Fecal Coliform Total Maximum Daily Load for the Clark Creek Watershed, Catawba County and Lincoln County

Final Report

August 2002

Catawba River Basin

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INDEX OF TMDL SUBMITTAL

303(d) List Information

State	North Carolina
Basin	Catawba River Basin

303(d) Listed Waters

Name of Stream	Description	Class	Index #	8 Digit CU	Miles
Clark Creek	From a point 0.9 mile upstream of Walker Creek to South Fork Catawba River.	WS1V	11-129-5-(9.5)	03050102	1.7

8 Digit Cataloging Unit(s)	03050102
Area of Impairment	1.7 miles
WQS Violated	Fecal Coliform
Pollutant of Concern	Fecal Coliform
Sources of Impairment	Nonpoint sources from entire watershed

Public Notice Information

Form of Public Notification:
A draft of the Clark Creek Fecal Coliform TMDL was publicly noticed though local newspapers, Hickory Daily Record and Lincoln Time-News, in the Catawba River Basin. The notice was also posted in the DQW web site (http://h2o.enr.state.nc.us/tmdl) for the interested parties. A public meeting was held in the Government Center, 100A-Southwest Blvd., Newton, on July1, 2002. A public comment period was held for 40 days prior to July 10, 2002.

Did notification contain specific mention of TMDL proposal?
Yes

Were comments received from the public?
Yes

Was a responsiveness summary prepared?
A summary of the comments and DQW's responses are included in Appendix VI of the TMDL document.

TMDL Information

Critical condition	Late Summer.
Seasonality	Modeled from 1996-2000 to include fluctuations in seasonal fecal coliform loading.
Development tools	Watershed Analysis Risk Management Framework (WARMF).
Supporting documents	Final Total Maximum Daily Load for Fecal Coliform, Clark Creek (Sub-basin 03-08-35)

TMDL(s)

Loading allowed at critical condition:

Waste Load Allocation (WLA)	4.5×10^{10} Colonies per day.
Load Allocation (LA):	6.5×10^{10} Colonies per day.
Margin of Safety (MOS):	7.0×10^{9} Colonies per day.
TMDL (WLA+LA+MOS):	11.7×10^{10} Colonies per day.

Total Maximum Daily Load (TMDL)	Sources	Fecal Coliform Loading Reductions
Wasteload Allocation (WLA)	WWTP	0%
Load Allocation (LA)	Low Intensity Development	80%
	High Intensity Development	86%
	Commercial/Industry	82%
	Failure of septic	89%
	Animal Grazing	69%

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1.0 INTRODUCTION

The North Carolina Division of Water Quality (DWQ) has identified a 10.1mile segment of Clark Creek in the Catawba River Basin as impaired by fecal coliform bacteria, turbidity, and copper (NCDWQ and WPCOG, 2001). The impaired segment due to fecal coliform bacteria is located from 0.9 miles upstream of Walker Creek to the confluence with the South Fork Catawba River. This section of the stream, located in sub-basin 030835, is designated as a class WS-IV water.[1]

The 303(d) process requires that a Total Maximum Daily Load (TMDL) be developed for each of the waters appearing on Part I of the 303(d) list. The objective of a TMDL is to allocate allowable pollutant loads to known sources so that actions may be taken to restore the water to its intended uses (USEPA, 1991). Generally, the primary components of a TMDL, as identified by USEPA (1991, 2000a) and the Federal Advisory Committee (FACA, 1998) are as follows:

Target identification or selection of pollutant(s) and end-point(s) for consideration. The pollutant and end-point are generally associated with measurable water quality related characteristics that indicate compliance with water quality standards. North Carolina indicates known pollutants on the 303(d) list.

Source assessment. All sources that contribute to the impairment should be identified and loads quantified, where sufficient data exist.

Assimilative capacity estimation or level of pollutant reduction needed to achieve water quality goal. The level of pollution should be characterized for the water body, highlighting how current conditions deviate from the target end-point. Generally, this component is identified through water quality modeling.

Allocation of pollutant loads. Allocating pollutant control responsibility to the sources of impairment. The waste load allocation portion of the TMDL accounts for the loads associated with existing and future point sources. Similarly, the load allocation portion of the TMDL accounts for the loads associated with existing and future non-point sources, storm water, and natural background.

Margin of Safety. The margin of safety addresses uncertainties associated with pollutant loads, modeling techniques, and data collection. Per EPA (2000a), the margin of safety may be expressed explicitly as unallocated assimilative capacity or implicitly due to conservative assumptions.

Seasonal variation. The TMDL should consider seasonal variation in the pollutant loads and end-point. Variability can arise due to stream flows, temperatures, and exceptional events (e.g., droughts, hurricanes).

[1] Class WS-IV waters are freshwaters that are protected for water supply, secondary recreation, fishing, and aquatic life, including propagation and survival of wildlife.

Section 303(d) of the CWA and the Water Quality Planning and Management regulation (USEPA, 2000a) require EPA to review all TMDLs for approval or disapproval. Once EPA approves a TMDL, then the water body may be moved to Part III of the 303(d) list. Water bodies remain on Part III of the list until compliance with water quality standards is achieved. Where conditions are not appropriate for the development of a TMDL, management strategies may be implemented in an effort to restoration of water quality.

The goal of the TMDL program is to restore designated uses to water bodies. Thus, the implementation of bacteria controls will be necessary to restore uses in Clark Creek. Although an implementation plan is not included as part of this TMDL, reduction strategies are needed. The involvement of local governments and agencies will be critical in order to develop implementation plans and reduction strategies. DWQ will begin contacting local governments and agencies about implementation strategies during public review of this TMDL.

1.1 Watershed Description.

Clark Creek flows from Catawba and Lincoln counties in the piedmont region of North Carolina (Figure1A). It is a tributary to the South Fork Catawba River (Sub-basin 030835) in the Catawba River Basin. Clark Creek joins the South Fork Catawba River near Lincolnton, NC. The hydraulic length of Clark Creek is approximately 22 miles and the creek has a drainage area of approximately 91 square miles. Land use in the watershed is primarily forest (45%), pasture and recreational grass (19%), cultivated (17%), urban development (17%), and other land uses such as wetland, pond, and barren (2%) (Figure 2). The average flow of the creek near Lincolnton is approximately 109 cubic feet per second (cfs), with a summer 7Q10 of 15 cfs (Giese and Mason, 1993). The Creek is less prone to become dry during drought conditions (NCDWQ, 2002). The watershed includes drainage from the municipalities of Hickory, Conover, Newton, Maiden, and Lincolnton. From the source of Clark Creek to a point 0.9 miles upstream of Walker Creek, Clark Creek is

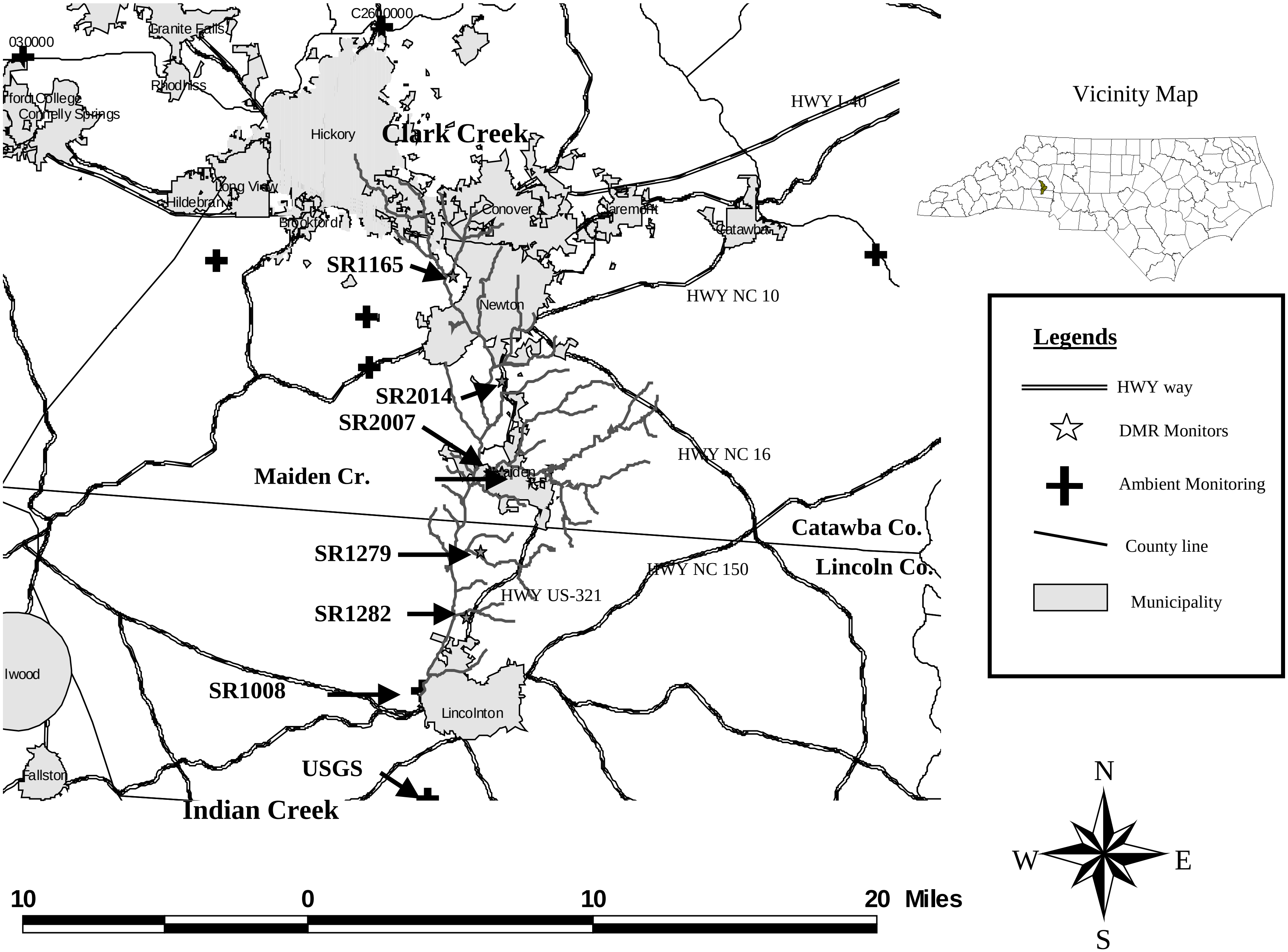


Figure 1A. Clark Creek Watershed showing Ambient and DMR monitoring Stations.

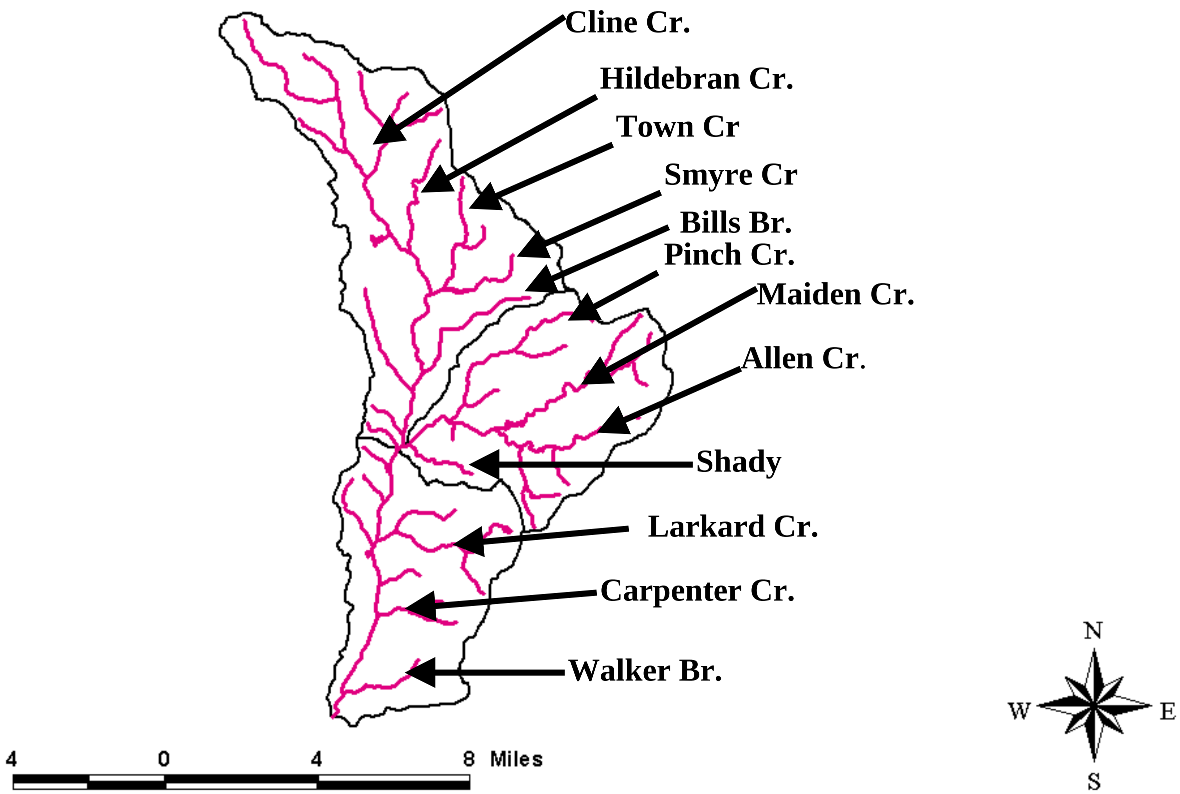


Figure 1B. Clark Creek Watershed showing major streams

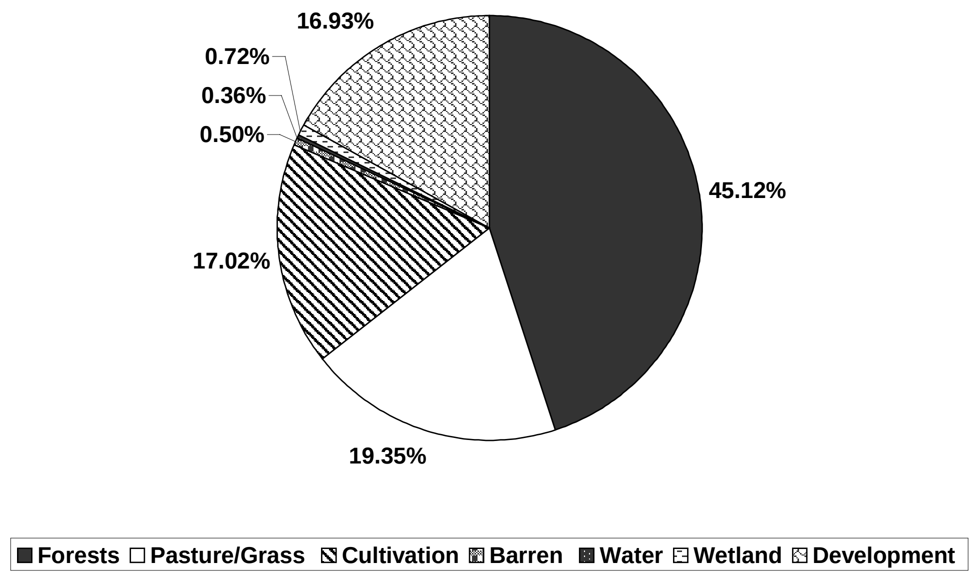


Figure 2. Distribution of land in the Clark Creek watershed.

classified C[2]. From the point 0.9 miles upstream of Walker Creek to the confluence with the South Fork Catawba River, the stream is classified WS-IV.

1.2 Water Quality Target: North Carolina Water Quality Standard.

The North Carolina fresh water quality standard for Class WS-IV and C waters for fecal coliform (T15A: 02B.0211) states:

> *Organisms of the coliform group: Fecal coliforms shall not exceed a geometric mean of 200/100mL (MF count) based upon at least five consecutive samples examined during any 30-day period, nor exceed 400/100mL in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution; all coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique will be used as the reference method.*

The in-stream numeric target, or endpoint, is the restoration objective that is expected to be reached by implementing the specified load reductions in the TMDL. The target allows for

[2] Class C waters are protected for aquatic life propagation / protection and secondary recreation.

the evaluation of progress towards the goal of reaching water quality standards for the impaired stream by comparing the in-stream data to the target. In the Clark Creek watershed, the water quality target is the 30-day geometric mean concentration of 200 colonies /100ml.

1.3 Water Quality Assessment.

The DWQ monitors a suite of water quality parameters, including fecal coliform bacteria, at ambient stations throughout the state on a monthly basis. There is one DWQ ambient station in this watershed located near the outlet of Clark Creek at Grove Street (SR 1008) near Lincolnton (Figure 1A). Fecal coliform levels at SR1008 are responsible for the 303(d) listing of a portion of Clark Creek.

Two of the three major NPDES permit holders in the Clark Creek watershed monitor instream levels of fecal coliform bacteria, the Newton and Maiden WWTPs. Both permit holders monitor instream fecal coliform weekly from October through May, and three times per week from June through September. Instream monitoring occurs at the following three locations: SR2014 (McKay Rd), SR2007 (West Maiden Rd), and SR1282 (Clarks Creek Dr). The instream Discharge Monitoring Report (DMR) data were available from 1996 though 2001. The DMR data offers the unique opportunity to calculate a 30-day geometric mean using 5 or more samples during that period. The 30-day geometric mean can be calculated for most of the June through September period, and at irregular intervals during the October through May period. In most of the periods, the 30-day geometric mean of the fecal coliform concentration at the DMR locations remained considerably higher than 200 colonies / 100 ml. The 30-day geometric mean fecal coliform concentrations for 1996 through 2000 are shown in Appendix IA for each location.

While DMR data can be used to evaluate potential compliance with the standard and to aid modeling studies, these data are not considered Level 1 data for use support and 303(d) listing purposes. Level 1 data requirements are described in the 2000 North Carolina 303(d) list. Generally, the bacterial levels at SR 1008 are typical of fecal coliform levels in many urban areas, with frequent concentration spikes. Out of 57 samples collected during the study period (1996 through 2000), 33 were exceeding 400 colonies / 100 ml (57%).

In February 2001 DWQ staff met with representatives from Catawba County, the City of Newton and the Town of Maiden. As a result of this meeting, a special study was conducted to further the spatial extent of fecal coliform data in the watershed. The City of Newton and the Town of Maiden each collected fecal coliform at two additional stations. Newton collected additional data at Settlemyre Bridge (SR 1165) over Clark Creek and near the mouth of Hildebran Creek. Maiden collected additional data downstream of SR 1279 over Larkard Creek and near the mouth of Maiden Creek (Pinch Gut Creek). These data were collected weekly for eight weeks beginning March 2001. A summary of these data is presented in Appendix IB. During the sampling period (April 2001), there was little rainfall. As a result, the concentration of the fecal coliform remained considerably lower than 200 colonies / 100 ml.

In April of 2001, DWQ staff conducted an additional study to determine compliance with the fecal coliform standard. Weekly samples were collected for eight weeks at SR 1008, Clark Creek at Grove Street in Lincolnton. A summary of these data is presented in Appendix IB. These additional samples verified impairment, generating geometric means greater than 200 cfu/100mL in all cases.

2.0 SOURCE ASSESSMENT

The source assessment characterizes the known and suspected sources of a pollutant to the impaired water body. These sources will be represented within the water quality model for the water body, whether explicitly or implicitly. Generally, sources of fecal coliform bacteria may be point or non-point in nature. Point sources are typically those regulated under the NPDES system, permitted discharges for which the DWQ has significant information. NPDES facilities measure fecal coliform levels in the effluent at a frequency based on facility class and waste type. Non-point sources are diffuse sources that typically cannot be identified as entering a water body at a single location. These sources may involve land activities that contribute fecal coliform bacteria to surface waters as a result of runoff producing storm events. The following sections describe point and non-point sources of fecal coliform bacteria in the Clark Creek watershed.

2.1 Point Source Assessment.

There are currently nine NPDES permits within the Clark Creek watershed (Table 1). However, two of these permitees, Fairgrove WWTP and Conover WWTP, did not discharge effluent during the study period, 1996 through 2000. Of the seven remaining permitees, the three facilities (Newton WWTP, Maiden WWTP, and Precedent, Inc.) that discharged domestic wastes monitored fecal coliform in the Clark Creek watershed. The monthly fecal coliform load from these facilities is presented in Appendix III.

Table 1. NPDES Permits in the Clark Creek Watershed

Facility	Permit number	Permitted flow (MGD)	Actual flow (a) (MGD)	Waste type
Fairgrove WWTP	NC0023264	N/A	N/A	Domestic
GE Hickory	NC0076643	0.12	0.074	Industrial
Conover WWTP	NC0024261	N/A	N/A	Domestic
Newton WWTP	NC0036196	5	3.429	Domestic + Industrial
Precedent, Inc.	NC0036871	0.008	0.002	Domestic
Maiden WWTP	NC0039594	1	0.365	Domestic
Maiden WTP	NC0080837	_	0.06	Industrial
Delta Mills, Inc.	NC0006190	1	0.809	Industrial
National Friut	NC0023761	-	0.144	Industrial
(a) Average annual flow for calendar year 2000.				

2.2 Non-point Source Assessment

Fecal coliform bacteria non-point sources include those sources that cannot be identified as entering the water body at a specific location. Non-point source pollution can include both urban and agricultural sources, and human and non-human sources (Table 2). The non-point sources of fecal coliform bacteria in Clark Creek include wildlife, livestock (land application of agricultural manure and grazing), urban development (stormwater runoff, including sources from domestic animals), failing septic systems, and sewer line systems (illicit connections, leaky sewer lines and sewer system overflows).

Table 2. Potential Source of Fecal Coliform Bacteria in Urban and Rural Watersheds.

Source Origin	Type	Source
Human Sources	Sewered watershed	Combined sewer overflows
		Sanitary sewer overflows
		Illegal sanitary connections to storm drains
		Illegal disposal to storm drains
	Non-sewered watershed	Failing septic systems
		Poorly operated package plant
		Landfills
		Marinas
Non-human Sources	Domestic animals and urban wildlife	Dogs, cats
		Rats, raccoons
		Pigeons, gulls, ducks, geese
	Livestock and rural wildlife	Cattle, horse, poultry
		Beaver, muskrats, deer, waterfowl
		Hobby farms

2.2.1 Livestock.

Catawba and Lincoln counties are accounted as the major producers of livestock in North Carolina. According to the 1999 livestock population census, there were about 17,000 and 15,000 livestock in the counties respectively (NCDA, 2001).

In order to incorporate the actual amount of fecal coliform deposit from these livestock, a survey was conducted with the help of Catawba County Agent, Mr. Jeff Carpenter and Catawba Valley Cattleman's Association Member, Dr. Clarence Hood, to innumerate the actual head count of livestock in the Clark Creek watershed. The estimated head count result is presented in Table 3.

About 50% of these cattle were managed under the NC Agriculture Cost Share Program since 1990 for about ten years (personal communication with the Catawba County District Conservationist, Mr. Larry Williams). The program prohibits the grazing of the cattle near the streams in the watersheds. (Picture of the cattle under the NC Agriculture Cost Share program is presented in ApprndixVII). One of the objectives of the program is to control the fecal coliform bacteria contamination due to direct contact between cattle and water.

Table 3. Estimated Livestock in the Clark Creek Watershed.

Livestock	Catawba Co.	Lincoln Co.
Mature Beef Cows	600	100
Milk Cows	10	90
Horses*	246	61
* The number of horses in the watershed was estimated based on the statistics presented in 1996 North Carolina Equine Survey.		

However, during a field survey, DWQ staff noted one large herd of beef cattle in the Cline Creek sub-watershed. Additionally, DWQ staff and local officials observed a dairy farm in the Larkard Creek sub-watershed, where cows were seen in the creek. Many smaller herds of cattle (i.e., 10-20 cows) were observed throughout the basin. One path utilized by animals was noted during a stream walk by the Watershed Assessment and Restoration Program; this path is located upstream of the SR2007 road crossing and provides direct access to Clark Creek.

DWQ staff and local staff also noted considerable number of horse farms. (Picture is presented in Appendix VII). Because of the limited time factor, a survey could not be conducted to estimate the number of horses in the watershed. However, a best estimation was performed using the statistics presented by North Carolina Equine Survey (1996). The estimated head count of the horses is presented in Table 3. There were no hog, pig, and chicken farms in the Clark Creek Watershed.

2.2.1.1 Livestock Grazing.

Cattle (dairy and beef cows) and horse graze on pastureland deposit feces onto the land. During a rainfall runoff event, a portion of the fecal material that contains coliform bacteria is transported to the streams. Open lots used heavily by animals have the greatest potential for bacteria in runoff to surface water. In addition, when cattle have direct access to streams, feces may be deposited directly into a stream.

Once the bacteria reach a water body, environmental factors influence the extent of their growth and decay. Physical factors such as photo-oxidation, adsorption, flocculation, coagulation, sedimentation, and temperature will have a great influence on the bacteria populations (USEPA, 1985). Some studies have suggested a significant positive correlation among the bacteria, stream flow, and stream temperature along with a negative correlation with pH, specific conductance, and disolved oxygen (Wilhelm and Maluk, 1998; and Clark and Norris, 1999).

2.2.1.2 Agricultural Manure Application.

Processed agricultural manure from confined dairy cattle operation is generally collected in lagoons and applied on land surfaces (USEPA, 2000b). Approximately 75 percent of dairy cattle manure was applied to cropland, and 25 percent was applied to pasture land in the Clark Creek watershed located in Catawba County (Best estimation from a Catawba County Agent, Mr. Jeff Carpenter). Similarly, about 50 percent of dairy cattle manure was applied to cropland and pastureland in the watershed located in Lincoln County. The cattle manure was applied during March and April. The application was also continued during September and October in the croplands.

Fecal coliform loading rates for livestock in the Clark Creek watershed were estimated to be 1.06×10^{11} colonies/day/beef cow, 1.04×10^{11} colonies/day/dairy cow, and 4.18×10^{8} colonies/day/horse (NCSU, 1994). The total fecal coliform load due to manure application is therefore estimated to be 2.2×10^{9} colonies/ ha/ month and 6.6×10^{9} colonies/ ha/ month for the cropland and pastureland respectively in Catawba County. Similarly, the load is estimated to be 2.0×10^{11} colonies/ ha/ month and 6.8×10^{10} colonies/ ha/ month for cropland and pastureland respectively in Lincoln County.

Beef cows and horses are assumed to be grazed in the pastureland throughout the year in the both counties. Because of the pasture management practices under the NC Agricultural Cost Share program, it is assumed that the total fecal coliform load was reduced by one third in the watershed. This assumption was however validated while calibrating the water quality model with the observed fecal coliform bacteria concentration in the watershed. With this assumption, the total fecal coliform load due to grazing beef cows were estimated to be 1.6 x 10^{11} colonies/ ha/ month and 9.3 x 10^{10} colonies/ ha/ month in Catawba County and Lincoln County respectively. The respective loads due to grazing horses are estimated to be 9.0 x 10^{8} colonies/ ha/ month and 2.3 x 10^{8} colonies/ ha/ month.

2.2.2. Failed Septic Systems.

Failing septic systems have been cited as a potential source of fecal coliform bacteria to water bodies (DEH, 2000). More than half of the residents in Catawba County and Lincoln County utilized septic systems (Table 4).

Table 4. Summary of Septic Usage in Catawba and Lincoln Counties (DEH 1999)

		Percent of Housing Units Utilizing:		
County	1999 Population	Sewer	Septic	Other
Catawba	118,412	44.13	54.90	1
Lincoln	50,319	17.75	80.60	2

In the Clark Creek watershed, the number of septic systems per square mile is greatest in the area surrounding Hickory and Newton. About 2,800 septic systems were estimated in the watershed region. A GIS map developed by Catawba County, NC, showing the spatial distribution of the houses with septic systems was utilized to estimate the number of septic systems. It was also estimated that there were about 3 people per household per septic systems. Septic system failure rate data in the counties are very limited. A study conducted in 1981 by the North Carolina Office of State Budget and Management suggested that approximately 11% of systems that were surveyed experienced malfunctions or failures over a year in North Carolina State (DEH, 2000).

The water quality model, WARMF, uses three types of septic to estimate fecal coliform discharge rates. These types represent varying performances and effluent quality such as standard systems, advance treatment systems, and or failing systems. Due to lack of site specific data Standard septic systems were used for this study.

2.2.3 Urban Development/Sanitary Sewer Overflows/WWTP Residual Land Application.

Fecal coliform bacteria can originate from various urban sources. These sources include pet waste, runoff through stormwater, sewers, illicit discharges/connections of sanitary waste, leaky sewer systems, and sewer systems overflows (Table 2). The City of Newton owns and operates the Newton Clark Creek WWTP and the sewage collection system. The pipelines connecting between the WWTPs and the sewages in the Clark Creek watershed run along the main Clark Creek. (Picture is presented in Appendix VII). Therefore, failure of connection between the sewer pipelines or any leak from the pipe could result in profound fecal coliform contamination in the creek.

Due to lack of data on the site specific fecal coliform loading from the urban development in the Clark Creek watershed, the estimation of fecal coliform loading from the nearby county, Mecklenburg County, was utilized for this study. As per the estimation (NCDWQ, 2002), the respective fecal coliform load from light residential land use, Heavy residential land use, and heavy industrial/commercial are 5.08×10^{11} colonies/ha/month, 6.7×10^{11} colonies/ha/month, and 2.0×10^{11} colonies/ha/month. These estimated values were respectively input in the model to estimate total fecal coliform load from low intensity development, commercial/industrial development and high intensity development. These values were, however, adjusted during the model calibration to imitate the estimated fecal coliform load with the observed load.

2.2.4 Wildlife (Background Source).

Wildlife deposit fecal material in forested, wetland, pasture and cropland areas which can be transported to a stream in a storm event. Deposition of fecal coliform due to wildlife population is natural and uncontrollable. Therefore, wildlife is considered as a background source of fecal coliform bacteria for this study.

Wildlife in the Clark Creek watershed includes deer, raccoons, squirrels, birds, and waterfowl. As population estimates of raccoons, squirrels, birds, waterfowl and other animals are not readily available, the wildlife fecal coliform contribution was accounted for in the deer population. The deer population was estimated to be 20 to 30 animals per square mile in the watershed (Best professional judgement from a wildlife expert for the region, Mr. Evin Stanford). The upper limit of 30 deer per square mile was chosen to account for deer and other wildlife in the watershed. The fecal coliform loading rate assigned to deer was estimated using 5.0×10^{8} colonies/animal/day (USEPA, 2002). The total fecal coliform load due to the wild animals was then estimated to be 1.8×10^{9} colonies/ ha/ month in the both counties.

3.0. MODELING APPROACH

3.1 Modeling Framework.

The watershed model named Watershed Analysis Risk Management Framework (WARMF) was selected for fecal coliform TMDL evaluation for the Clark Creek watershed. The watershed model is designed to support the USEPA's protocol for estimating TMDL calculation, allocation, and implementation. The model integrates all water quality equations and database in a window based graphical user interface (GUI). The model runs basically under four different modules, they are:

1. The Engineering module. The module simulates the hydrology and water quality for the landscape of a river basin. The simulated parameters include flow, water depth, and constituent concentrations.

2. The TMDL module. The module estimates TMDLs for non-point source loads (LA) under different control levels of point source loads (WLA) and vise versa. During TMDL estimation, the model considers conditions of all seasons as required by USEPA guidelines for TMDL calculation. In the case of fecal coliform bacteria TMDL, the model simulates the deposition and transportation of the bacteria from land surface discharge and point source discharge. The model then compute the resulting water quality response using the first order kinetic equation 1 as follows:

$$dC/dt = \theta^{(T-20)}KC \text{ -- } (1)$$

Where C is concentration of fecal coliform bacteria in count per100 ml (# / 100 ml); K is decay rate per day; θ is temperature adjustment coefficient; and T is temperature of water in centigrade.

The model then generates the percent reduction of the fecal coliform as required by the EPA guideline for TMDL calculation. The model calculates the TMDL from the most upstream water quality limit sections to the most downstream water quality limit sections of the Clark Creek watershed.

3. The Consensus module. The module follows the guidelines of the watershed approach issued by the USEPA.

4. The Data module. The module facilitates the model to simulate dynamics of river basin using meteorology, air quality, precipitation quality, point source discharge, and reservoir flow release data. Hydrology and water quality data are used to check against the module results. The data module stores data sets in ASCII text files, one file per monitoring station.

The WARMF model works on watersheds that include catchments, river segments, and stratified lakes. The model has been applied to different watershed regions in the USA and Taiwan (Systech Engineering, 2001).

3.2 Model Setup.

The Clark Creek watershed was delineated using the Reach file 3 (Rf3) stream coverage and Digital Elevation Model (DEM) data. The total drainage area of the watershed was estimated to be 91 square miles with drainage density of 0.55 per mile. The headwaters of the watershed were within the City of Hickory at an elevation of about 1100 feet above the mean sea level and were dominated by industrial and commercial development areas. The elevation dropped down to 340 feet at the outlet of the watershed. The lower drainage was dominated by cropland, pasture land, and forested land. The land coverage types were presented in Figure 2. WARMF represents the watersheds as a series of smaller catchements. A total of 20 catchements were simulated for the Clark Creek watershed.

