Water Quality Analysis of Fecal Coliform for Herring and Turville Creek of the Isle of Wight Bay Basin in Worcester County, Maryland

FINAL

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Submitted to:

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cfs	Cubic Feet per Second
CFR	Code of Federal Regulations
COMAR	Code of Maryland Regulations
CWA	Clean Water Act
EPA	Environmental Protection Agency
FDA	U.S. Food and Drug Administration
km	Kilometer
LA	Load Allocation
m	Meter
M_2	Lunar semi-diurnal tidal constituent
ml	Milliliter(s)
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
MPN	Most Probable Number
NOAA	National Oceanic and Atmospheric Administration
NSSP	National Shellfish Sanitation Program
TMDL	Total Maximum Daily Load
WQLS	Water Quality Limited Segment

EXECUTIVE SUMMARY

Section 303(d) of the federal Clean Water Act (CWA) and the U.S. Environmental Protection Agency's (EPA) implementing regulations direct each State to identify and list waters, known as water quality limited segments (WQLSs), in which current required controls of a specified substance are inadequate to achieve water quality standards. For each WQLS, the State is to either establish a Total Maximum Daily Load (TMDL) of the specified substance that the waterbody can receive without violating water quality standards, or demonstrate that water quality standards are being met.

Isle of Wight Bay (basin number 02-13-01-03) was first identified on the 1996 303(d) List submitted to U.S. Environmental Protection Agency (EPA) by the Maryland Department of the Environment (MDE) as impaired by nutrients and fecal coliform in tidal portions (1996) and impacts to biological communities in the non-tidal portion of the watershed (2004). On the 2004 303(d) List, the fecal coliform listing was clarified by the identification of Herring and Turville Creek as the specific area of impairment.

Recent monitoring data show that the applicable water quality criteria for fecal coliform are being met in Herring and Turville Creek. As a result, TMDLs of fecal coliform are not necessary to achieve water quality standards in that watershed. Barring the receipt of any contradictory data, this report will be used to support the bacteria listing change for Herring and Turville Creek from Category 5 ("waterbodies impaired by one or more pollutants and requiring a TMDL") to Category 2 ("surface waters that are meeting some standards and have insufficient information to determine attainment of other standards") when MDE proposes the revision of Maryland's 303(d) list for public review in the future. A TMDL to address the nutrient listing of Herring and Turville Creek, as part of the Northern Coastal Bay Watershed, was submitted and approved in 2001. Other impairments of the watershed will be addressed separately at a future date.

Although the waters of Herring and Turville Creek do not display signs of fecal coliform impairment, the State reserves the right to require additional pollution controls in the Herring and Turville Creek Watershed if evidence suggests that fecal coliform from the basin is contributing to downstream water quality problems.

1.0 INTRODUCTION

Section 303(d) of the federal Clean Water Act (CWA) and U.S. Environmental Protection Agency (EPA)'s implementing regulations direct each State to identify and list waters, known as water quality limited segments (WQLSs), in which current required controls of a specified substance are inadequate to achieve water quality standards. This list of impaired waters is commonly referred to as the "303(d) list". For each WQLS, the State is to either establish a Total Maximum Daily Load (TMDL) of the specified substance that the waterbody can receive without violating water quality standards, or demonstrate that water quality standards are being met.

A segment identified as a WQLS might not require the development and implementation of a TMDL if current information contradicts the previous finding of impairment. Based on EPA's guidance for water quality-based decisions, the reasons obviating the need for a TMDL are as follows: (1) recent data indicate that the impairment no longer exists (*i.e.*, water quality standards are being met); (2) more recent and updated water quality modeling demonstrates that the waterbody attains standards; (3) refinements to water quality standards, or the interpretation of those standards, result in the attainment of the standard; and (4) corrections are made to errors in the original listing. Scenarios 1 and 2 apply to Herring and Turville Creek.

