, primarily due to high costs. Alternative 5, was not recommended primarily because the Town of Sharon would not control the water supply source.

Alternative 5, however, provides the amount of water necessary to meet the Town of Sharon 2010 planning goal at a similar cost to proposed Well 8, and without the adverse environmental impact of Well 8. Under Alternative 5, the Town of Sharon would only need to purchase an annual average of 0.1 million gallons of water per day (mgd) from the MWRA through the Town of Canton distribution system in order to meet the projected 2010 water demand. Since this is an annual average, more water could be purchased during high demand periods and lesser amounts, or no MWRA water, could be purchased during low demand periods. Alternative 5 would also allow the Town of Sharon to purchase additional water from the MWRA in the future (i.e. post 2010) without additional construction costs. If Alternative 5 were modified to include a lift station with a 1.5 mgd capacity it could account for the worst case scenario of Well 4 being shut down and still meet the 2010 maximum daily demand of 3.78 mgd. The Town of Sharon would only be required to pay the MWRA prevailing rate charges for the additional withdrawals under the MWRA Emergency Water Supply Withdrawals Policy #: OP.05 Section V regulations if additional water needed to be purchased due to a well failure. Another advantage that Alternative 5 has over Alternative 2 is that the initial capital expenses of Alternative 5 are significantly lower than the initial capital expenses associated with Alternative 2. Table 1 summarizes the initial capital expenses of Alternatives 2 and 5 according to the *Water Supply Alternatives Evaluation* (Weston & Sampson, 2000) as well as projected annual costs for 2001 and 2010.

In addition to Alternative 5, there are two other alternatives that were not considered in the *Water Supply Alternatives Evaluation* (Weston & Sampson, 2000). Hydrogeologic information indicates that there are two additional locations in the Town of Sharon where suitable water supply wells might be developed with potentially less environmental impact. The two additional potential sources in the Town of Sharon are the School Meadow Brook aquifer and the aquifer underlying the Sharon Memorial Park and Knollwood Memorial Cemetery.

The *Aquifer Protection Study Town of Sharon, MA* (IEP, 1987) indicates that the School Meadow Brook aquifer has sufficient saturated thickness in the Town of Sharon for a municipal groundwater supply. The School Meadow Brook aquifer is presently being used by the Town of Walpole as a water source and is zoned for light industrial use in the Town of Sharon. Hydrogeologic investigations and water quality analyses would have to be done in order to consider the School Meadow Brook aquifer as a water supply source for the Town of Sharon.

Well logs for water supply wells near the Sharon Memorial Park Cemetery, in the northern portion of the Town of Sharon, indicate that there are thick deposits of sand and gravel capable of producing large quantities of water in the area near the cemetery. The *Groundwater Resources Exploration Study 21/2-Inch Test Well Program* (Weston and Sampson, 1997) indicates that the area of well 13-96, which is located in the northern portion of the Town of Sharon near Sharon Memorial Park and Knollwood Memorial Cemetery, is estimated to be able to produce 0.5 mgd. This area has not been adequately tested to fully assess its suitability for a water supply well. In order to properly assess the suitability for water supply in the Sharon Memorial Park and Knollwood Memorial Cemetery location additional test wells would have to be installed and tested.

Summary

Based on our review of the Draft Environmental Impact Report and supporting documents, it is our opinion that the hydraulic impact on Great Cedar Swamp and Massapaog Lake of long-term pumping from proposed well 8 are likely to be greater than estimated in the Draft EIR. There appear to be several other feasible and reasonable alternatives to provide the water needed by the Town of Sharon. Given the comments and concerns of the citizens of the Town of Sharon regarding environmental impacts to Great Cedar Swamp and Massapaog Lake, these other alternatives should be given consideration and evaluated further.

Sincerely,

Jonathan R. Bridge
Associate
Senior Hydrogeologist

Enclosure

cc: Greg Meister

JRB/blc

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Table 1. Summary of Expenses Associated with Alternatives 2 and 5

ALTERNATIVE NUMBER	ALTERNATIVE DESCRIPTION	INITIAL CAPITAL EXPENSES	ESTIMATED 2001 ANNUAL COSTS	ESTIMATED 2010 ANNUAL COSTS
2A	Well 8 without treatment	$1,665,000 (1)	$20,000 (3)	$26,095 (5)
2B	Well 8 treatment for sequestering	$1,695,000 (1)	$20,000 (3)	$26,095 (5)
2C	Well 8 greensand treatment	$3,325,000 (1)	$52,000 (3)	$67,848 (5)
5	MWRA supply via Canton w/ 1.0 mgd lift station	$1,418,500 (1)	$63,416 (4)	$134,815 (6)
5 (altered)	MWRA supply via Canton w/ 1.5 mgd lift station	$1,636,000 (2)	$63,416 (4)	$134,815 (6)

Notes: (1) = Initial capital expense as reported in Appendix B of the *Water Supply Alternatives Evaluation* (Weston and Sampson, 2000).

(2) = Initial capital expense assumes a 1.5 mgd lift station costs 1.5 times as much as a 1.0 mgd lift station.

(3) = Includes power, labor, and chemicals at operation of 300,000 gpd for 120 days per year (24 hours per day) as posted in the Water Supply Alternatives Evaluation (Weston and Sampson, 2000).

(4) = Based on the 2000 projected MWRA Wholesale Water Charge rate for 2001 for 300,000 gpd for 120 days per year (24 hours per day) (without wheeling fee from Canton to Sharon) and the estimated annual operation and maintenance cost from the Water Supply Alternatives Evaluation (Weston and Sampson, 2000).

(5) = Assumes a 3% annual inflation rate.

(6) = Based on an estimated 3% annual inflation rate on operation and maintenance and the 2000 projected MWRA Wholesale Water Charge rate for 2010.

APPENDIX A

Charges for Community Withdrawals Due to Supply Deficiency

Year One:

- 105% of the MWRA prevailing rate for water withdrawal

Year Two:

- 105% of the MWRA prevailing rate for water withdrawal *plus*
- 105% of 1/3 of the annual payment associated with an asset value contribution payment (applicable to such community which would be calculated under Policy # OP.10 - Admission of New Community to Waterworks System) amortized with interest over 15 years*.

Year Three

- 105% of the MWRA prevailing rate for water withdrawal *plus.*
- 105% of 2/3 of the annual payment associated with the asset value contribution payment (entrance fee equivalent) amortized with interest over 15 years*.

Year Four:

- 105% of the MWRA prevailing rate for water withdrawal *plus.*
- 105% of 3/3 of the annual payment associated with the asset value contribution payment (entrance fee equivalent amortized with interest over 15 years*.

Year Five:

- 110% of the MWRA prevailing rate for water withdrawal.
- 110% of the annual payment associated with the asset value contribution payment (entrance fee equivalent amortized with interest over 15 years*.

* Should a community withdrawing water under this policy apply for full admission to the MWRA water service system, the amortized asset value contribution payments, excluding premium payments, shall be credited toward the MWRA entrance payment.

Table 1. Summary of Expenses Associated with Alternatives 2 and 5

ALTERNATIVE NUMBER	ALTERNATIVE DESCRIPTION	INITIAL CAPITAL EXPENSES	ESTIMATED 2001 ANNUAL COSTS	ESTIMATED 2010 ANNUAL COSTS
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(2) = Initial capital expense assumes a 1.5 mgd lift station costs 1.5 times as much as a 1.0 mgd lift station.
(3) = Includes power, labor, and chemicals at operation of 300,000 gpd for 120 days per year (24 hours per day) as posted in the Water Supply Alternatives Evaluation (Weston and Sampson, 2000).
(4) = Based on the 2000 projected MWRA Wholesale Water Charge rate for 2001 for 300,000 gpd for 120 days per year (24 hours per day) (without wheeling fee from Canton to Sharon) and the estimated annual operation and maintenance cost from the Water Supply Alternatives Evaluation (Weston and Sampson, 2000).
(5) = Assumes a 3% annual inflation rate.
(6) = Based on an estimated 3% annual inflation rate on operation and maintenance and the 2000 projected MWRA Wholesale Water Charge rate for 2010.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, MA 02202

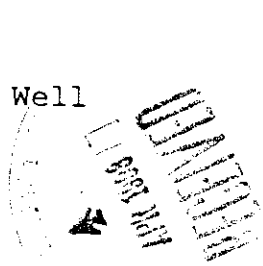
ARGEO PAUL CELLUCCI
GOVERNOR
TRUDY COXE
SECRETARY

Tel: (617) 727-9800
Fax: (617) 727-2754
http://www.magnet.state.ma.us/envir

April 10, 1998

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Islamic Site Production Well
PROJECT MUNICIPALITY	: Chase Drive - Sharon
PROJECT WATERSHED	: Neponset and Taunton
EOEA NUMBER	: 11522
PROJECT PROPONENT	: Town of Sharon
DATE NOTICED IN MONITOR	: March 11, 1998



Pursuant to the Massachusetts Environmental Policy Act (G. L., c. 30, ss. 61-62H) and Sections 11.04 and 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of an Environmental Impact Report (EIR). As part of this decision, I am allowing the proponent to proceed with its pumping test for the proposed well, as outlined by the Department of Environmental Protection (DEP), but the proponent should remain aware that the environmental analysis will be far reaching in terms of alternative analysis and mitigation measures.

I am requiring the preparation of an EIR because this project may result in impacts to rare species and wetlands on and near the site and within an Area of Critical Environmental Concern (ACEC). In addition, the proposed groundwater withdrawal may negatively impact water resources within the Neponset and Taunton River watersheds (as well as Lake Massapoag). One of the concerns with this project arises from the uncertainty about the nature and extent of impacts on these various watersheds. I note that the state permitting process for the development of a municipal water supply is quite detailed, and will focus on many of the same issues raised in this Certificate. However, the potential impacts of the project are sufficiently great to warrant additional MEPA review, and the MEPA process itself represents an appropriate public forum to analyze impacts and describe trade-offs between water supply, watershed management and rare species/wetlands protection.

The EIR should also summarize the alternatives already developed for the project site. DEP has requested that a numeric model be developed and that the EIR evaluate the possible impacts of relocating the withdrawal points across subbasins. The EIR should state how Sharon proposes to identify additional future well sites.

Cumulative Impacts:

The EIR should discuss the project within a larger regional planning context, consistent with Executive Order 385, Planning For Growth. It should discuss any cumulative impacts from the addition of another water withdrawal point within the watersheds, and propose mitigation as needed. To address cumulative impacts, the EIR should work with other municipalities in the watershed to develop a regional monitoring and drought contingency plan. The EIR should include brief summaries of the locations of other existing and proposed well projects within the watersheds and their proposed withdrawal levels. The EIR should discuss the growth impacts on the watersheds from the continuing development in the project area. The proponent should confer with Foxborough, Easton, Mansfield and Norton town officials regarding future water withdrawal projects. The EIR should identify ways to cooperatively manage their shared water resources. The EIR should explain how project design (including the selection of a preferred alternative) can minimize such cumulative impacts. It should discuss whether or not Sharon needs to increase in its Water Management Act permit withdrawal.

