NASHUA RIVER WATERSHED
SMART MONITORING PROGRAM 1998-2004

Technical MemorandumTM-81-8

The North Nashua River, Lancaster

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Cover photo by Therese Beaudoin, MassDEP. 15 September 2004
All photos in document taken by Therese Beaudoin. MassDEP. CERO.
SMART monitoring logo designed by Robert Kimball and Barbara Kimball.

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LIST OF LATIN NAMES

Latin Name	Common name	Latin Name	Common name
Ardea herodias	great blue heron	*Odocoileus virginianus*	white-tailed deer
Branta canadensis	Canada goose	*Ondatra zibethicus*	muskrat
Cambaridae *family*	crayfish	*Pontedaria cordata*	pickerelweed
Castor canadensis	North American beaver	*Procyon lotor*	raccoon
Catostomus commersonii	white sucker	*Rana pipiens*	leopard frog
Chara sp.	muskwort	*Salvelinus fontinalis*	brook trout
Lemna sp.	duckweed	*Vallisneria* sp.	American eelgrass
Lythrum salicaria	purple loosestrife	*Wolffia* sp.	watermeal
Myriophyllum sp.	milfoil		

LIST OF ACRONYMS

7Q10	lowest 7-day average streamflow that occurs, on average, once every 10 years
ATV	All Terrain Vehicle
BRP	Bureau of Resource Protection
ºC	degree Celsius
CERO	CEntral Regional Office
CFR	Coldwater Fishery Resource
cfs	cubic feet per second
CSO	Combined Sewer Overflow
DO	dissolved oxygen
DWM	Division of Watershed Management
ºF	degree Fahrenheit
GPD	gallons per day
in	inch
m	meter
MassDEP	Massachusetts Department of Environmental Protection
MDL	method detection limit
MGD	million gallons per day
mg/L	milligrams per liter
mi^2	square mile
NH_3-N	ammonia nitrogen
NO_3NO_2-N	nitrate-nitrite nitrogen
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
NWR	National Wildlife Refuge
ppm	parts per million
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RDL	reporting detection limit
RPD	relative percent difference
SMART	Strategic Monitoring and Assessment for River basin Teams
SOP	standard operating procedure
SSolids	suspended solids
SU	Standard Unit
T	temperature
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TMDL	Total Maximum Daily Load
TN	total nitrogen
TPhos	total phosphorus
Turb	turbidity
uS/cm	microsiemen per centimeter
USGS	United States Geological Survey
WES	Wall Experiment Station
WWTP	Wastewater Treatment Plant
% sat	percent oxygen saturation

INTRODUCTION

The Nashua River, a major tributary of the Merrimack River, flows approximately 41.6 miles (mi) from its beginning at the outlet of Lancaster Millpond in Clinton. Its watershed lies in both Massachusetts and New Hampshire. Of the total drainage area of 530 square miles (mi^2), most lies within Massachusetts and encompasses all or part of 3 cities and 21 towns. For an in-depth description of the watershed, see Nashua River Watershed Water Quality Assessment Report 2003 (MassDEP 2008). The river is characterized by long runs and large impoundments on the mainstem, and upstream, on the North and South Branches. Four dams remain on the mainstem, including the Pepperell Paper Company Dam behind which lies Pepperell Pond, a 296-acre eutrophic impoundment. In addition, the Ice House Dam in Ayer impounds 137 acres. Annual precipitation ranges from 48 to 50 inches (in) over most of the watershed, with a section in the northeast corner of the watershed averaging 46 to 48 inches, and a smaller region around Mt. Wachusett receiving 50 to 52 inches; more information can be found at Average Annual Precipitation For Massachusetts (Ostiguy et al 2010).

Major Massachusetts tributaries of the Nashua River include the North Nashua, Squannacook, and Nissitissit Rivers.

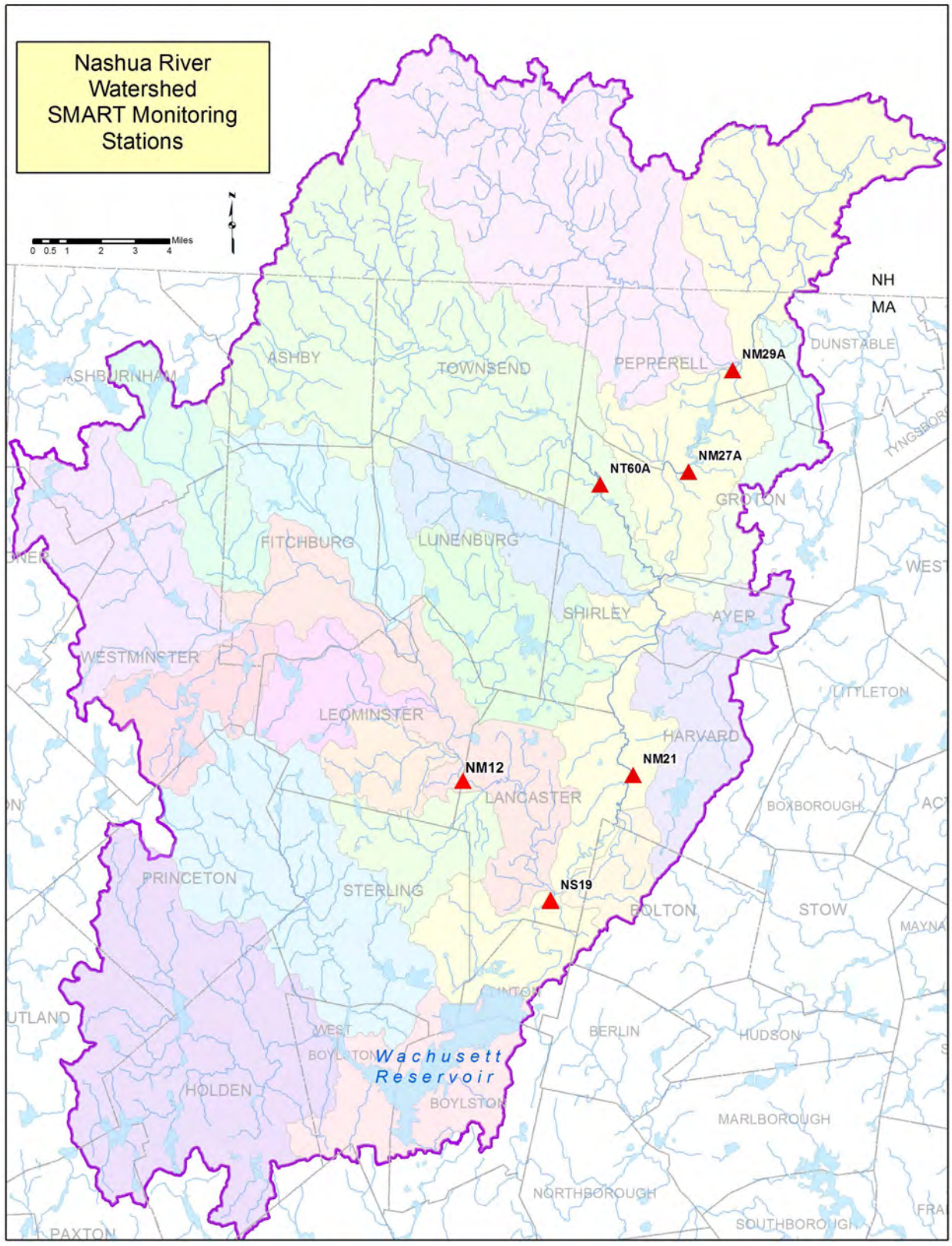
The purpose of this technical memo is to present observations and data collected in the Strategic Monitoring and Assessment for River basin Teams (SMART) program in the Nashua watershed, highlighting how the program supports and augments Mass DEP programs. Limited SMART monitoring began in the watershed in 1998 as part of a cooperative effort between Mass DEP CERO and WPP, as well as the NRWA; regular bimonthly water quality monitoring began in March 1999. Data collected under these programs provided the basis for HSPF modeling and the draft 2007 Nashua Watershed TMDL. The sampling plan matrix for the SMART monitoring program Years 1998-2004 is presented in Table 1; the location of sampling stations is presented in Figure 1. Sampling components at all stations included *in situ* measurements, physical/chemical and nutrient sampling, flow measurements (at existing gaging stations), and general field observations. Each sampling component is described in the sections that follow.

The quality assurance/control plan (QAPP) for the SMART program is presented in CN 12.1*: Quality Assurance Project Plan Strategic Monitoring and Assessment for River basin Teams (SMART) (Blackstone, Chicopee, Concord, French/Quinebaug, Millers, and Nashua Watersheds) 2008-2012* (Beaudoin 2010). The QAPP presents data quality objectives, quality assurance procedures, and other program-specific information.

Table 1 Nashua Basin SMART Sampling Summary – 1998 through 2004

Location and Segment Numbers	Station Name	Dates Sampled[1]
North Nashua River @ Old North Main Street, Lancaster MA81-04	NN12	1998: 5/27, 6/17, 7/21, 7/22, 8/12, 9/9, 10/7, 11/10 1999: 4/7, 5/5, 7/7, 8/4, 9/1, 11/3 2000: 4/5, 6/7, 8/2, 10/18, 12/6 2001: 3/21, 5/16, 7/11, 9/13, 11/14 2002: 1/9, 3/13, 5/8, 7/10, 9/11, 11/6 2003: 2/5, 4/9, 6/11, 8/13, 10/8 2004: 1/27, 3/10, 5/12, 7/14, 9/15, 11/3 [1]The SMART Monitoring program began in the Nashua basin in May 1998.
Nashua River "South Branch" @ Atherton Bridge, Bolton Road, Lancaster MA81-09	NS19	
Nashua River @ Oxbow National Wildlife Refuge, Still River Road, Harvard MA81-05	NM21	
Nashua River at canoe launch, South Road SR-119, Pepperell MA81-06	NM27/ INLTPEPPD	
Nashua River at former trestle site downstream of covered bridge, Mill Street, Pepperell MA81-07	NM29A	
Squannacook River west of Candace Lane, Groton MA81-18	NT60A	

Figure 1 MassDEP SMART Nashua River Watershed Water Quality Station Locations



PROJECT OBJECTIVES

The primary water quality objectives of the SMART monitoring program are:

- Document baseline water quality by: providing information on low flow/event flow variation, seasonal variation and frequency of selected constituents; and establishing reference distributions of key constituents for ecoregion delineation and "clean water" sites;
- Estimate loads of detected water constituents at key locations by: quantifying nitrogen loadings to coastal waters; and calculating phosphorous loads upstream/downstream of representative land use areas;
- Define long term trends in water quality by: documenting improvements associated with major abatement projects; and identifying trends at least-impacted stations (that may result from factors such as acid precipitation);
- Assess attainment of water quality uses by: comparing existing water quality with water quality standards; and by assessing use support for the fishable/swimmable goal;
- Provide support for other programs by: determining reference distributions for ecoregion stations; conducting trend analysis for the 305(b) reports and basin plans; quantifying nutrient loadings for load allocations (TMDLs); obtaining data on nonpoint source loadings for more intensive Year 2 sampling; providing guidance for volunteer monitoring; collecting data for development of statistically-based water quality standards and for improvement of CSO and Stormwater policies; and developing a long-term database on conditions at key locations for the development of new programs and basic research.

As stated in the Introduction, this document presents observations and data collected in the Nashua Watershed under the SMART program from 1998-2004. An assessment of the data will be presented in future reports.

METHODS

Water quality samples were collected in the Nashua basin on the dates shown in Table 1 for the parameters described below; station locations are shown in Figure 1 above. The parameters encompassed in the sampling program include:

- *in situ* measurements: dissolved oxygen (DO), percent oxygen saturation (% sat), pH, specific conductivity (cond), temperature (T), depth and total dissolved solids (TDS);
- physical-chemical constituents: total alkalinity, chlorides, hardness, total suspended solids (SSolids), turbidity (turb);
- nutrients: ammonia-nitrogen (NH_3-N), nitrate-nitrite-nitrogen (NO_3NO_2-N), total Kjeldahl nitrogen (TKN, 1998-2003), total nitrogen (TN, 2004), and total phosphorus (TPhos); and
- Microtox® from July 12, 2000 through July 11, 2001.

Water quality sampling procedures are included in *Grab Collection Techniques for DWM Water Quality Sampling, Standard Operating Procedure* (MassDEP 1999b). Use of the *in situ* monitoring equipment followed procedures set forth in *CN 4.0 Water Quality Multi-probe Instrument Use, Standard Operating Procedure* (MassDEP 1999a). Physical/chemical and nutrient samples were analyzed at the Wall Experiment Station (WES), the DEP analytical laboratory located in Lawrence, Massachusetts. All samples were collected, transported, analyzed, and discarded according to chain-of-custody procedures.

In addition to the measurements and analytes noted above, field observations were recorded at each station on standardized field sheets, field notebooks, and as photographs. Field observations included date/time, location, crewmembers, snow cover, canopy cover, water odors, colors, sheens, foams, estimated river height and velocity, weather conditions, observed uses, wildlife, aquatic algae and macrophytes, potential pollution sources, and unusual conditions. Number and type of samples were recorded, as well as the last set of *in situ* data collected. A summary of field observations by station collected during this sampling period are presented in Table 2 through Table 7 following the station descriptions.

Each station selected for the SMART Monitoring program is described according to key characteristics associated with water quality at that location, as follows:

- Reference: a reference station is located in a stream segment that is minimally influenced by anthropogenic activities;
- Impact: an impact station is located where several sources of pollution come together and can be is used to calibrate a mass balance model, or where critical reactions take place such as at an oxygen sag point; and

- Boundary: a boundary station is located at a pour point i.e., where water leaves a designated river basin, or at a state line.

Field sheets, raw data files, chain of custody forms, lab reports, and other metadata used in this report are managed and maintained by the MassDEP Division of Watershed Management (DWM) in the Water Quality Access Database in Worcester, MA. The validation of the water quality data included data entry into DWM databases, data entry quality control checks, analysis for outliers, blanks, duplicates, precision, and holding time violations, followed by project level review. The project coordinator, as identified in the QAPP for the SMART program, reviews the data for reasonableness, completeness and acceptability; see CN 56.0 83.0, CN149.0, CN202.0, CN211.0, and CN265.0 for the DWM data validation reports of 1999-2004 (MassDEP 2001, 2003, 2004b, 2005b, 2005a, 2006).

Due to resource limitations at the WES laboratory, samples collected for nutrient analyses were frozen, and later analyzed for total phosphorous only, from October 2003 through June 2004. Total alkalinity, chlorides and hardness analyses were also unavailable during this time. Turbidity analyses were performed at the DWM lab.

Although samples were collected for Microtox® analyses during the time period noted above, continuous manufacturer's product contamination issues with the assay's growth media produced invalid results and therefore, prevented use of the data.

STATION OBSERVATIONS

Station NN12 – North Nashua River at old North Main Street, Lancaster, MA (river mile 7.415)

Figure 2 Google Earth view of Station NN12 area

Figure 3 Station NN12 upstream – I-190 Bridges (5/8/2002)

Station NN12 was accessed from the southern shore downstream of the I-190 bridges. Samples were collected by wading to flowing water. Station NN12 serves as an impact station, and characterizes water quality conditions in this major headwater tributary.

Land uses near this station included urban, forest, residential, and major roadways (Figure 2; Google Earth 2011a). Three major municipal NPDES discharges are located upstream (design flow greater than 1 million gallons per day, or MGD), including the Fitchburg West (taken off-line in February 2010 but the permit is still active), Fitchburg East, and Leominster wastewater treatment plants (WWTP); Fitchburg East and Leominster WWTFs are the largest and most complex facilities in the watershed. This segment of the river also contains numerous CSOs which, with the WWTP discharges, define downstream water quality. Numerous large water withdrawals are located upstream (greater than 100,000 gallons per day, or GPD), including private and municipal drinking water supplies and industries.

The river is a run in this area, approximately 72 feet wide, and typically 3 to 5 feet deep (Figure 3). A midstream gravel bar was present during this time frame, extending approximately 70 feet from a point roughly 20 feet downstream of the I-190 Northbound Bridge. With a maximum height of roughly 3 feet, the gravel bar was covered with herbaceous vegetation during the growing season. At low flows, the stream south of this bar was a trickle or a series of stagnant pools, at which times monitoring was conducted in the northern channel. Deciduous and evergreen trees provided shade along the banks, but the canopy did not extend over the channel. The bottom was mostly gravel and sand, with boulder, cobble and silt also present. Periodic high flows and channel scouring resulted in minimal habitat for rooted vegetation; aquatic macrophytes observed at Station NN12 were limited to sparse milfoil (*Myriophyllum* sp.) on one event (9/11/2002). Periphyton was observed on most sampling dates, and typically consisted of moderate to dense filamentous algae, and moss. On September 11, 2002, the entire bottom was covered with filamentous algae, brown slime, and brown floc.

Riverine and terrestrial wildlife were observed at Station NN12. A single white sucker (*Catostomus commersonii*) was observed swimming in a backwater (7/11/2001), as well as brook trout fry (*Salvelinus fontinalis*) and other small fish of unknown species; crayfish (family Cambaridae) were noted on several events. Evidence of beaver (*Castor canadensis*) activity was noted in this area, including downed shrubs, partially severed trunks, and stripped bark from late 2000 through 2002. Canada geese (*Branta canadensis*) were noted on the midstream island on 4/7/1999. Animal tracks noted on the banks included dog, raccoon, and deer. Dense populations of mosquitoes were common after rain events. All terrain vehicle (ATV) tracks were seen on the banks and entering the river on numerous events in 2000-2001. Manmade cutting of riparian vegetation was noted on March 13, 2002.

Approximately half of observations indicated a slightly turbid water column; clear conditions were noted on approximately 25% of sampling events, with the remaining dates ranging from moderate to high turbidity. Water color was typically grey, with few observations of clear, light yellow or brown color. An effluent odor was noted on most sampling events (20 of 27 dates) while an absence of odor was noted on the rest. No sheens were noted during this time period. Foam was present on 10 of 24 sampling dates. Trash was noted in the stream bed on numerous events, although the volume decreased over this time period. Items noted included tires, beer bottles, miscellaneous metal and other objects, plastic shopping bags and other floatables. Floatables, as well as leafy and woody debris, caught in branches of shoreline trees and shrubs attest to occasional flood levels.

Station NS19 – Nashua River downstream from Bolton Road, Lancaster, MA (river mile 27.201)

Figure 4 Google Earth view of Station NS19 area

Figure 5 Station NS19 upstream (7/14/2004)

Station NS19 was accessed from several locations during this time frame, varying with riparian and flow conditions. Access points included: the eastern shore up- and downstream of the Bolton Road Bridge; western shore up- and downstream of the adjacent historic Atherton Bridge; and by bucket drop from the latter. All locations are considered to represent conditions in this area. Station NS19 serves as an impact station and characterizes the South Branch Nashua River waters as these waters enter the Mainstem Nashua River.

Upstream land uses include agriculture, forest and residential, as well as a large surface water supply and an urbanized area (Figure 4; Google Earth 2011b). The 4,135-acre Wachusett Reservoir is part of the water supply for the Metropolitan Boston area; for more information on the management of Wachusett Reservoir, see Wachusett Watershed (MWRA 2011); and Wachusett Tributaries Water Quality 1998-2007 for water quality information on the headwater streams of Wachusett Reservoir (Mass DCR 2011). At the base of the Reservoir lies Lancaster Millpond, whose outlet is the beginning of the Nashua River (also known as the Nashua River "South Branch"). Municipal NPDES discharges above Station NS19 include the Clinton WWTP.

The river at Station NS19 is a run, approximately 32 feet wide and shaded along its shores with deciduous trees and shrubs (Figure 5). The stream bottom consisted of a mixture of cobble, gravel and sand, with a large sand bar located along the western shore extending northward 60-70 feet from the Bolton Road Bridge; the bottom was typically described as highly embedded. Periphyton was usually absent, with sparse coverage on 6 monitoring events as either brown slime/film or green filamentous algae. Aquatic macrophytes observed at Station NS19 were characteristically not present; when noted, growth was sparse, and included pickerelweed (*Pontedaria cordata*) and purple loosestrife (*Lythrum salicaria*). A muskrat (*Ondatra zibethicus*) was seen swimming midstream on 12/6/2000. A beaver dam (*Castor canadensis*) was noted in 2000, at the upper side of the Bolton Road Bridge. It was partially breached on 7/11/2001, but growing in size on 9/13/2001; breached by a long pipe on 11/14/2001; and completely gone by 11/6/2002. Unidentified mammal tracks were seen in the sand along the edge of the western sand bar.

The water column was slightly turbid on most dates sampled; clear conditions were noted infrequently, with a single incidence of high turbidity on 11 June 2003 (dry weather conditions). The water column was described as free of color on roughly half of the events; color, when present, was light yellow, dark tan, brown or grey. The river here typically lacked odor, with "effluent" noted 6 times. The presence of foam was common, although typically sparse, and sheens were never observed. Minor levels of trash were present on most events; tires, a shopping cart, metals, wooden planks, beer cans, plastic bottles, and floatables were recorded.

