Staff Report of the
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

SURFACE WATER AMBIENT MONITORING PROGRAM FRESNO RIVER ANNUAL REPORT FISCAL YEAR 2001-2002

DRAFT

JULY 2003

State of California
California Environmental Protection Agency

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CENTRAL VALLEY REGION

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Special thanks to the United States Army Corps of Engineers;
Madera County Engineering; and the Central Sierra Watershed Committee

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FRESNO RIVER WATERSHED
ANNUAL REPORT FISCAL YEAR 2001-2002

EXECUTIVE SUMMARY

The Fresno River is located in Central California and it is the most southerly of the major eastside tributaries of the San Joaquin River, California. It rises on the western slopes of the Sierra Nevada and it flows in a southwesterly direction through the mountains and foothills and across the valley floor (via the eastside bypass) to the San Joaquin River. The Fresno River drainage area above Hidden Reservoir (a.k.a. Hensley Lake) consists of 234 square miles of mountainous and foothill terrain. It is about 33 miles in length and about 7 miles in width, and ranges in elevation from about 7,000 feet at the headwaters to about 300 feet at the dam. Tributaries that flow into the Fresno River include Lewis Creek, Nelder Creek, Redwood Creek, China Creek, Oak Creek, Miami Creek, Petersen Creek, and Coarsegold Creek. The river and tributaries flow in steep narrow canyons that have slopes ranging from 30 feet per mile in the headwaters areas to about 20 feet per mile near the reservoir. (United States Army Corps of Engineers, "USCOE, Hidden Lake, Fresno River Reservoir Regulation Manual," March 1975)

The State Water Resources Control Board (State Board) has developed a comprehensive monitoring program known as the Surface Water Ambient Monitoring Program (SWAMP). The SWAMP has provided funding to develop a surface water monitoring program to evaluate water quality within the San Joaquin River basin. Water quality results have been assessed using the water quality objectives contained in the Water Quality Control Plan for the Sacramento and San Joaquin Rivers – Fourth Edition 1998 (Basin Plan). During Fiscal Year (FY) 2001-2002, the intent of the study was to begin baseline sampling and gather preliminary data from the Fresno River and Hensley Lake. Algal blooms have been observed in Hensley Lake. The Fresno River watershed has been identified as a possible contributor of nutrients.

Four sampling events were conducted in the watershed between August 2001 and June 2002. The results indicate the following:

1. Of 35 samples collected on the Fresno River and its tributaries, eight did not meet the Basin Plan minimum numeric water quality objective for dissolved oxygen; two samples did not meet the minimum water quality objective for pH, two samples did not meet the maximum water quality objective for pH, and 17 samples did not meet the Basin Plan maximum electrical conductivity water quality objective;

2. Of 13 samples collected from Hensley Lake six did not meet the Basin Plan minimum numeric water quality objective for dissolved oxygen; five did not meet the maximum water quality objective for pH; and 9 of 12 samples exceeded the maximum electrical conductivity water quality objective

Due to the limited data obtained, additional monitoring is recommended to detect possible temporal, spatial, geographical, or other differences within the Fresno River watershed sampled

in FY 01-02. The County of Madera Engineering Department has been awarded a 205(j) grant to collect additional water quality data, develop a nutrient loading model, and develop a plan to reduce nutrients.

SURFACE WATER AMBIENT MONITORING PROGRAM
FRESNO RIVER WATERSHED
ANNUAL REPORT FISCAL YEAR 2001-2002

INTRODUCTION

The Fresno River is located in Central California and it is the most southerly of the major eastside tributaries of the San Joaquin River, California. It rises on the western slopes of the Sierra Nevada and it flows in a southwesterly direction through the mountains and foothills and across the valley floor (via the eastside bypass) to the San Joaquin River. The Fresno River drainage area above Hidden Reservoir (a.k.a. Hensley Lake) consists of 234 square miles of mountainous and foothill terrain. It is about 33 miles in length and about 7 miles in width, and ranges in elevation from about 7,000 feet at the headwaters to about 300 feet at the dam. Tributaries that flow into the Fresno River include Lewis Creek, Nelder Creek, Redwood Creek, China Creek, Oak Creek, Miami Creek, Petersen Creek, and Coarsegold Creek. The river and tributaries flow in steep narrow canyons that have slopes ranging from 30 feet per mile in the headwaters areas to about 20 feet per mile near the reservoir.

Soils in the area are predominantly decomposed granite and range in depth from shallow at high elevations to moderate at low elevations. Vegetation ranges from relatively dense coniferous forests to open grasslands.

The Fresno River watershed has a temperate semiarid climate characterized by cool wet winters and warm dry summers. Precipitation characteristics of the Fresno River watershed are significantly affected by topography. Normal annual precipitation varies from 50 inches in the headwater areas to 15 inches at Hensley Lake. About ninety percent of runoff producing precipitation occurs during the period from November to April.

Section 13192 of the Porter-Cologne Water Quality Control Act directs the State Water Resources Control Board (State Board) and Regional Water Quality Control Boards (Regional Boards) to develop a comprehensive surface water ambient monitoring program for the state. In order to meet this mandate, the State Board submitted a comprehensive monitoring program proposal entitled *Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program* to the California State Legislature on 30 November 2000. The proposal was expected to serve as a blueprint for implementing efforts both at the State and Regional Boards and was intended to protect and restore the State's water resources through the following:

1. Create an ambient monitoring program that addresses all hydrologic units of the State using consistent and objective monitoring, sampling, and analytical methods; consistent data quality assurance protocols; and centralized data management;

2. Document ambient water quality conditions in potentially clean as well as polluted areas;

3. Identify specific water quality problems preventing the State Board, Regional Boards, and the public from realizing beneficial uses of water in targeted watersheds; and

4. Provide data to evaluate the overall effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the State.

In order to accomplish the above goals, the Central Valley Regional Water Quality Control Board developed a *Surface Water Ambient Monitoring Program Work Plan* for Fiscal Year (FY) 2001-2002. The work plan takes into account that watersheds within the Central Valley vary extensively with respect to such features as ecology, topography, geology, and overall land use. Since each watershed has both a unique set of stakeholders and unique water quality concerns that should be addressed, the management process and the accompanying monitoring programs are somewhat watershed specific. The purpose of this Report is to document the data collection activities conducted within the Fresno River watershed in accordance with the Fiscal Year (FY) 01-02 Work Plan for the San Joaquin River Basin.

BENEFICIAL USES

Protection and enhancement of beneficial uses of water against water quality degradation is a basic requirement of water quality planning under the Porter Cologne Water Quality Control Act. The potential sources of contaminants and associated pollutants for the Fresno River watershed have not yet been identified. The monitoring program for FY 01-02 was primarily designed to address potential nonpoint source impacts, since most significant water quality problems in the region result from nonpoint sources (see 1998 Clean Water Act Section 303(d) List and 1996 Water Quality Assessment). Potential sources include, but are not limited to, publicly and privately owned treatment works, individual septic tanks, livestock grazing, development, and recreation. The monitoring indicators assessed in FY 01-02 included water temperature, water quality constituents, and microorganisms. The analytical results have been evaluated against narrative and numeric water quality objectives in the Basin Plan.

MONITORING LOCATIONS

During FY 01-02, monitoring locations were identified in the watershed with the assistance of staff of the Madera County Engineering Department. Sample locations were chosen along the Fresno River, at the confluence of tributaries to the Fresno River, at the inflow, mid point, and outflow of Hensley Lake and a cove within the lake where algal blooms have been observed. Sample locations were from an elevation of 4,300 feet at Lewis Creek to 400 feet in elevation at Hensley Lake. Additional consideration in choosing sample sites included public access and safety issues. Sampling efforts on the mainstem of the Fresno River, its tributaries, and Hensley Lake which drains the western face of the Sierra Nevada were intended to be on a monthly timetable to begin to establish baseline water quality conditions and to detect potential variations on a temporal and spatial scale. The sampling timetable was adjusted due to contracting and personnel issues.