The water quality data collected at the ambient monitoring stations, SR1008, and the Newton WWTP instream monitoring at SR2007 were utilized to calibrate the model. The SR2007 was located at the middle portion of the watershed near upstream of west Maiden Road (Figure 1A). The SR1008 was located near the outlet of the watershed at Grove Street in Lincolnton.

The meteorological data collected by the nearby weather stations located at Hickory and Lincolnton were also utilized to calibrate the model. The weather station in Hickory was assigned for the upper portion of the Clark Creek watershed, above SR2007. The weather station in Lincolnton was assigned to the lower portion of the watershed.

3.3 Model Calibration.

The variables were classified into two categories – controllable and uncontrollable variables. The controllable variables include: the estimates of non-point source loads (e.g. urbanization, fertilizer application, etc), point source load (e.g. flow and pollutant concentrations), and rate coefficients (e.g. infiltration rate, precipitation weighting factor, average temperature lapse, fecal coliform decay rate, etc). The in situ values for these variables were not available and hence the risk associated with the estimated values of these variables could be high. In order to minimize the risk, statistical testing was performed. The variation between the measured and estimated fecal coliform concentrations was evaluated by estimating the coefficient of determination (R-Squared). A high value of R-Squared value suggests less variation between the measured and estimated fecal coliform concentrations.

The uncontrollable variables include watershed characteristics (e.g. land classes, stream morphology etc) and meteorology (rainfall, temperature etc). These variables, on the other hand, are inherent with the environmental system. Hence, these variables were kept constant in the model simulation.

3.3.1 Hydrology.

Two hydrologic parameters - water flow and water temperature were chosen to calibrate the watershed model. Calibration of the model with regards to flow is essential, because the flow is the main carrier of fecal coliform bacteria from field to stream. Similarly the calibration with regards to water temperature is important, because the temperature determines the die-off rate of fecal coliform bacteria (Equation 1). As the temperature increases, the fecal coliform concentration also increases (Clark and Norris, 1999).

However, the calibration of the model with regards to flow during the study period could not be performed for the Clark Creek watershed. Only a few flow measurements were monitored during 1996 in the ambient gage station, SR1008. Flow monitoring did not occur at SR2007 during the study period. Therefore, the hydrologic calibration of the model was performed using flow data collected at the nearby USGS gage station, Indian Creek watershed near Laboratory. This station is 3.72 miles away from SR1008 (Figure 1B).

In the calibration process, the precipitation weighting factors for the Hickory and Lincoln weather stations were set to 1.0 and 1.05 respectively to obtain the close relationship between the simulated and observed flow values. The time series of the simulated flow values and the observed values were presented in Figure 3A. The correlation between the two flows was slightly weak (R-Square = 0.59) due to spatial variability in precipitation. However, the result suggests that the model considerably predicted the observed flow for the Indian Creek Watershed.

Using the precipitation weighing factors determined for the Indian Creek watershed, the hydrologic model was ground-truthed for the Clark Creek watershed using the 1996 flow data measured at the SR1008. The model simulated the flow values closely with the observed values (Figure 3B). However, due to the few data points, the model resulted in a relatively low R-Square value.

The calibration of the model with water temperature was performed using the measured water temperature data at the both stations - SR2007 and SR1008. The parameter coefficients for the average temperature lapse and altitude temperature lapse were set to 2.5 and 0.005 respectively for both weather stations. The model calibration scored a high R-Square values (0.71 to 0.77), suggesting a good correlation between the observed and predicted water temperature in the Clark Creek watershed (Figure 4).

3.2.2 Water quality.

The watershed model was calibrated with the fecal coliform observed in SR2007 and SR1008. In the calibration process, the reaction coefficients to adjust the decay rates of the fecal coliform bacteria in the field and in the stream were set to 0.01and 0.1 respectively. The input parameters estimated in the § 2.2.3 for the urban development were also further adjusted to correlate the estimated fecal coliform concentration with the observed concentration. An acceptable relationship between the simulated fecal coliform bacterial concentration and observed bacterial concentration was observed when the estimated parameters were multiplied by 0.17 and 0.33 for the winter and summer periods respectively (Figure 5).

The relationship was further examined by estimating 30-day geometric mean (Figure 6). The relationship was somewhat weak for the first two years, 1996 and 1997. However the relationship was significantly improved in the following years, 1998 through 2000. The respective r (Pearson correlation) values estimated for the years were 0.04, -0.38, 0.60, 0.51, and 0.12.

3.4 Model Uncertainty

Above week agreement between modeled and observed fecal coliform concentrations could be due in part to the high degree of uncertainty associated with predicting fecal coliform bacteria. The inability to accurately predict specific observed fecal coliform concentrations can be attributed to model error, lack of sufficient information in source assessment, gaps in our scientific knowledge, natural variability in instream fecal coliform concentrations, field and laboratory measurement error, and lack of current site specific model input parameters including decay rate, flow, rainfall data, and landuse information. The watershed model, WARMF, selected to guide initial decision making, is not adept at characterizing prediction uncertainty. The model estimates daily average fecal coliform concentrations based on landuse information. Because of lack of site specific information, professional guess and literature values were used to calculate the fecal coliform loading from the various land uses. Therefore, the model results should be interpreted in light of the model limitations and prediction uncertainty.

3.5 Model Output

<u>3.5.1 Existing Condition</u>

The model outputs indicate that the primary source of fecal coliform bacteria contamination in the Clark Creek watershed is the direct input from the non-point sources (Table 5). The

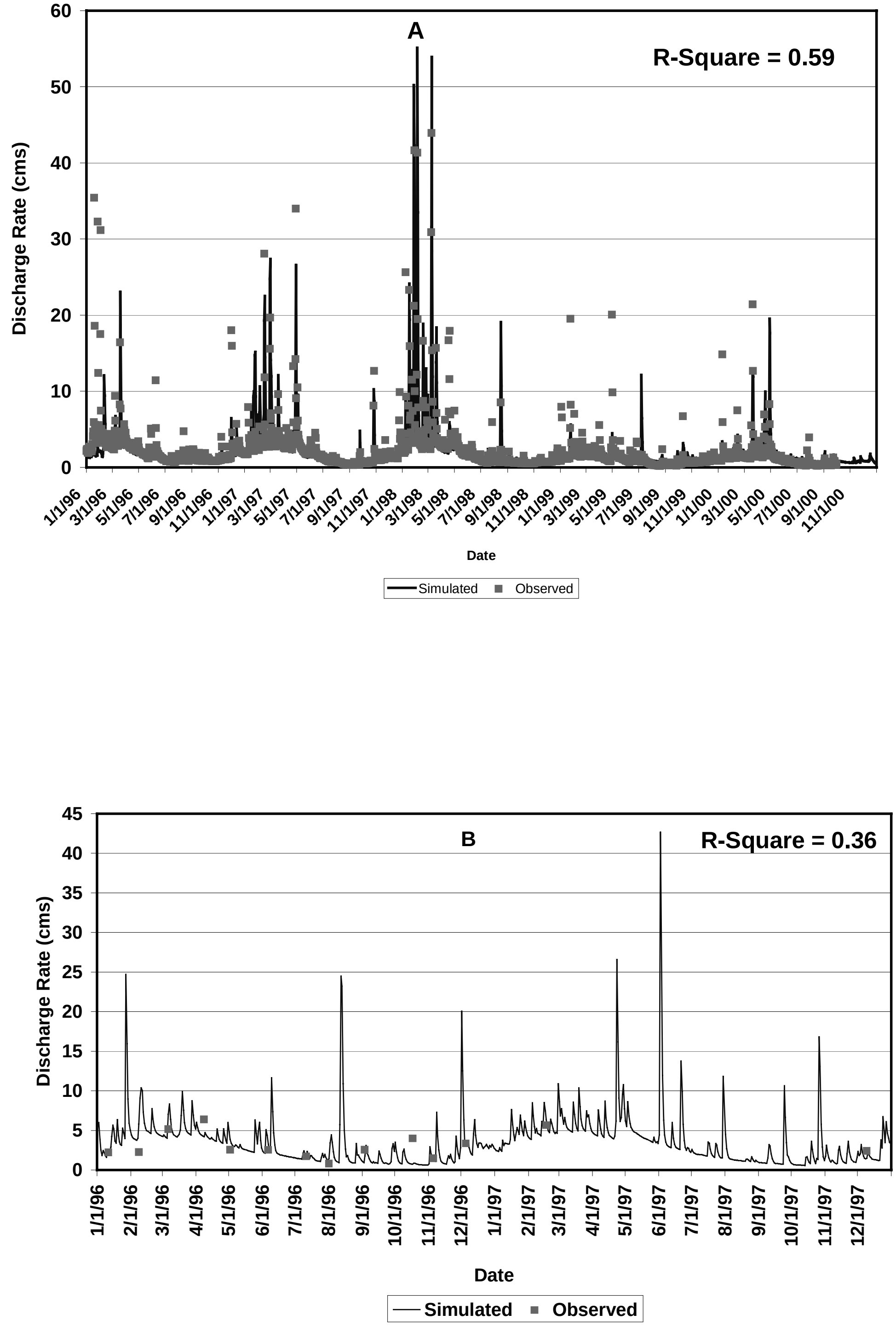


Figure 3. Simulated versus observed flow rates at the outlets of (A) the Indian Creek watershed and (B) the Clark Creek watershed.

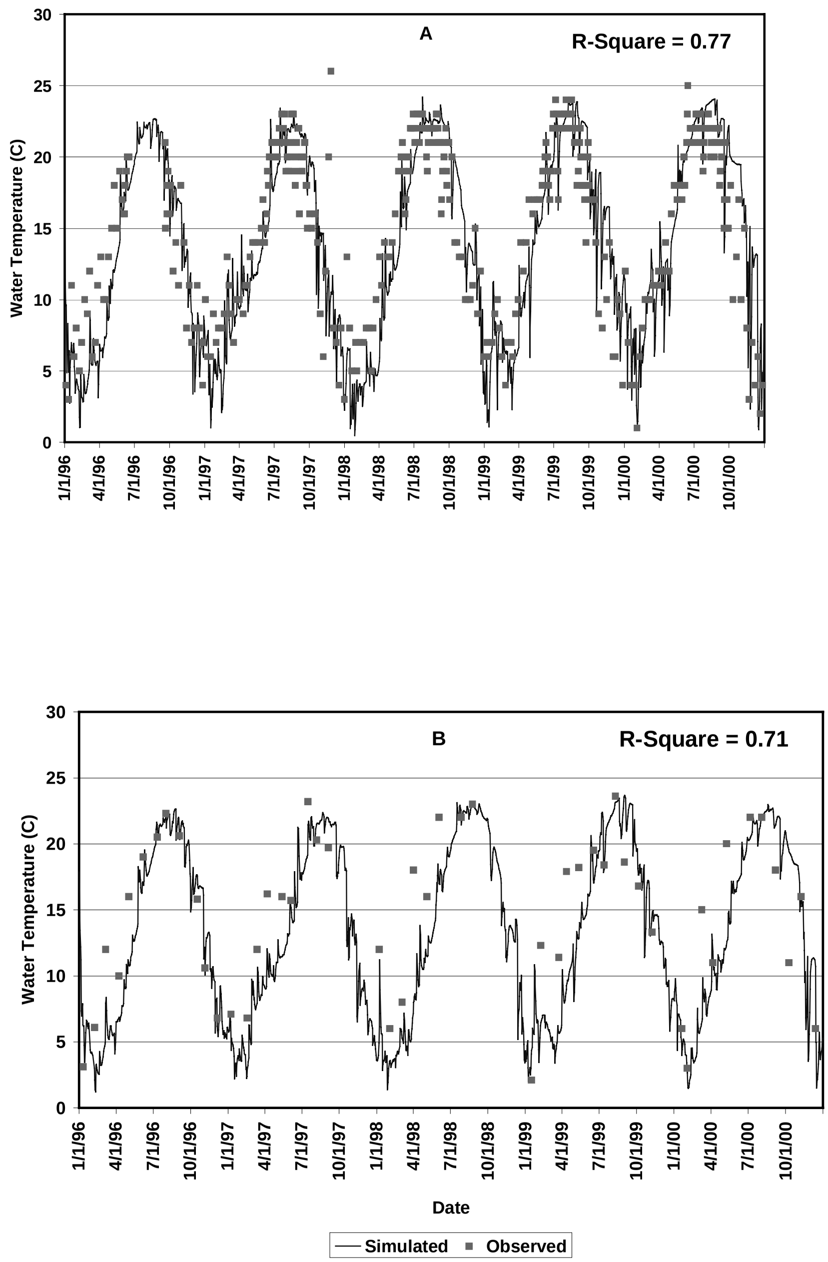
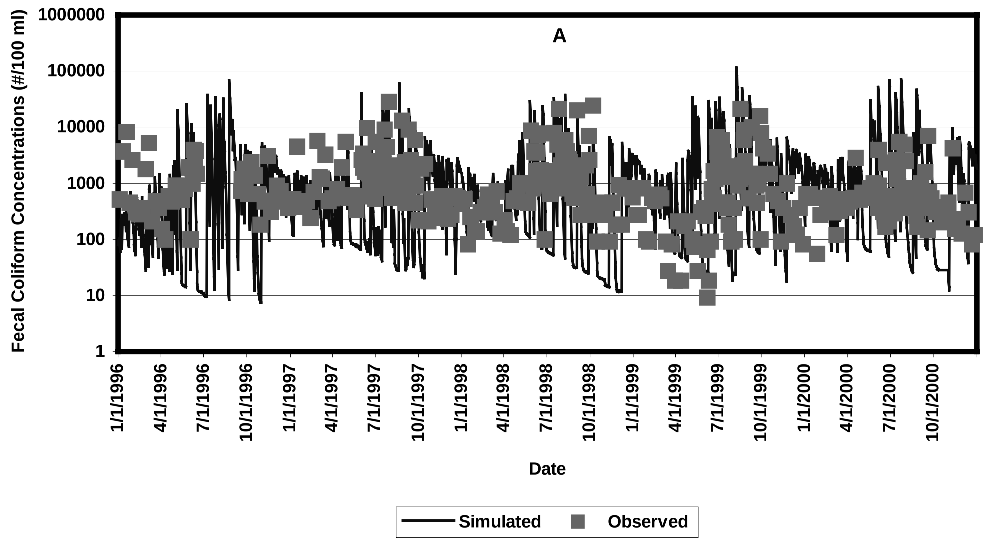


Figure 4. Simulated versus observed water temperature at (A) SR2007 and (B) SR1008.



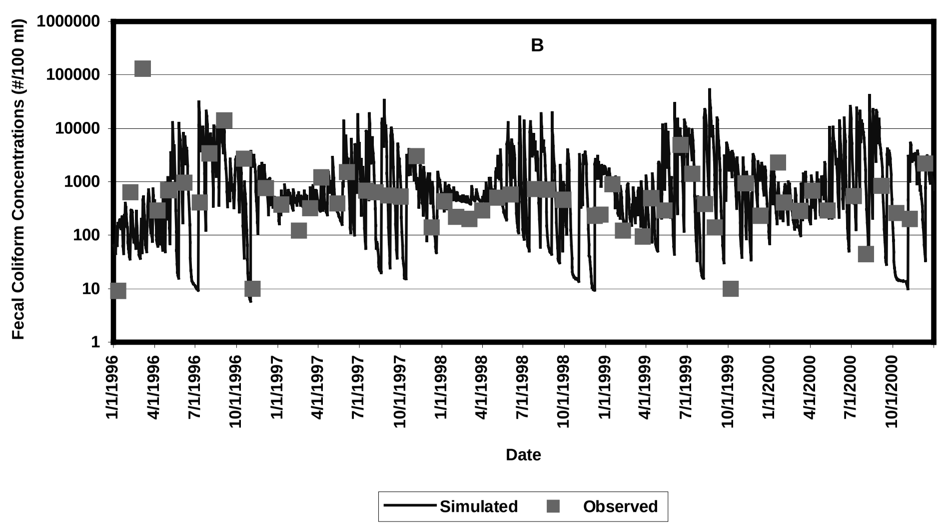


Figure 5. Simulated vs observed fecal coliform concentration at (A) the SR2007 and (B) SR1008.

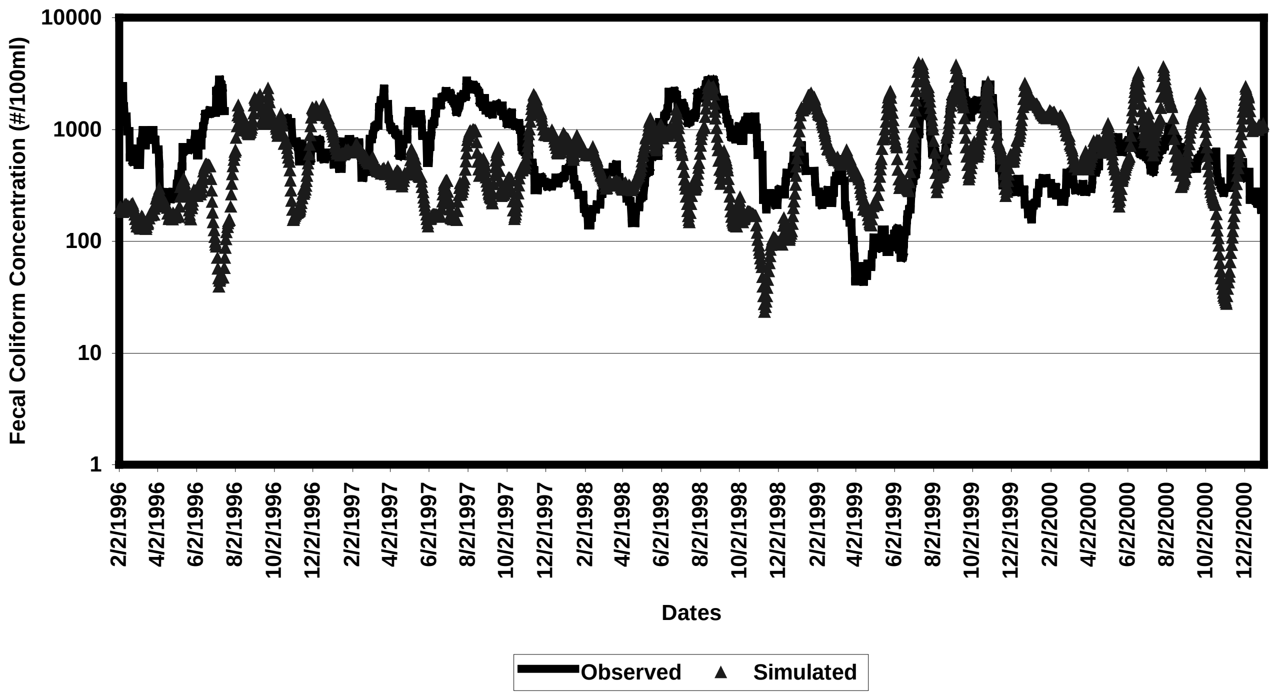


Figure 6. Rolling 30-day geometric mean of observed and predicted fecal coliform concentrations at SR2007.

contamination due to the point sources was only 5% (14,600 x 10^6 colonies /day) as compared to the non-point sources (278,645 x 10^6 colonies /day). Urban development, animal grazing, and septic system were seen to be more responsible for the fecal coliform contamination in the Clark Creek watershed. In urban areas, fecal coliform can be contributed to the creek by dog, cat, raccoon, stormwater runoff, and human waste during storm events. In a study conducted by Hyer et. al, 2001, the contamination due to the dog waste accounted for nearly 10 percent in the creeks of Virginia. Similarly, human waste accounted nearly 20 percent. The human waste included failing septic systems, leaking sewer lines, cross-connected pipes, straight pipes, and sewer line overflow. In this study, the bacterial contamination due to the failure of septic system alone accounted for about 15 % (45,400 x 10^6 colonies /day). The contamination due to urban activities accounted for about 53% (157,030 x 10^6 colonies /day). The contamination due to animal grazing accounted for about 22% (65,800 x 10^6 colonies /day). The similar accountability due to wildlife in forest, and other sources (e.g., wetland, water pond, and barren land) were found to be relatively low (≤1%).

Table 5. Total load of fecal coliform (1 x 10^6 colonies per day) in the Clark Creek watershed at SR1008 during the study period, 1996 through 2000.

Source Category	Simulated total Load	Percent of fecal coliform load
A. Non-point Sources (LA):		
Wildlife	2828.000	1.000
Pasture Land	65,800.000	22.000
Cultivated Land	7,500.000	3.000
Recreational Grass (golf courses, park land, cemetery, etc)	43.000	0.010
Urban Development	157,030.000	53.000
Septic System	45,400.000	15.000
Others (Wetland, ponds, barren etc)	4.300	0.002
B. Point Source (WLA)	14600.000	5.000
C. Total for non-point sources	278,645.000	95.000
D. Grand Total	293,245.000	100.000

3.5.2 Critical Period

Critical period is the period when the geometric mean of fecal coliform concentration reaches peak exceeding the water quality standard, 200 colonies / 100 ml. The DMR data and the ambient data both indicated that elevated fecal coliform concentration levels occurred during summer - May through October in the Clark Creek watershed (Appendices 1A). Usually, the concentration level was elevated after each rainfall event (Appendixes 1C) during summer. Interestingly, just opposite was the result during winter. The concentration level was reduced even after each rainfall event.

The result suggests that the elevated concentration of the bacteria during summer could be due to low flow in the Clark Creek. During the dry weather, the flow in the Clark Creek remained low as compared to winter (November through April). As per the flow from the nearest watershed, Indian Creek, the average flow during the summer ranged from 0.64 cubic meter per second in September to 2.1 cubic meter per second in May. In a contrast, the flow raised comparatively high during the winter. The flow ranged from 1.1 cubic meter per second in November to 4.28 cubic meter per second in January (Figure 7).

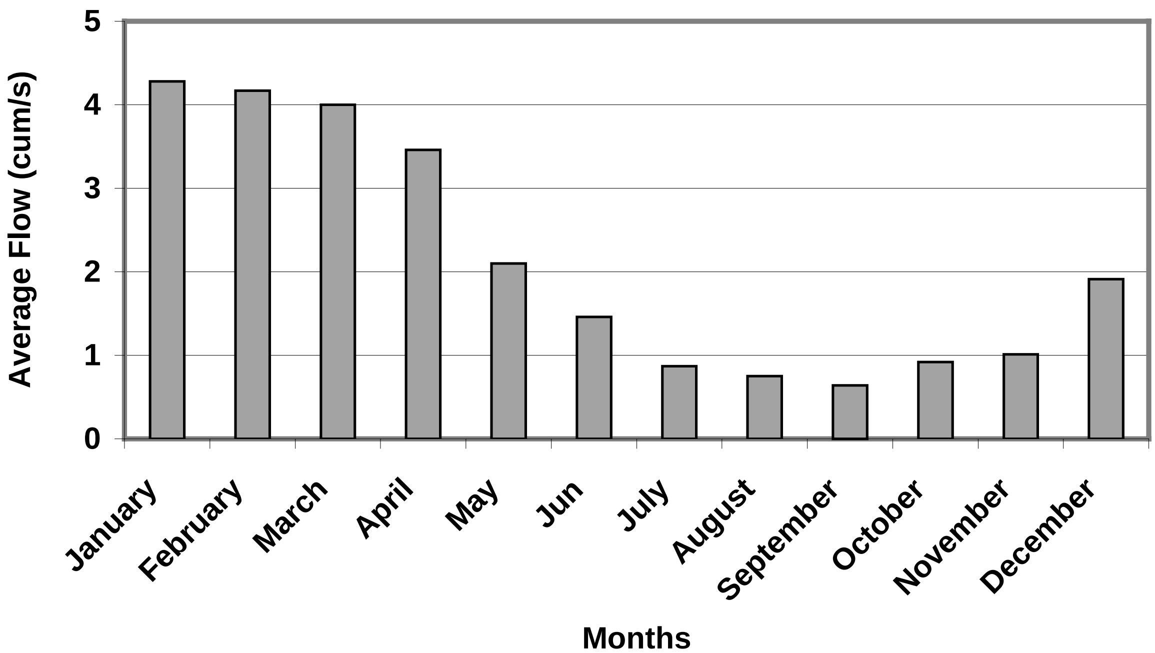


Figure 7. Monthly average flow from Indian Creek. The average flow was estimated using the flow data from 1996 through 2000.

The watershed model, WARMF, was run for a five-year simulation period, 1996 through 2000, using estimated daily flows to examine the critical period. The predicted maximum concentration level ranged from 635 colonies / 100 ml to 2,084 colonies / 100 ml during winter weather conditions (Table 6). The range of the concentration level was relatively high during summer weather conditions. The concentration level ranged from 2,062 colonies / 100 ml to 5,871 colonies / 100 ml. During the study period, the most critical period was observed to be in September 2000. Overall, both observed and estimated fecal coliform concentration (DMR, ambient, and model estimation data) jointly suggests summer as the critical period for the fecal coliform contamination in the Clark Creek watershed.

Table 6. Maximum exceedance of fecal coliform in the Clark Creek watershed

Season	Date of Predicted Maximum Exceedance	Value of Predicted Maximum Exceedance (30-day geomean fecal concentration) (Colonies / 100ml)
Summer (May through October)	08/6/96 09/18/97 08/14/98 07/09/99 09/08/00	5666 2062 2928 4338 5871
Winter (November through April)	10/01/96 11/12/97 01/20/98 10/21/99 12/04/00	1344 1675 635 2002 2084

4.0. ALLOCATION

4.1. Total Maximum Daily Load.

Total Maximum Daily Load (TMDL) can be defined as the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards. A TMDL can be expressed as the sum of all point source loads (WLAs), non-point source loads (LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluence limitations and water quality. This definition can be expressed by equation 2:

$$TMDL = \sum WLAs + \sum LAs + MOS \text{ ---------------(2)}$$

The objective of the TMDL is to estimate allowable pollutant loads and to allocate to the known pollutant source in the watershed so the appropriate control measures can be implemented and the water quality standard can be achieved. The Code of Federal Regulations (40 CFR § 130.2 (1)) states that TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures. For fecal coliform bacteria, TMDLs are expressed as colonies per 30 days. Therefore, the TMDL represents the maximum fecal coliform load that can be assimilated by the stream during the critical 30-day period while maintaining the fecal coliform water quality standard of the geometric mean of 200 colonies /100 ml over 30 days.

The TMDL module of the WARMF model, as describe in § 3.1 above, is utilized to estimate the TMDL for fecal coliform based on stream flow and instream fecal coliform concentrations that originated from different sources in the Clark Creek watershed. The TMDL was determined by systematically reducing the watershed loads until all 30-day geometrical mean concentration were below the TMDL target of 175 colonies / 100 ml. The resulting reduction is presented in Figure 9 for the period from 1996 through 2000. The existing average daily load of fecal coliform bacteria to SR1008 is 296,852 x 10^6 colonies / day (Table 5). The TMDL load at the same location is 21,254 x 10^6 colonies / day. The estimation of the TMDL is described in the following paragraphs.

4.2 . Seasonal Variation.

Seasonal variation was incorporated in the continuous simulation of the watershed model by using varying monthly loading rates and daily meteorological data for 5 years, 1996 through 2000. The variation of the predicted and observed fecal coliform bacteria was comparatively high during summer and low during winter, but the concentration level remained greater than the water quality standard (200 colonies / 100 ml) during most of the simulation periods (Figure 9).

4.3. Margin of Safety (MOS).

The MOS was explicitly included in the TMDL analysis by setting the TMDL target at 175 colonies / 100 ml, which is 25 colonies / 100 ml lower than the water quality target of 200 colonies / 100 ml. Conceptually, the MOS was included in the TMDL estimation to account for the uncertainty in the simulated relationship between the fecal coliform load and the water quality standard.

The explicit MOS for this study is, therefore, set to 25 colonies / 100 ml. The daily MOS load is estimated to be 7.0 x 10^9 colonies. The estimation was performed by calculating the differences between TMDL with MOS and TMDL without MOS using the equation 2.

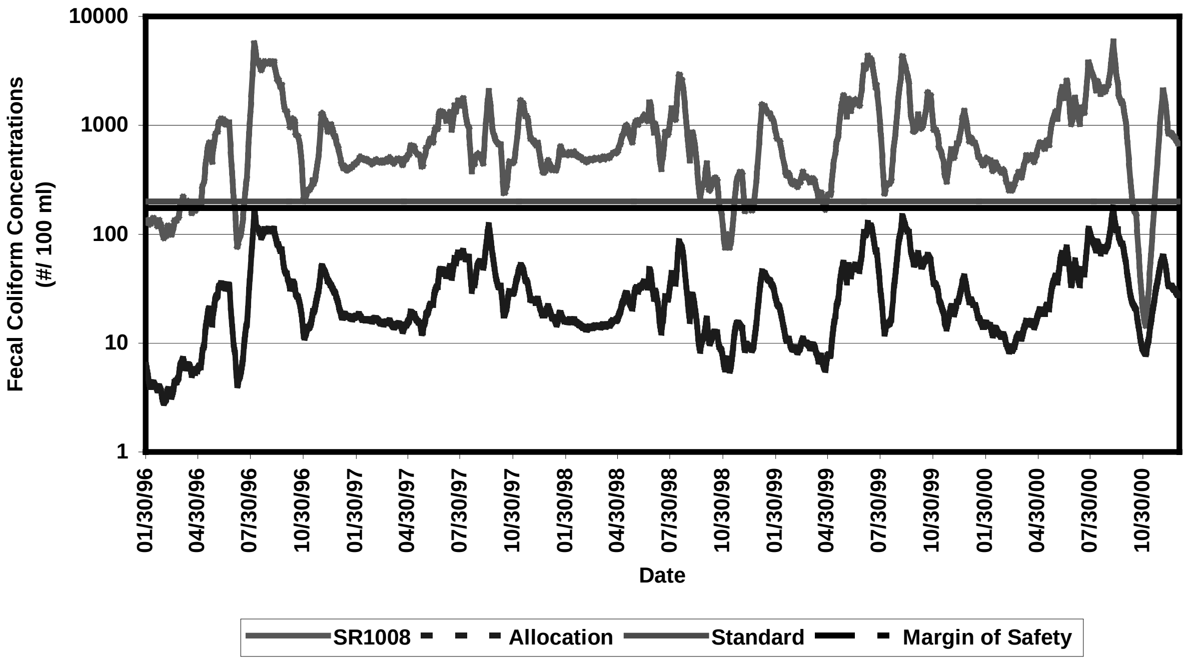


Figure 8. 30-day rolling geometric mean of the simulated fecal coliform concentration before and after TMDL allocation at SR1008.

4.4. Waste Load Allocation.

The fecal coliform contamination in the Clark Creek watershed due to point sources was only 5% of the total load (Table 5). The percentage of fecal coliform bacteria was attributed to the three main NPDES sources, Newton WWTP, Maiden WWTP, and Precedent, Inc

(Table 1 and Appendix 4). The remaining four sources, GE Hickory, Maiden WTP, Delta Mills Inc, and National Fruit, did not discharge fecal coliform to the creek.

Newton WWTP, Maiden WWTP, and Precedent, Inc, are permitted to discharge a monthly geometric mean fecal coliform concentration of 200 colonies / 100 ml with a maximum permitted discharges of 5 MGD, 0.008 MGD, and 1 MGD respectively. The total permitted load of fecal coliform bacteria is thus estimated to be 4.5 X 10^{10} colonies per day, which is indeed substantially higher than the actual discharge load, 1.5 X 10^{10} colonies per day (Table 5). Therefore, a waste load allocation (WLA) reduction was not recommended for the watershed.

4.5. Load Allocation (Non-point Source).

Based on the existing condition of the watershed (§ 3.3.1), the focus of reductions should be non-point sources. The load allocation (LA) for the non-point sources (NPS) was estimated by multiplying the 30-day geometric mean simulated by the model after reduction (Figure 8) by the respective flow values. The estimation was done for the period when the maximum 30-day geometric mean was simulated. The estimation suggests that the total maximum LA for the non- point sources be 6.5 x 10^{10} colonies per day. In average, the total reduction required to meeting the water quality standard, 175 colonies per 100 ml is thus estimated to be 77%.

The total LA was then proportionally distributed to each of the non-point sources. The LA distribution was mainly targeted to urban developed area, septic system, animal grazing, because these sources contributed substantial fecal coliform bacteria to the Clark Creek (§ 3.3.1). Fecal coliform bacteria from urban developed area can originate from various sources including leaking sanitary sewers, illicit sanitary sewer connection, and storm water runoff. The storm water runoff can include waste from domestic animals and urban wildlife. The model results suggest that a substantial amount of fecal coliform bacteria were transported to the Clark Creek from Newton and Maiden cities. The estimated proportional reductions required in the various sources to meeting the water quality standard, 175 colonies per 100ml, in the Clark Creek watershed are presented in Table 7.

