February 3, 2000

Robert Smith, Chief
Water Bureau/Standards and Planning Division
Connecticut Department of Environmental Protection
79 Elm Street
Hartford, CT 01606

Dear Mr. Smith:

Thank you for the submittal of **A Total Maximum Daily Load Analysis for Factory Brook, Salisbury, Connecticut** for copper, lead, zinc, ammonia and chlorine. This surface water is included on Connecticut's 1998 303(d) list and was targeted for TMDL development by April 1st, 2000. This Total Maximum Daily Load (TMDL) analysis was developed to address the aquatic life support impairments in Factory Brook due to point and nonpoint sources of pollution.

The U.S. Environmental Protection Agency - New England (EPA-New England) hereby approves Connecticut's final TMDL analysis for Factory Brook, received by EPA-New England on October 19th, 1998. EPA-New England has determined that the Factory Brook TMDL meets the requirements of §303(d) of the Clean Water Act (CWA), and EPA's implementing regulations (40 CFR Part 130).

The submittal includes all the required elements of a TMDL; loading capacity, load allocations, waste load allocations, margin of safety seasonal variation, and public participation process. Consistent with EPA policies, the TMDL also includes an implementation plan which addresses the primary sources contributing to the impairment. In addition, CT DEP has provided reasonable assurances that the necessary controls will be implemented in a timely manner.

My staff and I look forward to continued cooperation with CT DEP in exercising our shared responsibility to implement the requirements under Section 303(d) of the CWA. If you have any questions or comments regarding the attached approval documentation, please contact me at (617) 918-1500, or Jeanne Voorhees at (617) 918-1686.

Sincerely,

Linda M. Murphy, Director
Office of Ecosystem Protection

Enclosure

cc: Elizabeth Wikfors, CT DEP
Lee Dunbar, CT DEP
Ron Manfredonia, EPA
Ann Williams, EPA
Lynne Hamjian, EPA
Roger Janson, EPA

EPA-NEW ENGLAND'S APPROVAL DOCUMENTATION
FOR CT DEP'S FACTORY BROOK TMDL ANALYSIS

EFFECTIVE DATE: February 3, 2000

REVIEW ELEMENTS OF TMDLs

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

*Connecticut Department of Environmental Protection (CT DEP) submitted **A Total Maximum Daily Load Analysis for Factory Brook, Salisbury, Connecticut** on October 19, 1999 requesting EPA-New England's review and approval of TMDLs for copper, lead, zinc, ammonia and chlorine. The TMDL submission includes the following documents:*

- *Submittal letter dated October 6, 1999 and received by EPA-New England October 19, 1999*
- *Municipal NPDES permit issued September 30, 1999 to the Town of Salisbury, CT*
- *TMDL Cover Sheet (July 1999)*
- *Factory Brook Docket (September 15, 1999)*
- *Record of Public Notice: Notice of Tentative Determination (Hartford Courant, 8/9/99)*
- *Response to Comments including Provisions for Revising the TMDL (8/14/99)*
- *A Total Maximum Daily Load Analysis for Factory Brook, Salisbury CT (9/30/99)*

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments, or chlorophyl *a* and phosphorus loadings for excess algae.

a. Surface Water, Pollutant of Concern, and Priority Ranking

Factory Brook was originally identified on Connecticut's 1996 303(d) list of waterbodies not meeting water quality standards. In 1996, Factory Brook was prioritized as a surface water requiring the development of TMDLs by April 1st, 1998. The basis for the initial 1996 listing resulted from desktop dilution calculations. Calculation results demonstrated that water quality based discharge permit limits were required for the Salisbury sewage treatment plant to achieve water quality standards in Factory Brook. Initially, copper, lead, zinc and ammonia were identified by the dilution calculations as the pollutants requiring TMDLs. Factory Brook remained on the 1998 list, and was prioritized for TMDL development by April 1st, 2000. Subsequent to the 1996 and 1998 listings, chlorine was also included as a pollutant requiring TMDL development. The TMDLs presented in the final document are proposed for copper, lead, zinc, ammonia and chlorine.

