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OFFICE OF ECOSYSTEM PROTECTION  
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**FACT SHEET**

**DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES**

**PUBLIC NOTICE START AND END DATES:**

**CONTENTS:** 25 pages including Attachments A through E.

**NPDES PERMIT NO.:** NH0100919

**NAME AND MAILING ADDRESS OF APPLICANT:**

Town of Greenville  
Town Hall, 46 Main Street  
P.O. Box 343  
Greenville, New Hampshire 03048-0343

**NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:**

Greenville Wastewater Treatment Facility  
109 Old Wilton Road  
Greenville, New Hampshire 03048

**RECEIVING WATER:** Souhegan River (Hydrologic Basin Code: 01070002)

**CLASSIFICATION:** B

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## **I. Proposed Action, Type of Facility and Discharge Location.**

The Greenville Wastewater Treatment Facility (WWTF) is a publicly owned treatment works (POTW) owned by the Town of Greenville, NH and operated by Woodard Curran. The Town applied to the U.S. Environmental Protection Agency (EPA) for reissuance of its NPDES permit to discharge treated effluent into the Souhegan River. The facility collects and treats domestic, commercial, and industrial wastewater from the Town of Greenville, and also receives about 15,000 gallons per day of process wastewater from a food processing industry, Pilgrim Foods, Inc. The collection system consists entirely of separate sanitary sewers. The treatment plant has a design flow of 0.23 million gallons per day (mgd) and provides secondary treatment using extended aeration.

The influent passes through a v-notch weir and a grit collector prior to entering a wet well. From the wet well, the influent is pumped to a pair of aeration basins where activated sludge from the clarifiers is mixed with the wastewater. After leaving the aeration basins the wastewater flows to either of two clarifiers. The effluent from the two clarifiers is combined before entering the chlorine contact tank where sodium hypochlorite is added. The effluent is then dechlorinated using sodium bisulfite and flow is measured before it is discharged to the Souhegan River via Outfall 001. The discharge outfall is not located in the vicinity of a designated beach area.

Sludge from the clarifiers is either used as activated sludge in the treatment process, or is periodically sent to drying beds. The Town of Greenville ships offsite an average of 32.64 dry metric tons of sludge annually. The sludge is shipped to Fitchburg East WWTF in Fitchburg, Massachusetts for incineration.

The most recent permit was issued to the facility on January 31, 2002, and expired on March 3, 2007. This permit (hereafter referred to as the "existing permit") has been administratively extended as the applicant filed a complete application for permit reissuance within the prescribed time period as per 40 Code of Federal Regulations (CFR) §122.6.

The location of the treatment facility, Outfall 001, and the receiving water are shown in Attachment A.

## **II. Description of Discharge.**

A quantitative description of significant effluent parameters based on discharge monitoring data submitted during the five year period from January 2002 to December 2006 are shown in Attachment B.

## **III. Limitations and Conditions.**

The draft permit contains limitations for five-day biochemical oxygen demand (BOD<sub>5</sub>), total suspended solids (TSS), pH, *Escherichia coli* (*E. Coli*) bacteria, total residual chlorine (TRC), total recoverable lead, and whole effluent toxicity (WET). It also contains monitoring requirements for flow, ammonia nitrogen as nitrogen, hardness, and total recoverable metals

(aluminum, cadmium, chromium, copper, lead, nickel, and zinc). The effluent limitations and monitoring requirements are found in PART I of the draft NPDES permit. The basis for each limit and condition is discussed below in Section IV of this Fact Sheet.

#### **IV. Permit Basis and Explanation of Effluent Limitations Derivation.**

##### **A. General Regulatory Background**

Congress enacted the Clean Water Act (CWA), “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” CWA §101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into waters of the United States from any point source, except as authorized by specified permitting section of the CWA, one of which is Section 402. See CWA §§301(a), 402(a). Section 402 establishes one of the CWA’s principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the CWA, EPA may “issue a permit for the discharge of any pollutant, or combination of pollutants” in accordance with certain conditions. See CWA §402(a). NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. See CWA §402(a)(1)-(2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: “technology-based” limitations and “water quality based” limitations. See CWA §§ 301, 303, 304(b); 40 C.F.R. Parts 122, 125, and 131. Technology-based limitations, generally developed on an industry-by-industry basis, reflect a specified level of pollutant reducing technology available and economically achievable for the type of facility being permitted. See CWA §301(b). As a class, POTWs must meet limitations based on secondary treatment. CWA §301(b)(1)(B). Secondary treatment is expressed in terms of BOD<sub>5</sub>, TSS, and pH. 40 C.F.R. Part 133.

Water quality based effluent limits are designed to ensure that state water quality standards are met regardless of the decision made with respect to technology and economics in establishing technology based limitations. In particular, Section 301(b)(1)(C) requires achievement of, “any more stringent limitation, including those necessary to meet water quality standards.....established pursuant to any state law or regulation....”. See 40 C.F.R. §§122.4(d), 122.44(d)(1) (providing that a permit must contain effluent limits as necessary to protect state water quality standards, “including state narrative criteria for water quality”) (emphasis added) and 122.45(d)(5) (providing in part that a permit incorporate any more stringent limits required by Section 301(b)(1)(C) of the CWA).

The CWA requires that states develop water quality standards for all water bodies within the state. CWA § 303. These standards have three parts: (1) one or more “designated uses” for each water body or water body segment in the state; (2) water quality “criteria”, consisting of numerical concentration levels and/or narrative statements specifying the amounts of various pollutants that may be present in each water body without impairing the designated uses of that water body; and (3) an antidegradation provision, focused on protecting high quality waters and protecting and maintaining water quality necessary to protect existing uses. CWA

§303(c)(2)(A); 40 C.F.R. §131.12. The limits and conditions of the permit reflect the goal of the CWA and EPA to achieve and then to maintain water quality standards.

The applicable New Hampshire water quality standards can be found in Surface Water Quality Regulations, Chapter Env-Ws 1700 *et seq.* See generally, Title 50, Water and Management and Protection, Chapter 485A, Water Pollution and Waste Disposal Section 485-A.

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria from the state's water quality standards to develop permit limits, both the acute and chronic life criteria are used and expressed in terms of maximum allowable in stream pollutant concentrations. Acute aquatic life criteria are generally implemented through maximum daily limits and chronic aquatic life criteria are generally implemented through average monthly limits. Where a state has not established a numeric water quality criteria for a specific chemical pollutant that is present in the effluent in a concentration that causes or has a reasonable potential to cause a violation of narrative water quality standards, the permitting authority must establish effluent limits in one of three ways: based on a "calculated numeric criteria for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and fully protect the designated use"; on a "case-by-case basis" using CWA Section 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or, in certain circumstances, based on an "indicator parameter". 40 C.F.R. §122.44(d)(1)(vi)(A-C).