Because funding for the FY 01-02 was limited, the overall sampling strategy for the watershed was based on a directed sampling approach. As there is limited quantitative data available for the Fresno River watershed, physical, chemical, and microbiological parameters were assessed to provide baseline information.

SAMPLE DESIGN AND COLLECTION

Sample collection, preservation, and transport were conducted in accordance with the Fresno River System Sampling Plan (September 2001). Sample collection was conducted by Regional Board staff with assistance from the Madera County Engineering Department. Sample collection included surface water grab samples and field measurements. Grab samples were collected into laboratory supplied containers and immediately cooled to 4 degrees celsius for transfer to the laboratory. The water samples were transported to The Twining Laboraties, Inc. where they were cultured for bacterial population identification and distribution. Water samples were also collected for shipment to the University of California at Davis Limnology Laboratory and analzyed for nutrients; and Physical measurements were collected in the field using hand held meters. During sampling events from August 2001 through December 2001 electrical conductivity, dissolved oxygen and temperature were measured using a YSI 85 meter and pH was measured using a Checker meter. The June 2002 sampling utilized the following equipment: a YSI 30 meter to measure electrical conductivity, dissolved oxygen and temperature were measured using a YSI 55 meter, and pH was measured using an Oakton pH tester 2. Reservoir water clarity was visually measured using a Secchi disk. Specific monitoring sites for each of the water bodies are listed in Attachment A. Sample sites were designated using a Global Positioning System and photographic documentation. At each monitoring site, samples were collected and analyzed for the following paramenters as the budget allowed:

- Water Temperature
- pH
- Electrical Conductivity
- Dissolved Oxygen
- Water Clarity (reservoirs)
- Total Coliform
- Fecal coliform
- E. coli
- Fecal Streptococcus

Sample collection dates for FY 01-02 are summarized in Table 1.

TABLE 1
FRESNO RIVER WATERSHED
SAMPLING DATES
FISCAL YEAR 2001-2002

Sample Location	*First Sampling Event*	*Second Sampling Event*	*Third Sampling Event*	*Fourth Sampling Event*
Fresno River and Tributaries	8/20/01	10/15/01	12/13/01	6/25/02
Hensley Lake	8/21/01	10/16/01		6/27/02

RESULTS AND DISCUSSION

Water quality objectives for inland surface waters for the chemical parameters examined during FY 01-02 are summarized from the Water Quality Control Plan for the Sacramento and San Joaquin Rivers Basin Plan in Table 2.

TABLE 2
TULARE LAKE BASIN PLAN
SURFACE WATER QUALITY OBJECTIVES

Stream	*pH*	*Minimum Dissolved Oxygen (mg/L)*	*Maximum Electrical Conductivity (uS/cm)*
Fresno River	6.5 to 8.5	WARM 5	150
Fresno River		COLD 7	
Hensley Lake	6.5 to 8.5	COLD 7	150

mg/L = milligrams per liter
uS/cm = microSiemens per centimeter

The microorganism data is currently being evaluated to determine if a baseline for microbiological load can be established. The Sacramento and San Joaquin Rivers Basin Plan states:

> *"In waters designated contact recreation (REC-1) the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml."*

Because five samples for any 30-day period were not collected during the Surface Water Ambient Monitoring Program (SWAMP) sampling events, the resultant information should not be evaluated against the Basin Plan bacteria water quality objective. However, the information is useful in determining which sampling sites, if any, may necessitate more intensive sampling in the future. The Fresno River watershed is designated contact recreation (REC-1) as a beneficial use.

A comprehensive summary of the sample analytical results for the watershed is in Attachment B. General trends in the data are discussed below and, where applicable, the results evaluated against narrative and numeric water quality objectives summarized in the Basin Plan. Overall, due to the limited number of sampling events for FY 01-02, there is not enough data to submit to parametric testing and derive any meaningful statistical analysis with respect to temporal, spatial, geographical, or other differences within the watershed in FY 01-02. Therefore, additional samples are necessary to characterize reference and baseline water body conditions within the watershed.

Fresno River

The results indicate water samples collected and analyzed during the first two sampling events for FY 01-02 met the narrative water quality objectives of the Basin Plan for nutrients. Two of the seven samples collected on 20 August 2001 and all of the samples collected on 15 October 2001 did not meet the minimum dissolved oxygen water quality objective. Minimum dissolved oxygen water quality objectives were met on all samples collected on 13 December 2001 and 25 June 2002. The water quality objective for pH was met for all samples collected on 15 October 2001. One of seven samples on 20 August 2001 and one of eight samples on 25 June 2002 exceeded the water quality

objective for pH. Two of twelve samples collected on 13 December 2001 were less than the minimum water quality objective for pH. The water quality objective maximum allowable for electrical conductivity was exceeded five of seven times for samples collected on 20 August 2001, six of eight samples collected on 15, 16 October 2001, five of twelve samples collected on 13 December 2001, and three of eight samples collected on the 25th and 27th of June 2002. Future sampling events should include random laboratory analysis of electrical conductivity, dissolved oxygen, and pH to determine the precision and accuracy of the field meters. Attachment A provides an analysis of the sample results obtained during the sampling event.

Hensley Lake

The results indicate water samples collected and analyzed during the first two sampling events for FY 01-02 met the narrative water quality objectives of the Basin Plan for nutrients and the numeric water quality objective for dissolved oxygen on samples collected on 27 June 2002. The dissolved oxygen minimum water quality objective was not met on two of four samples collected on 21 August 2001 and all of the samples collected on 16 October 2001. The numeric water quality objective for pH was exceeded three of four samples collected on 21 August 2001, and two of four samples collected on 16 October 2001. All pH samples collected on 27 June 2002 met the water quality objective. The maximum numeric water quality objective for electrical conductivity was exceeded on all samples collected on 21 August 2001, and 27 June 2002. The electrical conductivity samples collected on 16 October 2001 met the numeric water quality objective. Future sampling events should include random laboratory analysis of electrical conductivity, dissolved oxygen, and pH to determine the precision and accuracy of the field meters. Attachment B provides an analysis of the sample results obtained during the sampling event.

REFERENCES

California Regional Water Quality Control Board, Central Valley Region. 19 January 2001. *Watershed Management Initiative*.

California Regional Water Quality Control Board, Central Valley Region. September 2001. *Draft Fresno River System Sampling Plan*.

California Regional Water Quality Control Board, Central Valley Region. August 2001. *Draft Fresno River Nutrient and Bacteria Monitoring Quality Assurance Project Plan.*

California Regional Water Quality Control Board, Central Valley Region. 1998. *The Water Quality Control Plan for the Sacramento and San Joaquin Rivers, Fourth Edition, 1998*.

State Water Resources Control Board, California Environmental Protection Agency. January 2002. Porter Cologne Water Quality Control Act, §13192.

State Water Resources Control Board, California Environmental Protection Agency. 30 November 2000. *Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program, Report to the Legislature*.