5.0 SUMMARY AND FUTURE CONSIDERATIONS

The sources of fecal coliform bacteria in the Clark Creek watershed include primarily urban development, animal grazing, and septic system. These sources accounted about 53%, 22%, and 15% respectively. In order for the water quality target to be met, the final allocation of the fecal coliform bacteria requires a non-point source load reduction 6.5 X 10^{10} colonies per day for the various non-point sources of the fecal coliform bacteria.

The pipelines connecting between the Newton Clark Creek WWTP and the sewage collection system in the watershed run along the main Clark Creek. The city of Newton is therefore suggested to check any leak from the connecting pipe. Failure of connection between the sewer pipelines or any leak from the pipe could result in profound fecal coliform contamination in the creek.

The model estimated that the point sources contributed about 5% of the total loading in the watershed. The waste load allocation, as of DWQ permission, was estimated to be 4.5 x 10^{10} colonies per day. The permitted load was appeared to be considerably lower than the actual discharged load, 1.5 x 10^{10} colonies per day. Therefore, reduction is not recommended for fecal coliform loading from point sources.

5.1 Monitoring

Fecal coliform monitoring will continue on a monthly interval at the existing ambient monitoring site. The continued monitoring of fecal coliform concentrations will allow for the evaluation of progress towards the goal of reaching water quality standards by comparing the instream data to the TMDL target. In addition, flow monitoring will be considered at SR1008. This additional flow monitoring will help to refine the TMDL in the future.

Table 7. The proposed in-stream fecal coliform load reductions for the Clark Creek watershed at SR1008.

Source Category	Simulated total Load (1 X 10^6 per day)	TMDL (1 X 10^6 per day)	Reduction (%)
A. Non-point Sources (LA):			
Wildlife	2,828	2,828	0
Pasture Land	65,800	20,369	69
Cultivated Land	7,540	7,540	0
Recreational Grass	43	43	0
Urban Development:			
Low Intensity Development	62,900	12,473	80
High Intensity Development	5,530	783	86
Commercial/ Industrial	88,600	16,054	82
Septic System	45,400	4,787	89
Others (Wetland, ponds, barren etc)	4	4	0
B. Total for Non-point Sources	**278,645**	**64,880**	**77**
C. Point Source (WWTP)	**14600**	**45,000**	**0**
D. Margin of safety (MOS)	**_**	**6980**	**_**

To comply with EPA guidance, North Carolina may adopt new bacteria standards utilizing Escherichia coli (E. coli) and enterococci in the near future. Thus, in future, monitoring efforts to measure compliance with this TMDL should include using the E. coli and enterococci. Per EPA recommendations (EPA, 2000b), if future monitoring for E. coli/enterococci indicates the standard has not been exceeded, these monitoring data may be used to support delisting the water body from the 303(d) list. If a continuing problem is identified using E. coli/enterococci, the TMDL may be revised.

5.2 Implementation

Implementation plans are not included in this TMDL. The involvement of local governments and agencies will be needed in order to develop implementation plans. The DWQ will begin developing the implementation plan during public review of the TMDL.

6.0 PUBLIC PARTICIPATION

Many local government officials have been notified of DWQ's intention to develop the Clark Creek fecal coliform TMDL. The extension services in Catawba and Lincoln Counties and local associations have supplied septic data, sewer data, and agricultural information to aid in the source assessment portion of the TMDL. The Clark Creek Fecal Colifom TMDL was public noticed in both counties through local newspapers (Hickory Daily Record and Lincoln Time-News) on June 10, 2002 (Appendix V). The TMDL was also public noticed through DWQ web site at http://h20.enr.state.nc.us/tmdl/.

A public meeting was held in Newton, NC, on July 1, 2002 as a part of the comment period. A group of seventeen (17) individuals participated the meeting from the following organizations:

1. Carolina Land and Lakes RC&D – 1 representative
2. Catawba County – 3 representatives
3. Catawba SWCD – 1 representative
4. Catawba Valley Cattleman's Association – 2 representatives
5. City of Newton – 2 representatives
6. Department of Environmental and Natural Resources, MRO – 1 representative
7. Natural Fruit Production CO. – 1 representative
8. NC Division of Water Quality – 4 representatives
9. Sherrill Furniture – 1 representative
10. Western Piedmont COG – 1 representative

A public comment period was through July 10, 2002. Four written comments were received through email and are included in Appendix V1. Each comment was carefully considered and the TMDL was revised accordingly.

7.0 REFERENCES

Clark, Melanie L. Clark and Jodi R. Norris. 2000. Occurance of Fecal Coliform Bacteria in Selected Streams in Wyoming, 1990-99. Water Resources Investigations Report 00-4198. USGS, Science for a Changing World. Cheyenne, Wyoming.

Canale, R. P., M.T. Auer, E.M. Owens, T.M. Heidtke, S.W. Effler. 1993. Modeling Fecal Coliform Bacteria –II. Model Development and Application. Water Research, 27(4):703-714.

Division of Environmental Health (DEH). NCDENR. 1999. North Carolina On-Site Wastewater Non-Point Source (NPS) Pollution Program. www.deh.enr.state.nc.us/oww/non-pointsource/NPS.htm June 24, 1999.

Division of Environmental Health (DEH). NCDENR. 2000. Report on the Proper Maintenance of Septic Tank Systems in Accordance with Section 13.5 of HB 1160 (Clean Water Act of 1999). http://www.deh.enr.state.nc.us/oww/Maintenance.PDF. March 15, 2000.

Giese G. L. and R. R. Mason. Jr. 1993. Low-Flow Characteristics of Streams in North Carolina. United States Geological Survey Water-Supply Paper 2403.

Hyer, Kenneth, Doughlas Moyer, and Trisha Baldwin. 2001. Bacteria Source Tracking to Improve TMDL Development in Bacteria. U.S. Geological Survey, WRD, 1730 East Parham Rd., Richmond, VA 23228. In va.water.usgs.gov/GLOBAL/posters/BST.pdf.

Khaleel, R., K.R. Reddy, and M.R. Overcash. 1980. Transport of Potential Pollutants in Runoff Water from Land Areas Receiving Animal Wastes: A Review. Water Research 14:421-436.

North Carolina Department of Agriculture. 2001. Agricultural Statistics Division-County Statistics. www.ncagr.com/stats/cntysumm/ and http://govinfo.library.orst.edu/cgi-bin/ag-state?North+Carolina.

North Carolina Division of Water Quality. January 2002. Assessment Report: Biological Impairment in the Upper Clark Creek Watershed (Internal Review Draft). Prepared for the Clean Water Management Trust Fund. NCDENR, DWQ, Planning Branch.

North Carolina Division of Water Quality. February 2002. Fecal Coliform Toatl Maximum Daily Laod for the Irwin, McAlpine, Little Sugar and Sugar Creek Watersheds, Mecklenburg County. Catawba River Basin. Final report submitted to EPA.

North Carolina Division of Water quality (DWQ) and the Western Piedmont Council of Governments (WPCOG). April 2001. North Carolina's Catawba River Basinwide Water Quality Plan: A Summary. NCDWQ, NC.

North Carolina Cooperative Extension Service, North Carolina State University (NCSU), College of Agriculture and Life Sciences, Raleigh, Livestock Manure Production and Characterization in North Carolina. January 1994.

North Carolina Equine Survey. 1996. North Carolina Agricultural Statistics. NC Department of Agriculture and Consumer Services, Raleigh, NC – 27611. http://www.agr.state.nc.us/stats.

Systech Engineering. October 2001. Watershed Analysis Risk Management Frame Work (WARMF): Update One: A Decision Support System for Watershed Analysis and Total Maximum Daily Load Calculation, Allocation and Implementation. EPRI, Palo Alto, CA: 1005181.

U.S. Environmental Protection Agency (USEPA). 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Assessment and Watershed Protection Division, Washington, DC.

U.S. Environmental Protection Agency, Federal Advisory Committee (FACA). Draft final TMDL Federal Advisory Committee Report. 4/28/98.

U.S. Environmental Protection Agency (USEPA) 2000a. Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and management Regulation; Final Rule. Fed. Reg. 65:43586-43670 (July 13, 2000).

U.S.Environmental Protection Agency (USEPA) 2000b. Implementation Guidance for Ambient Water Quality Criteria for Bacteria – 1986. DRAFT. Office of Water. EPA-823-D-00-001.

U.S.Environmental Protection Agency (USEPA). February 2002. TMDLs for Fecal Coliform in 303(d) Listed Streams in Altamaha River Basin. http://epa.gov/region4/water/tmdl/georgia.

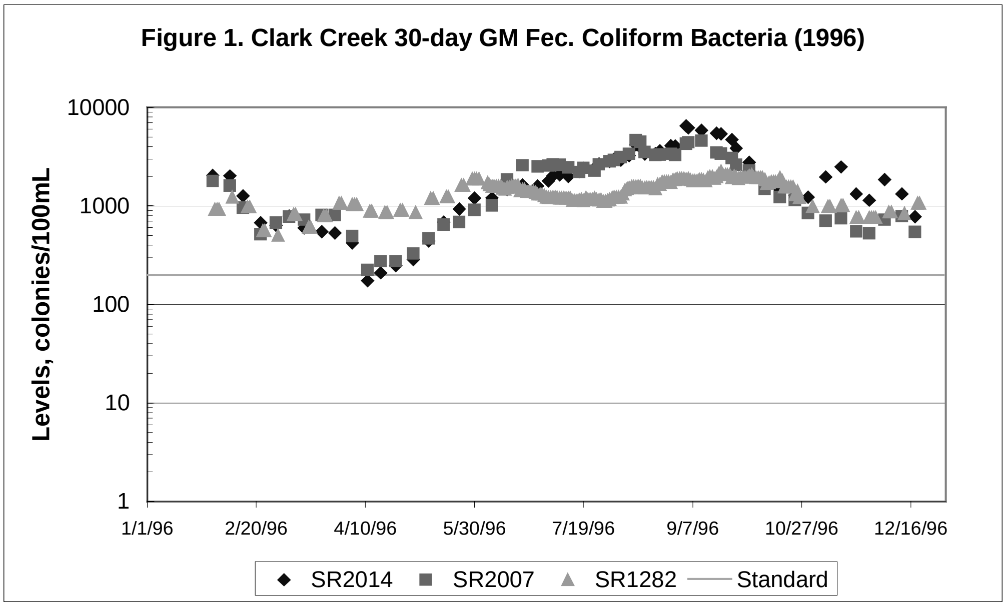
U.S.Environmental Protection Agency (USEPA). January 2001. Protocal for Developing Pathogen TMDLs: First Edition. http://www.epa.gov/owow/tmdl/techsupp.html.

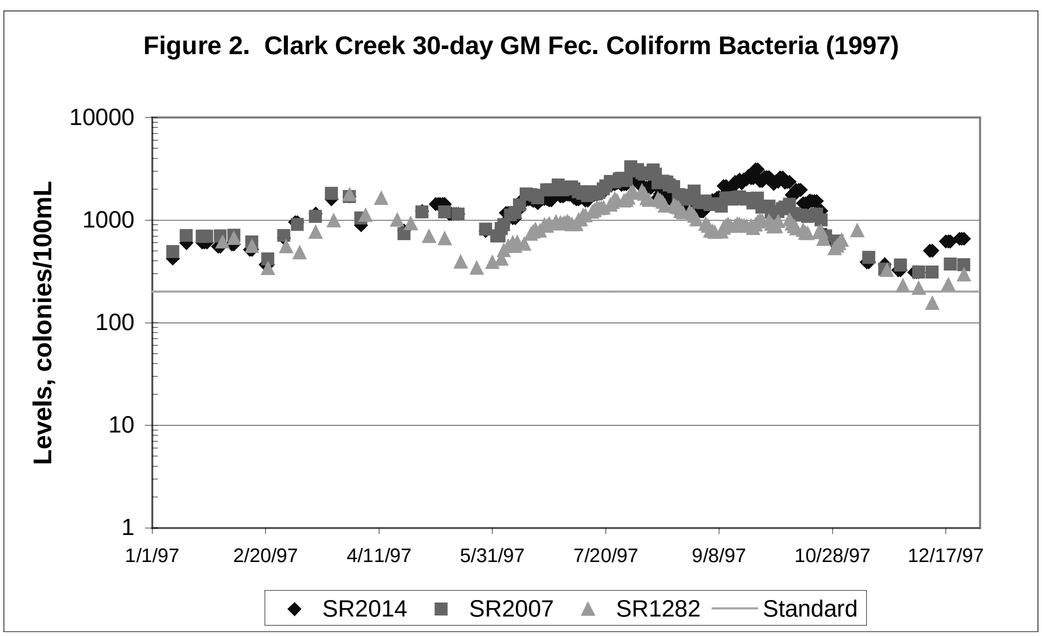
U.S. Environmental Protection Agency (USEPA) 1985. Rates, constants, and kinetics formulations in surface water quality modeling (II ed.). Athens, GA: EPA-600-3-85-040.

Wilhelm, Lance J. and Terry L. Maluk. October 1998. Fecal-Indicator Bacteria in Surface Waters of the Santee River Basin and Coastal Drainages, North and South Carolina, 1995-98. Fact Sheet FS-085-98. U.S. Geological Survey, Columbia, SC 29210-7651.

APPENDIX I. Figures for Water Quality Assessments.

Appendix 1A. Discharge Monitoring Report (DMR) data for the fecal coliform concentration in the Clark Creek watershed from 1996 through 2000.





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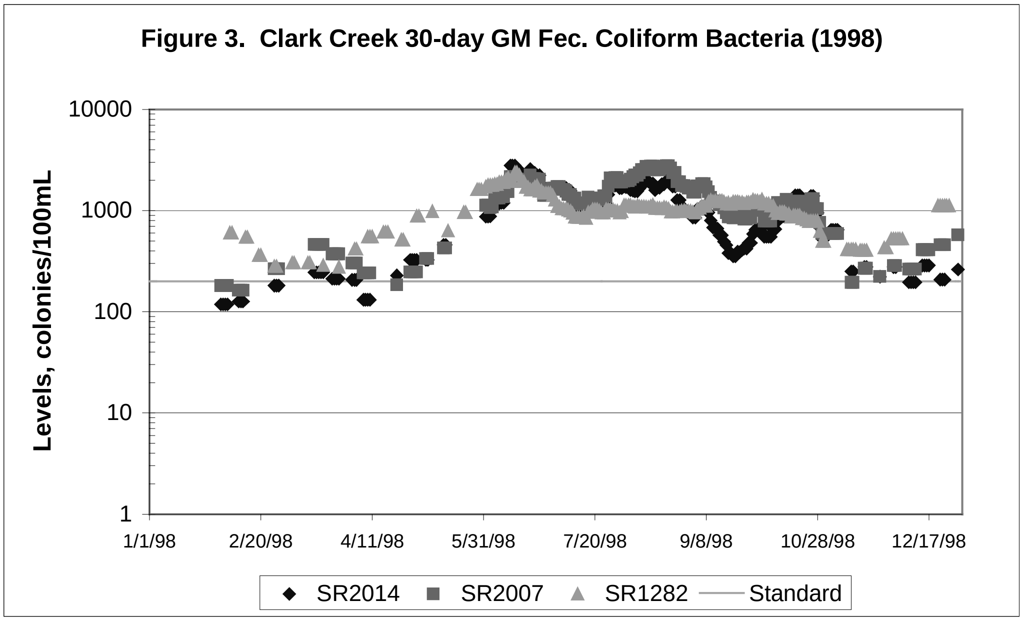

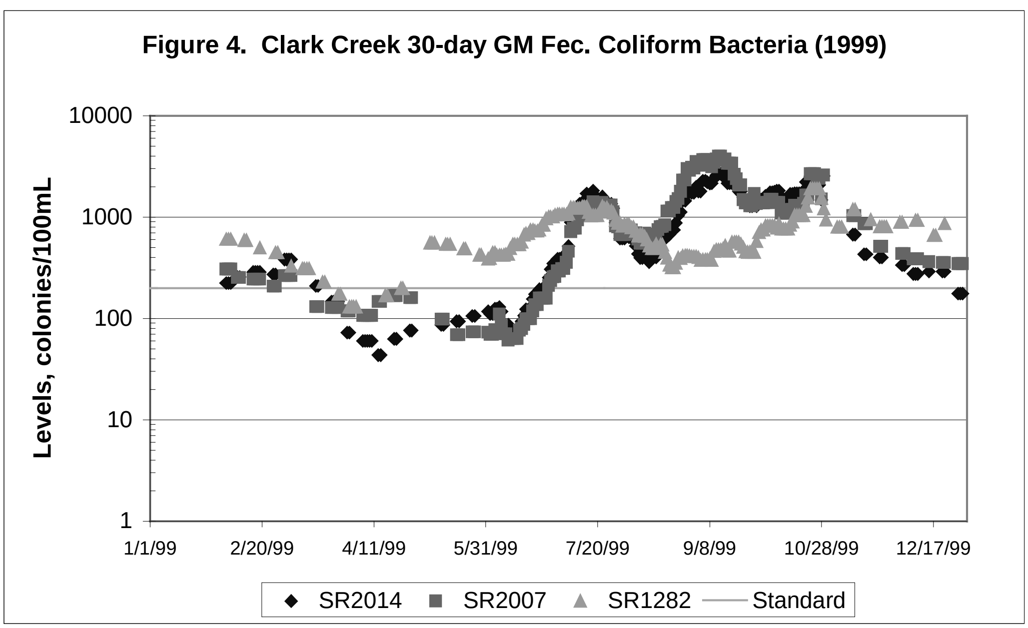

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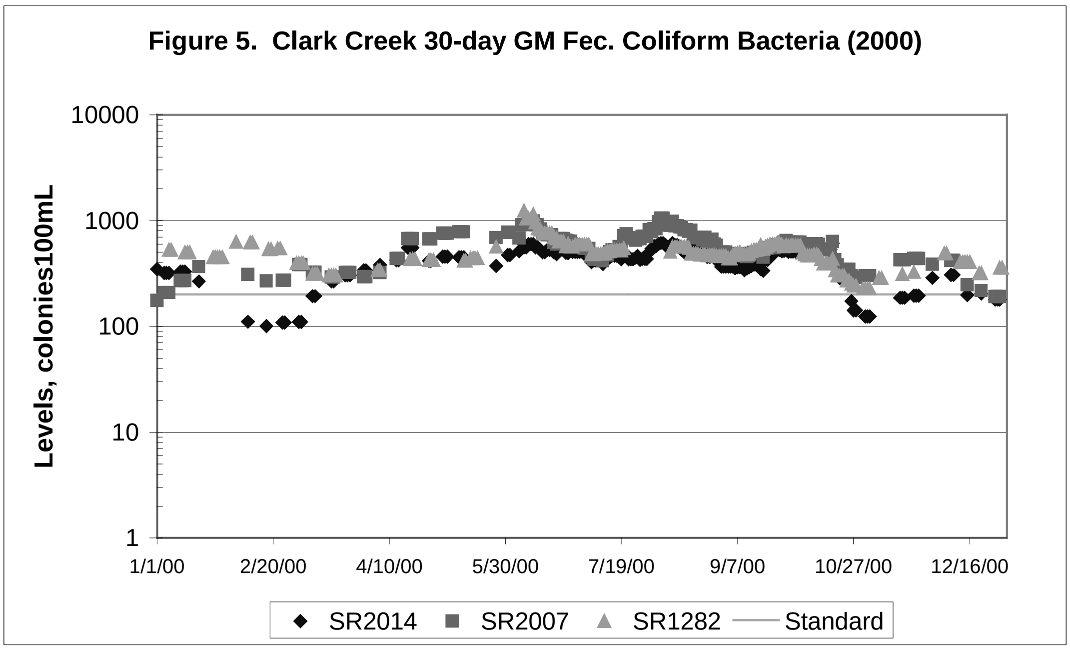
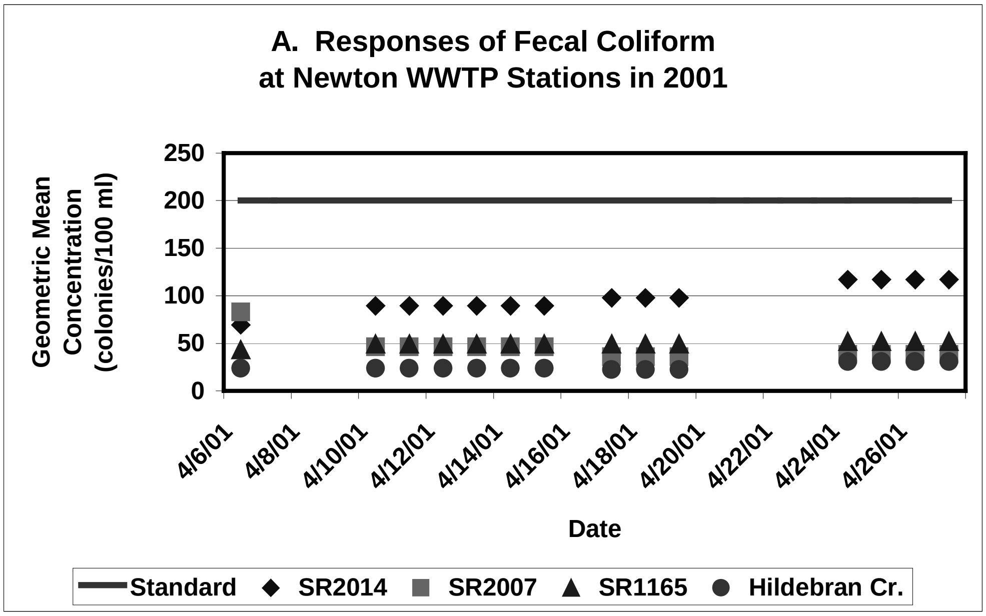
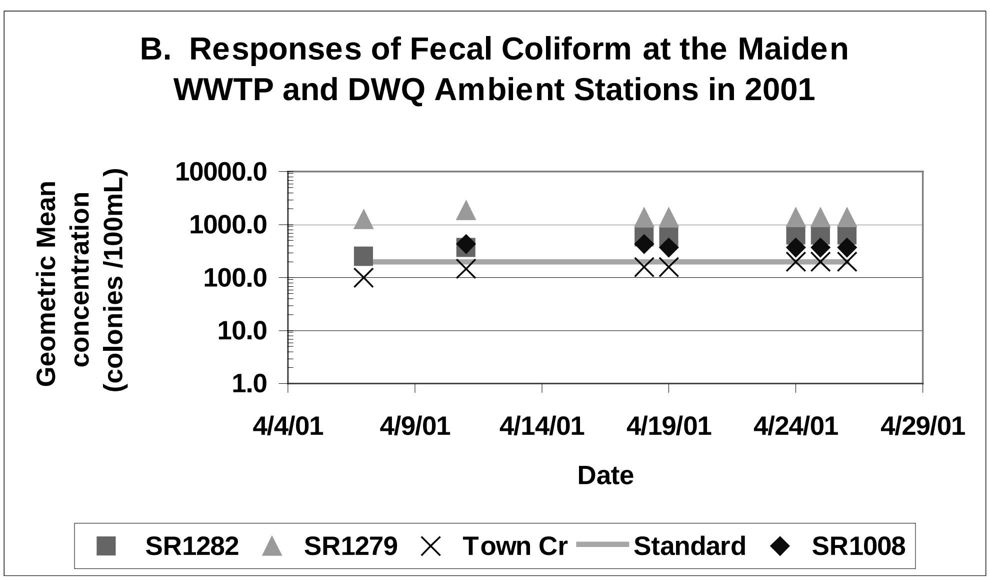
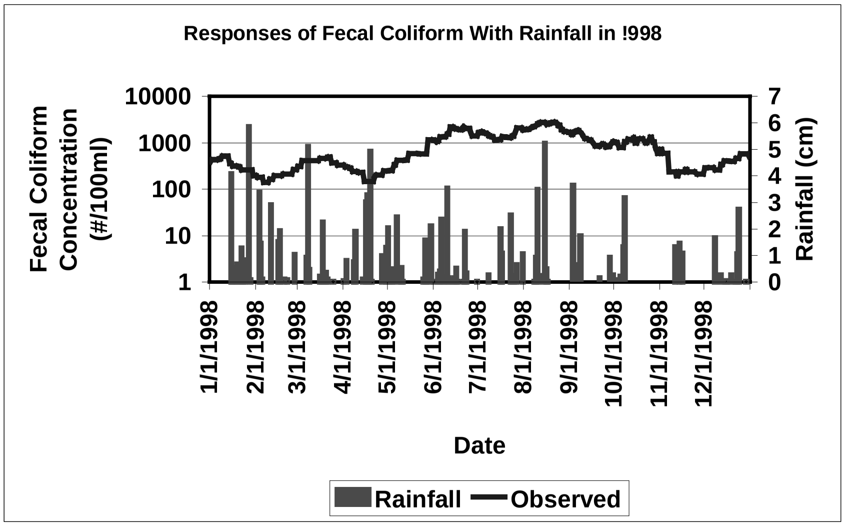


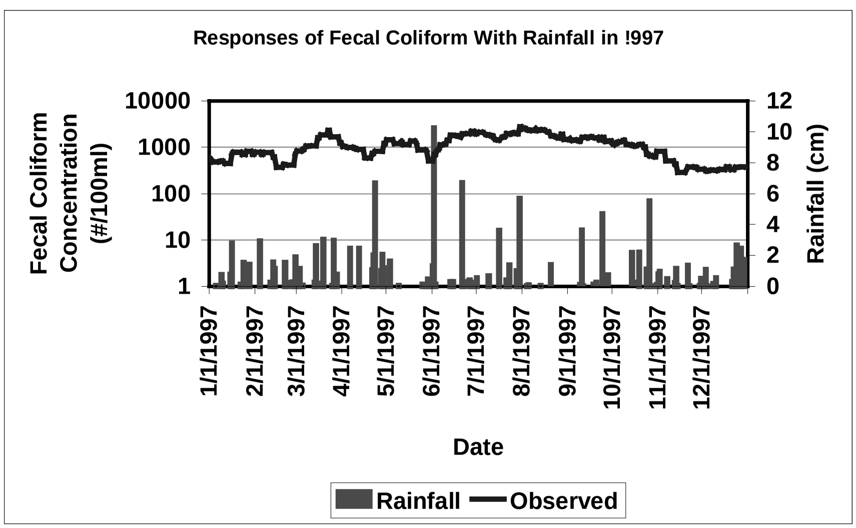
Appendix IB. Summary of spatial extent of fecal coliform measurements in Clark Creek watershed in 2001.





Appendix 1C. Rainfall vs observed fecal coliform bacteria concentration.





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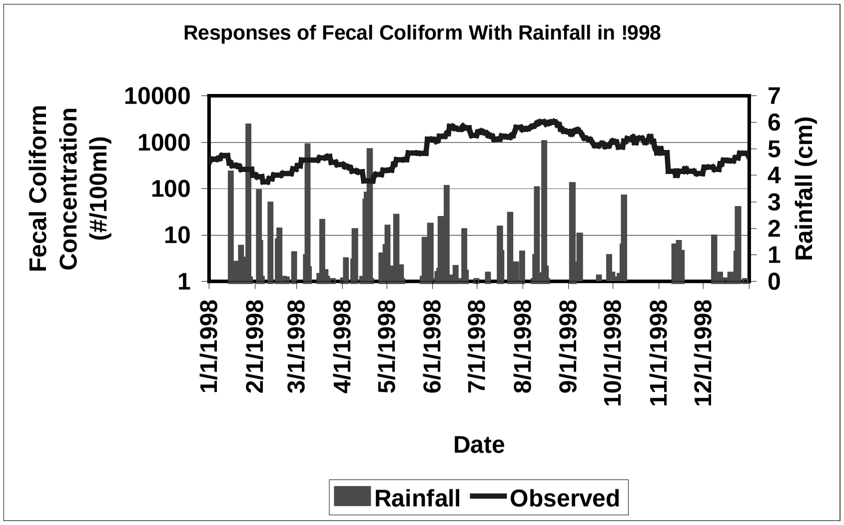

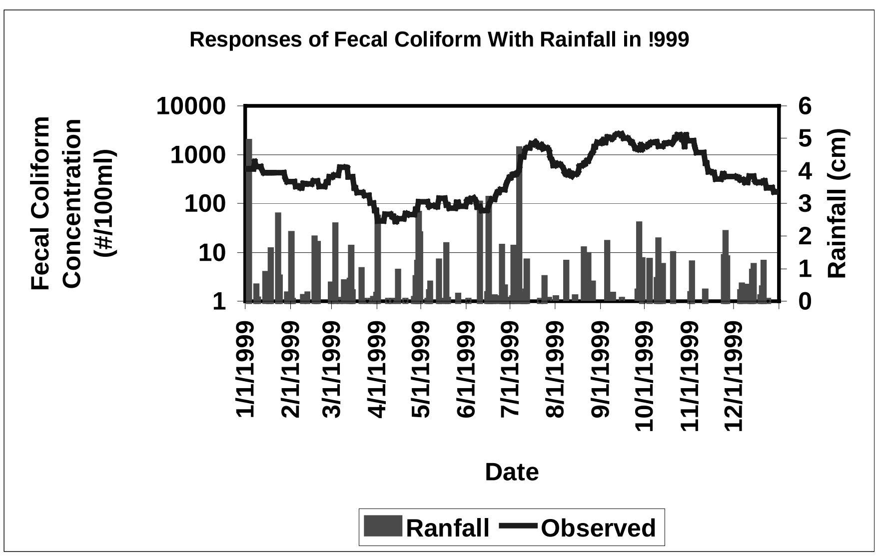

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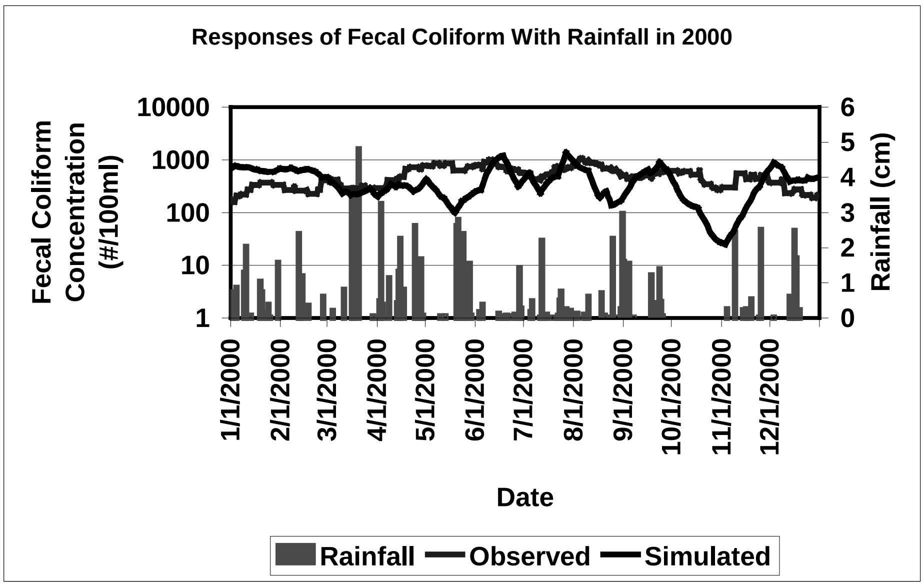

APPENDIX II. Clark Creek Monitoring Data.

