EXHIBIT 3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

FACT SHEET

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

NPDES PERMIT NO: **MA0100668**

PUBLIC NOTICE START AND END DATES:

NAME AND ADDRESS OF PERMITTEE:

Town of Concord
135 Keyes Road
Concord, MA 01742

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Concord Wastewater Treatment Plant
509 Bedford Street
Concord, MA 01742

RECEIVING WATERS: **Concord River (MA82A-07)**
USGS Hydrologic Code: 01070005

CLASSIFICATION: **Class B - Warm Water Fishery, Treated Water Supply**

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I. PROPOSED ACTION

The above named applicant has applied to the U.S. Environmental Protection Agency (EPA) for the re-issuance of its National Pollutant Discharge Elimination System (NPDES) permit to discharge into the designated receiving water. The current permit became effective March 13, 2006 and expired on February 28, 2011. EPA received the re-application on September 1, 2010. The draft permit proposes an expiration date five (5) years from the effective date of the final permit.

In discussions regarding the draft permit, the Town requested that EPA delay the public notice of the draft permit to allow the Town time to complete planning that it believes will support an increase to the authorized discharge flow. The Town has indicated that it will be conducting such planning consistent with EPA's recently issued *Integrated Municipal Stormwater and Wastewater Planning Approach Framework*. (EPA Office of Water and Office of Enforcement and Compliance Assurance. June 5, 2012) As stated in the framework, EPA is committed to working with states and communities to find efficiencies in implementing municipal wastewater and stormwater programs, and we encourage the Town to proceed with this approach.

However, as stated in the memorandum, "permit issuance and the implementation of existing permit and enforcement requirements and activities shall not be delayed while an integrated plan is being developed." We believe that completion of an integrated plan for the Town, addressing the six elements described in the June, 5, 2012 memo, is (conservatively) over a year away. In addressing the likely timeframe, we note that the Town's requested flow increase requires a state approved Comprehensive Wastewater Management Plan (CWMP). This CWMP can be an initial step, and potentially an effective basis, for the fourth element of the framework - a process for identifying, evaluating, and selecting alternatives.

For this reason, EPA has decided to release the draft permit for public comment without delay. EPA is committed to working with and assisting the Town as it undertakes its planning process. Completion of the plan, including the state-required CWMP, will be considered new information for purposes of reopening or modifying the final permit.

II. TYPE OF FACILITY AND DISCHARGE LOCATION

The facility's discharge outfall is listed below:

Outfall	Description of Discharge	Receiving water	Outfall Location
001	Treated Effluent	Concord River	42.475º N 71.341° W

The above named applicant has applied to EPA for the reissuance of its NPDES permit to discharge into the designated receiving waters. The facility collects and treats domestic wastewater and septage. The discharge from this advanced secondary wastewater treatment facility is via Outfall 001 to the Concord River. See Figure 1 for site location.

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The Town of Concord's Wastewater Treatment Plant (Concord WWTP or WWTP) is a 1.2 million gallon per day (MGD) secondary wastewater treatment facility located in Concord, Massachusetts, serving a population of about 6,500. The facility also accepts up to 13,000 gallons per day of septage from the Town of Concord. There are currently no industrial users contributing wastewater to this facility.

The collection system is 100% separate sanitary sewers.

III. DESCRIPTION OF DISCHARGE

Quantitative descriptions of the discharge in terms of significant effluent parameters, based on discharge monitoring reports (DMRs) submitted for January 2009 through December 2010, are shown in Appendix A of this fact sheet.

IV. LIMITATIONS AND CONDITIONS

The effluent limitations and monitoring requirements may be found in the draft NPDES permit.

V. PERMIT BASIS AND EXPLANATION OF EFFLUENT LIMITATION DERIVATION

A. PROCESS DESCRIPTION

The Concord WWTP, located in Concord, Massachusetts, is an advanced secondary treatment facility equipped with CoMag phosphorus removal and ultraviolet disinfection. See Figure 2 for treatment plant schematic.

The influent first passes through a rotary fine screen to remove solid material over ¼ inch in diameter. In-town septage is delivered via private hauler to a bar rack receiving station. Septage is stored in two 20,000-gallon capacity tanks, aerated to blend and freshen, circulated through chopper pumps to further blend and suspend solids and discharged to the headworks. Grit and sand is removed in a shallow detention basin using a motor-driven, continuously operating sweep.

After being screened and de-gritted, wastewater goes to primary clari-thickeners, and then flows through trickling filters for biological treatment, followed by secondary clarifiers, which provide further removal of solids. Aluminum sulfate is fed to the influent to the clarifiers to enhance phosphorus removal.

Following the secondary clarifiers, flow enters the CoMag process for further phosphorus removal. CoMag is a ballasted flocculation system consisting of a flocculator, clarifier, and magnetic filter. Magnetite, alum, and polymer are mixed with wastewater in the flocculator to create a floc with a high specific gravity. This floc settles quickly in the clarifier. Effluent quality is further enhanced by passing the clarified effluent through a magnet filter, which removes any remaining magnetite.

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Flow then goes to a single channel three bank ultraviolet disinfection system, and the final effluent then flows through a Parshall flume where the flow rate is measured before discharge to the Concord River.

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. Overview of Federal and State Regulations

EPA is issuing this permit pursuant to Section 402(a) of the Clean Water Act (CWA). The Commonwealth of Massachusetts is also issuing this permit pursuant to Massachusetts General Laws ch. 21, § 43 (2004).

The CWA prohibits the discharge of pollutants to waters of the United States without a NPDES permit unless such a discharge is otherwise authorized by the CWA. The NPDES permit is the mechanism used to implement technology and water quality-based effluent limitations and other requirements including monitoring and reporting. The draft NPDES permit was developed in accordance with various statutory and regulatory requirements established pursuant to the CWA and any applicable State administrative rules. The regulations governing EPA's NPDES permit program are generally found in 40 CFR Parts 122, 124, 125 and 136.

EPA is required to consider technology and water quality-based requirements when developing permit limits. The technology-based limits for publicly owned treatment works (POTWs) are based on secondary treatment and are found in 40 CFR Part 133.

Section 301(b)(1)(C) of the CWA requires NPDES permits to contain effluent limits more stringent than technology-based limits where more stringent limits are necessary to comply with, among other things, any applicable state or federal water quality standards. EPA's regulations at 40 C.F.R. §122.44(d)(1) requires that effluent limits more stringent than technology-based limits be included in permits when necessary to achieve water quality standards. Compliance schedules to meet water quality-based effluent limits may be included in permits only when the state's water quality standards clearly authorize such schedules and when the limits are established to meet a water quality standard that is adopted, revised, or newly interpreted after July 1, 1977.

A water quality standard consists of three elements: (1) beneficial designated use or uses for a water body or a segment of a water body; (2) numeric and narrative water quality criteria sufficient to protect the assigned designated use(s); and (3) antidegradation requirements to ensure that existing uses and high quality waters are protected and maintained.

The Massachusetts Surface Water Quality Standards (314 CMR 4.00) establish designated uses of the State’s waters, criteria to protect those uses, and an antidegradation provision to ensure that existing uses and high quality waters are protected and maintained. They also include requirements for the regulation and control of toxic constituents and specify that EPA’s recommended water quality criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site-specific criterion is established.

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Section 401(a)(1) of the CWA forbids the issuance of a federal license for a discharge to waters of the United States unless the state where the discharge originates either certifies that the discharge will comply with, among other things, state water quality standards, or waives certification. EPA's regulations at 40 CFR §122.44(d)(3), §124.53 and §124.55 describe the manner in which NPDES permits must conform to conditions contained in state certifications.

Section 402(o) of the CWA and 40 CFR §122.44(l) provide, generally, that the effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the previous permit. Except under certain limited circumstances "back-sliding" from effluent limitations contained in previously issued permits is prohibited.

2. Development of Water Quality-based Limits

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 aquatic life criteria are used and expressed in terms of maximum allowable in-stream pollutant concentration. Maximum daily limits are generally derived from the acute aquatic life criteria, and the average monthly limit is generally derived from the chronic aquatic life criteria. Chemical specific limits are established in accordance with 40 CFR § 122.44(d) and § 122.45(d).

The permit must limit any pollutant or 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. An excursion occurs if the projected or actual in stream concentration exceeds the applicable criterion.

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 application, monthly discharge monitoring reports (DMRs), and State and Federal water quality reports; (3) sensitivity of the species to toxicity testing; (4) statistical approach outlined in *Technical Support Document for Water Quality-based Toxics Controls*, March 1991, EPA/505/2-90-001 in Section 3; and, where appropriate, (5) dilution of the effluent in the receiving water. In accordance with Massachusetts Water Quality Standards [314 CMR 4.03(3)], available dilution for rivers and streams is based on a known or estimated value of the lowest average flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10).

3. Water Quality Standards; Designated Use; Outfall 001

The segment of the Concord River receiving the Concord WWTP discharge is classified in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) as a Class B-warm water fishery and treated water supply.

These waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

A warm water fishery is defined in the Massachusetts Surface Water Quality Standards (314 CMR 4.02) as waters in which the maximum mean monthly temperature generally exceeds 20^o Celsius (68^o Fahrenheit) during the summer months and are not capable of supporting a year-round population of cold water stenothermal aquatic life.

The Town of Billerica uses the Concord River as its drinking water supply. A designated treated water supply is a Class B water that is used as a water supply after appropriate treatment. These waters may be subject to site-specific criteria to protect this use. No site-specific criteria have been designated for the Concord River.

Section 303(d) of the CWA requires states to identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and, as such, require the development of total maximum daily loads (TMDL). This reach of the Concord River (MA82A-07), which extends from the confluence of the Sudbury and Assabet Rivers to the Billerica water supply intake, is listed on the *Massachusetts 2010 Integrated List of Waters* (303d) as impaired and requiring a TMDL for mercury in fish tissue, total phosphorus, and fecal coliform. EPA anticipates submission and approval of the final bacteria TMDL in 2012. The mercury impairment, which is caused by airborne deposition, is subject to a regional mercury TMDL. It is not known when the total phosphorus TMDL will be finalized.

4. Design Flow, 7Q10, and Available Dilution

Water quality based limits are established with the use of a calculated available dilution. Title 314 CMR 4.03(3)(a) requires that effluent dilution be calculated based on the receiving water 7Q10. The 7Q10 is the lowest observed mean river flow for 7 consecutive days, occurring over a 10-year recurrence interval. Additionally, the facility design flow is used to calculate available effluent dilution.

