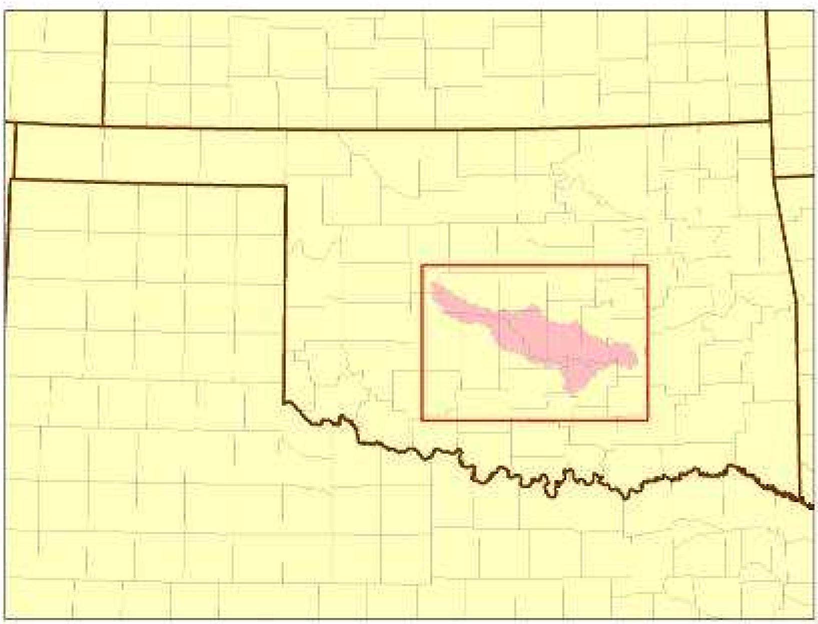
FINAL

BACTERIA TOTAL MAXIMUM DAILY LOADS FOR THE CANADIAN RIVER AREA, OKLAHOMA (OK520600, OK520610, OK520800)



Prepared for:

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

Prepared by:

PARSONS

AUGUST 2008

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OKWBID

OK520600010010, OK520600010060, OK520600020170, OK520600030030, OK520610010010, OK520610010080, OK520610010180, OK520610020120, OK520610020150, OK520610030080, OK520800010010

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Prepared by:

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AUGUST 2008

Oklahoma Department of Environmental Quality: FY07 106 Grant (CA# I-006400-05) Project 24 – Bacteria TMDL Development

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ACRONYMS AND ABBREVIATIONS

AEMS	Agricultural Environmental Management Service
ASAE	American Society of Agricultural Engineers
BMP	best management practice
CAFO	Concentrated Animal Feeding Operation
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cfu	Colony-forming unit
CPP	Continuing planning process
CWA	Clean Water Act
DMR	Discharge monitoring report
LA	Load allocation
LDC	Load duration curve
mg	Million gallons
mgd	Million gallons per day
mL	Milliliter
MOS	Margin of safety
MS4	Municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
O.S.	Oklahoma statutes
ODAFF	Oklahoma Department of Agriculture, Food and Forestry
ODEQ	Oklahoma Department of Environmental Quality
OPDES	Oklahoma Pollutant Discharge Elimination System
OSWD	Onsite wastewater disposal
OWRB	Oklahoma Water Resources Board
PBCR	Primary body contact recreation
PRG	Percent reduction goal
SBCR	Secondary body contact recreation
SSO	Sanitary sewer overflow
TMDL	Total maximum daily load
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WLA	Wasteload allocation
WQM	Water quality monitoring
WQS	Water quality standard
WWTP	Wastewater treatment plant

Executive Summary

This report documents the data and assessment used to establish Total Maximum Daily Loads (TMDL) for the pathogen indicator bacteria fecal coliform, *Escherichia coli (E. coli),* or Enterococci for certain waterbodies in the Canadian River Basin. Elevated levels of pathogen indicator bacteria in aquatic environments indicate that a receiving water is contaminated with human or animal feces and that there is a potential health risk for individuals exposed to the water. Data assessment and TMDL calculations are conducted in accordance with requirements of Section 303(d) of the Clean Water Act (CWA), Water Quality Planning and Management Regulations (40 CFR Part 130), U.S. Environmental Protection Agency (USEPA) guidance, and Oklahoma Department of Environmental Quality (ODEQ) guidance and procedures. ODEQ is required to submit all TMDLs to USEPA for review and approval. Once the USEPA approves a TMDL, then the waterbody may be moved to Category 4a of a state's Integrated Water Quality Monitoring and Assessment Report, where it remains until compliance with water quality standards (WQS) is achieved (USEPA 2003).

The purpose of this report is to establish pollutant load allocations for indicator bacteria in impaired waterbodies, which is the first step toward restoring water quality and protecting public health. TMDLs determine the pollutant loading a waterbody can assimilate without exceeding the WQS for that pollutant. A TMDL consists of a wasteload allocation (WLA), load allocation (LA), and a margin of safety (MOS). The WLA is the fraction of the total pollutant load apportioned to point sources, and includes stormwater discharges regulated under the National Pollutant Discharge Elimination System (NPDES) as point sources. The LA is the fraction of the total pollutant load apportioned to nonpoint sources. The MOS is a percentage of the TMDL set aside to account for the uncertainty associated with natural process in aquatic systems, model assumptions, and data limitations.

This report does not stipulate specific control actions (regulatory controls) or management measures (voluntary best management practices) necessary to reduce bacteria loadings within each watershed. Watershed-specific control actions and management measures will be identified, selected, and implemented under a separate process.

E.1 Problem Identification and Water Quality Target

A decision was made to place specific waterbodies in this Study Area, listed in Table ES-1, on the ODEQ 2004 303(d) list because evidence of nonsupport of primary body contact recreation (PBCR) was observed.

Elevated levels of bacteria above the WQS for one or more of the bacterial indicators result in the requirement that a TMDL be developed. The TMDLs established in this report are a necessary step in the process to develop the bacteria loading controls needed to restore the primary body contact recreation use designated for each waterbody.

Table ES-1 Excerpt from the 2004 Integrated Report – Comprehensive Waterbody Assessment Category List

Waterbody ID	Waterbody Name	Stream Miles	Category	TMDL Date	Primary Body Contact Recreation
OK520600010010_00	Canadian River	38.81	5	2005	N
OK520600010060_00	Factory Creek	6.11	5	2008	N
OK520600020170_00	Julian Creek	6.21	5	2008	N
OK520600030030_00	Spring Brook	26.78	5	2008	N
OK520610010010_05	Canadian River	33	5	2005	N
OK520610010080_00	Willow Creek	9.06	5	2008	N
OK520610010180_00	Bishop Creek	7.82	5	2008	N
OK520610020120_00	Buggy Creek	26.51	5	2008	N
OK520610020150_10	Canadian River	36	5	2005	N
OK520610030080_00	Walnut Creek-North Fork	16.84	5	2008	N
OK520800010010_00	Little River	24.8	5	2005	N

N = Not Supporting; Source: 2004 Integrated Report, ODEQ 2004

For the data collected between 1997 and 2005, evidence of nonsupport of the PBCR use based only on fecal coliform concentrations was observed in six waterbodies: Factory Creek (OK52060001006), Julian Creek (OK520600020170), Spring Brook (OK520600030030), Willow Creek (OK520610010080), Bishop Creek (OK520610010180) and Walnut Creek-North Fork (OK520610030080). Evidence of nonsupport of the PBCR use based only on Enterococci concentrations was observed in one waterbody on two separate segments: Canadian River (OK520600010010_00 and OK520610020150_10). Evidence of nonsupport of the SBCR use based only on Enterococci concentrations was observed in Canadian River (OK520610010010_05). Evidence of nonsupport of the PBCR use based on both fecal coliform and Enterococci concentrations was observed in Little River (OK520800010010). Lastly, evidence of nonsupport for all three bacterial indicators was observed only in Buggy Creek (OK520610020120). Table ES-2 summarizes the waterbodies requiring TMDLs for not supporting PBCR or SBCR.

Table ES-2 Waterbodies Requiring TMDLs for Not Supporting PBCR or SBCR Beneficial Use

Waterbody Station	Waterbody ID	Waterbody Name	Indicator Bacteria		
			FC	ENT	*E. coli*
OK520600010010-001AT	OK520600010010_00	Canadian River		X	
OK520600010060P	OK520600010060_00	Factory Creek	X		
OK520600020170B	OK520600020170_00	Julian Creek	X		
OK520600030030E	OK520600030030_00	Spring Brook	X		
OK520610010010-001AT	OK520610010010_05	Canadian River		X	
OK520610010080G	OK520610010080_00	Willow Creek	X		
OK520610010180G	OK520610010180_00	Bishop Creek	X		
OK520610020120G	OK520610020120_00	Buggy Creek	X	X	X
OK520610020150-001AT	OK520610020150_10	Canadian River		X	
OK520610030080G	OK520610030080_00	Walnut Creek-North Fork	X		
OK520800010010-001AT	OK520800010010_00	Little River	X	X	

ENT = enterococci; FC = fecal coliform

The definition of PBCR is summarized by the following excerpt from Chapter 45 of the Oklahoma WQSs.

(a) Primary Body Contact Recreation involves direct body contact with the water where a possibility of ingestion exists. In these cases the water shall not contain chemical, physical or biological substances in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings.

(b) In waters designated for Primary Body Contact Recreation...limits...shall apply only during the recreation period of May 1 to September 30. The criteria for Secondary Body Contact Recreation will apply during the remainder of the year.

To implement Oklahoma's WQS for PBCR, the Oklahoma Water Resources Board (OWRB) promulgated Chapter 46, *Implementation of Oklahoma's Water Quality Standards* (OWRB 2007). The excerpt below from Chapter 46: 785:46-15-6, stipulates how water quality data will be assessed to determine support of the PBCR use as well as how the water quality target for TMDLs will be defined for each bacterial indicator.

(a) Scope. The provisions of this Section shall be used to determine whether the subcategory of Primary Body Contact of the beneficial use of Recreation designated in OAC 785:45 for a waterbody is supported during the recreation season from May 1 through September 30 each year. Where data exist for multiple bacterial indicators on the same waterbody or waterbody segment, the determination of use support shall be based upon the use and application of all applicable tests and data.

(b) Screening levels:

(1) The screening level for fecal coliform shall be a density of 400 colonies per 100ml.

(2) The screening level for Escherichia coli shall be a density of 235 colonies per 100 ml in streams designated in OAC 785:45 as Scenic Rivers and in lakes, and 406 colonies per 100 ml in all other waters of the state designated as Primary Body Contact Recreation.

(3) The screening level for enterococci shall be a density of 61 colonies per 100 ml in streams designated in OAC 785:45 as Scenic Rivers and in lakes, and 108 colonies per 100 ml in all other waters of the state designated as Primary Body Contact Recreation.

(c) Fecal coliform:

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to fecal coliform if the geometric mean of 400 colonies per 100 ml is met and no greater than 25% of the sample concentrations from that waterbody exceed the screening level prescribed in (b) of this Section.

(2) The parameter of fecal coliform is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to fecal coliform if the geometric mean of 400 colonies per 100 ml is not met, or greater than 25% of the sample concentrations from that waterbody exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(d) Escherichia coli (E. coli):

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to E. coli if the geometric mean of 126 colonies per 100 ml is met, or the sample concentrations from that waterbody taken during the recreation season do not exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(2) The parameter of E. coli is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to E. coli if the geometric mean of 126 colonies per 100 ml is not met and any of the sample concentrations from that waterbody taken during the recreation season exceed a screening level prescribed in (b) of this Section.

(e) Enterococci:

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to enterococci if the geometric mean of 33 colonies per 100 ml is met, or the sample concentrations from that waterbody taken during the recreation season do not exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(2) The parameter of enterococci is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to enterococci if the geometric mean of 33 colonies per 100 ml is not met and any of the sample concentrations from that waterbody taken during the recreation season exceed a screening level prescribed in (b) of this Section.

Compliance with the Oklahoma WQS is based on meeting requirements for all three bacterial indicators. Where concurrent data exist for multiple bacterial indicators on the same waterbody or waterbody segment, each indicator group must demonstrate compliance with the numeric criteria prescribed (OWRB 2006).

As stipulated in the WQS, utilization of the geometric mean to determine compliance for any of the three indicator bacteria depends on the collection of five samples within a 30-day period. For most water quality monitoring (WQM) stations in Oklahoma there are insufficient data available to calculate the 30-day geometric mean since most water quality samples are collected once a month. As a result, waterbodies placed on the 303(d) list for not supporting the PBCR are the result of individual samples exceeding the instantaneous criteria or the long-term geometric mean of individual samples exceeding the geometric mean criteria for each respective bacterial indicator. Targeting the instantaneous criterion established for the primary contact recreation season (May 1^{st} to September 30^{th}) as the water quality goal for TMDLs corresponds to the basis for 303(d) listing and may be protective of the geometric mean criterion as well as the criteria for the secondary contact recreation season. However, both the instantaneous and geometric mean criteria for *E. coli* and Enterococci will be evaluated as water quality targets to ensure the most protective goal is established for each waterbody.

All TMDLs for fecal coliform must take into account that no more than 25 percent of the samples may exceed the instantaneous numeric criteria. For *E. coli* and Enterococci, no more than 10 percent of samples may exceed instantaneous criteria. Since the attainability of stream beneficial uses for *E. coli* and Enterococci is based on the compliance of either the instantaneous or a long-term geometric mean criterion, percent reductions goals will be calculated for both criteria. TMDLs will be based on the percent reduction required to meet either the instantaneous or the long-term geometric mean criterion, whichever is less.

Canadian River (OK520610010010_05) is designated in Chapter 45 of the Oklahoma WQS for secondary body contact recreation (SBCR) use. The data assessment method used for SBCR streams is the same as with the PBCR, although the criteria are five times those of the PBCR streams. The single sample criterion for SBCR for fecal coliform, *E. coli*, and Enterococci are 2,000, 2,030, and 540 colonies per 100 mL, respectively; and the geometric mean criterion for fecal coliform, E. coli, and Enterococci are 2000, 630, and 165 colonies per 100 mL, respectively.

E.2 Pollutant Source Assessment

A source assessment characterizes known and suspected sources of pollutant loading to impaired waterbodies. Sources within a watershed are categorized and quantified to the extent that information is available. Bacteria originate from warm-blooded animals; some plant life and sources may be point or nonpoint in nature.

There are no NPDES-permitted facilities of any type in the contributing watersheds of Factory Creek (OK520600010060_00), Julian Creek (OK520600020170_00) and Willow Creek (OK520610010080_00). Eight of the watersheds in the Study Area, Spring Brook (OK520600030030_00), Walnut Creek-North Fork (OK520610030080_00), Bishop Creek (OK520610010180_00), Buggy Creek (OK520610020120_00), Canadian River (OK520600010010_00, OK520610020150_10 and OK520610010010_05), and Little River (OK520800010010_00), have continuous point source discharges.

There are 12 no-discharge facilities in the Study Area; however, it is possible the wastewater collection systems associated with those WWTPs could be a source of bacteria loading. While not all sewer overflows are reported, ODEQ has some data on sanitary sewer overflows (SSO) available. There were 1,647 SSO occurrences, ranging from 0 to 7 million gallons, reported from six different waterbodies in the Study Area between July 1989 and April 2007. Given the significant number of occurrences and the size of the overflows reported, SSOs have been a significant source of bacteria loading in the past in the Canadian River (OK520610010010_05, and OK520600010010_00), Little River (OK520800010010_00), and Bishop Creek (OK520610010180_00) watersheds.

The MS4 permit for small communities in Oklahoma became effective on February 8, 2005. The City of Norman and University of Oklahoma in Bishop Creek (OK520610010180_00) have a permitted MS4. There are no other permitted MS4s in study area of this report.

There are 13 CAFOs located in the Canadian River (OK520610010010_05, OK520610020150_10, and OK520600010010_00), Little River (OK520800010010_00), and Buggy Creek (OK520610020120_00). Factory Creek, Julian Creek, Spring Brook, Willow Creek, Bishop Creek, and Walnut Creek-North Fork have no CAFOs within their contributing watershed.

Since there are no NPDES-permitted facilities in Factory Creek, Julian Creek and Willow Creek watersheds, nonsupport of PBCR use is caused by nonpoint sources of bacteria only. In watersheds with both point and nonpoint sources of bacteria, the available data suggests that the proportion of bacteria from point sources ranges from minor to moderate. Those waterbodies in which point sources are a minor contributor of bacteria include Canadian River (OK520610020150_10), Walnut Creek-North Fork (OK520610030080_00), and Spring Brook (OK520600030030_00). In the remaining five watersheds, Canadian River (OK520600010010_00), Bishop Creek (OK520610010180_00), Buggy Creek (OK520610020120_00), Canadian River (OK520610010010_05), and Little River (OK520800010010_00), point sources such as WWTP, SSOs, and CAFOs, contribute moderate bacteria loads in propotion to nonpoint sources. The urban areas designated as Phase II MS4s in the city of Norman and University of Oklahoma further increase the proportion of bacteria loading from point sources in Bishop Creek (OK520610010180_00). However, overall nonpoint sources are considered to be the major source of bacteria loading in each watershed.

Nonpoint source bacteria loading to the receiving streams of each waterbody emanate from a number of different sources including wildlife, various agricultural activities and domesticated animals, land application fields, urban runoff, failing onsite wastewater disposal systems, and domestic pets. The data analysis and the load duration curves (LDC) demonstrate that exceedances at the WQM stations are the result of a variety of nonpoint source loading occurring during a range of flow conditions. Low flow exceednaces are likely due to a combination of non-point sources, uncontrolled point sources and permit noncompliance.

E.3 Using Load Duration Curves to Develop TMDLs

The TMDL calculations presented in this report are derived from LDCs. LDCs facilitate rapid development of TMDLs and as a TMDL development tool, are effective in identifying whether impairments are associated with point or nonpoint sources.

Use of the LDC obviates the need to determine a design storm or selected flow recurrence interval with which to characterize the appropriate flow level for the assessment of critical conditions. For waterbodies impacted by both point and nonpoint sources, the “nonpoint source critical condition” would typically occur during high flows, when rainfall runoff would contribute the bulk of the pollutant load, while the “point source critical condition” would typically occur during low flows, when treatment plant effluents would dominate the base flow of the impaired water. However, flow range is only a general indicator of the relative proportion of point/nonpoint contributions. It is not used in this report to quantify point source or nonpoint source contributions. Violations that occur during low flows may not be caused exclusively by point sources. Violations have been noted in some watersheds that contain no point sources. Research has show that bacteria loading in streams during low flow conditions may be due to direct deposit of cattle manure into streams and faulty septic tank/lateral field systems.

The basic steps to generating an LDC involve:

- obtaining daily flow data for the site of interest from the U.S. Geological Survey ;
- sorting the flow data and calculating flow exceedance percentiles for the time period and season of interest;
- obtaining the water quality data from the primary contact recreation season (May 1 through September 30);
- obtaining water quality data from the entire calendar year for waterbodies not supporting the SBCR use;
- matching the water quality observations with the flow data from the same date;
- display a curve on a plot that represents the allowable load multiply the actual or estimated flow by the WQS for each respective indicator;
- multiplying the flow by the water quality parameter concentration to calculate daily loads; then
- plotting the flow exceedance percentiles and daily load observations in a load duration plot.

LDCs display the maximum allowable load over the complete range of flow conditions by a line using the calculation of flow multiplied by the water quality criterion. The TMDL can be expressed as a continuous function of flow, equal to the line, or as a discrete value derived from a specific flow condition.

E.4 TMDL Calculations

As indicated above, the bacteria TMDLs for the 303(d)-listed WQM stations covered in this report were derived using LDCs. A TMDL is expressed as the sum of all WLAs (point source loads), LAs (nonpoint source loads), and an appropriate MOS, which attempts to account for uncertainty concerning the relationship between effluent limitations and water quality.

This definition can be expressed by the following equation:

$$TMDL = \Sigma\ WLA + \Sigma\ LA + MOS$$

For each waterbody the TMDLs presented in this report are expressed as a percent reduction across the full range of flow conditions (See Table ES-3). The difference between existing loading and the water quality target is used to calculate the loading reductions required. Percent reduction goals (PRG) are calculated for each WQM site and bacterial indicator species as the reductions in load required so that no more than 25 percent of the existing instantaneous fecal coliform observations and no more than 10 percent of the existing instantaneous *E. coli* or Enterococci observations would exceed the water quality target.

Table ES-3 presents the percent reductions necessary for each bacterial indicator causing nonsupport of the PBCR use in each waterbody of the Study Area. Attainment of WQS in response to TMDL implementation will be based on results measured at each of these WQM stations. Selection of the appropriate PRG for each waterbody in Table ES-3 is denoted by bold text. The TMDL PRG will be the lesser of that required to meet the geometric mean or instantaneous criteria for *E. coli* and Enterococci because WQSs are considered to be met if, 1) either the geometric mean of all data is less than the geometric mean criteria, or 2) no more than 10 percent of samples exceed the instantaneous criteria. Based on this table, the TMDL PRGs for Canadian River (OK520600010010_00), Canadian River (OK520610010010_05), Buggy Creek, Canadian River (OK520610020150_10) and Little River will be based on Enterococci; the TMDL PRGs for Factory Creek, Julian Creek, Spring Brook, Willow Creek, Bishop Creek, and Walnut Creek-North Fork will be based on fecal coliform. The PRGs range from 40 to 96 percent.

Table ES-3 TMDL Percent Reduction Goals Required to Meet Water Quality Standards for Impaired Waterbodies in the Canadian River Study Area

Waterbody Station	Waterbody ID	Waterbody Name	Percent Reduction Required				
			FC	EC		ENT	
			Instant-aneous	Instant-aneous	Geo-mean	Instant-aneous	Geo-mean
OK520600010010-001AT	OK520600010010_00	Canadian River				**56%**	57%
OK520600010060P	OK520600010060_00	Factory Creek	**64%**				
OK520600020170B	OK520600020170_00	Julian Creek	**78%**				
OK520600030030E	OK520600030030_00	Spring Brook	**88%**				
OK520610010010-001AT	OK520610010010_05	Canadian River				94%	**29%**
OK520610010080G	OK520610010080_00	Willow Creek	**96%**				
OK520610010180G	OK520610010180_00	Bishop Creek	**67%**				
OK520610020120G	OK520610020120_00	Buggy Creek	40%	54%	47%	**71%**	74%
OK520610020150-001AT	OK520610020150_10	Canadian River				89%	**73%**
OK520610030080G	OK520610030080_00	Walnut Creek-North Fork	**40%**				
OK520800010010-001AT	OK520800010010_00	Little River	29%			86%	**61%**

The TMDL, WLA, LA, and MOS vary with flow condition, and are calculated at every 5th flow interval percentile. For illustrative purposes, the TMDL, WLA, LA, and MOS are calculated for the median flow at each site in Table ES-4. The WLA component of each TMDL is the sum of all WLAs within the contributing watershed of each WQM station. The sum of the WLAs can be represented as a single line below the LDC. The WLA for MS4s is estimated according to the percentage of watershed which falls under the MS4 coverage. The LDC and the simple equation of:

Average LA = average TMDL – MOS – WLA_WWTP - WLA_MS4

can provide an individual value for the LA in counts per day, which represents the area under the TMDL target line and above the WLA line. For MS4s the load reduction will be the same as the PRG established for the overall watershed (nonpoint sources). Where there are no continuous point sources the WLA_WWTP is zero.

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs include an MOS. The MOS is a conservative measure incorporated into the TMDL equation that accounts for the uncertainty associated with calculating the allowable pollutant loading to ensure WQSs are attained. USEPA guidance allows for use of implicit or explicit expressions of the MOS, or both. When conservative assumptions are used in development of the TMDL, or conservative factors are used in the calculations, the MOS is implicit. When a specific percentage of the TMDL is set aside to account for uncertainty, then the MOS is considered explicit.

For the explicit MOS the water quality target was set at 10 percent lower than the water quality criterion for each pathogen. For PBCR this equates to 360 colony-forming units per 100 milliliter (cfu/100 mL), 365.4 cfu/100 mL, and 97.2/100 mL for fecal coliform, *E. coli*, and Enterococci, respectively. For SBCR, this equates to 1,800 colony-forming units per 100 milliliter (cfu/100 mL), 1,827 cfu/100 mL, and 486/100 mL for fecal coliform, E. coli, and Enterococci, respectively. The net effect of the TMDL with MOS is that the assimilative capacity or allowable pollutant loading of each waterbody is slightly reduced. These TMDLs incorporate an explicit MOS by using a curve representing 90 percent of the TMDL as the average MOS. The MOS at any given percent flow exceedance, therefore, can be defined as the difference in loading between the TMDL and the TMDL with MOS. The use of instream bacteria concentrations to estimate existing loading is another conservative element utilized in these TMDLs that can be recognized as an implicit MOS. This conservative approach to establishing the MOS will ensure that both the 30-day geometric mean and instantaneous bacteria standards can be achieved and maintained.

E.5 Reasonable Assurance

As authorized by Section 402 of the CWA, ODEQ has delegation of the NPDES in Oklahoma, except for certain jurisdictional areas related to agriculture and the oil and gas industry retained by the Oklahoma Department of Agriculture and Oklahoma Corporation Commission, for which the USEPA has retained permitting authority. The NPDES program in Oklahoma is implemented via Title 252, Chapter 606 of the Oklahoma Pollution Discharge Elimination System (OPDES) Act, and in accordance with the agreement between ODEQ and USEPA relating to administration and enforcement of the delegated NPDES program. Implementation of WLAs for point sources is done through permits issued under the OPDES program.

Table ES-4 TMDL Summaries Examples

Waterbody ID	WQM Station	Waterbody Name	Bacteria Indicator	TMDL* (cfu/day)	WLA_WWTP (cfu/day)	WLA_MS4* (cfu/day)	LA* (cfu/day)	MOS* (cfu/day)
OK520600010010_00	OK520600010010-001AT	Canadian River	ENT	7.50E+11	4.56E+08	0	6.75E+11	7.50E+10
OK520600010060_00	OK520600010060P	Factory Creek	FC	9.64E+09	0	0	8.67E+09	9.64E+08
OK520600020170_00	OK520600020170B	Julian Creek	FC	2.09E+10	0	0	1.88E+10	2.09E+09
OK520600030030_00	OK520600030030E	Spring Brook	FC	9.85E+09	1.21E+09	0	7.66E+09	9.85E+08
OK520610010010_05	OK520610010010-001AT	Canadian River	ENT	7.16E+11	1.61E+10	0	6.28E+11	7.16E+10
OK520610010080_00	OK520610010080G	Willow Creek	FC	3.03E+10	0	0	2.73E+10	3.03E+09
OK520610010180_00	OK520610010180G	Bishop Creek	FC	1.73E+10	5.75E+09	5.38E+09	4.40E+09	1.73E+09
OK520610020120_00	OK520610020120G	Buggy Creek	ENT	2.22E+10	2.69E+08	0	1.97E+10	2.22E+09
OK520610020150_10	OK520610020150-001AT	Canadian River	ENT	1.61E+11	2.5E+08	0	1.45E+11	1.61E+10
OK520610030080_00	OK520610030080G	Walnut Creek-North Fork	FC	5.22E+10	2.27E+08	0	4.67E+10	5.22E+09
OK520800010010_00	OK520800010010-001AT	Little River	ENT	1.15E+11	9.99E+08	0	1.02E+11	1.15E+10

* Derived for illustrative purposes at the median flow value

SECTION 1
INTRODUCTION

1.1 TMDL Program Background

Section 303(d) of the Clean Water Act (CWA) and U.S. Environmental Protection Agency (USEPA) Water Quality Planning and Management Regulations (40 Code of Federal Regulations [CFR] Part 130) require states to develop total maximum daily loads (TMDL) for waterbodies not meeting designated uses where technology-based controls are in place. TMDLs establish the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so states can implement water quality-based controls to reduce pollution from point and nonpoint sources and restore and maintain water quality (USEPA 1991).

This report documents the data and assessment used to establish TMDLs for the pathogen indicator bacteria fecal coliform, *Escherichia coli (E. coli)*, or Enterococci for certain waterbodies in the Canadian River Basin. Elevated levels of pathogen indicator bacteria in aquatic environments indicate that a receiving water is contaminated with human or animal feces and that there is a potential health risk for individuals exposed to the water. Data assessment and TMDL calculations are conducted in accordance with requirements of Section 303(d) of the CWA, Water Quality Planning and Management Regulations (40 CFR Part 130), USEPA guidance, and Oklahoma Department of Environmental Quality (ODEQ) guidance and procedures. ODEQ is required to submit all TMDLs to USEPA for review and approval. Once the USEPA approves a TMDL, then the waterbody may be moved to Category 4a of a state's Integrated Water Quality Monitoring and Assessment Report, where it remains until compliance with water quality standards (WQS) is achieved (USEPA 2003).

The purpose of this TMDL report is to establish pollutant load allocations for indicator bacteria in impaired waterbodies, which is the first step toward restoring water quality and protecting public health. TMDLs determine the pollutant loading a waterbody can assimilate without exceeding the WQS for that pollutant. TMDLs also establish the pollutant load allocation necessary to meet the WQS established for a waterbody based on the relationship between pollutant sources and in-stream water quality conditions. A TMDL consists of a wasteload allocation (WLA), load allocation (LA), and a margin of safety (MOS). The WLA is the fraction of the total pollutant load apportioned to point sources, and includes stormwater discharges regulated under the National Pollutant Discharge Elimination System (NPDES) as point sources. The LA is the fraction of the total pollutant load apportioned to nonpoint sources. The MOS is a percentage of the TMDL set aside to account for the uncertainty associated with natural process in aquatic systems, model assumptions, and data limitations.

This report does not stipulate specific control actions (regulatory controls) or management measures (voluntary best management practices) necessary to reduce bacteria loadings within each watershed. Watershed-specific control actions and management measures will be identified, selected, and implemented under a separate process involving stakeholders who live and work in the watersheds, tribes, and local, state, and federal government agencies.

This TMDL report focuses on waterbodies that ODEQ placed in Category 5 of the 2004 Integrated Report [303(d) list] for nonsupport of primary or secondary body contact recreation (PBCR):

- Canadian River (OK520600010010_00),
- Factory Creek (OK520600010060_00),
- Julian Creek (OK520600020170_00),
- Spring Brook (OK5206000300030_00),
- Canadian River (OK520610010010_05),
- Willow Creek (OK520610010080_00),
- Bishop Creek (OK520610010180_00),
- Buggy Creek (OK520610020120_00),
- Canadian River (OK520610020150_10),
- Walnut Creek-North Fork, (OK520610030080_00), and
- Little River (OK520800010010_00).

Figure 1-1 is a location map showing the impaired segments of these Oklahoma waterbodies and their contributing watersheds. This map also displays the locations of the water quality monitoring (WQM) stations used as the basis for placement of these waterbodies on the Oklahoma 303(d) list. These waterbodies and their surrounding watersheds are hereinafter referred to as the Study Area.

Elevated levels of bacteria above the WQS result in the requirement that a TMDL be developed. The TMDLs established in this report are a necessary step in the process to develop the bacteria loading controls needed to restore the contact recreation use designated for each waterbody. Table 1-1 provides a description of the locations of the WQM stations on the 303(d)-listed waterbodies.

Table 1-1 Water Quality Monitoring Stations used for 2004 303(d) Listing Decision

Waterbody Name	Waterbody ID	WQM Station	WQM Station Location Descriptions
Canadian River	OK520600010010_00	OK520600010010-001AT	Canadian River, US 377, Konawa
Factory Creek	OK520600010060_00	OK520600010060P	Factory Creek
Julian Creek	OK520600020170_00	OK520600020170B	Julian Creek
Spring Brook	OK520600030030_00	OK520600030030E	Spring Brook Creek
Canadian River	OK520610010010_05	OK520610010010-001AT	Canadian River, US 77, Purcell
Willow Creek	OK520610010080_00	OK520610010080G	Willow Creek
Bishop Creek	OK520610010180_00	OK520610010180G	Bishop Creek, near Jenkins Street
Buggy Creek	OK520610020120_00	OK520610020120G	Buggy Creek
Canadian River	OK520610020150_10	OK520610020150-001AT	Canadian River, US 66, Bridgeport
Walnut Creek-North Fork	OK520610030080_00	OK520610030080G	Walnut Creek-North Fork
Little River	OK520800010010_00	OK520800010010-001AT	Little River, SH 56, Sasakwa

1.2 Watershed Description

General. The watersheds in the Canadian River Study Area are located in central Oklahoma. The majority of the 11 waterbodies included in this report are located in Caddo, Grady, McClain, Pontotoc, Hughes, Seminole, Cleveland, and Pottawatomie Counties. A small portion of Spring Brook (OK520600030030) is located in Garvin County, and a small portion of the northern part of the Canadian River (OK520610020150) is located in Canadian County.

The majority of the waterbodies in the Canadian River Study Area are located in the Central Oklahoma/Texas Plains ecoregion. Buggy Creek (OK520610020120), Walnut Creek (OK520610030080) and the northern part of the Canadian River (OK502610020150) are part of the Anadarko Basin geologic province. Little River (OK520800010010), Factory Creek (OK520600010060), and the southern portion of the Canadian River (OK520600010010) are part of the Arkoma Basin geologic province. All other waterbodies are part of the Northern Shelf Areas geological province. Table 1-2, derived from the 2000 U.S. Census, demonstrates that most of the counties in which these watersheds are located are sparsely populated (U.S. Census Bureau 2000), with the exception of Cleveland County. Cleveland County is part of the Oklahoma City Metropolitan Statistical Area.

Table 1-2 County Population and Density

County Name	Population (2000 Census)	Population Density (per square mile)
Caddo	30,150	24
Grady	45,516	41
McClain	27,740	49
Cleveland	208,016	388
Pottawatomie	65,521	83
Seminole	24,894	39
Pontotoc	35,143	49
Hughes	14,154	18

Climate. Table 1-3 summarizes the average annual precipitation for each WQM station. Average annual precipitation values among the WQM stations in this portion of Oklahoma range between 33.1 and 41.7 inches (Oklahoma Climate Survey 2005).

Table 1-3 Average Annual Precipitation by Watershed

Canadian River Precipitation Summary		
Waterbody Name	**Waterbody ID**	**Average Annual (Inches)**
Canadian River	OK520600010010_00	41.5
Factory Creek	OK520600010060_00	41.4
Julian Creek	OK520600020170_00	39.4
Spring Brook	OK520600030030_00	40.5
Canadian River	OK520610010010_05	38.2
Willow Creek	OK520610010080_00	39.9
Bishop Creek	OK520610010180_00	37.8
Buggy Creek	OK520610020120_00	33.9
Canadian River	OK520610020150_10	33.1

Canadian River Precipitation Summary		
Waterbody Name	**Waterbody ID**	**Average Annual (Inches)**
Walnut Creek-North Fork	OK520610030080_00	35.4
Little River	OK520800010010_00	41.7

Land Use. Table 1-4 summarizes the acreages and the corresponding percentages of the land use categories for the contributing watershed associated with each respective Oklahoma waterbody. The land use/land cover data were derived from the U.S. Geological Survey (USGS) 2001 National Land Cover Dataset (USGS 2007). The land use categories are displayed in Figure 1-2.

Deciduous forest and grassland/herbaceous are the first and second most dominant land use categories in the Canadian River (OK520600010010), Factory Creek, and Little River watersheds. Grassland/herbaceous and primarily deciduous forest are the first and second most dominant land use categories in Julian Creek and Walnut Creek-North Fork. Grassland/herbaceous and cultivated crops are the first and second most dominant land use categories in Buggy Creek, and two segments of Canadian River (OK520610010010 and OK520610020150). Spring Brook watershed is primarily grasslands/herbaceous and pasture/hay is the second most dominant land use category. The combination of low, medium, and high intensity developed land account for 39.1 percent of Bishop Creek watershed. The second largest land use category for the Bishop Creek watershed is grassland/herbaceous.

The watershed with the most cities is Canadian River (OK520610010010_05) with the following 10 cities: Blanchard, Cole, Dibble, Washington, Purcell, Wayne, Goldsby, Rosedale, Lexington, and Noble. Another segment of the Canadian River watershed contains four cities: Konawa, Byng, Francis, and Allen. Little River watershed has three cities within its boundaries: Sasakwa, Spaulding, and Holdenville. The City of Minco is located within the Buggy Creek watershed; Hinton is located in the Canadian River watershed (OK520610020150_10), Slaughterville is in Willow Creek watershed, Stratford is in the Spring Brook watershed, and Norman is in the Bishop Creek watershed. The final three watersheds, Factory Creek, Julian Creek, and Walnut Creek-North Fork do not contain any urban areas. With the exception of the Bishop Creek watershed, all other urban land use categories account for less than 2.1 percent of the land use in each watershed.

Table 1-4 Land Use Summaries by Watershed

Landuse Category	WQM Station										
	Canadian River	Factory Creek	Julian Creek	Spring Brook	Canadian River	Willow Creek	Bishop Creek	Buggy Creek	Canadian River	Walnut Creek-North Fork	Little River
Waterbody ID	OK52060001000_00	OK520600010060_00	OK520600020170_00	OK520600030030_00	OK520610010010_05	OK520610010080_00	OK520610010180_00	OK520610020120_00	OK520610020150_10	OK520610030080_00	OK520800010010_00
Percent of Open Water	3.8	0.4	0.3	0.6	1.6	0.7	0.6	0.4	1.7	0.7	1.1
Percent of Developed, Open Space	5.8	4.9	3.8	5.8	5.4	4.1	14.7	4.2	3.5	5.0	4.9
Percent of Developed, Low Intensity	0.6	0.3	0.1	1.5	1.5	0.8	27.6	0.7	0.5	1.0	0.6
Percent of Developed, Medium Intensity	0.1	0.0	0.0	0.2	0.4	0.1	8.5	0.1	0.2	0.5	0.1
Percent of Developed, High Intensity	0.0	0.0	0.0	0.1	0.2	0.0	3.0	0.1	0.1	0.1	0.0
Percent of Barren Land (Rock/Sand/ Clay)	2.3	0.0	0.1	0.1	0.9	0.0	0.5	0.0	0.3	0.0	0.0
Percent of Deciduous Forest	47.6	49.1	32.8	20.1	16.3	8.6	11.0	4.8	6.2	15.4	49.3
Percent of Evergreen Forest	2.1	0.9	0.3	0.0	0.2	0.0	1.6	7.5	7.8	0.1	0.2
Percent of Mixed Forest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percent of Shrub/Scrub	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percent of Grassland/Herbaceous	28.5	35.7	48.6	38.3	44.4	31.2	18.6	54.8	42.2	64.1	26.1
Percent of Pasture/Hay	7.4	8.6	10.3	22.4	11.1	34.4	6.8	0.3	0.1	0.5	15.6
Percent of Cultivated Crops	1.7	0.0	3.6	10.9	18.2	20.1	7.2	27.2	37.6	12.6	2.1
Percent of Woody Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percent of Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Landuse Category	WQM Station										
	Canadian River	Factory Creek	Julian Creek	Spring Brook	Canadian River	Willow Creek	Bishop Creek	Buggy Creek	Canadian River	Walnut Creek-North Fork	Little River
Waterbody ID	OK52060001000_00	OK520600010060_00	OK520600020170_00	OK520600030030_00	OK520610010010_05	OK520610010080_00	OK520610010180_00	OK520610020120_00	OK520610020150_10	OK520610030080_00	OK520800010010_00
Acres Open Water (percent of total)	3,432	19	37	250	2,749	102	57	239	2,380	283	874
Acres Developed, Open Space	5,135	238	404	2,341	9,362	616	1,357	2,758	5,027	2,070	3,975
Acres Developed, Low Intensity	510	14	8	604	2,581	121	2,543	435	703	411	480
Acres Developed, Medium Intensity	117	1	0	80	656	16	780	79	252	187	77
Acres Developed, High Intensity	34	0	0	25	268	4	273	34	73	23	35
Acres Barren Land (Rock/Sand/Clay)	2,061	2	10	24	1,486	0	43	0	481	2	10
Acres Deciduous Forest	42,489	2,365	3,448	8,034	28,145	1,309	1,012	3,148	8,836	6,384	39,749
Acres Evergreen Forest	1,901	42	30	0	300	0	147	4,949	11,090	34	174
Acres Mixed Forest	0	0	0	0	0	0	0	0	0	0	0
Acres Shrub/Scrub	0	0	0	0	1	0	0	0	12	0	0
Acres Grassland/Herbaceous	25,402	1,721	5,115	15,353	76,782	4,727	1,709	36,017	60,315	26,494	21,018
Acres Pasture/Hay	6,562	415	1,088	8,969	19,215	5,204	624	168	84	221	12,552
Acres Cultivated Crops	1,523	0	376	4,384	31,427	3,047	662	17,878	53,831	5,214	1,678
Acres Woody Wetlands	0	0	0	0	0	0	0	0	0	0	0
Acres Emergent Herbaceous Wetlands	8	0	2	0	14	0	0	0	0	0	2
Total (Acres)	**89,172**	**4,817**	**10,518**	**40,064**	**172,988**	**15,146**	**9,206**	**65,704**	**143,085**	**41,323**	**80,624**

Figure 1-1 Watersheds Not Supporting Primary Body Contact Recreation Use within the Study Area

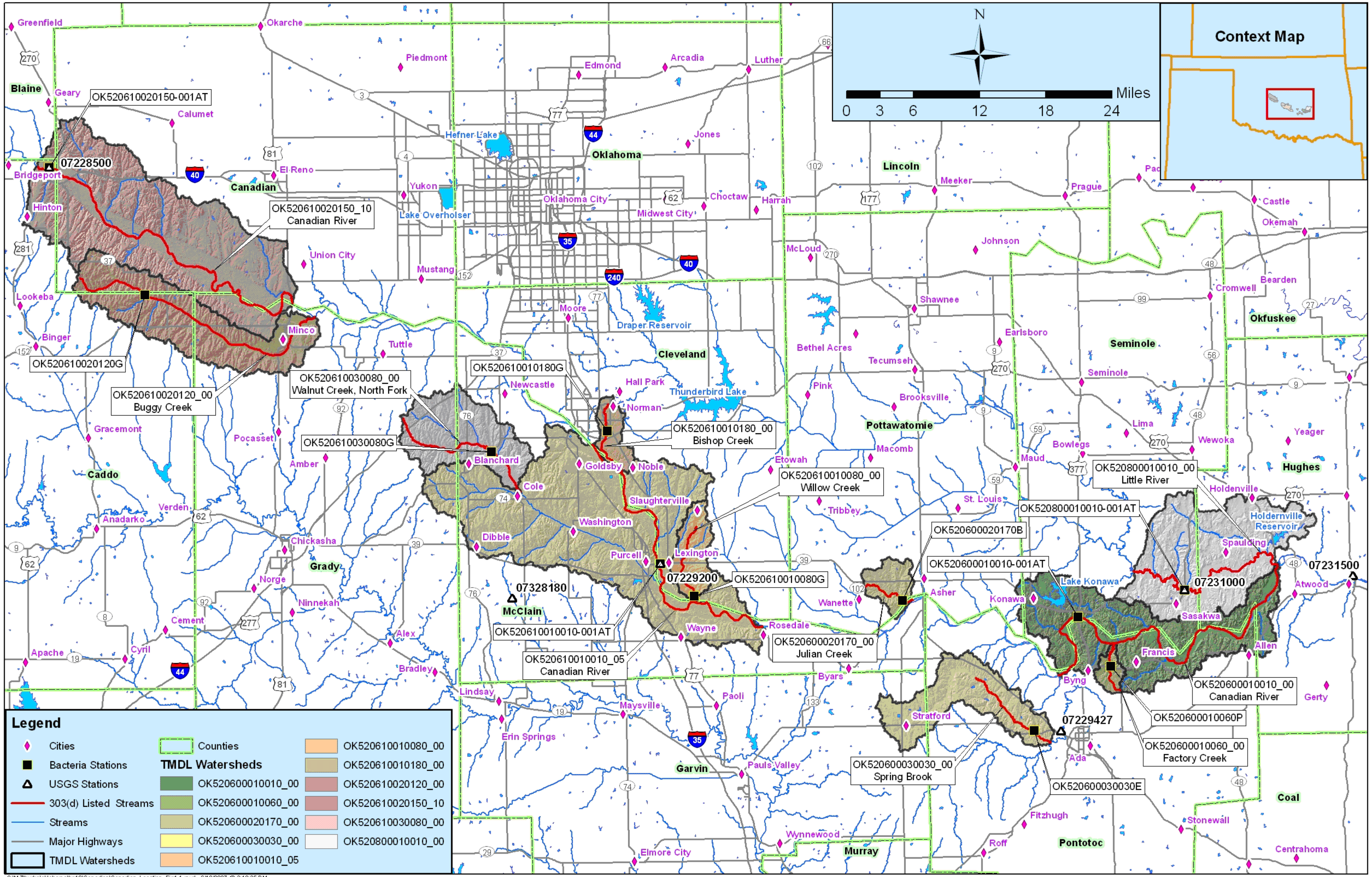
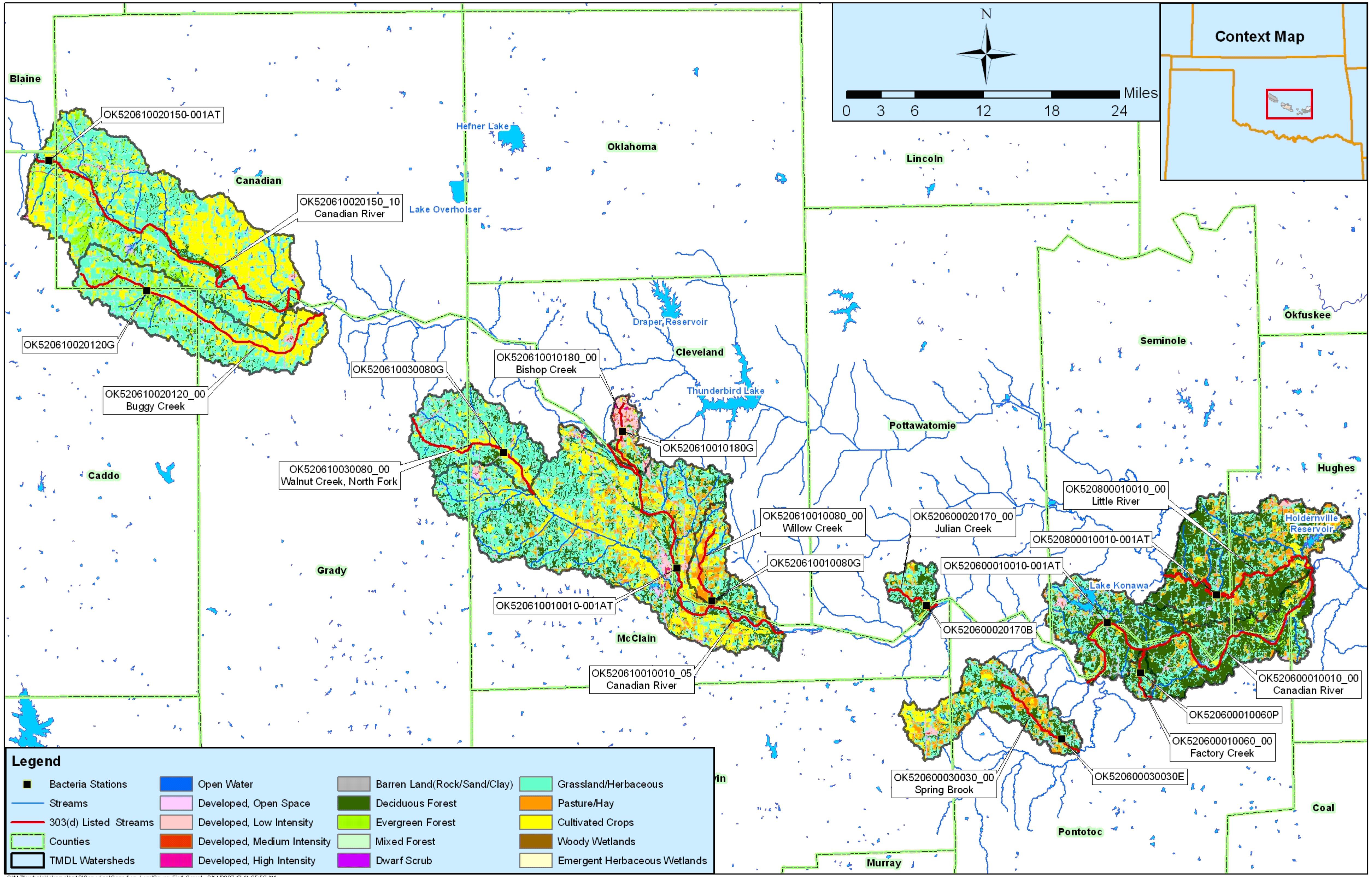


Figure 1-2 Land Use Map by Watershed



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SECTION 2
PROBLEM IDENTIFICATION AND WATER QUALITY TARGET

2.1 Oklahoma Water Quality Standards

Title 785 of the Oklahoma Administrative Code authorizes the Oklahoma Water Resources Board (OWRB) to promulgate Oklahoma's water quality standards (OWRB 2006). The OWRB has statutory authority and responsibility concerning establishment of state water quality standards, as provided under 82 Oklahoma Statute [O.S.], §1085.30. This statute authorizes the OWRB to promulgate rules …*which establish classifications of uses of waters of the state, criteria to maintain and protect such classifications, and other standards or policies pertaining to the quality of such waters.* [O.S. 82:1085:30(A)]. Beneficial uses are designated for all waters of the state. Such uses are protected through restrictions imposed by the antidegradation policy statement, narrative water quality criteria, and numerical criteria (OWRB 2006). The beneficial uses designated for Canadian River (OK520600010010), Factory Creek (OK520600010060), Julian Creek (OK520600020170), Spring Brook (OK5206000300030), Canadian River (OK520610010010), Willow Creek (OK520610010080), Bishop Creek (OK520610010180), Buggy Creek (OK520610020120), Canadian River (OK520610020150), Walnut Creek-North Fork, (OK520610030080) and Little River (OK520800010010) include PBCR, secondary body contact recreation (SBCR), public/private water supply, warm water aquatic community, industrial and municipal process and cooling water, agricultural water supply, emergency water supply, habitat-limited aquatic community, fish consumption, sensitive water supply, and aesthetics. The TMDLs in this report only address the PBCR-designated use. Table 2-1, an excerpt from Appendix B of the 2004 Integrated Report (ODEQ 2004), summarizes the PBCR use attainment status for the waterbodies of the Study Area and targeted TMDL dates. The TMDL date for a stream segment indicates the priority of the stream segment for which a TMDL needs to be developed. The TMDLs established in this report are a necessary step in the process to restore the PBCR use designation for each waterbody.

Table 2-1 Excerpt from the 2004 Integrated Report – Comprehensive Waterbody Assessment Category List

Waterbody ID	Waterbody Name	Stream Miles	Category	TMDL Date	Primary Body Contact Recreation	SecondaryBody Contact Recreation
OK520600010010_00	Canadian River	38.81	5	2005	N	
OK520600010060_00	Factory Creek	6.11	5	2008	N	
OK520600020170_00	Julian Creek	6.21	5	2008	N	
OK520600030030_00	Spring Brook	26.78	5	2008	N	
OK520610010010_05	Canadian River	33	5	2005		N
OK520610010080_00	Willow Creek	9.06	5	2008	N	
OK520610010180_00	Bishop Creek	7.82	5	2008	N	

Waterbody ID	Waterbody Name	Stream Miles	Category	TMDL Date	Primary Body Contact Recreation	SecondaryBody Contact Recreation
OK520610020120_00	Buggy Creek	26.51	5	2008	N	
OK520610020150_10	Canadian River	36	5	2005	N	

N = Not Attaining
Source: 2004 Integrated Report, ODEQ 2004

The definition of PBCR is summarized by the following excerpt from Chapter 45 of the Oklahoma WQSs.

(a) *Primary Body Contact Recreation involves direct body contact with the water where a possibility of ingestion exists. In these cases the water shall not contain chemical, physical or biological substances in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings.*

(b) *In waters designated for Primary Body Contact Recreation...limits...shall apply only during the recreation period of May 1 to September 30. The criteria for Secondary Body Contact Recreation will apply during the remainder of the year.*

To implement Oklahoma's WQS for PBCR, OWRB promulgated Chapter 46, *Implementation of Oklahoma's Water Quality Standards* (OWRB 2007). The excerpt below from Chapter 46: 785:46-15-6, stipulates how water quality data will be assessed to determine support of the PBCR use as well as how the water quality target for TMDLs will be defined for each bacterial indicator.

(a) Scope. The provisions of this Section shall be used to determine whether the subcategory of Primary Body Contact of the beneficial use of Recreation designated in OAC 785:45 for a waterbody is supported during the recreation season from May 1 through September 30 each year. Where data exist for multiple bacterial indicators on the same waterbody or waterbody segment, the determination of use support shall be based upon the use and application of all applicable tests and data.

(b) Screening levels.

(1) The screening level for fecal coliform shall be a density of 400 colonies per 100ml.

(2) The screening level for Escherichia coli shall be a density of 235 colonies per 100 ml in streams designated in OAC 785:45 as Scenic Rivers and in lakes, and 406 colonies per 100 ml in all other waters of the state designated as Primary Body Contact Recreation.

(3) The screening level for enterococci shall be a density of 61 colonies per 100 ml in streams designated in OAC 785:45 as Scenic Rivers and in lakes, and 108 colonies per 100 ml in all other waters of the state designated as Primary Body Contact Recreation.

(c) Fecal coliform:

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to fecal coliform if the geometric mean of 400 colonies per 100 ml is met and no greater than 25% of the sample concentrations from that waterbody exceed the screening level prescribed in (b) of this Section.

(2) The parameter of fecal coliform is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to fecal coliform if the geometric mean of 400 colonies per 100 ml is not met, or greater than 25% of the sample concentrations from that waterbody exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(d) Escherichia coli (E. coli):

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to E. coli if the geometric mean of 126 colonies per 100 ml is met, or the sample concentrations from that waterbody taken during the recreation season do not exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(2) The parameter of E. coli is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to E. coli if the geometric mean of 126 colonies per 100 ml is not met and any of the sample concentrations from that waterbody taken during the recreation season exceed a screening level prescribed in (b) of this Section.

(e) Enterococci:

(1) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be fully supported with respect to enterococci if the geometric mean of 33 colonies per 100 ml is met, or the sample concentrations from that waterbody taken during the recreation season do not exceed the screening level prescribed in (b) of this Section, or both such conditions exist.

(2) The parameter of enterococci is not susceptible to an assessment that Primary Body Contact Recreation is partially supported.

(3) The Primary Body Contact Recreation subcategory designated for a waterbody shall be deemed to be not supported with respect to enterococci if the geometric mean of 33 colonies per 100 ml is not met and any of the sample concentrations from that waterbody taken during the recreation season exceed a screening level prescribed in (b) of this Section.

Compliance with the Oklahoma WQS is based on meeting requirements for all three bacterial indicators. Where concurrent data exist for multiple bacterial indicators on the same waterbody or waterbody segment, each indicator group must demonstrate compliance with the numeric criteria prescribed (OWRB 2006).

As stipulated in the WQS, utilization of the geometric mean to determine compliance for any of the three indicator bacteria depends on the collection of five samples within a 30-day period. For most WQM stations in Oklahoma there are insufficient data available to calculate the 30-day geometric mean since most water quality samples are collected once a month. As a result, waterbodies placed on the 303(d) list for not supporting the PBCR are the result of individual samples exceeding the instantaneous criteria or the long-term geometric mean of individual samples exceeding the geometric mean criteria for each respective bacterial indicator. Targeting the instantaneous criterion established for the primary contact recreation season (May 1st to September 30th) as the water quality goal for TMDLs corresponds to the basis for 303(d) listing and may be protective of the geometric mean criterion as well as the criteria for the secondary contact recreation season. However, both the instantaneous and geometric mean criteria for *E. coli* and Enterococci will be evaluated as water quality targets to ensure the most protective goal is established for each waterbody.

The specific data assessment method for listing indicator bacteria based on instantaneous or single sample criterion is detailed in Oklahoma's 2004 Integrated Report. As stated in the report, a minimum of 10 samples collected between May 1st and September 30th (during the primary recreation season) is required to list a segment for *E. coli* and Enterococci.

A sample quantity exception exists for fecal coliform that allows waterbodies to be listed for nonsupport of PBCR if there are less than 10 samples. The assessment method states that if there are less than 10 samples and the existing sample set already assures a nonsupport determination, then the waterbody should be listed for TMDL development. This condition is true in any case where the small sample set demonstrates that at least three out of six samples exceed the single sample fecal coliform criterion. In this case if four more samples were available to meet minimum of 10 samples, this would still translate to >25 percent exceedance or nonsupport of PBCR (*i.e.*, three out of 10 samples = 33 percent exceedance). For *E. coli* and Enterococci, the 10-sample minimum was used, without exception, in attainment determination.

Canadian River (OK520610010010_05) is designated in Okalhoma Water Quality Standards for Secondary Body Contact Recreation (SBCR) beneficial use. The data assessment method used for SBCR streams is the same as with the PBCR, although the criteria are five times those of the PBCR streams. The single sample criterion for SBCR for fecal coliform, E. coli, and Enterococci are 2,000, 2,030, and 540 colonies per 100 mL, respectively; and the geometric mean criterion for fecal coliform, E. coli, and Enterococci are 2000, 630, and 165 colonies per 100 mL, respectively.

2.2 Problem Identification

Table 2-2 summarizes water quality data collected during primary body contact recreation season from the WQM stations between 1997 and 2005 for each indicator bacteria. Table 2-3 summarizes water quality data collected during secondary body contact recreation season from the WQM stations between 1997 and 2005 for each indicator bacteria. The 1999 to 2003 subset of this data was used to support the decision to place specific waterbodies within the Study Area on the ODEQ 2004 303(d) list (ODEQ 2004). Water quality data from the primary and secondary contact recreation seasons are provided in Appendix A. For the data collected between 1997 and 2005, evidence of nonsupport of the PBCR use based only on fecal coliform concentrations was observed in six waterbodies: Factory Creek (OK52060001006), Julian

Creek (OK520600020170), Spring Brook (OK520600030030), Willow Creek (OK520610010080), Bishop Creek (OK520610010180) and Walnut Creek-North Fork (OK520610030080). Evidence of nonsupport of the PBCR use based only on Enterococci concentrations was observed in one waterbody on two separate segments: Canadian River (OK520600010010_00 and OK520610020150_10). Evidence of nonsupport of the SBCR use based only on Enterococci concentrations was observed in Canadian River (OK520610010010_05). Evidence of nonsupport of the PBCR use based on both fecal coliform and Enterococci concentrations was observed in two waterbodies: Canadian River (OK520610010010) and Little River (OK520800010010). Lastly, evidence of nonsupport for all three bacterial indicators was observed only in Buggy Creek (OK520610020120). In Appendix C of the ODEQ 2004 Integrated Report total coliform is also identified as a pollutant of concern for some 303(d) listed waterbodies. This indicator is typically associated with evaluating use impairment for waterbodies with drinking water as a designated use. However, because there are no drinking water intakes within 5 miles of the WQM stations associated with total fecal coliform samples collected, the listing of this bacterial indicator in Category 5 of the 2004 Integrated Report does not require the development of a TMDL. Table 2-4 summarizes the waterbodies requiring TMDLs for not supporting designated beneficial uses..

2.3 Water Quality Target

The Code of Federal Regulations (40 CFR §130.7(c)(1)) states that, "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards." For the WQM stations requiring TMDLs in this report, defining the water quality target is somewhat complicated by the use of three different bacterial indicators with three different numeric criterion for determining attainment of PBCR use as defined in the Oklahoma WQSs. As previously stated, because available bacteria data were collected on an approximate monthly basis (see Appendix A) instead of at least five samples over a 30–day period, data for these TMDLs are analyzed and presented in relation to the instantaneous criteria for fecal coliform and both the instantaneous and a long-term geometric mean for both *E. coli* and Enterococci.

All TMDLs for fecal coliform must take into account that no more than 25 percent of the samples may exceed the instantaneous numeric criteria. For *E. coli* and Enterococci, no more than 10 percent of samples may exceed instantaneous criteria. Since the attainability of stream beneficial uses for *E. coli* and Enterococci is based on the compliance of either the instantaneous or a long-term geometric mean criterion, percent reductions goals will be calculated for both criteria. TMDLs will be based on the percent reduction required to meet either the instantaneous or long-term geometric mean criterion, whichever is less.

The water quality target for each waterbody will also incorporate an explicit 10 percent MOS. For example, if fecal coliform is utilized to establish the TMDL, then the water quality target is 360 organisms per 100 milliliters (mL), 10 percent lower than the instantaneous water quality criteria (400/100 mL). For *E. coli* the instantaneous water quality target is 365 organisms/100 mL, which is 10 percent lower than the criterion value (406/100 mL), and the geometric mean water quality target is 113 organisms/100 mL, which is 10 percent lower than the criterion value (126/100 mL). For Enterococci the instantaneous water quality target is 97/100 mL, which is 10 percent lower than the criterion value (108/100 mL) and the geometric mean water quality target is 30 organisms/100 mL, which is 10 percent lower than the criterion value (33/100 mL).

For SBCR, the water quality target for fecal coliform is 1,800 organisms per 100 mL, 10 percent lower than the instantaneous water quality criteria (2,000/100 mL). For E. coli the instantaneous water quality target is 1,827 organisms/100 mL, which is 10 percent lower than the criterion value (2,030/100 mL), and the geometric mean water quality target is 567 organisms/100 mL, which is 10 percent lower than the criterion value (630/100 mL). For Enterococci the instantaneous water quality target is 486/100 mL, which is 10 percent lower than the criterion value (540/100 mL) and the geometric mean water quality target is 149 organisms/100 mL, which is 10 percent lower than the criterion value (165/100 mL).

Each water quality target will be used to determine the allowable bacteria load which is derived by using the actual or estimated flow record multiplied by the instream criteria minus a 10 percent MOS. The line drawn through the allowable load data points is the water quality target which represents the maximum load for any given flow that still satisfies the WQS.

Table 2-2 Summary of Indicator Bacteria Samples from Primary Contact Recreation Season, 1997-2003

Waterbody ID	Waterbody Name	Indicator Bacteria	Single Sample Water Quality Criterion (#/100ml)	Geometric Mean Concentration (count/100ml)	Number of Samples	Number of Samples Exceeding Single Sample Criterion	% of Samples Exceeding Single Sample Criterion	Reason for Listing Change
OK520600010010_00	Canadian River, US 377, Konawa	FC	400	121	13	2	15%	
		EC	406	41	13	2	15%	
		ENT	108	69	13	6	46%	
OK520600010060_00	Factory Creek	FC	400	375	10	4	40%	
		EC	406	338	2	1	50%	Delist: Low Sample Count
		ENT	108	500	1	1	100%	Delist: Low Sample Count
OK520600020170_00	Julian Creek	FC	400	603	16	9	56%	
		EC	406	1360	2	2	100%	Delist: Low Sample Count
		ENT	108	700	1	1	100%	Delist: Low Sample Count
OK520600030030_00	Spring Brook Creek	FC	400	615	9	4	44%	
		EC	406					Delist: No Results Found
		ENT	108					
OK520610010080_00	Willow Creek	FC	400	1628	15	12	80%	
		EC	406	284	2	1	50%	Delist: Low Sample Count
		ENT	108	6000	1	1	100%	
OK520610010180_00	Bishop Creek: near Jenkins St.	FC	400	726	4	3	75%	List: >25%
		ENT	108					Delist: No Results Found
OK520610020120_00	Buggy Creek	FC	400	286	8	7	88%	
		EC	406	213	11	5	45%	
		ENT	108	122	12	9	75%	
OK520610020150_10	Canadian River, US 66, Bridgeport	FC	400	109	25	5	20%	
		EC	406	40	26	2	8%	
		ENT	108	109	26	10	38%	
OK520610030080_00	Walnut Creek-North Fork	FC	400	245	8	3	38%	
		EC	406	131	4	1	25%	Delist: Low Sample Count
		ENT	108	75	5	3	60%	
OK520800010010_00	Little River, SH 56, Sasakwa	FC	400	131	18	5	28%	
		EC	406	59	18	2	11%	

Waterbody ID	Waterbody Name	Indicator Bacteria	Single Sample Water Quality Criterion (#/100ml)	Geometric Mean Concentration (count/100ml)	Number of Samples	Number of Samples Exceeding Single Sample Criterion	% of Samples Exceeding Single Sample Criterion	Reason for Listing Change
		ENT	108	76	18	8	44%	
OK520810000100_00	Elm Creek	FC	400	138	9	3	33%	No TMDL as per ODEQ
		EC	406	338	2	1	50%	
		ENT	108	1100	1	1	100%	

EC = *E. coli*; ENT = enterococci; FC = fecal coliform
Highlighted bacterial indicators require TMDL

Table 2-3 Summary of Indicator Bacteria Samples from Secondary Contact Recreation Season, 1997-2003

Waterbody ID	Waterbody Name	Indicator Bacteria	Single Sample Water Quality Criterion (#/100ml)	Geometric Mean Concentration (count/100ml)	Number of Samples	Number of Samples Exceeding Single Sample Criterion	% of Samples Exceeding Single Sample Criterion	Reason for Listing Change
OK520610010010_05	Canadian River, US 77, Purcell	FC	2000	186	15	1	7%	
		EC	2030	45	15	0	0%	
		ENT	540	210	15	4	27%	

Table 2-4 Waterbodies Requiring TMDLs for Not Supporting Primary or Secondary Body Contact Recreation Use

WQM Station	Waterbody ID	Waterbody Name	Indicator Bacteria		
			FC	ENT	*E. coli*
OK520600010010-001AT	OK520600010010_00	Canadian River		X	
OK520600010060P	OK520600010060_00	Factory Creek	X		
OK520600020170B	OK520600020170_00	Julian Creek	X		
OK520600030030E	OK520600030030_00	Spring Brook	X		
OK520610010010-001AT	OK520610010010_05	Canadian River		X	
OK520610010080G	OK520610010080_00	Willow Creek	X		
OK520610010180G	OK520610010180_00	Bishop Creek	X		
OK520610020120G	OK520610020120_00	Buggy Creek	X	X	X
OK520610020150-001AT	OK520610020150_10	Canadian River		X	
OK520610030080G	OK520610030080_00	Walnut Creek-North Fork	X		
OK520800010010-001AT	OK520800010010_00	Little River	X	X	

ENT = enterococci; FC = fecal coliform

SECTION 3
POLLUTANT SOURCE ASSESSMENT

A source assessment characterizes known and suspected sources of pollutant loading to impaired waterbodies. Sources within a watershed are categorized and quantified to the extent that information is available. Bacteria originate from warm-blooded animals; some plant life and sources may be point or nonpoint in nature.

