The State of New Hampshire

DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

WATER CONSERVATION PLAN APPROVAL

January 6, 2012

Lawrence Robinson, Chairman
Board of Selectmen
Town of Marlborough
PO Box 487
Marlborough, NH 03455-0487

RE: Marlborough – Marlborough Water Works (PWS ID#: 1481010)
Water Conservation Plan, December 2011, NHDES # 999536

Dear Mr. Robinson:

On December 14, 2011, the New Hampshire Department of Environmental Services ("DES") Drinking Water and Groundwater Bureau received a water conservation plan (the "Plan"), dated December 2011, for Marlborough Water Works located in Marlborough, NH. Pursuant to RSA 485:61 and Env-Wq 2101, community water systems seeking permits from DES for new sources of groundwater shall submit a water conservation plan to DES. Based on review of the Plan, DES has determined the Plan complies with Env-Wq 2101.05, *Requirements for Existing Large Community Water Systems*.

Pursuant to Env-Wq 2101.11, the Southwest Region Planning Commission was provided the opportunity to comment on the Plan from December 14, 2011, the date of public notification, through to January 4, 2012. On December 30, 2011, DES received comments from Lisa J. Murphy, Senior Planner. DES reviewed the comments and responded to Ms. Murphy on January 6, 2011. DES determined that no changes to the Plan would be required at this time.

Conditions:

1. One year from the connection of the new wells to the system, Marlborough Water Works shall submit percent unaccounted for water calculations to DES based on source meter readings and service meter readings from the prior 12 months.

2. Source meter tests shall be documented yearly on the attached *Meter Calibration Report* form, and submitted along with the compliance form. The form may also be located on the DES Water Conservation Program webpage.

3. Marlborough Water Works shall install all meters in accordance with manufacturer's instructions and AWWA specifications.

4. Marlborough Water Works shall install source meters on all wells, including any existing wells which will remain active, prior to connection of the new wells.

5. On **January 6, 2015**, and every three years thereafter, the Marlborough Water Works shall submit a detailed and completed compliance report form to DES documenting compliance with the Plan. Required information includes contact information for the water-system owner and for

the individual responsible for carrying out plan tasks; dates tasks were performed; and data relating to meter reading, water audits, leak detection, and public outreach. A copy of the *Water Conservation Plan Ongoing Compliance Form* may be located on the DES Water Conservation Program webpage by going to the DES website, www.des.nh.gov, selecting the "A-Z List" in the right top corner of the page, and scrolling down to Water Conservation.

6. Marlborough Water Works (Water User ID # 20053) shall continue to report to the DES Water Use Registration and Reporting Program on a quarterly basis. The reporting program has recently gone electronic. Marlborough Water Works shall register as a data provider and utilize the DES Onestop application at www.des.nh.gov to report water use data in the future. If you have any questions about the Water Use Registration and Reporting or registering online please contact Derek Bennett at 271-6685 or derek.bennett@des.nh.gov.

7. Revisions to the Plan shall not be implemented without further approval from DES.

Please feel free to contact me with any questions at (603) 271-6989 or via e-mail at stacey.herbold@des.nh.gov .

Sincerely,

Stacey Herbold
Water Conservation Program
Drinking Water and Groundwater Bureau
Department of Environmental Services

Enclosed: Meter Calibration Report form

ec: John Northcott, Selectman
Sly Karanski, Primary Operator
Sandy LaPlante, Town of Marlborough
James Vernon, Nobis Engineering
Lisa J. Murphy, Southwest Regional Planning Commission
Derek Bennett, NHDES
Christine Bowman, NHDES

WATER CONSERVATION PLAN
Town of Marlborough Water System
EPA ID # 1481010
Marlborough, New Hampshire

December 2011

INTRODUCTION

The Town of Marlborough (Town), in conjunction with Nobis Engineering, is submitting this Water Conservation Plan to the New Hampshire Department of Environmental Services (NHDES). The Town has prepared this Plan according to the NHDES Water Conservation Rules, specifically Env-Wq 2101.05, Requirements for Existing Large Community Water Systems. This Conservation Plan documents ongoing conservation efforts by the Town of Marlborough and also meets the requirement that a Conservation Plan be prepared and submitted in conjunction with the development of a new groundwater source for a large community water system.

The Town is in the process of seeking permits for two new community wells (Well #3 and Well #4), located off Fitch Court in Marlborough. The wells are located on Tax Map 1, Lot 30, one of three Town-owned lots known as the Pavilion Site (see map). The new wells will replace existing Well #1 and Well #2 (see below). Once Well #3 and Well #4 are permitted and in service, Well #1 and Well #2 will no longer be used. Well #2 will be disconnected and filled in. Well #1 will be disconnected but will remain in place should it ever be needed as an emergency water source for the Town.

The Town of Marlborough and Nobis Engineering submitted a Preliminary Report for the new wells to the NHDES on September 1, 2011. The Preliminary Report constitutes a preliminary application for a Large Groundwater Withdrawal Permit under Env-Wq 403 and RSA 485-C:21. The Preliminary Report also constitutes the preliminary report required under Env-Dw 302, "Large Production Wells for Community Water Systems." As required by Env-Wq 403.05, this Conservation Plan has been prepared and submitted in conjunction with the Preliminary Report. The Conservation Plan was submitted in draft form on June 30, 2011; the present draft is a revision based on comments received from NHDES on the June 30 draft.

WATER SYSTEM DESCRIPTION

The Marlborough Community Water System (EPA #1481010) serves a portion of the Town of Marlborough, New Hampshire and has approximately 300 residential, commercial, and industrial customer service connections. The hookups are categorized as follows:

- Residential connections: 238
- Commercial and industrial connections: 53
- Municipal or public connections: 4 (Library, Fire Station, Town Hall, School)

A storage facility with capacity of 244,000 gallons is located off Pleasant St. in Marlborough; at this site, a booster pumping station lifts water to the Mountain Village Mobile Home Park, also served by the Town water system (see map).

The Marlborough water system is currently served by two existing gravel-packed production wells:

Well #1 off School Street
Well #2 off Fitch Court

Well #2 is the primary well, with Well #1 used only for back-up during maintenance of Well #2. Neither well is metered, and Well #1 has no chemical injection capability. Pumping rates for Well #2 are estimated by measuring pump run time and are currently estimated at about 89 gpm.

There are two "bleeders" and two cemetery spigots used for flushing (see below). The storage tank is not allowed to intentionally overflow because of system hydraulics or water quality concerns.

Currently, the Town uses an estimated average of 80,000 – 90,000 gallons per day (gpd) of water during the summer, according to the Water Operator. There is no significant seasonal fluctuation in water use; the residents and businesses are year-round. One exception is the Marlborough School, which uses less water in the summer. Generally less water is used on weekends, when the largest user, the "T-shirt Factory" (Mountain Corporation) is not operating. Actual daily water use is generally less than the average listed above if the T-shirt Factory is not operating and greater than the average listed above if the T-shirt Factory is operating. Under the latter condition, Well #2 typically operates up to 20 hours per day at an estimated pumping rate of about 89 gallons per minute, for a peak daily demand of over 100,000 gpd. When the Factory is not operating, Well #2 typically pumps about 10 hours per day, for a usage of about 53,000 gpd. The T-shirt factory is the only water user that consumes more than 20,000 gpd.

Well #1 is only used occasionally or when maintenance is performed on Well #2. If both Well #1 and Well #2 were to be pumped together for 24 hours, the Water Operator estimates that they could produce a combined 215,000 gallons (approximately). New Wells #3 and #4 have yet to be fully tested, but the Town anticipates seeking a combined Permitted Production Volume of 99 gallons per minute (142,560 gpd) for the new wells. Water usage data for January through September 2011 is found in Appendix A.

Little growth in water use is anticipated, as the water system serves the downtown area of Marlborough. This area is essentially built out, with few or no developable building lots within the water service area. The Town has no plans to expand the water service area.

WHY NEW WELLS ARE NEEDED

In an inspection report dated January 29, 2003, the NHDES stated, "Due to the vulnerability of the existing sources, we encourage the Town to continue investigation of an alternate groundwater supply." The NHDES, in its inspection report dated January 31, 2006, expressed concerns regarding the infrastructure of both existing wells and regarding wellhead protection. Although specific action items have been suggested regarding the pump houses and other aspects of the current water supply, the NHDES has also suggested taking a longer view, considering Marlborough's water supply needs in the next 20 – 30 years. To this end, a new well or wells have been suggested to serve the Town. The new well project is also referenced in an inspection report dated August 18, 2010. The 2003, 2006, and 2010 inspection reports can be found in Appendix A of the Preliminary Report.

The NHDES, in a letter dated December 11, 2008 (Appendix A of the Preliminary Report), required that Fitch Court be re-located farther away from Well #2 if Well #2 is to remain in service.