All statutory deadlines for meeting various treatment technology-based effluent limitations established pursuant to the CWA have expired. When technology-based effluent limits are included in a permit, compliance with those limitations is the date the issued permit becomes effective. See 40 C.F.R. §125.3(a)(1). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by and NPDES permit. The regulations governing EPA's NPDES program are generally found in 40 CFR Parts 122, 124, 125, and 136.

## **B. Introduction**

The permit must limit any pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water quality criterion, see 40 C.F.R. §122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration exceeds the applicable criterion.

### i. Reasonable Potential

In determining reasonable potential, EPA considers: 1) existing controls on point and non-point sources of pollution; 2) pollutant concentration and variability in the effluent and receiving water as determined from the permit's reissuance application, DMRs, and State and Federal Water Quality Reports; 3) sensitivity of the species to toxicity testing; 4) the statistical approach outlined in *Technical Support Document for Water Quality-Based Toxics Control*, March 1991,

EPA/502/2-90-001 in Section 3; and, where appropriate, 5) dilution of the effluent in the receiving water. In accordance with the New Hampshire statutes and administrative rules [RSA 485-A:8, VI, Env-Ws 1705], available dilution is based on a known or estimated value of the lowest average annual flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10) for aquatic life or the mean annual flow for human health (carcinogens only) in the receiving water at the point just upstream of the outfall. Furthermore, 10 percent of the assimilative capacity of the receiving water is held in reserve for future needs in accordance with New Hampshire's Surface Water Quality Regulations, Env-Ws 1705.01.

#### ii. Anti-Backsliding

Section 402(o) of the CWA generally provides that the effluent limitation of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the previous permit. EPA has also promulgated anti-backsliding regulations which are found at 40 C.F.R. §122.44(l). Unless applicable anti-backsliding requirements are met, the limits and conditions in the reissued permit must be at least as stringent as those in the previous permit.

#### iii. State Certification

Section 401(a)(1) of the CWA requires all NPDES permit applicants to obtain a certification from the appropriate state agency stating that the permit will comply with all applicable federal effluent limitations and state water quality standards. See CWA §401(a)(1). The regulatory provisions pertaining to state certification provide that EPA may not issue a permit until a certification is granted or waived by the state in which the discharge originates. 40 C.F.R. §124.53(a). The regulations further provide that, "when certification is required...no final permit shall be issued...unless the final permit incorporates the requirements specified in the certification under §124.53(e)." 40 C.F.R. 124.55(a)(2). Section 124.53(e) in turn provides that the state certification shall include "any conditions more stringent than those in the draft permit which the state finds necessary" to assure compliance with, among other things, state water quality standards, see 40 C.F.R. §124.53(e)(2), and shall also include "[a] statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of state law, including water quality standards," see 40 C.F.R. §124.53(e)(3).

However, when EPA reasonably believes that a state water quality standard requires a more stringent permit limitation than that reflected in a state certification, it has an independent duty under CWA §301(b)(1)(C) to include more stringent permit limitations. See 40 C.F.R. §§ 122.44(d)(1) and (5). It should be noted that under CWA §401, EPA's duty to defer to considerations of state law is intended to prevent EPA from relaxing any requirements, limitations, or conditions imposed by state law. Therefore, "[a] State may not condition or deny a certification on the grounds that state law allows a less stringent permit condition." 40 C.F.R. §124.55(c). In such an instance, the regulation provides that, "The Regional Administrator shall disregard any such certification conditions or denials as waivers of certification." Id. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 C.F.R. §122.4(d) and 40 C.F.R. §122.44(d).

## C. Conventional Pollutants

### i. Five-Day Biological Oxygen Demand (BOD<sub>5</sub>) and Total Suspended Solids (TSS)

The average monthly and average weekly concentration-based limits for BOD<sub>5</sub> and TSS are based on requirements under Section 301(b)(1)(B) of the CWA as defined by Secondary Treatment Standards in 40 CFR Section 133.102(a) and (b).

The average monthly and average weekly mass-based limits for BOD<sub>5</sub> and TSS corresponding to the respective concentration-based limits in the draft permit are based on 40 CFR Section 122.45(f) which requires the Agency to also apply these Secondary Treatment Standards (concentration-based) as mass-based limits. The mass-based (load) limitations for BOD<sub>5</sub> and TSS shown in the draft permit are based on the POTW's daily design flow of 0.23 MGD and the appropriate constituent concentration for the respective time period being limited. See Attachment C for the equation used to calculate each of these mass-based limits

The percent removal limits for BOD<sub>5</sub> and of TSS are based on the requirements of 40 CFR Section 133.102 (a) (3) and (b)(3), respectively.

All the concentration and mass-based effluent limits as well as the percent removal limits for BOD<sub>5</sub> and TSS in the draft permit are the same as the limits in the existing permit and, therefore, are consistent with the antibacksliding requirements found in 40 CFR §122.44(1). The permittee has been able to achieve consistent compliance with those limits.

### ii. Escherichia coli

The effluent limits are based on Class B water quality standards established by the State of New Hampshire in RSA 485-A:8.II. The average monthly limit for Escherichia coli is determined by calculating the geometric mean. The monitoring frequency for *E. Coli* in the draft permit is 3/week and samples for compliance monitoring must be taken concurrently with samples for total residual chlorine.

### iii. pH

The pH limits of 6.5 – 8.0 S.U. in the draft permit remain unchanged from the existing permit. Language under State Permit Conditions (PART I.G.5) allows for a change in the pH limit under certain conditions. A change would be considered if the applicant can demonstrate to the satisfaction of NHDES-WD that the pH standard of the receiving water will be protected when the discharge is outside the permitted range, then the applicant or NHDES-WD may request (in writing) that the permit limits be modified by EPA to incorporate the results of the demonstration. Anticipating the situation where NHDES-WD grants a formal approval changing the pH limits to outside 6.5 to 8.0 Standard Units (S.U.), EPA has added a provision to the draft permit (see SPECIAL CONDITIONS section). That provision will allow EPA to modify the pH limits using a certified letter approach. This change will be allowed only if it is demonstrated

that the revised pH limit range does not alter the naturally occurring receiving water pH. However, the pH limit range cannot be less restrictive than 6.0 to 9.0 S.U. found in the applicable National Effluent Limitation Guideline (Secondary Treatment Regulations in 40 C.F.R. Part 133) for the facility.

#### **D. Available Dilution and Nonconventional and Toxic Pollutants**

Water-quality based limits for specific toxic pollutants such as chlorine, ammonia, metals, etc. are determined from chemical-specific numeric criteria derived from extensive scientific studies. EPA-recommended criteria for specific toxic pollutants are known as the “Gold Book Criteria” which EPA summarized and published in Quality Criteria for Water, 1986, EPA 440/5-86-001 (as amended). The State of New Hampshire adopted these “Gold Book Criteria”, with certain exceptions, and included them as part of the State’s Surface Water Quality Regulations adopted on December 3, 1999. EPA-New England uses these pollutant-specific criteria, along with available dilution in the receiving water, to determine effluent limitations for these pollutants.

