Water Quality Analysis of Eutrophication for Town Creek, Allegany County, Maryland

FINAL

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Submitted to:

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List of Abbreviations

BOD	Biochemical Oxygen Demand
COMAR	Code of Maryland Regulation
CWA	Clean Water Act
DNR	Department of Natural Resources
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
MBSS	Maryland Biological Stream Survey
MDP	Maryland Department of Planning
MDE	Maryland Department of the Environment
mg/L	Milligrams Per Liter
mi^2	Square miles
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
USGS	U.S. Geological Survey
WQLS	Water Quality Limited Segment
μg/l	Micrograms Per Liter

EXECUTIVE SUMMARY

Section 303(d) of the federal Clean Water Act (CWA) and the 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.

Town Creek (basin code 02140512) was identified on the State's 1996 list of WQLSs as impaired by nutrients and sediments. In 2002 and 2004, Town Creek was also listed for impacts to biological communities. This document addresses the nutrient impairment in Town Creek; the sediment and biological impairments will be addressed at a future date.

An analysis of recent monitoring data shows that the dissolved oxygen criterion and designated uses associated with nutrients are being met in Town Creek. This analysis supports the conclusion that a TMDL for nutrients is not necessary to achieve water quality standards in this case. Barring the receipt of contradictory data, this report will be used to support a nutrients listing change for the Town Creek Watershed from Category 5 ("waterbodies impaired by one or more pollutants requiring a TMDL") to Category 2 ("Surface waters that are meeting some standards and have insufficient information to determine attainment of other standards"), when the Maryland Department of the Environment (MDE) proposes the revision of Maryland's 303(d) list for public review in the future. Although the waters of Town Creek do not display signs of eutrophication, the State reserves the right to require future controls in the Town Creek watershed if evidence suggests nutrients from the basin are contributing to downstream water quality problems.

1.0 INTRODUCTION

Section 303(d) of the federal Clean Water Act (CWA) and the 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.

In addition to the development of a TMDL, there are four other scenarios that may be used to address an impaired waterbody: 1) more recent data indicating that the impairment no longer exists (*i.e.*, water quality standards are being met); 2) more recent and updated water quality modeling which demonstrates that the segment is now attaining standards; 3) refinements to water quality standards, or the interpretation of those standards, which result in standards being met; or 4) correction to errors made in the initial listing.

Town Creek (basin code 02140512) was first identified on the 1996 303(d) list, submitted to EPA by the Maryland Department of the Environment (MDE), as being impaired by nutrients and sediments. Biological impairment was identified on the 2002 and 2004 303(d) lists. This report provides more recent information that supports the removal of the nutrients listing for Town Creek when the 303(d) list is revised; therefore, the aforementioned first scenario most closely applies, with the qualification that initial listing for nutrients was suspect due to the lack of data. The sediment and biological impairments will be addressed at a future date.

The remainder of this report lays out the general setting of the waterbody within the Town Creek watershed, presents a discussion of the water quality characteristics in the basin, and provides conclusions with regard to the current water quality characteristics and the current standards. The data will demonstrate that the Town Creek is achieving water quality standards.

2.0 GENERAL SETTING

The Town Creek Watershed extends through Bedford County, PA into Allegany County, MD and empties into the Potomac River (Figure 1). The drainage area of the Town Creek watershed is 164.9 mi^2 or 100,554 acres, with 44,292 acres or 44% in MD. The land uses in the Maryland portion of the watershed are forest (33,175 acres or 75% of the area), agriculture (7,685 acres or 17% of the area), and urban (3,458 acres or 8% of the area). Please refer to Figure 2 for a map of these land uses (Maryland Department of Planning (MDP), 2002).

