Final Report

AGREEMENT: 01-072-550-0

GREENVILLE BANNING CHANNEL URBAN RUNOFF DIVERSION PROJECT

COUNTY OF ORANGE PUBLIC FACILITIES AND RESOURCES DEPARTMENT WATERSHED AND COASTAL RESOURCES

Prepared By: Max Andersen, PE April 20, 2003

Photo No. 1 - The Greenville Banning Channel Urban Runoff Diversion Facility

The above photo was flown in March of 2003 prior to the activation of the facility. The photo is looking West. The dam is installed but is deflated due to anticipated storm events. The Greenville Banning Channel is located adjacent to the Santa Ana River. The arrows indicate the direction of flow. The pump station and the dam are located in the bottom half of the picture. The discharge line from the pump station is carried over the Greenville Banning Channel and over the Santa Ana River.

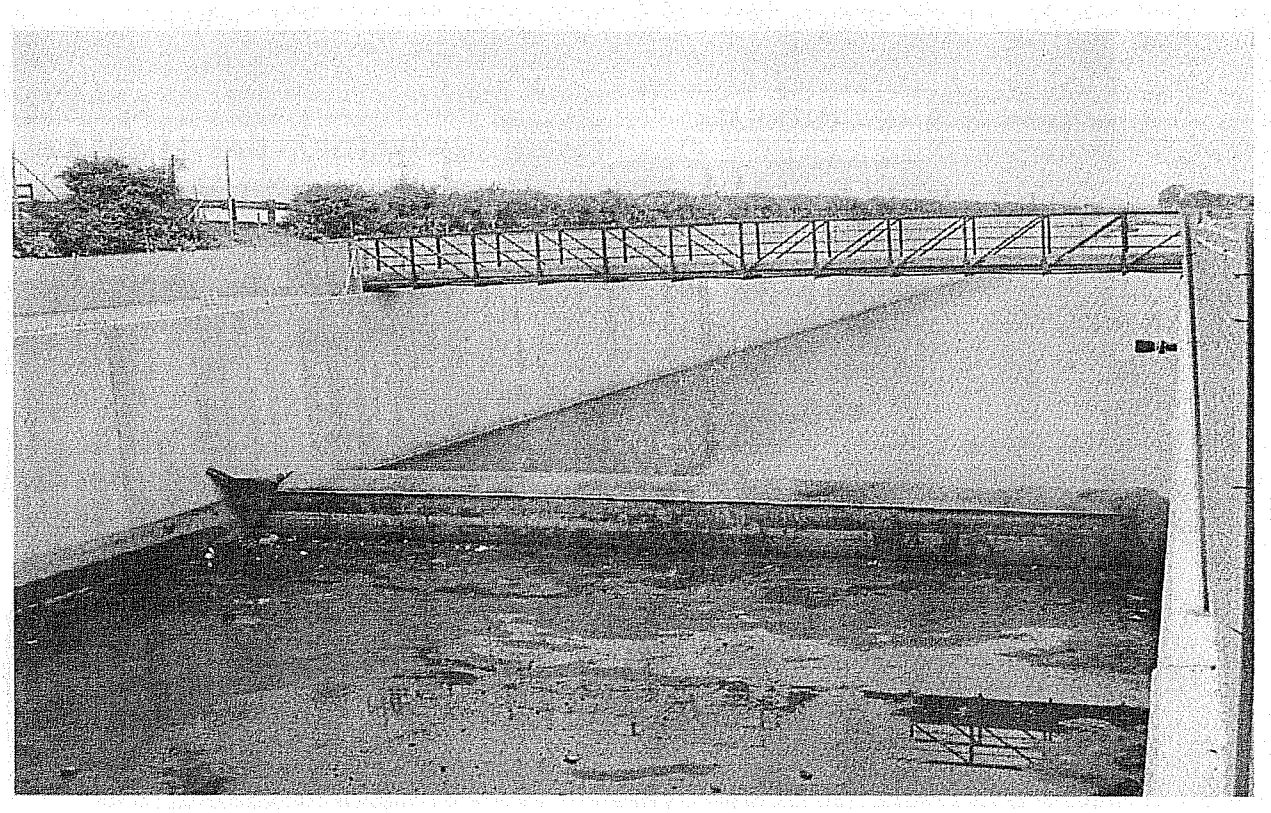


Photo No. 2 – The Greenville Banning Channel Diversion Dam

The Greenville Banning Channel Dam is shown inflated. The photo was taken in June of 2003 and is looking upstream (North). The water on the down stream side of the dam is left by the tide. Over the years sediments have settled on the concrete bottom evidenced by the dark brown color. The high tide line is visible on the wall. Trash occasionally floats in with the tide and might get stuck on the bottom while the tide retreats. In the top half of the photo the utility bridge for the diversion discharge spans the channel.

