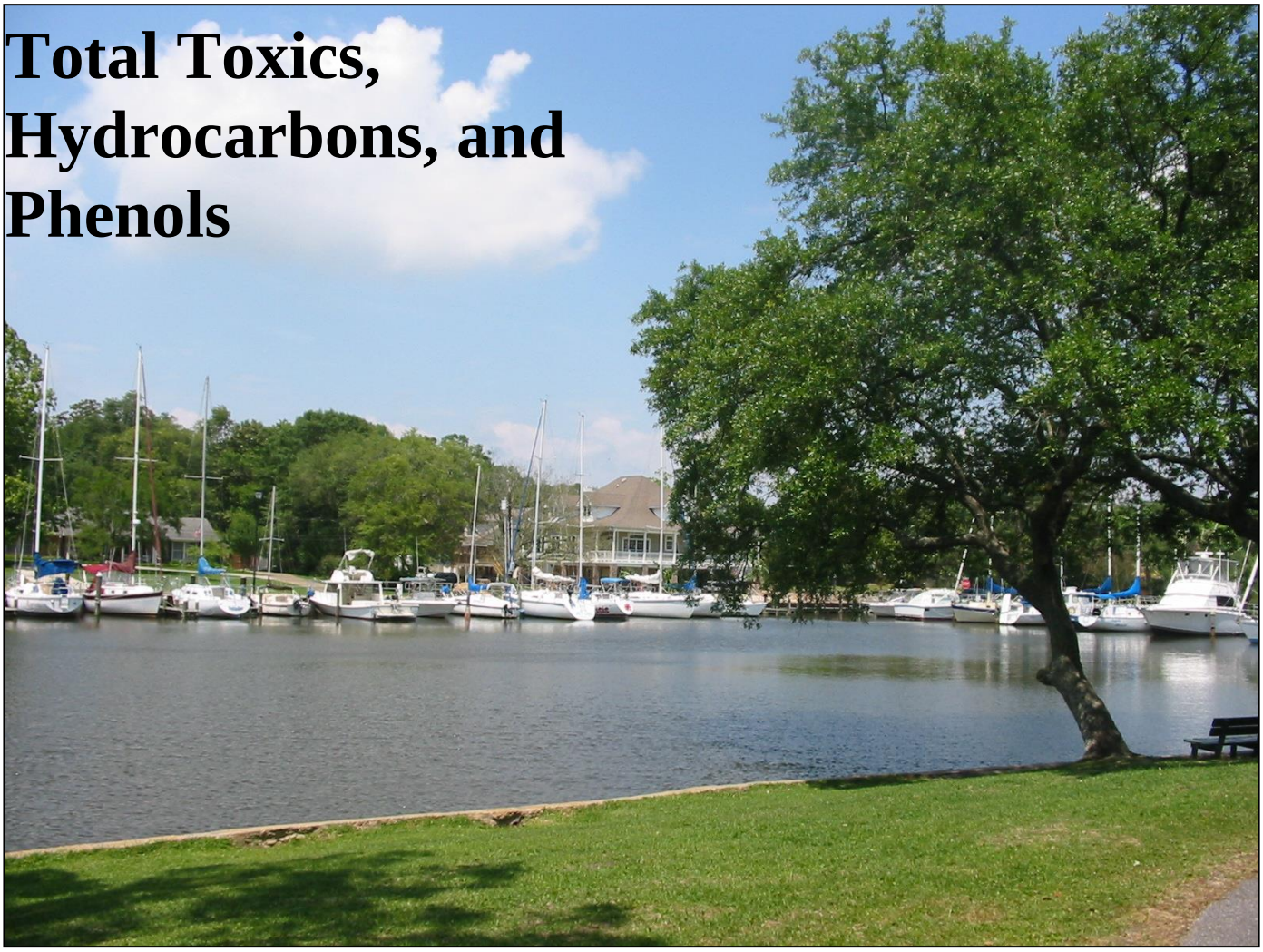
FINAL REPORT
September 2004
ID: 404093001

Phase 1 Total Maximum Daily Load
Lake Yazoo



Pascagoula River Basin
Jackson County, Mississippi

Prepared by
Mississippi Department of Environmental Quality
TMDL/WLA Branch
P.O. Box 10385
Jackson, MS 39289-0385
(601) 961-5171

FOREWORD

The report contains one or more Total Maximum Daily Loads (TMDLs) for water body segments found on Mississippi's 1996 Section 303(d) List of Impaired Waterbodies. Because of the accelerated schedule required by the consent decree, many of these TMDLs have been prepared out of sequence with the State's rotating basin approach. The implementation of the TMDLs contained herein will be prioritized within Mississippi's rotating basin approach.

The amount and quality of the data on which this report is based are limited. As additional information becomes available, the TMDLs may be updated. Such additional information may include water quality and quantity data, changes in pollutant loadings, or changes in landuse within the watershed. In some cases, additional water quality data may indicate that no impairment exists.

