Michigan Department of Environmental Quality
Water Bureau
July 2007

Total Maximum Daily Load for Dissolved Oxygen and Total Phosphorus for Lapointe Drain Monroe County

INTRODUCTION

Section 303(d) of the federal Clean Water Act (CWA) and the United States Environmental Protection Agency's (USEPA's) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations, Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for water bodies that are not meeting water quality standards (WQS). The TMDL process establishes the allowable loadings of pollutants for a water body based on the relationship between pollution sources and in-stream water quality conditions. TMDLs provide states a basis for determining the pollutant reductions necessary from both point and nonpoint sources (NPS) to restore and maintain the quality of their water resources. The purpose of this TMDL is to identify the sources of dissolved oxygen (D.O.) and nutrient standard nonattainment in Lapointe Drain near Luna Pier, and to quantify reductions in these sources necessary for attainment of the WQS. Lapointe Drain and its tributaries in the vicinity of Luna Pier are designated as warmwater streams with a D.O. standard of 5 milligrams per liter (mg/l) as a minimum [Rule 64 (R323.1064) of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA)]. Lapointe Drain and its tributaries are also protected against nuisance plant growths, which are, or may become injurious to the designated uses of the surface waters of the state [Rule 60 (R323.1060)]. This TMDL seeks to achieve D.O. standard attainment and eliminate nuisance plant growths through the reduction of total suspended solids (TSS) and total phosphorus loads to Lapointe Drain.

Lapointe Drain is part of the Ottawa-Stony River watershed illustrated in Figure 1, and is located in Erie Township, Monroe County. The Lapointe Drain watershed lies entirely in the Huron-Erie Lake Plains ecoregion (Omernik and Gallant, 1988). Figure 2 describes the Lapointe Drain watershed and location of the TMDL reach. The majority of the population in the Lapointe Drain watershed resides in Luna Pier, which had 1483 residents as of the 2000 census. Table 1 defines the extent and length of the reach. A total of 2200 river feet are addressed by the TMDL. The Lapointe Drain TMDL reach is a maintained and dredged straight-cut drain.

Table 1. Lapointe Drain D.O. TMDL Reach.

Water Body	Reach Start	Reach End	Distance (feet)
Lapointe Drain	Mouth of Lake Erie (T8S, R8E, Section 11 of Monroe County)	2200 feet upstream of mouth of Lake Erie (T8S, R8E, Section 11 of Monroe County)	2200

Lapointe Drain has a drainage area of approximately 18.4 square miles at the mouth of Lake Erie. Summer season 50 percent (%) and 95% exceedance flows (cubic feet per second [cfs]) for Lapointe Drain at this location are 0.2 cfs and 0.0 cfs, respectively. Lapointe Drain low flows were computed from historic data collected at a United States Geological Survey gage, Plum Brook near Utica, Michigan (Gage Number 04163500).

PROBLEM STATEMENT

The Lapointe Drain TMDL reach appears on the 2006 Section 303(d) list (Edly and Wuycheck, 2006) as:

LAPOINTE DRAIN WBID#: **060101E**
County: MONROE SIZE: 0.6 M
Location: About 2000 feet u/s of the Lake Erie confluence in the vicinity of the Luna Pier WWTP outfall.
NHD Reach Code: 04100001001144
Problem Summary: WQS exceedances for D.O.; Nuisance algal growths, phosphorus.
TMDL Year(s): 2007

This listing incorrectly indicates the TMDL reach as both 0.6 miles and approximately 2000 feet in length. The 2008 Section 303(d) list will correct these values to read 0.4 miles and 2200 feet. This TMDL addresses both the D.O. standard nonattainment and nuisance algal growth issues in Lapointe Drain near Luna Pier.

On August 19, 1998, staff from the Michigan Department of Environmental Quality (MDEQ) made a reconnaissance visit to Lapointe Drain and a tributary, Martin & Cousino Drain (Sunday and Alexander, 2000). The objectives of the visit were to assess the water quality of Lapointe Drain and determine the designated use attainment status of both the Lapointe and Martin & Cousino Drains. The visit was prompted by an application for a National Pollutant Discharge Elimination System (NPDES) permit for a proposed point source discharge to Martin & Cousino Drain upstream of Lapointe Drain. Stream chemistry grab samples were collected approximately 300 feet upstream and downstream of the Luna Pier Wastewater Treatment Plant's (WWTP's) (MIG570026) outfall 001 in order to gage the discharge's impact on Lapointe Drain. A grab sample of Luna Pier WWTP effluent (before chlorination) was also collected. Water chemistry sample results appear in Table 2.

Table 2. Luna Pier WWTP Effluent and Stream Chemistry - Single Round of Samples Taken August 19, 1998.

Parameter	Luna Pier WWTP	Lapointe Upstream of Luna Pier WWTP	Lapointe Downstream of Luna Pier WWTP
Time	1200	1130	1145
Temperature (field) (^{o}C)	-	18.5	18.5
Dissolved Oxygen (mg/l)	-	4.3	4.3
D.O. % Saturation	-	46.7	46.7
$CBOD_5$ (mg/l) *	5 LH	<2 LH	<2 LH
Nitrite (mg/l)	0.37	0.05	0.05
Nitrate + Nitrite (mg/l)	2.4 HT	0.60 HT	0.64 HT
Ammonia (mg/l)	14 HT	0.29 HT	0.42 HT
Kjeldahl Nitrogen (mg/l)	16.4 HT	1.25 HT	1.25 HT
Ortho Phosphate (mg/l)	1.8	0.05	0.06
Total Phosphorus (mg/l)	2.3 HT	0.160 HT	0.138 HT
Total Dissolved Solids (mg/l)	410	240	310

* - Five-day carbonaceous biochemical oxygen demand ($CBOD_5$).
LH - Quality control (QC) indicated possible low recovery. Actual level may be higher.
HT - recommended laboratory holding time (HT) was exceeded before analysis.

Note that HT codes are present on nutrient samples due to laboratory difficulties. D.O. concentrations were below the warmwater D.O. standard in both the upstream and downstream samples from Lapointe Drain. No D.O. sample was collected from the WWTP effluent. It was also

observed during this visit that seiches from Lake Erie influence flow direction in Lapointe Drain and ultimately influence water quality conditions. No nuisance algal growths were documented at the time of this visit.

In response to the findings of the August 19, 1998, reconnaissance visit, D.O. was monitored continuously at two locations in Lapointe Drain near Luna Pier from July 25 through August 7, 2000. In addition, a Surface Water Assessment Section (SWAS) aquatic biologist made observations on the macroinvertebrate community on August 3, 2000 (Sunday, 2001). The purpose of the study was to determine Lapointe Drain's compliance with the warmwater D.O. standard. The first sample location was approximately 600 feet upstream of the Luna Pier WWTP's outfall 001 and the second location was approximately 1,100 feet downstream of outfall 001. Water chemistry grab samples were collected and analyzed for conventional parameters and nutrients. D.O. diurnal variation (daily average minus minimum concentration) was also measured for potential use in modeling the effects of discharges to Lapointe Drain. The flow characteristics of Lapointe Drain were further observed to ascertain how Luna Pier WWTP effluent mixes with background flows.

The 2000 D.O. monitoring showed nonattainment of the warmwater D.O. standard at both monitored locations. Continuously recorded D.O. levels at the upstream monitoring location ranged from 0.8 to 17.4 mg/l, with an average concentration of 6.4 mg/l over the study period. D.O. concentrations below 3 mg/l are considered to be acutely toxic to aquatic organisms. D.O. percent saturation values ranged from 9.9 to 211%, with an average value of 77.8%. An overall average diurnal D.O. variation of 3.4 mg/l was measured at the upstream monitoring location during the study period. Based on continuous measurement of D.O. in typical, unpolluted, southern Michigan warmwater streams, the SWAS assumes a diurnal variation greater than 1 mg/l to indicate possible nutrient enrichment. See Table 3 for water chemistry grab sample results from the upstream location.

Table 3. Water chemistry sample results; grab samples from the 2000 D.O. study - upstream location.

