Totten and Eld Inlets Clean Water Projects: Annual Report

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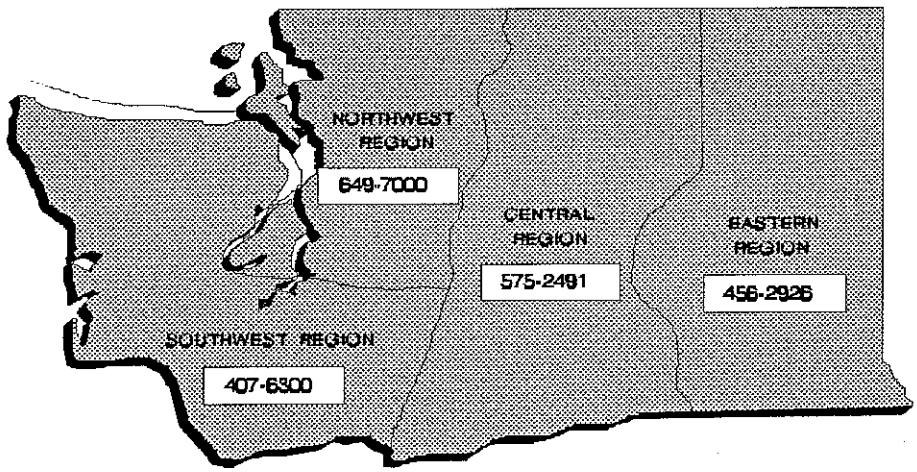

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Totten and Eld Inlets
Clean Water Projects: Annual Report

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Abstract

Four of a planned nine years of monitoring water quality and pollution controls were completed in six sub-basins within the Totten and Eld Inlet watersheds in Puget Sound as part of the U.S. Environmental Protection Agency's Section 319 National Monitoring Program. The goal of the monitoring program is to determine the effectiveness of nonpoint source pollution management programs at improving water quality. Failing on-site sewage systems and small farm livestock keeping practices are a major cause of bacterial contamination of shellfish growing areas in Totten and Eld Inlets. Water quality parameters monitored include fecal coliform (FC) bacteria, total suspended solids, turbidity, flow, temperature, conductivity, and precipitation. The monitoring designs used in this study are the paired watershed and single-site-over-time.

Most of the pollution controls installed in the study basins addressed livestock-keeping practices. Since 1993, 16 farm plans were developed and over 130 best management practices (BMPs) were installed in five of the six study basins. Water quality data show that FC levels continue to be highly variable at most sites which supports the need for a longer record of water quality in order to determine if trends are present.

Most farm planning and BMPs will be completed in 1997 in the Totten basins, and continue into 1999 in the Eld Basins. Water quality monitoring is scheduled to continue into 2001 and should provide at least two years of post-BMP water quality data. Analyses for determining trends in water quality are planned to be done in 1999 for Kennedy, Schneider, Burns, and Pierre basins, and in 2001 for the McLane and Perry basins. This should allow adequate time to implement BMPs and develop a sufficient data set that can be used to detect trends in water quality. The final report, scheduled for completion in 2002, will examine the association between water quality and the installation of pollution controls.

Acknowledgments

This monitoring project was made possible through the efforts of many individuals. The authors wish to acknowledge all who have played a role in the monitoring project and the larger effort to promote wise stewardship of our land and water resources. We extend particular appreciation to:

Ecology staff who provided guidance and support: thanks to Will Kendra, Barbara Tovrea, Jeannette Barreca, Marilou Pivirotto, Anna Trombley, Mike Woodall, Joy Denkers, and Sally McVaugh.

Local citizens and staff from Ecology and the Puget Sound Water Quality Authority who assisted with field sampling activities

Staff at Ecology/EPA Manchester Environmental Laboratory who processed and analyzed water quality samples with a high level of service: Will White, Nancy Jensen, Catherine Bickle, Pam Covey, and Dave Thompson.

The stewardship professionals at the Thurston Conservation District who promote stewardship and assist landowners in the installation of pollution controls. This project could not occur without the dedication and hard work of: Marilyn Mead, Ward Sagen, Troy Colley, Jeff Swotek (NRCS), Linda Boice, Bill Melton, and others

Staff at Thurston County Environmental Health Department whose dedication to water quality and public health is exemplary: Linda Hofstad, Dave Tipton, Tammy Thoemke, Sammy Berg, Cathy Hansen, Jane Hedges, and Sue Davis.

We wish to also recognize those who guide and support the National Monitoring Program and this project: Steve Dressing, Elbert Moore, and Judith Leckrone of the Environmental Protection Agency; Jean Spooner and Deanna Osmond of North Carolina State University; and Jill Saligoe-Simmel and Benno Warkentin of Oregon State University.

Recognition and appreciation are due to the residents of the Totten-Little Skookum and Eld Inlet watersheds whose stewardship activities are the foundation for improvements in water quality.

Introduction

The Washington State Department of Ecology (Ecology) is participating in the U.S. Environmental Protection Agency's (EPA) National Monitoring Program (NMP). This document has been prepared to fulfill part of the annual project report requirement for states that receive grants under the Clean Water Act (CWA) Section 319 (EPA 1991). The data and information presented in this report are also being submitted in the Nonpoint Source Management System (NPSMS) format.

The goal of the NMP is to evaluate the effectiveness of nonpoint source pollution control programs throughout the United States. In March 1995, Ecology received EPA approval of the final Quality Assurance Project Plan (QAPP) for monitoring six basins in the Totten Inlet (also called Totten-Little Skookum Inlet) and Eld Inlet watersheds as part of the NMP (Seiders, 1995). The basins were selected based on criteria described by EPA (1991) and the monitoring designs include the paired watershed and single-site-over-time. Figure 1 shows the location of the study basins. Since 1992, four seasons of water quality monitoring data and watershed information have been collected. Each water quality monitoring season began in November and extended 23 consecutive weeks. The three seasons of data and information collected prior to acceptance as a NMP project were funded by Ecology and EPA and followed a project plan similar to the approved QAPP.

Watershed management plans for the Totten and Eld Inlet watersheds were completed for the area in 1989 (Eld Watershed Management Committee, 1989; Totten-Little Skookum Watershed Management Committee, 1989). The management plans were developed by local citizens, interested parties, and local and state government. The planning effort identified potential nonpoint sources of pollution and recommended management measures to prevent or mitigate pollution. Although public involvement and planning has occurred since completing the management plans, until the last few years only limited resources have been available to implement pollution controls. Much of the funding to implement pollution controls in Totten and Eld Inlet watersheds has come from the Shellfish Protection Initiative (SPI) and from the Washington State Centennial Clean Water Fund (CCWF). Money for cost sharing or low interest loan contracts for site-specific management measures has come from the SPI, CCWF, Farm Service Agency (FSA), State Revolving Fund (SRF), and the U.S. Fish and Wildlife Service (USFWS).

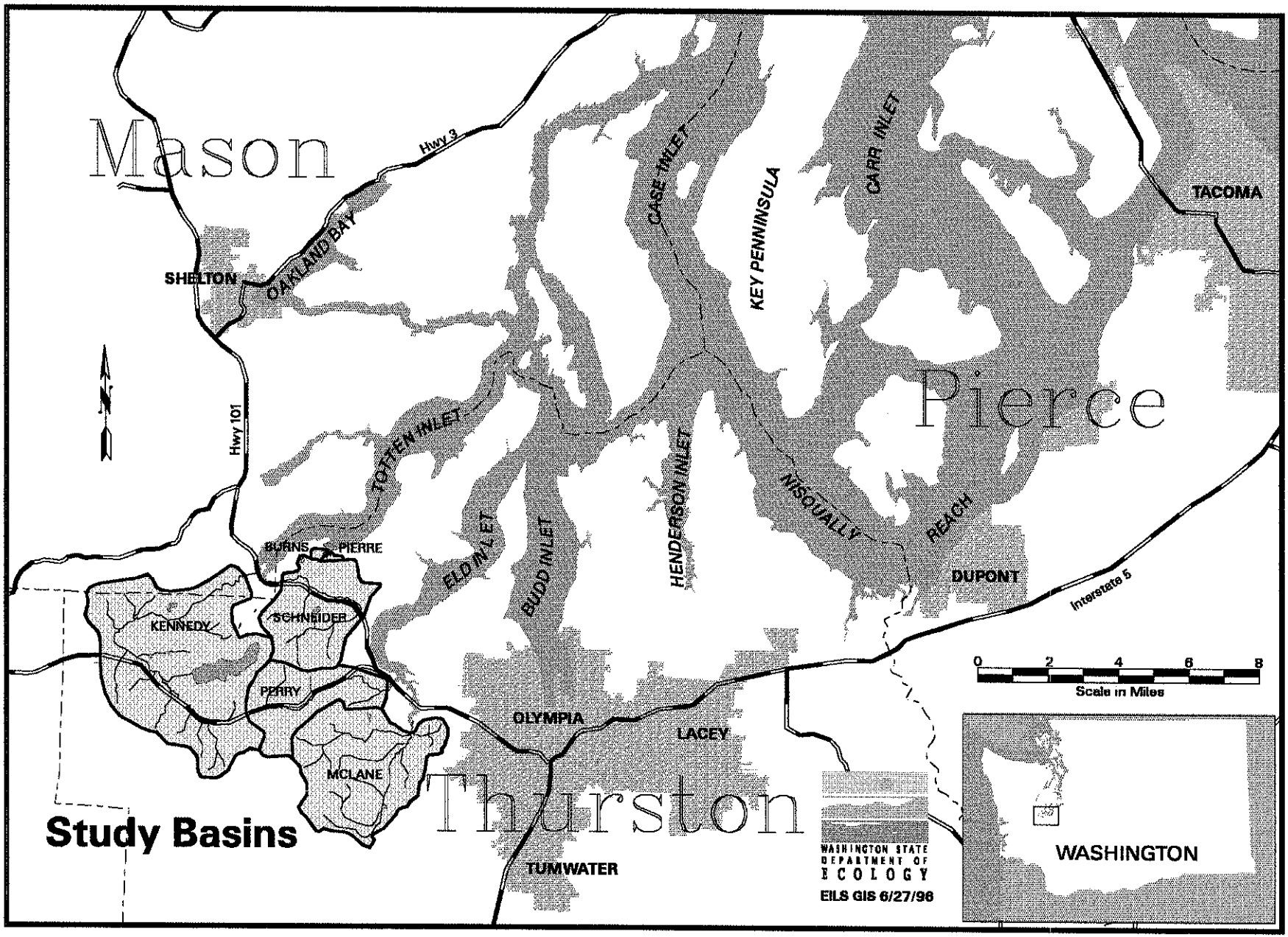

Figure 1. Location of study basins.

Problem Statement

The most significant pollution problem in the project area is bacterial contamination of highly productive shellfish growing areas. The major concern is that increasing population and associated human activities in the Totten and Eld Inlet watersheds will increase bacterial contamination in the freshwaters that discharge to the marine system, and thereby cause the restriction or closure of shellfish harvesting. The major sources of bacteria in the project watersheds were identified in the watershed management plans as failing on-site sewage systems and poor livestock keeping practices. Saturated soil conditions in the wet season (October-April) reduce the ability of many on-site sewage systems to operate. In addition, saturated soils and stormwater runoff during the wet season exacerbate water quality problems from livestock keeping practices such as overgrazing pastures and poor maintenance of livestock holding areas.

Background

Totten and Eld Inlets are located in southern Puget Sound (Figure 1) and are highly productive shellfish rearing areas. Many shellfish species are cultured, and a significant portion of the state's total shellfish harvest comes from these inlets. For example, Totten and Eld Inlets produce most of Washington's manila clams and also contribute to Puget Sound's pacific oyster production. Upland and lowland areas of the inlets' watersheds are productive forest land. The rural nature of the area has made it an attractive place to live. Consequently, stream corridors and shorelines, particularly in northern Thurston County, have experienced considerable residential development in the past decade and population pressures continue to increase. In 1990, Thurston County was ranked as the third fastest growing county in Washington with a population increase of nearly 30% since 1980 (personal communication, Thurston County Regional Planning Council, 1996). Also, more than 100 non-commercial "recreational" farms are now in each watershed. These recreational farms are typically less than 20 acres and keep several large animals, such as horses, cows, and llamas.

Commercial shellfish harvest areas are monitored at various frequencies by the state's Department of Health (DOH) for sanitary condition in accordance with federal Food and Drug Administration (FDA) guidelines. The surveys may include evaluating shoreline and upland areas for actual and potential pollution sources, examining hydrologic factors and their effects on water quality, and monitoring the concentrations of bacteria in shellfish growing waters (FDA, 1990). Totten Inlet is currently classified as "approved;" for shellfish harvesting. Most of Eld Inlet is also classified as "approved" however, the southern portion of Eld Inlet has been classified as "conditional" since 1983 (Figure 2). The conditional classification requires that the area be closed to shellfish harvesting for three days following a rainfall of 1.25 inches or more in the previous 24 hours.

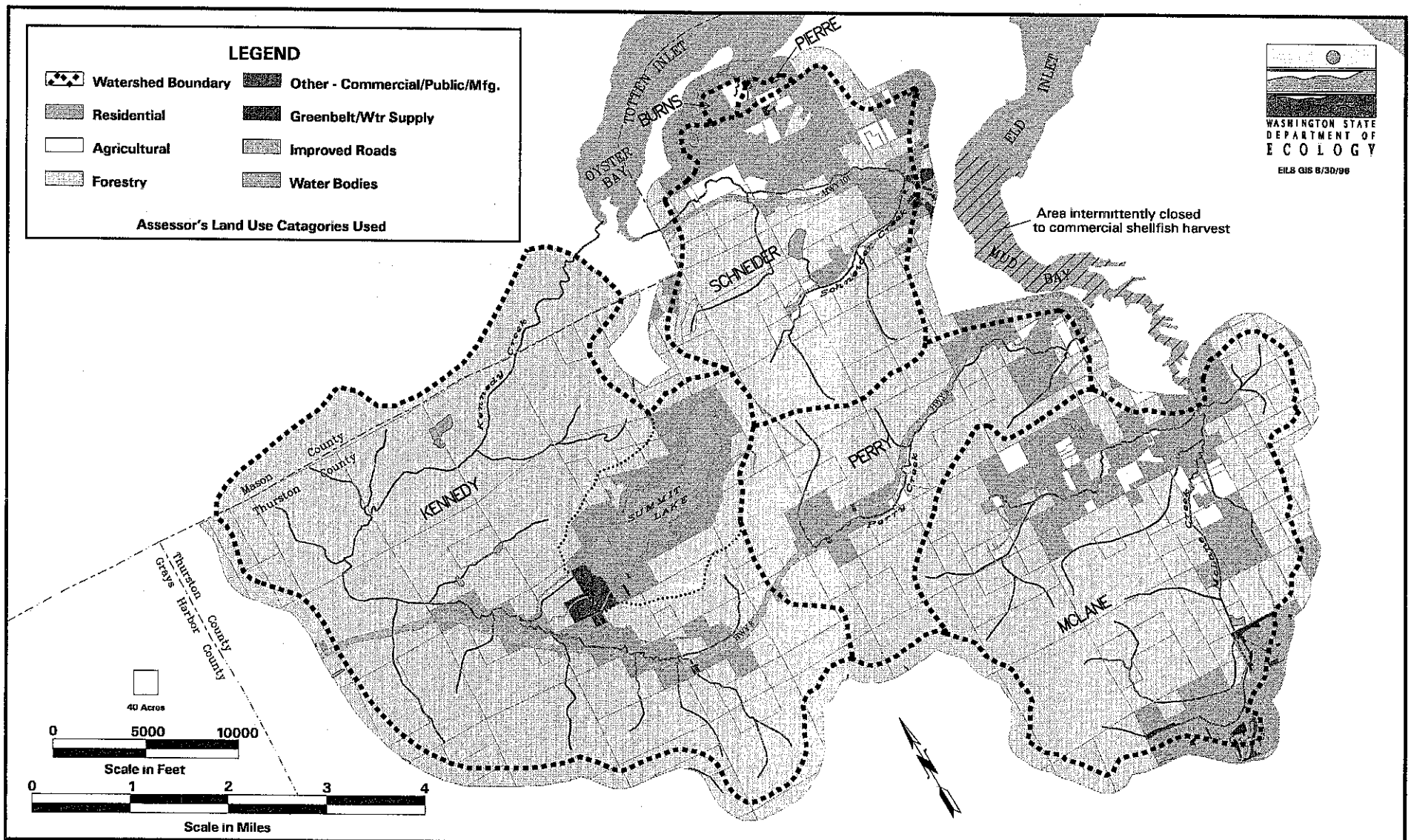

Figure 2. Land use characteristics of study basins in 1995.

Pollution control efforts in Puget Sound gained momentum in the mid- to late 1980's after several shellfish growing areas were restricted or closed for shellfish harvesting. Closures were due to high water column fecal coliform bacteria concentrations and other sanitary conditions not meeting national health standards for shellfish rearing areas. Contamination of shellfish harvest areas by fecal coliform bacteria has led to restricted harvesting in more than 40% of Puget Sound's previously certified areas. The creation of the Puget Sound Water Quality Authority (PSWQA) and funding mechanisms such as the CCWF have enabled citizens and local governments to develop watershed planning programs. The local planning efforts identify pollution problems and recommend management measures to control pollution within specific watersheds.

Nonpoint Source Pollution Management

Implementing nonpoint source pollution controls (and water quality monitoring) in Totten and Eld watersheds involves private citizens and local, state, and federal agencies including: Thurston County Environmental Health Division (TCEHD), Thurston Conservation District (TCD), DOH, Ecology, and EPA.

The major objective of managing nonpoint source pollution in the study basins is to reduce the sources of pollution by repairing failing on-site sewage systems and implementing resource management plans (farm plans) on priority farm sites. Priority farm sites are those farms that potentially threaten the quality of a receiving water due to their physical location or known management problems such as animal access to a stream, large numbers of animals, and lack of adequate pollution controls. Generally, management measures involve surveying all potential sources of pollution in critical areas, estimating the water quality impact, and then planning and undertaking corrective actions.

In the study basins, TCD is the lead agency involved in prioritizing farm sites and developing farm plans. Farm plans are developed cooperatively with the landowners. Farm plans address property resources and potential water quality impacts, and prescribe best management practices (BMPs) such as pasture and grazing management, livestock density reduction, animal waste management, stream fencing, and establishing stream buffer zones. Implementation of farm plans is voluntary in most cases. Education and outreach activities are being used to motivate farmers to participate in the program. In addition, state and local laws are also used to encourage landowners to implement pollution controls.

Testing on-site sewage systems consists of introducing dye into the system and checking downslope areas for traces of dye and fecal coliform bacteria. The dye testing effort is conducted during the wet season when soils are saturated. If found to be failing, the homeowner is required to repair or replace the system. All on-site sewage system technologies are considered during repair or replacement of an existing system. The type of system required is determined by site characteristics.

Conventional gravity systems are rarely used due to soil limitations in the area. As with farm plans, voluntary compliance is preferred, but TCEHD has the authority to pursue legal actions in order to get failing systems repaired.

Project Basin Descriptions

The following six basins within the Totten and Eld Inlet watersheds were identified as NMP study basins in the QAPP: Kennedy, Schneider, McLane, Perry, Burns, and Pierre (Figures 2 and 3). Table 1 shows that land-use in the larger Kennedy, Schneider, McLane, and Perry basins is dominated by forest (>65% of the land area), while residential and agricultural uses account for less than 15 percent. Residential and agricultural uses account for the majority of land area in the smaller basins of Burns and Pierre. Perennial streams in the larger basins provide important salmon and trout habitat, while the intermittent streams draining Burns and Pierre do not.

Historical data show that Kennedy Creek is the least impacted by bacterial contamination. Residential development is sparse and occurs mostly along the Highway 8 corridor in the upper watershed. Forest harvest impacts on salmon habitat may be of more concern than bacterial pollution in Kennedy Creek. However, Kennedy Creek may contribute large bacteria loads to Totten Inlet because it has higher flows than the other basin streams. Summit Lake, at the headwaters, has dense shoreline residential development and frequently violates drinking water standards for bacteria because of poorly functioning on-site sewage systems. (The drinking water standard is 1 colony forming unit [cfu] per 100 mL). Summit Lake is the drinking water source for most lake shore residences. There is a local water treatment facility, but most homes pump water directly from the lake. Summit Lake is not considered a significant source of downstream bacteria because bacteria concentrations in the open-water area of the lake are typically low, from 1-5 cfu per 100 mL; and a large amount of bacteria die-off probably occurs during travel from Summit Lake to the mouth of Kennedy Creek.

Although Schneider is predominantly forested, it has some agriculture and residential development. A number of priority farms are located in the northern part of the basin. Commercial and business areas are being developed along the State Highway 101 corridor. Since Schneider Creek drains to Oyster Bay at the southern end of Totten Inlet, there is concern about the potential of bacterial contamination from increasing development in the basin.

McLane has substantial agricultural and residential development. A large number of priority farms are located adjacent to McLane Creek, especially in the lower reaches. The creek drains into Mud Bay, in the southern portion of Eld Inlet. Shoreline areas along Mud Bay also contain priority farms and residential development. Residential and shoreline development in the basin contributed to the change in classification status of southern Eld Inlet shellfish harvest area from approved to conditional in 1983.

Table 1. Land-use characteristics in the study basins in 1995.

	Study Basins					
Assessor's Land-use Category *(% of area)*	Kennedy	Schneider	McLane	Perry	Burns	Pierre
residential	4%	8%	9%	3%	37%	34%
undeveloped residential	5%	15%	14%	11%	26%	35%
agriculture	0%	7%	4%	2%	36%	26%
forestry	84%	65%	71%	80%	0%	0%
commercial/public/other	5%	1%	1%	0%	0%	0%
roads	2%	3%	1%	4%	1%	5%
Total Acres	13,046	4,588	7,425	3,857	82	65
Farm Site Category *(% of area)*						
farm sites with BMPs	0%	6%	5%	4%	59%	44%
other farm sites	0%	4%	4%	3%	0%	0%
remainder of basin	100%	91%	91%	94%	41%	56%
Basin Stream Length						
% stream length thru BMP sites	0%	28%	10%	6%	100%	53%
% stream length thru other sites	1%	0%	8%	6%	0%	0%
% stream length thru non-ag sites	99%	72%	82%	88%	0%	47%

Notes:

- Land use areas based on Thurston County Assessor's designations rather than true land cover.
- Farm site areas and stream lengths based on GIS analysis.
- Assessor's land use categories do not always reflect true land use.

Perry drains to the west side of Mud Bay. Most priority farm sites in this basin are concentrated in the upper stream reaches, with residential areas in the lower basin upslope from the stream corridor. The upstream farms along Perry Creek have been the focus of past TCEHD efforts to document bacteria loading from specific farms and farm practices. However, TCEHD discontinued the monitoring program due to funding and logistic constraints.

Burns and Pierre are the smallest of the study basins (< 100 acres). Both basins drain into Burns Cove within Totten Inlet. Historically, elevated concentrations of fecal coliform have been measured in the marine waters of Burns Cove. These two basins,

as well as shoreline homes and other smaller drainages, are suspected to be the source of localized contamination of the marine waters. Land-use in Burns and Pierre basins is mostly residential and agriculture.

Project Goal and Monitoring Design

Few studies in the Pacific Northwest have adequately documented the effectiveness of nonpoint pollution controls at improving water quality. The major goal of this project is to evaluate the effectiveness of nonpoint pollution controls in six basins within the Totten and Eld Inlet watersheds.

The overall project objectives for the study basins are to:

1. Detect water quality trends over time.
2. Monitor and quantify the implementation of nonpoint pollution controls.
3. Associate water quality with the level of pollution controls taken.

Specific project objectives and tasks for the NMP, SPI, CCWF and other funded projects are listed in Appendix A of the QAPP.

Two monitoring designs are being used for the six study basins to determine the effects of basin-wide pollution controls on water quality: the paired-watershed approach and the single-site-over-time approach. As discussed in the QAPP, study basin characteristics were evaluated to determine which basins would be suitable for long-term monitoring using these monitoring designs. To determine if the paired watershed approach could be used, inter-basin relationships between flow, FC, TSS, and turbidity were examined using linear regression. The location and timing of remedial actions were also considered. This assessment suggested that the paired watershed study approach would be applicable for Kennedy and Schneider, but not for the other basins. No pollution controls were scheduled to be installed in Kennedy basin so it was chosen to be the "control" for Schneider basin. The single-site-over-time approach will be used in McLane, Perry, Burns, and Pierre because BMPs are scheduled to be installed in each of these basins.

Monitoring Program Timeline

This monitoring project is expected to be funded through 2002. Water quality monitoring is presently scheduled for completion in April 2001, but may need to be extended into 2002 in the McLane and Perry basins in order to gather sufficient post-BMP water quality data.

Project Schedule:

Wet Season	Project Year	Comment
1992-1993	1	initial monitoring season; SPI begins spring 1993
1993-1994	2	2nd monitoring season
1994-1995	3	Project plan finalized
1995-1996	4	CCWF begins in McLane/Perry
1996-1997	5	SPI ends in spring 1997
1997-1998	6	6th monitoring season
1998-1999	7	CCWF in McLane/Perry completed
1999-2000	8	last monitoring season for Totten basins
2000-2001	9	last monitoring season for McLane/Perry
Sep 2001	10	last annual report
Apr 2002	11	draft final report
Sep 2002	11	final report

Project Reports:

Semi-annual reports to EPA R10, as requested	Apr and Oct - through 2002
Annual reports to EPA R10 and NMP coordinator	Sep - through 2001
Annual summaries to SPI participants	Oct - through 2001
Draft Project Completion Report	Apr 2002
Final Project Completion Report	Sep 2002

Public Involvement and Education

Public involvement and education is an important part of any nonpoint source pollution program. There are a number of education and information activities within Thurston and Mason Counties that address land and water stewardship. These activities generally serve residents throughout the south Puget Sound area while some target specific areas or environments. The activities include awareness, learning, experience, and personal action programs. Many of the educators involved with these activities share ideas, resources, and programs through a Regional Education Team. Primary educators involved in the stewardship programs include: Thurston Cooperative Extension, Mason Cooperative Extension, Washington Sea Grant Program, Thurston County Health Department, Thurston Conservation District, Mason County Health Department, Mason County Conservation District, Eld Watershed Council, City of Olympia, Ecology, and the State Department of Health. Examples of current stewardship programs that serve the south Puget Sound area (including Totten and Eld Inlet Watersheds) are: Envirothon, Dobbs Creek Model Farm, Streamteam, Country Living, Common Sense Gardening, Shellfish in Your Frontyard, Project GREEN, 4-H

Horse Camp, Adopt-A-Stream, and Adopt-A-Beach. In addition, public service announcements on local radio, TV, and press are used to promote stewardship activities.

A watershed resident survey, conducted in August 1994, investigated public awareness and opinions regarding water quality and environmental issues. The survey targeted the Totten and Eld Inlet watersheds in southern Puget Sound as well as northern Puget Sound watersheds in Whatcom, Skagit, and Snohomish counties. About 1,300 residents responded to the mail survey. The survey was funded through CWA Section 319, and helps state and local governments evaluate levels of public awareness, effectiveness of current educational programs, and determine where education/involvement efforts should be directed (Elway Research, 1994). The major findings of the south Puget Sound portion of the survey include:

- Respondents home locations: About 67% of the south Puget Sound respondents lived in the Totten and Eld Inlet watersheds. Of these, 33% lived on the water, about 41% lived within one-half mile of any body of water, and about 9% kept farm animals on their property.

- Water resource priorities: Out of a list of 17 water resource problems, Totten and Eld Inlet watershed residents were most concerned about Puget Sound pollution in general and fish and shellfish habitat destruction in particular. Secondary concerns were: industrial, septic tank, and stormwater pollution; general pollution of rivers and streams; and increased amounts of runoff. Fifteen percent of respondents noted that pollution from agriculture was a major problem, while about 64% thought it a lesser problem.