United States Army Corps of Engineers. March 1975 *USCOE, Hidden Lake, Fresno River Reservoir Regulation Manual.*

ATTACHMENT A

Sample Station Locations

Station ID	Sample Station – Fresno River & Tributaries	Latitude	Longitude	Approximate Location
FRR010	Sugar Pine			Lewis Fork below the community of Sugar Pine
FRR020	Cedar Valley			Lewis Fork below the community of Cedar Valley
FRR030	Sky Ranch Road	37.37664 N	119.62233 W	Lewis Fork of the Fresno River at Sky Ranch Road
FRR040	Cheapo Saddle	37.32952 N	119.66319 W	Cheapo Saddle drainage on Road 427 in the town of Oakhurst
FRR050	Upstream of WWTF	37.33674 N	119.68389 W	Fresno River above Oakhurst WWTF below the confluence of China Creek
FRR060	Downstream of WWTF	37.35087 N	119.74522 W	Fresno River downstream of Oakhurst WWTF
FRR070	Fresno River - Miami Creek	37.23713 N	119.77524 W	Fresno River above the confluence of Miami Creek
FRR080	Fresno River - downstream of Miami Creek	37.35087N	119.74922W	Fresno River below the confluence of Miami Creek near Awanhnee
FRR090	Fresno River - Spangle Gold Creek	37.23713N	119.77524W	Fresno River below the confluence of Spangle Gold Creek
FRR100	Fresno River - Coarse Gold Creek			Fresno River above confluence of Coarse Gold Creek near Road 400
FRR110	Fresno River - downstream of Coarse Gold Creek			Fresno River below the confluence of Coarse Gold Creek before the inlet to Hensley Lake near Road 400
NEC010	Nelder Creek - Lewis Fork			Nelder Creek just upstream from the confluence with Lewis Fork
PEC010	Peterson Creek - Miami Creek			Peterson Creek just above the confluence with Miami Creek
CHC010	China Creek - Fresno River			China Creek upstream from the confluence with the Fresno River in Oakhurst
CGC010	Coarse Gold Creek - Highway 41			Coarse Gold Creek at Highway 41 Bridge just south of Coarsegold
CGC020	Coarse Gold Creek - Meadow Ridge Lane Bridge	37.218450N	119.710855W	Coarse Gold Creek at Meadow Ridge Lane Bridge approximately ¼ mile west of Highway 41
CGC030	Coarse Gold Creek at Yosemite Springs Parkway			Coarse Gold Creek at Yosemite Springs Parkway Bridge one mile west of Highway 41
CGC040	Coarse Gold Creek - Fresno River			Coarse Gold Creek upstream from the confluence with the Fresno River near Road 400
CRC010	Crooks Creek - Fresno River			Crooks Creek above the confluence to Fresno River
MIC010	Miami Creek - Peterson Creek			Miami Creek just below confluence with Peterson Creek

*Due to terrain some latitude and longitude readings were not available by GPS

ATTACHMENT A CONTINUED

Station ID	Sample Station	Latitude	Longitude	Approximate Location
HEL010	Hensley Lake - inflow	37.13824 N	119.87113 W	Inlet
HEL020	Hensley Lake - midpoint	37.12731 N	119.87725 W	Restroom #7 is east of sample point
HEL030	Andy's Cove	37.10817 N	119.87752 W	Andy’s Cove near Road 400
HEL035	North end Andy's Cove	37.10797 N	119.86976 W	Andy’s Cove near Road 400 close to parking area
HEL040	Hensley Lake - outflow	37.11200 N	119.88400 W	Outlet west side of tower

ATTACHMENT B
SUMMARY OF ANALYTICAL RESULTS

Fresno River & Tributaries

Sample Location	Sample Date	Water Temp Celcius	DO mg/L	pH	Conductivity us/cm	TKN ug/L	Ammonium ug/L	NO2/NO3 as N ug/L	PO4 ug/L	Soluble PO4 ug/L
FRR010	8/20/01	13.60	8.48	7.48	52.4	78.0	5.6	52.0	26.0	11.0
FRR020	8/20/01	16.60	7.84	7.71	37.0	94.0	7.1	32.0	40.0	15.0
FRR050	8/20/01	24.60	4.59	7.2	295.0	210.0	<3.0	6.5	19.0	7.7
FRR060	8/20/01	24.70	7.57	7.99	476.5	210.0	3.2	6.5	22.0	8.9
FRR080	8/20/01	27.40	7.23	8.88	604.0	210.0	5.2	5.4	21.0	7.0
FRR090	8/20/01	27.90	4.25	7.9	456.3	370.0	19.0	17.0	37.0	8.8
NEC010	8/20/01	16.30	8.47	7.9	230.5	120.0	4.4	18.0	27.0	14.0
FRR010	10/15/01	8.50	3.61	7.68	7.9	79.0	2.9	54.0	15.0	8.4
FRR020	10/15/01	11.60	3.76	6.65	1.5	41.0	<3	<10	22.0	11.0
FRR050	10/15/01	14.80	3.63	7.14	209.8	97.0	<3	<10	18.0	4.5
FRR080	10/15/01	17.10	3.66	7.88	367.4	82.0	<3	<10	9.2	1.8
FRR090	10/15/01	18.30	5.05	7.86	525.0	250.0	3.2	<10	16.0	1.8
NEC010	10/15/01	11.10	3.84	7.36	169.7	91.0	<3	15.0	13.0	10.0
FRR060	10/16/01	17.30	2.99	8.15	328.4	110.0	<3.0	<10	15.0	3.4
FRR010	12/13/01	2.30	7.43	6.0	1.9					
FRR020	12/13/01	2.00	8.42	6.4	1.2					
FRR050	12/13/01	3.60	8.3	7.5	149.8					
FRR080	12/13/01	4.70	7.5	7.8	260.8					
FRR090	12/13/01	6.80	5.25	7.9	219.5					
NEC010	12/13/01	3.10	9.26	6.6	125.7					
PEC010	12/13/01	6.80	5.6	7.7	12.0					
CGC010	12/13/01	5.70	5.3	7.8	9.2					
CGC020	12/13/01	7.10	5.85	8.0	245.9					
CGC030	12/13/01	9.30	5.24	8.0	156.3					
CRC010	12/13/01	6.90	6.75	7.6	1052.0					
MIC010	12/13/01	3.60	6.15	7.6	1.5					
FRR010	6/25/02	14.30	8.41	8.1	48.6					
FRR020	6/25/02	15.50	8.73	8.1	67.0					
FRR030	6/25/02	17.00	8.28	8.3	68.4					
FRR050	6/25/02	23.50	9.3	8.4	149.4					
FRR060	6/25/02	26.60	8.36	8.2	188.2					
FRR080	6/25/02	28.70	7.38	8.6	243.5					
FRR090	6/27/02	25.70	8.58	8.3	234.0					
NEC010	6/25/02	16.80	8.81	8.2	143.5					

DO = Dissolved Oxygen
MPN/100 ml = Most Probable Number per 100 milliters
mg/L = milligrams per liter
uS/cm = microSiemens per centimeter
ug/L = micrograms per liter
< = Less than
TKN = Total Kjeldahl Nitrogen
NO2/NO3 as N = Nitrite/Nitrate as Nitrogen
PO4 = Phoosphorus

Attachment B Continued

Fresno River & Tributaries

Sample Location	Sample Date	Total Coliform MPN/100 ml	E. Coli MPN/100 ml	Fecal Coliform MPN/100 ml	Fecal Strep MPN/100 ml
FRR010	8/20/01	170	33	33	300
FRR020	8/20/01	240	130	130	500
FRR050	8/20/01	500	80	80	80
FRR060	8/20/01	240	130	130	11
FRR080	8/20/01	240	30	30	1600
FRR090	8/20/01	1600	30	30	34
NEC010	8/20/01	>1600	500	500	300
FRR010	10/15/01	300	23	23	500
FRR020	10/15/01	170	30	30	240
FRR050	10/15/01	220	30	30	50
FRR080	10/15/01	60	23	23	280
FRR090	10/15/01	500	23	23	50
NEC010	10/15/01	240	130	130	500
FRR060	10/16/01	70	50	50	300
FRR010	6/25/02	70	26	26	300
FRR020	6/25/02	30	17	17	300
FRR030	6/25/02	170	130	130	300
FRR050	6/25/02	130	130	130	280
FRR060	6/25/02	240	240	240	500
FRR080	6/25/02	240	240	240	70
FRR090	6/27/02	130	22	22	240
NEC010	6/25/02	900	280	110	240