Station NM21 – Nashua River at Oxbow National Wildlife Refuge canoe launch, Harvard (river mile 21.030)

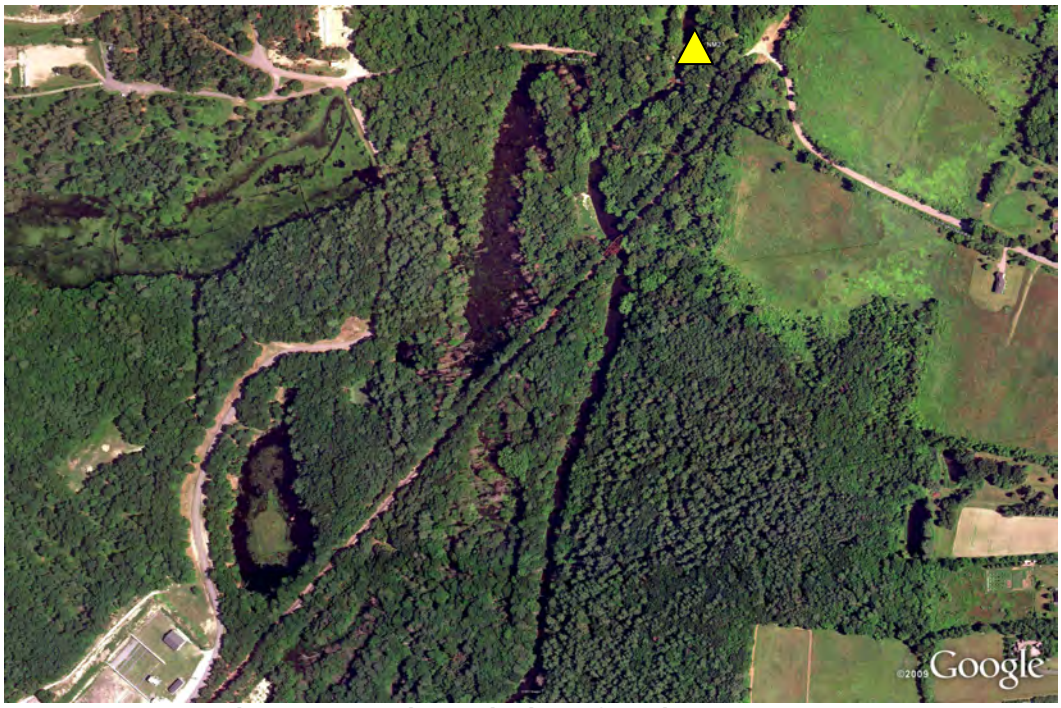


Figure 6 Google Earth view of Station NM21 area

Figure 7 Station NM21 upstream – Tank Bridge (11/6/2002)

Station NM21 was accessed from the eastern shore downstream (north) of the Fort Devens Tank Bridge, Harvard, at the boat launch from 1998 through 2003. Sampling could not be conducted on February 5, 2003 as the channel was covered with ice from bank to bank. Impounded conditions were noted from November 2001 through October 2003, potentially arising from the presence of downstream beaver dams and/or the (then) recent refurbishment and reuse of a hydropower facility at the Ice House Dam in Ayer. By October 2003, Station NM21 no longer met the criteria for a long-term monitoring program because of the lack of flowing i.e., riverine conditions, and was therefore abandoned. Samples were collected by wading in or from shore (depending on flow). Station NM21 was an impact station and characterizes the Nashua River near its beginning i.e., downstream of the confluence of the North and South Branches of the Nashua River.

Land uses near and upstream of NM21 included forest, agriculture and minor residential development (Figure 6) (Google Earth 2011c). The North Nashua River enters the Nashua approximately 1,300 feet downstream of Station NS19. There are no NPDES municipal discharges or major withdrawals near the river in the segment between Stations NS19 and NM21. Station NM21 lies within the 1,667-acre Oxbow National Wildlife Refuge (NWR), which includes 8 miles of protected riverfront beginning slightly downstream of Station NM21 (see Oxbow National Wildlife Refuge; USFWS 2011).

The river is a run in this area. The channel varies in width from 55 to 90 feet (approximate), and is shaded along the stream edges (Figure 7). Banks were undercut, in places severely, throughout the site area. The bottom consisted of sand and silt, with periodic accumulation of fine sediments. In addition to moss, periphyton included a sparse, mossy brown film (11/14/2001), and dense, rusty-colored filamentous algae (7/10/2002). Sparse duckweed (*Lemna* sp.) was the only aquatic macrophyte noted at this location, on one occasion. Animal life observed here include the leopard frog (*Rana pipiens*), muskrat (*Ondatra zibethicus)*, and Canada geese (*Branta canadensis*), as well as unspecified frogs. Very dense populations of mosquitoes were typical, particularly after rain events. The sound of artillery training from the adjacent Fort Devens range was common. Canoers and kayakers were seen utilizing the canoe launch and paddling on the river on several occasions. A cement boat ramp was built in 2003.

The water column at this station ranged from slightly to highly turbid, with slight turbidity noted on 9 events (n=16), and highly cloudy/murky on 6 dates. The water color ranged from light yellow/tan to brown on most events, with black water color noted on one event (9/11/2002), which coincided with highly turbid conditions. The water column lacked odor on most events; effluent odors were noted on 2 dates, and “musty, fungus-y” on one. Foams and sheens were absent throughout this time period, as well as trash.

Historic water quality data indicated that this location consistently exhibited the poorest water quality of stations within the Nashua watershed; therefore duplicate samples were collected here through Oct 2003. When this station was dropped from the SMART program, duplicate sampling was conducted at the North Nashua Station (NN12).

Station NT60A – Squannacook River near Candice Lane, Groton, MA (river mile 4.708)

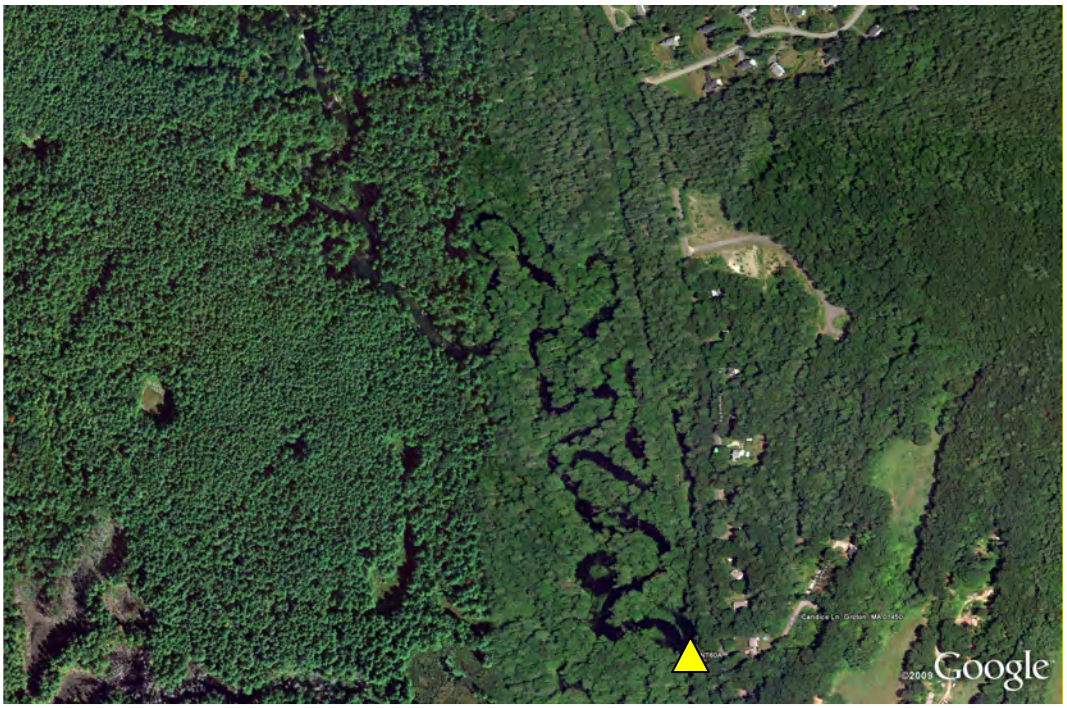


Figure 8 Google Earth view of Station NT60A area

Figure 9 Station NT60A upstream (7/10/2002)

Station NT60A was accessed from the eastern shore near Townsend Road, approximately opposite Candice Lane, Groton. On 2 sampling events, the river was inaccessible due to bank-to-bank ice coverage (1/9/2002, 2/5/2003). Samples were collected by wading in. Station NT60A serves as a reference station, charactering background conditions in this watershed.

Land uses near and upstream of this station include forest and sparse residential development; a downstream dam often impounds the river throughout this reach (Figure 8; Google Earth 2011d). The Squannacook River is a designated Coldwater Fisheries Resource (CFR; MassDFG 2011). There were no major municipal NPDES discharges (>1 MGD) or water withdrawals (>100,000 GPD) upstream of this station.

The river is a run near Station NT60A, approximately 60 to 75 feet wide, and the channel is typically too deep to wade (Figure 9). Trees provide shade along the stream corridor edges only; the channel is almost entirely open to the sun. Banks are undercut throughout the area. The bottom consisted mainly of gravel and sand (when visible), as well as cobble and traces of silt. No aquatic macrophytes or periphyton were observed near the station. Evidence of beaver activity (*Castor canadensis*) began in June 2004, and included partially severed trunks, trees and branches stripped of bark, and numerous downed branches. Other wildlife noted were unspecified ducks, raccoon (*Procyon lotor)*, and muskrat (*Ondatra zibethicus*); white-tailed deer (*Odocoileus virginianus)* and dog tracks were observed at the water's edge. Fishermen were frequently observed.

The water column noted at this station was typically clear, with slight turbidity noted on 5 events (n=17). Water color was clear on most dates; red/tannic color was observed, as well as brown (n=2) and grey (n=1). The station was characterized by a lack of water odors during this time period, with a single observation each of "strange", fishy, rotting vegetables and sulfide. Foams, sheens and trash were absent.

Station NM27 - Nashua River upstream of South Road (SR119), Pepperell, MA (river mile 7.426)

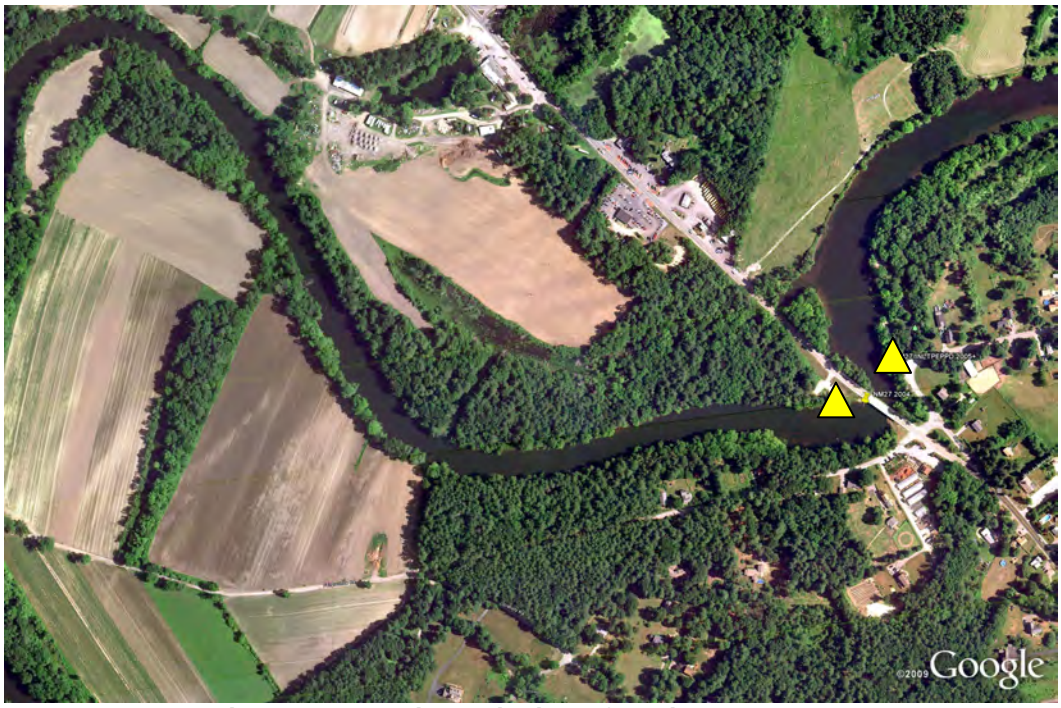


Figure 10 Google Earth view of Station NM27 area

Figure 11 Station NM27 upstream (5/12/2004)

Sampling began at Station NM27 when Station NM21 was dropped from the SMART program, in January 2004. The station was accessed from the northern shore upstream of the South Road/SR 119 Bridge, near the car top boat launch, Pepperell. However, the river at this location drops off quickly; the river near shore was typically backwatered, and flowing water was difficult to reach. Therefore, access was relocated to the downstream boat launch in 2005. Both sites are considered to represent water quality conditions in this reach. Ice covered the river from bank to bank on January 27, 2004. Samples were collected by wading in. Station NM27 serves as an impact station, characterizing water quality in the Nashua River above a major nutrient sink i.e., Pepperell Pond.

Land uses near and upstream of this station include agriculture, forest, and sparse residential (Figure 10; Google Earth 2011e). The Oxbow National Wildlife Refuge (described with Station NM21) abuts an 8-mile stretch of the Nashua River above this sampling site. Upstream municipal NPDES discharges (below Station NS19) include the Ayer WWTP and the Groton School (minor); a large groundwater discharge system is located near the river at Devens (design flow 3 MGD). There are no large water withdrawals (>100,000 GPD) near the river in this stretch.

The river is a run in this area, ranging from 110 to 200 feet wide and too deep to wade across (Figure 11). Trees provide shade along the stream corridor edges only; the channel is almost entirely open to the sun. Stream banks were undercut. The bottom mainly consisted of mud, gravel and sand; boulder and cobble were also present. Aquatic macrophyte growth was sparse, and included American eelgrass (*Vallisneria* sp), muskwort (*Chara* sp.), duckweed (*Lemna* sp.), and watermeal (*Wolffia* sp.). Periphytic growth was noted on 2 events (n=4), and consisted of a green filamentous algae (5/12/2004) and a green loose floc (11/3/2004). Wildlife observed included unspecified mussels, a Northern leopard frog (*Rana pipiens*), crayfish (dead), great blue herons (*Ardea herodias)*, and unidentified fish.

The water column ranged from clear (2 events) to moderately turbid (2 of 5). Water color was brown on 3 events, and clear on 2. The station was typified by a lack of odors, foams and sheens. Trash was observed on 3 of 5 sampling dates, consisting of floatables.

Duplicate samples were collected at this station on March 3 and May 12, 2004. Field blank samples were collected here throughout 2004.

Station NM29A - Nashua River at historic trestle, downstream of Groton Street, Pepperell, MA (river mile 2.917)

Figure 12 Google Earth view of Station NM29A area

Figure 13 Station NM29A upstream (5/12/2004)

Station NM29A was accessed from the southern shore at the former railroad trestle site, downstream of the Groton Street covered bridge. Samples were collected by wading in. Station NM29A serves as an impact station, characterizing water quality in the Nashua River as it leaves Massachusetts.

Land uses near and upstream of this station include agriculture, forest, and sparse residential, as well as the town center of Pepperell (Figure 12; Google Earth 2011f). Most of the river corridor between Station NM27 and NM29A lies within the Pepperell Pond impoundment, its length approximately 4.1 miles. A hydropower facility is located below Pepperell Pond. There are no NPDES municipal discharges or large water withdrawals (>100,000 GPD) near the river in this stretch (the Pepperell WWTF is location downstream of this station on the Nissitissit River).

The river is a run near Station NM29A, approximately 85 feet wide and typically too deep to wade across (Figure 13). Trees provide shade along the stream corridor edges only; the channel is almost entirely open to the sun. Stream banks were undercut. The bottom consisted of boulder, cobble, gravel, sand, silt and mud, and is littered with the wood and metal debris from the trestle that once stood at this site. Aquatic macrophyte growth included duckweed (*Lemna* sp.), watermeal (*Wolffia* sp.) and milfoil (*Myriophyllum* sp.). The presence of periphytic growth was noted on most events (n=22), and the types of periphyton included brown floc, mossy film, and filamentous algae, in densities ranging from sparse to dense. Wildlife noted at the station included mussels and fish jumping; raccoon tracks (*Procyon lotor)* were observed at the water's edge. Very dense populations of mosquitoes were typical, particularly after rain events.

The water column ranged from clear (8 events) to highly turbid (2, n=26). Observed water colors included grey (11), clear (6), light yellow (4), and brown (3). Effluent odors were typical (20, n=27), while foam was commonly observed (10, n=24); sheens were absent throughout this period. Trash was described as consisting of floatables, beer bottles, tires and miscellaneous objects (including debris from the railroad trestle formerly located here).

Field blank samples were collected at this station through 2003, after which time these were collected at Station NM27.

Table 2 Summary of Observations at Station NN12, North Nashua River, Lancaster 1998-2004

Survey Dates	Substrate	Trash	Periphyton	Color	Odor	Foam	Sheen	Turbidity	Wet/Dry Conditions
5/27/1998	--	--	--	--	--	--	--	--	Dry
6/17/1998	--	--	--	--	--	--	--	--	Wet
7/22/1998	--	--	--	--	--	--	--	--	Dry
8/12/1998	--	--	--	--	--	--	--	--	Wet
9/9/1998	--	--	--	--	--	--	--	--	Dry
10/7/1998	--	--	--	--	--	--	--	--	Dry
4/7/1999	--	--	--	--	--	--	--	--	Dry
5/5/1999	--	--	--	--	--	--	--	--	Wet
7/7/1999	--	--	--	--	--	--	--	--	Wet
8/4/1999 toxici	--	--	--	--	--	--	--	--	Dry
9/1/1999	--	--	--	--	Effluent, strong	--	--	--	Dry
11/3/1999	--	--	--	--	Effluent, strong	--	--	--	Wet
4/5/2000	--	--	--	--	--	--	--	--	Wet
6/7/2000	--	Dense; trash/debris	--	--	--	--	--	--	Wet
8/2/2000	--	--	--	--	--	--	--	--	Wet
10/18/2000	--	--	--	Clear	None	--	--	Clear	Wet
12/6/2000	Gravel	--	--	--	--	--	--	Not noted	Dry
3/21/2001	Gravel	--	--	Grey	Effluent, faint	Sparse	--	Slight	Dry
5/16/2001	--	--	--	--	Effluent, faint	Foam	--	Turbid	Wet
7/11/2001	--	None	None	Brown	None	None	None	Slight	Wet
9/13/2001	--	Garbage/trash	Dense, green mossy film; brown floc	Grey	Effluent	None	None	Slight	Dry
11/14/2001	Gravel	Tires	Sparse, mossy brown film	Grey	Effluent	Foam	None	Slight	Dry
1/9/2002	--	Garbage/trash	None	Clear	Effluent, mild	Sparse	None	Clear	Wet
3/13/2002	--	Minor; floatables, tires	Moderate, bright green filamentous	Light yellow	Effluent	Sparse	None	Slight	Dry
5/8/2002	--	Minor; tire, beer bottle	Sparse, brown moss	Clear	None	None	None	Clear	Dry
7/10/2002	--	Bottles, tires, embeddedness	Moderate, mossy green film	Grey	Effluent	None	None	Slight	Wet
9/11/2002	--	Minor	Dense, filamentous; dense, brown slime/film; dense, brown floc	Grey	Effluent	None	None	Slight	Dry
11/6/2002	Unobservable	Unobservable	Unobservable	Grey	Effluent	Sparse	None	Highly cloudy	Wet
2/5/2003	--	Minor; plastic trash bag	Unobservable	Brown	Effluent	None	None	Slight	Wet
4/9/2003	--	Minor; floatables	None	Grey	None	None	None	Slight	Wet
6/11/2003	--	Garbage/trash	Dense, green filamentous	Grey	Effluent	None	None	Slight	Dry
8/13/2003	Unobservable	None	Unobservable	Brown	None	None	None	Suspended solids/murky	Wet
10/8/2003	Boulder/sand/silt/mud	None	None	Clear	Effluent	None	None	Clear	Dry
1/27/2004	Boulder/cobble/gravel/sand/silt	None	Sparse brown filamentous	Clear	None	Sparse	None	Clear	Dry
3/10/2004	Boulder/gravel/sand/silt	None	Sparse, moss	Light yellow	Effluent	Sparse	None	Slight	Wet
5/12/2004	Boulder/gravel/sand/silt; highly embedded	None	Moderate, green filamentous	Clear	Effluent	Very sparse	None	Clear	Dry
7/14/2004	Boulder/gravel/sand/silt; highly embedded	Minor	Moderate, green filamentous; moss, moderate	Grey	Effluent	None	None	Moderate; opaque/milky	Wet
9/15/2004	Boulder/cobble/gravel/sand/silt	None	Moderate, green filamentous	Grey, slight	Effluent	None	None	Clear	Dry
11/3/2004	Boulder/cobble/gravel/sand/silt	None	Dense, brown moss	Grey	Effluent	None	None	Moderate	Wet

