

Results of the Nottingham Water Well Survey of November 2004

February 2005

A Partnership Initiative of
Nottingham, NH and
The Natural Resources Outreach Coalition



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I. Introduction

In 2003, the Nottingham Conservation Commission (NCC) applied to the Natural Resources Outreach Coalition (NROC) for assistance in addressing current issues related to the rapid growth of the town. NROC, coordinated by UNH Cooperative Extension, is a partnership of 10 state, private non-profit, local and regional organizations that assist NH coastal watershed communities in developing natural resource-based planning strategies. NROC works closely with the towns in this program and helps to identify resources and provides financial support for communities wanting to develop projects addressing population growth and population growth planning.

Upon acceptance of the application, community boards and municipal groups and citizens were invited to attend a number of formative meetings held in early 2004 to determine the direction of the initiative. At these early sessions of information gathering and deliberation, population growth impacts on Nottingham's water resources evolved as the focus of this project. At this time, the Nottingham Planning Board joined with the NCC as an equal partner in moving forward with the project. The decision was made to carry out a wellwater survey to help assist in planning decisions for the Town of Nottingham. Funding for the survey was provided through the NH Coastal Program. A total of \$2400 (Appendix 1) was provided for printing and mailing expenses associated with the survey (actual expenses totaled \$2077.48). Matching resources were provided through the volunteer activities associated with the survey (design of survey content, preparation for mailing, tallying results, and writing this report). More than 200 hours were volunteered by Nottingham residents.

II. Previous Wellwater Information

The Town of Nottingham Master Plan, February 1987, Amended 1990, 2004, offers robust support for targeting water quality and quantity as an investigative focus. In Chapter VI, Natural and Historic Resources, Section J: Groundwater states: "The residents of Nottingham rely entirely on private wells for water supply. There has never been a public water supply system and it is probably economically infeasible in the near future. The potential for groundwater derivation in Nottingham is moderate. The primary surficial geology is composed of till and marine deposits that usually have low domestic water yields."

In a table and subsequent paragraph, the following information is given:

"An early analysis (1964) of small private wells in Nottingham indicated the following:

Average depth	170.5 feet
Average yield	5.3 gallons per minute
Average depth to bedrock	30.0 feet

(Source: Stewart, Drilled Water Wells in New Hampshire, 1964.)"

"The average depth for Nottingham's wells was one of the highest in the seacoast region. The average yield was the lowest among the 44 towns surveyed. This (1964) report

suggests that the potential for groundwater development as a municipal water supply in Nottingham is minimal.”

“The most recent information on groundwater development is available from the NH Water Well Bank. Their records indicate that 24 new wells were drilled in 1984 and 34 in 1985. Of the total 58 wells completed, 55 are used for domestic purposes, one for agricultural and two for industrial (churches). Virtually all of these wells were drilled into bedrock.”

“In comparison to the 1964 survey, the 1984-85 well completion data indicates the following:

Average depth	254 feet
Average yield	9.61 gallons per minute
Average depth to bedrock	15 feet

The demand for water in Nottingham is growing. Residential consumption can be estimated by multiplying the number of persons by the average daily consumption (to obtain Gallons Per Day (GPD)). Using an average daily consumption of 70 gallons, Table VI-4 Water Demands in Nottingham, Past and Projected, can be updated to reflect:

Year	Population	Consumption (GPD)
1980	1952	136,640
1985	2373	166,110
1990	2530	177,100
2000 (Projected)	2750	192,500
2000 (Census)	3701	259,070

The Master Plan makes the following recommendations:

- “The Town should inventory the land uses that are situated in the best potential groundwater areas. This inventory should include: the type of development overlying the recharge zone; the surface water bodies overlying these areas; the size of the watershed contributing to these areas (indirect recharge); detailed information on private wells in these areas (depth, location, yield, etc.); and potential threats to the quantity and quality of these groundwater resources.
- The Town should inventory potential impacts to groundwater quality and quantity throughout the Town.
- The Town should consider implementing an aquifer protection ordinance to secure the quantity and quality of recharge water through the prime drainage areas mentioned (in the Master Plan).”

III. Survey Description

The Nottingham Water Well Survey was divided into three major groups of data associated with each well. The first group reflected the specifics of each well use, construction, and location. The second group reflected water quantity for each well. The third group reflects water quality of each well use. Each grouping provided applicable entries for up to three wells. The survey was mailed to all addresses in the Town of Nottingham by bulk mail on October 23, 2004, and the survey is attached as Appendix 2. This report summarizes the responses from this survey. Survey data are presented as tallies for each survey question, and graphs and maps of the results are provided where appropriate. The total number of surveys returned was 471 out of 1758 (26.8%), as of November 30, 2004. The Nottingham Wellwater Survey Results, which presented data as a compilation of responses, was mailed to all addresses in town on March 2, 2005 (Appendix 3).

IV. Survey Results

In October 2004, 1758 Nottingham Water Well Surveys were mailed to all mailing addresses in Nottingham and by the end of November, 417 surveys (26.8%) had been returned. The data supplied in those returned surveys were used to compile the results in this Summative Document.

In the initial survey, well owners were given assurance that the well data would be used for research purposes only and that the results would be reported in an anonymous summary format. The Water Well Survey allowed well owners to remain as anonymous as they wished by noting that names and addresses were optional information. When the results were tallied, only a small handful, fewer than 20 returned surveys, did not have owner names and/or addresses: the great majority of townspeople were comfortable enough to provide this information. As a result, we were able to summarize survey results on the basis of individual tax maps, providing a spatial component to the database. Distribution of well data across the community area is a powerful database that will allow better tracking of trends in water quality and quantity as Nottingham grows in population and the demand for water increases. This data can also assist in community planning options to insure that all citizens would be able to have enough good clean groundwater for their own needs.

The purpose of this Summative Document is to publish the results of the Nottingham Water Well Survey of November 2004, and to present the data in a useful manner. Readers are encouraged to provide their own interpretations.

The Project Leaders enthusiastically endorse the use of this document by all municipal groups and individuals who wish to monitor water usage and quality for the preservation of this natural resource for the good of all.

Numbers: Not all of the respondents were able to answer all of the queries: because of this, and the design of the Survey itself, the total numbers below do not necessarily mean the total number of wells.

Well Uses: In the 471 returned surveys, there were a total of 672 well uses for up to three wells per property. (Due to the wording on the survey, because a well might have more than one use, this does not mean that 471 well owners have 672 wells.)

Nottingham Tax Map

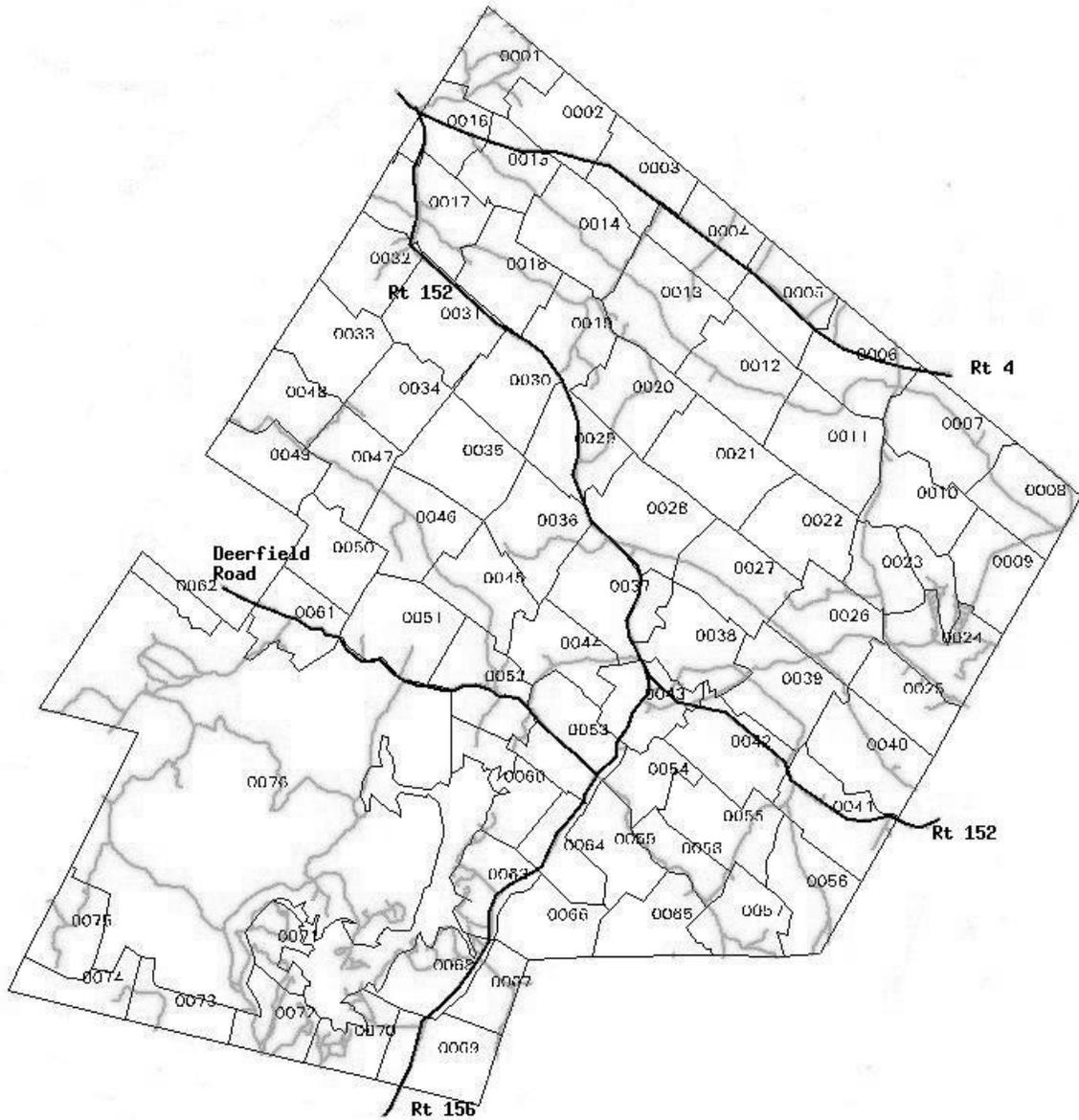


Figure 1

The Nottingham Tax Map is labeled with Tax Map number and major roads. Some of the results to follow are summarized and presented on the basis of Tax Map.