Parameter / Date / Time	July 25, 2000 10:30	July 27, 2000 10:15	July 31, 2000 10:45
Ammonia (mg N/l)	2.4	2.5	2.6
$CBOD_5$ (mg/l)	17	9 LH	4
D.O. (mg/l)	14.5	9.2	4.8
Nitrate+nitrite (mg N/l)	2.0	1.5	0.9 DL
Kjeldahl nitrogen (mg N/l)	5.9	5.6	4.1
Total Phosphorus (mg P/l)	0.49	0.46	0.37
Total Suspended Solids (mg/l)	52	46	27
Total Dissolved Solids (mg/l)	-	-	-

LH - QC indicated possible low recovery. Actual level may be higher.
DL - Sample analyzed using dilutions.

Continuously recorded D.O. levels at the downstream monitoring location ranged from 1.4 to 11.2 mg/l, with an average concentration of 5.9 mg/l over the study period. D.O. percent saturation values ranged from 15.6 to 139%, with an average value of 71.6%. An overall average diurnal D.O. variation of 2.3 mg/l was measured at the downstream monitoring location during the study period. See Table 4 for water chemistry grab sample results from the downstream location.

Table 4. Water chemistry sample results; grab samples from the 2000 D.O. study – downstream location.

Parameter / Date / Time	7/25/00 11:15	7/27/00 11:45	7/31/00 11:30
Ammonia (mg N/l)	0.7 DL	0.6 DL	1.2
$CBOD_5$ (mg/l)	5	<3 LH	<3
D.O. (mg/l)	10.0	8.7	4.4
Nitrate+nitrite (mg N/l)	2.5	2.2	1.7
Kjeldahl nitrogen (mg N/l)	2.2	1.7	2.2
Total phosphorus (mg P/l)	0.24	0.14	0.20
Total Suspended Solids (mg/l)	59	35	25
Total dissolved solids (mg/l)	-	-	340

LH – QC indicated possible low recovery. Actual level may be higher.
DL – Sample analyzed using dilutions.

The macroinvertebrate community within the study reach was dominated by surface breathing and low D.O.-tolerant taxa. Seiches were again observed to affect flows in Lapointe Drain, with flow from Lake Erie upstream in the drain occurring occasionally. Floating mats of algae were also observed at various locations in the study reach.

Wolf (2006) attempted to conduct a biological survey of Lapointe Drain on June 7-8, 2005, to determine attainment of Michigan WQS, identify potential NPS of water quality impairment, and evaluate general water quality trends within the watershed. At the time of the visit, Lapointe Drain had no observable flow and was stagnant. Due to these conditions, a macroinvertebrate assessment using Great Lakes and Environmental Assessment Section (GLEAS) Procedure 51 (MDEQ, 1990) was deemed inappropriate.

Schmitt (2007 Draft) conducted monitoring for total phosphorus in Lapointe Drain on September 28, 2006, to identify NPS of water quality impairment for use in developing this TMDL. The effects of the Mason Consolidated School and Luna Pier WWTP's discharges on the water quality of Lapointe Drain were also evaluated. In the upper reaches of Lapointe Drain, staff observed very little water and flow. The land use in the watershed of the reach upstream of Interstate 75 (I-75) is primarily agriculture and light residential. The vegetation present in the stream channel indicated that the flow in the reach upstream of I-75 is intermittent and dry, no flow conditions are present during the summer. From these observations, effluent from the Mason Consolidated Schools WWTP does not appear to reach Lapointe Drain downstream of I-75 during the summer months, when school operations are at a minimum. Lapointe Drain downstream of I-75 was again observed to be influenced by seiche effects from Lake Erie. No algal mats were observed during the visit. Table 5 contains total phosphorus sample results from the September 28, 2006, sampling.

Table 5. Lapointe Drain total phosphorus concentrations, September 28, 2006.

Location / Parameter	M-125	Bay Creek Road	City of Luna Pier Public Boat Launch	Luna Pier WWTP Outfall 001	Mason Consolidated Schools WWTP
Total Phosphorus (mg/l)	0.24	0.13	0.15	0.9*	0.5**

*Sample from September 27, 2006, Discharge Monitoring Report (DMR).
**Sample from September 28, 2006, DMR.

NUMERIC TARGETS

D.O.

Rule 100 (R323.1100) requires that all waters of the state are to be protected for warmwater fish, other indigenous aquatic life and wildlife, agriculture, navigation, industrial water supply, public water supply at the point of intake, partial body contact recreation, fish consumption, and total body contact recreation from May 1 to October 31. Regarding D.O., the impaired designated use for Lapointe Drain addressed by this TMDL is the warmwater fish and other indigenous aquatic life and wildlife use. The D.O. standard was developed to provide protection of these designated uses. Attainment of the warmwater D.O. standard of 5 mg/l as a daily minimum is the target of this TMDL. The D.O. WQS is defined as follows:

R 323.1064 Dissolved oxygen in Great Lakes, connecting waters, and inland streams.

Rule 64. (1) A minimum of 7 milligrams per liter of dissolved oxygen in all Great Lakes and connecting waterways shall be maintained, and, except for inland lakes as prescribed in R 323.1065, a minimum of 7 milligrams per liter of dissolved oxygen shall be maintained at all times in all inland waters designated by these rules to be protected for coldwater fish. In all other waters, except for inland lakes as prescribed by R 323.1065, a minimum of 5 milligrams per liter of dissolved oxygen shall be maintained. These standards do not apply for a limited warmwater fishery use subcategory or limited coldwater fishery use subcategory established pursuant to R 323.1100(11) or during those periods when the standards specified in subrule (2) of this rule apply.

(2) Surface waters of the state which do not meet the standards set forth in subrule (1) of this rule shall be upgraded to meet those standards. The department may issue permits pursuant to R 323.2145 which establish schedules to achieve the standards set forth in subrule (1) of this rule for point source discharges to surface waters which do not meet the standards set forth in subrule (1) of this rule and which commenced discharge before December 2, 1986. For point source discharges which commenced before December 2, 1986, the dischargers may demonstrate to the department that the dissolved oxygen standards specified in subrule (1) of this rule are not attainable through further feasible and prudent reductions in their discharges or that the diurnal variation between the daily average and daily minimum dissolved oxygen concentrations in those waters exceeds 1 milligrams per liter, further reductions in oxygen-consuming substances from such discharges will not be required, except as necessary to meet the interim standards specified in this subrule, until comprehensive plans to upgrade these waters to the standards specified in subrule (1) of this rule have been approved by the department and orders, permits, or other actions necessary to implement the approved plans have been issued by the department. In the interim, all of the following standards apply:

…(b) For surface waters of the state designated for use for warmwater fish and other aquatic life, except for inland lakes as prescribed in R 323.1065, the dissolved oxygen shall not be lowered below a minimum of 4 milligrams per liter, or below 5 milligrams per liter as a daily average, at the design flow during the warm weather season in accordance with R 323.1090(3) and (4). At the design flows during other seasonal periods as provided in R 323.1090(3), a minimum of 5 milligrams per liter shall be maintained. At flows greater than the design flows, dissolved oxygen shall be higher than the respective minimum values specified in this subdivision.

…(3) The department may cause a comprehensive plan to be prepared to upgrade waters to the standards specified in subrule (1) of this rule taking into consideration all factors affecting dissolved oxygen in these waters and the cost effectiveness of control measures to upgrade

these waters and, after notice and hearing, approve the plan. After notice and hearing, the department may amend a comprehensive plan for cause. In undertaking the comprehensive planning effort the department shall provide for and encourage participation by interested and impacted persons in the affected area. Persons directly or indirectly discharging substances which contribute towards these waters not meeting the standards specified in subrule (1) of this rule may be required after notice and order to provide necessary information to assist in the development or amendment of the comprehensive plan. Upon notice and order, permit, or other action of the department, persons directly or indirectly discharging substances which contribute toward these waters not meeting the standards specified in subrule (1) of this rule shall take the necessary actions consistent with the approved comprehensive plan to control these discharges to upgrade these waters to the standards specified in subrule (1) of this rule.

Total Phosphorus

The total phosphorus WQS (R 323.1060) is defined as follows:

R 323.1060 Plant Nutrients.