-- : Not noted

Table 3 Summary of Observations at Station NS19, Nashua River, Lancaster 1998-2004

Survey Dates	Substrate	Trash	Periphyton	Color	Odor	Foam	Sheen	Turbidity	Wet/Dry Conditions
5/27/1998	--	--	--	--	--	--	--	--	Dry
6/17/1998	--	--	--	--	--	--	--	--	Wet
7/22/1998	--	--	--	--	--	--	--	--	Dry
8/12/1998	--	--	--	--	--	--	--	--	Wet
9/9/1998	--	--	--	--	--	--	--	--	Dry
10/7/1998	--	--	--	--	--	--	--	--	Dry
4/7/1999	--	--	--	--	--	--	--	--	Dry
5/5/1999	--	--	--	--	--	--	--	--	Wet
7/7/1999	--	--	--	--	--	--	--	--	Wet
8/4/1999 Toxici	--	--	--	--	--	--	--	--	Dry
9/1/1999	--	--	--	--	--	--	--	--	Dry
11/3/1999	--	--	--	--	--	--	--	--	Wet
4/5/2000	--	--	--	--	--	--	--	--	Wet
6/7/2000	--	--	--	--	--	--	--	Turbid!	Wet
8/2/2000	--	--	--	--	--	--	--	--	Wet
10/18/2000	--	--	--	--	--	Foam	--	--	Wet
12/6/2000	--	--	--	--	--	Foam	--	--	Dry
3/21/2001	Sand	--	--	--	None	Foam	--	--	Dry
5/16/2001	Mud	--	--	--	--	Foam	--	--	Wet
7/11/2001	--	None	None	Clear	None	None	None	Clear	Wet
9/13/2001	--	Garbage/trash	Sparse, brown film	Light yellow	None	Foam	None	Clear	Dry
11/14/2001	--	Garbage/trash	Sparse, brown film	Brown	Effluent	None	None	Slight	Dry
1/9/2002	Sand	None	None	Brown	Effluent	Sparse	None	Clear	Wet
3/13/2002	--	Minor; trash, tires	Sparse, bright green filamentous	Light green	None	Sparse	None	Slight	Dry
5/8/2002	--	Minor; floatables	Sparse, brown slime	Clear	Effluent	Foam	None	Clear	Dry
7/10/2002	--	Tires, shopping cart	Sparse, mossy green film	Grey	None	None	None	Slight	Wet
9/11/2002	--	Tires, shopping cart	Sparse	Brown	None	None	None	Slight	Dry
11/6/2002	Unobservable	Unobservable	Unobservable	Grey	Effluent	Foam	None	Slight	Wet
2/5/2003	Unobservable	Sunken	None	Dark tan	Effluent	Foam	None	Slight	Wet
4/9/2003	--	None	None	Light yellow	None	None	None	Slight	Wet
6/11/2003	--	None	None	Light yellow	None	None	None	Highly turbid	Dry
8/13/2003	--	Tires	None	Grey	None	Sparse	None	Slight	Wet
10/8/2003	Boulder/cobble/sand/silt; embedded 50%	Tires, beer can, wood, plastic, bottles, shopping cart	None	Clear	None	Sparse	None	Clear	Dry
1/27/2004	Boulder/cobble/gravel/silt; highly embedded	Tires, metals, wooden planks	None	Clear	None	Sparse	None	Clear	Dry
3/10/2004	Boulder/cobble/sand	Trash	None	Light yellow	None	Sparse	None	Moderate	Wet
5/12/2004	Cobble/sand/silt; deeply embedded	Tires, metals, planks	None	Clear	None	Very sparse	None	Clear	Dry
7/14/2004	Cobble/gravel/sand	Wooden planks, trash	None	Unobservable	None	None	None	Unobservable	Wet
9/15/2004	Boulder/cobble/gravel/sand/silt	Floatables, beer cans, planks	None	Clear	None	Sparse	None	Clear	Dry
11/3/2004	Boulder/cobble/gravel/sand/silt	Wooden planks, metals	None	Clear	Effluent, strong	None	None	Clear	Wet

-- : Not noted

Table 4 Summary of Observations at Station NM21, Nashua River, Harvard/Lancaster 1998-2003

Survey Dates	Substrate	Trash	Periphyton	Color	Odor	Foam	Sheen	Turbidity	Wet/Dry Conditions
5/27/1998	--	--	--	--	--	--	--	--	Dry
6/17/1998	--	--	--	--	--	--	--	--	Wet
7/22/1998	--	--	--	--	--	--	--	--	Dry
8/12/1998	--	--	--	--	--	--	--	--	Wet
9/9/1998	--	--	--	--	--	--	--	--	Dry
10/7/1998	--	--	--	--	--	--	--	--	Dry
4/7/1999	--	--	--	--	--	--	--	--	Dry
5/5/1999	--	--	--	--	--	--	--	--	Wet
7/7/1999	--	--	--	--	--	--	--	--	Wet
8/4/1999	--	--	--	--	--	--	--	--	Dry
9/1/1999	--	--	--	--	--	--	--	Very turbid	Dry
11/3/1999	--	--	--	--	--	--	--	--	Wet
4/5/2000	--	--	--	--	--	--	--	--	Wet
6/7/2000	--	--	--	--	--	--	--	Highly turbid	Wet
8/2/2000	--	--	--	--	--	Foam	--	--	Wet
10/18/2000	--	--	--	--	--	--	--	--	Wet
12/6/2000	--	--	--	--	--	--	--	--	Dry
3/21/2001	--	--	--	--	Effluent	--	--	Turbid	Dry
5/16/2001	--	--	--	--	--	None	--	--	Wet
7/11/2001	--	None	None	Brown	None	None	None	Suspended solids/murky	Wet
9/13/2001	--	None	Sparse, bright green moss	Brown	None	None	None	Slight	Dry
11/14/2001	--	None	Sparse, mossy brown film	Brown	Effluent	None	None	Slight	Dry
1/9/2002	--	None	None	Brown	None	None	None	Slight	Wet
3/13/2002	Silt	Unobservable	None	Light green	None	None	None	Slight	Dry
5/8/2002	--	None	None	Dark tan	None	None	None	Slight	Dry
7/10/2002	--	None	Dense, rusty filamentous; brown/green moss	Light yellow	None	None	None	Highly cloudy	Wet
9/11/2002	--	None	None	Black	None	None	Pollen	Suspended solids/murky	Dry
11/6/2002	--	None	None	Light yellow	None	None	None	Slight	Wet
2/5/2003	Station not sampled on this date; not accessible due to snow/ice								
4/9/2003	--	None	None	Dark tan	None	None	None	Slight	Wet
6/11/2003	--	None	None	Light yellow	None	None	Pollen	Slight	Dry
8/13/2003	Unobservable	Unobservable	Unobservable	Brown	Musty, "fungus-y"	None	None	Suspended solids/murky	Wet
10/8/2003	Sand/silt	None	None	Grey	None	None	None	Slight	Dry
-- : Not noted									

Table 5 Summary of Observations at Station NT60A, Squannacook River, Groton/Townsend 1998-2004

Survey Dates	Substrate	Trash	Periphyton	Color	Odor	Foam	Sheen	Turbidity	Wet/Dry Conditions
5/27/1998	--	--	--	--	--	--	--	--	Dry
6/17/1998	--	--	--	--	--	--	--	--	Wet
7/22/1998	--	--	--	--	--	--	--	--	Dry
8/12/1998	--	--	--	--	--	--	--	--	Wet
9/9/1998	--	--	--	--	--	--	--	--	Dry
10/7/1998	--	--	--	--	--	--	--	--	Dry
4/7/1999	--	--	--	--	--	--	--	--	Dry
5/5/1999	--	--	--	--	--	--	--	--	Wet
7/7/1999	--	--	--	--	--	--	--	--	Wet
8/4/1999 Toxici	--	--	--	--	--	--	--	--	Dry
9/1/1999	--	--	--	--	--	--	--	--	Dry
11/3/1999	--	--	--	--	--	--	--	--	Wet
4/5/2000	--	--	--	--	--	--	--	--	Wet
6/7/2000	--	--	--	--	--	--	--	--	Wet
8/2/2000	--	--	--	--	--	--	--	--	Wet
10/18/2000	--	--	--	--	--	--	--	--	Wet
12/6/2000	--	--	--	--	--	--	--	--	Dry
3/21/2001	--	--	--	Tannic	"Strange"	--	--	--	Dry
5/16/2001	--	--	--	--	--	None	--	--	Wet
7/11/2001	--	None	None	Clear	None	None	None	Clear	Wet
9/13/2001	--	None	None	Clear	None	None	None	Clear	Dry
11/14/2001	--	None	None	Brown	None	None	None	Slight	Dry
1/9/2002	Station not sampled on this date; not accessible due to snow/ice								
3/13/2002	--	None	None	Grey	None	None	None	Slight	Dry
5/8/2002	--	None	None	Brown	None	None	None	Slight	Dry
7/10/2002	--	None	None	Red	Rotting vegetables	None	None	Slight	Wet
9/11/2002	--	None	--	Clear	None	None	None	Clear	Dry
11/6/2002	--	None	None	Clear	None	None	None	Clear	Wet
2/5/2003	Station not sampled on this date; not accessible due to snow/ice								
4/9/2003	--	None	None	Clear	None	None	None	Clear	Wet
6/11/2003	--	None	None	Clear	None	None	Pollen	Clear	Dry
8/13/2003	--	None	None	Red	Fishy	None	None	Slight	Wet
10/8/2003	Gravel/sand/silt	None	None	Clear	None	None	None	Clear	Dry
1/27/2004	Station not sampled on this date; not accessible due to snow/ice								
3/10/2004	Gravel/sand	None	None	Clear	None	None	None	Clear	Wet
5/12/2004	Cobble/gravel/sand/silt	None	None	Tannic, moderate	Sulfide	None	None	Clear	Dry
7/14/2004	Gravel/sand	None	None	Clear	None	None	None	Clear	Wet
9/15/2004	Cobble/gravel/sand/silt	None	None	Clear	None	None	None	Clear	Dry
11/3/2004	Gravel/sand/silt	None	None	Clear	None	None	None	Clear	Wet
-- : Not noted									

Table 6 Summary of Observations at Station NM27, Nashua River, Groton/Pepperell 2004

Survey Dates	Substrate	Trash	Periphyton	Color	Odor	Foam	Sheen	Turbidity	Wet/Dry Conditions
1/27/2004	Station not sampled on this date; not accessible due to snow/ice								
3/10/2004	Cobble/gravel/sand/silt/mud	Trash	None	Clear	None	None	None	Clear	Wet
5/12/2004	Boulder/cobble/sand/silt	Moderate, floatables	Green filamentous	Brown	None	None	Pollen	Slight	Dry
7/14/2004	Boulder/cobble/sand/silt	None	None	Brown	None	None	None	Moderate	Wet
9/15/2004	Boulder/cobble/gravel/sand/silt	None	None	Brown	None	None	None	Moderate	Dry
11/3/2004	Cobble/gravel/sand/silt/mud	Floatables, tires	Green loose floc	Clear	None	None	None	Clear	Wet
-- : Not noted									

Table 7 Summary of Observations at Station NM29A, Nashua River, Pepperell 1998-2004

Survey Dates	Substrate	Trash	Periphyton	Color	Odor	Foam	Sheen	Turbidity	Wet/Dry Conditions
5/27/1998	--	--	--	--	--	--	--	--	Dry
6/17/1998	--	--	--	--	--	--	--	--	Wet
7/22/1998	--	--	--	--	--	--	--	--	Dry
8/12/1998	--	--	--	--	--	--	--	--	Wet
9/9/1998	--	--	--	--	--	--	--	--	Dry
10/7/1998	--	--	--	--	--	--	--	--	Dry
4/7/1999	Boulders/woody debris	--	--	--	--	--	--	--	Dry
5/5/1999	--	--	--	--	--	--	--	--	Wet
7/7/1999	--	--	--	--	--	--	--	--	Wet
8/4/1999 Toxici	--	--	--	--	--	--	--	--	Dry
9/1/1999	--	--	--	--	--	--	--	--	Dry
11/3/1999	--	--	--	--	--	--	--	--	Wet
4/5/2000	--	--	--	--	--	--	--	--	Wet
6/7/2000	--	--	--	--	--	--	--	--	Wet
8/2/2000	--	--	--	--	--	--	--	--	Wet
10/18/2000	--	--	--	--	--	--	--	--	Wet
12/6/2000	--	Broken glass	--	--	--	Foam	--	--	Dry
3/21/2001	--	--	--	--	--	Foam	--	--	Dry
5/16/2001	--	--	--	--	--	Intermittent	--	--	Wet
7/11/2001	--	Minor	Moderate, brown slime/film	Brown	None	None	None	Slight	Wet
9/13/2001	--	Garbage/trash	Dense, mossy green/brown film	Brown	Musty	None	Pollen, intermittent	Slight	Dry
11/14/2001	--	Garbage/trash	Dense, mossy brown film	Brown	Musty	None	None	Slight	Dry
1/9/2002	--	Garbage/trash	None	Grey	Musty; strong "algal bloom" odor	None	None	Slight	Wet
3/13/2002	--	Garbage/trash	Dense, grey/green moss	Grey	Musty	Sparse	None	Slight	Dry
5/8/2002	--	Beer cans/bottles, trestle supports	Dense, mossy green filamentous	Clear	None	None	None	Clear	Dry
7/10/2002	--	Trestle beams/steelwork, broken glass	Dense, green/brown moss	Red	None	None	None	Slight	Wet
9/11/2002	Unobservable	Sunken	Very dense, blue green filamentous	Blue-green	Musty	None	None	Slight	Dry
11/6/2002	None	Trestle supports	Sparse, brown moss	Clear	None	None	None	Clear	Wet
2/5/2003	Unobservable	Garbage/trash	Unobservable	Brown	Effluent	None	None	Slight	Wet
4/9/2003	--	Garbage/trash	Dense moss, filamentous	Green	None	None	None	Slight	Wet
6/11/2003	Unobservable	Sunken, garbage/trash	Unobservable	Brown	None	Foam	Pollen	Slight	Dry
8/13/2003	--	Broken glass, trestle debris, miscellaneous	Moderate, filamentous	Clear	None	Foam	None	Clear	Wet
10/8/2003	Boulder/gravel/sand/silt	Railroad rails, ties, broken glass	None	Clear	None	None	None	Clear	Dry
1/27/2004	Boulder/cobble/gravel/sand/silt	Trestle stumps, steel rails,	None	Clear	None	Sparse	None	Clear	Dry
3/10/2004	Boulder/mud	Trash	Sparse, moss	Clear	Musty	Foam	None	Clear	Wet
5/12/2004	Boulder/cobble/sand/silt	Broken glass, metals, floatables	Brown filamentous	Clear	None	Sparse	None	Slight	Dry
7/14/2004	Boulder/gravel/sand/silt	Metals, trestle stumps, broken glass	Filamentous	Grey	None	Sparse	None	Slight; opaque/milky	Wet
9/15/2004	Boulder/cobble/gravel/sand/silt	Trestle timbers/metals, broken glass, floatables	Moderate, green filamentous	Red	Musty	None	None	Clear	Dry
11/3/2004	Boulder/cobble/gravel/sand/silt	Trash	Very dense, green filamentous	Clear	None	None	None	Clear	Wet
-- : Not noted									

SURVEY CONDITIONS

Stream discharge and precipitation data are used to determine hydrologic conditions and, consequently, if water quality surveys should be described as dry- or wet weather-influenced events. Precipitation data for each monitoring event were obtained from the National Oceanic and Atmospheric Administration (NOAA). The presence/absence of precipitation during the five days prior to each sampling event was based on the National Weather Service data located on their website NOAA Climatological Data Publications (NCDC 2011). The weather station closest to the Nashua watershed sampling stations is located in Fitchburg, MA; data collected here were utilized in this report. Precipitation ranges from 46 to 48 inches roughly on the northeastern portion of the watershed, and 48 to 50 inches on the rest; a small area ranges from 50 to 52 inches, centered approximately on Mount Wachusett (Ostiguy et al 2010).

During dry weather, trace amounts of precipitation may fall, but there is no measurable change in stream flow. The United States Geological Survey (USGS) operates four real time stream gaging stations in the Nashua River Watershed that are applicable to this water quality data set, as shown below:

- North Nashua River near Leominster, MA (USGS 2011a)
- Nashua River 0.4 mi Upstream Rte 110 at Clinton, MA (USGS 2011b)
- Squannacook River near West Groton, MA (USGS 2010c) and
- Nashua River at East Pepperell, MA (USGS 2010d).

Data from these stations can be accessed from Daily Data for Massachusetts: Stage and Streamflow (USGS 2011e).

The period of record (POR) mean streamflow values are the mean of daily mean values for each day for 60 years of record at the USGS Squannacook River gage at West Groton, MA (USGS station number 01096000), recorded in cubic feet per second (cfs). The daily mean data are reported at Daily mean data (USGS 2011f). The monthly and annual mean discharges are found at Monthly mean data (monthly, USGS 2011g) and Annual mean data (annual, USGS 2011h).

Wet weather is defined as precipitation within a five-day antecedent period that leads to more than a slight increase in stream discharge at the four stations listed above (i.e., flow). Under dry weather conditions, trace amounts of precipitation may fall, but no measurable change in stream flow occurs. At some of the Nashua Watershed flow gaging stations, precipitation-related stream fluctuations were difficult to distinguish from manipulated fluctuations on some events.

Table 8 (precipitation) and Table 9 (stream discharge) contain information on survey conditions during each sampling event. Both the precipitation and the stream discharge data were used to estimate hydrological conditions during water quality sampling. Observations of discharge were based on flows at the USGS gaging station on the Squannacook River near West Groton, which is approximately 0.1 miles downstream of the SMART reference station on the Squannacook River (Station NT60A). Low flows were compared to the 7Q10 flow (the lowest 7-day average streamflow that occurs, on average, once every 10 years) at that location, which is 6.525 cfs (Ries 1999).

May 22, 1998 – The first survey of the SMART Monitoring Program in the Nashua watershed was conducted during a dry period, in which no measured precipitation was recorded at the weather station in Ashburnham. As shown in Table 9, streamflow data show that discharge during the sampling event was well below the monthly and point of record mean values for that day at the Squannacook River gage. The samples collected during this event reflect dry weather conditions. Air temperature and cloud cover were not recorded.

June 17, 1998 – Precipitation fell on each of the 5 days prior to and the day of sampling; amounts ranged from 0.28 to 1.44 inches at the weather station in Ashburnham. Discharge at the West Groton gage increased at the same time; all mean values were greater than the daily and monthly means. Data collected during this event reflect wet weather/runoff conditions. Air temperature and cloud cover were not recorded.

July 21-22, 1998 –This summer survey occurred during a relatively dry period; in the 5 days prior to these monitoring events, only 0.04 inches of precipitation fell. Discharge decreased steadily in this period. Data reflect dry weather conditions. Air temperature and cloud cover were not recorded.

August 12, 1998 – Precipitation as 0.79 inches of rain were measured at the Ashburnham gage from August 11-12; flow at the Squannacook gage rose concurrently. Data collected during this event reflect wet weather/runoff conditions. Air temperature and cloud cover were not recorded.

September 9, 1998 – Rain was measured at Ashburnham on September 7th (0.38 in), and 0.09 inches on the sampling date (beginning over the previous night). Precipitation was also noted at the Worcester Airport weather station; 0.31 inches on September 7th, 0.01 on September 8th and 0.01 inches on September 9th. Discharge levels varied across the watershed; flows did not change in the 5-day period preceding this event at the Squannacook River gage (13-14 cfs), but rose from 115 cfs to 223 cfs on September 8-9 at the Nashua River gage in East Pepperell. Based on both precipitation and overall low discharge levels on the reference stream, data reflect dry weather conditions. Air temperature and cloud cover were not recorded.

October 7, 1998 – This autumn monitoring event occurred during a dry period; no precipitation was measured at the weather station in Ashburnham in the 5 days prior to this monitoring event. Discharge at the Squannacook River gage varied little over this time (9.5-12 cfs). Data collected during this event reflect dry conditions. Air temperature and cloud cover were not recorded.

November 10, 1998 – This late fall event also fell within a dry period, with no precipitation recorded in the preceding 5 days at the Ashburnham weather station. Discharge varied little at the Squannacook River gage (18 to 21 cfs). Data collected during this event reflect dry weather conditions. Air temperature and cloud cover were not recorded.