Isle of Wight Bay (basin number 02-13-01-03) was first identified on the 1996 303(d) List submitted to EPA by the Maryland Department of the Environment (MDE) as impaired by nutrients and fecal coliform (1996) and impacts to biological communities in the non-tidal portion of the watershed (2004). On the 2004 303(d) List, the fecal coliform listing was clarified by the identification of Herring and Turville Creek as the specific area of impairment. Shellfish waters are closed or restricted to harvesting when the fecal coliform criteria for shellfish harvesting waters are exceeded. The criteria include both a median and a 90^{th} percentile. In specific cases under the shellfish program, waterbodies maybe restricted or closed to harvesting due to the potential for harmful public health impacts even when fecal coliform criteria are being met. A TMDL to address the nutrient listing of Herring and Turville Creek, as part of the Northern Coastal Bay Watershed, was submitted and approved in 2001. Other impairments of the watershed will be addressed separately at a future date.

Fecal coliform are found in the intestinal tract of humans and other warm-blooded animals. Fecal coliform may occur in surface waters from point and nonpoint sources. Few fecal coliform are pathogenic; however, the presence of elevated levels of fecal coliform in shellfish waters may indicate recent sources of pollution. Some common waterborne diseases associated with the consumption of raw clams and oysters harvested from polluted water include viral and bacterial gastroenteritis and hepatitis A.

Fecal coliform is an indicator organism used in water quality monitoring in shellfish waters to indicate fresh sources of pollution from human and other animal wastes. When the water quality standard for fecal coliform in shellfish waters is exceeded, waters are closed to shellfish harvesting to protect human health due to the potential risk from consuming raw molluscan

shellfish from sewage contaminated waters. The U.S. Food and Drug Administration (FDA), rather than EPA, is responsible for food safety. Water quality criteria for shellfish waters are established under the National Shellfish Sanitation Program (NSSP), a cooperative program that involves States, industry, academic institutions and federal agencies with oversight by FDA. The NSSP continues to use fecal coliform as the indicator organism to assess shellfish harvesting waters.

The remainder of this report describes the general setting of the Herring and Turville Creek watershed, presents a discussion of the water quality characterization process, and draws conclusions regarding characterization.

2.0 GENERAL SETTING

A single restricted shellfish harvesting area in the Isle of Wight Bay basin is addressed in this report: Herring and Turville Creek. Herring and Turville Creek is located on Maryland's Eastern Shore in Worcester County, MD, as shown in Figure 1. Herring Creek has a length of 3.7 km and a width ranging from 120 to 280 m. Turville Creek has a length of 2.9 km and a width ranging from 100 to 200 m. The joined creek has a width of 450 m at the mouth, where Herring and Turville Creek flows to the northeast into Isle of Wight Bay. The Herring and Turville Creek restricted shellfish harvesting area has a drainage area of 7,994.5 acres (32.4 km^2).

The soils in the Isle of Wight Bay Basin are characterized as hydrology class D and as having high runoff. The dominant tide in this region is the lunar semi-diurnal (M_2) tide, with a tidal range of 0.58 m in the restricted portion of Herring and Turville Creek with a tidal period of 12.42 hours (National Oceanic and Atmospheric Administration (NOAA), 2004). Please refer to Table 1 for the mean volume and mean water depth of this restricted shellfish harvesting area.

Table 1: Physical Characteristics of the Isle of Wight Bay Restricted Shellfish Harvesting Area

Restricted Shellfish Harvesting Area	Mean Water Volume in m^3	Mean Water Depth in m
Herring and Turville Creek	1,010,302.0	0.242

The 2000 Maryland Department of Planning (MDP) land use/land cover data show that the watershed can be characterized as primarily rural for Herring and Turville Creek with nearly 75% of the area being forest and cropland. The land use information for this restricted shellfish harvesting area in the Isle of Wight Bay Basin is shown in Table 2 and Figure 2. Residential urban land use identified in Table 2 includes low-density residential, medium-density residential, and high-density residential. Non-residential urban land use in this table includes commercial, industrial, institutional, extractive, and open urban land.