- Information sources: Respondents had heard how to save water and prevent water pollution through the mass media (90%), word of mouth (70%), and brochures received in the mail (64%). Out of a printed list of eight local water quality enhancement programs, residents were most familiar with Adopt-A-Stream (73%), Adopt-A-Beach (62%), and Common Sense Gardening (60%). Overall, 40% of respondents had participated in at least one water-related program.

- Household Habits and Government Involvement: About 90% of respondents were on a septic system and 70% of these residents had maintained their system within the last 5 years. Residents indicated that information and education programs would do the most to influence their behavior (20%). Respondents considered enforcement of existing water pollution control regulations (50%) more important rather than creation of new laws (13%). Overall, 61% of respondents indicated they would be willing to pay at least $1 per month to help reduce water pollution.

Data Collection Methods

Data for on-site sewage system inspections and remedial actions taken were provided through personal communication with TCEHD staff. Data for agricultural management measures were compiled from farm inventory work sheets, quarterly and annual grant project reports, and personal communication with TCD staff.

Water quality monitoring data were collected by Ecology from surveys conducted from early November through mid-April (wet season) in the six study basins. Samples were collected weekly for 23 consecutive weeks at the stream mouths where historical sampling has occurred (Figure 3). Water quality parameters determined at Ecology-EPA Manchester Environmental Laboratory (MEL) were fecal coliform bacteria (FC), total suspended solids (TSS), and turbidity. Temperature, flow, and conductivity were determined in the field.

Thurston Geodata Center (TGC) provides geographic data such as hydrography, roads, and zoning. TGC also provides tax parcel information from the Thurston County Assessor and Thurston County Permit Center such as land-use classification, parcel size, and the number and types of buildings. The TGC data are used to map and analyze watershed characteristics in the study area.

Climate data are provided by the National Weather Service station at the Olympia Airport. Daily precipitation is reported from midnight to midnight. The antecedent precipitation index (API), API slope, and previous 24-, 48-, and 72-hour precipitation are determined by Ecology for each day during the sampling period. The API is an indicator of soil saturation and runoff potential and is based on the previous 15-day precipitation, evapo-transpiration, leaching, and runoff (Dunne and Leopold, 1978). API slope is the change in the API from one day to the next. Continuous recorders (capacitive probes and dataloggers) are used to record stream level every 30 minutes in all streams except Burns Creek.

The specific types and characteristics of project data are summarized in the data management section.

Data Quality

Data quality objectives (DQOs) for management practices and water quality data are described in the QAPP (Seiders, 1995). Data quality objectives for both types of data will be more thoroughly reviewed in the coming year to determine their adequacy to satisfy the project objectives. The following is a general review of the quality of all project data.

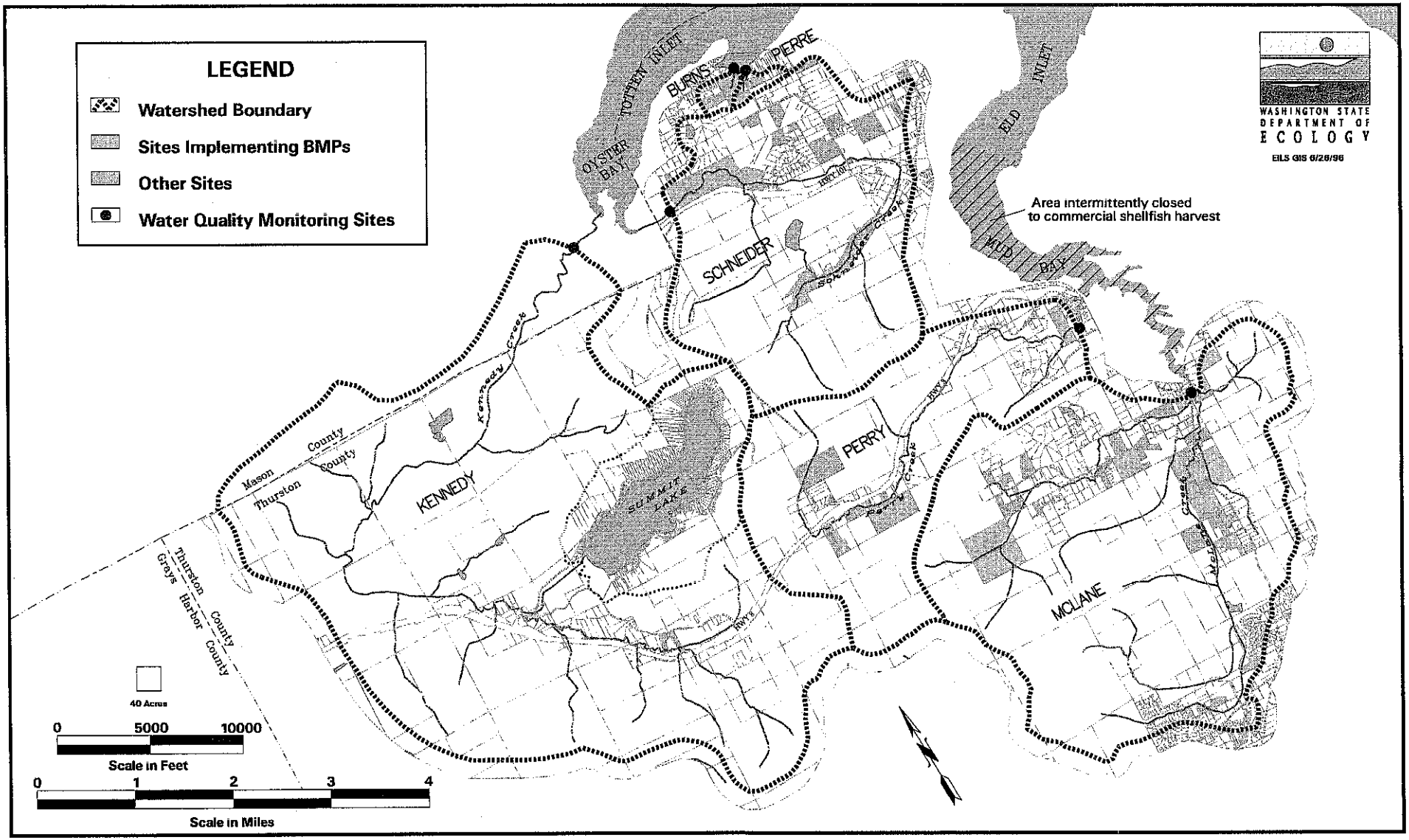

Figure 3. Farm sites in study basins.

Nonpoint Source Pollution Management Data

As noted above, information about the type, location, and time frame for the repair of on-site sewage systems and the installation of farm site BMPs was provided by TCEHD and TCD, respectively. To date, there are few on-site sewage systems in the study basins that have been surveyed, so most of the management data collected are for farm plan and BMP implementation. Overall, data on the management of nonpoint source pollution have met the DQOs stated in the QAPP. However, as described in Determan (1993), it is difficult to collect management data of known quality because of changes in land-use and changes in farm operations over time. In addition, there are usually insufficient resources to monitor and keep records of the operation and maintenance of BMPs. The accuracy, representativeness, and completeness of these data, which are usually qualitative, are described below.

Accuracy

The BMP data are accurate for the time they are installed or implemented. However, the accuracy of the data may decrease over time because it is uncertain if BMPs are properly operated and maintained after installation. For example, structural BMPs (e.g., roof runoff management and livestock troughs) require less long-term operation and maintenance than managerial practices (e.g., waste utilization and pasture and hayland management). In part, the uncertainty in the long-term accuracy of BMPs exists because state and local efforts have focused on getting BMPs implemented rather than on following up and determining whether the BMPs are being adequately operated and maintained. This may compromise the ability of this study to link water quality changes to the implementation of BMPs and farm plans.

Representativeness

The reported BMP data likely represent only the minimum level of pollution control in the study area because: 1) not all on-site sewage system surveys or repairs are reflected in the data, 2) farm site BMP data only represent pollution control efforts where TCD is involved in the development and implementation of farm plans, and 3) only NRCS-approved BMPs are included in farm plans. These data limitations are probably not significant because it is unlikely that there are many on-site sewage system surveys and repairs done outside the SPI grant program or many farms that develop farm plans without TCD's involvement. It is also unlikely that farms with a high potential to pollute were excluded from TCD's priority list, or that many effective BMPs are being implemented outside of TCD's programs.

Completeness

The collection of BMP data is incomplete, because information or data on the maintenance and operation of BMPs is not well documented. The locations and survey

status of on-site sewage systems and key characteristics of priority farm site management such as the amount, type, timing, and location of the BMP implemented are adequately reported.

Water Quality Data

Most of the water quality data collected are meeting DQOs for accuracy, representativeness, and completeness. Puget Sound Protocols for freshwater and other general quality assurance/quality control protocols are followed for the collection, identification, preservation, storage, and transport of samples (Tetra Tech, 1986). Collected samples are tagged, cooled to 4°C, kept in the dark, and transported to the MEL within 24 hours. Formal chain-of-custody procedures described in Kammin (1994) are followed to ensure sample security. Field instrument use follows manufacturer's instructions for maintenance, calibration, and operation. Equipment inventory, instruction manuals, and maintenance records are maintained at the Ecology facilities in Lacey, Washington.

Field duplicate samples (two samples taken consecutively at the same location) for 17% of the total number of laboratory samples are collected and all sample sites are represented. The mean duplicate precision from the last four seasons of monitoring data is presented in Table 2. Field duplicate samples are split (one homogeneous sample is separated into two sample containers) by the laboratory as part of their QA/QC protocols. The laboratory split sample precision is also presented in Table 2.

Precision targets, as determined by duplicate samples, have been met for TSS and turbidity but not for fecal coliform. The pooled standard deviations for the last four years of TSS and turbidity data are 3.2 and 1.5, respectively. Generally, as values approach the lower analytical reporting limits, precision decreases.

Table 2. Precision of duplicate samples.

	FC (all means)			FC (mean 15-900)			TSS			Turbidity		
	RSD	Sp	n	RSD	Sp	n	RSD	Sp	n	RSD	Sp	n
Field Duplicate:	26%	38	89	22%	24	54	10%	3	90	8%	2	89
Lab Split:	21%	61	87	18%	19	54	7%	2	96	4%	1	98

Note: Precision expressed as the mean Relative Standard Deviation (RSD) which is defined as the standard deviation divided by the mean, expressed as a percent. The pooled standard deviation (Sp) was used to calculate the RSD.

The precision for fecal coliform has not met the target precision for any of the study years except the second year, which was the year used to derive the target precision. However, the precision of the fecal coliform data is typical of other studies conducted in Washington State. The poorer than expected precision will be reviewed with respect to the established DQOs and to evaluate how it affects this study.

Land Use, Project Costs, and Climate Data

Land-use data are representative of the land use designations developed by the Thurston County Assessor. The Assessor's land use designations approximate actual land cover at the end of 1995. Tax parcel data will be updated annually for the remainder of the project. GIS data coverages for streams, roads, zoning, etc. are expected to be adequate for this project.

Cost data were derived from various estimates and assumptions, and are the best estimates available at this time. Cost data for monitoring efforts, project administration, and technical assistance for land treatment are relatively complete. The costs of BMP installation and maintenance are less complete, and not reported this year, but will be provided in the 1997 annual report.

Climate data are adequate for this project. Precipitation data are collected at the National Weather Service station at the Olympia Airport. The station is approximately 10 miles southeast from the center of the study area. The spatial variability of rainfall over the study area was reviewed during project design and data from the Olympia site was considered adequate for the study. Stream hydrograph data from stream level recorders are mostly complete and provide additional information about stream response to rainfall. Some hydrograph data were lost due to equipment problems or extreme weather events.

Results and Discussion

Data have been collected for 4 of the scheduled 9 years in the study basins. The following is an interim summary of the results for this study. Data are presented with a minimum of analyses because the project is only partially complete.

Nonpoint Source Pollution Management Data

Most of the management actions to control pollution from on-site sewage systems were taken outside of the six study basins, along the marine shoreline of Totten and Eld Inlets. TCEHD inspected nearly 900 homes in the shoreline areas since 1992. Only three on-site sewage systems were inspected in Burns and Pierre basins through 1994. About 120 homes in the Summit Lake drainage area, in the Kennedy basin, were also

inspected and remedial actions are underway. However, it is unlikely remedial actions will affect bacteria levels at the Kennedy Creek monitoring site, because in-lake bacteria levels have historically been low. TCEHD plans to inspect sewage systems along Schneider Creek during the 1996-97 wet season.

Over 190 agricultural BMPs have been implemented on 26 sites in Schneider, McLane, Perry, Burns, and Pierre basins since 1986. Most of the pollution controls have been installed on non-commercial farms that keep livestock. Appendix A lists the farms in each study basin and the status of farm planning and BMPs for each basin. However, the progress towards completing individual farm plans is unknown, because implementation and farm plan data are reported in different formats that have not yet been reconciled. The specific BMPs implemented on farms in the study basins are compiled in Appendix B. Tables 3, 4, and 5 summarize the number, type, and amount of BMPs implemented in the study basins.

Table 3 shows the number of BMPs that were implemented in each of the study basins and the total number of farm plans developed from 1986 to 1996. About 70% of the pollution controls were installed from 1993 to 1995. McLane and Perry basins had a number of BMPs installed prior to 1992 as part of other pollution control initiatives.

Table 3. Number of BMPs implemented in study basins from 1986 to 1996.

Basin	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
Kennedy	0	0	0	0	0	0	0	0	0	0	0	0
Schneider	0	0	0	0	0	0	0	13	19	9	2	43
McLane	0	5	0	17	3	6	0	20	19	12	1	83
Perry	0	0	1	0	7	9	0	0	0	5	0	22
Burns	1	0	0	0	4	0	0	2	22	0	0	29
Pierre	0	0	0	0	3	1	1	10	0	0	0	15
Total BMPs	1	5	1	17	17	16	1	45	60	26	3	192
Total Farm Plans	1	0	0	0	5	9	3	7	6	3	0	34

Table 4. Type and number of BMPs implemented in study basins

BMP#	BMP Description	Kennedy	Schneider	McLane	Perry	Burns	Pierre	Total
322	Channel Vegetation	0	1	0	0	0	0	1
352	Deferred Grazing	0	0	2	0	3	1	6
382	Fencing	0	7	14	6	3	1	31
393	Filter Strip	0	4	8	2	0	0	14
395	Fish Stream Improvement	0	3	7	1	0	0	11
412	Grassed Waterway	0	0	2	0	0	1	3
561	Heavy Use Area Protection	0	0	2	0	0	0	2
430	Irrigation Pipeline	0	0	1	0	0	0	1
575	Livestock Crossing	0	2	1	1	0	0	4
472	Livestock Exclusion	0	4	5	2	3	1	15
590	Nutrient Mgmt	0	2	1	0	0	0	3
510	Pasture & Hayland Mgmt	0	2	8	0	3	1	14
512	Pasture & Hayland Planting	0	2	1	1	3	1	8
516	Pipeline	0	0	1	1	1	0	3
556	Planned Grazing System	0	0	0	0	2	1	3
528	Prescribed Grazing	0	2	1	0	1	1	5
558	Roof Runoff Mgmt	0	1	3	2	3	1	10
570	Runoff Mgmt System	0	0	0	0	1	0	1
580	Streambank Protection	0	2	3	1	0	0	6
614	Trough	0	0	7	5	1	2	15
620	Underground Outlet	0	0	1	0	0	0	1
312	Waste Mgmt System	0	0	3	0	0	0	3
313	Waste Storage Structure	0	2	0	0	1	2	5
633	Waste Utilization	0	3	6	0	3	2	14
645	Wildlife Upland Habitat	0	1	4	0	1	0	6
644	Wildlife Wetland Habitat	0	1	2	0	0	0	3
654	Woodland Improved	0	1	0	0	0	0	1
666	Woodland Improvement	0	1	0	0	0	0	1
660	Woodland Pruning	0	1	0	0	0	0	1
490	Woodland Site Preparation	0	1	0	0	0	0	1
	Total BMPs Installed	0	43	83	22	29	15	192
	Farms that Developed Farm Plans	0	6	10	7	3	2	34
	Farms that Signed Farm Plans	0	4	9	4	2	1	20
	Farms that Installed BMPs	0	4	13	4	3	2	26
	Avg Number of BMPs per Farm	-	10.8	6.4	5.5	9.7	7.5	7.4

Table 5. Type and amount of BMPs implemented in study basins.

BMP#	BMP Description	Units	Kennedy	Schneider	McLane	Perry	Burns	Pierre	Total
322	Channel Vegetation	acres	0	1	0	0	0	0	1
352	Deferred Grazing	acres	0	0	18	0	56	6	80
382	Fencing	feet	0	13,190	14,647	2,627	2,718	50	33,232
393	Filter Strip	acres	0	167	10	4	0	0	181
395	Fish Stream Improvement	feet	0	8,510	11,470	220	0	0	20,200
412	Grassed Waterway	acres	0	0	1	0	0	1	2
561	Heavy Use Area Protection	acres	0	0	3	0	0	0	3
430	Irrigation Pipeline	feet	0	0	200	0	0	0	200
575	Livestock Crossing	each	0	2	1	1	0	0	4
472	Livestock Exclusion	acres	0	152	155	7	56	3	373
590	Nutrient Mgmt	acres	0	111	5	0	0	0	116
510	Pasture & Hayland Mgmt	acres	0	127	110	0	49	5	291
512	Pasture & Hayland	acres	0	2	5	5	6	5	23
516	Pipeline	feet	0	0	400	1,802	900	0	3,102
556	Planned Grazing System	acres	0	0	0	0	27	5	32
528	Prescribed Grazing	acres	0	111	90	0	2	3	206
558	Roof Runoff Mgmt	system	0	1	3	2	3	1	10
570	Runoff Mgmt System	system	0	0	0	0	1	0	1
580	Streambank Protection	feet	0	5,200	4,800	300	0	0	10,300
614	Trough	each	0	0	10	5	1	2	18
620	Underground Outlet	feet	0	0	105	0	0	0	105
312	Waste Mgmt System	system	0	0	3	0	0	0	3
313	Waste Storage Structure	structu	0	2	0	0	1	2	5
633	Waste Utilization	acres	0	111	90	0	57	8	265
645	Wildlife Upland Habitat	acres	0	600	79	0	40	0	719
644	Wildlife Wetland Habitat	acres	0	10	35	0	0	0	45
654	Woodland Improved	acres	0	427	0	0	0	0	427
666	Woodland Improvement	acres	0	427	0	0	0	0	427
660	Woodland Pruning	acres	0	427	0	0	0	0	427
490	Woodland Site Preparation	acres	0	427	0	0	0	0	427

Table 4 lists the type and number of specific pollution control practices that have been installed in each of the basins. The most frequently used BMPs include fencing, livestock exclusion, livestock troughs, pasture and hayland management, and waste utilization. Other commonly employed practices are fish stream improvement, roof runoff management, pasture and hayland planting, deferred grazing, and streambank protection. The number of individual practices installed per farm ranged from 1 to 16. Table 4 also shows that 34 farms have farm plans, 20 have signed plans, and 26 farms have implemented some BMPs. Within each basin, the average number of BMPs per farm ranged from 6 to 11. Table 5 lists the type and amount of specific BMPs installed in each basin for the period of January, 1986 to April, 1996.

Water Quality Data

Water quality and precipitation data are listed in Appendix C. Boxplots summarizing the FC, TSS, turbidity, and flow data are presented in Figures 4-7. The historical data only consist of 2-5 samples per wet season for FC, whereas sample sizes for the 4 years of NMP data are 23-28 per season. [Note: Boxplots graphically display information about the range and distribution of data. The "box" displays the interquartile range (25th to 75th percentile) while the minimum and maximum values are shown as the end of the line which extends from the "box". The median is represented by a line that divides the box. Outliers are shown as small circles or asterisks and are defined as values that lay more than 1.5 times the interquartile range beyond the minimum or maximum.]

Figure 4 shows that FC results are variable from year-to-year and that no trends are apparent in the study basins except perhaps for Schneider Creek. Schneider Creek's FC levels seem to be decreasing from high values between 220-280 cfu/100 mL (upper 25th percentile) during the 1989-90 wet season to 25-160 cfu/100 mL today. The increase of FC in the 1989-90 season may be due to increases in livestock at horse ranches in the basin. Since 1989, farm plans have been developed and BMPs implemented on these ranches, which are likely helping to lower FC concentrations. FC levels in Kennedy Creek have remained low for the length of the data record. The highest concentrations of FC have been found in Burns and Pierre Creeks. FC levels in Perry Creek over the past 4 years appear to be lower than previous years. However, analyses for determining trends in FC levels will not be performed until after BMP installation is complete.

Table 6 compares the last four wet seasons of FC data to Washington State water quality standards (Chapter 173-201A Washington Administrative Code). Kennedy, McLane, and Perry Creeks met both parts of the FC standard. Schneider Creek exceeded the second part of the water quality standard for the first three seasons, but met both parts of the standard in the 95-96 season. Burns and Pierre Creeks have failed to meet either part of the standard.