Conversion Factors

To convert from	To	Multiply by	To Convert from	To	Multiply by
acres	sq. miles	0.00156	days	seconds	86400
cubic feet	cu. meter	0.0283	feet	meters	0.305
cubic feet	gallons	7.48	gallons	cu. feet	0.134
cubic feet	liters	28.3	hectares	acres	2.47
cfs	gal/min	449	miles	meters	1610
cfs	MGD	0.646	mg/l	ppm	1
cubic meters	gallons	264	µg/l * cfs	gm/day	2.45
cubic meters	liters	1000	µg/l * MGD	gm/day	3.79

Fraction	Prefix	Symbol	Multiple	Prefix	Symbol
10-1	deci	d	10	deka	da
10-2	centi	c	102	hecto	h
10-3	milli	m	103	kilo	k
10-6	micro	µ	106	mega	M
10-9	nano	n	109	giga	G
10-12	pico	p	1012	tera	T
10-15	femto	f	1015	peta	P
10-18	atto	a	1018	exa	E

CONTENTS

TMDL INFORMATION PAGE

Listing Information

Name	ID	County	HUC	Cause	Mon/Eval
Lake Yazoo	MS096E04E1	Jackson	03170006	Phenol, Hydrocarbons, Total Toxics	Evaluated
Location – At Pascagoula: from inland boundary to mouth at East Pascagoula River					

Water Quality Standard

Parameter	Beneficial use	Water Quality Criteria
Phenol	Aquatic Life Support	Fresh Water Acute: instantaneous concentration may not exceed 300 µg/l Chronic: average concentration may not exceed 102 µg/l Salt Water Acute: instantaneous concentration may not exceed 300 µg/l Chronic: average concentration may not exceed 58 µg/l
Hydrocarbons	Aquatic Life Support	N/A
Total Toxics	Aquatic Life Support	free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations, which are toxic or harmful to humans, animals, or aquatic life

NPDES Facilities

NPDES ID	Facility Name	County	Receiving Water	Flow (MGD)
MS0003069	Ingalls Shipbuilding, Inc.	Jackson	Lake Yazoo	Stormwater
MS0055379	Pascagoula Water Treatment Plant, Communy Ave	Jackson	An unnamed ditch, bayou, thence Lake	Report

Total Maximum Daily Load Phenol

Type	Number	Unit	MOS Type
WLA	0.00	lbs/day phenol	
LA	0.0044	lbs/day phenol	
MOS		lbs/day phenol	Implicit
TMDL	0.0044	lbs/day phenol	

Total Maximum Daily Load Total Toxics

Type	Number	Unit	MOS Type
WLA	1.00	Toxicity unit	
LA	0.00	Toxicity unit	
MOS		Toxicity unit	Implicit
TMDL	1.00	Toxicity unit	

EXECUTIVE SUMMARY

Lake Yazoo MS096E04E1 is on the Mississippi 2002 Section 303(d) List of Water Bodies as evaluated due to phenols, hydrocarbons, and total toxics. These segments were originally listed on the 303(d) List based on data reported in the findings in *Pollutant Transport in Mississippi Sound Study* (Lytle and Lytle, 1985). During this study, elevated levels of phenol and hydrocarbons were measured in the sediment in Lake Yazoo. This water body is primarily used as a local marina for Pascagoula residents and an industrial site for shipbuilding. There is a public fishing pier and boat ramp as well as several private recreational marina slips located around the lake.

Shipbuilding at the mouth of Lake Yazoo

The Watershed Characterization System (WCS) model was used to characterize the watershed. This small watershed was difficult to characterize due to the small size and the predominant urban landuse.

The shipyard has several stormwater runoff permits that enter the lake. The Pascagoula Water Treatment Plant, Communy Avenue is a reverse osmosis well water treatment plant that discharges the backwash water from the well water treatment to an unnamed ditch into an unnamed bayou that then flows into Lake Yazoo. A review of the permit file indicates ongoing proper operation at this facility. There are no NPDES permitted discharges or point sources of treated wastewater effluent in this watershed. New NPDES permitted dischargers of treated wastewater effluent will not be allowed in this water body. It is not an appropriate discharge water body for effluent due to its small size, tidal influence, and recreational use.

Lake Yazoo is located at the mouth of the east branch of the Pascagoula River in Pascagoula. The water body is tidally influenced and is typically stratified with respect to salinity. Lake Yazoo, however, does not have any large freshwater sources, only runoff from the surrounding urban area.

INTRODUCTION

Background

The identification of water bodies not meeting their designated use and the development of total maximum daily loads (TMDLs) for those water bodies are required by Section 303(d) of the Clean Water Act and the Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR § 130). The TMDL process is designed to restore and maintain the quality of those impaired water bodies through the establishment of pollutant specific allowable loads. The pollutants of concern for this TMDL are phenol, hydrocarbons, and total toxics.

