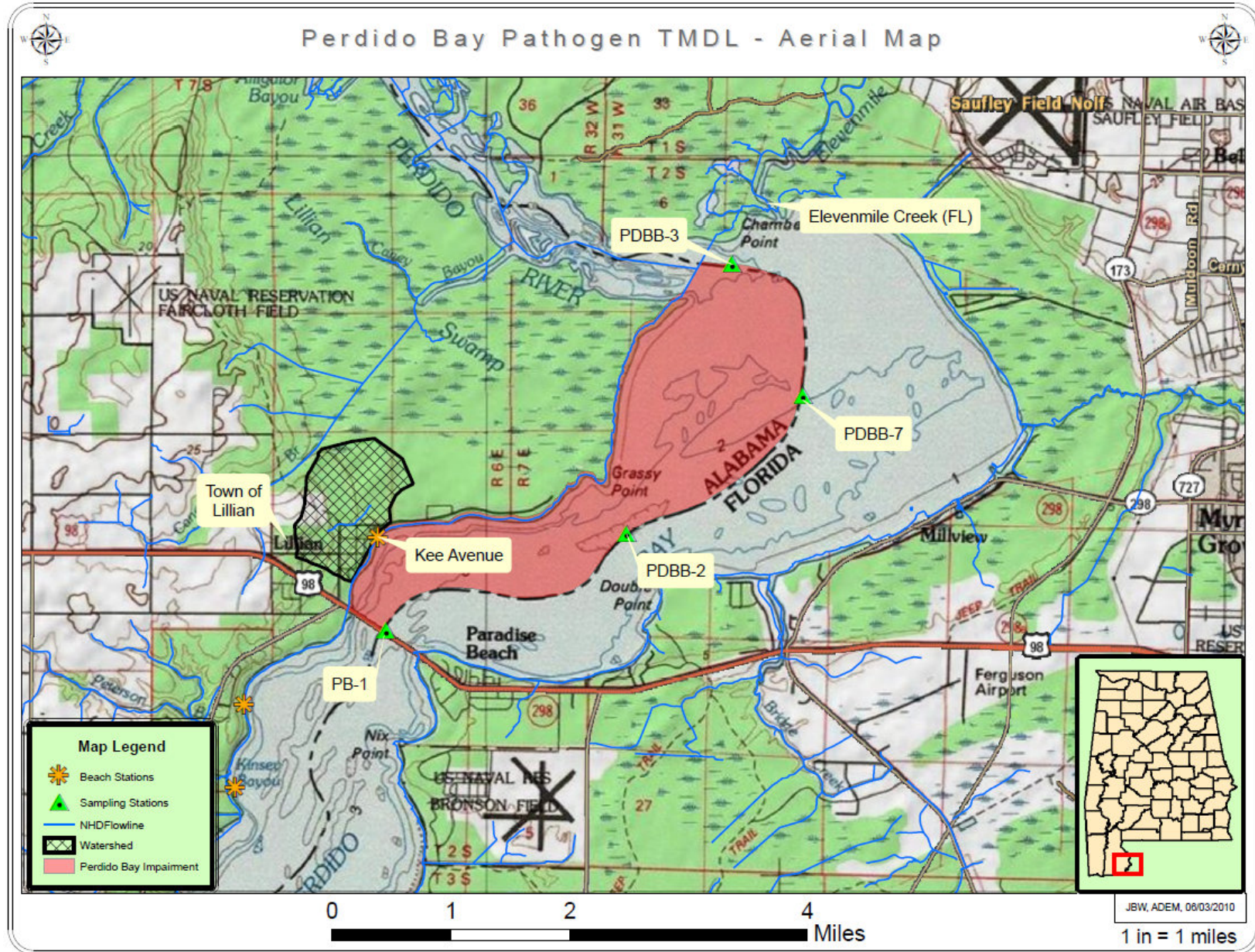




Final
**Total Maximum Daily Load (TMDL)
Perdido Bay
Assessment Unit ID # AL03140107-0103-100
Pathogens (Enterococci)**

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2010

Figure 1-1. Listed Portion of Perdido Bay in the Perdido River Basin



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1.0 Executive Summary

Section §303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) requires states to identify waterbodies which are not meeting their designated uses and to determine the Total Maximum Daily Load (TMDL) for pollutants causing the use impairment. A TMDL is the maximum amount of pollutant a waterbody can assimilate while meeting all applicable water quality standards for the pollutant of concern. All TMDLs include a wasteload allocation (WLA) for all National Pollutant Discharge Elimination System (NPDES) regulated discharges, a load allocation (LA) for all nonpoint sources, and an explicit and/or implicit margin of safety (MOS).

This Perdido Bay portion was originally placed on Alabama's 2006 §303(d) list of impaired waters for pathogens based on data collected by ADEM in 2001 and 2002. Perdido Bay is currently on the §303(d) list for pathogens (Enterococci) from the Lillian Bridge (US Hwy 98) to its source (the mouth of the Perdido River). This area only includes water on the Alabama portion of the bay and totals an area of 4.21 square miles. Perdido Bay is located in the Perdido-Escambia River Basin and forms in southeastern Baldwin County. Perdido Bay is considered a coastal waterbody with an average salinity level of 15 parts per thousand (ppt) and is tidally influenced. The listed portion of Perdido Bay holds use classifications of Swimming (S), Shellfish Harvesting (SH), as well as Fish & Wildlife (F&W).

In general, Perdido Bay has a total surface area of approximately 50 mi² (130 km²) with a total contributing drainage area of over 1197 mi² (3100 km²). It has an average depth of about 10 ft (3 m), and is generally shallower in the northernmost reaches and grows deeper as it nears the Gulf of Mexico. This elongated waterbody is oriented north-to-south and boasts over 265 mi² (688 km²) of coastal wetland habitat. The dominant inflow of freshwater is the Perdido River, which accounts for more than 70% of the freshwater inflow at about 2200 ft³/s (62 m³/s).

In 2008, a §303(d) sampling study was performed by ADEM on the listed portion of Perdido Bay for additional water quality assessment. ADEM collected samples from several different stations, including stations at mid-channel as well as near-shore beach monitoring stations (sampled year round from 2006 - Present). Further review of the general water quality and intensive Enterococci study revealed that the listed area of Perdido Bay was still not meeting the pathogen criterion applicable to its most stringent use classification (Swimming). Each station was carefully examined and the data compiled to identify specific areas of impairment. Specifically, the "Kee Avenue" beach station showed an unacceptable number of both single sample and geometric mean (geomean) exceedances, while the other mid-channel stations showed no exceedances. Therefore, a TMDL was developed for the listed portion of the bay specific to the data collected and all pertinent information available.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g. pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of

organism counts per day (colonies/day), in accordance with 40 CFR 130.2(i). In this instance, flow was not a consideration due to the tidal influence, small watershed size, and very localized exceedances. Therefore, a percent reduction was based solely on the highest exceedance value and the percent reduction required in order to meet the criterion applicable to the Swimming (S) use classification.

