Nueces River Authority

2008 Basin Summary Report

San Antonio-Nueces Coastal Basin

Nueces River Basin

Nueces-Rio Grande Coastal Basin

August 2008

Prepared in cooperation with the Texas Commission on Environmental Quality
Clean Rivers Program

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List of Acronyms

AU	Assessment Unit
BST	Bacteria Source Tracking
cfs	Cubic Feet per Second
cfu	Colony Forming Units
CM	Channel Marker
CR	County Road
CRP	Clean Rivers Program
CV	Criteria Value
DDE	Dichlorodiphenylethylene
DO	Dissolved Oxygen
DSHS	Department of State Health Services
FM	Farm to Market
gpd	Gallons Per Day
Hr	Hour
ICWW	Intracoastal Waterway
km	Kilometers
LP	Limited Partnership
m	Meters
mg/l	Milligrams Per Liter
MUD	Municipal Utility District
N+N	Nitrite+Nitrate
NAS	Naval Air Station
NPS	Nonpoint Source
NRA	Nueces River Authority
OP	Orthophosphorus
PCB	Polychorinated byphenyl
RRC	Railroad Commission
SH	State Highway
su	Standard Units
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TGLO	Texas General Land Office
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
TSS	Total Suspended Solids
TSSWCB	Texas State Soil and Water Conservation Board
TxDOT	Texas Department of Transportation
µg/l	Micrograms Per Liter
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WCID	Water Control and Improvement District
WPP	Watershed Protection Plan
WSC	Water Supply Corporation
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

In 1991, the Texas Legislature passed the Texas Clean Rivers Act requiring basin-wide water quality assessments to be conducted for each river basin in Texas. Under this act, the Clean Rivers Program (CRP) has developed an effective partnership involving the Texas Commission on Environmental Quality (TCEQ), other state agencies, river authorities, local governments, industry, and citizens. Using a watershed management approach, the Nueces River Authority (NRA) and TCEQ work together to identify and evaluate surface water quality issues and to establish priorities for corrective action. Under CRP, NRA is responsible for the the San Antonio – Nueces Coastal Basin, the Nueces River Basin, the Nueces – Rio Grande Coastal Basin, and the adjacent bays and estuaries.

Activities and Accomplishments

The primary goal of CRP is to collect quality assured data for use by the TCEQ to assess water bodies and develop the Water Quality Inventory for the State of Texas. In addition to the NRA data collected for CRP, the assessment includes data from TCEQ's Surface Water Quality Monitoring program and from other water quality monitoring programs performed under an approved Quality Assurance Project Plan. NRA conducts routine monitoring at approximately 26 sites on 16 stream segments and at 8 sites in 5 bays every year. NRA also conducts 24-Hour (Hr) Dissolved Oxygen (DO) monitoring and collects samples for metals analysis at several sites each year.

In addition to water quality monitoring, NRA participates in all the Total Maximum Daily Load (TMDL) stakeholder meetings. There at 10 TMDLs in various stages of development and implementation. Each of the TMDLs are discussed at the beginning the respective basin's Watershed Summaries beginning on Page 11.

NRA actively promotes public education and outreach with respect to water quality. NRA compliments the CRP public education and outreach component with several other contracts and grants in order to reach a larger audience. NRA received the Governor's 2008 Environmental Excellence Award in the education category for the Headwaters Stewardship Project. This project is discussed in the Public Outreach section on Page 6.

Significant Findings

The water quality data analysis for this report reviewed 13 parameters for 44 segments and 94 assessment units (AU) in the San Antonio – Nueces Coastal Basin, the Nueces River Basin, the Nueces – Rio Grande Coastal Basin, and the adjacent bays and estuaries.

The following paragraphs summarize the finding for each segment. Total dissolved solid (TDS), chloride, and sulfate were reviewed for the entire segment and only for fresh water segments. *E. coli* was reviewed in fresh water segments and Enterococcus was reviewed in the tidal segments and bays.

SAN ANTONIO – NUECES COASTAL BASIN

Segment 2001 Mission River Tidal: The segment is impaired for Enterococcus. It is included in the Copano Bay TMDL project and the Texas State Soil and Water Conservations Board (TSSWCB) sponsored sampling project to support the TMDL. All other parameters meet water quality standards.

Segment 2002 Mission River Above Tidal: All parameters meet water quality standards. Being in the Copano Bay watershed, this segment is included as part of the TMDL project.

Segment 2003 Aransas River Tidal: The segment is impaired for Enterococcus. It is included in the Copano Bay TMDL project and the TSSWCB sponsored sampling project to support the TMDL. Orthophosphorus (OP) is a concern. All other parameters meet water quality standards.

Segment 2004 Aransas River Above Tidal: The segment has two AUs, but only AU_02 had sampling data. Low DO, nitrite+nitrate (N+N), OP, and total phosphorus are concerns. All other parameters meet water quality standards. Being in the Copano Bay watershed, this segment is included as part of the TMDL project.

NUECES RIVER BASIN

Segment 2101 Nueces River Tidal: Chlorophyll-a is a concern. All other parameters meet water quality standards. pH and OP have decreasing trends.

Segment 2102 Nueces River Below Lake Corpus Christi: The segment has two AUs. Chlorophyll-a is a concern and has increasing trends in both AUs. All other parameters meet water quality standards. TDS, chloride, and sulfate have increasing trends. Total phosphorus has a decreasing trend in both AUs.

Segment 2103 Lake Corpus Christi: The segment has six AUs. Chlorophyll-a is a concern in AU_02 and AU_06 and has an increasing trend in AU_01. OP is a concern in AU_01 and AU_06. Total phosphorus is a concern in AU_01. Only pH and DO were sampled in AU_03, AU_04, and AU_05. There is insufficient data for OP analysis for AU_06. All other parameters meet water quality standards. TDS, chloride, and sulfate have increasing trends.

Segment 2104 Nueces River Above Frio River: The segment has three AUs. There is insufficient data for total suspended solids (TSS) analysis for AU_01 and AU_03. All other parameters meet water quality standards. pH has a decreasing trend in AU_02. The 2008 Assessment also indicates that there are concerns for impaired fish community in the entire segment and concerns for impaired habitat and macrobenthos community in AU_01.

Segment 2105 Nueces River Above Holland Dam: The segment has three AUs, but only AU_01 had sampling data. Low DO is a concern. All other parameters meet water quality standards.

Segment 2106 Nueces River / Lower Frio River: The segment has two AUs. The entire segment is impaired for TDS. All other parameters meet water quality standards.

Segment 2107 Atascosa River River: The segment has four AUs, but there was no data for AU_04. AU_01 and AU_02 are impaired for *E. coli*. AU_02 and AU_03 are impaired for low DO. This segment is included in the South Central Texas TMDL for Bacteria and DO. OP is a concern for AU_02, and chlorophyll-a is a concern for AU_01 and AU_03. There is insufficient data for TSS analysis for AU_02. All other parameters meet water quality standards. Chloride and sulfate have increasing trends. The 2008 Assessment also indicates that there is a concern for impaired habitat in AU_03.

Segment 2108 San Miguel Creek: The segment has two AUs, but only AU_01 had sampling data. The segment is impaired for *E. coli*. Chlorophyll-a is a concern. All other parameters meet water quality standards.

Segment 2109 Leona River: The segment has three AUs. The entire segment is impaired for *E. coli*. N+N is a concern for the entire segment. There is a potential impairment for low DO in AU_03. All other parameters meet water quality standards.

Segment 2110 Lower Sabinal River: The segment is impaired for N+N. A TMDL implementation plan is being implemented to correct this impairment. All other parameters meet water quality standards.

Segment 2111 Upper Sabinal River: The segment has two AUs, but only AU_01 had sampling data. All parameters meet water quality standards.

Segment 2112 Upper Nueces River: The segment has four AUs. The entire segment meets the water quality standards. *E. coli* has an apparent increasing trend.

Segment 2113 Upper Frio River: The segment has two AUs. The entire segment meets the water quality standards. However, the 2008 Assessment indicates that the entire segment is impaired for fish community, impaired for macrobenthos community in AU_01, and has concerns for impaired habitat for the entire segment.

Segment 2114 Hondo Creek: The segment has two AUs. There was insufficient data for assessment, but this analysis indicates a possible impairment for N+N. All other parameters appear to meet the water quality standards.

Segment 2115 Seco Creek: The segment has two AUs, but only AU_01 had sampling data. All parameters meet water quality standards.

Segment 2116 Choke Canyon Reservoir: The segment has seven AUs, but there was no data for AU_07. AU_06 is impaired for low DO. Low DO is a concern in AU_05. Only pH and DO were sampled in AU_01, AU_02, AU_04, and AU_05. TDS has a decreasing trend. All other parameters appear to meet the water quality standards.

Segment 2117 Frio River Above Choke Canyon Reservoir: The segment has five AUs, but there was no data for AU_05. AU_02 is impaired for *E. coli.* N+N is a concern for the entire segment. All other parameters meet water quality standards.

NUECES – RIO GRANDE COASTAL BASIN

Segment 2201 Arroyo Colorado Tidal: The segment has five AUs. AU_03, AU_04, and AU_05 are impaired for Enterococcus. AU_04 and AU_05 are impaired for low DO. A TMDL for DO has evolved into a Watershed Protection Plan (WPP) for the entire Arroyo Colorado watershed. N+N and chlorophyll-a are concerns for the entire segment. Ammonia and OP are concerns for AU_03, AU_04, and AU_05. Total phosphorus is a concern for AU_05 and has an increasing trend in AU_01. There are no problems with pH or TSS on this segment. The 2008 Assessment also indicates that AU_05 is impaired for mercury and polychorinated biphenyls in edible fish tissue.

Segment 2202 Arroyo Colorado Above Tidal: The segment has four AUs. *E. coli* is an impairment for the entire segment. Ammonia, N+N, OP, total phosphorus, and chlorophyll-a are concerns for the entire segment. All other parameters meet water quality standards. The WPP should address all of the impairments and concerns.

Segment 2203 Petronila Creek Tidal: Chlorophyll-a is concern for this segment. All other parameters meet water quality standards.

Segment 2204 Petronila Creek Above Tidal: The segment has two AUs, but there insufficient data for analysis for AU_02. The segment is impaired for TDS, chloride and sulfate. A TMDL implementation plan is being implemented to correct these impairments. There is a concern for chlorophyll-a. pH has a decreasing trend. All other parameters meet water quality standards.

Segment 2485A Oso Creek: The creek is impaired for Enterococcus. A TMDL is underway. N+N, total phosphorus, and chlorophyll-a are concerns. OP is a possible concern. Ammonia has a decreasing trend. N+N has an increasing trend. All other parameters meet water quality standards.

Segment 2492A San Fernando Creek: The creek is impaired for Enterococcus. N+N, and total phosphorus are concerns. All other parameters meet water quality standards.

BAYS, ESTUARIES, AND GULF OF MEXICO

Segment 2462 San Antonio Bay / Hynes Bay: N+N is a concern for the bay. Total phosphorus and chlorophyll-a are possible concerns. Total phosphorus has a decreasing trend. All other parameters meet water quality standards.

Segment 2463 Mesquite Bay: OP has a decreasing trend. All parameters meet water quality standards.

Segment 2471 Aransas Bay: The bay is considered a single AU. For this analysis, the bay was divided into three sections: the main portion of Aransas Bay, Little Bay, and Lydia Ann Channel**.** Chlorophyll-a is a possible concern in Little Bay. All other parameters meet water quality standards.

Segment 2472 Copano Bay: The bay has two AUs, but for this analysis, the bay was divided into five sections: the main portion of Copano Bay, the Copano Creek arm, the Aransas River arm, Mission Bay and Port Bay. There was insufficient data for analysis for the Copano Creek arm and Mission Bay. The entire bay is impaired for fecal coliform. A TMDL is underway. Total phosphorus is a possible concern in the Aransas River arm. 24-Hr DO measurements have been taken in Port Bay. All other parameters meet water quality standards.

Segment 2473 St. Charles Bay: Low DO is a concern for the bay. Enterococcus could be a possible impairment in the 2010 Assessment. All other parameters meet water quality standards.

Segment 2481 Corpus Christi Bay: The bay is considered a single AU, but for this analysis, the bay was divided into five sections: the main portion of Corpus Christi Bay, La Quinta Channel, Corpus Christi Ship Channel, Corpus Christi Marina, and the Upper Laguna Madre north of Park Road 22. There was insufficient data for analysis for the Corpus Christi Marina and the Upper Laguna Madre. pH has an increasing trend at one station in the main portion of the bay. All parameters meet water quality standards. However, EPA, based on Beach Watch data, has decided to list the bay as being impaired for Enterococcus. The exceedences occurred at two parks adjacent to major storm water outfalls and are not representative of the entire bay. But since the bay is a single AU, the entire bay will be listed.

Segment 2482 Nueces Bay: All parameters meet water quality standards, but total phosphorus is a possible concern.

Segment 2483 Aransas Bay: All parameters meet water quality standards. However, the Department of State Health Services (DSHS) lists the bay as being impaired for bacteria for oyster waters.

Segment 2483A Conn Brown Harbor: Only pH and DO had enough data for analysis, both of which meet the water quality standards.

Segment 2484 Corpus Christi Inner Harbor: Ammonia, N+N, and chlorophyll-a are concerns. All other parameters meet water quality standards.

Segment 2485 Oso Bay: The bay has three AUs. Based on 24-Hr DO measurements, the entire bay is listed as being impaired for low DO. AU_03 is also impaired for Enterococcus, and DSHS lists the bay as being impaired for bacteria for oyster waters. A TMDL for bacteria has been approved. A TMDL for low DO is underway. Chlorophyll-a is a concern in the entire bay, and total phosphorus and ammonia are concerns in AU_03.

Segment 2491 Laguna Madre: The bay has three AUs. The entire bay is listed as being impaired for low DO. DSHS lists AU_02 as being impaired for bacteria for oyster waters. Chlorophyll-a is a concern in AU_01 and AU_02. N+N is a concern for AU_02. Ammonia and total phosphorus are possible concerns for AU_02. OP has decreasing trends at three sites in AU_01. All other parameters meet water quality standards.

Segment 2492 Baffin Bay: The bay is considered a single AU, but for this analysis, the bay was divided into four sections: the main portion of Baffin Bay, Alazan Bay, Cayo Del Grullo, and Laguna Salado. There was insufficient data for analysis for Cayo Del Grullo. Chlorophyll-a is a concern for the entire segment. Ammonia is a possible concern in Alazan Bay and total phosphorus is a possible concern in Laguna Salado.

Segment 2493 South Bay: All parameters meet water quality standards.

Segment 2494 Brownsville Ship Channel: All parameters meet water quality standards. Low DO is a concern and ammonia and chlorophyll-a are potential concerns.

Segment 2494A Port Isabel Fishing Harbor: Enterococcus and N+N are concerns. TSS has a decreasing trend. All other parameters meet water quality standards.

Segment 2501 Gulf of Mexico: The entire Gulf of Mexico is listed for mercury in edible fish tissue. Only the Port Aransas and Port Isabel areas had data during the assessment period. All other parameters meet water quality standards. Enterococcus is a potential concern in the Port Isabel area.

Recommendations

As this report was being compiled, a number of recommendations for additional work were identified. The following paragraphs summarize these recommendations.

Segment 2004 Aransas River Above Tidal: Additional 24-Hr DO measurements are needed at Station 12952 in order to confirm or remove the concern for low DO. Four are scheduled for fiscal year (FY) 2009.

Segment 2103 Lake Corpus Christi (AU_01): OP sampling will be resumed at Station 12967 in FY 2009 in order to confirm or remove the concern this parameter.

Segment 2103 Lake Corpus Christi (AU_02): Sampling was discontinued in this AU due to accessibility issues. At that time, total phosphorus values appeared to be rising as the lake level fell. Chlorophyll-a is listed as a concern. Sampling should be resumed in this AU, if possible, to monitor these parameters.

Segment 2104 Nueces River Above Frio River (AU_02): pH shows a decreasing trend in this AU. The values are well within the criteria range (median value = 7.9 standard units), but there could be a concern in the future if this trend continues. It would be beneficial to try and determine why the pH is decreasing in this section of the river.

Segment 2106 Nueces River / Lower Frio River: The number of exceedences for chlorophyll-a in both AUs of this segment are just above 25%, but they were not listed as having a concern for this parameter. It is possible that this will become a concern in future assessments. It would be beneficial to try and determine why so many of the samples exceed the criteria.

Segment 2109 Leona River (AU_03): There are two monitoring sites in this AU – 12989 and 18418. Combined, the DO grab samples do not indicate any problems, but all of the exceedences occurred at the most upstream site – 18418. 24-Hr DO measurements would help determine whether or not there is a potential for a future DO impairment in this AU.

Segment 2204 Petronila Creek Above Tidal (AU_02): Routine monitoring in this AU has not been conducted because this part of the creek is usually dry. A new wastewater treatment plant permit for a new prison has been permitted for 150,000 gallons per day. It may be possible to begin routine monitoring in FY 2010.

Segment 2492 Baffin Bay: Alazan Bay and Laguna Salado, arms of Baffin Bay, do not have any routine monitoring stations, but were sampled during a special study. Baffin Bay is listed as having a concern for chlorophyll-a, and both Alazan Bay and Laguna Salado had elevated levels of this parameter. Alazan Bay also had high levels of ammonia and Laguna Salado had high levels of total phosphorus. Routine monitoring should be implemented is these sections in order to determine is there are concerns for these parameters.

1.0 INTRODUCTION

In 1991, the Texas Legislature passed the Texas Clean Rivers Act requiring basin-wide water quality assessments to be conducted for each river basin in Texas. Under this act, the Clean Rivers Program (CRP) has developed an effective partnership involving the Texas Commission on Environmental Quality (TCEQ), other state agencies, river authorities, local governments, industry, and citizens. Using a watershed management approach, the Nueces River Authority (NRA) and TCEQ work together to identify and evaluate surface water quality issues and to establish priorities for corrective action. Under CRP, NRA is responsible for the San Antonio – Nueces Coastal Basin, the Nueces River Basin, the Nueces – Rio Grande Coastal Basin, and the adjacent bays and estuaries (Figure 1), an area roughly 31,500 square miles, ranging from the hill country in Edwards County to San Antonio Bay in Refugio County to the Brownsville Ship Channel in Cameron County.

Figure 1 – 1: NRA's Basins of Responsibility

San Antonio – Nueces Coastal Basin

The San Antonio – Nueces Coastal Basin is approximately 3,100 square miles, covering all or part of 7 counties. The basin is bordered by the San Antonio River Basin to the north, the Lavaca-Guadalupe Coastal Basin to the northeast, bays, estuaries, and the Gulf of Mexico to the east, the Nueces-Rio Grande Coastal Basin to the south, and the Nueces River Basin to the northwest. Being a coastal area, the basin is naturally host to several state-operated recreational areas. These include Goose Island State Park near Rockport, Copano Bay State Fishing Pier along State Highway 35 north of Fulton, Fulton Mansion State Historic Park in Fulton, and the Aransas National Wildlife Refuge in Aransas County.

Nueces River Basin

The Nueces River Basin covers approximately 17,000 square miles, encompassing all or part of 23 counties in South-Central Texas. Other rivers within the basin include the Frio, Leona, Sabinal, and Atascosa Rivers. The basin is bordered by the Colorado, Guadalupe, and San Antonio River Basins to the north, the San Antonio – Nueces Coastal Basin to the southeast, the Nueces – Rio Grande Coastal Basin to the south, and the Rio Grande River basin to the south and southwest. Throughout the basin, the rivers are used for water supply and recreational purposes. The basin is home to numerous state-operated recreational areas including: Choke Canyon State Park on the south side of Choke Canyon Reservoir near Three Rivers, Lake Corpus Christi State Park on the southeast bank of Lake Corpus Christi near Mathis, Garner State Park north of Concan, Tips State Recreational Area on the Frio River in Three Rivers, Lipantitlan State Historic Park State Historic Park near Sandia, Lost Maples State Natural Area north of Vanderpool, and Hill Country State Natural Area north of Hondo.

Nueces – Rio Grande Coastal Basin

The Nueces – Rio Grande Coastal Basin covers approximately 10,400 square miles, encompassing all or part of 12 counties in South Texas. The basin is bordered by the Nueces River Basin and the San Antonio – Nueces Coastal Basin to the north, bays, estuaries, and the Gulf of Mexico to the east, and the Rio Grande River Basin to the south and southwest. The inland area of the basin is dominated by large ranches, including the King Ranch. State-operated recreational areas are primarily along the coast and include Mustang Island State Park, Port Isabel Light House State Historic Park in Port Isabel, and the Padre Island National Seashore.

2.0 PUBLIC INVOLVEMENT

CRP depends on public involvement and input from stakeholders to assist in understanding the needs of the basins and the areas of concern. The NRA steering committee serves as the focus for public input and assists with:

- Creation of specific achievable water quality objectives and basin priorities
- Review and development of work plans and allocation of resources
- Development and review of major reports
- Establishing monitoring priorities and developing monitoring plans
- Improving awareness of water quality, water resources, and pollutant source issues
- Increasing opportunities for citizens to identify pressing issues, concerns, and contributing ideas to the CRP process
- Expanding the public's role in water quality management issues

The steering committee includes stakeholder volunteers from across NRA's area of responsibility, representing:

- Private citizens
- Fee-payers (identified in Texas Water Code 26.0135(h))
- Political subdivisions (including local, regional, and state officials)
- Texas State Soil and Water Conservation Board (TSSWCB)
- Other appropriate state agencies including: Texas Parks and Wildlife Department (TPWD), Texas Water Development Board, Texas General Land Office (TGLO), Texas Department of State Health Services (DSHS), Texas Department of Agriculture, Texas Railroad Commission (RRC), and Texas Department of Transportation (TxDOT).
- Other entities interested in water quality matters including: TCEQ regional staff, business and industry, agriculture, environmental and other public interest groups.

NRA encourages stakeholder participation to provide suggestions for additional monitoring, special studies, outreach opportunities, and to be a voice for local concerns. For more information about stakeholder participation, the steering committee process, or how to become a steering committee member, visit our Public Involvement web page at http://www.nueces-ra.org/CP/CRP/public.php, or contact NRA using the contact information at the end of this report.

PUBLIC OUTREACH

NRA participated in numerous CRP supported activities to help educate students and adults on pollution sources, the importance of keeping our waters clean, and what they can to do help protect our rivers, lakes, and bays.

Aquatic Education Program

The Aquatic Education Program at the Center for Coastal Studies at Texas A&M University – Corpus Christi is designed to teach people the importance our riparian corridors, fresh water inflow, and the health of our bays and estuaries. The Wetland on Wheels (http://tamusystem.tamu.edu/systemwide/05/09/features/wetlands.html) is a trailer that has been made into a model of a waterway. The model starts in a stream/river habitat and shows the water flowing into the bays and estuaries, and finally ends in the Gulf of Mexico. Taxidermy mounts on display are representative of the wildlife in the variety of habitats found beside waterways. Also included are three video monitors that show films of these diverse habitats and animals living in these areas (riparian corridors, marshes, open bays and estuaries, and ocean habitat). The trailer is used at a variety of events, such as Bayfest, Hummingbird Festival, and Sea Fair, as well as area schools. Mini lectures are given on environmental issues and the importance of these waterways for humans and animals alike. NRA personnel help with these presentations, allowing for more events to be attended.

Figure 2 – 1: Inside the Wetlands on Wheels

Figure 2 – 2: Beth Almaraz gives a demonstration

Leadership Guidance and Support for Teachers

During 2007, in cooperation with groundwater conservation districts and soil and water conservation districts, NRA visited 58 schools and made 271 presentations to 7,621 students on nonpoint source (NPS) pollution and watersheds using the Nueces Basin watershed model. NRA also provided support and guidance to teachers with the incorporation of watershed education into their existing curriculums. At the request of community leaders, NRA presented the watershed model and other NPS pollution information to 625 members of the public at seven community events.

Headwaters Stewardship Project

NRA worked with others to promote good land stewardship and inform landowners about riparian function. With funding from the Dixon Water Foundation the Headwaters Stewardship Project-Riparian Landowners' Network is bringing riparian management information to landowners in the 10 counties located upstream from the basin's major drinking water supply reservoirs. Though not funded by CRP, the activities related to this project compliment CRP outreach.

As part of the project, NRA hosts an annual conference on land stewardship and water resources. Conference supporters included: local soil and water conservation districts, local groundwater districts, Rio Grande Nueces Resource Conservation and Development, Texas Cooperative Extension, Natural Resource Conservation Service and the Texas Wildlife Association.

Another component of the Headwaters Stewardship Project is the "Up To You" river litter prevention campaign. With support of local businesses, NRA continues to cultivate personal responsibility for keeping rivers clean and conserving water with this campaign. More than 30,000 litter bags and 100 posters have been distributed by local businesses and advocacy groups along the recreational reaches of the Nueces Basin headwater streams and in schools in support of the NPS pollution lesson.

NRA received the Governor's 2008 Environment Excellence Award (TEEA) for the Education category for this project.

Figure 2 – 3: Rocky Freund and Sky Lewey accept the TEEA from TCEQ Commissioners Bryan Shaw, Buddy Garcia, and Larry Soward

3.0 WATER QUALITY REVIEW

3.1 Water Quality Terminology

The 2008 Water Quality Inventory assesses all data in the State's water quality database (Surface Water Quality Monitoring Information System (SWQMIS)) for a 7-year period, and a new 7-year data set is assessed every two years. This has changed from the previous 5-year data sets. In most cases, a minimum of 10 samples is required to conduct the assessment. In some cases, the 10 samples are obtained by using a slightly longer period of time. The 2008 Assessment included data from December 1, 1999 through November 30, 2006.

The analysis for this report looked at Dissolved Oxygen (DO), pH, total phosphorus, nitrite+nitrate (N+N), ammonia, chlorophyll-a, orthophosphorus (OP), total suspended solids (TSS), and bacteria (*E.coli* for fresh water segments and Enterococcus on tidal and marine segments) on each assessment unit (AU) of a classified segment. A single segment can consist of one to several AUs. Total dissolved solids (TDS), chloride, and sulfate were assessed only on fresh water segments.

The following table explains the potential impacts when the water quality standards are not met along with an explanation of the most common causes for the standards not to be met.

Parameter	Impact	Cause
DO	Organisms that live water need oxygen to live. In segments where DO is low, organism may not have sufficient oxygen to survive.	Modifications to the riparian zone, human activity that causes water temperatures to increase, and increases in organic matter and bacteria, and over abundant algae.
pH	Most aquatic life is adapted to live within a narrow pH range. Different organisms can live and adjust to differing pH ranges, but all fish die if pH is below 4 (the acidity of orange juice) or above 12 (the pH of ammonia).	Industrial and wastewater discharge, runoff from quarry operations, and accidental spills.
Ammonia	Elevated levels of ammonia in the environment can adversely affect fish and invertebrate reproductive capacity and reduced growth of the young.	Ammonia is excreted by animals and is produced during the decomposition of plants and animals. It is an ingredient in many fertilizers and is also present in sewage, storm water runoff, certain industrial wastewaters, and runoff from animal feedlots.
Nutrients N+N OP Total phosphorus	These nutrients increase plant and algae growth. When plants and algae die, the bacteria that decompose them use oxygen so that is no longer available for fish and other living aquatic life. The more dead plants in the water, the more bacteria are produced to decompose the dead leaves. High levels of nitrate and nitrites can produce Nitrite Toxicity, or "brown blood disease," in fish. This disease reduces the ability of blood to transport oxygen throughout the body.	Nutrients are found in effluent released from wastewater treatment plants (WWTP)s, fertilizers, and agricultural runoff carrying animal waste from farms and ranches. Soil erosion and runoff from farms, lawns, and gardens can add nutrients to the water.
Chlorophyll-a	Chlorophyll-a is the photosynthetic pigment found in all green plants, algae, and cyanobacteria. Elevated levels indicate abundant plant growth which could lead to reduce DO levels.	Modifications to the riparian zone, human activity that causes water increases in organic matter and bacteria, and over abundant algae.
TSS	TSS measures the amount of particles that are suspended in water and which will not pass through a filter. It can also affect light penetration. Deposition of these particles can bury and/or destroy benthic habitat for most species of aquatic insects, snails and crustaceans.	TSS originates from multiple point and non-point sources but most commonly results from erosion of soils substrates. A good measure of the upstream land use conditions is how much TSS rises after a heavy rainfall.
TDS Chloride Sulfate	High levels of these parameters may affect the aesthetic quality of water, interfering with washing clothes and corroding plumbing fixtures. They can also affect the permeability of ions in aquatic organisms.	Mineral springs, carbonate deposits, salt deposits, and sea water intrusion are natural sources of these parameters. Other sources can be attributed to oil exploration, drinking water treatment chemicals, storm water and agricultrual runoff, and wastewater discharges.

Impairments for the following parameters are defined as follows:

Parameter	Criteria	Calculation Used for Impairment*
TDS, chloride, and sulfate	Segment specific	Average of samples are above the criteria
DO (for High Aquatic Life Use)	3.0 mg/l** grab sample 5.0 mg/l 24-Hr average	10% of samples are below either criteria
pH	6.5 su*** and 9 su	10% of samples are above or below the criteria
E. coli	126 cfu**** 394 cfu	Geometric mean is greater than the criteria 25% of samples are above the criteria
Enterococci	35 cfu 89 cfu	Geometric mean is greater than the criteria 25% of samples are above the criteria

*The percent of samples exceeding the criteria or screening level varies somewhat with small sample sizes (between 10 and 20). When sample sizes are greater than 20 samples, the percentage shown in the calculation column is much more accurate.
**mg/l: milligrams per liter
***su: standard units
****cfu: colony forming units

Concerns for the following parameters are defined as follows:

Parameter	Screening Levels*			Calculation Used for Concern
	Stream	Reservoir	Tidal Stream	
Ammonia-Nitrogen	0.33 mg/l	0.11 mg/l	0.46 mg/l	20% of samples are above the criteria
N+N	1.95 mg/l	0.37 mg/l	1.10 mg/l	
OP	0.37 mg/l	0.05 mg/l	0.46 mg/l	
Total phosphorus	0.69 mg/l	0.20 mg/l	0.66 mg/l	
Chlorophyll-a	14.1 µg/l**	26.7 µg/l l	21.0 µg/l	

*Screening levels to identify concerns have been developed by the State to enable an assessment of water quality for some the parameters, primarily nutrients, that only have a narrative criteria. The levels were developed by calculationg the 85th percentile for all water quality data in the TCEQ's water quality database over a 10 year period.
**µg/l: micrograms per liter

3.2 Data Review Methodology

In the next section, water quality is reviewed for each segment and AU in the San Antonio – Nueces Coastal Basin, the Nueces Basin, the Nueces – Rio Grande Coastal Basin, and the adjacent bays and estuaries.

Data for the analyses were extracted from the SQWMIS database using the TCEQ's Data Viewer (http://www8.tceq.state.tx.us/SwqmisWeb/public/index.faces). The SQWMIS database consists of data that has been collected under approved Quality Assurance Project Plans and have been screened for accuracy. Flow information is primarily from corresponding United States Geological Survey (USGS) flow stations since flow recorded during sampling events fail to show if sampling occurred before or after drought or flood conditions.

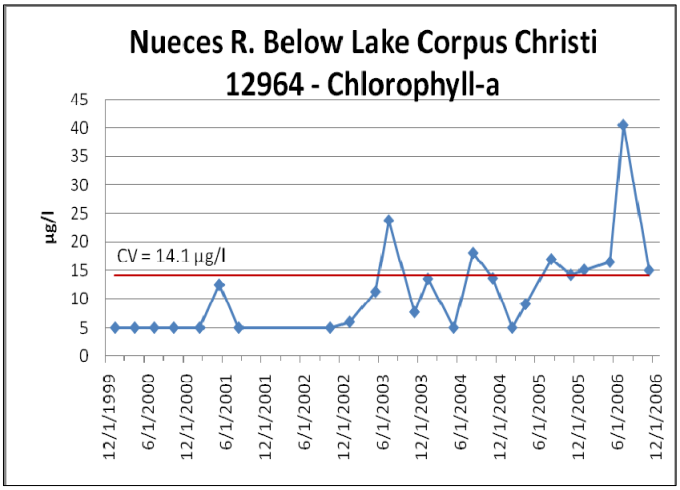
For each parameter reviewed, the data from December 1, 1999 through November 30, 2006 were imported into an Excel spreadsheet. The data were scanned, and duplicates and same-day measurements were removed. Data recorded as a "<" value indicates that the parameter was not present in concentrations above that particular analysis value. This < value differs based on the lab doing the analysis and the detection limits at that time. It does not necessarily mean that it is not present at a lower concentration. But for review purposes, all of these values are considered "non-detects." For graphing, all of these values were reduced to the lowest non-detect value of the data set.

The following information is provided for each parameter reviewed, if applicable:

- Units of measure
- Number of samples
- Range of values (minimum and maximum)
- Median value
- Average (TDS, chloride, and sulfate)
- Geometric mean (*E. coli* and Enterococcus)
- Criteria or screening level
- Number of values not meeting the criteria
- Number of non-detect values
- If a trend exists
- Brief explanation of possible sources of concerns or impairments, abnormal readings, etc.

Graphs are provided for any parameter that has, or is likely to have, a concern, impairment, or trend.

For example, chlorophyll-a is a concern on Segment 2102, Nueces River Below Lake Corpus Christi. The following is the analyses and review for that parameter:



Chlorophyll-a (µg/l): 24 samples, ranging from <5 to 40.5, median value = 10.2, 8 values above criteria value of 14 .1, 9 non-detects, increasing trend. This parameter is listed as having a concern in this part of the river. One possible explanation is that since the Mary Rhodes Pipeline came online, less water is diverted from the river for municipal and industrial use. So during times of little rainfall, the overall flow in the river has been reduced.

The graph includes the criteria, represented as a red line, with the criteria value (CV) noted.

The following is a list of parameter codes, in order of priority, that were used for the data analysis:

Parameter	Parameter Codes
TDS	70300, 00094*, 00095*, 70294, 47004, 70301
Chloride	00940, 00941
Sulfate	00945
DO grab sample	00300
DO 24-Hr Average	89857
DO 24-Hr Minimum	89855
pH	00400
Ammonia	00610, 00608
N+N	00620, 00630, 00593, 00631
OP	00671, 70507
Total Phosphorus	00665
Chlorophyll-a	70953, 32211
TSS	00530
E. coli	31699, 31700, 31648
Enterococcus	31701, 31649

*Parameter codes 00094 and 00095 measure conductivity. TDS is calculated by multiplying these values by 0.65.

For trend analysis, available data from January 1, 1990 through December 2007, using a minimum of ten years of data with no gaps of more than a year, were evaluated. All non-detects were reduced to the lowest non-detect value of the data set. Graphs were generated and the “Add Trendline” Excel function was used to generate a trend line and R^2 value. Parameters with an R^2 value >= |0.2| are reported as having a trend.

3.3 Watershed Summaries
SAN ANTONIO – NUECES COASTAL BASIN

The San Antonio – Nueces Coastal Basin is approximately 3,100 square miles, covering all or part of 7 counties.

The Aransas and Mission Rivers are the primary rivers in the watershed, both of which flow to Copano Bay.

The tidal segments of both the Aransas and Mission Rivers are impaired for bacteria for contact recreation. Copano Bay is impaired for fecal coliform in oyster waters. The *Copano Bay Total Maximum Daily Load (TMDL) Project for Bacteria in Oyster-Harvesting Waters* was initiated in 2005 by TCEQ, focusing on the bay and the two tidal segments. NRA is under contract with TSSWCB to conduct event-based monitoring throughout the entire watershed to support the TMDL. Other project partners include the Coastal Bend Bays and Estuaries Program, TGLO, and the DSHS.

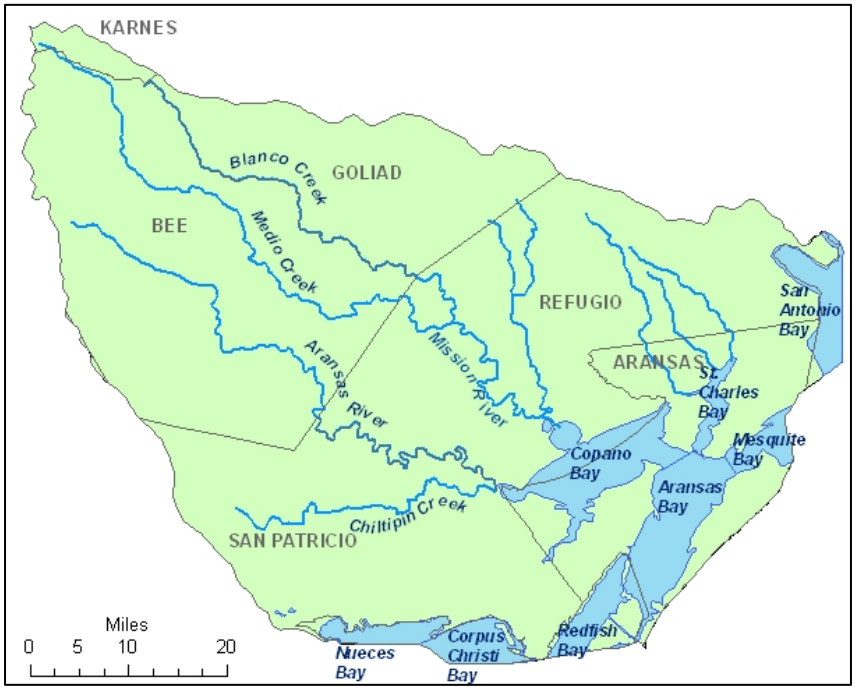


Figure 3.3 – 1: San Antonio – Nueces Coastal Basin

A model is being developed to help determine the source of the bacteria. Initially, historical water quality data were used. These data were limited because the routine Surface Water Quality Monitoring (SWQM) and CRP stations were all located in the lower portion of the watershed and on just the Aransas and Mission Rivers. The TSSWCB project includes sites are nearly every stream and creek. It also includes samples from WWTP outfalls. This additional data is being used to revise the model.

The TMDL also includes a bacteria source tracking (BST) component. This research is being done to determine the biological source of the bacteria. The possibilities include wild hogs and other wildlife, cattle, horses, birds, ducks, and humans.

Segment 2001, Mission River Tidal, flows 19 miles from a point 7.4 kilometers (km) (4.6 miles) downstream of US 77 in Refugio County to its confluence with Mission Bay in Refugio County.

The area is predominately ranchland.

Active Wastewater Permits

WQ0010156-001 – Town of Woodsboro: 250,000 gallons per day (gpd) via ditch to Willow Creek to Sous Creek to Mission River Tidal.

WQ0012013-001 – TxDOT: - Refugio County Rest Area: 3,200 gpd via evaporation in a 0.086 acre pond and irrigation of 1.5 acres of highway right-of-way land.

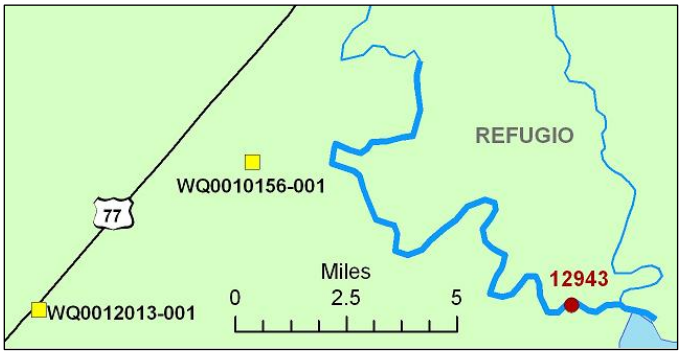


Figure 3.3 – 2: Mission River Tidal

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12943 – near south bank immediately downstream of the Farm to Market (FM) 2678 bridge between Refugio and Bayside	NRA	Quarterly	Conventional, Bacteria, Field	1969 – Present

Water Quality Analysis

DO (mg/l): 28 samples, ranging from 3.8 to 12.9, median value = 7.2, 1 value below screening level of 4, no trends. The low reading occurred in July 2002 after a significant rain event. There are no problems with low DO on this segment of the river. No 24-Hr DO measurements have been conducted on this segment.

Figure 3.3 – 3: Mission River Tidal Station 12943. June 2007

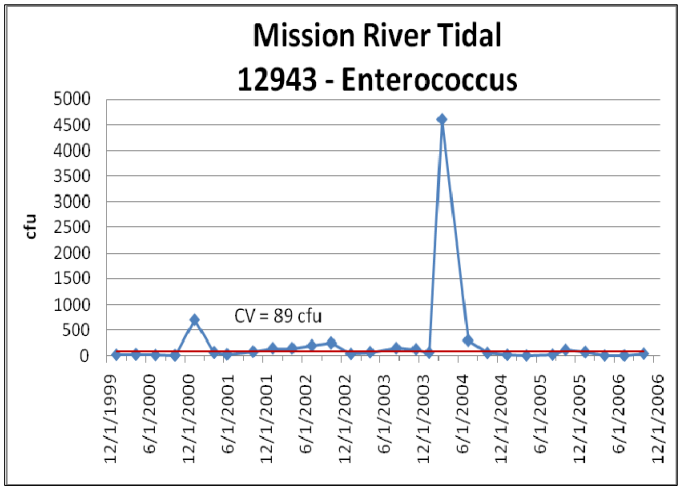
pH (su): 28 samples, ranging from 7.3 to 8.5, median value = 8.2, criteria range is 6.5 to 9, no trends. There are no problems with pH on this segment of the river.

Ammonia (mg/l): 28 samples, ranging from <0.02 to 0.09, median value = 0.02, criteria value = 0.46, 20 non-detects, no trends. There are no problems with ammonia on this segment of the river.

N+N (mg/l): 27 samples, ranging from <0.02 to 0.81, median value = 0.02, criteria value = 1.1, 19 non-detects, no trends. There are no problems with N+N on this segment of the river.

OP (mg/l): 14 samples, ranging from <0.01 to 0.07, median value = 0.01, criteria value = 0.46, 6 non-detects, no trends. There are no problems with OP on this segment of the river.

Total Phosphorus (mg/l): 28 samples, ranging from 0.03 to 0.25, median value = 0.1, criteria value = 0.66, no trends. There are no problems with total phosphorus on this segment of the river.



Chlorophyll-a (µg/l): 24 samples, ranging from 5 to 47, median value = 11.4, 6 values above criteria value of 21, 1 non-detect, no trends. There are no problems with chlorophyll-a on this segment of the river.

TSS (mg/l): 28 samples, ranging from 12 to 129, median value = 27.5, no trends. There are no problems with TSS on this segment of the river.

Enterococcus (cfu): 28 samplies, ranging from 8 to 4600, median value is 66, 10 values above the single sample criteria of 89, geometric mean of 67 criteria of 35. Enterococcus is listed as an impairment for this segment of the river. It is included in the Copano TMDL project. The highest value occurred in March 2004.

Segment 2002, Mission River Above Tidal, flows 9 miles from the confluence of Blanco Creek and Medio Creek to a point 7.4 km (4.6 miles) downstream of US 77 in Refugio County.

The area is predominately ranchland. The City of Refugio is located just to the northeast of the segment.

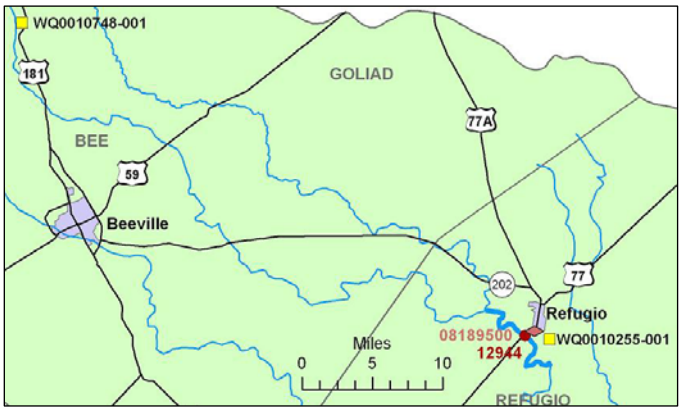


Figure 3.3 – 4: Mission River Above Tidal

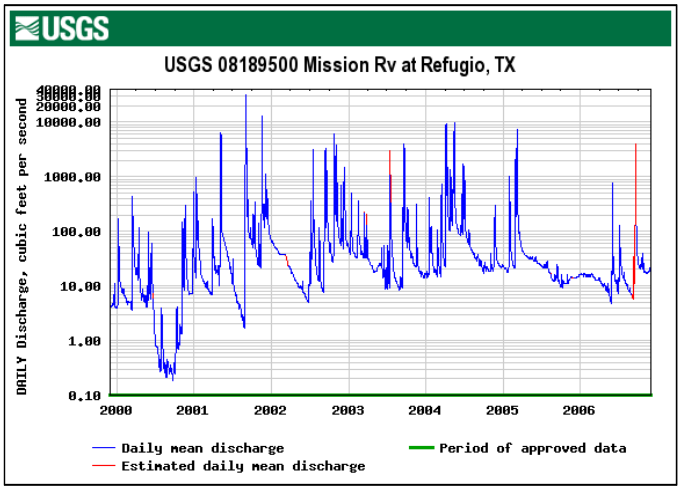
Active Wastewater Permits

WQ0010255-001 – Town of Refugio: 576,000 gpd.

WQ0010748-001 – Pettus Municipal Utility District (MUD): 105,000 gpd via Medio Creek to Mission River Above Tidal.

Flow

There is one USGS gauges in this segment: Mission River at Refugio, TX. It is located at the same location as Station 12944. Recorded flows during this time period range between 0.2 cubic feet per second (cfs) and 32,100 cfs, with a median flow of 21 cfs. There are a few times when the gauge was not recording and the flows are estimated.



Station Summary

Site	12944 – US 77 upstream from bridge at Refugio
Entity	NRA
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field, 2 24-Hr DO
Date Range	1968 – Present

Water Quality Analysis

DO (mg/l): 29 samples, ranging from 3.6 to 12.6, median value = 6.9, 3 values below screening level of 5, no trends. Although 10% of the grab samples were below the screening level, the 24-Hr DO measurements indicate that there are no problems with low DO on this segment of the river.

Average 24–Hr DO (mg/l): 10 samples, ranging from 5.7 to 7.4, median value = 6.8 criteria value = 5.0.

Minimum 24–Hr DO (mg/l): 10 samples, ranging from 5.1 to 6.8, median value = 6.8, criteria value = 3.0.

pH (su): 29 samples, ranging from 6.3 to 8.6, median value = 7.7, 1 value outside the criteria range of 6.5 to 9, no trends. The one low value occurred in January 2006 during relatively low flow.

Figure 3.3 – 5: Mission River Above Tidal Station 12944. March 2007

Ammonia (mg/l): 28 samples, ranging from <0.02 to 0.27, median value = 0.02, criteria value = 0.33, 14 non-detects, no trends. There are no problems with ammonia on this segment of the river.

N+N (mg/l): 28 samples, ranging from <0.02 to 0.53, median value = 0.1, criteria value = 1.95, 3 non-detects, no trends. There are no problems with N+N on this segment of the river.

OP (mg/l): 14 samples, ranging from <0.01 to 0.11, median value = 0.02, criteria value = 0.37, 4 non-detects, no trends. There are no problems with OP on this segment of the river.

Total Phosphorus (mg/l): 28 samples, ranging from <0.02 to 0.27, median value = 0.05, criteria value = 0.69, 10 non-detects, no trends. There are no problems with total phosphorus on this segment of the river.

Chlorophyll-a (µg/l): 22 samples, ranging from <2 to 16.8, median value = 2, 1 value above criteria value of 14.1, 10 non-detects, no trends. The one exceedence occurred in October 2000 during low flow. There are no problems with chlorophyll-a on this segment of the river.

TSS (mg/l): 28 samples, ranging from 5 to 94, median value = 15.5, no trends. There are no problems with TSS on this segment of the river.

***E. coli* (cfu): 29 samplies, ranging from 10 to 4200, median value = 74, geometric mean = 101, 5 values above single sample criteria of 394, geometric mean criteria = 126.** The highest exceedence occurred in October 2000 during low flow. There are no problems with bacteria on this segment of the river, but the segment is included in the Copano Bay TMDL Project.

TDS (mg/l): 35 samples, ranging from 125 to 3,959, median value = 842, average value = 1145, average criteria value = 2000, no trends. There does not appear to be any correlation between flow and TDS. There are no problems with TDS on this segment of the river.

Chloride (mg/l): 28 samples, ranging from 18 to 5,340, median value = 284, average value = 554, average criteria value = 850, no trends. There are no problems with chloride on this segment of the river.

Sulfate (mg/l): 28 samples, ranging from 6.5 to 152, median value = 31, average value = 34, average criteria value = 100, no trends. There are no problems with sulfate on this segment of the river.

Segment 2003, Aransas River Tidal, flows 6 miles from a point 1.6 km (1.0 mile) upstream of US 77 in Refugio/San Patricio County to its confluence with Copano Bay in Aransas/Refugio County.

The area is predominately ranchland.

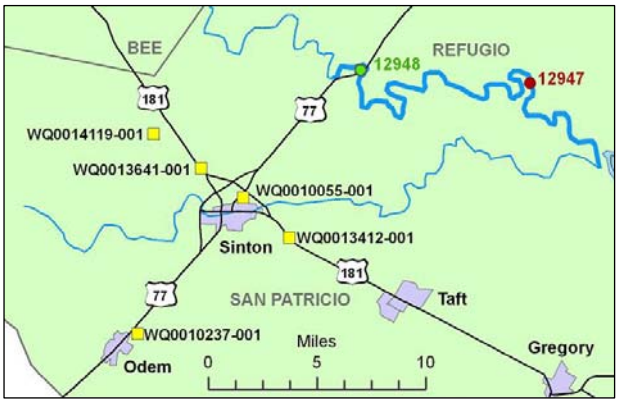


Figure 3.3 – 6: Aransas River Tidal

Active Wastewater Permits

WQ0010055-001 – City of Sinton: 800,000 gpd via San Patricio County Drainage District ditch to an unnamed tributary to Chiltipin Creek to Aransas River Tidal.

WQ0010237-001 – City of Odem: 273,000 gpd.

WQ0013412-001 – TxDOT: 380 gpd via Oliver Drainage Ditch to an unnamed tributary to Chiltipin Creek to Aransas River Tidal.

WQ0013641-001 – City of Sinton Rob and Bessie Welder Park: 15,000 gpd via San Patricio County Drainage District ditch to an unnamed tributary to Chiltipin Creek to Aransas River Tidal.

WQ0014119-001 – St. Paul Water Supply Corporation (WSC): 50,000 gpd via unnamed tributary to Chiltipin Creek to the Aransas River Tidal.

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12947 – at boat ramp at FM 629 terminus south of Bonnie View	NRA	Quarterly	Conventional, Bacteria, Field	2004 – Present
12948 – immediately upstream of US 77 bridge between Woodsboro and Sinton				1968 - 2004

Water Quality Analysis

DO (mg/l): 29 samples, ranging from 4.0 to 11.6, median value = 6.9, screening level = 4, no trends. There are no problems with low DO on this segment of the river. No 24-Hr DO measurements have been conducted on this segment.

pH (su): 27 samples, ranging from 7.4 to 8.7, median value = 8.1, criteria range is 6.5 to 9, no trends. There are no problems with pH on this segment of the river.

Ammonia (mg/l): 27 samples, ranging from <0.02 to 0.1, median value = 0.02, criteria value = 0.46, 19 non-detects, no trends. There are no problems with ammonia on this segment of the river.

Figure 3.3 – 7: Aransas River Tidal Station 12947, November 2007

N+N (mg/l): 27 samples, ranging from <0.01 to 2.6, median value = 0.03, 6 values above criteria value of 1.1, 13 non-detects, no trends. The 2008 Assessment does not list any problems with N+N on this segment of the river, showing only shows 2 exceedences. The last exceedence occurred in January 2004 at Station 12948. None of samples at 12947 exceed the criteria.

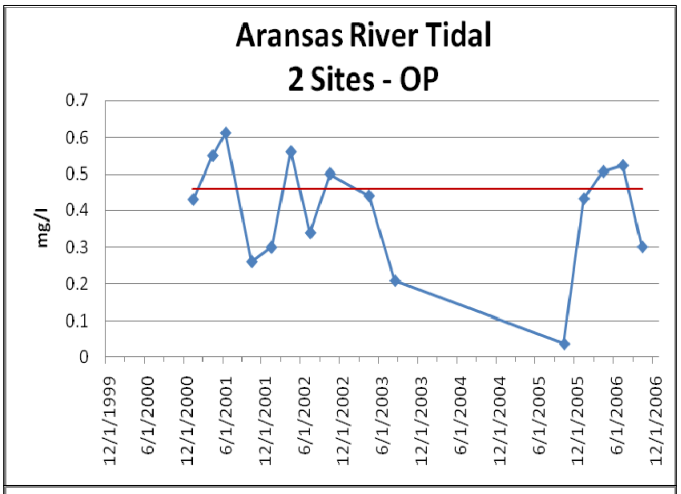
OP (mg/l): 15 samples, ranging from 0.037 to 0.612, median value = 0.432, 6 values above criteria value of 0.46, no no trends. OP is listed as a concern on this segment. The upstream segment, 2004, also has a concern for OP and may be a contributing factor.

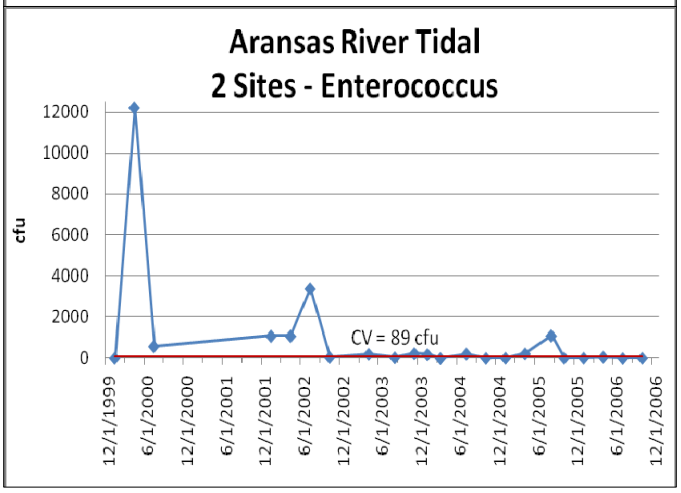
Total Phosphorus (mg/l): 26 samples, ranging from 0.15 to 1.8, median value = 0.5, 4 values above criteria value of 0.66, no trends. There are no problems with total phosphorus on this segment of the river.

Chlorophyll-a (µg/l): 23 samples, ranging from <5 to 30.5, median value = 12.6, 6 values above criteria value of 21, 4 non-detects, no trends. There are no problems with chlorophyll-a on this segment of the river.

TSS (mg/l): 27 samples, ranging from 9 to 210, median value = 22, no trends. There are no problems with TSS on this segment of the river.

Enterococcus (cfu): 22 samples, ranging from 7 to 12,200, median value = 130, geometric mean = 122, 11 values above the single sample criteria of 89, geometric mean criteria = 35. Enterococcus is listed as an impairment for this segment of the river. It is included in the Copano TMDL project.





Segment 2004, Aransas River Above Tidal, flows 35 miles from the confluence of Poesta Creek and Aransas Creek to a point 1.6 km (1.0 mile) upstream of US 77 in Refugio/San Patricio County.

The upper portion of the stream is effluent dominated. Data from the USGS stations shows a base flow even during the driest times.

The area is predominately ranchland. There are no towns located on this segment. There are two WWTP discharges into the creeks that become the river, one directly into the segment, and one that discharges into Papalote Creek which flows into the river near the Refugio County line.

The segment is divided into two AUs: (01) the lower 17 miles and (02) the upper 18 miles.

Active Wastewater Permits

WQ0010124-002 – City of Beeville: 3,000,000 gpd via Poesta Creek to the Aransas River Above Tidal with provisions for irrigation of the grass and landscaping of the plant site.

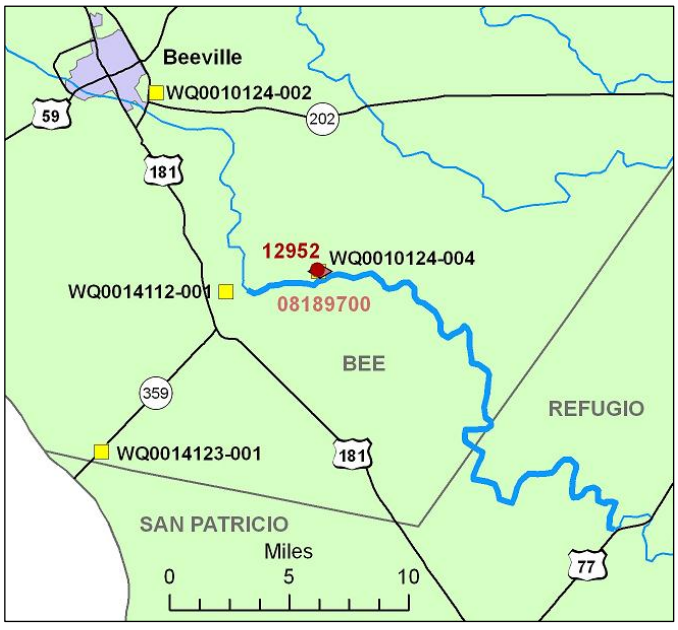


Figure 3.3 – 8: Aransas River Above Tidal

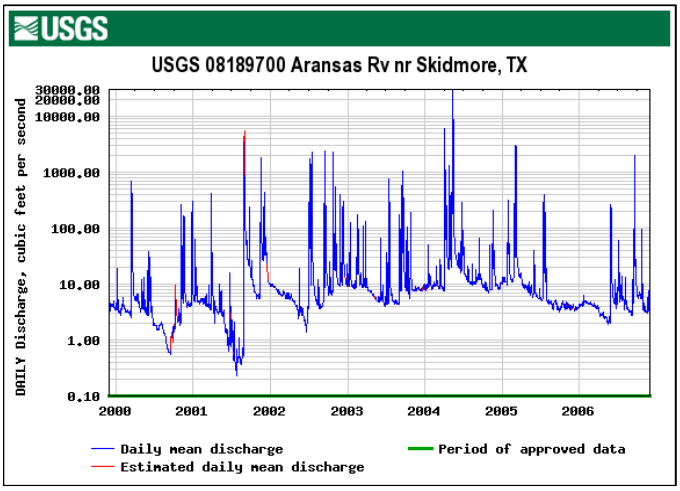
WQ0010124-004 – City of Beeville, Chase Field: 2,500,000 gpd directly to Aransas River Above Tidal.

WQ0014112-001 – Skidmore WSC: 131,000 via unnamed tributary to Aransas River Above Tidal.

WQ0014123-001 – Tynan WSC: 45,000 gpd via Papalote Creek to the Aransas River Above Tidal.

Flow

There is one USGS gauges in this segment: Aransas River near Skidmore, TX. It is located at the same location as Station 12952. Recorded flows during this time period range between 0.23 cfs and 29,300 cfs, with a median flow of 6.2 cfs.



Water Quality Analysis

2004_01: lower 17 miles

There are no stations in this AU with data during the 2008 Assessment period.

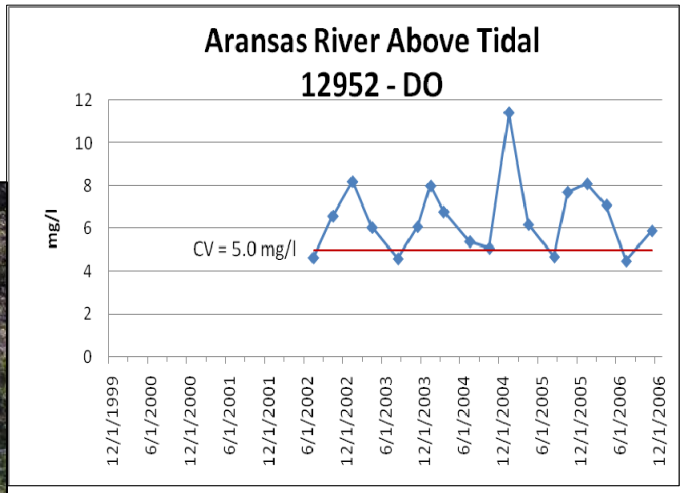
2004_02: upper 18 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12952 – at county round east of Skidmore	NRA	Quarterly	Conventional, Bacteria, Field	2002 – Present

DO (mg/l): 18 samples, ranging from 4.5 to 11.4, median value = 6.2, 4 values below screening level of 5. This segment is listed as having a concern for low DO. All of the exceedences occurred in the summer months of July and August. 24-Hr DO measurements are schedule to be collected during FY 2009.

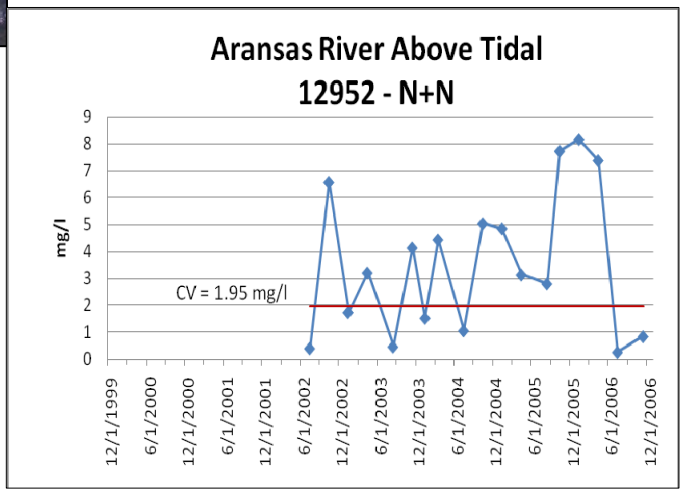
Figure 3.3 – 9: Aransas River Above Tidal Station 12952, November 2007



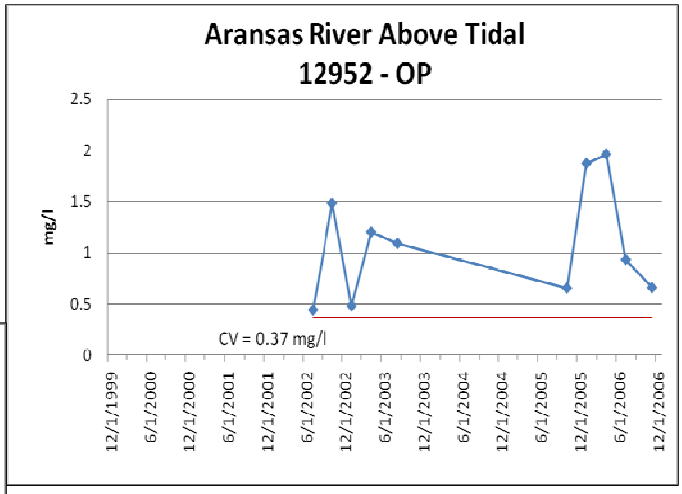
pH (su): 18 samples, ranging from 7.2 to 8.1, median value is 7.8, criteria range is 6.5 to 9. There are no problems with pH on this segment of the river.

Ammonia (mg/l): 18 samples, ranging from <0.02 to 0.17, median value = 0.04, criteria value = 0.33, 3 non-detects. There are no problems with ammonia on this segment of the river.

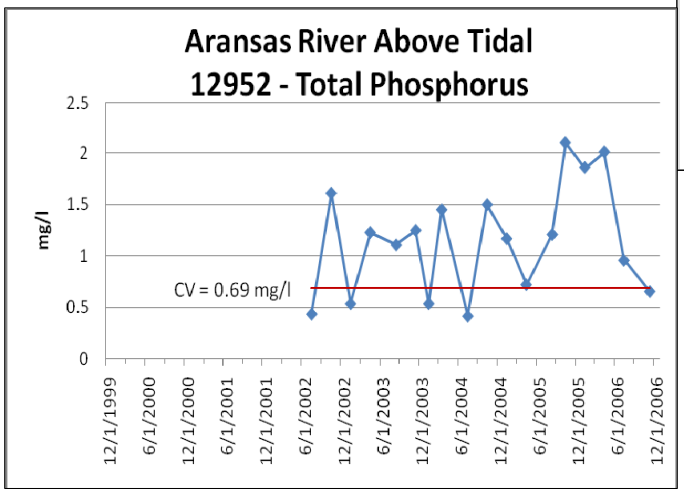
N+N (mg/l): 18 samples, ranging from 0.27 to 8.2, median value = 3.2, 11 values above criteria value of 1.95. This parameter remains a concern for this segment. The highest values correspond to lower flow when the stream is effluent dominated.



OP (mg/l): 10 samples, ranging from 0.44 to 1.96, median value = 1.01, all values above criteria value of 0.37. This parameter remains a concern for this segment. The highest values correspond to lower flow when the stream is effluent dominated.



Total Phosphorus (mg/l): 18 samples, ranging from 0.42 to 2.1, median value = 1.2, 13 values above criteria value of 0.69. This parameter remains a concern for this segment. The highest values correspond to lower flow when the stream is effluent dominated.



Chlorophyll-a (µg/l): 17 samples, ranging from <2 to 6.9, median value = 2, criteria value = 14.1, 11 non-detects. There are no problems with chlorophyll-a on this segment of the river.

TSS (mg/l): 18 samples, ranging from 6 to 27, median value = 15. There are no problems with TSS on this segment of the river.

***E. coli* (cfu): 18 samples, ranging from 3 to 460, median value = 100, geometric mean = 60, 1 value above the single sample criteria of 394, geometric mean criteria = 126.** The single exceedence occurred in November 2003 during normal flow. The 2008 Assessment does not list any problems with *E. coli* on this segment of the river. The value of 41,000 was recorded in March 2007 after a significant rainfall event. The segment is included in the Copano Bay TMDL Project.

TDS (mg/l): 23 samples, ranging from 325 to 1,260, median value = 814, average value = 792, average criteria value = 1,700. There are no problems with TDS on this segment of the river.

Chloride (mg/l): 22 samples, ranging from 35 to 427, median value = 234, average value = 235, average criteria value = 450. There are no problems with chloride on this segment of the river.

Sulfate (mg/l): 22 samples, ranging from 7.4 to 114, median value = 54, average value = 57, average criteria value = 100, no trends. There are no problems with sulfate on this segment of the river.

NUECES RIVER BASIN

The Nueces River Basin covers approximately 17,000 square miles, encompassing all or part of 23 counties in South-Central Texas. Other rivers within the basin include the Frio, Leona, Sabinal, and Atascosa Rivers.

The *South Central Texas Streams Evaluating Water Quality for Aquatic Life and Recreation* study includes TMDLs for one segment in the Colorado River Basin, four segments in the Guadalupe River Basin, two segments in the San Antonio River Basin, and three segments in the Nueces River Basin.

The upper 46 miles of Segment 2104, Nueces River above Frio River, was listed as being impaired for low DO in 1999. A TMDL study was completed in 2005. 11 24-Hr DO measurements were taken at Station 12974 from August 2002 to August 2004. As a result, this listing has been removed from the 2008 303(d) List.

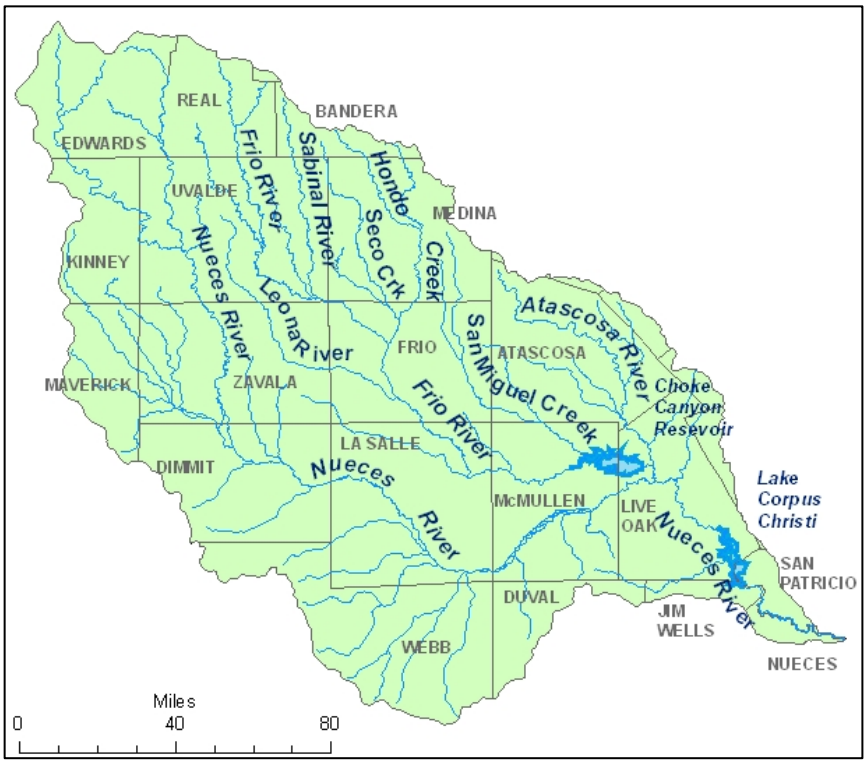


Figure 3.3 – 10: Nueces River Basin

The lower 25 miles and the 25 miles surrounding FM 541 of Segment 2107, Atascosa River, are impaired for bacteria for contact recreation. A TMDL has confirmed the impairment but further studies need to be conducted to determine the sources. Possibilities include monitoring of WWTPs, collecting water samples on smaller tributaries near suspected sources, and bacteria source tracking. The water quality standards are under review, and there is the potential for the criteria to include two levels of primary contact, a single level of secondary contact, and a noncontact recreation level.

The 25 miles surrounding FM 541 and the 25 miles surrounding State Highway (SH) 97 of Segment 2107, Atascosa River, are impaired for low DO. Preliminary studies indicate that the low DO is a result of low flows and that a process other than a TMDL would be better suited to address this issue.

All but the upper 35 miles of Segment 2113, Frio River above Choke Canyon Reservoir, had been listed as impaired for low DO. The original listing was from a comparison of grab data to the DO average screening level. This method is no longer used to determine DO impairments. Re-evaluation of the original dataset shows support of the DO minimum criteria. This listing has been removed from the 303(d) List.

A TMDL to address the N+N impairment of Segment 2110, Lower Sabinal River, has been completed and an implementation plan is currently underway. A new WWTP for the City of Sabinal is planned and will be built after funding is secured.

Segment 2101, Nueces River Tidal, flows 12 miles from Calallen Dam 1.7 km (1.1 miles) upstream of US 77 / IH 37 in Nueces and San Patricio Counties to the confluence with Nueces Bay in Nueces County.

The City of Corpus Christi borders the south bank of the river. There is virtually no development on the north side of the river. A large portion is included in the Coastal Bend Bays and Estuaries Nueces Delta Preserve and the rest is owned by private ranches.

Active Wastewater Permits

WQ0000531-000 – Flint Hill Resources Limited Partnership (LP): via ditch to Nueces River Tidal, Outfalls 005, 008, and 010.

WQ0010401-006 – City of Corpus Christi (Allison Plant): 5,000,000 gpd via Outfalls 001 directly to Nueces River Tidal and Outfall 002 via South Lake to Nueces Bay.

Figure 3.3 – 11: Nueces River Tidal

WQ0013644-001 – San Patricio County Municipal Utility District (MUD) No. 1: 75,000 gpd via unnamed ditch to Hondo Creek to Nueces River Tidal.

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12960 – north of Viola Turning Basin	TCEQ	Quarterly	Conventional, Bacteria, Field, 3 24-Hr DO	1973 – Present
12961 – mid-channel at IH 37 bridge downstream of saltwater barrier dam				2002 – 2006
17645 – mid channel 2.11 miles (3.36 km) upstream of confluence with Nueces Bay				2002 – 2003
17646 – 0.85 miles (1.35 km) downstream of Union Pacific and Southern Pacific Railroad trestle bridge 13				2002 – 2003
17647 – 0.44 miles (706 meters (m)) downstream of easternmost MOPAC railroad crossing				2002 – 2003

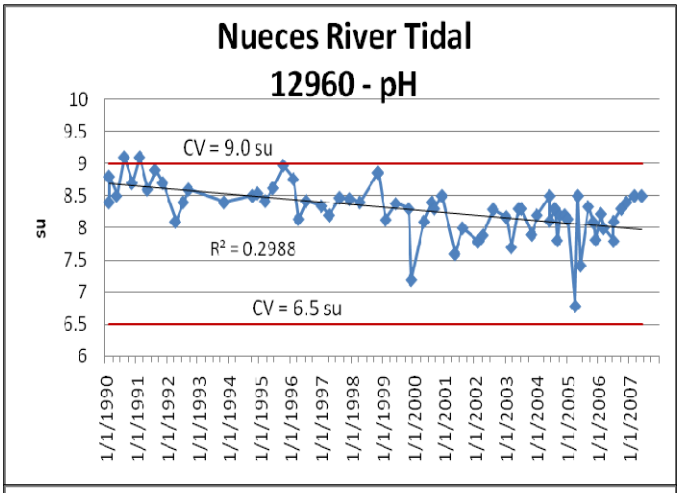
Water Quality Analysis

DO (mg/l): 81 samples, ranging from 5.2 to 12.9, median value = 8.0, screening level = 4.0, no trends. There are no problems with DO on this portion of the river, as also indicated by the 24-Hr DO measurements.

Average 24–Hr DO (mg/l): 5 samples, ranging from 5.0 to 7.6, median value = 5.7, criteria value = 4.0.

Minimum 24–Hr DO (mg/l): 5 samples, ranging from 3.1 to 7.3, median value = 4.6, criteria value = 3.0.

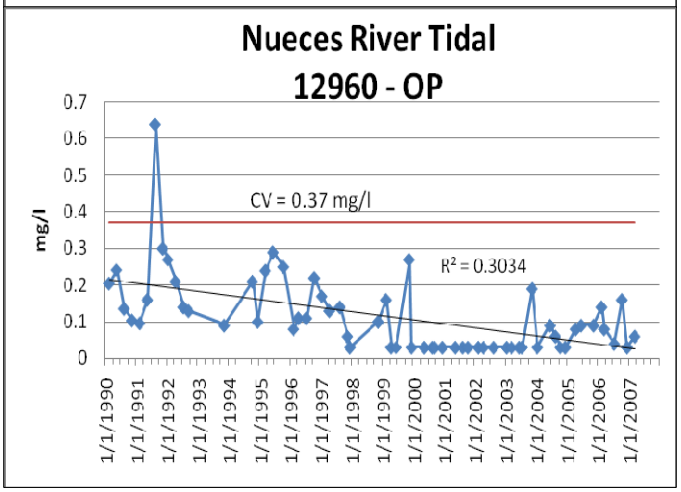
pH (su): 81 samples, ranging from 6.8 to 8.8, median value = 8.1, criteria range is 6.5 to 9, decreasing trend. Although there is a decreasing trend, the values are still well above the lower criteria value. There are no problems with pH on this section of the river.



Ammonia (mg/l): 28 samples, ranging from <0.05 to 0.12, median value is 0.05, criteria value = 0.46, 24 values non-detects, no trends. There are no problems with ammonia in this section of the river.

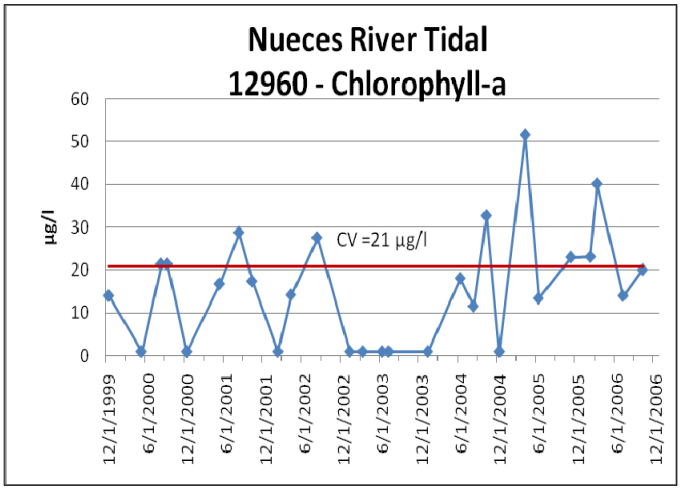
N+N (mg/l): 28 samples, ranging from <0.04 to 0.37, median value is 0.04, 0 values above criteria value of 1.1, 20 samples non-detects, no trends. There are no problems with N+N in this section of the river.

OP (mg/l): 28 samples, ranging from <0.03 to 0.19 median value = 0.03, criteria value = 0.46, 17 non-detects, decreasing trend. There are no problems with OP in this section of the river.



Total Phosphorus (mg/l): 28 samples, ranging from 0.11 to 0.4, median value = 0.18, criteria value = 0.66, no trends. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 27 samples, ranging from <1 to 51.6, median value = 14.2, 9 values above criteria value of 21, 9 non-detects, no trends. This parameter is listed as having a concern for this part of the river. One possible explanation is that the tidal portion is not flushed on a regular basis. In general, the amount of water released from Lake Corpus Christi for freshwater inflows into the Nueces Estuary is based on the amount of water that has flowed into the re servoir system. Except during times of major flooding, the water more or less sloshes back and forth with tides. This problem may be compounded when the Rincon Bayou Pipeline becomes operational and the freshwater inflows are diverted to the upper delta instead of being passed down the river. The data from January 2002 to January 2003 occurred following major inflows into the estuary of over 1 million acre feet of water. This was the first major flood on the river in almost ten years.



TSS (mg/l): 42 samples, ranging from 7 to 169, median value = 31, no trends. There is no apparent problem with TSS on this section of the river.

Enterococcus (cfu): 25 samples, ranging from <10 to 1300, median value = 10, geometric mean is 22, 3 values above the single sample criteria of 89, geometric mean criteria = 35, 11 non-detects. There are no problems with bacteria in this section of the river. The highest value occurred in February 2006 following heavy rains. All other values are <100.

Segment 2102, Nueces River Below Lake Corpus Christi, flows 39 miles from Wesley Seale Dam in Jim Wells and San Patricio Counties to Calallen Dam 1.7 km (1.1 miles) upstream of US 77 / IH 37 in Nueces and San Patricio Counties.

The City of Corpus Christi lies at the end of the segment. There are several small clusters of homes along the segment that easily flood.

The segment is divided into two AUs: (01) the lower 25 miles and (02) the upper 14 miles.

Active Wastewater Permits

WQ0002027-000 – Wright Materials, Inc.: this is a no-discharge permit, but there is occasional discharge after heavy rains.

Flow

There are three USGS gauges on this segment: Nueces River near Mathis, TX.; Nueces River at Bluntzer, TX; and Nueces River at Calallen, TX.

