GEOSPHERE
Environmental Management, Inc.

December 4, 2006

Ms. Marilyn Kunelius
635 Stow Road
Stow, Maine 04037

Attorney Michael C. McLaughlin
One Beacon Street, 33rd floor
Boston, Massachusetts 02108

Re: Letter Report
Ground Water Resource Evaluation
Red Acre Road
Stow, Massachusetts

Dear Ms. Kunelius:

Geosphere Environmental Management, Inc. (GEOSPHERE) is pleased to submit this letter report on our findings regarding the ground water resources on your property at 142 Red Acre Road, Stow, Massachusetts. This letter report has been prepared in accordance with our scope of work and cost estimate dated August 2. 2006.

BACKGROUND AND PROJECT UNDERSTANDING

Based on our conversations with you and Attorney Michael McLaughlin, it is GEOSPHERE's understanding that the court requires an evaluation of the ground water resources of your property located at 142 Red Acre Road. This evaluation includes the development of a dollar value for the ground water if it is assumed a potable public ground water supply well, permitted by the Massachusetts Department of Environmental Protection (MA DEP) in accordance with 310 CMR 22.00, is installed on your property.

D.L. Maher, Inc. (Maher), a well drilling contractor, performed a ground water test well exploration program between 1985 and 2000 that included the installation of three 2 ½-inch diameter ground water exploration test wells (identified as Test Well 1-85, Test Well 2-86, and 2-foot observation well), a four-hour aquifer-pumping test on Test Well 1-85 to determine a potential ground water yield, and the collection of a ground water sample from Test Well 1-85 at the end of the four-hour aquifer-pumping test to determine ground water quality. The continuous pumping rate for the aquifer-pumping test was 60 gallons per minute (gpm).

At the end of the four-hour aquifer-pumping test the drawdown in the aquifer was 4.41 feet according to Maher in their letter dated March 25, 1986. This drawdown indicates a specific capacity (i.e. gallons per minute divided by the drawdown) of 13.6 gpm/foot of drawdown (60 gpm/4.41 feet of drawdown) for this well. Maher indicated that "Test Well 1-85 was driven to a depth of 59.5 feet" below ground surface and that "brown fine to coarse sand with gravel was encountered from 15-59.5 feet." A well screen was

installed between 50 to 56 feet. The well screen allows the ground water to flow into the well.

Based on the results of the four-hour aquifer-pumping test, Maher proposed that a 24-inch by 18-inch gravel pack water supply well be installed to a depth of 59 feet with a 10-foot well screen. Using this proposed well design and aquifer characteristics, Maher indicated the proposed well should yield 300 to 350 gpm. Ground water quality results for Test Well 1-85, collected September 13, 2000 indicated good water quality that appears to meet U.S. EPA and Massachusetts ground water quality standards.

These reports are attached as Appendix A.

DOCUMENTS REVIEWED

The following documents were reviewed for this letter report. Most of these documents were found in the Town of Stow Planning Office files unless otherwise noted.

1. Summary Water Resources Study, Town of Stow, MA., dated October 28, 1977 by IEP, Inc.
2. Water Resources Study, Town of Stow, MA, dated October 28, 1977 by IEP, Inc.*
3. Flood Plain Information, Assabet River (Westborough to West Concord, MA), Department of the Army, NE Corps of Engineers, Waltham, MA, June 1966.
4. Letter to IEP, Inc. dated July 24, 1990 from John Clayton, Jr., Chairman, Board of Appeals, Town of Stow, MA.
5. Letter to IEP, Inc. dated August 4, 1977 regarding IEP Water Resources Study Draft Report dated July 28, 1977 from Stephen J. Daly, Board of Selectmen, Town of Stow, MA.
6. Letter to Stephen J. Daly, Administrative Assistant, Town of Stow, MA dated July 27, 1977 regarding IEP Water Resources Study of the Town of Stow, MA dated July 28, 1977 from Attorney Jacob C. Diemer, Town Counsel, Sherbourne, Powers & Needham.
7. The 1965 SUASCO River Study – Background data on water quality by Water Resources Commission, Division of Water Pollution Control dated February 1973, Publication # 6628, 37 pages.
8. Report on Proposed Water Supply and Distribution Facilities for the Town of Stow, MA by Morgenroth & Associates, Inc. dated October 5, 1966.*
9. Letter to Marilyn Kunelius dated March 25, 1986 from D.L. Maher, Inc. regarding test well exploration program for 142 Red Acre Road, Stow, MA from D.L. Maher, Inc.*
10. D.L. Maher, Inc. Record of test for four-hour aquifer pumping test on Test Well 1-85 dated September 13, 2000.*
11. Ground water quality results for ground water sample collected by D.L. Maher, Inc. from Test Well 1-85 on September 13, 2000.*
12. 2004 Massachusetts Water Rate Survey compiled by Tighe & Bond, Westfield, MA.*
13. MA DEP GIS database.
14. Town of Stow, Assessors Office files.

* - denotes documents, either in total or excerpts, included as attachments in Appendix A.

DESCRIPTION OF 142 RED ACRE ROAD PROPERTY AND TEST WELL SITES

The 142 Red Acre Road property is located in the northeast portion of the Town of Stow, MA (See Figure 1). It consists of approximately 50 acres of largely undeveloped land. The property is bounded to the northwest by South Acton Road, to the northeast by Tuttle Road, and to the southeast by Red Acre Road. The land to the southwest is undeveloped. A pond is located in the southeast portion of the property. Test Wells 1-85 and the 2-foot observation well are located approximately 150 – 200 feet northeast of the

east edge of the pond in a wooded wetland portion of the property (see Figure 2).

As shown on Figure 3, the surficial geology at the property is almost exclusively sand and gravel deposits. Even though there are extensive sand and gravel deposits as confirmed by the Maher Test Wells, they are not part of the high or medium yield aquifer for the Town of Stow as shown on the MassGIS maps (see Figure 4). However, the Maher aquifer-pumping test appears to indicate that the property is capable of the medium and/or high yield aquifer designation.

Subsurface geophysical studies have been performed along South Acton Road in 1966 (see Document 8) and along Tuttle Road in 1977 (see Document 2) (see Figure 5). The seismic survey along South Acton Road did not indicate any seismic velocities greater than 5,000 feet per second that is indicative of sand, gravel or clay (Document 8). The seismic survey performed along 1,910 feet of Tuttle Road from South Acton Road to Red Acre Road detected the presence of a "channel like form" with depths ranging from 30 feet to 80 feet. The deeper part of the seismic profile is close to Red Acre Road. This seismic profile was performed along Tuttle Road that marks the northeast boundary of the property and is located approximately 2,400 feet northeast of Test Well 1-85 and the 2-foot observation well. Thus, the depth of the "channel" is consistent with the thickness of the sand and gravel at Test Well 1-85.

SUMMARY OF PREVIOUS TEST WELL EXPLORATION IN STOW

Information contained in Document 8 indicates that the Town of Stow performed test well exploration for a ground water source on at least two occasions. This test well work occurred in 1962 and 1966 (see Appendix A for test well logs) (see Figure 5).

In 1962, 23 test wells were installed throughout the Town. Two locations were deemed "promising." One location was approximately "...2,000 feet southwest of the intersection of Great Road and Summer Street." The ground water yield for this location was estimated to be 250,000 gallons per day (gpd) or 174 gpm.

The second favorable test well location was south of Delaney Road. The ground water yield was estimated to be 750,000 gpd or 521 gpm.

Twenty-seven test wells were installed in 1966 throughout the Town. The most favorable locations were located between Warren Hill and Summer Hill to the east of Crescent Street. A group (i.e. multiple wells) aquifer-pumping test was performed at a pumping rate of 125 gpm. Based on the results of this test, an aquifer yield of 250 gpm was estimated. This group of wells is located approximately one mile southwest of 142 Red Acre Road.

The favorable ground water sites based on the results of the 1962 and 1966 test well exploration are located in close proximity to142 Red Acre Road (i.e. within one mile). Other areas were rated as not suitable for the development of a public ground water supply.

For all previously tested sites, additional aquifer-pumping tests would have to be performed to ensure that the performance standards described in 310 CMR 22.00 can be met before these potential sites could be evaluated for ground water supply production.

VALUATION OF WATER RESOURCES

The valuation of water resources for a single property is a complicated process and rarely performed. Of great importance in the valuation process is the safe yield of the aquifer. The safe yield is the amount of

ground water that can be withdrawn from an aquifer without causing an adverse impact to the ecosystem (i.e. wetland system, surface water bodies, etc.). In addition, the well cannot adversely impact adjacent wells such that their yields drop off to an unacceptable rate or that it dries up because of over-pumping and/or interference from another well.

Think of the behavior of an aquifer in terms of a bank account. The goal is to only use the interest derived from the principal. If we exceed the interest, we must now use the principal. This may be acceptable for emergency purposes, but not a desired practice. For an aquifer, the water in storage is the principal. Recharge to the aquifer from precipitation and snowmelt is the "interest". Safe yield is the interest the aquifer receives each year. As with a bank account, the interest varies from year to year. Some years it is higher than others. For an aquifer, recharge is dependent upon the amount of precipitation. Some years it is higher than others.

In order to determine the safe yield for the aquifer at 142 Red Acre Road, additional aquifer testing and water budget analysis must be performed. To date, this additional data has not been collected or calculations performed. However, in the absence of this information and based on the 1962, 1966, and site specific aquifer testing, a safe yield of 250 gpm can be assumed.

Ground water wells are typically pumped from 16 to 18 hour per day. This can vary significantly depending upon the season and community needs. However, at 250 gpm pumping rate for 16 hours, the daily withdrawal will be 250 gpm x 60 minutes per hour x 16 hours = 240,000 gallons per day. Wells operate 7 days per week for 365 days per year. Therefore, 240,000 gpd x 365 days = 87,600,000 gallons per year (gpy). There are many wells in production that are 30 – 50 years old. If we use a conservative well life of 40 years, the amount of water pumped by this well would be 87,600,000 gpy x 40 years or **3,504,000,000 gallons**.

Given the available data, the forgoing fundamental approach was used to determine the volume of ground water a permitted water supply well could potentially pump at 142 Red Acre Road.

A water rate must be assigned to calculate a dollar value for this volume of ground water. We will use the 2004 water rate for an adjacent community (Acton Water Supply District) (see Document 12). Their water bill includes a $ 10.00 charge for the first 500 cubic feet (or 3,740 gallons). Additional charges on a per cubic foot (or 7.48 gallons) basis are used in excess of the 500 cubic feet. The 2004 water rate study assumes a "typical" water usage of 12,000 cubic feet or 90,000 gallons per household per year and one billing cycle per year. There are approximately 2,100 households in Stow according to 2000 statistics. This calculates to 90,000 gallons of ground water per household per year and there are 2,100 households or 189,000,000 gpy. The well at 142 Red Acre Road produces only 87,600,000 gpy or approximately 46 percent of the projected town's demand (or 966 households).

The breakdown in the water rate would be, using the 90,000 gpy typical usage per household would be:

1. $ 10.00 for the first 3,740 gallons (500 cubic feet); and
2. $ 0.0385 per cubic foot for the remaining 11,532 cubic feet (86,260 gallons) using the average Summer/Winter water rate.

Assuming this well was to supply water to 966 homes, the calculations are as follows:

1. $ 10.00 + ($ 0.0385 per cubic foot x 11,532 cubic feet) x 966 households = $ 438,544.68 per year.
2. The conservative life span of the well is 40 years, therefore, 40 years x $ 438,544.68 per year = **$ 17,541,787.20** (present day value).

Ms. Marilyn Kunelius
635 Stow Road
Stow, Maine 04037

These calculations are fundamental and are based on assumptions, including the safe yield of the well. This a reasonable assessment of the ground water resource potential for this property at this stage of the technical investigation. We have not taken into consideration capital costs to develop the well, permitting costs, infrastructure costs (i.e. distribution system, hydrants, personnel, compliance testing and reporting to the State, etc.), and yearly operation and maintenance.

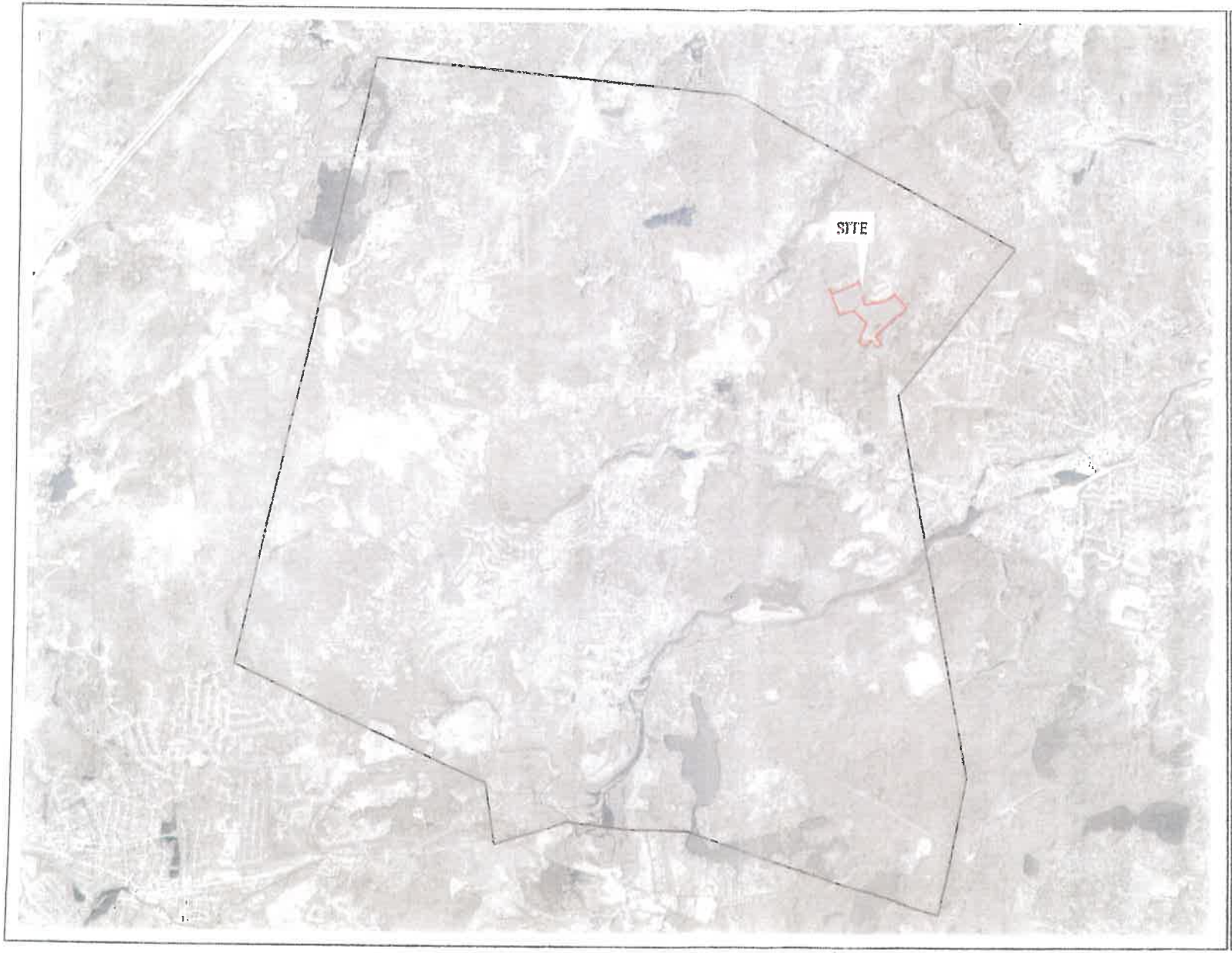
If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely,

GEOSPHERE ENVIRONMENTAL MANAGEMENT, INC.