As indicated on the 1998 303(d) list, the pollutants identified have resulted in impairments to aquatic life uses. The assessment of aquatic life use attainment was based on a Department of Environmental Protection (DEP) fisheries survey (1997) and chronic toxicity testing of the Salisbury sewage treatment plant's discharge. Based on the fisheries survey and chronic toxicity tests, Factory Brook was assessed as "partially supporting aquatic life uses" downstream of the treatment plant. CT DEP elected to use methods consistent with the "weight-of-evidence" approach to assess use attainment recommended in EPA guidance under §305(b) of the Clean Water Act (see TMDL document, page 2).

EPA-New England has determined that the Factory Brook TMDL submission provides an adequate description of the surface water, pollutant(s) of concern, and priority ranking for Factory Brook as it appears on the 1998 303(d) list of impaired surface waters.

b. Point And Nonpoint Sources: Description, Magnitude, and Location

The primary source of pollutants originates from a single permitted point source discharge; the Salisbury sewage treatment plant. The Salisbury treatment plant is located in the Factory Brook watershed, which remains within the boundary of the Town of Salisbury in northwest Connecticut (see TMDL, Figure 1, Locus Map). There are no other point sources in the Factory Brook watershed, nor are future point sources expected (see TMDL, page 5). The Salisbury treatment plant is solely responsible for point source contributions of the identified pollutants. It is considered a minor NPDES facility, and permit reissuance occurred on September 30, 1999. Prior to permit reissuance the treatment plant had been operating under the November 12, 1985 permit, which did not include metals or ammonia limits. The new permit has metals and ammonia limits that were calculated based on the WLAs in the TMDL. In addition, the new permit requires chlorine disinfection to be replaced by an alternative method of disinfection by May 1, 2001.

Background and nonpoint sources of the pollutants of concern are quantified by using available monitoring data from other CT streams with similar watershed characteristics. Adequate data was unavailable to distinguish between contributions of pollutants from nonpoint and natural background sources. Thus, the load allocations include both natural background and potential nonpoint source contributions. This approach is appropriate when meaningful data is unavailable

to distinguish between nonpoint and natural background sources, and in cases, such as this, when the primary source of pollutants is attributed to a single point source.

CTDEP considered the potential for nonpoint source loadings by evaluating land use coverage, which is predominately forest (approximately 68 %) with low to medium density development (approximately 3 %). Since the Factory Brook watershed is predominantly undeveloped, CT DEP concludes that nonpoint sources are not a significant contributor to total pollutant loads to Factory Brook. EPA supports this conclusion based on our review of literature, and the land use/land cover statistics for the Factory Brook watershed (see TMDL, Figure 2 and accompanying GIS generated Land Use/Land Cover Statistics table).

Arnold and Gibbons (1996) believe that if detailed site information is unavailable, impervious surface area can serve as a feasible and cost-effective means for addressing water pollution. Imperviousness can estimate or predict cumulative water resource impacts. Research consistently demonstrates a strong correlation between imperviousness of a watershed and health of a receiving water. In particular, Arnold and Gibbons (1996), explain the relationship between area of impervious surface area and stream degradation; specifically, there is a consistent relationship demonstrating that with increasing impervious surface area in a watershed there is an decrease in stream integrity/health. Also, Schueler (1992, in Arnold and Gibbons 1996) was able to develop thresholds values of imperviousness at which degradation occurs; degradation first occurs at 10% impervious surface area, and at 30% degradation becomes so severe as to become almost unavoidable. Schueler (1992, in Arnold and Gibbons 1996) develops three categories of stream health based on these thresholds; less than 10% imperviousness is "protected," 10% - 30% is "impacted," and greater than 30% is "degraded."

Review of Factory Brook watershed's land use/land cover categories and associated percent coverage, reveals that approximately 2-3% of the Factory Brook watershed includes impervious surface. Based on the total percent of impervious surface area in the Factory Brook watershed, we agree that, at this magnitude, nonpoint sources are not likely to be significant contributors to total pollutant loads to Factory Brook water, and that water quality degradation due to nonpoint source pollution is currently insignificant.