Number of Surveys Submitted, Shown by Tax Map

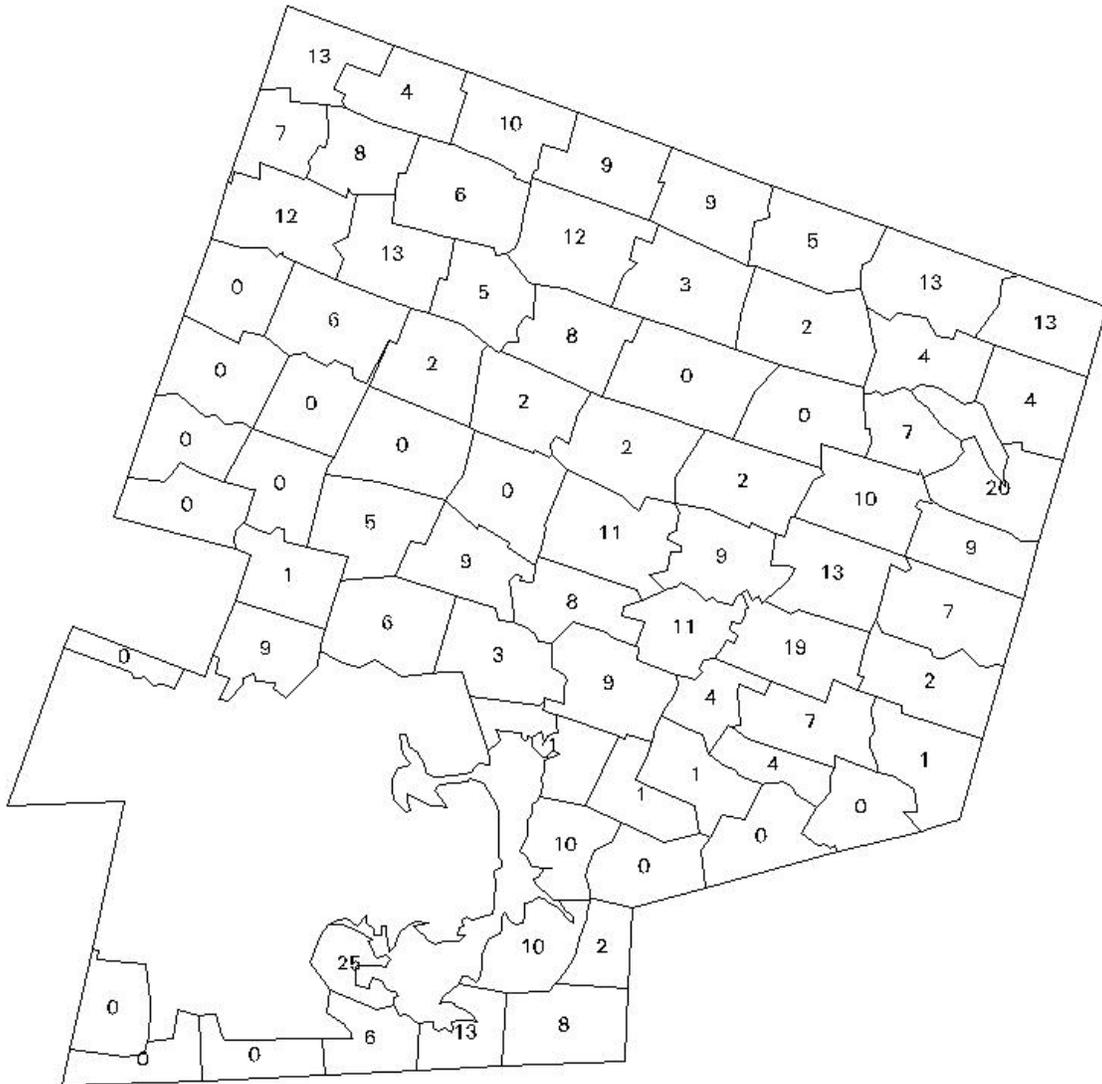


Figure 2

Each number on this figure indicates the number of surveys submitted for each tax map.

A. Water Well Use, Construction and Location.

As reported by the survey:

The average number of wells located at each address was 1.1, with the number of wells per property ranging from one to three wells. The average lot size of each reporting address was 5.6 acres with the smallest lot reported as 0.05 acres and the largest lot reporting as 72 acres.

The average number of full time residents at each reporting address was 2.57, with the least being one person and the most being 21 (this reflects one survey submitted for a community well serving 21 residents).

Use of Well <i>(check all that apply)</i>	Residential.....	460	13	1
	Commercial/Industrial.....	4	0	1
	Shared Water Supply.....	13	0	1
	Agricultural.....	18	5	0
	Irrigation (lawn & garden).....	99	9	2
	Irrigation (commercial/farm).....	3	0	0
	Out of service <i>(Why?)</i>	1	29	5
	Other <i>(Describe)</i> : Animals	7	0	1
Type of Well Construction	Drilled in Bedrock.....	316	9	0
	Drilled in sand/Gravel.....	43	2	0
	Driven Point.....	11	1	0
	Dug.....	30	34	9
	Other <i>(Describe)</i> : Artesian	14	0	0
Reason for Constructing a New or Additional Well	Not Applicable.....	253	13	0
	New Home.....	80	0	0
	Replace Existing Well.....	30	0	0
	Provide Additional Supply.....	9	4	0
	Other <i>(Describe)</i>	8	3	1
Total Depth of Well (in feet)		6-900'	8-540'	9-25'
Depth to Bedrock (in feet)		N/A	N/A	N/A
Length of Casing Installed in Well (in feet)		N/A	N/A	N/A
Well Casing extends above ground (inches)		N/A	N/A	N/A
Well Yield (in gallons per minute)		1-125	2-45	N/A
Date the well was drilled (or approximate age of well in years)		1844-2004	1800-1999	1800-1983

What type of residence occupies your property?

<input type="checkbox"/> Single family house (209) <2000 ft ²	(7) "Attached house" (shared walls between units) (e.g. Condominium)	(9) Mobile home (9) Apartment
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(121) 2000 -4000 ft ² (6) >4000 ft ²	or townhouse)	
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What are the primary activities if the property is non-residential?

(1) Commercial (type of business): Municipal	(4) Farm (describe): Animal, vegetable, (0) Nursery
(0) Industrial (type of business):	(2) Livestock (5) OTHER (describe): See Appendix 4

Well Uses: of these 672 uses,

- 474 (70.5%) are residential,
- 5 (0.7%) are industrial/commercial,
- 23 (3.4%) are agricultural,
- 110 (16.4) are for lawn and garden irrigation,
- 3 (0.4%) are for commercial and farm irrigation,
- 8 (1.2%) are for animal use, and
- 35 (5.2%) are out of service.

Type of Well Construction: the 471 surveys reported a total of 469 constructions.

- 325 (69.3%) were drilled in bedrock,
- 45 (9.6%) were drilled in sand or gravel,
- 12 (2.6%) were driven point wells,
- 73 (15.6%) were dug, and
- 14 (3.0%) were Artesian.

Reason for Constructing a New or Additional Well: there were 401 reasons noted:

- 266 (66.3%) not applicable,
- 80 (20.0%) for a new home,
- 30 (7.5%) to replace an existing well,
- 13 (3.2%) to provide additional supply, and
- 12 (3.0%) for other reasons.

Total depths of wells ranged from 6 to 900 feet for well #1,

- 8 to 540 feet for well #2 and
- 9 to 25 feet for well #3.

Well yields were 1 to 125 gallons per minute for well #1,

- 2 to 25 gallons per minute for well #2.
- There was no data available for well #3.

Age of well: Well #1 ages date from 1844 to 2004,

- Well #2 from 1800 to 1999, and
- Well #3 from 1800 to 1983.