Raymond W. Talkington, Ph.D., P.G., LSP
Principal Hydrogeologist

Attachments



Legend

Site Boundary

Town Boundary

N
W E
S

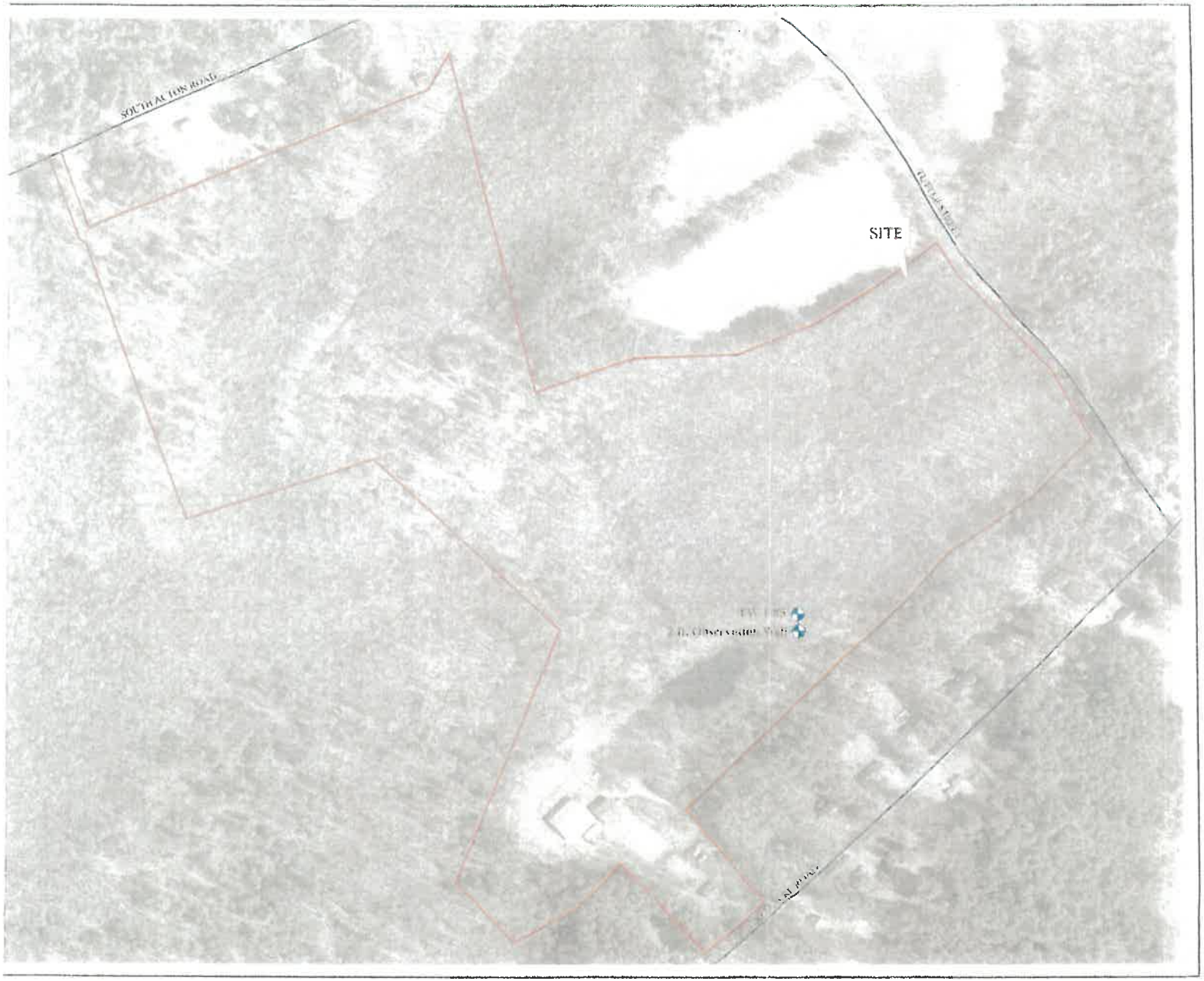
Figure 1
Location of 142 Red Acre Road
Town of Stow, Massachusetts

Kunelius Property
142 Red Acre Road
Stow, Massachusetts 01775

0 250 500 1,000 1,500 2,000
Meters

Created By: C. Prescon
Date Created: Oct. 12, 2006
Project No.: 06232

GEOSPHERE
Environmental Management, Inc.
51 Portsmouth Ave-Exeter, NH 03833
(603) 773-0075



Legend

- Site Boundary
- Town Roads
- Town Boundary
- 2 1/2 inch Diameter Test Wells

N
W E
S

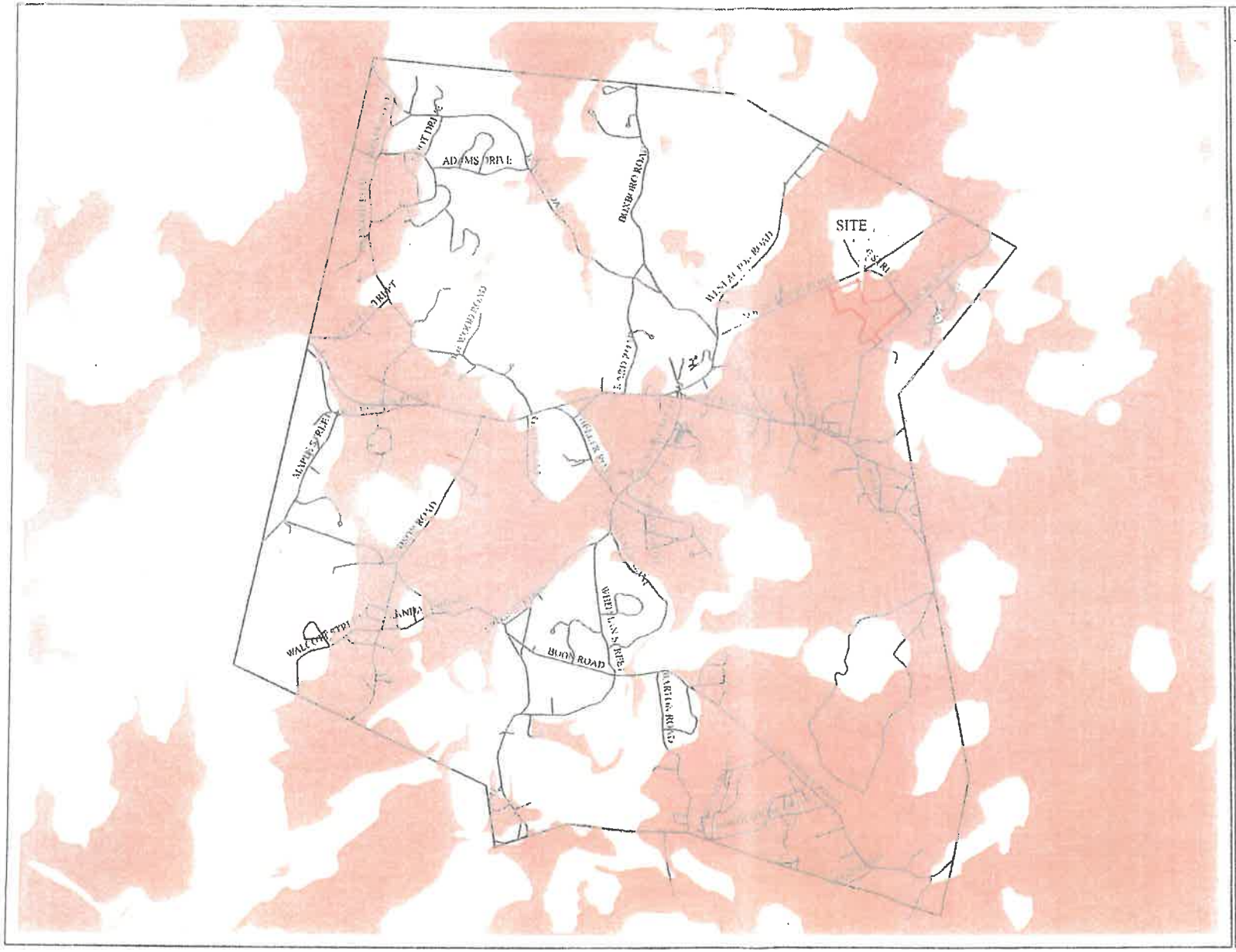
Figure 2
Locations of On-Site
2 1/2 inch Diameter Test Wells
Town of Stow, Massachusetts

Kunelius Property
142 Red Acre Road
Stow, Massachusetts 01775

0 20 40 80 120 160
Meters

Created By: C. Prescott
Date Created: Oct. 12, 2006
Project No.: 06232

GEOSPHERE
Environmental Management, Inc.
51 Portsmouth Ave-Exeter, NH 03833
(603) 773-0075



Legend

Site Boundary

Town Boundary

Surficial Geology

Sand and Gravel Deposits

Till or Bedrock

Floodplain Alluvium

Town Roads

N
W E
S

Figure 3
Surficial Geology
Town of Stow, Massachusetts

Kunelius Property
142 Red Acre Road
Stow, Massachusetts 01775

0 250 500 1,000 1,500 2,000
Meters

Created By: C. Prescott
Date Created: Oct. 12. 2006
Project No.: 06232

GEOSPHERE
Environmental Management, Inc.
51 Portsmouth Ave-Exeter, NH 03833
(603) 773-0075

Legend

Site Boundary

Town Boundary

Aquifers

YIELD GPM

100-300

>300

N

W E

S

Figure 4
High and Medium Yield Aquifers
Town of Stow, Massachusetts

Kunelius Property
142 Red Acre Road
Stow, Massachusetts 01775

0 250 500 1,000 1,500 2,000
Meters

Created By: C. Prescott
Date Created: Oct. 12, 2006
Project No.: 06232

GEOSPHERE
Environmental Management, Inc.
51 Portsmouth Ave-Exeter, NH 03833
(603) 773-9075

Legend

- Site Boundary
- Town Roads
- Town Boundary
- Seismic Line
- Test Wells 1962
- Test Wells 1966

N
W E
S

Figure 5
Locations of Seismic Survey Lines and 1962 and 1966 Test Wells Town of Stow, Massachusetts

Kunelius Property
142 Red Acre Road
Stow, Massachusetts 01775

0 250 500 1,000 1,500 2,000 Meters

Created By: C. Prescott
Date Created: Oct. 12, 2006
Project No.: 06232

GEOSPHERE
Environmental Management, Inc.
51 Portsmouth Ave-Exeter, NH 03833
(603) 773-0075

APPENDIX A

DOCUMENT #2

WATER RESOURCES STUDY
TOWN OF STOW, MA
DATED: OCTOBER 28, 1977
BY IEP, INC.

interdisciplinary environmental planning

534 Boston Post Road,
P.O. Box 438
Wayland, Mass. 01778

617-358-5156
617-899-7066

WATER RESOURCES STUDY

TOWN OF STOW, MASSACHUSETTS

OCTOBER 28, 1977

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Appendix	Title
A	TECHNICAL BACK-UP DATA (Detached)
A-1	Basic Data Sheets
A-2	Subsurface Cross-sections
A-3	References Cited
A-4	Subconsultant Reports: Seismic Investigations Water Quality Testing
B	WETLAND REPORTS (Detached)
C	800 SCALE MAPS, REPRODUCIBLE SEPIA (Detached)
Figure 2	Data Points
Figure 3	Bedrock Geology
Figure 4	Analysis of Well Yields
Figure 5	Bedrock Water Potential
Figure 6	Topographic Map of the Bedrock Surface
Figure 7	Surficial Geology
Figure 8	Thickness of Overburden
Figure 9	Analysis of Percolation Tests
Figure 10	Depth to the Water Table
Figure 11	Topographic Map of the Water Table Surface
Figure 12	Saturated Thickness of Overburden
Figure 13	Wetlands
Figure 14	Groundwater Potential
Figure 15	Groundwater Significance
Figure 16	Hydrologic Materials
Figure 17	Subsurface Pollution Reduction
Figure 18	Surface Watersheds
Figure 19	Water Table Determination Zones
Figure 20	Roadway Salt Use Zones
Figure 21	Assessors Map
D	800 SCALE MAPS, COLORED BLACKLINES (Detached)
E	SLIDES OF 800 SCALE COLORED BLACKLINES (Detached)

fractured in some areas and fractured and remelted or "cemented" in other areas. Hence, it is probable that the fractures in the fault zones of Stow have variable, localized fracture porosity. Similarly, the marble belt in the northwest corner of Stow has been described in well drilling logs as being highly weathered and fractured in the upper portions. Apparently this condition is localized and perhaps only of limited depth. Therefore, it must be concluded that the yields of bedrock wells in Stow are not related in most cases to bedrock units or major bedrock features such as faults or marble beds. It appears that the high yields correspond to irregularly located fracture zones.

2.5 Surficial Geology

2.5.1 Previous Investigations

The purpose of the surficial geologic investigations in Stow was to examine and understand the unconsolidated deposits of gravel, sand, silt and clay which overly the bedrock, and which were formed by glacial and post-glacial geologic processes. An understanding of the processes which formed these deposits and the history of these geologic events allows the geologist to predict the physical properties of the deposits. Land use interpretations based on this understanding of the geologic history and genesis of surficial geologic deposits has been found to be a useful tool by which to make land use decisions. (Pessel, Langer, and Ryder, 1972).

People making land-use decisions are often not trained in geology and thus geologic information must be presented in an understandable and useful manner for the general public. Earlier work by the U.S. Geological Survey in Stow (Hansen, 1956) presented surficial geologic data in a format useful primarily to a trained geologist. The purpose of this portion of the report is to build upon this earlier geologic knowledge and to present it in various formats which will be useful to decision making of the Town.

2.5.2 Bedrock Topography

The regional topography of central Massachusetts was developed by nearly 60 million years of stream erosion which created the bedrock topography (Hansen, 1956, 1953; Alden 1924, and Fenneman, 1938). During the past 1 million years of the Pleistocene Epoch, multiple glaciations altered the preglacial landscape. Glacial erosion and deposition reduced the relief and rearranged the drainage patterns. Subsequent post-glacial stream erosion has slightly modified the topography.

Hansen (1953) recognized that preglacial drainage in Stow was defined by two essentially southward flowing streams which connected with a larger stream which flowed east-southeastward along the Hudson-Stow town boundary. Subsequent investigations by the U.S. Geological Survey (Perlmutter 1962) located this

buried valley in the vicinity of White Pond near the intersection of the town boundaries of Hudson, Stow and Sudbury. Beginning with these two sources of data, this investigation determined, in detail, the configuration of the bedrock surface in Stow and bordering areas of surrounding towns. Figure 6, Topographic Map of the Bedrock Surface is the product of the findings of this investigation. Data used to construct this map in addition to the previous existing sources mentioned were 444 subsurface data points of various types (See Section 2.1), bedrock outcrops as mapped by Hansen (1956) and seismic surveys performed by this investigation. Using all of this data, the elevation of the bedrock surface was determined and a topographic map constructed.

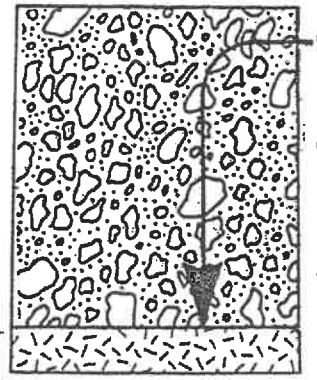
The map bears out the work of the earlier investigators (Hansen, 1953, 1956; Perlmutter, 1962). The preglacial drainage pattern is a trellis pattern which formed as a result of headward stream erosion along zones of relatively weaker rock structure such as faults and foliation planes. Preglacial buried valleys which are oriented northeast-southwest formed along the strike of bedrock units or along major regional faults. Valleys trending northwest-southwest formed along foliation planes. Those tending nearly north-south follow major joint directions. Valley segments of other orientations may have formed consequent to slope.

All preglacial drainage in Stow was southward to the major valley trending east-southeast along the Hudson-Stow town line. This valley then flowed into Sudbury where it also turns southward (Motts, 1977).

2.5.3 Surficial Geologic Descriptions

Glacial processes occurring in Stow had two major effects: (1) pre-existing bedrock topography was scoured and eroded and (2) most areas of Stow were covered with a veneer of unconsolidated deposits of varying thicknesses. Although New England was glaciated numerous times during the Pleistocene Epoch only deposits of the last two glaciations are recognized and the majority were formed during the last glaciation, beginning 26,000 years before the present and ending about 13,000 years ago.

Surface



Surficial Deposits

Bedrock

Figure 6 Explanation ➤

This map indicates the elevation in feet abo mean sea level of the underground bedrock. Surface "contour" lines are used to connect points of equal elevation.

Where the elevation of the bedrock surface is the same as the ground surface, "bedrock outcrops" occur.