Drinking Water:

The EIR should describe the well monitoring program for the project site to ensure that groundwater levels and quality are maintained at existing levels. The pump tests and observation wells should define the basin divide boundary for the Canoe River, the Upper Rumford River, the Taunton River, the Neponset River, and Lake Massapoag for the area of the proposed well. It should accurately delineate the boundaries of the groundwater contribution zone for the proposed well. The EIR should evaluate the impacts from the well withdrawal on these basins. It should clearly identify any impacts within the nearby Canoe River Aquifer ACEC. The proponent is reminded that no adverse impacts are permitted to wetlands and wildlife habitat located within the ACEC.

The EIR should address the concerns raised in the Department of Environmental Management's and DEP's comment letters dated

incorporated to ensure that no downstream impacts will occur. The drainage analysis should ensure that on- and off-site wetlands are not impacted by changes in stormwater runoff patterns.

For any amount of required wetlands replication, a detailed wetlands replication plan should be provided in the EIR which, at a minimum, includes: replication location(s) delineated on plans at a scale no greater than one inch = 100 feet, elevations, typical cross sections, test pits or soil boring logs, groundwater elevations, the hydrology of areas to be altered and replicated, list of wetland plant species of areas to be altered and the proposed wetland replication species, planned construction sequence, and a discussion of the required performance standards and monitoring. If wetlands monitoring is proposed, the EIR should detail the monitoring program.

Drainage:

The EIR should evaluate potential drainage impacts on water resources. The EIR should present drainage calculations and detailed plans for the management of stormwater from the proposed project. It should include a detailed description of the proposed drainage system design, including a discussion of the alternatives considered along with their impacts. The EIR should identify the quantity and quality of flows. The rates of stormwater runoff should be analyzed for the 2, 10, and 100-year storm events. If the proponent ties into the existing Chase Drive drainage system, the EIR should clarify if there will be a recharge deficit on-site. The EIR should indicate and discuss where the Chase Drive drainage system discharges in this area. It should demonstrate that the proposed drainage system will control storm flows at existing levels.

The EIR should address the performance standards of DEP's Stormwater Management Policy. It should demonstrate that the design of the drainage system is consistent with this policy, or in the alternative, why the proponent is proposing a drainage system design not recommended by DEP. The proponent should use the DEP Stormwater Management Handbook when addressing this issue.

In addition, a maintenance program for the drainage system will be needed to ensure its effectiveness. This maintenance program should outline the actual maintenance operations, responsible parties, and back-up systems.

DEM, 3/31/98
NRWA, 3/31/98
MA Audubon Society, 3/31/98
EOEA, 3/31/98
George Bailey, 3/31/98
SCC, 3/31/98
Foxborough Conservation Commission, 4/1/98
DEP/SERO, 4/2/98

E11522
TC/WTG/wtg

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE

ARGEO PAUL CELLUCCI
Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

BG

RECEIVED
APR
MEPA

April 2, 1998

Secretary Trudy Coxe
Executive Office of
Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

RE: SHARON -- ENF Review
EOEA #11522 - Islamic Site
Production Well, Chase Drive

Dear Secretary Coxe,

The Southeast Regional Office of the Department of Environmental Protection has reviewed the Environmental Notification Form (ENF) for the proposed Islamic Site Production Well to be constructed on Chase Drive in Sharon, Massachusetts (EOEA #11522).

The Taunton River Watershed Basin Team indicates that there have been numerous concerns expressed to DEP about the possible impacts that this well may have on other water resources. To address many of these concerns, DEP will require as part of the pump test proposal in the new source approval process that a detailed numeric model be developed to model the areas of concerns. Special attention will be made to the area near Gavins Pond as the Town of Foxboro has indicated that existing problems are evident due to present wells within the area. As we understand the proposal, this new well will become a principle source and Well #2 will be made a secondary source, e.g. last on and first off, and then followed by Well #6. No increase in total authorized flow will be requested under the existing water management act permit. The proponent will need to submit a Water Management Act Permit Amendment Form WP 02, however.

If an EIR were to be required we would encourage that an evaluation be made, at least on a conceptual level and possibly in the form of a water balance, of any possible impacts of relocating the withdrawal points across subbasins. A discussion of the existing water resource situation should be developed based upon the wetland monitoring information collected to date by the Towns of Sharon and Foxboro. The new nothing option, i.e. do not develop a new well, should also be developed as well as other reasonable options, including enhanced water conservation efforts, e.g. restrictions on the time of day for irrigation systems to maximize water usage effectiveness; require private irrigation wells maybe for new construction; conservation water rate structures and any other ones that the town may identify to enable them to achieve their goal of

being able to provide their customers the option of green grass within an efficient water management plan.

The Town of Sharon, to its credit, has developed much of the information that is indicated above. It may be useful to see this information brought together and obtain comments through MEPA, possibly in the form of a Draft EIR, whereupon if it were demonstrated that the Islamic Center Well were still a strong and viable candidate for implementation, then the more intensive and costly pumping test proposal and numeric modeling could proceed without having incurred the significant financial risk to the Town as a Supplemental Draft EIR.

Based on the location information provided in the ENF, the Bureau of Waste Site Cleanup (BWSC) has searched it's data base for disposal sites and release notifications in proximity to the proposed project and finds that there are no known disposal sites or reportable releases within approximately five hundred (500) feet of the project. However, the Project Proponent is advised, if oil and or hazardous material pursuant to 310 CMR 40.0000, the Massachusetts Contingency Plan (MCP) is identified during the implementation of this project, the BWSC should be notified pursuant to 310 CMR 40.0300, a Licensed Site Professional retained to render opinions as stated in 310 CMR 40.0000 and risk reduction measures undertaken pursuant to 310 CMR 40.0400, as appropriate. In addition, the BWSC may be contacted for guidance if questions regarding cleanup arise.

The DEP Southeast Regional Office appreciates the opportunity to comment on this proposed project. If you have any questions regarding these comments, please contact Sharon Stone at (508) 946-2846.

Very truly yours,

Robert P. Fagan,
Regional Engineer,
Bureau of Resource Protection

RPF/SS

cc: DEP/SERO
ATTN: David DeLorenzo,
Deputy Regional Director

David Johnston,
Deputy Regional Director

John Viola,
Deputy Regional Director

Lawrence Dayian
Chief, Water Supply

cc: DEP/SERO
ATTN: John Hamm, Team Leader
Taunton River Watershed Basin

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

DIVISION OF RESOURCE CONSERVATION
100 CAMBRIDGE ST., BOSTON, MA 02202 PHONE 617-727-3160
FAX 617-727-2630 www.state.ma.us/dem/

March 31, 1998

Trudy Coxe, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202

Attention: MEPA Unit
Re: EOEA #11522 Islamic Site Production Well; Town of Sharon

Dear Secretary Coxe:

The ENF for this project was reviewed by DEM's Office of Water Resources when it was first submitted in August, 1997. A copy of our comments is attached.

As stated then, because of the topography and geology of this site, we cannot tell where the boundaries of the groundwater contribution zone for this well are located. The pumping test should accurately delineate these boundaries so that the potential impacts of this well can be accurately assessed.

Thank you for this second opportunity to comment.

Very truly yours,

Peter C. Webber
Commissioner

PCW/MHD

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 CAMBRIDGE ST., BOSTON, MA 02202 617-727-3180 FAX 727-9402

Argeo Paul Cellucci
GOVERNOR

Trudy Coxe
SECRETARY

Peter C. Webber
COMMISSIONER

August 11, 1997

Trudy Coxe, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202

Attention: MEPA Unit
Re: EOEA #11239 Islamic Site Production Well; Town of Sharon

Dear Secretary Coxe:

Staff from DEM's Office of Water Resources (OWR) have reviewed the ENF for the Town of Sharon's proposed production well at the Islamic Site (EOEA #11239). Our understanding is that the Town is requesting approval to conduct a pumping test at the site, in order to evaluate the potential for development of a new groundwater supply well. The pumping test will involve construction of an 8-inch well in order to pump 500-700 gallons per minute for about 5 days.

The proposed well site is located adjacent to a wetland area (just over 100 feet from the well). The groundwater levels in and around these wetlands should be monitored to determine potential impacts to flow into the wetland area. In addition the wetland vegetation should be surveyed to provide a baseline which can be used for later monitoring in accordance with the methods outlined in Sharon's DEP Water Management Act permit, updated on May 19, 1997, for existing wells 2,3,4,5, and 6.

The map accompanying the ENF indicates that the test well and potential production well are located in the headwaters of the Taunton River Basin near the basin divide between the Taunton and Neponset River basins. The basin divide in this area can shift seasonally and in response to withdrawals because the water table is at the surface, as indicated by the wetland conditions. Groundwater can flow towards the Taunton River basin or the Neponset River basin. Therefore the groundwater flow direction, surface water flow direction and basin divide prior to pumping and after pumping should be determined to evaluate which basin could be impacted by the withdrawal.

3. any required permits mandate that Sharon develop and implement a conservation plan that includes a drought/emergency contingency plan; and

4. that the new well not be used if the flow in the affected Taunton River subbasins falls below 0.22 cubic feet per square mile (cfsm). If the Massapoag Brook subbasin is affected by this well, flow should not fall below 0.15 cfsm in that subbasin.

OWR will be available to help the Town site a gage at an appropriate point near the well. We also suggest that Sharon work with Foxborough, Easton, Mansfield and Norton, to cooperatively manage their shared water resources.

Thank you for the opportunity to comment.

Very truly yours,

for Peter C. Webber
Commissioner

PCW:MHD/VJG/RHT

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

BG

Wayne F. MacCallum, *Director*

February 27, 1998

RECEIVED
APR 7 1998
MEPA

Sharon Conservation Commission
Town Clerks Office
90 S. Main St.
Sharon, MA 02067

Re: Applicant: Town of Sharon DPW, Water Department
Project Location: Chase Road
Project Description: Installation of 8" well, piezometer and 2.5" test well; pumping test and discharge of water during pumping test
NHESP File No. 98-3149

Dear Commissioners:

The applicant listed above has submitted a Notice of Intent with project plans to our office in accordance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.59) for the subject project.