Resident types: Out of a total of 361 responses, 209 (57.9%) were single-family homes less than 2000 ft², 121 (33.5 %) were single-family homes 2000 to 4000 ft², 6 (1.7%) were single-family homes greater than 4000 ft², 7 (1.9%) were attached houses with shared walls), 9 (2.5%) were mobile homes, and 9 (2.5%) were apartments.

Non-residential uses of the property: there were a total of 12 properties in this category: Commercial 1; Farm 4; Livestock 2; Municipal, Church, and Garden totaled 5.

Several questions in this section required text answers – a summary of these responses are included in Appendix 4.

Well Depth and Yield – Summary of Data Sources

The following table shows the results of this survey with data from 2 earlier studies.

Year	Data Source	Number of wells	Well Depth	Well Yield
1964	Stewart	Unknown	170.5	5.3
1984-1985	NH Water Well Bank	58	254	9.61
1986-1994	This survey	67	332	18.4
1995-2004	This survey	95	350	20.3

Table 1. **Well Depth and Yield.** Summary of available data on well depth and yield from Stewart (1964, Drilled Water Wells in New Hampshire), NH Water Well Bank (1985), and this survey. Note that the data from 1984-85 is from the state well registry, whereas other data is derived from survey data and includes only a subset of wells.

Average Depth of Wells Reported, Shown by Tax Map

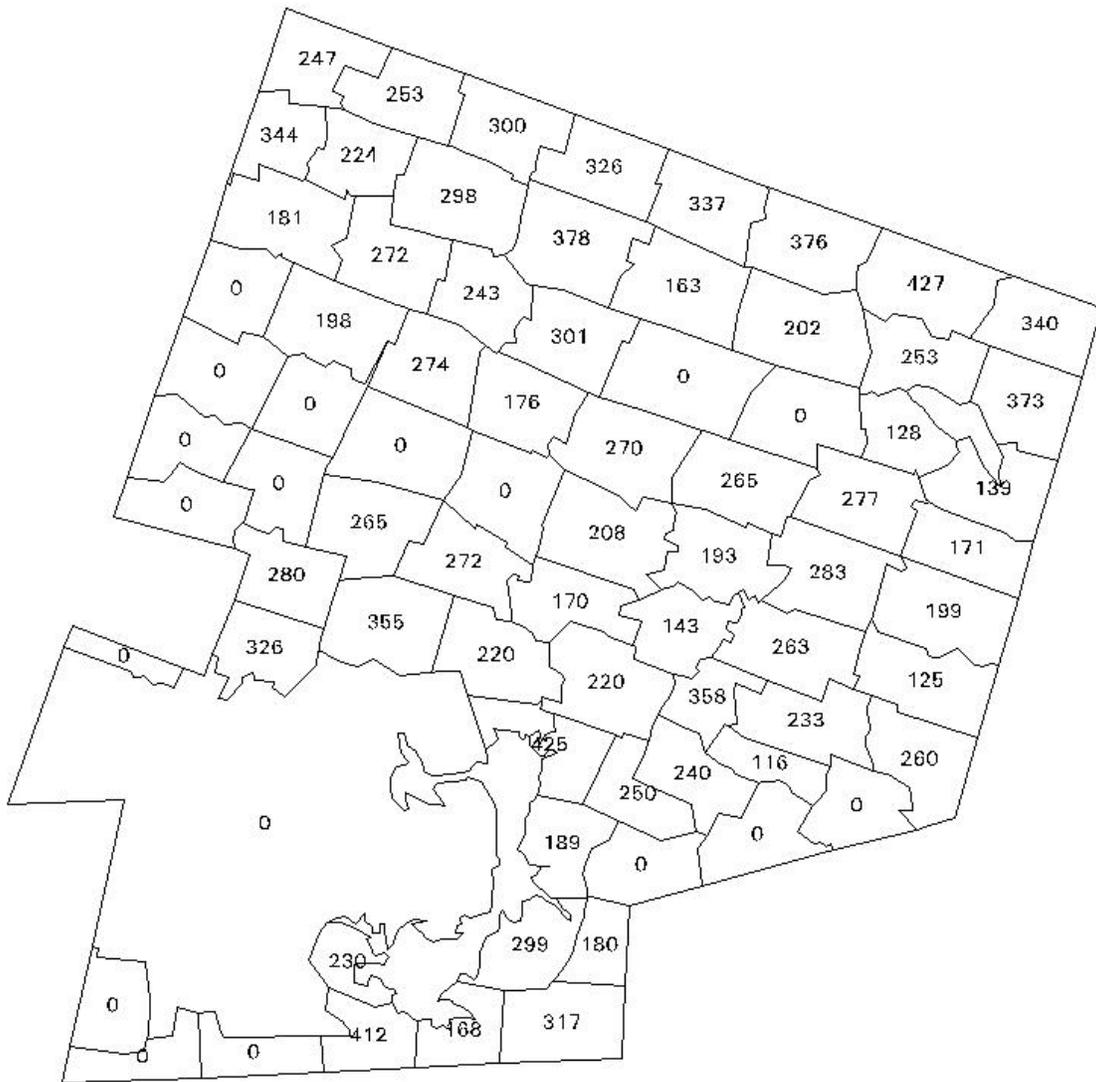


Figure 3

Each number on this figure indicates the average of the survey reported well depths of each tax map.

Maximum Depth of Wells Reported, Shown by Tax Map

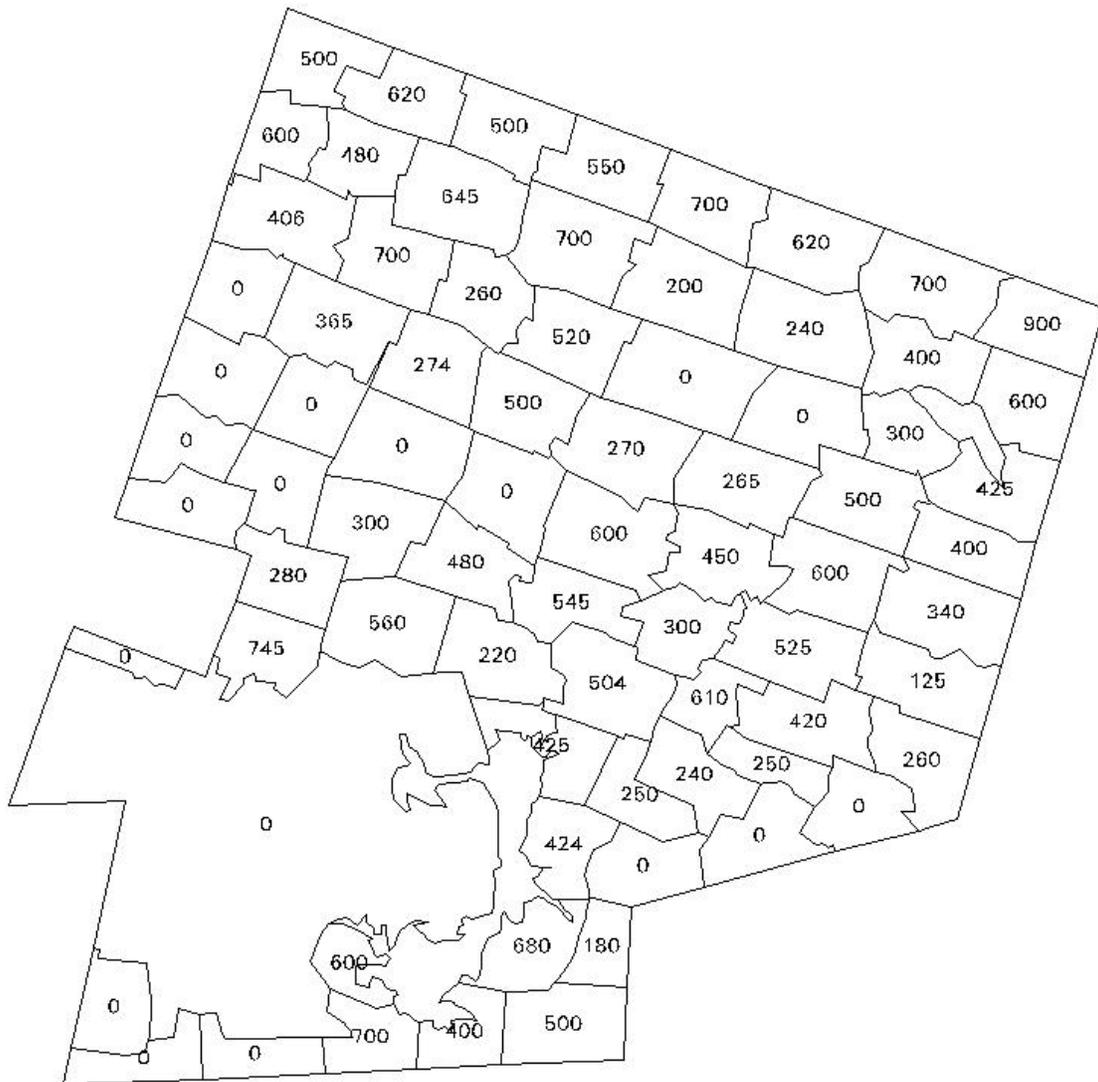


Figure 4. Each number on this figure indicates the maximum well depth reported by the survey for each tax map.