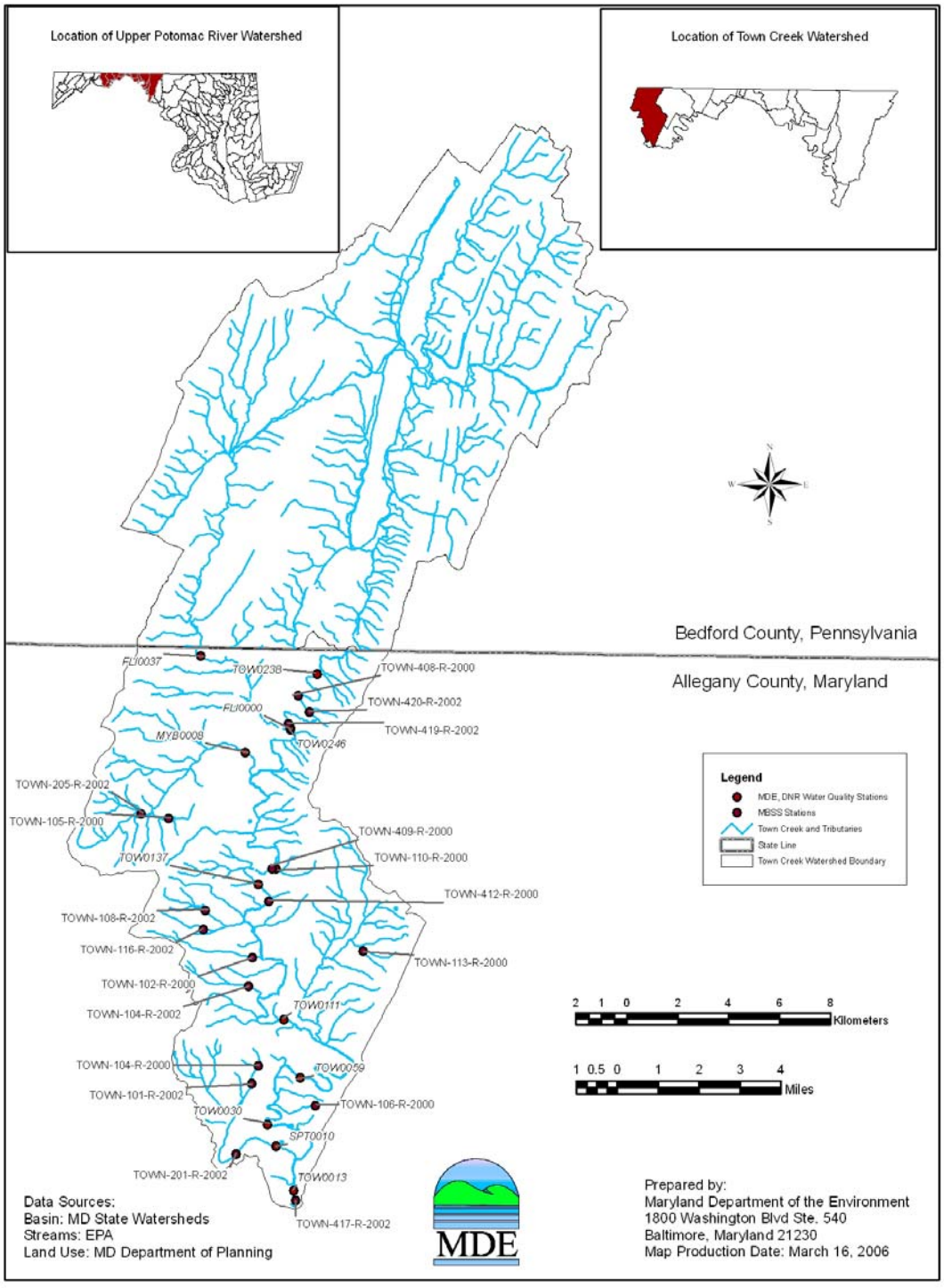

Figure 1: Town Creek Location Map and Monitoring Stations

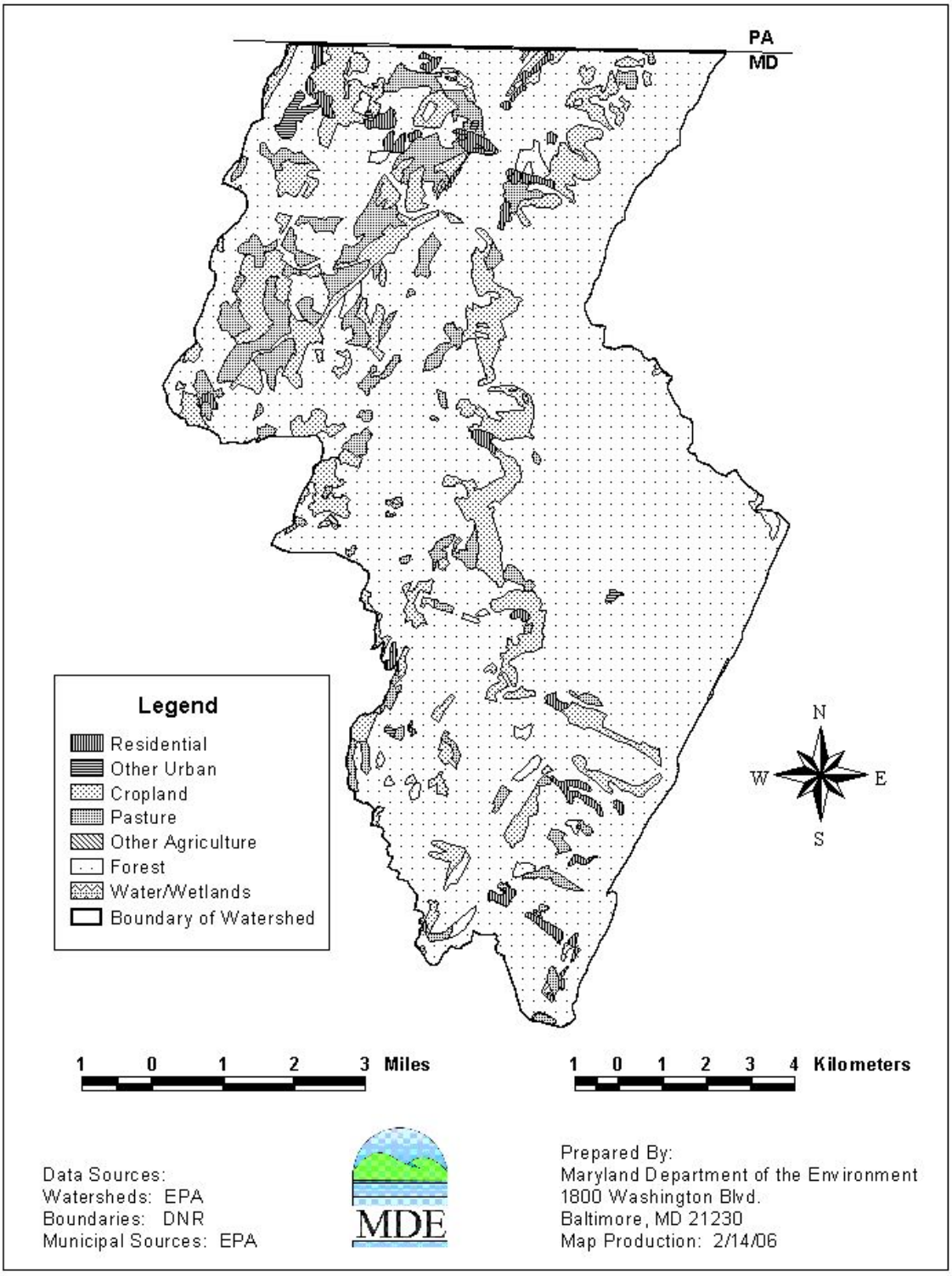

Figure 2: Land Use Map of the Town Creek Watershed

3.0 WATER QUALITY CHARACTERIZATION

A water quality standard is the combination of a designated use for a particular body of water and the water quality criteria designed to protect that use. Designated uses include activities such as swimming, drinking water supply, and shellfish propagation and harvest. Water quality criteria consist of narrative statements and numeric values designed to protect the designated uses. Criteria may differ among waters with different designated uses.

The Maryland Surface Water Use Designation (Code of Maryland Regulations (COMAR) 26.08.02.08(Q)) for Town Creek is Use IV-P- Recreational Trout waters and public water supply. The tributaries to Town Creek are designated as Use III-P; nontidal cold waters and public water supply. According to COMAR, the DO criteria to protect Use III-P water may not be less than 5 milligrams/Liter at any time with a minimum daily average of not less than 6 mg/L (COMAR 26.08.02.03-3E(2), unless resulting from natural conditions (COMAR 26.08.02.03A (2)). The DO criteria to protect the Use IV-P water may not be less than 5 mg/L at any time (COMAR 26.08.02.03-3G(1)), unless resulting from natural conditions. The water quality data presented in this section will show that the DO concentrations meet standards.

Maryland's water quality standards presently do not impose a limit on the concentration of nutrients in the water column. Rather, Maryland manages nutrients indirectly by limiting their effects expressed in terms of excess algal growth and low dissolved oxygen (DO). Because biochemical oxygen demand (BOD) also consumes DO, this potentially confounding factor must be considered in the analysis if low DO is observed.

Maryland's general water quality criteria prohibit pollution of waters of the State by any material in amounts sufficient to create nuisance or interfere with designated uses (COMAR 26.08.02.03B(2)). Excessive eutrophication, indicated by elevated levels of chlorophyll *a*, can produce nuisance levels of algae and interfere with designated uses such as fishing and swimming; therefore, an analysis to demonstrate no excessive algal growth as indicated by low chlorophyll *a* has been established for this watershed.

