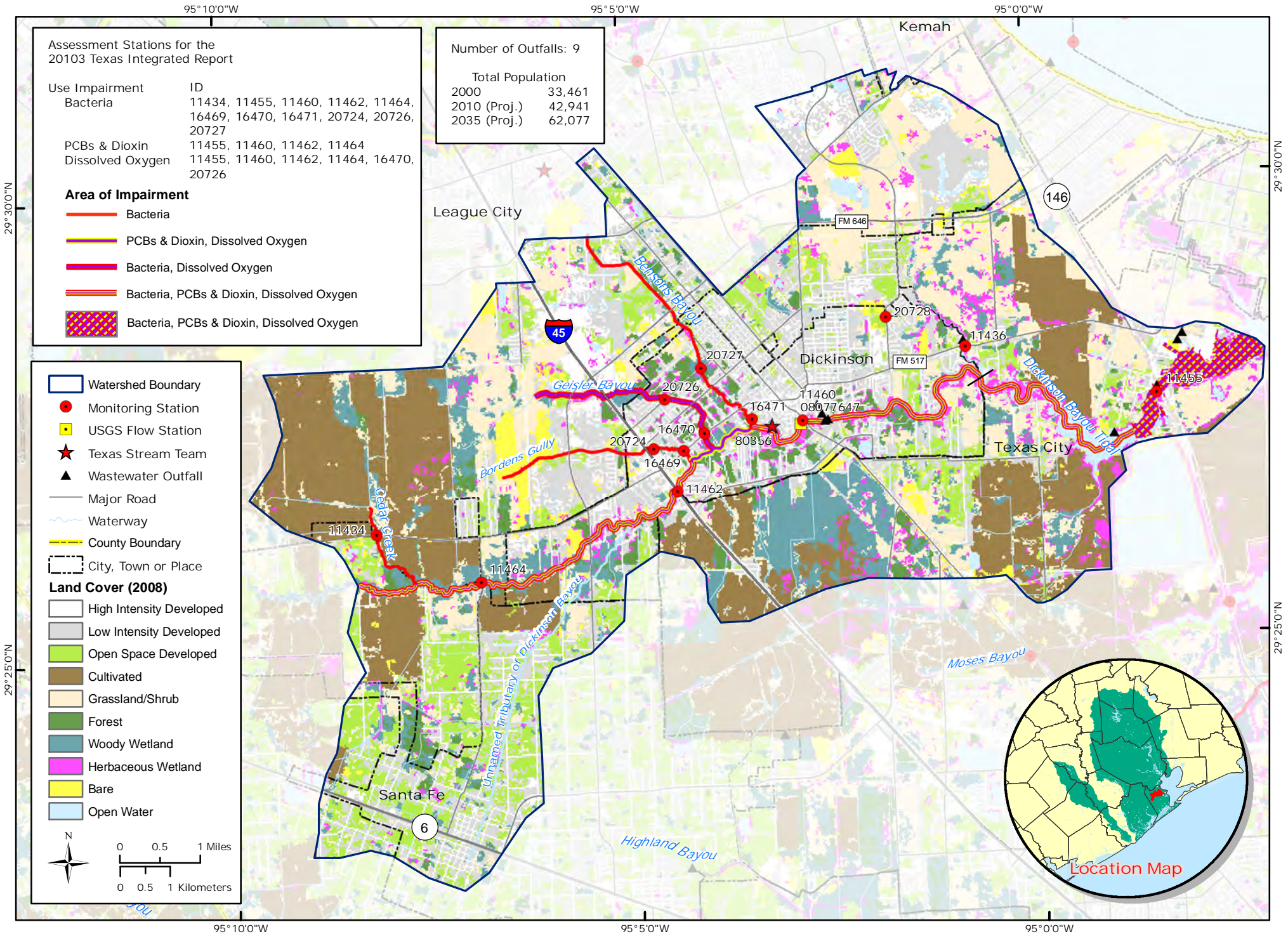


# DICKINSON BAYOU TIDAL - SEGMENT 1103



<b>Segment Number:</b>	<b>1103</b>	<b>Name:</b>	<b>Dickinson Bayou Tidal</b>			
<b>Length:</b>	15 miles	<b>Watershed Area:</b>	60 square miles	<b>Designated Uses:</b>	Contact Recreation; High Aquatic Life	
<b>Number of Active Monitoring Stations:</b>	13	<b>Texas Stream Team Monitors:</b>	1	<b>Permitted Outfalls:</b>	14	
<b>Description:</b>	<p>From the Dickinson Bay confluence 2.1 km (1.3 miles) downstream of SH 146 in Galveston County to a point 4.0 km (2.5 miles) downstream of FM 517 in Galveston County</p> <p>Sub-Segment 1103A: Bensons Bayou (unclassified water body)—From the Dickinson Bayou confluence to point 0.6 km (0.37 mi) upstream of FM 646 in Galveston County</p> <p>Sub-Segment 1103B: Bordens Gully (unclassified water body)—From the Dickinson Bayou Tidal confluence to a point 1.4 km (0.87 mi) upstream of FM 646 in Galveston County</p> <p>Sub-Segment 1103C: Geisler Bayou (unclassified water body)—From the Dickinson Bayou Tidal confluence to a point 1.37 km (0.85 mi) upstream of FM 646 in Galveston County</p> <p>Sub-Segment 1003D: Gum Bayou (unclassified water body)—From the Dickinson Bayou Tidal confluence to State Hwy 96 in Galveston County</p>					

Degree of Impairment and Overall Trends						
Segment ID	Dissolved Oxygen	Bacteria	Nutrients	PCBs/Dioxin	Chlorophyll <i>a</i>	Other
1103	78	71		100	29	
1103A		100				
1103B	100	100				
1103C	100	100				
1103D		100				
1103E	100	100				