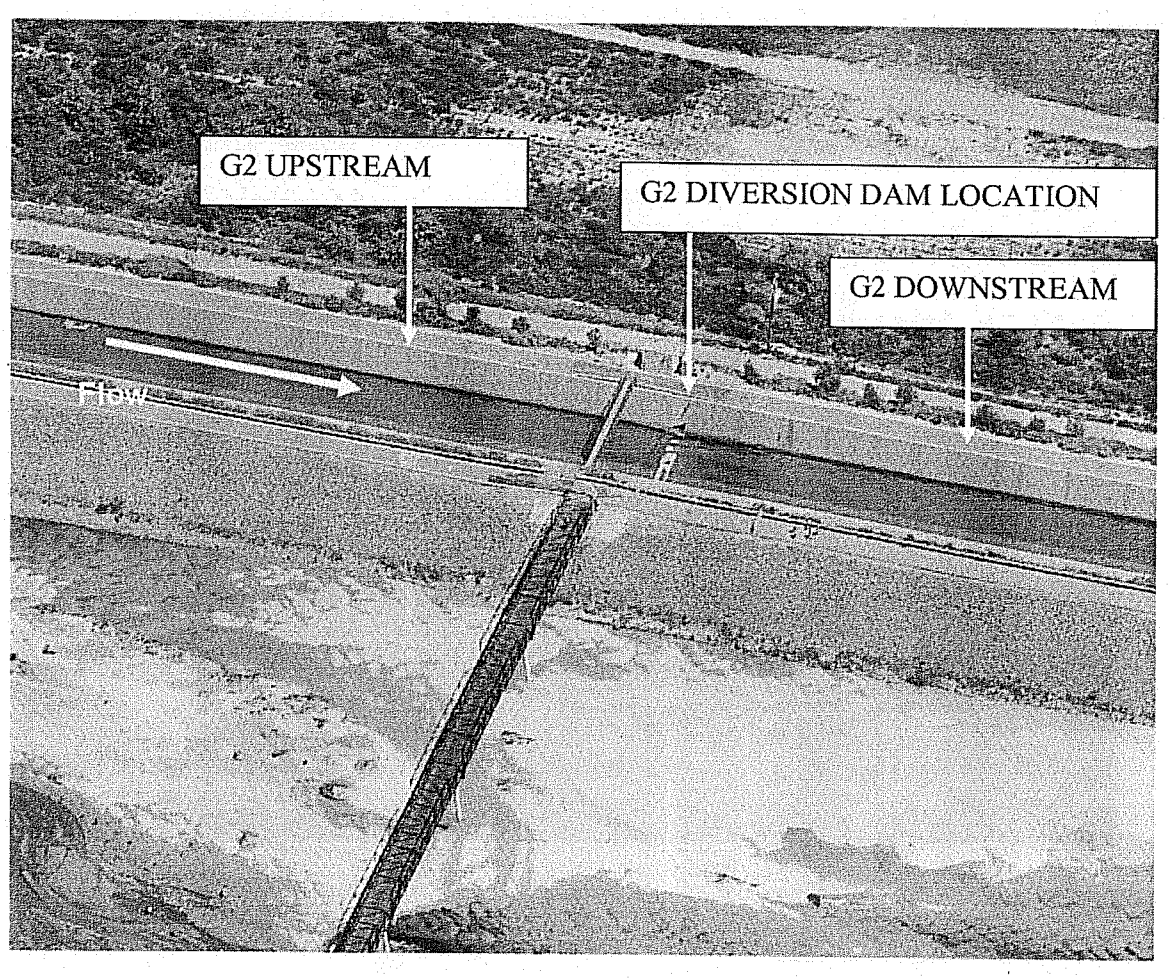