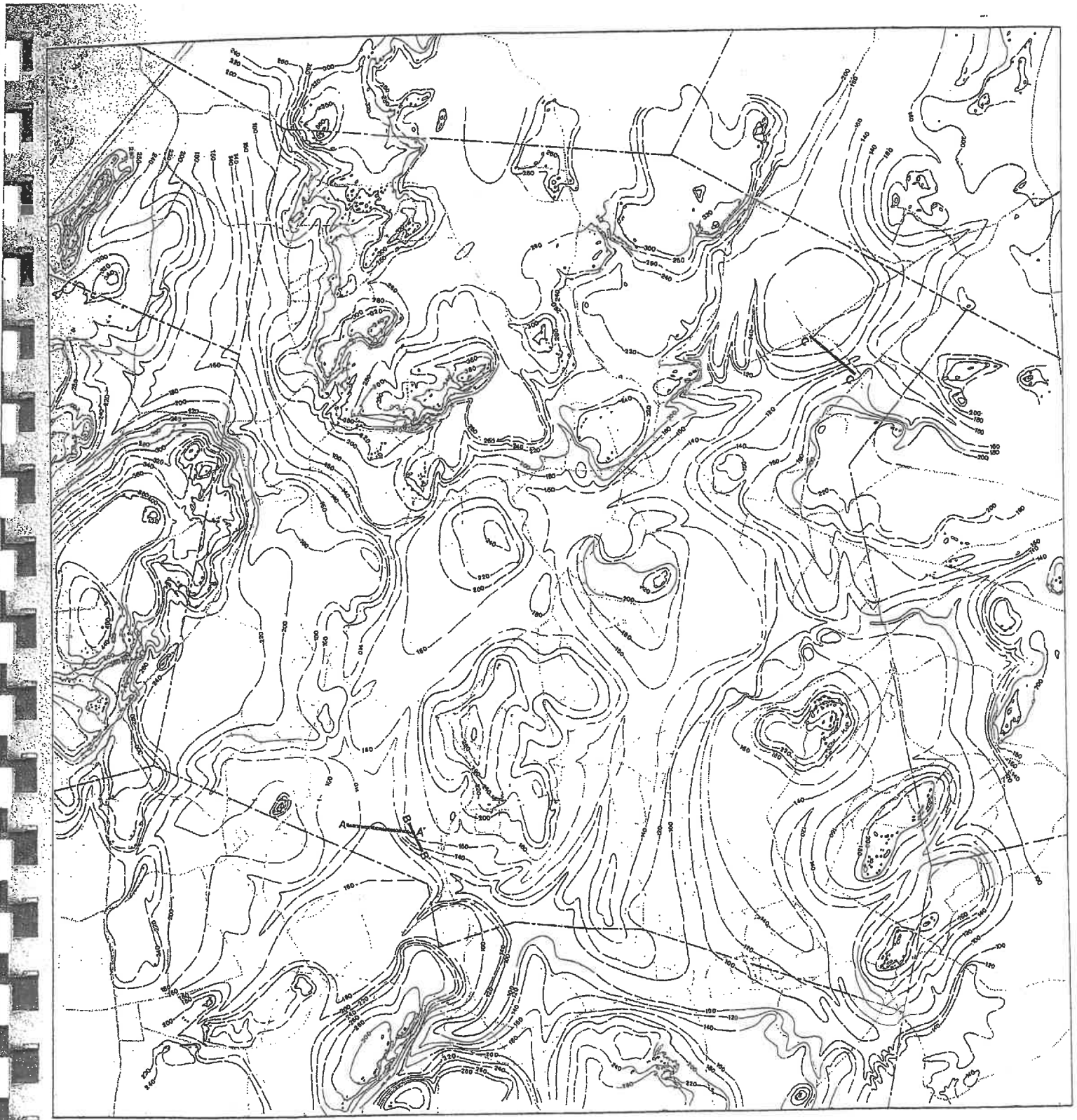


FIGURE 6
TOPOGRAPHIC MAP
OF THE
BEDROCK SURFACE

KEY

—240— Isopleths connecting points of equal elevation of the bedrock surface

Bedrock outcrops

A—A' Seismic Profiles (see Appendix A-4)

SCALE 4000' 2400' 800' 0 4000'
3200' 1600'

NORTH

WATER RESOURCE STUDY
TOWN OF STOW, MASSACHUSETTS

IEP INC. 534 BOSTON POST ROAD WAYLAND, MASSACHUSETTS 01778

SEISMIC INVESTIGATIONS

STOW, MASSACHUSETTS

prepared for

INTERDISCIPLINARY ENVIRONMENTAL PLANNING
534 Boston Post Road
Wayland, Massachusetts

by

John F. Kick Ph.D.
Box 6

Dunstable, Mass. 01827

SEISMIC INVESTIGATIONS
STOW, MASSACHUSETTS

Scope

Seismic investigations were completed in the town of Stow Massachusetts to determine depth to bedrock and other detectable subsurface interfaces. The purpose of the survey is to furnish data that will facilitate the towns current water resource evaluation program.

Investigations

Seismic surveys were completed at two sites referred to to as the Orchard Hill Site and the Tuttle road site.

Orchard Hill Site- The Orchard Hill site is located about 1000 feet north of the southern border of Stow and west of route 62.

An east west profile extending eastward from the Assabet river to the crest of Orchard Hill was completed on March 28, 1977. The profile covers a distance of 1950 feet and is made up of 8 shot points and 5 seismic lines. On March 29, 1977 a single seismic line 590 feet long was completed approximately along the long axis of Orchard Hill. It is tied into the above mentioned east-west profile near its center. Three shot points were included.

Tuttle Road Site- Tuttle road is in the northwest part of Stow. Seismic lines were completed on the southwest edge of Tuttle extending from near its intersection with South Acton road to near its intersection with Red Acre road. The profile is 1910 in total length and is made up of 7 seismic lines and 9 shot points.

All seismic lines were reversed and all were tied where possible. On many of the lines "off end" shot points were added to provide supplemental data. A 12 channel S.I.E. RS-4 seismograph was used to record seismic waves generated by the use of light explosive charges.

Seismic Results

The results of seismic computations are presented as profiles on cross sectional drawings.

Orchard Hill Site- Depths to bedrock range from 46 feet near the Assabet River to greater than 140 feet beneath the crest of Orchard Hill drumlin. Elevationwise this means that the bedrock surface is roughly at 150 feet above sea level near the Assabet River and rises gently to about 160-170 feet beneath the drumlin crest. The bedrock velocity is highest beneath the drumlin showing the presence of rock more compact than to the west.

The drumlin is made up of moderately compact till (6500 ft/sec) overlain by a thin layer of relatively loose till. On the western part of the profile drawing dashed lines indicate the probable presence of a till layer beneath sand and gravel (saturated sand and gravel). The data is not detailed enough to allow accurate delineation of the position of the till-sand interface.

Tuttle Road Site- Bedrock varies from 30 feet depth near SP-1 to 80 feet near SP-8. The channel like form of the profile is enhanced when one considers that the increases in surface elevation at each end of the profile mean a corresponding increase in the elevation of the bedrock surface.

The bedrock velocity is relatively low for metamorphic rock indicating considerable fracturing and or weathering.

The nature of the uppermost layer at SP7 (velocity 2700 feet/second) is unknown. Possibly a layer of peaty material exists at this location.

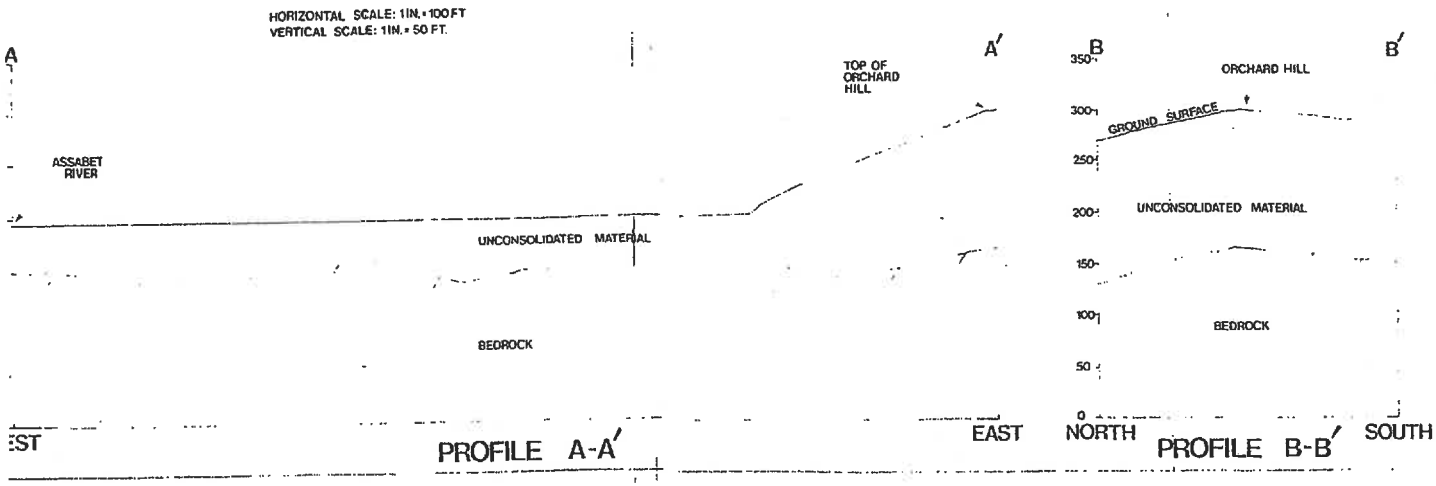
Over much of the profile the surface layer is coarse roadfill.

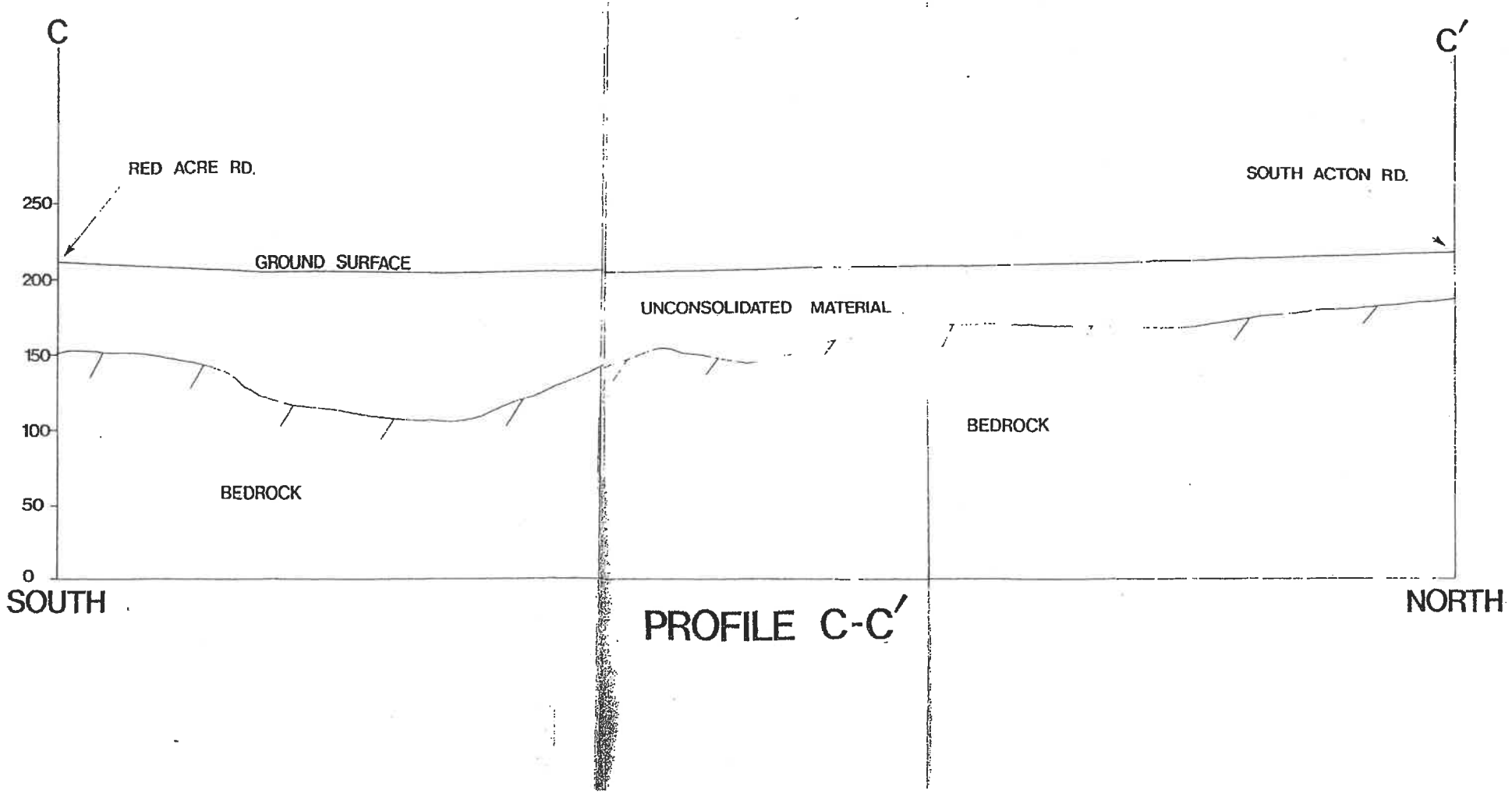
Seismic Velocities- Part of seismic interpretation is the association of velocities with material types. At the two sites of this survey very low velocities (1000 - 1500 ft/sec) are associated with unsaturated sand and gravel or other very porous materials. Slightly higher velocities (2000-2800 ft/sec)

are associated with more compact, unsaturated granular materials such as fine well sorted sands. Loose tills have velocity (3000-3400 ft/sec) and compact tills (6300-6600 ft/sec) at Orchard Hill.

Velocities close to 5000 feet per second are interpreted as saturated sand and gravel. This interpretation is by no means certain. Other materials such as clay, silt, till etc. may also have a velocity of 5000 feet per second.

High velocities (11,000-15,000 ft/sec) are due to the metamorphic rock that underlies the area. Velocities in the low bedrock range (11,000-12,000 ft/sec) are probably due to weathered and/or fractured rock. The higher velocities indicate more compact and/or unweathered rock.


HORIZONTAL SCALE: 1 IN. = 100 FT
VERTICAL SCALE: 1 IN. = 50 FT.
A
A'
ASSABET RIVER
TOP OF ORCHARD HILL
UNCONSOLIDATED MATERIAL
BEDROCK
EST
EAST
PROFILE A-A'
B
B'
ORCHARD HILL
GROUND SURFACE
350
300
250
200
150
100
50
0
UNCONSOLIDATED MATERIAL
BEDROCK
NORTH
SOUTH
PROFILE B-B'


C
C′
RED ACRE RD.
SOUTH ACTON RD.
250
200
150
100
50
0
GROUND SURFACE
UNCONSOLIDATED MATERIAL
BEDROCK
BEDROCK
SOUTH
NORTH

PROFILE C-C′

APPENDIX A

DOCUMENT #8

REPORT ON PROPOSED WATER SUPPLY AND DISTRIBUTION
FACILITIES FOR THE TOWN OF STOW, MA
BY MORGENROTH & ASSOCIATES, INC.
DATED: OCTOBER 5, 1966

of 10 g.p.m. to 12 g.p.m. per foot of draw-down with an estimated total yield of 250,000 g.p.d.

B. Seismic Soundings:

In 1964, Weston Geophysical Engineers carried out seismic soundings in the Assabet River Valley. The results are shown in the "Report on Seismic Survey, Assabet River Valley, for the Commonwealth of Massachusetts, Water Resources Commission". In seismic soundings, the velocity of sound in the various layers of the subsoil and the depth of the subsoil layers are measured. A velocity of 5,000 feet per second is indicative of sand, gravel or clay. Wherever the velocity is different from 5,000 feet per second, the soil will not yield sufficient water to warrant the construction of a well. The value of seismic soundings lies, therefore, in the fact that they establish those areas where water cannot be expected and wells should not be drilled.

So far no reliable seismic or related method has been developed to distinguish between sand and clay or between sand and gravel. Wherever the soundings show a velocity of 5,000 feet per second, it is necessary to drive a test well and establish the actual yield from pumping tests.

Seismic tests were carried out in seven areas. They are shown on Fig. 4.

Area 1 is the area between the Hudson - Stow boundary line in the south, Sudbury Road in the north, Marlborough Road in the west and Boons Pond in the east.

Area 1A. Three soundings, towards the south, show a velocity of 5,000 feet per second down to a depth ranging between 15 feet and 42 feet. There is no overburden.

Area 1B (four soundings) shows an overburden varying in depth between 5 feet and 18 feet. Underneath is a layer of 5,000 feet per second velocity, about 50 feet deep in the north and petering out towards the south.

Area 1C (six soundings) shows an overburden 5 feet to 22 feet deep. Underneath is a layer of 5,000 feet per second velocity, about 57 feet thick in the west, about 62 feet deep in the east and petering out to zero in the middle.

Area 2 is the area along South Acton Road. Eleven soundings were carried along the road. None of them showed a velocity of 5,000 feet per second.

Area 3 is the area along Edison Street between Hudson Road and Marlborough Street. Seven soundings were carried out along the road. None of them showed a velocity of 5,000 feet per second.

Area 4 is the area along Delaney Road, starting at the Town boundary line. Eight soundings were carried out over a distance of about 2,000 feet. They showed an overburden depth of 3 feet to 16 feet. Underneath is a layer of 5,000 feet per second velocity, varying in depth between 25 feet and 80 feet. The greatest depth is in the center of the sounding area, approximately where Delaney Road curves towards Harvard Road. Test boring No. 6 of the 1962 tests, shown as boring B on Fig.4, was taken in this area.

Area 5 is the area west of the Assabet Country Club. Nine soundings were taken in a northeast - southwest direction. The overburden varies in depth between 10 feet and 52 feet, increasing in depth towards the west. Underneath is a layer of 5,000 feet per second velocity varying in depth between 35 feet and 91 feet. The report by Weston Geophysical Engineers

supply, and then find later on that the sites which would yield ground water have been used for other purposes. Any long range planning should therefore systematically explore the entire Town area for possible ground water supplies, evaluate their yield and then secure such additional surface supplies as are needed for the long range development of the Town.