DWQ Ambient Monitoring Station - SR2007

Date	Temperature (Degree C)	Fecal Coli. (# / 100 ml)	DO mg/L
1/4/96	4	510	10.2
1/11/96	3	3700	11.2
1/19/96	11	8181.8	7.9
1/25/96	6	454.5	10
1/31/96	8	2600	9.5
2/8/96	5	300	10.4
2/14/96	7	280	10.6
2/22/96	10	360	9.3
2/29/96	9	1800	8.2
3/6/96	12	5200	9.3
3/13/96	6	210	9.2
3/21/96	7	480	9.2
3/27/96	11	360	8.5
4/4/96	13	154.5	7.6
4/11/96	10	100	9.5
4/17/96	10	590	7.8
4/24/96	13	470	7.6
5/2/96	15	900	7.8
5/9/96	18	900	6.2
5/16/96	15	500	6.9
5/23/96	19	800	8.4
5/30/96	17	1900	7
6/3/96	16	100	7.6
6/5/96	16	1909.1	7.3
6/7/96	18	1000	7.9
6/10/96	19	3900	7.6
6/12/96	20	2818.2	8
6/14/96	20	3800	7.6
6/17/96	20	1454.5	7.7
9/19/96	21	727.3	8
6/21/96	21	10000	7.2
6/24/96	22	1818.2	7.4
6/27/96	19	1600	7.8
6/28/96	20	1800	8.6
7/1/96	22	1800	7.6
7/3/96	22	3100	6.8
7/5/96	18	1300	8.4
7/8/96	22	1454.5	7.9
7/11/96	20	1300	8.3
7/12/96	20	1400	8.1
7/15/96	22	25000	7.1
7/17/96	23	2400	7.5
7/19/96	23	5800	7.3
7/22/96	23	2000	7.5

SR2007 Data Continued

7/24/96	23	1454.5	7.2
7/26/96	21	14000	7.3
7/29/96	21	2900	7.8
7/31/96	21	2800	7.9
8/2/96	21	2700	7.5
8/5/96	22	3300	7.6
8/8/96	22	6000	7.4
8/9/96	22	2300	7
8/12/96	22	34000	6.9
8/14/96	22	2700	7.7
8/16/96	21	909.1	7.6
8/20/96	21	1636.4	7.7
8/21/96	22	3200	7.8
8/23/96	21	2300	7.8
8/27/96	21	8000	8.1
8/28/96	21	3300	8
8/30/96	21	1909.1	7.6
9/3/96	20	26000	7.7
9/4/96	20	10909.1	7.9
9/5/96	21	5454.5	7.9
9/9/96	21	2200	7.7
9/11/96	21	11000	7.8
9/13/96	19	2400	7.6
9/16/96	17	636.4	8.4
9/18/96	17	1090.9	8.6
9/20/96	15	1181.8	8.8
9/24/96	16	909.1	8.8
9/25/96	18	1818.2	8.1
9/27/96	19	909.1	8
9/30/96	16	1545.4	8.2
10/3/96	18	636.4	8.6
10/10/96	12	2400	8.8
10/17/96	14	1363.6	8.6
10/24/96	11	636.4	8.5
10/30/96	18	181.8	7.6
11/7/96	14	470	8.6
11/14/96	8	3100	10.2
11/21/96	11	310	9.6
11/27/96	7	490	10.6
12/4/96	8	900	10.2
12/12/96	11	727.3	9.7
12/18/96	8	470	10.6
12/26/96	4		11.6
12/27/96	7	360	11
1/2/97	10	450	9.5
1/8/97	6	520	14.2
1/16/97	6	4500	10.8
1/23/97	9	420	10
1/30/97	7	380	9.9
2/5/97	8	480	10.1

SR2007 Data Continued

2/13/97	8	240	11.6
2/20/97	9	700	10.1
2/28/97	13	5700	8.9
3/5/97	11	1300	9.5
3/10/97	9	1200	10
3/17/97	7	3200	8.5
3/24/97	10	480	10
4/1/97	10	530	10.2
4/11/97	9	800	9.6
4/17/97	11	560	9.2
4/21/97	11	1900	9.5
4/29/97	13	5400	8
5/6/97	14	550	8.8
5/12/97	14	610	9
5/22/97	14	330	8.6
5/28/97	15	580	8.2
6/2/97	17	2600	6.8
6/4/97	14	1900	8.4
6/6/97	14	3400	8.5
6/9/97	15	1600	8.9
6/11/97	16	2100	8.3
6/13/97	19	9700	7.4
6/16/97	18	1636.4	7.2
6/18/97	20	1500	7.7
6/20/97	20	900	7.4
6/23/97	20	2500	7.8
6/25/97	21	2000	7.7
6/27/97	21	2000	7.2
6/30/97	20	520	7.4
7/2/97	21	5400	7.1
7/3/97	21	2100	7.2
7/7/97	20	836	7.9
7/9/97	20	1000	7.5
7/11/97	21	1181	7.2
7/14/97	22	945	8.5
7/17/97	21	2800	7.3
7/18/97	21	4400	7.3
7/21/97	23	9000	6.6
7/13/97	23	29000	6.5
7/25/97	22	4400	7
7/28/97	23	1272	7.3
7/30/97	21	28000	6.9
8/1/97	19	1545	8.7
8/4/97	20	1272	7.5
8/6/97	19	545	8.8
8/8/97	19	1363	7.5
8/11/97	20	909	7.9
8/13/97	21	1454	7.8
8/15/97	23	2100	7.6
8/18/97	23	1454	7.7

SR2007 Data Continued			
8/20/97	23	1000	7.6
8/22/97	19	1454	8
8/25/97	18	1454	8.6
8/27/97	20	13000	7.9
8/29/97	21	1000	7.7
9/2/97	22	2400	8
9/3/97	22	454.5	8
9/5/97	16	636.4	8.7
9/8/97	19	727.3	8.4
9/10/97	20	9090.9	7.4
9/12/97	19	1545.4	8.1
9/15/97	20	2600	8.1
9/18/97	21	1000	7.7
9/19/97	21	909	7.3
9/22/97	18	454.4	8.4
9/24/97	18	5900	8.8
9/26/97	15	909.1	8.7
10/1/97	16	220	8.8
10/7/97	15	1818.2	8.4
10/15/97	16	2200	8.3
10/22/97	14	210	9.2
10/29/97	9	510	9
11/6/97	6	270	10.9
11/12/97	12	240	9.2
11/20/97	20	580	10.4
11/26/97	26	330	11
12/3/97	8	230	9.1
12/10/97	7	272.7	10.1
12/17/97	4	580	11.6
12/23/97	8	545.4	10.2
12/31/97	3	430	11.4
1/7/98	13	520	8
1/14/98	8	81.8	10.4
1/20/98	5	250	11.2
1/30/98	7	136.4	10.4
2/2/98	5	136.4	10.8
2/10/98	7	300	8.8
2/19/98	7	370	10.8
2/26/98	8	627.3	10.6
3/6/98	8	420	11.2
3/12/98	5	300	9.2
3/16/98	8	718.2	9.1
3/24/98	10	127.3	8.8
4/2/98	13	220	8.4
4/7/98	11	136.4	8.9
4/15/98	14	118.2	7.7
4/22/98	13	480	7.9
4/28/98	13	540	7.7
5/5/98	14	1000	7.5
5/13/98	16	460	7.6

SR2007 Data Continued			
5/22/98	19	450	7.5
5/28/98	20	8700	7.8
6/1/98	21	1000	7.8
6/3/98	20	818.2	6.8
6/5/98	19	3700	7
6/8/98	16	1636	8.2
6/10/98	17	3500	7.1
6/12/98	20	7181	6.6
6/15/98	20	1181	7.2
6/17/98	20	1363	7.1
6/18/98	19	1727	7.1
6/22/98	22	1000	8.2
6/24/98	22	1636	7
6/26/98	22	100	6.4
6/29/98	23	1636	7.8
7/1/98	22	7818	7
7/3/98	21	1363	7.2
7/7/98	21	909	7.3
7/8/98	23	636	6.6
7/10/98	23	1181	7
7/13/98	22	1363	7
7/15/98	21	1454	7.3
7/17/98	23	8000	6.1
7/20/98	23	1000	7
7/22/98	23	818	6.7
7/24/98	23	4900	6.6
7/27/98	22	21000	6.7
7/29/98	22	1727	6.3
7/31/98	22	2100	6.2
8/3/98	20	2000	7
8/5/98	19	3000	7
8/7/98	21	1000	6.7
8/10/98	22	6000	6.2
8/12/98	22	3700	6.6
8/14/98	22	1636	6.8
8/17/98	22	2700	6
8/19/98	22	2400	6.3
8/21/98	21	1090.9	7.2
8/24/98	22	636	6.3
8/26/98	22	1363	6
8/28/98	23	545	6.3
8/31/98	23	1090	6.2
9/2/98	22	545.4	6.4
9/4/98	21	20000	6.1
9/8/98	21	727.3	6.3
9/10/98	16	272.7	7.8
9/11/98	17	1272.7	7.1
9/14/98	19	545.4	6.9
9/17/98	20	272.7	7.1
9/18/98	21	636.4	6.6

SR2007 Data Continued

9/22/98	22	2100	6.3
9/24/98	19	636.4	7.2
9/25/98	18	363.6	7.2
9/29/98	21	7000	6.3
9/30/98	21	2600	6.6
10/2/98	17	272.7	7.6
10/8/98	20	24000	6.7
10/15/98	14	90.9	8.2
10/21/98	14	454.5	8.2
10/27/98	13	272.7	8.5
11/3/98	13	270	7.9
11/12/98	10	90.9	8.9
11/18/98	10	454.5	8.8
11/25/98	10	181.8	8.9
12/1/98	11	927.3	8.8
12/8/98	15	181.8	7.1
12/14/98	9	818.2	9.3
12/22/98	12	818.2	7.9
12/30/98	6	560	9.9
1/8/99	7	272.7	9.9
1/12/99	6	270	10.1
1/21/99	7	818.2	9.9
1/28/99	9	100	8.8
2/4/99	10	90.9	8.8
2/9/99	8	550	9.8
2/16/99	6	480	9.8
2/25/99	4	618.2	10.8
3/2/99	7	540	10.6
3/12/99	7	90.9	10.8
3/16/99	6	27.3	9.8
3/23/99	9	81.8	10
3/30/99	10	18.2	9.9
4/6/99	14	210	7.8
4/13/99	12	18.2	9
4/20/99	14	172.7	7.8
4/27/99	17	210	7.4
5/7/99	16	100	6.9
5/11/99	17	72.7	7.3
5/18/99	17	27.3	6.6
5/25/99	17	310	7.1
6/1/99	18	360	7
6/2/99	19	81.8	8.3
6/4/99	19	260	6.5
6/7/99	19	63.6	7
6/8/99	20	9.1	7.1
6/11/99	21	18.2	5.8
6/15/99	20	90.9	7
6/16/99	19	800	6.7
6/18/99	18	430	6.9
6/21/99	17	1636.4	7.2

SR2007 Data Continued			
6/22/99	19	545.4	7.2
6/24/99	19	1190.9	6.8
6/28/99	22	6636.4	6.5
6/29/99	22	3600	6.1
6/30/99	23	1909.1	6.1
7/6/99	24	1454.5	6
7/8/99	23	6000	6.1
7/9/99	23	1272.7	6.2
7/12/99	19	3100	6.7
7/13/99	17	1818.2	7.3
7/16/99	22	454.5	7.6
7/19/99	22	363.6	7.5
7/20/99	22	454.5	6.7
7/23/99	23	181.8	6.2
7/27/99	23	363.6	5.4
7/28/99	23	90.9	6.8
7/30/99	23	100	6.9
8/2/99	24	1545.4	6.7
8/3/99	22	363.6	7
8/6/99	22	100	7.8
8/10/99	23	2000	7.5
8/12/99	23	909.1	6.8
8/13/99	23	1700	7.2
8/16/99	23	1181.8	7
8/17/99	24	21000	6.5
8/20/99	22	2100	7
8/24/99	21	6000	7
8/25/99	21	8818.2	7.2
8/27/99	22	2500	7.1
8/30/99	21	1272.7	7.5
8/31/99	18	1363.6	8.2
9/3/99	19	536.4	7.1
9/7/99	21	1454.5	6.7
9/8/99	22	1454.5	7
9/10/99	20	9818.2	7
9/14/99	18	1272.7	7.3
9/15/99	20		7
9/16/99	18	1454.3	7.2
9/20/99	17	909.1	7.6
9/21/99	18	454.5	7.1
9/23/99	14	1000	8.2
9/28/99	20	16000	6.4
9/29/99	21	100	6.6
9/30/99	18	8000	7.2
10/5/99	17	4200	7.3
10/14/99	17	3400	7.4
10/19/99	14	1454.5	8.1
10/26/99	9	636.4	9.1
11/5/99	8	480	9.6
11/11/99	13	90.9	8.8

SR2007 Data Continued			
11/16/99	10	363.6	8.7
11/23/99	14	1000	8
12/3/99	6	272.7	8.2
12/8/99	6	172.7	10.6
12/15/99	10	120	9.5
12/21/99	9	363.6	9.3
12/28/99	4	81.8	11
1/4/00	12	636.4	8.1
1/11/00	7	636.4	9.4
1/19/00	4	545.4	10.4
1/27/00	4	54.5	12.3
2/3/00	1	270	11.4
2/9/00	6	545.4	10.8
2/17/00	8	320	10.3
2/24/00	10	590.9	9.8
3/2/00	10	300	10.1
3/8/00	10	118.2	10.3
3/16/00	11	320	8.7
3/22/00	11	520	8.8
3/30/00	12	370	9.4
4/6/00	11	470	8.8
4/13/00	12	550	9.4
4/18/00	14	2800	7.7
4/27/00	12	510	10.8
5/3/00	16	681.8	7.3
5/10/00	18	545.4	6.6
5/18/00	17	827.3	9.6
5/26/00	18	1000	7.4
5/31/00	17	900	7.6
6/5/00	20	360	6.7
6/6/00	20	3900	7.4
6/7/00	18	909.1	7.6
6/12/00	21	520	6.7
6/14/00	23	454.5	6.6
6/15/00	25	310	6.6
6/20/00	21	163.6	7.9
6/21/00	22	420	7.4
6/22/00	22	2300	6.7
6/26/00	22	570	6.3
6/27/00	22	600	6.1
6/28/00	22	210	5.9
7/3/00	21	360	6.5
7/5/00	22	340	6.4
7/6/00	23	390	5.8
7/11/00	23	290	6.5
7/12/00	23	2600	6.4
7/14/00	22	1181.8	6.9
7/18/00	21	1363.6	6.2
7/19/00	23	454.5	6.4
7/20/00	22	5400	5.8

SR2007 Data Continued

7/25/00	19	363.6	7.4
7/26/00	20	818.2	6.6
7/28/00	21	363.6	6.9
7/31/00	22	4900	7
8/1/00	22	454.5	5
8/4/00	22	2500	7.6
8/7/00	23	363.6	6.4
8/8/00	23	360	6.5
8/11/00	22	727.3	6.7
8/14/00	20	818.2	7
8/15/00	21	400	7.4
8/18/00	22	581.8	7.1
8/23/00	20	370	7
8/24/00	21	800	7.1
8/25/00	22	260	7.3
8/28/00	22	163.6	6.8
8/29/00	21	410	6.9
8/31/00	22	590	6.7
9/5/00	22	1000	6.9
9/6/00	18	410	8.3
9/8/00	19	400	7.8
9/11/00	20	390	7.1
9/12/00	20	645.4	7.4
9/13/00	21	1600	6.6
9/18/00	15	145.4	8.4
9/19/00	17	7000	8.3
9/21/00	21	700	8.8
9/26/00	17	530	9.4
9/27/00	15	360	9.3
9/29/00	15	380	7.7
10/5/00	18	310	6.6
10/11/00	10	370	8.2
10/20/00	13	200	7.3
10/26/00	17	240	6.8
11/1/00	10	450	7.6
11/10/00	15	4200	7.2
11/16/00	8	154.5	9.8
11/22/00	3	230	10.8
11/30/00	7	127.3	10.2
12/8/00	4	681.8	10.8
12/15/00	6	300	10.5
12/21/00	2	81.8	14.2
12/27/00	4	118.2	12.1

DWQ Ambient Monitoring Satation - SR1008

SR1008 Date	SR1008 Flow (cms)	SR1008 Temperature (Degree C)	SR1008 Fecal Coli. (# / 100 ml)	SR1008 DO mg/L
1/7/92	_	6	390	10.6
2/11/92	_	3	240	11
3/10/92	_	15	410	8.8
4/7/92	_	11	450	9.8
5/7/92	_	20	10	9.8
6/9/92	_	22	1700	7.4
7/7/92	_	23	500	7
8/11/92	_	22	470	7.2
9/10/92	_	18	470	6.9
10/14/92	_	11	280	8.2
11/4/92	_	16		8.6
12/9/92	_	6	200	10.6
1/7/93	_	11	640	9.2
2/16/93	_	7	1400	10.4
2/24/93	_			
3/4/93	_	8.7	6600	10
4/6/93	_	9	860	10.3
5/6/93	_	17.8	3800	8
6/3/93	_	18	720	7.7
7/8/93	_	24	30	6.8
8/3/93	_	22.8	1500	7.1
9/23/93	_	18.7	10	6.9
10/25/93	_	13.3	160	9.3
11/22/93	_	7.8	300	11.3
2/14/94	_	5.9	400	11.3
3/9/94	_	11.3	400	8.8
4/6/94	_	14	970	9.1
5/4/94	_	13.3	8200	8.4
6/13/94	_	20.5	770	7.4
7/7/94	_	22.9	1400	6.8
8/4/94	_	21.8	1700	6.8
9/6/94	_	18.7	670	7.3
10/3/94	_	18.1	880	6.5
11/14/94	_	9.9	450	10
12/15/94	_	9.1	500	9.8
1/12/95	3.1152	8.8	950	9.8
2/2/95	2.94528	7.2	280	10.9
3/13/95	3.45504	11.2	120	9
4/24/95	3.05856	11.9	500	8
5/18/95	1.92576	19.9	1900	6.9
6/8/95	2.23728	20.8	2600	7.7
7/13/95	1.21776	22.9	520	6.5
8/7/95	0.73632	23.4	360	6.6
9/18/95	2.6904	20	1400	7
11/7/95	1.8408	11	8300	9
12/12/95	36.816	4	150	12
1/11/96	2.20896	3.1	9	12

SR1008 data Continued				
2/8/96	2.23728	6.1	630	10.7
3/6/96	5.15424	12	130000	8.7
4/8/96	6.372	10	290	10.2
5/2/96	2.5488	16	690	8.5
6/6/96	2.52048	19	960	7.7
7/11/96	1.6992	20.5	410	7.1
8/1/96	0.79296	22.3	3400	7.2
9/3/96	2.5488	20.6	14000	7.1
10/17/96	3.9648	15.8	2700	7.7
11/5/96	1.47264	10.6	10	8.8
12/5/96	3.34176	6.8	760	10
1/8/97		7.1	370	10.4
2/17/97	5.664	6.8	120	10.8
3/13/97		12	320	9.4
4/7/97		16.2	1200	8.4
5/13/97		16	390	8.7
6/4/97		15.7	1500	8
7/16/97		23.2	680	7.1
8/6/97		20.3	630	7.7
9/4/97		19.7	550	7.6
10/1/97			530	
11/6/97			3000	
12/9/97	2.4096		140	
1/7/98		12	430	10
2/2/98		6	220	11
3/4/98		8	200	11
4/1/98		18	290	8
5/4/98		16	500	8
6/3/98		22	580	8
7/27/98		22	720	6
8/24/98		23	710	6
9/28/98			460	
12/8/98			230	
11/16/98			200	
12/21/98			240	
1/16/99		2.1	890	12.5
2/8/99		12.3	120	9.3
3/24/99		11.4	95	8.6
4/12/99		17.9	490	8.1
5/12/99		18.2	290	7.8
6/17/99		19.5	4900	8
7/13/99		18.4	1400	7.2
8/10/99		23.6	380	5.8
9/1/99		18.6	140	7.1
10/6/99		16.8	10	7.4
11/8/99		13.3	940	9
12/12/99			230	
1/20/00		6	2300	10.5
2/2/00		3	410	11.8
3/9/00		15	280	8.5

SR1008 data Continued			
4/5/00	11	680	8.9
5/9/00	20	290	6.8
7/6/00	22	540	6.4
6/14/00	23	300	7
8/3/00	22	44	6
9/6/00	18	840	7
10/9/00	11	260	10
11/8/00	16	200	7
12/13/00	6	2200	11

APPENDIX III. NPDES Effluent discharge data in the Clark Creek Watershed.

GE Hickory Plant Daily Effluent Data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/2/96	0.0035	10	NA
1/10/96	0.0037	10	NA
1/15/96	0.0037	10	NA
1/22/96	0.0036	10	NA
1/29/96	0.0033	10	NA
2/5/96	0.0038	22	NA
2/12/96	0.0039	22	NA
2/19/96	0.0028	22	NA
2/29/96	0.004	22	NA
3/4/96	0.004	24	NA
3/11/96	0.004	24	NA
3/18/96	0.0037	24	NA
3/25/96	0.0038	24	NA
4/1/96	0.0038	18	NA
4/9/96	0.0037	18	NA
4/15/96	0.0032	18	NA
4/22/96	0.0039	18	NA
4/27/96	0.0038	18	NA
5/6/96	0.0042	32	NA
5/13/96	0.0046	32	NA
5/20/96	0.0038	32	NA
5/28/96	0.0039	32	NA
6/3/96	0.0044	34	NA
6/10/96	0.0044	34	NA
6/17/96	0.0045	34	NA
6/25/96	0.0043	34	NA
7/1/96	0.0041	33	NA
7/3/96	0.0041	33	NA
7/15/96	0.0041	33	NA
7/22/96	0.0043	33	NA
7/29/96	0.004	33	NA

GE Hickory Continued			
8/5/96	0.0038	30	NA
8/12/96	0.0035	30	NA
8/19/96	0.002	30	NA
8/27/96	0.0044	30	NA
9/3/96	0.0038	29	NA
9/9/96	0.0036	29	NA
9/16/96	0.0038	29	NA
9/23/96	0.0036	29	NA
9/30/96	0.0044	29	NA
10/7/96	0.0049	29	NA
10/16/96	0.0047	29	NA
10/22/96	0.0046	29	NA
10/28/96	0.0045	29	NA
11/4/96	0.0047	29	NA
11/11/96	0.0048	29	NA
11/18/96	0.0044	29	NA
11/25/96	0.0041	29	NA
12/2/96	0.0037	29	NA
12/9/96	0.0047	29	NA
12/16/96	0.0044	29	NA
12/23/96	0.0044	29	NA
12/30/96	0.0036	29	NA
1/6/97	0.0038	20	NA
1/13/97	0.004	20	NA
1/20/97	0.0042	20	NA
1/27/97	0.0034	20	NA
2/3/97	0.0034	19	NA
2/10/97	0.0033	19	NA
2/17/97	0.0042	19	NA
2/24/97	0.0042	19	NA
3/3/97	0.004	19	NA
3/10/97	0.0042	19	NA
3/17/97	0.0052	19	NA
3/26/97	0.0015	19	NA
4/1/97	0.0041	22	NA
4/7/97	0.0044	22	NA
4/14/97	0.0041	22	NA
4/21/97	0.0042	22	NA
4/28/97	0.0042	22	NA
5/5/97	0.0045	31	NA
5/12/97	0.0049	31	NA
5/19/97	0.0053	31	NA
5/26/97	0.0054	31	NA
6/2/97	0.0052	27	NA
6/10/97	0.0049	27	NA
6/16/97	0.005	27	NA
6/23/97	0.0051	27	NA
7/7/97	0.0049	27	NA
7/14/97	0.0049	27	NA
7/21/97	0.0047	27	NA

GE Hickory Continued			
7/28/97	0.0049	27	NA
8/30/97	0.0049	23	NA
9/1/97	0.0033	23	NA
9/8/97	0.0052	23	NA
9/15/97	0.0045	23	NA
9/22/97	0.0049	23	NA
9/29/97	0.0048	23	NA
10/6/97	0.0052	23	NA
10/13/97	0.0051	23	NA
10/20/97	0.0052	23	NA
10/27/97	0.0052	23	NA
11/3/97	0.0048	23	NA
11/10/97	0.0045	23	NA
11/17/97	0.0043	23	NA
11/24/97	0.0046	23	NA
12/1/97	0.005	19	NA
12/8/97	0.0037	19	NA
12/15/97	0.004	19	NA
12/22/97	0.0033	19	NA
12/29/97	0.0041	19	NA
1/5/98	0.0041	11	NA
1/12/98	0.0042	11	NA
1/19/98	0.0041	11	NA
1/26/98	0.0039	11	NA
1/2/98	0.0042	11	NA
2/9/98	0.004	14	NA
2/16/98	0.0042	14	NA
2/23/98	0.0048	14	NA
3/1/98	0.0045	9	NA
3/9/98	0.004	9	NA
3/16/98	0.004	9	NA
3/23/98	0.0034	9	NA
3/30/98	0.0044	9	NA
4/6/98	0.0035	21	NA
4/13/98	0.0045	21	NA
4/20/98	0.0039	21	NA
4/27/98	0.0043	21	NA
5/4/98	0.0048	21	NA
5/11/98	0.0049	21	NA
5/18/98	0.0049	21	NA
5/25/98	0.005	21	NA
6/1/98	0.0048	31	NA
6/8/98	0.0051	31	NA
6/15/98	0.0049	31	NA
6/22/98	0.0047	31	NA
6/29/98	0.0037	31	NA
7/6/98	0.0042	31	NA
7/13/98	0.0039	31	NA
7/20/98	0.0039	31	NA
7/27/98	0.0039	31	NA

GE Hickory Continued		
8/3/98	0.0041	29 NA
8/10/98	0.0043	29 NA
8/17/98	0.0046	29 NA
8/24/98	0.0045	29 NA
8/28/98	0.004	29 NA
9/7/98	0.0044	26 NA
9/14/98	0.0038	26 NA
9/22/98	0.0035	26 NA
9/28/98	0.0037	26 NA
10/5/98	0.004	26 NA
10/12/98	0.0045	26 NA
10/19/98	0.0042	26 NA
10/26/98	0.0042	26 NA
11/2/98	0.0042	26 NA
11/9/98	0.0039	26 NA
11/16/98	0.0038	26 NA
11/23/98	0.0039	26 NA
11/30/98	0.0038	26 NA
12/7/98	0.0039	16 NA
12/14/99	0.0039	16 NA
12/21/98	0.0041	16 NA
12/28/98	0.0041	16 NA
1/4/99	0.0042	12 NA
1/11/99	0.004	12 NA
1/18/99	0.0043	12 NA
1/25/99	0.0044	12 NA
2/2/99	0.0036	15 NA
2/8/99	0.0041	15 NA
2/15/99	0.0032	15 NA
2/22/99	0.0042	15 NA
3/1/99	0.0036	18 NA
3/8/99	0.0041	18 NA
3/15/99	0.0039	18 NA
3/22/99	0.004	18 NA
3/29/99	0.0041	18 NA
4/5/99	0.0039	23 NA
4/12/99	0.0041	23 NA
4/20/99	0.0042	23 NA
4/27/99	0.0039	23 NA
5/3/99	0.0038	26 NA
5/10/99	0.0041	26 NA
5/17/99	0.0039	26 NA
5/24/99	0.0038	26 NA
6/1/99	0.0038	27 NA
6/7/99	0.0038	27 NA
6/14/99	0.0038	27 NA
6/21/99	0.0037	27 NA
6/29/99	0.0039	27 NA
7/5/99	0.0035	27 NA
7/13/99	0.0036	27 NA

GE Hickory Continued			
7/19/99	0.0032	27	NA
7/27/99	0.003	27	NA
8/2/99	0.0033	31	NA
8/9/99	0.0032	31	NA
8/16/99	0.0036	31	NA
8/23/99	0.0031	31	NA
8/30/99	0.0033	31	NA
9/7/99	0.0035	25	NA
9/13/99	0.0038	25	NA
9/20/99	0.0038	25	NA
9/27/99	0.0039	25	NA
10/4/99	0.0032	16	NA
10/11/99	0.0036	16	NA
10/18/99	0.0039	16	NA
10/25/99	0.0039	16	NA
11/1/99	0.0035	12	NA
11/8/99	0.0022	12	NA
11/15/99	0.0025	12	NA
11/22/99	0.0021	12	NA
11/29/99	0.0037	12	NA
12/7/99	0.0032	12	NA
12/14/99	0.0028	12	NA
12/20/99	0.0032	12	NA
12/29/99	0.0034	12	NA
1/3/00	0.0032	12	NA
1/11/00	0.0028	12	NA
1/17/00	0.0033	12	NA
1/25/00	0.0032	12	NA
2/7/00	0.0032	12	NA
2/14/00	0.0032	12	NA
2/21/00	0.0031	12	NA
2/23/00	0.0032	12	NA
3/6/00	0.0031	19	NA
3/13/00	0.0027	19	NA
3/20/00	0.0034	19	NA
3/27/00	0.0033	19	NA
4/3/00	0.0031	20	NA
4/10/00	0.0032	20	NA
4/17/00	0.0035	20	NA
4/24/00	0.003	20	NA
5/1/00	0.0025	26	NA
5/8/00	0.0033	26	NA
5/15/00	0.0028	26	NA
5/22/00	0.0032	26	NA
5/30/00	0.0038	26	NA
6/5/00	0.0035	32	NA
6/12/00	0.0031	32	NA
6/19/00	0.0033	32	NA
6/26/00	0.0037	32	NA
7/30/00	0.0037	32	NA

GE Hickory Continued

8/2/00	0.0035	25	NA
8/7/00	0.0034	25	NA
8/14/00	0.0032	25	NA
8/21/00	0.0032	25	NA
9/5/00	0.0032	19	NA
9/11/00	0.0035	19	NA
9/18/00	0.0034	19	NA
9/25/00	0.0034	19	NA
10/2/00	0.0037	14	NA
10/10/00	0.0035	14	NA
10/16/00	0.0036	14	NA
10/23/00	0.0035	14	NA
10/30/00	0.0033	14	NA
11/5/00	0.0033	11	NA
11/13/00	0.0035	11	NA
11/20/00	0.003	11	NA
11/27/00	0.0032	11	NA
12/4/00	0.0029	11	NA
12/11/00	0.0031	11	NA
12/18/00	0.0031	11	NA
12/26/00	0.0031	11	NA

Newton Wastewater Treatment Plant Monthly Effluent Data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/1/96	0.1302	10	1.462
2/1/96	0.1193	10.52	0.2269
2/29/96	0.1193	10.52	0.2269
3/1/96	0.11	12.23	1.1685
4/1/96	0.0964	14.9	1.524
5/1/96	0.1012	19.59	0.7344
6/1/96	0.1151	23.35	1.8593
7/1/96	0.1129	24.77	0.9854
8/1/96	0.1265	25.22	1.3879
9/1/96	0.1215	23	6.3618
10/1/96	0.1466	19.73	2.3046
11/1/96	0.12268	20	5.6175
11/2/96	0.12268	20	1.0878
11/3/96	0.10953	20	45.7414
11/4/96	0.13144	16	5.451
11/5/96	0.1402	17	10.9625
11/6/96	0.13144	18	8.1083
11/7/96	0.1402	19	1.7322
11/8/96	0.18839	20	16.2772
11/9/96	0.10953	20	1.2521

Newton Continued

11/10/96	0.10515	20	7.2918
11/11/96	0.13144	13	1.0334
11/12/96	0.1402	14	84.7931
11/13/96	0.1402	14	84.7931
11/14/96	0.1402	15	84.7931
11/15/96	0.1402	15	6.9167
11/16/96	0.12268	15	7.7715
11/17/96	0.12268	15	4.4542
11/18/96	0.1402	14	3.8763
11/19/96	0.1402	16	10.3811
11/20/96	0.13582	16	4.2245
11/21/96	0.1402	15	4.7242
11/22/96	0.1402	16	5.451
11/23/96	0.13144	16	3.5813
11/24/96	0.11829	16	0.1154
11/25/96	0.1402	15	0.1938
11/26/96	0.14458	17	0.1999
11/27/96	0.12268	14	5.1936
11/28/96	0.08763	14	67.5061
11/29/96	0.08763	13	13.2619
11/30/96	0.09201	13	4.413
12/1/96	0.30669	13	527.747
12/2/96	0.13582	13	2.5993
12/3/96	0.10953	13	0.7003
12/4/96	0.10953	14	58.2006
12/5/96	0.11391	13	15.9343
12/6/96	0.10515	14	28.6177
12/7/96	0.08324	14	9.8375
12/8/96	0.07886	14	109.997
12/9/96	0.10515	10	4.0652
12/10/96	0.10953	12	1.0978
12/11/96	0.14896	13	4.8907
12/12/96	0.11829	15	8.7591
12/13/96	0.14458	16	1.1867
12/14/96	0.07448	16	4.4811
12/15/96	0.04819	16	76.4323
12/16/96	0.16211	12	8.1235
12/17/96	0.09639	13	1.2843
12/18/96	0.10515	13	8.2219
12/19/96	0.12268	13	63.5948
12/20/96	0.12268	12	180.185
12/21/96	0.12268	12	3.8449
12/22/96	0.10953	12	10.2939
12/23/96	0.10953	11	2.7954
12/24/96	0.10077	11	3.565
12/25/96	0.09639	11	4.6582
12/26/96	0.10953	11	15.8122
12/27/96	0.10077	10	8.0137
12/28/96	0.04819	10	7.6014
12/29/96	0.06134	10	1.2721
12/30/96	0.07886	14	10.6892