MPN/100 ml = Most Probable Number per 100 milliters
> = Greater than
< = Less than

Attachment B continued

Hensley Lake

Sample Location	Sample Date	Water Temp Celcius	DO mg/L	pH	Conductivity us/cm	Secci Disk Meters	TKN ug/L	Ammonium	NO2/NO3 as N ug/L	PO4 ug/L	Soluble PO4
HEL010	8/21/01	26.80	4.82	8.19	175.5	1.1	630.0	30.0	45.0	56.0	8.4
HEL020	8/21/01	27.10	5.08	8.69	172.0	0.8	650.0	6.4	26.0	55.0	4.3
HEL030	8/21/01	27.00	4.6	8.94	165.9	0.9	560.0	5.2	12.0	50.0	4.7
HEL040	8/21/01	26.40	5.92	8.96	159.3	1.1	420.0	11.0	24.0	44.0	3.6
HEL010	10/16/01	21.53	3.37	8.18	150.0	0.6	550.0	50.0	41.0	59.0	12.0
HEL020	10/16/01	21.00	3.41	8.09	148.0	0.6	570.0	42.0	37.0	62.0	10.0
HEL030	10/16/01	22.20	3.71	9.38	150.0	0.6	800.0	14.0	12.0	60.0	3.2
HEL040	10/16/01	21.50	3.26	8.59		0.6	780.0	14.0	15.0	64.0	4.1
HEL010	6/27/02	26.50	8.41	8.3	162.3	2.0					
HEL020	6/27/02	26.50	8.48	8.5	160.4	3.0					
HEL030	6/27/02	27.10	8.45	8.5	160.7	2.4					
HEL035	6/27/02	27.20	7.88	8.3	162.1	1.4					
HEL040	6/27/02	26.20	8.35	8.3	160.2	0.4					

DO = Dissolved Oxygen
MPN/100 ml = Most Probable Number per 100 milliters
mg/L = milligrams per liter

uS/cm = microSiemens per centimeter
ug/L = micrograms per liter
< = Less than

TKN = Total Kjeldahl Nitrogen
NO2/NO3 as N = Nitrite/Nitrate as Nitrogen
PO4 = Phoosphorus

Attachment B Continued

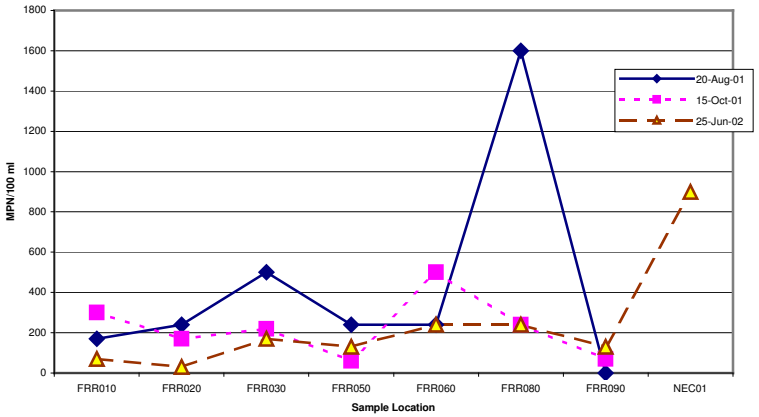
Henslev Lake

Sample Location	Sample Date	Total Coliform MPN/100 ml	E. Coli MPN/100 ml	Fecal Coliform MPN/100 ml	Fecal Strep MPN/100 ml
HEL010	8/21/01	<2	<2	<2	<2
HEL020	8/21/01	<2	<2	<2	<2
HEL030	8/21/01	<2	<2	<2	<2
HEL040	8/21/01	2	<2	<2	<2
HEL010	10/16/01	<2	<2	<2	<2
HEL020	10/16/01	<2	<2	<2	<2
HEL030	10/16/01	4	<2	<2	<2
HEL040	10/16/01	2	2	2	4
HEL010	6/27/02	8	<2	<2	4
HEL020	6/27/02	<2	<2	<2	<2
HEL030	6/27/02	4	<2	<2	<2
HEL035	6/27/02	13	<2	<2	<2
HEL040	6/27/02	8	<2	<2	<2

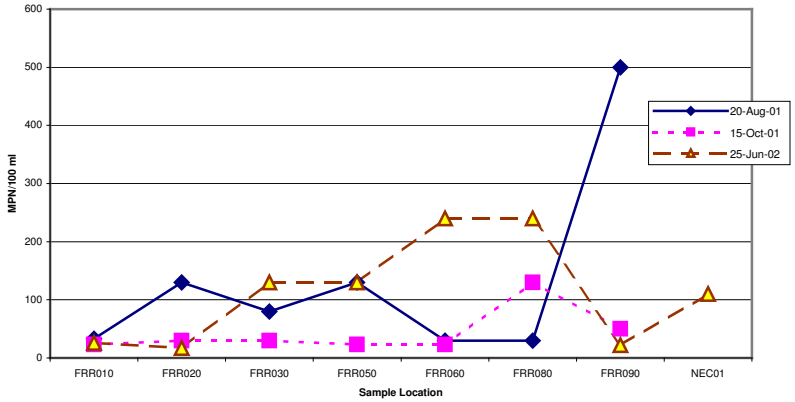
MPN/100 ml = Most Probable Number per 100 milliters
< = Less than