April 7, 1999 – Only trace precipitation was measured during the 5-day period prior to this event. Discharge fell steadily at the Nashua and Squannacook River gages. Precipitation and streamflow data indicate dry weather conditions. Air temperature ranged from 63 to 68 degrees Fahrenheit (ºF). Cloud cover varied widely throughout the day, from 0 to 95%.

May 5, 1999 – Precipitation measured at the Ashburnham station was approximately 0.39 inches within the 48 hours before this monitoring event. Discharge on the Nashua and Squannacook Rivers rose concurrent with the precipitation event. Water quality data collected on this date reflect wet weather/runoff conditions. Air temperature ranged from 55 to 60ºF; skies were overcast with intermittent rain.

July 7, 1999 – Precipitation was recorded in Ashburnham on 3 of the 5 days preceding this event, for a total of 0.90 inches. However, discharge remained steady at the Nashua River gage (E. Pepperell) and fell at the Squannacook River gage during this time. Additional precipitation data indicate lower levels at the Bedford station to the east, with 0.42 inches record over this 5-day time frame. Photographs taken during monitoring activities depict low water levels, with patches of duckweed (*Lemna* sp.) on the Nashua River in East Pepperell. Based on discharge data and field observations, water quality data collected on this date reflect dry conditions. Air temperature ranged from 77 to 85ºF under clear skies.

August 4, 1999 – This summer event was preceded by a dry period, with 0.01 inches of rain falling on July 30th. Streamflow fell steadily throughout the Nashua watershed as evidenced by decreasing discharge at area gages. Data collected during this event reflect dry weather conditions. Air temperature ranged from 85 to 87ºF with clear skies becoming partly cloudy over the morning.

September 1, 1999 – Rain was recorded at the Ashburnham gage on August 27 (0.66 in), followed by 4 days of dry weather. Discharge rose at the Squannacook gage on August 28th, then fell to approximately pre-event flows by September 1st. Field notes and photographs indicate low water levels throughout the watershed. Water quality data collected on this date reflect dry weather conditions. Air temperature ranged from 68 to 79°F and cloud cover from 30 to 55% throughout monitoring.

November 3, 1999 – This late fall/early winter sampling event was conducted within a storm event in which 0.92 inches of rain fell at the Ashburnham weather station between November 2nd and 3rd. Discharge at the Squannacook River gage was low and varied little in the preceding 5 days, rising on November 3rd concurrent with precipitation. Field notes indicate wet weather conditions following the overnight storm event, with water levels higher than in previous efforts. The data collected on this event reflect wet weather/runoff conditions. Air temperature ranged from 62 to 68°F and cloud cover from partly to mostly cloudy.

April 5, 2000 – Spring sampling in the Nashua watershed was preceded by 0.83 inches of rainfall on April 3-4. A concurrent rise in discharge was noted at area gages, and higher (than previous event) water levels noted at most monitoring sites. Water quality data on this date reflect wet weather/runoff. Air temperature ranged from 38 to 45ºF with 0 to 35% cloud cover.

June 7, 2000 – This event occurred within a wet period; 3.65 inches were recorded at the Ashburnham weather station in the 5 preceding days, and an additional 0.80 inches on the day of monitoring. Discharge rose significantly at gages

throughout the watershed on June 7th; flows were approximately four times higher on this date than the previous 5 days on the Squannacook River and the Nashua River in East Pepperell. Field observations noted very high flows at all stations. Water quality data from this survey reflect wet weather/runoff conditions. Air temperature ranged from 60 to 65ºF and cloud cover was partial to complete.

August 2, 2000 – Approximately 1.95 inches of rain fell during the 5 days prior to this summer sampling event. Flow data reflect surface runoff as well, with discharge levels above daily and monthly means. Water quality data collected on this date reflect wet weather/runoff conditions. Air temperature ranged from 71 to 75ºF under overcast skies.

October 18, 2000 - Rainfall over the 5 days before this event totaled 0.21 inches at the Ashburnham gage, falling on October 16th, with an additional 0.78 inches measured on the sampling date (field notes indicate the latter event began prior to monitoring activities, although field notes indicated rainfall as absent or intermittent throughout monitoring activities). Discharge at the Squannacook River gage was low overall throughout this period (24 to 29 cfs), with levels below both the daily and monthly mean values. Discharge at the East Pepperell gage on the Nashua River indicates upstream flow manipulation. Field notes indicate very low water levels at most stations; conductivity values were within the range of values typically observed under baseflow conditions. Based on discharge and field notes, water quality data reflect dry conditions. Air temperature ranged from 54 to 63ºF, with overcast skies and precipitation from intermittent sprinkles to light rain.

December 6, 2000 – Minimal precipitation fell in the 5 days preceding this event, with 0.15 inches of rain on December 1st**,** followed by 4 days of dry weather. Average daily discharge decreased steadily at the Squannacook River in West Groton. Water quality data collected during this event reflect dry weather conditions. Air temperature ranged from 19 to 23ºF with 20 to 90% cloud cover.

March 21, 2001 – This late winter event followed a period of relatively dry weather, with 0.12 inches recorded in the 5 days preceding this event. Although 0.25 inches of precipitation were measured at Ashburnham on the sampling date, it occurred after monitoring activities concluded. Snow remained throughout the watershed. However, during the same period, streamflow increased steadily at area gages (Squannacook River near West Groton, North Nashua River near Leominster, and the Nashua River at East Pepperell). Field observations indicated elevated water levels at most stations (NN12, NS19, NM21, NM29A), and low on the Squannacook River. Based on the discharge and field notes, water quality reflects wet weather/runoff conditions. Air temperature ranged from 38 to 42ºF under overcast skies.

May 16, 2001 – Little precipitation was noted in the five days prior to this spring sampling event (0.08 inches). Additional precipitation fell on the sampling date; field notes indicate the rain began to fall overnight prior to sampling. Streamflow decreased steadily at the Squannacook River gage. Field observations noted low water levels throughout the watershed. Precipitation and discharge data, as well as field notes indicate dry weather conditions. Air temperature ranged from 49 to 51ºF; skies were overcast with intermittent sprinkles at the beginning of monitoring, and developing to rain by the last station (NM29A, Nashua River at East Pepperell). Trees were budding and foliage partially emerged at area stations.

July 11, 2001 – Scant precipitation fell within the 5 days prior to this spring sampling event (0.19 inches), with 0.10 inches noted on July 11th (field notes show this event began overnight). Discharge fell steadily at area gages during this time, (Squannacook River at West Groton, North Nashua River at Leominster, Nashua River at East Pepperell), but rose on the sampling date at one gage only (Squannacook River). Field observations indicate relatively low water levels throughout the watershed. Precipitation, discharge and field data generally reflect dry weather conditions. Air temperature ranged from 66 to 72ºF; rain falling at the beginning of this event tapered off to partly cloudy skies.

September 13, 2001 – Precipitation recorded at the Ashburnham weather station between September 8-12 total 0.23 inches on September 10; the 0.10 inches measured on September 13th fell after completion of monitoring activities. Discharge was low at all area gages, while water levels were noted to be low at all sampling stations. Water quality data reflect dry conditions for this event. Air temperature ranged from 63 to 81ºF with sunny skies during monitoring activities. The downstream impoundment Thompsons Mill Pond was drawn down to accommodate repairs at the Squannacook River Dam below Groton Road, Shirley/Groton. This impoundment is separated from the segment of river near Station NT60A by a dam at the Hollingsworth and Vose facility on Townsend Mill Street.

November 14, 2001 – Approximately 0.10 inches of rain fell 5 days before this late autumn event, with an additional 0.03 inches on the sampling date (field notes indicate this occurred after sampling was concluded). Discharge varied little at watershed gages throughout the preceding 5-day period. Water quality data reflect dry weather conditions on this event. Air temperature ranged from 49 to 54ºF and cloud cover from50 to 100% during this event. Water levels were low at all stations.

January 9, 2002 - Precipitation in the 5 days preceding this winter monitoring event included 7.2 inches of snowfall at the Ashburnham weather station (0.61 inches water equivalent). Stream discharge data indicate conflicting trends – while discharge rose slightly over this period at the Squannacook River gage near West Groton, discharge decreased steadily at the Nashua River gage at East Pepperell; at the North Nashua River gage, discharge slightly from January 2nd through January 6th, rose from January 7-8th, then decreased on January 9th. The latter flow pattern roughly correlates with maximum daily temperatures recorded at area weather stations (data for Ashburnham were unavailable) as shown below:

Location	Maximum Daily Temperature (ºF)					
	Jan 4	Jan 5	Jan 6	Jan 7	Jan 8	Jan 9
Barre Falls Dam	37	35	38	43	34	31
Bedford	35	41	47	38	34	39
Data obtained at NOAA Climatological Data Publications (NCDC 2011).						

Data collected during this event reflect wet weather/runoff conditions. Air temperature ranged from 32 to 38ºF; cloud cover varied from 95 to 100%, with light snow falling at the last station. Snow remained throughout the watershed. Ice covered the Squannacook River at Station NT60A, therefore monitoring was not conducted at that site.

March 13, 2002 – This late winter monitoring event followed a storm that brought 0.45 inches of precipitation to the area on March 10th. Streamflow rose on March 10th and peaked the following day at the Squannacook River gage in West Groton; discharge did not return to pre-event flows by the sampling date. Water quality data collected on this event reflect wet weather/runoff conditions. Air temperature ranged from 44 to 50ºF and cloud cover from 90 to 100%. No snow remained on the banks at monitoring stations.

May 8, 2002 – This spring monitoring event followed a 5-day period with no precipitation recorded at the Ashburnham weather station. Discharge at the Squannacook River gage decreased steadily during this period. Data collected during this event reflect dry weather conditions. Air temperature ranged from 60 to 70ºF, with 0 to 50% cloud cover. Trees and shrubs in the watershed were budding, with some foliage emerged.

July 10, 2002 – Summer sampling fell within a relatively dry period; only 0.14 inches of rain fell within the previous 5 days, and streamflow fell concurrently. Data collected on this date reflect dry weather conditions. Air temperature ranged from 68 to 81ºF; cloud cover ranged from clear to 25%.

September 11, 2002 – This late summer monitoring event followed 5 days without precipitation**.** Discharge at the Squannacook River gage was low and varied little (5.6-8.9 cfs) throughout this period. Data collected on this date reflect dry conditions. Air temperature ranged from 75 to 82ºF; skies were overcast or hazy as Tropical Storm Gustav moved into the area.

November 6, 2002 – Fall monitoring followed a dry period, with little precipitation recorded during the preceding 5 days (0.04 inches). A storm event brought 0.67 inches of rain to the area on this date, beginning overnight. Streamflow on the Squannacook River gradually decreased during this 5-day period, increasing 5 cfs on November 6th. Discharge levels throughout this time were below the daily and monthly mean values for this location. Field observations noted turbid water columns with water levels generally above what is typical for this time of year at Stations NN12, NS19 and NM21. Water quality data collected on this event reflect wet weather/runoff conditions. Air temperature ranged from 44 to 52ºF, with rain increasing during monitoring activities. Most foliage had changed and fallen at monitoring sites throughout the watershed.

February 5, 2003 – Winter monitoring fell within a wet period; with 0.45 inches of precipitation (including 7.0 inches as snowfall) recorded during the preceding 5 days, and an additional 0.31 inches on February 5th (as rain). Daily maximum temperatures were above freezing throughout this time period. Streamflow increased at the Squannacook River gage from January 31 – February 5; data collected on this event reflect wet weather/runoff conditions. Air temperature ranged from 27 to 32ºF, with sunny skies turning to 90% cloud cover during monitoring activities. Ice covered the channel from bank to bank at Stations NM21 on the Nashua River and NT60A on the Squannacook River; monitoring was not conducted at those locations on this date.

April 9, 2003 – Precipitation over the 5 days preceding this spring monitoring event totaled 1.04 inches at the Ashburnham weather station. Streamflow gradually and consistently decreased at the Squannacook and Nashua River

gages during this time, and data collected on this event reflect dry weather/runoff conditions. Air temperature ranged from 36 to 42ºF, with sleet and snow observed throughout the monitoring effort.

June 11, 2003 – Rainfall during the 5 days before this event totaled 0.78 inches (Ashburnham). Streamflow generally decreased during this time, and data collected on this event reflect dry weather conditions. Air temperature ranged from 74 to 76ºF, with overcast skies and intermittent sprinkles throughout the monitoring effort.

August 13, 2003 –Rain totaled 1.05 inches in the 5 days preceding this summer monitoring event, with an additional 0.73 inches on this date. Field notes indicate that a heavy downpour occurred overnight prior to sampling activities. Streamflow generally decreased at the Squannacook River gage, but increased at the North Nashua River in Leominster and the Nashua River in East Pepperell on August 13th. Data collected on this event reflect wet weather/runoff conditions. Air temperature ranged from 81 to 88ºF, with mostly cloudy to overcast skies.

October 8, 2003 – Fall 2004 monitoring fell within a dry period, with 0.19 inches of precipitation recorded at the Ashburnham weather station during the preceding 5 days. Streamflow gradually decreased at the Squannacook River gage during this time, and data collected on this event reflect dry weather conditions. Air temperature ranged from 63 to 64ºF, with sunny skies throughout the monitoring effort.

January 27, 2004 – Winter 2004 monitoring fell within a dry period, with scant precipitation recorded during the preceding 5 days (0.02 inches). Streamflow gradually decreased at area gages during this time (Squannacook River, Nashua River at East Pepperell), and data collected on this event reflect dry weather conditions. Air temperature ranged from 16 to 24ºF, with overcast skies throughout the monitoring effort. Ice over the stream channel prevented accessed to Stations NT60A (Squannacook River) and NM27 (Nashua River, Groton) on this date.

March 10, 2004 – Precipitation recorded at the Ashburnham weather station during the 5 days preceding this event totaled 0.47 inches, including 3 inches of snowfall on March 9-10. Snow on the ground decreased from 7 inches on March 1 to trace on March 7th, then rose to 3 inches on the ground on the monitoring day. Streamflow followed no consistent pattern at area gages. Daily maximum temperatures ranged from 36 to 55ºF from March 5-10. Data collected on this event reflect wet weather/runoff conditions. Air temperature during monitoring activities ranged from 66 to 42ºF, with sunny skies becoming completely overcast.

May 12, 2004 – Fall 2004 monitoring fell within a period with light precipitation recorded during the preceding 5 days (0.23 inches). Streamflow steadily decreased during this time, and data collected on this event reflect dry weather conditions. Air temperature ranged from 72 to 86ºF, with cloudy skies (55% cloud cover) becoming sunny.

July 14, 2004 – A storm event brought 0.62 inches of rain to the area (as measured at the Ashburnham weather station) on July 9th, with scant precipitation in the next 4 days (0.01 inches). Rainfall began prior to monitoring activities on July 14th, with a total of 0.22 inches recorded. Streamflow patterns were inconsistent at area gages: while discharge rose at the Nashua River gage in East Pepperell, it decreased on the Squannacook River over the preceding 5-day period. At the North Nashua River in Leominster, discharge peaked on July 10th (following the July 9th event), decreased to approximately 58 cfs, then rose to approximately 71 cfs on July 14th. Data collected on this event reflect wet weather/runoff conditions. Air temperature ranged from 66 to 67ºF, with drizzly skies throughout monitoring activities.

September 15, 2004 – A storm event on September 9-10 dropped 2.23 inches of precipitation in the area, which was followed by 4 days without measured rainfall. Again, streamflow patterns were inconsistent at area gages, with discharge rising at the Nashua River gage (East Pepperell) and falling on the Squannacook River (West Groton). Discharge at the North Nashua River gage (Leominster) peaked on September 10th, then decreased to pre-event levels by September 15th. Data reflect dry weather conditions on this date. Air temperature ranged from 56 to 79ºF, with partly sunny skies.

November 3, 2004 – Little precipitation fell in the area during the 5 days preceding this fall monitoring event; 0.20 inches were recorded in Ashburnham on October 31st, and 0.15 inches on November 3rd (field notes indicate this occurred prior to monitoring activities). Streamflow patterns were inconsistent at area gages; discharge rose on the Nashua River (East Pepperell), but stayed constant on the Squannacook River (West Groton). Discharge rose on the North Nashua River between October 29th and November 1st, then fell to previous discharge levels by November 3rd. Data collected on this event reflect dry weather conditions. Air temperature ranged from 48 to 59ºF, with sunny skies throughout the day.

Table 8 Nashua Basin Precipitation Data Summary 1998-2004* (inches of precipitation)

Survey Dates	5 Days	4 Days	3 Days	2 Days	1 Day	Sample	Wet/Dry
27 May 1998	0.00	0.00	0.00	0.00	0.00	0.00	Dry
17 June1998	0.35	1.44	1.80	0.28	0.90	0.66	Wet
21 July 1998	T	0.03	0.00	0.00	0.00	0.01	Dry
12 Aug 1998	0.14	0.00	0.00	0.00	0.65	0.18	Wet
9 Sept 1998	0.00	0.00	0.00	0.38	0.00	0.09	Wet
7 Oct 1998	T	0.00	0.00	0.00	0.00	0.00	Dry
10 Nov 1998	0.00	0.00	0.00	0.00	0.00	0.01	Dry
7 April 1999	0.00	T	0.00	0.00	0.00	0.01	Dry
5 May 1999	0.00	0.00	0.00	T	0.21	0.18	Wet
7 July 1999	0.31	0.00	0.39	0.00	0.20	0.00	Dry
4 Aug 1999	0.01	0.00	0.00	0.00	0.00	0.00	Dry
1 Sept 1999	0.66	0.00	0.00	0.00	0.00	0.00	Dry
3 Nov 1999	0.00	0.00	0.00	0.00	0.40	0.52	Wet
5 April 2000	0.00	0.00	0.00	0.10	0.73	0.00	Wet
7 June 2000	0.73	0.00	0.12	0.00	2.80	0.80	Wet
2 Aug 2000***	0.67	T	T	0.64	0.20	0.02	Wet
18 Oct 2000	0.00	0.00	0.00	0.21	0.00	0.78	Dry
6 Dec 2000***	0.15	0.00	0.00	0.00	0.00	0.00	Dry
21 Mar 2001	0.00	0.06	0.06	0.00	0.00	0.25	Wet
16 May 2001	0.00	0.05	0.00	T	0.03	0.07	Dry
11 July 2001	0.00	0.00	0.05	0.06	0.08	0.10	Dry
13 Sept 2001	0.00	0.00	0.23	0.00	0.00	0.10	Dry
14 Nov 2001	0.10	0.00	0.00	T	0.00	0.03	Dry
9 Jan 2002	0.00	0.00	0.20	0.38	0.03	0.01	Wet
13 Mar 2002	0.00	T	0.45	0.00	T	T	Wet
8 May 2002	0.00	0.00	0.00	0.00	0.00	0.00	Dry
10 July 2002	0.00	0.00	0.00	0.00	0.14	0.01	Dry
11 Sept 2002	0.00	0.00	0.00	0.00	0.00	0.00	Dry
6 Nov 2002	T	0.00	0.01	0.03	T	0.67	Wet
5 Feb 2003	0.02	-	0.37	0.05	0.01	0.31	Wet
9 April 2003	0.38	0.21	0.20	0.00	0.25	T	Dry
11 June 2003	0.28	0.00	0.40	T	0.10	0.00	Dry
13 Aug 2003	0.20	0.31	0.11	0.00	0.45	0.73	Wet
8 Oct 2003	0.02	0.00	0.17	0.00	0.00	0.00	Dry

27 Jan 2004	0.00	0.02	0.00	0.00	0.00	0.00	Dry
10 Mar 2004	0.01	0.15	0.03	0.08	0.20	0.02	Wet
12 May 2004	0.00	0.01	0.00	0.22	T	0.00	Dry
14 July 2004	0.62	0.00	0.01	0.00	0.00	0.22	Wet
15 Sept 2004	0.36	0.00	0.00	0.00	0.00	0.00	Dry
3 Nov 2004	0.00	0.00	0.20	0.00	0.00	0.15	Wet

*Official data from the National Weather Service station in Ashburnham, MA available at NOAA Climatological Data Publications (NCDC 2011).
** = Based on streamflow and precipitation data.
*** In the absence of qualified data at the Ashburnham station, data are reported from Barre Falls Dam, Barre
T = trace amount; an amount too small to measure
– = No record. Data not recorded, determined unreliable by quality control check, or not received in time for publication.