EPA-New England has determined that the Factory Brook TMDL submission adequately identifies and describes the point and nonpoint sources of pollutants including the magnitude and location of these sources.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard

is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

a. Description of the Applicable Water Quality Standards

The TMDL document appropriately describes the applicable Water Quality Standards for Factory Brook. Factory Brook is designated as a Class A surface water from the headwaters to the outfall at the Salisbury sewage treatment plant. Below the outfall, Factory Brook is designated Class B, reflecting the presence of the treatment plant discharge. The impaired segment of Factory Brook is located in the Class B segment located between the outfall and the brooks confluence with Salmon Brook. The designated uses for Class B waters include recreational use; fish and wildlife habitat; agricultural and industrial supply and other legitimate uses including navigation (CT DEP, 1997). As indicated on the 1998 303(d) list, the pollutants identified have resulted in impairments to aquatic life uses. The assessment of aquatic life use attainment was based on a CT DEP fisheries survey in 1997 and chronic toxicity testing of the Salisbury sewage treatment plant's discharge. Based on the fisheries survey and chronic toxicity tests, Factory Brook was assessed as "partially supporting aquatic life uses" downstream of the treatment plant.

b. Applicable Numeric Targets

The applicable numeric water quality criteria (acute and chronic) for dissolved metals, copper, lead, and zinc, and chlorine and ammonia (summer and winter) are identified in the TMDL document as the numeric targets for developing the TMDLs. Although, the numeric criteria for copper, lead, and zinc are expressed as dissolved metals, the TMDLs were established as total recoverable metals to for consistency with the unit expression of permit effluent limits for metals (see TMDL document Table 1, page 4). These numeric water quality criteria are consistent with CT DEP's water quality standards (CT DEP, 1997).

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity (LC) of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a *critical condition* must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the

waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. *Critical condition*s are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. *Critical conditions* are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

a. Loading Capacity

The Factory Brook TMDL submission identifies the Loading Capacities (LCs) for each of the pollutants in Table 2 of the TMDL document (page 7). Loading capacity calculations for each pollutant were performed using a steady-state water quality model under critical low flow conditions. The LC for each identified pollutant was calculated by multiplying the waterbody's base low flow rate (equal to the7Q10 flow plus the treatment plant's design flow) by the adopted numeric water quality criteria. Individual LC calculations were applied to achieve consistency with acute and chronic criteria under critical base low flow (BLF) conditions. Loading capacity calculations and results appear in Attachments 1- 5 for each of the identified pollutants. Based on EPA - New England's review and analysis provided under section 5, Waste Load Allocations (page 11), we believe the estimated LCs are sufficient to meet WQS.

b. Assumptions

The application of the steady-state model included several assumptions regarding the fate of pollutants after discharging to Factory Brook and flow condition. The model assumed pollutants behaved conservatively after discharge to Factory Brook (see TMDL, page 4). Specifically, the model assumed that all metals were present in the dissolved phase without adsorption to particulate and the absence of attenuation, except through dilution. As a result of these conservative assumptions, and based on the analysis presented in section 5 of this document (page 9-11), EPA-New England concludes that the TMDLs will likely result in the attainment of Water Quality Standards during average discharge conditions from the treatment plant. Applying these assumptions will likely result in an overestimation of downstream concentrations since adsorption and attenuation will actually occur. Also, the model analysis assumed the simultaneous occurrence of low flow conditions (7Q10) and maximum pollutant loading from the treatment plant. This assumption represents the critical condition; a combination of worst-case assumptions regarding flow, and effluent quality and quantity. Each of these assumed conditions, by itself, have a low probability of occurrence, and the combination of conditions is rarely, if ever, expected to occur providing the Salisbury treatment facility is in compliance with the permit limits. Overall, the steady-state water quality model applied in this TMDL analysis is consistent with EPAs ***Technical Support Document for Water Quality-based Toxics Control*** *(US EPA, March 1991).*