Phenol

This is a priority organic compound. Details can be found in appendix A. Phenols (C_6H_5OH) are organic compounds that are products of petroleum refining, tanning, and textile, dye, and resin manufacturing. Low concentrations cause taste and odor problems in water; higher concentrations can kill aquatic life and humans (EPA-89/12). [1]

Hydrocarbons

Hydrocarbon is a vast family of compounds containing carbon and hydrogen in various combinations, found especially in fossil fuels. It contains energy-rich bonds such as the carbon-carbon and carbon-hydrogen bonds. While some hydrocarbons are a common source of chemical potential energy and a major component of fuel, some hydrocarbons are major air pollutants, some may be carcinogenic, and others contribute to photochemical smog. Several important families of hydrocarbons are summarized as follows:

- Paraffin ($C_nH_{(2n+2)}$): Saturated chain
- Olefin (C_nH_{2n}): Not saturated chain
- Diolefin ($C_nH_{(2n-2)}$): Not saturated chain
- Naphthene (C_nH_{2n}): Saturated ring
- Aromatic
    - Benzene ($C_nH_{(2n-6)}$): Not saturated ring
    - Naphthalene ($C_nH_{(2n-12)}$): Not saturated ring [2]

Total Toxics

Those pollutants, or combinations of pollutants, including disease-causing agents, which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism either directly from the environment or indirectly by ingestion through food chains, will cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in such organisms or their offspring (40 CFR 122.2; 125.58; 131.3; 501.2-91). [3]

Phased TMDL Approach

This document is phase one of a multi-phase TMDL. This Phase One TMDL will determine the maximum load of phenol that could be introduced into the water body based on Mississippi's water quality criteria and a conservative flow calculation. Phase Two of this TMDL project, to be completed at a later date, will quantify the other nonpoint sources. Phase Two will be based on future monitoring of the water body.

Applicable Water Body Segment Use

The water use classification for Lake Yazoo, as established by the *State of Mississippi in the Water Quality Criteria for Intrastate, Interstate and Coastal Waters* regulation, is Fish and Wildlife Support. Waters with this classification are intended for fishing and propagation of fish, aquatic life, and wildlife. Waters that meet the Fish and Wildlife Support criteria should also be suitable for secondary contact, which is defined as incidental contact with water including wading and occasional swimming.

Applicable Water Body Segment Standard

The water quality standard applicable to the use of the water body and the pollutant of concern is defined in the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. The state standard for phenol in saltwater is an acute criteria of 300 μg/L (0.300 mg/L) and a chronic criteria of 58 μg/L (0.058 mg/L). The saltwater criteria have been applied to Lake Yazoo because it is tidally influenced. This water quality standard will be used to develop the targeted endpoint for phenol and to evaluate impairment in the water body. Hydrocarbons do not have a specific standard, but are incorporated in the toxics standard which is waters shall be free from substances attributable to municipal, industrial, agricultural or other discharges in concentrations, which are toxic or harmful to humans, animals, or aquatic life.

Available Monitoring Data

The previous assessment of Lake Yazoo, which resulted in the phenol and hydrocarbon listings, was based on the findings of the *Pollutant Transport in Mississippi Sound Study* (Lytle and Lytle, 1985). The surface sediments of Lake Yazoo were sampled in November of 1979 as a part of this study. Phenol and hydrocarbons were identified as elevated in the surface sediments of this water body. More recent monitoring data are not available, as MDEQ does not typically sample for phenol and hydrocarbons in the water column or sediments.

Watershed Characteristics

Lake Yazoo is located in the Gulf Coast Flatwoods and Southern Lower Coastal Plain physiographic regions in the Coastal Basin. The Gulf Coast Flatwoods, which are located south of Interstate 10, are an area of low topographic relief and restricted drainage. The Southern Lower Coastal Plain is an area of rolling hills and slightly higher elevations located north of Interstate 10. The listed segment of Lake Yazoo is in the Pascagoula River Basin, Hydrologic Unit Code (HUC) 03170006, in south Mississippi. The drainage area of the listed segments is approximately 235 acres; and lies within Jackson County.

The 235-acre drainage area of Lake Yazoo contains urban, forest, and wetlands landuses. The landuse information is based on the State of Mississippi's Automated Resource Information System (MARIS 1997). This data set is based on Landsat Thematic Mapper digital images taken between 1992 and 1993. Figure 1.1 and Table 1.1 show the landuse distribution for the watershed. Urban and forest areas represent the largest percentage of landuses within the watershed. However, a significant portion of the watershed is occupied by the lake. The watershed is in the City of Pascagoula.

Assessment of Point Sources

There are no facilities permitted to discharge treated wastewater effluent in Lake Yazoo. The marinas and homes located in the area discharge sewage to the regional sewer system. The shipyard does have several NPDES stormwater permits for runoff. The Ingalls NPDES permit requires monitoring and a stormwater pollution prevention plan for the discharge. The Pascagoula Water Treatment Plant on Communy Avenue discharges backwash water from a reverse osmosis well water treatment process into an unnamed ditch into an unnamed bayou then into Lake Yazoo. A review of the permit file indicates ongoing proper operation of the treatment facility.