Number of Drilled Wells Versus Year Drilled, as Reported by Survey

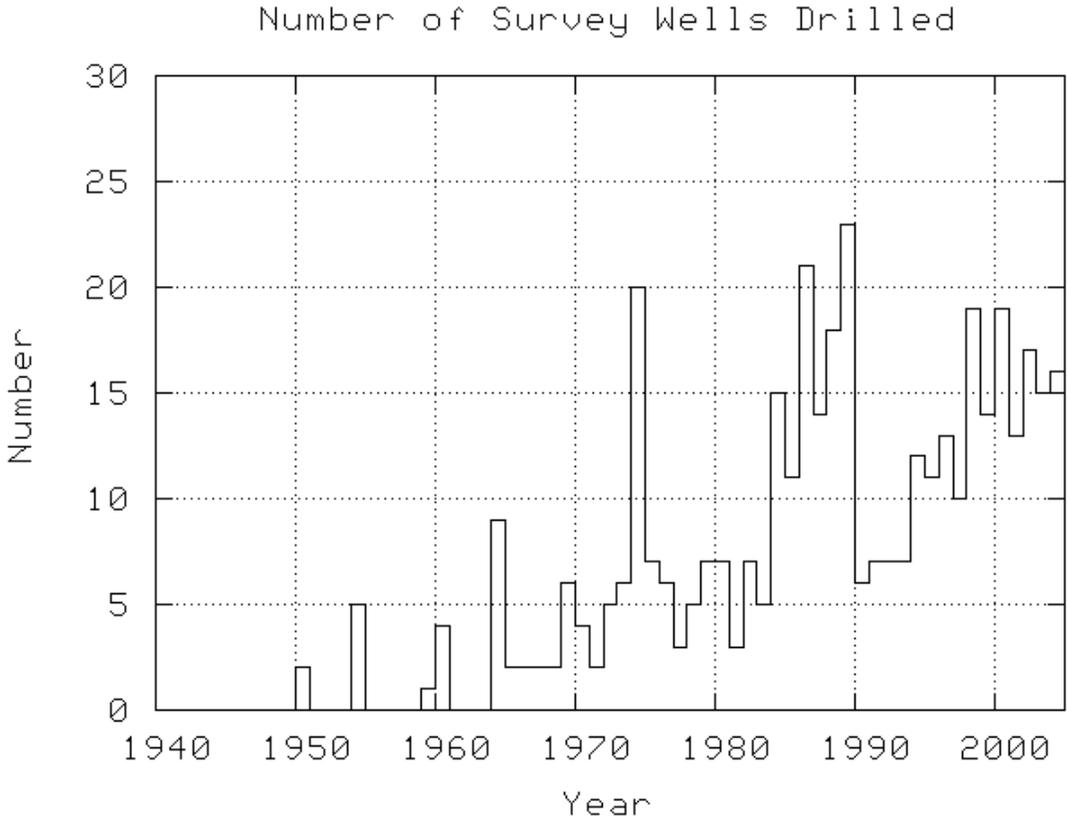


Figure 5. This bar chart indicates the number of wells reported by the survey-for each year. Note that the spikes, in general, reflect those years of building booms in Nottingham.

Yield Versus Depth, as Reported by Survey

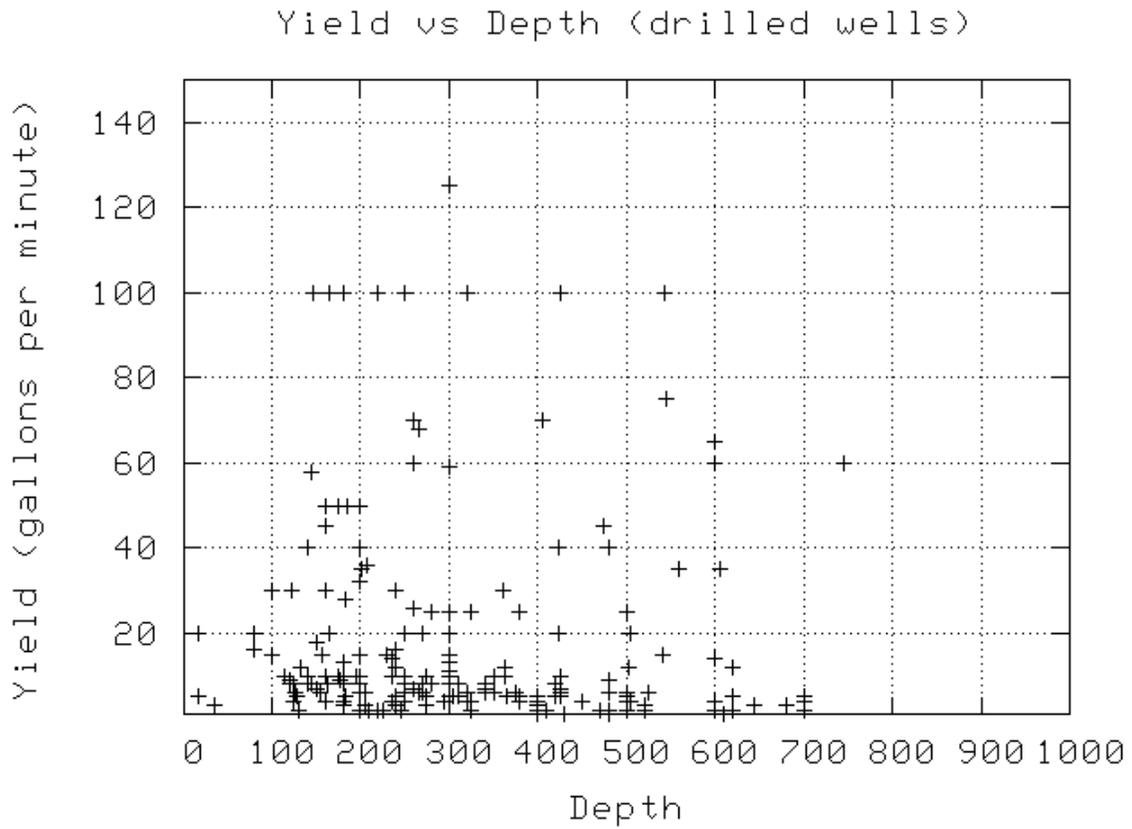


Figure 6. Points on this graph indicate the yield and depth of each drilled well reported by the survey.

Nottingham Tax Map

Depth Versus Year Drilled, as Reported by Survey

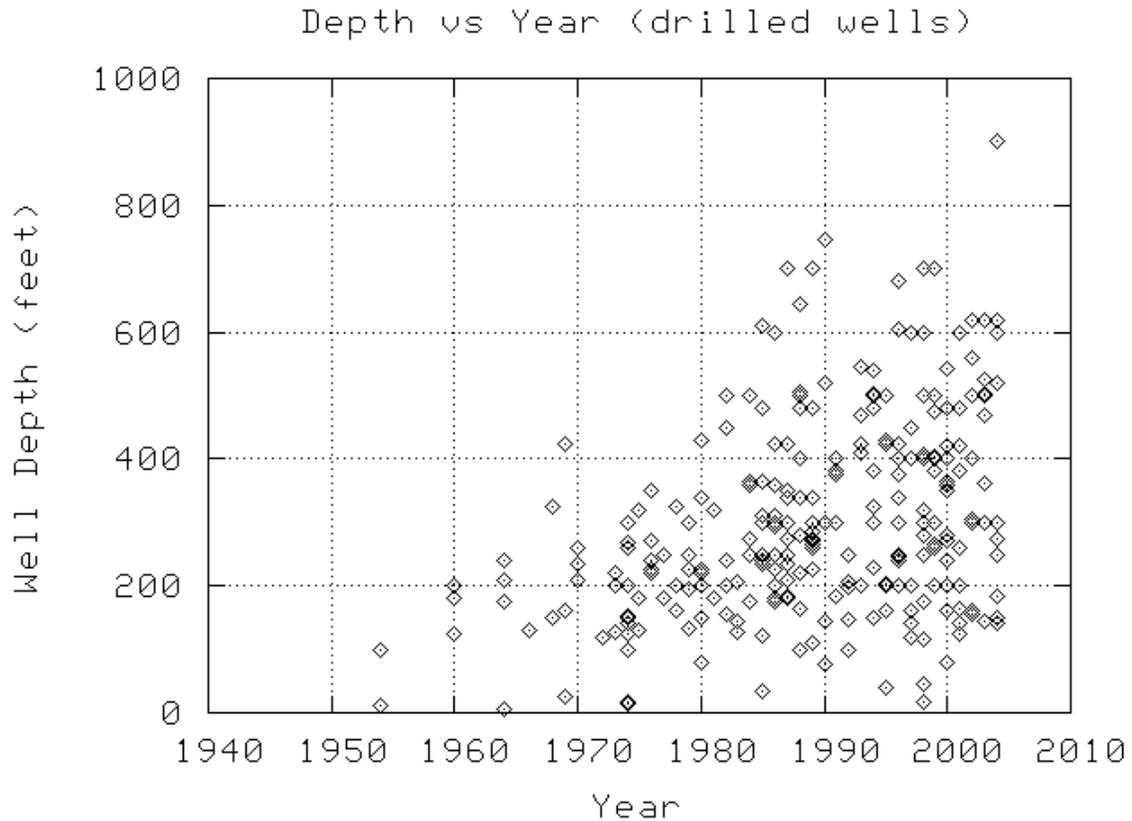


Figure 7. Each point on this graph indicates a well depth and year installed for each drilled well reported by the survey. It appears from this figure that wells are being drilled deeper, perhaps as a result of changes in technology, improved drilling equipment, increased financial resources per household and/or that the water yield was not adequate to sustain usage needs.