The Town of Marlborough has considered a number of water supply options, described in the Preliminary Report. The Town has elected to develop two new wells at the Pavilion site, based on the results of feasibility investigations and other factors described in the Preliminary Report.

New Wells #3 and #4 will be used to supply water to the Town of Marlborough Community Water System. The new wells will replace existing Well #1 and Well #2.

SOURCE AND SERVICE METERS

The two new wells, #3 and #4, will be metered. The meters will be installed prior to the new wells being placed into service. The source meters will be read 3 times per week. The source meters will be tested annually, or on the schedule recommended by the manufacturer. If the testing indicates that the meter is inaccurate, it will be sent out for calibration.

With the 2011 addition of water meters to the Public Library, Fire Station, and Town Hall, all users are metered. The new Marlborough School is metered, but does not pay a water bill. The old Marlborough School is currently not using water, but may resume use if the building is refurbished and put to use.

We recently (within the last 4 years) completed a complete replacement program of user meters. There were previously no records of installation dates on the former meters and they had to be read manually, but since 2006, the Town Clerk/Tax Collector has kept records of the new meter installations. The new meters are all read remotely, saving labor time and increasing data reliability. There are two routes, and the meters on each route can be read in less than an hour. The Town Clerk/Tax Collector downloads the meter readings from the hand-held remote reader used by the Water Operator; this process takes a few minutes.

The Town is currently setting up a schedule for replacing service meters. According to this schedule, starting in 2016, the Town will replace approximately 20% of its meters each year. Since the recommended change out frequency for water meters is 10 years, the Town will begin the change out cycle again in 2026, replacing approximately 20% of the meters each year. The Town believes that there are no longer any unmetered service connections.

Per Env-Wq 2101.05 (d), "In selecting, installing, and maintaining water meters, the water system shall comply with procedures and protocols described in 'Manual of Water Supply Practices, Water Meters – Selection, Installation, Testing, and Maintenance,' document identification number AWWA M6, American Water Works Association, 1999."

Source water meters will usually be read daily, but at least 3 times per week, and user water meters will be read at least once every 90 days.

Water user billing is quarterly (see below).

WATER AUDIT AND LEAK DETECTION

In addition to the water metering program described above, the Marlborough Water Department will estimate all unmetered water use, such as firefighting, hydrant flushing, testing, training, etc. A formal estimate of the amount of unaccounted-for water has not been done in the recent past, nor has a water audit been done in the recent past.

Unaccounted for Water

The Marlborough Water Department will maintain a database, spreadsheet, or similar mechanism that compares metered water use at the sources (wells) and the combined meter water use by the users. At least twice per year the Town will compare the total water pumped from the wells with the total water as recorded by the user water meters, using the spreadsheet or similar mechanism and a form provided by NHDES (Appendix B) to determine unaccounted for water. If unaccounted for water equals or exceeds 15%, a comprehensive water audit will be conducted and the Town will prepare and submit the audit and a Response Plan to NHDES within 60 days, per Env-Wq 2101.05 (j) and (k). The Response Plan will reflect the information acquired through the water audit and will identify steps, in addition to repairing leaks, that the Town will take within 2 years, to reduce the amount of "unaccounted-for water."

"Unaccounted-for water means water for which a specific use cannot be determined due to accounting procedure errors, data processing errors, meter inaccuracies, authorized water use that does not pass through meters, leaks, seepage, overflow, evaporation, theft, unauthorized water use, or malfunctioning distribution controls." This includes unmetered water use, such as firefighting, hydrant flushing, testing, training, etc. The 2011 addition of meters to the Library, Fire Station, and Town Hall will reduce the amount of unaccounted for water.

Results of the unaccounted for water will be submitted to NHDES at least every 3 years on the required "Water Conservation Plan Ongoing Compliance Form" (Appendix B). The form will document how compliance with the requirements of Env-Wq 2101 is being achieved.

Water Audit

The water audits will be conducted with the assistance of Granite State Rural Water to differentiate between apparent and real losses "using protocols and procedures described in 'Manual of Water Supply Practices, Water Audits and Loss Control Programs, document identification number AWWA M36, American Water Works Association, 2009."

Results of the water audits will be submitted to NHDES at least every 3 years on the required "Water Conservation Plan Ongoing Compliance Form" (Appendix B). The form will document how compliance with the requirements of Env-Wq 2101 is being achieved.

Leak Detection Survey

In the past, leaks and water mains in need of replacement have been evident, and a complete leak detection survey has not been performed recently. Marlborough has focused its efforts on leak repair and water main replacement in the last few years. It is anticipated that this water main replacement program will continue within available funding constraints.

Within one year of the approval of Wells #3 and 4, the Town will conduct a full leak detection program in accordance with AWWA M36 and with the assistance of Granite State Rural Water Association. The Town will repair any leaks discovered, within 60 days of discovery, unless a waiver is obtained, per Env-Wq 2101.09. The leak detection survey will focus on high pressure (low elevation) areas of the system (see below and see map).

In the future, leak detection surveys will be conducted at least once every two years, with the assistance of Granite State Rural Water Association. The entire water system will be surveyed at once. Unless the initial survey described above reveals problems in the high pressure area near Knowlton Street, the leak detection survey will not focus on

that area particularly, because the Town's experience is that leaks have been correlated more with the age of the pipes than with the pressure.

Results of the leak detection survey will be submitted to NHDES at least every 3 years on the required "Water Conservation Plan Ongoing Compliance Form". The form will document how compliance with the requirements of Env-Wq 2101 is being achieved.

Plans of the water system are located in the bottom drawer of a map storage unit in the Town Highway Garage on Route 124. The water distribution system generally consists of the following:

- 2100' of 10" Cast Iron, 1951
- 6000' of 8" Cast Iron, 1951
- 3000' of 8" Ductile Iron, 1970s
- 2100' of 8" Ductile Iron, 2008 – 2010
- 3000' of 6" Cast Iron, 1951
- 2200' of 6" Ductile Iron, 1980s-1990s
- 1500' of 6" Ductile Iron, 2000s
- 1400' of 4" Cast Iron (?), pre-1951
- 3100' of 2.5" Galvanized, 1960s – 1970s
- 1000' of 2.5" Galvanized, 1985
- 2500' of ¾ & 1" copper runs, starting 1960s
- Four river crossings

Valves are generally located at intersections and isolating leaks is currently difficult.

There are no pressure reducing valves (see below) or zone meters.

There are two "bleeders" used during flushing, and 2 cemeteries have spigots. These are at high elevation and are used only seasonally as "bleeders". These should not be eliminated because they serve a purpose for water quality on dead ends. They are operated manually and are not metered. Water used at these points will be considered unaccounted-for water.

PRESSURE REDUCTION

The Town of Marlborough water system does not use pressure reducing valves because they might inhibit firefighting capabilities. Marlborough's water system is gravity fed from the Pleasant St. holding facility, with the exception of the Mountain Village Mobile Home Park, to which water is pumped using a booster pumping station located hear the storage tank (see map). The estimated lowest pressure in the system is about 40 pounds per square inch (psi) near the Pleasant Street storage tank. The estimated highest pressure is about 130 psi at the Knowlton Street hydrant, near the western edge of the water distribution system (see map).

RATE STRUCTURE

Currently, the Town of Marlborough bills for water usage at a graduated rate with a minimum billing of $16.25, for 5000 gallons at $3.25 per 1000 gallons, based on billing every three (3) months. The Town does not intend to increase its billing frequency, due to the expense of preparing and sending bills. The rate of $3.25 per 1000 gallons holds up to 10,000 gallons in a quarter. If more water is used, the rates increase, although the increases are different for residential and commercial customers. See Appendix C for Marlborough's current rate schedule. Town buildings and the Marlborough School do not pay water bills.

In 2009, the Town met with Granite State Rural Water to consider an alternate rate structure. However, the rates shown on Appendix C were retained at that time and are still in effect as of October 2011.

Water and sewer rate structures will be reviewed and adjusted when the actual cost of the new wells is determined and we have accurate usage figures. The Town anticipates that it will continue to use the rate structure shown in Appendix C and will not lower rates for high volume water users. There are no plans to incorporate a seasonal rate structure.

The Town of Marlborough has never had to issue water use restrictions, either voluntary or mandatory. Irrigation is not believed to constitute a major water use, and there are no plans to install irrigation meters.

EDUCATIONAL OUTREACH INITIATIVE

Marlborough will begin the following educational outreach initiative immediately upon obtaining NHDES approval for new Well #3 and #4.

- Bill stuffers – We will put standard DES Water Conservation Fact Sheets and handouts (Appendix D) in the mail with water customers periodically, at least once per year. Additional stuffers could include educational information available through the USEPA and AWWA.
- Separate Water Conservation mailings to water customers in conjunction with annual Consumer Confidence Report.
- We plan on having a program to offer low-flow faucets and shower heads to users.
- The Town has an excellent relationship with the largest water user (and only significant industrial water user), the Mountain Corporation (a.k.a. T-shirt Factory) and will continue to work with them regarding water usage and conservation. In addition to the standard mailings, we will send them NHDES Fact Sheets 26-7 and 26-16 (Appendix E).
- The Town is considering joining the EPA's Water Sense program.