Assessment of Nonpoint Sources

The TMDL evaluation summarized in this report examined all known potential sources of phenol, hydrocarbons, and total toxics in Lake Yazoo. The source assessment was used as the basis of development of the TMDL. Sources were characterized with the best available information, monitoring data, literature values, and local management activities. This section documents the available information.

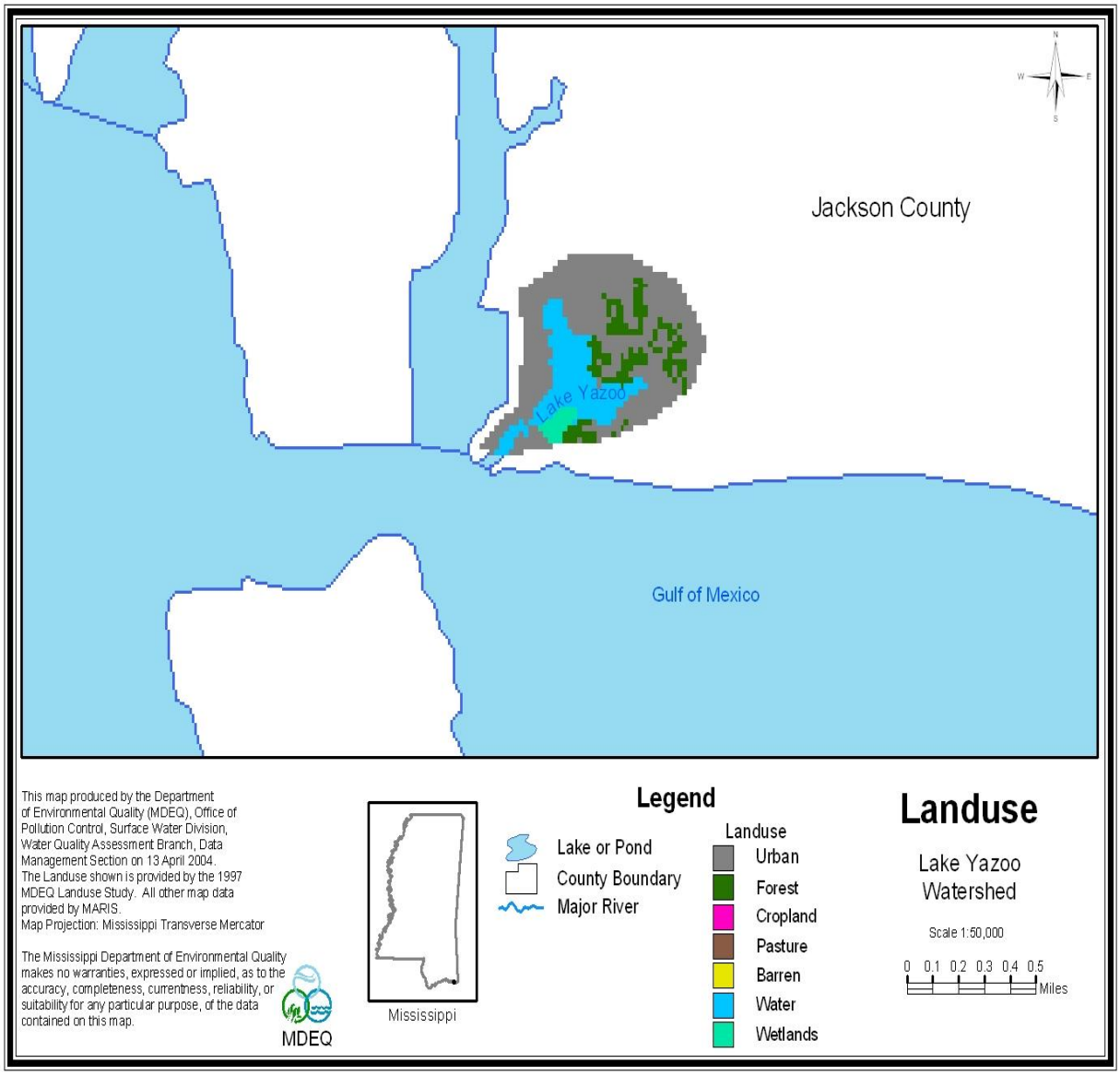
Nonpoint loading of phenols and hydrocarbons can result from the transport of the material into receiving waters by overland surface runoff and groundwater infiltration. Landuse activities within the drainage basin, such as industrial activities and the presence of landfills and hazardous waste sites can contribute to nonpoint source loading of organics and toxics. The use of commercial products containing organics and toxics can also contribute to the nonpoint source load. An additional source of organics and toxics in the water column may be due to leaching from contaminated sediments.

For this TMDL, however, there are no data available that could be used to quantify the nonpoint source load of organics and toxics. While it is recognized that there may be nonpoint sources present in the watershed, the nonpoint source load is unknown at this time. Future monitoring needs to be completed for future phases of this TMDL.