Discharge Flow
Review of facility flow between January 2009 and December 2010 shows that the average flow was 1.1 MGD. The facility design flow is 1.2 MGD (1.9 cfs). The flow limit in the current permit is expressed as a 12-month rolling average. No exceedances of this limit occurred during the specified data period. This limit has been carried forward in the draft permit.

7Q10
The 7Q10 for the Concord River at the Concord WWTP has been calculated as 34 cfs (21.9 MGD). Please see Appendix B for supporting calculations.

Available Dilution

Dilution Factor = (Facility Flow + 7Q10)/Facility Flow
Dilution Factor = (34 cfs + 1.9 cfs)/1.9 cfs = **19**

5. Conventional Pollutants: BOD_5, TSS, pH, and *E. coli*

BOD and TSS

The Biochemical Oxygen Demand (BOD) and the Total Suspended Solids (TSS) draft limits are based on secondary treatment requirements and are the same as those in the current permit. Discharge monitoring data was reviewed from January 2009- December 2010. There have been no violations for BOD or TSS during this period with discharge levels typically well below permit limitations. Mass limits of 300 pounds (lbs)/day average monthly and 450 lbs/day maximum daily have also been included for BOD and TSS. The BOD and TSS removal percentages have met the 85% removal requirement. The monitoring frequency remains twice per week.

E. coli

The *Escherichia coli* (*E. coli*) limits for Outfall 001 are based on state water quality standards for Class B waters (314 CMR 4.05(b)(4)). The Commonwealth of Massachusetts promulgated *E. coli* criteria in the Surface Water Quality Standards (314 CMR 4.00) on December 29, 2006, replacing fecal coliform bacteria criteria. These new criteria were approved by EPA on September 19, 2007.

The current permit contains a year-round monthly average fecal coliform limit of 200 colony forming units per 100 milliliters (mL) (cfu/100 mL) and a maximum daily limit of 400 cfu/100 mL. Monitoring frequency is twice per week. Concord WWTF met all of its fecal coliform limits, with reported bacteria counts well below the permit limit.

The *E. coli* limits proposed in the draft permit for Outfall 001 are a monthly geometric mean of 126 colony cfu/100 ml and a daily maximum of 409 cfu/100 ml (this is the 90% distribution of the geometric mean of 126 cfu/100 ml). The proposed *E. coli* monitoring frequency in the draft permit is twice per week.

pH

The current permit requires effluent pH to be between 6.0 and 8.3. The minimum pH limit of 6.0 is less stringent than the customary limit of 6.5 for facilities discharging to Class B waters, and was granted in the current permit based on dilution levels and operational considerations. Because the receiving water has not shown any adverse effects due to occasional low pH in the discharge, the pH range requirement in the draft permit is maintained as 6.0 to 8.3. From January 2009 through December 2010, two pH values exceeded the maximum limit of 8.3. The pH shall be monitored daily.

6. Non-Conventional Pollutants

Total Phosphorus

The Massachusetts Surface Water Quality Standards (314 CMR 4.00) do not contain numerical criteria for total phosphorus. The narrative criterion for nutrients is found at 314 CMR 4.05(5)(c), which states that, “unless naturally occurring, all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses…”

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The Standards also require that "any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment as determined by the Department, including, where necessary, highest and best practical treatment (HBPT) for POTWs,… to remove such nutrients to ensure protection of existing and designated uses." (314 CMR 4.05(5)(c)). The Massachusetts Department of Environmental Protection (MassDEP) has established that a monthly average total phosphorus limit of 0.2 mg/l (200 µg/l) represents highest and best practical treatment (HBPT) for Publicly Owned Treatment Works (POTWs).

The current permit contains the HBPT limit of 0.2 mg/l (200 µg/l) from April through October and a limit of 1 mg/l the rest of the year. From January 2009 through December 2010, there were no violations of the total phosphorus limit.

EPA calculated the downstream phosphorus concentration with the existing 0.2 mg/l permit limit for Concord WWTP to verify that the existing limit is sufficiently protective of designated uses. The upstream concentration, 45 µg/l, is the median phosphorus concentration reported for the Concord River at Lowell Street, Concord by the Organization for the Assabet River (OARS) in 2009 and 2010[1]. As the calculation below shows, the existing limit results in a downstream phosphorus concentration of 53 µg/l during 7Q10 conditions, lower than the Gold Book criteria of 100 µg/l.

Downstream Phosphorus Concentration

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 200 µg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 45 µg/l
Q_r = Streamflow below outfall = 23.1 MGD (effluent + upstream)

Therefore,

$$C_r = \frac{(1.2\ \text{MGD} \times 200\ \mu\text{g/l}) + (21.9\ \text{MGD} \times 45\ \mu\text{g/l})}{23.1\ \text{MGD}}$$

= **53 µg/l** <100 µg/l (Gold Book criterion)

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[1] http://www.oars3rivers.org/sites/default/files/Data-2009-2010-Appendix-II.pdf

The average monthly total phosphorus limit remains at 200 µg/l from April 1st through October 31st. From November 1st through March 31st, the average monthly limit remains at 1 mg/l. Sampling frequency will be once per month.

The draft permit also requires Concord WWTP to report daily alum, magnetite, and polymer dosing levels with the DMR. The CoMag process allows for rapid changes in phosphorus removal by adjusting the dosing levels of the chemicals used in the process. The rationale for this requirement is that reporting of dosing level will provide verification that nutrient removal occurs throughout the month without more frequent effluent monitoring.

Aluminum

Aluminum, in the form of alum or other compounds, is a commonly used chemical additive in wastewater treatment to remove phosphorus. The release of metals such as aluminum into the environment can result in levels that are highly toxic to aquatic life. Therefore, it is necessary to evaluate the downstream effects of discharges of aluminum from wastewater treatment plants. Water quality-based effluent limitations are imposed on dischargers when it is determined that limitations more stringent than technology-based limitations are necessary to achieve or maintain the water quality standards in the receiving water (40 CFR § 122.44(d)(1)). Such determinations are made when EPA finds that there is reasonable potential for the discharge to cause or contribute to an instream excursion above a water quality criterion contained within applicable state water quality standards (40 CFR § 122.44(d)(1)(i)).

In determining reasonable potential, EPA considers existing controls on point and nonpoint sources of pollution, pollutant concentration and variability in the effluent and receiving water as determined from the permittee's reissuance application, DMRs, state and federal water quality reports; and, where appropriate, the dilution of the effluent in the receiving water (see 40 CFR §122.44(d)(1)(ii)). If EPA concludes, after using the procedures found at 40 CFR § 122.44(d)(1)(ii), toxicity testing data, or other available information, that a discharge causes or has the reasonable potential to cause or contribute to an in-stream excursion above a numeric criterion within an applicable state water quality standard, effluent limitations must be included in NPDES discharge permits to ensure that water quality standards in the receiving water are met (40 CFR § 122.44(d)(1)(v)).

The Massachusetts Surface Water Quality Standards include requirements for the regulation and control of toxic constituents and also require that EPA-recommended criteria established pursuant to Section 304(a) of the CWA be used unless site-specific criteria are established (314 CMR § 4.05(5)(e)). Massachusetts has not adopted site-specific criteria for aluminum. Therefore, the freshwater criteria for aluminum found in the *National Recommended Water Quality Criteria*: *2002* (US EPA 2002 [EPA-822-R-02-047]), which are an acute concentration of 750 µg/l and a chronic concentration of 87 µg/l, apply in Massachusetts.

The potential for discharges of aluminum from the Concord WWTP to cause or contribute to an excursion above water quality criteria was determined by statistically projecting the maximum concentration of the pollutant in the discharge assuming a lognormal distribution. A histogram of the effluent data verified this assumption. EPA projected the maximum effluent concentration as 4,411 µg/l (4.4 mg/l) by calculating the 99th percentile measurement of the existing effluent data set from January 2009 through January 2011 (n=25). The 95th percentile concentration, 2,720 µg/l (2.7 mg/l), was also calculated for comparison with the chronic WQC (see Appendix C).

The projected pollutant level was then inserted into a steady-state mixing equation to determine if it could cause or contribute to an excursion from water quality standards under critical conditions. The median aluminum level reported in the 2008-2010 WET test dilution samples, 75 µg/l, was used in this analysis.

As shown in the boxes below, the projected maximum aluminum effluent of 4,411 µg/l results in a receiving water concentration of 303 µg/l during critical conditions, below the acute criterion of 750 µg/l. A concentration of 2,720 µg/l, the 95th percentile concentration, results in a receiving water concentration of 215 µg/l, above the chronic criterion of 87 µg/l. Therefore, there is reasonable potential for the discharge to cause or contribute to an excursion of the chronic water quality standard for aluminum.

Reasonable Potential Analysis for Aluminum

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 4,411 µg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 75 µg/l
Q_r = Streamflow below outfall = 23.1 MGD (effluent + upstream)

Therefore,

$$Cr = \frac{(1.2 \text{ MGD x } 4{,}411\ \mu g/l) + (21.9 \text{ MGD x } 75\ \mu g/l)}{23.1 \text{ MGD}}$$

= **300 µg/l** < 750 µg/l (acute criterion)

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an excursion from the acute water quality criterion for aluminum.

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Reasonable Potential Analysis for Aluminum

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 2,720 µg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 75 µg/l
Q_r = Streamflow below outfall = 23.1 MGD (effluent + upstream)

Therefore,

$$C_r = \frac{(1.2\text{ MGD} \times 2{,}720\ \mu\text{g/l}) + (21.9\text{ MGD} \times 75\ \mu\text{g/l})}{23.1\text{ MGD}}$$

= **212 µg/l** > 87 µg/l (chronic criterion)

Therefore, there **is reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for aluminum.

The effluent limits calculated below will result in attainment of water quality criteria downstream of the facility during critical conditions. The limit was calculated using the same steady state model that was used in determining reasonable potential, but setting the downstream concentration equal to the applicable water quality criteria and solving for the effluent concentration.

Monthly Average Aluminum Limit

$$C_d = \frac{(Q_rC_r - Q_sC_s)}{Q_d}$$

Where
C_d = Discharge concentration = ?
C_r = Concentration below outfall = 87 µg/l (chronic criterion)
Q_d = Discharge flow = 1.2 MGD
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 75 µg/l
Q_r = Streamflow below outfall (effluent + upstream) = 23.1 MGD

$$C_d = \frac{(23.1\text{ MGD})(87\ \mu\text{g/l}) - (21.9\text{ MGD})(75\ \mu\text{g/l})}{1.2\text{ MGD}}$$

= 306 µg/l

The draft permit therefore includes an average monthly limit of 306 μg/l and a requirement to report the maximum daily effluent concentration. The proposed monitoring frequency is once per month. If the facility monitors at this frequency, the single sample must be reported as both the monthly average and the daily maximum. If Concord WWTP chooses to sample more often than once per month, the average of the samples must be reported as the monthly average, and the highest sample of the month reported as the daily maximum.