Point sources are permitted through the NPDES program. NPDES-permitted facilities that discharge treated wastewater are required to monitor for one of the three bacterial indicators (fecal coliform, *E coli*, or Enterococci) in accordance with their permits. Nonpoint sources are diffuse sources that typically cannot be identified as entering a waterbody through a discrete conveyance at a single location. These sources may involve land activities that contribute bacteria to surface water as a result of rainfall runoff. For the TMDLs in this report, all sources of pollutant loading not regulated by NPDES are considered nonpoint sources. The following discussion describes what is known regarding point and nonpoint sources of bacteria in the impaired watersheds.

3.1 NPDES-Permitted Facilities

Under 40 CFR, §122.2, a point source is described as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Certain NPDES-permitted municipal plants are classified as no-discharge facilities. NPDES-permitted facilities classified as point sources that may contribute bacteria loading include:

- NPDES municipal wastewater treatment plants (WWTP);
- NPDES municipal no-discharge WWTP;
- NPDES municipal separate storm sewer discharge (MS4); and
- NPDES Concentrated Animal Feeding Operation (CAFO).

Continuous point source discharges such as WWTPs, could result in discharge of elevated concentrations of fecal coliform bacteria if the disinfection unit is not properly maintained, is of poor design, or if flow rates are above the disinfection capacity. While the no-discharge facilities do not discharge wastewater directly to a waterbody, it is possible that the collection systems associated with each facility may be a source of bacteria loading to surface waters. Stormwater runoff from MS4 areas, which is now regulated under the USEPA NPDES Program, can also contain high fecal coliform bacteria concentrations. CAFOs are recognized by USEPA as one of the significant sources of pollution, and may have the potential to cause serious impacts to water quality if not properly managed.

There are no NPDES-permitted facilities of any type in the contributing watersheds of Factory Creek (OK520600010060_00), Julian Creek (OK520600020170_00) and Willow Creek (OK520610010080_00). Eight of the watersheds in the Study Area, including Spring Brook (OK520600030030_00), Walnut Creek-North Fork (OK520610030080_00), Bishop Creek (OK520610010180_00), Buggy Creek (OK520610020120_00), Canadian River (OK520600010010_00, OK520610020150_10 and OK520610010010_05), and Little River (OK520800010010_00), have continuous point source discharges. The city of Norman and University of Oklahoma are the only permitted MS4s within this Study Area.

3.1.1 Continuous Point Source Dischargers

The locations of the NPDES-permitted facilities that discharge wastewater to surface waters addressed in these TMDLs are listed in Table 3-1 and displayed in Figure 3-1. For the purposes of the TMDLs calculated in Chapter 5, only facility types identified in Table 3-1 as Sewerage Systems are assumed to contribute bacteria loads within the watersheds of the impaired waterbodies. For some continuous point source discharge facilities the permitted design flow was not available and therefore is not provided in Table 3-1.

Table 3-1 Point Source Discharges in the Study Area

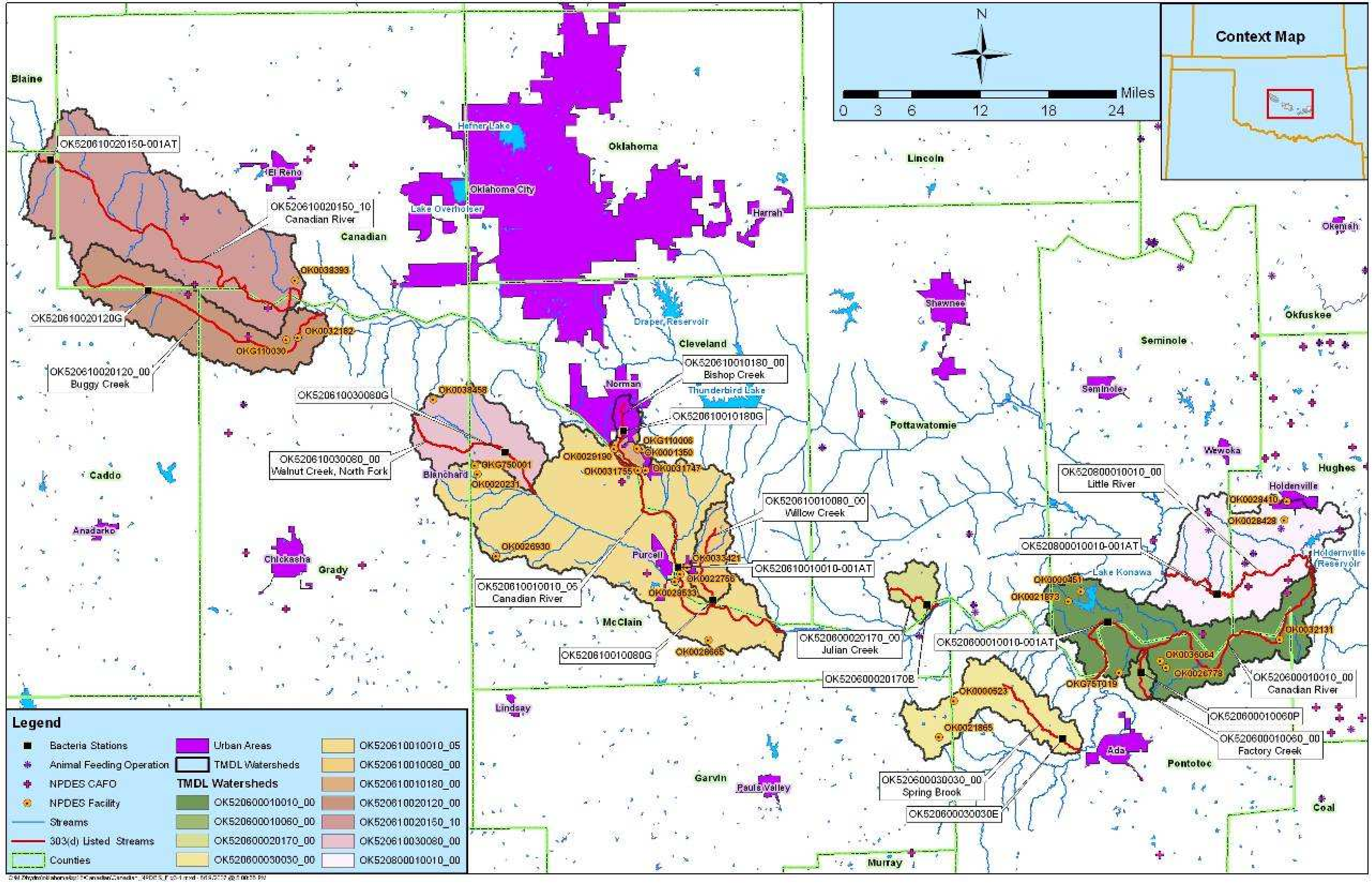
NPDES Permit No.	Name	Receiving Water	Facility Type	County Name	Design Flow (mgd)	Active/ Inactive	Facility ID
OK0000451	Oklahoma Gas & Electric Co. Seminole Generating Station	OK520600010010_00 Canadian River	Electrical Services	Seminole	N/A	Active	
OK0021873	City of Konawa	OK520600010010_00 Canadian River	Sewerage Systems	Seminole	0.32	Active	S20629
OK0036064	Town of Francis/Francis Public Works Authority	OK520600010010_00 Canadian River	Sewerage Systems	Pontotoc	0.045	Active	S20662
OK0021865	Stratford Public Works Authority	OK520600030030_00 Spring Brook	Sewerage Systems	Garvin	0.16	Active	S20625
OK0022756	Lexington Public Works Authority	OK520610010010_05 Canadian River	Sewerage Systems	Cleveland	0.25	Active	S20619
OK0028533	City of Purcell	OK520610010010_05 Canadian River	Sewerage Systems	McClain	0.65	Active	S20622
OK0029190	Norman	OK520610010010_05 Canadian River	Sewerage Systems	Cleveland	12	Active	S20616
OK0031755	Noble Utilities Authority - North	OK520610010180_00 Bishop Creek	Sewerage Systems	Cleveland	0.76	Active	S20651
OKG110006	Dolese Co. - S. Norman Batch Plant	OK520610010180_00 Bishop Creek	Ready-mixed Concrete	Cleveland	N/A	Active	
OK0038393	Union City WWTP	OK520610020150_10 Canadian River	Sewerage Systems	Canadian	0.2	Active	S20609
OK0038458	Bridge Creek Public School	OK520610030080_00 Walnut Creek, North Fork	Sewerage Systems	Grady	0.03	Active	S20675
OK0028428	Holdenville Public Works Authority	OK520800010010_00 Little River	Sewerage Systems	Hughes	0.8	Active	S20805
OKG75T019	Pirate Cove Car Wash	OK520600010010_00 Canadian River	Carwashes	Pontotoc	N/A	Inactive	
OK0028665	Wayne Public Works Authority	OK520610010010_05 Canadian River	Sewerage Systems	McClain	N/A	Inactive	S20623

NPDES Permit No.	Name	Receiving Water	Facility Type	County Name	Design Flow (mgd)	Active/ Inactive	Facility ID
OK0001350	South Norman Batch Plant	OK520610010180 _00 Bishop Creek	Ready-mixed Concrete	Cleveland	N/A	Inactive	
OK0032182	City of Minco	OK520610020120 _00 Buggy Creek	Sewerage Systems	Grady	0.215	Active	S20610
OK0026778	J J Layne Lease-Beebe Oilfield	OK520600010010 _00 Canadian River	Crude Petroleum And Natural Gas	Pontotoc	N/A	N/A	
OK0032131	Mid-continent Pipe Line Co-All	OK520600010010 _00 Canadian River	Crude Petroleum And Natural Gas	Pontotoc	N/A	N/A	
OK0020231	City of Blanchard	OK520610010010 _05 Canadian River	Sewerage Systems	McClain	N/A	N/A	
OK0026930	Town of Dibble	OK520610010010 _05 Canadian River	Sewerage Systems	McClain	N/A	N/A	
OK0033421	OK St Dpt Health-Lexington Comm	OK520610010010 _05 Canadian River	Sewerage Systems	Cleveland	N/A	N/A	
OKG750001	N/A	OK520610010010 _05 Canadian River	N/A	McClain	N/A	N/A	
OK0031747	City of Noble (South WWTP)	OK520610010180 _00 Bishop Creek	Sewerage Systems	Cleveland	N/A	N/A	
OKG110030	Chisholm Trial Concrete Inc.	OK520610020120 _00 Buggy Creek	Ready-mixed Concrete	Grady	N/A	N/A	
OK0028410	City of Holdenville (North Plant)	OK520800010010 _00 Little River	Sewerage Systems	Hughes	N/A	N/A	

N/A = not available

Discharge Monitoring Reports (DMR) were used to determine the number of fecal coliform analyses performed from 1998 through 2006, the maximum concentration during this period, the number of violations occurring when the monthly geometric mean concentration exceeded 200 cfu/100 mL, and the number of violations when a daily maximum concentration exceeded 400 cfu/100 mL. DMR data for fecal coliform were only available for the City of Konawa and Bridge Creek Public School (see Appendix B). These data indicate that there are no violations occurring at the City of Konawa. However, Bridge Creek Public School WWTP violated monthly geometric mean permit limits for fecal coliform 1 percent of the time. Given the limited amount of data it is not possible to provide an adequate evaluation on the performance of WWTPs in the impaired watersheds with respect to their compliance with fecal coliform permit limits over time.

Figure 3-1 Locations of NPDES-Permitted Facilities and Livestock Operations in the Study Area



3.1.2 NPDES No-Discharge Facilities and Sanitary Sewer Overflows

There are 12 NPDES no-discharge facilities within the Study Area. The locations of these facilities are shown in Figure 3-1, and are listed in Table 3-2. For the purposes of these TMDLs, it is assumed that no-discharge facilities do not contribute bacteria loading to the Canadian River and its tributaries. However, it is possible the wastewater collection systems associated with those WWTPs could be a source of bacteria loading, or that discharges may occur during large rainfall events that exceed the systems' storage capacities.

Table 3-2 NPDES No-Discharge Facilities in the Study Area

Facility	Facility ID	County	Facility Type	Type	Watershed	Active/ Inactive
Blanchard Wastewater Treatment (WWTP)	20620	McClain	Land Application	Municipal	OK520610010010_05 Canadian River	N/A
Byng-Chickasaw Housing Lagoon	20627	Pontotoc	Lagoon	Municipal	OK520600010010_00 Canadian River	N/A
Cherokee Trading Post WWTP	20639	Canadian	Lagoon	Municipal	OK520610020150_10 Canadian River	N/A
Adkins Hill MHP	20653	McClain	Lagoon	Municipal	OK520610010010_05 Canadian River	N/A
Ben's Trailer Park	20656	Cleveland	Lagoon	Municipal	OK520610010010_05 Canadian River	N/A
Dibble WWTP	20657	McClain	Lagoon	Municipal	OK520610010010_05 Canadian River	N/A
Mantooth Trailer Ct	20658	McClain	Lagoon	Municipal	OK520610010010_05 Canadian River	N/A
Crystal Lakes Lagoons WWTP	20668	McClain	Lagoon	Municipal	OK520610010010_05 Canadian River	N/A
Woodbrook Estates WWTP	20669	Pontotoc	Lagoon	Municipal	OK520600010060_00 Factory Creek	N/A
Clearview MHP	20670	Cleveland	Lagoon	Municipal	OK520610010010_05 Canadian River	N/A
Sasakwa WWTP	20809	Seminole	Land Application	Municipal	OK520800010010_00 Little River	N/A
Southwest Ostrich Processors	WD83-011	McClain	Total Retention	Industrial	OK520610010010_05 Canadian River	Inactive

N/A = not available

Sanitary sewer overflows (SSO) from wastewater collection systems, although infrequent, can be a major source of fecal coliform loading to streams. SSOs have existed since the introduction of separate sanitary sewers, and most are caused by blockage of sewer pipes by grease, tree roots, and other debris that clog sewer lines, by sewer line breaks and leaks, cross connections with storm sewers, and inflow and infiltration of groundwater into sanitary sewers. SSOs are permit violations that must be addressed by the responsible NPDES permittee. The reporting of SSOs over the last 6 years has been strongly encouraged by USEPA, primarily through enforcement and fines. While not all sewer overflows are reported, ODEQ has some data on SSOs available. There were 1,647 SSO occurrences, ranging from 0 to 7 million gallons, reported from six different waterbodies in the Study Area between July 1989 and April 2007. Table 3-3 summarizes the facilities in the Study Area that reported SSOs. Additional data on each individual SSO event are provided in Appendix B. Given the significant number of occurrences and the size of the overflows reported, SSOs have been a significant source of bacteria loading in the past in the Canadian River (OK520610010010_05, and OK520600010010_00), Little River (OK520800010010_00), and Bishop Creek (OK520610010180_00) watersheds.

Table 3-3 Sanitary Sewer Overflow (SSO) Summary

Facility Name	NPDES Permit No.	Receiving Water	Facility ID	Number of Occurrences	Date Range		Amount (Gallons)	
					From	To	Min	Max
Blanchard	OK0020231	OK520610010010_05 Canadian River	S20620	10	04/30/1990	04/23/2001	0	7,000,000
Bridge Creek School	OK0038458	OK520610030080_00 Walnut Creek, North Fork	S20675	4	10/21/1992	01/25/1996	0	50
Holdenville	OK0028428	OK520800010010_00 Little River	S20805	309	02/28/1990	02/20/2007	0	6,000,000
Konawa	OK0021873	OK520600010010_00 Canadian River	S20629	18	03/11/1990	06/30/1999	0	210,000
Lexington	OK0022756	OK520610010010_05 Canadian River	S20619	8	10/13/1991	07/24/2002	0	78,000
Minco	OK0032182	OK520610020120_00 Buggy Creek	S20610	4	05/10/1993	03/11/2003	250	5,000
Noble	OK0031755	OK520610010180_00 Bishop Creek	S20651	90	03/11/1990	04/10/2007	0	480,000
Norman	OK0029190	OK520610010010_05 Canadian River	S20616	1064	07/25/1989	04/11/2007	0	50,000
Purcell	OK0028533	OK520610010010_05 Canadian River	S20622	137	02/06/1995	03/22/2007	25	470,000
Union City	OK0038393	OK520610020150_10 Canadian River	S20609	3	06/24/1999	05/02/2005	10	650

SSOs are a common result of the aging wastewater infrastructure around the state. DEQ has been ahead of other states and, in some cases, EPA itself in its handling of SSOs. Due to the widespread nature of the SSO problem, DEQ has focused its limited resources to first target SSOs that result in definitive environmental harm, such as fish kills, or lead to citizen complaints. All SSOs falling in these two categories are addressed through DEQ's formal enforcement process. A Notice of Violation (NOV) is first issued to the owner of the collection system and a Consent Order (CO) is negotiated between the owner and DEQ to establish a schedule for necessary collection system upgrades to eliminate future SSOs.

Another target area for DEQ is chronic SSOs from OPDES major facilities, those with a total design flow in excess of 1 MGD. DEQ periodically reviews the bypass reports submitted by these major facilities and identifies problem areas and chronic SSOs. When these problems are attributable to wet weather, DEQ endeavors to enter into a CO with the owner of the collection system to establish a schedule for necessary repairs. When the problems seem to be dry weather-related, DEQ will encourage the owner of the collection system to implement the proposed Capacity, Management, Operation, and Maintenance (CMOM) guidelines aimed at minimizing or eliminating dry weather SSOs. This is often accomplished through entering into a Consent Order to establish a schedule for implementation and annual auditing of the CMOM program.

All SSOs are considered unpermitted discharges under State statute and DEQ regulations. The smaller towns have a smaller reserve, are more likely to use utility revenue for general purposes, and/or tend to budget less for ongoing and/or preventive maintenance. If and when DEQ becomes aware of chronic SSOs (more than one from a single location in a year) or receives a complaint about an SSO in a smaller community, DEQ will pursue enforcement action. Enforcement almost always begins with the issuance of an NOV and, if the problem is not corrected by a long-term solution, DEQ will enter into a CO with the facility for a long-term solution. Long-term solutions usually begin with sanitary sewer evaluation surveys (SSESs). Based on the result of the SSES, the facilities can prioritize and take corrective action.

3.1.3 NPDES Municipal Separate Storm Sewer Discharge

Phase I MS4

In 1990 the USEPA developed rules establishing Phase I of the NPDES Stormwater Program, designed to prevent harmful pollutants from being washed by stormwater runoff into MS4s (or from being dumped directly into the MS4) and then discharged into local water bodies (USEPA 2005). Phase I of the program required operators of medium and large MS4s (those generally serving populations of 100,000 or greater) to implement a stormwater management program as a means to control polluted discharges. Approved stormwater management programs for medium and large MS4s are required to address a variety of water quality-related issues, including roadway runoff management, municipal-owned operations, and hazardous waste treatment. There are no Phase I MS4 permits in the Study Area.

Phase II MS4

Phase II of the rule extends coverage of the NPDES stormwater program to certain small MS4s. Small MS4s are defined as any MS4 that is not a medium or large MS4 covered by Phase I of the NPDES Stormwater Program. Phase II requires operators of regulated small MS4s to obtain NPDES permits and develop a stormwater management program. Programs are designed to reduce discharges of pollutants to the “maximum extent practicable,” protect water quality, and satisfy appropriate water quality requirements of the CWA. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities. Instead, stormwater discharges are required to meet a performance standard of providing treatment to the “maximum extent practical” through the implementation of best management practices (BMPs).

Small MS4 stormwater programs must address the following minimum control measures:

- Public Education and Outreach;

- Public Participation/Involvement;
- Illicit Discharge Detection and Elimination;
- Construction Site Runoff Control;
- Post- Construction Runoff Control; and
- Pollution Prevention/Good Housekeeping.

The MS4 permit for small communities in Oklahoma became effective on February 8, 2005. The City of Norman, located in Bishop Creek (OK520610010180_00) watershed, falls under requirements designated by USEPA for inclusion in the Phase II Stormwater Program and has a permitted MS4. The municipalities were designated because their municipal boundaries intersected a U.S. Census-defined Urbanized Area. In an effort to quantify the relative contribution of bacteria loads from the MS4 area of the City of Norman and University of Oklahoma the percentage of the Biship Creek watershed under MS4 jurisdiction was calculated. The area of the City of Norman and University of Oklahoma MS4s within the Bishop Creek watershed is estimated to 5063 acres or 55% of the watershed. The bacterial loads from the City of Norman and University of Oklahoma may be of concern given that over half of the watershed is within the Norman's MS4 area. There are no Phase II MS4s in the following watersheds: Canadian River (OK520600010010_00 and OK520610020150_10), Factory Creek (OK520600010060_00), Julian Creek (OK520600020170_00), Spring Brook (OK520600030030_00), Willow Creek (OK520610010080_00), Bishop Creek (OK520610010180_00), Buggy Creek (OK520610020120_00) and Walnut Creek-North Fork (OK520610030080_00).

Runoff from urban areas not permitted under the MS4 program can be a significant source of fecal coliform bacteria. Water quality data collected from streams draining many of the nonpermitted communities show existing loads of fecal coliform bacteria at levels greater than the State's instantaneous standards. The specific requirements for bacteria control in a MS4 permit can be found in Appendix E. Appendix E also includes information on a list of BMPs and its effectiveness. ODEQ provides information on the current status of the MS4 program on its website, which can be found at:

http://www.deq.state.ok.us/WQDnew/stormwater/ms4/.

3.1.4 Concentrated Animal Feeding Operations

The Agricultural Environmental Management Services (AEMS) of the Oklahoma Department of Agriculture, Food and Forestry (ODAFF) was created to help develop, coordinate, and oversee environmental policies and programs aimed at protecting the Oklahoma environment from pollutants associated with agricultural animals and their waste. Through regulations established by the Oklahoma Concentrated Animal Feeding Operation Act, AEMS works with producers and concerned citizens to ensure that animal waste does not impact the waters of the state. A CAFO is an animal feeding operation that confines and feeds at least 1,000 animal units for 45 days or more in a 12-month period (ODAFF 2005). The CAFO Act is designed to protect water quality through the use of best management practices (BMP) such as dikes, berms, terraces, ditches, or other similar structures used to isolate animal waste from outside surface drainage, except for a 25-year, 24–hour rainfall event (ODAFF 2005). CAFOs are considered no-discharge facilities.

CAFOs are designated by USEPA as one of the significant sources of pollution, and may have the potential to cause serious impacts to water quality if not managed properly. Potential problems for CAFOs can include animal waste discharges to waters of the state and failure to properly operate wastewater lagoons.

Figure 3-1 depicts the locations of the 13 CAFOs located in the Canadian River (OK520610010010_05, OK520610020150_10, and OK520600010010_00), Little River (OK520800010010_00), and Buggy Creek (OK520610020120_00). Table 3-4 lists the CAFOs located in the Study Area. Factory Creek, Julian Creek, Spring Brook, Willow Creek, Bishop Creek, and Walnut Creek-North Fork have no CAFOs within their contributing watershed.

Table 3-4 NPDES-Permitted CAFOs in Study Area

ODAFF Owner ID	EPA Facility	ODAFF ID	ODAFF License Number	Maximum Number of Permitted Animals at Facility					Total # of Animal Units at Facility	County	Watershed
				Dairy Heifers	Dairy Cattle	Slaughter Feeder Cattle	Swine >55 lbs	Swine <55 lbs			
AGN036236	OKG010284	277	1494				2400		960	Caddo	OK520610020120_00 Buggy Creek
WQ0000058	OKU000357	150	980002				3840		1536	Canadian	OK520610020150_10 Canadian River
AGN031882	OKG010241	229	1398			800			800	Canadian	OK520610020150_10 Canadian River
WQ0000066	OKU000442	166	980005				5760		2304	Grady	OK520610020120_00 Buggy Creek
AGN031884	OKG010029	78	1396	1000	13000				19200	Grady	OK520610020150_10 Canadian River
WQ0000062	OKU000232	155	970029					10000	1000	Hughes	OK520600010010_00 Canadian River
AGN028939	OKU000223	72	1298					10000	1000	Hughes	OK520800010010_00 Little River
WQ0000023	OKU000406	87	970035					10000	1000	Hughes	OK520800010010_00 Little River
AGN031061	OKG010258	261	1321				2400		960	Hughes	OK520800010010_00 Little River
AGN031827	OKG010116	33	1378			750			750	McClain	OK520610010010_05 Canadian River
AGN032025	OKG010262	147	1431			800			800	McClain	OK520610010010_05 Canadian River
AGN026635	OKU000394	45	1246				1200		480	Hughes	OK520600010010_00 Canadian River
AGN031062	OKU000209	25	1322				600		240	Seminole	OK520800010010_00 Little River

3.2 Nonpoint Sources

Nonpoint sources include those sources that cannot be identified as entering the waterbody at a specific location. Bacteria originate from rural, suburban, and urban areas. The following section describes possible major nonpoint sources contributing fecal coliform loading within the Study Area.

These sources include wildlife, agricultural activities and domesticated animals, land application fields, urban runoff, failing onsite wastewater disposal (OSWD) systems and domestic pets. As previously stated, there are no NPDES-permitted facilities in the Factory Creek, Julian Creek, and Willow Creek watersheds; therefore, nonsupport of PBCR use is caused by nonpoint sources of bacteria only.

Bacteria associated with urban runoff can emanate from humans, wildlife, commercially raised farm animals, and domestic pets. Water quality data collected from streams draining urban communities often show existing concentrations of fecal coliform bacteria at levels greater than a state's instantaneous standards. A study under USEPA's National Urban Runoff Project indicated that the average fecal coliform concentration from 14 watersheds in different areas within the United States was approximately 15,000 /100 mL in stormwater runoff (USEPA 1983). Runoff from urban areas not permitted under the MS4 program can be a significant source of fecal coliform bacteria. Water quality data collected from streams draining many of the nonpermitted communities show existing loads of fecal coliform bacteria at levels greater than the State's instantaneous standards. Best management practices (BMP) such as buffer strips, repair of leaking sewage collection systems and proper disposal of domestic animal waste reduce bacteria loading to waterbodies.

3.2.1 Wildlife

Fecal coliform bacteria are produced by all warm-blooded animals, including wildlife such as mammals and birds. In developing bacteria TMDLs it is important to identify the potential for bacteria contributions from wildlife by watershed. Wildlife is naturally attracted to riparian corridors of streams and rivers. With direct access to the stream channel, wildlife can be a concentrated source of bacteria loading to a waterbody. Fecal coliform bacteria from wildlife are also deposited onto land surfaces, where it may be washed into nearby streams by rainfall runoff. Currently there are insufficient data available to estimate populations of wildlife and avian species by watershed. Consequently it is difficult to assess the magnitude of bacteria contributions from wildlife species as a general category.

However, adequate data are available by county to estimate the number of deer by watershed. This report assumes that deer habitat includes forests, croplands, and pastures. Using Oklahoma Department of Wildlife and Conservation county data, the population of deer can be roughly estimated from the actual number of deer harvested and harvest rate estimates. Because harvest success varies from year to year based on weather and other factors, the average harvest from 1999 to 2003 was combined with an estimated annual harvest rate of 20 percent to predict deer population by county. Using the estimated deer population by county and the percentage of the watershed area within each county, a wild deer population can be calculated for each watershed. Table 3-5 provides the estimated number of deer for each watershed.

Table 3-5 Estimated Deer Populations

Waterbody ID	Waterbody Name	Deer	Acre
OK520600010010_00	Canadian River	982	89,183
OK520600010060_00	Factory Creek	46	4,812
OK520600020170_00	Julian Creek	103	10,524
OK520600030030_00	Spring Brook	342	40,064
OK520610010010_05	Canadian River	981	172,991
OK520610010080_00	Willow Creek	120	15,144
OK520610010180_00	Bishop Creek	72	9,199
OK520610020120_00	Buggy Creek	467	65,715
OK520610020150_10	Canadian River	973	143,087
OK520610030080_00	Walnut Creek-North Fork	218	41,327
OK520800010010_00	Little River	934	80,627

According to a study conducted by ASAE (the American Society of Agricultural Engineers), deer release approximately $5x10^8$ fecal coliform units per animal per day (ASAE 1999). Although only a fraction of the total fecal coliform loading produced by the deer population may actually enter a waterbody, the estimated fecal coliform production for deer provided in Table 3-6 in cfu/day provides a relative magnitude of loading in each watershed.

Table 3-6 Estimated Fecal Coliform Production for Deer

Waterbody ID	Waterbody Name	Watershed Area (acres)	Wild Deer Population	Estimated Wild Deer per acre	Fecal Production (x 10^8cfu/day) of Deer Population
OK520600010010_00	Canadian River	89,183	982	0.01	4,908
OK520600010060_00	Factory Creek	4,812	46	0.01	231
OK520600020170_00	Julian Creek	10,524	103	0.01	515
OK520600030030_00	Spring Brook	40,064	342	0.01	1,711
OK520610010010_05	Canadian River	172,991	981	0.01	4,905
OK520610010080_00	Willow Creek	15,144	120	0.01	602
OK520610010180_00	Bishop Creek	9,199	72	0.01	362
OK520610020120_00	Buggy Creek	65,715	467	0.01	2,336
OK520610020150_10	Canadian River	143,087	973	0.01	4,863
OK520610030080_00	Walnut Creek-North Fork	41,327	218	0.01	1,090
OK520800010010_00	Little River	80,627	934	0.01	4,670

3.2.2 Non-Permitted Agricultural Activities and Domesticated Animals

There are a number of non-permitted agricultural activities that can also be sources of fecal bacteria loading. Agricultural activities of greatest concern are typically those associated with livestock operations (Drapcho and Hubbs 2002). Examples of commercially raised farm animals activities that can contribute to bacteria sources include:

- Processed commercially raised farm animals manure is often applied to fields as fertilizer, and can contribute to fecal bacteria loading to waterbodies if washed into streams by runoff.
- Animals grazing in pastures deposit manure containing fecal bacteria onto land surfaces. These bacteria may be washed into waterbodies by runoff.
- Animals often have direct access to waterbodies and can provide a concentrated source of fecal bacteria loading directly into streams.

Table 3-7 provides estimated numbers of selected commercially raised farm animals by watershed based on the 2002 USDA county agricultural census data (USDA 2002). The estimated animal populations in Table 3-7 were derived by using the percentage of the watershed within each county. Because the watersheds are generally much smaller than the counties, and commercially raised farm animals are not evenly distributed across counties or constant with time, these are rough estimates only. Cattle are clearly the most abundant species of commercially raised farm animals in the Study Area and often have direct access to the impaired waterbodies or their tributaries.

Detailed information is not available to describe or quantify the relationship between instream concentrations of bacteria and land application of manure. The estimated acreage by watershed where manure was applied in 2002 is shown in Table 3-7 These estimates are also based on the county level reports from the 2002 USDA county agricultural census, and thus, represent approximations of the land application area in each watershed. Because of the lack of specific data, land application of animal manure is not quantified in Table 3-8 but is considered a potential source of bacteria loading to the watersheds in the Study Area. Most poultry feeding operations are regulated by ODAFF, and are required to land apply chicken waste in accordance with their Animal Waste Management Plans or Comprehensive Nutrient Management Plans. While these plans are not designed to controlled bacteria loading, best management practices and conservation measures, if properly implemented, could reduce the contribution of bacteria from this group of animals to the watershed.

According to a study conducted by the ASAE, the daily fecal coliform production rates by species were estimated as follows (ASAE 1999):

- Beef cattle release approximately 1.04E+11 fecal coliform counts per animal per day;
- Dairy cattle release approximately 1.01E+11 per animal per day
- Swine release approximately 1.08E+10 per animal per day
- Chickens release approximately 1.36E+08 per animal per day
- Sheep release approximately 1.20E+10 per animal per day
- Horses release approximately 4.20E+08 per animal per day;
- Turkey release approximately 9.30E+07 per animal per day
- Ducks release approximately 2.43E+09 per animal per day
- Geese release approximately 4.90E+10 per animal per day

Using the estimated animal populations and the fecal coliform production rates from ASAE, an estimate of fecal coliform production from each group of commercially rairsed farm animals was calculated in each watershed of the Study Area in Table 3-8. Note that only a small fraction of these fecal coliform are expected to represent loading into waterbodies, either washed into streams by runoff or by direct deposition from wading animals. Cattle again appear to represent the largest source of fecal bacteria. For informational purposes, data on animal feeding operations provided by ODAFF are summarized in Table 3-9. This data was last updated on April 17, 2004. Table 3-9 lists an estimated number of animals within select watersheds for which data are available. These numbers are considered more representative since they are based on the number of permitted animal feeding operations within the selected watershed derived from an ODAFF GIS inventory. The general locations of animal feeding operations are shown in Figure 3-1. However, for consistency, estimated fecal coliform production for the general category of commercially raised farm animals is based on USDA county agriculture census numbers as summarized in Table 3-8.

Table 3-7 Commercially Raised Farm Animals and Manure Application Area Estimates by Watershed

Waterbody ID	Waterbody Name	Cattle & Calves-all	Dairy Cows	Horses & Ponies	Goats	Sheep & Lambs	Hogs & Pigs	Ducks & Geese	Chickens & Turkeys	Acres of Manure Application
OK520600010010_00	Canadian River	10,239	136	524	299	172	5,795	52	376	533
OK520600010060_00	Factory Creek	622	10	34	18	16	0	2	22	22
OK520600020170_00	Julian Creek	992	17	64	35	32	145	10	64	134
OK520600030030_00	Spring Brook	5,373	74	279	139	125	13	24	141	190
OK520610010010_05	Canadian River	24,879	757	1,477	350	1,032	2,392	61	1,249	1,169
OK520610010080_00	Willow Creek	1,114	10	142	70	68	95	11	179	36
OK520610010180_00	Bishop Creek	711	7	86	42	42	61	7	107	24
OK520610020120_00	Buggy Creek	11,485	767	230	72	228	1,634	18	119	237
OK520610020150_10	Canadian River	25,020	536	638	176	440	2,412	32	286	401
OK520610030080_00	Walnut Creek-North Fork	7,119	557	261	62	237	842	13	184	258
OK520800010010_00	Little River	8,856	58	349	194	75	14,789	36	274	969

Table 3-8 Fecal Coliform Production Estimates for Commercially Raised Fard Animals ($x10^9$ number/day)

Waterbody ID	Waterbody Name	Cattle & Calves-all	Dairy Cows	Horses & Ponies	Goats	Sheep & Lambs	Hogs & Pigs	Ducks & Geese	Chickens & Turkeys	Total
OK520600010010_00	Canadian River	1,064,902	13,783	220	N/A	2,070	62,584	514	51	1,144,123
OK520600010060_00	Factory Creek	64,668	1,001	14	N/A	193	0	27	3	65,906
OK520600020170_00	Julian Creek	103,181	1,681	27	N/A	380	1,564	161	9	107,003
OK520600030030_00	Spring Brook	558,773	7,486	117	N/A	1,497	141	339	19	568,373
OK520610010010_05	Canadian River	2,587,453	76,465	620	N/A	12,387	25,837	1,045	168	2,703,976
OK520610010080_00	Willow Creek	115,848	963	60	N/A	813	1,028	158	24	118,895
OK520610010180_00	Bishop Creek	73,962	720	36	N/A	504	662	95	14	75,993
OK520610020120_00	Buggy Creek	1,194,391	77,428	97	N/A	2,731	17,645	325	16	1,292,632
OK520610020150_10	Canadian River	2,602,073	54,167	268	N/A	5,281	26,053	818	39	2,688,698
OK520610030080_00	Walnut Creek-North Fork	740,347	56,273	110	N/A	2,847	9,089	241	25	808,932
OK520800010010_00	Little River	921,039	5,857	146	N/A	903	159,719	329	37	1,088,031

Table 3-9 Estimated Number of Animals for Animal Feeding Operations Inventoried by ODAFF

ODAFF Owner ID	ODAFF ID	ODAFF License Number	Maximum Number of Permitted Animals at Facility					Total # of Animal Units at Facility	County	Watershed
			Dairy Heifers	Dairy Cattle	Slaughter Feeder Cattle	Swine >55 lbs	Swine <55 lbs			
AGN026634	4	1245				600		240	Hughes	OK520800010010_00 Little River
AGN026891	56	1256				600		240	Hughes	OK520800010010_00 Little River
AGN028193	275	1284				600		240	Hughes	OK520800010010_00 Little River
AGN027153	236	1265				650		260	Seminole	OK520800010010_00 Little River

3.2.3 Failing Onsite Wastewater Disposal Systems and Illicit Discharges

ODEQ is responsible for implementing the regulations of Title 252, Chapter 641 of the Oklahoma Administrative Code, which defines design standards for individual and small public onsite sewage disposal systems (ODEQ 2004). OSWD systems and illicit discharges can be a source of bacteria loading to streams and rivers. Bacteria loading from failing OSWD systems can be transported to streams in a variety of ways, including runoff from surface ponding or through groundwater. Fecal coliform-contaminated groundwater discharges to creeks through springs and seeps.

To estimate the potential magnitude of OSWDs fecal bacteria loading, the number of OSWD systems was estimated for each watershed. The estimate of OSWD systems was derived by using data from the 1990 U.S. Census (U.S. Census Bureau 2000). The density of OSWD systems within each watershed was estimated by dividing the number of OSWD systems in each census block by the number of acres in each census block. This density was then applied to the number of acres of each census block within a WQM station watershed. Census blocks crossing a watershed boundary required additional calculation to estimate the number of OSWD systems based on the proportion of the census tracking falling within each watershed. This step involved adding all OSWD systems for each whole or partial census block.

Over time, most OSWD systems operating at full capacity will fail. OSWD system failures are proportional to the adequacy of a state's minimum design criteria (Hall 2002). The 1995 American Housing Survey conducted by the U.S. Census Bureau estimates that, nationwide, 10 percent of occupied homes with OSWD systems experience malfunctions during the year (U.S. Census Bureau 1995). A study conducted by Reed, Stowe & Yanke, LLC (2001) reported that approximately 12 percent of the OSWD systems in East Texas were chronically malfunctioning. Most studies estimate that the minimum lot size necessary to ensure against contamination is roughly one-half to one acre (Hall 2002). Some studies, however, found that lot sizes in this range or even larger could still cause contamination of ground or surface water (University of Florida 1987). It is estimated that areas with more than 40 OSWD systems per square mile (6.25 septic systems per 100 acres) can be considered to have potential contamination problems (Canter and Knox 1986). Table 3-10 summarizes estimates of sewered and unsewered households for each watershed in the Study Area.

Table 3-10 Estimates of Sewered and Unsewered Households

Waterbody ID	Waterbody Name	Public Sewer	Septic Tank	Other Means	Housing Units	% Sewered
OK520600010010_00	Canadian River	406	582	14	1,002	41%
OK520600010060_00	Factory Creek	17	37	1	55	32%
OK520600020170_00	Julian Creek	31	66	2	99	31%
OK520600030030_00	Spring Brook	80	75	3	158	51%
OK520610010010_05	Canadian River	2,570	986	37	3,592	72%
OK520610010080_00	Willow Creek	362	98	0	460	79%
OK520610010180_00	Bishop Creek	7,329	72	1	7,403	99%
OK520610020120_00	Buggy Creek	167	290	6	463	36%
OK520610020150_10	Canadian River	102	145	4	251	41%

Waterbody ID	Waterbody Name	Public Sewer	Septic Tank	Other Means	Housing Units	% Sewered
OK520610030080_00	Walnut Creek-North Fork	49	182	2	233	21%
OK520800010010_00	Little River	139	275	17	432	32%

For the purpose of estimating fecal coliform loading in watersheds, an OSWD failure rate of 12 percent was used. Using this 12 percent failure rate, calculations were made to characterize fecal coliform loads in each watershed.

Fecal coliform loads were estimated using the following equation (USEPA 2001):

$$\#\frac{counts}{day} = (\#Failing\_systems) \times \left(\frac{10^6 counts}{100ml}\right) \times \left(\frac{70gal}{personday}\right) \times \left(\#\frac{person}{household}\right) \times \left(3785.2\frac{ml}{gal}\right)$$

The average of number of people per household was calculated to be 2.44 for counties in the Study Area (U.S. Census Bureau 2000). Approximately 70 gallons of wastewater were estimated to be produced on average per person per day (Metcalf and Eddy 1991). The fecal coliform concentration in septic tank effluent was estimated to be 10^6 per 100 mL of effluent based on reported concentrations from a number of published reports (Metcalf and Eddy 1991; Canter and Knox 1985; Cogger and Carlile 1984). Using this information, the estimated load from failing septic systems within the watersheds was summarized below in Table 3-11.

Table 3-11 Estimated Fecal Coliform Load from OSWD Systems

Waterbody ID	Waterbody Name	Acres	Septic Tank or Cesspool	# of Failing Septic Tanks	Estimated Loads from Septic Tanks (x 10^9 counts/day)
OK520600010010_00	Canadian River	89,183	582	47	301
OK520600010060_00	Factory Creek	4,812	37	3	19
OK520600020170_00	Julian Creek	10,524	66	5	34
OK520600030030_00	Spring Brook	40,064	75	6	39
OK520610010010_05	Canadian River	172,991	986	79	510
OK520610010080_00	Willow Creek	15,144	98	8	51
OK520610010180_00	Bishop Creek	9,199	72	6	37
OK520610020120_00	Buggy Creek	65,715	290	23	150
OK520610020150_10	Canadian River	143,087	145	12	75
OK520610030080_00	Walnut Creek-North Fork	41,327	182	15	94
OK520800010010_00	Little River	80,627	275	22	142

3.2.4 Domestic Pets

Fecal matter from dogs and cats, which is transported to streams by runoff from urban and suburban areas can be a potential source of bacteria loading. On average nationally, there are 0.58 dogs per household and 0.66 cats per household (American Veterinary Medical Association 2004). Using the U.S. Census data at the block level (U.S. Census Bureau 2000), dog and cat populations can be estimated for each watershed. Table 3-12 summarizes the estimated number of dogs and cats for the watersheds of the Study Area.

Table 3-12 Estimated Number of Pets

Waterbody ID	Waterbody Name	Dogs	Cats
OK520600010010_00	Canadian River	561	661
OK520600010060_00	Factory Creek	31	36
OK520600020170_00	Julian Creek	55	65
OK520600030030_00	Spring Brook	88	104
OK520610010010_05	Canadian River	2,012	2,371
OK520610010080_00	Willow Creek	258	304
OK520610010180_00	Bishop Creek	4,146	4,886
OK520610020120_00	Buggy Creek	259	305
OK520610020150_10	Canadian River	141	166
OK520610030080_00	Walnut Creek-North Fork	130	153
OK520800010010_00	Little River	242	285

Table 3-13 provides an estimate of the fecal coliform load from pets. These estimates are based on estimated fecal coliform production rates of 5.4×10^8 per day for cats and 3.3×10^9 per day for dogs (Schueler 2000).

Table 3-13 Estimated Fecal Coliform Daily Production by Pets (x109)

Waterbody ID	Waterbody Name	Dogs	Cats	Total
OK520600010010_00	Canadian River	1,851	357	2,209
OK520600010060_00	Factory Creek	101	20	121
OK520600020170_00	Julian Creek	183	35	218
OK520600030030_00	Spring Brook	292	56	348
OK520610010010_05	Canadian River	6,638	1,280	7,919
OK520610010080_00	Willow Creek	851	164	1,015
OK520610010180_00	Bishop Creek	13,681	2,638	16,319
OK520610020120_00	Buggy Creek	855	165	1,020
OK520610020150_10	Canadian River	464	89	554
OK520610030080_00	Walnut Creek-North Fork	430	83	513
OK520800010010_00	Little River	797	154	951

3.3 Summary of Bacteria Sources

Table 3-14 summarizes the suspected sources of bacteria loading in each impaired watershed. As indicated in the table there are no NPDES-permitted facilities in the Factory Creek, Julian Creek, and Willow Creek watersheds; therefore, nonsupport of PBCR use is caused by nonpoint sources of bacteria only. In watersheds with both point and nonpoint sources of bacteria, the available data suggests that the proportion of bacteria from point sources ranges from minor to moderate. Those waterbodies in which point sources are a minor contributor of bacteria include Canadian River (OK520610020150_10), Walnut Creek-North Fork (OK520610030080_00), and Spring Brook (OK520600030030_00). In the remaining five watersheds, Canadian River (OK520600010010_00), Bishop Creek (OK520610010180_00), Buggy Creek (OK520610020120_00), Canadian River (OK520610010010_05), and Little River (OK520800010010_00), point sources such as WWTP, SSOs, and CAFOs, contribute moderate bacteria loads in propotion to nonpoint sources. The urban areas designated as Phase II MS4s in the city of Norman further increase the proportion of bacteria loading from point sources in Bishop Creek (OK520610010180_00). However, overall nonpoint sources are considered to be the major source of bacteria loading in each watershed.

Table 3-14 Estimated Major Source of Bacteria Loading by Watershed

Waterbody ID	Waterbody Name	Point Sources	Nonpoint Sources	Major Source
OK520600010010_00	Canadian River	Yes	Yes	Nonpoint
OK520600010060_00	Factory Creek	No	Yes	Nonpoint
OK520600020170_00	Julian Creek	No	Yes	Nonpoint
OK520600030030_00	Spring Brook	Yes	Yes	Nonpoint
OK520610010010_05	Canadian River	Yes	Yes	Nonpoint
OK520610010080_00	Willow Creek	No	Yes	Nonpoint
OK520610010180_00	Bishop Creek	Yes	Yes	Nonpoint
OK520610020120_00	Buggy Creek	Yes	Yes	Nonpoint
OK520610020150_10	Canadian River	Yes	Yes	Nonpoint
OK520610030080_00	Walnut Creek-North Fork	Yes	Yes	Nonpoint
OK520800010010_00	Little River	Yes	Yes	Nonpoint

Table 3-15 below provides a summary of the estimated fecal coliform loads in percentage for the four major nonpoint source categories (commercially raised farm animals, pets, deer, and septic tanks) that are contributing to the elevated bacteria concentrations in each watershed. Commercially raised farm animals are estimated to be the largest contributors of fecal coliform loading to land surfaces. It must be noted that while no data are available to estimate populations and fecal loading of wildlife other than deer, a number of bacteria source tracking studies demonstrate that wild birds and mammals represent a major source of the fecal bacteria found in streams.

The magnitude of loading to a stream may not reflect the magnitude of loading to land surfaces. While no studies have quantified these effects, bacteria may die off or survive at different rates depending on the manure characteristics and a number of other environmental conditions. Manure handling practices, use of BMPs, and relative location to streams can also affect stream loading. Also, the structural properties of some manures, such as cow patties, may limit their washoff into streams by runoff. Because litter is applied in a pulverized form, it could be a larger source during storm runoff events. The Shoal Creek report showed that poultry litter was about 71% of the high flow load and cow pats contributed only about 28% of it (Missouri Department of Natural Resources, 2003). The Shoal Creek report also showed that poultry litter was insignificant under low flow conditions up to 50% frequency. In contrast, malfunctioning septic tank effluent may be present in standing water on the surface, or in shallow groundwater, which may enhance its conveyance to streams.

Table 3-15 Summary of Fecal Coliform Load Estimates from Nonpoint Sources to Land Surfaces

Waterbody ID	Waterbody Name	Commercially Raised Farm Animals	Pets	Deer	Estimated Loads from Septic Tanks	Total Fecal Coliform Load (x10^9 counts/day)
OK520600010010_00	Canadian River	99.74%	0.19%	0.04%	0.03%	1,147,124
OK520600010060_00	Factory Creek	99.75%	0.18%	0.03%	0.03%	66,069
OK520600020170_00	Julian Creek	99.72%	0.20%	0.05%	0.03%	107,307
OK520600030030_00	Spring Brook	99.90%	0.06%	0.03%	0.01%	568,931
OK520610010010_05	Canadian River	99.67%	0.29%	0.02%	0.02%	2,712,895
OK520610010080_00	Willow Creek	99.06%	0.85%	0.05%	0.04%	120,021
OK520610010180_00	Bishop Creek	82.26%	17.66%	0.04%	0.04%	92,385
OK520610020120_00	Buggy Creek	99.89%	0.08%	0.02%	0.01%	1,294,036
OK520610020150_10	Canadian River	99.96%	0.02%	0.02%	0.00%	2,689,813
OK520610030080_00	Walnut Creek-North Fork	99.91%	0.06%	0.01%	0.01%	809,648
OK520800010010_00	Little River	99.86%	0.09%	0.04%	0.01%	1,089,591

SECTION 4
TECHNICAL APPROACH AND METHODS

The objective of a TMDL is to estimate allowable pollutant loads and to allocate these loads to the known pollutant sources in the watershed so appropriate control measures can be implemented and the WQS achieved. A TMDL is expressed as the sum of three elements as described in the following mathematical equation:

$$TMDL = \Sigma\ WLA + \Sigma\ LA + MOS$$

The WLA is the portion of the TMDL allocated to existing and future point sources. The LA is the portion of the TMDL allocated to nonpoint sources, including natural background sources. The MOS is intended to ensure that WQSs will be met. Thus, the allowable pollutant load that can be allocated to point and nonpoint sources can then be defined as the TMDL minus the MOS.

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, *E. coli*, or Enterococci bacteria, TMDLs are expressed as colony-forming units per day, where possible, or as a percent reduction goal (PRG), and represent the maximum one-day load the stream can assimilate while still attaining the WQS.

4.1 Using Load Duration Curves to Develop TMDLs

The TMDL calculations presented in this report are derived from load duration curves (LDC). LDCs facilitate rapid development of TMDLs, and as a TMDL development tool are effective at identifying whether impairments are associated with point or nonpoint sources. The technical approach for using LDCs for TMDL development includes the four following steps that are described in Subsections 4.2 through 4.4 below:

- Preparing flow duration curves for gaged and ungaged WQM stations;
- Estimating existing bacteria loading in the receiving water using ambient water quality data;
- Using LDCs to identify the critical condition that will dictate loading reductions necessary to attain WQS; and
- Interpreting LDCs to derive TMDL elements – WLA, LA, MOS, and PRG.

Historically, in developing WLAs for pollutants from point sources, it was customary to designate a critical low flow condition (*e.g.*, 7Q2) at which the maximum permissible loading was calculated. As water quality management efforts expanded in scope to quantitatively address nonpoint sources of pollution and types of pollutants, it became clear that this single critical low flow condition was inadequate to ensure adequate water quality across a range of flow conditions. Use of the LDC obviates the need to determine a design storm or selected flow recurrence interval with which to characterize the appropriate flow level for the assessment of critical conditions. For waterbodies impacted by both point and nonpoint sources, the "nonpoint source critical condition" would typically occur during high flows, when rainfall runoff would contribute the bulk of the pollutant load, while the "point source critical condition" would typically occur during low flows, when WWTP effluents would dominate the base flow of the impaired water. However, flow range is only a general indicator of the relative proportion of point/nonpoint contributions. It is not used in this report to quantify point source or nonpoint source contributions. Violations that occur during low flows may not be caused exclusively by point sources. Violations have been noted in some watersheds that contain no point sources. Research has show that bacteria loading in streams during low flow conditions may be due to direct deposit of cattle manure into streams and faulty septic tank/lateral field systems.

LDCs display the maximum allowable load over the complete range of flow conditions by a line using the calculation of flow multiplied by the water quality criterion. The TMDL can be expressed as a continuous function of flow, equal to the line, or as a discrete value derived from a specific flow condition.

4.2 Development of Flow Duration Curves

Flow duration curves serve as the foundation of LDCs and are graphical representations of the flow characteristics of a stream at a given site. Flow duration curves utilize the historical hydrologic record from stream gages to forecast future recurrence frequencies. Many WQM stations throughout Oklahoma do not have long term flow data and therefore, flow frequencies must be estimated. The most basic method to estimate flows at an ungaged site involves 1) identifying an upstream or downstream flow gage; 2) calculating the contributing drainage areas of the ungaged sites and the flow gage; and 3) calculating daily flows at the ungaged site by using the flow at the gaged site multiplied by the drainage area ratio. The more complex approach used here also considers watershed differences in rainfall, land use, and the hydrologic properties of soil that govern runoff and retention. More than one upstream flow gage may also be considered. A more detailed explanation of the methods for estimating flow at ungaged WQM stations is provided in Appendix C.

Flow duration curves are a type of cumulative distribution function. The flow duration curve represents the fraction of flow observations that exceed a given flow at the site of interest. The observed flow values are first ranked from highest to lowest, then, for each observation, the percentage of observations exceeding that flow is calculated. The flow value is read from the ordinate (y-axis), which is typically on a logarithmic scale since the high flows would otherwise overwhelm the low flows. The flow exceedance frequency is read from the abscissa, which is numbered from 0 to 100 percent, and may or may not be logarithmic. The lowest measured flow occurs at an exceedance frequency of 100 percent indicating that flow has equaled or exceeded this value 100 percent of the time, while the highest measured flow is found at an exceedance frequency of 0 percent. The median flow occurs at a flow exceedance frequency of 50 percent. The flow exceedance percentiles for each WQM station addressed in this report are provided in Appendix C.

While the number of observations required to develop a flow duration curve is not rigorously specified, a flow duration curve is usually based on more than 1 year of observations, and encompasses inter-annual and seasonal variation. Ideally, the drought of record and flood of record are included in the observations. For this purpose, the long-term flow gaging stations operated by the USGS are utilized (USGS 2007a).

A typical semi-log flow duration curve exhibits a sigmoidal shape, bending upward near a flow exceedance frequency value of 0 percent and downward at a frequency near 100 percent, often with a relatively constant slope in between. For sites that on occasion exhibit no flow, the curve will intersect the abscissa at a frequency less than 100 percent. As the number of observations at a site increases, the line of the LDC tends to appear smoother. However, at extreme low and high flow values, flow duration curves may exhibit a “stair step” effect due to the USGS flow data rounding conventions near the limits of quantitation.

Figures 4-1 through 4-11 are flow duration curves for each impaired waterbody. No flow gage exists on Canadian River, segment OK520600010010_00 at WQM station OK520600010010-001AT. Therefore, flows for this waterbody were based on the difference between measured flows at a downstream USGS gage station 07231500 (Canadian River at Calvin, OK) and another USGS gage station 07231000 (Little River near Sasakwa, OK) on the other tributary to gage 07231500. The flow period used for these stations was 1966 through 2006.

No flow gage exists on Factory Creek, segment OK121600010100_00. Therefore, flows for this waterbody were projected using the watershed area ratio method based on measured flows at USGS gage station 07328180 (North Criner Creek near Criner, OK). The flow period used for this station was 1989 through 2006.

No flow gage exists on Julian Creek, segment OK520600020170_00. Therefore, flows for this waterbody were projected using the watershed area ratio method based on measured flows at USGS gage station 07328180 (North Criner Creek near Criner, OK). The flow period used for this station was 1989 through 2006.

No flow gage exists on Spring Brook Creek, segment OK520600030030_00. Therefore, flows for this waterbody were projected using the watershed area ratio method based on measured flows at USGS gage station 07229427 (Canadian Sandy Creek near Ada, OK) just downstream of Spring Brook Creek. The flow period used for this station was 1986 through 1988. Since point source discharges can comprise a significant fraction of flow under low flow conditions, the permitted point source discharges were added to the projected natural flows.

The flow duration curve for Canadian River at Purcell, segment OK520610010010_05, was based on measured flows at USGS gage station 07229200 (Canadian River at Purcell, OK). This gage is co-located with WQM station OK520610010010-001AT. The flow duration curve was based on measured flows from 1986 through 2006.

No flow gage exists on Willow Creek, segment OK520610010080_00. Therefore, flows for this waterbody were projected using the watershed area ratio method based on measured flows at USGS gage station 07328180 (North Criner Creek near Criner, OK). The flow period used for this station was 1989 through 2006.

No flow gage exists on Bishop Creek, segment OK520610010180_00. Therefore, flows for this waterbody were projected using the watershed area ratio method based on measured flows at USGS gage station 07328180 (North Criner Creek near Criner, OK). The flow period used for this station was 1989 through 2006. Additionally, projected point source flows, estimated as one-half of the design flow of NPDES permit OK0031755, were added to the natural runoff flows.

No flow gage exists on Buggy Creek, segment OK520610020120_00. Therefore, flows for this waterbody were projected using the watershed area ratio method based on measured flows at USGS gage station 07328180 (North Criner Creek near Criner, OK). The flow period used for this station was 1989 through 2006.

The flow duration curve for Canadian River, segment OK520610020150_10 was based on measured flows at USGS gage station 07228500 (Canadian River at Bridgeport, OK). This gage is co-located with WQM station OK520610020150-001AT. The flow duration curve was based on measured flows from 1970 through 2006.

No flow gage exists on Walnut Creek, segment OK520610030080_00. Therefore, flows for this waterbody were estimated using the watershed area ratio method based on measured flows at USGS gage station 07328180 (North Criner Creek near Criner, OK). The flow period used for this station was 1989 through 2006. Additionally, the point source discharge inflows, estimated as one-half of the design flow of NPDES permit OK0038458, was added to the naturalized flow projections.

The flow duration curve for Little River, segment OK520800010010_00 was based on measured flows at USGS gage station 07231000 (Little River near Sasakwa, OK). This gage is co-located with WQM station OK520800010010-001AT. The flow duration curve was based on measured flows from 1943 through 2006.

Figure 4-1 Flow Duration Curve for Canadian River (OK520600010010_00)

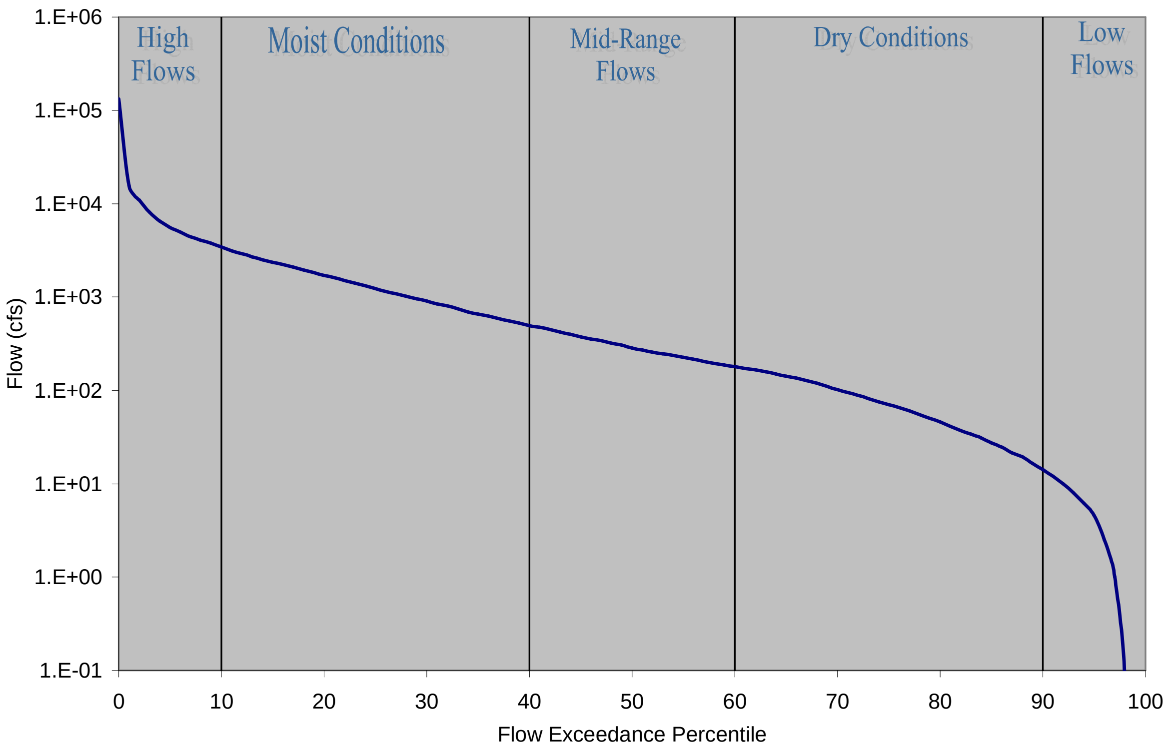


Figure 4-2 Flow Duration Curve for Factory Creek (OK520600010060_00)

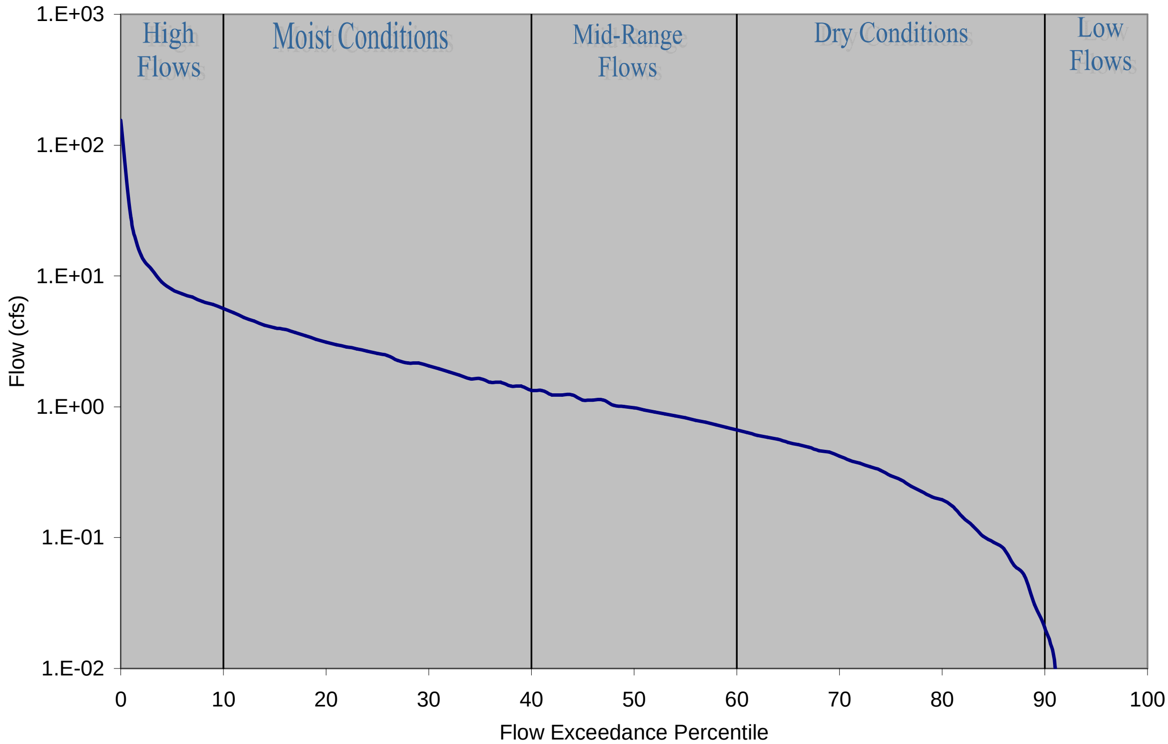


Figure 4-3 Flow Duration Curve for Julian Creek (OK520600020170_00)

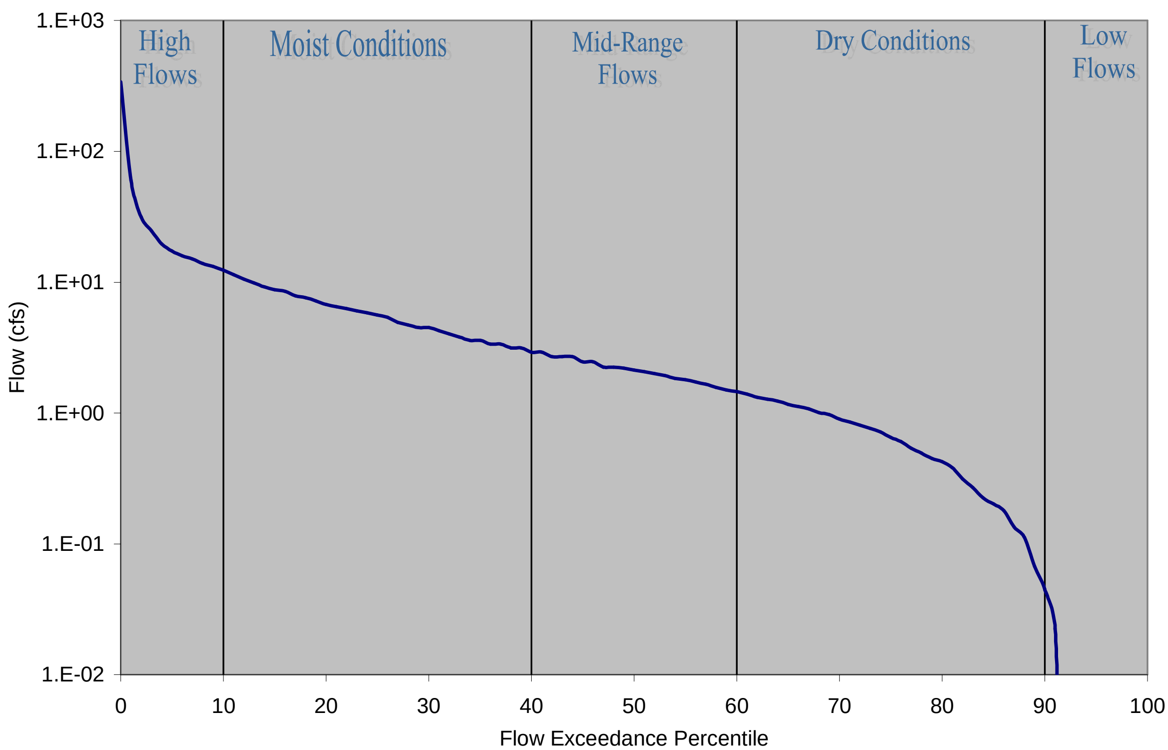
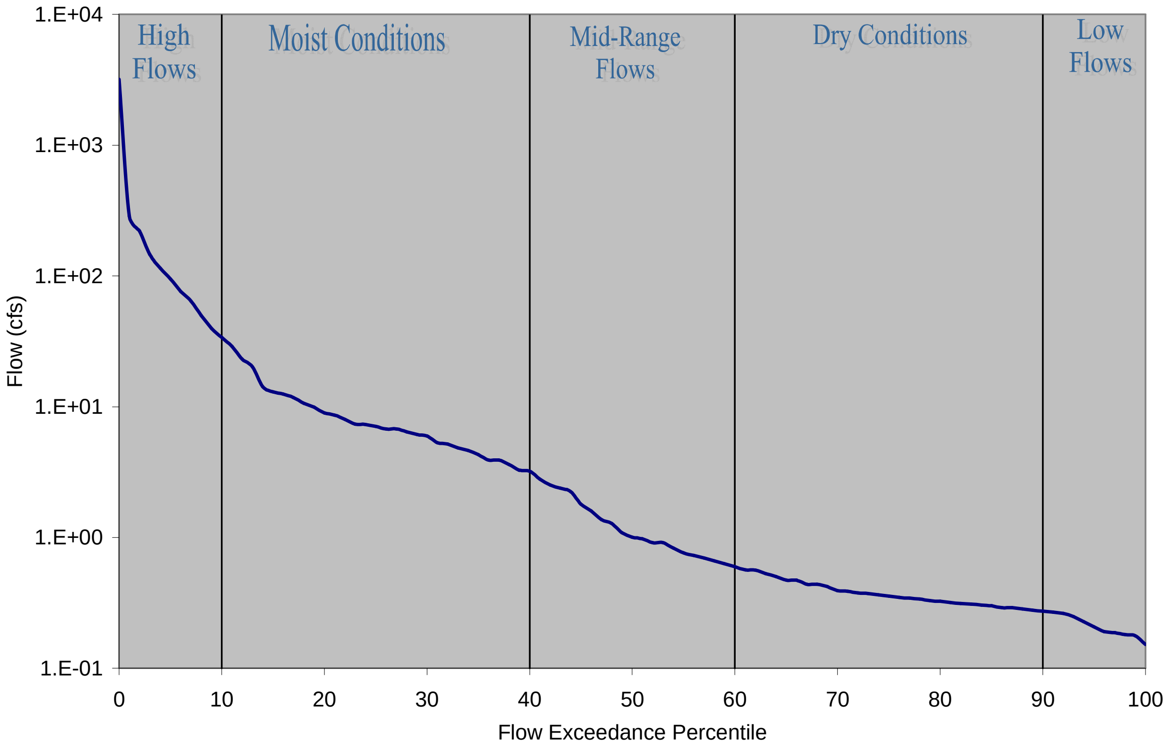


Figure 4-4 Flow Duration Curve for Spring Brook (OK520600030030_00)



Note: The stepped curve is caused by extremely low flow conditions near the limit of quantitation, as well as data rounding conventions.