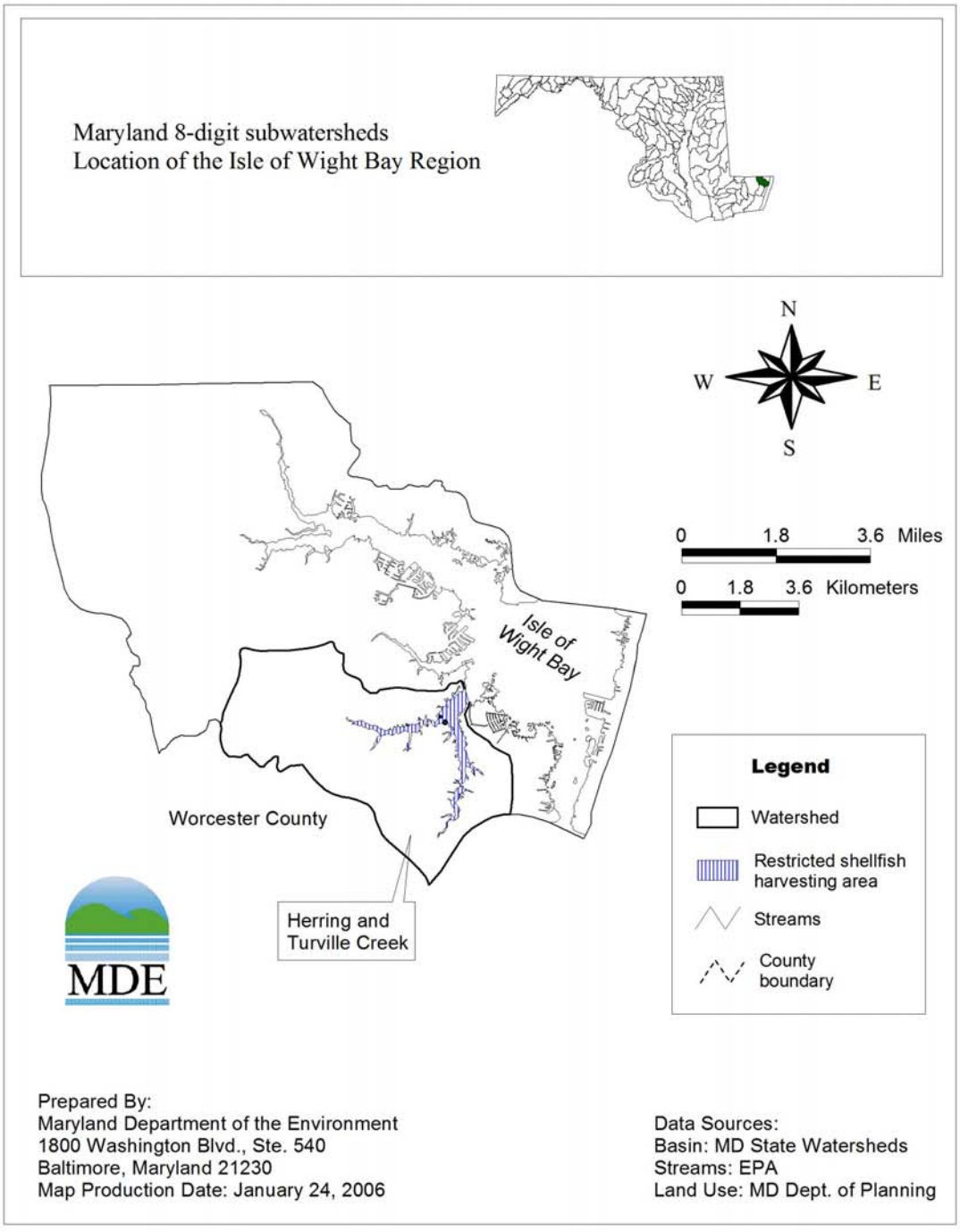

Figure 1: Location Map of the Isle of Wight Bay Basin

Table 2: Land Use Percentage Distribution for Herring and Turville Creek

Land Type	Acreage	Percentage
Residential urban	1060.1	13.3
Non-Residential urban	576.5	7.2
Cropland	2070.7	25.9
Pasture	0.0	0.0
Feedlot	84.5	1.1
Forest	3873.7	48.4
Water	0.0	0.0
Wetlands	320.2	4.0
Barren	8.7	0.1
Totals	**7994.4**	**100.0**