VIII. EXPLORATION OF GROUND WATER SOURCES OF SUPPLY

a. Exploration in 1962:

Twenty-three test wells were driven. Their location is shown on the enclosed Fig. 4. Out of these 23 wells, two seem to be promising. The well marked A in Fig. 4, located about 2,000 feet southwest of the intersection of Great Road and Summer Street, was 47 feet deep. The yield was estimated at 250,000 g.p.d. The water contained 0.01 ppm. of iron and no manganese, so that the quality can be considered as very good.

The other well marked B on Fig. 4, was located south of Delaney Road. The well was 42 feet deep. Its yield was estimated at 750,000 g.p.d. It contained about 0.05 ppm of iron and no manganese, so that the quality can be considered as good.

b. Exploration in 1966:

27 test wells were drilled in 1966. Their location is shown on Fig. 4. The first two, marked 1 and 2, were drilled in the gravel pit north of the B.& M. Railroad right-of-way, where seismic soundings marked 6 showed a velocity of 5,000 feet per second, evaluated by Weston Geophysical Engineers as "saturated sands and/or gravel." The ground water level was 6'-9" below the ground. In well No. 1 a layer of fine sand and gravel 21 feet to 37 feet below the surface did yield 45 g.p.m. The

water contained about 2 ppm of iron and can therefore not be used without further treatment.

Test wells Nos.3, 4, 5 and 6 were driven at the location of seismic sounding #5, east of the Assabet Country Club. The seismic sounding showed a velocity of 5,000 feet per second, evaluated by Weston Geophysical Engineers as "saturated sands and/or gravel". Well #3 was 31 feet deep, 4, 5 and 6 were 84 to 94 feet deep. The subsoil was a silty yellow sand with some clay and did not yield any water.

The location of further test wells was based upon three considerations:

1. The glacial valleys and the direction of the melt-water flow in these valleys are reasonably known. It is also known that glacial deposits are the major source of ground water. But the exact location of the melt-water stream is not known, neither is it known where the finer or the coarser materials were deposited. The test wells were therefore arranged to straddle these valleys, preferably where several valleys join.

2. The wells should be so located that the ground water flows to them from large tributary areas, determined by the subsurface divides.

3. The possible sites close to the built-up area should be tested and developed ahead of sites which require long pipe lines to reach the built-up areas.

The next four wells, number 7 - 10, were therefore located northeast of Crescent Street, in the western part of the valley between Warren Hill and Summer Hill.

Well No. 8 was 59 feet deep. The top 3'-6" was peat, with medium and coarse sand underneath to the depth of 59 feet. The well was pumped at 50 g.p.m. It had a very high iron content (about 5 ppm) and can therefore not be used without further treatment.

Test well No.11 was located in the valley between Warren Hill and Spindle Hill, east of Wheeler Road. The subsoil consisted of clay. Refusal was at 18 feet depth.

Test well No.12 was located north of Wheeler Pond, between Spindle Hill and the hills west of Hudson Road. The subsoil consisted of clay. Refusal was at 18 feet depth.

The next group of test wells, Nos.13 - 19, were located in the valley between Warren Hill and the hills south of Fletchers Pond. They ranged in depth from 14 feet to 40 feet and did not yield any water.

Test wells Nos. 20 - 24 were located again between Warren Hill and Summer Hill, east of Crescent Street and south of test well group 7 - 10. Test wells Nos. 21, 22, and 23 did not yield any water. Test wells Nos. 20 (48 feet deep) and No. 24, (49 feet deep) were pumped at 60 g.p.m. and 40 g.p.m. respectively.

Considering the result of the seismic soundings south of Delaney Pond, 3 more test wells, Nos.25 - 27, were driven along and straddling Delaney Road. The wells, up to 83 feet deep, showed silty subsoil which did not yield any water.

Based upon the result of these test wells, an extended pump test, using a test well group, was carried out at well No.20. The draw-down and recovery curves are shown on Fig.6. The well stabilized at a draw-down of 16'-2" when pumped at 125 g.p.m. resulting in an estimated yield of 250 g.p.m. or 15,000 gallons per hour.

During the pumping tests seven samples were taken and analyzed by the Lawrence Experiment Station of the Massachusetts Department of Public Health. The analyses are shown in Appendix No.2. They show that the water is of very good quality. It is soft and contains at times some iron and manganese, but the amounts are so small that no further treatment is required.

As shown in Chapter II, Population, the present population of the first

stage of construction is 880 persons. The per capita water consumption of a community the size of Stow is about 60 - 80 gallons. Using a safe figure of 100 gallons per capita per day, results in an average daily water demand of 88,000 gallons, a maximum demand on a hot summer day of about 180,000 g.p.d. Therefore, the well will be pumped normally about 6 hours per day and in summer a maximum of about 12 hours per day, leaving a coefficient of safety of almost 100 percent.

IX. PROPOSED FACILITIES

The proposed facilities will consist of three elements:

1. A gravel packed well with deep well turbine pump assembly.
2. The distribution system.
3. A standpipe.

1. The Well

The gravel packed well will be a 24/48 well. An outside shell of 48" diameter will be driven to the impermeable layer. In this shell, a 24" diameter screen and pump assembly will be introduced; the annular ring between the 24" diameter screen and the 48" diameter will be filled with selected, graded gravel and the shell will then be withdrawn. The well will be equipped with a deep well turbine pump, electromotor driven, with liquid propane standby power. The pump will cut in automatically when the pressure in the distribution system reaches a certain low and it will cut out automatically, when the storage tank is filled. Whenever the electricity fails, an alarm will ring either at the fire station or at the police station, so that the superintendent can start the standby power.

2. The Distribution System

The first stage of construction should cover the densely built-up

stage would therefore be the development of this well, marked B in Fig. 6 and the construction of the water main along Great Road to Packard Road. This way there will be - in the future - at least two sources of supply, or including a Gleasondale well, three sources of supply at opposite ends of the areas to be supplied.

As the necessity arises, well No. 20 can be supplemented by developing well No. 8, near Crescent Street and the well marked A, south of the lower Village. Both wells require iron-removal facilities. All three of these wells are in the same glacial valley and all three have a large tributary subsurface area. (Fig 5).

There are two surface brooks with a substantial drainage area: Heathen Meadow Brook and Assabet Brook. Heathen Meadow Brook can be dammed at the narrow gorge located about 2,600 feet south of the Boxborough boundary line and about 1,100 feet east of Boxboro Road. The bottom of the dam at elevation 240 feet above Mean Sea Level and the crest at elevation 260 feet above Mean Sea Level will impound about twenty million gallons, all located within the Town boundaries. Assabet Brook has two natural impoundments below Delaney Road: Wheeler Pond and Fletchers Pond. The tributary drainage area at Wheeler Pond is over 17 square miles. Assabet Brook should be considered as another future source of surface supply to be used once the ground water resources are exhausted. There are very few houses near the brook upstream from Wheeler Pond. All steps should be taken to prevent pollution upstream from Wheeler Pond.

APPENDIX #4

S

C-1

LAWRENCE EXPERIMENT STATION
MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
WATER ANALYSIS (Milligrams Per Liter)

Stow

Kinne
Collector:

Source A # 20 - 2½" Test Well
Source B
Source C
Source D
Source E
Source F

	A	B	C	D	E	F
Sample No.	475737					
Date of Collection	3-23-66					
Date of Receipt	3-25-66					
Turbidity	0					
Sediment	0					
Color	2					
Odor	0					
pH	6.2					
Alkalinity - M.O. phth	9					
Hardness	18					
Iron	.01					
Manganese	.02					
Free Ammonia - N	.00					
Nitrite - N	.000					
Nitrate - N	0.1					
Chloride	3.0					
Fluoride						
Phosphate - Total Ortho						
ABS						
Bacterial Sample Date of Receipt						
Coliform - MPN MF						
Micro-Amorphous Std. Units per ml.						

Note: Send Results to Morgenroth and Assoc.
294 Washington St.

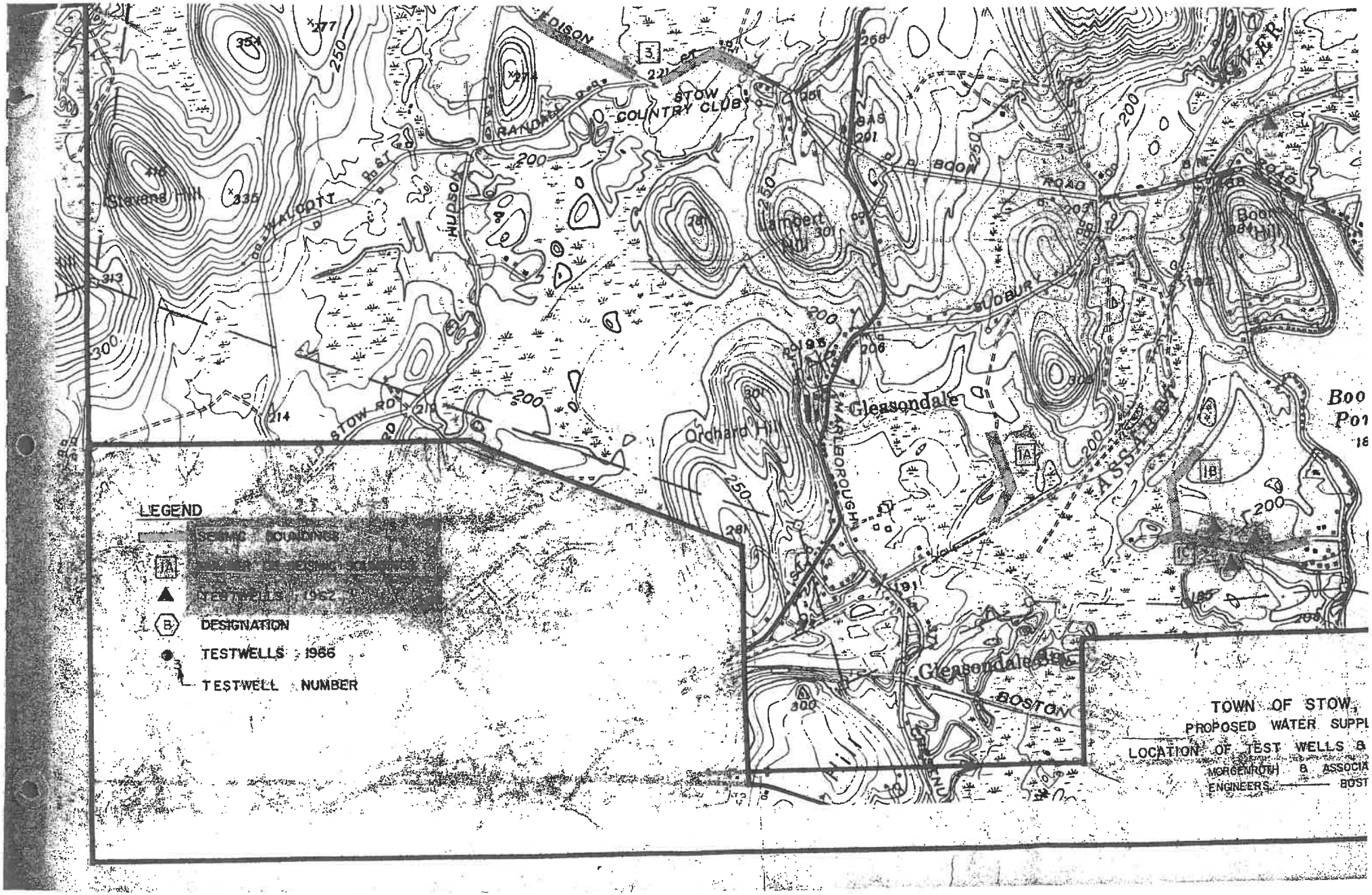

LEGEND
SEISMIC BOUNDINGS
TESTWELLS 1962
DESIGNATION
TESTWELLS 1966
TESTWELL NUMBER
Gleasondale
Ordhard Hill
Stevens Hill
Lambert Hill
STOW COUNTRY CLUB
HUDSON
RANDALL
WAYCOTT
STOW RD.
BOON
ROAD
SUDBURY
ASSABET
MARLBOROUGH
BOSTON
TOWN OF STOW,
PROPOSED WATER SUPPL
LOCATION OF TEST WELLS &
MORGENROTH & ASSOCIA
ENGINEERS

FIG. 4


RIVER
Lower Village
Summer Hill
SUMMER
ROAD
RED
ACTON ROAD
WEST ACTON ROAD
Minnesota Pond
A,B,C,D Group
Brook
Pond
B M 206
250
200
222
215
216
220
209
202
198

A-3

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221 MAR 28 1966

Job Location: Town of Stow, [illegible]

Date: 3/7/66 Hole No. #7

Started: Finished:

LOG OF HOLE

(Warren)

Depth From (Ground Surface)	Depth To	CLASSIFICATION of MATERIALS	No. of 12" blows on spoon	Penetration of Spoon in inches
0	2'	Loam		
2'	10'	gravel, clay & [illegible]		
10'	13'	[illegible] sand		
13'	29'	Gray sand & gravel & silt		
29'	35'	Very fine gray sand & silt		
35'	55'	silt & fine [illegible]		
55'	61'6	Fine gray sand & [illegible]		
		Refusal 61'-6"		

Used 61 ft. 6 inches of casing

Well rated at 0 G.P.M. ____ " Vacuum

Water level is 2' ft. below ground level

Remarks: No [illegible]

Pulled

Foreman: F. [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221 [illegible] 1966

Job Location: Town of Stow, [illegible]

Date: 3/8/66 Hole No. #8

Started: Finished:

LOG OF HOLE

(Warren)

Depth From (Ground Surface)	Depth To	CLASSIFICATION of MATERIALS	No. of 12" blows on spoon	Penetration of Spoon in inches
		240' SE [illegible] #7		
0	38"	Peat		
38"	44'	Gray fine sand		
44'	59'	coarse gray sand		
		Refusal 59'		
		set screen 50-49'		
		[illegible] 5.0' G.P.M. 30 Vac 24"		
		[illegible] screen 49-42'		
		[illegible] 5.0' GPM 30 Vac 14"		
		Re-[illegible] screen 42-32'		
		[illegible] 5.0' GPM 30 Vac 13"		
		Pumped 1 hr. [illegible]		

Used 59 ft. 0 inches of casing

Well rated at 50 G.P.M. 14 " Vacuum

Water level is [illegible] ft. below ground level

Remarks:

Pulled

Foreman: F. [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221 MAR 28 1966

Job Location: Town of Stow, [illegible]

Date: 3/9/66 Hole No. #7

Started: Finished:

LOG OF HOLE

(Warren)

Depth From (Ground Surface)	Depth To	CLASSIFICATION of MATERIALS	No. of 12" blows on spoon	Penetration of Spoon in inches
		600' [illegible] #7		
0	1'	Root		
1'	3'	Clay		
3'	15'	[illegible] silt		
15'	30'	[illegible] sand		
30'	38'6	Brown sand & [illegible] clay		
		Stopped at 38'6"		
		[illegible]		
		set screen		

Used 38 ft. 6 inches of casing

Well rated at 3 G.P.M. [illegible] " Vacuum

Water level is [illegible] ft. below ground level

Remarks: [illegible]

Foreman: [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221
MAR 28 1966

Job Location Town of [illegible]
Date 3/[illegible] Hole No. #10
Started .... Finished ....

LOG OF HOLE

Depth From (Ground Surface)	Depth To	CLASSIFICATION of MATERIALS	No. of 6" blows on spoon	Penetration of Spoon in inches
		[illegible]		
0	3'	Peat		
3'	12'	clay		
12'	15'	Silt		
15'	28'	Very fine brown sand & silt		
28'	38'	[illegible] clay		
38'	40'	Gray sand & clay		
		Stopped at 40'		
		Set screen		
		[illegible]		

Used 40 ft. — inches of casing
Well rated at 5 G.P.M. [illegible] " Vacuum
Water level is 1' 8" ft. below ground level
Remarks [illegible]
Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location Town of [illegible]
Date 3/11/66 Hole No. #11
Started .... Finished ....

LOG OF HOLE

Depth From (Ground Surface)	Depth To	CLASSIFICATION of MATERIALS	No. of 6" blows on spoon	Penetration of Spoon in inches
		[illegible] 40' [illegible]		
0'	6'	[illegible]		
6'	12'	yellow clay		
12'	18'	yellow clay & boulders		
		Refusal 18'		

Used .... ft. .... inches of casing
Well rated at .... G.P.M. .... " Vacuum
Water level is 14' ft. below ground level
Remarks [illegible]
Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location Town of [illegible]
Date [illegible] Hole No. #12
Started .... Finished ....

