Fecal Coliform Total Maximum Daily Load for the Northeast Creek Watershed, Durham County, Chatham County and Wake County

Final Report

July 2003

Cape Fear River Basin

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INDEX OF TMDL SUBMITTAL

303(d) List Information

State — North Carolina

Basin — Cape Fear River Basin

303(d) Listed Waters

Name of Stream	Description	Class	Assessment unit	8 Digit CU	Miles
Northeast Creek	From NC HWY 55 to Durham Co. WWTP	WS1V NSW	16-41-1-17-(07)a	03030002	2.6
	Durham Co. WWTP to a point 0.5 mile downstream of Panther Creek	WS1V NSW	16-41-1-17-(0.7)b	03030002	5.8

8 Digit Cataloging Unit(s) — 03030002

Area of Impairment — 7.4 miles

WQS Violated — Fecal Coliform

Pollutant of Concern — Fecal Coliform

Sources of Impairment — Point source and non-point source from upstream of SR1100 near Nelson

Public Notice Information

Form of Public Notification:

A draft of the Northeast Creek Fecal Coliform TMDL was publicly noticed though local newspapers, The Herald-Sun and The Chatham Record, in the Cape Fear 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 Durham County Agricultural Building on May 27, 2003. A public comment period was through June 5, 2003.

Did notification contain specific mention of TMDL proposal?
Yes

Were comments received from the public?
No

Was a responsiveness summary prepared?
No

TMDL Information

Critical condition	Wet weather throughout the year.
Seasonality fecal coliform loading.	Modeled from 1997-2001 to include fluctuations in seasonal
Development tools	Fecal Coliform Routing and Allocation Program (CRAP).
Supporting documents	Draft Total Maximum Daily Load for Fecal Coliform, Northeast Creek (Sub-basin 030605)

TMDL(s)

Loading allowed at critical condition:

Waste Load Allocation (WLA)	1.12E+11 Colonies per day.
Load Allocation (LA):	2.40E+11 Colonies per day.
Margin of Safety (MOS):	5.06E+10 Colonies per day.
TMDL (WLA+LA+MOS):	4.03E+11 Colonies per day.

Total Maximum Daily Load (TMDL)	Sources	Fecal Coliform Loading Reductions
Wasteload Allocation (WLA)	WWTP MS4	0% 92%
Load Allocation (LA)	Low Intensity Development High Intensity Development Herbaceous Land Wildlife	94% 92% 90% 0%

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1.0 INTRODUCTION

The North Carolina Division of Water Quality (DWQ) has identified an 8.4 mile segment of Northeast Creek in the Cape Fear River Basin as impaired by fecal coliform bacteria (NCDENR 2003). The impaired segments due to fecal coliform bacteria are located from 2.6 miles upstream of N.C. Hwy 55 to Durham County WWTP and 5.8 miles from Durham County WWTP to a point 0.5 mile downstream of Panther Creek. About 4.7 miles of upper Northeast Creek is designated as class C[1] water and the remaining length is designated as a class WS-IV water[2]. These sections of the stream are located in sub-basin 030605.

The 303(d) process requires that a Total Maximum Daily Load (TMDL) be developed for each of the waters appearing in category 5 of the 2002 Integrated Report. 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

[1] Class C waters are freshwaters that are protected for secondary recreation, fishing, aquatic life including propagation and survival of wildlife.

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

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).

Section 303(d) of the CWA and the Water Quality Planning and Management regulation (USEPA, 2000a) requires EPA to review all TMDLs for approval or disapproval. Once EPA approves a TMDL, then the water body may be moved to category 4a of the Integrated Report. Water bodies remain on category 4a 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 restore 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 Northeast 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.

Northeast Creek flows from Durham to Chatham counties in the piedmont region of North Carolina (Figures1and 2). It is a tributary to the New Hope River arm of B. Everett Jordan Reservoir (Sub-basin 030605) in the Cape Fear River Basin. Northeast Creek joins New Hope Creek in the northeast corner of Chatham County, NC. The hydraulic length of Northeast Creek is approximately 16 miles and the creek has a drainage area of approximately 47 square miles. Land cover based on 1993-95 satellite data in the watershed is primarily forest (86%), high intensity development land (6.5%), low intensity development land (1.5%), managed herbaceous land (4.5%), unmanaged herbaceous land (0.3%), cultivated land (0.2%) and water body 1% (Figure 3). The dense coverage of the developed

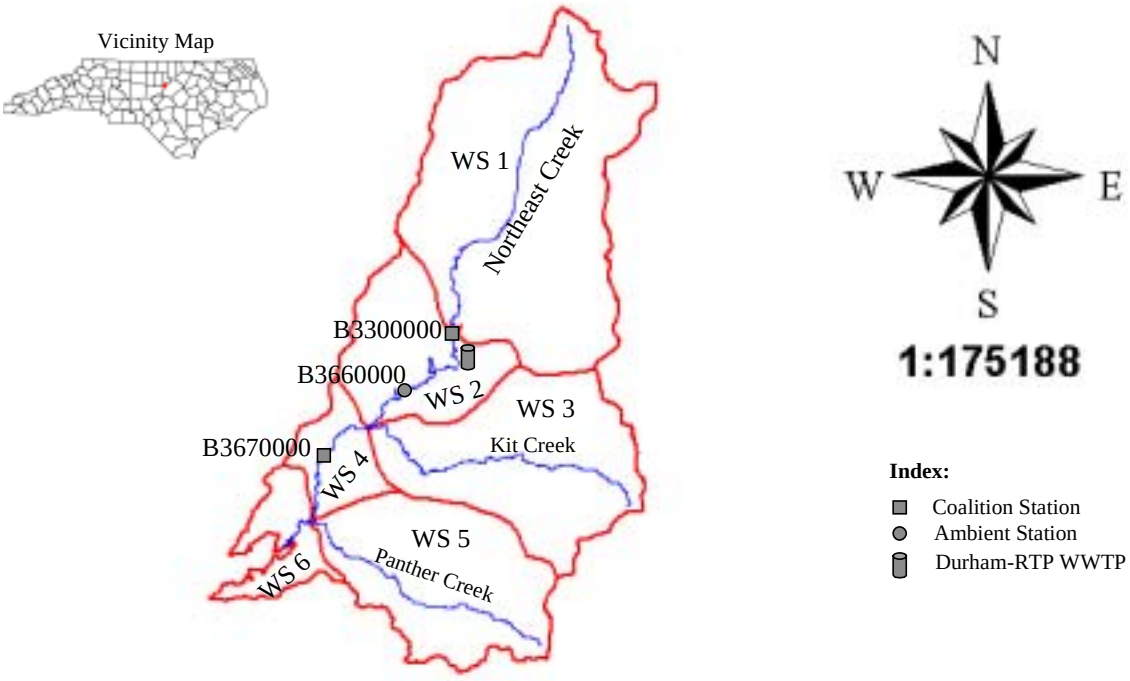

Figure 1. Northeast Creek watershed showing monitoring stations and Durham Triangle WWTP

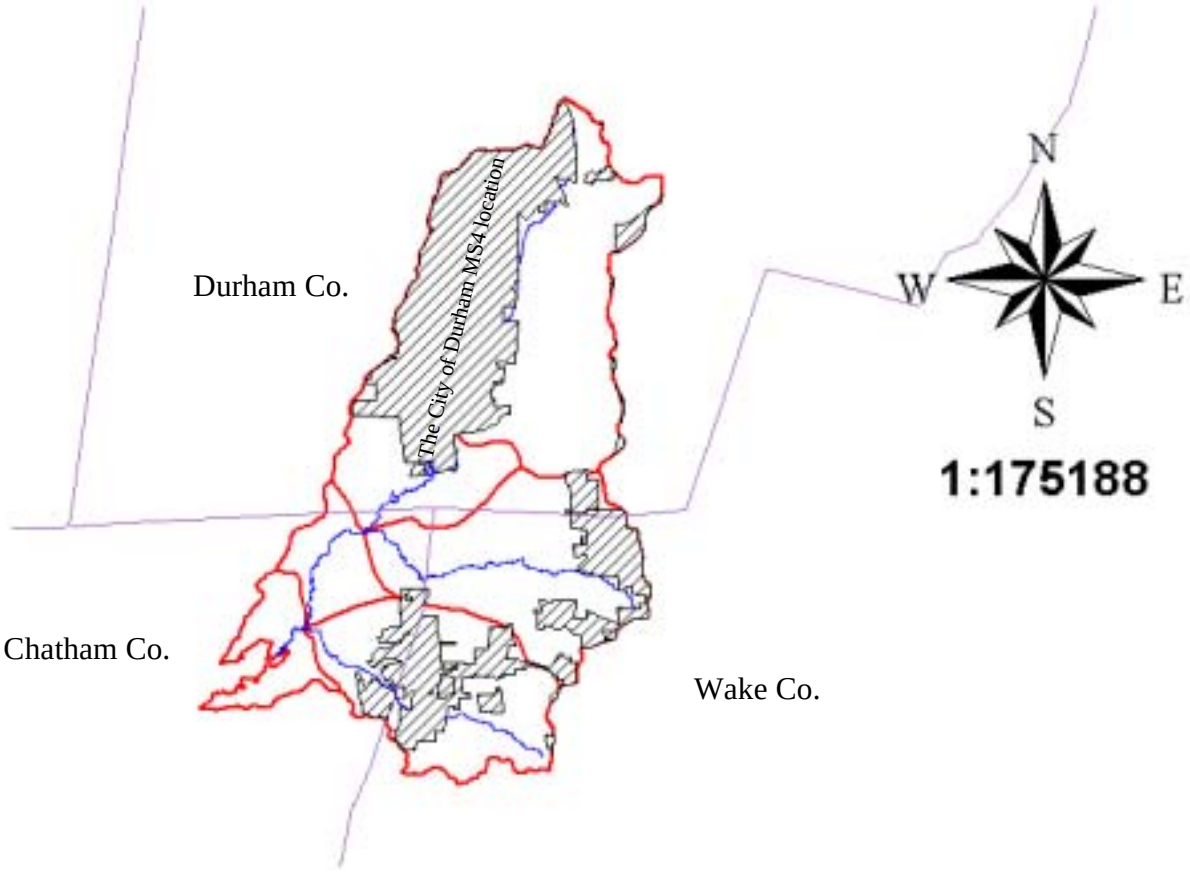

Figure 2. Location of the City of Durham MS4 within the city boundary in Northeast Creek Watershed

lands is often considered forestland. The annual average flow of the creek at the ambient station near Nelson in Durham, is approximately 31.5 cubic feet per second (cfs), with a 7Q10 of 1.8 cfs (Weaver and Benjamin, 2001). The Creek is prone to become dry during drought conditions (From DWQ staff's observation in 2002). It could be because the creek drains Triassic Basin soils, which have high clay content and are slowly permeable sub-soils with moderate to very high shrink-swell potentials. The watershed includes drainage from the City of Durham, Research Triangle Park, Town of Cary, and the northeast portion of Chatham County. Therefore, the watershed encompasses three counties – Durham County, Wake County, and Chatham County.

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 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 Northeast Creek watershed, the water quality target is the 30-day geometric mean concentration of 200 colonies /100ml with no more than 20% of the samples in the same period exceeding 400 colonies / 100 ml.

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

(B3660000) in this watershed located at SR 1100 near Nelson (Figure 1). Fecal coliform levels at SR1100 are responsible for the 303(d) listing of a portion of Northeast Creek.

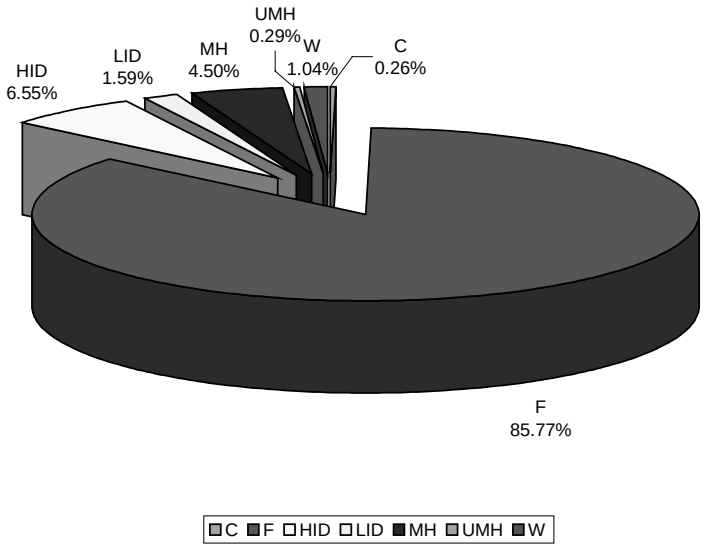

Figure 3. Distribution of land use in the Northeast Creek watershed. C = Cultivated land, F = Forested land, HID = High intensity developed land, LID = Low intensity developed land, MH = Managed herbaceous land, UMH = Unmanaged herbaceous land, and W = Water body.

The Upper Cape Fear River Basin Association monitored the water quality at two additional coalition stations - B3300000 and B3670000 near SR1102 (Sedwick Rd) and SR1731 (O kelly Church Rd) respectively during the years 2000 through 2002 (Figure 1). The DWQ staff also monitored the water quality at the stations during 2002. The monthly fecal coliform data is available for the years 2000 through 2002. The fecal coliform data collected at these two stations offers the unique opportunity to compare the longitudinal distribution of the bacterial concentration along the Northeast Creek. Figure 4 indicates that the average bacterial concentration (598 counts/100ml) at the ambient station (B3660000) was nearly double the concentration (259 counts/ 100ml) at its receiving station (B3300000) in the year 2000. Furthermore, the bacterial concentration in the effluent discharged from

the Durham Triangle WWTP to the ambient station was comparatively low, averaging 60 counts per 100 ml, which is below the DWQ standards. A similar pattern of bacterial concentration is also observed in the year 2001 and 2002.

The substantial spike of fecal concentrations at the ambient station (B3660000) could be due to a sewer pipe leaking or some other source between the coalition station (B3300000) and the ambient station (B3660000). The influence of this unknown source, however, gradually decreased moving downstream, as evident at the down stream coalition station (B3670000).

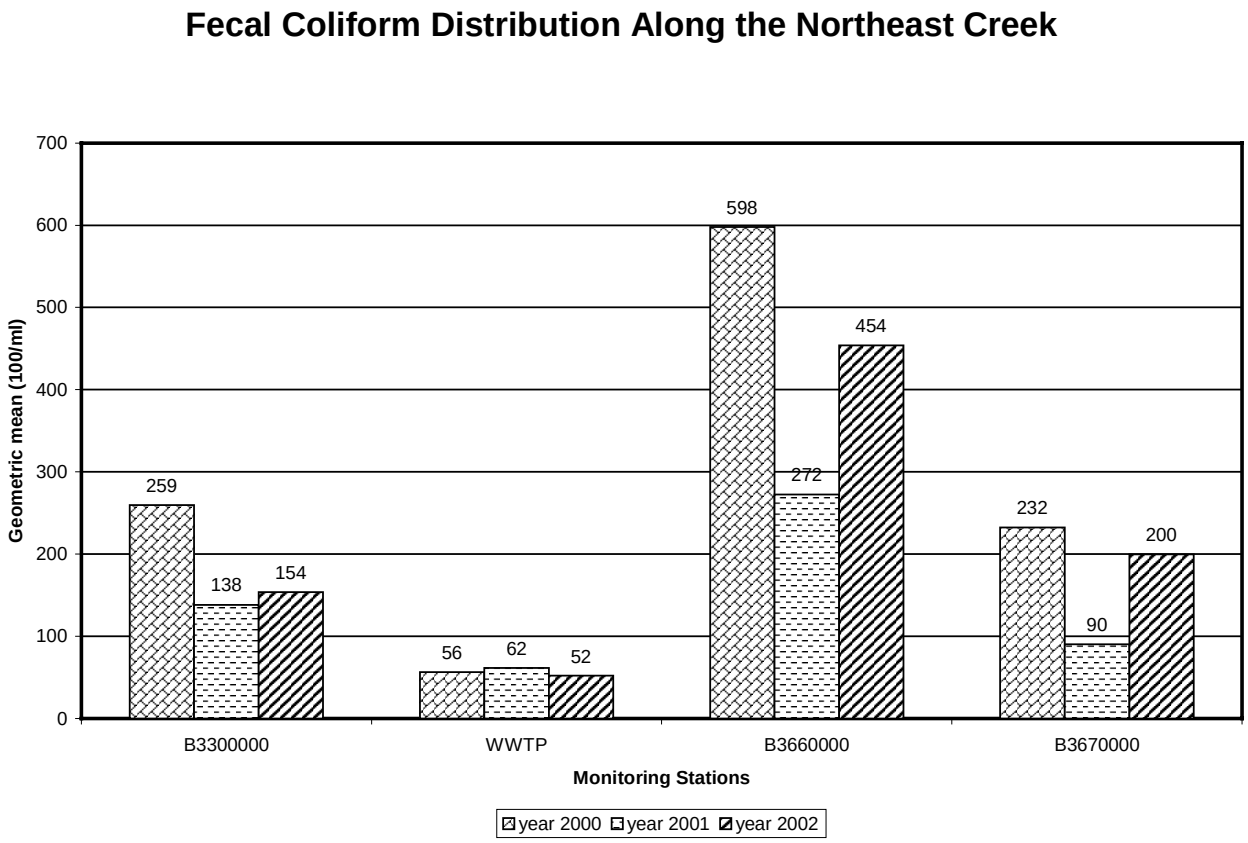

Figure 4. Geometric mean of fecal colifrom concentrations in the ambient and coalition stations and in the Durham Triangle WWTP for the years 2000 through 2002, from upstream to downstream.

DWQ staff also conducted an additional study at the ambient station (B3660000) to determine compliance with the fecal coliform standard. Weekly samples were collected during November 1999 and during May, June, August, and September 2000. These

additional samples also provided opportunity to calculate a 30-day geometric mean using 5 or more samples during that period. In most of the periods, the 30-day geometric mean of the fecal coliform concentration at the ambient station remained considerably higher than 200 colonies / 100 ml. The 30-day geometric mean fecal coliform concentrations for 1997 through 2001 are shown in Figures 6-8.

In general, the fecal bacterial levels at the ambient station (B3660000) are typical of fecal coliform levels in many urban areas, with frequent concentration spikes. Out of 59 samples collected during the study period at this station (1997 through 2001), 24 were exceeding 400 colonies / 100 ml (41%). The monthly fecal coliform concentrations for 1997 through 2001 are shown in Appendix I.

The USGS flow station monitored stream discharges (cfs) every 15 minutes at the ambient station (B3660000). These monitored discharge data were used to evaluate potential compliance with the standard and to aid modeling studies. The discharge data is presented in Appendix 2.

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 National Pollution Discharge Elimination System (NPDES) program. Wastewater facilities have permitted discharges for which the DWQ has significant information. Continuous discharge and/or wastewater 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 Northeast Creek watershed.

2.1 Point Source Assessment.

There are currently about 31 NPDES permits within the Northeast Creek watershed. Twenty-eight of them are individual and general permits. Monitoring of water quality under these permits is carried out once a year and measurement of fecal coliform is not mandatory. So, the data from these permits are not considered for this study. The partial list of these permits is presented in Appendix 6. Three out of the 31 permits are under regular NPDES permit, where measurement of fecal coliform is mandatory (Table 1). One of them is regulated under storm water program, which is commonly known as Municipal Separate Storm Sewer System (MS4).

In 1990, EPA promulgated rules establishing Phase 1 of the NPDES storm water program. The Phase I program for MS4 requires operators of medium and large MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a storm water management program as a means to control polluted discharges from these MS4s. The Storm Water Phase II Rule extends coverage of the NPDES storm water program to certain "small" MS4s, which is not already covered by the Phase I program as a medium or large MS4. The Phase II takes a slightly different approach to how the storm water management program is developed and implemented (US EPA 2000).

EPA guidance mandates that all the urban areas that are documented as MS4 must be categorized as point source (US EPA 2000). The two entities that are permitted through Phase I of NPDES storm water program to discharge in the Northeast Creek watershed are the City of Durham (NCS000249) and the North Carolina Department of Transportation (NCS000250). As part of Phase II of the NPDES storm water program, Durham County, which has jurisdiction over some land and storm pipes in the watershed, will be added.

In the Northeast Creek watershed, all the MS4 areas were located in Durham County. Out of the 940 hectares of the developed lands in WS1 and WS2 (Table 5), about 223 hectares (24%) of the lands were estimated to be draining to the MS4 areas. Of the 223 hectares, the City of Durham MS4 represented 197 hectares and NC DOT MS4 represented 26 hectares (a best estimation from Mr. John Cox, City of Durham).

Detailed information regarding the discharge rates and fecal concentration is not readily available for storm water in the MS4 areas. The load from the MS4 areas is therefore estimated by multiplying the total load discharged through the developed lands from the percentage (24%) occupied by the MS4 areas.

McCarthy and Associates and the Durham Triangle WWTP are regulated under the NPDES system. However, the McCarthy and Associates is not discharging and hence, it is not considered in this study. The Durham Triangle WWTP discharges domestic and industrial wastewater. The discharge is monitored for fecal coliform on a daily basis. The daily average fecal coliform load from the facility is presented in Appendix 4.

Table 1. NPDES Permits in the Northeast Creek Watershed

Facility	Permit number	Permitted flow (MGD)	Actual flow (a) (MGD)	Waste type
McCarthy and Associates	NC0085260	N/A	N/A	Industrial
Durham Triangle WWTP	NC0026051	6	3.24	Domestic + Industrial
MS4				
City of Durham	NCS000249	NA	NA	Domestic +
NC DOT	NCS000250	NA	NA	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 Northeast 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: Center for Watershed Protection, 1999)

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.

In order to incorporate the actual amount of fecal coliform deposited from livestock, a survey was conducted with the help of County Agents, Mr. Henry Outg (Chatham Co.), Mr. Steve Woodruff (Wake Co.), and Ms. Karen McAdams (Durham Co), to enumerate the approximate head count of livestock in the Northeast Creek watershed. The estimated head count from this survey is presented in Table 3.

Table 3. Estimated Livestock in the Northeast Creek Watershed.

Livestock	Durham Co.	Wake Co.	Chathem Co
Beef Cows	80	0	10
Horses	175	35	20

All of the beef cows are managed under the NC Agriculture Cost Share Program. The program prohibits the grazing of the cattle near the stream. As the result, during a field survey on January 15, 2000, DWQ staff and County agent, Ms. Karen McAdams, observed

no cattle grazing along Northeast Creek. They observed mainly horses grazing in the managed herbaceous land near the creek.

Furthermore, DWQ staff observed that more than half of the herbaceous land (mostly grass lands and crop lands), as identified by the 1996 land use data used for this study, have been converted to low intensity development. It is, therefore, assumed that the impact of fecal coliform due to the animal operations in the watershed should have been reduced by one fourth of the actual load rates. The actual loading rates for livestock in the Northeast Creek watershed were estimated to be 3000 to 7000 colonies per 100 ml. Fecal coliform concentrations from grazed pasture runoff have been measured in the range of 120-1.3E+6 colonies/100 ml (Doran et al. (1981). The presence of cattle on rangelands increased fecal coliform in stream concentrations from 0 to 2500 colonies per 100 ml (Khaleel et al.1980).

2.2.2. Domestic Animals

Dogs and cats are the major domestic animals in the watershed. As per the Durham County Animal Control database, the population of dogs and cats in the county is estimated to be 37,396 and 19,230 respectively. In a study conducted by Hyer et. al, 2001, the bacterial loads due to dog waste accounted for nearly 10 percent of the total bacterial load in three creeks of Virginia, Accotink Creek, Blacks Run, and Christians Creek. In Melbourne, Australia, dogs produced about 90 metric tons of feces each day - equivalent to the amount of feces produced daily by 90,000 people (http://www.esb.utexas.edu/nrm2001/dogdoo/WaterQuality(JJ)/Default.htm). Therefore a separate study of the fecal loads due to dogs and cats is essential for cities like Durham. During a survey, DWQ staff observed a considerable amount of dog waste along the creek near residential areas. During a rainfall runoff event, a portion of the fecal material, which contains coliform bacteria, is transported to the creek. Open lots used heavily by animals have the greatest potential for bacteria loads to surface water. In addition, when animals have direct access to streams, feces may be deposited directly into a stream. It is, therefore, assumed that out of the total fecal coliform load estimated for urban development, 10% of the load would have come from domestic animals.

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 between 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).

2.2.2. Failed Septic Systems

Failing septic systems have been cited as a potential source of fecal coliform bacteria to water bodies (DEH, 2000). About 18 percent of the residents in the Northeast Creek watershed utilized septic systems (Table 4) and there were about 2.3 people per household per septic system. A GIS map developed by the Soil Science Department, North Carolina State University showing the spatial distribution of houses with septic and sewer systems in the three counties (Durham, Chatham, and Wake) was utilized to estimate the number of septic and sewer systems in the watershed. The number of houses with septic and sewer systems in the counties were first divided by the respective areas of the counties. The houses per area were then multiplied by the area of the watershed within each county to estimate the total houses with sewer and septic systems in the watershed.

