# Delta Island Drainage Investigation Report

of the Interagency Delta Health Aspects Monitoring Program

A Summary of Observations During Consecutive Dry Year Conditions

Water Years 1987 and 1988

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June 1990

California Department of Water Resources
Division of Local Assistance
Sacramento, California

The cover photo is an aerial view of one of the many channels meandering through the Sacramento-San Joaquin Delta. The Delta is an intricate network of channels and islands encompassing 700,000 acres.

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This report was prepared under contract by Marvin Jung, Water Quality Consultant (Marvin Jung & Associates, Inc., Sacramento). Portions of the report were written by B. J. Archer, Registered Professional Engineer and Michael Sutliff, DWR Sanitary Engineer.

# Acknowledgements

Suggestions to the study were made by the following six participants, who served as the Delta Islands Drainage Investigation technical advisors:

*Jack Baber, Chairman, Reclamation District 1004*
*Mike Catino, California Central Valley Flood Control Association*
*Thomas M. Hardesty, Manager, Reclamation District 2068*
*Alex Hildebrand, Trustee, Reclamation District 2075 and South Delta Water Agency*
*Donald Kienlen, Consultant, Murray, Burns & Kienlen Engineers*
*James Shanks, Trustee, Reclamation District 38*

The views and opinions expressed in this Department of Water Resources report do not necessarily reflect those of the Delta Islands Drainage Investigation Technical Advisory Commitee participants nor are endorsed by them.

We appreciate the cooperation given to the Department by the reclamation districts and landowners for sampling drains in the Delta.

We also thank Professor Gary L. Amy, Department of Civil Engineering, University of Arizona for the use of his data and review comments.

The Technical Advisory Group of the Interagency Delta Health Aspects Monitoring Program also provided technical assistance to this study. The advisory group members included:

*Keith Carns, East Bay Municipal Utility District*
*John Coburn, State Water Contractors*
*Andrew Florendo, Alameda County Flood Control and Water Conservation District, Zone 7*
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# I. Summary

## Study Description

The Delta Island Drainage Investigation (DIDI) was established to assess the impacts of Delta island drainages on the quality of drinking water supplies taken from the Delta. The study was initiated after data from the Interagency Delta Health Aspects Monitoring Program (IDHAMP) showed high total trihalomethane formation potential (TTHMFP) in island drainages.

The Delta Islands Drainage Investigation was developed to collect information about:

1. What is the quality and quantity of Delta island drain water?

2. What processes affect the quality and quantity of island drainages?

3. What water quality impacts in the channels and at drinking water supply intakes are due to Delta island drainages?

4. How do the contributions from Delta island drainages compare with other major sources, which may include the San Francisco Bay estuary, inflows and drainages from rivers such as the San Joaquin, from Delta channels, and from weather-related events?

5. If the treatability and cost of treatment of Delta waters are affected, what are the alternatives for managing these impacts?

The information is intended to aid in making decisions about watershed management, discharge requirements, water quality monitoring, and water treatment requirements.

At this time, the study is continuing to address the first three questions stated above. Therefore, ***only preliminary conclusions are presented***. The purpose of this report is to summarize the progress and planned direction of this study for water agencies and the general public.

## The THM/DBP Problem

Water utilities are required to meet federal and state drinking water standards that have been established for the protection of human health. THMs or trihalomethanes are a class of organic compounds that are regulated. The current Maximum Contaminant Level (MCL) is 0.10 mg/L total trihalomethanes, the sum of concentrations of chloroform ($CHCl_3$), bromodichloromethane ($CHCl_2Br$), dibromochloromethane ($CHClBr_2$), and bromoform ($CHBr_3$). This MCL was not established strictly on the basis of health effects data but was set as a feasible level for compliance by water utilities. However, a much lower MCL (possibly as low as 0.025

mg/L or 0.050 mg/L) is being proposed by the U.S. Environmental Protection Agency (EPA) for human health protection and adoption by 1992.

The production of THMs and several other disinfection by-products (DBPs) can be generally shown as:

| | | | | | | |
|---|---|---|---|---|---|---|
| Natural Organics (Precursors) | + | Free Chlorine or other oxidants | + | Bromide ======> THMs | + | Other Disinfection By-products |

When free chlorine or other oxidants are added to drinking water as a disinfectant, the above reactions occur. Natural organic matter such as from decaying algae, soils, and organisms provide the carbon source to react with chlorine. If bromide is not present, only chloroform would be formed as the chlorine reacts with natural organic precursors. Bromide, another precursor, can exacerbate the problem of meeting the THM MCL because the heavier THM compounds containing bromine atoms, will be formed. Chlorine will oxidize bromide to hypobromous acid (HOBr), which will then react with the organic precursors to form the brominated methanes. Therefore, levels of both bromide ion and organic carbon in water supplies impact the control of DBPs.

New studies by The Metropolitan Water District of Southern California and EPA (MWDSC-EPA, 1989) on treatment options to reduce THM formation now show other DBPs of health concern are being formed. Alternative disinfecting chemicals such as ozone are being studied. However, these studies have shown that new disinfection technologies may not be adequate to meet anticipated MCLs for DBPs. Therefore, the sources of organic material and bromide in supply water are being studied to see if they can also be controlled.

The concern for meeting a THM MCL has now focused on ways of complying with proposed MCLs for a variety of DBPs. DBP regulations are scheduled for promulgation in 1992. THM formation potential can serve as a surrogate for DBP formation potential for many DBPs, although sometimes a reduction of THMs may increase other DBPs.

Data from several ongoing water studies (e.g. California Urban Water Agencies Delta Water Quality Study, MWDSC-EPA treatment research, DWR IDHAMP) including this investigation on Delta island drainage will be used to examine the most cost-effective solution for meeting new drinking water standards.
The information is also needed by the State Water Resources Control Board in setting water quality objectives in the Delta to meet and protect the needs of many competing beneficial uses such as agriculture, fisheries, recreation, municipal, and industrial. The economic importance and value of each of these aforementioned beneficial uses have been presented by various parties to the State Board during the 1987-90 Bay-Delta hearings.

## Delta THMFP

The Delta Islands Drainage Investigation (DIDI) began in January 1987 as an outgrowth of a Department of Water Resources study of the quality of Delta water for drinking water supplies. The study, known as the Interagency Delta Health Aspects Monitoring Program (IDHAMP), was initiated in July, 1983, in response to a 1982 scientific panel report which concluded that there were insufficient data to fully assess the present or projected quality of Delta drinking water supplies. The Panel recommended establishment of a program to monitor water quality as related to human health concerns.

Under IDHAMP, water quality at 15-18 stations is monitored each month. Samples are collected from areas representing fresh water inflow to the Delta, agricultural drainage, bay water, channels and sloughs, and water exports (Figure 1). Analyses include selected pesticides, sodium, selenium, minerals, and total trihalomethane formation potential (TTHMFP).

The THM formation potential test used in this study and in IDHAMP is used to compare the THM producing capacity of source water supplies. The test determines the maximum concentration of THMs that can be produced from any given sample. However, the concentration of THMs actually produced in drinking water systems is much lower than the THM formation potential because of pH adjustments, ammonia addition, water temperature, chlorine dosage, and other treatment practices and plant designs employed to reduce THMs.

Figure 2 shows the range of TTHMFP observed in the Delta. The Sacramento River at Mallard Island station represents the area where fresh and bay waters meet during the dry period investigated; in wet periods, freshwater can extend through Suisun Bay and even beyond Carquinez Strait. Water quality at this station typically is high in bromides and other seawater constituents because of changing tides and flows.

The Sacramento River at Greenes Landing station reflects the quality of the major source of fresh water flowing into the Delta. Water flowing into the Delta from the San Joaquin River upstream of Vernalis is a variable combination of Central Valley agricultural drainage mixed with fresh water. The monitoring station on the San Joaquin River near Vernalis station reflects these influences.

The qualities of water diverted by the Contra Costa Water District (CCWD) and SWP (State Water Project) are represented by the monitoring locations Rock Slough at Old River, and Banks Pumping Plant Headworks, respectively.

IDHAMP data from three Delta island drains suggest that peat soils can contain high concentrations of organic THM precursors, and may be a source of THM precursors. The significance of these inputs could not, however, be quantified without more information about TTHMFP concentrations in other drains, and volumes of drainage being discharged.

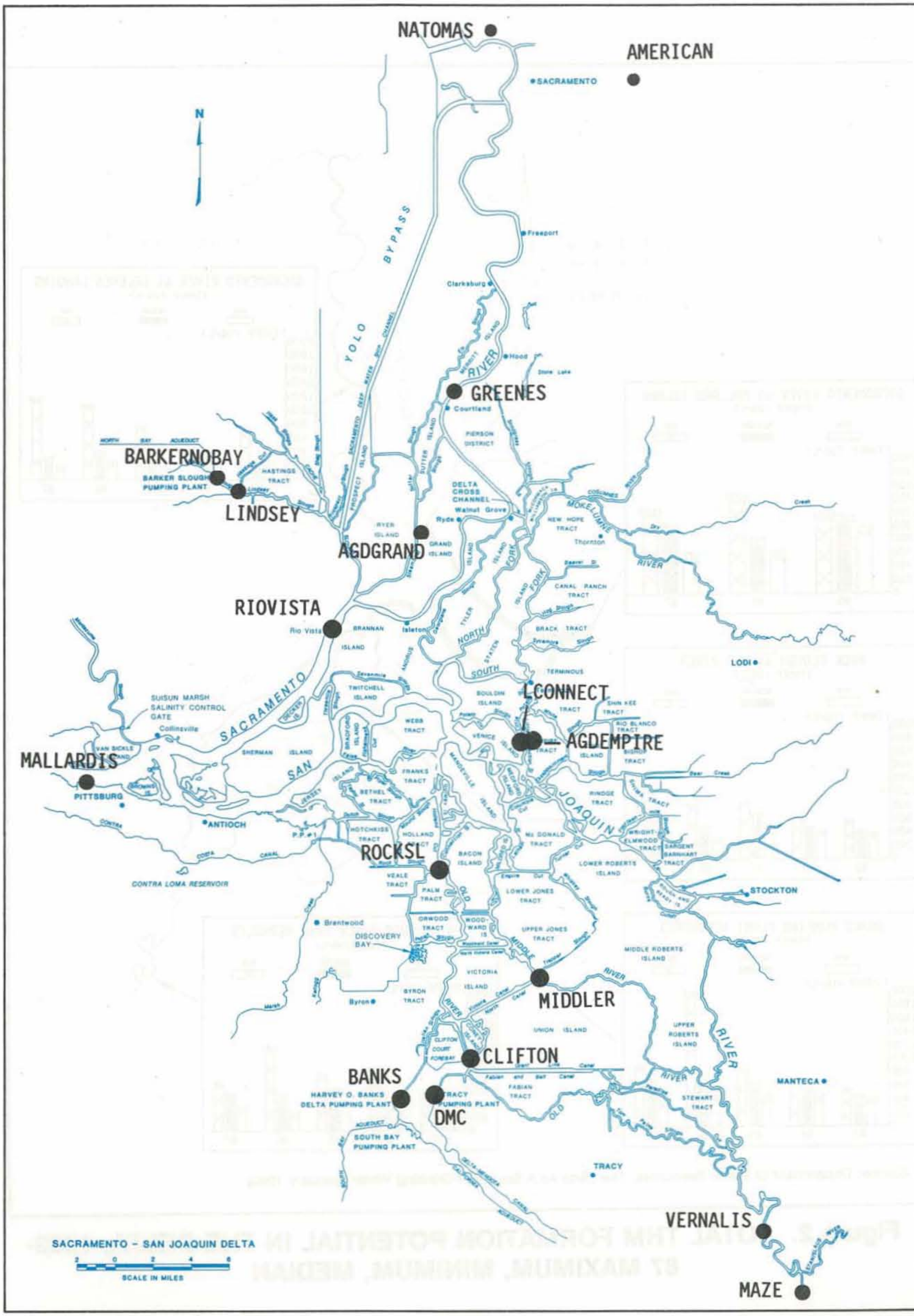
The range of TTHMFP at island drains located at Empire Tract, Tyler Island, and Grand Island are shown in Figure 3. The THMFP concentrations are significantly higher than that of the channel water samples shown in Figure 2.

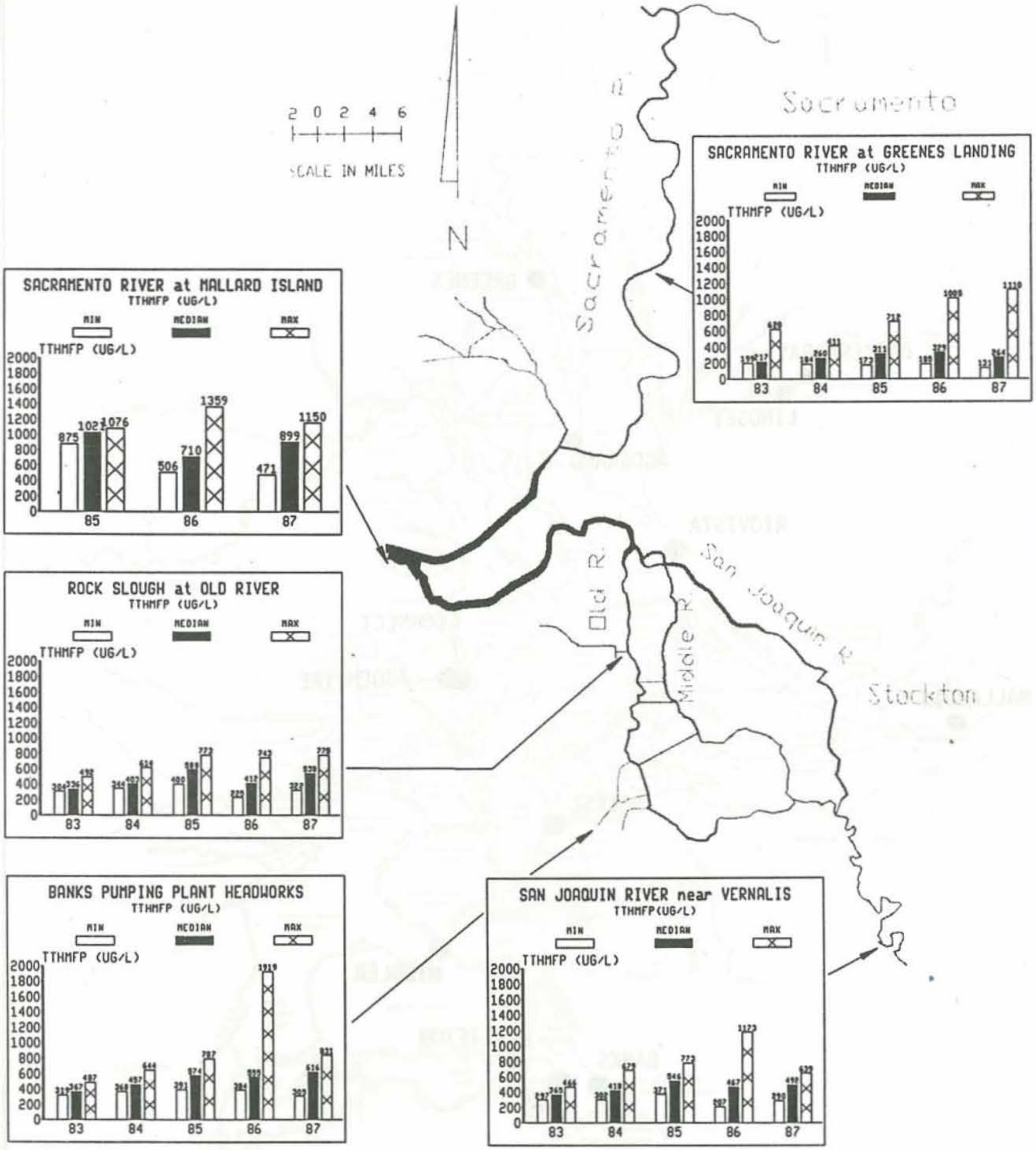
Five years of IDHAMP data demonstrate that waters diverted by the Contra Costa Water District (CCWD), State Water Project (SWP), and Federal Central Valley Project have higher TTHMFP concentrations than fresh water flowing into the Delta from the Sacramento and American Rivers. Organic matter carried in from sea water intrusion, from the San Joaquin River, and from peat soils and vegetation in the Delta Lowlands and surrounding channels are suspected to be major contributors to the increased TTHMFP. Bromides, which are salts of sea water origin, enter the Delta from San Francisco Bay. Reductions in the amount of organic matter and bromides in untreated water supplies would enable a reduction of THMFPs and other DBPs in drinking water.

Reduction of precursor substances would increase the reliability of water treatment processes in meeting more stringent drinking water criteria, and would also minimize treatment costs.

In response to these water quality concerns, the Technical Advisory Group of IDHAMP recommended that DWR initiate an investigation of the effects of agricultural drainage on Delta water quality. DWR acted on the Group's recommendation and proceeded with developing and commencing the Delta Islands Drainage Investigation (DIDI) in January 1987. This report describes the progress and results of the investigation.