B. Water Quantity

How have you been affected by droughts during the past 10 years?

	Well #1	Well #2	Well #3
No problem	398	13	2
Had to limit household use.....	38	14	2
Not enough water to irrigate as much as I wanted.....	31	10	2
Couldn't irrigate at all.....	5	6	1
Well(s) went completely dry.....	11	8	0

Have you run out of water during the past five years for reasons other than mechanical pump failure?

Never	398	12	1
Once	15	3	0
More than once	10	5	0
Regularly	11	5	0

If applicable, how have you dealt with these water shortages?

(17) Purchased bottled water	(60) Conserved or self-limited use
(4) Purchased bulk water	(6) Other (Describe): see Appendix 4

Have you taken any of the following actions to conserve water? (Please check all that apply)

(141) Take shorter showers	(139) Water outdoors during early morning or evening
(123) Repair running toilet	(14) Installed a water efficient irrigation system
(171) Installed low-flow plumbing fixture(s)	(51) Other (Please specify): See Appendix 4
(93) Reduced landscape area irrigated	

How have you been affected by droughts during the past ten years?

There were 483 Well #1 entries:

398 (82.4%) had no problem,

74 (15.3%) had to limit household and/or irrigation use'

11 (2.3%) of wells went dry.

There were 58 combined Well #2 and #3 entries:

15 (25.9%) had no problem,

35 (60.3%) had to limit household and /or irrigation use, and

8 (13.8%) of these wells went dry.

Have you ever run out of water during the past five years for reasons other than mechanical pump failure?

There were 434 Well #1 entries:
 398 (91.7%) never,
 15 (3.5%) reported one time,
 10 (2.3%) reported more than one time, and
 11 (2.5%) reported regularly.
 (Once or more times: 36 (8.3%)).

There were 26 combined Well #2 and #3 entries:
 13 (50%) never, and
 13 (50%) at least once.

How people dealt with water shortages (number of respondents who checked each item follows each entry).

- Purchased bottled water - 17
- Purchased bulk water - 4
- Conserved or self-limited use - 60
- Other (new well, wait for water to return) - 6
- Take shorter showers - 141
- Repair running toilet - 123
- Installed low flow plumbing fixtures - 171
- Reduced landscape area irrigated - 93
- Water outdoors during early morning or evening - 139
- Installed a water efficient irrigation system – 14
- Other (Energy Star, Neptune Washer, use rain/lake water, limit use) – 51

C. Well Quality Issues

Do you have a point-of –entry water treatment system in your home?

(178) Yes	(293) No
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Do you have any of the following color stains in your water fixtures (toilet bowl, etc.)

(44) Green	(10) Black	(21) Other see App 4
(202) Rust/brown/orange	(28) Blue	N/A

How often have you had to change your hot water heater?

	Gas	Electric	Other
Total	95	94	84
Never	45	27	51
Once	40	50	16
More than once in 10 years	5	12	3

Does your drinking water supply have any unpleasant odor, smell or taste?

Well #1 Well #2

Well #3

Odor.....	82	0	1
Smell.....	53	1	1
Taste.....	64	1	1

Are you aware of any seasonal variations in your water quality?

Well #1 Well #2

Well #3

No seasonal variations	420	5	0
Yes, there have been seasonal variations.....	40	8	0

If you answered YES to the above question, answer the following:

Well #1 Well #2

Well #3

What problems have you experienced? State time/s of year when you have experienced problems	34	6	1
In which year/s have you experienced problems?..... See Appendix 4 for details	31	5	1
	1995- 2003	1993	Most Years

Have you had any problems with sediment in your water?

Well #1 Well #2

Well #3

No sediment problems	128	5	0
Yes, sediment in water	89	3	0
If YES, have you undertaken any remedial action?.....	110	1	0
Describe any remedial actions taken: See Appendix 4	Filter	Filter	N/A

Have you tested your water for quality, and were any problems identified?

Well #1 Well #2

Well #3

Never tested	113	8	0
Yes, I have tested it	347	4	1
Describe any water quality problems identified: See Appendix 4			

Are you concerned about the following contaminants affecting your well/s?

(166) MTBE (gasoline) (111) Road salt	(151) Bacteria (134) Arsenic	(101) Nitrates (166) Radon	(36) Fluoride
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Do you have a point of entry water treatment system in your home?

Total 471: Yes – 178 (37.8%); No – 293 (62.2%).

Do you have any of the following color stains in your water fixtures?

Green – 44

Rust/brown/orange – 202

Black – 10

Blue – 28

Other – 21 (no details available).

How often have you had to change your hot water heater?

Gas total: 95

Never - 45 (47.4%);

Once - 40 (42.1%);

More than once in 10 years - 5 (5.3%)

Electric total: 94

Never - 27 (28.7%);

Once - 50 (53.2%);

More than once in 10 years - 12 (12.8%)

Other total: 84

Never - 51 (60.7%);

Once - 16 (19.0%);

More than once in 10 years - 3 (3.6%).

Does your drinking water supply have any unpleasant odor, smell or taste?

For all three wells: odor - 83; smell - 55 (since these are the same question, it can be assumed that at least 83 were unpleasant to the nose); taste - 66.

Are you aware of any seasonal variations in your water quality?

For Well #1, 420 (91.3%) stated no seasonal variations and

40 (8.7%) stated there were seasonal variations.

For Well #2, 5 (38.5%) stated no seasonal variations and

8 (61.5%) stated there were seasonal variations.

If you answered yes to the above question (a) please state what problems you have experienced, (b) the time of year problems were experienced and (c) in which years?

For Well #1: (a) 34 “low water”; (b) 31 “summer”; (c) 1995 – 2003.

For Well #2: (a) 6 “low water”; (b) 5 “summer”; (c) 1993.

For well #3: (a) 1 “low water”; (b) 1 “summer”; (c) “most years”.

Have you had any problem with sediment in your water?

For Well #1: 217 entries: No problems -128 (59.0%); Yes, Problems - 89 (41.0%).
110 had filters installed.

For Well #2: 8 entries: 5 - No problems; 3 - Yes, problems; 1 filter installed.

There were no entries for Well #3.

Have you tested your water for quality and were there any problems identified?

There were 460 entries for Well #1:

113 (24.6%) were never tested;

347 (75.4%) were tested.

For Well #2 and #3 there were 13 entries:

8 (61.5%) were never tested;

5 (38.5%) were tested.

Water quality problems identified were as follows:

Iron, manganese, radon, bacteria, hard water, sulfur, pH, salt, Coliforms (bacteria), magnesium, lead, (and none).

Are you concerned about the following contaminants affecting your wells?

116 - MTBE (gasoline)

111 - Road salt

151 - Bacteria

134 - Arsenic

101 - Nitrates

166 - Radon

36 - Fluoride

Would you be willing to have your water tested at no cost to you (and be willing to share the results)?

438 (93.0%) replied "Yes" and 33 (7.0%) replied "No".

Appendix 1

Grant Application and Contract

Well Survey and Groundwater Education Project

Contact Persons:

Susan Mooney
Nottingham Conservation Commission
603-670-5022

Nottingham Planning Board
603-679-9597

PO Box 114
Nottingham, NH 02390

A. Background

1. Specific natural resource or community value to be protected:

This proposal focuses on strategies to evaluate and protect the quality and quantity of our ground water resources.

2. Reason(s) for conducting the proposed project:

The Town of Nottingham is located on the northeastern edge of Rockingham County and is home to the headwaters of the Lamprey River Watershed. The Town has witnessed increased growth in the last several years like many other towns in the region. Additionally, Nottingham has been identified as a large groundwater withdrawal area for a water bottling facility. Pressures to develop previously undeveloped land pose a potential threat to the natural resources of the town. As population growth and development increase, our water resources will be impacted. While growth is inevitable in the region, by planning now, we can lessen the impact on our natural resources.

With no municipal water or sewer system, Nottingham's 3,700 residents and commercial sites rely solely on private wells to supply water. There is very little data for these existing wells, making it difficult for Nottingham to forecast how future demand will impact the town's aquifers. With funding from NROC, Nottingham will survey all households and businesses in Nottingham to develop baseline data regarding well water usage, and any water quality and quantity issues.

A well survey would serve as a baseline against which to measure future changes, and could be used in assessing possible public water supply sources in the future. There is concern that the lands overlying the town's aquifers are not adequately protected, and characterization of important water supply lands for future protection will be critical for preserving the integrity of our current and future water supplies. After receiving feedback from town residents and businesses, we can start to develop a conservation plan that includes groundwater as a key element. The survey also provides an opportunity for public education and outreach about groundwater conservation and protection.

