

## EPA NEW ENGLAND'S TMDL REVIEW

**TMDL:** **Goosefare Brook**, York County, Maine  
(ME ID#612R located in Saco and Old Orchard Beach, ME)  
1998 303(d) list: Toxics/nps; <2003 TMDL development.

**STATUS:** Final

**IMPAIRMENT/POLLUTANT:** Non-attainment of aquatic life standards (benthic community) due to toxics, including 7 heavy metals from industrial stormwater discharge and nonpoint source pollution. The TMDLs are proposed for cadmium (Cd), chromium (Cr+3), copper (Cu), iron (Fe), nickel (Ni), lead (Pb), zinc (Zn).

**BACKGROUND:** The Maine Department of Environmental Protection (ME DEP) submitted to EPA New England the final Goosefare Brook TMDL for seven heavy metals with a transmittal letter dated September 25, 2003, received by EPA on September 26, 2003. All of EPA's October 22, 2002 comments (on the public review draft) were taken into account in the final submission.

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The following review explains how the TMDL submission meets the statutory and regulatory requirements of total maximum daily loads (TMDLs) in accordance with Section 303(d) of the Clean Water Act, and 40 CFR Part 130.

### 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.*

#### 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 chlorophyll *a* and phosphorus loadings for excess algae.*

The Goosefare Brook TMDL describes the waterbody, the cause of impairment of Class B water quality standards as identified in the 1998 303(d) list (toxics due to nonpoint source pollution), and the priority ranking for TMDL development. Approximately 3.2 miles of Goosefare Brook are listed as impaired for not attaining Class B standards for aquatic life (due to low abundance of organisms) from downstream of the Maine Turnpike to below the Route 1 crossing (page 5 TMDL report). The stream flows through an interchange of the Maine Turnpike, two connector interchanges, through an industrial development that includes Saco Steel and Saco Defense Inc., and through the commercial Route 1 corridor. Catchment land use is described in terms of nine subcategories of land use within three sub-areas of the watershed. The uses fall within the following five land use categories: agricultural, transitional forest, forest, wetland, and urban/residential (page 4 TMDL report). Atmospheric deposition is considered to contribute a non-detectable load of the pollutants of concern (page 7 TMDL report).

Pollutants of concern include seven heavy metals from stormwater and nonpoint source pollution: cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), nickel (Ni), lead (Pb), zinc (Zn). ME DEP provides an explanation and analytical basis for expressing the TMDL for impaired aquatic life through the surrogate measure of sediment metal concentrations which were converted to aqueous concentrations. (See also the following section on loading capacity.) The separation of natural background from those from human-related sources was not possible with the existing data, and would have been very difficult to determine (page 7 TMDL report).

**Assessment:** EPA New England concludes that the ME DEP has done an admirable job of tracking down and characterizing sources of impairment. It is our understanding that concern over highway runoff prompted the 1999 – 2000 sediment study by U. ME. Subsequent fieldwork by indicated that discharge from a contaminated stormwater collection pond was the overwhelmingly significant source of impairment, and identified other sources of industrial and urban runoff downstream. Descriptive color photographs in appendix V are also effective in communicating relevant watershed characteristics.

## **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.*

The Goosefare Brook TMDL describes the applicable narrative water quality standard for Class B aquatic life: “waters shall be of sufficient quality to support all aquatic species indigenous to

the receiving water without detrimental changes in the resident biological community.” The report also defines designated uses, and antidegradation policy (pages 7-8 TMDL report).

ME DEP identifies numeric water quality targets for the heavy metal TMDLs in Table 4, as follows in terms of **ppm** or **mg/l** (from page 8 TMDL report):

Criteria	Cd	Cr	Cu	Fe	Ni	Pb	Zn
CCC	0.000321	0.0554	0.00299	1	0.0404	0.00041	0.0271

The numeric targets are selected using the metal-specific criteria chronic concentrations (CCC) from Maine’s statewide water quality criteria (SWQC). These aqueous or water column criteria are adopted from EPA’s ambient water quality criteria (AWQC) using a hardness of 20 mg/l and are designed to protect aquatic life. The “CCC are typically lower than CMC and [are] chosen as a conservative basis for the TMDL loading comparisons” in order to “insure the stream will achieve Class B benthic community standards” (page 8 TMDL report). Although the TMDL is developed using available sediment data, “Maine has no formal water quality criteria for sediment values...” (page 10 TMDL report, and see discussion of loading capacity below).

**Assessment:** EPA New England concludes that the ME DEP has properly presented its water quality standards, both narrative and numeric, and has made a reasonable interpretation of the narrative water quality criteria in the standards when setting numeric water quality targets for these heavy metal TMDLs.