Table 4. Summary of Septic Usage in Northeast Creek Watershed for 2000

		Percent of Housing Units Utilizing:		
Watershed/County	Housing units	Sewer	Septic	Other
NE Creek Watershed	43,910*	81	18	1
Durham	89,015	88	11	1
Chatham	19,741	26	73	1
Wake	242,040	84	15	1

*Estimated based on the housing distribution in the three counties.

Frequent failures of the septic systems are common in the Durham County. This argument is clearly made public by the daily NC newspaper, The News & Observer, on January 3, and January 10, 2002. The City of Durham conducted field sampling of septic and sand filter effluent during 1999 and 2000. The concentration of effluent fecal coliform bacteria due to

septic and sand filter effluent failure ranges from 11 to 490,000 counts/100ml based on study conducted by City of Durham (Appendix 5). These data were used as a basis for fecal coliform loads from failing septic systems 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 (discussed above), runoff through stormwater, sewers, illicit discharges/connections of sanitary waste, leaky sewer systems, and sewer system overflows (Table 2). The sewage pipelines to the WWTP run along Northeast Creek. In a record maintained by City of Durham, the sewer pipe leaked four times in the year beginning May 2001 from the residential and commercial properties and one time from the City Sanitary Sewer System. Failures of connections between the sewer pipelines, or any leak from the pipe, could result in profound fecal coliform loads to the creek.

Storm water runoff is the main carrier of solids, chemicals, and bacteria from urban sources, including cross-connections with sanitary sewers. Various studies suggest that fecal coliform counts in urban storm water typically range from 20 to 240,000 units per 100 ml (Farrell-Poe et al., 1997, Khaleel et al., 1980, and Canale et al., 1993). The magnitude of the bacterial concentration substantially increases with density of urbanization. Further concentrations increase substantially during wet weather conditions. For example, dry weather fecal coliform concentrations in Onondaga Lake and its seven tributaries in metropolitan Syracuse, NY, ranged from 108 to 25, 525 colonies per 100 ml throughout the summer of 1987 (Canale et al., 1993). Whereas, wet weather concentrations in the tributaries ranged from more than 8,000 to 240,000 colonies per 100 ml. In general, significantly higher colonies (≥ 100,000 colonies / 100 ml) suggest the presence of cross connections with sanitary sewers, which should be identified and corrected (Marsalek, 2002).

Because of the huge variation of fecal coliform concentration in urban storm water due to interactions between the seasonal weather pattern and different urban characteristics, a specific quantification of the fecal concentration in urban storm water for modeling purposes is difficult. Due to lack of data on site specific fecal coliform loading from urban

development in the Northeast Creek watershed, the estimation of fecal coliform loading is limited to best professional judgement based on the above studies. Marsalek (2002) suggests that fecal coliform concentrations in urban storm water, where sewer cross connection leaking is a problem, will exceed 100,000 colonies per 100 ml. Therefore, it is assumed that the fecal concentrations in wet weather and dry weather storm water will be 50,000 and 30,000 colonies per 100 ml respectively, where frequent occurrences of sewer overflows were observed. The wet weather period for this study was defined as the four consecutive days following a storm event that produced surface runoff. Remaining days were labeled as dry weather conditions.

These values were used to estimate total fecal coliform load from low intensity development and high intensity development. These values were, however, adjusted during the model calibration.

2.2.4 Wildlife (Background Source).

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

Wildlife in the Northeast 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 15 to 30 animals per square mile in the watershed (source: http://www.ncwildlife.org/pg07_WildlifeSpeciesCon). 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 to be 50 to 100 colonies per 100 ml. The Center for Watershed Protection (1999) has cited a fecal coliform concentration range of 10-100 colonies per 100 ml for forest runoff.

3.0. MODELING APPROACH

3.1 Modeling Framework.

The watershed model named "The Coliform Routing and Allocation Program (CRAP)" was selected for fecal coliform TMDL development for the Northeast Creek watershed. The watershed model is designed to support the USEPA's protocol for estimating TMDL calculation, allocation, and implementation. The model is a simple, flexible, steady-state modeling tool. The model can be applied in a variety of watersheds for which there is a limited available data. CRAP is a customized ArcView project, written in Avenue, ArcView's scripting language. Output from the model is intended to represent 'typical' instream fecal coliform concentrations within a given time step, for predefined design (critical) conditions.

The CRAP model estimates fecal loads for each source in each watershed using the concentration based method with the equation 1:

$$L=C*Q_{lc}*f \quad \text{----------(1)}$$

Where,
L = fecal load (cfu/day)
C = 'typical' fecal concentration specified by the user(cfu/100mL). The user might choose to think of this value as the fecal concentration measured in a stream draining a watershed containing just the single source-associated land cover type.
Q_{lc} = flow contributed by the source associated land cover within a given subwatershed (cfs)
f = factor to convert units of concentration and flow to cfu/day = 24,465,755.

The model estimates instream fecal coliform concentration by routing the total loads from each sub-watershed downstream taking into account any variation in fecal decay rate between sub-watersheds. The model utilizes the first order decay equation to estimate the decay rate:

$$C_t = C_0 e^{-kt} \quad \text{----------(2)}$$

Where,
C_t is the coliform concentration (colonies/100 ml) at time t.
C_0 is the initial coliform concentration (colonies/100 ml).
k is the decay rate constant (per day).

t is the exposure time (days).

Generally, the decay rate (k) varies from 0 to 1.0 per day (Herr et al., 2000). In this study, the decay rate was used as 0.1 per day.

The exposure time is estimated by dividing the travel distance by stream velocity. The model estimates the stream velocity using the power function equation:

$$V = a Q^{b} \text{ ----------(3)}$$

Where,
V is the stream velocity (ft per sec).
Q is the stream flow (cft per sec).
a is the flow coefficient (unitless constant).
b is the exponent coefficient for flow (unitless constant).
The constant coefficients, a and b, were estimated to be 0.32 and 0.24 respectively. The estimation was done using the instream velocity measured by USGS at the ambient station (B3660000). The measured velocity is presented in the Appendix (3).

3.2 Model Setup.

The Northeast Creek watershed was delineated using the watershed delineation tool built in the model. A total of six sub-watersheds (WS1 to WS6) were delineated based on the Reach file 3 (RF3) stream coverage for the Northeast Creek watershed (Figure1). The total drainage area of the watershed was estimated to be 12206 hectares (47 square miles) with hydraulic length of 16 miles (Table 5).

The dominant land cover in the watershed was forested lands. The second dominant land use was developed lands. The two watersheds, WS1 and WS2, were within Durham County, including City of Durham and Research Triangle Park and therefore, were dominated by developed lands. Industrial and commercial developments were located primarily in the Research Triangle Park. The rest of the watershed was dominated by herbaceous land.

The water quality data and flow data respectively collected by DWQ and USGS at the ambient monitoring station (B3660000) were utilized to calibrate the model. The station was located in WS2 at about 3 miles below the WS1 (Figure 1).

Table 5. Land cover characteristics of each sub-watershed in the Northeast Creek watershed.

Parameters	WS1	WS2	WS3	WS4	WS5	WS6	Total
A. Land use (ha)							
Cultivated	5.52	0.00	5.77	5.18	14.99	0.01	31.47
Forest	3506.32	1369.39	2415.58	580.37	2.55.58	541.81	10469.04
Development							
• High Intensity	704.74	45.47	24.47	00	23.98	0.63	799.29
• Low Intensity	190.90	0.00	3.76	0.00	0.00	0.00	194.65
Herbaceous							
• Managed	179.18	26.43	89.70	6.93	203.84	42.67	548.75
• Unmanaged	30.49	0.00	4.87	0.00	0.00	0.00	35.36
Water body	44.67	34.20	25.67	3.09	9.91	9.74	127.27
Total	4661.82	1475.45	2569.81	598.57	2308.29	594.85	12205.83
Stream Length (Hydraulic mile)	7.30	4.35	6.37	2.96	5.29	1.34	28.00

3.2.1 Wet Weather Versus Dry Weather Fecal Coliform Loading

In this study, it is assumed that surface runoff would be generated in excess of infiltration capacity of soil surface (maximum rate at which the soil can absorb water through the soil surface at the time of entry) after each rainfall event. The infiltration capacity is determined by soil type and moisture content. The soil type in the Northeast Creek watershed is Triassic soil, which has comparatively low infiltration capacity due to heavy clay layers in the soils. Owing to presence of clay, soil moisture holding capacity of the soil is reasonably high. Therefore, wet weather conditions for the watershed were defined as three consecutive days since the first flow rate increased at the USGS gauge station located at SR1100. The increment was examined after subtracting the total flow from the flow from the WWTP to account seepage from the watershed lands. Dry weather accounted for all the remaining days. There were 59 observed data at SR1100, of which 36 were estimated to be dry weather and the remaining 23 were to be wet weather period. Similarly, out of the 1826

simulation days, 846 days were estimated to be wet weather and the remaining 980 were dry weather during the study periods.

A partial correlation between flow and fecal coliform concentration during the wet weather and dry weather period was estimated. The correlations were 0.47 and 0.17. The result suggests that the correlation was significantly higher during wet weather periods, signifying that the assumption of the weather period was acceptable.

3.3 Model Calibration.

The watershed model was calibrated with fecal coliform concentrations observed at the ambient station (B3660000). Since the station was located above the outlet of WS2, the concentration of fecal coliform at the station was estimated using a proportional decrease in concentration between the inlet and the outlet of WS2. The formula used for the estimation of the concentration at the ambient station is as follows:

$$((Ci - Co)/Dio)*Doa) + Co \quad \text{----------(4)}$$

Where,
Ci = Concentration at the inlet of WS2.
Co = Concentration at the outlet of WS2.
Dio = Hydraulic distance of Northeast Creek in WS2 = 4.35 mile.
Doa = Hydraulic distance of ambient station from the outlet = 1.43 mile.

In the calibration process, the decay rate of the fecal coliform bacteria in the stream was set to 0.1. The input parameters estimated in § 2.2.3 for urban development were also further adjusted to associate the estimated fecal coliform concentration with the observed concentration. The adjusted concentrations were 40,000 colonies and 55,000 colonies per 100 ml of water during dry weather and wet weather periods respectively. Except for the first simulation year, 1997, an acceptable association between the simulated fecal coliform bacterial concentration and observed bacterial concentration was observed when the estimated parameters were adjusted for wet weather and dry weather periods (Figure 5).

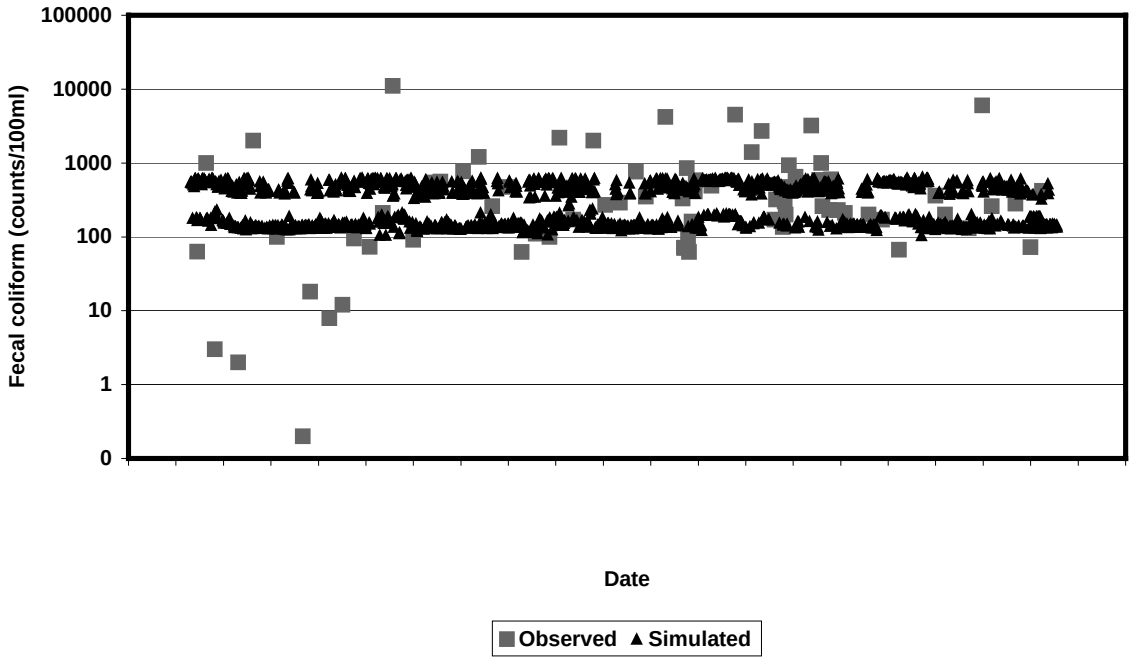

Figure 5. Observed vs Simulated fecal coliform concentration at the ambient station, B3660000.

The association was further comprehensible when the observed and simulated values were examined by estimating 30-day geometric mean (Figures 6, 7, and 8). This association could not be examined for the simulated five-year period since minimum of 5 samples a month is required for the comparison. The DWQ ambient monitoring station only has fecal coliform samples on a monthly basis. Therefore, the DWQ staff conducted a special study program to collect five samples in 30 days at the DWQ ambient monitoring site (SR 1100) during the summer periods of 1999 and 2000. These data were merged with the regular ambient data to have comparable geometric mean. The resulting 30-day geometric mean of the fecal coliform concentration is presented in Figures 6-8.

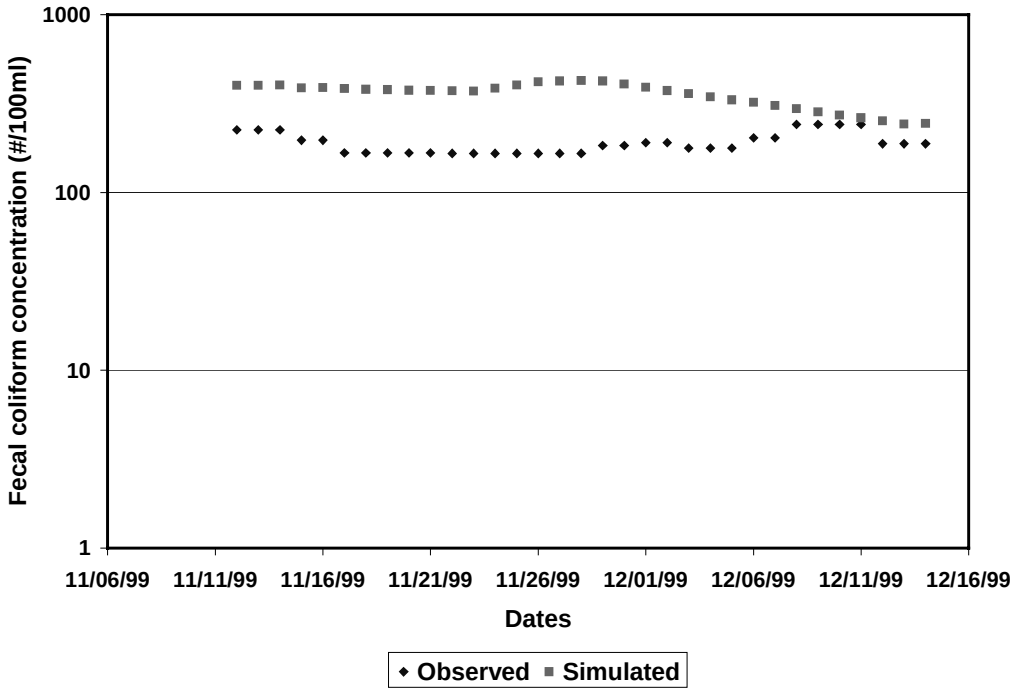

Figure 6. Rolling 30-day geometric mean of observed and predicted fecal coliform concentration at the ambient station (B3660000) for 1999.

The association between the 30-day geometric mean of observed and predicted fecal coliform concentrations was somewhat weak for 1999 (Figure 6). The model estimated considerably higher fecal coliform concentration than the observed concentration. It could be either due to the estimation of higher initial fecal coliform concentration for the model input in order to be consistent with the following years' developments in the watershed, or could be due to model uncertainty (discussed below). However, the association was significantly improved in the following years 2000 (Figures 7 and 8).

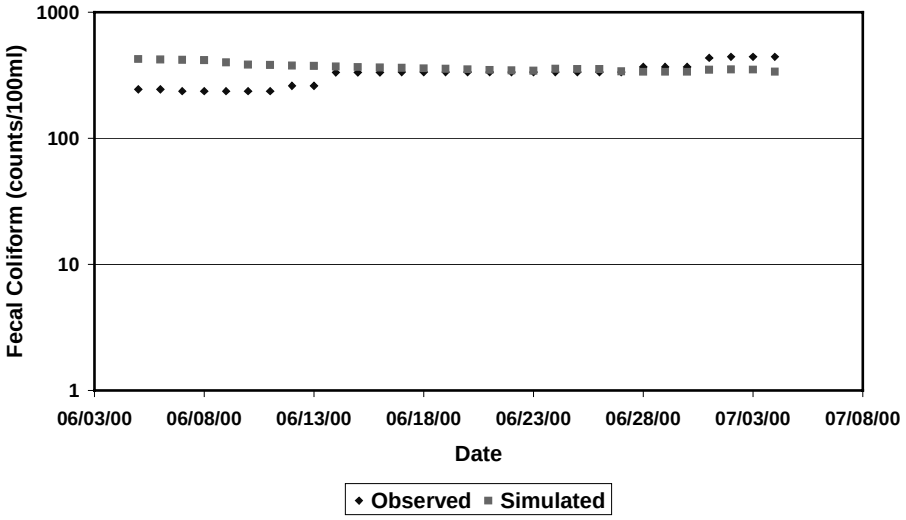

Figure 7. Rolling 30-day geometric mean of observed and predicted fecal coliform concentration at the ambient station (B3660000) for the early summer, 2000.

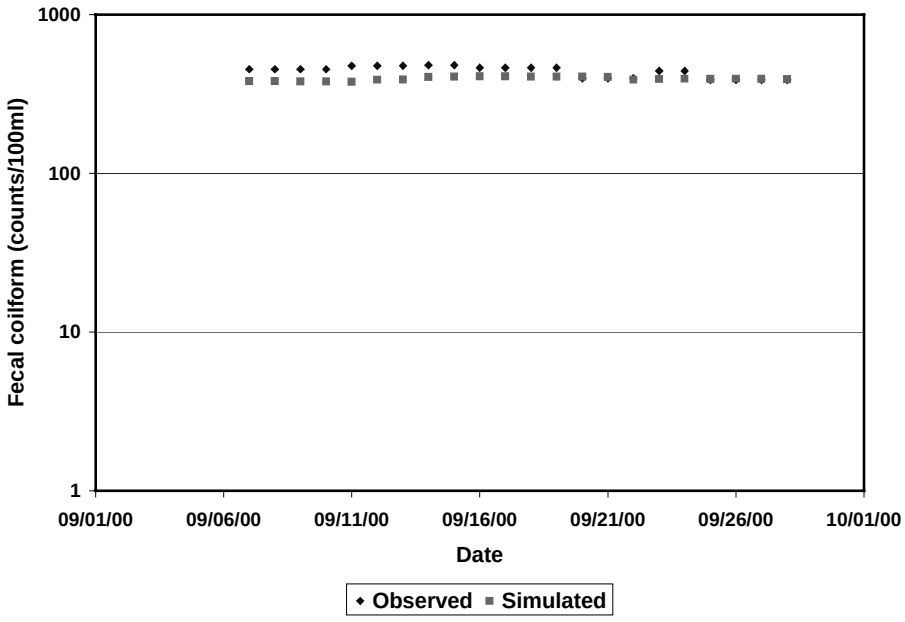

Figure 8. Rolling 30-day geometric mean of observed and predicted fecal coliform concentration at the ambient station (B3660000) for the late summer, 2000.

3.4 Model Uncertainty

The weak agreement between modeled and observed fecal coliform concentrations as described in Section 3.3 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, and land use information. The model, CRAP, selected to guide initial decision making, is not able to characterize prediction uncertainty. The model estimates daily average fecal coliform concentrations based on land use information and stream flow. The model does not consider the contribution of stream temperature to the fecal decay rate. Also, because of lack of a site-specific information, professional judgement 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

3.5.1 Existing Loading

The model outputs indicate that the primary source of fecal coliform bacteria loads to Northeast Creek is the direct input from both the non-point and point sources (Table 6). The load due to non-point sources was almost three times (76%) higher than that of point sources (24%). Among the point sources, the load due to the Durham Triangle WWTP discharge was 1.95E+10 colonies per day (0.53%), whereas the load due to the MS4 areas was 8.59E+11 colonies per day (23%).

Among the non-point sources, areas of high intensity development appeared to contribute high loads to Northeast Creek (60%). High intensity development includes lands where more than 80% of lands are covered by synthetic coverage. Any coverage between 50% and 80% is considered as low intensity development. The loads due to low intensity development were comparatively low (12%).

Urban development, animal grazing, and septic system contribute relatively higher fecal coliform loads. In urban areas, fecal coliform can be contributed to all creeks by dogs, cats, raccoons, stormwater runoff, and human waste during storm events. The DWQ staff hypothesizes that the bacterial load due to the domestic pets accounts for about 10 percent in the watershed. However, a study to track bacterial sources is required to quantify the actual sources.

The relative contribution due to wildlife, livestock, and other sources (e.g., wetland and water pond) was relatively low (≤1%).

Table 6. Total load of fecal coliform (colonies per day) in the Northeast Creek watershed at SR1100 during the study period, 1997 through 2001.

Source Category	Simulated total Load	Percent of fecal coliform load
A. Non-point Sources (LA):		
Forest	2.04E+10	0.56
Water body	5.53E+07	0.002
Herbaceous Lands	1.26E+11	3
Urban Development (without MS4)		
• High intensity development	2.20E+12	60
• Low intensity development	4.53E+11	12
B. Point Source (WLA)		
MS4 area (Storm water runoff)	8.59E+11	23
Durham Triangle WWTP	1.95E+10	0.53
C. Total for non-point sources	2.80E+12	76
D. Total for point source	8.78E+11	24
E. Grand Total	3.68E+12	100

3.5.2 Critical Period

The critical period is the period when the geometric mean of fecal coliform concentration reaches peak levels, exceeding the water quality standard of 200 colonies / 100 ml. Fecal coliform pollution in Northeast Creek watershed originated from both point and non-point

sources. Usually, excessive concentrations during the dry weather periods are due to point sources, while excessive concentration during the wet weather periods are due to non-point sources.

Extreme flows might carry excessive amount of fecal colifrom from both point and non-point sources to the Northeast Creek. In this study, the extreme flows were defined as the flows that were exceeded less than 10 percent of the time (90^{th} percentile) during the five years simulation period. These flows were considered anomalous and were excluded to estimate the critical period.

Extreme flows were determined by plotting flow duration curve (Figure 9). The duration curve represents the flow data from October 1982 through September 2002. The duration curve suggests that the flow that was equal to or above 56 cfs occurred less than 10 percent of time in the Northeast Creek. The flows below 56 cfs were hence considered for estimating critical period.

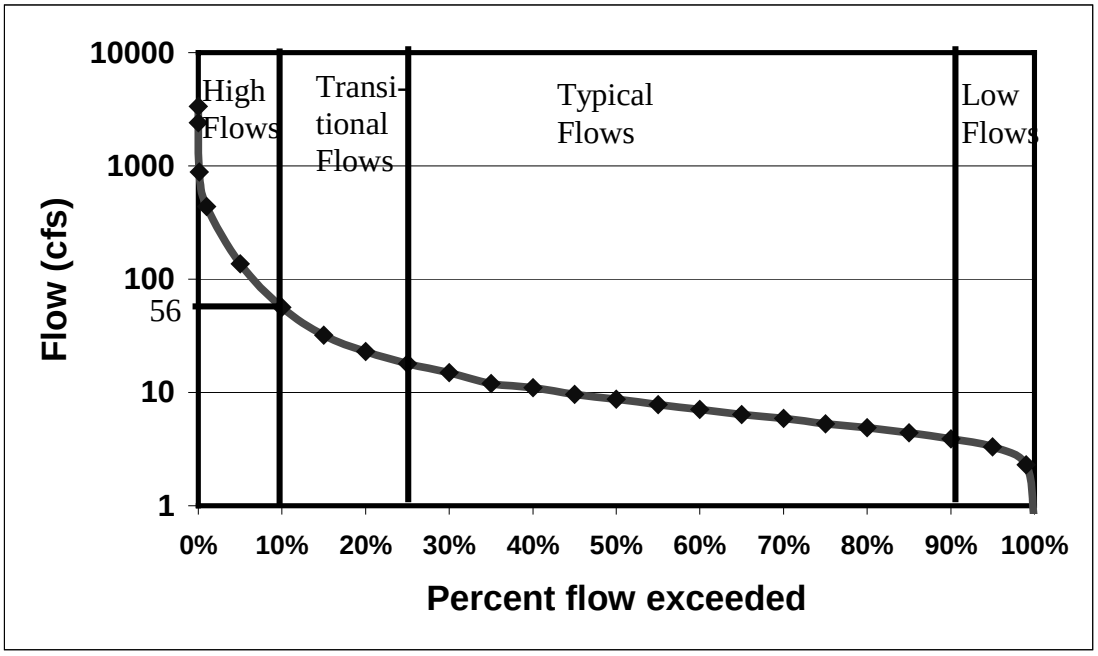

Figure 9. Flow duration curve for Northeast Creek watershed at the ambient station SR 1100 (B3660000).