 Indicates general improvement    
  Indicates general degradation    
 Numbers indicate percent of segment impaired

FY 2011 Active Monitoring Stations				
Site ID	Site Description	Frequency	Monitoring Entity	Parameter Groups
11434	Cedar Creek at FM 517	Quarterly	EIH	Field, Conventional, Bacteria
11436	Gum Bayou at FM 517	Quarterly	EIH	Field, Conventional, Bacteria
11455	Dickinson Bayou Tidal at SH 146	Quarterly	EIH	Field, Conventional, Bacteria
11460	Dickinson Bayou at SH 3	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll- <i>a</i>
11462	Dickinson Bayou Tidal At IH-45	Quarterly	EIH	Field, Conventional, Bacteria
11464	Dickinson Bayou Tidal N of Arcadia	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll- <i>a</i>
16469	Borden's Gulley at FM 517	Quarterly	EIH	Field, Conventional, Bacteria
16470	Geisler Bayou at FM 517 Bridge	Quarterly	EIH	Field, Conventional, Bacteria
16471	Benson's Bayou on Wagon Rd	Quarterly	EIH	Field, Conventional, Bacteria
20724	Borden's Gully at Spruce Drive	Quarterly	EIH	Field, Conventional, Bacteria, Flow
20726	Geisler Bayou at Sunset Drive	Quarterly	EIH	Field, Conventional, Bacteria, Flow
20727	Bensons Bayou at Sunset Drive	Quarterly	EIH	Field, Conventional, Bacteria, Flow
20728	Trib of Gum Bayou at Owens Drive	Quarterly	EIH	Field, Conventional, Bacteria, Flow

### Segment 1103

#### Standards

Temperature (°C):	35
Dissolved Oxygen (24-Hr Average) (mg/L):	4.0
Dissolved Oxygen (Absolute Minima) (mg/L):	3.0
pH (standard units):	6.5-9.0
Enterococci (MPN/100mL) (grab):	89
Enterococci (MPN/100mL) (geometric mean):	35

#### Screening Levels

Ammonia-N (mg/L):	0.46
Nitrate-N (mg/L):	1.10
Orthophosphate Phosphorus (mg/L):	0.46
Total Phosphorus-P (mg/L):	0.66
Chlorophyll- <i>a</i> (µg/L):	21

**Water Quality Issues Summary**

Issue	2008 Assessment	Draft 2010 Assessment	Affected Area	Possible Causes / Influences / Concerns Voiced by Stakeholders	Possible Solutions / Actions To Be Taken
Elevated Levels of Bacteria	I	I	1103_01 1103_03 1103_04 1103A_01 1103B_01 1103C_01 1103D_01 1103E_01	<ul style="list-style-type: none"> <li>- WWTP non-compliance, overflows, collection system by-passes</li> <li>- Small, privately-run WWTP</li> <li>- Developments with septic tanks</li> <li>- Rapid urbanization and increased impervious cover</li> <li>- Constructed storm water controls failing</li> <li>- Direct and dry weather discharges</li> <li>- Waste haulers illegal discharges/improper disposal</li> <li>- Improper or no pet waste disposal</li> <li>- Animal waste from agricultural production and domestic animal facilities</li> </ul>	<ul style="list-style-type: none"> <li>- Increase monitoring requirements for self-reporting</li> <li>- Impose new or stricter bacteria limits than those designated by TCEQ</li> <li>- Require all systems to develop and implement a utility asset management program and protect against power outages at lift stations or provide alternative power supplies during outages</li> <li>- Regionalize wastewater treatment to minimize number of small package plants and reduce OSSF dependency</li> <li>- Require larger portions of land in developments planned to use OSSFs</li> <li>- More public education regarding OSSF operations and maintenance</li> <li>- More public education regarding pet waste disposal</li> <li>- Improve storm water controls in new developments by adding bacteria reduction measures</li> <li>- Improve compliance and enforcement of existing storm water quality permits to minimize contaminated runoff</li> <li>- Improve construction oversight to minimize TSS discharges to waterways</li> <li>- Implement stream fencing or alternative water supplies to keep livestock out of or away from waterways</li> <li>- Promote and implement Water Quality Management Plans for individual agricultural properties</li> <li>- Protect or install vegetative buffers along</li> </ul>

					waterways
Low Dissolved Oxygen Concentrations	I	I	1103_02 1103_03 1103_04 1103C_01  1103B_01 (c) 1103E_01 (c)	<ul style="list-style-type: none"> <li>- Excessive nutrients and organic matter from WWTP effluent, sanitary sewer overflows, malfunctioning OSSFs, illegal disposal of grease trap waste, biodegradable solid waste such as grass clippings and pet waste</li> <li>- Excessive nutrients and organic matter from agricultural production, and related activities</li> <li>- Vegetative canopy removed</li> <li>- High temperatures discharges from industrial WWTPs</li> </ul>	<ul style="list-style-type: none"> <li>- Improve compliance and enforcement of existing storm water quality permits</li> <li>- Improve operation and maintenance of existing WWTP and collection systems</li> <li>- Regionalize wastewater treatment to minimize number of small package plants and reduce OSSFs dependency</li> <li>- More public education regarding pet waste disposal</li> <li>- More public education regarding disposal of household fats, oils, and grease</li> <li>- More stringent OSSF maintenance and education</li> <li>- Create and implement Water Quality Management Plans for individual agricultural properties</li> <li>- Install and/or maintain riparian buffer areas between agricultural fields and waterways</li> </ul>
Dioxin/PCBs	-	I	1103	<ul style="list-style-type: none"> <li>- Waste pit located along the San Jacinto River immediately upstream of I-10 bridge is now a National Priority List Superfund site managed by EPA</li> <li>- Concentrated deposits outside boundaries of the waste pits</li> <li>- Unknown industrial or urban sources</li> </ul>	<ul style="list-style-type: none"> <li>- Encourage EPA and responsible parties to work together to remediate Superfund site</li> <li>- Remove or contain contamination from locations already identified</li> <li>- Encourage additional testing to locate all unknown sources/deposits</li> </ul>
Elevated Chlorophyll -a Concentrations	-	C	1103_02	<ul style="list-style-type: none"> <li>- Fertilizer runoff from surrounding watershed promote algal growth in waterways</li> <li>- Nutrient loading from WWTPs effluent, sanitary sewer overflows, and malfunctioning OSSFs promote algal growth</li> </ul>	<ul style="list-style-type: none"> <li>- Improve storm water controls in new developments</li> <li>- Improve compliance and enforcement of existing storm water quality permits.</li> <li>- Support/continue/initiate public education regarding nutrients and consequences</li> <li>- Reduce or manage fertilizer runoff from agricultural areas</li> </ul>