##### i. Available Dilution

The dilution factor is an estimate of the dilution afforded the POTW’s effluent by the receiving water. The dilution factor used to calculate the water quality-based effluent limitations in the existing permit was 6.9, based on a POTW design flow of 0.233 mgd and a 7Q10 low flow at Outfall 001 of 2.4 cfs, and 90 percent of the Assimilative Capacity Reserve (saving 10 percent for future needs in accordance with NH Regulation Env-Ws 1705.01).

The dilution factor was recalculated for this draft permit based on an updated calculation of the 7Q10 for the receiving water. In accordance with the NHDES 7Q10 policy, the 7Q10 at the Greenville WWTF was derived by using an empirical equation developed by Dingman<sup>1</sup>. The Dingman equation gives estimates of 7Q10 flow in un-gaged, unregulated streams based upon watershed (basin) area, mean basin elevation, and the percent of the basin underlain by coarse-grained stratified drift in contact with streams.

Then, a ratio of the 7Q10 in the watershed area between the Greenville WWTF and USGS gage No. 0109400 was multiplied by the USGS gaged flow to derive the final 7Q10 of 1.88 cfs at the Greenville WWTF.

The dilution factor of 5.6 is applicable to this draft permit and was calculated as follows:

$$DF = 0.9 \times \frac{[(0.646 \text{ mgd/cfs} \times 1.88 \text{ cfs}) + 0.233 \text{ mgd}]}{0.233 \text{ mgd}} = 5.6$$

See Attachment C for the calculations of 7Q10 flow and the dilution factor.

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<sup>1</sup> Dingman, S.L., and S.C. Lawlor, 1995. Estimating Low-Flow Quantiles from Drainage-Basin Characteristics in New Hampshire and Vermont. American Water Resources Association, Water Resources Bulletin, pp. 243-256.

ii. Total Residual Chlorine

The TRC average monthly and maximum daily limitations in the existing permit (0.08 mg/l and 0.13 mg/l) were based on the dilution factor of 6.9 and the NH Standards for chronic and acute aquatic-life criteria of 0.011 and 0.019 mg/l. Effluent limitations calculated using the new dilution factor and the aquatic life criteria are more stringent than those calculated for the existing permit. The chronic and acute water quality limits for TRC in this draft permit are 0.062 and 0.106 mg/L respectively.

iii. Total Recoverable Lead

The chronic freshwater criteria listed in New Hampshire's Surface Water Quality Regulations for lead is 0.54 ug/l (0.00054 mg/l). Accounting for dilution, Greenville's allowable concentration of total recoverable lead would be 3.0 ug/L (5.6 \* 0.54 ug/l). Effluent and receiving water sampling presented below shows that both the effluent and the receiving water samples contain elevated concentration of lead. Four of the effluent samples exceed the allowable concentration of lead of 3.0 ug/l (0.003 mg/l) and nine of the receiving water samples exceed the instream chronic lead criteria of 0.00054 mg/l.

<b>WET Test Total Recoverable Lead Monitoring Results</b>		
<b>WET Test Date</b>	<b>Effluent (mg/l)</b>	<b>Receiving Water (mg/l)</b>
March 4, 2008	0.00073	0.00082
October 23, 2007	<0.005	<0.005
August, 21, 2007	<0.005	<0.005
June 5, 2007	<0.005	<0.005
January 23, 2007	<0.005	<0.005
October 24, 2006,	0.025	0.007
July 18, 2006	<0.005	0.010
April 18, 2006	0.005	0.007
March 22, 2006	0.007	0.011
November 8, 2005	<0.005	<0.005
August 11, 2005	<0.005	0.014
June 14, 2005	<0.005	0.006
January 4, 2005	<0.005	<0.005
October 19, 2004	<0.005	<0.005
July 27, 2004	0.008	0.011
June 15, 2004	0.005	<0.005
March 30, 2004	<0.005	<0.005
December 2, 2003	<0.005	0.009
August 19, 2003	0.025	0.011
April 22, 2003	<0.005	<0.005
January 21, 2003	<0.0026	<0.0026
December 3, 2002	<0.0026	<0.0026
July 23, 2002	<0.0026	<0.0026
January 12, 2002	<0.0026	<0.0026

In addition to the WET test sampling data instream monitoring data taken from NH's Onestop Data retrieval site shows that samples taken just downstream of the Greenville Wastewater Treatment Facility contain lead concentrations as high as 0.0122 mg/l (12.2 ug/l).

Because the Souhegan River contains lead concentration in excess of the allowable lead criteria, no further degradation can occur. Therefore, the draft permit contains a monthly average total recoverable lead limit at the chronic criteria of 0.54 ug/l (0.0054 mg/l). Sampling frequency shall be two times per month.

#### iv. Total Recoverable Aluminum

According to the State of New Hampshire's Surface Water Quality Regulations, the chronic criteria for aluminum is 0.087 mg/l (87 ug/l). Presented below are total recoverable aluminum levels in the treatment plant's effluent and in the receiving water taken from WET tests performed from March 2004 to March 2008.

<b>WET Test Total Recoverable Aluminum Monitoring Results</b>		
<b>WET Test Date</b>	<b>Effluent (mg/l)</b>	<b>Receiving Water (mg/l)</b>
March 4, 2008	0.3	0.12
October 23, 2007	0.035	<0.02
August, 21, 2007	0.13	0.089
June 5, 2007	0.2	0.086
January 23, 2007	0.11	0.058
October 24, 2006,	<0.01	0.087
July 18, 2006	0.08	<0.01
April 18, 2006	0.09	0.1
March 22, 2006	0.03	0.1
November 8, 2005	0.21	0.15
August 11, 2005	0.06	0.068
June 14, 2005	0.07	0.13
January 4, 2005	0.08	0.11
October 19, 2004	0.04	0.066
July 27, 2004	0.08	0.1
June 15, 2004	0.13	0.01
March 30, 2004	<0.01	0.1

Based upon the data above, the chronic aluminum criteria of 0.087 mg/l is exceeded 8 times out of 17 total sampling events. Additionally, the State of New Hampshire's *Final – 2006 List of Threatened or Impaired Waters that Require a TMDL (NHDES, 2006)*, also referred to as the 303(d) list, lists the stretch of river below the discharge as not meeting aquatic life criteria due to (among other items) aluminum concentrations. Because of the elevated aluminum concentrations present in the Souhegan River, no further degradation from this pollutant can occur. As a result, a permit limit of 0.087 mg/l has been established with a monitoring frequency of two times per month.

## v. Phosphorus

Phosphorus and other nutrients (i.e. nitrogen) promote the growth of nuisance algae and rooted aquatic plants. Typically, elevated levels of nutrients will cause excessive algal and/or plant growth resulting in reduced water clarity and poor aesthetic quality. Through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce in-stream dissolved oxygen concentrations to levels that could negatively impact aquatic life and/or produce strong unpleasant odors.