Ammonia Nitrogen

High levels of ammonia in the water column can be toxic to fish by making it more difficult for fish to excrete this chemical via passive diffusion from gill tissues. Ammonia toxicity varies with pH and temperature. Ammonia can also lower dissolved oxygen levels by conversion to nitrate/nitrate, which consumes oxygen.

The current permit does not contain a limit for ammonia. DMR data show that effluent ammonia levels range from 0.49 mg/l to 2.81 mg/l (see Appendix A).

EPA ammonia criteria recommend using the 30Q10 conditions (the lowest 30-day average daily flow with a 10-year expected recurrence interval) rather than the 7Q10 for setting ammonia limits. Interpolation of flow records for USGS Gages in Maynard and Lowell indicates that the 30Q10 is 49 cfs. The 30Q10 and dilution factor calculations are presented in Appendix D.

Given the dilution factor of 27 during 30Q10 conditions, no reasonable potential for an exceedance of water quality standards exists (see Appendix E for calculations). The draft permit carries forward the monitoring requirements of once per week from June 1- September 30 and twice per month from October 1 – May 31.

Copper

Copper is an abundant naturally occurring trace element in the earth’s crust that is also found in surface waters. Copper is a micronutrient at low concentrations and is essential to virtually all plants and animals. At higher concentrations copper can become toxic to aquatic life.

An examination of Concord WWTP’s whole effluent toxicity (WET) testing data shows effluent copper concentrations ranging from non-detect to 16 μg/l (see Appendix A).

The *National Recommended Water Quality Criteria*: *2002* (US EPA 2002 [EPA-822-R-02-047]) includes copper criteria for the protection of aquatic life. These criteria are hardness-based. The calculations below estimate hardness in the receiving water downstream of the facility, which is then used to establish the applicable copper criteria. The hardness data used in the calculations are from Concord WWTP’s Whole Effluent Toxicity (WET) test reports from March 2008 through December 2010. The hardness values used in this calculation are the median hardness values measured in the treatment plant discharge and the upstream receiving water during this period. Hardness data used to calculate the criteria are included in Appendix F.

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Hardness Analysis

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 86 mg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 55 mg/l
Q_r = Streamflow below outfall (effluent + upstream) = 23.1 MGD

Therefore,

$$C_r = \frac{(1.2 \text{ MGD} \times 87 \text{ mg/l}) + (21.9 \text{ MGD} \times 50 \text{ mg/l})}{23.1 \text{ MGD}}$$

$$= 56 \text{ mg/l}$$

1. Acute Criteria (Total Recoverable) = $\exp\{m_a [\ln(h)] + b_a\}$ = **8.11 µg/l**

Where:

m_a = Pollutant-specific coefficient = 0.9422
b_a = Pollutant-specific coefficient = -1.700
ln = Natural logarithm
h = hardness of the receiving water = 56 mg/l

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2. Chronic Criteria (Total Recoverable) = $\exp\{m_c [\ln(h)] + b_c\}$ = **5.68 µg/l**

Where:

m_c = Pollutant-specific coefficient = 0.8545
b_c = Pollutant-specific coefficient = -1.702
ln = Natural logarithm
h = hardness of the receiving water = 56 mg/l

EPA used information from the quarterly WET tests to perform a Reasonable Potential Analysis to determine the potential for discharges of copper from the Concord WWTP to cause or contribute to an excursion above water quality criteria. First, EPA projected the maximum effluent concentration as 46.40 µg/l by calculating the 99th percentile measurement the effluent data from March 2008 through December 2010. EPA then calculated the 95th percentile concentration, 27.82 µg/l, to characterize the maximum monthly average concentration (see Appendix F).

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Background conditions in the Concord River were determined from the median of the WET chemistry dilution water samples from March 2008 through December 2010. The projected pollutant levels were then inserted into a steady-state mixing equation to determine if the discharge could cause or contribute to an excursion from water quality criteria under critical conditions.

As shown in the box below, the projected maximum copper effluent concentration of 46.40 μg/l results in a downstream receiving water concentration of 5.25 μg/l, below the acute criteria of 8.11 μg/l. A concentration of 27.82 μg/l, the 95th percentile concentration, results in a receiving water concentration of 4.29 μg/l, below the chronic criterion of 5.68 μg/l. Therefore, there is no reasonable potential for the discharge to cause or contribute to an excursion of either the acute or chronic water quality standard for copper.

Reasonable Potential Analysis for Copper – Acute

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 46.40 μg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 3 μg/l
Q_r = Streamflow below outfall (effluent + upstream) = 23.1 MGD

Therefore,

$$C_r = \frac{(1.2\text{ MGD} \times 46.40\ \mu\text{g/l}) + (21.9\text{ MGD} \times 3\ \mu\text{g/l})}{4.1\text{ MGD}}$$

= **5.25** < 8.11 μg/l (acute criterion)

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an excursion from the acute water quality criterion for copper.

Reasonable Potential Analysis for Copper – Chronic

$$Q_rC_r = Q_dC_d + Q_sC_s$$

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 27.82 μg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 3 μg/l
Q_r = Streamflow below outfall (effluent + upstream) = 23.1 MGD

Therefore,

$$C_r = \frac{(1.2 \text{ MGD x } 27.82 \text{ μg/l}) + (21.9 \text{ MGD x } 3 \text{ μg/l})}{23.1 \text{ MGD}}$$

$$= \mathbf{4.29\ μg/l} < 5.68 \text{ μg/l (chronic criterion)}$$

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an excursion from the chronic water quality criterion for copper.

Because there is no reasonable potential for an excursion from water quality standards from copper discharges from Concord WWTP, the draft permit does not contain copper limits. The permittee will continue to monitor for copper as part of the quarterly whole effluent toxicity testing.

Di(2-ethylhexyl) Phthalate

Di(2-ethylhexyl) phthalate (also known as DEHP) is used in the production of polyvinyl chloride (PVC). It is commonly detected in the environment due to the widespread use of plastic products, though it is only slightly soluble in water and is broken down quickly in the presence of oxygen. For more information on this chemical, see Appendix G for a fact sheet on DEHP produced by the Agency for Toxic Substances and Disease Registry (ATSDR).

DEHP was detected in pollutant scans of Concord WWTP effluent conducted for the NPDES reissuance application.

Table 1. DEHP Levels in Concord WWTP Effluent

Date	Concentration
4/19/2010	<10 μg/l *
6/21/2010	11 μg/l
8/22/2010	19 μg/l
5/31/2011	6.6 μg/l

* not detected in laboratory analysis

EXHIBIT 3

The human health criteria for DEHP are 1.2 µg/L for consumption of water and organism, and 2.2 µg/L for organism only. The water and organism criterion applies when the water body is used for drinking water and animals from the water body are consumed. The organism-only criterion applies when animals from the water body are consumed. The drinking water MCL (Maximum Contaminant Level) for DEHP is 6 µg/L. The reason for the apparent discrepancy in these numbers is that cost and laboratory detection limits are considered in the determination of MCLs, while human health criteria do not account for either.

As of 2010 (the most recent report available online), the Town of Billerica, which uses the Concord River as a drinking water source, did not detect DEHP in its drinking water. Because the Concord River is a drinking water source for towns downstream, the water and organism criterion was used to determine whether an effluent limit would be needed under the Massachusetts Water Quality Standards and the Clean Water Act.

To determine whether an effluent limit is necessary, EPA conducted a Reasonable Potential Analysis to assess the likelihood that the effluent caused or contributed to an exceedance of water quality standards under critical conditions. Critical conditions are considered to be 7Q10 streamflow with the facility operating at design capacity. EPA could not project the 99% or 95% percentile concentration, because at least ten samples are necessary to confirm that the data are lognormally distributed. Therefore, EPA used the highest observed effluent concentration. Finally, because DEHP breaks down quickly in the presence of oxygen, EPA assumes that the upstream concentration of DEHP is zero.

Reasonable Potential Analysis for DEHP

Where

C_r = Concentration below outfall
Q_d = Discharge flow = 1.2 MGD
C_d = Discharge concentration = 19 µg/l
Q_s = Upstream flow = 21.9 MGD
C_s = Upstream concentration = 0 µg/l
Q_r = Streamflow below outfall = 23.1 MGD (effluent + upstream)

Therefore,

$$Cr = \frac{(1.2 \text{ MGD} \times 19\ \mu\text{g/l}) + (21.9 \text{ MGD} \times 0\ \mu\text{g/l})}{23.1 \text{ MGD}}$$

$$= \mathbf{0.99\ \mu g/l} < 1.2\ \mu\text{g/l (water and organism criterion)}$$

Therefore, there is **no reasonable potential** for the discharge to cause or contribute to an exceedance of the water and organism human health criterion for DEHP.

EXHIBIT 3

Because there is not reasonable potential at this time for the effluent to cause or contribute to an exceedance of the human health criteria for DEHP, the draft permit does not include a limit for this pollutant. However, the permittee is required to monitor for and report DEHP concentrations in the effluent. Monitoring frequency will be once per quarter, in the same months as the Whole Effluent Toxicity tests. Because the detection level of DEHP can vary widely, if DEHP is not detected in the effluent, Concord WWTP must report the detection level of the analysis with the DMR. This requirement will help EPA determine if water quality standards are being met and assist in future permit limit development, if needed.

Outfall 001 – Whole Effluent Toxicity

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts Surface Water Quality Standards require that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria: All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife.

National studies conducted by the EPA have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents, aromatic hydrocarbons and others. Pursuant to EPA Region 1 and MassDEP policy, discharges having a dilution ratio between 10:1 and 20:1 require an acute toxicity limit of LC50 >100% and chronic toxicity testing four times per year. (See also "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 49 Fed. Reg. 9016 March 9, 1984, and EPA's "Technical Support Document for Water Quality-Based Toxics Control", September, 1991.)

The current permit requires acute and chronic toxicity tests to be performed four times each year; in March, June, September, and December. The current permit also requires that the LC50 concentration exceed 100% effluent (i.e. 100% of effluent not cause mortality in more than 50% of test organisms), and that the Chronic C-NOEC (concentration of effluent that produces significant chronic effects in the test organism) be reported. From March 2008 through December 2010, there was one violation of the acute toxicity limit in June 2008, when the LC50 was 62% effluent.