Newton Continued

12/31/96	0.05696	15	0.0787
1/1/97	0.04381	15	88.415
1/2/97	0.06572	15	1.3627
1/3/97	0.0701	14	2.4054
1/4/97	0.04819	14	4.6324
1/5/97	0.06134	14	0.2405
1/6/97	0.07886	14	406.217
1/7/97	0.09201	14	0.9733
1/8/97	0.10515	13	13.0179
1/9/97	0.17087	12	203.878
1/10/97	0.12268	12	4.1489
1/11/97	0.10077	12	1.1376
1/12/97	0.08324	12	3.6373
1/13/97	0.14458	9	3.2479
1/14/97	0.1402	10	1.1603
1/15/97	0.13144	10	0.2839
1/16/97	0.15334	12	11.3543
1/17/97	0.13144	11	1.3173
1/18/97	0.11829	11	2.8094
1/19/97	0.10953	11	19.6398
1/20/97	0.13144	11	0.9424
1/21/97	0.12268	10	1.0011
1/22/97	0.11391	11	2.0668
1/23/97	0.11391	13	0.8956
1/24/97	0.12706	13	0.9282
1/25/97	0.11829	13	10.0768
1/26/97	0.07448	13	1.5864
1/27/97	0.10953	12	0.9369
1/28/97	0.12268	12	0.6995
1/29/97	0.10953	12	14.8672
1/30/97	0.10953	11	52.0493
2/1/97	0.10953	12	236.588
2/1/97	0.07448	12	0.8118
2/2/97	0.05258	12	8.0282
2/3/97	0.08763	13	7.2074
2/4/97	0.11391	14	78.7364
2/5/97	0.10515	13	48.6046
2/6/97	0.10515	13	4.6333
2/7/97	0.09639	13	53.6197
2/8/97	0.09201	13	61.0827
2/9/97	0.07448	13	3.2373
2/10/97	0.10953	12	1.4858
2/11/97	0.10953	13	96.2399
2/12/97	0.10515	12	4.4516
2/13/97	0.10077	11	15.3407
2/14/97	0.16211	12	33.6144
2/15/97	0.28916	12	4.8577
2/16/97	0.10077	12	1.9905
2/17/97	0.11391	10	0.8169
2/18/97	0.10515	10	63.5948
2/19/97	0.09639	12	83.2789

Newton Continued

2/20/97	0.09639	15	5.155
2/21/97	0.09639	14	2.082
2/22/97	0.0701	14	23.1523
2/23/97	0.08324	14	11.9673
2/24/97	0.11391	12	8.1875
2/25/97	0.10077	13	49.4152
2/26/97	0.09201	13	3.4023
2/27/97	0.10515	14	3.3614
2/28/97	0.2103	16	6.0324
3/1/97	0.14458	16	0.9182
3/2/97	0.08763	16	0.5513
3/3/97	0.10953	16	1.0126
3/4/97	0.09639	14	3.9974
3/5/97	0.10077	15	4.005
3/6/97	0.10077	15	6.6343
3/7/97	0.10077	14	2.699
3/8/97	0.06572	14	0.7285
3/9/97	0.06134	14	1.1266
3/10/97	0.09201	14	0.9857
3/11/97	0.07886	15	10.6467
3/12/97	0.08324	16	0.4172
3/13/97	0.07886	15	0.1631
3/14/97	0.12706	17	26.0967
3/15/97	0.07448	17	0.8198
3/16/97	0.06134	17	10.518
3/17/97	0.09639	12	0.8245
3/18/97	0.09639	15	1.5811
3/19/97	0.22783	14	373.998
3/20/97	0.13144	14	0.2068
3/21/97	0.10953	15	31.2296
3/22/97	0.06572	15	0.0161
3/23/97	0.06572	15	0.6375
3/24/97	0.10953	14	8.1489
3/25/97	0.08763	14	4.0009
3/26/97	0.10515	15	0.6723
3/27/97	0.08324	16	0.2949
3/28/97	0.07448	16	0.6445
3/29/97	0.07886	16	8.8075
3/30/97	0.05696	16	0.2064
3/31/97	0.0701	15	0.0969
4/1/97	0.08763	14	0.1067
4/2/97	0.10515	14	0.1164
4/3/97	0.09201	15	0.1262
4/4/97	0.09201	15	0.136
4/5/97	0.06134	15	0.1458
4/6/97	0.09201	15	0.1555
4/7/97	0.11391	17	0.1653
4/8/97	0.09201	16	0.1751
4/9/97	0.08763	16	0.1848
4/10/97	0.09201	16	0.1946
4/11/97	0.08324	15	0.2044

Newton Continued

4/12/97	0.09639	15	0.2141
4/13/97	0.08763	15	0.2239
4/14/97	0.12268	15	0.2337
4/15/97	0.12706	15	0.2434
4/16/97	0.13144	15	0.2532
4/17/97	0.12706	16	0.263
4/18/97	0.11391	16	0.2727
4/19/97	0.10515	16	0.2825
4/20/97	0.10515	16	0.2923
4/21/97	0.12706	15	0.3021
4/22/97	0.15773	16	0.3118
4/23/97	0.27164	16	0.3216
4/24/97	0.15773	16	0.3314
4/25/97	0.13582	16	0.3411
4/26/97	0.11829	16	0.3509
4/27/97	0.12706	16	0.3607
4/28/97	0.24535	15	0.3704
4/29/97	0.24973	16	0.3802
4/30/97	0.16649	16	0.39
5/1/97	0.1402	18	0.3997
5/2/97	0.11829	18	3.3733
5/3/97	0.14458	18	0.1513
5/4/97	0.11391	18	1.0555
5/5/97	0.1402	16	0.7963
5/6/97	0.13144	17	0.8404
5/7/97	0.12706	17	0.8123
5/8/97	0.13144	18	1.2151
5/9/97	0.12268	19	0.1696
5/10/97	0.12706	19	0.1745
5/11/97	0.11829	19	0.8563
5/12/97	0.12706	17	0.5489
5/13/97	0.09639	18	0.1332
5/14/97	0.09201	18	0.2022
5/15/97	0.10953	19	0.3123
5/16/97	0.08324	18	0.1151
5/17/97	0.07886	18	0.4262
5/18/97	0.09201	18	0.1978
5/19/97	0.13144	19	2.0153
5/20/97	0.13582	20	3.2857
5/21/97	0.13582	20	13.4128
5/22/97	0.13144	20	4.7696
5/23/97	0.11829	19	0.511
5/24/97	0.11391	19	0.7305
5/25/97	0.10515	19	6.594
5/26/97	0.11391	19	0.4548
5/27/97	0.12706	20	5.3927
5/28/97	0.13582	19	0.5867
5/29/97	0.13144	20	1.8738
5/30/97	0.13582	20	0.575
5/31/97	0.10077	20	0.1777
6/1/97	0.11391	20	5.2653

Newton Continued			
6/2/97	0.17525	20	88.5785
6/3/97	0.13582	19	234.695
6/4/97	0.12706	19	7.3221
6/5/97	0.12706	19	5.7523
6/6/97	0.11391	19	68.8944
6/7/97	0.11829	19	12.4912
6/8/97	0.09639	19	1.6486
6/9/97	0.12706	19	23.0531
6/10/97	0.13144	20	21.6336
6/11/97	0.13144	21	38.6111
6/12/97	0.12706	22	4.0617
6/13/97	0.10515	22	6.4867
6/14/97	0.12706	22	22.9291
6/15/97	0.12706	22	0.5929
6/16/97	0.14458	22	45.5108
6/17/97	0.14458	22	0.4122
6/18/97	0.18839	23	68.7568
6/19/97	0.18401	24	1.1765
6/20/97	0.17525	25	2.6346
6/21/97	0.16649	25	23.8639
6/22/97	0.1402	25	19.8164
6/23/97	0.17087	24	0.4872
6/24/97	0.17963	24	1.9827
6/25/97	0.16211	25	42.018
6/26/97	0.13144	25	18.4879
6/27/97	0.12268	24	33.9172
6/28/97	0.10515	24	3.0136
6/29/97	0.10077	24	21.7983
6/30/97	0.14458	23	5.7462
7/1/97	0.14896	22	4.762
7/2/97	0.11391	24	30.5838
7/3/97	0.11391	25	128.226
7/4/97	0.09639	25	0.6268
7/5/97	0.09639	25	0.8769
7/6/97	0.10515	25	33.4691
7/7/97	0.12268	23	137.774
7/8/97	0.13144	23	9.7323
7/9/97	0.13144	25	8.256
7/10/97	0.13144	25	116.265
7/11/97	0.12706	25	59.2795
7/12/97	0.10515	25	0.6835
7/13/97	0.10077	25	1.4531
7/14/97	0.13144	24	3.5204
7/15/97	0.12706	24	0.9111
7/16/97	0.12268	25	0.7843
7/17/97	0.13144	25	0.9426
7/18/97	0.12706	26	2.3053
7/19/97	0.10077	26	4.3516
7/20/97	0.09639	26	26.8451
7/21/97	0.1402	25	3.7551
7/22/97	0.12706	26	1.0868

Newton Continued

7/23/97	0.17525	25	378.541
7/24/97	0.14458	26	27.482
7/25/97	0.13582	26	0.2934
7/26/97	0.11391	26	44.9357
7/27/97	0.10077	26	2.3369
7/28/97	0.13582	27	6.0053
7/29/97	0.13582	25	73.335
7/30/97	0.26726	24	1085.28
7/31/97	0.14896	25	10.6309
8/1/97	0.13144	24	9.6641
8/2/97	0.10953	24	0.5249
8/3/97	0.10953	24	5.5971
8/4/97	0.12706	25	0.7245
8/5/97	0.1402	24	14.221
8/6/97	0.15773	24	71.5442
8/7/97	0.13582	24	29.3369
8/8/97	0.1402	24	30.2832
8/9/97	0.10953	24	270.996
8/10/97	0.10515	24	1.3007
8/11/97	0.13582	24	3.6378
8/12/97	0.13582	24	3.1684
8/13/97	0.1402	26	3.634
8/14/97	0.1402	26	1.8049
8/15/97	0.13582	27	1.3612
8/16/97	0.10953	27	0.2399
8/17/97	0.10515	27	1.9779
8/18/97	0.13144	26	0.4656
8/19/97	0.13582	25	1.2556
8/20/97	0.1402	26	2.9072
8/21/97	0.1402	26	1.599
8/22/97	0.13144	25	6.5866
8/23/97	0.10953	25	0.5889
8/24/97	0.10515	25	0.0123
8/25/97	0.13144	23	158.987
8/26/97	0.13582	24	12086.8
8/27/97	0.13582	25	161.283
8/28/97	0.13144	26	0.9694
8/29/97	0.13582	26	0.2934
8/30/97	0.10515	26	3.9439
8/31/97	0.10077	26	150.794
9/1/97	0.10077	26	7.259
9/2/97	0.13144	25	1.499
9/3/97	0.13582	25	1.6429
9/4/97	0.13582	24	4.6939
9/5/97	0.11829	24	10.3024
9/6/97	0.10515	24	14.8577
9/7/97	0.10077	24	4.5878
9/8/97	0.13144	24	11.3562
9/9/97	0.13144	23	15.8646
9/10/97	0.12706	24	32.3841
9/11/97	0.12268	24	5.2996

Newton Continued

9/12/97	0.10953	24	3.3122
9/13/97	0.08763	24	5.7888
9/14/97	0.08763	24	0.4405
9/15/97	0.10953	24	6.8043
9/16/97	0.11391	23	0.7283
9/17/97	0.10953	24	5.3942
9/18/97	0.12268	25	3.0737
9/19/97	0.11391	25	1.2106
9/20/97	0.09639	25	2.7341
9/21/97	0.07886	25	6.3198
9/22/97	0.11391	22	15.206
9/23/97	0.10953	23	21.7661
9/24/97	0.17087	22	101.23
9/25/97	0.11391	21	43.305
9/26/97	0.10515	21	29.0719
9/27/97	0.09201	21	1.0488
9/28/97	0.08324	21	0.3068
9/29/97	0.11391	22	0.1575
9/30/97	0.11391	22	2.2637
10/1/97	0.11391	22	2.8542
10/2/97	0.12268	21	10.3342
10/3/97	0.10515	20	9.085
10/4/97	0.08763	20	3.4617
10/5/97	0.07886	20	9.7229
10/6/97	0.11391	21	1.6239
10/7/97	0.10953	22	7.9777
10/8/97	0.11391	22	4.7242
10/9/97	0.11391	22	1.5452
10/10/97	0.10953	22	5.1292
10/11/97	0.09201	22	9.1734
10/12/97	0.0701	22	7.0223
10/13/97	0.11391	21	0.2461
10/14/97	0.11391	22	49.2103
10/15/97	0.11391	21	22.6367
10/16/97	0.11391	20	5.2163
10/17/97	0.11391	20	16.8693
10/18/97	0.09201	20	2.1754
10/19/97	0.13144	20	22.1963
10/20/97	0.11391	18	1.7913
10/21/97	0.10077	19	2.0025
10/22/97	0.10515	19	10.2115
10/23/97	0.08763	18	12.6204
10/24/97	0.0701	18	0.3997
10/25/97	0.07448	18	0.7771
10/26/97	0.16649	18	3.6784
10/27/97	0.11829	19	0.511
10/28/97	0.10953	18	3.6908
10/29/97	0.11829	18	9.9651
10/30/97	0.11391	18	4.1337
10/31/97	0.11391	18	1.2204
11/1/97	0.12706	18	0.4671

Newton Continued

11/2/97	0.09639	18	0.99
11/3/97	0.11391	17	1.4074
11/4/97	0.11829	17	5.7235
11/5/97	0.12268	17	0.6147
11/6/97	0.1402	17	10.3748
11/7/97	0.13144	17	6.0188
11/8/97	0.07886	17	3.1133
11/9/97	0.06134	17	3.1419
11/10/97	0.13582	16	6.6888
11/11/97	0.10515	16	4.1791
11/12/97	0.10077	17	3.4826
11/13/97	0.11391	16	4.7242
11/14/97	0.11829	16	2.3507
11/15/97	0.07448	16	0.8557
11/16/97	0.06572	16	0.4322
11/17/97	0.09639	13	0.2082
11/18/97	0.10077	14	1.9154
11/19/97	0.10077	14	7.0522
11/20/97	0.10077	15	4.005
11/21/97	0.11391	15	8.4346
11/22/97	0.11391	15	2.3882
11/23/97	0.07448	15	1.7243
11/24/97	0.10077	14	25.2487
11/25/97	0.09639	14	0.7578
11/26/97	0.09639	14	18.7378
11/27/97	0.0701	14	2.0445
11/28/97	0.06134	14	0.3074
11/29/97	0.0701	14	0.5255
11/30/97	0.06572	14	4.6088
12/1/97	0.10953	15	8.5645
12/2/97	0.10953	15	145.104
12/3/97	0.10077	15	67.5793
12/4/97	0.11829	16	2.7596
12/5/97	0.11391	16	3.051
12/6/97	0.07886	16	7.1637
12/7/97	0.06134	16	5.8788
12/8/97	0.09201	11	5.4571
12/9/97	0.10515	12	22.7124
12/10/97	0.11391	13	78.7364
12/11/97	0.10515	14	70.0815
12/12/97	0.10953	15	37.8541
12/13/97	0.08763	15	1.1701
12/14/97	0.08324	15	7.9831
12/15/97	0.10953	11	2.082
12/16/97	0.11391	12	0.8956
12/17/97	0.11391	13	4.0352
12/18/97	0.10515	13	5.1784
12/19/97	0.10953	13	0.2366
12/20/97	0.08763	13	41.0563
12/21/97	0.07886	13	40.7302
12/22/97	0.12268	12	0.7843

Newton Continued			
12/23/97	0.09639	12	0.6174
12/24/97	0.12706	12	0.8469
12/25/97	0.10515	12	85.7246
12/26/97	0.08324	12	0.7618
12/27/97	0.13582	12	11.7853
12/28/97	0.09639	12	7.4713
12/29/97	0.09201	10	1.1368
12/30/97	0.09639	10	0.8245
12/31/97	0.10515	10	0.1454
1/1/98	0.123	10	0.4143
2/1/98	0.12	12.2	0.4459
3/1/98	0.0924	13.36	1.3576
4/1/98	0.0926	17.33	0.16
5/1/98	0.0766	21.1	0.3706
6/1/98	0.0806	24.36	1.1005
7/1/98	0.1153	26.77	1.6839
8/1/98	0.1396	26.14	1.5563
9/1/98	0.1411	24.85	2.706
10/1/98	0.1324	21.54	2.5858
11/1/98	0.1281	18.05	0.6861
12/1/98	0.128	15.57	1.1616
1/1/99	0.1399	12.94	1.632
2/1/99	0.1454	13.5	1.0801
3/1/99	0.1395	13.69	0.7352
4/1/99	0.1509	17.76	1.0167
5/1/99	0.1508	20.1	0.469
6/1/99	0.1456	23.5	1.0945
7/1/99	0.1345	25.28	1.0113
8/1/99	0.1095	25.77	3.2838
9/1/99	0.1309	23.52	11.1924
10/1/99	0.1369	20.61	4.8513
11/1/99	0.1231	18.05	1.6168
12/1/99	0.1249	14.47	2.4935
1/1/00	0.1426	12.31	1.7742
2/1/00	0.1471	12.33	2.0342
3/1/00	0.1532	15.6	1.2972
4/1/00	0.1573	17.31	0.7338
5/1/00	0.1606	20.81	7.6987
6/1/00	0.1647	23.95	3.6152
7/1/00	0.1608	24.85	1.5841
8/1/00	0.148	25.26	2.736
9/1/00	0.1309	23.52	11.1924
10/1/00	0.1369	20.61	4.8513
11/1/00	0.1231	18.05	1.6168
12/1/00	0.1249	14.47	2.4935
7/1/00	0.1608	24.85	1.5841
8/1/00	0.148	25.26	2.736
9/1/00	0.1309	23.52	11.1924
10/1/00	0.1369	20.61	4.8513
11/1/00	0.1231	18.05	1.6168
12/1/00	0.1249	14.47	2.4935

Precedent Inc. Monthly Effluent Data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/31/96	0.000033	16	0.00003
2/29/96	0.000033	14.7	0.00003
3/31/96	0.000033	13	0.00003
4/30/96	0.000033	14.25	0.00002
5/31/96	0.000033	23.9	0.00003
6/30/96	0.000033	30.8	0.00003
7/31/96	0.000033	28	0.00004
8/30/96	0.000033	32	0.00006
9/30/96	0.000033	32	0.00004
10/30/96	0.000033	32	0.00004
11/30/96	0.000033	27	0.00003
12/31/96	0.000033	17.4	0.00003
1/31/97	0.000033	12	0.00003
2/28/97	0.000033	8.25	0.00009
3/31/97	0.000058	11.25	0.00016
4/30/97	0.000055	12	0.00007
5/31/97	0.000075	15.4	0.00012
6/30/97	0.000083	19	0.00035
7/31/97	0.00008	24.3	0.00015
8/30/97	0.000078	24	0.00022
9/30/97	0.000081	22.7	0.00023
10/31/97	0.00008	18	0.00019
11/30/97	0.000082	12.3	0.0004
12/31/97	0.000081	8.5	0.00023
1/31/98	0.000125	8.6	0.00036
2/28/98	0.000136	8	0.00039
3/31/98	0.000088	8.75	0.00025
4/30/98	0.000081	14	0.00015
5/31/98	0.000073	18.4	0.00021
6/30/98	0.000083	22	0.00024
7/31/98	0.00008	25	0.00022
8/30/98	0.000871	25	0.00241
9/30/98	0.000073	23.25	0.0004
10/31/98	0.00007	20.4	0.00242
11/30/98	0.000074	15.25	0.0022
12/31/98	0.000084	13.3	0.00053
1/31/99	0.000052	11	0.00009
2/28/99	0.00008	9	0.00223
3/31/99	0.000083	8.75	0.00679
4/30/99	0.000085	14	0.00181
5/31/99	0.000079	17	0.0001
6/30/99	0.000082	19.5	0.00014
7/31/99	0.000079	22.5	0.00014
8/30/99	0.000084	24.5	0.00014
9/30/99	0.000084	23	0.00014

Precedent Inc continued			
10/31/99	0.000083	19.2	0.00014
11/30/99	0.000083	14.4	0.00035
12/31/99	0.000095	11.5	0.00023
1/31/00	0.000082	8.75	0.0001
2/28/00	0.000088	9.5	0.00008
3/31/00	0.000083	12.2	0.00024
4/30/00	0.000197	14.5	0.00017
5/31/00	0.000091	17.5	0.00008
6/30/00	0.000091	24.4	0.00126
7/31/00	0.000092	25	0.00008
8/30/00	0.000074	25	0.00014
9/30/00	0.000074	25	0.00006
10/31/00	0.000083	21.25	0.00007
11/30/00	0.000079	13.8	0.00041
12/31/00	0.00007	8.6	0.01007

Maiden Waste Water Treatment Plant Monthly Effluent Data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/1/96	0.0213	13.5	0.8145
2/1/96	0.0217	12.8	0.7234
2/29/96	0.0217	12.8	0.7234
3/1/96	0.0216	13.47	3.5463
4/1/96	0.0139	15.18	1.3839
5/1/96	0.0118	18.17	0.6125
6/1/96	0.0148	20.22	0.2719
7/1/96	0.0104	22.35	0.0957
8/1/96	0.0139	22.74	0.1745
9/1/96	0.0133	22.26	0.4056
10/1/96	0.0132	20.01	0.316
11/1/96	0.019	18.5	0.0985
11/2/96	0.0114	17	2.34962
11/3/96	0.0142	17	0.07702
11/4/96	0.01591	16.6	8.24689
11/5/96	0.01342	17.3	0.7887
11/6/96	0.01354	19.3	0.08188
11/7/96	0.01685	19.2	0.08735
11/8/96	0.02938	19.7	15.231
11/9/96	0.01431	19	0.02365
11/10/96	0.01013	18	0.07323
11/11/96	0.01227	17.6	0.06359
11/12/96	0.01191	17.3	0.05146
11/13/96	0.01246	17.3	1.72251
11/14/96	0.01175	18.1	3.04574
11/15/96	0.01315	18.5	0.14773
11/16/96	0.01038	18	0.03179

Maiden WWTP Continued			
11/17/96	0.00987	18	0.00218
11/18/96	0.01337	17.5	0.09242
11/19/96	0.0129	18.2	0.59064
11/20/96	0.0127	17.8	0.08776
11/21/96	0.01342	17.6	0.09276
11/22/96	0.01136	16.6	0.09812
11/23/96	0.00947	16.9	0.03602
11/24/96	0.00818	16.9	0.09502
11/25/96	0.01994	17.4	0.08616
11/26/96	0.01741	17.4	0.0752
11/27/96	0.0143	15.9	0.04941
11/28/96	0.00776	16	1.13302
11/29/96	0.01082	17.6	0.04675
11/30/96	0.02981	17	0.72252
12/1/96	0.060684	16	2.40193
12/2/96	0.029525	15.3	0.20408
12/3/96	0.020031	15.6	0.08653
12/4/96	0.017029	16.5	0.11771
12/5/96	0.018813	16.2	0.13004
12/6/96	0.01802	15.1	0.18683
12/7/96	0.016377	15	0.21139
12/8/96	0.011505	15	0.21463
12/9/96	0.014261	15.4	0.07393
12/10/96	0.017717	15.3	0.09185
12/11/96	0.012867	15.7	0.06671
12/12/96	0.028246	16.6	0.24405
12/13/96	0.025222	15.9	26.1511
12/14/96	0.015132	15	0.02208
12/15/96	0.014834	15	0.1199
12/16/96	0.016434	14.9	0.38337
12/17/96	0.016236	15.7	0.14029
12/18/96	0.021538	16.2	0.13026
12/19/96	0.018602	15.1	0.09644
12/20/96	0.016434	14.1	2.27185
12/21/96	0.013021	14	0.29406
12/22/96	0.013695	14	0.04492
12/23/96	0.015032	14.6	2.33779
12/24/96	0.015579	14.6	0.01672
12/25/96	0.012066	14.6	0.19949
12/26/96	0.011912	14.6	0.05146
12/27/96	0.020329	14.6	1.25026
12/28/96	0.016017	14.8	0.77098
12/29/96	0.016066	15	0.77753
12/30/96	0.019387	15.7	0.28476
12/31/96	0.020315	15.6	0.70212
1/1/97	0.010449	15.3	5.39915
1/2/97	0.016395	15	0.07082
1/3/97	0.019426	15.2	0.28534
1/4/97	0.015146	15	0.41823
1/5/97	0.01448	15	0.83849

Maiden WWTP Continued			
1/6/97	0.015733	14.9	8.15604
1/7/97	0.015869	15.6	0.20566
1/8/97	0.019987	15.4	0.55261
1/9/97	0.039147	14.6	1.42055
1/10/97	0.023208	14.1	1.12287
1/11/97	0.019076	14.2	0.11075
1/12/97	0.013972	14.4	14.1601
1/13/97	0.017437	14.5	0.27119
1/14/97	0.015545	14	0.16117
1/15/97	0.022634	14.1	0.11733
1/16/97	0.026134	13.2	3.61279
1/17/97	0.024206	14.3	0.18823
1/18/97	0.022726	14	0.2693
1/19/97	0.022046	13	1.53142
1/20/97	0.020763	12.8	0.30496
1/21/97	0.019523	13.4	0.06747
1/22/97	0.020158	13.8	2.31641
1/23/97	0.018673	14.2	0.20973
1/24/97	0.028044	13.9	2.59265
1/25/97	0.021416	14	0.58523
1/26/97	0.016154	14	0.20058
1/27/97	0.01767	14.4	0.0916
1/28/97	0.027567	14.1	14.2907
1/29/97	0.014839	12.7	2.38474
1/30/97	0.01469	13.9	0.8504
1/31/97	0.018393	13.5	5.08516
2/1/97	0.013293	13.5	0.37447
2/2/97	0.009884	13.4	0.05853
2/3/97	0.018782	13.4	0.25965
2/4/97	0.030818	13.9	15.9759
2/5/97	0.02227	14.3	0.15393
2/6/97	0.017827	14.4	0.18483
2/7/97	0.020255	15.6	1.57499
2/8/97	0.020224	14.6	0.32171
2/9/97	0.015624	13.8	1.65334
2/10/97	0.019146	13.4	9.92533
2/11/97	0.016254	13.4	4.69065
2/12/97	0.016636	13.4	0.3737
2/13/97	0.017801	14.4	0.09228
2/14/97	0.030726	13.4	0.21238
2/15/97	0.058218	13.1	0.30136
2/16/97	0.023549	12.8	0.13763
2/17/97	0.022371	12.5	0.19328
2/18/97	0.023102	13.2	2.53498
2/19/97	0.026261	12.7	0.2269
2/20/97	0.021407	13.8	0.29593
2/21/97	0.025547	15.1	0.13244
2/22/97	0.016653	14.8	0.08773
2/23/97	0.013735	13.8	0.72347
2/24/97	0.017617	13.9	0.10655

Maiden WWTP Continued			
2/25/97	0.018195	13.9	0.15721
2/26/97	0.018274	13.9	0.12631
2/27/97	0.018839	14.8	0.08139
2/28/97	0.052575	14.6	324.788
3/1/97	0.032859	14.7	0.23009
3/2/97	0.02103	14.8	0.0314
3/3/97	0.016649	14.9	0.69046
3/4/97	0.017963	13.9	0.0776
3/5/97	0.017087	14.4	0.47242
3/6/97	0.016855	14.5	0.05825
3/7/97	0.016474	13.8	0.15656
3/8/97	0.014835	14.2	0.30583
3/9/97	0.010476	14.8	0.78119
3/10/97	0.01586	15.1	0.09592
3/11/97	0.01763	14.9	0.06093
3/12/97	0.018445	14.9	0.06375
3/13/97	0.022594	15.1	2.9282
3/14/97	0.02443	17.8	10.5537
3/15/97	0.017586	16	1.56361
3/16/97	0.014243	15	0.08416
3/17/97	0.017586	14.2	0.06078
3/18/97	0.020092	14.8	0.06944
3/19/97	0.060277	14.6	0.83327
3/20/97	0.025254	14.9	0.15273
3/21/97	0.026905	14.1	0.34869
3/22/97	0.02174	14.1	2.55419
3/23/97	0.016106	15.4	0.03697
3/24/97	0.019694	15.4	0.06806
3/25/97	0.01986	14.8	0.10296
3/26/97	0.019965	15.4	3.27752
3/27/97	0.019786	15.1	0.10257
3/28/97	0.021827	15.2	0.05887
3/29/97	0.019212	15.2	0.85303
3/30/97	0.014717	15.2	0.28573
3/31/97	0.017017	15.3	0.07351
4/1/97	0.017218	15.2	0.10414
4/2/97	0.017328	15.1	0.07486
4/3/97	0.016478	15.5	0.82574
4/4/97	0.01873	15.6	4.45022
4/5/97	0.014975	15.6	0.46441
4/6/97	0.020636	15.9	6.69244
4/7/97	0.019146	15.9	2.9776
4/8/97	0.018441	15.9	0.25492
4/9/97	0.018721	17.4	1.89248
4/10/97	0.016079	16.4	7.50192
4/11/97	0.019199	15.9	0.16588
4/12/97	0.025902	15.9	0.29429
4/13/97	0.01455	15.6	0.16385
4/14/97	0.019273	15.6	0.96582
4/15/97	0.01866	15.6	0.35468

Maiden WWTP Continued			
4/16/97	0.019273	16.3	0.24978
4/17/97	0.017026	17.7	0.41188
4/18/97	0.016425	16.3	14.7591
4/19/97	0.017078	16	0.3285
4/20/97	0.015286	16.3	0.47394
4/21/97	0.018677	16.3	9.35957
4/22/97	0.036286	16.9	1.15998
4/23/97	0.039116	15.9	2.6023
4/24/97	0.022371	16.7	0.09664
4/25/97	0.020123	18.5	0.06955
4/26/97	0.017223	17	3.51913
4/27/97	0.012408	17	0.04881
4/28/97	0.087156	16.1	45.1819
4/29/97	0.070635	15.5	0.36617
4/30/97	0.028395	16.5	0.12267
5/1/97	0.026266	16.4	0.59003
5/2/97	0.032434	17.6	0.25221
5/3/97	0.03342	17	1.48403
5/4/97	0.016947	17	0.12821
5/5/97	0.019922	16.3	0.06885
5/6/97	0.018353	16.8	3.64713
5/7/97	0.019072	16.4	1.61483
5/8/97	0.016693	16.8	0.20191
5/9/97	0.017727	17.8	1.22526
5/10/97	0.014112	17.8	0.56185
5/11/97	0.011768	17.3	0.11333
5/12/97	0.015891	17.3	0.68648
5/13/97	0.014208	16.8	0.07366
5/14/97	0.015974	16.3	0.09661
5/15/97	0.015409	17.8	0.07988
5/16/97	0.017959	18.1	0.07758
5/17/97	0.012947	18.8	0.0302
5/18/97	0.012964	18.6	0.00981
5/19/97	0.013538	19	0.07018
5/20/97	0.013415	18.2	0.08114
5/21/97	0.016202	18.4	0.13998
5/22/97	0.015378	17.8	0.21259
5/23/97	0.016	17.6	0.35943
5/24/97	0.013394	17.8	0.09387
5/25/97	0.015786	17.8	0.3793
5/26/97	0.013902	18.8	0.24864
5/27/97	0.014007	19.2	0.04841
5/28/97	0.015067	19.3	0.09113
5/29/97	0.015159	19	0.11788
5/30/97	0.017245	19.2	0.0596
5/31/97	0.014598	19.2	0.09549
6/1/97	0.01427	18.8	0.63654
6/2/97	0.022603	18.8	0.23435
6/3/97	0.016246	19.5	0.08422
6/4/97	0.017359	18.5	0.07499

Maiden WWTP Continued			
6/5/97	0.014962	18.5	0.16805
6/6/97	0.014603	19.7	0.06308
6/7/97	0.01402	19.7	0.07284
6/8/97	0.012754	19.1	0.93224
6/9/97	0.014559	19.1	0.06289
6/10/97	0.014971	18.8	0.84076
6/11/97	0.01377	19	0.08328
6/12/97	0.018546	19.5	0.16024
6/13/97	0.025275	19	0.13103
6/14/97	0.024767	19	0.06817
6/15/97	0.015098	19.2	0.36175
6/16/97	0.019054	19.2	0.95484
6/17/97	0.01508	19.3	0.15635
6/18/97	0.017573	19.4	0.10628
6/19/97	0.016272	19.2	3.51475
6/20/97	0.019142	19.2	0.46308
6/21/97	0.015409	19.2	0.22718
6/22/97	0.014151	19.9	0.05101
6/23/97	0.015374	19.9	2.78943
6/24/97	0.013696	19.5	0.355
6/25/97	0.014213	19.7	0.15964
6/26/97	0.017227	19.7	0.25303
6/27/97	0.015225	20	0.3157
6/28/97	0.008062	20	0.1512
6/29/97	0.006879	19.6	0.03954
6/30/97	0.010603	19.6	0.76034
7/1/97	0.010533	19.9	0.1183
7/2/97	0.009941	20.4	0.06871
7/3/97	0.010914	20.7	0.09429
7/4/97	0.007019	20.7	0.2424
7/5/97	0.015558	20.4	0.13059
7/6/97	0.012605	19.6	2.15643
7/7/97	0.014055	19.6	7.28615
7/8/97	0.014813	20	1.85578
7/9/97	0.0154	20.1	3.59254
7/10/97	0.014739	20.2	0.06367
7/11/97	0.012364	20	0.16024
7/12/97	0.013429	20	0.60297
7/13/97	0.009556	20.7	14.1968
7/14/97	0.012636	20.7	0.04367
7/15/97	0.014292	20.8	1.71637
7/16/97	0.017902	20.8	3.09343
7/17/97	0.01271	21	5.87508
7/18/97	0.015229	21.2	5.19744
7/19/97	0.013078	21.2	0.28376
7/20/97	0.011567	21.2	9.43999
7/21/97	0.012837	21.2	4.88015
7/22/97	0.013205	21.8	0.39932
7/23/97	0.025749	21.7	0.11123
7/24/97	0.018204	21.9	0.07864