EPA has produced several guidance documents which contain recommended total phosphorus criteria for receiving waters. The 1986 Quality Criteria for Water (Gold Book) recommends in-stream phosphorus concentrations of 0.005 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly to lakes or impoundments, and 0.025 mg/l within a lake or reservoir.

In December 2000, EPA released “Ecoregional Nutrient Criteria” (USEPA 2000), which was established as part of an effort to reduce problems associated with excess nutrients in water bodies located within specific areas of the country. The published criteria represent conditions in waters within each specific ecoregion which are minimally impacted by human activities, and thus are representative of waters without cultural eutrophication. Greenville is located within Ecoregion VIII, *Nutrient Poor largely glaciated Upper Midwest and Northeast*. Recommended criteria for this ecoregion are a total phosphorus concentration of 10 ug/l (0.010 mg/l) and a chlorophyll *a* concentration of 0.63 ug/l (0.00063 mg/l). These recommended criteria are found in *Ambient Water Quality Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion VIII* (USEPA 2001).

More recently, Mitchell, Liebman, Ramseyer, and Card (in draft 2004), in conjunction with the New England States, developed potential nutrient criteria for rivers and streams in New England. Using several river examples representative of typical conditions for New England streams and rivers, they investigated several approaches for the development of river and stream nutrient criteria that would be dually protective of designated uses in both upstream reaches and downstream impoundments. Based on this investigation an in-stream total phosphorus concentration of 0.020 – 0.022 mg/l was identified as protective of designated uses for New England rivers and streams. The development of this New England – wide total phosphorus concentration was based on more recent data than the National Ecoregional nutrient criteria, and has been subject to quality assurance measures. Additionally, the development of the New England – wide concentration included reference conditions for waters presumed to be protective of designated uses.

The New Hampshire Surface Water Quality Regulations contain a narrative criterion which states that phosphorus contained in effluent shall not impair a water body’s designated use. Specifically, Env-Ws 1703.14(b) states that, “Class B waters shall contain no phosphorus or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring.” Env-Ws 1703.14(c) further states that, “Existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated to remove

phosphorus or nitrogen to ensure attainment and maintenance of water quality standards.” Cultural eutrophication is defined in Env-Ws 1702.15 as, “...the human-induced addition of wastes containing nutrients which results in excessive plant growth and/or decrease in dissolved oxygen.” Although numeric nutrient criteria have not yet been developed in New Hampshire, a total phosphorus concentration of 0.05 mg/l is considered by the NHDES as a level of concern.

Section 303(d) of the Clean Water Act requires States to identify those waterbodies that are not expected to meet surface water quality standards after implementation of technology-based controls and thus require the development of total maximum daily loads (TMDL). Impaired water quality conditions persist in the Souhegan River and have resulted in its listing in the State of New Hampshire’s *Final – 2006 List of Threatened or Impaired Waters that Require a TMDL (NHDES, 2006)*, also referred to as the 303(d) list. According to the 303(d) list, aquatic life and primary contact recreation used in the Souhegan River are impaired in stretches of the river below the discharge from the Greenville Wastewater Treatment Plant. Parameters for which impair aquatic life uses include aluminum, benthic-macroinvertebrate assessments, dissolved oxygen, and pH. The parameter which impairs primary contact recreation is *Escherichia coli* bacteria. In September of 2001, the NHDES performed sampling of the Souhegan River in order to prepare a TMDL. At present no TMDL has been prepared for the Souhegan however data from this sampling effort is presented below. Locations of the sampling stations are shown in Attachment D.

Souhegan River TMDL Sampling Data											
Station ID	Date	Town	Chl 'a' (ug/l)	Total P (mg/l)	Ortho P (mg/l)	Station ID	Date	Town	Chl 'a' (ug/l)	Total P (mg/l)	Ortho P (mg/l)
19N-SHG	9/12/01	Greenville	1.42	0.028	0.01	19N-SHG	9/19/01	Greenville	2.68	0.025	0.01
Greenville POTW	9/12/01	Greenville	0.44	6.34	4.959	Greenville POTW	9/19/01	Greenville	1.25	5.52	5.16
19-SHG	9/12/01	Greenville	6.59	0.394	0.344	19-SHG	9/19/01	Greenville	4.74	0.864	0.746
19-SHG	9/12/01	Greenville	6.21	0.32	0.287	19-SHG	9/19/01	Greenville	4.06	0.851	0.745
18-SHG	9/12/01	Wilton	7.68	0.216	0.192	18-SHG	9/19/01	Wilton	6.38	0.353	0.307
17-SHG	9/12/01	Wilton	2.92	0.115	0.098	17-SHG	9/19/01	Wilton	3.06	0.145	0.121
01-BBK	9/12/01	Wilton	0.55	0.007	0.01	01-BBK	9/19/01	Wilton	0.69	0.01	0.01
16-SHG	9/12/01	Wilton	2.18	0.047	0.037	16-SHG	9/19/01	Wilton	2.32	0.041	0.03
14T-SHG	9/12/01	Wilton	2.16	0.028	0.015	14T-SHG	9/19/01	Wilton	2.51	0.022	0.009
01-STY	9/12/01	Wilton	1.09	0.011	0.01	01-STY	9/19/01	Wilton	1.4	0.009	0.01
13-SHG	9/12/01	Milford	4.19	0.021	0.01	13-SHG	9/19/01	Milford	4.55	0.015	0.01
11-SHG	9/12/01	Milford	1.42	0.012	0.01	11-SHG	9/19/01	Milford	1.61	0.01	0.01
Milford Fish Hatchery	9/21/01	Milford	2.89	0.142	0.071	Milford Fish Hatchery	9/19/01	Milford	2.51	0.145	0.079
00T-PRG	9/12/01	Milford	9.48	0.031	0.01	00T-PRG	9/19/01	Milford	9.15	0.034	0.01
10-SHG	9/12/01	Milford	2.92	0.02	0.01	00M-PRG	9/19/01	Milford	4.01	0.147	0.073
09-SHG	9/12/01	Milford	2.7	0.019	0.01	10-SHG	9/19/01	Milford	4.34	0.025	0.01
						09-SHG	9/19/01	Milford	2.16	0.018	0.01

Based upon the monitoring results above, the Gold Book total phosphorus criteria of 0.1 mg/l is exceeded in the Souhegan River from the Greenville Wastewater Treatment Facility to sampling station 17-SHG located downstream in the Town of Wilton. The ecoregional criteria of 0.01 mg/l is exceeded at all sampling stations with the exception of one sample 01-BBK which is a tributary to the Souhegan River and the New England criteria of 0.02 – 0.022 mg/l was exceeded at most of the sampling stations. Additionally, the ecoregional criteria for chlorophyll 'a' of 0.63 ug/l was exceeded at all sampling stations with the exception of one sample at 01-BBK.