The draft permit carries forward the requirements for quarterly chronic and acute toxicity tests using the species *Ceriodaphnia dubia*, only. The acute toxicity endpoint, expressed as LC50, must equal or exceed 100% effluent. The reporting requirement for chronic toxicity is carried forward into the draft permit. The tests must be performed in accordance with the test procedures and protocols specified in **Permit Attachment A**. The tests will be conducted four times a year, during the following months: March, June, September and December.

The draft permit also requires reporting of certain metals in the 100% effluent sample. These are parameters that the permittee already measures and reports as part of the quarterly WET test. The requirement to report the parameters on the DMR will add these data to the compliance database and facilitate reasonable potential analyses for future permits.

VI. OPERATION AND MAINTENANCE OF THE COLLECTION SYSTEM

EXHIBIT 3

EPA regulations set forth a standard condition for "Proper Operation and Maintenance" that is included in all NPDES permits. *See* 40 CFR § 122.41(e). This condition is specified in Part II.B.1 (Standard Conditions) of the draft permit and it requires the proper operation and maintenance of all wastewater treatment systems and related facilities installed or used to achieve permit conditions.

EPA regulations also specify a standard condition to be included in all NPDES permits that specifically imposes on permittees a “duty to mitigate.” *See* 40 CFR § 122.41(d). This condition is specified in Part II.B.3 of the draft permit and it requires permittees to take all reasonable steps – which in some cases may include operations and maintenance work - to minimize or prevent any discharge in violation of the permit which has the reasonable likelihood of adversely affecting human health or the environment.

Proper operation of collection systems is critical to prevent blockages and equipment failures that would cause overflows of the collection system (sanitary sewer overflows, or SSOs), and to limit the amount of non-wastewater flow entering the collection system (inflow and infiltration or I/I). I/I in a collection system can pose a significant environmental problem because it may displace wastewater flow and thereby cause, or contribute to causing, SSOs. Moreover, I/I could reduce the capacity and efficiency of the treatment plant and cause bypasses of secondary treatment. Therefore, reducing I/I will help to minimize any SSOs and maximize the flow receiving proper treatment at the treatment plant. There is presently estimated to be approximately 198,075 gpd of (I/I) in the sewer system. MassDEP has stated that the inclusion in NPDES permits of I/I control conditions is a standard State Certification requirement under Section 401 of the CWA and 40 CFR § 124.55(b).

Therefore, specific permit conditions have been included in Part I.B., and I.C. and I.D. of the draft permit. These requirements include mapping of the wastewater collection system, preparing and implementing a collection system operation and maintenance plan, reporting unauthorized discharges including SSOs, maintaining an adequate maintenance staff, performing preventative maintenance, controlling infiltration and inflow to the extent necessary to prevent SSOs and I/I related-effluent violations at the wastewater treatment plant, and maintaining alternate power where necessary. These requirements are intended to minimize the occurrence of permit violations that have a reasonable likelihood of adversely affecting human health or the environment.

Several of the requirements in the draft permit are not included in the current permit, including collection system mapping, and preparation of a collection system operation and maintenance plan. EPA has determined that these additional requirements are necessary to ensure the proper operation and maintenance of the collection system and has included schedules for completing these requirements in the draft permit.

VII. SLUDGE INFORMATION AND REQUIREMENTS

Concord WWTP transports its sludge to the Upper Blackstone Water Pollution Abatement District for final treatment and disposal. Concord WWTP generates approximately 200 dry metric tons of sludge each year.

In February 1993, the Environmental Protection Agency (EPA) promulgated standards for the use and disposal of sewage sludge. The regulations were promulgated under the authority of

§405(d) of the Clean Water Act (CWA). Section 405(f) of the CWA requires that these regulations be implemented through permits. This permit is intended to implement the requirements set forth in the technical standards for the use and disposal of sewage sludge, commonly referred to as the Part 503 regulations.

Section 405(d) of the CWA requires that sludge conditions be included in all municipal permits. The sludge conditions in the draft permit satisfy this requirement and are taken from EPA's proposed Standards for the Disposal of Sewage Sludge to be codified at 40 CFR Part 503 (February 19, 1993 - Volume 58, pp 9248-9415). These conditions are outlined in the draft permit.

VIII. ESSENTIAL FISH HABITAT (EFH)

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA’s action or proposed actions that it funds, permits, or undertakes may adversely impact any essential fish habitat as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species’ fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

EFH is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999.

Concord WWTP discharges to the Concord River, which is a tributary of the Merrimack River. The Merrimack River system has been designated as EFH for Atlantic salmon. Although EFH has been designated for this general location, EPA has concluded that this activity is not likely to affect EFH or its associated species for the following reasons:

- The quantity of the discharge from the WWTP is 1.2 MGD and the effluent receives advanced treatment;
- The facility withdraws no water from the Concord River; therefore no life stages of Atlantic salmon are vulnerable to impingement or entrainment from this facility;
- Limits specifically protective of aquatic organisms have been established for phosphorus and aluminum based on EPA water quality criteria;
- The facility uses ultra-violet disinfection; therefore the effluent is free from chlorine.
- Acute and chronic toxicity testing on *Ceriodaphnia dubia* is required four (4) times per year and the recent toxicity results are in compliance with permit limits;
- The permit prohibits any violation of state water quality standards.

EPA believes that the conditions and limitations contained within the draft permit adequately protect all aquatic life, including those species with EFH designation. Impacts associated with issuance of this permit to the EFH species, their habitat and forage, have been minimized to the extent that no significant adverse impacts are expected. Further mitigation is not warranted.

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IX. ENDANGERED SPECIES

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants (“listed species”) and habitat of such species that has been designated as critical (a “critical habitat”). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administers Section 7 consultations for bird, terrestrial, and freshwater aquatic species. The National Marine Fisheries Service (NMFS) typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the federal endangered or threatened species of fish and wildlife to determine if any listed species might potentially be impacted by the re-issuance of this NPDES permit. The review revealed that one federally protected species, the small whirled pogonia (*Isotria medeoloides*), an orchid, merited further discussion.

The small whirled pogonia orchid has been identified in Groton, Massachusetts, which is three towns away from the Concord WWTP. In addition, the small whorled pogonia is found in “forests with somewhat poorly drained soils and/or a seasonally high water table,” according to the USFWS website. This species is not aquatic; therefore it is unlikely that it would come into contact with the facility discharge.

EPA is coordinating a review of this finding with USFWS and NMFS through the Draft Permit and Fact Sheet, and consultation under Section 7 of the ESA with USFWS and NMFS is not required.

X. MONITORING AND REPORTING

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308 (a) of the CWA in accordance with 40 CFR §§122.41 (j), 122.44 (l), and 122.48.

The Draft Permit includes new provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The Draft Permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports (“opt-out request”).

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA

EXHIBIT 3

through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR § 122.41 and § 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr. Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for Massachusetts.

The Draft Permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR, no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. **However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.**

The Draft Permit also includes an “opt-out” request process. Permittees who believe they cannot use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt-outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt-outs expire at the end of this twelve (12) month period. Upon expiration, the permittee must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt-out request sixty (60) days prior to expiration of its opt-out, and such a request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the Draft Permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

XI. STATE PERMIT CONDITIONS

The NPDES Permit is issued jointly by the U. S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection under federal and state law, respectively. As such, all the terms and conditions of the permit are, therefore, incorporated into and constitute a discharge permit issued by the MassDEP Commissioner.

XII. GENERAL CONDITIONS

The general conditions of the permit are based on 40 CFR Parts 122, Subparts A and D and 40 CFR 124, Subparts A, D, E, and F and are consistent with management requirements common to other permits.

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XIII. STATE CERTIFICATION REQUIREMENTS

The staff of MassDEP has reviewed the draft permit. EPA has requested permit certification by the State pursuant to 40 CFR Part 124.53 and expects that the draft permit will be certified.

XIV. PUBLIC COMMENT PERIOD AND PROCEDURES FOR FINAL DECISION

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 the U.S. EPA, Office of Ecosystem Protection, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. Public hearings may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates a 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's Boston office.

Following the close of the comment period and after a public hearing, if such a 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.

XV. EPA CONTACT

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays from:

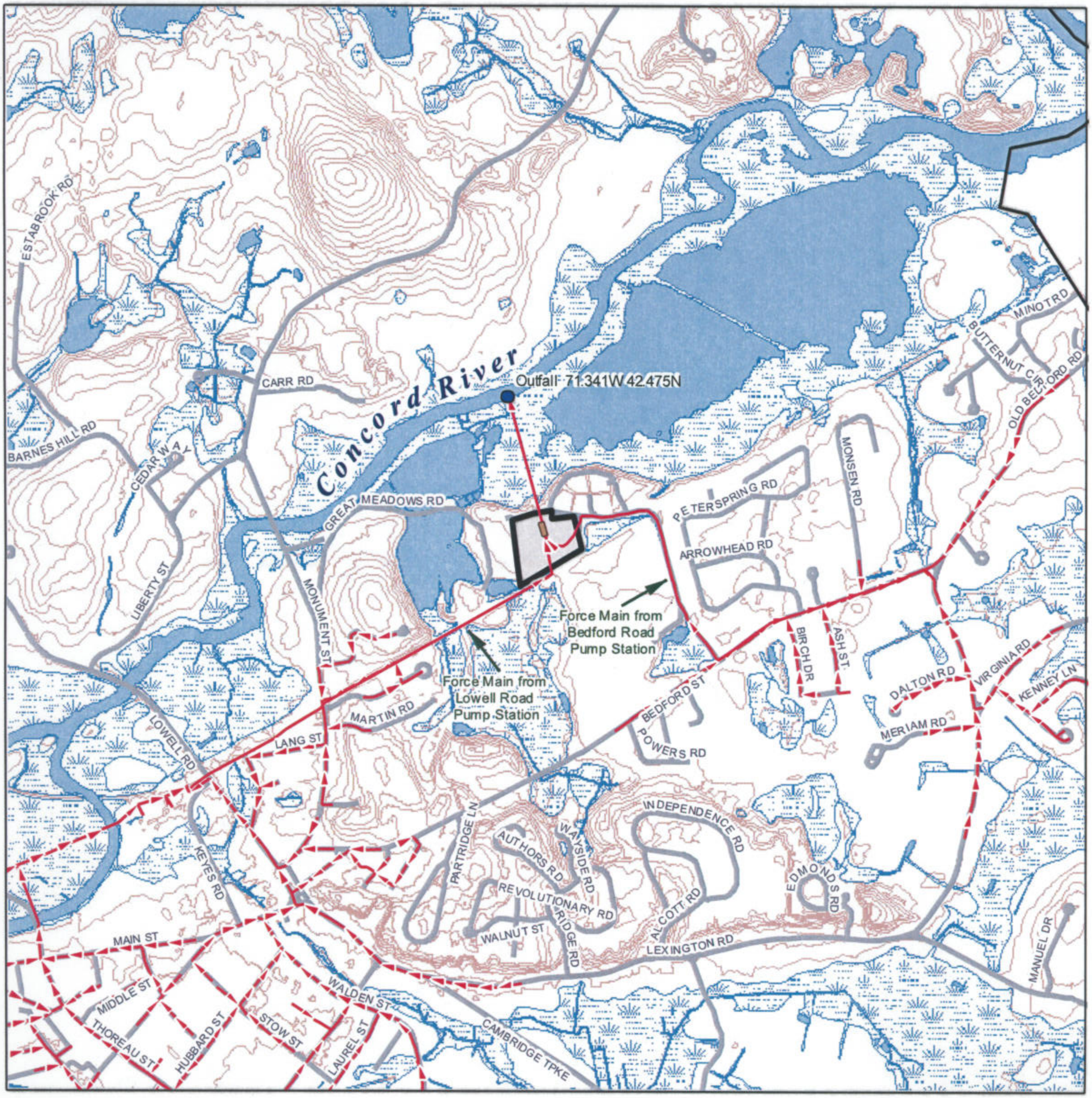
Robin L. Johnson
EPA New England – Region 1
5 Post Office Square, Suite 100
Mail Code OEP06-1
Boston, MA 02109-3912
Telephone: (617) 918-1045
Johnson.Robin@epa.gov