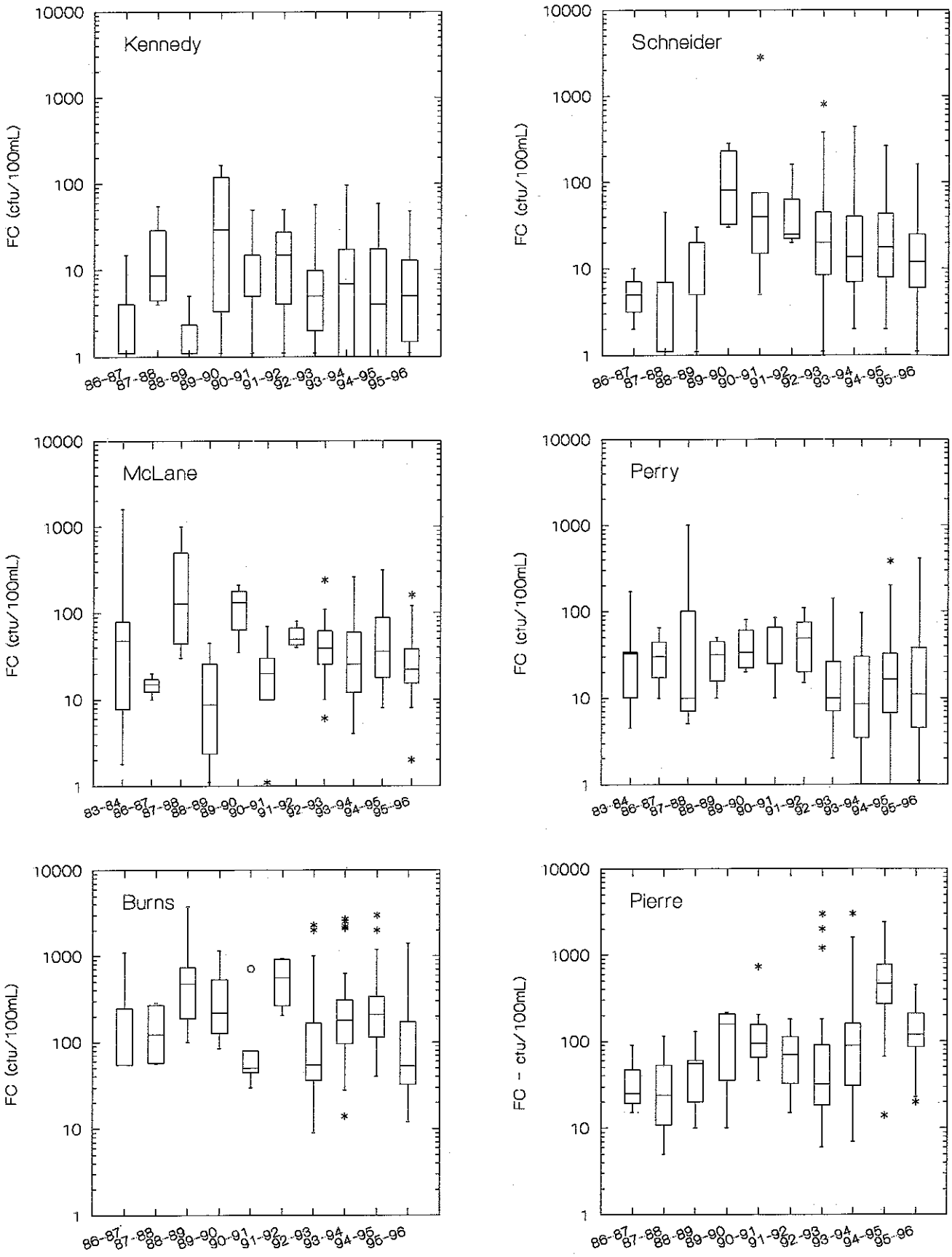

Figure 4 Box-plots of fecal coliform (FC) data

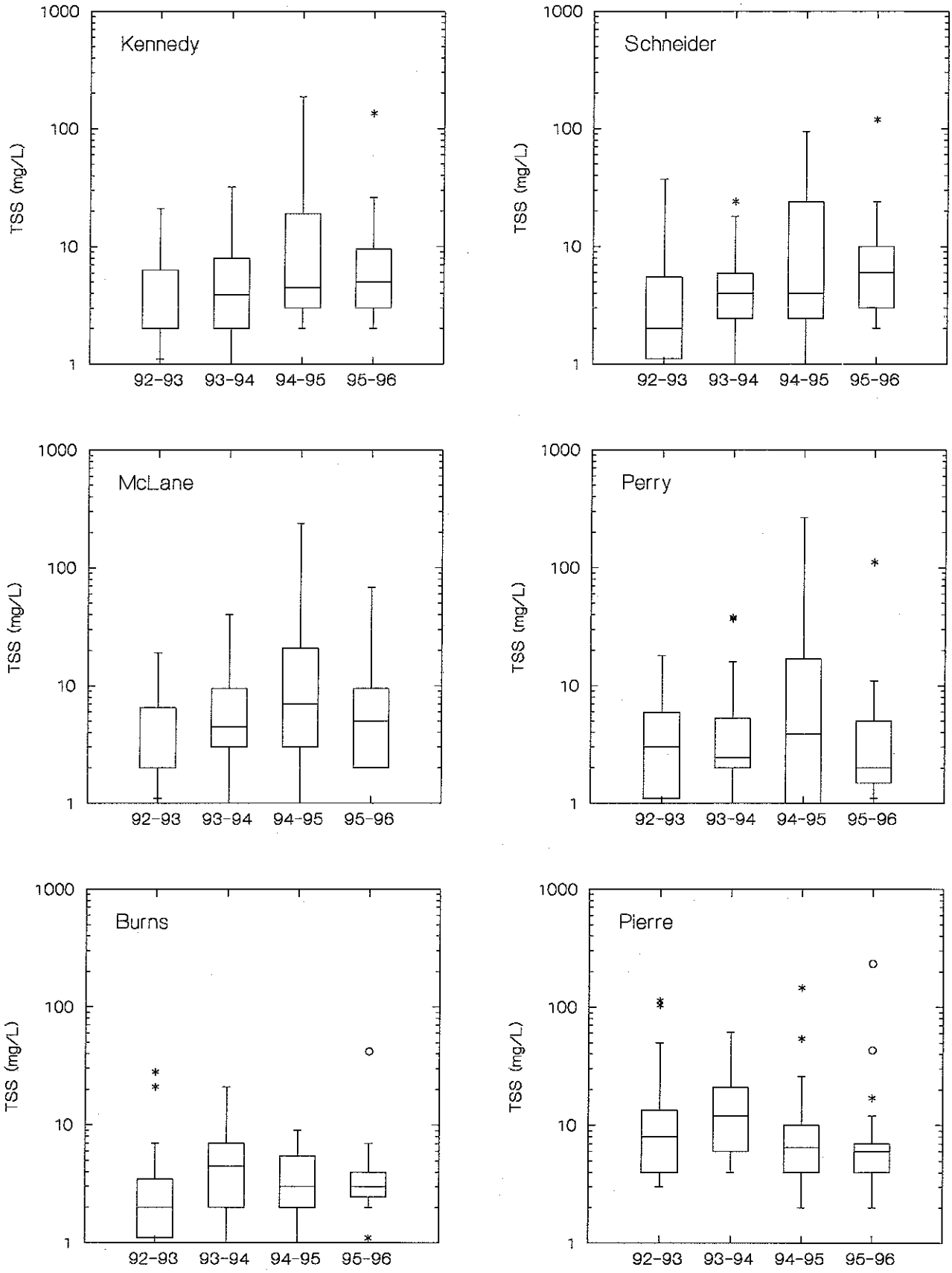

Figure 5 Box-plots of total suspended solids (TSS) data

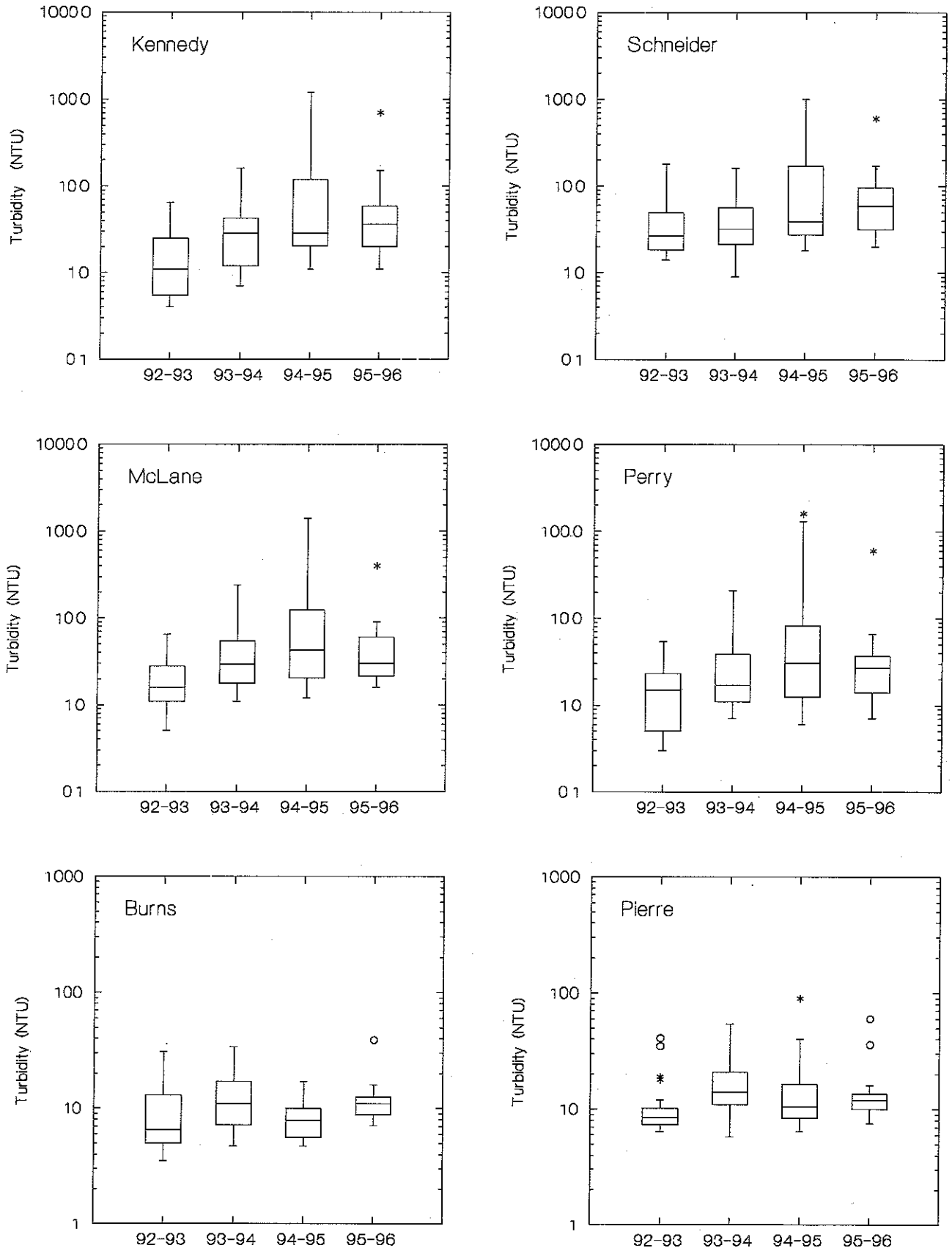

Figure 6 Box-plots of turbidity data

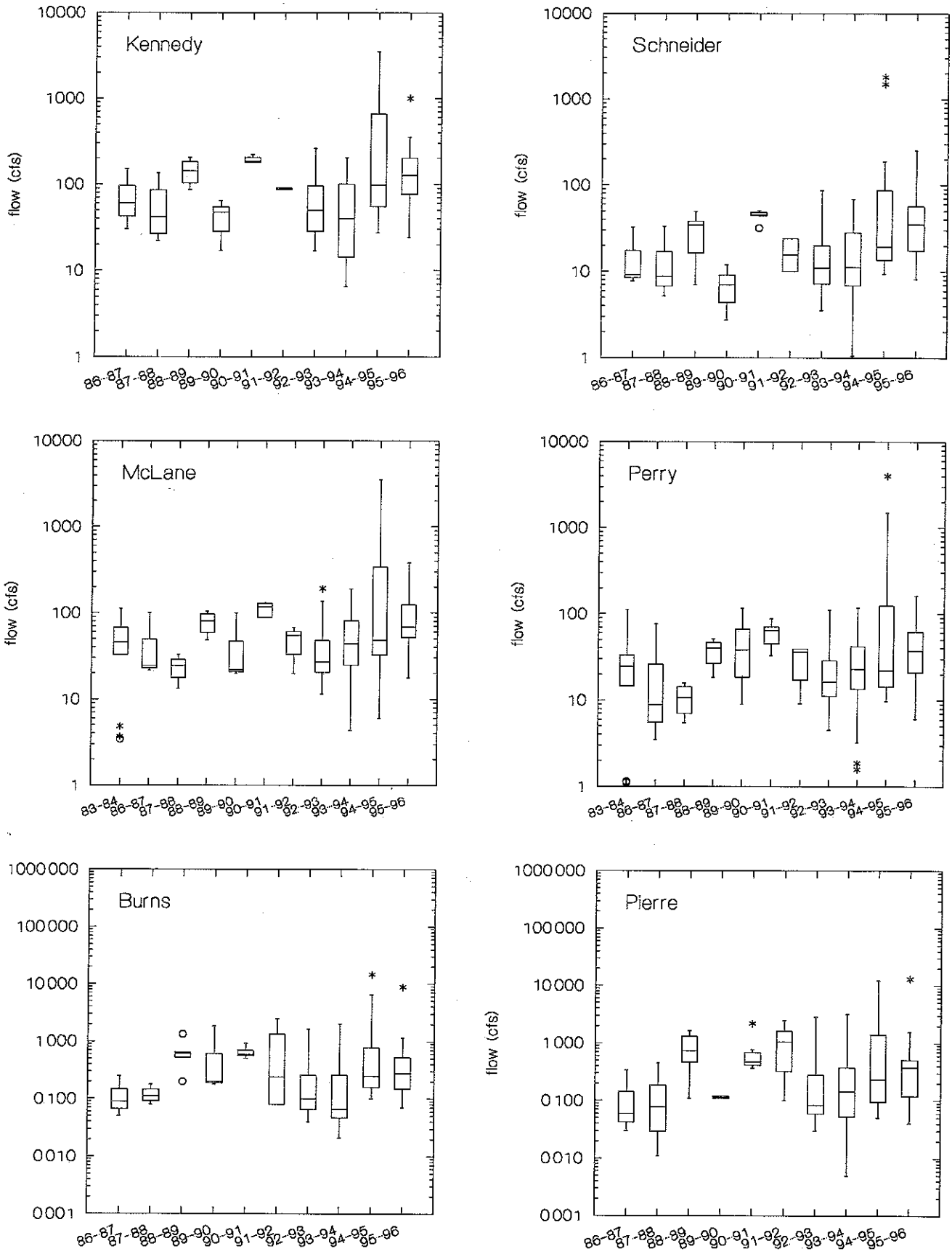

Figure 7 Box-plots of flow data

Table 6. Comparison of fecal coliform data to water quality standards.

Site	Class	Geometric Mean Value during wet season				Part 1 meet standard?				Percent of samples greater than Part 2 of standard				Part 2 meet standard?			
		92-93	93-94	94-95	95-96	92-93	93-94	94-95	95-96	92-93	93-94	94-95	95-96	92-93	93-94	94-95	95-96
Kennedy	AA	5	6	5	5	Yes	Yes	Yes	Yes	0%	0%	0%	0%	Yes	Yes	Yes	Yes
Schneider	AA	24	17	20	11	Yes	Yes	Yes	Yes	**17%**	**11%**	**17%**	4%	**No**	**No**	**No**	Yes
McLane	A	37	27	37	23	Yes	Yes	Yes	Yes	4%	4%	4%	0%	Yes	Yes	Yes	Yes
Perry	A	14	10	17	13	Yes	Yes	Yes	Yes	0%	0%	4%	4%	Yes	Yes	Yes	Yes
Pierre	AA	**52**	**55**	**410**	**120**	**No**	**No**	**No**	**No**	**22%**	**40%**	**92%**	**61%**	**No**	**No**	**No**	**No**
Burns	AA	**94**	**210**	**220**	**80**	**No**	**No**	**No**	**No**	**35%**	**74%**	**79%**	**30%**	**No**	**No**	**No**	**No**

Class AA Standard:
Part 1 - geometric mean value (GMV) shall not exceed 50 colonies/100mL
Part 2 - not more than 10% of the samples used for calculating the GMV shall exceed 100 colonies/100mL

Class A Standard:
Part 1 - geometric mean value (GMV) shall not exceed 100 colonies/100mL
Part 2 - not more than 10% of the samples used for calculating the GMV shall exceed 200 colonies/100mL

Rainfall and seasonal "wetness" are commonly examined to help interpret FC data. Table 7 summarizes rainfall conditions for the last four wet seasons. Total and average daily rainfall and API show that the past two monitoring seasons were "wetter" than the first two monitoring seasons. Wetness conditions on the sample days were also examined using boxplots (Figure 8). These plots show that values for daily precipitation and the previous 24-hour and 48-hour rainfall were similar for all four NMP sampling years. Plots of the API show that API values for the days of sample collection for the last two years were higher than those for the first two years.

Table 7. Summary of wet season precipitation (November 1 through April 30). All units are inches.

Monitoring Season	Rainfall Total	Rainfall - Daily Average	API Total	API - Daily Average
1992-93	29.25	0.16	291	1.61
1993-94	25.71	0.14	258	1.43
1994-95	40.53	0.22	448	2.48
1995-96	48.62	0.27	471	2.59

Relationships among water quality variables within basins were sought for their possible use in helping to determine change in FC over time. The results of linear regression analyses presented in Table 8 show that flow and API correlate poorly with FC. API slope, TSS, and turbidity correlate more strongly with FC but were generally inconsistent among the stations or between years. Results suggest that the hydrologic characteristics in the study basins will make poor covariates of FC data for use in trends analyses or pre- and post-BMP comparisons. API slope, TSS, and turbidity will be more closely examined over the coming years for their possible use as covariates.

Pollution Controls and Water Quality

The paired watershed and single-site-over-time study design each requires that water quality data be collected before and after the installation of pollution controls. Pre- and post-BMP periods for each of the study basins will be defined based on the timing, location, and types of BMPs installed. Table 3 showed that a substantial number of BMPs were implemented from 1993 to 1996 in Schneider, McLane, Burns, and Pierre basins. The installation of pollution controls in Schneider, Burns, and Pierre funded

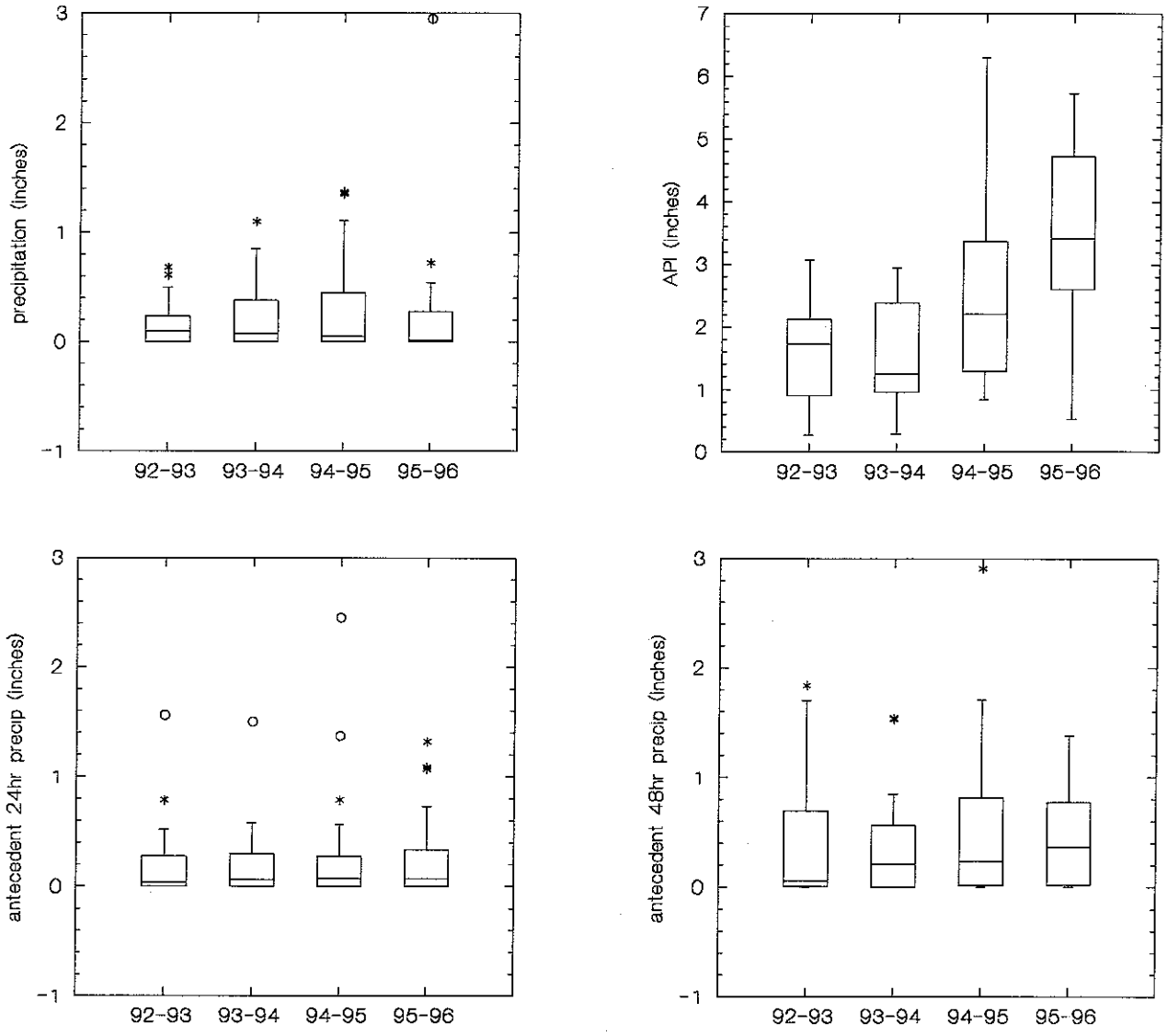

Figure 8 Box-plots of precipitation data

Table 8. Coefficients of determination (r^2) from intra-basin linear regressions.

Site	Year(s)	Parameters Q-FC	TRB-FC	TSS-FC	API-FC	SLP-FC
Kennedy	92-93	0.00	0.00	0.06	0.00	0.10
	93-94	0.13	0.27	0.01	0.12	0.00
	94-95	0.14	0.42	0.43	0.31	0.41
	95-96	0.44	0.44	0.45	0.21	0.21
	92-96	**0.00**	**0.16**	**0.18**	**0.00**	**0.15**
Schneider	92-93	0.00	0.23	0.19	0.00	0.08
	93-94	0.00	0.18	0.16	0.00	0.00
	94-95	0.45	0.71	0.59	0.38	0.59
	95-96	0.10	0.19	0.23	0.00	0.50
	92-96	**0.04**	**0.26**	**0.25**	**0.00**	**0.26**
McLane	92-93	0.04	0.20	0.20	0.00	0.08
	93-94	0.00	0.77	0.76	0.00	0.09
	94-95	0.22	0.40	0.32	0.09	0.37
	95-96	0.04	0.07	0.05	0.00	0.27
	92-96	**0.01**	**0.26**	**0.28**	**0.00**	**0.24**
Perry	92-93	0.00	0.32	0.44	0.00	0.30
	93-94	0.00	0.57	0.46	0.00	0.00
	94-95	0.24	0.37	0.37	0.02	0.44
	95-96	0.05	0.23	0.26	0.03	0.06
	92-96	**0.06**	**0.31**	**0.37**	**0.03**	**0.18**
Burns	92-93	0.08	0.64	0.35	0.00	0.33
	93-94	0.00	0.80	0.44	0.00	0.06
	94-95	0.05	0.55	0.49	0.00	0.18
	95-96	0.20	0.07	0.00	0.07	0.30
	92-96	**0.04**	**0.46**	**0.28**	**0.00**	**0.20**
Pierre	92-93	0.11	0.74	0.40	0.00	0.26
	93-94	0.00	0.51	0.00	0.00	0.14
	94-95	0.00	0.00	0.00	0.00	0.00
	95-96	0.31	0.17	0.12	0.23	0.14
	92-96	**0.04**	**0.10**	**0.05**	**0.01**	**0.05**

NOTES:

- All data were log transformed so they would meet the assumption of normal distribution
- Q=flow, FC=fecal coliform, TRB=turbidity, TSS=total suspended solids, SLP=API slope
- 1992-93 data, n=16; 1993-94 data, n=13-14; 1994-95 data, n=17-18
- Data used met any one of three criteria: API > 1.5; antecedent 24 hr and 48 hr rain > 0.2; API slope > 0.2
- All correlations were positive; for all r^2 values > 0.20, the regressions were significant at alpha=0.05
- Outlined values suggest good (0.50 - 0.70) or strong (>0.70) linear relationships between sites

under current grants is nearly complete. Few pollution controls are expected to be installed in these basins beyond 1997 unless additional funds target these areas. Approximately 15 farms in the McLane and Perry basins are scheduled to develop and implement farm plans as CCWF grant work occurs between 1996 and 1999.

In summary, water quality monitoring is scheduled to continue for up to five more years and should provide at least two years of post-BMP water quality data. BMP installation is scheduled to continue into 1999. Final analyses for determining FC trends are planned to be done in 1999 for Kennedy, Schneider, Burns, and Pierre and in 2001 for the McLane and Perry basins. This should allow the time needed to implement BMPs and develop a sufficient data set that can be used to detect trends in FC levels. Associating water quality trends and the installation of pollution controls can then be pursued.

Cost Data

Budget estimates for the pollution control activities in the study basins were presented in the QAPP. Annual expenditures per cost category and funding sources and amounts are shown in Table 9. Most of these expenditures are related to agricultural pollution controls or monitoring. Other activities of the grants are not represented because they generally target areas outside the study basin boundaries or do not directly address the agricultural operations in the study basins. Various assumptions and portioning of costs were used to estimate expenditures, because farms in the study basins are part of a larger number of farms targeted for pollution control in the Totten and Eld Inlet watersheds. The estimates of project expenditures were made as follows:

Pollution Controls

1. Expenditures data from individual grant vouchers were compiled into semi-annual periods.

2. Expenditures for cost-share reimbursements were then subtracted from #1 (because cost-share funds can be tracked to specific farm sites while other funds cannot).

3. Pollution control expenditures for each grant were then adjusted based on the number of farms in the study basin. For each grant, the amount in #2 was multiplied by the ratio of the number of farms treated in the basin divided by the number of farms targeted for treatment in the larger watershed project. These ratios are: Totten SPI - 10/32; Eld SPI- 10/18; Eld CCWF - 1/35.

4. Seventy-nine percent of the adjusted cost was then reported as the pollution control cost; the remaining 21% was reported as project administration costs.

Table 9. Estimated project expenditures and funding sources for study basins.

Project expenditures:

	1992	1993	1994	1995	1996	Total	Percent of Total	Funding Source
Pollution Control	$4,784	$29,241	$37,427	$26,590	$5,214	$103,256	30%	local, state
Cost Share	$0	$0	$3,835	$1,826	$0	$5,661	2%	state
Monitoring	$20,000	$40,000	$40,000	$40,000	$20,000	$160,000	47%	state, federal
Project Admin.	$6,453	$19,994	$22,177	$19,088	$6,782	$74,493	22%	local, state, federal
Total Project Cost	$31,238	$89,234	$103,439	$87,504	$31,996	$343,410	100%	

Project funding sources:

Grant Fund	Total Project Amount		Estimated Amount for Farms in Study Basins	Prorate Factor for Targeted Farms in Study Basins	Use of Funds	Time Period
Totten SPI	$341,486	(1)	$234,772	22/32	pollution control	1992-1997
Eld SPI	$96,667	(1)	$64,445	12/18	pollution control	1992-1996
Eld CCWF	$331,750	(1)	$142,179	15/35	pollution control	1995-1999
EPA 319	$500,000		$500,000		monitoring	1993-2002
Total	$1,269,903		$941,395			

Note:

- This amount is the agriculture-related task budget of each grant and includes the following cost-share totals: Totten SPI - $62,500; Eld SPI - $10,000; Eld CCWF - none.

5. The costs for 3 on-site sewage surveys ($1800) in Burns and Pierre basins was added to the 1994 pollution control costs. TCEHD uses $600 as the cost to survey one on-site sewage system (personal communication, Hofstad 1996).

Cost Share

Cost share expenditures are those from grant funds only; FSA cost share data are not included.

Monitoring

Expenditures are based on the annual monitoring budget. Twenty percent of the budgeted monitoring cost was allocated to project administration and the remaining 80% to actual monitoring.

Project Administration

Project administration costs include indirect costs associated with grants (e.g. facilities, materials, equipment) at the following rates: TCD - 21% of billable costs after cost share is subtracted out; Ecology - 3% of billable grant costs; and Ecology - 20% of monitoring costs.

Approximately 36% of estimated project funds have been spent in the study basins as of April 1996. Monitoring activities account for the largest share (47%), while pollution controls (30%) and project administration (22%) account for most of the remainder. The bulk of the monitoring and pollution control expenditures go towards staffing the activities associated with each cost category. Expenditures to date are less than previously scheduled estimates because: (1) some activities were deferred to a later date, (2) state cost-share moneys are not being used as much by landowners as originally expected, and (3) previously scheduled estimates used simplified assumptions.

The cost-share expenditure (2%) does not include federal FSA funds spent in the project area. Funding amounts from FSA are expected to be minor since FSA will not cost-share on the majority of farms in the study area, because there are few commercial farms or the commercial farms raising horses are considered "recreational" operations.

Data Management

The goal of this project requires that a variety of data be collected, processed, analyzed, and reported. A data management system is being developed to organize project data. The major project data include pollution control, water quality, land-use, and cost data. Table 10 lists the types of data collected and some of their

characteristics such as units of measure, method of collection, source of information, and spatial and temporal resolution.

Project data are collected by different agencies and then compiled and processed by Ecology. Data types vary in the level of quality and complexity. For example, water quality data are direct measurements at given points in time with associated quality assurance procedures, while cost data for installing a specific BMP that is not part of the grant project can only be estimated from anecdotal information. When possible, the completeness and accuracy of project data are quantified--e.g. water quality data. When it is not possible to quantify the completeness and accuracy of project data, the providers of the data are asked to review draft summaries and interpretations of the data--e.g. project costs or farm plan implementation data. When exact data are not available, estimates are made and qualified--e.g., seasonal counts of livestock.

Computer spreadsheet software is used to compile most project data. Separate spreadsheets are used for the different types of data. Spreadsheets can be combined for further analysis or used to transfer data. Database software also will be used to help manage project data. Computer software currently used for this project includes: Lotus, Excel, SYSTAT, Access, ArcInfo (UNIX based), and word-processing software such as Microsoft Word and Wordperfect. A data dictionary documenting data file structures, filenames, and file contents for project data is under development and should be completed in 1997.

Data management also involves transfer of some data to other agencies. For example, TCEHD requests and receives water quality data, and water quality data will be entered into EPA's STORET database. Water quality and other project data will also be reported annually using EPA's NPSMS database. The NPSMS requires that some analyses be performed prior to entry into the system. Data may also need to be reformatted for transfer into ArcInfo for the GIS component of this project. All of these operations involve some level of additional data manipulation that will be completed during the coming years of the project.

Table 10. Data types and characteristics.

Type of Data	Unit of Measure	Method of Collection	Source of Information	Frequency of Collection	Spatial Resolution	Temporal Resolution
Watershed						
parcel	each	GIS	TGC	varies, annual to decadal	parcel	annual to decadal
on-site sewage system	each	site visit limited areas	TCEHD	once during project life	parcel	month
farm inventory	each	windshield survey	TCD	once or twice over project life	parcel	year
farm BMPs	varies (feet,acres,etc.)	site visit	TCD	once, when installed	parcel	quarter
livestock	number, type of each	windshield srvy,farm plan	TCD, Ecology	varies, annual to every 5 years	parcel	1-5 years
land use category (e.g. ag)	acre	tax assessment	TCA	annual	acre	year
GIS spatial location	point or polygon	varies; digitizing of aerial photos, maps	TGC	varies, one time to annual	point to parcel	varies among layers, 1 -10 years
Water Quality						
fecal coliform	cfu/100 mL	field sample	Ecology	weekly	point	5 minutes
tss	mg/L	field sample	Ecology	weekly	point	5 minutes
turbidity	NTU	field sample	Ecology	weekly	point	5 minutes
conductivity	mS	field sample	Ecology	weekly	point	5 minutes
temperature	degree Celsius	field sample	Ecology	weekly	point	5 minutes
stream stage height	feet	data recorder	Ecology	30 minutes	point	30 minutes
precipitation	inches	NWS gage	NWS	daily	study area	daily
antecedent precipitation	inches	calculated	Ecology	daily	study area	daily
Costs						
technical assistance	dollars or time	records review	TCD, TCEHD	annual	subbasin	annual
ag BMP installation	dollars or time	records review	TCD	annual	parcel	annual
ag cost share	dollars or time	records review	TCD	annual	parcel	annual
OSSS survey/repair	dollars or time	records review	TCEHD	annual	parcel	annual
WQ monitoring	dollars or time	records review	Ecology	annual	subbasin	annual
project administration	dollars or time	records review	TCD, TCEHD, Ecology	annual	subbasin	annual

Notes:

- GIS - Geographic Information System
- TCA - Thurston County Assessor
- TCEHD - Thurston County Environmental Health Division
- TCD - Thurston Conservation District (also involves Natural Resources Conservation Service and Consolidated Farm Service Agency)
- NWS - National Weather Service

Conclusions and Recommendations

Conclusions

Four of nine years of monitoring water quality and pollution controls has been accomplished. The data collected will help determine the effectiveness of nonpoint source pollution control programs in the Totten and Eld Inlet watersheds. Thorough analysis of water quality data and associations with pollution controls will begin in 1999.

Since 1993, 16 farm plans have been developed and over 130 BMPs have been installed in 5 of the 6 study basins. Most farm planning and BMP implementation will be completed in 1997 in the Totten basins and continue into 1999 for the Eld basins.

There is currently no program in place to determine whether BMPs are properly used and maintained over time after their initial installation. Lack of this information will likely compromise the ability of this study to link changes in water quality to the implementation of BMPs and farm plans.

Water quality data show that FC levels continue to be variable, which supports the need for a longer term record of water quality in order to determine if trends are present. Analyses of rainfall and wetness data show that the first two years were drier than the third and fourth years of the project.

Most targeted data are being collected as originally planned. The collection of some data (i.e., costs of individual BMPs, numbers and types of animals on farms, residential growth and development) is currently incomplete and will be pursued in the coming years.

Recommendations

Ecology continue to monitor water quality and the installation of pollution controls in the study basins as scheduled.

Ecology work with TCD to determine the completeness of farm plan implementation.