ATTACHMENT C
ANALYTICAL TRENDS, FRESNO RIVER & TRIBUTARIES

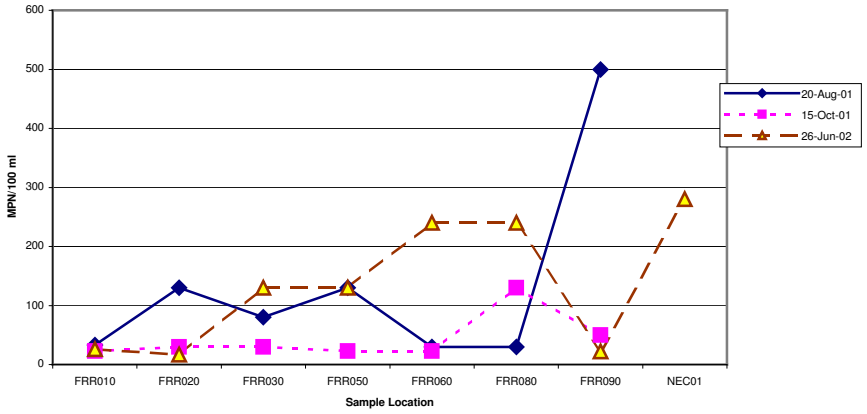
Total Coliform



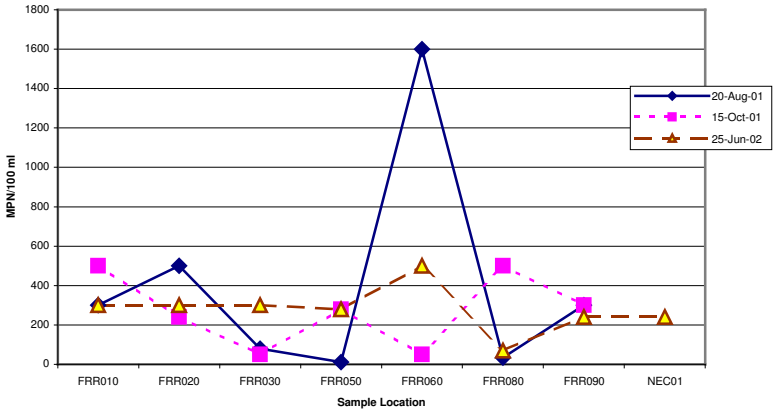
Fecal Coliform



E. Coli

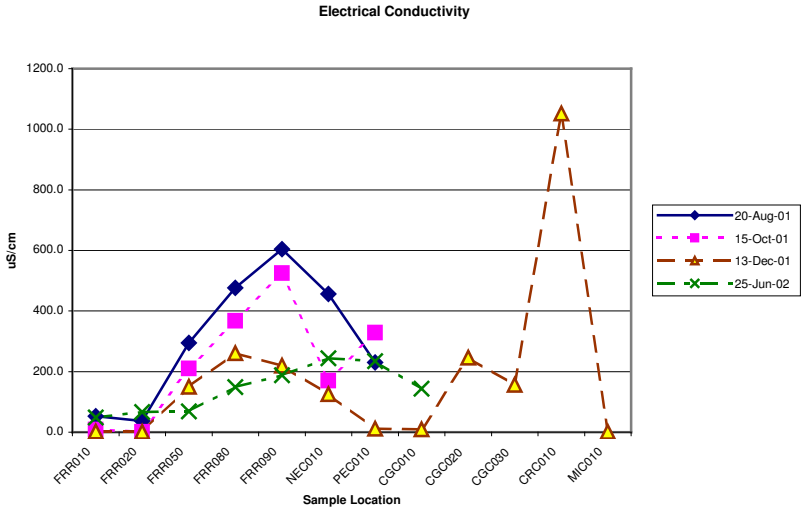


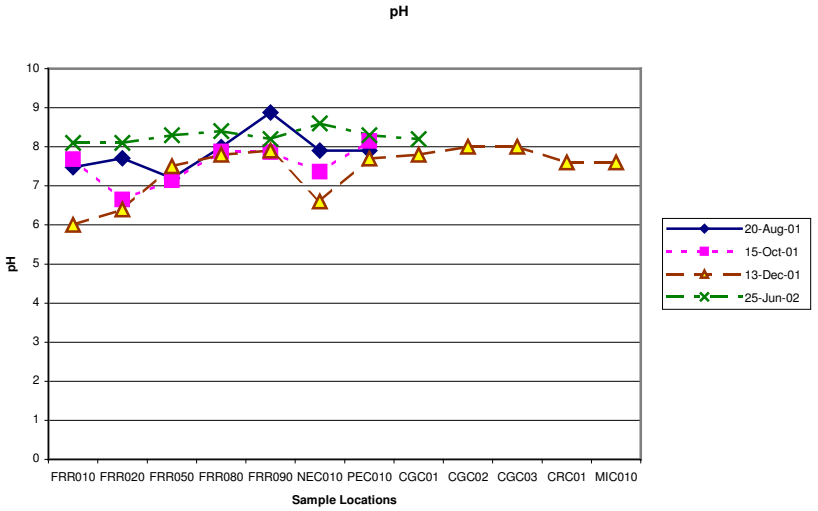
Fecal Streptococcus

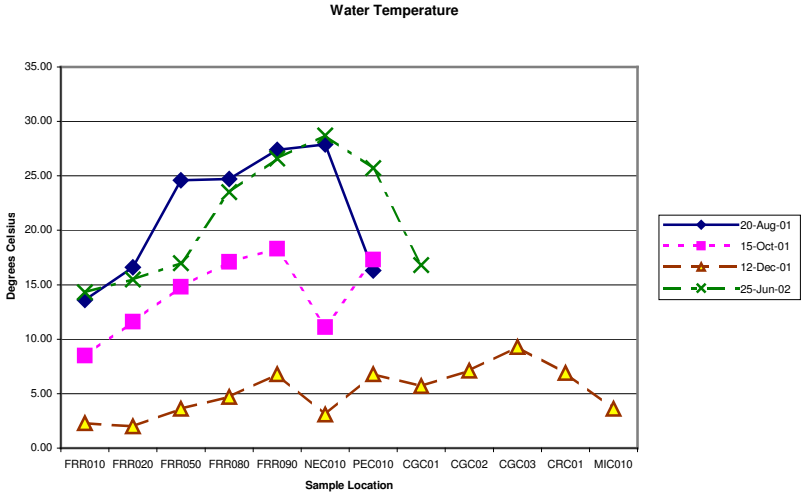


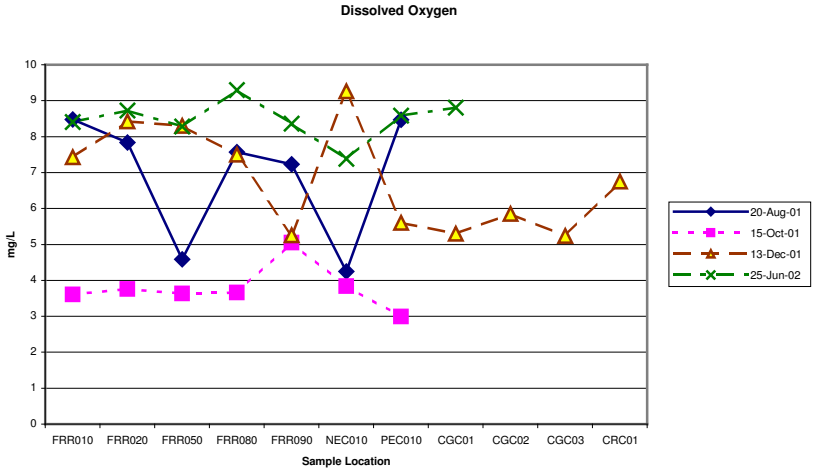
MPN/100 ml = Most Probable Number per 100 milliliters