Kathleen Keohane, Massachusetts Department of Environmental Protection
Division of Watershed Management, Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608
Telephone: (508) 767-2856 FAX: (508) 791-4131
kathleen.keohane@state.ma.

____
Date

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

Town of Concord, Massachusetts



▨ WWTP Site

🟫 WWTP Building

● WWTP Outfall 001

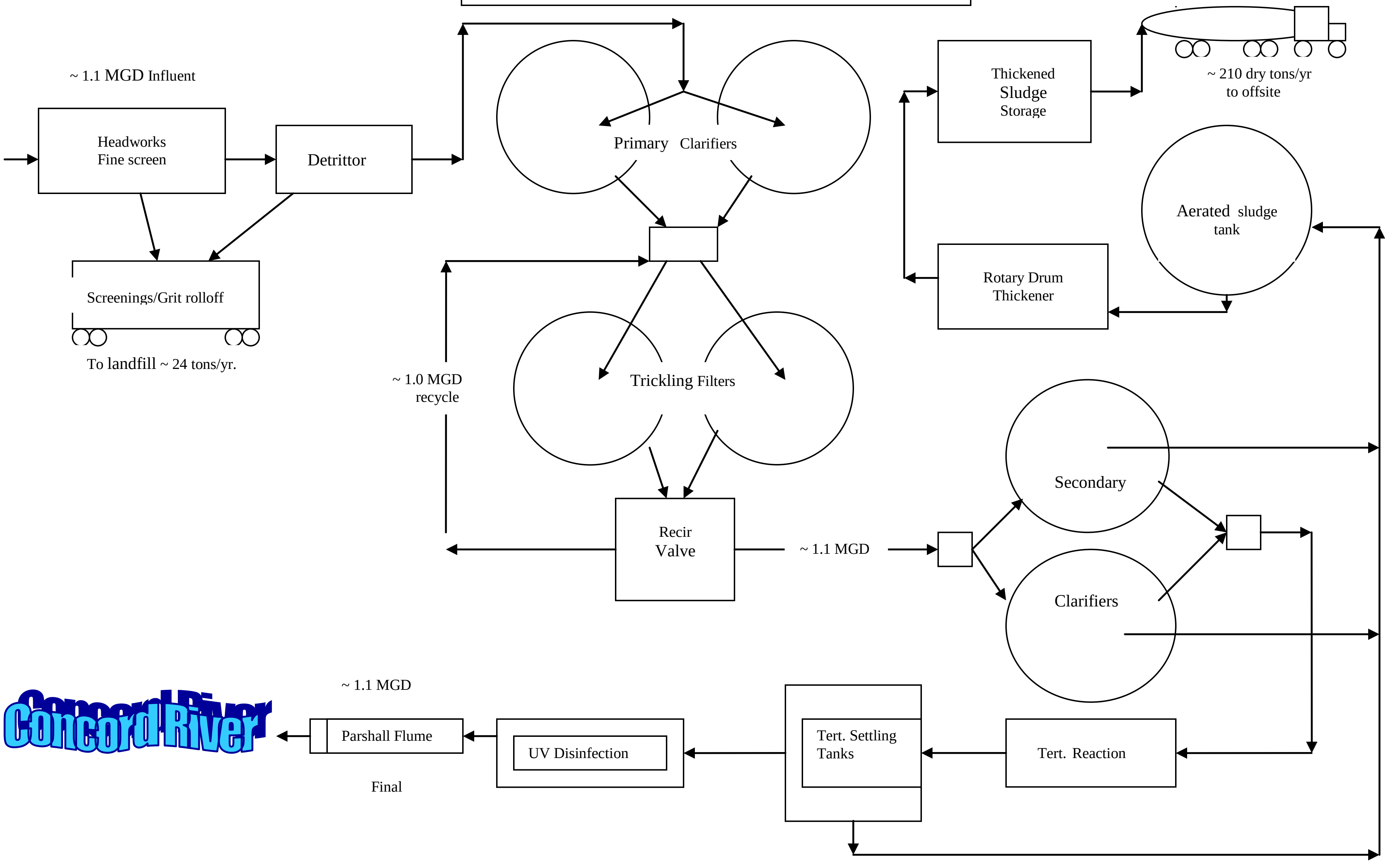
— Sanitary Sewer

Concord WWTP
MA0100668
Location Map

July 2010

0 0.1 0.2 Miles

Concord, Mass. Wastewater Treatment Facility
Process Flow Diagram



Appendix A

DMR SUMMARY - Concord WWTF

1/1/2009 - 12/31/2010

Monitoring Period End Date	Flow Max	Flow avg*	pH Min	pH Max	BOD, avg monthly loading	BOD, max daily loading	BOD, monthly avg	BOD, weekly avg	BOD, daily max	TSS, avg monthly loading	TSS, max daily loading	TSS, avg monthly	TSS, avg weekly	TSS, max daily
	MGD	MGD	s.u.	s.u.	lb/day	lb/day	mg/l	mg/l	mg/l	lb/day	lb/day	mg/l	mg/l	mg/l
01/31/2009	1.559	1.278	6.3	7.3	59.	79.	5.	7.	7.	95.	159.	9.	12.	13.
02/28/2009	1.24	1.1179	6.2	7.	45.	56.	5.	6.	6.	77.	116.	8.	10.	12.
03/31/2009	1.417	1.2382	6.2	7.04	40.	51.	4.	5.	5.	75.	104.	7.	10.	10.
04/30/2009	1.3583	1.1688	6.01	6.98	29.	33.	3.	4.	3.	15.	39.	2.	5.	4.
05/31/2009	1.131	.974	6.31	8.3	32.	47.	4.	5.	5.	13.	26.	2.	2.	3.
06/30/2009	.92	.82	6.	7.8	52.	75.	4.	5.	6.	25.	48.	2.	4.	4.
07/31/2009	1.19	.96	6.15	8.63	27.	34.	3.	4.	4.	26.	42.	3.	5.	5.
08/31/2009	1.134	.919	6.28	7.08	25.	37.	3.	4.	4.	22.	41.	3.	4.	5.
09/30/2009	.95	.839	6.32	6.78	50.	148.	3.	6.	10.	31.	92.	2.	4.	6.
10/31/2009	.947	.849	6.3	7.3	20.	29.	3.	4.	4.	15.	22.	2.	3.	3.
11/30/2009	1.097	.931	6.31	9.62	40.	62.	5.	6.	7.	80.	97.	10.	13.	13.
12/31/2009	1.224	1.096	6.38	6.93	41.	57.	4.	5.	6.	81.	144.	9.	16.	16.
01/31/2010	1.278	1.032	6.36	6.66	43.	67.	5.	6.	8.	63.	94.	7.	8.	9.
02/28/2010	2.09	1.12	6.11	7.66	40.	53.	5.	5.	6.	75.	135.	9.	10.	13.
03/31/2010	3.76	2.4	6.06	6.78	136.	269.	6.	9.	9.	283.	847.	12.	24.	25.
04/30/2010	3.213	1.89	6.28	6.8	58.	107.	4.	4.	4.	34.	65.	2.	6.	3.
05/31/2010	1.147	1.02	6.31	6.72	26.	38.	3.	4.	4.	14.	35.	2.	2.	4.
06/30/2010	.97	.83	6.15	6.71	20.	24.	3.	3.	3.	16.	25.	2.	3.	3.
07/31/2010	.753	.6731	6.16	6.47	18.	24.	3.	4.	4.	13.	24.	2.	3.	4.
08/31/2010	.979	.799	6.08	6.64	23.	51.	3.	5.	7.	20.	58.	3.	5.	8.
09/30/2010	1.	.82	6.08	6.76	16.	22.	2.	3.	3.	11.	21.	2.	2.	3.
10/31/2010	.972	.869	6.4	7.16	17.	23.	2.	2.	3.	11.	22.	2.	2.	3.
11/30/2010	1.02	.895	6.31	7.07	28.	38.	4.	4.	5.	56.	100.	7.	10.	13.
12/31/2010	1.093	.958	6.25	6.85	35.	43.	4.	5.	5.	88.	254.	11.	18.	30.
Jan 2006 limits	Report	1.2	6	8.3	300	450	30	45	Report	300	450	30	45	Report
Minimum	.753	.6731	6.	6.47	16.	22.	2.	2.	3.	11.	21.	2.	2.	3.
Maximum	3.76	2.4	6.4	9.62	300.	269.	6.	9.	10.	283.	847.	12.	24.	30.
Average	1.35	1.06	6.22	7.21	48.80	61.13	3.75	4.79	5.33	51.63	108.75	5.00	7.54	8.83
Standard Deviation	0.71	0.37	0.12	0.73	57.54	52.83	1.03	1.44	1.93	57.45	167.16	3.55	5.79	7.15
#measurement	24	24	24	24	25	25	25	24	24	24	25	25	25	24
#exceed 2006 limits	N/A	0	0	2	0	0	0	0	N/A	0	1	0	0	N/A