Rule 60. (1) Consistent with Great Lakes protection, phosphorus which is or may readily become available as a plant nutrient shall be controlled from point source discharges to achieve 1 milligram per liter of total phosphorus as a maximum monthly average effluent concentration unless other limits, either higher or lower, are deemed necessary and appropriate by the department.

(2) In addition to the protection provided under subrule (1) of this rule, nutrients shall be limited to the extent necessary to prevent stimulation of growths of aquatic rooted, attached, suspended, and floating plants, fungi or bacteria which are or may become injurious to the designated uses of the surface waters of the state.

The D.O. study conducted in 2000 (Sunday, 2001) documented floating algal mats and high diurnal D.O. variations indicating excessive levels of plant photosynthesis and respiration. The Lapointe Drain watershed is comprised of agricultural and light residential land uses. The drain is not anticipated to revert to reference quality due to historical and continued dredging and widening of the drain. There is no data available of historical background total phosphorus concentrations in Lapointe Drain to use as a reference for restoration targets. In addition, there are no nearby water bodies to use as a basis for reference phosphorus conditions. Therefore, a review of federal and state guidance, literature, and target levels used in other TMDLs was conducted to determine a total phosphorus target in Lapointe Drain to eliminate nuisance aquatic plant conditions and a total phosphorus target of 0.1 mg/l was selected. This goal is primarily based on the recommendation in the USEPA water quality criteria document (USEPA, 1986), referencing the research of Mackenthum (1973), that preventing nuisance plant growth in streams or other flowing waters, the total phosphorus concentration not exceed 0.1 mg/l.

SOURCE ASSESSMENT

Both point source discharges and NPS pollution are potential sources of D.O. demanding pollutants, such as CBOD, ammonia nitrogen, sediments (expressed as TSS), and (indirectly) nutrients. CBOD and ammonia can be oxidized in the water column, depleting levels of D.O. Decay of deposited organic sediments can also negatively affect in-stream D.O. concentrations. This decay process is known as sediment oxygen demand (SOD) and is exacerbated by inputs of TSS. Nutrients such as phosphorus and nitrogen can stimulate plant growths, which in turn can reduce D.O. levels through plant and algae respiration. These nutrients are often adsorbed onto solids, which can enter waterways during wet weather events as TSS. Sorbed phosphorus can then enter the water column through biochemical processes (Chapra, 1997).

There are three individual NPDES permitted point source discharges and one non-storm water general permitted discharge to the Lapointe Drain watershed in the vicinity of Luna Pier. The individual permits include the Michigan Department of Transportation's (MDOT's) statewide permit covering storm water (MI0057364), the Mason Consolidated Schools WWTP (MI0047201) and the LaSalle MHP (MI0056022). The Luna Pier WWTP has a certificate of coverage (COC) (MIG570026) issued under the secondary treatment wastewater general permit (MIG570000). See Appendix A, Table A.1 for a listing of all NPDES permittees discharging to the TMDL reach. Figure 2 indicates the location of these NPDES permittees with the exception of the MDOT permit. The statewide MDOT storm water permit covers runoff from state managed roads in the basin (US 23, US 24, I-75, Luna Pier Road, and Dixie Highway). Of these point sources, the Luna Pier WWTP is a relatively significant point source of conventional pollutants in the TMDL reach. Runoff from the lands covered under the MDOT statewide stormwater permit is considered insignificant in relation to runoff from other land uses. There are no general industrial stormwater permittees, construction sites under Notice of Coverage (NOC) (construction sites greater than five acres in area), or Concentrated Animal Feeding Operations (CAFOs) in the Lapointe Drain watershed.

Luna Pier WWTP

The Luna Pier WWTP (MIG570026), with a design flow of 0.348 million gallons per day (MGD), is permitted to continuously discharge treated sanitary wastewater from outfall 001 to Lapointe Drain in Section 11, T8S, R8E of Erie Township, Monroe County. See Table B.1 of Appendix B for Luna Pier WWTP current NPDES permit conventional parameter effluent limits. The Luna Pier WWTP was issued COC No. MIG570026 on March 29, 2005, which expires April 1, 2010. The city of Luna Pier has no known combined sewer or sanitary sewer overflows, and none have been known to exist in the past.

A summary of averaged data from Luna Pier WWTP DMRs from May 2003 through October 2006, is presented in Table 6. During that time period, monthly average total phosphorus concentrations ranged from 0.53 mg/l to 2.1 mg/l. Total phosphorus loads ranged from 0.78 pounds per day (lbs/day) to 3.8 lbs/day. Monthly average total phosphorus concentrations were above the total phosphorus limit of 1.0 mg/l a total of seven times during this time period. The percent removal requirement (85% minimum as a monthly average) for TSS was not met during the period.

In April 2005, the Luna Pier's COC was modified to limit $CBOD_5$ rather than five-day total biochemical oxygen demand (BOD_5). From May 2003 through March 2006, when BOD_5 was limited, the average BOD_5 concentration (35 mg/l) was above the permit limit of 30 mg/l as a monthly average. The percent removal requirements (85% minimum as a monthly average) for BOD_5 was not met during the period. From April 2005 through October 2006, $CBOD_5$ concentrations averaged 14 mg/l, in compliance with the permit limit of 30 mg/l. During that period, $CBOD_5$ percent removal rates were not reported.

Mason Consolidated Schools

The Mason Consolidated Schools WWTP (MI0028142), with a design flow of 0.035 MGD, is permitted to continuously discharge treated sanitary wastewater from outfall 001 to Lapointe Drain located in Section 4, T8S, R8E, Erie Township, Monroe County. See Table B.2 of Appendix B for the Mason Consolidated Schools current NPDES permit conventional parameter effluent limits. The current NPDES permit took effect on October 1, 2001, and expired on October 1, 2006. As the permittee submitted a timely application for permit reissuance, the current permit has been extended and will remain in effect until the permit is reissued in 2007.

Historically, the Mason Consolidated Schools WWTP had problems with total phosphorus treatment. Monthly average total phosphorus concentrations from January 1997 through October

1999 ranged from 0.9 mg/l to 3.6 mg/l. Monthly average total phosphorus concentrations were above the total phosphorus limit of 1.0 mg/l a total of 31 times during this time period. These noncompliance issues were addressed when the water treatment additive, ChemTreat P891L, was approved by the MDEQ on May 5, 2000, for use by the Mason Consolidated Schools WWTP to control total phosphorus in the effluent.

See Table 6 for a summary of averaged data from Mason Consolidated Schools WWTP DMRs from January 2003 through October 2006. Monthly average total phosphorus concentrations in that period ranged from 0.4 mg/l to 1.3 mg/l and total phosphorus loads ranged from 0.02 lbs/day to 0.2 lbs/day. The total phosphorus limit of 1.0 mg/l was exceeded twice during this time period.

The facility's current NPDES permit requires advanced waste treatment (AWT) limits (MDEQ, 1995) throughout the year. AWT limits are treatment technology-based effluent limits and are the most restrictive conventional pollutant limits imposed on sanitary wastewater facilities employing biological treatment. Such effluent is assumed to exert no in-stream D.O. demand and is often referred to as "stable effluent" due to very low BOD decay rates and high ultimate BOD to BOD_5 ratios (Chapra, 1997; MDEQ, 1995).

Table 6. Luna Pier WWTP and Mason Consolidated Schools WWTP Averaged DMR data from May 2003 through October 2006.

Parameter	Luna Pier WWTP	Mason Consolidated Schools WWTP
Flow (MGD)	0.227	0.017
Ammonia (mg N/l)	-	0.15
$CBOD_5$ (mg/l) @	14	1.8
BOD_5 (mg/l) *	35	-
BOD % removal *	78	-
D.O. (mg/l)	4.6	10
Total phosphorus (mg P/l)	0.83	0.63
TSS (mg/l)	16	1.7
TSS % removal	81	-

@ - CBOD5 limits are effective from April 2006 through the present.
* - BOD_5 limits were in effect from May 2003 through March 2006.