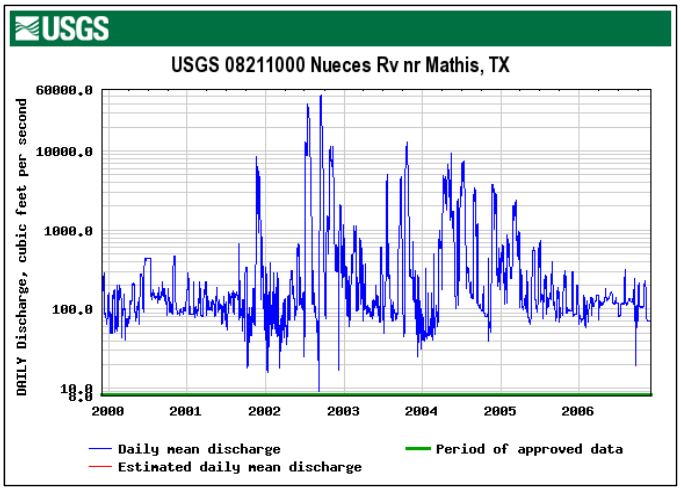
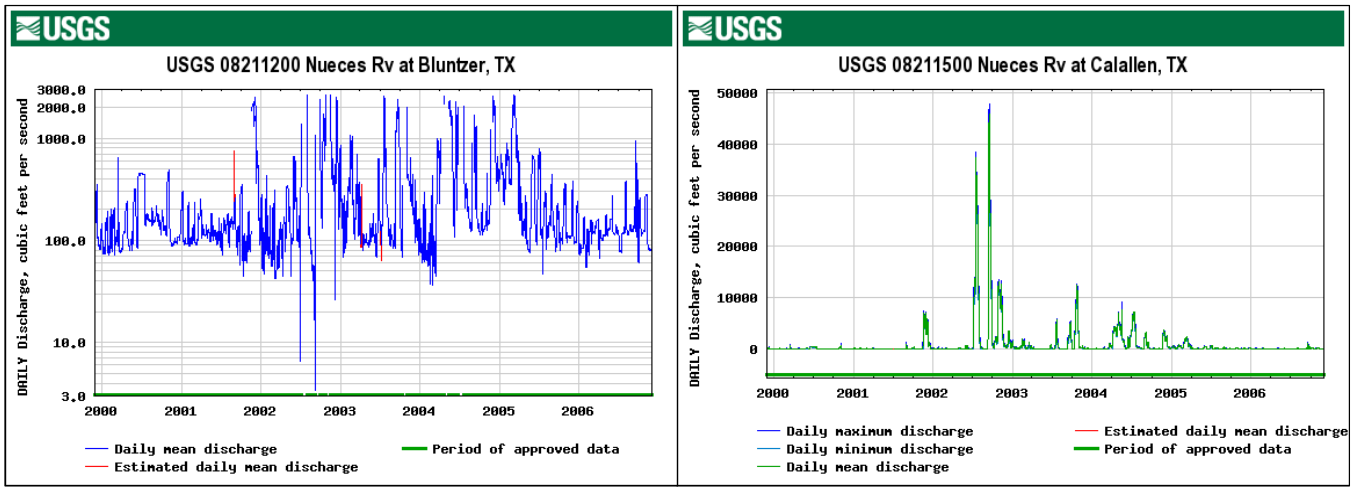


Figure 3.3 – 12: Nueces River Below Lake Corpus Christi

The gauge near Mathis is located at the same location as Station 12965, just below Lake Corpus Christi. In general, the gauge measures the release from the lake. However, during rain events, the release plus runoff is recorded. Recorded flows during this time period range between 9 cfs and 50,800 cfs, with a median flow of 128 cfs.



The gauge at Bluntzer is located at the same location as Station 12964. Recorded flows during this time period range between 3 cfs and 2,650 cfs, with a median flow of 133 cfs.

The gauge at Calallen is located just above the salt water barrier dam and is used to record inflows into the Nueces Estuary. There are five fresh water intakes in the river between this gauge and the one at Bluntzer. Recorded flows during this time period range between 0 cfs and 45,800 cfs, with a median flow of 40 cfs.

Water Quality Analysis

2102_01: lower 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12964 – Bluntzer Bridge at FM 666	NRA	Quarterly	Conventional, Bacteria, Field	1998 – Present

DO (mg/l): 28 samples, ranging from 4.9 to 11.2, median value = 7.8, 1 value below screening level of 5.0, no trends. The one exceedence occurred in August 2002 during relatively high flow. There are no problems with low DO on this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 28 samples, ranging from 7.4 to 8.3, median value = 8.0, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 28 samples, ranging from <0.02 to 0.03, median value = 0.02, criteria value is 0.33, 23 non-detects, no trends. There are no problems with ammonia in this section of the river.

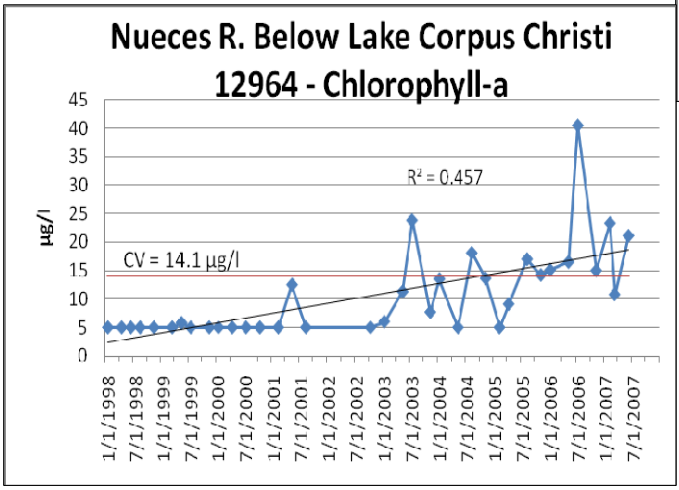
N+N (mg/l): 28 samples, ranging from <0.02 to 0.44, median value = 0.07, criteria value = 1.95, 3 non-detects, no trends. There are no problems with N+N in this section of the river.

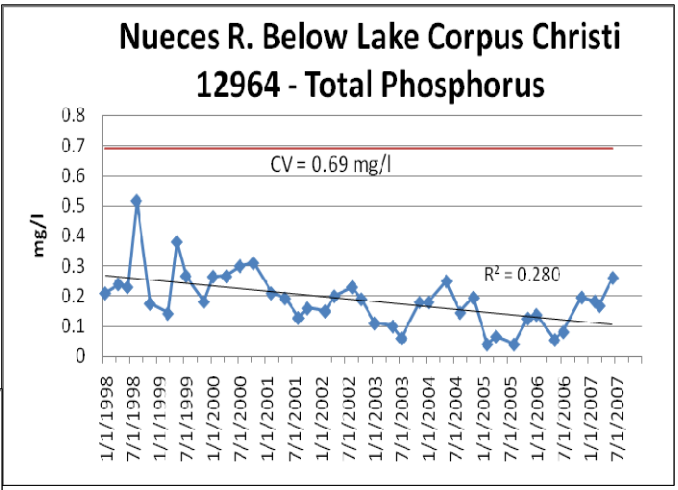
Figure 3.3 – 13: Nueces River Station 12964, June 2007

OP (mg/l): 15 samples, ranging from <0.01 to 0.23, median value = 0.13, criteria value = 0.37, 1 non-detect. There is insufficient data for trend analysis, but there was an overall decrease in values from 1998 to 2003, when the last OP sample was taken. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 28 samples, ranging from <0.04 to 0.31, median value = 0.17, criteria value = 0.69, 1 value non-detect, decreasing trend. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 24 samples, ranging from <5 to 40.5, median value = 10.2, 8 values above criteria value of 14 .1, 9 non-detects, increasing trend. This parameter is listed as being a concern in this part of the river. One possible explanation is that since the Mary Rhodes Pipeline came online, less water is diverted from the river for municipal and industrial use. So during times of little rainfall, the overall flow in the river has been reduced.





TSS (mg/l): 28 samples, ranging from 7 to 61, median value = 31, no trends. There is no apparent problem with TSS on this section of the river.

***E. coli* (cfu): 28 samples, ranging from <1 to 396, median value = 57, geometric mean = 58, 1 value above single sample criteria of 394, geometric mean criteria = 126.** The one exceedence occurred in November 2004 following a flood event. There are no problems with bacteria in this section of the river.

2102_02: upper 14 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12965 – At La Fruta Bridge on SH 359	NRA	Quarterly	Conventional, Bacteria, Field	1998 – Present

DO (mg/l): 28 samples, ranging from 5.7 to 10.6, median value = 8.4, screening level = 5.0, no trends. There are no problems with low DO on this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 28 samples, ranging from 7.7 to 8.5, median value = 8.3, criteria range is 6.5 to 9. There are no problems with pH on this section of the river.

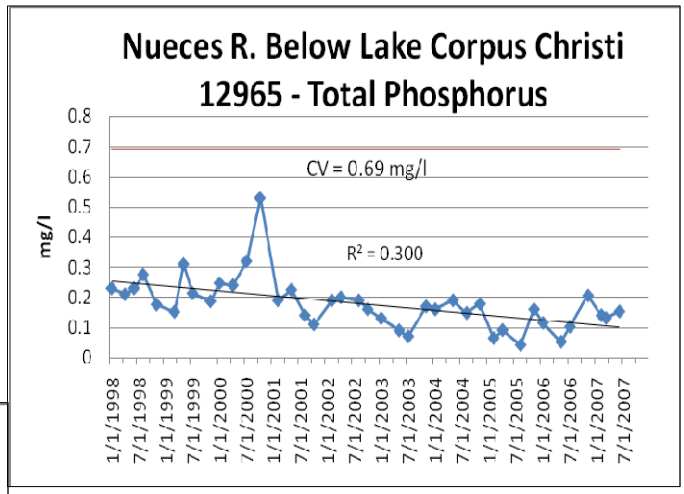
Ammonia (mg/l): 28 samples, ranging from <0.02 to 0.08, median value = 0.02, criteria value = 0.33, 23 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 28 samples, ranging from <0.02 to 0.27, median value = 0.03, criteria value = 1.95, 9 non-detects, no trends. There are no problems with N+N in this section of the river.

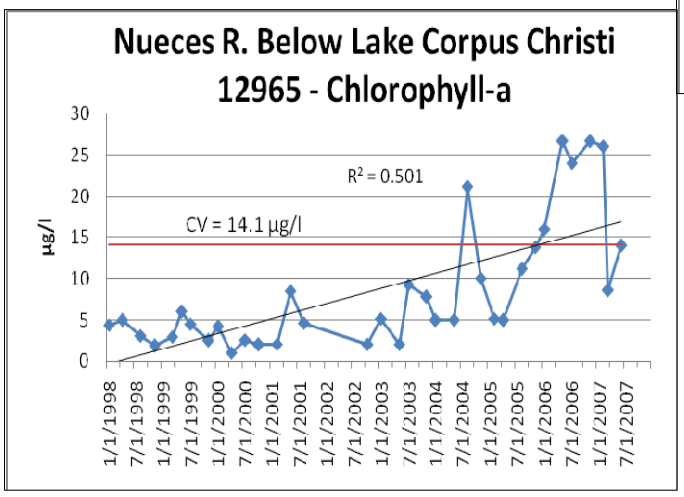
Figure 3.3 – 14: Nueces River Station 12965. June 2007

OP (mg/l): 15 samples, ranging from 0.02 to 0.26, median value = 0.14, criteria value = 0.37. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 28 samples, ranging from 0.04 to 0.53, median value is 0.16 criteria value = 0.69, decreasing trend. There are no problems with total phosphorus in this section of the river.



Chlorophyll-a (µg/l): 24 samples, ranging from 1.1 to 26.7, median value = 5.2, 5 values above criteria value of 14.1, 2 non-detects, increasing trend. This parameter is not listed as being a concern for this part of the river, but it has the potential of being one. One possible explanation is that since the Mary Rhodes Pipeline came online, less water is diverted from the river for municipal and industrial use. So during times of little rainfall, the overall flow in the river has been reduced.

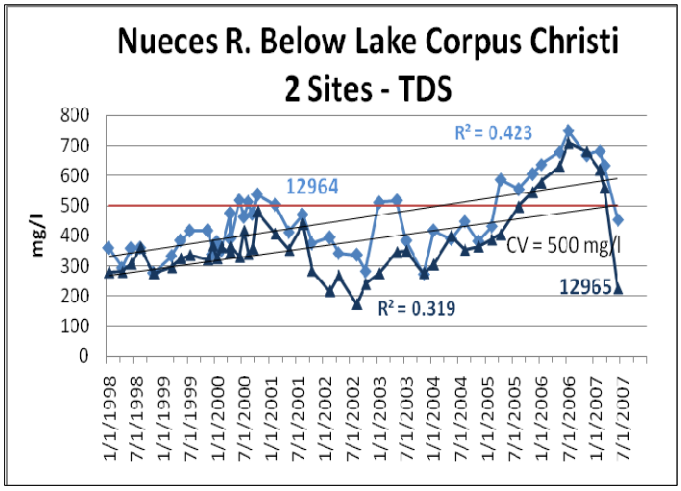


TSS (mg/l): 28 samples, ranging from 3 to 30, median value = 16, no trends. There are no apparent problems with TSS on this section of the river.

***E. coli* (cfu): 28 samples, ranging from <2 to 83, median value = 22, geometric mean = 18, single sample criteria = 394, geometric mean criteria = 126, 3 non-detects.** There are no problems with bacteria in this section of the river.

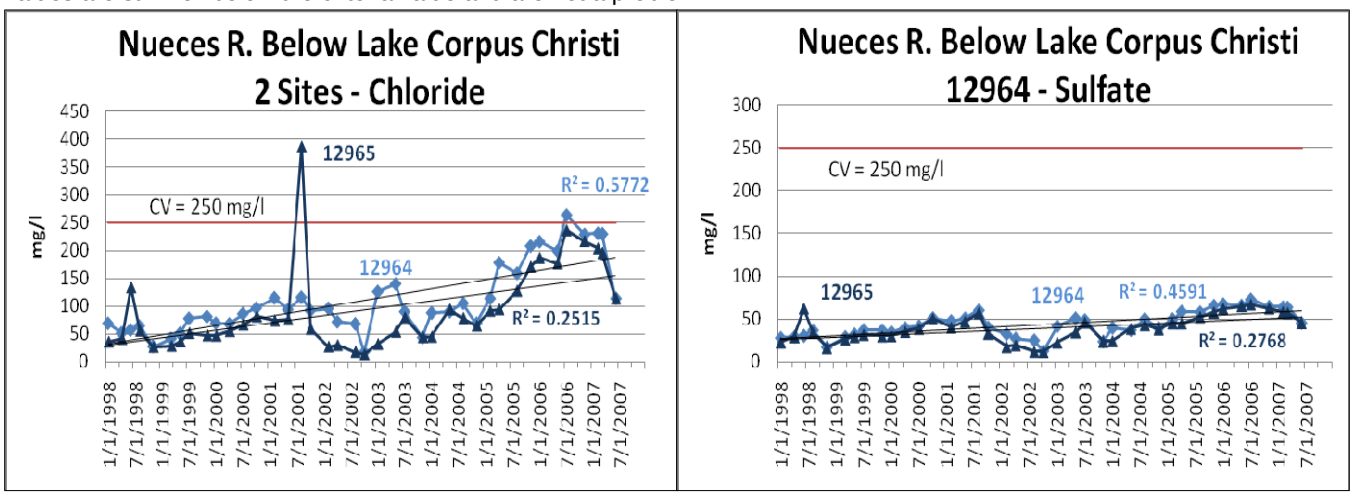
Entire Segment

TDS (mg/l): 66 samples, rangi ng from 173 to 749, median value = 397, average value = 427, average criteria value = 500, increasing trends. As mentioned above, there are a number of fresh water intakes located on this segment, and the increasing TDS levels have caused concern amongst the water providers since the cost to treat the water also increases. There are several suspected causes: groundwater influx, over flow from gravel mining operations, and illegal dumping. None of the possible causes have been confirmed. Another possible reason is that since the Mary Rhodes Pipeline, which supplies water from Lake Texana, came online, less water is diverted from the river for municipal and industrial use. So during times of little rainfall, the overall flow in the river has been reduced. If the trend continues, the segment may be impaired for TDS.



Chloride (mg/l): 56 samples, ranging from 13.3 to 387, median value = 90, average value = 108, average criteria value = 250, increasing trend. Chloride displays a similar pattern as TDS. The problems and possible causes associated with the high TDS also apply to the chloride levels.

Sulfate (mg/l): 56 samples, ranging from 11.6 to 72.7, median value = 44.2, average value = 43, average criteria value = 250, increasing trend. Sulfate displays a similar pattern as TDS and chloride. The problems and possible causes associated with the high TDS and chlorides also apply to the sulfate levels. While there is an increasing trend, the measured values are still well below the criteria value and are not a problem.



Segment 2103, Lake Corpus Christi, impounds the Nueces River and is defined by the 94' MSL elevation from a point 100 m (110 yards) upstream of US 59 in Live Oak County to the Wesley Seale Dam in Jim Wells and San Patricio Counties.

There are many communities and town surrounding the lake.

There are two permitted WWTPs that discharge into the tributaries of the lake.

The segment is divided into six AUs: (01) mid-lake near dam, (02) area approximately 4 miles SE of FM 3162 and FM 534 intersection near western shore, (03) western arm of lake near Lagarto Creek Inlet, (04) upper portion of lake on opposite shore from Hideaway Hill, (05) upper arm of lake at FM 534 crossing, and (06) remainder of the lake (river portion).

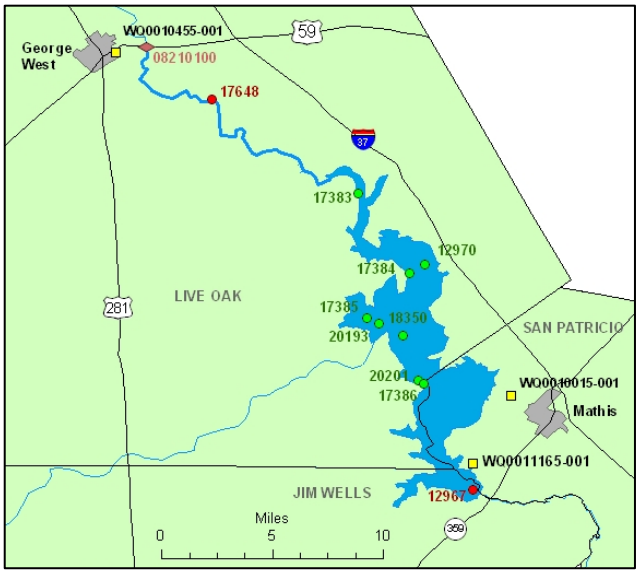


Figure 3.3 – 15: Lake Corpus Christi

Active Wastewater Permits

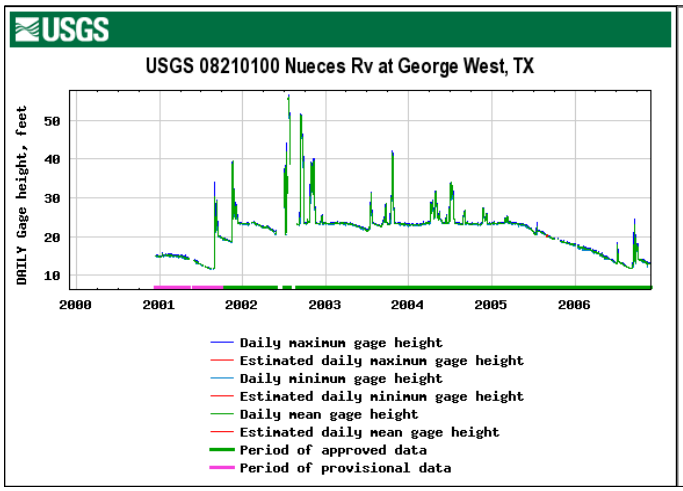
WQ0010015-001 – City of Mathis: 947,000 gpd via ditch to an unnamed reservoir to an unnamed tributary to Lake Corpus Christi.

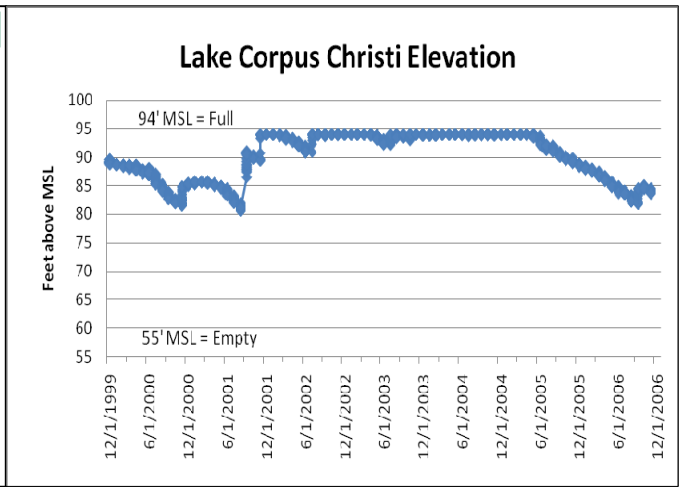
WQ0010455-001 – City of George West: 539,000 gpd via Timon Creek to the Nueces River.

WQ0011165-001 – TPWD – Lake Corpus Christi SP: 67,000 gpd via evaporation and surface irrigation of 25 acres of non-public access land.

Flow and Elevation

There is one USGS gauge at the upper end of this segment: Nueces River at George West, TX. Because this portion of the river is influenced by the level of the water in the lake, only gauge height is recorded.





The lowest the lake levels ever fell during the 2008 Assessment Period was 80.6'. It was full at 94' for a total of 827 days. The median level was 92.1'.

Water Quality Analysis

2103_01: mid-lake near dam

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12967 –380 m NNW of northern tip of dam	NRA	Quarterly	Conventional, Bacteria, Field	1999 – Present

DO (mg/l): 43 samples, ranging from 5.8 to 10.5, median value = 7.9, screening level = 5.0, no trends. There are no problems with DO on this section of the lake. No 24-Hr DO measurements have been taken at this station.

pH (su): 43 samples, ranging from 7.3 to 8.9, median value = 8.4, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the lake.

Ammonia (mg/l): 25 samples, ranging from <0.02 to 0.07, median value = 0.02, criteria value = 0.11, 19 non-detects, no trends. There are no problems with ammonia in this section of the lake.

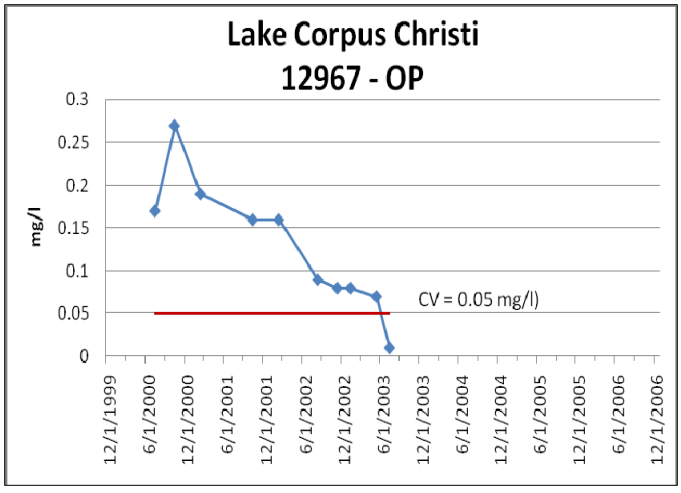
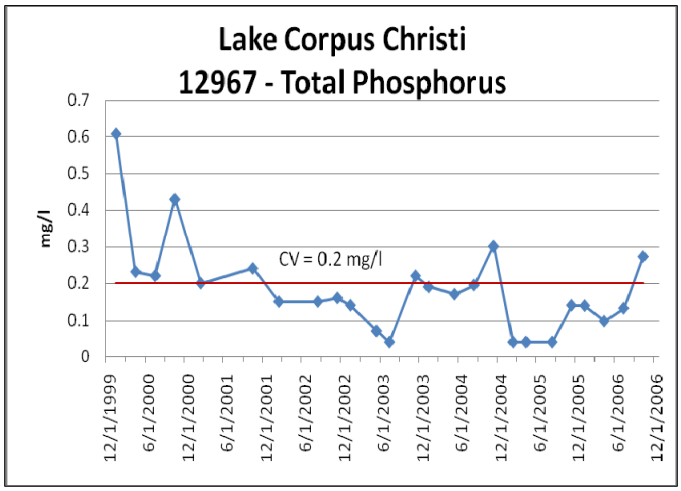


Figure 3.3 – 16: Lake Corpus Christi Station 12967. January 2006

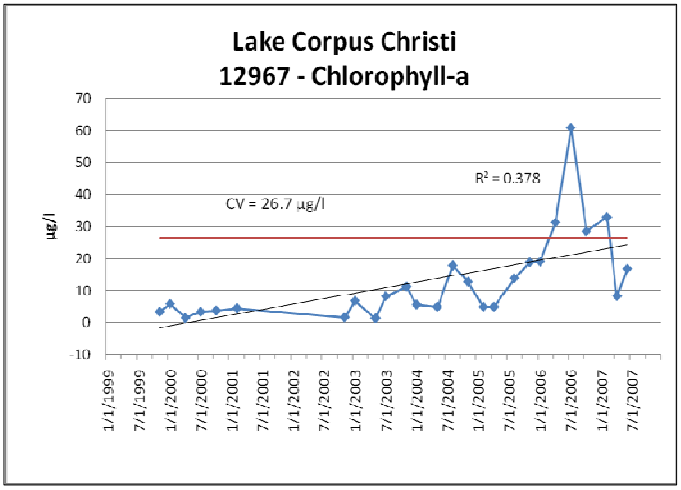
N+N (mg/l): 25 samples, ranging from <0.01 to 0.66, median value = 0.01, 1 value above criteria value of 0.37, 14 samples non-detects, no trends. The one exceedence occurred following a major inflow event. There are no problems with N+N in this section of the lake.

OP (mg/l): 10 samples, ranging from <0.01 to 0.27, median value = 0.12, 9 values above criteria value of 0.05, 1 non-detect. OP has been listed as a concern for this area of the lake. OP sampling was discontinued in FY 2004 due to the TCEQ's requirement that the samples be field filtered. Since this parameter is a concern, OP sampling will be resumed in FY 2009.

Total Phosphorus (mg/l): 25 samples, ranging from <0.04 to 0.61, median value = 0.16, 8 values above criteria value of 0.2, 3 non-detects. Total phosphorus has also been listed as a concern for this area of the lake. The higher values tend to correlate to lower lake levels.



Chlorophyll-a (µg/l): 22 samples, ranging from 1.4 to 60.9, median value = 6, 3 values above criteria value of 26.7, 3 non-detects, increasing trend. This parameter is not listed as being a concern for this part of the lake, but based on limited data, there appears to be an increasing trend. The general rise in values corresponds to lower lake levels.



TSS (mg/l): 25 samples, ranging from 2 to 24, median value = 10. There are no apparent problems with TSS on this section of the lake.

***E. coli* (cfu): 25 samples, ranging from <1 to 490, median value = 1, geometric mean = 2, 1 value above the single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the lake. The one exceedence occurred in October 2000 after significant inflow into the lake.

2103_02: area approximately 4 miles SE of FM 3162 and FM 534 intersection near western shore

Station Summary

Site	Date Range
17386 – approx 4 miles SE of intersection of FM 3162 and FM 534, approximately 0.2 miles off western shore	1999 – 2004
18350 – mid-lake 1.42 km east of the intersection of Canyon Dr. and McWhorter Dr. in the Lagarto Subdivision	2004 – 2006
20201 – 262 m north and 266 m east of Live Oak Lane at Miller Drive near Mathis, Texas	2005 – 2006

NRA had conducted routine monitoring at Station 18350. The site had to be dropped because the boat ramp was closed.

DO (mg/l): 30 samples, ranging from 5.7 to 11.6, median value = 7.9, screening level = 5.0. There are no problems with DO on this section of the lake. No 24-Hr DO measurements have been taken at any of the stations.

pH (su): 31 samples, ranging from 7.8 to 8.7, median value = 8.4, criteria range is 6.5 to 9. There are no problems with pH on this section of the lake.

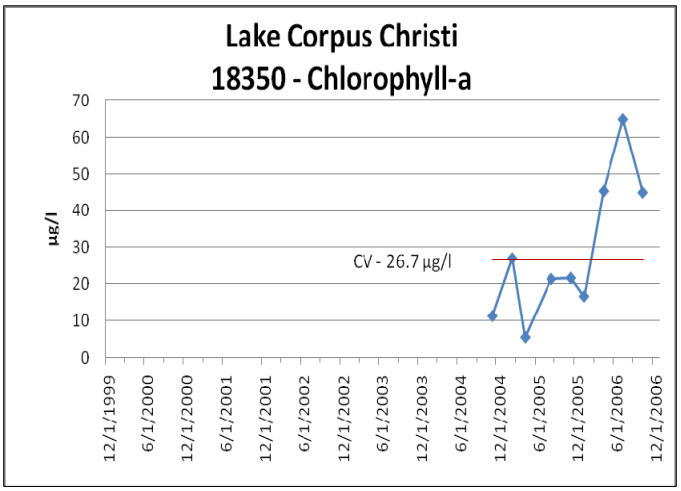
Ammonia (mg/l): 9 samples, ranging from <0.02 to 0.04, median value = 0.02, criteria value = 0.11, 8 non-detects. There are no problems with ammonia in this section of the lake.

N+N (mg/l): 9 samples, ranging from <0.02 to 0.22, median value = 0.02, criteria value = 0.37, 5 non-detects. There are no problems with N+N in this section of the lake.

Figure 3.3 – 17: Lake Corpus Christi Station 12967 – January 2006

Total Phosphorus (mg/l): 9 samples, ranging from <0.04 to 0.24, median value = 0.17, 2 values above criteria value of 0.2, 3 non-detect. There are no problems with total phosphorus in this section of the lake. Although there is not enough data for a trend analysis, there was an increase in values in 2006 as the lake level fell. Monitoring may need to be re-established in this AU to determine whether or not there should be a concern for total phosphorus in this section of the lake.

Chlorophyll-a (µg/l): 9 samples, ranging from 5.4 to 64.9, median value = 21.6, 4 values above criteria value of 26.7. This parameter is listed as being a concern for this part of the lake. The general rise in values corresponds to lower lake levels. Monitoring may need to be re-established in this AU to determine if is there is actually a concern for chlorophyll-a in this section of the lake.



TSS (mg/l): 9 samples, ranging from 10 to 60, median value = 28. There are no apparent problems with TSS on this section of the lake.

***E. coli* (cfu): 9 samples, ranging from <1 to 51, median value = 4, geometric mean = 3, single sample criteria = 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the lake.

2103_03: western arm of lake near Lagarto Creek Inlet

Station Summary

Site	Date Range
17385 – approx 1 mile east of FM 534 bridge near Ramireno Creek	2002 – 2004
20193 – near Lagarto Creek arm 785 m north and 71 m east of Live Oak County Road (CR) 175 at Minson/Alligator Drive	2005 – 2006

Only DO and pH data were available during the 2008 Assessment period.

DO (mg/l): 15 samples, ranging from 5.9 to 10.1, median value = 8.1, screening level = 5.0. There are no problems with DO on this section of the lake. No 24-Hr DO measurements have been taken at either station.

pH (su): 15 samples, ranging from 7.8 to 8.7, median value = 8.3, criteria range is 6.5 to 9. There are no problems with pH on this section of the lake.

2103_04: upper portion of lake on opposite shore from Hideaway Hill

Station Summary

Site	Date Range
12970 – near Hideaway Hollow west of Hideaway Hill 2.27 km west of FM 3024 at Live Oak CR 392	2005 – 2006
17384 – approx 0.2 miles off western shore directly west of Hideaway Hill	2002 – 2004

Only DO and pH data were available during the 2008 Assessment period.

DO (mg/l): 14 samples, ranging from 4.6 to 9.9, median value = 7.5, 1 value below screening level of 5.0. The one exceedence occurred in July 2002 following a large inflow event. There are no problems with DO on this section of the lake. No 24-Hr DO measurements have been taken at either station.

pH (su): 14 samples, ranging from 7.4 to 8.6, median value = 8.2, criteria range is 6.5 to 9. There are no problems with pH on this section of the lake.

2103_05: upper arm of lake at FM 534 crossing

Station Summary

Site	Date Range
17383 – FM 534 bridge near upper end of Nueces River arm	1999 – 2006

Only DO and pH data were available during the 2008 Assessment period.

DO (mg/l): 18 samples, ranging from 4.2 to 10.7, median value = 6.7, 1 value below screening level of 5.0. The one exceedence occurred in July 2002 following a large inflow event. There are no problems with DO on this section of the lake. No 24-Hr DO measurements have been taken at this station.
pH (su): 18 samples, ranging from 7.2 to 8.5, median value = 8.0, criteria range is 6.5 to 9. There are no problems with pH on this section of the lake.

2103_06: remainder of lake (river portion)

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
17648 – Live Oak CR 141 near River Creek Acres	NRA	Quarterly	Conventional, Bacteria, Field	2002 – Present

This AU is more like a river than a lake, but it is influenced by the water level in the lake. Some of the parameters discussed below have exceedences based on lake criteria, but not for stream criteria. Since this is a transitional section between the river and the lake, the criteria value may be too low.

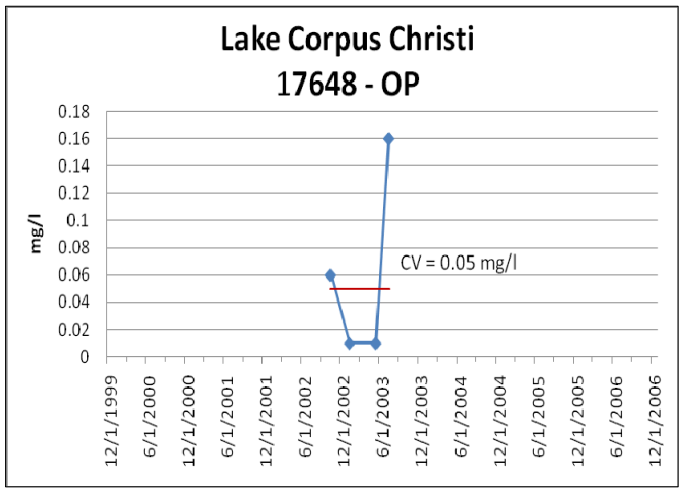
Figure 3.3 – 18: Lake Corpus Christi/Nueces River Station 17648. June 2007

DO (mg/l): 17 samples, ranging from 5.4 to 14.8, median value = 9.1, screening level = 5.0. DO does not show the typical seasonal variation. The highest reading was taken in August 2004. There are no apparent problems with DO on this section of the river, and no 24-Hr DO measurements have been taken at this station.

pH (su): 17 samples, ranging from 7.7 to 8.7, median value = 8.0, criteria range is 6.5 to 9. There is a slight upward shift in the overall range beginning in mid 2004 which corresponds to the lower water levels. There are no problems with pH on this section of the river.

Ammonia (mg/l): 17 samples, ranging from <0.02 to 0.05, median value = 0.02 criteria value = 0.11, 14 non-detects. There are no problems with ammonia in this section of the river.

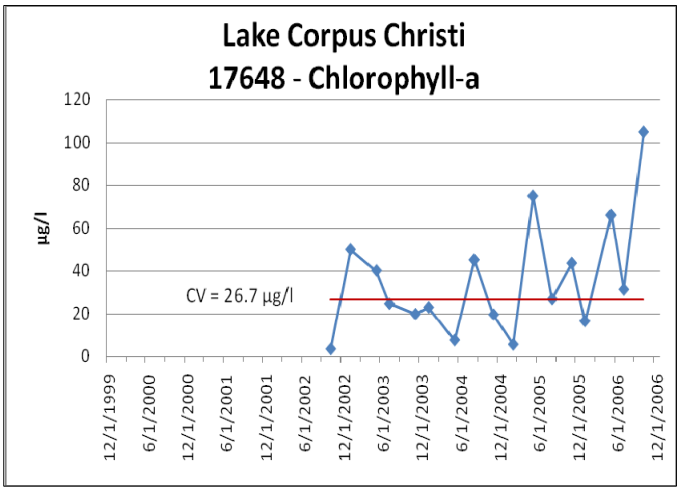
N+N (mg/l): 17 samples, ranging from <0.02 to 1.05, median value = 0.02, 2 values above criteria value of 0.37, 9 non-detects. Both of the exceedences are less that the 1.95 criteria value for N+N on rivers. There are no problems with N+N in this section of the river.



OP (mg/l): 4 samples, ranging from <0.01 to 0.16, 2 values above criteria value of 0.05, 2 non-detects. OP is listed as being a concern on this section of the river based on this limited data. Both of the exceedences are less that the 0.37 criteria value for OP on rivers.

Total Phosphorus (mg/l): 17 samples, ranging from <0.04 to 0.65, median value = 0.11, 5 values above criteria value of 0.2, 1 non-detect. There are no problems with total phosphorus in this section of the river. All of the exceedences are less that the 0.69 criteria value for total phosphorus on rivers.

Chlorophyll-a (µg/l): 17 samples, ranging from 3.6 to 105, median value = 27, 9 values above criteria value of 26.7. This parameter is listed as being a concern for this part of the river. If the river criteria value of 14.1 is used, 14 of the values are exceedeences. The general rise in values corresponds to lower lake levels.

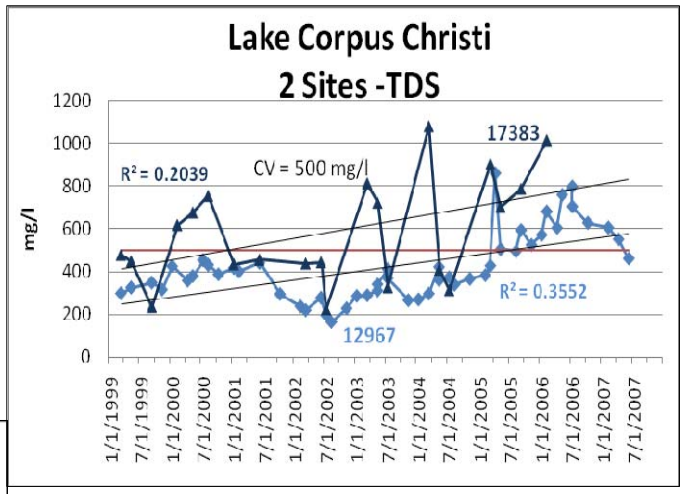


TSS (mg/l): 17 samples, ranging from 7 to 200, median value = 19. The highest reading occurred in October 2002 following flooding. All other values are <55. There is no apparent problem with TSS on this section of the river.

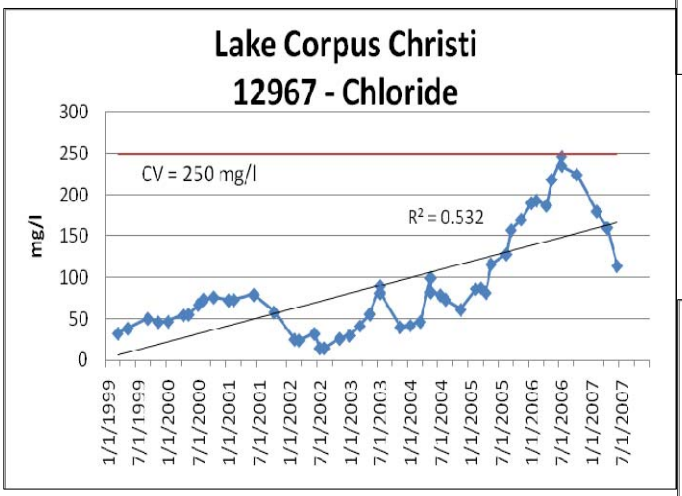
***E. coli* (cfu): 16 samples, ranging from 2 to 3500, median value = 8, geometric mean = 12, 1 value above single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river. The highest reading occurred in October 2002 following flooding. All other values are <60.

Entire Segment

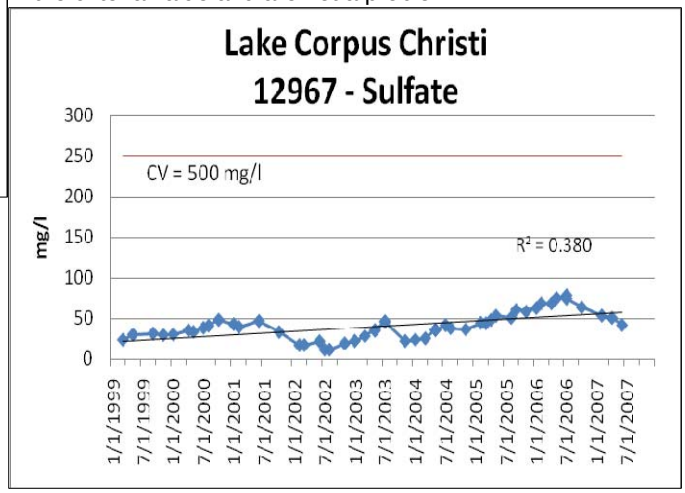
TDS (mg/l): 116 samples, ranging from 165 to 1079, median value = 424, average value = 478, average criteria value = 500, increasing trends. TDS values tend to fall after a major inflow event, but then slowly rise as the lake remains nearly full and as then again as the water levels drop. If the trend continues, TDS may become an impairment in this segment.



Chloride (mg/l): 53 samples, ranging from 14.6 to 251, median value = 80.9, average value = 103, average criteria value = 250, increasing trend. Chloride displays a similar pattern as TDS, with falling values after major inflows then an overall rise. While there is an increasing trend, the measured values are still below the criteria value.



Sulfate (mg/l): 53 samples, ranging from 11.4 to 81.3, median value = 44.2, average value = 44, average criteria value = 250, increasing trend. Sulfate also displays a similar pattern as TDS and chloride, with falling values after major inflows then an overall rise. While there is an increasing trend, the measured values are still well below the criteria value and are not a problem.



Segment 2104, Nueces River Above Frio River, flows 91 miles from Holland Dam in La Salle County to its confluence with the Frio River in Live Oak County.

This section of the segment is known as the braided reach. It is a wide, flat area where the river branches into multiple channels. The area is generally ranch lands and brush. Tilden is the only town along this segment.

The segment is divided into three AUs: (01) the lower 25 miles, (02) the 25 miles surrounding SH 16, and (03) the upper 46 miles.

Figure 3.3 – 19: Nueces River Above Frio River

Active Wastewater Permits

WQ0004184-000 – Webb County – Colorado Acres Water Plant: 28,800 gpd of reject water from reverse osmosis treatment via evaporation.

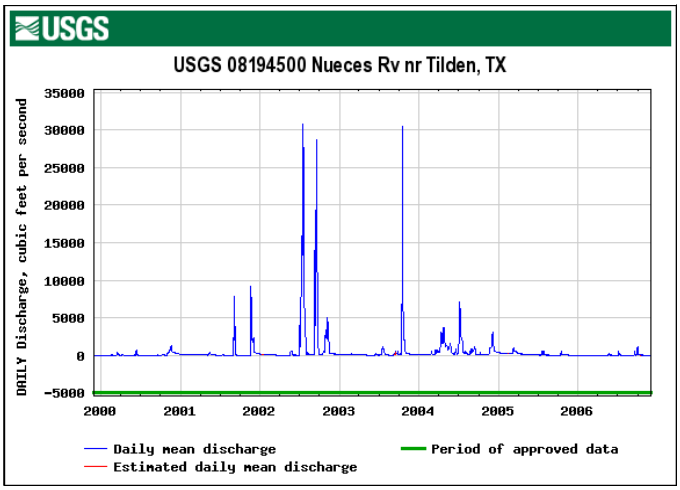
WQ0010088-001 – Freer Water Control and Improvement District (WCID): 280,000 gpd via surface irrigation on 250 acres of nonpublic access agricultural land.

WQ0013461-001 – US Department of Justice: 300,000 gpd via effluent line to the Nueces River plus irrigation on 82 acres in Segment 2116 watershed.

WQ0013943-001 – Encinal WSC: 95,000 gpd via irrigation on 40 acres.

Flow

There is one USGS gauge in this segment: Nueces River near Tilden, TX. The gauge is at the same location as Station 12973. Recorded flows during this time period range between 0 cfs and 30,800 cfs, with a median flow of 42 cfs.



Water Quality Analysis

2104_01: lower 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12972 – FM 1042 bridge 1.2 miles north of Simmons	NRA	Quarterly	Conventional, Bacteria, Field	2002 – Present

DO (mg/l): 12 samples, ranging from 5.6 to 11.0, median value = 6.4, screening level = 5.0. There are no problems with low DO on this section of the river.

Average 24–Hr DO (mg/l): 11 samples, ranging from 5.4 to 10.9, median value = 6.3, criteria value = 5.0. The 24-Hr DO measurements seem to confirm that low DO is not a problem on this section of the river.

Minimum 24–Hr DO (mg/l): 11 samples, ranging from 5.1 to 10.2, median value = 5.9, criteria value = 3.0.

pH (su): 11 samples, ranging from 6.8 to 8.1, median value = 7.8, criteria range is 6.5 to 9. The relatively low pH value occurred in August 2003 during very low flow conditions.

Ammonia (mg/l): 11 samples, ranging from <0.02 to 0.08, median value = 0.02, criteria value = 0.33, 10 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 13 samples, ranging from <0.01 to 2.1, median value = 0.17, 1 value above criteria value of 1.95, 3 non-detects. There are no problems with N+N in this section of the river. The one high reading correlates to relatively high flows, indicating possible runoff from the surrounding farm and ranch lands.

OP (mg/l): 11 **samples, ranging from <0.01 to 1.84, median value = 0.07, 1 value above criteria value of 0.37, 1 non-detect.** There are no problems with OP in this section of the river. The one high value occurred in May 2003 and may not be an accurate reading. The field notes indicate that the OP reading was greater than the total phosphorus reading on this date.

Total Phosphorus (mg/l): 10 samples, ranging from <0.01 to 0.41, median value = 0.13, criteria value = 0.69, 3 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 12 samples, ranging from <0.25 to 13.8, median value = 0.25, criteria value = 14.1, 9 non-detects. There are no problems with chlorophyll-a in this section of the river. The highest value occurred in October 2006 during very low flow conditions.

Figure 3.3 – 20: Nueces River Above Frio River Station 12972. June 2007

TSS (mg/l): 4 samples, ranging from 24 to 115, median value = 104. There is a noticeable decrease in TSS levels from the TMDL sampling and the routine sampling, with no apparent correlation to flow.

***E. coli* (cfu): 7 samples, ranging from 12 to 390, median value = 71, geometric mean = 59, single sample criteria = 394, geometric mean criteria = 126.** There are not enough samples for the 2008 Assessment, but there does not appear to any problems with bacteria in this section of the river. The one high reading close to the criteria occurred in September 2003 during relatively high flow.

The 2008 Assessment also lists concerns for impaired habitat, fish community, and macrobenthos community on this section of the river.

2104_02: 25 miles surrounding SH 16

Station Summary

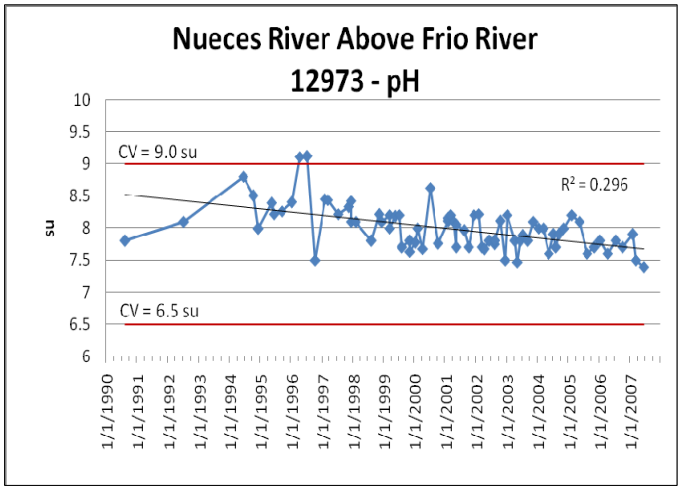
Site	Entity	Frequency	Parameter Groups	Date Range
12973 – SH 16 south of Tilden	NRA	Quarterly	Conventional, Bacteria, Field	1972 – Present
17897 – approx 13.9 km downstream of SH 16 on Smith Lease				2002 – 2004

DO (mg/l): 56 samples, ranging from 2.6 to 10.4, median value = 6.8, 6 values below screening level of 5.0, no trends. Although there are a number of values below the criteria, there are not enough to be considered an impairment.

Average 24–hour DO (mg/l): 14 samples, ranging from 5.1 to 9.9, median value = 6.0, criteria value = 5.0. The 24-Hr DO measurements confirm that low DO is not a problem on this section of the river.

Minimum 24–hour DO (mg/l): 14 samples, ranging from 3.1 to 9.6, median value = 5.4, criteria value = 3.0.

pH (su): 58 samples, ranging from 7.5 to 8.6, median value = 7.8, criteria range is 6.5 to 9, decreasing trend. There is a fairly large variation in pH values, but it does not seem to correlate with seasons or changes in flow. The data indicates a decreasing trend. The values are still well above the minimum criteria value and are not a concern at this time. However, this parameter needs to be watched and understood so that it does not become a problem.



Ammonia (mg/l): 54 samples, ranging from <0.02 to 0.15, median value = 0.02, criteria value = 0.33, 45 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 55 samples, ranging from <0.01 to 1.59, median value = 0.15, criteria value = 1.95, 19 non-detects, no trends. There are no problems with N+N in this section of the river. All of the highest readings correlate to relatively high flows, indicating possible runoff from the surrounding farm and ranch lands.

OP (mg/l): 41 samples, ranging from <0.01 to 0.41, median value = 0.05, 1 value above criteria value of 0.37, 10 non-detects, no trends. There are no problems with OP in this section of the river. The one high value occurred during a very high flow event during July 2004 at Station 12973. Flow was measured at 5,650 cfs.

Total Phosphorus (mg/l): 38 samples, ranging from <0.01 to 0.33, median value = 0.10, criteria value = 0.69, 7 non-detects, no trends. There are no problems with total phosphorus in this section of the river.

Figure 3.3 – 21: Nueces River Above Frio River Station 12973, June 2007

Chlorophyll-a (µg/l): 33 samples, ranging from <0.25 to 37.5, median value = 2, 3 values above criteria value of 14.1, 14 non-detects, no trends. There are no problems with chlorophyll-a in this section of the river. The two highest values occurred in April and July 2006 occurred following periods of very little or no flow. The other exceedance occurred in February 2001 during moderate flows.

TSS (mg/l): 32 samples, ranging from 6 to 311, median value = 30, no trends. The higher values correlate to higher flow and are mostly due to runoff from the surrounding farm and ranch lands.

***E. coli* (cfu): 38 samples, ranging from <1 to 3800, median value = 64, geometric mean = 56, 1 value above the single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river. The one high reading occurred in November 2003 following a flood event in October 2003.

The 2008 Assessment also lists a concern for impaired fish community on this section of the river.

2104_03: upper 46 miles

Station Summary

Site	Date Range
12974 – at FM 624	2002 – 2004

DO (mg/l): 12 samples, ranging from 2.1 to 10.1, median value = 5.9, 3 values below screening level of 5.0. Low DO had been listed as an impairment on this section of the segment. Based on 24-Hr DO measurements taken as part of a TMDL, this is impairment has been de-listed. The 2008 Assessment still lists low DO as a concern in this section of the river based on the grab samples, but the 24-Hr DO readings take precedent.

Average 24–Hr DO (mg/l): 11 samples, ranging from 3.0 to 10.0, median value = 6.1, 2 values below the criteria value of 5.0. The 24-hour DO measurements removed the impairment for low DO.

Minimum 24–Hr DO (mg/l): 11 samples, ranging from 1.9 to 9.8, median value = 5.6, 1 value below the criteria value of 3.0.

pH (su): 13 samples, ranging from 7.4 to 8.2, median value = 7.9, criteria range is 6.5 to 9. There are no problems with pH in this section of the river.

Ammonia (mg/l): 11 samples, ranging from <0.03 to 0.16, median value = 0.03, criteria value = 0.33, 10 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 12 samples, ranging from <0.01 to 0.31, median value = 0.02, criteria value = 1.95, 6 non-detects. There are no problems with N+N in this section of the river.

OP (mg/l): 11 **samples, ranging from <0.01 to 0.148, median value = 0.04, criteria value = 0.37, 2 non-detects.** There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 9 samples, ranging from <0.01 to 0.28, median value = 0.16, criteria value = 0.69, 3 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 12 samples, ranging from <0.25 to 10, median value = 0.25, criteria value = 14.1, 8 non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 2 samples, ranging from 72 to 206. There is insufficient data to say whether or not TSS is a problem in this section of the river.

***E. coli* (cfu): 8 samples, ranging from 14 to 1000, median value = 43, geometric mean = 52, 1 value above the single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river. The one high reading correlates to higher flow.

The 2008 Assessment also lists a concern for impaired fish community on this section of the river.

Entire Segment

TDS (mg/l): 82 samples, ranging from 210 to 4650, median value = 392, average value = 605, average criteria value = 1500, no trends. The higher values were recorded in January and April 2006 during times of very low flow in the river. Flows resumed due to September and October 2006 rains and TDS have since fallen below the criteria value.

Chloride (mg/l): 80 samples, ranging from 9.8 to 2310, median value = 89, average value = 186, average criteria value = 700, no trends. Like TDS, the values were highest in 2006 and fell after the October 2006 rains.

Sulfate (mg/l): 77 samples, ranging from 6.1 to 183, median value = 35, average value = 43, average criteria value = 300, 4 non-detects, no trends. Like TDS and chloride, the values rose from August 2004 through August 2006 and fell after the October 2006 rains.

Segment 2105, Nueces River above Holland Dam,

flows 78 miles from a point 100 m (110 yards) upstream of FM 1025 in Zavala County to Holland Dam in La Salle County.

This segment is the middle reach of the Nueces River, above Lake Corpus Christi. The area is generally farm and ranch lands. There are a several small cities along the river, including Crystal City and Cotulla.

The segment is divided into three AUs: (01) the lower 25 miles, (02) the 25 miles around FM 190, and (03) remainder of segment (upper reach).

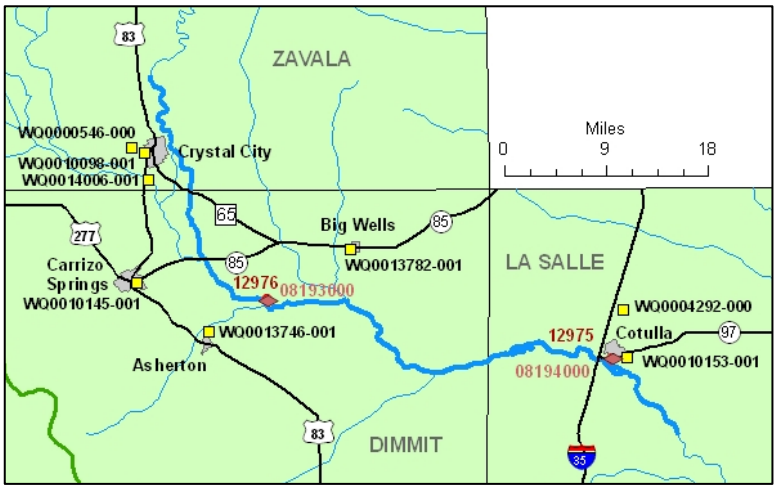


Figure 3.3 – 22: Nueces River Above Holland

Active Wastewater Permits

WQ0000546-000 – Del Monte Foods (Crystal City Plant)

WQ0004292-000 – Cotulla Border Patrol Station

WQ0010098-001 – City of Crystal City: 1,200,000 gpd via unnamed tributary to Turkey Creek to Espantosa Lake to Soldier Slough to Line Oak Slough to the Nueces River.

WQ0010145-001 – City of Carrizo Springs: 950,000 gpd via Carrizo Creek to Soldier Slough to the Nueces River.

WQ0010153-001 – City of Cotulla: 990,000 gpd via Mustang Creek to the Nueces River.

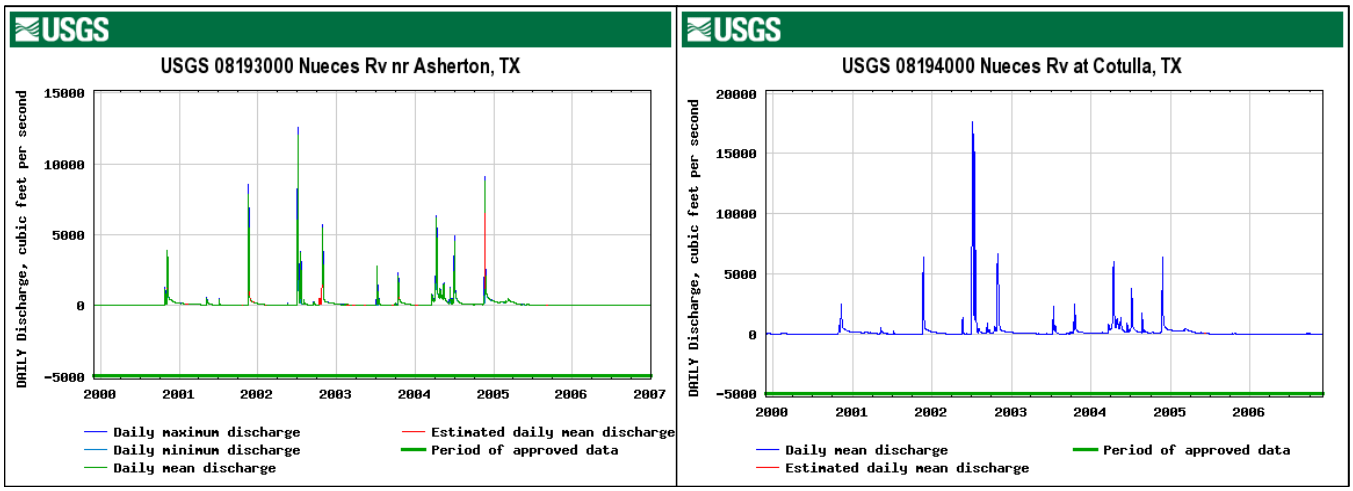
WQ0013746-001 – City of Asherton: 180,000 gpd via unnamed tributary to El Moro Creek to Soldier Slough to the Nueces River.

WQ0013782-001 – City of Big Wells: 150,000 gpd via unnamed tributary to Arroyo Negro to the Nueces River.

WQ0014006-001 – Zavala County (Crystal City Land Fill): 50,000 gpd via Turkey Creek to Espantosa Lake to Soldier Slough to Soldier Lake to Soldier Slough to the Nueces River.

Flow

There are two USGS gauges in this segment: Nueces River near Asherton, TX and Nueces River at Cotulla, TX.



The gauge located near Asherton, TX is at the same location as Station 12976. Recorded flows during this time period range between 0 cfs and 12,000 cfs, with a median flow of 16 cfs. The gauge located at Cotulla, TX is located at the same location as Station 12975. Recorded flows during this time period range between 0 cfs and 17,600 cfs, with a median flow of 20 cfs.

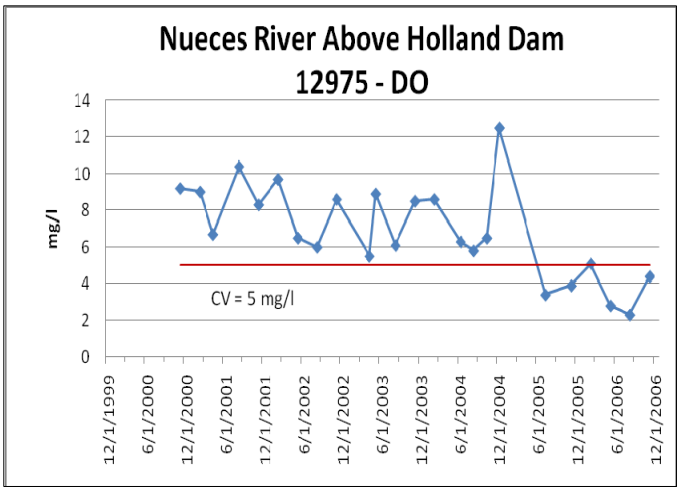
Water Quality Analysis

2105_01: lower 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12975 – at Bus. IH 35 south of Cotulla	TCEQ	Quarterly	Conventional, Bacteria, Field	1972 – Present

DO (mg/l): 24 samples, ranging from 2.3 to 12.5, median value = 6.5, 5 values below screening level of 5.0, no trends. The 2008 Assessment lists this as being a concern. However, all the values that were below the criteria value occurred with stream flows were negligible (0 cfs to 0.3 cfs). The DO values have increased since the end of the assessment period. No 24-Hr DO measurements have been taken at this site.



pH (su): 23 samples, ranging from 7.0 to 8.5, median value = 7.9, criteria range is 6.5 to 9, no trends. There are no problems with pH in this section of the river.

Ammonia (mg/l): 25 samples, ranging from <0.05 to 0.15, median value = 0.05, criteria value = 0.33, 19 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 26 samples, ranging from <0.04 to 2.02, median value = 0.09, 1 value above criteria value of 1.95, 11 non-detects, no trends. There are no problems with N+N in this section of the river. The one high value occurred in November 2000 following relatively high flows.

OP (mg/l): 26 samples, ranging from <0.04 to 0.14, median value = 0.04 criteria value = 0.37, 21 non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 24 samples, ranging from <0.05 to 0.71, median value = 0.08, 1 value above criteria value of 0.69, 15 values non-detects, no trends. There are no problems with total phosphorus in this section of the river. The one value that exceeded the criteria value occurred in May 2002 during relatively high flow following several months of no flow.

Chlorophyll-a (µg/l): 25 samples, ranging from <1 to 122, median value = 1, 4 values above criteria value of 14.1, 21 non-detects, no trends. There are no problems with chlorophyll-a in this section of the river. All but one of the high values occurred during times of virtually no flow and the water was stagnant.

TSS (mg/l): 25 samples, ranging from 1 to 596, median value = 25, no trends. There are no problems with TSS in this section of the river. The maximum value occurred in May 2002 during relatively high flow following several months of no flow. All other values are <200.

***E. coli* (cfu): 21 samples, ranging from 3 to 1011, median value = 63, geometric mean = 75, 3 values above the single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river. The higher readings tend to correlate to higher flow and runoff from the surrounding farm and ranch lands and storm water from the City of Cotulla. However, there is one value of 1000 recorded in November 2006 after about a month of no flow. No comments were recorded at the time of sampling to indicate any unusual circumstances. Both the City of Cotulla and the Cotulla Border Patrol WWTPs discharge below the sampling point. The three values recorded in 2007 are all below the single sample criteria.

2105_02: 25 miles around FM 190

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12976 – bridge on FM 190-north of Asherton	TCEQ	Quarterly	Conventional, Bacteria, Field	1999 – 2001, 2007 – Present

There is insufficient data for analysis on this AU. Only TDS data, calculated from conductivity, were recorded from 1999 to 2001.

2105_03: remainder of segment (upper reach)

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
20156 – immediately upstream of SH 85 approx 12 miles east of Carrizo Springs	TCEQ	Quarterly	Conventional, Bacteria, Field	2007 – Present

There is insufficient data for analysis on this AU.

Entire Segment

TDS (mg/l): 37 samples, ranging from 161 to 1200, median value = 312, average value = 405, average criteria value = 900, no trends. Values rose from ~400 to 1200 from August 2004 through August 2006 when there was little or no flow in the river. Flows resumed due to September and October 2006 rains and TDS values have since fallen below the criteria.

Chloride (mg/l): 26 samples, ranging from 10 to 451, median value = 39, average value = 76, average criteria value = 200, no trends. Like TDS, the values rose from August 2004 through August 2006 and fell after the October 2006 rains.

Sulfate (mg/l): 26 samples, ranging from 12 to 185, median value = 31, average value = 50, average criteria value = 200, no trends. Like TDS and chloride, the values rose from August 2004 through August 2006 and fell after the October 2006 rains.

Segment 2106, Nueces River / Lower Frio River, flows 27 miles from Choke Canyon Dam in Live Oak County to a point 100 m (110 yards) upstream of US 59 in Live Oak County.

This section of the segment includes the Frio River from Choke Canyon Dam to its confluence with the Nueces at the end of segment 2104. The City Three Rivers is on the Frio River and the City of George West is located just west of the end of the segment at Hwy 59. The area is a combination of row crop, ranch and brush.

The segment is divided into two AUs: (01) the lower 17 miles and (02) the upper 10 miles.

Figure 3.3 – 23: Nueces River / Lower Frio River

Active Wastewater Permits

WQ0001353-000 – Diamond Shamrock Refining Company: 1,500,000 gpd: unnamed ditch to the Lower Frio River. Diamond Shamrock Refining Company has applied for a major amendment to this permit to:

- increase the daily average and maximum permitted flow at Outfall 001 to 3,000,000 gpd
- increase effluent limitations for all limited parameters at Outfall 001
- remove monitoring/reporting requirements for metals and toxic chemicals

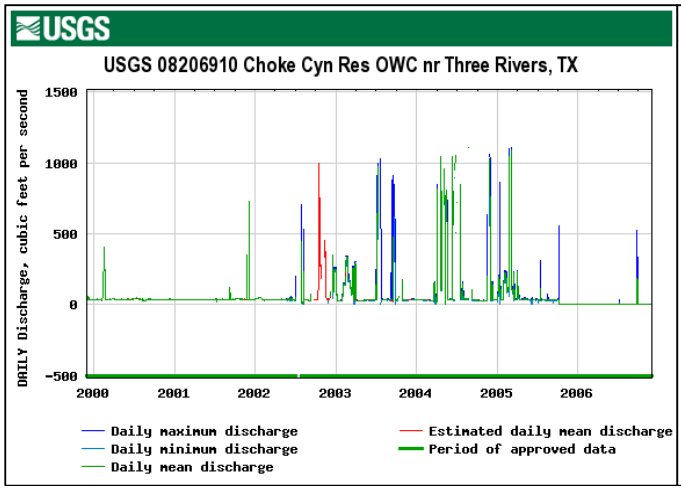
The discharge from this plant is upstream of Lake Corpus Christi, the main water supply for the City of Corpus Christi and the surrounding area. The City and NRA are concerned about the water quality standards being exceeded on this segment, primarily TDS, and about the potential for contamination of Lake Corpus Christi. The City and NRA have met with Diamond Shamrock officials to express their concerns and to try and develop a compromise.

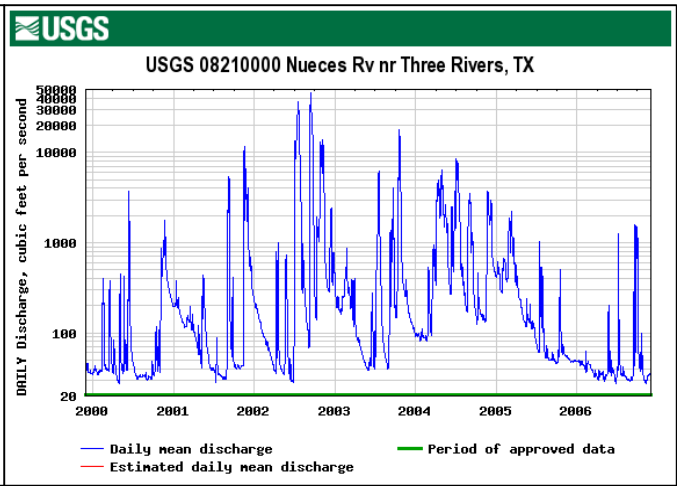
WQ0010301-001 – City of Three Rivers: 400,000 gpd, directly to the Frio River.

WQ0010301-002 – City of Three Rivers: 400,000 gpd, proposed – will replace WQ0010301-001 but use the same outfall.

Flow

There are two USGS gauge in this segment: Frio River at Choke Canyon Reservoir Outlet Works Channel near Three Rivers, TX; and Nueces River near Three Rivers, TX.





The gauge at Choke Canyon more or less measures the release from the reservoir, but can be influenced by backflow during flood events from the Atascosa River. The normal release from the reservoir to satisfy downstream water rights is was reduced to 29 cfs from 33 cfs after the City of Three Rivers began withdrawing water directly from the reservoir.

The gauge near Three Rivers is located at the same location as Station 12979. Recorded flows during this time period range between 27 cfs and 46,200 cfs, with a median flow of 102 cfs. This gauge is below the confluence of the Frio and Atascosa Rivers with the Nueces River.

Water Quality Analysis

2106_01: lower 17 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12978 – US 59 east of George West	NRA	Quarterly	Conventional, Bacteria, Field	1998 – Present
12979 – bridge on US 281 south of Three Rivers	NRA	Quarterly	Conventional, Bacteria, Field	1968 – Present

DO (mg/l): 51 samples, ranging from 4.4 to 10.7, median value = 6.8, 3 values below screening level of 5.0, no trends. There are no problems with low DO on this section of the river. The last time DO measured below the criteria value was in July 2003. No 24-Hr DO measurements have been taken at either station.

pH (su): 50 samples, ranging from 7.3 to 8.2, median value = 7.8, criteria range is 6.5 to 9, no trends. The general range of values decreased after the flood of July 2002. The values have since rebounded, but not with as much of a range as during the extended drought prior to July 2002. There are no problems with pH on this section of the river.

Ammonia (mg/l): 43 samples, ranging from <0.02 to 0.166, median value = 0.02, criteria value = 0.33, 25 non-detects, no trends. There are no problems with ammonia in this section of the river. In general, the higher values tend to correlate to lower flows.

Figure 3.3 – 24: Nueces River Station 12978. June 2007

N+N (mg/l): 48 samples, ranging from <0.01 to 1.26, median value = 0.16, criteria value = 1.95, 5 non-detects, no trends. There are no problems with N+N in this section of the river.

OP (mg/l): 31 samples, ranging from <0.01 to 0.25, median value = 0.06, criteria value = 0.37, 2 non-detects, no trends. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 31 samples, ranging from <0.04 to 0.48, median value = 0.11, criteria value = 0.69, 2 non-detects, no trends. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 27 samples, ranging from <1 to 53.5, median value = 8.54, 7 values above criteria value of 14.1, 2 non-detects, no trends. The highest values occurred in January and July 2003 after relatively high flows. Even though 26% of the samples exceed the criteria value, this parameter is not listed a concern, but does bear watching.

TSS (mg/l): 32 samples, ranging from 9 to 134, median value = 26, no trends. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 32 samples, ranging from <2 to 1800, median value = 28, geometric mean = 32, 2 values above the single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river. The higher readings occurred following flood events.

2106_02: upper 10 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12977 – US 72 in Three Rivers	NRA	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water	1998 – Present
17437 – approx 1.0 miles downstream of SH 72 in Three Rivers near Diamond Shamrock outfall				2001 – 2005
18357 – 292 m downstream of Choke Canyon Reservoir Dam release associated with USGS gauges 08206890 and 08206910				2000 – 2001

Station 17437 was monitored from October 2001 through August 2005 to check for possible volatile organic compound(VOC) contaminants from the Diamond Shamrock Refinery in Three Rivers. No VOCs were detected and NRA moved to Station 12979 for easier access to the site.

Only TDS data, calculated from conductivity, were recorded at Station 18357.

DO (mg/l): 47 samples, ranging from 3.9 to 10.1, median value = 6.6, 5 values below screening level of 5.0, no trends. There are no problems with low DO on this section of the river. No 24-Hr DO measurements have been taken at either station.

pH (su): 48 samples, ranging from 7.4 to 8.3, median value = 7.9, criteria range is 6.5 to 9, no trends. The general range of values decreased after the flood of July 2002. The values have since rebounded, but not quite as high as during the extended drought prior to July 2002. There are no problems with pH on this section of the river.

Figure 3.3 – 25: Frio River Station 12977, June 2007

Ammonia (mg/l): 45 samples, ranging from <0.02 to 1.26, median value = 0.02, 1 value above criteria value of 0.33, 29 non-detects. There are no problems with ammonia in this section of the river. The one high value occurred in February 2003 at Station 17437, just below the Diamond Shamrock Refinery, during fairly high flows. All other value are <0.1.

N+N (mg/l): 45 samples, ranging from <0.01 to 0.64, median value = 0.17, criteria value = 1.95, 3 non-detects. There are no problems with N+N in this section of the river.

OP (mg/l): 22 **samples, ranging from <0.04 to 0.22, median value = 0.07, criteria value = 0.37, 4 non-detects.** There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 45 samples, ranging from <0.04 to 0.34, median value = 0.11, criteria value = 0.69, 5 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 35 samples, ranging from 2.6 to 31.4, median value = 9, 9 values above criteria value of 14.1, 9 non-detects. The highest values occurred in January and July 2003 after relatively high flows. Even though 26% of the samples exceed the criteria value, this parameter is not listed a concern, but does bear watching.

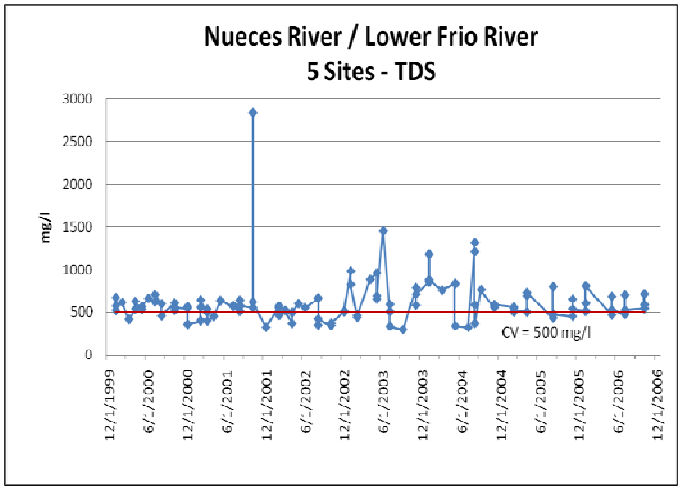
TSS (mg/l): 45 samples, ranging from 10 to 113, median value = 23. There are no problems with TSS in this section of the river. The highest values occurred in August 2002 and November 2003 following flood flows.

***E. coli* (cfu): 44 samples, ranging from <2 to 2500, median value = 116, geometric mean = 85, 5 values above the single sample criteria of 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river. The higher readings tend to correlate to higher flow, but not always.

Entire Segment

TDS (mg/l): 115 samples, ranging from 299 to 2840, median value = 566, average value = 617, average criteria value = 500, no trends. The maximum value was recorded in October 2001 at Station 17437 during relatively low flow, but between two flood events. All other values are <1500, but even if the maximum value is removed, the remaining data still indicate an impairment for this parameter.

Chloride (mg/l): 99 samples, ranging from 45 to 496, median value = 141, average value = 156, average criteria value = 250, no trends. There is an overall increase in values beginning in 2003, primarily in the lower AU, i.e. at Stations 12978 and 12979, and needs to be watched. There is no apparent correlation between flow and chloride levels.



Sulfate (mg/l): 99 samples, ranging from 23 to 358, median value = 79, average value = 90, average criteria value = 250, no trends. These values do not show the same general increase as is seen with the chloride data. Two high values occurred in August 2004 at Stations 12977 and 17437.

For all three of these parameters, the values at Stations 12977 and 17437, just above and below the Diamond Shamrock Refinery discharge point, respectively, are relatively higher following actual discharge from the plant. The plant's discharge is normally used for irrigation, but during, and for a time following wet periods, the plant has to discharge to the river.

Segment 2107, Atascosa River, flows 103 miles from the confluence of the West Prong Atascosa River and the North Prong Atascosa River in Atascosa County to the confluence with the Frio River in Live Oak County.

The segment is divided into four AUs: (01) the lower 25 miles, (02) the 25 miles surrounding FM 541, (03) the 25 miles surrounding SH 97, and (04) the upper 28 miles.

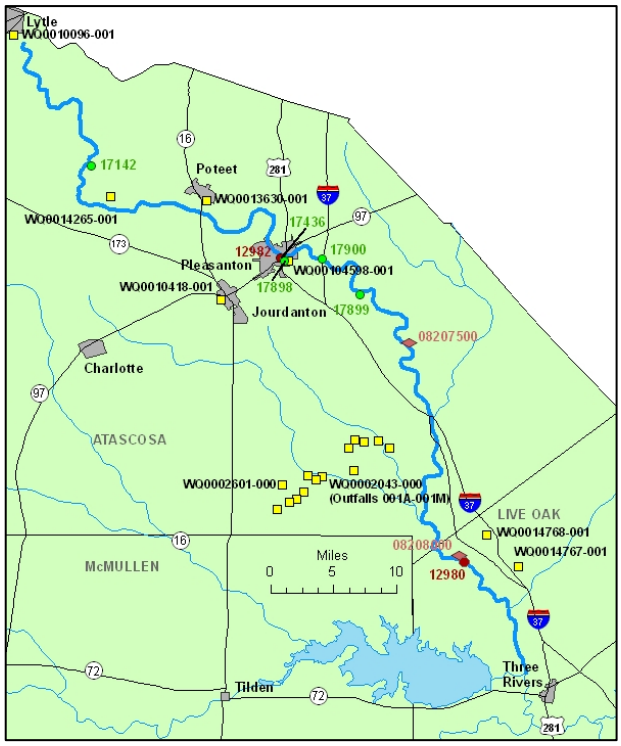


Figure 3.3 – 26: Atascosa River

Active Wastewater Permits

WQ0002043-000 – San Miguel Electric Cooperative: 62,000 gpd via evaporation and mine pit water and storm water runoff on an intermittent and flow variable basis via nine outfalls. Outfalls 001A – 001M discharge to Caballos Creek, Souse Creek, La Parita Creek, Christine Creek, and Metate Creek, and/or their tributaries; to the Atascosa River. (Outfall 002 discharges to San Miguel Creek, Segment 2108.)

WQ0002601-000 – San Miguel Electric Cooperative: Intermittent and flow variable via unnamed tributary to Souse Creek to La Parita Creek to the Atascosa River.

WQ0010096-001 – City of Lytle: 450,000 gpd via West Prong Atascosa River to the Atascosa River.

WQ0010418-001 – City of Jourdanton: 330,000 gpd via unnamed tributary to Goose Creek to La Parita Creek to Metate Creek to the Atascosa River.

WQ0010598-001 – City of Pleasanton: 1,420,000 gpd.

WQ0013630-001 – City of Poteet: 640,000 gpd via unnamed ditch to Rutledge Hollow to the Atascosa River.

WQ0014265-001 – Benton City WSC: 15,000 gpd:via unnamed tributary to the Atascosa River.

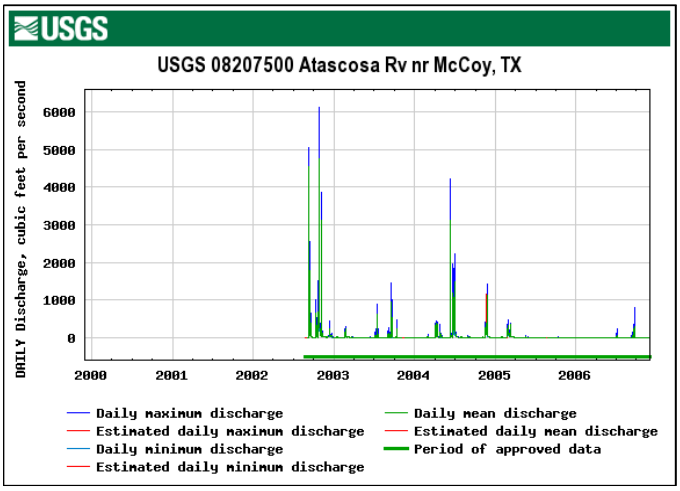
WQ0014767-001 – TxDOT (Northbound rest stop): 10,000 gpd via man-made ditch to unnamed tributary to the Atascosa River. Located approximately 5.9 miles north of the intersection of IH 37 and US 281 near the City of Three Rivers.

WQ0014768-001 – TxDOT (Southbound rest stop): 10,000 gpd via Salt Branch Creek to the Atascosa River. Located approximately 9.6 miles north of the intersection of IH 37 and US 281 near the City of Three Rivers.