### 3. Loading Capacity - Linking Water Quality and Pollutant Sources

*As described in EPA guidance, a TMDL identifies the loading capacity 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 conditions 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.*

The loading capacities for Goosefare Brook are set in Table 5 (from page 9 TMDL report) as follows, in terms of **kg/yr** for each metal of concern:

Ave. LC	<b>Cd</b>	<b>Cr</b>	<b>Cu</b>	<b>Fe</b>	<b>Ni</b>	<b>Pb</b>	<b>Zn</b>
<b>Kg/yr</b>	0.4	72	3.9	1301	53	0.5	35

The target for each metal is the product of the CCC value times the volume of flow or annual mean discharge from each of two impaired sites. The assimilative capacities at each flow for the two sites are then averaged to provide the average loading capacity for each metal of concern. ME DEP uses measured flow data (1998 – 2000) to calculate an annual mean flow for each of the two impaired sites. “Loading capacity is expressed as an annual load rather than a daily load to account for the spatial and temporal variation associated with instream metal concentrations.” (Page 8, TMDL report).

In order to determine existing metals loads in Goosefare Brook for comparison to the TMDL or target loads for each metal, available sediment and flow data from a U. ME. study of Goosefare Brook (1998 – 2000) were input into a spreadsheet model used to calculate existing metal loads. (This study was funded by a ME DEP Section 319 grant and was guided by an EPA-approved quality assurance project plan (QAPP).) The measured sediment metals concentrations were converted to aqueous values using the model MINEQL+ v3.01 (Appendix III TMDL report).

By comparing existing (converted) aqueous metal loads to target loads (CCC's), the model is used to “predict pollutant loadings and reductions that will insure attainment of Maine’s water quality standards” (page 9 TMDL report; see Table 9 on page 12 for % reductions). ME DEP describes the strengths and weaknesses of the model (page 10, TMDL report), and states that the percent reductions will be applied to both load and waste load allocations (page 12 TMDL report). The total load allocations for the metals of concern in Goosefare Brook are reported by ME DEP in Table 9 as follows (page 14 TMDL report; see also WLA sections below):

**Load Allocations and Waste Load Allocations for each metal in the TMDL.**

<b><u>TMDL= LA +WLA</u></b>	<b>Loads in kg/yr</b>						
	<b><u>Metals</u></b>						
	Cd	Cr	Cu	Fe	Ni	Pb	Zn
<b><i>Load Allocations (LA)</i></b>	0.1	18	1.0	325	13	0.1	9
<b><i>Waste Load Allocations (WLA)</i></b>	0.3	54	2.9	976	39	0.4	26
<b><i>Loading Capacity (TMDL)</i></b>	0.4	72	3.9	1301	53	0.5	35

**Assessment:** EPA New England concludes that the loading capacity for each pollutant of concern has been appropriately set at a level necessary to attain and maintain applicable water quality standards. The TMDL is based on a reasonable approach for establishing the relationship between existing data on pollutant loading and water quality in the stream.

EPA New England concurs with expressing the metal TMDLs as annual loadings based on the reason provided by ME DEP (spatial and temporal variability of instream metal concentrations). Given the sporadic changes in metal solubility over time, the use of annual, as opposed to daily, loads will assure that critical conditions are addressed and water quality standards attained.

#### **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.*

ME DEP sets the load allocation (LA) for existing and future nonpoint sources of each metal as a gross allotment for Goosefare Brook in Table 9, as presented above. The LAs represent 25% of the loading capacity or TMDL based on a comparison of sediment copper concentrations from sites receiving unregulated versus regulated stormwater runoff (see boxed material on page 13 TMDL report). Results show that downstream sediment (receiving regulated stormwater from highway and industrial sources) has copper concentrations 4 times greater than concentrations upstream (receiving runoff from Saco Heath). The loading capacity of Goosefare Bk. is split between the LA and WLA according to the same proportion based on the assumption that LA:WLA ratio of 1:4 represents the desired split in loading capacity after site remediation and other controls are in place to attain the WLA.

Any elevated levels of metals from the Saco Heath are assumed to be from natural causes (naturally low pH or reducing conditions) and, therefore, not a violation of water quality standards (personal communication with Melissa Evers, ME DEP on 9/24/03). As a justification for this assumption, ME DEP explains that The Nature Conservancy, current owner of Saco Heath, investigated past sources of environmental contaminants before acquiring the heath, and found that that all disturbances and potential problems identified in Saco heath were in areas that drain to streams other than Goosefare Brook (page 7 TMDL report).

**Assessment:** EPA concludes that the load allocation is adequately specified in the TMDL at a level necessary to attain and maintain water quality standards. The split between LA and WLA is based on a reasonable approach for comparing existing metal concentrations between areas receiving unregulated and regulated stormwater discharges, taking natural background conditions into account.

## 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.*

ME DEP allocates 75% of the loading capacity or TMDL to the WLA as a gross allotment to existing and future point sources (currently regulated stormwater) in Table 9, based on a comparison of sediment copper concentrations from sites receiving unregulated versus regulated stormwater runoff, as presented above. (See also the LA section above for discussion of splitting the total loading capacity between LA and WLA.)