LOG OF HOLE

Depth From (Ground Surface)	Depth To	CLASSIFICATION of MATERIALS	No. of 6" blows on spoon	Penetration of Spoon in inches
		([illegible])		
0	1'	[illegible]		
1'	4'	Hard pan & boulders		
4'	16'	[illegible]		
16'	18'	Yellow clay		
		Refusal 18'		

Used .... ft. .... inches of casing
Well rated at .... G.P.M. .... " Vacuum
Water level is .... ft. below ground level
Remarks [illegible]
Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

MAR 28 1966

Job Location [illegible]

Date 3/14/66 Hole No. #13

Started .... Finished ....

LOG OF HOLE

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of Blows on Spoon	Penetration of Spoon in Inches
Ground Surface		(O.T. Location) 100' E. of mill		
0	1'	Loam		
1'	3'	Hard Pan & [illegible]		
3'	18'	[illegible]		
18'	21'	[illegible]		
		Refused 21'		

Used .... ft. .... inches of casing

Well rated at .... G.P.M. .... Vacuum

Water level is .... ft. below ground level

Remarks

Pulled

Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

MAR 28 1966

Job Location [illegible]

Date 3/14/66 Hole No. #14

Started .... Finished ....

LOG OF HOLE

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of Blows on Spoon	Penetration of Spoon in Inches
Ground Surface		(C.D. Location) 200' [illegible] 13		
0	1'	Loam		
1'	3'	[illegible]		
3'	11'	[illegible]		
		[illegible]		
11'	22'	[illegible]		
		[illegible]		
22'	30'	Hard Pan		
		Refused 30'		

Used .... ft. .... inches of casing

Well rated at .... G.P.M. .... Vacuum

Water level is .... ft. below ground level

Remarks

Pulled

Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

MAR 28 1966

Job Location [illegible]

Date 3/15/66 Hole No. #15

Started .... Finished ....

LOG OF HOLE

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of Blows on Spoon	Penetration of Spoon in Inches
Ground Surface		(C.D. Location) 200' S. of mill		
0'	1'	Loam		
1'	5'	Sandy [illegible]		
5'	31'	[illegible]		
		Refused 31'		

Used .... ft. .... inches of casing

Well rated at .... G.P.M. .... Vacuum

Water level is .... ft. below ground level

Remarks

Pulled

Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location Town of [illegible]
Date 3/15/80 Hole No. #16
Started .... Finished ....

LOG OF HOLE

#(CD [illegible])

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of 10" blows on spoon	Penetration of Spoon in inches
Ground Surface		200' C of #15		
0	2'	Peat		
2	6'	Hard Pan + boulders		
6'	8'	Very fine brown sand		
8'	15'	Silt		
15'	30'	Fine gray sand + traces of yellow clay		
30'	40'	silt		
		Refusal 40'		

Used ...... ft. ...... inches of casing
Well rated at ...... G.P.M. ...... " Vacuum
Water level is ...... ft. below ground level
Remarks
Pulled

Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location Town of [illegible]
Date 3/5/80 Hole No. #17
Started .... Finished ....

LOG OF HOLE

(CD [illegible])

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of 10" blows on spoon	Penetration of Spoon in inches
Ground Surface		200' S of #16		
0	1	Loam		
1	12	Hard Pan		
12	18'	Hard Pan + boulders		
18'	23'	[illegible] clay		
23'	37'	Brown [illegible] sand		
		+ [illegible] clay		
37	40	Gray sand		
		Refusal 40'		

Used 40 ft. — inches of casing
Well rated at 2 G.P.M. 20 " Vacuum
Water level is 1' 4" ft. below ground level
Remarks
[illegible]
Pulled

Foreman [illegible]

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

MAR 23 1980

Job Location Town of [illegible]
Date 3/14/80 Hole No. #18
Started .... Finished ....

LOG OF HOLE

(CD [illegible])

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of 10" blows on spoon	Penetration of Spoon in inches
Ground Surface		100' S of #17 [illegible]		
0	1'	Loam		
1'	2'	Clay		
2	10'	Hard Pan + boulders		
10'	12'	Silt + clay		
12'	14'	[illegible]		
		[illegible]		
14'	24' 9"	Hard Pan		
		Refusal 24' 9"		

Used ...... ft. ...... inches of casing
Well rated at ...... G.P.M. ...... " Vacuum
Water level is ...... ft. below ground level
Remarks
[illegible]

Foreman [illegible]

A-6

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS MAR 28 1966
DIAL 835-3727 — 835-3221

Job Location: Town of Stow Mass
Date: 3/16/1966 Hole No. #19
Started .... Finished ....

LOG OF HOLE

Depth From (Ground Surface)	To	CLASSIFICATION of MATERIALS	No. of 30" blows on spoon	Penetration of Spoon in Inches
		(C D Fletcher)		
		In sand Pit		
0	2'	Sand + boulders		
2'	6'	Brown gravel & boulders		
6'	10'	Hard Pan		
10'	14'	Blue clay		
		Refusel 14'		

Used .... ft. .... inches of casing
Well rated at .... G.P.M. .... " Vacuum
Water level is .... ft. below ground level
Remarks: Pulled

Foreman: F. Thimo

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location: Town of Stow Mass MAR 28 1966
Date: 3/17/66 Hole No. #20
Started .... Finished ....

LOG OF HOLE

Depth From (Ground Surface)	To	CLASSIFICATION of MATERIALS	No. of 30" blows on spoon	Penetration of Spoon in Inches
		(R Fletcher)		
		Crescent St		
0	11'	Peat		
11'	15'	clay		
15'	28	Gridy sand		
		set screen + pumped		
		1 GPM from 5.0		
28'	31-6	Brown gravel		
31-6	45-6	Brown sand + gravel + silt		
		set screen + pumped		
		30 GPM from 0.3		
45-6	48'	Brown sand & gravel		
		Refusel 48'		

Used 48 ft. 0 inches of casing
Well rated at 60 G.P.M. 20 " Vacuum
Water level is 5-1 ft. below ground level
Remarks: set 10' 60 slot screen
48-43'
left 43' casing & 10' screen

Foreman: F. Thimo

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location: Town of Stow Mass
Date: 3/21/66 Hole No. #21
Started .... Finished ....

LOG OF HOLE

Depth From (Ground Surface)	To	CLASSIFICATION of MATERIALS	No. of 30" blows on spoon	Penetration of Spoon in Inches
		(R. Fletcher)		
		150' N of #20		
0	11'	Peat		
11'	15'	Clay & boulders		
15'	21'	Hard Pan		
		Refusel 21'		

Used .... ft. .... inches of casing
Well rated at .... G.P.M. .... " Vacuum
Water level is .... ft. below ground level
Remarks: Pulled

Foreman: F. Thimo

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location: Town of Stow Mass.
Date: 3/21/60 Hole No.: #21
Started: Finished:

LOG OF HOLE

(R. Felsenna)

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of 30" blows on spoon	Penetration of Spoon in inches
Ground Surface		5' N of #21		
0	11'	Peat		
11'	15'	Clay & boulders		
15'	25'	Hardpan & boulders		
25'	30'	Gray sand		
30'	46'	Silt		
46'	50'	Med. brown sand		
50'	52'6"	Sh. gravel		
		Refused 52'6"		

Used 52 ft. 6 inches of casing
Well rated at 2 G.P.M. 25" Vacuum
Water level is 4'4" ft. below ground level
Remarks: Pulled
Left 42'6" casing

Foreman: F. Nelson

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221 MAR 23 1960

Job Location: Town of Stow Mass.
Date: 3/22/60 Hole No.: #23
Started: Finished:

LOG OF HOLE

(R. Felsenna)

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of 30" blows on spoon	Penetration of Spoon in inches
Ground Surface		Obs. to #21		
0	11'	Peat		
11'	18'	Clay		
18'	28'	Silty sand		
28'	31'6	Br. fine gravel		
31'6	48'	Brown sand & gravel		
		Silt		

Used 48' ft. inches of casing
Well rated at 5 G.P.M. 16" Vacuum
Water level is 5' ft. below ground level
Remarks: No casing
Left no casing

Foreman: F. Nelson

R. E. CHAPMAN CO.
OAKDALE, MASSACHUSETTS
DIAL 835-3727 — 835-3221

Job Location: Town of Stow [illegible]
Date: 3/?/60 Hole No.: #24
Started: Finished:

LOG OF HOLE

(R. Felsenna)

Depth From	Depth To	CLASSIFICATION of MATERIALS	No. of 30" blows on spoon	Penetration of Spoon in inches
Ground Surface		[illegible]		
0	1'	Loam		
1'	4'	Peat		
4'	[illegible]	[illegible]		
10'	[illegible]	[illegible]		
[illegible]	[illegible]	Hardpan		
[illegible]	[illegible]	[illegible] sand		
[illegible]	[illegible]	Brown fine sand & silt		
		To be cont.		

Used 48 ft. inches of casing
Well rated at G.P.M. " Vacuum
Water level is ft. below ground level
Remarks: [illegible]
[illegible]

Foreman: [illegible]

3/28/

R. E. CHAPMAN CO., OAKDALE, MASS.

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER

TOWN Town of Hinsdale

STREET Crescent STATE

OWNER OF PROPERTY: R F Litchen

OPERATORS: F Hines

A Hines

SIZE & TYPE OF PUMP: 2"

DISCHARGE LINE: Size 1½ in.; Length 50 feet To Brook

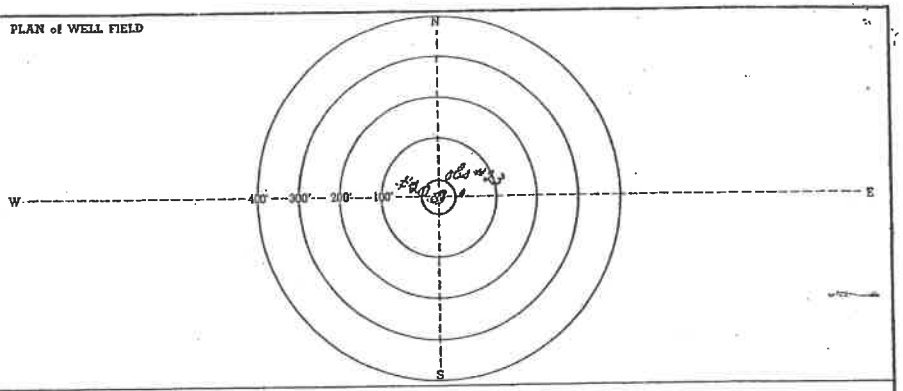
ORIFICE PIPE in.; SIZE ORIFICE PLATE in.

DESCRIPTION OF WELL BEING PUMPED: #20 2½"

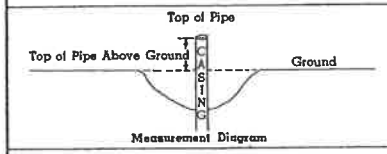
LENGTH OF DUNKER ON TAPE 0 in. ADD TO READINGS (When you make read.)

LENGTH OF ALTITUDE LINE FROM CENTER OF GAUGE ft. in.

PLAN of WELL FIELD



ALL MEASUREMENTS TO BE MADE FROM TOP OF CASINGS



Measurement Diagram

FINISHED WELL NO. #20 2½	Observation Wells Information						
	No. 23	No.	No.	No.	No.	No.	
DEPTH OF WELL 48'	Depth	Depth	Depth	Depth	Depth	Depth	
TOP OF PIPE ABOVE GROUND 3'	Pipe AG	Pipe AG	Pipe AG	Pipe AG	Pipe AG	Pipe AG	
STATIC READING 6'8½	Static 6'8½	Static	Static	Static	Static	Static	

VAC

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	~~Air Gauge~~ Readings	Tape Meas'nt in Well	Orifice Head in Inches	GPM	Water Level	Water Level	Water Level	Water Level	Water Level	Water Level
3/23/66 AM	7:30		0			0	6'8½					
	7:31		25½			75	7'11"					
	7:35		25½			75	9'10"					
	7:45		25½			75	9'10½"					
	8:00		25½			75	9'11"					
	9:00		25½			75	10'0"					
	10:00		25½			75	10'0"					
	11:00		25½			75	10'½"					
Noon	12:00		25½			75	10'1"					

3/28

R. E. CHAPMAN CO., OAKDALE, MASS.

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

#OBL 23 NO. 2

CUSTOMER Town of New Mar

VAC

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	~~Discharge~~ Reading	Tape Meas'nt in Well	Orifice Head in Inches	GPM	Water Level	Water Level	Water Level	Water Level	Water Level	Water Level
PM	1:00		25½			75	10'1"					
PM	2:00		25½			75	10'1"					
Pump stopped	3:00		25½			75	10'1"					
			Recovery									
	3:01		0			0	8'4"					
	3:05						7'7"					
	3:15						7'4"					
	3:30						7'					
	4:00						7'0"					

R. E. CHAPMAN CO., OAKDALE, MASS.

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER TOWN OF STOW

TOWN STOW

STREET OFF CRESCENT ST. STATE MASS.

OWNER OF PROPERTY: —

OPERATORS: TERRY LINDSTEDT
EMERY PATTEN

SIZE & TYPE OF PUMP: 4" SUCTION

DISCHARGE LINE: Size 6 in.; Length 160 feet.

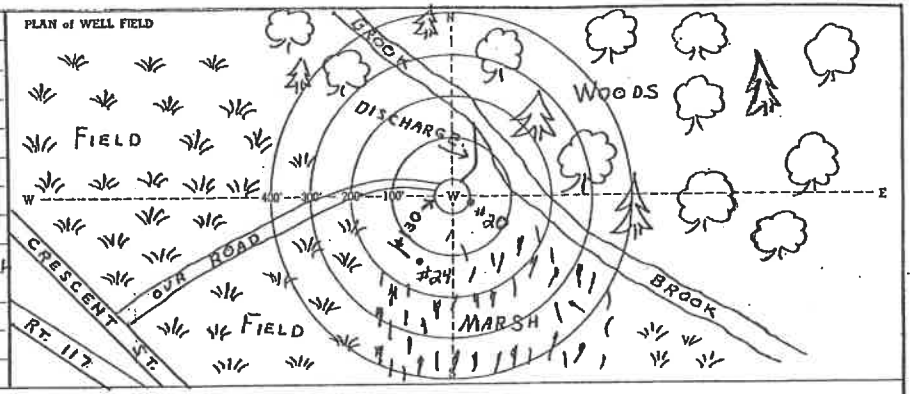
ORFICE PIPE 6 in.; SIZE ORFICE PLATE 3 in.

DESCRIPTION OF WELL BEING PUMPED: 2½" GROUP TEST WELL

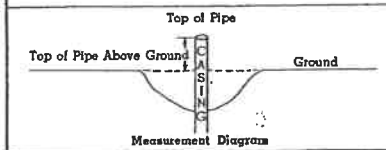
LENGTH OF DUNKER ON TAPE 2½ in. ADD TO READINGS (When you make read.)

LENGTH OF ALTITUDE LINE FROM CENTER OF GAUGE ft. in.

PLAN of WELL FIELD



ALL MEASUREMENTS TO BE MADE FROM TOP OF CASINGS



	Observation Wells Information					
FINISHED WELL NO.	No. 20	No. 24	No.	No.	No.	No.
DEPTH OF WELL	Depth 40'	Depth 30' 6"	Depth	Depth	Depth	Depth
TOP OF PIPE ABOVE GROUND	Pipe AG 2'8"	Pipe AG 6"	Pipe AG	Pipe AG	Pipe AG	Pipe AG
STATIC READING	Static 7' ½"	Static 6' ¼"	Static	Static	Static	Static

VAC.

