TOTAL MAXIMUM DAILY LOAD ANALYSIS FOR HAYDEN CREEK CLINTON, CONNECTICUT

This document has been established pursuant to the requirements of Section 303(d) of the Federal Clean Water Act

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INTRODUCTION

The Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), requires that states adopt water quality standards that support designated uses for each waterbody within its boundary. Examples of designated uses adopted into Connecticut Water Quality Standards (WQS) include drinking water supply, fish and wildlife habitat, recreational use, agricultural use, industrial supply, and others. Section 303(d) of the CWA requires states to develop Total Maximum Daily Loads (TMDLs) for waters where current pollution controls are not stringent enough to attain or maintain compliance with adopted State Water Quality Standards.

The TMDL represents the maximum pollutant loading that a waterbody can receive without exceeding the adopted Water Quality Criteria (WQC) for that pollutant. Federal regulations require that the TMDL analysis identify the portion of the total pollutant loading which is allocated to point source discharges (termed the Wasteload Allocation or WLA) and the portion attributed to nonpoint sources and natural background (termed the Load Allocation or LA). In addition, TMDLs include a Margin of Safety (MOS) to account for uncertainty in establishing the relationship between pollutant loadings and water quality. Seasonal variability in the relationship between pollutant loadings and WQS attainment must also be considered in TMDL analyses.

A TMDL analysis also provides a written report that describes the pollution control actions necessary to achieve acceptable water quality conditions in the impaired waterbody. Public review and comment is strongly encouraged. Following public review and comment, the TMDL established by the State is submitted to the Regional Office of the Federal Environmental Protection Agency (EPA) for review. EPA can either approve the State's TMDL or disapprove the TMDL and act in lieu of the State. TMDL reports also may include an implementation plan and a description of monitoring activities to confirm that the TMDL has been effectively implemented and that WQS have been achieved.

Hayden Creek was listed on the 1998 303(d) list *of Connecticut Waterbodies Not Meeting Water Quality Standards*[1] based on desktop calculations that indicated the potential for exceedances of water quality-based limits for copper, lead, and zinc from a combined sanitary

and industrial discharge from a pharmaceutical industry, Unilever Home and Personal Care USA facility (formerly Chesebrough Ponds, Inc). TMDLs were developed for copper, lead, and zinc in Hayden Creek below the discharge point near Grove Street. During the process of developing this TMDL, it was determined that the Unilever Home Care facility could not operate a treatment plant capable of consistently achieving projected water quality based limits for copper, lead, and zinc in Hayden Creek. Therefore, the implementation plan of this TMDL recommends the removal of the Unilever discharge from Hayden Creek.

HAYDEN CREEK

According to the classification system of Nosal [2], "Hayden Creek" is contained within the local drainage basin 5000-12, Clinton Coastal Area Adjacent to Clinton Harbor. Nosal's classification does not name the creeks within this basin, but locally the waterbody is referred to as Hayden Creek. The name Hayden Creek is used throughout this document and is identified in Figure 1.

Hayden Creek is a tidal tributary of the Hammonasset River and is contained within a small local basin that drains approximately 2.4 square kilometers. The basin is located entirely in Clinton, Connecticut, a town with a population of approximately 13,000 located on the shoreline of Long Island Sound. Hayden Creek flows for approximately 1.5 miles from its headwaters to the confluence with the Hammonasset River. Biological surveys conducted by CTDEP field personnel have established that Hayden Creek and the surrounding wetland provide important habitat for numerous bird and mammal species [3].

Hayden Creek is bordered by a lightly developed residential area to the south and a small commercial area that includes the Unilever facility near US Route 1 to the north (Figure 1). Unilever manufactures cosmetic products at the Clinton facility and is the only permitted point source discharge to Hayden Creek. The Unilever facility discharges an average of 23,500 gallons per day of treated sanitary and industrial wastewater into the headwaters of Hayden Creek. At this point in Hayden Creek, there is little water available for dilution and the discharge