## Segment Discussion:

**Watershed Characteristics:** The Dickinson Bayou Tidal Watershed is heavily developed in the areas surrounding I-45 and FM517 around the City of Dickinson. This watershed also includes parts of Santa Fe and Texas City. Recent development has occurred mostly in grasslands and forested lands adjacent to existing developments. Large tracts of the watershed are still undeveloped or are used for agriculture particularly at the west end of FM517 and south of the City of Dickinson. There are a number of small acreage farms in these areas that are used for grazing by cattle and horses. Most of the developed areas within the City of Dickinson are on sanitary sewer but the rest of the rural area uses on-site sewage facilities.

**Water Quality Issues:** Many of the assessment units in segment 1103 (Dickinson Bayou Tidal) are not supporting their contact recreation use designations. Assessment units 1103\_03, 1103\_04, 1103A\_01, 1103B\_01, and 1103C\_01 are listed as impaired for bacteria in both the 2008 and *Draft* 2010 Texas Integrated Reports (IRs). Two assessment units (1103\_01 and 1103E\_01) not listed as a concern or impaired in the 2008 assessment were listed in the *Draft* 2010 IR. Conversely, 1103\_02 was listed in 2008 as impaired for enterococci but the geometric mean has since dropped below the criteria of 35 MPN and it was subsequently not included in the *Draft* 2010 IR. Particularly noteworthy are the enterococci results for assessment unit 1103F\_01 where 75% of the samples assessed exceeded the single grab criteria. The geometric mean was greater than 26 times the criteria of 35 MPN at 930.9 MPN, while the mean of those that exceeded the single grab criteria of 89 MPN was 10,513.3 MPN. This assessment unit is not yet listed as impaired due to an insufficient number of samples having been collected.

Four assessment units (1103\_02, 1103\_03, 1103\_04, and 1103C\_01) were listed as having an impairment regarding low dissolved oxygen (DO) levels in the *Draft* 2010 IR while two (1103B\_01 and 1103E\_01) were listed at a level of concern. All were at least listed as a concern in the 2008 assessment. Of the assessment units impaired for DO in the *Draft* 2010 IR, 1103\_04 had the lowest mean (1.68 mg/L) for samples that did not meet the DO grab minimum criteria of 3.00 mg/L.

The entire Dickinson Bayou Tidal main channel was deemed to not support the fish consumption use in the *Draft* 2010 IR due to elevated levels of PCBs and dioxin being found in the edible tissue of fish.

Additionally, there is a water quality concern regarding chlorophyll *a* for assessment unit 1103\_02 in the 2010 assessment because 6 of the 20 samples collected exceeded the screening level of 21 µg/L with a mean exceedance more than two times the screening level of 43.38 µg/L. Chlorophyll *a* was not of concern in the 2008 assessment.

**Special Studies/Projects:** This segment is included in two TMDL projects and a watershed protection plan (WPP). First, there is a bacteria TMDL being developed for this segment and the above tidal segment. Texas Agrilife is facilitating both the TMDL and the WPP projects. Second, the Galveston Bay System Survey for Dioxin and PCBs is currently under way. For more information, please refer to the detailed discussions located at the beginning of the water quality section of the 2011 Basin Summary Report regarding dioxin and PCB contamination.

**Trends:** Regression analysis of watershed-level data revealed statistically significant trends for enterococci, chlorophyll-*a*, total phosphorus (TP), and nitrogen (ammonia). Each of these constituents is trending upwards, with the exception of ammonia. Examination of station-level data reveals significant trends for the same parameters, plus the parameters of orthophosphate (OP) (four of the nine stations in the watershed), nitrate nitrogen (nitrate) (three of nine stations), and DO (two stations). The remaining trends were seen at no more than one station.

The tidal section of Dickinson Bayou is impaired for bacteria in three of the four classified assessment units and four assessment units on unclassified tributaries. Enterococci are the indicator bacteria at 8 of 10 stations in the watershed. The density of enterococci in five of the eight relevant assessment units is trending upwards. A plot of the annual geometric mean of enterococci, combining all data in the watershed, follows.

The concentration of chlorophyll *a* in the watershed has been identified as a concern by TCEQ. Samples collected at two stations are routinely analyzed for chlorophyll *a*. With data from station 11460 in assessment unit 1103\_03 showing a trend toward increasing concentrations. Statistically significant increases in the concentrations of nitrate, OP, and TP were also observed at this station. Nine percent of samples collected at this station exceeded the screening level for OP during the period of record, one sample exceeded the nitrate screening level, and no samples exceeded the TP screening levels. Plots of these parameters for that station follow. Overall, nitrate concentrations are increasing at two stations and decreasing at one, OP is trending upward at four stations, and TP concentrations are increasing at two stations.

Impairments and concerns for DO have been identified throughout the watershed. A trend toward increasing DO was seen in two assessment units, and no statistically-significant negative trends are suggested by the data.