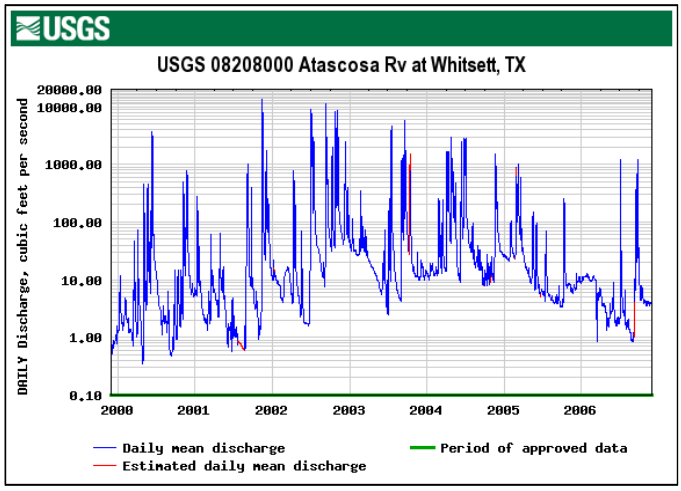
Flow

There are two USGS gauges in this segment: Atascosa River near McCoy, TX, and Atascosa River at Whitsett, TX.

The gauge near McCoy, TX began recording in August 2002 and is about half way between Pleasanton and Whitsett. Recorded flows during this time period range between 0 cfs and 4,750 cfs, with a median flow of 5.5 cfs. There are a few times when the gauge was not recording and the flows are estimated.



The gauge at Whitsett, TX is located at the same location as Station 12980. Recorded flows during this time period range between 0.34 cfs and 13,600 cfs, with a median flow of 11 cfs.



Water Quality Analysis
2107_01: lower 25 miles
Station Summary

Site	12980 – FM 99 Bridge west of Whitsett
Entity	NRA
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field
Date Range	1996 – Present

DO (mg/l): 42 samples, ranging from 3.1 to 10.2, median value = 6.1, 6 values below screening level of 5. There are no problems with low DO on this section of the river.

Average 24–Hr DO (mg/l): 3 samples, ranging from 6.2 to 7.3 criteria value = 5.0. Although not enough 24-Hr DO measurement sfor the 2008 Assessment, they indicate that low DO is not problem in this section of the river.

Minimum 24–Hr DO (mg/l): 3 samples, ranging from 5.9 to 7.1 criteria value = 3.0.

pH (su): 44 samples, ranging from 7.3 to 8.8, median value = 8.2, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 32 samples, ranging from <0.02 to 0.12, median value = 0.02, criteria value = 0.33, 17 non-detects, no trends. There are no problems with ammonia in this section of the river.

Figure 3.3 – 27: Atascosa River Station 12980, July 2006

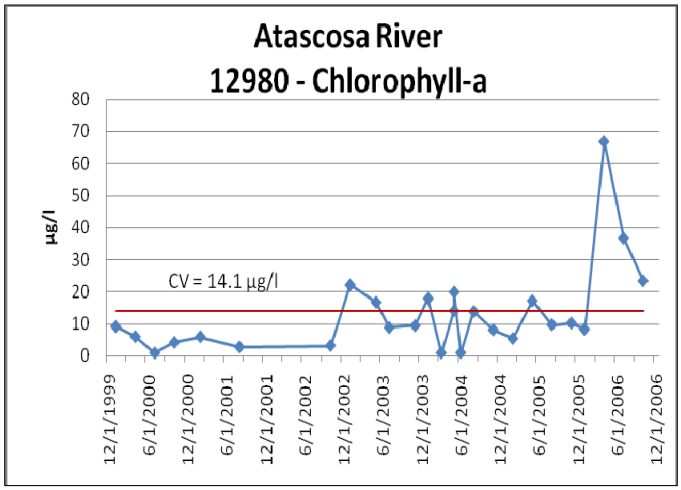
N+N (mg/l): 32 samples, ranging from <0.02 to 1.1, median value = 0.12, criteria value = 1.95. 5 non-detects, no trends. There are no problems with N+N in this section of the river.

OP (mg/l): 18 samples, ranging from 0.03 to 0.34, median value = 0.20, criteria value of 0.37, no trends. There are no problems with OP in this section of the river.

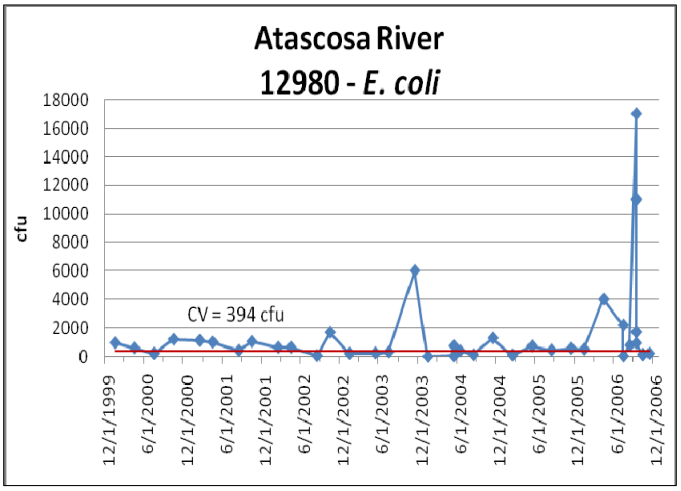
Total Phosphorus (mg/l): 32 samples, ranging from 0.12 to 1.22, median value = 0.33, 3 values above criteria value of 0.69, no trends. The 3 high values occurred in October 2001 and April and July 2006 and may be related to runoff from surrounding fields. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 26 samples, ranging from <1 to 66.9, median value = 9.4, 9 values above criteria value of 14.1, 1 non-detect, no trends. There is a concern for chlorophyll-a in this section of the river.

TSS (mg/l): 32 samples, ranging from 8 to 158, median value = 39, no trends. There are no problems with TSS in this section of the river.



***E. coli* (cfu): 40 samples, ranging from 2 to 17,000, median value = 608, geometric mean = 490, 25 samples exceed single sample criteria of 394, geometric mean criteria value = 126.** *E. coli* is listed as an impairment on this section of the river based on the geometric mean and the grab samples. A TMDL is underway to try and determine the source of the bacteria.

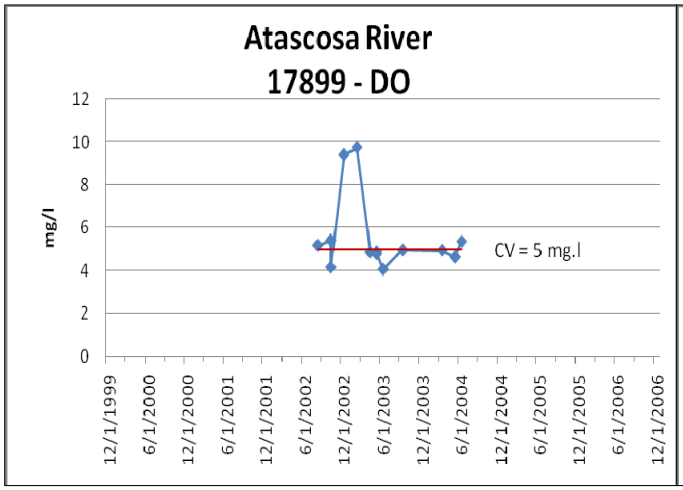


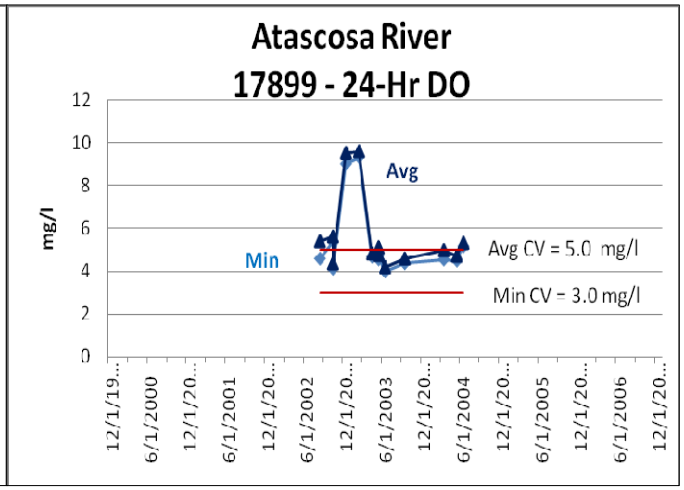
2107_02: 25 miles surrounding FM 541

Station Summary

Site	17899 – 500 m SW of intersection of Leal Rd and MOPAC railroad
Date Range	2002 – 2004

DO (mg/l): 13 samples, ranging from 4.0 to 9.7, median value = 5.0, 8 values below screening level of 5. This section of the river is listed as being impaired for low DO.





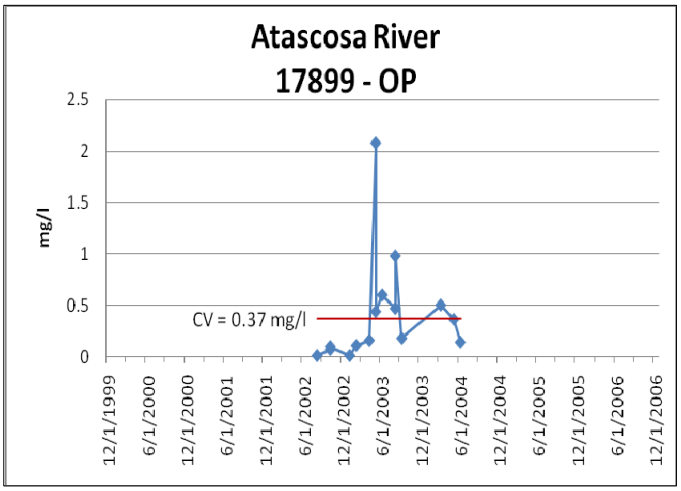
Average 24–Hr DO (mg/l): 13 samples, ranging from 4.2 to 9.6, median value = 5.0, 7 values below the criteria value of 5.0. The 24-Hr DO measurements, taken as part of the TMDL impairment verification monitoring, confirm the impairment. However, the TMDL final report states these measurements provided inconclusive information for use attainment. It also states that additional data is necessary to fully characterize the DO levels within the watershed in relation to other variables such as flow. The water quality standards will be reviewed before a TMDL is implemented."

Minimum 24–Hr DO (mg/l): 13 samples, ranging from 4.0 to 9.3, median value = 4.6, criteria value = 3.0.

pH (su): 13 samples, ranging from 7.3 to 8.1, median value = 7.6, criteria range is 6.5 to 9. There are no problems with pH on this section of the river.

Ammonia (mg/l): 15 samples, ranging from <0.03 to 0.42, median value = 0.03, 1 value above criteria value of 0.33, 11 non-detects. The one exceedence occurred in January 2003 during normal flow conditions. All but one of the subsequent samples were non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 13 samples, ranging from <0.05 to 5.2, median value = 1.6, 3 values above criteria value of 1.95, 2 non-detects. The last exceedence occurred in May 2003. There are no problems with N+N in this section of the river.



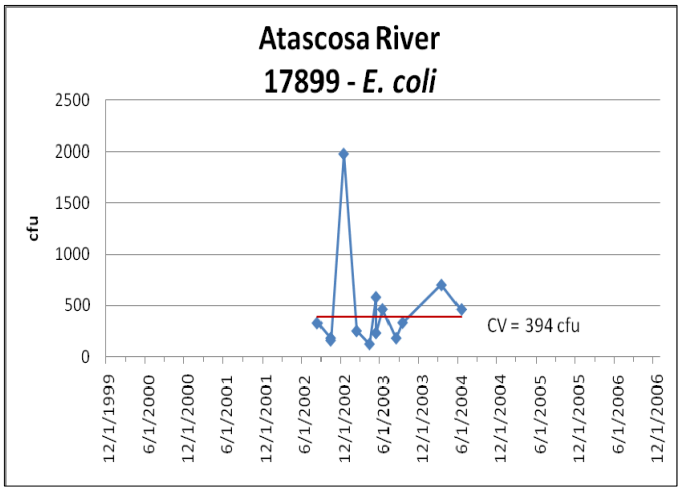
OP (mg/l): 15 samples, ranging from 0.01 to 2.08, median value = 0.18, 6 values above criteria value of 0.37, 1 non-detect. OP is a concern on this section of the river. The samples were collected during TMDL sampling which targeted runoff events and may have biased the data.

Total Phosphorus (mg/l): 12 samples, ranging from <0.01 to 0.65, median value = 0.24, criteria value = 0.69, 2 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 16 samples, ranging from <0.25 to 15.1, median value = 0.25, 1 value above criteria value of 14.1, 14 values non-detects. The one exceedence occurred in September 2003 during relatively high flow. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 4 samples, ranging from 35 to 109, median value = 42. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 13 samples, ranging from 120 to 1986, median value = 325, geometric mean = 333, 5 samples exceed single sample criteria of 394, geometric mean is above criteria value = 126.** *E. coli* is listed as an impairment on this section of the river based on the geometric mean and the grab samples and is part of the onging TMDL.



The 2008 Assessment also lists a concern for impaired fish community on this section of the river.

2107_03: 25 miles surrounding SH 97

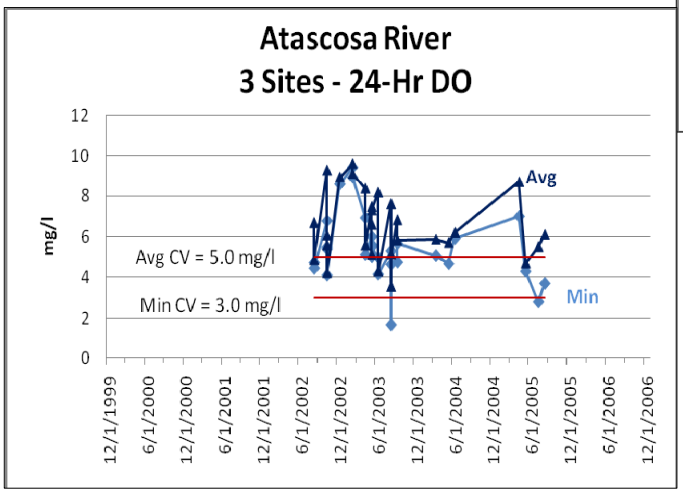
Station Summary

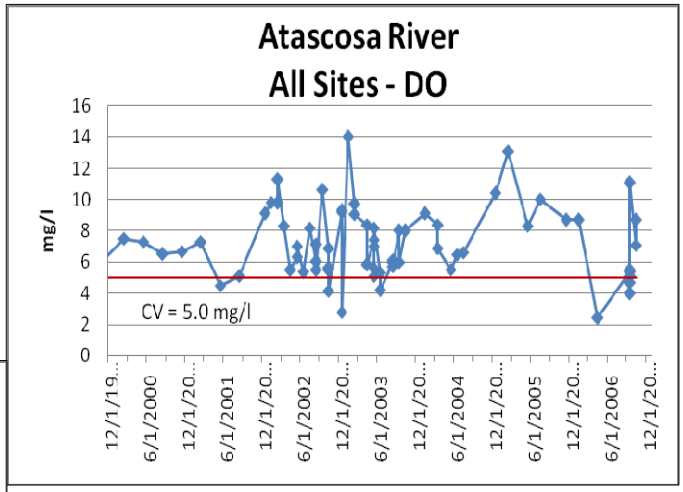
Site	Entity	Frequency	Parameter Groups	Date Range
12982 – US 281 at Pleasanton	TCEQ	Quarterly	Conventional, Bacteria, Field	1998 – Present
17436 – East Hunt Street in Pleasanton				2001 – 2002
17898 – 150 m downstream of Hunt Road				2002 – 2004
17900 – IH 37				2002 – 2003

Only DO and pH were measured at Station 17436.

DO (mg/l): 67 samples, ranging from 2.4 to 14.0, median value = 7.0, 7 values below screening level of 5, no trends. This section of the river is listed as being impaired for low DO.

Average 24–Hr DO (mg/l): 29 samples, ranging from 3.6 to 9.6, median value = 6.1, 5 values below the criteria value of 5.0. 24-Hr DO measurements were taken at Stations 12982, 17898, and 17900 between May and September 2003 as part of the TMDL impairment verification monitoring.





Minimum 24–Hr DO (mg/l): 29 samples, ranging from 1.7 to 9.4, median value = 5.1, 2 values below the criteria value of 3.0.

pH (su): 65 samples, ranging from 6.3 to 9.1, median value = 7.7, 1 values below and 1 value above the criteria range of 6.5 to 9, no trends. Both exceedences occurred at Station 12982. The low was recorded in February 2002 during a low flow and the high was recorded in September 2006 during a wet-weather monitoring event. There are no problems with pH on this section of the river.

Ammonia (mg/l): 50 samples, ranging from <0.02 to 0.67, median value = 0.02, 7 values above criteria value of 0.33, 28 non-detects, no trends. All but one of the exceedences occurred during the TMDL monitoring in December 2002 and January 2003 which targeted runoff events. There are no problems with ammonia in this section of the river.

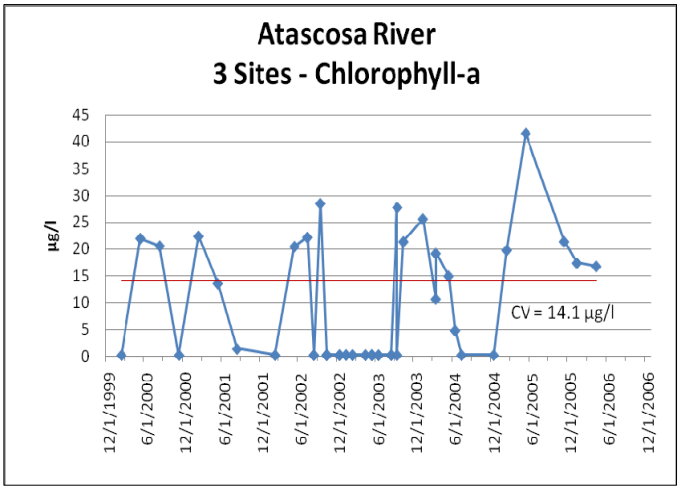
N+N (mg/l): 45 samples, ranging from <0.02 to 9.51, median value = 0.7, 5 values above criteria value of 1.95, 21 non-detects, no trends. All but one of the exceedences occurred during the TMDL monitoring which targeted runoff events. There are no problems with N+N in this section of the river.

OP (mg/l): 49 samples, ranging from <0.01 to 2.2, median value = 0.08, 6 values above criteria value of 0.37, 16 non-detects, no trends. All of the exceedences occurred during the TMDL monitoring which targeted runoff events. There are no problems with OP in this section of the river.

Figure 3.3 – 28: Atascosa River Station 12982, May 2005

Total Phosphorus (mg/l): 23 samples, ranging from <0.05 to 0.2, median value = 0.05, criteria value = 0.69, 14 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 50 samples, ranging from <0.25 to 41.6, median value = 0.25, 16 values above criteria value of 14.1, 29 non-detects, no trends. Chlorophyll-a is listed as a concern in this section of the river. All of the values at Station 17900 are non-detects. There does not appear to be any correlation between flow and chlorophyll-a levels.



TSS (mg/l): 30 samples, ranging from 3 to 121, median value = 22, no trends. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 47 samples, ranging from <1 to 13,000, median value = 120, geometric mean = 113, 10 samples exceed single sample criteria of 394, geometric mean criteria value = 126.** The 2008 Assessment shows that this section of the river is fully supporting for *E. coli*. All but one of the exceedences occurred during the TMDL monitoring which targeted runoff events. The highest value was recorded at Station 12982 in September 2006 during a relatively high flow event following an extended dry period.

The 2008 Assessment also lists this section as being impaired for fish community and as having a concern for impaired habitat.

2107_04: upper 28 miles

Station Summary

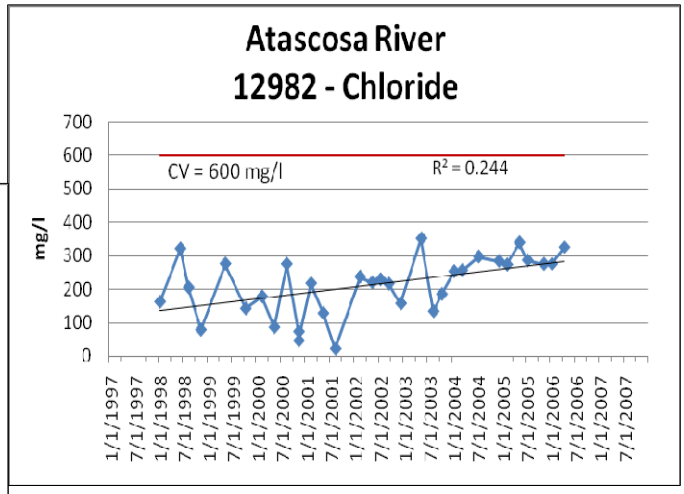
Site	Date Range
17142 – FM 2504 near Anchorage 6.4 miles SE of Poteet	2000 – 2002

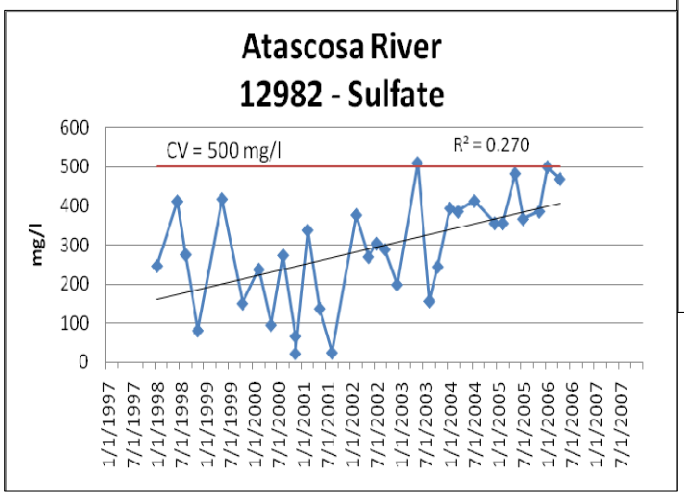
There is insufficient data for analysis. For the 6 sampling attempts, the river was dry 5 times and there was no flow the 6th time.

Entire Segment

TDS (mg/l): 119 samples, ranging from 99 to 1851, median value = 1170, average value = 1082, average criteria value = 1500, no trends. The higher TDS values tend to correlate to the higher flows. There are no problems with TDS on this segment of the river.

Chloride (mg/l): 87 samples, ranging from 10 to 480, median value = 231, average value = 233, average criteria value = 600, increasing trend. There is an increasing trend at 12982, but the values are well below the criteria. There are no problems with chloride on this segment of the river.





Sulfate (mg/l): 80 samples, ranging from 23 to 1543, median value = 245, average value = 273, average criteria value = 500, increasing trends. Like chloride, there is an increasing trend for sulfate. The values are approaching the criteria. There are currently no problems with sulfate on this segment of the river.

Segment 2108, San Miguel Creek, flows 66 miles from the confluence of San Francisco Perez Creek and Chacon Creek in Frio County to a point immediately upstream of the confluence of Mustang Branch in McMullen County.

The creek flows through primarily farm and ranch lands. There are no towns along the creek, but several towns near the headwaters.

The segment is divided into two AUs: (01) the lower 25 miles and (02) the upper 41 miles.

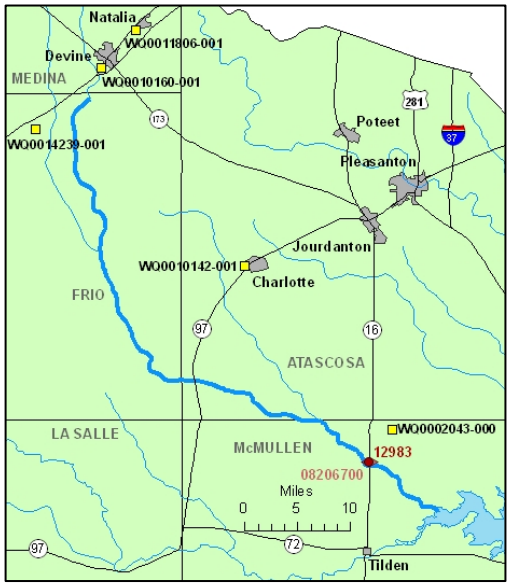


Figure 3.3 – 29: San Miguel Creek

Active Wastewater Permits

WQ0002043-000 – San Miguel Electric Cooperative: 62,000 gpd via evaporation and mine pit water and storm water runoff on an intermittent and flow variable basis via nine outfalls. Outfall 002 discharges to Hog Creek to La Jarita Creek, to San Miguel Creek. (All other outfalls discharge to the Atascosa River, segment 2107).

WQ0010142-001 – City of Charlotte: 220,000 gpd via unnamed tributary to Lagunillas Creek to San Miguel Creek.

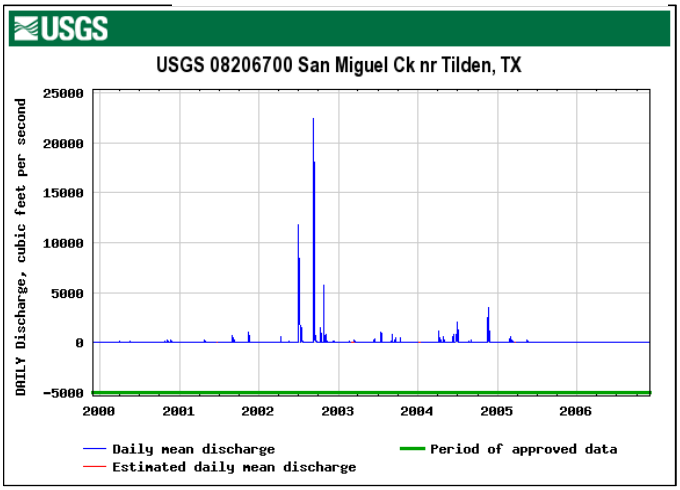
WQ0010160-001 – City of Devine: 650,000 gpd via San Francisco Perez Creek to an unnamed reservoir to San Francisco Perez Creek to San Miguel Creek.

WQ0011806-001 – City of Natalia: 190,000 gpd via Fort Ewell Creek to Chacon Creek to San Miguel Creek.

WQ0014239-001 – Moore WSC: 65,000 gpd via Moore Hollow to Black Creek to San Miguel Creek.

Flow

There is one USGS gauge in this segment: San Miguel Creek near Tilden, TX. The gauge is located at the same location as Station 12981. Recorded flows during this time period range between 0 cfs and 22,400 cfs, with a median flow of 0.01 cfs.



Water Quality Analysis
2108_01: lower 25 miles
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12983 – At SH 16 north of Tilden	NRA	Quarterly	Conventional, Bacteria, Field	1996 – Present

DO (mg/l): 27 samples, ranging from 1.2 to 9.7, median value = 4.9, 14 values below screening level of 5.0, no trends. The values are lower overall during extended periods of very little or no flow. The 2008 Assessment did not list this as being a concern or an impairment. Removing the readings when <1 cfs of flow was recorded during sampling leaves 1 of 12 samples below the screening level. No 24-Hr DO measurements have been taken at this site.

pH (su): 28 samples, ranging from 6.94 to 7.9, median value = 7.6, criteria range is 6.5 to 9, no trends. pH values also correlate to stream flow, with the lower values occurring during very little or no flow, but all are within the criteria range.

Ammonia (mg/l): 27 samples, ranging from <0.02 to 0.1, median value = 0.02, criteria value = 0.33, 18 non-detects, no trends. There are no problems with ammonia in this section of the creek.

Figure 3.3 – 30: San Miguel Creek Station 12983, June 2007

N+N (mg/l): 27 samples, ranging from <0.30 to 1.01, median value = 0.02, criteria value = 1.95, 18 non-detects, no trends. There are no problems with N+N in this section of the creek, but the higher readings tend to correlate to higher flow.

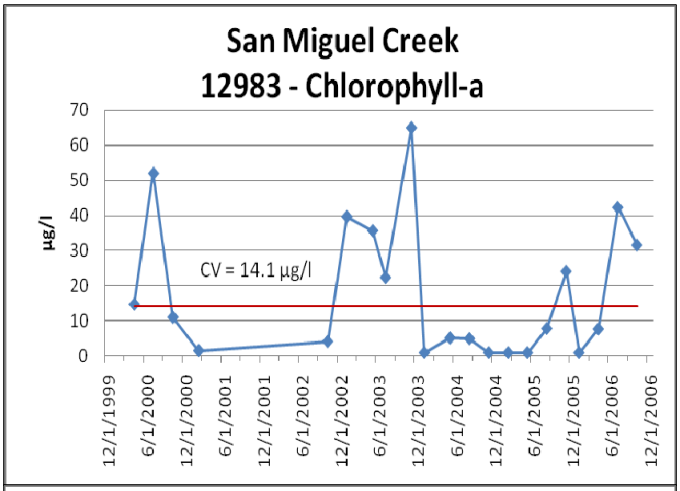
OP (mg/l): 13 samples, ranging from <0.04 to 0.169, median value = 0.04, criteria value = 0.37, 4 non-detects. There are no problems with OP in this section of the creek.

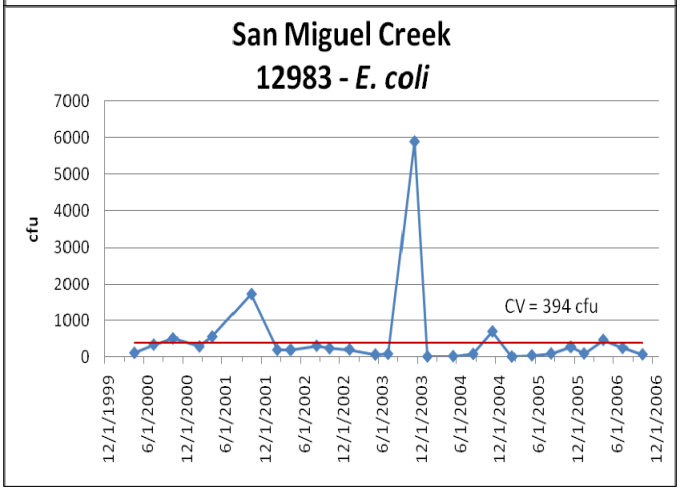
Total Phosphorus (mg/l): 27 samples, ranging from <0.04 to 8.02, median value = 0.18, 2 values above criteria value of 0.69, 1 non-detect, no trends. There are no problems with total phosphorus in this section of the river. The one very high reading occurred in August 2005 and is an anomaly. There was no flow at the time, and the field report noted that the water was yellow and that there was a film on the water's surface.

Chlorophyll-a (µg/l): 13 samples, ranging from <1 to 65, median value = 7.9, 9 values above criteria value of 14.1, 5 non-detects, no trends. Chlorophyll-a is listed as a concern for this segment. The high readings correlate to flow periods when the water is stagnant.

TSS (mg/l): 27 samples, ranging from 9 to 232, median value = 24, no trends. There is no correlation between TSS levels and flow. The highest readings were recorded in July and October 2000 during times of no flow. All the other values are <70.

***E. coli* (cfu): 27 samples, ranging from 15 to 5900, median value = 204, geometric mean = 182, 6 values exceed the single sample criteria of 394, geometric mean criteria = 126.** *E. coli* is listed as an impairment in this segment. The high values occur for period of time following high flow events. In March 2007, following heavy rains in February and March, *E. coli* levels were measured at 18,000. The most likely source is runoff from agricultural and ranch lands.





2108_02: upper 41 miles

No stations where sampled on this AU during the assessment period.

Entire Segment

TDS (mg/l): 28 samples, ranging from 187 to 2240, median value = 740, average value = 990, average criteria value = 2000, no trends. There is a large variation in TDS levels. The lower values tend to correspond to periods of little or no flow, and the higher values occur for a period after flood flows.

Chloride (mg/l): 27 samples, ranging from 6.8 to 650, median value = 179, average value = 256, average criteria value = 700, no trends. There is a large variation in chloride levels. Similar to TDS, the lower values tend to correspond to periods of little or no flow, and the higher values occur for a period after flood flows.

Sulfate (mg/l): 27 samples, ranging from 45 to 90, median value = 16, average value = 19, average criteria value = 50, no trends. There is also a large variation in sulfate levels. Similar to TDS and chloride, the lower values tend to correspond to periods of little or no flow, and the higher values occur for a period after flood flows.

Segment 2109, Leona River, flows 85 miles from US 83 in Uvalde County to the confluence with the Frio River in Frio County.

The segment is divided into three AUs: (01) the lower 25 miles, (02) the 25 miles surrounding US 57, and (03) the upper 28 miles.

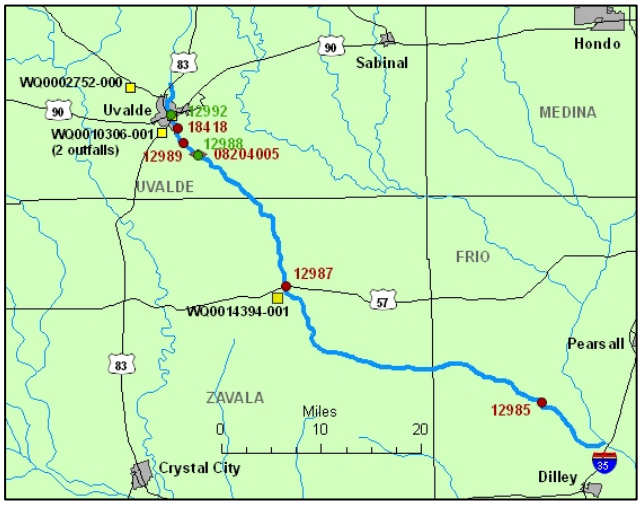


Figure 3.3 – 31: Leona River

Active Wastewater Permits

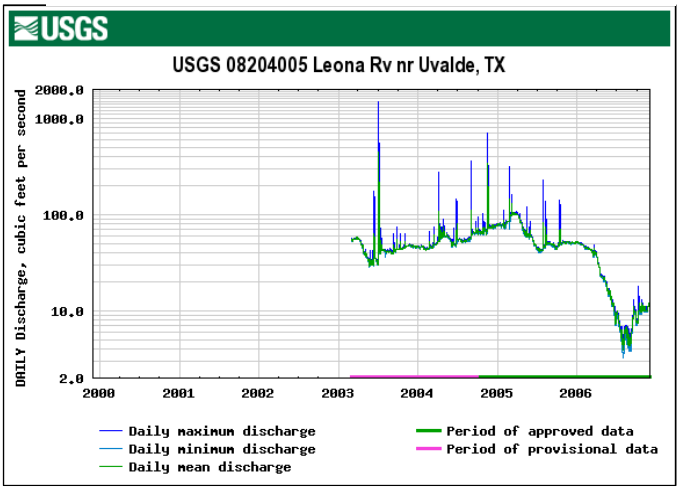
WQ0002752-000 – TAFMI, Inc., Agrilink Foods: 250,000,000 gallons per year via irrigation.

WQ0010306-001 – City of Uvalde: 970,000 gpd.

WQ0014394-001 – Batesville WSC: 184,000 gpd via Gallina Slough to Leona River.

Flow

There is one USGS gauge in this segment: Leona River near Uvalde, TX, installed in March 2003. It is located at the same location as Station 12988 in. Recorded flows from March 1, 2003 through November 30, 2006 range between 3.9 cfs and 450 cfs, with a median flow of 48 cfs. The gauge is located below the City of Uvalde's WWTP outfall.



Water Quality Analysis

2109_01: lower 25 miles

Station Summary

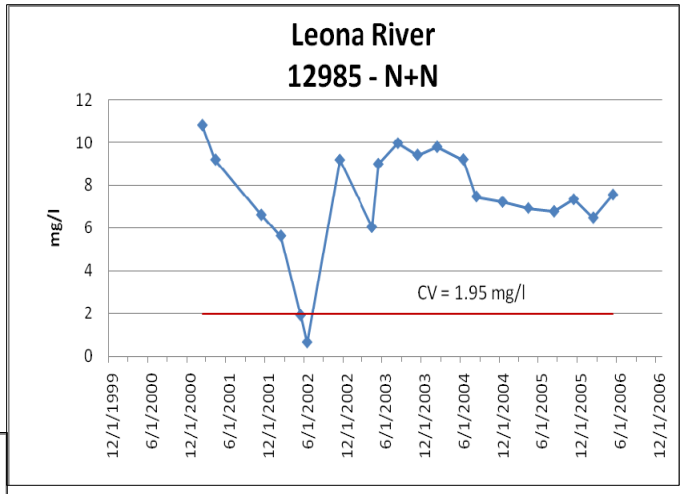
Site	12985 – FM 1581 SW of Pearsall
Entity	TCEQ
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field
Date Range	1998 – Present

DO (mg/l): 20 samples, ranging from 6.5 to 10.9, median value = 8.6, screening level = 5.0. DO does not show the usual seasonal at this station, but there are no problems with DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 19 samples, ranging from 6.5 to 8.1, median value = 7.9, criteria range is 6.5 to 9. Two values near the lower limit occurred in November 2005 and February 2006 during normal flow.

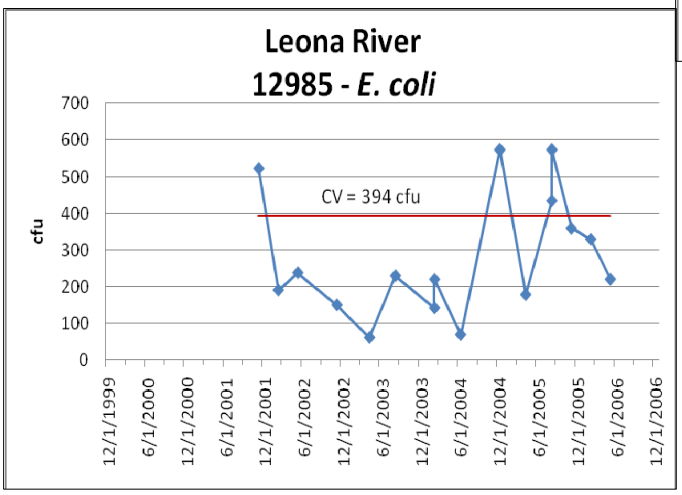
Ammonia (mg/l): 24 samples, 1 value = 0.08, criteria value = 0.33, 23 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 20 samples, ranging from 0.63 to 10.8, median value = 7.4, 18 values above criteria value of 1.95. N+N is listed as a concern on section of the river. The overall N+N values increase from upstream to downstream.



OP (mg/l): 20 samples, ranging from <0.04 to 0.06, median value = 0.04, criteria value = 0.37, 18 non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 20 samples, ranging from <0.05 to 0.17, median value = 0.06, criteria value = 0.69, 7 non-detects. There are no problems with total phosphorus in this section of the river.



Chlorophyll-a (µg/l): 20 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 20 samples, ranging from 4 to 70, median value = 30. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 16 samples, ranging from 60 to 575, median value = 225, geometric mean = 232, 4 samples exceed single sample criteria of 394, geometric mean criteria value = 126.** *E. coli* is listed as an impairment on this section of the river based on the geometric mean and the grab samples. The maximum value in each AU decreases from upstream to downstream, but the geometric means are nearly the same.

2109_02: 25 miles surrounding US 57

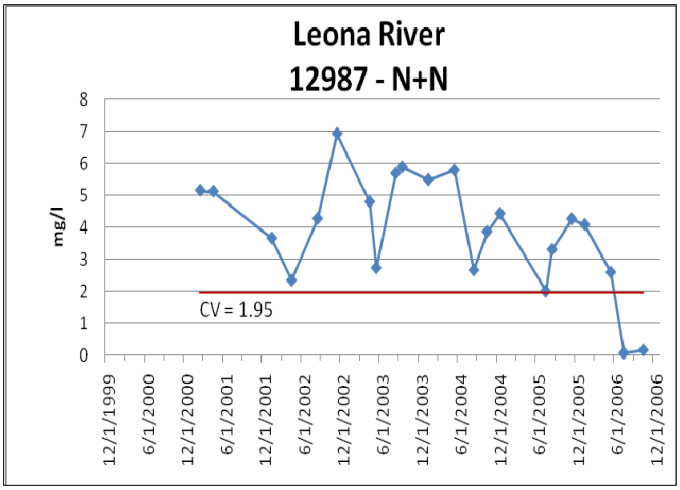
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12987 – US 57 near Batesville	TCEQ	Quarterly	Conventional, Bacteria, Field	1988 – Present

Although the table above shows that this station has been monitored since 1988, some of the data prior to 1992 and from June 1997 to February 2001 are only flow data. Therefore, there is not enough data on which to conduct trend analysis.

DO (mg/l): 23 samples, ranging from 3.0 to 12.1, median value = 8.3, 1 value below screening level of 5.0. The one low reading occurred in October 2006 during a period of very little to no flow. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 23 samples, ranging from 7.8 to 8.6, median value = 8.0, criteria range is 6.5 to 9. There are no problems with pH on this section of the river.



Ammonia (mg/l): 23 samples, ranging from <0.05 to 0.19, median value = 0.05, criteria value = 0.33, 20 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 22 samples, ranging from 0.07 to 6.92, median value = 4.17, 20 values above criteria value of 1.95. N+N is listed as a concern on section of the river. The last two samples as well as a post-assessment sample are below the criteria value. This will continue to be monitored to see if an actual downward trend exists.

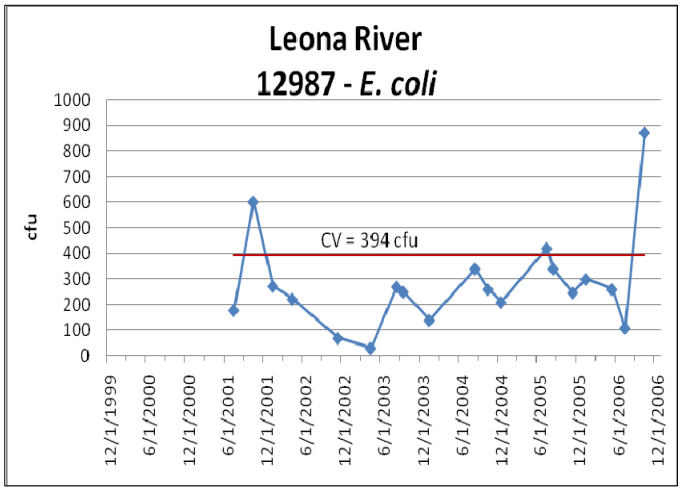
OP (mg/l): 20 samples, 1 value = 0.04, below criteria value = 0.37, 19 non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 23 samples, ranging from <0.05 to 0.2, median value = 0.05, criteria value = 0.69, 14 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 23 samples, ranging from <3 to 6.54, median value = 3, criteria value = 14.1, 21 non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 23 samples, ranging from 7 to 43, median value = 19. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 19 samples, ranging from 31 to 870, median value = 260, geometric mean = 228, 3 samples exceed single sample criteria of 394, geometric mean criteria value = 126.** *E. coli* is listed as an impairment on this section of the river based on the geometric mean.



2109_03: upper 28 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12989 – Hoags Dam, upstream side	TCEQ	Quarterly	Conventional, Bacteria, Field	2001, 2005 – Present
12992 – US 90 west of Uvalde				2001
18418 – 370 m upstream of FM 140	NRA	Quarterly	Conventional, Bacteria, Field	2004 – Present

DO (mg/l): 17 samples, ranging from 3.7 to 11.7, median value = 6.7, 4 values below screening level of 5.0. All four exceedences occurred at Station 18418. The 2008 Assessment did not identify low DO as an impairment in this section of the river, but it does appear to be a potential problem at Station 18418 as 4 of the 8 samples are <5. No 24-hr measurements have been taken at this station.

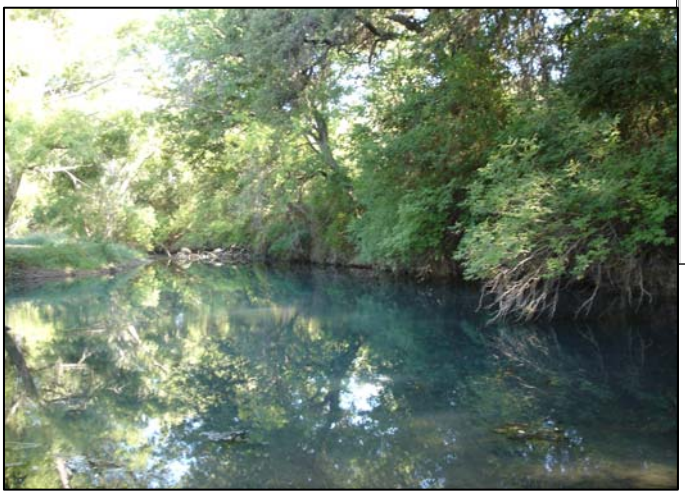
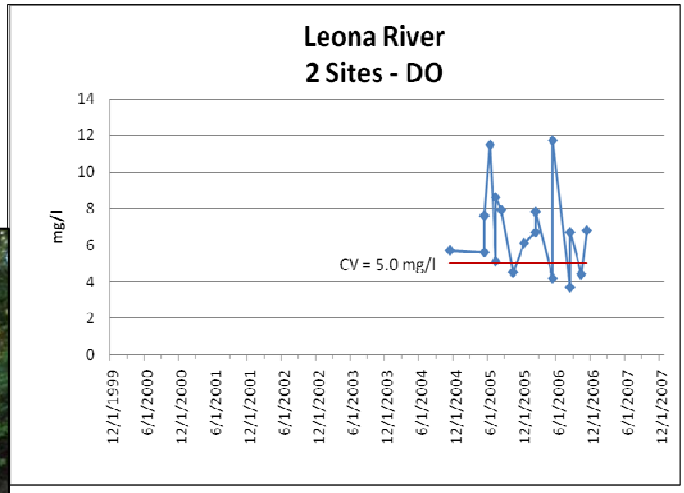


Figure 3.3 – 32: Leona River Station 18418, October 2006



pH (su): 17 samples, ranging from 6.3 to 7.6, median value = 7.2, criteria range is 6.5 to 9. There are no problems with pH on this section of the river.

Ammonia (mg/l): 16 samples, ranging from <0.02 to 0.2, median value = 0.02, criteria value = 0.33, 10 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 17 samples, ranging from <0.05 to 3.1, median value = 2.51, 14 values above criteria value of 1.95, 1 non-detect. N+N is listed as a concern on section of the river. Both stations show elevated levels. 12989 is also below the confluence of Cooks Slough which drains runoff from area farm fields.

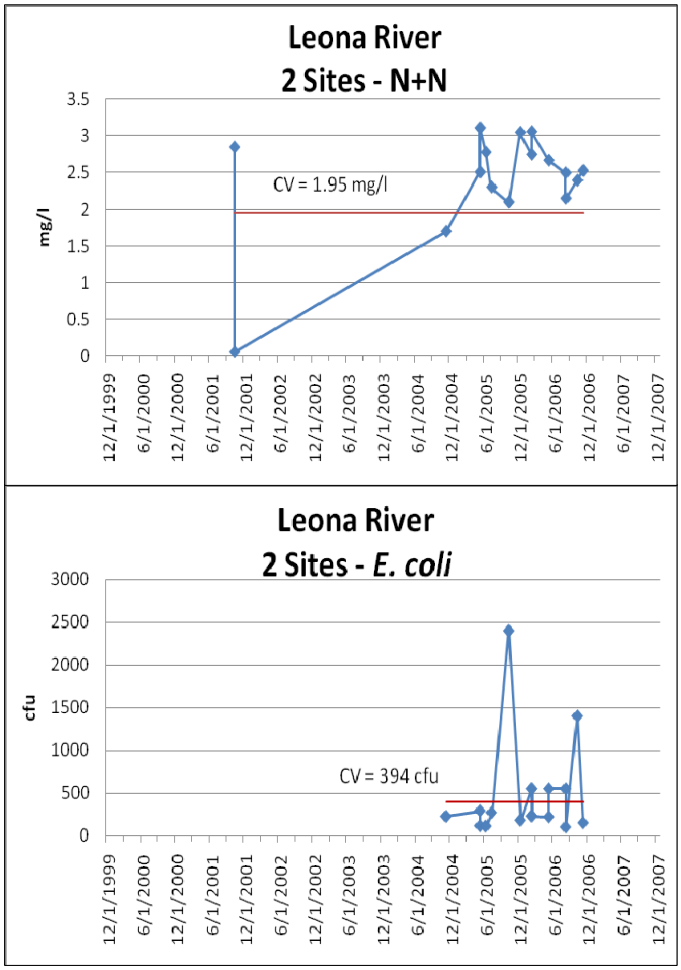
OP (mg/l): 8 samples, ranging from <0.04 to 0.18, median value = 0.04, criteria value = 0.37, 7 non-detect. OP was only recorded at stations 12989 and 12992. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 16 samples, ranging from <0.04 to 0.32, median value = 0.06, criteria value = 0.69, 9 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 16 samples, ranging from <2 to 0.21.9, median value = 2, 1 value above criteria value of 14.1, 13 non-detects. The one exceedence occurred at Station 12989 in June 2005. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 16 samples, ranging from <4 to 76, median value = 8.5, 1 non-detect. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 15 samples, ranging from 100 to 2400, median value = 230, geometric mean = 230, 5 samples exceed single sample criteria of 394, geometric mean criteria = 126.** Bacteria is listed as an impairment on this section of the river. The values are generally higher at Station 18418.



Entire Segment

TDS (mg/l): 84 samples, ranging from 212 to 2180, median value = 456, average value = 590, criteria value = 2000. The only value >2000 occurred at Station 12985, the most downstream station, in May of 2000. All values at all the other stations are <1000. There are no problems with TDS on the river.

Chloride (mg/l): 63 samples, ranging from 7 to 383, median value = 63, average value = 95, average criteria value = 650. There are no problems with chloride on the river.

Sulfate (mg/l): 63 samples, ranging from 18 to 720, median value = 116, average value = 147, average criteria value = 500. The 2 values >500 occurred at Station 12985, the most downstream station, in May and July of 2000. All values at all the other stations are <150. There are no problems with sulfate on the river.

Segment 2110, Lower Sabinal River, flows 27 miles from a point 100 m (110 yards) upstream of SH 127 in Uvalde County to the confluence with the Frio River in Uvalde County.

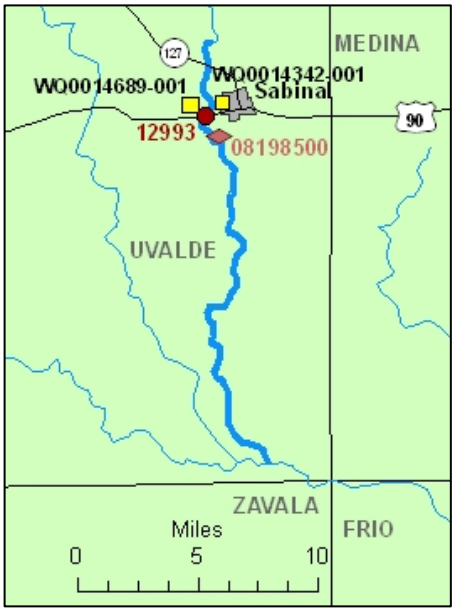


Figure 3.3 – 33:
Lower Sabinal River

Active Wastewater Permits

WQ0014342-001 – City of Sabinal: 142,000 gpd via unnamed tributary to the Sabinal River.

WQ0014689-001 – City of Sabinal: 340,000 gpd, new permit to replace WQ0010604-001. The location shown on the map is an approximate location.

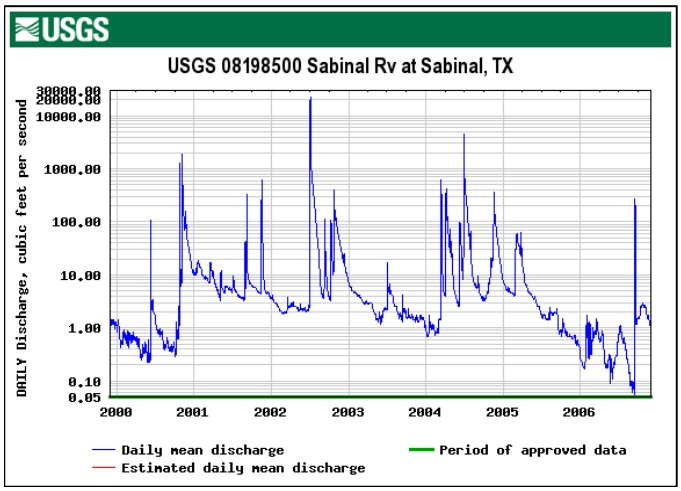
Flow

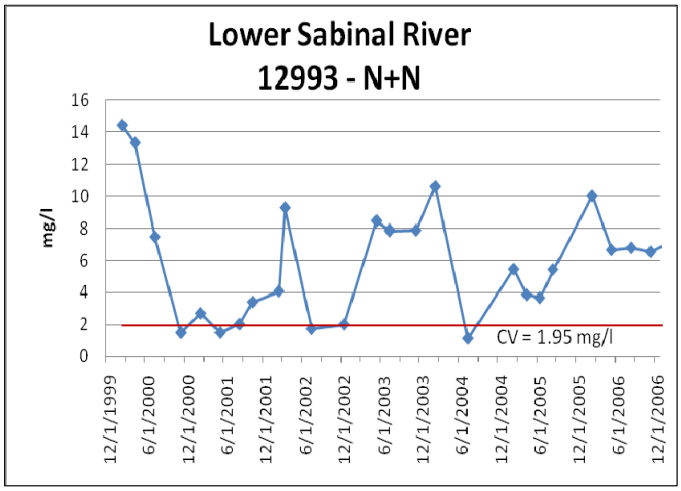
There is one USGS gauge in this segment: Sabinal River at Sabinal, TX. The gauge is located at the same location as Station 12993. Recorded flows during this time period range between 0.05 cfs and 22,900 cfs, with a median flow of 2.6 cfs.

Water Quality Analysis

Station Summary

Site	12993 – bridge at US 90 west of Sabinal
Entity	TCEQ
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field
Date Range	1996 – Present





DO (mg/l): 25 samples, ranging from 5.2 to 13.2, median value = 7.8, screening level = 5.0, no trends. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 25 samples, ranging from 6.2 to 7.9, median value = 7.4, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 27 samples, ranging from <0.05 to 0.09, median value = 0.05, criteria value = 0.33, 23 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 26 samples, ranging from 1.13 to 14.4, median value = 6.0, 22 values above the criteria value of 1.95, no trends. This segment has been on the list of impaired water bodies for this parameter since the 2002 Assessment. The suspected source of the nitrogen is the Sabinal WWTP. A TMDL was conducted and an Implementation Plan has been approved. The plan calls for the construction of a new plant. The proposed new facility will include a mechanical screen, looped aeration basin, two clarifiers, and an ultraviolet disinfection system. The WWTP will be permitted to discharge 0.34 million gpd of treated effluent to the Sabinal River. It is to be located outside of the floodplain and/or protected from flooding. The City of Sabinal is in the process of finding interim funding to purchase the land, after which they can start the bidding process to hire a contractor.

OP (mg/l): 25 samples, ranging from <0.04 to 0.07, median value = 0.04, criteria value = 0.37, 24 non-detects. There are no problems with OP in this segment of the river.

Total Phosphorus (mg/l): 27 samples, ranging from <0.05 to 0.11, median value = 0.05, criteria value = 0.69, 25 non-detects. There are no problems with total phosphorus in this segment of the river.

Chlorophyll-a (µg/l): 28 samples, ranging from <1 to 23, median value = 1, 2 values above criteria value of 14.1, 23 non-detects. Both exceedences occurred after long periods of little or no flow. There are no problems with chlorophyll-a in this segment of the river.

TSS (mg/l): 28 samples, ranging from <4 to 65, median value = 4, 6 non-detects, no trends. There are no problems with TSS in this segment of the river.

***E. coli* (cfu): 19 samples, ranging from 8.5 to 1200, median value = 50, geometric mean = 43, 1 sample exceeds the single sample criteria of 394, geometric mean criteria = 126.** The one exceedence occurred in May 2006, but it was not related to flow. There are no problems with bacteria in this segment of the river.

TDS (mg/l): 33 samples, ranging from 252 to 704, median value = 502, average value = 479, average criteria value = 700, no trends. There are no problems with TDS on this segment of the river.

Chloride (mg/l): 28 samples, ranging from 14 to 154, median value = 81, average value = 74, average criteria value = 200, no trends. There are no problems with chloride on this segment of the river.

Sulfate (mg/l): 28 samples, ranging from 21 to 70, median value = 44, average value = 43, average criteria value = 100, no trends. There are no problems with sulfate on this segment of the river.

Segment 2111, Upper Sabinal River, flows 48 miles from the most upstream crossing of FM 187 in Bandera County to a point 100 m (110 yards) upstream of SH 127 in Uvalde County.

The segment is divided into two AUs: (01) the lower 25 miles and (02) the upper 23 miles.

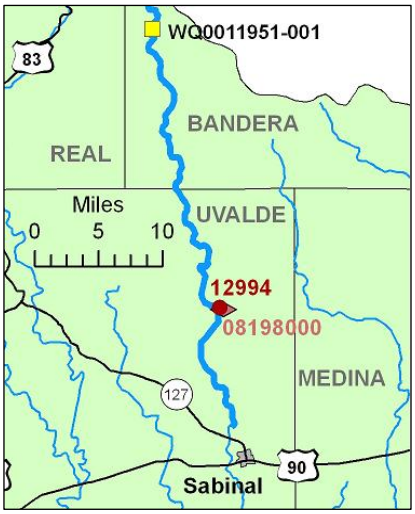


Figure 3.3 – 34:
Upper Sabinal River

Active Wastewater Permits

WQ0011951-001 – TPWD – Lost Maples State Park: 8,000 gpd via irrigation of 3.25 acres of non-public access grassland.

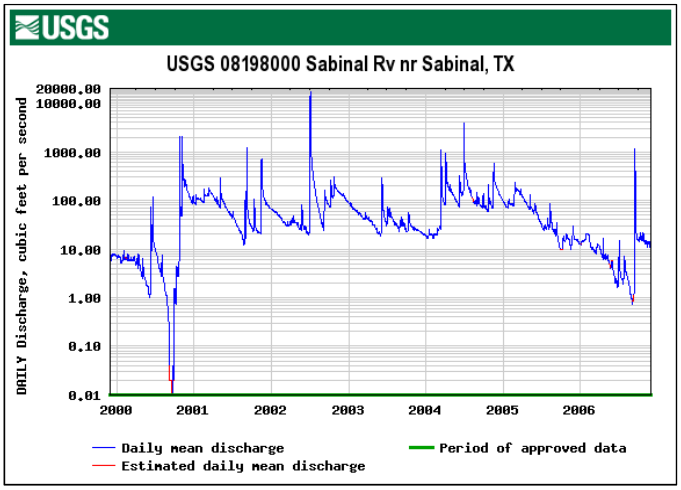
Flow

There is one USGS gauge in this segment: Sabinal River near Sabinal, TX. The gauge is located at the same location as Station 12994. Recorded flows during this time period range between 0.01 cfs and 17,100 cfs, with a median flow of 34 cfs.

Water Quality Analysis

Station Summary

Site	12994 – 12.5 miles north of Sabinal and 2.3 miles downstream from the mouth of Onion Creek
Entity	TCEQ
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field
Date Range	1996 – Present



DO (mg/l): 26 samples, ranging from 5.5 to 13.4, median value = 8.8, screening level = 5.0, no trends. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 25 samples, ranging from 7.4 to 8, median value = 7.8, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 25 samples, ranging from <0.05 to 0.07, median value = 0.07, criteria value = 0.33, 23 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 24 samples, ranging from 0.05 to 1.29, median value = 0.34, criteria value = 1.95, no trends. There are no problems with N+N in this section of the river.

OP (mg/l): 24 samples, all non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 25 samples, ranging from <0.05 to 0.08, median value = 0.05, criteria value = 0.69, 24 non-detects, no trends. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 25 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 25 samples, ranging from <1 to 3, median value = 1, 16 non-detects. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 17 samples, ranging from <1 to 84, median value = 24, geometric mean = 16, single sample criteria = 394, geometric mean criteria = 126, 1 non-detect.** There are no problems with bacteria in this section of the river.

2111_02: upper 23 miles

No stations where sampled on this AU during the assessment period.

Entire Segment

TDS (mg/l): 33 samples, ranging from 254 to 341, median value = 278, average value = 286, average criteria value = 500, no trends. There are no problems with TDS on this segment of the river.

Chloride (mg/l): 25 samples, ranging from 9 to 91, median value = 11, average value = 14, average criteria value = 50, no trends. There was one reading above the criteria value occurring towards the end of 2006 after a long dry periods. All other values are <20. There are no problems with chloride on this segment of the river.

Sulfate (mg/l): 25 samples, ranging from 20 to 38, median value = 24, average value = 25, average criteria value = 75, no trends. There are no problems with sulfate on this segment of the river.

Segment 2112, Upper Nueces River, flows 123 miles from the confluence of the East Prong Nueces River and Hackberry Creek in Edwards County to a point 100 m (110 yards) upstream of FM 1025 in Zavala County.

This segment is the uppermost reach of the Nueces River, originating in the Texas Hill County. It is the section of the river that crosses the Edwards Aquifer Recharge Zone. As the river flows southward, the land goes from hilly brush country to farm and ranch lands.

No WWTPs discharge to this segment. The one permitted site, in the upper portion, discharges via irrigation. There are a couple of small communities along the river, with the City of La Pryor being the largest. It is located in the lower portion of the segment.

The segment is divided into four AUs: (01) the lower 25 miles, (02) the 25 miles surrounding US 83, (03) from US 90 to 25 miles upstream near RR 334, and (04) the upper 43 miles.

Active Wastewater Permits

WQ0012334-001 – City of Camp Wood: 101,000 gpd via irrigation on 14 acres.

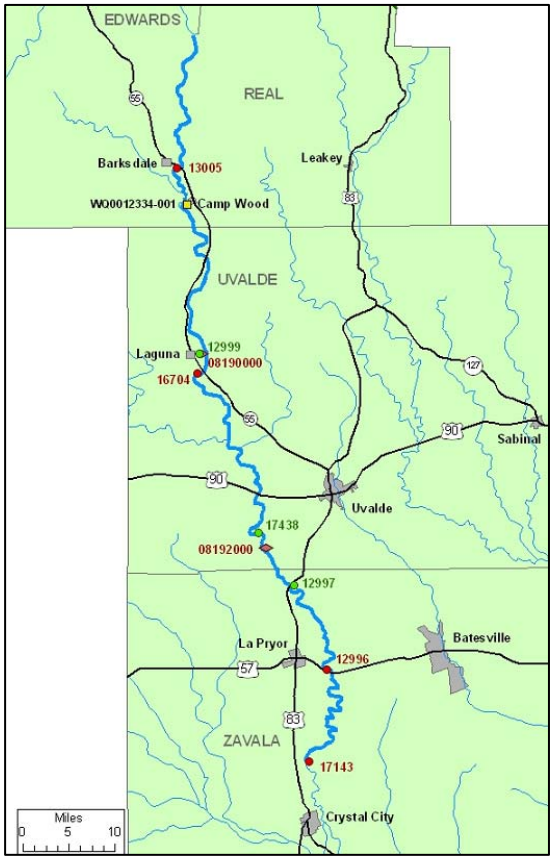
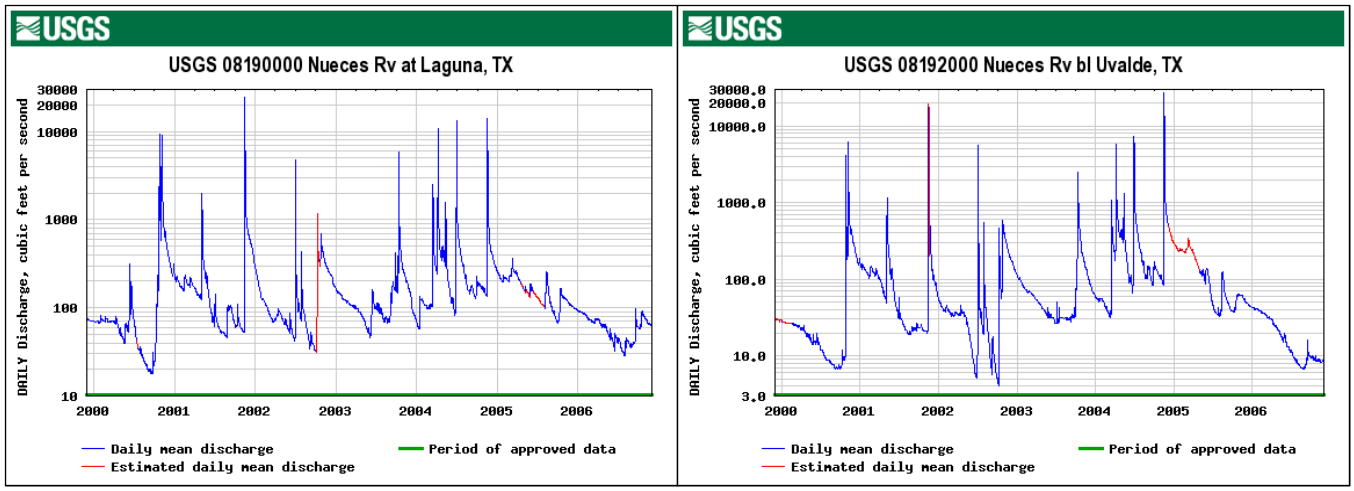


Figure 3.3 – 35: Upper Nueces River

Flow

There are two USGS gauges in this segment: Nueces River at Laguna, TX (above the Edwards Aquifer Recharge Zone) and Nueces River near Uvalde, TX (below the Edwards Aquifer Recharge Zone).



The gauge located at Laguna, TX is at the same location as Station 12999. Recorded flows during this time period range between 18 cfs and 24,800 cfs, with a median flow of 104 cfs. The gauge located near Uvalde, TX is located just downstream of Station 17438. Recorded flows during this time period range between 4.1 cfs and 26,900 cfs, with a median flow of 42 cfs.

Water Quality Analysis

2112_01: lower 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12996 – 20 m upstream of US 57 south of Uvalde	TCEQ	Quarterly	Conventional, Bacteria, Field	1997 – Present
17143 – Lake Averhoff / Upper Nueces Lake 1.62 km upstream of TPWD boat ramp	TCEQ	Quarterly	Conventional, Bacteria, Field	2000 – Present

DO (mg/l): 40 samples, ranging from 4.9 to 13.8, median value = 9.1, 1 value below screening level of 5.0, no trends. Neither station shows the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. Although not completely reversed, some of the higher readings occur in the warmer months. These stations are located below the Edwards Aquifer Recharge Zone, but there does not appear to be any correlation to flow. The one value recorded below the criteria value occurred in November 2006 at Station 17143, which is considered to be in a lake. No 24-Hr DO measurements have been taken at either station.

pH (su): 40 samples, ranging from 7.4 to 8.3, median value = 7.9, criteria range is 6.5 to 9, no trends. There are no problems with pH in this section of the river.

Ammonia (mg/l): 43 samples, ranging from <0.05 to 0.15, median value = 0.05, criteria value = 0.33, 36 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 42 samples, ranging from <0.04 to 1.76 median value = 0.9, = criteria value = 1.95, 3 non-detects, no trends. There are no problems with N+N in this section of the river. All of the non-detects occurred at Station 17143.

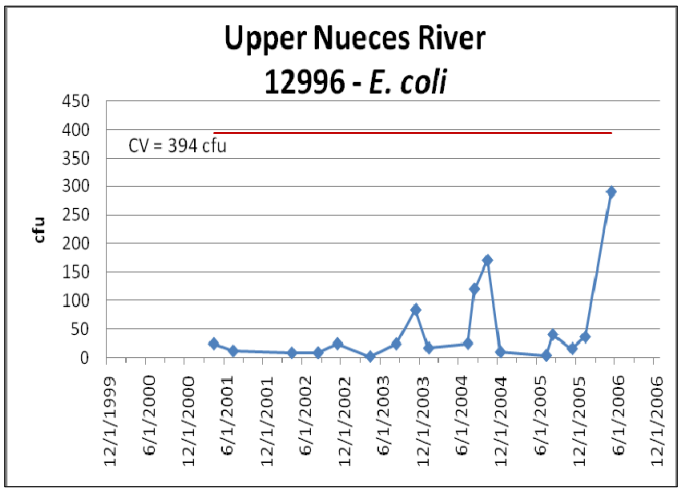
OP (mg/l): 42 samples, all values non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 42 samples, all values non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 42 samples, ranging from <1 to 10.6, median value = 1, criteria value = 14.1, 38 non-detects, no trends. There are no problems with chlorophyll-a in this section of the river. All of the samples with measurable values occurred at Station 17143.

TSS (mg/l): 43 samples, ranging from <4 to 16, median value = 4, 22 non-detects, no trends. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 35 samples, ranging from <1 to 290, median value = 12, geometric mean = 11, single sample criteria = 394, geometric mean criteria = 126, 2 non-detects.** Based on limited data, Station 12996 may be developing an increasing trend, and will continue to be monitored. The values are still below the single sample criteria. All values recorded at Station 17143 are <35.



2112_02: 25 miles surrounding US 83

Station Summary

Site	Date Range
12997 – west bank 60 m downstream of US 83 bridge south of Uvalde	2001 – 2004
17438 – Marisole Ranch approx 2.5 miles upstream of FM 481 SW of Uvalde	2001 – 2002

DO (mg/l): 27 samples, ranging from 5.3 to 10.5, median value = 6.5, screening level = 5.0. There are no problems with low DO on this section of the river. No 24-Hr DO measurements have been taken at either of these sites.

pH (su): 17 samples, ranging from 7.1 to 8.4, median value = 7.8, criteria range is 6.5 to 9. There are no problems with pH on this section of the river.

Ammonia (mg/l): 16 samples, ranging from <0.02 to 0.12, median value = 0.04, criteria value = 0.33, 6 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 17 samples, ranging from 0.44 to 1.6, median value = 1.1, criteria value = 1.95. There are no problems with N+N in this section of the river.

OP (mg/l): 9 samples, ranging from <0.002 to 0.2, median value = 0.002, criteria value = 0.33, 6 non-detects. There are no problems with OP in this section of the river.

Figure 3.3 – 36: Upper Nueces River Station 12997, July 2003

Total Phosphorus (mg/l): 17 samples, ranging from <0.002 to 0.3, median value = 0.002, criteria value = 0.69, 8 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 11 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 17 samples, ranging from <1 to 3, median value = 1, 12 non-detects. There are no problems with TSS in this section of the river, as evident from the photo.

***E. coli* (cfu): 17 samples, ranging from 7 to 50, median value = 24, geometric mean = 23, single sample criteria = 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river.

2112_03: from US 90 to 25 miles upstream near RR 334

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12999 – 1 mile NE of Laguna and 0.54 miles downstream from Sycamore Creek, 2.5 miles upstream of SH 55 Bridge				1997 - 1999
16704 – Immediately downstream of SH 55 southbound bridge approx 2.5 km south of Laguna	TCEQ	Quarterly	Conventional, Bacteria, Field	1999 – Present

There are no data for Station 12999 during the 2008 Assessment period. Earlier data were combined with the data from Station 16704 in order to conduct the trend analysis.

DO (mg/l): 28 samples, ranging from 7.0 to 12.3, median value = 7.4, screening level = 5.0, no trends. There are no problems with low DO on this section of the river. No 24-Hr DO measurements have been taken at either of these sites.

pH (su): 26 samples, ranging from 6.4 to 8.2, median value = 7.9, 1 value below lower criteria range of 6.5 to 9, no trends. There is very little variation in pH values except for the one low reading in February 2006. This appears to be an anomaly as none of the other parameters show a significant increase or decrease at this time.

Ammonia (mg/l): 27 samples, ranging from <0.05 to 0.06, median value = 0.05, criteria value = 0.33, 26 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 27 samples, ranging from 0.34 to 2.17, median value = 0.83, 1 value above criteria value of 1.95, no trends. A single high reading occurred in November 2001 during relatively high flow and may be attributed to runoff from upstream agriculture. Otherwise, there are no problems with N+N in this section of the river.

OP (mg/l): 27 samples, all non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 26 samples, ranging from <0.01 to 0.1, median value = 0.01, criteria value = 0.69, 25 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 27 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 27 samples, ranging from <1 to 3, median value = 1, 20 non-detects, no trends. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 21 samples, ranging from <1 to 260, median value = 7, geometric mean = 11, single sample criteria = 394, geometric mean criteria = 126, 3 non-detects.** The single high reading occurred in November 2001 during relatively high flow. Otherwise, there are no problems with bacteria in this section of the river.

2112_04: upper 43 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13005 – SH 55 south of Barksdale	NRA	Quarterly	Conventional, Bacteria, Field	2001 – Present

DO (mg/l): 21 samples, ranging from 5.3 to 10.7, median value = 7.6, screening level = 5.0.
There appears to be a general increase over time in the winter values, but a longer period of record is needed to verify if a trend exists. There are no problems with low DO on this section of the river. No 24-Hr DO measurements have been taken at this site.

pH (su): 21 samples, ranging from 7.4 to 8.2, median value = 7.9, criteria range is 6.5 to 9. pH varied widely prior to 2005 when both the minimum and maximum values occurred. Since then, the values have been closer to the median value. In general, the lower pH values correlate to higher flow, but all values are well within the criteria range. There are no problems with pH on this section of the river.

Ammonia (mg/l): 20 samples, ranging from <0.02 to 0.17, median value = 0.02, criteria value = 0.33, 13 non-detects. There are no problems with ammonia in this section of the river.

Figure 3.3 – 37: Upper Nueces River Station 13005, October 2006

N+N (mg/l): 21 samples, ranging from 0.36 to 1.34, median value = 0.63 criteria value = 1.95. There are no problems with N+N in this section of the river.

OP (mg/l): 6 samples, ranging from <0.002 to 0.003, median value = 0.002, criteria value = 0.37, 4 non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 21 samples, ranging from <0.002 to 0.4, median value = 0.002, criteria value = 0.69, 15 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 18 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 21 samples, ranging from <0.1 to 2, median value = 1. There are no problems with TSS in this section of the river, as evident from the photo in Figure 3.3 – 37

***E. coli* (cfu): 21 samples, ranging from 2 to 152, median value = 16, geometric mean = 16, single sample criteria = 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river.

Entire Segment

TDS (mg/l): 128 samples, ranging from 168 to 729, median value = 250, average value = 266, average criteria value = 400. The higher readings are only seen at Station 17143 in the most downstream section during the low flow periods in November 2000 and August 2006.

Chloride (mg/l): 105 samples, ranging from 7 to 184, median value = 16, average value = 26, average criteria value = 50, 4 non-detects. The higher readings also occurred only at Station 17143 corresponding to low flow during the latter half of 2006.

Sulfate (mg/l): 105 samples, ranging from 7.5 to 90, median value = 16, average value = 19, average criteria value = 50, 4 non-detects. Like TDS and chloride, the higher readings occur only at Station 17143 corresponding to low flow during the latter half of 2006.

Segment 2113, Upper Frio River

, flows 47 miles from the confluence of the West Frio River and the East Frio River in Real County to a point 100 m (110 yards) upstream of US 90 in Uvalde County.

This segment is the uppermost reach of the Frio River, originating in the Texas Hill County. It is the section of the river that crosses the Edwards Aquifer Recharge Zone. As the river flows southward, the land goes from hilly brush country to farm and ranch lands.

This portion of the river is a popular recreational spot for tubing.

The segment is divided into two AUs: (01) the lower 25 miles and (02) the upper 22 miles.

Active Wastewater Permits

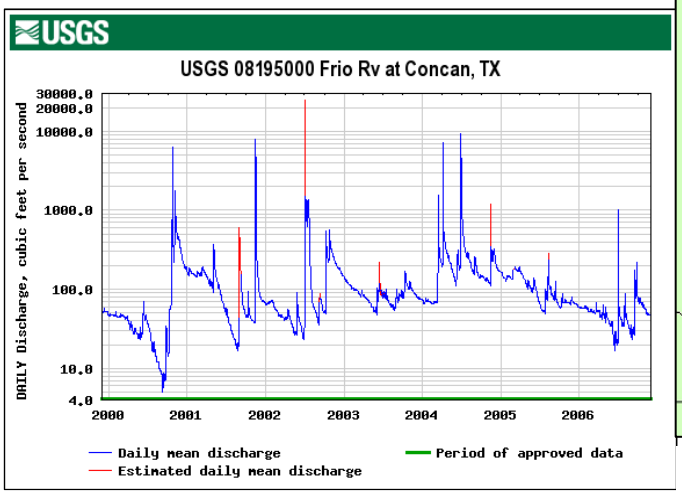
WQ0011683-001 – Alto Frio Baptist Encampment: 20,000 gpd via irrigation of 2.0 acres of pasture land.

WQ0011962-001 – Garner SP: 60,000 gpd via irrigation of 20 acres of non-public access land.

Flow

There is one USGS gauge in this segment: Frio River at Concan, TX (above the Edwards Aquifer Recharge Zone).

The gauge is located at the same location as Station 13006. Recorded flows during this time period range between 5 cfs and 9,270 cfs, with a median flow of 71 cfs. Missing data, indicated by the red lines in the graph, are not included in the stats. The highest estimated value is between 20,000 cfs and 30,000 cfs.



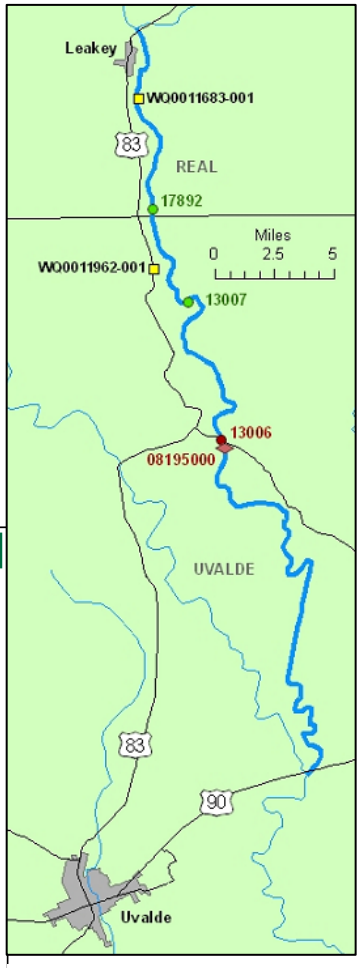


Figure 3.3 – 38: Upper Frio River

Water Quality Analysis

2113_01: lower 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13006 – SH 127 east of Concan	TCEQ	Quarterly	Conventional, Bacteria, Field	1996 – Present

DO (mg/l): 65 samples, ranging from 5.1 to 13.3, median value = 8.6, 1 value below screening level of 6.0, no trends. The one exceedence occurred in September 2001. There are no problems with low DO on this segment of the river.

Average 24–Hr DO (mg/l): 14 samples, ranging from 6.7 to 10.8, median value = 7.8, criteria value = 6.0. These 24-Hr DO measurements confirm there are no problems with DO on this segment.

Minimum 24–Hr DO (mg/l): 14 samples, ranging from 6.1 to 10.4, median value = 7.5, criteria value = 4.0.

pH (su): 69 samples, ranging from 5.7 to 8.8, median value = 7.9, 1 value below lower criteria range of 6.5 to 9, no trends. There is very little variation in pH values except for the one low reading in February 2006. This appears to be an anomaly as none of the other parameters show a significant increase or decrease at this time.

Ammonia (mg/l): 74 samples, ranging from <0.01 to 0.3, median value = 0.01, criteria value = 0.33, 68 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 54 samples, ranging from <0.05 to 1.44, median value = 0.58, criteria value = 1.95. There are no problems with N+N in this section of the river.

OP (mg/l): 74 samples, ranging from <0.01 to 0.12, median value = 0.01, criteria value = 0.37, 71 non-detects, no trends. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 62 samples, ranging from <0.01 to 0.1, median value = 0.01, criteria value = 0.69, 56 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 42 samples, ranging from <0.01 to 1.4, median value = 0.01, criteria value = 14.1, 41 non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 30 samples, ranging from <1 to 3, median value = 1, 23 non-detects, no trends. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 32 samples, ranging from <1 to 299, median value = 20, geometric mean = 16, single sample criteria = 394, geometric mean criteria = 126, 1 non-detect.** There are no problems with bacteria in this section of the river.