Appendix A

DMR SUMMARY - Concord WWTF

1/1/2009 - 12/31/2010

Monitoring Period End Date	Fecal coliform, geo avg	Fecal coliform, daily max	Dissolved oxygen	Total Phosphorus, monthly avg	Total Phosphorus, daily max	Ortho-phosphate, max daily	Ortho-phosphate, avg monthly	Ammonia, monthly avg	Ammonia, daily max	Aluminum, daily max	Aluminum, monthly avg
	#/100 ml	#/100 ml	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µg/l	µg/l
01/31/2009	2.	20.	9.5	.79	1.52	.05	.07	.96	1.01	2270.	2270.
02/28/2009	1.	2.	7.9	.98	1.28	.06	.11	1.03	1.51	2270.	2270.
03/31/2009	1.	4.	10.1	.51	.76	.05	.09	.87	.95	1510.	1510.
04/30/2009	1.	1.	9.2	.11	.18			.85	1.08	444.	444.
05/31/2009	1.	1.	9.8	.15	.28			.55	.91	737.	737.
06/30/2009	1.	1.	8.2	.2	.3			1.34	1.54	375.	375.
07/31/2009	2.	10.	8.5	.19	.32			.62	1.13	598.	598.
08/31/2009	1.	1.	8.3	.18	.25			.93	1.21	415.	415.
09/30/2009	1.	1.	8.	.2	.25			1.05	1.21	625.	625.
10/31/2009	1.	1.	8.6	.19	.39			1.24	1.67	283.	283.
11/30/2009	1.	2.	9.5	.76	.81	.38	.64	1.29	1.66	870.	870.
12/31/2009	2.	22.	9.6	.68	.91	.09	.12	1.88	2.21	1840.	1840.
01/31/2010	1.	4.	9.9	.66	.84	.16	.33	.55	.97	1260.	1260.
02/28/2010	1.	2.	10.	.96	1.02	.09	.12	.71	.76	1370.	1370.
03/31/2010	2.	9.	10.	.66	.99	.05	.07	1.36	1.81	1360.	1360.
04/30/2010	1.	6.	10.	.2	.28			.62	.67	577.	577.
05/31/2010	1.	1.	9.2	.19	.28			1.14	1.3	893.	893.
06/30/2010	1.	1.	8.7	.19	.26			.49	.61	662.	662.
07/31/2010	1.	1.	8.	.16	.27			.75	.92	329.	329.
08/31/2010	1.	2.	8.3	.19	.3			.98	1.48	1280.	1280.
09/30/2010	1.	2.	8.4	.19	.24			1.49	1.88	1210.	1210.
10/31/2010	1.	4.	7.8	.17	.28			.95	1.13	191.	191.
11/30/2010	1.	4.	9.2	.5	.75	.09	.28	2.81	4.18	609.	609.
12/31/2010	2.	36.	9.	.61	.78	.02	.02	.67	.78	2170.	2170.
Jan 2006 limits	200	400	5	Varies	Report	Report	Report	Report	Report	Report	Report
Minimum	1.	1.	7.8	.11	.18	.02	.02	.49	.61	191.	191.
Maximum	2.	36.	10.1	.98	1.52	.38	.64	2.81	4.18	2270.	2270.
Average	1.21	5.75	8.99	0.40	0.56	0.10	0.19	1.05	1.36	1006.17	1006.17
Standard Deviation	0.41	8.59	0.77	0.29	0.38	0.10	0.19	0.51	0.73	643.45	643.45
#measurement	24	25	24	24	24	10	10	24	24	24	24
#exceed 2006 limits	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix A
DMR SUMMARY - Concord WWTF
1/1/2009 - 12/31/2010

Whole Effluent Toxicity							
Date	LC50	C-NOEC	Copper (mg/l)	Zinc (mg/l)	Lead (mg/l)	Cadmium (mg/l)	Nickel (mg/l)
March-08	100	12.5	0.0116	0.0061	<0.0005	<0.0002	0.0019
June-08	60.2	100.	0.0099	0.0223	<0.0005	<0.0002	0.0022
September-08	100	100.	0.0069	0.0211	<0.0005	<0.0002	0.0024
December-08	100	100.	0.0081	0.0174	<0.0005	<0.0002	0.0023
March-09	100	100.	0.0076	0.0238	<0.0005	<0.0002	0.0053
June-09	100	100.	0.0055	0.0045	<0.001	<0.0002	0.0045
September-09	100	100.	<0.01	0.023	<0.04	<0.004	<0.01
December-09	100	100.	0.009	0.025	<0.0005	<0.0002	<0.01
March-10	100	100.	0.009	0.027	<0.0005	<0.0002	0.007
June-10	100	100.	0.008	0.015	<0.001	<0.0002	0.005
September-10	100	100.	0.006	0.016	<0.001	<0.0002	0.005
December-10	100	100.	0.016	0.035	<0.001	<0.0002	0.005
Limit	100.	Report	Report	Report	Report	Report	Report
Minimum	60.2	12.5	.0055	.0045	N/A	N/A	.0019
Maximum	100.	100.	.016	.035	N/A	N/A	.007
# measurements	21.	21.	21.	22.	23.	24.	25.
#exceed limit	1	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX B – 7Q10 AND DILUTION CALCULATIONS

To obtain an estimate of a 7Q10 flow at a point between the two USGS gages listed below, the drainage areas (DA) between them must be calculated and other flows included or excluded as explained below. All drainage area values for the locations below are estimated from USGS topographic maps and the USGS gazetteer of 1984 for the Merrimack River in which the SUASCO (Sudbury-Assabet-Concord) river basin is included. The streamflows were determined using DFlow 3.1b, a streamflow modeling computer program.

Lowell, MA USGS gage (01099500), 7Q10 for the period 1971 - 2000: **38 cfs**
Maynard, MA USGS gage (01097000), 7Q10 for the period 1971 - 2000: **14 cfs**(1)

Flow factor calculation for main stretch of river between Maynard and Lowell gages:

400 square miles -116 square miles = 284 sq. mi. (Lowell gage DA) (Maynard gage DA) (DA between Maynard and Lowell)

Low flow attributable to this stretch of river:

38 cfs -14 cfs -1.5 cfs(2) = 22.5 cfs (7Q10 @ Lowell) (7Q10 @ Maynard)

Flow factor for this stretch of river:

22.5 cfs / 284 square miles = **0.079 cfs/sq. mile**

Estimated 7Q10 flow at Concord MCI:

14 cfs + 1.5 cfs + (168 mi^2 - 116 mi^2) 0.079 = **20 cfs** (DA between Maynard gage and Concord MCI discharge)

Estimated 7Q10 flow at Concord POTW:

20 cfs + (345 mi^2 -168 mi^2) 0.079 = **34 cfs** (DA between Concord MCI and Concord POTW)

(1). This is the estimated 7Q10 at the Maynard USGS gage.
(2). This is the average effluent flow from the Maynard WWTP from the period of June to Sept of 2009-2010, reflecting the low flow season over that period. This discharge is just downstream of the Maynard gage.

Design Flow Dilution:

Design Flow = 1.2 MGD x 1.55(3) cfs/MGD = 1.9 cfs

$$\frac{\text{Design flow + 7Q10 flow}}{\text{Design flow}} = \frac{1.9\text{ cfs} + 34\text{ cfs}}{1.9\text{ cfs}} = \mathbf{19} = \text{Dilution Factor}$$

(3). This is the conversion factor between cubic feet per second and million gallons per day.

Appendix C
Aluminum Calculations

Background Al (from WET chemistry)	
3/10/2008	183
6/18/2008	154
9/8/2008	235
12/8/2008	118
3/18/2009	76
6/10/2009	29.4
9/14/2009	50
12/7/2009	72
3/8/2010	62
6/7/2010	75
9/13/2010	73
12/13/2010	565
Average	141.0333333
Median	75.5

originally non-detect. Changed to 1/2 detection level for this analysis

Appendix C
Aluminum Calculations

Aluminum RP Analysis

Al, no ND, >10 samples, Lognormal distribution

Date	Al (ug/L)	Yi lnAl (ug/L)	$(y_i - u_y)^2$
01/31/2009	2270.	7.7275	0.972854
02/28/2009	2270.	7.7275	0.972854
03/31/2009	1510.	7.3199	0.334852
04/30/2009	444.	6.0958	0.416511
05/31/2009	737.	6.6026	0.019214
06/30/2009	375.	5.9269	0.663044
07/31/2009	598.	6.3936	0.120833
08/31/2009	415.	6.0283	0.508259
09/30/2009	625.	6.4378	0.092082
10/31/2009	283.	5.6454	1.200678
11/30/2009	870.	6.7685	0.000745
12/31/2009	1840.	7.5175	0.602672
01/31/2010	1260.	7.1389	0.158138
02/28/2010	1370.	7.2226	0.231712
03/31/2010	1360.	7.2152	0.224713
04/30/2010	577.	6.3578	0.146964
05/31/2010	893.	6.7946	0.00285
06/30/2010	662.	6.4953	0.060484
07/31/2010	329.	5.7961	0.893296
08/31/2010	1280.	7.1546	0.170911
09/30/2010	1210.	7.0984	0.127574
10/31/2010	191.	5.2523	2.216906
11/30/2010	609.	6.4118	0.108493
12/31/2010	2170.	7.6825	0.88601
01/31/2011	2250.	7.7187	0.955475

Aluminum- (Lognormal distribution, no ND)

Daily Maximum Limit Derivation

u_y = Avg of Nat. Log of daily Discharge (lbs/day) = 6.74120

σ_y = Std Dev. of Nat Log of daily discharge = 0.70970

$\Sigma (y_i - u_y)^2$ = 12.08812

k = number of daily samples = 25

$\sigma_y{}^2$ = estimated variance = $(\Sigma[(y_i - u_y)^2]) / (k-1)$ = 0.50367

Daily Max Limit = exp (u_y + 2.326*σ_y)

Daily Max Limit = 4411.45 ug/L

(Lognormal distribution, 99th percentile)

Average Monthly Limit Derivation

Number of samples per month, n = 1

E(x) = Daily Avg = exp(u_y + 0.5 $\sigma_y{}^2$) = 1089.02403

V(x) = Daily Variance = exp(2u_y + $\sigma_y{}^2$) * [exp($\sigma_y{}^2$) - 1] = 776559.07235

$\sigma_n{}^2$ = Monthly Average variance = ln{ V(x) / (n[E(x)]^2) + 1} = 0.50367

σ_n = Monthly Average standard deviation = $\sigma_n{}^2$^(0.5) = 0.70970

u_n = n-day monthly average = ln(E(x)) - 0.5$\sigma_n{}^2$ = 6.74120

Monthly Average Limit = exp (u_n + 1.645*σ_n)