A data solicitation was conducted in September 2005. All readily available water quality data from 1998 through 2004 pertaining to Town Creek were considered for this analysis. Other available resources, including U.S. Geological Survey (USGS), were also investigated to determine if there were other available stations in the Town Creek watershed. Water quality data from MDE surveys conducted at 11 stations in the Maryland portion of the Town Creek watershed during November 1999 through October 2002 was used to perform this analysis. Dissolved oxygen, total nitrogen, and total phosphorus data from one Department of Natural Resources (DNR) station (same as MDE's station TOW0030) during 1998 through 2004 and dissolved oxygen, total nitrogen, and total phosphorus data from 16 Maryland Biological Stream Survey Stations (MBSS) during 2000 through 2002 were also used. Other available resources, including U.S. Geological Survey (USGS) were also investigated to determine if there were other available stations in the Town Creek Watershed. Table 1 shows the list of MDE, DNR and MBSS stations with their geographical coordinates and descriptive location in the Town Creek watershed. Figure 3 provides graphical representation of the collected data for the parameters discussed below.

Table 1: Locations of Town Creek Water Quality Stations Monitored From 1998-2003.

Station Code	Latitude Degrees	Longitude Degrees
AMO0009	39.72	78.55
BVA0004	39.76	78.52
FLI0000	39.69	78.55
FLI0037	39.72	78.59
MYB0008	39.69	78.57
SPT0010	39.55	78.55
TOW0013	39.53	78.54
TOW0030	39.55	78.56
TOW0059	39.57	78.54
TOW0111	39.59	78.55
TOW0173	39.64	78.56
TOW0246	39.69	78.55
TOW0283	39.71	78.54
TOW0352	39.78	78.5
TOW0030 (DNR)	39.55	78.55
TOWN-101-R-2000	39.57	-78.56
TOWN-102-R-2000	39.61	-78.56
TOWN-104-R-2000	39.57	-78.56
TOWN-104-R-2002	39.60	-78.57
TOWN-105-R-2000	39.66	-78.60
TOWN-106-R-2000	39.56	-78.53
TOWN-108-R-2002	39.63	-78.59
TOWN-110-R-2000	39.64	-78.55
TOWN-113-R-2000	39.62	-78.51
TOWN-116-R-2002	39.62	-78.59
TOWN-201-R-2002	39.54	-78.57
TOWN-205-R-2002	39.66	-78.62
TOWN-408-R-2000	39.71	-78.54
TOWN-409-R-2000	39.64	-78.56
TOWN-412-R-2000	39.63	-78.56
TOWN-417-R-2002	39.53	-78.54
TOWN-419-R-2002	39.70	-78.55
TOWN-420-R-2002	39.70	-78.54