Table 9 USGS Flow Data Summary Discharge (cfs) 1998-2004 Squannacook River at West Groton, MA								
Survey Dates	**5 Days**	**4 days**	**3 Days**	**2 Days**	**1 Day**	**Sample**	**Monthly****	**Daily*****
27 May 1998	95	87	78	71	65	60	196	130
17 June 1998	65	189	1,000	1,460	712	782	329.6	87
21-22 July 1998	39	37	33	30	29	29	63.5	38-35
12 Aug 1998	20	20	19	17	18	29	23.5	35
9 Sept 1998	14	14	13	13	14	13	13.7	25
7 Oct 1998	9.5	9.8	10	11	11	11	28.1	44
10 Nov 1998	20	21	20	19	18	18	31.7	99
7 April 1999	143	132	127	118	110	107	87.6	356
5 May 1999	51	48	46	45	40[e]	57	54.8	168
7 July 1999	34	36	40	39	32	27	16.5	45
4 Aug 1999	8.7	12	12	8.8	6.9	6.2	7.86	32
1 Sept 1999	9.7	24	13	10	8.1	7.0	63.5	36
3 Nov 1999	48	45	44	42	41	68	60.9	84
5 April 2000	242	189	164	150	156	223	302.9	384
7 June 2000	68	71	82	76	73	437	149.8	129
2 Aug 2000	112	108	77	166	428	253	75.0	39
18 Oct 2000	28	26	28	24	26	29	32.1	67
6 Dec 2000	77	69	61	56	54	52	105.7	121
21 Mar 2001	106	115	128	139	152	174	232.5	255
16 May 2001	60	57	54	50	46	46	66.3	158
11 July 2001	72	67	52	50	46	40	40.6	38
13 Sept 2001	9.6	9.2	8.9	9.0	8.6	8.5	14.9	42
14 Nov 2001	12	12	12	12	12	12	12.6	102
9 Jan 2002	16	17	18	21	21	20	24.8	126
13 Mar 2002	58	53	72	96	79	67	94.2	207
8 May 2002	202	164	123	104	91	82	178.5	150
10 July 2002	25	22	20	19	19	19	17.9	41
11 Sept 2002	7.9	8.9	7.2	6.3	6.2	5.6	7.86	25
6 Nov 2002	22	20	19	19	19	26	66.4	85
5 Feb 2003	50	52	60	70	73	77[e]	77.5	149
9 April 2003	338	317	274	244	219	203	270.3	263
11 June 2003	159	137	145	143	123	105	131.5	93
13 Aug 2003	55	59	54	47	41	46	36.6	35
8 Oct 2003	34	32	32	31	29	27	82.6	44

27 Jan 2004	54[e]	52[e]	50[e]	49[e]	48[e]	47	89.2	178
10 Mar 2004	167	165	216	182	143	120	129.2	206
12 May 2004	156	133	118	117	111	104	131.6	173
14 July 2004	40	34	29	26	22	25	25.9	48
15 Sept 2004	55	46	33	27	23	20	46.3	27
3 Nov 2004	27	28	28	28	28	28	52.1	84

***Gage # 01096500 data found at Daily Data at Squannacook River near West Groton, MA (USGS 2011c)**
****Mean of monthly mean discharge (cfs) based on data collected from 10/1/1949 to 10/30/2009, found at Monthly mean discharge at the Squannacook River near West Groton, MA (USGS 2011g)**
*****POR= Period of Record, mean of daily mean discharge based on data collected from 10/1/1949 to 10/30/2009, found at Point of Record discharge at the Squannacook River near West Groton, MA (USGS 2011f)**
[e] = Value has been estimated
7Q10 = 6.525 cfs @ USGS gaging station, Squannacook River near West Groton, MA (Ries 1999)

RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL

The results of SMART monitoring conducted in the Nashua watershed from 1998 through 2004 are included below. In situ multiprobe readings, including temperature, pH, dissolved oxygen, percent oxygen saturation, depth, specific conductivity, and total dissolved solids, are presented for each station in Table 10 through Table 15. Nutrient and chemistry data are presented in Table 16 through Table 21. Ambient field blank results are presented in Table 22; field duplicate results and relative percent difference calculations are found in Table 23.

Field sheets, field notebooks, chain of custody forms, raw data files, lab reports and other metadata are maintained by the Massachusetts Department of Environmental Protection (MassDEP) Bureau of Resource Protection (BRP) CEntral Regional Office (CERO) in Worcester, MA and data are stored electronically in the Division of Watershed Management's (DWM) water quality database. Detailed information regarding the data validation process is explained in the separate document, *Summary of Current Data Validation Procedures* (MassDEP 2004a). Specific validation criteria used for 2000-2004 data include, but are not limited to: conformance to the SMART Monitoring Quality Assurance Project Plan (Beaudoin 2010) and DWM standard operating procedures (SOPs), precision, accuracy, representativeness, holding times, sample preservation, frequency of field QC samples, contamination of field blanks, stability of multiprobe readings and documentation. The following data qualifiers were applied as needed:

Multiprobe data qualifiers:
** = Missing data.
-- = No data.
= Censored data (data that have been discarded for some reason).
c = Greater than calibration standard used for pre-calibration, or outside the acceptable range about the calibration standard.
i = Inaccurate readings from multiprobe likely.
m = Method not followed; one or more protocols contained in the DWM Multi-probe SOP not followed.
r = Data not representative of actual field conditions.
s = Field sheet recorded data were used to accept data, not data electronically recorded in the Multi-probe surveyor unit, due to operator error or equipment failure.
u = Unstable readings.

Laboratory sample data qualifiers:
** = Missing data.
-- = No data.
= Censored data (data that have been discarded for some reason).
[ ] = A result reported inside brackets has been censored, but is shown for informational purposes.
b = Blank contamination in lab reagent blanks and/or field blank samples.
d = Precision of field duplicates (as RPD) did not meet project data quality objectives identified for program or in QAPP.
e = Not theoretically possible. Specifically, used for bacteria data where colonies per unit volume for *E. coli* bacteria are greater than fecal coliform bacteria.
h = Holding time violation (usually indicating possible bias low).
j = 'Estimated' value; used for lab-related issues where certain lab QC criteria are not met and re-testing is not possible (as identified by the WES lab only). Also used to report sample data where the sample concentration is less than the reporting detection limit (RDL) and greater than the method detection limit (MDL) (RDL > x > MDL). Also used to note where values have been reported at levels less than the MDL.
m = Method SOP not followed, only partially implemented or not implemented at all, due to complications with sample matrix (e.g. sediment in sample, floc formation), lab error (e.g. cross-contamination between samples), additional steps taken by the lab to deal with matrix complications, lost/unanalyzed samples, and missing data.

Table 10 MassDEP SMART 1998-2004 Nashua Watershed In Situ Multiprobe Data. Station NN12.

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
5/27/1998	81-0003	10:34	0.4	16.4	6.9	280	200	9.4	94
6/17/1998	81-0018	10:42	1.2	16.7	6.7	132	80	9	92
7/22/1998	81-0058	10:26	0.6	22.3	7.0	358	200	7.5	85
8/12/1998	81-0085	10:22	0.4	21.7	7.0	455	300	6.7	76
9/9/1998	81-0100	10:24	<0.3	17.4	7.1	469	300	8.3	86
10/7/1998	81-0115	9:47	0.6	11.3	6.9	527	300	9.6	85
4/7/1999	81-0135	9:14	0	10.03	6.7	279	179	10.47	91.5
5/5/1999	81-0142	9:19	0.4	13.4	6.8	334	214	8.83	83.1
7/7/1999	81-0149	9:29	0.3	24.48	6.9	399	255	6.4	75.8
8/4/1999	81-0156	10:33	0.2	21.52	7.3	576	--	7.52	83.6
9/1/1999	81-0163	9:13	0.4	18.34	7.1	545	349	7.87	81.6
11/3/1999	81-0170	9:24	0.4	14.17	6.6	206	132	8.88	86.2
4/5/2000	SM-0022	9:03	0.2	8.9	6.6	235	151	11	95
6/7/2000	SM-0062	9:21	0.4	11.7	6.4	105	67.1	10.5	95
8/2/2000	SM-0109	9:15	0.3	18.6	6.7	241	154	8.7	91
10/18/2000	SM-0156	9:25	0.7	11.8	6.8	403	258	9.2	82
12/6/2000	SM-0196	9:20	0.3	1.8	6.6	324	208	12.6	89
3/21/2001	SM-0234	9:20	0.9	3.1	6.4u	466	298	13.4	97
5/16/2001	SM-0274	9:34	0.4	13.5	6.9c	456	292	8.6	82
7/11/2001	SM-0314	9:28	0.5	20.1	6.8	376	241	8.0i	87i
9/13/2001	SM-0354	9:07	0.1i	17.9	7.1c	605	387	7.4	76
11/14/2001	SM-0394	9:27	0.3	7.6	6.8	544	348	11	89
1/9/2002	SM-0434	9:42	0.1 i	2.5	6.7	745 c	477 c	12.4	90
3/13/2002	SM-0473	9:10	0.3	3.9	6.7	406	260	12.6	93
5/8/2002	SM-0513	9:20	1.1	15.4	6.8 c	383	245	9.1	89
7/10/2002	SM-0553	9:42	0.3	21.8	7.0 c	522	334	6.2	70
9/11/2002	SM-0593	9:39	0.1 i	23	7.3 c	621	397	7.4	86
11/6/2002	SM-0633	9:33	## i	7	6.6	352	225	11	90
2/5/2003	SM-0673	9:18	0.1 i	0.64	6.5	586	375	13.0 u	93 u
4/9/2003	SM-0714	9:11	0.5	3.4	6.3	453	290	12.5	95
6/11/2003	SM-0755	9:01	0.3	17.4	6.9 cu	379	243	8.5	90
8/13/2003	SM-0805	9:24	0.4	23.3	6.9 c	303 u	194 u	7.5	89
10/8/2003	SM-0848	9:02	0.6	11.9	6.9 c	490	319	10	93
1/27/2004	SM-5891	9:18	0.6 i	0.16	6.7	405	263	13.7	94
3/10/2004	SM-5933	9:12	0.7	2.4	6.7 i	372	242	13.5	99
5/12/2004	SM-5974	9:19	0.6	16.4	6.8	343	223	9.4	97
7/14/2004	SM-6015	9:10	0.4	18.6	6.9	449	292	7.9	84
9/15/2004	SM-6057	9:03	0.4	17.1	6.9	472	307	8.5	88
11/3/2004	SM-6098	9:30	0.4	11.1	6.9	422	274	9.8	90

** = missing/censored data
-- = no data
See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 11 MassDEP SMART 1998-2004 Nashua Watershed *In Situ* Multiprobe Data. Station NS19.

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
5/27/1998	81-0006	11:46	0.6	16.4	7.0	176	100	9.3	94
6/17/1998	81-0021	11:48	0.8	16.6	6.4	92	60	4.4	45
7/22/1998	81-0061	11:42	0.7	22.1	7.1	190	100	7.3	82
8/12/1998	81-0087	11:21	0.4	20.5	7.0	206	100	7.7	84
9/9/1998	81-0102	11:25	0.3	16.9	7.1	212	100	8.6	89
10/7/1998	81-0117	10:27	0.7	10.2	7.1	208	100	9.9	85
4/7/1999	81-0136	10:04	0.2	10.23	6.8	169	108	10.62	93.2
5/5/1999	81-0143	9:54	0.6	12.56	6.9	185	118	9.84	90.8
7/7/1999	81-0150	10:08	0.3	22.67	6.8	219	140	6.89	78.9
8/4/1999	81-0157	11:07	0.3	20.19	7.2	273	--	7.31	79
9/1/1999	81-0164	9:52	0.6	16.35	7.2	268	171	8.11	80.7
11/3/1999	81-0171	10:10	0.6	13.69	6.5	159	102	7.25	69.7
4/5/2000	SM-0023	9:36	0.4	9.2	6.8	147	94	10.3	89
6/7/2000	SM-0063	10:02	1.8	11.8	6.5	90.6	58	9.8	89
8/2/2000	SM-0110	9:55	0.3	19.1	6.8	180	115	8.2	87
10/18/2000	SM-0157	10:01	0.9	11.7	6.8	203	130	8.2	73
12/6/2000	SM-0197	9:58	0.4	1.9	6.8	194	124	12.1	86
3/21/2001	SM-0235	10:13	1	3.7	6.6	211	135	13.1	96
5/16/2001	SM-0275	10:13	0.4	12.9	6.8	229	147	9.7	90
7/11/2001	SM-0315	10:11	0.2	19.5	6.8u	212	136	7.7i	83i
9/13/2001	SM-0355	9:53	0.1i	16.9	7.0c	316	202	7.6	76
11/14/2001	SM-0395	10:26	0.3	6.7	6.7	286	183	11.3	90
1/9/2002	SM-0435	10:29	0.4	2.7	6.7	230	148	12.3	90
3/13/2002	SM-0474	9:51	0.3	4.7	7.0 c	206	132	13.6	103
5/8/2002	SM-0514	10:05	0.7	14.7	6.8 c	224	143	9.8	94
7/10/2002	SM-0554	10:30	0.4	20.7	6.9 c	238	152	7.4	82
9/11/2002	SM-0594	10:15	0.2	21.2	7.2 c	262	168	7.6	86
11/6/2002	SM-0634	10:09	## i	6.9	6.3	149	95	10.4	85
2/5/2003	SM-0674	9:58	0.6	1.3	6.5	254	162	12.4	90
4/9/2003	SM-0715	9:59	0.1 i	3.5	6.4	142	90.9	12.6	96
6/11/2003	SM-0756	9:44	0.1 i	13.4	6.6 u	157	100	9.7	94
8/13/2003	SM-0806	10:07	0.8	16.3	6.7	137	87.6	9.1 u	93 u
10/8/2003	SM-0849	9:34	0.6	11.2	7.1 c	237	154	10.1	92
1/27/2004	SM-5892	9:59	0.5 i	0.5	6.8	214	139	13.4	93
3/10/2004	SM-5934	9:48	1	3.2	6.9 ci	138	90	13.5	101
5/12/2004	SM-5975	10:01	0.3	12.2	6.9 c	142	92	10.9	102
7/14/2004	SM-6017	9:58	0.8	13.2	6.8	130	85	10.1	96
9/15/2004	SM-6059	9:50	0.5	16.3	7.0	229	149	8.5	87
11/3/2004	SM-6100	10:05	0.5	10.4	7.0	208	135	10.1	90

** = missing/censored data
-- = no data
See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 12 MassDEP SMART 1998-2004 Nashua Watershed *In Situ* Multiprobe Data. Station NM21.

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
5/27/1998	81-0007	12:26	0.4	17	6.8	237	200	8.2	83
6/17/1998	81-0022	12:37	0.6	17.3	6.4	113	70	6.5	67
7/22/1998	81-0062	12:11	1	23.1	7.0	288	200	6.7	77
8/12/1998	81-0088	11:53	0.5	22	7.1	350	200	7.1	80
9/9/1998	81-0103	11:56	0.6	17.6	7.2	384	200	8.4	88
10/7/1998	81-0118	10:47	0.9	9.3	7.1	400	300	9.7	82
4/7/1999	81-0137	10:38	0.3	10.72	6.8	256	164	9.31	82.7
5/5/1999	81-0144	10:28	0.6	12.97	6.8	291	186	7.7	71.8
7/7/1999	81-0151	10:49	0.7	25.41	7.1	375	240	5.87	70.8
8/4/1999	81-0158	11:42	0.4	21.66	7.3	368	--	6.79	75.3
9/1/1999	81-0165	10:30	0.6	17.21	7.2	435	278	7.83	79.3
11/3/1999	81-0172	10:50	0.3	13.67	6.7	248	159	7.86	75.5
4/5/2000	SM-0024	10:04	0.5	10.4	6.6	231	148	9.3	83
6/7/2000	SM-0064	10:44	0.5	12	6.4	106u	67.6u	9	82
8/2/2000	SM-0111	10:35	0.4u	18.7	6.6	212	135	7.6	80
10/18/2000	SM-0158	10:45	0.9	11	6.8	318	204	7.8	69
12/6/2000	SM-0198	10:30	0.5	0.95	6.6	256	164	12	83
3/21/2001	SM-0236	11:05	1	4	6.4	382	244	11.6	86
5/16/2001	SM-0276	11:02	0.5	13.2	6.8	341	218	7.8	73
7/11/2001	SM-0316	11:00	0.3	20.8	6.8	305	195	6.8i	75i
9/13/2001	SM-0356	10:32	0.3	17.1	7.1c	448	287	7	71
11/14/2001	SM-0396	11:12	0.5	4	6.6	425	272	11.6u	86u
1/9/2002	SM-0436	11:27	0.4	0.81	6.6	546	350	12.4	86
3/13/2002	SM-0475	10:42	0.7	4	6.6	353	226	11.3	84
5/8/2002	SM-0515	10:54	1.3	16.3	6.6 c	305	195	7.6	76
7/10/2002	SM-0555	11:29	0.6	22.1	6.9 c	392	251	5.9	67
9/11/2002	SM-0595	10:55	0.5	22.6	7.1 c	534	342	6.3	73
11/6/2002	SM-0635	11:15	0.4 i	6.6	6.5	376	241	9.9	80
2/5/2003	**Ice Out**								
4/9/2003	SM-0716	10:51	0.9	3.4	6.3	376	241	11.5	87
6/11/2003	SM-0757	10:18	0.6	16.4	6.5	256	164	8	83
8/13/2003	SM-0807	10:55	0.7	21.5	6.7	240	154	6.5	74
10/8/2003	SM-0850	10:18	1.1	10.6	6.9 c	376	245	8.0 ui	72 ui

** = missing/censored data
-- = no data
See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 13 MassDEP SMART 1998-2004 Nashua Watershed In Situ Multiprobe Data. Station NT60A.

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
5/27/1998	81-0011	11:08	0.8	16.1	6.3	124	80	8.6	85
6/17/1998	81-0026	11:36	0.5	15.8	5.8	53	30	8.7	87
7/22/1998	81-0067	10:56	1.1	22.7	6.6	145	90	7	81
8/12/1998	81-0093	11:18	0.6	22.4	6.4	161	100	6.7	76
9/9/1998	81-0108	11:32	<0.3	18.3	6.4	165	100	6.9	73
10/7/1998	81-0123	11:29	0.3	10.2	6.4	162	100	8.2	71
4/7/1999	81-0138	11:29	0.4	10.41	6.4	121.7	77.9	10.5	92.5
5/5/1999	81-0146	11:16	0.6	13.51	6.4	148.8	95	8.84	83.4
7/7/1999	81-0153	11:45	0.7	26.54	6.5	149	95	5.57	68.5
8/4/1999	81-0159	12:31	0.3	23.76	6.6	181	--	4.82	55.8
9/1/1999	81-0167	11:22	0.7	19.61	6.5	176	112	5.56	59.1
11/3/1999	81-0174	11:43	0.1	10.67	6.2	140.2	89.7	9.47	84.9
4/5/2000	SM-0026	11:04	0.2	9.1	6.2	120	77	10.9	94
6/7/2000	SM-0066	11:34	0.4	11.9	6.0	94.4	60.4	10	91
8/2/2000	SM-0113	11:32	0.5	17.6	6.0	79.4	50.8	8.3	85
10/18/2000	SM-0160	11:41	1	10.2	6.3	155	99	7.7	67
12/6/2000	SM-0200	11:24	0.4	0.57	6.2	132	84.3	12.9	88
3/21/2001	SM-0238	12:09	1	1.5	5.9	170	109	13.6u	94u
5/16/2001	SM-0278	11:52	0.5	13.5	6.5	182	116	8.7	82
7/11/2001	SM-0318	11:46	0.5	21	6.3	167	107	6.8iu	76iu
9/13/2001	SM-0358	11:34	0.4	18.8u	6.5	208	133	5.9	62
11/14/2001	SM-0398	12:09	0.5	3.9	6.2	204	131	10.4	77
3/13/2002	SM-0477	11:33	0.4	2.8	6.2	149	95.2	12.5	90
5/8/2002	SM-0517	11:51	1.2	16.5	6.2 c	153	98	8.8	88
7/10/2002	SM-0557	12:22	0.6	22.7	6.4	200	128	6.3	72
9/11/2002	SM-0597	11:40	0.5	21.5	6.5	232	148	6.9	79
11/6/2002	SM-0637	12:04	0.3 i	4.5	6.0	202	129	10.6	81
2/5/2003	**Ice Out**								
4/9/2003	SM-0718	11:40	0.4	2.5	5.8	188	120	12.0 u	89 u
6/11/2003	SM-0759	11:07	0.7	17.6	6.1	155	99	8	86
8/13/2003	SM-0809	11:47	0.6	23.1	6.4	192 u	123 u	6.1	72
10/8/2003	SM-0852	11:03	0.9	9.3	6.6 u	205	133	9.8	85
1/27/2004	**Ice Out**								
3/10/2004	SM-5935	11:11	1	1	6.4 i	150	98	13.6	96
5/12/2004	SM-5976	11:16	0.8	16.1 u	6.5	155	101	9.2	94
7/14/2004	SM-6018	11:06	0.8	19.6	6.5	227	148	6.3	69
9/15/2004	SM-6060	11:03	1.3	17	6.5	195	127	7.2	74
11/3/2004	SM-6101	11:10	0.9	8.6	6.4	206	134	10.0 u	86 u

Table 14 MassDEP SMART 1998-2004 Nashua Watershed In Situ Multiprobe Data. Station NM27/INLTPEPPD.