The 2008 Assessment also lists this section as being impaired for fish and macrobenthos community and as having a concern for impaired habitat.

2113_02: upper 22 miles

Station Summary

Site	Date Range
13007 – at Magers Crossing 670m downstream of Garner State Park Dam	1999 – 2004
17892 – Apache Bluffs 450m upstream of FM 1120	2002 – 2004

DO (mg/l): 38 samples, ranging from 5.7 to 11.8, median value = 8.2, 1 value below screening level of 6.0. The one exceedence occurred in October 2002. There are no problems with low DO on this segment of the river.

Average 24–Hr DO (mg/l): 24 samples, ranging from 6.3 to 10.6, median value = 7.8, criteria value = 6.0. These 24-Hr DO measurements confirm there are no problems with DO on this segment.

Minimum 24–Hr DO (mg/l): 24 samples, ranging from 5.9 to 9.8, median value = 6.9, criteria value = 4.0.

pH (su): 41 samples, ranging from 7.5 to 8.4, median value = 8.0, criteria range is 6.5 to 9. There are no problems with pH on this segment of the river.

Ammonia (mg/l): 41 samples, ranging from <0.05 to 0.53, median value = 0.05, 1 value above criteria value of 0.33, 32 non-detects. The one exceedence occurred in January 2003 at Station 13007. Station 17892 also had a relatively high reading on that day. There is no apparent correlation to flow. There are no problems with ammonia in this section of the river.

N+N (mg/l): 40 samples, ranging from <0.05 to 1.75, median value = 0.4, criteria value = 1.95. There are no problems with N+N in this section of the river.

OP (mg/l): 40 samples, ranging from <0.01 to 0.095, median value = 0.01, criteria value = 0.37, 38 non-detects. There are no problems with OP on this segment of the river.

Total Phosphorus (mg/l): 37 samples, ranging from <0.01 to 0.1, median value = 0.001 criteria value = 0.69, 34 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 48 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 24 samples, ranging from <1 to 15, median value = 1. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 37 samples, ranging from 8 to 687, median value = 48, geometric mean = 48, 2 values exceed the single sample criteria of 394, geometric mean criteria = 126.** Both exceedences occurred after a heavy rain event. There are no problems with bacteria in this section of the river.

The 2008 Assessment also lists this section as being impaired for fish community and as having a concern for impaired habitat.

Entire Segment

TDS (mg/l): 124 samples, ranging from 197 to 330, median value = 263, average value = 258, average criteria value = 400, no trends. There are no problems with TDS on this section of the river.

Chloride (mg/l): 117 samples, ranging from 7 to 32, median value = 11, average value = 12, average criteria value = 50, no trends. There are no problems with chloride on this section of the river.

Sulfate (mg/l): 113 samples, ranging from <7.2 to 90, median value = 14, average value = 14, average criteria value = 50, 16 non-detects, no trends. The one high reading is very much an anomaly and occurred in May 2003 at Station 17892. All other values are <30. Comments indicate a possible problem with analysis for this sample set. There are no problems with sulfate on this section of the river.

Segment 2114, Hondo Creek, flows 78 miles from FM 470 in Bandera County to the confluence with the Frio River in Frio County.

The segment is divided into two AUs: (01) the upper 25 miles and (02) the lower 53 miles.

Active Wastewater Permits

WQ0001645-000 – Hondo Vitreous China Plant Wastewater Treatment Facility: 30,000 gpd via evaporation.

WQ0010189-001 – City of Hondo: 1,800,000 gpd via Elm Slough to Hondo Creek.

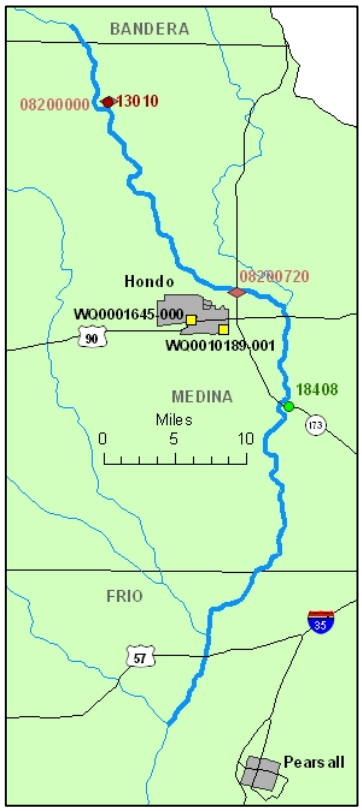
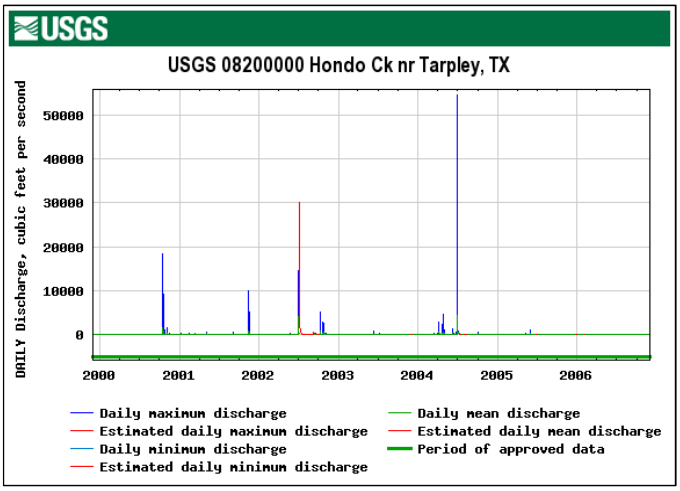


Figure 3.3 – 38:
Hondo Creek

Flow

There are two USGS gauges in this segment: Hondo Creek near Tarpley, TX and Hondo Creek at SH 173 near Hondo. The gauge at Hondo Creek near Tarpley is located at the same location as Station 13010. Recorded flows during this time period range between 0 cfs and 54,400 cfs, with a median flow of 16 cfs. The higher flows are estimated, as the gauge was unable to record during flooding periods.

The gauge at Hondo Creek at SH 173 near Hondo has only been operational since July 2006, with all recorded values at 0 cfs. Both gauges are above, and therefore do not include, the discharge from the City of Hondo's WWTP.



Water Quality Analysis

2114_01: upper 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13010 – 150 m downstream of RR 462 bridge near Tarpley	TCEQ	Quarterly	Conventional, Bacteria, Field	1996 – Present

DO (mg/l): 24 samples, ranging from 4.6 to 13, median value = 9.3, 1 value below screening level of 5.0, no trends. The one exceedence occurred in August 2000 after an extended period of little or no flow. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 23 samples, ranging from 6.9 to 8.5, median value = 7.9, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 24 samples, ranging from <0.05 to 0.37, median value = 0.05, 1 value above criteria value of 0.33, 21 non-detects, no trends. The one exceedence occurred in November 2000 following the first flow event in months. There are no problems with ammonia in this section of the river.

N+N (mg/l): 22 samples, ranging from <0.05 to 0.92, median value = 0.18, criteria value = 1.95, no trends. There are no problems with N+N in this section of the river.

OP (mg/l): 23 samples, all non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 25 samples, ranging from <0.05 to 0.12, median value = 0.05, criteria value = 0.69, 23 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 25 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 25 samples, ranging from <1 to 5, median value = 1, 12 non-detects. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 13 samples, ranging from <1 to 105, median value = 15, geometric mean = 12, single sample criteria = 394, geometric mean criteria = 126, 1 non-detect.** There are no problems with bacteria in this section of the river.

2114_02: lower 53 miles

Station Summary

Site	Date Range
18408 – Mid channel immediately downstream of SH 173 SE of Hondo	2004 – 2007

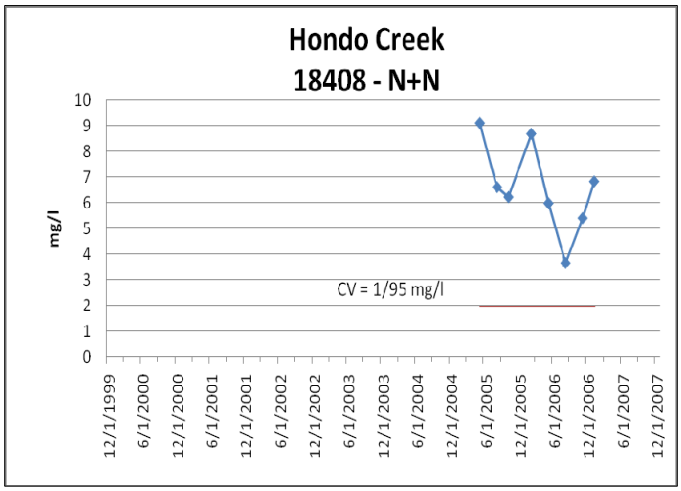
This AU was not evaluated in for the 2008 Assessment since there were only 8 samples collected at Station 18408 during the assessment period. Therefore, the water quality analysis for this section used data from December 2004 to May 2007.

DO (mg/l): 10 samples, ranging from 8.1 to 13.9, median value = 10.3, screening level = 5.0. There are no apparent problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 10 samples, ranging from 5.9 to 8, median value = 7.8, 1 value below criteria range of 6.5 to 9. The one exceedence occurred in February 2006 and has since rebounded. There are no apparent problems with pH on this section of the river.

Ammonia (mg/l): 8 samples, ranging from <0.05 to 0.06, median value = 0.05, criteria value = 0.33, 7 non-detects. There are no apparent problems with ammonia in this section of the river.

N+N (mg/l): 8 samples, ranging from 3.67 to 9.13, median value = 6.24, all values above criteria value of 1.95. There appears to be a problem with N+N in this section of the river and may be one of the contributing factors to the high N+N readings in the Frio River below Hondo Creek. This sampling site is located below the City of Hondo's WWTP outfall. Sampling at this site was discontinued because it was dry most of the time.



OP (mg/l): 8 samples, all non-detects. There are no apparent problems with OP in this section of the river.

Total Phosphorus (mg/l): 8 samples, all non-detects. There are no apparent problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 8 samples, ranging from <3 to 19.9, median value = 3, 1 value above criteria value of 14.1, 7 non-detects. It is difficult to say whether or not there is a potential problem with chlorophyll-a in this section of the river since the only recorded value is an exceedence and all others are non-detects. However, the Frio River below Hondo Creek does not have a concern for this parameter.

TSS (mg/l): 8 samples, ranging from <4 to 9, median value = 4, 6 non-detects. There are no apparent problems with TSS in this section of the river.

***E. coli* (cfu): 10 samples, ranging from <1 to 101, median value = 19, geometric mean = 14, single sample criteria = 394, geometric mean criteria = 126, 1 non-detect.** There are no apparent problems with bacteria in this section of the river.

Entire Segment

TDS (mg/l): 43 samples, ranging from 208 to 624, median value = 274, average value = 328, average criteria value = 400, no trends. There are no problems with TDS on this segment of the river. However, all of the values at Station 18408 are >530 and all of the values at 13010 are <320.

Chloride (mg/l): 33 samples, ranging from 8 to 149, median value = 11, average value = 38, average criteria value = 50, no trends. There are no problems with chloride on this segment of the river. However, all of the values at Station 18408 are >90 and all of the values at 13010 are <20.

Sulfate (mg/l): 33 samples, ranging from 22 to 104, median value = 36, average value = 51, average criteria value = 100, no trends. There are no problems with sulfate on this segment of the river. However, all of the values at Station 18408 are >85 and all of the values at 13010 are <75.

Segment 2115, Seco Creek, flows 70 miles from the confluence of West Seco Creek in Bandera County to the confluence with Hondo Creek in Frio County.

The segment is divided into two AUs: (01) the upper 25 miles and (02) the lower 45 miles.

Figure 3.3 – 40: Seco Creek

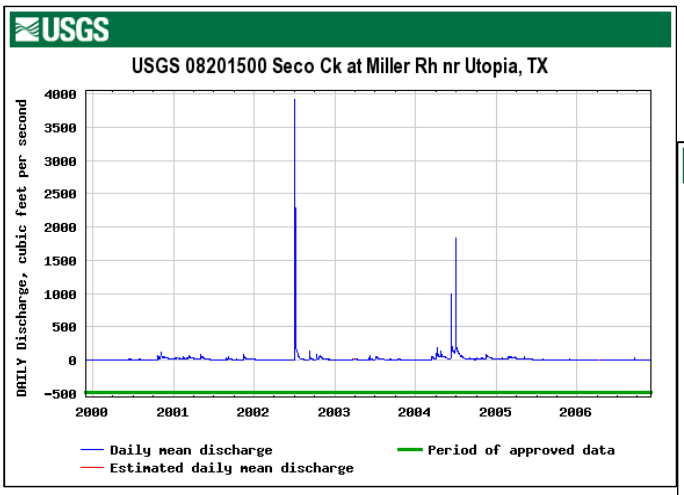
Active Wastewater Permits

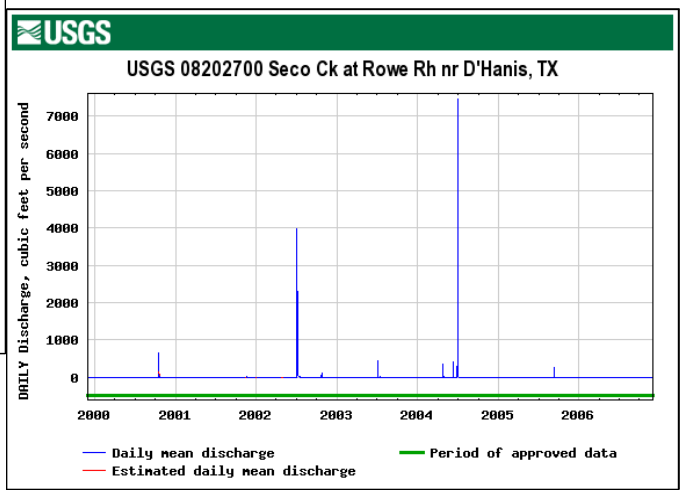
WQ0011144-001 – Medina County WCID 002: 80,000 gpd directly to Seco Creek.

Flow

There are two USGS gauges in this segment: Seco Creek at Miller Ranch near Utopia, TX and Seco Creek at Rowe Ranch near D'Hanis, TX. The gauge at Seco Creek at Miller Ranch near Utopia is located at the same location as Station 13013. Recorded flows during this time period range between 0 cfs and 3,920 cfs, with a median flow of 5.2 cfs. There are data gaps in March 2003 and December 2004 because the gauge was unable to record during flooding periods.

The gauge at Seco Creek at Row Ranch near D'Hanis recorded flows during this time period ranging between 0 cfs and 7,450 cfs, with a median flow of 0 cfs.





Water Quality Analysis

2115_01: upper 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13013 – Medina CR 111 on Miller Ranch near Utopia at 4th crossing downstream of SH 470	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 24-Hr DO	1975 – Present

DO (mg/l): 24 samples, ranging from 7.1 to 12.9, median value = 8.8, screening level = 5.0, no trends. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 24 samples, ranging from 5.9 to 8.4, median value = 8, 1 value below criteria range of 6.5 to 9, no trends. The one exceedence occurred in January 2006. There are no problems with pH on this section of the creek.

Ammonia (mg/l): 23 samples, ranging from <0.05 to 0.09, median value = 0.05, criteria value = 0.33, 21 non-detects, no trends. There are no problems with ammonia in this section of the creek.

N+N (mg/l): 22 samples, ranging from <0.04 to 0.22, median value = 0.14, criteria value = 1.95, 5 non-detects, no trends. There are no problems with N+N in this section of the creek.

OP (mg/l): 22 samples, all non-detects. There are no problems with OP in this section of the creek.

Total Phosphorus (mg/l): 23 samples, ranging from <0.05 to 0.08, median value = 0.05, = criteria value = 0.69, 22 non-detects. There are no problems with total phosphorus in this section of the creek.

Chlorophyll-a (µg/l): 24 samples, all non-detects. There are no problems with chlorophyll-a in this section of the creek.

TSS (mg/l): 24 samples, ranging from <1 to 15, median value = 2, 5 non-detects, no trends. There are no problems with TSS in this section of the creek.

***E. coli* (cfu): 14 samples, ranging from <1 to 55, median value = 4, geometric mean = 5, single sample criteria = 394, geometric mean criteria = 126, 1 non-detect.** There are no problems with bacteria in this section of the creek.

2115_02: lower 53 miles

No stations where sampled on this AU during the assessment period.

Entire Segment

TDS (mg/l): 35 samples, ranging from 194 to 311, median value = 252, average value = 255, average criteria value = 400, no trends. There are no problems with TDS on the creek.

Chloride (mg/l): 23 samples, ranging from 9 to 14, median value = 10, average value = 11, average criteria value = 50, no trends. There are no problems with chloride on the creek.

Sulfate (mg/l): 23 samples, ranging from 24 to 75, median value = 41, average value = 42, average criteria value = 70, no trends. There are no problems with sulfate on the creek.

Segment 2116, Choke Canyon Reservoir

, impounds the Frio River and is defined by the 220.5' MSL elevation from a point 4.2 km (2.6 miles) downstream of SH 16 on the Frio River Arm in McMullen County and from a point 100 m (110 yards) upstream of the confluence of Mustang Branch on the San Miguel Creek Arm in McMullen County to the Choke Canyon Dam in Live Oak County.

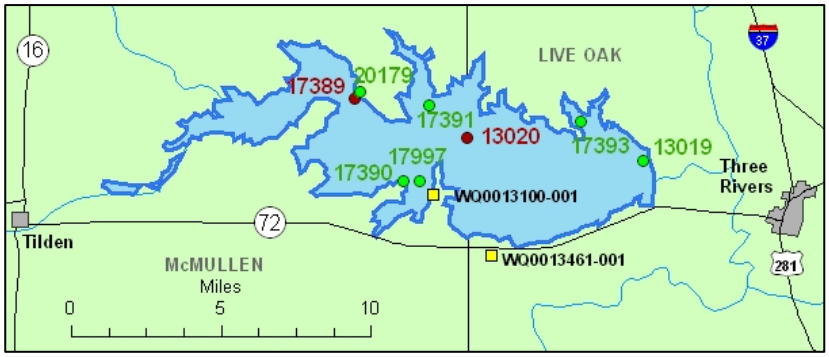


Figure 3.3 – 41: Choke Canyon Reservoir

The reservoir was built by the Bureau of Reclamation and operated by the City of Corpus Christi. There is no private property around the reservoir. There are two State Parks: the Calliham Unit located on the southern peninsula just west of the Duval – Live Oak County line; and the South Shore Unit located along the southern shore near the dam.

The segment is divided into seven AUs: (01) the 5120 acres near dam, (02) the small north arm of lake near dam and Willow Hollow Tank, (03) the 5120 acres in middle of lake, (04) the large north arm near mid lake and Jacob Oil Field, (05) the southern arm near mid lake and Rec. Rd. 7 west of Calliham, (06) the western end of lake up to RR 99 bridge, and (07) the remainder of the lake.

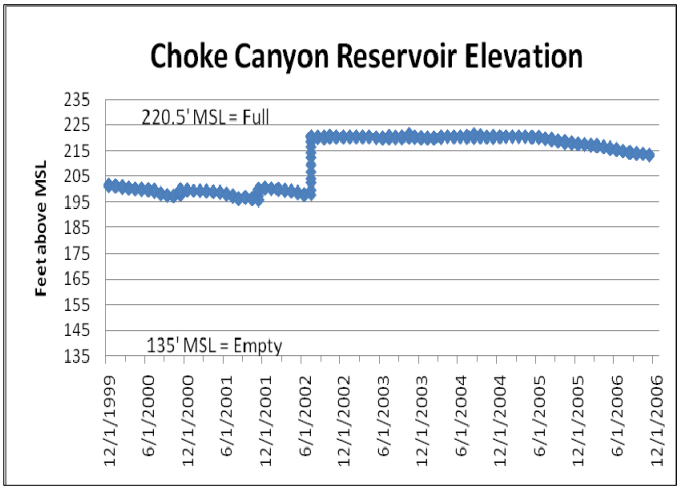
Active Wastewater Permits

WQ0013100-001 – TPWD – Choke Canyon State Park, Calliham Unit WWTP: 13,000 gpd via evaporation.

WQ0013461-001 – US Department of Justice – Federal Correctional Institution at Three Rivers: 300,000 gpd via irrigation on 82 acres plus effluent line to the Nueces River Segment 2104.

Elevation

The lowest the lake levels ever fell during the 2008 Assessment Period was 195.6'. It was full at 220.5' for a total of 644 days. The median level was 217.4'



Water Quality Analysis

2116_01: 5120 acres near dam

Station Summary

Site	Date Range
13019 – Near the dam 422 m south and 129 m east of spillway channel	1999 – 2006

Only DO and pH were collected at this station.

DO (mg/l): 20 samples, ranging from 6.1 to 10.2, median value = 7.9, screening level = 5.0. There are no problems with low DO in this portion of the reservoir. No 24-Hr DO measurements have been taken at this station.

pH (su): 20 samples, ranging from 8.0 to 8.6, median value = 8.4, criteria range is 6.5 to 9. There are no problems with pH on this portion of the reservoir.

2116_02: small north arm of lake near dam and Willow Hollow Tank

Station Summary

Site	Date Range
17393 – Mid arm in the NE arm west of the intersection of US 281 and IH 37	1999 – 2006

Only DO and pH were collected at this station.

DO (mg/l): 22 samples, ranging from 6.1 to 10.7, median value = 8.1, screening level = 5.0. There are no problems with low DO in this portion of the reservoir. No 24-Hr DO measurements have been taken at this station.

pH (su): 22 samples, ranging from 7.9 to 8.7, median value = 8.4, criteria range is 6.5 to 9. There are no problems with pH on this portion of the reservoir.

2116_03: 5120 acres in middle of lake

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13020 – mid lake 15 m east of Live Oak/McMullen County line near old HWY 99 1.25 km north of Choke Canyon State Park Point	NRA	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water	2000 – Present

DO (mg/l): 41 samples, ranging from 4.6 to 10.7, median value = 7.6, 1 value below screening level of 5.0. There are no problems with low DO in this portion of the reservoir. No 24-Hr DO measurements have been taken at this station.

pH (su): 43 samples, ranging from 7.8 to 8.8, median value = 8.4, criteria range is 6.5 to 9. There are no problems with pH in this portion of the reservoir.

Ammonia (mg/l): 22 samples, ranging from <0.02 to 0.05, median value = 0.02, criteria value = 0.11, 19 non-detects. There are no problems with ammonia in this portion of the reservoir.

N+N (mg/l): 21 samples, ranging from <0.01 to 0.17, median value = 0.01, criteria value = 0.37, 11 non-detects. There are no problems with N+N in this portion of the reservoir.

Figure 3.3 – 42: Choke Canyon Reservoir Station 13020, July 2006

OP (mg/l): 8 samples, ranging from <0.01 to 0.03, median value = 0.01, criteria value = 0.05, 5 non-detects. There are no problems with OP in this portion of the reservoir.

Total Phosphorus (mg/l): 22 samples, ranging from <0.02 to 0.1, median value = 0.02, criteria value = 0.2, 11 non-detects. There are no problems with total phosphorus in this portion of the reservoir.

Chlorophyll-a (µg/l): 19 samples, ranging from 6.4 to 22.8, median value = 14.5, criteria value = 26.7. There are no problems with chlorophyll-a in this portion of the reservoir.

TSS (mg/l): 22 samples, ranging from 4 to 22, median value = 6.5. There are no problems with TSS in this portion of the reservoir.

***E. coli* (cfu): 23 samples, ranging from <1 to 1, median value = 1, geometric mean = 1, single sample criteria = 394, geometric mean criteria = 126, 16 non-detects.** There are no problems with bacteria in this portion of the reservoir.

2116_04: large north arm near mid lake and Jacob Oil Field

Station Summary

Site	Date Range
17391 – Approx. 2.0 km SW of SR Road 8 termination at shore mouth of Opossum Creek arm	1999 – 2006

Only DO and pH were collected at this station.

DO (mg/l): 23 samples, ranging from 6.5 to 11.3, median value = 7.5, screening level = 5.0. There are no problems with low DO in this portion of the reservoir. No 24-Hr DO measurements have been taken at this station.

pH (su): 23 samples, ranging from 8.1 to 8.7, median value = 8.4, criteria range is 6.5 to 9. There are no problems with pH on this portion of the reservoir.

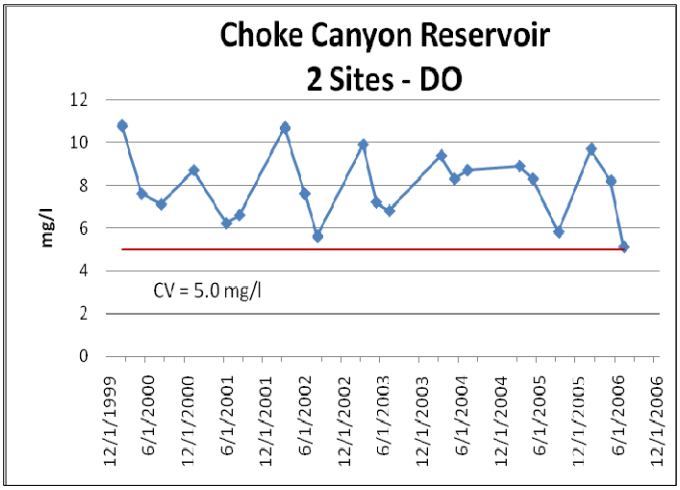
2116_05: southern arm near mid lake and Rec. Rd. 7 west of Calliham

Station Summary

Site	Date Range
17390 – approx 0.5 km west of Choke Canyon State Park and 4 km north of SH 72 crossing the Salt Creek arm	1999 – 2002
17997 – Salt Creek arm mid channel 2.17 km north and 430 m east of north end of McMullen CR 303	2002 - 2006

Only DO and pH were collected at these stations.

DO (mg/l): 24 samples, ranging from 5.1 to 10.8, median value = 7.9, screening level = 5.0, no trends. The data used in this analysis only consists of the surface readings. The parameter is listed as a concern in this portion of the reservoir, which may be due to lower readings occurring deeper in the water column. No 24-Hr DO measurements have been taken at either of these stations.



pH (su): 24 samples, ranging from 7.9 to 8.7, median value = 8.4, criteria range is 6.5 to 9. There are no problems with pH on this portion of the reservoir.

2116_06: western end of lake up to RR 99 bridge

Station Summary

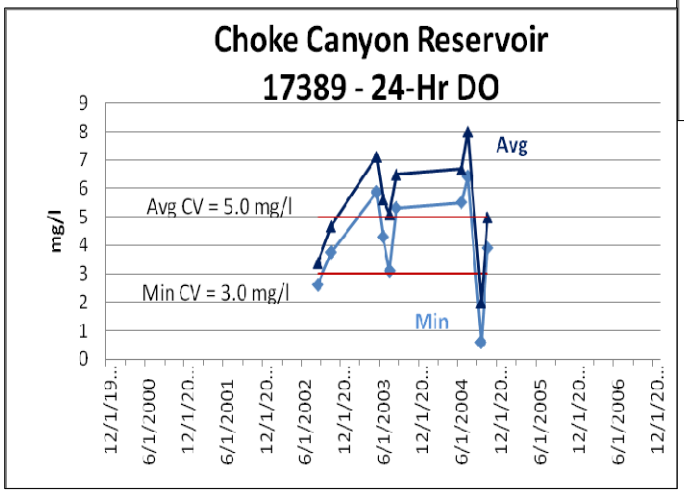
Site	Entity	Frequency	Parameter Groups	Date Range
17389 – approx 0.45 km SE of FM 99 southern most bridge crossing the Frio River Arm	NRA	Quarterly	Conventional, Bacteria, Field, 2 24-Hr DO	1999 – Present
20179 – Frio River arm 70 m north and 660 m east of the FM 99 bridge centerpoint near Horseshoe Tank				2005 - 2006

Only DO and pH were collected at station 20179.

DO (mg/l): 34 samples, ranging from 3.2 to 13.3, median value = 8, 5 values below screening level of 5.0, no trends. This section of the reservoir is listed as having a concern for low DO.

Average 24–Hr DO (mg/l): 10 samples, ranging from 2 to 8, median value = 5.4, 3 values below the criteria value of 5.0. The 24-Hr DO measurements confirm that there is a DO problem in this section of the reservoir.

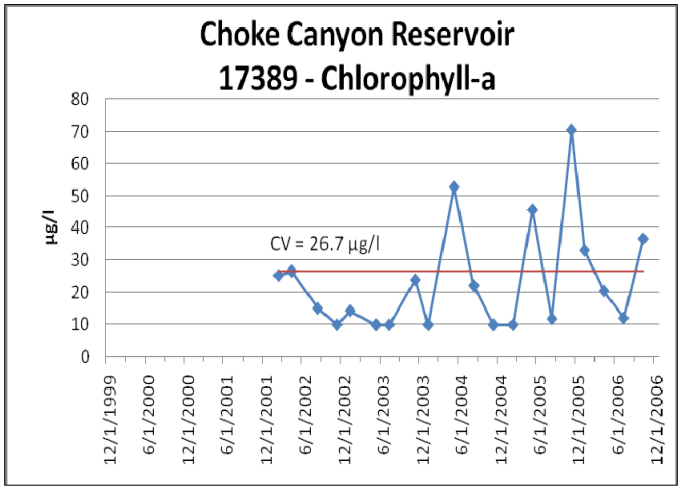
Minmum 24–Hr DO (mg/l): 10 samples, ranging from 2 to 8, median value = 5.4, 3 values below the criteria value of 5.0.

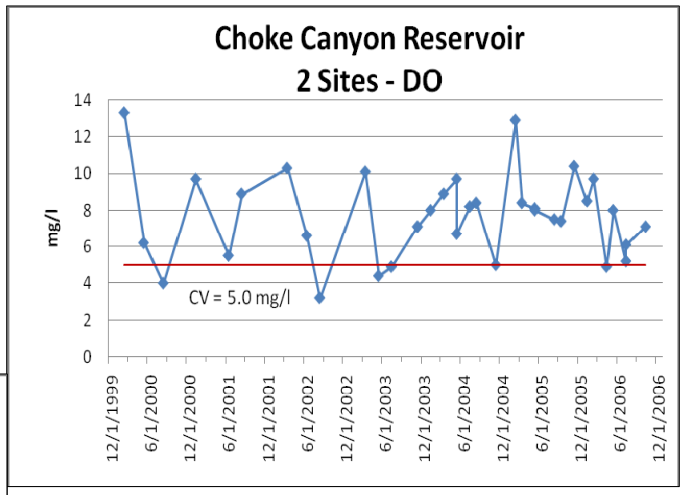


N+N (mg/l): 20 samples, ranging from <0.02 to 0.76, median value = 0.03, 2 values above criteria value of 0.37, 10 non-detects. There have been no exceedences since January 2003. There are no problems with N+N in this section of the reservoir.

OP (mg/l): 8 samples, all non-detects. There are no problems with OP in this section of the reservoir.

Total Phosphorus (mg/l): 20 samples, ranging from <0.04 to 0.14, median value is 0.06, 0 values above criteria value of 0.2, 8 values non-detects. There are no problems with total phosphorus in this section of the reservoir.





pH (su): 34 samples, ranging from 7.7 to 8.8, median value = 8.4, criteria range is 6.5 to 9, no trends. Although the maximum value is close to the upper criteria level, it has been two years since it has been that high. There are no problems with pH in this section of the reservoir.

Ammonia (mg/l): 20 samples, ranging from <0.02 to 0.095, median value = 0.03, criteria value = 0.11, 10 non-detects. There are no problems with ammonia in this section of the reservoir.

Figure 3.3 – 43: Choke Canyon Reservoir Station 17389, July 2006

Chlorophyll-a (µg/l): 20 samples ranging from <10 to 70.7, median value = 17.8, 5 values above criteria value of 26.7, 3 non-detects. The 2008 Assessment does not list this parameter as being a concern in this section of the reservoir, even though 25% of the samples exceed the criteria value. Two of the three values recorded since the assessment have also exceeded the criteria, so this may become a concern with the next assessment.

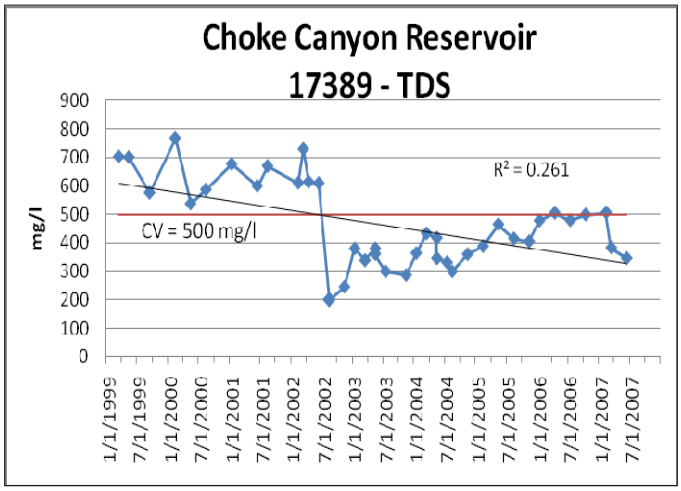
TSS (mg/l): 20 samples, ranging from 3 to 34, median value = 10. There are no problems with TSS in this section of the reservoir.

***E. coli* (cfu): 13 samples, ranging from <1 to 390, median value = 1, geometric mean = 2.4, single sample criteria = 394, geometric mean criteria = 126, 8 non-detects.** There are no problems with bacteria in this section of the reservoir.

2116_07: remainder of the lake

No stations where sampled on this AU during the assessment period.

Entire Segment



TDS (mg/l): 166 samples, ranging from 171 to 767, median value = 464, average value = 446, average criteria value = 500, decreasing trend. Station 17389 is the only station with enough continuous data for trend analysis. During the period prior to the reservoir filling in July 2002, the median TDS level at this station was >600. Levels fell immediately after the reservoir filled, but have continued to rise as the lake remained full.

Chloride (mg/l): 62 samples, ranging from 14 to 147, median value = 82, average value = 88, average criteria value = 250, no trends. There are no problems with chloride on the reservoir. The data shows a similar pattern to TDS, with a large drop then steady rise in values after the reservoir filled in July 2002.

Sulfate (mg/l): 62 samples, ranging from 13.8 to 152, median value = 66, average value = 62, average criteria value = 250, no trends. There are no problems with sulfate on this segment of the reservoir. The data shows a similar, but not as drastic pattern as TDS and chloride, with a drop then steady rise in values after the reservoir filled in July 2002.

Segment 2117, Frio River Above Choke Canyon Reservoir, flows 158 miles from a point 100 m (110 yards) upstream of US 90 in Uvalde County to a point 4.2 km (2.6 miles) downstream of SH 16 in McMullen County.

This land through which this segment flows is primarily brush country, farm, and ranch lands.

The segment is divided into five AUs: (01) the lower 25 miles, (02) from 1.5 miles downstream of SH 97 to 23.5 miles upstream of SH 97 crossing, (03) the 33 miles surrounding SH 85, (04) the 40 miles surrounding US 57, and (05) the upper 35 miles.

Figure 3.3 – 44: Frio River Above Choke Canyon Reservoir

Active Wastewater Permits

WQ0010360-001 – City of Pearsall: 1,950,000 gpd via unnamed tributary to Buck Creek to the Frio River.

WQ0010404-002 – City of Dilley: 300,000 gpd via unnamed tributary to Cibolo Creek to the Frio River.

WQ0010404-003 – City of Dilley

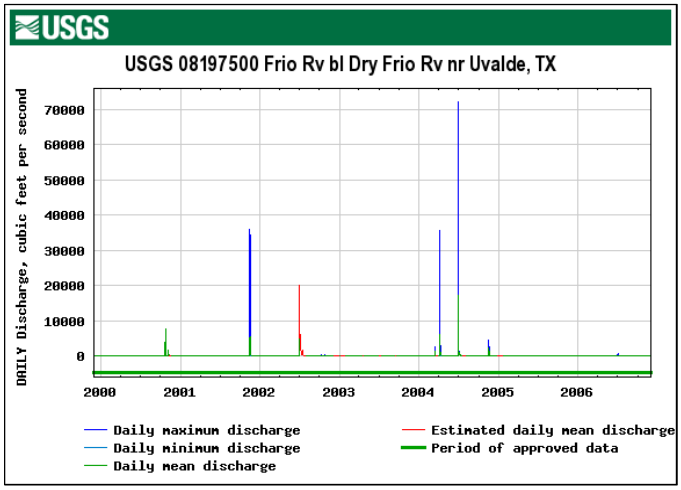
WQ0010404-004 – City of Dilley: 15,000 gpd via drainage ditch to unnamed tributary of Martin Branch Creek to Martin Branch Creek to the Frio River. (Proposed – not plotted on map.)

WQ0011962-001 – TPWD: 60,000 gpd via irrigation on 20 acres of non-public access land.

WQ0013543-001 – McMullen County WCID No. 1 – Tilden WWTP

Flow

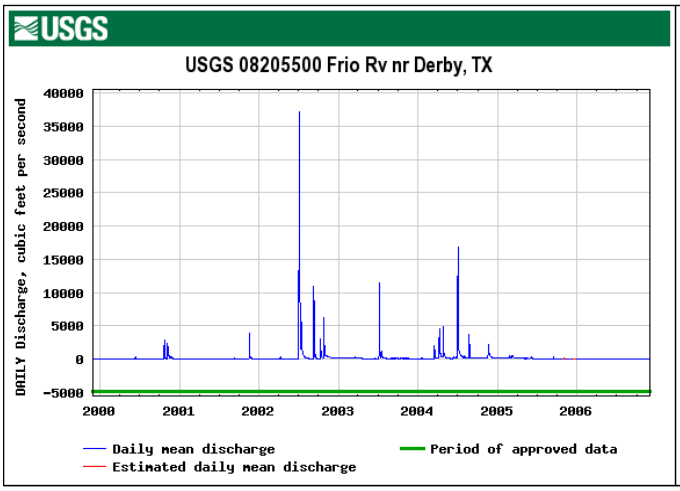
There are three USGS gauges in this segment: Frio River below Dry Frio River near Uvalde, TX; Frio River near Derby, TX; and Frio River at Tilden, TX.

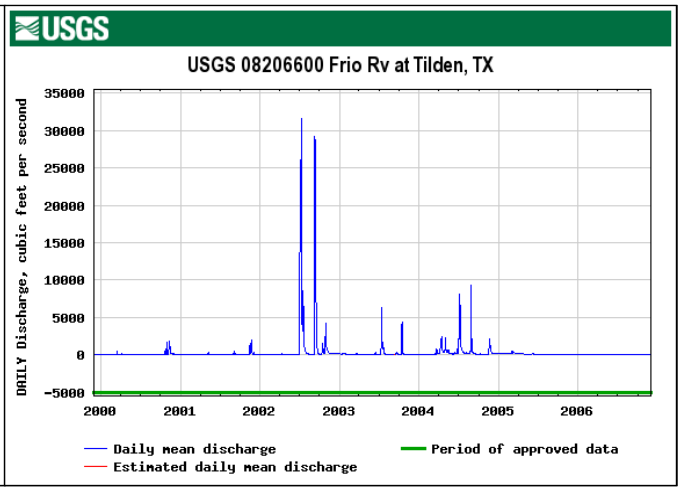


The gauge near Uvalde, TX is located just below the Edwards Aquifer recharge zone. Recorded flows during this time period range between 0 cfs and 972,300 cfs, with a median flow of 0 cfs. There needs to be a very large flow event for water to make it past the recharge zone. During the 7 year assessment period, the gauge only recorded flow >0cfs on 353 days.

The gauge near Derby, TX is located at the same location as Station 13024. Recorded flows during this time period range between 0 cfs and 37,200 cfs, with a median flow of 50 cfs. Base flow returns to the river via springs below the recharge zone.

The gauge at Tilden, TX is located at the same location as Station 13023. Recorded flows during this time period range between 0 cfs and 31,500 cfs, with a median flow of 51 cfs. This gauge is influenced by Choke Canyon Reservoir when the reservoir is full.





Water Quality Analysis

2117_01: lower 25 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13023 – SH 16 in Tilden	NRA	Quarterly	Conventional, Bacteria, Field	1996 – Present

DO (mg/l): 45 samples, ranging from 2.0 to 10.8, median value = 6.6, 10 values below screening level of 5.0, no trends. There are no problems with low DO on this section of the river.

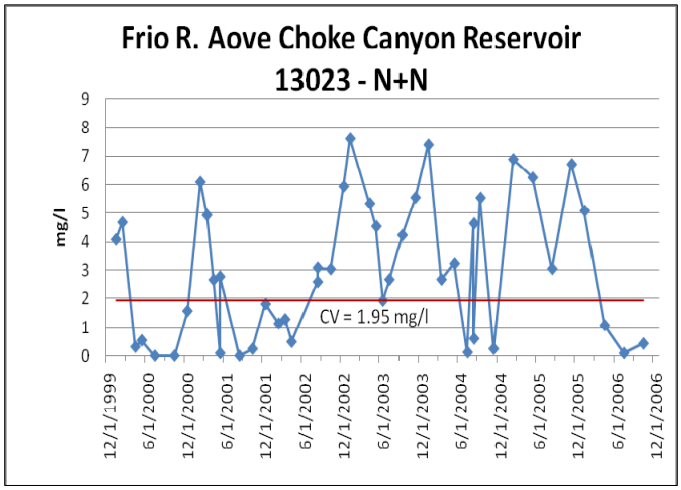
Average 24–Hr DO (mg/l): 1 sample of 3.5, below the criteria value of 5.0. This 24-hr DO measurement was taken during a very low flow period and corresponds to the low DO grab sample taken at nearly the same time.

Minimum 24–Hr DO (mg/l): 1 sample of 3.1, criteria value = 3.0.

pH (su): 45 samples, ranging from 7.1 to 8.4, median value = 8.0, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 42 samples, ranging from <0.02 to 0.81, median value = 0.02, 1 value above criteria value of 0.33, 32 non-detects, no trends. The one high value occurred in July 2006 when there was very little flow (<1 cfs). There are no problems with ammonia in this section of the river.

N+N (mg/l): 45 samples, ranging from <0.01 to 7.6, median value = 2.7, 24 values above criteria value of 1.95, 2 non-detects, no trends. The higher readings tend to correlate to higher flow. This could be attributed to runoff from surrounding farm and ranch lands, or possibly the Tilden WWTP which discharges near this location. N+N is listed as a concern for this section of the river.

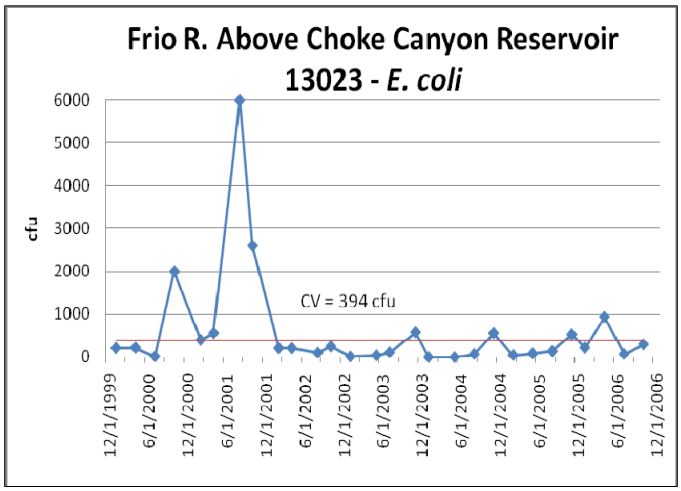


OP (mg/l): 29 samples, ranging from <0.01 to 0.42, median value = 0.04, 1 value above criteria value of 0.37, 11 non-detects, no trends. The one high value occurred in August 2001 when there was no flow. There are no problems with OP on this segment of the river.

Total Phosphorus (mg/l): 29 samples, ranging from <0.02 to 0.78, median value = 0.14, 1 value above criteria value of 0.69, 2 non-detects, no trends. The one high value also occurred in August 2001 when there was no flow. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 24 samples, ranging from <1 to 62.4, median value = 3.9, 4 values above criteria value of 14.1, 8 non-detects, no trends. The exceedences occurred after extended dry periods. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 29 samples, ranging from 6 to 195, median value = 102, no trends. There are no problems with TSS in this section of the river.



***E. coli* (cfu): 28 samples, ranging from <1 to >6000, median value = 212, geometric mean = 157, 9 samples exceed single sample criteria of 394, geometric mean criteria = 126.** Although bacteria is not listed as an impairment in this AU in the 2008 Assessment, the data seem to indicate that there is problem. The higher values do not appear to correlate to higher flow to suggest that it is caused by runoff. In fact, the field notes report that there was little or no flow when the highest values were recorded. The field notes, on a number of occasions, report stagnant water, animal and fish carcasses, and lots of trash. Therefore, the elevated bacteria levels may be related to illegal dumping.

2117_02: from 1.5 miles downstream of SH 97 to 23.5 miles upstream of SH97 crossing

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
18373 – immediately upstream of SH 97 north of Fowlerton	NRA	Quarterly	Conventional, Bacteria, Field	2003 – Present

DO (mg/l): 13 samples, ranging from 5.3 to 9.9, median value = 7.1, screening level = 5.0. There are no problems with low DO on this section of the river.

Average 24–Hr DO (mg/l): 6 samples, ranging from 6.4 to 7.8, median value = 7.0, criteria value = 5.0. The 24-Hr DO meausements confirm that low DO is not a problem.

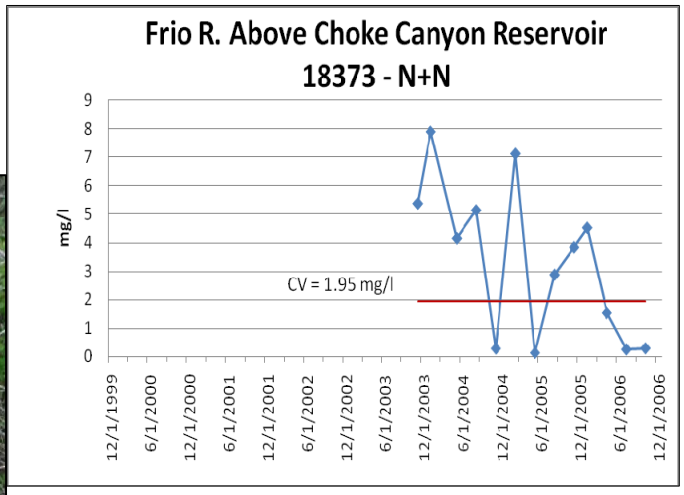
Minimum 24–Hr DO (mg/l): 6 samples, ranging from 6.2 to 7.7, median value = 6.8, criteria value = 3.0.

pH (su): 13 samples, ranging from 7.7 to 8.7, median value = 8.1, criteria range is 6.5 to 9. There are no problems with pH on this section of the river. Values approaching the upper limit occurred towards the end of 2006 after an extended dry period. Values have since fallen closer to the median value.

Ammonia (mg/l): 13 samples, ranging from <0.02 to 0.06, median value = 0.02, criteria value = 0.33, 8 values non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 13 samples, ranging from 0.14 to 7.9, median value = 3.8, 8 values above criteria value of 1.95. While the values exceed the criteria, they are lower than for the upstream assessments. Even though there is not enough data for a trend analysis, all 6 values from May 2006 to June 2007 have met the criteria.

Figure 3.3 – 45: Frio River Above Choke Canyon Reservoir Station 18373, March 2007



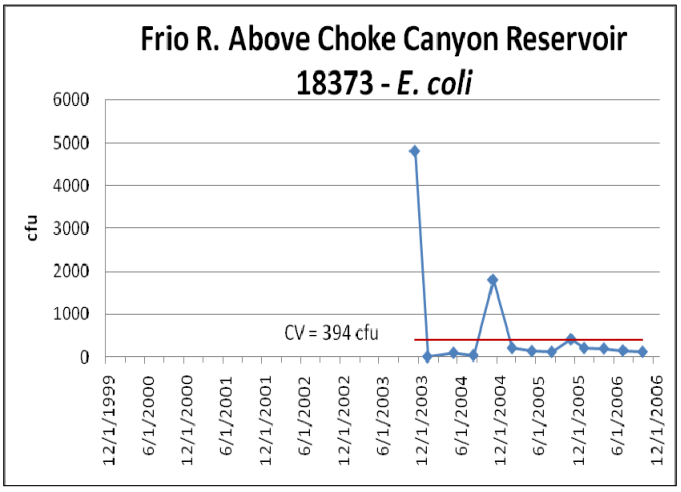
OP (mg/l): OP samples have not been taken at this station. This site was added to the routine monitoring after the requirement that the samples be field-filtered. Since no other sections of the segment had seen problems with OP, it was not included as one of the parameters for which to be analyzed.

Total Phosphorus (mg/l): 13 samples, ranging from <0.04 to 7.2, median value = 0.1, 1 value above criteria value of 0.69, 2 non-detects. The one high value occurred in August 2005 and is very much an anomaly, all other values are <=0.15. The field notes do not indicate any problems with the sampling on this date. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 13 samples, ranging from <2 to 126, median value = 2, 2 values above criteria value of 14.1, 9 non-detects. The two exceedences occurred towards the end of 2006 after an extended dry period. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 13 samples, ranging from 16 to 171, median value = 88. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 13 samples, ranging from 7 to 4800, median value = 150, geometric mean = 183, 3 samples exceed single sample criteria of 394, geometric mean criteria = 126.** Bacteria is listed as an impairment in this section of the segment. Although the graph of the data used for the assessment makes it looks as if the 4800 reading was an anomaly, the next two samples in February and March 2007 have values of 2200 and 9600, respectively. Bacteria is a problem on this section of the river following high flow events.



2117_03: 33 miles surrounding SH 85

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13024 – IH 35 northbound bridge north of Dilley	TCEQ	Quarterly	Conventional, Bacteria, Field, 4 14-Hr DO	1974 – Present

DO (mg/l): 21 samples, ranging from 4.9 to 14.5, median value = 8.4, 1 value below screening level of 5.0, no trends. There are no problems with low DO on this section of the river.

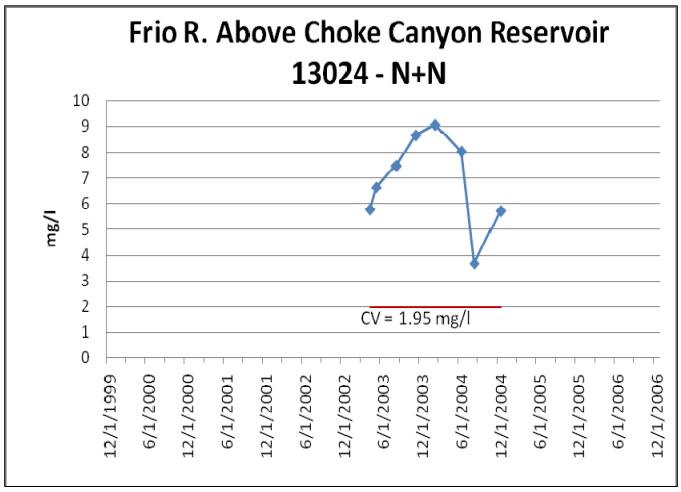
Average 24–Hr DO (mg/l): 2 samples, ranging from 2.5 to 8.1, 1 value below the criteria value of 5.0.

Minimum 24–Hr DO (mg/l): 2 samples, ranging from 1.5 to 7.9, 1 value below the criteria value of 3.0.

pH (su): 20 samples, ranging from 6.1 to 8.3, median value = 7.8, criteria range = 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 24 samples, ranging from <0.05 to 0.19, median value = 0.05, criteria value = 0.33, 18 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 8 samples, ranging from 3.7 to 9.1, median value = 7.1, all values above criteria value of 1.95. The problem with N+N might be being carried down from the upstream section. This station is also below the confluence of Hondo Creek and the Pearsall WWTP. A data gap between 1997 and 2003 prohibits running a trend analysis on this parameter. However, of the 17 samples taken from July 1990 to August 1997, 9 exceed the criteria value.



OP (mg/l): 24 samples, ranging from <0.03 to 0.14, median value = 0.03 criteria value = 0.37, 18 non-detects, no trends. There are no problems with OP on this segment of the river.

Total Phosphorus (mg/l): 24 samples, ranging from <0.05 to 0.21, median value = 0.08, criteria value = 0.69, 6 non-detects, no trends. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 25 samples, ranging from <1 to 120, median value = 1, 3 values above criteria value of 14.1, 21 non-detects, no trends. The highest reading occurred in August 2001. There is no apparent correlation to, or lack of, flow. The other two exceedences are <25. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 25 samples, ranging from 12 to 78, median value = 44, no trends. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 18 samples, ranging from 20 to 201, median value = 66, geometric mean = 73, single sample criteria = 394, geometric mean criteria = 126.** There are no problems with bacteria in this section of the river.

2117_04: 40 miles surrounding US 57

Station Summary

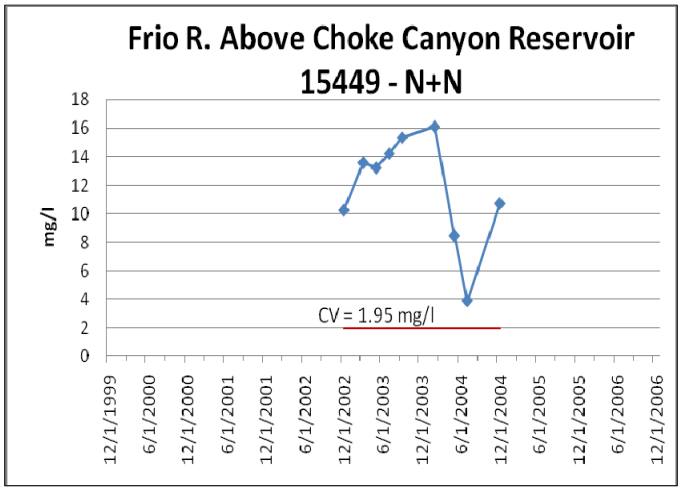
Site	Entity	Frequency	Parameter Groups	Date Range
15449 – FM 187 8 miles south of Sabinal	TCEQ	Quarterly	Conventional, Bacteria, Field	2002 – Present

DO (mg/l): 16 samples, ranging from 6.6 to 13.5, median value = 9.6, screening level = 5.0. There are no problems with low DO on this section of the river.

pH (su): 16 samples, ranging from 6.9 to 7.6, median value is 7.4, criteria range is 6.5 to 9. There are no problems with pH on this section of the river.

Ammonia (mg/l): 17 samples, ranging from <0.05 to 0.26, median value = 0.05 criteria value = 0.33, 14 non-detects. There are no problems with ammonia in this section of the river.

N+N (mg/l): 9 samples, ranging from 3.9 to 16.1, median value = 13.2, all values above criteria value of 1.95. This station is just below the confluence with the Sabinal River, which has had an impairment for N+N since the 2002 Assessment. A new WWTP for the City of Sabinal is being constructed, which should correct the problem. There are no other dischargers above this station.



OP (mg/l): 16 samples, all non-detects. There are no problems with OP in this section of the river.

Total Phosphorus (mg/l): 17 samples, ranging from <0.05 to 0.07, median value = 0.05, criteria value = 0.69, 15 non-detects. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (μg/l): 17 samples, all non-detects. There are no problems with chlorophyll-a in this section of the river.

TSS (mg/l): 17 samples, ranging from <4 to 37, median value = 4, 5 non-detects. There are no problems with TSS in this section of the river.

***E. coli* (cfu): 15 samples, ranging from <1 to 47, median value = 5, geometric mean = 6, single sample criteria = 394, geometric mean criteria = 126, 1 non-detect.** There are no problems with bacteria in this section of the river.

2117_05: upper 35 miles

There are no stations in this AU.

Entire Segment

TDS (mg/l): 121 samples, ranging from 148 to 5840, median value = 992, average value = 1098, average criteria value = 1700, no trends. There are no problems with TDS on this segment of the river. The highest readings occurred at Station 18373 at the end of 2006 after a long period of no flow. Values have since returned to closer to the median value.

Chloride (mg/l): 100 samples, ranging from 8.1 to 2460, median value = 236, average value = 295, average criteria value = 620, no trends. There are no problems with chloride on this segment of the river. The highest readings occurred at Station 18373 at the end of 2006 after a long period of no flow. Values have since returned to closer to the median value.

Sulfate (mg/l): 100 samples, ranging from 10.7 to 509, median value = 198, average value = 200, average criteria value = 380, no trends. There are no problems with sulfate on this segment of the river.

NUECES – RIO GRANDE COASTAL BASIN

The Nueces – Rio Grande Coastal Basin covers approximately 10,400 square miles, encompassing all or part of 12 counties in South Texas.

Segments 2201, Arroyo Colorado Tidal, has impairments for bacteria and low DO. Segment 2202, Arroyo Colorado above Tidal, has an impairment for bacteria. Both segments have concerns for chlorophyll-a, N+N, OP, ammonia, and total phosphorus. The results of a TMDL for the low DO impairment indicated that a 90% reduction in loadings would have to be obtained before the water quality standards could be met. Since the reduction is not realistically feasible, the Arroyo Colorado Watershed Partnership developed a Watershed Protection Plan (WPP) to address all problems throughout the entire watershed.

In FY 2009, NRA will conduct a bacteria indicator study for Segment 2202. A USGS study found that *E. coli* do not survive in waters with conductivity readings above 1000 µMhos /cm and may not be the best indicator bacteria for these waters. Conductivity levels average 4000 µMhos/cm in this segment. The study will collect *E. coli*, enterococcus, and fecal coliform monthly at six sites. The objective is to compare the three bacteria readings to evaluate the appropriateness of using *E. coli* as the indicator bacteria in this segment.

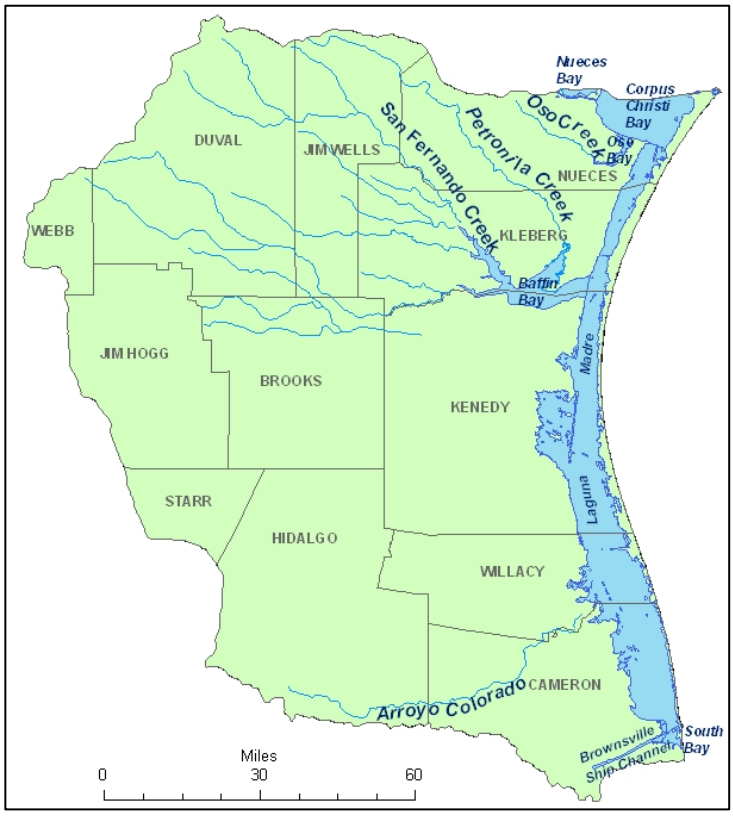


Figure 3.3 – 46: Nueces – Rio Grande Coastal Basin

Segment 2204, Petronila Creek above Tidal, has an impairment for TDS, chloride, and sulfate. A TMDL has been completed and an Implementation Plan initiated. The source of the impairment was found to be from historic oil and gas well drilling and production activities. Improperly plugged and abandoned wells, as well as those that were not plugged prior to abandonment, are being found and the problem corrected by the Texas Railroad Commission (RRC). Some of the pollutants seeped into the ground for many years, and it will take many years for all to be eventually flushed out. TCEQ installed a continuous water quality monitoring (CWQM) station on this segment to be able to assess the results of the RRC's work. NRA maintains the CQWM site for TCEQ.

Segment 2485A, Oso Creek, is impaired for bacteria for contact recreation. A TMDL has been implemented to try and determine the source of the bacteria. BST is one of the components of the study. Effluent from the WWTPs that discharge into the creek has been determined not to be a likely source of the contamination.

Segment 2201, Arroyo Colorado Tidal, flows 26 miles from a point 100 m (110 yards) downstream of Cemetery Road south of Port Harlingen in Cameron County to the confluence with Laguna Madre in Cameron/Willacy County.

The segment is divided into five AUs: (01) the lower 9 miles, (02) from 2 miles upstream to 2 miles downstream of Marker 22, (03) from 3 miles upstream to 2 miles downstream of Marker 27, (04) from1 mile upstream to 3 miles downstream of Camp Perry, and (05) the upper 4 miles.

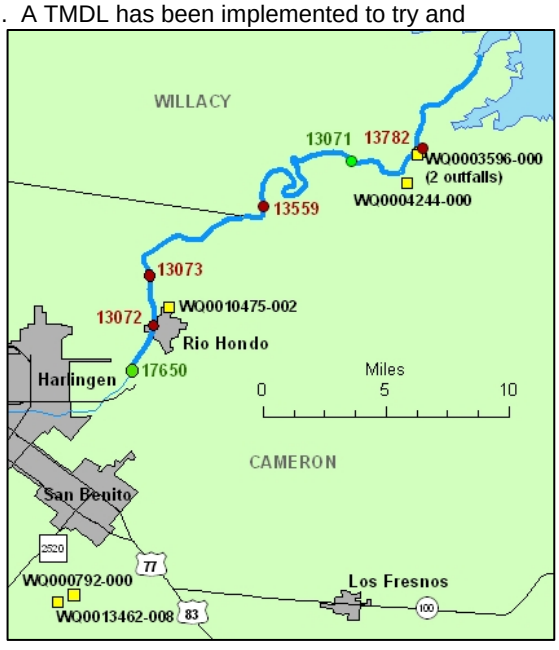


Figure 3.3 – 47: Arroyo Colorado Tidal

Active Wastewater Permits

WQ0003596-000 – Taiwan Shrimp Village Association and Arroyo Aquaculture Association: 100,000,000 gpd from Outfall 001 directly to the Arroyo Colorado and Outfall 002 via a drainage ditch to the Arroyo Colorado.

WQ0004244-000 – Southern Star Inc.: 60,000,000 gpd via an unnamed drainage ditch to the Arroyo Colorado.

WQ0004792-000 – Military Highway WSC: 1,440,000 gpd via ditch to Resaca Del Rancho Viejo to the Arroyo Colorado.

WQ0010475-002 – City of Rio Hondo: 400,000 gpd directly to the Arroyo Colorado.

WQ0013462-008 – Military Highway WSC Lago: 510,000 gpd via drainage ditch to Resaca Del Rancho Viejo to the Arroyo Colorado Tidal.

Water Quality Analysis
2201_01: upper 4 miles
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13782 – near Marker 16 at Arroyo City 492 m downstream of confluence with Arroyo Colorado and Arroyo Colorado cutoff	TCEQ	Quarterly	Conventional, Bacteria, Field	1993 – Present

DO (mg/l): 34 samples, ranging from 4.4 to 17.7, median value = 10.2, screening level = 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. There are no problems with low DO in this section of the river.

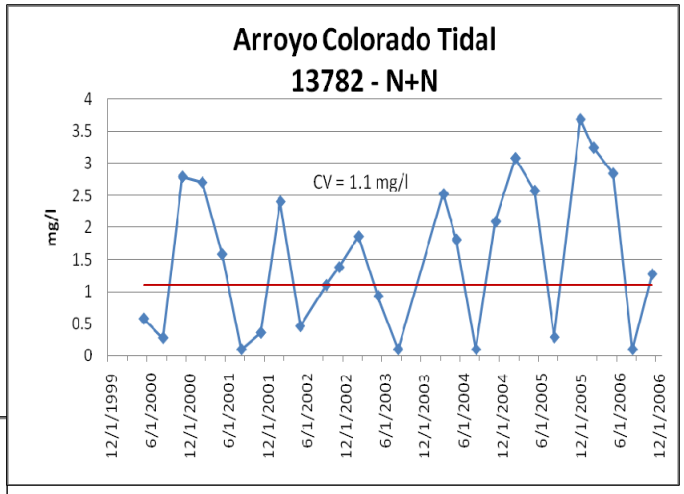
Average 24–hour DO (mg/l): 4 samples, ranging from 5.7 to 14.5, median value = 9.2, criteria value = 4. These 4 measurements also indicate that there are no problems with low DO in this section of the river.

Minimum 24–hour DO (mg/l): 4 samples, ranging from 4.5 to 11.8, median value = 7.0, criteria value = 3.

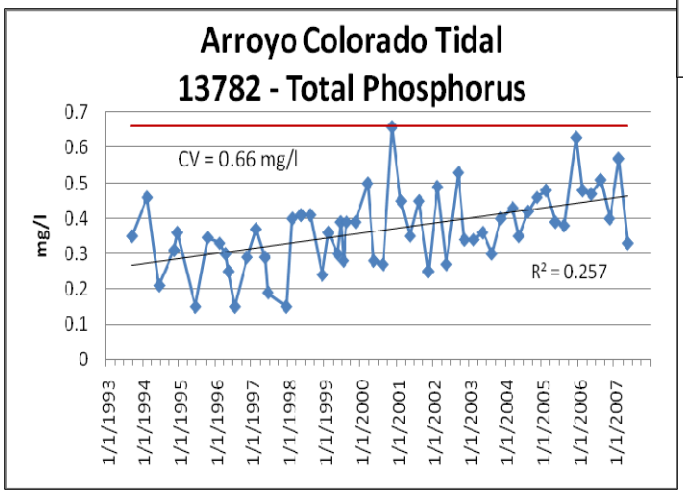
pH (su): 37 samples, ranging from 7.7 to 9.3, median value is 8.4, 1 value above criteria range of 6.59, no trends. The one exceedence occurred in November 2003. There are no problems with pH on this section of the river.

Ammonia (mg/l): 28 samples, ranging from <0.05 to 0.46, median value = 0.06, criteria value = 0.46, 13 non-detects, no trends. There are no problems with ammonia in this section of the river.

N+N (mg/l): 26 samples, ranging from <0.1 to 3.7, median value = 1.5, 15 values above criteria value of 1.1, no trends. There is a concern for N+N in all AUs of this segment, most likely associated with the unloading of fertilizers at the Port of Harlingen. Although there is no statistical trend, the overall values do appear to be an increasing during the assessment period.

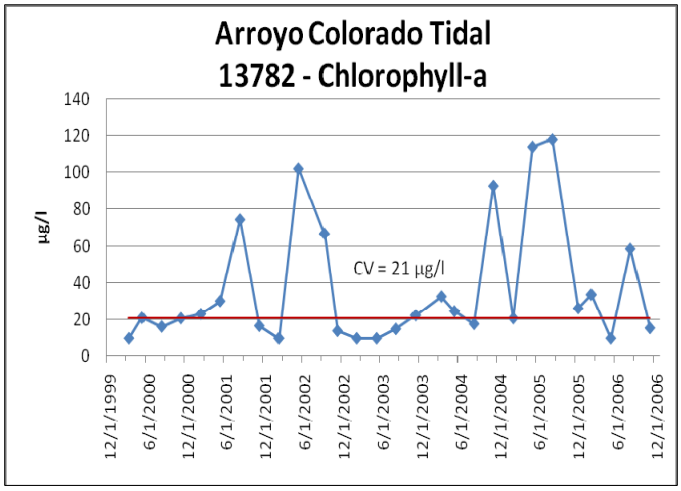


OP (mg/l): 26 samples, ranging from <0.06 to 0.53, median value = 0.15, 2 values above criteria value of 0.46, 13 non-detects, no trends. The exceedences occurred in August 2003 and December 2005 and may be related to the Port of Harlingen activities. There are no problems with OP in this section of the river.



Total Phosphorus (mg/l): 28 samples, ranging from 0.25 to 0.66, median value = 0.41, criteria value = 0.66, increasing trend. There are no concerns for total phosphorus in this section of the, but there is an increasing trend with the values approaching the criteria. It is possible that implementation of best management practices (BMP) in the WPP will stop this trend so that this parameter does not become a concern.

Chlorophyll-a (µg/l): 28 samples, ranging from <10 to 118, median value = 21.7, 14 values above criteria value of 21, 4 non-detects, no trends. There is a concern for chlorophyll-a in all AUs of this segment and may be related to the elevated N+N levels.



TSS (mg/l): 27 samples, ranging from 6 to 112, median value = 15, no trends. There are no problems with TSS in this section of the river.

Enterococcus (cfu): 17 samples, ranging from <1 to 2419, median value = 23, geometric mean = 18, 2 samples exceed the single sample criteria of 89, geometric mean criteria = 35. The maximum value is an anomaly as all other values are <300. There are no problems with bacteria on this section of the river.

2201_02: 2 miles upstream to 2 miles downstream of Marker 22

Station Summary

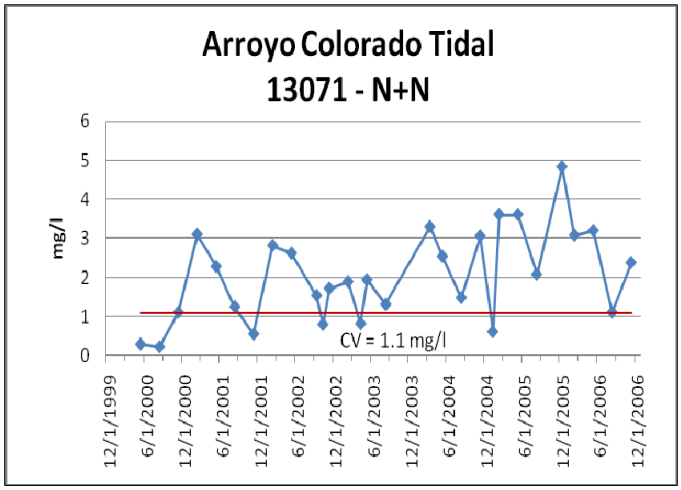
Site	Date Range
13071 – at Mile 10 Marker 22 81 m upstream from San Vicente drainage ditch	1973 – 2008

DO (mg/l): 36 samples, ranging from 4.3 to 14, median value = 8.8, screening level = 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station during the 2008 Assessment period.

pH (su): 37 samples, ranging from 7.4 to 9.2, median value = 8.2, 1 value above criteria range of 6.5 to 9, no trends. The one exceedence occurred in November 2003. There are no problems with pH on this section of the river.

Ammonia (mg/l): 31 samples, ranging from <0.05 to 0.56, median value = 0.16, 2 values above criteria value of 0.46, 10 non-detects, no trends. The exceedences occurred in February 2001 and November 2004 and may be related to the Port of Harlingen activities. There are no problems with ammonia in this section of the river.

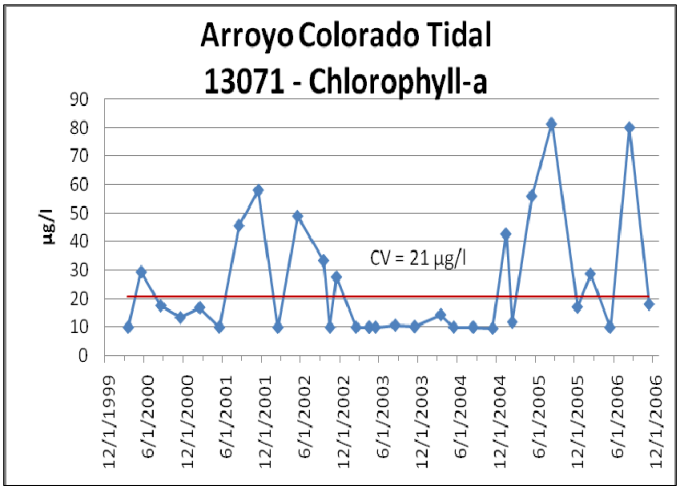
N+N (mg/l): 29 samples, ranging from 0.22 to 4.8, median value = 1.9, 23 values above criteria value of 1.1, no trends. There is a concern for N+N in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen. Although there is no statistical trend, the overall values appear to be an increasing during the assessment period.



OP (mg/l): 29 samples, ranging from <0.12 to 0.59, median value = 0.33, 6 values above criteria value of 0.46, 8 non-detects, no trends. The 2008 Assessment does not list this AU as having a concern for OP, but 20% of the samples exceed the criteria. It is possible that implementation of BMPs in the WPP will keep this parameter off of the concerns list.

Total Phosphorus (mg/l): 31 samples, ranging from 0.23 to 0.63, median value = 0.45, criteria value = 0.66, no trends. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 31 samples, ranging from <10 to 81.4, median value = 14.4, 11 values above criteria value of 21, 10 non-detects, no trends. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels. Although there is no statistical trend, the overall values appear to be an increasing during the assessment period.



TSS (mg/l): 30 samples, ranging from 5 to 38, median value = 13, no trends. There are no problems with TSS in this section of the river.

Enterococcus (cfu): 17 samples, ranging from <1 to >2419, median value = 23, geometric mean = 18, 3 samples exceed single sample criteria of 89, geometric mean criteria = 35. The maximum value is an anomaly as all other values are <300. There are no problems with bacteria on this section of the river.

2201_03: 3 miles upstream to 2 miles downstream of Marker 27

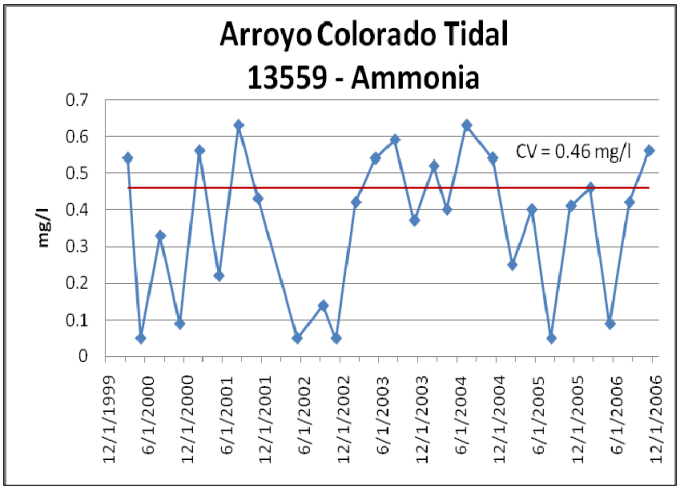
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13559 – at Marker 27 Mile 15 0.8 km north of the point where channel becomes boundary between Willacy and Cameron counties	TCEQ	Quarterly	Conventional, Bacteria, Field	1997 – Present

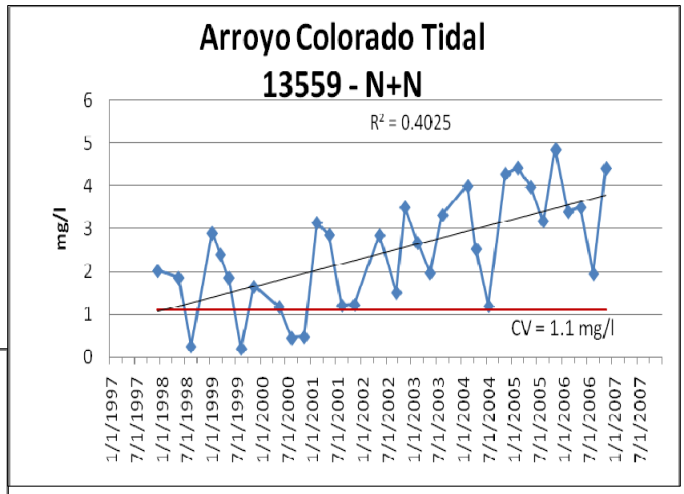
DO (mg/l): 27 samples, ranging from 1.2 to 12.2, median value = 6.4, 2 values below screening level of 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. There are no problems with low DO in this section of the river. No 24-Hr DO measurements have been taken at this station.

pH (su): 26 samples, ranging from 7.5 to 9, median value = 7.8, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

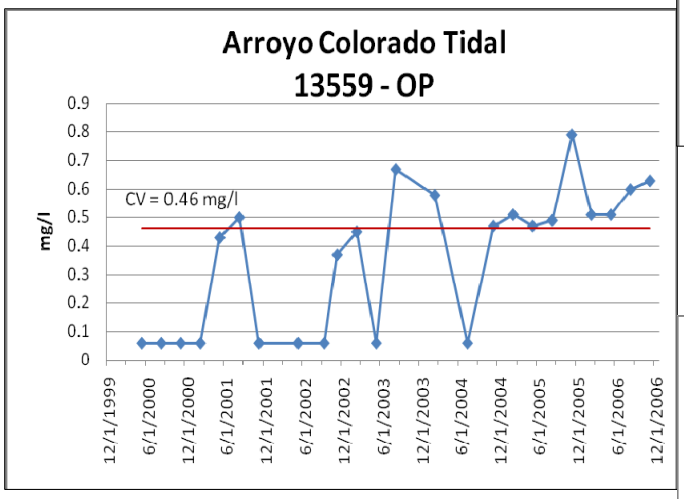
Ammonia (mg/l): 27 samples, ranging from <0.05 to 0.63, median value = 0.41, 9 values above criteria value of 0.46, 4 non-detects, no trends. There is a concern for ammonia in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen.



N+N (mg/l): 24 samples, ranging from 0.45 to 4.8, median value = 2.9, 23 values above criteria value of 1.1, increasing trend. There is a concern for N+N in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen.

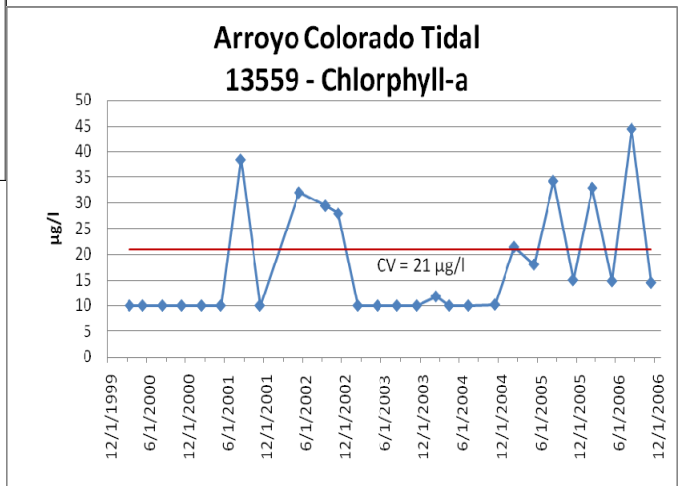


OP (mg/l): 24 samples, ranging from <0.06 to 0.79, median value = 0.46, 12 values above criteria value of 0.46, 9 non-detects, no trends. There is a concern for OP in this section of the river. Although there is no statistical trend, the overall values appear to be an increasing during the assessment period.