3.1 Dissolved Oxygen

During the January 1998 through April 2004 sampling period, DO concentrations ranged from 4.9 mg/L to 13.5 mg/L. The data points show that there is only one DO value below 5 mg/L (4.9 mg/L) accounting for 0.5 % of 217 measurements. The DO values between 5.0 mg/L to 6.0 mg/L represented approximately 3 % of the observations and the values are all above 5.5 mg/L. This data is summarized in Figure 3. Tabular data is presented in Appendix A.

3.2 Biochemical Oxygen Demand (BOD)

Because BOD also consumes DO, this potentially confounding factor must be considered in the analysis if low DO is observed. During the November 1999 through October 2002 sampling period, BOD concentrations ranged from 1 mg/L to 4 mg/L. Please refer to Figure 3 for graphical representations of this data; data tables are presented in Appendix A. Please note that all but one of the DO concentrations were above 5 mg/L during the sampling period.

3.3 Chlorophyll *a*

Chlorophyll *a* data was collected during the period from November 1999 through October 2002 covering algal growing season, when concentrations are at their peak. Observed chlorophyll *a* concentrations are low and do not reach levels higher than 4.9 μg/L.

The low chlorophyll *a* concentrations found in Town Creek suggests that chlorophyll *a* photosynthesis and respiration will have no significant effect on observed DO values. Nothing out of the ordinary was observed during sampling. This data is summarized in Figure 3. Tabular data is presented in Appendix A.

3.4 Nutrients

During the January 1998 through April 2004 sampling period, total phosphorus (TP) concentrations ranged from 0.003 mg/L to 1.00 mg/L and total nitrogen (TN) concentrations ranged from 0.083 mg/L to 2.6 mg/L. Please refer to Figure 3 for graphical representations of this data; data tables are presented in Appendix A.