The highest 30-day geometric mean of the predicted daily fecal coliform concentration occurred during wet weather on January 27, 2000 and May 24, 2000 (Appendix 7). The respective fecal coliform concentration was 503 colonies per 100 ml and 491 colonies per 100 ml. The difference between the two concentrations was only 12 colonies per 100 ml, which is indeed very close. The result suggests that wet weather is the critical period for all the seasons in the Northeast Creek watershed.

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 effluent limitations and water quality. This definition can be expressed by equation 5:

$$TMDL = \sum WLAs + \sum LAs + MOS \text{ ----------(5)}$$

The objective of the TMDL is to estimate allowable pollutant loads and to allocate to the known pollutant sources 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 was allocated for the ambient station at SR1100 in order to facilitate monitoring of water quality after the TMDL implementation in future. There was a strong relationship between the ambient station and the watershed outlet (Figure 10) based on the modeling

results. The predicted fecal coliform concentration at the outlet of the watershed can be determined by using the following linear equation 6:

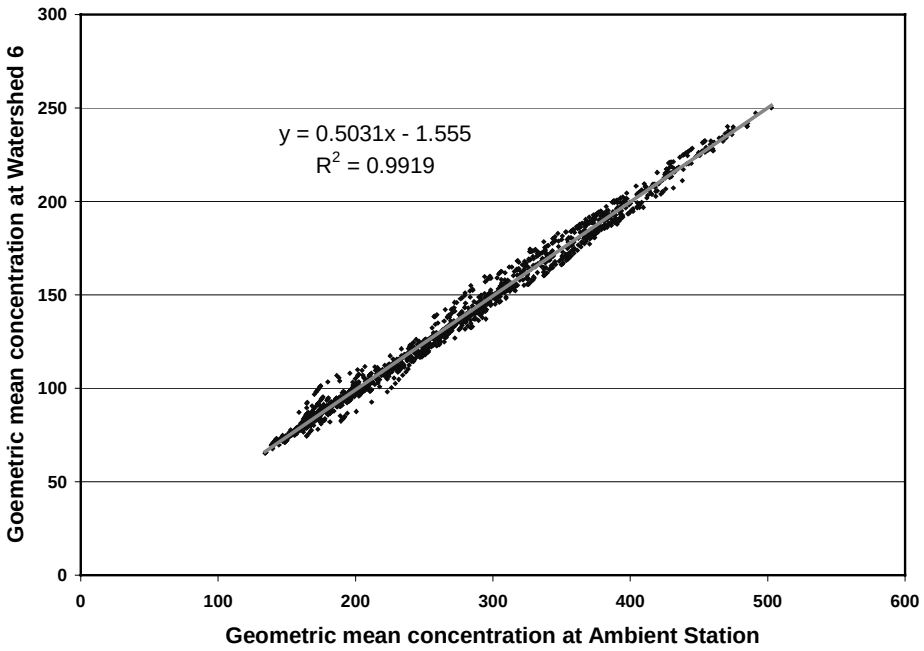

Figure 10. Relationship between the watershed outlet and the ambient station (B3660000) with regards to the simulated fecal coliform concentrations.

Concentration at outlet = 0.5031 * Concentration at ambient station – 1.555 ----------(6)

The coefficient of determination (R-Square) was found to be 0.99 for Equation 6. The result suggests that the variation of the fecal coliform concentration in the watershed outlet is significantly affected by the variation of the ambient station. The result also suggests that the variation due to the fecal coliform concentration from the sub-watersheds (WS3 through WS6) below the station was significantly low.

The TMDL was determined by systematically reducing the watershed loads until all 30-day geometrical mean concentrations were below the TMDL target of 175 colonies / 100 ml (marginal of safety = 25 colonies / 100ml). The resulting reduction is presented in Figure 11 for the study period, 1997 through 2001. During the entire study period, the reduction

remained below or equal to TMDL target of 175 colonies / 100 ml. None of the fecal coliform concentration in the same study period exceeded 400 colonies / 100 ml.

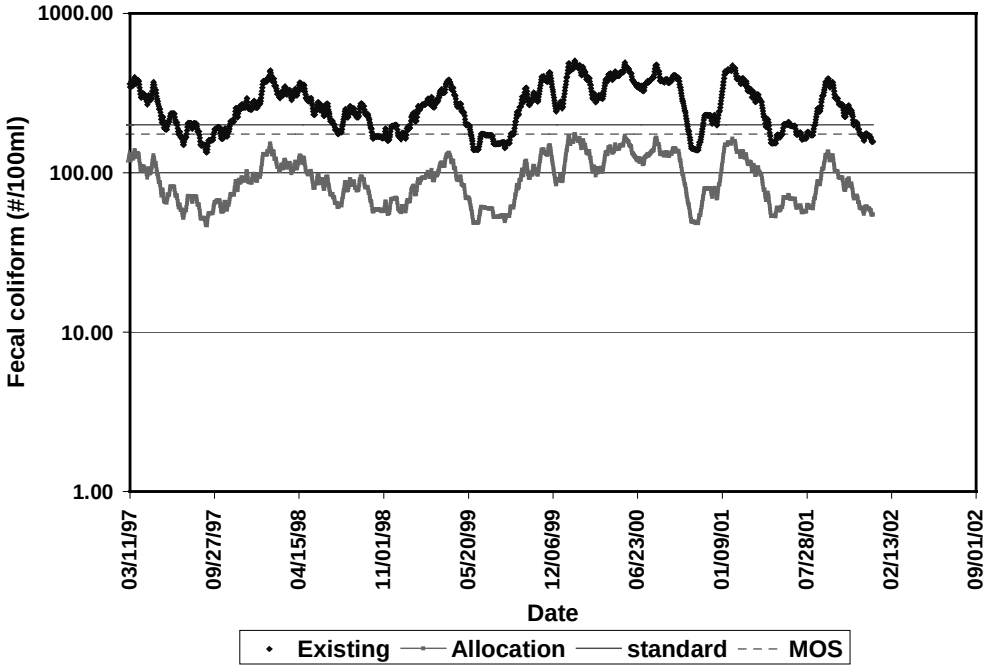

Figure 11. 30-day rolling geometric mean of the simulated fecal colifrom concentration before and after TMDL allocation at the ambient station (B3660000).

The TMDL for both point source and non-point source was estimated by multiplying the 30-day geometric mean simulated by the model after reduction by the respective flow values. The TMDL was then proportionally distributed to each of the sources. The estimation was done for the period when the maximum 30-day geometric mean was simulated. The existing average daily load of fecal coliform bacteria at the ambient station is 3.67E+12 colonies / day (Table 8). The TMDL load at the same location is 3.52E+11 colonies/day.

4.2 Seasonal Variation.

Seasonal variation was incorporated in the continuous simulation of the CRAP model by using varying loading rates for wet and dry weather periods under varying daily flow conditions for 5 years, 1997 through 2001. The variation of the predicted and observed fecal

coliform bacteria was remained high during both wet and dry weather periods. The concentration level remained greater than the water quality standard (200 colonies / 100 ml) for about 70% of the simulation period (Figure 11).

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 5.06E+10 colonies. The estimation was performed by calculating the differences between TMDL with MOS and TMDL without MOS using the equation 2.

4.4. Waste Load Allocation.

The fecal coliform loads in the Northeast Creek watershed due to point sources were about 24% of the total load (Table 6). This percentage of fecal coliform bacteria was attributed to the two main sources, the Durham Triangle WWTP and the MS4 areas. Both sources respectively contributed daily fecal coliform load about 1.95E+10 colonies and 8.59E+11 colonies in the ambient site.

The Durham Triangle WWTP was permitted to discharge a monthly geometric mean fecal coliform concentration of 200 colonies / 100 ml with a maximum permitted discharge of 6 MGD. The total permitted load of fecal coliform bacteria is thus estimated to be 4.54E+10 colonies per day, which is indeed substantially higher than the actual discharge load, 1.95E+10 colonies per day (Table 6). Therefore, a waste load allocation (WLA) reduction was not recommended for the Durham Triangle WWTP.

However, about 92% of the existing load (8.59E+11 colonies per day) from the MS4 areas should be reduced. The estimated TMDL for the MS4 areas are about 6.68E+10 (Table 8).

4.5 Load Allocation (Non-point Source).

The fecal coliform load in Northeast Creek watershed due to non-point sources was about 76% of the total load (Table 6). The model estimation suggests that the TMDL for the non-point sources be 2.40E+11 colonies per day. On average, the total reduction required to meet the water quality standard, 175 colonies per 100 ml, is thus estimated to be 91% (Table 8).

Table 8. Proposed in-stream fecal coliform load reductions for the Northeast Creek watershed at SR1008.

Source Category	Simulated total Load (Colonies per day)	TMDL (Colonies per day)	Reduction (%)
A. Non-point Sources (LA):			
Forest	2.04E+10	2.04E+10	0
Water body	5.53E+07	5.53E+07	0
Herbaceous Lands	1.26E+11	1.20E+10	90
Urban Development (without MS4)			
• High intensity development	2.20E+12	1.80E+11	92
• Low intensity development	4.53E+11	2.79E+10	94
B. Point Source (WLA)			
MS4 area	8.59E+11	6.68E+10	92
Durham Triangle WWTP	1.95E+10	4.54E+10	0
B. Total for non-point sources	2.80E+12	2.40E+11	92
C. Total for point source	8.78E+11	1.12E+11	86
E. Margin of safety (MOS)	_	5.06E+10	_

The load allocation distribution for the non-point source was mainly targeted to urban developed areas, because developed areas contributed substantial fecal coliform bacteria to Northeast Creek. Fecal coliform bacteria from developed areas can originate from various sources including leaking sanitary sewers, illicit sanitary sewer connections, and storm water runoff. Storm water runoff can include waste from domestic animals and urban wildlife.

Furthermore, the model results suggest that a substantial amount of fecal coliform bacteria were transported to Northeast Creek from the developed areas in the City of Durham (outside of the MS4 area) and Research Triangle Park. The total contribution of fecal coliform bacteria is estimated to be 2.65E+12 colonies per day. About 92-94% of the load needs to be reduced to meet the water quality standard (Table 8).

Similarly, about 90% of the loads (1.26E+11 colonies) from the herbaceous lands need to be reduced to meet the water quality standard. Domestic animals and wildlife were seen to be the main sources of fecal coliform from these lands. Fecal coliform loads from the forested lands are considered as background sources in this study and hence, the reduction is not recommended.

Overall, the total fecal coliform load observed in the ambient station, B3660000, was 3.68E+12 colonies per day during the study periods, 1997 through 2001. The estimated TMDL required to meet the water quality standard, 175 colonies per 100ml of water, at the station was 4.03E+11 colonies per day. The detailed estimated proportional reductions required for the various sources in the Northeast Creek watershed are presented in Table 8.

5.0 SUMMARY AND FUTURE CONSIDERATIONS

The CRAP model estimated that the non-point sources contributed 76% of the total load (3.68E+12 colonies per day) in the Northeast Creek. The contribution was primarily due to urban development. In order for the water quality target to be met, the final allocation of the fecal coliform bacteria requires a reduction of 2.40E+11 colonies per day for the various non-point sources.

The pipelines connecting between the Durham Triangle WWTP and the sewage collection system in the watershed run along the main Northeast Creek. Failure of connection between the sewer pipelines or any leak from the pipe could result in profound fecal coliform loads in

the creek. The city of Durham and the respected line agencies are therefore suggested to check any leak from the connecting pipe.

The model estimated that the point sources contributed about 24% of the total loading in the watershed. A majority of that load was contributed by storm water runoff from the City of Durham MS4 area. About 92% of the load (8.59E+11 colonies per day) was estimated to be reduced to meet the water quality. In contrast, the reduction is not recommended for fecal coliform loading from the WWTP. The waste load allocation for the WWTP, in accordance with the NPDES permit, was estimated to be 4.54E+10 colonies per day. The permitted load appeared to be marginally higher than the actual discharged load, 1.95E+10 colonies per day.

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.

To comply with EPA guidance, North Carolina may adopt new bacteria standards utilizing Escherichia coli (E. coli) or enterococci in the near future. Thus, in future, monitoring efforts to measure compliance with this TMDL should include using E. coli or 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 initiate the development of an implementation plan.

6.0 PUBLIC PARTICIPATION

Many local government officials have been notified of DWQ's intention to develop the Northeast Creek fecal coliform TMDL. The extension services in Durham County, Chatham County, Wake County and local associations have supplied septic data, sewer data, agricultural information, and stormwater runoff in MS4 areas to aid in the source assessment portion of the TMDL. The Northeast Creek Fecal Colifom TMDL was public noticed through local newspapers, The Herald-Sun and The Chatham Record, on May 6 and May 8, 2003 respectively (Appendix 8). The TMDL was also public noticed through DWQ web site at http://h20.enr.state.nc.us/tmdl/.

A public meeting was held in Durham County Agricultural Building and Curb Market, NC, on May 27, 2003 as a part of the comment period. A group of eight (8) individuals participated the meeting from the following organizations:

City of Durham, Stormwater Services – 5 representatives
Cooperative Extension Service – 1 representative
Raleigh Regional Office – 2 representatives

A public comment period was through June 5, 2003. No written comments were received.

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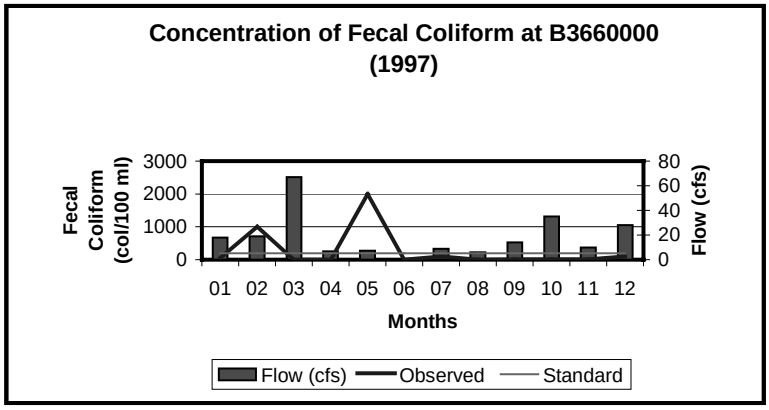
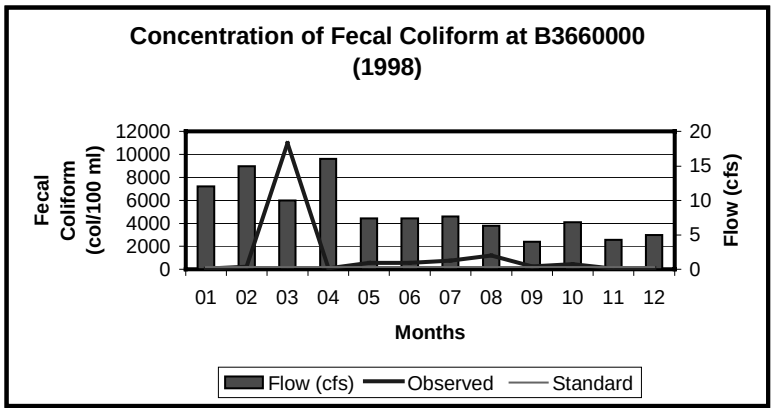
Appendix 1. Fecal Coliform in the Ambient Station (B3660000)

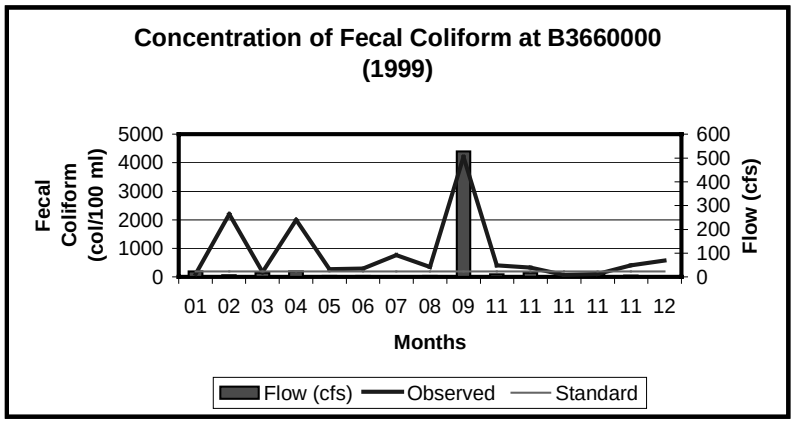
Appendix 1.1 Table of fecal coliform responses during 1997 through 2001.

Date	Weather Status	Fecal (col/100 ml)	Flow (cfs)	Date	Weather Status	Fecal (col/100 ml)	Flow (cfs)
1/15/97	dry	63	18	1/13/00	wet	490	32
2/3/97	dry	1000	19	2/22/00	dry	4500	27
3/21/97	wet	3	67	3/28/00	wet	1400	27
4/11/97	dry	2	6.9	4/18/00	wet	2700	154
5/13/97	dry	2000	7.2	6/1/00	dry	136	9.2
7/2/97	dry	100	8.9	6/28/00	wet	650	9.9
8/25/97	dry	0.2	5.8	7/31/00	wet	3200	14
9/10/97	wet	18	14	8/30/00	wet	540	29
10/20/97	wet	7.9	35	9/25/00	wet	230	14
11/17/97	dry	12	10	10/10/00	dry	210	5.2
12/11/97	wet	95	28	11/29/00	dry	200	5.5
1/12/98	dry	73	12	12/27/00	dry	170	19
2/10/98	dry	210	15	2/1/01	wet	67	20
3/3/98	dry	11000	10	4/19/01	dry	360	6.7
4/15/98	wet	91	16	5/9/01	dry	200	5
5/26/98	wet	540	7.4	6/28/01	dry	130	8.5
6/11/98	dry	560	7.4	7/26/01	wet	6000	18
7/29/98	wet	770	7.7	8/15/01	dry	260	18
8/31/98	wet	1200	6.3	10/4/01	dry	280	6.5
9/28/98	dry	260	4	11/5/01	dry	72	7.2
10/27/98	dry	470	6.8	11/29/01	dry	420	4.2
11/29/98	dry	62	4.3				
12/29/98	dry	110	5				
1/27/99	dry	100	23				
2/17/99	dry	2200	7.8				
3/18/99	dry	170	17				
4/29/99	wet	2000	23				
5/24/99	dry	270	4.3				
6/24/99	dry	290	3.9				
7/28/99	dry	760	3.5				
8/18/99	dry	350	4				
9/28/99	wet	4200	528				
11/1/99	wet	410	11				
11/3/99	wet	330	18				
11/6/99	wet	71	10				
11/15/99	dry	100	8.7				
11/29/99	wet	410	5.2				
12/1/99	dry	580	3.7				

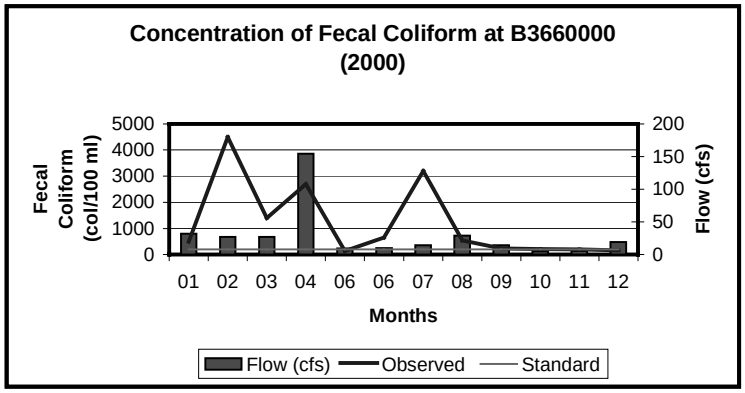
Appendix 1.2. Graphical responses of fecal coliform

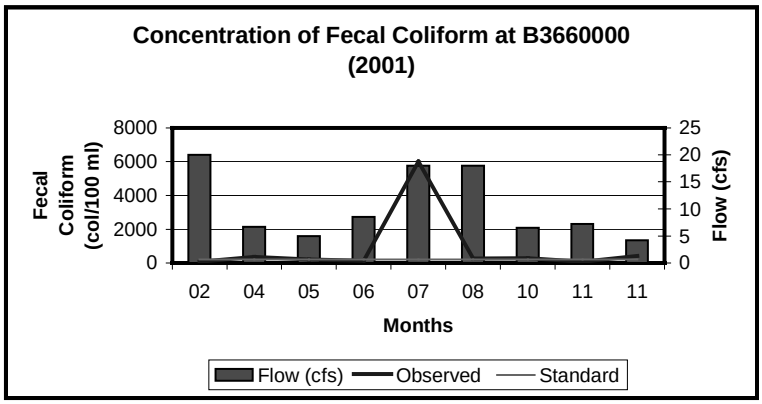






Appendix 1.2 continued.





Appendix 2. Flow Recorded by USGS at the ambient Station (B3660000).

Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
01/01/97	20.00	01/01/98	11.00	01/01/99	3.90	01/01/00	28.00	01/01/01	18.00
01/02/97	25.00	01/02/98	9.00	01/02/99	3.60	01/02/00	27.00	01/02/01	18.00
01/03/97	21.00	01/03/98	8.10	01/03/99	518.00	01/03/00	28.00	01/03/01	18.00
01/04/97	18.00	01/04/98	7.20	01/04/99	303.00	01/04/00	31.00	01/04/01	19.00
01/05/97	17.00	01/05/98	7.40	01/05/99	36.00	01/05/00	57.00	01/05/01	19.00
01/06/97	18.00	01/06/98	7.50	01/06/99	18.00	01/06/00	32.00	01/06/01	18.00
01/07/97	15.00	01/07/98	10.00	01/07/99	14.00	01/07/00	29.00	01/07/01	19.00
01/08/97	14.00	01/08/98	197.00	01/08/99	12.00	01/08/00	28.00	01/08/01	21.00
01/09/97	165.00	01/09/98	312.00	01/09/99	11.00	01/09/00	32.00	01/09/01	22.00
01/10/97	334.00	01/10/98	43.00	01/10/99	10.00	01/10/00	207.00	01/10/01	22.00
01/11/97	82.00	01/11/98	17.00	01/11/99	9.60	01/11/00	278.00	01/11/01	21.00
01/12/97	30.00	01/12/98	12.00	01/12/99	9.20	01/12/00	48.00	01/12/01	22.00
01/13/97	23.00	01/13/98	11.00	01/13/99	9.10	01/13/00	32.00	01/13/01	21.00
01/14/97	19.00	01/14/98	11.00	01/14/99	8.30	01/14/00	28.00	01/14/01	22.00
01/15/97	18.00	01/15/98	40.00	01/15/99	25.00	01/15/00	25.00	01/15/01	23.00
01/16/97	139.00	01/16/98	362.00	01/16/99	20.00	01/16/00	24.00	01/16/01	23.00
01/17/97	182.00	01/17/98	616.00	01/17/99	11.00	01/17/00	25.00	01/17/01	22.00
01/18/97	36.00	01/18/98	135.00	01/18/99	178.00	01/18/00	25.00	01/18/01	23.00
01/19/97	22.00	01/19/98	107.00	01/19/99	194.00	01/19/00	28.00	01/19/01	23.00
01/20/97	21.00	01/20/98	259.00	01/20/99	29.00	01/20/00	43.00	01/20/01	50.00
01/21/97	19.00	01/21/98	69.00	01/21/99	17.00	01/21/00	57.00	01/21/01	34.00
01/22/97	17.00	01/22/98	24.00	01/22/99	13.00	01/22/00	32.00	01/22/01	23.00
01/23/97	18.00	01/23/98	192.00	01/23/99	14.00	01/23/00	36.00	01/23/01	20.00
01/24/97	19.00	01/24/98	374.00	01/24/99	548.00	01/24/00	53.00	01/24/01	19.00
01/25/97	75.00	01/25/98	116.00	01/25/99	394.00	01/25/00	65.00	01/25/01	18.00
01/26/97	74.00	01/26/98	28.00	01/26/99	66.00	01/26/00	53.00	01/26/01	17.00
01/27/97	28.00	01/27/98	95.00	01/27/99	23.00	01/27/00	39.00	01/27/01	16.00
01/28/97	49.00	01/28/98	767.00	01/28/99	17.00	01/28/00	33.00	01/28/01	16.00
01/29/97	90.00	01/29/98	239.00	01/29/99	14.00	01/29/00	20.00	01/29/01	18.00
01/30/97	35.00	01/30/98	52.00	01/30/99	11.00	01/30/00	108.00	01/30/01	21.00
01/31/97	39.00	01/31/98	22.00	01/31/99	9.40	01/31/00	579.00	01/31/01	22.00
02/01/97	29.00	02/01/98	16.00	02/01/99	12.00	02/01/00	224.00	02/01/01	20.00
02/02/97	22.00	02/02/98	14.00	02/02/99	102.00	02/02/00	101.00	02/02/01	19.00
02/03/97	19.00	02/03/98	15.00	02/03/99	66.00	02/03/00	67.00	02/03/01	17.00
02/04/97	18.00	02/04/98	623.00	02/04/99	23.00	02/04/00	99.00	02/04/01	17.00
02/05/97	17.00	02/05/98	449.00	02/05/99	19.00	02/05/00	101.00	02/05/01	21.00
02/06/97	17.00	02/06/98	170.00	02/06/99	13.00	02/06/00	57.00	02/06/01	21.00
02/07/97	15.00	02/07/98	41.00	02/07/99	12.00	02/07/00	44.00	02/07/01	19.00
02/08/97	35.00	02/08/98	26.00	02/08/99	11.00	02/08/00	39.00	02/08/01	18.00
02/09/97	55.00	02/09/98	19.00	02/09/99	9.90	02/09/00	35.00	02/09/01	17.00
02/10/97	27.00	02/10/98	15.00	02/10/99	9.10	02/10/00	32.00	02/10/01	16.00
02/11/97	23.00	02/11/98	13.00	02/11/99	8.70	02/11/00	31.00	02/11/01	16.00
02/12/97	19.00	02/12/98	15.00	02/12/99	8.50	02/12/00	68.00	02/12/01	15.00
02/13/97	17.00	02/13/98	13.00	02/13/99	8.10	02/13/00	181.00	02/13/01	25.00
02/14/97	328.00	02/14/98	10.00	02/14/99	7.40	02/14/00	110.00	02/14/01	40.00
02/15/97	438.00	02/15/98	9.30	02/15/99	7.60	02/15/00	100.00	02/15/01	36.00
02/16/97	245.00	02/16/98	18.00	02/16/99	7.80	02/16/00	37.00	02/16/01	30.00