**Recommendations:**

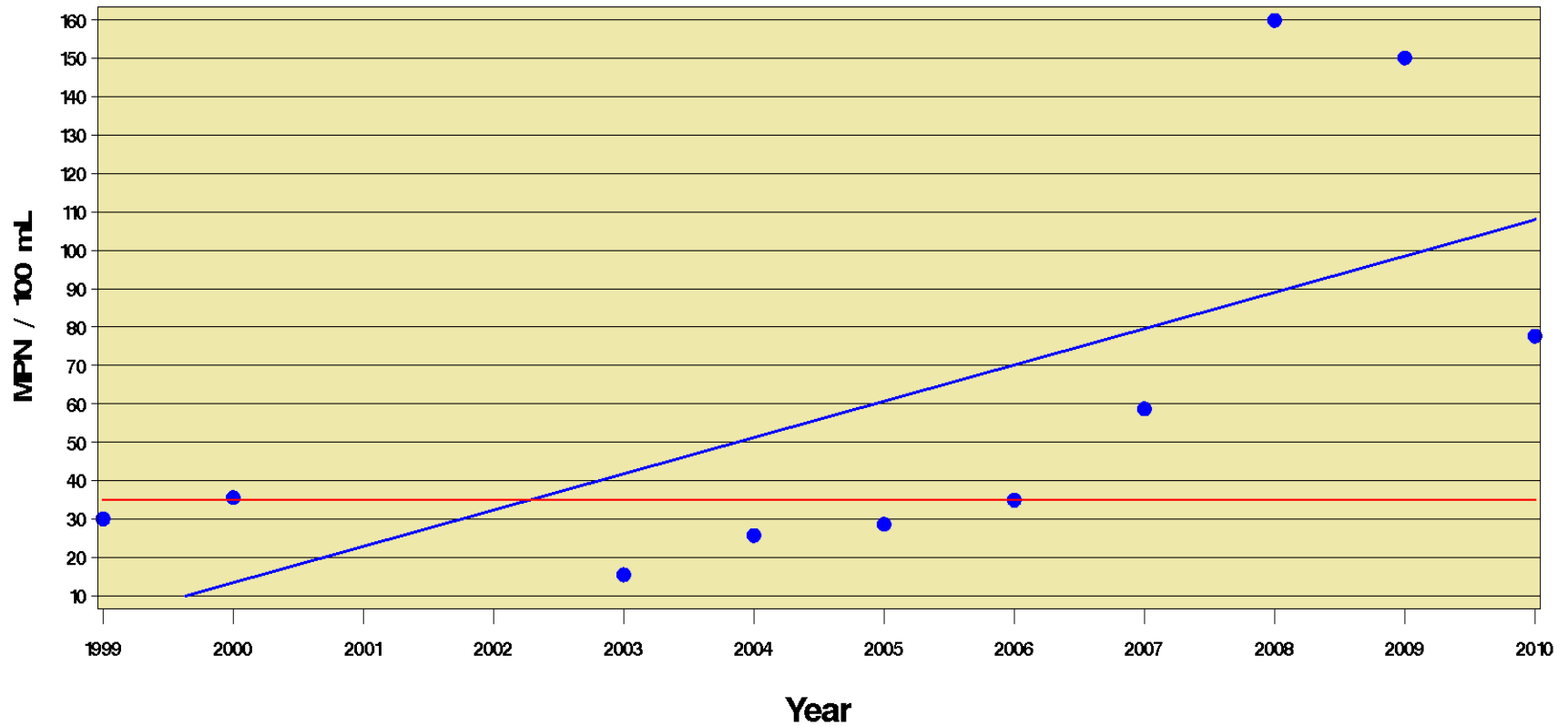
- Continue working with Texas Agrilife to help complete the bacteria TMDL and the WPP.
- Address concerns found in this segment summary through stakeholder participation.
- Continue collecting water quality data to support actions associated with WPP development and future modeling.
- Work with local partner and contract labs to lower detection limits for nutrients

## Dickinson Bayou Tidal

Segment: 1103 Parameter: Enterococci Annual Geometric Mean

Water Body Type: Classified Tidal Stream

2010 Water Quality Standard : 35 MPN / 100 mL



Trends are considered significant if the p-value is < 0.10

Trend is significant at p= 0.0367 R-Square = 0.4393 T-Value = 2.504 Number of samples: 218