PUBLIC NOTIFICATION

As required by Env-Wq 2101.11, ENSR and the Town will send, via certified mail, a copy of this Conservation Plan to:

- The Town of Marlborough
- Southwest Regional Planning Commission, Keene, New Hampshire

The Town of Marlborough will provide copies of the certified mail receipts and the returned confirmation of delivery cards to NHDES as soon as they are available.

FUTURE COMPLIANCE

The water system will submit a "Water Conservation Plan Ongoing Compliance Form" once every three years documenting how compliance with the requirements of Env-Wq 2101 is being achieved. The form may be located on the DES Water Conservation webpage found at www.des.nh.gov – go to the A-Z List and scrolling down to Water Conservation. Activities outlined in the Water Conservation Plan will be completed by

water system personnel (or Town representatives) under the supervision of a certified water system operator.

I certify that I have read this Water Conservation Plan, understand the responsibilities of the water system as referenced in the plan, and that all information provided is complete, accurate, and not misleading.

System Owner Name (print): JOHN NORTHCOTT

System Owner Signature: _____ Date: 12/9/2011

APPENDIX A

WATER USAGE DATA

January to September 2011

MARLBOROUGH WATER
WELL #2 2010

JAN.	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	10.9	89	60	58206.0
2	13.6	89	60	72624.0
3	11.5	89	60	61410.0
4	16.8	89	60	89712.0
5	15.5	89	60	82770.0
6	16.0	89	60	85440.0
7	16.1	89	60	85974.0
8	16.3	89	60	87042.0
9	15.3	89	60	81702.0
10	15.8	89	60	84372.0
11	16.4	89	60	87576.0
12	16.4	89	60	87576.0
13	16.2	89	60	86508.0
14	18.1	89	60	96654.0
15	15.2	89	60	81168.0
16	14.6	89	60	77964.0
17	16.8	89	60	89712.0
18	17.4	89	60	92916.0
19	15.8	89	60	84372.0
20	16.4	89	60	87576.0
21	17.4	89	60	92916.0
22	17.6	89	60	93984.0
23	15.0	89	60	80100.0
24	22.2	89	60	118548.0
25	22.0	89	60	117480.0
26	18.0	89	60	96120.0
27	14.7	89	60	78498.0
28	17.7	89	60	94518.0
29	16.0	89	60	85440.0
30	16.4	89	60	87576.0
31	15.6	89	60	83304.0
TOTALS	503.7			2689758.0
AVG. HRS.	16.2	AVG. GAL/DAY		86766.4

MARLBOROUGH WATER
WELL #2 2010

FEB	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	20.5	89	60	109470.0
2	15.0	89	60	80100.0
3	21.7	89	60	115878.0
4	17.7	89	60	94518.0
5	15.0	89	60	80100.0
6	12.3	89	60	65682.0
7	11.3	89	60	60342.0
8	24.1	89	60	128694.0
9	19.7	89	60	105198.0
10	17.1	89	60	91314.0
11	17.5	89	60	93450.0
12	14.3	89	60	76362.0
13	10.3	89	60	55002.0
14	13.4	89	60	71556.0
15	20.8	89	60	111072.0
16	22.3	89	60	119082.0
17	16.3	89	60	87042.0
18	17.0	89	60	90780.0
19	13.4	89	60	71556.0
20	15.2	89	60	81168.0
21	14.9	89	60	79566.0
22	23.0	89	60	122820.0
23	18.6	89	60	99324.0
24	23.1	89	60	123354.0
25	17.5	89	60	93450.0
26	16.2	89	60	86508.0
27	12.0	89	60	64080.0
28	14.6	89	60	77964.0
TOTALS	474.8			2535432.0
AVG. HRS.	17.0	AVG. GAL/DAY		90551.1

MARLBOROUGH WATER
WELL #2 2010

MARCH	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	21.3	89	60	113742.0
2	23.1	89	60	123354.0
3	17.7	89	60	94518.0
4	21.1	89	60	112674.0
5	14.0	89	60	74760.0
6	13.2	89	60	70488.0
7	14.1	89	60	75294.0
8	21.7	89	60	115878.0
9	20.9	89	60	111606.0
10	19.4	89	60	103596.0
11	23.4	89	60	124956.0
12	13.6	89	60	72624.0
13	12.8	89	60	68352.0
14	14.4	89	60	76896.0
15	23.8	89	60	127092.0
16	20.9	89	60	111606.0
17	21.0	89	60	112140.0
18	21.3	89	60	113742.0
19	13.1	89	60	69954.0
20	12.1	89	60	64614.0
21	15.7	89	60	83838.0
22	23.5	89	60	125490.0
23	22.2	89	60	118548.0
24	18.4	89	60	98256.0
25	22.6	89	60	120684.0
26	14.2	89	60	75828.0
27	12.2	89	60	65148.0
28	14.6	89	60	77964.0
29	24.0	89	60	128160.0
30	18.8	89	60	100392.0
31	22.5	89	60	120150.0
TOTALS	571.6			3052344.0
AVG. HRS.	18.4	AVG. GAL/DAY		98462.7

MARLBOROUGH WATER
WELL #2 2010

APRIL	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	20.7	89	60	110538.0
2	14.9	89	60	79566.0
3	12.4	89	60	66216.0
4	16.5	89	60	88110.0
5	23.6	89	60	126024.0
6	19.4	89	60	103596.0
7	21.7	89	60	115878.0
8	24.0	89	60	128160.0
9	14.8	89	60	79032.0
10	15.7	89	60	83838.0
11	14.6	89	60	77964.0
12	23.4	89	60	124956.0
13	22.3	89	60	119082.0
14	20.0	89	60	106800.0
15	22.9	89	60	122286.0
16	13.8	89	60	73692.0
17	12.1	89	60	64614.0
18	14.2	89	60	75828.0
19	24.0	89	60	128160.0
20	24.0	89	60	128160.0
21	23.6	89	60	126024.0
22	18.9	89	60	100926.0
23	14.3	89	60	76362.0
24	12.1	89	60	64614.0
25	13.7	89	60	73158.0
26	24.0	89	60	128160.0
27	17.0	89	60	90780.0
28	19.3	89	60	103062.0
29	20.4	89	60	108936.0
30	13.7	89	60	73158.0
TOTALS	552.0			2947680.0
AVG. HRS.	18.4	AVG. GAL/DAY		98256.0

MARLBOROUGH WATER
WELL #2 2010

MAY	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	14.2	89	60	75828.0
2	14.9	89	60	79566.0
3	24.0	89	60	128160.0
4	18.4	89	60	98256.0
5	17.6	89	60	93984.0
6	20.7	89	60	110538.0
7	14.1	89	60	75294.0
8	11.5	89	60	61410.0
9	12.9	89	60	68886.0
10	20.6	89	60	110004.0
11	19.2	89	60	102528.0
12	17.8	89	60	95052.0
13	22.3	89	60	119082.0
14	12.1	89	60	64614.0
15	11.8	89	60	63012.0
16	12.6	89	60	67284.0
17	20.3	89	60	108402.0
18	18.6	89	60	99324.0
19	19.0	89	60	101460.0
20	15.3	89	60	81702.0
21	13.8	89	60	73692.0
22	12.1	89	60	64614.0
23	13.1	89	60	69954.0
24	20.2	89	60	107868.0
25	17.5	89	60	93450.0
26	19.4	89	60	103596.0
27	16.7	89	60	89178.0
28	15.2	89	60	81168.0
29	11.2	89	60	59808.0
30	12.7	89	60	67818.0
31	14.3	89	60	76362.0
TOTALS	504.1			2691894.0
AVG. HRS.	16.3	AVG. GAL/DAY		86835.3

MARLBOROUGH WATER
WELL #2 2010

JUNE	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	21.8	89	60	116412.0
2	23.0	89	60	122820.0
3	17.2	89	60	91848.0
4	13.3	89	60	71022.0
5	12.1	89	60	64614.0
6	13.0	89	60	69420.0
7	21.5	89	60	114810.0
8	19.6	89	60	104664.0
9	20.2	89	60	107868.0
10	17.4	89	60	92916.0
11	19.5	89	60	104130.0
12	15.0	89	60	80100.0
13	19.4	89	60	103596.0
14	19.9	89	60	106266.0
15	19.7	89	60	105198.0
16	17.7	89	60	94518.0
17	20.1	89	60	107334.0
18	11.8	89	60	63012.0
19	11.5	89	60	61410.0
20	12.8	89	60	68352.0
21	23.0	89	60	122820.0
22	14.8	89	60	79032.0
23	17.9	89	60	95586.0
24	21.1	89	60	112674.0
25	14.1	89	60	75294.0
26	12.2	89	60	65148.0
27	12.2	89	60	65148.0
28	23.0	89	60	122820.0
29	15.6	89	60	83304.0
30	19.6	89	60	104664.0
TOTALS	520.0			2776800.0
AVG. HRS.	17.3	AVG. GAL/DAY		92560.0