Appendix 2 continued

02/17/97	52.00	02/17/98	841.00	02/17/99	7.80	02/17/00	31.00	02/17/01	400.00
02/18/97	29.00	02/18/98	427.00	02/18/99	29.00	02/18/00	86.00	02/18/01	120.00
02/19/97	25.00	02/19/98	74.00	02/19/99	28.00	02/19/00	79.00	02/19/01	60.00
02/20/97	21.00	02/20/98	28.00	02/20/99	100.00	02/20/00	38.00	02/20/01	35.00
02/21/97	19.00	02/21/98	19.00	02/21/99	31.00	02/21/00	30.00	02/21/01	21.00
02/22/97	22.00	02/22/98	13.00	02/22/99	16.00	02/22/00	27.00	02/22/01	19.00
02/23/97	17.00	02/23/98	73.00	02/23/99	12.00	02/23/00	25.00	02/23/01	17.00
02/24/97	17.00	02/24/98	106.00	02/24/99	10.00	02/24/00	25.00	02/24/01	18.00
02/25/97	14.00	02/25/98	25.00	02/25/99	9.60	02/25/00	24.00	02/25/01	19.00
02/26/97	13.00	02/26/98	16.00	02/26/99	9.10	02/26/00	23.00	02/26/01	20.00
02/27/97	14.00	02/27/98	13.00	02/27/99	8.20	02/27/00	27.00	02/27/01	17.00
02/28/97	16.00	02/28/98	12.00	02/28/99	8.20	02/28/00	215.00	02/28/01	15.00
03/01/97	25.00	03/01/98	11.00	03/01/99	10.00	02/29/00	50.00	03/01/01	14.00
03/02/97	18.00	03/02/98	11.00	03/02/99	9.30	03/01/00	16.00	03/02/01	13.00
03/03/97	20.00	03/03/98	10.00	03/03/99	8.50	03/02/00	13.00	03/03/01	20.00
03/04/97	30.00	03/04/98	9.50	03/04/99	8.90	03/03/00	12.00	03/04/01	200.00
03/05/97	20.00	03/05/98	8.90	03/05/99	8.30	03/04/00	11.00	03/05/01	130.00
03/06/97	38.00	03/06/98	8.30	03/06/99	7.10	03/05/00	10.00	03/06/01	80.00
03/07/97	21.00	03/07/98	7.30	03/07/99	6.50	03/06/00	10.00	03/07/01	48.00
03/08/97	14.00	03/08/98	99.00	03/08/99	7.40	03/07/00	9.60	03/08/01	30.00
03/09/97	12.00	03/09/98	545.00	03/09/99	7.80	03/08/00	9.50	03/09/01	25.00
03/10/97	13.00	03/10/98	242.00	03/10/99	9.70	03/09/00	9.40	03/10/01	20.00
03/11/97	12.00	03/11/98	36.00	03/11/99	9.40	03/10/00	9.30	03/11/01	16.00
03/12/97	11.00	03/12/98	20.00	03/12/99	8.60	03/11/00	8.40	03/12/01	14.00
03/13/97	12.00	03/13/98	14.00	03/13/99	7.60	03/12/00	8.50	03/13/01	14.00
03/14/97	37.00	03/14/98	11.00	03/14/99	20.00	03/13/00	8.70	03/14/01	13.00
03/15/97	61.00	03/15/98	10.00	03/15/99	400.00	03/14/00	8.80	03/15/01	15.00
03/16/97	19.00	03/16/98	9.80	03/16/99	144.00	03/15/00	8.60	03/16/01	16.00
03/17/97	14.00	03/17/98	10.00	03/17/99	27.00	03/16/00	8.80	03/17/01	13.00
03/18/97	13.00	03/18/98	288.00	03/18/99	17.00	03/17/00	12.00	03/18/01	8.00
03/19/97	153.00	03/19/98	1720.00	03/19/99	13.00	03/18/00	8.90	03/19/01	6.00
03/20/97	315.00	03/20/98	319.00	03/20/99	10.00	03/19/00	8.10	03/20/01	9.00
03/21/97	67.00	03/21/98	238.00	03/21/99	123.00	03/20/00	14.00	03/21/01	459.00
03/22/97	23.00	03/22/98	146.00	03/22/99	349.00	03/21/00	57.00	03/22/01	280.00
03/23/97	15.00	03/23/98	44.00	03/23/99	61.00	03/22/00	16.00	03/23/01	37.00
03/24/97	13.00	03/24/98	34.00	03/24/99	21.00	03/23/00	12.00	03/24/01	15.00
03/25/97	11.00	03/25/98	21.00	03/25/99	16.00	03/24/00	10.00	03/25/01	11.00
03/26/97	14.00	03/26/98	18.00	03/26/99	20.00	03/25/00	9.50	03/26/01	9.70
03/27/97	12.00	03/27/98	15.00	03/27/99	14.00	03/26/00	9.00	03/27/01	8.80
03/28/97	9.80	03/28/98	13.00	03/28/99	11.00	03/27/00	9.90	03/28/01	8.30
03/29/97	9.90	03/29/98	13.00	03/29/99	10.00	03/28/00	27.00	03/29/01	125.00
03/30/97	9.90	03/30/98	13.00	03/30/99	9.90	03/29/00	13.00	03/30/01	722.00
03/31/97	9.60	03/31/98	12.00	03/31/99	9.00	03/30/00	11.00	03/31/01	224.00
04/01/97	9.30	04/01/98	54.00	04/01/99	53.00	03/31/00	9.90	04/01/01	345.00
04/02/97	8.10	04/02/98	41.00	04/02/99	174.00	04/01/00	8.60	04/02/01	402.00
04/03/97	7.80	04/03/98	17.00	04/03/99	30.00	04/02/00	9.30	04/03/01	76.00
04/04/97	8.10	04/04/98	34.00	04/04/99	16.00	04/03/00	11.00	04/04/01	30.00
04/05/97	7.20	04/05/98	22.00	04/05/99	14.00	04/04/00	13.00	04/05/01	16.00
04/06/97	7.40	04/06/98	15.00	04/06/99	11.00	04/05/00	12.00	04/06/01	11.00
04/07/97	16.00	04/07/98	13.00	04/07/99	10.00	04/06/00	12.00	04/07/01	10.00
04/08/97	11.00	04/08/98	11.00	04/08/99	9.50	04/07/00	12.00	04/08/01	9.10

Appendix 2 continued.

04/09/97	8.00	04/09/98	116.00	04/09/99	9.30	04/08/00	18.00	04/09/01	9.00
04/10/97	7.20	04/10/98	119.00	04/10/99	7.90	04/09/00	51.00	04/10/01	8.40
04/11/97	6.90	04/11/98	24.00	04/11/99	37.00	04/10/00	13.00	04/11/01	8.10
04/12/97	12.00	04/12/98	15.00	04/12/99	69.00	04/11/00	12.00	04/12/01	7.60
04/13/97	19.00	04/13/98	12.00	04/13/99	15.00	04/12/00	9.90	04/13/01	7.30
04/14/97	9.80	04/14/98	13.00	04/14/99	10.00	04/13/00	11.00	04/14/01	6.40
04/15/97	7.90	04/15/98	16.00	04/15/99	9.00	04/14/00	16.00	04/15/01	6.20
04/16/97	7.60	04/16/98	12.00	04/16/99	8.70	04/15/00	36.00	04/16/01	6.50
04/17/97	10.00	04/17/98	25.00	04/17/99	7.50	04/16/00	31.00	04/17/01	6.80
04/18/97	7.30	04/18/98	23.00	04/18/99	7.00	04/17/00	14.00	04/18/01	6.80
04/19/97	6.20	04/19/98	16.00	04/19/99	7.60	04/18/00	154.00	04/19/01	6.70
04/20/97	5.80	04/20/98	18.00	04/20/99	7.90	04/19/00	70.00	04/20/01	6.40
04/21/97	6.60	04/21/98	12.00	04/21/99	7.80	04/20/00	22.00	04/21/01	5.90
04/22/97	40.00	04/22/98	10.00	04/22/99	7.70	04/21/00	19.00	04/22/01	6.00
04/23/97	112.00	04/23/98	9.40	04/23/99	7.80	04/22/00	16.00	04/23/01	6.00
04/24/97	82.00	04/24/98	8.70	04/24/99	6.90	04/23/00	15.00	04/24/01	6.00
04/25/97	19.00	04/25/98	7.30	04/25/99	6.40	04/24/00	15.00	04/25/01	9.00
04/26/97	11.00	04/26/98	6.90	04/26/99	7.10	04/25/00	17.00	04/26/01	7.50
04/27/97	7.70	04/27/98	7.40	04/27/99	7.70	04/26/00	19.00	04/27/01	6.00
04/28/97	280.00	04/28/98	8.10	04/28/99	10.00	04/27/00	37.00	04/28/01	5.00
04/29/97	875.00	04/29/98	7.40	04/29/99	23.00	04/28/00	34.00	04/29/01	5.40
04/30/97	249.00	04/30/98	7.00	04/30/99	185.00	04/29/00	58.00	04/30/01	5.60
05/01/97	57.00	05/01/98	7.60	05/01/99	92.00	04/30/00	31.00	05/01/01	6.00
05/02/97	118.00	05/02/98	9.50	05/02/99	7.50	05/01/00	18.00	05/02/01	5.90
05/03/97	38.00	05/03/98	6.90	05/03/99	5.10	05/02/00	15.00	05/03/01	5.80
05/04/97	38.00	05/04/98	8.80	05/04/99	4.00	05/03/00	14.00	05/04/01	5.70
05/05/97	16.00	05/05/98	7.50	05/05/99	3.70	05/04/00	14.00	05/05/01	5.50
05/06/97	12.00	05/06/98	6.50	05/06/99	3.80	05/05/00	14.00	05/06/01	5.40
05/07/97	9.80	05/07/98	6.40	05/07/99	4.10	05/06/00	14.00	05/07/01	5.30
05/08/97	8.50	05/08/98	16.00	05/08/99	3.80	05/07/00	15.00	05/08/01	5.00
05/09/97	8.20	05/09/98	9.10	05/09/99	3.40	05/08/00	15.00	05/09/01	5.00
05/10/97	7.00	05/10/98	6.90	05/10/99	3.80	05/09/00	16.00	05/10/01	4.90
05/11/97	6.30	05/11/98	79.00	05/11/99	3.70	05/10/00	16.00	05/11/01	4.80
05/12/97	6.80	05/12/98	34.00	05/12/99	4.00	05/11/00	16.00	05/12/01	4.80
05/13/97	7.20	05/13/98	11.00	05/13/99	4.00	05/12/00	16.00	05/13/01	5.00
05/14/97	7.60	05/14/98	8.00	05/14/99	4.20	05/13/00	16.00	05/14/01	4.60
05/15/97	7.00	05/15/98	6.90	05/15/99	5.30	05/14/00	16.00	05/15/01	4.00
05/16/97	6.40	05/16/98	6.00	05/16/99	4.00	05/15/00	16.00	05/16/01	20.00
05/17/97	5.70	05/17/98	5.70	05/17/99	4.00	05/16/00	17.00	05/17/01	10.00
05/18/97	5.50	05/18/98	6.00	05/18/99	4.30	05/17/00	17.00	05/18/01	5.20
05/19/97	6.30	05/19/98	6.10	05/19/99	4.30	05/18/00	17.00	05/19/01	5.10
05/20/97	6.40	05/20/98	5.90	05/20/99	4.40	05/19/00	16.00	05/20/01	5.00
05/21/97	6.30	05/21/98	6.10	05/21/99	4.30	05/20/00	16.00	05/21/01	5.00
05/22/97	6.20	05/22/98	5.80	05/22/99	4.70	05/21/00	16.00	05/22/01	5.50
05/23/97	5.80	05/23/98	16.00	05/23/99	5.90	05/22/00	30.00	05/23/01	6.00
05/24/97	5.30	05/24/98	19.00	05/24/99	4.30	05/23/00	17.00	05/24/01	5.60
05/25/97	6.20	05/25/98	9.80	05/25/99	4.00	05/24/00	12.00	05/25/01	5.30
05/26/97	21.00	05/26/98	7.40	05/26/99	3.90	05/25/00	10.00	05/26/01	42.00
05/27/97	13.00	05/27/98	9.80	05/27/99	3.80	05/26/00	9.60	05/27/01	17.00
05/28/97	7.20	05/28/98	7.60	05/28/99	3.50	05/27/00	8.30	05/28/01	7.00
05/29/97	6.20	05/29/98	7.00	05/29/99	3.00	05/28/00	8.00	05/29/01	6.10

Appendix 2 continued

05/30/97	6.20	05/30/98	6.10	05/30/99	2.60	05/29/00	11.00	05/30/01	5.60
05/31/97	5.70	05/31/98	5.70	05/31/99	3.00	05/30/00	12.00	05/31/01	5.00
06/01/97	8.80	06/01/98	6.00	06/01/99	3.50	05/31/00	10.00	06/01/01	80.00
06/02/97	21.00	06/02/98	6.00	06/02/99	3.90	06/01/00	9.20	06/02/01	50.00
06/03/97	26.00	06/03/98	5.70	06/03/99	3.90	06/02/00	9.00	06/03/01	30.00
06/04/97	16.00	06/04/98	28.00	06/04/99	3.80	06/03/00	7.90	06/04/01	18.00
06/05/97	8.80	06/05/98	19.00	06/05/99	3.20	06/04/00	9.40	06/05/01	12.00
06/06/97	8.30	06/06/98	9.40	06/06/99	3.00	06/05/00	9.60	06/06/01	8.50
06/07/97	13.00	06/07/98	10.00	06/07/99	3.70	06/06/00	9.60	06/07/01	6.00
06/08/97	7.30	06/08/98	7.50	06/08/99	3.90	06/07/00	8.60	06/08/01	5.50
06/09/97	6.40	06/09/98	6.40	06/09/99	4.20	06/08/00	8.30	06/09/01	5.00
06/10/97	6.00	06/10/98	7.40	06/10/99	4.50	06/09/00	8.00	06/10/01	4.40
06/11/97	5.80	06/11/98	7.40	06/11/99	4.80	06/10/00	7.10	06/11/01	4.00
06/12/97	6.00	06/12/98	6.60	06/12/99	4.10	06/11/00	7.40	06/12/01	3.50
06/13/97	12.00	06/13/98	5.80	06/13/99	4.30	06/12/00	8.40	06/13/01	6.00
06/14/97	8.30	06/14/98	5.10	06/14/99	5.70	06/13/00	8.40	06/14/01	30.00
06/15/97	5.80	06/15/98	12.00	06/15/99	9.10	06/14/00	8.40	06/15/01	15.00
06/16/97	5.70	06/16/98	13.00	06/16/99	9.30	06/15/00	8.60	06/16/01	6.00
06/17/97	5.90	06/17/98	7.50	06/17/99	32.00	06/16/00	8.50	06/17/01	4.50
06/18/97	5.90	06/18/98	6.20	06/18/99	5.80	06/17/00	7.50	06/18/01	3.30
06/19/97	5.90	06/19/98	5.80	06/19/99	3.80	06/18/00	6.80	06/19/01	2.90
06/20/97	5.60	06/20/98	5.10	06/20/99	3.20	06/19/00	8.10	06/20/01	2.40
06/21/97	4.90	06/21/98	4.80	06/21/99	3.40	06/20/00	8.80	06/21/01	2.20
06/22/97	4.60	06/22/98	5.50	06/22/99	3.80	06/21/00	8.50	06/22/01	3.80
06/23/97	5.30	06/23/98	5.70	06/23/99	3.90	06/22/00	8.90	06/23/01	6.00
06/24/97	5.50	06/24/98	6.10	06/24/99	3.90	06/23/00	8.30	06/24/01	5.20
06/25/97	5.70	06/25/98	5.90	06/25/99	4.10	06/24/00	7.40	06/25/01	40.00
06/26/97	5.80	06/26/98	5.80	06/26/99	4.00	06/25/00	6.80	06/26/01	19.00
06/27/97	7.80	06/27/98	5.10	06/27/99	4.50	06/26/00	7.70	06/27/01	10.00
06/28/97	6.30	06/28/98	4.80	06/28/99	4.70	06/27/00	8.50	06/28/01	8.50
06/29/97	5.10	06/29/98	5.30	06/29/99	4.90	06/28/00	9.90	06/29/01	7.00
06/30/97	5.60	06/30/98	6.00	06/30/99	4.60	06/29/00	15.00	06/30/01	6.00
07/01/97	6.20	07/01/98	8.10	07/01/99	4.70	06/30/00	9.70	07/01/01	5.00
07/02/97	8.90	07/02/98	5.90	07/02/99	5.00	07/01/00	6.70	07/02/01	4.90
07/03/97	6.50	07/03/98	4.80	07/03/99	4.30	07/02/00	5.80	07/03/01	4.80
07/04/97	5.20	07/04/98	4.60	07/04/99	3.70	07/03/00	5.70	07/04/01	5.00
07/05/97	7.50	07/05/98	19.00	07/05/99	3.50	07/04/00	6.40	07/05/01	5.00
07/06/97	5.70	07/06/98	8.30	07/06/99	4.00	07/05/00	8.10	07/06/01	4.90
07/07/97	5.60	07/07/98	6.20	07/07/99	4.10	07/06/00	10.00	07/07/01	4.80
07/08/97	5.40	07/08/98	5.60	07/08/99	4.10	07/07/00	12.00	07/08/01	7.00
07/09/97	5.50	07/09/98	9.00	07/09/99	4.10	07/08/00	11.00	07/09/01	7.80
07/10/97	5.60	07/10/98	6.90	07/10/99	4.20	07/09/00	12.00	07/10/01	8.00
07/11/97	5.40	07/11/98	5.50	07/11/99	4.70	07/10/00	14.00	07/11/01	6.20
07/12/97	4.50	07/12/98	4.70	07/12/99	5.30	07/11/00	15.00	07/12/01	5.00
07/13/97	4.40	07/13/98	5.10	07/13/99	8.00	07/12/00	15.00	07/13/01	5.00
07/14/97	5.20	07/14/98	5.40	07/14/99	25.00	07/13/00	16.00	07/14/01	4.90
07/15/97	5.50	07/15/98	5.60	07/15/99	9.10	07/14/00	15.00	07/15/01	4.80
07/16/97	6.10	07/16/98	14.00	07/16/99	5.40	07/15/00	20.00	07/16/01	4.70
07/17/97	11.00	07/17/98	31.00	07/17/99	3.70	07/16/00	16.00	07/17/01	4.50
07/18/97	6.90	07/18/98	19.00	07/18/99	3.20	07/17/00	13.00	07/18/01	4.40
07/19/97	5.30	07/19/98	6.80	07/19/99	3.60	07/18/00	13.00	07/19/01	4.30

Appendix 2 Continued

07/20/97	4.80	07/20/98	6.50	07/20/99	3.80	07/19/00	13.00	07/20/01	4.10
07/21/97	5.50	07/21/98	6.60	07/21/99	3.80	07/20/00	13.00	07/21/01	4.00
07/22/97	6.50	07/22/98	6.70	07/22/99	3.90	07/21/00	13.00	07/22/01	4.00
07/23/97	37.00	07/23/98	7.10	07/23/99	3.70	07/22/00	13.00	07/23/01	4.00
07/24/97	290.00	07/24/98	6.90	07/24/99	3.20	07/23/00	12.00	07/24/01	8.00
07/25/97	261.00	07/25/98	25.00	07/25/99	3.20	07/24/00	80.00	07/25/01	16.00
07/26/97	19.00	07/26/98	15.00	07/26/99	3.30	07/25/00	36.00	07/26/01	18.00
07/27/97	9.00	07/27/98	8.20	07/27/99	3.40	07/26/00	18.00	07/27/01	90.00
07/28/97	9.50	07/28/98	12.00	07/28/99	3.50	07/27/00	12.00	07/28/01	18.00
07/29/97	8.50	07/29/98	7.70	07/29/99	3.60	07/28/00	12.00	07/29/01	4.00
07/30/97	8.30	07/30/98	9.90	07/30/99	3.60	07/29/00	11.00	07/30/01	5.00
07/31/97	8.50	07/31/98	12.00	07/31/99	3.10	07/30/00	21.00	07/31/01	3.80
08/01/97	7.60	08/01/98	7.90	08/01/99	3.00	07/31/00	14.00	08/01/01	3.00
08/02/97	6.30	08/02/98	6.30	08/02/99	3.20	08/01/00	21.00	08/02/01	2.60
08/03/97	5.80	08/03/98	6.30	08/03/99	3.40	08/02/00	107.00	08/03/01	3.10
08/04/97	6.70	08/04/98	6.10	08/04/99	3.40	08/03/00	28.00	08/04/01	3.60
08/05/97	8.10	08/05/98	5.90	08/05/99	3.90	08/04/00	20.00	08/05/01	3.80
08/06/97	8.80	08/06/98	5.90	08/06/99	3.20	08/05/00	198.00	08/06/01	4.20
08/07/97	6.80	08/07/98	6.00	08/07/99	2.60	08/06/00	71.00	08/07/01	4.20
08/08/97	6.50	08/08/98	6.00	08/08/99	3.10	08/07/00	13.00	08/08/01	4.20
08/09/97	5.60	08/09/98	6.10	08/09/99	3.60	08/08/00	10.00	08/09/01	3.80
08/10/97	5.50	08/10/98	14.00	08/10/99	3.50	08/09/00	9.50	08/10/01	3.80
08/11/97	6.40	08/11/98	16.00	08/11/99	3.60	08/10/00	14.00	08/11/01	7.70
08/12/97	6.50	08/12/98	8.30	08/12/99	3.40	08/11/00	11.00	08/12/01	87.00
08/13/97	6.50	08/13/98	7.20	08/13/99	3.60	08/12/00	8.80	08/13/01	34.00
08/14/97	6.60	08/14/98	6.50	08/14/99	8.50	08/13/00	7.70	08/14/01	32.00
08/15/97	6.60	08/15/98	5.50	08/15/99	15.00	08/14/00	8.10	08/15/01	18.00
08/16/97	5.70	08/16/98	5.80	08/16/99	5.00	08/15/00	9.30	08/16/01	11.00
08/17/97	5.60	08/17/98	32.00	08/17/99	4.00	08/16/00	11.00	08/17/01	11.00
08/18/97	6.20	08/18/98	9.50	08/18/99	4.00	08/17/00	9.70	08/18/01	11.00
08/19/97	6.10	08/19/98	7.40	08/19/99	3.40	08/18/00	9.60	08/19/01	12.00
08/20/97	6.30	08/20/98	6.40	08/20/99	3.20	08/19/00	8.70	08/20/01	13.00
08/21/97	7.40	08/21/98	6.10	08/21/99	2.80	08/20/00	8.20	08/21/01	14.00
08/22/97	6.60	08/22/98	5.50	08/22/99	2.40	08/21/00	8.80	08/22/01	11.00
08/23/97	5.60	08/23/98	5.40	08/23/99	2.70	08/22/00	9.30	08/23/01	10.00
08/24/97	5.10	08/24/98	5.90	08/24/99	3.00	08/23/00	9.30	08/24/01	23.00
08/25/97	5.80	08/25/98	6.30	08/25/99	4.70	08/24/00	9.80	08/25/01	12.00
08/26/97	6.00	08/26/98	9.00	08/26/99	41.00	08/25/00	9.80	08/26/01	9.80
08/27/97	6.00	08/27/98	6.70	08/27/99	33.00	08/26/00	9.00	08/27/01	9.90
08/28/97	6.00	08/28/98	6.60	08/28/99	6.00	08/27/00	28.00	08/28/01	14.00
08/29/97	5.80	08/29/98	5.90	08/29/99	3.30	08/28/00	17.00	08/29/01	12.00
08/30/97	5.30	08/30/98	8.70	08/30/99	3.00	08/29/00	11.00	08/30/01	38.00
08/31/97	5.10	08/31/98	6.30	08/31/99	3.00	08/30/00	29.00	08/31/01	188.00
09/01/97	6.10	09/01/98	6.20	09/01/99	2.80	08/31/00	26.00	09/01/01	18.00
09/02/97	7.70	09/02/98	6.00	09/02/99	2.70	09/01/00	16.00	09/02/01	16.00
09/03/97	6.30	09/03/98	8.50	09/03/99	2.70	09/02/00	11.00	09/03/01	11.00
09/04/97	5.90	09/04/98	106.00	09/04/99	3.10	09/03/00	11.00	09/04/01	10.00
09/05/97	5.70	09/05/98	45.00	09/05/99	627.00	09/04/00	21.00	09/05/01	10.00
09/06/97	5.20	09/06/98	7.20	09/06/99	1270.00	09/05/00	26.00	09/06/01	9.10
09/07/97	5.00	09/07/98	5.10	09/07/99	685.00	09/06/00	12.00	09/07/01	8.50
09/08/97	5.80	09/08/98	10.00	09/08/99	147.00	09/07/00	9.20	09/08/01	8.20