ATTACHMENT C CONTINUED



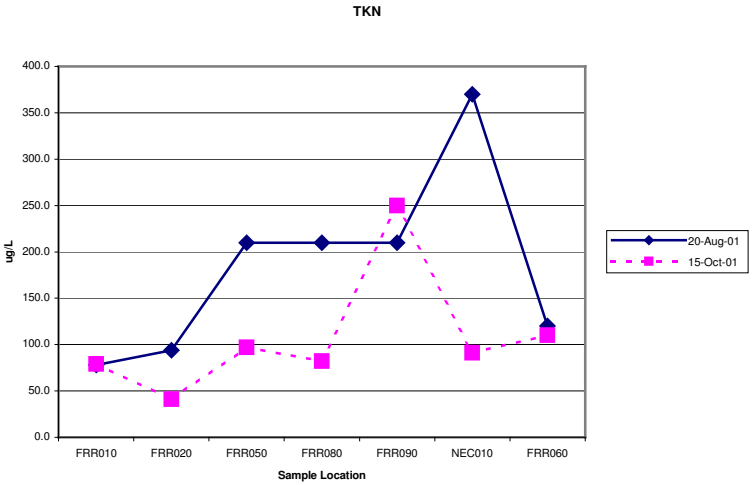


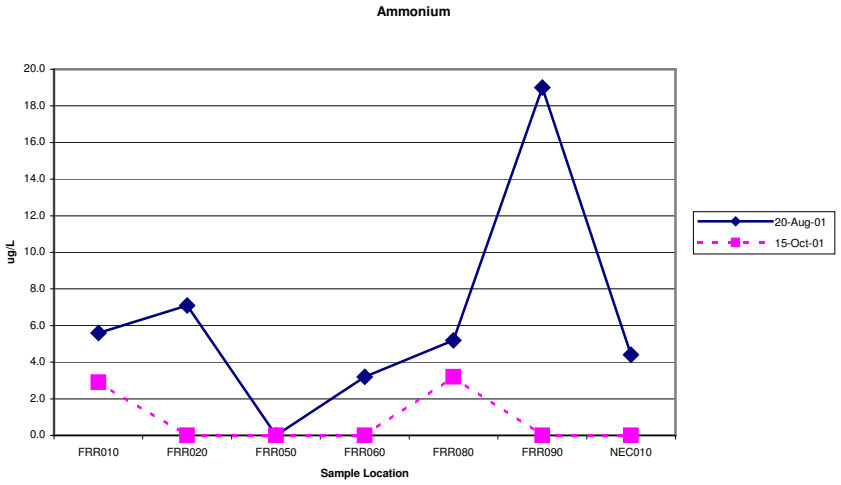


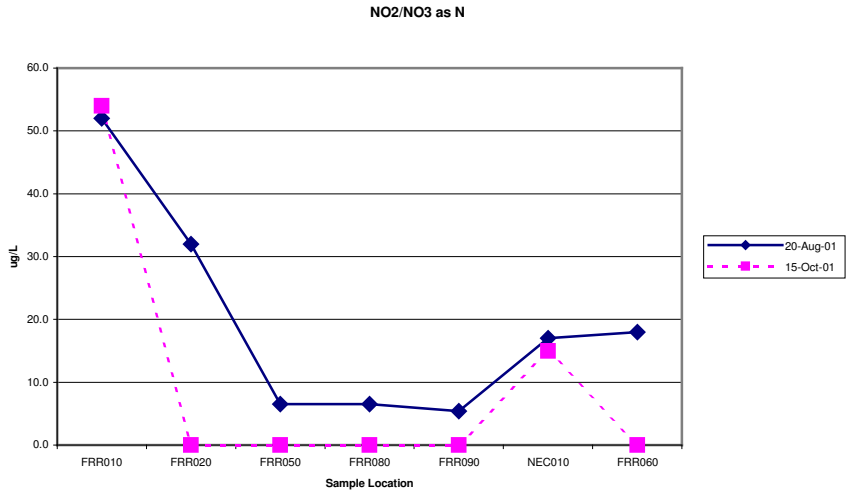


uS/cm = microSiemens per centimeter
mg/L = milligrams per liter

ATTACHMENT C CONTINUED





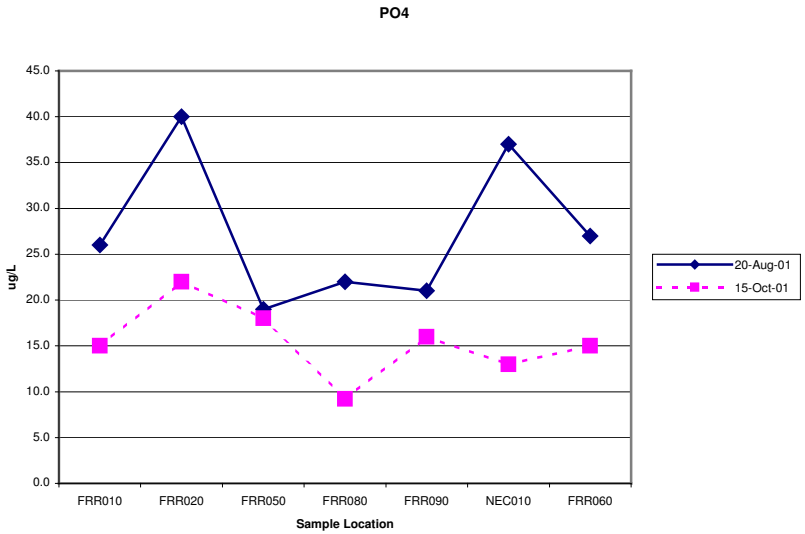


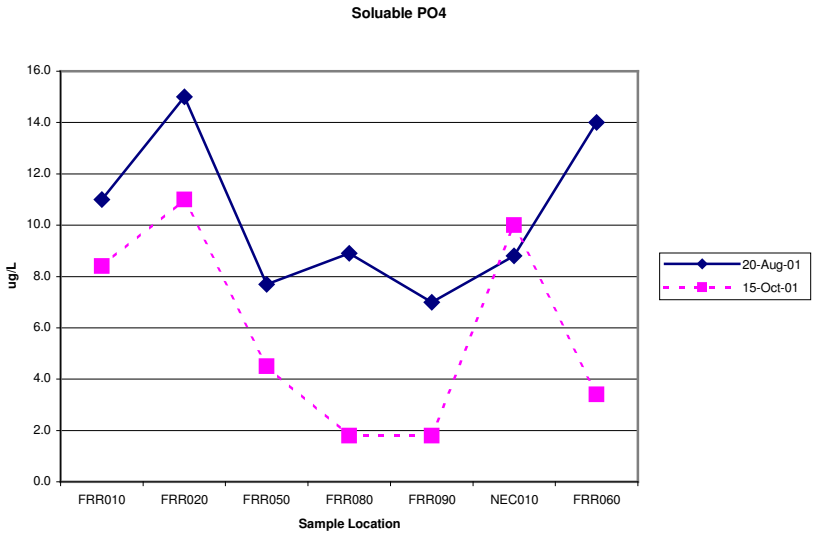
TKN = Total Kjeldahl Nitrogen

ug/L = micrograms per liter

NO2/NO3 as N = Nitrite/Nitrate as Nitrogen

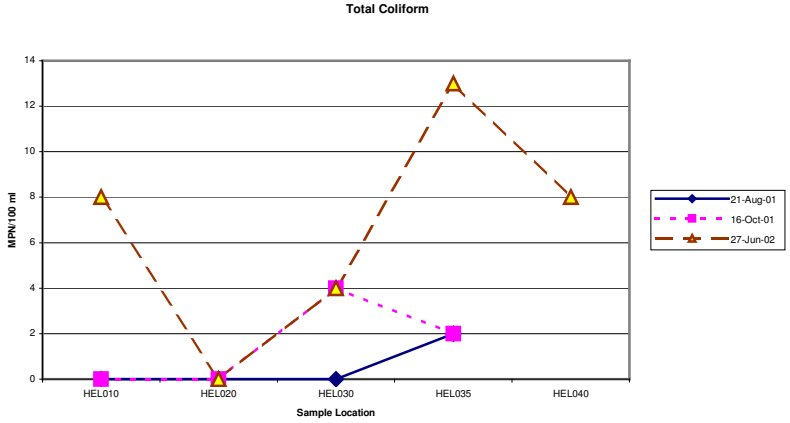