## Figure 1. IDHAMP Monitoring Stations

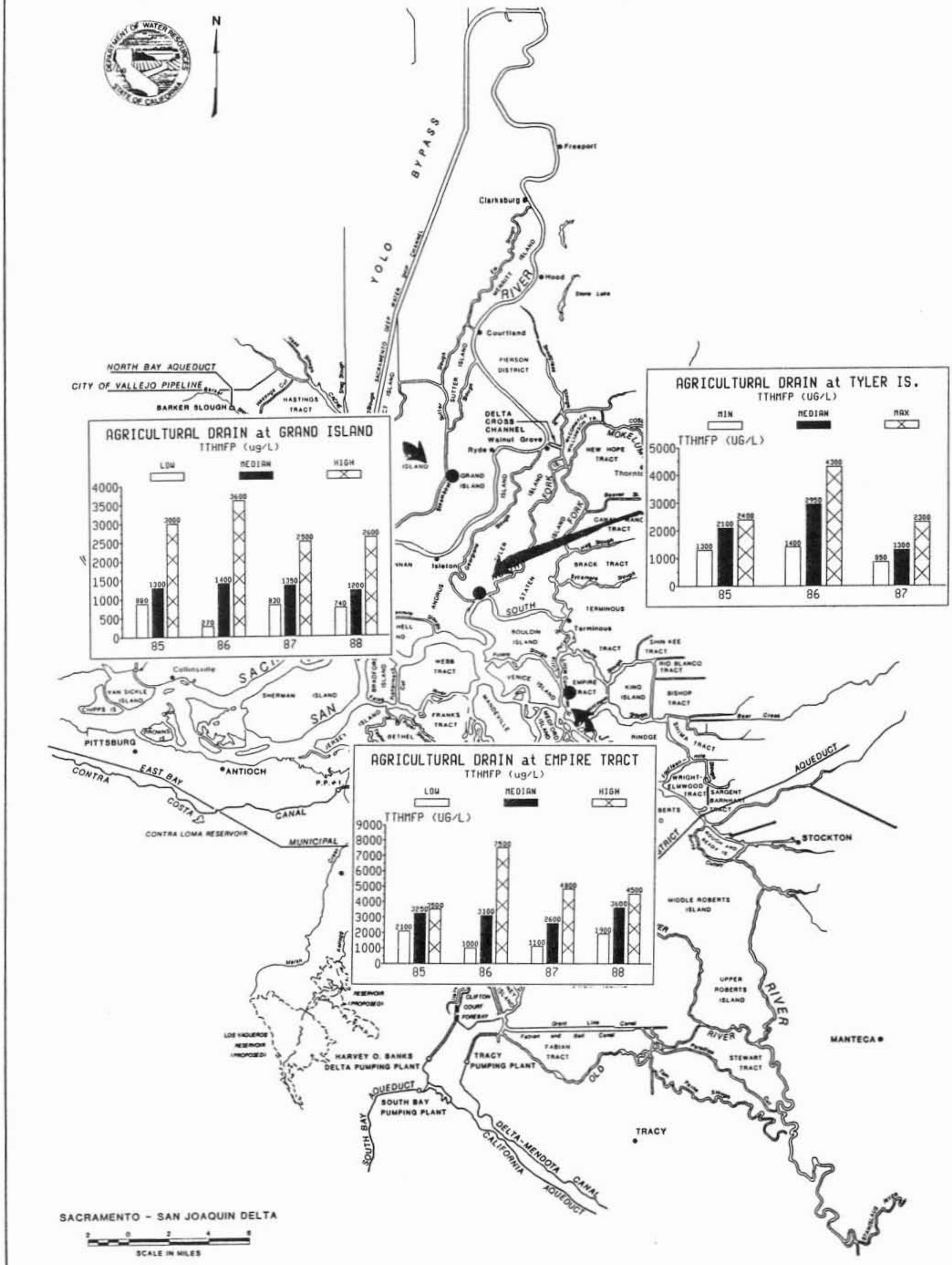





Source: Department of Water Resources, The Delta As A Source of Drinking Water (January 1989)

**Figure 2. TOTAL THM FORMATION POTENTIAL IN THE DELTA, 1983-87 MAXIMUM, MINIMUM, MEDIAN**

## Figure 3. TOTAL THM FORMATION POTENTIAL AT THREE AGRICULTURAL DRAINAGES, MAXIMUM, MINIMUM, MEDIAN



## Findings

Natural waters contain organic matter of plant and animal origin. The total amount of organic matter in water can be operationally classified into dissolved and particulate phases. Dissolved organic matter (DOM) or dissolved organic carbon (DOC) is that which passes through a 0.45 μ pore sized filter. DOM can be further classified into four major groups: (1) identifiable compounds, (2) hydrophilic acids, (3) humic acid, and (4) fulvic acid. The humic and fulvic acids are collectively refered to as humic substances. The formation of THM when humic substances in natural waters are combined with a strong oxidant such as chlorine has been extensively documented. Aquatic humic substances originate from soil humic material and terrestrial and aquatic plants.

The preliminary findings of this study show that both bromide and the types of organic matter present can affect the total THM formation potential of Delta waters.

A study of the characteristics of DOM humic and nonhumic substances showed distinct differences between drain and riverine Delta water samples (Amy et al, 1990). Drain samples when compared to river and lake water samples had a higher average molecular weight for DOM and were more propense in forming DBPs. Drainage contained heavier and larger sized humic substances (based on molecular weight measurements) than riverine Delta samples. Drainage generally had four times greater THMFP and ten or more times greater DBPs than Delta river samples.

Besides DOC, bromide will contribute to the high TTHMFP seen in various regions of the Sacramento-San Joaquin Delta. The amount of brominated methane compounds that are formed from waters of the same dissolved organic carbon (DOC) concentration will vary with bromide concentrations. This implies that bromide concentrations and the form and types of DOC material present affect TTHMFP and the distribution of brominated THMs that are formed.

The distinct characteristics of drain and nondrain organic matter indicate the potential capability to study the movement of island DOM humic substances in the Delta by tracking the molecular weight distribution of organic material in water.

The DOM or DOC characteristics (e.g. molecular weight and propensity to DBP formation) between drain and river samples are distinct enough to indicate that drainage DOC compounds are predominantly from Delta island soils and not solely the result of the concentrating effects from evapotranspiration of applied irrigation water. Historically, much of the Delta was a vast tule marsh whereby peat was formed from the decay of the marsh vegetation (the great bulrush or tule, *Scirpus lacustris*). On islands overlying peat type soils, the peat is the major source of island soil organic matter. The Delta basin soils are mostly organic soils and associated soils in which there is advanced alteration and an admixture of mineral soils.

Data collected from the Delta Islands Drainage Investigation and Interagency Delta Health Aspects Monitoring Program have shown that drain waters do have a higher potential to form trihalomethanes than Delta channel waters. These results corroborate the work reported by Amy et al. (1990).

Drainage volume discharges correspond to the seasonal farming activities on the islands. There is a summer peak of maximum drainage, typically, in July-August, that corresponds to the increased irrigation that occurs. There is also a winter peak of maximum drainage, typically observed in December-January. This winter drainage is caused by the flooding of fields by landowners to leach out salts accumulated in the soil.

In general, the highest observed range of THMFP concentrations in the island drainages during the summer and winter peak drainage months correlated with island soil type. Delta soil types can be grouped into three simple classes: mineral, intermediate organic, and peaty organic. All three soil types contain organic matter with mineral soils the least amount (less than 10%) and peaty organic the most (about 50% to 80%). The organic soils, which are confined to the Delta basin, occupy a larger aggregate acreage (about 250,000 acres) than the mineral soils, which occupy the margins of the basin. The basin organic soils are more typical of the low-lying area and the mineral soils represent a transition zone where basin organic soils begin to mix with upland mineral soils that originate from areas beyond the Delta boundaries.

The August maximum THMFP concentrations appeared to be higher on islands with the greatest amounts of peat soils and lower on islands with mineral soils. In most cases generally, the January maximum THMFP concentrations on all islands were higher than those observed in August. Higher concentrations were still observed on peat soil island drainages as compared to mineral soil island drainages.

In 1982 DWR tests showed composited Delta peat soils and mineral soil extracts had 61,000 µg/kg and 27,000 µg/kg TTHMFP, respectively. Island drainage TTHMFP is therefore most likely related to soil type and water saturation of the island soils. Organic soils are extremely permeable and have a high water-holding capacity.

There are about 2200 siphons and 260 drainage pump stations on nearly 60 islands and tracts in the Delta that were identified by DWR in 1986 and 1987. There is insufficient data to identify single islands or drainages which may be representative of large areas of the Delta.

The most comprehensive study on Delta island drainage volume was conducted by DWR in 1954-55 and published in DWR Report No. 4 (1956). Based on comparisons of past and present land use data, water year classification, and DWR's Division of Planning Consumptive Use model runs, the estimated total W.Y. 1988 drainage volume in the Delta Lowlands was between 633,195 and 773,905 acre-feet. These estimates correspond to 90 and 110% of the drainage volume estimates of the 1954-55 study.

During summers of critical water years, the volume of Delta Lowland drainage can be significant when compared to total river inflow from the Sacramento and San Joaquin rivers or the amount of Delta exports. The July 1954 drainage volume was equivalent to as much as 15% of the July 1954 combined total of Sacramento and San Joaquin river flows into the Delta.

The impact of island drainage on Delta waters will vary with location and hydrology within the Delta. The Delta Islands Drainage Investigation has been monitoring conditions during a four-year drought. Under these severe water shortage conditions, San Joaquin River (SJR) flows have been constantly low (about 1200 to 1500 cfs). DWR's State Water Project Operations and Maintenance flow data show that nearly all of the SJR flows near Vernalis were diverted to the DMC intake during W.Y. 1988. The DMC flows (pumping) were 2 to 3 times greater than the SJR flows at Vernalis. SJR water entering the Delta near Vernalis was an insignificant portion of the water flowing into the Delta past Stockton. These observations were substantiated with synoptic water quality surveys and SJR selenium monitoring that tracked the flow of SJR water to the DMC intake at Lindemann Road. Observations under other hydrologic conditions such as normal and wet years are needed as SJR flows can become a more significant portion of Delta inflow.

DOC has been observed to behave conservatively in waters of less than 5 parts per thousand salinity, the salinity range generally found in the Delta. Humic substances, the most reactive fraction of DOM in forming THMs, are very biorefractory (resistant to natural biological degradation). Carbon dating has established that humics from the Suwanee River (Florida) are 30 years old. It is the nonhumic fraction of DOM, consisting largely of biochemicals such as proteins and amino acids, which is more biodegradable. Therefore, humic substances (THM precursors) in Delta waters are not expected to decrease appreciably because of biological decay or transformation within the Delta. Also decay may not be significant in reservoirs or aqueducts if Delta humics are as biorefractory as those carbon dated from the Suwanee River.

The impact of drainage THM precursors on Delta water quality was estimated. The method converted measured TTHMFP concentrations to TTHMFP organic carbon concentrations (TFPC). These conversions were made to eliminate the bias of comparisons due to the heavier THMs that contained bromine.

A preliminary estimate of the monthly TFPC entering the Delta from river and bay inflows and Delta island drainages was made. The calculations used monthly Delta inflow data for W.Y. 1988 and the estimated monthly drainage volumes. For simplification, the preliminary impact assessment lumped together the average TFPC values of selected IDHAMP stations (Banks Headworks, Sacramento River at Mallard Island, Clifton Court Forebay intake gate, Middle River at Borden Highway) to represent the monthly water quality of the Delta. Similarly, TFPC data were averaged for mineral-intermediate organic islands versus peat islands. The monthly TFPC and river inflow and drainage discharge estimates were then used to derive monthly flow-weighted estimates of drainage plus river TFPC. These estimates were then compared against the average TFPC in the Delta.

The estimates showed that drainage contributed 40 to 45% of the TFPC in the Delta during the irrigation months (April-August) and 38 to 52% during the winter leaching period (November-February) during W.Y. 1988.

The calculated TFPC estimates showed good agreement with the general rise and fall of observed average values in the Delta during October 1987-June 1988. There was about a two-week lag period between the monthly average calculated estimates and observed data. The lag period is attributed to different sampling dates, the averaging and grouping of values, and time between observing an impact in the channels caused by island drainages.

The TFPC estimates appeared to be reasonable, since the annual average, minimum, and maximum estimates were 4.5 µg/L of their respective observed values. Overall, the estimates averaged 14.5% higher than the observed mean values based on data from the four IDHAMP stations used to represent the average TTHMFP in the Delta.

Overall, the results were good and indicated a start in the correct approach to studying TTHMFP in the Delta. Further monitoring will improve the precision of these estimates and hasten the development of a Delta TTHMFP model by DWR.

While the information produced in this study strongly indicates islands are significant sources of organic THM precursor material, we have not completed our work in measuring the impact of these discharges on the drinking water quality of Delta supplies. Due to the variety of island acreages, soil types, and drainage volume as well as different locations and flow patterns within the Delta, it is conceivable that not all Delta islands significantly impact channel water quality. Some of our synoptic water quality surveys in the channels support that thought.

The analysis showed the need for more drainage flow and drainage water quality data to improve the precision of the study. The preliminary findings are an indicator of the relative magnitude of the potential THM precursor loadings from Delta islands. The continuation of this study over different hydrologic conditions and coverage of more island drainages will aid in determining the need and best method for setting further water quality criteria or policy in the Bay-Delta.

DIDI sampling also included monitoring of pesticides in the drainages. Thirty of 260 Delta island drainages were sampled in July 1988 for pesticide residues. July is both a peak application month of most agricultural pest control chemicals and the summer peak month for drainage discharge in the Delta. Pesticide chemicals were mostly below laboratory detection limits. Where pesticide residues were detected, they were near the detection limits, and well below current established drinking water criteria or action levels established by the California Department of Health Services. Further sampling is needed before making any conclusions about pesticide residues in the remaining 230 drains throughout the Delta.

## Recommendations

The need to complete the assessment of the impacts of island drainages, San Joaquin River drainage, bay water intrusion, and other significant, potentially controllable factors on the quality of Delta drinking water supplies grows stronger because of new proposed drinking water standards.

In this program, the impact of Delta island drainage on the quality of drinking water supplies was estimated both by sampling the channels and drains. Overall, the 54 drains provided valuable data in understanding the factors that affect the quality and quantity of island drainage. Further sampling of other drainages will improve the precision of data analysis and interpretation. An expanded monitoring program will be necessary.

Study activities for 1990 will need to identify the characteristics of other Delta islands and further study the impacts of discharges to the channels.

Based on these factors, the following recommendations are made:

1. The study period must include other hydrologic conditions. The study has been observing conditions during a four-year drought. The results cannot be extrapolated to other hydrologic conditions.

2. The monitoring program must be expanded to include a larger number of significant Delta island drains and associated channels. The assistance of the State or Regional Boards should be requested to encourage further cooperation from some districts.

3. Synoptic surveys must be continued and conducted more frequently, especially during these prolonged drought year conditions. These surveys provide valuable information on water quality as related to flow conditions in the Delta.

4. Analytical studies to characterize drain and nondrain humic substances as conducted by Dr. Gary Amy must be continued. Such studies provide a method of "fingerprinting" the contribution of THM organic precursor material from various sources.

5. The sampling of channel sediments and island soils for TTHMFP and other DBP formation potential should be added to the study. Sampling should include at least two depths to conduct soil and sediment profile comparisons.

6. A study of the relationship of bromide to other water quality measurements and constituents should be performed.

7. Develop a study to compare the raw water TTHMFP concentrations to finished water THM and DBP.

8. Continue laboratory studies on the effects of holding times, incubation temperature, chlorine dosage, DOC, and bromide concentration on the DWR TTHMFP test method.

9. Continue analysis of the IDHAMP and DIDI data base to examine water quality relationships and trends at individual sampling stations.

10. Work cooperatively with the DWR Delta Modeling Group on developing a Delta island salinity model and a Delta THMFP model. Develop and locate funding sources to implement the necessary studies for these models.

The Department will re-direct funds and resources to achieve some of these recommendations; however, since DWR resources are limited, outside resources will be sought from interested water agencies that would benefit from the study.

DWR's Division of Operations and Maintenance for the State Water Project have added TTHMFP testing to their existing monitoring of the SWP.

# II. Study Description

## Objectives

The Delta Islands Drainage Investigation was developed to address specific questions, including:

1. What is the quality and quantity of Delta island drainwater being discharged?

2. What processes affect the quality and quantity of island drainages?

3. What water quality impacts in the channels and at drinking water supply intakes are from Delta island drainages?

4. How do the contributions from Delta island drainages compare to other major sources, which may include the San Francisco Bay estuary, inflows and drainages from rivers such as the San Joaquin, from Delta channels, and from weather-related events?

5. If the treatability and cost of treatment of Delta waters are affected, what are the alternatives for managing these impacts?

The information generated from this study is intended to aid in making decisions about watershed management (e.g. State Board Delta Hearings) and water treatment practices.

At this time, the study is continuing to address the first three questions stated above. Therefore, only preliminary conclusions are presented. The purpose of this report is to summarize the progress and planned direction of this study for water agencies and the general public.

## Project Team

The Delta Islands Drainage Investigation is directed through the Department's Division of Local Assistance, Water Resources Assessment Program. Data collection, laboratory coordination, and database management support was provided by the Water Quality Section, Operations Branch, of the Central District Office. Additional technical support and data analysis are provided under contract with the water quality consulting firm of Marvin Jung & Associates, Inc. of Sacramento.

Laboratory services were provided by the DWR Laboratory located in Bryte (West Sacramento), and our contract laboratories, ENSECO-CAL of West Sacramento (F.Y.s 87-88 and 88-89) and Pace Laboratories, Santa Rosa (F.Y. 89-90). Laboratory quality assurance evaluation was provided by each laboratory, and through interlaboratory checks conducted by the State Department of Health Services, Sanitation and Radiation Laboratory in Berkeley.

Quality assurance procedures are practiced by DWR staff during field sampling, data entry, retention, and storage. A complete description of our quality assurance measures can be found in Appendix E of "The Delta As A Source of Drinking Water, Monitoring Results 1983-1987," published by DWR in August 1989.

## Methodology

The following sections describe sampling equipment, field measurements, study sites, sampling frequency, and laboratory analyses.

### Sampling Equipment

The field crew collected drain water samples at the intakes of the pump stations. Many of the scaffolding and walkways at the pump stations provided a platform for sampling.