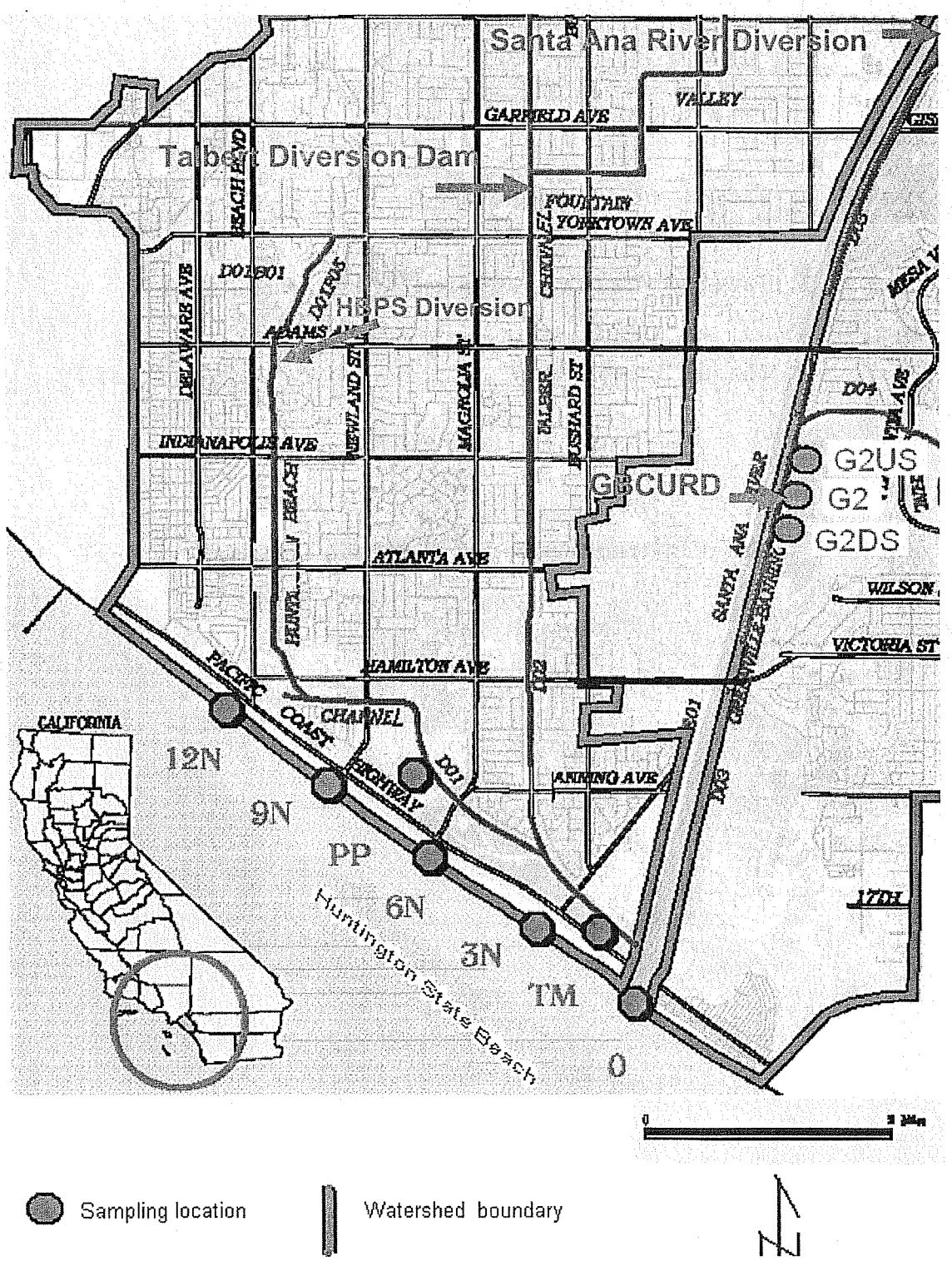