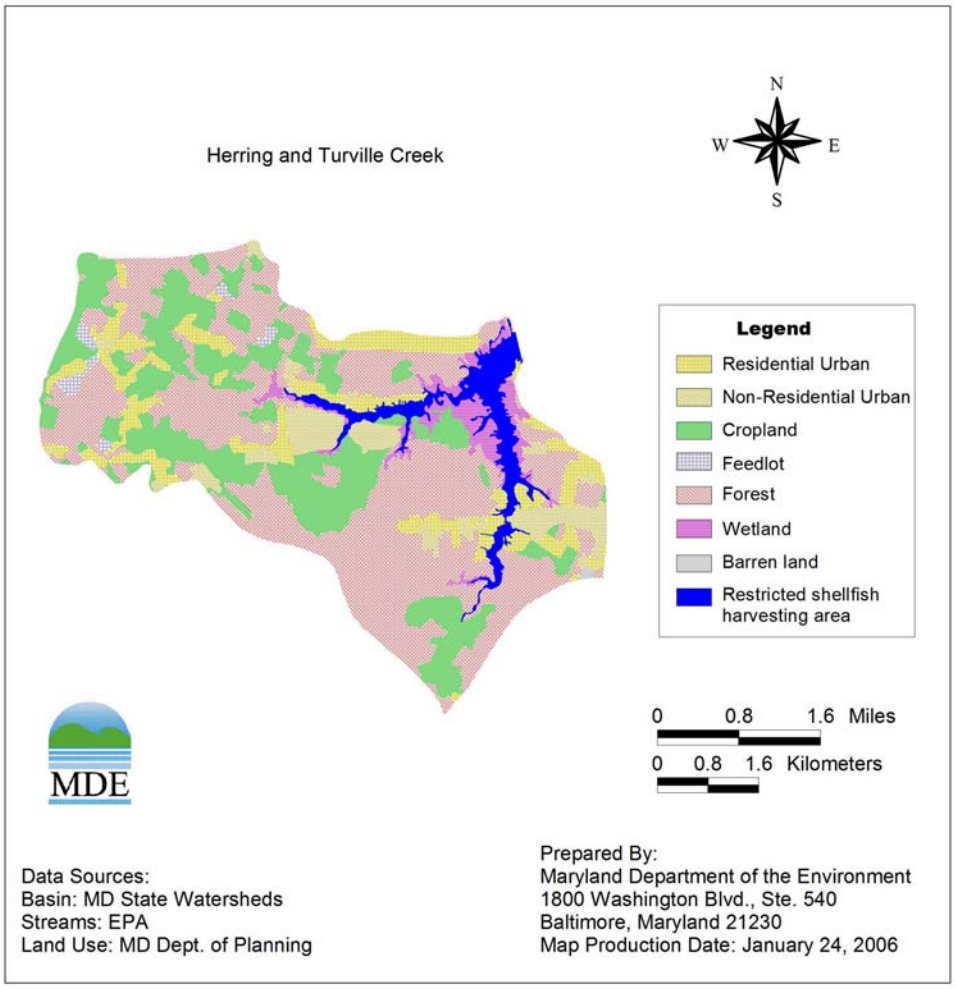

Figure 2: Land Use in the Herring and Turville Creek Basin

3.0 WATER QUALITY CHARACTERIZATION

MDE's Shellfish Certification Program is responsible for classifying shellfish harvesting waters to ensure oysters and clams are safe for human consumption. MDE adheres to the requirements of the National Shellfish Sanitation Program (NSSP), with oversight by the U.S. Food and Drug Administration. MDE conducts shoreline surveys and collects routine bacteria water quality samples in the shellfish waters of Maryland. These data are used to determine if the shellfish water classification is being met.

MDE's Shellfish Certification Program has monitored shellfish waters throughout Maryland for the past several decades. There is one shellfish monitoring station in the restricted shellfish harvesting area addressed in this report. This was the station used to determine the original impairment in 1996, the revision of the geographic extent of the impairment in 2004 and this water quality analysis. The station identification and observations recorded during the period of June 2000 – June 2005 are provided in Table 3 and in Figures 3 and 4. A tabulation of observed fecal coliform values in Most Probable Number/ 100 milliliters (MPN/100ml) at the single monitoring station included in this report is provided in Appendix A.