Based on a review of the information that was provided, and the information that is currently contained in our database we have determined that this project occurs within the actual habitat of the Spotted Turtle (*Clemmys guttata*). The Spotted Turtle is listed as a species of "Special Concern" pursuant to the Massachusetts Endangered Species Act (MGL c.131A) and its implementing regulations (321 CMR 10.00). It is our opinion that the project as currently proposed will not adversely impact the actual habitat of a state-listed rare wildlife species.

Please note that this determination only applies to the pumping test. Possible impacts to wetland habitat due to long-term water withdrawal can be more accurately determined through the Water Management Act process.

Please note that this determination addresses only the matter of rare wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project.

Sincerely,

Patricia Huckery
Wetlands Environmental Reviewer

cc: John A. Sulik, Department of Public Works
DEP Regional Office
file

Natural Heritage & Endangered Species Program
Route 135, Westborough, MA 01581 Tel: (508) 792-7270 x 200 Fax: (508) 792-7275
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement
http://www.state.ma.us/dfwele

BC-

Weston & Sampson
ENGINEERS, INC.

Five Centennial Drive
Peabody, Massachusetts 01960-7985
Tel (978) 532-1900 Fax (978) 977-0100

Environmental Consultants since 1899

Town of Sharon
WSE Job No. 97222.A

March 4, 1998

Ms. Trudy Coxe
Secretary of Environmental Affairs
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

RECEIVED
MAR
MEPA

Attn: Mr. William Gage

Re: Sharon, Massachusetts EOEA file # 11522

Dear Ms. Coxe:

On behalf of our client, the Town of Sharon, Weston and Sampson Engineers, Inc. (WSE) is transmitting the attached Figures 2 and 3 for the groundwater project at the above-referenced site. These figures are a part of the pumping test plan submitted with the ENF last week and were left out of that submittal.

Please do not hesitate to contact me at (978) 532-1900 if you have any questions.

Very truly yours,

WESTON & SAMPSON ENGINEERS, INC.

Paul M. Williams
Senior Hydrogeologist

cc: Mr. Jack Sulik, Sharon

J:\SUTTON\WILLIAMS\SHAREXT2.WPD

BG

March 19, 1998

Trudy Coxe
Secretary of Environmental Affairs
Executive Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202

RECEIVED
MEPA

EOEA #11522, New Water Supply Well: Sharon, MA

Dear Ms. Coxe,

The Sharon Lake Management Study Committee is a duly commission town advisory board created to provide advice to the Town Meeting and various town officials on the proper management and restoration programs to improvement the quality of Lake Massapoag, a Great Pond, and its watershed.

On March 19, 1998 at its regularly scheduled monthly meeting, the Committee voted to affirm and apply the following policy:

> " To the maximum extent feasible all future groundwater withdrawals should be developed in aquifers which will not impact Lake Massapoag."

Subsequently the Committee voted on the following position statement in reference to the development of a new water supply well (EOEA #11522) in Sharon, MA.

> "The Lake Management Study Committee believes there is a significant possibility that the proposed Well #8 at the Islamic Center of New England property in Sharon, MA may impact Lake Massapoag and is therefore opposed to the development of a public water supply well at this site at this time."

Both votes of the Committee were unanimous. Thank you for your consideration in this serious matter.

Sincerely yours,

Cliff

Cliff Towner
Chairman

Cc: Sharon Board of Selectmen
Sharon Conservation Commission
Members of the Lake Management Study Committee
Sharon Water Supply Advisory Board
Sharon Board of Health

March 23, 1998

Mr. William Gage
Executive Office Environmental Affairs
M.E.P.A. Office
20th floor
100 Cambridge Street
Boston, MA 02202

RE: EOEA #11522

Dear Mr. Gage:

In the summer of 1997 Lake Massapoag's water level dropped 22" with less water leaving the Lake than in recent years. Well over one hundred million gallons is unaccounted for in the following water budget for the Lake in a four month period in 1997.

I believe there is no questions, this unaccounted for water went to existing Town Wells.

The water budget was arrived at by adding all water that entered the Lake from June 1, 1997 to September 30, 1997, that could be measured and all water leaving the Lake over the same period through it's outlet and evaporation.

The evaporation calculation is based on N.O.A.A. Douglas, MA for this region.

No credit was given to water entering the Lake through ground water nor was credit given for the 9.5" of rain that fell on the approximately 1000 acres of watershed on the east and south side of the Lake.

No ground water entered the Lake from the west and south west as three studies indicate the water leaves the Lake through unbroken stratified drift and flows in the direction of the Town Wells.

Water outlet readings were taken daily and outlet adjusted daily.

Inlet readings were taken periodically from three surface streams throughout the summer, two of which dried up except for occasional flow after rain.

The Budget is based on a twenty inch drop in Lake levels from June 1, 1997 to September 30, 1997 (122 days).

1. Amount of water that entered the Lake from surface runoff	63,244,800 MG
2. Rain Fall 9.5" on Lake	90,523,125 MG
3. Amount of water let out	200,275,200 MG
4. Evaporation	20,075,200 MG
5. Lake should have dropped	7"
6. Lake level dropped an additional	13"
7. 13 inches of Lake level equals	123,873,750 MG

Having no way of knowing how much of the 1800 acre water shed contributes to the Lake in the summer and having no way to estimate evapotranspiration or evaporation in the watershed, contribution from the watershed ground water, as stated has been omitted.

What is known is 465,546,600 million gallons fell on the 1800 acre watershed and some had to have entered the Lake increasing the amount of unaccounted for water.

Also, although 1.8" was mandated as outflow which equals approximately one and one half cubic feet per second 1.5 CFS, 2.5 CFS was used for the purpose of the water budget.

Less than 1.5 CFS was routinely let out throughout the summer months.

I wish to end with a few facts.

Studies done in 1981 and 1982 with monitoring test wells showed that ground water from the west and south western shores flowed into Lake Massapoag.

Later studies using monitoring wells show water leaving the Lake from the west and southwest.

This change in flow is logical because more and more water has been pumped from the areas west of the Lake and distributed to other areas of Town as the Town is being built out.

This means we are presently pumping all of our water from one section of Town and putting it into other aquifers.

There is no question Sharon needs more Wells, the Town has put in one Well in the last twenty-three years and no new storages tank in thirty-five years.

The west side of the Lake now becomes bone dry each summer and the answer to Sharon's water problem is not to put another Well even closer to the Lake in an already extremely stressed area.

The public reason given for the selection of this site is, "it's the cheapest place to put a Well at this time".

It is my opinion there is another reason, Lake Massapoag will guarantee a supply of water.

Sharon has parts of nine aquifers within its borders, some very promising have not been tested.

In closing it is my hope that the state will do everything in it's power to protect the citizens of Sharon, our environment and natural resources.

Yours Truly,

Clifford L Towner

Clifford L. Towner
21 Pole Plain Road
Sharon, MA 02067
(781) 551-9976 (work)
(781) 784-7240 (home)

To: Bill Gage@MEPA@EOEA
Cc: Jack Hamm@BRP WPC@DEP SERO
Leslie Oshea@BRP WPC@DEP SERO
Elizabeth Sorenson@RC@DEM Boston
Bcc:
From: Leslie Luchonok@Dial-In@DEM Amherst
Subject: EOEA 11522, Islamic Site Well, Sharon
Date: Monday, March 30, 1998 15:41:27 EST
Attach:
Certify: N
Priority: Normal
Defer until:
Expires:
Forwarded by:

Bill,

I've had a chance to review the ENF for this project. The proposed pumping well site is located just outside of the Canoe River Aquifer ACEC - the ACEC boundary is located to the east of the site (the ACEC boundary is located southwest along Mohawk Street to its intersection with the Conrail ROW, then south along the ROW to its intersection with Chase Drive, then west along Chase Drive) - but the "groundwater exploration location" (figure 1) extends into the ACEC.

I believe Jack Hamm's DEP January 12, 1998 letter to Sharon's John Sulik identifies and summarizes any issues that would be raised from the ACEC perspective. These are not strictly ACEC issues, but involve addressing potential impacts on nearby wetlands and rare species habitat. The pump tests and observation wells should define, as Jack states, "the basin divide boundary and thereby allow an evaluation of the impacted basin(s)."

The most likely area of potential impacts will be outside of the ACEC, but the evaluation of potential impacts should ensure there will be no adverse impacts to the wetlands and wildlife habitat located withinthe ACEC.

Please call if we need to discuss.

Thanks, Leslie

Board of Water and Sewer Commissioners

TOWN OF FOXBOROUGH

MASSACHUSETTS 02035

Joan F. Sozio, Chairperson
Carol R. Ashe, Vice-Chairperson
Jonathan L. Brucks, Clerk

Warren A. McKay
Superintendent
Telephone 508-543-1209
Fax 508-543-6278

March 28, 1998

Trudy Coxe, Secretary
Executive Office of Environmental Affairs
Attention: MEPA Unit
100 Cambridge Street - 20th Floor
Boston, MA 02202

Re: EOEA # 11522 Islamic Site Production Well Town of Sharon

Dear Ms. Coxe:

In regard to the Islamic Site Production Well, the Board of Water and Sewer Commissioners asks that no further water withdrawals in the Upper Rumford River Aquifer be allowed for the following reasons:

1. Since the early 1960's, the Town of Foxborough has had four drinking water wells, three at Station 3 and one at Station 3A, in the upper Rumford River Aquifer. In 1987, when the Town conducted a "Town-Wide Groundwater Protection Study" for its existing wellfields, SEA Consultants informed the water department that the Upper Rumford River Aquifer was close to being a stressed aquifer. SEA recommended that the water department not develop its future well at Gavin's Pond unless the development of this well was to replace one of the four wells already in existence at Stations 3 and 3A.

2. In 1990, the Town of Sharon developed Well #7 at Gavin's Pond. Since the development of this wellsite, Sharon's water withdrawals have steadily increased at this location. As a result, the wetlands, wildlife, and stream flows in this area have been impacted substantially. This caused David Risch, Foxborough's Conservation Agent, to file a complaint against the Town of Sharon with Mr. Jack Hamm at DEP's Southeast Regional Office. Mr. Risch provided DEP with several years of photographs showing the impacts to the area since Sharon's well was developed.

3. During the drought of 1995 and again in 1997, Foxborough had to shut one of its four wells down at Station 3 due to lack of water. In the thirty years prior to the development of Well #7 in Sharon, even during periods of drought, Foxborough has never had to shut down a well in this aquifer because of no water. Sharon's

development of a well at Gavin's Pond proved SEA's predictions about over stressing the aquifer.

4. The recent "1997 Update Taunton River Basin Plan" indicates the Upper Rumford River is stressed. DEM shows the 1995 MGD cumulative inflow/outflow at a deficit of -0.78.