LaSalle MHP

The LaSalle MHP with a design flow of 0.0996 MGD is permitted to continuously discharge treated sanitary wastewater from outfall 001 to the North Branch Wenrick and Cousino Drain located in Section 33, T7S, R8E, LaSalle Township, Monroe County. The North Branch Wenrick and Cousino Drain is a tributary to Whitewood Creek, which is a tributary to Lapointe Drain. See Table B.3 of Appendix B for the LaSalle MHP current NPDES permit conventional parameter effluent limits. AWT limits are required throughout the year. The current NPDES permit took effect on October 1, 2006, and expires on October 11, 2011. To date, the LaSalle MHP has not been constructed and has not discharged any effluent.

Table 7 contains permitted daily conventional pollutant loads for the listed primary point sources. The loads are calculated from the facilities' monthly NPDES permit load limits. For parameters not limited by load, daily loads were estimated from concentration permit limits or estimates of effluent concentrations, and the facility design flows. Note that the facilities may, in fact, be discharging significantly lower loads of these pollutants than they are permitted to discharge. Loads of ammonia nitrogen from the Luna Pier WWTP are estimated based on an effluent concentration of 15 mg/l, a value typical of secondary effluent.

Table 7. Lapointe Drain Permitted Point Source Conventional Pollutant Loadings.

Daily Load (lbs/day)	Luna Pier WWTP	LaSalle MHP WWTP	MDOT Stormwater Permit	Mason Consolidated Schools
$CBOD_5$	87 (BOD_5)	3.3	13	1.2
TSS	87	17	40	5.8
Ammonia nitrogen	44 *	0.4	0.2	0.15
Total phosphorus	2.9	0.8	0.2	0.3

* - Facility's NPDES permit contains no limits for the listed parameters. Load is estimated.

Potential NPS of pollutants were evaluated based on land uses in the watershed (Table 8). Land use proportions were derived using the Long-Term Hydrologic Impact Assessment (L-THIA) Web-based application created and maintained by Purdue University and USEPA (Purdue University and USEPA, 2001). This geographic information system-based software uses the event mean concentration (EMC) and curve number (CN) procedures to calculate daily pollutant loads based on site-specific land use, soil type, and meteorological data. The L-THIA application is supported by staff of the USEPA, Region 5.

It is possible that the urban land use proportions (e.g., commercial and residential) are in fact higher than indicated in Table 8 due to increased residential development. MDEQ, Water Bureau district staff indicate no knowledge of CAFOs or problematic agricultural operations in the affected basin. As there are no NOC-covered construction sites or facilities discharging runoff under the general industrial stormwater permit in the basin, no separate estimates of load from those permittees are provided. No transportation land use area (relevant to the MDOT statewide stormwater permit) was reported by L-THIA.

Table 8. Lapointe Drain Basin Land Use Categories as Percentages at the Confluence with Lake Erie.

Land Use Category	Percent Land Use Category
Water	1.2
Commercial	1.0
Agriculture	65.5
High density residential	0.6
Low density residential	3.0
Grass/pasture	20.4
Forest	8.3

There are no significant loads of pollutants to the TMDL reach contributed by land under the MDOT statewide stormwater permit, and no significant loads contributed by land uses covered under NPDES permits or NOCs. Essentially, all land use-related loads are from non-NPDES land uses.

Estimates of all non-NPDES land use-related daily loads of BOD ($CBOD_5$ + nitrogenous BOD), TSS, total phosphorus, and total nitrogen to Lapointe Drain near the city of Luna Pier were estimated using the L-THIA application. Estimates of these loads appear in Table 9 and represent pollutant loads to the TMDL reach, in addition to those generated by the facilities in Table 7. The loads in Table 9 include those to Lapointe Drain and all of its tributaries. These estimates are based on site-specific data and represent a best approximation using software default EMC and CN values. These pollutant loads include estimated loads from lands covered under the statewide MDOT stormwater permit.

Table 9. Estimated Daily Total Land Use-Related Conventional Pollutant Loads to Lapointe Drain at its Confluence with Lake Erie.

Pollutant	Daily Load (lbs/day)
BOD	70
TSS	1165
Total nitrogen	48
Total Phosphorus	14

LINKAGE ANALYSIS

D.O. and Total Phosphorus

The observed D.O. standard nonattainment in Lapointe Drain can be attributed to a number of factors. These factors were assessed using mathematical D.O. models of the reach of concern. The model chosen was the Water Bureau's continuously stirred tank reactor (CSTR) steady-state D.O. model (Chapra and Reckhow, 1983), based on the modified Streeter-Phelps equation. The model simulates D.O. depletion due to SOD and the decay of CBOD and ammonia, and it incorporates a term for D.O. diurnal variation. The model also includes a dispersion term to account for the tidal river-like nature of Lapointe Drain. The CSTR model is considered appropriate for use in the TMDL as it can represent the system without being unnecessarily complex or too data-intensive. Modeling was conducted in accordance with guidance described in the GLEAS Procedure 80 (MDEQ, 1995). The model was calibrated to data collected in the summer of 2000. River surveys and D.O. modeling have revealed that excessive plant respiration is the leading cause of D.O. depletion in Lapointe Drain. However, SOD and BOD from the Luna Pier WWTP also play significant roles in the D.O. problem in the TMDL reach.

Plant Respiration: The presence of aquatic plants in a water body can have a very significant affect on levels of D.O. Plants, such as rooted macrophytes and algae, use photosynthesis during daylight hours to convert carbon dioxide and water into glucose, a process that releases oxygen. The oxygen is released to the surrounding water increasing levels of D.O. Throughout the day and night, plants also respire aerobically. This process removes D.O. from the water column. D.O. concentrations vary throughout the day in response to photosynthesis and respiration. Since the photosynthetic contribution of D.O. occurs only with sunlight, and respiration is relatively constant, levels of D.O. are most often lowest just before sunrise. Plant growth can be encouraged by the addition of nutrients, such as phosphorus, to a water body. This increased growth causes increases in photosynthesis and respiration rates, resulting in exaggerated daytime D.O. concentration peaks and potentially problematic early morning lows as have been observed in Lapointe Drain.

Phosphorus can exist in the water column as dissolved phosphorus and/or particulate phosphorus sorbed to solids and expressed as TSS. When dissolved, some of the phosphorus is available for use by aquatic plants and increased growth can result. Phosphorus, in the particulate form in river sediments contributed by inputs of TSS from runoff or direct discharges, can be released as dissolved phosphorus under certain conditions, contributing to increased plant growth. These conditions include those often found in river bottom sediments, where anaerobic processes can liberate dissolved, bioavailable phosphorus species such as ortho-phosphate (PO_4^{3-}) from settled, particulate-sorbed phosphorus (Bowie et al., 1985). Substantial loads of TSS can therefore result in substantial inputs of phosphorus available for plant use in a stream. The association of total phosphorus with TSS is well documented in research literature (Havlin, 2004; Sharpley et al., 1992), and past WB efforts (Suppnick, 1996).

As a wide, straight-cut, maintained drain, much of Lapointe Drain's surface is exposed to sunlight. Little shade exists throughout Lapointe Drain upstream of its confluence with Lake Erie. The

conditions of little or no shade and nutrient inputs create ideal conditions for nuisance plant growth in the TMDL reach. The resulting plant growth causes high rates of photosynthesis and respiration. Elevated levels of total phosphorus above the 0.1 mg/l target are evident in total phosphorus samples collected since 1998. Tables 2-5 describe total phosphorus concentrations throughout Lapointe Drain. Based on the 2000 D.O. study, surveys, and modeling, D.O. standard nonattainment in Lapointe Drain appears primarily due to plant respiration caused by excessive nutrients.

SOD: Solids present in the water column of a flowing water body can settle to the stream bed, forming layers of sediments with variable depths and compositions. Organic solids on the surface layer of the bottom deposit in direct contact with the water can undergo aerobic decomposition. This process causes diffusion of D.O. from the water column into the sediment layer, depleting D.O. levels in the overlying river water. High levels of TSS in a water body can potentially cause high SOD rates if the solids settle to the bottom and decompose.