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
1/27/2004	**Ice Out**								
3/10/2004	SM-5937	12:19	1.3	2.4	6.8 i	239	155	13.3	97
5/12/2004	SM-5978	12:24	1	16.1	6.8	224	146	9.1	93
7/14/2004	SM-6020	12:14	2.2	18.5	6.8	238	155	7.8	84
9/15/2004	SM-6062	12:05	2.2	18.5	6.9	301	195	7.1	76
11/3/2004	SM-6103	12:13	1.7	10	6.7	266	173	6.6 u	58 u

** = missing/censored data
-- = no data
See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 15 MassDEP SMART 1998-2004 Nashua Watershed In Situ Multiprobe Data. Station NM29A.

Date	OWMID	Time	Depth	Temp	pH	Cond@ 25°C	TDS	DO	SAT
		(24hr)	(m)	(°C)	(SU)	(uS/cm)	(mg/L)	(mg/L)	(%)
5/27/1998	81-0009	10:12	0.4	18.6	6.7	195	100	7.9	83
6/17/1998	81-0024	10:01	<0.3	17.7	6.4	101	60	9.3	97
7/22/1998	81-0064	9:46	0.4	26	7.2	242	200	7.9	96
8/12/1998	81-0091	10:25	<0.3	24.5	7.2	278	200	**	**
9/9/1998	81-0106	10:24	<0.3	21.1	7.1	306	200	8	89
10/7/1998	81-0121	10:22	0.4	13.9	7.1	299	200	9.3	87
4/7/1999	81-0139	12:03	0.1	10.75	6.9	198	127	11.25	100
5/5/1999	81-0147	11:56	0.6	14.71	7.0	249	160	10.35	100.2
7/7/1999	81-0154	12:37	0.4	27.74	7.0	322	206	4.96	62.3
8/4/1999	81-0161	12:55	0.2	25.57	7.3	391	--	5.81	1.8
9/1/1999	81-0168	11:59	0.4	21.76	7.3	407	260	5.94	65.9
11/3/1999	81-0175	12:15	0.4	12.13	6.7	257	164	9.34	86.7
4/5/2000	SM-0027	11:47	0.5	10.5	6.7	211	135	10.2	92
6/7/2000	SM-0067	12:10	0.6	14.8	6.8	209	134	9.2	89
8/2/2000	SM-0114	12:07	0.6u	19.1	6.5	155	99	7.3	77
10/18/2000	SM-0161	12:15	0.8	12	6.8	257	165	7.7	70
12/6/2000	SM-0201	11:56	0.5	1.2	6.7	229	147	12.8	89
3/21/2001	SM-0239	12:54	1.2	3.8	6.5	319	204	12.9	95
5/16/2001	SM-0279	12:30	0.3	15.6	7.0c	295	189	9	89
7/11/2001	SM-0319	12:29	0.4	22.8	6.9	253	162	7.5i	86i
9/13/2001	SM-0359	12:12	0.2	22.1u	7.1c	388	248	5.9	67
11/14/2001	SM-0399	12:50	0.3	6.3	6.9cu	383	245	10.9u	86u
1/9/2002	SM-0438	13:06	0.2	2.2	6.6	345	221	12.6	91
3/13/2002	SM-0478	12:16	0.4	5.8	7.1 c	317	203	12.1 m	94 m
5/8/2002	SM-0518	12:32	1	16.9	6.9	256	164	10.3	104
7/10/2002	SM-0558	13:01	0.5	25.5	6.9 c	309	198	6.5	78
9/11/2002	SM-0598	12:19	0.1 i	21.8	7.9 c	408	261	11.7	133
11/6/2002	SM-0638	12:42	0.1 i	5.9	6.6	298	191	10.3 u	82 u
2/5/2003	SM-0678	11:54	0.6	0.26	6.4	315 u	202 u	11.9	85
4/9/2003	SM-0719	12:20	0.6	3.3	6.4	265	170	12.4 u	93 u
6/11/2003	SM-0760	11:56	0.7	18	6.5	255	163	7.8	83
8/13/2003	SM-0810	12:28	0.7	23.5	6.7	245	157	6.7	80
10/8/2003	SM-0853	11:34	0.6	12.1	6.9 uc	300	195	9.8	91
1/27/2004	SM-5894	11:39	0.5	0.18	6.7	325	211	12.9	89
3/10/2004	SM-5936	11:48	1	2.7	6.7 i	217	141	13.2	97
5/12/2004	SM-5977	11:51	0.8	15.9	6.8	224	146	9.6	97
7/14/2004	SM-6019	11:41	0.6	20.7	6.8	252	164	6.7	74
9/15/2004	SM-6061	11:36	0.3	18.6	6.9	286	186	7.9	84
11/3/2004	SM-6102	11:43	0.6	9.4	6.8	316	206	9.8	86

** = missing/censored data
-- = no data
See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 16 MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NN12.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
5/27/1998	81-0004	81-0003	**	20	35	57	1.6	1.7	--	--	0.22	1.3	0.07
5/27/1998	81-0003	81-0004	10:34	21	35	56	1.2	1.3	--	--	0.2	1.3	0.07
6/17/1998	81-0018	81-0019	10:40	11	17	25	7.8	--	--	--	0.04	0.27	0.08
6/17/1998	81-0019	81-0018	10:40	11	17	26	7.8	--	--	--	0.03	0.28	0.08
7/22/1998	81-0058	81-0059	10:20	28	53	--	3.1	1.5	--	--	0.08	2.2	0.12
7/22/1998	81-0059	81-0058	10:20	26	40	--	3	1.6	--	--	0.07	2.4	0.12
8/12/1998	81-0085	--	10:20	37	63	--	5.1	2.5	--	--	0.39	3	0.18
9/9/1998	81-0100	--	10:24	42	69	77	2.6	2.7	--	--	0.32	2.5	0.14
10/7/1998	81-0115	--	9:45	40	76	92	1.4	2.1	--	--	0.25	4.6	0.07
4/7/1999	81-0135	--	9:14	19	33	58	4.1	2.0hj	1.4	--	1.2	0.44	0.06
5/5/1999	81-0142	--	9:19	28	40	62	8.2	1.6	2.2	--	2	0.77	0.23
7/7/1999	81-0149	--	9:29	32	56	65	7.6	4.9	0.79	--	0.32	2.5	0.17
9/1/1999	81-0163	--	9:13	38	75	86	5.7	3.1	1.3	--	0.29	7	0.18
11/3/1999	81-0170	--	9:24	14	26	40	20	4.8	0.8	--	0.03	0.45	0.17
4/5/2000	SM-0022	--	9:03	11	24	50	5.8	2.2	0.71	--	0.43	0.32	0.064
6/7/2000	SM-0062	--	9:21	6	12	19	13	7.8	0.45	--	0.05	0.23	0.12
8/2/2000	SM-0109	--	9:15	14	28	51	7.4	3.9	0.5	--	0.11	0.88	0.1
10/18/2000	SM-0156	--	9:20	30	48	75 b	3.1	1.7	0.63	--	0.07	3.6	0.12
12/6/2000	SM-0196	--	9:20	20	37	61	11	2.7	0.88	--	0.32	1.9	0.21
3/21/2001	SM-0234	--	9:21	15	40	120	5.6	2.8	1.2	--	0.98	0.7	0.12
5/16/2001	SM-0274	--	9:34	35	**m	88	6.6	2.3	2.7	--	2.6	1.4	0.13
7/11/2001	SM-0314	--	9:15	21	43	82	5.6	3.7	0.59	--	<0.02	1.9	0.085
9/13/2001	SM-0354	--	9:00	50	69	110	4.5	2.5	1	--	0.23	4.7	0.27
11/14/2001	SM-0394	--	9:25	36	65	97	1.6	1.8	1.3	--	0.35	5.2	0.48

** = missing/censored data

Table 16 continued. MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NN12.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
1/9/2002	SM-0434	--	9:50	35	52	180	2.5	2.7	2.2	--	1.5	3.2	0.57
3/13/2002	SM-0473	--	9:10	19	38	92	2.2	2.1	1.2	--	0.81	0.97	0.14
5/8/2002	SM-0513	--	9:25	19	39	82	4.9	1.9	0.63	--	0.23	0.87	0.074
7/10/2002	SM-0553	--	9:35	42	59	100	4.2	3.5	1.2	--	0.26	3	0.15
9/11/2002	SM-0593	--	9:30	52	83	110	3.2	2.3	1.1	--	0.08	6.2	0.31
11/6/2002	SM-0633	--	9:15	19	40	73	11	4.3	1	--	0.21	2.1	0.18
2/5/2003	SM-0673	--	9:00	14	40	150	7.2	9	0.92 h	--	0.54	1.2	0.12
4/9/2003	SM-0714	--	9:00	10	33	110	2.1	1.4	0.75	--	0.33	0.82	0.059
6/11/2003	SM-0755	--	9:00	16	37	82	5.9 j	1.4	0.66 b	--	0.15	1	0.054
8/13/2003	SM-0805	--	9:20	16	29	48 d	19	7.3 d	0.68	--	0.08	0.56	0.14
10/8/2003	SM-0848	--	9:00	30	53	96	120	2	--	3.9 bh	## bdh	3.2 h	0.091
1/27/2004	SM-0891	--	8:50	--	--	--	--	3.7*	--	1.8 j	0.45 j	0.96 j	0.13
3/10/2004	SM-0933	--	8:55	--	--	--	--	2.8*	--	1.9 j	0.58 j	0.68 j	0.18
5/12/2004	SM-0974	--	9:00	--	--	--	--	3.1*	--	1.4 j	0.41 j	0.62 j	0.047
7/14/2004	SM-1015	SM-1016	9:00	27	48	96	9.2	4	--	3.6	0.33	2.4	0.22
7/14/2004	SM-1016	SM-1015	9:00	25	49	92	7.9	3.4	--	3.7	0.32	2.5	0.22
9/15/2004	SM-1057	SM-1058	9:15	25	52	97	4.7	2.9	--	4.3	0.12	3.6	0.21
9/15/2004	SM-1058	SM-1057	9:15	26	51	96	4.5	3	--	4.3	0.12	3.5 h	0.2
11/3/2004	SM-1098	SM-1099	9:20	--	--	--	--	3.69*	--	2.1 d	0.56 hj	1.2 d	0.086
11/3/2004	SM-1099	SM-1098	9:20	--	--	--	--	3.23*	--	2.7 d	0.63 hj	1.6 d	0.098

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 17 MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NS19.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
5/27/1998	81-0006	--	11:46	28	32	22	1.8	1.9	--	--	0.03	2.1	0.31
6/17/1998	81-0021	--	11:45	21	27	12	3.4	--	--	--	0.12	0.61	0.19
7/22/1998	81-0061	--	11:45	33	36	--	2.9	1.6	--	--	<0.02	1	0.32
8/12/1998	81-0087	--	11:30	29	36	--	1.4	1.3	--	--	0.02	2.1	0.47
9/9/1998	81-0102	--	11:25	31	36	25	2.4	2.1	--	--	0.56	3.1	0.65
10/7/1998	81-0117	--	10:23	34	39	27	1	1.8	--	--	0.02	2.1	0.53
4/7/1999	81-0136	--	10:04	22	35	24	1.6	1.1hj	0.39	--	<0.02	1.4	0.21
5/5/1999	81-0143	--	9:54	27	35	23	2.2	1.6	0.42	--	0.03	2.6	0.42
7/7/1999	81-0150	--	10:08	23	37	22	3.4	2.8	0.54	--	0.1	5	0.95
9/1/1999	81-0164	--	9:52	49	35	30	2.4	2.3	0.47	--	0.04	4	0.76
11/3/1999	81-0171	--	10:10	24	32	19	23	2.7	0.38	--	<0.02	1.1	0.26
4/5/2000	SM-0023	--	9:36	22	28	20	3.6	2.1	1.3	--	1.2	0.55	0.21
6/7/2000	SM-0063	--	10:02	14	19	10	4.7	4.4	0.63	--	0.12	0.59	0.2
8/2/2000	SM-0110	--	9:55	27	33	23	3.5	2	0.44	--	0.04	1.8	0.29
10/18/2000	SM-0157	--	10:01	29	37	24 b	1.9	1.7	0.38	--	<0.02	3.3	0.42
12/6/2000	SM-0197	--	9:58	30	35	26	4.3	2.3	0.3	--	<0.02	2	0.25
3/21/2001	SM-0235	--	10:13	22m	38m	37m	1.9m	2.0m	0.65m	--	0.44m	0.94m	0.13m
5/16/2001	SM-0275	--	10:13	24m	39m	32m	3.6m	1.9m	0.77m	--	0.60m	3.3m	0.14m
7/11/2001	SM-0315	--	10:05	26m	37m	30m	2.3m	1.8m	0.29m	--	<0.02m	2.1m	0.064m
9/13/2001	SM-0355	--	9:55	32m	36m	44m	3.0m	2.8m	0.56m	--	<0.02m	7.3m	0.079m
11/14/2001	SM-0395	--	10:20	33	44	35	2.1	2	0.4	--	<0.02	5.8	0.14

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 17 continued. MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NS19.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
1/9/2002	SM-0435	--	10:20	28	34	37	5.7	2.1	1.1	--	0.79	2	0.093
3/13/2002	SM-0474	--	9:55	24	36	32	2.4	2	0.37	--	<0.02	2.1	0.25
5/8/2002	SM-0514	--	10:10	22	40	34	3.3	1.8	0.47	--	0.06	2.2	0.1
7/10/2002	SM-0554	--	10:20	29	36	34	4	2.2	0.52	--	<0.06	2.4	0.1
9/11/2002	SM-0594	--	10:10	36	34	35	3.4	1.6	0.42	--	<0.02	3.2	0.086
11/6/2002	SM-0634	--	10:05	14	26	22	8.1	6	0.45	--	0.06	1.7	0.11
2/5/2003	SM-0674	--	9:50	18	37	48	4	2.6	0.36 h	--	0.08	2.3	0.25
4/9/2003	SM-0715	--	9:45	8 m	20 m	28 m	5.9 m	1.6 m	0.38 m	--	<0.02 m	0.39 m	0.053 m
6/11/2003	SM-0756	--	9:40	8	22	32	9.3 j	0.6	0.36 b	--	0.07	0.54	0.044
8/13/2003	SM-0806	--	10:00	16 m	29 m	47 dm	3.0 m	7.4 dm	0.30 m	--	<0.02 m	0.38 m	0.033 m
10/8/2003	SM-0849	--	9:35	35 m	34 m	34 m	4.2 m	1.6 m	--	2.2 bhm	## bdhm	1.7 hm	0.037 hm
1/27/2004	SM-0892	--	9:40	--	--	--	--	2.2*	--	2.6 j	<0.03 j	2.4 j	0.23
3/10/2004	SM-0934	--	9:45	--	--	--	--	1.7* m	--	0.87 jm	<0.04 jm	0.61 jm	0.084 m
5/12/2004	SM-0975	--	9:50	--	--	--	--	1.2* m	--	0.51 jm	<0.01 jm	0.39 jm	0.033 m
7/14/2004	SM-1017	--	9:45	5	17	23	3.4	0.69	--	0.8	<0.01	0.59	0.021
9/15/2004	SM-1059	--	9:50	24	39	36	2.8	1.4	--	2.8	0.06	2.2	0.059
11/3/2004	SM-1100	--	10:02	--	--	--	--	2.86*	--	1.9	0.06 h	1.7	0.079

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 18 MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NM21.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
5/27/1998	81-0007	**	12:26	20	34	45	1.2	2.4	--	--	0.04	1.4	0.1
6/17/1998	81-0022	**	12:30	11	17	20	4.4	--	--	--	<0.02	0.26	0.1
7/22/1998	81-0062	**	12:10	22	47	--	3.2	1.6	--	--	<0.02	1.8	0.12
8/12/1998	81-0088	81-0089	11:50	31	54	--	4.6	1.6	--	--	0.04	2.9	**
8/12/1998	81-0089	81-0088	11:50	31	54	--	3.9	1.8	--	--	0.05	2.6	**
9/9/1998	81-0104	81-0103	**	37	59	60	2.6	2.9	--	--	<0.02	2.5	0.22
9/9/1998	81-0103	81-0104	11:56	37	59	61	2.6	2.8	--	--	<0.02	2.4	0.22
10/7/1998	81-0118	81-0119	10:45	36	62	67	1.8	2.2	--	--	0.11	3.9	0.25
10/7/1998	81-0119	81-0118	10:45	37	62	67	2.2	2.1	--	--	0.11	4	0.24
4/7/1999	81-0137	**	10:38	19	35	51	4	0.95hj	1.2	--	0.99	0.76	0.08
5/5/1999	81-0145	81-0144	**	26	38	54	2.8	1.3	1.7	--	1.3	1.6	0.17
5/5/1999	81-0144	81-0145	10:28	25	38	54	3.3	1.3	1.6	--	1.3	1.5	0.18
7/7/1999	81-0151	81-0152	10:49	35	56	58	6.2	3.2	0.53	--	0.08	2	0.32
7/7/1999	81-0152	81-0151	10:50	36	56	60	5.6	3.9	0.57	--	0.08	3	0.3
9/1/1999	81-0165	81-0166	10:30	37	66	68	6.4	3.3	0.9	--	0.06	4	0.21
9/1/1999	81-0166	81-0165	10:35	38	66	68	6.5	2.8	0.9	--	0.05	4.5	0.21
11/3/1999	81-0173	81-0172	**	26	37	43	18	3.5	0.55	--	<0.02	1.6	0.23
11/3/1999	81-0172	81-0173	10:50	26	37	43	15	3.3	0.6	--	<0.02	1.6	0.24
4/5/2000	SM-0024	SM-0025	10:04	14	27	46	9.4	** m	0.96	--	0.57	0.45	0.12
4/5/2000	SM-0025	SM-0024	10:09	13	28	46	9	** m	0.88	--	0.57	0.45	0.12
6/7/2000	SM-0064	SM-0065	10:44	10	17	20	30	10	0.74	--	0.06d	0.28	0.2
6/7/2000	SM-0065	SM-0064	10:44	9	16	21	31	11	0.79	--	0.12d	0.27	0.21
8/2/2000	SM-0111	SM-0112	10:35	17	27	41	16	5	0.56	--	0.03	1	0.18
8/2/2000	SM-0112	SM-0111	10:40	17	28	47	16	6.3	0.53	--	0.04	1	0.16
10/18/2000	SM-0158	SM-0159	10:45	27	45	56 b	2.1	2.4	0.61	--	0.07	2.9	0.16
10/18/2000	SM-0159	SM-0158	10:50	26	45	55 b	2	2.5	0.66	--	0.07	2.8	0.16

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 18 continued. MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NM21.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
12/6/2000	SM-0198	SM-0199	10:30	20	34	20	1.7	1.7	0.5	--	0.16	1.4	0.13
12/6/2000	SM-0199	SM-0198	10:35	20	34	20	1.7	1.7	0.55	--	0.17	1.4	0.12
3/21/2001	SM-0236	SM-0237	11:06	17	39	90	10	3.4	1.1	--	0.86	0.72	0.13
3/21/2001	SM-0237	SM-0236	11:11	16	39	91	11	3.4	1.1	--	0.82	0.71	0.12
5/16/2001	SM-0276	SM-0277	11:02	22	41	67	4.5	2	0.89	--	0.63	1.8	0.079
5/16/2001	SM-0277	SM-0276	11:07	22	42	67	4.7	1.7	0.89	--	0.62	1.8	0.085
7/11/2001	SM-0317	SM-0316	**	22	37	60	6	3.9	0.46d	--	<0.02	1.4	0.089
7/11/2001	SM-0316	SM-0317	10:54	21	37	58	5.7	3.8	0.36d	--	<0.02	1.4	0.086
9/13/2001	SM-0357	SM-0356	**	42	53	80	4.5	2.4	0.63	--	0.07	2.9	0.13
9/13/2001	SM-0356	SM-0357	10:35	42	53	80	4.7	3.3	0.7	--	0.07	3	0.13
11/14/2001	SM-0397	SM-0396	**	32	62	74	1.1	1.6	0.52	--	<0.02	3.9	0.16
11/14/2001	SM-0396	SM-0397	11:05	32	61	75	1.3	1.6	0.53	--	<0.02	3.8	0.18
1/9/2002	SM-0436	SM-0437	11:30	27	48	120	1.8	1.7	0.92	--	0.34	2.5	0.2
1/9/2002	SM-0437	SM-0436	11:30	28	48	130	1.6	1.7	1	--	0.36	2.6	0.21
3/13/2002	SM-0475	SM-0476	10:35	18	38	78	2.6	2	0.92	--	0.39	1.4	0.16
3/13/2002	SM-0476	SM-0475	10:35	16	37	78	2.5	2	0.92	--	0.41	1.4	0.15
5/8/2002	SM-0515	SM-0516	10:55	20	37	63	4.2	1.8	0.48	--	0.08	0.9	0.07
5/8/2002	SM-0516	SM-0515	10:55	20	36	62	4	2	0.49	--	0.07	0.91	0.07
7/10/2002	SM-0555	SM-0556	11:20	35	50	76	5.6	3.4	0.7	--	0.09 d	2.4	0.11
7/10/2002	SM-0556	SM-0555	11:20	35	49	74	4.8	3.4	0.67	--	<0.06 d	2.5	0.11
9/11/2002	SM-0595	SM-0596	10:45	43	68	90	12 d	1.9	0.81	--	<0.06	4.1	0.16
9/11/2002	SM-0596	SM-0595	10:45	44	68	90	15 d	2.2	0.74	--	<0.06	4.3	0.16
11/6/2002	SM-0635	SM-0636	11:10	27	48	72	2.6	1.5	0.86	--	0.07	2.2	0.066
11/6/2002	SM-0636	SM-0635	11:10	25	48	72	2.2	1.5	0.86	--	0.06	2.2	0.068