In conclusion, while an Environmental Impact Report (EIR) should and must be done on this site prior to conducting the pump test, an EIR is only going to demonstrate a larger deficit of water in the aquifer - more water pumped out less water returned. The town that will be affected further by the over pumping of this aquifer is Foxborough. Take a good look at what is happening at Gavin's Pond. Therefore, the Town of Sharon should first be required to explore other areas within its borders for water, as well as, other solutions to its water problems before DEP considers the development of additional wells in a stressed aquifer.

Foxborough fully understands Sharon's needs for water. There isn't a town in this area of the state that isn't hurting for water, Foxborough included. However, if we are going to preserve our water capacity within the aquifers for the future, we can not over withdraw the aquifers from which we obtain our water. What state agencies and towns must look at in this region is the control of growth, as resources, such as, water is limited.

Thank you for the opportunity to provide comments on this project. Please keep us informed of your decision concerning this matter.

Very truly yours,
Board of Water and Sewer Commissioners

Joan F. Sozio

Joan F. Sozio, Chairperson

cc: Mr. William Hocking, Chairman, Foxborough Conservation Commission
Robert Bell, P.E., Earth Tech
David DeLorenzo, Deputy Regional Director, DEP, SERO
Jack Hamm, Taunton River Basin, DEP SERO
Michelle Drury, Regional Planner, DEM
David Masciarelli, Sharon Water Department

NEPONSET RIVER WATERSHED ASSOCIATION

2438 Washington Street • Canton, MA 02021
voice 781/575-0354 • fax 781/575-9971

March 31, 1998

Secretary Trudy Coxe
Executive Office of Environmental Affairs
Attention: MEPA Unit
100 Cambridge Street - 20th Floor
Boston, MA 02202

RE: EOEA #11522

ATTN: William Gage

Dear Secretary Coxe,

The Neponset River Watershed Association (NepRWA) submits the following additional comments along with our previous letter dated September 26, 1997 for consideration regarding the Islamic Site Well, Sharon. NepRWA urges MEPA to require an Environmental Impact Report. The MEPA process is the only opportunity for public comment, as the town does not plan to seek an increase in their WMA authorized withdrawals.

It is NepRWA's hope that EOEA will use the MEPA review of this project as an opportunity to put into practice extensive discussions over how to address environmental issues on the front end of the permitting process.

Towards that end, NepRWA strongly believes that a thorough alternatives analysis, along with a discussion of need vs. demand, demand reduction, aquifer sustainability, growth planning, and operational plans must be prepared, before the pump test takes place. The results of this analysis should be used to determine whether a new well is needed at all, and if so, what well site would be likely to generate the least possible environmental impacts. Once this comparison of different possible sites has taken place, the pump test plan should be designed and publicly reviewed. Finally the results of the pump test plan, and information which it will provide on site specific impacts should be reviewed though a Supplemental EIR.

The pump test represents a commitment by the proponent to a particular location and to a particular course of action. Conversely it represents a decision not to pursue other alternatives. Meaningful alternatives analysis is possible only before the design and completion of the pump test.

Need vs. Demand and Demand Reduction

Need for this well must be reviewed now, early in the process. The town has just begun a public education campaign and is finalizing conservation strategies for summer 1998 water use. The EIR should discuss these measures, their success to date and their expected future results in detail.

The increase in water use during the summer peak season is dramatic. Per capita water residential use reported by Sharon to DEP for 1996, shows that Sharon's water use peaked in June with 94 GPCD over an annual geometric mean of 67 GPCD; an increase of 40%. Sharon's lowest average month demand is just under 53 GPCD making the summer use a 77% increase. It should also be noted that these numbers include an unexpected summer population increase of 1814 or 9.5%.

The dramatic increase in demand during the summer months clearly shows Sharon must focus on the wise use of their water resources. Demand management should be evaluated as an alternative to new supply development, both in generating the desired redundancy in Sharon's system and in meeting Sharon's future water needs.

Alternatives Analysis

The search for an additional well in Sharon has focused on this one site, regardless of the concern expressed by citizens and other stakeholders. We worry that the town has all it's wells located on the west side of town in only two aquifers. Alternative sites should be discussed in detail in the EIR.

According to the available data and correspondence with the USGS (1997), there are grounds for concern about a hydrologic connection to Lake Massapoag and the downstream environment, particularly the wetlands. During the summer of 1997, the level of Lake Massapoag dropped a total of 22 inches between June and October. In order to reduce the rate of drop, the conservation agent was instructed to reduce the volume of water being released downstream. This resulted in less water being let downstream to Massapoag Brook and ultimately the East Branch of the Neponset River.

The East Branch has been listed as non-supportive of the State Surface Water Quality Standards (SWQS) because of excessively high water temperatures, 91°F. In a study completed by the Army Corps of Engineers (ACOE), they concluded the high temperatures are the result of natural meteorological conditions and low flows through wide-open areas.

One recommendation by the ACOE for improving conditions in the East Branch, calls for cool water withdrawals from Lake Massapoag but ACOE acknowledges that the town would probably be unwilling and the expense too great. However, the ACOE report also recommends recognition of the interrelationship between communities and the watershed. "Continued development will cause greater demand for groundwater resulting in increasingly warm water during low flow conditions. If fisheries and the overall quality of the river is a priority in the affected communities, then measures that will decrease demand on the watershed's ground and surface water supplies must be explored more seriously (ACOE 1998)."

In light of this information, it is clear that further study of the relationship between Lake Massapoag and the existing wells must be conducted before an additional well is located in the same area. Moreover, in order for all parties to buy in to the study, it must be included as part of an EIR which can be reviewed by the public and all stakeholders.

Aquifer Sustainability and Growth Planning

The town of Sharon is a growing community with a population increase of 14% from 1980 to 1990. In order to continue providing water to a growing population, the town must address where development is occurring. Within the scope of the EIR should be a quantitative study of land use change within the town boundaries and special consideration should be given to aquifer recharge. This task could be conducted using the town's GIS. Data is readily available from MassGIS for the three most recent landuse data layer updates. The final product should include maps showing land use change in relation to the Beaver Brook, Billings and Canoe River aquifers, respectively.

Throughout the discussion regarding water supply in Sharon, we have heard that the town is at the top of two basins, the Neponset and the Taunton. Because of this, no water flows into the town and in fact, the majority of the water flows out of the town boundaries. To take the greatest advantage of the water that falls into the town, the town should pursue the acquisition of parcels identified as highly permeable and within the recharge zone of the aquifer. A similar study was conducted by the Charles River Watershed Association and the Medfield Open Space Committee.

Water Management Act and Operational Plans

According to the ENF and a meeting held on March 24, 1998, the Town of Sharon is not planning to increase their authorized withdrawal volume above their May 1997, Water Management Act Permit. However, as stated in earlier comments, submitted by NepRWA, the town currently pumps 3.58 MGD to meet demands, but is permitted for 3.12 MGD.

Where does or will Sharon get this additional 0.46 MGD? Is it purchased from other systems? Does the town plan to reduce demand by conservation? Will this resolve the problems with water supply to certain areas of town? Does this new source address the public health and safety concerns discuss in the Amory Report, 1997? How does this excess pumping affect the delineation of Zone II's?

The EIR should reconcile discrepancies between the ENF, Water Master Plan and DEP Public Water Supply Statistics. The Water Master Plan Update appears to indicate that current pumping rates exceed daily rates allowed under the Water Management Act. The EIR should discuss whether or not Sharon needs an increase in its WMA permit in greater detail.

There are also important unresolved questions regarding how this well will be operated in conjunction with the other Sharon wells. The superintendent of the DPW suggested a plan where wells #2 and #6 will be "first off, last on". The approved withdrawals for wells #2 and #6 are 0.82 MGD. Will the proponent look for a WMA increase later for the remaining capacity of well #8, 0.18 mgd? The proponent should be required to submit an operational plan within the scope of the EIR. The plan should include pumping regimes for all the wells, focusing on periods of peak demand. It is necessary that further pumping scenario analysis being conducted within the scope of modeling. This project must not have any additional negative impacts on the Neponset Watershed.

Local and Downstream Impacts

As previously stated in the Alternatives Analysis section, significant issues have been raised regarding town wells and observed environmental impacts. The consultant suggests these

concerns are only speculative, however, it is these very issues that MEPA must address. NepRWA was glad to see many issues addressed with the pump test plan. Recent studies by The Nature Conservancy (TNC) (McHorney, 1998) suggests a 5-day test may not be adequate. Having seen a presentation of Mr. McHorney's research, impacts can take greater than 5 days to reach a surface water body 1000 feet away. The proponent should review TNC's work and meet with Rich McHorney to determine if this type of analysis is appropriate to address the issues regarding Lake Massapoag and ultimately, the downstream environment.

Finally, NepRWA recommends the proponent be require to complete a Subbasin Return Analysis. This analysis would look at individual subwatersheds and provide an accounting of the amount of water pumped compared to the amount of water returned via septic systems.

Thank you for your consideration.

Sincerely,

Michele Cobban Barden
Water Policy Director

Ian Cooke
Executive Director

Attachments

cc Ben Puritz, Town of Sharon
Richard Chretien, DEP Neponset Basin Team Leader
Vickie Gartland, DEM
Jack Hamm, DEP Southeast Region, Water Supply
Richard Kleinman, EOEA Boston Harbor Basin Team Leader
Greg Meister, Town of Sharon, Conservation Commission
Mark Smith, Water Policy Director, EOEA
Cliff Towner, Town of Sharon, Lake Management Study Committee

NEPONSET RIVER WATERSHED ASSOCIATION

2438 Washington Street • Canton, MA 02021
voice 781/575-0354 • fax 781/575/9971

September 26, 1997

Secretary Trudy Coxe
Executive Office of Environmental Affairs, Attention: MEPA Unit
100 Cambridge Street – 20th Floor
Boston, MA 02202

RE: EOEA #11239

ATTN: William Gage

Dear Secretary Coxe,

Please accept these comments with regard to the Islamic Site Well, Sharon on behalf of the Neponset River Watershed Association. NepRWA strongly supports the completion of an EIR to address the potential impacts to groundwater supplies, surface waters, wetlands, adjacent municipal wells, the Canoe River ACEC and the Fowl Meadow ACEC.

The ENF summary describes a project with the "eventual" construction of a new groundwater supply production well but the responses focus on the development of an 8 inch pump test well which would pump between 0.72 mgd and 1.01 mgd for 5 days. The proponent states that a request will be made to DEP to construct the 24 inch production well following the favorable completion of the pump test. Based on this information, I assume this is the only MEPA review, therefore, the need for an Environmental Impact Report must be stressed. The proponent considers the additional drinking water supply well as a long term positive impact but does not address the potential negative impacts on the groundwater supply, surface waters, surrounding wetlands and adjacent municipal wells.