Figure 4-5 Flow Duration Curve for Canadian River (OK520610010010_05)

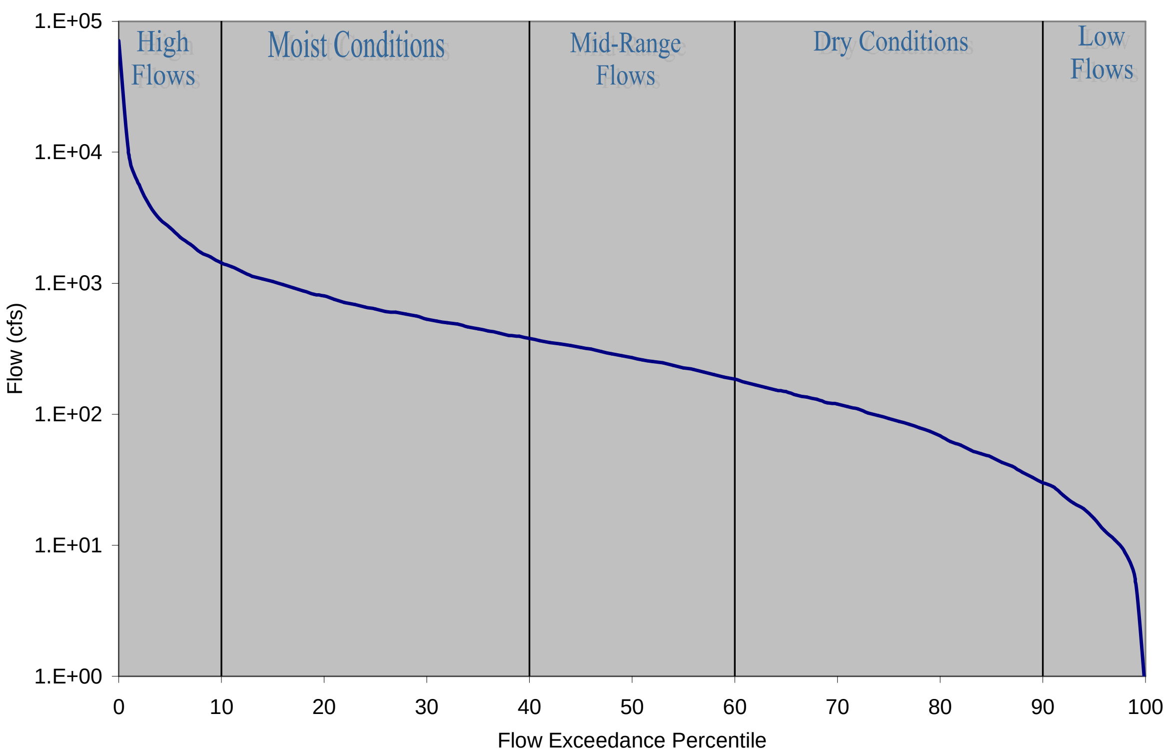


Figure 4-6 Flow Duration Curve for Willow Creek (OK520610010080_00)

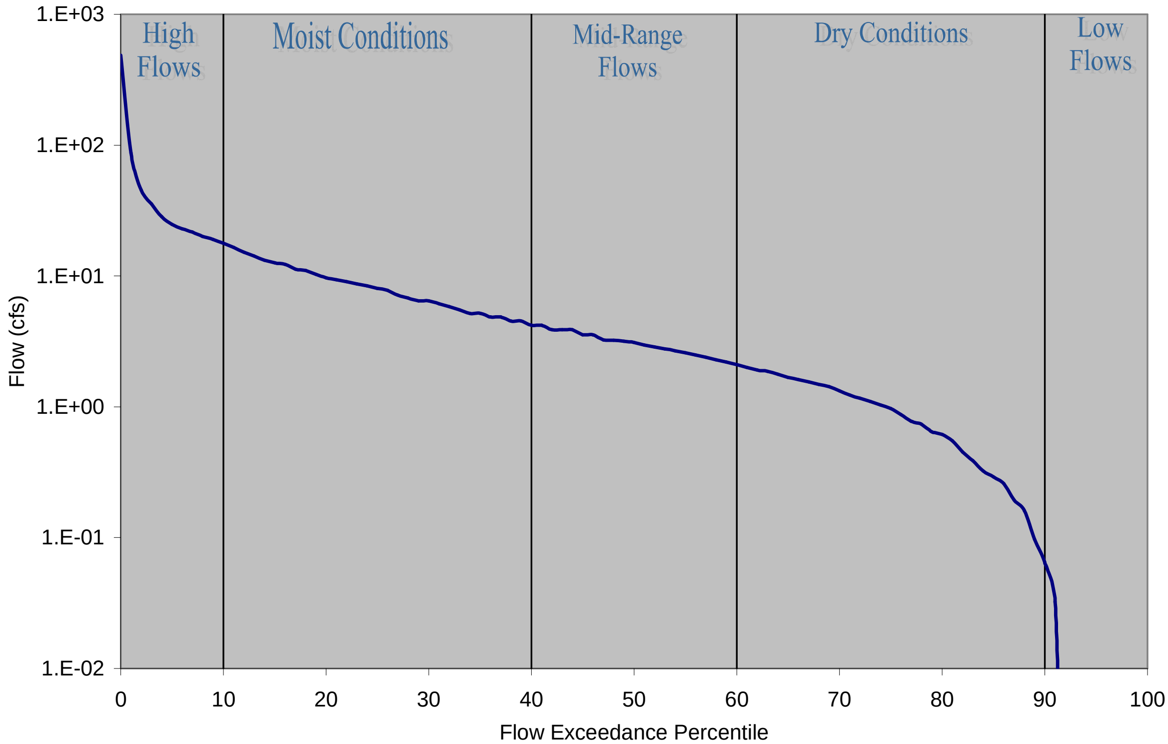


Figure 4-7 Flow Duration Curve for Bishop Creek (OK520610010180_00)

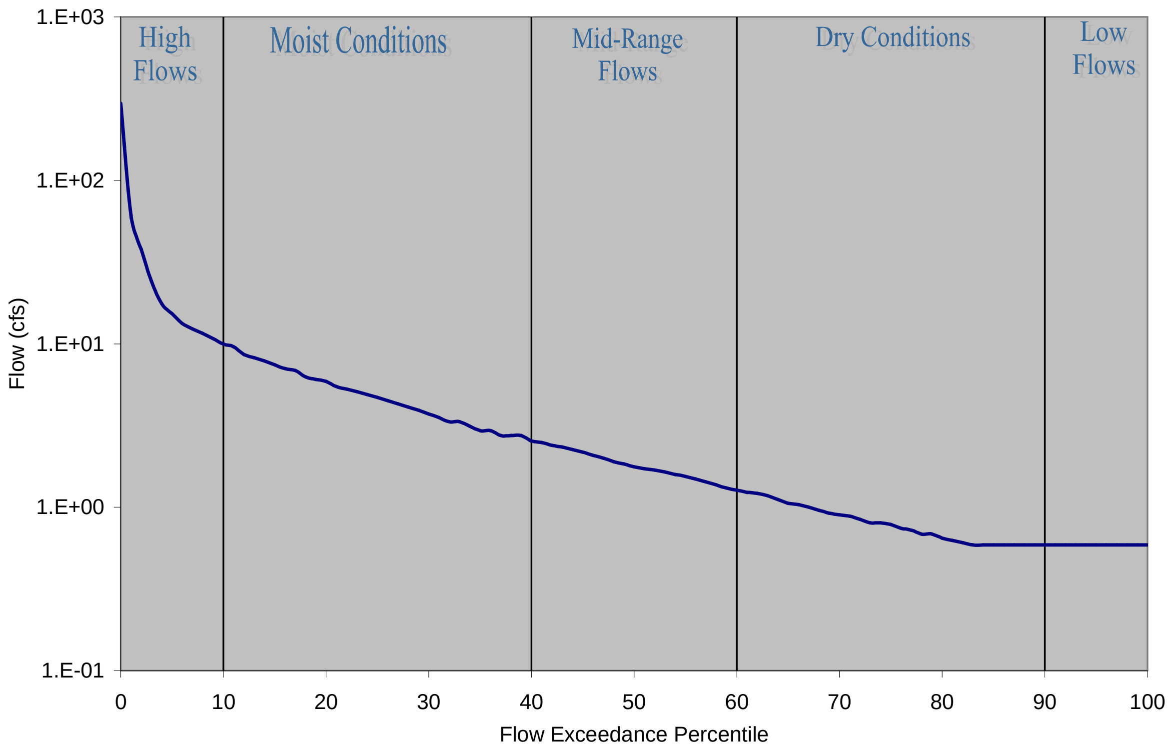
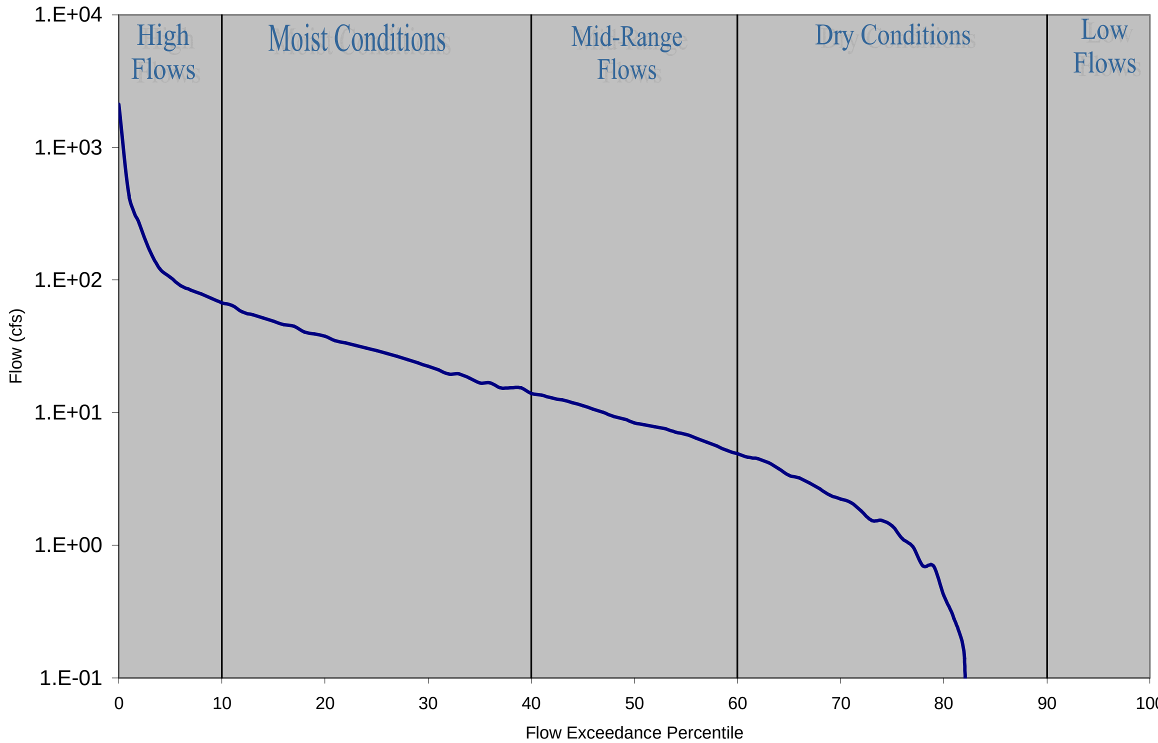


Figure 4-8 Flow Duration Curve for Buggy Creek (OK520610020120_00)



Note: The stepped curve is caused by extremely low flow conditions near the limit of quantitation, as well as data rounding conventions.

Figure 4-9 Flow Duration Curve for Canadian River (OK520610020150_10)

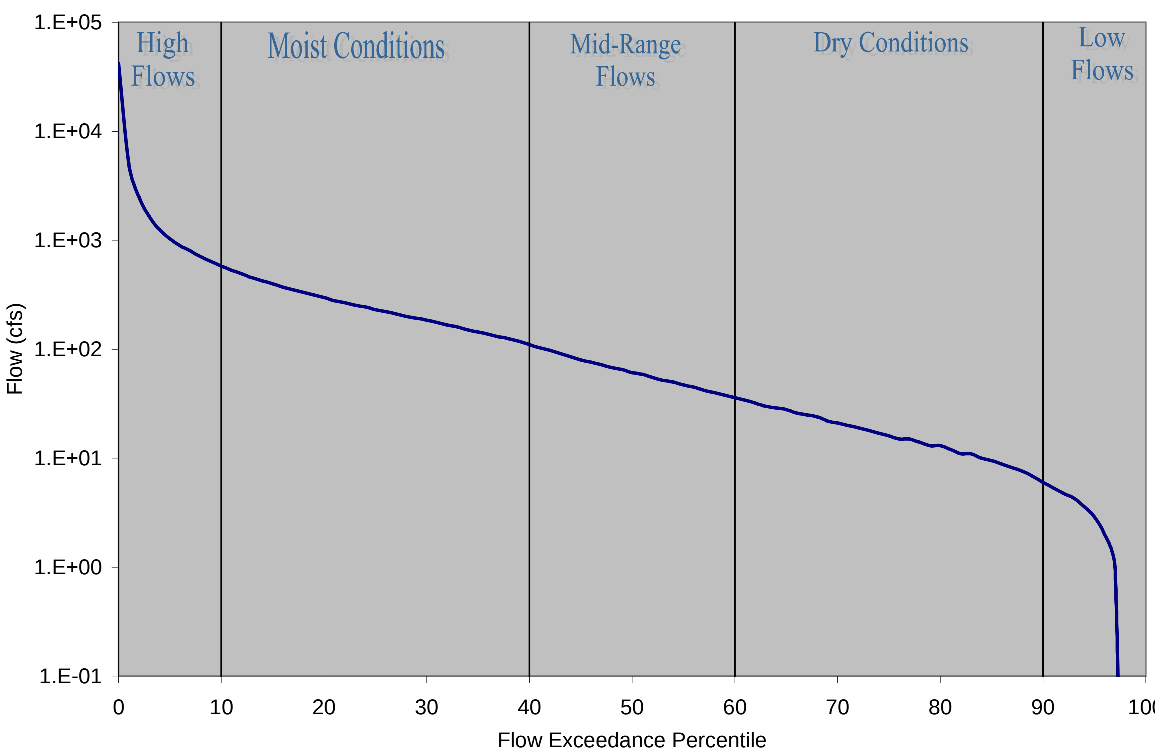
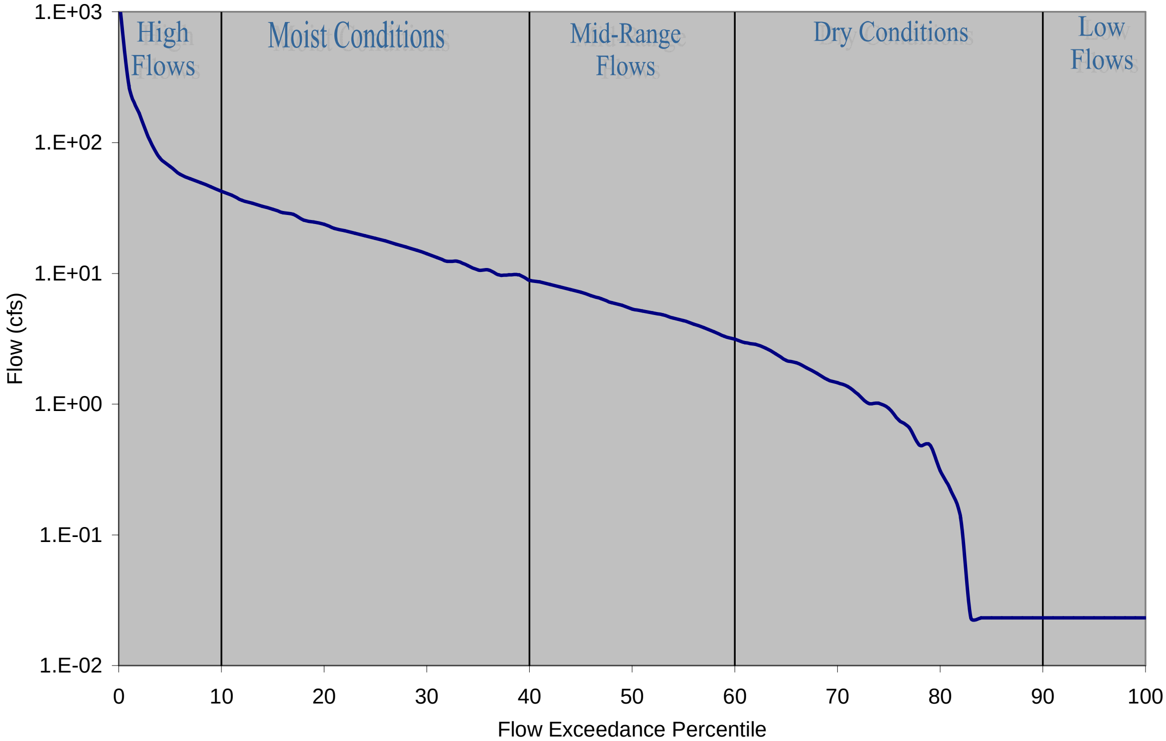
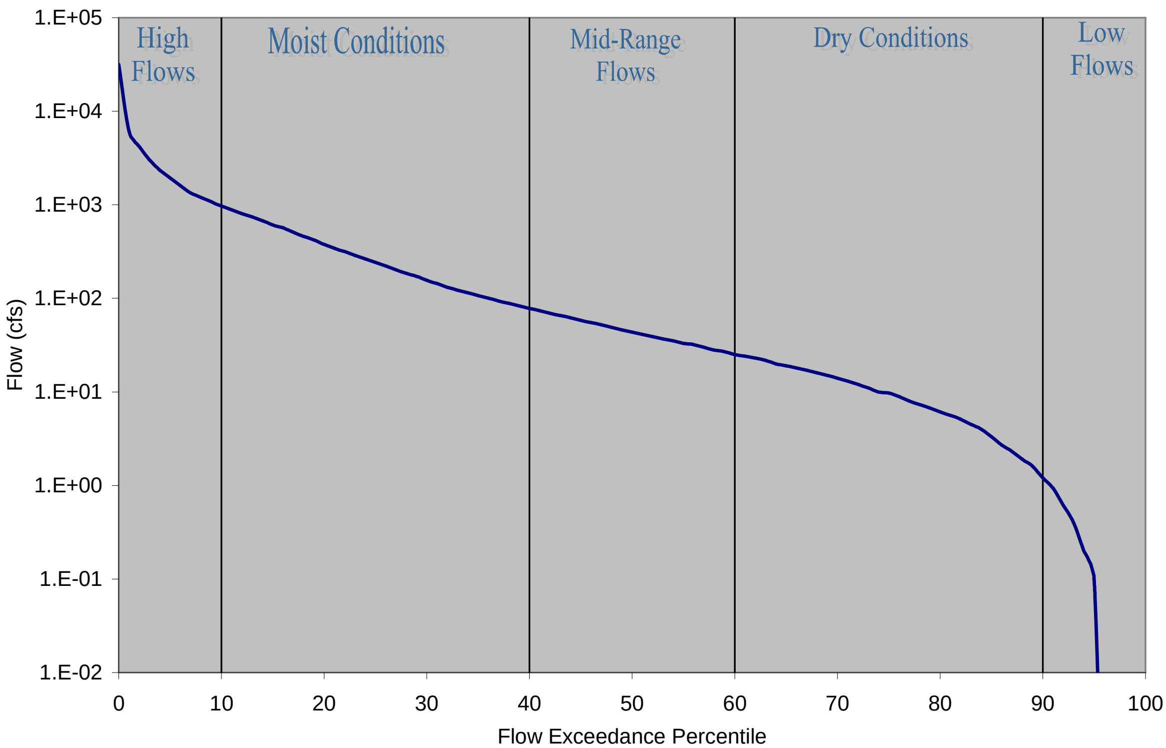


Figure 4-10 Flow Duration Curve for Walnut Creek-North Fork (OK520610030080_00)



Note: The stepped curve is caused by extremely low flow conditions near the limit of quantitation, as well as data rounding conventions.

Figure 4-11 Flow Duration Curve for Little River (OK520800010010_00)



Flow duration curves can be subdivided into hydrologic condition classes to facilitate the diagnostic and analytical uses of flow and LDCs. The hydrologic classification scheme utilized in this application is similar to that described by Cleland (2003):

Table 4-1 Hydrologic Classification Scheme

Flow Exceedance Percentile	Hydrologic Condition Class
0-10	High flows
10-40	Moist Conditions
40-60	Mid-Range Conditions
60-90	Dry Conditions
90-100	Low Flows

Flow duration curves are generated using an ODEQ automated application referred to as the bacteria LDC toolbox. A step-by-step procedure on how to generate flow duration curves and flow exceedance percentiles is provided in Appendix C.

The USGS National Water Information System serves as the primary source of flow measurements for the application. All available daily average flow values for all gages in Oklahoma, as well as the nearest upstream and downstream gages in adjacent states, were retrieved for use in the application. The application includes a data update module that automatically downloads the most recent USGS data and appends it to the existing flow database.

Some instantaneous flow measurements were available from various agencies. These were not combined with the daily average flows or used in calculating flow percentiles, but were matched to bacteria grab measurements collected at the same site and time. When available, these instantaneous flow measurements were used in lieu of the daily average flow to calculate instantaneous bacteria loads.

4.3 Estimating Current Point and Nonpoint Loading

Another key step in the use of LDCs for TMDL development is the estimation of existing bacteria loading from point and nonpoint sources and the display of this loading in relation to the TMDL. In Oklahoma, WWTPs that discharge treated sanitary wastewater must meet the state WQSs for fecal bacteria at the point of discharge. However, for TMDL analysis it is necessary to understand the relative contribution of WWTPs to the overall pollutant loading and its general compliance with required effluent limits. The monthly bacteria load for continuous point source dischargers is estimated by multiplying the monthly average flow rates by the monthly geometric mean using a conversion factor. Where available, data necessary for this calculation were extracted from each point source's discharge monitoring reports from 1997 through 2006. The 90^{th} percentile value of the monthly loads was used to express the estimated existing point source load in counts/day. The current pollutant loading from each permitted point source discharge is calculated using the equation below.

Point Source Loading = monthly average flow rates (mgd) * geometric mean of corresponding fecal coliform concentration * unit conversion factor

Where:

unit conversion factor = 37,854,120 100-ml/million gallons (mg)

It is difficult to estimate current nonpoint loading due to lack of specific water quality and flow information that would assist in estimating the relative proportion of non-specific sources within the watershed. Therefore, existing instream loads minus the point source loads were used as an estimate for nonpoint loading.

4.4 Development of TMDLs Using Load Duration Curves

The final step in the TMDL calculation process involves a group of additional computations derived from the preparation of LDCs. These computations are necessary to derive a PRG (which is one method of presenting how much bacteria loading must be reduced to meet WQSs in the impaired watershed).

Step 1: Generate Bacteria LDCs. LDCs are similar in appearance to flow duration curves; however, the ordinate is expressed in terms of a bacteria load in cfu/day. The curve represents the single sample water quality criterion for fecal coliform (400 cfu/100 mL), *E. coli* (406 cfu/100 mL), or Enterococci (108 cfu/100 mL) expressed in terms of a load through multiplication by the continuum of flows historically observed at this site. The basic steps to generating an LDC involve:

- obtaining daily flow data for the site of interest from the USGS;
- sorting the flow data and calculating flow exceedance percentiles for the time period and season of interest;
- obtaining the water quality data from the primary contact recreation season (May 1 through September 30);
- obtaining water quality data from the entire calendar year for waterbodies not supporting the SBCR use;
- matching the water quality observations with the flow data from the same date;
- display a curve on a plot that represents the allowable load multiply the actual or estimated flow by the WQS for each respective indicator;
- multiplying the flow by the water quality parameter concentration to calculate daily loads; then
- plotting the flow exceedance percentiles and daily load observations in a load duration plot.

The culmination of these steps is expressed in the following formula, which is displayed on the LDC as the TMDL curve:

TMDL (cfu/day) = WQS * flow (cfs) * unit conversion factor

Where

PBCR: WQS = 400 cfu /100 ml (Fecal coliform); 406 cfu/100 ml (E. coli); or 108 cfu/100 ml (Enterococci)

SBCR: WQS = 2000 cfu /100 ml (Fecal coliform); 2030 cfu/100 ml (E. coli); or 540 cfu/100 ml (Enterococci)

unit conversion factor = 24,465,525 ml*s / ft3*day

The flow exceedance frequency (x-value of each point) is obtained by looking up the historical exceedance frequency of the measured or estimated flow, in other words, the percent of historical observations that equal or exceed the measured or estimated flow. Historical observations of bacteria concentration are paired with flow data and are plotted on the LDC. The fecal coliform load (or the y-value of each point) is calculated by multiplying the fecal coliform concentration (colonies/100 mL) by the instantaneous flow (cubic feet per second) at the same site and time, with appropriate volumetric and time unit conversions. Fecal coliform/*E. coli*/Enterococci loads representing exceedance of water quality criteria fall above the water quality criterion line.

Only those flows and water quality samples observed in the months comprising the primary contact recreation season are used to generate the LDCs. It is inappropriate to compare single sample bacteria observations and instantaneous or daily flow durations to a 30-day geometric mean water quality criterion in the LDC.

As noted earlier, runoff has a strong influence on loading of nonpoint pollution. Yet flows do not always correspond directly to local runoff; high flows may occur in dry weather and runoff influence may be observed with low or moderate flows.

Step 2: Develop LDCs with MOS. An LDC depicting slightly lower estimates than the TMDL is developed to represent the TMDL with MOS. The MOS may be defined explicitly or implicitly. A typical explicit approach would reserve some fraction of the TMDL (*e.g.,* 10%) as the MOS. In an implicit approach, conservative assumptions used in developing the TMDL are relied upon to provide an MOS to assure that WQSs are attained.

For the TMDLs in this report, an explicit MOS of 10 percent of the TMDL value (10% of the instantaneous water quality criterion) has been selected to slightly reduce assimilative capacity in the watershed. The MOS at any given percent flow exceedance, therefore, is defined as the difference in loading between the TMDL and the TMDL with MOS.

Step 3: Calculate WLA. As previously stated, the pollutant load allocation for point sources is defined by the WLA. A point source can be either a wastewater (continuous) or stormwater (MS4) discharge. Stormwater point sources are typically associated with urban and industrialized areas, and recent USEPA guidance includes NPDES-permitted stormwater discharges as point source discharges and, therefore, part of the WLA.

The LDC approach recognizes that the assimilative capacity of a waterbody depends on the flow, and that maximum allowable loading will vary with flow condition. TMDLs can be expressed in terms of maximum allowable concentrations, or as different maximum loads allowable under different flow conditions, rather than single maximum load values. This concentration-based approach meets the requirements of 40 CFR, 130.2(i) for expressing TMDLs “in terms of mass per time, toxicity, or other appropriate measures” and is consistent with USEPA’s Protocol for Developing Pathogen TMDLs (USEPA 2001).

WLA for WWTP. WLAs may be set to zero in cases of watersheds with no existing or planned continuous permitted point sources. For watersheds with permitted point sources, wasteloads may be derived from NPDES permit limits. A WLA may be calculated for each active NPDES wastewater discharger using a mass balance approach as shown in the equation below. The permitted average flow rate used for each point source discharge and the water quality criterion concentration are used to estimate the WLA for each wastewater facility. All WLA values for each NPDES wastewater discharger are then summed to represent the total WLA for the watershed.

WLA = WQS * flow * unit conversion factor (#/day)

Where: WQS = 200 cfu /100 ml (Fecal coliform); 126 cfu/100 ml (E. coli); or 33 cfu/100 ml (Enterococci)

flow (10^6 gal/day) = permitted flow

unit conversion factor = 37,854,120-10^6gal/day

Step 4: Calculate LA and WLA for MS4s. Given the lack of data and the variability of storm events and discharges from storm sewer system discharges, it is difficult to establish numeric limits on stormwater discharges that accurately address projected loadings. As a result, EPA regulations and guidance recommend expressing NPDES permit limits for MS4s as BMPs.

LAs can be calculated under different flow conditions as the water quality target load minus the WLA. The LA is represented by the area under the LDC but above the WLA. The LA at any particular flow exceedance is calculated as shown in the equation below.

LA = TMDL - WLA_WWTP - WLA_MS4 - MOS

WLA for MS4s. If there are no permitted MS4s in the study area, WLA_MS4 is set to zero. When there are permitted MS4s in the watershed, we can first calculate the sum of LA + WLA_MS4 using the above formula, then separate WLA for MS4s from the sum based on the percentage of a watershed that is under a MS4 jurisdiction. This WLA for MS4s may not be the total load allocated for permitted MS4s unless the whole MS4 area is located within the study watershed boundry. However, in most case the study watershed intersects only a portion of the permitted MS4 coverage areas.

Step 5: Estimate WLA Load Reduction. The WLA load reduction was not calculated as it was assumed that continuous dischargers (NPDES-permitted WWTPs) are adequately regulated under existing permits to achieve water quality standards at the end-of-pipe and, therefore, no WLA reduction would be required. All SSOs are considered unpermitted discharges under State statute and DEQ regulations. For any MS4s that are located within a watershed requiring a TMDL the load reduction will be equal to the PRG established for the overall watershed.

Step 6: Estimate LA Load Reduction. After existing loading estimates are computed for each bacterial indicator, nonpoint load reduction estimates for each WQM station are calculated by using the difference between estimated existing loading and the allowable load expressed by the LDC (TMDL-MOS). This difference is expressed as the overall percent reduction goal (PRG) for the impaired waterbody. For fecal coliform the PRG which ensures that no more than 25 percent of the samples exceed the TMDL based on the instantaneous criteria allocates the loads in manner that is also protective of the geometric mean criterion. For *E. coli* and Enterococci, because WQSs are considered to be met if 1) either the geometric mean of all data is less than the geometric mean criteria, or 2) no sample exceeds the instantaneous criteria, the

TMDL PRG will be the lesser of that required to meet the geometric mean or instantaneous criteria.

SECTION 5
TMDL CALCULATIONS

5.1 Estimated Loading and Critical Conditions

USEPA regulations at 40 CFR 130.7(c) (1) require TMDLs to take into account critical conditions for stream flow, loading, and all applicable water quality standards. To accomplish this, available instream WQM data were evaluated with respect to flows and magnitude of water quality criteria exceedance using LDCs. Furthermore, TMDLs are derived for all bacterial indicators at any given WQM station placed on the 303(d) list.

To calculate the bacteria load at the WQS, the flow rate at each flow exceedance percentile is multiplied by a unit conversion factor (*24,465,525 mLs /* ft^3 *day*) and the criterion specific to each bacterial indicator. This calculation produces the maximum bacteria load in the stream without exceeding the instantaneous standard over the range of flow conditions. The allowable bacteria (fecal coliform, *E. coli*, or Enterococci) loads at the WQS establish the TMDL and are plotted versus flow exceedance percentile as a LDC. The x-axis indicates the flow exceedance percentile, while the y-axis is expressed in terms of a bacteria load.

To estimate existing loading, bacteria observations for the primary contact recreation season (May 1st through September 30th) from 1999 to 2003 are paired with the flows measured or estimated in that segment on the same date. Pollutant loads are then calculated by multiplying the measured bacteria concentration by the flow rate and the unit conversion factor of *24,465,525 mLs /* ft^3 *day*. The associated flow exceedance percentile is then matched with the measured flow from the tables provided in Appendix C. The observed bacteria loads are then added to the LDC plot as points. These points represent individual ambient water quality samples of bacteria. Points above the LDC indicate the bacteria instantaneous standard was exceeded at the time of sampling. Conversely, points under the LDC indicate the sample met the WQS.

The LDC approach recognizes that the assimilative capacity of a waterbody depends on the flow, and that maximum allowable loading varies with flow condition. Existing loading, and load reductions required to meet the TMDL water quality target can also be calculated under different flow conditions. The difference between existing loading and the water quality target is used to calculate the loading reductions required. Percent reduction goals are calculated for each watershed and bacterial indicator species as the reductions in load required so no more than 10 percent of the existing instantaneous water quality observations would exceed the water quality target. This is because for the PBCR use to be supported, criteria for each bacterial indicator must be met in each impaired waterbody.

Table 5-1 presents the percent reductions necessary for each bacterial indicator in each of the impaired waterbodies in the Study Area. Attainment of WQSs in response to TMDL implementation will be based on results measured at each of these WQM stations. Based on this table, the TMDL PRGs for Canadian River (OK520600010010_00), Canadian River (OK520610010010_05), Buggy Creek, Canadian River (OK520610020150_10) and Little River will be based on Enterococci. The TMDL PRGs for Factory Creek, Julian Creek, Spring Brook, Willow Creek, Bishop Creek, and Walnut Creek-North Fork will be based on fecal coliform.

Table 5-1 TMDL Percent Reductions Required to Meet Water Quality Standards for Impaired Waterbodies in the Canadian River Study Area

Waterbody Station	Waterbody ID	Waterbody Name	Percent Reduction Required				
			FC	EC		ENT	
			Instant-aneous	Instant-aneous	Geo-mean	Instant-aneous	Geo-mean
OK520600010010-001AT	OK520600010010_00	Canadian River				**56%**	57%
OK520600010060P	OK520600010060_00	Factory Creek	**64%**				
OK520600020170B	OK520600020170_00	Julian Creek	**78%**				
OK520600030030E	OK520600030030_00	Spring Brook	**88%**				
OK520610010010-001AT	OK520610010010_05	Canadian River				94%	**29%**
OK520610010080G	OK520610010080_00	Willow Creek	**96%**				
OK520610010180G	OK520610010180_00	Bishop Creek	**67%**				
OK520610020120G	OK520610020120_00	Buggy Creek	40%	54%	47%	**71%**	74%
OK520610020150-001AT	OK520610020150_10	Canadian River				89%	**73%**
OK520610030080G	OK520610030080_00	Walnut Creek-North Fork	**40%**				
OK520800010010-001AT	OK520800010010_00	Little River	29%			86%	**61%**

A subset of the LDCs for each impaired waterbody are shown in Figures 5-1 through 5-11. While some waterbodies may be listed for multiple bacterial indicators, only one LDC for each waterbody is presented in Figures 5-1 through 5-11 – the LDC for the bacterial indicator that is highlighted by bold text in Table 5-1. In otherwords, Figures 5-1 through 5-11 display a LDC for each waterbody based on the bacterial indicator that represents the most conservative PRG. The LDCs for the other bacterial indicators that require TMDLs are presented in Subsection 5.7 of this report.

The LDC for Canadian River (Figure 5-1) is based on Enterococci bacteria measurements during the primary contact recreation season at WQM station OK520600010010-001AT (Canadian River, U.S. 377, Konawa, OK). The LDC indicates that Enterococci levels exceed the instantaneous water quality criteria during moist and dry conditions, possibly indicating a combination of point and nonpoint sources.

The LDC for Factory Creek (Figure 5-2) is based on fecal coliform bacteria measurements during primary contact recreation season at WQM station OK520600010060P (Factory Creek, OK). Fecal coliform measurements collected during the secondary contact recreation season (October – April) are also displayed on the figure, although the load for the secondary contact recreation criterion is not shown. The PRG is calculated so measurements under the primary contact recreation season are met; however, this percent reduction is sufficient to ensure that secondary contact recreation criteria are also met. The LDC indicates that fecal coliform levels exceed the instantaneous water quality criteria under a variety of flow conditions. Since there are no point sources in the watershed, all loading must be from nonpoint sources.

The LDC for Julian Creek (Figure 5-3) is based on fecal coliform bacteria measurements during primary contact recreation season at WQM station OK520600020170B (Julian Creek, OK). Fecal coliform measurements collected during the secondary contact recreation season (October – April) are also displayed on the figure, although the load for the secondary contact recreation criterion is not shown. The PRG is calculated so measurements under the primary contact recreation season are met; however, this percent reduction is sufficient to ensure that secondary contact recreation criteria are also met. The LDC indicates that fecal coliform levels exceed the instantaneous water quality criteria under high flows, moist and dry conditions. Since there are no point sources in the watershed, all loading must be from nonpoint sources.

The LDC for Spring Brook Creek (Figure 5-4) is based on fecal coliform bacteria measurements during the primary contact recreation season at WQM station OK520600030030E (Spring Brook Creek, OK). Fecal coliform measurements collected during the secondary contact recreation season (October – April) are also displayed on the figure, although the load for the secondary contact recreation criterion is not shown. The PRG is calculated so measurements under the primary contact recreation season are met; however, this percent reduction is sufficient to ensure that secondary contact recreation criteria are also met. The LDC indicates that fecal coliform levels exceed the instantaneous water quality criteria under a variety of flow conditions, indicative of nonpoint sources or a combination of point and nonpoint sources.

The LDC for Canadian River at Purcell (Figure 5-5) is based on Enterococci bacteria measurements during the primary contact recreation season at WQM station OK520610010010-001AT (Canadian River at Purcell, OK). The LDC indicates that Enterococci levels exceed the instantaneous water quality criteria during most conditions, but particularly under dry conditions and low flows, are indicative of point sources.

The LDC for Willow Creek (Figure 5-6) is based on fecal coliform bacteria measurements during the primary contact recreation season at WQM station OK520610010080G. Fecal coliform measurements collected during the secondary contact recreation season (October – April) are also displayed on the figure, although the load for the secondary contact recreation criterion is not shown. The PRG is calculated so measurements under the primary contact recreation season are met; however, this percent reduction is sufficient to ensure that secondary contact recreation criteria are also met. The LDC indicates that fecal coliform levels exceed the instantaneous water quality criteria under many flow conditions. Since there is no point source in the watershed, all loadings must be from nonpoint sources.

The LDC for Bishop Creek (Figure 5-7) is based on fecal coliform bacteria measurements during the primary contact recreation season at WQM station OK520610010180G (Bishop Creek near Jenkins Street). The LDC indicates that fecal coliform levels exceeded the instantaneous water quality criteria under a wide range of flow conditions, indicative of a combination of point and nonpoint sources.

The LDC for Buggy Creek (Figure 5-8) is based on Enterococci bacteria measurements during the primary contact recreation season at WQM station OK520610020120G (Buggy Creek, OK). Enterococci measurements collected during the secondary contact recreation season (October – April) are also displayed on the figure, although the load for the secondary contact recreation criterion is not shown. The PRG is calculated so measurements under the primary contact recreation season are met; however, this percent reduction is sufficient to ensure that secondary contact recreation criteria are also met. The LDC indicates that Enterococci levels exceed the instantaneous water quality criteria under a variety of hydrologic conditions, indicative of a combination of point and nonpoint sources.

The LDC for Canadian River (Figure 5-9) is based on Enterococci bacteria measurements during the primary contact recreation season at WQM station OK520610020150-001AT (Canadian River, US 66, Bridgeport, OK). The LDC indicates that Enterococci levels sometimes exceed the instantaneous water quality criteria under all hydrologic conditions, possibly indicating a combination of point and nonpoint sources.

The LDC for Walnut Creek (Figure 5-10) is based on fecal coliform bacteria measurements during the primary contact recreation season at WQM station OK520610030080G (Walnut Creek-North Fork, OK). Fecal coliform measurements collected during the secondary contact recreation season (October – April) are also displayed on the figure, although the load for the secondary contact recreation criterion is not shown. The PRG is calculated so measurements under the primary contact recreation season are met; however, this percent reduction is sufficient to ensure that secondary contact recreation criteria are also met. The LDC indicates that fecal coliform levels exceed the instantaneous water quality criteria under a variety of flow conditions, indicative of a combination of point and nonpoint sources.

The LDC for Little River (Figure 5-11) is based on Enterococci bacteria measurements during the primary contact recreation season at WQM station OK520800010010-001AT (Little River, SH 56, Sasakwa, OK). The LDC indicates that Enterococci levels exceed the instantaneous water quality criteria under most flow conditions, indicative of nonpoint sources.

Figure 5-1 Load Duration Curve for Enterococci in Canadian River (OK520600010010_00)

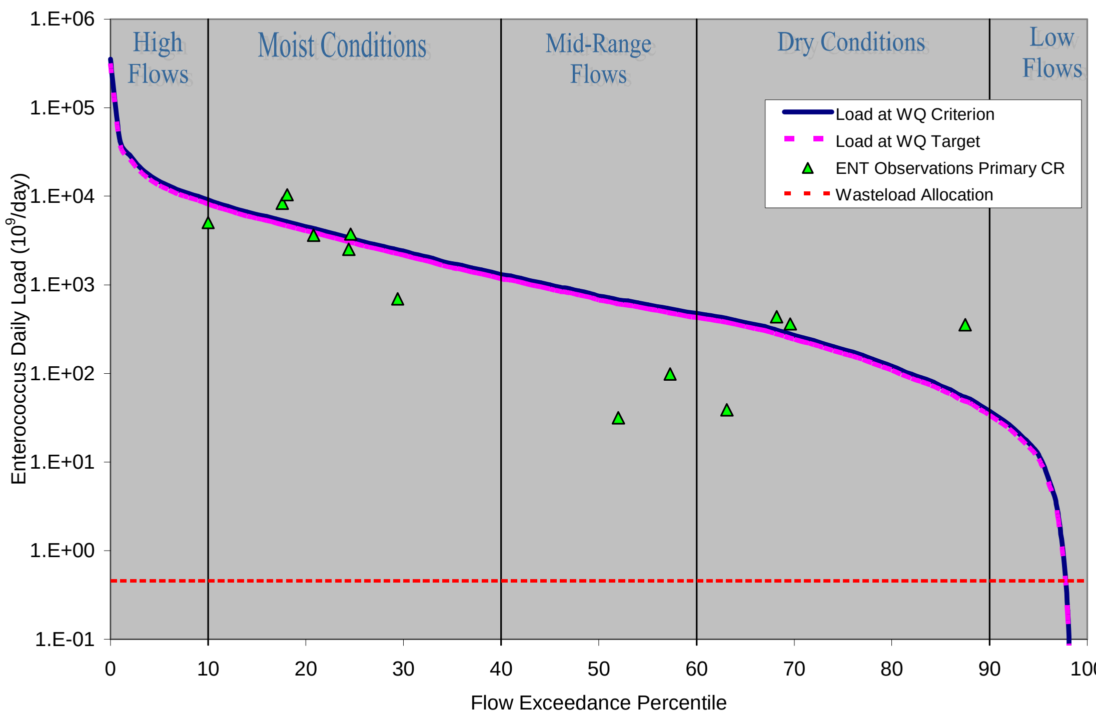
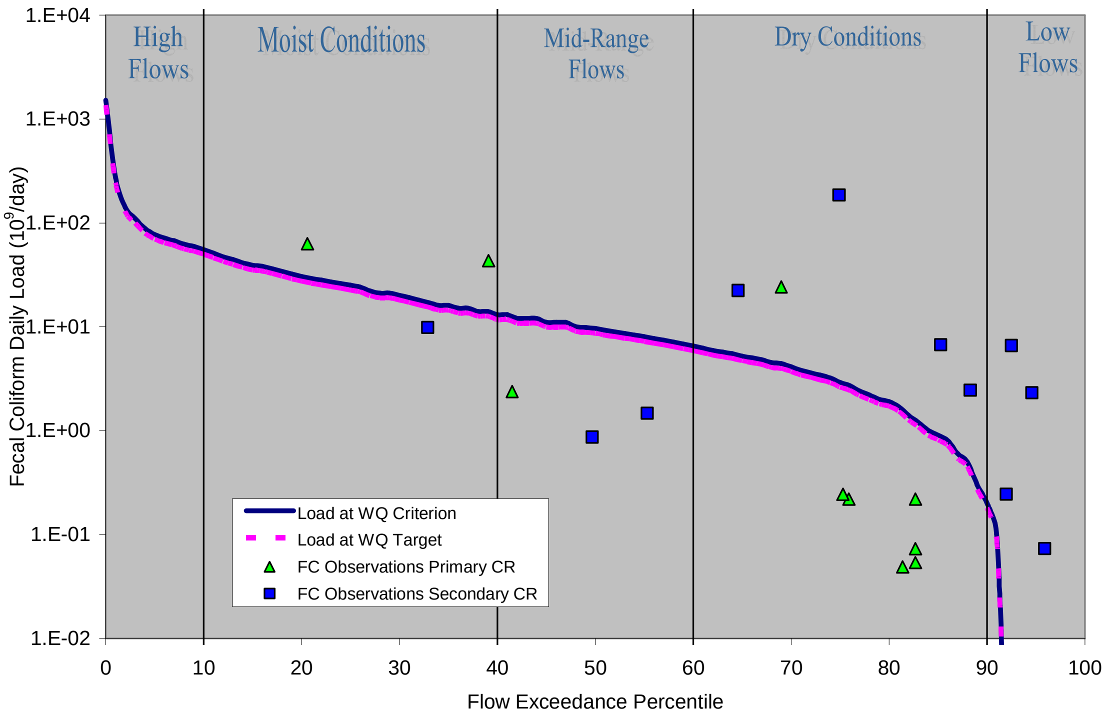
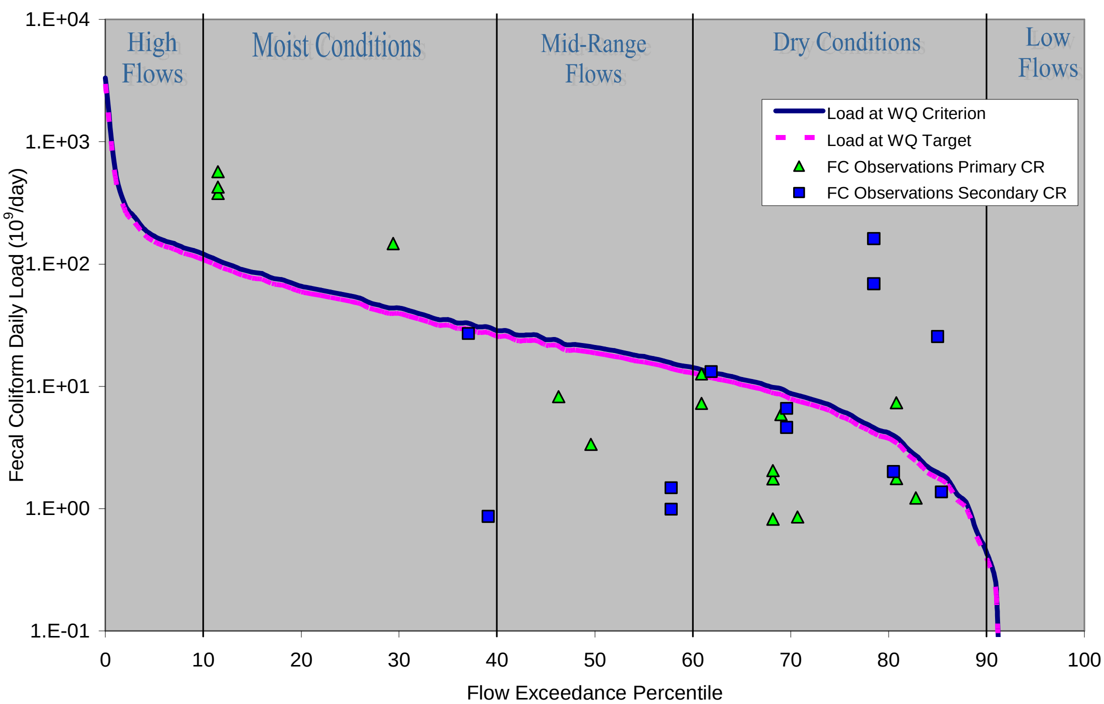


Figure 5-2 Load Duration Curve for Fecal Coliform in Factory Creek (OK520600010060_00)



* there is no wasteload allocation for this waterbody

Figure 5-3 Load Duration Curve for Fecal Coliform in Julian Creek (OK520600020170_00)



* there is no wasteload allocation for this waterbody

Figure 5-4 Load Duration Curve for Fecal Coliform in Spring Brook (OK520600030030_00)

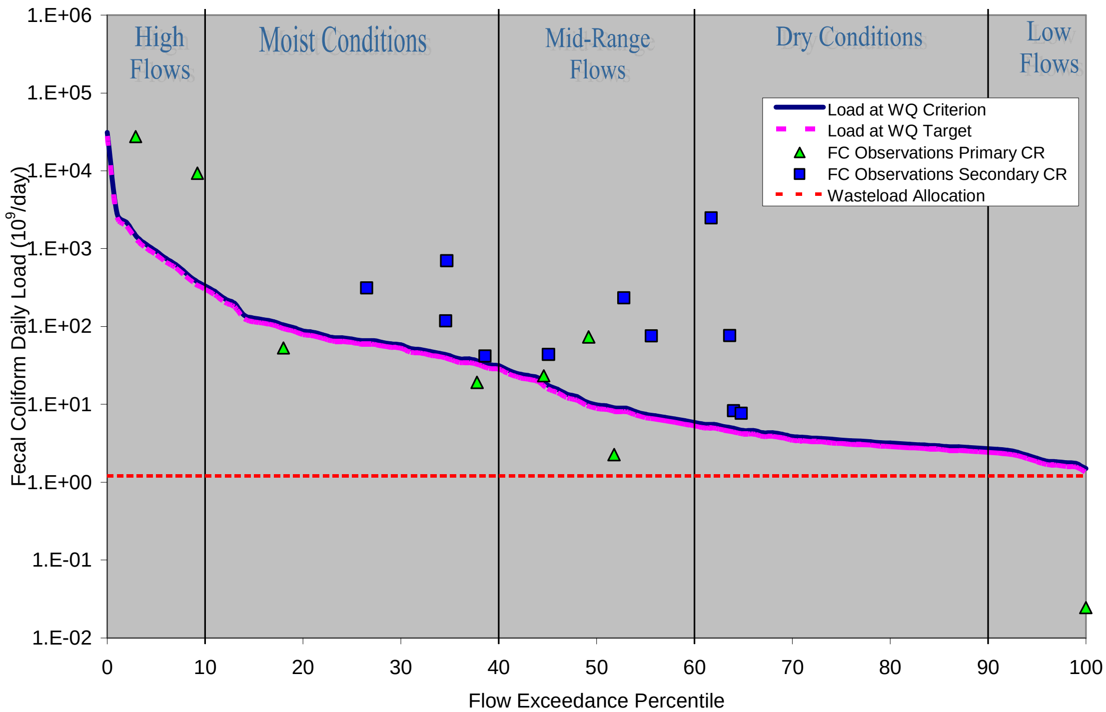


Figure 5-5 Load Duration Curve for Enterococci in Canadian River (OK520610010010_05)

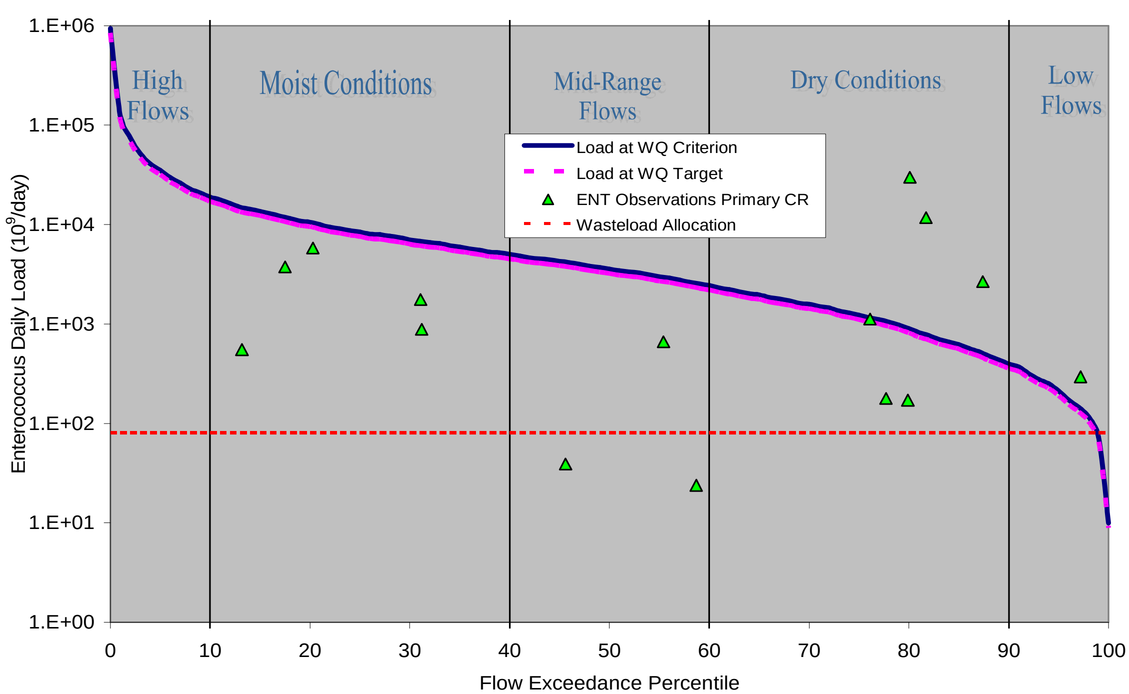
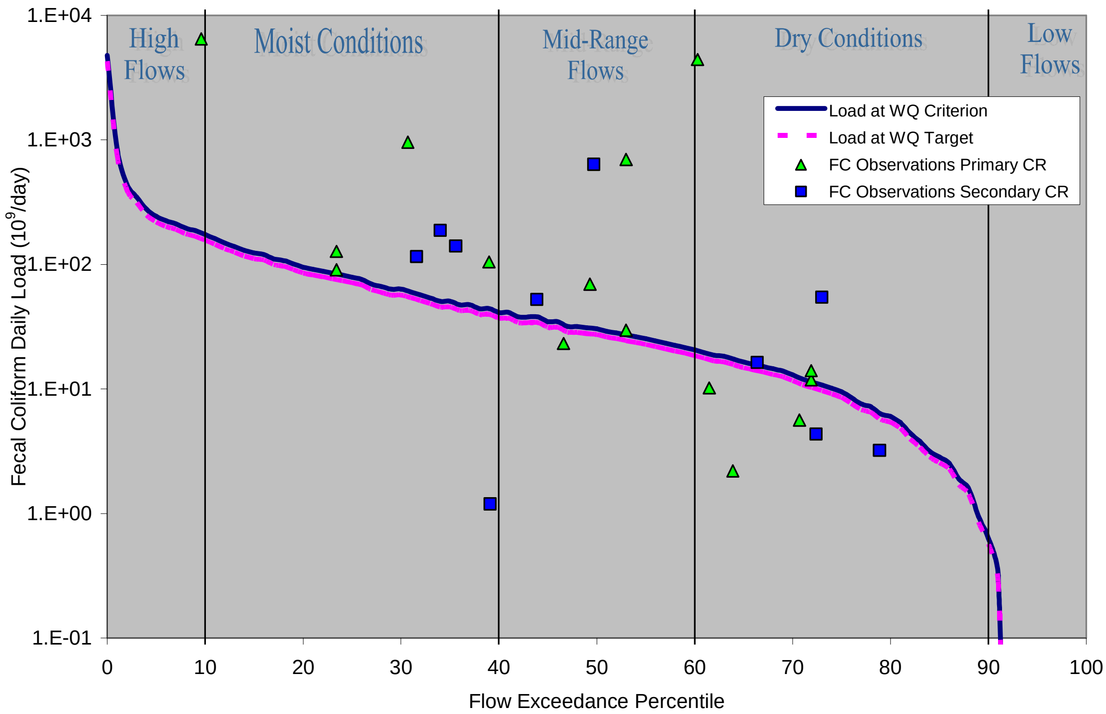


Figure 5-6 Load Duration Curve for Fecal Coliform in Willow Creek (OK520610010080_00)



* there is no wasteload allocation for this waterbody

Figure 5-7 Load Duration Curve for Fecal Coliform in Bishop Creek (OK520610010180_00)

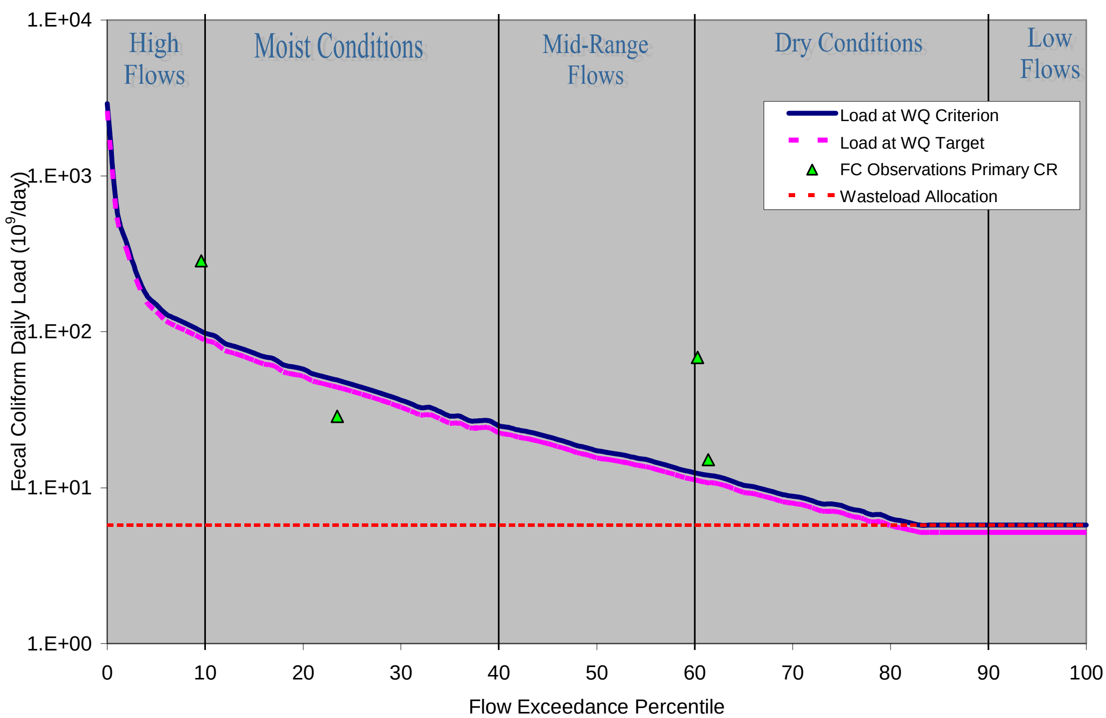
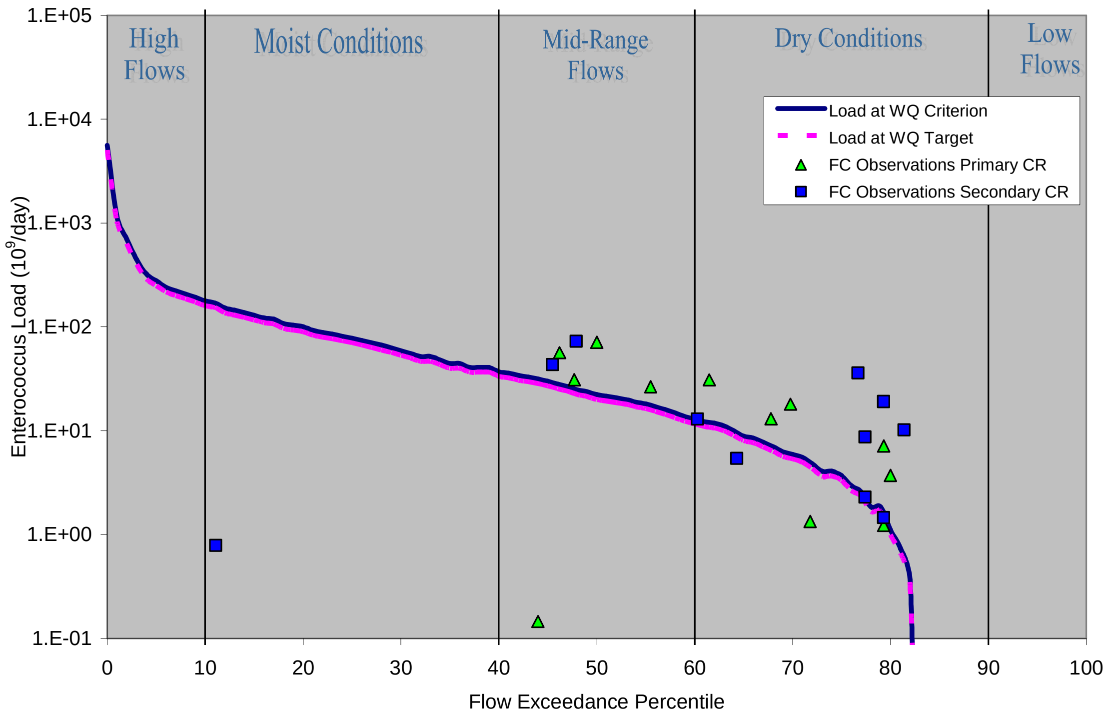