By conducting the project outlined in this proposal, we will be in a stronger position to protect our water resources and to educate Nottingham residents and others about the value of our groundwater.

3. Evidence of community backing for the project.

This project has strong support from the Nottingham Planning Board and Conservation Commission, Board of Selectmen, Budget Committee and Nottingham Historical Society. In addition, there have been several activities in Nottingham over the last four years defining what natural resources exist in Nottingham, how the citizenry views it, and what they think the future of it should be. In addition to NROC involvement, activities have included: a Community Profile (a facilitated community visioning forum) in 2000, establishing a Natural Resource Inventory Committee, a Basic Natural Resources Inventory provided by Bear Paw Regional Greenways, and an Update to Chapter 1 (Policies and Procedures) of the Master Plan in 2002. Heightened awareness of the demand for groundwater has been displayed by townspeople as a result of the application for a large groundwater withdrawal permit from DES by USA Springs to use groundwater to supply a water bottling plant in Nottingham. Citizen groups such as Save Our Groundwater (SOG) have been

created as a result of the outcry for preserving our groundwater resource. These activities have provided a strong background of support for this proposed project.

The 1990 Master Plan, and the 2002 Draft revised Chapter 1 (Policies and procedures) both recommend protection of the integrity of groundwater supply and quality in Nottingham. For example, page 4 of revised Chapter 1 states that “New development within Nottingham shall contain the facilities and resources necessary to support on-site water usage and waste systems, and provide for adequate water recharge.” Page 11 of Chapter 1 goes on to say: “Private wells are the only source of drinking water in Nottingham. The Town must ensure both the quality and quantity of groundwater for the current and future needs of all people and development within the town. To this end, a local water resource management and protection plan is to be incorporated into this master plan. In order to maintain the purity of the drinking water supplies and to prevent surface and groundwater contamination from occurring, residents and officials alike must work to maintain and protect this fragile resource”.

This proposal will provide information that will help to implement these and other groundwater-related recommendations in the Master Plan.

4. Collaboration that will be involved in accomplishing the project

Nottingham Conservation Commission – chaired by Jay Michael and Sam Demeritt

Nottingham Planning Board – chaired by Dave Smith

Nottingham Natural Resources Inventory Committee – chaired by Susan Mooney

Nottingham Board of Selectmen – chaired by Jon Caron

Input from groundwater experts, e.g. NH DES staff, NROC staff

Collaboration with the Candia-NROC group on putting the groundwater survey together.

5. How funding will help your project advance natural resource protection

Funding will be used to cover the costs of: (a) developing and mailing a questionnaire to all local residences and businesses, and (b) including public educational materials in the mailings.

Funding of a well survey will help Nottingham to better understand local groundwater supply issues, and develop a strategy to address these issues and plan for future water needs. By educating the public about the importance of groundwater supply protection, we intend to raise public awareness about the importance of conservative water use, and the role residents can play in maintaining water quality.

B. Project Description

1. Project goal – Overall purpose statement

To collect information about Nottingham's current water usage, and plan for future water needs;

To preserve Nottingham's water resources by educating residents and businesses about the importance of conserving and protecting the quality and quantity of our groundwater supplies.

2. Project Objectives – Specific outcomes or results you plan to achieve

- Through the well survey, the community will establish baseline data regarding current water usage and water quality issues in different parts of town.
- The public will increase their knowledge and awareness of water supply issues, and will begin to implement water conservation strategies.
- The community will determine which aquifer areas need immediate protection from further development.

3. Project Activities – The actions that you will undertake to achieve your objectives.

- a) Draw up, with the aid of experts in the field and in collaboration with the Candia-NROC group, a detailed questionnaire concerning how water is supplied and used in Nottingham. Questions that may be asked include: How deep is the well, what is the yield of the well, the level of satisfaction with their water supply, whether people feel their water supply has changed over time, and water quality problems they may have experienced.
- b) Identify groundwater educational fact sheets to be included in the mailing.
- c) Develop a mailing list of all residences and businesses.
- d) Mail the questionnaire to all town residences and businesses. This will include at least two mailings, additional mailings going to those who did not respond to the first mailing.
- e) Compile the data from those questionnaires returned and publicize the results town-wide.
- f) Identify and compile appropriate public education materials (e.g. fact sheets) about groundwater to include in the survey mailing.

4. Project Products – A description of any products that will be developed during the project (i.e. maps, brochures, reports, etc.)

- a) A questionnaire that can be used again for future surveys, results which can be compared to the baseline created from the initial survey, and allowing conclusions to be drawn concerning Nottingham's expanding water usage;
- b) A report developed from the answers received from the questionnaires that will be published for all to review.

- c) Public education materials and letters developed for mailings, copies of any press releases and newsletter articles.

C. Project Work Plan

1. Identify a project leader and a project team.

Project Leaders: Susan Mooney (Conservation Commission)
Skip Seaverns (Planning Board)
Project Team: Nottingham Conservation Commission, Nottingham Planning Board,
Nottingham Board of Selectman, and Nottingham Natural Resource
Inventory Committee, with the support of NROC staff.

2. Outline the project timeline and indicate how responsibility will be allocated for each activity.

- Contact groundwater experts (e.g. NHDES staff) (June-July, 2004)
- Place a “heads-up” notice in the bimonthly newsletter for residents to begin to find well documents they might have, such as depth of well, flow of well, when installed, any water testing results, etc. This information will aid in completing the questionnaire.
- Develop the well survey questionnaire, with assistance from groundwater experts and in collaboration with the Candia-NROC group (June-July, 2004)
- Identify groundwater fact sheets to be included in the mailing (June-July, 2004)
- Mail out survey (August, 2004)
- Mail out second copy of survey to those who did not respond to the initial mailing (September, 2004)
- Coordinate the compilation of data from the surveys (October-November 2004)
- Compile the final report based on survey data (November-December, 2004)
- Publicize the results of the survey (mail survey report to all survey respondents, include summary in the town newsletter), including recommendations for future work (December, 2004)

Conservation Commission and Planning Board members, and other members of the Nottingham-NROC group will assist in proof reading, copying and distribution of the surveys, collecting data from the surveys, and publishing a final report of the results. NROC representatives will provide assistance as needed.

3. Specify how you will communicate with NROC on an ongoing basis.

NROC will be kept informed of project activities through our main NROC contact, Amanda Stone, and the project leaders, Susan Mooney and Skip Seaverns.

D. Project Budget – List expenses (i.e., salaries, publications, map creation, travel, supplies, etc.) Be sure to include the 100% match requirement. Match can be monetary or “in-kind” services, such as volunteer time by conservation commission members, etc.

MATERIALS COSTS:

First mailing

Copies of 2,400 groundwater fact sheets x 2 @ 0.10/copy.....	\$480
Copies of 2,400 cover letters @ 0.05/copy	\$120
Copies of 2,400 surveys @ 0.10/copy.....	\$240
Mailing labels.....	\$ 25
Envelopes for the mailing plus return envelopes (4,800).....	\$130
Postage for 2,400 pieces @0.146/unit.....	\$350

Second mailing

Copies of 1,500 cover letters @ 0.05/copy	\$75
Copies of 1,500 surveys @ 0.10/copy.....	\$150
Postage for 1,500 pieces @0.146/unit.....	\$219

Summary report

Print summary report – 2,400 copies @ 0.10/page.....	\$240
Mail summary report – 2,400 pieces @0.146/unit.....	\$350

Total materials cost:..... \$2,379**

IN-KIND MATCH (Volunteer hours)

Project planning and identification of fact sheets	30 hours
Write, review and print surveys	40 hours
Stamp and mail surveys x 2 and return envelopes	20 hours
Compile and analyze return surveys	40 hours
Write, copy, and mail out Survey Summary Report	30 hours

Total volunteer hours)..... 160 hours

Total in-kind match (volunteer rate @ \$17.19/hour)..... \$2,750.40*

* Total in-kind match (volunteer hours).....	\$2,750.40
**Amount requested	\$2,379.00
TOTAL PROJECT COST	\$5,129.40

Appendix 2

Nottingham Water Well Survey November 2004

This document was mailed to all residences to collect the wellwater data

Nottingham Water Well Survey

To help your local officials better assess current water needs and plan for the future, please answer the following questions. This information is being collected for **research purposes**. The results of this survey will be reported only in **anonymous summary form, and individual surveys will be kept confidential**. Thank you for taking time to help us compile this important information.

We realize you may not have the information available to answer all of these questions.

Please answer whatever questions you can.

If you have your well records, these will be helpful for answering the questions below

PLEASE CHECK () OR PROVIDE YOUR MOST APPROPRIATE RESPONSE
FOR EACH QUESTION YOU CAN ANSWER.

Fold and mail the completed survey in the enclosed pre-addressed, stamped envelope, by November 10, 2004.

These completed surveys can also be dropped in the collection box at the Town Office Building.