MARLBOROUGH WATER
WELL #2 2010

JULY	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	15.7	89	60	83838.0
2	13.6	89	60	72624.0
3	12.1	89	60	64614.0
4	11.1	89	60	59274.0
5	13.3	89	60	71022.0
6	21.6	89	60	115344.0
7	18.5	89	60	98790.0
8	16.8	89	60	89712.0
9	14.3	89	60	76362.0
10	11.5	89	60	61410.0
11	12.8	89	60	68352.0
12	23.8	89	60	127092.0
13	17.6	89	60	93984.0
14	19.3	89	60	103062.0
15	18.3	89	60	97722.0
16	14.4	89	60	76896.0
17	13.0	89	60	69420.0
18	13.8	89	60	73692.0
19	21.6	89	60	115344.0
20	22.5	89	60	120150.0
21	20.8	89	60	111072.0
22	23.6	89	60	126024.0
23	17.2	89	60	91848.0
24	12.9	89	60	68886.0
25	15.0	89	60	80100.0
26	22.8	89	60	121752.0
27	14.5	89-	60	870.0
28	12.0	89	60	64080.0
29	22.8	89	60	121752.0
30	12.0	89	60	64080.0
31	12.2	89	60	65148.0
TOTALS	511.4			2654316.0
AVG. HRS.	16.5	AVG. GAL/DAY		85623.1

MARLBOROUGH WATER
WELL #2 2010

AUGUST	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	14.6	89	60	77964.0
2	18.1	89	60	96654.0
3	19.6	89	60	104664.0
4	19.0	89	60	101460.0
5	19.1	89	60	101994.0
6	12.7	89	60	67818.0
7	10.3	89	60	55002.0
8	11.8	89	60	63012.0
9	17.7	89	60	94518.0
10	17.7	89	60	94518.0
11	16.9	89	60	90246.0
12	15.3	89	60	81702.0
13	13.6	89	60	72624.0
14	10.3	89	60	55002.0
15	10.5	89	60	56070.0
16	17.6	89	60	93984.0
17	15.0	89	60	80100.0
18	15.2	89	60	81168.0
19	16.2	89	60	86508.0
20	10.7	89	60	57138.0
21	12.9	89	60	68886.0
22	12.9	89	60	68886.0
23	17.1	89	60	91314.0
24	18.2	89	60	97188.0
25	20.8	89	60	111072.0
26	17.2	89	60	91848.0
27	9.6	89	60	51264.0
28	10.1	89	60	53934.0
29	13.3	89	60	71022.0
30	16.9	89	60	90246.0
31	17.3	89	60	92382.0
TOTALS	468.2			2500188.0
AVG. HRS.	15.1	AVG. GAL/DAY		80651.2

MARLBOROUGH WATER
WELL #2 2010

SEPT	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	16.5	89	60	88110.0
2	16.1	89	60	85974.0
3	9.8	89	60	52332.0
4	10.7	89	60	57138.0
5	11.2	89	60	59808.0
6	11.0	89	60	58740.0
7	17.5	89	60	93450.0
8	16.2	89	60	86508.0
9	16.6	89	60	88644.0
10	13.1	89	60	69954.0
11	10.5	89	60	56070.0
12	11.8	89	60	63012.0
13	17.1	89	60	91314.0
14	16.9	89	60	90246.0
15	15.8	89	60	84372.0
16	16.5	89	60	88110.0
17	14.3	89	60	76362.0
18	13.0	89	60	69420.0
19	15.6	89	60	83304.0
20	17.2	89	60	91848.0
21	17.2	89	60	91848.0
22	16.9	89	60	90246.0
23	16.6	89	60	88644.0
24	13.8	89	60	73692.0
25	11.5	89	60	61410.0
26	13.3	89	60	71022.0
27	19.3	89	60	103062.0
28	18.1	89	60	96654.0
29	16.6	89	60	88644.0
30	17.3	89	60	92382.0
TOTALS	448.0			2392320.0
AVG. HRS.	14.9	AVG.	GAL/DAY	79744.0

MARLBOROUGH WATER
WELL #2 2010

OCT	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	0.0	89	60	0.0
2	0.0	89	60	0.0
3	0.0	89	60	0.0
4	0.0	89	60	0.0
5	0.0	89	60	0.0
6	0.0	89	60	0.0
7	0.0	89	60	0.0
8	0.0	89	60	0.0
9	0.0	89	60	0.0
10	0.0	89	60	0.0
11	0.0	89	60	0.0
12	0.0	89	60	0.0
13	0.0	89	60	0.0
14	0.0	89	60	0.0
15	0.0	89	60	0.0
16	0.0	89	60	0.0
17	0.0	89	60	0.0
18	0.0	89	60	0.0
19	0.0	89	60	0.0
20	0.0	89	60	0.0
21	0.0	89	60	0.0
22	0.0	89	60	0.0
23	0.0	89	60	0.0
24	0.0	89	60	0.0
25	0.0	89	60	0.0
26	0.0	89	60	0.0
27	0.0	89	60	0.0
28	0.0	89	60	0.0
29	0.0	89	60	0.0
30	0.0	89	60	0.0
31	0.0	89	60	0.0
TOTALS	0.0			0.0
AVG. HRS.	0.0	AVG.	GAL/DAY	0.0

MARLBOROUGH WATER
WELL #2 2010

NOV	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	0.0	89	60	0.0
2	0.0	89	60	0.0
3	0.0	89	60	0.0
4	0.0	89	60	0.0
5	0.0	89	60	0.0
6	0.0	89	60	0.0
7	0.0	89	60	0.0
8	0.0	89	60	0.0
9	0.0	89	60	0.0
10	0.0	89	60	0.0
11	0.0	89	60	0.0
12	0.0	89	60	0.0
13	0.0	89	60	0.0
14	0.0	89	60	0.0
15	0.0	89	60	0.0
16	0.0	89	60	0.0
17	0.0	89	60	0.0
18	0.0	89	60	0.0
19	0.0	89	60	0.0
20	0.0	89	60	0.0
21	0.0	89	60	0.0
22	0.0	89	60	0.0
23	0.0	89	60	0.0
24	0.0	89	60	0.0
25	0.0	89	60	0.0
26	0.0	89	60	0.0
27	0.0	89	60	0.0
28	0.0	89	60	0.0
29	0.0	89	60	0.0
30	0.0	89	60	0.0
TOTALS	0.0			0.0
AVG. HRS.	0.0	AVG. GAL/DAY		0.0

MARLBOROUGH WATER
WELL #2 2010

DEC	HOURS	G/MIN	MIN/HR	SUBTOTALS
1	0.0	89	60	0.0
2	0.0	89	60	0.0
3	0.0	89	60	0.0
4	0.0	89	60	0.0
5	0.0	89	60	0.0
6	0.0	89	60	0.0
7	0.0	89	60	0.0
8	0.0	89	60	0.0
9	0.0	89	60	0.0
10	0.0	89	60	0.0
11	0.0	89	60	0.0
12	0.0	89	60	0.0
13	0.0	89	60	0.0
14	0.0	89	60	0.0
15	0.0	89	60	0.0
16	0.0	89	60	0.0
17	0.0	89	60	0.0
18	0.0	89	60	0.0
19	0.0	89	60	0.0
20	0.0	89	60	0.0
21	0.0	89	60	0.0
22	0.0	89	60	0.0
23	0.0	89	60	0.0
24	0.0	89	60	0.0
25	0.0	89	60	0.0
26	0.0	89	60	0.0
27	0.0	89	60	0.0
28	0.0	89	60	0.0
29	0.0	89	60	0.0
30	0.0	89	60	0.0
31	0.0	89	60	0.0
TOTALS	0.0			0.0
AVG. HRS.	0.0	AVG. GAL/DAY		0.0

APPENDIX B

WATER CONSERVATION PLAN ONGOING COMPLIANCE FORM

AND

UNACCOUNTED FOR WATER WORKSHEET

The water system will submit a "Water Conservation Plan Ongoing Compliance Form" once every three years documenting how compliance with the requirements of Env-Wq 2101 is being achieved. The Town of Marlborough understands that NHDES is currently revising this form. The form may be located on the DES Water Conservation webpage found at www.des.nh.gov – go to the A-Z List and scrolling down to Water Conservation.

The Town understands that the form will include an Unaccounted for Water Worksheet.