Figure 5-8 Load Duration Curve for Enterococci in Buggy Creek (OK520610020120_00)



* there is no wasteload allocation for this waterbody

Figure 5-9 Load Duration Curve for Enterococci in Canadian River (OK520610020150_10)

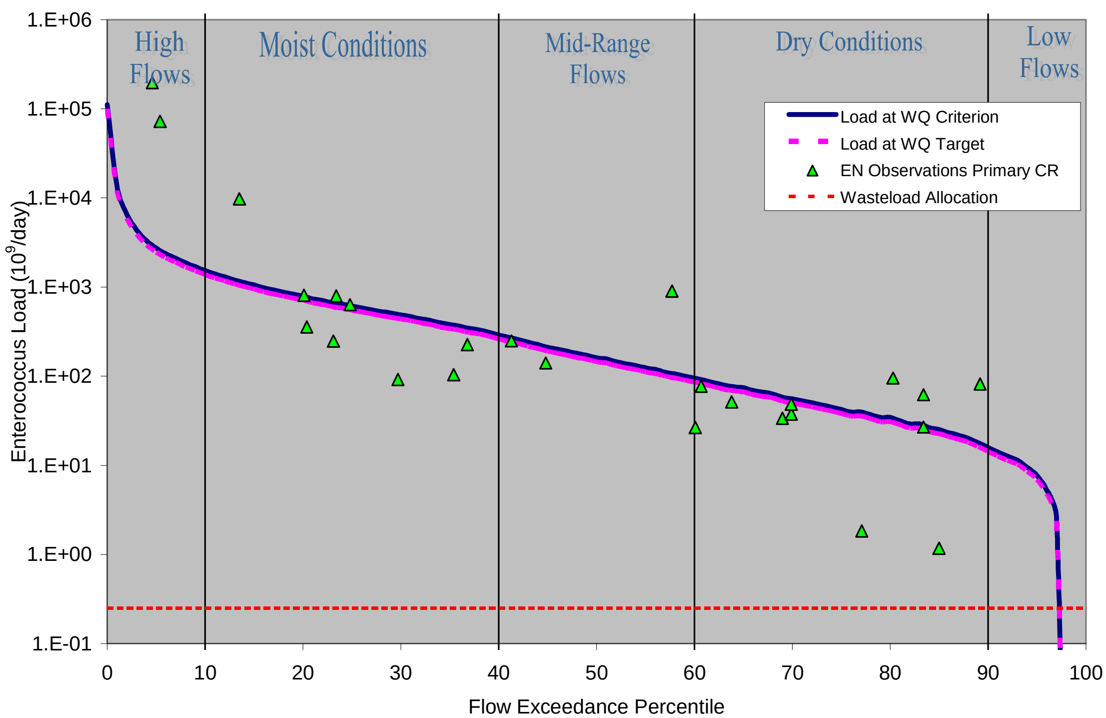


Figure 5-10 Load Duration Curve for Fecal Coliform in Walnut Creek-North Fork (OK520610030080_00)

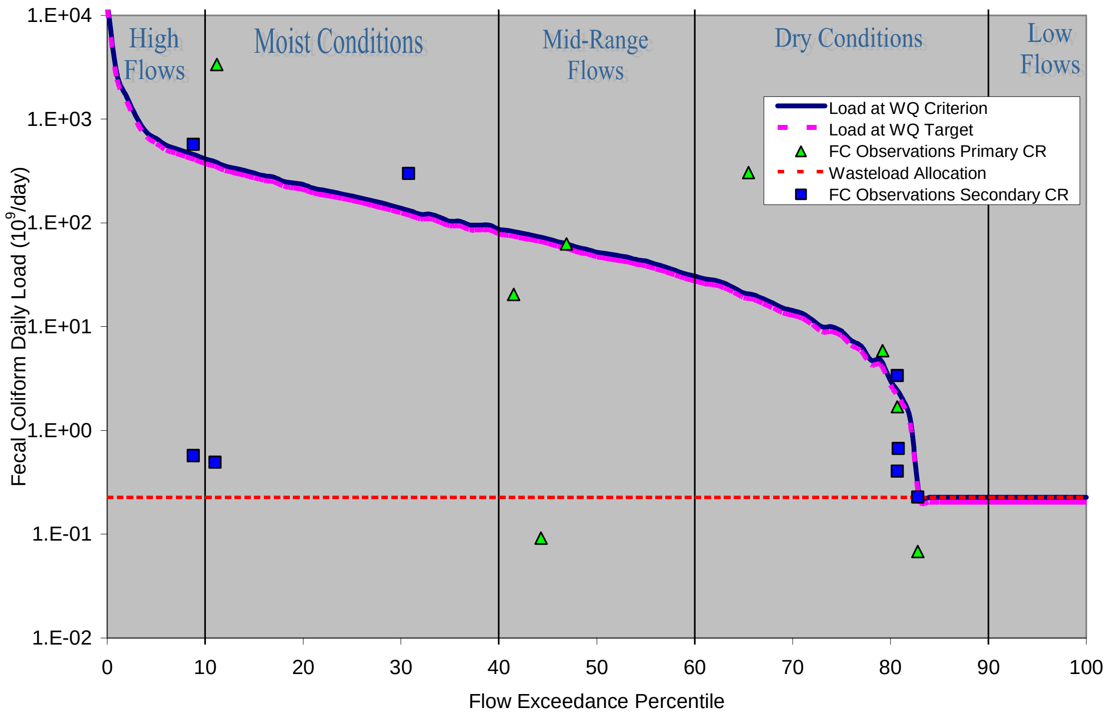
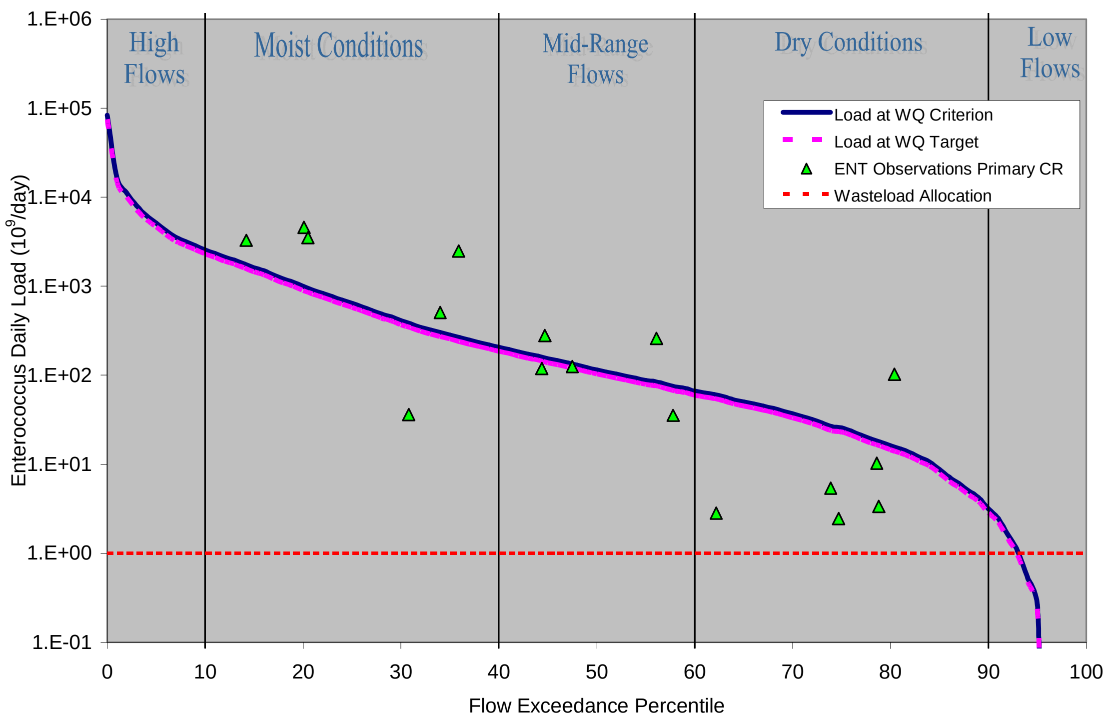


Figure 5-11 Load Duration Curve for Enterococci in Little River (OK520800010010_00)



5.2 Wasteload Allocation

NPDES-permitted facilities are allocated a daily wasteload calculated as their permitted daily average discharge flow rate multiplied by the instream single-sample water quality criterion. In other words, the facilities are required to meet instream criteria in their discharge. Table 5-2 summarizes the WLA for the NPDES-permitted facilities within the Canadian River Study Area. The WLA for each facility is derived from the following equation:

WLA = WQS * flow * unit conversion factor (#/day)

Where:

WQS = 33, 200, and 126 cfu/100ml for Enterococci, fecal coliform, and E. coli respectively

flow (10^6 gal/day) = permitted flow

unit conversion factor = 37,854,120-10^6gal/day

When multiple NPDES facilities occur within a watershed, individual WLAs are summed and the total WLA for continuous point sources is included in the TMDL calculation for the corresponding waterbody. When there are no NPDES WWTPs discharging into the contributing watershed of a WQM station, then the WLA is zero. Compliance with the WLA will be achieved by adhering to the fecal coliform limits and disinfection requirements of NPDES permits. Table 5-2 indicates which point source dischargers within Oklahoma currently have a disinfection requirement in their permit. Certain facilities that utilize lagoons for treatment have not been required to provide disinfection since storage time and exposure to ultraviolet radiation from sunlight should reduce bacteria levels. In the future, all point source dischargers which are assigned a wasteload allocation but do not currently have a bacteria limit in their permit will receive a permit limit consistent with the wasteload allocation as their permits are reissued.

Permitted stormwater discharges are considered point sources. The WLA calculations for MS4s must be expressed as different maximum loads allowable under different flow conditions. Therefore the percentage of a watershed that is under a MS4 jurisdictional is used to estimate the MS4 contribution. The only urbanized area designated as an MS4 within this Study Area is the City of Norman and University of Oklahoma located in the Bishop Creek (OK520610010180_00) watershed.

Table 5-2 Wasteload Allocations for NPDES-Permitted Facilities

Waterbody ID	NPDES Permit No.	Name	Design Flow (mgd)	Disinfection	Wasteload Allocation (cfu/day)		
					Fecal Coliform	*E. Coli*	Enterococci
OK520600010010_00 Canadian River	OK0021873	City of Konawa	0.32	Yes	2.42E+09	1.53E+09	4.00E+08
	OK0036064	Town of Francis/Francis Public Works Authority	0.045	No	3.41E+08	2.15E+08	5.62E+07
OK520600030030_00 Spring Brook	OK0021865	Stratford Public Works Authority	0.16	No	1.21E+09	7.63E+08	2.00E+08
OK520610010010_05 Canadian River	OK0022756	Lexington Public Works Authority	0.25	Yes	1.89E+09	1.19E+09	3.12E+08
	OK0028533	City of Purcell	0.65	Yes	4.92E+09	3.10E+09	8.12E+08
	OK0029190	Norman	12	Yes	9.08E+10	5.72E+10	1.50E+10
OK520610010180_00 Bishop Creek	OK0031755	Noble Utilities Authority - North	0.76	Yes	5.75E+09	3.62E+09	9.49E+08
OK520610020150_10 Canadian River	OK0038393	Union City Waste Water treatment plant	0.2	No	1.51E+09	9.54E+08	2.50E+08
OK520610020120_00 Buggy Creek	OK0032182	City of Minco	0.215	No	1.63E+09	1.03E+09	2.69E+08
OK520610030080_00 Walnut Creek-North Fork	OK0038458	Bridge Creek Public School	0.03	Yes	2.27E+08	1.43E+08	3.75E+07
OK520800010010_00 Little River	OK0028428	Holdenville Public Works Authority	0.8	Yes	6.06E+09	3.82E+09	9.99E+08

5.3 Load Allocation

As discussed in Section 3, nonpoint source bacteria loading to the receiving streams of each waterbody emanate from a number of different sources. The data analysis and the LDCs demonstrate that exceedances at the WQM stations are the result of a variety of nonpoint source loading. The LAs for each stream segment are calculated as the difference between the TMDL, MOS, and WLA for WWTP and MS4s as follows:

LA = TMDL – WLA_WWTP – WLA_MS4 - MOS

5.4 Seasonal Variability

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs account for seasonal variation in watershed conditions and pollutant loading. The TMDLs established in this report adhere to the seasonal application of the Oklahoma WQS which limits the PBCR use to the period of May 1st through September 30th. Seasonal variation was also accounted for in these TMDLs by using more than 5 years of water quality data and by using the longest period of USGS flow records when estimating flows to develop flow exceedance percentiles.

5.5 Margin of Safety

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs include an MOS. The MOS is a conservative measure incorporated into the TMDL equation that accounts for the uncertainty associated with calculating the allowable pollutant loading to ensure WQSs are attained. USEPA guidance allows for use of implicit or explicit expressions of the MOS, or both. When conservative assumptions are used in development of the TMDL, or conservative factors are used in the calculations, the MOS is implicit. When a specific percentage of the TMDL is set aside to account for uncertainty, then the MOS is considered explicit.

For the explicit MOS the water quality target was set at 10 percent lower than the water quality criterion for each pathogen. For PBCR, this equates to 360 cfu/100 mL, 365.4 cfu/100 mL, and 97.2/100 mL for fecal coliform, E. coli, and Enterococci, respectively. For secondary body contact recreation this equates to 1,800 organisms/100 mL, 1,827 organisms/100 mL, and 486/100 mL, for fecal coliform, E. coli, and Enterococci, respectively. The net effect of the TMDL with MOS is that the assimilative capacity or allowable pollutant loading of each waterbody is slightly reduced. These TMDLs incorporate an explicit MOS by using a curve representing 90 percent of the TMDL as the average MOS. The MOS at any given percent flow exceedance, therefore, can be defined as the difference in loading between the TMDL and the TMDL with MOS. The use of instream bacteria concentrations to estimate existing loading is another conservative element utilized in these TMDLs that can be recognized as an implicit MOS. This conservative approach to establishing the MOS will ensure that both the 30-day geometric mean and instantaneous bacteria standards can be achieved and maintained.

5.6 TMDL Calculations

The bacteria TMDLs for the 303(d)-listed WQM stations covered in this report were derived using LDCs. A TMDL is expressed as the sum of all WLAs (point source loads), LAs (nonpoint source loads), and an appropriate MOS, which attempts to account for uncertainty concerning the relationship between effluent limitations and water quality.

This definition can be expressed by the following equation:

$$TMDL = \Sigma\, WLA + \Sigma\, LA + MOS$$

Where the Σ WLA component can be further divided into WLA for WWTPs and WLA for MS4s:

$$\Sigma\, WLA = WLA\_WWTP + WLA\_MS4$$

For each stream segment the TMDLs presented in this report are expressed as a percent reduction across the full range of flow conditions. The TMDL, WLA, LA, and MOS will vary with flow condition, and are calculated at every 5^{th} flow interval percentile (Tables 5-4 through 5-14). For illustrative purposes, the TMDL, WLA, LA, and MOS are calculated for the median flow at each site in Table 5-3. The WLA component of each TMDL is the sum of all WLAs within the contributing watershed of each WQM station. The sum of the WLAs can be represented as a single line below the LDC. The LDC and the simple equation of:

$$Average\ LA = average\ TMDL - MOS - WLA\_WWTP - WLA\_MS4$$

can provide an individual value for the LA in counts per day, which represents the area under the TMDL target line and above the WLA line. For MS4s the load reduction will be the same as the PRG established for the overall watershed.. The LDCs and TMDL calculations for additional bacterial indicators are provided in Subsection 5.7.

Table 5-3 TMDL Summary Examples

Waterbody ID	WQM Station	Waterbody Name	Bacteria Indicator	TMDL* (cfu/day)	WLA_WWTP (cfu/day)	WLA_MS4* (cfu/day)	LA* (cfu/day)	MOS* (cfu/day)
OK520600010010_00	OK520600010010-001AT	Canadian River	ENT	7.50E+11	4.56E+08	0	6.75E+11	7.50E+10
OK520600010060_00	OK520600010060P	Factory Creek	FC	9.64E+09	0	0	8.67E+09	9.64E+08
OK520600020170_00	OK520600020170B	Julian Creek	FC	2.09E+10	0	0	1.88E+10	2.09E+09
OK520600030030_00	OK520600030030E	Spring Brook	FC	9.85E+09	1.21E+09	0	7.66E+09	9.85E+08
OK520610010010_05	OK520610010010-001AT	Canadian River	ENT	7.16E+11	1.61E+10	0	6.28E+11	7.16E+10
OK520610010080_00	OK520610010080G	Willow Creek	FC	3.03E+10	0	0	2.73E+10	3.03E+09
OK520610010180_00	OK520610010180G	Bishop Creek	FC	1.73E+10	5.75E+09	5.38E+09	4.40E+09	1.73E+09
OK520610020120_00	OK520610020120G	Buggy Creek	ENT	2.22E+10	2.69E+08	0	1.97E+10	2.22E+09
OK520610020150_10	OK520610020150-001AT	Canadian River	ENT	1.61E+11	2.5E+08	0	1.45E+11	1.61E+10
OK520610030080_00	OK520610030080G	Walnut Creek-North Fork	FC	5.22E+10	2.27E+08	0	4.67E+10	5.22E+09
OK520800010010_00	OK520800010010-001AT	Little River	ENT	1.15E+11	9.99E+08	0	1.02E+11	1.15E+10

* Derived for illustrative purposes at the median flow value

Table 5-4 Enterococci TMDL Calculations for Canadian River (OK520600010010_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	132,900	3.51E+14	4.56E+08	3.16E+14	3.51E+13
5	5,576	1.47E+13	4.56E+08	1.33E+13	1.47E+12
10	3,438	9.08E+12	4.56E+08	8.18E+12	9.08E+11
15	2,357	6.23E+12	4.56E+08	5.61E+12	6.23E+11
20	1,711	4.52E+12	4.56E+08	4.07E+12	4.52E+11
25	1,236	3.27E+12	4.56E+08	2.94E+12	3.27E+11
30	908	2.40E+12	4.56E+08	2.16E+12	2.40E+11
35	655	1.73E+12	4.56E+08	1.56E+12	1.73E+11
40	494	1.31E+12	4.56E+08	1.17E+12	1.31E+11
45	376	9.93E+11	4.56E+08	8.94E+11	9.93E+10
50	284	7.50E+11	4.56E+08	6.75E+11	7.50E+10
55	226	5.97E+11	4.56E+08	5.37E+11	5.97E+10
60	180	4.76E+11	4.56E+08	4.28E+11	4.76E+10
65	142	3.75E+11	4.56E+08	3.37E+11	3.75E+10
70	102	2.70E+11	4.56E+08	2.42E+11	2.70E+10
75	71	1.87E+11	4.56E+08	1.67E+11	1.87E+10
80	46	1.21E+11	4.56E+08	1.08E+11	1.21E+10
85	27	7.23E+10	4.56E+08	6.47E+10	7.23E+09
90	14	3.75E+10	4.56E+08	3.33E+10	3.75E+09
95	4.6	1.22E+10	4.56E+08	1.05E+10	1.22E+09
100	0	5.07E+08	4.56E+08	0.00E+00	5.07E+07

Table 5-5 Fecal Coliform TMDL Calculations for Factory Creek (OK520600010060_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	155	1.52E+12	0	1.36E+12	1.52E+11
5	7.9	7.73E+10	0	6.96E+10	7.73E+09
10	5.6	5.52E+10	0	4.97E+10	5.52E+09
15	4.0	3.92E+10	0	3.52E+10	3.92E+09
20	3.1	3.05E+10	0	2.75E+10	3.05E+09
25	2.6	2.51E+10	0	2.26E+10	2.51E+09
30	2.1	2.01E+10	0	1.81E+10	2.01E+09
35	1.6	1.61E+10	0	1.44E+10	1.61E+09
40	1.3	1.31E+10	0	1.17E+10	1.31E+09
45	1.1	1.10E+10	0	9.93E+09	1.10E+09
50	0.98	9.64E+09	0	8.67E+09	9.64E+08
55	0.82	8.03E+09	0	7.23E+09	8.03E+08
60	0.67	6.53E+09	0	5.87E+09	6.53E+08
65	0.53	5.22E+09	0	4.70E+09	5.22E+08
70	0.42	4.12E+09	0	3.70E+09	4.12E+08
75	0.30	2.91E+09	0	2.62E+09	2.91E+08
80	0.19	1.91E+09	0	1.72E+09	1.91E+08
85	0.09	9.03E+08	0	8.13E+08	9.03E+07
90	0.02	2.01E+08	0	1.81E+08	2.01E+07
95	0	0	0	0	0
100	0	0	0	0	0

Table 5-6 Fecal Coliform TMDL Calculations for Julian Creek (OK520600020170_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	339	3.31E+12	0	2.98E+12	3.31E+11
5	17	1.69E+11	0	1.52E+11	1.69E+10
10	12	1.21E+11	0	1.09E+11	1.21E+10
15	8.7	8.56E+10	0	7.70E+10	8.56E+09
20	6.7	6.58E+10	0	5.92E+10	6.58E+09
25	5.6	5.48E+10	0	4.93E+10	5.48E+09
30	4.5	4.39E+10	0	3.95E+10	4.39E+09
35	3.6	3.51E+10	0	3.16E+10	3.51E+09
40	2.9	2.85E+10	0	2.57E+10	2.85E+09
45	2.5	2.41E+10	0	2.17E+10	2.41E+09
50	2.1	2.09E+10	0	1.88E+10	2.09E+09
55	1.8	1.76E+10	0	1.58E+10	1.76E+09
60	1.5	1.43E+10	0	1.28E+10	1.43E+09
65	1.2	1.14E+10	0	1.03E+10	1.14E+09
70	0.90	8.78E+09	0	7.90E+09	8.78E+08
75	0.65	6.36E+09	0	5.73E+09	6.36E+08
80	0.43	4.17E+09	0	3.75E+09	4.17E+08
85	0.20	1.97E+09	0	1.78E+09	1.97E+08
90	0.04	4.39E+08	0	3.95E+08	4.39E+07
95	0	0	0	0	0
100	0	0	0	0	0

Table 5-7 Fecal Coliform TMDL Calculations for Spring Brook (OK520600030030_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	3,186	3.12E+13	1.21E+09	2.81E+13	3.12E+12
5	95	9.25E+11	1.21E+09	8.31E+11	9.25E+10
10	34	3.32E+11	1.21E+09	2.97E+11	3.32E+10
15	13	1.28E+11	1.21E+09	1.14E+11	1.28E+10
20	9.0	8.76E+10	1.21E+09	7.77E+10	8.76E+09
25	7.1	6.91E+10	1.21E+09	6.10E+10	6.91E+09
30	6.0	5.83E+10	1.21E+09	5.13E+10	5.83E+09
35	4.3	4.21E+10	1.21E+09	3.67E+10	4.21E+09
40	3.2	3.15E+10	1.21E+09	2.71E+10	3.15E+09
45	1.8	1.76E+10	1.21E+09	1.47E+10	1.76E+09
50	1.0	9.85E+09	1.21E+09	7.66E+09	9.85E+08
55	0.76	7.46E+09	1.21E+09	5.50E+09	7.46E+08
60	0.60	5.84E+09	1.21E+09	4.05E+09	5.84E+08
65	0.47	4.61E+09	1.21E+09	2.94E+09	4.61E+08
70	0.39	3.84E+09	1.21E+09	2.24E+09	3.84E+08
75	0.36	3.48E+09	1.21E+09	1.92E+09	3.48E+08
80	0.33	3.19E+09	1.21E+09	1.66E+09	3.19E+08
85	0.30	2.94E+09	1.21E+09	1.43E+09	2.94E+08
90	0.27	2.68E+09	1.21E+09	1.20E+09	2.68E+08
95	0.21	2.03E+09	1.21E+09	6.15E+08	2.03E+08
100	0.15	1.49E+09	1.21E+09	1.29E+08	1.49E+08

Table 5-8 Enterococci TMDL Calculations for Canadian River (OK520610010010_05)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	71000	9.38E+14	8.06E+10	8.44E+14	9.38E+13
5	2664	3.52E+13	8.06E+10	3.16E+13	3.52E+12
10	1430	1.89E+13	8.06E+10	1.69E+13	1.89E+12
15	1030	1.36E+13	8.06E+10	1.22E+13	1.36E+12
20	800	1.06E+13	8.06E+10	9.43E+12	1.06E+12
25	638	8.43E+12	8.06E+10	7.51E+12	8.43E+11
30	532	7.03E+12	8.06E+10	6.25E+12	7.03E+11
35	450	5.95E+12	8.06E+10	5.27E+12	5.95E+11
40	380	5.02E+12	8.06E+10	4.44E+12	5.02E+11
45	324	4.28E+12	8.06E+10	3.77E+12	4.28E+11
50	271	3.58E+12	8.06E+10	3.14E+12	3.58E+11
55	226	2.99E+12	8.06E+10	2.61E+12	2.99E+11
60	185	2.44E+12	8.06E+10	2.12E+12	2.44E+11
65	149	1.97E+12	8.06E+10	1.69E+12	1.97E+11
70	120	1.59E+12	8.06E+10	1.35E+12	1.59E+11
75	93	1.23E+12	8.06E+10	1.03E+12	1.23E+11
80	68	9.04E+11	8.06E+10	7.33E+11	9.04E+10
85	47	6.21E+11	8.06E+10	4.78E+11	6.21E+10
90	30	3.96E+11	8.06E+10	2.76E+11	3.96E+10
95	16	2.11E+11	8.06E+10	1.10E+11	2.11E+10
100	0.75	8.95E+10	8.06E+10	0.00E+00	8.95E+09

Table 5-9 Fecal Coliform TMDL Calculations for Willow Creek (OK520610010080_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	487	4.77E+12	0	4.29E+12	4.77E+11
5	25	2.43E+11	0	2.19E+11	2.43E+10
10	18	1.74E+11	0	1.56E+11	1.74E+10
15	13	1.23E+11	0	1.11E+11	1.23E+10
20	9.7	9.47E+10	0	8.53E+10	9.47E+09
25	8.1	7.89E+10	0	7.10E+10	7.89E+09
30	6.5	6.32E+10	0	5.69E+10	6.32E+09
35	5.2	5.05E+10	0	4.55E+10	5.05E+09
40	4.2	4.11E+10	0	3.70E+10	4.11E+09
45	3.5	3.47E+10	0	3.13E+10	3.47E+09
50	3.1	3.03E+10	0	2.73E+10	3.03E+09
55	2.6	2.53E+10	0	2.27E+10	2.53E+09
60	2.1	2.05E+10	0	1.85E+10	2.05E+09
65	1.7	1.64E+10	0	1.48E+10	1.64E+09
70	1.3	1.30E+10	0	1.17E+10	1.30E+09
75	0.97	9.47E+09	0	8.53E+09	9.47E+08
80	0.61	6.00E+09	0	5.40E+09	6.00E+08
85	0.29	2.84E+09	0	2.56E+09	2.84E+08
90	0.06	6.31E+08	0	5.68E+08	6.31E+07
95	0	0	0	0	0
100	0	0	0	0	0

Table 5-10 Fecal Coliform TMDL Calculations for Bishop Creek (OK520610010180_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA_WWTP (cfu/day)	WLA_MS4 (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	297	2.90E+12	5.75E+09	1.44E+12	1.17E+12	2.90E+11
5	15	1.50E+11	5.75E+09	7.10E+10	5.81E+10	1.50E+10
10	10	9.78E+10	5.75E+09	4.53E+10	3.70E+10	9.78E+09
15	7.4	7.29E+10	5.75E+09	3.29E+10	2.69E+10	7.29E+09
20	5.9	5.75E+10	5.75E+09	2.53E+10	2.07E+10	5.75E+09
25	4.7	4.60E+10	5.75E+09	1.96E+10	1.61E+10	4.60E+09
30	3.7	3.64E+10	5.75E+09	1.49E+10	1.22E+10	3.64E+09
35	2.9	2.88E+10	5.75E+09	1.11E+10	9.05E+09	2.88E+09
40	2.5	2.49E+10	5.75E+09	9.19E+09	7.52E+09	2.49E+09
45	2.2	2.13E+10	5.75E+09	7.37E+09	6.03E+09	2.13E+09
50	1.8	1.73E+10	5.75E+09	5.38E+09	4.40E+09	1.73E+09
55	1.5	1.52E+10	5.75E+09	4.33E+09	3.55E+09	1.52E+09
60	1.3	1.25E+10	5.75E+09	3.01E+09	2.46E+09	1.25E+09
65	1.1	1.04E+10	5.75E+09	1.96E+09	1.61E+09	1.04E+09
70	0.90	8.82E+09	5.75E+09	1.20E+09	9.86E+08	8.82E+08
75	0.78	7.67E+09	5.75E+09	6.33E+08	5.18E+08	7.67E+08
80	0.65	6.39E+09	5.75E+09	0.00E+00	0.00E+00	6.39E+08
85	0.59	6.39E+09	5.75E+09	0.00E+00	0.00E+00	6.39E+08
90	0.59	6.39E+09	5.75E+09	0.00E+00	0.00E+00	6.39E+08
95	0.59	6.39E+09	5.75E+09	0.00E+00	0.00E+00	6.39E+08
100	0.59	6.39E+09	5.75E+09	0.00E+00	0.00E+00	6.39E+08

Table 5-11 Enterococci TMDL Calculations for Buggy Creek (OK520610020120_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	2,115	5.59E+12	2.69E+08	5.03E+12	5.59E+11
5	105	2.78E+11	2.69E+08	2.50E+11	2.78E+10
10	67	1.78E+11	2.69E+08	1.60E+11	1.78E+10
15	49	1.30E+11	2.69E+08	1.17E+11	1.30E+10
20	38	9.99E+10	2.69E+08	8.96E+10	9.99E+09
25	29	7.77E+10	2.69E+08	6.97E+10	7.77E+09
30	22	5.92E+10	2.69E+08	5.30E+10	5.92E+09
35	17	4.44E+10	2.69E+08	3.97E+10	4.44E+09
40	14	3.70E+10	2.69E+08	3.30E+10	3.70E+09
45	11	3.00E+10	2.69E+08	2.67E+10	3.00E+09
50	8.4	2.22E+10	2.69E+08	1.97E+10	2.22E+09
55	6.9	1.81E+10	2.69E+08	1.60E+10	1.81E+09
60	4.9	1.30E+10	2.69E+08	1.14E+10	1.30E+09
65	3.4	8.88E+09	2.69E+08	7.72E+09	8.88E+08
70	2.2	5.92E+09	2.69E+08	5.06E+09	5.92E+08
75	1.4	3.70E+09	2.69E+08	3.06E+09	3.70E+08
80	0.42	1.11E+09	2.69E+08	7.30E+08	1.11E+08
85	0	0	0	0	0
90	0	0	0	0	0
95	0	0	0	0	0
100	0	0	0	0	0

Table 5-12 Enterococci TMDL Calculations for Canadian River (OK520610020150_10)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	42,100	1.11E+14	2.50E+08	1.00E+14	1.11E+13
5	1,040	2.75E+12	2.50E+08	2.47E+12	2.75E+11
10	580	1.53E+12	2.50E+08	1.38E+12	1.53E+11
15	400	1.06E+12	2.50E+08	9.51E+11	1.06E+11
20	300	7.93E+11	2.50E+08	7.13E+11	7.93E+10
25	231	6.10E+11	2.50E+08	5.49E+11	6.10E+10
30	185	4.89E+11	2.50E+08	4.40E+11	4.89E+10
35	144	3.80E+11	2.50E+08	3.42E+11	3.80E+10
40	110	2.91E+11	2.50E+08	2.61E+11	2.91E+10
45	80	2.11E+11	2.50E+08	1.90E+11	2.11E+10
50	61	1.61E+11	2.50E+08	1.45E+11	1.61E+10
55	47	1.24E+11	2.50E+08	1.12E+11	1.24E+10
60	36	9.51E+10	2.50E+08	8.54E+10	9.51E+09
65	28	7.40E+10	2.50E+08	6.63E+10	7.40E+09
70	21	5.55E+10	2.50E+08	4.97E+10	5.55E+09
75	16	4.23E+10	2.50E+08	3.78E+10	4.23E+09
80	13	3.43E+10	2.50E+08	3.07E+10	3.43E+09
85	9.5	2.51E+10	2.50E+08	2.23E+10	2.51E+09
90	6.0	1.59E+10	2.50E+08	1.40E+10	1.59E+09
95	2.9	7.66E+09	2.50E+08	6.65E+09	7.66E+08
100	0	2.75E+08	2.50E+08	0.00E+00	2.50E+07

Table 5-13 Fecal Coliform TMDL Calculations for Walnut Creek-North Fork (OK520610030080_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	1330.2	1.30E+13	2.27E+08	1.17E+13	1.30E+12
5	66.1	6.47E+11	2.27E+08	5.82E+11	6.47E+10
10	42.3	4.14E+11	2.27E+08	3.73E+11	4.14E+10
15	30.9	3.02E+11	2.27E+08	2.72E+11	3.02E+10
20	23.8	2.33E+11	2.27E+08	2.10E+11	2.33E+10
25	18.5	1.81E+11	2.27E+08	1.63E+11	1.81E+10
30	14.1	1.38E+11	2.27E+08	1.24E+11	1.38E+10
35	10.6	1.04E+11	2.27E+08	9.33E+10	1.04E+10
40	8.9	8.67E+10	2.27E+08	7.78E+10	8.67E+09
45	7.2	7.03E+10	2.27E+08	6.30E+10	7.03E+09
50	5.3	5.22E+10	2.27E+08	4.67E+10	5.22E+09
55	4.4	4.27E+10	2.27E+08	3.82E+10	4.27E+09
60	3.1	3.06E+10	2.27E+08	2.73E+10	3.06E+09
65	2.2	2.11E+10	2.27E+08	1.88E+10	2.11E+09
70	1.5	1.42E+10	2.27E+08	1.26E+10	1.42E+09
75	0.9	9.07E+09	2.27E+08	7.94E+09	9.07E+08
80	0.3	3.04E+09	2.27E+08	2.51E+09	3.04E+08
85	0.02	2.52E+08	2.27E+08	0.00E+00	2.52E+07
90	0.02	2.52E+08	2.27E+08	0.00E+00	2.52E+07
95	0.02	2.52E+08	2.27E+08	0.00E+00	2.52E+07
100	0.02	2.52E+08	2.27E+08	0.00E+00	2.52E+07

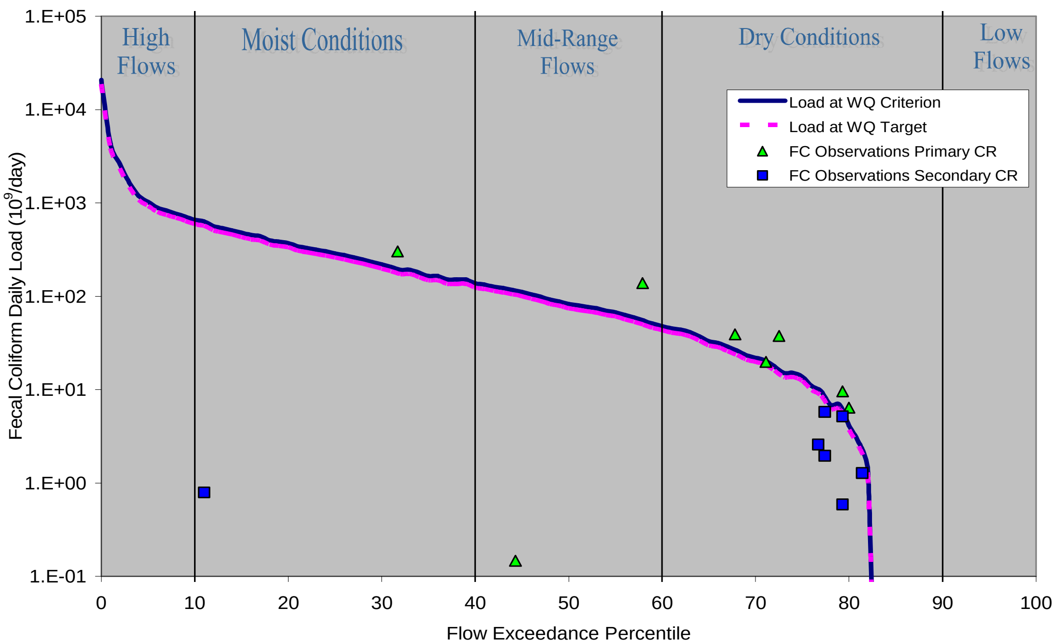
Table 5-14 Enterococci TMDL Calculations for Little River (OK520800010010_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	31,600	8.35E+13	9.99E+08	7.51E+13	8.35E+12
5	1,940	5.13E+12	9.99E+08	4.61E+12	5.13E+11
10	966	2.55E+12	9.99E+08	2.30E+12	2.55E+11
15	609	1.61E+12	9.99E+08	1.45E+12	1.61E+11
20	376	9.93E+11	9.99E+08	8.93E+11	9.93E+10
25	242	6.40E+11	9.99E+08	5.75E+11	6.40E+10
30	155	4.10E+11	9.99E+08	3.68E+11	4.10E+10
35	107	2.83E+11	9.99E+08	2.53E+11	2.83E+10
40	78	2.06E+11	9.99E+08	1.84E+11	2.06E+10
45	58	1.53E+11	9.99E+08	1.37E+11	1.53E+10
50	44	1.15E+11	9.99E+08	1.02E+11	1.15E+10
55	33	8.72E+10	9.99E+08	7.75E+10	8.72E+09
60	25	6.61E+10	9.99E+08	5.85E+10	6.61E+09
65	19	5.02E+10	9.99E+08	4.42E+10	5.02E+09
70	14	3.70E+10	9.99E+08	3.23E+10	3.70E+09
75	9.7	2.56E+10	9.99E+08	2.21E+10	2.56E+09
80	6.1	1.61E+10	9.99E+08	1.35E+10	1.61E+09
85	3.3	8.72E+09	9.99E+08	6.85E+09	8.72E+08
90	1.2	3.17E+09	9.99E+08	1.85E+09	3.17E+08
95	0.10	2.64E+08	2.38E+08	0.00E+00	2.64E+07
100	0.00	2.64E+05	2.38E+05	0.00E+00	2.64E+04

5.7 LDCs and TMDL Calculations for Additional Bacterial Indicators

As mentioned previously in Section 5.1, USEPA regulations at 40 CFR 130.7(c) (1) require TMDLs to take into account critical conditions for stream flow, loading, and all applicable water quality standards. To accomplish this, available instream WQM data were evaluated with respect to flows and magnitude of water quality criteria exceedance using LDCs. Furthermore as required, TMDL calculations from LDCs for all bacterial indicators not supporting the PBCR use were prepared. The remaining LDCs and TMDL calculations for additional bacterial indicators are shown in Figures 5-12 through 5-15 and Table 5-15 through 5-17 respectively.

Figure 5-12 Load Duration Curve for Fecal Coliform in Buggy Creek (OK520610020120_00)

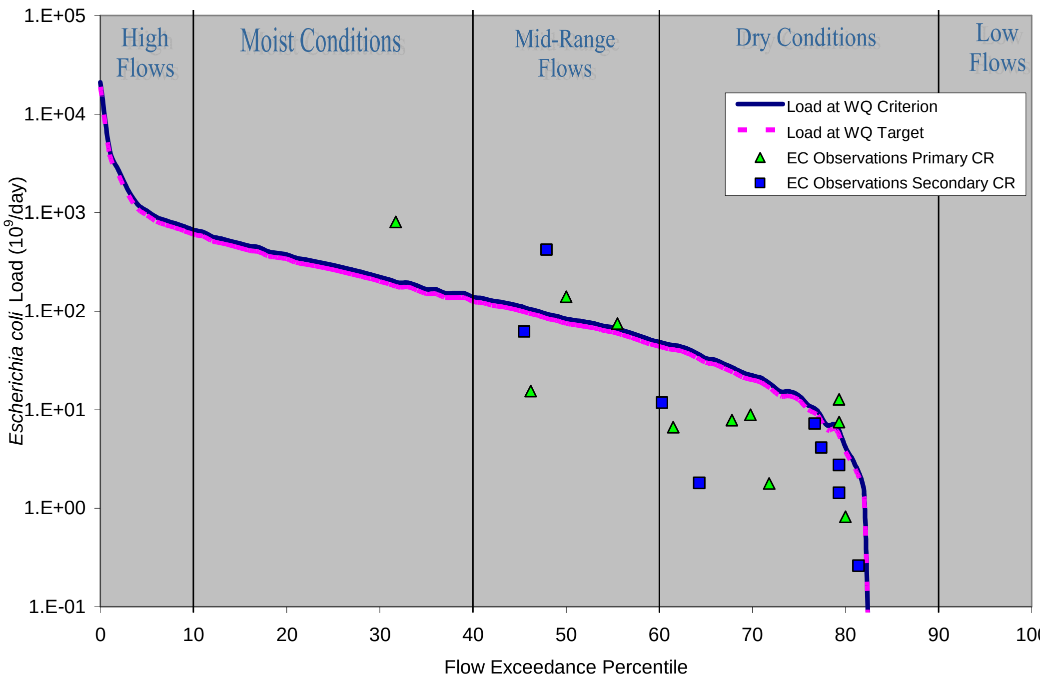


* there is no wasteload allocation for this waterbody

Table 5-15 Fecal Coliform TMDL Calculations for Buggy Creek (OK520610020120_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	2,115	2.07E+13	1.63E+09	1.86E+13	2.07E+12
5	105	1.03E+12	1.63E+09	9.25E+11	1.03E+11
10	67	6.58E+11	1.63E+09	5.91E+11	6.58E+10
15	49	4.80E+11	1.63E+09	4.30E+11	4.80E+10
20	38	3.70E+11	1.63E+09	3.31E+11	3.70E+10
25	29	2.88E+11	1.63E+09	2.58E+11	2.88E+10
30	22	2.19E+11	1.63E+09	1.95E+11	2.19E+10
35	17	1.64E+11	1.63E+09	1.46E+11	1.64E+10
40	14	1.37E+11	1.63E+09	1.22E+11	1.37E+10
45	11	1.11E+11	1.63E+09	9.83E+10	1.11E+10
50	8.4	8.22E+10	1.63E+09	7.24E+10	8.22E+09
55	6.9	6.72E+10	1.63E+09	5.89E+10	6.72E+09
60	4.9	4.80E+10	1.63E+09	4.16E+10	4.80E+09
65	3.4	3.29E+10	1.63E+09	2.80E+10	3.29E+09
70	2.2	2.19E+10	1.63E+09	1.81E+10	2.19E+09
75	1.4	1.37E+10	1.63E+09	1.07E+10	1.37E+09
80	0.42	4.11E+09	1.63E+09	2.07E+09	4.11E+08
85	0	0	0	0	0
90	0	0	0	0	0
95	0	0	0	0	0
100	0	0	0	0	0

Figure 5-13 Load Duration Curve for *E. Coli* in Buggy Creek (OK520610020120_00)



* there is no wasteload allocation for this waterbody

Table 5-16 *E. Coli* TMDL Calculations for Buggy Creek (OK520610020120_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	2,115	2.10E+13	1.03E+09	1.89E+13	2.10E+12
5	105	1.04E+12	1.03E+09	9.35E+11	1.04E+11
10	67	6.68E+11	1.03E+09	6.00E+11	6.68E+10
15	49	4.87E+11	1.03E+09	4.37E+11	4.87E+10
20	38	3.75E+11	1.03E+09	3.36E+11	3.75E+10
25	29	2.92E+11	1.03E+09	2.62E+11	2.92E+10
30	22	2.22E+11	1.03E+09	1.99E+11	2.22E+10
35	17	1.67E+11	1.03E+09	1.49E+11	1.67E+10
40	14	1.39E+11	1.03E+09	1.24E+11	1.39E+10
45	11	1.13E+11	1.03E+09	1.01E+11	1.13E+10
50	8.4	8.35E+10	1.03E+09	7.41E+10	8.35E+09
55	6.9	6.82E+10	1.03E+09	6.04E+10	6.82E+09
60	4.9	4.87E+10	1.03E+09	4.28E+10	4.87E+09
65	3.4	3.34E+10	1.03E+09	2.90E+10	3.34E+09
70	2.2	2.23E+10	1.03E+09	1.90E+10	2.23E+09
75	1.4	1.39E+10	1.03E+09	1.15E+10	1.39E+09
80	0.42	4.17E+09	1.03E+09	2.72E+09	4.17E+08
85	0	0	0	0	0
90	0	0	0	0	0
95	0	0	0	0	0
100	0	0	0	0	0

Figure 5-14 Load Duration Curve for Fecal Coliform in Little River (OK520800010010_00)

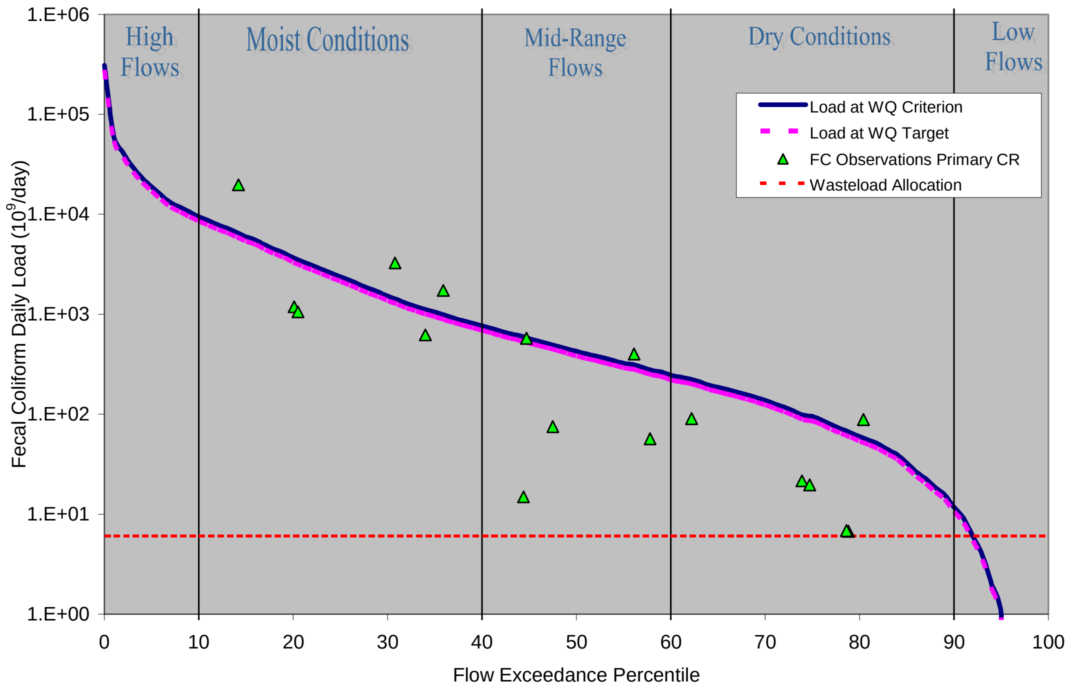


Table 5-17 Fecal Coliform TMDL Calculations for Little River (OK520800010010_00)

Percentile	Flow (cfs)	TMDL (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
0	31,600	3.09E+14	6.06E+09	2.78E+14	3.09E+13
5	1,940	1.90E+13	6.06E+09	1.71E+13	1.90E+12
10	966	9.45E+12	6.06E+09	8.50E+12	9.45E+11
15	609	5.96E+12	6.06E+09	5.36E+12	5.96E+11
20	376	3.68E+12	6.06E+09	3.30E+12	3.68E+11
25	242	2.37E+12	6.06E+09	2.13E+12	2.37E+11
30	155	1.52E+12	6.06E+09	1.36E+12	1.52E+11
35	107	1.05E+12	6.06E+09	9.36E+11	1.05E+11
40	78	7.63E+11	6.06E+09	6.81E+11	7.63E+10
45	58	5.68E+11	6.06E+09	5.05E+11	5.68E+10
50	44	4.26E+11	6.06E+09	3.77E+11	4.26E+10
55	33	3.23E+11	6.06E+09	2.85E+11	3.23E+10
60	25	2.45E+11	6.06E+09	2.14E+11	2.45E+10
65	19	1.86E+11	6.06E+09	1.61E+11	1.86E+10
70	14	1.37E+11	6.06E+09	1.17E+11	1.37E+10
75	9.7	9.49E+10	6.06E+09	7.94E+10	9.49E+09
80	6.1	5.97E+10	6.06E+09	4.77E+10	5.97E+09
85	3.3	3.23E+10	6.06E+09	2.30E+10	3.23E+09
90	1.2	1.17E+10	6.06E+09	4.51E+09	1.17E+09
95	0.10	6.73E+09	6.06E+09	0.00E+00	6.73E+08
100	0.00	6.73E+09	6.06E+09	0.00E+00	6.73E+08

5.8 Reasonable Assurances

ODEQ will collaborate with a host of other state agencies and local governments working within the boundaries of state and local regulations to target available funding and technical assistance to support implementation of pollution controls and management measures. Various water quality management programs and funding sources provide reasonable assurance that the pollutant reductions as required by these TMDLs can be achieved and water quality can be restored to maintain designated uses. ODEQ's Continuing Planning Process (CPP), required by the CWA §303(e)(3) and 40 CFR 130.5, summarizes Oklahoma's commitments and programs aimed at restoring and protecting water quality throughout the State (ODEQ 2002). The CPP can be viewed from ODEQ's website at http://www.deq.state.ok.us/WQDnew/pubs/2002_cpp_final.pdf. Table 5-19 provides a partial list of the state partner agencies ODEQ will collaborate with to address point and nonpoint source reduction goals established by TMDLs.

Table 5-19 Partial List of Oklahoma Water Quality Management Agencies

Agency	Web Link
Oklahoma Conservation Commission	http://www.okcc.state.ok.us/WQ/WQ_home.htm
Oklahoma Department of Wildlife Conservation	http://www.wildlifedepartment.com/watchabl.htm
Oklahoma Department of Agriculture, Food, and Forestry	http://www.oda.state.ok.us/aems-home.htm
Oklahoma Water Resources Board	http://www.owrb.state.ok.us/quality/index.php

Nonpoint source pollution is managed by the Oklahoma Conservation Commission. The primary mechanisms used for management of nonpoint source pollution are incentive-based programs that support the installation of BMPs and public education and outreach. Other programs include regulations and permits for CAFOs. The CAFO Act, as administered by the ODAFF, provides CAFO operators the necessary tools and information to deal with the manure and wastewater animals produce so streams, lakes, ponds, and groundwater sources are not polluted.

As authorized by Section 402 of the CWA, the ODEQ has delegation of the NPDES Program in Oklahoma, except for certain jurisdictional areas related to agriculture and the oil and gas industry retained by State Department of Agriculture and Oklahoma Corporation Commission, for which the USEPA has retained permitting authority. The NPDES Program in Oklahoma is implemented via Title 252, Chapter 606 of the Oklahoma Pollution Discharge Elimination System (OPDES) Act and in accordance with the agreement between ODEQ and USEPA relating to administration and enforcement of the delegated NPDES Program. Implementation of point source WLAs is done through permits issued under the OPDES program.

The reduction rates called for in this TMDL report are as high as 96 percent. The ODEQ recognizes that achieving such high reductions may not be realistic, especially since unregulated nonpoint sources are a major cause of the impairment. The high reduction rates are not uncommon for pathogen-impaired waters. Similar reduction rates are often found in other pathogen TMDLs around the nation. The suitability of the current criteria for pathogens and the beneficial uses of the receiving stream should be reviewed. For example, the Kansas Department of Environmental Quality has proposed to exclude certain high flow conditions during which pathogen standards will not apply, although that exclusion was not approved by the USEPA. Additionally, USEPA has been conducting new epidemiology studies and may develop new recommendations for pathogen criteria in the near future.

Revisions to the current pathogen provisions of Oklahoma's WQSs should be considered. There are three basic approaches to such revisions that may apply.

- **Removing the PBCR use:** This revision would require documentation in a Use Attainability Analysis that the use is not existing and cannot be attained. It is unlikely that this approach would be successful since there is evidence that people do swim in these waterbodies, thus constituting an existing use. Existing uses cannot be removed.
- **Modifying application of the existing criteria:** This approach would include considerations such as an exemption under certain high flow conditions, an allowance for wildlife or "natural conditions," a sub-category of the use or other special provision for urban areas, or other special provisions for storm flows. Since large bacteria violations occur over all flow ranges, it is likely that large reductions would still be necessary. However, this approach may have merit and should be considered.
- **Revising the existing numeric criteria:** Oklahoma's current pathogen criteria are based on USEPA guidelines (See Implementation Guidance for Ambient Water Quality Criteria for Bacteria, May 2002 Draft; and Ambient Water Quality Criteria for Bacteria-1986, January 1986). However, those guidelines have received much criticism and USEPA studies that could result in revisions to their recommendations are ongoing. The use of the three indicators specified in Oklahoma's standards should be evaluated. The numeric criteria values should also be evaluated using a risk-based method such as that found in USEPA guidance.

Unless or until the WQSs are revised and approved by USEPA, federal rules require that the TMDLs in this report must be based on attainment of the current standards. If revisions to the pathogen standards are approved in the future, reductions specified in these TMDLs will be re-evaluated.

SECTION 6
PUBLIC PARTICIPATION

This TMDL report was sent to other related state agencies and local government agencies for peer review. Then the report was submitted to the EPA for technical review. The report was technically approved by the EPA on May 8, 2008. A public notice was published on June 25, 2008 and the TMDL report was made available for public review and comments. The public comment period started on June 25, 2008 and ended on August 11, 2008. Three written comments were received.

All comments were responded and the report was updated accordingly. The response to comments was included in Appendix F of this report.

SECTION 7
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Missouri Department of Natural Resources 2003, Total Maximum daily Loads (TMDLs) for Shoal

Creek Newton and Barry Counties, Missouri.

APPENDIX A
AMBIENT WATER QUALITY BACTERIA DATA – 1999 TO 2003

Appendix A

Ambient Water Quality Bacteria Data – 1999 to 2003

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520600010010-001AT	Canadian River, US 377, Konawa	6/15/1999	970	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	7/13/1999	4200	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	8/11/1999	100	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	9/21/1999	30	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	5/8/2000	280	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	6/12/2000	40	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	5/16/2001	130	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	6/13/2001	100	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	7/18/2001	20	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	8/15/2001	190	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	6/10/2002	90	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	7/16/2002	10	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	9/17/2002	190	FC	400
OK520600010010-001AT	Canadian River, US 377, Konawa	6/15/1999	909	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	7/13/1999	794	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	8/11/1999	10	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	9/21/1999	41	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	5/8/2000	272	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	6/12/2000	52	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	5/16/2001	61	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	6/13/2001	10	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	7/18/2001	5	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	8/15/2001	20	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	6/10/2002	10	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	7/16/2002	10	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	9/17/2002	41	EC	406
OK520600010010-001AT	Canadian River, US 377, Konawa	6/15/1999	30	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	7/13/1999	60	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	8/11/1999	5	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	9/21/1999	20	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	5/8/2000	170	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	6/12/2000	220	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	5/16/2001	90	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	6/13/2001	120	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	7/18/2001	140	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	8/15/2001	700	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	6/10/2002	80	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	7/16/2002	10	ENT	108
OK520600010010-001AT	Canadian River, US 377, Konawa	9/17/2002	150	ENT	108

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520600010060P	Factory Creek	4/20/1999	15200	FC	2000
OK520600010060P	Factory Creek	5/18/1999	1700	FC	400
OK520600010060P	Factory Creek	6/15/1999	5500	FC	400
OK520600010060P	Factory Creek	7/13/1999	100	FC	400
OK520600010060P	Factory Creek	8/17/1999	100	FC	400
OK520600010060P	Factory Creek	9/28/1999	100	FC	400
OK520600010060P	Factory Creek	11/2/1999	1900	FC	2000
OK520600010060P	Factory Creek	12/7/1999	1100	FC	2000
OK520600010060P	Factory Creek	1/11/2000	100	FC	2000
OK520600010060P	Factory Creek	2/15/2000	100	FC	2000
OK520600010060P	Factory Creek	3/21/2000	500	FC	2000
OK520600010060P	Factory Creek	5/2/2000	1000	FC	400
OK520600010060P	Factory Creek	6/6/2000	100	FC	400
OK520600010060P	Factory Creek	7/11/2000	300	FC	400
OK520600010060P	Factory Creek	8/15/2000	220	FC	400
OK520600010060P	Factory Creek	9/19/2000	900	FC	400
OK520600010060P	Factory Creek	10/24/2000	3000	FC	2000
OK520600010060P	Factory Creek	11/28/2000	1200	FC	2000
OK520600010060P	Factory Creek	1/9/2001	30	FC	2000
OK520600010060P	Factory Creek	2/13/2001	200	FC	2000
OK520600010060P	Factory Creek	3/20/2001	60	FC	2000
OK520600010060P	Factory Creek	8/15/2000	145	EC	406
OK520600010060P	Factory Creek	9/19/2000	789	EC	406
OK520600010060P	Factory Creek	10/24/2000	3448	EC	2030
OK520600010060P	Factory Creek	11/28/2000	1178	EC	2030
OK520600010060P	Factory Creek	1/9/2001	41	EC	2030
OK520600010060P	Factory Creek	2/13/2001	169	EC	2030
OK520600010060P	Factory Creek	3/20/2001	31	EC	2030
OK520600010060P	Factory Creek	9/19/2000	500	ENT	108
OK520600010060P	Factory Creek	10/24/2000	23000	ENT	540
OK520600010060P	Factory Creek	11/28/2000	800	ENT	540
OK520600010060P	Factory Creek	1/9/2001	90	ENT	540
OK520600010060P	Factory Creek	2/13/2001	200	ENT	540
OK520600010060P	Factory Creek	3/20/2001	60	ENT	540
OK520600020170B	Julian Creek	5/18/1999	1600	FC	400
OK520600020170B	Julian Creek	6/15/1999	100	FC	400
OK520600020170B	Julian Creek	7/13/1999	200	FC	400
OK520600020170B	Julian Creek	8/17/1999	100	FC	400
OK520600020170B	Julian Creek	9/28/1999	600	FC	400
OK520600020170B	Julian Creek	12/7/1999	1800	FC	2000
OK520600020170B	Julian Creek	1/11/2000	100	FC	2000
OK520600020170B	Julian Creek	2/15/2000	100	FC	2000
OK520600020170B	Julian Creek	3/21/2000	300	FC	2000
OK520600020170B	Julian Creek	5/2/2000	1600	FC	400

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520600020170B	Julian Creek	5/2/2000	1800	FC	400
OK520600020170B	Julian Creek	5/2/2000	2400	FC	400
OK520600020170B	Julian Creek	6/6/2000	700	FC	400
OK520600020170B	Julian Creek	6/6/2000	400	FC	400
OK520600020170B	Julian Creek	7/11/2000	170	FC	400
OK520600020170B	Julian Creek	7/11/2000	80	FC	400
OK520600020170B	Julian Creek	7/11/2000	200	FC	400
OK520600020170B	Julian Creek	8/15/2000	1200	FC	400
OK520600020170B	Julian Creek	8/15/2000	5000	FC	400
OK520600020170B	Julian Creek	9/19/2000	5000	FC	400
OK520600020170B	Julian Creek	10/24/2000	3000	FC	2000
OK520600020170B	Julian Creek	10/24/2000	7000	FC	2000
OK520600020170B	Julian Creek	11/28/2000	140	FC	2000
OK520600020170B	Julian Creek	11/28/2000	200	FC	2000
OK520600020170B	Julian Creek	1/9/2001	30	FC	2000
OK520600020170B	Julian Creek	1/9/2001	20	FC	2000
OK520600020170B	Julian Creek	2/13/2001	300	FC	2000
OK520600020170B	Julian Creek	3/20/2001	10	FC	2000
OK520600020170B	Julian Creek	8/15/2000	425	EC	406
OK520600020170B	Julian Creek	9/19/2000	4352	EC	406
OK520600020170B	Julian Creek	10/24/2000	669	EC	2030
OK520600020170B	Julian Creek	11/28/2000	169	EC	2030
OK520600020170B	Julian Creek	1/9/2001	20	EC	2030
OK520600020170B	Julian Creek	2/13/2001	388	EC	2030
OK520600020170B	Julian Creek	3/20/2001	20	EC	2030
OK520600020170B	Julian Creek	9/19/2000	700	ENT	108
OK520600020170B	Julian Creek	10/24/2000	10000	ENT	540
OK520600020170B	Julian Creek	10/24/2000	11000	ENT	540
OK520600020170B	Julian Creek	11/28/2000	4000	ENT	540
OK520600020170B	Julian Creek	11/28/2000	2000	ENT	540
OK520600020170B	Julian Creek	1/9/2001	3000	ENT	540
OK520600020170B	Julian Creek	1/9/2001	500	ENT	540
OK520600020170B	Julian Creek	2/13/2001	600	ENT	540
OK520600020170B	Julian Creek	2/13/2001	300	ENT	540
OK520600020170B	Julian Creek	3/20/2001	90	ENT	540
OK520600020170B	Julian Creek	3/20/2001	110	ENT	540
OK520600030030E	Spring Brook Creek	4/20/1999	21000	FC	2000
OK520600030030E	Spring Brook Creek	5/18/1999	10000	FC	400
OK520600030030E	Spring Brook Creek	6/15/1999	200	FC	400
OK520600030030E	Spring Brook Creek	7/13/1999	200	FC	400
OK520600030030E	Spring Brook Creek	8/17/1999	100	FC	400
OK520600030030E	Spring Brook Creek	9/28/1999	500	FC	400
OK520600030030E	Spring Brook Creek	11/2/1999	1000	FC	2000
OK520600030030E	Spring Brook Creek	12/7/1999	800	FC	2000

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520600030030E	Spring Brook Creek	1/11/2000	100	FC	2000
OK520600030030E	Spring Brook Creek	2/15/2000	100	FC	2000
OK520600030030E	Spring Brook Creek	3/21/2000	400	FC	2000
OK520600030030E	Spring Brook Creek	5/2/2000	7000	FC	400
OK520600030030E	Spring Brook Creek	6/6/2000	100	FC	400
OK520600030030E	Spring Brook Creek	7/11/2000	2900	FC	400
OK520600030030E	Spring Brook Creek	10/24/2000	310	FC	2000
OK520600030030E	Spring Brook Creek	11/28/2000	200	FC	2000
OK520600030030E	Spring Brook Creek	1/9/2001	90	FC	2000
OK520600030030E	Spring Brook Creek	2/13/2001	1200	FC	2000
OK520600030030E	Spring Brook Creek	3/20/2001	130	FC	2000
OK520600030030E	Spring Brook Creek	10/24/2000	5172	EC	2030
OK520600030030E	Spring Brook Creek	11/28/2000	408	EC	2030
OK520600030030E	Spring Brook Creek	1/9/2001	135	EC	2030
OK520600030030E	Spring Brook Creek	2/13/2001	1039	EC	2030
OK520600030030E	Spring Brook Creek	3/20/2001	120	EC	2030
OK520600030030E	Spring Brook Creek	10/24/2000	70000	ENT	540
OK520600030030E	Spring Brook Creek	11/28/2000	5000	ENT	540
OK520600030030E	Spring Brook Creek	1/9/2001	900	ENT	540
OK520600030030E	Spring Brook Creek	2/13/2001	13000	ENT	540
OK520600030030E	Spring Brook Creek	3/20/2001	700	ENT	540
OK520610010010-001AT	Canadian River, US 77, Purcell	6/16/1999	2100	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	7/19/1999	350	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	8/11/1999	60	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	5/8/2000	260	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	6/12/2000	150	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	7/24/2000	900	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	8/14/2000	20	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	9/11/2000	1800	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	5/16/2001	500	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	6/11/2001	400	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	7/16/2001	170	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	7/18/2001	20	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	8/13/2001	300	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	8/15/2001	5	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	9/4/2001	200	FC	400
OK520610010010-001AT	Canadian River, US 77, Purcell	6/16/1999	389	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	7/19/1999	288	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	8/11/1999	10	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	5/8/2000	314	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	6/12/2000	148	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	7/24/2000	51	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	8/14/2000	5	EC	406