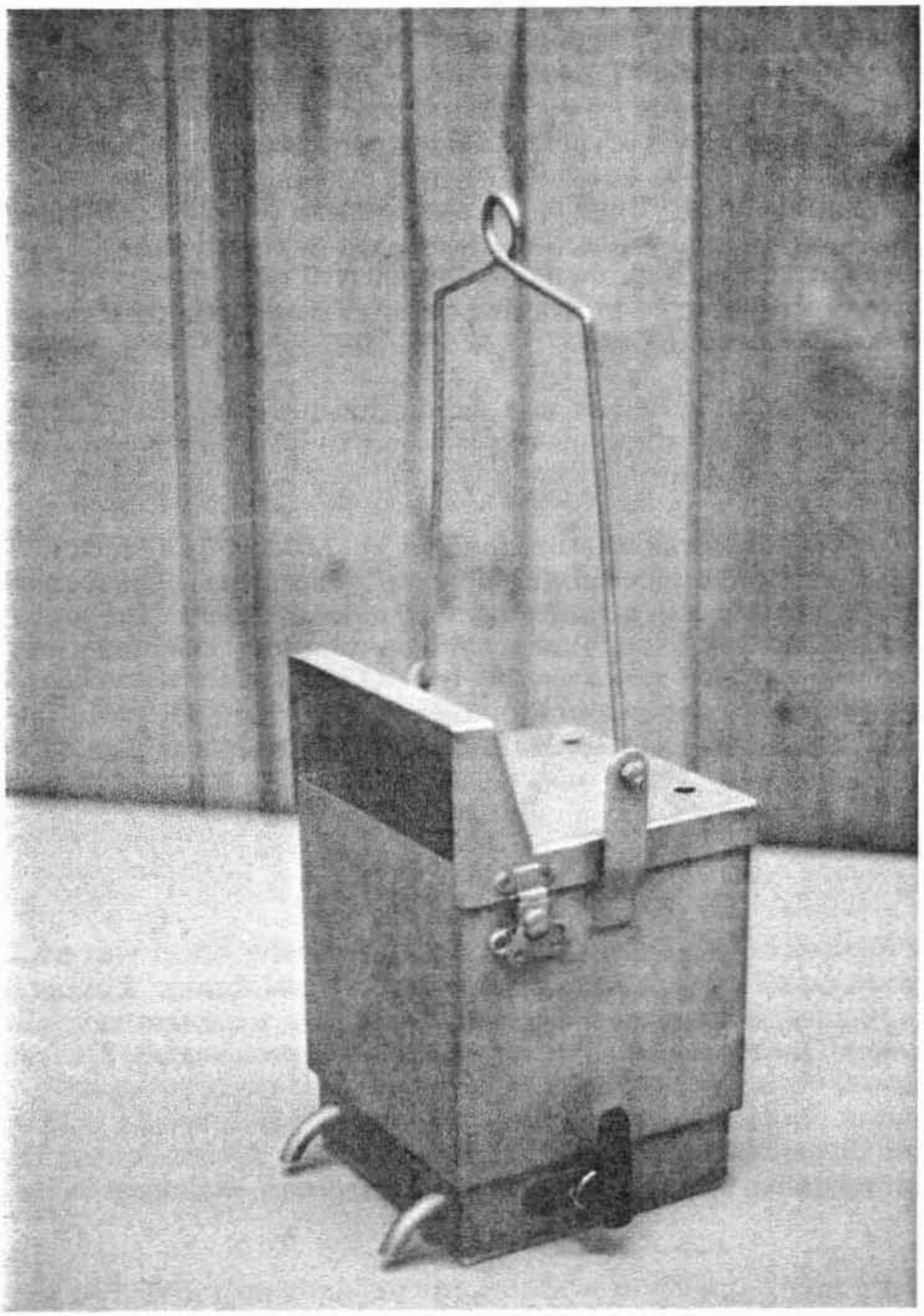
Water samples from the Delta channels were collected with a shallow water sampler, a stainless steel pail, or a Kemmerer water sampler. Samples were taken at the 1-3 foot depth.

Most drains were too shallow to use traditional devices designed to sample deeper waters (e.g., Kemmerer sampler). Consequently, a new shallow water sampling device was designed and constructed. The sampling device was a 2-gallon stainless steel box. The sampler was designed to allow water to flow into the device but keep at a minimum the admittance of foreign matter. The handle was approximately 18 inches long, with a steel cable attached to it. Two valves, constructed of stainless steel and Teflon, were attached to the bottom of the sampling device. These valves were used to fill sample containers (Figure 4).

Field crews took samples from boats, off bridges, and pier structures that provided the best and safest access to the sampling points.

Water samples were tested for selenium, minerals, turbidity, dissolved organic carbon (DOC), color, and TTHMFP. Some channel water samples were also tested for chlorophyll. Except for turbidity and color, all samples were filtered in the field through 0.45 micron pore sized Millipore membranes, using a stainless steel filtration apparatus. Selenium samples were preserved with nitric acid. Mineral samples were filtered into a one-quart bottle and a half-pint bottle and preserved with nitric acid. Chlorophyll samples required two filters. Each filter received 200 ml. of sample water. Filters were then stored in dry ice until they were delivered to the Lab. All other samples were stored on ice during delivery.

Figure 4. Shallow Water Sampler



TTHMFP samples were collected in three standard 40 ml. VOA (volatile organic analyses) vials while DOC samples were placed in amber colored 250 ml. bottles, preserved with sulfuric acid. After January 1988, TTHMFP containers remained the same while DOC samples were taken in one 40 ml. vial, preserved with hydrochloric acid.

Field Measurements

Field measurements included temperature, dissolved oxygen (DO), specific conductance (EC), and pH. Temperature and EC were taken using a Yellow Springs Instrument (YSI) Model 3000 T-L-C Electrical Conductivity meter. This meter was calibrated using two separate tests. The first test checked the meter readings against standards made at the DWR Bryte Lab. The second test required an electrical probe supplied by YSI. The probe tested the internal system of the meter with pre-programmed readings. If the meter was within a standard reading established by YSI, then the meter was in calibration. If not, it was returned to the manufacturer for re-calibration. Using both methods, the internal components of the meter and the probe were verified to be in working order. These methods were performed prior to each day's sampling run.

The Beckman Model 10 pH meter was standardized prior to each sampling trip. Commercial pH standard solutions of pH 4 and 10 were purchased from VWR Scientific and Fisher Scientific.

Dissolved Oxygen (DO) was measured with a YSI Model 50 DO meter. This meter was calibrated using a number of available calibration tests. The main method used was calibration in air in mg/L for fresh water measurements. The probe was placed in moist air and allowed to stabilize for fifteen minutes. The meter was then calibrated to the stabilized meter reading for DO. The meter was also regularly checked by using the independent Modified Winkler Method. Triplicate water samples were titrated by the Winkler method. The meter was then calibrated to the average of the 3 results. Membranes on the probes were replaced every two to three weeks, per manufacturer's recommendations.

Study Sites

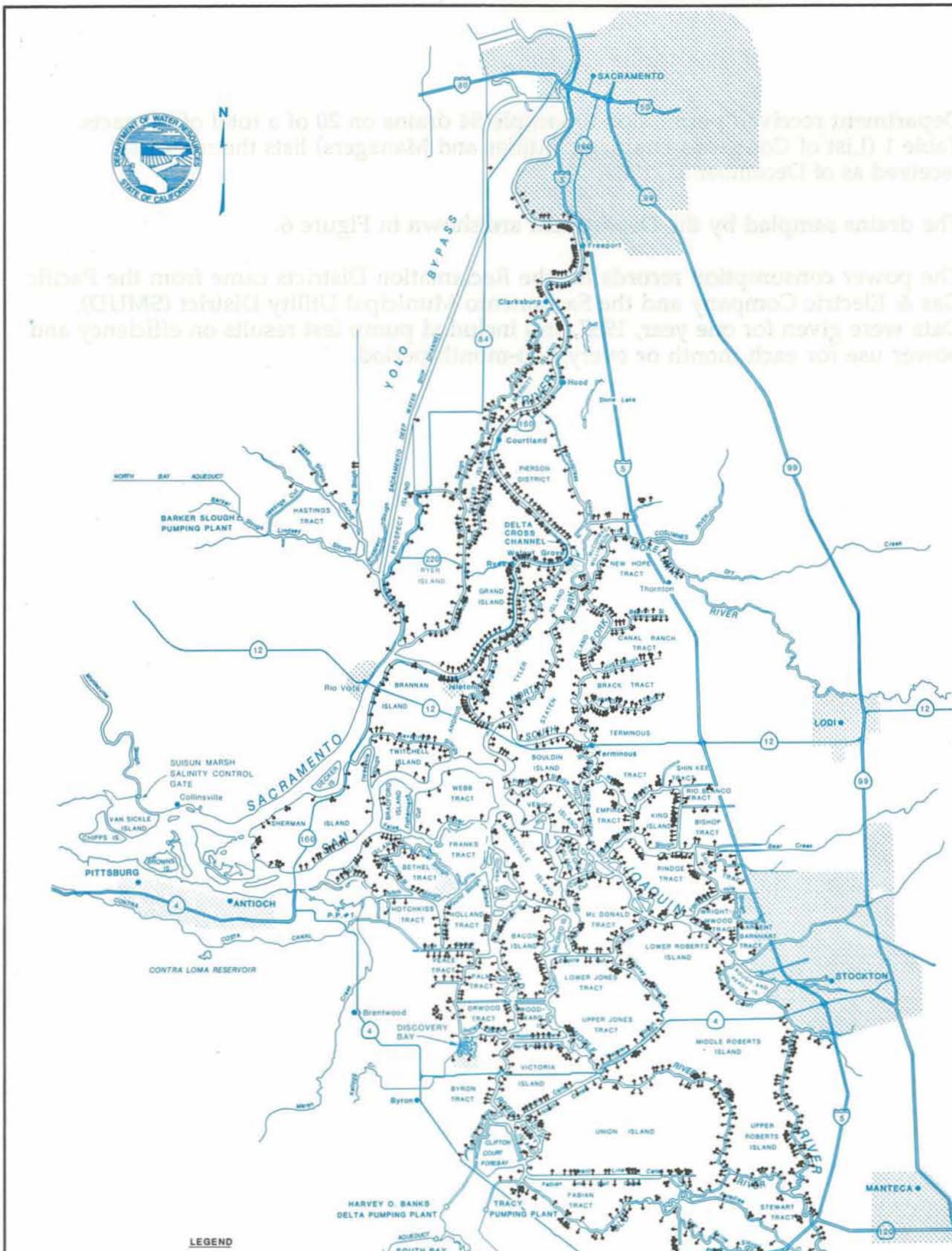
This study focused on the Delta Lowlands. An extensive effort was made to locate both irrigation water intakes (siphons) and agricultural drains. Topographic maps and navigation charts were examined and field crews were sent to confirm the size and locations of the siphons and pump stations. Approximately 2,200 siphons and 260 agricultural drains were located and identified by Department staff. Documentation for each visited site was compiled for later use by field staff. Figures 5 (Irrigation Diversions) and 6 (Agricultural Drainage Return Points) show the locations of irrigation water diversions and agricultural drainages in the Delta, respectively.

It is the Department's policy to work on private lands only after receiving permission from the landowner or land manager. Therefore, letters requesting permission to sample the 260 drains and to procure power consumption records for pump stations were sent to the Reclamation Districts that managed the drains. The

Department received permission to sample 54 drains on 20 of a total of 51 tracts. Table 1 (List of Contacted Drainage Entities and Managers) lists the responses received as of December 31, 1987.

The drains sampled by the Department are shown in Figure 6.

The power consumption records for the Reclamation Districts came from the Pacific Gas & Electric Company and the Sacramento Municipal Utility District (SMUD). Data were given for one year, 1987, and included pump test results on efficiency and power use for each month or every two-month period.




Source: Department of Water Resources, Sacramento-San Joaquin Delta Atlas (August 1987)

Figure 5. Irrigation Diversions

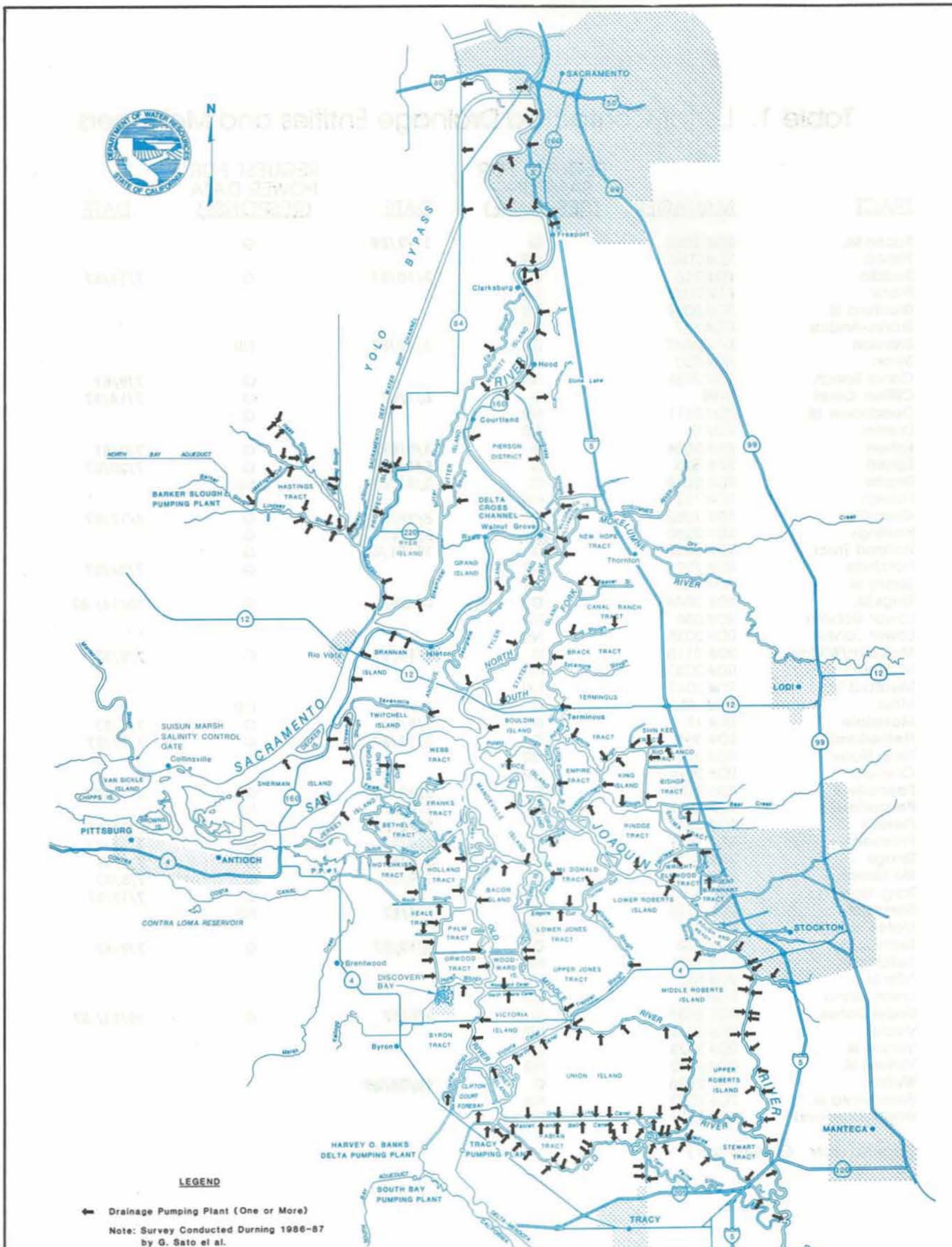



Figure 6. Agricultural Drainage Return Points

# Table 1. List of Contacted Drainage Entities and Managers

| TRACT | MANAGER | REQUEST FOR SAMPLING (RESPONSE) | DATE | REQUEST FOR POWER DATA (RESPONSE) | DATE |
|---|---|---|---|---|---|
| Bacon Isl. | RD# 2028 | G | 11/2/89 | G | |
| Bishop | RD# 2042 | NR | | | |
| Bouldin | RD# 756 | G | 3/10/87 | G | 7/14/87 |
| Brack | RD# 2033 | NR | | | |
| Bradford Isl. | RD# 2059 | NR | | | |
| Brann.-Andrus | RD# 317 | NR | | | |
| Brannan | RD# 2067 | G | 3/12/87 | NR | |
| Byron | RD# 800 | NR | | | |
| Canal Ranch | RD# 2086 | NR | | G | 7/9/87 |
| Clifton Court | DWR | G | 6/1/87 | G | 7/14/87 |
| Deadhorse Isl. | RD# 2111 | NR | | G | |
| Drexler | RD# 0 | NR | | | |
| Egbert | RD# 2084 | G | 3/9/87 | G | 7/9/87 |
| Egbert | RD# 536 | G | 5/1/87 | G | 7/20/87 |
| Empire | RD# 2029 | G | 3/31/87 | NR | |
| Fabian | RD# 773 | NR | | | |
| Glanville | RD# 1002 | G | 8/19/87 | G | 8/17/87 |
| Hastings | RD# 2060 | G | 8/1/87 | G | |
| Holland Tract | RD# 2025 | G | 10/31/89 | G | |
| Hotchkiss | RD# 799 | NR | | G | 7/24/87 |
| Jersey Isl. | RD# 830 | NR | | | |
| Kings Isl. | RD# 2044 | G | 3/6/87 | G | 10/14/ 87 |
| Lower Roberts | RD# 684 | NR | | | |
| Lower Jones | RD# 2038 | NR | | | |
| McCorm/William | RD# 2110 | G | 3/16/87 | G | 7/8/87 |
| McDonald | RD# 2030 | NR | | | |
| Medford Isl. | RD# 2041 | NR | | | |
| Moss | RD# 404 | G | 3/7/87 | NR | |
| Mossdale | RD# 17 | G | 3/9/87 | G | 7/8/87 |
| Netherlands | RD# 999 | G | 3/12/87 | G | 7/17/87 |
| New Hope | RD# 348 | NR | | | |
| Orwood | RD# 2024 | NR | | | |
| Pescadero | RD# 2095 | G | 3/12/87 | G | 8/18/87 |
| Pescadero | RD# 2058 | G | 4/9/87 | NR | |
| Pierson | RD# 551 | G | 3/12/87 | G | 7/17/87 |
| Prospect | RD# 1667 | G | 3/5/87 | G | 7/15/87 |
| Rindge | RD# 2037 | G | 3/9/87 | G | 7/9/87 |
| Rio Blanco | RD# 2114 | G | 3/9/87 | G | 7/8/87 |
| Sarg.-Barnhart | RD# 2074 | NR | | G | 7/17/87 |
| Shima PP | RD# 2115 | G | 3/6/87 | NR | |
| Staten Isl. | RD# 38 | NR | | | |
| Terminous | RD# 548 | G | 3/19/87 | G | 7/9/87 |
| Twitchell Isl. | RD# 1601 | NR | | | |
| Tyler Isl. | RD# 563 | NR | | | |
| Union Island | RD# 1 | NR | | | |
| Upper Jones | RD# 2039 | G | 3/5/87 | G | 10/13/ 87 |
| Veale | RD# 2065 | NR | | | |
| Venice Isl. | RD# 2023 | NR | | | |
| Victoria Isl. | RD# 2040 | NR | | | |
| Webb | RD# 2026 | G | 10/26/89 | | |
| Woodward Isl. | RD# 2072 | NR | | | |
| Wright-Elmwood | RD# 2119 | NR | | | |

(NR = No reply G = Granted )

Sampling Frequency

Initially, quarterly sampling was planned for each site. Sampling began in March 1987 at the 54 drains for which permission was obtained. Water samples were analyzed for minerals, selenium, Dissolved Organic Carbon (DOC), and Total Trihalomethane Formation Potential (TTHMFP). Standard field measurements of temperature, dissolved oxygen, pH, and electrical conductivity were also performed on site.