**Assessment:** EPA New England concurs that the WLA component of the TMDL is appropriately set based on Maine's proportional analysis of current loadings from regulated versus unregulated areas.

## 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.*

The Goosefare Brook TMDL includes an implicit margin of safety (MOS) through the conservative assumptions made in both the targets chosen (CCC versus CMC), and the use of sediment metals instead of water column measurements (page 15 TMDL report). An additional MOS is provided by modeling the metals individually.

**Assessment:** EPA New England concludes that adequate MOS is provided for the following reasons: EPA believes a significant implicit MOS is provided in the selection of in-stream metals concentrations based on the state-wide CCC toxics criteria. EPA also believes that the margin of safety provided by potential overestimation of aqueous metal levels through the use of sediment values is sufficient to off-set the potential underestimation of aqueous metal levels

from the fact that suspended particulate materials are not included in the converted aqueous phase values.

## **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)).*

Goosefare Brook TMDLs consider seasonal variation “because the allowable annual loads of metals are developed to be protective of macroinvertebrates and other aquatic life, which are influenced by seasonal fluctuations in environmental conditions such as flow, runoff, and pH” (page 15 TMDL report). ME DEP describes the complex variabilities in flow, instream reducing conditions, metals concentrations, and sources of pollutants over time.

**Assessment:** EPA New England concludes that seasonal variation has been adequately accounted for in the TMDL because the TMDL was developed to protect aquatic life during critical, stressful conditions, whenever they may occur throughout the year. In addition, site remediation actions will remove some sources permanently, and BMPs for other sources are expected to be in place throughout the year so that those controls will reduce pollution whenever sources are active.

## **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.*

ME DEP recommends future site assessments (including in-stream monitoring) to be conducted by individual sites (Saco Steel and the Maine Turnpike) “to develop specific engineering design criteria” (pages 16-17 TMDL report). ME DEP intends to conduct both future aqueous sampling and biological monitoring evaluations as restoration plans proceed to assess water quality status under the existing rotating basin sampling schedule.

**Assessment:** Addressed, though not required.

## **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.*

ME DEP provides specific recommendations for effective abatement of metal-laden runoff to Goosefare Brook. Included are: site assessment and remediation plan for the Saco Steel (Earth Waste Management) hazardous material site; site assessment of runoff from the Maine Turnpike's I-195 exit 5; implementation of the City of Saco's watershed survey to stabilize erosion problems and protect future stream habitat quality (funded by a \$319 grant, scheduled for completion in 2003).

**Assessment:** Addressed, though not required.

## **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."*

Reasonable assurances are not necessary for the Goosefare TMDLs because point sources (regulated stormwater in this case) are not given a less stringent WLA based on any assumption that NPS load reductions will occur. However, there is reasonable assurance that reductions in regulated stormwater will happen, given the facts that the Saco Steel site is now in ME DEP's VRAP Program for uncontrolled sites, that ME DEP now regulates phase II stormwater with Maine NPDES general permits, and that MDOT, MTA and the City of Saco are all actively involved in activities to address stormwater runoff problems.

**Assessment:** Addressed, though not required.

## **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.*

The public participation process for the Goosefare Brook TMDL is described on page 18 of the TMDL report. ME DEP issued public notice of the TMDL availability on October 13 and 20, 2002, via local newspapers, and on ME DEP's Internet web site. ME DEP staff also participated in local education/outreach meetings with the Cities of Saco and Old Orchard Beach on the TMDL and 319 watershed surveys. The public comment period deadline was November 9, 2002. There was only one public comment, from the Maine Turnpike Authority. ME DEP included a response to comment in the final TMDL report (Appendix VII, pages 34-35 TMDL report) and attached a copy of MTA's comment letter to the report.

**Assessment:** EPA New England concludes that ME DEP has done an admirable job of involving the public during the development of the TMDL, provided adequate opportunities for the public to comment on the TMDL, and provided reasonable responses to the public comments.

**Data for entry in EPA's National TMDL Tracking System**

TMDL Name	<b>Goosefare Brook</b>
Lead State	Maine (ME)
TMDL Status	Final
Pollutant IDs	- Cadmium (Cd) - Chromium (Cr) 16 - Copper (Cu) - Iron (Fe) (ferric +3) - Nickel (Ni) 18 - Lead (Pb) 21 - Zinc (Zn)
TMDL End Points	0.000321 ppm - Cadmium (Cd) 0.0554 ppm - Chromium (Cr) 0.00299 ppm - Copper (Cu) 1 ppm - Iron (Fe) (ferric +3) 0.0404 ppm - Nickel (Ni) 0.00041 ppm - Lead (Pb) 0.0271 ppm - Zinc (Zn)
TMDL Type	Nonpoint Source and Point Source (regulated stormwater)
List ID (from system)	
Impairment ID	Toxicity to aquatic life
Cycle (list date)	1998
Establishment Date (approval)	September 29, 2003
EPA Developed	No

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