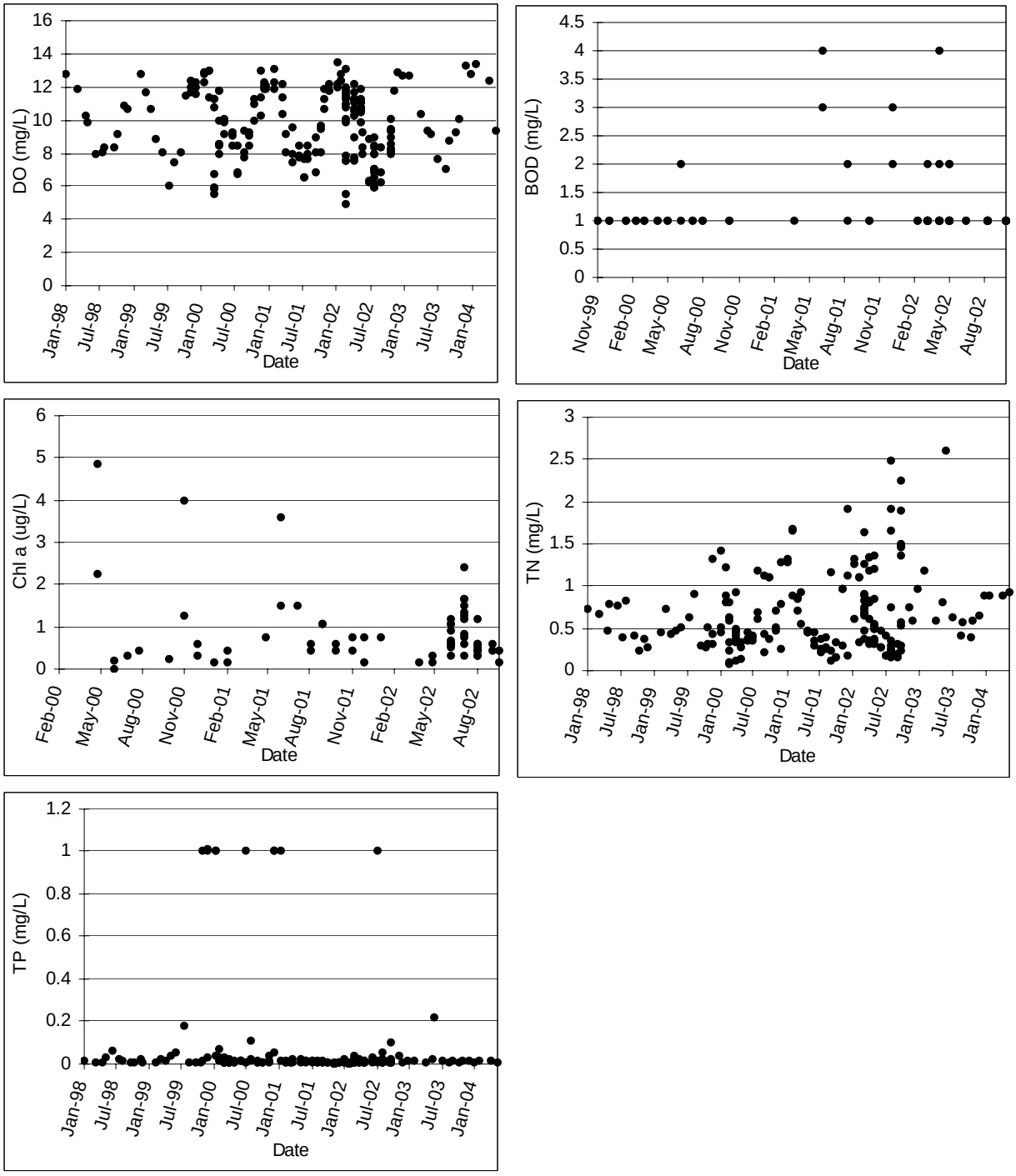

Figure 3: Town Creek Water Quality Data from 1998 through 2004

4.0 CONCLUSION

The data presented above clearly demonstrates that excessive algal growth does not exist in the Town Creek, as indicated by the chlorophyll *a* levels. Similarly, 99.6 % of the DO observations are above the criterion of 5.0 mg/L and 97% are above the Use III-P criteria of a 6.0 mg/L daily average. Based on 305(b) guidance, MDE applies a "rule-of-thumb" that a waterbody is impaired in the water column when greater than 10% of the samples exceed the applicable criteria. This water quality analysis shows only 3.0 % violation of criteria within the watershed if the 6.0 mg/L daily average criterion is applied with the synoptic surveys conducted during 1998-2004. This result does not exceed the 10% rule MDE has defined as a standard for impairment. Barring the receipt of contradictory data, this report will be used to support a nutrients listing change for the Town Creek Watershed from Category 5 ("waterbodies impaired by one or more pollutants requiring a TMDL") to Category 2 ("Surface waters that are meeting some standards and have insufficient information to determine attainment of other standards"), when the Maryland Department of the Environment (MDE) proposes the revision of Maryland's 303(d) list for public review in the future. Although the waters of Town Creek do not display signs of eutrophication, the State reserves the right to require future controls in the Town Creek watershed if evidence suggests nutrients from the basin are contributing to downstream water quality problems.

REFERENCES

Code of Maryland Regulations, 26.08.02.07, 26.08.02.08(Q), 26.08.02.03-3E(2), 26.08.02.03-3G(1), 26.08.02.03A(2), 26.08.02.03B(2)

Maryland Department of Planning, 2002 Land Use, Land Cover Map Series. 2002.

U.S. Environmental Protection Agency. Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports). EPA-841-B97-002. 1997.

Appendix A: Tabular Water Quality Data

Source	Station	Date	DO (mg/L)	BOD (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)	Active Chlorophyll a (μg/L)
MDE	FLI0000	03/27/02	11.5	1	0.897	0.027	1.05
MDE	FLI0000	04/23/02	11.7	1	0.322	0.014	1.64
MDE	FLI0000	05/21/02	11.3	1	0.377	0.010	0.60
MDE	FLI0000	08/27/02	8.4	1	1.922	0.023	0.45
MDE	FLI0000	10/01/02	9.0	1	0.231	0.025	1.05
MDE	FLI0037	03/27/02	11.8	1	0.727	0.019	0.60
MDE	FLI0037	04/23/02	11.3	1		0.015	1.64
MDE	FLI0037	05/21/02	11.1	2	0.355	0.009	0.45
MDE	FLI0037	08/27/02	8.5	1	1.663	0.009	0.30
MDE	FLI0037	10/01/02	9.4	1	1.505	0.009	0.60
MDE	MYB0008	03/27/02	11.3	2	1.269	0.018	0.90
MDE	MYB0008	04/23/02	12.2	1	0.838	0.012	2.39
MDE	MYB0008	05/21/02	10.8	2	1.354	0.017	1.20
MDE	MYB0008	08/27/02	9.0	1	0.751	0.013	0.90
MDE	MYB0008	10/01/02	9.4	1	1.889	0.014	0.45
MDE	SPT0010	03/27/02	12.0	1	0.479	0.011	
MDE	SPT0010	04/23/02	11.1	1	1.184	0.010	0.30
MDE	SPT0010	05/21/02	11.9	1	1.201	0.013	0.30
MDE	SPT0010	08/27/02	6.5	1	0.257	0.009	0.30
MDE	SPT0010	10/01/02	8.6	1	0.302	0.010	
MDE	TOW0013	01/18/00	12.9	1	0.515	1.001	
MDE	TOW0013	02/14/00	13.0	1	0.804	0.031	2.24
MDE	TOW0013	03/06/00	10.8	1	0.599	0.011	0.21
MDE	TOW0013	04/10/00	11.8	1	0.410	0.008	0.30
MDE	TOW0013	05/08/00	9.2	1	0.268	0.011	0.43
MDE	TOW0013	06/12/00	9.1	1	0.369	0.012	
MDE	TOW0013	07/10/00	6.8	1	0.399	0.008	0.25
MDE	TOW0013	08/07/00	8.1	1	1.193	0.110	3.99
MDE	TOW0013	09/11/00	8.5		1.125	0.008	0.30
MDE	TOW0013	10/12/00	11.0	1	1.111	0.009	0.15
MDE	TOW0013	11/13/00	10.3		0.510	0.016	0.45
MDE	TOW0013	12/12/00	11.9		1.281	1.006	
MDE	TOW0013	01/18/01	11.9		1.328	1.006	
MDE	TOW0013	02/14/01	11.9		1.676	0.006	0.75
MDE	TOW0013	03/15/01	10.4		0.850	0.016	3.59
MDE	TOW0013	04/09/01	8.1	1	0.548	0.010	1.50
MDE	TOW0013	05/09/01	7.4		0.455	0.009	0.60
MDE	TOW0013	03/27/02	11.8	1	0.693	0.009	0.30
MDE	TOW0013	04/23/02	10.3	1	0.365	0.020	1.50
MDE	TOW0013	05/21/02	10.5	1	0.506	0.011	0.30
MDE	TOW0013	08/27/02	7.0	1	0.206	0.011	0.00
MDE	TOW0013	10/01/02	8.1	1	1.463	0.008	0.45
MDE	TOW0030	11/08/99	12.4	1	0.523	1.002	