APPENDIX C

TOWN OF MARLBOROUGH WATER/SEWER RATES

OFFICE OF THE TOWN CLERK/TAX COLLECTOR

Post Office Box 487
Marlborough, New Hampshire 03455-0487

Telephone (603) 876-4529
Fax (603) 876-4703
e-mail: marlboroughtc@monad.net

Office Hours
Monday Nights 7 to 9
Mon, Tues Thurs 9-4:30/Wed 9-noon/Fri 9-

TOWN OF MARLBOROUGH
Water/Sewer Rates

WATER

Residential-Water

Minimum billing: $16.25 (based upon a minimum usage of 5,000 gallons)

Up to 10,000 gallons	**$3.25/1000**
11,000 gallons up to 15,000 gallons	**$3.35/1000**
16,000 gallons up to 20,000 gallons	**$3.75/1000**
21,000 gallons up to 25,000 gallons	**$4.00/1000**
26,000 gallons and up	**$4.10/1000**

Commercial-Water

Minimum billing: $16.25 (based upon a minimum usage of 5,000 gallons)

Up to 10,000 gallons	**$3.25/1000**
11,000 – 99,000	**$3.65/1000**

SEWER

Residential-Sewer

Minimum billing: $26.70

All sewer billed at $5.34/1000

All sewer customers are subject to a quarterly Fixed Base Rate of $26.50

Commercial-Sewer

Minimum billing: $26.70

All sewer billed at $5.34/1000

Updated 7/30/2007 (new sewer rates and the charging of the quarterly fixed base rate effective with the billing of 2nd quarter 2007

APPENDIX D

WATER CONSERVATION EDUCATIONAL MATERIALS

ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WD-DWGB-26-1 2010

An Introduction to Water Use Management and Water Efficiency Practices

Water is essential to all life on our planet. Surface and ground waters support a variety of human uses including drinking, irrigation of crops and landscape, industrial processes, domestic applications, and recreation.

Residents have historically thought of New Hampshire as water rich and that conservation was something only people in arid states needed to practice. However, that perception is changing. As Ben Franklin said, "When the well's dry, you know the worth of water," later paraphrased by Rowland Howard as "You never miss the water 'til the well runs dry." In some parts of the state, wells have indeed gone dry. Water levels in some New Hampshire lakes, ponds, aquifers and streams have dropped, largely due to over-mining of groundwater supplies. When private and public water wells withdraw more water than the aquifer that supplies them can provide, surface waters may recharge the groundwater. This condition can have serious impacts on both public health and the economy.

Federal regulations applicable to public drinking water quality have become progressively more stringent. Untreated water that once met federal drinking water quality standards is no longer considered potable, and public water suppliers are faced with the increasing chemical, energy and waste disposal costs of treating raw water. This increase is passed along to their customers in the form of higher rates.

Groundwater supplies are more frequently experiencing quantity deficits. Many private and community wells in New Hampshire have been deepened, replaced, or abandoned due to dwindling production. This decline can be attributed to the stress of escalating housing and industrial development and periodic near-drought conditions. Drilling more or deeper wells, however, will not solve long-term water availability problems. This does not mean New Hampshire residents have to do without adequate water. It simply means that we need to adopt more efficient ways of using water.

States that are less water-rich than New Hampshire have practiced water efficiency methods for decades. Hundreds of water efficient products are now available. Water efficiency management techniques have also been developed including water use and conservation audits, water fixture retrofitting, irrigation scheduling, xeriscape, and water supply maintenance programs.

Water efficiency practices are proven to save valuable water resources and protect the environment. One of the great side benefits of these practices is the simple fact that they save money. Even though the initial cost of replacements or retrofits might be high, most water users find the water-related savings result in a surprisingly short payback period.

Water Efficiency Success Stories

During 2008-2009, the Department of Environmental Services retrofitted 22 bathrooms in its Concord office with water-efficient toilets, urinals and faucets. In all, 76 toilets, 30 urinals and 86 faucet sets were replaced with more efficient models. DES anticipates saving 1.8 million gallons per year resulting in an annual reduction of $13,000 in water and sewer bills.

Even homeowners can realize astounding savings. One New Hampshire household reported replacing a dripping kitchen faucet and reaping a $30 drop in the monthly electricity bill. The payback period on the new faucet was less than two months.

One of the most water-intensive uses is lawn and landscape irrigation. A single lawn sprinkler operating at five gallons per minute for half an hour uses as much water as 83 low-flow toilet flushes. That's about a week's worth of bathroom visits for an average family.

These are just a few examples of how practicing water efficiency can benefit you substantially. To help you save money and protect the environment and New Hampshire's valuable drinking water supplies, DES has created a series of fact sheets on water efficiency practices and conservation techniques. These fact sheets are characterized by the type of water use and are listed on the following page with cross-referencing to different users associated with the category.

For Additional Information

Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at http://des.nh.gov/organization/divisions/water/dwgb/index.htm. All of the bureau's fact sheets are on-line at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm. More information about the DES Water Conservation Program can be found at http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm

References:

New England Interstate Water Pollution Control Commission (NEIWPCC), *MRI Water Conservation Technical Bulletin #1, Water Conservation Best Management Practices General Practices and References;* NEIWPCC, Lowell, Mass.; 1996.

Vickers, Amy; *Handbook of Water Use and Conservation;* WaterPlow Press, Amherst, Mass.; 2001; pp 2-9, 276.

Note: This fact sheet is accurate as of May 2010. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

Water Use Categories and Related Water Efficiency Fact Sheets

Fact Sheet ⇒	Intro-duction	Agri-cultural	Aqua-culture	Domestic Indoor	Golf	Health Care	Indus-trial	Institu-tions	Laundry	Out-doors	Sand/ Gravel	Snow-making	Water Audits	Water Supply	Xeri-scape
Category ⇓	WD-DWGB-26-1	WD-DWGB-26-5	WD-DWGB-26-12	WD-DWGB-26-2	WD-DWGB-26-6	WD-DWGB-26-14	WD-DWGB-26-7	WD-DWGB-26-13	WD-DWGB-26-10	WD-DWGB-26-3	WD-DWGB-26-8	WD-DWGB-26-11	WD-DWGB-26-15 &16	WD-DWGB-26-9	WD-DWGB-26-4
Homeowners	X			X						X			X		X
Fruit, Vegetable, Nursery Stock Growers	X	X								X			X		X
Turf Growers	X	X			X					X			X		X
Commercial Greenhouses	X	X								X			X		X
Concrete Mfg.	X			X			X			X			X		
Golf Courses	X			X	X					X			X		X
Hospital & Nursing Homes	X			X		X		X	X	X			X		X
Laundries & Laundromats	X			X					X	X			X		
Manufacturing/ Industry	X			X			X			X			X		X
Prisons	X			X				X	X	X			X		X
Mining	X			X						X	X		X		
Sawmills	X						X			X			X		
Schools & Colleges	X			X				X	X	X			X		X
Ski Areas	X			X						X		X	X		X
Steam Power Generators	X			X			X			X			X		
Water Suppliers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

All fact sheets are available from DES by calling (603) 271-2975 or can be downloaded at http://www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm.

ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WD-DWGB-26-2 2010

Water Efficiency Practices for Domestic Indoor Water Use

Only 1 percent of the earth's water is available for drinking. The average American uses 100 gallons of water a day. Our excessive water use habits deplete potable drinking water supplies and return trillions of gallons of wastewater to streams and coastal waters. The following indoor water efficiency practices can save as much as 25,000 gallons of water per person per year. Water efficiency practices not only save water, they save money. For a description of how to determine water use in your home, see the following fact sheets at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm and scroll to WD-DWGB-26-15, "Performing a Domestic Water Use and Conservation Audit." To save water on outdoor use, see fact sheet WD-DWGB-26-3, "Water Efficiency Practices for Outdoor Water Use" at the same website.

General Water Efficiency Practices

The following water efficiency practices apply to general domestic water use. Bathroom, kitchen and laundry water use are addressed in later sections.

- Look for the WaterSense label when considering water using fixtures, appliances, and services. WaterSense, sponsored by the U.S. Environmental Protection Agency (EPA), labels water-efficient products that have been independently tested to ensure water savings without sacrificing performance or quality.
- Shut off water when not in use, such as when you brush your teeth or shave.
- Never put water down the drain when you can use it for something else, such as watering plants.
- Insulate water pipes and hot water heaters. This retains heat so that water doesn't need to run as long to get hot. It also saves on energy costs.
- Avoid water softening systems unless absolutely necessary. Backwashing these systems uses large quantities of water. If you do use a water softener, run the minimum amount of recommended regenerations to maintain softness.
- Turn off pumps, water softeners, and other water-using equipment while on vacation.
- Check for and repair leaks. Not only will you save water but you will save energy and money. A large percentage of energy costs can be attributed to pumping, treating, heating, and cooling water.
- If you are on municipal water and have a meter at your house, check the meter over a period of time when no one is using water. If the meter moves, you have a leak.
- If you have a well, the pump shouldn't run at times when no water is being used.