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520610010010-001AT	Canadian River, US 77, Purcell	9/11/2000	41	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	5/16/2001	20	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	6/11/2001	121	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	7/16/2001	30	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	7/18/2001	10	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	8/13/2001	74	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	8/15/2001	10	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	9/4/2001	20	EC	406
OK520610010010-001AT	Canadian River, US 77, Purcell	6/16/1999	170	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	7/19/1999	5	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	8/11/1999	5	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	5/8/2000	140	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	6/12/2000	20	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	7/24/2000	120	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	8/14/2000	2800	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	9/11/2000	1200	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	5/16/2001	70	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	6/11/2001	300	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	7/16/2001	18000	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	7/18/2001	8000	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	8/13/2001	520	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	8/15/2001	100	ENT	108
OK520610010010-001AT	Canadian River, US 77, Purcell	9/4/2001	90	ENT	108
OK520610010080G	Willow Creek	5/21/1997	16000	FC	400
OK520610010080G	Willow Creek	6/22/1997	700	FC	400
OK520610010080G	Willow Creek	6/22/1997	500	FC	400
OK520610010080G	Willow Creek	8/12/1997	16000	FC	400
OK520610010080G	Willow Creek	9/15/1997	160000	FC	400
OK520610010080G	Willow Creek	5/18/1999	1300	FC	400
OK520610010080G	Willow Creek	6/15/1999	400	FC	400
OK520610010080G	Willow Creek	8/17/1999	100	FC	400
OK520610010080G	Willow Creek	9/28/1999	1400	FC	400
OK520610010080G	Willow Creek	11/2/1999	100	FC	2000
OK520610010080G	Willow Creek	12/7/1999	1300	FC	2000
OK520610010080G	Willow Creek	1/11/2000	100	FC	2000
OK520610010080G	Willow Creek	2/15/2000	300	FC	2000
OK520610010080G	Willow Creek	3/21/2000	7000	FC	2000
OK520610010080G	Willow Creek	5/2/2000	8000	FC	400
OK520610010080G	Willow Creek	6/6/2000	400	FC	400
OK520610010080G	Willow Creek	7/11/2000	680	FC	400
OK520610010080G	Willow Creek	8/15/2000	460	FC	400
OK520610010080G	Willow Creek	9/19/2000	1100	FC	400
OK520610010080G	Willow Creek	9/19/2000	1300	FC	400

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520610010080G	Willow Creek	10/24/2000	10	FC	2000
OK520610010080G	Willow Creek	11/28/2000	500	FC	2000
OK520610010080G	Willow Creek	1/9/2001	700	FC	2000
OK520610010080G	Willow Creek	2/13/2001	1000	FC	2000
OK520610010080G	Willow Creek	3/20/2001	1300	FC	2000
OK520610010080G	Willow Creek	8/15/2000	131	EC	406
OK520610010080G	Willow Creek	9/19/2000	617	EC	406
OK520610010080G	Willow Creek	10/24/2000	8664	EC	2030
OK520610010080G	Willow Creek	11/28/2000	408	EC	2030
OK520610010080G	Willow Creek	1/9/2001	110	EC	2030
OK520610010080G	Willow Creek	2/13/2001	416	EC	2030
OK520610010080G	Willow Creek	3/20/2001	1148	EC	2030
OK520610010080G	Willow Creek	9/19/2000	6000	ENT	108
OK520610010080G	Willow Creek	10/24/2000	141000	ENT	540
OK520610010080G	Willow Creek	11/28/2000	2000	ENT	540
OK520610010080G	Willow Creek	1/9/2001	5000	ENT	540
OK520610010080G	Willow Creek	2/13/2001	600	ENT	540
OK520610010080G	Willow Creek	3/20/2001	500	ENT	540
OK520610010180G	Bishop Creek: near Jenkins St.	5/21/1997	1100	FC	400
OK520610010180G	Bishop Creek: near Jenkins St.	6/22/1997	230	FC	400
OK520610010180G	Bishop Creek: near Jenkins St.	7/22/1997	500	FC	400
OK520610010180G	Bishop Creek: near Jenkins St.	9/15/1997	2200	FC	400
OK520610020120G	Buggy Creek	5/16/2000	900	FC	400
OK520610020120G	Buggy Creek	6/20/2000	1000	FC	400
OK520610020120G	Buggy Creek	7/25/2000	400	FC	400
OK520610020120G	Buggy Creek	8/29/2000	570	FC	400
OK520610020120G	Buggy Creek	10/3/2000	200	FC	2000
OK520610020120G	Buggy Creek	11/14/2000	100	FC	2000
OK520610020120G	Buggy Creek	12/18/2000	40	FC	2000
OK520610020120G	Buggy Creek	3/5/2001	0	FC	2000
OK520610020120G	Buggy Creek	5/14/2001	0	FC	400
OK520610020120G	Buggy Creek	6/18/2001	600	FC	400
OK520610020120G	Buggy Creek	8/27/2001	600	FC	400
OK520610020120G	Buggy Creek	9/18/2001	600	FC	400
OK520610020120G	Buggy Creek	10/1/2001	320	FC	2000
OK520610020120G	Buggy Creek	11/5/2001	250	FC	2000
OK520610020120G	Buggy Creek	11/5/2001	85	FC	2000
OK520610020120G	Buggy Creek	8/29/2000	73	EC	406
OK520610020120G	Buggy Creek	10/3/2000	41	EC	2030
OK520610020120G	Buggy Creek	11/14/2000	281	EC	2030
OK520610020120G	Buggy Creek	12/18/2000	98	EC	2030
OK520610020120G	Buggy Creek	6/18/2001	120	EC	406
OK520610020120G	Buggy Creek	7/23/2001	520	EC	406
OK520610020120G	Buggy Creek	8/14/2001	460	EC	406

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520610020120G	Buggy Creek	8/27/2001	800	EC	406
OK520610020120G	Buggy Creek	9/18/2001	1600	EC	406
OK520610020120G	Buggy Creek	10/1/2001	170	EC	2030
OK520610020120G	Buggy Creek	10/22/2001	100	EC	2030
OK520610020120G	Buggy Creek	11/5/2001	180	EC	2030
OK520610020120G	Buggy Creek	4/23/2002	230	EC	2030
OK520610020120G	Buggy Creek	7/9/2002	60	EC	406
OK520610020120G	Buggy Creek	8/6/2002	155	EC	406
OK520610020120G	Buggy Creek	9/9/2002	40	EC	406
OK520610020120G	Buggy Creek	10/15/2002	20	EC	2030
OK520610020120G	Buggy Creek	4/7/2003	1800	EC	2030
OK520610020120G	Buggy Creek	5/12/2003	670	EC	406
OK520610020120G	Buggy Creek	6/16/2003	60	EC	406
OK520610020120G	Buggy Creek	8/29/2000	330	ENT	108
OK520610020120G	Buggy Creek	10/3/2000	1600	ENT	540
OK520610020120G	Buggy Creek	11/14/2000	1400	ENT	540
OK520610020120G	Buggy Creek	12/18/2000	1300	ENT	540
OK520610020120G	Buggy Creek	3/5/2001	0	ENT	540
OK520610020120G	Buggy Creek	5/14/2001	0	ENT	108
OK520610020120G	Buggy Creek	6/18/2001	200	ENT	108
OK520610020120G	Buggy Creek	7/23/2001	85	ENT	108
OK520610020120G	Buggy Creek	8/14/2001	163	ENT	108
OK520610020120G	Buggy Creek	8/27/2001	450	ENT	108
OK520610020120G	Buggy Creek	10/1/2001	90	ENT	540
OK520610020120G	Buggy Creek	10/22/2001	110	ENT	540
OK520610020120G	Buggy Creek	11/5/2001	380	ENT	540
OK520610020120G	Buggy Creek	11/5/2001	100	ENT	540
OK520610020120G	Buggy Creek	4/23/2002	160	ENT	540
OK520610020120G	Buggy Creek	5/29/2002	130	ENT	108
OK520610020120G	Buggy Creek	7/9/2002	280	ENT	108
OK520610020120G	Buggy Creek	8/6/2002	315	ENT	108
OK520610020120G	Buggy Creek	9/9/2002	30	ENT	108
OK520610020120G	Buggy Creek	10/15/2002	60	ENT	540
OK520610020120G	Buggy Creek	4/7/2003	310	ENT	540
OK520610020120G	Buggy Creek	5/12/2003	340	ENT	108
OK520610020120G	Buggy Creek	6/16/2003	220	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/16/1999	120	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/12/1999	1500	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/18/1999	1400	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/15/1999	70	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/9/2000	540	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/13/2000	100	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/19/2000	130	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/16/2000	5	FC	400

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/13/2000	5	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/22/2001	21000	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/18/2001	350	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/23/2001	40	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/20/2001	50	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/17/2001	80	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/14/2002	20	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/12/2002	30	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/17/2002	10	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/14/2002	120	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/12/2003	310	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/27/2003	30	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/16/2003	2000	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/30/2003	30	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/25/2003	130	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/8/2003	90	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/29/2003	50	FC	400
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/16/1999	122	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/12/1999	884	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/18/1999	85	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/15/1999	110	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/9/2000	404	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/13/2000	62	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/19/2000	5	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/16/2000	5	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/13/2000	5	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/22/2001	12033	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/18/2001	96	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/23/2001	10	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/20/2001	5	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/17/2001	30	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/14/2002	20	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/12/2002	20	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/17/2002	10	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/14/2002	10	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/12/2003	41	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/27/2003	52	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/16/2003	247	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/30/2003	10	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/21/2003	31	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/25/2003	10	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/8/2003	97	EC	406

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/29/2003	10	EC	406
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/16/1999	40	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/12/1999	50	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/18/1999	60	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/15/1999	90	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/9/2000	900	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/13/2000	130	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/19/2000	70	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/16/2000	5	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/13/2000	5	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/22/2001	7000	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/18/2001	110	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/23/2001	70	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/20/2001	90	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/17/2001	900	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/14/2002	70	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/12/2002	20	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/17/2002	30	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/14/2002	300	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/12/2003	100	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	5/27/2003	30	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/16/2003	3000	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	6/30/2003	110	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	7/21/2003	70	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	8/25/2003	500	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/8/2003	100	ENT	108
OK520610020150-001AT	Canadian River, US 66, Bridgeport	9/29/2003	230	ENT	108
OK520610030080G	Walnut Creek: North Fork	5/16/2000	400	FC	400
OK520610030080G	Walnut Creek: North Fork	6/20/2000	3500	FC	400
OK520610030080G	Walnut Creek: North Fork	7/25/2000	6000	FC	400
OK520610030080G	Walnut Creek: North Fork	8/29/2000	120	FC	400
OK520610030080G	Walnut Creek: North Fork	10/3/2000	400	FC	2000
OK520610030080G	Walnut Creek: North Fork	12/18/2000	900	FC	2000
OK520610030080G	Walnut Creek: North Fork	3/5/2001	0	FC	2000
OK520610030080G	Walnut Creek: North Fork	4/9/2001	500	FC	2000
OK520610030080G	Walnut Creek: North Fork	4/9/2001	0	FC	2000
OK520610030080G	Walnut Creek: North Fork	5/14/2001	0	FC	400
OK520610030080G	Walnut Creek: North Fork	6/18/2001	100	FC	400
OK520610030080G	Walnut Creek: North Fork	7/23/2001	230	FC	400
OK520610030080G	Walnut Creek: North Fork	8/27/2001	600	FC	400
OK520610030080G	Walnut Creek: North Fork	10/1/2001	110	FC	2000
OK520610030080G	Walnut Creek: North Fork	11/5/2001	460	FC	2000
OK520610030080G	Walnut Creek: North Fork	11/5/2001	55	FC	2000

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520610030080G	Walnut Creek: North Fork	8/29/2000	52	EC	406
OK520610030080G	Walnut Creek: North Fork	10/3/2000	537	EC	2030
OK520610030080G	Walnut Creek: North Fork	12/18/2000	988	EC	2030
OK520610030080G	Walnut Creek: North Fork	6/18/2001	52	EC	406
OK520610030080G	Walnut Creek: North Fork	7/23/2001	135	EC	406
OK520610030080G	Walnut Creek: North Fork	8/27/2001	800	EC	406
OK520610030080G	Walnut Creek: North Fork	10/1/2001	180	EC	2030
OK520610030080G	Walnut Creek: North Fork	11/5/2001	230	EC	2030
OK520610030080G	Walnut Creek: North Fork	8/29/2000	110	ENT	108
OK520610030080G	Walnut Creek: North Fork	10/3/2000	1300	ENT	540
OK520610030080G	Walnut Creek: North Fork	12/18/2000	13000	ENT	540
OK520610030080G	Walnut Creek: North Fork	3/5/2001	0	ENT	540
OK520610030080G	Walnut Creek: North Fork	4/9/2001	90	ENT	540
OK520610030080G	Walnut Creek: North Fork	4/9/2001	0	ENT	540
OK520610030080G	Walnut Creek: North Fork	5/14/2001	0	ENT	108
OK520610030080G	Walnut Creek: North Fork	6/18/2001	100	ENT	108
OK520610030080G	Walnut Creek: North Fork	7/23/2001	340	ENT	108
OK520610030080G	Walnut Creek: North Fork	8/27/2001	630	ENT	108
OK520610030080G	Walnut Creek: North Fork	10/1/2001	170	ENT	540
OK520610030080G	Walnut Creek: North Fork	11/5/2001	170	ENT	540
OK520610030080G	Walnut Creek: North Fork	11/5/2001	135	ENT	540
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/15/1999	220	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/13/1999	1200	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/11/1999	160	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/21/1999	510	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/8/2000	130	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/12/2000	390	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/24/2000	700	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/14/2000	80	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/11/2000	5	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/16/2001	60	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/13/2001	120	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/18/2001	80	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/15/2001	40	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/5/2001	600	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/20/2002	900	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/10/2002	10	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/16/2002	80	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/17/2002	40	FC	400
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/15/1999	185	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/13/1999	74	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/11/1999	41	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/21/1999	637	EC	406

WQM Station	Water Body Name	Date	Bacteria Concentration (#/100ml)	Bacteria Indicator	Single Sample Criteria * (#/100ml)
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/8/2000	143	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/12/2000	345	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/24/2000	305	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/14/2000	10	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/11/2000	5	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/16/2001	52	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/13/2001	41	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/18/2001	20	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/15/2001	20	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/5/2001	121	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/20/2002	439	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/10/2002	30	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/16/2002	20	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/17/2002	10	EC	406
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/15/1999	180	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/13/1999	200	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/11/1999	5	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/21/1999	330	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/8/2000	500	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/12/2000	190	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/24/2000	1000	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/14/2000	20	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/11/2000	5	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/16/2001	100	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/13/2001	400	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/18/2001	50	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	8/15/2001	20	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/5/2001	700	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	5/20/2002	10	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	6/10/2002	80	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	7/16/2002	10	ENT	108
OK520800010010-001AT	Little River, SH 56, Sasakwa	9/17/2002	60	ENT	108

EC = E. coli; ENT = enterococci; FC = fecal coliform
* Single sample criterion for secondary contact recreation season is shown for all samples collected between October 1st and April 30th.

APPENDIX B
NPDES PERMIT DISCHARGE MONITORING REPORT DATA AND SANITARY SEWER OVERFLOW DATA

Appendix B

NPDES Permit Discharge Monitoring Report Data 1998-2006

NPDES	Monthly Average Concentration (cfu/100ml)	Monthly Maximum Concentration (cfu/100ml)	Outfall	Report Date	Parameter Code	Parameter	Monthly Average Flow (MGD)	Monthly Maximum Flow (MGD)	Parameter Code	Parameter
OK0021873	< 20	< 20	001	5/31/1998	74055	FC	0.174	0.408	50050	Flow
OK0021873	< 20	< 20	001	6/30/1998	74055	FC	0.112	0.147	50050	Flow
OK0021873	76	120	001	7/31/1998	74055	FC	0.087	0.106	50050	Flow
OK0021873	< 20	< 20	001	8/31/1998	74055	FC	0.09	0.105	50050	Flow
OK0021873	33	45	001	9/30/1998	74055	FC	0.105	0.187	50050	Flow
OK0021873	29	38	001	5/31/1999	74055	FC	0.289	0.417	50050	Flow
OK0021873	24	28	001	6/30/1999	74055	FC	0.274	0.419	50050	Flow
OK0021873	< 20	< 20	001	7/31/1999	74055	FC	0.195	0.412	50050	Flow
OK0021873	< 20	< 20	001	8/31/1999	74055	FC	0.0965	0.116	50050	Flow
OK0021873	< 20	< 20	001	9/30/1999	74055	FC	0.119	0.252	50050	Flow
OK0021873	< 20	< 20	001	5/31/2000	74055	FC	0.152	0.372	50050	Flow
OK0021873	< 20	< 20	001	6/30/2000	74055	FC	0.152	0.373	50050	Flow
OK0021873	< 20	< 20	001	7/31/2000	74055	FC	0.15	0.288	50050	Flow
OK0021873	< 20	< 20	001	8/31/2000	74055	FC	0.0813	0.0978	50050	Flow
OK0021873	< 20	< 20	001	9/30/2000	74055	FC	0.079	0.111	50050	Flow
OK0021873	< 20	< 20	001	5/31/2001	74055	FC	0.192	0.34	50050	Flow
OK0021873	< 20	< 20	001	6/30/2001	74055	FC	0.107	0.198	50050	Flow
OK0021873	11	21	001	7/31/2001	74055	FC	0.0825	0.142	50050	Flow
OK0021873	< 20	< 20	001	8/31/2001	74055	FC	0.088	0.132	50050	Flow
OK0021873	< 20	< 20	001	9/30/2001	74055	FC	0.17	0.358	50050	Flow
OK0021873	< 20	< 20	001	5/31/2002	74055	FC	0.151	0.279	50050	Flow
OK0021873	< 20	< 20	001	6/30/2002	74055	FC	0.163	0.349	50050	Flow
OK0021873	< 20	< 20	001	7/31/2002	74055	FC	0.139	0.306	50050	Flow
OK0021873	< 20	< 20	001	8/31/2002	74055	FC	0.126	0.295	50050	Flow
OK0021873	< 20	< 20	001	9/30/2002	74055	FC	0.113	0.13	50050	Flow
OK0021873	< 20	< 20	001	5/31/2003	74055	FC	0.13	0.181	50050	Flow
OK0021873	29.5	31	001	6/30/2003	74055	FC	0.162	0.321	50050	Flow

NPDES	Monthly Average Concentration (cfu/100ml)	Monthly Maximum Concentration (cfu/100ml)	Outfall	Report Date	Parameter Code	Parameter	Monthly Average Flow (MGD)	Monthly Maximum Flow (MGD)	Parameter Code	Parameter
OK0021873	< 20	< 20	001	7/31/2003	74055	FC	0.0898	0.104	50050	Flow
OK0021873	28.5	37	001	8/31/2003	74055	FC	0.0975	0.26	50050	Flow
OK0021873	35.5	37	001	9/30/2003	74055	FC	0.145	0.32	50050	Flow
OK0021873	< 20	< 20	001	5/31/2004	74055	FC	0.106	0.163	50050	Flow
OK0021873	< 20	< 20	001	6/30/2004	74055	FC	0.149	0.361	50050	Flow
OK0021873	< 20	< 20	001	7/31/2004	74055	FC	0.182	0.38	50050	Flow
OK0021873	< 20	< 20	001	8/31/2004	74055	FC	0.108	0.154	50050	Flow
OK0021873	< 20	< 20	001	9/30/2004	74055	FC	0.0839	0.104	50050	Flow
OK0021873	< 20	< 20	001	5/31/2005	74055	FC	0.094	0.162	50050	Flow
OK0021873	< 20	< 20	001	6/30/2005	74055	FC	0.122	0.329	50050	Flow
OK0021873	22	24	001	7/31/2005	74055	FC	0.126	0.401	50050	Flow
OK0021873	< 20	< 20	001	8/31/2005	74055	FC	0.135	0.413	50050	Flow
OK0021873	48.5	77	001	9/30/2005	74055	FC	0.096	0.137	50050	Flow
OK0021873	< 20	< 20	001	5/31/2006	74055	FC	0.109	0.249	50050	Flow
OK0021873	< 20	< 20	001	6/30/2006	74055	FC	0.073	0.091	50050	Flow
OK0021873	< 20	< 20	001	7/31/2006	74055	FC	0.075	0.111	50050	Flow
OK0021873	< 20	< 20	001	8/31/2006	74055	FC	0.076	0.104	50050	Flow
OK0021873	< 20	< 20	001	9/30/2006	74055	FC	0.075	0.194	50050	Flow
OK0038458	0.0	0.0	001	5/31/1998	74055	FC	0.006568	0.012442	50050	Flow
OK0038458	0.0	0.0	001	6/30/1998	74055	FC	0.007	0.014641	50050	Flow
OK0038458	6	6	001	7/31/1998	74055	FC	0.006	0.008	50050	Flow
OK0038458	33	33	001	8/31/1998	74055	FC	0.007	0.01173	50050	Flow
OK0038458	0	0	001	9/30/1998	74055	FC	0.014	0.03	50050	Flow
OK0038458	0	0	001	5/31/1999	74055	FC	0.007	0.011	50050	Flow
OK0038458			001	6/30/1999	74055	FC	0.008	0.011	50050	Flow
OK0038458	1	1	001	7/31/1999	74055	FC	0.007	0.0118	50050	Flow
OK0038458	0	0	001	8/31/1999	74055	FC	0.008	0.015	50050	Flow
OK0038458	0	0	001	9/30/1999	74055	FC	0.011	0.014	50050	Flow
OK0038458	6	6	001	5/31/2000	74055	FC	0.008	0.013	50050	Flow
OK0038458	10	10	001	6/30/2000	74055	FC	0.006	0.007	50050	Flow

NPDES	Monthly Average Concentration (cfu/100ml)	Monthly Maximum Concentration (cfu/100ml)	Outfall	Report Date	Parameter Code	Parameter	Monthly Average Flow (MGD)	Monthly Maximum Flow (MGD)	Parameter Code	Parameter
OK0038458	12	12	001	7/31/2000	74055	FC	0.002	0.006	50050	Flow
OK0038458	< 1	< 1	001	8/31/2000	74055	FC	0.003	0.007	50050	Flow
OK0038458	1	1	001	9/30/2000	74055	FC	0.005	0.007	50050	Flow
OK0038458	6000	6000	001	5/31/2001	74055	FC	0.006	0.017	50050	Flow
OK0038458	10	10	001	6/30/2001	74055	FC	0.003	0.016	50050	Flow
OK0038458	0	0	001	7/31/2001	74055	FC	0.004	0.013	50050	Flow
OK0038458	0	0	001	8/31/2001	74055	FC	0.002	0.011	50050	Flow
OK0038458	1	1	001	9/30/2001	74055	FC	0.005	0.008	50050	Flow
OK0038458	0	0	001	6/30/2002	74055	FC	0.003	0.004	50050	Flow
OK0038458	0	0	001	7/31/2002	74055	FC	0.002	0.005	50050	Flow
OK0038458	0	0	001	8/31/2002	74055	FC	0.004	0.006	50050	Flow
OK0038458	0	0	001	9/30/2002	74055	FC	0.003	0.004	50050	Flow
OK0038458	0	0	001	5/31/2003	74055	FC	0.003	0.003	50050	Flow
OK0038458	0	0	001	6/30/2003	74055	FC	0.003	0.005	50050	Flow
OK0038458	0	0	001	8/31/2003	74055	FC	0.002	0.002	50050	Flow
OK0038458	47	47	001	5/31/2004	74055	FC	0.002	0.002	50050	Flow
OK0038458			001	5/31/2006	74055	FC	0.003	0.003	50050	Flow
OK0038458			001	6/30/2006	74055	FC	0.001	0.001	50050	Flow
OK0038458			001	7/31/2006	74055	FC	0.002	0.002	50050	Flow
OK0038458			001	8/31/2006	74055	FC	0.004	0.004	50050	Flow
OK0038458			001	9/30/2006	74055	FC	0.001	0.001	50050	Flow

ODEQ Summary of Available Reports of Sanitary Sewer Overflows

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
BLANCHARD	4/30/1990	S20620			RAIN	
BLANCHARD	5/3/1990	S20620	LIFT STATION UNABLE TO LOAD BYPASS	0	EXCESSIVE RAIN	
BLANCHARD	1/11/1993	S20620	SEWER PLANT	0	RAINFALL	
BLANCHARD	5/24/1993	S20620	LAGOON	7000000	EXCESSIVE RAINS AND I/I	
BLANCHARD	4/28/1999	S20620	623 S. MONROE		ELECTRICAL PROBLEM	
BLANCHARD	4/28/1999	S20620	623 S. MONROE		ELECTRICAL PROBLEM	
BLANCHARD	6/23/1999	S20620	623 S. MONROE			
BLANCHARD	10/16/1999	S20620	500 FT. E. OF SOUTH TYLER & HWY 62		GREASE	
BLANCHARD	7/18/2000	S20620	76 HWY & LOVER LANEOF W. OF DOCTOR 'S OFFICE		GREASE	
BLANCHARD	4/23/2001	S20620	BROADWAY & 62 HWY	400	HOLE IN LINE	PIPE
BRIDGE CREEK SCHOOL	10/21/1992	S20675	AT FACILITY	0	VANDALISM TURNED OFF FLOW VALVE & TURNED ON WATER HYDRANT	
BRIDGE CREEK SCHOOL	10/21/1992	S20675	AT TREATMENT PLANT		VANDALISM	
BRIDGE CREEK SCHOOL	3/21/1994	S20675	LAGOON	50	OPERATING MISTAKE	
BRIDGE CREEK SCHOOL	1/25/1996	S20675	WWTP		FLOAT BROKE	
HOLDENVILLE	2/28/1990	S20805	IN THE ALLEY BEHIND 215 S. OAK		HEAVY RAINS	
HOLDENVILLE	3/6/1990	S20805			RAINFALL	
HOLDENVILLE	3/6/1990	S20805	AQUA FARM ROAD	1000	HEAVY RIANFALL	
HOLDENVILLE	3/6/1990	S20805	215 S. OAK	5000	HEAVY RAINFALL	
HOLDENVILLE	3/6/1990	S20805	200 W. HICKORY	25000	HEAVY RAINFALL	
HOLDENVILLE	3/9/1990	S20805	AQUA FARM ROAD	1000	HEAVY RAINFALL	
HOLDENVILLE	3/9/1990	S20805	215 S. OAK	2500	HEAVY RAINFALL	
HOLDENVILLE	3/9/1990	S20805	200 W. HICKORY	15000	HEAVY RAINFALL	
HOLDENVILLE	3/11/1990	S20805	200 W. HICKORY	1000	HEAVY RAINFALL	
HOLDENVILLE	3/11/1990	S20805	AQUA FARM ROAD	1000	HEAVY RAINFALL	
HOLDENVILLE	3/11/1990	S20805	215 S. OAK	20000	HEAVY RAINFALL	
HOLDENVILLE	3/11/1990	S20805	200 W. HICKORY	65000	HEAVY RAINFALL	
HOLDENVILLE	3/14/1990	S20805	215 S. OAK	19500	HEAVY RAINFALL	
HOLDENVILLE	3/14/1990	S20805	200 W. HICKORY	48400	HEAVY RAINFALL	
HOLDENVILLE	3/14/1990	S20805	AQUA FARM ROAD	72000	HEAVY RAINFALL	
HOLDENVILLE	3/27/1990	S20805	MANHOLEAT 200 W. HICKORY	5000	HEAVY RAINFALL	
HOLDENVILLE	3/27/1990	S20805	200 W. HICKORY	5000	HEVY RAIFALL	
HOLDENVILLE	3/28/1990	S20805	MANHOLE 215 OAK	500	HEAVY RAINFALL	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	3/28/1990	S20805	215 S. OAK	500	HEAVY RAINFALL	
HOLDENVILLE	4/25/1990	S20805	AQUA FARM ROAD	423000	DISCHARGES DUE TO HEAVY RAINFALL	
HOLDENVILLE	4/26/1990	S20805	SOUTH OAK	6750	DISCHARGES DUE TO HEAVY RAINFALL	
HOLDENVILLE	4/26/1990	S20805	AT WEST HICKORY	282000	DISCHARGES DUE TO HEAVY RAINFALL	
HOLDENVILLE	4/27/1990	S20805	SOUTH OAK	938	DISCHARGES DUE TO HEAVY RAINFALL	
HOLDENVILLE	5/2/1990	S20805	215 S. OAK	18375	EXCESSIVE RAIN	
HOLDENVILLE	5/2/1990	S20805	200 W. HICKORY	73500	EXCESSIVE RAIN	
HOLDENVILLE	5/2/1990	S20805	AQUAFARM ROAD MANHOLE OVERFLOW	126000	EXCESSIVE RAIN	
HOLDENVILLE	5/4/1990	S20805	WEST HICKORY AND AQUA FARM ROAD	141000	HEAVY RAINFALL	
HOLDENVILLE	5/3/1991	S20805	215 S. OAK	4	EXCESSIVE RAIN	
HOLDENVILLE	5/3/1991	S20805	200 W. HICKORY	6	EXCESSIVE RAIN	
HOLDENVILLE	5/3/1991	S20805	AQUA-FARL ROAD	8	EXCESSIVE RAIN	
HOLDENVILLE	5/6/1991	S20805	215 S. OAK	310	HEAVY RAIN	
HOLDENVILLE	6/2/1991	S20805	215 S. OAK	6	EXCESSIVE RAIN	
HOLDENVILLE	6/2/1991	S20805	200 W. HICKORY	8	EXCESSIVE RAIN	
HOLDENVILLE	6/2/1991	S20805	AQUA FARMS ROAD	10	EXCESSIVE RAIN	
HOLDENVILLE	6/3/1991	S20805	200 COMMERCE		LIFT STATION MOTOR BROKE	
HOLDENVILLE	6/3/1991	S20805	215 S OAK	6000	HEAVY RAIN	
HOLDENVILLE	6/3/1991	S20805	200 W HICKORY	8000	HEAVY RAIN	
HOLDENVILLE	6/3/1991	S20805	AQUA FARON RD	10000	HEAVY RAIN	
HOLDENVILLE	6/5/1991	S20805	215 S. OAK	2	EXCESSIVE RAIN	
HOLDENVILLE	6/5/1991	S20805	200 W. HICKORY	6	EXCESSIVE RAIN	
HOLDENVILLE	6/5/1991	S20805	AQUA FARMS ROAD	10	EXCESSIVE RAIN	
HOLDENVILLE	10/31/1991	S20805	AQUA FARM ROAD		EXCESSIVE RAINFALL	
HOLDENVILLE	10/31/1991	S20805	200 W HICKORY		EXCESSIVE RAINFALL	
HOLDENVILLE	10/31/1991	S20805	215 S OAK		EXCESSIVE RAINFALL	
HOLDENVILLE	6/11/1992	S20805	1/4 N OF #270 #48 INTERSECTION		LINE STOPPED UP	
HOLDENVILLE	6/11/1992	S20805	1/4 MI NORTH OF HIGHWAY 270 AND HIGHWAY 48 INTERSECTION	0	HEAVING RAIN AND STOPPAGE IN THE LINE	
HOLDENVILLE	9/6/1993	S20805	ARNOLD ACRES APARTMENTS	300	LINE STOPPAGE	
HOLDENVILLE	2/22/1994	S20805	215 S OAK	1500	RAINFALL	
HOLDENVILLE	3/8/1994	S20805	215 SOUTH OAK	30000	RAIN AND SLEET I/I	
HOLDENVILLE	3/26/1994	S20805	215 S OAK	1000	I/I	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	4/11/1994	S20805	215 SOUTH OAK	1500	HEAVY RAIN	
HOLDENVILLE	4/29/1994	S20805	215 OAK	3000	RAIN I/I	
HOLDENVILLE	5/3/1994	S20805	1/4 MILE N. HIWAY 270 ON HIWAY 48	50	PUMP FAILURE	
HOLDENVILLE	6/27/1994	S20805	N LIFT STATION	200	PUMPS WENT OUT AT MAIN LIFT STATION	
HOLDENVILLE	1/26/1995	S20805	410 NORTH HINKLEY	20	LINE BLOCKAGE	
HOLDENVILLE	1/26/1995	S20805	300 POPLAR	2000	LINE BLOCKAGE	
HOLDENVILLE	5/9/1995	S20805	1/4 N OF 270 & 48TH HERITAGE VILLAGE	25000	LINE BACK PRESSURE	
HOLDENVILLE	6/21/1996	S20805	HOUSING PROJECT LIFT STATION	1000	ELECTRICAL FAILURE	
HOLDENVILLE	9/5/1996	S20805	100 LAKESIDE	50	SEWER INSTALLED IMPROPERLY	
HOLDENVILLE	11/14/1996	S20805	1ST BETWEEN OAK		LINE PLUGGED	
HOLDENVILLE	2/26/1997	S20805	1/4 OF 270 - 48		RAIN	
HOLDENVILLE	2/26/1997	S20805	CYPRESS		RAIN	
HOLDENVILLE	2/26/1997	S20805	202 N. CHERRY		RAIN	
HOLDENVILLE	2/26/1997	S20805	200 W. HICKORY		RAIN	
HOLDENVILLE	2/26/1997	S20805			RAIN	
HOLDENVILLE	12/23/1997	S20805	270/48		RAIN	
HOLDENVILLE	12/23/1997	S20805	100 S. BURGESS		OLD SEWER LINE	
HOLDENVILLE	4/26/1998	S20805	MH AT PLANT		RAIN	
HOLDENVILLE	6/16/1998	S20805	L.S.		PUMPS DOWN	
HOLDENVILLE	7/9/1998	S20805	KINGS BERRY L.S.		PUMP FAILURE	
HOLDENVILLE	1/16/2000	S20805	BEHIND WALMART		LINE STOPPED	
HOLDENVILLE	2/9/2001	S20805			RAIN	
HOLDENVILLE	2/20/2002	S20805	CHAPMAN L.S.		UNDER REPAIR	LIFT STATION
HOLDENVILLE	3/25/2002	S20805	WWTP	10,000	RAIN	
HOLDENVILLE	6/13/2002	S20805	CYPRESS ST.	150,000	RAIN	MANHOLE
HOLDENVILLE	7/1/2002	S20805	HOLDING POND S. OF TREATMENT PLANT	86,400	RAIN	
HOLDENVILLE	7/10/2002	S20805	ALLEY AT VORHEES & 2ND IN PENN WEST	100	LINE STOPPAGE	MANHOLE
HOLDENVILLE	7/10/2002	S20805	ALLEY AT VORHEES & 2ND P.W. BEHIND 206 E. 2ND P.W.	100	STOPPED MANHOLE	
HOLDENVILLE	7/10/2002	S20805	W. OF TOWN AT THE ARNOLD ACRES APTS.	5,000	L.S. DOWN	MANHOLE
HOLDENVILLE	7/12/2002	S20805	S. OF TREATMENT PLANT	75,000	RAIN	LAGOON/BASIN
HOLDENVILLE	7/17/2002	S20805	S. OF PLANT - HOLDING PONDS	8,000	RAIN	
HOLDENVILLE	7/29/2002	S20805	S. OF PLANT - HOLDING POND	7,800	I&I	LAGOON/BASIN
HOLDENVILLE	9/19/2002	S20805	S. OF PLANT	9,000	I&I	LAGOON/BASIN
HOLDENVILLE	10/9/2002	S20805	HOLDING PONDS S. OF PLANT	>1 MILLN	I&I	LAGOON/BASIN
HOLDENVILLE	10/20/2002	S20805	S. OF PLANT - HOLDING POND	95,000	I&I	LAGOON/BASIN

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	10/24/2002	S20805	S. OF PLANT - HOLDING POND		I&I	
HOLDENVILLE	10/28/2002	S20805	S. OF PLANT	57,600	I&I	LAGOON/BASIN
HOLDENVILLE	11/5/2002	S20805	S. OF PLANT	10,000	I&I	MANHOLE
HOLDENVILLE	12/3/2002	S20805	WEST OF PLANT	6,000	I&I	MANHOLE
HOLDENVILLE	12/13/2002	S20805	S. OF PLANT	8,000	I&I	LAGOON/BASIN
HOLDENVILLE	12/24/2002	S20805	PLANT	1,000	I&I	MANHOLE
HOLDENVILLE	12/26/2002	S20805	LAGOON	6,000	I&I	MANHOLE
HOLDENVILLE	12/30/2002	S20805	S. OF PLANT	12,500	I&I	LAGOON/BASIN
HOLDENVILLE	2/3/2003	S20805	3RD & GULF	1,000	MALFUNCTION OF L.S.	LIFT STATION
HOLDENVILLE	2/6/2003	S20805	HOLDING PONDS S. OF PLANT	9,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/8/2003	S20805	301 DIAMOND	350	ROOTS	MANHOLE
HOLDENVILLE	2/10/2003	S20805	209 GRIMES ST.	10	STORM WATER	MANHOLE
HOLDENVILLE	4/16/2003	S20805	108 BUTTS ST.	20	STOPPED LINE	PIPE
HOLDENVILLE	5/10/2003	S20805	108 BUTTS DR.	100	STORM WATER	MANHOLE
HOLDENVILLE	5/20/2003	S20805	S. OF PLANT	100	I&I	LAGOON/BASIN
HOLDENVILLE	5/20/2003	S20805	PLANT	50	I&I	MANHOLE
HOLDENVILLE	5/21/2003	S20805	S. OF PLANT	95	I&I	LAGOON/BASIN
HOLDENVILLE	6/12/2003	S20805	S. OF PLANT	450	I&I	MANHOLE
HOLDENVILLE	6/13/2003	S20805	HEADWORKS	100	I&I	MANHOLE
HOLDENVILLE	8/2/2003	S20805	HEADWORKS	150	I&I	MANHOLE
HOLDENVILLE	9/2/2003	S20805	LAGOON S. OF WWTP	250	I&I	LAGOON/BASIN
HOLDENVILLE	9/23/2003	S20805	201 DIAMOND	150	BLOCKAGE	MANHOLE
HOLDENVILLE	10/14/2003	S20805	ARNOLD ACRES	3,500	RAGS	PIPE
HOLDENVILLE	12/2/2003	S20805	1000 S. OAK	2,000	STOPPAGE	MANHOLE
HOLDENVILLE	12/4/2003	S20805	NORTH L.S. ON HWY 48	200	PUMP DOWN	LIFT STATION
HOLDENVILLE	1/13/2004	S20805	500 E. HWY 270	2,000	PIPE COLLAPSED	PIPE
HOLDENVILLE	1/21/2004	S20805	HOLDING POND	600	I&I	LAGOON/BASIN
HOLDENVILLE	3/4/2004	S20805		100		
HOLDENVILLE	3/13/2004	S20805	W. OF HWY 48 ON HWY 270	50,000	LINE BREAK	PIPE
HOLDENVILLE	3/18/2004	S20805	ARNOLD ACRES	1,200	PIPE BREAK	PIPE
HOLDENVILLE	5/15/2004	S20805	ARNOLD ACRES ON SPAULDING RD.	1,500	BLOCKAGE	LIFT STATION
HOLDENVILLE	9/29/2004	S20805	ECHO ST. AT COVEY RD. & SPAULDING	5500	BUSTED PIPE	PIPE
HOLDENVILLE	10/4/2004	S20805	PLANT	1,500	ELECTRICAL DAMAGE	LAGOON/BASIN
HOLDENVILLE	10/11/2004	S20805	PLANT	20,000	RAIN	LAGOON/BASIN
HOLDENVILLE	10/27/2004	S20805	PLANT	50,000	RAIN	LAGOON/BASIN
HOLDENVILLE	10/31/2004	S20805	PLANT	100,000	RAIN	LAGOON/BASIN

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	10/31/2004	S20805	1/4 MILE N. OF HWY 270 ON HWY 48 - HERITAGE VILLAGE	2,500	RAIN	PIPE
HOLDENVILLE	11/1/2004	S20805	1101 S. BROADWAY	1,000	BLOCKAGE	PIPE
HOLDENVILLE	11/17/2004	S20805	PLANT	200	I&I	LAGOON/BASIN
HOLDENVILLE	11/18/2004	S20805	HOLDING PONDS	2,000	I&I	LAGOON/BASIN
HOLDENVILLE	11/19/2004	S20805	PLANT	2,000	I&I	LAGOON/BASIN
HOLDENVILLE	11/22/2004	S20805	PLANT	2,000	I&I	LAGOON/BASIN
HOLDENVILLE	11/23/2004	S20805	PLANTS	5,000	I&I	MANHOLE
HOLDENVILLE	12/6/2004	S20805	PLANT	2,000	I&I	
HOLDENVILLE	12/7/2004	S20805	PLANT	2,000	I&I	LAGOON/BASIN
HOLDENVILLE	12/8/2004	S20805	PLANT	2,000	I&I	LAGOON/BASIN
HOLDENVILLE	12/9/2004	S20805	PLANT	1,000	I&I	LAGOON/BASIN
HOLDENVILLE	12/27/2004	S20805	PLANT	500	I&I	LAGOON/BASIN
HOLDENVILLE	12/28/2004	S20805	PLANT	500	I&I	LAGOON/BASIN
HOLDENVILLE	1/3/2005	S20805	HEADWORKS	5,000	I&I	MANHOLE
HOLDENVILLE	1/4/2005	S20805	PLANT	2,000	I&I	PIPE
HOLDENVILLE	1/4/2005	S20805	PLANT	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/5/2005	S20805	HOLDING PONDS	5,000	RAIN	LAGOON/BASIN
HOLDENVILLE	1/5/2005	S20805	PLANT	5,000	RAIN	PIPE
HOLDENVILLE	1/6/2005	S20805	PLANT	10,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/6/2005	S20805	PLANT	10,000	I&I	PIPE
HOLDENVILLE	1/19/2005	S20805	HOLDING PONDS	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/20/2005	S20805	PLANT	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/20/2005	S20805	PLANT	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/24/2005	S20805	PLANT	1,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/25/2005	S20805	PLANT	1,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/26/2005	S20805	PLANTS	1,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/27/2005	S20805	PLANT	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	1/31/2005	S20805	PLANT	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/2/2005	S20805	PLANT	5,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/3/2005	S20805	PLANT	4,500	I&I	LAGOON/BASIN
HOLDENVILLE	2/4/2005	S20805	PLANT	4,500	I&I	LAGOON/BASIN
HOLDENVILLE	2/7/2005	S20805	PLANT	10,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/8/2005	S20805	PLANT	20,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/9/2005	S20805	PLANT - HOLDEN PONDS	20,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/10/2005	S20805	PLANT	20,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/14/2005	S20805	PLANT	10,000	I&I	LAGOON/BASIN

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	2/15/2005	S20805	PLANT	10,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/15/2005	S20805	HERITAGE VILLAGE RETIREMENT VILLAGE	30	STOPPAGE	MANHOLE
HOLDENVILLE	2/16/2005	S20805	PLANT	10,000	I&I	LAGOON/BASIN
HOLDENVILLE	2/17/2005	S20805	PLANT	6 MILLN	I&I	LAGOON/BASIN
HOLDENVILLE	3/8/2005	S20805	NORTH LIFT STATION	2 MILLN	PUMP FAILURE	LIFT STATION
HOLDENVILLE	3/21/2005	S20805	101 SPALDING RD.	75	STOPPAGE	MANHOLE
HOLDENVILLE	3/21/2005	S20805	N. OF CITY IN FRONT OF HERITAGE VILLAGE	80	I&I	MANHOLE
HOLDENVILLE	3/27/2005	S20805	101 E. POPLAR	30	STOPPAGE	PIPE
HOLDENVILLE	5/9/2005	S20805	S. BROADWAY & S. CREEK AT 1ST	200	BLOCKAGE	PIPE
HOLDENVILLE	5/30/2005	S20805	PLANT	100,000	SLUDGE	CLARIFIER
HOLDENVILLE	7/2/2005	S20805	HERITAGE VILLAGE		RAIN	MANHOLE
HOLDENVILLE	7/3/2005	S20805		2,500	RAIN	MANHOLE
HOLDENVILLE	7/5/2005	S20805		2,000	I&I	MANHOLE
HOLDENVILLE	7/29/2005	S20805	1023 S. BROADWAY	900	BLOCKAGE	PIPE
HOLDENVILLE	8/14/2005	S20805	HERITAGE VILLAGE	1,000	I&I	LAGOON/BASIN
HOLDENVILLE	8/14/2005	S20805	PLANT	25,000	I&I	MANHOLE
HOLDENVILLE	8/14/2005	S20805	PLANT	25,000	I&I	
HOLDENVILLE	8/14/2005	S20805	PLANT	5,000	I&I	MANHOLE
HOLDENVILLE	8/15/2005	S20805	PLANT	25,000	I&I	LAGOON/BASIN
HOLDENVILLE	8/16/2005	S20805	PLANT	25,000	I&I	LAGOON/BASIN
HOLDENVILLE	8/16/2005	S20805	PLANT	25,000	I&I	MANHOLE
HOLDENVILLE	8/17/2005	S20805	PLANT	2,000	I&I	MANHOLE
HOLDENVILLE	8/17/2005	S20805	PLANT	25,000	I&I	LAGOON/BASIN
HOLDENVILLE	8/17/2005	S20805	PLANT	5,000	I&I	MANHOLE
HOLDENVILLE	8/23/2005	S20805	405 & 403 S. BROADWAY	500	BLOCKAGE	PIPE
HOLDENVILLE	9/15/2005	S20805	ON GROUND AT DITCH	500	CONSTRUCTION ERRORS	
HOLDENVILLE	9/15/2005	S20805	PLANT	500,000	I&I	MANHOLE
HOLDENVILLE	9/23/2005	S20805	101 POPLAR	50	BLOCKAGE	PIPE
HOLDENVILLE	9/25/2005	S20805	HERITAGE VILLAGE NURSING HOME - HWY 48	100	BLOCKAGE	PIPE
HOLDENVILLE	10/25/2005	S20805	101 POPLAR ST.	20	BLOCKAGE	PIPE
HOLDENVILLE	10/27/2005	S20805	HERITAGE VILLAGE	2,000	BLOCKAGE	PIPE
HOLDENVILLE	10/31/2005	S20805	HERITAGE VILLAGE	200,000	I&I	MANHOLE
HOLDENVILLE	11/11/2005	S20805	KELKER & MAIN	2,000	BLOCKAGE	MANHOLE
HOLDENVILLE	11/12/2005	S20805	KELKER & MAIN	2,000	BLOCKAGE	MANHOLE
HOLDENVILLE	11/13/2005	S20805	KELKER & MAIN	2,000	BLOCKAGE	MANHOLE
HOLDENVILLE	11/14/2005	S20805	KELKER & MAIN	2,000	BLOCKAGE	MANHOLE
HOLDENVILLE	11/15/2005	S20805	KELKER & MAIN ST.	2,000	BLOCKAGE	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	11/18/2005	S20805	MAIN & KELKER	1,000	BLOCKAGE	PIPE
HOLDENVILLE	11/18/2005	S20805	HERITAGE VILLAGE	200	BLOCKAGE	PIPE
HOLDENVILLE	11/21/2005	S208005	101 SPALDING RD.	1,000	L.S. DOWN	LIFT STATION
HOLDENVILLE	11/23/2005	S20805	100 GRIMES ST.	1,000	BLOCKAGE	PIPE
HOLDENVILLE	11/30/2005	S20805	HERITAGE VILLAGE	500	OVERFLOW	
HOLDENVILLE	12/5/2005	S20805	206 E. 2ND	2,000	BLOCKAGE	PIPE
HOLDENVILLE	12/14/2005	S20805	101 POPLAR	20	BLOCKAGE	PIPE
HOLDENVILLE	12/14/2005	S20805	HERITAGE VILLAGE	5,000	BLOCKAGE	MANHOLE
HOLDENVILLE	12/15/2005	S20805	HERITAGE VILLAGE	5,000	BLOCKAGE	PIPE
HOLDENVILLE	12/16/2005	S20805	HERITAGE VILLAGE	2,000	BLOCKAGE	PIPE
HOLDENVILLE	12/20/2005	S20805	100 CLIFT DR. HOUSING PROJECT	1,500	PIPE CRACKED	PIPE
HOLDENVILLE	12/20/2005	S20805	402 COUNTRY CLUB	15	BLOCKAGE	PIPE
HOLDENVILLE	12/21/2005	S20805	MCDOUGLE & RODGERS	500	BLOCKAGE	PIPE
HOLDENVILLE	12/25/2005	S20805	HERITAGE VILLAGE HWY 48	2,000	BLOCKAGE	MANHOLE
HOLDENVILLE	12/28/2005	S20805	ARNOLD ACRES	2,000	MALFUNCTION	LIFT STATION
HOLDENVILLE	12/29/2005	S20805	ARNOLD ACRES	2,000	ELECTRICAL PROBLEM	LIFT STATION
HOLDENVILLE	12/30/2005	S20805	ARNOLD ACRES	2,000	ELECTRICAL PROBLEMS	MANHOLE
HOLDENVILLE	1/5/2006	S20805	OLD HWY 270AT TYSON L.S.	100,000	BUSTED PIPE	PIPE
HOLDENVILLE	1/16/2006	S20805	HERITAGE VILLAGE	1,000	BLOCKAGE	PIPE
HOLDENVILLE	1/23/2006	S20805	HERITAGE VILLAGE	2,000	BLOCKAGE	PIPE
HOLDENVILLE	1/24/2006	S20805	101 POPLAR	20	BLOCKAGE	PIPE
HOLDENVILLE	1/30/2006	S20805	101 POPLAR	20	LINE STOPPAGE	PIPE
HOLDENVILLE	2/17/2006	S20805	412 HICKORY	100	BLOCKAGE	PIPE
HOLDENVILLE	2/24/2006	S20805	101 POPLAR	50	BLOCKAGE	PIPE
HOLDENVILLE	2/27/2006	S20805	615 N. HINKLEY	100	BLOCKAGE	MANHOLE
HOLDENVILLE	3/3/2006	S20805	1105 S. OAK	200	BLOCKAGE	MANHOLE
HOLDENVILLE	3/3/2006	S10805	HOUSING	50	BLOCKAGE	MANHOLE
HOLDENVILLE	3/4/2006	S20805	101 POPLAR	50	BLOCKAGE	PIPE
HOLDENVILLE	3/6/2006	S20805	PLANT	100	FOAM	CLARIFIER
HOLDENVILLE	3/7/2006	S20805	103 SURREY LN.		PROBLEM WITH MANHOLE	MANHOLE
HOLDENVILLE	3/9/2006	S20805	702 GRIMES	20	BLOCKAGE	MANHOLE
HOLDENVILLE	3/11/2006	S20805	101 POPLAR	50	BLOCKAGE	PIPE
HOLDENVILLE	3/19/2006	S20805	PLANT	100	STORMWATER	MANHOLE
HOLDENVILLE	3/20/2006	S20805	PLANT	200	FOAM	CLARIFIER
HOLDENVILLE	3/21/2006	S20805	PLANT		FOAM	CLARIFIER
HOLDENVILLE	3/26/2006	S20805	PLANT	50	UNKNOWN	MANHOLE
HOLDENVILLE	3/30/2006	S20805	PLANT	1,000	I&I	CLARIFIER

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	3/30/2006	S20805	PLANT	100	I&I	CLARIFIER
HOLDENVILLE	3/30/2006	S20805	PLANT	500	I&I	MANHOLE
HOLDENVILLE	4/17/2006	S20805	1100 S. OAK	100	BLOCKAGE	MANHOLE
HOLDENVILLE	4/25/2006	S20805	207 KELLY DR.	50	CLOGGED LINE	MANHOLE
HOLDENVILLE	4/25/2006	S20805	101 KELLY DR.	50	CLOGGED LINE	MANHOLE
HOLDENVILLE	4/29/2006	S20805	PLANT	400	RAINS	MANHOLE
HOLDENVILLE	5/5/2006	S208005	GULF & 7TH	1,000	BLOCKAGE	
HOLDENVILLE	5/8/2006	S20805	N. SIDE OAK RIDGE ACROSS FROM CHAPMAN L.S.	1,000	L.S. DOWN	MANHOLE
HOLDENVILLE	5/17/2006	S20805	PLANT	100	LEAK AT POOL	MANHOLE
HOLDENVILLE	5/20/2006	S20805	LINE IN FRONT OF NICHOLS	100	CLOGGED	
HOLDENVILLE	5/31/2006	S20805	PLANT SPITTER BOX	300	RAIN	PIPE
HOLDENVILLE	6/14/2006	S20805	PLANT	100	LEAK IN HOSE AT PUMP	
HOLDENVILLE	7/8/2006	S20805	HOUSING LIFT STATION	200	LIFT STATION	
HOLDENVILLE	7/9/2006	S20805	HOUSING LIFT STATION - 400 CLIFT DR.	400	LIFT STATION DOWN	LIFT STATION
HOLDENVILLE	9/11/2006	S20805	PLANT	1,000	PUMP FAILURE	LAGOON/BASIN
HOLDENVILLE	9/19/2006	S20805	PLANT		BLOCKAGE	
HOLDENVILLE	10/5/2006	S20805	LIFT STATION	350	PUMP FAILURE	MANHOLE
HOLDENVILLE	10/21/2006	S20805	TYSON LIFT STATION	1,000	PUMP FAILURE	LIFT STATION
HOLDENVILLE	11/1/2006	S20805	TYSON L.S.	300	TRASH IN PUMP	MANHOLE
HOLDENVILLE	11/6/2006	S20805	HOLDENVILLE RIDGE APTS.	500	PUMP FAILURE	MANHOLE
HOLDENVILLE	11/7/2006	S20805	HOLDENVILLE RIDGE APTS.	500	PUMP AIR LOCKED	MANHOLE
HOLDENVILLE	11/29/2006	S20805	ARNOLD ACRES	800	PUMPS LOCKED	MANHOLE
HOLDENVILLE	12/7/2006	S20805	ARNOLD ACRES APTS.	100	PUMP FAILURE	MANHOLE
HOLDENVILLE	12/19/2006	S20805	PLANT	5,000	OVERFLOW	MANHOLE
HOLDENVILLE	12/23/2006	S2085	HOLDENVILLE RIDGE APTS.	300	PUMP FAILURE	MANHOLE
HOLDENVILLE	12/29/2006	S20805	RIDGE APTS	300	MALFUNCTION	MANHOLE
HOLDENVILLE	1/4/2007	S20805	430 VORHEIS	100	L.S. DOWN	LIFT STATION
HOLDENVILLE	1/5/2007	S20805	ARNOLD ACRES	250	L.S. AIR LOCKED	MANHOLE
HOLDENVILLE	1/9/2007	S20805	RIDGE APTS.	96,000	LIFT STATION	MANHOLE
HOLDENVILLE	1/12/2007	S20805	RIDGE APTS.	400	PUMP FAILURE	MANHOLE
HOLDENVILLE	1/13/2007	S20805	RIDGE APTS	5,000	PUMP FAILURE	MANHOLE
HOLDENVILLE	1/13/2007	S20805	RIDGE APTS.	56,000	LIFT STATION	MANHOLE
HOLDENVILLE	1/14/2007	S20805	REGIONAL APTS.	200,000		
HOLDENVILLE	1/16/2007	S20805	RIDGE APTS.	5,000	L.S. DOWN	MANHOLE
HOLDENVILLE	1/19/2007	S20805	LIFT STATION	500,000	DISASSEMBLE & CLEAN LINES	MANHOLE
HOLDENVILLE	1/23/2007	S20805	PLANT	10,000	I&I	MANHOLE
HOLDENVILLE	1/23/2007	S20805	TYSON L.S. ON OLD HWY 270	20,000	CLAMP ON PIPE DIDN'T HOLD	PIPE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE	1/23/2007	S20805	PLANT	200	I&I	
HOLDENVILLE	1/26/2007	S20805	114 7TH	1,000	BLOCKAGE	MANHOLE
HOLDENVILLE	1/26/2007	S20805	124 E. COMMERCE	500	BLOCKAGE	LAGOON/BASIN
HOLDENVILLE	2/8/2007	S20805	RIDGE APTS.	500	PUMP FAILURE	MANHOLE
HOLDENVILLE	2/12/2007	S20805	RIDGE APTS.	400	PUMP FAILURE	MANHOLE
HOLDENVILLE	2/19/2007	S20805	714 E. MAIN	7,000	SEWER STOPPAGE	MANHOLE
HOLDENVILLE	2/20/2007	S20805	RIDGE APTS.	5,000	PUMP FAILURE	LIFT STATION
HOLDENVILLE	2/20/2007	S20805	815 S. CREEK	500	SEWER STOPPED UP	MANHOLE
HOLDENVILLE		S20805	S. OF PLANT			
HOLDENVILLE		S20805	HOLDING PONDS			LAGOON/BASIN
HOLDENVILLE		S20805	HOLDING PONDS S. OF PLANT		I&I	
HOLDENVILLE		S20805	PLANT		I&I	LAGOON/BASIN
HOLDENVILLE		S20805	PLANT		I&I	
HOLDENVILLE		S20805	PLANT		I&I	
HOLDENVILLE		S20805				
HOLDENVILLE		S20805	BECK & MCCOY RD.			
HOLDENVILLE		S20805	200 W. HICKORY	23	HEAVY RAIN	
HOLDENVILLE		S20805	215 S. OAK	12000	HEAVY RAIN	
HOLDENVILLE		S20805	AQUA FARM ROAD	25000	HEAVY RAIN	
HOLDENVILLE WWTP	4/11/2000	S20805	1/4 N OF HWY 270 AT HWY 48		EXCESSIVE RAIN	
HOLDENVILLE WWTP	4/15/2000	S20805	1/4 N OF HWY 270 AT HWY 48. AND 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	4/22/2000	S20805	1/2 N OF HWY 270 AT HWY 48. AND 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	5/9/2000	S20805	1/4 N OF HWY 270 AT HWY 48. AND 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	5/24/2000	S20805	1/4 N OF HWY 270 AT HWY 48. AND 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	5/26/2000	S20805	1/4 N OF HWY 270 ON HWY 48 & 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	7/12/2000	S20805	1/4 N OF HWY 270 AT HWY 48. AND AT 200 W HICKORY			
HOLDENVILLE WWTP	7/21/2000	S20805	1/4 N OF HWY 270 AT HWY 48. AND AT 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	7/22/2000	S20805	1/4 N OF HWY 270 AT HWY 48. AND 200 W HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	7/28/2000	S20805	HERITAGE VILLAGE & 200 W. HICKORY		EXCESSIVE RAIN	
HOLDENVILLE WWTP	11/6/2000	S20805	BECK/MCCOY RD			
HOLDENVILLE WWTP	1/29/2001	S20805	400 E 9TH	UNKNOWN	LINE BLOCKAGE. HEAVY RAIN	
HOLDENVILLE WWTP	1/30/2001	S20805	48/270 N 4 MILE	UNKNOWN	RAIN	
HOLDENVILLE WWTP	1/30/2001	S20805	BECK/MCCOY RD	UNKNOWN	RAIN	
HOLDENVILLE WWTP	2/9/2001	S20805	BECK/MCCOY RD		RAIN	
HOLDENVILLE WWTP	2/15/2001	S20805	1/4 MILE NORTH OF 270/48 INTERSECTION		RAIN	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
HOLDENVILLE WWTP	2/15/2001	S20805	BECK/MCCOY RD		RAIN	
HOLDENVILLE WWTP	2/23/2001	S20805	BECK/MCCOY RD		HEAVY RAINS	
HOLDENVILLE WWTP	2/23/2001	S20805	1/4 N OF 270/48		HEAVY RAIN	
HOLDENVILLE WWTP	3/10/2001	S20805	200 BLK OF W. CYPRESS		RAIN	
HOLDENVILLE WWTP	3/10/2001	S20805	PENN WEST LIFT STATION COMMERCE ST		RAIN	LIFT STATION
HOLDENVILLE WWTP	3/10/2001	S20805	BECK MCCOY RD		RAIN	
KONAWA	3/11/1990	S20629	KONAWA WASTEWATER TREATMENT PLANT		HEAVY RAINFALL	
KONAWA	4/26/1990	S20629	BYPASSING AT HEADWORKS OF THE PLANT	100000	RAIN INDUCED HYDRAULIC OVERLOAD	
KONAWA	5/2/1990	S20629	BYPASSING AT THE BAR SCREEN AT THE SEWAGE TREATMENT PLANT	100000	HYDRAULIC OVERLOAD DUE TO RAIN	
KONAWA	6/8/1991	S20629	HEAD OF SEWER PLANT	82	OVERLOAD DUE TO RAIN	
KONAWA	6/30/1991	S20629	2425 WEATHERFORD DRIVE - BISHOP CREEK	75	PAPER TOWELS, GREASE	
KONAWA	7/1/1991	S20629	LIFT STATION ON EAST COLONIAL DRIVE	1500	POWER FAILURE	
KONAWA	11/16/1991	S20629	SOUTH BAR SCREEN AT THE WASTEWATER TREATMENT PLANT	80000	INFLOW/INFILTRATION OVERLOADED THE SYSTEM	
KONAWA	12/20/1991	S20629	WEST WTP	210	INFILTRATION, HEAVY RAIN	
KONAWA	12/20/1991	S20629	WWTP HOLDING POND FILLED UP	210000	EXCESSIVE RAINFALL	
KONAWA	5/19/1992	S20629	WWTP	100000	PLANT OVERLOAD DUE TO I/I	
KONAWA	6/2/1992	S20629	WWTP	100000	PLANT SURCHARGE BY RAIN & I/I	
KONAWA	6/29/1992	S20629	WWTP	100000	EXCESSIVE RAINFALL I/I	
KONAWA	12/9/1992	S20629	SOUTH BAR SCREEN AND MH 2	0	I/I FROM HEAVY RAINFALL	
KONAWA	12/13/1992	S20629	WWTP HOLDING POND		I/I FROM HEAVY RAINFALL	
KONAWA	2/15/1993	S20629	AT WWTP		RAIN OVERLOAD	
KONAWA	4/4/1993	S20629	AT PLANT HEADWORKS AND MH #2		HYDROLIC OVER LOAD FROM RAIN	
KONAWA	6/5/1995	S20629	AT THE PLANT	0	WET WEATHER	
KONAWA	6/30/1999	S20629			RAIN	
LEXINGTON	10/13/1991	S20619	TREATMENT PLANT	78000	ELECTRICAL FAILURE	
LEXINGTON	10/14/1991	S20619	TREATMENT PLANT	78	POWER OUTAGE	
LEXINGTON	12/27/1991	S20619	LINE ACROSS CREEK IN TOWN	10000	LINE COLLASPED	
LEXINGTON	5/11/1992	S20619	SE FIRST STREET - 2 MANHOLES	0	OG&E'S POWER WENT OUT CAUSING POWER SHORTAGE	
LEXINGTON	12/11/1992	S20619	LIFT STATION AND MH AT NE 2ND AND ASH	1000	I/I FROM HEAVY RAINFALL	
LEXINGTON	5/9/1993	S20619	S.E. 1ST	10	CREEK OVERFLOWED MANHOLE - HEAVY RAIN	
LEXINGTON	5/23/1993	S20619	SE 1ST	5000	RAINFALL	
LEXINGTON	7/24/2002	S20619	S.E. 1ST & CATALPA	26,0000	LIFT STATION DOWN	LIFT STATION
MINCO	5/10/1993	S20610	NORTH & SECOND ST	5000	EXCESSIVE RAIN	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
MINCO	11/7/2002	S20610	LAGOON			LAGOON/BASIN
MINCO	1/16/2003	S20610		325	BLOCKAGE	MANHOLE
MINCO	3/11/2003	S20610	6TH ST AT BELLE & PONTOTOC	250	BLOCKAGE	MANHOLE
NOBLE	3/11/1990	S20651	NORTH TREATMENT PLANT		HEAVY RAINS	
NOBLE	3/11/1990	S20651	MANHOLE AT MAGUIRE ROAD AND BELL CREEK		HEAVY RAINS	
NOBLE	3/14/1990	S20651	MANHOLE AT 814 CATHERINE		HEAVY RAINS	
NOBLE	11/19/1990	S20651	NORTH PLANT		MAINTANANCE	
NOBLE	12/1/1990	S20651	900 ASPEN	1500	LINE BLOCK	
NOBLE	5/20/1991	S20651	814 CATHERINE STREET		SEWER STOPPED UP	
NOBLE	6/24/1991	S20651	NOBLE NORTH PLANT		AERATOR MOTOR BURNED UP	
NOBLE	6/24/1991	S20651	NORTH PLANT/ PASSING THROUGH PLANT W/OUT AERIATION		MOTOR ON AERATION BROKE DOWN	
NOBLE	12/14/1992	S20617	901 MAGUIRE, 814 CATHERINE	0	TOO MUCH RAIN - SOUTH LAGOON TOO FULL	
NOBLE	12/8/1993	S20651	800 SOUTH HIWAY 77	1500	POP OFF VALVE ON FORCE MAIN	
NOBLE	3/14/1995	S20651	8143 CATHRINE	1000	COLLAPSED LINE	
NOBLE	3/22/1995	S20651	900 ACIACA	200	GREASE STOPPAGE	
NOBLE	5/26/1995	S20651	814 KATHERINE	0	RAIN I/I	
NOBLE	5/26/1995	S20651	810 CARTWRIGHT	0	RAIN I/I	
NOBLE	5/26/1995	S20651	MACQUIRE AND BELL CREEK	0	RAIN I/I	
NOBLE	6/4/1995	S20651	HEADWORKS AT PLANT	50000	RAIN I/I	
NOBLE	6/6/1995	S20651	5TH & 6TH AT MAPLE	1500	RAIN I/I	
NOBLE	6/6/1995	S20651	810 CARTWRIGHT	1500	RAIN I/I	
NOBLE	6/6/1995	S20651	814 KATHERINE	1500	RAIN I/I	
NOBLE	6/6/1995	S20651	BELL CREEK & MCQUIRE	1500	RAIN I/I	
NOBLE	1/4/1997	S20651	MCGUIRE & BELL CREEK/ KATHRINE & BELL CREEK	100,000	RAIN	
NOBLE	7/10/1997	S20651	1000 BLK. N. ASPEN	2,000	STOPPAGE	
NOBLE	12/24/1997	S20651	8TH & PECAN	70,000	LINE STOPPAGE	
NOBLE	4/25/1999	S20651	810 CARTWRIGHT/ CATHERINE ST INTO BELL CK. AT MAGUIRE RD.		PUMP FAILURE	
NOBLE	4/26/1999	S20651	810 CARTWRIGHT		PUMP FAILURE	
NOBLE	4/27/1999	S20651	CATHERINE ST		PUMP FAILURE	
NOBLE	6/27/2000	S	KATHERINE & JACQULYN/ MCGUIRE RD & BELL CREEK		RAIN	
NOBLE	7/2/2000	S20651	KATHERINE ST/MCGUIRE RD/CARTWRIGHT/MAPLE AT 5TH & 6TH		RAIN	
NOBLE	10/23/2000	S	MAGUIRE RD. & BELL CREEK / JACQUELYN & CATHERINE		RAIN	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NOBLE	10/26/2000	S20651	CATHERINE & JAQUELYN		RAIN	
NOBLE	10/26/2000	S20651	MAGUIRE RD & BELL CREEK		RAIN	
NOBLE	11/6/2000	S20651	KATHERINE & JACKSON/ MCGUIRE & BELL CK/ 812 CARTWRIGHT		RAIN	
NOBLE	11/8/2000	S20651	812 CARTWRIGHT		RAIN	
NOBLE	11/8/2000	S20651	MAGUIRE RD & BELL CR		RAIN	
NOBLE	11/15/2000	S	WOODLAND MHP		LINE STOPPAGE	
NOBLE	11/15/2000	S20651	WOODLAND MHP		GREASE & TRASH	
NOBLE	12/19/2000	S20651	807 E. ETOWAH		STOPPED LINE	
NOBLE	1/11/2001	S20651	812 CARTWRIGHT / BELL CREEK & MCGUIRE		WET WEATHER	
NOBLE	1/27/2001	S20651	812 CARTWRIGHT/ MCGUIRE RD. & BELL CR/ CATHERINE		RAIN	
NOBLE	1/30/2001	S20651	812 CARTWRIGHT		RAIN	
NOBLE	2/9/2001	S20651	CATHERINE & MCGUIRE & BELL CREEK		BLOCKAGE	
NOBLE	2/15/2001	S20651	CATHERINE & BELL CREEK/MAGUIRE RD.		RAIN	
NOBLE	2/23/2001	S20651	CATHERINE & MAGUIRE AT BELL CREEK		RAIN	
NOBLE	4/14/2001	S20651	MCGUIRE RD. & 8TH		BLOCKAGE	
NOBLE	5/30/2001	S20651	812 CARTWRIGHT/ MCGUIRE RD & BELL		RAIN	
NOBLE	2/19/2002	S20651	700 BLK. OF S. HWY77		ROOTS	
NOBLE	2/21/2002	S20651	PLANT L.S. WEST OF RR TRACKS		ROCKS & DEBRIS	
NOBLE	3/6/2002	S20651	4505 BROOKWOOD		ROOTS	
NOBLE	9/1/2004	S20651	4601 BROOKWOOD		ROOTS	MANHOLE
NOBLE	5/13/2005	S20651	PLANT	10,000	EQUIPMENT FAILURE	HEAD WORKS
NOBLE	4/10/2006	S20651	712 W. ETOWAH	160,000	ROOTS , RAGS & GREASE	
NOBLE	4/29/2006	S20651	200 BLK. OF CHERRY	4,000	ROOTS & GREASE	MANHOLE
NOBLE	6/27/2006	S206		400		
NOBLE	2/1/2007	S20651	1006 LINDEN LN.	4,000	BACKUP	PIPE
NOBLE	2/2/2007	S20651	1006 LINDEN LN.	400	BACKUP	PIPE
NOBLE	2/3/2007	S20651	812 ETOWAH RD.	75	ROOTS	MANHOLE
NOBLE	2/8/2007	S20651	900 BLK. N. MAIN IN CREEK N.E. OF 7-ELEVEN STORE	480,000	RAGS, GREASE & ROOTS	MANHOLE
NOBLE	2/19/2007	S20651	4600 BLK. OF ETOWAH	5,000	ROOTS	MANHOLE
NOBLE	3/12/2007	S20651	900 BLK. OF PARKWOODS	10,000	TOWELS & DEBRIS	MANHOLE
NOBLE	3/17/2007	S20651	1011 E. ETOWAH	1,000	ROOTS	MANHOLE
NOBLE	3/29/2007	S206	600 BLK. N. MAIN	800	ROOTS & GREASE	MANHOLE
NOBLE	3/30/2007	S206	4601 BROOKWOOD	1,000	ROOTS	
NOBLE	4/3/2007	S20651	1013 E. ETOWAH	125	ROOTS	MANHOLE
NOBLE	4/9/2007	S206		50,000		