Predicting toxicity of metals and ultimate fate of metals in the aquatic environment is complex due to several factors (i.e. pH, alkalinity, etc.) and requires site specific data to understand . It is likely that even with site-specific data there remains some uncertainties associated with predicting the ultimate fate and toxicity of the pollutants. Considering the absence of site specific metals data, CT DEP took an approach that incorporates conservative assumptions to help ensure the protection of aquatic resources. As a result of these conservative assumptions, and based on the

analysis presented above, EPA-New England concludes that the TMDLs will likely result in the attainment of Water Quality Standards during average discharge conditions from the treatment plant.

c. Strengths and Weaknesses

The assumptions regarding the chemical phase of metals (e.g. dissolved) and ultimate fate of pollutants after discharge to Factory Brook represent a conservative approach used in the model and can be considered as strengths in the analysis. Connecticut DEP considered that metals are in the most toxic, bioavailable form (e.g. dissolved), and that no attenuation, except through dilution, would occur. If in-stream data were collected, it would be expected that some portion of the discharged metals would not be bioavailable, and that some portion of the pollutants would be attenuated through natural processes. Rather than expending resources and time to collect in-stream data that could be used to predict the quantity of each metal that is dissolved, or adsorbed to particulate, or be used to determine attenuation, Connecticut DEP chose a simple and conservative approach to ensure the likelihood that water quality standards will be attained.

One weakness in the analysis is the unavailability of site-specific data to establish the nonpoint source and natural background loadings of the pollutants. Considering that CT DEP relied upon measured concentrations in other surface waters, nonpoint and/or natural background source contributions could be either higher or lower than estimated for Factory Brook. However, CT DEP based their estimates of nonpoint and natural background sources on reasonable, conservative assumptions (see TMDL document, page 5). EPA-New England believes these assumptions are reasonable (see 8 for an explanation).

d. Critical Conditions

The steady-state model calculated the TMDLs under critical conditions representing worst-case assumptions regarding flow (7Q10), effluent quality, and potential to cause environmental effects. CT DEP appropriately defined the critical condition for low flow event as the seven-day, ten year low flow (7Q10). This is also consistent with CT's WQS, in which the 7Q10 represents the minimum low flow to which criteria apply (CT DEP, 1997). Additionally, since the Salisbury Treatment Plant was determined to be the dominant source of pollutants of concern and nonpoint source contributions were determined to be minimal, EPA-New England agrees that the highest concentrations of pollutants are expected under low flow conditions rather than during storm events when nonpoint sources pollutant loadings would be elevated. This approach is consistent with EPAs ***Technical Support Document For Water Quality-based Toxics Control*** *(US EPA, March 1991).*

We agree that calculating the loading capacity under 7Q10 conditions at maximum effluent discharge is the expected critical condition that would provide the necessary capacities to protect water quality, and meet water quality standards.

Based on EPA-New England's review of the loading capacity calculations relative to the ***Technical Support Document For Water Quality-based Toxics Control*** *(US EPA, March 1991), we conclude that CT DEP's approach is reasonable. Also, based on EPA - New England's analysis*

provided under section 5, Waste Load Allocations (pages 9-11), we believe the estimated LCs are sufficient to meet WQS. The TMDL submission included the strengths and weaknesses in the overall analysis and appropriately defined the critical condition that is also consistent with CT's WQS, in which the 7Q10 represents the minimum low flow to which criteria apply (CTDEP, 1997).

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

Given the relatively undeveloped character of the Factory Brook watershed, nonpoint source contributions of the identified pollutants were determined to be minimal. We agree with this conclusion based on the land use cover percentages in the watershed; 0.01 % impervious surface; 3.05% residential, medium density, and 67.59 % forested (deciduous and coniferous). A thorough explanation regarding this issue is provided in section ***1.b. Point And Nonpoint Sources: Description, Magnitude, and Location****, (page 2). Data were unavailable to distinguish between nonpoint and natural background sources, thus, load allocations (LA) include both nonpoint and natural background sources.*