During staff visits and the 2000 D.O. monitoring, river substrates in the TMDL reach were observed to be silty, mucky, and organic in nature. Such substrates commonly occur naturally near the mouths of Lake Erie tributaries; however, sediments present in NPS runoff and Luna Pier WWTP effluent also settle out of the water column in the TMDL reach. The occasionally stagnant nature of Lapointe Drain may exacerbate the effects of SOD, as the water often tends to spend more time over the high-SOD sediments rather than flowing into Lake Erie. Note that SOD and sediment deposits are typically highly variable spatially and temporally due to varying flow regimes affecting deposition and scour (Bowie et al., 1985).

BOD: BOD is the amount of D.O. that a given organic material will consume when it is oxidized by aerobic microorganisms in a water body. BOD has units of mg/l of D.O. consumed in the decomposition process. Sources of BOD in Lapointe Drain include the point source Luna Pier WWTP and NPS sources such as pet wastes and other organic materials present in surface runoff. The Mason Consolidated Schools and LaSalle MHP discharges are not likely to contribute significant amounts of BOD due to their AWT permit limits. When carbon-based compounds are oxidized, the oxygen demand is referred to as carbonaceous BOD, or CBOD. When nitrogen-based compounds are oxidized, it is called nitrogenous BOD, or NBOD. Most commonly, NBOD is exerted when ammonia is oxidized into nitrates and nitrites. Organic nitrogen can be converted into ammonia, which then is also oxidized. The CSTR model accounts for CBOD and NBOD separately, as the rates of decay are very likely different for both.

LOADING CAPACITY (LC) DEVELOPMENT

The LC represents the maximum loading of oxygen demanding substances (e.g., sediments, BOD) and total phosphorus that can be assimilated by the water body while still achieving WQS and preventing nuisance plant growths. As indicated in the Numeric Target section, the targets for this TMDL are the WQS of 5 mg/l minimum for D.O. and 0.1 mg/l for total phosphorus.

The TMDL development defines the environmental conditions that will be used when defining allowable pollutant loads. The “critical condition” is defined as the set of environmental conditions that result in the attainment of WQS and have an acceptably low frequency of occurrence. The critical conditions for the applicability of WQS in Michigan surface waters are given in Rule 90 (R323.1090), applicability of WQS. Rule 90 requires that the WQS apply at all flows equal to or exceeding the water body design flow. In general, the lowest monthly 95% exceedance flow and 90% occurrence temperature for streams are used as design conditions for oxygen-demanding pollutant loads (CBOD, ammonia nitrogen, and TSS). For this TMDL, the critical condition for both D.O. and total phosphorus is the summer low-flow period. This is the period that is most conducive for plant and algal growth due to high temperatures and low stream flow.

D.O. models were used to quantify reductions in river D.O. demands necessary to attain the D.O. standard at critical conditions as described in this TMDL's Margin of Safety (MOS) discussion. Calibration data show that along the 2,200 foot TMDL reach of Lapointe Drain, on average, SOD is responsible for approximately 30% of the D.O. deficit at design conditions, while decay of BOD from the Luna Pier WWTP accounts for approximately 31% of the deficit. Excessive plant respiration, encouraged by loadings of phosphorus, is estimated to be responsible for approximately 39% of the deficit. The calculated relative contributions to the D.O. deficit from BOD, plant respiration, and SOD will vary depending on the conditions to which the model is calibrated.

In order to decrease SOD and nutrient loads, the loading of suspended solids and total phosphorus (the target pollutants for this TMDL) to the drain system from both point and NPS must be reduced. It is likely that most NPS nutrient inputs to the system are transported with the suspended sediment loads likely to accompany runoff. This is supported by wet weather water chemistry sampling conducted in other watersheds similar to that of Lapointe Drain. Wet weather sampling conducted in development of the Grand and Portage Rivers (at Jackson) D.O. TMDL (Sunday, 2003) showed that total phosphorus concentrations are significantly higher than orthophosphate dissolved concentrations. These data indicate that most NPS phosphorus loads are adsorbed to solids rather than being in a dissolved form. In order to meet the target of 0.1 mg/l total phosphorus and to reduce D.O. demand due to BOD oxidation in Lapointe Drain during critical conditions of no background flows, the Luna Pier WWTP will be required to reduce its loadings of those pollutants. BOD loading reductions can be accomplished by requiring the Luna Pier WWTP to meet AWT permit limits. The implementation of AWT permit limits and a total phosphorus limit of 0.1 mg/l at the Luna Pier WWTP, and the reduction of suspended solids loads to Lapointe Drain, is therefore the best overall strategy to improve D.O. in the stream and prevent nuisance plant growths.

ALLOCATIONS

The LC is comprised of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for NPS and natural background levels. In addition, the LC must include a MOS, either implicitly or explicitly, that accounts for uncertainty in the relation between pollutant loads and the quality of the receiving water body. Conceptually, this definition is denoted by the equation:

$$LC = WLAs + \sum LAs + MOS$$

The LC represents the maximum loading of pollutants that can be assimilated by the receiving water while still achieving WQS. The LC is allocated into WLAs for point sources, LAs for NPS, and the MOS.

The calibrated CSTR D.O. model was used to simulate Lapointe Drain D.O. concentrations at critical design conditions. Assuming that the instream total phosphorus target of 0.1 mg/l is achieved, a D.O. diurnal variation of 1.0 mg/l, typical of non-nutrient enriched streams, was assumed in the model. Modeling suggests that the Luna Pier WWTP must achieve an effluent quality as characterized by AWT permit limits, and that SOD must also be reduced in order for the warmwater D.O. standard to be attained in Lapointe Drain. At receiving water design conditions with the Luna Pier WWTP discharging at its design flow and at AWT limits, D.O. modeling indicates that SOD must be reduced by approximately 63% overall to attain the D.O. standard. This will be achieved by reducing TSS loads to the TMDL reach by 63%.

Table 10 contains total estimated existing TSS loads to Lapointe Drain at its confluence with Lake Erie. TSS loads from the Luna Pier WWTP have been reduced by 33% to reflect the reduced loading of TSS under AWT permit limits compared to the secondary treatment general permit limits

(20 vs. 30 mg/l, 87 vs. 58 lbs/day). TSS loads remain the same for the Mason Consolidated Schools and LaSalle MHP WWTPs as they are currently under year-round AWT limits. To achieve an overall 63% TSS load reduction to Lapointe Drain (given that only one point source load, that of the Luna Pier WWTP can be reduced by only 33%) the land use-related TSS loads must be reduced by 69%. The overall TSS load reduction calculation is illustrated below using existing TSS loading data from Tables 7 and 9. The TSS load reduction equals a target LC of 472 lbs/day TSS, a 63% reduction from the current TSS load of 1275 lbs/day.

Table 10. TSS loads to Lapointe Drain TMDL reach.

TSS load (lbs/day)	Luna Pier WWTP	LaSalle MHP WWTP	Mason Consolidated Schools	MDOT Stormwater Permit	Land Use-related loads	Total TSS loads (lbs/day)
Existing load	87	17	5.8	40	1125	1275
Target load	58	17	5.8	40	351	472
Percent reduction	33%	0%	0%	0%	69%	63%

$$\text{Overall reduction} = \frac{\text{Existing load - Target load}}{\text{Existing load}}$$

$$= \frac{[(87+17+5.8+40)+1125] - [(58+17+5.8+40)+351]\ \text{lbs/d}}{(87+17+5.8+40)+1125\ \text{lbs/d}}$$

= 63%

A reduction in the TSS loading will result in load reductions of total phosphorus. Based on literature values, it is estimated that approximately 75% of the NPS total phosphorus load in the LA is sorbed to solids (Havlin, 2004). Table 11 shows existing and target total phosphorus loads based on the discussed 69% TSS load reduction in the LA, and a WLA load reduction resulting from lowering the Luna Pier WWTP's permitted monthly average total phosphorus concentration from 1.0 to 0.1 mg/l. Considering both the total phosphorus load reduction gained through LA TSS load reductions, and the reduction of total phosphorus itself from the Luna Pier WWTP, the total phosphorus LC for this TMDL is 3.7 lbs/day, a 57% reduction from the current loading of 9.0 lbs/day.