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Source	Station	Date	DO (mg/L)	BOD (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)	Active Chlorophyll a (μg/L)
MDE	TOW0030	12/06/99	12.0	1	1.322	1.003	
MDE	TOW0030	06/13/01	7.7	3	0.360	0.012	1.05
MDE	TOW0030	07/18/01	6.5		0.218	0.015	0.45
MDE	TOW0030	08/15/01	7.6	1	0.262	0.011	0.45
MDE	TOW0030	09/12/01	6.8		1.159	0.010	0.15
MDE	TOW0030	10/11/01	9.5	1	0.158	0.006	
MDE	TOW0030	11/15/01	11.3		0.966	0.004	
MDE	TOW0030	12/12/01	11.8	2	1.922	0.008	
MDE	TOW0030	01/16/02	12.0		1.315	0.008	
MDE	TOW0030	02/13/02	12.4	1	1.115	0.003	0.30
MDE	TOW0030	03/13/02	10.6		0.981	0.007	0.60
MDE	TOW0030	03/27/02	11.4	1	0.682	0.011	0.45
MDE	TOW0030	04/10/02	10.2	3	1.252	0.010	0.30
MDE	TOW0030	04/23/02	10.4	1	0.383	0.022	1.35
MDE	TOW0030	05/08/02	9.3		0.307	0.011	0.75
MDE	TOW0030	05/21/02	10.5	1		0.010	0.30
MDE	TOW0030	06/19/02	7.9	1	0.280	0.016	0.45
MDE	TOW0030	07/17/02	6.2		0.187	0.010	0.15
MDE	TOW0030	08/14/02	5.8	1	0.285	0.019	0.45
MDE	TOW0030	08/27/02	6.3	1	0.197	0.009	0.15
MDE	TOW0030	09/18/02	6.2		0.155	0.013	0.30
MDE	TOW0030	10/01/02	8.1	1	0.527	0.011	0.75
MDE	TOW0059	03/27/02	11.4	1	0.658	0.009	0.60
MDE	TOW0059	04/23/02	10.6	1	0.357	0.018	1.35
MDE	TOW0059	05/21/02	10.6	1	0.489	0.010	0.45
MDE	TOW0059	08/27/02	5.9	1	0.193	0.010	0.30
MDE	TOW0059	10/01/02	7.9	1	1.482	0.009	0.90
MDE	TOW0111	03/27/02	10.1	1	0.669	0.013	1.05
MDE	TOW0111	04/23/02	10.7	1	1.337	0.020	1.20
MDE	TOW0111	05/21/02	10.7	1	0.529	0.010	0.45
MDE	TOW0111	08/27/02	6.8	1	0.167	0.008	0.60
MDE	TOW0111	10/01/02	8.3	1	1.484	0.008	0.90
MDE	TOW0173	03/27/02	10.8	1	0.758	0.021	1.05
MDE	TOW0173	03/27/02	10.8		0.740	0.020	1.35
MDE	TOW0173	04/23/02	10.7	1	1.344	0.016	1.35
MDE	TOW0173	04/23/02	10.7		1.351	0.020	1.20
MDE	TOW0173	05/21/02	10.8	1	0.544	0.009	0.41
MDE	TOW0173	05/21/02	10.8		0.530	0.010	0.45
MDE	TOW0173	08/27/02	7.0	1	0.304	0.016	0.75
MDE	TOW0173	08/27/02	7.0		0.299	0.014	0.75
MDE	TOW0173	10/01/02	8.3	1	0.570	0.010	0.90
MDE	TOW0173	10/01/02	8.3		0.582	0.010	0.90
MDE	TOW0246	03/27/02	11.6	1	1.637	0.010	0.60
MDE	TOW0246	04/23/02	11.3	1	0.351	0.014	0.75
MDE	TOW0246	05/21/02	11.1	1	0.498	0.010	
MDE	TOW0246	08/27/02	5.9	1	0.352	0.013	0.60