Maiden WWTP Continued			
7/25/97	0.017363	22.5	2.02521
7/26/97	0.014703	22.5	0.09103
7/27/97	0.014611	22	0.36227
7/28/97	0.023882	22	1.23805
7/29/97	0.031804	21.9	0.60452
7/30/97	0.045692	21.9	23.6868
7/31/97	0.024171	22.1	0.10442
8/1/97	0.022415	21.9	0.87148
8/2/97	0.019939	21.9	0.61966
8/3/97	0.018524	22.1	0.11562
8/4/97	0.020833	22.1	9.35979
8/5/97	0.019676	21.9	0.119
8/6/97	0.016447	21.4	0.07105
8/7/97	0.012403	21.8	0.1286
8/8/97	0.01289	21.9	0.16705
8/9/97	0.013025	21.9	0.64938
8/10/97	0.011475	21.7	0.02278
8/11/97	0.012473	21.7	0.29098
8/12/97	0.011987	21.9	4.14275
8/13/97	0.014839	22.2	3.46172
8/14/97	0.01257	21.8	0.38011
8/15/97	0.01363	22.4	0.11776
8/16/97	0.010344	22.4	0.84232
8/17/97	0.011461	21.9	1.06335
8/18/97	0.011343	21.9	0.049
8/19/97	0.012324	22.2	0.10648
8/20/97	0.012311	22.6	0.05318
8/21/97	0.012749	22.2	0.3525
8/22/97	0.015168	21.8	0.19658
8/23/97	0.009972	21.8	0.40575
8/24/97	0.014265	21.5	0.57334
8/25/97	0.013148	21.5	0.48848
8/26/97	0.01197	21.1	0.82734
8/27/97	0.013113	21.7	6.79783
8/28/97	0.011667	21.7	0.0504
8/29/97	0.012158	21.6	0.06303
8/30/97	0.011089	21.6	0.04703
8/31/97	0.008649	22.2	0.0851
9/1/97	0.010051	22.8	0.26122
9/2/97	0.011965	22.8	1.00278
9/3/97	0.011777	22.4	0.0814
9/4/97	0.01151	20.7	0.04972
9/5/97	0.011238	22.1	0.04855
9/6/97	0.008706	22.1	0.26973
9/7/97	0.007921	22.4	0.54434
9/8/97	0.012693	22.4	0.05483
9/9/97	0.01512	21.4	0.26127
9/10/97	0.016438	21.2	0.07101
9/11/97	0.013113	20.4	0.19261
9/12/97	0.013744	21.6	0.29687

Maiden WWTP Continued			
9/13/97	0.013954	21.6	0.05469
9/14/97	0.010335	21.9	0.04881
9/15/97	0.013433	21.9	0.90527
9/16/97	0.015514	21.6	0.21447
9/17/97	0.015111	20.9	0.09139
9/18/97	0.014668	21.5	7.60412
9/19/97	0.015957	21.7	0.12408
9/20/97	0.009906	21.7	0.33738
9/21/97	0.010252	20.5	0.70362
9/22/97	0.014826	20.5	0.15372
9/23/97	0.013648	20.8	0.08254
9/24/97	0.033214	20.5	0.57394
9/25/97	0.013814	20.8	0.05968
9/26/97	0.012408	21.1	0.1072
9/27/97	0.011461	21.1	0.04491
9/28/97	0.009875	22.2	0.06025
9/29/97	0.012027	22.2	0.10391
9/30/97	0.011426	21.7	0.32579
10/1/97	0.01076	21.9	0.51133
10/2/97	0.009569	21.3	0.08267
10/3/97	0.011067	21.6	0.14343
10/4/97	0.008267	21.6	0.14879
10/5/97	0.008342	21.5	0.66917
10/6/97	0.016942	21.5	0.07319
10/7/97	0.014962	19.3	7.23921
10/8/97	0.014279	20.1	1.4804
10/9/97	0.012969	20.3	0.13446
10/10/97	0.014138	20.5	0.06108
10/11/97	0.010944	20.5	1.16057
10/12/97	0.010817	19.5	0.11826
10/13/97	0.013415	19.5	0.78818
10/14/97	0.014866	20.3	5.77975
10/15/97	0.012999	20.5	6.17721
10/16/97	0.012447	19.6	1.50561
10/17/97	0.016254	20.7	0.14044
10/18/97	0.016872	20.7	0.30946
10/19/97	0.014506	19.2	1.97854
10/20/97	0.012294	19.2	0.07435
10/21/97	0.013376	19.5	0.0809
10/22/97	0.013398	19.6	0.19679
10/23/97	0.011461	19.3	0.04951
10/24/97	0.014984	20.4	0.06473
10/25/97	0.01087	20.4	0.04254
10/26/97	0.039725	20.3	0.80763
10/27/97	0.018914	20.3	0.21244
10/28/97	0.01239	18.3	0.05353
10/29/97	0.012268	20.9	0.053
10/30/97	0.014896	19.3	7.72223
10/31/97	0.014774	17.8	0.22976
11/1/97	0.018616	17.8	2.60957

Maiden WWTP Continued			
11/2/97	0.014029	18.5	0.0632
11/3/97	0.0131	18.5	4.75371
11/4/97	0.013074	18.7	0.05648
11/5/97	0.013582	18.1	0.05867
11/6/97	0.013104	18	4.81191
11/7/97	0.014427	18.3	1.78254
11/8/97	0.01133	18.3	0.0166
11/9/97	0.009902	18	0.05855
11/10/97	0.012276	18	0.05303
11/11/97	0.012399	17.8	0.05356
11/12/97	0.014905	18	1.93169
11/13/97	0.021354	17.5	0.27675
11/14/97	0.017529	16.3	0.07573
11/15/97	0.012907	16.3	0.03387
11/16/97	0.010392	17.1	0.00227
11/17/97	0.012723	17.1	0.05496
11/18/97	0.013148	17.2	0.1704
11/19/97	0.01264	18.1	0.08737
11/20/97	0.012324	16.8	0.04259
11/21/97	0.022419	16.9	0.60047
11/22/97	0.020447	16.8	0.06586
11/23/97	0.014432	16.2	0.13354
11/24/97	0.014007	16.1	0.06051
11/25/97	0.014436	16	0.06236
11/26/97	0.016474	16	0.07117
11/27/97	0.01073	16.5	1.0854
11/28/97	0.011965	17.2	0.05169
11/29/97	0.013047	17.2	0.24196
11/30/97	0.015312	16.9	0.58584
12/1/97	0.021806	16.9	0.15072
12/2/97	0.015996	15.4	0.0691
12/3/97	0.021924	16.5	0.09471
12/4/97	0.02036	17.4	4.30974
12/5/97	0.019562	16.8	1.97752
12/6/97	0.014292	16.8	0.35604
12/7/97	0.014436	15.7	0.63184
12/8/97	0.019111	15.7	0.08256
12/9/97	0.015816	15.7	6.01274
12/10/97	0.018866	16.6	19.5599
12/11/97	0.015895	16	8.24007
12/12/97	0.014655	16.1	0.03799
12/13/97	0.016333	16.1	0.01448
12/14/97	0.010235	15.6	0.12457
12/15/97	0.017319	15.6	0.05985
12/16/97	0.017832	16.7	0.07703
12/17/97	0.01459	14.4	6.55481
12/18/97	0.011891	15.8	2.67113
12/19/97	0.015326	14.6	0.06621
12/20/97	0.010883	14.7	0.63807
12/21/97	0.009582	14.6	0.02934

Maiden WWTP Continued			
12/22/97	0.019177	14.6	19.8825
12/23/97	0.013836	15	0.35863
12/24/97	0.031606	15	0.01752
12/25/97	0.020583	15	0.74888
12/26/97	0.021017	14.8	5.70678
12/27/97	0.032018	14.8	5.97532
12/28/97	0.016728	14.5	3.14788
12/29/97	0.019453	14.3	0.08404
12/30/97	0.018607	13.2	0.08038
12/31/97	0.020066	13.9	0.08669
1/1/98	0.0328	14.13	1.2837
2/1/98	0.0308	14.67	0.6168
3/1/98	0.0244	14.6	0.3688
4/1/98	0.0258	16.26	0.6811
5/1/98	0.0239	17.81	2.1122
6/1/98	0.0151	20.23	0.203
7/1/98	0.0145	22.1	0.395
8/1/98	0.0148	23.08	0.2797
9/1/98	0.0149	22.37	0.5866
10/1/98	0.014	21.25	0.3933
11/1/98	0.0131	18.8	0.293
12/1/98	0.0136	17.06	0.6163
1/1/99	0.0178	14.52	1.5112
2/1/99	0.0154	14.55	0.4913
3/1/99	0.0152	14.91	0.8982
4/1/99	0.021	16.31	1.2817
5/1/99	0.0164	17.9	0.7915
6/1/99	0.0147	19.94	0.9732
7/1/99	0.0137	21.55	0.4754
8/1/99	0.0134	22.35	0.7284
9/1/99	0.0129	22.41	0.8994
10/1/99	0.0189	20.5	0.9438
11/1/99	0.0172	18.7	0.4785
12/1/99	0.0165	16.64	0.9572
1/1/00	0.0171	14.34	0.6511
2/1/00	0.018	13.49	0.945
3/1/00	0.0231	14.76	2.9159
4/1/00	0.0256	16.14	1.4143
5/1/00	0.0218	18.63	0.8747
6/1/00	0.0204	21.05	0.4985
7/1/00	0.0128	22	0.206
8/1/00	0.0098	22.46	0.5136
9/1/00	0.0129	22.41	0.8994
10/1/00	0.0189	20.5	0.9438
11/1/00	0.0172	18.7	0.4785
12/1/00	0.0165	16.64	0.9572

Maiden WTP Weekly Effluent Data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/4/96	0.0077	7.5	NA
1/11/96	0.0077	10.3	NA
1/18/96	0.0077	10.6	NA
1/26/96	0.0077	11.2	NA
2/3/96	0.0077	5.9	NA
2/8/96	0.0077	10.9	NA
2/15/96	0.0077	8.5	NA
2/22/96	0.0077	9.9	NA
2/28/96	0.0077	15.9	NA
3/7/96	0.0077	18.7	NA
3/14/96	0.0077	13.4	NA
3/21/96	0.0077	11.9	NA
3/26/96	0.0077	10.5	NA
4/4/96	0.0077	17.8	NA
4/11/96	0.0077	16.1	NA
4/18/96	0.0077	15.8	NA
4/25/96	0.0077	18.5	NA
5/2/96	0.0077	17.8	NA
5/9/96	0.0077	19.8	NA
5/16/96	0.0077	23.6	NA
5/23/96	0.0077	22.6	NA
5/30/96	0.0077	21.4	NA
6/6/96	0.0077	21.4	NA
6/13/96	0.0077	24.6	NA
6/20/96	0.0077	22.5	NA
6/24/96	0.0077	23.6	NA
7/1/96	0.0127	25.5	NA
7/11/96	0.0113	23.3	NA
7/17/96	0.0128	25.2	NA
7/25/96	0.0148	25.6	NA
8/1/96	0.0113	14.3	NA
8/8/96	0.0216	14.3	NA
8/15/96	0.017	24.3	NA
8/22/96	0.0114	25.1	NA
8/29/96	0.0077	24.1	NA
9/5/96	0.0212	22.7	NA
9/12/96	0.0223	22.7	NA
9/19/96	0.0172	19.2	NA
9/26/96	0.0212	21.2	NA
10/4/96	0.0256	19.4	NA
10/10/96	0.0256	16.8	NA
10/17/96	0.0175	16.8	NA
10/24/96	0.0298	18	NA
10/31/96	0.0151	6.1	NA
11/8/96	0.0246	17.6	NA
11/14/96	0.0325	12.4	NA
11/21/96	0.02	14.1	NA
11/26/96	0.0193	18.5	NA

Maiden WTP Continued			
12/5/96	0.0216	15	NA
12/12/96	0.0317	13.1	NA
12/19/96	0.0127	15.5	NA
12/27/96	0.0234	13.7	NA
1/2/97	0.0159	14	NA
1/9/97	0.0196	22	NA
1/16/97	0.0178	11.6	NA
1/23/97	0.0264	10.8	NA
1/31/97	0.0159	10.3	NA
2/6/97	0.0214	12.1	NA
2/13/97	0.0155	16.4	NA
2/20/97	0.0184	14.4	NA
2/27/97	0.0158	15.6	NA
3/6/97	0.0022	19.5	NA
3/15/97	0.0021	12.1	NA
3/20/97	0.0012	13.4	NA
3/27/97	0.0046	15.3	NA
4/3/97	0.0045	18	NA
4/9/97	0.006	20.4	NA
4/17/97	0.0018	17.8	NA
4/23/97	0.0029	15.4	NA
5/2/97	0.0049	20.1	NA
5/8/97	0.0041	18.1	NA
5/15/97	0.0035	20.7	NA
5/22/97	0.0051	20.5	NA
5/30/97	0.0033	19.4	NA
6/5/97	0.0041	20.3	NA
6/12/97	0.0049	20.5	NA
6/18/97	0.0039	24.1	NA
6/23/97	0.0032	24.4	NA
7/3/97	0.0035	26.2	NA
7/10/97	0.0039	21.9	NA
7/17/97	0.0049	25.1	NA
7/24/97	0.0052	23.9	NA
7/31/97	0.0057	22.6	NA
8/6/97	0.0053	23.4	NA
8/14/97	0.0046	25.9	NA
8/21/97	0.0054	26	NA
8/28/97	0.005	25.5	NA
9/4/97	0.0057	22.7	NA
9/11/97	0.0073	21.3	NA
9/18/97	0.0014	23.4	NA
9/25/97	0.0075	20.2	NA
10/2/97	0.0066	19	NA
10/9/97	0.0044	20.1	NA
10/16/97	0.0036	17.8	NA
10/23/97	0.0073	15.9	NA
10/30/97	0.0049	16	NA
11/7/97	0.0046	13	NA
11/13/97	0.0034	14.6	NA

Maiden WTP Continued			
11/20/97	0.0056	8.7	NA
11/28/97	0.0053	11.3	NA
12/4/97	0.0049	13.7	NA
12/11/97	0.0056	8.6	NA
12/19/97	0.0036	10.3	NA
12/23/97	0.0033	10.1	NA
1/2/98	0.007	11.4	NA
1/9/98	0.0057	14.2	NA
1/15/98	0.0031	14.4	NA
1/22/98	0.0047	12.3	NA
1/29/98	0.0064	10.3	NA
2/7/98	0.0108	9.5	NA
2/12/98	0.0146	10.9	NA
2/21/98	0.0079	13	NA
2/26/98	0.005	12.6	NA
3/5/98	0.019	17.6	NA
3/12/98	0.0054	9	NA
3/20/98	0.0086	14.1	NA
3/27/98	0.0028	16.3	NA
4/2/98	0.0063	20.5	NA
4/9/98	0.0032	19	NA
4/17/98	0.0059	20.9	NA
4/24/98	0.0044	23.4	NA
4/30/98	0.0005	17.8	NA
5/7/98	0.0058	19.3	NA
5/12/98	0.0094	19.1	NA
5/22/98	0.0077	18.4	NA
5/27/98	0.0033	22.7	NA
6/4/98	0.007	24	NA
6/11/98	0.0073	21	NA
6/18/98	0.0053	22	NA
6/25/98	0.0012	24	NA
7/2/98	0.0066	23	NA
7/9/98	0.0067	24.8	NA
7/16/98	0.0026	23.8	NA
7/23/98	0.0068	26.1	NA
7/30/98	0.0058	27.5	NA
8/6/98	0.007	26	NA
8/13/98	0.0082	26.8	NA
8/20/98	0.0093	23.6	NA
8/27/98	0.003	27	NA
9/3/98	0.0039	24.5	NA
9/10/98	0.0075	25	NA
9/17/98	0.0097	24	NA
9/24/98	0.004	22.9	NA
10/1/98	0.0069	24.1	NA
10/8/98	0.0149	22.9	NA
10/15/98	0.0018	21.2	NA
10/22/98	0.0041	18.4	NA
10/29/98	0.0039	17.8	NA

Maiden WTP Continued			
11/5/98	0.007	15.1	NA
11/12/98	0.007	14	NA
11/19/98	0.0038	16.5	NA
11/27/98	0.0115	15.3	NA
12/3/98	0.0019	14.6	NA
12/11/98	0.0061	15.5	NA
12/17/98	0.0101	10.2	NA
12/23/98	0.0074	11.3	NA
12/31/98	0.0044	8.8	NA
1/18/99	0.0026	7	NA
1/14/99	0.0021	8.8	NA
1/21/99	0.0036	10.4	NA
1/29/99	0.0071	15.2	NA
2/4/99	0.0042	12	NA
2/10/99	0.0081	16.4	NA
2/18/99	0.0075	12.5	NA
2/27/99	0.0005	9.1	NA
3/4/99	0.0069	14.3	NA
3/11/99	0.0026	12	NA
3/18/99	0.0079	13.6	NA
3/25/99	0.0029	14.8	NA
4/1/99	0.002	14	NA
4/8/99	0.0038	18.2	NA
4/15/99	0.0027	16.2	NA
4/22/99	0.0032	19	NA
4/29/99	0.0042	16	NA
5/6/99	0.0001	17.4	NA
5/13/99	0.0036	19	NA
5/19/99	0.0076	21	NA
5/27/99	0.003	18.9	NA
7/8/99	0.004	22	NA
7/15/99	0.0009	20	NA
7/22/99	0.002	23	NA
7/30/99	0.0033	29	NA
8/5/99	0.0019	26	NA
8/12/99	0.0023	26.8	NA
8/19/99	0.0026	27.2	NA
8/26/99	0.0028	25.6	NA
9/2/99	0.003	25.7	NA
9/10/99	0.0018	24.1	NA
9/14/99	0.0026	23.2	NA
9/23/99	0.0015	20.2	NA
9/30/99	0.0033	22.7	NA
10/7/99	0.0008	19.1	NA
10/14/99	0.0031	18.8	NA
10/21/99	0.0027	16.8	NA
10/28/99	0.0023	13	NA
11/4/99	0.0026	12.5	NA
11/12/99	0.0032	13	NA
11/19/99	0.0015	13.1	NA

11/23/99	0.0023	13.9	NA
12/3/99	0.0033	9	NA
12/10/99	0.0025	13.1	NA
12/15/99	0.0076	10	NA
12/24/99	0.0022	8	NA
12/31/99	0.0027	7	NA
1/7/00	0.0021	7.5	NA
1/12/00	0.0037	13	NA
1/20/00	0.0028	4	NA
1/28/00	0.0047	6.5	NA
2/3/00	0.0039	6.5	NA
2/10/00	0.0053	4	NA
2/17/00	0.0049	7	NA
2/24/00	0.002	11	NA
3/2/00	0.0006	13.2	NA
3/9/00	0.0024	13.5	NA
3/16/00	0.0019	10.5	NA
3/23/00	0.002	13	NA
3/28/00	0.0155	14	NA
4/6/00	0.0035	15	NA
4/14/00	0.0061	15	NA
4/20/00	0.0053	16	NA
4/27/00	0.0038	16	NA
5/4/00	0.007	20.5	NA
5/11/00	0.0037	22	NA
5/18/00	0.0071	20.5	NA
5/26/00	0.0078	23.7	NA
6/1/00	0.0029	24	NA
6/8/00	0.0053	20	NA
6/16/00	0.0032	25	NA
6/22/00	0.0048	26	NA
6/30/00	0.003	22.1	NA
7/5/00	0.0012	27	NA
7/13/00	0.0011	21.5	NA
7/20/00	0.0059	26.8	NA
7/28/00	0.0026	24.4	NA
8/4/00	0.0036	27	NA
8/11/00	0.0032	26	NA
8/17/00	0.0037	25	NA
8/25/00	0.0011	24	NA
9/1/00	0.0011	21	NA
9/7/00	0.0031	22	NA
9/15/00	0.0036	24	NA
9/23/00	0.0018	20	NA
9/29/00	0.0021	20	NA
10/6/00	0.0056	21	NA
10/13/00	0.0028	15	NA
10/20/00	0.0033	16.5	NA
10/27/00	0.0043	13.8	NA
11/2/00	0.0036	11.4	NA
11/9/00	0.0027	9	NA
11/16/00	0.0025	10	NA

Maiden WTP Continued			
11/24/00	0.0054	11.1	NA
12/1/00	0.0032	3.6	NA
12/8/00	0.0016	3	NA
12/15/00	0.0026	5	NA
12/21/00	0.0032	5.1	NA
12/28/00	0.0047	6.7	NA

Delta Mills Inc. Monthly Effluent Data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/1/96	0.026099	15.27	NA
2/1/96	0.026857	18.14	NA
2/29/96	0.026857	18.14	NA
3/1/96	0.031904	20.52	NA
4/1/96	0.032679	23.04	NA
5/1/96	0.030375	25	NA
6/1/96	0.029249	26.45	NA
7/1/96	0.028741	28.1	NA
8/1/96	0.033674	28.54	NA
9/1/96	0.032846	26.57	NA
10/1/96	0.031273	24.52	NA
11/1/96	0.029617	25	NA
11/2/96	0.029354	23	NA
11/3/96	0.030362	21	NA
11/4/96	0.032465	20	NA
11/5/96	0.026988	22	NA
11/6/96	0.033034	22	NA
11/7/96	0.030405	23	NA
11/8/96	0.030756	23	NA
11/9/96	0.030493	22	NA
11/10/96	0.029836	22	NA
11/11/96	0.037109	21	NA
11/12/96	0.035575	20	NA
11/13/96	0.033209	21	NA
11/14/96	0.03299	22	NA
11/15/96	0.033823	21	NA
11/16/96	0.037503	22	NA
11/17/96	0.038379	22	NA
11/18/96	0.03724	23	NA
11/19/96	0.041052	22	NA
11/20/96	0.038598	23	NA
11/21/96	0.040044	23	NA
11/22/96	0.041052	22	NA
11/23/96	0.039694	22	NA
11/24/96	0.039694	23	NA
11/25/96	0.035882	23	NA
11/26/96	0.040789	23	NA

Delta Mill Continued			
11/27/96	0.039475	21	NA
11/28/96	0.042235	21	NA
11/29/96	0.038379	21	NA
11/30/96	0.040964	22	NA
12/1/96	0.04517	22	NA
12/2/96	0.039124	23	NA
12/3/96	0.038423	22	NA
12/4/96	0.036276	22	NA
12/5/96	0.038905	22	NA
12/6/96	0.03908	22	NA
12/7/96	0.037591	22	NA
12/8/96	0.035488	21	NA
12/9/96	0.030537	21	NA
12/10/96	0.037678	21	NA
12/11/96	0.038116	20	NA
12/12/96	0.039168	21	NA
12/13/96	0.042848	23	NA
12/14/96	0.040307	22	NA
12/15/96	0.041008	22	NA
12/16/96	0.039825	21	NA
12/17/96	0.043374	22	NA
12/18/96	0.040964	21	NA
12/19/96	0.045258	21	NA
12/20/96	0.045871	20	NA
12/21/96	0.046485	20	NA
12/22/96	0.040263	19	NA
12/23/96	0.033823	19	NA
12/24/96	0.009857	19	NA
12/25/96	0.000789	15	NA
12/26/96	0.021774	9	NA
12/27/96	0.041578	17	NA
12/28/96	0.044206	19	NA
12/29/96	0.042892	22	NA
12/30/96	0.0439	25	NA
12/31/96	0.036714	27	NA
1/1/97	0.037196	27	NA
1/2/97	0.03816	28	NA
1/3/97	0.044995	27	NA
1/4/97	0.046003	26	NA
1/5/97	0.041972	25	NA
1/6/97	0.03413	25	NA
1/7/97	0.034261	24	NA
1/8/97	0.035575	23	NA
1/9/97	0.036934	23	NA
1/10/97	0.039475	22	NA
1/11/97	0.043374	20	NA
1/12/97	0.039168	19	NA
1/13/97	0.034436	18	NA
1/14/97	0.035181	19	NA
1/15/97	0.036583	19	NA

Delta Mill Continued			
1/16/97	0.034962	22	NA
1/17/97	0.031895	19	NA
1/18/97	0.033998	20	NA
1/19/97	0.034524	21	NA
1/20/97	0.036627	21	NA
1/21/97	0.034874	22	NA
1/22/97	0.035751	23	NA
1/23/97	0.033034	22	NA
1/24/97	0.032596	22	NA
1/25/97	0.031326	21	NA
1/26/97	0.029573	20	NA
1/27/97	0.029967	18	NA
1/28/97	0.038029	20	NA
1/29/97	0.03299	21	NA
1/30/97	0.035137	22	NA
1/31/97	0.034787	22	NA
2/1/97	0.037766	22	NA
2/2/97	0.037459	21	NA
2/3/97	0.03413	21	NA
2/4/97	0.034831	22	NA
2/5/97	0.038905	22	NA
2/6/97	0.037722	21	NA
2/7/97	0.03816	21	NA
2/8/97	0.040132	21	NA
2/9/97	0.03816	21	NA
2/10/97	0.037678	21	NA
2/11/97	0.040263	19	NA
2/12/97	0.041315	21	NA
2/13/97	0.038204	20	NA
2/14/97	0.038248	19	NA
2/15/97	0.041052	19	NA
2/16/97	0.042103	20	NA
2/17/97	0.040658	20	NA
2/18/97	0.042717	20	NA
2/19/97	0.046134	22	NA
2/20/97	0.039619	23	NA
2/21/97	0.042783	23	NA
2/22/97	0.043852	23	NA
2/23/97	0.04457	22	NA
2/24/97	0.038493	22	NA
2/25/97	0.042217	23	NA
2/26/97	0.038191	22	NA
2/27/97	0.038761	23	NA
2/28/97	0.042191	23	NA
3/1/97	0.040101	23	NA
3/2/97	0.040789	24	NA
3/3/97	0.041153	25	NA
3/4/97	0.036342	24	NA
3/5/97	0.037078	24	NA
3/6/97	0.038988	24	NA

Delta Mill Continued			
3/7/97	0.037648	23	NA
3/8/97	0.03802	23	NA
3/9/97	0.036504	23	NA
3/10/97	0.041678	23	NA
3/11/97	0.043593	22	NA
3/12/97	0.037748	23	NA
3/13/97	0.041043	24	NA
3/14/97	0.047028	24	NA
3/15/97	0.047913	24	NA
3/16/97	0.045771	23	NA
3/17/97	0.044522	23	NA
3/18/97	0.04213	23	NA
3/19/97	0.04082	24	NA
3/20/97	0.039729	24	NA
3/21/97	0.040496	23	NA
3/22/97	0.046047	23	NA
3/23/97	0.042064	23	NA
3/24/97	0.040912	23	NA
3/25/97	0.042572	23	NA
3/26/97	0.045433	24	NA
3/27/97	0.044623	25	NA
3/28/97	0.043352	24	NA
3/29/97	0.041446	30	NA
3/30/97	0.04135	27	NA
3/31/97	0.042585	23	NA
4/1/97	0.042082	22	NA
4/2/97	0.039479	23	NA
4/3/97	0.036898	22	NA
4/4/97	0.039505	23	NA
4/5/97	0.044211	23	NA
4/6/97	0.046077	23	NA
4/7/97	0.03788	23	NA
4/8/97	0.039383	23	NA
4/9/97	0.041919	24	NA
4/10/97	0.046375	24	NA
4/11/97	0.044093	24	NA
4/12/97	0.044272	24	NA
4/13/97	0.042818	23	NA
4/14/97	0.041687	23	NA
4/15/97	0.041332	23	NA
4/16/97	0.04461	24	NA
4/17/97	0.042717	25	NA
4/18/97	0.042734	23	NA
4/19/97	0.044903	23	NA
4/20/97	0.046787	24	NA
4/21/97	0.046638	24	NA
4/22/97	0.046169	24	NA
4/23/97	0.048408	24	NA
4/24/97	0.037104	24	NA
4/25/97	0.036491	24	NA

Delta Mill Continued			
4/26/97	0.040951	24	NA
4/27/97	0.043238	24	NA
4/28/97	0.041521	24	NA
4/29/97	0.038953	24	NA
4/30/97	0.032951	24	NA
5/1/97	0.03097	24	NA
5/2/97	0.03201	23	NA
5/3/97	0.03783	23	NA
5/4/97	0.03352	23	NA
5/5/97	0.03379	23	NA
5/6/97	0.03099	23	NA
5/7/97	0.03271	23	NA
5/8/97	0.03147	23	NA
5/9/97	0.03491	23	NA
5/10/97	0.03555	23	NA
5/11/97	0.03548	23	NA
5/12/97	0.032	23	NA
5/13/97	0.03306	24	NA
5/14/97	0.03348	24	NA
5/15/97	0.03145	24	NA
5/16/97	0.03239	24	NA
5/17/97	0.03409	24	NA
5/18/97	0.03231	25	NA
5/19/97	0.03401	25	NA
5/20/97	0.0325	26	NA
5/21/97	0.02946	25	NA
5/22/97	0.03367	25	NA
5/23/97	0.03443	25	NA
5/24/97	0.03527	25	NA
5/25/97	0.00998	25	NA
5/26/97	0.00593	24	NA
5/27/97	0.00025	24	NA
5/28/97	0.00013	23	NA
5/29/97	0.00014	23	NA
5/30/97	0.00021	22	NA
5/31/97	0.00031	22	NA
6/1/97	0.00271	21	NA
6/2/97	0.03223	20	NA
6/3/97	0.03276	23	NA
6/4/97	0.0313	24	NA
6/5/97	0.03225	23	NA
6/6/97	0.03327	23	NA
6/7/97	0.03307	23	NA
6/8/97	0.03026	24	NA
6/9/97	0.03158	24	NA
6/10/97	0.03513	27	NA
6/11/97	0.03313	24	NA
6/12/97	0.03475	25	NA
6/13/97	0.03318	25	NA
6/14/97	0.03869	26	NA

Delta Mill Continued			
6/15/97	0.039	26	NA
6/16/97	0.03573	27	NA
6/17/97	0.03472	27	NA
6/18/97	0.03411	27	NA
6/19/97	0.02953	27	NA
6/20/97	0.02796	28	NA
6/21/97	0.0072	28	NA
6/22/97	0.00044	27	NA
6/23/97	0.00026	27	NA
6/24/97	0.00021	27	NA
6/25/97	0.0002	26	NA
6/26/97	0.00018	26	NA
6/27/97	0.00016	26	NA
6/28/97	0.00028	25	NA
6/29/97	0.00016	25	NA
6/30/97	0.00017	25	NA
7/1/97	0.00022	24	NA
7/2/97	0.00013	24	NA
7/3/97	0.00443	24	NA
7/4/97	0.00074	23	NA
7/5/97	0.00066	23	NA
7/6/97	0.00333	22	NA
7/7/97	0.02962	22	NA
7/8/97	0.0294	25	NA
7/9/97	0.02865	26	NA
7/10/97	0.03286	26	NA
7/11/97	0.03286	26	NA
7/12/97	0.03098	26	NA
7/13/97	0.02624	27	NA
7/14/97	0.02651	28	NA
7/15/97	0.02826	28	NA
7/16/97	0.03426	28	NA
7/17/97	0.03115	29	NA
7/18/97	0.03251	27	NA
7/19/97	0.03242	28	NA
7/20/97	0.03496	28	NA
7/21/97	0.02865	29	NA
7/22/97	0.0276	28	NA
7/23/97	0.03045	27	NA
7/24/97	0.03255	28	NA
7/25/97	0.03163	28	NA
7/26/97	0.03308	28	NA
7/27/97	0.03286	28	NA
7/28/97	0.03636	28	NA
7/29/97	0.03531	29	NA
7/30/97	0.03864	28	NA
7/31/97	0.03264	29	NA
8/1/97	0.04018	28	NA
8/2/97	0.03886	28	NA
8/3/97	0.03693	28	NA