** = missing/censored data

Table 18 continued. MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NM21.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
2/5/2003	**Ice Out**												
4/9/2003	SM-0716	SM-0717	10:45	10	29	94	9.1	2.5	0.67	--	0.24	0.65	0.065
4/9/2003	SM-0717	SM-0716	10:45	10	30	95	8.4	2.5	0.7	--	0.22	0.63	0.064
6/11/2003	SM-0757	SM-0758	10:25	14	31	56	11 j	1.4	0.55 b	--	<0.06 d	0.73	0.077
6/11/2003	SM-0758	SM-0757	10:25	14	30	55	11 j	1.4	0.52 b	--	0.10 d	0.73	0.079
8/13/2003	SM-0807	SM-0808	10:55	7 d	19 d	## d	26	## d	0.63 d	--	0.07 d	0.66	0.18
8/13/2003	SM-0808	SM-0807	10:55	17 d	28 d	## d	25	## d	0.78 d	--	0.10 d	0.68	0.18
10/8/2003	SM-0850	SM-0851	10:15	30	46	74	3.2	1.8	--	3.2 bh	## bdh	2.4 h	0.057 h
10/8/2003	SM-0851	SM-0850	10:15	29	46	76	2.8	2	--	3.7 bh	## bdh	2.5 h	0.062 h

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 19 MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NT60A.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
5/27/1998	81-0012	81-0011	**	10	14	25	<1.0	1.4	--	--	0.02	0.36	0.02
5/27/1998	81-0011	81-0012	11:08	9	14	26	<1.0	1.4	--	--	<0.02	0.36	0.02
6/17/1998	81-0026	--	**	5	7.5	9	2.6	--	--	--	<0.02	0.04	0.05
7/22/1998	81-0067	--	10:56	12	19	--	<1.0	1	--	--	<0.02	0.43	<0.01
8/12/1998	81-0093	81-0094	11:18	12	20	--	<1.0	<1.0	--	--	<0.02	0.48	0.02
8/12/1998	81-0094	81-0093	11:18	12	20	--	<1.0	<1.0	--	--	<0.02	0.48	0.02
9/9/1998	81-0108	81-0109	11:25	14	20	33	1	1.2	--	--	<0.02	0.4	0.02
9/9/1998	81-0109	81-0108	11:25	13	20	33	<1.0	1.1	--	--	<0.02	0.47	0.02
10/7/1998	81-0123	81-0124	11:30	14	23	34	<1.0	1.1	--	--	<0.02	0.51	0.02
10/7/1998	81-0124	81-0123	11:30	13	23	34	1	1.2	--	--	<0.02	0.45	0.02
4/7/1999	81-0138	81-0140	11:29	6	14	26	<1.0	0.55hj	0.2	--	<0.02	0.24	0.02
4/7/1999	81-0140	81-0138	11:29	6	14	26	<1.0	0.60hj	0.2	--	<0.02	0.24	0.02
5/5/1999	81-0146	--	11:16	9	16	31	1.2	1.1	0.37	--	0.02	0.4	0.03
7/7/1999	81-0153	--	11:45	11	17	28	<2.5	1.3	0.27	--	0.04	0.24	0.03
9/1/1999	81-0167	--	11:22	15	21	38	2.3	1	0.31	--	0.02	0.21	0.018
11/3/1999	81-0174	--	11:43	6	16	29	10	0.85	0.25	--	<0.02	0.31	0.02
4/5/2000	SM-0026	--	11:04	4	12	26	1.4	1	0.2	--	<0.02	0.2	0.017
6/7/2000	SM-0066	--	11:34	4	9.3	21	9.6	3.5	0.44	--	<0.02	0.12	0.066
8/2/2000	SM-0113	--	11:32	4	9.1	16	3.5	2	0.4	--	<0.02	0.08	0.04
10/18/2000	SM-0160	--	11:41	8	18	33 b	6.8	1.2	0.47	--	<0.02	0.41	0.054
12/6/2000	SM-0200	--	11:24	8	14	28	<1.0	1.1	<0.10	--	<0.02	0.44	0.031

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 19 continued. MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NT60A.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
3/21/2001	SM-0238	--	12:09	3	15	40	1.5	1.1	0.23	--	0.06	0.28	0.018
5/16/2001	SM-0278	--	11:52	8	18	42	8.2	2.4	0.21	--	<0.02	0.55	0.026
7/11/2001	SM-0318	--	11:45	8	17	38	<1.0	1.6	0.31	--	<0.02	0.39	0.028
9/13/2001	SM-0358	--	11:30	13	21	51	2.2	1.3	0.25	--	<0.02	0.32	0.017
11/14/2001	SM-0398	--	11:55	11	26	47	<1.0	1.2	<0.10	--	<0.02	0.55	0.014
3/13/2002	SM-0477	--	11:30	4	14	35	2	2.8	0.22 j	--	<0.02	0.23	0.019
5/8/2002	SM-0517	--	11:55	5	15	35	1.5	0.98	0.3	--	<0.02	0.2	0.024
7/10/2002	SM-0557	--	12:15	13	20	47	1.5	1.4	0.43	--	<0.02	0.32	0.024
9/11/2002	SM-0597	--	11:35	12	25	54	1.5	0.85	0.4	--	<0.02	0.32	0.022 j
11/6/2002	SM-0637	--	12:05	8	22	47	1.4	1.1	0.28 j	--	<0.02	0.44	0.014 j
2/5/2003	**Ice Out**												
4/9/2003	SM-0718	--	11:30	3	15	46	1.2	0.57	0.22	--	<0.02	0.38	0.014
6/11/2003	SM-0759	--	11:05	5	15	36	2.4 j	1.4	0.35 b	--	<0.02	0.25	0.021
8/13/2003	SM-0809	--	11:45	9	18	43 d	9.7	2.1 d	0.37	--	<0.02	0.33	0.038
10/8/2003	SM-0852	--	11:05	9	21	47	2.8	1.7	--	1.0 bh	## bdh	0.52 h	0.043 h
1/27/2004	**Ice Out**												
3/10/2004	SM-0935	--	11:05	--	--	--	--	1.8*	--	0.58 j	<0.04 j	0.37 j	0.018
5/12/2004	SM-0976	--	11:00	--	--	--	--	2.4*	--	0.45 j	<0.03 j	0.26 j	0.02
7/14/2004	SM-1018	--	11:00	10	21	53	1.7	1.4 h	--	0.78	<0.03	0.5	0.024
9/15/2004	SM-1060	--	11:00	9	20	44	2.7	1.7	--	0.66	<0.01	0.32	0.036
11/3/2004	SM-1101	--	11:05	--	--	--	--	1.96*	--	0.55	<0.06 h	0.44	0.016

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 20 MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NM27/INLTPEPPD.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
1/27/2004	**Ice Out**												
3/10/2004	SM-0937	SM-0938	12:15	--	--	--	--	2.3*	--	1.1 j	0.19 j	0.58 j	0.071
3/10/2004	SM-0938	SM-0937	12:15	--	--	--	--	2.3*	--	1.0 j	0.18 j	0.52 j	0.067
5/12/2004	SM-0978	SM-0979	12:15	--	--	--	--	2.0*	--	0.58 dj	0.05 j	0.34 dj	0.03
5/12/2004	SM-0979	SM-0978	12:15	--	--	--	--	2.4*	--	0.74 dj	0.06 j	0.45 dj	0.036
7/14/2004	SM-1020	--	12:05	14	31	49	2.4	1.8 h	--	1.2	0.05	0.81	0.068
9/15/2004	SM-1062	--	12:05	23	42	61	1.8	2.1	--	1.3	0.04	0.87	0.069
11/3/2004	SM-1103	--	12:05	--	--	--	--	2.85*	--	0.85	0.06 h	0.62	0.041

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 21 MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NM29A.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
5/27/1998	81-0009	--	10:12	20	31	36	<1.0	3.5	--	--	0.1	0.58	0.08
6/17/1998	81-0024	--	10:01	12	17	18	6.4	--	--	--	0.03	0.15	0.09
7/22/1998	81-0064	--	9:46	33	42	--	2.4	4.1	--	--	<0.02	0.76	<0.01
8/12/1998	81-0091	--	10:26	30	45	--	2.9	1.2	--	--	0.06	0.93	0.08
9/9/1998	81-0106	--	10:25	63	49	50	2.4	5.3	--	--	0.02	1.1	0.09
10/7/1998	81-0121	--	10:22	3.6	50	51	2.2	2.8	--	--	0.05	1.2	0.09
4/7/1999	81-0139	--	12:03	15	30	40	2	1.1hj	0.71	--	0.26	0.51	0.08
5/5/1999	81-0147	--	11:56	23	37	47	3.9	2.1	0.77	--	0.23	1	0.09
7/7/1999	81-0154	--	12:37	34	48	55	3.3	2.5	0.83	--	0.2	0.82	0.12
9/1/1999	81-0168	--	11:59	51	60	64	5	3.4	2	--	1.4	1.3	0.36
11/3/1999	81-0175	--	12:15	25	59	46	3.3	2.6	0.7	--	0.08	0.98	0.09
4/5/2000	SM-0027	--	11:47	14	29	40	13	1.7	0.57	--	0.2	0.44	0.055
6/7/2000	SM-0067	--	12:10	18	30	38	8.2	4.8	0.58	--	0.07	0.68	0.14
8/2/2000	SM-0114	--	12:07	13	22	30	3.4	2.9	0.56	--	0.07	0.46	0.09
10/18/2000	SM-0161	--	12:15	26	41	45 b	4.7	10	0.66	--	0.1	1.1	0.12
12/6/2000	SM-0201	--	11:56	18	31	42	1.2	2	0.6	--	0.25	0.9	0.14
3/21/2001	SM-0239	--	12:55	16	35	76	4.5	2	0.57	--	0.27	0.62	0.053
5/16/2001	SM-0279	--	12:30	22	41	57	3.7	2.1	0.67	--	0.27	1	0.079
7/11/2001	SM-0319	--	12:29	23	34	53	3.6	1.8	0.56	--	<0.02	0.7	0.074
9/13/2001	SM-0359	--	12:09	36	52	72	2.3	2.5	0.99	--	0.08	1.4	0.082
11/14/2001	SM-0399	--	12:50	34	62	67	2.2	2.8	0.59	--	0.08	2	0.084
1/9/2002	SM-0438	--	13:05	29	48	70	7.8	3.7	1.2	--	0.29	1.8	0.21
3/13/2002	SM-0478	--	12:15	19	36	68	1.7	1.6	0.75	--	0.31	1	0.1
5/8/2002	SM-0518	--	12:35	16	33	53	2.7	1.7	0.52	--	0.07	0.42	0.058
7/10/2002	SM-0558	--	12:55	29	42	62	1.2	1.3	0.66	--	0.06	0.67	0.084
9/11/2002	SM-0598	--	12:10	40	56	74	2.4	1.9	0.79	--	<0.02	1.5	0.075
11/6/2002	SM-0638	--	12:40	25	44	59	1.5	1.2	0.46	--	<0.06	0.89	0.038

Table 21 continued. MassDEP SMART 1998-2004 Nashua Watershed Chemistry Data. Station NM29A.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
2/5/2003	SM-0676	SM-0678	11:45	18	40	70	1.6	1.5	0.50 h	--	0.27	1.2	0.08
2/5/2003	SM-0678	SM-0676	11:45	18	40	68	1.7	1.7	0.52 h	--	0.24	1.3	0.08
4/9/2003	SM-0719	--	12:15	10	28	61	3.4	1.6	0.37	--	<0.06	0.5	0.045
6/11/2003	SM-0760	--	11:50	18	33	56	3.3 j	1.6	0.56 b	--	<0.02	0.51	0.064
8/13/2003	SM-0810	--	12:25	19	31	46 d	19	2.4 d	0.48	--	<0.02	0.54	0.098
10/8/2003	SM-0853	--	11:30	25	41	60	1.1	1.9	--	1.6 bh	## bdh	0.96 h	0.054 h
1/27/2004	SM-0894	SM-0896	11:25	--	--	--	--	2.1*	--	1.0 j	0.22 j	0.62 j	0.046
1/27/2004	SM-0896	SM-0894	11:25	--	--	--	--	1.9*	--	1.0 j	0.26 j	0.68 j	0.049
3/10/2004	SM-0936	--	11:40	--	--	--	--	3.4*	--	1.1 j	0.15 j	0.55 j	0.07
5/12/2004	SM-0977	--	11:45	--	--	--	--	3.6*	--	0.67 j	0.04 j	0.36 j	0.041
7/14/2004	SM-1019	--	11:35	15	33	52	2.2	1.9 h	--	1.2	0.09	0.66	0.066
9/15/2004	SM-1061	--	11:30	24	42	55	1.4	1.8	--	1.3	<0.03	0.87	0.063
11/3/2004	SM-1102	--	11:40	--	--	--	--	3.30*	--	1.3	0.06 hj	1	0.044

** = missing/censored data

-- = no data

See Section **RESULTS AND QUALITY ASSURANCE/QUALITY CONTROL for** full description of qualifiers.

Table 22 MassDEP SMART 1998-2004 Nashua Watershed Ambient Field Blanks

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
5/27/1998	81-0008	Blank	**	2	<0.66	<1.0	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
5/27/1998	81-0015	Blank	**	4	<0.66	<1.0	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
6/17/1998	81-0027	Blank	**	3	<0.70	<1.0	<1.0	--	--	--	<0.02	<0.02	<0.01
6/17/1998	81-0023	Blank	12:30	3	<0.70	<1.0	<1.0	--	--	--	<0.02	<0.02	<0.01
7/21/1998	81-0042	Blank	**	--	--	--	--	--	--	--	--	--	<0.01
7/22/1998	81-0054	Blank	**	--	--	--	--	--	--	--	--	--	<0.01
7/22/1998	81-0068	Blank	**	3	<0.66	--	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
7/22/1998	81-0063	Blank	12:20	3	<0.66	--	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
8/11/1998	81-0073	Blank	10:00	--	--	--	--	--	--	--	--	--	<0.01
8/12/1998	81-0079	Blank	**	--	--	--	--	--	--	--	--	--	<0.01
8/12/1998	81-0095	Blank	11:25	2	<0.66	--	<1.0	<1.0	--	--	<0.02	<0.02	<0.01
8/12/1998	81-0090	Blank	12:00	2	<0.66	--	<1.0	<1.0	--	--	<0.02	<0.02	<0.01
9/9/1998	81-0105	Blank	**	<1.0	<0.66	<1.0	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
9/9/1998	81-0110	Blank	11:30	<1.0	<0.66	<1.0	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
10/7/1998	81-0120	Blank	**	1.5	<0.66	<1.0	<1.0	<0.1	--	--	<0.02	<0.02	<0.01
10/7/1998	81-0125	Blank	11:40	1.5	<0.66	<1.0	<1.0	<0.1	--	--	0.03	<0.02	<0.01
4/7/1999	81-0141	Blank	11:29	2	<0.10	<1.0	<1.0	<0.1hj	<0.10	--	<0.02	<0.02	<0.01
5/5/1999	81-0148	Blank	**	2	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.01
7/7/1999	81-0155	Blank	12:30	1.5	<0.66	<1.0	<2.5	<0.1	<0.10	--	<0.02	<0.02	<0.01
9/1/1999	81-0169	Blank	12:05	2	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.005
11/3/1999	81-0176	Blank	**	<2.0	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.01
4/5/2000	SM-0028	Blank	11:52	<2	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.010
6/7/2000	SM-0068	Blank	12:15	<2	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.010
8/2/2000	SM-0115	Blank	12:20	<2	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.01
10/18/2000	SM-0162	Blank	12:20	<2	<0.66	2.0b	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.010
12/6/2000	SM-0202	Blank	12:01	<2	<0.66	<1.0	<1.0	<0.1	<0.10	--	<0.02	<0.02	<0.010
3/21/2001	SM-0240	Blank	13:00	<2	<0.66	<1	<1.0	<0.10	<0.10	--	<0.02	<0.06	<0.010
5/16/2001	SM-0280	Blank	12:35	<2	<0.66	<1	<1.0	<0.10	<0.10	--	<0.02	<0.06	<0.010
7/11/2001	SM-0320	Blank	**	<2	<0.66	<1	<1.0	<0.10	<0.10	--	<0.02	<0.06	<0.005
9/13/2001	SM-0360	Blank	**	<2	<0.66	<1	<1.0	<0.10	<0.10	--	<0.02	<0.06	<0.005
11/14/2001	SM-0400	Blank	**	<2	<0.66	<1	<1.0	<0.10	<0.10	--	<0.02	<0.06	<0.005

** = missing/censored data;

-- = no data

Table 22 MassDEP SMART 1998-2004 Nashua Watershed Ambient Field **Blanks**

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			24hr	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
1/9/2002	SM-0439	Blank	12:40j	<2.0	<0.66	<1.0	<1.0	<0.10	<0.10	--	<0.02	<0.02	<0.005
3/13/2002	SM-0479	Blank	11:55j	<2.0	<0.66	<1.0	<1.0	<0.10	<0.10	--	<0.02	<0.02	<0.005
5/8/2002	SM-0519	Blank	12:15j	<2.0	<0.66	<1.0	<1.0	<0.10	<0.10	--	<0.02	<0.02	<0.005
7/10/2002	SM-0559	Blank	12:35j	<2.0	<0.66	<1.0	<1.0	0.10 bj	<0.10	--	<0.02	<0.02	<0.005
9/11/2002	SM-0599	Blank	12:00j	<2.0	<0.66	<1.0	<1.0	<0.10	<0.10	--	<0.02	<0.02	<0.020
11/6/2002	SM-0639	Blank	12:30j	<2.0	<0.66	<1.0	<1.0	<0.10	<0.10	--	<0.02	<0.02	<0.005
2/5/2003	SM-0679	Blank	11:30j	<2	<0.66	<1	<1.0	<0.10	0.10 bh	--	<0.02	<0.02	<0.005
4/9/2003	SM-0720	Blank	12:00j	<2	<0.66	<1	<1.0	<0.10	0.10 b	--	<0.02	<0.02	<0.005
6/11/2003	SM-0761	Blank	11:40j	<2	<0.66	<1	<1.0 j	<0.10	0.13 b	--	<0.02	<0.06	<0.005
8/13/2003	SM-0811	Blank	12:15j	<2	<0.66	<1 d	<1.0	0.34 bd	0.10 b	--	<0.02	<0.02	<0.005
10/8/2003	SM-0854	Blank	11:30j	<2	<0.66	<1	<1.0	<0.10	--	0.22 bh	[0.12] bdh	<0.02 h	<0.005 h
3/10/2004	SM-0939	Blank	12:20	--	--	--	--	<0.5*	--	0.063 bj	<0.01 j	<0.02 j	<0.005
5/12/2004	SM-0980	Blank	12:20	--	--	--	--	<0.5*	--	<0.040 j	<0.01 j	<0.02 j	<0.005
7/14/2004	SM-1021	Blank	12:10	<2	<0.66	<1	<1.0	0.11 h	--	0.048 b	<0.01	<0.02	<0.005
9/15/2004	SM-1063	Blank	12:10	<2	<0.66	<1	<1.0	<0.10	--	<0.040	<0.01	<0.02	<0.005
11/3/2004	SM-1104	Blank	12:08	--	--	--	--	<0.5*	--	<0.040	<0.02 h	<0.06	<0.005
1/27/2004	SM-0897	Blank	11:27	--	--	--	--	<0.5*	--	<0.040 j	<0.01 j	<0.02 j	<0.005