Appendix 2 continued

09/09/97	7.40	09/09/98	12.00	09/09/99	19.00	09/08/00	8.50	09/09/01	9.40
09/10/97	14.00	09/10/98	6.20	09/10/99	77.00	09/09/00	8.00	09/10/01	11.00
09/11/97	45.00	09/11/98	5.00	09/11/99	18.00	09/10/00	8.00	09/11/01	11.00
09/12/97	12.00	09/12/98	3.80	09/12/99	8.80	09/11/00	8.00	09/12/01	9.30
09/13/97	5.10	09/13/98	3.90	09/13/99	7.30	09/12/00	7.50	09/13/01	9.30
09/14/97	4.20	09/14/98	4.20	09/14/99	7.00	09/13/00	8.00	09/14/01	9.10
09/15/97	4.70	09/15/98	4.40	09/15/99	45.00	09/14/00	9.30	09/15/01	9.40
09/16/97	4.60	09/16/98	4.20	09/16/99	1940.00	09/15/00	12.00	09/16/01	8.60
09/17/97	4.30	09/17/98	4.40	09/17/99	337.00	09/16/00	7.80	09/17/01	8.90
09/18/97	4.30	09/18/98	4.20	09/18/99	35.00	09/17/00	7.80	09/18/01	8.80
09/19/97	4.20	09/19/98	3.60	09/19/99	15.00	09/18/00	8.90	09/19/01	8.70
09/20/97	3.70	09/20/98	3.50	09/20/99	11.00	09/19/00	11.00	09/20/01	8.60
09/21/97	3.30	09/21/98	4.10	09/21/99	10.00	09/20/00	10.00	09/21/01	9.50
09/22/97	3.80	09/22/98	4.30	09/22/99	124.00	09/21/00	9.60	09/22/01	8.50
09/23/97	3.90	09/23/98	4.10	09/23/99	37.00	09/22/00	9.40	09/23/01	8.30
09/24/97	10.00	09/24/98	4.00	09/24/99	12.00	09/23/00	17.00	09/24/01	19.00
09/25/97	20.00	09/25/98	4.00	09/25/99	8.60	09/24/00	17.00	09/25/01	34.00
09/26/97	7.60	09/26/98	3.60	09/26/99	7.30	09/25/00	14.00	09/26/01	8.20
09/27/97	4.70	09/27/98	3.40	09/27/99	83.00	09/26/00	74.00	09/27/01	6.20
09/28/97	4.10	09/28/98	4.00	09/28/99	528.00	09/27/00	11.00	09/28/01	5.50
09/29/97	4.90	09/29/98	4.20	09/29/99	734.00	09/28/00	6.90	09/29/01	5.20
09/30/97	4.50	09/30/98	6.60	09/30/99	619.00	09/29/00	6.10	09/30/01	5.40
10/01/97	4.40	10/01/98	5.00	10/01/99	161.00	09/30/00	6.00	10/01/01	5.90
10/02/97	4.10	10/02/98	4.40	10/02/99	21.00	10/01/00	5.80	10/02/01	6.20
10/03/97	4.10	10/03/98	3.60	10/03/99	12.00	10/02/00	6.40	10/03/01	6.40
10/04/97	3.50	10/04/98	3.70	10/04/99	10.00	10/03/00	6.10	10/04/01	6.50
10/05/97	3.30	10/05/98	4.60	10/05/99	9.30	10/04/00	5.80	10/05/01	6.60
10/06/97	3.70	10/06/98	4.50	10/06/99	8.80	10/05/00	5.90	10/06/01	8.20
10/07/97	4.00	10/07/98	4.40	10/07/99	8.10	10/06/00	5.70	10/07/01	9.30
10/08/97	4.30	10/08/98	42.00	10/08/99	7.60	10/07/00	5.00	10/08/01	7.30
10/09/97	4.20	10/09/98	116.00	10/09/99	6.80	10/08/00	4.70	10/09/01	7.10
10/10/97	4.40	10/10/98	15.00	10/10/99	7.20	10/09/00	5.20	10/10/01	7.30
10/11/97	3.80	10/11/98	7.00	10/11/99	16.00	10/10/00	5.20	10/11/01	7.50
10/12/97	3.50	10/12/98	5.80	10/12/99	11.00	10/11/00	5.00	10/12/01	7.40
10/13/97	4.00	10/13/98	5.40	10/13/99	8.90	10/12/00	4.70	10/13/01	7.20
10/14/97	4.50	10/14/98	5.20	10/14/99	9.20	10/13/00	4.40	10/14/01	10.00
10/15/97	6.10	10/15/98	5.10	10/15/99	8.90	10/14/00	4.10	10/15/01	63.00
10/16/97	5.10	10/16/98	5.00	10/16/99	7.50	10/15/00	3.90	10/16/01	11.00
10/17/97	4.80	10/17/98	4.30	10/17/99	25.00	10/16/00	4.70	10/17/01	8.10
10/18/97	4.00	10/18/98	4.30	10/18/99	204.00	10/17/00	4.80	10/18/01	7.20
10/19/97	40.00	10/19/98	5.30	10/19/99	47.00	10/18/00	4.90	10/19/01	6.80
10/20/97	35.00	10/20/98	6.10	10/20/99	19.00	10/19/00	4.80	10/20/01	6.50
10/21/97	9.30	10/21/98	5.80	10/21/99	46.00	10/20/00	4.50	10/21/01	6.30
10/22/97	7.40	10/22/98	6.00	10/22/99	23.00	10/21/00	4.50	10/22/01	7.20
10/23/97	6.80	10/23/98	6.40	10/23/99	14.00	10/22/00	4.50	10/23/01	7.60
10/24/97	6.30	10/24/98	6.10	10/24/99	11.00	10/23/00	5.00	10/24/01	7.70
10/25/97	5.50	10/25/98	6.00	10/25/99	10.00	10/24/00	4.80	10/25/01	8.00
10/26/97	6.20	10/26/98	6.60	10/26/99	10.00	10/25/00	4.70	10/26/01	7.90
10/27/97	12.00	10/27/98	6.80	10/27/99	10.00	10/26/00	4.40	10/27/01	7.20
10/28/97	8.10	10/28/98	6.80	10/28/99	10.00	10/27/00	4.10	10/28/01	7.10
10/29/97	6.60	10/29/98	7.00	10/29/99	10.00	10/28/00	3.60	10/29/01	7.50

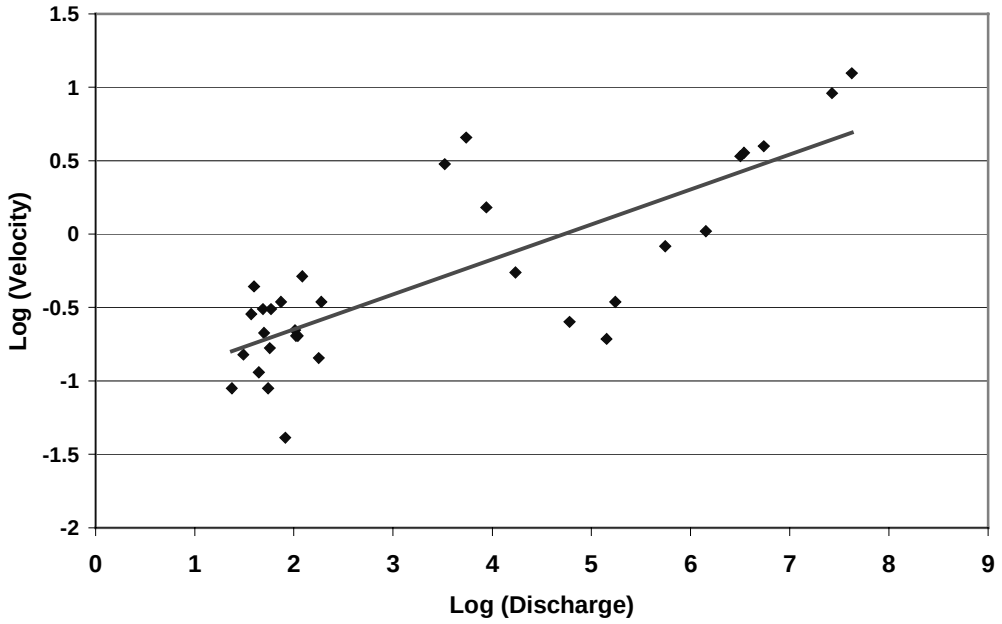
Appendix 2 continued

10/30/97	6.20	10/30/98	7.00	10/30/99	9.30	10/29/00	3.30	10/30/01	7.80
10/31/97	5.90	10/31/98	6.20	10/31/99	9.70	10/30/00	3.40	10/31/01	7.70
11/01/97	11.00	11/01/98	6.10	11/01/99	11.00	10/31/00	3.50	11/01/01	7.30
11/02/97	12.00	11/02/98	6.90	11/02/99	15.00	11/01/00	3.50	11/02/01	7.30
11/03/97	9.80	11/03/98	37.00	11/03/99	18.00	11/02/00	3.70	11/03/01	6.50
11/04/97	8.20	11/04/98	22.00	11/04/99	12.00	11/03/00	3.90	11/04/01	6.50
11/05/97	7.20	11/05/98	10.00	11/05/99	11.00	11/04/00	3.90	11/05/01	7.20
11/06/97	7.00	11/06/98	7.30	11/06/99	10.00	11/05/00	4.50	11/06/01	7.00
11/07/97	7.00	11/07/98	5.90	11/07/99	10.00	11/06/00	5.20	11/07/01	7.10
11/08/97	6.30	11/08/98	5.70	11/08/99	11.00	11/07/00	5.50	11/08/01	7.00
11/09/97	5.90	11/09/98	6.20	11/09/99	11.00	11/08/00	5.90	11/09/01	6.80
11/10/97	6.40	11/10/98	6.50	11/10/99	11.00	11/09/00	6.20	11/10/01	6.80
11/11/97	6.60	11/11/98	6.80	11/11/99	10.00	11/10/00	6.50	11/11/01	5.90
11/12/97	6.90	11/12/98	7.30	11/12/99	10.00	11/11/00	6.50	11/12/01	6.70
11/13/97	25.00	11/13/98	7.00	11/13/99	8.90	11/12/00	6.90	11/13/01	7.10
11/14/97	108.00	11/14/98	6.70	11/14/99	8.50	11/13/00	7.70	11/14/01	7.20
11/15/97	43.00	11/15/98	12.00	11/15/99	8.70	11/14/00	9.90	11/15/01	7.50
11/16/97	13.00	11/16/98	9.90	11/16/99	8.80	11/15/00	7.50	11/16/01	7.40
11/17/97	10.00	11/17/98	19.00	11/17/99	9.50	11/16/00	7.30	11/17/01	6.70
11/18/97	9.10	11/18/98	12.00	11/18/99	10.00	11/17/00	7.30	11/18/01	5.60
11/19/97	8.30	11/19/98	6.70	11/19/99	10.00	11/18/00	7.10	11/19/01	6.10
11/20/97	7.50	11/20/98	5.60	11/20/99	10.00	11/19/00	7.60	11/20/01	6.30
11/21/97	8.20	11/21/98	4.80	11/21/99	10.00	11/20/00	9.80	11/21/01	6.10
11/22/97	259.00	11/22/98	4.30	11/22/99	10.00	11/21/00	8.70	11/22/01	5.30
11/23/97	155.00	11/23/98	4.70	11/23/99	10.00	11/22/00	8.20	11/23/01	4.80
11/24/97	18.00	11/24/98	4.90	11/24/99	10.00	11/23/00	7.40	11/24/01	4.90
11/25/97	12.00	11/25/98	4.70	11/25/99	9.60	11/24/00	7.20	11/25/01	4.80
11/26/97	10.00	11/26/98	4.90	11/26/99	37.00	11/25/00	16.00	11/26/01	4.60
11/27/97	8.60	11/27/98	4.50	11/27/99	146.00	11/26/00	42.00	11/27/01	4.30
11/28/97	7.20	11/28/98	4.00	11/28/99	13.00	11/27/00	6.80	11/28/01	4.20
11/29/97	6.60	11/29/98	4.30	11/29/99	5.20	11/28/00	5.70	11/29/01	4.20
11/30/97	11.00	11/30/98	5.00	11/30/99	4.10	11/29/00	5.50	11/30/01	4.20
12/01/97	18.00	12/01/98	5.10	12/01/99	3.70	11/30/00	5.20	12/01/01	3.90
12/02/97	12.00	12/02/98	4.90	12/02/99	3.20	12/01/00	5.10	12/02/01	3.70
12/03/97	9.50	12/03/98	5.00	12/03/99	3.10	12/02/00	5.10	12/03/01	4.00
12/04/97	8.90	12/04/98	4.60	12/04/99	3.20	12/03/00	5.10	12/04/01	4.00
12/05/97	8.00	12/05/98	4.20	12/05/99	4.10	12/04/00	5.10	12/05/01	4.00
12/06/97	6.80	12/06/98	4.00	12/06/99	6.10	12/05/00	5.20	12/06/01	4.00
12/07/97	5.90	12/07/98	4.50	12/07/99	6.90	12/06/00	5.20	12/07/01	3.90
12/08/97	6.20	12/08/98	5.00	12/08/99	6.40	12/07/00	5.20	12/08/01	3.60
12/09/97	6.80	12/09/98	5.10	12/09/99	6.10	12/08/00	5.40	12/09/01	3.50
12/10/97	21.00	12/10/98	4.90	12/10/99	6.30	12/09/00	5.40	12/10/01	3.90
12/11/97	28.00	12/11/98	4.70	12/11/99	7.30	12/10/00	5.40	12/11/01	17.00
12/12/97	13.00	12/12/98	4.10	12/12/99	5.70	12/11/00	5.60	12/12/01	4.90
12/13/97	9.50	12/13/98	41.00	12/13/99	5.90	12/12/00	5.60	12/13/01	3.10
12/14/97	7.60	12/14/98	62.00	12/14/99	146.00	12/13/00	5.40	12/14/01	2.80
12/15/97	7.40	12/15/98	9.50	12/15/99	183.00	12/14/00	5.70	12/15/01	2.80
12/16/97	7.20	12/16/98	65.00	12/16/99	41.00	12/15/00	5.60	12/16/01	2.80
12/17/97	7.00	12/17/98	25.00	12/17/99	33.00	12/16/00	6.70	12/17/01	3.10
12/18/97	6.80	12/18/98	7.50	12/18/99	29.00	12/17/00	153.00	12/18/01	6.90
12/19/97	6.60	12/19/98	5.00	12/19/99	29.00	12/18/00	170.00	12/19/01	4.60

Appendix 2 continued

12/20/97	5.60	12/20/98	3.90	12/20/99	31.00	12/19/00	29.00	12/20/01	3.80
12/21/97	5.00	12/21/98	3.70	12/21/99	30.00	12/20/00	29.00	12/21/01	3.70
12/22/97	37.00	12/22/98	3.50	12/22/99	33.00	12/21/00	25.00	12/22/01	3.60
12/23/97	73.00	12/23/98	4.70	12/23/99	30.00	12/22/00	23.00	12/23/01	3.50
12/24/97	31.00	12/24/98	87.00	12/24/99	28.00	12/23/00	21.00	12/24/01	3.80
12/25/97	80.00	12/25/98	229.00	12/25/99	27.00	12/24/00	20.00	12/25/01	3.90
12/26/97	24.00	12/26/98	30.00	12/26/99	26.00	12/25/00	19.00	12/26/01	3.90
12/27/97	57.00	12/27/98	8.20	12/27/99	26.00	12/26/00	19.00	12/27/01	4.10
12/28/97	118.00	12/28/98	6.00	12/28/99	27.00	12/27/00	19.00	12/28/01	4.10
12/29/97	31.00	12/29/98	5.00	12/29/99	27.00	12/28/00	19.00	12/29/01	4.10
12/30/97	26.00	12/30/98	4.70	12/30/99	27.00	12/29/00	18.00	12/30/01	4.10
12/31/97	16.00	12/31/98	4.40	12/31/99	28.00	12/30/00	19.00	12/31/01	4.30
						12/31/00	18.00		

Appendix 3. Relationship between Flow and Velocity at the Ambient Station (3660000)



The relationship is expressed by $V = 0.325\ Q^{0.24}$ where V is velocity in ft and Q is discharge rate in cfs. The coefficient of determination (R- Square) is 0.62. (Data Source: USGS).

Appendix 4. Fecal coliform at Durham West Water Treatment Plant (WWTP).
Daily Fecal Coliform concentration and Flow data measured for the year 1997 through 2001.

Date	fecal #/100ml	Flow cfs	Date	fecal #/100ml	Flow cfs	Date	fecal #/100ml	Flow cfs
01_01_1997	17.00	4.48	01_01_1999	30.00	3.57	01_01_2001	124.00	3.91
01_02_1997	7.00	5.46	01_02_1999	6.00	12.15	01_02_2001	22.00	4.02
01_03_1997	2.00	5.53	01_03_1999	30.00	26.84	01_03_2001	11.00	4.86
01_04_1997	17.00	4.70	01_04_1999	30.00	7.33	01_04_2001	2.00	4.90
01_05_1997	17.00	5.01	01_05_1999	4.00	5.82	01_05_2001	1.00	4.78
01_06_1997	2.00	5.72	01_06_1999	6.00	5.82	01_06_2001	181.00	4.12
01_07_1997	9.00	5.39	01_07_1999	13.00	5.52	01_07_2001	181.00	4.33
01_08_1997	21.00	5.87	01_08_1999	9.00	5.00	01_08_2001	18.00	5.07
01_09_1997	54.00	21.27	01_09_1999	11.00	4.43	01_09_2001	7.00	5.45
01_10_1997	78.00	7.24	01_10_1999	30.00	4.12	01_10_2001	410.00	5.15
01_11_1997	17.00	5.36	01_11_1999	30.00	5.04	01_11_2001	2600.00	5.15
01_12_1997	17.00	5.03	01_12_1999	30.00	5.07	01_12_2001	145.00	5.46
01_13_1997	15.00	6.25	01_13_1999	15.00	5.20	01_13_2001	181.00	5.04
01_14_1997	12.00	5.89	01_14_1999	8.00	5.40	01_14_2001	181.00	4.69
01_15_1997	27.00	7.12	01_15_1999	6.00	6.05	01_15_2001	181.00	3.71
01_16_1997	42.00	9.14	01_16_1999	22.00	3.50	01_16_2001	45.00	5.04
01_17_1997	29.00	6.59	01_17_1999	10.00	8.22	01_17_2001	38.00	5.01
01_18_1997	17.00	4.94	01_18_1999	30.00	24.23	01_18_2001	43.00	5.07
01_19_1997	17.00	5.03	01_19_1999	30.00	6.87	01_19_2001	4.00	5.26
01_20_1997	17.00	6.19	01_20_1999	26.00	6.56	01_20_2001	181.00	5.37
01_21_1997	6.00	5.82	01_21_1999	12.00	6.11	01_21_2001	181.00	6.50
01_22_1997	6.00	6.43	01_22_1999	190.00	5.69	01_22_2001	34.00	4.10
01_23_1997	6.00	5.98	01_23_1999	11.00	15.18	01_23_2001	11.00	5.45
01_24_1997	3.00	6.62	01_24_1999	30.00	28.67	01_24_2001	40.00	5.69
01_25_1997	17.00	8.18	01_25_1999	30.00	13.85	01_25_2001	9.00	6.03
01_26_1997	17.00	5.04	01_26_1999	4.00	6.51	01_26_2001	38.00	5.23
01_27_1997	8.00	6.34	01_27_1999	8.00	6.45	01_27_2001	181.00	5.77
01_28_1997	2.00	9.25	01_28_1999	29.00	5.77	01_28_2001	181.00	4.55
01_29_1997	17.00	6.78	01_29_1999	210.00	5.89	01_29_2001	27.00	4.66
01_30_1997	5.00	6.76	01_30_1999	2.00	4.70	01_30_2001	31.00	5.63
01_31_1997	6.00	6.42	01_31_1999	30.00	4.16	01_31_2001	278.00	6.11
02_01_1997	340.00	5.37	02_01_1999	4.00	8.34	02_01_2001	24.00	5.35
02_02_1997	340.00	5.38	02_02_1999	22.00	6.44	02_02_2001	23.00	5.45
02_03_1997	4.00	6.21	02_03_1999	8.00	6.13	02_03_2001	151.00	5.77
02_04_1997	3.00	5.87	02_04_1999	3.00	5.88	02_04_2001	151.00	4.61
02_05_1997	340.00	5.96	02_05_1999	62.00	4.95	02_05_2001	55.00	4.38
02_06_1997	8.00	6.02	02_06_1999	683.00	4.98	02_06_2001	31.00	5.76
02_07_1997	11.00	6.12	02_07_1999	683.00	5.57	02_07_2001	41.00	5.48
02_08_1997	340.00	6.41	02_08_1999	94.00	5.51	02_08_2001	60.00	5.40
02_09_1997	340.00	5.46	02_09_1999	6000.00	5.51	02_09_2001	300.00	5.35
02_10_1997	21.00	6.24	02_10_1999	1200.00	5.31	02_10_2001	151.00	5.34
02_11_1997	26.00	6.21	02_11_1999	1170.00	5.55	02_11_2001	151.00	4.35
02_12_1997	99.00	5.90	02_12_1999	305.00	5.55	02_12_2001	27.00	4.72
02_13_1997	37.00	9.66	02_13_1999	683.00	4.21	02_13_2001	37.00	6.03
02_14_1997	207.00	13.07	02_14_1999	683.00	3.88	02_14_2001	58.00	6.30
02_15_1997	340.00	9.93	02_15_1999	4.00	4.98	02_15_2001	41.00	6.64
02_16_1997	340.00	6.89	02_16_1999	1310.00	5.31	02_16_2001	24.00	6.39