Table 3: Location of the Shellfish Monitoring Stations in Herring and Turville Creek

Station Location	Shellfish Monitoring Station	Obs. Period	Total Obs.	LATITUDE Deg-min-sec	LONGITUDE Deg-min-sec
Herring and Turville Creek	20-01-010C	2000-2005	55	38 21 53.0	75 07 31.0

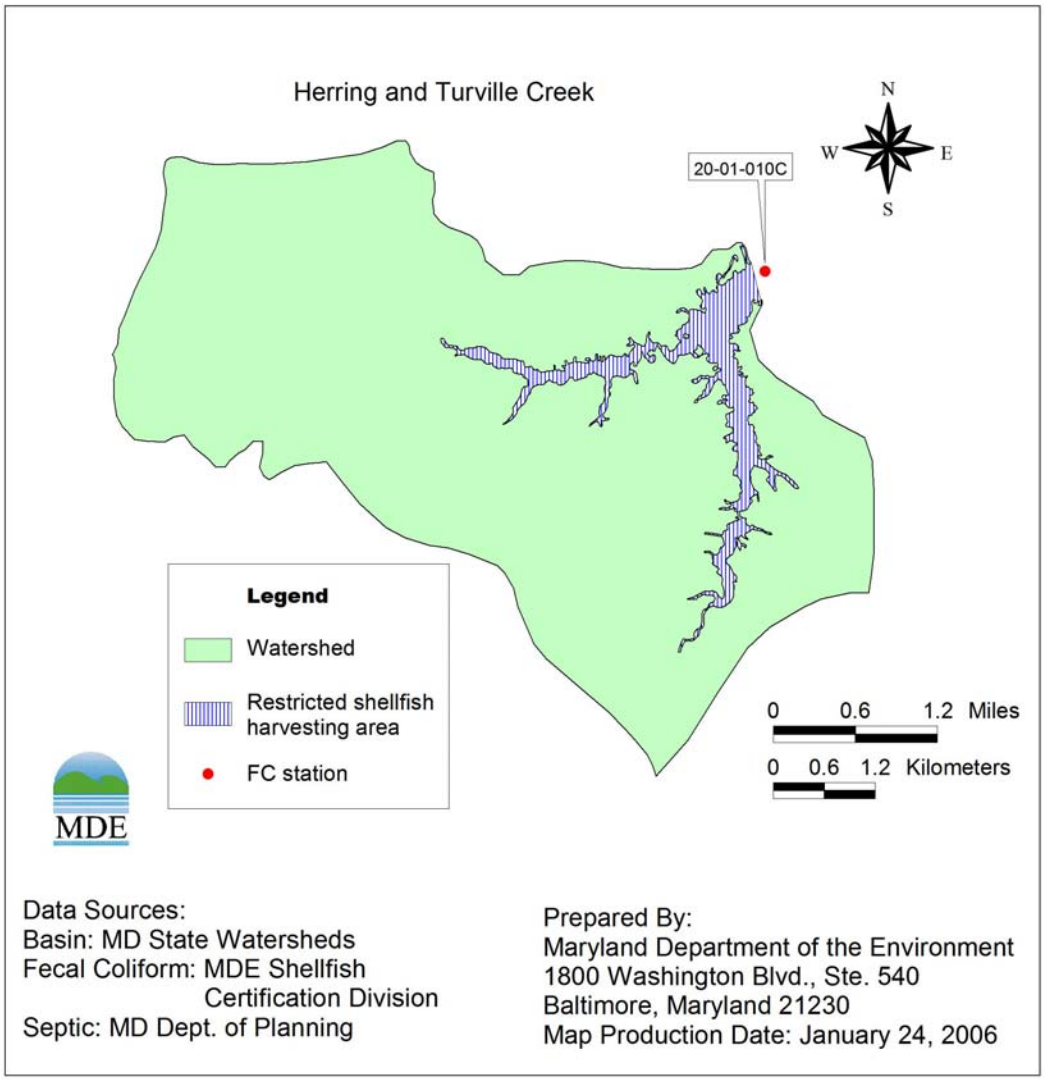

Figure 3: Shellfish Monitoring Station in Herring and Turville Creek

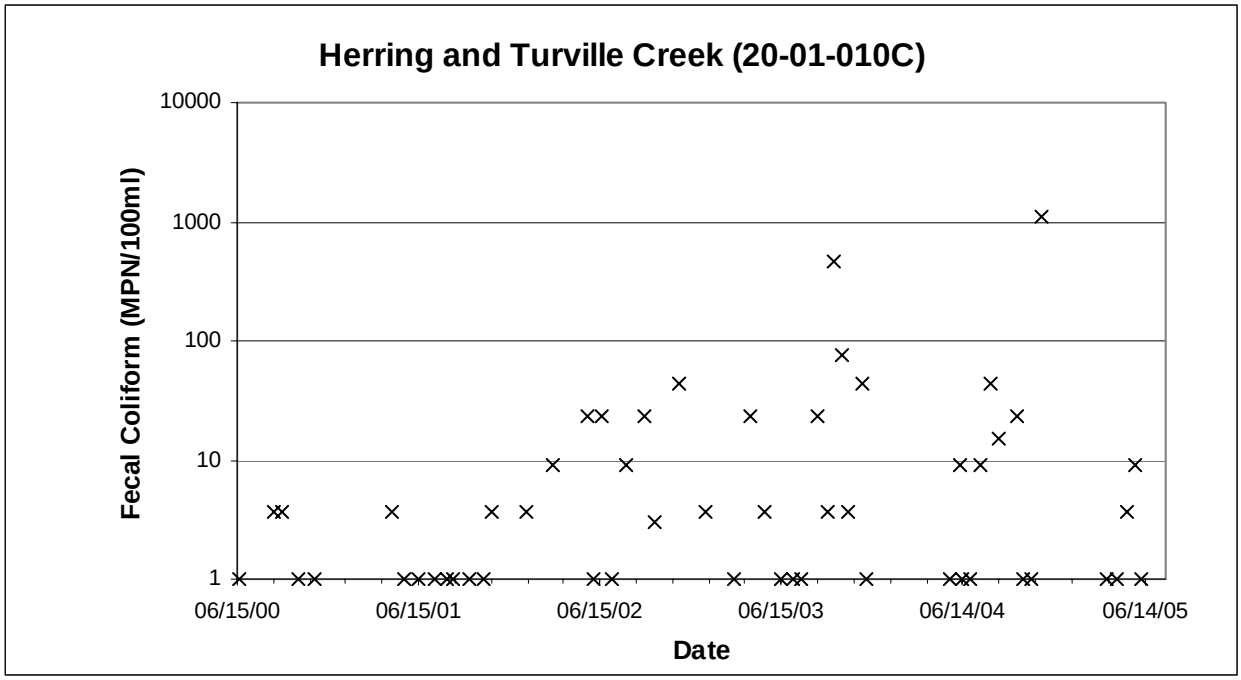

Figure 4: Observed Fecal Coliform Concentrations at Station 20-01-010C

3.1 Water Quality Standard

The fecal coliform listing addressed in this analysis was determined with reference to Maryland's Classification of Use II Waters-Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting in COMAR, Surface Water Quality Criteria 26.08.02.03-3C(1), which states:

2) Classification of Use II Waters for Harvesting.

(a) Approved classification means that the median fecal coliform MPN of at least 30 water sample results taken over a 3-year period to incorporate inter-annual variability does not exceed 14 per 100 milliliters; and:

(i) In areas affected by point source discharges, not more than 10 percent of the samples exceed an MPN of 43 per 100 milliliters for a five tube decimal dilution test or 49 MPN per 100 milliliters for a three tube decimal dilution test; or

(ii) In other areas, the 90th percentile of water sample results does not exceed an MPN of 43 per 100 milliliters for a five tube decimal dilution test or 49 MPN per 100 milliliters for a three tube decimal dilution test.

MDE updated and promulgated shellfish water quality criteria for shellfish waters in June 2004. Bacteriological criteria for shellfish harvesting waters were unchanged and the intent was to include the classification criteria as required under the NSSP, which previously was not included in COMAR. In 2005, MDE revised the use designations in COMAR as part of the Chesapeake Bay Program revision to reflect living resources based habitat needs and did not change the fecal coliform criteria for shellfish harvesting waters or shellfish harvesting use designations.