Table 11. Total phosphorus (TP) load reductions.

Source of TP	Current TP Load (lbs/day)	Target TP Load (lbs/day)	Target TP load calculation
Luna Pier WWTP	2.9	0.3	0.1 mg/l x 0.348 MGD x 8.34
LaSalle MHP WWTP	0.8	0.8	No reduction
Mason Consolidated Schools	0.3	0.3	No reduction
MDOT Stormwater Permit	0.2	0.2	No reduction
LA *	4.8	2.3	4.8 lbs/day x 75% sorbed x (1 - 0.69) + 4.8 lbs/day x 25% soluble
TOTALS	9.0	3.9	Total TP load reduction = 57%

* Attributed to land uses in Erie and LaSalle townships and the city of Luna Pier.

To summarize, D.O. modeling indicates that an overall 63% TSS load reduction, in conjunction with AWT and a 0.1 mg/l total phosphorus permit limit for the Luna Pier WWTP, will result in D.O. standard attainment in the TMDL reach and elimination of nuisance aquatic plant conditions.

WLAs

The current total phosphorus load from all point sources is 4.0 lbs/day. The three permitted point source discharges account for approximately 44% of the total phosphorus loading to Lapointe Drain (from Table 10: [2.9 + 0.8 + 0.3 lbs/day] / 9.0 lbs day = 0.44). Among the three point sources, the Luna Pier WWTP accounts for approximately 73% of the total load.

The Mason Consolidated Schools WWTP and LaSalle MHP are located approximately 2.2 and 2.8 miles, respectively, upstream of the TMDL reach. Both receiving waters for these point sources have a summer season 50% and 95% exceedance flow of 0.0 cfs. It has been observed that effluent from the Mason Consolidated Schools WWTP appears to not reach the TMDL reach as the effluent evaporates and/or soaks into the ground during the summer season. Further, little flow is expected from the Mason Consolidated School WWTP during the critical summer growing season as school operations are at a minimum with no classes held. Therefore, no total phosphorus reductions are recommended at this time for the Mason Consolidated Schools WWTP due to dry conditions observed downstream of the Mason Consolidated Schools WWTP in 2006 and in previous years. The LaSalle MHP has not been constructed to date and also discharges to a stream with no summer season flow. No total phosphorus reductions are recommended at this time for the LaSalle MHP.

The Luna Pier WWTP discharges within the TMDL reach and is a significant source of total phosphorus to Lapointe Drain. Since the summer season 50% and 95% exceedance flow in Lapointe Drain is 0.0 cfs and this portion of Lapointe Drain may at times be effluent dominated, a monthly average total phosphorus water quality-based effluent limit (WQBEL) of 0.1 mg/l is recommended for the Luna Pier WWTP effluent. A total phosphorus concentration of 0.1 mg/l is recommended in the USEPA water quality criteria document (USEPA, 1986), referencing the research of Mackenthum (1973), as an ambient goal to prevent nuisance plant growth. The proposed 0.1 mg/l WQBEL for total phosphorus is equal to 0.29 lbs/day at current discharge design conditions for the Luna Pier WWTP.

The D.O. standard nonattainment in Lapointe Drain has been documented during the summer months only. During the summer months (May through September), the most potentially significant point source of oxygen demanding substances to nonattaining reaches, the Luna Pier WWTP, is currently required by its COC to treat its effluent at secondary treatment limits (Table B.1). D.O. modeling conducted for this TMDL and previous modeling conducted in the development of WQBELs for the facility's NPDES permit has indicated the need for the facility to meet AWT permit limits for $CBOD_5$ and ammonia in the critical summer period to ensure attainment of the minimum D.O. WQS in Lapointe Drain. See Tables B.2 and B.3 for examples of AWT permit limits. Requiring the Luna Pier WWTP to meet AWT limits will result in an 86% reduction in the permitted $CBOD_5$ loading and a 97% reduction in ammonia nitrogen loading from the facility (based on permitted monthly average concentration limits). Permitted TSS loads from the Luna Pier WWTP will be reduced by 33% in the WLA as reflected in Table12.

The Mason Consolidated Schools WWTP and the proposed LaSalle MHP are required by their NPDES permits to treat wastewater to AWT limits year-round (Tables B.2 and B.3), based on WQBEL modeling. Further reductions in conventional pollutants (CBOD, ammonia nitrogen, and TSS) from this facility will not impact Lapointe Drain D.O. levels in the critical summer months.

No TSS load reduction is targeted for the statewide MDOT storm water permit (NPDES land use), as only a very small fraction of the overall transportation land use in the watershed consists of state-maintained roads as described in the Source Assessment section of this TMDL.

LAs

The NPS and natural background levels of phosphorus are combined to produce the LA. The primary NPS of phosphorus in Lapointe Drain are from runoff from various land uses found throughout the reach. Current total phosphorus loading from NPS and natural background sources account for approximately 5.0 lbs/day of the total 9.0 lbs/day (Table 11), or approximately 56% of the total phosphorus loading to Lapointe Drain.

TSS inputs resulting from land use-related sediment loads will be the primary targets for TSS reductions, and ultimately total phosphorus reductions in this TMDL. Table 12 lists the land use source LAs for Lapointe Drain. In order to achieve an overall TSS load reduction of 63%, existing TSS loads from land use-related sources have been reduced by 73% in the LA as described in Table 10. Lands contributing TSS loads to Lapointe Drain are located in the townships of Erie and LaSalle and the city of Luna Pier. The reduction of LA TSS loads by 73% is projected to reduce LA total phosphorus loads from 5.0 to 2.4 lbs/day (Table 11), a reduction of 52%. The L-THIA analysis indicates that a substantial portion of the annual phosphorus load delivered to Lapointe Drain is attributable to the agricultural land uses in the watershed.

Table 12. Daily TSS Load Source Allocations and Numeric Targets - Lapointe Drain at the mouth of Lake Erie.

Water Body	Current Daily TSS Load (lbs)	Daily TSS Load Numeric Target (lbs)	WLA Daily TSS Load (lbs)	LA Daily TSS Load (lbs)
LAPOINTE DRAIN:				
Industrial Storm Water Permitted Outfalls	-	-	-	-
Land Use-Related Sources*	1125	351	-	351
Existing Individual/General NPDES Permitted Facilities	150	121	121	-
Totals:	1275			
Daily TSS Load Numeric Target To D.O. TMDL Reach		472	121	351

* Attributed to land uses in the townships of Erie and LaSalle and the City of Luna Pier.

MOS

The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality. The MOS can be either implicit (i.e., incorporated into the TMDL analysis through conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings).

The portion of the TMDL specific to D.O. uses an implicit MOS due to very conservative assumptions incorporated in D.O. modeling used to determine appropriate load reductions for TSS and total phosphorus. Background flows and tributary inflows are represented at the 95%

exceedance summer low flow as determined by the MDEQ, Land and Water Management Division. The summer 95% exceedance flow is a stream flow that would be expected only during periods of severe drought. Stream flows would be expected to be this low for only 5% or less of the time during the summer season. Michigan WQS (R 323.1090), specify that WQS apply at all flows equal to or exceeding the 12-month 95% exceedance low flow. This is the stream flow employed in the modeling of the critical summer season, the minimum flow at which WQS are to be applied. Similarly, river temperatures are represented at the highest monthly 90% occurrence temperature for the summer season as defined in the Effluent Limit Coordination Procedure No. 15 (Buda, 1980). This temperature would be expected to be exceeded only 10% of the time during the summer months. This design temperature is derived from R 323.1075 of the WQS. Such high temperatures result in lower D.O. saturation concentrations and increased rates of in-stream oxygen utilization. The conservative assumptions regarding stream flow and water temperature are the same as those employed in the determination of WQBELs in NPDES WLAs at critical design conditions. For design condition TMDL modeling, the Luna Pier WWTP was represented as discharging its maximum design flow and maximum permitted concentrations of oxygen demanding substances. This is an extremely unlikely scenario and further lends to the conservative assumptions of the modeling. A large degree of uncertainty in the D.O. modeling is also removed as the models used were calibrated to observed data.