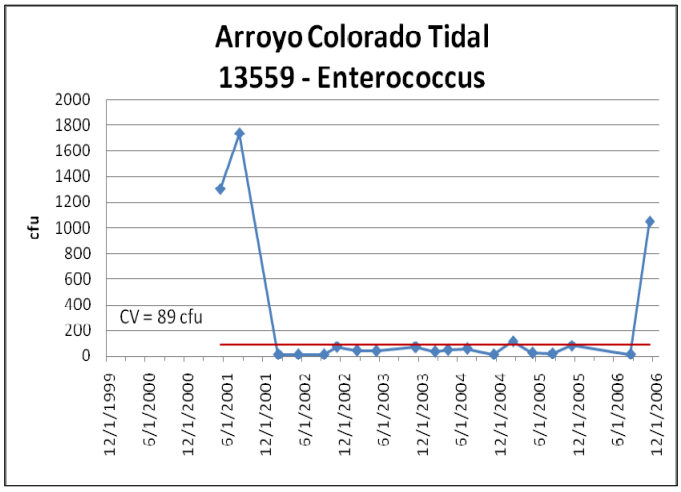


Total Phosphorus (mg/l): 27 samples, ranging from 0.2 to 0.83, median value is 0.53, 3 values above criteria value of 0.66, no trends. There are no problems with total phosphorus in this section of the river.

Chlorophyll-a (µg/l): 27 samples, ranging from <10 to 44.4, median value = 10.2, 8 values above criteria value of 21, 13 non-detects, no trends. There is a concern for chlorophyll-a in this section of the river. Although there is no statistical trend, the overall values appear to be an increasing during the assessment period.



TSS (mg/l): 26 samples, ranging from 8 to 38, median value = 15, no trends. There are no problems with TSS in this section of the river.



Enterococcus (cfu): 20 samples, ranging from <10 to 1733, median value = 41, geometric mean = 53, 4 samples exceed single sample criteria of 89, geometric mean criteria = 35. There is an impairment for bacteria on this section of the river. The geometric mean decreases from upstream to downstream. These higher levels may be a continuation of the bacteria impairment on the upstream segment, Segment 2202.

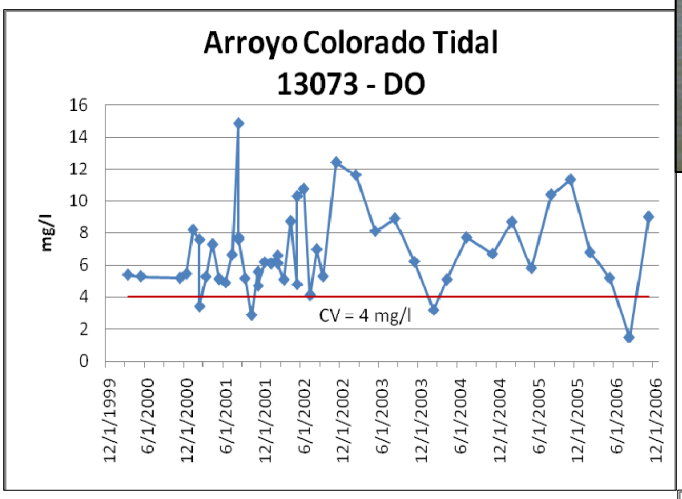
2201_04: 1 mile upstream to 3 miles downstream of Camp Perry

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13073 – at Camp Perry north of Rio Hondo 177 m downstream from confluence with unnamed ditch west side of Arroyo Colorado	TCEQ	Quarterly	Conventional, Bacteria, Field	1997 – Present

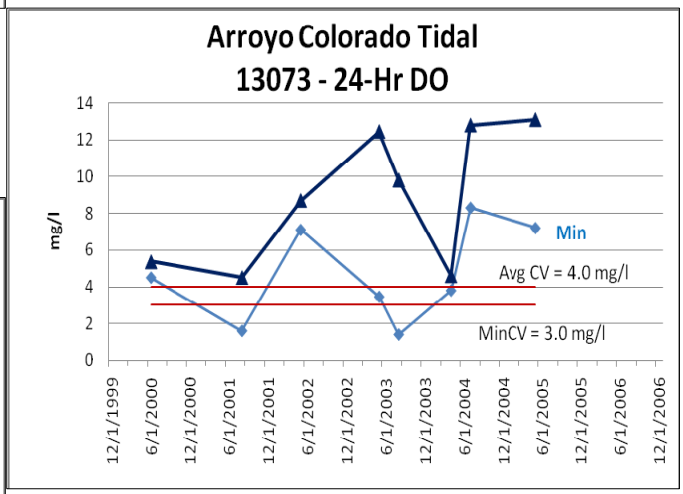
DO (mg/l): 49 samples, ranging from 1.5 to 14.8, median value = 6.2, 4 values below screening level of 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. This section of the river has been on the 303(d) for low DO since 1996. The TMDL to evaluate this impairment found that a 90% reduction in loading would have to occur in order for the segment to meet water quality standards. Dredging and other mechanical changes to the river also contribute to this impairment and other concerns.

Figure 3.3 – 48: Arroyo Colorado Tidal Station 13073, July 2006

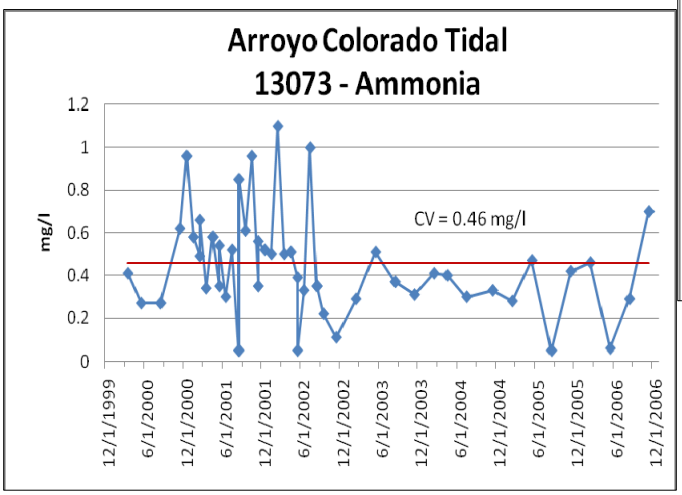


Average 24–hour DO (mg/l): 8 samples, ranging from 4.5 to 13.1, median value = 8.3, criteria value = 4.

Minimum 24–hour DO (mg/l): 8 samples, ranging from 1.4 to 8.3, median value = 4.2, 2 values below criteria value of 3. The 2008 Assessment continues to list low DO as an impairment based on 24-hr DO minimums not meeting the criteria.

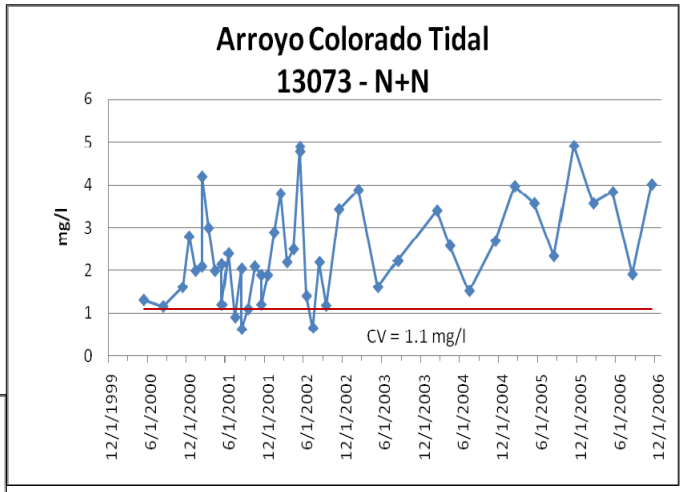


pH (su): 48 samples, ranging from 6.8 to 9.1, median value = 7.7, 1 value above criteria value range of 6.5 to 9, no trends. The one exceedence occurred in August 2003. There are no problems with pH on this section of the river.

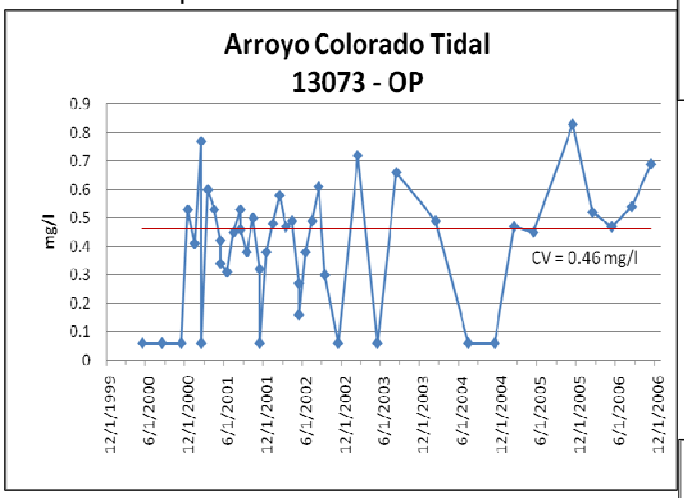


Ammonia (mg/l): 48 samples, ranging from <0.05 to 1.1, median value = 0.41, 21 values above criteria value of 0.46, 3 non-detects, no trends. There is a concern for ammonia in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen.

N+N (mg/l): 46 samples, ranging from 0.63 to 4.9, median value = 2.2, 42 values above criteria value of 1.1, no trends. There is a concern for N+N in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen. Although there is no statistical trend, the overall values appear to be an increasing during the assessment period.

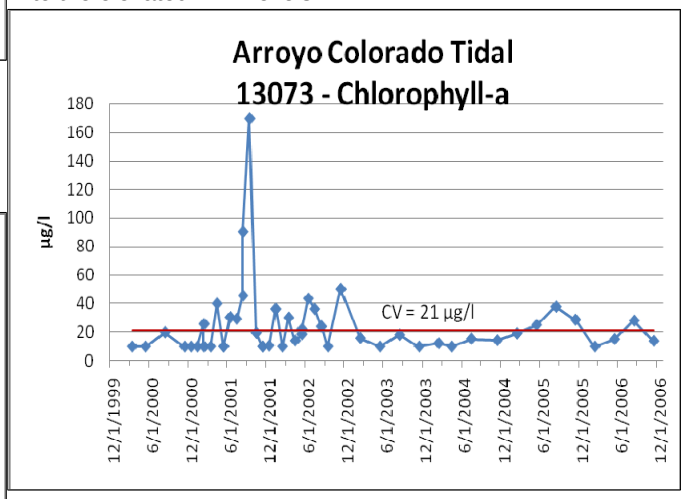


OP (mg/l): 44 samples, ranging from <0.06 to 0.83, median value = 0.45, 21 values above criteria value of 0.46, 9 non-detects, no trends. There is a concern for OP in this section of the river. Although there is no statistical trend, the overall values appear to be an increasing during the assessment period.

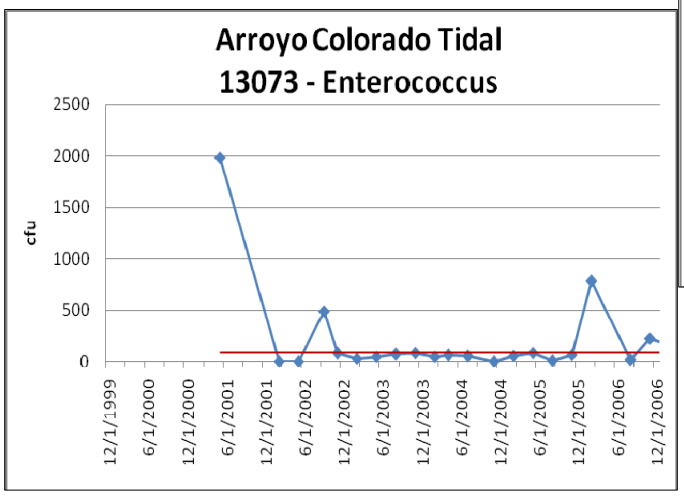


Total Phosphorus (mg/l): 48 samples, ranging from 0.3 to 1.09, median value = 0.51, 7 values above criteria value of 0.66, no trends. The higher readings correlate to the higher OP readings, but not enough exceed the criteria to be considered a concern.

Chlorophyll-a (µg/l): 48 samples, ranging from <10 to 170, median value = 15.8, 18 values above criteria value of 21, 13 non-detects, no trends. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels.



TSS (mg/l): 47 samples, ranging from 9 to 105, median value = 18, no trends. There are no problems with TSS in this section of the river.



Enterococcus (cfu): 22 samples, ranging from <1 to 1986, median value = 63, geometric mean = 48, 6 samples exceed single sample criteria of 89, geometric mean criteria = 35. There is an impairment for bacteria on this section of the river. These higher levels may be a continuation of the bacteria impairment on the upstream segment, Segment 2202.

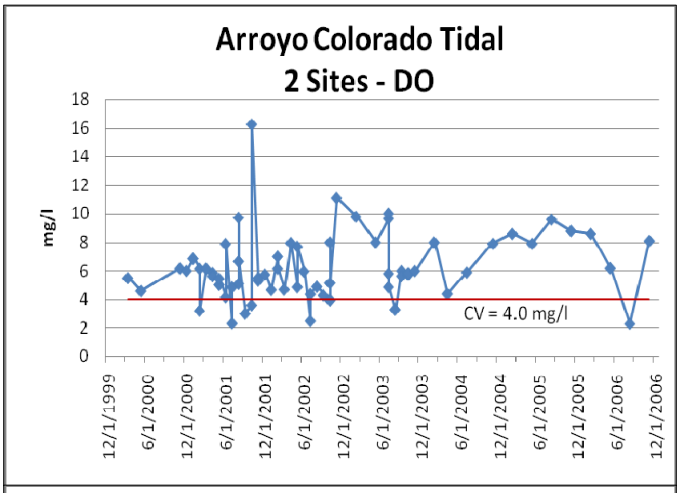
2201_05: upper 19 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13072 – FM 106 bridge at Rio Hondo	TCEQ	Quarterly	Conventional, Bacteria, Field	1997 – Present
17650 – at Port of Harlingen downstream fertilizer unloading dock				2002 – 2003, 2006

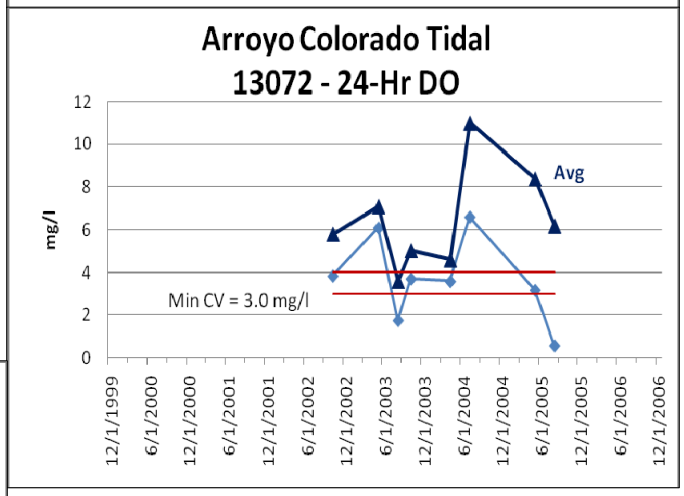
Only DO and pH were measured at Station 17650.

DO (mg/l): 66 samples, ranging from 2.3 to 16.2, median value = 5.8, 8 values below screening level of 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. This section of the river has been of the 303(d) for low DO since 1996. The TMDL to evaluate this impairment found that a 90% reduction in loading would have to occur in order for the segment to meet water quality standards. The Port of Harlingen is in this part of the Arroyo Colorado. Dredging and other mechanical changes to the river also contribute to this impairment and other concerns.

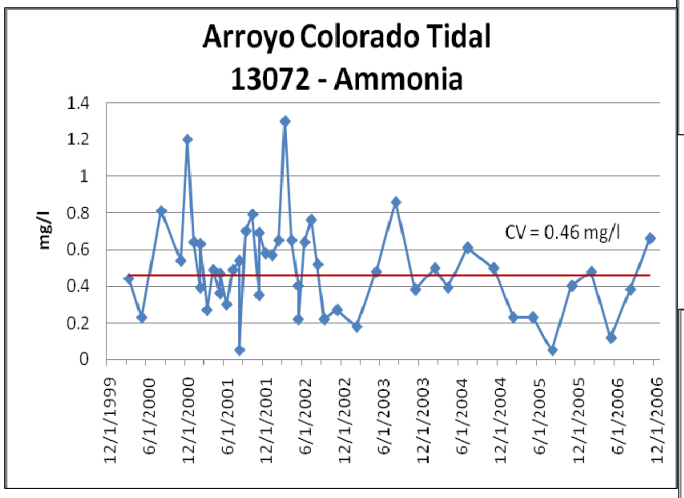


Average 24–Hr DO (mg/l): 8 samples, ranging from 3.6 to 11, median value = 6.0, 1 value below criteria value of 4. The 2008 Assessment continues to list low DO as an impairment based on 24-Hr DO averages and minimums not meeting the criteria.

Minimum 24–Hr DO (mg/l): 8 samples, ranging from 0.6 to 6.6, median value = 3.7, 2 values below criteria value of 3.

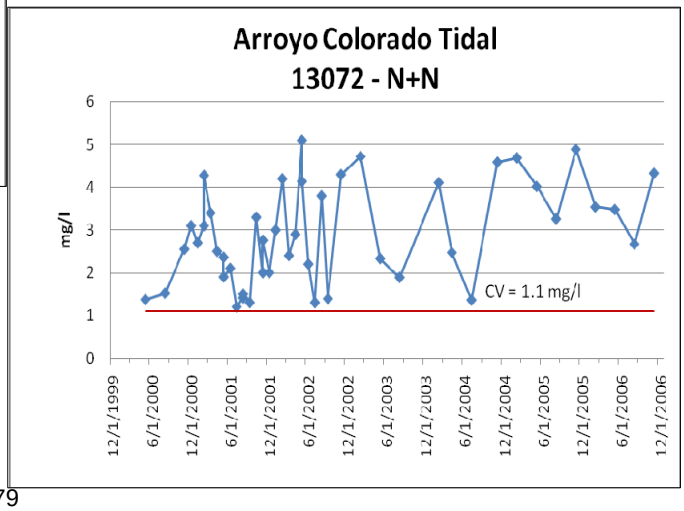


pH (su): 66 samples, ranging from 6.7 to 9.3, median value = 7.7, 1 value above criteria range of 6.5 to 9, no trends. The one exceedence occurred in November 2003. There are no problems with pH on this section of the river.

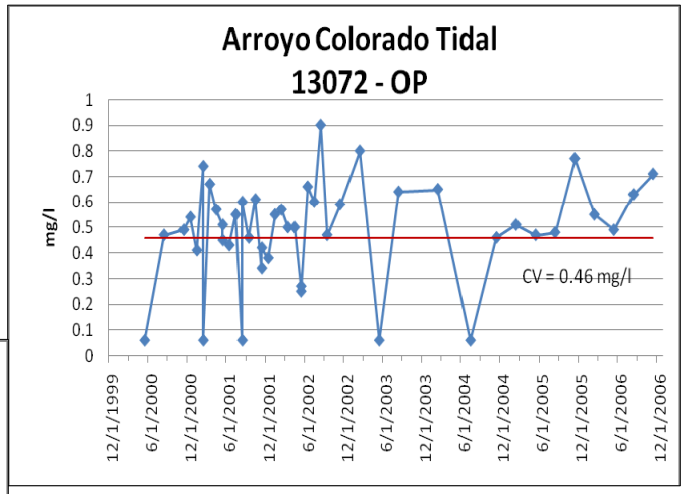


Ammonia (mg/l): 48 samples, ranging from <0.05 to 1.3, median value = 0.48, 27 values above criteria value of 0.46, 2 non-detects, no trends. There is a concern for ammonia in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen.

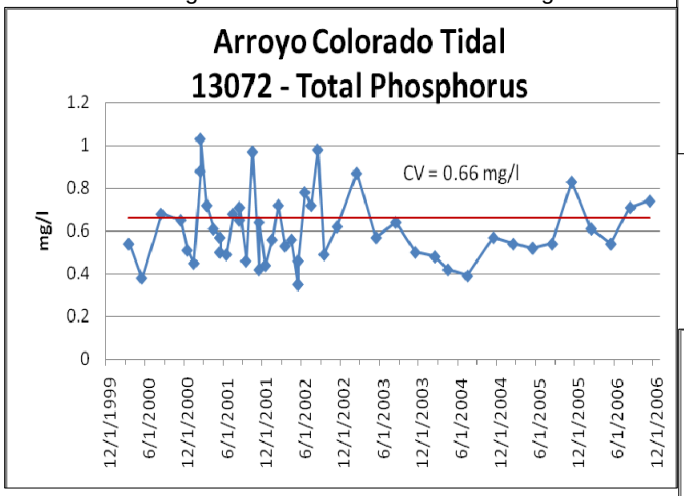
N+N (mg/l): 46 samples, ranging from 1.2 to 5.1, median value = 2.73, all values above criteria value of 1.1, no trends. There is a concern for N+N in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen. Although there is no statistical trend, the overall values appear to be increasing during the assessment period.



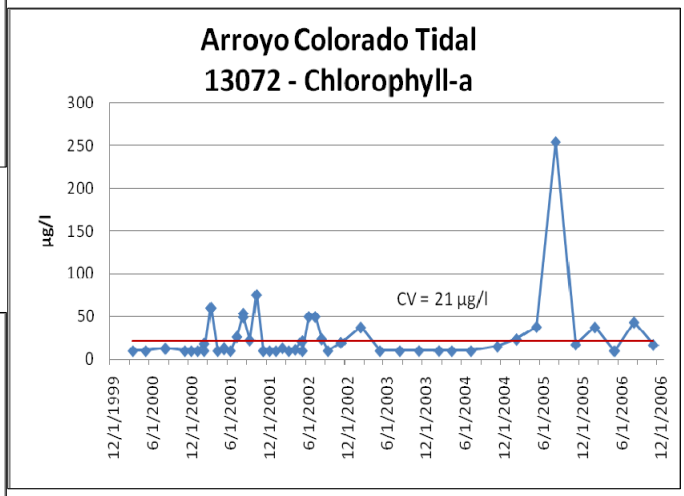
OP (mg/l): 45 samples, ranging from <0.06 to 0.9, median value = 0.5, 30 values above criteria value of 0.46, 5 non-detects, no trends. There is a concern for OP in this section of the river. Although there is no statistical trend, the overall values appear to be increasing during the assessment period.



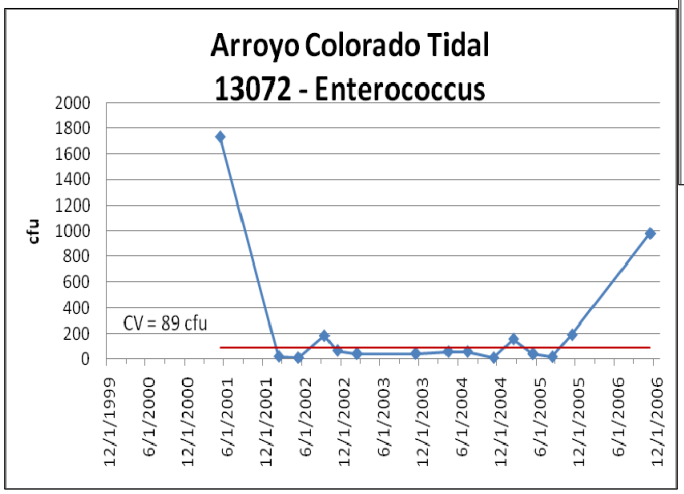
Total Phosphorus (mg/l): 48 samples, ranging from 0.35 to 1.03, median value = 0.57, 15 values above criteria value of 0.66, no trends. There is a concern for total phosphorus in this section of the river, most likely associated with the unloading of fertilizers at the Port of Harlingen.



Chlorophyll-a (µg/l): 48 samples, ranging from <10 to 254, median value = 12.4, 16 values above criteria value of 21, 11 non-detects, no trends. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels.



TSS (mg/l): 46 samples, ranging from 7 to 90, median value = 23. There are no problems with TSS in this section of the river.



Enterococcus (cfu): 15 samples, ranging from 10 to 1733, median value = 58, geometric mean = 70, 5 samples exceed single sample criteria of 89, geometric mean criteria = 35. There is an impairment for bacteria on this section of the river. The impairment was originally based on fecal coliform form and the Enterococcus data supports this assessment. These higher levels may be a continuation of the bacteria impairment on the upstream segment, Segment 2202.

The 2008 Assessment lists this section of the river as being impaired for DDE, mercury, and PCBs in fish tissue.

Segment 2202, Arroyo Colorado Above Tidal, flows 63 miles from FM 2062 in Hidalgo County to a point 100 m (110 yards) downstream of Cemetery Road south of Port Harlingen in Cameron County.

The Arroyo Colorado, once a major river but replace by the current Rio Grande River, is now primarily a flood control canal and conduit for wastewater discharge. There are numerous cities and towns along its entire length.

The segment is divided into four AUs: (01) the lower 4 miles; (02) from 11 miles upstream to 4 miles downstream of US 77; (03) from 14 miles upstream to 11 miles downstream of FM 1015; and (04) the upper 19 miles.

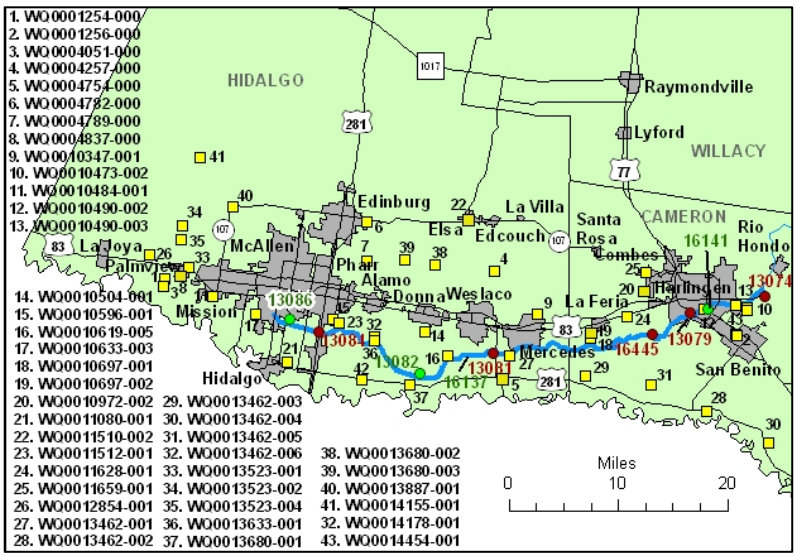


Figure 3.3 – 49: Arroyo Colorado Above Tidal

Active Wastewater Permits

WQ0001254-000 – CPL Bate Facility: 2,000,000 gpd via Hidalgo County Drainage Ditch to the Arroyo Colorado Above Tidal.

WQ0001256-000 – CPL La Palma Power Station: 1,120,000 gpd via Cameron County Drainage Ditch to the Arroyo Colorado Above Tidal.

WQ0004051-000 – Frontera Generation Ltd.: 1,240,000 gpd via Hidalgo County Drainage Ditch to the Main Floodway to Arroyo Colorado Above Tidal.

WQ0004257-000 – Watermill Express: 1,000 gpd via a subsurface drainfield with an area of approximately 7,000 square feet.

WQ0004754-000 – Military Highway WSC Progresso Water Treatment Plant: 2,300,000 gpd via Progresso Main Canal to Llano Grande Lake - part of the Arroyo Colorado Above Tidal.

WQ0004782-000 – North Alamo: 2,000,000 gpd via Curry Drain to Doolittle Road drainage ditch to Donna Drain to North Floodway.

WQ0004789-000 – North Alamo: 2,000,000 gpd via unnamed elevated ditch to Donna Drain to North Floodway.

WQ0004837-000 – La Joya WSC: 432,000 gpd via Perezville Drain to North Floodway.

WQ0010347-001 – City of Mercedes: 5,000,000 gpd via unnamed drainage ditch to Arroyo Anacuitas to Arroyo Colorado Above Tidal.

WQ0010473-002 – City of San Benito: 2,160,000 gpd.

WQ0010484-001 – City of Mission: 9,000,000 gpd.

WQ0010490-002 – Harlingen Water Works Facililty No. 1: 3,100,000 gpd directly to the Arroyo Colorado Above Tidal.

WQ0010490-003 – Harlingen Water Works Facililty No. 2: 12,200,000 gpd directly to the Arroyo Colorado Above Tidal.

WQ0010504-001 – City of Donna: 2,700,000 gpd via unnamed drainage ditch to Llano Grande Lake - part of the Arroyo Colorado Above Tidal.

WQ0010596-001 – City of Pharr: 5,000,000 gpd via Hidalgo County Drainage No. 1 Ditch to the Main Floodway in the Arroyo Colorado Above Tidal.

WQ0010619-005 – City of Weslaco South Plant: 2,000,000 gpd via unnamed drainage ditch to the South Donna Drain to Arroyo Colorado Above Tidal.

WQ0010633-003 – City of McAllen Facility No. 2: 10,000,000 gpd via unnamed drainage ditch to Arroyo Colorado Above Tidal.

WQ0010697-001 – City of La Feria: 500,000 gpd via drainage ditch to Arroyo Colorado Above Tidal.

WQ0010697-002 – City of La Feria: 1,250,000 gpd via drainage ditches to the Arroyo Colorado Tidal.

WQ0010972-002 – Palm Valley Estates: 280,000 gpd via irrigation on 139.5 acres of golf course land.

WQ0011080-001 – City of Hidalgo: 280,000 gpd via Hidalgo County Drainage Ditch along HCID No. 2 Canal to Arroyo Colorado Above Tidal.

WQ0011510-002 – City of Elsa: 280,000 gpd via Hidalgo County Drainage Ditch along HCID No. 2 Canal to Arroyo Colorado Above Tidal.

WQ0011512-001 – City of San Juan: 4,000,000 gpd from Outfall 001 via unnamed drainage ditch to the Main Floodway - part of the Arroyo Colorado Above Tidal; proposed addition of Outfall 002 at 200,000 gpd.

WQ0011628-001 – Winter Garden Park Association: 11,000 gpd into Reba Bass Lake, a closed lake in the drainage area of the Arroyo Colorado Above Tidal.

WQ0011659-001 – Harlingen Consolidated ISD Wilson Elementary.: 6,000 gpd.

WQ00112854-001 – Hidalgo County MUD #1: 500,000 gpd.

WQ0013462-001 – Military Highway WSC Progresso: 400,000 gpd via unnamed drainage ditch to an International Boundary and Water Commission canal to the Arroyo Colorado Above Tidal.

WQ0013462-002 – Military Highway WSC La Paloma: 210,000 gpd via flood irrigation of 59 acres of non public access grassland.

WQ0013462-003 – Military Highway WSC Santa Maria: 230,000 gpd via flood irrigation of 59 acres of land.

WQ0013462-004 – Military Highway WSC San Pedro: 160,000 gpd via flood irrigation of 56 acres of non public access grassland.

WQ0013462-005 – Military Highway WSC Los Indios: 135,000 gpd via flood irrigation of 49 acres of non public access grassland.

WQ0013462-006 – Military Highway WSC South Alamo: 510,000 gpd directly to the Arroyo Colorado.

WQ0013523-001 – La Joya ISD La Joya Elementary: 20,000 gpd via a subsurface pressure system with a minimum area of 1.36 acres.

WQ0013523-002 – La Joya ISD Chapa Elementary: 15,000 gpd via a subsurface pressure system with a minimum area of 0.96 acres.

WQ0013523-003 – La Joya ISD Kika Dela Garza Elementary: 15,000 gpd via a subsurface pressure system with a minimum area of 40,000 square feet. (Not plotted on map.)

WQ0013523-004 – La Joya ISD 11th and 12th Elementary: 15,000 gpd via a subsurface pressure system with a minimum area of 1.44 acres.

WQ0013523-010 – La Joya ISD: 20,000 gpd via a subsurface low pressure dosed drainfields with a minimum area of 63,000 square feet. (Proposed, not plotted on map.)

WQ0013523-011 – La Joya ISD: 15,000 gpd via 8 pressure dosed fields. (Proposed, not plotted on map.)

WQ0013633-001 – City of Alamo: 2,000,000 gpd via Hidalgo County Drainage Ditch #2 to the Arroyo Colorado Above Tidal.

WQ0013680-001 – Donna ISD Runn Elementary: 17,000 gpd via 3-inch force main into a drainage ditch to Donna Irrigation District Drainage Ditch to the Arroyo Colorado Above Tidal.

WQ0013680-002 – Donna ISD Munoz Elementary: 2,500 gpd via subsurface drainfields with a minimum area of 47,600 square feet.

WQ0013680-003 – Donna ISD Garza Elementary: 12,500 gpd via subsurface drainfields with a minimum area of 71,400 square feet.

WQ0013887-001 – Mission ISD Mission Elementary: 3,000 gpd via subsurface drainfields.

WQ0014155-001 – US Department of Agriculture Moore Field WWTP: 3,300 gpd via subsurface drainfields.

WQ0014178-001 – US Fish and Wildlife Service Santa Ana National Wildlife Refuge: 1,500 gpd via evaporation of 1.7 acres.

WQ0014454-001 – City of San Benito: 3,750,000 gpd via drainage ditch to the Arroyo Colorado.

Flow

There are no USGS gauges in this segment. Flow data taken during sampling events has been inconsistent.

Water Quality Analysis

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13074 – at low water bridge at Port Harlingen at Cemetery Rd bridge	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Sed, 2 Organics in Sed	1997 – Present
	NRA		4 24-Hr DOs	

2202_01: lower 4 miles

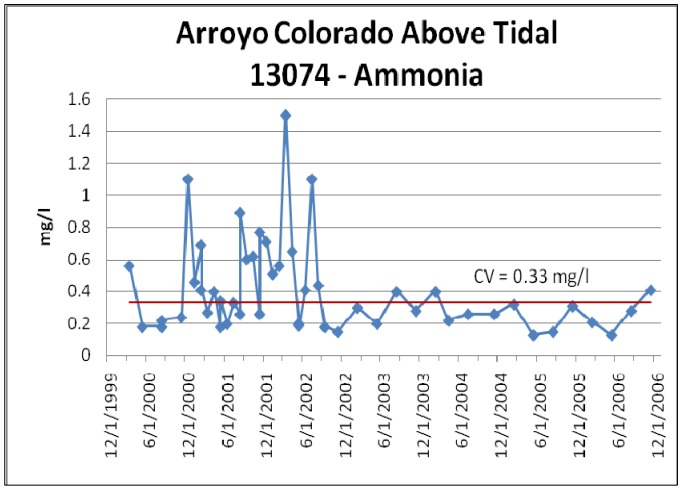
DO (mg/l): 46 samples, ranging from 4.1 to 10.6, median value = 6.1, screening level = 4.0, no trends. There are no problems with DO on this section of the river.

Average 24–Hr DO (mg/l): 3 samples, ranging from 5.6 to 7, criteria value = 4. The 24-hr DO's taken to date seem to indicate that DO is not a problem, and additional 24-Hr DO measurements are probably not needed.

Minimum 24–Hr DO (mg/l): 3 samples, ranging from 4.2 to 5.7, criteria value = 3.

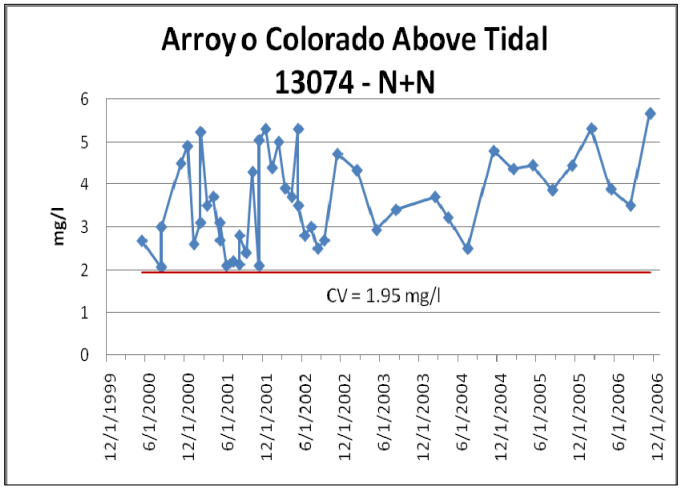
pH (su): 45 samples, ranging from 7.3 to 9, median value = 7.7, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Figure 3.3 – 50: Arroyo Colorado Above Tidal Station 13074, July 2006

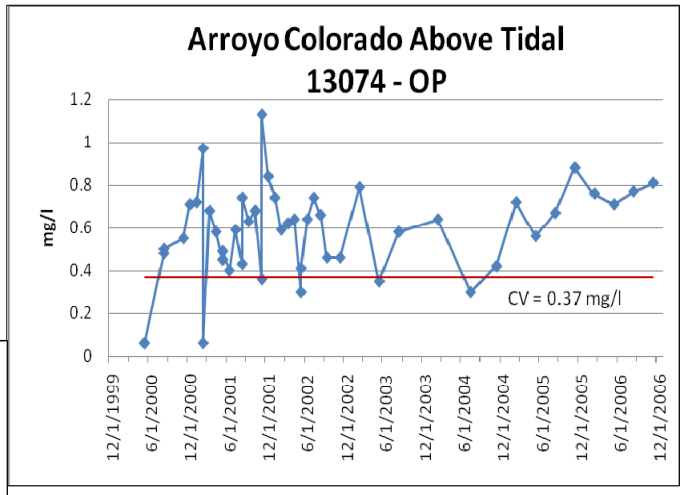


Ammonia (mg/l): 49 samples, ranging from 0.13 to 1.5, median value = 0.31, 22 values above criteria value of 0.33, no trends. There is a concern for ammonia in this section of the river, most likely associated with the numerous WWTP discharges. While no statistical trend exists, there is an obvious decrease in concentration beginning about August 2002. This decrease may be related to the implementation of BMPs in the WPP.

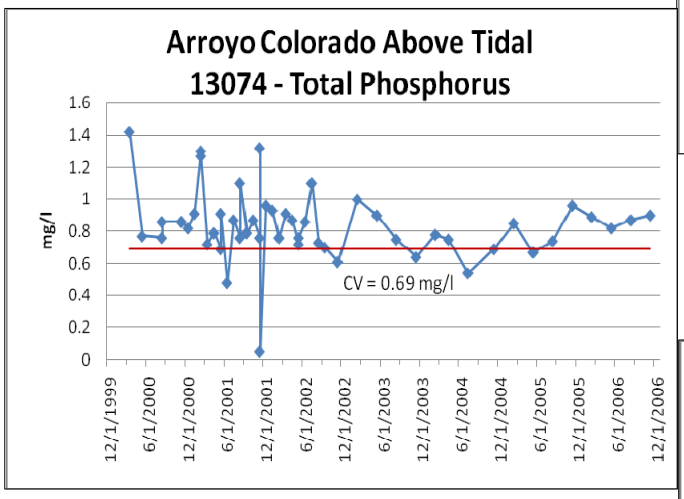
N+N (mg/l): 47 samples, ranging from 2.07 to 5.66, median value = 3.5, all values above criteria value of 1.95, no trends. There is a concern for N+N in this section of the river, and may be related to runoff from area crop lands. Although there is no statistical trend, the overall values appear to be increasing during the assessment period.



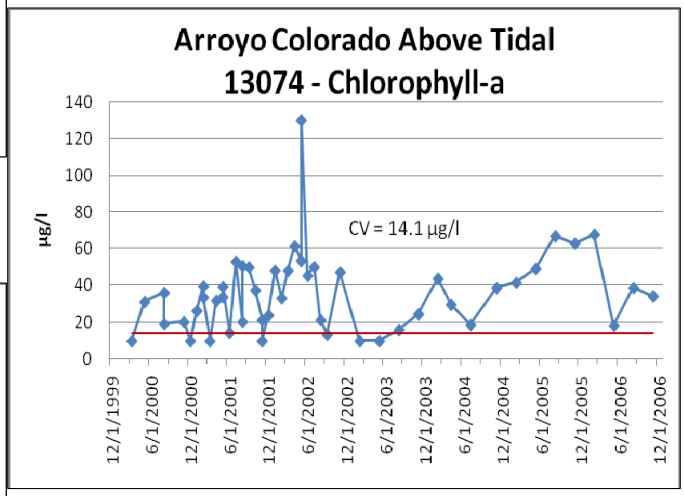
OP (mg/l): 46 samples, ranging from <0.06 to 1.13, median value = 0.62, 40 values above criteria value of 0.37, 2 non-detects, no trends. There is a concern for OP in this section of the river, and may be related to runoff from area crop lands. Although there is not a statistical trend, the values appear to be increasing.



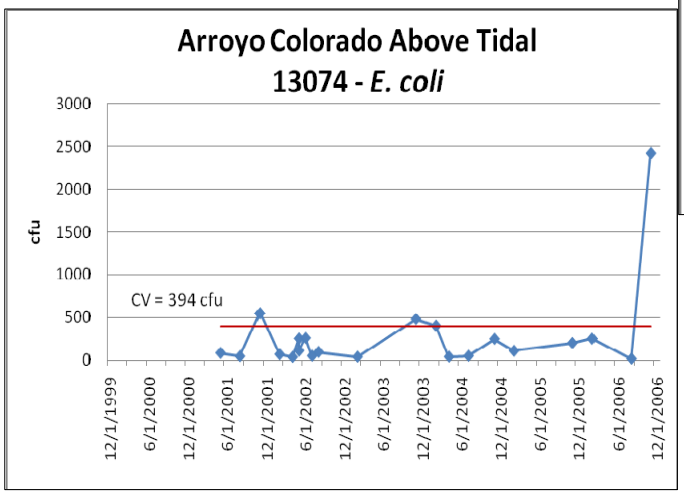
Total Phosphorus (mg/l): 50 samples, ranging from <0.05 to 1.42, median value = 0.82, 42 values above criteria value of 0.69, 1 non-detect, no trends. There is a concern for OP in this section of the river, and may be related to runoff from area crop lands.



Chlorophyll-a (µg/l): 49 samples, ranging from <10 to 130, median value = 33.8, 42 values above criteria value of 14.1, 4 non-detects, no trends. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels.



TSS (mg/l): 48 samples, ranging from 1.4 to 574, median value = 122, no trends. There are no problems with TSS in this section of the river.



***E. coli* (cfu): 21 samples, ranging from 19 to 2419, median value = 110, geometric mean = 130, 4 samples exceed single sample criteria of 394, geometric mean criteria = 126.** There is an impairment for bacteria on this section of the river. The impairment was originally based on fecal coliform form and the *E. coli* data supports this assessment for single samples.

The 2008 Assessment lists this section of the river as being impaired for dichlorodiphenylethylene (DDE), mercury, and polychlorinated byphenyls (PCB) in fish tissue.

2202_02: 11 miles upstream to 4 miles downstream of US 77

Station Summary

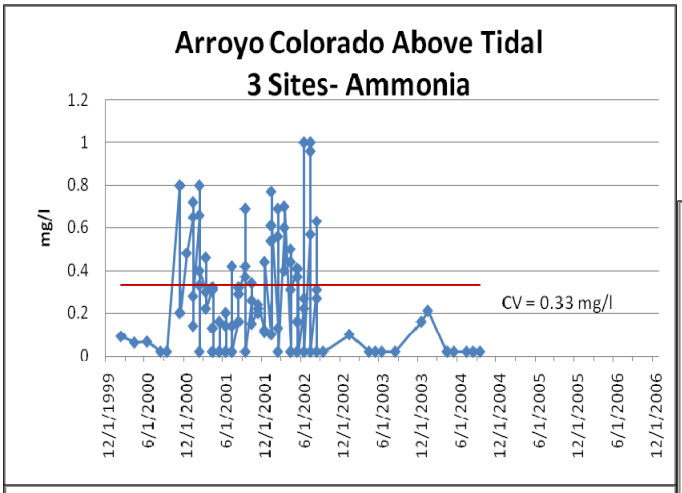
Site	Entity	Frequency	Parameter Groups	Date Range
13079 – at US 77 in SW Harlingen	NRA	Quarterly	Conventional, Bacteria, Field	1990 – 2004, 2007 – Present
16141 – 75 m downstream from Commerce St. in Harlingen				1998 – 2002
16445 – at low water crossing at Dilworth Rd east of La Feria	NRA	Quarterly	Conventional, Bacteria, Field	1999 – 2002, 2007 - Present

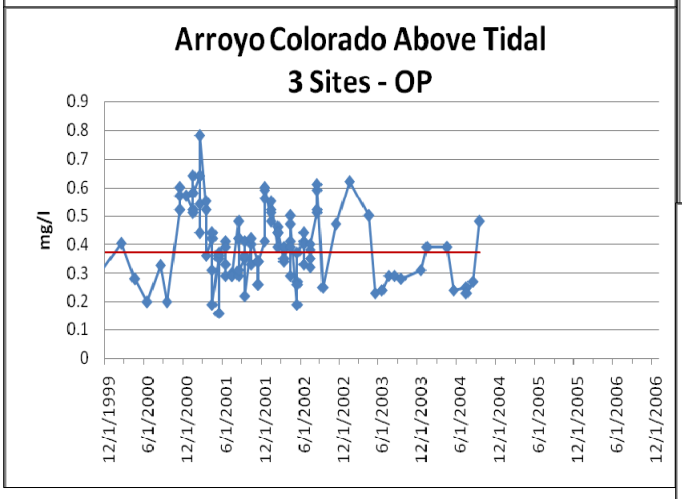
DO (mg/l): 102 samples, ranging from 2.1 to 13, median value = 7.7, 3 values below screening level of 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. No 24-Hr DOs have been taken on this AU. There are no problems with low DO on this section of the river.

pH (su): 102 samples, ranging from 6.9 to 8.3, median value = 7.7, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Ammonia (mg/l): 96 samples, ranging from <0.02 to 1, median value = 0.21, 31 values above criteria value of 0.33, 28 non-detects, no trends. There is a concern for ammonia in this section of the river, most likely associated with the numerous WWTP discharges. While no statistical trend exists, there is an obvious decrease in concentration beginning about August 2002. This decrease may be related to the implementation of BMPs in the WPP.

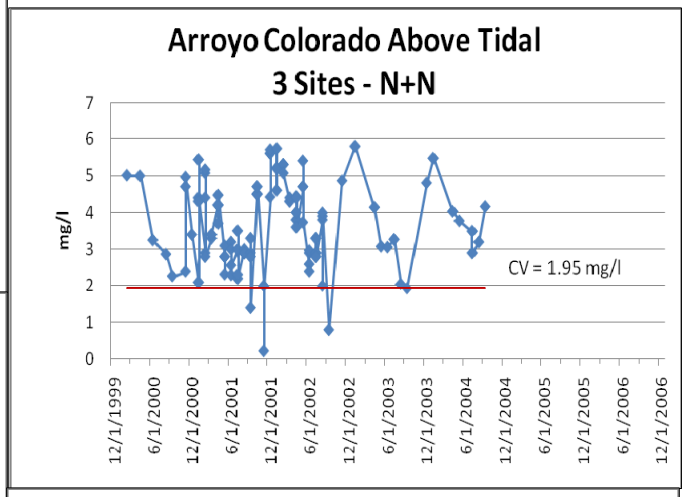
Figure 3.3 – 51: Arroyo Colorado Above Tidal Station 13079, November 2007

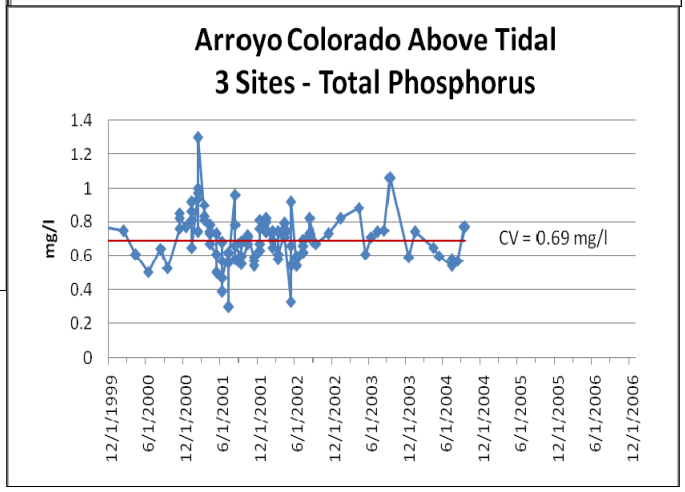




OP (mg/l): 105 samples, ranging from <0.06 to 0.78, median value = 0.39, 57 values above criteria value of 0.37, 1 non-detect, no trends. There is a concern for OP in this section of the river which may be related to runoff from area crop lands.

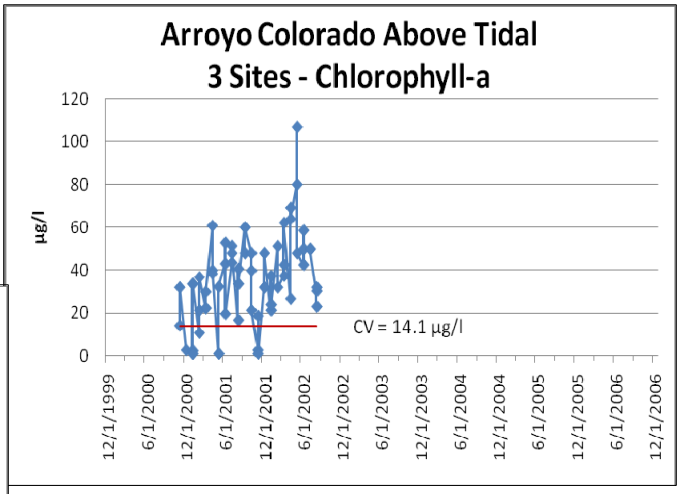
N+N (mg/l): 104 samples, ranging from 0.22 to 5.8, median value = 3.6, 100 values above criteria value of 1.95, no trends. There is a concern for N+N in this section of the river and may be related to runoff from area crop lands.



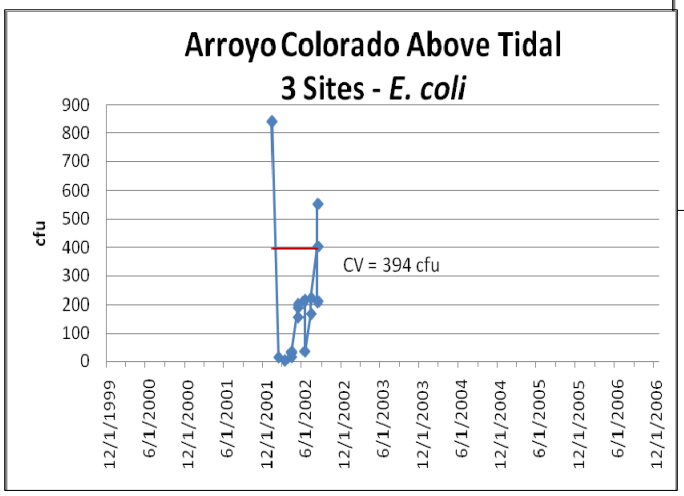


Total Phosphorus (mg/l): 106 samples, ranging from 0.3 to 1.3, median value = 0.71, 54 values above criteria value of 0.69, no trends. There is a concern for total phosphorus in this section of the river which may be related to runoff from area crop lands.

Chlorophyll-a (µg/l): 62 samples, ranging from <1 to 107, median value = 37.1, 54 values above criteria value of 14.1, 4 non-detects. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels.



TSS (mg/l): 63 samples, ranging from 87 to 290, median value = 187. There are no problems with TSS in this section of the river.



***E. coli* (cfu): 16 samples, ranging from 3.1 to 840, median value = 178, geometric mean = 95, 3 samples exceed single sample criteria of 394, geometric mean criteria = 126.** There is an impairment for bacteria on this section of the river. The impairment was originally based on fecal coliform and the *E. coli* data supports this assessment for single samples.

The 2008 Assessment lists this section of the river as being impaired for DDE, mercury, and PCBs in fish tissue.

2202_03: 14 miles upstream to 11 miles downstream of FM 1015

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13081 – at FM 1015 south of Weslaco	TCEQ	Quarterly	Conventional, Bacteria, Field	1990 – Present
	NRA		1 24-Hr DO	
13082 – at FM 493 south of Donna				1998 - 2002

DO (mg/l): 68 samples, ranging from 4.2 to 15.4, median value = 9.0, screening level = 4.0, no trends. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. There are no problems with low DO on this section of the river.

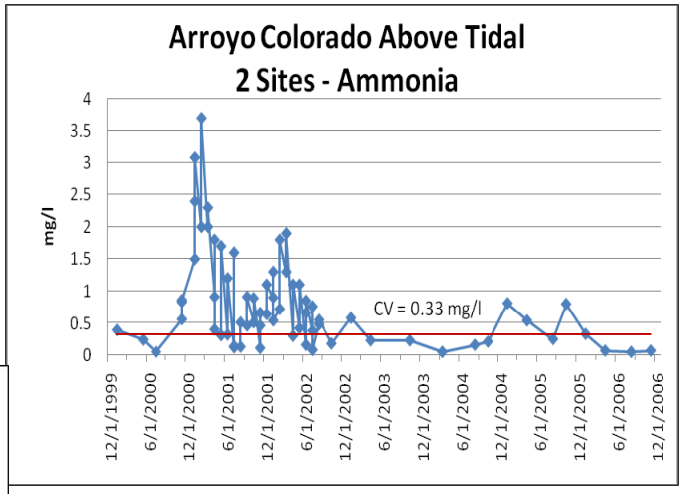
Average 24–Hr DO (mg/l): 2 samples, ranging from 7.5 to 7.6, criteria value = 4.0. The 24-Hr DO measurements taken to date seem to indicate that DO is not a problem, and additional 24-hr DO measurements are probably not needed.

Average 24–Hr DO (mg/l): 2 samples, ranging from 4.7 to 5.2, criteria value = 3.0.

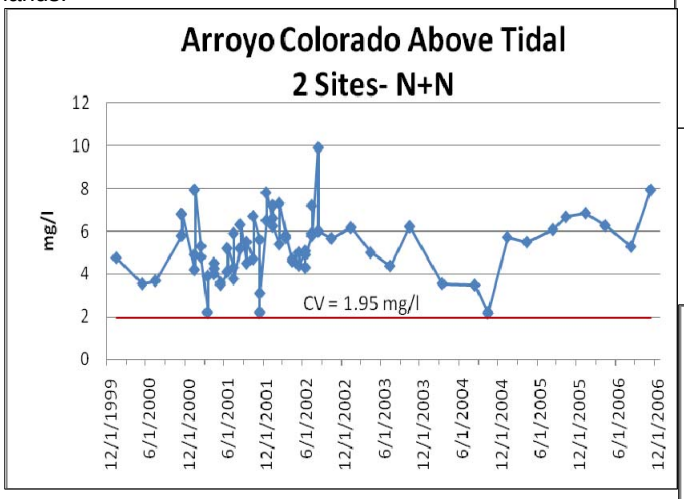
pH (su): 68 samples, ranging from 6.7 to 8.4, median value = 7.5, criteria range is 6.5 to 9, no trends. There are no problems with pH on this section of the river.

Figure 3.3 – 52: Arroyo Colorado Above Tidal Station 13081, July 2006

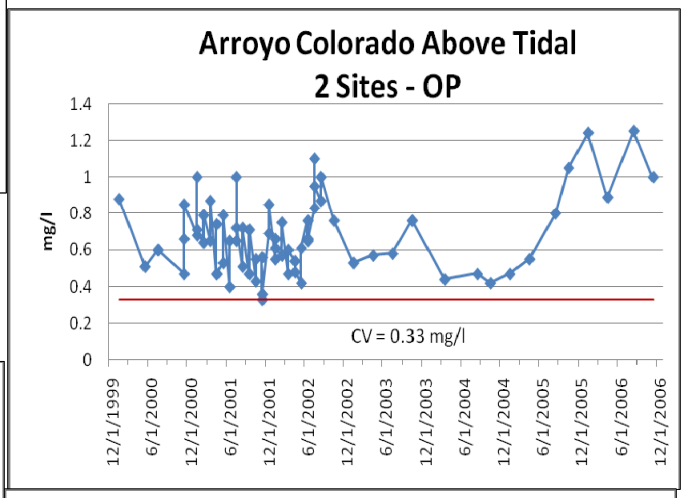
Ammonia (mg/l): 68 samples, ranging from <0.05 to 3.7, median value = 0.56, 46 values above criteria value of 0.33, 3 non-detects, no trends. There is a concern for ammonia in this section of the river, most likely associated with the numerous WWTP discharges. Although there is no statistical trend since 1990, ammonia concentrations appear to be decreasing.



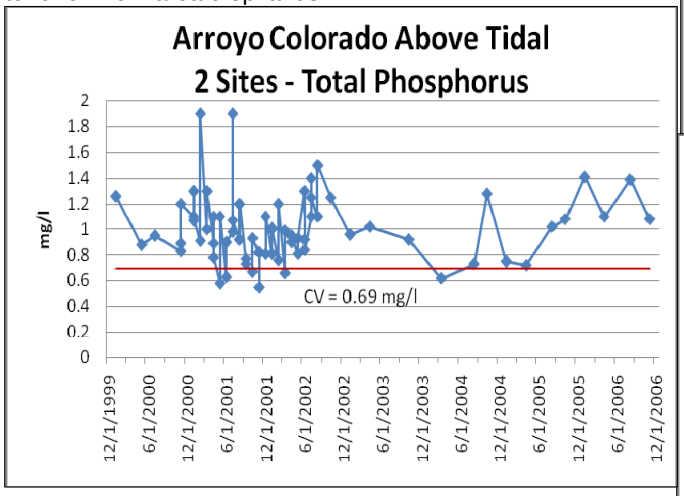
N+N (mg/l): 69 samples, ranging from 2.18 to 9.9, median value = 5.28, all values above criteria value of 1.95, no trends. There is a concern for N+N in this section of the river and may be related to runoff from area crop lands.

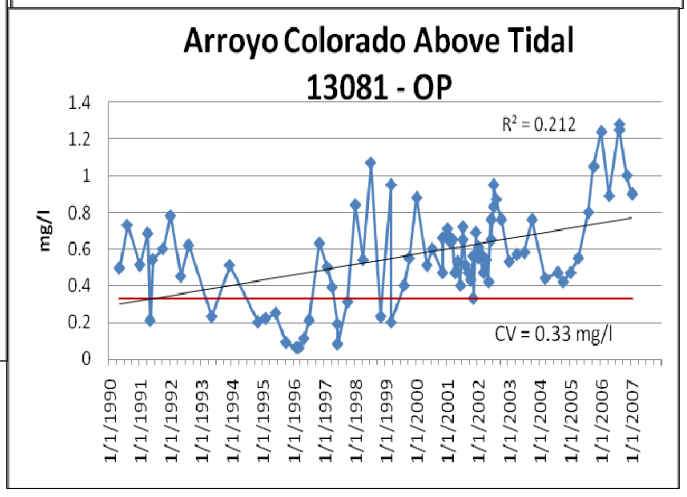


OP (mg/l): 69 samples, ranging from 0.33 to 1.25, median value = 0.65, 67 values above criteria value of 0.37, increasing trend. There is a concern for OP in this section of the river which may be related to runoff from area crop lands. It appears to be getting worse.

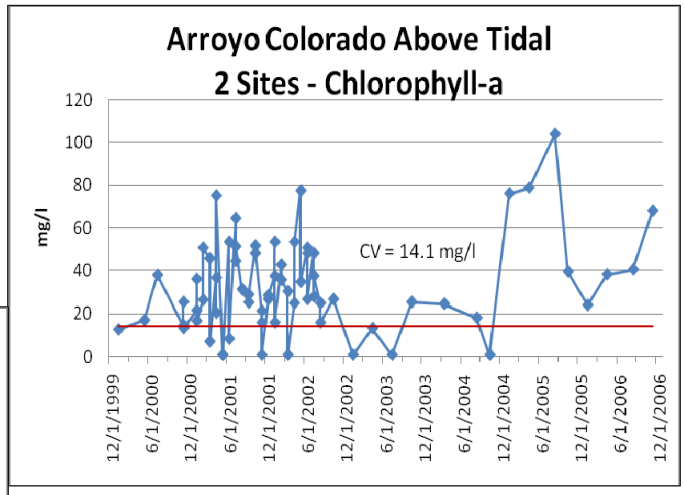


Total Phosphorus (mg/l): 68 samples, ranging from 0.55 to 1.9, median value = 0.97, 62 values above criteria value of 0.69, no trends. There is a concern for total phosphorus in this section of the river which may be related to runoff from area crop lands.

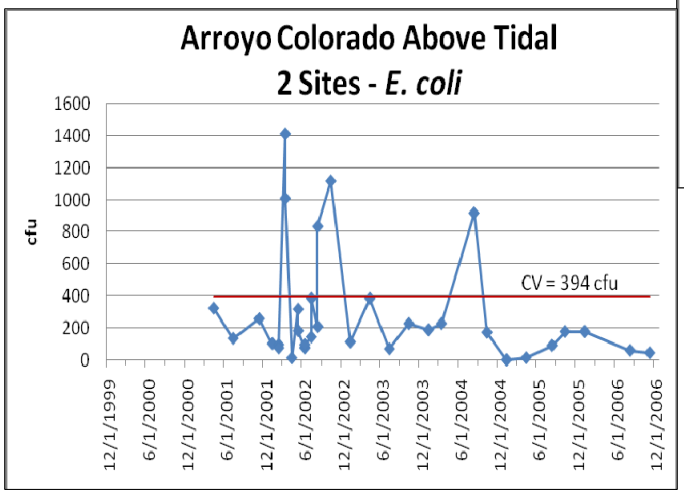




Chlorophyll-a (mg/l): 69 samples, ranging from <1 to 104, median value = 28.5, 57 values above criteria value of 14.1, 7 non-detects, no trends. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels.



TSS (mg/l): 69 samples, ranging from 14 to 732, median value = 181, no trends. There are no problems with TSS in this section of the river. The one high reading occurred at Station 13081 in October 2004. All other readings are <425.



***E. coli* (cfu): 34 samples, ranging from 3 to 1414, median value = 178, geometric mean = 152, 5 samples exceed single sample criteria of 394, geometric mean criteria = 126.** There is an impairment for bacteria on this section of the river. The impairment was originally based on fecal coliform form and the *E. coli* data supports this assessment.

The 2008 Assessment lists this section of the river as being impaired for DDE, mercury, and PCBs in fish tissue.

2202_04: upper 19 miles

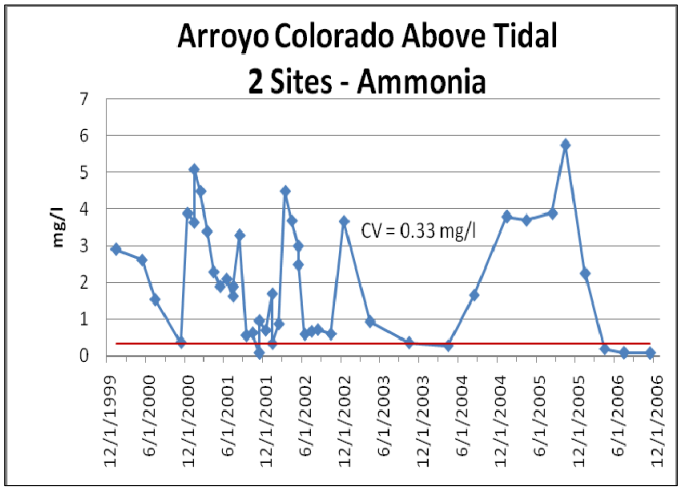
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13084 – at US 281 south of Pharr	TCEQ	Quarterly	Conventional, Bacteria, Field	1999 – Present
13086 – at FM 336 south of McAllen				2000 – 2002

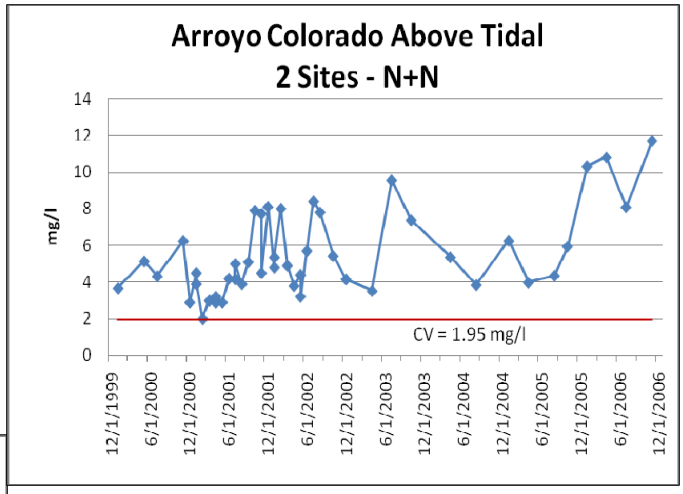
DO (mg/l): 43 samples, ranging from 3.4 to 12.2, median value = 6.4, 3 values below screening level of 4.0. This station does not show the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. No 24-Hr DO measurements have been taken on this AU. There are no problems with low DO on this section of the river.

pH (su): 43 samples, ranging from 6.5 to 8, median value is 7.3 criteria range = 6.5 to 9. There are no problems with pH on this section of the river.

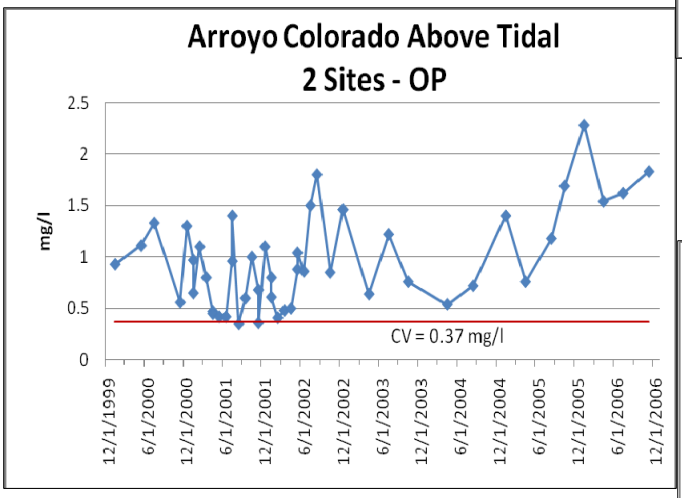
Ammonia (mg/l): 44 samples, ranging from 0.08 to 5.77, median value = 1.8, 39 values above criteria value of 0.33. There is a concern for ammonia in this section of the river, most likely associated with the numerous WWTP discharges.



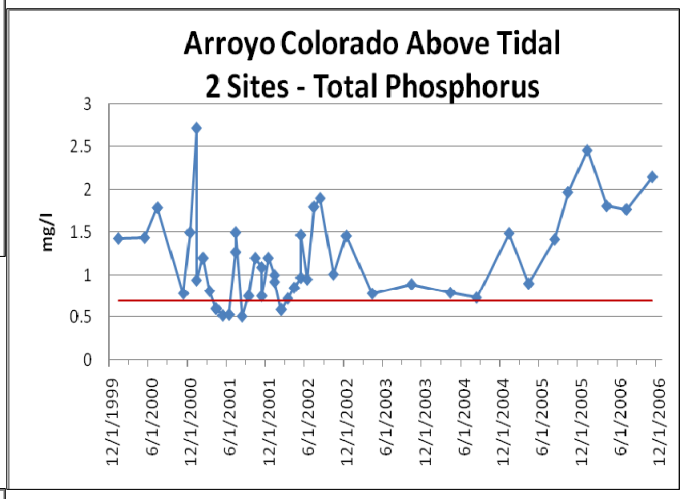
N+N (mg/l): 46 samples, ranging from 2 to 11.7, median value is 4.85, all values above criteria value of 1.95. There is a concern for N+N in this section of the river and may be related to runoff from area crop lands. Although there is insufficient data for a long-term trend analysis, there appears to be an increasing trend during the assessment period.



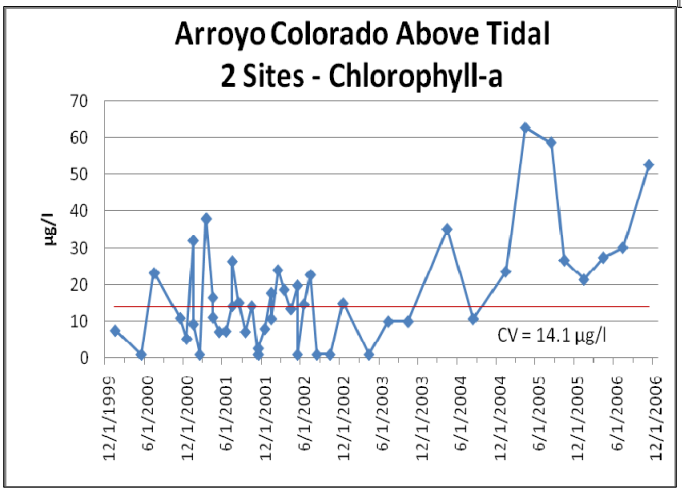
OP (mg/l): 46 samples, ranging from 0.35 to 2.28, median value = 0.87, 44 values above criteria value of 0.37. There is a concern for OP in this section of the river which may be related to runoff from area crop lands Although there is insufficient data for a long-term trend analysis, the does appear to be an increasing trend during the assessment period.



Total Phosphorus (mg/l): 45 samples, ranging from 0.51 to 2.72, median value = 1.01, 39 values above criteria value of 0.69. There is a concern for total phosphorus in this section of the river which may be related to runoff from area crop lands.

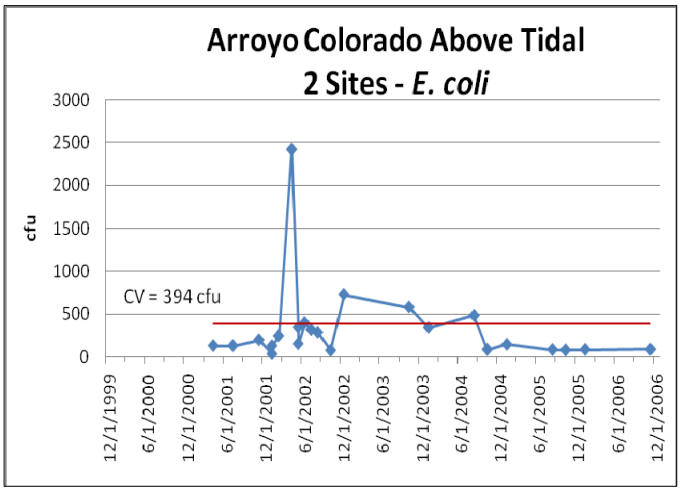


Chlorophyll-a (mg/l): 46 samples, ranging from <1 to 62.8, median value = 14.2, 24 values above criteria value of 14.1, 9 non-detects. There is a concern for chlorophyll-a in this section of the river and may be related to the elevated N+N levels. Although there is insufficient data for a long-term trend analysis, the does appear to be an increasing trend during the assessment period.



TSS (mg/l): 46 samples, ranging from 28 to 832, median value = 105. There are no problems with TSS in this section of the river. The one high reading occurred at Station 13086 in May 2002. All other readings are <315.

***E. coli* (cfu): 23 samples, ranging from 31 to 2419, median value = 148, geometric mean = 191, 5 samples exceed single sample criteria of 394, geometric mean criteria = 126.** There is an impairment for bacteria on this section of the river. The impairment was originally based on fecal coliform and the *E. coli* data supports this assessment.



The 2008 Assessment lists this section of the river as being impaired for DDE, mercury, and PCBs in fish tissue.

Entire Segment

TDS (mg/l): 274 samples, ranging from 10 to 5680, median value = 2710, average value = 2637, criteria value = 4000, no trends. There are no problems with TDS on this segment of the river.

Chloride (mg/l): 268 samples, ranging from 101 to 1800, median value = 836, average value = 811, criteria value = 1200, no trends. There are no problems with chloride on this segment of the river.

Sulfate (mg/l): 265 samples, ranging from 123 to 1150, median value = 748, average value = 719, criteria value = 900, no trends. There are no problems with sulfate on this segment of the river.

Segment 2203, Petronila Creek Tidal, flows 14 miles from a point 1 km (0.6 miles) upstream of private road crossing near Laureles Ranch in Kleberg County to the confluence of Chiltipin Creek in Kleberg County.

This segment of the creek flows through the King Ranch.

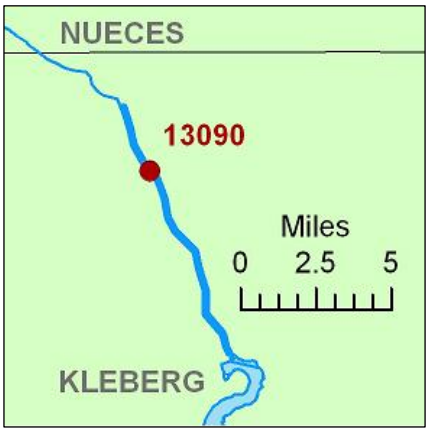


Figure 3.3 – 53: Petronila Creek Tidal

Active Wastewater Permits

There are no active wastewater permits that discharge in this segment.

Water Quality Analysis

Station Summary

Site	13090 – 1.2km upstream of the confluence with Tunas Creek
Entity	TCEQ
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field
Date Range	1989 – 2001, 2004 – Present

DO (mg/l): 17 samples, ranging from 6.9 to 13.9, median value = 9.7, screening level = 4. DO does not show the traditional annual variation with the higher values in winter and lower values in summer. No 24-Hr DO measurements have been conducted on this segment. There are no problems with low DO on this segment of the creek.

pH (su): 17 samples, ranging from 7.5 to 9.3, median value = 8.1, 2 values above the criteria range of 6.5 to 9. The exceedences occurred in April 2000 and June 2006. There are no problems with pH on this segment of the creek.

Ammonia (mg/l): 17 samples, ranging from <0.05 to 0.23, median value = 0.05, criteria value = 0.46, 12 non-detects. There are no problems with ammonia on this segment of the creek.

N+N (mg/l): 17 samples, ranging from <0.04 to 0.16, median value = 0.04, criteria value = 1.1, 16 non-detects. There are no problems with N+N on this segment of the creek.

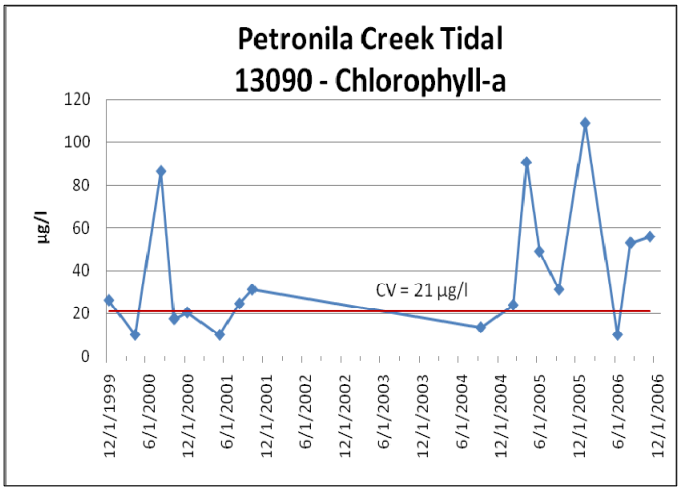
OP (mg/l): 17 samples, ranging from <0.04 to 0.26, median value = 0.04, criteria value = 0.46, 11 non-detects. There are no problems with OP on this segment of the creek.

Total Phosphorus (mg/l): 17 samples, ranging from 0.07 to 0.59, median value = 0.15, criteria value = 0.66. There are no problems with total phosphorus on this segment of the creek.

Chlorophyll-a (µg/l): 17 samples, ranging from <10 to 109, median value = 26.2, 11 values above criteria value of 21, 2 non-detects. There is a concern for chlorophyll-a on this segment of the creek. This may be a continuation of the chlorophyll-a concern on the upstream segment. The graphs tend to track, with values in this segment being somewhat lower.

TSS (mg/l): 16 samples, ranging from 12 to 436, median value = 40. There are no problems with TSS on this segment of the creek.

Enterococcus (cfu): 11 samplies, ranging from <5 to 671, median value = 20, geometric mean = 29.9, 3 values above the single sample criteria of 89, geometric mean criteria = 35. There are no problems with bacteria on this segment of the creek.



Segment 2204, Petronila Creek Above Tidal, flows 35 miles from the confluence of Agua Dulce and Banquete Creeks in Nueces County to a point 1 km (0.6 miles) upstream of private road crossing near Laureles Ranch in Kleberg County.

This segment is divided into two AUs: (01) the lower 25 miles and (02) the upper 10 miles.

Active Wastewater Permits

WQ0002888-000 – US Ecology Texas: storm water discharge at an intermittent and flow variable rate via four outfalls via Nueces County Drainage Ditch to Petronila Creek Above Tidal.

WQ0010140-001 – City of Agua Dulce: 160,000 gpd via drainage ditch to Agua Dulce Creek to Petronila Creek Above Tidal.

WQ0010592-001 – City of Orange Grove: 200,000 gpd via Leon Creek to Quinta Creek to Agua Dulce Creek to Petronila Creek Above Tidal.

WQ0011541-001 – City of Driscoll: 100,000 gpd directly to Petronila Creek Above Tidal.

WQ0011583-001 – Nueces County WCID No. 5: 100,000 gpd via Banquete Creek to Petronila Creek Above Tidal.

WQ0011689-001 – Coastal Bend Youth City: 15,000 gpd via unnamed ditch to Petronila Creek Above Tidal.

WQ0011754-001 – Bishop Consolidated Independent School District (ISD): 8,000 gpd via unnamed ditch to Petronila Creek Above Tidal.

WQ0014802-001 – LCS Corrections Services, Inc.: proposed 150,000 gpd via unnamed ditch to Petronila Creek Above Tidal.

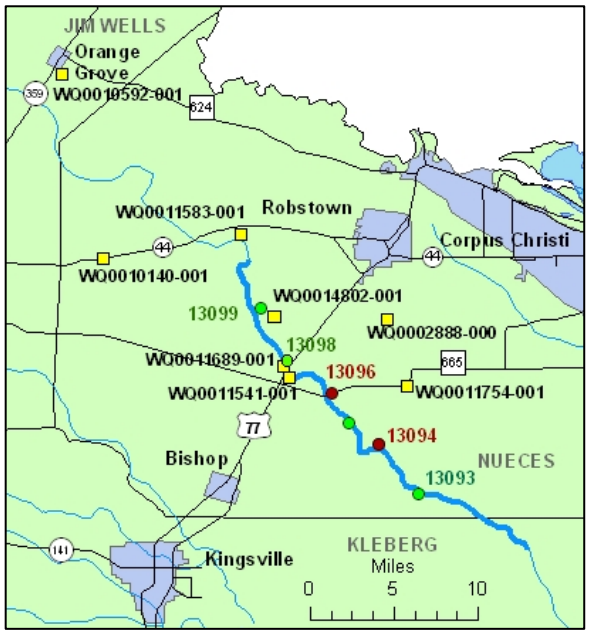
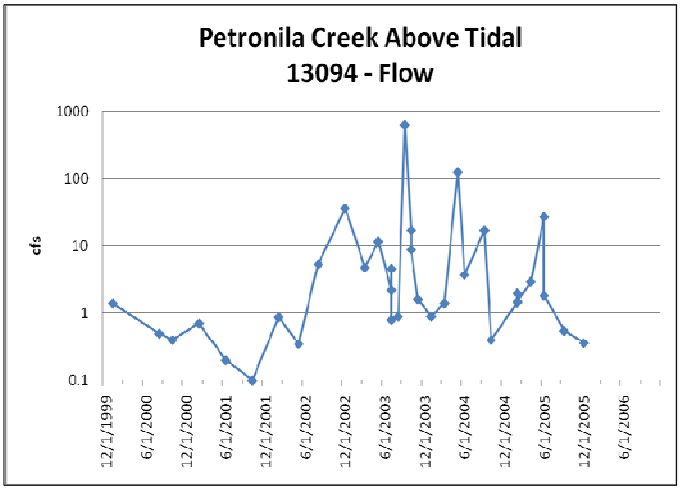


Figure 3.3 – 54: Petronila Creek Above Tidal

Flow

There are no USGS stream flow gauges on this creek. The graph shows available flow and flow estimates taken during sampling at Station 13094. Flows range between 0.1cfs and 634 cfs, with a median flow of 1.6 cfs.