Ecology work with TCD to determine the status of operation and maintenance of previously installed BMPs.

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Appendices

Appendix A. Status of Farm Planning Efforts in Study Basins.							
Farm ID	Basin	Acres	Date Farm Plan Developed	Date Farm Plan Signed	Are BMPs Installed?	Has a Farm Plan Been Developed?	Has Farm Plan Been Signed by Cooperator?
10	Kennedy	8.2					
996	Kennedy	9.3					
2	**Kennedy Count**				**0**	**0**	**0**
	Kennedy Total	**17.5**					
1	Schneider	26.4	93.4Q	94.2Q	y	y	y
3	Schneider	10					
5	Schneider	127.8	92.0	92.4Q	y	y	y
8	Schneider	4.3					
12	Schneider	160	95.3Q		y	y	
13	Schneider	9.8					
17	Schneider	1.3					
18	Schneider	25.3					
19	Schneider	3.2					
25	Schneider	36.9					
26	Schneider	11.7					
29	Schneider	9.8					
32	Schneider	1.4					
34	Schneider	3.3					
38	Schneider	7.2					
39	Schneider	9.4					
40	Schneider	3.1	91.0	91.3Q	y	y	y
990	Schneider	7.2					
991	Schneider						
992	Schneider						
993	Schneider						
995	Schneider	5.8					
997	Schneider	16.7	95.2Q			y	
999	Schneider	5.1	94.4Q	95.1Q		y	y
24	**Schneider Count**				**4**	**6**	**4**
	Schneider Total	**485.7**					
1020	McLane	40.4					
1021	McLane						
1022	McLane						
1023	McLane						
1024	McLane						
1025	McLane						
1026	McLane						
1027	McLane						
1028	McLane						
1029	McLane						

Appendix A. Status of Farm Planning Efforts in Study Basins.							
Farm ID	Basin	Acres	Date Farm Plan Developed	Date Farm Plan Signed	Are BMPs Installed?	Has a Farm Plan Been Developed?	Has Farm Plan Been Signed by Cooperator?
10	Kennedy	8.2					
1030	McLane						
1031	McLane						
1033	McLane						
1034	McLane	0.9					
1035	McLane						
1036	McLane						
1037	McLane						
1038	McLane						
1089	McLane	0.93					
1091	McLane						
1092	McLane	18.7		91.1Q	y	y	y
1093	McLane						
1094	McLane	4.3	91.1Q	91.2Q		y	y
1107	McLane	18.8					
1108	McLane		93.3Q	94.1Q	y	y	y
1121	McLane	17.2	93.2Q	94.2Q	y	y	y
1133	McLane	162.5	93.2Q	94.3Q	y	y	y
1134	McLane	13.2					
1135	McLane	6.9					
1136	McLane	5.6					
1137	McLane	24.5					
1138	McLane						
1140	McLane	23.7					
1141	McLane	33.4					
1142	McLane	10.3	94.4Q		y	y	
1143	McLane	20.5	94.3Q			y	
1144	McLane	8.3					
1145	McLane	5.6					
1146	McLane						
1147	McLane	23.7					
1148	McLane		87.4Q		y	y	
1149	McLane	13.5	93.0	93.4Q		y	y
1150	McLane	15.9	90.0	91.1Q		y	y
1151	McLane						
1152	McLane	4.1					
1153	McLane	54.8	93.4Q	94.3Q	y	y	y
1154	McLane	59.7	90.4Q		y	y	
1155	McLane	7.3					
1156	McLane						

Appendix A. Status of Farm Planning Efforts in Study Basins.							
Farm ID	Basin	Acres	Date Farm Plan Developed	Date Farm Plan Signed	Are BMPs Installed?	Has a Farm Plan Been Developed?	Has Farm Plan Been Signed by Cooperator?
10	Kennedy	8.2					
1157	McLane	12.9					
1159	McLane	29.2	91.4Q		y	y	
1182	McLane						
1200	McLane	7.3	95.2Q		y	y	
1991	McLane						
1992	McLane	15	90.1Q		y	y	y
1998	McLane	4	94.0		y	y	
56	**McLane Count**				**12**	**16**	**9**
	McLane Total	**663.13**					
1080	Perry	13.7		91.1Q	y	y	y
1081	Perry	13.2		91.1Q		y	y
1082	Perry	76.4		91.2Q	y	y	y
1090	Perry	2.7	91.2Q			y	
1124	Perry	31.3	92.4Q		y	y	
1126	Perry	15.1	94.1Q		y	y	
1127	Perry	2.7					
1129	Perry	75	90.4Q	93.0		y	y
1132	Perry	5.4					
9	**Perry Count**				**4**	**7**	**4**
	Perry Total	**235.5**					
6	Burns	10.7	94.2Q		y	y	
7	Burns	37.5	90.2Q	91.2Q	y	y	y
11	Burns	5.6	93.3Q	94.3Q	y	y	y
3	**Burns Count**				**3**	**3**	**2**
	Burns Total	**53.8**					
22	Pierre	9.7	91.3Q		y	y	
31	Pierre	15		92.0	y	y	y
2	**Pierre Count**				**2**	**2**	**1**
	Pierre Total	**24.7**					
96	**Grand Count**				**25**	**34**	**20**
	Grand Total	**1480.33**					
Notes:							
Acreage data incomplete for some basins; values for total acreage for these basins are underestimates.							
Date formats indicate the last 2 digits of the year and the quarter of the year if known.							

Appendix B. BMPs Installed on Farms in Study Basins							
Farm ID	Basin	BMP#	Description	Units	Amount	Year	Qtr
10	Kennedy						
996	Kennedy						
	Kennedy Count		0				
1	Schneider	382	Fencing	feet	600	1996	1
1	Schneider	393	Filter Strip	acre	1	1996	1
1	Schneider	472	Livestock Exclusion	acres	7	1994	2
1	Schneider	510	Pasture & Hayland Mgmt	acres	17	1994	2
1	Schneider	313	Waste Storage Structure	structure	1	1994	2
1	Schneider	633	Waste Utilization	acres	17	1994	2
3	Schneider						
5	Schneider	382	Fencing	feet	600	1993	3
5	Schneider	382	Fencing	feet	4200	1994	2
5	Schneider	382	Fencing	feet	1800	1994	1
5	Schneider	382	Fencing	feet	600	1993	3
5	Schneider	393	Filter Strip	acres	28	1993	3
5	Schneider	393	Filter Strip	acres	28	1994	2
5	Schneider	395	Fish Stream Improvement	feet	4200	1993	3
5	Schneider	395	Fish Stream Improvement	feet	4200	1994	2
5	Schneider	472	Livestock Exclusion	acres	72	1993	3
5	Schneider	472	Livestock Exclusion	acres	72	1994	2
5	Schneider	580	Streambank Protection	feet	3200	1993	3
5	Schneider	633	Waste Utilization	acres	93	1993	3
8	Schneider						
12	Schneider	382	Fencing	feet	5270	1995	
12	Schneider	393	Filter Strip	acres	110	1995	
12	Schneider	575	Livestock Crossing	each	1	1994	4
12	Schneider	575	Livestock Crossing	each	1	1994	
12	Schneider	590	Nutrient Mgmt	acres	110	1995	
12	Schneider	510	Pasture & Hayland Mgmt	acres	110	1995	
12	Schneider	528	Prescribed Grazing	acres	110	1995	
12	Schneider	580	Streambank Protection	feet	2000	1995	4
12	Schneider	645	Wildlife Upland Habitat Mgmt	acres	600	1994	
12	Schneider	654	Woodland Improved Harvesting	acres	427	1994	
12	Schneider	666	Woodland Improvement	acres	427	1994	
12	Schneider	660	Woodland Pruning	acres	427	1994	
12	Schneider	490	Woodland Site Preparation	acres	427	1994	
13	Schneider						
17	Schneider						
18	Schneider						
19	Schneider						
25	Schneider						
26	Schneider						
29	Schneider						
32	Schneider						
34	Schneider						
38	Schneider						
39	Schneider						
40	Schneider	322	Channel Vegetation	acres	1	1993	2
40	Schneider	395	Fish Stream Improvement	feet	110	1993	2
40	Schneider	472	Livestock Exclusion	acres	1	1993	2
40	Schneider	512	Pasture & Hayland Planting	acres	1	1993	2
40	Schneider	313	Waste Storage Structure	structure	1	1993	2
40	Schneider	633	Waste Utilization	acres	1	1993	2
997	Schneider						
999	Schneider	382	Fencing	feet	120	1995	
999	Schneider	590	Nutrient Mgmt	acre	1	1994	
999	Schneider	512	Pasture & Hayland Planting	acre	1	1994	
999	Schneider	528	Prescribed Grazing	acre	1	1995	

Appendix B. BMPs Installed on Farms in Study Basins .							
Farm ID	Basin	BMP#	Description	Units	Amount	Year	Qtr
999	Schneider	558	Roof Runoff Mgmt	system	1	1994	
999	Schneider	644	Wildlife Wetland Habitat Mgmt	acre	10	1995	2
999	Schneider						
	Schneider Count		43				
1092	McLane	382	Fencing	feet	370	1991	1
1092	McLane	395	Fish Stream Improvement	feet	370	1991	1
1092	McLane	472	Livestock Exclusion	acres	1	1991	1
1094	McLane						
1108	McLane	412	Grassed Waterway	acres	0.25	1993	
1121	McLane	352	Deferred Grazing	acres	1	1993	2
1121	McLane	393	Filter Strip	acres	0.25	1993	3
1121	McLane	395	Fish Stream Improvement	feet	400	1994	4
1121	McLane	412	Grassed Waterway	acres	1	1993	3
1121	McLane	472	Livestock Exclusion	acres	9	1993	3
1121	McLane	510	Pasture & Hayland Mgmt	acres	10	1993	3
1121	McLane	510	Pasture & Hayland Mgmt	acres	10	1995	1
1121	McLane	633	Waste Utilization	acres	10	1993	2
1121	McLane	645	Wildlife Upland Habitat Mgmt	acres	4	1993	1
1133	McLane	382	Fencing	feet	3400	1994	1
1133	McLane	382	Fencing	feet	1200	1994	4
1133	McLane	393	Filter Strip	acres	1.5	1993	4
1133	McLane	395	Fish Stream Improvement	feet	5000	1994	4
1133	McLane	395	Fish Stream Improvement	feet	2500	1994	4
1133	McLane	472	Livestock Exclusion	acres	100	1993	3
1133	McLane	510	Pasture & Hayland Mgmt	acres	7	1993	1
1133	McLane	528	Prescribed Grazing	acres	90	1993	2
1133	McLane	558	Roof Runoff Mgmt	system	1	1993	4
1133	McLane	580	Streambank Protection	feet	1000	1993	4
1133	McLane	580	Streambank Protection	feet	1300	1994	3
1133	McLane	580	Streambank Protection	feet	2500	1994	4
1133	McLane	620	Underground Outlet	feet of pipe	105	1993	3
1133	McLane	312	Waste Mgmt System	system	1	1993	3
1133	McLane	645	Wildlife Upland Habitat Mgmt	acres	69	1993	2
1133	McLane	644	Wildlife Wetland Habitat Mgmt	acres	30	1993	2
1142	McLane	395	Fish Stream Improvement	feet	400	1994	4
1142	McLane	510	Pasture & Hayland Mgmt	acres	6	1993	3
1142	McLane	510	Pasture & Hayland Mgmt	acres	7	1994	4
1142	McLane	558	Roof Runoff Mgmt	system	1	1994	4
1142	McLane	312	Waste Mgmt System	system	1	1995	1
1142	McLane	633	Waste Utilization	acres	6	1993	1
1142	McLane	633	Waste Utilization	acres	8.5	1994	4
1142	McLane	645	Wildlife Upland Habitat Mgmt	acres	1	1994	4
1143	McLane	395	Fish Stream Improvement	feet	800	1995	1
1148	McLane	382	Fencing	feet	600	1987	4
1148	McLane	382	Fencing	feet	200	1987	4
1148	McLane	382	Fencing	feet	300	1987	4
1148	McLane	430	Irrigation Pipeline	feet	200	1987	4
1148	McLane	614	Trough	each	1	1987	4
1149	McLane						
1150	McLane						
1153	McLane	382	Fencing	feet	2000	1994	
1153	McLane	393	Filter Strip	acres	2	1995	
1153	McLane	395	Fish Stream Improvement	feet	2000	1995	
1153	McLane	561	Heavy Use Area Protection	acres	3	1994	
1153	McLane	472	Livestock Exclusion	acres	15	1994	
1153	McLane	510	Pasture & Hayland Mgmt	acres	30	1994	
1153	McLane	633	Waste Utilization	acres	30	1995	
1153	McLane	645	Wildlife Upland Habitat Mgmt	acres	5	1995	
1153	McLane	644	Wildlife Wetland Habitat Mgmt	acres	5	1995	

Appendix B. BMPs Installed on Farms in Study Basins .							
Farm ID	Basin	BMP#	Description	Units	Amount	Year	Qtr
1154	McLane	382	Fencing	feet	566	1989	1
1154	McLane	382	Fencing	feet	1429	1989	1
1154	McLane	382	Fencing	feet	55	1989	1
1154	McLane	382	Fencing	feet	1450	1990	3
1154	McLane	382	Fencing	feet	334	1990	3
1154	McLane	393	Filter Strip	acres	1	1989	1
1154	McLane	393	Filter Strip	acres	1	1989	1
1154	McLane	393	Filter Strip	acres	1	1989	1
1154	McLane	393	Filter Strip	acres	1	1990	3
1154	McLane	575	Livestock Crossing	each	1	1989	2
1154	McLane	614	Trough	each	1	1989	2
1154	McLane	614	Trough	each	1	1989	2
1154	McLane	614	Trough	each	2	1989	3
1159	McLane	352	Deferred Grazing	acres	16.5	1991	4
1159	McLane	382	Fencing	feet	1283	1989	4
1159	McLane	393	Filter Strip	acres	2	1989	4
1159	McLane	558	Roof Runoff Mgmt	system	1	1991	3
1159	McLane	614	Trough	each	1	1989	4
1159	McLane	614	Trough	each	1	1991	3
1200	McLane	561	Heavy Use Area Protection	acres	0.25	1996	1
1200	McLane	590	Nutrient Mgmt	acres	5	1995	1
1200	McLane	512	Pasture & Hayland Planting	acres	5	1995	1
1200	McLane	312	Waste Mgmt System	system	1	1995	1
1200	McLane	633	Waste Utilization	acres	5	1995	1
1992	McLane	382	Fencing	feet	1460	1989	
1992	McLane	510	Pasture & Hayland Mgmt	acres	10	1989	
1992	McLane	516	Pipeline	feet	400	1989	
1992	McLane	614	Trough	each	3	1989	
1998	McLane	472	Livestock Exclusion	acres	30	1994	4
1998	McLane	510	Pasture & Hayland Mgmt	acres	30	1994	2
1998	McLane	633	Waste Utilization	acres	30	1994	2
	McLane Count		83				
1080	Perry	382	Fencing	feet	178	1990	3
1080	Perry	392	Fencing	feet	439	1990	3
1080	Perry	382	Fencing	feet	550	1990	3
1080	Perry	393	Filter Strip	acres	1	1990	3
1080	Perry	614	Trough	each	1	1990	3
1080	Perry	614	Trough	each	1	1990	3
1080	Perry	614	Trough	each	1	1990	3
1082	Perry	395	Fish Stream Improvement	feet	220	1991	1
1082	Perry	472	Livestock Exclusion	acres	4	1991	1
1126	Perry	382	Fencing	feet	500	1995	2
1126	Perry	472	Livestock Exclusion	acres	3	1995	
1126	Perry	512	Pasture & Hayland Planting	acres	5	1995	2
1126	Perry	558	Roof Runoff Mgmt	system	1	1988	1
1126	Perry	558	Roof Runoff Mgmt	system	1	1995	2
1126	Perry	580	Streambank Protection	feet	300	1995	2
1129	Perry	382	Fencing	feet	332	1991	2
1129	Perry	383	Fencing	feet	628	1991	2
1129	Perry	393	Filter Strip	acres	3	1991	2
1129	Perry	575	Livestock Crossing	each	1	1991	2
1129	Perry	516	Pipeline	feet	1802	1991	3
1129	Perry	614	Trough	each	1	1991	2
1129	Perry	614	Trough	each	1	1991	3
	Perry Count		22				
6	Burns	352	Deferred Grazing	acres	11	1994	2
6	Burns	382	Fencing	feet	549	1994	2
6	Burns	382	Fencing	feet	1169	1994	2
6	Burns	472	Livestock Exclusion	acres	11	1994	2

Appendix B. BMPs Installed on Farms in Study Basins							
Farm ID	Basin	BMP#	Description	Units	Amount	Year	Qtr
6	Burns	510	Pasture & Hayland Mgmt	acres	4	1994	2
6	Burns	512	Pasture & Hayland Planting	acres	2	1994	2
6	Burns	556	Planned Grazing System	acres	4	1994	2
6	Burns	633	Waste Utilization	acres	11	1994	2
7	Burns	352	Deferred Grazing	acres	22.5	1990	2
7	Burns	352	Deferred Grazing	acres	22.5	1994	2
7	Burns	382	Fencing	feet	1000	1994	2
7	Burns	472	Livestock Exclusion	acres	22.5	1990	2
7	Burns	472	Livestock Exclusion	acres	22.5	1994	2
7	Burns	510	Pasture & Hayland Mgmt	acres	22.5	1990	2
7	Burns	510	Pasture & Hayland Mgmt	acres	22.5	1994	2
7	Burns	512	Pasture & Hayland Planting	acres	2	1994	2
7	Burns	516	Pipeline	feet	900	1994	3
7	Burns	556	Planned Grazing System	acres	22.5	1994	2
7	Burns	558	Roof Runoff Mgmt	system	1	1986	2
7	Burns	558	Roof Runoff Mgmt	system	1	1994	2
7	Burns	614	Trough	each	1	1994	3
7	Burns	633	Waste Utilization	acres	23	1990	2
7	Burns	633	Waste Utilization	acres	22.5	1994	2
7	Burns	645	Wildlife Upland Habitat Mgmt	acres	40	1993	1
11	Burns	512	Pasture & Hayland Planting	acres	1.5	1994	4
11	Burns	528	Prescribed Grazing	acres	1.5	1993	3
11	Burns	558	Roof Runoff Mgmt	system	1	1994	1
11	Burns	570	Runoff Mgmt System	system	1	1994	1
11	Burns	313	Waste Storage Structure	structure	1	1994	4
	Burns Count		29				
22	Pierre	382	Fencing	feet	50	1990	4
22	Pierre	472	Livestock Exclusion	acres	3	1990	4
22	Pierre	528	Prescribed Grazing	acres	3	1990	4
22	Pierre	558	Roof Runoff Mgmt	system	1	1993	3
22	Pierre	313	Waste Storage Structure	structure	1	1991	1
22	Pierre	633	Waste Utilization	acres	3	1992	2
31	Pierre	352	Deferred Grazing	acres	6	1993	4
31	Pierre	412	Grassed Waterway	acres	1	1993	3
31	Pierre	510	Pasture & Hayland Mgmt	acres	5	1993	4
31	Pierre	512	Pasture & Hayland Planting	acres	5	1993	3
31	Pierre	556	Planned Grazing System	acres	5	1993	3
31	Pierre	614	Trough	each	1	1993	4
31	Pierre	614	Trough	each	1	1993	4
31	Pierre	313	Waste Storage Structure	structure	1	1993	2
31	Pierre	633	Waste Utilization	acres	5	1993	1
	Pierre Count		15				
	Grand Count		192				

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
BCUL	11/29/94	835	3200						18		26		6 2		55													
BCUL	12/06/94	1440	200						2		9.0		4 0		55													
BCUL	12/13/94	905	320		0 19				5		15		4 4		47													
BCUL	12/19/94	1245	770						11		18		8 3		43													
BCUL	02/21/95	1455	60						5		7 8		9 8		81													
BCUL	03/14/95	1100	240						9		16		9 8		70													
BCUL	04/18/95	1450	69						6		8 0		13 2		68													
BUR	07/29/86	1145	240																									
BUR	12/12/86	1500	55		0.050								6 4												0 04	1 73	0 12	-0 08
BUR	02/04/87	1345	55		0.25								8 3												0 06	4 03	0 11	-0 37
BUR	04/06/87	950	1100		0 090								9 2												0 14	0 67	0 12	0 07
BUR	07/27/87																											
BUR	12/07/87	1250	285		0 18								7 5												0 46	4 14	0 64	0 26
BUR	01/06/88	1045	255		0.11								3 3												0 01	0 57	0 00	-0 07
BUR	02/01/88	1018	60		0.080								1 8												0 00	1 14	0 00	-0 14
BUR	02/29/88	1000	56		0 12								9 5												0 07	0 51	0 00	-0 05
BUR	07/05/88	1445	50										10 4															
BUR	12/06/88	925	740		0 53								9 0												0 33	1 85	0 23	0 07
BUR	12/06/88	925	725		0 53								9 0												0 33	1 85	0 23	0 07
BUR	01/03/89	1435	190		0 20								7 0												0 40	2 82	0 14	-0 14
BUR	01/03/89	852	480		0 65								7 2												0 40	2 82	0 14	-0 14
BUR	01/03/89	852	385		0.65								7 2												0 40	2 82	0 14	-0 14
BUR	03/06/89	1000	3750		1 3								6 5												0 19	1 92	0 51	0 35
BUR	03/06/89	1000	3125		1.3								6 5												0 19	1 92	0 51	0 35
BUR	04/04/89	1155	135		0 62								8 5												0 55	2 93	0 25	-0 02
BUR	04/04/89	1155	100		0.62								8 5												0 55	2 93	0 25	-0 02
BUR	07/03/89	1222	120		0 030								17 0															
BUR	07/03/89	1222	135		0 030								17 0															
BUR	08/07/89	1355	455																									
BUR	11/06/89	855	1150										10 0												0 80	1 69	0 00	-0 11
BUR	12/04/89	1430	250		1.9								5 9												2 27	5 25	0 81	0 53
BUR	01/03/90	1435	190		0 20								7 0												0 22	1 06	0 01	-0 09
BUR	03/05/90	1525	85		0 18								6 2												0 02	1 20	0 02	-0 12
BUR	07/09/90	1339	370																									
BUR	07/09/90	1339	320																									
BUR	08/13/90	1500																										
BUR	11/13/90	1030	710		0 93								9 3												0 91	3 44	0 49	0 23
BUR	12/10/90	1400	45		0 70								9 2												0 32	4 10	0 34	-0 09
BUR	01/10/91	803	80		0 59								5 0												0 48	2 47	0 41	0 21
BUR	02/06/91	1410	30		0 57								7 0												0 00	2 36	0 02	-0 27
BUR	03/05/91	1325	50		0 51								7 0												0 10	2 71	0 22	-0 08
BUR	07/07/91	918	800																									
BUR	08/06/91																											
BUR	12/16/91	830	205		0 080								4 8												0 00	1 61	0 00	-0 20
BUR	12/16/91	830	900		0 080								4 8												0 00	1 61	0 00	-0 20
BUR	01/28/92	1446	940		2.5								9 0												1 32	4 50	1 48	1 25
BUR	02/18/92	1130	345		0 73								6 7												0 54	2 24	0 27	0 09
BUR	07/21/92	1600																										
BUR	08/17/92	1100																										
BUR	11/11/92	1300	2300		0 14				10		19		8 6		360										0 48	1 93	0 01	0 32
BUR	11/11/92	1300	2400						13		21		8 6		360													
BUR	11/17/92	1555	400		0 080				104		35		10 3		800		7 3		10 5						0 61	2 00	0 29	0 46
BUR	11/23/92	1105	190		0.090				4		11		6 4		555										0 00	3 03	0 05	-0 34
BUR	12/01/92	710	100		0 14				3		12		5 4		195										0 05	2 23	0 52	-0 19
BUR	12/08/92	1055	1000		0 34				50		18		5 3		163										0 68	1 87	0 06	0 55
BUR	12/15/92	1635	69		0 10				3		8 5		5 0		430		7 3		5 1		12 8		2 0		0 00	1 88	0 11	-0 21
BUR	12/21/92	935	150		0 36				3		8 0		4 5		162										0 27	2 28	0 27	0 05
BUR	12/28/92	1450	450		0 49				8		9 5		5 4		190										0 20	1 81	0 34	0 02
BUR	01/05/93	955	54		0.16				8		7 7		3 2		133										0 00	1 72	0 36	-0 19
BUR	01/12/93	1425	130		0 040				23		8.2		0 3		79		7 4		2 0		15 0 J		0 5		0 00	0 82	0 00	-0 09
BUR	01/19/93	950	2000	JH >	1.6				113		41		1 3		110										0 50	0 92	0 00	0 45
BUR	01/26/93	1345	52		0.74				5		6 9		7 1		178										0 07	3 08	0 79	-0 26
BUR	02/02/93	1625	44		0 060	g			3		6 7		6 1		248		6 8		6 9		9 5		6 5		0 00	1 60	0 00	-0 18
BUR	02/09/93	1320	36		0 070				10		8 3		8 2		950										0 10	0 88	0 02	0 01
BUR	02/09/93	1320	61		0 080				11		7 8		8 2		950													
BUR	02/16/93	845	37		0 040				20		8 7		1 5		340										0 00	0 44	0 00	-0 05
BUR	02/23/93	1220	17		0 050				5		6 9		3 8		925										0 00	0 27	0 00	-0 03
BUR	03/02/93	1425	52		0 040				4		7 1		6 7		545										0 11	0 46	0 25	0 07
BUR	03/09/93	1220	27		0 040				3		6 8		8 7		880		6 7		10 1		11 7		8 9		0 00	0 65	0 00	-0 07
BUR	03/16/93	1500	51		0.080				12		9 1		7 3		308										0 61	1 46	0 04	0 52
BUR	03/23/93	1315	84		0 71				7		9 0		11 1		185										0 17	2 57	1 56	-0 10
BUR	03/30/93	1355	9		0.11				8		6 4		11 5		900										0 16	1 40	0 01	0 02
BUR	04/06/93	1215	32		0 090				10		9 3		9 3		825										0 10	1 34	0 03	-0 04
BUR	04/06/93	1215	19		0 080				7		7 0		9 3		790													