Water Efficiency Practices in the Bathroom
More than one fourth of all domestic indoor water consumption is used in the bathroom. The following water efficiency practices will help you save water in the bathroom.

- Install ultra-low flow toilets (ULF) that use a maximum of 1.28 gal/flush (4.8L/flush) or retrofit existing toilets with displacement bottles or dams. Dual flush toilets offer a choice between the 1.6-gallon flush for solid wastes and a 1.0-gallon flush for liquid only. Never put bricks in toilet tanks; they disintegrate over time. Use a squat, fat glass jar, like a pickle jar, no more than 6" high, filled with water. Glass is heavier than plastic and less apt to shift around in the tank.
- Install low-flow bathroom faucets that use no more than 1.5 gallons per minute or install low-flow faucet aerators or laminar flow restrictors. These devices are readily available at most hardware and building supply stores.
- Install low-flow showerheads that use no more than 2.0 gallons per minute. Low-flow showerheads are designed to use less water and still provide the same invigorating spray as their water-wasting counterparts.
- Don't use the toilet as a garbage disposal. Avoid unnecessary toilet flushing by disposing of tissues, cigarette butts and other items in the trash, and composting vegetable food waste.
- Replace or repair toilet flush handles that stick in the flush position.
- Avoid using automatic bowl cleaners in your toilet tank. These chemicals rapidly degrade flapper valves and other tank components, causing the toilet to leak.
- Adjust the toilet tank float level so that water fills no higher than 0.5"-1.0" below the top of the overflow pipe. At higher levels water can flow down the pipe and leak through to the bowl. The refill valve then tops off the tank, causing a continuous cycle of drain and fill.
- Detect leaks in toilet tanks by dropping food coloring in the tank (12 drops). Do not flush the toilet for at least an hour. If the tank leaks the dye will show up in the bowl.
- Fill bathtubs no more than half full.

Water Efficiency Practices in the Kitchen
The following water efficiency practices can be applied to routine kitchen chores.

- Operate dishwashers with full loads only. Use the water-save cycle if your dishwasher is equipped with one.
- If washing dishes by hand, rinse them in a basin rather than under running water.
- Store drinking water in the refrigerator rather than running the tap for cold water.
- Compost food scraps rather than using a garbage disposal. Not only do disposal units waste water; the fine particles they produce can clog a septic system.
- Consider installing an instant water heater on the kitchen faucet. This reduces the time needed to run water until it becomes hot.
- Do not run water to melt ice or thaw frozen foods. Defrost them in a microwave or in the refrigerator overnight.
- Rinse vegetables in a pan of water rather than under running water.

Water Efficiency Practices in the Laundry
The laundry is usually the second highest domestic indoor water use. The following water efficiency practices are designed to save water in the laundry.

- Wash full loads only. If unable to wash a full load, set your washer to the appropriate water level setting.
- Consider replacing your top-loading, vertical-axis washer with a more efficient horizontal-axis washer. Most of these are front-loading, but some newer models are also top-loading. These washers rotate clothes rather than agitating them and use much less water, an average of 20 gallons per load compared to an average of 43 gallons for conventional washers. See the EPA's Energy Star website listed at the end of this document for a catalog of Energy Star-approved washing machines.

For Additional Information
Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at http://des.nh.gov/organization/divisions/water/dwgb/index.htm. All of the bureau's fact sheets are on-line at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm. More information about the DES Water Conservation Program can be found at http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm.

Resources
Woodinville, WA Water District. In-depth water-saving tips, how to check for leaks. http://www.woodinvillewater.com/Conservation/District%20Program/District%20Program.htm

US EPA. Listing of Energy Star rated washing machines. www.energystar.gov

References:
New England Interstate Water Pollution Control Commission (NEIWPCC) *MRI Water Conservation Technical Bulletin #5, Water Conservation Best Management Practices for Domestic/Sanitary Water Use;* NEIWPCC, Lowell, Mass.; 1996.
US Dept. of Defense, *MIL-Handbook-1165, Water Conservation;* US Dept. of Defense; 1997; pp 25-37.
Vickers, Amy; *Handbook of Water Use and Conservation;* WaterPlow Press, Amherst, Mass.; 2001; pp 23-75, 87-133.

Note: This fact sheet is accurate as of May 2010. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

ENVIRONMENTAL
Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

WD-DWGB-26-15 2010

Performing a Domestic Water Use and Conservation Audit

Performing a water audit of your home is the first step in designing an effective water conservation plan. A water audit surveys all water-using or conveying fixtures, plumbing, equipment and practices in your home to determine the present water uses, losses and conservation practices and to recommend improvements. A water audit serves as the starting point for identifying losses and implementing useful water efficiency practices.

The following steps are designed as a general guide to the water audit process. Since this is a generic document, not all portions of the audit process will apply to your home.

Step 1: Identify your source.

- Where do you get your water? Is it from an offsite municipal or community water supply, or an onsite private well?

Step 2: Gather all existing information including:

- Water and sewer bills.
- Number of occupants and a typical schedule of their activity. Does anyone stay home all day? These factors make a difference in the magnitude of your water use.
- Paperwork (owner's manuals) related to water-using equipment, appliances, fixtures, pumps, etc.
- Capacities, storage and water use of all appliances, fixtures, pumps, hoses and other water-using equipment such as spas and pools. Some of this information should be in the owner's manuals. You may have to call the manufacturer or installer, such as your plumber, to get the information you don't have.

Step 3: Quantify your water use.

- If your house is metered this task is easy. Locate your water meter. It may be located at or near the property line and probably has the name of the water company on it somewhere. Most meters read in cubic feet. To convert cubic feet to gallons, multiply the reading by 7.48. To measure daily water use, record the meter readings at the beginning and end of any 24-hour period. Subtract the initial reading from the final one. This is how much water you used on that day. Do this several times and average the daily readings.
- If you want to know how much water individual appliances or practices use, read the meter before and after each water use. Make sure no one else in the house is using water when you are taking these readings. For instance, if you want to know how much water you use

when washing dishes, take a meter reading before and after you run the dishwasher, but make sure no one flushes a toilet or takes a shower during the cycle.

- If your home is not metered, determining water use is more difficult. You can easily measure the flow from your faucets, showerheads or garden hose by following the next step.
- Hold a large container under the device to be measured and run the water for 10 seconds. Measure the amount of water in the container and multiply it by 6 to get the volume per minute. This is the flow rate for that device. For example, if there are 2 quarts of water in the container after 10 seconds, multiply 2 by 6, equaling 12 quarts. Dividing this number by 4 (the number of quarts in a gallon) yields a flow rate of 3 gallons per minute for that faucet.
- You can determine the water used by appliances and other water-using devices by contacting the manufacturer, reading the owner's manual or checking with your plumber.

Step 4. Perform the audit.

- Catalog your water-using devices. Note the number of each, the manufacturer and the amount of water each uses (flow rate calculated in step 3). For example: Homes built after 1994 typically have toilets that flush at 1.6 gallons per flush and those built prior to 1994 usually flush a minimum of 3.5 gallons per flush. Don't forget to include fixtures and practices employed in outside water use.
- Multiply the flow rate for each device by the amount of time the device is used in a day for each water use, such as brushing teeth or taking a shower. For instance, multiply the flow rate of a garden hose in gallons per minute times the number of minutes you run the water. If you water the garden twice a day for 20 minutes with a 5-gallon per minute hose, you would use 200 gallons of water a day on your garden.
- Note any leaks and try to determine how much water is being lost to that leak. If the leak is in a kitchen sink, place a measuring device under the leak and measure how long it takes to fill. Let's say it takes 15 minutes to fill a 2-quart measure. This means the leaking faucet wastes 2 gallons of water an hour, or 48 gallons of water a day. Depending on your water rates, one small leak could be costing you about $5 a month. If you have your own well, this leak could cost as much as $30 a month in electricity to run your pump.
- If you aren't sure whether you have leaks in the house, turn off all water-using devices and watch your meter. If it still spins, you have a leak. Otherwise listen to your pump if you have a private well. It shouldn't come on if you aren't using any water.
- Identify and quantify water conservation devices and practices already in place, such as low-flow faucets and shutting off the water when you brush your teeth. Quantify their water use and savings over conventional devices and methods.

Step 5. Analyze the audit results.

- Determine how and where you use water in your house.
- Identify areas where you can save water. Include retrofit and replacement of high water-using devices and appliances. Visit the fact sheets webpage at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm and scroll to WD-DWGB-26-2 "Water Efficiency Practices for Domestic Indoor Water Use." Determine which water efficiency measures you might implement in your home.

Step 6. Prepare a benefit/cost analysis of potential water conservation measures.