In August 1987, a decision was made to increase the sampling frequency at the available DIDI sites from the original four times per year to six times per year. The increased sampling frequency was intended to partially compensate for the smaller number of drainages sampled than planned, and to study the impacts of the dry weather conditions which began in 1987.

The program was further modified in August 1988 to include more frequent sampling during the months of June to July and November to January because of the summer and winter peak discharges of agricultural drainage.

The advisory committee suggested more frequent monitoring of drainage from two Delta tracts and their surrounding channels. Bouldin Island and Upper Jones Tract were selected because they might serve as good representatives of the northern and southern areas of the Delta, respectively. Samples were collected weekly during two 4-week periods that fell within the summer and winter peak drainage periods. The remaining drainage stations in the program continued to be sampled every two months.

In July 1989 DWR staff conducted a synoptic survey along the major channels where Sacramento and San Joaquin river water flowed toward the State and Federal water project intakes. This activity was repeated in January 1990. The channel stations are shown in Figure 7. The data provided water quality and flow mixing information across some parts of the Delta.

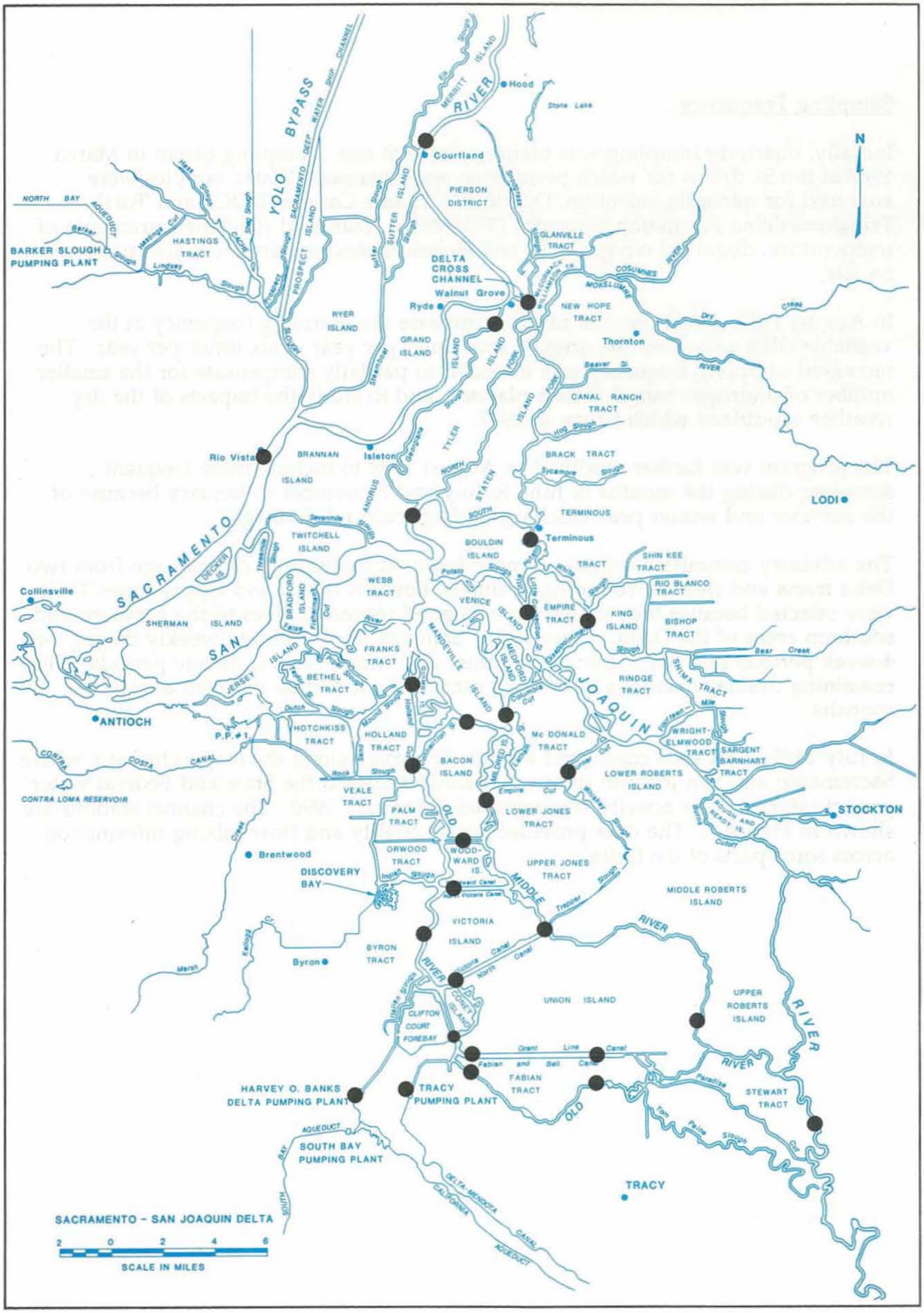



**Figure 7. Deltawide Channel Survey, July 25, 1989**

Laboratory Analyses

TTHMFP and TOC samples were analyzed by ENSECO-CAL Analytical Labs between July 1987 and December 1988, and between May and June 1989. DWR Bryte Lab performed the TTHMFP and TOC analyses between January and April 1988 and August 1989 to present. Pace Laboratories performed TTHMFP in July 1989. Except as noted, other constituents were analyzed at the Department's Bryte Laboratory.

In 1981 DWR developed a raw water TTHMFP test to compare the relative maximum concentrations of THM precursors in Delta waters prior to water treatment. It is one of many types of measurements used to study the quality of different sources and types of water.

This raw water TTHMFP test requires a high dose of chlorine to meet the "chlorine demand" of suspended and organic material in the samples and to maintain a chlorine residual during the holding period after adding chlorine to the sample. While the chlorine dosage and holding time may not reflect the THM concentration of a treated water sample, the Technical Advisory Group members of IDHAMP, which include water quality engineers and chemists from major water utilities and the State Department of Health Services, found the procedure acceptable for the purposes of comparing the relative levels of THM precursors in Delta waters.

Comparisons of the raw water TTHMFP to those THM concentrations in treated water have led to a multitude of correlations. The numerous correlations are a function of the unique design and operating characteristics of individual water treatment plants. These differences go far beyond the use of specific disinfection chemicals and holding times. There are differences in the operating efficiencies to reduce suspended material prior to chlorination as well as in the characteristics of the raw water quality. This, thereby, affects the chlorine demand and resulting concentrations of disinfection by products that are formed. Therefore, there is no single relationship that can be modeled for all raw water and treated water TTHMFP. The data does, however, show that there is some type of proportional relationship between raw water TTHMFP and that of treated water.

Reductions in the THM formation potential of untreated water will generally result in lowered production of THMs and other DBPs (disinfection by products) in treated drinking water.

Upon arrival at the laboratories, the TTHMFP samples were spiked with a dosage of 120 mg/L of chlorine, a concentration sufficiently high to meet the highest chlorine demand and maintain a chlorine residual after incubation for seven days at 25.C. Earlier DWR results showed this high dose was necessary for meeting the exceptionally high chlorine demand in agricultural drain water samples. After incubation, the samples were quenched with sodium thiosulfate and analyzed using a gas chromatograph, with periodic confirmation by means of gas chromatograph-mass spectrometer. ENSECO-CAL Laboratory and the DWR Bryte Lab followed EPA Methods 601 and 502.1 for total trihalomethane formation potential (TTHMFP) analyses.

Unless specified elsewhere in this report, the TOC analyses were on filtered samples (0.45 μ pore size). Therefore, these were DOC (dissolved organic carbon) results.

Pesticides were analyzed according to standard EPA procedures. All other constituents were analyzed according to the latest edition of "Standard Methods for the Examination of Water and Wastewater." These procedures are summarized in Appendix E of "The Delta As A Source of Drinking Water, Monitoring Results, 1983 to 1987," published by DWR, August 1989. The results of duplicate and spiked samples for pesticides and THMFP analyses are described in the Appendix.

# III. Results

The study is currently collecting data to: (1) characterize the quality of drain water and volume of discharge to the Delta and (2) estimate their impact on water quality in the channels and at drinking water supply intakes. As this work is completed, the impacts from other sources (e.g. bay water, San Joaquin River) will be compared.

Our observations have helped develop a series of working hypotheses about the water quality (e.g. pesticides, TTHMFP) in drains and channels in some segments of the Delta.

Figure 8 illustrates the exchanges of water on a typical Delta island during the growing season. Irrigation water is siphoned from the adjacent channels into ditches about 10 feet wide. These ditches parallel the levee about 100 feet inside the inner toe and then discharge into lateral ditches 4 feet wide that divide the island into checks ranging in size from 20 to 50 acres. The water then flows from these laterals into smaller temporary spud ditches, about 10 inches wide and about 20 inches deep, which parallel the crop rows at intervals of 50 feet to 100 feet. Rainfall also contributes to irrigation. Some of this water is lost to evaporation and transpiration (ET) by growing crops and the remainder percolates through the soils to the deeper island drainages. Water also enters and leaves the islands as underground seepage. Drain water collects into open drainage ditches (6 feet to 10 feet deep) downslope of the irrigated fields. Drainage is then periodically pumped out into the channels. The drainage pump motors are electrically driven and automatically activated by float switches that operate the pumps whenever drainage reaches a certain water level at the base of the pump station platform, which sits above the drain terminus.

The magnitude of these exchanges will vary with season and hydrology. For example, rainfall contribution is insignificant during the summer and ET minimal during the winter. The annual drainage discharge cyle has two peaks and two troughs. During the growing season, drainage volumes reflect the degree of irrigation. The peak drainage period is during the summer, typically July. As irrigation decreases and crops are harvested, drainage volumes become less as the summer ends and fall begins. Drainage volume begins to increase in December through the following February as farmers flood the fields to leach out accumulated salts in the soil. This flooding is necessary to prevent crop damage and to prevent loss of crop yield. The winter peak drainage time is typically mid-January. Depending on weather conditions and seasonal hydrology, the peak summer and winter drainage months may be a few weeks earlier or later. In the late winter, drainage is again low but will increase as spring irrigation begins.

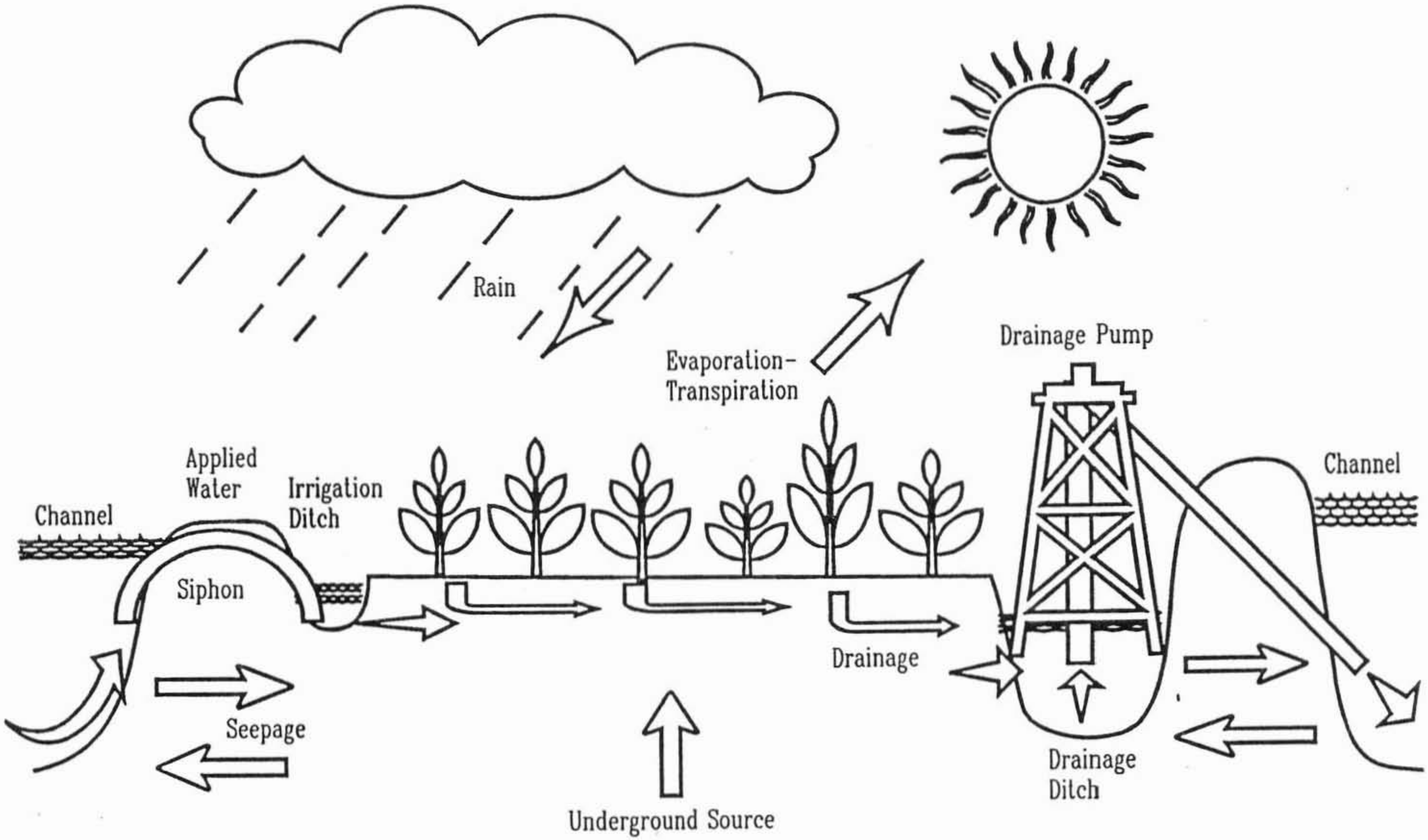
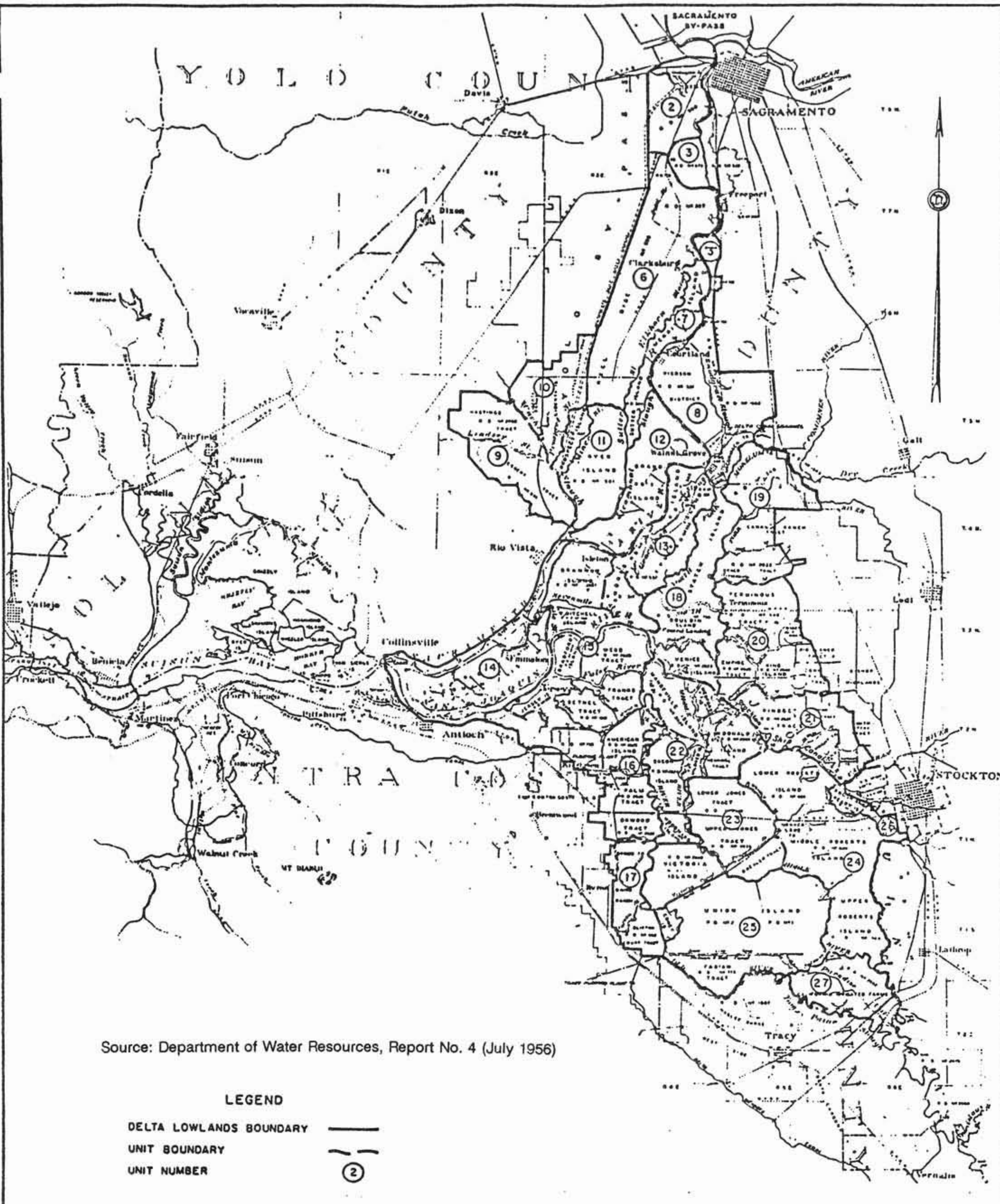



**Figure 8. Typical Delta Island Water Exchange**

## A. Literature Review

Initial activities focused on compiling and reviewing reports from earlier DWR studies on agricultural drainages in the Delta. The most informative report was DWR Report No. 4 "Investigation of Sacramento-San Joaquin Delta Quantity and Quality of Water Applied To and Drained From Delta Lowlands." This study conducted in 1954-55 examined the quantity and quality of applied irrigation water and of agricultural drainage on a combined field and computed basis.