Appendix 4 continued

02_17_1997	340.00	6.60	02_17_1999	1900.00	5.68	02_17_2001	151.00	10.78
02_18_1997	3.00	6.68	02_18_1999	40.00	6.47	02_18_2001	151.00	23.50
02_19_1997	24.00	6.29	02_19_1999	1060.00	8.42	02_19_2001	47.00	5.37
02_20_1997	17.00	6.54	02_20_1999	683.00	6.53	02_20_2001	46.00	6.28
02_21_1997	2150.00	6.67	02_21_1999	683.00	4.84	02_21_2001	21.00	6.16
02_22_1997	340.00	5.00	02_22_1999	14.00	5.66	02_22_2001	1900.00	5.79
02_23_1997	340.00	4.50	02_23_1999	72.00	5.55	02_23_2001	29.00	7.91
02_24_1997	7.00	5.86	02_24_1999	27.00	5.54	02_24_2001	151.00	6.19
02_25_1997	2640.00	5.78	02_25_1999	42.00	5.49	02_25_2001	151.00	5.55
02_26_1997	780.00	6.14	02_26_1999	320.00	5.32	02_26_2001	36.00	5.77
02_27_1997	78.00	6.22	02_27_1999	683.00	4.69	02_27_2001	173.00	6.25
02_28_1997	17.00	6.75	02_28_1999	568.00	4.83	02_28_2001	48.00	6.00
03_01_1997	218.00	5.73	03_01_1999	15.00	5.88	03_01_2001	31.00	5.96
03_02_1997	218.00	5.33	03_02_1999	136.00	5.74	03_02_2001	40.00	5.89
03_03_1997	46.00	6.85	03_03_1999	1200.00	5.59	03_03_2001	367.00	5.80
03_04_1997	400.00	6.13	03_04_1999	2100.00	5.21	03_04_2001	367.00	9.50
03_05_1997	380.00	6.87	03_05_1999	29.00	5.03	03_05_2001	13.00	18.58
03_06_1997	1070.00	6.63	03_06_1999	568.00	4.12	03_06_2001	33.00	7.36
03_07_1997	190.00	6.14	03_07_1999	568.00	3.76	03_07_2001	14.00	6.47
03_08_1997	218.00	4.96	03_08_1999	3200.00	5.09	03_08_2001	54.00	5.89
03_09_1997	218.00	4.88	03_09_1999	3600.00	5.18	03_09_2001	33.00	6.02
03_10_1997	380.00	6.26	03_10_1999	27.00	5.23	03_10_2001	367.00	5.48
03_11_1997	270.00	5.96	03_11_1999	220.00	5.60	03_11_2001	367.00	4.81
03_12_1997	250.00	6.02	03_12_1999	46.00	4.44	03_12_2001	480.00	4.78
03_13_1997	222.00	6.26	03_13_1999	568.00	4.02	03_13_2001	41.00	6.19
03_14_1997	600.00	7.63	03_14_1999	568.00	16.74	03_14_2001	210.00	7.41
03_15_1997	218.00	5.21	03_15_1999	92.00	21.04	03_15_2001	29.00	3.62
03_16_1997	218.00	4.82	03_16_1999	86.00	6.65	03_16_2001	45.00	6.19
03_17_1997	48.00	5.97	03_17_1999	35.00	6.28	03_17_2001	367.00	5.52
03_18_1997	27.00	6.57	03_18_1999	420.00	5.97	03_18_2001	367.00	4.47
03_19_1997	110.00	11.15	03_19_1999	69.00	5.34	03_19_2001	58.00	4.29
03_20_1997	80.00	8.01	03_20_1999	568.00	4.33	03_20_2001	136.00	5.32
03_21_1997	118.00	6.79	03_21_1999	568.00	26.29	03_21_2001	367.00	18.12
03_22_1997	218.00	5.30	03_22_1999	1040.00	13.57	03_22_2001	6200.00	28.14
03_23_1997	218.00	4.92	03_23_1999	74.00	6.56	03_23_2001	39.00	11.43
03_24_1997	20.00	5.83	03_24_1999	16.00	6.30	03_24_2001	54.00	7.27
03_25_1997	85.00	6.06	03_25_1999	20.00	6.19	03_25_2001	42.00	5.91
03_26_1997	23.00	6.13	03_26_1999	13.00	5.97	03_26_2001	55.00	5.60
03_27_1997	9.00	5.66	03_27_1999	568.00	4.66	03_27_2001	58.00	5.77
03_28_1997	218.00	5.92	03_28_1999	568.00	4.33	03_28_2001	56.00	5.82
03_29_1997	218.00	4.48	03_29_1999	6.00	6.17	03_29_2001	210.00	6.22
03_30_1997	218.00	4.10	03_30_1999	607.00	5.31	03_30_2001	510.00	27.45
03_31_1997	28.00	5.33	03_31_1999	9.00	5.57	03_31_2001	367.00	20.59
04_01_1997	104.00	5.74	04_01_1999	136.00	19.84	04_01_2001	135.00	4.21
04_02_1997	232.00	5.59	04_02_1999	423.00	7.98	04_02_2001	135.00	4.21
04_03_1997	52.00	5.38	04_03_1999	423.00	5.11	04_03_2001	25.00	7.44
04_04_1997	108.00	5.69	04_04_1999	423.00	4.81	04_04_2001	91.00	6.42
04_05_1997	43.00	4.64	04_05_1999	56.00	5.37	04_05_2001	600.00	5.72
04_06_1997	43.00	4.84	04_06_1999	36.00	5.42	04_06_2001	100.00	6.92
04_07_1997	4.00	5.46	04_07_1999	60.00	5.42	04_07_2001	54.00	6.11
04_08_1997	43.00	5.44	04_08_1999	230.00	5.26	04_08_2001	135.00	5.89

Appendix 4 continued

04_09_1997	7.00	5.30	04_09_1999	44.00	5.49	04_09_2001	91.00	6.68
04_10_1997	25.00	5.34	04_10_1999	423.00	4.21	04_10_2001	360.00	5.96
04_11_1997	20.00	5.24	04_11_1999	423.00	9.04	04_11_2001	40.00	5.68
04_12_1997	43.00	5.41	04_12_1999	38.00	5.68	04_12_2001	40.00	5.37
04_13_1997	43.00	4.59	04_13_1999	205.00	5.29	04_13_2001	57.00	4.60
04_14_1997	13.00	5.77	04_14_1999	29.00	5.21	04_14_2001	135.00	3.93
04_15_1997	4.00	5.48	04_15_1999	10.00	5.46	04_15_2001	135.00	4.02
04_16_1997	12.00	5.63	04_16_1999	8.00	5.18	04_16_2001	19.00	5.11
04_17_1997	12.00	5.65	04_17_1999	423.00	4.25	04_17_2001	84.00	5.43
04_18_1997	5.00	5.47	04_18_1999	423.00	4.19	04_18_2001	42.00	7.01
04_19_1997	43.00	4.17	04_19_1999	69.00	5.04	04_19_2001	21.00	5.94
04_20_1997	43.00	4.11	04_20_1999	380.00	4.92	04_20_2001	9.00	5.04
04_21_1997	7.00	6.00	04_21_1999	280.00	5.09	04_21_2001	135.00	4.60
04_22_1997	9.00	7.58	04_22_1999	2400.00	5.11	04_22_2001	135.00	4.50
04_23_1997	5.00	8.17	04_23_1999	1740.00	5.25	04_23_2001	91.00	5.37
04_24_1997	42.00	6.64	04_24_1999	423.00	3.84	04_24_2001	600.00	5.94
04_25_1997	22.00	6.08	04_25_1999	423.00	3.65	04_25_2001	73.00	5.86
04_26_1997	43.00	4.47	04_26_1999	160.00	5.42	04_26_2001	39.00	5.12
04_27_1997	43.00	7.32	04_27_1999	2600.00	5.18	04_27_2001	217.00	5.01
04_28_1997	165.00	12.93	04_28_1999	260.00	5.88	04_28_2001	135.00	4.33
04_29_1997	43.00	18.23	04_29_1999	120.00	14.71	04_29_2001	135.00	3.85
04_30_1997	9.00	6.97	04_30_1999	20.00	17.78	04_30_2001	185.00	5.26
05_01_1997	56.00	8.28	05_01_1999	129.00	4.90	05_01_2001	70.00	5.14
05_02_1997	5.00	6.70	05_02_1999	129.00	4.60	05_02_2001	220.00	5.14
05_03_1997	7.00	6.30	05_03_1999	7.00	5.43	05_03_2001	136.00	5.11
05_04_1997	39.00	5.25	05_04_1999	10.00	5.32	05_04_2001	110.00	5.09
05_05_1997	2.00	6.18	05_05_1999	20.00	5.46	05_05_2001	128.00	4.16
05_06_1997	8.00	6.22	05_06_1999	9.00	5.63	05_06_2001	128.00	3.98
05_07_1997	470.00	5.94	05_07_1999	20.00	5.72	05_07_2001	40.00	5.31
05_08_1997	6.00	5.83	05_08_1999	129.00	4.27	05_08_2001	9.00	4.77
05_09_1997	1.00	5.84	05_09_1999	129.00	4.08	05_09_2001	580.00	5.17
05_10_1997	39.00	4.37	05_10_1999	50.00	5.25	05_10_2001	118.00	6.25
05_11_1997	39.00	4.53	05_11_1999	23.00	5.06	05_11_2001	133.00	5.86
05_12_1997	6.00	5.64	05_12_1999	70.00	5.21	05_12_2001	128.00	5.42
05_13_1997	58.00	5.66	05_13_1999	53.00	5.28	05_13_2001	128.00	4.90
05_14_1997	17.00	6.04	05_14_1999	128.00	5.40	05_14_2001	44.00	5.38
05_15_1997	50.00	5.17	05_15_1999	129.00	3.70	05_15_2001	38.00	6.19
05_16_1997	13.00	5.08	05_16_1999	129.00	4.08	05_16_2001	410.00	6.70
05_17_1997	39.00	4.34	05_17_1999	64.00	5.09	05_17_2001	100.00	5.49
05_18_1997	39.00	4.09	05_18_1999	1200.00	5.34	05_18_2001	46.00	6.33
05_19_1997	9.00	5.66	05_19_1999	564.00	6.93	05_19_2001	128.00	5.18
05_20_1997	2.00	5.65	05_20_1999	5.00	5.48	05_20_2001	128.00	5.12
05_21_1997	9.00	5.18	05_21_1999	6.00	4.87	05_21_2001	33.00	6.24
05_22_1997	1.00	5.06	05_22_1999	129.00	4.56	05_22_2001	200.00	6.00
05_23_1997	3.00	4.86	05_23_1999	129.00	4.30	05_23_2001	72.00	5.32
05_24_1997	39.00	4.52	05_24_1999	72.00	5.09	05_24_2001	48.00	4.87
05_25_1997	39.00	4.91	05_25_1999	200.00	5.04	05_25_2001	220.00	5.34
05_26_1997	39.00	4.71	05_26_1999	11.00	5.14	05_26_2001	128.00	5.86
05_27_1997	110.00	5.48	05_27_1999	13.00	4.92	05_27_2001	128.00	4.39
05_28_1997	17.00	5.21	05_28_1999	52.00	4.36	05_28_2001	128.00	5.28
05_29_1997	4.00	5.34	05_29_1999	129.00	3.40	05_29_2001	80.00	5.79

Appendix 4 continued

05_30_1997	5.00	5.42	05_30_1999	129.00	3.30	05_30_2001	70.00	5.63
05_31_1997	39.00	4.51	05_31_1999	129.00	3.65	05_31_2001	34.00	5.43
06_01_1997	18.00	5.24	06_01_1999	36.00	4.83	06_01_2001	25.00	22.31
06_02_1997	3.00	6.71	06_02_1999	88.00	5.07	06_02_2001	102.00	11.56
06_03_1997	8.00	6.24	06_03_1999	4.00	5.12	06_03_2001	102.00	5.49
06_04_1997	18.00	6.00	06_04_1999	46.00	4.75	06_04_2001	28.00	6.10
06_05_1997	7.00	5.39	06_05_1999	113.00	4.47	06_05_2001	43.00	6.56
06_06_1997	23.00	5.82	06_06_1999	113.00	3.30	06_06_2001	136.00	6.45
06_07_1997	18.00	5.82	06_07_1999	4.00	5.18	06_07_2001	112.00	5.82
06_08_1997	18.00	4.34	06_08_1999	16.00	5.37	06_08_2001	500.00	6.30
06_09_1997	7.00	5.18	06_09_1999	23.00	6.07	06_09_2001	102.00	6.28
06_10_1997	71.00	5.46	06_10_1999	72.00	5.46	06_10_2001	102.00	3.93
06_11_1997	4.00	5.47	06_11_1999	5.00	5.26	06_11_2001	62.00	6.11
06_12_1997	9.00	6.12	06_12_1999	113.00	3.91	06_12_2001	8.00	5.96
06_13_1997	6.00	6.41	06_13_1999	113.00	3.98	06_13_2001	23.00	6.84
06_14_1997	18.00	4.32	06_14_1999	693.00	2.10	06_14_2001	23.00	19.77
06_15_1997	18.00	4.18	06_15_1999	19.00	4.69	06_15_2001	76.00	8.49
06_16_1997	1.00	4.18	06_16_1999	108.00	7.02	06_16_2001	102.00	6.10
06_17_1997	18.00	5.25	06_17_1999	81.00	5.35	06_17_2001	102.00	5.71
06_18_1997	4.00	5.82	06_18_1999	42.00	5.28	06_18_2001	25.00	6.08
06_19_1997	4.00	5.62	06_19_1999	113.00	4.50	06_19_2001	8.00	6.10
06_20_1997	13.00	5.62	06_20_1999	113.00	4.50	06_20_2001	23.00	5.77
06_21_1997	18.00	4.95	06_21_1999	13.00	5.37	06_21_2001	109.00	6.19
06_22_1997	18.00	4.67	06_22_1999	25.00	5.37	06_22_2001	31.00	6.67
06_23_1997	23.00	3.87	06_23_1999	111.00	5.23	06_23_2001	102.00	6.10
06_24_1997	4.00	5.80	06_24_1999	420.00	5.42	06_24_2001	102.00	6.10
06_25_1997	12.00	5.12	06_25_1999	98.00	5.62	06_25_2001	57.00	6.20
06_26_1997	56.00	6.00	06_26_1999	113.00	4.89	06_26_2001	210.00	6.03
06_27_1997	15.00	5.60	06_27_1999	113.00	9.73	06_27_2001	250.00	6.20
06_28_1997	18.00	4.17	06_28_1999	99.00	5.97	06_28_2001	220.00	6.03
06_29_1997	18.00	4.04	06_29_1999	174.00	5.97	06_29_2001	182.00	5.77
06_30_1997	64.00	5.50	06_30_1999	300.00	6.20	06_30_2001	102.00	5.77
07_01_1997	25.00	6.14	07_01_1999	213.00	6.36	07_01_2001	359.00	5.01
07_02_1997	7.00	5.90	07_02_1999	25.00	6.07	07_02_2001	360.00	5.38
07_03_1997	12.00	5.40	07_03_1999	113.00	4.29	07_03_2001	1700.00	5.52
07_04_1997	47.00	4.19	07_04_1999	113.00	4.36	07_04_2001	359.00	4.80
07_05_1997	47.00	4.02	07_05_1999	113.00	4.78	07_05_2001	530.00	6.03
07_06_1997	47.00	4.14	07_06_1999	18.00	5.82	07_06_2001	1000.00	4.83
07_07_1997	4.00	5.27	07_07_1999	6.00	5.69	07_07_2001	900.00	4.58
07_08_1997	3.00	5.27	07_08_1999	105.00	5.48	07_08_2001	359.00	5.32
07_09_1997	25.00	5.27	07_09_1999	56.00	5.93	07_09_2001	230.00	5.91
07_10_1997	45.00	5.54	07_10_1999	113.00	5.03	07_10_2001	280.00	5.62
07_11_1997	47.00	5.01	07_11_1999	113.00	4.94	07_11_2001	520.00	5.45
07_12_1997	47.00	3.74	07_12_1999	54.00	6.11	07_12_2001	249.00	4.90
07_13_1997	47.00	4.06	07_13_1999	83.00	6.78	07_13_2001	211.00	5.12
07_14_1997	134.00	5.38	07_14_1999	217.00	7.06	07_14_2001	263.00	4.08
07_15_1997	66.00	5.66	07_15_1999	105.00	6.33	07_15_2001	359.00	3.93
07_16_1997	14.00	6.51	07_16_1999	109.00	5.88	07_16_2001	176.00	5.34
07_17_1997	24.00	5.99	07_17_1999	113.00	4.70	07_17_2001	88.00	4.84
07_18_1997	9.00	5.99	07_18_1999	113.00	4.69	07_18_2001	97.00	5.99
07_19_1997	47.00	4.59	07_19_1999	266.00	5.99	07_19_2001	282.00	5.74

Appendix 4 continued

07_20_1997	47.00	4.48	07_20_1999	210.00	6.13	07_20_2001	4.00	5.01
07_21_1997	4.00	5.92	07_21_1999	195.00	6.07	07_21_2001	359.00	4.95
07_22_1997	27.00	7.09	07_22_1999	15.00	6.08	07_22_2001	359.00	4.12
07_23_1997	96.00	7.29	07_23_1999	292.00	5.57	07_23_2001	230.00	5.51
07_24_1997	47.00	14.25	07_24_1999	113.00	4.78	07_24_2001	95.00	5.79
07_25_1997	212.00	7.11	07_25_1999	113.00	4.53	07_25_2001	110.00	5.80
07_26_1997	84.00	5.49	07_26_1999	73.00	4.61	07_26_2001	200.00	7.61
07_27_1997	47.00	1.86	07_27_1999	204.00	5.48	07_27_2001	359.00	22.78
07_28_1997	47.00	7.34	07_28_1999	35.00	5.43	07_28_2001	359.00	4.47
07_29_1997	29.00	5.61	07_29_1999	40.00	5.71	07_29_2001	359.00	5.43
07_30_1997	115.00	5.98	07_30_1999	46.00	5.54	07_30_2001	359.00	5.89
07_31_1997	6.00	5.93	07_31_1999	113.00	4.60	07_31_2001	11.00	5.60
08_01_1997	28.00	5.53	08_01_1999	143.00	4.52	08_01_2001	151.00	5.94
08_02_1997	28.00	4.21	08_02_1999	73.00	5.03	08_02_2001	4.00	4.52
08_03_1997	28.00	4.25	08_03_1999	265.00	5.06	08_03_2001	73.00	5.20
08_04_1997	5.00	5.92	08_04_1999	1200.00	5.60	08_04_2001	151.00	4.94
08_05_1997	50.00	5.99	08_05_1999	73.00	5.32	08_05_2001	151.00	4.66
08_06_1997	28.00	5.26	08_06_1999	31.00	4.36	08_06_2001	11.00	5.80
08_07_1997	56.00	5.27	08_07_1999	143.00	4.19	08_07_2001	2.00	5.37
08_08_1997	2.00	5.19	08_08_1999	143.00	5.29	08_08_2001	320.00	5.72
08_09_1997	28.00	4.08	08_09_1999	40.00	5.29	08_09_2001	720.00	5.54
08_10_1997	28.00	4.13	08_10_1999	225.00	5.43	08_10_2001	28.00	5.37
08_11_1997	2.00	5.82	08_11_1999	80.00	5.32	08_11_2001	151.00	7.91
08_12_1997	21.00	5.89	08_12_1999	15.00	5.42	08_12_2001	151.00	6.70
08_13_1997	18.00	5.71	08_13_1999	14.00	5.49	08_13_2001	12.00	6.82
08_14_1997	25.00	5.95	08_14_1999	143.00	5.83	08_14_2001	28.00	6.00
08_15_1997	170.00	5.59	08_15_1999	143.00	4.69	08_15_2001	38.00	5.55
08_16_1997	28.00	4.95	08_16_1999	66.00	5.69	08_16_2001	43.00	5.85
08_17_1997	28.00	4.60	08_17_1999	29.00	6.03	08_17_2001	29.00	5.55
08_18_1997	9.00	5.73	08_18_1999	42.00	5.74	08_18_2001	151.00	5.32
08_19_1997	9.00	5.26	08_19_1999	23.00	5.69	08_19_2001	151.00	6.58
08_20_1997	23.00	5.85	08_20_1999	42.00	5.29	08_20_2001	100.00	3.78
08_21_1997	11.00	5.78	08_21_1999	143.00	4.44	08_21_2001	590.00	5.38
08_22_1997	4.00	5.27	08_22_1999	143.00	4.04	08_22_2001	510.00	5.42
08_23_1997	28.00	3.98	08_23_1999	45.00	5.59	08_23_2001	81.00	6.05
08_24_1997	28.00	3.93	08_24_1999	42.00	5.68	08_24_2001	151.00	4.97
08_25_1997	6.00	5.35	08_25_1999	91.00	6.93	08_25_2001	151.00	4.38
08_26_1997	30.00	5.25	08_26_1999	210.00	9.13	08_26_2001	151.00	4.97
08_27_1997	64.00	5.25	08_27_1999	310.00	6.16	08_27_2001	60.00	5.31
08_28_1997	14.00	5.61	08_28_1999	143.00	4.60	08_28_2001	140.00	6.08
08_29_1997	12.00	4.67	08_29_1999	143.00	4.60	08_29_2001	36.00	6.02
08_30_1997	28.00	3.91	08_30_1999	125.00	4.98	08_30_2001	43.00	19.74
08_31_1997	28.00	4.20	08_31_1999	106.00	4.98	08_31_2001	310.00	6.44
09_01_1997	69.00	4.31	09_01_1999	216.00	4.83	09_01_2001	181.00	5.57
09_02_1997	1.00	5.58	09_02_1999	142.00	5.01	09_02_2001	181.00	4.84
09_03_1997	4.00	5.47	09_03_1999	44.00	4.60	09_03_2001	181.00	4.87
09_04_1997	5.00	4.40	09_04_1999	423.00	12.55	09_04_2001	170.00	5.82
09_05_1997	5.00	4.73	09_05_1999	423.00	25.27	09_05_2001	385.00	5.93
09_06_1997	69.00	3.91	09_06_1999	423.00	29.23	09_06_2001	200.00	5.00
09_07_1997	69.00	3.87	09_07_1999	1200.00	21.74	09_07_2001	520.00	4.84
09_08_1997	8.00	5.23	09_08_1999	1200.00	8.97	09_08_2001	181.00	4.39

Appendix 4 continued

09_09_1997	42.00	6.14	09_09_1999	60.00	10.82	09_09_2001	181.00	4.83
09_10_1997	116.00	7.72	09_10_1999	78.00	6.62	09_10_2001	110.00	5.74
09_11_1997	112.00	6.25	09_11_1999	423.00	5.31	09_11_2001	340.00	4.69
09_12_1997	218.00	5.26	09_12_1999	423.00	4.87	09_12_2001	18.00	4.92
09_13_1997	69.00	3.99	09_13_1999	5.00	6.24	09_13_2001	49.00	4.66
09_14_1997	69.00	4.17	09_14_1999	102.00	7.23	09_14_2001	94.00	4.15
09_15_1997	3.00	5.44	09_15_1999	600.00	21.23	09_15_2001	181.00	4.15
09_16_1997	3.00	5.26	09_16_1999	423.00	27.66	09_16_2001	181.00	4.15
09_17_1997	6.00	5.23	09_17_1999	740.00	10.66	09_17_2001	181.00	4.94
09_18_1997	69.00	5.52	09_18_1999	447.00	9.05	09_18_2001	70.00	4.84
09_19_1997	3.00	5.50	09_19_1999	423.00	9.21	09_19_2001	12.00	4.75
09_20_1997	69.00	4.41	09_20_1999	171.00	7.50	09_20_2001	120.00	5.12
09_21_1997	69.00	3.61	09_21_1999	1200.00	9.41	09_21_2001	240.00	4.87
09_22_1997	69.00	4.81	09_22_1999	384.00	10.38	09_22_2001	181.00	4.39
09_23_1997	69.00	5.20	09_23_1999	52.00	6.20	09_23_2001	181.00	4.44
09_24_1997	68.00	6.50	09_24_1999	41.00	5.57	09_24_2001	10.00	7.26
09_25_1997	3.00	5.76	09_25_1999	423.00	4.75	09_25_2001	86.00	4.94
09_26_1997	6.00	5.32	09_26_1999	423.00	4.86	09_26_2001	390.00	4.66
09_27_1997	69.00	4.52	09_27_1999	112.00	26.60	09_27_2001	295.00	5.15
09_28_1997	69.00	4.52	09_28_1999	520.00	27.70	09_28_2001	155.00	4.90
09_29_1997	19.00	5.35	09_29_1999	1200.00	28.08	09_29_2001	181.00	4.55
09_30_1997	1100.00	4.97	09_30_1999	380.00	22.67	09_30_2001	181.00	4.50
10_01_1997	575.00	4.65	10_01_1999	188.00	7.71	10_01_2001	8.00	5.38
10_02_1997	870.00	5.11	10_02_1999	47.00	5.60	10_02_2001	42.00	5.38
10_03_1997	720.00	4.74	10_03_1999	47.00	5.21	10_03_2001	23.00	5.00
10_04_1997	211.00	3.73	10_04_1999	50.00	6.16	10_04_2001	17.00	5.00
10_05_1997	211.00	3.91	10_05_1999	42.00	5.63	10_05_2001	63.00	5.26
10_06_1997	4.00	4.87	10_06_1999	48.00	5.46	10_06_2001	30.00	4.43
10_07_1997	3.00	5.21	10_07_1999	86.00	5.46	10_07_2001	30.00	3.84
10_08_1997	10.00	5.29	10_08_1999	92.00	4.97	10_08_2001	3.00	4.47
10_09_1997	4.00	5.28	10_09_1999	47.00	5.29	10_09_2001	7.00	4.58
10_10_1997	211.00	5.34	10_10_1999	47.00	5.29	10_10_2001	64.00	4.89
10_11_1997	211.00	3.87	10_11_1999	36.00	6.33	10_11_2001	155.00	5.00
10_12_1997	211.00	3.98	10_12_1999	50.00	5.60	10_12_2001	2.00	4.32
10_13_1997	211.00	4.61	10_13_1999	84.00	5.54	10_13_2001	30.00	4.10
10_14_1997	22.00	5.62	10_14_1999	16.00	5.49	10_14_2001	30.00	6.75
10_15_1997	64.00	4.98	10_15_1999	46.00	5.20	10_15_2001	82.00	5.15
10_16_1997	102.00	5.04	10_16_1999	47.00	4.69	10_16_2001	12.00	4.92
10_17_1997	5.00	4.57	10_17_1999	47.00	16.69	10_17_2001	2.00	4.70
10_18_1997	211.00	3.80	10_18_1999	11.00	11.37	10_18_2001	15.00	4.50
10_19_1997	211.00	6.24	10_19_1999	6.00	7.04	10_19_2001	18.00	4.69
10_20_1997	5.00	5.14	10_20_1999	60.00	7.77	10_20_2001	30.00	4.15
10_21_1997	121.00	5.33	10_21_1999	33.00	7.41	10_21_2001	30.00	4.41
10_22_1997	126.00	5.05	10_22_1999	9.00	6.14	10_22_2001	15.00	4.92
10_23_1997	27.00	4.83	10_23_1999	47.00	5.23	10_23_2001	25.00	5.18
10_24_1997	100.00	5.00	10_24_1999	47.00	4.63	10_24_2001	64.00	5.18
10_25_1997	211.00	4.40	10_25_1999	27.00	5.68	10_25_2001	1.00	4.72
10_26_1997	211.00	4.88	10_26_1999	26.00	5.74	10_26_2001	5.00	4.38
10_27_1997	54.00	5.10	10_27_1999	34.00	5.79	10_27_2001	30.00	4.13
10_28_1997	5.00	4.78	10_28_1999	25.00	5.48	10_28_2001	30.00	4.32
10_29_1997	190.00	4.92	10_29_1999	23.00	5.40	10_29_2001	11.00	4.32