Load allocations appear in Table 2 (see TMDL document, page 7) and calculations appear in Attachments 1-5. Load allocations were calculated by multiplying an estimated concentration for each pollutant by the base low flow. Estimated pollutant concentrations for copper and zinc were based on previous studies conducted by CT DEP which established values as the upper 95th percentile of median dissolved copper and zinc concentrations for surface waters with high levels of biological integrity. Estimated concentrations for lead were based on concentrations in Connecticut waters monitored by the U.S. Geological Survey. Since lead concentrations in the monitored waters were typically below 1.0 ug/l, CT DEP chose a more conservative estimate for lead levels to be one half of this value. Chlorine is naturally absent in surface waters, thus the estimated concentration was set equal to zero. CT DEP based estimates for ammonia concentrations on data from monitoring studies conducted in Connecticut by the U.S. Geologic Survey annual published reports. It was found that ammonia is typically present at concentrations below 0.1 mg/l in streams unaffected by point source discharges. CT DEP chose an estimated concentration of 0.1 mg/l for ammonia under all flow and temperature conditions. EPA-New England believes CT DEP's strategy to estimate the background concentrations is reasonable because it represents a conservative approach, and the estimations are based on reasonably sound

sources of data.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

The Salisbury sewage treatment facility is a permitted point source in the Factory Brook watershed. There are no other point sources in the watershed, nor are future point sources expected (see TMDL, page 5). Therefore, 100 % of the waste load allocation (WLA) was assigned to the Salisbury plant with no allocation reserved for future point sources (cite TMDL). WLAs (acute and chronic) for each pollutant were calculated by subtracting the LA (below Burton Brook) from the LC available at the Salisbury plant's discharge point. Calculations appear in Attachments 1-5 in the TMDL document.

It is important to note that during critical low flow conditions in Factory Brook, the treatment plant discharge contributes the majority of flow to the stream during both average (approximately 80%) and design flow conditions (84.5%). Based on the TMDL document, EPA-New England agrees that the estimated LCs, and WLAs, are appropriate when the treatment plant is at full design flow. However, because Factory Brook is highly effluent dominated, it was important for EPA-New England to assess the adequacy of the proposed WLAs under actual treatment plant discharge conditions. Therefore, EPA-New England also reviewed the effluent limitations in the Salisbury treatment plant's NPDES permit, which is being used to implement the WLAs.

The WLAs are expressed in terms of mass loadings. To implement the WLAs, the permit limits for ammonia and chlorine are expressed as concentrations (i.e., mg/l) while the limits for metals are expressed as mass (i.e., gm/day). The advantage of concentration limits, in this case, is that they will be protective of water quality for treatment plant discharge conditions less than design flow.

With mass limits alone, the treatment facility could theoretically discharge the specified maximum mass loading at less than maximum effluent discharge flow. In a highly effluent dominated system, such as Factory Brook, maximum mass loading at less than design flow, could result in exceedances of the numeric metals criteria. With respect to copper, lead, and zinc, the TMDL submission did not clearly document that applicable water quality standards would be attained by applying mass limits alone during average treatment plant discharge flows and critical low flow conditions.

The lack of concentration limits for metals in the permit made it necessary to obtain supplemental documentation to offer additional support that WQS would likely be achieved. The supplemental documentation provided by EPA-New England included the review of baseline metals data from three Connecticut treatment facilities, and review of the ***Interim Guidance on Interpretation and Implementation of Aquatic Life Criteria for Metals*** *(May 1992). In developing the mass-based WLAs and effluent limits for the metals, CTDEP used an environmentally conservative approach by assuming that all of the copper, lead, and zinc is in the dissolved form. In reality, there is an abundance of data and evidence documenting the partitioning of individual metals between the dissolved and particulate phases, with the dissolved phase considered to be significantly more bioavailable, and, therefore, being the toxic form. Together, the dissolved and particulate-bound metals comprise total recoverable metals. Mass limits are expressed as total recoverable metals in the permit. EPA-New England evaluated the likely partitioning of metals in the Salisbury effluent and estimated the magnitude of the dissolved fraction to assess Water Quality Standards attainment.*

In the absence of dissolved metals data from the Salisbury treatment facility, CT DEP provided additional data from three treatment plants to examine the percent of dissolved metals (copper, and zinc) to total metals in their effluent. The three selected facilities are reasonably similar to the Salisbury treatment plant and offer a reasonable baseline for estimating the dissolved fraction of metals. Also, although the metals data from the three facilities was measured in the effluent, it is reasonable to use this data to estimate expected dissolved in-stream fractions of metals for Factory Brook since the brook is an effluent dominated system. For instance, the in-stream waste concentration at design flow is 84.5%, and using 1997 and 1998 average effluent flows the in-stream waste concentrations were 80% and 78%, respectively.