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	Air-Gauge Reading	Tape Meas'nt in Well	Orfice Head in Inches	GPM	Water Level	Water Level	Water Level	Water Level	Water Level	Water Level
		STARTED PUMP TEST MAY 17, 1966 AT 12:30 PM										
MAY 17, 1966	12:35		17		20	150	13' 6"	6' 9½"				
	12:40		17		20	150	13' 10"	6' 11"				
	12:45		19		22	158	14' ⅛"	7' ¼"				
	1:00 PM		19		22	158	14' 2¾"	7' 1½"				
	1:15		19		22	158	14' 4"	7' 2"				
FAIR + WARM	1:30		19		22	158	14' 4"	7' 2¾"				
	2:00		19		22	158	14' 4¼"	7' 3½"				
	3:00		19		22	158	14' 4¼"	7' 4½"				

B-2

R. E. CHAPMAN CO., OAKDALE, MASS. NO. 2

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER TOWN OF STOW

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	Vac. Air-Gauge Readings	Tape Meas'nt in Well	Orifice Head in Inches	GPM	#20 Water Level	#24 Water Level	Water Level	Water Level BROOK	Water Level	Water Level
SAMPLE TAKEN	4:00 PM	48°	19		22	158	14' 5¾"	7' 5¼"		17"		
	5:00		19		22	158	14' 6¼"	7' 6"		17½"		
MAY 17, 1966	6:00		19		22	158	14' 6¼"	7' 6½"		17¾"		
	7:00		19		22	158	14' 6½"	7' 7"		18"		
	8:00		19		22	158	14' 7½"	7' 7½"		18¼"		
	9:00		19		22	158	14' 8½"	7' 7¾"		18½"		
	10:00		19		22	158	14' 8½"	7' 8¼"		18½"		
	11:00		19		22	158	14' 9"	7' 8½"				
	12:00 MID.		19		22	158	14' 9¾"	7' 9"				
MAY 18, 1966	1:00 AM		19		22	158	14' 10½	7' 9¼"				
	2:00		19		22	158	14' 11"	7' 9½"		19"		
	3:00		19		22	158	14' 11¼"	7' 9¾"				
	4:00		19		22	158	14' 11¼"	7' 10"				
	5:00		19		22	158	14' 11"	7' 10¼"				
	6:00		19		22	158	14' 11"	7' 10¼"		19½"		
	7:00		19		22	158	14' 11"	7' 10½"				
	8:00		19		22	158	14' 11"	7' 10¾"				
	9:00		19		22	158	15'	7' 11"				
CLOUDY + COOL	10:00		19		22	158	15'	7' 11¼"		19½"		
	11:00		19		22	158	15'	7' 11¼"				
	12 NOON		19		22	158	15'	7' 11½"				
	1:00 PM		19		22	158	15'	7' 11¾"				
	2:00		19		22	158	15'	8'				
SAMPLE TAKEN	3:00	48°	19		22	158	15' ¼"	8'		19½"		
	4:00		19		22	158	15' ¾"	8' ¼"				
	5:00		19		22	158	15' 1"	8' ½"				
LIGHT RAIN	6:00		19		22	158	15' 1¼"	8' ¾"				
	7:00		19		22	158	15' 1¾"	8' 1¼"				
	8:00		19		22	158	15' 2"	8' 1¼"		20"		
	9:00		19		22	158	15' 2¼"	8' 1¼"				
	10:00		19		22	158	15' 2¼"	8' 1½"				

R. E. CHAPMAN CO., OAKDALE, MASS. — LOG OF PUMP TEST

NO. 3 — TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER TOWN OF STOW — BROOK

Date, Weather and Sample Taken	Time	Water Temperature	Vac. Air-Line Reading	Time Reading in Well	Orifice Head in Inches	GPM	#20 Water Level	#24 Water Level	Water Level	Water Level	Water Level	Water Level
			START PUMP TEST READINGS BELOW THIS LINE									
MAY 18, 1966	11:00 PM		19		22	158	15' 2½"	8' 1½"		20"		
	12 MID		19		22	158	15' 2½"	8' 1½"				
MAY 19, 1966	2:00 AM		19		22	158	15' 2¾"	8' 1¾"				
	4:00		19		22	158	15' 2¾"	8' 2"				
	6:00		19		22	158	15' 3"	8' 2¼"		20"		
	8:00		19½		22	158	15' 3¼"	8' 2¾"				
CLOUDY + COOL	10:00		19½		22	158	15' 3½"	8' 3"				
	12 NOON		19½		22	158	15' 3¾"	8' 3"				
RAIN	2:00		19½		22	158	15' 3¾"	8' 3¼"				
SAMPLE TAKEN	4:00	48°	19½		22	158	15' 4"	8' 3½"				
	6:00		19½		22	158	15' 4¼"	8' 3¾"		20"		
ADDED 350' OF	8:00			PUMP	SHUT	OFF						
DISCHARGE	10:00		20½		22	158	16' ¼"	8' 4¼"				
	12 MID		20½		22	158	16' 1½"	8' 4¾"				
MAY 20, 1966	2:00 AM		20½		22	158	16' 2"	8' 5¼"				
	4:00		20½		22	158	16' 2¼"	8' 5¾"				
	6:00		20½		22	158	16' 2½"	8' 6"				
	8:00		20½		22	158	16' 2½"	8' 6"				
	10:00		20½		22	158	16' 3"	8' 6¼"		20½"		
Rain, Mist, Cloudy	12 NOON	48°	20½		22	158	16' 3¼"	8' 6½"				
SAMPLE TAKEN	2:00 PM		20½		22	158	16' 3½"	8' 6¾"				
	4:00 "		20½		22	158	16' 3½"	8' 7"		20½"		
	6:00 "		20½		22	158	16' 4"	8' 7¼"				
Cloudy	8:00		20½		22	158	16' 4¼"	8' 7¾"				
	10:00		20½		22	158	16' 5"	8' 8"				
	12 Mid.		20½		22	158	16' 5½"	8' 8¼"				
MAY 21, 1966	2:00 AM		20½		22	158	16' 5¾"	8' 8½"				
	4:00		20½		22	158	16' 6"	8' 8¾"		20½"		
	6:00		20½		22	158	16' 6¼"	8' 9"				
	8:00		20½		22	158	16' 6¼"	8' 9"				
	10:00		20½		22	158	16' 6¼"	8' 9"				

R. E. CHAPMAN CO. OAKDALE, MASS.

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

4

CUSTOMER Town of Stow

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	Vac Air Gauge Reading	Tape Measure in Well	Orifice Head in Inches	GPM	#20 Water Level	#21 Water Level	Water Level	Brook Water Level	Water Level	Water Level
May 21, 1966	Noon		20½		22	158	16' 6¾	8' 9"		20½"		
	2 PM		20½		22	158	16' 6¾	8' 9"				
Warm + Cloudy	4:00		20½		22	158	16' 6¾	8' 9¼		•		
	6 PM		20½		22	158	16' 6¾	8' 9½				
	8:00		20½		22	158	16' 6¾	8' 9¾		20½"		
	10:00		20½		22	158	16' 6¾	8' 10"				
	12 Mid.		20½		22	158	16' 6¾	8' 10"				
May 22, 1966	2:00 AM		20½		22	158	16' 6¾	8' 10¼				
Rain	4:00		20½		22	158	16' 6¾	8' 10¼"		21"		
	6:00		21		22	158	16' 6¾	8' 10½"				
	8:00		21		22	158	16' 6¾	8' 10½				
Clearing	10:00		21		22	158	16' 7"	8' 10¾"				
	Noon		21		22	158	16' 7"	8' 11"				
	2:00 PM		21		22	158	16' 7"	8' 11"		21"		
	4:00		21		22	158	16' 7"	8' 11"				
	6:00		21		22	158	16' 7"	8' 11"				
	8:00		21		22	158	16' 7¼	8' 11¼"				
Clear	10:00		21		22	158	16' 7¼	8' 11½				
	12 Mid.		21		22	158	16' 7¼	8' 11¾"		20½"		
May 23, 1966	2:00 AM		21		22	158	16' 7¼	8' 11¾				
	4:00		21		22	158	16' 7½	9'				
	6:00		21		22	158	16' 7½	9'		20½"		
	8:00		21		22	158	16' 7½	9'				
	10:00		21		22	158	16' 7½	9'				
Sample Taken	Noon	48°	21		22	158	16' 7½	9' ¼"				
	2 PM		21		22	158	16' 7½	9' ¼"				
Fair + Warm	4:00		21		22	158	16' 7¾	9' ¼"				
	6:00		21		22	158	16' 7¾	9' ½"				
	8:00		21		22	158	16' 7¾	9' ½"		20½"		
	11:00		21		22	158	16' 7¾	9' ½"				
	Midnight		21		22	158	16' 8"	9' ¾"				

B-5

R. E. CHAPMAN CO., OAKDALE, MASS. NO. 5

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER TOWN OF STOW — BROOK

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	VAC Reading	Pipe Measmt in Well	Orifice Reading in Inches	GPM #	20 Water Level +	24 Water Level	Water Level	Water Level	Water Level	Water Level
MAY 24, 1966	2:00 PM		21		22	158	16' 8"	9' 1/4"				
	4:00		21		22	158	16' 8 1/4"	9' 1"		20 1/2		
	6:00		21		22	158	16' 8 1/4"	9' 1"				
	8:00		21		22	158	16' 8 1/4"	9' 1"				
FAIR + WARM	10:00		21		22	158	16' 8 1/4"	9' 1 1/4"				
	NOON		21		22	158	16' 8 1/4"	9' 1 1/4"				
	2 P.M.		21		22	158	16' 8 1/2"	9' 1 1/2"				
	4:00		21		22	158	16' 8 1/2"	9' 1 1/2"		20 1/2		
	6:00		21		22	158	16' 8 1/2"	9' 1 3/4"				
	8:00		21		22	158	16' 8 1/2"	9' 1 3/4"				
	10:00		21		22	158	16' 8 1/2"	9' 2"				
	12 Mid.		21		22	158	16' 8 3/4"	9' 2"				
MAY 25, 1966	2:00 AM		21		22	158	16' 8 3/4"	9' 2"				
	4:00		21		22	158	16' 8 3/4"	9' 2 1/4"				
	6:00		21		22	158	16' 8 3/4"	9' 2 1/4"				
CLOUDY + WARM	8:00		21		22	158	16' 8 3/4"	9' 2 1/4"				
	10:00		21		22	158	16' 9"	9' 2 1/4"		20 1/2		
SAMPLE TAKEN	NOON	48°	21		22	158	16' 9"	9' 2 1/2"				
	2 P.M.		21		22	158	16' 9"	9' 2 1/2"				
	4:00		21		22	158	16' 9 1/4"	9' 2 3/4"				
	6:00		21		22	158	16' 9 1/4"	9' 2 3/4"				
	8:00		21		22	158	16' 9 1/4"	9' 2 3/4"				
	10:00		21		22	158	16' 9 1/4"	9' 3"		20 1/2		
	12 Mid.		21		22	158	16' 9 1/4"	9' 3"				
MAY 26, 1966	2:00 AM		21		22	158	16' 9 1/2"	9' 3"				
	4:00		21 1/2		22	158	16' 9 1/2"	9' 3 1/4"				
	6:00		21 1/2		22	158	16' 10"	9' 3 1/4"				
CLOUDY + WARM	8:00		21 1/2		22	158	16' 10"	9' 3 1/4"				
	10:00		21 1/2		22	158	16' 10"	9' 3 1/2"				
SAMPLE TAKEN	NOON		21 1/2		22	158	16' 10"	9' 3 1/2"				
	2 P.M.		21 1/2		22	158	16' 10"	9' 3 1/2"				

R. E. CHAPMAN CO., OAKDALE, MASS.

NO. 6

LOG OF PUMP TEST

TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER Town of Stow, Mass.

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Air Temperature	Air Gauge Reading	Tape Measure in Well	Orifice Head in Inches	GPM	#20 Water Level	#21 Water Level	Water Level	Brook Water Level	Water Level	Water Level
			Var.									
May 26, 1966	4 P.M.		21½		22	158	16' 10"	9' 3½"				
	6:00		21½		22	158	16' 10¼"	9' 3¼"		down 5 minutes		
Checked oil	8:00		21½		22	158	16' 10¼"	9' 3¼"				
	10:00		21½		22	158	16' 10¼"	9' 3¼"				
	Midnight		21½		22	158	16' 10¼"	9' 3¼"		20½		
May 27, 1966	2:00 AM		21½		22	158	16' 10½"	9' 4"				
	4:00		21½		22	158	16' 10½"	9' 4"				
	6:00		21½		22	158	16' 10¾"	9' 4¼"				
	8:00		21½		22	158	16' 10¾"	9' 4¼"				
	10:00		21½		22	158	16' 10¾"	9' 4½"				
Fair & Hot	Noon	78°	21½		22	158	16' 10¾"	9' 4¾"				
Sample Taken	2 P.M.		21½		22	158	16' 11"	9' 4¾"				
	4:00		21½		22	158	16' 11"	9' 4¾"				
	6:00		21½		22	158	16' 11"	9' 4¾"		down 5 minutes		
Checked oil	8:00		21½		22	158	16' 11"	9' 5"				
	10:00		21½		22	158	16' 11"	9' 5"				
	12 Mid.		21½		22	158	16' 11¼"	9' 5"		20½		
May 28, 1966	2:00 AM		21½		22	158	16' 11¼"	9' 5"				
Rain	4:00		21½		22	158	16' 11¼"	9' 5¼"		21		
	6:00		21½		22	158	16' 11½"	9' 5¼"				
	8:00		21½		22	158	16' 11½"	9' 5¼"		21¼		
	10:00		21½		22	158	16' 11½"	9' 5¼"				
Sample Taken	Noon	48°	21½	Shut down	To change #21							
Light rain	12:05		21½		22	158	16' 11½"	9' 5¼"				
	2 P.M.		21½		22	158	16' 11¼"	9' 5¼"				
	4:00		21½		22	158	16' 11¼"	9' 5¼"				
	6:00		21½		22	158	16' 11¼"	9' 5¼"				
	8:00		21½		22	158	16' 11¾"	9' 5½"				
Cloudy	10:00		21½		22	158	16' 11¾"	9' 5¾"				
	12 Mid.		21½		22	158	17' 0"	9' 5¾"				
May 29, 1966	8:00 AM		21½									

B-7

R. E. CHAPMAN CO., OAKDALE, MASS.

LOG OF PUMP TEST

TEL. WEST BOYLSTON, TEmple 5-3727

NO. 7

CUSTOMER Town of Stow

Vac. START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	Air Gauge Reading	Feet Meas'd in Well	Orifice Head in Inches	GPM	20 Water Level	24 Water Level	Water Level	Brook Water Level	Water Level	Water Level
May 29, 1966	4 AM		21 1/2		22	158	17'—	9'6"		20 1/2		
	6:00		21 1/2		22	158	17'—	9'6"				
	8:00		21 1/2		22	158	17'1/4"	9'6 1/4				
	10:00		21 1/2		22	158	17'1/4"	9'6 1/2				
Cloudy	12 Noon		21 1/2		22	158	17'1/4"	9'6 1/2				
Checked oil	2 P.M.		21 1/2		22	158	17'1/4"	9'6 1/2		20 1/2		
	4:00		21 1/2		22	158	17'1/2"	9'6 1/2				
	6:00		21 1/2		22	158	17'1/2"	9'6 3/4				
	8:00		21 1/2		22	158	17'1/2"	9'6 3/4				
	10:00		21 1/2		22	158	17'3/4"	9'7"				
	12 Mid		21 1/2		22	158	17'3/4"	9'7"				
May 30, 1966	2 A.M.		21 1/2		22	158	17'1"	9'7"				
	4:00		21 1/2		22	158	17'1"	9'7 1/4		20 1/2		
	6:00		21 1/2		22	158	17'1 1/4"	9'7 1/4				
Fair & Warm	8:00		21 1/2		22	158	17'1 1/4"	9'7 1/2				
	10:00		21 1/2		22	158	17'1 1/4"	9'7 1/2				
	12 Noon		21 1/2		22	158	17'1 1/4"	9'7 1/2				
Checked oil	2 P.M.		21 1/2		22	158	17'1 1/4"	9'7 1/2		20 1/2		
	4:00		21 1/2		22	158	17'1 1/4"	9'7 1/2				
	6:00		21 1/2		22	158	17'1 1/2"	9'7 3/4				
	8:00		21 1/2		22	158	17'1 1/2"	9'7 3/4				
	10:00		21 1/2		22	158	17'1 3/4"	9'7 3/4				
	12 Mid		21 1/2		22	158	17'1 3/4"	9'8"				
May 31, 1966	2 A.M.		21 1/2		22	158	17'1 3/4"	9'8"		20 1/2		
	4:00		21 1/2		22	158	17'2"	9'8"				
	6:00		21 1/2		22	158	17'2"	9'8 1/4"				
Clear	8:00		21 1/2		22	158	17'2 1/4"	9'8 1/4"				
	10:00		21 1/2		22	158	17'2 1/4"	9'8 1/4"				
Checked oil	12 Noon		21 1/2		22	158	17'2 1/2"	9'8 1/2"				
	2 P.M.		21 1/2		22	158	17'2 1/2"	9'8 1/2"				
	4:00		21 1/2		22	158						