Last Name _____ **First Name** _____

(optional)

Street Address _____

Town _____ **Tax map & Parcel Number** _____

Number of Wells at this Address _____ **Lot size** _____ **acres**

Number of Full-Time Residents _____

Please provide descriptive information (if known) for each well on your property, in the space provided below:

		Well #1	Well #2	Well #3
Use of Well <i>(check all that apply)</i>	Residential.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Commercial/Industrial.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Shared Water Supply.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Agricultural.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Irrigation (lawn & garden).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Irrigation (commercial/farm).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Out of service (<i>Why?</i>).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (<i>Describe</i>) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Type of Well Construction	Drilled in Bedrock.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Drilled in sand/Gravel.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Driven Point.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Dug.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other (<i>Describe</i>) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reason for Constructing a New or Additional Well	Not Applicable.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	New Home.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Replace Existing Well.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Provide Additional Supply.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other (<i>Describe</i>) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Depth of Well (in feet)				
Depth to Bedrock (in feet)				
Length of Casing Installed in Well (in feet)				
Well Casing extends above ground (inches)				
Well Yield (in gallons per minute)				
Date the well was drilled (or approximate age of well in years)				

What type of residence occupies your property?

<input type="checkbox"/> Single family house <input type="checkbox"/> <2000 ft ² <input type="checkbox"/> 2000 -4000 ft ² <input type="checkbox"/> >4000 ft ²	<input type="checkbox"/> “Attached house” (shared walls between units) (e.g. Condominium or townhouse)	<input type="checkbox"/> Mobile home <input type="checkbox"/> Apartment
--	--	--

What are the primary activities if the property is non-residential?

<input type="checkbox"/> Commercial (type of business): _____	<input type="checkbox"/> Farm (describe) _____
<input type="checkbox"/> Industrial (type of business): _____	<input type="checkbox"/> Nursery <input type="checkbox"/> Livestock <input type="checkbox"/> OTHER (describe) _____

WATER QUANTITY ISSUES:

How have you been affected by droughts during the past 10 years?

	Well #1	Well #2	Well #3
No problem	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Had to limit household use.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not enough water to irrigate as much as I wanted.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Couldn't irrigate at all.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Well(s) went completely dry.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Have you run out of water during the past five years for reasons other than mechanical pump failure?

Never.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Once (state which year and month) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More than once (state how often) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regularly.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If applicable, how have you dealt with these water shortages?

<input type="checkbox"/> Purchased bottled water	<input type="checkbox"/> Conserved or self-limited use
<input type="checkbox"/> Purchased bulk water	<input type="checkbox"/> Other (Describe) _____

Have you taken any of the following actions to conserve water? (Please check all that apply)

<input type="checkbox"/> Take shorter showers	<input type="checkbox"/> Water outdoors during early morning or evening
<input type="checkbox"/> Repair running toilet	<input type="checkbox"/> Installed a water efficient irrigation system
<input type="checkbox"/> Installed low-flow plumbing fixture(s)	<input type="checkbox"/> Other (Please specify) _____
<input type="checkbox"/> Reduced landscape area irrigated	

WATER QUALITY ISSUES:

Do you have a point-of-entry water treatment system in your home?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------

Do you have any of the following color stains in your water fixtures (toilet bowl, etc.)

<input type="checkbox"/> Green	<input type="checkbox"/> Black	<input type="checkbox"/> Other (describe)
<input type="checkbox"/> Rust/brown/orange	<input type="checkbox"/> Blue	

Appendix 3

Nottingham Water Well Survey Results, February 2005

This document was mailed to all residences to report the results of the survey

Nottingham Water Well Survey - Results

February 2005

Thank you to all of you who provided contributing data for this project. The results of this survey establish a base line of groundwater information that can be used to monitor trends as Nottingham's population grows. Although this report reflects the surveys collected to date, survey information will still be collected and added into the database. Blank surveys can be obtained in the Selectman's Office and, once completed, may be returned there. The final report, including analysis, will be available at Town Meeting and bound copies will be available at the Town Library, the Selectman's Office, and the Planning Zoning Office for use by citizens.

The Nottingham Water Well Survey initiative is an outcome of the "Dealing With Growth in Nottingham" partnership with the Natural Resources Outreach Coalition (NROC), local boards and municipal groups. Several meetings were held in the spring of 2004, and after deliberation on a number of concerns, it was decided at the April meeting to pursue a Well Survey and Groundwater Education Project. The proposal was submitted to the New Hampshire Coastal Program for funding to provide financial support to evaluate the quality and quantity of groundwater resources in Nottingham.

In October 2004, 1758 surveys were mailed to all mailing addresses in Nottingham and by November 30, 471 surveys (26.8%) had been returned. In this document, total entries have been tallied and ranges, as applicable, have been computed for your review. Some entries were omitted due to low response numbers, but remain in the database to be included in the final report.

		Well #1	Well #2	Well #3
Use of Well <i>(check all that apply)</i>	Residential.....	460	13	1
	Commercial/Industrial.....	4	0	1
	Shared Water Supply.....	13	0	1
	Agricultural.....	18	5	0
	Irrigation (lawn & garden).....	99	9	2
	Irrigation (commercial/farm).....	3	0	0
	Out of service <i>(Why?)</i>	1	29	5
	Other <i>(Describe):</i> Animals	7	0	1
Type of Well Construction	Drilled in Bedrock.....	316	9	0
	Drilled in sand/Gravel.....	43	2	0
	Driven Point.....	11	1	0
	Dug.....	30	34	9
	Other <i>(Describe):</i> Artesian	14	0	0
Reason for Constructing a New or Additional Well	Not Applicable.....	253	13	0
	New Home.....	80	0	0
	Replace Existing Well.....	30	0	0
	Provide Additional Supply.....	9	4	0
	Other <i>(Describe)</i>	8	3	1
Total Depth of Well (in feet)		6-900'	8-540'	9-25'
Depth to Bedrock (in feet)		N/A	N/A	N/A
Length of Casing Installed in Well (in feet)		N/A	N/A	N/A
Well Casing extends above ground (inches)		N/A	N/A	N/A
Well Yield (in gallons per minute)		1-125	2-45	N/A
Date the well was drilled (or approximate age of well in years)		1844-2004	1800-1999	1800-1983

What type of residence occupies your property?

<input type="checkbox"/> Single family house (209) <2000 ft ² (121) 2000 -4000 ft ² (6) >4000 ft ²	(7) “Attached house” (shared walls between units) (e.g. Condominium or townhouse)	(9) Mobile home (9) Apartment
--	---	----------------------------------

What are the primary activities if the property is non-residential?

(1) Commercial (type of business): Municipal (0) Industrial (type of business):	(4) Farm (describe): Animal, vegetable, (0) Nursery (2) Livestock (5) OTHER (describe): Municipal, Church, garden
---	--

WATER QUANTITY ISSUES:

How have you been affected by droughts during the past 10 years?

	Well #1	Well #2	Well#3
No problem	398	13	2
Had to limit household use.....	38	14	2
Not enough water to irrigate as much as I wanted.....	31	10	2
Couldn't irrigate at all.....	5	6	1
Well(s) went completely dry.....	11	8	0

Have you run out of water during the past five years for reasons other than mechanical pump failure?

Never	398	12	1
Once	15	3	0
More than once	10	5	0
Regularly	11	5	0

If applicable, how have you dealt with these water shortages?

(17) Purchased bottled water (4) Purchased bulk water	(60) Conserved or self-limited use (6) Other (Describe): new well, wait for water to come back
--	---

Have you taken any of the following actions to conserve water? (Please check all that apply)

(141) Take shorter showers (123) Repair running toilet (171) Installed low-flow plumbing fixture(s) (93) Reduced landscape area irrigated	(139) Water outdoors during early morning or evening (14) Installed a water efficient irrigation system (51) Other (Please specify): Energy Star, Neptune washer, use rain/lake, limit
--	--

WATER QUALITY ISSUES:

Do you have a point-of –entry water treatment system in your home?

(178) Yes	(293) No
-----------	----------

Do you have any of the following color stains in your water fixtures (toilet bowl, etc.)

(44) Green (202) Rust/brown/orange	(10) Black (28) Blue	(21) Other (describe) N/A
---------------------------------------	-------------------------	------------------------------

How often have you had to change your hot water heater?

	Gas	Electric	Other
Total	95	94	84
Never	45	27	51
Once	40	50	16
More than once in 10 years	5	12	3

Does your drinking water supply have any unpleasant odor, smell or taste?

	Well #1	Well #2	Well#3
Odor.....	82	0	1
Smell.....	53	1	1
Taste.....	64	1	1

Are you aware of any seasonal variations in your water quality?

	Well #1	Well #2	Well#3
No seasonal variations	420	5	0
Yes, there have been seasonal variations.....	40	8	0

If you answered YES to the above question, answer the following:

	Well #1	Well #2	Well#3
What problems have you experienced? (low water)	34	6	1
State time/s of year when you have experienced problems (summer)	31	5	1
In which year/s have you experienced problems?.....	1995- 2003	1993	Most Years

Have you had any problems with sediment in your water?