ATTACHMENT C CONTINUED

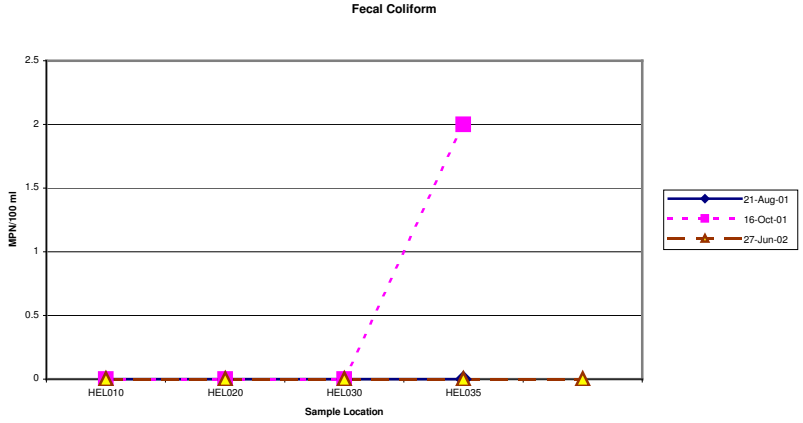


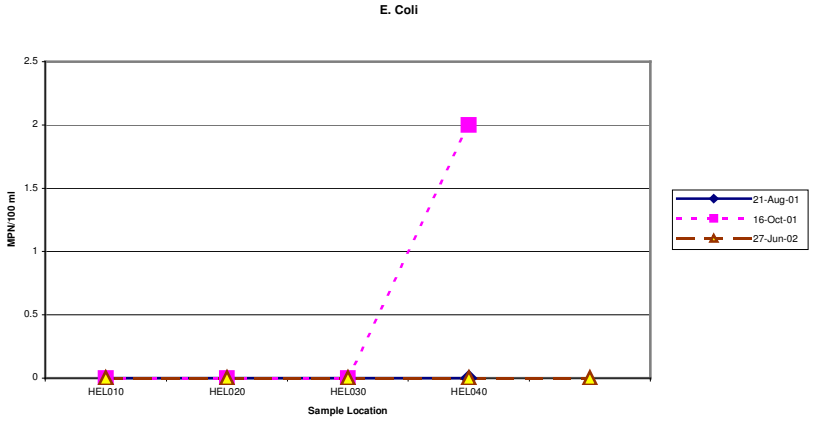


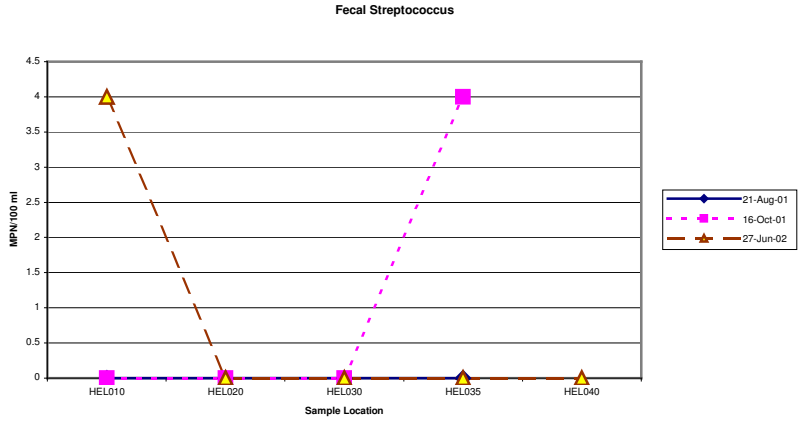
PO4 = Phosphorus
ug/L = micrograms/liter

ATTACHMENT D
ANALYTICAL TRENDS, HENSLEY LAKE



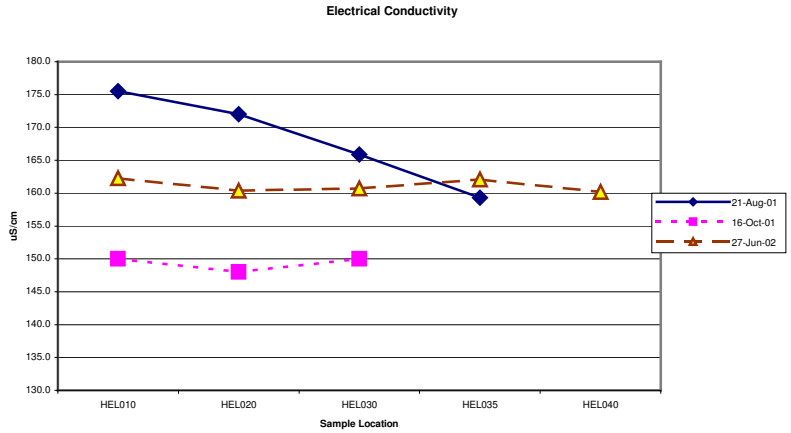


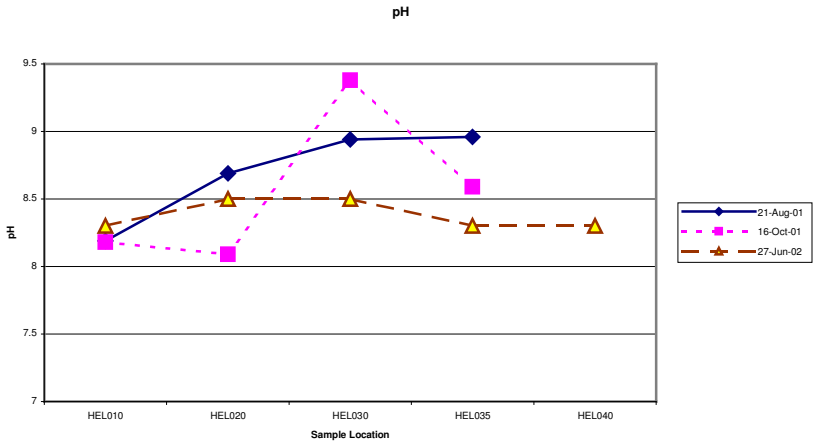


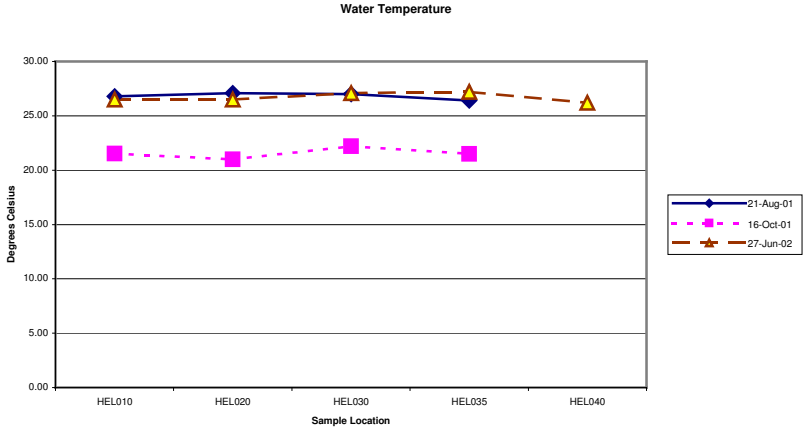


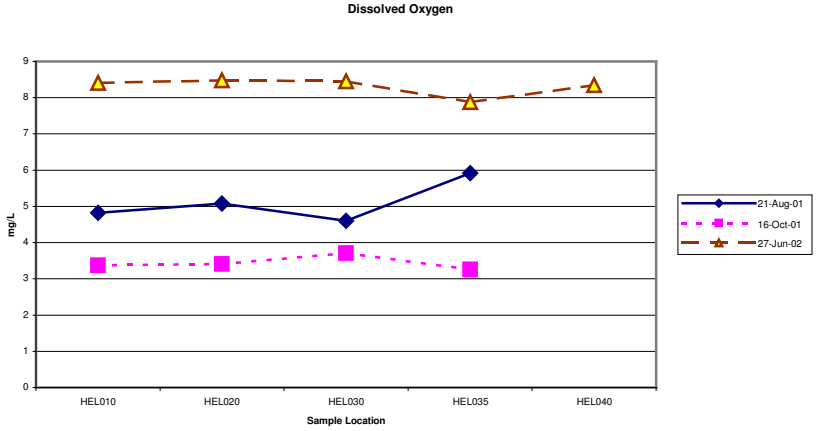
MPN = Most Probable Number per 100 milliliters