Responses with respect to water quality and quantity are obscure considering this project will result in the development of a public drinking water supply. The proponent advises there will not be any significant changes in the drainage patterns, however, there is little understanding about the drainage in this area. A summary of Boston Harbor Drainage Basin Projects by the USGS states that; "Streamflow in many of the subbasins is affected by ground-water pumpage…Unlike most other basins in the State, ground-water divides do not always correspond with surface-water divides in the Neponset, Weymouth and Weir basins. One example of this occurs along parts of the southern boundary of the Neponset basin, where ground water flows north from the Taunton River basin into the East Branch Neponset River basin."
In a meeting with the proponent and DEP–Lakeville, the proponent connoted the well will supply approximately 1 mgd at full production. USGS Hydrologic Investigations Atlas HA-460, Sheet 2 of 3 shows that the available groundwater in the unconsolidated deposit is less than 430,000 gallons per day.

for an EIR. This well is planned for an area for which there is a limited understanding of the surface water / groundwater interaction, the actual watershed boundary and the current impact of existing wells. In 1991, DEM reported to the Water Resources Commission that the Neponset Basin is hydrologically stressed. The scope for this EIR must be broad and should include a full modeling of the surface water and groundwater hydrology for the entire area which will be impacted, the East Branch subwatershed in the Neponset Basin, the Canoe River subwatershed in the Taunton and the Foxboro and Sharon wells. The model must be run under a variety of scenarios including at a pump rate exceeding 1 mgd during low flows periods when demand is high.

MEPA is the only step in the permitting process that can require a true evaluation of alternatives and the regional impacts. If an EIR is not required, as was the case with Canton's well #9, there will be no such evaluation of alternatives and substantive discussion of these issues. This summer, water supply issues in the town of Sharon came to a head. Water levels in Lake Massapoag, a Great Pond, began to drop dramatically. Lake managers were at loss as to the cause. The most obvious solution was to limit the amount of water flow out of the pond and down Massapoag Brook. However, these attempts did little to increase lake level. As of the beginning of September , the Lake had dropped 18 inches below the desired level of 10.5 feet. Many hypothesis were made. 'Excessive pumping of the municipal wells had drawn water from the lake.' 'Excessive pumping had intercepted groundwater supply which recharges the Lake.' 'The conservation agent was allowing too much water out of the lake in an attempt to flush it.' After attending numerous meetings one thing has become clear; the data needed to assess what was occurring at Lake Massapoag, the contributing streams and the adjacent wetlands does not exist. Until the necessary data is collected and interpreted, we do not know what is the impact of the existing wells or the potential impact of the proposed well.

Although it is beyond MEPA to deal with the cumulative effects of water withdrawals, it has become apparent that this information must be collected. For example, in the East Branch of the Neponset Basin, an area of 27 square miles, there are 11 active wells and 4 wells currently proposed or in the permitting process. No single proponent can be required to address questions of this magnitude. There appears to be no attempt by the Commonwealth to establish a mechanisms to address these issues. NepRWA recommends the development of a GEIR or other report which would provide a comprehensive planning tool.

Thank you for your consideration.

Sincerely,

Michele Cobban Barden
Water Policy Director

cc Ben Puritz, Town of Sharon
Phil DiPetro, DEP-NERO, Basin Team Leader

BG

Massachusetts Audubon Society

208 South Great Road
Lincoln, Massachusetts 01773
(617) 259-9500

March 31, 1998

Trudy Coxe, Secretary of Environmental Affairs
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

RE: MEPA File No.: 11239, Environmental Notification Form for the proposed Islamic Site Well, Sharon, Massachusetts

Dear Secretary Coxe:

On behalf of the Massachusetts Audubon Society, I have reviewed the above referenced Environmental Notification Form (ENF). The Massachusetts Audubon Society is the largest private conservation organization in Massachusetts with 57,000 household members and a wildlife sanctuary system comprising over 27,000 acres. The Society has a mission of biological conservation with a focus on the priorities of protecting water resources and biological diversity. The Society's oldest wildlife sanctuary, the Moose Hill Wildlife Sanctuary, is located in the Town of Sharon.

We request that an Environmental Impact Report (EIR) be required for this project. The EIR should, at minimum, address the issues described below.

Project Alternatives

The ENF does not indicate whether water conservation and demand management and/or water sharing arrangements with other communities have been considered as alternatives to a new well. These alternatives should be fully evaluated in the EIR. The EIR should present information indicating how well the Town has complied with the 1992 Massachusetts Water Conservation Standards. In addition, the EIR should include information on historic water use by class of use (residential, commercial, etc.), an analysis of historic use, and an audit of current water use to determine potential water savings from the implementation of measures such as conservation water rates, replacement of water efficient bathroom fixtures, technical assistance to large users to reduce water use, and public education programs to encourage conservation.

Future water needs projections for the Town should be presented in the EIR. We suggest that the methodology used by the Department of Environmental Management's Office of Water Resources be used to project Sharon's water needs. The EIR should include an analysis of how water conservation and demand management measures may be applied to reduce the Town's future water needs.

The EIR should also include an evaluation of possible water sharing arrangements with adjacent communities to determine if such an arrangement may be used to meet current and future water needs.

The discussion of alternatives should also include a review all known potential new well sites and evaluate each in regards to both water supply and environmental impact. Potential sites should be compared and ranked to identify the sites with the least environmental impact.

Environmental Impacts of Proposed Water Withdrawal

If a full and detailed analysis of alternatives demonstrates that the Islamic site well or another well is needed, a full assessment of the environmental impacts of the proposed water withdrawal from the site should be presented in the EIR. This should include a discussion of the impacts on any and all rare, threatened or endangered species or communities and impacts of adjacent wetlands, lakes and ponds, and waterways. A worst case scenario of drawdown should be used to model the hydrologic impacts of the new well. If significant impacts are anticipated, mitigation measures should be proposed and fully described.

Massachusetts Audubon appreciates the opportunity to comment on this project.

Sincerely,

Louis J. Wagner
Water Resources Specialist

CC: Lealdon Langley, DEP Water Management Program
Hanni Dinkeloo, Natural Heritage & Endangered Species Program
Paul Williams, Weston & Sampson Engineers, Inc.
John Sulik, Supt., Sharon Dept. of Public Works

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, MA 02202

ARGEO PAUL CELLUCCI
GOVERNOR

TRUDY COXE
SECRETARY

Tel: (617) 727-9800
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March 31, 1998

Ms. Trudy Coxe, Secretary
Executive Office of Environmental Affairs
c/o Mr. William Gage
MEPA Office
100 Cambridge Street
Boston, MA 02108

Post-it™ brand fax transmittal memo 7671 | # of pages ▸
To Bill Gage | From Rick Kleinman
Co. | Co.
Dept. | Phone #
Fax # 7-1598 | Fax #

RECEIVED
APR
MEPA

RE: MEPA No. 11522
Islamic Well Site
Sharon, Massachusetts

Dear Secretary Coxe:

I am writing in my role as Basin Team Leader for the Boston Harbor Watershed to provide comments regarding the proposed municipal well in the Town of Sharon at the so-called Islamic site. Although there is some question as to whether the aquifer for the proposed well is partly located in the Neponset River watershed, I feel justified in commenting on this issue due to the potential environmental impact to natural resources in the Boston Harbor watershed. I am, however, not commenting for the Basin Team as a whole, as no team meetings were held to discuss this issue.

After reviewing various reports related to the proposed well and attending a MEPA hearing on this issue on March 24, 1998, I have the following comments:

1. Should the MEPA Office see the need for an EIR, the proposed pump test for the proposed well should be done as part of the EIR scope.
2. Should the MEPA Office see the need for an EIR, further investigation as to the need for this well (i.e., through a water budget analysis or other analysis) should be included in the EIR scope.
3. Should the MEPA Office see the need for an EIR, further investigation as to the proposed operation of the proposed well should be included in the EIR scope. It was unclear to me after the March 24th hearing whether this well is to be used as a backup/redundant supply or as a primary supply that would replace existing wells. If this well is to be operated as a primary source on a regular basis, the potential

environmental impacts to the well's aquifer and surrounding resources would be substantially different than if the well is to be operated as a backup supply. This issue should be clarified and enough environmental data should be provided to support the determined use/operation scenario.

4. Should the MEPA Office see the need for an EIR, further investigation as to the sustainability of operating this well under proposed operation and potential future operation scenarios should be included in the EIR scope. By sustainability I mean: will the continued, long-term operation of the proposed well cause significant environmental damage to the well's aquifer and surrounding resources?

Sincerely,

Richard Kleiman
Basin Team Leader, Boston Harbor Watershed

3G

To: Honorable Trudy Coxe

Executive Office of Environmental Affairs
MEPA Unit: 100 Cambridge St.
Boston, MA 02202 FAX: 617-727-1598

RECEIVED
APR 1 1998
MEPA

Date: 1998/03/31
Location: Sharon,
Project: Islamic Site Well MEPA # ENF 11522
From: George Bailey, MAPC Representative, Sharon Community Reviewer

Impacts on Community are adequately described:

1. The Water Department of the Town of Sharon wishes to conduct pumping tests (8 inch) to further test a site that has indicated favorable characteristics with 2.5 inch test wells.
2. If successful, a request to construct a large diameter (24 inch) well and pumping station is expected to be made by the town.
3. Several town groups have expressed concern over allowing tests without an Environmental Impact Report preliminary to testing at the 8 inch level.
4. The town contends that the 8 inch test will provide the basis for a decision on further construction at which time the full ENR can be justified. The data for such a report will, in large measure, be provided from data accumulated during the proposed test.

Reviewer comments:

Community objections to further well construction have been exacerbated by the drought situation occurring in the summer of 1997 when Lake Massapoag and other water bodies in the town became noticeably depleted. The situation was such that, should it be repeated, anecdotal assumptions would lead many to believe that many of these water resources are threatened permanently and that only drastic conservation measures will save them.

No actual studies or recorded data suitable for analysis have been made that would bear out the contentions made. However, all responsible parties appear to concur that further conservation efforts regarding homeowner use of water must be instituted. These should be initiated as testing begins as part of a long range plan to limit water use to truly essential activities.

The reviewer suggests that the project be given approval at the test level requested.

This leads to the following questions. Which watershed will be impacted? Neponset? Taunton? Both? To what degree? Will this impact the Canoe River Area of Critical Environmental Concern and/or the Fowl Meadow ACEC? What is the relationship between well #8 and wells #2, 3, 4, 5, 6, 7 and the Foxboro wells # 7, 8, 9 and 10? What will be the relation between well # 8 and Lake Massapoag? The adjacent wetlands? If significant supply is not available from the groundwater source where will it come from? I believe it would be in the best interest of the proponent to conduct a full evaluation of this area. Decisions about a 1 mgd municipal well should not be made without detailed hydrological data including multiple scenario modeling. Unless we know where the water is coming from, informed water supply management and planning cannot take place.