The study area and study subunits (groups of tracts and islands) are shown in Figure 9. Tracts within each study unit are presented in Table 2.




Source: Department of Water Resources, Report No. 4 (July 1956)

LEGEND

DELTA LOWLANDS BOUNDARY

UNIT BOUNDARY

UNIT NUMBER

**Figure 9. Subdivision Units of the Delta 1955**

DEPARTMENT OF WATER RESOURCES

## Table 2. Delta Study Units, DWR Report No. 4

| Unit | Tract or Island or Reclamation District |
|---|---|
| 2 | RD 900 West Sacramento |
| 3 | RD 673 |
| 6 | RD 307 |
| 7 | Sutter and Merritt |
| 8 | Pierson, McCormick, and Glanville |
| 9 | Hastings and Egbert |
| 10 | Liberty |
| 11 | Ryer and Prospect |
| 12 | Grand |
| 13 | Twitchell, Brannon, Andrus, Tyler |
| 14 | Sherman |
| 15 | Bradford, Webb, Bethel, Franks, and Jersey |
| 16 | Orwood, Palm, Holland, Hotchkiss, and Quimby |
| 17 | Byron and Clifton |
| 18 | Staten, Bouldin, and Venice |
| 19 | Bract, Canal Ranch, and New Hope |
| 20 | Empire, King, Terminous |
| 21 | Bacon, Mandeville, McDonald, Mildred, and Medford |
| 23 | Upper and Lower Jones and Dressler |
| 24 | Lower, Middle, and Upper Roberts |
| 25 | Union, Fabian, Woodward, and Victoria |
| 26 | Rough and Ready Island and part of Middle Roberts |
| 27 | California Irrigated Farms (Stewart and Pescadero) |

The 1954-55 study defined the Delta Lowlands to cover a land and water area of about 469,000 acres of which about 374,000 acres were developed for agricultural purposes and which about 292,000 acres were irrigated in 1955. Within the Lowland areas developed
for agricultural purposes, 33% (121,000 acres) have a north mineral soil type, 16% (61,000 acres) a south mineral type, and 51% (192,000 acres) a middle organic type.

The soils of the Delta margin are mainly mineral in character with variable admixtures of organic matter. The mineral soils were developed from valley plain materials and for the most part represent a transition between organic soils of the flat and depressed river delta basin and the better drained soils of the alluvial fans and valley floor.

The organic soils are derived from the extensive marshland vegetation that once occupied the Delta basin. A century and a half ago, the Delta was a vast tule march. Dense stands of the great bulrush, or tule (*Scirpus lacustris*) occupied the center of each island, where shallow water covered the surface most of the year (USDA, 1941). The organic content of peat soils is 50% to 80%. Areas with intermediate organic soils will have 10% to 50% organic matter and mineral soils about 10% or less.

The organic soils occupy a larger aggregate acreage (about 250,000 acres) than the mineral soil areas. Most of the central Delta has Staten and Venice peaty muck soil that have 60% to 70% organic matter. Most areas that have the intermediate organic type soils (Ryde silty clay loam) will have 30% to 50% organic matter.

DWR Report 4 (1956) was used to identify the magnitude of drainage volume on a Delta-wide basis and to determine drainage patterns associated with crop acreages, island soil types, and specific islands and tracts. The report showed that summer drainage volume was highest in July-August and winter volume highest during December-January. There was no information on TTHMFP concentrations as THM was not a water quality issue at that time. The conclusion of this report with respect to drainage impacts on salts in Delta waters was:

> *"... that agricultural practices within the Delta Lowlands during the summer, when the problem of water quality there is most critical, do not degrade good quality Sacramento River water as it moves through the Delta to the Tracy Pumping Plant but rather enhances its quality by removing a portion of its salt content. In the winter months, when the accumulated surplus salts are discharged to the channels, there is usually sufficient surplus flow through the Delta to dilute and to carry out to the ocean the leached salts. However, it should be noted that the preceding statement applied to conditions as of 1954-55. Any additional upstream regulation of a dry year, such as 1924 or 1931, will decrease winter flows through the Delta to the extent that leached salts may not be completely removed from the area."*

In 1964, the Department re-examined the qualities and quantities of agricultural drainage in the Delta. The field study, however, was selective rather than exhaustive, and ran from July through November. Figure 10 shows the location of the study's sampling stations and soil types in the Delta. Only 7 percent of the 200 pump stations in the Delta were sampled but they accounted for 20 percent (73,400 acres) of the irrigated land (367,000 acres). The findings are reported in DWR Bulletin No. 123 "Delta and Suisun Bay Water Quality Investigation" (August 1967). As found in DWR Report No. 4, drain flows, computed from power meter readings, indicated that more water per acre was drained from organic soils than mineral soils. They also noted that:

> *"Conditions of pumping from the drains varied from intermittent pumping on Grand Island, composed mostly of mineral soils, to constant and high rate pumping on Staten Island, composed almost entirely of organic peaty soils...When consumptive use is high, during July and August, the drainage is primarily tailwater. In the winter, salts are leached out of the soils and the dissolved minerals reach a maximum...Seasonal concentrations of TDS, Cl, and N during 1964 appear reasonably consistent and indicate that the poorest quality water was discharged during the winter months...Examination of the data shows that drainage waters discharged in the south-eastern Delta were of poorest quality."*

As with the 1954 study, there was no information on TTHMFP.

Source: Department of Water Resources, Bulletin No. 123 (August 1967)

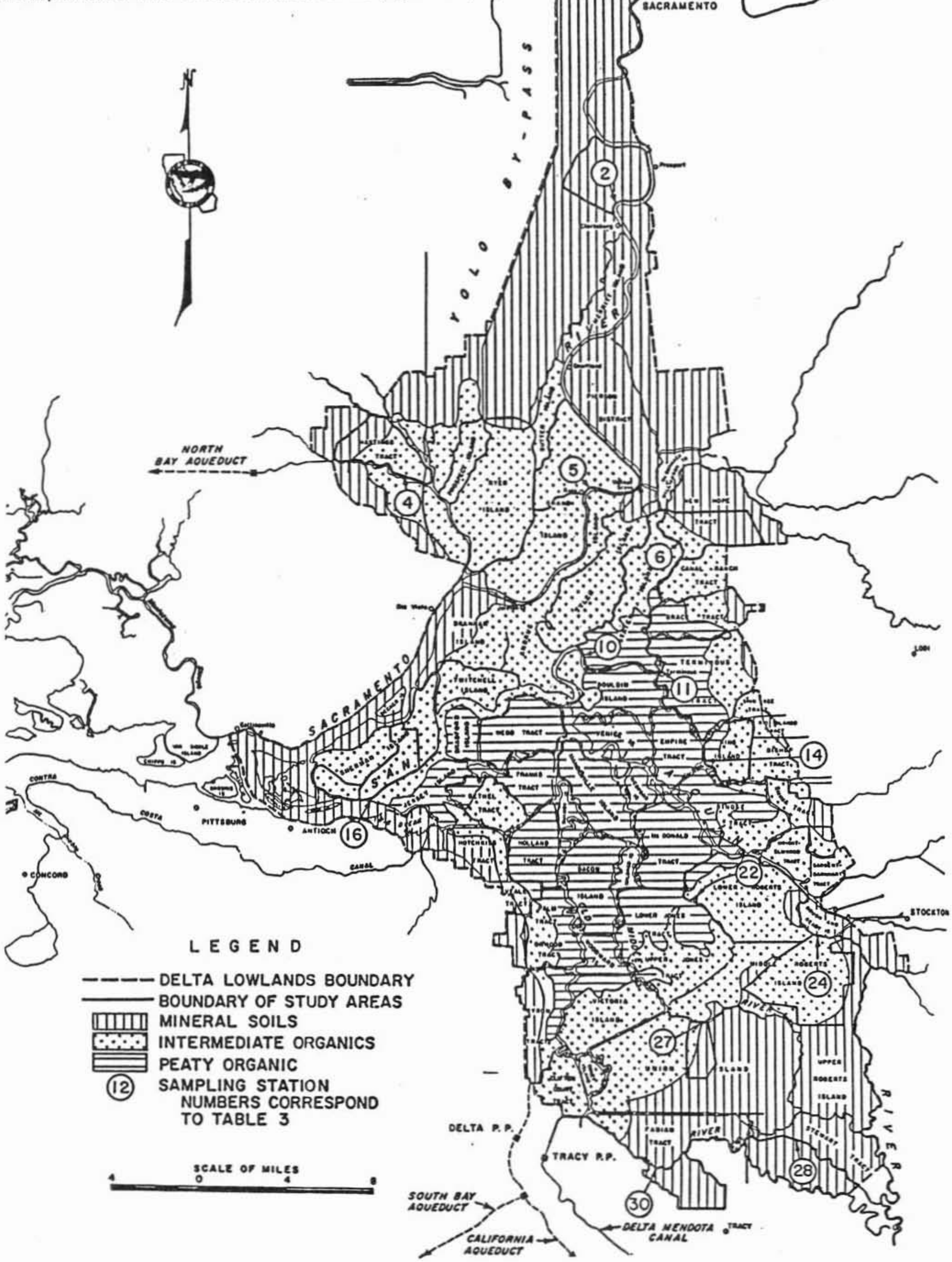



**Figure 10 . Composition and Distribution of Soils in the Sacramento-San Joaquin Delta Lowlands**

## B. Drainage Water Quality

1. Pesticide Survey

From July 18 to July 22, 1988, 30 drains were sampled for pesticides. The list of pesticides to be analyzed by the laboratory was based on the selection scheme used in the Department's Interagency Delta Health Aspects Monitoring Program (IDHAMP).

Recognizing the cost and technical limitations associated with analyzing water samples for all pesticide contaminants, a selection procedure was developed to identify those pesticides with the most likelihood of being present at a particular sampling site and time period in the Delta. Pesticide use data compiled by the State Department of Food and Agriculture were evaluated to determine quantities used and time of application. The list of pesticides with the highest reported use was further reviewed to delete those that were insoluble in water and, therefore, would not appear in water samples but rather sediment and biota.

The final target list of 26 chemicals for monitoring represented those pesticides that had the higher probability of being detectable in Delta waters if present as a contaminant in the summer. To water treatment and distribution entities, these water soluble compounds pose difficulties in removal when compared to insoluble contaminants that can be removed by flocculation, coagulation, or filtration processes during treatment.

Sampling was conducted in July because it is the peak month of farm pest control chemical applications and peak summer drainage discharge month. Therefore, sampling in July would enable a higher likelihood of detecting pesticide residues in the island drainages.

Detailed steps of the selection scheme are reported in the IDHAMP reports.

Six pesticides were found above the analytical limit of detection in one or more of the drain water samples. The pesticides were atrazine, bentazon, carbaryl, methamidophos, ordram, and simazine.

One or more of the six detected pesticides were detected in thirteen of the drains. Atrazine was detected in drains on Bouldin, Kings, Pierson, Terminous, and Upper Egbert Islands. Bentazon and ordram were detected in Colusa Drain. Carbaryl was detected in a Egbert Island Drain. Methamidophos was detected on Upper Egbert Island. Simazine was detected in drains on Mossdale and Upper Egbert Islands and Shima Tract. In all cases, the levels found were below existing drinking water standards or action levels established by the California Department of Health Services. Table 3 summarizes the pesticide data compared to drinking water criteria. Since 30 drains are a small proportion of the 260 drains in the Delta, it is premature to conclude that similar results would be seen at all drainages. The detection of pesticides in water is also highly dependent on timing. Water samples collected on a single day of the year do not necessarily reflect pesticide concentrations during the rest of the year. Further sampling would confirm whether pesticide regulations and farming practices have effectively reduced the threat of serious contamination to the Bay-Delta environment.

Since this study focused only on drinking water quality concerns, we did not sample sediment or biota for pesticide analyses. Therefore, ecological concerns about pesticides are not addressed.

Table 3. Pesticide Monitoring Results
July 18-22, 1988
(ug/L)

| STA. NAME | EC (uS/cm) | 2,4-D | Alachlor | Atrazine | Bentazon | Bolero | Captan | Carbaryl | Carbofuran | Dacthal | Dicofol | Dinoseb | Diazinon | Ethyl Parathion | Methyl Parathion | MCPA | Methamidophos | Nudrin | Ordram | Orthene | Paraquat | Proparagite | Propanil | Propham | Simazine | Triforine | Ziram |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BOULDIN1 | 178 | -- | -- | 0.60 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BOULDIN2 | 202 | -- | -- | 0.25 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BRANNANPP03 | 1010 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BRANNANPP04 | 579 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| COLUSA | 554 | -- | -- | -- | 2.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.76 | -- | -- | -- | -- | -- | -- | -- | -- |
| EGBERTPP01 | 297 | -- | -- | -- | -- | -- | -- | 8.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| KINGISPP01 | 439 | -- | -- | 0.13 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| KINGISPP02 | 652 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MCCORWIL01 | 166 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MOSSDALE01 | 1000 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MOSSDALE04 | 1120 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.1 | -- | -- |
| MOSSDALE10 | 992 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.1 | -- | -- |
| MOSSDALE11 | 1080 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.3 | -- | -- |
| NETHERLAND01 | 222 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| NETHERLAND02 | 206 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PESCADERO01 | 1280 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PESCADERO02 | 1560 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PESCADERO03 | 1850 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PESCADERO04 | 1890 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PIERSONPP01 | 268 | -- | -- | 0.34 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PROSPECTPP01 | 183 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RINDGEPP02 | 870 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RIOBLANCO01 | 739 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SHIMATR | 577 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.2 | -- | -- |
| TERMPP01 | 425 | -- | -- | 0.41 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TERMPP02 | 542 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| UPEGBERTPP01 | 344 | -- | -- | 0.91 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| UPEGBERTPP02 | 277 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| UPEGBERTPP03 | 331 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.6 | -- | -- | -- | -- | -- | -- | -- | 8.4 | -- | -- |
| UPJONESPP02 | 860 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Note: All other values (--) below reporting limit.

2. TTHMFP

a. Monthly Concentrations

Drains in this study were generally high in TTHMFP, as compared to water in the Delta channels. Although concentrations at any given site varied with time, they tended to fall within characteristic concentration ranges at a given drain and time of year. Overall, TTHMFP ranged from a high of 5100 μg/L in May 1987 on Egbert to a low of only 100 μg/L in October 1987 on McCormick-Williamson tract.

The range of drainage TTHMFP concentrations by calendar month is shown in Table 4. The full station names and locations of the sampled drainages are listed in the Appendix. When a range of values for a specific month (e.g., AGDEMPIRE January) appear, it is the result of combined data for 1987 and 1988 and/or reflects multiple samples having been taken in some months. The ranges indicate the magnitude of concentrations and show that changes in TTHMFP such as in the winter (December-February) will vary with the stages of flooding and draining operations on the islands. All observations are reported in the Appendix. With few exceptions, TTHMFP observations from multiple drainages of the same island are within the same range of values.

Monthly differences among the multiple drainages for the same island are thought to be due to the extent of irrigation. For example, DWR sampling crew observed farmers alternating the areas being flooded during the winter. In areas where flooded fields were being drained, the power consumption was higher for the pump stations than at pump stations that were inactive in unflooded and undrained field areas on the same island. Therefore, drainage water quality and volume probably reflected what stage of activity (e.g., initial flooding, holding, draining) was occurring on the area drained by the individual pump stations. For example, during a holding period (ponding), there was less variability in TTHMFP. However, if sampling occurred during the stage of flooding or draining the fields, the observations were more variable and reflected these stages.