- Calculate the cost of water lost to leaks as identified in Step 4. This cost could be either cost per gallon to buy water or cost per gallon to pump it. Be sure to include cost of wastewater disposal. If you know the wattage rating for your pump you can estimate the

cost of pumping water. Multiply the wattage times the number of hours a day the pump runs times the kilowatt-hour rate your electric company charges. A licensed pump installer should be able to tell you the wattage rating for your type of pump.

- Consider all costs associated with a proposed conservation measure including initial purchase and installation.
- Determine the savings the new conservation measure will provide. Consider the cost savings of buying, pumping or heating water that would be used without the measure and the disposal costs of wastewater. Also take into consideration savings due to leak repair. Water efficiency practice implementation could eliminate or reduce the need for water pump or septic system upgrades or replacements. Take these avoided costs into consideration as well.
- Calculate a payback period for water efficiency measures. The payback period equals the amount of time it will take to recover the initial expenditure of a retrofit as a result of the savings associated with its use.

Step 7. Develop a long-range water conservation plan.

- Use your audit results and benefit/cost analysis to formulate your plan.
- Include a regular leak detection and repair program. See the fact sheet WD-DWGB-26-2, "Water Efficiency Practices for Indoor Water Use" at the above webpage.
- Determine where and how you will replace or retrofit water efficiency devices. For example, "I am going to install faucet aerators in the kitchen and bathrooms."
- Determine how water efficiency practices will be implemented. For instance, "Everyone in the family will take 5-minute showers and turn off the water while brushing their teeth. I will put a timer in each bathroom to remind everyone to take shorter showers."
- Document an implementation schedule for any proposed water efficiency practices and upgrades. For example, "I am going to start watering the garden by drip irrigation next summer and I am going to mail order soaker hoses this winter."
- Educate your family about the implemented practices and the installed devices. Without your family's help, water efficiency practices will not work.

For Additional Information

Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov , or visit our website at http://des.nh.gov/organization/divisions/water/dwgb/index.htm. All of the bureau's fact sheets are on-line at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm. More information about the DES Water Conservation Program can be found at http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm.

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APPENDIX E

WATER CONSERVATION EDUCATIONAL MATERIALS

FOR

INDUSTRIAL WATER USERS

ENVIRONMENTAL
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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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WD-DWGB-26-7 2010

Water Efficiency Practices for Industrial Water Users

Many industrial processes are water intensive including washing and rinsing, heating and cooling, shop clean-up and outdoor water use. The water efficiency practices in this fact sheet address these industrial water uses. Employing these methods saves considerable water and water-related costs. Though seemingly costly to implement, investment payback on most water efficiency methods can be relatively short. A comprehensive audit and economic analysis should be performed to assess the facility's water system and identify locations where these practices can be employed to conserve water. Visit the fact sheets webpage at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm and scroll to WD-DWGB-26-16, "Performing a Business or Industry Water Use and Conservation Audit."

General Water Efficiency Practices
The following general water efficiency practices apply to all areas of the facility.

- Regularly check for leaks. Metering water uses throughout the plant helps detect leaks and maintain minimum flow rates.
- Sweep and shovel floors, loading docks, drives, parking lots and sidewalks rather than hosing them down.
- Wash fleet vehicles less often.
- Use low-flow plumbing and equipment in bathrooms, cafeterias and other domestic areas.
- Turn off all water flows during shutdowns.
- Eliminate the need to purge hot water lines by installing on-demand point-of-use water heating systems.
- Reuse blowdown water in other applications. Blowdown or bleed-off from a cooling tower is the deliberate release of water containing high concentrations of dissolved solids that would affect the proper functioning of the cooling tower.
- Establish a routine maintenance program to check and replace worn parts, tanks, and connections in water using and conveying equipment before leaks can occur.
- Upgrade to water-saving models as old equipment wears out.

Rinsing and Cleaning Water Efficiency Practices
The following water efficiency practices relate to the majority of rinsing and cleaning techniques. Many are specific to metal finishing and plating processes, some refer to aggregate washing and production, others refer to general cleaning practices.

- Clean products, equipment and the facility only when necessary.
- Use dry methods wherever possible. Compressed air or the brushing of surfaces rather than rinsing

with water can be used for many types of cleaning processes.

- Install flow restrictors on plumbing fixtures to limit flow.
- Check nozzles for clogging.
- Install sensors or spring-loaded valves that shut off water flows when not in use.
- Use high pressure, low volume nozzles.
- Reclaim wash and rinse water. Reuse final rinse water in previous rinse or wash stages. Consider using dissolved air floatation, settling, filtration or centrifugation treatment techniques. All of these techniques are designed to separate solids from liquid. For instance, concrete manufacturers can recycle tailings and rinse water from the trucks into the production of concrete blocks.
- Switch to intermittent flow systems and use measured amounts of water rather than continuous rinsing and cleaning.
- Schedule similar processes together and use sequential rinses where water from one process is reused in the next. For instance, schedule color related processes from light to dark to reduce interim cleaning needs.
- Utilize air injection or mechanical mixers to improve rinse efficiency.
- Use air knives and wetting agents to reduce drag-out. Air knives use air streams to remove excess plating solution. Wetting agents reduce surface tension causing the plating solution to flow easily and cover the work piece more completely.
- Allow drag-out to drain completely before moving to the rinse process. Install drain boards to divert drag-out back to the process tank as the product moves to the rinse tank.
- Use static rinse tanks where feasible or switch to smaller tanks. Static rinse tanks work well for pre-wetting surfaces. Consider reusing static rinse water as make-up water.
- Use counter-current rinsing systems that flow water in the opposite direction of the process, leaving the last tank cleanest and the previous tanks requiring less water. Counter-current systems can reduce water use by 25 percent to 50 percent.
- Cover bath tanks when not in use to reduce evaporation losses.
- Install water-saving spray rinse or fog rinse systems where appropriate. Use the correct nozzles so that sprays and fogs are directed appropriately.
- Employ recirculation technology on reverse osmosis and deionized water systems. Operate filtration equipment properly to avoid producing excess reject wastewater.

A metal finishing plant in San Jose, Calif., installed air knives and flow restrictors and cut water use by 25 percent. They realized payback on the investment within two months.

Non-Contact Cooling Water Efficiency Practices

Non-contact cooling is the most common industrial water use practice. This process generally uses the largest amount of water at a facility. Processing machine, air compressor, refrigeration, steam condenser and air conditioning cooling systems are common in various industries and institutions. Employing efficiency practices addressing non-contact cooling water conservation achieves significant facility water savings.

- Retrofit or eliminate once-through cooling systems. Retrofits allow for recirculation of cooling water and can be adapted to some once-through systems. Install closed loop water/air heat exchangers or chillers or an evaporative cooling tower system for cooling water recycling.
- Replace water-cooled equipment with air-cooled.

- Install temperature control valves on equipment with recirculating cooling water, minimizing discharge to the water-cooling system.
- Use just enough water flow needed for adequate cooling.
- Install a timer to shut off the cooling tower when cooling is not needed.
- Reuse single-pass or cooling tower discharge in other applications.
- Properly operate and maintain evaporative cooling systems. Consider the following techniques for improving efficiency.
    - Install meters and monitor water use to ensure the tower is operating within recommended limits.
    - Reduce blow-down and make-up flows by pre-treating the source water or applying in-line treatment techniques. Pre-treating the make-up water protects the system from excessive scale development and corrosion, and allows more cooling water cycles. Before conditioning the water with chemical additions, evaluate the chemical changes to the blowdown water and notify state and federal agencies. Discharge permits and additional wastewater treatment may be required.
    - **Pre-Treatment and In-Line Treatment Methods include:** Side stream filtration, ozonation, ion exchange, chemical additions, pH adjustment, lime/soda softeners and oil and grease removal with detergent addition, separator or filter.
    - Cycle cooling water at least five times if possible without forming scale. Higher quality make-up water and chemical additions to control bacteria, algae, hardness and pH can make this possible.
    - Install meters that measure make-up and bleed off water conductivity and flow. Use the measurements to assess evaporation and drift losses and to optimize cooling system performance.
    - Maintain drift eliminators or install them if excessive drift exists.

Hot Water and Steam Systems Water Efficiency Practices

Heating systems heat water in boilers or hot water tanks for indoor heating, specific process heating and steam electric generation. Water is lost from these systems by evaporation, blowdown and process consumption. Effective management minimizes losses, conserves water, reduces demands and lowers energy costs.

- Properly operate and maintain boilers and employ water conservation techniques that include:
    - Returning steam condensate to the boiler.
    - Inspecting the system for leaks. Repair or replace corroded or worn parts promptly.
    - Treating boiler make up water with the same methods as evaporative cooling tower water. (See above) Minimize blowdown by increasing the number of concentration cycles and pre-treat accordingly.
    - Discharging blowdown through an expansion tank for later.
    - Automating blowdown and make-up water controls to increase boiler efficiency.
- Insulate steam, condensate and hot water pipes and storage tanks to reduce heat losses.
- Install meters on blowdown and make-up lines.
- Maintain, inspect and repair steam traps and lines regularly.
- Use efficient heat exchanger designs and operate them according to the manufacturer/installer's specifications.