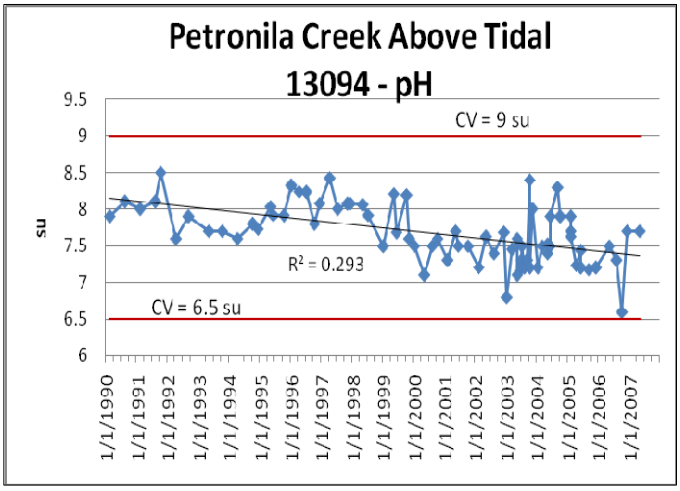
Water Quality Analysis
2204_01: lower 25 miles
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13093 – immediately upstream of FM 70 bridge east of Bishop				2003 – 2005
13094 – at FM 892 SE of Driscoll	TCEQ	Quarterly	Conventional, Bacteria, Field	1982 – Present
13095 – at Beatty Rd 2.5 miles downstream of FM 665				2003 – 2005
13096 – at FM 665 east of Driscoll	TCEQ	Quarterly	Conventional, Bacteria, Field	2003 – Present
13098 – at US 77 bridge				2003 – 2005

Only DO and pH data were available at Stations 13093, 13095, and 13098.

DO (mg/l): 100 samples, ranging from 3.7 to 19.2, median value = 7.8, 1 value below screening level of 4, no trends. The one exceedence occurred at Station 13098 in October 2004 during TMDL sampling. No 24-Hr DOs have been conducted on this segment. There are no problems with low DO on the creek.

pH (su): 100 samples, ranging from 6.2 to 9.6, median value = 7.5, 1 value below and 1 value above the criteria range of 6.5 to 9, decreasing trend. There are no problems with pH on the creek. The exceedences occurred at Stations 13095 in January 2003 and 13098 in October 2004 during TMDL sampling. While there is a decreasing trend, the median is still well above the lower criteria.



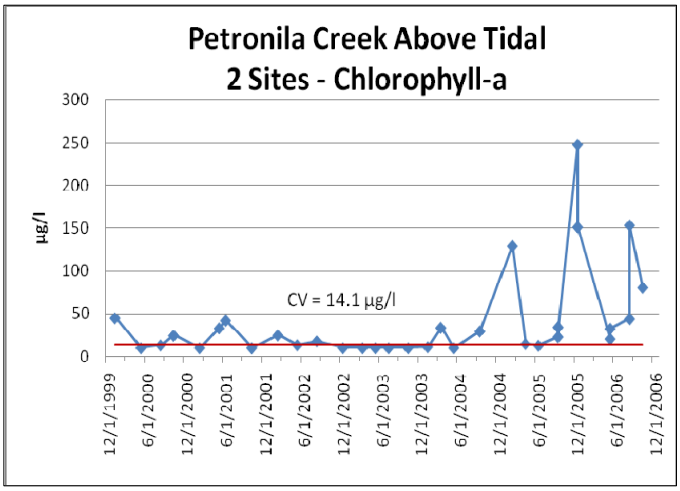
Ammonia (mg/l): 34 samples, ranging from <0.05 to 0.17, median value = 0.05, criteria value = 0.33, 24 non-detects, no trends. There are no problems with ammonia on this segment of the creek.

N+N (mg/l): 30 samples, ranging from <0.04 to 1.58, median value = 0.04 criteria value = 1.95, 17 non-detects, no trends. There are no problems with N+N on this segment of the creek.

OP (mg/l): 32 samples, ranging from <0.04 to 0.57, median value = 0.04, 4 values above criteria value of 0.37, 21 non-detects, no trends. All of the exceedences correspond to high flows and were collected during targeted TMDL sampling. There are no problems with OP on this segment of the creek.

Total Phosphorus (mg/l): 29 samples, ranging from <0.05 to 0.59, median value = 0.09, criteria value = 0.69, 6 non-detects, no trends. There are no problems with total phosphorus on this segment of the creek.

Chlorophyll-a (µg/l): 32 samples, ranging from <10 to 247, median value = 21.8, 19 values above criteria value of 14.1, 9 non-detect, no trends. Chlorophyll-a is a concern on the creek. Even though statistically there is no trend, the graph of the data during the Assessment Period seems to indicate an overall increase in chlorophyll-a values. The higher values tend to correlate to low flow.



TSS (mg/l): 32 samples, ranging from 7 to 230, median value = 33, no trends. There are no problems with TSS on this creek.

***E. coli* (cfu): 11 samples, ranging from <1 to >2400, median value = 40, 3 values above the single sample criteria of 394, 3 non-detects, geometric mean = 36, geometric mean criteria value = 126.** The 2008 Assessment used only the 7 measurements from Station 13094 which had only one exceedence and met the geometric mean. Therefore, *E. coli* was not listed as an impairment on this segment. Flow was not recorded on these sampling dates, but most likely the higher values occurred during higher flows.

2204_02: upper 10 miles

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13099 – at FM 2826 north of Driscoll				2003 – 2005

Only 7 DO and pH samples have been taken at Station 13099. There is not enough data to make any assumptions as to whether or not problems exist in this portion of the bay, so only the range and median are reported.

DO (mg/l): 7 samples, ranging from 1.8 to 6.4, median value = 3.7.

pH (su): 7 samples, ranging from 6.2 to 7.8, median value = 7.4.

NRA investigated resuming routine monitoring in this AU in FY 2009 but found that the creek is usually dry west of US 77. Residents in the area were concerned about the water quality and debris in the creek which contributes to flooding during rain events. They were also concerned about a new WWTP permit for a private prison that is under construction. If approved, the prison will be permitted to discharge 150,000 gallons per day into the creek. The prison officials worked with the residents and agreed to clean the debris out of the creek. The residents in turn agreed not to oppose the permit application. Properly treated wastewater from the new WWTP could improve flow and reduce stagnation in this section of the creek. It is possible that routine monitoring will resume if this happens.

Entire Segment

TDS (mg/l): 107 samples, ranging from 59 to 29,100, median value = 8762, average value = 8600, average criteria = 4000, no trends. The segment is impaired for TDS and has been addressed by a TMDL. The source of the impairments was contributed primarily to historic oil and gas well activity in the area. An Implementation Plan has also been completed.

Chloride (mg/l): 107 samples, ranging from 2.2 to 11,200, median value = 4400, average value = 4403, average criteria = 1500, no trends. The segment is impaired for chloride and has been addressed by a TMDL. The source of the impairments was contributed primarily to historic oil and gas well activity in the area. An Implementation Plan has also been completed.

Sulfate (mg/l): 107 samples, ranging from 2 to 2000, median value = 870, average value = 786, average criteria = 500, no trends. The segment is impaired for sulfate and has been addressed by a TMDL. The source of the impairments was contributed primarily to historic oil and gas well activity in the area. An Implementation Plan has also been completed.

Segment 2485A, Oso Creek, flows 29.5 miles from a point 3 miles upstream of SH 44, west of Corpus Christi in Nueces County to its confluence with Oso Bay in southern Corpus Christi in Nueces County.

Figure 3.3 – 55: Oso Creek

Active Wastewater Permits

WQ0002075-000 – Equistar Chemicals LP – Corpus Christi Plant: 2,000,000 gpd.

WQ0004752-000 – Mineral Processing & Marketing, Inc.: 15,700 gpd via evaporation in a 7.5 acre evaporation pond system.

WQ0010261-001 – City of Robstown: 3,000,000 gpd via unnamed ditch to Oso Creek.

WQ0010401-003 – City of Corpus Christi – Greenwood Plant: 16,000,000 gpd via La Volla Creek to Oso Creek.

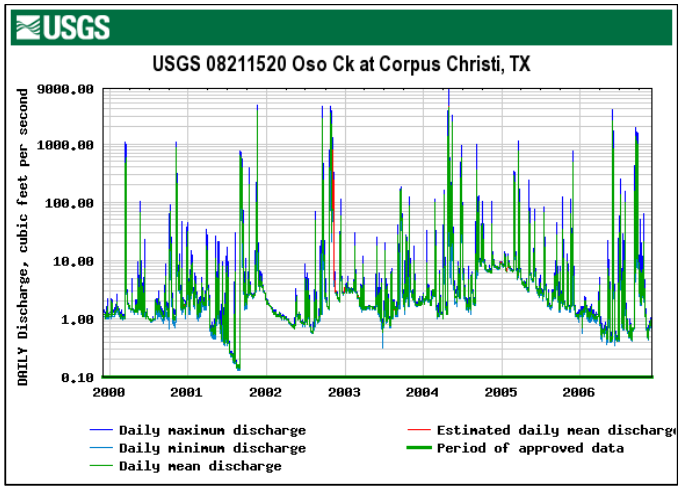
WQ0011134-001 – Corpus Christi Peoples Baptist Church: 20,000 gpd directly to Oso Creek.

WQ0011345-001 – Texas A&M University System Agricultural Research and Extension Center: 1,500 gpd via drainage ditch to Oso Creek.

WQ0014228-001 – Tennessee Pipeline Construction (Cudahy Field): 60,000 gpd directly to Oso Creek.

Flow

Although this is considered a tidally influenced creek, there is a UGS stream flow gauge, Oso Creek at Corpus Christi, TX, located at the same site as Station 13029. Recorded flows during this time period range between 0.13 cfs and 8780 cfs, with a median flow of 1.9 cfs.



Water Quality Analysis

Station Summary

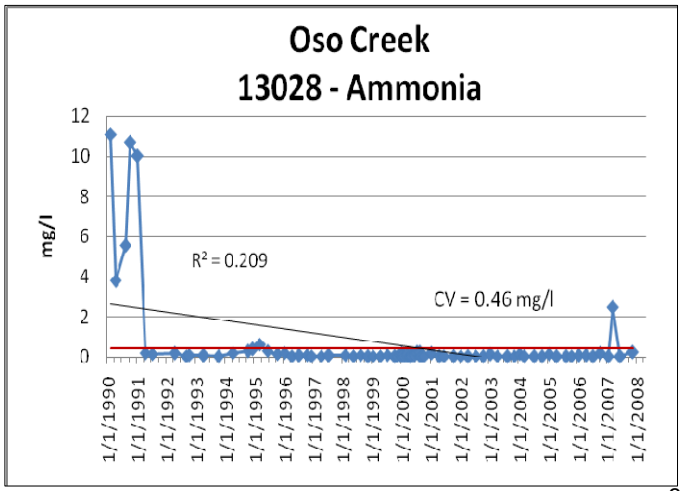
Site	Entity	Frequency	Parameter Groups	Date Range
13026 – immediately upstream of Yorktown St. in Corpus Christi				1999 – 2000, 2005 – 2006
13027 – immediately downstream of FM 2444 south of Corpus Christi				1999 – 2000, 2005 – 2006
13028 – immediately downstream of SH 286 south of Corpus Christi	NRA	Quarterly	Conventional, Bacteria, Field	1971 – Present
13029 – immediately downstream of FM 763 SW of Corpus Christi				1999 – 2000, 2004 – 2006
16712 – at Elliot Landfill west of SH 286 2325m upstream of SH 286				1999 – 2000, 2005 – 2006
18499 – immediately downstream of SH 44 1.07 km east of FM 24				2005 – 2006

Only DO, pH, and Enterococcus were measured at Station 18499.

DO (mg/l): 310 samples, ranging from 1.5 to 20, median value = 6.1, 50 values below screening level of 4, no trends. All exceedences were measured during TMDL monitoring which targeted rain events and were not intended to be used for assessment purposes. No 24-Hr DO measurements have been conducted on this segment. There are no problems with low DO on the creek.

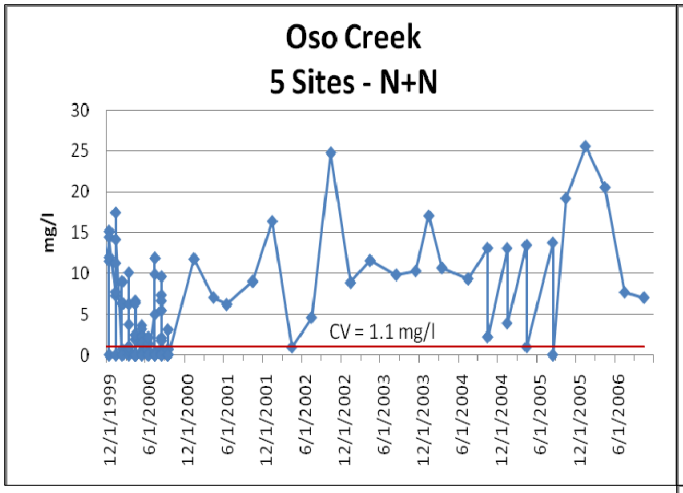
pH (su): 320 samples, ranging from 7.2 to 9.9, median value = 7.8, 4 values above the criteria range of 6.5 to 9, no trends. Three of the four exceedences were measured during TMDL monitoring which targeted rain events and were not intended to be used for assessment purposes. There are no problems with pH on the creek.

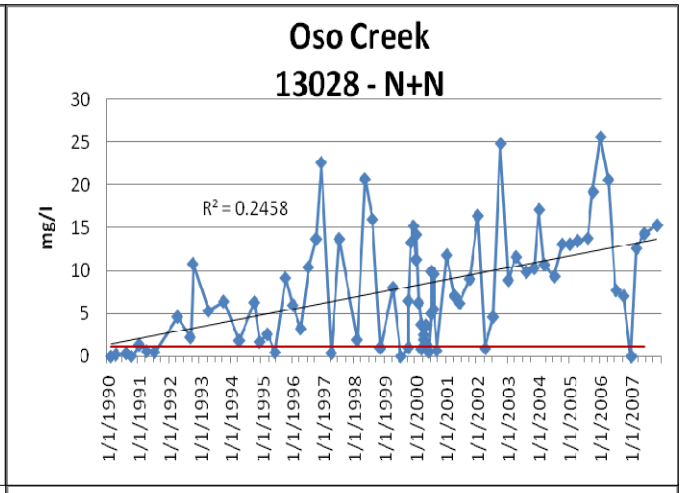
Figure 3.3 – 56: Oso Creek Station 13028, November 2007



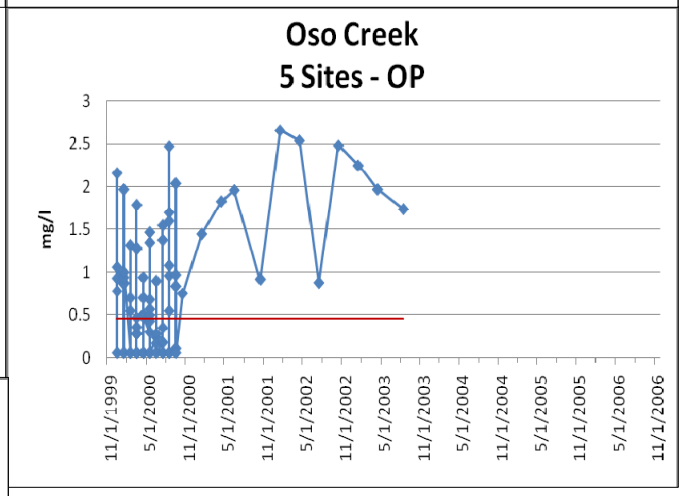
Ammonia (mg/l): 98 samples, ranging from <0.02 to 0.84, median value = 0.05, 1 value above criteria value of 0.46, 41 non-detects, decreasing trend. Values recorded in 1990 and early 1991 are very high, causing the decreasing trend. Something happened between January and April 1991 that caused the values to fall below the criteria. No trends exist if the first five data points shown on the graph are removed. There are no current problems with ammonia on this segment of the river.

N+N (mg/l): 98 samples, ranging from <0.01 to 25.6, median value = 3.7, 65 values above criteria value of 1.1, 14 non-detects, increasing trend. There is a concern for N+N on the creek. In addition to two major WWTPs, the creek drains a large area that is predominately row crop acreage. The increase in N+N appears to correspond with the decrease in ammonia.

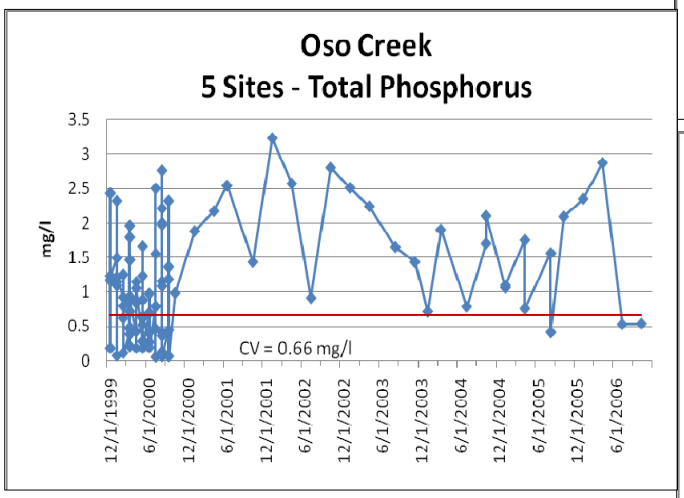


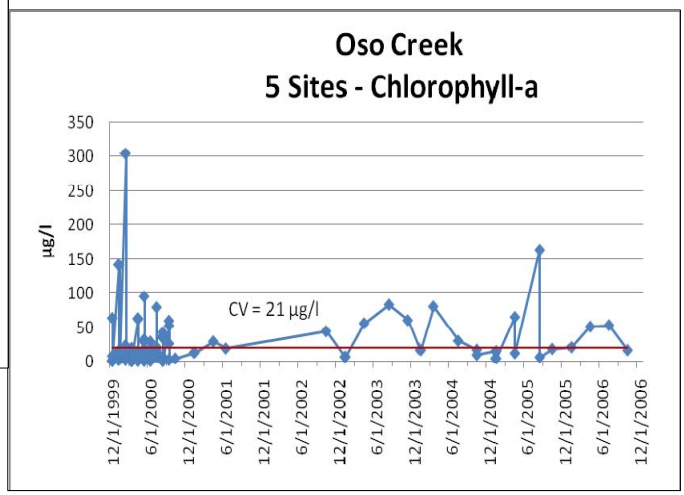


OP (mg/l): 79 samples, ranging from <0.06 to 2.66, median value = 0.7, 49 values above criteria value of 0.46, 19 non-detects, no trends. The last OP data was collected in 2003. The creek was not assessed for OP but the graph tends to mimic the values for total phosphorus and should also be considered a concern on this segment.



Total Phosphorus (mg/l): 98 samples, ranging from <0.05 to 3.23, median value = 1.02, 67 values above criteria value of 0.66, no trends. Total phosphorus is listed as a concern on the creek and is probably related to the local farming activities.

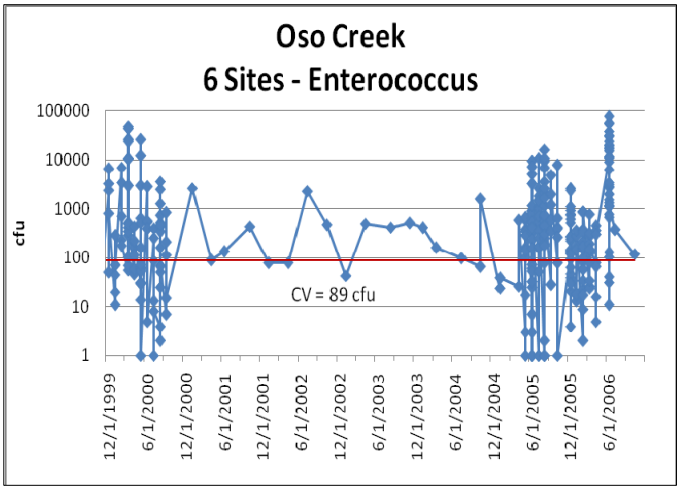




Chlorophyll-a (µg/l): 94 samples, ranging from <1 to 305, median value = 15.6, 34 values above criteria value of 21, 13 non-detect, no trends. Chlorophyll-a is also a concern on the creek.

TSS (mg/l): 96 samples, ranging from 8 to 1010, median value = 61, no trends. There are no problems with TSS on the creek. The higher values were recorded during TMDL sampling which targeted rainfall events.

Enterococcus (cfu): 315 samples, ranging from <1 to 76,500, median value = 345, 222 values above the single sample criteria of 89. Due to the large number of samples, the geometric mean was calculated for each station. These values ranged from 24 to 1330. Only station 13026 met the geometric mean criteria of 35. No trends. Bacteria is an impairment for the creek, and it is being addressed in the Oso Bay / Oso Creek Bacteria TMDL. The area is rich in avian wildlife. Hundreds, if not thousands, of birds can been seen congregating in the surrounding agriculture fields after heavy rains. The City of Corpus Christi's Greenwood WWTP, which discharges into a tributary of Oso Creek, has been ruled out as a contributing source.



Segment 2492A, San Fernando Creek, flows 45.6 miles from a point just east of the Nueces and Jim Wells county line to the confluence of the Cayo del Grullo arm of Baffin Bay in Kleberg County.

While primarily rural, the creek flows through the City of Alice and the City of Kingsville. It is a single AU.

Active Wastewater Permits

WQ0000579-000 – Ticona Polymers, Inc.: 3,500,000 gpd.

WQ0004589-000 – Coil Tubing Services: 1,000 gpd via drainage ditch to San Fernando Creek.

WQ0004819-000 – SNBL USA Ltd.: 35,000 gpd via evaporation.

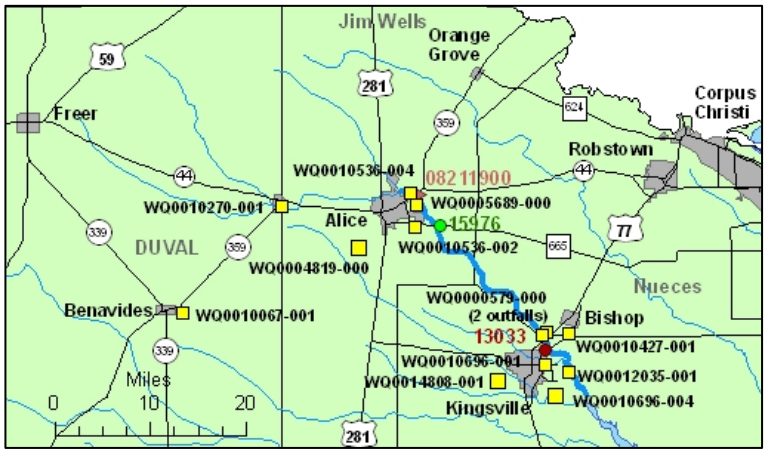


Figure 3.3 – 57: San Fernando Creek

WQ0010067-001 – Duval County Conservation and Reclamation District: 250,000 gpd via Santa Gertrudis Creek to San Fernando Creek.

WQ0010270-001 – San Diego MUD: 750,000 gpd via San Diego Creek to San Fernando Creek.

WQ0010427-001 – City of Bishop: 320,000 gpd via Carreta Creek to San Fernando Creek.

WQ0010536-002 – City of Alice: 2,600,000 gpd via Lattas Creek to San Fernando Creek.

WQ0010536-004 – City of Alice: 2,020,000 gpd directly to San Fernando Creek. Also authorizes the disposal of treated domestic wastewater via irrigation of a total of 164 acres which include the municipal golf course, softball fields, and park acreage.

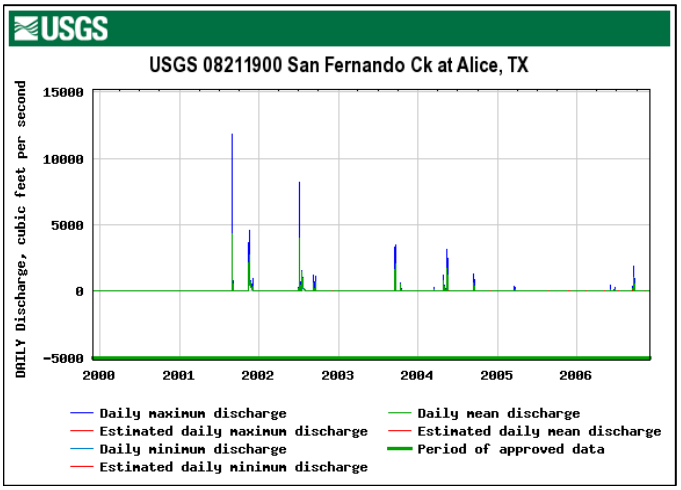
WQ0010696-001 – City of Kingsville – Plant 1: 3,000,000 gpd via Tranquitas Creek to San Fernando Creek.
WQ0010696-004 – City of Kingsville: 1,000,000 gpd via wetlands to Santa Gertrudis Creek to San Fernando Creek. Also provides for irrigation of a golf course.

WQ0012035-001 – US Department of the Navy (Kingsville Naval Air Station (NAS): 400,000 gpd directly to San Fernando Creek.

WQ0014808-001 – King Ranch: 25,000 via evaporation.

Flow

Although this is considered a tidally influenced creek, there is a UGS stream flow gauge, San Fernando Creek at Alice, TX, located at the same site as Station 15977. Recorded flows during this time period range between 0 cfs and 11,800 cfs, with a median flow of 1.8 cfs.



Water Quality Analysis
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13033 – at US 77 at Kingsville	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
15976 – at FM 665 6 miles east of Alice in Jim Wells County				2002 – 2003

Only DO and pH were measured at Station 15976.

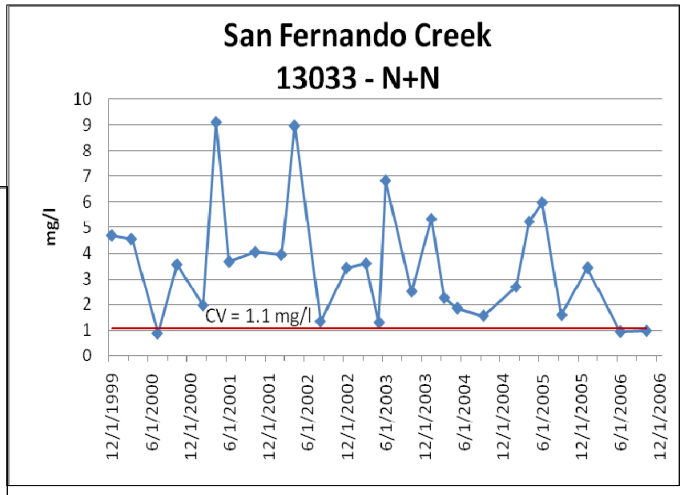
DO (mg/l): 39 samples, ranging from 3.3 to 16.3, median value = 8.9, 3 values below screen level of 4, no trends. All exceedences were recorded at Station 15976 in 2003 when there was very little water in the creek. No 24-Hr DO measurements have been conducted on this segment. There are no problems with low DO on this segment of the creek.

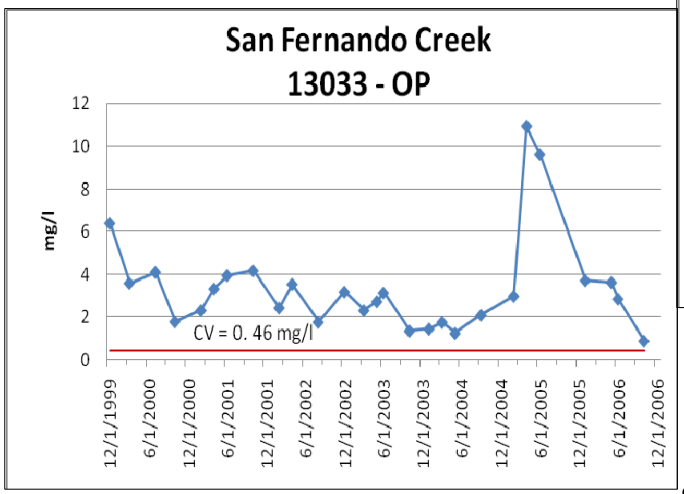
pH (su): 39 samples, ranging from 7 to 8.4, median value = 8, criteria range is 6.5 to 9, no trends. There are no problems with pH on this segment of the creek.

Ammonia (mg/l): 27 samples, ranging from <0.05 to 1.29, median value = 0.12, 1 value above criteria value of 0.46, 2 non-detects, no trends. The one exceedence occurred at Station 13033 in September 2005 is an anomaly. All other values are < 0.3. There are no problems with ammonia on this segment of the creek.

N+N (mg/l): 27 samples, ranging from 0.89 to 9.11, median value = 3.45, 24 values above criteria value of 1.1, no trends. There is a concern N+N on the creek, possibly from a combination of agriculture run off and WWTP discharges.

Figure 3.3 – 58: San Fernando Creek Station 15976, February 2003





OP (mg/l): 27 samples, ranging from 0.91 to 10.9, median value = 2.99, all values above criteria value of 0.46, no trends. The creek was not assessed for OP but the graph tends to mimic the values for total phosphorus and should also be considered a concern on this segment.

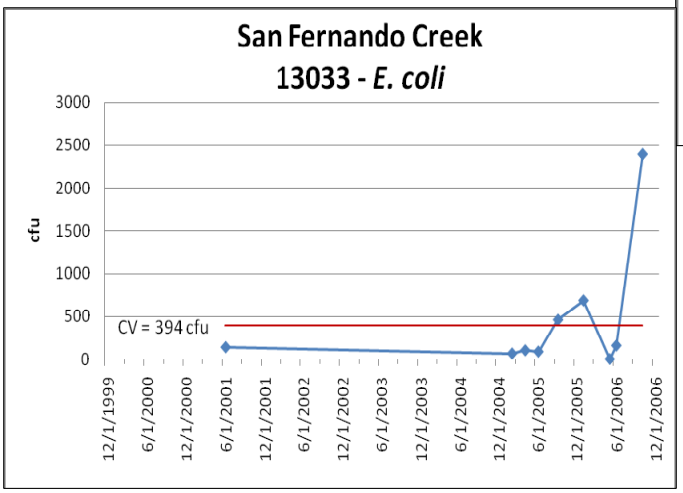
Total Phosphorus (mg/l): 25 samples, ranging from 1.14 to 13.2, median value = 3.1, all values above criteria value of 0.66, no trends. There is a concern for total phosphorus on the creek, possibly from a combination of agriculture run off and WWTP discharges.

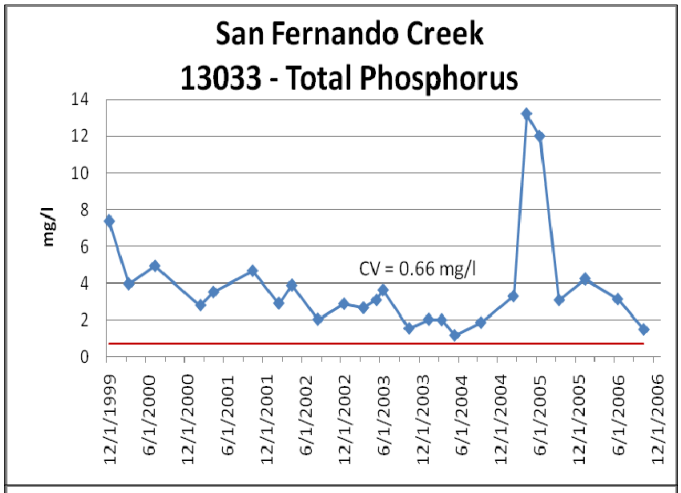
Chlorophyll-a (µg/l): 28 samples, ranging from <10 to 27.8, median value = 10, 1 value above criteria value of 21, 14 non-detects, no trends. The one exceedence occurred in June 2005 when the water was very shallow. There are no problems with chlorophyll-a on the creek.

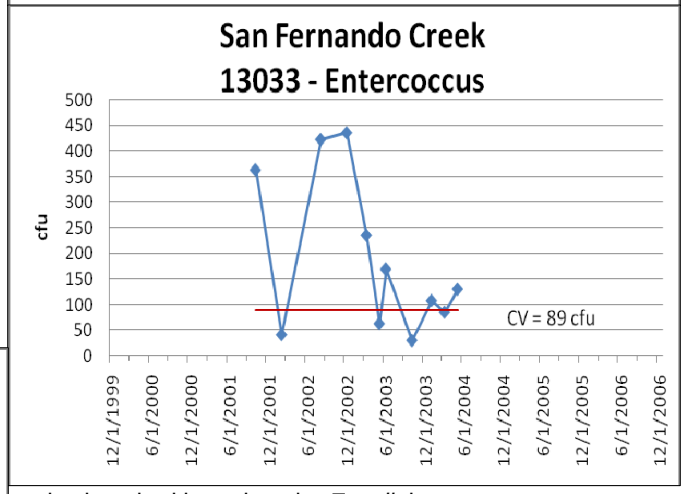
TSS (mg/l): 28 samples, ranging from 16 to 1310, median value = 54, no trends. The maximum value is an anomaly. All other values are < 135. There are no problems with TSS on this segment of the creek.

Enterococcus (cfu): 11 samplies, ranging from 30 to 435, median value = 130, geometric mean = 134, 7 values above the single sample criteria of 89, geometric mean criteria = 35. There is an impairment for bacteria for the creek based on the Enterococcus data.

***E. coli* (cfu): 9 samplies, ranging from <1 to >2400, median value = 140, geometric mean = 130, 3 values above the single sample criteria 0f 394, geometric mean criteria = 126.** *E. coli* replaced Enterococcus as the indicator bacteria in 2005 but there were not enough data points to assess. This analysis indicates that the segment is also impaired based on the *E. coli* data.







The source of the bacteria is unknown, but may be a combination of non-point source runoff and discharge from the WWTPs.

BAYS, ESTUARIES, AND GULF OF MEXICO

Segment 2472 Copano Bay is impaired for fecal coliform in oyster waters. The tidal segments of both the Aransas and Mission Rivers, which flow into Copano Bay, are impaired for bacteria for contact recreation. The *Copano Bay TMDL Project for Bacteria in Oyster-Harvesting Waters* was initiated in 2005 by TCEQ, focusing on the bay and the two tidal segments. NRA is under contract with TSSWCB to conduct event-based monitoring throughout the entire watershed to support the TMDL. Other project partners include the Coastal Bend Bays and Estuaries Program, TGLO, and DSHS.

A model is being developed to help determine the source of the bacteria. Initially, historical water quality data were used. These data were limited because the routine SWQM and CRP stations were all located in the lower portion of the watershed and on just the Aransas and Mission Rivers. The TSSWCB project includes sites on nearly every stream and creek. It also includes samples from WWTP outfalls. This additional data is being used to revise the model.

The TMDL also includes a BST component. This research is being done to determine the biological source of the bacteria. The possibilities include wild hogs and other wildlife, cattle, horses, birds, ducks, and humans.

An Implementation Plan for Segment 2482, Nueces Bay, has been completed. The evaluation of zinc loadings to Nueces Bay in the TMDL indicated that there are no existing discharges that would result in violation of the proposed revised zinc criterion. For this reason, implementation strategies will address zinc in oyster tissue as a legacy pollutant . The attenuation of the pollutant will be monitored by means of targeted sampling in the impaired area. In addition, the TCEQ also recalculated a more protective criterion for total zinc in water to be protective of human health via ingestion of oysters. This Implementation Plan recommends that this be included as a site-specific criterion for Nueces Bay in the 2008 water quality standards triennial revision.

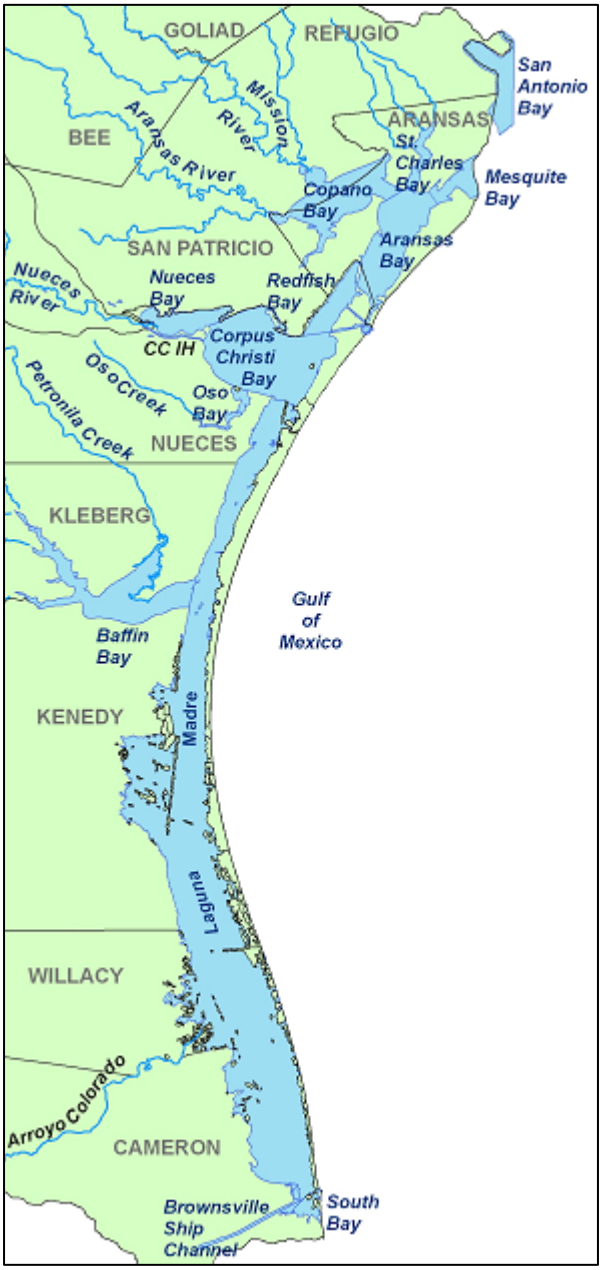


Figure 3.3 – 59: Bays and Estuaries

Segment 2485, Oso Bay, is impaired for bacteria. A TMDL has been completed. Model-based analyses indicate that bacteria concentrations significantly exceeding contact recreation criteria occur only in the portion of Oso Bay known as the Blind Oso, and that those concentrations are the result of dry-weather loads. The TCEQ believes the source of the dry-weather loads to be the many waterfowl and shorebirds that inhabit the Blind Oso. The Blind Oso, which is included on the TPWD's Great Texas Coastal Birding Trail, is a highly popular bird-watching location. A municipal domestic wastewater treatment facility discharges to the Blind Oso area, but the TCEQ did not find it to be a significant contributor to elevated bacteria concentrations in the bay.

Oso Bay and Segment 2491, Laguna Madre, are impaired for low DO. The Upper Laguna Madre strongly influences Oso Bay through the once pass through cooling system of the Barney Davis Power Plant, while the water quality of the Arroyo Colorado influences much of the central portion of the Lower Laguna Madre. The final report suggests that the DO criteria established by TCEQ fails to fully take into account the actual physical, chemical, and biological characteristics of the water body. The Laguna Madre is one of several unique hypersaline lagoons in the world and exhibits different characteristics between the Upper and Lower portions of this large geographical area. The report concludes that the low DO levels are often common and routinely expected in such shallow (physical), warm water, highly saline (chemical) systems and are not necessarily indicative of "impaired" water quality as the biota (biological) of the systems are well adapted to dramatically changing conditions. The report also recommends that site-specific criterion for these bays be evaluated.

Segment 2462, San Antonio Bay / Hynes Bay, 119.5 square miles. (Only the portion of the bay within the San Antonio – Nueces Coastal Basin is shown.)

The area around the bay is dominated by farm and ranch lands. The small town of Austwell is on the bay, and is the only community is this area.

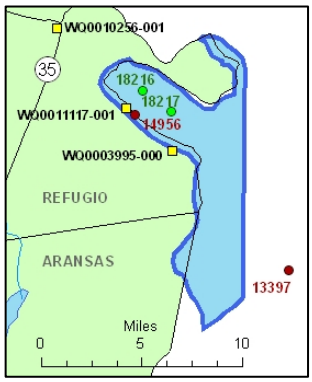


Figure 3.3 – 60: San Antonio / Hynes Bay

Active Wastewater Permits

WQ0003995-000 – Austwell Aqua Farm, Inc: 3,700,000 gpd of aquaculture pond effluent directly into the bay.

WQ0010256-001 – Refugio WCID No. 1

WQ0011117-001 – City of Austwell

Water Quality Analysis
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13397 – at Intracoastal Waterway (ICWW) Buoy C-17	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
14956 – at Austwell at TPWD public boat ramp	NRA	Quarterly	Conventional, Bacteria, Field	1995 – Present
18216 – from Austwell TPWD boat ramp steer 029 degrees for 1.946 km (Hynes Bay)				2002
18217 – from Austwell TPWD boat ramp steer 090 degrees for 2.996 km (Hynes Bay)				2002

Only Enterococcus was measured at Stations 18216 and 18217. Trend analysis was conducted using data from Station 14956.

DO (mg/l): 50 samples, ranging from 4.8 to 12.5, median value = 7.5, 1 value below screening level of 5.0, no trends. The only exceedence occurred at Station 14956 in July 2006. There are no problems with low DO in the bay. No 24-Hr DO measurements have been taken at either station.

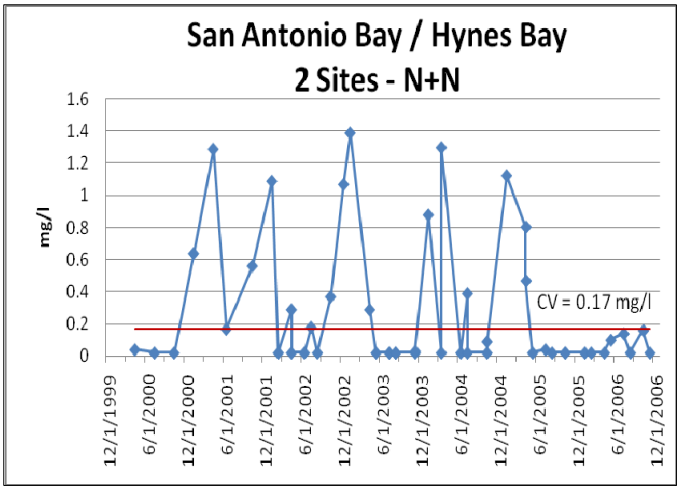
pH (su): 49 samples, ranging from 7.8 to 8.8, median value = 8.2, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 49 samples, ranging from <0.02 to 0.27, median value = 0.02, 3 values above criteria value of 0.1, 31 non-detects, no trends. All of the exceedences occurred at Station 14956 in October 2000, March 2004, and July 2006. There are no problems with ammonia in the bay.

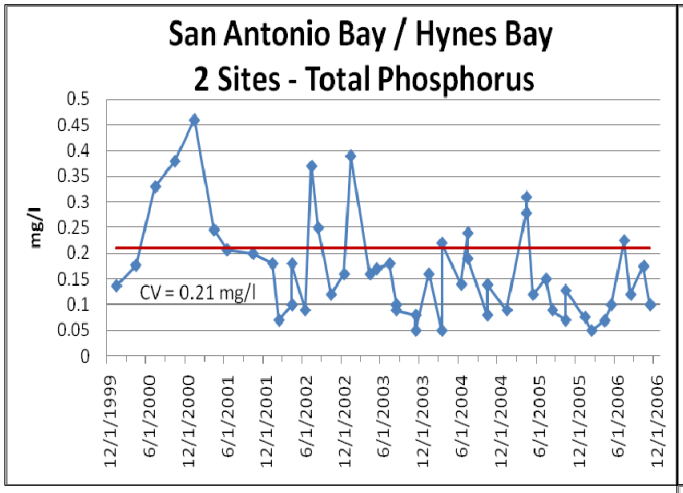
N+N (mg/l): 48 samples, ranging from <0.02 to 1.39, median value = 0.02, 16 values above criteria value of 0.17, no trends. There is a concern for N+N in the bay. The higher levels tend to correlate with rainy periods, so the source of the N+N may be from runoff from nearby farm lands.

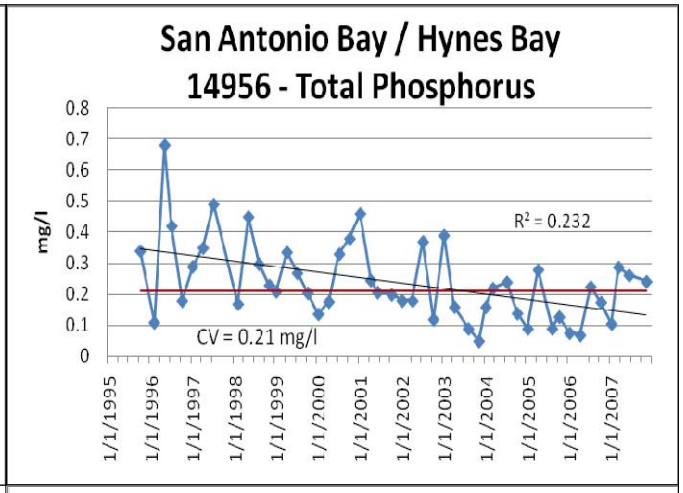
OP (mg/l): 35 samples, ranging from <0.01 to 0.3, median value = 0.03, 2 values above criteria value of 0.19, 16 non-detects. There was one exceedence at each of the stations: at 13397 in April 2005 and at 14956 in October 2001. There are no problems with OP in bay.

Figure 3.3 – 61: San Antonio / Hynes Bay Station 14956, January 2006

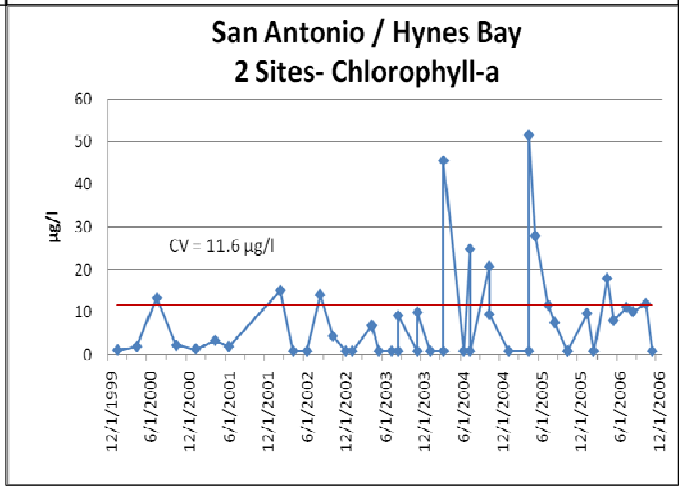


Total Phosphorus (mg/l): 49 samples, ranging from <0.05 to 0.46, median value = 0.15, 12 values above criteria value of 0.21, 2 non-detects, decreasing trend. The 2008 Assessment does not list total phosphorus as a concern in the bay, even though more than 20% of the samples exceed the criteria. All but 2 of the exceedences occurred at Station 14956. The good news is that the values are decreasing over time.





Chlorophyll-a (µg/l): 45 samples, ranging from <1 to 51.6, median value = 2.3, 11 values above criteria value of 11.6, 17 non-detects, no trends. The 2008 Assessment does not list chlorophyll-a as a concern in the bay, even though more than 20% of the samples exceed the criteria. The number of exceedences are about evenly split between the two stations: 6 at 13397 and 5 at 14956. The source of this possible concern is unknown.



TSS (mg/l): 49 samples, ranging from 5 to 460, median value = 41. There are no problems with TSS in the bay.

Enterococcus (cfu): 51 samples, ranging from <1 to 980, median value = 3, geometric mean = 6, 4 samples exceed single sample criteria of 89, geometric mean criteria = 35. The higher values may be related to runoff. There are no problems with bacteria in the bay.

Segment 2463, Mesquite Bay, 12.6 square miles. (Only the portion of the bay within the San Antonio – Nueces Coastal Basin is shown.)

The bay surrounded by natural areas. The Aransas Wildlife Refuge is to the northwest and uninhabited St. Joe and Matagorda Islands are to the southeast.

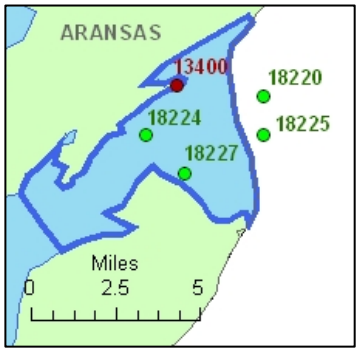


Figure 3.3 – 62: Mesquite Bay

Active Wastewater Permits

There are no active wastewater permits in this segment.

Water Quality Analysis

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13400 – south of ICWW Marker 13	TCEQ	Quarterly	Conventional, Bacteria, Field	1973 – Present
18220 – from channel bend Mesquite Bay steer 077 degrees for 3.299 km				2002
18224 – from channel bend Mesquite Bay steer 235 degrees for 2.039 km (Carlos Bay)				2002
18225 – from channel bend Mesquite Bay steer 108 degrees for 3.418 km				2002
18227 – from channel bend Mesquite Bay steer 180 degrees for 2.989 km				2002

Only Enterococcus was measured at Stations 18220, 18224, 18225, and 18227.

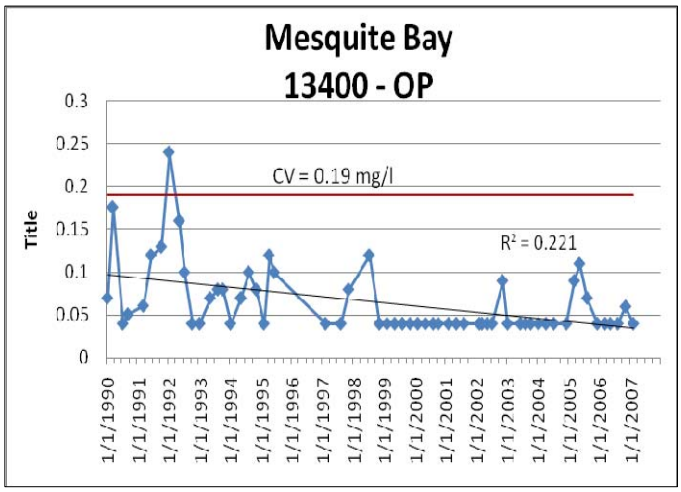
DO (mg/l): 28 samples, ranging from 5.3 to 12.3, median value = 7.7, screening level = 5.0, no trends. There are no problems with low DO in the bay. No 24-Hr DO measurements have been taken.

pH (su): 29 samples, ranging from 7.4to 8.5, median value = 8.2, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 28 samples, ranging from <0.05 to 0.13, median value = 0.05, 2 values above criteria value of 0.1, 22 non-detects, no trends. The two exceedences are mostly likely related to runoff from rain events. There are no problems with ammonia in the bay.

N+N (mg/l): 28 samples, ranging from <0.04 to 0.63, median value = 0.04, 5 values above criteria value of 0.17, 21 non-detects, no trends. The higher values are mostly likely related to runoff from rain events. There are no problems with N+N in the bay.

OP (mg/l): 28 samples, ranging from <0.04 to 0.11, median value = 0.04, criteria value = 0.19, 22 non-detects, decreasing trend. There are no problems with OP in the bay.



Total Phosphorus (mg/l): 28 samples, ranging from <0.04 to 0.11, median value = 0.04, criteria value = 0.21, 22 values non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 28 samples, ranging from <1 to 20.5, median value = 1, 3 values above criteria value of 11.6, 17 non-detects, no trends. The exceedences are sporadic, and do not necessarily correspond to temperature or rainfall. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 28 samples, ranging from 7 to 197, median value = 32, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 25 samples, ranging from <10 to 20, median value = 10, geometric mean = 10, single sample criteria = 89, geometric mean criteria = 35. There are no problems with bacteria in the bay.

Segment 2471, Aransas Bay, 87.8 square miles.

The City of Rockport is along the western shore of the bay and the uninhabited St. Joe Island forms the eastern shore. The Aransas Wildlife Refuge is to the north.

Due to the large number of sampling sites in the bay that were used in the water quality analysis, only the active stations and stations that are referenced in the discussion below are labeled on the map.

The bay is considered a single AU, but for the water quality analysis, the bay was divided into three sections: (1) Aransas Bay, (2) Little Bay, and (3) Lydia Ann Channel.

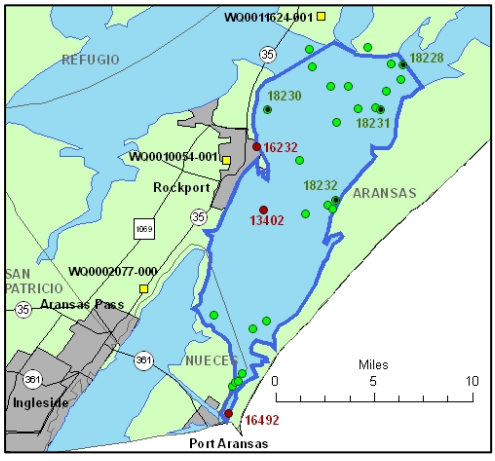


Figure 3.3 – 63: Aransas Bay

Active Wastewater Permits

WQ0002077-000 – Degussa Engineered Carbons, L.P.: storm water, intermittent and variable.

WQ0010054-001 – City of Rockport: 2,500,000 gpd via Tulle Ditch to Tulle Lake to an unnamed ditch to Little Bay to Aransas Bay. Also authorizes the disposal of treated domestic wastewater via irrigation of 200 acres.

WQ0011624-001 – Aransas County MUD #1: 263,000 gpd (was previously 88,000 gpd via irrigaion.

Water Quality Analysis
Aransas Bay
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13402 – intersection of Intracoastal Canal and Lydia Ann Channel south of Rockport	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
17710 – south of Mud Island approx 1.3 mi SE of Mud Island Point located on western end of Mud Island				2000
17711 – south of Mud Island approx 1.2 mi SE of Mud Island Point located on western end of Mud Island				2000
17712 – north Corpus Christi Bayou approx 1.2 mi WSW western tip of Mud Island Point				2000
17713 – west of Allyns Lake approx 5 mi SSE of protected public boat ramp in Fulton Harbor				2000
17795 – approx 4.5 mi SE of protected public boat ramp in Fulton Harbor				2001
17796 – approx 4.8 mi SE of protected public boat ramp in Fulton Harbor				2000
17797 – approx 2.4 mi SE of protected public boat ramp in Fulton Harbor				2000
17798 – approx 4.5 mi south of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2001
17799 – approx 2 mi east of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2001
17800 – approx 4.2 mi SSE of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17801 – approx 2.7 mi SSE of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17802 – approx 2.6 mi south of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17803 – approx 4 mi SE of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17804 – approx 3.9 mi SE of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2001
17805 – approx 1.5 mi south of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17806 – approx 4 mi SE of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17807 – approx 3.3 mi ESE of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
17808 – approx 1 mi SW of Neptune Harbor at Goose Island State Park on Lamar Peninsula				2000
18228 – from Goose Island State Park boat ramp steer 110 degrees for 6.337 km				2002
18230 – from Goose Island State Park boat ramp steer 212 degrees for 7.108 km				2002
18231 – from Goose Island State Park boat ramp steer 143 degrees for 7.327 km				2002
18232 – from Marker 43 steer 107 degrees for 3.767 km				2002

Station 13402 is the only site with N+N and OP data.

Only Enterococcus was measured at Stations 18228, 18230, 18231, and 18232.

DO (mg/l): 51 samples, ranging from 4.8 to 12.8, median value = 7.4, 1 value below screening level of 5.0, no trends. There are no problems with low DO in the bay. No 24-Hr DO measurements have been taken.

pH (su): 50 samples, ranging from 7.3 to 8.5, median value = 8.1, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 50 samples, ranging from <0.05 to 0.17, median value = 0.05, 1 value above criteria value of 0.1, 47 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 64 samples, ranging from <0.04 to 1.86, median value = 0.04, 2 values above criteria value of 0.17, 24 values non-detects, no trends. The maximum reading is an anomaly as all other values are <0.25. There are no problems with N+N in the bay.

OP (mg/l): 59 samples, ranging from <0.04 to 0.08, median value = 0.04, criteria value = 0.19, 25 non-detects, no trends. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 49 samples, ranging from <0.05 to 0.15, median value = 0.06, criteria value = 0.21, 19 non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 50 samples, ranging from <1 to 11.8, median value = 3.2, 1 value above criteria value of 11.6, 39 non-detects, no trends. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 49 samples, ranging from <4 to 61, median value = 16, 1 non-detect, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 26 samples, ranging from <10 to 19, median value = 10, geometric mean = 10, single sample criteria = 89, geometric mean criteria = 35, 20 non-detects. There are no problems with bacteria in the bay.

2471_01: Little Bay

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
16232 – Little Bay at Broadway and the inlet Canal to Canoe Lake in Rockport	TCEQ	Quarterly	Conventional, Bacteria, Field	2002 – Present

DO (mg/l): 19 samples, ranging from 3.7 to 10.5, median value = 8.1, 1 value below screening level of 5.0. The one exceedence occurred during August 2002. There are no problems with low DO in the bay. No 24-Hr DO measurements have been taken.

pH (su): 10 samples, ranging from 7.7 to 8.6, median value = 8.1, criteria range is 6.5 to 9. There are no problems with pH in the bay.

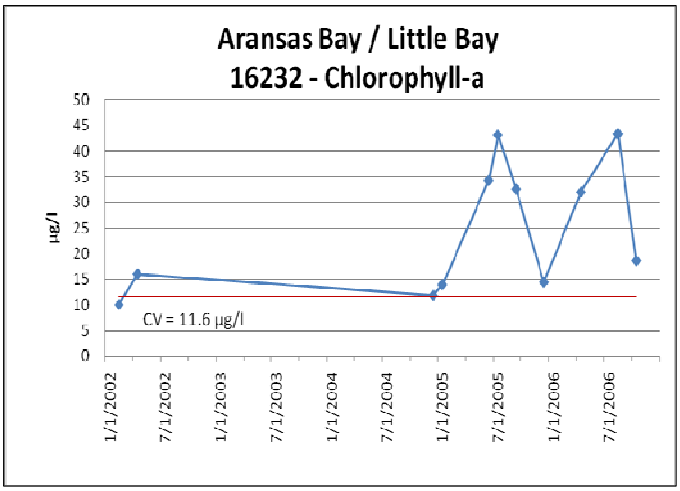
Ammonia (mg/l): 11 samples, ranging from <0.05 to 0.12, median value = 0.05, 1 value above criteria value of 0.1, 9 non-detects. There are no problems with ammonia in the bay.

N+N (mg/l): 11 samples, ranging from <0.04 to 0.15, median value = 0.05, criteria value = 0.17, 7 non-detects. There are no problems with N+N in the bay.

OP (mg/l): 11 samples, ranging from <0.04 to 0.07, median value = 0.04, criteria value = 0.19, 6 non-detects. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 11 samples, ranging from 0.06 to 0.17, median value = 0.12, criteria value = 0.21. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 11 samples, ranging from <10 to 43.4, median value = 18.6, 10 values above criteria value of 11.6, 1 non-detects. There is a potential concern for this parameter and it may be due to the limited water circulation in the bay.



TSS (mg/l): 10 samples, ranging from 6 to 30, median value = 18. There are no problems with TSS in the bay.

Enterococcus (cfu): 9 samples, ranging from <10 to 65, median value = 10, geometric mean = 10, single sample criteria = 89, geometric mean criteria = 35, 3 non-detects. There are no problems with bacteria in the bay.

2471_01: Lydia Ann Channel

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
16492 – Lydia Ann/Palacios Channel 2.04 km north and 660 m west of northern tip of Oliver Point and west of Aransas Light House	TCEQ	Quarterly	Conventional, Bacteria, Field	1998 – Present
17704 – Lydia Ann Channel approx 2.5 mi NNE of TPWD boat ramps in Port Aransas Harbor				2000
17705 – Lydia Ann Channel approx 2.6 mi NNE of TPWD boat ramps in Port Aransas Harbor				2000
17706 – Lydia Ann Channel approx 2.9 mi NNE of TPWD boat ramps in Port Aransas Harbor				2000
17707 – Lydia Ann Channel approx 3.4 mi NNE of TPWD boat ramps in Port Aransas Harbor				2001

DO (mg/l): 42 samples, ranging from 4.4 to 11.2, median value = 7, 1 value below screening level of 5.0. The one exceedence occurred during May 2000. There are no problems with low DO in the channel. No 24-Hr DO measurements have been taken.

pH (su): 41 samples, ranging from 7.1 to 8.3, median value = 8, criteria range is 6.5 to 9. There are no problems with pH in the channel.

Ammonia (mg/l): 31 samples, ranging from <0.05 to 0.06, median value = 0.05, criteria value = 0.1, 28 non-detects, no trends. There are no problems with ammonia in the channel.

N+N (mg/l): 27 samples, the only value not a non-detect is 0.32 which is above the criteria value of 0.17, no trends. The one exceedence occurred during November 2002 after very heavy rains. There are no problems with N+N in the channel.

OP (mg/l): 27 samples, the only value not a non-detect is 0.4, the same as the non-detect limit, no trends. There are no problems with OP in the channel.

Total Phosphorus (mg/l): 30 samples, ranging from <0.05 to 0.18, median value = 0.05, criteria value = 0.21, 24 non-detects, no trends. There are no problems with total phosphorus in the channel.

Chlorophyll-a (µg/l): 31 samples, ranging from <1 to 17.8, median value = 1, 1 value above criteria value of 11.6, 28 non-detects, no trends. There are no problems with chlorophyll-a in the channel.

TSS (mg/l): 30 samples, ranging from 4 to 161, median value = 15, no trends. There are no problems with TSS in the channel.

Enterococcus (cfu): 22 samples, ranging from <10 to 26, median value = 10, geometric mean = 11, single sample criteria = 89, geometric mean criteria = 35, 17 non-detects. There are no problems with bacteria in the channel.

Segment 2472, Copano Bay,

65.2 square miles.

The south and east sides of the bay have more developments and small communities that to the northwest, which is primarily farm and ranch lands.

Due to the large number of sampling sites in the bay that were used in the water quality analysis, only the active stations are labeled on the map.

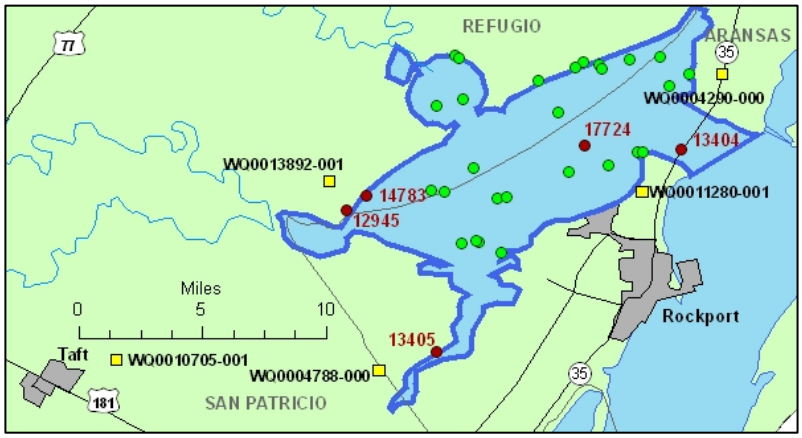


Figure 3.3 – 64: Copano Bay

Active Wastewater Permits

WQ0004290-000 – Holiday Beach WSC: 120,000 gpd viaTaft Drainage Ditch to Mud Flats to Copano Bay.

The bay is divided into two AUs: (1) Mission Bay, Aransas River arm, Port Bay, and eastern shoreline, and (2) remainder of bay.

For this report, the following divisions were used: (1) Copano Bay, (2) Copano Creek Arm, (3) Aransas River Arm, (4) Mission Bay, and (5) Port Bay.

WQ0004788-000 – Sherwin Alumina Inc. Sludge on 3149.6 acres in four beds.

WQ0010705-001 – City of Taft: 900,000 gpd via Taft Drainage Ditch to mud flats to Copano Bay.

WQ0011228-001 – Aransas County Airport: 3,600 gpd via evaporation.

WQ0013892-001 – Town of Bayside: 30,000 gpd. (Replaced WQ0003487-000)

Water Quality Analysis
Copano Bay
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13404 – at west side of fishing pier near south end of SH 35 Causeway	NRA	Quarterly	Conventional, Bacteria, Field	1969 – Present
14783 – 125 m south and 655 m east of Copano Bay Dr. at Spoonbill east of Bayside	TCEQ	Quarterly	Conventional, Bacteria, Field	1985 – Present
14784 – at end of Shell Bank Reef				1985 – 2005
17714 – approx 4.4 mi WNW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2000
17715 – approx 5.2 mi NNW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2000
17716 – approx 5.8 mi NW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2001
17717 – approx 5 mi NW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2000
17718 – approx 4.48 mi NW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2001
17719 – approx 4.32 mi NW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2000
17722 – approx 1.2 mi SW of western most tip of Redfish Point				2000
17723 – approx 4.1 mi WSW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35				2000
17724 – approx 3.5 mi west of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35	TCEQ	Quarterly	Conventional, Bacteria, Field	2000, 2004 – Present
17725 – approx 0.5 mi NW of Rattlesnake Point Island				2000
17726 – approx 5.5 mi east of TPWD boat ramp on northern side of FM 136 bridge crossing Aransas River				2000
17727 – approx 1 mi WNW of western tip of Rattlesnake Point Island				2000
17739 – approx 3.5 mi ENE of TPWD boat ramp on northern side of FM 136 bridge crossing Aransas River				2000
17740 – approx 0.3 mi SE of Rattlesnake Point Island				2001
17741 – approx 0.3 mi SE of western most tip of Redfish Point				2000
17810 – approx 3.2 mi east of TPWD boat ramp on northern side of FM 136 bridge crossing Aransas River				2000
17811 – approx 0.3 mi SE of western most tip of Redfish Point				2000
17812 – approx 5.8 mi ENE of TPWD boat ramp on northern side of FM 136 bridge crossing Aransas River				2000

Stations 13404, 14783, and 17724 are the only sites with N+N and OP data.

DO (mg/l): 87 samples, ranging from 4.6 to 11.8, median value = 7.5, 4 values below screening level of 5.0, no trends. All exceedences occurred at Station 13404 during summer months. There are no problems with low DO in the bay. No 24-Hr DO measurements have been taken.

pH (su): 87 samples, ranging from 7.5 to 8.6, median value = 8, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 87 samples, ranging from <0.02 to 0.14, median value = 0.05, 2 values above criteria value of 0.1, 70 non-detects, no trends. There are no problems with ammonia in the bay.

Figure 3.3 – 65: Copano Bay Station 13404, January 2006

N+N (mg/l): 107 samples, ranging from <0.01 to 0.59, median value = 0.01, 10 values above criteria value of 0.17, 81 non-detects, no trends. All exceedences occurred at Station 14783 and may be related to runoff from rain events. There are no problems with N+N in the bay.

OP (mg/l): 52 samples, ranging from <0.04 to 0.31, median value = 0.04, 1 value above criteria value of 0.19, 32 non-detects, no trends. The one exceedence occurred at Station 14783 in March 2000. NRA discontinued sampling for this parameter at Station 13404 in September 2003, but TCEQ still collects it at Station 14783.

Total Phosphorus (mg/l): 87 samples, ranging from <0.04 to 0.41, median value = 0.1, 2 values above criteria value of 0.21, 12 non-detects, no trends. The maximum reading is an anomaly as all other values are <0.25. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 82 samples, ranging from <1 to 19.8, median value = 5.1, 2 values above criteria value of 11.6, 50 non-detects, no trends There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 86 samples, ranging from 5 to 262, median value = 24, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 60 samples, ranging from <1 to 980, median value = 4, geometric mean = 5, 1 sample exceeds single sample criteria of 89, geometric mean criteria = 35, 20 non-detects, no trends. The data used for this analysis indicates that Enterococcus may not be a problem in the main portion of the bay. The one exceedence occurred in July 2002 after very heavy rainfall. But the bay is listed as having an impairment for bacteria based on Fecal coliform using data from 2472_01 which includes Mission Bay, the Aransas River arm, Port Bay, and the eastern shoreline.

2472: Copano Creek Arm

Station Summary

Site	Date Range
17720 – approx 3.1 mi north of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35	2000
17721 – approx 4.1 mi NW of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35	2000
17809 – approx 3.3 mi north of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35	2000
17816 – approx 3.9 mi north of Copano Bay Fishing Pier boat ramp at south end of Copano Bay Causeway SH 35	2001

None of the stations were sampled for N+N, OP, or Enterococcus. There is not enough data to make any assumptions as to whether or not problems exist in this portion of the bay, so only the range and median are reported.

DO (mg/l): 4 samples, ranging from 5.8 to 8.8, median value = 7.6, 0 values below screening level of 5.0. No 24-Hr DO readings have been taken.

pH (su): 4 samples, ranging from 7.9 to 8.1, median value = 8, criteria range is 6.5 to 9.

Ammonia (mg/l): 4 samples, all values non-detects.

Total Phosphorus (mg/l): 4 samples, ranging from <0.05 to 0.09, median value = 0.08, criteria value = 0.21, 1 non-detect.

Chlorophyll-a (µg/l): 4 samples, ranging from <1 to 1.2, median value = 1.2, criteria value = 11.6, 2 non-detects.

TSS (mg/l): 4 samples, ranging from 6 to 26, median value = 25.

2472_01: Aransas River Arm

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
12945 – At FM 136 bridge 355 m from intersection with Egery Island Rd south of Bayside	NRA	Quarterly	Conventional, Bacteria, Field	1969 – Present

DO (mg/l): 28 samples, ranging from 4.1 to 11.4, median value = 7.1, screening level = 4.0, no trends. There are no problems with low DO in this portion of the bay. No 24-Hr DO measurements have been taken.

pH (su): 28 samples, ranging from 7.8 to 8.4, median value = 8.1, criteria range is 6.5 to 9, no trends. There are no problems with pH in this portion of the bay.

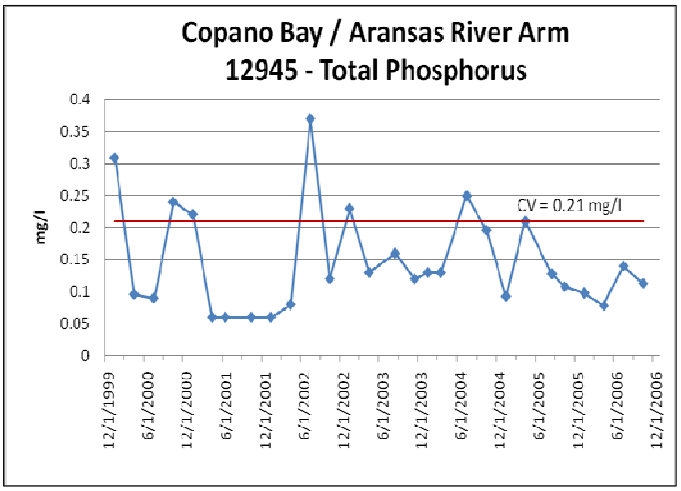
Ammonia (mg/l): 28 samples, ranging from <0.02 to 0.08, median value = 0.02, criteria value = 0.1, 16 non-detects, no trends. There are no problems with ammonia in this portion of the bay.

N+N (mg/l): 26 samples, ranging from <0.01 to 0.34, median value = 0.02, 2 values above criteria value of 0.17, 21 non-detects, no trends. The one exceedence occurred in July 2002 after very heavy rainfall. There are no problems with N+N in the bay.

Figure 3.3 – 66: Copano Bay Station 12945, October 2005

OP (mg/l): 13 samples, ranging from <0.01 to 0.33, median value = 0.04, 1 value above criteria value of 0.19, 4 non-detects, no trends. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 28 samples, ranging from <0.06 to 0.37, median value = 0.12, 6 values above criteria value of 0.21, 1 non-detect, no trends. The 2008 Assessment list this parameter as not being a concern based on the limited data of 6 data points. This analysis indicates that it could be a concern with 21% of the values exceeding the criteria.



Chlorophyll-a (µg/l): 23 samples, ranging from <5 to 36.3, median value = 5.8, 4 values above criteria value of 11.6, 3 non-detects, no trends. The maximum reading is an anomaly as all other values are <14.5. There are no problems with chlorophyll-a in this portion of the bay.

TSS (mg/l): 28 samples, ranging from 15 to 182, median value = 52, no trends. There are no problems with TSS in this portion of the bay.

Enterococcus (cfu): 28 samples, ranging from 1 to 600, median value = 40, geometric mean = 25, 5 samples exceed the single sample criteria of 89, geometric mean criteria = 35, no trends. The data used for this analysis indicates that Enterococcus may not be a problem in this portion of the bay. This is surprising because the Aransas River Tidal segment is listed as impaired for Enterococcus and the bay is listed as having an impairment for bacteria based on Fecal coliform using data from 2472_01 which includes the Aransas River arm.

2472_01: Mission Bay

Station Summary

Site	Date Range
17700 – Mission Bay approx. 3.1 mi SE of the intersection of FM 136 and FM 2678 SE of Refugio	2000
17701 – Mission Bay approx. 2.1 mi ESE of the intersection of FM 136 and FM 2678 SE of Refugio	2001
17702 – Mission Bay approx. 2.7 mi east of the intersection of FM 136 and FM 2678 SE of Refugio	2000
17703 – Mission Bay approx. 3.3 mi east of the intersection of FM 136 and FM 2678 SE of Refugio	2000

None of the stations were sampled for N+N, OP, or Enterococcus. There is not enough data to make any assumptions as to whether or not problems exist in this portion of the bay, so only the range and median are reported.

DO (mg/l): 4 samples, ranging from 6.1 to 10, median value = 6.8, screening level = 5.0. No 24-Hr DO measurements have been taken.

pH (su): 4 samples, ranging from 7.9 to 8.2, median value = 8.1, criteria range is 6.5 to 9.

Ammonia (mg/l): 4 samples, all values non-detects.

Total Phosphorus (mg/l): 4 samples, ranging from 0.06 to 0.13, median value = 0.1, criteria value = 0.21.

Chlorophyll-a (µg/l): 4 samples, ranging from <1 to 5.1, median value = 1, criteria value = 11.6, 3 non-detects.

TSS (mg/l): 4 samples, ranging from 9 to 34, median value = 26.

2472_01: Port Bay

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13405 – Port Bay at middle of SH 118 west of Rockport	NRA	Quarterly	Conventional, Bacteria, Field	1973 – Present

DO (mg/l): 28 samples, ranging from 4.2 to 11, median value = 7.9, 3 values below screening level of 5.0, no trends. All of the exceedences occurred in warm months.

24-Hr DO Average (mg/l): 10 samples, ranging from 6.2 to 8, median value = 7.2, criteria value = 5.0. These measurements confirm that there are no problems with low DO in this portion of the bay.

24-Hr DO Minimum (mg/l): 10 samples, ranging from 4.1 to 6.9, median value = 5.8, criteria value = 4.0.

pH (su): 28 samples, ranging from 7.7 to 8.8, median value is 8.3, 0 values outside criteria range of 6.5 to 9, no trends. There are no problems with pH in this portion of the bay.

Ammonia (mg/l): 28 samples, ranging from <0.02 to 0.12, median value = 0.02, 1 value above criteria value of 0.1, 18 non-detects, no trends. There are no problems with ammonia in this portion of the bay.

Figure 3.3 – 67: Copano Bay Station 13405, October 2006

N+N (mg/l): 25 samples, ranging from <0.01 to 0.07, median value = 0.02, criteria value = 0.17, 22 non-detects, no trends. There are no problems with N+N in this portion of the bay.

OP (mg/l): 12 samples, ranging from <0.01 to 0.13, median value = 0.03, criteria value = 0.19, 10 non-detects, no trends. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 28 samples, ranging from <0.01 to 0.2, median value = 0.06, criteria value = 0.21, 10 non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 23 samples, ranging from <5 to 61.9, median value = 5, 4 values above criteria value of 11.6, 4 non-detects, no trends. Three of the exceedences are clustered in 2003 and 2004 with more consistent lower values since. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 28 samples, ranging from 5 to 228, median value = 48, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 28 samples, ranging from 1 to 800, median value = 9.5, geometric mean = 10, 2 samples exceed single sample criteria of 89, geometric mean criteria = 35, no trends. The data used for this analysis indicates that Enterococcus may not be a problem in this portion of the bay. This is surprising because the bay is listed as having an impairment for bacteria based on Fecal coliform using data from 2472_01 which includes Port Bay.

Segment 2473, St. Charles Bay, 12.6 square miles.

The bay is nearly surrounded by the Aransas Wildlife Refuge. The small community of Lamar is locates on the southwest side adjacent to Aransas Bay.

Active Wastewater Permits

There are no active wastewater discharge permits in this segment.

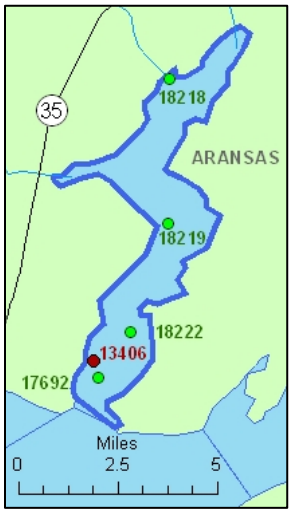


Figure 3.3 – 68
St. Charles Bay

Figure 3.3 – 69: St. Charles Bay Station 13406, March 2004

Water Quality Analysis Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13406 – NE of Goose Island State Park 95 m south of Lamar Beach Rd at 4th St	NRA	Quarterly	Conventional, Bacteria, Field	1973 – Present
17692 – 0.5 mi NE of Hail Point on Lamar Peninsula				2000
18218 – from St. Charles Marina steer 016 degrees for 12.075 km				2002
18219 – from St. Charles Marina steer 031 degrees for 6.722 km				2002
18222 – from St. Charles Marina steer 058 degrees for 2.538 km				2002

Only Enterococcus was measured at Stations 18218, 18219, and 18222.

DO (mg/l): 35 samples, ranging from 2.9 to 10.7, median value = 6.8, 5 values below screening level of 5.0, no trends. There is a concern for low DO in the bay. All of the exceedences occur in the warm summer months. There is no impairment because less than 10% of the samples are below the grab minimum criteria of 4.0. No 24-Hr DO readings have been taken.