Most of the drains sampled to date lie along the periphery of the Delta. The northern, eastern, and southern edges of the Delta are covered. We have not yet collected data in the central region nearest to the State and Federal water project intakes and the Contra Costa Water District intake. Recently (December 1989), written permission was granted to sample on Webb and Holland Tracts, and Bacon Island.

Table 4. Monthly Range of TTHMFP Concentrations, 1987-88
Units in micrograms per liter

| STATION | JAN | FEB | APR | MAY | JUN | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|
| AGDEMPIRE | 3600-4300 | 2300-4000 | 2100-4800 | 2700-4400 | 1100-4300 | 3400-3700 | 2700-2800 | 1600-2200 | 1400-1500 | 2500-2900 |
| AGDGRAND | 2400-2600 | 2200 | 980-1500 | 790-1100 | 860-1400 | 750-760 | 1200-1300 | 860-1200 | 950-2500 | 1700-1900 |
| AGTYLER | | | 1400 | | 1100 | | | | | |
| BOULDIN1 | 1600-2900 | 1600 | | 1100 | | 750-2100 | | 2000 | | 1700-3300 |
| BOULDIN2 | 1600-3300 | 1600 | | 2300 | | 900-3700 | | 1800 | | 2800-3100 |
| BRANNANPP01 | 2200-2700 | | | 2400 | | 1300 | | 1000 | | 1900 |
| BRANNANPP02 | 1200-2100 | | | 1800 | | 1900 | | 370 | | 620 |
| BRANNANPP03 | 1600-2400 | | | 980 | | 1600 | | 160 | | |
| BRANNANPP04 | 2200-3100 | | | 1300 | | 950 | | 1700 | | 2000 |
| CLIFTONCT | 1000 | | | 2000 | | | | | | |
| EGBERTPP01 | 890-2100 | | | 3400 | | 1300 | | 1700 | | |
| EGBERTPP02 | 1300-2400 | | | 5100 | | | | 3600 | | |
| KINGISPP01 | 1000 | 480 | | 1200 | | 2400 | | 830 | | 1200 |
| KINGISPP02 | 1500 | 660 | | 1500 | | 2200 | | 800 | | 1700 |
| KINGISPP03 | 1400 | 900 | | 1800 | | 2600 | | 1400 | | 2000 |
| MCCORWIL01 | 410 | | | 660-720 | | 410 | | 1100 | | |
| MCCORWIL02 | 320 | | | 670 | | 390 | | 100 | | |
| MOSSDALE01* | 300 | | | 460 | | 990 | | 230 | | |
| MOSSDALE02* | 300-320 | | | 650 | | 670 | | | | |
| MOSSDALE03* | | | | | | 1300 | | | | |
| MOSSDALE04* | 750 | | | 970 | | 1100 | | 880 | | |
| MOSSDALE05* | | | | | | 1100 | | | | |
| MOSSDALE06* | | | | | | 2500 | | | | |
| MOSSDALE08* | | | | | | 820 | | 700 | | |
| MOSSDALE09* | | | | | | 1400 | | 560 | | |
| MOSSDALE10* | 1500 | | | 1200 | | 890 | | 480 | | |
| MOSSDALE11* | 560 | | | 1700 | | 770 | | | | |
| MOSSTRPP02* | 640-870 | | | 990 | | 400 | | 760 | | |
| MOSSTRPP03* | 930 | | | 1100 | | 730 | | 590 | | |
| NETHERLAND01 | 380-900 | | | 490 | | 690 | | 220 | | |
| NETHERLAND02 | 350-900 | | | 450 | | 880 | | 360 | | |
| PESCADERO01 | 930 | | 430 | 580 | | 1500 | | 530 | | |
| PESCADERO02 | 770 | | 470 | | | 1500 | | 550 | | |
| PESCADERO03 | 770 | | 660 | 840 | | 1100 | | 630 | | |
| PIERSONPP01 | 940-2600 | | | 1700 | | 640 | | 680 | | |
| PROSPECTPP01 | 2000 | | | 640 | | 650 | | 1100 | | |
| RINDGEPP01 | 3100 | 1200 | | 2500 | | 2800 | | 1100 | | 2000 |
| RINDGEPP02 | 2200 | 1200 | | 2100 | | 2000 | | 1100 | | 2000 |
| RIOBLANCO01 | 720 | 410 | | 750 | | 620 | | 710 | | 610 |
| RIOBLANCO02 | 720 | 370 | | 870 | | 690 | | 710 | | 500 |
| SHIMATR | 490 | 430 | | 1000 | | 960 | | 870 | | 820 |
| TERMPP01 | 1300-2400 | | | 1600 | | 1400 | | 490 | | 2700 |
| TERMPP02 | 1500-1900 | | | 1700 | | 990 | | | | 1300 |
| UPEGBERTPP01 | 540 | | | 2100 | | 1400 | | 960 | | |
| UPEGBERTPP02 | 340 | | | 860 | | 1000 | | 730 | | |
| UPEGBERTPP03 | 600 | | | 2400 | | 1000 | | 1600 | | |
| UPJONESPP02 | 670-1700 | 810 | | 1400 | | 590-1400 | | 950 | | 1200-1600 |

* Moss Tract is now a golf course. Mossdale Tract is being converted from agriculture to residential uses. Drainage volumes observed during the period of record were very small. Both of these tracts lie outside the Delta Lowlands and have been dropped from the study.

b. Soil Type Relationships

The expected maximum range of TTHMFP concentrations for sampled islands was estimated for the summer and winter peak drainage periods, respectively. Data for August were used to estimate the summer month concentrations. January data were used to estimate the winter flooding TTHMFP levels. These two months had the most data on drainages during the summer and winter peak drainage periods.

When TTHMFP data were not available, the assumption was made that concentrations observed at a sampled drain were representative of the unsampled drains on the same island. This assumption was based on the uniform soil types reported for the sampled islands or tracts. Additional data collection is needed to enable these assumptions to be further tested and revised. Three TTHMFP concentration ranges were plotted to determine if there were any geographic pattern associated with the TTHMFP concentrations. The ranges were: (1) less than 1000 µg/L, (2) between 1000 and 2000 µg/L, and (3) greater than 2000 µg/L. The range of values assigned to each sampled island were based on the values reported for August and January observations. Maximum values rather than the averages or average of maximum values for an island or tract were used when there were more than one observation.

The August TTHMFP distribution clearly showed a relationship to the soil composition of the Delta for the islands sampled (Figures 10 and 11). Drainages on islands and tracts overlying mineral soils had less than 1000 µg/L TTHMFP. Areas with intermediate organic soils had expected TTHMFP concentrations ranging from 1000 to 2000 µg/L. The highest TTHMFP concentrations (greater than 2000 µg/L) were observed from islands and tracts overlying peaty organic soils. TTHMFP in the 3000 µg/L to 4000 µg/L range were observed in drainwater samples from Empire Tract and Bouldin Island. However, these high values are in part due to bromides in connate water in that particular region of the Delta (Figure 11).

During January when fields are being flooded or drained from winter leaching, the highest observed TTHMFP concentrations in the drains were mostly over 1000 µg/L for the islands that were sampled (Figure 12). Drainage from intermediate organic soil and peaty organic soils typically had more than 2000 µg/L TTHMFP, as did drainage from northern mineral soil areas. Southern mineral soil areas had drainage below 1000 µg/L. In most cases, the January maximum TTHMFP concentrations were higher than those observed in August for the same drain. For example, the respective August and January maximum TTHMFP were 3700 and 4300 µg/L for Empire Tract (AGDEMPIRE), 2900 and 3100 µg/L for Bouldin Island (average of maximums at BOULDIN1 and BOULDIN2), 1215 and 2150 µg/L at Terminous Tract (average of maximums at TERMPP01 and TERMPP02), 1440 and 2600 µg/L at Brannan Island (average of maximums at BRANNANPP01-4), 760 and 2600 µg/L at Grand Island (AGDGRAND), and 1400 and 1700 µg/L at Upper Jones Tract (UPJONESPP02).

Figure 13 graphically shows the August and January ranges of TTHMFP at some drainages from peat, intermediate organic, and mineral soil islands or tracts. At some drainages (e.g. King and Upper Egbert), the January observations were lower than that of August. This may have been attributed to sampling late after these islands were leached or there was no leaching performed that winter. The figure demonstrates the earlier conclusion that it is difficult to assign a single expected TTHMFP value to an area. The use of ranges of TTHMFP concentrations over a specific time period is a more reasonable approach in describing the TTHMFP of a drainage.

Data from previously unsampled tracts and islands are needed to confirm the relationship between soil and TTHMFP concentrations observed thus far. Variations may occur because of non-uniform soil type on some islands or proximity to bay water influences. Islands near the western tip of the Delta may have higher TTHMFP because of bromides in bay-fresh water mixtures used for irrigation during the dry summer. Other islands such as Empire Tract have connate water that is high in salts including bromide as seen by brominated THM concentrations. Islands in the central Delta may have the greatest influence on the water quality of Delta exports.

In 1981 DWR collected soils along the alignment of the proposed Peripheral Canal project (DWR, 1982). Filtered soil extracts from composited mineral soils collected along the northern alignment and composited peat soils collected along the southern alignment were analyzed for TTHMFP. The soil samples were taken 0.6 meters below the surface with a core sampler. The extracts from the composited mineral soils had 27,000 µg/kg TTHMFP and the composited peat soils had 61,000 µg/kg TTHMFP. The TTHMFP in both composited sample extracts was comprised of chloroform with no measurable brominated THM compounds. The soil extract data may, therefore, explain the soil type relationship with drainage TTHMFP being observed during high irrigation months (summer irrigation and winter flooding to remove salts).

The island drains are open ditches that are dug to a depth of 6 feet to 10 feet on most Lowland areas. These drains collect water percolating through the soils. By design, surface runoff is not commonly channeled into these drains. The chemistry of the drainwater therefore reflects the water coming in contact with salts and organic matter in these soils (e.g. leaching, ion exchange, reactions).

Additional soil sampling at depth is planned for 1990 to further examine differences among regions of the Delta. More drainage sampling on other islands is needed to confirm the observed relationship between TTHMFP and soil type classification.