Table 1.1. Landuse Distribution in Acres for the Lake Yazoo Watershed

	Urban	Forest	Cropland	Pasture	Barren	Water	Wetland	Total
Area (acres)	148	33	0	0	0	48	6	235
% Area	63%	14%	0%	0%	0%	20%	3%	100%

Figure 1.1 Location of 303(d) Listed Segments



PHENOL TMDL

Endpoint and Critical Condition

One of the major components of a TMDL is the establishment of instream numeric endpoints, which are used to evaluate the attainment of acceptable water quality. Instream numeric endpoints, therefore, represent the water quality goals that are to be achieved by meeting the load and waste load allocations specified in the TMDL. The endpoints allow for a comparison between observed instream conditions and conditions that are expected to restore designated uses. The instream target used for this TMDL is a phenol concentration no greater than 0.058 mg/L. This target corresponds to the chronic water quality standard for phenol in saltwater. This standard was selected as the target for the TMDL because it is the most stringent, and thus, will be most protective of water quality.

In order to ensure the attainment of water quality standards under all possible flow conditions, the TMDL target will be applied at all flow conditions. The low-flow condition used will be the 7Q10 flow, the lowest flow for seven consecutive days to occur within a 10-year period. The United States Geological Survey (USGS) has established the 7Q10 flow for many waterbodies in Mississippi based on data from their statewide network of stream gaging stations. A 7Q10 flow has not been established directly for Lake Yazoo; however, MDEQ will estimate with the use of data from nearby monitoring stations.

The 7Q10 flow coefficient was calculated using the most current data available for the Little Biloxi River Watershed. These data are found in *Low-Flow and Flow-Duration Characteristics of Mississippi Streams* (Telis, 1991). According to this publication, the 7Q10 flow of the Little Biloxi River near Lyman, MS, USGS Station 0241130, is 2.6 cfs. The drainage area of this station is 68.5 square miles. Thus, the 7Q10 flow coefficient is (2.6 cfs/68.5 square miles) = 0.038 cfs/square mile. The 7Q10 flow of Lake Yazoo can then be calculated by multiplying the flow coefficient by the drainage area of Lake Yazoo. The drainage area of Lake Yazoo is 235 acres based on a delineation of the watershed. Thus, the estimated low-flow for Lake Yazoo (0.038 cfs/square mile*0.367 square miles) = 0.014 cfs. This flow will be used as the critical low-flow condition for the TMDL. This is a conservative assumption because the impact of tidal flushing is ignored in the calculation.

Calculation of the TMDL

The TMDL for phenol in Lake Yazoo was calculated by multiplying the TMDL target of 0.058 mg/L by the low-flow into Lake Yazoo. The product of the TMDL target, the low-flow, and a conversion factor is the maximum daily load of phenol in lbs/day.

The TMDL is (0.014 cfs*0.058mg/L*5.39) = 0.0044 lbs of phenol/day. The WLA is set to zero. The MOS is implicit due to the conservative low-flow used that ignores the tidal influence. The LA is therefore equal to the TMDL.

Table 4.1. Calculation of the TMDL for Lake Yazoo

Parameter	WLA (lbs/day)	LA (lbs/day)	MOS (lbs/day)	TMDL (lbs/day)

Phenol (lbs/day)	0.00	0.0044	implicit	0.0044

TOTAL TOXICS TMDL

The target for the Total Toxics TMDL is that waters shall be free from substances attributable to municipal, industrial, agricultural, or other discharges in concentrations, which are toxic or harmful to humans, animals, or aquatic life. Specific requirements for toxicity are found in Section II.10. State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters – 2003. Hydrocarbons will be represented by this TMDL because no specific criterion exists and one toxicity units will protect the water body from hydrocarbon impairment.

For some pollutants, TMDLs are expressed on a mass-loading basis (e.g., pounds per day). In accordance with 40CFR Part 130.2(i), "TMDLs can be expressed in terms of …mass per time, toxicity, or other appropriate measure." In addition, NPDES permitting regulations in 40 CFR 122.45(f) state that, "All pollutants limited in permits shall have limitations…expressed in terms of mass except…pollutants which cannot appropriately be expressed by mass." For the total toxics and hydrocarbons TMDLs for waters in the Coastal Basin, the TMDL is expressed in terms of toxicity units (TUs). Using the conventions in EPA's Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001), a WLA that allows no toxicity can be represented as 1.0 TU.

This TMDL has been established to protect against total toxics and hydrocarbons. Due to the inappropriateness of this water body to accept an effluent discharge from a NPDES Permitted facility, the wasteload allocation for toxicity is one TU. Nonpoint toxicity is believed to be absent, and therefore the load allocation for total toxicity is zero. Therefore, the TMDLs for total toxics and hydrocarbons in Lake Yazoo is one TUs.

The discharge from the water treatment plant is routinely monitored for iron as are all water treatment plants. The DMRs indicate that iron is below detection limits for this facility and is not a concern. In the future, MDEQ will also require the facility to monitor for phenols and hydrocarbons in the discharge to prove this is not a source for pollution in Lake Yazoo.