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SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
BUR	04/13/93	1450	26		0.20				15		8.2		9 9		488										0 18	2 44	0 00	-0 07
BUR	11/16/93	1330	2700	J	0 055				36		32		7 2		3940	L									0 13	0 50	0 21	0 09
BUR	11/22/93	1030			0 030	r																			0 04	0 55	0 27	-0 02
BUR	11/30/93	1315	2200		0.065				61		54		5 8		1300	J									0 85	1 90	0 58	0 73
BUR	12/07/93	740	2500		0 61				23		35		5 1		140		7 6		7 2		11 6		7 0		0 50	2 30	0 05	0 30
BUR	12/14/93	1300	210		0 24				6		18		8 0		290										0 01	2 55	0 18	-0 27
BUR	12/14/93	1300	200						6		18		8 0		285													
BUR	12/21/93	725	165		0 047	r			5		15		4 8		265										0 00	1 25	0 00	-0 14
BUR	12/21/93	750	120						6		14		4 9		250													
BUR	12/28/93	1140	180		0 021				22		16.3		4 8		1880										0 08	0 68	0 00	0 01
BUR	01/04/94	1650	630		1.5				20		21		8 2		115		7 0		8 4		10 6		8 2		0 45	2 76	0 31	0 19
BUR	01/11/94	1145	300		0.26				29		31		8 5		290										0 04	2 07	0 30	-0 19
BUR	01/18/94	1500	170		0.068				7		13		6 4		500										0 00	1 05	0 00	-0 12
BUR	01/23/94	930	250		0 14	r			14		21		8 3		142										0 12	1 22	0 41	0 00
BUR	01/25/94	1045	14	S	0.14	r			12		5 8		7 8		168										0 00	1 25	0 30	-0 14
BUR	02/01/94	1430	190		0 052	r			5		11		5 6		590										0 00	0 60	0 00	-0 07
BUR	02/08/94	1045	150		0 043	r			43		14		1 8		2200	J	6 6		3 6		12 8		1 9		0 00	0 29	0 00	-0 03
BUR	02/08/94	1100	170						28		12		1 9		1300													
BUR	02/14/94	1515	630		0.20	r			24		28		6 9		155										0 04	1 68	1 50	-0 14
BUR	02/15/94	1555	77		2.0				6		13		7 2		84										1 10	2 62	0 04	0 93
BUR	02/22/94	945	42		0 26				5		11		5 0		170										0 55	2 87	0 43	0 29
BUR	02/22/94	1100	1						4		4 6		5 7		68													
BUR	03/01/94	1455	310		0 23	r			10		15		10 0		144		6 1		10 5		10 5		10 5		0 00	2 35	0 07	-0 26
BUR	03/01/94	1455	260						13		16																	
BUR	03/02/94	1540	310		0.87	r			16		21		10 6		110										0 83	2 94	0 00	0 60
BUR	03/08/94	945	63		0 066	r			5		7 9		5 5		168										0 00	2 18	0 00	-0 24
BUR	03/08/94	945	56						6		7 4																	
BUR	03/15/94	1410	120		0 047	r			6		8 6		10 3		350		6 0		10 4						0 07	1 23	0 00	-0 06
BUR	03/15/94	1410	100						8		8 2																	
BUR	03/21/94	1525	210		0 28	r			9		12		8 8		115										0 29	2 42	0 47	0 05
BUR	03/21/94	1525	12						3		2 8																	
BUR	03/22/94	850	180		0 32				4		8.1		5 4		126										0 40	2 57	0 29	0 16
BUR	03/22/94	1135	200						10		12																	
BUR	03/29/94	1320	28		0 043	r			12		8 0		14 7		560										0 00	1 23	0 00	-0 14
BUR	04/05/94	935	40		0 040	r			11		8 1		8 5		690										0 27	0 87	0 00	0 20
BUR	04/06/94	1055	2100	J	0 058	r			16		18		9 3		355										0 36	1 14	0 27	0 27
BUR	04/12/94	1340	60		0 047	r			9		12		13 9		380										0 17	1 19	0 00	0 06
BUR	04/19/94	1500	130		0 037	r			15		12		13 9		660										0 00	0 65	0 02	-0 07
BUR	05/04/94	1000			0.062																							
BUR	11/15/94	945	2000		0 26	r			146		90		7 7		490										0 25	2 06	0 10	0 05
BUR	11/21/94	555	300		0.26	r			10		16		3 8		2000	>									0 00	1 86	0 00	-0 21
BUR	11/29/94	820	3000		2.6	r			26		30		6 2		85										1 05	2 87	0 24	0 85
BUR	12/06/94	1435	120		0 26	r			4		9 2		4 0		370										0 00	3 37	0 09	-0 37
BUR	12/13/94	850	310		0.19				8		18		4 4		50										0 00	2 34	0 00	-0 26
BUR	12/19/94	1240	1000		5 1	r			11		19		8 3		58										1 37	4 52	0 27	1 02
BUR	12/20/94	1340	270		6.5	r			8		13		8 4		49										1 35	5 42	1 37	0 90
BUR	12/27/94	750	370		15	r			13		17		8 4		37		6 3		10 2		11 1		8 8		1 11	6 30	2 45	0 53
BUR	01/03/95	1315	45		0 19	r			3		6.4		3 2		275										0 00	3 03	0 00	-0 34
BUR	01/10/95	755	120		0 41	r			3		11		5 8		55										0 19	2 34	0 38	-0 05
BUR	01/17/95	1250	400		0 25	r			7		12		5 7		150		6 3		6 5		12 0		5 7		0 20	1 99	0 04	0 00
BUR	01/24/95	1650	180		0.14				2		9.1		4 9		455										0 00	1 04	0 00	-0 12
BUR	01/31/95	1235	200		2.3				54		40		9 8		135										1 36	3 43	0 79	1 13
BUR	02/07/95	1615	220		0 20	r			4		8 8		9 2		185		7 1		9 9		11 1		9 2		0 00	1 74	0 00	-0 19
BUR	02/14/95	1220	78		0 19	r			6		10		3 6		50										0 01	1 07	0 00	-0 11
BUR	02/21/95	1455	40		0 26	r			5		7 7		9 8		81										0 00	4 50	0 07	-0 50
BUR	02/28/95	1040	220		0 17	r			5		6 6		4 6		220										0 00	2 20	0 00	-0 24
BUR	03/07/95	1630	200		0 16	r			6		8 5		8 1		275		6 5		8 7		12 3		8 2		0 00	1 27	0 00	-0 14
BUR	03/14/95	1100	200		0 95	r			10		16		9 8		70										0 45	3 23	0 32	0 14
BUR	03/21/95	1430	110		0 78				5		11		10 0		90										0 49	3 56	0 57	0 15
BUR	03/28/95	1115	53		0 15				4		6 6		9 2		175										0 00	1 76	0 00	-0 20
BUR	04/04/95	1350	1200		0 10				8		10		13 0		270										0 20	1 10	0 00	0 10
BUR	04/11/95	1005	220		0 11				4		8 3		8 4		218										0 00	1 29	0 28	-0 14
BUR	04/18/95	1440	51	X	0 13	r			7		8 2		13 2		450										0 05	1 04	0 04	-0 06
BUR	11/14/95	710	320		0.36				6		15		10 8		90										0 00	4 87	0 40	-0 43
BUR	11/20/95	845	89		0.090				7		16		7 3		525										0 00	3 41	0 01	-0 27
BUR	11/28/95	1535	260		0 80				8		14		11 4		135										0 54	4 93	1 07	0 16
BUR	12/05/95	1130	130		0 35				4		7.5		6 9		100		7 2		6 9		11 7		7 0		0 00	5 19	0 00	-0 47
BUR	12/12/95	1520	320						6		11																	
BUR	12/12/95	1520	230		1.2				6		12		9 1		64										0 72	5 09	0 34	0 35
BUR	12/19/95	925	46		0 50				4		9 0		7 8		105										0 00	3 85	0 14	-0 32
BUR	12/26/95	1440	56		0 11				2		7.6		5 0		375										0 00	2 36	0 00	-0 15
BUR	01/02/96	940	87		0 28				5		12		8 7		106										0 41	3 31	0 03	0 20
BUR	01/09/96	1510	88		0 62				6		12		8 3		112										0 07	3 95	0 00	-0 25
BUR	01/16/96	1725	53		0 55				4		10		7 5		118		7 6		8 0		11 8		7 7		0 13	3 82	1 09	-0 17

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SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
BUR	01/23/96	1335	32		0 89				4		8.8		6 1		110										0 38	4 13	0 22	0 07
BUR	01/30/96	1700	34		0.21				233		60		1 7		275										0 00	2 87	0 01	-0 21
BUR	02/06/96	1420	1400		8 9				43		36		6 4		45		6 5		7 0		12 5		6 2		2 95	5 29	1 32	2 69
BUR	02/13/96	1550	29						3		8 4																	
BUR	02/13/96	1550	29		0 50				3		8.4		7 0		148										0 00	5 73	0 00	-0 53
BUR	02/20/96	1410	33		0 40	g			4		13		8 4		135										0 35	4 57	0 24	-0 01
BUR	02/27/96	1700	28						16		10																	
BUR	02/27/96	1700	22		0 28				17		11		4 5		160										0 00	3 33	0 00	-0 26
BUR	03/05/96	1245	35		0 28				3		12		6 5		210										0 18	2 99	0 33	-0 02
BUR	03/12/96	1610	53						6		13																	
BUR	03/12/96	1610	51		0 28				6		13		10 4		152										0 02	2 55	0 07	-0 15
BUR	03/19/96	1230	22		0.11				6		11		11 5		385										0 07	0 81	0 00	-0 01
BUR	03/26/96	1625	12		0 080				7		10		10 2		340		6 8		10 4		10 9		10 1		0 00	0 65	0 00	-0 07
BUR	04/02/96	1130	25		0 070				5		11		9 9		480										0 00	0 86	0 32	-0 10
BUR	04/09/96	1515	620		0.080				12		13		14 0		840										0 00	0 52	0 00	-0 06
BUR	04/16/96	1255	1200		0 24				7		16		13 4		289										0 20	2 65	0 73	0 04
BUR	04/28/95	1345			0 10																				0 11	0 83	0 28	0 03
GRN	01/05/88	1011	15		0.72								3 0												0 00	0 63	0 00	-0 08
GRN	02/02/88	1513	15		2 5								3 0												0 09	1 12	0 00	-0 13
GRN	03/01/88	1215	5		1.3								9 0												0 02	0 47	0 07	0 02
GRN	07/05/88	925	50		0 37								11 5															
GRN	08/02/88	1020	50		0.17								13 0															
GRN	12/07/88	1004	10		3 0								8 0												0 00	1 67	0 33	0 16
GRN	01/04/89	1205	15		6 2								6 5												0 11	2 65	0 40	0 13
GRN	01/04/89	1205	50		6 2								6 5												0 11	2 65	0 40	0.13
GRN	03/07/89	1137	40		5 7								4 5												0 12	1 85	0 19	0 00
GRN	04/04/89	900	10		9.5								8 5												0 55	2 93	0 25	-0 02
GRN	07/05/89	1130	55		0 67								12 0															
GRN	08/08/89	925	25		0 21								13 5															
GRN	11/07/89	859	25		0 58								8 0												0 04	1 56	0 80	0 70
GRN	12/05/89	1310	125		13								9 0												0 01	4 73	2 27	1 94
GRN	01/02/90	1200	70		1 6								4 0												0 01	0 94	0 35	0 27
GRN	03/07/90	1240	165		18								7 9												0 33	1 76	0 51	0 39
GRN	07/10/90	1500	45		0 44								16 0															
GRN	08/14/90	1455	45		0.54								15 8															
GRN	11/06/90	1030	40		5 0								8 0												0 05	1 54	0 00	-0 18
GRN	12/10/90	1155	145		13								7 2												0 32	4 10	0 34	-0 09
GRN	01/10/91	1322	65		7 5								3 0												0 48	2 47	0 41	0 21
GRN	01/10/91	1322	65		7.5								3 0												0 48	2 47	0 41	0 21
GRN	02/06/91	935	15		14								5 4												0 00	2 36	0 02	-0 27
GRN	03/05/91	820	25		17								5 2												0 10	2 71	0 22	-0 08
GRN	07/09/91	1403	35		0 48								13 0															
GRN	07/09/91	1403	10		0 48								13 0															
GRN	08/07/91	1425	165		0.29								15 0															
GRN	11/18/91	1330	20		1 4								8 3												0 10	1 78	0 31	0 14
GRN	11/18/91	1330	5		1 4								8 3												0 10	1 78	0 31	0 14
GRN	12/10/91	845	100		3.3								5 5												0 06	2 43	0 31	0 05
GRN	01/28/92	1050	110		26								8 0												1 32	4 50	1 48	1 25
GRN	02/18/92	855	240		9 8								6 0												0 54	2 24	0 27	0 09
GRN	07/14/92	1315	60		0 19								15 0															
GRN	08/13/92	1330	820		0.38								17 0															
GRN	11/11/92	1035	76		1 3				1		1 2		7 4		110										0 48	1 93	0 01	0 32
GRN	11/17/92	1220	9		1 0				15		2 9		9 0		127		7 3		9 0						0 61	2 00	0 29	0 46
GRN	11/17/92	1230	8	U	1 1				12		1 8		9 0		127		7 5		9 0									
GRN	11/23/92	920	20		5 0				5		2 8		5 2		90										0 00	3 03	0 05	-0 34
GRN	12/01/92	1315	3		2 0				2		1 5		5 6		102										0 05	2 23	0 52	-0 19
GRN	12/08/92	1445	110		2 3		0 54		8		3 1		5 1		92										0 68	1 87	0 06	0 55
GRN	12/15/92	1235	6		2 2		0 53		1		1 3		3 9		88		7 1		4 2		13 3		0 9		0 00	1 88	0 11	-0 21
GRN	12/21/92	1535	29		6 5		0 76		2		1 5		4 3		80										0 27	2 28	0 27	0 05
GRN	12/28/92	1005	120		4 3		0 61		3		1 9		4 1		80										0 20	1 81	0 34	0 02
GRN	01/05/93	1410	27		3 8		0 61		1		1 2		1 8		78										0 00	1 72	0 36	-0 19
GRN	01/12/93	955	8		1 2		0 45		1		0 7		0 4		84		6 9		1 4		14 9		0 2		0 00	0 82	0 00	-0 09
GRN	01/19/93	1440	77	JH	2 3		0 52		7		4 7		2 7		89										0 50	0 92	0 00	0 45
GRN	01/19/93	1440	110	JH	2.3		0 52		8		4.5		2 8		87													
GRN	01/26/93	915	43		19		1 00		5		2 3		5 8		63										0 07	3 08	0 79	-0 26
GRN	02/02/93	1145	21		3 4		0 64		1	U	0 7		4 3		73		6 7		5 2		10 1		4 9		0 00	1 60	0 00	-0 18
GRN	02/09/93	910	9		1 9		0 50		1		0 7		6 2		87										0 10	0 88	0 02	0 01
GRN	02/16/93	1315	8		1 3		0 47		1		0 5		2 7		92										0 00	0 44	0 00	-0 05
GRN	02/23/93	920	17		1 3		0 48		1		0 8		2 6		95										0 00	0 27	0 00	-0 03
GRN	03/02/93	1110	12		1 2		0 47		2		0 5		4 9		100										0 11	0 46	0 25	0 07
GRN	03/09/93	1005	2		1 9		0 52		2		0 9		5 6		85		7 0		6 1		13 3		5 8		0 00	0 65	0 00	-0 07
GRN	03/16/93	1145	12		2 1		0 52		2		0 5		6 8		87										0 61	1 46	0 04	0 52
GRN	03/23/93	1055	64		17		1 00		9		3 0		9 2		65										0 17	2 57	1 56	-0 10
GRN	03/30/93	910	11		2 2		0 54		4		1 2		6 9		82										0 16	1 40	0 01	0 02

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
GRN	03/30/93	910	10		2 1		0 54		4		1 3		6 9		82													
GRN	04/06/93	945	23		2 6		0 58		3		1 9		8 5		82										0 10	1 34	0 03	-0 04
GRN	04/13/93	1155	27		6 2		0 68		3		1 2		8 9		75										0 18	2 44	0 00	-0 07
KND	07/29/86	1240	20										16 2															
KND	12/12/86	1609	15		60	g							7 9												0 04	1 73	0 12	-0 08
KND	02/04/87	1232	1		150	g							7 7												0 06	4 03	0 11	-0 37
KND	04/06/87	917	1		30	g							8 9												0 14	0 67	0 12	0 07
KND	07/27/87	1401	5		4.1								16 1															
KND	12/07/87	1450	55		135								7 8												0 46	4 14	0 64	0 26
KND	01/06/88	1041	15		22								6 5												0 01	0 57	0 00	-0 07
KND	02/01/88	930	5		54								3 0												0 00	1 14	0 00	-0 14
KND	02/29/88	1130	4		32								9 0												0 07	0 51	0 00	-0 05
KND	07/05/88	1304	5		9 2								10 4															
KND	08/03/88	1323	1		4 4								15 0															
KND	08/03/88	1328	10		4.4								15 0															
KND	12/06/88	1310	1		86								7 3												0 33	1 85	0 23	0 07
KND	01/03/89	1040	1		163								12 0												0 40	2 82	0 14	-0 14
KND	03/06/89	1115	5		123								6 0												0 19	1 92	0 51	0 35
KND	04/03/89	1030	1		204								6 0												0 12	1 85	0 19	0 00
KND	07/03/89	1050	20		20								12 0															
KND	08/07/89	1500	45		4.5								17 0															
KND	11/06/89	1015	85		17								9 5												0 80	1 69	0 00	-0 11
KND	12/04/89	1200	165										6 8												2 27	5 25	0 81	0 53
KND	01/03/90	1323	1		47								3 2												0 22	1 06	0 01	-0 09
KND	03/05/90	1400	10		64								4 2												0 02	1 20	0 02	-0 12
KND	07/09/90	1030	70		12								14 0															
KND	08/13/90	1308	30		4 1								16 5															
KND	11/13/90	858	50										11 0												0 91	3 44	0 49	0 23
KND	12/10/90	910	15		188								9 0												0 32	4 10	0 34	-0 09
KND	01/10/91	945	5		219								6 0												0 48	2 47	0 41	0 21
KND	02/06/91	1210	5		179								6 0												0 00	2 36	0 02	-0 27
KND	03/05/91	1200	1		178								6 0												0 10	2 71	0 22	-0 08
KND	07/09/91	1021	20		9 1								13 8															
KND	08/06/91	1010	15		6.4								14 7															
KND	12/16/91	1045	1		87								6 0												0 00	1 61	0 00	-0 20
KND	01/28/92	1125	50										8 8												1 32	4 50	1 48	1 25
KND	02/18/92	1415	15		91								7 1												0 54	2 24	0 27	0 09
KND	07/21/92	1510	40		3 8								15.0															
KND	08/17/92	1235	20		3.1								16 1															
KND	11/11/92	1145	35		21		0 80		15		3 2		8 2		109										0 48	1 93	0 01	0 32
KND	11/17/92	1010	9		23		0 90		10		2 5		9 3		108		7 3		9 4						0 61	2 00	0 29	0 46
KND	11/23/92	1320	11		98				8		2 5		7 0		82										0 00	3 03	0 05	-0 34
KND	11/23/92	1320	10		101				8		3 0				81													
KND	12/01/92	1105	22		55		1 39		2		1 1		6 4		85										0 05	2 23	0 52	-0 19
KND	12/08/92	1235	28		41		1 14		2		0 4		6 1		90										0 68	1 87	0 06	0 55
KND	12/15/92	1500	6		107		2 01		3		1 5		6 2		72		7 4		6 3		12 2		3 2		0 00	1 88	0 11	-0 21
KND	12/21/92	1200	21		190		2 45		14		4 6		5 8		70										0 27	2 28	0 27	0 05
KND	12/28/92	1230	5		97		1 91		2		1 4		4 9		74										0 20	1 81	0 34	0 02
KND	12/28/92	1230	10		100		1 91		2		0 7		4 9		74													
KND	01/05/93	1215	5		80		1 76		1		0 5		4 0		75										0 00	1 72	0 36	-0 19
KND	01/12/93	1255	4		38		1 04		2		0 5		2 2		84		7 3		2 4		15 0	J	1 0		0 00	0 82	0 00	-0 09
KND	01/19/93	1200	57	JH	42		1 07		5		1 4		3 8		83										0 50	0 92	0 00	0 45
KND	01/26/93	1220	9		260	r	3 22		21		6 4		7 0		65										0 07	3 08	0 79	-0 26
KND	02/02/93	1410	1	U	84		2 08		3		1 1		5 7		71		6 7		6 8		9 3		5 9		0 00	1 60	0 00	-0 18
KND	02/09/93	1200	1		50		1 64		2		0 6		7 2		80										0 10	0 88	0 02	0 01
KND	02/16/93	1035	2		23		1 12		2		0 5		3 1		84										0 00	0 44	0 00	-0 05
KND	02/23/93	1420	3		20		0 95		2		0 7		4 3		90										0 00	0 27	0 00	-0 03
KND	03/02/93	1230	4		17		0 84		1		3 6		5 4		91										0 11	0 46	0 25	0 07
KND	03/09/93	1445	1	U	25		0 96		1		0 4		7 4		88		6 9		8 9		12 6		7 5		0 00	0 65	0 00	-0 07
KND	03/09/93	1445	1	U	25		0 96		2		0 5				88		6 9		8 8									
KND	03/16/93	1300	4		33		1 08		2		0 5		6 3		82										0 61	1 46	0 04	0 52
KND	03/23/93	1525	7		196	r	2 78		21		5 9		8 8		67										0 17	2 57	1 56	-0 10
KND	03/30/93	1215	2		58		1 46		3		1 1		7 6		77										0 16	1 40	0 01	0 02
KND	04/06/93	1350	1	U	40		1 24		1		1 7		8 5		82										0 10	1 34	0 03	-0 04
KND	04/13/93	1310	2		94		1 80		3		0 8		8 1		75										0 18	2 44	0 00	-0 07
KND	11/16/93	1550	96		6 5		0 10		11		5 4		6 6		112										0 13	0 50	0 21	0 09
KND	11/16/93	1550	52				0 10		10		5 2		6 6		111													
KND	11/22/93	1200	53		10		0 26		14		5 1		4 8		88										0 04	0 55	0 27	-0 02
KND	11/30/93	1525	20		13		0 30		9		3 8		5 7		100										0 85	1 90	0 58	0 73
KND	12/07/93	940	16		54		1 43		5		3 5		5 9		68		7 8		8 7		11 2		7 0		0 50	2 30	0 05	0 30
KND	12/14/93	1415	12		134		2 28		6		3 6		8 0		66										0 01	2 55	0 18	-0 27
KND	12/21/93	1015	9		50		1 28		2		1 0		6 4		72										0 00	1 25	0 00	-0 14
KND	12/28/93	1035	8		14	r	0 72		1		0 8		4 9		79										0 08	0 68	0 00	0 01
KND	01/04/94	1515	19		202		2 56		32		16		8 6		57		6 9		8 8		10 8		9 0		0 45	2 76	0 31	0 19

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
KND	01/11/94	1220	4		74	r	1 68		3		2 2		8 3		65										0 04	2 07	0 30	-0 19
KND	01/18/94	1340	2		55		1 12		2		1 0		6 5		71										0 00	1 05	0 00	-0 12
KND	01/23/94	1015	24		30	r	1 06		3		1 6		8 5		75										0 12	1 22	0 41	0 00
KND	01/25/94	1155	68		30	r	1 06		2		11		7 8		71										0 00	1 25	0 30	-0 14
KND	02/01/94	1100	28		14	r	0 72		1		1 0		4 8		73										0 00	0 60	0 00	-0 07
KND	02/08/94	1235	6		7.8	r	0 52		1		0.7		3 2		78		6 4		3 8		12 6		3 1		0 00	0 29	0 00	-0 03
KND	02/14/94	1555	10		84	r	1 80		18		12		6 4		63										0 04	1 68	1 50	-0 14
KND	02/14/94	1555	120	S					19		25																	
KND	02/15/94	1430	13		152		2 20		6		4 0		6 8		60										1 10	2 62	0 04	0 93
KND	02/22/94	1120	6		101	r	1 98		20		2 6		6 0		61										0 55	2 87	0 43	0 29
KND	03/01/94	1345	1	U	114	r	2 11		6		4 4		8 8		61		6 0		9 4		10 8		10 0		0 00	2 35	0 07	-0 26
KND	03/02/94	1630	1		135	r	2 30		12		6 4		9 3		60										0 83	2 94	0 00	0 60
KND	03/08/94	925	1		81	r	1 76		7		3 3		6 3		63										0 00	2 18	0 00	-0 24
KND	03/15/94	1455	1		32	r	1 08		3		1 3		9 2		65		6 0		9 4						0 07	1 23	0 00	-0 06
KND	03/21/94	1500	2		117	r	2 14		7		4 1		6 9		58										0 29	2 42	0 47	0 05
KND	03/22/94	1045	1		99	r	1 96		5		3 1		6 1		58										0 40	2 57	0 29	0 16
KND	03/29/94	1440	1	U	29	r	1 04		3		1 5		10 4		70										0 00	1 23	0 00	-0 14
KND	04/05/94	1015	1	U	12	r	0 66		2		1 0		8 1		74										0 27	0 87	0 00	0 20
KND	04/06/94	1020	9		18	r	0 80		3		1 7		8 4		71										0 36	1 14	0 27	0 27
KND	04/12/94	1305	1	U	27	r	1 00		3		2 0		10 0		65										0 17	1 19	0 00	0 06
KND	04/19/94	1415	1		13	r	0 67		2		1 1		12 0		85										0 00	0 65	0 02	-0 07
KND	05/04/94	1140			21		0 50																					
KND	11/15/94	1015	25		27	r	1 06		9		4 3		8 3		67										0 25	2 06	0 10	0 05
KND	11/21/94	645	4		29	r	1 10		6		2.7		5 4		60										0 00	1 86	0 00	-0 21
KND	11/29/94	935	59		146	r	2 14		40		15		6 8		57										1 05	2 87	0 24	0 85
KND	12/06/94	1400	6		92	r	1 84		6		3 0		5 1		57										0 00	3 37	0 09	-0 37
KND	12/13/94	1040	22		108		1 66		3		2 4		5 7		65										0 00	2 34	0 00	-0 26
KND	12/19/94	1205	15		655	r	3 10		13		8 2		8 0		50										1 37	4 52	0 27	1 02
KND	12/20/94	1320	29		3500	r	4 85		186		110		8 4		37										1 35	5 42	1 37	0 90
KND	12/27/94	915	57		2200	r	4 60		179		120		8 5		38		6 6		10 6		12 2		8 4		1 11	6 30	2 45	0 53
KND	01/03/95	1235	4		137	r	2 10		5		3 5		4 2		55										0 00	3 03	0 00	-0 34
KND	01/10/95	1030	10		92		1 93		4		3 0		6 8		57										0 19	2 34	0 38	-0 05
KND	01/17/95	1355	3		118	r	2 00		3		2 0		5 2		55		6 6		7 0		11 8		6 1		0 20	1 99	0 04	0 00
KND	01/24/95	1550	2		65		1 66		2		2.1		5 4		58										0 00	1 04	0 00	-0 12
KND	01/31/95	1455	17		896	r	3 30		86		45		8 8		45										1 36	3 43	0 79	1 13
KND	02/07/95	1530	1		97	r	1 88		4		2 2		8 3		58		7 0		9 4		11 1		8 2		0 00	1 74	0 00	-0 19
KND	02/14/95	1140	1		43	r	1 36		2		2.0		3 8		60										0 01	1 07	0 00	-0 11
KND	02/21/95	1425	3		924	r	3 32		32		20		8 3		46										0 00	4 50	0 07	-0 50
KND	02/28/95	950	1		144	r	2 13		4		2 4		5 5		56										0 00	2 20	0 00	-0 24
KND	03/07/95	1540	1		74	r	1 70		2		1 5		6 6		61		6 5		7 6		12 0		6 8		0 00	1 27	0 00	-0 14
KND	03/14/95	1015	11		709	r	3 15		21		11		8 2		45										0 45	3 23	0 32	0 14
KND	03/21/95	1325	18		709	r	3 15		17		13		8 0		45										0 49	3 56	0 57	0 15
KND	03/21/95	1325	10				3 15		18		13		8 0		45													
KND	03/28/95	1000	1		88		2 08		4		2 2		7 2		55										0 00	1 76	0 00	-0 20
KND	04/04/95	1225	3		39		1 41		3		1 5		10 9		63										0 20	1 10	0 00	0 10
KND	04/11/95	1125	1	U	55		1 48		2		1 7		7 9		60										0 00	1 29	0 28	-0 14
KND	04/18/95	1615	1		40	r	1 31		2		1 1		9 6		64										0 05	1 04	0 04	-0 06
KND	04/28/95	1440			38		1 11																		0 11	0 83	0 28	0 03
KND	11/14/95	850	33		200	r	2 46		13		6 9		10 8		57										0 00	4 87	0 40	-0 43
KND	11/20/95	1035	4		73		1 68		5		3.6		8 3		62										0 00	3 41	0 01	-0 27
KND	11/28/95	1215	40						25		14																	
KND	11/28/95	1215	20		350	r	3 07		26		15		10 7		52										0 54	4 93	1 07	0 16
KND	12/05/95	1500	3		193		2 34		10		7 0		7 8		54		7 5		7 7		11 1		7 8		0 00	5 19	0 00	-0 47
KND	12/12/95	1410	20		291		2 92		13		8 9		9 0		49										0 72	5 09	0 34	0 35
KND	12/19/95	1125	5		173		2 20		7		4 1		8 5		54										0 00	3 85	0 14	-0 32
KND	12/26/95	1330	14		71		1 50		3		1 7		4 6		61										0 00	2 36	0 00	-0 15
KND	01/02/96	1115	14		127		1 88		4		3 0		8 8		55										0 41	3 31	0 03	0 20
KND	01/09/96	1630	12		200	r	2 44		10		5 8		8 4		48										0 07	3 95	0 00	-0 25
KND	01/16/96	1555	5		244		2 49		8		6 0		7 7		49		7 5		9 0		11 5		7 8		0 13	3 82	1 09	-0 17
KND	01/23/96	1500	12		305		2 80		7		5 8		6 4		45										0 38	4 13	0 22	0 07
KND	01/30/96	1520	5		95		1 62		4		2.7		3 0		58										0 00	2 87	0 01	-0 21
KND	02/06/96	1620	48		1000	r	3 45		135		70		6 8		45		6 5		7 2		12 0		6 4		2 95	5 29	1 32	2 69
KND	02/13/96	1355	3		159		2 35		9		5 1		6 6		57										0 00	5 73	0 00	-0 53
KND	02/20/96	1330	3		190	r	2 34		7		5 1		7 6		54										0 35	4 57	0 24	-0 01
KND	02/27/96	1445	1		116		2 02		4		2 7		5 3		56										0 00	3 33	0 00	-0 26
KND	03/05/96	1410	2		81		1 70		3		2 0		6 8		60										0 18	2 99	0 33	-0 02
KND	03/12/96	1410	1	U	79		1 70		3		2 0		9 0		60										0 02	2 55	0 07	-0 15
KND	03/19/96	1500	1		50		1 39		2		1 7		9 5		66										0 07	0 81	0 00	-0 01
KND	03/26/96	1430	1		35		1 22		2		1 1				75		6 7		8 3		11 9		7 9		0 00	0 65	0 00	-0 07
KND	04/02/96	1320	1	U	36		1 24		2		1 2		8 3		71										0 00	0 86	0 32	-0 10
KND	04/09/96	1355	1		24		1 12		2		1 1		11 8		78										0 00	0 52	0 00	-0 06
KND	04/16/96	1545	11						4		3 4																	
KND	04/16/96	1545	5		82		1 68		4		3 3		11 2		63										0 20	2 65	0 73	0 04
MCL	08/22/83		170	MP									16 8															