The proponent also states that there will be no introduction of pollutants into the surface fresh water or ground water. With such limited understanding of the hydrology in this area, the proponent can not know this to be true. Wastewater in the town of Sharon is primarily disposed through on-site septic systems. Questions arise about nearby septic systems. The surficial geology of the region is highly permeable Pleistocene sands and gravels. Where is the Islamic Center's septic system relative to the proposed well site? Have any nitrate studies been conducted for this area? This is an important issue in light of the elevated nitrogen levels found in Sharon's well #4.

Although this project is not in the watershed of any surface water drinking supply, it is in the Zone II of Sharon wells #5, #7 and Foxboro wells #7, #8, #9 and #10. Questions remain about Sharon wells #2, #3 and #4 for which the zone IIs have been redeliniated but have not been reviewed by DEP.

In the ENF, the proponent states that the new well will not result in any water consumption increase. During June 1997, the town exceeded their permitted withdrawal for 17 days for well #4. According to the Water Master Plan Update (Amory, 1997) the current operating rate for well #4 is 1.21 mgd although the permitted rate is 1 mgd. Additionally Wells #3, #6 and #7 are also reported to exceed water withdrawal permits limits. Permit totals are 3.12 mgd and the current operating total is 3.58 mgd. The Amory Update states, "...With a new well on line (Well No. 8), Sharon's permits presumably would be increased to allow maximum-day usage to meet maximum-day demand. Should Sharon's permitted maximum-day usage not be increased, further conservation measures will be required to restrict summertime use of water." How can two consultants for the same town have such opposing points of view?

In Sharon's Water Management Act permits #9P-4-19-266.01 & #9P-4-25-266.01, DEP has issued Special Conditions. Many of the conditions are in the process of being met, but others have not been addressed. NepRWA would like to be assured these conditions are being met in good faith. With respect to conservation, the town of Sharon should meet the conditions outlined in the WMA permit before pursuing an additional supply and total increase in withdrawal. As far as the pump test goes, more detailed information should be provided. For example, when the water is pumped out of the ground where is it discharged? Does it recharge the well or is it discharged further off site. If so, where, an adjacent wetland?

The ambiguity of the information provided in the ENF, the contradictions between the ENF and the Water Master Plan Update and the past lack of compliance by the Town accentuates the need

FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

March 31, 1998

RECEIVED
APR
MEPA

Trudy Coxe, Secretary
Executive Office of Environmental Affairs
MEPA Office
100 Cambridge Street
Boston, MA 02202

RE: ENF Sharon's Proposed Well #8
MEPA Project #11522

Dear Ms. Coxe:

The Sharon Conservation Commission would like to submit the following comments regarding this project:

- Please refer to our attached letter dated, September 24, 1997, which served as a submittal to the previously filed ENF for this same project (at that time #11239). Though that filing was subsequently withdrawn, the comments contained therein remain valid, as this new ENF entails the same scope of work.

- Since September of 1997, there have been further discussions regarding the process for securing the new well. While we have received a written letter (February 19, 1998) from the Superintendent of Public Works, Jack Sulik, stating his commitment to establish, at some point in the future, a long term monitoring system, it does little to provide information we believe to be vital when deciding upon placement of a new well. The groundwater boundaries and divides in many areas are vague, and in others unknown. Due to what we believe is progressive impact in the Zone II's and III's, it is clear the town is not as informed as it could be with regard to it's groundwater supplies and therefore the appropriateness of choosing this location. Some consideration should also be given to what impact neighboring town wells may be having upon recharge areas in Sharon. Some Zone II's of Foxboro's pumping stations extend well up into Sharon, for example.

- The urgent need for this project is being driven by numbers that are disturbing (maximum day demands; currently ±3.50 million gallons/day). First, as explained to the Commission, the maximum day demand is determined from a number set on a day which reflects a "luxury" use of water, not a basic consumptive use. That luxury use, in Sharon, translates to automatic lawn sprinkler systems. It appears the Town is basing the necessity of a new well on the idea that the systems are a "given". An odd/even watering ban has been in effect over the years and last summer (July 4 - October 1) also included no weekend watering (with a hand held hose exemption). Second, opportunities for the town to implement more stringent

use restrictions in addition to water rate increase and educational outreach programs are not being considered which would permit the sensible irrigation of lawns while relieving the stress on our water system infrastructure and the water resources upon which it depends.

The Commission acknowledges the need for at least one additional pumping station and other water system improvements. After all, there has been just one well constructed during the last 22 years and no new storage tanks constructed within the last 34 years. The Commission believes however, that the justification of need should be based upon providing backup and/or relief for the existing stations, not to more easily attain the system capacity to supply over 3-1/2 million gallons of expensive treated water per day to Sharon's water customers.

- The Commission is concerned with the time frame of the pump test. There has been no convincing justification presented that a pump test done during a time of little stress to the groundwater will better determine environmental impacts. It is difficult for the Commission to understand why a pump test performed under stressed conditions would not provide more indicative data relative to potential environmental impact. We would suggest that if it can be proven that a summer-time pump test should not be required then any subsequently approved pump test should be performed for a period of ten days to attain a more reliable indication of potential impact. [We would base this request on up-to-date research performed by the Nature Conservancy]

  We are not aware of any situation in which the pump test having been completed has resulted in the denial of a proposed well because the test showed clear potential for environmental impact (that is our concern here). There have been wells approved in the state that despite favorable pump test results, have later been proven to cause negative environmental impact [Franklin (Kingsbury Pond) and Peabody (Ipswich River)]. We would request that the pump test and its results be made part of the EIR to allow the opportunity for public comment and review.

- The site itself is one of our more serious concerns due to its proximity to the lake, the Great Cedar Swamp and its location within an existing Zone II. It is also relatively close to the railroad tracks which bisect the town. This has been a source of concern with regards to existing town wells should there ever be a train accident releasing hazardous materials.

- The Commission has been unable to secure convincing data that an alternative site does not exist. In May of 1986, this very area was tested and determined not to be particularly desirable from a water supply standpoint. However, in June of 1996 the site was retested and then determined to be the most favorable site for a well. Perhaps other sites would also prove favorable if they also were revisited and retested. We would recommend that MEPA require an EIR and that as part of the report an in depth alternatives analysis be submitted. Where would the town search for a well if this site did not exist?

- There are other issues that can be resolved on the local level. However, the lack of information in itself should require that more data be forthcoming, especially in the area of groundwater mapping and monitoring. This should be established before substantial moneys are expended in either doing a pump test that fails, or worse, doing a pump test that all models, numerical, analytical, and/or digital, show a successful site, yet we find out in the future, has cost us our recharge areas including Lake Massapoag.

Thank you for the opportunity to comment on this project. If there are any concerns or questions to which you believe we may have information, please do not hesitate to call the office at (781)784-1511.

For the Commission,

Margaret D. Arguimbau

Margaret D. Arguimbau
Chairman

MA/dm
cc: Jack Hamm, DEP
Sharon Board of Selectmen
Jack Sulik, Supt. of Public Works
WMAC
Neponset River Water Association
Vicki Gartland, DEM
Rick Kleinman

FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

September 24, 1997

Trudy Coxe, Secretary
Executive Office of Environmental Affairs
MEPA Office
100 Cambridge Street
Boston, MA 02202

Attn.: Mr. William Gage

RE: ENF Sharon's Proposed Well #8
MEPA Project #11239

Dear Secretary Coxe;

The Town of Sharon lies at the head of two major water basins, the Neponset and Taunton Rivers. Consequently, no surface water flows into Sharon and thus, assumedly only precipitation falling within the municipal borders is available for recharge to Sharon's groundwater aquifers.

The Town has several thousand acres of protected open space and has incorporated comprehensive land use regulations over time to mitigate development impacts. Although current regulations require retention and/or detention of post development runoff, the cumulative result of past and on-going construction has assuredly increased stream flows during storm events. Of course, once precipitation runoff reaches the Town's surface water streams, little is available for groundwater recharge before flowing out of Sharon.

In addition, past mosquito control projects (Cedar Swamp, etc.) may have contributed to the lowering of groundwater regimes in various wetland and recharge areas in the Town. Lake Massapoag, which has been carried at higher maximum levels in the past (1987-92), is now maintained approximately 8" below maximum historical levels. This level was implemented in 1992 to decrease the significant shore erosion associated with the higher levels, as well as, the likelihood of hydraulic connection with on-shore leaching systems.

Because of Sharon's geographic elevation, changes in the Town's drainage characteristics and the increasing water supply demand placed on the capacity of its aquifers, recharge of available precipitation and runoff is an increasingly crucial and limiting factor in maintaining the quantity and quality of our water resources. The Commission is concerned that groundwater reserves are now impacted.

We offer these additional comments:

1. Based upon available Town and other public hydrogeological studies and reports, the aquifers, within which are located Sharon's existing wells, are unconfined and subject to lateral leakage. The general recharge rate for fine sandy aquifers is approximately 17 inches per year with an average precipitation in Sharon of approximately 40 inches.

2. Due to lack of groundwater monitoring wells within the adjacent Zone II's and III's of Sharon's pumping stations, subbasin groundwater flow, levels and aquifer boundaries at any given time can not be accurately determined. Nor can the full extent of groundwater draw down by existing wells be measured.

3. Despite precipitation of ±60 inches last year (approximately 20 inches above normal) the Commission witnessed, by early June, an abnormal drop in surface water levels and flows and abnormally dry conditions in various wetland communities within the upgradient recharge areas of the Town wells.

Of particular concern was the significant and/or total loss of surface water in the major tributaries to Lake Massapoag, starting in early June. The lake itself, (350 acres) lost 18-1/2 inches of water level by the end of August. In addition, the Commission witnessed the increasingly dry condition of the Great Cedar Swamp. This occurrence has been progressing for several years with facultative plant species becoming more prominent.

4. Further, more extensive, site investigations discovered drops in the levels of various groundwater connected ponds and streams in the Zone II's and III's and once open wetland areas, historically containing standing water, were now invaded by saplings and facultative woody vegetation.

In order to address our concerns regarding these circumstances, the Commission retained one of the Town's water consultants (Weston and Sampson Engineers, Inc.) to prepare a proposed scope of work to evaluate the causes. Since our first scoping meeting with a principal and hydrogeologist of the firm on July 10, 1997, the Commission now believes that a comprehensive study of the hydrogeological conditions of the Town is warranted. We continue to believe that a well designed system of surface and groundwater monitoring wells throughout the recharge zones and aquifers of the Town's pumping stations and around Lake Massapoag is advisable.