In a flowing water body, nuisance growths of plants and their negative impacts on D.O. are driven more by ambient concentration of total phosphorus, rather than a daily load. In the critical summer season when the design background flow in Lapointe Drain is 0.0 cfs and Lapointe Drain flows are comprised entirely of Luna Pier WWTP effluent, the limiting of the Luna Pier WWTP to 0.1 mg/l of total phosphorus should ensure that nuisance plant growths will not occur. This, in turn, should ensure that the current high D.O. diurnal variations observed in Lapointe Drain will be reduced to a value near 1.0 mg/l, typical of unpolluted southern Michigan streams. In addition to reducing the Luna Pier WWTP discharge to 0.1 mg/l, NPS of total phosphorus are reduced by another 27% in the LA via TSS load reductions, further reducing the likelihood of nuisance plant growth and its impacts on D.O. SOD is also reduced by limiting TSS loads, and improvements in Luna Pier WWTP effluent quality reduce potentially deleterious BOD and TSS loadings.

SEASONALITY

Monitoring and modeling indicates that design conditions occurring during the summer season represents the most critical conditions for D.O. standard attainment and nuisance plant growths in Lapointe Drain. Modeling of Lapointe Drain in other seasons using appropriate 95% exceedance low flows and 90% occurrence temperatures shows no predicted instances of D.O. standard nonattainment. However, the very large diurnal variations documented in Lapointe Drain may persist into the fall season, possibly leading to early morning D.O. standard nonattainment. The reduction in TSS loads and Luna Pier WWTP effluent total phosphorus concentration recommended in this TMDL should result in decreased plant growth and activity, D.O. diurnal variations, and SOD in Lapointe Drain during all seasons. The improved Luna Pier WWTP's discharge will have a better quality throughout the year, with lower levels of BOD, TSS, and total phosphorus discharged to Lapointe Drain, which will further discourage nuisance plant growths and D.O. standard nonattainment.

MONITORING

Future monitoring will be conducted to assess whether activities implemented under the TMDL result in water quality improvements. This monitoring will be conducted as resources allow. Typically, the Water Bureau monitors watersheds in accordance with the five-year NPDES permit review process. D.O. and total phosphorus standard attainment will result in the water bodies being removed from the Section 303(d) list, while continued nonattainment will result in further evaluation under the TMDL process. Monitoring for D.O. during the fall season may be included to

assess standard attainment during that season. Wet weather pollutant load sampling may aid in directing future efforts toward specific areas contributing significant NPS loads. Lapointe Drain is next scheduled for monitoring in 2010.

REASONABLE ASSURANCE ACTIVITIES

Under the NPDES Permit Program, point sources discharging in the Lapointe Drain watershed are responsible for meeting their effluent limits for oxygen demanding substances and total phosphorus. Compliance is determined based on review of DMR data by the MDEQ. Violations of the Luna Pier WWTP's effluent D.O. limit will be addressed by increased treatment provided by the upgraded facility. It is also expected that the upgraded facility will provide improved treatment for total phosphorus.

The Lapointe Drain TMDL reaches are designated as a county drain, managed by the Monroe County Drain Commission. The Monroe County Drain Commissioner and the Michigan Department of Agriculture, manage Lapointe Drain for water quantity and, to a limited extent, for water quality issues.

Monroe County administers the Part 91, Soil Erosion and Sedimentation Control (SESC) Program of the NREPA. This program aims to reduce sedimentation in rivers, lakes, and streams by controlling sediments in runoff from construction sites greater than 1 acre in area, or those located within 500 feet of a water of the state. Temporary (silt fences) and permanent control measures (such as fully vegetation buffer strips) are employed. The MDEQ, WB, oversees the counties' programs to ensure that they are effectively enforcing SESC regulations.

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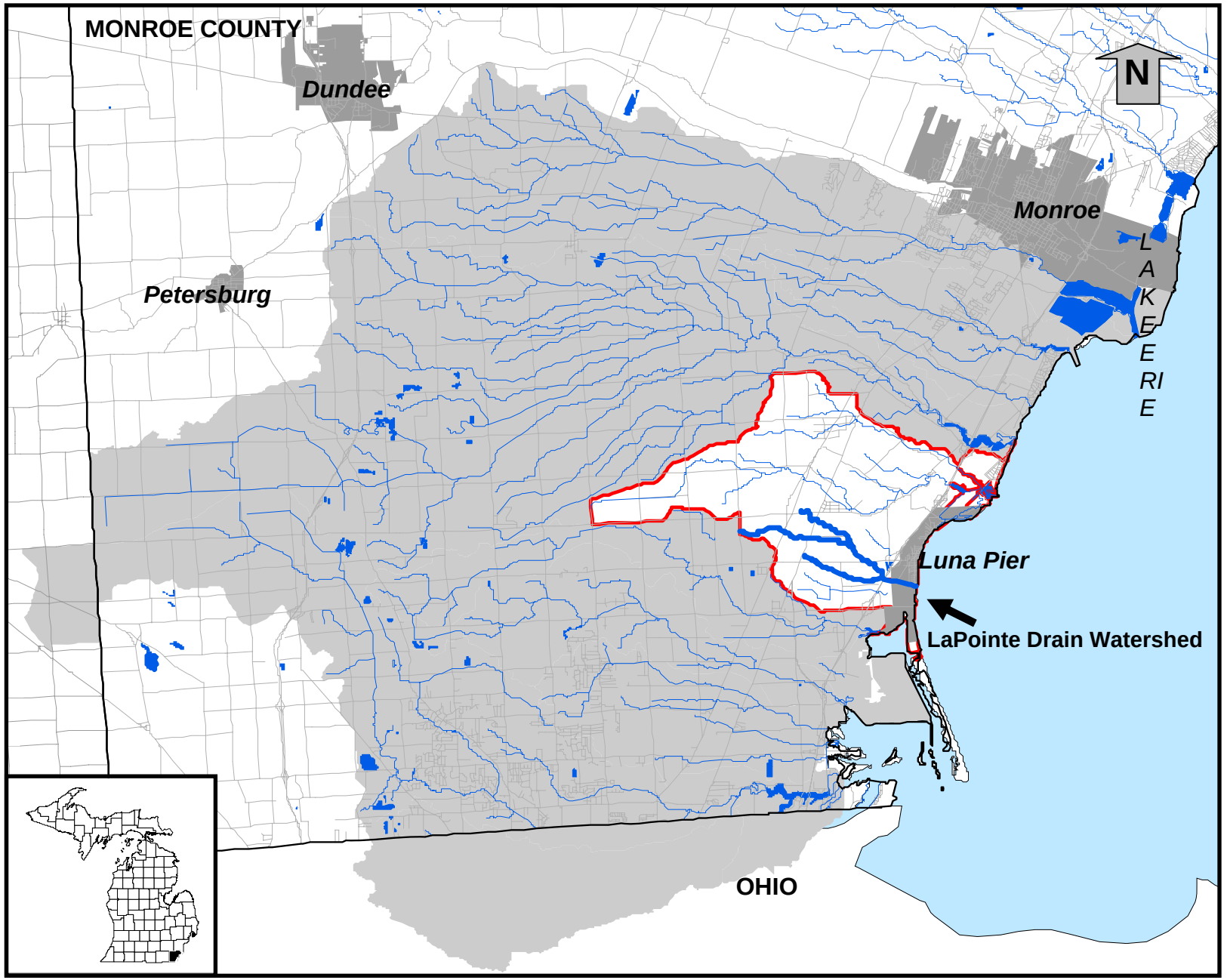

Figure 1. The Lapointe Drain watershed highlighting the TMDL reach located in Monroe County, Michigan.