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NOBLE SOUTH	5/17/1995	S20617	1200 S 8TH	2000	PUMPS FAILED AT LAGOON	
NOBLE WWTP	1/4/1998	20651	MAGUIRE & BELL CRK, CATHERINE & BELL CRK		HEAVY RAINS CAUSED TO HIGH INFILTRATION FOR SOUTH LIFT	
NOBLE(SOUTH)	5/2/1990	S20651	814 CATHERINE,BELL CREEK&MAGUIRE,500 BLK MAPLE ST,N PLANT		HEAVY RAINS WASHED OUT AERATION BASIN	
NOBLE(SOUTH)	9/23/1991	S20651	301 N 8TH		TREE ROOTS STOPPED UP	
NOBLE(SOUTH)	6/2/1992	S20651	814 CATHRINE			
NOBLE(SOUTH)	6/2/1992	S20651	814 KATHERINE	0	UNKNOWN. CHD SAID THAT REPORT WAS CALLED IN TO THEM.	
NOBLE(SOUTH)	11/18/1992	S20651	WWTP(AERATION BASIN)	220000	AERATATORS WENT OUT	
NOBLE(SOUTH)	11/19/1992	S20651	901 MAGUIRE RD	50	RAINFALL	
NOBLE(SOUTH)	11/25/1992	S20651	901 MCQUIRE RD	1000	HEAVY RAINS; FILTRATION INTO LINES	
NOBLE(SOUTH)	11/25/1992	S20651	814 KATHERINE	1000	HEAVY RAINFALL; LINE INFILTRATION	
NOBLE(SOUTH)	12/10/1992	S20651	901 MAGUIRE ROAD	0	RAINFALL	
NOBLE(SOUTH)	1/19/1993	S20651	ETOWAH & 48TH STREET	3000	ROOT STOPPAGE	
NOBLE(SOUTH)	2/10/1993	S20651	901 MCGUIRE	6000	EXTENDED RAINFALL	
NOBLE(SOUTH)	2/10/1993	S20651	814 KATHERINE	6000	HEAVY RAINFALL	
NOBLE(SOUTH)	2/16/1993	S20651	901 MCGUIRE RD	4000	HEAVY RAINFALL	
NOBLE(SOUTH)	2/16/1993	S20651	814 KATHRINE	4000	HEAVY RAINFALL	
NOBLE(SOUTH)	3/1/1993	S20651	814 CATHERINE	2000	RAIN OVERLOAD	
NOBLE(SOUTH)	3/1/1993	S20651	901 MCGUIRE	2000	RAIN OVERLOAD	
NOBLE(SOUTH)	3/30/1993	S20651	901 MCQUIRE RD	2000	HYDROLIC OVERLOAD FROM RAIN	
NOBLE(SOUTH)	3/30/1993	S20651	814 CATHRINE CLRCLE	2000	HYDROLIC OVERLOAD FROM RAIN	
NOBLE(SOUTH)	3/30/1993	S20651	901 MAGUIRE ROAD	2000	SYSTEM OVERLOAD DUE TO I/I	
NOBLE(SOUTH)	3/30/1993	S20651	814 CATHRINE CIRCLE	2000	SYSTEM OVERLOAD DUE TO I/I	
NOBLE(SOUTH)	5/9/1993	S20651	901 MCGUIRE RD	4	HEAVY RAIN	
NOBLE(SOUTH)	5/9/1993	S20651	814 CATHRINE	4	HEAVY RAINS	
NOBLE(SOUTH)	5/23/1993	S20651	901 MACGUIRE	3000	RAIN FALL	
NOBLE(SOUTH)	5/23/1993	S20651	814 CATHERINE	3000	RAIN FALL	
NORMAN	7/25/1989	S20616	HIGHWAY #9 AND JENKINS	0	MANHOLE RUNNING OVER	
NORMAN	10/2/1989	S20616	ANDOVER & JUSTIN STR.	0	MANHOLE OVERFLOW/LINE STOPPAGE	
NORMAN	10/2/1989	S20616	ANDOVER APTS	0	MANHOLES OVERFLOWING	
NORMAN	10/11/1989	S20616	ELMWOOD AND COLLEGE	0	OVERFLOW	
NORMAN	10/12/1989	S20616	817 BARBOUR, MANHOLE BACK-UP	0	OBSTRUCTION IN THE LINE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	10/16/1989	S20616	231 S PETERS	0	MANHOLE OVERFLOW	
NORMAN	10/24/1989	S20616	510 UNIVERSITY DR.	0	OBSTRUCTION	
NORMAN	11/6/1989	S20616	510 UNICERSITY BLVD.	0	MANHOLE GOT CHOKED	
NORMAN	11/13/1989	S20616	800 BLOCK OF MOCKINBIRD	0	OBSTRUCTION IN LINE	
NORMAN	11/14/1989	S20616	2904 CYNTHIA CICLE	0	OBSTRUCTED SEWER LINE	
NORMAN	11/15/1989	S20616	419 GEORGE CROSS COURT	0	OBSTRUCTION IN THE SEWER LINE	
NORMAN	11/15/1989	S20616	1027 N. PORTER	0	LINE OBSTRUCTION	
NORMAN	11/15/1989	S20616	N. PORTER	0	LINE OBSTRUCTION	
NORMAN	11/20/1989	S20616	536 S. PICKARD	0	OBSTRUCTION IN LINE	
NORMAN	12/4/1989	S20616	ELWOOD & COLLEGE	0	OBSTRUCTION IN MANHOLE	
NORMAN	12/11/1989	S20616	1532 E. BOYD	10	OBSTRUCTION IN THE SEWER LINE	
NORMAN	12/18/1989	S20616	2609 WILLOWCREEK DR.	20	OBSTRUCTION IN SEWER LINE	
NORMAN	12/20/1989	S20616	3750 W. MAIN	40	MANHOLES WERE BACK-UP. THE DEAD END MANHOLE WAS RUNNING OVE	
NORMAN	12/21/1989	S20616	3750 W MAIN	40		
NORMAN	1/2/1990	S20616	SUTTON PLACE LIFT STATION	20	FIRE BREAKAGE CAUSINF LIFT STATION NOT OPERATE MANHOLE OVERF	
NORMAN	1/2/1990	S20616	705 E LINDSEY	100	TREE ROOTS IN THE SEWER LINE	
NORMAN	1/2/1990	S20616	705V E LINDSEY	100	ROOTS IN LINE	
NORMAN	1/5/1990	S20616	12TH & ALAMEDA	20	CHOKE UNSTOP	
NORMAN	1/8/1990	S20616	2745 MEADOW BROOK DR.	10	SEWER MAN BACKUP, OVERFLOW INTO HOUSE	
NORMAN	1/10/1990	S20616	300 HAL MULDROW	30	OVERFLOW	
NORMAN	1/17/1990	S20616	201 MERKLE DR.	10	OBSTRUCTION IN SEWER LINE	
NORMAN	1/21/1990	S20616	1926 OAK HILL	50	ROOTS IN LINE	
NORMAN	1/22/1990	S20616	3219 WILLOW ROCK	100	OBSTRUCTION	
NORMAN	1/23/1990	S20616	2510 WYANDOTTE WAY	30	MANHOLE IN CREEK WAS RUNNING OVER	
NORMAN	2/1/1990	S20616	909 EAST ALAMEDA	25	OBSTRUCTION IN LINE	
NORMAN	2/2/1990	S20616	1806 SHELBY COURT	20	OBSTRUCTION IN THE LINE	
NORMAN	2/9/1990	S20616	2745 MEADOW BROOK DR.	10	OBSTRUCTION IN SEWER MAIN LINE	
NORMAN	2/21/1990	S20616	1701 ELM	10	OBSTRUCTION IN SEWER LINE	
NORMAN	2/26/1990	S20616	FLOOD AND MCNAMEU	25	OBSTRUCTION OF LINE	
NORMAN	2/26/1990	S20616	MANHOLE AT PICKARD & BOYD	25		
NORMAN	2/28/1990	S20616	MANHOLE AT 200 CHALMETTE	20	OBSTRUCTION IN SEWER MAIN	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	3/9/1990	S20616	2002 SADDLEBACK	10	LIFT STATION WAS PUMPING	
NORMAN	3/9/1990	S20616	BOYD AND PICKARD	30	OBSTRUCTION IN THE SEWER LINE	
NORMAN	3/14/1990	S20616	MANHOLE CHAUTAUTUA & COMANCHE	0	HEAVY RAINFALL	
NORMAN	3/14/1990	S20616	1806 SHELBY CT	50	RAIN WATER	
NORMAN	3/14/1990	S20616	MANHOLE PICKARD & BOYDE	100	HEAVY RAINFALL	
NORMAN	3/15/1990	S20616	2512 WALNUT ROAD	100	EXCESSIVE RAINFALL	
NORMAN	3/15/1990	S20616		7000	CRACK IN WIRE BOX SEEPAGE TO WEIRTROUGH.	
NORMAN	3/16/1990	S20616	200 BLOCK OF CHALNETTE	20	OBSTRUCTION IN CITY SEWER MAIN	
NORMAN	3/16/1990	S20616	PICKARD AND BOYD	50	RAIN	
NORMAN	3/16/1990	S20616	536 S PICKARD	50	HEAVY RAIN	
NORMAN	3/29/1990	S20616	424 GEORGE CROSS	2	OBSTRUCTION IN THE SEWER LINE	
NORMAN	3/30/1990	S20616	500 BLK E ROBINSON	50		
NORMAN	4/4/1990	S20616	500 BLOCK E. ROBINSON	50	OBSTRUCTION IN THE MANHOLE	
NORMAN	4/9/1990	S20616	1613 N. CRAWFORD	30	OBSTRUCTION IN SEWER LINE	
NORMAN	4/25/1990	S20616	100 BLK OF LAHOMA	100	EXCESSIVE RAINFALL	
NORMAN	4/25/1990	S20616	BOYD & PICKARD	500	INFLOW OF RAIN WATER CAUSING MANHOLES TO OVERFLOW	
NORMAN	4/25/1990	S20616	BOYD THRU MCNAMEE	500	EXCESSIVE RAINFALL	
NORMAN	4/26/1990	S20616	821 SYMMES MANHOLE	500	EXCESSIVE RAIN	
NORMAN	4/26/1990	S20616	LAHOMA & COMANCHE MANHOLE	500	EXCESSIVE RAIN	
NORMAN	4/26/1990	S20616	BOYD & PICKARD	500	EXCESSIVE RAIN	
NORMAN	4/26/1990	S20616	LAHOMA & COMMANCHE	500	EXCESSIVE RAINFALL	
NORMAN	4/30/1990	S20616	821 BARBOUR	10	OBSTRUCTION IN LINE	
NORMAN	5/2/1990	S20616	200-500 BLK LAHOMA		RAIN IN CITY MAINE CAUSING MANHOLES TO OVERFLOW	
NORMAN	5/2/1990	S20616	400 BLK CHAUTAUQUA		RAIN CAUSING OVERFLOW	
NORMAN	5/2/1990	S20616	200 BLK CHAUTAUQUA		RAIN CAUSING OVERFLOW	
NORMAN	5/2/1990	S20616	100 BLK LAHOMA		RAIN CAUSING OVERFLOW	
NORMAN	5/2/1990	S20616	MCNAMEE THRU BOYD		RAIN CAUSING MANHOLE TO OVERFLOW	
NORMAN	5/2/1990	S20616	2508 S WALNUT ROAD	0	EXCESSIVE RAINFALL	
NORMAN	5/2/1990	S20616	400,500,600,700,800 BLOCKS OF PICKARD	0	EXCESSIVE RAINWATER	
NORMAN	5/2/1990	S20616	424 N. UNIVERSITY	0	EXCESSIVE RAIN	
NORMAN	5/2/1990	S20616	312 MIMOSA MANHOLE	0	EXCESSIVE RAIN	
NORMAN	5/2/1990	S20616	1507-1527 EISENHOWER MANHOLES	0	EXCESSIVE RAINS	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	5/3/1990	S20616	MCNAMEE & BOYD	0	RAINWATER	
NORMAN	5/3/1990	S20616	1804 AIKEN CT	100	RAIN IN CITY MAIN CAUSING MANHOLE TO OVERFLOW	
NORMAN	5/3/1990	S20616	200 BLOCK OF CHAUTAUQUEA	1000	EXCESSIVE RAIN	
NORMAN	5/3/1990	S20616	400 BLOCK OF CHAUTAUQUEA	1000	RAINWATER	
NORMAN	5/3/1990	S20616	100 BLOCK OF LAHOMA	1000	RAINWATER	
NORMAN	5/9/1990	S20616	401 MERCEDES	200	18" BROKEN SEWER LINE	
NORMAN	5/9/1990	S20616	1912-1920 LOGAN	200	BYPASS DUE TO A BROKEN LINE	
NORMAN	5/10/1990	S20616	1804 AIKEN COURT	100	EXCESSIVE RAINFALL	
NORMAN	5/10/1990	S20616	1733 CRESTMONT	200	SEWERLINE BROKEN DOWN	
NORMAN	5/10/1990	S20616	BOYD & PICKARD MANHOLE	500	FLOODING	
NORMAN	5/31/1990	S20616	HALL PARK UTILITIES/WESTERN HOME SERVICE CORP.		OVERNIGHT RAIN	
NORMAN	6/18/1990	S20616	1300 BLOCK MCGEE	15	SHOWER OVERFLOW NOT SPECIFIC AS TO CAUSE	
NORMAN	6/19/1990	S20616	1300 MCGEE	18	OBSTRUCTION IN SEWER MAIN	
NORMAN	6/21/1990	S20616	HUNDRED BLOCK 1617	10	SEWER MAIN OBSTRUCTED	
NORMAN	6/21/1990	S20616	1617 PARKVIEW	10	OBSTRUCTION	
NORMAN	6/25/1990	S20616	2706 WINDING CREEK	10	SEWER MAIN OBSTRUCTION	
NORMAN	7/2/1990	S20616	2321 REMINGTON COURT	10	OBSTRUCTION IN THE SEWER MAIN	
NORMAN	8/12/1990	S20616	2500 9TH		MAIN BLOCK	
NORMAN	8/16/1990	S20616	BISHOP CR 333 0RR	20	MAIN BLOCK	
NORMAN	8/20/1990	S20616	ELMWOOD & COLLEGE	30	MAIN BLOCK	
NORMAN	8/22/1990	S20616	700 HIGHLAND PKWY	100	MAIN BLOCK	
NORMAN	8/30/1990	S20616	CRESTMONT LIFT	2000	FUSE OUT	
NORMAN	8/30/1990	S20616	MERKLE CR LIFT STA	2000	FUSE BLOWN	
NORMAN	8/31/1990	S20616	GEORGE L CROSS CT	150	CLOGGED SEWER	
NORMAN	9/11/1990	S20616	GEORGE L CROSS CT	10	EXCESSIVE GREASE	
NORMAN	9/11/1990	S20616	N CRAWFORD	100	SEWAR MAIN BLOCK	
NORMAN	9/12/1990	S20616	JENKINS &HY 9	10	ROOT & GREASE	
NORMAN	9/21/1990	S20616	IMHOFF CREEK	100	RAINFALL	
NORMAN	9/21/1990	S20616	500 PICKARD	100	RAIN	
NORMAN	10/10/1990	S20616	IMHOFF INTERCEPTOR	100	MAIN BLOCK	
NORMAN	10/22/1990	S20616	1440 HOMELAND	20	LINE BLOCK	
NORMAN	10/22/1990	S20616	BISHOP CREEK	20	MAIN BLOCK	
NORMAN	11/5/1990	S20616	900APACHE	100	LINE BLOCK	
NORMAN	11/5/1990	S20616	E APACHE	100	LINE BLOCK	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	11/19/1990	S20616	SUTTON PL LIFT STA	1200	POWER FAILURE	
NORMAN	11/23/1990	S20616	48 & MAIN	20	LINE BREAK	
NORMAN	11/23/1990	S20616	MAIN ST	20	LINE BREAK	
NORMAN	11/24/1990	S20616	1237 BARKLEY	20	LINE BLOCK	
NORMAN	11/24/1990	S20616	1900 OAKHURST DR	20	LINE BLOCK	
NORMAN	12/3/1990	S20616	BISHOP CREEK	5	LINE BLOCK	
NORMAN	12/3/1990	S20616	1900 OAKHURST	5	LINE BLOCK	
NORMAN	12/15/1990	S20616	BISHOP CREEK	40	MAIN BLOCK	
NORMAN	12/18/1990	S20616	12TH AVE NE	100	MAIN BLOCK	
NORMAN	12/22/1990	S20616	1400 HOMELAND	20	LINE BLOCK	
NORMAN	1/7/1991	S20616	1900 OAKHURST	20	LINE BLOCK	
NORMAN	1/23/1991	S20616	IMHOFF CR	10	LINE BLOCK	
NORMAN	1/31/1991	S20616	600 N JONES	20	BLOCK	
NORMAN	2/7/1991	S20616	ELM & DELTA	20	MAIN BLOCK	
NORMAN	2/9/1991	S20616	2425 WEATHERFORD DR	10	LINE BLOCK	
NORMAN	2/22/1991	S20616	1938 PHILLMORE		LINE BLOCK	
NORMAN	3/4/1991	S20616	1816 WREN	30	LINE BLOCK	
NORMAN	3/5/1991	S20616	1100 CANTABURY	15	PAPER TOWELS	
NORMAN	3/6/1991	S20616	1900 ROLLING STONE	20	LINE BLOCK	
NORMAN	3/9/1991	S20616	616 E. COMANCHE	25	SEWER MAIN WAS OBSTRUCTED	
NORMAN	3/11/1991	S20616	1212 BENSON	25	LINE BLOCK	
NORMAN	3/18/1991	S20616	BILOXI DR. & LINDSEY	50	SEWER MAIN OBSTRUCTION	
NORMAN	3/29/1991	S20616	429 E. ROBINSON	20	OBSTRUCTION IN SEWER MAIN	
NORMAN	4/3/1991	S20616	1518 CINDERELLA	20	OBSTRUCTION IN SEWER	
NORMAN	4/11/1991	S20616	24TH AVE & MAIN		BROKEN LINE	
NORMAN	4/19/1991	S20616	1927 TWISTED OAK	20	LINE BLOCK	
NORMAN	4/22/1991	S20616	500 MARYWOOD LANE	5	ROOTS	
NORMAN	4/24/1991	S20616	2300 ALEMEDA	25	LINE BLOCK	
NORMAN	4/26/1991	S20616	3200 S BERRY	50	LINE BLOCK	
NORMAN	4/27/1991	S20616	1900 ROLLING STONE DR	50	ROOTS	
NORMAN	5/4/1991	S20616	1631 N. CRAWFORD	1	GREASE	
NORMAN	5/6/1991	S20616	1131 CADDELL LANE	10	OBSTRUCTION IN SEWER MAIN	
NORMAN	5/8/1991	S20616	1405 PEACHTREE LANE	2	DEBRIS STOPPING UP LINE	
NORMAN	5/8/1991	S20616	440 S. PICKARD	100	EXCESSIVE RAIN	
NORMAN	5/9/1991	S20616	1903 ROLLING STONE CIRCLE	50	SEWER MAIN OBSTRUCTION	
NORMAN	5/13/1991	S20616	CELL NO. 1, BEYOND N.E. CORNER		EXCESSIVE RAIN	
NORMAN	5/13/1991	S20616	501 E. ROBINSON	2	OBSTRUCTION	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	5/17/1991	S20616	621 SHERRY	15	BREAK IN LINE	
NORMAN	5/20/1991	S20616	1401 PEACHTREE LANE	30	LINE OBSTRUCTED WITH GREASE AND DEBRIS	
NORMAN	5/21/1991	S20616	12TH AVE AND HIGH MEADOWS	100	SEWER MAIN OBSTRUCTION	
NORMAN	5/23/1991	S20616			HEAVY RAIN	
NORMAN	5/24/1991	S20616	1002 MCNAMEE	30	SEWER MAIN OBSTRUCTION	
NORMAN	5/28/1991	S20616	SUTTON PLACE	40	FUSE BLOWN, CAUSING LIFT STATION TO MALFUNCTION	
NORMAN	6/2/1991	S20616	536 S PICKARD	30	EXCESSIVE RAIN	
NORMAN	6/17/1991	S20616	1600 BEAUMONT	50	VANDALISM	
NORMAN	6/30/1991	S20616	2429 WEATHERFORD	75	PAPER TOWELS & GREASE BLOCKING LINE CAUSING OVERFLOW	
NORMAN	7/12/1991	S20616	33RD AND JENKINS	400	BLOCKED BY DEBRIS	
NORMAN	7/15/1991	S20616	563 BUCHANAN - IMHOFF CREEK	6	GREASE WAS POURED INTO STORM DRAIN	
NORMAN	7/16/1991	S20616	24TH AND ALEMEDA		OBSTRUCTION IN CITY LINE CAUSING MANHOLE OVERFLOW	
NORMAN	7/28/1991	S20616	1200 E. BROOKS	200	GREASE IN LINE AND MANHOLE	
NORMAN	8/19/1991	S20616	N OF TECUMSEH /12TH AVE NORTH SIDE	10000	PRESSURE LINE FROM L.S. D RUPTURED	
NORMAN	9/4/1991	S20616	500 S UNIVERSITY	20	STOPPED UP LINE	
NORMAN	9/9/1991	S20616	BROOKHAVEN; 4001 KNIGHT BRIDGE ST	20	MUD BLOCKAGE	
NORMAN	9/16/1991	S20616	PICKARD STREET, 5 AND 6 HUNDRED BLOCK, MANHOLES	50	RAIN	
NORMAN	9/16/1991	S20616	WASTEWATER TREATMENT FACILITY	2000	FULL STORMWATER HOLDING CELL	
NORMAN	9/16/1991	S20616	DIVERSION BOX 3 PRIOR TO STROM WATER HOLDING BASIN	2000	HEAVY RAINFALL AND IMPROPER GATE SETTINGS	
NORMAN	9/19/1991	S20616	1/4 MILE NORTH OF TECUMSEH ON 12TH AVE. N.E., WEST SIDE	0	PRESSURE LINE FROM LIFT STATION D	
NORMAN	9/21/1991	S20616	BISHOP INTERCEPTOR	25	GREASE PLUG	
NORMAN	9/21/1991	S20616	AEROBIC DIGESTER	1500	OPERATOR ERROR	
NORMAN	9/25/1991	S20616	1109 PORTER	25	GREASE IN LINE	
NORMAN	10/18/1991	S20616	721 N. GALE		VANDALS PLACED ROCKS IN MANHOLE	
NORMAN	11/8/1991	S20616	200 LAHOMA AVE	20	ROOTS AND GREASE	
NORMAN	12/10/1991	S20616	1209 W. LINDSEY	15	GREASE IN LINE	
NORMAN	12/10/1991	S20616	1209 LINDSEY	15	GREASE STOPPAGE	
NORMAN	12/15/1991	S20616	THE CORNER OF CLASSEN AND DRAKE	500	OBSTRUCTION	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	12/20/1991	S20616	210 S. LAHOMA		RAINFALL	
NORMAN	12/20/1991	S20616	536 S. PICKARD	100	RAINFALL	
NORMAN	12/20/1991	S20616	PICKARD AND BOYD	100	RAINFALL	
NORMAN	12/20/1991	S20616	100 S. LAHOMA	100	RAINFALL	
NORMAN	12/20/1991	S20616	1836 W. ROBINSON	100	RAINFALL	
NORMAN	12/20/1991	S20616	210 S LAHOMA	150	HEAVY RAINFALL	
NORMAN	12/20/1991	S20616	PICKARD/BOYD	150	HEAVY RAINFALL	
NORMAN	12/30/1991	S20616	2100 W LINDSEY	25	GREASE STOPPAGE	
NORMAN	12/31/1991	S20616	2100 BLOCK OF WEST LINDSEY-MANHOLE OVERFLOW	0	GREASE IN LINE	
NORMAN	12/31/1991	S20616	2300 CLYDE COURT	500	LINE BREAK	
NORMAN	1/27/1992	S20616	600 VICKSBERG,BISHOP CREEK INTERCEPTOR	40	OBSTRUCTION IN LINE	
NORMAN	2/7/1992	S20616	BISHOP CREEK, 200 REED	50	GREASE	
NORMAN	2/7/1992	S20616	200 REED ST	50	GREASE BLOCKAGE	
NORMAN	2/26/1992	S20616	3400 JENKINS & BISHOP CREEK	100	ROOTS AND CREEK	
NORMAN	3/14/1992	S20616	400 GEORGE L CROSSCORT	100	OBSTRUCTION IN THE LINE	
NORMAN	3/26/1992	S20616	HIGH MEADOWS INTERCEPTOR 12TH AVE. NE SOUTHEAST FIELD	30	BLOCKAGE OF TISSUE PAPER & PAPER TOWELS	
NORMAN	3/27/1992	S20616	MH IN 200 BLOCK OF VICKSBURG	20	LINE BLOCKAGE DUE TO DEIBRIS FROM APARTMENT COMPLEX	
NORMAN	3/27/1992	S20616	200 BISHOP CREEK	20	PAPER & GREASE BLOCKAGE	
NORMAN	4/6/1992	S20616	BILOXI & SINCLAIR CORNER	1	CALLAPSE SEWER LINE	
NORMAN	4/15/1992	S20616	4001 KNIGHTS BRIDGE	25	STOPPAGE IN LINE	
NORMAN	5/11/1992	S20616	2027 ALLENHURST	100	PAPER & GREASE BLOCKAGE	
NORMAN	5/11/1992	S20616	ALLENHURST	100	LINE STOPPAGE	
NORMAN	5/29/1992	S20616	1601 MCGEE DRIVE	15	TOILET PAPER AND PAPER TOWELS	
NORMAN	5/29/1992	S20616	414 CRIPPLE CREEK	100	OBSTRUCTION IN THE LINE	
NORMAN	6/2/1992	S20616	400 BLOCK OF PICKARD	50	RAIN INDUCED	
NORMAN	6/2/1992	S20616	200 S. LAHOMA	50	RAIN INDUCED	
NORMAN	6/2/1992	S20616	500 BLOCK OF PICKARD	100	RAIN INDUCED	
NORMAN	6/2/1992	S20616	BOYD AND PICKARD	100	RAIN INDUCED	
NORMAN	6/2/1992	S20616	1400 KINGSTON RD	1400	OBSTRUCTION IN LINE	
NORMAN	6/8/1992	S20616	1400 KINGSTON ROAD	50	OBSTRUCTION IN THE LINE	
NORMAN	6/10/1992	S20616	200 HUBERT ST.	0	SERVICE LINE BROKEN	
NORMAN	6/25/1992	S20616	800 DRAKE	25	LINE STOPPAGE	
NORMAN	6/25/1992	S20616	800 DRAKE	25	UNKNOWN	
NORMAN	6/25/1992	S20616	1300 ANDOVER	50	LINE STOPPAGE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	6/25/1992	S20616	12TH AND ROCK CREEK ROAD	150	GREASE AND DEBRIS	
NORMAN	7/2/1992	S20616	1300 ANDOVR APTS.	50	REMOVE OBSTRUCTION LINE; REGAIN FLOW; & WASH AND DISENFECT	
NORMAN	7/20/1992	S20616	200 FINDLAY	50	GREASE AND PAPER STOPPAGE	
NORMAN	7/27/1992	S20616	452 PICKARD (MANHOLE)	500	RAIN WATER	
NORMAN	7/27/1992	S20616	536 PICKARD (MANHOLE)	500	RAIN WATER	
NORMAN	7/27/1992	S20616	BOYD AND PICKARD INTERSECTION (MANHOLE)	500	RAIN WATER	
NORMAN	8/13/1992	S20616	102 CRAWFORD CT	50	STOPPAGE	
NORMAN	8/15/1992	S20616	629 VICKSBERG	75	STOPPAGE	
NORMAN	9/1/1992	S20616	MANHOLE 500 W. TONAWA	100	OBSTRUCTION IN LINE OVERFLOW INTO CREEK	
NORMAN	9/6/1992	S20616	NORMANDY C CRESTMONT AVE.	500	POWER FAILURE DUE TO STORM	
NORMAN	9/6/1992	S20616	2014 SADDLEBACK	500	POWER FAILURE DUE TO STORM	
NORMAN	9/13/1992	S20616	102 CRAWFORD COURT	50	LINE OBSTRUCTION	
NORMAN	9/16/1992	S20616	200 BLOCK JASON	0	DIAPERS & PAPER TOWELS BLOCKAGE	
NORMAN	9/22/1992	S20616	1300 SUPERIOR & HURON	200	OBSTRUCTION IN SEWER MAIN	
NORMAN	9/23/1992	S20616	200 S. LAHOMA MANHOLE	10	PAPER TOWELS & GREASE	
NORMAN	9/25/1992	S20616	1500 HIGH TRAIL	100	MANHOLE-OBSTRUCTION IN LINE	
NORMAN	10/7/1992	S20616	1500 REBECCA LANE	80	GREASE BLOCKAGE	
NORMAN	10/7/1992	S20616	200 HUGHBERT	200	ROOT BLOCKAGE	
NORMAN	10/7/1992	S20616	2000 ALLENHURST	2000	ROOT BLOCKAGE	
NORMAN	10/15/1992	S20616	100 BLOCK OF LAHOMA	200	OBSTRUCTION IN MAIN LINE	
NORMAN	10/23/1992	S20616	1400 BLOCK NEBRASKA	175	OBSTRUCTION IN LINE	
NORMAN	11/6/1992	S20616	200 BLOCK - 300 BLOCK OF 36 AVENUE NW	250	SAND AND GREASE IN LINE.	
NORMAN	11/6/1992	S20616	200 36TH AVE NW	250	SAND AND GREASE BLOCKAGE	
NORMAN	11/19/1992	S20616	500 BLK PICKARD(BOYD)	1000	RAINWATER	
NORMAN	11/19/1992	S20616	500 BLOCK OF PICKARD	1000	RAINWATER	
NORMAN	12/7/1992	S20616	100 MERKLE	50	UNKNOWN OBSTRUCTION	
NORMAN	12/10/1992	S20616	2110 CRESTMONT	200	GREASE BLOCKAGE	
NORMAN	12/10/1992	S20616	2205 W MAIN	200	GREASE BLOCKAGE	
NORMAN	12/10/1992	S20616	HIWAY 9 & JENKINS 300 BLK	250	GREASE AND ROOT BLOCKAGE	
NORMAN	12/27/1992	S20616	945 MOCKING BIRD	500	BLOCKAGE	
NORMAN	12/28/1992	S20616	600 LINDSEY	500	LINE BLOCKED	
NORMAN	1/4/1993	S20616	641 WELSTON	50	LINE BLOCKAGE	
NORMAN	1/6/1993	S20616	500 EAST ROBINSON-BISHOP CREEK INTERSEPTOR	30	PAPER TOWELS	
NORMAN	1/15/1993	S20616	1508 WESTBROOK TERRACE	50	GREASE AND PAPER	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	1/20/1993	S20616	12 AVE NE & HIGH MEADOWS	100	GREASE STOPPAGE	
NORMAN	2/5/1993	S20616	3800 W BISHOP	500	GREASE BLOCKAGE	
NORMAN	3/4/1993	S20616	419 GEORGE L CROSS CT	100	GREASE FROM FURR'S CAFETERIA	
NORMAN	3/19/1993	S20616	3219 WILLOW ROCK RD.	100	BLOCKAGE BY GREASE AND TOWELS	
NORMAN	3/20/1993	S20616	2100 VANESSA	20	LINE BLOCKAGE	
NORMAN	4/7/1993	S20616	200 ANDOVER	50	GREASE AND DEBRIS BOLCKAGE	
NORMAN	4/9/1993	S20616	517 UNIVERSITY BLVD	30	GREASE BLOCKAGE	
NORMAN	4/20/1993	S20616	2000 CRESTMONT AVE.	2000	POWER FAILURE AT LIFT STATION	
NORMAN	5/10/1993	S20616	500 PICKARD		HEAVY RAINS	
NORMAN	5/10/1993	S20610	2512 WALNUT RD		HEAVY RAINS	
NORMAN	5/10/1993	S20616	PITCHARD AND MCNAMEE	500	HEAVY RAIN	
NORMAN	5/10/1993	S20616	1500 E LINDSDEY	4800	HEAVY RAINS	
NORMAN	6/15/1993	S20616	301 COOK	25	GREASE AND DEBRIS STOPPAGE	
NORMAN	6/18/1993	S20616	1100 MAIN ST	50	OBSTRUCTION IN MANHOLE	
NORMAN	6/21/1993	S20616	1100 E MAIN, NORMAN	50	OBSTRUCTION IN SEWER LINE, OVERFLOW AT MANHOLE SITE	
NORMAN	6/29/1993	S20616	1800 LAKEHURST	10	GREASE BLOCKAGE	
NORMAN	7/4/1993	S20616	3300 N PORTER	2500	OBSTRUCTI0N IN THE LINE	
NORMAN	7/7/1993	S20616	800 S CANADIAN TRAILS DRIVE	20	LINE BLOCKAGE	
NORMAN	7/14/1993	S20616	731 WEST IMHOFF	5	GREASE BLOCKAGE	
NORMAN	7/22/1993	S20616	213 CHALMETT	5000	LINE BLOCKAGE	
NORMAN	7/31/1993	S20616	1700 CHAMBLEE	10000	DEBRIS BLOCKAGE	
NORMAN	8/2/1993	S20616	100 N PORTER	50	LINE BLOCKAGE	
NORMAN	8/3/1993	S20616	1900 THORNTON	100	OBSTRUCTION IN THE LINE	
NORMAN	8/16/1993	S20616	1000 N COLLEGE	75	GREASE BLOCKAGE	
NORMAN	8/18/1993	S20616	1200 OAKHURST	5	LINE BLOCKAGE	
NORMAN	8/19/1993	S20616	1400 ELM	50	GREASE BLOCKAGE	
NORMAN	8/20/1993	S20616	2100 CRESTMONT	50	MALFUNCTION AT LIFT STATION	
NORMAN	8/25/1993	S20616	1528 ROSEMONT DRIVE	25	GREASE AND SOAP	
NORMAN	8/25/1993	S20616	500 ROBINSON	30	GREASE STOPPAGE	
NORMAN	8/27/1993	S20616	1400 12 STREET	25	GREASE AND DEBRIS BLOCKAGE	
NORMAN	8/27/1993	S20616	12TH AVE. NORTH EAST	30	LINE BLOCKAGE	
NORMAN	9/7/1993	S20616	2502 NW WYANDOTTE	25	ROOTS BLOCKAGE IN MANHOLE	
NORMAN	9/10/1993	S20616	419 GEORGE L CROSS CT	100	GREASE BLOCKAGE	
NORMAN	9/11/1993	S20616	1611 ISENHOWER ROAD	50	GREASE AND SMALL LOG CHAIN	
NORMAN	9/14/1993	S20616	204 SOUTH STEWART	25	OBSTRUCTED LINE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	10/13/1993	S20616	300 W BAKER	200	LINE BLOCKAGE	
NORMAN	10/21/1993	S20616	3100 WALNUT ROAD	15	LINE BLOCKAGE(PAPER TOWELS)	
NORMAN	10/26/1993	S20616	2014 SADDLEBACK	100	LIFT STATION MALFUNCTION	
NORMAN	10/27/1993	S20616	600 WEST MAIN	20	GREASE BLOCKAGE	
NORMAN	10/28/1993	S20616	600 W BEAUMONT	25	LINE BLOCKAGE	
NORMAN	11/1/1993	S20616	2500 WYANDOTTE WAY	50	LINE STOPPAGE	
NORMAN	11/15/1993	S20616	206 S LAHOMA	5	GREASE STOPPAGE	
NORMAN	11/29/1993	S20616	1421 KINGSTON	10	GREASE BLOCKAGE	
NORMAN	12/16/1993	S20616	2014 SADDLEBACK	200	LIFT STATION MALFUNCTION	
NORMAN	12/30/1993	S20616	1025 BILOXI	1500	DEBRIS BLOCKAGE	
NORMAN	1/12/1994	S20616	5`12 STARBROOK CRT	10	EASE BLOCKAGE	
NORMAN	1/14/1994	S20616	1938 FILMORE	50	GREASE AND DEBRIS BLOCKAGE	
NORMAN	1/14/1994	S20616	207 MERKLE DRIVE	200	GREASE BLOCKAGE	
NORMAN	1/19/1994	S20616	1609 PARKVIEW TERRACE	30	UNKNOWN BLOCKAGE	
NORMAN	2/3/1994	S20616	510 SOUTH UNIVERSITY BLVD.	20	GREASE BLOCKAGE	
NORMAN	2/8/1994	S20616	415 12TH AVENUE NE	50	BOARDS IN THE MOUTH OF 10-INCH PIPE	
NORMAN	2/9/1994	S20616	1713 EAST BOYD	350	OBSTRUCTION IN LINE	
NORMAN	2/16/1994	S20616	827 RICHMOND DRIVE	2	DEBRIS BLOCKAGE	
NORMAN	2/16/1994	S20616	528 COCKREL AVE	50	ROOT BLOCKAGE	
NORMAN	3/11/1994	S20616	801 DRAKE DRIVE	30	GREASE STOPPAGE	
NORMAN	3/14/1994	S20616	4321 24TH AVE NORTHWEST	1000	OKEN FORCE MAIN	
NORMAN	3/15/1994	S20616	2400 SOUTH CLASSEN	30	GREASE BLOCKAGE	
NORMAN	3/30/1994	S20616	2517 HOLLYWOOD	8	LINE BLOCKAGE	
NORMAN	4/6/1994	S20616	2500 WYANDOTTE	50	ROOT STOPPAGE	
NORMAN	4/8/1994	S20616	1300 LOUISANA ST	100	DEBRIS AND ROOT BLOCKAGE	
NORMAN	4/10/1994	S20616	3511 H E BLACK DRIVE	100	LINE BLOCKAGE	
NORMAN	4/17/1994	S20616	1911 TWISTED OAK	400	GREASE AND DEBRIS	
NORMAN	4/18/1994	S20616	1532 LINDSEY	100	LINE BLOCKAGE	
NORMAN	4/19/1994	S20616	226 SKYLARK COURTS	200	LINE BLOCKAGE	
NORMAN	4/24/1994	S20616	2104 LA DEAN DRIVE	100	GREASE BLOCKAGE	
NORMAN	4/26/1994	S20616	3450 SOUTH LINCOLN	400	DEBRIS BLOCKAGE	
NORMAN	4/27/1994	S20616	2262 WEST MAIN	30	GREASE BLOCKAGE	
NORMAN	5/1/1994	S20616	519 SOUTH UNIVERSITY	100	GREASE BLOCKAGE	
NORMAN	5/2/1994	S20616	429 ROBINSON STREET	50	LINE BLOCKAGE	
NORMAN	5/9/1994	S20616	CANDLEWOOD DR W OF BRANDYWINE LANE	200	DEBRIS STOPPAGE	
NORMAN	5/11/1994	S20616	2025 RISING HILL DRIVE	1000	OBSTRUCTION IN LINE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	5/15/1994	S20616	LADBROOK STREET	500	UNKNOWN OBSTRUCTION IN LINE	
NORMAN	5/16/1994	S20616	2380 INDUSTRIAL BLVD	25	LIFT STATION DOWN	
NORMAN	5/28/1994	S20616	528 MARYWOOD LANE	50	GREASE BLOCKAGE	
NORMAN	6/1/1994	S20616	2029 RISING HILL DRIVE	100	UNKNOWN OBSTRUCTION	
NORMAN	6/7/1994	S20616	LIFT STATION AT SANDPIPER LANE	50	ELECTRICAL FAILURE	
NORMAN	6/12/1994	S20616	1502 FARMINGTON AVE	20	UNKNOWN	
NORMAN	6/12/1994	S20616	12TH AND HIGH MEDOWS DRIVE	400	GREASE BLOCKAGE	
NORMAN	6/13/1994	S20616	2025 RISING HILLS DRIVE	30	UNKNOWN	
NORMAN	6/13/1994	S20616	1140 MCGEE DRIVE	50	UNKNOWN	
NORMAN	6/17/1994	S21616	4025 HIDDEN HILLS DRIVE	15	GREASE BLOCKAGE	
NORMAN	6/17/1994	S20616	POSTAL LIFT STATION ON S IMHOFF ROAD	600	INTAKE CLOGGED	
NORMAN	7/9/1994	S20616	501 MEDOW RIDGE CIRCLE	10	SERVICE LINE STOPPED UP AND RAIN CAUSED OVERFLOW	
NORMAN	7/9/1994	S20616	1801-1805 SADDLE BACK BLVD	75	LINE STOPPED UP AND RAIN CAUSED OVERFLOW	
NORMAN	7/14/1994	S20616	402 WOODLINE DR	300	OBSTRUCTION IN LINE	
NORMAN	7/23/1994	S20616	712 MOCKING BIRD LANE	50	OBSTRUCTION IN LINE	
NORMAN	7/25/1994	S20616	HIWAY 77 N ON 24TH 1/2 MILE	500	BROKEN FORCE MAIN	
NORMAN	8/1/1994	S20616	2845 CREEKVIEW TR	50	UNKNOWN BLOCKAGE	
NORMAN	8/8/1994	S20616	536 S PICKARD	50	DEBRIS BLOCKAGE	
NORMAN	8/11/1994	S20616	3300 S JENKINS	50	OBSTRUCTION IN THE LINE	
NORMAN	8/19/1994	S20616	ROYAL OAK LIFT STATION	2000	PUMP FAILURE	
NORMAN	8/22/1994	S20616	604 WEST MAIN	20	GREASE STOPPAGE	
NORMAN	8/24/1994	S20616	200 VICKSBURG AVE	20	DEBRIS BLOCKAGE	
NORMAN	9/11/1994	S20616	1200 E BROOKS ST	350	GREASE BLOCKAGE	
NORMAN	9/19/1994	S20616	1000 MOCKINGBIRD LANE	20	UNKNOWN OBSTRUCTION	
NORMAN	9/19/1994	S20616	1600 FARMING AVE.	30	GREASE AND PAPER BLOCKAGE	
NORMAN	10/2/1994	S20616	2743 WINDING CREEK CIRCLE	100	DEBRIS BLOCKAGE	
NORMAN	10/3/1994	S20616	4205 HARROGATE	15	DEBRIA BLOCKAGE	
NORMAN	10/7/1994	S20616	300 PICKARD	15	UNKNOWN OBSTRUCTION	
NORMAN	10/9/1994	S20616	PICKARD & MAIN	300	GREASE	
NORMAN	10/10/1994	S20616	PICKARD AND MAIN	200	GREASE	
NORMAN	10/10/1994	S20616	300 PICKARD	300	GREASE	
NORMAN	10/16/1994	S20616	901 BEONNE CIRCLE	100	UNKNOWN OBSTRUCTION	
NORMAN	10/22/1994	S20616	731 WEST MAIN	100	GREASE AND DEBRIS BLOCKAGE	
NORMAN	10/23/1994	S20616	820 CHAUTAUQUA AVE	5	UNKNOWN OBSTRUCTION	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	10/26/1994	S20616	206 ORR DRIVE	10	DEBRIS BLOCKAGE(PAPER TOWELS)	
NORMAN	10/26/1994	S20616	1938 FILMOORE	50	OBSTRUCTION IN THE LINE	
NORMAN	10/28/1994	S20616	510 S UNIVERSITY BLVD.	10	DEBRIS AND GREASE	
NORMAN	10/28/1994	S20616	4725 RANCHWOOD & N 48TH AVE	40	UNKNOWN OBSTRUCTION	
NORMAN	10/30/1994	S20616	215 E VIDA WAY	200	GREASE	
NORMAN	10/30/1994	S20616	2205 W MAIN ST	500	GREASE	
NORMAN	11/2/1994	S20616	2743 WINDING CREEK CIRCLE	25	UNKNOWN OBSTRUCTION	
NORMAN	11/5/1994	S20616	2205 WEST MAIN	100	GREASE BLOCKAGE	
NORMAN	11/7/1994	S20616	709 W MAIN	90	GREASE STOPPAGE	
NORMAN	11/9/1994	S20616	DELTA AND ELM	75	OBSTRUCTION IN LINE	
NORMAN	11/27/1994	S20616	101 ANDOVER STREET	50	GREASE BLOCKAGE	
NORMAN	11/28/1994	S20616	505 CORONADO STREET	20	GREASE BLOCKAGE	
NORMAN	11/29/1994	S20616	2014 SADDLEBACK ROAD (LIFT STATION)	50	PUMP FAILURE	
NORMAN	12/10/1994	S20616	2526 BRENTWOOD DRIVE	80	ROOT STOPPAGE	
NORMAN	12/12/1994	S20616	500 FLEETWOOD	10	OBSTRUCTION IN LINE	
NORMAN	12/27/1994	S20616	1516 MORLAND STREET	5	OBSTRUCTION IN THE LINE	
NORMAN	12/28/1994	S20616	1403 KINGSTON ROAD	30	DEBRIS BLOCKAGE	
NORMAN	12/30/1994	S20616	FIELD BEHIND 2801 RAMPART COURT	30	LINE OBSTRUCTION	
NORMAN	12/31/1994	S20616	702 MCCALL DRIVE	25	LINE OBSTRUCTION	
NORMAN	12/31/1994	S20616	629 VICKBURG AVE.	25	LINE OBSTRUCTION	
NORMAN	1/2/1995	S20616	500 N E 23RD AVE	25	LINE OBSTRUCTION	
NORMAN	1/2/1995	S20616	1000 QUANNAH PARKER TRAIL	150	LINE OBSTRUCTION	
NORMAN	1/11/1995	S20616	1504 DAKOTA	15	LINE OBSTRUCTION	
NORMAN	1/11/1995	S20616		50	LINE OBSTRUCTION	
NORMAN	1/15/1995	S20616	1545 HIGH TRAIL ROAD	25	DEBRIS BLOCKAGE	
NORMAN	1/17/1995	S20616	1022 QUANAH PARKER TRAIL	100	UNK OBSTRUCTION	
NORMAN	1/23/1995	S20616	629 SINCLAIR	20	LINE OBSTRUCTION	
NORMAN	1/28/1995	S20616	503 ELM CREST DRIVE	50	GREASE BLOCKAGE	
NORMAN	1/30/1995	S20616	623 SINCLAIR DRIVE	20	OBSTRUCTION IN LINE	
NORMAN	1/31/1995	S20616	804 WEST COMANCHE	20	OBSTRUCTION ON THE LINE	
NORMAN	1/31/1995	S20616	1610 TERRA JOE DRIVE	150	OBSTRUCTION ON THE LINE	
NORMAN	2/1/1995	S20616	BEAUMONT AND PEPPER TREE	50	GREASE AND PAPER OBSTRUCTION	
NORMAN	2/3/1995	S20616	640 WELLSTON CIRCLE	20	GREASE BLOCKAGE	
NORMAN	2/4/1995	S20616	1814 E LINDSEY	500	DEBRIS BLOCKAGE	
NORMAN	2/9/1995	S20616	2200 CLASSEN	20	LINE BLOCKAGE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	2/10/1995	S20616	300 VICKABERG	500	UNK OBSTRUCTION	
NORMAN	2/13/1995	S20616	556 24TH AVE NW	20	DEBRIS BLOCKAGE	
NORMAN	2/13/1995	S20616	600 EAST LINDSEY	100	UNKNOWN OBSTRUCTION	
NORMAN	2/17/1995	S20616	2518 WYANDOTTE WAY	20	UNKNOWN LINE BLOCKAGE	
NORMAN	2/21/1995	S20616	500 FLEETWOOD DRIVE	15	PAPER TOWEL STOPPAGE	
NORMAN	2/27/1995	20616	524 JEAN MARIE DRIVE	10	UNKNOWN OBSTRUCTION	
NORMAN	3/8/1995	S20616	508 SEQUOYAH TRAIL	25	LINE OBSTRUCTION	
NORMAN	3/20/1995	S20616	302 VICKSBURG	50	GREASE BLOCKAGE	
NORMAN	3/21/1995	S21616	1419 PECAN AVE	100	UNK OBSTRUCTION	
NORMAN	3/27/1995	S20616	900 N CRAWFORD AVE	5	DEBRIS BLOCKAGE BY CONTRACTOR	
NORMAN	3/27/1995	S20616	1910 CHEROKEE LN.	20	OBSTRUCTION IN LINE	
NORMAN	3/27/1995	S20616	115 BILUXI DR	100	OBSTRUCTION IN LINE	
NORMAN	3/30/1995	S20616	1 MILE WEST OF HIWAY 77 AND TECHUMSEH	1500	CONTRACTOR BROKE FORCE MAIN	
NORMAN	4/2/1995	S20616	2743 WINDING CREEK CIRCLE	20	UNKNOWN OBSTRUCTION	
NORMAN	4/21/1995	S20616	2308 DAKOTA STREET	100	NK OBSTRUCTION	
NORMAN	4/25/1995	S20616	1300 COMMERCE DRIVE	20	UNK OBSTRUCTION	
NORMAN	4/25/1995	S20616	1318 ABBEY DRIVE	500	UNK OBSTRUCTION	
NORMAN	4/30/1995	S20616	1604 FARMINGTON AVE	50	GREASE BLOCKAGE	
NORMAN	5/5/1995	S20616	2107 JACKSON DRIVE	15	ROOT BLOCKAGE	
NORMAN	5/6/1995	S20616	1418 ABBIE DRIVE	100	DEBRIS BLOCKAGE	
NORMAN	5/10/1995	S20616	1600 OAK CLIFF ROAD	50	UNK OBSTRUCTION	
NORMAN	5/14/1995	S20616	629 VICKSBERG AVE	100	GREASE	
NORMAN	5/24/1995	S20616	NW 36TH AND ROBINSON	75	UNK OBSTRUCTION	
NORMAN	6/1/1995	S20616	1613 AVENDALE DRIVE	10	DEBRIS BLOCKAGE	
NORMAN	6/8/1995	S20616	4305 LYREWOOD LANE	100	LINE STOPPAGE	
NORMAN	6/12/1995	S20616	1120 WESTBROOKE TERRACE	50	GREASE AND ROOT BLOCKAGE	
NORMAN	6/24/1995	S20616	508 SEQUYOHA TRAIL	100	LINE STOPPAGE	
NORMAN	10/5/1995	S20616	2543 WAST MAIN ST	50	GREASE BLOCKAGE	
NORMAN	10/7/1995	S20616	640 WELLSTON CIRCLE	100	GREASE BLOCKAGE	
NORMAN	10/13/1995	S20616	2400 CLASSEN	15	GREASE STOPPAGE	
NORMAN	10/15/1995	S20616	3116 MEADOWS	200	GREASE & PAPER STOPPAGE	
NORMAN	10/24/1995	S20616	24TH AVE SE & IMHOFF	250	LIFT STATION BACKUP FROM GREASE	
NORMAN	11/15/1995	S20616	3761 CEADER RIDGE	8	UNK	
NORMAN	11/15/1995	S20616	1209 WEST LINDSEY	50	GREASE STOPPAGE	
NORMAN	11/19/1995	S20616	721 BOYD	25	UNK LINE STOPPAGE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	11/20/1995	S20616	414 CRIPPLE CREEK	20	LINE STOPPAGE	
NORMAN	11/23/1995	S20616	2919 WILLOW CREEK DR	100	GREASE AND ROOTS	
NORMAN	11/29/1995	S20616	414 CRIPPLE CREEK	15	UNKNOWN	
NORMAN	11/29/1995	S20616	2743 WINDING CREEK	15	UNKNOWN	
NORMAN	12/5/1995	S20616	2308 DACOTA	15	UNKNOWN	
NORMAN	12/10/1995	S20616	203 JUSTINE DR.	100	GREASE & PAPER	
NORMAN	12/11/1995	S20616	100 BLK. OF LAHOMA	20	UNKNOWN	
NORMAN	12/12/1995	S20616	2204 HARTFORD	10	UNKNOWN	
NORMAN	12/24/1995	S20616	206 ORR DR.	50	GREASE & PAPER	
NORMAN	1/8/1996	S20616	CORNER OF DRAKE & CLASSEN	500	UNKNOWN	
NORMAN	1/10/1996	S20616	1310 GARFIELD	10	UNKNOWN	
NORMAN	1/11/1996	S20616	801 DRAKE	8	GREASE STOPPAGE	
NORMAN	1/19/1996	S20616	821 E. FRANK	20	MANHOLE STOPPAGE	
NORMAN	1/22/1996	S20616	1501 ELM	6	GREASE STOPPAGE	
NORMAN	1/26/1996	S20616	1212 S. BERRY RD.	10	GREASE	
NORMAN	1/27/1996	S20616	600 W. MAIN ST.	50	GREASE	
NORMAN	1/28/1996	S20616	903 GARVER	10	GREASE COMING FROM TACO MAYO	
NORMAN	2/1/1996	S20616	1400 ELM AVE.	100	UNKNOWN	
NORMAN	2/9/1996	S20616	822 WYLIE RD.	20	UNKNOWN	
NORMAN	2/12/1996	S20616	4105 BEECHWOOD	20	UNKNOWN	
NORMAN	2/12/1996	S20616	1922 OAK MEADOWS	30	OBSTRUCTION IN LINE	
NORMAN	2/12/1996	S20616	2211 W. MAIN ST.	100	PRIVATE SERVICE LINE OVERFLOW	
NORMAN	2/14/1996	S20616	603 TERRACE PL.	20	OBSTRUCTION IN LINE	
NORMAN	2/18/1996	S20616	205 E. DALE	100	GREASE & PAPER IN MAIN	
NORMAN	2/19/1996	S20616	233 CHALMETTE	300	OBSTRUCTION IN MAIN	
NORMAN	2/20/1996	S20616	1920 CHERRYSTONE	50	OBSTRUCTION IN LINE	
NORMAN	3/1/1996	S20616	904 COLLEGE	20	GREASE & PAPER TOWELS IN MAIN	
NORMAN	3/3/1996	S20616	1840 E. LINDSAY	50	GREASE & PAPER	
NORMAN	3/20/1996	S20616	515 E. ALAMEDA	18	MUD FROM NEW CONSTRUCTION	
NORMAN	3/21/1996	S20616	2330 N. PORTER	500	UNKNOWN	
NORMAN	3/22/1996	S20616	2330 N. PORTER	200	DROP FELL INTO MANHOLE	
NORMAN	4/1/1996	S20616	2931 WILLOW CREEK DR.	50	OBSTRUCTION IN LINE	
NORMAN	4/1/1996	S20616	300 BLK. SKYLARK CT.	100	OBSTRUCTION IN LINE	
NORMAN	4/4/1996	S20616	822 N. PORTER AVE.	3	UNKNOWN	
NORMAN	4/8/1996	S20616	206 ORR	5	PAPER TOWELS	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	4/28/1996	S20616	1623 SHEFFIELD DR.	50	GREASE & PAPER	
NORMAN	5/9/1996	S20616	2200 BLK. BUD WILKINSON DR.	100	OBSTRUCTION IN LINE	
NORMAN	5/13/1996	S20616	FLOOD AVE. & MAIN ST.	100	FLOOD AVE. & MAIN ST.	
NORMAN	5/13/1996	S20616	HWY 9 & CHATAUQUA AVE	100	OBSTRUCTION IN LINE	
NORMAN	5/18/1996	S20616	2713 WYANDOTTE WAY	50	GREASE & PAPER	
NORMAN	6/24/1996	S20616	1650 W. TECUMSEH RD.	30	LIFT STATION DOWN	
NORMAN	8/3/1996	S20616		100	GREASE & PAPER	
NORMAN	8/4/1996	S20616	806 MOCKINGBIRD LN.	100	GREASE & PAPER	
NORMAN	8/26/1996	S20616	FLEETWOOD & JAMES	50	OBSTRUCTION IN LINE	
NORMAN	8/26/1996	S20616	S.E. 24TH AVE. & IMHOFF RD.	50	LIFT STATION STOPPED RUNNING	
NORMAN	9/4/1996	S20616	1134 MCGEE DR.		GREASE & PAPER	
NORMAN	9/5/1996	S20616	3500 S. JENKINS	5	GREASE	
NORMAN	9/11/1996	S20616	1007 CANTERBURY	5	GREASE	
NORMAN	9/13/1996	S20616	200 VICKSBURG	50	OBSTRUCTION IN LINE	
NORMAN	9/20/1996	S20616	1028 W. BROOKS ST.		GREASE	
NORMAN	10/1/1996	S20616	800 W. ROCK CREEK RD.	500	LIFT STATION DOWN	
NORMAN	10/23/1996	S20616	BOYD ST. & ELM AVE.	1000	COLLAPSED LINE	
NORMAN	11/3/1996	S20616	ALAMEDA & RANCHO	200	BRICKS & DEBRIS IN MH FROM CONTRACTOR	
NORMAN	11/18/1996	S20616	N.E. 12TH & ALAMEDA	100	OBSTRUCTION & BREAK IN MAIN	
NORMAN	11/27/1996	S20616	BERRY RD. & IMHOFF RD.	25	GREASE	
NORMAN	11/27/1996	S20616	500 RAMBLING OAKS DR.	50	OBSTRUCTION IN LINE	
NORMAN	11/27/1996	S20616	2114 BUD WILKINSON CT.	75	OBSTRUCTION IN LINE	
NORMAN	12/3/1996	S20616	2600 BLK. WILDWOOD LN.	100	OBSTRUCTION IN LINE	
NORMAN	12/9/1996	S20616	205 E. DALE	15	OBSTRUCTION	
NORMAN	12/16/1996	S20616	228 N. FLOOD	100	OBSTRUCTION IN LINE	
NORMAN	12/22/1996	S20616	516 STARBROOK CT.	100	GREASE & PAPER	
NORMAN	12/22/1996	S20616	1525 CINDERELLA	100	GREASE & PAPER	
NORMAN	12/22/1996	S20616	1731 BRANDON CIR.	300	GREASE & PAPER	
NORMAN	1/7/1997	S20616	1202 CHARLESTON CT.	30	OBSTRUCTION	
NORMAN	1/21/1997	S20616	1728 WESTBROOK TER.	50	OBSTRUCTION	
NORMAN	1/23/1997	S20616	1720 ROLLINGSTONE DR.	25	OBSTRUCTION	
NORMAN	2/1/1997	S20616	500 ROSEWOOD	50	UNKNOWN	
NORMAN	2/9/1997	S20616	508 SEQUOYAH TR.	200	GREASE & PAPER	
NORMAN	2/10/1997	S20616	COLLEGE & ELMWOOD	50	OBSTRUCTION	
NORMAN	2/15/1997	S20616	635 WELLSTON CIR.	100	GREASE & PAPER	
NORMAN	2/22/1997	S20616	1208 HIGH MEADOWS	100	GREASED & PAPER	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	2/23/1997	S20616	515 S. UNIVERSITY BLVD.	100	GREASE & PAPER	
NORMAN	3/25/1997	S20616	1109 N. PORTER AVE.	50	GREASE	
NORMAN	3/25/1997	S20616	LINN & FINDLAY	150	UNKNOWN	
NORMAN	3/26/1997	S20616	1441 VINE ST.	300	GREASE & PAPER	
NORMAN	3/28/1997	S20616	1109 N. PORTER	75	OBSTRUCTION IN MAIN	
NORMAN	5/5/1997	S20616	1200 BLK. LOUISIANA ST.	50	OBSTRUCTION IN LINES	
NORMAN	5/7/1997	S20616	633 SINCLAIR		OBSTRUCTION IN LINES	
NORMAN	5/9/1997	S20616	900 BLK. ALAMEDA ST.	25	OBSTRUCTION	
NORMAN	5/10/1997	S20616	510 S. UNIVERSITY BLVD.	25	OBSTRUCTION IN LINE	
NORMAN	5/13/1997	S20616	WWTP	2,000	DEBRIS	
NORMAN	5/13/1997	S20616	MH AT WWTP	2000	LINE CLOGGED UP BY SOLIDS DURING DIGESTER CLEANOUT	
NORMAN	5/19/1997	S20616				
NORMAN	5/19/1997	S20616	CITY WWTP	7,500	RAIN	
NORMAN	6/11/1997	S20616	3800 COBBLE CIR.	25	OBSTRUCTION IN LINE	
NORMAN	7/5/1997	S20616	SUTTON PLACE L.S.	300	POWER FAILURE	
NORMAN	7/11/1997	S20616	448 CLAREMONT	20	OBSTRUCTION IN LINE	
NORMAN	8/7/1997	S20616	1901 OAKHURST AVE.	200	OBSTRUCTION IN LINE	
NORMAN	8/15/1997	S20616	2509 HOLLYWOOD	20	ROOTS	
NORMAN	9/9/1997	S20616	624 SINCLAIR	2,000	ROCKS IN MH	
NORMAN	4/22/1998	S20616	705 W. MAIN	10	GREASE	
NORMAN	5/7/1998	S20616	WILEY & BROOKS	30	SEWER BACKUP	
NORMAN	5/27/1998	S20616	CLASSEN & DRAKE	100	OBSTRUCTION	
NORMAN	7/7/1998	S20616	200 S. VICKSBURG	100		
NORMAN	7/29/1998	S20616	1100 BLK. OF E. MAIN	150	LINE BREAK	
NORMAN	7/30/1998	S20616	817 DENISON	75	SEWER BACKUP	
NORMAN	8/7/1998	S20616	SHAKLEE	500	SEWER BACKUP	
NORMAN	8/30/1998	S20616	WWP	2,000	PUMP FAILURE	
NORMAN	9/2/1998	S20616	634 WELSTON CIR.	500	DEBRIS	
NORMAN	9/30/1998	S20616	DRAKE & CLASSEN	200	ROOTS	
NORMAN	10/2/1998	S20616	501 CHESWICK	100		
NORMAN	10/8/1998	S20616	2907 WILLOWCREEK DR.	100	CHOKE	
NORMAN	10/13/1998	S20616	HWY 9 & S. JENKINS/WOODED AREA S. OF HWY 9	1,500	ROOTS	
NORMAN	11/2/1998	S20616	1730 PARKVIEW TER.	50	UNKNOWN	
NORMAN	11/3/1998	S20616	PETERS & ROBINSON	300	UNKNOWN	
NORMAN	11/19/1998	S20616	1900 FILMORE	100	OBSTRUCTION	
NORMAN	11/21/1998	S20616	640 WELSTON CIR.	50	LINE BACKUP	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	12/3/1998	S20616	2027 ALLENHURST	500	CHOKE	
NORMAN	12/25/1998	S20616	VICKSBURG APTS.	200	CHOKE	
NORMAN	12/26/1998	S20616	1606 EISENHOWER	300	CHOKE	
NORMAN	12/29/1998	S20616	WASHINGTON-IRVING MIDDLE SCHOOL	100	CHOKE	
NORMAN	1/9/1999	S20616	PETERS & ROBINSON	200	CHOKE	
NORMAN	1/16/1999	S20616	1303 OAKHURST	300	CHOKE	
NORMAN	1/27/1999	S20616	1921 SHELBY CT.	100	UNKNOWN	
NORMAN	2/9/1999	S20616	1016 COLLEGE	50	CHOKE	
NORMAN	2/11/1999	S20616	ROCKHOLLOW & QUEENSTON	100	GREASE	
NORMAN	2/12/1999	S20616	623 SINCLAIR		STOPPAGE	
NORMAN	2/26/1999	S20616	1314 ABBEY DR.	50	SEWER CHOKE	
NORMAN	2/26/1999	S20616	501 CORONADO	50		
NORMAN	3/4/1999	S20616	623 SINCLAIR DR.	50	SEWER CHOKE	
NORMAN	3/25/1999	S20616	500 ED NOBLE PARKWAY	200	GREASE & CHOKE	
NORMAN	3/26/1999	S20616	2203 ALAMEDA PLAZA DR.	500	SEWER CHOKE	
NORMAN	4/15/1999	S20616	332 WICHITA ST.	100	UNKNOWN	
NORMAN	5/13/1999	S20616	1300 HIGH MEADOWS	200	GREASE & PAPER	
NORMAN	5/26/1999	S20616	2014 SADDLEBACK	200	L.S. DOWN	
NORMAN	6/2/1999	S20616	O.U. GOLF COURSE	50	UNKNOWN	
NORMAN	6/17/1999	S20616	OU GOLF COURSE	100	UNKNOWN	
NORMAN	6/23/1999	S20616	704 STINSON	3,600	RAINWATER	
NORMAN	6/23/1999	S20616	1521 W. LINDSEY	50	CHOKE	
NORMAN	7/15/1999	S20616	O.U. GOLF COURSE	50	UNKNOWN	
NORMAN	7/16/1999	S20616	IRVING MIDDLE SCHOOL	500	CHOKE	
NORMAN	8/1/1999	S20616	315 MIMOSA	50	CHOKE	
NORMAN	8/19/1999	S20616	826 W. SYMMES	500	UNKNOWN	
NORMAN	8/20/1999	S20616	1501 ELM	250	CHOKE	
NORMAN	9/6/1999	S20616	413 CRESTLAND DR.	300	CHOKED LINE	
NORMAN	9/9/1999	S20616	SUTTON PLACE L.S.	300	L.S. FAILURE	
NORMAN	9/24/1999	S20616	4201 NORTHHAMPTON CT.	50	GREASE	
NORMAN	9/27/1999	S20616	1717 MCGEE	50	OBSTRUCTION IN LINE	
NORMAN	9/30/1999	S20616	707 WESTPARK	30	OBSTRUCTION IN LINE	
NORMAN	10/1/1999	S20616	1100 COLLEGE	100	OBSTRUCTION	
NORMAN	10/10/1999	S20616	1623 SHEFFIELD	100	SEWER STOPPAGE	
NORMAN	10/13/1999	S20616	2312 CAROLYN CT.	50	STOPPAGE	
NORMAN	10/22/1999	S20616	2502 WYANDOTTE WAY	25	UNKNOWN	
NORMAN	10/23/1999	S20616	3124 MEADOW AVE.	50	SEWER CHOKE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	10/28/1999	S20616	2235 BUD WILKINSON CT.	500	UNKNOWN	
NORMAN	10/28/1999	S20616	1419 PECAN	500	UNKNOWN	
NORMAN	11/4/1999	S20616	DAKOTA & PICKARD, IN ALLEY	25	OBSRUCTION	
NORMAN	11/11/1999	S20616	1606 EISENHOWER	50	OBSTRUCTION IN LINE	
NORMAN	11/16/1999	S20616	2743 WINDING CREEK CIR.	150	STOPPAGE	
NORMAN	11/19/1999	S20616	501 & 505 CORONADO	50	ROOTS	
NORMAN	11/29/1999	S20616	613 E. ROCK CREEK	50	UNKNOWN	
NORMAN	12/2/1999	S20616	1901 E. LINDSEY	50	UNKNOWN	
NORMAN	12/5/1999	S20616	2510 WYANDOTTE WAY	600	STOPPAGE	
NORMAN	12/6/1999	S20616	2510 WYANDOTTE WAY		STOPPAGE	
NORMAN	12/7/1999	S20616	3500 S. JENKINS	5,000		
NORMAN	12/12/1999	S20616	623 SINCLAIR	500	SEWER CHOKE	
NORMAN	12/17/1999	S20616	441 THORNTON	100	STOPPAGE	
NORMAN	12/28/1999	S20616	1727 WESTBROOK TER.	300	CHOKE IN LINE	
NORMAN	1/6/2000	S20616	1028 CEDARCREST	100	STOPPAGE	
NORMAN	1/6/2000	S20616	314 SKYLARK	100	STOPPAGE	
NORMAN	1/6/2000	20616	213 CHALMETTE	100	UNKNOWN	
NORMAN	1/9/2000	S20616	623 SINCLAIR	300	SEWER STOPPAGE	
NORMAN	1/12/2000	S20616	LINDSAY & WYLIE	500	SEWER STOPPAGE	
NORMAN	1/13/2000	S20616	623 SINCLAIR	200		
NORMAN	1/19/2000	S20616	120 MERKLE	500	SEWER STOPPAGE	
NORMAN	1/23/2000	S20616	ALLEY N. OF COMMERCE DR. W. OF LINDSEY PLAZA DR.	100	SEWER STOPPAGE	
NORMAN	2/7/2000	S20616	1300 OAKHURST	1,000	OBSTRUCTION IN LINE	
NORMAN	2/7/2000	S20616	FLEETWOOD & JAMES	150	ROOTS	
NORMAN	2/8/2000	S20616	2402 S. CLASSEN	100	UNKNOWN	
NORMAN	2/11/2000	S20616	2811 RAINTREE CR	500	STOPPAGE	
NORMAN	2/14/2000	S20616	908 MCNAMEE	30	OBSTRUCTION	
NORMAN	2/23/2000	S20616	707 S.W. 24TH AVE	20	GREASE	
NORMAN	2/27/2000	S20616	2001 BURGUNDY CT.	100	GREASE	
NORMAN	2/27/2000	S20616	1713 PARKVIEW TERR	200	STOPPAGE	
NORMAN	3/4/2000	S20616	1304 HIGH MEADOW DR.	250	STOPPAGE	
NORMAN	3/6/2000	S20616	221 MERKLE	100	OBSTRUCTION	
NORMAN	3/9/2000	S20616	1912 THORNTON ST.	100	SEWER STOPPAGE	
NORMAN	3/13/2000	S20616	3627 BELLWOOD	30	OBSTRUCTION IN LINE	
NORMAN	3/26/2000	S20616	903 DEONNE CIR.	40	GREASE	
NORMAN	3/28/2000	S20616	1300 MCGEE DR	50	STOPPED MH	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	4/20/2000	S20616	1713 PARKVIEW TERR.	20	STOPPAGE	
NORMAN	4/24/2000	S20616	401 N. MERKLE	100	OBSTRUCTION	
NORMAN	5/2/2000	S20616	714 LONG CIR.	50	OBSTRUCTION	
NORMAN	5/11/2000	S20616	1432 24TH AVE. S.E.	100	OBSTRUCTION	
NORMAN	5/12/2000	S20616	1501 MORREN	50		
NORMAN	5/30/2000	S20616	2601 S. BERRY RD.		OBSTRUCTION IN LINE	
NORMAN	6/5/2000	S20616	1713 PARKVIEW TERR.	20	GREASE & PAPER TOWELS	
NORMAN	6/13/2000	S20616	708 STINSON	500	OKLA. UNIV. PUMPING DUCK POND	
NORMAN	6/29/2000	S20616	1610 EISENHOWER	10	OBSTRUCTION IN LINE	
NORMAN	6/29/2000	S20616	603 TERRACE PL	150	UNKNOWN	
NORMAN	7/3/2000	S20616	HWY 9 & JENKINS - SHAKLEE	500	ROOTS	
NORMAN	7/18/2000	S20616	965 BILOXI (BROOK HOLLOW APTS.)	200	UNKNOWN	
NORMAN	7/20/2000	S20616	1405 S. ELM	50	SEWER STOPPAGE	
NORMAN	7/28/2000	S20616	711 TERRY DR.	30	SEWAGE STOPPAGE	
NORMAN	7/31/2000	S20616	1201 CHARLESTON CT.	30	STOPPAGE	
NORMAN	8/24/2000	S20616	2704 S. BERRY	50	OBSTRUCTION IN LINE	
NORMAN	9/14/2000	S20616	CHISOLM TRAIL PARK	250	OVERFLOW	
NORMAN	9/23/2000	S20616	808 RICHMOND	100	STICKS IN MH	
NORMAN	9/27/2000	S20616	901 DEONNE CIR	75	STOPPAGE	
NORMAN	10/9/2000	S20616	12TH AVE N.E. & ROCK CREEK RD.	1,500	BROKE LINE	
NORMAN	10/13/2000	S20616	1351 REGENT	500	SEWER STOPPAGE	
NORMAN	10/19/2000	S20616	HWY 9 & JENKINS - SHAKLEE	50,000	ROOTS	
NORMAN	10/23/2000	S20616	OAKTREE APTS	10,000	RAIN	
NORMAN	10/23/2000	S20616	48TH S.W. AVE & MAIN ST	10,000	RAIN	
NORMAN	10/23/2000	S20616	704 STINSON	10,000	RAIN	
NORMAN	10/30/2000	S20616	901 DEONNE CIR	450	CHOKE	
NORMAN	11/13/2000	S20616	2708 CHELSEA CT.	50,000	LINE BREAK	
NORMAN	11/22/2000	S20616	2505 BOXWOOD	10	STOPPAGE	
NORMAN	11/29/2000	S20616	515 N.W. 24	100	OBSTRUCTION	
NORMAN	12/8/2000	S20616	1429 BILL CARROLL	100	GREASE & PAPER	
NORMAN	12/11/2000	S20616	1631 N. CRAWFORD	100	OBSTRUCTION	
NORMAN	12/11/2000	S20616	707 S.W. 24	50	OBSTRUCTION	
NORMAN	12/13/2000	S20616	1501 ELM	50	OBSTRUCTION	
NORMAN	1/4/2001	S20616	1806 SHELBY COURT	1,000	STOPPAGE IN MAIN	
NORMAN	1/10/2001	S20616	1314 ABBEY	300	STOPPAGE	
NORMAN	1/12/2001	S20616	2205 W MAIN ST	100	OBSTRUCTION IN LINES	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	1/15/2001	S20616	1600 CHAMBLEE DR.	10,000	LINE COLLAPSED	
NORMAN	1/18/2001	S20616	1606 EISENHOWER	50	REMOVED OBSTRUCTION	
NORMAN	1/21/2001	S20616	1003 MEADOW RIDGE DR	40	OBSTRUCTION OF MAIN	
NORMAN	1/22/2001	S20616	1314 ABBEY	50	OBSTRUCTION IN LINE	
NORMAN	1/24/2001	S20616	1308 MCKINLEY	10	OBSTRUCTION IN MAIN	
NORMAN	1/25/2001	S20616	1717 E BOYD	1000	OBSTRUCTION IN LINE	
NORMAN	1/29/2001	S20616	213 MOUNT VERNON	25	ROOTS	
NORMAN	1/29/2001	S20616	12TH AVE N.E. & PALOMA ST	40	SEWER OBSTRUCTION	
NORMAN	2/4/2001	S20616	601 S.E. 12TH AVE	300	SEWER OBSTRUCTION	
NORMAN	2/9/2001	S20616	2919 WILLOW CREEK DR	50	OBSTRUCTION IN LINE	
NORMAN	2/10/2001	S20616	708 RICHMOND DR	40	OBSTRUCTION IN LINE	
NORMAN	2/19/2001	S20616	4501 W. MAIN	50	OBSTRUCTION	
NORMAN	2/21/2001	S20616	624 SINCLAIR	500	OBSTRUCTION	
NORMAN	2/25/2001	S20616	920 HARDIN	30	SEWER OBSTRUCTION	
NORMAN	2/26/2001	S20616	1056 CARLISLE CIR	1,000		
NORMAN	2/27/2001	S20616	3913 STONEWALL	25		
NORMAN	3/2/2001	S20616	1404 DENISON	50	SEWER OBSTRUCTION	
NORMAN	3/6/2001	S20616	1510 BEDFORD LANE	500	SEWER OBSTRUCTION	
NORMAN	3/7/2001	S20616	2029 BEAUMONT	200	SEWER OBSTRUCTION	
NORMAN	3/7/2001	S20616	200 S.E. VICKSBURG	30	SEWER OBSTRUCTION	
NORMAN	3/7/2001	S20616	2800 CHAUTAUQUA	50	SEWER OBSTRUCTION	
NORMAN	3/17/2001	S20616	1300 OAKHURST AVE	400	SEWER OBSTRUCTION	MANHOLE
NORMAN	3/19/2001	S20616	1818 W LINDSEY	100	SEWER OBSTRUCTION	
NORMAN	3/24/2001	S20616	1501 E. LINDSAY ST	50	SEWER OBSTRUCTION	
NORMAN	3/30/2001	S20616	901 DEONNE CIR	200	SEWER OBSTRUCTION	
NORMAN	4/11/2001	S20616	629 SINCLAIR	50	OVERFLOW	
NORMAN	4/17/2001	S20616	2743 WINDING CREEK CIR.	20	SEWER OBSTRUCTION	
NORMAN	4/17/2001	S20616	YORK L.S.	300	BLOCKAGE	
NORMAN	4/20/2001	S20616	1240 NORTHCLIFF	75	GREASE	
NORMAN	5/4/2001	S20616	2900 S. CHAUTAUQUA	100	OVERFLOW	
NORMAN	5/30/2001	S20616	OAKTREE APTS	1000	OVERFLOWING MH DUE TO HEAVY RAIN	MANHOLE
NORMAN	5/30/2001	S20616	12TH & LINDSEY ST	1500	ROOTS	MANHOLE
NORMAN	5/30/2001	S20616	W MAIN & W 48TH	500	MH OVERFLOW DUE TO RAIN	MANHOLE
NORMAN	6/15/2001	S20616	1125 E. ALAMEDA	50	GREASE & PAPER	
NORMAN	6/16/2001	S20616	200 W. DALE	100	GREASE & PAPER	
NORMAN	6/18/2001	S20616	500 W. TONHAWA ST.	40	OBSTRUCTION	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	6/30/2001	S20616	48TH AVE N.W. N. OF HERITAGE PL. DR.	400	COLLAPSED MAIN	
NORMAN	7/7/2001	S20616	4303 PRAIRIE CREEK DR.	40	OBSTRUCTION	
NORMAN	7/15/2001	S20616	1631 N. CRAWFORD AVE	20	OBSTRUCTION	
NORMAN	7/16/2001	S20616	TECUMSEH	10,000	PRESSURE LINE BROKE	
NORMAN	7/18/2001	S20616	202 STANTON DR	50	OBSTRUCTION	PIPE
NORMAN	7/20/2001	S20616	3000 HARWICH CT.	1,000	OBSTRUCTION	MANHOLE
NORMAN	8/2/2001	S20616	NATIONAL & TECUMSEH	500	MAIN BREAK	PIPE
NORMAN	8/9/2001	S20616	1200 E. BROOKS	50	OBSTRUCTION	
NORMAN	8/13/2001	S20616	3432 RAMBLING OAKS DR.	20	OBSTRUCTION	
NORMAN	9/17/2001	S20616	1400 S.W. 28	500	OBSTRUCTION	
NORMAN	9/18/2001	S20616	1900 RENAISSANCE DR. - APT. BLDG 10	0	OBSTRUCTION	
NORMAN	9/20/2001	S20616	708 STINSON	700	RAIN	
NORMAN	10/1/2001	S20616	1214 WESTBROOK TERR.	1,000	BLOCKAGE	MANHOLE
NORMAN	10/10/2001	S20616	1501 PARKVIEW TERR	10,000	RAIN	
NORMAN	10/10/2001	S20616	704 STINSON	10,000	RAIN	
NORMAN	10/28/2001	S20616	1633 WINDMILL	750	OVERFLOW	MANHOLE
NORMAN	11/4/2001	S20616	911 BARBOUR	30	OBSTRUCTION	MANHOLE
NORMAN	11/21/2001	S20616	1000 BLK CARLISLE CIR.	200	OVERFLOW	MANHOLE
NORMAN	11/25/2001	S20616	ROLLING STONE & OAKHURST	5,000	OVERFLOW	MANHOLE
NORMAN	12/1/2001	S20616	710 RICHMOND AVE	20	OBSTRUCTION	
NORMAN	12/6/2001	S20616	12TH AVE N.E. & E. MAIN ST	50	STOPPAGE	
NORMAN	12/10/2001	S20616	HALRAY DR.	50	ROOTS & GREASE	
NORMAN	12/12/2001	S20616	640 WELSTON CIR	20	MAIN LINE CHOKED	
NORMAN	12/18/2001	S20616	515 ALAMEDA	100	GREASE & ROOTS	
NORMAN	1/6/2002	S20616	DRAKE & CLASSEN	75	MH OVERFLOW	MANHOLE
NORMAN	1/7/2002	S20616	2107 JACKSON	2,500	MH SURCHARGED	
NORMAN	1/8/2002	S20616	N.E. 24TH AVE	1,500	MAIN HIT BY CONTRACTORS	
NORMAN	1/8/2002	S20616	1119 LOIS ST	25	OBSTRUCTION	
NORMAN	1/13/2002	S20616	524 JEAN MARIE	20	CHOKE	
NORMAN	1/18/2002	S20616	2312 CAROLYN	100	CHOKE	
NORMAN	1/19/2002	S20616	1037 MONTGOMERY	25	CHOKE	
NORMAN	1/27/2002	S20616	1250 36TH AVE N.W.	100	CHOKE	MANHOLE
NORMAN	1/27/2002	S20616	1210 WYANDOTTE	75	CHOKE	MANHOLE
NORMAN	1/31/2002	S20616	1915 CRAWFORD	30	CHOKE	MANHOLE
NORMAN	2/11/2002	S20616	ELMWOOD & COLLEGE	1,500	CHOKE	MANHOLE
NORMAN	2/15/2002	S20616	237 CHALMETTE	300	CHOKE	
NORMAN	2/15/2002	S20616	3526 RAMBLING OAKS	80	CHOKE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	3/3/2002	S20616	3926 PINETREE CIR	30	CHOKE	PIPE
NORMAN	3/4/2002	S20616	1521 GREENBRIAR DR.	1,000	CHOKE	
NORMAN	3/5/2002	S20616	905 CANTERBURY	100	CHOKE	
NORMAN	3/6/2002	S20616	3926 PINE TREE CIR	100	OBSTRUCTION	
NORMAN	3/11/2002	S20616	1631 N. CRAWFORD	1,000	OVERFLOW	MANHOLE
NORMAN	3/13/2002	S20616	704 TERRY DR.	500	OBSTRUCTION	MANHOLE
NORMAN	3/14/2002	S20616	1300 MCGEE	100	OBSTRUCTION	
NORMAN	3/21/2002	S20616	2107 JACKSON	700	OBSTRUCTION	
NORMAN	3/23/2002	S20616	421 CRIPPLE CREEK	200	OBSTRUCTION	
NORMAN	3/25/2002	S20616	5201 DEERHURST	65	GREASE	PIPE
NORMAN	3/29/2002	S20616	711 TERRY DR	200	OBSTRUCTION	
NORMAN	3/31/2002	S20616	2107 JACKSON	250	OVERFLOW	MANHOLE
NORMAN	4/1/2002	S20616	3212 POCOSSET	3,600	DEBRIS	
NORMAN	4/10/2002	S20616	1037 MONTGOMERY CIRCLE	50	OBSTRUCTION	
NORMAN	4/14/2002	S20616	2900 12TH AVE N.E.	150	MAIN BREAK	
NORMAN	4/14/2002	S20616	2221 PARKLAND WAY	35	OVERFLOW	MANHOLE
NORMAN	5/6/2002	S20616	LINDSEY & PICKARD	50	ROOT	
NORMAN	5/7/2002	S20616	100 12TH AVE N.E.	200	OBSTRUCTION	MANHOLE
NORMAN	5/13/2002	S20616	1404 DENISON ST	25	OBSTRUCTION	
NORMAN	6/14/2002	S20616	WESTWOOD GOLF COURSE	150	OVERFLOW	MANHOLE
NORMAN	8/2/2002	S20616	2800 LOCKWOOD	2,500	OVERFLOW	MANHOLE
NORMAN	9/30/2002	S20616	2743 WINDING CREEK	250	GREASE	MANHOLE
NORMAN	10/26/2002	S20616	STEEPLE CHASE	150	OVERFLOW	MANHOLE
NORMAN	10/31/2002	S20616	704 TERRY CIRCLE	2.5	OBSTRUCTION	MANHOLE
NORMAN	11/6/2002	S20616	3216 COVE HOLLOW	100	OBSTRUCTED MAIN	
NORMAN	11/10/2002	S20616	1300 BLK REGENT	20	GREASE & ROOTS	
NORMAN	11/18/2002	S20616	816 RUSSELL CIR.	20	ROOTS & TOILET PAPER	
NORMAN	11/20/2002	S20616	710 LONG CIR	100	OVERFLOW	MANHOLE
NORMAN	11/20/2002	S20616	2900 CHAUTAUQUA	50	OVERFLOW	MANHOLE
NORMAN	11/24/2002	S20616	2800 CHAUTAUQUA	50	GREASE	MANHOLE
NORMAN	11/25/2002	S20616	BERRY RD. & GREENBRIAR DR.	250	ROOTS	MANHOLE
NORMAN	12/2/2002	S20616	314 SKYLARK	50	GREASE	
NORMAN	12/9/2002	S20616	2601 S. CLASSEN, LOT 28-B	1,000	OVERFLOW	MANHOLE
NORMAN	12/10/2002	S20616	941 JONA KAY	250	OVERFLOW	MANHOLE
NORMAN	12/11/2002	S20616	305 WOODSIDE	450	OVERFLOW	MANHOLE
NORMAN	12/14/2002	S20616	202 JASON	100	OBSTRUCTION	
NORMAN	12/17/2002	S20616	1910 CHEROKEE LN.	25	OBSTRUCTION	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	1/10/2003	S20616	POSTAL L.S.	8,000	RAGS	LIFT STATION
NORMAN	1/11/2003	S20616	1612 NORTHCLIFFE	50	OBSTRUCTED	
NORMAN	1/11/2003	S20616	2743 WINDING CREEK CIR.	50	OBSTRUCTED	
NORMAN	1/20/2003	S20616	305 WOODSIDE DR.	20	OBSTRUCTION	
NORMAN	1/24/2003	S20616	900 S. CRAWFORD	200	OVERFLOW	MANHOLE
NORMAN	2/14/2003	S20616	1909 BEVERLY HILLS	10	OBSTRUCTION	MANHOLE
NORMAN	2/22/2003	S20616	500 ED NOBLE PARKWAY	200	OBSTRUCTION	
NORMAN	2/25/2003	S20616	36TH N.W. & TECUMSEH RD.	10,000	GREASE	
NORMAN	3/7/2003	S20616	1223 E. LOUISANA	50	OBSTRUCTION	
NORMAN	3/13/2003	S20616	2829 REDWOOD DR.	20	OBSTRUCTION	MANHOLE
NORMAN	3/14/2003	S20616	2814 CYNTHIA CIR.	25	OBSTRUCTION	
NORMAN	3/16/2003	S20616	1223 E. LOUISIANA	50	OBSTRUCTION	
NORMAN	3/22/2003	S20616	501 GARLAND	20	OBSTRUCTION	MANHOLE
NORMAN	3/23/2003	S20616	2201 LAFAYETTE	10	OBSTRUCTION	MANHOLE
NORMAN	3/30/2003	S20616	1223 E. LOUISANA	250	BROKEN MAIN	MANHOLE
NORMAN	4/14/2003	S20616	501 DAKOTA	50	OBSTRUCTION	MANHOLE
NORMAN	4/20/2003	S20616	1000 BLK MEADOW RIDGE RD.	20	OBSTRUCTION	MANHOLE
NORMAN	4/30/2003	S20616	1321 SUPERIOR	50	OBSTRUCTION	
NORMAN	5/3/2003	S20616	2907 WILLOW CREEK	100	OBSTRUCTION	MANHOLE
NORMAN	5/16/2003	S20616	300 HAL MULDROW DR.	100	GREASE	
NORMAN	6/12/2003	S20616	400 BLK. N. UNIVERSITY	100	OBSTRUCTION	MANHOLE
NORMAN	6/16/2003	S20616	2601 S. BERRY RD.	150	GREASE & ROOTS	MANHOLE
NORMAN	6/20/2003	S20616	1812 RIDGEWOOD DR.	15	OBSTRUCTION	MANHOLE
NORMAN	7/8/2003	S20616	2821 CEDARCREST	2,000	BROKEN MAIN	PIPE
NORMAN	7/11/2003	S20616	2340 HEATHERFIELD	100	OBSTRUCTION	MANHOLE
NORMAN	8/11/2003	S20616	2803 WOODBRIAR	250	GREASE	MANHOLE
NORMAN	8/15/2003	S20616	817 BARBOUR	20	OBSTRUCTION	MANHOLE
NORMAN	8/15/2003	S20616	305 WOODSIDE	500	OBSTRUCTION	MANHOLE
NORMAN	9/1/2003	S20616	WWTP	11,500	COLLAPSED LINE	
NORMAN	9/3/2003	S20616	1125 SHADOWLAKE	20,000	RUPTURED PIPE	PIPE
NORMAN	9/4/2003	S20616	515 W. DAWS	75	OBSTUCTION	MANHOLE
NORMAN	9/5/2003	S20616	300 BEACON	20	OBSTRUCTION	MANHOLE
NORMAN	9/15/2003	S20616	630 SINCLAIR	500	GREASE & STICKS	MANHOLE
NORMAN	9/17/2003	S20616	423 S. FLOOD	200	CRACKED PIPE	PIPE
NORMAN	9/20/2003	S20616	1713 SANDALWOOD	10	OBSTRUCTION	MANHOLE
NORMAN	9/24/2003	S20616	1720 ROLLING STONE	75	BLOCKAGE	
NORMAN	10/5/2003	S20616	24TH AVE. N.E. & ROBINSON	100	L.S. DOWN	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	10/18/2003	S20616	2312 CAROLYN	30	GREASE	MANHOLE
NORMAN	10/29/2003	S20616	300 CHALMETTE	50	OBSTRUCTION	
NORMAN	11/18/2003	S20616	3100 RIDGECREST	3,500	OBSTRUCTION	MANHOLE
NORMAN	11/18/2003	S20616	BOYD & EMELYN	500	OBSTRUCTION	PIPE
NORMAN	11/21/2003	S20616	24TH AVE. S.E. & ALAMEDA	1,700	CONTRACTOR HIT MAIN	PIPE
NORMAN	11/30/2003	S20616	1139 MERRYMEN GREEN	3	OBSTRUCTION	MANHOLE
NORMAN	12/5/2003	S20616	1819 ROLLINGSTONE	200	BLOCKAGE	MANHOLE
NORMAN	12/8/2003	S20616	ROYAL OAKS L.S.	2,000	PUMP FAILURE	LIFT STATION
NORMAN	12/22/2003	S20616	SHADOW LAKE ADDITION	3,000	MAIN CUT BY CONTRACTOR	PIPE
NORMAN	1/2/2004	S20616	2301 24TH AVE S.W.	21	OBSTRUCTION	MANHOLE
NORMAN	1/6/2004	S20616	2743 WINDING CREEK CIR	50	OBSTRUCTION	MANHOLE
NORMAN	1/10/2004	S20616	WYLIE RD. & BROOKS ST.	100	OBSTRUCTION	MANHOLE
NORMAN	1/13/2004	S20616	2312 CAROLYN CT.	20	OBSTRUCTION	MANHOLE
NORMAN	1/18/2004	S20616	1700 BLK. OF RIDGEMONT	50	OBSTRUCTION	MANHOLE
NORMAN	1/24/2004	S20616	1925 ROBIN RIDGE	30	OBSTRUCTION	MANHOLE
NORMAN	1/25/2004	S20616	1736 CLASSEN BLVD.	10	OBSTRUCTION	
NORMAN	2/1/2004	S20616	3600 BLK. OF BLACKHAWK	60	OBSTRUCTION	MANHOLE
NORMAN	2/3/2004	S20616	1910 CHEROKEE LANE	100	GREASE	MANHOLE
NORMAN	2/10/2004	S20616	1908 SHELBY CT.	5	GREASE & ROOTS	MANHOLE
NORMAN	2/10/2004	S20616	HIGH MEADOWS & HIGH TRAILS	50	OBSTRUCTION	MANHOLE
NORMAN	2/16/2004	S20616	1303 OAKHURST	800	OBSTRUCTION	MANHOLE
NORMAN	2/21/2004	S20616	2014 SADDLEBACK	300	L.S. DOWN	LIFT STATION
NORMAN	2/22/2004	S20616	1718 OAKCLIFF RD.	25	GREASE & PAPER	MANHOLE
NORMAN	3/7/2004	S20616	700 BLK. OF BLACK HAWK	10	OBSTRUCTION	MANHOLE
NORMAN	3/7/2004	S20616	1700 BLK. OF CHARLES	7	OBSTRUCTION	MANHOLE
NORMAN	3/14/2004	S20616	PICKARD & HOOVER	20	OBSTRUCTION	MANHOLE
NORMAN	3/15/2004	S20616	2401 BUTLER DR.	10	GREASE	MANHOLE
NORMAN	3/16/2004	S20616	444 S. FLOOD	20	PAPER & STICKS	
NORMAN	4/12/2004	S20616	2100 BLK. BROOKS ST.	20	GREASE & ROOTS	MANHOLE
NORMAN	4/12/2004	S20616	300 BLK VICKSBURG	375	OBSTRUCTION	MANHOLE
NORMAN	4/17/2004	S20616	1830 LAKEHURST DR.	5	ROOTS	MANHOLE
NORMAN	4/21/2004	S20616	3212 POCASSET	32	OBSTRUCTION	MANHOLE
NORMAN	6/20/2004	S20616	1300 BLK OF LOUISIANA	75	OBSTRUCTION	MANHOLE
NORMAN	7/4/2004	S20616	205 WOODSIDE	50	GREASE	MANHOLE
NORMAN	7/9/2004	S20616	ROYAL OAKS L.S. - 6000 COALBROOK DR	250	GREASE	LIFT STATION
NORMAN	7/19/2004	S20616	HALL PARK L.S.	12,049	L.S. DISCONNECTED BY O.G. & E.	LIFT STATION
NORMAN	7/22/2004	S20616	ROYAL OAKS L.S.	5,000		