If present, the dashed red line indicates the 2010 Water Quality Standard

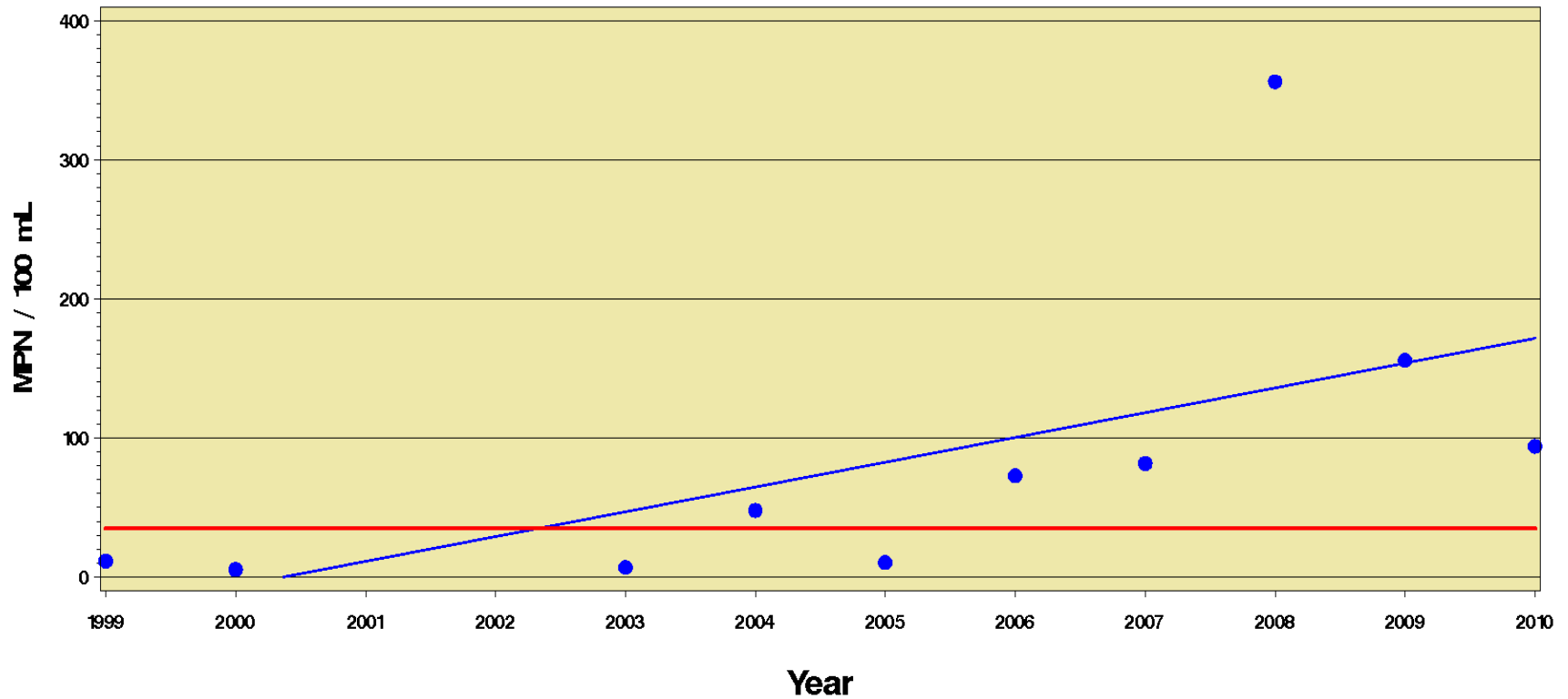


## Dickinson Bayou Tidal

Monitoring Station: 11455 Segment: 1103 Assessment Unit: 1103\_04

Parameter: Enterococci Annual Geometric Mean

2010 Water Quality Standard: 35 MPN / 100 mL



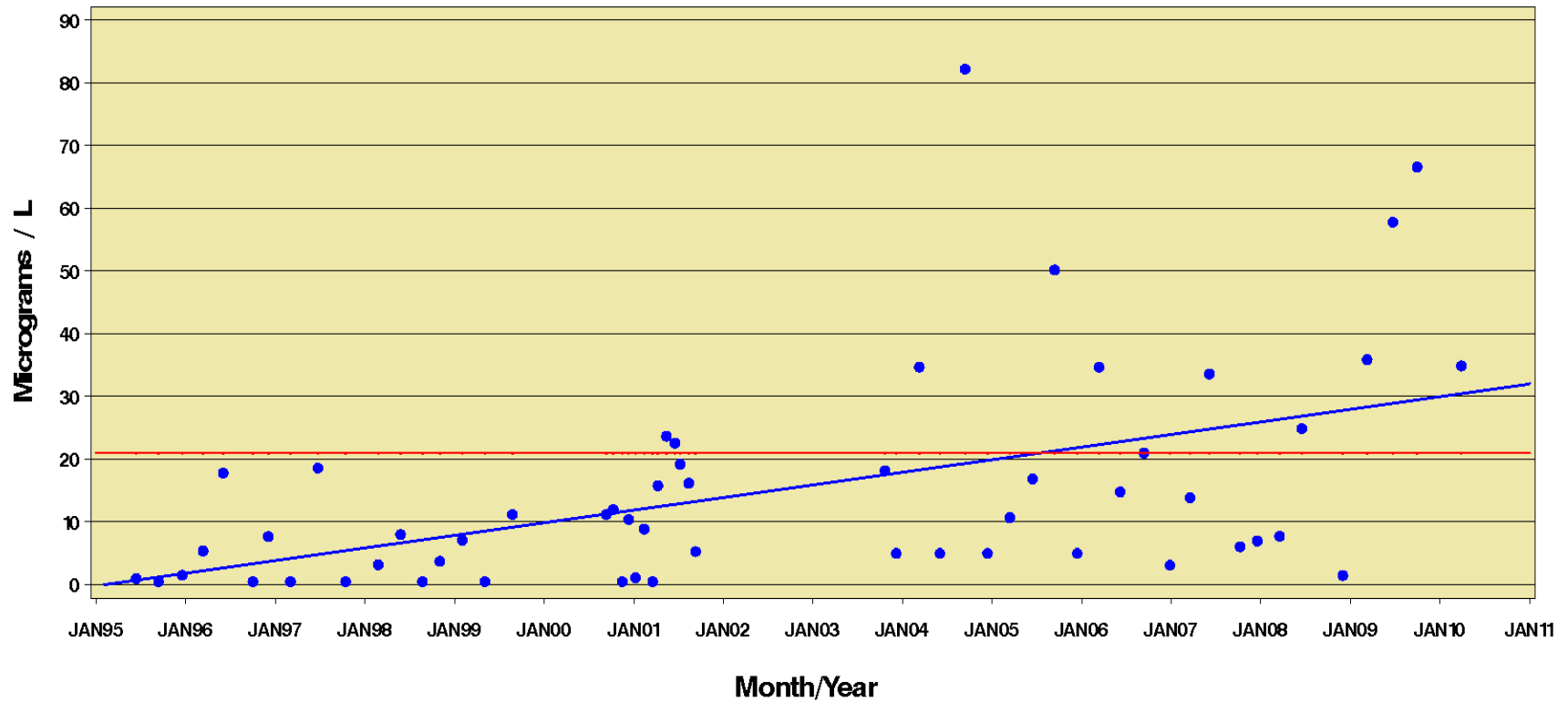
Trends are considered significant if the p-value is < 0.10