When analyzing both effluent and instream total phosphorus data, EPA-New England has decided to apply the Gold Book criterion rather than the more stringent ecoregional or New England criteria. The decision was made due to the fact the the Gold Book criterion was developed from an effects-based approach versus the ecoregional and New England criteria that were developed on the basis of reference conditions. The effects-based approach is taken because it is a more directly associated with an impairment to a designated use (i.e. fishing, swimming). The effects-based approach provides a threshold value above which adverse effects (i.e. water quality impairments) are likely to occur. It applies empirical observations of a causal variable (i.e. phosphorus) and a response variable (i.e. chlorophyll 'a') associated with designated use impairments. Reference-based values are statistically derived from a comparison within a population of rivers in the same ecoregional class. They are a quantitative set of river characteristics (physical, chemical, and biological) that represent minimally impacted conditions.

By applying the Gold Book criterion, an effluent permit limit for total phosphorus of 0.43 mg/l was calculated. This limit is a monthly average and is applicable from April 1 through October 31 of each year. The calculation of this limit can be found in Attachment E.

The permit also includes a winter total phosphorus limit of 1.0 mg/l which is applicable from November 1 through March 31 of each year. The winter effluent limitation for total phosphorus is necessary to ensure that the higher levels of phosphorus discharged in the winter do not result in the accumulation of phosphorus in downstream sediments. The limitation assumes that the vast majority of the phosphorus discharged will be in the dissolved fraction and that dissolved phosphorus will pass through the system during the winter period.

#### **E. Whole Effluent Toxicity (WET)**

EPA's **Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991**, recommends using an "integrated strategy" containing both pollutant (chemical) specific approaches and whole effluent (biological) toxicity approaches to control toxic pollutants in effluent discharges from entering the nation's waterways. EPA-New England adopted this "integrated strategy" on July 1, 1991, for use in permit development and issuance. These approaches are designed to protect aquatic life and human health. Pollutant-specific approaches such as those in the Gold Book and State regulations address individual chemicals, whereas, Whole Effluent Toxicity (WET) approaches evaluate interactions between pollutants, thus rendering an "overall" or "aggregate" toxicity assessment of the effluent. Furthermore, WET measures the "additivity" and/or "antagonistic" effects of individual chemical pollutants which pollutant specific approaches do not, thus the need for both approaches. In addition, the presence of an unknown toxic pollutant can be discovered and addressed through this process.

New Hampshire law states that, "all surface waters shall be free from toxic substances or chemical constituents in concentrations or combination that injure or are inimical to plants, animals, humans, or aquatic life;...." (N.H. RSA 485-A:8, VI and the N.H. Code of Administrative Rules, PART Env-Ws 1730.21(a)(1)). The federal NPDES regulations at 40 CFR §122.44(d)(1)(v) require whole effluent toxicity limits in a permit when a discharge has a "reasonable potential" to cause or contribute to an excursion above the State's narrative criterion for toxicity. Furthermore, results of these toxicity tests will demonstrate compliance of the POTW's discharge with the "no toxic provision of the NH Standards."

Accordingly, to fully implement the "integrated strategy" and to protect the "no toxic provision of the NH Standards," EPA-New England requires toxicity testing in all municipal permits with the type of toxicity test(s) (acute and/or chronic) and effluent limitation(s) (LC50 and/or C-NOEC) based on the available dilution as shown in the Toxicity Strategy for Municipal Permits (Attachment D).

The existing permit contains a WET testing requirement of four times per year with an LC50 limit of 100% and a C-NOEC limit of 14.5%. This condition has been revised in this draft permit due to the revised dilution factor; the revised C-NOEC limit is 17.8%. The permittee is required to collect and test effluent samples four times per year during calendar quarters ending March 31<sup>st</sup>, June 30<sup>th</sup>, September 30<sup>th</sup> and December 31<sup>st</sup> using two species, *Ceriodaphnia dubia* (Daphnia) and *Pimephales promelas* (Fathead Minnow).

The LC50 is defined as the percentage of effluent that would be lethal to 50% of the test organisms during an exposure of 48 hours. Therefore, a 100% limit means that a sample of

100% effluent shall cause no greater than a 50% mortality rate in that effluent sample. Chronic NOEC is defined as the highest concentration effluent to which organisms are exposed in a life cycle or partial life cycle test, which causes no adverse effect on growth, survival or reproduction.

The WET limits in the draft permit include conditions to allow EPA-New England to modify, or alternatively, revoke and reissue to incorporate additional toxicity testing requirements, including chemical specific limits, if the results of the toxicity tests indicate the discharge causes an exceedance of any State water quality criterion. Results from these toxicity tests are considered “New Information” and the permit may be modified as provided in 40 CFR §122.62(a)(2).

Alternately, if a permittee has consistently demonstrated on a maximum daily basis that its discharge, based on data for the most recent one-year period, or four sampling events, whichever yields the greater time period, causes no acute and chronic toxicity, the permitted limits will be considered eligible for a reduced frequency of toxicity testing. This reduction in testing frequency is evaluated on a case-by-case basis. Accordingly, a special condition has been carried forward from the existing permit into the draft permit that allows for a reduced frequency of WET testing using a certified letter from EPA-New England. This permit provision anticipates the time when the permittee requests a reduction in WET testing that is approvable by both EPA-New England and the NHDES-WD. As previously stated, EPA-New England’s current policy is that after completion of a minimum of four consecutive WET tests all of which must be valid tests and must demonstrate compliance with the permit limits for whole effluent toxicity, the permittee may submit a written request to EPA-New England seeking a review of the toxicity test results. EPA-New England’s policy is to reduce the frequency of toxicity testing to no less than one (one-species) test per year. The permittee is required to continue testing at the frequency specified in the permit until the permit is either formally modified or until the permittee receives a certified letter from the EPA-New England indicating a change in the permit condition. This special condition does not negate the permittee’s right to request a permit modification at any time prior to the permit expiration.

This draft permit, as in the existing permit, requires the permittee to continue reporting selected parameters from the chemical analysis of the WET tests’ 100 percent effluent sample. Specifically, hardness, total ammonia nitrogen as nitrogen, and total recoverable aluminum, cadmium, copper, chromium, lead, nickel and zinc are to be reported on the appropriate DMR for entry into EPA’s data base. EPA-New England does not consider these reporting requirements an unnecessary burden as reporting these constituents is already required with the submission of each toxicity testing report.

## **F. Sludge**

Section 405(d) of the Clean Water Act (CWA) requires that EPA develop technical standards regulating the use and disposal of sewage sludge. These regulations were signed on November 25, 1992, published in the Federal Register on February 19, 1993, and became effective on March 22, 1993. Domestic sludge which is land applied, disposed of in a surface disposal unit, or fired in a sewage sludge incinerator is subject to Part 503 technical and to State Env-Ws 800 standards. Part 503 regulations have a self-implementing provision, however, the CWA requires

implementation through permits. Domestic sludge which is disposed of in municipal solid waste landfills are in compliance with Part 503 regulations provided the sludge meets the quality criteria of the landfill and the landfill meets the requirements of 40 CFR Part 258.