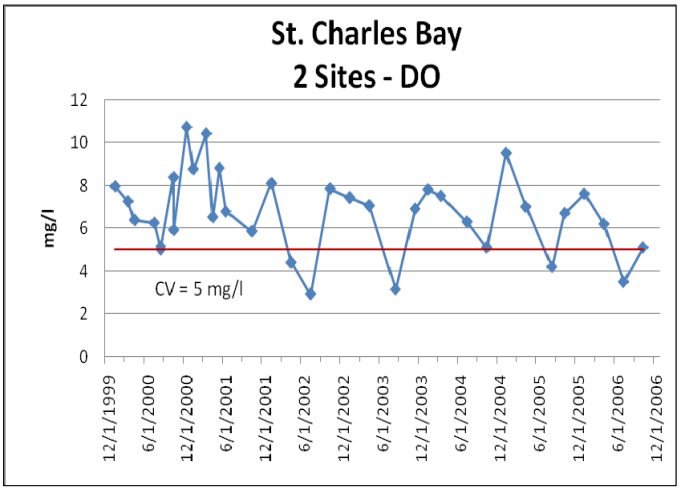
pH (su): 35 samples, ranging from 7.6 to 8.5, median value = 8, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

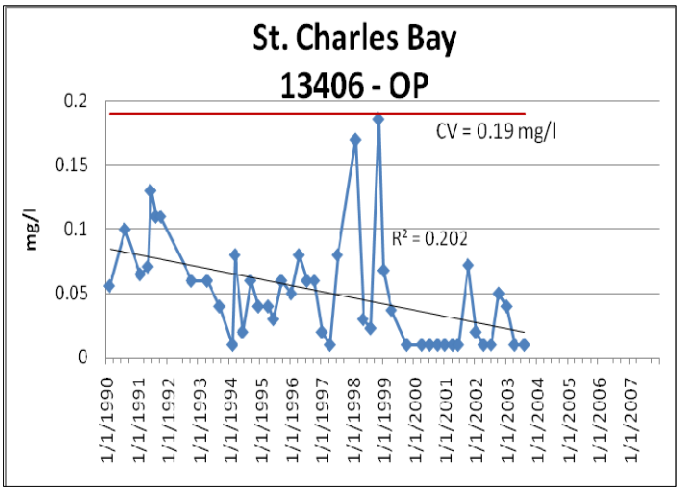
Ammonia (mg/l): 35 samples, ranging from <0.02 to 0.11, median value = 0.02, 1 value above criteria value of 0.1, 21 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 27 samples, ranging from <0.02 to 0.67, median value = 0.2 1 value above criteria value of 0.17, 24 non-detects, no trends. The maximum reading is an anomaly as all other values are <= 0.03. There are no problems with N+N in the bay.

OP (mg/l): 14 samples, ranging from <0.01 to 0.07, median value = 0.01, criteria value = 0.19, 10 non-detects, decreasing trend. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 35 samples, ranging from <0.02 to 0.14, median value = 0.07, criteria value = 0.21, 6 non-detects, no trends. There are no problems with total phosphorus in the bay.





Chlorophyll-a (µg/l): 30 samples, ranging from <1 to 14.9, median value = 1.2, 1 value above criteria value of 11.6, 12 non-detects, no trends There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 35 samples, ranging from 7 to 236, median value = 30, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 31 samples, ranging from <1 to 720, median value = 17, geometric mean = 15, 7 samples exceed single sample criteria of 89, geometric mean criteria = 35. The maximum value occurred in July 2002 following very heavy rains. The remaining values are <440. While there are exceedences, Enterococcus is not listed a concern or impairment because only 22% of the samples exceed the criteria and the geometric mean is met. Although the bay is not listed for Enteroccocus, a reading of 5500 was measured at 13406 in January 2007 which may cause a listing with the 2010 Assessment.

Segment 2481, Corpus Christi Bay, 123.1 square miles.

The bay is nearly surrounded by cities and industries. The City of Corpus Christi borders the south side of the bay and encompasses a large portion of Mustang Island. The City of Port Aransas is on the north end of the island. Along the northern shore are Portland, Ingleside and Ingleside-by-the-Bay. The Naval Station and several industries are located along La Quinta Channel.

Due to the large number of sampling sites in the bay that were used in the water quality analysis, only the active stations and stations that are referenced in the discussion below are labeled on the map.

The bay is considered a single AU, but for this water quality analysis, the bay was divided into five sections: (1) Corpus Christi Bay, (2) La Quinta Channel, (3) Corpus Christi Ship Channel, (4) Corpus Christi Marina, and (5) Upper Laguna Madre North of PR 22.

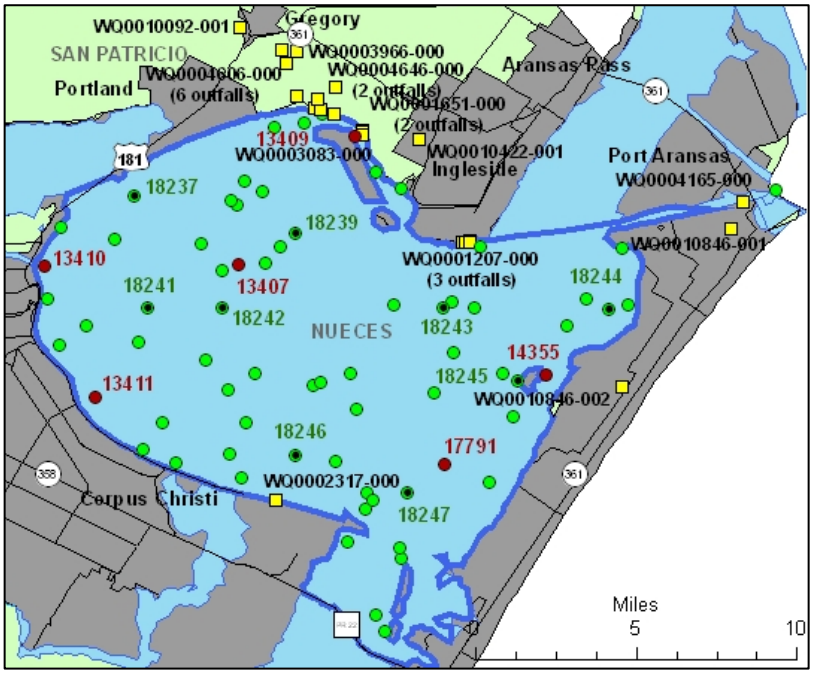


Figure 3.3 – 70: Corpus Christi Bay

Active Wastewater Permits

WQ0001207-000 – Koch Pipeline Company, LP: storm water runoff associated with industrial activity via Outfalls 001, 002, 003, and 004 via roadside ditch to Corpus Christi Bay.

WQ0001651-000 – E. I. Du Pont De Nemours & Co.: 4,610,000 gpd via Outfall 001 via pipe with a submerged outlet into a barge slip on La Quinta Channel to Corpus Christi Bay; and storm water runoff on an intermittent and flow variable basis via Outfall 002.

WQ0002317-000 – US Department of the Navy Corpus Christi NAS: 1,500,000 gpd directly to the bay.

WQ0003083-000 – Occidental Chemical Corporation: 2,240,000 gpd via submerged pipeline in La Quinta Channel.

WQ0003966-000 – Reynolds Metal Company: 1,000 metric tons per year on 190 acres of closed bauxite tailing beds.

WQ0004165-000 – Texas A&M University System: 30,000 gpd via Outfall 001 (from 10,000gpd) and 30,000 gpd via Outfall 002.

WQ0004606-000 – Reynolds Metals Co.: storm water and leachate on an intermittent and flow variable basis from six outfalls.

WQ0004646-000 – Sherwin Alumina LP: storm water on an intermittent and flow variable basis from two outfalls

WQ0010092-001 – City of Gregory: 320,000 gpd via drainage ditch to Green Lake to Corpus Christi Bay.

WQ0010422-001 – City of Ingleside: 1,200,000 gpd (from 1,720,000) via unnamed ditch to unnamed tributary to Kinney Bayou to Corpus Christi Bay.

WQ0010846-001 – Nueces Co. WCID No. 4 Mustang Island North Plant: 1,880,000 gpd via mud flats to Corpus Christi Bay.

WQ0010846-002 – Nueces Co. WCID No. 4 Mustang Island South Plant: 1,200,000 gpd via 350 feet of diffuser pipe to mud flats to Shamrock Cove to Corpus Christi Bay.

Water Quality Analysis
Corpus Christi Bay
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13407 – at Corpus Christi Channel Marker (CM) 62	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
13410 – near Corpus Christi Ship CM 86 approx 0.8 km east of US 181	TCEQ	Quarterly	Conventional, Bacteria, Field	1973 – Present
13411 – approx 1 km NE of Intersection of Doddridge St. and Ocean Dr.	TCEQ	Quarterly	Conventional, Bacteria, Field	1973 – Present
14355 – approx 0.4 km east of Shamrock Island and 1.5 km NE of Shamrock Point	TCEQ	Quarterly	Conventional, Bacteria, Field	1998 – Present
17748 – approx 4.5 mi WNW of TPWD boat ramp in Ingleside				2000
17749 – at middle of long reef approx 2.3 mi west of TPWD boat ramp at Ingleside-on-the-Bay				2000
17750 – approx 4.6 mi east of TPWD boat ramp on Rincon Point at south end of Nueces Bay Causeway SH 181				2001
17751 – approx 5.1 mi east of TPWD boat ramp on Rincon Point 4.4 mi east of Indian Point south of SH 181				2000
17752 – approx 5.4 mi west of TPWD boat ramp on Rincon Point immediately east of Long Reef south of SH 181				2000
17754 – immediately west of La Quinta Channel approx 4 mi NW of TPWD boat ramp in Ingleside				2000
17755 – approx 0.6 mi SSE of Rincon Point at south end of Nueces Bay Causeway SH 181				2000
17756 – approx 1.6 mi ESE of TPWD boat ramp SE of Rincon Point and south of SH 181				2000
17757 – NNE Channel Marker 68 approx 4 mi ESE of TPWD boat ramp on Rincon Point off south end of SH 181				2000
17758 – west of CM 61 approx 6.7 mi north of entrance of Oso Bay				2000
17759 – west of CM 56 approx 4.5 mi WSW of TPWD boat ramp at Ingleside-on-the-Bay				2000
17760 – NE of CM 56 approx 3.9 mi WSW of TPWD boat ramp at Ingleside-on-the-Bay				2000
17761 – east flats approx 0.7 mi SE of western tip of point of Mustang				2000
17763 – immediately east of Alto Vista reef approx 3.7 mi SSE of TPWD boat ramp on Rincon Point south of SH 181				2000
17764 – approx 2.5 mi ESE of Yacht basin ramp in Corpus Christi Marina Harbor				2000
17765 – mid bay approx 3.1 mi south of TPWD boat ramp at Ingleside-on-the-Bay				2001
17766 – immediately east of ICWW 1.8 mi SW of intersection of Corpus Christi Ship Channel				2001
17767 – approx 2.9 mi SW of western tip of point of Mustang				2001
17768 – approx 0.5 mi east of ICWW and approx 1.8 mi south of intersection of ICWW and Corpus Christi Channel				2000
17769 – approx 1.9 mi south of point of Mustang and 0.75 mi west of Mustang Island				2000
17770 –approx 2.3 mi SSE of point of Mustang and 0.5 mi west of Mustang Island				2000
17771 – approx 0.5 mi west of Shamrock Island				2000
17772 – approx 0.7 mi east of intersection of Cole St. and Ocean Dr. approx 1.2 mi SSE of yacht basin boat ramp				2000
17773 – approx 3.8 mi NNW of mouth of Oso Bay				2000
17774 – approx 3.6 mi NNE of mouth of Oso Bay				2001
17775 – approx 5 mi NE of mouth of Oso Bay				2000
17776 – approx 0.4 mi east of ICWW and approx 3.4 mi SSW of intersection of Corpus Christi Channel				2000
17777 – approx 3.1 mi north of mouth of Oso Bay				2000
17778 – approx 4.4 mi NNW of Demit Island and 3.9 mi NE of mouth of Oso Bay				2001
17779 – approx 4.1 mi NNE of mouth of Oso Bay				2000
17780 – approx 2.9 mi south of Shamrock Point on Shamrock Island				2000
17781 – approx 4.9 mi SE of Yacht basin ramp in Corpus Christi Marina Harbor				2001
17782 – approx 2.2 mi north of mouth of Oso Bay				2000

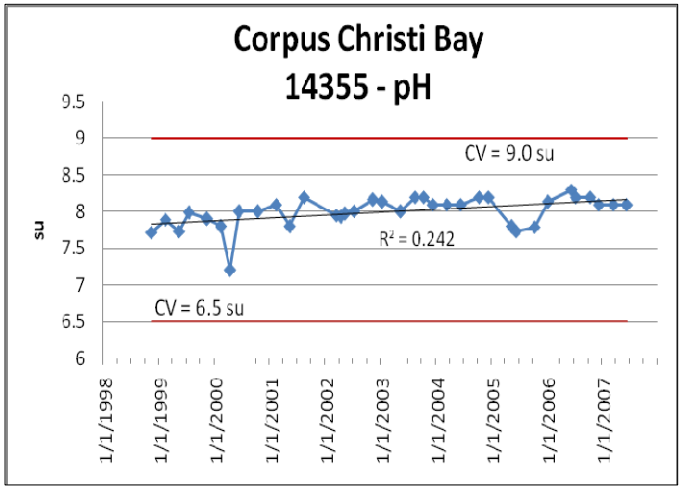
Station Summary (cont.)				
17783 – approx 4.4 mi NE of mouth of Oso Bay				2000
17784 – south of ICWW CM 77 approx 2.4 mi west of Shamrock Point on Shamrock Island				2000
17785 – SW of Shamrock Cove approx 0.8 mi south of Shamrock Point on Shamrock Island				2001
17786 – at Oso Fishing Pier approx 1.5 mi NW of mouth of Oso Bay				2001
17787 – approx 0.6 mi NE of mouth of Oso Bay				2000
17788 – approx 3.2 mi NE of entrance to Oso Bay due north of NAS CC				2000
17789 – approx 1 mi north of entrance to Oso Bay				2000
17790 – approx 5.2 mi SSE of Yacht basin ramp in Corpus Christi Marina Harbor				2000
17791 – approx 3.1 mi SW of Shamrock Point on Shamrock Island	TCEQ	Quarterly	Conventional, Bacteria, Field	2000, 2004 – Present
17792 – approx 3.9 mi east of entrance to Oso Bay due north of Dimmit Island				2000
17793 – approx 4 mi ESE of entrance to Oso Bay due north of Dimmit Island				2001
17794 – approx 4.2 mi east of entrance to Oso Bay due north of Dimmit Island				2000
18237 – from Indian Point Pier steer 327 degrees for 9.207 km				2002
18239 – from Marker 56 steer 018 degrees for 1.562 km				2002
18241 – from Marker 73 steer 172 degrees for 1.971 km				2002
18242 – from Marker 61 steer 200 degrees for 2.09 km				2002
18243 – from ICWW Marker 71 steer 020 degrees for 0.063 km				2002
18244 – from Marker 20 steer 161 degrees for 4.448 km				2002
18245 – from Marker 76 steer 096 degrees for 3.83 km				2002
18246 – from Oso bridge public boat ramp steer 065 degrees for 3.765 km				2002
18247 – from ICWW Marker 1 at entrance to Laguna Madre steer 295 degrees for 0.566 km				2002

Stations 13407, 13410, 13411, 14355, and 17791 are the only sites with N+N and OP data.

Only Enterococcus was measured at Stations 18237, 18239, 18241, 18242, 18243, 18244, 18245, 18246, and 18247.

DO (mg/l): 182 samples, ranging from 4.7 to 13, median value is 6.7, 2 values below screening level of 5.0, no trends. DO shows the typical seasonal variation of higher values occurring in the winter and lower values occurring in the summer. There are no problems with low DO in the bay. No 24-hr DOs have been taken.

pH (su): 183 samples, ranging from 7.2 to 8.5, median value = 8, criteria range is 6.5 to 9, increasing trend at Station 14355. There are no problems with pH in the bay. While there is an increasing trend at this one station, the values are still well within the criteria range.



Ammonia (mg/l): 178 samples, ranging from <0.05 to 0.07, median value = 0.05, criteria value = 0.1, 158 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 121 samples, ranging from <0.04 to 0.87, median value = 0.04, 3 values above criteria value of 0.17, 110 non-detects, no trends. There are no problems with N+N in the bay.

OP (mg/l): 121 samples, ranging from <0.04 to 0.07, median value = 0.04, criteria value = 0.19, 111 non-detects, no trends. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 174 samples, ranging from <0.05 to 0.26, median value = 0.05, 2 values above criteria value of 0.21, 84 non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 179 samples, ranging from <1 to 25.1, median value = 1, 8 values above criteria value of 11.6, 134 non-detects, no trends. Most of the exceedences occurred in 2001 and 2002. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 177 samples, ranging from 4 to 113, median value = 15, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 108 samples, ranging from <10 to 2489, median value = 10, geometric mean = 14, 6 samples exceed single sample criteria of 89, 72 non-detects, geometric mean criteria = 35. While this data indicates that there are no problems with Enterococcus in the bay, the EPA has decided to list the bay as impaired for Enterococcus based on data collected through the TGLO's Beach Watch Program. These data are collected at public beaches throughout the year. As expected, the readings are generally high following heavy runoff events. The data were not originally intended to be used for assessment purposes. Since the bay is considered a single AU, the entire bay is being listed as opposed to localized areas of the bay.

La Quinta Channel

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13409 – La Quinta CM 16	TCEQ	Quarterly	Conventional, Bacteria, Field	2002 – Present
14979 – at mouth of Jewell Fulton Harbor				2000 – 2001
17747 – north end of La Quinta Channel Sherwin Alumina docks approx 3.8 mi NW of TPWD boat ramp in Ingleside				2000
17753 – in La Quinta Channel between Donnel and Welder Points approx 1.5 mi NW of TPWD boat ramp in Ingleside				2001

Station 13409 is the only site with N+N and OP data.

DO (mg/l): 28 samples, ranging from 5.9 to 9.5, median value = 6.8, screening level = 5.0. There are no problems with low DO in the channel. No 24-Hr DO measurements have been taken.

pH (su): 28 samples, ranging from 7.7 to 8.3, median value = 8.1, criteria range is 6.5 to 9. There are no problems with pH in the channel.

Ammonia (mg/l): 30 samples, ranging from <0.05 to 0.11, median value = 0.05, 1 value above criteria value of 0.1, 28 non-detects. There are no problems with ammonia in the channel.

N+N (mg/l): 21 samples, only value not a non-detect is 0.85 which is above the criteria value of 0.17. The only measured value occurred in March 2002. There are no problems with N+N in the channel.

OP (mg/l): 23 samples, all non-detects. There are no problems with OP in the channel.

Total Phosphorus (mg/l): 30 samples, ranging from <0.05 to 0.18, median value = 0.05, criteria value = 0.21, 21 non-detects. There are no problems with total phosphorus in the channel.

Chlorophyll-a (μg/l): 29 samples, ranging from <1 to 9.5, median value = 1, criteria value = 11.6, 23 non-detects. There are no problems with chlorophyll-a in the channel.

TSS (mg/l): 29 samples, ranging from 5 to 49, median value = 10. There are no problems with TSS in the channel.

Enterococcus (cfu): 20 samples, ranging from <11 to 41, median value = 1, geometric mean = 2, single sample criteria = 89, 14 non-detects, geometric mean criteria = 35. There are no problems with bacteria in the channel.

Corpus Christi Ship Channel

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13419 – at intersection of Corpus Christi Ship Channel with Aransas Pass and Lydia Ann Channels				2000 – 2001
14830 – at Port Ingleside				1989 - 2005

N+N, OP, and Enterococcus were not collected at any stations during the assessment period.

DO (mg/l): 12 samples, ranging from 5.5 to 9.2, median value = 7, screening level = 5.0. There are no problems with low DO in the channel. No 24-Hr DO measurements have been taken.

pH (su): 12 samples, ranging from 8 to 8.1, median value = 8, criteria range is 6.5 to 9. There are no problems with pH in the channel.

Ammonia (mg/l): 12 samples, ranging from <0.05 to 0.06, median value = 0.05, criteria value = 0.1, 10 non-detects. There are no problems with ammonia in the channel.

Total Phosphorus (mg/l): 12 samples, ranging from <0.05 to 0.08, median value = 0.05, criteria value = 0.21, 9 non-detects. There are no problems with total phosphorus in the channel.

Chlorophyll-a (µg/l): 12 samples, ranging from <1 to 2.1, median value = 1, criteria value = 11.6, 10 non-detects. There are no problems with chlorophyll-a in the channel.

TSS (mg/l): 12 samples, ranging from 6 to 59, median value = 14. There are no problems with suspended solids in the channel.

Corpus Christi Marina

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
17762 – approx 0.3 mi NNE of Yacht basin ramp in Corpus Christi Marina Harbor				2001

There is insufficient data for water quality analysis in this section of the bay.

Upper Laguna Madre North of PR 22

Site	Entity	Frequency	Parameter Groups	Date Range
18061 – near Laguna Madre entrance from fixed ICWW navigation marker 9 steer 196 degrees for 1.272 km				2001
18062 – near Laguna Madre entrance from fixed ICWWW navigation marker 9 steer 207 degrees for 0.845 km				2002
18063 – in Boathole area east of NAS CC from Dimmit Point steer 207 degrees for 10.845 km				2001
18064 – north of JFK Causeway from fixed ICWW navigation marker 33 steer 351 degrees for 1.389 km				2002
18065 – north of JFK Causeway from fixed ICWW navigation marker 33 steer 014 degrees for 0.581 km				2001

There is not enough data to make any assumptions as to whether or not problems exist in this portion of the bay, so only the range and median are reported.

DO (mg/l): 5 samples, ranging from 3.8 to 9.6, median value = 5.5, 2 values below screening level of 5.0. No 24-Hr DO readings have been taken.

pH (su): 5 samples, ranging from 8.1 to 8.6, median value = 8.3, criteria range is 6.5 to 9.

Ammonia (mg/l): 5 samples, ranging from <0.02 to 0.04, median value = 0.03, criteria value = 0.1.

N+N (mg/l): 5 samples, all non-detects.

OP (mg/l): 5 samples, all non-detects.

Total Phosphorus (mg/l): 5 samples, only value not a non-detect is 0.08 which is below the criteria value of 0.21.

Chlorophyll-a (µg/l): 5 samples, ranging from 1.1 to 8.2, median value = 5.2, criteria value = 11.6.

TSS (mg/l): 5 samples, ranging from 7 to 48, median value = 13.

Enterococcus (cfu): 5 samples, ranging from <10 to 41, median value = 10, single sample criteria = 89, 3 non-detects.

Segment 2482, Nueces Bay, 28.9 square miles.

The bay is bordered on the south by the City of Corpus Christi where there are many industries associated with the Corpus Christi Ship Channel. A large portion of the Nueces Delta has been bought and designated as a preserve. The area north of the bay is primarily farm and ranch lands.

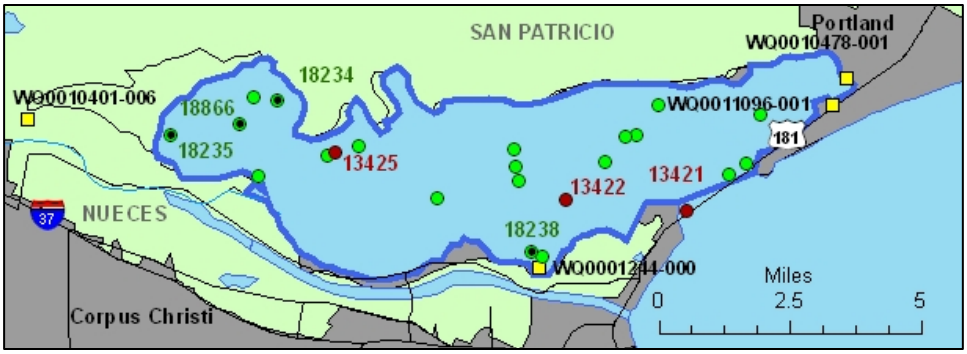


Figure 3.3 – 71: Nueces Bay

Due to the large number of sampling sites in the bay that were used in the water quality analysis, only the active stations and stations that are referenced in the discussion below are labeled on the map.

Active Wastewater Permits

WQ0001244-000 – Nueces Bay WLE LP: 500,000,000 gpd of once through cooling water and previously monitored effluent.

WQ0010401-006 – City of Corpus Christi Allison Plant: 5,000,000 gpd via Outfalls 001 (Nueces River Tidal) and 002.

WQ0010478-001 – City of Portland WWTP: 2,500,000 gpd via drainage ditch to Nueces Bay.

WQ0011096-001 – Sublight Enterprises, Inc. (Portland Inn): 9,000 gpd.

Water Quality Analysis

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13420 – US 181 bridge at causeway north side				1969 – 2006
13421 – US 181 bridge at causeway north side approx 0.5 km NE of Rincon Point	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
13422 – 0.5 mi from south shore at east overhead powerline	TCEQ	Quarterly	Conventional, Bacteria, Field	1973 – Present
13423 – 1 mi from north shore at east overhead powerline				2004 – 2006
13424 – approx 1.6 km from north shore at west overhead powerline at the 11th pair of pylons from north shore				2004 – 2006
13425 – approx 0.8 km SE of Whites Point	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water	1988 – Present
14833 – south side of bay at CP&L's discharge				1988 – 2006
17729 – approx 1.6 mi NW of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2001
17730 – approx 1.4 mi NE of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2000
17731 – approx 2.5 mi NE of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2001
17732 – approx 2.2 mi north of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2000
17733 – approx 2.7 mi west of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2000
17734 – approx 4 mi west of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2000
17736 – approx 3 mi NW of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2000
17737 – approx 1.1 mi NW of end of paved road at tip of Whites Point in San Patricio County				2000
17738 – approx 1 mi ESE of end of paved road at tip of Whites Point in San Patricio County				2000
17813 – approx 1.8 mi NNW of TPWD boat ramp at Rincon Point on south end of Nueces Bay causeway SH 181				2000
17815 – approx 1.3 mi SW of end of paved road at tip of Whites Point in San Patricio County				2001
17817 – approx 0.6 mi SE of end of paved road at tip of Whites Point in San Patricio County				2000
18234 – from Whites Point steer 340 degrees for 1.007 km				2002
18235 – from mouth of Allison Diversion channel steer 082 degrees for 1.081 km				2002
18238 – from 4th pylon from SE power line steer 266 degrees for 1.285 km				2002
18866 – 323 m north and 1.72 km west of end of paved Nueces CR 63 at Whites Point				2006

Only TSS was measured at Station 18866. Only Enterococcus was measured at Stations 18234, 18235, and 18238.

DO (mg/l): 143 samples, ranging from 4.8 to 11.2, median value = 7.6, 2 values below screening level of 5.0, no trends. There are no problems with low DO in the bay. No 24-Hr DOs have been taken.

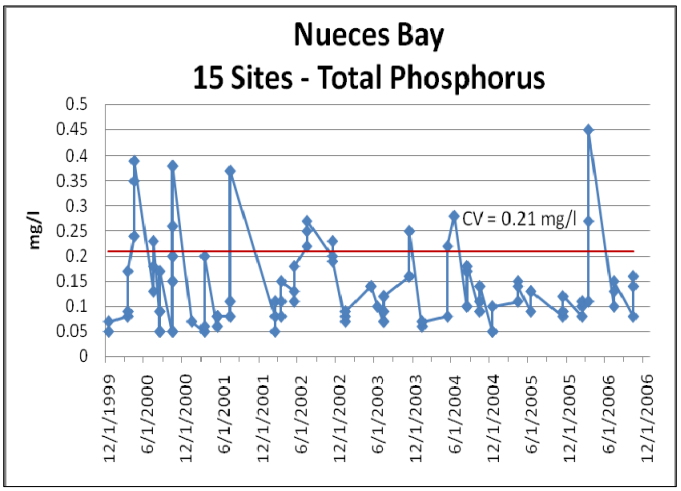
pH (su): 142 samples, ranging from 7.0 to 8.7, median value is 8, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 94 samples, ranging from <0.05 to 0.23, median value = 0.05, 3 values above criteria value of 0.1, 75 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 65 samples, ranging from <0.01 to 1.21, median value = 0.01, 5 values above criteria value of 0.17, 54 non-detects, no trends. The two highest values were recorded at Stations 13421 and 13422 in March 2002. All other values are <=0.35. There are no problems with N+N in the bay.

OP (mg/l): 83 samples, ranging from <0.01 to 2.45, median value = 0.01, 4 values above criteria value of 0.19, 54 non-detects, no trends. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 92 samples, ranging from <0.05 to 0.45, median value = 0.11, 16 values above criteria value of 0.21, 3 non-detects, no trends. TCEQ did not list this parameter as a concern for the bay even though 20% of the samples exceed the criteria. It is possible that this may become a concern in the 2010 Assessment. The source is unknown.



Chlorophyll-a (µg/l): 93 samples, ranging from <1 to 26.7, median value = 1, 7 values above criteria value of 11.6, 65 non-detects, no trends. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 149 samples, ranging from 4 to 417, median value = 27, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 67 samples, ranging from <10 to 200, median value = 10, geometric mean i=s 16, 5 samples exceeds single sample criteria of 89, 37 non-detects, geometric mean criteria = 35. The highest readings were recorded at Station 13425 in February and March 2003. There are no problems with Enterococcus in the bay.

Segment 2483, Redfish Bay, 28.8 square miles.

There is very little undeveloped land on the western shore of the bay. The main cities are Ingleside and Aransas Pass, with numerous small communities all the way to Rockport. Port Aransas encompasses most of the eastern shoreline.

Due to the large number of sampling sites in the bay that were used in the water quality analysis, only the active stations and stations that are referenced in the discussion below are labeled on the map.

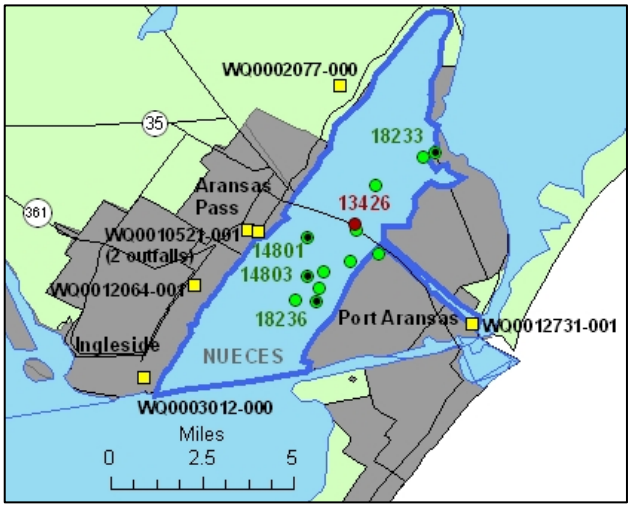


Figure 3.3 – 72: Redfish Bay

Active Wastewater Permits

WQ0002077-000 – Degussa Engineered Carbons: storm water, intermittent and flow variable.

WQ0003012-000 – Aker Gulf Marine: 4,000 gpd.

WQ0010521-001 – City of Aransas Pass: 1,600,000 gpd.

WQ0012064-001 –Gulf Marine Fabricators: 12,000 gpd via pipe to a drainage ditch to Redfish Bay.

WQ0012731-001 – Martin Operating Partnership, LP: 3,800 gpd.

Water Quality Analysis
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13426 – at SH 361 at 3rd bridge between Aransas Pass and Port Aransas	NRA	Quarterly	Conventional, Bacteria, Field	1971 – Present
14801 – at the ICWW at Aransas Pass 0.5 mi south of Stedman Island				1999 – 2005
14803 – 1 mi NE of Ransom Island				1994 – 2005
17693 – north side of Hog Island approx 1.3 mi NNE of Fin and Feather Marina boat ramp off SH 361				2000
17694 – at small island SE of Stedman Island approx 0.2 mi SE of Fin and Feather Marina boat ramp off SH 361				2000
17695 – at NW tip of Harbor Island approx 1 mi SE of Fin and Feather Marina boat ramp off SH 361				2000
17696 – approx 0.4 mi SE of Ransom Island and approx 2.5 mi SSW of Fin and Feather Marina boat ramp				2000
17697 – SSW of Stedman Island approx 1.4 mi SSW of Fin and Feather Marina boat ramp off SH 361				2000
17698 – south of Stedman Island approx 1 mi south of Fin and Feather Marina boat ramp off SH 361				2000
17699 – SSW of Stedman Island approx 1.9 mi SSW of Fin and Feather Marina boat ramp off SH 361				2001
17709 – in south Corpus Christi Bayou approx 2.3 mi NNE of Fin and Feather Marina boat ramp off SH 361				2001
18233 – from Marker 79 steer 256 degrees for 2.152 km				2002
18236 – from Marker 20 steer 034 degrees for 3.987 km				2002

Stations 13426, 14801, and 14803 are the only sites with N+N and OP data. Only Enterococcus was measured at Stations 18233 and 18236.

DO (mg/l): 66 samples, ranging from 4.2 to 9.9, median value = 7.2, 2 values below screening level of 5.0, no trends. The exceedences occurred in April and July 2000. There are no problems with low DO in the bay.

24-Hr DO Average (mg/l): 10 samples, ranging from 6.3 to 10.2, median value = 6.7, criteria value = 5.0. These readings confirm that there are no problems with low DO in the bay.

24-Hr DO Minimum (mg/l): 10 samples, ranging from 3.8 to 8.8, median value = 5.0, criteria value = 4.0.

pH (su): 65 samples, ranging from 7.6 to 8.5, median value = 8.1, criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.

Figure 3.3 – 73: Redfish Bay Station 13426, January 2006

Ammonia (mg/l): 61 samples, ranging from <0.02 to 0.17, median value = 0.02, 2 values above criteria value of 0.1, 53 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 52 samples, ranging from <0.02 to 0.27, median value = 0.02, 1 value above criteria value of 0.17, 49 non-detects, no trends. There are no problems with N+N in the bay.

OP (mg/l): 39 samples, ranging from <0.01 to 0.2, median value = 0.01, 1 values above criteria value of 0.19, 37 non-detects, no trends. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 60 samples, ranging from <0.01 to 0.57, median value = 0.01, 1 value above criteria value of 0.21, 33 non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 56 samples, ranging from <1 to 18.2, median value = 1, 4 values above criteria value of 11.6, 29 non-detects, no trends. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 60 samples, ranging from 5 to 193, median value = 28, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 48 samples, ranging from <1 to 140, median value = 2, geometric mean = 4, 1 sample exceeds single sample criteria of 89, 20 non-detects, geometric mean criteria = 35, no trends. There are no problems with Enterococcus in the bay. However, DSHS lists the bay as being impaired for bacteria for oyster waters.

Segment 2483A, Conn Brown Harbor,

0.07 square miles: from the confluence with the Aransas Channel southeast of Aransas Pass in San Patricio County to a point 1 mile northeast in Aransas County.

The harbor is a commercial harbor, used primarily by shrimpers.

Active Wastewater Permits

WQ0002007-000 – Liberty Seafood: 1,000,000 gpd.

Figure 3.3 – 75: Conn Brown Harbor Station 18848, June 2007

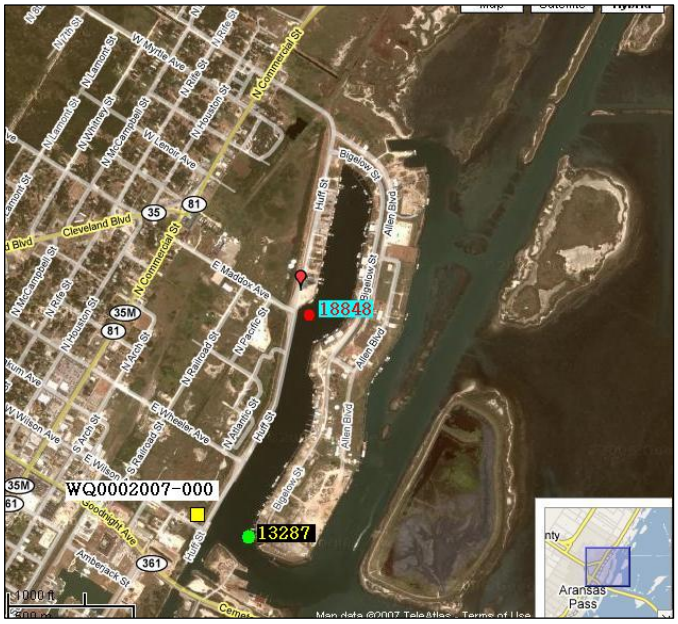


Figure 3.3 – 74: Conn Brown Harbor

Water Quality Analysis

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13287 – 180 m east of Huff St at E Wilson Ave at end of Harbor Shrimp Co Pier at 524 Bigelow St in Aransas Pass				2000 – 2005
18848 – mid harbor 50 m NE of the intersection of Huff St and E Maddox Ave in Aransas Pass	NRA	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water	2006 – Present

It was felt that Station 13287 was not representative of the harbor due to its close proximity to the channel. NRA began sampling at Station 18848 in order to better characterize the bay. More data will be available for the 2010 Assessment.

DO and pH where the only parameters with enough data for water quality analysis, so only the range and median are reported for the other parameters.

DO (mg/l): 25 samples, ranging from 5 to 9.4, median value = 7, screening level = 4.0. There is no apparent problem with low DO in the harbor. No 24-Hr DO measurements have been taken.

pH (su): 25 samples, ranging from 8 to 9.3, median value = 8.3, 2 above the criteria range of 6.5 to 9. Both of the exceedences occurred at Station 13287. There is no apparent problem with pH in the harbor.

Ammonia (mg/l): 5 samples, ranging from <0.02 to 0.07, median value = 0.02, criteria value = 0.1, 3 non-detects.

N+N (mg/l): 5 samples, the only non-detect = 0.02, same as the non-detect level.

OP (mg/l): 4 samples, all non-detects.

Total Phosphorus (mg/l): 5 samples, the only non-detect = 0.2, criteria value = 0.21.

Chlorophyll-a (µg/l): 5 samples, the only non-detect = 16.4 which exceeds the criteria value of 11.6.

TSS (mg/l): 5 samples, ranging from 5 to 17, median value = 10.

Enterococcus (cfu): 3 samples, the only non-detect = 20, single sample criteria value = 89.

Segment 2484, Corpus Christi Inner Harbor,

0.7 square miles.

The Corpus Christi Inner Harbor is home to the Port of Corpus Christi, the second deepest port in the State of Texas. Many refineries and other industries are located all along the harbor.

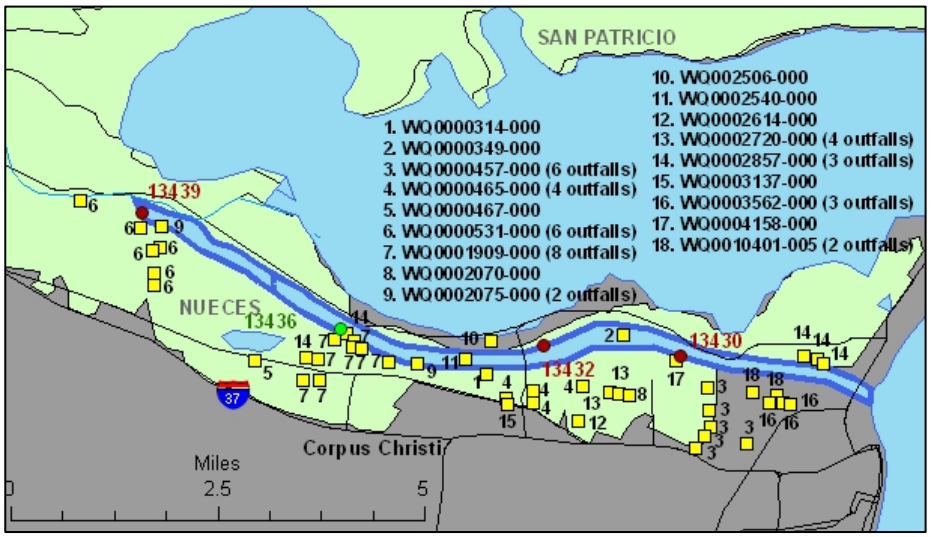


Figure 3.3 – 76: Corpus Christi Inner Harbor

Active Wastewater Permits

WQ0000314-000 – Encycle / Texas, Inc.: 320,000 gpd via Outfall 001 (from 750,000) and storm water on an intermittent and flow variable basis via Outfall 002.

WQ0000349-000 – Elementis Chromium LP: 20,000,000 gpd.

WQ0000457-000 – Flint Hills Resources LP: 2,160,000 gpd via Outfall 001.

WQ0000465-000 – Coastal Refining and Marketing

WQ0000467-000 – Citgo Refining and Chemicals: 3,500,000 gpd via Outfall 001; storm water not to exceed 1,600,000 gpd via Outfall 2; intermittent storm water runoff via Outfalls 003, 004 ,005, 006, and 007.

WQ0000531-000 – Flint Hills Resources LP: 145,000 gpd via irrigation on Unit 1 & 2; storm water discharge from construction activities, add waste streams via Outfalls 004, 011, and 012: Outfall 001 via ditch to tidal bayou to Tule Lake Turning Basin; Outfalls 002, 004, 007, 009 and 012 via ditch to Tule Lake Channel; Outfall 003 via ditch to the Viola Turning Basin; Outfall 006 via docks in Viola Turning Basin; and Outfall 011 directly to Inner Harbor.

WQ0001909-000 – Valero Refining Company-Texas: 50,000 gpd via Outfall 005; storm water from Outfall 003 at 2,390,000 gpd Outfall 007 at 3,300,000 gpd.

WQ0002070-000 – Williams Terminals Holdings: 350,000 gpd via drainage ditch to Inner Harbor.

WQ0002075-000 – Equistar Chemicals LP: 2,000,000 gpd via Outfall 001 and storm water intermittent and flow variable from Outfalls 002 and 003.

WQ0002506-000 – Star Fire Port Services: storm water on intermittent and flow variable basis and via evaporation.

WQ0002540-000 – Coastal Refining and Marketing: storm water on intermittent and flow variable basis.

WQ0002614-000 – Citgo Refining and Chemicals: storm water on intermittent and flow variable rate via Outfalls 001, 002, and 003 via unnamed ditch to Inner Harbor.

WQ0002720-000 – Trifinery Petroleum Services: 120,000 gpd via Outfall 001 via Valero Storm Water Culvert to underground pipe to Inner Harbor and storm water on intermittent and flow variable basis via Outfall 002 via unnamed ditch to Tule Lake to Inner Harbor.

WQ0002857-000 – Shamrock Logistics Operations Diamond Shamrock Refining

WQ0003137-000 – Markwest Company: 288,000 gpd plus 100,000 gpd via irrigation on 23.6 acres of pasture land.

WQ0003562-000 – Citgo Refining and Chemicals: storm water on intermittent and flow variable rate via Outfalls 001, 002, and 003 via unnamed ditch to Inner Harbor.

WQ0004158-000 – Corpus Christi Cogeneration: 11,000,000 gpd.

WQ0010401-005 – City of Corpus Christi Broadway Plant: 10,000,000 gpd.

Water Quality Analysis
Station Summary

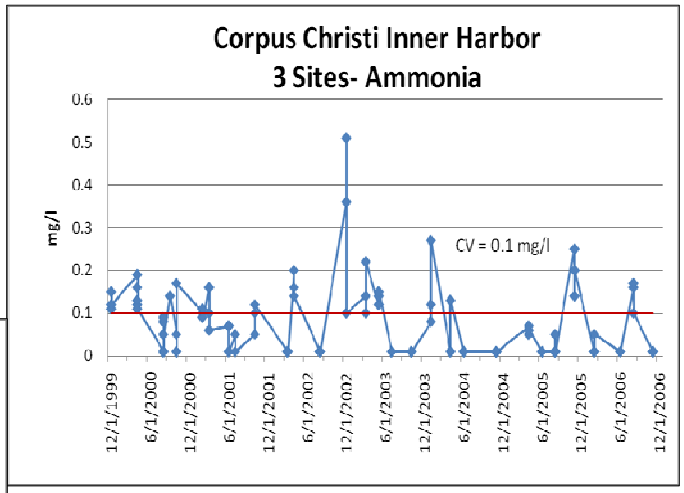
Site	Entity	Frequency	Parameter Groups	Date Range
13430 – in Avery turning basin	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water, 2 Metals in Sediment, 2 Organics in Sediment	1973 – Present
13432 – approx 0.4 km east of Navigation Blvd draw bridge	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
13436 – mid channel adjacent to Saber Refining Co. barge dock				2004 – 2006
13439 – Viola turning basin	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water, 2 Metals in Sediment, 2 Organics in Sediment	1971 - Present

Only DO, pH and TSS were measured at Station 13436.

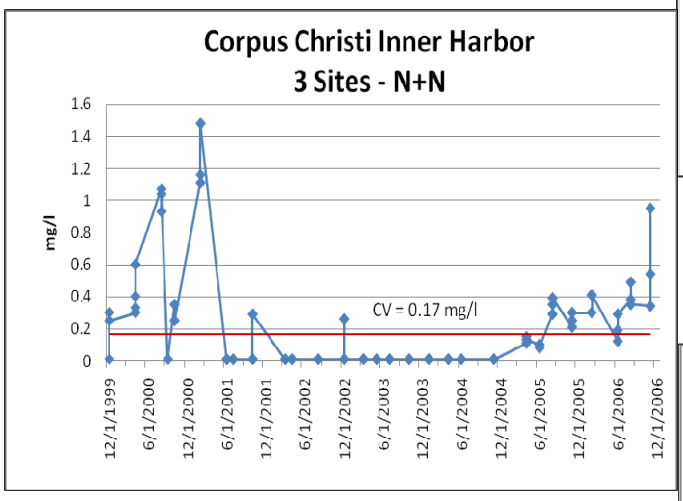
DO (mg/l): 117 samples, ranging from 4.9 to 10.5, median value = 6.8, screening level = 3.0, no trends. There are no problems with low DO in the harbor. No 24-Hr DO measurements have been taken.

pH (su): 117 samples, ranging from 7 to 8.5, median value = 8, criteria range is 6.5 to 9, no trends. There are no problems with pH in the harbor.

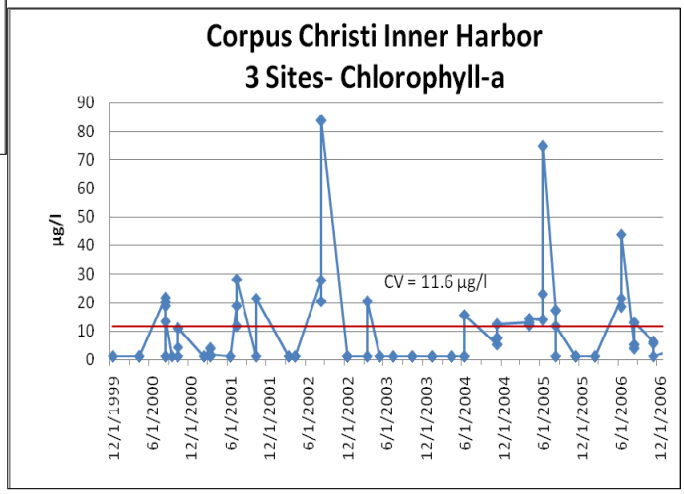
Ammonia (mg/l): 99 samples, ranging from <0.01 to 0.51, median value = 0.06, 35 values above criteria value of 0.1, 41 non-detects, no trends. There is a concern for ammonia in the harbor which may be a result of the numerous WWTP discharge permits.



N+N (mg/l): 86 samples, ranging from <0.01 to 1.48, median value = 0.01, 34 values above criteria value of 0.17, 45 non-detects, no trends. There is a concern for N+N in the harbor which may be a result of the numerous WWTP discharge permits.



OP (mg/l): 86 samples, ranging from <0.04 to 0.11, median value = 0.04, criteria value = 0.19, 71 non-detects, no trends. There are no problems with OP in the harbor.



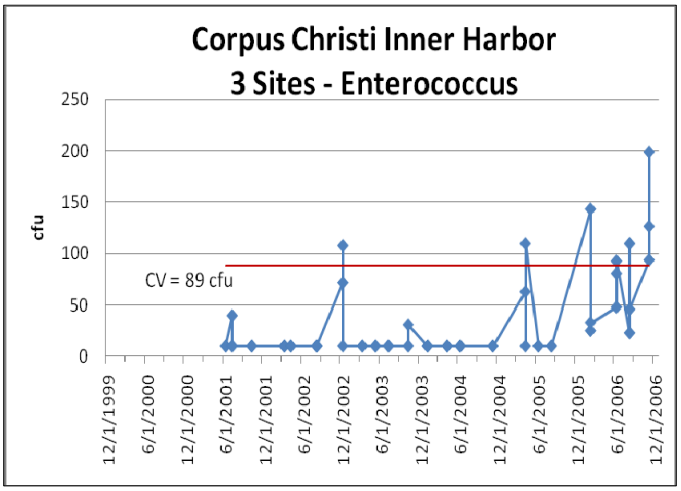
Total Phosphorus (mg/l): 101 samples, ranging from <0.06 to 0.34, median value = 0.1, 4 values above criteria value of 0.21, 2 non-detects, no trends. There are no problems with total phosphorus in the harbor.

Chlorophyll-a (µg/l): 99 samples, ranging from <1 to 83.7, median value = 1, 27 values above criteria value of 11.6, 59 non-detects, no trends. There is a concern for chlorophyll-a in the harbor which may be related to the fact that the harbor is a dead-end channel and may not have

much water circulation.

TSS (mg/l): 124 samples, ranging from <1 to 48, median value = 14, 1 non-detect, no trends. There are no problems with TSS in the harbor.

Enterococcus (cfu): 65 samples, ranging from <10 to 199, median value = 10, geometric mean = 17, 8 samples exceed single sample criteria of 89, geometric mean criteria = 35. 35 non-detects. Enterococcus is not listed as a concern or impairment in the harbor. Although there is not enough data for a statistical trend analysis, the values appear to be increasing since 2004. The source may be the numerous WWTP discharges.



Segment 2485, Oso Bay, 7.2 square miles.

Active Wastewater Permits

WQ0001490-000 – AEP Texas Central Barney M. Davis Plant: 540,000,000 gpd.

WQ0003646-000 – Texas A&M University System La Coss Facility Corpus Christi: 900,000 gpd.

WQ0010401-004 – City of Corpus Christi Oso Facility: 16,200,000 gpd.

The bay is divided into three AUs: (1) Upper Bay, Holly Rd. to Yorktown Blvd., (2) Middle Bay, SH 358 to Holly Rd, and (3) Lower Bay, Ocean Drive to SH 358.

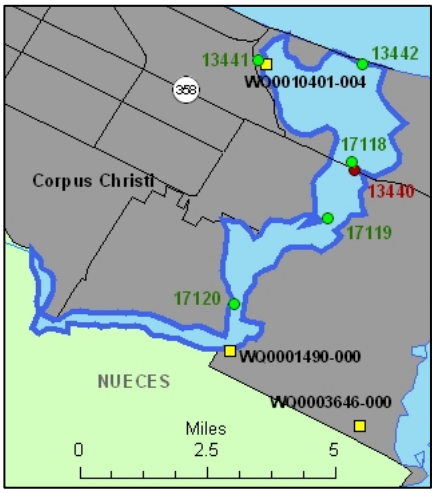


Figure 3.3 – 77: Oso Bay

Water Quality Analysis

2485_01: Upper Bay, Holly Rd to Yorktown Blvd

Station Summary

Site	Date Range
17120 – 50 m NE of Yorktown bridge CR 24 in Corpus Christi	2000 – 2005

No Enterococcus data were collected at this station.

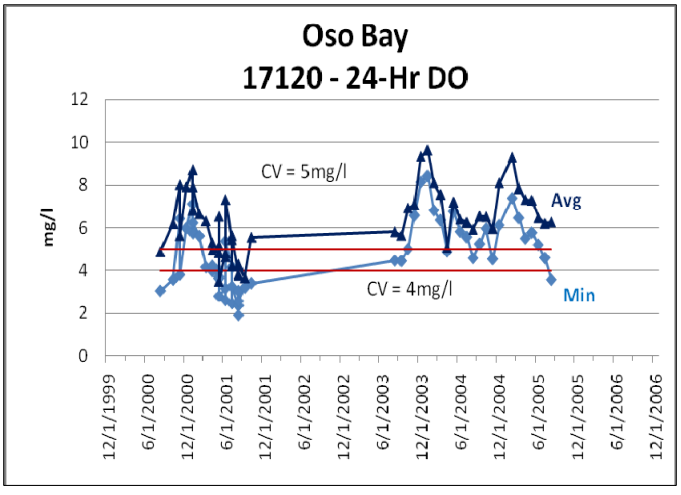
DO (mg/l): 21 samples, ranging from 5.3 to 11.4, median value = 6.5, screening level = 5.0. Based on these readings, there is no problem with low DO. However, this portion of the bay is listed as having an impairment based on 24-Hr DO measurements.

24-Hr DO Average (mg/l): 52 samples, ranging from 3.5 to 9.6, median value = 6.3, 12 values below average criteria of 5.0. There is an apparent shift in values after the 2001 – 2003 data gap and it appears this portion of the bay is now meeting the standard.

24-Hr DO Minimum (mg/l): 52 samples, ranging from 1.9 to 8.4, median value = 4.6, 18 values below minimum criteria of 4.0.

pH (su): 21 samples, ranging from 7.8 to 8.5, median value = 8.1, criteria range is 6.5 to 9. There are no problems with pH in the bay.

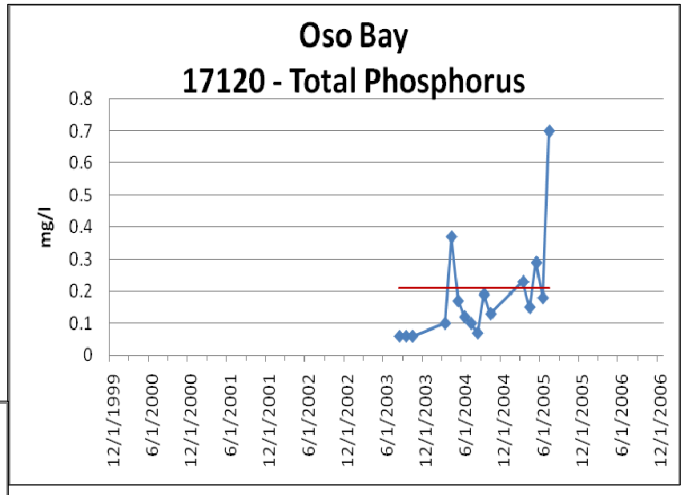
Ammonia (mg/l): 16 samples, ranging from <0.02 to 0.14, median value = 0.03, 2 values above criteria value of 0.1, 3 non-detects. There are no problems with ammonia in this portion of the bay.

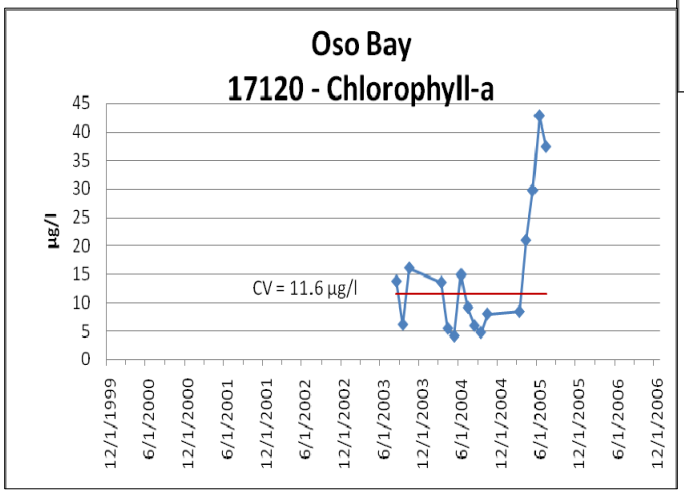


N+N (mg/l): 16 samples, ranging from <0.04 to 0.91, median value = 0.04, 3 values above criteria value of 0.17, 9 non-detects. There are no problems with N+N in this portion of the bay.

OP (mg/l): 16 samples, all values non-detects. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 16 samples, ranging from <0.06 to 0.7, median value = 0.14, 4 values above criteria value of 0.21, 1 non-detects. Total phosphorus is a concern in the bay. Monitoring may need to be reconsidered for this portion of the bay to determine whether or not there is a problem with this parameter.





Chlorophyll-a (µg/l): 16 samples, ranging from 4.2 to 42.7, median value = 11.4, 8 values above criteria value of 11.6. There is a concern for chlorophyll-a in this portion of the bay and may be a continuation of the concern in Oso Creek. It is also a concern in the other two AUs.

TSS (mg/l): 16 samples, ranging from 33 to 85, median value = 44.5. There are no problems with TSS in this portion of the bay.

2485_02: Middle Bay, SH 358 to Holly Road

Station Summary

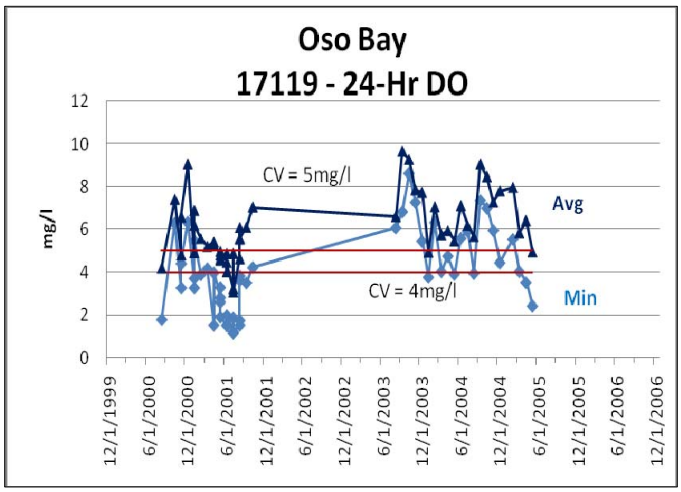
Site	Entity	Frequency	Parameter Groups	Date Range
13440 – immediately offshore at tip of peninsula at Padre Island Drive/southbound SH 358	NRA	Quarterly	Conventional, Bacteria, Field	1981 – Present
17119 – 100 m NE of Holly Road at RR bridge in Corpus Christi				2000 - 2005

DO (mg/l): 100 samples, ranging from 2.1 to 14.1, median value = 6.5, 20 values below screening level of 5.0, no trends. This portion of the bay is listed as having an impairment based on 24-Hr DO measurements.

24 Hr DO Average (mg/l): 49 samples, ranging from 3.1 to 9.6, median value = 5.8, 16 values below average criteria of 5.0. There is an apparent shift in values after the 2001 – 2003 data gap and it appears this portion of the bay is now meeting the standard.

24 Hr DO Minimum (mg/l): 49 samples, ranging from 1.1 to 8.6, median value = 3.9, 27 values below minimum criteria of 4.0.

pH (su): 100 samples, ranging from 7.5 to 8.7, median value = 8.2 criteria range is 6.5 to 9, no trends. There are no problems with pH in the bay.



Ammonia (mg/l): 58 samples, ranging from <0.02 to 0.28, median value = 0.02, 8 values above criteria value of 0.1, 32 non-detects. This parameter is not listed as a concern for this portion of the bay, but the frequency of exceedences appears to be increasing and may become a concern. The source is unknown.

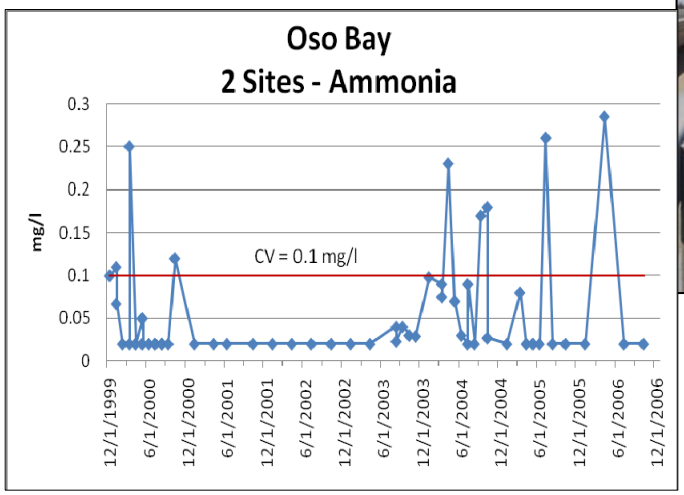
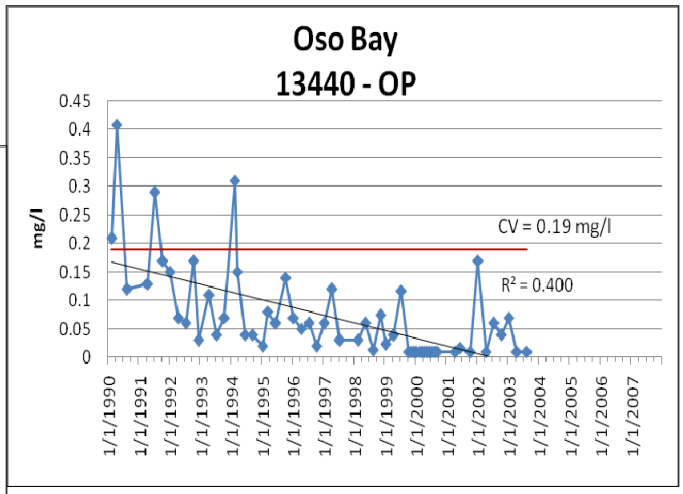
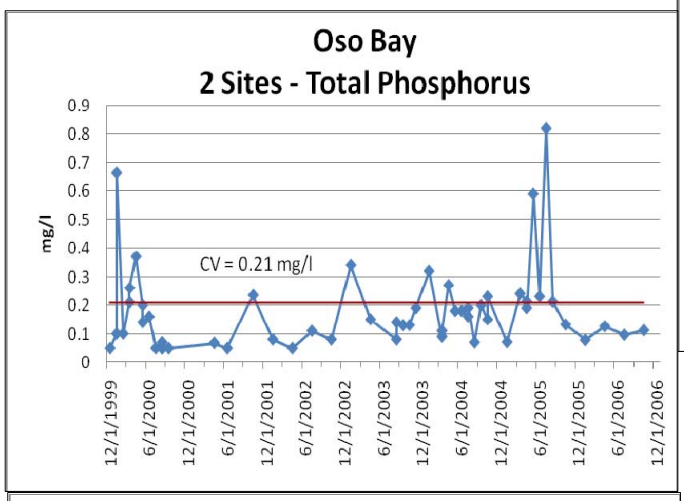


Figure 3.3 – 78: Oso Bay Station 13440, January 2006

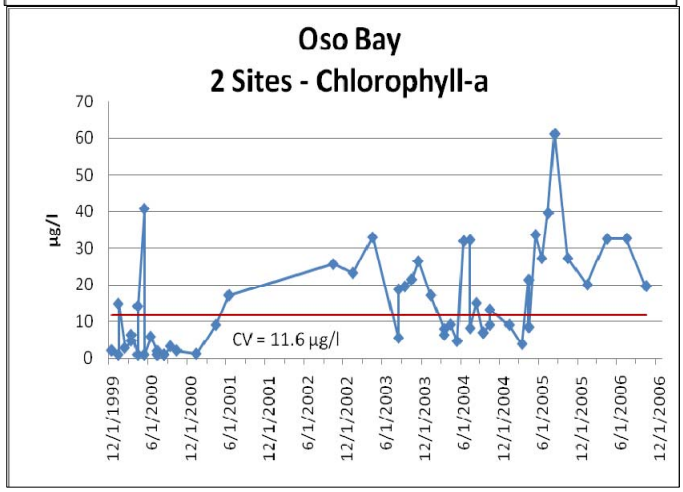
N+N (mg/l): 55 samples, ranging from <0.01 to 0.54, median value = 0.01, 6 values above criteria value of 0.17, 38 non-detects, no trends. Most of the exceedences occurred between 2003 and 2005. There are no problems with N+N in this portion of the bay.

OP (mg/l): 40 samples, ranging from <0.01 to 0.17, median value is 0.01, criteria value = 0.19, 34 non-detects, decreasing trend. There are no problems with OP in this portion of the bay.





Total Phosphorus (mg/l): 54 samples, ranging from <0.05 to 0.8, median value = 0.14, 14 values above criteria value of 0.21, 5 non-detects, no trends. This parameter is not listed as a concern for this portion of the bay even though 25% of the samples exceed the criteria. The source is unknown.



Chlorophyll-a (µg/l): 54 samples, ranging from <1 to 61.2, median value = 9.2, 26 values above criteria value of 11.6, 7 non-detects, no trends. There is a concern for chlorophyll-a in this portion of the bay. Although there is no statistical trend, the values appear to be increasing. The source is unknown.

TSS (mg/l): 57 samples, ranging from 11 = 868, median value = 93. There are no problems with TSS in the bay.

Enterococcus (cfu): 79 samples, ranging from <1 to 1387, median value = 39, geometric mean = 25, 21 samples exceed single sample criteria of 89, 8 non-detects, geometric mean criteria = 35. There are no problems with Enterococcus in this portion of the bay. 12 of the samples were not used in the assessment since they were related to TMDL sampling that targeted high runoff events. Without these samples the highest value is 560 and only 15 samples exceed the single sample criteria of 89. DSHS also lists this section of the bay as being impaired for bacteria for oyster waters.

2485_03: Lower Bay, Ocean Driver to SH 358

Station Summary

Site	Date Range
13441 – opposite Oso WWTP discharge 500 ft east of Ennis Joslin Road	1999 – 2000, 2005 - 2006
13442 – 40 m upstream of Ocean Drive and 50 m west of eastern landfall of bridge	1999 - 2006
17118 – NE of SH 358 100 m from NE corner of bridge in Corpus Christi	2000 - 2005

DO (mg/l): 144 samples, ranging from 3.6 to 15, median value = 6.9, 12 values below screening level of 5.0. This portion of the bay is listed as having an impairment based on 24-Hr DO measurements.

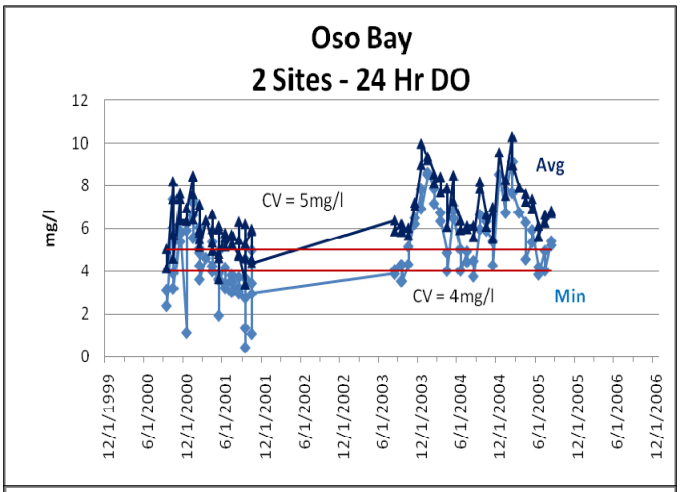
24 Hr DO Average (mg/l): 97 samples, ranging from 3.4 to 10.3, median value is 6.2, 13 values below average criteria of 5. There is an apparent shift in values after the 2001 – 2003 data gap and it appears this portion of the bay is now meeting the standard.

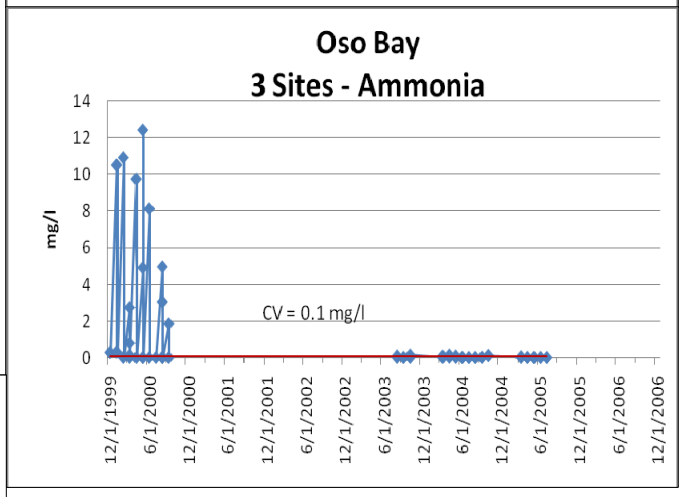
24 Hr DO Minimum (mg/l): 97 samples, ranging from 0.4 to 9.1, median value is 4.5, 30 values below minimum criteria of 4.

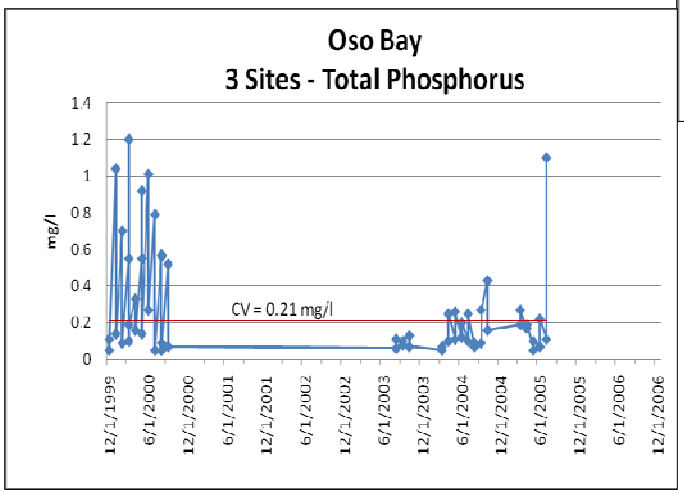
pH (su): 144 samples, ranging from 6.9 to 8.8, median value = 8, criteria range is 6.5 to 9. There are no problems with pH in this portion of the bay.

Ammonia (mg/l): 59 samples, ranging from <0.02 to 12.4, median value = 0.03, 22 values above criteria value of 0.1, 24 non-detects. There is a concern for ammonia in this portion of the bay. The levels have dropped significantly beginning in 2003, and most likely will not be listed as a concern in the 2010 Assessment.

N+N (mg/l): 32 samples, ranging from <0.02 to 0.36, median value = 0.02, 2 values above criteria value of 0.17, 17 non-detects. There are no problems with N+N in this portion of the bay.





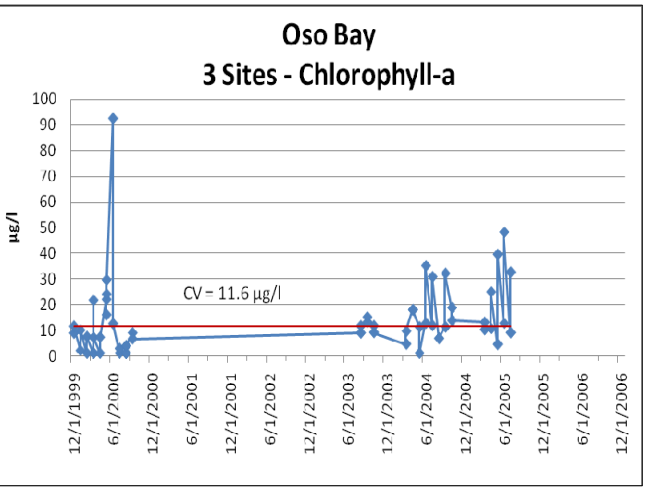


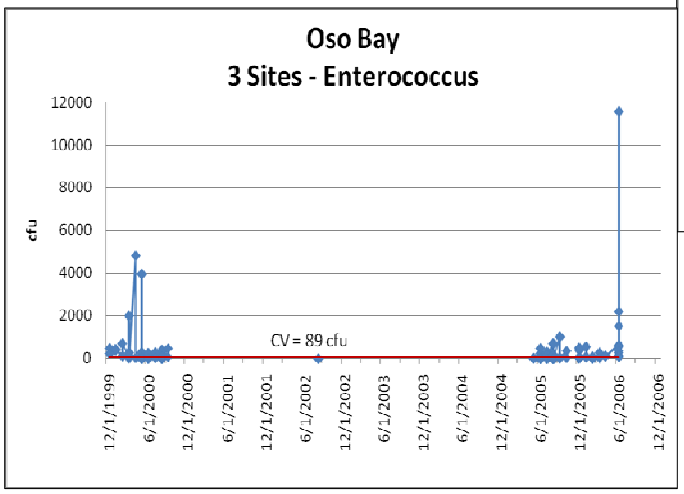
OP (mg/l): 58 samples, ranging from <0.04 to 0.34, median value = 0.04, 2 values above criteria value of 0.19, 47 non-detects. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 60 samples, ranging from <0.05 to 1.2, median value = 0.15, 23 values above criteria value of 0.21, 3 non-detects. There is a concern for total phosphorus in this portion of the bay. The source is unknown.

Chlorophyll-a (µg/l): 60 samples, ranging from <1 to 92.5, median value = 10.4, 25 values above criteria value of 11.6, 8 non-detects. There is a concern for chlorophyll-a in this portion of the bay. The source is unknown.

TSS (mg/l): 59 samples, ranging from 12 to 1040, median value = 56. There are no problems with TSS in this portion of the bay.





Enterococcus (cfu): 101 samples, ranging from <1 to 11,550, median value = 90, geometric mean = 60, 51 samples exceed the single sample criteria of 89, geometric mean criteria = 35, 5 non-detects. There is an impairment for bacteria in this portion of the bay. The maximum value was recorded at Station 13442 in June 2006. One possible source is the thousands of birds that roost in the shallow area known as the Blind Oso between Ward Island and Ennis Joslin Rd.

Segment 2491, Laguna Madre, 347.4 square miles.

The Laguna Madre is a very unique body of water. The only development is the very northern and very southern ends, Corpus Christi and Port Isabel, respectively. Padre Island National Seashore encompasses most of the barrier island to the east. The land to the west is predominantly large ranches such as the King Ranch.

There is little water exchange directly from the Gulf of Mexico. The Laguna is connected to Corpus Christi Bay and there are two channels through the island at Port Mansfield and Port Isabel. Additional channels open periodically with tropical storms and hurricanes.

The bay is divided into three AUs: (1) Upper Laguna Madre North of Arroyo Colorado Confluence, (2) Area Adjacent to the Arroyo Colorado Confluence, and (3) Lower Laguna Madre South of Arroyo Colorado Confluence.

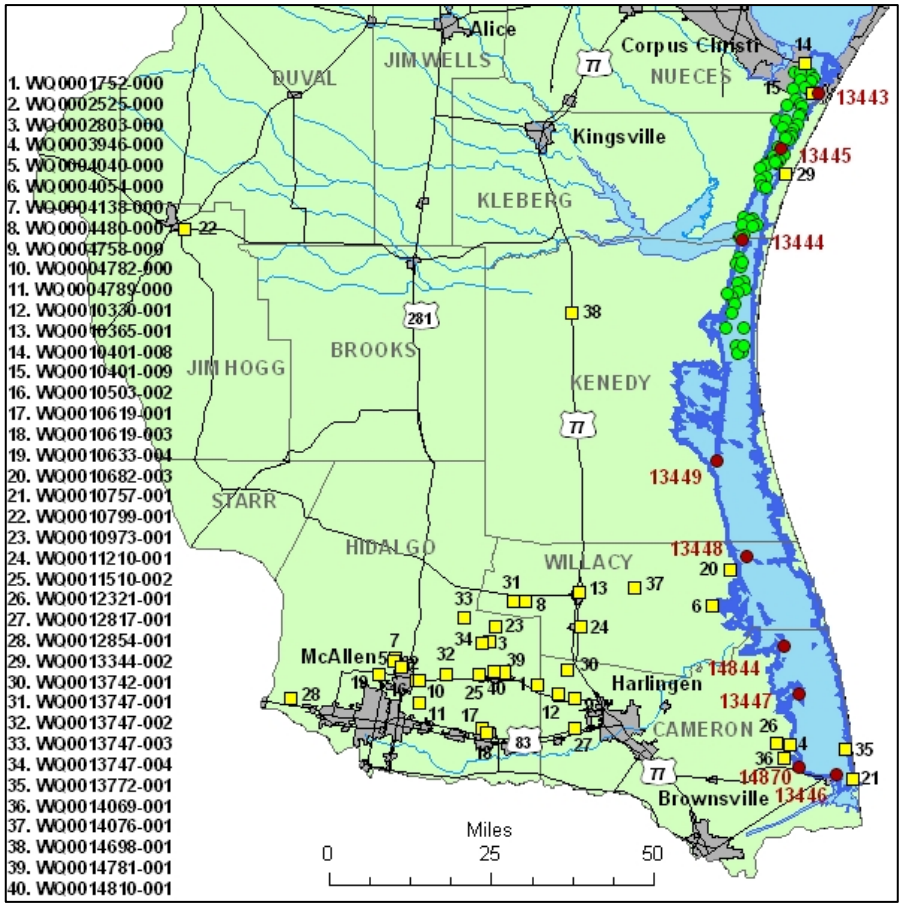


Figure 3.3 – 79: Laguna Madre

Active Wastewater Permits

WQ0001752-000 – Rio Grande Valley Sugar Growers: 289,000 gpd via Valley Acres Drainage Canal to North Floodway Pilot Channel to Laguna Madre.

WQ0002525-000 – Azteca Milling: 300,000 gpd via irrigation.

WQ0002803-000 – Value Frozen Foods: 6.9 acre feet/acre/year via irrigation on 98 acres.

WQ0003946-000 – Harlingen Shrimp Farms, LTD: 8,000,000 gpd via tidal ditch to Laguna Madre.

WQ0004040-000 – Calpine Construction Finance: 1,110,000 gpd via Hidalgo County Drainage District Ditch No. 1 (North Main Drain) to Santa Cruz Canal to the Donna Drain to North Floodway Pilot Channel to Laguna Madre.

WQ0004054-000 – Loma Alta Trust (Loma Alta Aquaculture): 8,200,000 gpd via Hidalgo County Drainage Ditch to Laguna Madre.

WQ0004138-000 – Calpine Hidalgo Energy Center: 920,000 gpd via Hidalgo County Drainage District Ditch to Santa Cruz Canal to Donna Drain to North Floodway Pilot Channel to Laguna Madre.

WQ0004480-000 – North Alamo WSC: 1,000,000 gpd via 12" pip to West Main Drain to East Main Drain to Laguna Madre.

WQ0004758-000 – North Alamo WSC (La Sara): 2,000,000 gpd: elevated drainage ditch to North Floodway to Laguna Madre.

WQ0004782-000 – North Alamo WSC: 2,000,000 gpd via Doolittle Rd. drainage ditch at Curry Drain to Donna Drain to Laguna Madre.

WQ0004789-000 – North Alamo WSC: 2,000,000 gpd via unnamed drainage ditch to Donna Drain to Laguna Madre.

WQ0010330-001 – City of Santa Rosa: 681,000 gpd via unnamed drainage ditch to North Floodway to Laguna Madre.

WQ0010365-001 – City of Raymondville: 1,500,000 gpd via ditch to Delta Irrigation Ditch to Laguna Madre.

WQ0010401-008 – City of Corpus Christi Laguna Madre: 3,000,000 gpd via pipeline to Laguna Madre.

WQ0010401-009 – City of Corpus Christi Whitecap: 2,500,000 gpd.

WQ0010503-002 – City of Edinburg: 5,900,000 gpd via San Juan holding pond to drainage ditch to North Floodway to Laguna Madre.

WQ0010619-001 – City of Weslaco: 250,000 gpd via ditch to North Floodway System to Laguna Madre.

WQ0010619-003 – City of Weslaco: 3,000,000 gpd via drainage ditch to North Floodway to Laguna Madre.

WQ0010633-004 – City of McAllen: 18,000,000 gpd (from 8,000,000 gpd) via Hidalgo County Drainage Ditch to Santa Cruz Canal to Donna Drain to North Floodway to Laguna Madre.

WQ0010682-003 – Willacy Co. Navigation District: 221,000 gpd via ditch within Four Mile Slough to Laguna Madre.

WQ0010757-001 – Laguna Madre Water District Isla Blanca Plant: 2,600,000 gpd via irrigation on 6 acres.

WQ0010799-001 – Jim Hogg County WCID No. 2 (Hebbronville Plant): 796,000 gpd: Noriacitas Creek to Palo Blanco Creek to undefined drainage paths to the Laguna Madre.

WQ0010973-001 – County of Hidalgo Delta Lake Park: 5,000 gpd via Hidalgo and Willacy WCID Ditch No. 1 to Laguna Madre.

WQ0011210-001 – City of Lyford: 270,000 gpd via drainage ditch to North Floodway to Laguna Madre.

WQ0011510-002 – City of Elsa: 800,000 gpd via ditch to HCCID Ditch 10F to North Floodway to Laguna Madre.