Trend is significant at p= 0.0615 R-Square = 0.3712 T-Value = 2.173 Number of Samples= 48

Red line indicates the applicable 2010 Water Quality Standard

## Dickinson Bayou Tidal

Station: 11460 Segment: 1103 Parameter: Chlorophyll a  
2010 Nutrient Screening Level: 21.0 Micrograms / L  
Assessment Unit: 1103\_03



Trends are considered significant if the p-value is < 0.10

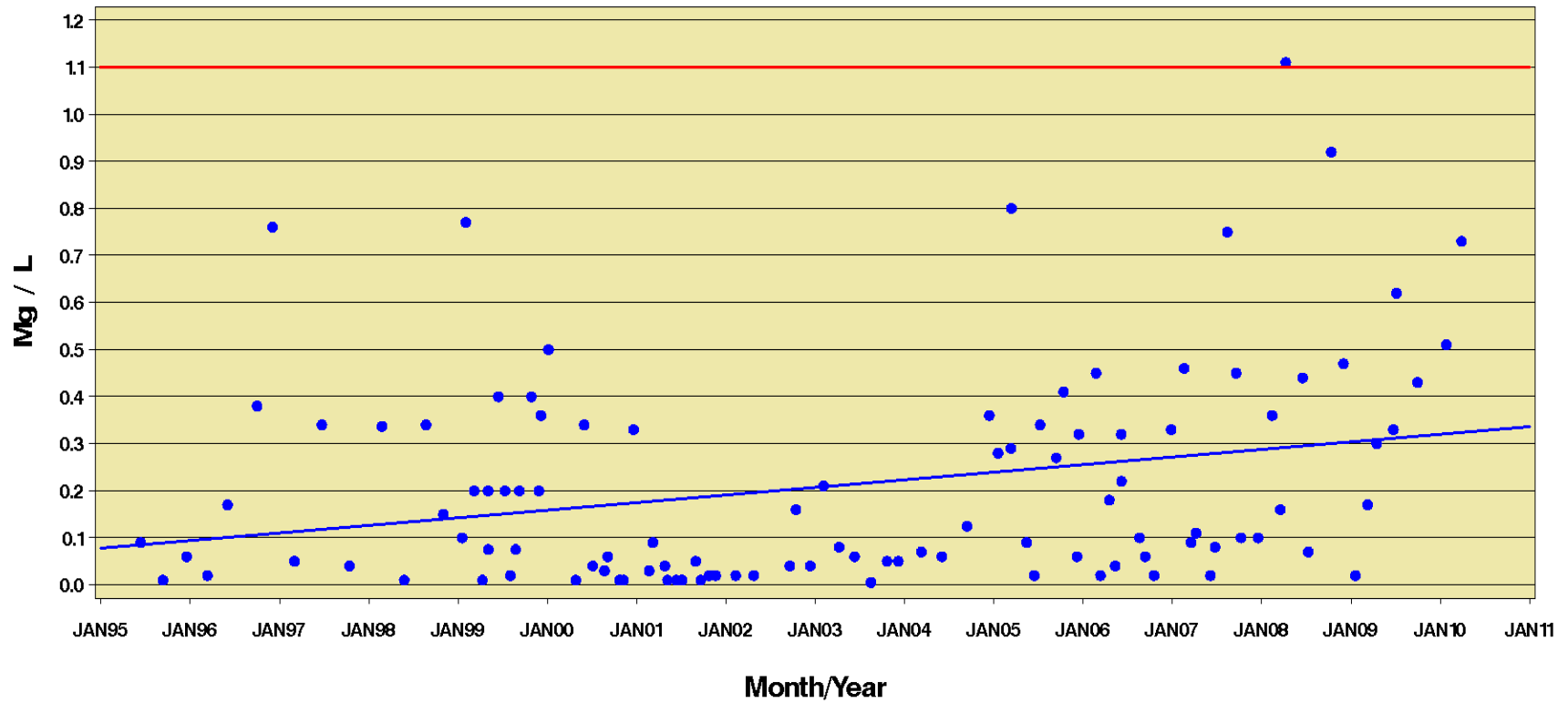
Trend is significant at p=0.0000 R-Square= 0.2987 T-Value= 4.7510 Number of Samples= 55

The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

## Dickinson Bayou Tidal

Station: 11460 Segment: 1103 Parameter: Nitrate—N  
2010 Nutrient Screening Level: 1.10 Mg / L  
Assessment Unit: 1103\_03