Photo No. 3 Sampling location at the Greenville Banning Channel diversion dam

The photo is looking East and shows three locations. G2 is the location for the Bridgestone inflatable rubber dam. G2 Upstream (G2 U/S) is located 200 feet upstream of the dam. G2 Downstream (G2 D/S) is located 200 feet down stream of the dam.



MAP OF DIVERSION FACILITIES AND SAMPLING LOCATIONS

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FINAL REPORT FOR THE GREENVILLE BANNING CHANNEL URBAN RUNOFF DIVERSION PROJECT

INTRODUCTION

This report is the Final Report for the Clean Beaches Initiative Grant that funded the construction of the diversion facility on the Greenville Banning Channel (GBC).

Ocean waters along 4.5 miles of Huntington State Beach and Huntington City Beach were closed to human contact for two months during the summer of 1999. The OCSD monitoring program initially revealed a pattern of bacteria suggesting a sewage leak of considerable magnitude. Later that summer and after certain sewer lines had been repaired, the profile of bacterial indicators at the beach changed from one suggestive of sewage to one more typical of urban runoff.

On October 15, 1999, the Santa Ana Regional Water Quality Control Board (Region 8) issued a Section 13267 letter to the County of Orange and five cities requesting:

- A technical report that provides a plan to identify, characterize and control sources that contribute to the coliform bacteria problems in the Huntington Beach area; and
- To submit by November 17, 1999 all water quality data collected by the County of Orange and the Co-Permittees during the investigation of the Huntington Beach beach closures; a proposed monitoring plan, including time schedules, to assess concentrations of indicator bacteria species throughout the storm drain systems of the Talbert Channel, Lower Santa Ana River and Greenville Banning Channel; and a plan to identify and control sources which may be contributing to bacteria concentrations in urban run-off.

In response to the 13267 directive, the County of Orange constructed the four diversion facilities to divert all of the urban runoff low flow water from the Huntington Beach Channel, Talbert Channel, Santa Ana River and the Greenville Banning Channel.

The project goal for the construction of the runoff diversion facilities in the Talbert Lower Santa Ana River Watershed is to reduce the number of beach-mile-days (BMD) postings at Huntington State Beach by diverting the urban runoff water to the Orange County Sanitation District (OCSD) for treatment. The Greenville Banning Channel Urban Runoff Diversion (GBCURD) facility is one of four facilities that the County of Orange completed in year 2002 - 2003. The diversion facility for the GBC intercepts all dry weather urban runoff in the channel and prevents the runoff water and channel low flows from reaching the ocean at the Huntington State Beach. The three other diversion facilities,

Huntington Beach Pump Station, Talbert Channel, and Santa Ana River Urban Runoff Diversion facilities, are addressed peripherally in this report.

A map of all of the diversion facilities and the location of the sample stations is included as Map No. 1, Page IV

SCOPE OF THE PROJECT

The State Water Resources Control Board (SWRCB) awarded a grant contract No. 01-772-550-0 to the County of Orange to plan, design and implement the Greenville-Banning Channel Urban Runoff Diversion (GBCURD) project.

The Budget Act of 2001 (SB739) appropriated $1,000,000 from the Coastal Nonpoint Source Control (CNPSC) subaccount established in the Costa-Machado Water Act of 2000 to County of Orange for diverting the urban runoff in the Talbert-Lower Santa Ana River Watershed, an area of 16,575 acres. By May 2003, the County of Orange had implemented diversions on each of the major drainage ways in this watershed that includes the Santa Ana River (SAR), the Talbert Channel, the Huntington Beach Channel and the Greenville-Banning Channel. Approximately 90% of the urban runoff in the watershed is captured by diversion facilities at these four flood control channels and diverted to OCSD

PROJECT DESCRIPTION AND TECHNIQUES

The Orange County Flood Control District (OCFCD) executed an on-call contract for engineering services with Moffat and Nichol Engineers on October 3, 2000 for the design of the GBCURD. The target date for completion of construction was May, 2002. Complications on acquisition of construction and utility easements for the GBCURD delayed the advertisement of this project to December 18, 2001. In an effort to meet the target date for the completion of construction, OCFCD purchased the dam for the GBCURD from Bridgestone International on November 16, 2001 ahead of the advertising of the GBCURD but together with the purchase for the Talbert Channel Diversion Dam mention earlier in this report. The construction contractor, KEC Engineering, submitted the low bid of $897,000 for the GBCURD project. Six other construction contractors submitted bids ranging from $900,000 to $1.5 million. The construction contract was awarded to KEC Engineering, Inc. on February 14, 2002.