Appendix 4 continued

10_30_1997	820.00	5.01	10_30_1999	47.00	4.78	10_30_2001	40.00	5.06
10_31_1997	600.00	5.05	10_31_1999	47.00	4.56	10_31_2001	27.00	4.97
11_01_1997	94.00	4.63	11_01_1999	22.00	5.55	11_01_2001	29.00	5.57
11_02_1997	94.00	4.16	11_02_1999	600.00	5.97	11_02_2001	56.00	5.60
11_03_1997	170.00	4.90	11_03_1999	35.00	5.18	11_03_2001	1283.00	4.55
11_04_1997	7.00	4.68	11_04_1999	42.00	5.18	11_04_2001	1283.00	4.25
11_05_1997	8.00	4.99	11_05_1999	12.00	5.46	11_05_2001	2.00	4.81
11_06_1997	5.00	4.86	11_06_1999	47.00	4.25	11_06_2001	64.00	4.84
11_07_1997	15.00	4.92	11_07_1999	47.00	4.29	11_07_2001	1300.00	4.63
11_08_1997	94.00	3.81	11_08_1999	16.00	5.45	11_08_2001	6000.00	4.75
11_09_1997	94.00	3.78	11_09_1999	27.00	5.37	11_09_2001	600.00	5.09
11_10_1997	94.00	4.65	11_10_1999	83.00	4.67	11_10_2001	6000.00	4.92
11_11_1997	94.00	4.87	11_11_1999	14.00	5.34	11_11_2001	1283.00	3.87
11_12_1997	25.00	5.53	11_12_1999	18.00	4.95	11_12_2001	1283.00	5.23
11_13_1997	20.00	5.78	11_13_1999	4.00	4.29	11_13_2001	32.00	5.57
11_14_1997	109.00	4.33	11_14_1999	47.00	4.38	11_14_2001	42.00	5.45
11_15_1997	94.00	4.71	11_15_1999	31.00	5.25	11_15_2001	30.00	5.25
11_16_1997	94.00	3.83	11_16_1999	5.00	5.25	11_16_2001	40.00	4.90
11_17_1997	76.00	4.97	11_17_1999	7.00	5.23	11_17_2001	1283.00	4.18
11_18_1997	50.00	4.82	11_18_1999	3.00	5.28	11_18_2001	1283.00	4.33
11_19_1997	2.00	5.02	11_19_1999	15.00	5.45	11_19_2001	1.00	4.95
11_20_1997	156.00	5.02	11_20_1999	47.00	4.35	11_20_2001	3.00	5.18
11_21_1997	730.00	8.75	11_21_1999	47.00	4.38	11_21_2001	550.00	5.04
11_22_1997	94.00	6.85	11_22_1999	10.00	5.34	11_22_2001	1283.00	3.79
11_23_1997	94.00	5.08	11_23_1999	1.00	5.38	11_23_2001	1283.00	4.33
11_24_1997	70.00	5.54	11_24_1999	3.00	5.06	11_24_2001	1283.00	4.52
11_25_1997	52.00	5.50	11_25_1999	47.00	4.10	11_25_2001	1283.00	4.60
11_26_1997	13.00	5.59	11_26_1999	47.00	16.08	11_26_2001	41.00	6.24
11_27_1997	94.00	3.20	11_27_1999	47.00	6.30	11_27_2001	6000.00	5.09
11_28_1997	94.00	3.90	11_28_1999	47.00	4.47	11_28_2001	4700.00	5.40
11_29_1997	94.00	4.02	11_29_1999	1.00	5.60	11_29_2001	100.00	5.15
11_30_1997	54.00	4.94	11_30_1999	56.00	5.45	11_30_2001	72.00	4.92
12_01_1997	16.00	10.74	12_01_1999	17.00	5.46	12_01_2001	118.00	4.07
12_02_1997	16.00	5.22	12_02_1999	52.00	5.28	12_02_2001	118.00	4.04
12_03_1997	51.00	5.61	12_03_1999	580.00	5.11	12_03_2001	96.00	5.71
12_04_1997	92.00	5.24	12_04_1999	182.00	4.16	12_04_2001	300.00	5.38
12_05_1997	132.00	4.70	12_05_1999	182.00	4.47	12_05_2001	110.00	4.49
12_06_1997	54.00	3.92	12_06_1999	1200.00	4.47	12_06_2001	210.00	4.90
12_07_1997	54.00	3.77	12_07_1999	6.00	5.66	12_07_2001	94.00	4.50
12_08_1997	40.00	5.17	12_08_1999	10.00	5.35	12_08_2001	118.00	3.87
12_09_1997	88.00	5.38	12_09_1999	10.00	5.52	12_09_2001	118.00	3.95
12_10_1997	168.00	6.37	12_10_1999	203.00	5.49	12_10_2001	34.00	5.65
12_11_1997	54.00	5.42	12_11_1999	182.00	4.36	12_11_2001	76.00	5.26
12_12_1997	56.00	5.77	12_12_1999	182.00	4.33	12_12_2001	85.00	5.89
12_13_1997	54.00	4.36	12_13_1999	14.00	7.77	12_13_2001	580.00	4.56
12_14_1997	54.00	4.11	12_14_1999	300.00	24.83	12_14_2001	47.00	4.84
12_15_1997	126.00	5.02	12_15_1999	25.00	6.20	12_15_2001	118.00	3.82
12_16_1997	54.00	5.30	12_16_1999	20.00	5.76	12_16_2001	118.00	3.76
12_17_1997	21.00	5.20	12_17_1999	24.00	5.62	12_17_2001	16.00	5.06
12_18_1997	39.00	5.30	12_18_1999	182.00	4.97	12_18_2001	62.00	4.90
12_19_1997	18.00	4.80	12_19_1999	182.00	4.83	12_19_2001	3.00	5.04

Appendix 4 continued

12_20_1997	10.00	3.78	12_20_1999	7.00	5.49	12_20_2001	14.00	5.14
12_21_1997	54.00	3.88	12_21_1999	1.00	5.43	12_21_2001	380.00	4.92
12_22_1997	18.00	8.56	12_22_1999	1.00	5.09	12_22_2001	118.00	4.36
12_23_1997	21.00	5.65	12_23_1999	2.00	4.35	12_23_2001	118.00	4.36
12_24_1997	54.00	6.29	12_24_1999	182.00	3.76	12_24_2001	118.00	5.15
12_25_1997	54.00	4.97	12_25_1999	182.00	3.76	12_25_2001	118.00	3.71
12_26_1997	54.00	4.49	12_26_1999	182.00	3.70	12_26_2001	118.00	4.43
12_27_1997	54.00	10.19	12_27_1999	182.00	3.70	12_27_2001	8.00	4.55
12_28_1997	54.00	5.22	12_28_1999	840.00	4.24	12_28_2001	3.00	4.63
12_29_1997	3.00	6.02	12_29_1999	340.00	4.43	12_29_2001	118.00	4.36
12_30_1997	16.00	5.56	12_30_1999	1.00	4.10	12_30_2001	118.00	4.08
12_31_1997	100.00	4.92	12_31_1999	182.00	4.02	12_31_2001	1.00	4.77
01_01_1998	30.00	4.04	01_01_2000	91.00	3.65			
01_02_1998	6.00	4.62	01_02_2000	91.00	3.81			
01_03_1998	30.00	4.36	01_03_2000	5.00	5.07			
01_04_1998	30.00	4.08	01_04_2000	5.00	6.22			
01_05_1998	4.00	5.50	01_05_2000	15.00	5.11			
01_06_1998	6.00	5.89	01_06_2000	3.00	5.32			
01_07_1998	13.00	6.52	01_07_2000	0.90	5.34			
01_08_1998	9.00	20.37	01_08_2000	91.00	4.46			
01_09_1998	11.00	9.14	01_09_2000	91.00	5.83			
01_10_1998	30.00	5.08	01_10_2000	7.30	5.48			
01_11_1998	30.00	4.99	01_11_2000	17.30	5.46			
01_12_1998	30.00	5.66	01_12_2000	5.50	6.20			
01_13_1998	15.00	5.75	01_13_2000	7.30	5.89			
01_14_1998	8.00	5.62	01_14_2000	1200.00	5.21			
01_15_1998	6.00	13.33	01_15_2000	91.00	4.46			
01_16_1998	22.00	26.97	01_16_2000	91.00	4.36			
01_17_1998	10.00	8.55	01_17_2000	2.70	5.01			
01_18_1998	30.00	5.92	01_18_2000	0.90	4.64			
01_19_1998	30.00	18.47	01_19_2000	2.70	5.35			
01_20_1998	26.00	9.16	01_20_2000	0.90	6.47			
01_21_1998	12.00	7.09	01_21_2000	2.50	6.10			
01_22_1998	190.00	8.47	01_22_2000	91.00	4.98			
01_23_1998	11.00	22.00	01_23_2000	91.00	6.08			
01_24_1998	30.00	8.38	01_24_2000	6.20	7.07			
01_25_1998	30.00	5.83	01_25_2000	9.00	6.08			
01_26_1998	4.00	6.51	01_26_2000	11.00	5.35			
01_27_1998	8.00	22.57	01_27_2000	7.30	4.95			
01_28_1998	29.00	15.81	01_28_2000	9.00	3.61			
01_29_1998	210.00	8.44	01_29_2000	91.00	4.78			
01_30_1998	2.00	7.15	01_30_2000	91.00	17.64			
01_31_1998	30.00	5.61	01_31_2000	600.00	12.81			
02_01_1998	92.00	5.20	02_01_2000	8.00	7.58			
02_02_1998	46.00	6.32	02_02_2000	2.00	6.13			
02_03_1998	10.00	16.17	02_03_2000	19.10	6.22			
02_04_1998	570.00	19.72	02_04_2000	17.30	6.39			
02_05_1998	29.00	10.68	02_05_2000	139.00	4.84			
02_06_1998	10.00	7.44	02_06_2000	139.00	4.63			
02_07_1998	92.00	6.21	02_07_2000	6.40	4.73			
02_08_1998	92.00	5.30	02_08_2000	14.50	4.44			

Appendix 4 continued

02_09_1998	13.00	6.13	02_09_2000	16.40	4.61
02_10_1998	12.00	6.08	02_10_2000	7.80	4.39
02_11_1998	42.00	6.59	02_11_2000	7.30	4.30
02_12_1998	4.00	6.41	02_12_2000	139.00	5.59
02_13_1998	6.00	5.87	02_13_2000	139.00	3.67
02_14_1998	92.00	4.87	02_14_2000	23.60	5.20
02_15_1998	92.00	4.73	02_15_2000	26.00	4.95
02_16_1998	5.00	15.80	02_16_2000	41.00	5.40
02_17_1998	44.00	27.23	02_17_2000	221.00	6.47
02_18_1998	4.00	12.00	02_18_2000	136.00	10.13
02_19_1998	4.00	7.28	02_19_2000	139.00	6.14
02_20_1998	4.00	6.29	02_20_2000	139.00	5.93
02_21_1998	92.00	5.16	02_21_2000	33.90	6.37
02_22_1998	92.00	5.22	02_22_2000	1040.00	6.53
02_23_1998	15.00	12.31	02_23_2000	240.00	5.68
02_24_1998	8.00	6.75	02_24_2000	757.00	5.60
02_25_1998	650.00	6.06	02_25_2000	228.00	5.38
02_26_1998	320.00	5.99	02_26_2000	139.00	5.52
02_27_1998	46.00	6.19	02_27_2000	139.00	15.86
02_28_1998	92.00	5.15	02_28_2000	34.00	13.24
03_01_1998	1249.00	4.83	02_29_2000	40.00	5.91
03_02_1998	2550.00	5.94	03_01_2000	26.00	5.94
03_03_1998	6000.00	5.57	03_02_2000	59.00	5.65
03_04_1998	6000.00	5.60	03_03_2000	44.00	5.29
03_05_1998	59.00	5.63	03_04_2000	75.00	4.73
03_06_1998	6000.00	5.49	03_05_2000	75.00	4.52
03_07_1998	1249.00	4.81	03_06_2000	340.00	5.35
03_08_1998	1249.00	19.34	03_07_2000	230.00	5.55
03_09_1998	132.00	16.56	03_08_2000	64.00	5.59
03_10_1998	15.00	6.81	03_09_2000	168.00	5.65
03_11_1998	48.00	6.45	03_10_2000	217.00	5.14
03_12_1998	164.00	4.70	03_11_2000	75.00	4.47
03_13_1998	740.00	5.82	03_12_2000	75.00	4.22
03_14_1998	1249.00	4.50	03_13_2000	38.00	5.11
03_15_1998	1249.00	5.38	03_14_2000	17.60	5.28
03_16_1998	4.00	12.13	03_15_2000	14.80	5.38
03_17_1998	52.00	11.88	03_16_2000	75.00	6.19
03_18_1998	174.00	26.71	03_17_2000	38.50	4.63
03_19_1998	1249.00	27.93	03_18_2000	28.00	3.70
03_20_1998	2120.00	27.05	03_19_2000	75.00	4.02
03_21_1998	183.00	27.25	03_20_2000	235.00	6.79
03_22_1998	1249.00	15.49	03_21_2000	21.00	7.54
03_23_1998	86.00	7.02	03_22_2000	24.00	6.08
03_24_1998	550.00	6.68	03_23_2000	15.00	5.49
03_25_1998	70.00	6.28	03_24_2000	45.00	6.17
03_26_1998	28.00	6.19	03_25_2000	75.00	3.76
03_27_1998	1249.00	5.76	03_26_2000	75.00	4.94
03_28_1998	1249.00	6.36	03_27_2000	12.00	6.89
03_29_1998	1249.00	3.33	03_28_2000	60.00	6.07
03_30_1998	1249.00	5.93	03_29_2000	25.00	5.32
03_31_1998	14.00	5.99	03_30_2000	14.50	5.11

Appendix 4 continued

04_01_1998	12.00	8.66	03_31_2000	1.60	5.00
04_02_1998	26.00	6.03	04_01_2000	28.00	4.10
04_03_1998	26.00	6.19	04_02_2000	28.00	4.10
04_04_1998	26.00	5.11	04_03_2000	16.60	4.05
04_05_1998	26.00	6.19	04_04_2000	19.60	5.71
04_06_1998	5.00	5.57	04_05_2000	6.00	5.11
04_07_1998	8.00	5.72	04_06_2000	4.90	4.36
04_08_1998	2.00	7.12	04_07_2000	7.60	4.97
04_09_1998	9.00	10.68	04_08_2000	28.00	4.83
04_10_1998	26.00	5.72	04_09_2000	28.00	5.03
04_11_1998	26.00	4.64	04_10_2000	7.00	5.62
04_12_1998	26.00	4.33	04_11_2000	91.00	5.86
04_13_1998	26.00	5.57	04_12_2000	28.00	5.60
04_14_1998	48.00	5.72	04_13_2000	42.00	4.81
04_15_1998	5.00	5.57	04_14_2000	33.00	5.18
04_16_1998	2.00	11.29	04_15_2000	28.00	5.25
04_17_1998	17.00	5.88	04_16_2000	28.00	5.80
04_18_1998	26.00	6.34	04_17_2000	12.00	4.70
04_19_1998	1.00	6.03	04_18_2000	91.00	9.31
04_20_1998	5.00	9.13	04_19_2000	43.00	13.69
04_21_1998	10.00	7.89	04_20_2000	12.20	5.51
04_22_1998	5.00	7.58	04_21_2000	28.00	5.25
04_23_1998	26.00	8.82	04_22_2000	28.00	4.75
04_24_1998	124.00	5.11	04_23_2000	28.00	3.93
04_25_1998	26.00	4.18	04_24_2000	16.30	3.82
04_26_1998	26.00	8.51	04_25_2000	10.70	5.15
04_27_1998	26.00	5.42	04_26_2000	4.00	5.04
04_28_1998	26.00	5.42	04_27_2000	30.00	5.48
04_29_1998	130.00	5.42	04_28_2000	56.00	5.71
04_30_1998	26.00	5.57	04_29_2000	28.00	6.39
05_01_1998	2.00	5.57	04_30_2000	28.00	5.26
05_02_1998	123.00	4.18	05_01_2000	101.00	4.58
05_03_1998	123.00	4.18	05_02_2000	9.00	5.25
05_04_1998	123.00	5.72	05_03_2000	18.00	5.21
05_05_1998	6.00	5.42	05_04_2000	50.00	5.12
05_06_1998	4.00	5.42	05_05_2000	11.00	4.95
05_07_1998	123.00	7.58	05_06_2000	125.00	4.94
05_08_1998	26.00	5.88	05_07_2000	125.00	4.38
05_09_1998	123.00	4.64	05_08_2000	25.00	4.29
05_10_1998	123.00	10.06	05_09_2000	73.00	5.29
05_11_1998	8.00	9.59	05_10_2000	336.00	5.20
05_12_1998	116.00	6.19	05_11_2000	460.00	5.42
05_13_1998	112.00	5.88	05_12_2000	147.00	4.87
05_14_1998	58.00	3.56	05_13_2000	125.00	5.38
05_15_1998	128.00	5.42	05_14_2000	125.00	4.16
05_16_1998	123.00	4.95	05_15_2000	187.00	5.11
05_17_1998	123.00	4.64	05_16_2000	566.00	3.87
05_18_1998	470.00	5.72	05_17_2000	62.00	5.01
05_19_1998	48.00	5.72	05_18_2000	92.00	5.17
05_20_1998	61.00	5.72	05_19_2000	166.00	5.06
05_21_1998	25.00	5.57	05_20_2000	125.00	4.50

Appendix 4 continued

05_22_1998	188.00	5.26	05_21_2000	125.00	3.98
05_23_1998	123.00	5.57	05_22_2000	22.00	4.55
05_24_1998	123.00	4.95	05_23_2000	136.00	5.37
05_25_1998	123.00	5.11	05_24_2000	21.00	5.51
05_26_1998	78.00	6.03	05_25_2000	152.00	5.23
05_27_1998	310.00	6.03	05_26_2000	84.00	5.18
05_28_1998	560.00	5.72	05_27_2000	125.00	4.61
05_29_1998	15.00	5.88	05_28_2000	125.00	4.44
05_30_1998	123.00	4.64	05_29_2000	125.00	4.08
05_31_1998	123.00	4.64	05_30_2000	16.00	3.91
06_01_1998	105.00	6.30	05_31_2000	22.00	5.07
06_02_1998	85.00	5.80	06_01_2000	141.00	5.18
06_03_1998	84.00	6.95	06_02_2000	87.00	5.31
06_04_1998	26.00	6.48	06_03_2000	198.00	5.15
06_05_1998	4.00	6.56	06_04_2000	198.00	4.55
06_06_1998	460.00	4.83	06_05_2000	38.00	4.32
06_07_1998	460.00	4.27	06_06_2000	132.00	5.45
06_08_1998	410.00	5.62	06_07_2000	143.00	5.11
06_09_1998	84.00	5.68	06_08_2000	247.00	4.83
06_10_1998	52.00	5.99	06_09_2000	24.00	4.73
06_11_1998	232.00	6.03	06_10_2000	198.00	4.69
06_12_1998	26.00	5.88	06_11_2000	198.00	4.07
06_13_1998	460.00	4.56	06_12_2000	214.00	4.12
06_14_1998	460.00	4.46	06_13_2000	59.00	5.04
06_15_1998	3420.00	6.47	06_14_2000	168.00	5.07
06_16_1998	27.00	6.00	06_15_2000	200.00	5.29
06_17_1998	2360.00	5.82	06_16_2000	218.00	5.31
06_18_1998	1216.00	5.79	06_17_2000	198.00	5.25
06_19_1998	14.00	5.69	06_18_2000	198.00	4.19
06_20_1998	460.00	4.60	06_19_2000	550.00	4.18
06_21_1998	460.00	4.50	06_20_2000	340.00	5.51
06_22_1998	96.00	5.99	06_21_2000	187.00	5.54
06_23_1998	427.00	6.19	06_22_2000	269.00	5.65
06_24_1998	950.00	5.86	06_23_2000	184.00	5.49
06_25_1998	460.00	5.89	06_24_2000	198.00	5.54
06_26_1998	2.00	5.97	06_25_2000	198.00	4.13
06_27_1998	460.00	4.80	06_26_2000	223.00	4.15
06_28_1998	460.00	4.41	06_27_2000	41.00	5.29
06_29_1998	42.00	5.77	06_28_2000	420.00	5.63
06_30_1998	7.00	5.69	06_29_2000	243.00	6.10
07_01_1998	350.00	5.55	06_30_2000	237.00	6.10
07_02_1998	7.00	4.84	07_01_2000	427.00	5.72
07_03_1998	50.00	3.91	07_02_2000	427.00	3.73
07_04_1998	50.00	4.83	07_03_2000	88.00	3.54
07_05_1998	50.00	4.24	07_04_2000	427.00	4.13
07_06_1998	16.00	5.42	07_05_2000	68.00	3.79
07_07_1998	216.00	5.42	07_06_2000	70.00	5.18
07_08_1998	21.00	6.13	07_07_2000	224.00	5.14
07_09_1998	46.00	6.24	07_08_2000	427.00	5.04
07_10_1998	19.00	5.71	07_09_2000	427.00	4.15
07_11_1998	50.00	4.32	07_10_2000	97.00	4.66

Appendix 4 continued

07_12_1998	50.00	4.33	07_11_2000	251.00	5.52
07_13_1998	50.00	5.48	07_12_2000	122.00	5.49
07_14_1998	50.00	5.68	07_13_2000	101.00	5.52
07_15_1998	4.00	5.88	07_14_2000	71.00	5.31
07_16_1998	4.00	8.18	07_15_2000	427.00	5.86
07_17_1998	50.00	6.24	07_16_2000	427.00	4.56
07_18_1998	50.00	4.66	07_17_2000	1200.00	3.98
07_19_1998	50.00	4.87	07_18_2000	960.00	5.06
07_20_1998	4.00	5.79	07_19_2000	4800.00	5.51
07_21_1998	10.00	6.03	07_20_2000	281.00	5.45
07_22_1998	6.00	6.31	07_21_2000	5.00	5.04
07_23_1998	4.00	6.37	07_22_2000	45.00	5.31
07_24_1998	2.00	6.16	07_23_2000	427.00	4.04
07_25_1998	50.00	6.19	07_24_2000	158.00	7.54
07_26_1998	50.00	5.14	07_25_2000	8.00	10.01
07_27_1998	89.00	6.54	07_26_2000	6.00	6.31
07_28_1998	42.00	6.31	07_27_2000	155.00	5.69
07_29_1998	97.00	6.17	07_28_2000	44.00	5.54
07_30_1998	4.00	6.59	07_29_2000	427.00	5.31
07_31_1998	10.00	5.88	07_30_2000	427.00	6.20
08_01_1998	141.00	4.27	07_31_2000	220.00	5.85
08_02_1998	141.00	4.30	08_01_2000	480.00	6.36
08_03_1998	35.00	5.46	08_02_2000	530.00	10.77
08_04_1998	58.00	5.31	08_03_2000	81.00	11.74
08_05_1998	64.00	5.29	08_04_2000	132.00	7.29
08_06_1998	188.00	5.65	08_05_2000	267.00	11.79
08_07_1998	16.00	5.66	08_06_2000	267.00	16.28
08_08_1998	141.00	4.89	08_07_2000	133.00	5.01
08_09_1998	141.00	5.03	08_08_2000	22.00	6.02
08_10_1998	33.00	6.96	08_09_2000	91.00	5.86
08_11_1998	13.00	6.10	08_10_2000	225.00	6.07
08_12_1998	210.00	5.72	08_11_2000	760.00	6.16
08_13_1998	82.00	5.80	08_12_2000	267.00	5.45
08_14_1998	155.00	5.29	08_13_2000	267.00	4.21
08_15_1998	141.00	4.55	08_14_2000	86.00	3.84
08_16_1998	141.00	5.71	08_15_2000	50.00	5.46
08_17_1998	101.00	6.02	08_16_2000	165.00	7.64
08_18_1998	123.00	5.76	08_17_2000	360.00	6.81
08_19_1998	208.00	5.28	08_18_2000	174.00	5.55
08_20_1998	72.00	5.20	08_19_2000	267.00	5.68
08_21_1998	30.00	5.06	08_20_2000	267.00	4.53
08_22_1998	141.00	4.39	08_21_2000	535.00	4.04
08_23_1998	141.00	4.43	08_22_2000	530.00	5.37
08_24_1998	103.00	5.69	08_23_2000	410.00	5.09
08_25_1998	68.00	5.89	08_24_2000	455.00	5.17
08_26_1998	198.00	5.91	08_25_2000	595.00	5.63
08_27_1998	78.00	5.99	08_26_2000	9.00	5.49
08_28_1998	12.00	5.66	08_27_2000	267.00	4.53
08_29_1998	141.00	7.36	08_28_2000	85.00	6.36
08_30_1998	141.00	2.20	08_29_2000	305.00	6.08
08_31_1998	1120.00	5.62	08_30_2000	77.00	6.27