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
MCL	09/06/83		1600	MP	2 9								13 5												0 00	1 04	0 00	-0 12
MCL	09/19/83		170	MP	6 1								10 3												0 00	1 27	0 75	-0 14
MCL	10/03/83		1600	MP	3 4								10 7												0 05	0 32	0 00	-0 03
MCL	10/17/83		540	MP	3 7								10 2												0 22	0 32	0 03	0 02
MCL	10/31/83		79	MP	4 8								10 1												0 00	0 76	0 27	0 21
MCL	11/28/83		33	MP									8 9												0 09	3 64	0 00	-0 44
MCL	12/12/83		79	MP	113								7 2												0 42	3 57	0 02	-0 37
MCL	12/27/83		33	MP	32								3 1												0 40	1 63	0 26	0 14
MCL	01/10/84		8	MP	67								7 4												0 30	2 48	0 00	-0 27
MCL	01/23/84		79	MP	68								6 1												0 92	2 04	0 46	0 37
MCL	02/06/84		8	MP	33								7 2												0 00	1 14	0 00	-0 14
MCL	02/21/84		49	MP	64								5 8												0 09	2 04	0 55	0 37
MCL	03/05/84		5	MP	45								5 7												0 00	1 41	0 00	-0 17
MCL	03/21/84		110	MP	80								7 8												0 44	3 50	0 57	0 26
MCL	04/05/84		2	MP	37								8 2												0 01	1 32	0 12	-0 03
MCL	04/18/84		46	MP	55								8 8												0 32	1 55	0 00	-0 15
MCL	04/25/84			MP																					0 00	1 08	0 17	0 06
MCL	05/03/84		8	MP	68								8 2															
MCL	05/16/84		33	MP	28								10 3															
MCL	05/31/84		5	MP	37								10 9															
MCL	06/12/84		2	MP	16								12 9															
MCL	06/25/84		79	MP	9 7								15 7															
MCL	07/09/84		79	MP	8 2								12 8															
MCL	07/23/84		170	MP									16 6															
MCL	08/06/84		79	MP	4 1								14 8															
MCL	05/29/85		142		7 7								11 2															
MCL	06/16/86	915	10										12 4															
MCL	12/10/86	1000	10		24								4 1												0 00	1 95	0 00	-0 24
MCL	02/03/87	1403	15		100																				0 11	4 41	0 23	-0 27
MCL	04/06/87	1718	20		22								10 3												0 14	0 67	0 12	0 07
MCL	07/27/87	1225	315		2.3								14 7															
MCL	12/01/87	1015	1000		33								9 5												1 44	2 54	0 13	0 01
MCL	01/05/88	1122	65		13								3 8												0 00	0 63	0 00	-0 08
MCL	02/02/88	1410	30		25								3 5												0 09	1 12	0 00	-0 13
MCL	03/01/88	1330	250		24								9 0												0 02	0 47	0 07	0 02
MCL	07/05/88	1115	250		5 6								11 8															
MCL	08/02/88	1240	320		2.8								14 0															
MCL	12/07/88	1303	5		48								9 0												0 00	1 67	0 33	0 16
MCL	01/04/89	1039	1		104								7 2												0 11	2 65	0 40	0 13
MCL	03/07/89	1000	45		72								3 5												0 12	1 85	0 19	0 00
MCL	04/04/89	1100	15		90								7 0												0 55	2 93	0 25	-0 02
MCL	07/05/89	1017	180		7 5								11 0															
MCL	08/08/89	1055	375		3.4								14 5															
MCL	11/07/89	1130	150		20								9 0												0 04	1 56	0 80	0 70
MCL	12/05/89	1525	35										6 0												0 01	4 73	2 27	1 94
MCL	01/02/90	1030	115		22								5 0												0 01	0 94	0 35	0 27
MCL	03/07/90	1100	210		99								7 8												0 33	1 76	0 51	0 39
MCL	07/10/90	1338	150		6 1								15 5															
MCL	08/14/90	1335	150		4 0								15 0															
MCL	08/14/90	1335	175		4.0								15 0															
MCL	11/06/90	940	20		88								8 0												0 05	1 54	0 00	-0 18
MCL	12/10/90	1110	30		88								8 5												0 32	4 10	0 34	-0 09
MCL	01/10/91	1220	70		131								5 0												0 48	2 47	0 41	0 21
MCL	02/06/91	1020	10		129								5 5												0 00	2 36	0 02	-0 27
MCL	03/05/91	950	1		117								5 5												0 10	2 71	0 22	-0 08
MCL	07/09/91	1605	105		5 1								13 5															
MCL	08/07/91	1500	425		2.9								15 8															
MCL	11/18/91	1455	55		20								8 6												0 10	1 78	0 31	0 14
MCL	12/10/91	1045	40		54								6 1												0 06	2 43	0 31	0 05
MCL	01/28/92	1159	80										9 0												1 32	4 50	1 48	1 25
MCL	02/18/92	930	45		68								7 0												0 54	2 24	0 27	0 09
MCL	07/14/92	1400	170		3 0								14 9															
MCL	08/13/92	1510	405		2.3								19 0															
MCL	11/11/92	915	110		15				11		3 5		7 5		95										0 48	1 93	0 01	0 32
MCL	11/17/92	1140	240		11				17		4 9		9 3		99		7 2		9 3						0 61	2 00	0 29	0 46
MCL	11/23/92	1000	60		53				11		4 0		6 3		78										0 00	3 03	0 05	-0 34
MCL	12/01/92	1405	26		27				5		2 1		6 6		82										0 05	2 23	0 52	-0 19
MCL	12/08/92	940	79		21		0 51		4		1 9		5 4		82										0 68	1 87	0 06	0 55
MCL	12/15/92	1110	47		41	r	0 72		2		1 6		5 1		79		6 8		5 3		12 1		2 2		0 00	1 88	0 11	-0 21
MCL	12/21/92	1435	27		99		1 50		7		2 5		6 6		67										0 27	2 28	0 27	0 05
MCL	12/28/92	1540	27		69		1 04		2		1 5		6 0		71										0 20	1 81	0 34	0 02
MCL	01/05/93	915	57		43		0 76		2		1 6		3 7		72										0 00	1 72	0 36	-0 19
MCL	01/12/93	1135	21		21		0 44		4		0 8		2 7		80		7 1		2 8		14 9		1 5		0 00	0 82	0 00	-0 09
MCL	01/12/93	1135	28				0 44		3		1 6		2 7		80		7 1		3 2									

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SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
MCL	01/19/93	930	83	JH	20		0 46		4		1 8		3 7		80										0 50	0 92	0 00	0 45
MCL	01/26/93	1105	13		191		1 96		18		6 5		7 2		62										0 07	3 08	0 79	-0 26
MCL	02/02/93	1015	6		43		0 68		2		1 1		5 5		70		6 7		5 6		9 5		5 8		0 00	1 60	0 00	-0 18
MCL	02/09/93	1010	39		27		0 30		2		1 1		7 1		76										0 10	0 88	0 02	0 01
MCL	02/16/93	1155	25		16		0 10		2		1 4		3 2		78										0 00	0 44	0 00	-0 05
MCL	02/23/93	955	31		15		0 05		1		0 6		3 3		78										0 00	0 27	0 00	-0 03
MCL	03/02/93	940	14		14		0 04		2		0 9				82													
MCL	03/02/93	940	10		14		0 04		1		0 9		4 9		80										0 11	0 46	0 25	0 07
MCL	03/09/93	1110	80		25		0 22		2		1 1		6 3		75		6 9		7 5		12 5		6 0		0 00	0 65	0 00	-0 07
MCL	03/16/93	1115	13		24		0 22		1		0 7		6 0		75										0 61	1 46	0 04	0 52
MCL	03/23/93	1200	55	S	136		1 56		19		6 3		8 8		65										0 17	2 57	1 56	-0 10
MCL	03/30/93	1100	27		34		0 38		1		0 5		7 2		72										0 16	1 40	0 01	0 02
MCL	04/06/93	1030	64		28		0 22		1		2 1		8 1		74										0 10	1 34	0 03	-0 04
MCL	04/13/93	1025	43		75		0 78		6		3 1		7 8		72										0 18	2 44	0 00	-0 07
MCL	04/13/93	1025	36		75		0 78		6		2 8		7 8		72													
MCL	11/16/93	1230	65		4 3		-0 04		15		6 4		5 9		94										0 13	0 50	0 21	0 09
MCL	11/22/93	1320	33		4 3		0 03		10		7 7		3 8		90										0 04	0 55	0 27	-0 02
MCL	11/22/93	1325	47						11		7 1		3 8		90													
MCL	11/30/93	1055	120		8.4		0 03		23		9 0		5 0		91										0 85	1 90	0 58	0 73
MCL	12/07/93	1310	40		28		0 46		11		7 7		5 9		80		7 0				11 1		7 8		0 50	2 30	0 05	0 30
MCL	12/14/93	1040	55		48		0 75		6		4 7		7 8		65										0 01	2 55	0 18	-0 27
MCL	12/21/93	815	12		19		0 27		5		1 2		5 5		73										0 00	1 25	0 00	-0 14
MCL	12/28/93	1000	20		12	r	0 14		3		2 1		4 2		77										0 08	0 68	0 00	0 01
MCL	01/04/94	1255	76		190		2 16		36		16		8 8		53		6 7		9 5		10 5		9 0		0 45	2 76	0 31	0 19
MCL	01/11/94	1110	8		80	r	0 98		3		2 5		8 3		60										0 04	2 07	0 30	-0 19
MCL	01/18/94	1220	31		34		0 52		9		3 8		6 3		65										0 00	1 05	0 00	-0 12
MCL	01/23/94	905	31		48	r	0 59		3		2 4		8 4		66										0 12	1 22	0 41	0 00
MCL	01/25/94	950	4		46	r	0 56		2		1 3		7 5		64										0 00	1 25	0 30	-0 14
MCL	02/01/94	1305	12		25	r	0 30		1		1 1		5 2		69		6 1				11 5				0 00	0 60	0 00	-0 07
MCL	02/08/94	1325	8		16	r	0 20		2		1.5		3 1		50		6 3		3 7		12 4		3 1		0 00	0 29	0 00	-0 03
MCL	02/14/94	1455	260		81	r	1 00		40		24		6 4		60										0 04	1 68	1 50	-0 14
MCL	02/15/94	1300	51	S	157		1 72		5		4 0		6 8		52										1 10	2 62	0 04	0 93
MCL	02/22/94	820	49		81	r	1 00		4		3 4		5 5		58										0 55	2 87	0 43	0 29
MCL	03/01/94	1250	16		107	r	1 32		6		3 0		9 1		57		6 0		9 7		10 6		9 8		0 00	2 35	0 07	-0 26
MCL	03/02/94	1520	80		151	r	1 86		28		14		9 6		52										0 83	2 94	0 00	0 60
MCL	03/08/94	850	12		67	r	0 83		4		2 6		5 8		58										0 00	2 18	0 00	-0 24
MCL	03/15/94	1215	6		34	r	0 42		3		2 0		8 9		65		5 9		9 2						0 07	1 23	0 00	-0 06
MCL	03/21/94	1425	80		112	r	1 38		5		3 6		7 1		56										0 29	2 42	0 47	0 05
MCL	03/22/94	1135	16		102	r	1 26		3		2 9		6 5		50										0 40	2 57	0 29	0 16
MCL	03/29/94	1545	21		42	r	0 52		3		1 6		11 2		64										0 00	1 23	0 00	-0 14
MCL	04/05/94	1050	16		25	r	0 30		3		1 5		8 4		65										0 27	0 87	0 00	0 20
MCL	04/05/94	1050	12						2		1 5																	
MCL	04/06/94	945	92		45	r	0 55		5		3.2		8 4		62										0 36	1 14	0 27	0 27
MCL	04/06/94	1055	1800	J					16		18																	
MCL	04/12/94	1220	12		42	r	0 52		3		2 0		9 8		64										0 17	1 19	0 00	0 06
MCL	04/19/94	1320	9		25	r	0 30		3		1 5		11 2		81										0 00	0 65	0 02	-0 07
MCL	05/04/94	1245			16		0 21																					
MCL	11/15/94	840	37		6 0	r	0 32		11		4 0		7 6		63										0 25	2 06	0 10	0 05
MCL	11/21/94	805	35				0 48		8		4 2		4 3		58													
MCL	11/21/94	805	35		6.3	r	0 48		7		4.5		4 3		54										0 00	1 86	0 00	-0 21
MCL	11/29/94	1025	310		503	r	2 35		67		38		6 7		47										1 05	2 87	0 24	0 85
MCL	12/06/94	1300	35		33	r	0 96		11		6 0		5 0		52										0 00	3 37	0 09	-0 37
MCL	12/13/94	1220	12		58		1 00		16		7 6		5 6		60										0 00	2 34	0 00	-0 26
MCL	12/19/94	1050	84	S	413	r	2 25		29		15		8 2		43										1 37	4 52	0 27	1 02
MCL	12/20/94	1140	40		2100	r	4 11		126		75		8 4		34		6 2		9 4		10 9				1 35	5 42	1 37	0 90
MCL	12/27/94	1030	116		3500	r	4 94		238		140		8 0		27										1 11	6 30	2 45	0 53
MCL	12/27/94	1030	124	JS			4 94		204		130		8 0		27													
MCL	01/03/95	1055	20		49	r	1 16		4		2 7		3 9		48										0 00	3 03	0 00	-0 34
MCL	01/10/95	1225	23		56		1 10		3		3 0		7 1		52										0 19	2 34	0 38	-0 05
MCL	01/17/95	1535	100		62	r	1 28		7		5 2		6 4		48		6 7		7 1		11 3		6 5		0 20	1 99	0 04	0 00
MCL	01/24/95	1325	10		44		1 00		2		1.8		5 6		52										0 00	1 04	0 00	-0 12
MCL	01/31/95	1050	92		800	r	2 94		64		35		8 9		39										1 36	3 43	0 79	1 13
MCL	02/07/95	1425	13		39	r	1 05		4		2 7		8 6		52		6 6		9 6		10 6		8 5		0 00	1 74	0 00	-0 19
MCL	02/07/95	1425	8				1 05		4		2 3		8 6		52		6 6		9 6		10 6		8 5					
MCL	02/14/95	1005	51		22	r	0 75		3		2.2		3 2		52										0 01	1 07	0 00	-0 11
MCL	02/21/95	1345	40		375	r	2 20		23		14		8 5		40										0 00	4 50	0 07	-0 50
MCL	02/28/95	900	16		41	r	1 07		4		2 6		4 7		49										0 00	2 20	0 00	-0 24
MCL	03/07/95	1425	8		32	r	0 95		1		1 4		6 8		54		6 3		8 1		11 5		6 8		0 00	1 27	0 00	-0 14
MCL	03/07/95	1425	8				0 95		2		1 5		6 8		54		6 3		8 1		11 5		6 8					
MCL	03/14/95	905	100	S	340	r	2 15		19		11		8 1		42										0 45	3 23	0 32	0 14
MCL	03/21/95	1050	35	JS	154		1 93		8		5 5		7 6		42										0 49	3 56	0 57	0 15
MCL	03/28/95	1310	8		48		1 16		2		1 3		8 7		50										0 00	1 76	0 00	-0 20
MCL	03/28/95	1310	12		48		1 16		2		1 4		8 7		50													
MCL	04/04/95	945	160		32		1 02		3		1 9		8 8		57										0 20	1 10	0 00	0 10

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SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
MCL	04/11/95	1255	49		32		1 04		1	U	1 6		8 2		56										0 00	1 29	0 28	-0 14
MCL	04/18/95	1340	24		32	r	0 94		2		1 2		8 6		57										0 05	1 04	0 04	-0 06
MCL	04/28/95	1215			23		0 90																		0 11	0 83	0 28	0 03
MCL	11/14/95	1055	27		121		1 75		10		6 0		10 8		50										0 00	4 87	0 40	-0 43
MCL	11/20/95	1225	21		52		1 00		6		4 5		8 4		55										0 00	3 41	0 01	-0 27
MCL	11/20/95	1225	10						6		3 7				55													
MCL	11/28/95	1325	76		194		2 30		14		8 9		10 9		45										0 54	4 93	1 07	0 16
MCL	12/05/95	920	19		103		1 68		10		6 1		7 3		46		6 9		7 2		10 4		7 4		0 00	5 19	0 00	-0 47
MCL	12/12/95	1235	22		160		2 14		10		6 6		9 0		45										0 72	5 09	0 34	0 35
MCL	12/19/95	750	56		83		1 28		5		2 9		8 2		48										0 00	3 85	0 14	-0 32
MCL	12/26/95	1050	57		37		0 59		3		1 7		4 2		53										0 00	2 36	0 00	-0 15
MCL	01/02/96	815	17		67		1 08		4		3 0		8 7		53										0 41	3 31	0 03	0 20
MCL	01/09/96	1315	14		126		1 76		13		9 0		8 4		44										0 07	3 95	0 00	-0 25
MCL	01/16/96	1245	23		147		1 78		9		6 4		7 8		45		7 2		8 8		11 1		5 5		0 13	3 82	1 09	-0 17
MCL	01/23/96	1140	44		190	r	2 15		7		5 4		5 8		40										0 38	4 13	0 22	0 07
MCL	01/30/96	1240	10		53		0 75		2		2.2		3 0		52										0 00	2 87	0 01	-0 21
MCL	02/06/96	1210	160		380	r	3 12		68		40		6 3		40		6 2		7 2		11 6		6 2		2 95	5 29	1 32	2 69
MCL	02/13/96	1145	2		79		1 54		6		3 7		6 3		50										0 00	5 73	0 00	-0 53
MCL	02/20/96	1250	33		110	r	1 68		6		4 9		7 7		48										0 35	4 57	0 24	-0 01
MCL	02/27/96	1200	8		69		1 24		2		2 0		5 0		52										0 00	3 33	0 00	-0 26
MCL	03/05/96	1055	18		53		1 05		2		2 1		6 7		54										0 18	2 99	0 33	-0 02
MCL	03/12/96	1235	19		60		1 10		3		2 6		9 1		54										0 02	2 55	0 07	-0 15
MCL	03/19/96	1035	8		37		0 80		2		2 5		8 7		60										0 07	0 81	0 00	-0 01
MCL	03/26/96	1220	14		26		0 62		2		1 6		7 0		62		6 6		8 2		11 9		6 9		0 00	0 65	0 00	-0 07
MCL	04/02/96	940	28						2		2 0																	
MCL	04/02/96	940	27		28		0 67		2		2 1		7 5		62										0 00	0 86	0 32	-0 10
MCL	04/09/96	1200	22	X	18		0 50		2		1 9		11 8		69										0 00	0 52	0 00	-0 06
MCL	04/16/96	1015	120		53		0 98		2		2 3		10 1		59										0 20	2 65	0 73	0 04
PIE	07/29/86	1145	79										18 1															
PIE	12/12/86	1520	25		0.030								5 9												0 04	1 73	0 12	-0 08
PIE	02/04/87	1325	15		0.34								8 2												0 06	4 03	0 11	-0 37
PIE	04/06/87	1004	90		0 060								8 3												0 14	0 67	0 12	0 07
PIE	07/27/87		360																									
PIE	12/07/87	1320	115		0.45								7 8												0 46	4 14	0 64	0 26
PIE	01/06/88	1100																							0 01	0 57	0 00	-0 07
PIE	02/01/88	1045	5		0 078								3 5												0 00	1 14	0 00	-0 14
PIE	02/29/88	1018	24		0.011								8 3												0 07	0 51	0 00	-0 05
PIE	07/05/88	1402	160		0.10								15.7															
PIE	08/03/88	1400	35		0 095								25 5															
PIE	08/03/88	1405	45		0.095								25 5															
PIE	12/06/88	1010	60		0 74								9 5												0 33	1 85	0 23	0 07
PIE	01/03/89	1445	20		0 11								8 5												0 40	2 82	0 14	-0 14
PIE	01/03/89	820	55		0.47								7 0												0 40	2 82	0 14	-0 14
PIE	03/06/89	1025	130		1 6								6 5												0 19	1 92	0 51	0 35
PIE	04/04/89	1130	10		1 3								8 5												0 55	2 93	0 25	-0 02
PIE	07/03/89	1037	140										16 0															
PIE	08/07/89	1325	545										26 0															
PIE	11/06/89	830	125										9 8												0 80	1 69	0 00	-0 11
PIE	12/04/89	1530	215										6 2												2 27	5 25	0 81	0 53
PIE	01/03/90	1445	200		0 11								7 0												0 22	1 06	0 01	-0 09
PIE	03/05/90	1545	10		0 12								4 8												0 02	1 20	0 02	-0 12
PIE	07/09/90	1230	100										16 5															
PIE	08/13/90	1500																										
PIE	11/13/90	1010	730		2.2								9 5												0 91	3 44	0 49	0 23
PIE	12/10/90	1425	35		0 77								8 5												0 32	4 10	0 34	-0 09
PIE	01/10/91	830	205		0 60								4 3												0 48	2 47	0 41	0 21
PIE	02/06/91	1440	85		0 47								7 4												0 00	2 36	0 02	-0 27
PIE	02/06/91	1440	120		0 47								7 4												0 00	2 36	0 02	-0 27
PIE	02/06/91	1440	85		0 47								7 4												0 00	2 36	0 02	-0 27
PIE	03/05/91	1305	105		0 36								7 5												0 10	2 71	0 22	-0 08
PIE	03/05/91	1305	50		0 36								7 5												0 10	2 71	0 22	-0 08
PIE	07/07/91	935	80																									
PIE	08/06/91																											
PIE	12/16/91	922	15		0.10								4 2												0 00	1 61	0 00	-0 20
PIE	01/28/92	1418	70		2 5								9 8												1 32	4 50	1 48	1 25
PIE	02/18/92	1145	180		1.0								7 0												0 54	2 24	0 27	0 09
PIE	07/21/92	1545	355		0.030								22 0															
PIE	08/17/92	1145			0.00																							
PIE	11/11/92	1330	3000	J	0 070				4		31		8 3		108										0 48	1 93	0 01	0 32
PIE	11/17/92	1530	77		0.030				2		21		9 8		100		7 4		9 8						0 61	2 00	0 29	0 46
PIE	11/23/92	1130	84	S	0 15				3		14		5 3		66										0 00	3 03	0 05	-0 34
PIE	12/01/92	1140	51		0 15				2		14		5 1		68										0 05	2 23	0 52	-0 19
PIE	12/01/92	1215	75		0 16				2		14		5 3		68													
PIE	12/08/92	1025	1200	J	0 38		0 41		5		20		4 7		68										0 68	1 87	0 06	0 55