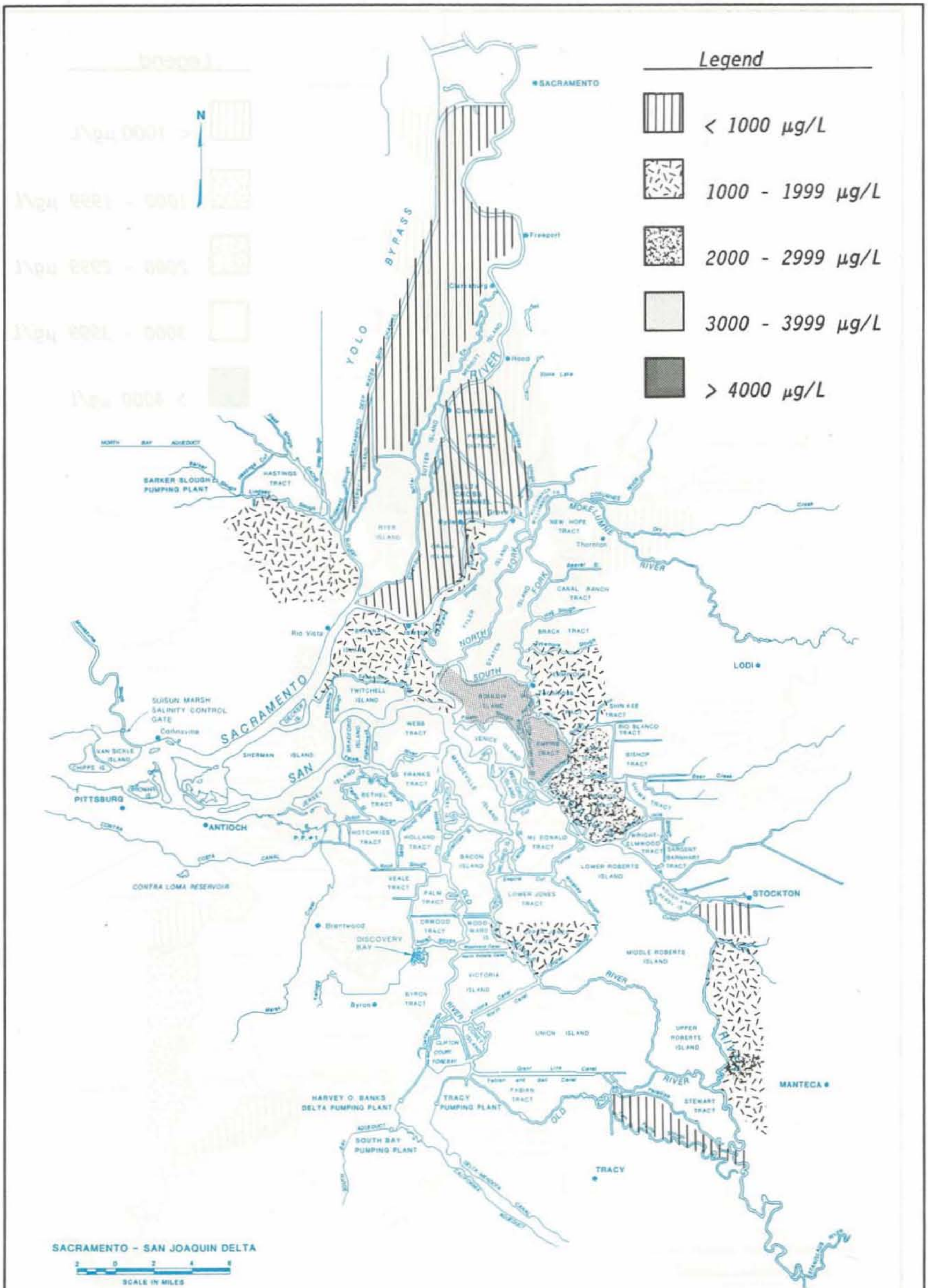



**Figure 11. August THMFP Concentrations**
*Observed Maximums*

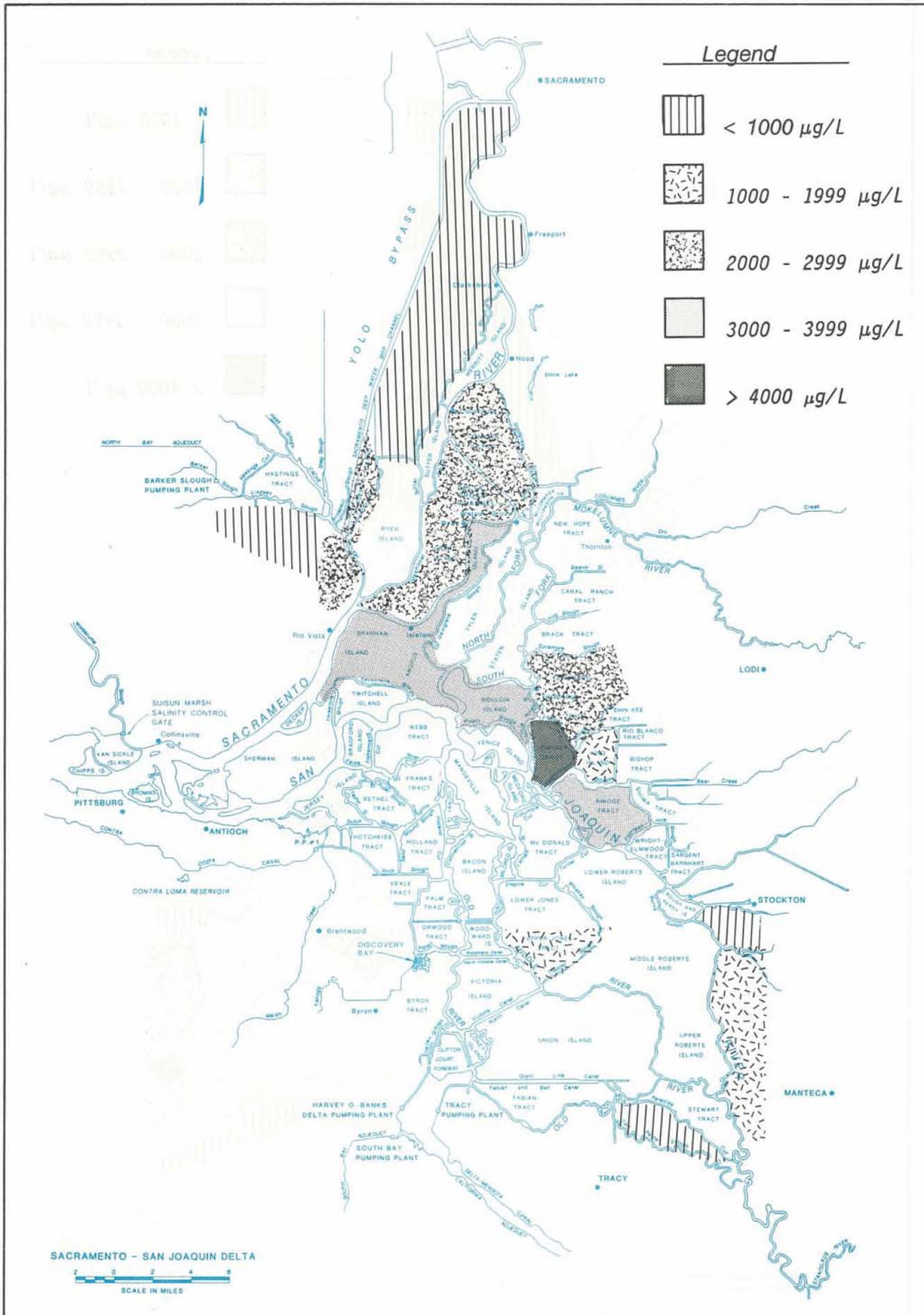



**Figure 12. January THMFP Concentrations**

*Observed Maximums*

# Summer and Winter Drainage TTHMFP

Observed ranges for selected drainages

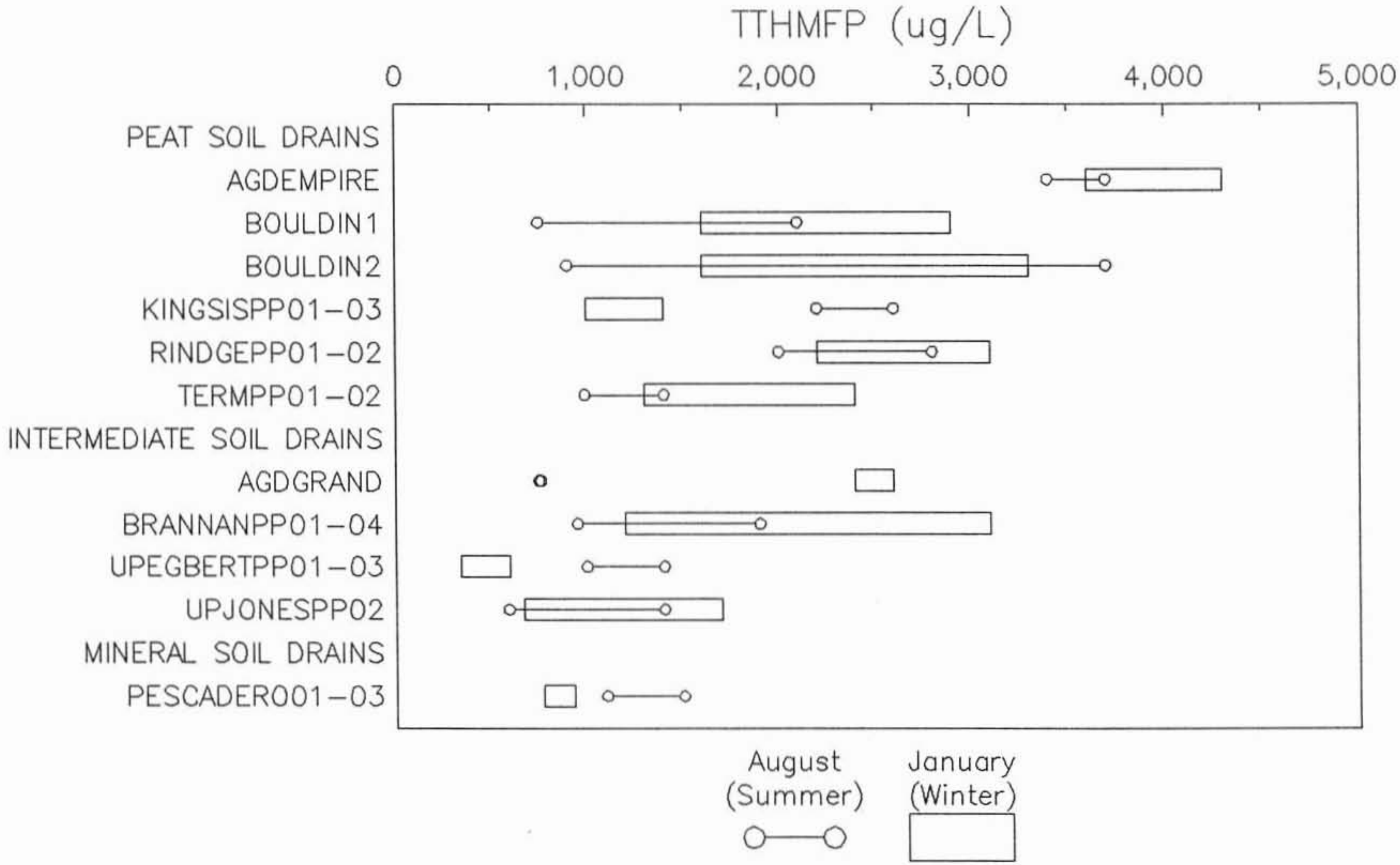



**Figure 13.**

c. <u>Bouldin Island - Upper Jones Tract</u>

Drainage water from two Bouldin Island drains and one drain from Upper Jones Tract were sampled weekly during times of increased drain activity. In the summer the drains were sampled during July-August; winter sampling was conducted between December and early February. The results of the sampling are summarized in Table 5.

Based on the DWR soil composition maps (1967), Bouldin Island overlies peat soil while Upper Jones Tract overlies soil classified as intermediate organics.

All measures, including EC, DOC, and TTHMFP gradually increased and then decreased over the period of irrigation and leaching. For example, sampling during summer 1988 at Bouldin Pump Number 2, showed a smooth increase of THMFP from 1100 μg/L on July 18 to a maximum of 3700 μg/L on August 24. (EC and TOC peaked one week earlier.) All measures were beginning to drop by the final week of sampling on August 31.

Measurements during winter of 1988-89 show that drain THMFP concentrations were already elevated on December 20, and held approximately steady until January 26, when THMFP concentrations dropped by about half. Monitoring at the other stations reflect similar features.

In view of the limited sampling opportunities, there was hope that the Bouldin Island data might serve as a good representative of northern Delta islands and Upper Jones Tract representing the southern region in spite of varying soil types.

Bouldin Island data were compared to the northern area drainages which included the adjacent peat soil islands (Empire Tract and Terminous Tract) and northern intermediate organics areas (Brannan Island, Tyler Island, Grand Island). Upper Jones Tract data were compared with Pescadero Tract drainages.

The data are inconclusive to show that Bouldin Island and Upper Jones Tract drainages are representative of drainage water quality conditions that would be observed in the northern and southern Delta areas, respectively. More sampling at other islands is needed for comparison, as there is an undetermined variety of Delta island drainage conditions.

The data demonstrate the importance of monitoring during key periods of drain activity. They also demonstrate that single measurements of THMFP or other water quality parameters in island drainages should not be used to characterize drain water quality. Regular measurements over time will provide good overall information about the drains. Monthly ranges of data should be used to best characterize drain water quality rather than single values. Estimates of specific drain discharge impacts on Delta water quality will require detailed monitoring of more islands for both drainage quality and quantity to obtain flow-weighted estimates of water quality constituents.

# Table 5. Bouldin Island - Upper Jones Tract THMFP
## Summer irrigation and winter leaching period

| Station | Date | EC | DOC | CHCL3 | CHBRCL2 | CHBR2CL | CHBR3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|
| BOULDIN1 | 07/18/88 | 178 | 6.8 | 840 | 14 | 1 | 1 | 860 |
| BOULDIN1 | 08/10/88 | 186 | 5.9 | 710 | 33 | 1 | 1 | 750 |
| BOULDIN1 | 08/17/88 | 338 | 19 | 2000 | 98 | 4 | 1 | 2100 |
| BOULDIN1 | 08/24/88 | 323 | 19 | 2000 | 110 | 2 | 1 | 2100 |
| BOULDIN1 | 08/31/88 | 349 | 25 | 2000 | 120 | 3 | 1 | 2100 |
| BOULDIN2 | 07/18/88 | 202 | 10 | 1100 | 19 | 1 | 1 | 1100 |
| BOULDIN2 | 08/10/88 | 218 | 14 | 1600 | 56 | 1 | 1 | 1700 |
| BOULDIN2 | 08/17/88 | 440 | 39 | 1800 | 170 | 1 | 1 | 2000 |
| BOULDIN2 | 08/24/88 | 350 | 32 | 3200 | 150 | 2 | 1 | 3400 |
| BOULDIN2 | 08/24/88 | 351 | 26 | 3600 | 120 | 1 | 1 | 3700 |
| BOULDIN2 | 08/31/88 | 312 | 25 | 2000 | 91 | 2 | 1 | 2100 |
| UPJONESPP02 | 07/18/88 | 860 | 8.1 | 770 | 220 | 48 | 1 | 1000 |
| UPJONESPP02 | 08/10/88 | 598 | 8.3 | 920 | 210 | 28 | 1 | 1200 |
| UPJONESPP02 | 08/17/88 | 721 | 14 | 1200 | 210 | 19 | 1 | 1400 |
| UPJONESPP02 | 08/24/88 | 766 | 10 | 1200 | 200 | 26 | 1 | 1400 |
| UPJONESPP02 | 08/31/88 | 516 | 4.8 | 420 | 120 | 44 | 3 | 590 |
| BOULDIN1 | 12/20/88 | | 51 | 3100 | 130 | 22 | 4 | 3300 |
| BOULDIN1 | 12/28/88 | | 56 | 2500 | 190 | 23 | 1 | 2700 |
| BOULDIN1 | 01/03/89 | | 63 | 2400 | 220 | 22 | 1 | 2600 |
| BOULDIN1 | 01/11/89 | | | 2700 | 170 | 1 | 1 | 2900 |
| BOULDIN1 | 01/26/89 | | | 1400 | 160 | 8 | 1 | 1600 |
| BOULDIN1 | 02/03/89 | | | 1340 | 230 | 20 | 1 | 1600 |
| BOULDIN2 | 12/20/88 | | 56 | 2700 | 120 | 23 | 4 | 2800 |
| BOULDIN2 | 12/28/88 | | 85 | 2800 | 67 | 25 | 1 | 2900 |
| BOULDIN2 | 01/03/89 | | 70 | 2400 | 220 | 22 | 1 | 2600 |
| BOULDIN2 | 01/11/89 | | | 3100 | 160 | 8 | 1 | 3300 |
| BOULDIN2 | 01/26/89 | | | 1500 | 96 | 13 | 1 | 1600 |
| BOULDIN2 | 02/03/89 | | | 1500 | 120 | 11 | 1 | 1600 |
| UPJONESPP02 | 12/28/88 | | 9.8 | 980 | 200 | 48 | 3 | 1200 |
| UPJONESPP02 | 01/03/89 | | 9.6 | | | | | |
| UPJONESPP02 | 01/11/89 | | | 1200 | 200 | 43 | 1 | 1400 |
| UPJONESPP02 | 01/26/89 | | | 530 | 110 | 25 | 3 | 670 |
| UPJONESPP02 | 02/03/89 | | | 510 | 240 | 52 | 3 | 810 |

EC (electrical conductivity) in µS/cm
DOC (total organic carbon) in mg/L
CHCL3, CHBRCL2, CHBR2CL, CHBR3, and TTHMFP in µg/L

d. Precursor Reactivities and Characteristics

Several studies have shown humic substances to be important THM precursors in natural waters (Oliver and Thurman, 1981; Rook, 1974; Rook, 1978; Stevens et al, 1976; Oliver and Lawrence, 1979). The yield of THMs from the reaction of humics with chlorine may in part be caused by the different origins and properties of the humic substances which vary widely with source (Ghassemi and Christman, 1968; Weber and Wilson, 1975).

During 1987 DWR sent water samples to the University of Arizona for characterization of dissolved organic matter (DOM). Samples from Tyler Island drain, Grand Island drain, Empire Tract drain, Upper Jones Tract drain, Sacramento River at Greenes Landing, San Joaquin River near Vernalis, and the H.O. Banks Pumping Plant Headworks were collected from the Delta. The analyses were performed by Dr. Gary Amy and reported in AWWA Journal, vol. 82, January 1990 (Amy et al, 1990).

The objective of the research was to use molecular weight and other characterizations to identify possible "fingerprints" of agricultural versus nonagricultural sources of THM precursors and humic substances. The apparent molecular weight (AMW) distributions of the nonpurgeable dissolved organic carbon (DOC) were compared.

AMW distributions, based on DOC or THMFP, can be studied as bar graphs representing the discrete molecular weight fractions. If different molecular weight fractions exhibited different THM yields and reactivities (μg THMFP/mg DOC), the calculated average molecular weight of the DOC should differ from that of the THMFP. A higher average molecular weight based on THMFP rather than DOC indicates that higher molecular weight material produces more reactive in forming THMs.

The general observations were that drain samples when compared with river and lake samples had:

1. a higher molecular weight for DOM, greater levels of DOC, UV absorbance, THMFP, and TOXFP (Total Organic Halide Formation Potential),

2. a higher percentage of humic substances,

3. a higher average THMFP:DOC ratio thus indicating more DOC and material that formed THMs,

4. values of TOXFP:DOC that showed a higher propensity to form organic halide, and

5. had four times greater TTHMFP and ten or more times greater DBPs being formed.

Amy's work indicates that the THM organic precursors in drain and nondrain water samples are significantly different in their character and propensity to form THMs and other DBPs. The drain water THM organic precursors (DOC) as characterized in this study are more reactive in forming greater levels of THMFP, TOXFP, and other DBPs than the applied source water (Sacramento and San Joaquin rivers) from the Delta channels.

Since the DOC characteristics of channel water and drain water differ, drain water THMFP concentrations are probably not due to concentrating effects of THM precursors of DOC such as from the evaporation of applied water. The higher TTHMFP in island drainages in the winter when evaporation-transpiration is lowest also strongly indicate that soil leaching is the dominant cause of increased TTHMFP in the Delta. Further study of the fate of applied water THM precursors is necessary to verify this conclusion.

Drain water had much higher AMW compounds (5,000 to 10,000 and 1,000 to 5,000) while most river source water had 1,000 or less AMW (Table 6). Empire Tract drainage samples of DOC and TTHMFP had about 16% to 18% of its organic compounds less than 1,000 AMW and about 83% to 85% above 1,000 AMW. Samples from the San Joaquin River, Sacramento River, and Banks Headworks had 45% to 60% of their DOC and TTHMFP compounds less than 1,000 AMW and 37% to 55% above 1,000 AMW.

Microbial decay would be expected to break down high molecular weight compounds to lower molecular weight compounds rather than synthesize larger and more complex compounds. The UV data also showed more humic substances in the DOC pool of the drainwater. These results agree with other studies that found marsh-bog water to have higher THM formation potential than surface water (Oliver and Thurman, 1981).

Because of the underlying decaying organic soils, Delta islands are major storage pools of soil humic substances. Soil humics are considered to be the precursor to aquatic humics over geological time frames. However, additional studies on the consistency and seasonality of the AMW distribution in drainages and river channels should be pursued further to determine the extent of impact to Delta drinking water supplies.

Other studies (Thurman, 1985) of the concentration of humic substances in natural waters support Dr. Amy's findings. In wetlands, the DOC is different from river and lake waters. This difference is the increased percentage of humic and fulvic acid which is 70% to 90% of the DOC (Figure 15).

**Table 6. Percent Distribution of AMW**

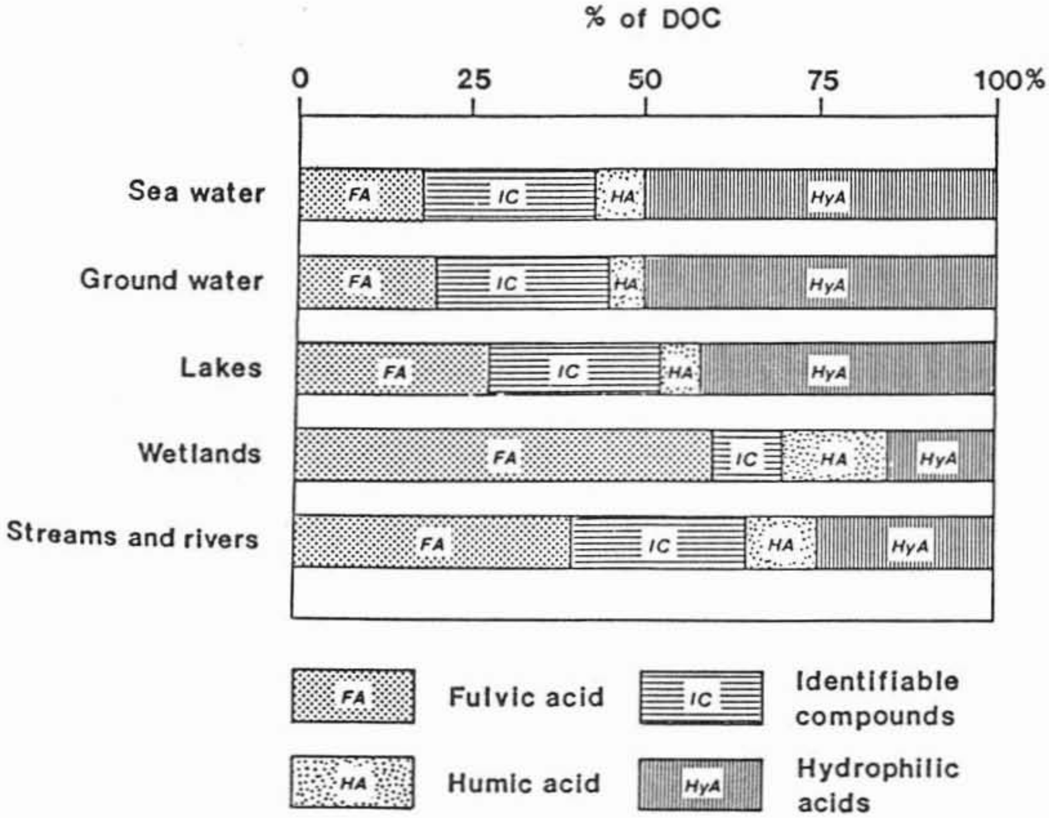
Percent distribution by wt. of DOC

| Sampling Station | Number of samples | >10,000 AMW | 5,000 to 10,000 AMW | 1,000 to 5,000 AMW | 500 to 1,000 AMW | <500 AMW |
|---|---|---|---|---|---|---|
| San Joaquin River (Vernalis) | 2 | 13 | 4.5 | 29.5 | 26 | 26 |
| Sacramento River (Greenes Landing) | 2 | 8 | 12 | 28.5 | 27.5 | 30 |
| Banks Headworks | 3 | 8 | 12 | 27 | 27 | 26 |
| Empire Tract | 3 | 12.5 | 30.5 | 42 | 9 | 7 |

Percent distribution by wt. of TTHMFP

| Sampling Station | Number of samples | >10,000 AMW | 5,000 to 10,000 AMW | 1,000 to 5,000 AMW | 500 to 1,000 AMW | <500 AMW |
|---|---|---|---|---|---|---|
| San Joaquin River (Vernalis) | 2 | 4 | 4 | 34 | 30 | 30 |
| Sacramento River (Greenes Landing) | 2 | 9.5 | 2.5 | 43 | 11 | 34 |
| Banks Headworks | 3 | 3 | 14 | 34 | 36 | 13 |
| Empire Tract | 3 | 17 | 27 | 39 | 14 | 4 |

Data read from bar charts in Amy et al, 1990




Reference: Figure from E.M. Thurman, Organic Geochemistry of Natural Waters, 1985.