EPA-New England applied the mass balance water quality equation to calculate in-stream metals concentrations using the average1998 effluent flow (0.43 MGD)from the Salisbury treatment facility under 7Q10 stream flow conditions with each of the permitted Maximum Daily and Average Monthly Limits, and estimated background levels; specifically, for copper, zinc and lead. As a conservative approach, the facility having the largest percent of dissolved copper and zinc was then used to estimate the potential in-stream dissolved metals in Factory Brook for comparison to the water quality criteria. For instance, for two of the selected treatment facilities the highest percent of dissolved copper was 74%, and the third facility was 46%. The final estimated in-stream copper concentration was then multiplied by 74% and the result compared to the acute and chronic water quality criteria. For two of the selected treatment facilities, the percent of zinc found in the dissolved phase was 64% and 68%. Similarly, the final estimated in-stream zinc concentration was

then multiplied by 68%, and the result compared to the acute and chronic water quality criteria. For lead, EPA-New England relied on the observed average fraction of dissolved lead (0.10) in ambient waters (fresh water, east coast)appearing in Table B-1 of the ***Interim Guidance on Interpretation and Implementation of Aquatic Life Criteria for Metals*** *(May 1992) because of the lack of data from CT DEP. Comparisons of the estimated dissolved in-stream copper, zinc and lead concentrations with acute and chronic criteria are provided in the following table:*

Table 1. In-stream Metals Concentrations vs. Criteria

Metal	*In-stream Concentration using Maximum Daily Limit (ug/l)*	*In-stream Concentration using Average Monthly Limit (ug/l)*	*Acute Criteria (ug/l)*	*Chronic Criteria (ug/l)*
Copper	*23.6*	*18.00*	*25.7*	*18.1*
Zinc	*62.0*	*34.5*	*63.6*	*58.2*
Lead	*0.214*	*0.187*	*30*	*1.2*

The resulting estimates of in-stream metals concentrations do not account for any attenuation or additional sorption to the solids, that could occur in Factory Brook. Although the estimates for copper are near criteria, applying the observed average fraction of dissolved copper (0.62) in ambient waters appearing (fresh water, east coast) in Table B-1 of the ***Interim Guidance on Interpretation and Implementation of Aquatic Life Criteria for Metals*** *(May 1992), yields in-stream copper concentrations of 15 ug/l and 19.8 ug/l using the AML and MDL, respectively. Without actual in-stream dissolved metals data for Factory Brook, CT DEP's approach to calculating the LCs, and WLAs, represents a reasonable method for establishing the TMDLs for copper, zinc, and lead. EPA-New England's evaluation of the likely partitioning of metals in the Salisbury effluent, and the estimated magnitude of the dissolved fraction, indicates that the calculated WLAs, and LCs, will result in criteria being met during critical conditions.*

EPA- New England concludes that CT DEP's approach to set the WLAs is reasonable and that the WLAs for each of the pollutants have been set at levels sufficient to attain applicable WQS.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Implied MOS is provided by the application of a steady-state water quality model which incorporates conservative, worst-case assumptions regarding flow, effluent and environmental effects. For instance, CT DEP used a steady state model for all pollutants considering the maximum effluent discharge loading from the treatment plant to occur during the lowest stream flow (7Q10). Each of these conditions alone has a low probability of occurring; and the simultaneous occurrence of all of them is even less likely to occur (i.e. flows at less than 7Q10 are expected to occur approximately 1% of the time).