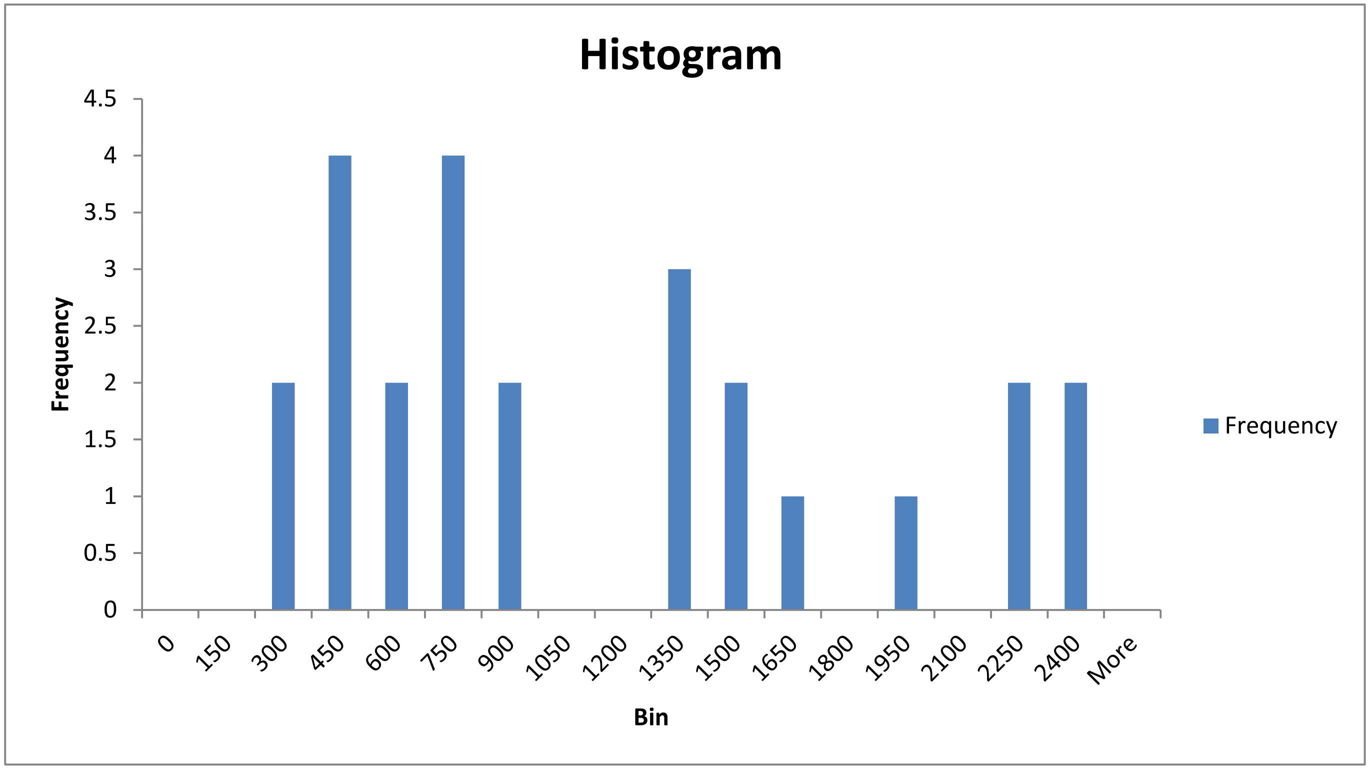
Monthly Avg Limit* = 2720.73 ug/L

(Lognormal distribution, 95th percentile of average monthly values)

*Based on sampling frequency of 1 time per month

Appendix C
Aluminum Calculations

Bin	*Frequency*
0	0
150	0
300	2
450	4
600	2
750	4
900	2
1050	0
1200	0
1350	3
1500	2
1650	1
1800	0
1950	1
2100	0
2250	2
2400	2
More	0



APPENDIX D – 30Q10 LOW FLOW AND DILUTION FACTOR CALCULATIONS

Summer (April 1st – October 31st) 30Q10 Calculations

Lowell, MA USGS gage (01099500), 30Q10 for the period 1981 - 2000: **55.3 cfs**
Maynard, MA USGS gage (01097000, 30Q10 for the period 1981 - 2000: **19.8 cfs** (1)

Flow factor calculation for main stretch of river between Maynard and Lowell gages:

400 square miles -116 square miles = 284 sq. mi. (Lowell gage DA) (Maynard gage DA) (DA between Maynard and Lowell)

Low flow attributable to this stretch of river:

55.3 cfs -19.8 cfs -1.7 cfs(b) = 33.8 cfs (30Q10 @ Lowell) (30Q10 @ Maynard)

Flow factor for this stretch of river:

33.8 cfs / 284 square miles = **0.12 cfs/sq. mile**

Estimated 30Q10 flow at Concord MCI:

19.8 cfs(a)+ 1.7 cfs(b) + (168 mi^2 - 116 mi^2) 0.12 = **28 cfs** (DA between Maynard gage and Concord MCI discharge)

Estimated 30Q10 flow at Concord WWTP:

28 cfs + (345 mi^2 -168 mi^2) 0.12 = **49 cfs** (DA between Concord MCI and Concord WWTP)

(a) This is the estimated 30Q10 at the Maynard USGS gage.

(b) This is the average effluent flow from the Maynard WWTP from the period of 2009-2010, reflecting the low flow season over that period. This discharge is just downstream of the Maynard gage.

(c) This is the conversion factor between cubic feet per second and million gallons per day.

Design Flow Dilution:

Design Flow = 1.2 MGD x 1.55(c) cfs/MGD = 1.9 cfs

$$\frac{\text{Design flow} + \text{30Q10 flow}}{\text{Design flow}} = \frac{1.9 \text{ cfs} + 49 \text{ cfs}}{1.9 \text{ cfs}} = \mathbf{27} = \text{Dilution Factor}$$

APPENDIX E
AMMONIA CALCULATIONS

Summer Ammonia Criteria (at 22° C and pH 7.2, salmonids present, early fish life stages present)[1]

Acute:	19.7 mg/l
Chronic:	3.33 mg/l

Ambient Data (from OARS 2009-2010 data, Concord at Lowell Road, Station ABT-010[2])

Date	pH	Temperature
6/21/2009	7.09	19.86
7/19/2009	7.14	22.91
8/16/2009	7.26	23.51
6/13/2010	7.16	18.51
7/18/2010	7.43	26.17
8/22/2010	7.59	21.37
Median	7.21	22.14

Reasonable Potential Analysis for Summer Ammonia Discharges

$$C_r = \frac{Q_dC_d + Q_sC_s}{Q_r}$$

Q_d = effluent flow, i.e. facility design flow = 1.2 MGD
C_d = effluent pollutant concentration = 2.47 mg/l (projected highest data point)
Q_s = 30Q10 flow of receiving water = 49 cfs = 31.6 MGD
C_s = upstream concentration = 0 mg/l
Q_r = receiving water flow = $Q_s + Q_d$ = 1.2 MGD + 31.6 MGD = 32.8 MGD
C_r = receiving water concentration = ?

$$C_r = \frac{(1.2\text{ MGD} \times 2.47\text{ mg/l}) + (31.6\text{ MGD} \times 0\text{ mg/l})}{32.8\text{ MGD}}$$

$$C_r = 0.09\text{ mg/l} < 3.33\text{ mg/l (summer chronic criterion)}$$

There is no reasonable potential for the discharge to cause or contribute to an exceedance of the acute or chronic water quality criterion.

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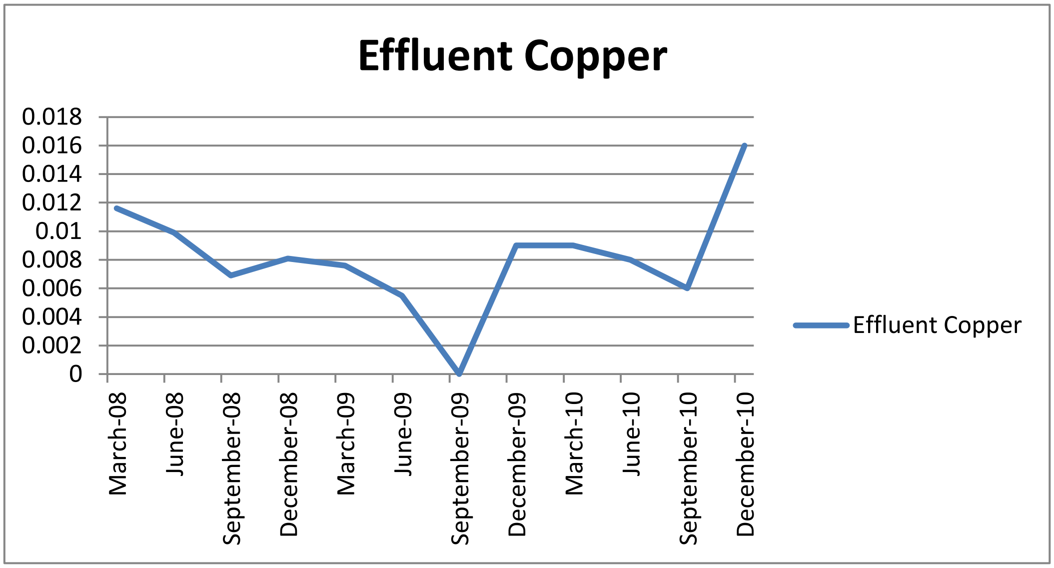
[1] Pages 86-87 of 1999 Update of Ambient Water Quality Criteria for Ammonia (EPA-822-R-99-014)

[2] http://www.oars3rivers.org/sites/default/files/Data-2009-2010-Appendix-II.pdf

Appendix F
Copper Calculations

	Effluent		Upstream	
	mg/l	ug/l		
March-08	0.0116	11.6	0.00445	0.00445
June-08	0.0099	9.9	0.0034	0.0034
September-08	0.0069	6.9	0.0041	0.0041
December-08	0.0081	8.1	0.0017	0.0017
March-09	0.0076	7.6	0.0013	0.0013
June-09	0.0055	5.5	0.0093	0.0093
September-09	<0.01		<0.01	0.0005
December-09	0.009	9	0.003	0.003
March-10	0.009	9	0.003	0.003
June-10	0.008	8	0.004	0.004
September-10	0.006	6	0.002	
December-10	0.016	16	0.001	
	0.008873	mean	0.003386	0.003475
		median	0.0034	



Freshwater Metals Criteria and Limits

Step 1: Input the following values (highlighted in green)