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	7/25/2004	S20616	3009 ED NOBLE PARKWAY	500	GREASE	MANHOLE
NORMAN	7/31/2004	S20616	711 TERRY DR.	20	ROOTS	MANHOLE
NORMAN	8/10/2004	S20616	635 WELSTON CIR.	10	OBSTRUCTION	
NORMAN	8/18/2004	S20616	192 ROBIN RIDGE RD.	300	SAND	MANHOLE
NORMAN	8/22/2004	S20616	1717 DAISY LN.	40	ELECTRICAL PROBLEMS	MANHOLE
NORMAN	8/24/2004	S20616	1601 CHAMBLEE	400	GREASE	MANHOLE
NORMAN	8/24/2004	S20616	1200 BLK. OF COLLEGE ST.	500	GREASE	MANHOLE
NORMAN	8/26/2004	S20616	903 W. EUFAULA	20	OBSTRUCTION	
NORMAN	8/31/2004	S20616	116 N. CARTER	200	BROKEN LINE	PIPE
NORMAN	9/4/2004	S20616	925 HOOVER	200	OBSTRUCTION IN LINE	
NORMAN	9/7/2004	S20616	413 S. LAHOMA	20	CONTRACTOR ERROR	PIPE
NORMAN	9/8/2004	S20616	1325 E. LINDSEY - LAUNDRAMAT		BLOCKAGE	PIPE
NORMAN	9/10/2004	S20616	300 BLK. N. COCKREL	10	ROOTS & GREASE	MANHOLE
NORMAN	9/19/2004	S20616	1712 CINDERELLA	20	BLOCKAGE	
NORMAN	9/20/2004	S20616	2605 BELKNAP	15	OBSTRUCTION	
NORMAN	9/22/2004	S20616	1202 N. FLOOD	30	BLOCKAGE	PIPE
NORMAN	9/22/2004	S20616	1427 CHERRYSTONE	35	OBSTRUCTION	MANHOLE
NORMAN	9/23/2004	S20616	1600 ANN BRANDON ST.	200	OBSTRUCTION	MANHOLE
NORMAN	9/26/2004	S20616	810 RUSSELL CIR.	20	OBSTRUCTION	PIPE
NORMAN	9/28/2004	S20616	1125 SHADOWLAKE RD.	100	LINE BREAK	PIPE
NORMAN	10/3/2004	S20616	1616 ALAMEDA, BLDG E. APT 7	5	OBSTRUCTION	
NORMAN	10/3/2004	S20616	1805 RIDGEWOOD DR.	5	OBSTRUCTION	
NORMAN	10/3/2004	S20616	2601 S. BERRY RD.	50	OBSTRUCTION	MANHOLE
NORMAN	10/4/2004	S20616	1718 DENNISON	20	OBSTRUCTION	
NORMAN	10/12/2004	S20616	514 W. COMANCHE	20	DEBRIS	
NORMAN	10/12/2004	S20616	425 W. EUFAULA	25	DEBRIS	
NORMAN	10/12/2004	S20616	314 SKYLARK CT.	300	OBSTRUCTION	MANHOLE
NORMAN	10/12/2004	S20616	501 W. EUFAULA	50	DEBRIS	
NORMAN	10/13/2004	S20616	2601 S. BERRY RD.	50	OBSTRUCTION	MANHOLE
NORMAN	10/21/2004	S20616	PLANT	2,000	CONTRACTOR HIT LINE	MANHOLE
NORMAN	10/22/2004	S20616	2701 9TH AVE. N.E.	5	OBSTRUCTION	
NORMAN	10/27/2004	S20616	SHAWDOWLAKE & N.E. 12TH AVE	10	MALFUNCTION	MANHOLE
NORMAN	11/1/2004	S20616	4200 N. HAMPTON	20	GREASE	
NORMAN	11/9/2004	S20616	1616 ALAMEDA ST. - PINES APTS.	150	OBSTRUCTION	MANHOLE
NORMAN	11/12/2004	S20616	817 HAYES ST.	50	OBSTRUCTION	MANHOLE
NORMAN	11/20/2004	S20616	ROBINSON & PETERS	75	GREASE	MANHOLE
NORMAN	11/24/2004	S20616	1802 E. LINDSAY	50	OBSTRUCTION	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	11/27/2004	S20616	705 GRILL	25	OBSTRUCTION	MANHOLE
NORMAN	12/2/2004	S20616	4711 7TH AVE. N.E.	20,000	OBSTRUCTION & BROKEN MAIN	PIPE
NORMAN	12/4/2004	S20616	2906 RAIN TREE CIR.	30	OBSTRUCTION	MANHOLE
NORMAN	12/17/2004	S20616	800 BARBOUR	15	STOPPAGE	
NORMAN	12/22/2004	S20616	213 CHALMETTE DR.	600	CONTRACTOR ERROR	PIPE
NORMAN	12/26/2004	S20616	4412 BALMORAL CT.	20	OBSTRUCTION	MANHOLE
NORMAN	12/28/2004	S20616	1305 QUAIL HOLLOW DR.	800	GREASE	MANHOLE
NORMAN	1/3/2005	S20616	508 ROSEWOOD DR.	15	ROOTS	MANHOLE
NORMAN	1/5/2005	S20616	1231 BARKLEY	200	OBSTRUCTION	MANHOLE
NORMAN	1/13/2005	S20616	201 E. HINES	20	PRIVATE SERVICE LINE	PIPE
NORMAN	1/15/2005	S20616	1238 NORTHCLIFF	50	OBSTRUCTION	
NORMAN	1/19/2005	S20616	1829 CHERRY STONE	100	OBSTRUCTION	MANHOLE
NORMAN	1/19/2005	S20616	5201 DEERHURST DR.	15	OBSTRUCTION	MANHOLE
NORMAN	1/23/2005	S20616	1826 ROLLING STONE	5	OBSTRUCTION	MANHOLE
NORMAN	1/25/2005	S20616	1251 ALAMEDA ST. IN ALBERTSON'S MALL	100	OBSTRUCTION	MANHOLE
NORMAN	1/27/2005	S20616	201 W. HIMES	20	SERVICE LINE TIED TO ABANDONED MAIN	PIPE
NORMAN	1/27/2005	S20616	603 TERRACE PL.	3	OBSTRUCTION	MANHOLE
NORMAN	1/30/2005	S20616	1923 TWISTED OAKS - TURNBURY APTS.	50	OBSTRUCTION	
NORMAN	1/31/2005	S20616	1921 SHELBY CT.	200	OBSTRUCTION	MANHOLE
NORMAN	2/1/2005	S20616	3400 W. MAIN	50	DEBRIS	MANHOLE
NORMAN	2/8/2005	S20616	1214 W. LINDSAY	50	OBSTRUCTION	PIPE
NORMAN	2/9/2005	S20616	1214 WINDSOR WAY	5	OBSTRUCTION	MANHOLE
NORMAN	2/13/2005	S20616	2526 BRENTWOOD DR.	5	OBSTRUCTION	MANHOLE
NORMAN	2/14/2005	S20616	WOODED AREA E. END OF CEDAR LN.	5,000	OBSTRUCTION	MANHOLE
NORMAN	2/15/2005	S20616	339 WOODCREST DR.	20	ROOTS & PAPER	
NORMAN	2/15/2005	S20616	2517 HOLLYWOOD	25	OBSTRUCTION	MANHOLE
NORMAN	2/22/2005	S20616	4413 NEWPORT	30	BROKEN SERVICE LINE	PIPE
NORMAN	2/23/2005	S20616	2100 BLK. N. PORTER	10	OBSTRUCTION	MANHOLE
NORMAN	2/24/2005	S20616	325 GEORGE L. CROSS	20	OBSTRUCTION	MANHOLE
NORMAN	2/25/2005	S20616	INDUSTRIAL BLVD. ROCK CREEK RD.	5,000	CONTRACTOR ERROR	MANHOLE
NORMAN	2/25/2005	S20616	1932 GRASSLAND DR.	50	OBSTRUCTION	MANHOLE
NORMAN	3/2/2005	S20616	1023 COLLEGE AVE		OBSTRUCTION	
NORMAN	3/2/2005	S20616	1600 ANN BRANDON	50	OBSTRUCTION	MANHOLE
NORMAN	3/8/2005	S20616	252 WATERFRONT	10	OBSTRUCTION	MANHOLE
NORMAN	3/10/2005	S20616	3720 W. ROBINSON	125	OBSTRUCTION	MANHOLE
NORMAN	3/14/2005	S20616	300 HAL MULDROW DR.	<10	OBSTRUCTION	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	3/17/2005	S20616	401 E. BOYD	2	BROKEN LINE	MANHOLE
NORMAN	3/26/2005	S20616	2014 SADDLEBACK DR.	300	LIFT STATION DOWN	LIFT STATION
NORMAN	3/27/2005	S20616	1710 TELSTAR	10	OBSTRUCTION	MANHOLE
NORMAN	4/1/2005	S20616	314 SKYLARK CT.	100	OBSTRUCTION	MANHOLE
NORMAN	4/2/2005	S20616	412 KANSAS ST.	10	OBSTRUCTION	
NORMAN	4/7/2005	S20616	1801 TIFFANY DR.	25	OBSTRUCTION	MANHOLE
NORMAN	4/18/2005	S20616	2410 WILDWOOD	20	OBSTRUCTION	
NORMAN	4/18/2005	S20616	2145 MELROSE CT. #125	25	OBSTRUCTION	
NORMAN	5/1/2005	S20616	746 ASP	100	OBSTRUCTION	PIPE
NORMAN	5/8/2005	S20616	1022 QUANAH PARK TRAIL	200	OBSTRUCTION	MANHOLE
NORMAN	5/9/2005	S20616	505 GRILL AVE	30	OBSTRUCTION	MANHOLE
NORMAN	5/9/2005	S20616	2101 W. TECUMSEH	50	OBSTRUCTION	
NORMAN	5/11/2005	S20616	1913 OAK CREEK RD.	25	OBSTRUCTION	MANHOLE
NORMAN	5/16/2005	S20616	ROYAL OAKS L.S.	150	OBSTRUCTION	MANHOLE
NORMAN	5/24/2005	S20616	ROYAL OAKS L.S. - S.E. 24TH & ALAMEDA	300	OBSTRUCTION	MANHOLE
NORMAN	5/30/2005	S20616	2101 WESTWOOD DR.	1,500	BLOCKLAGE	MANHOLE
NORMAN	6/1/2005	S20616	YORK L.S. - 4600 24TH AVE N.W.	5,000	ELECTRICAL FAILURE/ LIGHTNING	LIFT STATION
NORMAN	6/7/2005	S20616	718 N. PORTER	75	OBSTRUCTION	
NORMAN	7/8/2005	S20616	2898 GLEN OAKS - CLEARWATER L.S.	1,000	PUMP FAILURE	LIFT STATION
NORMAN	8/22/2005	S20616	1200 BLK. S. ELM	200	OBSTRUCTION	MANHOLE
NORMAN	8/28/2005	S20616	1433 BROOKDALE DR.	120	OBSTRUCTION	MANHOLE
NORMAN	9/1/2005	S20616	1717 DAISY LN.	50	OVERLOAD	MANHOLE
NORMAN	9/7/2005	S20616	501 E. ALAMEDA		CONTRACTOR ERROR	
NORMAN	9/7/2005	S20616	YORK L.S. - 4600 N.W. 24TH AVE		LIFT STATION FOUND IN OFF POSITION	LIFT STATION
NORMAN	9/24/2005	S20616	821 E. FRANK	4	OBSTRUCTION	MANHOLE
NORMAN	10/8/2005	S20616	2901 OAK TREE	200	OBSTRUCTION	MANHOLE
NORMAN	10/8/2005	S20616	3212 CADDO LN.	25	OBSTRUCTION	MANHOLE
NORMAN	10/23/2005	S20616	3841 WAVERLY CT.	25	CLEANOUT	
NORMAN	10/29/2005	S20616	GRIFFIN PARK AT 12TH AVE. N.E. & ROBINSON	100	MALFUNCTION	LIFT STATION
NORMAN	10/30/2005	S20616	1500 BLK. OF CAMBRIDGE	5	BLOCKAGE	MANHOLE
NORMAN	10/31/2005	S20616	1809 TIFFANY	100	OBSTRUCTION	MANHOLE
NORMAN	11/3/2005	S20616	619 E. BOYD	10	OBSTRUCTION	
NORMAN	11/4/2005	S20616	1711 HOLLIDAY DR.	10	OBSTRUCTION	MANHOLE
NORMAN	11/7/2005	S20616	HUGHBERT & FINDLAY AVE.	1,000	CONTRACTOR ERROR	MANHOLE
NORMAN	11/11/2005	S20616	HAVENBROOK & N.W. 36TH	5,000	CONTRACTOR ERROR	MANHOLE
NORMAN	11/14/2005	S20616	317 EDGE BROOK LN.	900	OBSTRUCTION	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	11/21/2005	S20616	499 SANDPIPER LN. - SUTTON L.S.	1,200	MALFUNCTION	MANHOLE
NORMAN	11/22/2005	S20616	600 WEBSTER AVE.	40	BLOCKAGE	
NORMAN	11/23/2005	S20616	1901 OAKHURST AVE	400	OBSTRUCTION	MANHOLE
NORMAN	12/10/2005	S20616	2919 WILLOW CREEK DR.	25	OBSTRUCTION	MANHOLE
NORMAN	12/11/2005	S20616	825 RICHMOND DR.	20	CITY MAIN CHOKED	MANHOLE
NORMAN	12/15/2005	S20616	1118 N. BERRY RD.	25	BLOCKAGE	
NORMAN	12/21/2005	S20616	1116 PINEWOOD	20	OBSTRUCTION	
NORMAN	12/21/2005	S20616	2918 QUEENSTON	20	OBSTRUCTION	
NORMAN	12/22/2005	S20616	1801 TIFFANY	250	OBSTRUCTION	MANHOLE
NORMAN	12/27/2005	S20616	ROYAL OAKS L.S. - 598 COALBROOK DR.	55	LIFT STATION WAS TURNED OFF	MANHOLE
NORMAN	12/28/2005	S20616	2900 CHAUTAUQUAH	50	OBSTRUCTION	MANHOLE
NORMAN	12/29/2005	S20616	3921 PRESTON CT.	20	OBSTRUCTION	MANHOLE
NORMAN	1/3/2006	S20616	4110 MORRISON CT. CHERRY CREEK PARK	300	OBSTRUCTION	MANHOLE
NORMAN	1/7/2006	S20616	2125 ALLENHURST	100	OBSTRUCTION	MANHOLE
NORMAN	1/7/2006	S20616	1303 OAKHURST AVE.	70	OBSTRUCTION	
NORMAN	1/11/2006	S20616	625 W. COMANCHE	25	OBSTRUCTION	
NORMAN	1/16/2006	S20616	1631 N. CRAWFORD	100	OBSTRUCTION	MANHOLE
NORMAN	1/16/2006	S20616	1212 S. BERRY RD.	20	OBSTRUCTION	PIPE
NORMAN	1/17/2006	S20616	1308 NORTHERN HILLS DR.	1,200	OBSTRUCTION	MANHOLE
NORMAN	1/25/2006	S20616	105-119 TIMBERDELL	50	OBSTRUCTION	
NORMAN	2/6/2006	S20616	1819 ROLLING STONE DR.	10	OBSTRUCTION	MANHOLE
NORMAN	2/7/2006	S20616	1237 OAKHURST AVE.	30	OBSTRUCTION	MANHOLE
NORMAN	2/7/2006	S20616	1640 EISENHOWER RD.	5	RAGS	MANHOLE
NORMAN	2/9/2006	S20616	2743 WINDINGCREEK CIR.	1,000	OBSTRUCTION	MANHOLE
NORMAN	2/12/2006	S20616	1616 FARMINGTON RD.	10	OBSTRUCTION	MANHOLE
NORMAN	2/12/2006	S20616	1000 MOCKINGBIRD LN.	10	BLOCKAGE	
NORMAN	2/16/2006	S20616	1315 ATLANTA CIR.	1	OBSTRUCTION	
NORMAN	2/28/2006	S20616	1706 OSAGE WAY	40	OBSTRUCTION	
NORMAN	2/28/2006	S20616	1416 LAKECREST	5	OBSTRUCTION	
NORMAN	3/16/2006	S20616	3127 WALNUT RD.	35	OBSTRUCTION	MANHOLE
NORMAN	3/20/2006	S20616	200 VICKSBURG AVE	50	OBSTRUCTION	MANHOLE
NORMAN	3/22/2006	S20616	2400 S. CLASSEN BLVD.	100	OBSTRUCTION	MANHOLE
NORMAN	3/24/2006	S20616	1801 CANDLEWOOD	20	OBSTRUCTION	MANHOLE
NORMAN	3/28/2006	S20616	4501 W. MAIN	6,000	CONTRACTOR ERROR	MANHOLE
NORMAN	3/31/2006	S20616	1819 ROLLINGSTONE DR.	100	OBSTRUCTION	MANHOLE
NORMAN	3/31/2006	S20616	332 ST. CLAIRE	75	OBSTRUCTION	MANHOLE
NORMAN	4/1/2006	S20616	2212 TWISTED OAKS DR.	20	OBSTRUCTION	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	4/2/2006	S20616	2829 REDWOOD DR.	50	STICKS	MANHOLE
NORMAN	4/11/2006	S20616	929 CRUCE ST.	1	OBSTRUCTION	
NORMAN	4/12/2006	S20616	1213 CEDAR CREEK	1	LINE STOPPAGE	PIPE
NORMAN	4/20/2006	S20616	804 RICHMOND DR.	20	ROOT CUT	MANHOLE
NORMAN	4/24/2006	S20616	2024 FROST LN.	20	GARBAGE	MANHOLE
NORMAN	4/26/2006	S20616	2606 BELKNAP AVE	2	OBSTRUCTION	
NORMAN	4/27/2006	S20616	1030 W. BOYD	75	OBSTRUCTION	
NORMAN	5/5/2006	S20616	409 MERCEDES	3	OBSTRUCTION	
NORMAN	5/7/2006	S20616	2743 WINDING CREEK CIR	35	OBSTRUCTION	MANHOLE
NORMAN	5/9/2006	S20616	631 & 629 SINCLAIR DR.	25	OBSTRUCTION	
NORMAN	5/14/2006	S20616	1223 LOUISIANA	20	BLOCKAGE	MANHOLE
NORMAN	5/15/2006	S20616	705 RIDGECREST CT.	150	OBSTRUCTION	
NORMAN	5/24/2006	S20616	102 CRAWFORD CT.	10	OVERFLOW	
NORMAN	5/29/2006	S20616	1713 DAISY LN.	500	BROKEN FORCE MAIN	LIFT STATION
NORMAN	6/1/2006	S20616	1125 ELM AVE.	50	BLOCKAGE	
NORMAN	6/2/2006	S20616	1125 ELM AVE.	25	BLOCKAGE	
NORMAN	6/9/2006	S20616	709 N. PETERS AVE	2	OBSTRUCTION	
NORMAN	6/14/2006	S20616	1713 PARKVIEW TERR.	20	ROOTS	MANHOLE
NORMAN	6/23/2006	S20616	1840 WINDING RIDGE	30	OBSTRUCTION	MANHOLE
NORMAN	7/3/2006	S20616	2120 CRESTMONT ST.	500	GREASE	MANHOLE
NORMAN	7/11/2006	S20616	1120 W. ROBINSON	5	OBSTRUCTION	
NORMAN	7/17/2006	S20616	302 WILLOW CREEK CIR.	4	GREASE	MANHOLE
NORMAN	7/25/2006	S20616	1308 REGENT ST.	20	OBSTRUCTION	
NORMAN	7/27/2006	S20616	638 WELLSTON CIR	75	OBSTRUCTION	MANHOLE
NORMAN	8/5/2006	S20616	ROBINSON & BROOKHAVEN BLVD.	50	OBSTRUCTION	MANHOLE
NORMAN	8/15/2006	S20616	YORK L.S. - 4600 24TH AVE. N.W.	1,500	POWER FAILURE	LIFT STATION
NORMAN	8/15/2006	S20616	917 MCCALL ST.	5	OBSTRUCTION	
NORMAN	8/17/2006	S20616	2112 W. BROOKS	20	OBSTRUCTION	
NORMAN	8/24/2006	S20616	101 CRESTLAND DR. - HILLCREST ESTATES APTS.	30	OBSTRUCTION	
NORMAN	8/30/2006	S20616	2821 SHADOW LAKE RD.	1,200	COLLAPSED MAIN	PIPE
NORMAN	9/4/2006	S20616	420 LONE OAK DR.	1,000	AIR RELEASE VALVE	MANHOLE
NORMAN	9/4/2006	S20616	1401 OAK CREST DR.	20	OBSTRUCTION	MANHOLE
NORMAN	9/6/2006	S20616	2100 W. MAIN	50	OBSTRUCTION	
NORMAN	9/8/2006	S20616	1914 CHERRY STONE	50	OBSTRUCT	
NORMAN	9/12/2006	S20616	1209 W. LINDSEY	30	GREASE	MANHOLE
NORMAN	9/15/2006	S20616	2601 S. BERRY RD.	200	OBSTRUCTION	MANHOLE
NORMAN	9/16/2006	S20616	1018 MISSOURI	50	CONTRACTOR ERROR	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	9/19/2006	S20616	2100 W. RECUMSEH RD.	30	LEAKING	LIFT STATION
NORMAN	9/27/2006	S20616	1129 CADDELL LN.	100	OBSTRUCTION	
NORMAN	10/30/2006	S20616	2606 AKASHIA CT.		OBSTRUCTION	
NORMAN	11/4/2006	S20616	2422 WEATHERFORD DR.	10	BLOCKAGE	
NORMAN	11/7/2006	S20616	2916 CASTLEWOOD DR.	700	OBSTRUCTION	MANHOLE
NORMAN	11/12/2006	S20616	1315 MCGEE ST.	8	OBSTRUCTION	
NORMAN	11/13/2006	S20616	2200 NASHVILLE DR.	10	OBSTRUCTION	
NORMAN	11/17/2006	S20717	505 EMERALD WAY	10	OBSTRUCTION	
NORMAN	11/18/2006	S20616	740 DEBARR AVE.	100	OBSTRUCTION	
NORMAN	11/21/2006	S20616	2504 DAKOTA ST.	100	OBSTRUCTION	MANHOLE
NORMAN	12/4/2006	S20616	744 ELM ST.	5	OBSTRUCTION	
NORMAN	12/11/2006	S20616	E. TECUMSEH AVE. & 12TH AVE. N.E. IN FIELD	10,000	VALVE MALFUNCTION	LIFT STATION
NORMAN	12/12/2006	S20616	637 WELSTON	5	OBSTRUCTION	
NORMAN	12/13/2006	S20616	315 S. LAHOMA	20	OBSTRUCTION	
NORMAN	12/14/2006	S20616	1357 DORCHESTER DR.	20	OBSTRUCTION	
NORMAN	12/18/2006	S20616	2601 QUEENSTON AVE.	5	OBSTRUCTION	
NORMAN	12/26/2006	S20616	500 W. TONHAWA ST.	20	DEBRIS & VANDALISM	PIPE
NORMAN	12/26/2006	S20616	2700 BLK. S. PICKARD AVE.	250	OBSTRUCTION	MANHOLE
NORMAN	1/5/2007	S20616	1717 ROLLINGSTONE DR.	50	OBSTRUCTION	MANHOLE
NORMAN	1/5/2007	S20616	417 COLLEGE ST.	55	OBSTRUCTION	
NORMAN	1/6/2007	S20616	1811 BARRINGTON	50	OBSTRUCTION	MANHOLE
NORMAN	1/10/2007	S20616	3225 COVE HOLLOW CT.	100	OBSTRUCTION	MANHOLE
NORMAN	1/10/2007	S20616	2132 CRESTMONT	50	OBSTRUCTION	MANHOLE
NORMAN	1/12/2007	S20616	2220 WYANDOTTE WAY	20	OBSTRUCTION	
NORMAN	1/12/2007	S20616	E. OF JENKINS S. OF HWY 9	20	CONTRACTOR ERROR	MANHOLE
NORMAN	1/20/2007	S20616	740 DEBARR AVE.	25	OBSTRUCTED	
NORMAN	1/25/2007	S20616	1529 HOLLYWOOD	35	OBSTRUCTION	MANHOLE
NORMAN	1/28/2007	S20616	1022 QUANAH PARKER TR.	100	OBSTRUCTED	MANHOLE
NORMAN	1/29/2007	S20616	711 TERRY ST.	20	OBSTRUCTION	MANHOLE
NORMAN	2/5/2007	S20616	1215 OAKHURST AVE.	50	OBSTRUCTION	MANHOLE
NORMAN	2/7/2007	S20616	E. ROBINSON & N. PETERS	100	OBSTRUCTION	MANHOLE
NORMAN	2/15/2007	S20616	1614 EISENHOWER RD.	2	OBSTRUCTION	MANHOLE
NORMAN	2/18/2007	S20616	1217 S. BERRY RD.	30	OBSTRUCTED	MANHOLE
NORMAN	2/21/2007	S20616	2731 WOODBRIAR DR.	20	GREASE	MANHOLE
NORMAN	2/21/2007	S20616	339 WOODCREST	25	OBSTRUCTION	
NORMAN	2/25/2007	S20616	711 TERRY DR.	15	OBSTRUCTION	MANHOLE
NORMAN	2/25/2007	S20616	1481 E. ALAMEDA	75	OBSTRUCTION	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN	3/3/2007	S20616	200 BLK. N. LAHOMA	50	OBSTRUCTED	PIPE
NORMAN	3/4/2007	S20616	1826 ROLLING STONE DR.	5	OBSTRUCTION	
NORMAN	3/5/2007	S20616	1038 CRUCE ST.	10	OBSTRUCTION	MANHOLE
NORMAN	3/7/2007	S20616	1200 FRANKLIN RD.	75	VALVE MALFUNCTION	PIPE
NORMAN	3/12/2007	S20616	2928 OAK TREE AVE.	1,500	VANDALISM	MANHOLE
NORMAN	3/17/2007	S20616	36TH AVE. & HIDDEN HILLS RD.	100	OBSTRUCTED	MANHOLE
NORMAN	3/18/2007	S20616	2743 WINDING CREEK CIR.	10	OBSTRUCTION	MANHOLE
NORMAN	3/18/2007	S20616	2908 CITY VIEW DR.	250	OBSTRUCTION	MANHOLE
NORMAN	3/20/2007	S20616	707 24TH AVE SW	47	OBSTRUCTION	MANHOLE
NORMAN	3/28/2007	S20616	2200 N. PORTER	50	OBSTRUCTION	MANHOLE
NORMAN	4/2/2007	S20616	1620 GLENN BO DR.	100	OBSTRUCTION	MANHOLE
NORMAN	4/2/2007	S20616	629 SINCLAIR DR.	40	DEBRIS	MANHOLE
NORMAN	4/4/2007	S20616	620 SMALLEY DR.	25	OVERFLOW	MANHOLE
NORMAN	4/7/2007	S20616	1711 SURREY PL.	20	OBSTRUCTION	
NORMAN	4/11/2007	S20616	1419 PECAN AVE.	30	OBSTRUCTION	MANHOLE
NORMAN		S20616	746 ASP			
NORMAN		020616				
NORMAN		S20616				
NORMAN OK UTILITY LINE MAINT	12/14/1997	20616	634 WELSTON CIR.	250	CONSTRUCTION DEBRIS IN MANHOLE	
NORMAN OK UTILITY LINE MAINT	12/14/1997	20616	1631 CRAWFORD	400	OBSTRUCTION IN MANHOLE	
NORMAN UTILITY LINE MAINT.	1/18/1998	20616	1615 BEAUMONT	500	UNKNOWN	
NORMAN UTILITY LINE MAINT.	1/19/1998	20616	1419 PECAN	50	OBSTRUCT IN LINE	
NORMAN WWTP	3/2/1998	20616	EAST OF WWTP	500	CHOKED SEWER MAIN	
NORMAN WWTP	3/16/1998	20616	1342 TARMAN CIR	100	RAINWATER	
NORMAN WWTP	3/16/1998	20616	927 CHAUTAUQUA	100	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	1125 ALAMEDA	1800	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	12TH & ALAMEDA (PIZZA HUT)	1800	RAINWATER	
NORMAN WWTP	3/16/1998	206116	206 S. UNIVERSITY	200	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	1214 BARKLEY	300	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	206 FORMAN CIR	300	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	216 FOREMAN CIR	300	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	3220 MARSHALL AVE	300	RAIN WATER	
NORMAN WWTP	3/16/1998	20616	501 CORONADO	300	RAIN WATER	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
NORMAN WWTP	3/16/1998	20616	1338 TARMAN CIR	300	RAIN WATER	
PUCELL	2/3/1998	20622	SW CORNER OF HWY 39 & 77		OBSTRUCTION IN MANHOLE	
PURCELL	2/6/1995	S20622	BEHIND FORD GARAGE	200	PIPE JOINT LEAK OFF LIFT STATION	
PURCELL	8/29/1995	S20622	LAGOON OUTFALL LINE	3000	REPAIR IN AREA DAMAGED LINE	
PURCELL	12/18/1995	S20622	LIFT STATION	50000	LIFT STATION DOWN	
PURCELL	1/9/1996	S20622	2000 BLK N. GREEN	3000	SEWER LINE STOPPAGE THROUGH MANHOLE	
PURCELL	8/22/1996	S20622	1700 WEST ADAMS		ELECTRICAL PROBLEM AT LIFT STATION	
PURCELL	2/18/1997	S20622	1700 WEST ADAMS			
PURCELL	5/21/1997	S20622	MANHOLE WEST SIDE OF PLANT		PUMP MALFUNCTIONS	
PURCELL	2/5/1998	20622	WEST END OF BOB-0-LINK LANE, PURCELL		OBSTUCTION INSEWER LINE	
PURCELL	2/14/1998	S20622	S. OF OLD DEPOT EAST END OF MAIN ST.		CONTRACTOR CUT SEWER MAIN	
PURCELL	2/20/1998	S20622	21 BROOKSIDE DR.		GREASE	
PURCELL	2/20/1998	S20622	MH N. OF CALDWELL BANKERS REAL ESTATE ON N. GREEN AVE.		GREASE	
PURCELL	7/14/1998	S20622	HWY 74; MH ON N. SIDE OF HWY ACROSS FROM WESTBROOK ADDITION	500		
PURCELL	11/23/1998	S20622	N. GREEN AVE. N. OF BRAUMS	1,000	OBSTRUCTION	
PURCELL	3/25/1999	S20622	L.S. ON SOUTH 10TH ST.	5,000	L.S. MALFUNCTION	
PURCELL	4/19/1999	S20622	WILLOWCREEK CIR. & 9TH	200	OBSTRUCTION	
PURCELL	4/27/1999	S20622	1518 S. GREEN IN PASTURE	1,000	OBSTRUCTION	
PURCELL	5/22/1999	S20622	MH S.E. OF CHURCH & MOBILE HOME PARK OFF HWY 74		DEBRIS	
PURCELL	5/24/1999	S20622	TIMBERLAKE & 9TH ON WEST SIDE OF 9TH		OBSTRUCTION	
PURCELL	6/29/1999	S20622	S. OF WALNUT CREEK E. SIDE OF GREEN AVE. IN PASTURE	1,500	STOPPED MAIN	
PURCELL	7/2/1999	S20622	7TH ST. ALLEY AT 1ST PRESBYTERIAN CHURCH & SUNSET ESTATES		GREASE	
PURCELL	7/2/1999	S20622	HARRISON & POLK ST.		GREASE	
PURCELL	7/10/1999	S20622	2ND MH S. OF DEPOT HILL ON WEST SIDE OF RR TRACKS	10,000	POWER OUTAGE	
PURCELL	7/10/1999	S20622	1 1/2 BLKS S. OF OLD DEPOT	5,000	PUMP STATION FAILURE	
PURCELL	7/14/1999	S20622	BOBOLINK ST.	300,000	POWER FAILURE	
PURCELL	10/3/1999	S20622	1213 DOUGLAS ST.		OBSTRUCTION	
PURCELL	10/6/1999	S20622	600 BLK OF 6TH ST	500	OBSTRUCTION	
PURCELL	11/7/1999	S20622	820 S. SANTE FE		POWER FAILURE	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
PURCELL	11/19/1999	S20622	HWY 74 & I-35	200	GREASE	
PURCELL	12/2/1999	S20622	1ST MH S. OF DEPOT HILL ALONG THE RR TRACKS	2,000		
PURCELL	12/5/1999	S20622	DUMP ST. AT CHANDLER RV PARK	2,000	OBSTRUCTION	
PURCELL	1/16/2000	S20622	WILLOW CREEK CIR.		OBSTRUCTION	
PURCELL	1/18/2000	S20622	MH AT VAN BUREN & SANTA FE	200	OBSTRUCTION	
PURCELL	2/11/2000	S20622	MH W. OF I-35 AT LAKE SPILLWAY		ROOTS	
PURCELL	2/23/2000	S20622	7TH & POLK IN ALLEY	4000	OBSTRUCTION	
PURCELL	2/28/2000	S20622	MH E. OF 9TH ST. AT ELEMENTARY SCHOOL GYM	750	OBSTRUCTION	
PURCELL	4/7/2000	S20622	OAKRIDGE & I-35 MH	200	OBSTRUCTION	
PURCELL	5/2/2000	S20622	DELTA HEAD START ON FOX ST.	25	OBSTRUCTION	
PURCELL	5/26/2000	S20622	117 S. 3RD	250	OBSTRUCTION	
PURCELL	10/2/2000	S20622	N. GREEN AVE.	800	GREASE	
PURCELL	10/3/2000	S20622	9TH & LUGLENA	250	OBSTRUCTION	
PURCELL	10/5/2000	S20622	#12 LUGLENA	400	OBSTRUCTION	
PURCELL	10/9/2000	S20622	#12 LUGLENA - MH BEHIND HOUSE	500	GREASE	
PURCELL	10/11/2000	S20622	1104 GRANT/ LUGLENA	30	OBSTRUCTION	
PURCELL	10/26/2000	S20622	415 N. SANTE FE	40	RAINS	
PURCELL	11/27/2000	S20622	MH AT 800 BLK OF NORTH 6 ST	350	GREASE	
PURCELL	12/10/2000	S20622	902 GRANT	250	ROOTS	
PURCELL	12/26/2000	S20622	WWP	200,000	PUMPS DOWN	
PURCELL	1/14/2001	S20622	L.S. #3	20,000	ELECTRICAL PROBLEMS	
PURCELL	1/22/2001	S20622	GRADE SCHOOL	<100	BLOCKAGE	
PURCELL	2/10/2001	S20622	800 WILLOWCREEK DR.	50,000	GREASE	
PURCELL	2/16/2001	S20622	100 BLK E. JEFFERSON	1,000	GREASE	
PURCELL	2/16/2001	S20622	800 WILLOW CREEK DR	500	GREASE	
PURCELL	2/19/2001	S20622	100 BLK E. MAIN	2,000	GREASE & SILT	
PURCELL	5/18/2001	S20622	W. ADAMS ST.	3,000	POWER FAILURE	
PURCELL	5/28/2001	S20622	W. ADAMS	4,000	ELECTRICAL PROBLEMS	
PURCELL	6/3/2001	S20622	#3 L.S. ON BOTH SIDES I-35	9,000	MOTOR FAILURE	LIFT STATION
PURCELL	6/5/2001	S20622	1517 S. GREEN	300,000	GREASE	
PURCELL	6/22/2001	S20622	1800 W. ADAMS	75,000	GREASE	
PURCELL	7/30/2001	S20622	MAS-TEC 74 HWY 997	5,000	GREASE	MANHOLE
PURCELL	9/2/2001	S20622	1801 W. ADAMS	500	PUMP FAILURE	MANHOLE
PURCELL	10/11/2001	S20622	S. CANADIAN ST.		MALFUNCTION	LIFT STATION
PURCELL	1/21/2002	S20622	PASTURE N. OF WWTP	10,000	GREASE	
PURCELL	2/4/2002	S20622	512 N. 7TH	150	GREASE & ROOTS	
PURCELL	3/5/2002	S20622	N. 9TH & TIMBERLAKE & 9TH & WILLOW CREEK DR.	500	GREASE	MANHOLE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
PURCELL	4/5/2002	S20622	HALLMARK TP	400	GREASE	MANHOLE
PURCELL	6/3/2002	S20622	BOTTOM OF HILL	5,000	GREASE	
PURCELL	10/20/2002	S20622	206 E. MAIN	1,000	L.S. FAILURE	MANHOLE
PURCELL	10/20/2002	S20622	810 S. SANTE FE	100,000	L.S. FAILURE	MANHOLE
PURCELL	10/21/2002	S20622	N. 9TH & WILLOWCREEK	1,000	GREASE	MANHOLE
PURCELL	10/29/2002	S20622		1,000	GREASE	
PURCELL	11/27/2002	S20622	S. CANADIAN L.S.	1,500	MALFUNCTION	LIFT STATION
PURCELL	12/11/2002	S20622	MCKUNDY L.S.	150,000	MALFUNCTION	LIFT STATION
PURCELL	1/2/2003	S20622	9TH & HALLMARK DR.	50	ROOTS	MANHOLE
PURCELL	2/1/2003	S20622	912 LUGENA	100	BLOCKAGE	MANHOLE
PURCELL	3/17/2003	S20622	100 BLK. E. MAIN	500	LINE SILTED IN	
PURCELL	7/17/2003	S20622	W. ADAMS PAST WWTP	500	L.S. MALFUNCTION	MANHOLE
PURCELL	8/19/2003	S20622	WWTP	100,000	L.S. FAILURE	LIFT STATION
PURCELL	1/14/2004	S20622	ACKERMAN CONSTRUCTION	100	BLOCKAGE	MANHOLE
PURCELL	2/10/2004	S20622	BEHIND PLANTS & THINGS ON 220TH ST.	25,000	GREASE	MANHOLE
PURCELL	2/13/2004	S20622	#5 BROOKSIDE	2,000	GREASE	MANHOLE
PURCELL	4/8/2004	S20622	EAST OF I-35 BY WALNUT CREEK IN PASTURE	470,000	PUMP FAILURE	LIFT STATION
PURCELL	4/15/2004	S20622	1220 CHAMPION	50	ROOTS & GREASE	
PURCELL	4/16/2004	S20622	I-35 &	3,000	PUMP FAILURE	
PURCELL	4/21/2004	S20622	9TH & LAGLENA	6,000	GREASE	
PURCELL	8/21/2004	S20622	612 N. 6TH	600	GREASE	MANHOLE
PURCELL	8/28/2004	S20622	1729 BROOKSIDE	500	GREASE	MANHOLE
PURCELL	9/28/2004	S20622	1200 N. KNIGHT	50	GREASE	PIPE
PURCELL	10/8/2004	S20622	GREEN AVE. & 6TH ON W. MONROE	300	GREASE	MANHOLE
PURCELL	10/18/2004	S20622	9TH & LINCOLN AVE.	200	GREASE	PIPE
PURCELL	11/27/2004	S20622	912 N. 7TH	100	GREASE	PIPE
PURCELL	1/19/2005	S20622	1930 S. GREEN	800	GREASE	MANHOLE
PURCELL	2/9/2005	S20622	PLANT AT 9TH & LUGLENA	500	GREASE & ROOTS	MANHOLE
PURCELL	2/14/2005	S20622	9TH & WILLOWCREEK CIR.	900	ROOTS	MANHOLE
PURCELL	3/17/2005	S20622	1201 N. 4	50	GREASE	MANHOLE
PURCELL	4/11/2005	S20622	BEHIND 809 BONNIE ST.	100	PAPER TOWELS & GREASE	MANHOLE
PURCELL	5/6/2005	S20622	S. OF CITY LAKE DAM	1,000	GREASE	MANHOLE
PURCELL	5/31/2005	S20622	S. OF CITY LAKE DAM	2,000	GREASE & ROOTS	MANHOLE
PURCELL	7/4/2005	S20622	1729 BROOKSIDE	500	GREASE	MANHOLE
PURCELL	7/19/2005	S20622	#5 BROOK SIDE DR.	1,000	GREASE & ROOTS	MANHOLE
PURCELL	10/7/2005	S20622	620 S. CANADIAN	25	GREASE	PIPE
PURCELL	10/23/2005	S20622	301 N. 8TH	300	GREASE	PIPE