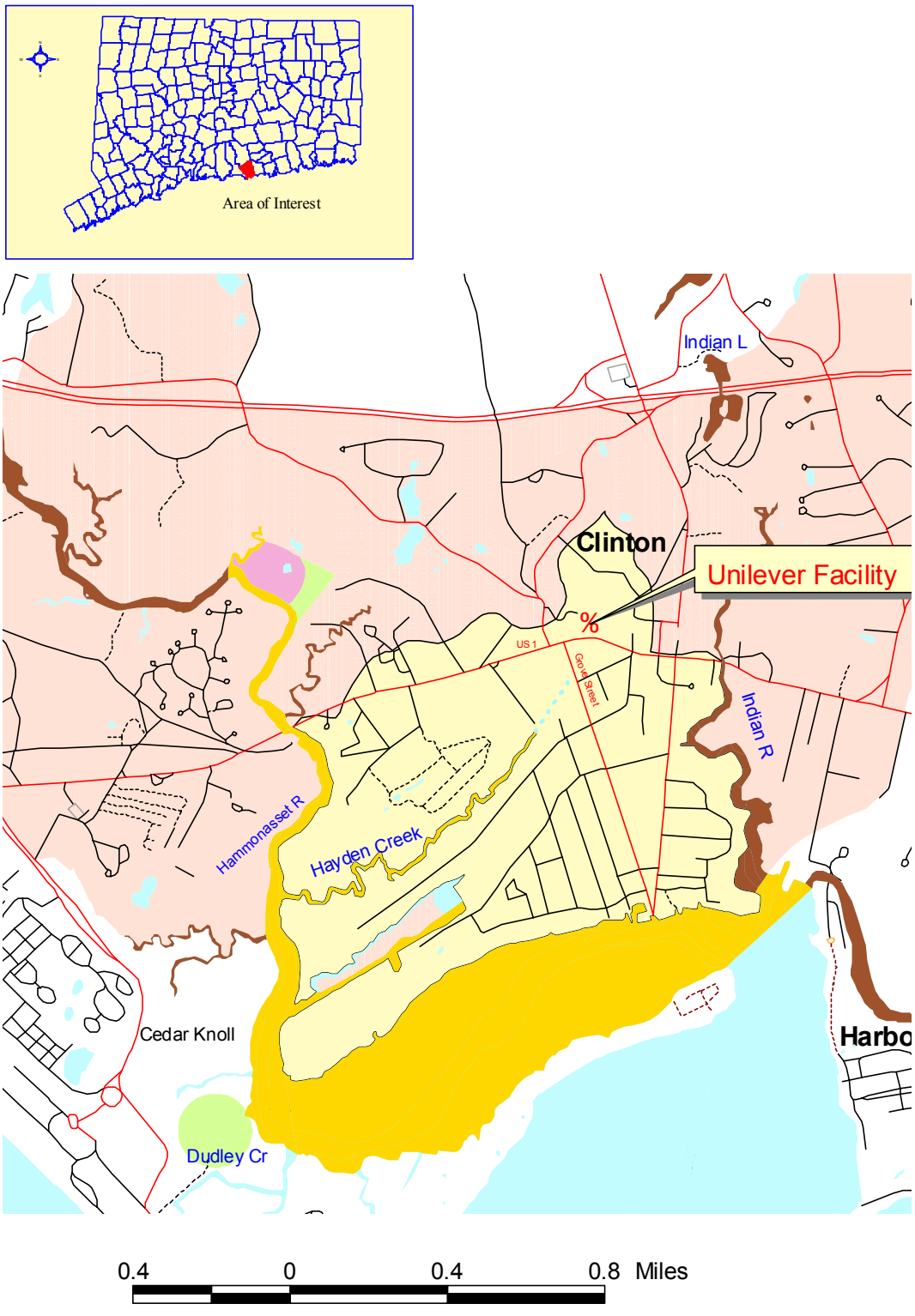

Figure 1. Hayden Creek and Clinton Coastal Area. 3

constitutes the majority of surface water flow.

APPLICABLE WATER QUALITY STANDARDS

Connecticut WQS [4] establish the magnitude, frequency, and duration of exposure to dissolved copper, lead, and zinc which must not be exceeded in order to protect the biological integrity of aquatic organisms. Separate criteria have been adopted to protect against short exposure to high concentrations and average or typical exposure concentrations. Consistency with both criteria values is evaluated on an annual basis. Freshwater criteria (Table 1) were applied in this TMDL analysis because 1) a dye dilution study that characterized the effluent concentration from the Unilever facility indicated that tides do not affect the system at the point of discharge [5] and 2) the discharge from the Unilever facility is composed of freshwater.

Table 1. Connecticut Water Quality Criteria applicable to the Hayden Creek TMDL.