The draft permit has been conditioned to ensure that sewage sludge use and disposal practices meet the CWA Section 405(d) Technical Standards. In addition, EPA-New England has included with the draft permit a 72-page document entitled “EPA Region I NPDES Permit Sludge Compliance Guidance, November 1999” for use by the permittee in determining the appropriate sludge conditions for the chosen method of sewage sludge use or disposal practices.

The permittee is required to submit an annual report to EPA-New England and NHDES- WD, by February 19<sup>th</sup> each year, containing the information specified in the Sludge Compliance Guidance document for their chosen method of sewage sludge use or disposal practices. All sludge generated at the Greenville WWTP is sent to the Fitchburg East WWTF in Fitchburg, Massachusetts for incineration.

### **G. Industrial Users (Pretreatment Program)**

The permittee is not required to administer a pretreatment program based on the authority granted under 40 CFR §122.44(j), 40 CFR §403 and Section 307 of the Act. However, the draft permit contains conditions that are necessary to allow EPA and NHDES-WD to ensure that pollutants from industrial users will not pass through the facility and cause water quality standards violations and/or sludge use and disposal difficulties or cause interference with the operation of the treatment facility. The permittee is required to notify EPA and NHDES-WD whenever a process wastewater discharge to the facility from a primary industrial category (see 40 CFR §122 Appendix A for list) is planned or if there is any substantial change in the volume or character of pollutants being discharged into the facility by a source that was discharging at the time of issuance of the permit. The permit also contains the requirements to: 1) report to EPA and NHDES-WD the name(s) of all Industrial Users subject to Categorical Pretreatment Standards (see 40 CFR §403 Appendix C for list) who commence discharge to the POTW after the effective date of the finally issued permit, and 2) submit copies of Baseline Monitoring Reports and other pretreatment reports submitted by industrial users to EPA and NHDES-WD.

### **H. Operation and Maintenance**

Regulations regarding proper operation and maintenance are found at 40 C.F.R. § 122.41(e). These regulations require, “that the permittee shall at all times operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of the permit.” The treatment plant and the collection system are included in the definition “facilities and systems of treatment and control” and are therefore subject to proper operation and maintenance requirements.

Similarly, a permittee has a “duty to mitigate” pursuant to 40 C.F.R. § 122.41(d), which requires the permittee to “take all reasonable steps to minimize or prevent any discharge in violations of the permit which has a reasonable likelihood of adversely affecting human health or the environment.”

General requirements for proper operation and maintenance, and mitigation have been included in Part II of the permit. Specific permit conditions have also been included in Part I.B., I.C., and I.D. of the draft permit. These requirements include mapping of the wastewater collection system, reporting of unauthorized discharges including SSOs, maintaining an adequate maintenance staff, performing preventative maintenance, controlling inflow and infiltration to the extent necessary to prevent SSOs and I/I related effluent violations at the wastewater treatment plant, and maintaining alternate power where necessary.

### **I. Antidegradation**

This draft permit is being reissued with allowable wasteloads and parameter coverages which are the same as, or more stringent than the existing permit and with no change in outfall location. The State of New Hampshire has indicated that there is no lowering of water quality and no loss of existing water uses and that no additional antidegradation review is warranted at this time.

### **J. Additional Requirements and Conditions**

In the draft permit, compliance monitoring frequency and sample type for Flow, BOD<sub>5</sub>, TSS, pH, TRC, and Escherichia coli bacteria are consistent with the latest version of EPA/NHDES-WD's Effluent Monitoring Guidance (EMG) mutually agreed upon and first implemented in March 1993 and last revised on July 19, 1999. In addition, the WET test monitoring requirements are consistent with EPA-New England's Municipal Toxicity Policy. It is the intent of EPA-New England and NHDES-WD to establish minimum monitoring frequencies in all NPDES permits that (1) are reasonable from environmental and human health perspective; and, (2) are in accordance with the EMG. The effluent monitoring requirements in the draft permit have been established to yield data representative of the discharge under the authority of Section 308(a) of the CWA in accordance with 40 CFR §122.41(j), §122.44(i) and §122.48. The remaining conditions of the permit are based on the NPDES regulations 40 CFR, Parts 122 through 125, and consist primarily of management requirements common to all permits.

### **K. Essential Fish Habitat and Endangered Species**

#### **i. Essential Fish Habitat**

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104267), established a new requirement to describe and identify (designate) "essential fish habitat" (EFH) in each federal fishery management plan. Only species managed under a federal fishery management plan are covered. Fishery Management Councils determine which area will be designated as EFH. The Councils have prepared written descriptions and maps of EFH, and include them in fishery management plans or their amendments. EFH designations for New England were approved by the Secretary of Commerce on March 3, 1999.

The 1996 Sustainable Fisheries Act broadly defined EFH as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and

their associated physical, chemical, and biological properties. Substrate includes sediment, hard bottom, and structures underlying the waters. Necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types utilized by a species throughout its life cycle. Adversely affect means any impact which reduces the quality and/or quantity of EFH. Adverse impacts may include direct (i.e. contamination, physical disruption), indirect (i.e. loss of prey), site specific or habitat wide impacts including individual, cumulative, or synergistic consequences of actions.

According to the National Marine Fisheries Service (NMFS), the Souhegan River is EFH for Atlantic salmon (*Salmo salar*). The Souhegan River drains into the Merrimack River. Adult Atlantic salmon are trapped at a dam in Lawrence, Massachusetts and do not make it up to the Souhegan River

EPA has concluded that the limits and conditions contained in the draft permit minimize adverse effects to EFH for the following reasons:

- The permit requires toxicity testing four (4) times per year to ensure that the discharge does not present toxicity problems.
- The permit contains water quality based limits for chlorine, lead, and aluminum.
- The permit prohibits the discharge to cause a violation of state water quality standards.

EPA believes the draft permit adequately protects EFH and therefore additional mitigation is not warranted. NMFS will be notified and an EFH consultation will be reinitiated if adverse impacts to EFH are detected as a result of this permit action or if new information is received that changes the basis for these conclusions.

## ii. Endangered Species

The Endangered Species Act (16 U.S.C. 1451 et seq), Section 7, requires the EPA to ensure, in consultation with the U.S. Fish and Wildlife Service (USFWS) and/or NMFS, as appropriate, that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species, or adversely affect its critical habitat.

EPA believes that the authorized discharge from this facility is not likely to adversely affect and federally listed species or their habitats. EPA is informally consulting with USFWS to confirm this determination.

## V. State Certification Requirements.

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving water(s) either certifies that the effluent limitations contained in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State Water Quality Standards or waives its right to certify as set forth in 40 CFR §124.53.

State water quality standards contain three major elements: Beneficial uses; Water Quality Criteria; and an Antidegradation Policy, all of which are part of the State's Water-Quality Certification under Section 401 of the Act. The only exception to this is that sludge conditions/requirements are not part of the Section 401 State Certification. The staff of the NHDES-WD has reviewed the draft permit and advised EPA-New England that the limitations are adequate to protect water quality. EPA-New England has requested permit certification by the State and expects that the draft permit will be certified. Regulations governing state certification are set forth in 40 CFR §§124.53 and §124.55.