Delta Mill Continued			
8/4/97	0.0333	28	NA
8/5/97	0.03457	29	NA
8/6/97	0.03873	27	NA
8/7/97	0.03479	29	NA
8/8/97	0.03667	28	NA
8/9/97	0.03641	28	NA
8/10/97	0.04451	29	NA
8/11/97	0.03943	29	NA
8/12/97	0.03864	29	NA
8/13/97	0.04239	29	NA
8/14/97	0.04031	30	NA
8/15/97	0.0393	29	NA
8/16/97	0.03996	29	NA
8/17/97	0.04066	29	NA
8/18/97	0.04302	29	NA
8/19/97	0.04495	29	NA
8/20/97	0.04004	29	NA
8/21/97	0.0365	28	NA
8/22/97	0.03689	29	NA
8/23/97	0.03891	28	NA
8/24/97	0.03882	28	NA
8/25/97	0.04285	27	NA
8/26/97	0.03685	28	NA
8/27/97	0.03882	29	NA
8/28/97	0.03685	29	NA
8/29/97	0.03987	29	NA
8/30/97	0.03912	29	NA
8/31/97	0.03579	29	NA
9/1/97	0.03794	29	NA
9/2/97	0.03623	29	NA
9/3/97	0.03571	29	NA
9/4/97	0.04018	28	NA
9/5/97	0.03829	26	NA
9/6/97	0.03812	27	NA
9/7/97	0.04202	28	NA
9/8/97	0.04127	29	NA
9/9/97	0.0421	28	NA
9/10/97	0.03518	28	NA
9/11/97	0.0368	29	NA
9/12/97	0.04171	29	NA
9/13/97	0.04254	29	NA
9/14/97	0.0404	29	NA
9/15/97	0.04171	29	NA
9/16/97	0.03698	29	NA
9/17/97	0.03601	29	NA
9/18/97	0.03623	28	NA
9/19/97	0.04635	29	NA
9/20/97	0.04359	29	NA
9/21/97	0.04232	28	NA
9/22/97	0.03588	29	NA

Delta Mill Continued			
9/23/97	0.03842	29	NA
9/24/97	0.04259	28	NA
9/25/97	0.02042	27	NA
9/26/97	0.00478	23	NA
9/27/97	0.00351	23	NA
9/28/97	0.02589	23	NA
9/29/97	0.03623	23	NA
9/30/97	0.04513	24	NA
10/1/97	0.04267	26	NA
10/2/97	0.03707	26	NA
10/3/97	0.03812	26	NA
10/4/97	0.0439	26	NA
10/5/97	0.04031	25	NA
10/6/97	0.03632	25	NA
10/7/97	0.03829	26	NA
10/8/97	0.03965	27	NA
10/9/97	0.03698	28	NA
10/10/97	0.0425	28	NA
10/11/97	0.04237	27	NA
10/12/97	0.03693	27	NA
10/13/97	0.03076	26	NA
10/14/97	0.03413	26	NA
10/15/97	0.03658	26	NA
10/16/97	0.03785	26	NA
10/17/97	0.03794	26	NA
10/18/97	0.03715	25	NA
10/19/97	0.0407	25	NA
10/20/97	0.034	24	NA
10/21/97	0.03014	25	NA
10/22/97	0.03496	24	NA
10/23/97	0.04026	25	NA
10/24/97	0.04342	23	NA
10/25/97	0.04316	23	NA
10/26/97	0.04465	24	NA
10/27/97	0.03093	25	NA
10/28/97	0.03711	24	NA
10/29/97	0.04013	24	NA
10/30/97	0.02988	21	NA
10/31/97	0.03601	20	NA
11/1/97	0.03763	21	NA
11/2/97	0.03785	22	NA
11/3/97	0.02624	23	NA
11/4/97	0.0294	22	NA
11/5/97	0.03207	22	NA
11/6/97	0.03128	23	NA
11/7/97	0.03479	23	NA
11/8/97	0.03536	22	NA
11/9/97	0.03457	22	NA
11/10/97	0.0333	21	NA
11/11/97	0.02664	22	NA

Delta Mill Continued		
11/12/97	0.03431	22 NA
11/13/97	0.03492	21 NA
11/14/97	0.03501	21 NA
11/15/97	0.03439	20 NA
11/16/97	0.03422	20 NA
11/17/97	0.0319	19 NA
11/18/97	0.03562	20 NA
11/19/97	0.03273	19 NA
11/20/97	0.03242	18 NA
11/21/97	0.03956	20 NA
11/22/97	0.03457	21 NA
11/23/97	0.03273	21 NA
11/24/97	0.00819	22 NA
11/25/97	0.00057	22 NA
11/26/97	0.00053	21 NA
11/27/97	0.00031	21 NA
11/28/97	0.00022	20 NA
11/29/97	0.00127	20 NA
11/30/97	0.02962	19 NA
12/1/97	0.03562	19 NA
12/2/97	0.03308	19 NA
12/3/97	0.03803	21 NA
12/4/97	0.03575	22 NA
12/5/97	0.03654	22 NA
12/6/97	0.04302	21 NA
12/7/97	0.03851	21 NA
12/8/97	0.03098	21 NA
12/9/97	0.03487	22 NA
12/10/97	0.03544	21 NA
12/11/97	0.03882	22 NA
12/12/97	0.04153	22 NA
12/13/97	0.03746	22 NA
12/14/97	0.03588	22 NA
12/15/97	0.03544	22 NA
12/16/97	0.0375	21 NA
12/17/97	0.03404	21 NA
12/18/97	0.03457	22 NA
12/19/97	0.03159	22 NA
12/20/97	0.00832	21 NA
12/21/97	0.00031	20 NA
12/22/97	0.00504	19 NA
12/23/97	0.0011	18 NA
12/24/97	0.0011	17 NA
12/25/97	0.00114	16 NA
12/26/97	0.00153	15 NA
12/27/97	0.0018	14 NA
12/28/97	0.01249	12 NA
12/29/97	0.02423	10 NA
12/30/97	0.02007	12 NA
12/31/97	0.02861	14 NA

Delta Mill Continued			
1/1/98	0.036658	21.77	NA
2/1/98	0.037153	20.5	NA
3/1/98	0.036789	20.86	NA
4/1/98	0.035996	23.9	NA
5/1/98	0.038401	26.38	NA
6/1/98	0.035689	29.1	NA
7/1/98	0.033082	29.4	NA
8/1/98	0.038997	29.85	NA
9/1/98	0.041043	29.09	NA
10/1/98	0.039518	26.4	NA
11/1/98	0.03862	23.9	NA
12/1/98	0.032846	21.23	NA
1/1/99	0.040101	21.14	NA
2/1/99	0.042537	22.75	NA
3/1/99	0.039304	22.26	NA
4/1/99	0.031036	24.72	NA
5/1/99	0.028478	25.84	NA
6/1/99	0.030997	27.15	NA
7/1/99	0.029674	28.1	NA
8/1/99	0.037486	27.59	NA
9/1/99	0.036272	25.77	NA
10/1/99	0.038616	23.52	NA
11/1/99	0.039742	21.17	NA
12/1/99	0.034695	20.09	NA
1/1/00	0.037959	18.96	NA
2/1/00	0.037919	19.2	NA
3/1/00	0.035128	21.57	NA
4/1/00	0.033722	23.02	NA
5/1/00	0.033744	25.89	NA
6/1/00	0.034059	26.14	NA
7/1/00	0.031492	28.72	NA
8/1/00	0.034476	29.03	NA
9/1/00	0.036272	25.77	NA
10/1/00	0.038616	23.52	NA
11/1/00	0.039742	21.17	NA
12/1/00	0.034695	20.09	NA

National Fruit Monthly Effluent Data data data

Date	Flow (cms)	Temperature (Degree C)	Fecal Coli. (10^9 # / day)
1/31/96	0.00092	16	NA
2/28/96	0.003767	22	NA
3/31/96	0.037668	24	NA
4/30/96	0.001883	18	NA
5/31/96	0.003767	32	NA
6/30/96	0.000044	34	NA
7/31/96	0.003767	33	NA
8/30/96	0.000613	30	NA
9/30/96	0.000613	29	NA
10/30/96	0.000613	29	NA
11/30/96	0.000613	29	NA
12/30/96	0.000613	29	NA
1/31/97	0.000613	20	NA
2/28/97	0.018922	18.9	NA
3/31/97	0.012614	19.4	NA
4/30/97	0.011344	20.3	NA
5/31/97	0.001883	22.5	NA
6/30/97	0.002278	31	NA
7/31/97	0.018922	27.3	NA
8/30/97	0.018922	27.3	NA
9/30/97	0.000188	23	NA
10/30/97	0.000188	23	NA
11/30/97	0.000188	23	NA
12/31/97	0.000315	19.1	NA
1/31/98	0.011353	10.6	NA
2/28/98	0.018922	14.1	NA
3/31/98	0.000315	9.3	NA
4/30/98	0.000063	20.6	NA
5/30/98	0.000063	20.6	NA
6/30/98	0.011353	30.6	NA
7/31/98	0.012614	30.7	NA
8/30/98	0.000315	29.1	NA
9/30/98	0.000063	26.6	NA
10/30/98	0.000063	26.6	NA
11/30/98	0.000063	26.6	NA
12/31/98	0.001135	16.3	NA
1/31/99	0.006307	21.1	NA
2/28/99	0.000315	15.2	NA
3/31/99	0.003784	17.6	NA
4/30/99	0.000631	23.4	NA
5/31/99	0.022706	26	NA
6/30/99	0.05694	27.2	NA
7/31/99	0.017082	27.5	NA
8/30/99	0.031536	31.4	NA
9/30/99	0.003154	27.2	NA
10/31/99	0.000127	25.7	NA
11/30/99	0.000254	16.2	NA
12/31/99	0.000946	12.5	NA

National Continued			
1/31/00	0.000377	12.3	NA
2/29/00	0.000377	12.3	NA
3/31/00	0.018922	19.1	NA
4/30/00	0.000946	20	NA
5/31/00	0.037843	25.7	NA
6/30/00	0.003154	32	NA
7/31/00	0.001577	31.8	NA
8/30/00	0.001577	31.8	NA
9/30/00	0.005046	25.5	NA
10/31/00	0.002271	19.6	NA
11/30/00	0.001577	13.9	NA
12/31/00	0.018834	10.8	NA

APPENDIX IV. Indian Creek and Clark Creek Flow Data

A. Indian Creek Flow Data at the DWQ Ambient Monitoring Station near NC Laboratory.

Date	Flow (cms)
1/1/96	2.12384
1/2/96	2.32207
1/3/96	2.40702
1/4/96	1.95393
1/5/96	1.86898
1/6/96	1.98225
1/7/96	2.49197
1/8/96	2.71852
1/9/96	2.12384
1/10/96	2.03889
1/11/96	2.03889
1/12/96	2.15216
1/13/96	2.09552
1/14/96	2.35038
1/15/96	3.0017
1/16/96	4.07777
1/17/96	4.67245
1/18/96	5.94675
1/19/96	35.3974
1/20/96	18.5482
1/21/96	5.5503
1/22/96	4.24768
1/23/96	3.73796
1/24/96	4.53086
1/25/96	3.93619
1/26/96	3.1716
1/27/96	32.2824
1/28/96	12.3749
1/29/96	5.52199
1/30/96	4.44591
1/31/96	4.10609
2/1/96	3.51142
2/2/96	17.4721
2/3/96	31.1497
2/4/96	7.4476
2/5/96	5.04058
2/6/96	4.30432
2/7/96	4.07777
2/8/96	4.53086
2/9/96	4.36095
2/10/96	3.85123
2/11/96	3.59637
2/12/96	3.31319
2/13/96	3.1716
2/14/96	3.1716
2/15/96	3.0017

Indian Creek Continued	
2/16/96	2.88842
2/17/96	2.71852
2/18/96	2.63356
2/19/96	2.63356
2/20/96	4.38927
2/21/96	3.90787
2/22/96	3.28487
2/23/96	3.11497
2/24/96	3.0017
2/25/96	2.6902
2/26/96	2.74683
2/27/96	2.66188
2/28/96	2.6902
2/29/96	2.52029
3/1/96	2.46366
3/2/96	2.54861
3/3/96	2.40702
3/4/96	2.35038
3/5/96	2.32207
3/6/96	4.78572
3/7/96	9.37322
3/8/96	6.11666
3/9/96	4.04946
3/10/96	3.42646
3/11/96	3.1716
3/12/96	3.05833
3/13/96	2.83179
3/14/96	2.80347
3/15/96	2.88842
3/16/96	2.94506
3/17/96	4.21936
3/18/96	8.2405
3/19/96	16.4244
3/20/96	7.70246
3/21/96	4.67245
3/22/96	3.90787
3/23/96	3.4831
3/24/96	3.14328
3/25/96	3.11497
3/26/96	3.11497
3/27/96	2.94506
3/28/96	5.66358
3/29/96	4.84236
3/30/96	3.85123
3/31/96	3.62469
4/1/96	4.53086
4/2/96	3.70964
4/3/96	3.36983
4/4/96	3.22824
4/5/96	3.05833
4/6/96	2.97338

Indian Creek Continued

4/7/96	2.94506
4/8/96	2.77515
4/9/96	2.86011
4/10/96	2.66188
4/11/96	2.57693
4/12/96	2.54861
4/13/96	2.52029
4/14/96	2.54861
4/15/96	2.54861
4/16/96	2.60524
4/17/96	2.32207
4/18/96	2.29375
4/19/96	2.40702
4/20/96	2.86011
4/21/96	3.22824
4/22/96	2.54861
4/23/96	2.35038
4/24/96	2.29375
4/25/96	2.12384
4/26/96	3.03001
4/27/96	2.80347
4/28/96	2.20879
4/29/96	2.20879
4/30/96	3.39815
5/1/96	2.57693
5/2/96	2.20879
5/3/96	2.06721
5/4/96	2.01057
5/5/96	1.8973
5/6/96	1.92562
5/7/96	1.95393
5/8/96	1.98225
5/9/96	1.95393
5/10/96	1.72739
5/11/96	1.78403
5/12/96	1.81234
5/13/96	1.61412
5/14/96	1.81234
5/15/96	1.69907
5/16/96	1.67075
5/17/96	1.55748
5/18/96	1.50085
5/19/96	1.52917
5/20/96	1.41589
5/21/96	1.2743
5/22/96	1.18935
5/23/96	1.16103
5/24/96	1.16103
5/25/96	2.57693
5/26/96	1.72739
5/27/96	1.69907

Indian Flow Continued	
5/28/96	2.46366
5/29/96	5.0689
5/30/96	4.38927
5/31/96	1.86898
6/1/96	1.55748
6/2/96	1.44421
6/3/96	1.44421
6/4/96	1.86898
6/5/96	1.81234
6/6/96	1.44421
6/7/96	1.33094
6/8/96	1.72739
6/9/96	11.4121
6/10/96	5.15385
6/11/96	2.88842
6/12/96	2.15216
6/13/96	2.09552
6/14/96	1.81234
6/15/96	1.75571
6/16/96	1.61412
6/17/96	1.52917
6/18/96	1.44421
6/19/96	1.38758
6/20/96	1.41589
6/21/96	1.35926
6/22/96	1.24599
6/23/96	1.13272
6/24/96	1.18935
6/25/96	1.13272
6/26/96	1.1044
6/27/96	1.01944
6/28/96	0.991126
6/29/96	0.962808
6/30/96	0.962808
7/1/96	0.991126
7/2/96	0.991126
7/3/96	0.906172
7/4/96	0.792901
7/5/96	0.764583
7/6/96	0.849536
7/7/96	0.792901
7/8/96	0.792901
7/9/96	0.821218
7/10/96	0.821218
7/11/96	0.764583
7/12/96	0.707947
7/13/96	0.736265
7/14/96	0.93449
7/15/96	1.01944
7/16/96	1.47253
7/17/96	0.962808

Indian Flow Continued	
7/18/96	0.849536
7/19/96	0.991126
7/20/96	0.849536
7/21/96	0.622993
7/22/96	0.622993
7/23/96	0.679629
7/24/96	0.764583
7/25/96	0.707947
7/26/96	1.38758
7/27/96	1.01944
7/28/96	1.07608
7/29/96	1.38758
7/30/96	0.93449
7/31/96	0.93449
8/1/96	1.24599
8/2/96	1.75571
8/3/96	1.04776
8/4/96	0.849536
8/5/96	0.877854
8/6/96	1.1044
8/7/96	0.877854
8/8/96	0.93449
8/9/96	0.906172
8/10/96	1.38758
8/11/96	1.07608
8/12/96	2.20879
8/13/96	4.70077
8/14/96	1.78403
8/15/96	1.21767
8/16/96	1.04776
8/17/96	0.962808
8/18/96	1.30262
8/19/96	1.18935
8/20/96	0.962808
8/21/96	0.93449
8/22/96	0.93449
8/23/96	0.877854
8/24/96	0.821218
8/25/96	1.24599
8/26/96	2.32207
8/27/96	2.01057
8/28/96	1.21767
8/29/96	1.1044
8/30/96	1.04776
8/31/96	1.01944
9/1/96	0.93449
9/2/96	0.906172
9/3/96	1.24599
9/4/96	2.35038
9/5/96	2.15216
9/6/96	1.50085

Indian Flow Continued	
9/7/96	1.13272
9/8/96	0.991126
9/9/96	1.01944
9/10/96	0.962808
9/11/96	1.18935
9/12/96	1.16103
9/13/96	1.04776
9/14/96	0.93449
9/15/96	0.849536
9/16/96	0.962808
9/17/96	1.8973
9/18/96	1.13272
9/19/96	0.877854
9/20/96	0.877854
9/21/96	0.877854
9/22/96	0.962808
9/23/96	0.877854
9/24/96	0.821218
9/25/96	0.821218
9/26/96	0.877854
9/27/96	0.849536
9/28/96	0.93449
9/29/96	1.52917
9/30/96	0.962808
10/1/96	1.84066
10/2/96	1.30262
10/3/96	1.04776
10/4/96	0.849536
10/5/96	0.821218
10/6/96	0.877854
10/7/96	0.849536
10/8/96	1.30262
10/9/96	1.07608
10/10/96	1.1044
10/11/96	0.93449
10/12/96	0.849536
10/13/96	0.821218
10/14/96	0.877854
10/15/96	0.821218
10/16/96	0.849536
10/17/96	0.849536
10/18/96	0.792901
10/19/96	0.877854
10/20/96	0.821218
10/21/96	0.849536
10/22/96	0.821218
10/23/96	0.821218
10/24/96	0.849536
10/25/96	0.849536
10/26/96	0.821218
10/27/96	0.792901

Indian Flow Continued	
10/28/96	0.849536
10/29/96	0.877854
10/30/96	0.877854
10/31/96	0.849536
11/1/96	0.877854
11/2/96	1.35926
11/3/96	1.04776
11/4/96	0.906172
11/5/96	0.906172
11/6/96	0.906172
11/7/96	0.93449
11/8/96	3.99282
11/9/96	2.71852
11/10/96	1.52917
11/11/96	1.18935
11/12/96	1.1044
11/13/96	1.04776
11/14/96	1.04776
11/15/96	1.01944
11/16/96	1.04776
11/17/96	0.991126
11/18/96	1.1044
11/19/96	1.33094
11/20/96	1.1044
11/21/96	1.16103
11/22/96	1.50085
11/23/96	1.16103
11/24/96	1.04776
11/25/96	1.1044
11/26/96	2.71852
11/27/96	1.64244
11/28/96	1.33094
11/29/96	1.16103
11/30/96	1.24599
12/1/96	18.0102
12/2/96	15.943
12/3/96	4.5875
12/4/96	3.08665
12/5/96	2.49197
12/6/96	2.80347
12/7/96	3.03001
12/8/96	3.03001
12/9/96	2.3787
12/10/96	2.06721
12/11/96	1.95393
12/12/96	1.95393
12/13/96	5.69189
12/14/96	3.31319
12/15/96	2.63356
12/16/96	2.26543
12/17/96	2.32207

Indian Flow Continued	
12/18/96	2.20879
12/19/96	3.4831
12/20/96	2.74683
12/21/96	2.29375
12/22/96	2.09552
12/23/96	1.98225
12/24/96	2.01057
12/25/96	2.06721
12/26/96	1.86898
12/27/96	1.84066
12/28/96	1.81234
12/29/96	1.86898
12/30/96	1.84066
12/31/96	1.78403
1/1/97	1.72739
1/2/97	1.72739
1/3/97	1.72739
1/4/97	1.67075
1/5/97	2.12384
1/6/97	2.01057
1/7/97	1.78403
1/8/97	1.69907
1/9/97	7.90069
1/10/97	5.83348
1/11/97	3.82291
1/12/97	2.97338
1/13/97	2.52029
1/14/97	2.32207
1/15/97	2.18048
1/16/97	4.19105
1/17/97	3.19992
1/18/97	2.60524
1/19/97	2.29375
1/20/97	2.23711
1/21/97	2.15216
1/22/97	2.15216
1/23/97	2.23711
1/24/97	2.54861
1/25/97	4.61581
1/26/97	3.19992
1/27/97	2.6902
1/28/97	3.70964
1/29/97	3.51142
1/30/97	3.0017
1/31/97	2.60524
2/1/97	2.43534
2/2/97	2.32207
2/3/97	2.23711
2/4/97	5.32376
2/5/97	5.26713
2/6/97	3.82291

Indian Flow Continued	
2/7/97	3.08665
2/8/97	3.53973
2/9/97	3.28487
2/10/97	2.97338
2/11/97	2.88842
2/12/97	2.63356
2/13/97	2.6902
2/14/97	4.95563
2/15/97	28.0347
2/16/97	11.8086
2/17/97	5.60694
2/18/97	4.33264
2/19/97	3.70964
2/20/97	3.34151
2/21/97	3.34151
2/22/97	3.93619
2/23/97	3.14328
2/24/97	2.80347
2/25/97	2.80347
2/26/97	2.66188
2/27/97	2.83179
2/28/97	15.5465
3/1/97	19.6526
3/2/97	7.07947
3/3/97	6.37152
3/4/97	5.18217
3/5/97	4.13441
3/6/97	4.72909
3/7/97	3.7946
3/8/97	3.42646
3/9/97	3.31319
3/10/97	3.1716
3/11/97	3.03001
3/12/97	2.80347
3/13/97	2.71852
3/14/97	4.50254
3/15/97	3.59637
3/16/97	2.94506
3/17/97	2.80347
3/18/97	2.83179
3/19/97	9.59976
3/20/97	7.50424
3/21/97	4.7574
3/22/97	3.93619
3/23/97	3.31319
3/24/97	3.08665
3/25/97	3.03001
3/26/97	3.59637
3/27/97	3.0017
3/28/97	3.11497
3/29/97	3.82291

3/30/97	3.05833
3/31/97	2.86011
4/1/97	2.60524
4/2/97	2.54861
4/3/97	2.52029
4/4/97	2.46366
4/5/97	2.43534
4/6/97	3.51142
4/7/97	5.15385
4/8/97	3.25656
4/9/97	2.83179
4/10/97	2.60524
4/11/97	2.54861
4/12/97	4.44591
4/13/97	4.19105
4/14/97	3.14328
4/15/97	3.0017
4/16/97	2.80347
4/17/97	2.6902
4/18/97	2.49197
4/19/97	2.46366
4/20/97	2.3787
4/21/97	2.32207
4/22/97	3.0017
4/23/97	13.2528
4/24/97	5.89012
4/25/97	4.16273
4/26/97	3.34151
4/27/97	3.9645
4/28/97	14.1873
4/29/97	33.9815
4/30/97	9.06172
5/1/97	5.43703
5/2/97	4.276
5/3/97	10.4776
5/4/97	6.11666
5/5/97	4.24768
5/6/97	3.68132
5/7/97	3.25656
5/8/97	3.08665
5/9/97	3.03001
5/10/97	2.77515
5/11/97	2.63356
5/12/97	2.54861
5/13/97	2.49197
5/14/97	2.35038
5/15/97	2.29375
5/16/97	2.12384
5/17/97	2.12384
5/18/97	2.06721
5/19/97	2.01057
5/20/97	1.8973

Indian Flow Continued

5/21/97	1.81234
5/22/97	1.75571
5/23/97	1.78403
5/24/97	1.72739
5/25/97	1.84066
5/26/97	2.12384
5/27/97	1.86898
5/28/97	1.81234
5/29/97	1.75571
5/30/97	2.01057
5/31/97	1.92562
6/1/97	2.52029
6/2/97	3.51142
6/3/97	3.53973
6/4/97	2.77515
6/5/97	2.12384
6/6/97	1.86898
6/7/97	1.86898
6/8/97	1.78403
6/9/97	1.81234
6/10/97	1.75571
6/11/97	1.61412
6/12/97	1.61412
6/13/97	4.53086
6/14/97	3.82291
6/15/97	2.54861
6/16/97	1.92562
6/17/97	1.69907
6/18/97	1.5858
6/19/97	1.52917
6/20/97	1.41589
6/21/97	1.38758
6/22/97	1.41589
6/23/97	1.41589
6/24/97	1.24599
6/25/97	1.21767
6/26/97	1.16103
6/27/97	1.67075
6/28/97	1.55748
6/29/97	1.44421
6/30/97	1.21767
7/1/97	1.2743
7/2/97	1.44421
7/3/97	1.13272
7/4/97	1.04776
7/5/97	1.07608
7/6/97	1.30262
7/7/97	0.93449
7/8/97	0.93449
7/9/97	0.906172
7/10/97	0.962808

Indian Flow Continued	
7/11/97	0.849536
7/12/97	0.877854
7/13/97	0.792901
7/14/97	0.764583
7/15/97	0.736265
7/16/97	0.764583
7/17/97	1.18935
7/18/97	0.877854
7/19/97	0.707947
7/20/97	0.679629
7/21/97	0.707947
7/22/97	0.679629
7/23/97	0.991126
7/24/97	1.47253
7/25/97	0.906172
7/26/97	0.792901
7/27/97	0.764583
7/28/97	0.764583
7/29/97	0.707947
7/30/97	1.16103
7/31/97	1.24599
8/1/97	0.849536
8/2/97	0.679629
8/3/97	0.622993
8/4/97	0.651311
8/5/97	0.736265
8/6/97	0.651311
8/7/97	0.622993
8/8/97	0.622993
8/9/97	0.622993
8/10/97	0.651311
8/11/97	0.679629
8/12/97	0.594675
8/13/97	0.566358
8/14/97	0.53804
8/15/97	0.53804
8/16/97	0.481404
8/17/97	0.481404
8/18/97	0.453086
8/19/97	0.424768
8/20/97	0.39645
8/21/97	0.424768
8/22/97	0.39645
8/23/97	0.39645
8/24/97	0.368132
8/25/97	0.39645
8/26/97	0.481404
8/27/97	0.481404
8/28/97	0.39645
8/29/97	0.39645
8/30/97	0.368132

Indian Flow Continued

8/31/97	0.368132
9/1/97	0.39645
9/2/97	0.339815
9/3/97	0.339815
9/4/97	0.311497
9/5/97	0.311497
9/6/97	0.339815
9/7/97	0.368132
9/8/97	0.311497
9/9/97	0.26902
9/10/97	0.424768
9/11/97	0.707947
9/12/97	0.481404
9/13/97	0.453086
9/14/97	0.453086
9/15/97	0.39645
9/16/97	0.339815
9/17/97	0.368132
9/18/97	0.424768
9/19/97	0.368132
9/20/97	0.39645
9/21/97	0.339815
9/22/97	0.311497
9/23/97	0.311497
9/24/97	1.47253
9/25/97	1.98225
9/26/97	0.877854
9/27/97	0.622993
9/28/97	0.594675
9/29/97	0.707947
9/30/97	0.53804
10/1/97	0.481404
10/2/97	0.481404
10/3/97	0.53804
10/4/97	0.53804
10/5/97	0.481404
10/6/97	0.53804
10/7/97	0.481404
10/8/97	0.481404
10/9/97	0.481404
10/10/97	0.481404
10/11/97	0.792901
10/12/97	0.53804
10/13/97	0.509722
10/14/97	0.53804
10/15/97	0.566358
10/16/97	0.594675
10/17/97	0.566358
10/18/97	0.594675
10/19/97	0.877854
10/20/97	0.849536

Indian Flow Continued

10/21/97	0.849536
10/22/97	0.707947
10/23/97	0.622993
10/24/97	0.594675
10/25/97	0.792901
10/26/97	8.09891
10/27/97	12.6581
10/28/97	2.40702
10/29/97	1.47253
10/30/97	1.1044
10/31/97	1.01944
11/1/97	1.1044
11/2/97	1.69907
11/3/97	1.30262
11/4/97	1.1044
11/5/97	0.962808
11/6/97	0.906172
11/7/97	1.01944
11/8/97	0.991126
11/9/97	0.93449
11/10/97	0.93449
11/11/97	0.906172
11/12/97	0.906172
11/13/97	1.2743
11/14/97	1.95393
11/15/97	1.44421
11/16/97	1.21767
11/17/97	1.13272
11/18/97	1.04776
11/19/97	1.04776
11/20/97	1.01944
11/21/97	1.13272
11/22/97	3.53973
11/23/97	2.01057
11/24/97	1.5858
11/25/97	1.33094
11/26/97	1.21767
11/27/97	1.21767
11/28/97	1.18935
11/29/97	1.16103
11/30/97	1.2743
12/1/97	1.47253
12/2/97	1.24599
12/3/97	1.18935
12/4/97	2.09552
12/5/97	1.64244
12/6/97	1.44421
12/7/97	1.33094
12/8/97	1.2743
12/9/97	1.30262
12/10/97	1.41589

Indian Flow Continued

12/11/97	1.44421
12/12/97	1.2743
12/13/97	1.24599
12/14/97	1.18935
12/15/97	1.16103
12/16/97	1.18935
12/17/97	1.21767
12/18/97	1.18935
12/19/97	1.18935
12/20/97	1.16103
12/21/97	1.16103
12/22/97	2.40702
12/23/97	2.18048
12/24/97	6.14498
12/25/97	9.88294
12/26/97	3.73796
12/27/97	4.55918
12/28/97	4.19105
12/29/97	3.14328
12/30/97	2.6902
12/31/97	2.32207
1/1/98	2.06721
1/2/98	2.03889
1/3/98	1.8973
1/4/98	1.8973
1/5/98	1.84066
1/6/98	2.01057
1/7/98	2.09552
1/8/98	25.6277
1/9/98	9.25995
1/10/98	4.41759
1/11/98	3.39815
1/12/98	2.80347
1/13/98	2.43534
1/14/98	2.29375
1/15/98	8.09891
1/16/98	23.2773
1/17/98	15.9146
1/18/98	6.22993
1/19/98	6.79629
1/20/98	4.5875
1/21/98	3.34151
1/22/98	3.1716
1/23/98	11.4687
1/24/98	7.39097
1/25/98	3.9645
1/26/98	3.1716
1/27/98	21.2101
1/28/98	41.6273
1/29/98	9.99621
1/30/98	5.52199

Indian Flow Continued	
1/31/98	4.07777
2/1/98	3.56805
2/2/98	3.28487
2/3/98	12.1484
2/4/98	41.3441
2/5/98	19.4544
2/6/98	7.84405
2/7/98	4.72909
2/8/98	3.76628
2/9/98	3.36983
2/10/98	3.03001
2/11/98	2.94506
2/12/98	3.68132
2/13/98	2.83179
2/14/98	2.57693
2/15/98	2.3787
2/16/98	4.276
2/17/98	16.5943
2/18/98	8.69359
2/19/98	4.21936
2/20/98	3.42646
2/21/98	3.05833
2/22/98	2.80347
2/23/98	7.87237
2/24/98	4.92731
2/25/98	3.34151
2/26/98	3.03001
2/27/98	6.14498
2/28/98	5.12554
3/1/98	3.34151
3/2/98	2.97338
3/3/98	2.71852
3/4/98	2.49197
3/5/98	2.43534
3/6/98	2.35038
3/7/98	2.40702
3/8/98	30.8665
3/9/98	43.8927
3/10/98	15.3766
3/11/98	8.58032
3/12/98	5.89012
3/13/98	4.41759
3/14/98	3.93619
3/15/98	3.62469
3/16/98	3.34151
3/17/98	3.25656
3/18/98	3.39815
3/19/98	15.6598
3/20/98	7.10779
3/21/98	5.04058
3/22/98	3.82291

Indian Flow Continued

3/23/98	3.42646
3/24/98	3.31319
3/25/98	3.11497
3/26/98	3.08665
3/27/98	3.0017
3/28/98	2.94506
3/29/98	2.88842
3/30/98	2.77515
3/31/98	2.66188
4/1/98	2.88842
4/2/98	2.6902
4/3/98	2.60524
4/4/98	3.53973
4/5/98	2.6902
4/6/98	2.57693
4/7/98	2.49197
4/8/98	2.49197
4/9/98	6.22993
4/10/98	3.31319
4/11/98	2.74683
4/12/98	2.60524
4/13/98	2.49197
4/14/98	2.49197
4/15/98	2.49197
4/16/98	2.40702
4/17/98	16.6792
4/18/98	7.30601
4/19/98	11.5537
4/20/98	17.8969
4/21/98	6.90956
4/22/98	4.41759
4/23/98	3.76628
4/24/98	3.31319
4/25/98	3.14328
4/26/98	2.88842
4/27/98	2.94506
4/28/98	3.76628
4/29/98	2.83179
4/30/98	3.53973
5/1/98	7.4476
5/2/98	4.64413
5/3/98	3.4831
5/4/98	3.28487
5/5/98	3.34151
5/6/98	2.80347
5/7/98	3.62469
5/8/98	3.93619
5/9/98	3.03001
5/10/98	2.60524
5/11/98	2.77515
5/12/98	2.26543