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
PURCELL	10/30/2005	S20622	301 N. 8TH	500	GREASE	PIPE
PURCELL	11/7/2005	S20622	209 E. JEFFERSON	200	GREASE	MANHOLE
PURCELL	11/16/2005	S20622	315 N. 7TH	1,000	ROOTS & GREASE	MANHOLE
PURCELL	12/9/2005	S20622	610 N. 6TH	500	GREASE	MANHOLE
PURCELL	12/30/2005	S20622	E. OF CITY LAKE	1,000	ROOTS	MANHOLE
PURCELL	1/1/2006	S20622	912 N. 7TH	100	ROOTS, RAGS & GREASE	PIPE
PURCELL	2/2/2006	S20622	9TH & LUGLENA N. OF GRANT ST.	1,500	GREASE	MANHOLE
PURCELL	2/15/2006	S20622	1200 BLK. W. ADAMS		L.S. DOWN	MANHOLE
PURCELL	2/28/2006	S20622	9TH & LINCOLN	300	GREASE	PIPE
PURCELL	3/3/2006	S20622	BETWEEN THE SPILLWAY OF THE CITY LAKE & I-35	15,000	GREASE	MANHOLE
PURCELL	3/29/2006	S20622	S.E. CORNER OF 9TH & WILLOW CREEK CIR.	250	ROOTS	MANHOLE
PURCELL	6/26/2006	S20622	1030 LUGLENA	1,000	GREASE	MANHOLE
PURCELL	7/27/2006	S20622	N.E. OF CITY LAKE DAM	5,000	ROOTS & GREASE	MANHOLE
PURCELL	7/31/2006	S20622	W. OF SHERRI CLASSICS & HARD CASTLE 700	1,500	ROOTS	PIPE
PURCELL	8/10/2006	S20622	S. 39 HWY ON GREEN AVE.	1,000	GREASE	PIPE
PURCELL	10/30/2006	S20622	W. OF FAIRMONT DR. S. OF CHANDLER	800	GREASE	MANHOLE
PURCELL	11/3/2006	S20622	2128 S. GREEN	700	GREASE	PIPE
PURCELL	11/22/2006	S20622	800 BLK. BROOKSIDE DR.	1,000	GREASE	MANHOLE
PURCELL	11/25/2006	S20622	908 N. 7TH	400	ROOTS & GREASE	MANHOLE
PURCELL	12/4/2006	S20622	N. OF CITY RV PARK	500	GREASE & ROOTS	MANHOLE
PURCELL	12/8/2006	S20622	1500 BLK. HARDCASTLE BLVD.	500	ROOTS	MANHOLE
PURCELL	12/9/2006	S20622	105 W. MADISON	300	GREASE	PIPE
PURCELL	12/14/2006	S20622	#5 BROOKE SIDE DR. REAR OF PROPERTY	1,000	GREASE & ROOTS	MANHOLE
PURCELL	1/2/2007	S20622	W. OF 9TH ST. N. OF GRANT	10,000	GREASE	MANHOLE
PURCELL	2/6/2007	S20622	E. SIDE OF CITY GOLF COURSE	200	ROOTS	MANHOLE
PURCELL	2/15/2007	S20622	N.W. CORNER OF HALLMARK TP	300	GREASE	MANHOLE
PURCELL	3/22/2007	S20622	RV PARK	500	GREASE	MANHOLE
PURCELL		S20622	9TH & LINCOLN		GREASE	
PURCELL		S20622	BEHIND RV PARK	2,500		
PURCELL		S20622	WEST ADAMS	30,000	L.S. DOWN	LIFT STATION
PURCELL		S20622		5,000	CONTROL PANEL	
PURCELL		S20622	9TH & WILLOWCREEK	500	GREASE	MANHOLE
PURCELL		S20622	8TH & COMANCHE	500		
PURCELL		S20622	6TH & VAN BUREN	500	GREASE	
PURELL	4/24/1998	20622	NW OF WOODBROOK ADD		PIPE BECAME DISCONNECTED	
STRATFORD	11/23/2004	S20625	500 BLK E. STATE		CLOGGED LINES	MANHOLE
UNION CITY	6/24/1999	S20609	LAGOONS		LEAK IN LAGOON	

Facility Name	Date	Facility ID	Location	Amount (Gal)	Cause	Type Of Source
UNION CITY	11/12/2003	S20609	410 PARK DR.	10	GREASE	PIPE
UNION CITY	5/2/2005	S20609	HWY 152 & HWY 81 103 HWY 81	650	BLOCKAGE	MANHOLE
WAYNE	12/16/1991	S20623	INFALL LINE TO EAST LAGOON		HEAVY RAINFALL AND LINE STOPPAGE	
WAYNE	12/16/1991	S20623	WEST LAGOON		HEAVY RAINFALL AND GOT TOO FULL	
WAYNE	1/7/1993	S20623	EAST FLOW THROUGH LAGOON	0	DIKE LEAKING	
WAYNE	6/28/2000	S20623	N. OF TOWN		HOLE IN LINE	
WAYNE(WEST)	3/5/1993	S20623	WEST LAGOON ON WEST SIDE		HEAVY RAINFALL FOR TWO MONTHS	
WAYNE(WEST)	5/11/1993	S20623	WEST LAGOON	0	HEAVY RAINS	

APPENDIX C
ESTIMATED FLOW EXCEEDANCE PERCENTILES

Appendix C

Estimated Flow Exceedance Percentiles

WQ Station	OK520600010010-001AT	OK520600010060P	OK520600020170B	OK520600030030E	OK520610010010-001AT	OK520610010080G	OK520610010180G	OK520610020120G	OK520610020150-001AT	OK520610030080G	OK520800010010-001AT
	Canadian River	**Factory Creek**	**Julian Creek**	**Spring Brook**	**Canadian River**	**Willow Creek**	**Bishop Creek**	**Buggy Creek**	**Canadian River**	**Walnut Creek-North Fork**	**Little River**
WBID Segment	OK520600010010_00	OK520600010060_00	OK520600020170_00	OK520600030030_00	OK520610010010_05	OK520610010080_00	OK520610010180_00	OK520610020120_00	OK520610020150_10	OK520610030080_00	OK520800010010_00
USGS Gage Reference	07231500 & 07231000	07328180	07328180	07229427	07229200	07328180	07328180	07328180	07228500	07328180	07231000
Watershed Area (sq. mile)	139.3	7.5	16.4	62.6	270.3	23.7	14.4	102.7	223.6	64.6	126.0
NRCS Curve Number	61.2	61.5	63.0	68.5	68.4	71.0	76.7	69.4	71.9	65.6	61.8
Average Annual Rainfall (inch)	41.5	41.4	39.4	40.5	38.2	39.9	37.8	33.9	33.1	35.4	41.7
Percentile	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**
0	132,900	155	339	114	71,000	487	297	2,115	42,100	1,330	31,600
1	15,721	28	60	95	9,532	87	61	434	5,086	273	6,154
2	10,945	14	31	76	5,645	45	38	266	2,488	167	4,202
3	8,108	11	25	64	3,938	36	24	168	1,654	106	3,020
4	6,541	9.0	20	50	3,090	28	18	122	1,250	77	2,350
5	5,576	7.9	17	40	2,664	25	15	105	1,040	66	1,940
6	4,968	7.3	16	34	2,246	23	13	91	891	57	1,595
7	4,425	6.9	15	29	1,982	22	12	84	800	53	1,340
8	4,071	6.4	14	23	1,720	20	12	78	708	49	1,200
9	3,781	6.1	13	20	1,579	19	11	73	641	46	1,078
10	3,438	5.6	12	14	1,430	18	10	67	580	42	966
11	3,140	5.2	11	13	1,340	16	9.6	64	531	40	883
12	2,926	4.8	11	12	1,230	15	8.6	57	493	36	802
13	2,699	4.5	10	12	1,130	14	8.2	55	454	34	739
14	2,513	4.2	9.2	11	1,080	13	7.8	52	426	33	674
15	2,357	4.0	8.7	10	1,030	13	7.4	49	400	31	609
16	2,235	3.9	8.5	9	974	12	7.1	46	371	29	564
17	2,090	3.7	7.8	9	920	11	6.9	45	350	28	505
18	1,950	3.5	7.6	8	872	11	6.3	41	332	26	457
19	1,837	3.3	7.2	7.4	823	10	6.1	39	315	25	420
20	1,711	3.1	6.7	7.3	800	9.7	5.9	38	300	24	376
21	1,617	3.0	6.5	7.1	753	9.4	5.5	35	280	22	342
22	1,509	2.9	6.3	6.7	713	9.0	5.3	34	268	21	315
23	1,417	2.8	6.1	6.7	687	8.7	5.1	32	253	20	288
24	1,321	2.7	5.8	6.4	657	8.4	4.9	31	244	19	263
25	1,236	2.6	5.6	6.1	638	8.1	4.7	29	231	19	242
26	1,151	2.5	5.4	6.0	607	7.7	4.5	28	221	18	222
27	1,089	2.3	4.9	5.3	600	7.1	4.3	27	211	17	202
28	1,026	2.2	4.7	5.2	580	6.8	4.1	25	201	16	185
29	961	2.2	4.5	4.9	560	6.5	3.9	24	193	15	171
30	908	2.1	4.5	4.6	532	6.5	3.7	22	185	14	155
31	849	1.9	4.3	4.3	515	6.1	3.5	21	176	13	143
32	802	1.8	4.0	3.9	500	5.8	3.3	20	167	12	131
33	751	1.7	3.8	3.9	488	5.5	3.3	20	160	12	122
34	696	1.6	3.6	3.6	465	5.2	3.1	18	150	11	114

WQ Station	OK520600010010-001AT Canadian River	OK520600010060P Factory Creek	OK520600020170B Julian Creek	OK520600030030E Spring Brook	OK520610010010-001AT Canadian River	OK520610010080G Willow Creek	OK520610010180G Bishop Creek	OK520610020120G Buggy Creek	OK520610020150-001AT Canadian River	OK520610030080G Walnut Creek-North Fork	OK520800010010-001AT Little River
WBID Segment	OK520600010010_00	OK520600010060_00	OK520600020170_00	OK520600030030_00	OK520610010010_05	OK520610010080_00	OK520610010180_00	OK520610020120_00	OK520610020150_10	OK520610030080_00	OK520800010010_00
USGS Gage Reference	07231500 & 07231000	07328180	07328180	07229427	07229200	07328180	07328180	07328180	07228500	07328180	07231000
Watershed Area (sq. mile)	139.3	7.5	16.4	62.6	270.3	23.7	14.4	102.7	223.6	64.6	126.0
NRCS Curve Number	61.2	61.5	63.0	68.5	68.4	71.0	76.7	69.4	71.9	65.6	61.8
Average Annual Rainfall (inch)	41.5	41.4	39.4	40.5	38.2	39.9	37.8	33.9	33.1	35.4	41.7
Percentile	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)
35	655	1.6	3.6	3.3	450	5.2	2.9	17	144	11	107
36	624	1.5	3.4	3.2	433	4.8	2.9	17	137	11	100
37	587	1.5	3.4	2.8	419	4.8	2.7	15	130	9.7	93
38	556	1.4	3.1	2.5	400	4.5	2.7	15	125	9.7	88
39	526	1.4	3.1	2.4	394	4.5	2.7	15	118	9.7	83
40	494	1.3	2.9	2.2	380	4.2	2.5	14	110	8.9	78
41	475	1.3	2.9	1.8	365	4.2	2.5	14	103	8.6	74
42	448	1.2	2.7	1.6	352	3.9	2.4	13	98	8.2	69
43	420	1.2	2.7	1.4	344	3.9	2.3	12	91	7.9	65
44	399	1.2	2.7	1.3	335	3.9	2.3	12	86	7.5	62
45	376	1.1	2.5	1.1	324	3.5	2.2	11	80	7.2	58
46	355	1.1	2.5	1.0	314	3.5	2.1	11	76	6.7	55
47	342	1.1	2.2	1.0	302	3.2	2.0	10	72	6.4	52
48	321	1.0	2.2	0.9	290	3.2	1.9	9.4	68	5.9	49
49	305	1.0	2.2	0.9	280	3.2	1.8	9.0	65	5.7	46
50	284	1.0	2.1	0.8	271	3.1	1.8	8.4	61	5.3	44
51	271	0.94	2.1	0.76	260	3.0	1.7	8.1	59	5.2	41
52	257	0.91	2.0	0.73	253	2.9	1.7	7.8	55	5.0	39
53	248	0.88	1.9	0.70	248	2.8	1.6	7.6	52	4.8	37
54	237	0.85	1.8	0.66	236	2.7	1.6	7.1	50	4.5	35
55	226	0.82	1.8	0.63	226	2.6	1.5	6.9	47	4.4	33
56	216	0.79	1.7	0.60	220	2.5	1.5	6.4	45	4.1	32
57	205	0.76	1.7	0.57	210	2.4	1.4	6.0	42	3.8	30
58	196	0.73	1.6	0.56	200	2.3	1.4	5.6	40	3.6	28
59	187	0.70	1.5	0.53	192	2.2	1.3	5.2	38	3.3	27
60	180	0.67	1.5	0.50	185	2.1	1.3	4.9	36	3.1	25
61	172	0.64	1.4	0.47	175	2.0	1.2	4.6	34	3.0	24
62	166	0.61	1.3	0.47	168	1.9	1.2	4.5	32	2.9	23
63	159	0.58	1.3	0.44	160	1.9	1.2	4.2	30	2.7	22
64	151	0.56	1.2	0.44	153	1.8	1.1	3.8	29	2.4	20
65	142	0.53	1.2	0.42	149	1.7	1.1	3.4	28	2.2	19
66	135	0.51	1.1	0.39	140	1.6	1.0	3.2	26	2.1	18
67	128	0.49	1.1	0.39	135	1.5	1.0	2.9	25	1.9	17
68	119	0.46	1.0	0.38	130	1.5	0.96	2.7	24	1.7	16
69	110	0.45	1.0	0.37	123	1.4	0.92	2.4	22	1.5	15
70	102	0.42	0.90	0.36	120	1.3	0.90	2.2	21	1.5	14
71	95	0.39	0.85	0.36	114	1.2	0.88	2.1	20	1.4	13
72	89	0.37	0.81	0.35	110	1.2	0.84	1.8	19	1.2	12

WQ Station	OK520600010010-001AT **Canadian River**	OK520600010060P **Factory Creek**	OK520600020170B **Julian Creek**	OK520600030030E **Spring Brook**	OK520610010010-001AT **Canadian River**	OK520610010080G **Willow Creek**	OK520610010180G **Bishop Creek**	OK520610020120G **Buggy Creek**	OK520610020150-001AT **Canadian River**	OK520610030080G **Walnut Creek-North Fork**	OK520800010010-001AT **Little River**
WBID Segment	OK520600010010_00	OK520600010060_00	OK520600020170_00	OK520600030030_00	OK520610010010_05	OK520610010080_00	OK520610010180_00	OK520610020120_00	OK520610020150_10	OK520610030080_00	OK520800010010_00
USGS Gage Reference	07231500 & 07231000	07328180	07328180	07229427	07229200	07328180	07328180	07328180	07228500	07328180	07231000
Watershed Area (sq. mile)	139.3	7.5	16.4	62.6	270.3	23.7	14.4	102.7	223.6	64.6	126.0
NRCS Curve Number	61.2	61.5	63.0	68.5	68.4	71.0	76.7	69.4	71.9	65.6	61.8
Average Annual Rainfall (inch)	41.5	41.4	39.4	40.5	38.2	39.9	37.8	33.9	33.1	35.4	41.7
Percentile	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**
73	82	0.35	0.76	0.34	102	1.1	0.80	1.5	18	1.0	11
74	76	0.33	0.72	0.34	98	1.0	0.80	1.5	17	1.0	10
75	71	0.30	0.65	0.33	93	0.97	0.78	1.4	16	0.93	10
76	66	0.28	0.61	0.33	88	0.87	0.74	1.1	15	0.75	8.9
77	61	0.25	0.54	0.32	84	0.77	0.73	1.0	15	0.66	8.0
78	55	0.23	0.49	0.31	79	0.73	0.69	0.70	14	0.49	7.3
79	50	0.21	0.45	0.31	74	0.65	0.69	0.70	13	0.49	6.7
80	46	0.19	0.43	0.30	68	0.61	0.65	0.42	13	0.31	6.1
81	41	0.17	0.38	0.30	62	0.55	0.63	0.28	12	0.22	5.6
82	37	0.14	0.31	0.29	58	0.45	0.61	0.14	11	0.13	5.1
83	34	0.12	0.27	0.29	53	0.39	0.59	0	11	0.02	4.5
84	31	0.10	0.22	0.29	50	0.32	0.59	0	10	0.02	4.0
85	27	0.09	0.20	0.28	47	0.29	0.59	0	9.5	0.02	3.3
86	25	0.08	0.18	0.27	43	0.26	0.59	0	8.8	0.02	2.7
87	21	0.06	0.13	0.27	40	0.19	0.59	0	8.2	0.02	2.3
88	19	0.05	0.11	0.26	36	0.16	0.59	0	7.6	0.02	1.9
89	16	0.03	0.07	0.25	33	0.10	0.59	0	6.8	0.02	1.6
90	14	0.02	0.04	0.23	30	0.06	0.59	0	6.0	0.02	1.2
91	12	0.01	0.02	0.21	28	0.03	0.59	0	5.3	0.02	0.93
92	10	0	0	0.19	24	0	0.59	0	4.8	0.02	0.61
93	8.0	0	0	0.19	21	0	0.59	0	4.3	0.02	0.40
94	6.2	0	0	0.18	19	0	0.59	0	3.6	0.02	0.20
95	4.6	0	0	0.18	16	0	0.59	0	2.9	0.02	0.10
96	2.5	0	0	0.15	13	0	0.59	0	2.0	0.02	0
97	1.0	0	0	0.15	11	0	0.59	0	1.0	0.02	0
98	0.08	0	0	0.15	8.8	0	0.59	0	0	0.02	0
99	0	0	0	0.15	5.5	0	0.59	0	0	0.02	0
100	0	0	0	0.15	0.75	0	0.59	0	0	0.02	0

Appendix C
General Methodology for Estimating Flow at WQM Stations

Flows duration curve will be developed using existing USGS measured flow where the data exist from a gage on the stream segment of interest, or by estimating flow for stream segments with no corresponding flow record. Flow data to support flow duration curves and load duration curves will be derived for each Oklahoma stream segment in the following priority:

i) In cases where a USGS flow gage occurs on, or within one-half mile upstream or downstream of the Oklahoma stream segment.

a. If simultaneously-collected flow data matching the water quality sample collection date are available, these flow measurements will be used.

b. If flow measurements at the coincident gage are missing for some dates on which water quality samples were collected, the gaps in the flow record will be filled, or the record will be extended, by estimating flow based on measured streamflows at a nearby gage. First, the most appropriate nearby stream gage is identified. All flow data are first log-transformed to linearize the data because flow data are highly skewed. Linear regressions are then developed between 1) daily streamflow at the gage to be filled/extended, and 2) streamflow at all gages within 95 miles that have at least 300 daily flow measurements on matching dates. The station with the best flow relationship, as indicated by the highest r-squared value, is selected as the index gage. R-squared indicates the fraction of the variance in flow explained by the regression. The regression is then used to estimate flow at the gage to be filled/extended from flow at the index station. Flows will not be estimated based on regressions with r-squared values less than 0.25, even if that is the best regression. In some cases, it will be necessary to fill/extend flow records from two or more index gages. The flow record will be filled/extended to the extent possible based on the best index gage (highest r-squared value), and remaining gaps will be filled from the next best index gage (second highest r-squared value), and so forth.

c. Flow duration curves will be based on measured flows only, not on the filled or extended flow time series calculated from other gages using regression.

d. On a stream impounded by dams to form reservoirs of sufficient size to impact stream flow, only flows measured after the date of the most recent impoundment will be used to develop the flow duration curve. This also applies to reservoirs on major tributaries to the stream.

ii) In the case no coincident flow data are available for a stream segment, but flow gage(s) are present upstream and/or downstream without a major reservoir between, flows will be estimated for the stream segment from an upstream or downstream gage using a watershed area ratio method derived by delineating subwatersheds, and relying on the National Resources Conservation Service (NRCS) runoff curve numbers and antecedent rainfall condition. Drainage subbasins will first be delineated for all impaired 303(d)-listed WQM stations, along with all USGS flow stations located in the 8-digit HUCs with impaired streams. Parsons will then identify all the USGS gage stations upstream and downstream of the subwatersheds with 303(d) listed WQM stations.

a. Watershed delineations are performed using ESRI Arc Hydro with a 30 m resolution National Elevation Dataset (NED) digital elevation model, and National Hydrography Dataset (NHD) streams. The area of each watershed will be calculated following watershed delineation.

b. The watershed average curve number is calculated from soil properties and land cover as described in the U.S. Department of Agriculture (USDA) Publication *TR-55: Urban Hydrology for Small Watersheds*. The soil hydrologic group is extracted from NRCS STATSGO soil data, and land use category from the 2001 National Land Cover Dataset (NLCD). Based on land use and the hydrologic soil group, SCS curve numbers are estimated at the 30-meter resolution of the NLCD grid as shown in Table 7. The average curve number is then calculated from all the grid cells within the delineated watershed.

c. The average rainfall is calculated for each watershed from gridded average annual precipitation datasets for the period 1971-2000 (Spatial Climate Analysis Service, Oregon State University, http://www.ocs.oregonstate.edu/prism/, created 20 Feb 2004).

Table C-1 Runoff Curve Numbers for Various Land Use Categories and Hydrologic Soil Groups

NLCD Land Use Category	Curve number for hydrologic soil group			
	A	B	C	D
0 in case of zero	100	100	100	100
11 Open Water	100	100	100	100
12 Perennial Ice/Snow	100	100	100	100
21 Developed, Open Space	39	61	74	80
22 Developed, Low Intensity	57	72	81	86
23 Developed, Medium Intensity	77	85	90	92
24 Developed, High Intensity	89	92	94	95
31 Barren Land (Rock/Sand/Clay)	77	86	91	94
32 Unconsolidated Shore	77	86	91	94
41 Deciduous Forest	37	48	57	63
42 Evergreen Forest	45	58	73	80
43 Mixed Forest	43	65	76	82
51 Dwarf Scrub	40	51	63	70
52 Shrub/Scrub	40	51	63	70
71 Grasslands/Herbaceous	40	51	63	70
72 Sedge/Herbaceous	40	51	63	70
73 Lichens	40	51	63	70
74 Moss	40	51	63	70
81 Pasture/Hay	35	56	70	77
82 Cultivated Crops	64	75	82	85
90-99 Wetlands	100	100	100	100

d. Flow at the ungaged site is calculated from the gaged site. The NRCS runoff curve number equation is:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \quad (1)$$

where:

Q = runoff (inches)

P = rainfall (inches)

S = potential maximum retention after runoff begins (inches)

I_a = initial abstraction (inches)

If $P < 0.2$, $Q = 0$. Initial abstraction has been found to be empirically related to S by the equation

$$I_a = 0.2*S \quad (2)$$

Thus, the runoff curve number equation can be rewritten:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \quad (3)$$

S is related to the curve number (CN) by:

$$S = \frac{1000}{CN} - 10 \quad (4)$$

e. First, S is calculated from the average curve number for the gaged watershed. Next, the daily historic flows at the gage are converted to depth basis (as used in equations 1 and 3) by dividing by its drainage area, then converted to inches. Equation 3 is then solved for daily precipitation depth of the gaged site, P_{gaged}. The daily precipitation depth for the ungaged site is then calculated as the precipitation depth of the gaged site multiplied by the ratio of the long-term average precipitation in the watersheds of the ungaged and gaged sites:

$$P_{ungaged} = P_{gaged}\left(\frac{M_{ungaged}}{M_{gaged}}\right) \quad (5)$$

where M is the mean annual precipitation of the watershed in inches. The daily precipitation depth for the ungaged watershed, along with the average curve number of the ungaged watershed, are then used to calculate the depth equivalent daily flow Q of the ungaged site. Finally, the volumetric flow rate at the ungaged site is calculated by multiplying by the area of the watershed of the ungaged site and converted to cubic ft..

f. If any flow measurements are available on the stream segment of interest, the projected flows will be compared to the measured flows on each date. If there is poor agreement, projections will be repeated with a simpler approach, using only the watershed area ratio and the gaged site (thereby eliminating the influence of differences in curve number and precipitation between the gaged and ungaged stream watersheds). If this simpler approach provides better agreement with existing data, the projected flows based on the simpler approach will be used.

iii) In the rare case where no coincident flow data are available for a WQM station and no gages are present upstream or downstream, flows will be estimated for the WQM station from a gage on an adjacent watershed of similar size and properties, via the same procedure described above for upstream or downstream gages.

APPENDIX D
STATE OF OKLAHOMA ANTIDEGRADATION POLICY

Appendix D
State of Oklahoma Antidegradation Policy

785:45-3-1. Purpose; Antidegradation policy statement

(a) Waters of the state constitute a valuable resource and shall be protected, maintained and improved for the benefit of all the citizens.

(b) It is the policy of the State of Oklahoma to protect all waters of the state from degradation of water quality, as provided in OAC 785:45-3-2 and Subchapter 13 of OAC 785:46.

785:45-3-2. Applications of antidegradation policy

(a) Application to outstanding resource waters (ORW). Certain waters of the state constitute an outstanding resource or have exceptional recreational and/or ecological significance. These waters include streams designated "Scenic River" or "ORW" in Appendix A of this Chapter, and waters of the State located within watersheds of Scenic Rivers. Additionally, these may include waters located within National and State parks, forests, wilderness areas, wildlife management areas, and wildlife refuges, and waters which contain species listed pursuant to the federal Endangered Species Act as described in 785:45-5-25(c)(2)(A) and 785:46-13-6(c). No degradation of water quality shall be allowed in these waters.

(b) Application to high quality waters (HQW). It is recognized that certain waters of the state possess existing water quality which exceeds those levels necessary to support propagation of fishes, shellfishes, wildlife, and recreation in and on the water. These high quality waters shall be maintained and protected.

(c) Application to beneficial uses. No water quality degradation which will interfere with the attainment or maintenance of an existing or designated beneficial use shall be allowed.

(d) Application to improved waters. As the quality of any waters of the state improve, no degradation of such improved waters shall be allowed.

785:46-13-1. Applicability and scope

(a) The rules in this Subchapter provide a framework for implementing the antidegradation policy stated in OAC 785:45-3-2 for all waters of the state. This policy and framework includes three tiers, or levels, of protection.

(b) The three tiers of protection are as follows:

(1) Tier 1. Attainment or maintenance of an existing or designated beneficial use.

(2) Tier 2. Maintenance or protection of High Quality Waters and Sensitive Public and Private Water Supply waters.

(3) Tier 3. No degradation of water quality allowed in Outstanding Resource Waters.

(c) In addition to the three tiers of protection, this Subchapter provides rules to implement the protection of waters in areas listed in Appendix B of OAC 785:45. Although Appendix B areas are not mentioned in OAC 785:45-3-2, the framework for protection of Appendix B areas is similar to the implementation framework for the antidegradation policy.

(d) In circumstances where more than one beneficial use limitation exists for a waterbody, the most protective limitation shall apply. For example, all antidegradation policy implementation rules applicable to Tier 1 waterbodies shall be applicable also to Tier 2 and Tier 3 waterbodies or areas, and implementation rules applicable to Tier 2 waterbodies shall be applicable also to Tier 3 waterbodies.

(e) Publicly owned treatment works may use design flow, mass loadings or concentration, as appropriate, to calculate compliance with the increased loading requirements of this section if those flows, loadings or concentrations were approved by the Oklahoma Department of Environmental Quality as a portion of Oklahoma's Water Quality Management Plan prior to the application of the ORW, HQW or SWS limitation.

785:46-13-2. Definitions

The following words and terms, when used in this Subchapter, shall have the following meaning, unless the context clearly indicates otherwise:

"Specified pollutants" means

(A) Oxygen demanding substances, measured as Carbonaceous Biochemical Oxygen Demand (CBOD) and/or Biochemical Oxygen Demand (BOD);

(B) Ammonia Nitrogen and/or Total Organic Nitrogen;

(C) Phosphorus;

(D) Total Suspended Solids (TSS); and

(E) Such other substances as may be determined by the Oklahoma Water Resources Board or the permitting authority.

785:46-13-3. Tier 1 protection; attainment or maintenance of an existing or designated beneficial use

(a) General.

(1) Beneficial uses which are existing or designated shall be maintained and protected.

(2) The process of issuing permits for discharges to waters of the state is one of several means employed by governmental agencies and affected persons which are designed to attain or maintain beneficial uses which have been designated for those waters. For example, Subchapters 3, 5, 7, 9 and 11 of this Chapter are rules for the permitting process. As such, the latter Subchapters not only implement numerical and narrative criteria, but also implement Tier 1 of the antidegradation policy.

(b) Thermal pollution. Thermal pollution shall be prohibited in all waters of the state. Temperatures greater than 52 degrees Centigrade shall constitute thermal pollution and shall be prohibited in all waters of the state.

(c) Prohibition against degradation of improved waters. As the quality of any waters of the state improves, no degradation of such improved waters shall be allowed.

785:46-13-4. Tier 2 protection; maintenance and protection of High Quality Waters and Sensitive Water Supplies

(a) General rules for High Quality Waters. New point source discharges of any pollutant after June 11, 1989, and increased load or concentration of any specified pollutant from any point source discharge existing as of June 11, 1989, shall be prohibited in any waterbody or watershed designated in Appendix A of OAC 785:45 with the limitation "HQW". Any discharge of any pollutant to a waterbody designated "HQW" which would, if it occurred, lower existing water quality shall be prohibited. Provided however, new point source discharges or increased load or concentration of any specified pollutant from a discharge existing as of June 11, 1989, may be approved by the permitting authority in circumstances where the discharger demonstrates to the satisfaction of the permitting authority that such new discharge or increased load or concentration would result in maintaining or improving the level of water quality which exceeds that necessary to support recreation and propagation of fishes, shellfishes, and wildlife in the receiving water.

(b) General rules for Sensitive Public and Private Water Supplies. New point source discharges of any pollutant after June 11, 1989, and increased load of any specified pollutant from any point source discharge existing as of June 11, 1989, shall be prohibited in any waterbody or watershed designated in Appendix A of OAC 785:45 with the limitation "SWS". Any discharge of any pollutant to a waterbody designated "SWS" which would, if it occurred, lower existing water quality shall be prohibited. Provided however, new point source discharges or increased load of any specified pollutant from a discharge existing as of June 11, 1989, may be approved by the permitting authority in circumstances where the discharger demonstrates to the satisfaction of the permitting authority that such new discharge or increased load will result in maintaining or improving the water quality in both the direct receiving water, if designated SWS, and any downstream waterbodies designated SWS.

(c) Stormwater discharges. Regardless of subsections (a) and (b) of this Section, point source discharges of stormwater to waterbodies and watersheds designated "HQW" and "SWS" may be approved by the permitting authority.

(d) Nonpoint source discharges or runoff. Best management practices for control of nonpoint source discharges or runoff should be implemented in watersheds of waterbodies designated "HQW" or "SWS" in Appendix A of OAC 785:45.

785:46-13-5. Tier 3 protection; prohibition against degradation of water quality in outstanding resource waters

(a) General. New point source discharges of any pollutant after June 11, 1989, and increased load of any pollutant from any point source discharge existing as of June 11, 1989, shall be prohibited in any waterbody or watershed designated in Appendix A of OAC 785:45 with the limitation "ORW" and/or "Scenic River", and in any waterbody located within the watershed of any waterbody designated with the limitation "Scenic River". Any discharge of any pollutant to a waterbody designated "ORW" or "Scenic River" which would, if it occurred, lower existing water quality shall be prohibited.

(b) Stormwater discharges. Regardless of 785:46-13-5(a), point source discharges of stormwater from temporary construction activities to waterbodies and watersheds designated "ORW" and/or "Scenic River" may be permitted by the permitting authority. Regardless of 785:46-13-5(a), discharges of stormwater to waterbodies and watersheds designated "ORW" and/or "Scenic River" from point sources existing as of June 25, 1992, whether or not such stormwater discharges were permitted as point sources prior to June 25, 1992, may be permitted by the permitting authority; provided, however, increased load of any pollutant from such stormwater discharge shall be prohibited.

(c) Nonpoint source discharges or runoff. Best management practices for control of nonpoint source discharges or runoff should be implemented in watersheds of waterbodies designated "ORW" in Appendix A of OAC 785:45, provided, however, that development of conservation plans shall be required in sub-watersheds where discharges or runoff from nonpoint sources are identified as causing or significantly contributing to degradation in a waterbody designated "ORW".

(d) LMFO's. No licensed managed feeding operation (LMFO) established after June 10, 1998 which applies for a new or expanding license from the State Department of Agriculture after March 9, 1998 shall be located...[w]ithin three (3) miles of any designated scenic river area as specified by the Scenic Rivers Act in 82 O.S. Section 1451 and following, or [w]ithin one (1) mile of a waterbody [2:9-210.3(D)] designated in Appendix A of OAC 785:45 as "ORW".

785:46-13-6. Protection for Appendix B areas

(a) General. Appendix B of OAC 785:45 identifies areas in Oklahoma with waters of recreational and/or ecological significance. These areas are divided into Table 1, which includes national and state parks, national forests, wildlife areas, wildlife management areas and wildlife refuges; and Table 2, which includes areas which contain threatened or endangered species listed as such by the federal government pursuant to the federal Endangered Species Act as amended.

(b) Protection for Table 1 areas. New discharges of pollutants after June 11, 1989, or increased loading of pollutants from discharges existing as of June 11, 1989, to waters within the boundaries of areas listed in Table 1 of Appendix B of OAC 785:45 may be approved by the permitting authority under such conditions as ensure that the recreational and ecological significance of these waters will be maintained.

(c) Protection for Table 2 areas. Discharges or other activities associated with those waters within the boundaries listed in Table 2 of Appendix B of OAC 785:45 may be restricted through agreements between appropriate regulatory agencies and the United States Fish and Wildlife Service. Discharges or other activities in such areas shall not substantially disrupt the threatened or endangered species inhabiting the receiving water.

(d) Nonpoint source discharges or runoff. Best management practices for control of nonpoint source discharges or runoff should be implemented in watersheds located within areas listed in Appendix B of OAC 785:45.

APPENDIX E
STORM WATER PERMITTING REQUIREMENTS AND PRESUMPTIVE BEST MANAGEMENT PRACTICES (BMPS) APPROACH

Appendix E

Storm water permitting Requirements and Presumptive Best Management practices (BMP) Approach

A. BACKGROUND

The National Pollutant Discharge Elimination System (NPDES) permitting program for stormwater discharges was established under the Clean Water Act as the result of a 1987 amendment. The Act specifies the level of control to be incorporated into the NPDES stormwater permitting program depending on the source (industrial versus municipal stormwater). These programs contain specific requirements for the regulated communities/facilities to establish a comprehensive stormwater management program (SWMP) or storm water pollution prevention plan (SWPPP) to implement any requirements of the total maximum daily load (TMDL) allocation. [See 40 CFR §130.]

Storm water discharges are highly variable both in terms of flow and pollutant concentration, and the relationships between discharges and water quality can be complex. For municipal stormwater discharges in particular, the current use of system-wide permits and a variety of jurisdiction-wide BMPs, including educational and programmatic BMPs, does not easily lend itself to the existing methodologies for deriving numeric water quality-based effluent limitations. These methodologies were designed primarily for process wastewater discharges which occur at predictable rates with predictable pollutant loadings under low flow conditions in receiving waters.

EPA has recognized these problems and developed permitting guidance for stormwater permits. [See "Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits" (EPA-833-D-96-00, Date published: 09/01/1996)] Due to the nature of storm water discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA recommends an interim permitting approach for NPDES storm water permits which is based on BMPs. "The interim permitting approach uses best management practices (BMPs) in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards." (*ibid.*)

A monitoring component is also included in the recommended BMP approach. "Each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits." (*ibid.*)

This approach was further elaborated in a guidance memo issued in 2002. [See Memorandum from Robert Wayland, Director of OWOW and James Hanlon, Director of OWM to Regional Water Division Directors: "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit requirements Based on Those WLAs " (Date published: 11/22/2002)] "The policy outlined in this memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address storm water discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality. …… If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the storm water component of the TMDL, EPA recommends that the TMDL reflect this." This TMDL adopts the EPA recommended approach and relies on appropriate BMPs for implementation. No numeric effluent limitations are required or anticipated for municipal stormwater discharge permits.

B. SPECIFIC SWMP/SWPPP REQUIREMENTS

As noted in Section 3 of this report, Oklahoma Pollutant Discharge Elimination System (OPDES)-permitted facilities and non-point sources (e.g., wildlife, agricultural activities and domesticated animals, land application fields, urban runoff, failing onsite wastewater disposal system, and domestic pets) could contribute to exceedances of the water quality criteria. In particular, stormwater runoff from the Phase 1 and 2 municipal separate storm sewer systems (MS4s) is likely to contain elevated bacteria concentrations. Permits for these discharges must comply with the provisions of this TMDL. Table E-1 provides a list of Phase 1 and 2 MS4s that are affected by this bacteria TMDL report.

Agricultural activities and other nonpoint sources of bacteria are unregulated. Voluntary measures and incentives should be used and encouraged wherever possible and such sources should strive to attain the reduction goals established in this TMDL.

The provisions of this appendix apply only to OPDES/NPDES regulated stormwater discharges. Regulated CAFOs within the watershed operate under NPDES permits issued and overseen by EPA. In order to comply with this TMDL, those CAFO permits in the watershed and their associated management plans must be reviewed. Further actions to reduce bacteria loads and achieve progress toward meeting the specified reduction goals must be implemented. This provision will be forwarded to EPA, as the responsible permitting agency, for follow up.

Table E-1. MS4 Permits affected by this bacteria TMDL Report

ENTITIES	PHASE 1 OR PHASE 2 MS4	DATE ISSUED	NOTES
	Phase 2 MS4		
	Phase 2 MS4		

To ensure compliance with the TMDL requirements under the permit, stormwater permittees must develop strategies designed to achieve progress toward meeting the reduction goals established in the TMDL. Relying primarily upon a Best Management Practices (BMP) approach, permittees should take advantage of existing information on BMP performance and select a suite of BMPs appropriate to the local community that are expected to result in progress toward meeting the reduction goals established in the TMDL. The permittee should provide guidance on BMP installation and maintenance, as well as a monitoring and/or inspection schedule.

Table E–2 provides a summary description of some BMPs with reported effectiveness in reducing bacteria. Permittees may choose different BMPs to meet the permit requirements, as long as the permittees demonstrate that these practices will result in progress toward attaining water quality standards.

As noted above, when a BMP approach is selected a coordinated monitoring program is necessary to establish the effectiveness of the selected BMPs and demonstrate progress toward attaining water quality standards. The monitoring results should be used to refine bacteria controls in the future. Individual permittees could participate in a coordinated program if there is one in the area or they could develop their own program.

After EPA approval of the final TMDL, existing small MS4 permittees will be notified of the TMDL provisions and schedule. The re-issued permit will contain general provisions addressing this TMDL. Industrial stormwater permittees are not expected to be a significant source of bacteria but if any are identified, similar actions will be required. Compliance with the following provisions will constitute compliance with the requirements of this TMDL.

1. Develop A Bacteria Reduction Plan

Permittees shall submit an approvable Bacteria Reduction Plan to the DEQ within 12 months of notification. Unless disapproved by the Director within 60 days of submission, the plan shall be approved then implemented by the permittee. This plan shall, at a minimum, include the following:

a. Consideration of ordinances or other regulatory mechanisms to require bacteria pollution control, as well enforcement procedures for noncompliance;
b. Evaluation of the existing SWMP in relation to TMDL reduction goals;
c. Educational programs directed at reducing bacterial pollution;
d. Investigation and implementation of BMPs that prevent additional storm water bacteria pollution associated with new development and re-development;
e. Implementation of BMPs applicable to bacteria. Table E-2 below presents summary information on some BMPs that should be considered. Permittees are not limited to BMPs on this list and should select BMPs appropriate to the local community that are expected to meet all or part of the reduction goals established in the TMDL.
f. Modifications to the dry weather field screening and illicit discharge detection and elimination provisions of the SWMP to consider storm water sampling and other measures intended to specifically identify bacterial pollution sources and high priority areas for bacteria reductions.
g. Periodic evaluation of the effectiveness of the bacteria reduction plan to ensure progress toward attainment of water quality standards.
h. An implementation schedule leading to modification of the SWMP and full implementation of the plan within 3 years of notification.

2. Develop Or Participate In A Bacteria Monitoring Program

Permittees may participate in a coordinated regional bacteria monitoring program or develop their own individual program. The monitoring program should be designed to establish the effectiveness of the selected BMPs and demonstrate progress toward the reduction goals of the TMDL and eventual attainment of water quality standards.

a. Within 18 months of notification, the permittee shall prepare and submit to the DEQ either a TMDL monitoring schedule or a commitment to participate in a coordinated regional monitoring program. The schedule or program shall include:

   (1) A detailed description of the goals, monitoring, and sampling and analytical methods;

   (2) A list and map of the selected TMDL monitoring sites;

   (3) The frequency of data collection to occur at each station or site;

   (4) The parameters to be measured, as appropriate for and relevant to the TMDL;

   (5) A Quality Assurance Project Plan that complies with EPA requirements [EPA Requirements for QA Project Plans (QA/R-5)]

b. The monitoring program shall be fully implemented within 3 years of notification.

3. Annual Reporting

The permittee shall include a TMDL implementation report as part of their annual report. The TMDL report shall include the status and actions taken by the permittee to implement the TMDL. The TMDL report shall document relevant actions taken by the permittee that affect MS4 storm water discharges to the waterbody segment that is the subject of the TMDL. This TMDL report also shall identify the status of any applicable TMDL implementation schedule milestones.

Table E–2. Some BMPs Applicable to Bacteria

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
Animal waste management: A planned system designed to manage liquid and solid waste from livestock and poultry. It improves water quality by storing and spreading waste at the proper time, rate and location.	X		75 %[1]	
Artificial wetland/rock reed microbial filter: Long shallow hydroponic plant/rock filter system that treats polluted waste and wastewater. It combines horizontal and vertical flow of water through the filter (filled with aquatic and semi-aquatic plants and microorganisms) and provides a high surface area of support media, such as rocks or crushed stone.	X	X		
Compost facility: Treating organic agricultural wastes in order to reduce the pollution potential to surface and ground water. The composting facility must be constructed, operated and maintained without polluting air and/or water resources.	X	X		DEQ permit needed
Conservation landscaping: The placement of vegetation in and around stormwater management BMPs. Its purpose is to help stabilize disturbed areas, enhance the pollutant removal capabilities of storm water BMP, and improve the overall aesthetics of a storm water BMP.		X		
Detention pond/basin: Detention ponds/basins maintain a permanent pool of water in addition to temporarily detaining storm water. The permanent pool of water enhances the removal of many pollutants. These ponds fill with stormwater and release most of it over a period of a few days, slowly returning to its normal depth of water.	X	X	25 %[1], 40%[2], 51%[3]	
Diversions/earthen embankments: 1). Diversions -Establishing a channel with a supporting ridge on the lower side constructed along the general land slope which improves water quality by directing nutrient and sediment laden water to sites where it can be used or disposed of safely. 2). Earthen embankment- A raised impounding structure made from compacted soil. It is appropriate for use with infiltration, detention,	X	X		

BEST MANAGEMENT PRACTICE	**IMPAIRMENT SOURCE**		**REPORTED EFFICIENCY**	**NOTE**
	AGRICULTURE	URBAN		
extended-detention or retention facilities.				
Drain Inlet Inserts: A proprietary BMP that is generally easily installed in a drain inlet or catch basin to treat storm water runoff. Three basic types of inlet insert are available, the tray type, bag type and basket type. The tray type allows flow to pass through filter media residing in a tray located around the perimeter of the inlet.		X	5%[2]	
Drip irrigation: An irrigation method that supplies a slow, even application of low-pressure water through polyethylene tubing running from supply line directly to a plant's base. Water soaks into the soil gradually, reducing runoff and evaporation (i.e., salinity). Transmission of nutrients and pathogens spread by splashing water and wet foliage created by overhead sprinkler irrigation is greatly reduced. Weed growth is minimized, thereby reducing herbicide applications. Vegetable farming and virtually every type of landscape situation can benefit from the use of drip irrigation.	X	X		
Fencing: A constructed barrier to livestock, wildlife or people. Standard or conventional (barbed or smooth wire), suspension, woven wire, or electric fences shall consist of acceptable fencing designs to control the animal(s) or people of concern and meet the intended life of the practice.	X		75 %[1]	
Filtration (e.g., sand filters): Intermittent sand filters capture, pre-treat to remove sediments, store while awaiting treatment, and treat to remove pollutants (by percolation through sand media) the most polluted stormwater from a site. Intermittent sand filter BMPs may be constructed in underground vaults, in paved trenches within or at the perimeter of impervious surfaces, or in either earthen or concrete open basins.	X	X	30 %[1], 55%[2], 51%[3]	
Infiltration Basin: A vegetated open impoundment where incoming stormwater runoff is stored until it gradually infiltrates into the soil strata. While flooding and channel erosion control may be achieved within an infiltration basin, they are primarily used for water quality enhancement.		X	50 %[1]	
Infiltration Trench: A shallow, excavated trench backfilled with a coarse stone aggregate to		X	50 %[1]	

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
create an underground reservoir. Stormwater runoff diverted into the trench gradually infiltrates into the surrounding soils from the bottom and sides of the trench. The trench can be either an open surface trench or an underground facility.				
Irrigation water management: The process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner. An irrigation system adapted for site conditions (soil, slope, crop grown, climate, water quantity and quality, etc.) must be available and capable of applying water to meet the intended purpose(s).	X	X		
Lagoon pump out: A waste treatment impoundment made by constructing an embankment and/or excavating a pit or dugout in order to biologically treat waste (such as manure and wastewater) and thereby reduce pollution potential by serving as a treatment component of a waste management system.	X	X		
Land-use conversion: BMPs that involve a change in land use in order to retire land contributing detrimentally to the environment. Some examples of BMPs with associated land use changes are: Conservation Reserve Program (CRP) - cropland to pasture; Forest conservation - pervious urban to forest; Forest/grass buffers - cropland to forest/pasture; Tree planting - cropland/pasture to forest; and Conservation tillage – conventional tillage to conservation tillage.	X	X		
Limit livestock access: Excluding livestock from areas where grazing or trampling will cause erosion of stream banks and lowering of water quality by livestock activity in or adjacent to the water. Limitation is generally accomplished by permanent or temporary fencing. In addition, installation of an alternative water source away from the stream has been shown to reduce livestock access.	X			
Litter control: Litter includes larger items and articulates deposited on street surfaces, such as paper, vegetation residues, animal feces, bottles and broken glass, plastics and fallen leaves. Litter-control programs can reduce the amount of		X		

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
deposition of pollutants by as much as 50%, and may be an effective measure of controlling pollution by storm runoff.				
Livestock water crossing facility: Providing a controlled crossing for livestock and/or farm machinery in order to prevent streambed erosion and reduce sediment.	X		100 %[1]	
Manufactured BMP systems: Structural measures which are specifically designed and sized by the manufacturer to intercept storm water runoff and prevent the transfer of pollutants downstream. They are used solely for water quality enhancement in urban and ultra-urban areas where surface BMPs are not feasible.	X	X		
Onsite treatment system installation: Conventional onsite wastewater treatment and disposal system (onsite system) consists of three major components: a septic tank, a distribution box, and a subsurface soil absorption field (consisting of individual trenches). This system relies on gravity to carry household waste to the septic tank, move effluent from the septic tank to the distribution box, and distribute effluent from the distribution box throughout the subsurface soil absorption field. All of these components are essential for a conventional onsite system to function in an acceptable manner.		X		
Porous pavement: An alternative to conventional pavement, it is made from asphalt (in which fine filler fractions are missing) or modular or poured-in concrete pavements. Its use allows rainfall to percolate through it to the sub-base, providing storage and enhancing soil infiltration that can be used to reduce runoff and combined sewer overflows. The water stored in the sub-base then gradually infiltrates the subsoil.		X	50 %[1]	
Proper site selection for animal feeding facility: Establishing or relocating confined feeding facilities away from environmentally vulnerable areas such as sinkholes, streams, and rivers in order to reduce or eliminate the amount of pollutant runoff reaching these areas.	X			
Rain garden /bio-retention basin: Rain gardens are landscaped gardens of trees, shrubs, and		X	40 %[1]	

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
plants located in commercial or residential areas in order to treat storm water runoff through temporary collection of the water before infiltration. They are slightly depressed areas into which storm water runoff is channeled by pipes, curb openings, or gravity.				
Range and pasture management: Systems of practices to protect the vegetative cover on improved pasture and native rangelands. It includes practices such as seeding or reseeding, brush management (mechanical, chemical, physical, or biological), proper stocking rates and proper grazing use, and deferred rotational systems.	X		50 %[1]	
Retention ponds/basins Retention basin: A storm water facility that includes a permanent pool of water and, therefore, is normally wet even during non-rainfall periods. Inflows from storm water runoff may be temporarily stored above this permanent pool.	X	X	32 %[1]	
Riparian Buffer Zone: A protection method used along streams to reduce erosion, sedimentation, and the pollution of water from agricultural non-point sources.	X	X	43 – 57 %[1]	Forested buffer w/o incentive payment
Septic system pump-out: A typical septic system consists of a tank that receives waste from a residence or business, and a drain field or subsurface absorption system consisting of a series of percolation lines for the disposal of the liquid effluent. Solids (sludge) that remain after decomposition by bacteria in the tank must be pumped out periodically.		X	5 %[1]	
Sewer line maintenance/sewer flushing: Sewer flushing during dry weather is designed to periodically remove solids that have deposited on the bottom of the sewer and the biological slime that grows on the walls of combined sewers during periods of low-flow. Flushing is especially necessary in sewer systems that have low grades which has resulted in velocities during low-flow periods that fall below those needed for self-cleaning.		X		
Stream bank protection and stabilization (e.g., riprap, gabions): Stabilizing shoreline areas	X	X	40 - 75 %[1]	40 % w/o fencing;

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
that are being eroded by landscaping, constructing bulkheads, riprap revetments, gabion systems, or establishing vegetation.				75 % w/ fencing
Terrace: An earth embankment, or a combination ridge and channel, constructed across the field slope. Terraces can be used when there is a need to conserve water, excessive runoff is a problem, and the soils and topography are such that terraces can be constructed and farmed with reasonable effort.	X	X		
Vegetated filter strip: A densely vegetated strip of land engineered to accept runoff from upstream development as overland sheet flow. It may adopt any naturally vegetated form, from grassy meadow to small forest. The purpose of a vegetated filter strip is to enhance the quality of stormwater runoff through filtration, sediment deposition, infiltration and absorption.	X	X		
Waste system/storage (e.g., lagoons, litter shed): Waste treatment lagoons biologically treat liquid waste to reduce the nutrient and BOD content. Lagoons must be emptied and their contents disposed of properly.	X	X	80 – 100 %[1]	
Water treatment (e.g., disinfection, flocculation, carbon filter system) Water treatment: Physical, chemical and/or biological processes used to treat concentrated discharges. Physical-chemical processes that have been demonstrated to effectively treat discharge include sedimentation, vortex separation, screening (e.g., fine-mesh screening), and sand-peat filters. Chemical additives used to enhance separation of particles from liquid include chemical coagulants such as lime, alum, ferric chloride, and various polyelectrolytes. Biological processes that have been demonstrated to effectively treat discharges include contact stabilization, biodiscs, oxidation ponds, aerated lagoons, and facultative lagoons.	X	X		
Wetland development/enhancement: The construction of a wetland for the treatment of animal waste runoff or storm water runoff. Wetlands improve water quality by removing nutrients from animal waste or sediments and nutrients from storm water runoff.	X	X	30 %[1]	Including creation and restoration

[1] Sources: BMP Efficiencies Chesapeake Bay Watershed Model (Phase IV) August 1999; Draft FC and Nitrate TMDL IP for Dry River (2001); EPA (1998); EPA (1999b); Novotny (1994); Storm Water Best

Management Practice Categories and Pollutant Removal Efficiencies (2003); USDA (2003); DCR (1999); DEQ/DCR (2001).

[2] Barrett, M.E., Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices, Texas Natural Resource Conservation Commission Report RG-348, June, (1999).

[3] Watershed Protection Techniques. *Vol 3. No. 1*, 1999

Appendix F

Response to Comments

A. Comments from Oklahoma Department of Agriculture, Food, and Forestry

A1. Section 3.1: NPDES-Permitted Facilities, last sentence of the third paragraph (p. 3-1); and 3.1.4. Concentrated Animal Feeding Operations, first sentence of the second paragraph (p. 3-9): It appears that CAFOs were unfairly singled out as "significant" sources of Pollution, and may have the potential to cause "serious" impact to water quality…. It is suggested that the words "significant" and "serious" be removed from these sentences.

- *Response A#1: The sentence was changed to: "CAFOs are designated by USEPA as one of the significant sources of pollution, and may have the potential to cause serious impacts to water quality if not managed properly."*

A2. Table 3-4. NPDES-Permitted CAFOs in Study Areas (p. 3-10), last 2 columns:
Buggy Creek watershed is located in Caddo, Canadian and Grady Counties, not in Hughes County; Canadian River watershed 520610020150_10 is located in Canadian and Grady Counties, not in McClain and Seminole Counties. Little River watershed is not located in Grady County.

- *Response A#2: Table 3-4 was updated*

A3. Section 3.2.2: Non-Permitted Agricultural Activities and Domesticated Animals, last paragraph, lines 2, 3 and 4 of page 3-14: Table 3-9 is for licensed swine operations in Hughes County inventoried by ODAFF, not for poultry operations. As a matter of fact, there are no registered poultry operations in the study areas. The sentences: " For informational purpose….last updated on April 17, 2004" should be deleted. The next sentence should be read as: "Table 3-9 lists an estimated number of animal feeding operations (AFO) within selected watershed(s) for which data are available".

- *Response A#3: The sentence was changed to: "For informational purposes, data on animal feeding operations provided by ODAFF are summarized in Table 3-9"*

A4. Section 3.3: Summary of Bacteria Sources, the last four sentences of the last paragraph (p. 3-20): Since no registered poultry operations are located in the study areas (Caddo, Canadian, Grady, Hughes, McClain and Seminole counties), the amount of poultry litter produced in the areas is insignificant. These four generic sentences excerpted from Shoal Creek Study Area in Missouri, where poultry litter is abundant, may be irrelevant to this report.

- *Response A#4: We agree that poultry litter in the study area is insignificant. The reference to Shoal Creek further explains the impacts the manure handling practices and the structure of manure may have on bacteria level in streams. No change was made.*

A5. Section 5.8, Reasonable Assurances: Table 5-19, p. 5-29: the web-site address of Water Quality and other Environmental Management Programs of Oklahoma Department of Agriculture, Food and Forestry should be: http://www.oda.state.ok.us/aems-home.htm.

- *Response A#5: Suggested change was made.*

B. Comments from Bernard Keeth, Norman, Oklahoma

B1. I was appalled at the article in Saturday's Oklahoman, "S. Canadian River Germs Make Swimming Risky". I strongly disagree with the statement that "Pollution standards should be based on actual use of the water" and "areas not often used for swimming should not have to meet the same requirements as rivers that are popular swimming holes". This is WRONG!!! All public waters should be held to the same standards. The key word here is PUBLIC!!!

Response B#1: This report is based on Oklahoma's Water Quality Standards, which are designed to protect both existing and designated beneficial uses. All waters which are assigned the Primary Body Contact Recreation use must meet the same standards, regardless of the degree of actual use. The report does include a discussion of possible approaches to revise the water quality standards but unless such changes are made in the future, the existing standards must be met.

C. Comments from Aaron Milligan, City of Norman, Storm Water Pollution Control

C1. Table 2-2, and Appendix A, page A-6 of the Study shows that 4 samples for FC were analyzed for Bishop Creek, all of which were collected in 1997 from the same location. Considering the potential for significant requirements on the City to reduce bacteria in Bishop Creek, we are concerned about the small sample size, number of sample locations and time period. Will sampling be ongoing during development of the TMDL? Will additional sites be sampled? Will the City of Norman be allowed to submit sample data for consideration in development of the TMDL?

- *Response C#1: Normally, ten is the minimum number of samples required to determine the impairment status of a stream. Bishop Creek is an exception. There are only four fecal coliform samples in Bishop Creek but three of them are above the standards. Even if six additional samples were collected and they all met standards, there still would be 30% of the samples violating standards and the stream would still be considered impaired. This assessment is in accord with the adopted Use Support Assessment Protocols (OAC785:46). No additional sampling was conducted as part of the TMDL development. Since the TMDL is already developed, there is no opportunity to submit additional data for consideration in development of the TMDL. Additional sampling is part of the implementation requirements for regulated MS4 discharges such as the City of Norman. See Appendix E of the report.*

D. Staff Identified Changes

D1. Appendix E: Storm water permitting Requirements and Presumptive Best Management practices (BMP) Approach was added to the report.

D2. City of Minco's sewage facility was added to the active continuous point discharge list in section 3.1.