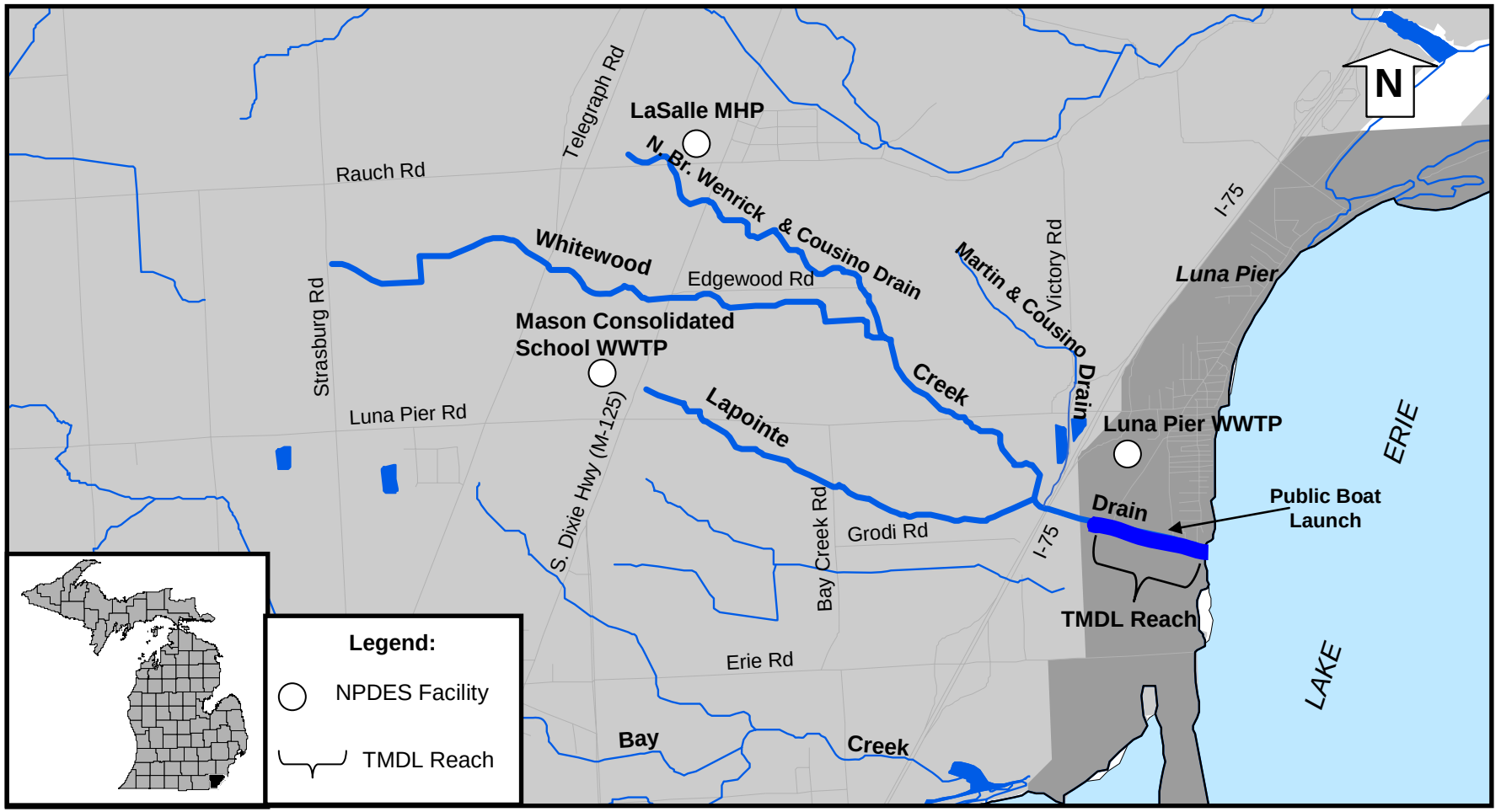

Figure 2. Lapointe Drain watershed highlighting the TMDL reach and indicating locations of NPDES permitted discharges, Monroe County, Michigan.

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APPENDIX A - PERMITTED OUTFALLS TO LAPOINTE DRAIN IN THE VICINITY OF LUNA PIER

TABLE A.1
Individual and general NPDES permitted outfalls to Lapointe Drain in the vicinity of Luna Pier
Source: MDEQ/WB NPDES Permit Management System (NMS)

PERMIT NUMBER	FACILITY	RECEIVING WATER	DESIGN FLOW (MGY)
Individual NPDES Permits			
MI0047201	Mason Consolidated Schools	Lapointe Drain	12.8
MI0056022	LaSalle WWTP	North Branch Wenrick and Cousino Drain	36.4
MI0057364	MDOT storm water	-	-
		Total Design Discharge (MGY):	49.2
General Permits:			
MIG570026	Luna Pier WWTP	Lapointe Drain	127
		Total Design Discharge (MGY):	127

APPENDIX A - PERMITTED OUTFALLS TO LAPOINTE DRAIN IN THE VICINITY OF LUNA PIER.

TABLE A.2

Individual and general NPDES permitted outfalls to Lapointe Drain in the vicinity of Luna Pier with estimated TSS loads

PERMIT NUMBER	FACILITY	RECEIVING WATER	DESIGN FLOW (MGY*)	Monthly TSS Limit (mg/l)	Annual TSS Loading (lbs)
Individual NPDES Permits					
MI0047201	Mason Consolidated Schools	Lapointe Drain	12.8	20	2,000
MI0056022	LaSalle MHP	North Branch Wenrick and Cousino Drain	36.4	20	6,000
		Total Design Discharge (MGY):	49.2		
General Permits:					
MIG570026	Luna Pier WWTP	Lapointe Drain	127	40 and 70 **	32,000
		Total Design Discharge (MGY):	127		

* Not limited but assumed maximum monthly TSS concentration

** Seasonal limits, spring and fall

APPENDIX B – LUNA PIER WWTP (MIG570026), MASON CONSOLIDATED SCHOOLS (MI0028142), LASALLE MHP (MI0056022) CONVENTIONAL PARAMETER NPDES PERMIT LIMITS.

Table B.1. Luna Pier WWTP NPDES conventional parameter permit limits (secondary treatment general permit (MIG570000)).

Parameter	Period	Maximum loading (lbs/day)		Maximum concentration (mg/l)		
		Monthly	7-day	Monthly	7-day	Daily
$CBOD_5$ (mg/l)	Year-round	-	-	30	45	-
$CBOD_5$ % Removal (minimum)	Year-round	-	-	85	-	-
TSS (mg/l)	Year-round	-	-	30	45	-
TSS % Removal (minimum)	Year-round	-	-	85	-	-
Ammonia Nitrogen (mg/l)	Year-round	-	-	(report)	-	-
TP (mg/l)	Year-round	-	-	1.0	-	-
D.O. (min., mg/l)	Year-round	-	-	4.0	-	-

Design flow of 0.348 MGD, outfall 001 is to Lapointe Drain

Table B.2. Mason Consolidated School NPDES conventional parameter permit limits (advanced waste treatment limits).

Parameter	Period	Maximum loading (lbs/day)		Maximum concentration (mg/l)		
		Monthly	7-day	Monthly	7-day	Daily
$CBOD_5$ (mg/l)	Year-round	1.2	2.9	4.0	-	10
TSS (mg/l)	Year-round	5.8	8.6	20	30	-
Ammonia Nitrogen (mg/l)	Year-round	0.1	0.6	0.5	-	2.0
TP (mg/l)	Year-round	0.3	-	1.0	-	-
D.O. (min., mg/l)	Year-round	-	-	-	-	6.0

Design flow of 0.035 MGD, outfall 001 is to Lapointe Drain

Table B.3. LaSalle MHP NPDES conventional parameter permit limits (advanced waste treatment limits).

Parameter	Period	Maximum loading (lbs/day)		Maximum concentration (mg/l)		
		Monthly	7-day	Monthly	7-day	Daily
$CBOD_5$ (mg/l)	Year-round	3.3	8.3	4.0	-	10
TSS (mg/l)	Year-round	17	25	20	30	-
Ammonia Nitrogen (mg/l)	Year-round	0.4	1.7	0.5	-	2.0
TP (mg/l)	Year-round	0.8	-	1.0	-	-
D.O. (min., mg/l)	Year-round	-	-	-	-	6.0

Design flow of 0.0996 MGD, outfall 001 is to the North Branch Wenrick and Cousino Drain