## **VI. Comment Period, Hearing Requests, and Procedures for Final Decisions.**

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period to:

Dan Arsenault  
U.S. Environmental Protection Agency  
One Congress Street, Suite 1100 (Mail Code: CMP)  
Boston, Massachusetts 02114-2023  
Telephone No.: (617) 918-1562  
FAX No.: (617) 918-0562

Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA-New England and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA-New England's Boston office.

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

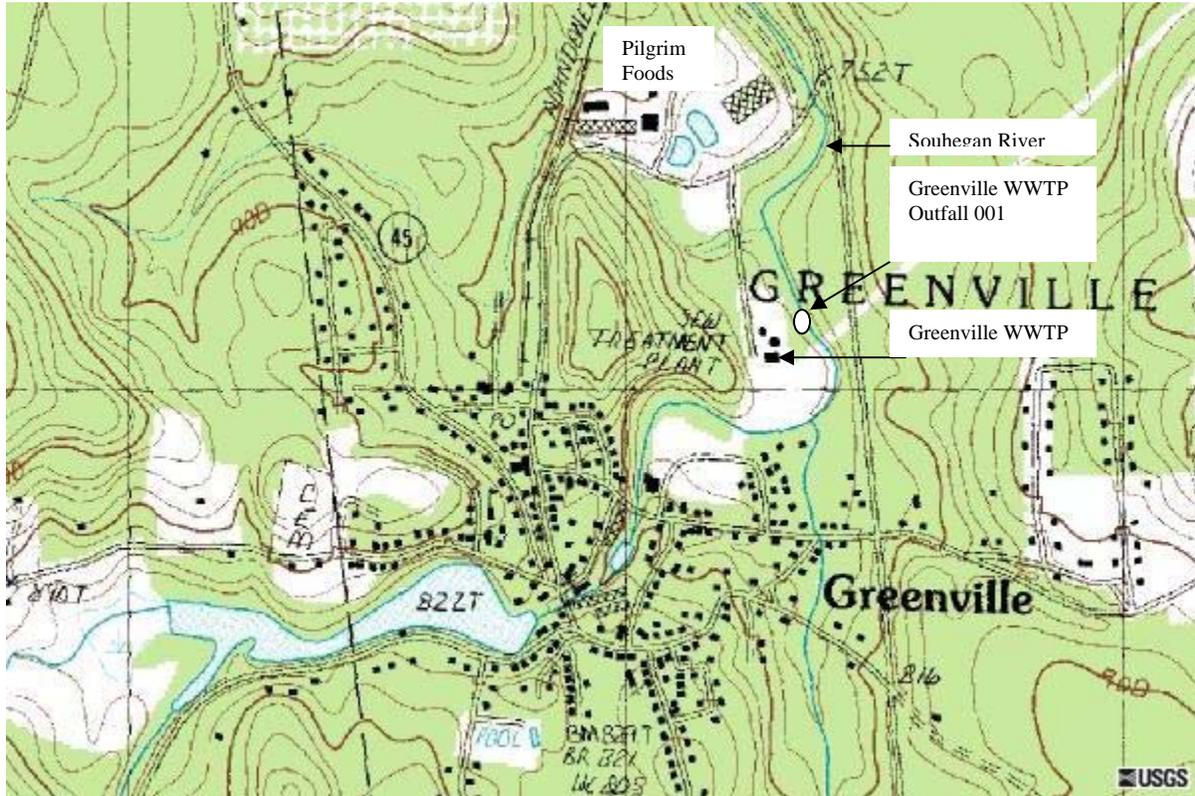
Additional information concerning the draft permit may be obtained between the hours of 9:00 A.M. and 5:00 P.M. (8:00 A.M. and 4:00 P.M. for the state), Monday through Friday, excluding holidays.

\_\_\_\_\_  
**Date:**

**Stephen S. Perkins, Director**  
**Office of Ecosystem Protection**  
**U.S. Environmental Protection Agency**

**ATTACHMENT A**

**Location of Greenville Wastewater Treatment Plant**



**ATTACHMENT B****EFFLUENT CHARACTERISTICS AT OUTFALL 001**

The following effluent characteristics were derived from analysis of discharge-monitoring data collected from Outfall 001 during the five year period January 2002 through December 2006. Data were extracted from the monthly Discharge Monitoring Reports submitted by the Greenville Wastewater Treatment Facility. The effluent values characterize treated sanitary and commercial wastewaters discharged from this facility.

<b>Parameter</b>	<b>Average of Monthly Averages</b>	<b>Range of Monthly Averages</b>	<b>Maximum Daily</b>
Effluent Flow (mgd)	0.168	0.108 - 0.269	0.520
Effluent BOD <sub>5</sub> (mg/l)	7.99	0.0 – 29.3	110
Effluent BOD <sub>5</sub> (lb/day)	11.75	0.0 - 56.04	270.2
Effluent TSS (mg/l)	9.38	0.0- 39.6	98.0
Effluent TSS (lb/day)	13.64	0.0 - 60.04	260.1
Escherichia coli (counts/100 ml)	9.17	0.0 – 71.3	830
Effluent pH (s.u.)	----	----	7.6
<b><i>Range of WET Test Results (January 2004 – December 2006)</i></b>			
	<b>ACUTE</b>	<b>CHRONIC</b>	
LC50 (% Effluent)		<b>Ceriodaphnia</b>	<b>Pimephales</b>
		Survival	Reproduction
	>100% - >100%	50% - 100%	25% - 100%
		Survival	Reproduction
		100% - 100%	100% - 100%
Total Recoverable Lead (mg/L)	----	Range of values from WET: 0.0026 – 0.038	

**ATTACHMENT C**  
**CALCULATIONS OF MASS-BASED LIMITS**

Calculations of maximum allowable loads for average monthly BOD<sub>5</sub> and TSS are based on the following equation.

$$L = 8.345 * Q * C$$

Where:

L = Maximum allowable load, in lbs/day, rounded to nearest 1 lbs/day.

C = Maximum allowable effluent concentration for average monthly reporting period, in mg/L.

Q = Treatment plant's design flow, in MGD

8.345 = Factor to convert effluent concentration, in mg/L, and plant's design flow, in MGD, to lbs/day.

**DERIVATION OF 7Q10 LOW-FLOW AT OUTFALL 001**

$$Q_{001} = \left( \frac{Q_{\text{Greenville POTW}}}{Q_{\text{Merrimack Gage}}} \right) (Q_{\text{Merrimack Ding}})$$

where:

$Q_{001}$  = Estimated 7Q10 flow at Outfall 001, in cubic feet per second (cfs)

$Q_{\text{Merrimack Gage}}$  = 7Q10 flow of Souhegan at the Merrimack gage No. 0109400, in cfs

$Q_{\text{Merrimack Ding}}$  = Dingman flow associated with the gaged portion of the Souhegan River

$Q_{\text{Greenville POTW}}$  = Dingman flow between the POTW and the Merrimack gage.