	Connecticut DEP Freshwater Criteria	
Pollutant	Acute Criterion	Chronic Criterion
Copper	14.3 *u*g/l	4.8 *u*g/l
Lead	30.0 *u*g/l	1.2 *u*g/l
Zinc	63.6 *u*g/l	58.2 *u*g/l

The frequency of acceptable exceedances for the freshwater copper criteria adopted in the Connecticut Water Quality Standards are: for acute exposure, the biological integrity of Connecticut surface waters is impaired when ambient concentrations exceed 14.3 *u*g/l on more than 5% of the days in any year; for chronic exposure, biological integrity is impaired when ambient concentrations exceeds 4.8 *u*g/l on more than 50% of the days in any year.

The frequency of acceptable exceedances for the freshwater lead and zinc criteria adopted in the Connecticut Water Quality Standards are: for acute exposure, biological integrity is impaired when the acute criteria is exceeded for 1 hour more than once every three years on average; for chronic exposure, biological integrity is impaired when 4-day average exceeds the chronic criteria more than once every three years on average.

The Connecticut DEP surface water classification for Hayden Creek is SB. Designated uses for Class SB surface waters include marine fish, shellfish and wildlife habitat, shellfish harvesting for transfer to a depuration plant or relay area (transplant) to approved area for purification prior to human consumption, recreation, industrial and other legitimate uses including navigation. In Connecticut, Public Act 89-321 assigns the responsibility for regulating shellfish harvest to the Department of Agriculture. Currently, the Department of Agriculture, Aquaculture Division has determined that harvesting shellfish is prohibited in Hayden Creek.

TOTAL MAXIMUM DAILY LOAD (TMDL)

TMDLs were calculated using a steady-state model to simulate loading capacity of copper, lead, and zinc in Hayden Creek at Grove Street below the point of discharge of the Unilever facility.

Once the TMDLs were calculated, allocations were made to point sources (termed the wasteload allocation or WLA), nonpoint sources (termed the load allocation of LA) and Margin of Safety (MOS). The TMDL can thus be expressed as a mathematical equation:

TMDL = WLA + LA + MOS.

TMDL

A steady-state model was used to simulate loading capacity of each pollutant under critical conditions at Hayden Creek near Grove Street. Critical conditions were defined as the "worst case" scenario of environmental conditions in Hayden Creek in which the pollutant load capacity expressed in a TMDL will not exceed Water Quality Criteria adopted by the State of Connecticut. The critical condition for this TMDL was defined as the low flow period in Hayden Creek, from July-October. For all pollutants, the critical streamflow in Hayden Creek near Grove Street was set equal to zero because no instream dilution is available during the critical low flow period.

Wasteload Allocations (WLA)

Copper, lead, and zinc (as well as any other potential pollutant) will be eliminated from the discharge as a condition in the reissued NPDES permit to the Unilever facility. Since this

discharge is the only point source of copper, lead, and zinc in Hayden Creek near Grove Street, the WLA for each pollutant was set equal to zero.

Load Allocations (LA)

There are no upstream sources of copper, lead, or zinc at the TMDL model location below the discharge outfall of Hayden Creek near Grove Street. Therefore, LA = 0 for all pollutants of concern.

Margin of Safety (MOS)

The TMDLs for copper, lead, and zinc were developed using a steady-state model under critical, worst case conditions and have an implicit MOS built into the analysis. That is, no separate amount is allocated to MOS as a result of the conservative nature of the TMDL analysis. The removal of the Unilever discharge will eliminate the only source of copper, lead, and zinc and does not require a numerical value.

TMDL SUMMARY

The TMDLs for each pollutant were calculated by multiplying the adopted WQC for each pollutant (Table 1) by the critical streamflow condition in the Hayden Creek near Grove Street. Since the critical streamflow was determined to be zero, the TMDL for each pollutant was zero (Table 2). No numerical portion was assigned to Load Allocation, Wasteload Allocation or Margin of Safety. The TMDL has an implicit Margin of Safety and does not require a numerical value since removal of the sole source of these pollutants will ensure that Water Quality Standards will be met in Hayden Creek.

Table 2. TMDL summary for Hayden Creek near Grove Street, Clinton, Connecticut. All values are in g/day.