The inflatable rubber dam is 6 ½ feet high and 60 feet long and was custom manufactured by Bridgestone at the cost of $300,000. The dam was installed in the GBC upstream of the confluence with the Santa Ana River (SAR) and approximately 13,000 feet from the ocean. Tidewater was computed to not to exceed the height of the dam except during rare events of storm surges. Urban runoff and channel low flows are held behind the dam where pumps and

pipelines transport the water to a sanitary sewer connection about 4000 feet away from the diversion facility. Please see Photo No. 1 and Photo No. 2

The diversion facility pump station is located immediately adjacent to the flood control channel. The runoff water flows by gravity from the channel to the wet well under the pump station. Two submersible electrical pumps with a capacity of 500 gallons per minute GPM (each) alternate at lifting the water 25 feet from a wet well to a gravity discharge line. The total length of the 10-inch high density poly-ethylene (HDPE) discharge line is approximately 4000 linear feet (LF).

Equipment operating data and water level information are collected and transmitted via the Scada Lynx 50386 data collection unit. The Bridgestone control panel includes a Siemens Programmable Logic Controller (PLC) that also controls the operation of the submersible pumps. Telemetry allows remote monitoring of pumping operation as well as offsite control of the pneumatic pressure of the inflatable dam. In the event of a storm event, the dam will be deflated itself so that the storm flows can bypass the diversion system.

In year 2002 and 2003 the sampling and testing for indicator bacteria was contracted through Associated Laboratories. Additionally, in 2002 and 2003 the sampling and testing for metals and pesticides were contracted through Truesdail Laboratories and submitted to OCSD.

Scheduled Submittals:

The submittals listed in the CBI grant agreement include:

- Quarterly Reports,
- Contract Summary Form,
- Subcontract Documentation,
- Project Survey Form,
- Cooperative Agreement with OCSD,
- Monitoring and Reporting Plan,
- Quality Assurance Project Plan (QAPP), Plans and specifications,
- Board of Supervisors Minute Order
- Purchase Order,
- Board Resolution to Award Construction,
- Notice to proceed,
- Notice of Completion,
- Draft Report,
- Final Report.

Documents Submitted with the Report No. 1

Progress Payment Report No. 8
Bridgestone Invoice for Rubber Dam

Documents Submitted with the Report No. 2

Progress Payment Report No. 12
Notice of Completion
Diversion Volumes

Documents Submitted with the Report No. 3.

Effluent Meter Readings – Monthly Reports for Year 2003
Subcontractor's Final Progress Payment Report No. 15

Additional Submittals

March 24, 2003 video of the diversion facility by Station KOCE
Media Report on GBCURD for October 3, 2003
Monitoring Plan and QAPP submitted on October 25, 02

Observations on the Construction Project

- The construction project was successfully completed on December 30, 2002. However, due to an unusual spring of 2003 with frequent rain events, continuous diversion at the GBCURD commenced on May 23, 2003 and a deactivation was ordered on October 30, 2003. This facility is capable of diverting year round. Intermittent diversion did occur in January and February 2003 between storm events.

- Total telemetry operation was not achieved prior to start of operation in the 2003. Additional programming modifications are planned including separating the operational control of the submersible pumps from the Bridgestone PLC to the pump control panel.

Observations on the Diversion Activity

- When the dam is inflated all urban runoff can be diverted. The channel immediately downstream of the dam undergoes wet and dry cycles as it is subjected to tidewater.

- The volume of diverted runoff varies daily. The total volume of urban runoff water diverted in 2003 was approximately 80 million gallons.

- The volume of discharge is measured via a Tigermag, Sparling Flowmeter. The digital display has not been 100% reliable. Satisfactory calibration was performed at the installation and OCSD is requiring hydraulic calibration annually. However, the digital display differed with irregular frequency from the remote telemetry unity (RTU) transmitted data.