Trends are considered significant if the p-value is < 0.10

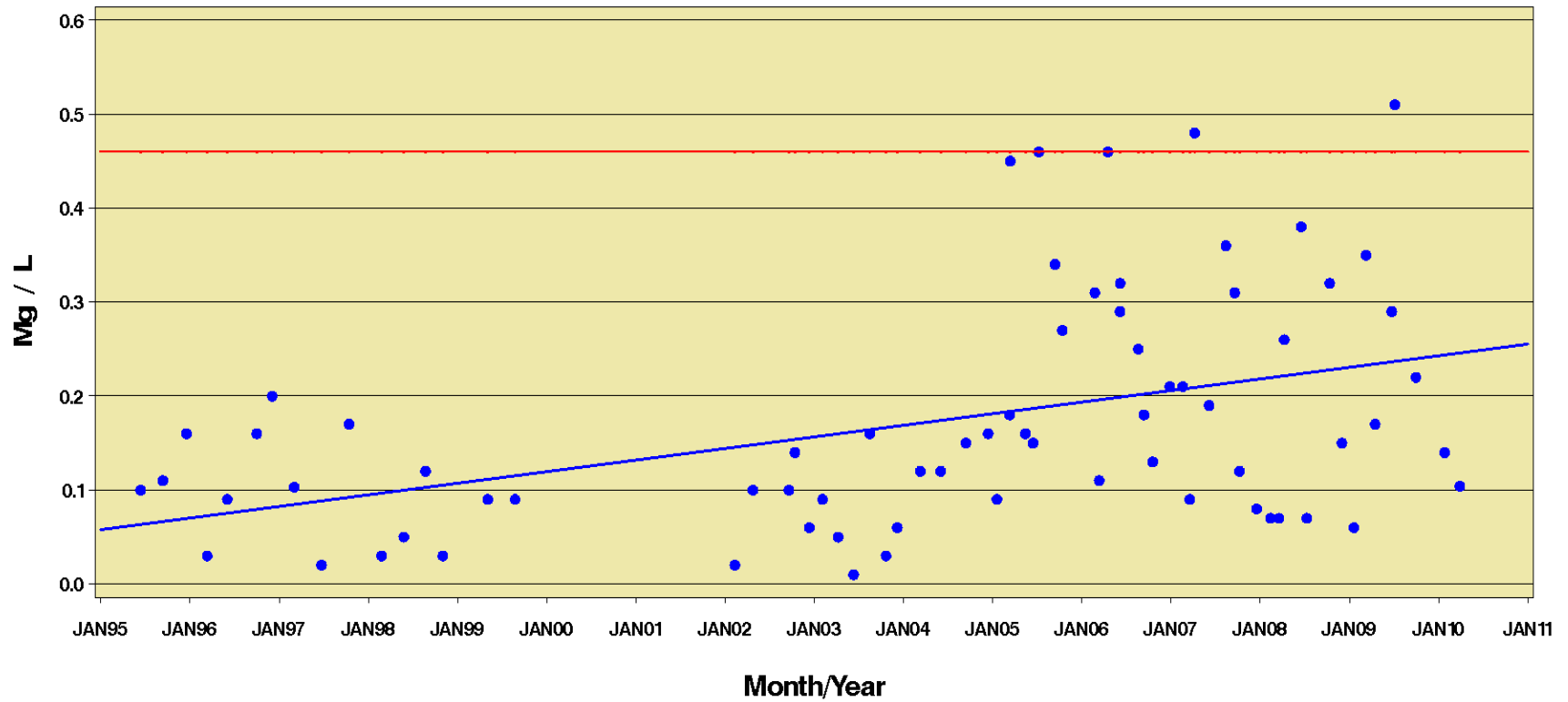
Trend is significant at  $p=0.0028$  R-Square= 0.0829 T-Value= 3.0670 Number of Samples= 106

The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

## Dickinson Bayou Tidal

Station: 11460 Segment: 1103 Parameter: Orthophosphate—P  
2010 Nutrient Screening Level: 0.46 Mg / L  
Assessment Unit: 1103\_03



Trends are considered significant if the p-value is < 0.10

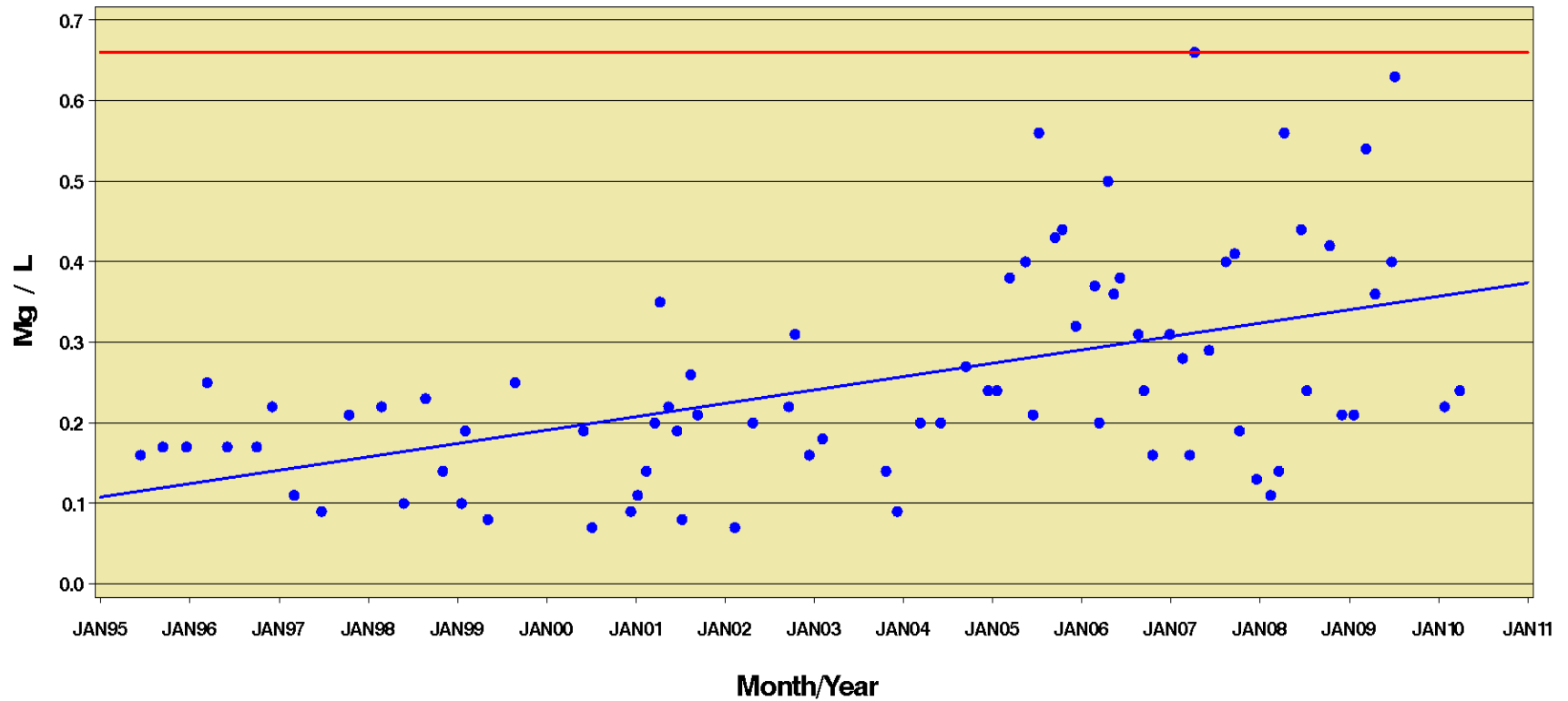
Trend is significant at  $p=0.0001$  R-Square= 0.1893 T-Value= 4.0140 Number of Samples= 71