All seasons are represented in this calculation so seasonality is not an issue. The margin of safety is implicit.

ALLOCATION

The allocation for this TMDL involves a wasteload allocation (WLA) for point sources and an implicit margin of safety (MOS), which will result in attainment of water quality standards in Lake Yazoo.

However, it is recognized that the methods used in these TMDLs are limited, because collection of additional data and refinement of the methods are necessary in order to better represent the physical and chemical processes occurring in the water body. Due to the limitations in the TMDL, it is also recognized that the actual assimilative capacity of the water body may be greater than the loads specified in these TMDLs.

Wasteload Allocations

This water body is not an appropriate discharge location for treated wastewater effluent from future development. The regional sewer system serves this area.

Load Allocations

The load allocations developed for these TMDLs are an estimation of the contribution of all nonpoint sources in the watershed. Measurements of the relative contribution of actual sources in the watershed were not considered due to the difficulty of obtaining such data. As explained previously, the load allocation for this TMDL will be set to zero for total toxics and hydrocarbons. Future monitoring is needed to improve the TMDL calculations for future phases of this TMDL.

Incorporation of a Margin of Safety (MOS)

The two types of MOS development are to implicitly incorporate the MOS using conservative assumptions or to explicitly specify a portion of the total TMDL as the MOS. The MOS selected for this TMDL is implicit.

Seasonality

These TMDLs ensure that the water quality standards for phenol will be maintained during all seasons. This is because the TMDL was calculated using the low-flow critical condition, which represents the worst-case condition. Low flows typically occur during the late summer and early fall in Mississippi, when temperatures are extremely warm and rainfall is at its lowest level.

CONCLUSION

Historically, Lake Yazoo was used to build ships for national defense in World War II. This water body is now used for a marina. Due to lack of current sediment and water column monitoring data and information on potential nonpoint sources of phenol, hydrocarbons, and total toxics in the watershed, no point source dischargers of treated effluent will be allowed in Lake Yazoo. Run-off from stormwater should be controlled by installation of best management practices (BMPs), and this TMDL encourages stormwater control BMP implementation. This is especially relevant for the shipbuilding industry located on the north shore of Lake Yazoo.

Future Monitoring

MDEQ has adopted the Basin Approach to Water Quality Management, a plan that divides Mississippi's major drainage basins into five groups. During each yearlong cycle, MDEQ resources for water quality monitoring will be focused on one of the basin groups. During the next monitoring phase in the Pascagoula River Basin, the Lake Yazoo Watershed may receive additional monitoring to identify any changes or improvements in water quality.

Due to the level of public participation in this TMDL, MDEQ is planning a project proposal to secure a grant to fund a future monitoring project that will duplicate the Lytle study in this and other coastal watersheds. Funding for this project will be solicited from the Gulf of Mexico Program, EPAR4, and CIAP. MDEQ plans to present this monitoring project at the next available grant proposal opportunities with these organizations

Public Participation

This TMDL will be published for a 30-day public notice. During this time, the public will be notified by publication in the statewide newspaper and a newspaper in the area of the watershed. The public will be given an opportunity to review the TMDL and submit comments. All comments received during the public notice period and at any public meeting become a part of the record of this TMDL. All comments will be considered in the ultimate completion of this TMDL for submission of this TMDL to EPA Region 4 for final approval.

DEFINITIONS

Aerobic: Environmental conditions characterized by the presence of dissolved oxygen; used to describe biological or chemical processes that occur in the presence of oxygen.

Ambient stations: a network of fixed monitoring stations established for systematic water quality sampling at regular intervals, and for uniform parametric coverage over a long-term period.

Assimilative capacity: The capacity of a body of water or soil-plant system to receive wastewater effluents or sludge without violating the provisions of the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters and Water Quality regulations.

Background: The condition of waters in the absence of man-induced alterations based on the best scientific information available to MDEQ. The establishment of natural background for an altered water body may be based upon a similar, unaltered or least impaired, water body or on historical pre-alteration data.

Calibrated model: a model in which reaction rates and inputs are significantly based on actual measurements using data from surveys on the receiving water body.

Calibration: The process of adjusting model parameters within physically defensible ranges until the resulting predictions give a best possible good fit to observed data.

Chronic toxicity: Toxicity impact that lingers or continues for a relatively long period of time, often one-tenth of an organism's life span or longer. Chronic effects could include mortality, reduced growth, or reduced reproduction.

Critical Condition: Hydrologic and atmospheric conditions in which the pollutants causing impairment of a water body have their greatest potential for adverse effects.

Daily discharge: The "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily average" is calculated as the average.

Decay: The gradual decrease in the amount of a given substance in a given system due to various sink processes including chemical and biological transformation, dissipation to other environmental media, or deposition into storage areas.

Decomposition: Metabolic breakdown of organic materials; the formation of by-products of decomposition releases energy and simple organic and inorganic compounds.

Designated Use: Use specified in water quality standards for each water body or segment regardless of actual attainment.

Dynamic model: A mathematical formulation describing and simulating the physical behavior of a system or a process and its temporal variability.