B-8

LOG OF PUMP TEST

R. E. CHAPMAN CO. OAKDALE, MASS. NO. 8

TEL. WEST BOYLSTON TEmple 5-3727

CUSTOMER Town of Stow

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	Alt. Gauge Reading	Tape Meas't. in Well	Orifice Head in Inches	GPM	20 Water Level	24 Water Level	Water Level	Water Level	Water Level	Water Level
May 31, 1966	6 PM		21½		22	158	17'2¾	9'8½				
	8:00		21½		21	158	17'2¾	9'8½				
	10:00		21½		22	158	17'3"	9'8¾		20'½"		
	12 mid		21½		22	158	17'3¼	9'8¾"				
June 1st 1966	2:00		21½		22	158	17'3¼	9'8¾				
Light Rain	4:00		21½		22	158	17'3½	9'8¾"				
	6:00		21½		22	158	17'3½	9'8¾"				
	8:00		21½		22	158	17'3¼	9'9"		20'½"		
	10:00		21½		22	158	17'4"	9'9"				
Raining	11:45		Reduced	rate	(125)	of	flow					
	11:55		18.5		14	125	16'1½					
	12:05		18.5		14	125	16'1¼	9'7"				
	12:30		18.5		14	125	16'½"	9'6¾				
	1 PM		18.5		14	125	16'¼"	9'6½				
	1:30		18.5		14	125	16'½"	9'6¼				
	2 PM		18.5		14	125	16'½	9'6¼				
	3:00		18.5		14	125	16'½	9'6"				
	4:00		18.5		14	125	16'½	9'6"				
	5:00		18.5		14	125	16'½	9'6"				
	6 PM		18.5		14	125	16'½	9'6"				
	7:00		18.5		14	125	16'½	9'6"				
	8:00		18.5		14	125	16'½	9'6"				
	10:00		18.5		14	125	16'½	9'6"				
	12 mid		18.5		14	125	16'½	9'6"				
June 2, 66	2 AM		18.5		14	125	16'½	9'6"				
	4:00		18.5		14	125	16'½	9'6				
	6:00		18.5		14	125	16'½	9'6				
	8:00		18.5		14	125	16'½	9'6				
	10:00		18.5		14	125	16'½"	9'6"				
Sample Taken	12 Noon		18.5		14	125	16'½"	9'6"				
	2 PM.		18.5		14	125	16'½"	9'6"				

ck 615 74

LOG OF PUMP TEST

Rg 9

R. E. CHAPMAN CO., OAKDALE, MASS. TEL. WEST BOYLSTON TEmple 5-3727

NO. 9

CUSTOMER Town of Stow

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	Air Gauge Reading (Vac.)	Tape Measure in Well	Orifice Head in Inches	GPM	#22 Water Level	#24 Water Level	Water Level	Water Level	Water Level	Water Level
June 3, 1966	4 P.M.		18.5		14	125	16'1"	9'6"				
	6:00		18.5		14	125	16'1½"	9'6"				
	8:00		18.5		14	123	16'2"	9'6¼"				
	10:00		18.5		14	125	16'2¼	9'6¼				
	12 Mid		18.5		14	125	16'2¼	9'6¼"				
June 3, 1966	2 A.M.		18.5		14	125	16'2¼	9'6¼				
	4:00		18.5		14	125	16'2½	9'6¼				
	6:00		18.5		14	125	16'2½	9'6½				
	8:00		18.5		14	128	16'2½	9'6½				
	10:00		18.5		14	125	16'2½	9'6½"				
	12 Noon		18.5		14	125	16'2½	9'6½"				
	2 P.M.		18.5		14	125	16'2½	9'6½"				
Clear	4:00		18.5		14	125	16'2½	9'6½				
	6:00		18.5		14	125	16'2½	9'6½				
	8:00		18.5		14	125	16'2½	9'6½				
	10:00		18.5		14	125	16'2½	9'6½				
	12 Mid		18.5		14	125	16'2½	9'6½				
June 4, 66	2 AM		18.5		14	125	16'2½	9'6½				
	4:00		18.5		14	125	16'2½	9'6½				
	6:00		18.5		14	125	16'2½	9'6½				
	8:00		18.5									
June 4 1966	9:00 AM	Shut down										
							10'10"					
	9:01						10'4½					
	9:02						10'2½					
	9:03						10'1¾	8'11¾				
	9:04						10'1½	8'11				
	9:05						10'1¼	8'10½				
	9:10						10'½"	8'9½				
	9:20						10'	8'8¼				
	9:35											

B-10

LOG OF PUMP TEST

R. E. CHAPMAN CO., OAKDALE, MASS. — TEL. WEST BOYLSTON TEmple 5-3727

NO. 10

CUSTOMER: Town of Stow

START PUMP TEST READINGS BELOW THIS LINE

Date, Weather and Sample Taken	Time	Water Temperature	All Ghuns Reading	Tape Meas'mt in Well	Orifice Head in Inches	GPM	[illegible] Water Level	[illegible] Water Level	Water Level	Water Level	Water Level	Water Level
June 4, 1966	10:30						9'10½	8'7¼				
	11:00						9'9¼	8'6				
	12 Noon						9'9"	8'5½"				
	7 PM						9'5¼	8'2¼				
June 5, 66	8 PM						8'11½"	7'9½"				
June 6, 66	11 AM						8'9½"	7'7¾"				
	static levels →						7'1½"	6'¼"				

APPENDIX A

DOCUMENT #9

LETTER TO MARILYN KUNELIUS DATED MARCH 25, 1986
FROM D.L. MAHER, INC. REGARDING TEST WELL EXPLORATION
PROGRAM FOR 142 RED ACRE ROAD, STOW, MA

D. L. MAHER CO.
GROUND WATER DEVELOPMENT

P.O. BOX 127 • 71 CONCORD STREET • NORTH READING • MA 01864 • 617/933-3210

March 25, 1986

Ms. Marilyn Kunelius
142 Red Acre Road
Stow, MA 01775

Dear Marilyn:

We have completed a 2.5-inch diameter test well exploration program on your property in Stow, Mass. Two test wells were installed at selected locations (see attached sketch).

Test well 1-85 was driven to a depth of 59.5 feet. Brown fine to coarse sand with gravel was encountered from 15-59.5 feet. A 50 slot (0.050 inches) test well screen was set and exposed from 50-56 feet. The well was developed and test pumped at 60 gallons per minute (gpm).

Based on the yield, an observation well was installed 2.0 feet in distance from T.W. 1-85. A four hour pumping test was conducted on T.W. 1-85 with drawdown measurements recorded in the observation well.

After 4.0 hours of continuous pumping a 4.41 foot drawdown was observed in the observation well. This drawdown resulted in a specific capacity of 13.6 gallons per foot of drawdown. A water quality sample was taken at the end of the test and submitted to Reitzel Associates of W. Boylston, Mass. for analysis.

Test well 2-86 was installed on what is perceived to be remnants of an esker. Eskers are glacial land formations comprised of sand gravels that are generally high yield aquifers. Test well 2-86 was driven to a depth of 39.0 feet where non-water bearing glacial sediments were encountered.

Well Yield Estimate

Based on the specific capacity of 13.6 gallons per foot of drawdown, a 24" x 18" gravel pack well installed to a depth of 59 feet with 10.0 feet of stainless steel well screen should yield 300-350 gpm. This yield is subject to long term pump test verification, D.E.Q.E. approval, and ground water recharge.

Due to the heterogeneous nature of the glacial deposits, it is likely that additional test wells may locate a higher yielding well. We recommend that 2-3 more test wells be installed at selected locations in the vicinity of T.W. 1-85. Once a higher yielding well is located, then contact should be made with a water purveyor (i.e. So. N.H. Water Co.) to provide marketing guidance.

If you should have any questions, please do not hesitate to contact our office.

Very truly yours,

D. L. MAHER CO.

Gary L. Smith

Gary L. Smith mec
Hydrogeologist

GLS/mec
Encs.

APPENDIX A

DOCUMENT #10

D.L. MAHER, INC. RECORD OF TEST FOR FOUR-HOUR AQUIFER PUMPING TEST ON TEST WELL 1-85
DATED: SEPTEMBER 13, 2000

Well No. I-85 9-13-00

D.L. MAHER CO.

Contract

Location Stow Ma. Red Fox Farm

RECORD OF TEST

Orifice meter

Date	Time (HHMM)	Elapsed Time	Pumping Rate	Rainfall	Well 2'ab	Well	Well	Well	Well	Well	Well	Well	Well	Well	Well	Well
Static			60		.70											
1m.					5.11											
2					5.30											
3					5.35											
4					5.41											
5					5.44											
6					5.47			Recoveries								
7					5.48			1m	1.35							
8					5.50			2	1.13							
9					5.58			3	.93							
10					5.40			4	.90							
20					5.43			5	.88							
30					5.43			6	.85							
1					5.43			7	.83							
1½					5.44			8	.82							
2					5.44			9	.80							
2½					5.49			10	.79							
3					5.51											
3½					5.55											
4					5.54											

APPENDIX A

DOCUMENT #11

GROUND WATER QUALITY RESULTS FOR GROUND WATER SAMPLE COLLECTED BY D.L. MAHER, INC. FROM TEST WELL 1-85 ON SEPTEMBER 13, 2000

Thorstensen Laboratory, Inc.

OCT 03 2000

66 LITTLETON ROAD, WESTFORD, MA 01886 (978) 692-8395 FAX (978) 692-0023 1-800-649-TEST

Report Number: 50318
Client:

DL Maher Co.
71 Concord St.
N. Reading MA 01864

Report Date: October 2, 2000
Sample Information:
PWS ID#:
Date Collected: 9/13/00
Collected by: D.L. Maher Staff
Location ID's: Town of Stow
Number: Name:
A: Red Acre Road Well #1-85
B:
C:
D:

Test Parameter	Date of Analysis	EPA Maximum	A	B	C	D	Detection Limit	Units	Analytical Method
Aluminum	9/26/00	Not Spec	ND				0.005	mg/L	200.9
Calcium	9/13/00	Not Spec	11.6				0.01	mg/L	200.7
Copper	9/13/00	1.3	ND				0.01	mg/L	200.7
Iron	9/13/00	0.3	0.36				0.01	mg/L	200.7
Magnesium	9/13/00	Not Spec	4.6				0.01	mg/L	200.7
Manganese	9/13/00	0.05	0.06				0.01	mg/L	200.7
Sodium	9/13/00	none	17.2				0.1	mg/L	200.7
Potassium	9/13/00	Not Spec	3.1				0.1	mg/L	200.7
Silver	9/22/00	0.05	ND				0.001	mg/L	200.9
Zinc	9/13/00	Not Spec	ND				0.01	mg/L	200.7
Alkalinity	9/13/00	Not Spec	14.5				1	mg/L	SM2320B
Chloride	9/13/00	250	43.2				0.01	mg/L	300.0
Color	9/13/00	15	0				0	CPU	SM2120B
Hardness	9/13/00	Not Spec	48				2	mg/L	SM2340B
pH	9/13/00	6.5-8.5	6.3					SU	150.1
Odor	9/13/00	3	0				0	TON	SM2150B
Sulfates	9/13/00	250	11.9				0.1	mg/L	300.0
Turbidity	9/13/00	1-5	0.15				0.1	NTU	SM2130B
TDS	9/13/00	500	152				1	mg/L	SM2540C
Nitrate	9/13/00	10	0.80				0.01	mg/L	300.0
Nitrite	9/13/00	1	ND				0.01	mg/L	300.0

ND=None Detected

Massachusetts State Certified
Testing Laboratory #MA048

Michael P. Carlson, for
Thorstensen Laboratory, Inc.

MASSACHUSETTS DEP/DIVISION OF WATER SUPPLY

SECONDARY CONTAMINANT REPORT
(Thorstensen Replacement FORM #12.2)

I. PWS INFORMATION.

1. PWS ID#:
2. City/Town: Stow
3. PWS Name: Town of Stow
4. PWS Class (circle one): COM, NTNC, NC

	5. DEP Source Code/Location ID	6. Sample Location	7. Date Collected	8. Collected by:
A:	Red Acre Road	Well #1-85	9/13/00	D.L. Maher Staff
B:				
C:				
D:				

9. Is the source Treated? NO
10. Was the sample collected after treatment? NO
11. Manifolded: [N] If applicable, list the connected sources:

12. Routine [X] Special[ ] (explain below)

Notes:

II. LABORATORY ANALYTICAL INFORMATION:

Lab Name: Thorstensen Laboratory, Inc. Lab Cert.#: M-MA048
Subcontracted? N (use symbols to relate each analyte to a specific lab)
Sub Lab Name: Sub.Lab Cert.#:
Composited[ ] If applicable, list the composited sources:

Notes:

	Analytical Method	Detection Limit mg/L	Date Analyzed	Results mg/L A	B	C	D	Lab Symbol
Lab Sample ID	---	---	---	50318				
Turbidity NTU	SM2130B	0.1	9/13/00	0.15				
TDS	SM2540C	1	9/13/00	152				
Color (Color units)	SM2120B	0	9/13/00	0				
Odor(TON)	SM2150B	0	9/13/00	0				
pH	150.1		9/13/00	6.3				
Alkalinity total(CaCO3)	SM2320B	1	9/13/00	14.5				
Hardness	SM2340B	2	9/13/00	48				
Calcium(Ca)	200.7	0.01	9/13/00	11.6				
Magnesium(Mg)	200.7	0.01	9/13/00	4.6				
Aluminum(Al)	200.9	0.005	9/26/00	ND				
Potassium(K)	200.7	0.1	9/13/00	3.1				
Iron (Fe)	200.7	0.01	9/13/00	0.36				
Manganese(Mn)	200.7	0.01	9/13/00	0.06				
Sulfate(SO4)	300.0	0.1	9/13/00	11.9				

PWSID#: (Form #12.2) Town: Stow

SEC_CON
page 2 of 2

	Analytical Method	Detection Limit mg/L	Date Analyzed	Results mg/L A	B	C	D	Lab Symbol
Chloride (Cl)	300.0	0.01	9/13/00	43.2				
Silver (Ag)	200.9	0.001	9/22/00	ND				
Copper (Cu)	200.7	0.01	9/13/00	ND				
Zinc (Zn)	200.7	0.01	9/13/00	ND				

Laboratory Director Signature and Date Michael Curley 10/2/00

Attention: Mail TWO copies of this report to your DEP Regional Office within 30 days of receipt of results and no later than 10 days after the end of the reporting period.

For DEP/DWS USE ONLY: PLEASE INITIAL & DATE AS COMPLETED

Accepted: Disapproved: Data entered into WQTS:

Comments:

N

MASSACHUSETTS DEP/DIVISION OF WATER SUPPLY

NITRATE REPORT
(Thorstensen Replacement FORM #1B.2)

I. PWS INFORMATION:

1. PWS ID#:
2. City/Town: Stow
3. PWS Name: Town of Stow
4. PWS Class (circle one): COM, NTNC, NC

	5. DEP Source Code/Location ID	6. Sample Location	7. Date Collected	8. Collected by:
A:	Red Acre Road	Well #1-85	9/13/00	D.L. Maher Staff
B:				
C:				
D:				

9. Is the source Treated? NO
10. Is the sample Chlorinated? NO
11. Was the sample collected after treatment? NO
12. Manifolded: [N] If applicable, list the connected sources:
13. Routine [X] Special[ ] (explain below)
Notes:

II. LABORATORY ANALYTICAL INFORMATION:

Lab Name: Thorstensen Laboratory, Inc. Lab Cert.#: M-MA048
Subcontracted? N (use symbols to relate each analyte to a specific lab)
Sub Lab Name: Sub.Lab Cert.#:
Composited[ ] If applicable, list the composited sources:

Notes:

	Sample A	Sample B	Sample C	Sample D
Result (mg/L)	0.80			
MCL (mg/L)	10.0			
Detection Limit (mg/L)	0.01			
Analytical Method	300.0			
Date Analyzed*	9/13/00			
Lab Sample ID#	50318			

* Holding time for chlorinated samples is 48 hours. Holding time for non-chlorinated samples is 14 days.

Laboratory Director Signature and Date Michael Cohen 10/2/00

Attention: Mail TWO copies of this report to your DEP Regional Office within 30 days of receipt of results and no later than 10 days after the end of the reporting period.

For DEP/DWS USE ONLY: PLEASE INITIAL & DATE AS COMPLETED

Accepted: Disapproved: Data entered into WQTS:

Comments:

NI

MASSACHUSETTS DEP/DIVISION OF WATER SUPPLY

NITRITE REPORT
(Thorstensen Replacement FORM #1C.2)

I. PWS INFORMATION:

1. PWS ID#:
2. City/Town: Stow
3. PWS Name: Town of Stow
4. PWS Class (circle one): COM, NTNC, NC

	5. DEP Source Code/Location ID	6. Sample Location	7. Date Collected	8. Collected by:
A:	Red Acre Road	Well #1-85	9/13/00	D.L. Maher Staff
B:				
C:				
D:				

9. Is the source Treated? NO
10. Was the sample collected after treatment? NO
11. Manifolded: [N]
If applicable, list the connected sources:
12. Routine [X]
Special[ ]
(explain below)
Notes:

II. LABORATORY ANALYTICAL INFORMATION:

Lab Name: Thorstensen Laboratory, Inc.
Lab Cert.#: M-MA048
Subcontracted? N
(use symbols to relate each analyte to a specific lab)
Sub Lab Name:
Sub.Lab Cert.#:
Composited[ ] If applicable, list the composited sources:

Notes:

	Sample A	Sample B	Sample C	Sample D
Result (mg/L)	ND			
MCL (mg/L)	1.0			
Detection Limit (mg/L)	0.01			
Analytical Method	EPA 300.0			
Date Analyzed	9/13/00			
Lab Sample ID#	50318			

Laboratory Director Signature and Date Michael A. Carlson 10/2/00

Attention: Mail TWO copies of this report to your DEP Regional Office within 30 days of receipt of results and no later than 10 days after the end of the reporting period.