Indian Flow Continued	
5/13/98	2.12384
5/14/98	2.12384
5/15/98	2.15216
5/16/98	2.06721
5/17/98	2.01057
5/18/98	1.81234
5/19/98	1.78403
5/20/98	1.72739
5/21/98	1.67075
5/22/98	1.61412
5/23/98	1.61412
5/24/98	1.61412
5/25/98	1.64244
5/26/98	1.52917
5/27/98	1.64244
5/28/98	2.52029
5/29/98	1.81234
5/30/98	1.75571
5/31/98	1.95393
6/1/98	1.5858
6/2/98	1.47253
6/3/98	1.47253
6/4/98	1.35926
6/5/98	2.09552
6/6/98	2.09552
6/7/98	1.69907
6/8/98	1.47253
6/9/98	1.44421
6/10/98	2.94506
6/11/98	2.60524
6/12/98	1.98225
6/13/98	1.61412
6/14/98	1.38758
6/15/98	1.38758
6/16/98	1.24599
6/17/98	1.18935
6/18/98	1.13272
6/19/98	1.1044
6/20/98	1.13272
6/21/98	1.07608
6/22/98	1.13272
6/23/98	1.38758
6/24/98	1.04776
6/25/98	1.04776
6/26/98	0.962808
6/27/98	0.962808
6/28/98	0.906172
6/29/98	0.962808
6/30/98	1.72739
7/1/98	1.01944
7/2/98	0.821218

Indian Flow Continued	
7/3/98	0.906172
7/4/98	0.792901
7/5/98	0.821218
7/6/98	0.736265
7/7/98	0.707947
7/8/98	0.736265
7/9/98	0.764583
7/10/98	0.764583
7/11/98	0.707947
7/12/98	0.651311
7/13/98	0.622993
7/14/98	0.594675
7/15/98	0.566358
7/16/98	0.53804
7/17/98	1.55748
7/18/98	0.849536
7/19/98	0.736265
7/20/98	0.821218
7/21/98	1.01944
7/22/98	0.651311
7/23/98	0.849536
7/24/98	1.86898
7/25/98	0.93449
7/26/98	2.06721
7/27/98	5.94675
7/28/98	2.15216
7/29/98	1.18935
7/30/98	0.906172
7/31/98	0.821218
8/1/98	0.877854
8/2/98	0.821218
8/3/98	0.792901
8/4/98	0.736265
8/5/98	0.679629
8/6/98	0.679629
8/7/98	0.679629
8/8/98	0.736265
8/9/98	0.821218
8/10/98	1.47253
8/11/98	1.55748
8/12/98	0.849536
8/13/98	0.651311
8/14/98	0.679629
8/15/98	2.26543
8/16/98	8.49536
8/17/98	2.26543
8/18/98	1.41589
8/19/98	1.13272
8/20/98	1.01944
8/21/98	0.962808
8/22/98	0.93449

Indian Flow Continued	
8/23/98	0.877854
8/24/98	0.821218
8/25/98	0.764583
8/26/98	0.736265
8/27/98	0.707947
8/28/98	0.679629
8/29/98	0.651311
8/30/98	0.991126
8/31/98	0.792901
9/1/98	0.651311
9/2/98	0.594675
9/3/98	0.707947
9/4/98	2.06721
9/5/98	0.991126
9/6/98	0.764583
9/7/98	0.736265
9/8/98	0.707947
9/9/98	0.679629
9/10/98	0.651311
9/11/98	0.651311
9/12/98	0.651311
9/13/98	0.622993
9/14/98	0.594675
9/15/98	0.566358
9/16/98	0.53804
9/17/98	0.566358
9/18/98	0.566358
9/19/98	0.594675
9/20/98	0.566358
9/21/98	0.707947
9/22/98	0.792901
9/23/98	0.622993
9/24/98	0.594675
9/25/98	0.566358
9/26/98	0.53804
9/27/98	0.566358
9/28/98	0.53804
9/29/98	0.622993
9/30/98	0.707947
10/1/98	0.651311
10/2/98	0.509722
10/3/98	0.509722
10/4/98	0.566358
10/5/98	0.736265
10/6/98	0.679629
10/7/98	0.736265
10/8/98	1.50085
10/9/98	0.849536
10/10/98	0.594675
10/11/98	0.481404
10/12/98	0.566358

Indian Flow Continued	
10/13/98	0.509722
10/14/98	0.53804
10/15/98	0.509722
10/16/98	0.509722
10/17/98	0.509722
10/18/98	0.509722
10/19/98	0.53804
10/20/98	0.509722
10/21/98	0.481404
10/22/98	0.481404
10/23/98	0.481404
10/24/98	0.509722
10/25/98	0.53804
10/26/98	0.53804
10/27/98	0.481404
10/28/98	0.481404
10/29/98	0.53804
10/30/98	0.481404
10/31/98	0.509722
11/1/98	0.509722
11/2/98	0.53804
11/3/98	0.821218
11/4/98	0.651311
11/5/98	0.622993
11/6/98	0.622993
11/7/98	0.622993
11/8/98	0.622993
11/9/98	0.622993
11/10/98	0.651311
11/11/98	0.764583
11/12/98	0.707947
11/13/98	0.651311
11/14/98	0.707947
11/15/98	1.04776
11/16/98	0.849536
11/17/98	1.24599
11/18/98	0.764583
11/19/98	0.736265
11/20/98	0.707947
11/21/98	0.679629
11/22/98	0.679629
11/23/98	0.651311
11/24/98	0.651311
11/25/98	0.651311
11/26/98	0.707947
11/27/98	0.707947
11/28/98	0.651311
11/29/98	0.651311
11/30/98	0.679629
12/1/98	0.679629
12/2/98	0.651311

Indian Flow Continued	
12/3/98	0.679629
12/4/98	0.679629
12/5/98	0.679629
12/6/98	0.679629
12/7/98	0.679629
12/8/98	0.707947
12/9/98	0.736265
12/10/98	0.736265
12/11/98	0.679629
12/12/98	0.679629
12/13/98	1.5858
12/14/98	1.41589
12/15/98	0.849536
12/16/98	1.41589
12/17/98	0.906172
12/18/98	0.792901
12/19/98	0.764583
12/20/98	0.821218
12/21/98	0.764583
12/22/98	0.764583
12/23/98	0.764583
12/24/98	1.8973
12/25/98	2.49197
12/26/98	1.44421
12/27/98	1.07608
12/28/98	0.991126
12/29/98	1.01944
12/30/98	0.93449
12/31/98	0.877854
1/1/99	0.821218
1/2/99	0.849536
1/3/99	7.92901
1/4/99	6.54143
1/5/99	2.23711
1/6/99	1.50085
1/7/99	1.38758
1/8/99	1.35926
1/9/99	1.5858
1/10/99	1.44421
1/11/99	1.21767
1/12/99	1.21767
1/13/99	1.13272
1/14/99	1.1044
1/15/99	1.30262
1/16/99	1.1044
1/17/99	1.07608
1/18/99	1.50085
1/19/99	1.52917
1/20/99	1.35926
1/21/99	1.16103
1/22/99	1.16103

Indian Flow Continued	
1/23/99	5.12554
1/24/99	19.511
1/25/99	8.21218
1/26/99	3.19992
1/27/99	2.15216
1/28/99	1.81234
1/29/99	1.64244
1/30/99	1.67075
1/31/99	1.50085
2/1/99	2.63356
2/2/99	7.02283
2/3/99	3.31319
2/4/99	2.66188
2/5/99	2.18048
2/6/99	2.03889
2/7/99	1.95393
2/8/99	1.78403
2/9/99	1.64244
2/10/99	1.64244
2/11/99	1.55748
2/12/99	1.55748
2/13/99	1.50085
2/14/99	1.41589
2/15/99	1.41589
2/16/99	1.38758
2/17/99	1.35926
2/18/99	2.43534
2/19/99	2.49197
2/20/99	4.53086
2/21/99	3.34151
2/22/99	2.46366
2/23/99	1.98225
2/24/99	1.84066
2/25/99	1.81234
2/26/99	1.72739
2/27/99	1.61412
2/28/99	1.61412
3/1/99	1.52917
3/2/99	1.44421
3/3/99	1.92562
3/4/99	2.57693
3/5/99	1.84066
3/6/99	1.61412
3/7/99	1.55748
3/8/99	1.44421
3/9/99	1.5858
3/10/99	1.72739
3/11/99	1.67075
3/12/99	1.52917
3/13/99	1.38758
3/14/99	1.75571

Indian Flow Continued	
3/15/99	2.57693
3/16/99	1.92562
3/17/99	1.67075
3/18/99	1.52917
3/19/99	1.47253
3/20/99	1.41589
3/21/99	2.77515
3/22/99	2.71852
3/23/99	1.92562
3/24/99	1.75571
3/25/99	1.69907
3/26/99	1.61412
3/27/99	1.44421
3/28/99	1.35926
3/29/99	1.33094
3/30/99	1.30262
3/31/99	1.24599
4/1/99	5.52199
4/2/99	3.53973
4/3/99	2.35038
4/4/99	1.84066
4/5/99	2.12384
4/6/99	1.67075
4/7/99	1.50085
4/8/99	1.41589
4/9/99	1.44421
4/10/99	1.30262
4/11/99	1.21767
4/12/99	1.18935
4/13/99	1.04776
4/14/99	1.04776
4/15/99	1.16103
4/16/99	1.2743
4/17/99	1.01944
4/18/99	0.962808
4/19/99	0.962808
4/20/99	0.962808
4/21/99	0.877854
4/22/99	0.877854
4/23/99	0.849536
4/24/99	0.792901
4/25/99	0.792901
4/26/99	0.764583
4/27/99	0.821218
4/28/99	2.60524
4/29/99	1.75571
4/30/99	20.0491
5/1/99	9.8263
5/2/99	3.53973
5/3/99	2.49197
5/4/99	2.12384

Indian Flow Continued	
5/5/99	1.8973
5/6/99	1.98225
5/7/99	2.12384
5/8/99	1.92562
5/9/99	1.67075
5/10/99	1.52917
5/11/99	1.44421
5/12/99	1.38758
5/13/99	1.38758
5/14/99	1.55748
5/15/99	1.47253
5/16/99	1.21767
5/17/99	1.24599
5/18/99	1.18935
5/19/99	3.45478
5/20/99	1.78403
5/21/99	1.30262
5/22/99	1.16103
5/23/99	1.24599
5/24/99	1.16103
5/25/99	1.04776
5/26/99	1.07608
5/27/99	1.16103
5/28/99	1.01944
5/29/99	0.991126
5/30/99	0.962808
5/31/99	0.906172
6/1/99	0.849536
6/2/99	0.849536
6/3/99	1.07608
6/4/99	0.877854
6/5/99	0.792901
6/6/99	0.792901
6/7/99	0.764583
6/8/99	0.736265
6/9/99	0.651311
6/10/99	0.736265
6/11/99	2.20879
6/12/99	1.16103
6/13/99	0.821218
6/14/99	0.792901
6/15/99	0.962808
6/16/99	1.21767
6/17/99	1.98225
6/18/99	1.21767
6/19/99	1.1044
6/20/99	1.01944
6/21/99	0.93449
6/22/99	0.877854
6/23/99	0.849536
6/24/99	0.792901

Indian Flow Continued	
6/25/99	1.1044
6/26/99	3.34151
6/27/99	3.11497
6/28/99	1.52917
6/29/99	1.72739
6/30/99	1.01944
7/1/99	0.906172
7/2/99	0.849536
7/3/99	1.21767
7/4/99	0.93449
7/5/99	0.764583
7/6/99	0.707947
7/7/99	1.55748
7/8/99	1.64244
7/9/99	0.849536
7/10/99	0.764583
7/11/99	0.849536
7/12/99	1.04776
7/13/99	1.30262
7/14/99	0.991126
7/15/99	0.906172
7/16/99	0.821218
7/17/99	0.764583
7/18/99	0.764583
7/19/99	0.679629
7/20/99	0.651311
7/21/99	0.651311
7/22/99	0.622993
7/23/99	0.566358
7/24/99	0.53804
7/25/99	0.566358
7/26/99	0.509722
7/27/99	0.453086
7/28/99	0.453086
7/29/99	0.509722
7/30/99	0.39645
7/31/99	0.368132
8/1/99	0.39645
8/2/99	0.368132
8/3/99	0.283179
8/4/99	0.283179
8/5/99	0.311497
8/6/99	0.280347
8/7/99	0.277515
8/8/99	0.274683
8/9/99	0.283179
8/10/99	0.283179
8/11/99	0.271852
8/12/99	0.263356
8/13/99	0.243534
8/14/99	0.184066

Indian Flow Continued	
8/15/99	0.226543
8/16/99	0.184066
8/17/99	0.220879
8/18/99	0.186898
8/19/99	0.169907
8/20/99	0.257693
8/21/99	0.368132
8/22/99	0.311497
8/23/99	0.311497
8/24/99	2.35038
8/25/99	0.707947
8/26/99	0.453086
8/27/99	0.736265
8/28/99	0.453086
8/29/99	0.39645
8/30/99	0.368132
8/31/99	0.283179
9/1/99	0.339815
9/2/99	0.311497
9/3/99	0.283179
9/4/99	0.235038
9/5/99	0.311497
9/6/99	0.509722
9/7/99	0.39645
9/8/99	0.368132
9/9/99	0.311497
9/10/99	0.622993
9/11/99	0.424768
9/12/99	0.271852
9/13/99	0.254861
9/14/99	0.254861
9/15/99	0.274683
9/16/99	0.274683
9/17/99	0.240702
9/18/99	0.226543
9/19/99	0.229375
9/20/99	0.252029
9/21/99	0.249197
9/22/99	0.53804
9/23/99	0.280347
9/24/99	0.260524
9/25/99	0.235038
9/26/99	0.206721
9/27/99	0.509722
9/28/99	1.04776
9/29/99	0.93449
9/30/99	0.849536

B. Clark Creek Flow Data at SR1008

Date	Flow (cms)
1/11/96	2.20896
2/8/96	2.23728
3/6/96	5.15424
4/8/96	6.372
5/2/96	2.5488
6/6/96	2.52048
7/11/96	1.6992
8/1/96	0.79296
9/3/96	2.5488
10/17/96	3.9648
11/5/96	1.47264
12/5/96	3.34176
2/17/97	5.664
12/9/97	2.4096

APPENDIX V. Public Notice of Draft Clark Creek Fecal Coliform TMDL

A. Public Notice in The Hickory Daily Record.

Duplicate of # 20165

FYI

20166

NORTH CAROLINA
CATAWBA COUNTY

Norma McKinney

being first duly sworn, says: That he or she is Asst Bookkeeper of the Hickory Daily Record, a newspaper published at Hickory, North Carolina; that in the issues of the said newspaper for the following days, to wit:

June 10, 2002

there appeared 34 spaced ~~inches~~ lines of advertising as per attached named advertiser:

The Hickory Daily Record is a qualified newspaper within the meaning of section 1-597 of the General Statutes of N. C.

Norma McKinney
Affiant

Sworn to and subscribed before me,

this 12th day of

July, 2002

Evelyn L. Hefner
Notary Public

My Commission Expires

March 11, 2004

PUBLIC NOTICE
STATE OF NORTH CAROLINA
DIVISION OF WATER QUALITY
Availability of the total Maximum Daily Load (TMDL) for Fecal Coliform Bacteria
To Clark Creek, North Carolina

A public meeting for the TMDL will be held on July 1, 2002 from 10AM to 12PM in the Government Center, 100-A Southwest Blvd, Newton, NC 28658. Copies of the TMDL may be obtained by calling Ms. Robin Markham at (919) 733-5083, ext 558 or on the internet at http://h20.enr.state.nc.us/tmdl/
Written comments regarding the TMDL will be accepted until July 10, 2002. Please mail comments to NC DWQ - Planning Branch, attn: Ms. Robin Markham, 1617 Mail Service Center, Raleigh, NC 27699-1617.
PUBLISH: JUNE 10, 2002.

B. Public Notice in Lincoln Times-News

LINCOLN TIMES-NEWS

P.O. Box 40
Lincolnton, North Carolina 28093-0040
Telephone (704) 735-3031

I, Beverly S. Baker, A/R of the Lincoln Times-News, do hereby acknowledge that the attached advertisement was published in the Lincoln Times-News on the following dates: June 10, 2002.

This is the 19th day of June, 2002.

WITNESS NOTARY A/R

My Commission Expires: 5/19/2007

COPY

Public Notice
State of North Carolina
Division of Water Quality
Availability of the Total Maximum Daily Load (TMDL)
for Fecal Coliform Bacteria
To Clark Creek, North Carolina

A public meeting for the TMDL will be held on July 1, 2002 from 10AM to 12 PM in the Government Center, 100-A Southwest Blvd, Newton, NC 28658. Copies of the TMDL may be obtained by calling Ms. Robin Markham at (919) 733-5083, ext 558 or on the internet at http://h20.enr.state.nc.us/tmdl/. Written comments regarding the TMDL will be accepted until July 10, 2002. Please mail comments to NC DWQ-Planning Branch, attn: Ms. Robin Markham, 1617 Mail Service Center, Raleigh, NC 27699-1617.

1T: June 10, 2002

APPENDIX VI. Public comments on Clark Creek TMDL and DWQ responses.

A. Comments from Ms. Anne Coan, NC Farm Bureau Federation:

July 10, 2002

Mr. Narayan Rajbhandari
Water Quality Planning Branch
NC Division of Water Quality
1617 Mail Service Center
Raleigh, NC 27699-1617

Dear Mr. Rajbhandari:

The North Carolina Farm Bureau Federation is the state's largest general farm organization representing the interests of farm and rural people in our state. This letter is to comment on the Clark Creek (in Subbasin 03-08-35) Fecal Coliform Total Maximum Daily Load (TMDL.)

We feel that the methodology used to estimate the sources and to allocate the reductions is highly flawed. Therefore, we oppose this TMDL document.

On Page 10 of the TMDL it is stated that there is one dairy and some beef cattle in the watershed. However the paragraph goes on to discuss land application of poultry waste. It is our understanding that there is no poultry waste applied to land ***in this watershed***. Also, there is a reference to the colonies per day of hog waste, but it is our understanding that there are no hog operations and there is no hog waste applied ***in this watershed***. Because the only reference given is to confirm the presence of dairy and beef cattle in this watershed, we assume that DWQ could not confirm the presence of poultry and hogs in this watershed either, or a reference would have been cited. Therefore, the presence of poultry waste and/or hog waste in the watershed must be confirmed if they are used to calculate sources and source reductions. If these sources are not in the watershed, any references to these should be removed, and any source calculations and reduction allocations using them must be eliminated from the TMDL.

Also on page 10 there are fecal coliform loading rates given for livestock in the watershed. It is obvious to us that the author is misusing the terminology for "loading" here. The NCSU reference gives the data for fecal coliform totally excreted from the animal into an animal waste treatment system or confinement area, prior to any treatment, exposure to sunlight, etc. Using these numbers as "loadings" is comparable to figuring all of the fecal coliform that arrives at all of the waste treatment plants in the watershed, prior to any treatment, as the "loading" for these plants. It would be comparable to figuring the septic tank loadings by using all of the fecal coliform delivered from the buildings into every septic tank in the watershed as the "loading" for septic tanks. Using the numbers on page 10 for livestock as "loadings" absolutely cannot be justified.

Mr. Narayan Rajbhandari
July 10, 2002
Page 2

On page 11 of the document, there is a reference to 11 percent of the septic systems failing. Therefore, it is assumed that 89 percent are working properly. Again, if animal waste loadings are to be determined based on what is delivered to all of the treatment systems or to all of the pastures, then septic waste fecal coliform levels should be figured based on what is delivered from the homes or businesses to all of the septic tanks in the watershed, prior to any treatment by the septic system. Also, using the methodology used to estimate livestock fecals, all septic fecals should be considered as "loadings," without any adjustment for 89 percent of septic systems functioning properly.

Regarding wildlife estimates, it is nonsensical to use the deer population to represent all of the fecal coliform producing wildlife in this watershed. Further, this section states that "Wildlife deposit fecal material in these areas which can be transported to a stream in a storm event." Then the document assigns a "loading rate" to deer. Because there is no reference given, we cannot determine if this is what is delivered to the landscape or to the stream. If the estimated loads of livestock waste on page 10 are used, then fecal estimates delivered to the landscape by deer ***and all other wildlife*** must be used as well. As written, this document substantially underestimates the wildlife fecal contribution.

The same comment regarding equitable estimates of loading applies to all of the sources, both point and nonpoint, discussed in this document.

On page 20, the statement is made that the model indicates nonpoint sources as the primary sources of fecal coliform. While the waste from sewer overflows, leaking sewer lines, and cross-connected pipes is counted in the nonpoint source load, the point sources should be held responsible for these sources, because they are attached to their systems. Therefore, the nine point sources in the watershed should be assigned load reductions specifically for these, because they are causing these nonpoint source problems. Assigning these types of load reductions to "urban development" dilutes the responsibility for these problems by adding them to runoff fecals generated by pet waste, urban wildlife, and other urban sources. Clear responsibility should be assigned to these point sources for the nonpoint source loads they are generating through reduction targets being specifically established for sewer overflows, leaking sewer lines, cross-connected pipes and any other contamination caused by failure of delivery systems to point sources.

Further, we feel it is important to point out that the point source loads are based on what is reported by the point sources themselves, and they select the time the sample is taken. Such timing can be adjusted to the most favorable conditions of weather and plant operation and, therefore, may or may not be skewed towards the lowest measured fecal concentrations.

DWQ should substantiate these numbers over all weather conditions and during times of optimum and less-than-optimum plant operation conditions.

Mr. Narayan Rajbhandari
July 10, 2002
Page 3

We oppose the reductions assigned to agriculture on page 28 of this document, based on the comments above. We do not see how these 93 and 94 percent reductions from agriculture can possibly be rationalized.

The statement is made that the implementation plan development will begin during the public review of the TMDL. We were informed by a local citizen of this draft TMDL after the public meeting, and few people were aware of the meeting or of this draft TMDL. Farm Bureau should be informed of all TMDL development in North Carolina, and we hereby request that we be informed. As the state's largest farm organization, we represent substantial numbers of stakeholders in all of these watersheds and should be kept informed of the development of TMDLs. Further, we could have contacted affected farmers in the watershed and let them know about the TMDL and the meeting, thereby increasing the public participation. We are disappointed that we were not informed of this meeting, or of the draft TMDL until very late in the process, and not by DWQ.

In summary, we feel this draft TMDL lacks the necessary scientific basis to go forward, and request its withdrawal and reworking.

Thank you for the opportunity to comment on this draft TMDL. If you have any questions, please contact me at (919) 788-1005.

Sincerely,

Anne Coan
Natural Resources Director
North Carolina Farm Bureau Federation

Responses to the comments from Ms. Anne Coan, NC Farm Bureau Federation:

1. DWQ greatly appreciates your comments on the Fecal Coliform Bacteria TMDL for Clark Creek. The following clarifications are made in regards to your comment:

2. The final TMDL report does not consider the poultry or hog waste loads

3. The terminology "Load" used to address total fecal coliform from the cattle seems appropriate. The water quality model is required to input monthly loading rate of the fecal coliform from the livestock without considering its decay rate. The model estimates the actual amount of fecal coliform that could be delivered overland to the stream considering the overland decay rates. The model uses a first order kinetic rate equation to account for the strong temperature influence on the fecal coliform bacteria die-off rate as stated in the report.

4. Eleven percent of the septic system failing addresses the State of North Carolina.

5. Except for deer, a wildlife inventory in the Clark Creek watershed is not readily available. So, the upper limit of the deer population is used to estimate the fecal coliform load from the wild animals in the watershed. This is an acceptable way of estimation.

6. DWQ periodically monitors the waste loads from the nine WWTP and has not noticed exceeded flow of fecal coliform from the WWTP during the study period. Also, because the model requires inputs regarding sewer system and WWTP separately, the model allocates load reduction to the point sources and non-point sources separately. The model does not care whether the two sources are attached to one pipeline in the watershed.

7. Public notice for the Clark Creek Fecal Coliform TMDL development was processed through a standard procedure. The notice was posted in the DWQ web site (http://h2o.enr.state.nc.us/tmdl) a month prior to the public meeting date, July 1, 2002. The notice was also announced through local newspapers, Hickory Daily Record and Lincoln Time-News on June 10, 2002.

B. Comments from Dr. Clarence Hood, Catawba Cattlemen's Association:

Dear Raj: Thanks for your E-mail and for discussing your report with me yesterday afternoon. I will make a few comments on the report as we discussed yesterday:

1) I believe that your Fecal Coliform study should be integrated with the report of Tom Yocum and others on the Biological Impairment in the Upper Clark Creek Watershed. There seems to me to be some conflicting issues; and by combining these to present to local governments would be a better approach and reduce confusion about what local agencies need to do to address the problems in Clark Creek.

2) I believe that the impact of cattle on Clark Creek could be better presented by giving an accurate inventory of cattle and pastureland in the watershed; I believe there are 1000 to 1200 head of cattle in the watershed and no swine or chickens or chicken litter applied to pasturelands.

3) The number of horses in the area is considerable and they strip most all vegetation and thus considerable manure etc reach streams.

4) On page 10 of the report the 1.06 x e11 colonies/day/beef cow; is the amount produced but only a very small portion reaches the streams; Sunlight and other factors such as rainfall should be considered; Does the model account for this?

5) Almost 60 % of flow in Clark Creek below Newton Waste Water Treatment Plant; is contributed by the plant; Also considerable irrigation water is removed below this point for turf applications; Is this accounted for in your; model?

6) On page 13 the 1100 ft elevation for Hickory dropping down to 800 ft at Lincolnton seem to be error; That would be a 300 ft drop.

7) On page 20 the sentence ...manure application in pastureland... may be misleading and using the words...livestock grazing...should be sufficient since it is understood that no poultry litter or manure from confined cattle is being applied in the watershed. I hope these comments will be helpful;

Please contact me if I can clarify. Clarence Hood.

Response to comments from Dr. Clarence Hood, Cattleman Association:

DWQ greatly appreciates your comments on the Fecal Coliform Bacteria TMDL for Clark Creek. The following clarifications are made in regards to your comment:

1. We look forward to integrating the TMDL with the Biological Impairment in the Upper Clark Creek Watershed to develop an implementation plan to reduce the fecal coliform concentration in the entire Clark Creek watershed.

2. The NCDA report (2000) was used to best estimate the cattle population for the Clark Creek watershed. However, DWQ appreciates your help together with Mr. Jeff Carpentor, Area Livestock Agent and Mr. Carl Rector for providing the actual cattle inventory in the watershed. The final TMDL report has included the inventory results.

3. The water quality model has considered the horse population. The 1996 Equine Survey Statistics reported by NC Department of Agriculture and Consumer Services was utilized to best estimate the population in the watershed.

4. The water quality model considers the fecal coliform decay factors. It utilizes a first order kinetic rate equation to account for the strong temperature influence on the fecal coliform bacteria die-off rate.

5. The water quality model considers the flow from the WWTP. The precipitation weighting factor is well adjusted while calibrating the model to account the localized water uses.

6. We appreciate your correction on the estimation of the elevation and the manure application. The corrections have been considered in the final report. The actual change in elevation is 340 ft at the outlet of the watershed. The model has not considered any manure applications other than dairy cattle manure in the watershed.

C. Comments from Mr. Jeff Carpenter, Area Livestock Agent, Newton, NC.

Raj:

I enjoyed speaking with you on the phone on Wednesday concerning the report that has been prepared for the Clark Creek watershed in Catawba and Lincoln Counties. It seems as there has been quite a bit of monitoring and data gathering to support the need for work in this basin. However, I have several questions/concerns about the model that I hope you can answer.

Page 8 - one of the non-point sources you mention is concentrated animal feedlots. There are no concentrated feedlots in this basin. In the 3 counties I serve there is only one operation that fits this description and it is not in the Clarks Creek basin.

On page 9 you mention that open lots used by animals have the greatest potential for bacterial runoff to surface water. I am not aware of any such heavy use areas in this watershed as our beef operations are predominantly pasture based with grazing activities accounting for about 9-10 months worth of feed for these animals. I suppose the one dairy you mention in your report has such an area for the milking herd, but that particular operation is small enough to not be impacted by .0200 regulations.

On page 10 your data appears to come straight from the Census of Agriculture, which is the most reliable source for livestock numbers. I am not sure how you interpreted the number of cattle, which is 17,000 for Catawba and 15,000 for Lincoln County. This number reflects the number of all cattle of all sizes and uses for both counties. The next number gives the total number of mature beef cows, which is a more useful in calculating total fecal coliform production/loading. A safe estimate for all cattle numbers would be to assume 85% of these cows produce a calf each year and it is usually marketed at an average of 525 lbs. I believe an accurate estimation of the amount of fecal coliform produced by these animals should take into account their smaller size and body weight, and the limited time these calves are present on the farm each year. I am not sure if your model assigns the same FC production to all 32,000 head or not.

Also on page 10, you report a fecal coliform loading rate of 1.06 x 10 (11) colonies/day/beef cow. The American Society of Agricultural Engineers and the reference you cite for this figure (NCSU, 1994) both report that this is TOTAL fecal coliform production per cow per day. I believe to assume that all of this material reaches surface waters is very inaccurate and I encourage you to give some credit for bacterial death due to drying, exposure to sunlight, application on land by grazing animals, ... I am also aware of several operations within this watershed that are participating in the NC Ag Cost Share Program and have excluded their livestock from all streams on their property, thereby limiting the amount of FC loading in these waters. For accuracy I would encourage you to include this in your model.

As I mentioned in our phone conversation, there are no poultry operations that I am aware of within the Clarks Creek watershed and I do not know of farmers within this area that are applying poultry litter to lands. I would encourage you to revisit your model and make these revisions also for accuracy.

On page 17 there is a discussion of the accuracy of the model in estimating fecal coliform in the stream, but no accuracy values are presented in figure 5. Is this information available?

I cannot determine from the report how many head of livestock are estimated within the watershed, but I would be very happy to assist your department in obtaining a very accurate count. The number of livestock farms north of West Maiden Road are very limited and I think that within a few days a very accurate estimate of these animals can be obtained. The same could be done for the Lincoln County portion of the watershed.

If I can be of any assistance please do not hesitate to call on me. If reductions in fecal coliform loading are needed by the livestock industry I would be happy to assist your agency in working with landowners in this effort.

Sincerely,

Jeff Carpenter
Area Livestock Agent

<u>Responses to Mr. Jeff Carpenter, Area Livestock Agent, Newton, NC.</u>

DWQ greatly appreciates your comments on the Fecal Coliform Bacteria TMDL for Clark Creek. The following clarifications are made in regards to your comment:

1. The final TMDL does not include the concentrated feedlots and poultry operations in the Clark Creek Watershed.

2. The fecal coliform load from the livestock operation is included in the model as per the estimated census data provided by you.

3. The water quality model has considered the decay rate of the fecal coliform bacteria in land and in streams. The reaction rates for the decomposition of the fecal coliform in land and in streams are set at 0.01 per day and 0.1 per day respectively. A better prediction of fecal coliform is obtained by using the reaction rates in this study.

E. Comments from Ms. Mary Geoge:

Thank you for your presentation on the results of DWQ's fecal coliform study on Clark Creek. In addition to the comments/questions at the July 1, meeting I would like to reiterate that additional monitoring stations should be put in place to better identify the sources of non-point source pollution. Based on our discussions, it appears that there could be a large contributor on the lower end of the watershed who may be influencing the fecal coliform bacteria count. Before we work on implementation strategies, I think it would be in everyone's best interest to be certain of the contribution each source makes to more effectively prepare an implementation plan.

Should you have any questions regarding this matter, please feel free to contact me.

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Response to comments from Ms. Mary Geoge:

DWQ greatly appreciates your comments on the Fecal Cloriform Bacteria TMDL for Clark Creek. We look forward to working with Catawba County Planning & Community Development to develop implementation plan to reduce the fecal coliform concentration in the Clark Creek watershed. We agree with regards to your comment on addition of monitoring stations to measure flow rates in the watershed to better identify the sources of non-point source pollution.

APPENDIX VII. Pictures of Clark Creek Watershed.

Picture 1. Clark Creek with low flow (July 22, 2002).

Picture 2. Sewer Line running along the Clark Creek River near SR2014.

Picture 3. Cattle under the NC Cost Sharing Program.

Picture 4. Horse grazing in the recreation pastureland.