The percent reduction in loading was found by taking the highest single sample exceedance, the maximum allowable instream loading for this particular waterbody, and using these values in order to establish a percent reduction for all point sources and non-point sources within the watershed. A localized drainage area was delineated to represent the source(s) of the pollutant causing impairment. The Swimming (S) use classification criterion states a maximum allowable single sample level of 104 colonies/100ml and a maximum allowable geomean of 35 colonies/100ml (*Alabama Department of Environmental Management Water Division - Water Quality Program: Chapter 335-6-11-.02*). The single sample criterion was employed in this instance because it yielded the greatest reduction among the qualified data. The allowable loading, defined as the single sample criterion including the 10% explicit margin of safety (MOS), was calculated using the Enterococci single sample allowable concentration of 94 colonies/100 ml (104 colonies/100 ml - 10% MOS) and the highest exceedance (2440 colonies/100ml) to yield a total load reduction of 96%.

Table 1-1 is a summary of estimated existing and allowable concentrations required to meet the applicable water quality pathogen single sample criterion for the Perdido Bay Impairment. Table 1-2 lists the TMDL (maximum allowable) pathogen loadings under critical conditions for the Perdido Bay Impairment.

Table 1-1. Enterococci Concentrations and Required Reductions

Source	Existing Conditions (col/100ml)	Allowable Conditions (col/100ml)	% Reduction
Nonpoint	2440	94	96%

Table 1-2. Enterococci TMDL and Percent Reductions for Perdido Bay Impairment

TMDL (col/100ml)	Margin of Safety (MOS) (col/100ml)	Waste Load Allocation (WLA) ^a			Load Allocation (LA)	
		WWTPs ^b (col/day)	MS4s ^c (% reduction)	Leaking Collection Systems ^d (col/day)	(col/100ml)	(% reduction)
104	10	NA	NA	0	94	96%

(See notes on following page)

- a. There are no CAFOs in the subject watershed. Future CAFOs will be assigned a waste load allocation (WLA) of zero.
- b. WLAs for WWTPs are expressed as a daily maximum; NA = not applicable, no point sources. Future WWTPs must meet the applicable instream water quality criteria for pathogens at the point of discharge.
- c. NA = not applicable, no regulated MS4 areas. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
- d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in pathogen loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for pathogens.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria and we are committed towards targeting the load reductions to improve water quality in the Perdido Bay watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

2.0 Basis for §303(d) Listing

2.1 Introduction

Section §303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants for a waterbody based on the relationship between pollution sources and instream water quality conditions, so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified the 4.21 square miles of Perdido Bay (north of Lillian Bridge to its Source west of the state line that runs down the middle of the Bay) as impaired for pathogens. The §303(d) listing was originally reported on Alabama's 2006 List of Impaired Waters based on intensive field studies performed in 2001-02. Additional supporting data was gathered during the 2008 sampling season and on-going beach monitoring data is still taking place.

2.2 Problem Definition

Waterbody Impaired: Perdido Bay from Lillian Bridge (US HWY 98) to its source

Impaired Area: ~4.21 square miles

Contributing Drainage Area: ~0.76 square miles

Water Quality Standard Violation: Enterococci (Pathogens)

Water Use Classification: Swimming (S) Shellfish Harvesting (SH)
& Fish and Wildlife (F&W)

Usage Related to Classification:

This particular impaired waterbody is classified as Shellfish Harvesting (SH), Swimming (S), and Fish and Wildlife (F&W). Usage of waters in this classification is described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), and (d).

(a) *Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.*

(b) *Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.*

(c) *Other usage of waters: it is recognized that the waters may be used for incidental water contact and recreation during June through September, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.*

(d) *Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports.*

Shellfish Harvesting Criterion:

It should be noted that though this portion of Perdido Bay is classified as SH, the Swimming use classification holds the same single sample and geometric mean criteria, but is in effect year-round as opposed to the seasonal limits applicable to the SH classification criterion. Furthermore, under the Shellfish Sanitation Program administered by the Alabama Department of Public Health (ADPH), Perdido Bay is defined as an “unclassified” area, therefore is closed to the harvesting of shellfish.

Enterococci Criterion:

Criterion for acceptable bacteria levels for the Swimming & Other Whole-Body Contact Sports (S) use classification is described in ADEM Administrative Code R. 335-6-10-.09(3)(c)6(i-iii):

6. Bacteria:

(i) Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water-contact sports.

(ii) In all other areas, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 235 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the Enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 104 colonies/100 ml in any sample.

The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric mean bacterial organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters.

(iii) The policy of nondegradation of high quality waters shall be stringently applied to bacterial quality of recreational waters.

Criteria Exceeded:

Water quality data collected by ADEM in 2001-02 was used in listing this portion of Perdido Bay on Alabama's 2006 §303(d) list. Data indicated that it exceeded the single sample maximum criterion for its swimming use classification (year-round). The geometric mean and single sample maximum criterion limits are 35 colonies/100 ml and 104 colonies/100ml, respectively. As previously mentioned, none of the intensive monitoring stations sampled in 2008 showed any exceedances. However, the beach monitoring station at Kee Avenue had a total of 15 exceedances from January 2006 to May 2010. This dataset included a total of 141 samples. The complete dataset analyzed for listing this portion of Perdido Bay can be viewed in Appendix B, Figure 7-1. The ADEM §303(d) monitoring program collected thirty samples from three stations in 2008. The study resulted in no stations with exceedances during the sampling season. This data can be viewed in Appendix B, Table 7-2.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

The single sample Enterococci allowable concentration of 96 colonies/100 ml will be used for TMDL development. This concentration was derived by using the single sample criterion of 104 colonies/100 ml and a 10% (10.4 colonies/100 ml) explicit margin of safety. This allowable concentration is considered protective of water quality standards and should not allow the geometric mean of 35 colonies/100 ml (year-round) or the single sample maximum of 104 colonies/100 ml to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the Perdido Bay Impairment Watershed

Continuous Point Sources

There are no continuous NPDES discharges located in the contributing watershed of the impaired portion of Perdido Bay (See Figure 1-1). However, any future NPDES regulated discharges that are considered by the Department to be a pathogen source will be required to meet the instream water quality criteria for pathogens at the point of discharge.

Non-Continuous Point Sources

The specific watershed contributing to the Perdido Bay Impairment is not located within a qualified Municipal Separate Stormwater Sewer System (MS4) area; therefore a WLA is not applicable in this instance.

Sanitary sewer overflows (SSOs) have the potential to severely impact water quality and can often result in the violation of water quality standards. It is the responsibility of the NPDES wastewater discharger, or collection system operator for non-permitted "collection only" systems, to ensure that releases do not occur. Unfortunately releases to surface waters from SSOs are not always preventable or reported. From a review of ADEM files it was determined that numerous SSOs have occurred in the Lillian area, but were south of the area contributing to the impaired portion of the Bay. These overflows typically occur from manholes located in the town of Lillian and from percolation ponds located at a UIC treatment facility south of the Lillian Bridge.

Future NPDES regulated stormwater discharges will be required to demonstrate consistency with the assumptions and requirements of this TMDL. It should also be noted that any and all contributing point and/or nonpoint sources to the impairment of this waterbody will be addressed, not just those which lie within the delineated watershed. This watershed was based on topographic and hydrological data in order to approximate where the most likely sources are located. It is not, however, meant to act as a boundary of actionable area specific to this TMDL.