Where:

Souhegan River gage at Merrimack NH;

U.S. Geological Survey No. 0109400;

Drainage Area: 171 mi<sup>2</sup>

7Q10 = 13.0 cfs

Period of Record: July 1909 – September 1976.

$$Q_{001} = \frac{1.427 \text{ cfs}}{9.8774 \text{ cfs}} (13.0 \text{ cfs}) = 1.88 \text{ cfs}$$

**DILUTION FACTOR**

Equation used to calculate available dilution factor at Outfall 001:

$$\text{Dilution Factor} = \frac{(Q_{001}) + (Q_{PDF} \times 1.547)}{Q_{PDF} \times 1.547} \times 0.9$$

where:

- $Q_{001}$  = Estimated 7Q10 flow at Outfall 001, in cfs;  
 $Q_{PDF}$  = Treatment plant's design flow, in mgd;  
1.547 = Factor to convert mgd to cfs  
0.9 = Factor to reserve 10% of river's assimilative capacity.

$$DilutionFactor = \frac{(1.88cfs) + (0.233mgd \times 1.547)}{0.233 \times 1.547} \times 0.9 = 5.6$$

#### WATER-QUALITY BASED LIMIT

Equation used to calculate Average Monthly and Maximum Daily Total Residual Chlorine limits, of applicable:

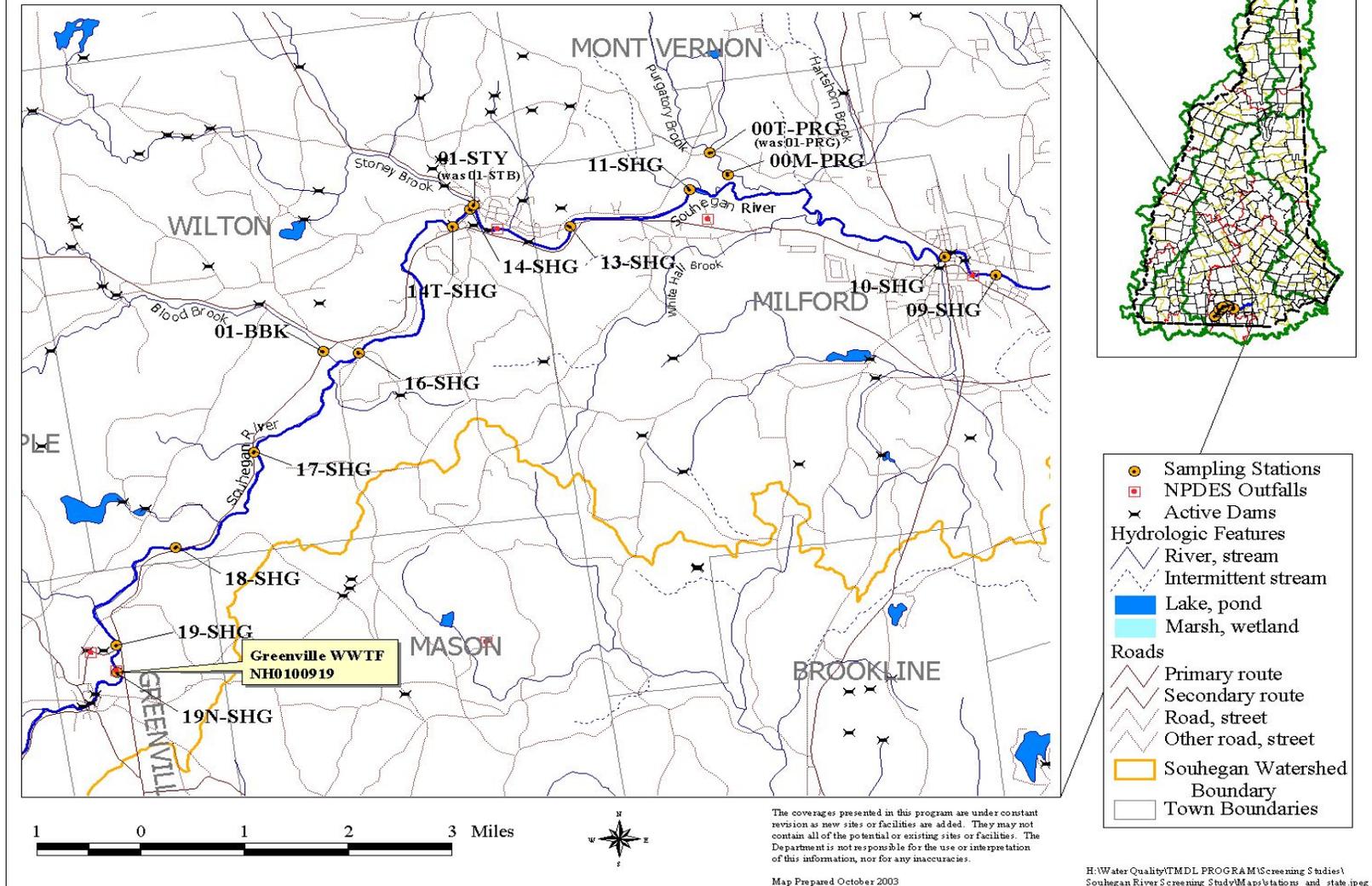
$$\text{Chlorine Limit} = \text{Dilution Factor} \times \text{Water Quality Criteria}$$

Where Water Quality Criteria for chlorine are:

- 0.011 = Chronic Aquatic-Life Criteria, mg/L  
0.019 = Acute Aquatic-Life Criteria, mg/L

ATTACHMENT D

Souhegan River TMDL Sampling Stations, 2001



**ATTACHMENT E****TOTAL PHOSPHORUS LIMIT CALCULATIONS**

The following equation was used to derive the phosphorus limit:

$$(Q_{\text{up}})(P_{\text{up}}) + (Q_{\text{Plant}})(P_{\text{Plant}}) = ((Q_{\text{up}} + Q_{\text{Plant}})(0.9))(0.1)$$

where:

$Q_{\text{up}}$  = Upstream 7Q10 flow = 1.88 cfs

$P_{\text{up}}$  = Upstream phosphorus concentration; the average of two upstream readings were used.  $(0.028 + 0.025)/2 = 0.0265$  mg/l

$Q_{\text{Plant}}$  = Design flow of the plant = 0.23 mgd = 0.356 cfs

$P_{\text{Plant}}$  = Effluent concentration to meet Gold Book Criterion of 0.1 mg/l

0.9 = Factor to reserve 10% of the assimilative capacity of the receiving water

0.1 = Gold Book recommended instream concentration for P; mg/l

$$(1.88 \text{ cfs})(0.0265 \text{ mg/l}) + (0.356 \text{ cfs})(P_{\text{Plant}}) = ((1.88 \text{ cfs} + 0.356 \text{ cfs})(0.9))(0.1 \text{ mg/l})$$

$$P_{\text{Plant}} = 0.43 \text{ mg/l} = \text{Permit Limit}$$