Effluent: Treated wastewater flowing out of the treatment facilities.

Effluent standards and limitations: All State or Federal effluent standards and limitations on quantities, rates, and concentrations of chemical, physical, biological, and other constituents to which waste or wastewater discharge may be subject under the Federal Act or the State law. This includes, but is not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, pretreatment standards, and schedules of compliance.

Impaired Water Body: Any water body that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

Land Surface Runoff: Water that flows into the receiving stream after application by rainfall or irrigation. It is a transport method for nonpoint source pollution from the land surface to the receiving stream.

Load allocation (LA): The portion of a receiving water's loading capacity attributed to or assigned to nonpoint sources (NPS) or background sources of a pollutant. The load allocation is the value assigned to the summation of all direct sources and land applied fecal coliform that enter a receiving water body.

Loading: The total amount of pollutants entering a stream from one or multiple sources.

Nonpoint Source: Pollution that is in runoff from the land. Rainfall, snowmelt, and other water that does not evaporate become surface runoff and either drains into surface waters or soaks into the soil and finds its way into groundwater. This surface water may contain pollutants that come from land use activities such as agriculture, construction, silviculture, surface mining, disposal of wastewater, hydrologic modifications, and urban development.

NPDES permit: An individual or general permit issued by the Mississippi Environmental Quality Permit Board pursuant to regulations adopted by the Mississippi Commission on Environmental Quality under Mississippi Code Annotated (as amended) §§ 49-17-17 and 49-17-29 for discharges into State waters.

Nutrient: A primary element necessary for the growth of living organisms. Carbon dioxide, nitrogen, and phosphorus, for example, are required nutrients for phytoplankton growth

Phased approach: Under the phased approach to TMDL development, load allocations and wasteload allocations are calculated using the best available data and information recognizing the need for additional monitoring data to accurately characterize sources and loadings. The phased approach is typically employed when nonpoint sources dominate. It provides for the implementation of load reduction strategies while collecting additional data.

Point Source: Pollution loads discharged at a specific location from pipes, outfalls, and conveyance channels from either wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving stream.

Pollution: Contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the State, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance, or leak into any waters of the State, unless in compliance with a valid permit issued by the Permit Board.

Publicly Owned Treatment Works (POTW): A waste treatment facility owned and/or operated by a public body or a privately owned treatment works which accepts discharges which would otherwise be subject to Federal Pretreatment Requirements.

Regression Coefficient: An expression of the functional relationship between two correlated variables that is often empirically determined from data, and is used to predict values of one variable when given values of the other variable.

Total Maximum Daily Load or TMDL: The calculated maximum permissible pollutant loading to a water body at which water quality standards can be maintained.

Waste: Sewage, industrial wastes, oil field wastes, and all other liquid, gaseous, solid, radioactive, or other substances which may pollute or tend to pollute any waters of the State.

Wasteload allocation (WLA): The portion of a receiving water's loading capacity attributed to or assigned to point sources of a pollutant.

Water Quality Standards: The criteria and requirements set forth in State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters. Water quality standards are standards composed of designated present and future most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, and the Mississippi antidegradation policy.

Water quality criteria: Elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports the present and future most beneficial uses.

Waters of the State: All waters within the jurisdiction of this State, including all streams, lakes, ponds, wetlands, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, situated wholly or partly within or bordering upon the State, and such coastal waters as are within the jurisdiction of the State, except lakes, ponds, or other surface waters which are wholly landlocked and privately owned, and which are not regulated under the Federal Clean Water Act (33 U.S.C.1251 et seq.).

Watershed: The area of land draining into a stream at a given location.

ABBREVIATIONS

7Q10	Seven-Day Average Low Stream Flow with a Ten-Year Occurrence Period
ATSDR	Agency for Toxic Substances and Disease Registry
BMP	Best Management Practice
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LA	Load Allocation
MARIS	State of Mississippi Automated Information System
MDEQ	Mississippi Department of Environmental Quality
MOS	Margin of Safety
ND	Non-Detectable
NPDES	National Pollution Discharge Elimination System
SESD	Science and Ecosystem Support Division
USGS	United States Geological Survey
WLA	Waste Load Allocation

REFERENCES

ATSDR. 1998. Toxicological Profile for Phenol. Atlanta, GA. U.S. Department of Health and Human Services, Public Health Service.

Gaines, J.L , V. E. Carr, J. F. Musselman, and L. A. Chandler. 1987. Comprehensive Sanitary Survey of Biloxi Bay and the Back Bay of Biloxi. Northeast Technical Services Unit, Shellfish Sanitation Branch.

Lee, C.C., Ph.D., Environmental Engineering Dictionary, 3rd Edition, Government Institutes, Inc., Rockville, Maryland, 1998.

Lytle, Thomas F. and Julia S. Pollutant Transport in the Mississippi Sound. Gulf Coast Research Laboratory – Mississippi-Alabama Sea Grant Consortium Publication No. MASGP-82-003, April 1986.