	Well #1	Well #2	Well#3
No sediment problems	128	5	0
Yes, sediment in water	89	3	0
If YES, have you undertaken any remedial action?.....	110	1	0
<i>Describe any remedial actions taken:</i>	Filter	Filter	N/A

Have you tested your water for quality, and were any problems identified?

	Well #1	Well #2	Well#3
Never tested	113	8	0
Yes, I have tested it	347	4	1
<i>Describe any water quality problems identified:</i> Iron, manganese, radon, bacteria, hard water, sulfur, pH, salt, Coliform, magnesium, lead, none.			

Are you concerned about the following contaminants affecting your well/s?

(166) MTBE (gasoline)	(151) Bacteria	(101) Nitrates	(36) Fluoride
(111) Road salt	(134) Arsenic	(166) Radon	

Would you be willing to have your water tested at no cost to you (and be willing to share the results)?

(438) Yes	(33) No
-----------	---------

Thank you! Your participation in this survey is greatly appreciated!

Appendix 4

Nottingham Water Well Survey Results

This appendix contains the responses from survey text boxes.

1. Text responses to Well Construction section

Describe the type of commercial business
municipal offices

Describe type of industrial business
horses, pigs, chickens, etc.

Other use of well
vegetables and flowers
town library
sheep operation
Hay and forest
Church

Describe well construction if other than drilled/dug/.....
Pound Well, Slate
Artesian (5)

Other reasons for construction
previous water supply was from lake
orig well 1989 500', went dry, re-drilled
no need unless bottling plant comes in
neighbor's well 50' from mine has pH 6.0; my pH 7.0
Fractured in 1998
first well went dry in summer
dry existing well
Both wells pumped on property when purchased
dried up due to additional homes and wells built across street
contaminated with road salt
Both wells pumped on property when purchased

Other uses of well
Church
Municipal building
In home business use (2)
Animals (2)
Garden only (1)

Describe reason well is out of service
Went dry or low water (13)
Shallow surface well (3)
Out of service (7)
Spare well (2)
Dry well attributed to nearby new homes (1)
Replaced with new well (3)
Poor quality (5)

2. Text responses to Well Quantity questions.

Describe other methods used to deal with water shortages
well recovered after several hours
waited for well level to rise
used neighbor's hose
part time at residence
drilled well deeper 279-543'
changed pump

Describe other actions taken to conserve water
Use water from lake/pond/water (10)
Use rainwater (5)
Water saving appliances (6)
Use water elsewhere (Laundromat, carwash) (3)
Wash only full loads (3)
Mulch (1)
Repair leaks (1)
Replace pump (1)
Drop irrigation (1)
Recycle bathwater (1)
Pee outside when possible (1)
Water when necessary (2)
Use bottled drinking water (1)

3. Text responses to well water quality questions.

What seasonal problems have you noticed
Poor taste (5)
Smell/odor (14)
Iron
Rust (2)
Brown/orange (6)
Non-coliform bacteria
extreme odor after testing was done by USA Springs
Stains (2)
Low water (12)
High sediment

What time of year do you have seasonal problems
winter
summer, winter, fall
summer drought period (3)
Summer (13)
spring, summer
spring, heavy rain
spring, and after heavy rain
spring, also related to nearby construction
spring and fall (2)
Spring (5)

What time of year do you have seasonal problems
following snow melt
fall
August (2)
Aug - Dec
Anytime at drought or excessive rain such as spring
July-Aug (2)

In which year(s) have you experienced problems?
most years (3)
every year (11)
drought years
2004
2003-2004 (3)
2003 (3)
2002-2003
2001
2000-2004
2000-2002
2000 and 2003
2000
1999, 2000
1998-2004
1993
Late 1990s

Describe any remedial action taken
will be getting a filter in the future
whole house water filter (13)
We use a water softener and filter
water treatment system (not salt)
water softener, acid neutralizer and filter system
water softener
water filtering system (11)
water conditioners installed
washer filter clogs with sediment
very little, no action yet
strainers
small filter by pump in cellar on water line
sediment filter installed (15)
required pump replacement
replaced well
replaced water tank, some fixtures/filters
replace water filters monthly
replace piping to well so that it doesn't sit at bottom
ran water until clear
pipe pulled out of well and filter (sand filter) installed on bottom
Only on occasion when we've had near flooding rainfall
only after heavy use of watering lawn extensively
once in 11 yrs. Pumped 45min to clear

Describe any remedial action taken
None (2)
no action, sporadic problem
no action, sediment in water heater
new water heater-bleach once
need to check filter
minor sand in washing machine line
mica filter
iron, whole house filter, water softener
iron, installed water softener
installed two filters
installed string filter (2)
installed spin down filter
inline particulate water filter
inline filter
inline 20 micron filter
high iron content (mica)
H2O filter
Flushed system for extended period. Happened twice this past summer
filtration system for sand and rust particles
filters on faucets and hoses
filter for drinking (2)
filter for black silt, improved with new well
filter change
empty aerator screens
corrected itself with use
clean/replace filter
clean washer screen once every 5 years
change water filter often
cartridge at point of entry
Back-flush water filter system
5 micron inline water filter
30 micron filter

Describe any water quality problems identified in water testing
within EPA radon limit, but exceeded state limit
very high iron + manganese. Also had radon test in
test every 2 yrs, undrinkable, fails federal stand
taste and smell
Tannic acid
Sulfur (2)
sulfur smell, installed ionizer
slightly low pH
rust, magnesium
rust, iron
rust issues
rust and high iron content
radon, hard water
radon slightly above NH limit
radon 30,399pCi//L , 514 w bubble-up system

Describe any water quality problems identified in water testing
Radon (6)
presence of coliforms.pH 6.19
pH6.3, radon exceeds EPA and NH guidelines
pH=6, iron=.602
pH level high
pH (acidic)
odor
non coliform >200 after hydrofracturing
MTBE and iron; state installed treatment system
massive radon, results attached
Manganese (6)
Magnesium, low pH
Magnesium (2)
manganese and iron
low level lead
low fluoride
lead pending
iron/manganese/low refresh rate
iron, manganese (6)
iron, hard water, arsenic
iron levels high
iron 3.7 manganese .41 installed softener and filter
Iron (12)
installed system for radon
hydrogen sulfide
Hydrogen sulfide
high nitrates (4)
high iron, some sulfur
high iron, magnesium, sulfur, hardness
High iron, installed filtration system
high iron, E. coli at next house
High iron in 1983
high iron and sulfur content
high iron and minerals
high in bacteria, iron and manganese
High Mn at a time. High coliform Treated w/Cl shock
hardness, not within recommendations
hardness, acidic, high manganese, others
Hardness 5.2, iron 2.0, ph 7.10, radon 3,334 pCi/L
hard, and radon level too high
hard water, rust, magnesium
hard water, now softened
hard water, high copper and iron
hard water, borderline arsenic
hard water with iron
hard water iron manganese
hard water and radon
hard water (5)
elevated iron and lead in 'stagnant' test

Describe any water quality problems identified in water testing
Coliform (3)
chlorine was added
Bacteria (3)
Bacteria, nitrates
arsenic ~.029 mg/L
acidic, low pH (4)
salt
7.0ppm iron/manganese, sulfur, hard water and more
5 years ago, some iron
1993: high iron & manganese. Radon not tested
1960, it was OK.
.150 manganese

Color/Other (describe)
white, not hard water, looks like calcium
white
white
water system takes care of color
untreated water, foul smell, ok with softener
sediment filter
sand/particle filter
point of entry water treatment system not in use
Pink
not a problem now
none
No stains since adding filter
lime?
lime scale
just a little rust if you let the toilet sit for weeks
hard water stains
grey
film
color prior to filtering
black sludge in pipes
before installing system

Year in which water heater was replaced	
	2004 (18)
	2003 (12)
	2002 (10)
	2001 (6)
	2000 (11)
	1999 (12)
	1998 (10)
	1997 (6)
	1996 (5)
	1995 (7)
	1994 (4)
	1993 (4)
	1992 (4)
	1990 (4)
	1989 (4)
	1988 (2)
	1987
	1986
	1985
	1984
	1980
	1975

Acknowledgements and Appreciations

The Nottingham Water Well Survey is the product of a partnership of the Town of Nottingham with several people of the Natural Resources Outreach Coalition (NROC). The New Hampshire Coastal Program (NHCP) provided project funding. Members of the Planning Board, Conservation Commission, Natural Resources Committee and volunteers from the community donated many hours. The town of Candia also conducted a well survey: the survey format was the result of workshops between the two communities. Accommodations made by North River Printing for the two survey mailings and the Final Report are gratefully acknowledged.

Guidance and facilitation provided by

- Amanda Stone, NROC
- Frank Mitchell, NROC
- Sally Soule, NHCP

Project Leaders

- Skip Seaverns, Planning Board
- Susan Mooney, Conservation Commission
- Mary Martin, Natural Resources Committee

Volunteers

- Celia Abrams
- Deborah Ames-Kimball
- Diane Kirkwood
- April Bacon
- Sam Demeritt
- Elaine Schmottlach
- Carl Schmottlach
- Heidi Seaverns
- Chet Batchelder

And a special thank you to the Selectmen's Office for their assistance in the mailing and collecting of the surveys