5. The Zone II's of Well #5 and #7 encompass a major portion of the Great Cedar Swamp. This important resource area serves as an Estimated Habitat for Wetland Wildlife; designated by the State Natural Heritage and Endangered Species Program. The proposed well site lies in the Canoe River Aquifer ACEC.

6. The Commission is increasingly concerned by the per capita water consumption by its residents between the months of May and August and the stress this places on the aquifers and their recharge capabilities. In May of this year, DEP modified the Town's Water Management Permit, imposing a maximum daily pumping limit per well. In order to come into compliance with this requirement, the Town, for the first time, implemented a weekend watering band in addition to the traditional odd-even restriction.

Despite the additional conservation measures, and a concerted enforcement effort by the Water Division, water consumption in June and July was historically high.

7. After investigating the Town's water distribution patterns, the Commission would like to note that much of the water withdrawn from the Town's producing aquifers is transferred for consumption outside the known boundaries of these very same aquifers. Water from the septic and irrigation systems of these outlying users, therefore, is recharged into sub-basins and aquifers not directly associated with our pumping stations.

8. Considering the above conditions, the extent of the Town's understanding of groundwater parameters and the location of Sharon's proposed Well #8 in relation to existing wells and sensitive surface and wetland resources, review of this project should be deliberative and exhaustive. We believe an EIR is needed, requiring a submittal of a numerical aquifer model based on data collected from surface and groundwater monitoring wells. The prolonged pump test plan should include full instrumentation.

The Commission ultimately believes that insufficient data exists to determine current groundwater parameters in the Zone II's and III's of the Town's existing wells. Considering the emerging problems associated with Lake Massapoag, the Great Cedar Swamp and evidence of induced surface water infiltration in the Beaver Brook well field and perhaps Gavins Pond/Billings Brook, the Commission is encouraging the Town to establish a comprehensive monitoring program throughout the well supply recharge areas. This should be done regardless of the decision by MEPA on the need for an EIR. Although the Town's existing well supplies are not of adequate capacity to meet demand under certain circumstances (firm capacity 2.37 mgd), siting of a well at the proposed site without the most extensive environmental impact analysis would be ill-advised.

The Commission is grateful for the interest and concern being given this project and we look forward to any insight gained as a result of a comprehensive EIR.

For the Commission,

Margaret D. Arguimbau

Margaret D. Arguimbau
Chairman

MA/dm

cc: Board of Selectmen
Benjamin Puritz, Town Administrator
Jack Sulik, Supt. of Public Works
Neponset River Watershed Assoc.
Water Management Committee
Jack Hamm, DEP Southeast Region

Conservation Commission
40 SOUTH STREET
FOXBOROUGH, MASSACHUSETTS 02035

BG

Date: April 1, 1998

To: William Gage, Exec Off. of Env. Affairs

From: David A. Risch, Conservation Manager

Re: Islamic Site Production Well EOEA # 11522

RECEIVED
APR 1 1998
MEPA

VIA FAX

Dear Mr. Gage,

I am enclosing correspondence to Jack Hamm of the DEP S. E. Region regarding what the town of Foxborough considers to be excessive use of an already stressed watershed in the upper Taunton River Basin. Could you please make this correspondence a viable part of any MEPA review regarding Sharon's use of this aquifer. If needed I will make any documentation that we have gathered over the years available to you for your review.

Thank you for your time.

Sincerely,

David A. Risch,
Conservation Manager

Conservation Commission
40 SOUTH STREET
FOXBOROUGH , MASSACHUSETTS 02035

Date: January 27, 1998

To: Jack Hamm, DEP S. E. Region
Division of Water Supply
20 Riverside Drive
Lakeville, MA 02347

From: David A. Risch, Conservation Manager
Foxborough Conservation Commission
40 South Street
Foxborough, MA 02035

Re: Excess Water Withdrawal Well No. 7 Sharon, MA

Dear Mr. Hamm,

As the Town of Foxborough's designated person responsible for monitoring changes in wetland conditions impacting the Taunton River Basin, I am by way of this correspondence officially notifying you that conditions have now reached a point where a complaint must be initiated and preventative action should be taken..

You may remember back in October of 1997, I spoke to you regarding the area just downstream from Sharon's well No. 7 and my concerns. For the past 4 out of 5 years there appears to have been excessive pumping from this wellfield that has completely dried up the area just downstream of Gavin's Pond even though flow into the pond was being maintained. There appears to be an adequate amount of water flowing into this pond but no water was flowing downstream of the dam and spillway.. These conditions did not exist prior to the installation of this well. The loss of hydrology has changed the habitat, and effectively eliminated wildlife, such as fisheries, mollusks, crustaceans, reptiles, amphibians, insects, etc., and any other type of wildlife that are dependent on these species as part of their food chain.

This excessive drawdown can be well documented, and I would hope that under 310 CMR 36.29 your Department will consider mitigating these negative impacts and proceed with amending Sharon's Water Withdrawal Permit #9p-4-25-266.01. in an appropriate manner.

Please give me call at 508-543-1251 and I will be glad to produce additional documentation or whatever else you may need to promptly correct this condition.

Sincerely,

David A. Risch,
Conservation Manager

Attachments (10)

cc: Town of Foxborough Water & Sewer Commissioners
Patricia Huckery, NHESP, Div. of Fisheries & Wildlife
Glenn Haas, Director, DEP Division of Watershed Management
Kathleen M. Keohane, E.E., DEP Office of Watershed Management
David Terry, Director, Div. of Water Supply
David Masciarelli, Water Division Supervisor

FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

March 23, 1998

SECRETARY TRUDY COXE
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS, ATTENTION MEPA UNIT
100 CAMBRIDGE STREET - 20TH FLOOR
BOSTON, MA 02202
RE: EOEA #11522 - PROPOSED MUNICIPAL WELL #8/SHARON

DEAR SECRETARY COXE:

PLEASE ACCEPT THE ENCLOSED MATERIAL AND INFORMATION IN RESPONSE TO THE TOWN'S PROPOSED SITING OF MUNICIPAL WELL #8. IN JANUARY OF THIS YEAR, I ASSEMBLED MUCH OF THIS INFORMATION FOR THE CONSERVATION COMMISSION DUE TO MY CONCERN WITH THE SITING OF THIS WELL AND THE TOWN'S AGGRESSIVE PURSUIT TO SECURE ULTIMATE SOURCE APPROVAL. THIS PACKAGE WAS FORWARDED TO ALL APPROPRIATE TOWN BODIES AND PERSONNEL. THE CONSERVATION COMMISSION WILL PROVIDE FURTHER CORRESPONDENCE BY THE MARCH 31ST COMMENT DEADLINE.

FOR THE COMMISSION,

GREGORY E. MEISTER
CONSERVATION OFFICER

CC: DISTRIBUTION

FROM THE OFFICE OF THE

Conservation Commission

SHARON, MASSACHUSETTS

TO: The Sharon Conservation Commission

FROM: Gregory Meister, Conservation Officer GM

DATE: January 28, 1998

RE: General Comments/Assessment of Wetland/Water Resources in Sharon

I would appreciate it all members of the Commission would take the time to review the enclosed material. I am hoping it will be somewhat useful in helping to define some issues which will require your attention in the very near future.

Although I make no claim to being an expert in areas such as hydrogeology, etc., I am assuming that it is not inappropriate for me to ask questions and to offer some opinions based on my observations and research. I, as I am sure you, members of the Commission, are aware of the interelatedness of features in the environment. We also understand the often complex nature of these relationships (if we even know of them) and that impacts caused by alteration of existing conditions, are not always immediately apparent.

Yes, it was very dry during portions of this summer. Several summers in the 1990's have been dry. Does it make any sense, however, to just keep pumping water full blast with little regard to already stressed conditions? Is the Town even able to assess what groundwater levels are in the aquifers and recharge areas heading into the spring and/or throughout the period of peak demand? Even with the imposition of the weekend watering ban on July 1st, more water was withdrawn than ever before in July 1997. Withdrawal totals for June ended up very near historic highs.

Some individuals in Town, as usual, are attempting to frame the debate over the perceived causes of observed impact in very limited terms. In attempting to address concerns and to look for potential contributing factors related to observed conditions, you would think from the public discourse that has occurred this year, that I was suggesting that there is pipe going directly from Lake Massapoag to the municipal wells. This, of course, is a ludicrous and unproductive distortion. Why anyone who has even a rudimentary comprehension of the complexity of natural systems would continue the discourse in this vein is beyond me.

For the record, I offer the following:

1. I believe the Town has an inadequate level of understanding concerning the hydrogeologic characteristics and relationships which exist in our recharge areas and aquifers. The Town currently does not have the tools and/or mechanisms in place to adequately assess what is going on season to season, year to year. I would think this lack of comprehensive knowledge hinders the ability to manage our water resources properly.

2. There is a need to reassess basin and sub-basin water budgets and recharge capabilities. Drainage patterns and runoff rates surely continue to change as the Town further develops. Am I to assume that recharge rates and groundwater levels are not affected?

3. If one accepts the premise that Lake Massapoag is connected to the Town's producing aquifers and is significant to aquifer recharge, then obviously the change in the Lake level policy and the permitted maximum level is significant. Of course, little can be done to assess the impact of the policy change since the public debate is still centered on whether a hydrologic connection even exists!!

4. In light of the level of existing information and my observations and correspondence, I find it hard to believe that the operation of Sharon's existing wells, particularly during periods of peak demand and less than normal precipitation, is benign to the environment. I would hope that the most thorough review and analysis of the proposal for Well #8 is permitted to take place.

Thanks for this opportunity to "unload".

GM/dm

Sharon Conservation Commission
Town Hall Building
90 South Main Street
Sharon, MA 02067

Telephone (781) 784-1511
Fax: (781) 784-1503

MEMO

TO: Sharon Conservation Commission

FROM: Gregory Meister, Administrator

RE: Need for Commission's Action as it relates to groundwater recharge & wetland hydrology.