Source	Station	Date	DO (mg/L)	BOD (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)	Active Chlorophyll a (μg/L)
MDE	TOW0246	10/01/02	9.4	1	2.246	0.010	0.30
MDE	TOW0283	11/08/99	12.0	1			
MDE	TOW0283	12/06/99	11.6	1	0.323	1.011	
MDE	TOW0283	01/18/00	12.8	1	1.422	1.000	
MDE	TOW0283	02/14/00	13.0	1	1.233	0.072	4.86
MDE	TOW0283	03/06/00	11.3	1	0.625	0.012	0.00
MDE	TOW0283	04/10/00	11.8	1	0.376	0.006	
MDE	TOW0283	05/08/00	10.1	1	0.143	0.012	
MDE	TOW0283	06/12/00	9.3	2	0.361	0.013	
MDE	TOW0283	07/10/00	6.7	1	0.407	1.007	
MDE	TOW0283	08/07/00	9.4	1	0.606	0.023	1.25
MDE	TOW0283	09/11/00	9.1		0.213	0.008	0.60
MDE	TOW0283	10/12/00	11.3	1	1.102	0.009	
MDE	TOW0283	11/13/00	11.4		0.469	0.039	0.15
MDE	TOW0283	12/12/00	12.3		0.259	1.008	
MDE	TOW0283	01/18/01	12.1		1.280	0.015	
MDE	TOW0283	02/14/01	12.3		1.660	0.006	
MDE	TOW0283	03/15/01	11.4		0.874	0.011	1.50
MDE	TOW0283	05/09/01	7.9		0.449	0.013	0.45
MDE	TOW0283	06/13/01	7.8	4	0.447	0.013	1.05
MDE	TOW0283	07/18/01	7.6		0.259	0.010	0.60
MDE	TOW0283	08/15/01	8.5	2	0.285	0.007	0.75
MDE	TOW0283	09/12/01	8.1		0.228	0.009	0.75
MDE	TOW0283	10/11/01	9.7	1	0.167	0.011	0.75
MDE	TOW0283	11/15/01	11.9		0.959	0.003	
MDE	TOW0283	12/12/01	12.2	3	1.131	0.007	
MDE	TOW0283	01/16/02	12.2		1.261	0.008	0.15
MDE	TOW0283	02/13/02	12.4	1	1.096	0.004	0.15
MDE	TOW0283	03/13/02	10.8		0.132	0.006	0.75
MDE	TOW0283	03/27/02	12.0	1	1.682	0.013	0.60
MDE	TOW0283	04/10/02	11.0	4	1.249	0.009	0.45
MDE	TOW0283	04/23/02	11.4	1	0.359	0.009	0.75
MDE	TOW0283	05/08/02	10.2		0.266	0.009	0.90
MDE	TOW0283	05/21/02	11.1	1	1.436	0.008	0.30
MDE	TOW0283	06/19/02	9.3	1	0.277	0.008	0.60
MDE	TOW0283	07/17/02	8.2		0.185	1.001	0.45
MDE	TOW0283	08/14/02	7.9	1	0.275	0.014	0.90
MDE	TOW0283	08/27/02	7.7	1	0.199	0.010	0.60
MDE	TOW0283	09/18/02	6.1		0.198	0.012	1.05
MDE	TOW0283	10/01/02	8.9	1	1.473	0.006	0.68
DNR	TOW0030	01/14/98	12.8		0.729	0.017	
DNR	TOW0030	03/18/98	11.9		0.673	0.01	
DNR	TOW0030	04/29/98	10.3		0.465	0.01	
DNR	TOW0030	05/13/98	9.9		0.787	0.033	
DNR	TOW0030	06/24/98	8.0		0.775	0.066	
DNR	TOW0030	07/29/98	8.1		0.385	0.024	