WQ0012321-001 – U.S. Department of Homeland Security Immigration and Customs Enforcement: 160,000 gpd via ditch to Cameron County WCID No. 11 Drainage Ditch to Laguna Madre.

WQ0012817-001 – Fig Tree R.V. Resort, L.C.

WQ0012854-001 – Hidalgo County MUD: 500,000 gpd.

WQ0013344-002 – US Department of the Interior: 25,000 gpd intermittent wetland to Laguna Madre.

WQ0013742-001 – Sebastian MUD: 225,000 gpd via North Floodway to Laguna Madre.

WQ0013747-001 – North Alamo WSC: 100,000 gpd via series of ditches and drains to Laguna Madre.

WQ0013747-002 – North Alamo WSC: 210,000 gpd via surface irrigation of 56 acres.

WQ0013747-003 – North Alamo WSC: 122,000 gpd via surface irrigation of 34 acres.

WQ0013747-004 – North Alamo WSC: 300,000 gpd via Delta Irrigation District Drain Ditch to series of drainage ditches to the Laguna Madre.

WQ0013772-001 – Laguna Madre Water District Andy Bowie Park Plant: 1,500,000 gpd via wetland area contiguous with and part of Laguna Madre.

WQ0014069-001 – Laguna Madre Water District Laguna WWTP: 650,000 gpd via City of Port Isabel Reservoir to the Laguna Madre.

WQ0014076-001 – City of San Perlita: 100,000 gpd via evaporation/ percolation on 8.87 acres.

WQ0014698-001 – TxDOT: 13,000 gpd via a series of drainage ditches to Laguna Madre.

WQ0014781-001 –City of La Villa: 400,000 gpd via drainage ditch to North Floodway to Laguna Madre.

WQ0014810-001 –City of Edcouch: 3100,000 gpd via Hidalgo County Drainage Ditch to North Floodway Pilot Channel to Laguna Madre.

Water Quality Analysis

2491_01: Upper Laguna Madre North of Confluence with Arroyo Colorado

Station Summary

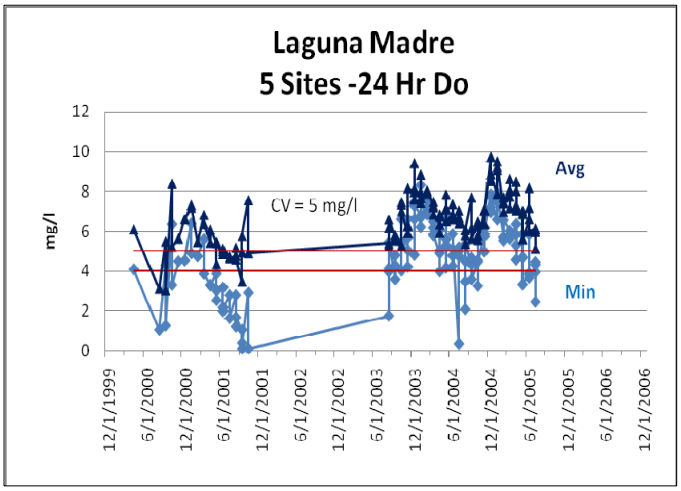
Site	Entity	Frequency	Parameter Groups	Date Range
13443 - south of the intersection of ICWW and Padre Island Causeway	TCEQ	Quarterly	Conventional, Bacteria, Field	1975 – Present
13444 - 1.87 km NW of Point Penascal at intersection of ICWW at Baffin Bay marker	TCEQ	Quarterly	Conventional, Bacteria, Field	1972 – Present
13445 - at ICWW approx. 1.6 km SW from the southernmost point of south Bird Island	TCEQ	Quarterly	Conventional, Bacteria, Field	1973 – Present
13448 - intersection of ICWW and Port Mansfield Channel	TCEQ	Quarterly	Conventional, Bacteria, Field	1669 – Present
13449 – CM C-225A north of Port Mansfield	TCEQ	Quarterly	Conventional, Bacteria, Field	1999 – Present
17121 - 0.7 km SE of the end of Yorktown Rd. approx. 1.3 km NW of Pita Island in Corpus Christi				2000 – 2005
18066 - south of JFK Causeway from fixed ICWW Navigation Marker 41 steer 335 degrees for 2.501 km				2002
18067 - south of JFK Causeway from fixed ICWW Navigation Marker 41 steer 325 degrees for 2.708 km				2001
18068 - south of JFK Causeway from fixed ICWW Navigation Marker 41 steer 306 degrees for 4.163 km				2002
18069 - south of JFK Causeway from fixed ICWW Navigation Marker 41 steer 341 degrees for 1.027 km				2002
18070 - south of JFK Causeway from fixed ICWW Navigation Marker 41 steer 283 degrees for 1.021 km				2002
18071 - south of JFK Causeway from fixed ICWW Navigation Marker 41 steer 282 degrees for 3.482 km				2001
18072 - near Padre Isles from fixed ICWW Navigation Marker 49 steer 157 degrees for 0.469 km				2001
18073 - west of Padre Isles Canal subdivision from fixed ICWW Navigation Marker 49 steer 239 degrees for 0.782 km				2001
18074 - NNW of Pita Island from fixed ICWW Navigation Marker 49 steer 273 degrees for 4.168 km				2001
18075 - south of Pita Island from fixed ICWW Navigation Marker 73 steer 333 degrees for 2.736 km				2002
18076 - SSE of Pita Island from fixed ICWW Navigation Marker 73 steer 343 degrees for 1.468 km				2002
18077 - north of Marker 73 from fixed ICWW Navigation Marker 73 steer 354 degrees for 0.573 km				2001
18078 - near Marker 79 from fixed ICWW Navigation Marker 81 steer 036 degrees for 0.607 km				2002
18079 - north of Marker 81 from fixed ICWW Navigation Marker 81 steer 035 degrees for 0.275 Km				2001
18080 - south of Pure Oil Channel from fixed ICWW Navigation Marker 97 steer 307 degrees for 3.834 km				2001
18081 - north of Pure Oil Channel from fixed ICWW Navigation Marker 89 steer 291 degrees for 2.269 km				2002
18082 - north of North Bird Island from fixed ICWW Navigation Marker 89 steer 121 degrees for 0.8 km				2002
18083 - west of North Bird Island from fixed ICWW Navigation Marker 97 steer 071 degrees for 0.538 km				2002

Station Summary (cont.)

18084 - south of Pure Oil Channel from fixed ICWW Navigation Marker 97 steer 287 degrees for 2.045 km	2002
18085 - Night Hawk Bay from fixed ICWW Navigation Marker 97 steer 164 degrees for 0.882 km	2001
18086 - west of Marker 105 from fixed ICWW Navigation Marker 105 steer 100 degrees for 0.75 km	2001
18087 - west of Marker 105 from fixed ICWW Navigation Marker 105 steer 257 degrees for 0.526 km	2001
18088 - Night Hawk Bay from fixed ICWW Navigation Marker 105 steer 154 degrees for 0.753 km	2002
18089 - west of ICWW and Bird Island Basin from fixed ICWW Navigation Marker 121 steer 341 degrees for 0.924 km	2002
18090 - at entrance to Bird Island Basin from fixed ICWW Navigation Marker 121 steer 033 degrees for 0.655 km	2001
18091 - south of Bird Island Basin from fixed ICWW Navigation Marker 121 steer 131 degrees for 1.049 km	2001
18092 - west of Marker 129 from fixed ICWW Navigation Marker 129 steer 307 degrees for 0.732 km	2002
18093 - SE of Marker 129 from fixed ICWW Navigation Marker 129 steer 145 degrees for 0.885 km	2001
18094 - near Marker 133 from fixed ICWW Navigation Marker 129 steer 209 degrees for 0.954 km	2001
18095 - SE of Marker 129 from fixed ICWW Navigation Marker 129 steer 176 degrees for 1.404 km	2002
18096 - NW of ICWW Marker 145 from fixed ICWW Navigation Marker 145 steer 337 degrees for 1.928 km	2001
18097 - NW of ICWW Marker 145 from fixed ICWW Navigation Marker 145 steer 329 degrees for 1.981 km	2002
18098 - NW of ICWW Marker 145 from fixed ICWW Navigation Marker 145 steer 327 degrees for 1.474 km	2001
18099 - west of ICWW Marker 145 from fixed ICWW Navigation Marker 145 steer 284 degrees for 2.093 km	2002
18100 - NNE of Marker 153 from fixed ICWW Navigation Marker 153 steer 056 degrees for 3.387 km	2002
18101 - at fixed ICWW Navigation Marker 154 north of Baffin Bay	2002
18102 - NW of Marker 161 from fixed ICWW Navigation Marker 161 steer 345 degrees for 1.383 km	2001
18103 - SW of Marker 161 from fixed ICWW Navigation Marker 161 steer 223 degrees for 0.436 km	2001
18104 - ESE of Marker 161 from fixed ICWW Navigation Marker 161 steer 126 degrees for 1.115 km	2002
18160 - west of ICWW Marker 201 from fixed ICWW Navigation Marker 201 steer 274 degrees for 0.95 km	2001
18161 - east of ICWW Marker 207 from fixed ICWW Navigation Marker 201 steer 093 degrees for 1.117 km	2001
18162 - ESE of Marker Marker 201 from fixed ICWW Navigation Marker 201 steer 124 degrees for 0.691 km	2001
18163 - WSW of ICWW Marker 207 from fixed ICWW Navigation Marker 207 steer 243 degrees for 0.756 km	2002
18164 - east of ICWW Marker 207 from fixed ICWW Navigation Marker 207 steer 101 degrees for 2.591 km	2002
18165 - ESE of ICWW Marker 207 from fixed ICWW Navigation Marker 207 steer 110 degrees for 1.924 km	2002
18167 - from fixed Baffin Bay Navigation Marker 2 steer 338 degrees for 0.671 km	2001
18168 - from fixed Baffin Bay Navigation Marker 2 steer 114 degrees for 0.131 km	2002
18169 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 21 steer 126 degrees for 0.386 km	2002
18170 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 27 steer 114 degrees for 0.393 km	2001
18171 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 27 steer 170 degrees for 0.219 km	2001
18172 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 27 steer 138 degrees for 1.209 km	2001
18173 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 51 steer 074 degrees for 2.729 km	2001
18174 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 51 steer 068 degrees for 1.493 km	2001
18175 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 51 steer 104 degrees for 3.134 km	2002
18176 - south of Baffin Bay in Yarbrough area from fixed ICWW Navigation Marker 51 steer 140 degrees for 2.057 km	2002
18177 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 348 degrees for 8.413 km	2001
18178 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 347 degrees for 8.242 km	2002
18179 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 352 degrees for 6.601 km	2001
18180 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 336 degrees for 4.488 km	2002

Station Summary (cont.)	
18181 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 188 degrees for 3.842 km	2001
18182 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 173 degrees for 5.438 km	2002
18183 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 183 degrees for 6.017 km	2001
18184 - in 9-Mile Hole from end of 9-Mile Hole Channel steer 183 degrees for 5.916 km	2002
18188 - east of ICWW Marker 221 at south end of dredge material placement island	2003 – 2005
18251 - from Marker 49 steer 271 degrees for 1.701 km	2002
18253 - from Marker 73 steer 289 degrees for 3.385 km	2002
18254 - from Marker 105 steer 222 degrees for 0.667 km	2002
18255 - from Marker 161 steer 281 degrees for 1.071 km	2002
18259 - from Marker 223 steer 346 degrees for 1.085 km	2002
18261 - from Marker 27 steer 085 degrees for 1.346 km	2002
18262 - from Marker 59 steer 247 degrees for 0.701 km	2002
18263 - from Land Cut Marker 2 steer 183 degrees for 2.343 km	2002
18264 - from end of channel at 9-Mile Hole steer 065 degrees for 1.218 km	2002
18265 - from end of channel at 9-Mile Hole steer 165 degrees for 4. km	2002

DO (mg/l): 287 samples, ranging from 2.63 to 15.9, median value = 7.1, 17 values below screening level of 5.0, no trends. Based on these readings, there is no problem with low DO. However, this portion of the bay is listed as having an impairment based on 24-Hr DO measurements.



24 Hr DO Average (mg/l): 124 samples, ranging from 3 to 9.7, median value = 6.7, 11 values below average criteria of 5.0. There is an apparent shift in values after the 2001 – 2003 data gap and it appears the averages are now meeting the standard but the minimums are not.

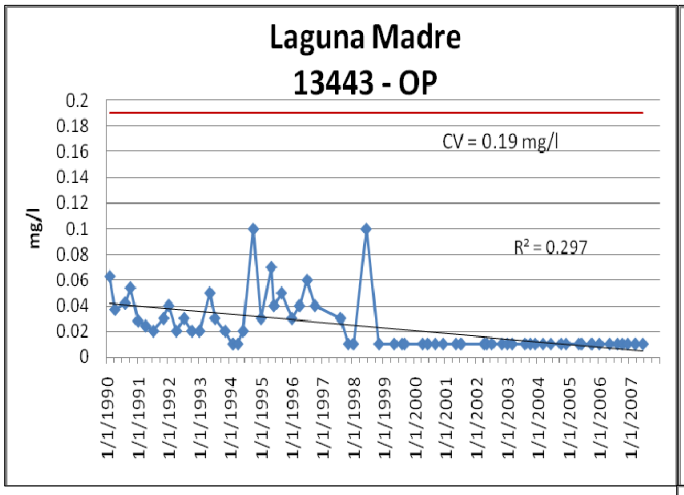
24 Hr DO Minimum (mg/l): 124 samples, ranging from 0.1 to 8.3, median value is 4.9, 37 values below minimum criteria of 4.0.

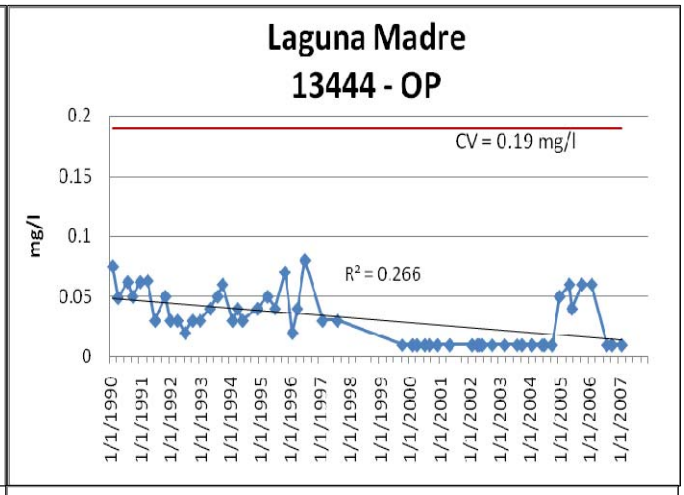
pH (su): 292 samples, ranging from 7 to 9.01, median value = 8.2, 1 value above criteria range of 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 245 samples, ranging from <0.01 to 0.16, median value = 0.01, 3 values above criteria value of 0.1, 173 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 243 samples, ranging from <0.01 to 3.11, median value = 0.01, 4 values above criteria value of 0.17, 228 non-detects, no trends. There are no problems with N+N in the bay.

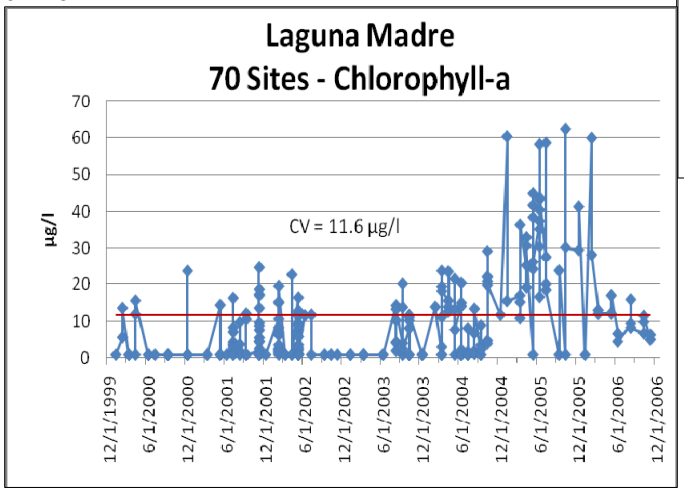
OP (mg/l): 244 samples, ranging from <0.01 to 0.19, median value = 0.01, criteria value = 0.19, 224 non-detects, decreasing trends at Stations 13443, 13444, 13445. There are no problems with OP in the bay.

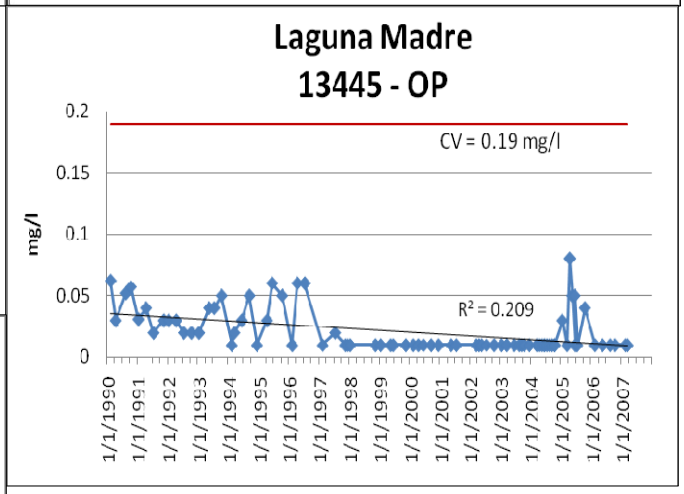




Total Phosphorus (mg/l): 246 samples, ranging from <0.01 to 0.6, median value = 0.05, 5 values above criteria value of 0.21, 95 non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 245 samples, ranging from <1 to 62.3, median value = 4.8, 84 values above criteria value of 11.6, 73 non-detects, no trends. There is a concern for chlorophyll-a in this portion of the bay. The source is unknown.





TSS (mg/l): 245 samples, ranging from 2 to 214, median value = 19. There are no problems with TSS in this portion of the bay.

Enterococcus (cfu): 166 samples, ranging from <10 to >2419, median value = 10, geometric mean = 15, 12 samples exceed the single sample criteria of 89, geometric mean criteria = 35, 105 non-detects. Although there is not enough data for a trend analysis, the exceedences appear to be decreasing over time. There are no problems with Enterococcus in this portion of the bay.

2491_02: Area Adjacent to Confluence with Arroyo Colorado

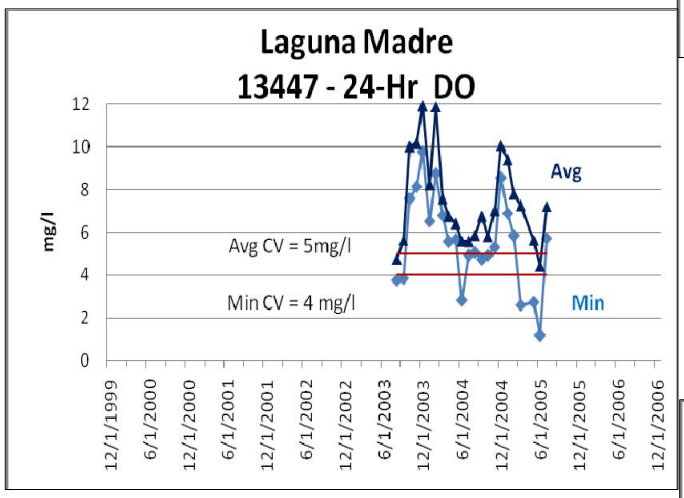
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13447 - intersection of ICWW and Arroyo Colorado	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present

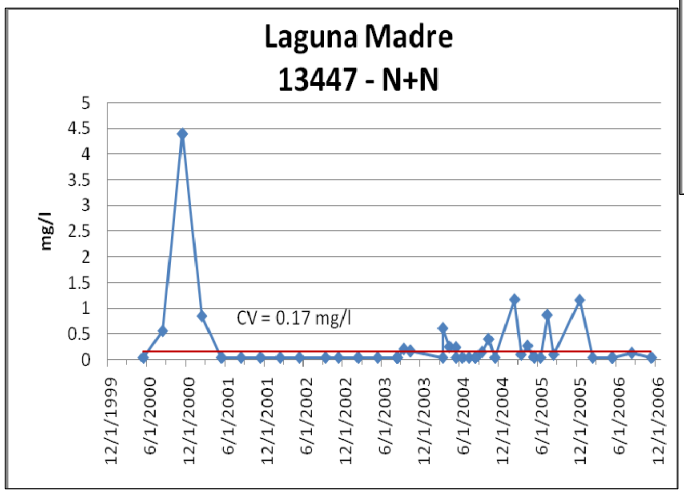
DO (mg/l): 50 samples, ranging from 1.1 to 14.1, median value = 7.3, 5 values below screening level of 5.0, no trends. This portion of the bay is listed as having an impairment based on 2-Hr DO measurements base on grab samples and 24-Hr minimum DO measurements. A review of the water quality standards will be reviewed to determine if this actually an impairment.

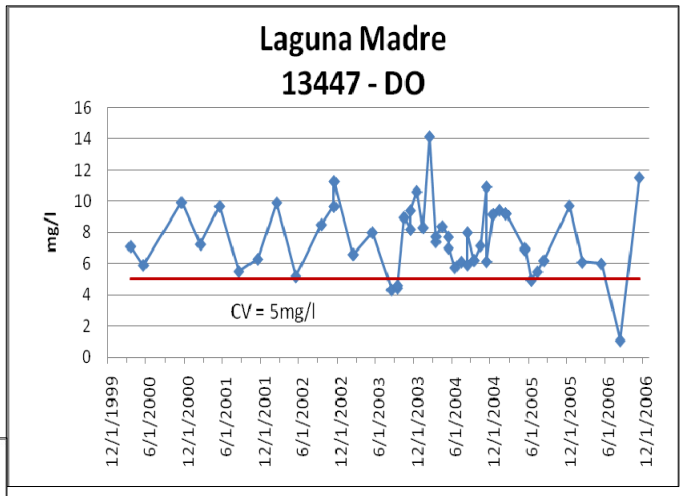
24-Hr DO Average (mg/l): 23 samples, ranging from 4.4 to 11.9, median value = 7, 2 values below average criteria of 5.0.

24-Hr DO Minimum (mg/l): 23 samples, ranging from 1.2 to 9.8, median value = 5.6, 6 values below minimum criteria of 4.0.



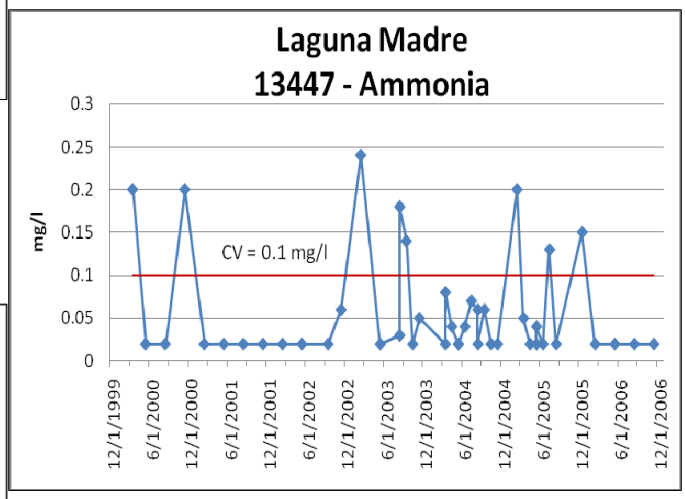
N+N (mg/l): 42 samples, ranging from <0.04 to 4.4, median value = 0.04, 12 values above criteria value of 0.17, 24 non-detects, no trends. This parameter is not listed as concern even though 29% of the samples exceed the criteria and may be listed in the 2010 Assessment. The source may be the Arroyo Colorado.





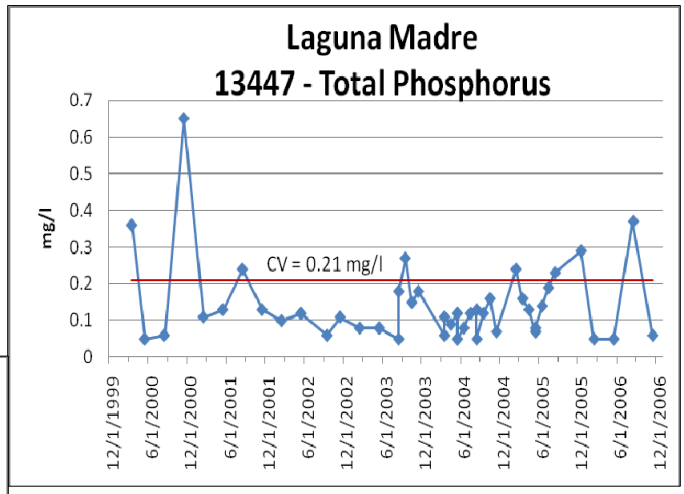
pH (su): 49 samples, ranging from 7.6 to 9.6, median value = 8.3, 2 values above criteria range of 6.5 to 9, no trends. There are no problems with pH in this portion of the bay.

Ammonia (mg/l): 44 samples, ranging from <0.02 to 0.24, median value = 0.02, 8 values above criteria value of 0.1, 24 non-detects, no trends. This parameter is close to being consider a concern as 18% of the samples exceed the criteria and may be listed in the 2010 Assessment. The source may be the Arroyo Colorado.

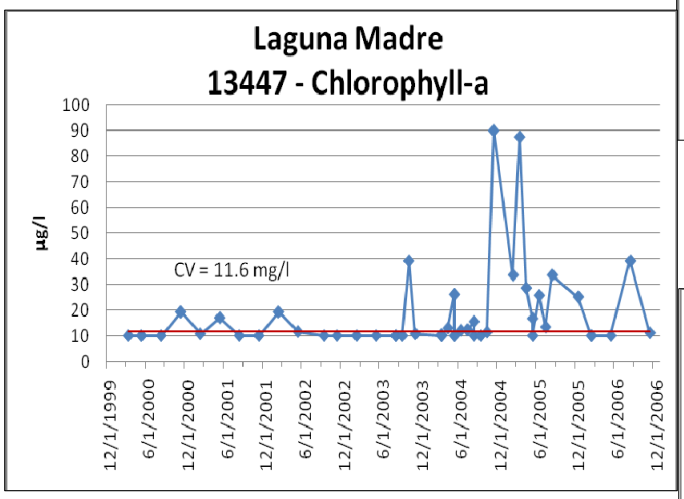


OP (mg/l): 41 samples, ranging from <0.04 to 0.49, median value = 0.04, 2 values above criteria value of 0.19, 33 non-detects, no trends. There are no problems with OP in this portion of the bay.

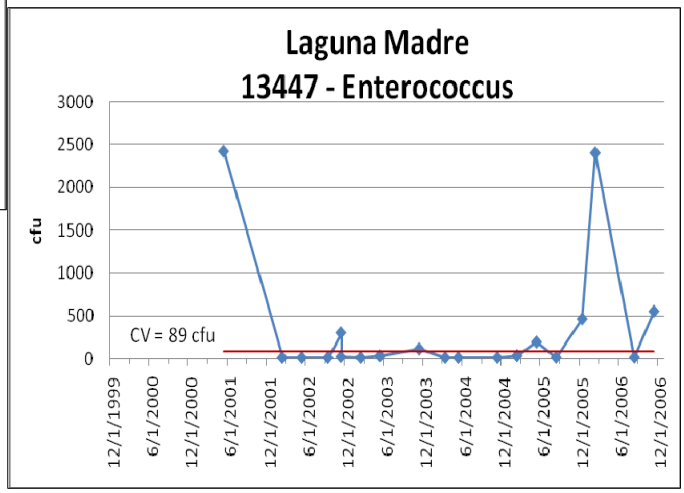
Total Phosphorus (mg/l): 44 samples, ranging from <0.05 to 0.65, median value = 0.12, 8 values above criteria value of 0.21, 6 non-detects, no trends. This parameter is close to being consider a concern as 18% of the samples exceed the criteria and may be listed in the 2010 Assessment. The source may be the Arroyo Colorado.



Chlorophyll-a (µg/l): 44 samples, ranging from <10 to 89.9, median value = 10.9, 19 values above criteria value of 11.6, 15 non-detects, no trends. There is a concern for chlorophyll-a in this portion of the bay. The source may be the Arroyo Colorado.



TSS (mg/l): 42 samples, ranging from 10 to 61, median value = 24. There are no problems with suspended solids in the bay.



Enterococcus (cfu): 20 samples, ranging from <10 to >2419, median value = 25, geometric mean = 50, 7 samples exceeds single sample criteria of 89, geometric mean criteria = 35, 7 values non-detects, This portion of the bay is listed as having an impairment for bacteria. The source may be the Arroyo Colorado. DSHS also lists the bay as being impaired for bacteria for oyster waters.

2491_03: South of Confluence with Arroyo Colorado

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13446 - ICWW at Marker 129 east of Port Isabel	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present
14844 - At ICWW Channel Marker 49	TCEQ	Quarterly	Conventional, Bacteria, Field	1991 – 2005, 2007 - Present
14870 - 200 yds off Laguna Vista shoreline	TCEQ	Quarterly	Conventional, Bacteria, Field	1992 – Present

None of these parameters were sampled at Station 14844 during the assessment period.

DO (mg/l): 55 samples, ranging from 1.2 to 10.3, median value = 7.8, 6 values below screening level of 5.0, no trends. There are no problems with low DO on this section of the bay.

24 Hr DO Average (mg/l): 21 samples, ranging from 5.5 to 9.2, median value is 7.6, criteria value = 5.0.

24 Hr DO Minimum (mg/l): 21 samples, ranging from 3.7 to 7.8, median value is 5.9, criteria value = 2.

pH (su): 58 samples, ranging from 7.5 to 11, median value is 8, 1 value above criteria range of 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 54 samples, ranging from <0.02 to 0.09, median value = 0.02, criteria value = 0.1, 46 non-detects, no trends. There are no problems with ammonia in this portion of the bay.

N+N (mg/l): 55 samples, ranging from <0.04 to 1.51, median value = 0.04, 3 values above criteria value of 0.17, 50 non-detects, no trends. There are no problems with N+N in this portion of the bay.

OP (mg/l): 53 samples, all non-detects, no trends. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 55 samples, ranging from <0.05 to 0.19, median value = 0.05, criteria value = 0.21, 32 non-detects, no trends. There are no problems with total phosphorus in this portion of the bay.

Chlorophyll-a (µg/l): 55 samples, ranging from <3 to 12.5, median value = 3, 1 value above criteria value of 11.6, 38 non-detects, no trends. There are no problems with chlorophylla in this portion of this portion of the bay.

TSS (mg/l): 55 samples, ranging from <4 to 190, median value = 18, no trends. There are no problems with TSS in this portion of the bay.

Enterococcus (cfu): 27 samples, ranging from <1 to >2419, median value = 15, geometric mean = 12, 4 samples exceed single sample criteria of 89, 8 non-detects, geometric mean criteria = 35. The maximum value was recorded at Station 13446 in June 2001 and is an anomaly as all other values are <370. There are no problems with Enterococcus in this portion of the bay.

Segment 2492, Baffin Bay-

49.8 square miles.

The City of Kingsville is the only large city in the watershed. Most of the bay is surrounded by large ranches such as the King Ranch. There are only a few public access points.

The bay is considered a single AU, but for this water quality analysis, the bay was divided into four sections: (1) Baffin Bay, (2) Alazan Bay, (3) Cayo Del Grullo, and (4) Laguna Salado.

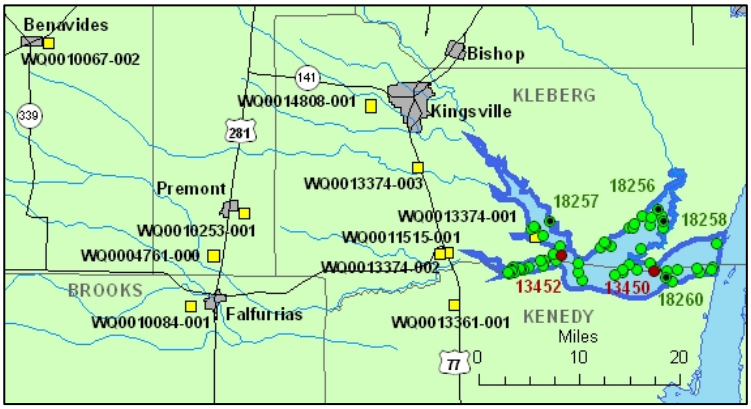


Figure 3.3 – 80: Baffin Bay

Active Wastewater Permits

WQ0004761-000 – El Paso Merchant Energy-Petroleum Company: 7,200 gpd via evaporation.

WQ0010067-002 – Duval County Conservation and Reclamation District: 40,000 gpd via Macho Creek to Los Olmos Creek to Baffin Bay.

WQ0010084-001 – Utility Board of Falfurias: 460,000 gpd via surface irrigation on 158 acres.

WQ0010253-001 – City of Premont: 430,000 gpd via surface irrigation of 150 acres of non-public access agricultural land.

WQ0011515-001 – Riviera ISD: 16,000 gpd via surface irrigation on 40 acres of agriculture land.

WQ0013361-001 – Sarita Sewer Service and WSC: 44,000 gpd via evaporation.

WQ0013374-001 – Kleberg County Kaufer Hubert Memorial Park: 33,000 gpd via Kaufer Lake to Hubert Lake to unnamed ditch to Cayo Del Grullo.

WQ0013374-002 – Riviera WCID: 60,000 gpd via drainage ditch to Salado Creek to Los Olmos Creek, to Baffin Bay.

WQ0013374-003 – County of Kleberg Ricardo WWTP: 48,500 gpd via drainage ditch to Jaboncillos Creek to Baffin Bay.

WQ0014808-001 – King Ranch Inc.: 25,500 gpd via evaporation. (New permit)

Water Quality Analysis
Baffin Bay
Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13450 – at CM 14	TCEQ	Quarterly	Conventional, Bacteria, Field	1973 – Present
13452 – at CM 36	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Water	1973 – Present
18105 – WSW of Marker 207 from fixed ICWW Navigation Marker 207 steer 252 degrees for 1.65 km				2002
18106 – from fixed Baffin Bay Navigation Marker 5 steer 230 at degrees for 0.373 km				2001
18107 – from fixed Baffin Bay Navigation Marker 5 steer 222 degrees for 0.834 km				2002
18108 – from fixed Baffin Bay Navigation Marker 8 steer 188 degrees for 1.288 km				2001
18109 – from fixed Baffin Bay Navigation Marker 8 steer 216 degrees for 0.806 km				2002
18110 – from fixed Baffin Bay Navigation Marker 12 steer 096 degrees for 0.383 km				2001
18111 – from fixed Baffin Bay Navigation Marker 12 steer 185 degrees for 1.931 km				2002
18112 – from fixed Baffin Bay Navigation Marker 12 steer 256 degrees for 0.959 km				2001
18113 – from fixed Baffin Bay Navigation Marker 12 steer 268 degrees for 2.686 km				2002
18114 – from fixed Baffin Bay Navigation Marker 20 steer 030 degrees for 2.272 km				2002
18115 – from fixed Baffin Bay Navigation Marker 20 steer 326 degrees for 1.116 km				2001
18116 – from fixed Baffin Bay Navigation Marker 24 steer 023 degrees for 1.885 km				2001
18117 – from fixed Baffin Bay Navigation Marker 24 steer 244 degrees for 0.498 km				2002
18118 – from fixed Baffin Bay Navigation Marker 24 steer 352 degrees for 0.845 km				2001
18119 – from fixed Baffin Bay Navigation Marker 26 steer 222 degrees for 0.118 km				2002
18120 – from fixed ICWW Navigation Marker 34				2001
18121 – from fixed Baffin Bay Navigation Marker 34 steer 196 degrees for 0.77 km				2002
18122 – from fixed Baffin Bay Navigation Marker 34 steer 342 degrees for 0.665 km				2001
18257 – from boat ramp at Hubert-Kaufer Park steer 044 degrees for 3.012 km				2002
18260 – from Marker 14 steer 167 Degrees For 0.771 K km m				2002

Only Enterococcus was measured at Stations 18257 and 18260.

DO (mg/l): 70 samples, ranging from 1.6 to 13.6, median value = 6.9, 1 value below screening level of 4.0, no trends. There are no problems with DO in the bay. No 24-Hr DO measurements have been taken.

pH (su): 70 samples, ranging from 7.2 to 8.8, median value = 8.2, criteria range is 6.5 to 9, no trends. There are no problems with pH in this portion of the bay.

Ammonia (mg/l): 70 samples, ranging from <0.02 to 0.37, median value = 0.02, 6 values above criteria value of 0.1, 48 non-detects, no trends. The maximum value occurred at Station 13450 in August 2003. All over values are <=0.21. There are no problems with ammonia in this portion of the bay.

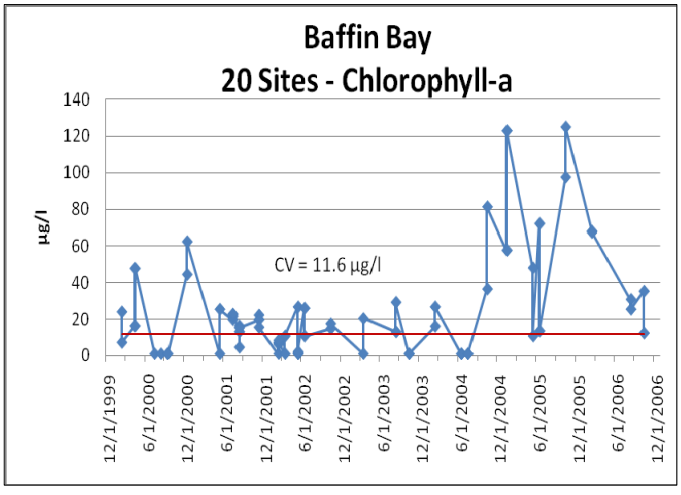
N+N (mg/l): 70 samples, ranging from <0.01 to 1.11, median value = 0.01, 2 values above criteria value of 0.17, 62 non-detects, no trends. The maximum value occurred at Stations 13450 and 13452 in March 2002. All over values are <=0.13. There are no problems with N+N in this portion of the bay.

OP (mg/l): 69 samples, ranging from <0.04 to 0.11, median value = 0.04, criteria value = 0.19, 58 values non-detects, no trends. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 70 samples, ranging from <0.04 to 0.44, median value is 0.1, 9 above criteria value of 0.21, 9 non-detects, no trends. All of the exceedences occurred prior to October 2002. There are no problems with total phosphorus in this portion of the bay.

Chlorophyll-a (µg/l): 70 samples, ranging from <1 to 125, median value = 15, 40 values above criteria value of 11.6, 16 non-detects, no trends. There is a concern for chlorophyll-a in the bay. Although there is no statistical trend, the values appear to be increasing. The source is unknown.

TSS (mg/l): 70 samples, ranging from 4 to 386, median value = 37, no trends. There are no problems with TSS in this portion of the bay.



Enterococcus (cfu): 60 samples, ranging from <10 to 195, median value = 10, geometric mean = 15, 4 samples exceed single sample criteria of 89, geometric mean criteria = 35, 34 non-detects. There are no problems with bacteria in this portion of the bay.

2492_01: Alazan Bay

Station Summary

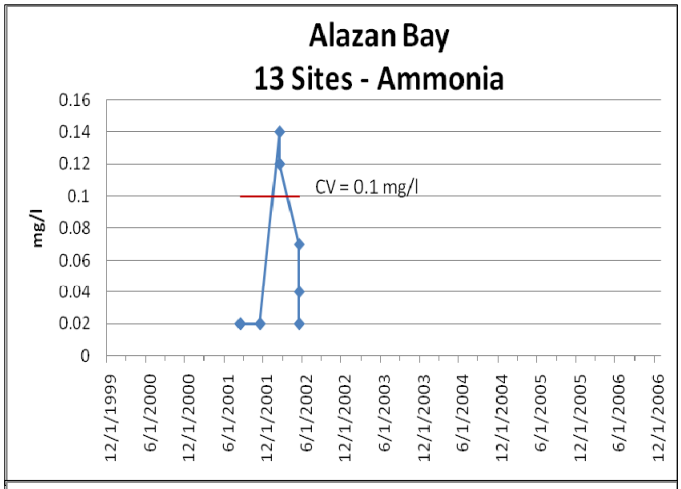
Site	Entity	Frequency	Parameter Groups	Date Range
18147 – mouth from Starvation Point steer 285 degrees for 4.151 km				2002
18148 – from Starvation Point steer 229 degrees for 2.813 km				2001
18149 – from Starvation Point steer 062 degrees for 2.15 km				2001
18150 – from Starvation Point steer 299 degrees for 3.677 km				2002
18151 – from Starvation Point steer 301 degrees for 3.931 km				2002
18152 – from Starvation Point steer 003 degrees for 4.364 km				2002
18153 – from Starvation Point steer 009 degrees for 4.4 km				2002
18154 – from Starvation Point steer 011 degrees for 5.057 km				2001
18155 – from Starvation Point steer 033 degrees for 5.687 km				2002
18156 – from Starvation Point steer 049 degrees for 6.613 km				2002
18157 – from Starvation Point steer 018 degrees for 6.589 km				2001
18158 – from Starvation Point steer 028 degrees for 6.855 km				2001
18159 – from Starvation Point steer 037 degrees for 7.913 km				2001
18256 – from Starvation Point steer 030 degrees for 8.268 km				2002
18258 – from Starvation Point steer 042 degrees for 7.265 km				2002

Only Enterococcus was measured at Stations 18256 and 18258.

DO (mg/l): 13 samples, ranging from 5.3 to 9.7, median value = 7.4, screening level = 4.0. There are no problems with DO in this portion of the bay. No 24-Hr DO measurements have been taken.

pH (su): 13 samples, ranging from 7.9 to 8.8, median value = 8.2, criteria range is 6.5 to 9. There are no problems with pH in this portion of the bay.

Ammonia (mg/l): 13 samples, ranging from <0.02 to 0.14, median value = 0.02, 3 values above criteria value of 0.1, 6 non-detects. There is a potential for a concern for this parameter in this portion of the bay. The source is unknown.

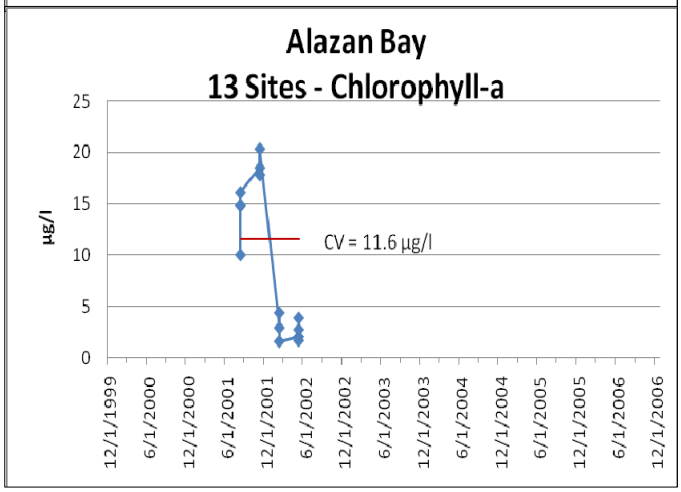


N+N (mg/l): 13 samples, the only non-detect was the same as the non-detect value of 0.05. There are no problems with N+N in this portion of the bay.

OP (mg/l): 13 samples, the only non-detect was the same as the non-detect value of 0.05. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 13 samples, ranging from <0.05 to 0.26, median value = 0.04, 1 value above criteria value of 0.21, 8 non-detects. There are no problems with total phosphorus in this portion of the bay.

Chlorophyll-a (µg/l): 13 samples, ranging from 2 to 20, median value = 4, 5 values above criteria value of 11.6. The concern for chlorophyll-a is for the entire bay, and this portion of the bay also show elevated values.



TSS (mg/l): 13 samples, ranging from 9 to 150, median value = 21. There are no problems with TSS in this portion of the bay.

Enterococcus (cfu): 15 samples, ranging from <10 to 53, median value = 10, geometric mean = 15, single sample criteria = 89, geometric mean criteria = 35, 6 non-detects. There are no problems with bacteria in this portion of the bay.

2492_01: Cayo Del Grullo

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
18124 – from fixed Baffin Bay Navigation Marker 40 Steer 347 degrees for 2.396 Km				2002
18126 – from Kaufer-Hubert Boat Ramp Steer 094 degrees for 1.226 km				2002
18127 – from Kaufer-Hubert Boat Ramp Steer 337 degrees for 1.067 km				2002
18128 – from Kaufer-Hubert Boat Ramp Steer 002 degrees for 1.207 km				2002
18129 – from Kaufer-Hubert Boat Ramp Steer 352 degrees for 1.384 km				2001

There is not enough data to make assumptions as to whether or not problems exist in this portion of the bay, so only the range and median are reported.

DO (mg/l): 5 samples, ranging from 6.1 to 11.7, median value is 6.7, screening level = 4.0. No 24-Hr DO measurements have been taken.

pH (su): 5 samples, ranging from 8.1 to 8.6, median value = 8.3, criteria range is 6.5 to 9.

Ammonia (mg/l): 5 samples, ranging from <0.02 to 0.06, median value = 0.02, criteria value = 0.1, 2 non-detects.

N+N (mg/l): 5 samples, all non-detects.

OP (mg/l): 5 samples, ranging from <0.05 to 0.09, median value = 0.05, criteria value = 0.19, 3 non-detects.

Total Phosphorus (mg/l): 5 samples, ranging from <0.05 to 0.29, median value = 0.13, 2 values above criteria value of 0.21, 2 non-detects.

Chlorophyll-a (µg/l): 5 samples, ranging from 2 to 26, median value = 8, 2 values above criteria value of 11.6.
TSS (mg/l): 5 samples, ranging from 12 to 144, median value = 87.

Enterococcus (cfu): 5 samples, ranging from <10 to 42, median value = 20, geometric mean = 22, single sample criteria =89, geometric mean criteria = 35, 1 non-detect.

2492_01: Laguna Salado

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
18123 – from fixed Baffin Bay Navigation Marker 40 steer 277 degrees for 1.04 km				2001
18125 – from fixed Baffin Bay Navigation Marker 40 steer 305 degrees for 1.741 km				2001
18131 – from fixed Baffin Bay Navigation Marker 40 steer 272 degrees for 2.81 km				2001
18132 – from fixed Baffin Bay Navigation Marker 40 steer 258 degrees for 3.103 km				2002
18133 – from fixed Baffin Bay Navigation Marker 40 steer 254 degrees for 3.115 km				2001
18134 – from fixed Baffin Bay Navigation Marker 40 steer 272 degrees for 3.276 km				2002
18135 – from fixed Baffin Bay Navigation Marker 40 steer 258 degrees for 5.159 km				2002
18136 – from fixed Baffin Bay Navigation Marker 40 steer 256 degrees for 5.993 km				2001
18137 – from fixed Baffin Bay Navigation Marker 40 steer 257 degrees for 6.366 km				2001
18138 – from fixed Baffin Bay Navigation Marker 40 steer 259 degrees for 6.489 km				2002
18139 – from fixed Baffin Bay Navigation Marker 40 steer 261 degrees for 7.314 km				2001
18140 – from fixed Baffin Bay Navigation Marker 40 steer 261 degrees for 7.356 km				2002
18141 – from fixed Baffin Bay Navigation Marker 40 steer 255 degrees for 7.304 km				2001
18142 – from fixed Baffin Bay Navigation Marker 40 steer 259 degrees for 7.575 km				2002
18143 – from fixed Baffin Bay Navigation Marker 40 steer 259 degrees for 7.625 km				2001
18144 – from fixed Baffin Bay Navigation Marker 40 steer 257 degrees for 7.672 km				2002
18145 – from fixed Baffin Bay Navigation Marker 40 steer 255 degrees for 8.082 km				2002
18146 – from fixed Baffin Bay Navigation Marker 40 steer 257 degrees for 8.112 km				2001

DO (mg/l): 18 samples, ranging from 5 to 8.9, median value = 7.4, screening level = 4.0. There are no problems with low DO in this portion of the bay. No 24-Hr DO measurements have been taken.

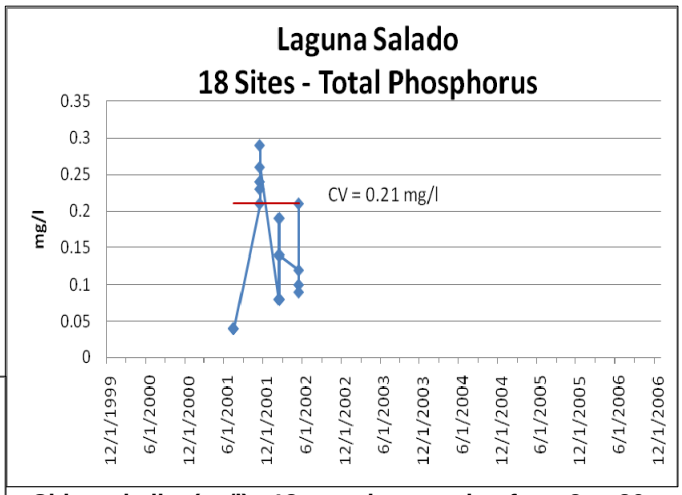
pH (su): 18 samples, ranging from 8.1 to 8.7, median value = 8.4, criteria range = 6.5 to 9. There are no problems with pH in this portion of the bay.

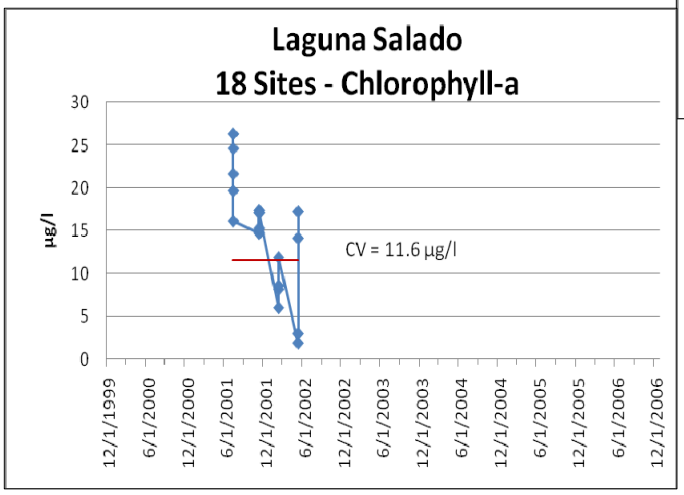
Ammonia (mg/l): 18 samples, ranging from <0.02 to 0.08, median value = 0.02, criteria value = 0.1, 11 non-detects.
There are no problems with ammonia in this portion of the bay.

N+N (mg/l): 18 samples, all non-detects. There are no problems with N+N in this portion of the bay.

OP (mg/l): 5 samples, ranging from <0.05 to 0.09, median value = 0.05, criteria value = 0.19, 8 non-detects. There are no problems with OP in this portion of the bay.

Total Phosphorus (mg/l): 18 samples, ranging from <0.04 to 0.29, median value = 0.11, 4 values above criteria value of 0.21, 5 non-detects. There is a potential for a concern for this parameter in this portion of the bay. The source is unknown.





Chlorophyll-a (µg/l): 18 samples, ranging from 2 to 26, median value = 16, 13 values above criteria value of 11.6. The concern for chlorophyll-a is for the entire bay, and this portion of the bay also shows elevated values.

TSS (mg/l): 18 samples, ranging from 9 to 100, median value = 36. There are no problems with TSS in this portion of the bay.

Enterococcus (cfu): 18 samples, ranging from <10 to 53, median value = 10, geometric mean = 14, single sample criteria = 89, geometric mean criteria = 35, 9 non-detects. There are no problems with bacteria in this portion of the bay.

Segment 2493, South Bay, 7.8 square miles.

South Bay is the southernmost bay in Texas and is part of the South Bay Coastal Preserve. It supports the largest concentration of oysters in the Lower Laguna Madre and is relatively inaccessible.

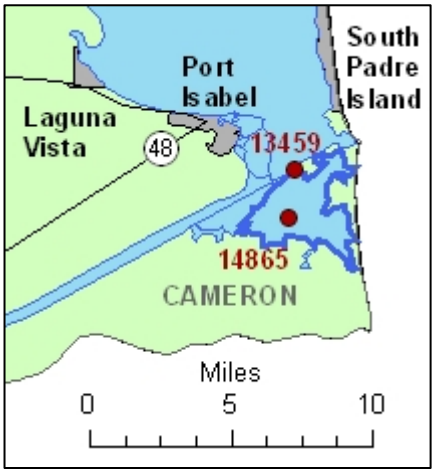


Figure 3.3 – 81: South Bay

Active Wastewater Permits

There are no active wastewater permits in this segment.

Water Quality Analysis

Station Summary

Site	13459 – near ship CM 17	14865 – middle of bay
Entity	TCEQ	
Frequency	Quarterly	
Parameter Groups	Conventional, Bacteria, Field	
Date Range	1969 – Present	1985 – Present

DO (mg/l): 34 samples, ranging from 4.4 to 10.3, median value = 7.8, 1 value below screening level of 5.0, no trends. There are no problems with low DO in the bay. No 24-Hr DO measurements have been taken.

pH (su): 37 samples, ranging from 7.8 to 10.9, median value = 8.2, 1 value above criteria range of 6.5 to 9, no trends. There are no problems with pH in the bay.

Ammonia (mg/l): 40 samples, ranging from <0.05 to 0.3, median value = 0.05, 2 values above criteria value of 0.1, 36 non-detects, no trends. There are no problems with ammonia in the bay.

N+N (mg/l): 40 samples, ranging from <0.04 to 1.48, median value = 0.04, 2 values above criteria value of 0.17, 38 non-detects, no trends. The exceedences occurred at Station 13459 in March 2001 and March 2002. There are no problems with N+N in the bay.

OP (mg/l): 39 samples, ranging from <0.04 to 0.05, median value = 0.04, criteria value = 0.19, 38 non-detects, no trends. There are no problems with OP in the bay.

Total Phosphorus (mg/l): 40 samples, ranging from <0.05 to 0.15, median value = 0.05, criteria value = 0.21, 30 non-detects, no trends. There are no problems with total phosphorus in the bay.

Chlorophyll-a (µg/l): 40 samples, all non-detects. There are no problems with chlorophyll-a in the bay.

TSS (mg/l): 39 samples, ranging from 8 to 122, median value = 17, no trends. There are no problems with TSS in the bay.

Enterococcus (cfu): 23 samples, ranging from <10 to >2419, median value = 29, geometric mean = 32, 4 samples exceed single sample criteria of 89, geometric mean criteria = 35, 5 values non-detects. The maximum value occurred at Station 13459 in June 2001. All other values are <140. There are no problems with Enterococcus in this portion of the bay.

Segment 2494, Brownsville Ship Channel,

1.5 square miles.

The ship channel is part of the Port of Brownsville, a major center of industrial development with over 230 companies doing business there.

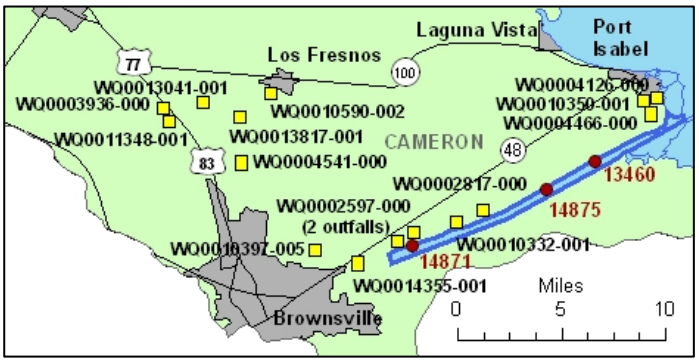


Figure 3.3 – 82: Brownsville Ship Channel

Active Wastewater Permits

WQ0002597-000 – Brownsville Navigation District: 100,000 gpd via evaporation.

WQ0002817-000 – Brownsville Navigation District Fishing Harbor: 250,000 gpd.

WQ0003936-000 – Valley MUD No. 2: 500,000 gpd via a series of San Martin Drainage ditches to San Martin Lake to the Brownsville Ship Channel.

WQ0004126-000 – Texas Pack, Inc: 150,000 gpd via irrigation on 4.5 acres.

WQ0004466-000 – Lone Star Hatchery, Inc.: 500,000 gpd via pipeline to Port Isabel Turning Basin to Port Isabel Channel to Brownsville Ship Channel.

WQ0004541-000 – Southmost Regional Water Authority and Brownsville Public Utilities Board: 4,000,000 gpd via a series of Cameron County Drainage District ditches to San Martin Lake to Brownsville Ship Channel.

WQ0010332-001 – Brownsville Navigation District Northside Plant: 98,000 gpd via drainage ditch to Brownsville Ship Channel.

WQ0010350-001 – Laguna Madre Water District Port Isabel Plant: 1,100,000 gpd via tidal mud flat to Vadia Ancha to Brownsville Ship Channel. Also provides for monofill sludge on permittee property.

WQ0010397-005 – Brownsville Public Utilities N. Robindale Plant: 10,000,000 gpd via Cameron County Drainage Ditch No.1 to San Martin Lake to the Brownsville Ship Channel.

WQ0010590-002 – City of Los Fresnos: 1,000,000 gpd via unnamed ditch to via a series of Cameron County Drainage District ditches to San Martin Lake to Brownsville Ship Channel.

WQ0011348-001 – Valley MUD No. 2: 400,000 gpd via a series of San Marin Drainage Ditches to San Martin Lake to Brownsville Ship Channel.

WQ0013041-001 – John Frias (St. Francis of Assisi)

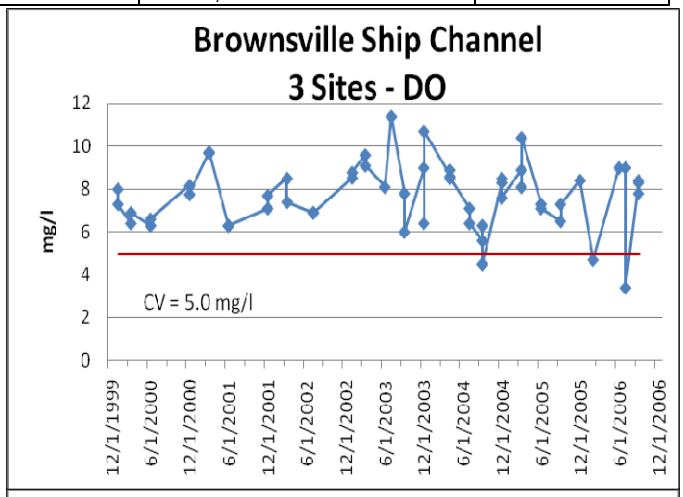
WQ0013817-001 – Olmito WSC (Olmito Plant): 750,000 gpd via a series of Cameron County Drainage District ditches to San Martin Lake to Brownsville Ship Channel.

WQ0014355-001 – Brownsville Navigation District: 100,000 gpd via a series of Cameron County Drainage District ditches to San Martin Lake to Brownsville Ship Channel.

Water Quality Analysis
Station Summary

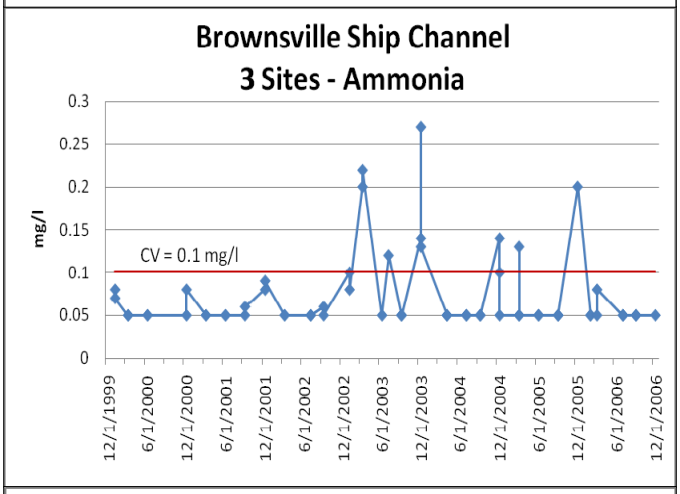
Site	Entity	Frequency	Parameter Groups	Date Range
13460 – near ship CM35 / black buoy	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Sediment	1969 – Present
14871 – mid-channel 595 m east of SH 48 at Foust Rd.	TCEQ	Quarterly	Conventional, Bacteria, Field	2003 – Present
14875 – mid-channel at entrance to San Martin Lake	TCEQ	Quarterly	Conventional, Bacteria, Field, 2 Metals in Sediment	1997 – Present

DO (mg/l): 56 samples, ranging from 3.4 to 11 .4, median value = 7.8, 3 values below screening level of 5.0, no trends. There are no apparent problems with low DO in the ship channel based on the data used for this water quality analysis, but the 2008 Assessment reports that 9 of 57 samples exceed the criteria. The difference may be that TCEQ included readings from multiple depths and this analysis used only surface samples. No 24-Hr DO measurements have been taken.



pH (su): 64 samples, ranging from 7.4 to 10.4, median value = 8.1, 2 values above criteria range of 6.5 to 9, no trends. There are no problems with pH in the ship channel.

Ammonia (mg/l): 67 samples, ranging from <0.05 to 0.27, median value = 0.05, 9 values above criteria value of 0.1, 46 non-detects, no trends. The 2008 Assessment does not list this parameter as a concern since <20% of the samples exceeded the criteria, and even though there is no statistical trend, the values appear to be increasing over time. All three stations recorded exceedences. The source may be from the numerous WWTP permit discharges or operations at the Port of Brownsville.

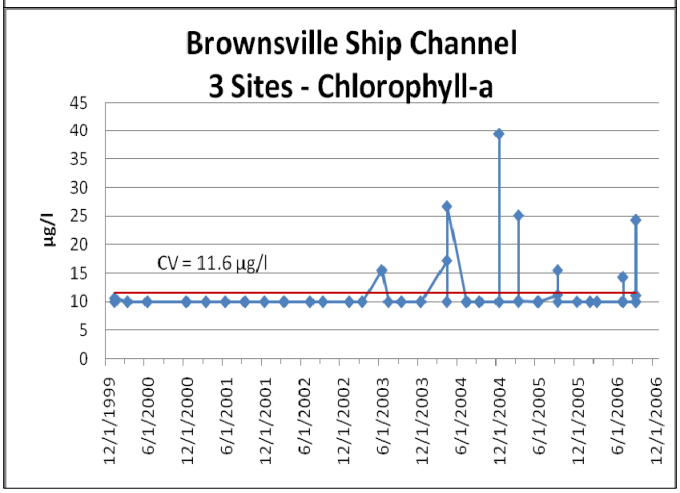


N+N (mg/l): 66 samples, ranging from <0.04 to 1.52, median value is 0.04, 4 values above criteria value of 0.17, 57 non-detects, no trends. There are no problems with N+N in the ship channel.

OP (mg/l): 60 samples, ranging from <0.04 to 0.09, median value = 0.04, criteria value = 0.19, 54 non-detects, no trends. There are no problems with OP in the ship channel.

Total Phosphorus (mg/l): 66 samples, ranging from <0.05 to 0.66, median value = 0.6, 4 values above criteria value of 0.21, 21 non-detects, no trends. There are no problems with total phosphorus in the ship channel.

Chlorophyll-a (µg/l): 66 samples, ranging from <10 to 39, median value = 10, 8 values above criteria value of 11.6, 50 non-detects, no trends. Like ammonia, chlorophyll-a has the potential of becoming a concern. This may be related to the fact that the harbor is a dead-end channel and may not have much water circulation.



TSS (mg/l): 66 samples, ranging from 6 to 153, median value = 18, no trends. There are no problems with TSS in the ship channel.

Enterococcus (cfu): 42 samples, ranging from <1 to 1733, median value = 28, geometric mean = 24, 8 samples exceed single sample criteria = 89, geometric mean criteria = 35, 8 values non-detects. The maximum value was recorded at Station 13460 in June 2001. All other values are <725. There are no problems with bacteria in this portion of the ship channel.

Segment 2494A, Port Isabel Fishing Harbor,

0.2 square miles.

The fishing harbor is connected directly to the Laguna Madre to the north and indirectly to the Brownsville ship Channel to the south. The properties along the canals are primarily residential properties.

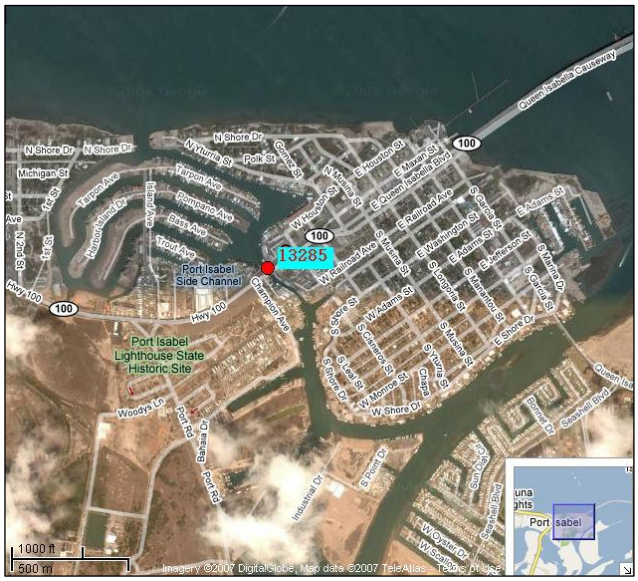


Figure 3.3 – 83: Port Isabel Fishing Harbor

Active Wastewater Permits

There are no active wastewater permits in this segment.

Water Quality Analysis

Station Summary

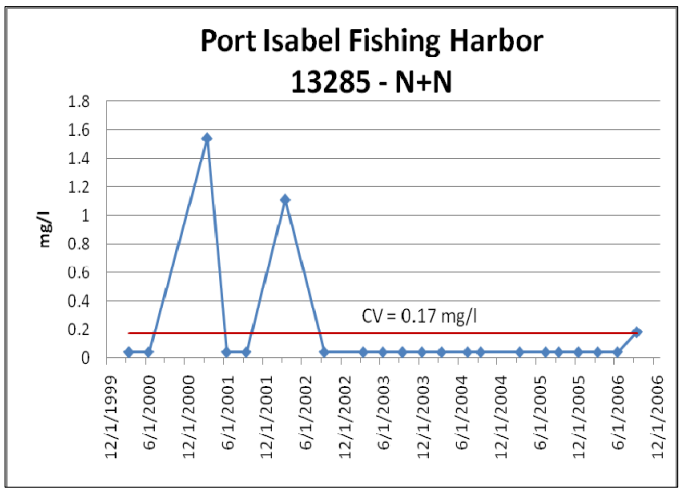
Site	13285 – Port Isabel Fishing Harbor
Entity	TCEQ
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field, 2 Metals in Sediment
Date Range	1984 – Present

DO (mg/l): 20 samples, ranging from 4 to 8.9, median value = 7.2, screening level = 4.0, no trends. There are no problems with low DO in the fishing harbor. No 24-Hr DO measurements have been taken.

pH (su): 22 samples, ranging from 7.7 to 11, median value is 8, 1 value above upper criteria value of 9, no trends. There are no problems with pH in the fishing harbor.

Ammonia (mg/l): 21 samples, ranging from <0.05 to 0.06, median value = 0.05, criteria value = 0.1, 18 non-detects, no trends. There are no problems with ammonia in the fishing harbor.

N+N (mg/l): 21 samples, ranging from <0.04 to 1.54, median value = 0.04, 3 values above criteria value of 0.17, 18 non-detects, no trends. There are no apparent problems with N+N in the fishing harbor based on the data used for this water quality analysis, but the 2008 Assessment reports that 9 of 14 samples exceed the criteria. This difference may be that only one of the three parameter codes for this parameter were evaluated and some of the non-detect levels were reported higher that the criteria.

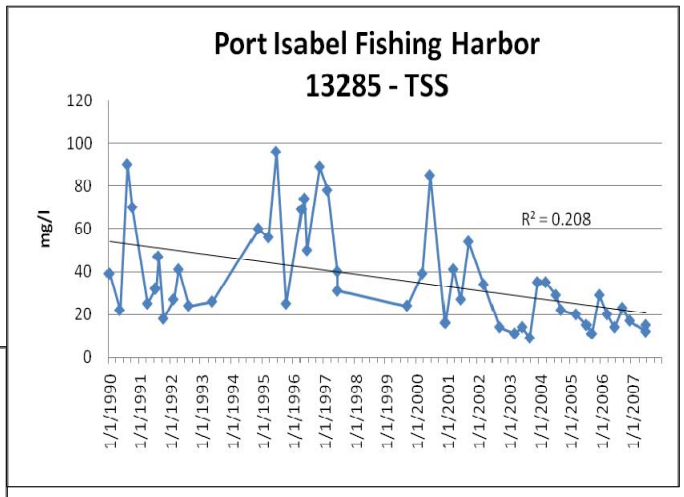


OP (mg/l): 20 samples, all non-detects. There are no problems with OP in the fishing harbor.

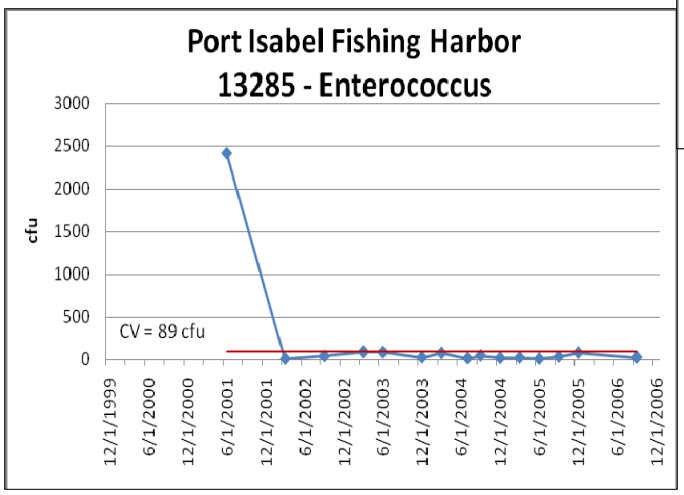
Total Phosphorus (mg/l): 22 samples, ranging from <0.05 to 0.09, median value = 0.05, criteria value = 0.21, 19 non-detects, no trends. There are no problems with total phosphorus in the fishing harbor.

Chlorophyll-a (µg/l): 22 samples, ranging from <3 to 3.4, median value = 3, criteria value = 11.6, 20 non-detects, no trends. There are no problems with chlorophyll-a in the fishing harbor.

TSS (mg/l): 22 samples, ranging from 9 to 85, median value = 22, decreasing trend. There are no problems with suspended solids in fishing harbor.



Enterococcus (cfu): 15 samples, ranging from <10 to >2419, median value = 35, geometric mean = 44, 2 samples exceed single sample criteria of 89, geometric mean criteria = 35. 1 non-detect. There is a concern Enterococcus in the fishing harbor based on the geometric mean exceeding the criteria. However, the maximum is an anomaly, and if that value is removed, the geometric mean is met.



Segment 2501, Gulf of Mexico, 7.8 square miles.

Active Wastewater Permits

There are no active wastewater permits in this segment.

The gulf is divided into ten AUs, five of which are adjacent to NRA's area a responsibility for CRP: (06) Port Aransas area, (07) area between Port Aransas and Port Mansfield, (08) Port Mansfield area, (09) area between Port Mansfield and Port Aransas, and (10) Port Isabel area.

Only the Port Aransas and Port Isabel AUs have any data during the assessment period.

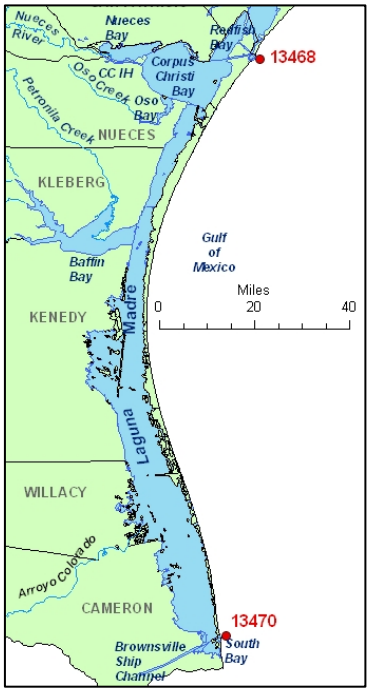


Figure 3.3 – 84
Gulf of Mexico

Water Quality Analysis

2501_06: Port Aransas Area

Station Summary

Site	13468 – at Aransas Pass 165 m south and 413 m east of tip of South Jetty near Marker R-7
Entity	TCEQ
Frequency	Quarterly
Parameter Groups	Conventional, Bacteria, Field
Date Range	1969 – Present

DO (mg/l): 28 samples, ranging from 5.5 to 10.1, median value = 7.2, screening level = 5.0, no trends. There are no problems with low DO in this area of the gulf. No 24-Hr DO measurements have been taken.

pH (su): 27 samples, ranging from 7.1 to 8.3, median value = 8.1, criteria range is 6.5 to 9, no trends. There are no problems with pH in this area of the gulf.

Ammonia (mg/l): 27 samples, ranging from <0.05 to 0.07, median value = 0.05, criteria value = 0.1, 25 non-detects, no trends. There are no problems with ammonia in this area of the gulf.

N+N (mg/l): 27 all non-detects, no trends. There are no problems with N+N in this area of the gulf.

OP (mg/l): 27 samples, ranging from <0.04 to 0.1, median value = 0.04, criteria value = 0.19, 25 non-detects, no trends. There are no problems with OP in this area of the gulf.

Total Phosphorus (mg/l): 26 samples, ranging from <0.05 to 0.11, median value = 0.05, criteria value = 0.21, 20 non-detects, no trends. There are no problems with total phosphorus in this area of the gulf.

Chlorophyll-a (µg/l): 27 samples, all non-detects. There are no problems with chlorophyll-a in this area of the gulf.

TSS (mg/l): 26 samples, ranging from 6 to 68, median value = 18, no trends. There are no problems with TSS in this area of the gulf.

Enterococcus (cfu): 22 samples, ranging from <10 to 23, median value = 10, geometric mean = 11, single sample criteria = 89, geometric mean criteria = 35, 17 values non-detects. There are no problems with bacteria in this area of the gulf.

DSHS lists the entire Gulf of Mexico as being impaired for mercury in edible fish tissue (King Mackerel > 43").

2501_06: Port Isabel Area

Station Summary

Site	Entity	Frequency	Parameter Groups	Date Range
13470 – at Port Isabel, 1.18 km east and 35 m south of Brazos Santiago Pass North Jetty	TCEQ	Quarterly	Conventional, Bacteria, Field	1969 – Present

DO (mg/l): 11 samples, ranging from 4.5 to 10.8, median value = 7.9, 1 value below screening level of 5.0. There are no problems with low DO in this area of the gulf. No 24-Hr DO measurements have been taken.

pH (su): 13 samples, ranging from 7.7 to 8.2, median value = 8.1, criteria range is 6.5 to 9. There are no problems with pH in this area of the gulf.

Ammonia (mg/l): 13 samples, all non-detects. There are no problems with ammonia in this area of the gulf.

N+N (mg/l): 13 samples, all non-detects. There are no problems with N+N in this area of the gulf.

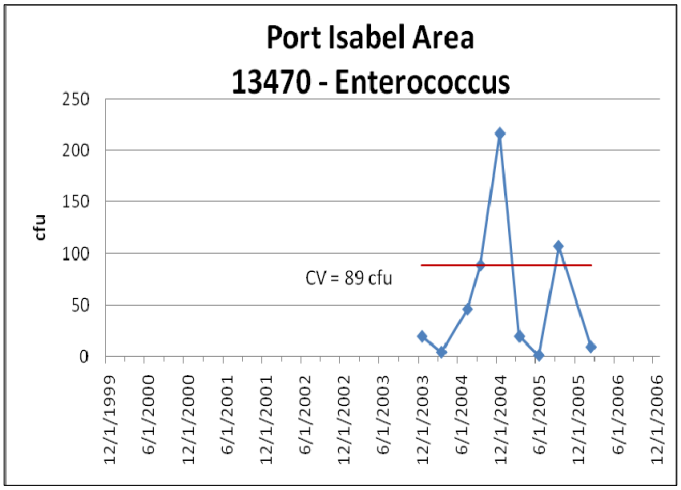
OP (mg/l): 13 samples, all non-detects. There are no problems with OP in this area of the gulf.

Total Phosphorus (mg/l): 13 samples, ranging from <0.05 to 0.06, median value = 0.05, criteria value = 0.21, 10 non-detects. There are no problems with total phosphorus in this area of the gulf.

Chlorophyll-a (µg/l): 13 samples, ranging from <3 to 5.7, median value = 3, criteria value = 11.6, 12 non-detects. There are no problems with chlorophyll-a in this area of the gulf.

TSS (mg/l): 13 samples, ranging from 4 to 41, median value = 1. There are no problems with TSS in this area of the gulf.

Enterococcus (cfu): 9 samples, ranging from <1 to 217, median value = 19, geometric mean = 22, 2 samples exceed single sample criteria of 89, geometric mean criteria = 35, 1 non-detect. It is possible that bacteria may become a concern or impairment in the 2010 Assessment. To date, four additional data points have been collected, one of which exceeds the single sample criteria (291), but the geometric mean remains about the same. The source is unknown.



DSHS lists the entire Gulf of Mexico as being impaired for mercury in edible fish tissue (King Mackerel > 43").

4.0 RECOMMENDATIONS and CONCLUSIONS

As this report was being compiled, a number of recommendations for additional work were identified. The following paragraphs summarize these recommendations.

Segment 2004 Aransas River Above Tidal: Additional 24-Hr DO measurements are needed at Station 12952 in order to confirm or remove the concern for low DO. Four are scheduled for FY 2009.

Segment 2103 Lake Corpus Christi (AU_01): OP sampling will be resumed at Station 12967 in FY 2009 in order to confirm or remove the concern this parameter.

Segment 2103 Lake Corpus Christi (AU_02): Sampling was discontinued in this AU due to accessibility issues. At that time, total phosphorus values appeared to be rising as the lake level fell. Chlorophyll-a is listed as a concern. Sampling should be resumed in this AU, if possible, to monitor these parameters.

Segment 2104 Nueces River Above Frio River (AU_02): pH shows a decreasing trend in this AU. The values are well within the criteria range (median value = 7.9 su), but there could be a concern in the future if this trend continues. It would be beneficial to try and determine why the pH is decreasing in this section of the river.

Segment 2106 Nueces River / Lower Frio River: The number of exceedences for chlorophyll-a in both of the AUs in this segment are just above 25%, but they were not listed as having a concern for this parameter. It is possible that this will become a concern in future assessments. It would be beneficial to try and determine why so many of the samples exceed the criteria.

Segment 2109 Leona River (AU_03): There are two monitoring sites in this assessment – 12989 and18418. Combined, the DO grab samples do not indicate any problems, but all of the exceedences occurred at the most upstream site – 18418. 24-Hr DO measurements would help determine whether or not there is a potential for a future DO impairment in this AU.

Segment 2204 Petronila Creek Above Tidal (AU_02): Routine monitoring in this AU has not been conducted because this part of the creek is usually dry. A new WWTP permit for a new prison has been permitted for 150,000 gpd. It may be possible to begin routine monitoring in FY 2010.

Segment 2492 Baffin Bay: Alazan Bay and Laguna Salado, arms of Baffin Bay, do not have any routine monitoring stations, but were sampled during a special study. Baffin Bay is listed as having a concern for chlorophyll-a, and both Alazan Bay and Laguna Salado had elevated levels of this parameter. Alazan Bay also had high levels of ammonia and Laguna Salado had high levels of total phosphorus. Routine monitoring should be implemented is these sections in order to determine is there are concerns for these parameters.

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