** = missing/censored data;

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NORTH NASHUA RIVER, Station: NN12													
5/27/1998	81-0004	81-0003	**	20	35	57	1.6	1.7	--	--	0.22	1.3	0.07
5/27/1998	81-0003	81-0004	10:34	21	35	56	1.2	1.3	--	--	0.2	1.3	0.07
Relative Percent Difference (RPD):				***4.9%***	***0.0%***	***1.8%***	***28.6%***	***26.7%***	***--***	***--***	***9.5%***	***0.0%***	***0.0%***
SQUANNACOOK RIVER, Station: NT60A													
5/27/1998	81-0012	81-0011	**	10	14	25	<1.0	1.4	--	--	0.02	0.36	0.02
5/27/1998	81-0011	81-0012	11:08	9	14	26	<1.0	1.4	--	--	<0.02	0.36	0.02
Relative Percent Difference (RPD):				***10.5%***	***0.0%***	***3.9%***	***0.0%***	***0.0%***	***--***	***--***	***0.0%***	***0.0%***	***0.0%***
NORTH NASHUA RIVER, Station: NN12													
6/17/1998	81-0018	81-0019	10:40	11	17	25	7.8	--	--	--	0.04	0.27	0.08
6/17/1998	81-0019	81-0018	10:40	11	17	26	7.8	--	--	--	0.03	0.28	0.08
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***3.9%***	***0.0%***	***--***	***--***	***--***	***28.6%***	***3.6%***	***0.0%***
NASHUA RIVER, Station: NM21A													
6/17/1998	81-0030	81-0029	**	11	17	21	8.8	--	--	--	<0.02	0.26	0.08
6/17/1998	81-0029	81-0030	13:02	11	17	20	6.8	--	--	--	0.02	0.26	0.09
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***4.9%***	***25.6%***	***--***	***--***	***--***	***0.0%***	***0.0%***	***11.8%***
NASHUA RIVER, Station: GROTSCH													
7/21/1998	81-0036	81-0038	10:20	--	--	--	--	--	--	--	--	--	0.12
7/21/1998	81-0038	81-0036	10:20	--	--	--	--	--	--	--	--	--	0.11
Relative Percent Difference (RPD):				***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***8.7%***
NORTH NASHUA RIVER, Station: NN12													
7/22/1998	81-0058	81-0059	10:20	28	53	--	3.1	1.5	--	--	0.08	2.2	0.12
7/22/1998	81-0059	81-0058	10:20	26	40	--	3	1.6	--	--	0.07	2.4	0.12
Relative Percent Difference (RPD):				***7.4%***	***28.0%***	***--***	***3.3%***	***6.5%***	***--***	***--***	***13.3%***	***8.7%***	***0.0%***
NASHUA RIVER, Station: GROTSCH													
7/22/1998	81-0048	81-0050	**	--	--	--	--	--	--	--	--	--	0.09
7/22/1998	81-0050	81-0048	**	--	--	--	--	--	--	--	--	--	0.09
Relative Percent Difference (RPD):				***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***0.0%***
NISSITISSIT RIVER, Station: NT68													
7/22/1998	81-0066	81-0065	**	20	26	--	1.6	1.0	--	--	<0.02	0.1	<0.01
7/22/1998	81-0065	81-0066	10:16	20	26	--	1.8	1.2	--	--	<0.02	0.1	<0.01
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***--***	***11.8%***	***18.2%***	***--***	***--***	***0.0%***	***0.0%***	***0.0%***

** = missing/censored data;

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NASHUA RIVER/Pepperell Pond, Station: OUTPEPPD													
8/11/1998	81-0071	81-0072	10:00	--	--	--	--	--	--	--	--	--	0.09
8/11/1998	81-0072	81-0071	10:00	--	--	--	--	--	--	--	--	--	0.1
		Relative Percent Difference (RPD):		***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***10.5%***
8/12/1998	81-0077	81-0078	**	--	--	--	--	--	--	--	--	--	0.09
8/12/1998	81-0078	81-0077	**	--	--	--	--	--	--	--	--	--	0.09
		Relative Percent Difference (RPD):											***0.0%***
NASHUA RIVER, Station: NM21													
8/12/1998	81-0088	81-0089	11:50	31	54	--	4.6	1.6	--	--	0.04	2.9	**
8/12/1998	81-0089	81-0088	11:50	31	54	--	3.9	1.8	--	--	0.05	2.6	**
		Relative Percent Difference (RPD):		***0.0%***	***0.0%***	***--***	***16.5%***	***11.8%***	***--***	***--***	***22.2%***	***10.9%***	
SQUANNACOOK RIVER, Station: NT60A													
8/12/1998	81-0093	81-0094	11:18	12	20	--	<1.0	<1.0			<0.02	0.48	0.02
8/12/1998	81-0094	81-0093	11:18	12	20	--	<1.0	<1.0			<0.02	0.48	0.02
		Relative Percent Difference (RPD):		***0.0%***	***0.0%***	***0.0%***	***0.0%***	***0.0%***			***0.0%***	***0.0%***	***0.0%***
9/9/1998	81-0108	81-0109	11:25	14	20	33	1	1.2			<0.02	0.4	0.02
9/9/1998	81-0109	81-0108	11:25	13	20	33	<1.0	1.1			<0.02	0.47	0.02
		Relative Percent Difference (RPD):		***7%***	***0%***	***0%***	***0%***	***9%***			***0%***	***16%***	***0%***
NASHUA RIVER, Station: NM21													
9/9/1998	81-0104	81-0103	**	37	59	60	2.6	2.9	--	--	<0.02	2.5	0.22
9/9/1998	81-0103	81-0104	11:56	37	59	61	2.6	2.8	--	--	<0.02	2.4	0.22
		Relative Percent Difference (RPD):		***0.0%***	***0.0%***	***1.7%***	***0.0%***	***3.5%***	***--***	***--***	***0.0%***	***4.1%***	***0.0%***
10/7/1998	81-0118	81-0119	10:45	36	62	67	1.8	2.2	--	--	0.11	3.9	0.25
10/7/1998	81-0119	81-0118	10:45	37	62	67	2.2	2.1	--	--	0.11	4	0.24
		Relative Percent Difference (RPD):		***2.7%***	***0.0%***	***0.0%***	***20.0%***	***4.7%***	***--***	***--***	***0.0%***	***2.5%***	***4.1%***
SQUANNACOOK RIVER, Station: NT60A													
10/7/1998	81-0123	81-0124	11:30	14	23	34	<1.0	1.1			<0.02	0.51	0.02
10/7/1998	81-0124	81-0123	11:30	13	23	34	1	1.2			<0.02	0.45	0.02
		Relative Percent Difference (RPD):		***7.4%***	***0.0%***	***0.0%***	***0.0%***	***8.7%***			***0.0%***	***12.5%***	***0.0%***

** = missing/censored data;

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NASHUA RIVER, Station: NM21													
5/5/1999	81-0145	81-0144	**	26	38	54	2.8	1.3	1.7		1.3	1.6	0.17
5/5/1999	81-0144	81-0145	10:28	25	38	54	3.3	1.3	1.6		1.3	1.5	0.18
Relative Percent Difference (RPD):				***3.9%***	***0.0%***	***0.0%***	***16.4%***	***0.0%***	***6.1%***		***0.0%***	***6.5%***	***5.7%***
7/7/1999	81-0151	81-0152	10:49	35	56	58	6.2	3.2	0.53		0.08	2	0.32
7/7/1999	81-0152	81-0151	10:50	36	56	60	5.6	3.9	0.57		0.08	3	0.3
Relative Percent Difference (RPD):				***2.8%***	***0.0%***	***3.4%***	***10.2%***	***19.7%***	***7.3%***		***0.0%***	***40.0%***	***6.5%***
9/1/1999	81-0165	81-0166	10:30	37	66	68	6.4	3.3	0.9		0.06	4	0.21
9/1/1999	81-0166	81-0165	10:35	38	66	68	6.5	2.8	0.9		0.05	4.5	0.21
Relative Percent Difference (RPD):				***2.7%***	***0.0%***	***0.0%***	***1.6%***	***16.4%***	***0.0%***		***18.2%***	***11.8%***	***0.0%***
11/3/1999	81-0173	81-0172	**	26	37	43	18	3.5	0.55		<0.02	1.6	0.23
11/3/1999	81-0172	81-0173	10:50	26	37	43	15	3.3	0.6		<0.02	1.6	0.24
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***0.0%***	***18.2%***	***5.9%***	***8.7%***		***0.0%***	***0.0%***	***4.3%***
SQUANNACOOK RIVER, Station: NT60A													
4/7/1999	81-0138	81-0140	11:29	6	14	26	<1.0	0.55hj	0.2		<0.02	0.24	0.02
4/7/1999	81-0140	81-0138	11:29	6	14	26	<1.0	0.60hj	0.2		<0.02	0.24	0.02
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***0.0%***	***0.0%***	***8.7%***	***0.0%***		***0.0%***	***0.0%***	***0.0%***

** = missing/censored data

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NASHUA RIVER, Station: NM21													
4/5/2000	SM-0024	SM-0025	10:04	--	14	27	46	9.4	** m	0.96	0.57	0.45	0.12
4/5/2000	SM-0025	SM-0024	10:09	--	13	28	46	9	** m	0.88	0.57	0.45	0.12
Relative Percent Difference (RPD):					***7.4%***	***3.6%***	***0.0%***	***4.3%***		***8.7%***	***0.0%***	***0.0%***	***0.0%***
6/7/2000	SM-0064	SM-0065	10:44	--	10	17	20	30	10	0.74	0.06d	0.28	0.2
6/7/2000	SM-0065	SM-0064	10:44	--	9	16	21	31	11	0.79	0.12d	0.27	0.21
Relative Percent Difference (RPD):					***10.5%***	***6.1%***	***4.9%***	***3.3%***	***9.5%***	***6.5%***	***66.7%***	***3.6%***	***4.9%***
8/2/2000	SM-0111	SM-0112	10:35	--	17	27	41	16	5	0.56	0.03	1	0.18
8/2/2000	SM-0112	SM-0111	10:40	--	17	28	47	16	6.3	0.53	0.04	1	0.16
Relative Percent Difference (RPD):					***0.0%***	***3.6%***	***13.6%***	***0.0%***	***23.0%***	***5.5%***	***28.6%***	***0.0%***	***11.8%***
10/18/2000	SM-0158	SM-0159	10:45	--	27	45	56 b	2.1	2.4	0.61	0.07	2.9	0.16
10/18/2000	SM-0159	SM-0158	10:50	--	26	45	55 b	2	2.5	0.66	0.07	2.8	0.16
Relative Percent Difference (RPD):					***3.8%***	***0.0%***	***1.8%***	***4.9%***	***4.1%***	***7.9%***	***0.0%***	***3.5%***	***0.0%***
12/6/2000	SM-0198	SM-0199	10:30	--	20	34	20	1.7	1.7	0.5	0.16	1.4	0.13
12/6/2000	SM-0199	SM-0198	10:35	--	20	34	20	1.7	1.7	0.55	0.17	1.4	0.12
Relative Percent Difference (RPD):					***0.0%***	***0.0%***	***0.0%***	***0.0%***	***0.0%***	***9.5%***	***6.1%***	***0.0%***	***8.0%***
3/21/2001	SM-0236	SM-0237	11:06	17	39	90	10	3.4	1.1		0.86	0.72	0.13
3/21/2001	SM-0237	SM-0236	11:11	16	39	91	11	3.4	1.1		0.82	0.71	0.12
Relative Percent Difference (RPD):				***6.1%***	***0.0%***	***1.1%***	***9.5%***	***0.0%***	***0.0%***		***4.8%***	***1.4%***	***8.0%***
5/16/2001	SM-0276	SM-0277	11:02	22	41	67	4.5	2	0.89		0.63	1.8	0.079
5/16/2001	SM-0277	SM-0276	11:07	22	42	67	4.7	1.7	0.89		0.62	1.8	0.085
Relative Percent Difference (RPD):				***0.0%***	***2.4%***	***0.0%***	***4.3%***	***16.2%***	***0.0%***		***1.6%***	***0.0%***	***7.3%***
7/11/2001	SM-0317	SM-0316	**	22	37	60	6	3.9	0.46d		<0.02	1.4	0.089
7/11/2001	SM-0316	SM-0317	10:54	21	37	58	5.7	3.8	0.36d		<0.02	1.4	0.086
Relative Percent Difference (RPD):				***4.7%***	***0.0%***	***3.4%***	***5.1%***	***2.6%***	***24.4%***		***0.0%***	***0.0%***	***3.4%***
9/13/2001	SM-0357	SM-0356	**	42	53	80	4.5	2.4	0.63		0.07	2.9	0.13
9/13/2001	SM-0356	SM-0357	10:35	42	53	80	4.7	3.3	0.7		0.07	3	0.13
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***0.0%***	***4.3%***	***31.6%***	***10.5%***		***0.0%***	***3.4%***	***0.0%***
11/14/2001	SM-0397	SM-0396	**	32	62	74	1.1	1.6	0.52		<0.02	3.9	0.16
11/14/2001	SM-0396	SM-0397	11:05	32	61	75	1.3	1.6	0.53		<0.02	3.8	0.18
Relative Percent Difference (RPD):				***0.0%***	***1.6%***	***1.3%***	***16.7%***	***0.0%***	***1.9%***		***0.0%***	***2.6%***	***11.8%***

** = missing/censored data

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NASHUA RIVER, Station: NM21													
1/9/2002	SM-0436	SM-0437	11:30	27	48	120	1.8	1.7	0.92	--	0.34	2.5	0.2
1/9/2002	SM-0437	SM-0436	11:30	28	48	130	1.6	1.7	1	--	0.36	2.6	0.21
Relative Percent Difference (RPD):				***3.6%***	***0.0%***	***8.0%***	***11.8%***	***0.0%***	***8.3%***		***5.7%***	***3.9%***	***4.9%***
3/13/2002	SM-0475	SM-0476	10:35	18	38	78	2.6	2	0.92	--	0.39	1.4	0.16
3/13/2002	SM-0476	SM-0475	10:35	16	37	78	2.5	2	0.92	--	0.41	1.4	0.15
Relative Percent Difference (RPD):				***11.8%***	***2.7%***	***0.0%***	***3.9%***	***0.0%***	***0.0%***		***5.0%***	***0.0%***	***6.5%***
5/8/2002	SM-0515	SM-0516	10:55	20	37	63	4.2	1.8	0.48	--	0.08	0.9	0.07
5/8/2002	SM-0516	SM-0515	10:55	20	36	62	4	2	0.49	--	0.07	0.91	0.07
Relative Percent Difference (RPD):				***0.0%***	***2.7%***	***1.6%***	***4.9%***	***10.5%***	***2.1%***		***13.3%***	***1.1%***	***0.0%***
7/10/2002	SM-0555	SM-0556	11:20	35	50	76	5.6	3.4	0.7	--	0.09 d	2.4	0.11
7/10/2002	SM-0556	SM-0555	11:20	35	49	74	4.8	3.4	0.67	--	<0.06 d	2.5	0.11
Relative Percent Difference (RPD):				***0.0%***	***2.0%***	***2.7%***	***15.4%***	***0.0%***	***4.4%***		***40.0%***	***4.1%***	***0.0%***
9/11/2002	SM-0595	SM-0596	10:45	43	68	90	12 d	1.9	0.81	--	<0.06	4.1	0.16
9/11/2002	SM-0596	SM-0595	10:45	44	68	90	15 d	2.2	0.74	--	<0.06	4.3	0.16
Relative Percent Difference (RPD):				***2.3%***	***0.0%***	***0.0%***	***22.2%***	***14.6%***	***9.0%***		***0.0%***	***4.8%***	***0.0%***
11/6/2002	SM-0635	SM-0636	11:10	27	48	72	2.6	1.5	0.86	--	0.07	2.2	0.066
11/6/2002	SM-0636	SM-0635	11:10	25	48	72	2.2	1.5	0.86	--	0.06	2.2	0.068
Relative Percent Difference (RPD):				***7.7%***	***0.0%***	***0.0%***	***16.7%***	***0.0%***	***0.0%***		***15.4%***	***0.0%***	***3.0%***

** = missing/censored data

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NASHUA RIVER, Station: NM29A													
2/5/2003	SM-0676	SM-0678	11:45	18	40	70	1.6	1.5	0.50 h	--	0.27	1.2	0.08
2/5/2003	SM-0678	SM-0676	11:45	18	40	68	1.7	1.7	0.52 h	--	0.24	1.3	0.08
Relative Percent Difference (RPD):				***0.0%***	***0.0%***	***2.9%***	***6.1%***	***12.5%***	***3.9%***	***--***	***11.8%***	***8.0%***	***0.0%***
NASHUA RIVER, Station: NM21													
4/9/2003	SM-0716	SM-0717	10:45	10	29	94	9.1	2.5	0.67	--	0.24	0.65	0.065
4/9/2003	SM-0717	SM-0716	10:45	10	30	95	8.4	2.5	0.7	--	0.22	0.63	0.064
Relative Percent Difference (RPD):				***0.0%***	***3.4%***	***1.1%***	***8.0%***	***0.0%***	***4.4%***	***--***	***8.7%***	***3.1%***	***1.6%***
6/11/2003	SM-0757	SM-0758	10:25	14	31	56	11 j	1.4	0.55 b	--	<0.06 d	0.73	0.077
6/11/2003	SM-0758	SM-0757	10:25	14	30	55	11 j	1.4	0.52 b	--	0.10 d	0.73	0.079
Relative Percent Difference (RPD):				***0.0%***	***3.3%***	***1.8%***	***0.0%***	***0.0%***	***5.6%***	***--***	***50.0%***	***0.0%***	***2.6%***
8/13/2003	SM-0807	SM-0808	10:55	7 d	19 d	## d	26	## d	0.63 d	--	0.07 d	0.66	0.18
8/13/2003	SM-0808	SM-0807	10:55	17 d	28 d	## d	25	## d	0.78 d	--	0.10 d	0.68	0.18
Relative Percent Difference (RPD):				***83.3%***	***38.3%***	***--***	***3.9%***	***--***	***21.3%***	***--***	***35.3%***	***3.0%***	***0.0%***
10/8/2003	SM-0850	SM-0851	10:15	30	46	74	3.2	1.8	--	3.2 bh	## bdh	2.4 h	0.057 h
10/8/2003	SM-0851	SM-0850	10:15	29	46	76	2.8	2	--	3.7 bh	## bdh	2.5 h	0.062 h
Relative Percent Difference (RPD):				***3.4%***	***0.0%***	***2.7%***	***13.3%***	***10.5%***	***--***	***14.5%***	***--***	***4.1%***	***8.4%***

** = missing/censored data

-- = no data

Table 23 MassDEP SMART 1998-2004 Nashua Field Duplicate Results.

Date	OWMID	QAQC	Time	Alkalinity	Hardness	Chloride	SSolids	Turb	TKN	TN	NH3-N	NO3-NO2-N	TPhos
			(24hr)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
NASHUA RIVER, Station: NM29A													
1/27/2004	SM-0894	SM-0896	11:25	--	--	--	--	2.1*	--	1.0 j	0.22 j	0.62 j	0.046
1/27/2004	SM-0896	SM-0894	11:25	--	--	--	--	1.9*	--	1.0 j	0.26 j	0.68 j	0.049
Relative Percent Difference (RPD):								***10.0%***		***0.0%***	***16.7%***	***9.2%***	***6.3%***
NASHUA RIVER, Station: NM27/INLTPEPPD													
3/10/2004	SM-0937	SM-0938	12:15	--	--	--	--	2.3*	--	1.1 j	0.19 j	0.58 j	0.071
3/10/2004	SM-0938	SM-0937	12:15	--	--	--	--	2.3*	--	1.0 j	0.18 j	0.52 j	0.067
Relative Percent Difference (RPD):								***0.0%***		***9.5%***	***5.4%***	***10.9%***	***5.8%***
5/12/2004	SM-0978	SM-0979	12:15	--	--	--	--	2.0*	--	0.58 dj	0.05 j	0.34 dj	0.03
5/12/2004	SM-0979	SM-0978	12:15	--	--	--	--	2.4*	--	0.74 dj	0.06 j	0.45 dj	0.036
Relative Percent Difference (RPD):								***18.2%***		***24.2%***	***18.2%***	***27.8%***	***18.2%***
NASHUA RIVER, Station: NN12													
7/14/2004	SM-1015	SM-1016	9:00	27	48	96	9.2	4	--	3.6	0.33	2.4	0.22
7/14/2004	SM-1016	SM-1015	9:00	25	49	92	7.9	3.4	--	3.7	0.32	2.5	0.22
Relative Percent Difference (RPD):				***7.7%***	***2.1%***	***4.3%***	***15.2%***	***16.2%***		***2.7%***	***3.1%***	***4.1%***	***0.0%***
9/15/2004	SM-1057	SM-1058	9:15	25	52	97	4.7	2.9	--	4.3	0.12	3.6	0.21
9/15/2004	SM-1058	SM-1057	9:15	26	51	96	4.5	3	--	4.3	0.12	3.5 h	0.2
Relative Percent Difference (RPD):				***3.9%***	***1.9%***	***1.0%***	***4.3%***	***3.4%***		***0.0%***	***0.0%***	***2.8%***	***4.9%***
11/3/2004	SM-1098	SM-1099	9:20	--	--	--	--	3.69*	--	2.1 d	0.56 hj	1.2 d	0.086
11/3/2004	SM-1099	SM-1098	9:20	--	--	--	--	3.23*	--	2.7 d	0.63 hj	1.6 d	0.098
Relative Percent Difference (RPD):								***13.3%***		***25.0%***	***11.8%***	***28.6%***	***13.0%***

** = missing/censored data

-- = no data

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