For DEP/DWS USE ONLY: PLEASE INITIAL & DATE AS COMPLETED

Accepted: Disapproved: Data entered into WQTS:

Comments:

Thorstensen Laboratory, Inc.
66 LITTLETON ROAD, WESTFORD, MA 01886 (978) 692-8395 FAX (978) 692-0023 1-800-649-TEST

FASCIMILE MESSAGE

DATE: 10/10/00

TO: 978-664-3299

FROM: Mike Carlson

ATTN: Ted Monica

REF:

SUBJECT:

MESSAGE: FYI

TOTAL PAGES INCLUDING THIS ONE: 4

MASSACHUSETTS DEP/DIVISION OF WATER SUPPLY
VOLATILE ORGANIC CONTAMINANT REPORT
(FORM #7.3)

VOC

I. PWS INFORMATION:

1. PWS ID#: 2. City/Town: Stow

3. PWS Name: 4. PWS Class (circle one): COM, NTNC, NC

5. DEP Source Code/Location ID	6. Sample Location	7. Date Collected	8. Collected by
Red Acre Rd	Well 1-85	9-13-00	D. L. Maher

9. Is the Source Treated? ___ 10. Was the Sample Collected after Treatment? ___

11. Manifolded [ ] If applicable, list the connected sources:

12. Routine [ ] Special [ ] (explain below)

Notes:

II. LABORATORY ANALYTICAL INFORMATION:

Lab Name: Thorstensen Laboratories Lab Cert.#: MA048

Subcontracted? (Y,N) Y Lab Sample ID#: 21-10114

Sub. Lab Name: Revet Environmental Sub. Lab Cert.#: MA 082

Composited [ ] If applicable, list the composited sources:

Compound (Regulated - has MCL)	Result µg/L	MCL µg/L	Detection Limit µg/L	Analytical Method	Date Analyzed
Benzene	ND	5.0	0.4	524.2	09/22/00
Carbon Tetrachloride	ND	5.0	0.4	524.2	09/22/00
1,1-Dichloroethylene	ND	7.0	0.4	524.2	09/22/00
1,2-Dichloroethane	ND	5.0	0.4	524.2	09/22/00
para-Dichlorobenzene	ND	5.0	0.4	524.2	09/22/00
Trichloroethylene	ND	5.0	0.4	524.2	09/22/00
1,1,1-Trichloroethane	ND	200.0	0.4	524.2	09/22/00
Vinyl Chloride	ND	2.0	0.4	524.2	09/22/00
Monochlorobenzene	ND	100.0	0.4	524.2	09/22/00
o-Dichlorobenzene	ND	600.0	0.4	524.2	09/22/00
trans-1,2-Dichloroethylene	ND	100.0	0.4	524.2	09/22/00
cis-1,2-Dichloroethylene	ND	70.0	0.4	524.2	09/22/00
1,2-Dichloropropane	ND	5.0	0.4	524.2	09/22/00
Ethylbenzene	ND	700.0	0.4	524.2	09/22/00
Styrene	ND	100.0	0.4	524.2	09/22/00
Tetrachloroethylene	ND	5.0	0.4	524.2	09/22/00
Toluene	ND	1000.0	0.4	524.2	09/22/00
Xylenes (total)	ND	10000.0	0.4	524.2	09/22/00
Dichloromethane	ND	5.0	0.4	524.2	09/22/00
1,2,4-Trichlorobenzene	ND	70.0	0.4	524.2	09/22/00
1,1,2-Trichloroethane	ND	5.0	0.4	524.2	09/22/00

PWS ID No: Well 1-85 (FORM #7.3) Town: Stow

VOC

Compound (Unregulated - no MCL)	Result µg/L	Detection Limit µg/L	Analytical Method	Date Analyzed
Chloroform	ND	0.4	524.2	09/22/00
Bromodichloromethane	ND	0.4	524.2	09/22/00
Chlorodibromomethane	ND	0.4	524.2	09/22/00
Bromoform	ND	0.4	524.2	09/22/00
m-Dichlorobenzene	ND	0.4	524.2	09/22/00
Dibromomethane	ND	0.4	524.2	09/22/00
1,1-Dichloropropene	ND	0.4	524.2	09/22/00
1,1-Dichloroethane	ND	0.4	524.2	09/22/00
1,1,2,2-Tetrachloroethane	ND	0.4	524.2	09/22/00
1,3-Dichloropropane	ND	0.4	524.2	09/22/00
Chloromethane	ND	0.4	524.2	09/22/00
Bromomethane	ND	0.4	524.2	09/22/00
1,2,3-Trichloropropane	ND	0.4	524.2	09/22/00
1,1,1,2-Tetrachloroethane	ND	0.4	524.2	09/22/00
Chloroethane	ND	0.4	524.2	09/22/00
2,2-Dichloropropane	ND	0.4	524.2	09/22/00
o-Chlorotoluene	ND	0.4	524.2	09/22/00
p-Chlorotoluene	ND	0.4	524.2	09/22/00
Bromobenzene	ND	0.4	524.2	09/22/00
1,3-Dichloropropene	ND	0.4	524.2	09/22/00
1,2,4-Trimethylbenzene	ND	0.4	524.2	09/22/00
1,2,3-Trichlorobenzene	ND	0.4	524.2	09/22/00
n-Propylbenzene	ND	0.4	524.2	09/22/00
n-Butylbenzene	ND	0.4	524.2	09/22/00
Naphthalene	ND	0.4	524.2	09/22/00
Hexachlorobutadiene	ND	0.4	524.2	09/22/00
1,3,5-Trimethylbenzene	ND	0.4	524.2	09/22/00
p-Isopropyltoluene	ND	0.4	524.2	09/22/00
Isopropylbenzene	ND	0.4	524.2	09/22/00
Tert-butylbenzene	ND	0.4	524.2	09/22/00

PWS ID No: Well 1-85 (FORM #7.3) Town: Stow

VOC

Compound (Unregulated - no MCL)	Result µg/L	Detection Limit µg/L	Analytical Method	Date Analyzed
Sec-butylbenzene	ND	0.4	524.2	09/22/00
Fluorotrichloromethane	ND	0.4	524.2	09/22/00
Dichlorodifluoromethane	ND	0.4	524.2	09/22/00
Bromochloromethane	ND	0.4	524.2	09/22/00
Methyl Tertiary Butyl Ether*	ND	0.4	524.2	09/22/00

* optional

Surrogate Recoveries (As required by EPA method 524.2)

Compound	% Recovered	QC Limits (%)
4-bromofluorobenzene	100	80-120
1,2-dichlorobenzene-d₄	111	80-120

The QA/QC required matrix spike sample information is on file at our office.

Laboratory director signature and date: Michael P. Carlson 10/10/00

Attention: Mail TWO copies of this report to your **DEP Regional Office** within 30 days of receipt of results and no later than 10 days after the end of the reporting period.

FOR DEP/DWS USE ONLY: PLEASE INITIAL AND DATE AS COMPLETED

Accepted:	Disapproved:	Data entered into WQTS:
Comments:		

APPENDIX A

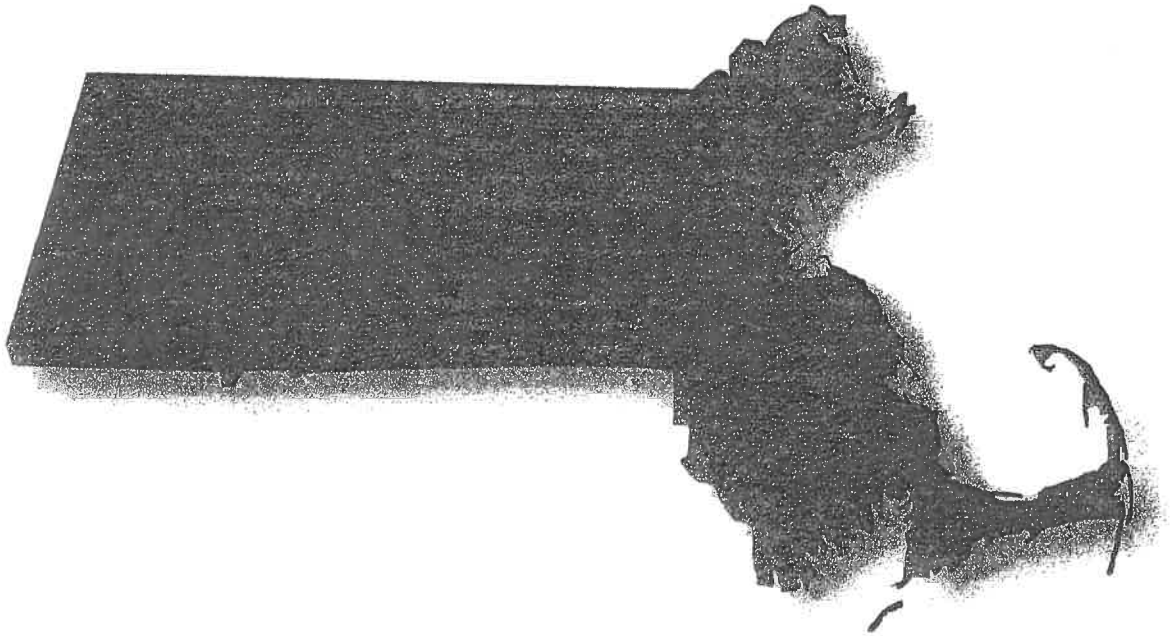
DOCUMENT #12

200 MASSACHUSETTS WATER RATE SURVEY
COMPLIED BY TIGHE & BOND, WESTFIELD, MA

Tighe&Bond

Consulting Engineers • Environmental Specialists

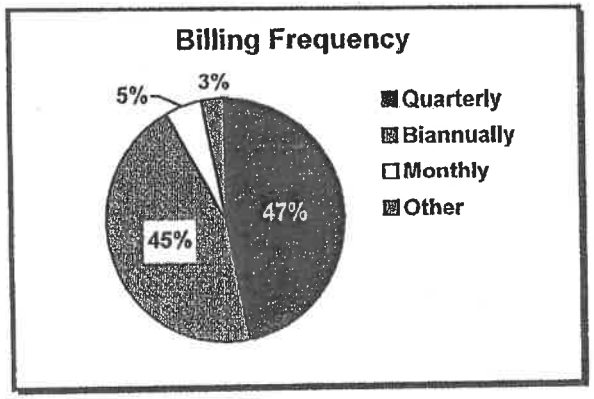
2004 Massachusetts Water Rate Survey



53 Southampton Road, Westfield, MA 01085 T 413-562-1600 F 413-562-5317
4 Barlows Landing Road, Unit #18, Pocasset, MA 02559 T 508-564-7285 F 508-564-4298
324 Grove Street, Worcester, MA 01605 T 508-754-2201 F 508-795-1087

Other offices: Bellows Falls, VT; Danbury, CT; Middletown, CT; Shelton, CT

rates.tighebond.com



The majority of respondents to the written survey use either a quarterly billing cycle (47%) or a biannual billing cycle (45%). Five percent use a monthly billing cycle, and the remainder use either an annual, bimonthly, or tri-annual frequency. Of those communities responding to the written survey 18% stated that they have a separate rate structure for businesses and 16% provide elderly discounts. Seven percent of communities report that they offer an early payment discount, 6% provide separate seasonal and 7% provide low-income rates.

Tighe & Bond would like to thank all public water suppliers for their participation in this survey. Comparisons of water rate structures and resulting typical homeowner's costs can be difficult given the wide variety of user charge methods in use. If we have incorrectly interpreted information for any community please let us know and we will make appropriate corrections. Questions, comments or suggestions are certainly welcome. Please contact Mary Beth Morris, P.E. at (413) 572-3247 for further information.

Tighe & Bond has been providing consulting engineering services to government and industry for decades. An adequate, good quality drinking water supply is essential for every community. Tighe & Bond provides a wide range of water resources services, from identifying needs and evaluating supplies to engineering new sources, treatment facilities and storage and distribution systems. Tighe & Bond also provides expertise in wastewater and residuals management, civil engineering and solid and hazardous waste management.

Abington/Rockland Joint Water Works

Annual Cost	Water Rate	Billing Cycle	Primary Water Source Type	Funding	Separate Business Rate	Seasonal Rate	Elderly Discounts	Low Income Discounts	Early Payment Discounts	Population Served	Last Rate Change
$348	$2.50/HCF	Quarterly	SW	Special Revenue	No	No	No	No	No	32,000	7/1/00

Notes: Service charge: $10.00 per billing. Customary charge: $2.00/billing meter charge.

Acton Water Supply District

Annual Cost	Water Rate	Billing Cycle	Primary Water Source Type	Funding	Separate Business Rate	Seasonal Rate	Elderly Discounts	Low Income Discounts	Early Payment Discounts	Population Served	Last Rate Change
$342	Ascending	Biannually	GW	NA	No	Yes	No	No	No	19,305	3/1/03

Notes: $10.00 per bill includes 500 CF. 2 Separate rates for all usage when 500 CF has been exceeded (Summer & Winter) - Winter - $0.024/CF - 1-5,000CF; $0.026/CF - 5,000-10,000CF; $0.035/CF - over 10,000CF. Summer - $0.029/CF - 1-5,000CF; $0.031/CF - 5,001-10,000CF; $0.042/HCF - over 10,000CF.

Acushnet, Town of

Annual Cost	Water Rate	Billing Cycle	Primary Water Source Type	Funding	Separate Business Rate	Seasonal Rate	Elderly Discounts	Low Income Discounts	Early Payment Discounts	Population Served	Last Rate Change
$254	$2.00/HCF	Biannually	PSW	Enterprise	No	No	No	No	No	2,750	7/1/96

Notes: Customary charge: $7.00 per billing/meter rental. Connection fee: $1,000.00. Per 2002 Water Rate Survey.

Adams Fire District

Annual Cost	Water Rate	Billing Cycle	Primary Water Source Type	Funding	Separate Business Rate	Seasonal Rate	Elderly Discounts	Low Income Discounts	Early Payment Discounts	Population Served	Last Rate Change
$204	$1.60/1000 gals.	Quarterly	GW	General/ Special Revenue	No	No	No	No	No	3,100	7/1/02

Notes: $15.00 Customer Charge per billing. Other Customary Charges: Fire Protection: $11.75 per unit per billing; Street Lighting: $6.15 per unit per billing. Connection Fees: Water Installation Permit: $50.00; Capital Outlay Fee: $500 - $8,000 (based on size of pipe).

Agawam, Town of

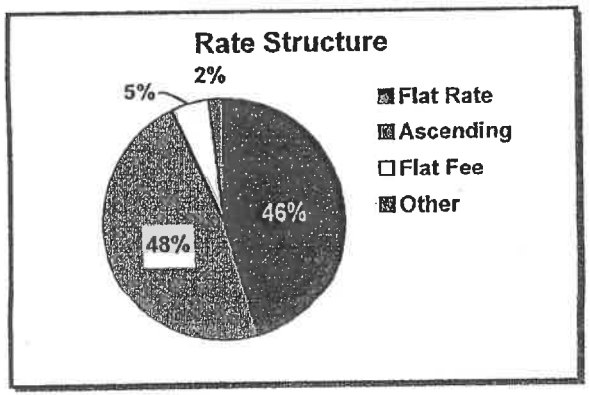
Annual Cost	Water Rate	Billing Cycle	Primary Water Source Type	Funding	Separate Business Rate	Seasonal Rate	Elderly Discounts	Low Income Discounts	Early Payment Discounts	Population Served	Last Rate Change
$151	$1.02/HCF	Biannually	PSW	Enterprise	No	No	Yes	Yes	No	30,000	1/1/91

Notes: Customary charge: $14.50 Account Service Charge per billing. Connection fees: $865 minimum/3/4" service.

Tighe & Bond is pleased to publish our 2004 "Water Rate Survey" of public water suppliers of communities in Massachusetts. The survey provides available information from the following sources:

- data entered directly on our website (rates.tighebond.com)
- written survey responses
- our extensive database of rate information for our existing clients
- the 2004 Annual Water & Sewer Retail Rate Survey published by The Massachusetts Water Resources Authority (MWRA) Advisory Board
- telephone surveys
- City and Town websites

Our written survey was mailed to all communities in Massachusetts. Approximately 84% of communities in Massachusetts have public water supply. About 62% of the communities use groundwater as their primary water source, with the remaining 38% relying on surface water sources.



A variety of different **rate structures** are used throughout the Commonwealth. Based on the written survey results, 46% of communities use a flat rate structure; 48% use an ascending rate structure and only 5% use a flat fee, with less than two percent using descending rates. To allow for a comparative analysis, we have calculated the "typical" yearly homeowner's cost assuming consumption of 120 hundred cubic feet (90,000 gallons) per year. Based on the information included in this survey, typical annual water costs in Massachusetts range from a low of $45 per household to a high of over $1,215!. The 2004 average is $321 per household, representing an increase of 9.7% over 2002 averages.