- The RTU pulse count is received at the remote control center located at Public Facilities and Resources Department (PFRD) Operations and Maintenance Yard in Anaheim and is posted on the Orange County Website at http://www.oc.ca.gov/pfrd/envres/Telemetry/volume_diverted.asp. The daily diversion activity can be monitored in form of volume discharged in the 24 hour period for the particular calendar day. The website shows the diversion volumes for the last 31 days.

Data Collection In Accordance With the Project Monitoring and Reporting Plan,

Water quality samples were taken upstream and downstream of the inflatable dam by PFRD staff. The samples were delivered to Associated Laboratories at 806 N. Batavia, in Orange California. The results are attached in table 2.

Coastline monitoring was performed by OCSD and reported in OCHCA's Annual Ocean and Bay Water Quality Report. Said report can be downloaded from http://www.ochealthinfo.com/regulatory/ocean/downloads. This site also includes Historical Bacteriological Water Quality Data for various years. This report includes data from 2003 back to year 1998.

Review of the Monitoring Data at the Dam

Table 2, Water Quality Sampling at the Dam 2002/2003, includes the sampling results and dates for the sampling upstream of the dam and downstream of the dam. Sampling was performed approximately 200 feet upstream of the inflatable dam and 200 feet downstream of the dam. Sampling was performed by Orange County staff and Associated Laboratories performed the testing. The time period covered in Table 2 is from October 31, 2002 to September 22, 2003.

When the dam is inflated, the channel downstream is found to be dry during ebb condition. This supports the statements that the dam does not leak and that all urban runoff in the channel is being diverted successfully. (Table 2 includes times when the channel is dry)

Table 2, Figure 5 and Figure 6 support the statement that the diversion of the urban runoff in the Greenville Banning Channel contributes to the reduction of the concentration of fecal and total coliform in the channel section downstream of the diversion station.

Figure 2 and Figure 3 include a spike in the downstream channel concentration of fecal and total coliform in the month of September, 2003. Since all runoff is diverted, the spike is from something other than urban runoff. The down stream channel section does provide fishing ground for a variety of water foul that could be a source of the contaminant.

The presence of enterococcus exhibits a slightly different correlation between upstream and downstream in the sample test results. During the days of diversion, the downstream concentration of enterococcus frequently appeared to be higher than the upstream concentration. See Table2 and Figure 7. During time of diversion, the source of water in the downstream channel section is related to the tide and not the urban runoff. Whereas the water in the upstream channel section is entirely of urban runoff during time of diversion.

Figure 3 shows the monitoring results for fecal coliform at the dam. The data for Figure 3 is included in Table 2 Water Quality Monitoring results at the Greenville Banning Channel Urban Runoff Diversion Structure. The dam was deflated during the period from 10/31/02 to 5/15/03. During the period between 5/29/03 to 9/18/03 the dam was inflated and all runoff water was diverted. The sampling results were generally lower downstream and upstream (except for an event on September 4, 2003).

Figure 4 shows the monitoring results for enterococcus at the dam. The data for Figure 4 is included in Table 2 Water Quality Monitoring results at the Greenville Banning Channel Urban Runoff Diversion Structure. In the time period from 5/29/03 to 9/18/03 when the dam is inflated and all runoff is diverted, it is noteworthy that we find higher numerical values for the concentrations of enterococcus in sampling results for the downstream channel section. This would lead to the speculation that sources other than urban runoff are contributing significantly to the contamination of the water. Among these sources are the various water foul including ducks, heron, seagulls and others that frequent the channel.

Figure 5 is extracted from Figure 2 and focused on the time of diversion only from 5/23/03 to 8/22/03. The narrower time frame in Figure 5 allows for a better visual comparison of the sampling results. Throughout this selected field of data the concentration of coliform is higher upstream of the dam than downstream (note that all runoff water in this time period is diverted).

Figure 6 is extracted from Figure 3 and is focused on the time of diversion only (5/23/03 to 8/22/03). It is a visual comparison of the sample results for fecal coliform and leads to the same observation as in Figure 5.

Figure 7 is extracted from Figure 4 and is focused on the time of diversion only (5/23/03 to 8/22/03). It shows that there is no apparent relationship between the upstream and downstream concentration of enterococcus.

Remaining contents of Final Report are in Master File for reference