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
PIE	12/15/92	1720	22		0.090		0 33		1		9 0		4 5		69		7 5		4 7				1 5		0 00	1 88	0 11	-0 21
PIE	12/21/92	1010	96		0 64		0 44		1		9 5		4 0		68										0 27	2 28	0 27	0 05
PIE	12/28/92	1425	180		0 85		0 45		3		9 0		4 9		67										0 20	1 81	0 34	0 02
PIE	01/05/93	1035	32		0.17		0 36		1		6 5		1 5		67										0 00	1 72	0 36	-0 19
PIE	01/12/93	1400	32		0 040		0 28		1		4.8		1 2		1300	J	7 1		3 1		14 8		0 2		0 00	0 82	0 00	-0 09
PIE	01/19/93	1030	2000	JH>	2.8		0 60		28		27		0 6		55										0 50	0 92	0 00	0 45
PIE	01/26/93	1425	35		0 87		0 46		1		7 7		7 7		62										0 07	3 08	0 79	-0 26
PIE	01/26/93	1425	49		0.78		0 46		2		7 6		7 7		62													
PIE	02/02/93	1605	20		0 084	r	0 32		1	U	6 3		6 4		70		6 8		7 8		9 5		6 8		0 00	1 60	0 00	-0 18
PIE	02/09/93	1350	16		0 070		0 30		1	U	6 5		7 5		85										0 10	0 88	0 02	0 01
PIE	02/16/93	820	20		0 030		0 27		21		4 8		1 9		70										0 00	0 44	0 00	-0 05
PIE	02/23/93	1200	12		0 030		0 28		2		4 7		2 1		76										0 00	0 27	0 00	-0 03
PIE	03/02/93	1400	18		0 030		0 28		2		4 8		4 5		76										0 11	0 46	0 25	0 07
PIE	03/09/93	1255	6		0 080		0 30		1		5 2		6 8		75		7 1		8 5		11 8		6 9		0 00	0 65	0 00	-0 07
PIE	03/16/93	1435	22		0.080		0 32		3		6.4		7 2		76										0 61	1 46	0 04	0 52
PIE	03/23/93	1345	130	S	0.92		0 48		7		12		12 3		65										0 17	2 57	1 56	-0 10
PIE	03/23/93	1345	110	S	1.0		0 48		6		12		12 3		65													
PIE	03/30/93	1330	19		0 050		0 30		3		4 5		8 8		77										0 16	1 40	0 01	0 02
PIE	04/06/93	1150	12		0.080		0 32		2		3 5		8 8		80										0 10	1 34	0 03	-0 04
PIE	04/13/93	1430	14		0 21		0 36		4		5 7		10 1		75										0 18	2 44	0 00	-0 07
PIE	11/16/93	1415			0 00		0 24																		0 13	0 50	0 21	0 09
PIE	11/22/93	1040			0.00		0 26																		0 04	0 55	0 27	-0 02
PIE	11/30/93	1410	3000		0 005		0 34		3		34		5 5		122										0 85	1 90	0 58	0 73
PIE	12/07/93	850	1300				0 42		4		24		4 6		70		7 0		7 4		12 3		6 0					
PIE	12/07/93	825	1600		0 67		0 43		6		25		4 6		66		7 5		7 2		12 3		6 0		0 50	2 30	0 05	0 30
PIE	12/14/93	1225	160		0.35		0 38		2		11		7 7		67										0 01	2 55	0 18	-0 27
PIE	12/21/93	740	31		0 057	r	0 30		1	U	7 2		4 6		76										0 00	1 25	0 00	-0 14
PIE	12/28/93	1205	28		0 038	r	0 28		1		7 0		3 6		81										0 08	0 68	0 00	0 01
PIE	01/04/94	1620	100		2 2		0 54		10		17		8 6		55		7 0		8 7		10 9		9 5		0 45	2 76	0 31	0 19
PIE	01/04/94	1620	150				0 54		11		17																	
PIE	01/11/94	1200	63		0.20	r	0 37		3		10		8 7		66										0 04	2 07	0 30	-0 19
PIE	01/18/94	1440	37		0.053		0 32		1		6.5		6 1		76										0 00	1 05	0 00	-0 12
PIE	01/23/94	940	130		0 24	r	0 38		5		14		8 3		72										0 12	1 22	0 41	0 00
PIE	01/25/94	1110	180		0.24	r	0 38		3		18		7 5		70										0 00	1 25	0 30	-0 14
PIE	02/01/94	1405	140		0 070	r	0 31		1		5 3		4 6		75										0 00	0 60	0 00	-0 07
PIE	02/01/94	1405	140				0 31		1		5 3																	
PIE	02/08/94	1130	210		0.047	r	0 29		2		4.7		0 9		87		6 6		1 7		12 5		0 9		0 00	0 29	0 00	-0 03
PIE	02/14/94	1325	100		0.33	r	0 40		21		25		7 4		63										0 04	1 68	1 50	-0 14
PIE	02/15/94	1625	80	X	3 1		0 57		5		13		7 5		50										1 10	2 62	0 04	0 93
PIE	02/15/94	1700	12						6		3 6		7 4		49													
PIE	02/22/94	1020	110		0 22		0 37		2		8.4		5 9		60										0 55	2 87	0 43	0 29
PIE	03/01/94	1520	140		0.38	r	0 41		6		12		11 3		62		6 1		11 5		10 2		11 5		0 00	2 35	0 07	-0 26
PIE	03/02/94	1550	76		1 1	r	0 49		13		18		12 2		57										0 83	2 94	0 00	0 60
PIE	03/08/94	1000	80		0.10	r	0 33		3		5 8		5 2		66										0 00	2 18	0 00	-0 24
PIE	03/15/94	1345	200		0.057	r	0 30		4		6 9		10 7		86		6 0		10 7						0 07	1 23	0 00	-0 06
PIE	03/21/94	1530	63		0 44	r	0 42		5		11		9 7		63										0 29	2 42	0 47	0 05
PIE	03/22/94	940	31		0.40		0 39		4		8 1		5 7		62										0 40	2 57	0 29	0 16
PIE	03/29/94	1340	17		0 047	r	0 29		7		8 0		12 9		80										0 00	1 23	0 00	-0 14
PIE	04/05/94	945	13		0 038	r	0 28		5		8 9		7 2		82										0 27	0 87	0 00	0 20
PIE	04/06/94	1040	690		0 085	r	0 32		14		18		8 8		80										0 36	1 14	0 27	0 27
PIE	04/12/94	1330	19		0 057	r	0 30		10		12		12 6		76										0 17	1 19	0 00	0 06
PIE	04/19/94	1445	7		0 030	r	0 27		9		14		13 3		98										0 00	0 65	0 02	-0 07
PIE	05/04/94	1020			0.022		0 28																					
PIE	11/15/94	930	1000		0 25	r	0 36		3		8 1		7 3		47										0 25	2 06	0 10	0 05
PIE	11/21/94	615	470		0 25	r	0 36		1		6 0		2 4		41										0 00	1 86	0 00	-0 21
PIE	11/29/94	855	2400		4.4	r	0 60		9		14		5 8		45										1 05	2 87	0 24	0 85
PIE	12/06/94	1425	830		0 25	r	0 36		2		4 7		2 5		48										0 00	3 37	0 09	-0 37
PIE	12/13/94	830	180		0.18		0 36		1	U	5.1		3 4		55										0 00	2 34	0 00	-0 26
PIE	12/19/94	1225	590		7 5	r	0 66		8		17		8 8		35										1 37	4 52	0 27	1 02
PIE	12/20/94	1350	480		7 5	r	0 68		4		9.3		8 5		35										1 35	5 42	1 37	0 90
PIE	12/20/94	1350	590				0 68		4		10		8 5		35													
PIE	12/27/94	810	460		12	r	0 75		7		10		8 9		32		6 4		10 0		11 5		9 1		1 11	6 30	2 45	0 53
PIE	01/03/95	1300	440		0 12	r	0 30		1	U	5 0		1 3		52										0 00	3 03	0 00	-0 34
PIE	01/10/95	820	1100		0 62		0 42		2		7 6		5 5		44										0 19	2 34	0 38	-0 05
PIE	01/17/95	1225	310		0 22	r	0 35		2		6 2		5 1		44		6 5		5 9		12 1		5 2		0 20	1 99	0 04	0 00
PIE	01/24/95	1635	390		0 10		0 30		1		5 5		5 5		47										0 00	1 04	0 00	-0 12
PIE	01/31/95	1050	270		4.0		0 64		7		13		11 1		35										1 36	3 43	0 79	1 13
PIE	02/07/95	1600	1200		0 14	r	0 31		2		6 8		10 2		51		7 2		10 9		10 7		10 5		0 00	1 74	0 00	-0 19
PIE	02/14/95	1235	540		0 12	r	0 30		1		6 0		2 0												0 01	1 07	0 00	-0 11
PIE	02/14/95	1220	480	J			0 30		1		5 3		2 0															
PIE	02/21/95	1445	680		0.25	r	0 36		3		8 3		11 8		42										0 00	4 50	0 07	-0 50
PIE	02/28/95	1030	730		0 070	r	0 26		2		4 7		3 2		50										0 00	2 20	0 00	-0 24
PIE	03/07/95	1610	1400		0 060	r	0 24		2		4.9		7 8		52		6 6		8 7		12 2		7 8		0 00	1 27	0 00	-0 14
PIE	03/14/95	1040	230		1 5	r	0 51		8		13		11 1		37										0 45	3 23	0 32	0 14

Appendix C Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
PIE	03/21/95	1400	270		1.3		0 41		5		10		11 0		43										0 49	3 56	0 57	0 15
PIE	03/28/95	1200	390		0 090		0 25		3		5 8		8 8		55										0 00	1 76	0 00	-0 20
PIE	04/04/95	1310	150		0 050		0 24		6		10		11 5		67										0 20	1 10	0 00	0 10
PIE	04/04/95	1310	150		0 050		0 24		6		11		11 5		67													
PIE	04/11/95	925	66		0.080		0 28		5		11		7 4		59										0 00	1 29	0 28	-0 14
PIE	04/18/95	1500	14		0.00	r	0 23		5		10		10 3		60										0 05	1 04	0 04	-0 06
PIE	04/28/95	1320			0.070		0 25																		0 11	0 83	0 28	0 03
PIE	11/14/95	800	310		0.54		0 36		4		13		10 3		48										0 00	4 87	0 40	-0 43
PIE	11/20/95	910	80		0 080		0 28		2		8 8		6 4		57										0 00	3 41	0 01	-0 27
PIE	11/28/95	1500	210		1 1		0 42		3		12		11 9		52										0 54	4 93	1 07	0 16
PIE	12/05/95	1145	76						2		7 3																	
PIE	12/05/95	1205	100		0.26		0 34		2		7.4		5 9		50		7 3		5 9		12 0		6 0		0 00	5 19	0 00	-0 47
PIE	12/12/95	1500	170		1.6		0 46		5		14		9 3		42										0 72	5 09	0 34	0 35
PIE	12/19/95	1000	160		0 42		0 35		5		9 2		7 1		48										0 00	3 85	0 14	-0 32
PIE	12/26/95	1425	240						2		7 3																	
PIE	12/26/95	1410	150		0 10		0 27		1		7.5		4 1		57										0 00	2 36	0 00	-0 15
PIE	01/02/96	1010	210		0 18		0 32		4		11		8 7		54										0 41	3 31	0 03	0 20
PIE	01/09/96	1535	240		0 39		0 37		3		14		8 3		47										0 07	3 95	0 00	-0 25
PIE	01/16/96	1650	230						3		11																	
PIE	01/16/96	1650	210		0 51		0 37		4		11		7 7		48		7 5		8 0		11 8		7 8		0 13	3 82	1 09	-0 17
PIE	01/23/96	1300	100		0 85		0 40		3		11		5 8		40										0 38	4 13	0 22	0 07
PIE	01/30/96	1645	230		0 14		0 30		1		8.8		1 4		55										0 00	2 87	0 01	-0 21
PIE	02/06/96	1530	450	S	13		0 80		42		39		6 4		34		6 4		7 5		12 6		6 6		2 95	5 29	1 32	2 69
PIE	02/13/96	1515	120		0 24				2		11		8 2		51										0 00	5 73	0 00	-0 53
PIE	02/20/96	1400	110		0 50	g			3		15		9 2		48										0 35	4 57	0 24	-0 01
PIE	02/20/96	1425	88						3		15		9 2		47													
PIE	02/27/96	1640	84		0 19				2		8 2		4 7		53										0 00	3 33	0 00	-0 26
PIE	03/05/96	1230	88		0 40				4		12		7 0		52										0 18	2 99	0 33	-0 02
PIE	03/12/96	1535	150		0.38				4		11		11 4		57										0 02	2 55	0 07	-0 15
PIE	03/19/96	1300	52		0 090				3		8 6		10 9		61										0 07	0 81	0 00	-0 01
PIE	03/26/96	1605	23		0 060				4		7 1		9 4		70		6 7		9 5		11 1		9 3		0 00	0 65	0 00	-0 07
PIE	04/02/96	1155	28		0 090				3		11		8 6		73										0 00	0 86	0 32	-0 10
PIE	04/09/96	1450	22						6		11																	
PIE	04/09/96	1450	20		0.040				6		11		13 3		89										0 00	0 52	0 00	-0 06
PIE	04/16/96	1320	120		0 39				7		16		14 3		71										0 20	2 65	0 73	0 04
PRY	08/22/83		23	MP									15 0															
PRY	09/06/83		7	MP	0.67								13 3												0 00	1 04	0 00	-0 12
PRY	09/19/83		79	MP	2 2								10 7												0 00	1 27	0 75	-0 14
PRY	10/03/83		7	MP	1 1																				0 05	0 32	0 00	-0 03
PRY	10/17/83		33	MP	1.1								8 8												0 22	0 32	0 03	0 02
PRY	10/31/83		5	MP	0 67								9 9												0 00	0 76	0 27	0 21
PRY	11/14/83		35	MP	34								9 3												0 87	4 18	0 61	0 27
PRY	11/28/83		79	MP									8 9												0 09	3 64	0 00	-0 44
PRY	12/12/83		17	MP	68								7 3												0 42	3 57	0 02	-0 37
PRY	12/27/83		170	MP	16								2 9												0 40	1 63	0 26	0 14
PRY	01/09/84		27	MP	33								7 8												0 00	2 42	0 03	-0 27
PRY	01/23/84		33	MP	20								6 0												0 92	2 04	0 46	0 37
PRY	02/06/84		7	MP	15								7 1												0 00	1 14	0 00	-0 14
PRY	02/21/84		33	MP	31								5 6												0 09	2 04	0 55	0 37
PRY	03/05/84		8	MP	24								5 6												0 00	1 41	0 00	-0 17
PRY	03/12/84		13	MP	112								7 7												0 92	1 79	0 13	0 04
PRY	04/05/84		33	MP	15								7 9												0 01	1 32	0 12	-0 03
PRY	04/18/84		79	MP	25								8 7												0 32	1 55	0 00	-0 15
PRY	04/25/84			MP	25								8 7												0 00	1 08	0 17	0 06
PRY	05/03/84		49	MP	46								7 0															
PRY	05/16/84		33	MP	14								9 2															
PRY	05/31/84		23	MP	18								11 0															
PRY	06/25/84		33	MP	3 5								15 2															
PRY	07/10/84		33	MP	3 4								12 9															
PRY	07/23/84		33	MP									15 9															
PRY	08/06/84		33	MP	1 6								13 8															
PRY	06/16/86	940	1										12 4															
PRY	12/10/86	930	30		8.9								3 7												0 00	1 95	0 00	-0 24
PRY	02/03/87	1405	65		76								7 8												0 11	4 41	0 23	-0 27
PRY	04/06/87	1655	10		3.5								9 8												0 14	0 67	0 12	0 07
PRY	07/27/87	1208	75		0 77								13 7															
PRY	12/01/87	1105	1000		16								8 0												1 44	2 54	0 13	0 01
PRY	01/05/88	1149	5		5.5								3 2												0 00	0 63	0 00	-0 08
PRY	02/02/88	1344	10		13								3 0												0 09	1 12	0 00	-0 13
PRY	03/01/88	1430	10		9 0								9 0												0 02	0 47	0 07	0 02
PRY	07/05/88	1045	55		1.7								11 8															
PRY	08/02/88	1207	210		0 89								13 0															
PRY	12/07/88	1217	50		18								9 0												0 00	1 67	0 33	0 16
PRY	01/04/89	1000	40		38								6 0												0 11	2 65	0 40	0 13

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
PRY	03/07/89	930	25		42								5 0												0 12	1 85	0 19	0 00
PRY	04/04/89	1025	10		51								7 5												0 55	2 93	0 25	-0 02
PRY	07/05/89	930	85		2 2								11 0															
PRY	08/08/89	1030	95		0 10								13 0															
PRY	11/07/89	1030	80		0 95								8 0												0 04	1 56	0 80	0 70
PRY	12/05/89	1450	20		116								10 0												0 01	4 73	2 27	1 94
PRY	01/02/90	950	45		9.0								7 0												0 01	0 94	0 35	0 27
PRY	03/07/90	1015	25		38								7 7												0 33	1 76	0 51	0 39
PRY	07/10/90	1415	15		2.6								15 0															
PRY	08/14/90	1410	45		0 62								14 0															
PRY	11/06/90	855	25		33								8 0												0 05	1 54	0 00	-0 18
PRY	12/10/90	1054	85		45								8 0												0 32	4 10	0 34	-0 09
PRY	01/10/91	1145	25		71								6 1												0 48	2 47	0 41	0 21
PRY	02/06/91	1105	10		87								6 0												0 00	2 36	0 02	-0 27
PRY	03/05/91	1030	65		64								5 5												0 10	2 71	0 22	-0 08
PRY	07/09/91	1525	85		1.2								13 5															
PRY	08/07/91	1525	80		0 74								15 0															
PRY	08/07/91	1525	85		0.74								15 0															
PRY	11/18/91	1536	20		9.2								8 4												0 10	1 78	0 31	0 14
PRY	12/10/91	1007	15		33								6 1												0 06	2 43	0 31	0 05
PRY	01/28/92	1230	40										9 0												1 32	4 50	1 48	1 25
PRY	01/28/92	1230	60										9 0												1 32	4 50	1 48	1 25
PRY	02/18/92	1510	75		39								7 0												0 54	2 24	0 27	0 09
PRY	02/18/92	1510	110		39								7 0												0 54	2 24	0 27	0 09
PRY	07/14/92	1440	30		0 97								14 9															
PRY	08/13/92	1436	35		0.52								16 8															
PRY	11/11/92	945	140		4 5		1 08		16		2 7		7 3		103										0 48	1 93	0 01	0 32
PRY	11/17/92	1050	46		4.5		1 00		18		3 0		8 7		108		7 2		8 9						0 61	2 00	0 29	0 46
PRY	11/23/92	1025	10		29		1 42		9		3 0		6 1		82										0 00	3 03	0 05	-0 34
PRY	12/01/92	1305	6		16		1 08		4		1 6		6 4		85										0 05	2 23	0 52	-0 19
PRY	12/08/92	850	35		16		1 14		5		1 9		5 0		76										0 68	1 87	0 06	0 55
PRY	12/15/92	1320	4		27		1 34		3		1 5		5 7		60		7 3		6 1		12 8		2 8		0 00	1 88	0 11	-0 21
PRY	12/21/92	1340	16		59		1 76		5		2 0		6 5		71										0 27	2 28	0 27	0 05
PRY	12/21/92	1350	12				1 76		4		2 0		6 4		71													
PRY	12/28/92	1050	22		28		1 37		3		1 1		4 9		75										0 20	1 81	0 34	0 02
PRY	01/05/93	1455	9		21		1 24		1		0 6		3 5		75										0 00	1 72	0 36	-0 19
PRY	01/12/93	1105	7		11		0 93		1		0 5		1 7		82		6 7		2 5		15 0	J	0 4		0 00	0 82	0 00	-0 09
PRY	01/19/93	1310	84	JH	34		1 42		10		5 4		3 5		70										0 50	0 92	0 00	0 45
PRY	01/26/93	1010	7		111		2 00		7		2 7		7 3		66										0 07	3 08	0 79	-0 26
PRY	02/02/93	1055	5		24		1 24		1	U	0 6		5 4		74		6 8		5 7		10 0		5 5		0 00	1 60	0 00	-0 18
PRY	02/09/93	1040	10		12		1 00		1		0 5		7 1		80										0 10	0 88	0 02	0 01
PRY	02/16/93	1230	8		6 5		0 88		1	U	0 3		2 7		82										0 00	0 44	0 00	-0 05
PRY	02/16/93	1230	5				0 88		1	U	0 4		2 7		82													
PRY	02/23/93	1105	14		6 1		0 86		1		0 4		3 2		81										0 00	0 27	0 00	-0 03
PRY	03/02/93	1010	7		5 5		0 84		1		0 3		4 5		83										0 11	0 46	0 25	0 07
PRY	03/09/93	1145	19		12		1 01		1		0 4		6 0		80		7 0		7 2		13 3		6 1		0 00	0 65	0 00	-0 07
PRY	03/16/93	1045	7		11		1 00		1		0 5		5 6		78										0 61	1 46	0 04	0 52
PRY	03/23/93	1235	40		67		1 80		8		3 4		8 3		69										0 17	2 57	1 56	-0 10
PRY	03/30/93	1025	21		18		1 16		2		2 0		6 8		77										0 16	1 40	0 01	0 02
PRY	04/06/93	1105	2		13		1 04		1	U	1 8		7 8		80										0 10	1 34	0 03	-0 04
PRY	04/13/93	1110	31		36		1 40		3		1 4		7 5		74										0 18	2 44	0 00	-0 07
PRY	11/16/93	1135	28		1 6				3		1 2		6 1		97										0 13	0 50	0 21	0 09
PRY	11/17/93	1150			1 4		0 88																					
PRY	11/22/93	1245	3		1 9		0 90		3		2 3		3 9		94										0 04	0 55	0 27	-0 02
PRY	11/30/93	1230	17						33		9 3				95													
PRY	11/30/93	1220	33		3.2		0 94		16		6 9		4 9		90										0 85	1 90	0 58	0 73
PRY	12/07/93	1120	65		20		1 35		9		8 7		5 5		77		7 7				11 3		7 2		0 50	2 30	0 05	0 30
PRY	12/14/93	1050	7		35		1 62		7		4 3		7 2		67										0 01	2 55	0 18	-0 27
PRY	12/21/93	925	8		11		1 28		4		0 8		5 7		74										0 00	1 25	0 00	-0 14
PRY	12/28/93	945	27		6 4		1 16		2		0 9		3 8		75										0 08	0 68	0 00	0 01
PRY	01/04/94	1215	63		119		2 18		38		17		8 7		56		6 1		9 4		11 1		9 1		0 45	2 76	0 31	0 19
PRY	01/11/94	1050	1		36		1 67		2		1 7		8 3		65										0 04	2 07	0 30	-0 19
PRY	01/18/94	1205	3				1 42		2		1 1		6 0		70													
PRY	01/18/94	1155	6		18		1 42		1		1 0		6 0		68										0 00	1 05	0 00	-0 12
PRY	01/23/94	850	22		18	r	1 44		3		1 7		8 5		71										0 12	1 22	0 41	0 00
PRY	01/25/94	1020	17	S	17		1 42		1		6 0		7 5		71										0 00	1 25	0 30	-0 14
PRY	02/01/94	1235	9		12	r	1 32		1		0 8		4 7		68		6 4				12 2		5 0		0 00	0 60	0 00	-0 07
PRY	02/08/94	1425	5		7.1		1 24		1		0.7		2 9		75		6 4		3 5		13 1		2 6		0 00	0 29	0 00	-0 03
PRY	02/14/94	1440	96		43	r	1 75		37		21		6 4		64										0 04	1 68	1 50	-0 14
PRY	02/15/94	1235	20		89		2 05		3		2 5		6 7		57										1 10	2 62	0 04	0 93
PRY	02/22/94	855	1	U	33		1 80		2		1 6		5 7		67										0 55	2 87	0 43	0 29
PRY	03/01/94	1220	4		61	r	1 89		3		2 4		9 1		62		5 7		9 3		11 0		10 0		0 00	2 35	0 07	-0 26
PRY	03/02/94	1500	52		88	r	2 05		14		8 2		9 6		58										0 83	2 94	0 00	0 60
PRY	03/02/94	1500	61						13		8 4																	

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
PRY	03/08/94	840	4		41	r	1 73		2		1 5		5 7		64										0 00	2 18	0 00	-0 24
PRY	03/15/94	1315	1		22		1 47		2		1 2		9 0		71		6 0		9 1						0 07	1 23	0 00	-0 06
PRY	03/21/94	1430	5		79	r	2 00		4		2 8		6 7		60										0 29	2 42	0 47	0 05
PRY	03/22/94	1110	15		69	r	1 94		2		2 0		6 3		62										0 40	2 57	0 29	0 16
PRY	03/29/94	1515	3		24	r	1 54		2		1 0		9 8		72										0 00	1 23	0 00	-0 14
PRY	03/29/94	1515	5						2		1 0																	
PRY	04/05/94	1035	2		15	r	1 40		2		1 3		8 4		70										0 27	0 87	0 00	0 20
PRY	04/06/94	930	88		24	r	1 54		10		3 5		8 1		67										0 36	1 14	0 27	0 27
PRY	04/12/94	1200	32		28	r	1 60		2		1 4		9 2		65										0 17	1 19	0 00	0 06
PRY	04/19/94	1300	3		17	r	1 43		2		1 0		10 8		84										0 00	0 65	0 02	-0 07
PRY	05/04/94	1415			7 7		1 33																					
PRY	11/15/94	905	33		9 7	r	1 24		7		3 7		7 5		65										0 25	2 06	0 10	0 05
PRY	11/21/94	745	14		9.7	r	1 28		8		3.3		3 9		62										0 00	1 86	0 00	-0 21
PRY	11/29/94	1000	380		198	r	2 13		64		38		6 7		50										1 05	2 87	0 24	0 85
PRY	12/06/94	1240	14		54	r	1 62		15		6 2		4 8		58										0 00	3 37	0 09	-0 37
PRY	12/13/94	1155	9		37		1 61		10		5 3		5 6		65										0 00	2 34	0 00	-0 26
PRY	12/19/94	1115	52		276	r	2 26		25		15		8 2		48										1 37	4 52	0 27	1 02
PRY	12/20/94	1225	53		1500	r	3 22		211		130		8 5		38		6 7		9 2		11 6		8 8		1 35	5 42	1 37	0 90
PRY	12/27/94	1000	116	JS	4000	r	3 80		266		160		8 9		34										1 11	6 30	2 45	0 53
PRY	01/03/95	1120	4		21	r	1 26		3		1 9		3 8		52										0 00	3 03	0 00	-0 34
PRY	01/10/95	1115	26		30		1 26		3		2 6		7 2		55										0 19	2 34	0 38	-0 05
PRY	01/10/95	1155	45		30		1 24		2		1 9		7 2		55													
PRY	01/17/95	1440	19				1 42		3		2 8		6 4		52		6 6		7 3		12 0		6 5		0 20	1 99	0 04	0 00
PRY	01/17/95	1500	21				1 42		4		3 0		6 3		51		6 6		7 2		12 0		6 3					
PRY	01/24/95	1205	4		23		1 18		1	U	1.0		5 2		55										0 00	1 04	0 00	-0 12
PRY	01/31/95	1150	27		148		2 04		34		20		8 9		46										1 36	3 43	0 79	1 13
PRY	02/07/95	1445	11		18	r	1 20		1		1 3		8 1		56		6 7		9 3		11 3		8 2		0 00	1 74	0 00	-0 19
PRY	02/14/95	1040	32		11	r	1 00		1		1 5		2 9		57										0 01	1 07	0 00	-0 11
PRY	02/21/95	1400	2		104	r	1 88		8		5 3		8 2		47										0 00	4 50	0 07	-0 50
PRY	02/28/95	920	1		19	r	1 22		1		1 6		4 7		55										0 00	2 20	0 00	-0 24
PRY	03/07/95	1450	5		14	r	1 09		1	U	0.6		6 3		58		6 3		7 0		12 5		6 3		0 00	1 27	0 00	-0 14
PRY	03/14/95	930	200		149	r	2 02		19		11		8 1		45										0 45	3 23	0 32	0 14
PRY	03/21/95	1220	29	JS	98		1 86		5		4 0		7 5		45										0 49	3 56	0 57	0 15
PRY	03/28/95	1245	9		22		1 24		1		0 9		7 9		56										0 00	1 76	0 00	-0 20
PRY	04/04/95	1030	5		13		1 09		1	U	1 0		8 9		60										0 20	1 10	0 00	0 10
PRY	04/11/95	1215	19		18		1 19		1	U	1 2		7 9		58										0 00	1 29	0 28	-0 14
PRY	04/11/95	1215	29		18		1 19		1		1 3		7 9		58													
PRY	04/18/95	1410	13		15	r	1 12		1		0 6		8 1		59										0 05	1 04	0 04	-0 06
PRY	04/28/95	1245			12		1 07																		0 11	0 83	0 28	0 03
PRY	11/14/95	1025	31	S	43		1 55		6		3 2		10 7		58										0 00	4 87	0 40	-0 43
PRY	11/14/95	1040	31	S			1 55		6		3 9		10 8		58													
PRY	11/20/95	1210	11		20		1 22		4		2 6		8 0		62										0 00	3 41	0 01	-0 27
PRY	11/28/95	1310	59	S	98		1 85		11		6 6		10 8		53										0 54	4 93	1 07	0 16
PRY	12/05/95	1030	6		63		1 67		6		3 9		7 4		54		7 2		7 2		10 6		7 5		0 00	5 19	0 00	-0 47
PRY	12/12/95	1215	44		112		1 94		8		5 6		9 2		48										0 72	5 09	0 34	0 35
PRY	12/19/95	850	61		50		1 62		4		2 7		8 2		54										0 00	3 85	0 14	-0 32
PRY	12/26/95	1205	33		15		1 33		1	U	0 8		4 2		60										0 00	2 36	0 00	-0 15
PRY	01/02/96	915	6		40		1 56		2		1 7		8 8		56										0 41	3 31	0 03	0 20
PRY	01/09/96	1425	33		71		1 75		3		3 5		8 5		52										0 07	3 95	0 00	-0 25
PRY	01/16/96	1405	6		58		1 70		2		2 7		7 5		50		7 5		8 2		12 2		7 5		0 13	3 82	1 09	-0 17
PRY	01/23/96	1205	15		96		1 92		3		2 7		6 2		47										0 38	4 13	0 22	0 07
PRY	01/23/96	1225	7				1 92		2		2 8		6 2		38													
PRY	01/30/96	1340	4		23		1 42		1		1.3		2 5		59										0 00	2 87	0 01	-0 21
PRY	02/06/96	1320	73		161		2 15		111		60		6 8		45		6 6		7 1		12 4		6 8		2 95	5 29	1 32	2 69
PRY	02/13/96	1255	9		37		1 52		2		2 1		6 3		55										0 00	5 73	0 00	-0 53
PRY	02/20/96	1230	110		61	r	1 70		5		5 6		7 5		52										0 35	4 57	0 24	-0 01
PRY	02/27/96	1330	2		36		1 50		2		1 5		5 0		56										0 00	3 33	0 00	-0 26
PRY	03/05/96	1145	11		22		1 34		2		1 7		6 4		58										0 18	2 99	0 33	-0 02
PRY	03/12/96	1325	2		30		1 45		2		2 7		8 8		60										0 02	2 55	0 07	-0 15
PRY	03/19/96	1155	4		16		1 27		1		1 0		8 7		63										0 07	0 81	0 00	-0 01
PRY	03/26/96	1315	1		11		1 14		1		0 7		7 2		66		6 6		7 8		12 3		7 0		0 00	0 65	0 00	-0 07
PRY	04/02/96	1045	5		10		1 16		1	U	1 2		7 5		66										0 00	0 86	0 32	-0 10
PRY	04/09/96	1250	2		6.1		1 08		1		0 9		11 7		72										0 00	0 52	0 00	-0 06
PRY	04/16/96	1145	410		23		1 38		5		4 4		9 9		64										0 20	2 65	0 73	0 04
SHN	07/29/86	1210	70										13 1															
SHN	12/12/86	1643	10		9.2								6 1												0 04	1 73	0 12	-0 08
SHN	02/04/87	1205	2		32								7 7												0 06	4 03	0 11	-0 37
SHN	04/07/87	855	5		7.7								8 4												0 47	1 07	0 14	0 08
SHN	07/27/87	1306	75		0 56								14 8															
SHN	12/07/87	1413	45		33								7 8												0 46	4 14	0 64	0 26
SHN	01/06/88	1020	1		5 2								3 5												0 01	0 57	0 00	-0 07
SHN	02/01/88	900	1		8 8								2 5												0 00	1 14	0 00	-0 14
SHN	07/05/88	1230	230		1.1								11 0															
SHN	08/03/88	1305	160		0 72								13 7															