3.2.2 Nonpoint Sources in the Perdido Bay Delineated Watershed

Nonpoint sources appear to be the predominant source of Enterococci bacteria in the watershed. Land use in this watershed is characterized mostly by forested areas, developed land, agricultural uses. Forest land use covers 63%, developed areas encompass nearly 20%, followed by agriculture at 5%, and other land uses totaled nearly 12%.

The following are examples of how different land uses can contribute to Enterococci bacterial loading:

- Agricultural land can be a source of Enterococci bacteria due to runoff from pastures, animal operations, improper land application of animal wastes, and animals with access to streams. These mechanisms can significantly contribute to the loading of Enterococci bacteria.
- Forested areas can be a source of Enterococci bacteria due to the presence of wild animals such as deer, raccoons, turkeys, beavers, waterfowl, etc. Control of these sources is usually limited and may be impractical in most cases. As a result, forested areas are not specifically targeted in this TMDL.
- Developed land can be a source of Enterococci bacteria due to storm water runoff, illicit discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, leaking sewer infrastructure, and domestic animals. An illicit discharge refers to non-permitted facilities or individuals discharging wastewater through storm drains and/or directly to the waterbody.
 - The residential section of the town of Lillian included within the delineated watershed is predominantly on septic systems. The Alabama Department of Public Health (ADPH) in Baldwin County was contacted and stated that there were currently no known faulty systems.

3.3 Land Use Assessment

Land uses for the Lillian area and surrounding watershed were determined using ArcMap 9.3. The land use datasets were derived from the 2001 National Land Cover Dataset (NLCD). Figure 3-1 displays land use areas, Figure 3-2 displays impervious surfaces, Figure 3-3 gives an aerial illustration, and Table 3-1 & 3-2 and Figures 3-4 & 3-5 display land use categories and grouped land uses (See Following Pages for Illustrations).

****Note: Due to report formatting, some map elements may not be to scale****

Figure 3-1. Land Use Map for the Delineated Watershed

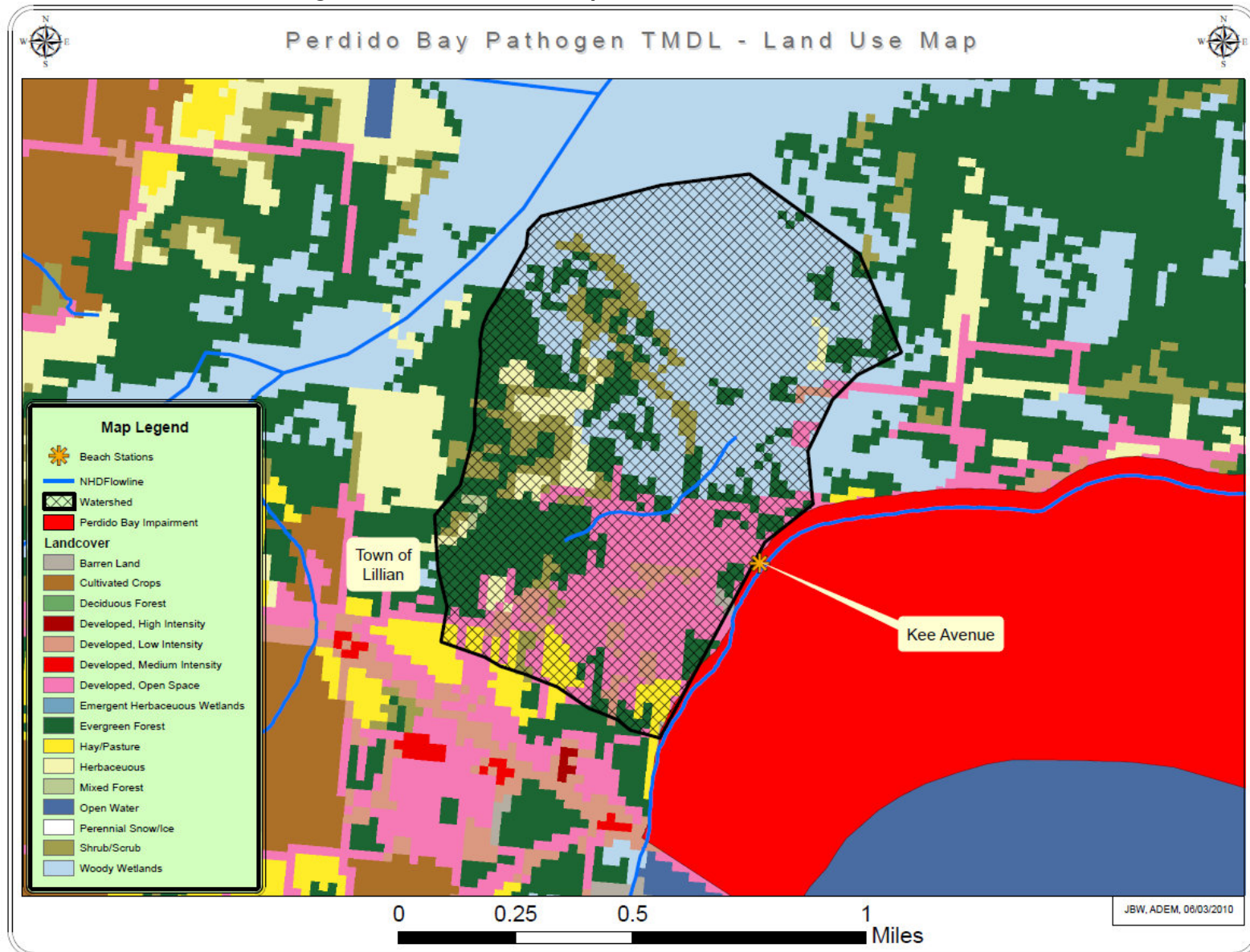


Figure 3-2. Impervious Surfaces for the Delineated Watershed

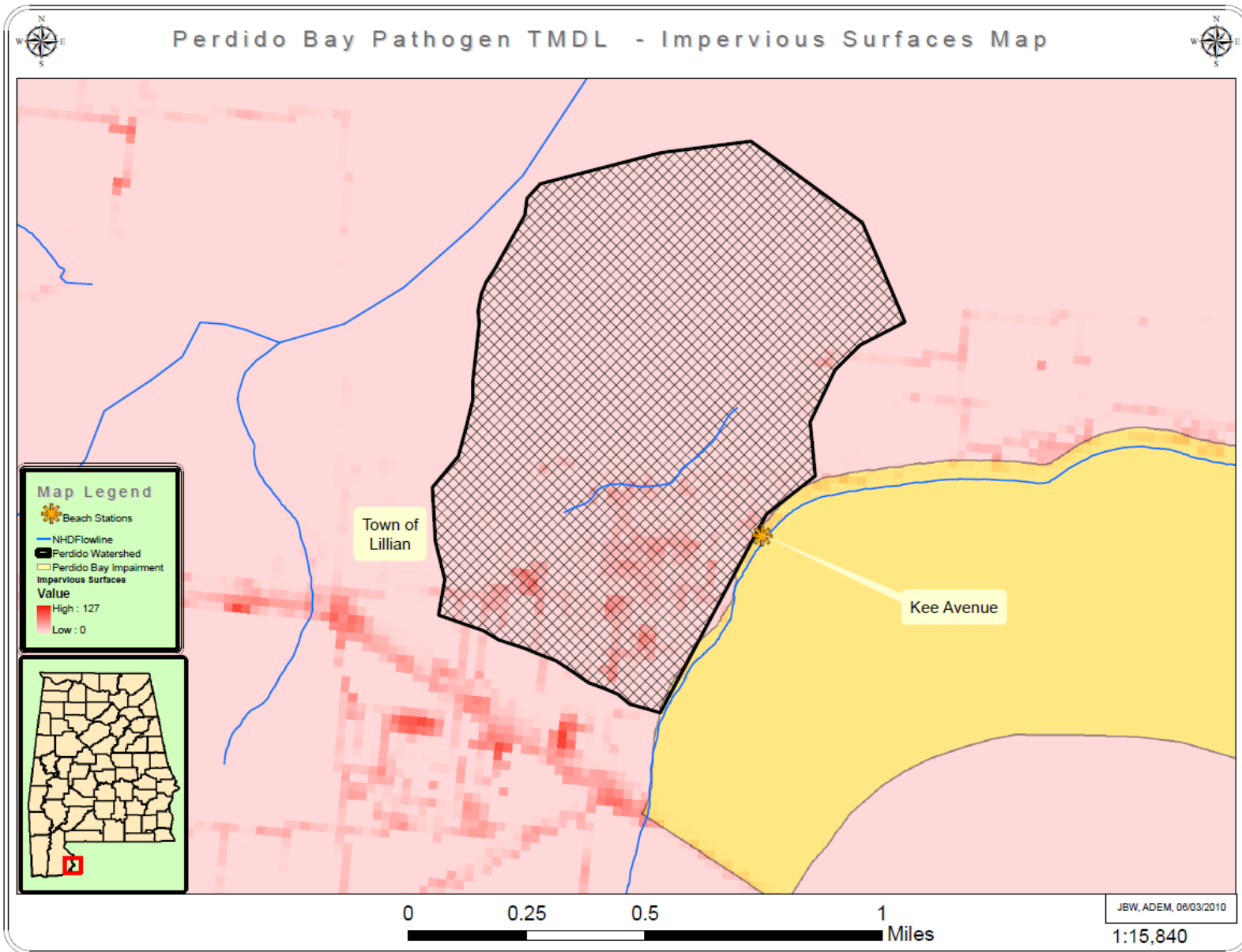


Figure 3-3. Aerial Map of the Perdido Bay Impairment

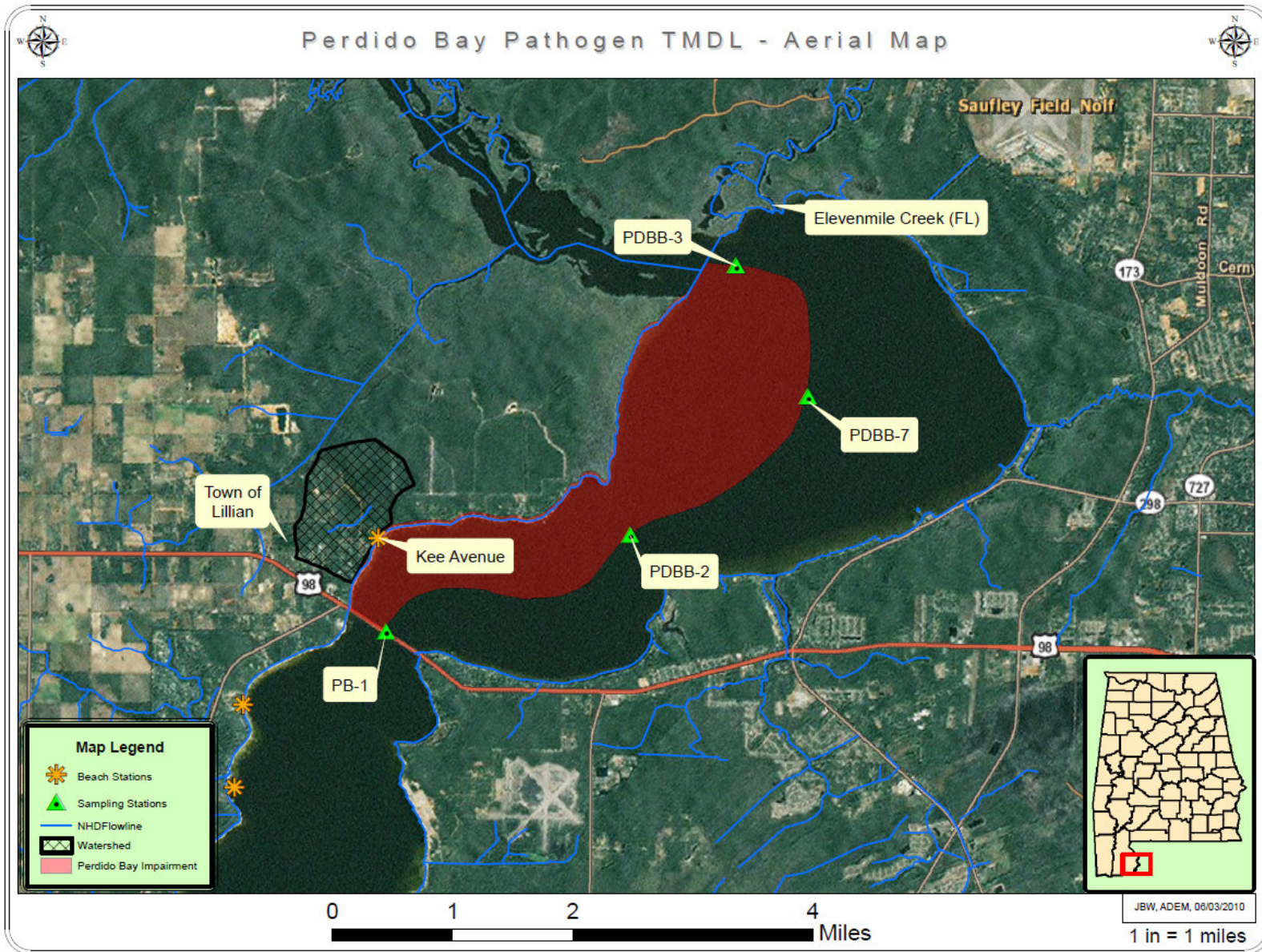


Table 3-1. Land Use Areas for Delineated Watershed (Ungrouped)

Land Cover				
Cover Type	Count	Percent	Area (mi²)	Area (ac)
Woody Wetlands	863	38.4%	0.291	186.5
Evergreen Forest	553	24.6%	0.187	119.5
Developed (Open Space)	380	16.9%	0.128	82.1
Shrub	178	7.9%	0.060	38.5
Herbacious	87	3.9%	0.029	18.8
Developed (Low Intensity)	62	2.8%	0.021	13.4
Pasture	59	2.6%	0.020	12.8
Cultivated Crops	58	2.6%	0.020	12.5
Mixed Forest	6	0.3%	0.002	1.3
Barren Land	3	0.1%	0.001	0.6
TOTALS:	2249	100.0%	0.759578	486.1

Table 3-2. Land Use Areas for Delineated Watershed (Grouped)

Land Cover				
Cover Type	Count	Percent	Area (mi²)	Area (ac)
Forest	1422	63.2%	0.480	307.4
Developed	442	19.7%	0.149	95.5
Other	268	11.9%	0.091	57.9
Agriculture	117	5.2%	0.040	25.3
TOTALS:	2249	100.0%	0.759578	486.1

Figure 3-4. Land Use Areas for Delineated Watershed (Ungrouped)

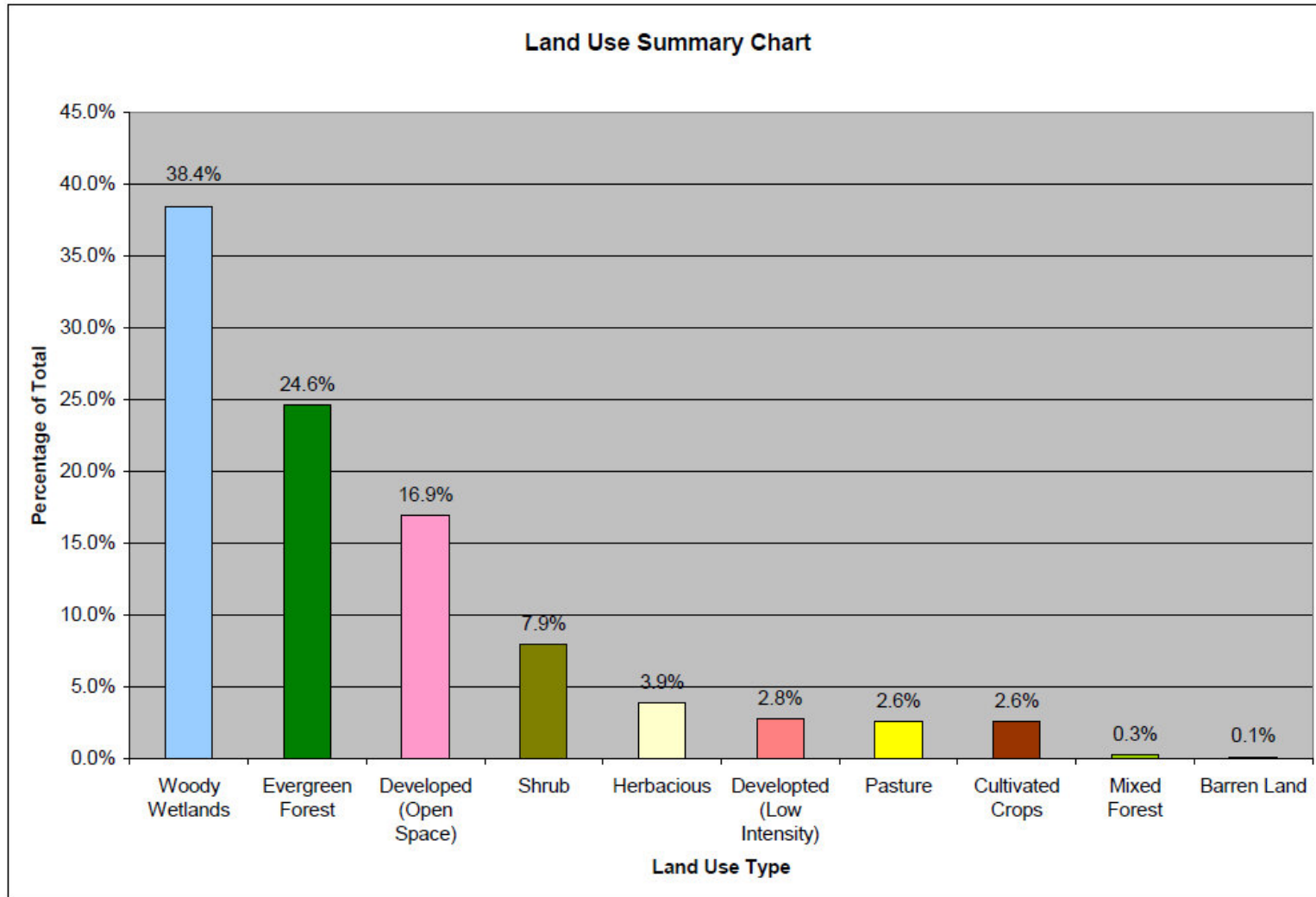
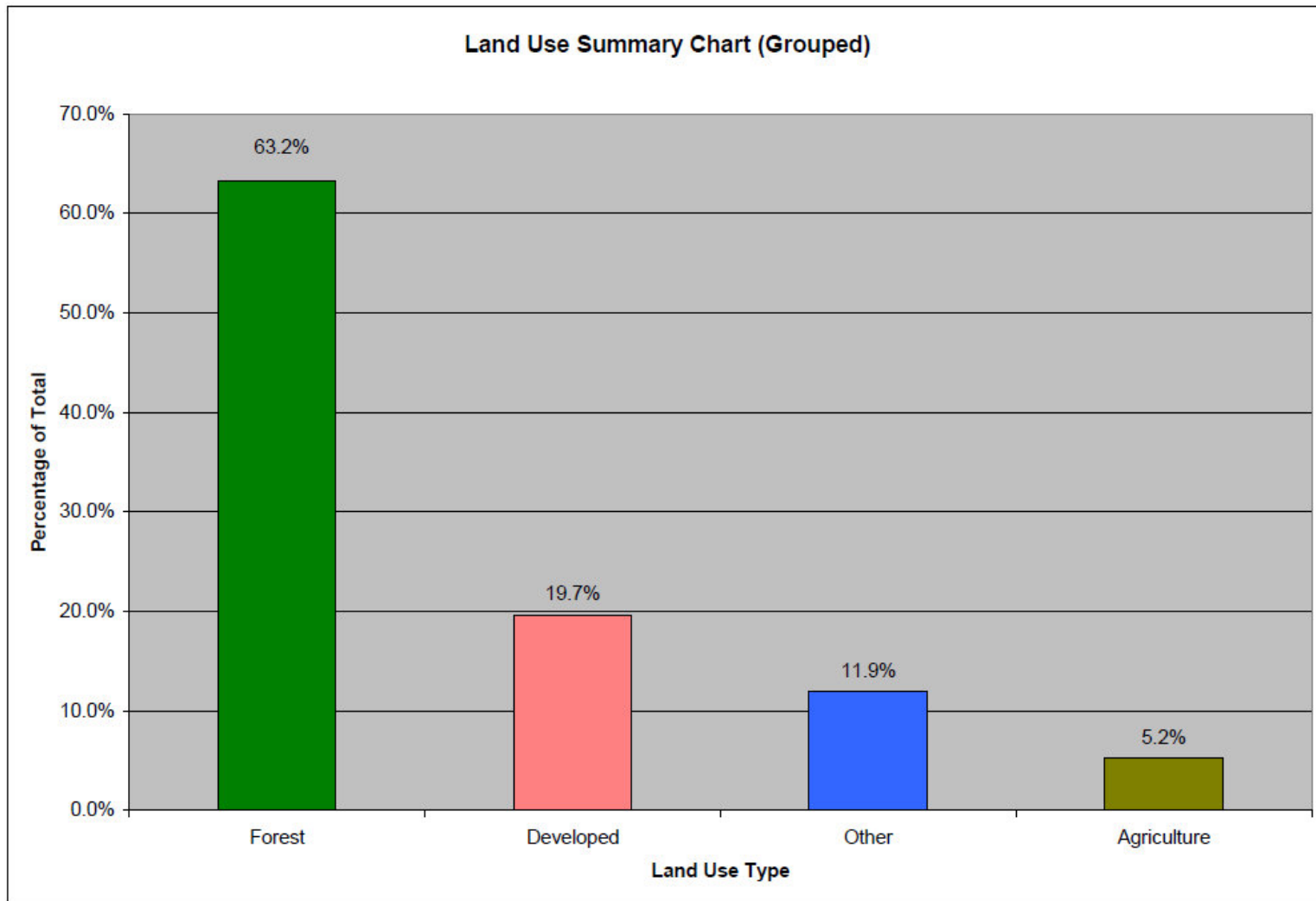


Figure 3-5. Land Use Areas for Delineated Watershed (Grouped)



3.4 Linkage between Numeric Targets and Sources

Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loadings in this delineated watershed are from urban runoff, SSOs, failing septic tanks, and/or agricultural operations. Individual loads and reductions will not be calculated for the range of nonpoint sources, but rather, the loadings and reductions will be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

The Kee Avenue Beach Monitoring Station has been collecting water quality data in Perdido Bay since January 2006. In addition to this beach monitoring data, part of the Department's Coastal Program, ADEM conducted intensive §303(d) studies on 3 stations within the impairment. Section 4.8.2 of *Alabama's Water Quality Assessment and Listing Methodology* provides the Department's rationale to use the most recent data to prepare a TMDL for an impaired waterbody when that data indicates a change in water quality has occurred. This data can be viewed in Appendix B, Table 7-1 & 7-2.

ADEM collected water quality data on Perdido Bay from 2006 to 2010 as part of ADEM's §303(d) Monitoring Program at Stations PB-1, PDBB2, PDBB-3, & PDBB-7, as well as ADEM/ADPH's Beach Monitoring Station dubbed "Kee Avenue". Figure 3-6 and Table 3-2 display locations and list descriptions for the ADEM stations. During this study, a total of 171 samples were collected; 30 of which from the §303(d) stations, and 141 samples from the Beach Monitoring Station. Of the Enterococci samples collected, there were exceedances of both the single sample maximum criterion of 104 colonies/100 ml and the geometric mean criterion 35 colonies/100 ml for the Swimming (S) use classification. There were a total of 15 single sample exceedances, with the highest being 2440 colonies/100 ml. In addition, of the available geomeans, there were a total of 7 exceedances, the highest being 76 colonies/100 ml. As a result, the single sample exceedance of 2440 colonies/100ml was utilized to develop the TMDL because it resulted in the higher percent reduction of the applicable Enterococci criteria.

Figure 3-6. Map of ADEM Sampling Stations (Topographic View)

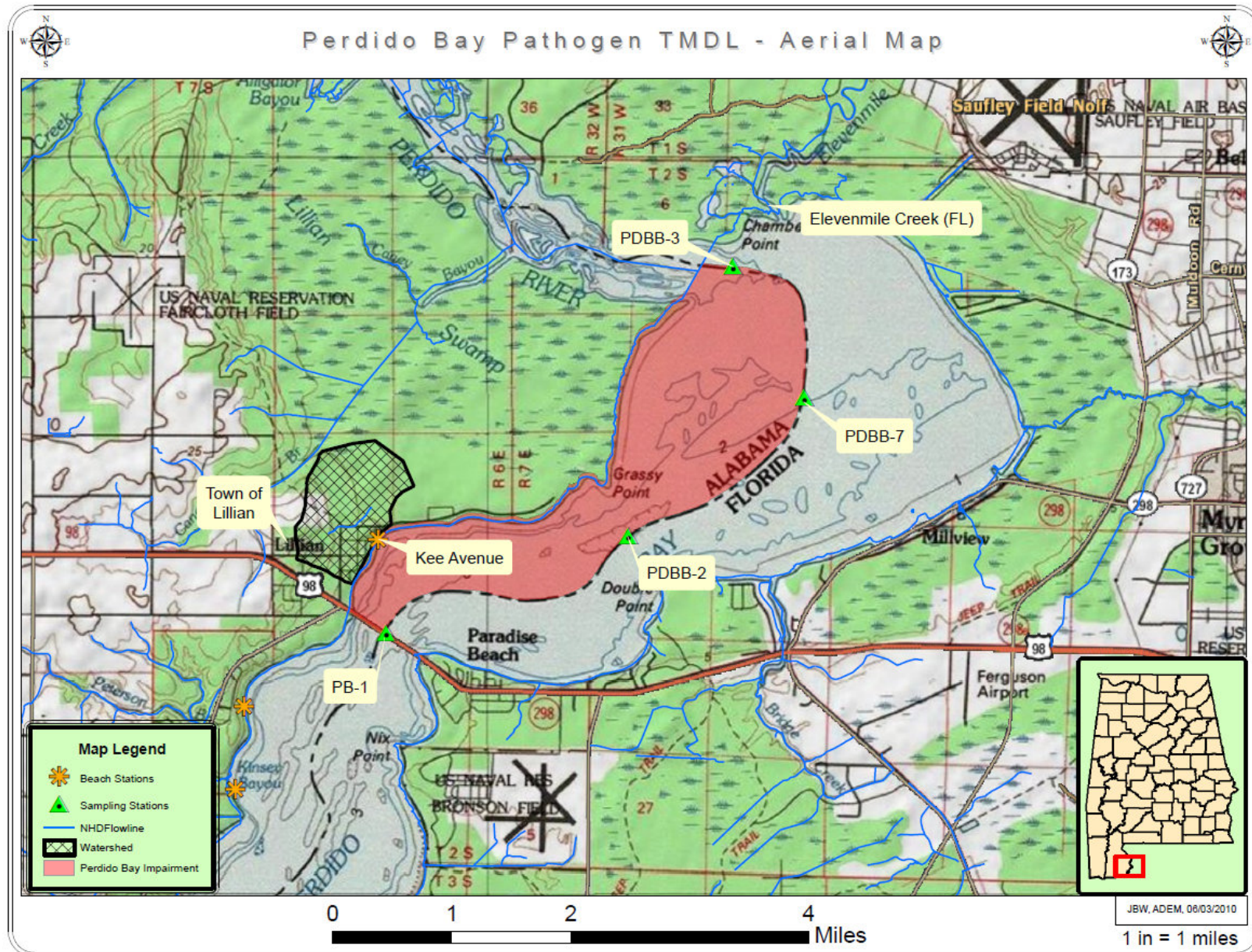


Table 3-2. Perdido Bay Pathogen TMDL Sampling Station Descriptions

Year	Station ID	Data Source	Station Description / Location	Latitude	Longitude
2008	PDBB-3	ADEM	Near Mouth of Perdido River, Mid-channel Perdido Bay	30.4501°	-87.3820°
2008	PBDD-7	ADEM	Fish Tissue Station <u>Only!</u>	30.4340°	-87.3720°
2008	PDBB-2	ADEM	Mid-channel Perdido Bay (approx. Midpoint of Impairment)	30.4170°	-87.3967°
2008	PB-1	ADEM	Mid-channel @ Lillian Bridge	30.4050°	-87.4307°
2008	Kee Avenue	ADEM/ ADPH	Beach Monitoring Station North of Lillian Bridge (near shore)	30.4164°	-87.4319°

3.7 Critical Conditions

Critical conditions typically occur during the summer months. This can be explained by the nature of storm events in the summer versus the winter. Periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of bacteria into streams, resulting in spikes of bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up bacteria on the land surface, resulting in a more uniform loading rate. The data collected by ADEM from 2006-present in Perdido Bay follow this trend as well. Also, the summer criterion is typically more stringent than the winter criterion (though in this case, the criterion remains the same throughout the year due to the use classification).

3.8 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the analysis: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations.

Both an explicit and implicit MOS was incorporated into this TMDL. The MOS accounts for the uncertainty associated with the limited availability of Enterococci data used in this analysis. An explicit MOS was applied to the TMDL by reducing the Enterococci single sample mean criterion concentration by ten percent and calculating a mass loading target with measured flow data. The single sample mean criterion was reduced by ten percent to achieve a target concentration of 96 colonies/100 mL. An implicit MOS was incorporated in the TMDL by basing the existing condition on the highest measured Enterococci concentration that was collected during critical conditions.

4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual waste load allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS). As discussed earlier, the MOS is both implicit and explicit in this TMDL.

A TMDL can be denoted by the equation:

$$\text{TMDL} = \text{WLAs} + \text{LAs} + \text{MOS}$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while achieving water quality standards under critical conditions.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g. pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of organism counts per day (colonies/day), in accordance with 40 CFR 130.2(i). In this instance, flow was not a consideration due to the tidal influence, small watershed size, and very localized exceedances. Therefore, a percent reduction was based solely on the highest exceedance value and the percent reduction required in order to meet the criterion applicable to the Swimming (S) use classification.

4.2 Load Calculations

A percent reduction approach was utilized to calculate the pathogen TMDL for the Perdido Bay Impairment listed herein. The following equation was used to calculate the appropriate load reduction:

$$= \frac{(\text{Highest Exceedance} - \text{Single Sample Criterion w/ MOS})}{\text{Highest Exceedance}} \times 100\%$$

The single sample criterion was used because it yielded the greatest reduction among the available data. Allowable concentrations were calculated for the single sample criterion of 104 colonies/100ml. The TMDL was based on a single sample violation that produced percent reductions of Enterococci necessary to achieve applicable water quality criteria.

Allowable Conditions Calculation:

$$\frac{(2440 \text{ col/100 ml} - 94 \text{ col/100 ml})}{2440 \text{ col/100 ml}} \times 100\% = 96\%$$

The difference in the pathogen concentrations between the existing conditions (violation event) and the allowable conditions converted to a percent reduction represents the total load reduction needed to achieve the Enterococci water quality criterion. The TMDL was calculated as the total daily Enterococci load to Perdido Bay as evaluated at the Kee Avenue Station. Table 4-1 shows the results of the Enterococci TMDL and percent reductions for each criterion. Since the single sample violation yielded the greatest reduction it will be used to develop the Perdido Bay Pathogen TMDL.

Table 4-1. Enterococci Loads and Required Reductions

Source	Current Conc. (col/100 ml)	Allowable Conc. with MOS (col/100 ml)	MOS (col/100 ml)	Percent Reduction (%)
NPS	2440	94	10	96
Point Source	0	0	0	0
Total	2440	94	10	96

The TMDL, WLA, LA and MOS values necessary to achieve the applicable Enterococci criteria are provided in Table 4-2 below. Additional TMDL calculations are provided in Appendix C.

Table 4-2. Enterococci TMDL and % Reductions for the Perdido Bay Impairment

TMDL = WLA + LA + MOS			
TMDL (col/100 ml)	WLA (col/100 ml)	LA (col/100 ml)	MOS (col/100 ml)
104	0	94	10

4.3 TMDL Summary

This portion of Perdido Bay was placed on Alabama’s §303(d) list in 2006 based on data collected from 2001-2002. ADEM performed §303(d) intensive monitoring in 2008 and also performed ongoing beach monitoring as part of the Department’s Coastal Program. These results indicated an impairment of the waterbody.

A percent reduction approach was used to calculate the Enterococci TMDL for the Perdido Bay Impairment. Based on the TMDL analysis, it was determined that a 96% reduction was necessary to achieve compliance with applicable water quality standards.

Compliance with the terms and conditions of existing and future NPDES sanitary and stormwater permits will effectively implement the WLA and demonstrate consistency

with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria and we are committed towards targeting the load reductions to improve water quality in the Perdido Bay watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

5.0 Follow-up Monitoring

ADEM has adopted a basin approach to water quality management; an approach that divides Alabama's fourteen major river basins into five groups. Each year, the ADEM water quality resources are concentrated in one of the five basin groups. One goal is to continue to monitor §303(d) listed waters. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices in the watershed. This monitoring will occur in each basin according to the schedule shown.

Table 5-1. §303(d) Follow Up Monitoring Schedule

River Basin Group	Year to be Monitored
Alabama / Coosa / Tallapoosa	2010
Escatawpa / Upper Tombigbee / Lower Tombigbee / Mobile	2011
Black Warrior / Cahaba	2012
Chattahoochee / Chipola / Escatawpa / Perdido-Escambia	2013

6.0 Public Participation

As part of the public participation process, this TMDL was placed on public notice and made available for review and comment. The public notice was prepared and published in the four major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL was made available on ADEM's Website: www.adem.state.al.us. The public can also request paper or electronic copies of the TMDL by contacting Mr. Chris Johnson at 334-271-7827 or cljohnson@adem.state.al.us. The public was given an opportunity to review the TMDL and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period became part of the administrative record. ADEM considered all comments received by the public prior to finalization of this TMDL and subsequent submission to EPA Region 4 for final review and approval.

Appendix A

References

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criterion.

ADEM Administrative Code, 2007. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Monitoring Program. 2007. ADEM.

Alabama Department of Environmental Management (ADEM), Alabama's Water Quality Assessment and Listing Methodology, December 2005.

Alabama Department of Environmental Management, 1998 - 2008 §303(d) List. ADEM.

Comprehensive Sanitary Survey of Alabama's Area I Shellfish Growing Water in Mobile & Baldwin Counties. 2007. Alabama Department of Public Health - Seafood Branch.

United States Environmental Protection Agency, 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Office of Water. EPA 440/4-91-001.

Appendix B Water Quality Data

Table 7-1. Beach Monitoring Station Data (Kee Avenue, Perdido Bay)

ADEM/ADPH Beach Monitoring Program Microbiological Analyses Kee Avenue, Perdido Bay Latitude: 30.41643° N Longitude: 87.43187° W		
Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean
	14	11.49
05/26/10	< 2	xxxx
05/19/10	102	xxxx
05/12/10	< 7	xxxx
05/05/10	10	xxxx
04/29/10	7	xxxx
03/08/10 resample	126	xxxx
03/04/10	80	xxxx
02/03/10	20	xxxx
01/05/10	87	xxxx
12/03/09 resample	327	xxxx
12/02/09	6	xxxx
11/03/09	12	14.55
10/06/09	4	20.47
09/30/09	14	17.82
09/23/09	54	15.50
09/16/09	18	10.04
09/10/09	66	10.04
09/02/09	2	11.06
08/26/09	18	15.30
08/19/09	6	10.61
08/12/09	4	8.84
08/05/09	18	8.84
07/30/09 resample	118	7.66
07/29/09	14	5.00
07/22/09	2	4.22
07/15/09	2	4.85
07/08/09	4	8.83
07/01/09	14	7.69
06/24/09	6	5.21
06/17/09	4	7.28
06/10/09	40	13.05
06/04/09	2	11.13
05/28/09	2	14.68
05/20/09	32	xxxx
05/13/09	74	xxxx
05/06/09	18	xxxx
04/30/09	8	xxxx
04/22/09	18	xxxx
03/03/09	28	xxxx
02/03/09	10	xxxx
01/06/09	6	xxxx
12/02/08	14	xxxx
11/04/08	< 2	53.01
10/09/08 resample	94	76.30
10/08/08 resample	773	74.33
10/07/08	< 2	40.24
09/25/08 resample	413	56.18
09/24/08	< 2	31.07
09/17/08	4	43.78
09/15/08 resample	2440	49.09
09/12/08 resample	400	28.10
09/11/08 resample	187	18.05
09/10/08	< 7	11.31
09/05/08 resample	220	8.80
09/04/08	6	3.44
08/28/08	< 2	2.76
08/20/08	10	5.41
08/13/08	< 2	6.45
08/06/08	2	6.45
07/30/08	< 2	6.45
07/23/08	58	9.77
07/16/08	24	7.13
07/09/08	< 2	9.25
07/02/08	2	9.25
06/25/08	16	9.25
06/18/08	12	9.00
06/11/08		

Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean
06/05/08	88	7.84
05/29/08	< 2	5.94
05/21/08	2	7.40
05/14/08	14	xxxx
05/07/08	6	xxxx
05/01/08	22	xxxx
04/23/08	6	xxxx
03/04/08	22	xxxx
02/12/08	42	xxxx
01/08/08	22	xxxx
12/04/07	1	xxxx
11/06/07	2	xxxx
10/17/07	19	xxxx
09/26/07	4	13.26
09/19/07	< 1	17.03
09/12/07	< 1	18.80
09/10/07 resample	16	30.66
09/07/07 resample	470	19.31
09/06/07	> 200	10.20
08/29/07	12	4.06
08/22/07	23	4.62
08/15/07	2	3.26
08/08/07	1	3.68
08/01/07	2	4.85
07/25/07	23	4.08
07/18/07	4	2.45
07/05/07	3	7.41
06/27/07	< 1	15.43
06/20/07	3	22.72
06/13/07	6	30.21
06/08/07 resample	29	23.38
06/07/07	106	22.56
6/1/2007 resample	29	19.77
05/23/07	130	18.31
05/16/07	15	xxxx
05/09/07	22	xxxx
05/02/07	< 1	xxxx
04/09/07	48	xxxx
03/12/07	4	xxxx
2/13/2007 resample	39	xxxx
02/12/07	24	xxxx
01/08/07	139	xxxx
12/11/06	21	xxxx
11/06/06	< 1	xxxx
10/18/06	19	xxxx
09/27/06	33	xxxx
09/20/06	1	3.77
09/13/06	2	5.39
09/07/06	19	9.39
08/30/06	10	10.42
08/23/06	2	7.55
08/16/06	6	6.58
08/09/06	32	8.60
08/02/06	32	8.60
07/26/06	2	7.07
07/19/06	1	7.07
07/12/06	23	7.82
07/05/06	12	3.91
06/28/06	1	3.28
06/21/06	< 1	2.86
06/14/06	38	2.86
06/08/06	< 1	7.52
06/01/06	5	7.52
05/22/06	1	8.05
05/17/06	< 1	12.22
05/11/06 resample	21	xxxx
05/10/06	> 200	xxxx
05/08/06	65	xxxx
05/03/06	1	xxxx
04/10/06	< 1	xxxx

Date Collected	Enterococcus Count/100 ml *	Enterococcus Geo. Mean
03/28/06	< 1	xxxx
02/06/06	81	xxxx
01/10/06	4	xxxx

See next page for color key and further explanation of data table.

Note: Geometric mean is calculated from no fewer than 5 samples collected at a given station over not more than a 30 day period at intervals not less than 24 hrs.
 ADEM coastal whole body water contact standard for fecal coliform = 100col/100ml (geo. mean).
 ADPH and EPA whole body water contact guidelines for enterococci = 104 col/100ml (single sample max)
 All fecal coliform analyses performed by ADEM Mobile Branch Lab using EPA standard method 9222D.
 All enterococci analyses performed by ADPH Mobile Laboratory using EPA standard method 1600

nd: no data

Advisory Key




-  The most recent testing of water from this site revealed enterococci levels within the recommended EPA standards. Water quality is acceptable.
-  The most recent testing of water from this site revealed Enterococci levels over the EPA recommended threshold. There may be an increased risk of illness associated with swimming at this site. Because elevated bacteria levels are often transient and usually fall quickly, this site is now being retested. The status will be revised to red or green based on the results of the retest.
-  Repeat testing of this site has again revealed Enterococci levels over the EPA recommended threshold. There may be an increased risk of illness associated with swimming at this site. Because elevated bacteria levels have persisted, a public health advisory will be issued. This site will be retested.

Table 7-2. ADEM ALAWADR §303-d Sampling Station Data

Station ID	Visit Date	Enterococc	Ent Col dc
PB-1	9/30/2008	2	L
PB-1	7/21/2008	2	L
PB-1	7/23/2008	2	L
PB-1	8/5/2008	2	L
PB-1	9/15/2008	2	L
PB-1	9/29/2008	2	L
PB-1	7/28/2008	2	L
PB-1	9/22/2008	2	L
PB-1	8/13/2008	2	L
PB-1	9/4/2008	8	J
PDBB-2	9/4/2008	18	J
PDBB-2	9/29/2008	2	J
PDBB-2	9/15/2008	2	L
PDBB-2	7/21/2008	2	L
PDBB-2	7/23/2008	2	L
PDBB-2	8/5/2008	2	L
PDBB-2	9/30/2008	2	L
PDBB-2	8/13/2008	2	L
PDBB-2	7/28/2008	2	L
PDBB-2	9/22/2008	4	J
PDBB-3	9/15/2008	2	J
PDBB-3	9/30/2008	2	J
PDBB-3	7/23/2008	2	L
PDBB-3	8/5/2008	2	L
PDBB-3	7/21/2008	2	L
PDBB-3	9/29/2008	2	L
PDBB-3	9/22/2008	2	L
PDBB-3	7/28/2008	2	L
PDBB-3	9/4/2008	26	J
PDBB-3	8/13/2008	6	J