ATTACHMENT D CONTINUED





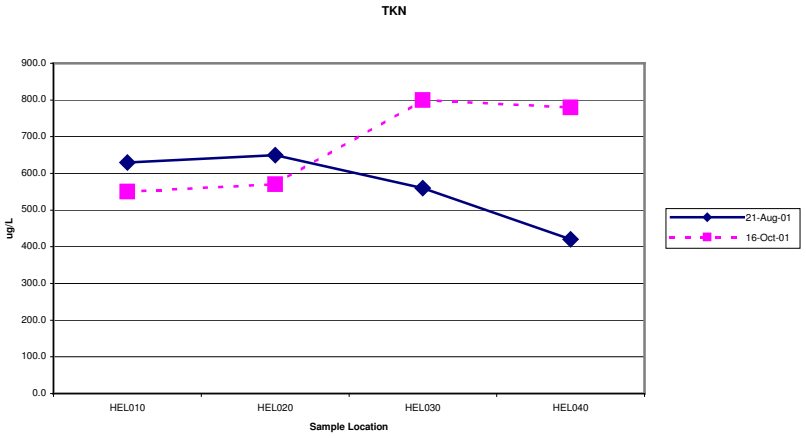


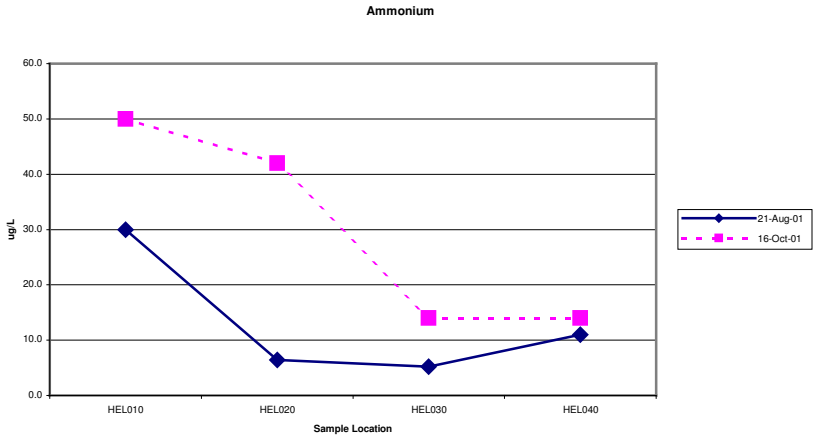


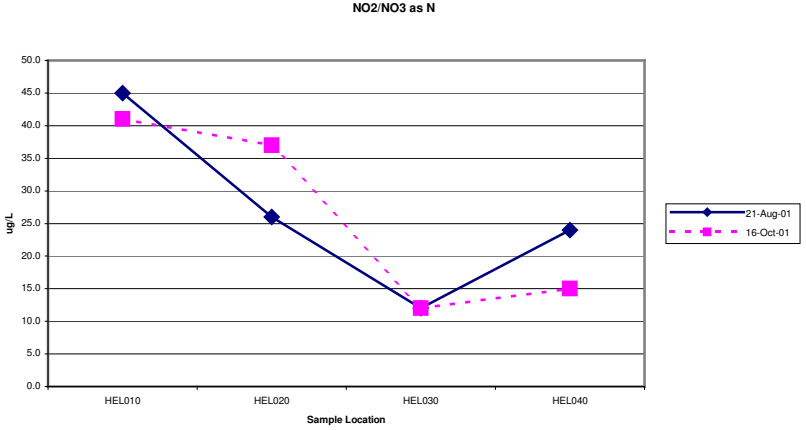
uS/cm = microSiemens per centimeter

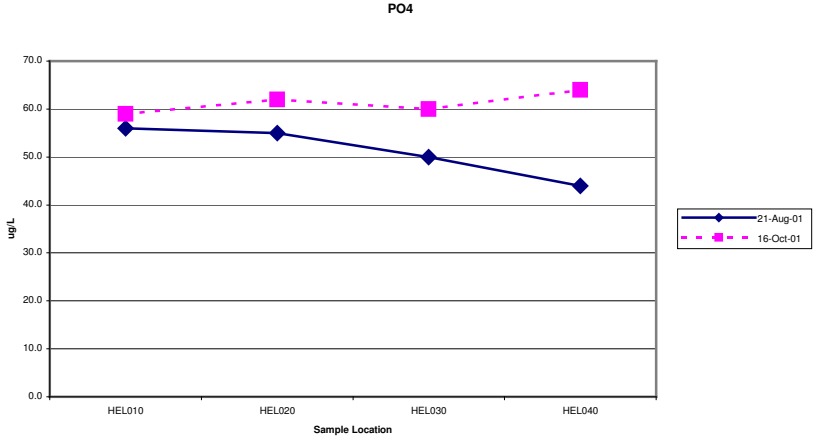
mg/L = milligrams per liter

ATTACHMENT D CONTINUED









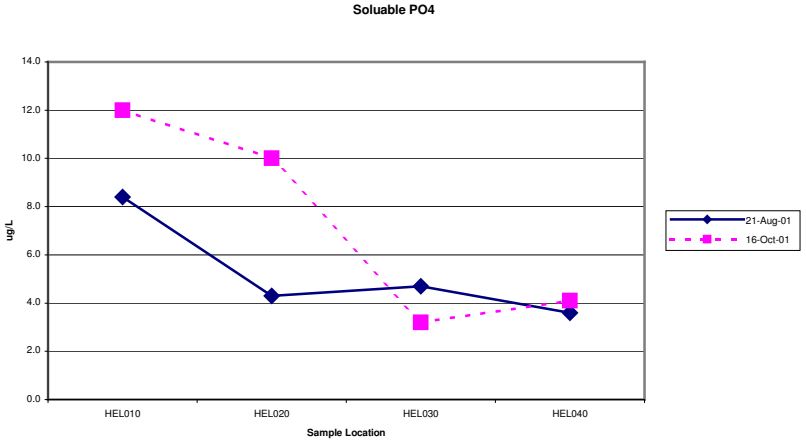
TKN = Total Kjeldahl Nitrogen

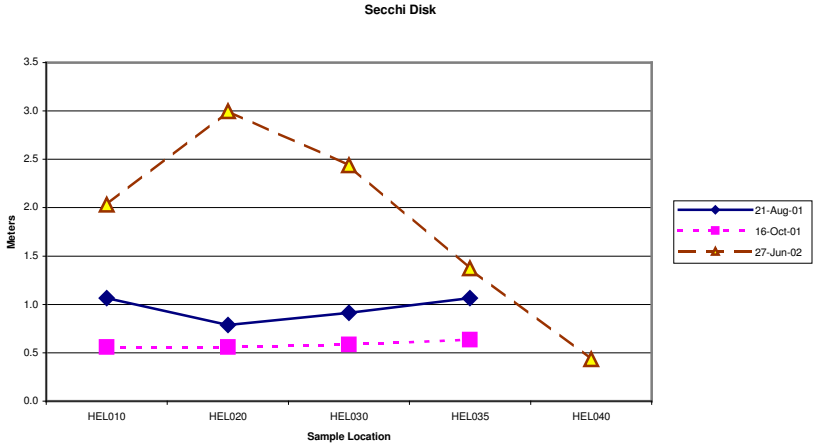
NO2/NO3 as N = Nitrite/Nitrate as Nitrogen

ug/L = micrograms per liter

PO4 = Phosphorus

ATTACHMENT D CONTINUED





PO4 = Phosphorus

ug/L = micrograms/liter