The assumption that copper, zinc and lead are completely dissolved and bioavailable provides implied MOS because some portion of the metals will not actually be biovailable due to adsorption to particulate material. As stated in the TMDL document (page 6), attenuation of pollutants was assumed to occur only through dilution, and natural processes that serve to attenuate the toxicity of pollutants were not accounted for in the model. EPA-New England is in agreement that some implied MOS is provided by assuming no additional in-stream attenuation of metals. It is likely that additional attenuation occurs in-stream due to sorption and settling processes, and that downstream metals concentrations are likely to be overestimated using this approach.

EPA-New England concludes that adequate implied MOS is provided in the TMDLs because of the conservative assumptions (e.g., no attenuation) used to establish the TMDLs. Additionally, we conclude that the LCs, corresponding WLAs and LAs, together with the conservative MOS are sufficient to result in attainment of WQS. CT DEP is committed to conduct post-implementation monitoring to assess the adequacy of the assumptions used in the TMDLs. In the event that WQS are not being attained, the TMDLs will be revised accordingly.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)).

Seasonal loading capacities were calculated for ammonia since criteria differ for summer and winter temperatures. In addition, 7Q10 flows were calculated on a monthly basis to account for seasonal flow variations and then used to develop seasonal allocations for ammonia. EPA-New England agrees that the TMDL is protective of water quality for all seasonal conditions because the TMDL was established for critical low flow conditions when the impacts from the treatment facility discharge are most pronounced.

8. Monitoring Plan for TMDLs Developed Under the Phased Approach

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the

point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA's guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.

Monitoring will be accomplished through two vehicles: 1) the terms specified in Salisbury's sewage treatment facility NPDES permit, and 2) monitoring by CT DEP consistent with the Rotating Basin Ambient Monitoring Plan.

The treatment facility's NPDES permit requires the Town of Salisbury to monitor the facility's discharge. In particular, effluent monitoring for heavy metals will be conducted on a weekly basis. Also, the NPDES permit requires quarterly whole effluent toxicity testing of the discharge effluent, and an annual chronic toxicity monitoring test using water from Factory Brook collected upstream of the facility outfall for diluent. Based on CT DEP's Rotating Basin Ambient Monitoring Plan, monitoring will be provided by CT DEP to determine the attainment of WQS in Factory Brook no later than 2002. CT DEP will continue providing assessment updates consistent with obligations under Section 305(b) of the Clean Water Act.

EPA-New England supports the conditions of this monitoring approach because it will adequately evaluate the adequacy of the TMDLs, and the efficacy of the NPDES permit to implement conditions as specified in the TMDLs to meet WQS.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

The TMDLs are being implemented through the provisions of the NPDES permit issued to the Salisbury treatment facility on September 30, 1999.

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a

point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

The NPDES permit to issued to the Salisbury treatment facility is legally enforceable and offers reasonable assurances that controls will be implemented, and that WQS will be met in Factory Brook.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

Public participation for these TMDLs was achieved in accordance with CT DEP's statutes. Given that the major source of pollution to Factory Brook was determined to be the Salisbury sewage treatment facility, the TMDL was public noticed with the draft NPDES permit on August 9, 1999 in the Hartford Courant.

During the 30 day public comment period, EPA-New England provided comments regarding the draft TMDL (Jeanne Voorhees, September 9, 1999). Concerns were raised by EPA-New England that in the absence of concentration based limits, as derived from the WLA in the TMDL, under low flow conditions (i.e. 7Q10) with average effluent discharge flows, numeric criteria might be exceeded, especially since Factory Brook is an effluent dominated system under these conditions. CT DEP provided a response in the final submittal, and revised the TMDL submission to specifically include conditions for modifying the NPDES permit with concentration based limits.

Specifically, CT DEP will review the effectiveness of the NPDES permit in implementing the TMDLs through monitoring, and will revise the NPDES permit to include concentration limits if the review indicates that permit modification is necessary to insure that the TMDLs are effectively implemented (see TMDL document, page 8).

EPA-New England concludes that CT DEP provided reasonable opportunities for public involvement and comment, and reasonable responses to comments.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a *technical review* or is a *final submittal*. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.

The submittal letter identified the TMDL document as a final TMDL submittal under Section 303(d) of the Clean Water Act for EPA review and approval.

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