The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

## Dickinson Bayou Tidal

Station: 11460 Segment: 1103 Parameter: Total Phosphorus  
2010 Nutrient Screening Level: 0.66 Mg / L  
Assessment Unit: 1103\_03



Trends are considered significant if the p-value is < 0.10

Trend is significant at p=0.0000 R-Square= 0.2629 T-Value= 5.3080 Number of Samples= 81

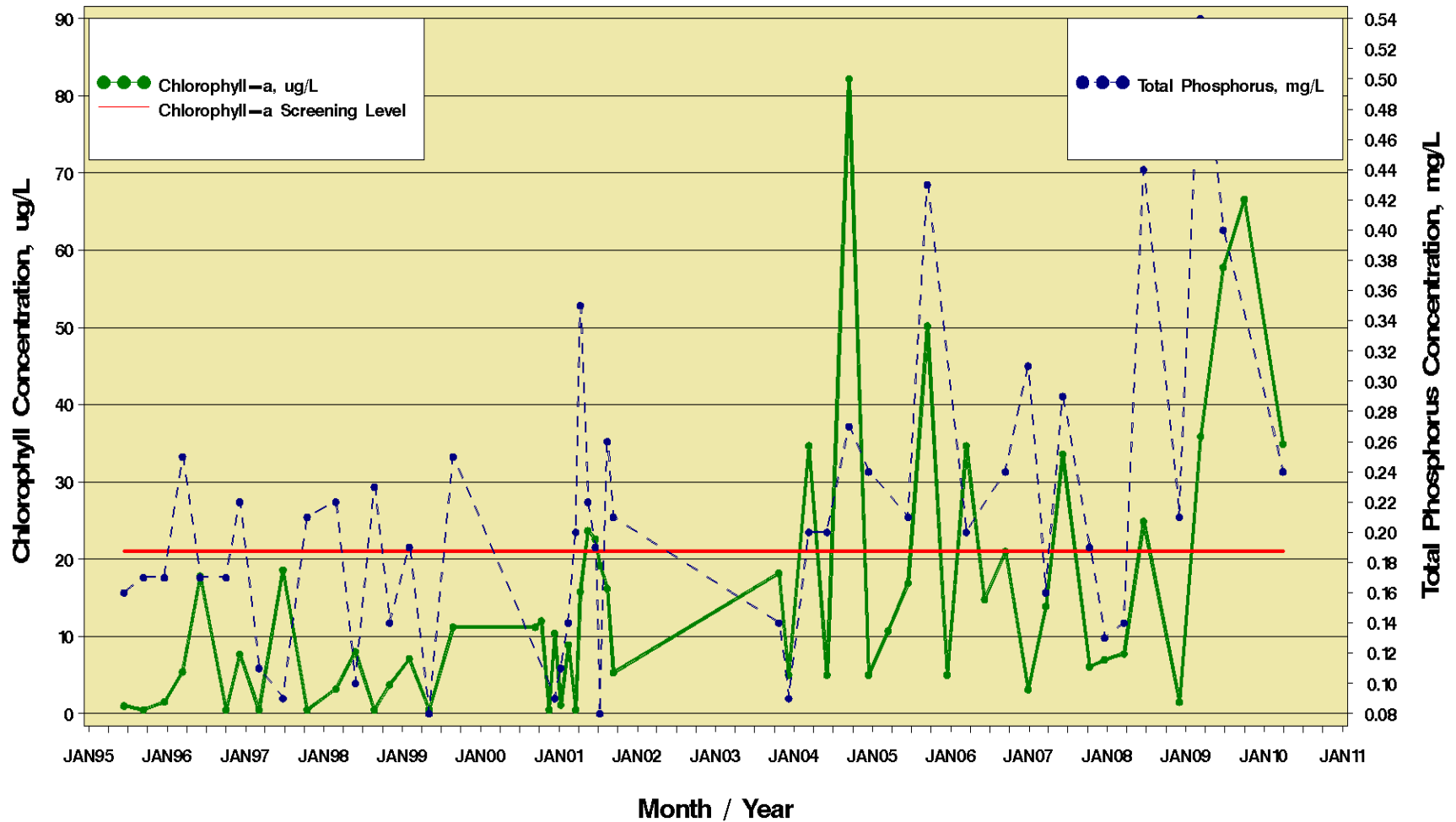
The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

# Chlorophyll-a and Total Phosphorus Concentrations

Segment: 1103      Watershed: Dickinson Bayou Tidal

Station: 11460      Assessment Unit: 1103\_03



# Chlorophyll-a and Nitrate-Nitrogen Trends

Segment: 1103 Watershed: Dickinson Bayou Tidal

Station: 11460 Assessment Unit: 1103\_03