DATE: July 15, 2004

This Town absolutely has a serious groundwater recharge condition which, for obvious reasons, (groundwater levels have been lowered) have negatively impacted the hydrology of wetlands communities in this Town for years. The factors contributing to this impact have been cumulative. This impact in recent years has only been buffered by above average precipitation. Consider the following:

- Sharon is higher in elevation than all of the surrounding 7 Towns.
- No water flows into Sharon (except one small area on the Foxboro Line)
- All water drains out of Sharon both on the surface and underground.
- Sharon is, therefore, totally dependent on precipitation to recharge its groundwater, which maintains our wetlands, brooks, streams, ponds and water supply.
- Norfolk County Mosquito Control, has created and continues to maintain, thousands of feet of drainage ditches in this town. " Stream cleaning" has been and continues to be a yearly activity. Both functions are intended to lower groundwater and facilitate the flow of water out of Town.
- Our municipal wells basically withdraw from 2 aquifers and distribute the water to 10 others.
- Less than 50% of the nearly 600 million gallons of water withdrawn each year is returned to the 2 aquifers, upon which the wells depend.
- Approximately 40 production wells exist in the seven Towns surrounding Sharon. Some of these wells are located virtually on the Town line.
- Only the newer subdivisions provide detention/retention to mitigate runoff rates and volumes as a consequence of impervious coverage.
- There are really only 2 windows of opportunity each year, during which significant recharge can occur from precipitation, i.e.: after the ground has thawed in the spring up to leaf out (March to May) and in the Fall, after the growing season up to ground freeze) October to December. When the ground is frozen, water runs off. During the growing season, evapo-transpitation prevents any significant recharge.

Our brooks and streams have less and less water. In the Zone II & III's perennial flow is becoming intermittent. Marshes and wet meadows are evolving into wooded swamps not due to natural succession, but because there is no longer enough water for a long enough period of time during the growing season to maintain these communities.
The Cedar Swamp, and other forested wetlands are transitioning. Facultative species such as buckthorn, catbrier, and tree samplings are filling the voids that used to hold standing water during much of the growing season. Each year in these various wetlands, vegetation thickens, trees multiply and grow, and more water is lost through evapo-transpiration.

Surface and groundwater under your jurisdiction is being negatively impacted. You should now understand the causes. I suggest you should begin to require mitigation.

Sharon Conservation Commission
Town Hall Building
South Main Street
Sharon, MA 02067

Telephone (781) 784-1511
Fax: (781) 784-1503

Ms. Patti Kellogg
Bureau of Resource Protection
Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

September 4, 2006

Dear Ms. Kellogg:

On behalf of the Town of Sharon Conservation Commission, please carefully consider the following response and supporting documentation regarding the Draft WMA Permit #9P-4-25-266.01 and 9P-4-19-266.01. The Commission only recently became aware of the brief window allowed to provide these comments. The Commission has been at the forefront of internal debates and mitigation within the Town for many years, voicing its concerns regarding the condition of surface and groundwater resources and the consequent impacts to wetlands communities in the zones of contribution of our municipal wells.

The Commission cannot stand by and permit unchallenged, the apparent conclusions reached by the Department in eliminating Condition #13, Wetland Monitoring ("Wetlands monitoring data has been reviewed by the Department and it has been determined that no further monitoring is required as a condition of this permit. Therefore, this condition has been eliminated"). To do so would seem to indicate that the DEP feels there are no signs of unacceptable environmental impacts to surface and groundwater resources which can be attributed even in part to the withdrawal and redistribution of groundwater and surface water by our municipal wells. The Commission does not nor is it able to concur with this implied conclusion.

From 1992-1997, I was responsible for performing the wellhead wetland impact analysis. I did not choose the protocol nor location of the plots and always felt that the monitoring program established in Sharon was flawed and ridiculously inadequate. I was prevented from instituting additional procedures considered desirable by the Department (stream gauges, additional monitoring plots, etc.) Short of airing internal dirty laundry, my services were terminated, but even then, I was convinced that this Town was being drained and pumped dry.

In addition to important comments received during this particular comment period, I suggest that the Bureau review previous correspondence which has been made available to your personnel in the past, particularly the ENF and the Draft EIR (2000) for the proposed Islamic Center Well off of Chase Drive.

As I enter my seventeenth year as Conservation Administrator for the Town of Sharon, I wish to provide on behalf of the Commission, the following additional facts and observations which are a matter of record.

- Sharon is higher in elevation than all of its surrounding 7 Towns.
- No water flows into Sharon (except one small area on the Foxboro Line.)
- All water drains out of Sharon both on the surface and underground.
- Sharon is, therefore, totally dependent on precipitation to recharge its groundwater, which maintains our wetlands, brooks, streams, ponds and water supply.
- Norfolk County Mosquito Control has created and continues to maintain, thousands of feet of drainage ditches in this town. "Stream cleaning" has been and continues to be a yearly activity. Both functions are intended to lower groundwater and facilitate the flow of water out of Town.
- Our municipal wells basically withdraw from 3 aquifers and distribute the water to 10 others.
- Less than 50% of the nearly 600 million gallons of water withdrawn each year is returned to the 3 aquifers, upon which the wells depend.
- Approximately 40 production wells exist in the seven Towns surrounding Sharon. Some of these wells are located virtually on the Town line.
- Only the newer subdivisions provide detention/retention to mitigate runoff rates and volumes as a consequence of impervious coverage.
- There are really only 2 windows of opportunity each year, during which significant recharge can occur from precipitation, i.e.: after the ground has thawed in the spring up to leaf out (March to May) and in the Fall, after the growing season up to ground freeze (October to December.) When the ground is frozen, water runs off. During the growing season, evapo-transpitation prevents any significant recharge.
- The impacts of Sharon's municipal well pumping and distribution network is not of a benign nature. During the growing season, in particular, Beaver Brook, Billings Brook, Gavins Pond, and Turning Mill Brook are impacted by induced infiltration and groundwater interception, often diminishing to an unacceptable degree base stream flows and groundwater levels. As recently as the mid 1980's Turning Mill Brook, a tributary of Billings Brook, originating from the Cedar Swamp, contained native brook trout. The brook is now intermittent and the Cedar Swamp ditch went dry for the first time, ever, in August 2005.

It is the reasoned opinion of the Sharon Conservation Commission that the cumulative impacts of the above factors have created a disturbing decline in groundwater recharge. Only above average yearly precipitation in Sharon over most of the decade has buffered more glaring symptoms.

In the Zone II's and III's, less recharge has resulted in once perennial brooks and streams becoming intermittent. Marshes and wet meadows are evolving into wooded swamps not due to natural succession, but because there is no longer enough water for a long enough period of time during the growing season to maintain these communities. The Cedar Swamp, and other forested wetlands are transitioning. Facultative species such as buckthorn, catbrier, and tree samplings are filling the voids that used to hold standing water. Each year in these various wetlands, vegetative layers thicken, trees multiply and grow, and more water is lost through evapo-transpiration. Groundwater and surface water resources within the deep valley aquifers where our municipal wells are located will be the last areas to exhibit more permanent signs of altered hydrology.

Were the most ardent skeptics in this Town to wait for convincing evidence (to them) that hydrologic changes are occurring within our recharge areas and well heads, then I can assure you all, that it may be too late to do anything about it.

Anyone who has.... 1.) even a minimal degree of historical reference of this Town's resources; 2.) can recognize the relationship between groundwater levels and base stream flow; 3.) can observe and/or measure current stream flow response to precipitation; 4.) is capable of offering a reasonably easy guess why many perennial streams in Town are now intermittent and/or; 5.) can distinguish the difference between a White Oak and a Red Maple, or muck versus just soil, should have no reason to pretend or contend that there is nothing to worry about.

The streams and brooks, ponds and lakes and the changing make up of associated wetland communities in Sharon's recharge zones tell and display an irrefutable truth. Base flows have become intermittent because groundwater levels and recharge rates have been altered. The facultative and upland plant species that are invading wetland communities in our central recharge zones simply could not establish themselves nor survive were groundwater levels where they should be. When such plant species become established and begin to thrive where historically they have no business being, they are telling everyone that we have a big problem. This Town is being dried out from its top to bottom and from its outside in, period. This unacceptable impact is visible, measurable and indisputable. Come see for yourselves.

Condition #13 "Wetland Monitoring" should not be eliminated but rather required to be strengthened and broadened to include stream flow monitoring, additional test wells within the Zone II's and Zone III's and actual groundwater elevations in feet or inches below the surface, at each monitoring well point, established and recorded. The groundwater monitoring program initiated in 1998 has no frame of reference or baseline and took advantage of test wells previously installed for other purposes with no particular methodology. At a minimum, by requiring additional logically located monitoring wells which clearly depict how far below the surface in feet/inches various groundwater levels fluctuate seasonally, a more useful analysis will be available.

I can only assume that the Department has not been provided a copy of the groundwater monitoring data. Although they amount to little more than comparative lines on a graph, one can still easily see, that groundwater levels drop several feet below the surface of many wetland communities in the Zones II's and III's during the growing season. This was apparent in 1998. Is it any wonder that these communities are transitioning? Has the Department carefully analyzed what this data does depict?

The Commission is left to assume that the Department is prepared to increase the daily and yearly caps on Sharon's existing municipal withdrawals based upon the assumption that there are no unacceptable environmental impacts as well as, the Town's projected population growth.

On this topic, virtually all of the anticipated development is as a consequence of Comprehensive Permit filings. Although Sharon is beginning to make significant progress on the path toward the 400 or so additional units required, we are facing up to 10 times that number of units if private developers are depended upon to meet the threshold. What will be the cap figures permitted by the Department if this level of growth occurs? What will be the long-term impact upon Sharon's ground and surface water resources, then? Do affordable housing regulations and initiatives mandate that a Town such as Sharon not only provide water to all corners but, in the process destroy its environment? How can the Department of Environmental Protection "permit" this to happen with no recourse offered?

Even with further water conservation initiatives implemented by the Town, Sharon will not be in a position to prevent what will amount to an environmental crime, the commission of which we will perpetuate together.

Should not Sharon be allowed the flexibility to comply fully with the threshold of Chapter 40B in a manner which protects its environment? Considering the already tenuous condition of Sharon's surface and groundwater resources, how can it be forced to permit thousands of units of new development when 400 will bring it into compliance?

The Town's Water Protection Resource Overlay Districts and many provisions of Board of Health and Conservation Commission Rules and Regulations were legitimately implemented to ensure and sustain the viability and safety of Sharon's independent water supply and the open space, wetland and surface and groundwater resources upon which it depends. This Town, if given the time and opportunity, can achieve its mandate to provide and maintain affordable housing stock, while protecting the public health, sustaining its independent water supply and protecting its natural resources. Sharon has a plan to accomplish this and will soon be more than half way to satisfying its remaining housing obligations.

The Commission does not believe that a Town should be forced to pollute itself and/or dry itself up. The deck is stacked in favor of housing at the expense of the environment.

Some towns have secured temporary relief from the Executive Office of Housing and Community Development. Sharon has a housing plan which will protect the environment and the viability of its water resources. It needs the temporary protection (5-10 years) to implement it fully.

Can the Department of Environmental Protection provide any assistance in this regard, particularly considering our common charge? At a minimum, please do not eliminate Condition #13, Wetland Monitoring. Strengthen it.

For the Commission,

Gregory E. Meister,
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