7Q10	21.90	MGD
Design flow	1.2	MGD
Hardness =	56	mg/L

Step 2: The spreadsheet calculates the Total Recoverable Limits

Step 3: Input background metals values (if available)

Metal	m_A	b_A	m_C	b_C	CF acute	CF chronic	Background (ug/l)	Dissolved Criteria	
								Acute Criteria (CMC) (ug/L)	Chronic Criteria (CCC) (ug/L)
Hardness Dependent Metals									
Cadmium	1.0166	-3.9240	0.7409	-4.7190	0.968	0.933	0.000	1.15	0.16
Chromium III	0.8190	3.7256	0.8190	0.6848	0.316	0.860	0.000	354.37	46.10
Copper	0.9422	-1.7000	0.8545	-1.7020	0.960	0.960	3.000	7.78	5.46
Lead	1.2730	-1.4600	1.2730	-4.7050	0.875	0.875	0.000	34.17	1.33
Nickel	0.8460	2.2550	0.8460	0.0584	0.998	0.997	0.000	286.70	31.84
Silver	1.7200	-6.5900	---	---	0.850	---	0.000	1.19	---
Zinc	0.8473	0.8840	0.8473	0.8840	0.978	0.986	0.000	71.70	72.28
Non-Hardness Dependent Metals									
Arsenic					1.000	1.000	0.000	340.00	150.00
Chromium VI					0.982	0.962	0.000	16.00	11.00
Mercury					0.850	0.850	0.000	1.40	0.77
Aluminum					---	---	75.000	---	---

Source: National Recommended Water Quality Criteria 2002
http://www.epa.gov/waterscience/criteria/wqctable/

Step 4: Identifiy the limit (highlighted in blue)

Total Recoverable Criteria		Total Recoverable Limit	
Acute Criteria (CMC) (ug/L)	Chronic Criteria (CCC) (ug/L)	Maximum Daily Limit (ug/L)	Monthly Ave Limit (ug/L)
1.18	0.18	22.8	3.4
1121.43	53.60	21587.6	1031.8
8.11	5.68	101.3	54.7
39.03	1.52	751.3	29.3
287.28	31.94	5530.1	614.8
1.40	---	26.9	
73.31	73.31	1411.2	1411.2
340.00	150.00	358.6	2887.5
16.29	11.43	17.2	220.1
1.65	0.91	1.7	17.4
750.00	87.00	13068.8	306.0

Hardness (mg/l)

	Background	Effluent
March-08	23.8	81.2
June-08	60.6	83.3
September-08	30.8	77
December-08	42.6	78.2
March-09	44.2	89.4
June-09	63.8	97.2
September-09	54.9	96
December-09	42.2	89.4
March-10	40.5	88.9
June-10	60.3	86
September-10	81.3	86
December-10	58.7	84.2
median	54.9	86
average	52.71818182	86.87273

Hardness Analysis

Conc downstream = (QeCe+QsCs)/(Qe+Qs) 56.51311

Qe	1.2	MGD	Design flow
Ce	86.00	mg/l	Effluent Hardness
Qs	21.93548	MGD	7Q10 Stream flow
Cs	54.9	mg/l	Background concentration

Reasonable Potential Analysis
data with ND, >10 samples, lognormal distribution

Dilution Factor:	19

Date	Cu* (ug/l)	ln/Cu (ug/l)	$(y_i - u_y)^2$
March-08	11.6	2.4510	0.0968339
June-08	9.9	2.2925	0.0233207
September-08	6.9	1.9315	0.0433898
December-08	8.1	2.0919	0.0023001
March-09	7.6	2.0281	0.0124714
June-09	5.5	1.7047	0.1892908
September-09	0*		4.5788454
December-09	9	2.1972	0.0032949
March-10	9	2.1972	0.0032949
June-10	8	2.0794	0.003646
September-10	6	1.7918	0.1211487
December-10	16	2.7726	0.4003916

Cu- (Lognormal distribution, ND)

Daily Maximum Effluent Derivation (some measurements < detection limit)

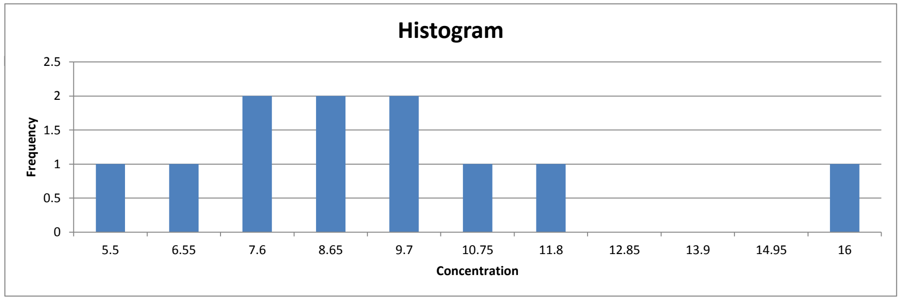
Detection Limit** =	10.0	
u_y = Avg of Nat. Log of daily Discharge (mg/L) =	2.13982	
S $(y_i - u)^2$ =	5.47823	
k = number of daily samples =	12	
r = number of non-detects =	1	
s_y^2 = estimated variance = $(S[(y_i - u_y)^2]) / (k-r-1)$ =	0.54782	
s_y = standard deviation = square root s_y^2 =	0.74015	
δ = number of nondetect values/number of samples =	0.08333	
z 99th percentile=z-score[(0.99-δ)/(1-δ)] =	2.29352	
z 95th percentile=z-score[(0.95-δ)/(1-δ)] =	1.602292655	
Daily Max = exp (u_y + z-score*s_y)		
99th Percentile Daily Max Estimate=	**46.4034**	**ug/l**
99th Percentile Daily Max Estimate including dilution factor=	**2.4423**	**ug/l**
95th Percentile Daily Max Estimate =	**27.8202**	**ug/l**
95th Percentile Daily Max Estimate including dilution factor=	**1.4642**	**ug/l**

** Detection limit here is the detection limit that resulted in the greatest number of Non Detects in the dataset

Histogram 1

max	16	
min	5.5	*not including NDs
number of bins	10	*not including min bin -
bin separation	1.05	

	Bin	count
0	5.5	1
1	6.55	1
2	7.6	2
3	8.65	2
4	9.7	2
5	10.75	1
6	11.8	1
7	12.85	0
8	13.9	0
9	14.95	0
10	16	1

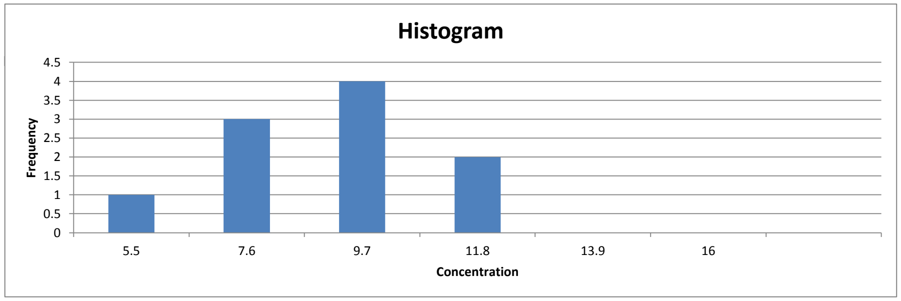


*ND values not plotted

Histogram 2

max	16	
min	5.5	*not including NDs
number of bins	5	*not including min bin -
bin separation	2.1	

	Bin	count
0	5.5	1
1	7.6	3
2	9.7	4
3	11.8	2
4	13.9	0
5	16	0



*ND values not plotted

Acute

Conc downstream = (QeCe+QsCs)/(Qe+Qs) 5.251263

Qe	1.2	MGD	Design flow
Ce	46.40	ug/l	Projected copper
Qs	21.93548	MGD	7Q10 Stream flow
Cs	3	ug/l	Background concentration

Chronic

Conc downstream = (QeCe+QsCs)/(Qe+Qs) 4.287382

Qe	1.2	MGD	Design flow
Ce	27.82	ug/l	Projected copper
Qs	21.93548	MGD	7Q10 Stream flow
Cs	3	ug/l	Background concentration

(calculations also in Fact Sheet)

Appendix G

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

Di(2-ethylhexyl) phthalate (DEHP)

CAS # 117-81-7

Division of Toxicology ToxFAQs™ **September 2002**

This fact sheet answers the most frequently asked health questions (FAQs) about di(2-ethylhexyl) phthalate (DEHP). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Di(2-ethylhexyl) phthalate (DEHP) is found in many plastics. Exposure to DEHP is generally very low. Increased exposures may come from intravenous fluids delivered through plastic tubing, and from ingesting contaminated foods or water. DEHP is not toxic at the low levels usually present in the environment. In animals, high levels of DEHP damaged the liver and kidney and affected the ability to reproduce. DEHP has been found in at least 733 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is di(2-ethylhexyl) phthlate?

Di(2-ethylhexyl) phthlate (DEHP) is a manufactured chemical that is commonly added to plastics to make them flexible. DEHP is a colorless liquid with almost no odor.

DEHP is present in plastic products such as wall coverings, tablecloths, floor tiles, furniture upholstery, shower curtains, garden hoses, swimming pool liners, rainwear, baby pants, dolls, some toys, shoes, automobile upholstery and tops, packaging film and sheets, sheathing for wire and cable, medical tubing, and blood storage bags.

What happens to DEHP when it enters the environment?

❑ DEHP is everywhere in the environment because of its use in plastics, but it does not evaporate easily or dissolve in water easily.
❑ DEHP can be released in small amounts to indoor air from plastic materials, coatings, and flooring.
❑ It dissolves faster in water if gas, oil, or paint removers are present.
❑ It attaches strongly to soil particles.
❑ DEHP in soil or water can be broken down by microorganisms into harmless compounds.
❑ DEHP does not break down easily when it is deep in the soil or at the bottom of lakes or rivers.
❑ It is in plants, fish, and other animals, but animals high on the food chain are able to break down DEHP, so tissue levels are usually low.

How might I be exposed to DEHP?

DEHP is usually present at very low levels in:
❑ Medical products packaged in plastic such as blood products.
❑ Some foods packaged in plastics, especially fatty foods like milk products, fish or seafood, and oils.
❑ Well water near waste sites.
❑ Workplace air or indoor air where DEHP is released, but usually not at levels of concern.
❑ Fluids from plastic intravenous tubing if used extensively as for kidney dialysis.

How can DEHP affect my health?

At the levels found in the environment, DEHP is not expected to cause harmful health effects in humans. Most of what we know about the health effects of DEHP comes from studies of rats and mice given high amounts of DEHP.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry