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WATER QUALITY REPORT FOR PELICAN BAY AND CLAM BAY

PREPARED FOR
PELICAN BAY
SERVICES DIVISION

JULY, 1999

PIN No. N0103-068-004

Planners Engineers Ecologists Surveyors
Landscape Architects Transportation Consultants

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1. Introduction

1.1. Background Information

Pelican Bay is a 1200± acre subdivision located in northern Collier County. See Figure 1 for a location map. The subdivision is served by typical infrastructure including public and private roadways; potable and irrigation water systems; a wastewater collection and pumping system; drainage; power; telephone; and cable. In 1977 the Pelican Bay Improvement District(PBID) was formed to provide much of this infrastructure. To the west of Pelican Bay is Clam Bay as shown on Figure 1. Clam Bay is an estuary which serves as the receiving waters for the drainage from Pelican Bay.

During the initial environmental permitting of Pelican Bay, the agencies required water quality testing within Pelican Bay and Clam Bay to help evaluate the impact of development in Clam Bay. The water quality testing program was first implemented by PBID starting in the early 1980's. In 1991, PBID became the Pelican Bay Services Division(PBSD), a dependent Division of Collier County. PBSD continued the testing program after 1991. PBSD is currently the responsible entity for the testing program.

1.2. Purpose and Scope

The purpose of the report is to present the water quality testing data and to determine if there are any significant trends in the data.

The scope includes:

- Gather and cull the water quality data.
- Identify the sample point locations.
- Describe the water quality testing parameters.
- Identify any significant data trends.

PROJECT: *PELICAN BAY WATER QUALITY REPORT*

TITLE *REPORT AREA MAP*

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FIGURE 1
REPORT AREA MAP

COUNTY: COLLIER	DATE: JULY, 1999
SEC: 33,4,9 TWP: 49S RGE: 25E	REV NO:
PROJECT NO. N0103-068-004	FILE NO: C-0103-05
DRWN BY/EMP NO. JCR/319	SHEET NO: 1 OF 2

2. Description of Water Quality Sampling Program

2.1. Sample Point Locations

The water quality testing was performed at several sample points within Pelican Bay and Clam Bay. The sample point locations are shown on Figure 2. There are twenty-three (23) sample points within Pelican Bay and Clam Bay. Sample points W-8, W-2, LAG7, LAGU-7, and LAGU-11 have not been sampled since 1989 and their locations were not provided to us. Sample points VAND-D and SEAGATE were temporary sample points and do not provide useful data. Since these sample points have not been sampled in 10 years and/or they provide insignificant data, they have been excluded from Figure 2.

2.2. Definition of Sample Parameters

The sample parameters are given in Table 1. The first column gives the parameter label and name. The second column gives the units of parameter measurement. The third and fourth columns give the maximum contaminant level(MCL) allowable by the FDEP for Class II and Class III waters. Clam Bay is a Class II water while Pelican Bay is a Class III water. Some of the data parameters may not have a stated MCL. In this case, the data could be used as an indicator of some trend in the system. The final column of Table 1 gives the purpose and usage of each parameter. There are nineteen different sample parameters.

2.3. Sample Matrix

Table 2 gives a matrix of the sample parameters taken from each location. Depending on the location of the test area and the type of water the sample is taken from, the sample is tested for different parameters.

2.4. Sample Results

Figure 3 shows dissolved oxygen (DO) for five sample points, W-7, W-6, W-1, PB-I3, and PB-11 for the period between 1981 and 1998. W-7, 6, and 1 are located in Clam Bay in Class II waters. PB-13 and 11 are located in Pelican Bay in Class III waters. The MCL's for DO in Class II and III waters are also shown on the figure. The data for the Clam Bay sample points shows a downward trend until 1993 then an upward trend through 1998. Between 1989 and 1996, the average DO levels have been below the MCL. There is not an apparent reason for the decline, however, it is not unusual for DO levels to drop in estuarine waters where organics in the water cause DO depletion. The trend over the past five years is upward and above the MCL. We recommend that PBSD continues to monitor DO and observe the trend.

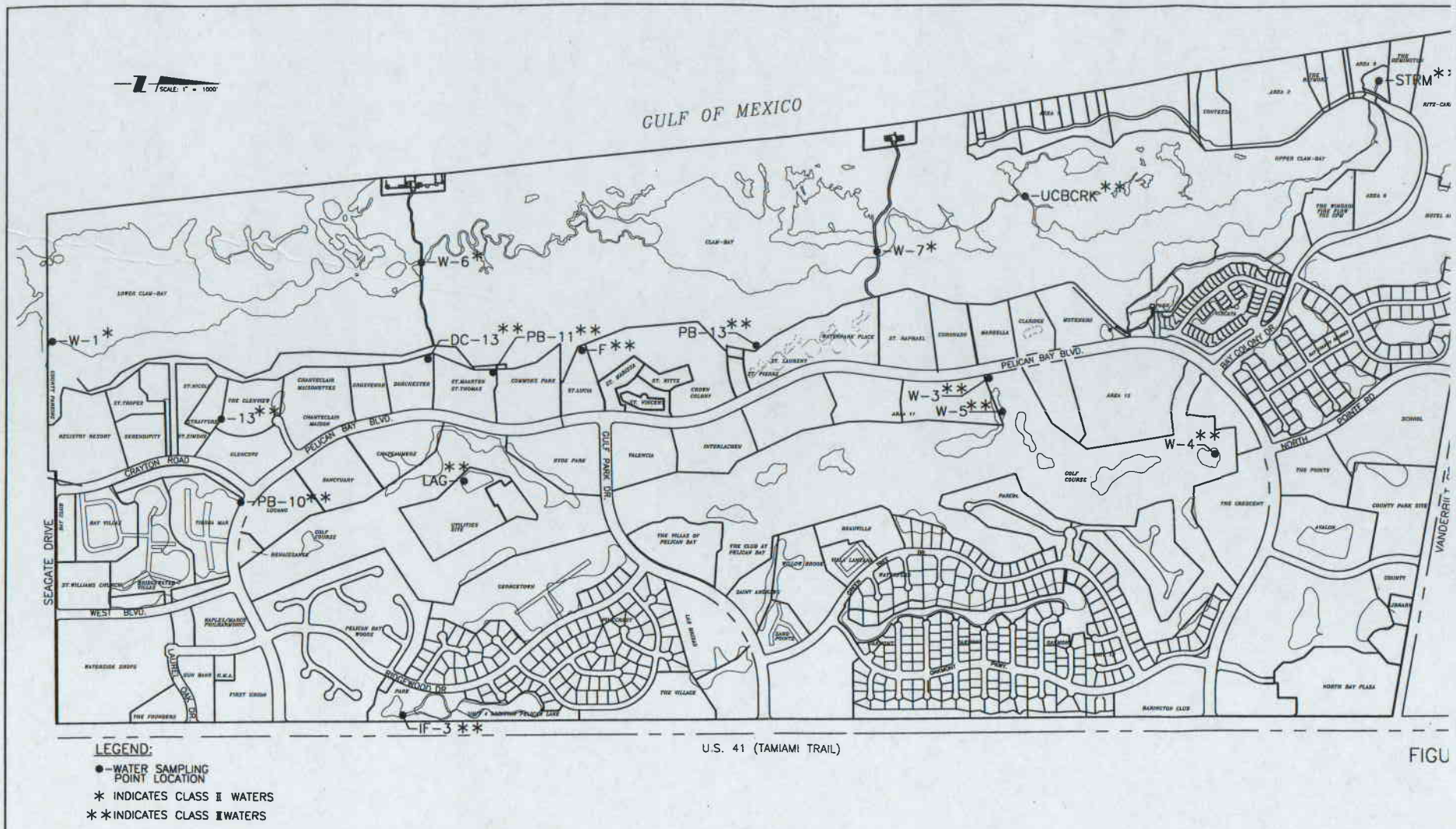
Figure 4 shows BOD levels for the five sample points. We are not sure why, but the sampling of BOD was stopped in 1987. However, the general data trend was downward which is positive for the environment.

Figure 5 and 6 show Nitrate and Phosphate for the five sample points. Nitrate and Phosphate are ingredients in fertilizers. The higher the levels, the greater the potential that there is fertilizer runoff into the water bodies adjacent to the sample points. Note that the two sample points PB-13 and 11, which are located within the water treatment areas in Pelican Bay show the highest levels of Nitrate and Phosphate, while the sample points within Clam Bay show lower levels. This data observation is consistent with the design of the Pelican Bay water management system whereby nutrients are taken up in the system prior to release to Clam Bay. The only data anomaly is for Nitrate in 1990 where levels in Clam Bay were up to 100 times greater than other years. There is no explanation for this other than sampling error.

Figure 7 shows TDS for the five sample points. TDS is a measurement of salts in the water. Low levels indicate fresh water. High levels indicate salt water. The data is consistent with the expectation that sample points PB-13 and 11 are located in fresh water bodies in Pelican Bay and W-7, 6, and 1 are located in brackish water in Clam Bay.

The scope of this report is to organize the water quality data and note any significant trends. The most significant trend is the DO consistently dropped below the State MCL for several years. However, the recent trend is back above the MCL for the past two years. There appear to be no other significant trends.

Although it was not part of the scope, we recommend that PBSD review the reasons for sampling 19 different parameters. It may be possible to eliminate some of the sample parameters thus reducing the annual cost.



LEGEND:

- ●—WATER SAMPLING POINT LOCATION
- * INDICATES CLASS II WATERS
- ** INDICATES CLASS I WATERS

FIGU

NOTE: SAMPLE POINT LOCATIONS ARE AP

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CLIENT: PELICAN BAY SERVICES DIVISION	COUNTY: COLLIER	DATE: JULY, 1999	PROJECT: PELICAN BAY WATER QUALITY REPORT		
TITLE: WATER QUALITY SAMPLING POINTS	DESIGN BY: SAM/302	HORIZONTAL SCALE: 1" = 1000'			
	DRAWN BY: JCR/319	VERTICAL SCALE:	CROSS REF. FILE NO.:	PROJECT NO.: N0103-068-004	SHEET NUMBER: 2 OF 2
	REV.:	SEC: 4 TWP: 49S RGE: 25E			

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Parameter Label (Name)	Units	Maximum Contaminant Level (MCL) Class II waters	Maximum Contaminant Level (MCL) Class III waters(Fresh)	Purpose of Sample
TEMP Water Temperature	°C	Total Temp. limit = Ambient + ΔT June - Aug. ΔT ≤ 1.11°C w/ Max. T = 33.3°C Sept. - May ΔT ≤ 2.23°C w/ Max. T = 32.2°C ΔT and T converted from °F to °C	Total Temp. limit = Ambient + ΔT ΔT ≤ 1.67°C w/ Max. T = 33.3°C ΔT and T converted from °F to °C	Measures water temperature Affects aquatic organisms as well as limiting/aiding chemical reactions
COND Conductivity	μΩ/cm	N/A	Not more than 50% above normal background or 1275, whichever is greater	Measures conductivity Indicator of water quality changes
pH	Standard (0-14)	not more than 8.5 not less than 6.5	not more than 8.5 not less than 6.0	Measures acidity/alkalinity of the water Indicates the ability of the system to support life
TDS Total Dissolved Solids	mg/liter	N/A	N/A	Measures the amount of dissolved solids in the water Dissolved solids are minerals and chemicals such as salt
DO Dissolved Oxygen	$mg^{(oxygen)}$/liter	Not less than 5.0 in a 24 hr period, and never less than 4.0	Not less than 5.0	Measures the quantity of oxygen available in the water Low levels indicate a depletion in available oxygen
NH3 Ammonia	$mg^{(Nitrogen)}$/liter	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	≤ 0.02	Measures the amount of soluble ammonia in the sample High levels indicate the potential for an algal bloom
NO2 Nitrite	$mg^{(Nitrogen)}$/liter	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	Measures nitrite content High levels indicate the potential for an algal bloom
NO3 Nitrate	$mg^{(Nitrogen)}$/liter	N/A	N/A	Measures nitrate content High levels indicate the potential for an algal bloom
TKN Total Kjeldahl Nitrogen	$mg^{(Nitrogen)}$/liter	TKN/TOC ≤ 15	TKN/TOC ≤ 15	Measures amount of ammonia and organic bound nitrogen in the water Necessary to establish amount of organic bound nitrogen in system
OPO4 Orthophosphate	$mg^{(phosphorus)}$/liter	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	Measures orthophosphate content High levels indicate the potential for an algal bloom
TPO4 Total Phosphate	$mg^{(Phosphorus)}$/liter	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	Measures phosphate content High levels indicate the potential for an algal bloom
BOD Bio-Chemical Oxygen Demand	$mg^{(Oxygen)}$/liter	Shall not exceed values that would cause dissolved oxygen levels to be depressed below limit established for each class	Shall not exceed values that would cause dissolved oxygen levels to be depressed below limit established for each class	Measures the oxygen demand on the system High levels indicate a potential depletion in oxygen content in the system
SALINITY Salt	$mg^{(Chloride)}$/liter	Not more than 10% above natural background conditions	N/A	Measures the salt content of the water Indicates salinity of the system
TURB Turbidity	NTU (Nepthalometric Turbidity Units)	≤ 29 above natural background conditions	≤ 29 above natural background conditions	Measures the amount of suspended solids in the water Indicates the clarity of the water in the system
SIO2 Silicates	$mg^{(Silica)}$/liter	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	In no case shall the nutrient concentrations be altered to cause an imbalance in natural populations	Measures the amount of silica in the water Silica is necessary for the survival of the primary phytoplankton in an estuary
CHLA Chlorophyll A	$mg^{(Chlorophyll)}$/liter	N/A	N/A	Measures the amount of chlorophyll A in the water Indicates phytoplankton biomass in the system
PHAEOA Phaeophytin	$mg^{(Phaeophytin)}$/liter	N/A	N/A	Measures inactive chlorophyll To establish a true chlorophyll count it is necessary to know phaeophytin content
TOC Total Organic Carbons	$mg^{(Carbon)}$/liter	TKN/TOC ≤ 15	TKN/TOC ≤ 15	Measures the concentration of carbonaceous material in the water Assesses the potential amount of oxygen demanding matter in the system

Table 1 - Sample Parameters

Sample Point	TEMP	COND	pH	CONDUC	TDS	DO	NH3	NO2	NO3	TKN	OPO4	TPO4	BOD5	SALINITY	TURB	SIO2	CHLA	PHAEOA	TOC
W-8	X	X	X		X	X		X	X	X	X	X	X						
W-7	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W-6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W-5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
W-3	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
W-2	X	X	X		X	X	X	X	X	X	X	X	X						
W-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
VAND-D	X				X	X	X	X	X	X	X	X		X		X			X
UCBCRK	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
STRM	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SEAGATE	X		X		X	X	X	X	X	X	X	X		X					X
PB-13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PB-11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PB-10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LAG,U-7	X	X	X	X	X	X	X	X	X	X	X	X	X		X				
LAG,U-11	X	X	X	X	X	X		X	X		X	X	X						
LAG,7	X	X	X	X	X	X	X	X	X	X	X	X	X						
LAG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
IF-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
F	X	X	X	X	X	X	X	X	X	X	X	X	X		X				
DC-13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: " X " indicates criteria is present at this location

Table 2 - Sample Matrix

Figure 3 - Average Yearly DO(Dissolved Oxygen) Content

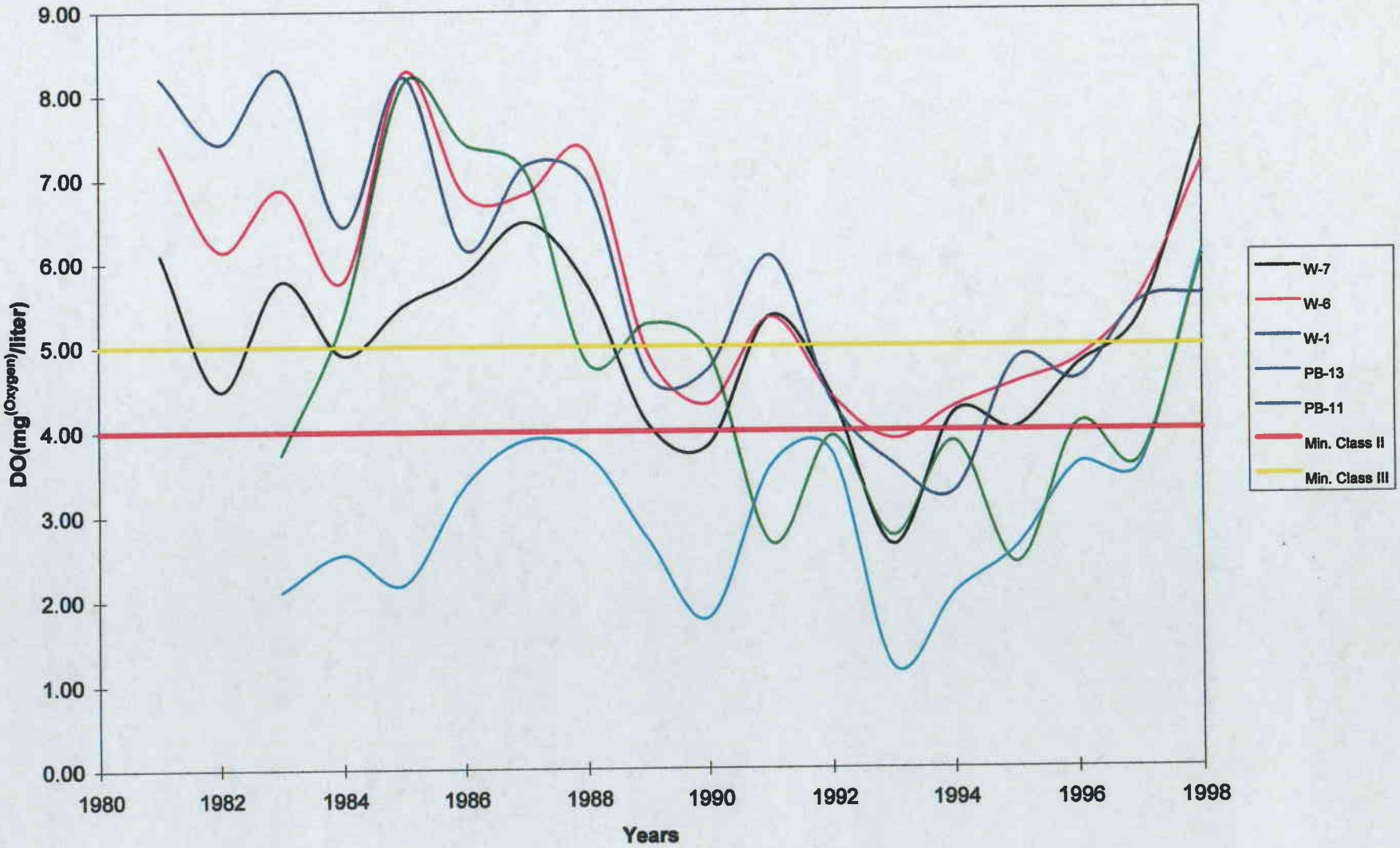

Figure 4 - Average yearly BOD(Bio-chemical Oxygen Demand)

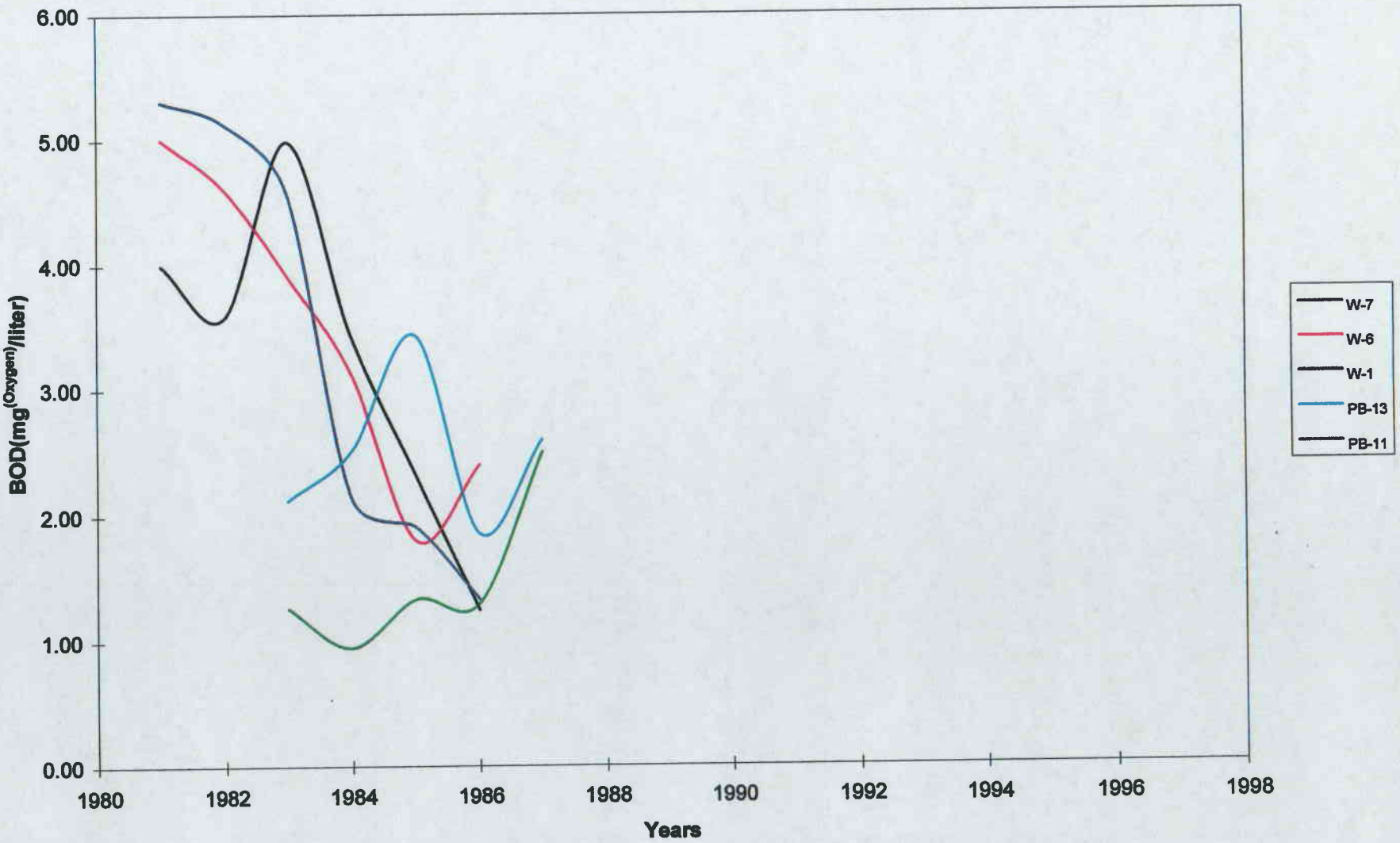

Figure 5 - Average Yearly NO3(Nitrate) Content

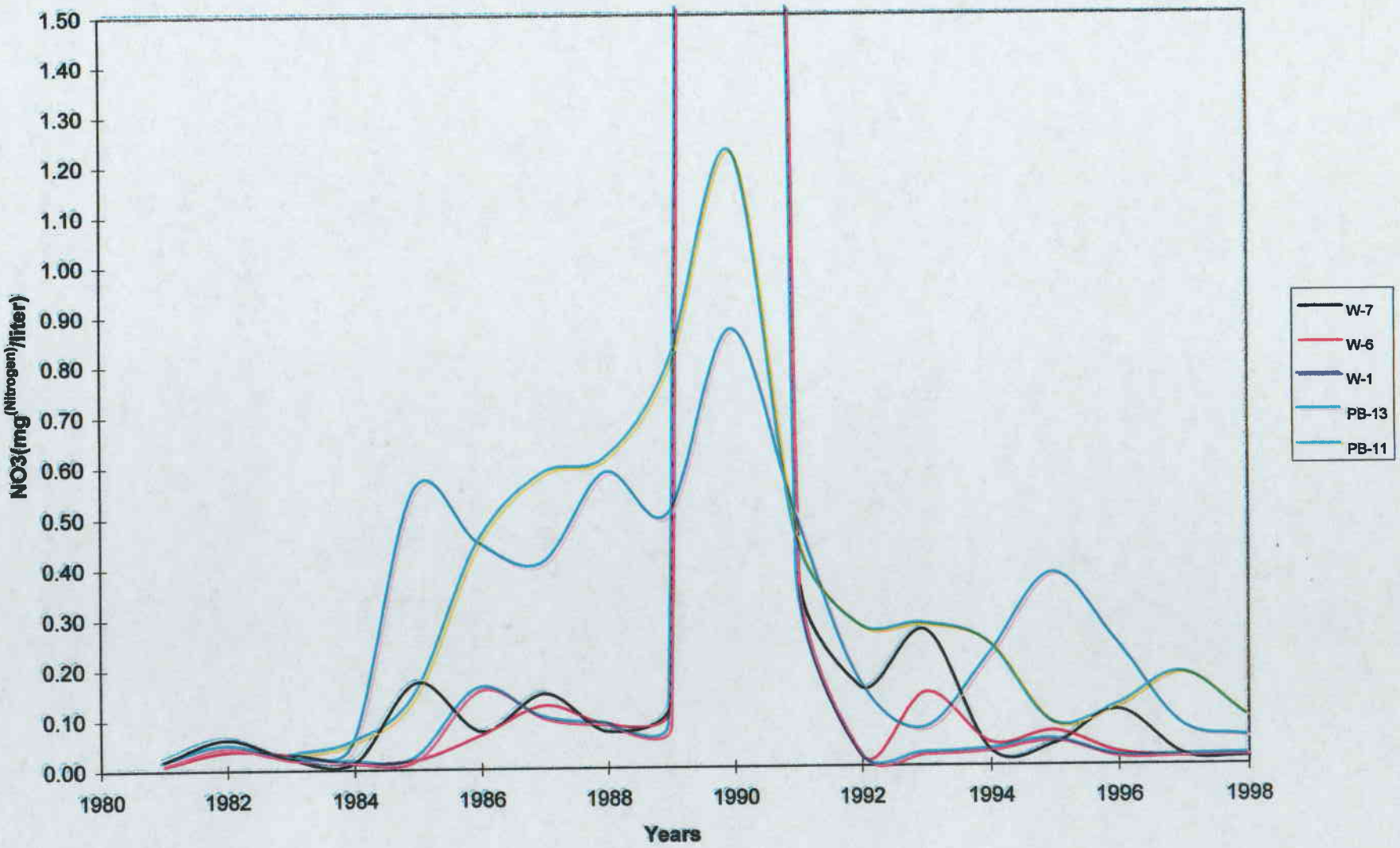

Figure 6 - Average Yearly OPO4(Orthophosphate) Content