- Install a hot water recovery system on hot water tanks.

Outdoor Water Efficiency Practices
The following water efficiency practices will help you save water in outdoor applications. Visit the fact sheets webpage at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm and scroll to WD-DWGB-26-3, "Water Efficiency Practices for Outdoor Water Use," for a more in-depth discussion.

- Underlay all turf grass areas with at least six inches of loam.
- Irrigate only when necessary or not at all.
- If you use automatic pop-up sprinkler heads choose the type that incorporate electronic sensors to monitor soil moisture and rain events.
- Be sure sprinkler heads are producing drops rather than a mist. This helps reduce evaporation.
- Operate automatic sprinkler systems connected to public water systems only when the water demand is low, usually between 4 a.m. and 6 a.m.
- Irrigate before 9 a.m. to prevent evaporative water loss. Nighttime watering may promote bacterial and fungal growth.
- Don't water the pavement. Adjust sprinklers so that they water just the plants.
- Check your irrigation system, outdoor faucets and hose connections for leaks.
- For larger systems, develop an irrigation maintenance program. Routinely inspect all water lines, valves and pumps for leaks. Keep replacement and repair parts on hand. Inspect sprinkler nozzles to ensure they are operating properly and are distributing the water uniformly. Evaluate irrigation system pressures to better control application rates.
- Do not irrigate during windy conditions.
- Use mulch around shrubs, trees and other landscape plantings.
- Use drip or trickle irrigation wherever possible. These systems apply water near the root zone of the plant, ensuring a complete watering while eliminating excess water usage.
- Minimize turf area. Replace grass with mulched flowerbeds, gravel, wood chips, moss or a Zen garden. Consider xeriscaping. Xeriscape effectively uses drought tolerant vegetation that subsists on precipitation alone. Zen gardens traditionally contain no vegetation whatsoever, only raked sand, sculpture and a water feature. Visit the fact sheets webpage at www.des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm and scroll to WD-DWGB-26-4, "Fundamentals of Xeriscape and Water Wise Landscaping."
- Plant drought-resistant turf grass. The most drought-tolerant grasses are the fine leaf fescues. Choose a mix that favors at least 50 percent fine leaf fescues. The University of New Hampshire Cooperative Extension recommends a mix containing hard fescue, Chewings fescue and perennial ryegrass. For more information visit the UNH Cooperative Extension's website at www.extension.unh.edu.
- Set your mower height to two inches. Longer grass blades retain moisture better, shade the root system, and encourage roots to grow deeper and stronger.
- Keep the mower blades sharp. Mowing with a dull blade gives grass a "split ends" look making it seem drier than it is.
- Plant local species. Native plants are hardier and tend to need less water. Check with your county cooperative extension for recommended native plantings. Visit the UNH Cooperative Extension website (above) for a complete listing of UNH county extension services and contacts.

By installing a closed loop non-contact cooling system, New Hampshire Ball Bearings Inc. in Peterborough reduced its water demand by approximately 65,000 gallons per day. It also incorporated a membrane ultra-filtration system to treat process wash water for reuse. This system shows an average water savings of 1,813 gallons per month.

For Additional Information

Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at http://des.nh.gov/organization/divisions/water/dwgb/index.htm. All of the bureau's fact sheets are on-line at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm. More information about the DES Water Conservation Program can be found at http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm.

Resources

USEPA. "Using Water Efficiently: Ideas for Industry." www.epa.gov/watersense/docs/industry508.pdf

Cooling Tower Institute. Listing of technical papers related to water reuse and recycling that may be purchased from this site. Most papers cost $10. www.cti.org/tech_papers/water_reuse.shtml

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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WD-DWGB-26-16 2010

Performing a Business or Industry Water Use and Conservation Audit

Performing a water audit of your facility is the first step in designing an effective water conservation plan. A water audit surveys all water-using or conveying fixtures, plumbing, equipment and practices at a business or manufacturing facility to determine the present water uses, losses and conservation practices and to recommend improvements. A water audit serves as the starting point for identifying losses and implementing useful water efficiency practices.

An audit for a large facility that uses vast quantities of water is a significant undertaking. You may want to obtain outside help from a consultant or your water utility. The following steps are designed as a general guide to the water audit process. Since this is a generic document, not all portions of the audit process will apply to your facility.

Step 1: Identify your source.

- Where do you get your water? Is it from an offsite municipal supplier, an onsite community water supply, an onsite private water supply, a surface water body or a combination?

Step 2: Gather all existing information, including:

- Water and sewer bills.
- Maps, schematics, and floor plans of the distribution system, plumbing and equipment.
- Number of employees/occupants and their schedules. Does your facility have shifts covering the entire 24 hours? These factors make a difference in the magnitude of your water use.
- Capacities, storage and water use of all appliances, fixtures, pumps, hoses, rinse tanks, cooling towers, recycling ponds and other water-using equipment and structures. You may have to call the manufacturer or installer to get this information.
- Paperwork (owner's manuals) related to water-using equipment, appliances, fixtures, pumps, etc.

Step 3: Quantify your water use from each source.

- If your business or facility is metered this task is easy. Calculate your water use based on a 24-hour period. Record the meter readings at the beginning and end of the 24 hours. Subtract the initial reading from the final one. This is how much water you used on that day. Do this several times and average the daily readings.
- If you are not metered, you will need to estimate water use based on the use type and equipment you have, employees/occupant numbers, and information gathered in Step 2. You may also use a portable, non-invasive, ultrasonic water meter to measure flows at various points in the facility. This is a device that clamps onto the outside of pipes and, using ultrasound, measures water flow through the pipe.

Step 4. Perform the audit.

- Catalog all water-using devices and measure daily use of each. Note the number of each, the manufacturer and the amount of water each uses. Don't forget to include fixtures and practices employed in outside water use.
- Identify and quantify water losses due to leaks for each device. This can be as simple as comparing manufacturing specifications with meter readings. If the device uses more water than the manufacturer recommends, then it is possible there is a leak.
- Determine water consumption for each device. Consumption = water in – leaks – (waste) water out. For instance, consumption can be blow down, or the water used to make your product, such as concrete or bottled beverages, or the water left in linens after washing that is subsequently lost in the drying process.
- Identify and quantify water conservation devices and practices already in place. Quantify their water use and savings over conventional devices and methods.

Step 5. Analyze the audit results.

- Water in from the source should equal wastewater out plus consumption plus losses.
- Compare measured water consumption of devices to the manufacturer's claims.
- Calculate the amount of "lost" water for each device. This includes consumptive use plus leaks.
- Identify ways to locate and repair leaks.

Step 6. Develop a forecast of future water use.

- Consider historical water demand, future expansion, employee/occupant increases or decreases, planned water conservation practices, retrofits and upgrades, and weather conditions and trends.

Step 7. Prepare a benefit/cost analysis of potential water conservation measures.

- Calculate the cost of "lost" water identified in Step 5. Include consumptive use plus leaks. This cost could be either cost per gallon to buy water or cost per gallon to pump it. Include treatment and processing costs of lost water. Be sure to include wastewater disposal costs. If you know the wattage rating for your pump you can estimate cost of pumping water. Multiply the wattage times the number of hours a day the pump runs times the kilowatt-hour rate your electric company charges.
- Consider all costs associated with a proposed conservation measure including initial purchase and installation, administrative, maintenance, leak detection, repair and personnel.
- Determine the savings the new conservation measure will provide. Take into consideration savings due to leak repair. Calculate the cost savings of buying, pumping, treating, processing and heating water that would be used without the measure. Factor in the disposal costs of wastewater. Water efficiency practice implementation could also eliminate or reduce the need for water or sewer system expansions or replacements or infrastructure upgrades. Take avoided costs into consideration as well.
- Calculate a payback period for the proposed water efficiency measures. The payback period is the time it takes to recover the initial expenditure of an installation or retrofit as a result of the savings associated with its use.

Step 8. Develop a long-range water conservation plan.

- Use your forecast and benefit/cost analysis to formulate your plan.
- State the goals of the plan and how water will be used in the future.
- Include a regular leak detection and repair program.
- Determine where and how you will replace or retrofit water efficiency devices.
- Determine how water efficiency practices will be implemented.
- Document an implementation schedule for any proposed water efficiency practices and upgrades.
- Inaugurate employee or public education of the implemented practices and installed devices. Without the participants' buy-in and help, water efficiency practices will not work.

For Additional Information

Please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov or visit our website at http://des.nh.gov/organization/divisions/water/dwgb/index.htm. All of the bureau's fact sheets are on-line at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm. More information about the DES Water Conservation Program can be found at http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm

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