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
SHN	12/06/88	1125	1		16								8 7												0 33	1 85	0 23	0 07
SHN	01/03/89	1402	30		7.0								1 8												0 40	2 82	0 14	-0 14
SHN	01/03/89	935	5		34								12 5												0 40	2 82	0 14	-0 14
SHN	03/06/89	930	5		38								5 5												0 19	1 92	0 51	0 35
SHN	04/03/89	915	20		49								6 5												0 25	2 65	0 52	0 28
SHN	07/03/89	1007	185		2 6								13 0															
SHN	08/07/89	1418	320		1 0								16 0															
SHN	11/06/89	935	190		2 7								9 5												0 80	1 69	0 00	-0 11
SHN	12/04/89	1245	280										6 3												2 27	5 25	0 81	0 53
SHN	01/03/90	1402	30		7.0								6 0												0 22	1 06	0 01	-0 09
SHN	03/05/90	1445	35		12								9 0												0 02	1 20	0 02	-0 12
SHN	07/09/90	1136	70		1.0								14 5															
SHN	08/13/90	1402	130		0 65								16 5															
SHN	11/13/90	925	2812		32								10 5												0 91	3 44	0 49	0 23
SHN	12/10/90	950	5		45								8 0												0 32	4 10	0 34	-0 09
SHN	01/10/91	1045	75		44								5 0												0 48	2 47	0 41	0 21
SHN	02/06/91	1310	15		48								6 2												0 00	2 36	0 02	-0 27
SHN	03/05/91	1115	40		50								5 5												0 10	2 71	0 22	-0 08
SHN	07/09/91	1145	10		1 6								14 0															
SHN	08/06/91	920	150		1 1								14 5															
SHN	08/06/91	920	150		1.1								14 5															
SHN	12/16/91	1002	20		10								3 6												0 00	1 61	0 00	-0 20
SHN	01/28/92	1345	160										9 0												1 32	4 50	1 48	1 25
SHN	02/18/92	1330	25		24								7 0												0 54	2 24	0 27	0 09
SHN	07/21/92	1450	335		0 75								15 5															
SHN	08/17/92	1200	65		0.64								16 0															
SHN	11/11/92	1115	380		3 5				11		3 8		7 8		118										0 48	1 93	0 01	0 32
SHN	11/17/92	930	83		3 7				4		2 4		8 8		129		7 2		8 8						0 61	2 00	0 29	0 46
SHN	11/23/92	1340	340	XS	17				6		5 5		6 3		90										0 00	3 03	0 05	-0 34
SHN	12/01/92	1010	16	SX	9 8				6		5 2		5 5		95										0 05	2 23	0 52	-0 19
SHN	12/08/92	1320	170	X	11		0 86		4		3 9		5 1		92										0 68	1 87	0 06	0 55
SHN	12/08/92	1340	120	S	11		0 86		4		4 5		5 1		92													
SHN	12/15/92	1425	31		16		0 95		1		3 9		5 5		84		7 2		5 7		12 4		2 2		0 00	1 88	0 11	-0 21
SHN	12/21/92	1250	28	X	35		1 38		5		5 0		5 3		74										0 27	2 28	0 27	0 05
SHN	12/28/92	1125	33		27		1 16		4		4 9		4 3		76										0 20	1 81	0 34	0 02
SHN	01/05/93	1245	56		19		1 04		2		2 9		3 3		79										0 00	1 72	0 36	-0 19
SHN	01/05/93	1300	41		18		1 04		1		3 1		3 3		79													
SHN	01/12/93	1225	8		7.0		0 80		1		1.8		1 5		90		7 3		2 1		15 0	J	0 2		0 00	0 82	0 00	-0 09
SHN	01/19/93	1230	800	JH	37		1 40		37		18		2 4		68										0 50	0 92	0 00	0 45
SHN	01/26/93	1150	20		87		2 18		16		6 7		7 0		64										0 07	3 08	0 79	-0 26
SHN	02/02/93	1235	9		16		1 10		2		2 1		5 5		80		6 6		5 0		9 5		5 8		0 00	1 60	0 00	-0 18
SHN	02/09/93	1120	25		8 4		0 95		2		1 9		7 0		90										0 10	0 88	0 02	0 01
SHN	02/16/93	1110	10		6 0		0 86		1	U	1 4		2 9		94										0 00	0 44	0 00	-0 05
SHN	02/23/93	1505	3		5 7		0 84		1	U	1 5		4 1		98													
SHN	02/23/93	1450	5		5 7		0 85		1		1 6		4 0		97										0 00	0 27	0 00	-0 03
SHN	03/02/93	1200	18		4 1		0 82		1		1 8		4 8		100										0 11	0 46	0 25	0 07
SHN	03/09/93	1515	4		7 5		0 87		2		1 5		8 0		95		6 9		9 0		11 7		8 1		0 00	0 65	0 00	-0 07
SHN	03/16/93	1240	17		9.3		0 88		1		2 7		6 4		92										0 61	1 46	0 04	0 52
SHN	03/23/93	1600	36	S	56		1 70		18		9 5		9 9		70										0 17	2 57	1 56	-0 10
SHN	03/30/93	1145	4		11		0 94		1		1 7		7 5		86										0 16	1 40	0 01	0 02
SHN	04/06/93	1430	4		8.9		0 90		1		2 6		9 1		91										0 10	1 34	0 03	-0 04
SHN	04/13/93	1240	1		21		1 10		3		2 2		8 5		82										0 18	2 44	0 00	-0 07
SHN	11/16/93	1440	40		1 1		0 59		1	U	0 9		5 9		120										0 13	0 50	0 21	0 09
SHN	11/22/93	1120	8		1 6		0 60		1		2 3		4 0		112										0 04	0 55	0 27	-0 02
SHN	11/30/93	1445	27	S	1 6		0 61		4		3 2		5 0		120										0 85	1 90	0 58	0 73
SHN	12/07/93	1025	440	S	13		0 95		7		7 9		4 8		96		7 5				11 4		7 2		0 50	2 30	0 05	0 30
SHN	12/14/93	1455	31	X	27		1 36		5		6 0		7 7		77										0 01	2 55	0 18	-0 27
SHN	12/21/93	945	22	S	8 5	r	0 98		3		2 0		5 4		86										0 00	1 25	0 00	-0 14
SHN	12/28/93	1110	26				0 88		1	U	1 4		4 1		94													
SHN	12/28/93	1110	12		3.6		0 88		1		1.4		4 1		93										0 08	0 68	0 00	0 01
SHN	01/04/94	1500	56	S	68		1 70		18		15		8 7		62		6 8		8 9		10 4		8 8		0 45	2 76	0 31	0 19
SHN	01/11/94	1235	14				1 19		3		4 4		8 1		75													
SHN	01/11/94	1235	8		18	r	1 19		3		4 7		8 2		72										0 04	2 07	0 30	-0 19
SHN	01/18/94	1405	3		8.8	r	0 99		2		2 5		6 3		82										0 00	1 05	0 00	-0 12
SHN	01/23/94	1000	11	S	11	r	1 05		4		4 9		8 3		82										0 12	1 22	0 41	0 00
SHN	01/25/94	1130	8		13	r	1 09		4		1 6		7 7		80										0 00	1 25	0 30	-0 14
SHN	01/25/94	1140	27				1 09		4		2 3		7 7		80													
SHN	02/01/94	1150	45		7 0	r	0 93		1		1 9		4 5		84										0 00	0 60	0 00	-0 07
SHN	02/08/94	1205	4		5.2	r	0 86		1		2 2		2 2		88		6 4		2 8		13 1		2 0		0 00	0 29	0 00	-0 03
SHN	02/14/94	1540	110	S	31	r	1 38		24		16		6 7		66										0 04	1 68	1 50	-0 14
SHN	02/15/94	1515	150	S	55		1 60		8		9 3		6 9		60										1 10	2 62	0 04	0 93
SHN	02/22/94	1055	7		25	r	1 30		3		4 4		5 7		68										0 55	2 87	0 43	0 29
SHN	03/01/94	1415	14		29	r	1 36		7		3.9		9 9		70		6 0		10 3		10 2		10 2		0 00	2 35	0 07	-0 26
SHN	03/02/94	1605	40		42	r	1 50		15		10		10 2		67										0 83	2 94	0 00	0 60

Appendix C. Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
SHN	03/08/94	910	13		19	r	1 22		5		3 8		6 2		70										0 00	2 18	0 00	-0 24
SHN	03/15/94	1435	2		9.2	r	1 00		3		2 2		9 8		85		5 9		9 8						0 07	1 23	0 00	-0 06
SHN	03/21/94	1510	66		47	r	1 54		10		7 9		7 1		65										0 29	2 42	0 47	0 05
SHN	03/22/94	1030	5		39		1 46		5		5 3		6 0		65										0 40	2 57	0 29	0 16
SHN	03/29/94	1405	5		9 9	r	1 02		3		2 3		11 3		80										0 00	1 23	0 00	-0 14
SHN	04/05/94	1000	3		6 7	r	0 92		3		2 1		7 7		85										0 27	0 87	0 00	0 20
SHN	04/06/94	1010	24	SX	9.2	r	1 00		5		3 2		8 5		82										0 36	1 14	0 27	0 27
SHN	04/12/94	1245	7		11	r	1 05		4		2 5		11 0		78										0 17	1 19	0 00	0 06
SHN	04/12/94	1255	12	S					4		2 7																	
SHN	04/19/94	1350	15		6 4	r	0 91		2		2 0		12 6		100										0 00	0 65	0 02	-0 07
SHN	04/19/94	1350	9						2		2 0																	
SHN	05/04/94	1110			4.7		0 86																					
SHN	11/15/94	1030	18	S	10	r	0 93		3		2 8		7 6		74										0 25	2 06	0 10	0 05
SHN	11/21/94	705	53		12	r	1 01		2		3.8		3 5		74										0 00	1 86	0 00	-0 21
SHN	11/29/94	915	150	S	37	r	1 61		49		34		6 0		61										1 05	2 87	0 24	0 85
SHN	12/06/94	1335	21		24	r	1 40		5		4 5		3 5		63										0 00	3 37	0 09	-0 37
SHN	12/13/94	955	6		25		1 43		4		4 0		4 8		67										0 00	2 34	0 00	-0 26
SHN	12/19/94	1145	49	S	186	r	2 46		24		17		8 2		46										1 37	4 52	0 27	1 02
SHN	12/20/94	1300	260		1800	r	4 26		94		100		8 7		37										1 35	5 42	1 37	0 90
SHN	12/27/94	850	180	JS	1500	r	4 10		78		55		8 8		37		6 4		10 3		10 8		9 0		1 11	6 30	2 45	0 53
SHN	01/03/95	1155	15				1 17		3		4 0		3 1		59													
SHN	01/03/95	1155	7		16	r	1 17		3		3 8		3 1		58										0 00	3 03	0 00	-0 34
SHN	01/10/95	940	38		33		1 32		5		5 9		6 0		58										0 19	2 34	0 38	-0 05
SHN	01/17/95	1325	13				1 30		4		4 0		6 0		57		6 4		6 9		11 5		6 2		0 20	1 99	0 04	0 00
SHN	01/24/95	1430	10		17		1 10		2		2 8		5 1		62										0 00	1 04	0 00	-0 12
SHN	01/24/95	1500	31		17		1 10		2		3.0		5 2		62													
SHN	01/31/95	1405	150		131		2 45		52		34		9 5		45										1 36	3 43	0 79	1 13
SHN	01/31/95	1440	69	S	131		2 46		57		39		9 6		45													
SHN	02/07/95	1510	17		19	r	1 28		4		3 5		8 7		62		6 9		9 7		11 2		8 5		0 00	1 74	0 00	-0 19
SHN	02/14/95	1105	14		15	r	1 13		1		2 7		2 8		66										0 01	1 07	0 00	-0 11
SHN	02/21/95	1415	23		97	r	2 12		30		17		8 5		47										0 00	4 50	0 07	-0 50
SHN	02/28/95	940	5		19	r	1 26		3		2 9		4 6		62										0 00	2 20	0 00	-0 24
SHN	02/28/95	945	6				1 26		3		3 0		4 6		62													
SHN	03/07/95	1515	3		15	r	1 16		1		2 0		6 7		68		6 5		7 5		12 2		6 5		0 00	1 27	0 00	-0 14
SHN	03/14/95	1000	30	S	93	r	2 10		24		17		9 0		45										0 45	3 23	0 32	0 14
SHN	03/21/95	1300	20		81		1 95		15		11		8 4		48										0 49	3 56	0 57	0 15
SHN	03/28/95	1030	2		19		1 24		3		2 6		7 9		63										0 00	1 76	0 00	-0 20
SHN	04/04/95	1120	16		13		1 11		3		2 4		10 3		71										0 20	1 10	0 00	0 10
SHN	04/11/95	1040	9		13		1 11		1		2 7		8 4		71										0 11	0 83	0 28	0 03
SHN	04/18/95	1530	5		13	r	1 05		2		1 8		10 3		69										0 00	1 29	0 28	-0 14
SHN	04/28/95	1405			9.3		1 02																		0 05	1 04	0 04	-0 06
SHN	11/14/95	910	21		35		1 46		11		9 4		10 3		63										0 00	4 87	0 40	-0 43
SHN	11/20/95	1110	7		14		1 16		4		4.2		8 0		70										0 00	3 41	0 01	-0 27
SHN	11/28/95	1135	52	S	62		1 76		14		13		10 4		56										0 54	4 93	1 07	0 16
SHN	12/05/95	1310	4		53		1 76		9		7.9		6 3		55		7 4		6 2		11 1		6 1		0 00	5 19	0 00	-0 47
SHN	12/12/95	1340	28		102		2 25		24		17		8 9		48										0 72	5 09	0 34	0 35
SHN	12/19/95	1030	12						7		6 0																	
SHN	12/19/95	1030	6		40		1 71		6		6 3		7 9		56										0 00	3 85	0 14	-0 32
SHN	12/26/95	1245	6		13		1 33		2		2 6		4 1		68										0 00	2 36	0 00	-0 15
SHN	01/02/96	1050	16						5		4 6																	
SHN	01/02/96	1050	26		30		1 54		6		4 6		8 7		60										0 41	3 31	0 03	0 20
SHN	01/09/96	1605	13		52		1 88		11		9 8		8 0		53										0 07	3 95	0 00	-0 25
SHN	01/09/96	1615	10				1 88		10		9.8		8 0		53													
SHN	01/16/96	1500	24		61		1 86		9		10		7 6		42		7 4		9 0		11 1		7 6		0 13	3 82	1 09	-0 17
SHN	01/23/96	1410	12		93		2 20		16		12		5 5		47										0 38	4 13	0 22	0 07
SHN	01/30/96	1435	15				1 38		3		3 4		2 3		66													
SHN	01/30/96	1410	22		25		1 38		3		3.1		2 3		64										0 00	2 87	0 01	-0 21
SHN	02/06/96	1600	110						108		70																	
SHN	02/06/96	1600	160		250	r	2 90		119		60		5 9		45		6 5		6 5		11 8		6 0		2 95	5 29	1 32	2 69
SHN	02/13/96	1435	4		37		1 85		6		5 9		6 4		60										0 00	5 73	0 00	-0 53
SHN	02/20/96	1315	11		60	r	1 95		8		8 8		7 8		57										0 35	4 57	0 24	-0 01
SHN	02/27/96	1530	7		36		1 72		5		4 2		4 7		60										0 00	3 33	0 00	-0 26
SHN	03/05/96	1325	11		24		1 58		3		3 2		6 9		69										0 18	2 99	0 33	-0 02
SHN	03/05/96	1335	6						3		3 4		7 0		69													
SHN	03/12/96	1455	16		30		1 70		5		5 9		10 1		65										0 02	2 55	0 07	-0 15
SHN	03/19/96	1350	1	U	15		1 45		3		2 6		10 2		75										0 07	0 81	0 00	-0 01
SHN	03/19/96	1415	2						3		2 7		10 3		75													
SHN	03/26/96	1505	1		11		1 36		2		2 0		8 7		80		6 7		9 2		11 3		8 7		0 00	0 65	0 00	-0 07
SHN	03/26/96	1520	2						2		1 7		8 8		80		6 8		9 2		11 3		8 7					
SHN	04/02/96	1235	31		12		1 36		2		2 0		9 1		83										0 00	0 86	0 32	-0 10
SHN	04/09/96	1325	2		8.1		1 29		2		2 0		12 6		90										0 00	0 52	0 00	-0 06
SHN	04/16/96	1430	49		20		1 52		5		4 9		12 3		77										0 20	2 65	0 73	0 04
SKO	06/04/90	1145	170	RR MP	33										95													
SKO	07/09/90	820	23	RR MP	9 3						2 6				521													

Appendix C Water Quality Data from the Totten and Eld Inlet Study Basins. (Explanatory notes are provided in Appendix D.

SITE	DATE	TIME	FC	K-FC	FLOW	K-	GAGE	K-	TSS	K	TURB	K	TEMP	K	COND	K	PH	K	T-PH	K	DO	K	T-DO	K	PREC	API	A24HR	APISLP
SKO	08/13/90	945	130	RR MP	2 1						2 5				156													
SKO	09/10/90	825	33	RR,MP	3 1						2 5														0 00	0 17	0 00	-0 02
SKO	10/04/90	1000	350	RR MP																					0 13	0 93	0 65	0 04
SKO	11/13/90	1155	240	RR MP																					0 91	3 44	0 49	0 63
SKO	12/10/90	935	7	RR MP							10 1				59										0 32	4 10	0 34	-0 10
SKO	01/10/91	1130	23	RR MP							17 2				56										0 48	2 47	0 41	0 26
SKO	02/06/91	1010	11	RR MP	157						11 3				56										0 00	2 36	0 02	-0 26
SKO	03/05/91	1110	23	RR MP	170						11 3				56										0 10	2 71	0 22	-0 19
SKO	04/02/91	1055	22	RR MP																					0 25	0 75	0 00	0 19
SKO	11/11/92	1220	250		30				6		3 2		8 0		113										0 48	1 93	0 01	0 32
SKO	11/17/92	835	31		24				3		2 5		9 2		114		6 8		9 2						0 61	2 00	0 29	0 46
SKO	11/23/92	1220	33		97				12		5 0		6 9		90										0 00	3 03	0 05	-0 34
SKO	12/01/92	800	13		63				5		2 2		6 1		90										0 05	2 23	0 52	-0 19
SKO	12/08/92	1155	24		37		0 78		3		2 0		5 7		90										0 68	1 87	0 06	0 55
SKO	12/15/92	1540	18		71		1 17		4		2 0		5 8		90		7 3		5 6		12 5		2 8		0 00	1 88	0 11	-0 21
SKO	12/15/92	1600	27		71		1 18		4		2 3		5 4		85		7 4		5 6		12 5		2 8					
SKO	12/21/92	1100	29		117		1 60		18		4 5		5 2		80										0 27	2 28	0 27	0 05
SKO	12/28/92	1320	31		92		1 34		5		2 1		5 4		80										0 20	1 81	0 34	0 02
SKO	01/05/93	1120	24		67		1 18		3		1 4		4 2		75										0 00	1 72	0 36	-0 19
SKO	01/12/93	1325	11		34		0 78		2		1 3		2 3		92		7 3		3 0						0 00	0 82	0 00	-0 09
SKO	01/19/93	1120	59	JH	29		0 65		4		3.0		3 6		90										0 50	0 92	0 00	0 45
SKO	01/26/93	1250	29		270 r		2 80		42		17		6 9		69										0 07	3 08	0 79	-0 26
SKO	02/02/93	1520	11		68 r		1 16		5		2 1		5 9		82		6 7		6 9		9 1		6 1		0 00	1 60	0 00	-0 18
SKO	02/02/93	1520	4				1 16		4		2 4		5 9		82		6 8		7 2		9 2		6 1					
SKO	02/09/93	1240	11		37		0 84		3		1 8		7 3		89										0 10	0 88	0 02	0 01
SKO	02/16/93	945	13		23		0 60		2		1 7		2 9		88										0 00	0 44	0 00	-0 05
SKO	02/23/93	1315	8		20		0 52		2		1 5		3 8		91										0 00	0 27	0 00	-0 03
SKO	03/02/93	1315	4		17		0 46		1		1 1		5 7		96										0 11	0 46	0 25	0 07
SKO	03/09/93	1355	5		24		0 60		2		1 2		7 0		96		6 9		8 8		12 8		7 0		0 00	0 65	0 00	-0 07
SKO	03/16/93	1400	68		29		0 70		2		2 0		6 2		90										0 61	1 46	0 04	0 52
SKO	03/16/93	1400	52		30		0 70		2		1.7		6 2		90													
SKO	03/23/93	1425	41		278 r		2 85		62		20		8 8		67										0 17	2 57	1 56	-0 10
SKO	03/30/93	1255	4		61 r		1 08		5		2 3		7 9		82										0 16	1 40	0 01	0 02
SKO	04/06/93	1310	39		39		0 88		3		3 0		8 4		86										0 10	1 34	0 03	-0 04
SKO	04/13/93	1340	20	S	86		1 40		8		3 5		8 2		78										0 18	2 44	0 00	-0 07

Appendix D. Explanatory Notes for Water Quality Data.

Location	Field Name	Description
A	SITE	site name
B	DATE	date of sample collection
C	TIME	time of sample collection
D	FC	fecal coliform (colony forming units per 100 milliliters)
E	K-FC	FC qualifier
F	LGFC	log10 of FC value
G	FCW	FC load (colony forming units per day)
H	LGFCW	log10 of FCW
I	FLOW	streamflow (cubic feet per second)
J	K-FLOW	FLOW qualifier
K	LGQRAW	log10 of streamflow value
L	GAGE	stream gage reading (feet of elevation - arbitrary zero)
M	K-GAGE	GAGE qualifier
N	TSS	total suspended solids (milligrams per liter)
O	K-TSS	TSS qualifier
P	LGTSS	log10 of TSS value
Q	TSSW	TSS load (pounds per day)
R	LGTSSW	log10 of TSSW
S	TURB	turbidity (Nephelometric Turbidity Units)
T	K-TURB	TURB qualifier
U	LGTRB	log10 of TURB value
V	ENT	enterococci (colony forming units per 100 milliliters)
W	K-ENT	ENT qualifier
X	LGENT	log10 of ENT value
Y	ENTW	ENT load (colony forming units per day)
Z	LGENTW	log10 of ENTW value
AA	EC	Escherichia coli (colony forming units per 100 milliliters)
AB	K-EC	EC qualifier
AC	LGEC	log10 of EC
AD	ECW	EC load (colony forming units per day)
AE	LGECW	log10 of ENTW value
AF	TEMP	stream temperature (degrees Celsius)
AG	K-T-HG	TEMP qualifier
AH	COND	conductivity (micromhos per centimeter)
AI	K-COND	COND qualifier
AJ	PH	pH (Standard units)
AK	K-PH	PH qualifier
AL	T-PH	temperature that pH thermister read at time of pH measurement (degrees Celcius)
AM	K-T-PH	T-PH qualifier
AN	DO	dissolved oxygen (milligrams per liter)
AO	K-DO	DO qualifier
AP	T-DO	temperature that DO meter read at time of DO measurement (degrees Celsius)
AQ	K-T-DO	T-DO qualifier
AR	WEEKID	identifier for week of year
AS	SDGTLBID	single digit sample identification number (may be called 1DGTLBID)
AT	LABID	four digit sample identification number (may be six digits)
AU	REPLCATE$	identifier for replicate samples
AV	SEASON	numerical identifier for season that sample was collected
AW	SEASON2$	character identifier for season that sample was collected
AX	MNTHCRIT$	identifier for month of year criteria
AY	MONTH	month that sample was collected
AZ	DAY	day that sample was collected
BA	YEAR	year that sample was collected
BB	PREC	24 hour precipitation for the day that sample was collected (inches)
BC	API	antecedent precipitation index (inches)
BD	A24HR	antecedent 24 hour precipitation (inches)
BE	A48HR	antecedent 48 hour precipitation (inches)
BF	A72HR	antecedent 72 hour precipitation (inches)

Appendix D. Explanatory Notes for Water Quality Data.

BG	APISLP	API slope - derived from the API values for the day before and day of sample collection
BH	APICRIT$	identifier for API criteria being met
BI	DRYSPL00	number of dry days (24 hour rainfall of 0.00 inches) into a dry spell
BJ	DRYSPL05	number of dry days (24 hour rainfall less than 0.05 inches) into a dry spell
BK	DRYSPL10	number of dry days (24 hour rainfall less than 0.10 inches) into a dry spell
BL	DDPR00	number of dry days (24 hour rainfall of 0.00 inches) preceeding rainfall
BM	DDPR05	number of dry days (24 hour rainfall of 0.05 inches) preceeding rainfall
BN	DDPR10	number of dry days (24 hour rainfall of 0.10 inches) preceeding rainfall

Site Name	Latitude	Longitude	Waterbody ID	Class
BCUL- Burns Creek culvert at bay side of road	47 06.33' N	123 02.69 W	-	-
BUR - Burns Creek, on the beach	47 06.33' N	123' 02.69 W	WA-14-1195	AA
GRN - Green Cove Creek	47 06.12' N	122 56.62' W	WA-13-1200	A
KND - Kennedy Creek	47 05.93' N	123 05.56' W	WA-14-1300	AA
MCL - McLane Creek	47 01.92' N	122 59.40' W	WA-13-1100	A
PIE - Pierre Creek	47 06.28' N	123 02.56' W	WA-14-1190	AA
PRY - Perry Creek	47 02.95' N	123 00.28' W	WA-14-1100	A
SHN - Schneider Creek	47 05.51' N	123 04.21' W	WA-14-1200	AA
SKO - Skookum Creek	47 06.21' N	123 05.40' W	WA-14-1400	AA

Data Qualifiers

U - the analyte was not detected at or above the reported result
X - high background count: plate crowded by other non-motile bacteria
S - spreader: plate crowded by other motile bacteria
J - analyte was positively identified, the reported result is an estimate
H - sample holding time was exceeded, result should be used with caution
> - greater than the reported result
MP - the MPN method was used rather than the MF method
r - estimated from rating curve
g - estimated from similar previous hydrologic/meteorologic conditions and interbasin flow relationships
RR - sample taken 1/4 mile upstream at railroad bridge; influence of Clary Creek not represented

NOTE: bacteria, tss, and turb values of 1 or 0 set to 1.1 for this table and for calculations;
where values were undetected, the detection limit was used in calculations and analyses
Skookum Creek (SKO) 1990-91 data were collected about 300 meters upstream (at the railroad bridge) from the 1992-93 sample site (at Kamilche Point Road bridge)