For this analysis MDE is using routine monitoring data collected over a five-year period between June 2000 and June 2005. The assimilative capacity will be based on the approved classification requirements of a median of 14 MPN/100 ml and a 90^{th} percentile of less than 49 MPN/100ml.

3.2 Water Quality Evaluation

The observed fecal coliform median and 90th percentile are 3.60 and 33.90 MPN/100ml, respectively (Table 4). Since the bacteria water quality criteria applicable to the designated use are being met in Herring and Turville Creek, a TMDL for fecal coliform is not necessary to achieve water quality standards in this watershed.

Table 4: Herring and Turville Creek Fecal Coliform Statistics (data from 2000-2005)

Area Name	Station	Median		90th Percentile	
		Monitoring Data	Criterion	Monitoring Data	Criterion
		MPN/100ml	MPN/100ml	MPN/100ml	MPN/100ml
Herring and Turville Creek	20-01-010C	3.60	14	33.90	49

4.0 CONCLUSION

The data presented in this report indicate that fecal coliform concentration in Herring and Turville Creek fall within the State's standards. Barring the receipt of any contradictory data, this report will be used to support the bacteria listing change for Herring and Turville Creek from Category 5 ("waterbodies impaired by one or more pollutants and requiring a TMDL") to Category 2 ("surface waters that are meeting some standards and have insufficient information to determine attainment of other standards") when MDE proposes the revision of Maryland's 303(d) list for public review in the future. MDE continues to routinely monitor this station under the NSSP requirements. Reclassification as open for shellfish harvesting is not being considered at this time due to the prevalence of waterfront properties with docks, boats, and other human activities that have a potential for an adverse impact to the safety of oysters or clams harvested and consumed from these waters.

REFERENCES

Code of Maryland Regulations, 26.08.02.03-3C(1). Bacteriological Criteria for Use II Waters - Shellfish harvesting. Website http://www.dsd.state.md.us/comar/26/26.08.02.03-3.htm.

Maryland Department of the Environment (2004). Maryland's 2004 Section 303(d) List. Website http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Maryland%20303%20dlist/final_2004_303dlist.asp.

Maryland Department of Planning. 2000 Reference for Land Use.

National Oceanic and Atmospheric Administration (NOAA) (2004). Tides Online. National Ocean Survey. Website: http//co-ops.nos.noaa.gov/

Appendix A. Tabulation of Fecal Coliform Data

This appendix provides a tabulation of fecal coliform values for the one monitoring station of Herring and Turville Creek of the Isle of Wight Bay Basin in Table A-1. These data are plotted in report Figure 4.

Table A-1: Observed Fecal Coliform data at Herring and Turville Creek Station 20-01-010C

DATE	Fecal Coliform MPN/100 ml	DATE	Fecal Coliform MPN/100 ml
6/5/2000	1	5/13/2003	3.6
6/19/2000	1	6/12/2003	1
8/29/2000	3.6	7/7/2003	1
9/13/2000	3.6	7/24/2003	1
10/17/2000	1	8/28/2003	23
11/16/2000	1	9/15/2003	3.6
4/24/2001	3.6	9/29/2003	460
5/17/2001	1	10/14/2003	75
6/14/2001	1	10/28/2003	3.6
7/18/2001	1	11/24/2003	43
8/9/2001	1	12/4/2003	1
8/22/2001	1	5/19/2004	1
9/24/2001	1	6/8/2004	9.1
10/25/2001	1	6/14/2004	1
11/8/2001	3.6	6/29/2004	1
1/16/2002	3.6	7/21/2004	9.1
3/11/2002	9.1	8/9/2004	43
5/20/2002	23	8/25/2004	15
6/3/2002	1	9/30/2004	23
6/18/2002	23	10/14/2004	1
7/9/2002	1	10/28/2004	1
8/7/2002	9.1	11/18/2004	1100
9/11/2002	23	3/31/2005	1
10/2/2002	3	4/18/2005	1
11/20/2002	43	5/12/2005	3.6
1/15/2003	3.6	5/26/2005	9.1
3/11/2003	1	6/9/2005	1
4/15/2003	23		