Metcalf and Eddy. 1991. Wastewater Engineering: Treatment, Disposal, Reuse. 3rd Edition. McGraw-Hill, Inc., New York.

MDEQ. 1994. Wastewater Regulations for National Pollutant Discharge Elimination System (NPDES) Permits, Underground Injection Control (UIC) Permits, State Permits, Water Quality Based Effluent Limitations and Water Quality Certification. Office of Pollution Control.

MDEQ. 2003. State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters. Office of Pollution Control.

MDEQ. 1998. Mississippi List of Waterbodies, Pursuant to Section 303(d) of the Clean Water Act. Office of Pollution Control.

MDEQ. 1998. Mississippi 1998 Water Quality Assessment, Pursuant to Section 305(b) of the Clean Water Act. Office of Pollution Control.

Telis, Pamela A. 1992. Techniques for Estimating 7-Day, 10-Year Low Flow Characteristics for Ungaged Sites on Streams in Mississippi. U.S. Geological Survey, Water Resources Investigations Report 91-4130.

USEPA, Office of Water. 1986. Quality Criteria for Water, 1986. EPA 440/5-86-001.

APPENDIX A - Phenol

Phenol is a colorless-to-white solid when pure; however, the commercial product, which contains some water, is a liquid. Phenol has a distinct odor that is sickeningly sweet and tarry. Phenol evaporates more slowly than water, and a moderate amount can form a solution with water. Phenol can catch on fire. Phenol is both a man-made chemical and produced naturally. It is found in nature in some foods and in human and animal wastes and decomposing organic material. The largest single use of phenol is as an intermediate in the production of phenolic resins. However, it is also used in the production of caprolactam (which is used in the manufacture of nylon 6 and other synthetic fibers) and bisphenol A (which is used in the manufacture of epoxy and other resins). Phenol is also used as a slimicide (a chemical toxic to bacteria and fungi characteristic of aqueous slimes), as a disinfectant, and in medicinal preparations such as over-the-counter treatments for sore throats. Phenol ranks in the top 50 in production volumes for chemicals produced in the United States.

Following small, single releases, phenol is rapidly removed from the air; generally, half is removed in less than 1 day. It is also relatively short-lived in the soil (generally, complete removal in 2-5 days). However, it can remain in water a week or more. Phenol can remain in the air, soil, and water for much longer periods if a large amount of it is released at one time, or if it is constantly released to the environment. Levels of phenol above those found naturally in the environment are usually found in surface waters and surrounding air contaminated by phenol released from industrial activity and from the commercial use of products containing phenol. Phenol has been detected, however, in the materials released from landfills and hazardous waste sites, and it has been found in the groundwater near these sites. The levels of phenol found in indoor environments as a part of environmental tobacco smoke (ETS) are usually below 100 ppb, although much higher levels have been reported. One ppb or less of phenol has been found in relatively unpolluted surface water and groundwater, and low levels are also found in indoor environments and are principally derived from ETS. Only low levels of phenol are found in the organisms that live in water, which also contains low levels of phenol.

Phenol is present in a number of consumer products, which are swallowed, rubbed on, or added to various parts of the body. These include ointments, ear and nose drops, cold sore lotions, mouthwashes, gargles, toothache drops, analgesic rubs, throat lozenges, and antiseptic lotions. Phenol has been found in drinking water, tobacco smoke, air, and certain foods, including smoked summer sausage, fried chicken, mountain cheese, and some species of fish. It is also found in urine of children and adults. The magnitude, frequency, and likelihood of exposure, and the relative contribution of each exposure route and source to total phenol exposure cannot be estimated using information currently available. Nonetheless, for persons not exposed to phenol in the workplace, possible routes of exposure include: breathing industrially contaminated air; inhaling cigarette, cigar, or pipe smoke, or ETS polluted air; drinking water from contaminated surface water or groundwater supplies; swallowing products containing phenol; changing diapers; and coming into contact with contaminated water and products containing phenol through bathing or skin application.

Populations residing near phenol spills, waste disposal sites, or landfill sites may be at risk for higher exposure to phenol than other populations. If phenol is present at a waste site near homes that have wells as a source of water, it is possible that the well water could be contaminated. If phenol is spilled at a waste site, it is possible for a person, such as a child playing in dirt containing phenol, to

have skin contact or to swallow soil or water contaminated with phenol. Skin contact with phenol or swallowing products containing phenol may lead to increased exposure. This type of exposure is expected to occur infrequently and generally occurs over a short time period. At the workplace, exposure to phenol can occur from breathing contaminated air. However, skin contact with phenol during its manufacture and use is considered the major route of exposure in the workplace. It has been estimated that about 584,000 people in the United States are exposed to phenol at work. Total exposure at the workplace is potentially higher than in non-workplace settings.

[1] Lee, C.C., Ph.D., Environmental Engineering Dictionary, 3rd Edition, Government Institutes, Inc., Rockville, Maryland, 1998. pg. 428.
[2] Ibid., pg. 293.
[3] Ibid., pg. 585.