FINAL

Source	Station	Date	DO (mg/L)	BOD (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)
DNR	TOW0030	08/12/98	8.4		0.83	0.012
DNR	TOW0030	09/30/98	8.4		0.407	0.01
DNR	TOW0030	10/21/98	9.2		0.236	0.01
DNR	TOW0030	11/24/98	10.9		0.383	0.026
DNR	TOW0030	12/09/98	10.7		0.282	0.01
DNR	TOW0030	02/24/99	12.8		0.455	0.01
DNR	TOW0030	03/24/99	11.7		0.721	0.026
DNR	TOW0030	04/20/99	10.7		0.44	0.016
DNR	TOW0030	05/18/99	8.9		0.464	0.037
DNR	TOW0030	06/15/99	8.1		0.51	0.052
DNR	TOW0030	07/27/99	6.0		0.64	0.179
DNR	TOW0030	08/24/99	7.4		0.914	0.01
DNR	TOW0030	09/29/99	8.1		0.3	0.011
DNR	TOW0030	10/26/99	11.5		0.27	0.011
DNR	TOW0030	11/16/99	11.7		0.31	0.017
DNR	TOW0030	12/14/99	12.3		0.436	0.028
DNR	TOW0030	01/26/00	12.3		0.455	0.041
DNR	TOW0030	02/24/00	11.4		0.883	0.013
DNR	TOW0030	03/22/00	11.3		0.809	0.032
DNR	TOW0030	04/18/00	10.0		0.5	0.022
DNR	TOW0030	05/16/00	9.9		0.332	0.01
DNR	TOW0030	06/28/00	8.5		0.45	0.019
DNR	TOW0030	07/27/00	8.5		0.355	0.01
DNR	TOW0030	08/30/00	7.7		0.692	0.013
DNR	TOW0030	09/26/00	9.3		0.444	0.019
DNR	TOW0030	10/25/00	10.0		0.371	0.01
DNR	TOW0030	11/29/00	13.0		0.704	0.01
DNR	TOW0030	12/20/00	12.1		0.789	0.056
DNR	TOW0030	02/07/01	13.1		0.887	0.013
DNR	TOW0030	03/28/01	12.2		0.714	0.01
DNR	TOW0030	04/11/01	9.2		0.927	0.022
DNR	TOW0030	05/16/01	9.6		0.466	0.02
DNR	TOW0030	06/27/01	8.5		0.305	0.01
DNR	TOW0030	07/26/01	6.5		0.384	0.014
DNR	TOW0030	08/08/01	7.9		0.401	0.015
DNR	TOW0030	09/26/01	9.0		0.112	0.014
DNR	TOW0030	10/24/01	8.1		0.34	0.01
DNR	TOW0030	11/07/01	10.7		0.3	0.01
DNR	TOW0030	12/05/01	11.8		0.17	0.01
DNR	TOW0030	01/16/02	13.5		0.618	0.024
DNR	TOW0030	02/06/02	12.8		0.33	0.01
DNR	TOW0030	03/06/02	13.1		0.377	0.01
DNR	TOW0030	04/17/02	9.0		0.616	0.013
DNR	TOW0030	05/22/02	11.1		0.545	0.01
DNR	TOW0030	06/05/02	8.4		0.479	0.028
DNR	TOW0030	07/10/02	6.3		0.412	0.019

FINAL

Source	Station	Date	DO (mg/L)	BOD (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)
DNR	TOW0030	08/07/02	8.0		2.48	0.055
DNR	TOW0030	09/11/02	6.8		0.31	0.01
DNR	TOW0030	10/30/02	10.1		1.356	0.1
DNR	TOW0030	11/20/02	11.8		0.757	0.039
DNR	TOW0030	12/04/02	12.9		0.597	0.01
DNR	TOW0030	01/07/03	12.7		0.967	0.015
DNR	TOW0030	02/05/03	12.7		1.182	0.012
DNR	TOW0030	04/16/03	10.4		0.586	0.01
DNR	TOW0030	05/21/03	9.4		0.817	0.021
DNR	TOW0030	06/04/03	9.2		2.6	0.221
DNR	TOW0030	07/16/03	7.6		0.624	0.014
DNR	TOW0030	08/27/03	7.0		0.42	0.01
DNR	TOW0030	09/10/03	8.8		0.57	0.012
DNR	TOW0030	10/22/03	9.3		0.397	0.01
DNR	TOW0030	11/05/03	10.1		0.593	0.015
DNR	TOW0030	12/10/03	13.3		0.649	0.015
DNR	TOW0030	1/7/2004	12.8		0.891	0.01
DNR	TOW0030	2/11/2004	13.4		0.895	0.018
DNR	TOW0030	03/10/04	12.4		0.881	0.016
DNR	TOW0030	04/21/04	9.4		0.93	0.01

Source	Station	Date	DO (mg/L)	BOD (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)
MBSS	TOWN-101-R-2000	03/23/00	6.7			
MBSS	TOWN-102-R-2000	03/23/00	5.8		0.3394	0.0041
MBSS	TOWN-104-R-2000	03/23/00	5.9		0.083	0.007
MBSS	TOWN-105-R-2000	04/10/00			0.9336	0.0099
MBSS	TOWN-106-R-2000	03/23/00			0.0991	0.0047
MBSS	TOWN-110-R-2000	04/10/00	7.9		0.1204	0.0052
MBSS	TOWN-113-R-2000	03/23/00	5.5		0.2356	0.0051
MBSS	TOWN-408-R-2000	04/03/00	8.5		0.33	0.0044
MBSS	TOWN-409-R-2000	04/10/00	8.6		0.478	0.0053
MBSS	TOWN-412-R-2000	04/10/00	8.6		0.4471	0.0078
MBSS	TOWN-104-R-2002	03/26/02	7.5			
MBSS	TOWN-108-R-2002	03/26/02	7.5			
MBSS	TOWN-116-R-2002	03/26/02	4.9			
MBSS	TOWN-201-R-2002	03/26/02	5.5			
MBSS	TOWN-205-R-2002	03/27/02	9.9			
MBSS	TOWN-417-R-2002	03/27/02	7.8			
MBSS	TOWN-419-R-2002	04/10/02	7.7			
MBSS	TOWN-420-R-2002	04/10/02	7.5			