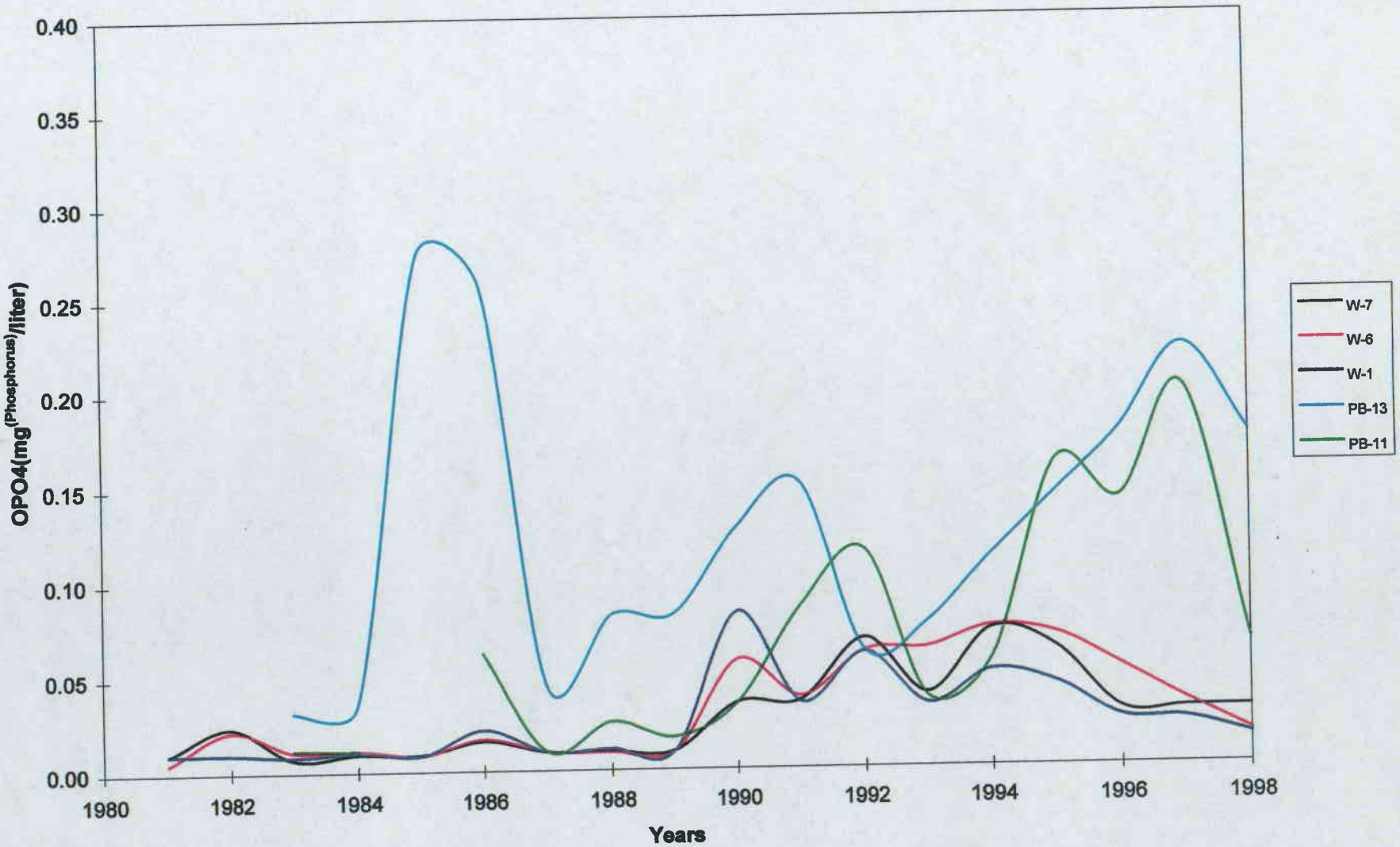

Figure 7 - Average Yearly TDS(Total Dissolved Solids) Content