Pollutant	Condition	Freshwater Water Quality Criterion	TMDL (g/day)	WLA (g/day)	LA (g/day)	MOS (g/day)
Copper	Acute	14.3 *u*g/L	0.0	0.0	0.0	0.0
	Chronic	4.8 *u*g/L	0.0	0.0	0.0	0.0
Lead	Acute	30.0 *u*g/L	0.0	0.0	0.0	0.0
	Chronic	1.2 *u*g/L	0.0	0.0	0.0	0.0
Zinc	Acute	63.6 *u*g/L	0.0	0.0	0.0	0.0
	Chronic	58.2 *u*g/L	0.0	0.0	0.0	0.0

SEASONAL ANALYSIS

Criteria for dissolved copper, lead, and zinc do not vary seasonally but remain in effect at all times of the year. No seasonal variation was applied to the Water Quality Criteria concentration level for copper, lead or zinc in this analysis since Water Quality Criteria adopted by the State Of Connecticut do not vary seasonally for these pollutants.

TMDL IMPLEMENTATION PLAN

A TMDL can also be viewed as a critical element of a plan or strategy to attain WQS in an impaired waterbody. Through the development of this TMDL analysis it was determined that the only way to achieve WQS in Hayden Creek was to eliminate the Unilever discharge from Hayden Creek. The NPDES permit issued to the Unilever facility contains a compliance schedule to investigate alternatives for elimination of the discharge or relocate the discharge to an acceptable alternate receiving water. The most feasible option at this time appears to be relocation to the Hammonasset River. The revised NPDES permit will require monitoring of the final effluent according to a schedule established in the permit. Unilever will operate under stringent technology-based permit limits in the interim period until the discharge is eliminated from Hayden Creek.

MONITORING PLAN

The Unilever facility will provide monitoring results to CTDEP as a requirement in the NPDES permit. In addition, the Department of Agriculture, Bureau of Aquaculture routinely monitors the Clinton Coastal Area including Hayden Creek. Water quality monitoring and assessment will be conducted as part of their triennial evaluation. The goal of this TMDL is to improve the water quality so that all aquatic life will be fully supporting the uses of Hayden Creek.

REASONABLE ASSURANCE

Removal of the Unilever discharge will eliminate all point sources of copper, lead, and zinc to Hayden Creek. The NPDES permit provides a legally enforceable control document and offers reasonable assurances that WQS will be met in Hayden Creek.

PROVISIONS FOR REVISING THE TMDL

The Department reserves the authority to modify the TMDL as needed to account for new information made available during the implementation of the TMDL. Any new source of pollutants (e.g. new stormwater NPDES Permit) that may affect TMDL calculations will be carefully considered by the Department and if necessary, revisions will be made to the TMDL. DEP will provide an opportunity for public participation prior to any modification of the TMDL and any modifications will be subject to the review and approval of the U.S. EPA as required by Federal law.

PUBLIC PARTICIPATION PROCESS

The Department has made reasonable efforts to involve Unilever and the public in the development of this TMDL. This TMDL analysis has been modified from an earlier draft version to reflect comments received from reviewers. A Public Notice soliciting comments from the public on the TMDL was published in the *Hartford Courant* on 12/19/01 [6]. Documentation of public participation and DEP's response to comments received on the TMDL is included in the transmittal letter submitting the TMDL to EPA for review and approval.

REFERENCES

[1] CTDEP 1998. *Connecticut waterbodies not meeting water quality standards*. State of Connecticut, Department of Environmental Protection, Bureau of Water Management, 79 Elm Street, Hartford, CT 06106-5127. 32 pp.

[2] Nosal, T. 1997. *Gazetteer of drainage areas of Connecticut*. Water Resources Bulletin Number 45. State of Connecticut, Department of Environmental Protection, Bureau of Water Management, 79 Elm Street, Hartford, CT 06106-5127.

[3] CTDEP 1984. Interdepartmental memorandum. State of Connecticut, Department of Environmental Protection, Bureau of Natural Resources, 79 Elm Street, Hartford, CT 06106-5127.

[4] CTDEP 1997. *Water quality standards*. State of Connecticut, Department of Environmental Protection, Bureau of Water Management, 79 Elm Street, Hartford, CT 06106-5127. 39 pp.

[5] Turner, C. 1988. Effluent dilution study in Hayden Creek Clinton, CT. Applied Science Associates, Inc. Narragansett, RI.

[6] Public Notice. In Legal Classified Section of Hartford Courant December 19, 2001.