Appendix 4 continued

09_01_1998	72.00	5.35	08_31_2000	109.00	7.18
09_02_1998	600.00	5.86	09_01_2000	690.00	6.90
09_03_1998	1940.00	18.10	09_02_2000	178.00	6.41
09_04_1998	37.00	3.90	09_03_2000	178.00	5.60
09_05_1998	327.00	4.81	09_04_2000	178.00	5.23
09_06_1998	327.00	4.75	09_05_2000	218.00	6.16
09_07_1998	327.00	4.75	09_06_2000	163.00	6.08
09_08_1998	44.00	6.05	09_07_2000	167.00	5.29
09_09_1998	116.00	5.49	09_08_2000	90.00	5.28
09_10_1998	36.00	5.26	09_09_2000	178.00	5.23
09_11_1998	18.00	5.26	09_10_2000	178.00	4.55
09_12_1998	327.00	4.29	09_11_2000	199.00	4.36
09_13_1998	327.00	4.43	09_12_2000	295.00	6.07
09_14_1998	92.00	5.72	09_13_2000	420.00	4.77
09_15_1998	42.00	5.89	09_14_2000	231.00	5.85
09_16_1998	45.00	5.80	09_15_2000	244.00	6.10
09_17_1998	25.00	5.88	09_16_2000	178.00	5.17
09_18_1998	640.00	5.57	09_17_2000	178.00	4.15
09_19_1998	327.00	4.27	09_18_2000	94.00	3.99
09_20_1998	327.00	4.35	09_19_2000	212.00	5.62
09_21_1998	80.00	5.69	09_20_2000	120.00	5.65
09_22_1998	56.00	5.77	09_21_2000	26.00	5.66
09_23_1998	22.00	5.11	09_22_2000	69.00	5.99
09_24_1998	420.00	5.38	09_23_2000	178.00	6.54
09_25_1998	1660.00	5.34	09_24_2000	178.00	4.08
09_26_1998	327.00	4.56	09_25_2000	28.00	5.09
09_27_1998	327.00	4.49	09_26_2000	59.00	7.95
09_28_1998	720.00	5.59	09_27_2000	53.00	6.54
09_29_1998	16.00	5.79	09_28_2000	69.00	5.59
09_30_1998	188.00	6.00	09_29_2000	73.00	5.29
10_01_1998	92.00	5.65	09_30_2000	175.00	5.12
10_02_1998	46.00	4.97	10_01_2000	158.00	4.27
10_03_1998	192.00	4.41	10_02_2000	230.00	4.29
10_04_1998	192.00	3.99	10_03_2000	335.00	4.98
10_05_1998	136.00	5.21	10_04_2000	230.00	5.09
10_06_1998	107.00	5.55	10_05_2000	960.00	5.48
10_07_1998	135.00	5.52	10_06_2000	270.00	5.35
10_08_1998	2700.00	15.89	10_07_2000	158.00	5.28
10_09_1998	71.00	6.39	10_08_2000	158.00	3.62
10_10_1998	192.00	4.56	10_09_2000	248.00	4.70
10_11_1998	192.00	4.12	10_10_2000	265.00	3.51
10_12_1998	48.00	4.94	10_11_2000	82.00	4.78
10_13_1998	56.00	5.12	10_12_2000	73.00	4.61
10_14_1998	48.00	5.14	10_13_2000	66.00	4.81
10_15_1998	170.00	4.87	10_14_2000	158.00	4.80
10_16_1998	62.00	4.90	10_15_2000	158.00	3.95
10_17_1998	192.00	3.88	10_16_2000	45.00	4.18
10_18_1998	192.00	3.93	10_17_2000	14.00	4.94
10_19_1998	75.00	5.48	10_18_2000	32.00	5.09
10_20_1998	132.00	5.09	10_19_2000	82.00	5.09
10_21_1998	89.00	4.78	10_20_2000	45.00	4.75

Appendix 4 continued

10_22_1998	113.00	4.78	10_21_2000	158.00	4.55
10_23_1998	23.00	4.92	10_22_2000	158.00	3.99
10_24_1998	192.00	4.30	10_23_2000	44.00	3.96
10_25_1998	192.00	4.02	10_24_2000	42.00	4.64
10_26_1998	70.00	5.07	10_25_2000	57.00	4.94
10_27_1998	14.00	5.00	10_26_2000	303.00	4.95
10_28_1998	25.00	5.15	10_27_2000	25.00	4.92
10_29_1998	10.00	4.95	10_28_2000	158.00	4.77
10_30_1998	11.00	5.07	10_29_2000	158.00	4.08
10_31_1998	192.00	3.95	10_30_2000	14.00	3.74
11_01_1998	212.00	4.02	10_31_2000	7.00	4.81
11_02_1998	40.00	5.71	11_01_2000	25.00	4.84
11_03_1998	66.00	6.36	11_02_2000	12.00	4.89
11_04_1998	171.00	5.40	11_03_2000	54.00	4.94
11_05_1998	790.00	5.20	11_04_2000	124.00	4.72
11_06_1998	144.00	4.89	11_05_2000	124.00	4.13
11_07_1998	212.00	4.10	11_06_2000	32.00	3.87
11_08_1998	212.00	4.13	11_07_2000	23.00	4.80
11_09_1998	126.00	5.42	11_08_2000	69.00	4.73
11_10_1998	260.00	5.23	11_09_2000	48.00	5.31
11_11_1998	26.00	4.89	11_10_2000	20.00	5.01
11_12_1998	1090.00	4.89	11_11_2000	124.00	4.75
11_13_1998	136.00	4.67	11_12_2000	124.00	4.10
11_14_1998	212.00	4.53	11_13_2000	39.00	3.98
11_15_1998	212.00	4.33	11_14_2000	52.00	4.98
11_16_1998	91.00	6.03	11_15_2000	63.00	5.06
11_17_1998	172.00	5.57	11_16_2000	550.00	4.94
11_18_1998	101.00	5.00	11_17_2000	236.00	4.89
11_19_1998	208.00	5.07	11_18_2000	124.00	4.89
11_20_1998	46.00	5.11	11_19_2000	124.00	4.12
11_21_1998	212.00	3.99	11_20_2000	128.00	4.35
11_22_1998	212.00	3.78	11_21_2000	600.00	4.92
11_23_1998	290.00	4.98	11_22_2000	94.00	4.84
11_24_1998	132.00	4.80	11_23_2000	124.00	4.46
11_25_1998	29.00	4.66	11_24_2000	124.00	3.42
11_26_1998	212.00	3.45	11_25_2000	124.00	3.93
11_27_1998	212.00	3.53	11_26_2000	124.00	5.82
11_28_1998	212.00	3.54	11_27_2000	124.00	4.64
11_29_1998	212.00	3.78	11_28_2000	97.00	5.43
11_30_1998	104.00	5.00	11_29_2000	99.00	4.80
12_01_1998	10.10	10.51	11_30_2000	111.00	4.94
12_02_1998	48.00	10.10	12_01_2000	57.00	5.15
12_03_1998	66.00	10.01	12_02_2000	124.00	5.32
12_04_1998	590.00	10.03	12_03_2000	124.00	4.39
12_05_1998	107.00	10.03	12_04_2000	38.00	3.99
12_06_1998	107.00	10.03	12_05_2000	45.00	5.37
12_07_1998	44.00	10.57	12_06_2000	34.00	5.31
12_08_1998	41.00	10.29	12_07_2000	53.00	5.28
12_09_1998	15.00	10.12	12_08_2000	57.00	5.38
12_10_1998	11.00	10.03	12_09_2000	124.00	5.04
12_11_1998	134.00	9.95	12_10_2000	124.00	4.29

Appendix 4 continued

12_12_1998	107.00	9.95	12_11_2000	14.00	4.30
12_13_1998	107.00	9.95	12_12_2000	21.00	5.17
12_14_1998	108.00	10.23	12_13_2000	36.00	4.73
12_15_1998	5.00	10.18	12_14_2000	21.00	5.15
12_16_1998	124.00	9.84	12_15_2000	21.00	5.42
12_17_1998	35.00	9.95	12_16_2000	124.00	5.04
12_18_1998	29.00	10.01	12_17_2000	124.00	8.45
12_19_1998	107.00	10.01	12_18_2000	43.00	6.76
12_20_1998	107.00	10.01	12_19_2000	14.00	6.76
12_21_1998	28.00	9.96	12_20_2000	43.00	6.11
12_22_1998	34.00	10.03	12_21_2000	14.00	5.40
12_23_1998	600.00	10.06	12_22_2000	20.00	5.32
12_24_1998	107.00	10.06	12_23_2000	124.00	4.94
12_25_1998	107.00	10.06	12_24_2000	124.00	4.13
12_26_1998	107.00	10.06	12_25_2000	124.00	3.99
12_27_1998	107.00	10.06	12_26_2000	124.00	3.42
12_28_1998	18.00	10.29	12_27_2000	13.00	4.04
12_29_1998	18.00	10.32	12_28_2000	11.00	4.60
12_30_1998	34.00	10.20	12_29_2000	3.00	4.55
12_31_1998	260.00	9.86	12_30_2000	124.00	4.55
			12_31_2000	124.00	4.15

Appendix 5. Fecal Coliform Sampling in Durham County, NC.

Concentration in Septic and Sand Filter Effluent

Street	Permit No.	Sample Date	FC (#/100ml)
Bartlett Dr	no permit	**12/13/99**	5,500
Barclay Rd	NCG550571	**12/14/99**	discarded, beyond holding time
Sandlewood Rd	NCG550951	**12/14/99**	discarded, beyond holding time
Sandlewood Road	Not a septic system	**12/14/99**	discarded, beyond holding time
Michael	NCG550851 & NCG550852	**12/15/99**	**490,000**
Michael Dr	NCG550818	**12/15/99**	5,800
Mineral Springs Rd	NCG550771	**12/15/99**	1,622
Redwood Rd	NCG550800	**12/15/99**	<100
Barclay Rd	NCG550571	1/12/00	46
Bartlett Dr	no permit	1/12/00	**27,000**
Sandlewood Rd	NCG550951	1/12/00	**56,000**
Michael	NCG550851 & NCG550852	2/17/00	2,500
Michael Dr	NCG550818	2/17/00	44
Mineral Springs Rd	NCG550771	2/17/00	11
Redwood Rd	NCG550800	2/17/00	70
Barclay Rd	NCG550571	2/23/00	4,000
Bartlett Dr	no permit	2/23/00	5,800
Michael	NCG550851 & NCG550852	2/23/00	1,733
Michael Dr	NCG550818	2/23/00	4,900
Mineral Springs Rd	NCG550771	2/23/00	5,700
Redwood Rd	NCG550800	2/23/00	400
Sandlewood Rd	NCG550951	2/23/00	>6,000
Biscayne Road	no permit	**6/1/00**	**200,000**
Dresden Drive	no permit	6/1/00	2,800
Edenton Lane	NCG550609	6/1/00	270
Farrington	NCG550785	6/1/00	100
Brecknock Street	NCG550920	6/6/00	1,200
Welcome Circle	no permit	6/6/00	141
Ed Cook Road	NCG550574	6/7/00	180
Glover Road	NCG551022	6/7/00	880
		Statistics	**FC**
		Average	32,668
		median	1,733
		min	11
		max	490,000

Appendix 6. Partial List of General NPDES Permits in Northeast Creek Watershed.

PERMIT	FACILITY	COUNTY	STREET	ZIP
NCG550813	CANUTO, JUAN & MARGARITO	DURHAM	3826 ANGIER AVENUE	27703
NCG140090	CHANDLER CONCRETE CO-PLT #608	DURHAM	1014 ELLIS ROAD	27703
NCG550574	DEAN, THOMAS - RESIDENCE	DURHAM	1711 ED COOK ROAD	27703
NCG550665	DICK PATTON REALTY	DURHAM	2023 EASTWOOD DRIVE	27713
NCG080595	FEDEX GROUND	DURHAM	2530 S. TRI-CENTER BLVD	27713
NCG550148	FLETCHER, THOMAS A. - RESIDENCE	DURHAM	1336 LYNLEY DRIVE	27703
NCG050116	FOAM DESIGN, INC.	DURHAM	2425 S. ALSTON AVE.	27713
NCG551020	FOX, BILLY E. - RESIDENCE	DURHAM	2802 GLOVER ROAD	27703
NCG080082	GIANT CEMENT COMPANY	DURHAM	824 ELLIS ROAD PO BOX 11097	27703
NCG060107	GLAXO WELLCOME INC-DURHAM/CORN	DURHAM	FIVE MOORE DRIVE	27709
NCG550905	HIGHT, ROBERT/928 JONES CIR	DURHAM	928 JONES CIRCLE	27705
NCG550893	HOWARD, LUCY/916 JONES CIR	DURHAM	916 JONES CIRCLE	27705
NCG551022	INSCOE, WALLACE R. - RESIDENCE	DURHAM	2810 GLOVER ROAD	27703
NCG030279	INTERNATIONAL BUSINESS MACHINE	DURHAM	3039 CORNWALLIS ROAD	27709
NCG550932	JONES, J.P./922 JONES CIR	DURHAM	922 JONES CIRCLE	27703
NCG030311	MOTOROLA, INC-MOS 15/DURHAM SI	DURHAM	3026 CORNWALLIS ROAD	27709
NCS000046	NATIONAL SPECIALTY GASES	DURHAM	63 UNITED DR.	27713
NCG550739	OLD DOMINION FREIGHT LINE, INC	DURHAM	1810 NEW RALEIGH ROAD	27703
NCG550601	PERDERGRASS, MARY - RESIDENCE	DURHAM	1617 ED COOK ROAD	27703
NCG080580	ROADWAY EXPRESS, INC. (T672)	DURHAM	920 ELLIS ROAD	27703
NCG550624	ROGERS, JIMMY L. & LISA - RESIDENCE	DURHAM	1901 LEONARD DRIVE	27703
NCG130010	SONOCO PROD CO-DURHAM	DURHAM	4619 INDUSTRY LANE	27713
NCG140129	SOUTHERN EQUIPMENT CO-DUR #17	DURHAM	3411 APEX HWY	27713
NCG100024	SOUTHSIDE AUTO PARTS, INC.	DURHAM	1915 RIDDLE ROAD	27713
NCG020283	TRIANGLE BRICK CO-DURHAM	DURHAM	6523 APEX RD	27713
NCG060087	TRIANGLE SERVICES CORPORATION	DURHAM	P. O. BOX 13448	27709
NCG050016	VALASSIS INSERTS INC	DURHAM	4918 PROSPECTUS DRIVE	27713
NCG100026	WAGNER AUTO SALVAGE, INC.	DURHAM	1818 ISENHOUR STREET	27713

Appendix 7. Estimated high fecal coliform (≥ 400) occurrence.

Fecal coliform occurrence in the ambient station, B3660000, during the study period, 1997 through 2001.

Date	Flow at SR1100 (cfs)	Fecal Coliform (#/100 ml) Geo. mean	Weather Conditions	Date	Flow at SR1100 (cfs)	Fecal Coliform (#/100 ml) Geo. mean	Weather Conditions	Date	Flow at SR1100 (cfs)	Fecal Coliform (#/100 ml) Geo. mean	Weather Conditions
01_30_1997	35	425.75	wet	**01_26_2000**	**53**	**502.55**	wet	05_02_2000	15	417.94	dry
01_31_1997	39	426.35	wet	**01_27_2000**	**39**	**502.67**	wet	05_03_2000	14	404.82	dry
02_01_1997	29	426.76	wet	01_28_2000	33	485.29	dry	05_04_2000	14	405.25	wet
02_02_1997	22	427.08	wet	01_29_2000	20	467.26	dry	05_05_2000	14	405.38	wet
02_03_1997	19	411.27	dry	01_30_2000	108	467.16	wet	05_06_2000	14	406.50	wet
02_04_1997	18	410.95	dry	01_31_2000	579	467.94	wet	05_07_2000	15	407.74	wet
02_04_1998	623	409.49	wet	02_01_2000	224	468.64	wet	05_08_2000	15	407.01	wet
02_05_1998	449	431.39	wet	02_02_2000	101	469.89	wet	05_09_2000	16	405.02	wet
02_06_1998	170	437.93	wet	02_03_2000	67	454.29	dry	05_10_2000	16	406.40	wet
02_07_1998	41	422.29	dry	02_04_2000	99	454.55	wet	05_11_2000	16	408.29	wet
02_08_1998	26	406.15	dry	02_05_2000	101	455.74	wet	05_12_2000	16	425.05	wet
11_13_1999	8.9	401.27	wet	02_06_2000	57	456.77	wet	05_13_2000	16	427.39	wet
11_14_1999	8.5	402.11	wet	02_07_2000	44	474.07	wet	05_14_2000	16	427.51	wet
11_25_1999	9.6	401.99	wet	02_08_2000	39	457.88	dry	05_15_2000	16	426.78	wet
11_26_1999	37	418.60	wet	02_09_2000	35	441.00	dry	05_16_2000	17	425.59	wet
11_27_1999	146	423.50	wet	02_10_2000	32	424.61	dry	05_17_2000	17	430.08	wet
11_28_1999	13	425.80	wet	02_11_2000	31	409.40	dry	05_18_2000	17	428.41	wet
11_29_1999	5.2	423.90	wet	02_12_2000	68	410.33	wet	05_19_2000	16	426.51	wet
11_30_1999	4.1	406.81	dry	02_13_2000	181	425.63	wet	05_20_2000	16	426.42	wet
01_09_2000	32	418.08	wet	02_14_2000	110	442.51	wet	05_21_2000	16	441.78	wet
01_10_2000	207	438.68	wet	02_15_2000	100	460.08	wet	05_22_2000	30	458.75	wet
01_11_2000	278	460.34	wet	02_16_2000	37	444.31	dry	05_23_2000	17	474.93	wet
01_12_2000	48	485.23	wet	02_17_2000	31	428.54	dry	**05_24_2000**	**12**	**491.23**	wet
01_13_2000	32	484.87	wet	02_18_2000	86	429.31	wet	05_25_2000	10	471.47	dry
01_14_2000	28	467.57	dry	02_19_2000	79	430.01	wet	05_26_2000	9.6	469.17	wet
01_15_2000	25	450.63	dry	02_20_2000	38	429.58	wet	05_27_2000	8.3	464.73	wet
01_16_2000	24	434.56	dry	02_21_2000	30	413.82	dry	05_28_2000	8	460.98	wet
01_17_2000	25	450.12	wet	04_15_2000	36	412.76	wet	05_29_2000	11	458.20	wet
01_18_2000	25	449.88	wet	04_16_2000	31	415.06	wet	05_30_2000	12	455.16	wet
01_19_2000	28	449.73	wet	04_17_2000	14	411.95	wet	05_31_2000	10	452.37	wet
01_20_2000	43	450.05	wet	04_18_2000	154	415.75	wet	06_01_2000	9.2	449.94	dry
01_21_2000	57	450.53	wet	04_19_2000	70	419.68	wet	06_02_2000	9	447.59	dry
01_22_2000	32	450.46	wet	04_20_2000	22	418.65	wet	06_03_2000	7.9	429.72	dry
01_23_2000	36	450.14	wet	04_21_2000	19	405.08	dry	06_04_2000	9.4	428.65	wet
01_24_2000	53	466.72	wet	04_30_2000	31	414.92	wet	06_05_2000	9.6	425.61	wet
01_25_2000	65	484.35	wet	05_01_2000	18	432.30	wet	06_06_2000	9.6	422.90	wet

Appendix 7 continued

Date	Flow at SR1100 (cfs)	Fecal Coliform (#/100 ml)	Weather Conditions	Date	Flow at SR1100 (cfs)	Fecal Coliform (#/100 ml)	Weather Conditions
06_07_2000	8.6	420.58	wet	01_26_2001	17	440.88	dry
06_08_2000	8.3	417.94	wet	01_27_2001	16	440.52	wet
06_09_2000	8	400.16	dry	01_28_2001	16	440.20	wet
08_01_2000	21	411.49	wet	01_29_2001	18	439.21	wet
08_02_2000	107	431.74	wet	01_30_2001	21	438.46	wet
08_03_2000	28	449.76	wet	01_31_2001	22	438.36	wet
08_04_2000	20	466.98	wet	02_01_2001	20	454.49	wet
08_05_2000	198	471.61	wet	02_02_2001	19	470.89	wet
08_06_2000	71	475.44	wet	02_03_2001	17	454.20	dry
08_07_2000	13	474.09	wet	02_04_2001	17	453.85	wet
08_08_2000	10	454.45	dry	02_05_2001	21	453.47	wet
08_09_2000	9.5	435.43	dry	02_06_2001	21	453.49	wet
08_10_2000	14	434.61	wet	02_07_2001	19	453.23	wet
08_11_2000	11	433.85	wet	02_08_2001	18	452.58	wet
08_12_2000	8.8	432.40	wet	02_09_2001	17	435.99	dry
08_13_2000	7.7	416.51	dry	02_10_2001	16	419.63	dry
09_14_2000	9.3	404.84	wet	02_11_2001	16	404.22	dry
09_15_2000	12	407.11	wet				
09_16_2000	7.8	407.32	wet				
09_17_2000	7.8	408.27	wet				
09_18_2000	8.9	406.61	wet				
09_19_2000	11	406.32	wet				
09_20_2000	10	406.53	wet				
09_21_2000	9.6	404.99	wet				
01_14_2001	22	410.15	wet				
01_15_2001	23	431.40	wet				
01_16_2001	23	430.13	wet				
01_17_2001	22	428.70	wet				
01_18_2001	23	428.52	wet				
01_19_2001	23	428.05	wet				
01_20_2001	50	428.88	wet				
01_21_2001	34	429.81	wet				
01_22_2001	23	445.13	wet				
01_23_2001	20	444.17	dry				
01_24_2001	19	442.73	dry				
01_25_2001	18	441.86	dry				

Appendix 8. Public notice of draft Northeast Creek Fecal Coliform TMDL

Appendix 8.1. The Herald-Sun

AFFIDAVIT OF PUBLICATION

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

A public meeting for the TMDL will be held on May 27, 2003 from 10 AM to 12 PM in Durham County Agricultural Building and Curb Market, 721 Foster Street, Durham, NC 27701. 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 June 6, 2003. Please mail comments to: NC DWQ-Planning Branch, attn: Ms. Robin Markham, 1617 Mail Service Center, Raleigh, NC 27699-1617.

H-S: May 6, 2003

State of North Carolina
County of Durham

Donna B. Minor being duly sworn says that she is the Principal Clerk of The Durham Herald Co., Inc., publishers of The Herald-Sun, a newspaper published in and of general circulation in said County, and that a notice of which the annexed is a true copy, was published in said newspaper one time on the 6th day of May, 2003.

Donna B. Minor
Principal Clerk

Sworn to and subscribed before me this 8th day of May, 2003.

Polly J. Mims
Notary Public

My commission expires December 16, 2006.

Durham County, North Carolina

POLLY J. MIMS NOTARY PUBLIC DURHAM COUNTY, NC

Appendix 8.2 The Chatham News.

The Chatham News

NORTH CAROLINA

CHATHAM COUNTY

AFFIDAVIT OF PUBLICATION

Before the undersigned, a Notary Public of said County and State, duly commissioned, qualified, and authorized by law to administer oaths, personally appeared

Florence Turner, who being first duly sworn, deposes and says: that he (she) is

Accounts Receivable Clerk

(Owner, partner, publisher, or other officer or employee authorized to make this affidavit)

of The Chatham News Publishing Co., Inc., engaged in the publication of a newspaper known as, The Chatham News, published, issued, and entered as second class mail in the Town of Siler City, in said County and State; that he (she) is authorized to make this affidavit and sworn statement; that the notice or legal advertisement, a true copy of which is attached hereto, was published in The Chatham News on the following dates:

May 8 2003

and that the said newspaper in which such notice, paper, document, or legal advertisement was published was, at the time of each and every such publication, a newspaper meeting all of the requirements and qualifications of Section 1-597 of the General Statutes of North Carolina and was a qualified newspaper within the meaning of Section 1-597 of the General Statues of North Carolina.

This 8th day of May, 2003

Florence E. Turner

(Signature of person making affidavit)

Sworn to and subscribed before me, this 8th

day of May, 2003

Notary Public

My Commission expires: 11-07-2005

Public Notice
State of North Carolina
Division of Water Quality

Availability of the Total Maximum Daily Load (TMDL) for Fecal Coliform Bacteria To Northeast Creek, North Carolina. A public meeting for the TMDL will be held on May 27, 2003 from 10 AM to 12 PM in Durham County Agricultural Building and Curb Market, 721 Foster Street, Durham, NC 27701. Copies of the TMDL may be obtained by calling Ms. Robin Markham at (919) 733-5083, ext. 538 or on the internet at http://h20.enr.state.nc.us/tmdl. Written comments regarding the TMDL will be accepted until June 5, 2003.

Please mail comments to: NC DWQ-Planning Branch, attn: Ms. Robin Markham, 1617 Mail Service Center, Raleigh, NC 27699-1617.

Myb-1tc