**Figure 14. Humic Substances in Natural Waters**

As for the decomposition rates of DOM, Saunders (1976) proposed the following generalization. Simple low molecular weight organic compounds decompose most quickly with turnover times of less than one hour to several hours. Higher molecular weight organics released by phytoplankton and bacteria decompose in 2 to 10 days. Other higher molecular weight dissolved organics decompose on the order of 100 days and there is assumed to be at least another class of organics that decays much longer than 100 days. This suggests that the highly reactive humic substances or THM precursors in island drainages originating from the organic soils will be more persistent than humics in water applied to the islands. In fact, humic substances, the most reactive fraction of the DOM in forming THMs, are very biorefractory. Carbon dating has established that humics in the Suwannee River (Florida) are 30 years old. It is the nonhumic fraction of the DOM, consisting largely of biochemicals such as proteins and amino acids, which is more biodegradable (G. Amy, pers. comm.).

The relationship between salinity and DOC in an estuary has been studied by many. Some studies have found a conservative behavior of DOC in estuaries such as the North Dawes, the Beaulieu, the Ems, the Rhine, and the Severn (Loder and Hood, 1972; Moore and others, 1979; Laane, 1982; Eisma and others, 1982; Mantoura and Woodward, 1983).

Mantoura and Woodward (1983) found that degradation did not significantly change the DOC concentration during its 200-day residence time in the Severn Estuary. Other studies showed that precipitation and flocculation of DOC, particularly humic substances, occurred at salinities of 5 parts per thousand and more (Sholkovitz, 1976). Sholkovitz (1978) found only 1% to 6% removal of DOC in the Amazon estuary by precipitation. However, the humic acid, which accounted for 5% to 10% of the DOC was nearly all removed in the estuary (60% to 80%). It appeared that fulvic acid is not removed in the Amazon estuary.

Aquatic fulvic acids generally have molecular weights of less than 2000 and are more soluble than humic acids which have molecular weights from 2000 to 5000 or more. Humic acids are more colloidal in size and will therefore "salt out" in saline estuarine waters.

While these studies show different conservative behavior in an estuary, they agree that in waters of less than 5 parts per thousand salinity (<5,000 mg/L), DOC behaves conservatively.

The conclusion based on the above studies is that estuarine waters of 5 parts per thousand or more salinity will tend to remove by precipitation the more reactive THM precursor humic acid fractions in DOC carried downstream by river inflow.

The studies show that humic substances (fulvic and humic acids) in Delta waters may be treated as conservative constituents because of short water residence time relative to decay rates, and low salinities. With the exception of a few Delta sloughs, water flowing into the Delta is generally transported to the export pumps or out into the bay in a few days or weeks.

The relationship of bromides to the yield of brominated methane compounds (THMs containing bromide) for waters with similar DOC vary with the level of bromide in the untreated water. The wide variability is seen in the column THM-Br:THM-X percent in Table 7.

Two samples from the Empire Tract drain with DOC of 22.2 and 22.3 mg/L had 34% and 5% of the THMs as brominated THMs, respectively. This was due to 3040 µg/L bromide in the former sample while only 183 µg/L bromide was in the latter sample. However, two San Joaquin River (near Vernalis) samples had comparable DOC and bromide levels but the second sample had more brominated THMs (33% versus 48%). This suggests that the type of DOC compounds (humic versus nonhumic) may have a significant role in the TTHMFP and TBFP (total brominated methane formation potential) of water. Therefore, both bromides and organic matter influence the TTHMFP and TBFP in water supplies.

Additional samples of water, channel sediments, and island soils need to be collected for further characterization of THM precursors in the Delta. This work is needed to delineate the contribution and impact on the Delta of THM precursors from other sources besides island drainage.

# Table 7. Characteristics of Drain vs. Nondrain DOC

**Delta Island Drainage Samples**

| Date | Sample | DOC mg/L | Amy TTHMFP g/L | Modif. TTHMFP g/L | Br g/L | THM-Br: THM-X % | Humic of DOC % | AMW DOC based | Avg. AMW TTHMFP based | Avg. humic TTHMFP g/L | Non-Humic TTHMFP mol/L | Non-Humic TTHMFP g/L | Humic TTHMFP mol/L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/6/87 | EMPIRE 1 | | 22.2 | 2470 | 3580 | 3040* | 34 | 51.4 | 5060 | 4720 | 1040 | 5.35 | 1430 | 11.8 |
| 7/28/87 | EMPIRE 2 | | 22.3 | 2690 | 2510 | 183 | 5 | 59.6 | 4530 | 7470 | 744 | 5.63 | 1950 | 16.4 |
| 9/22/87 | EMPIRE 3 | | 18.7 | 1800 | 2700 | 898 | 25 | | | 2780 | 2650 | | | |
| 6/10/87 | GRAND 1 | | 7.24 | 290 | 791 | 120* | 4 | 61.7 | 2330 | 6930 | 77 | 0.56 | 213 | 1.81 |
| 7/28/87 | GRAND 2 | | 6.38 | 239 | 720 | 22 | 6 | 47.6 | 1440 | 2930 | 146 | | | |
| 6/24/87 | TYLER 1 | | 7.66 | 456 | 857 | 32 | 11 | 57.4 | 3140 | 2860 | 252 | 2.02 | 204 | 1.6 |
| 7/8/87 | TYLER 2 | | 10.4 | 642 | 1460 | 29 | 5 | 58 | 3880 | 5590 | 151 | 1.18 | 491 | 4.09 |
| 8/12/87 | JONES 1 | | 10 | 637 | 1550 | 175 | 17 | 40.3 | 2550 | 2700 | 224 | 1.59 | 413 | 3.29 |
| 9/28/87 | JONES 2 | | 6.36 | 433(-) | 770 | 130 | 21 | | | 2330 | 2410 | | | |

**Delta Non-Drainage Samples (Rivers and Channels)**

| Date | Sample | DOC mg/L | Amy TTHMFP g/L | Modif. TTHMFP g/L | Br g/L | THM-Br: THM-X % | Humic of DOC % | AMW DOC based | Avg. AMW TTHMFP based | Avg. humic TTHMFP g/L | Non-Humic TTHMFP mol/L | Non-Humic TTHMFP g/L | Humic TTHMFP mol/L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/10/87 | SACTO 1 | | 2.12 | 29(-) | 200 | 12 | 7 | 38 | 730 | 440 | | | | |
| 8/25/87 | SACTO 2 | | 3.14 | 164 | 208 | 22 | 11 | | | | 985 | | 2440 | |
| 5/6/87 | BANKS 1 | | 4.1 | 225 | 585 | 100* | 18 | 55.1 | 790 | 1050 | 31 | 0.22 | 194 | 1.46 |
| 8/12/87 | BANKS 2 | | 3.37 | 199 | 426 | 213 | 56 | | 940 | 920 | | | | |
| 9/22/87 | BANKS 3 | | 3.5 | 241 | 450 | 173 | 50 | | 1650 | 2000 | | | | |
| 6/24/87 | SJR 1 | | 3.67 | 249 | 535 | 127 | 33 | 44.4 | 721 | 560 | 49 | 0.34 | 200 | 1.4 |
| 8/25/87 | SJR 2 | | 3.54 | 262 | 504 | 134 | 48 | | 2100 | 2270 | | | | |

(-) A positive chlorine residual was observed for all TTHMFP samples except Sacramento 1 and Jones 2 samples. This means for these two
samples the TTHMFP would have been higher if the chlorine dosage met the chlorine demand and residual concentrations.
* IC data
Amy TTHMFP test conditions: pH 7.0, 20 degrees C., 168 hrs. holding, Chlorine dose = 3:1 ($Cl_2$:DOC)
Modified TTHMFP: pH 8.0, 25 degrees C., 168 hrs. holding, Chlorine dose at 120 mg/L

Reference: Amy et al, 1990, "Evaluation of THM Precursor Contributions from Agricultural Drains"
Modified TTHMFP data, THM-Br:THM-X (% on wt. basis), and IC bromide data from Metropolitan Water District of S. Calif.

3. Other Parameters

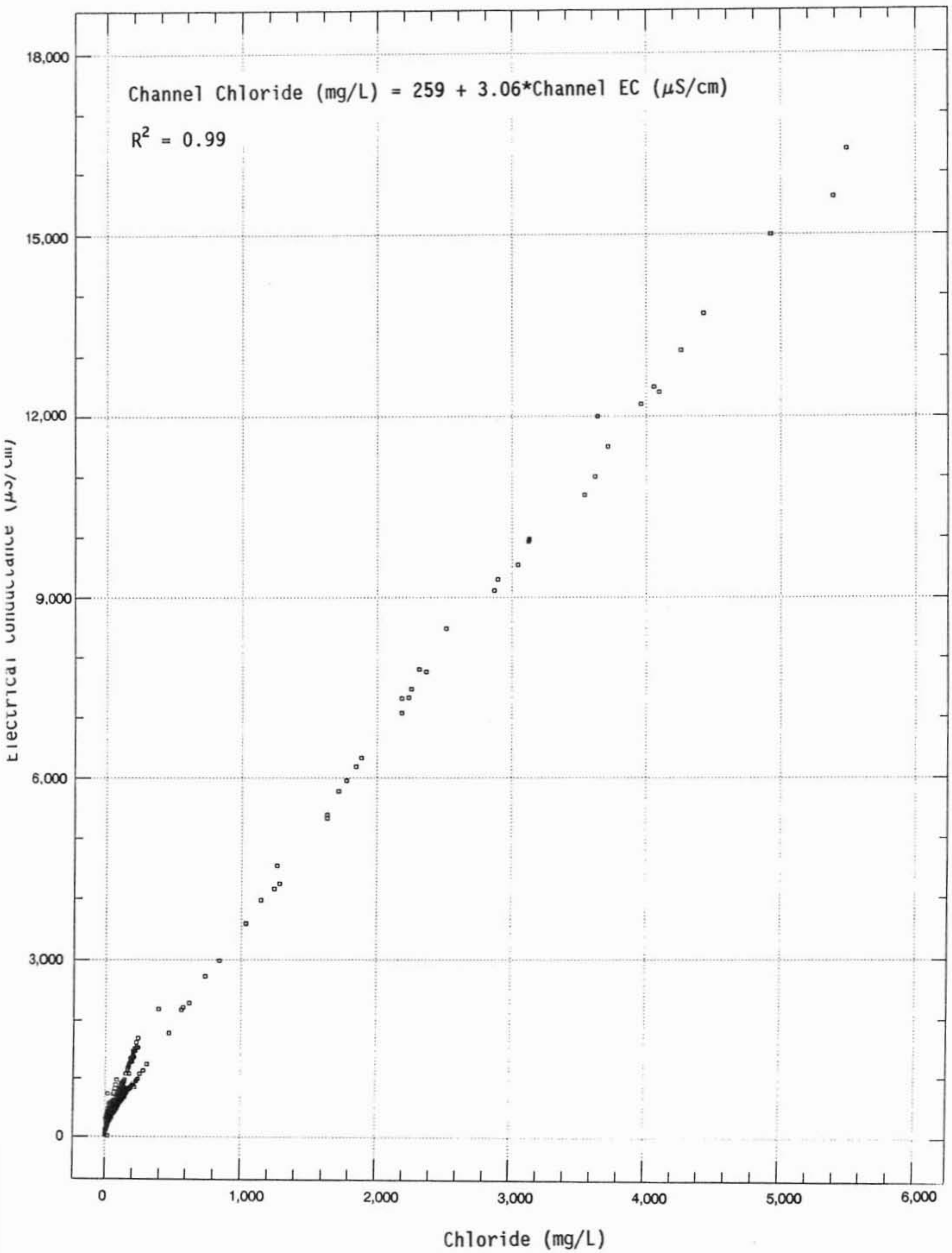
Correlations between different water quality measurements were tested. The data included observations from the Interagency Delta Health Aspects Monitoring Program and this study. The data were divided into two sets: (1) Delta drainage samples and (2) Delta channel water samples. All observations were used in computing and plotting the following regressions. The data set included mineral and TTHMFP analyses conducted on about 650 drain and 965 channel water samples collected each month from July 1983 - September 1989 throughout the Delta.

The correlations between EC and chloride concentrations and for EC and TDS were high for both data sets. Therefore, EC can be used to predict the TDS and chloride concentrations in most parts of the Delta. However, the EC to chloride data for drain water indicated not all drainages followed a common regression line (Figures 15-18).

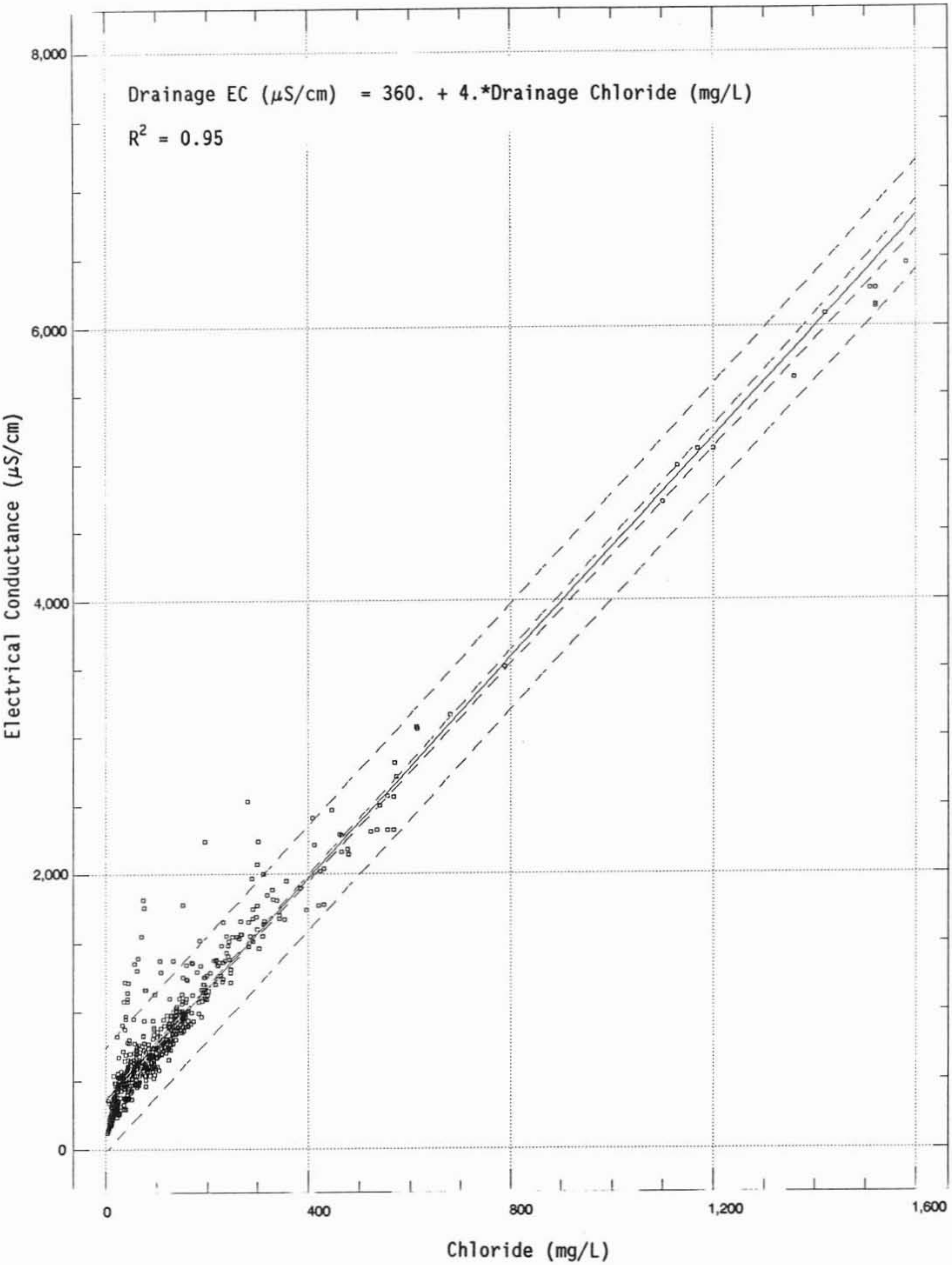
The correlations of TTHMFP, each of the 4 THM compounds, and the sum concentration of the bromomethane compounds (TBFP, total bromomethane formation potential) with EC were found to be poorly defined. The TBFP to EC simple linear regression lines are shown in Figures 19 and 20. Therefore, the use of EC, chloride, or TDS to predict TBFP throughout the Delta is not recommended. Separate relationships, however, may exist for each location.

Further examination of the mineral data to characterize water types, origin, and mixing of Delta waters is a major part of the scope of work of both IDHAMP and this investigation. Future work will test relationships among different water quality measurements for individual stations and model development.

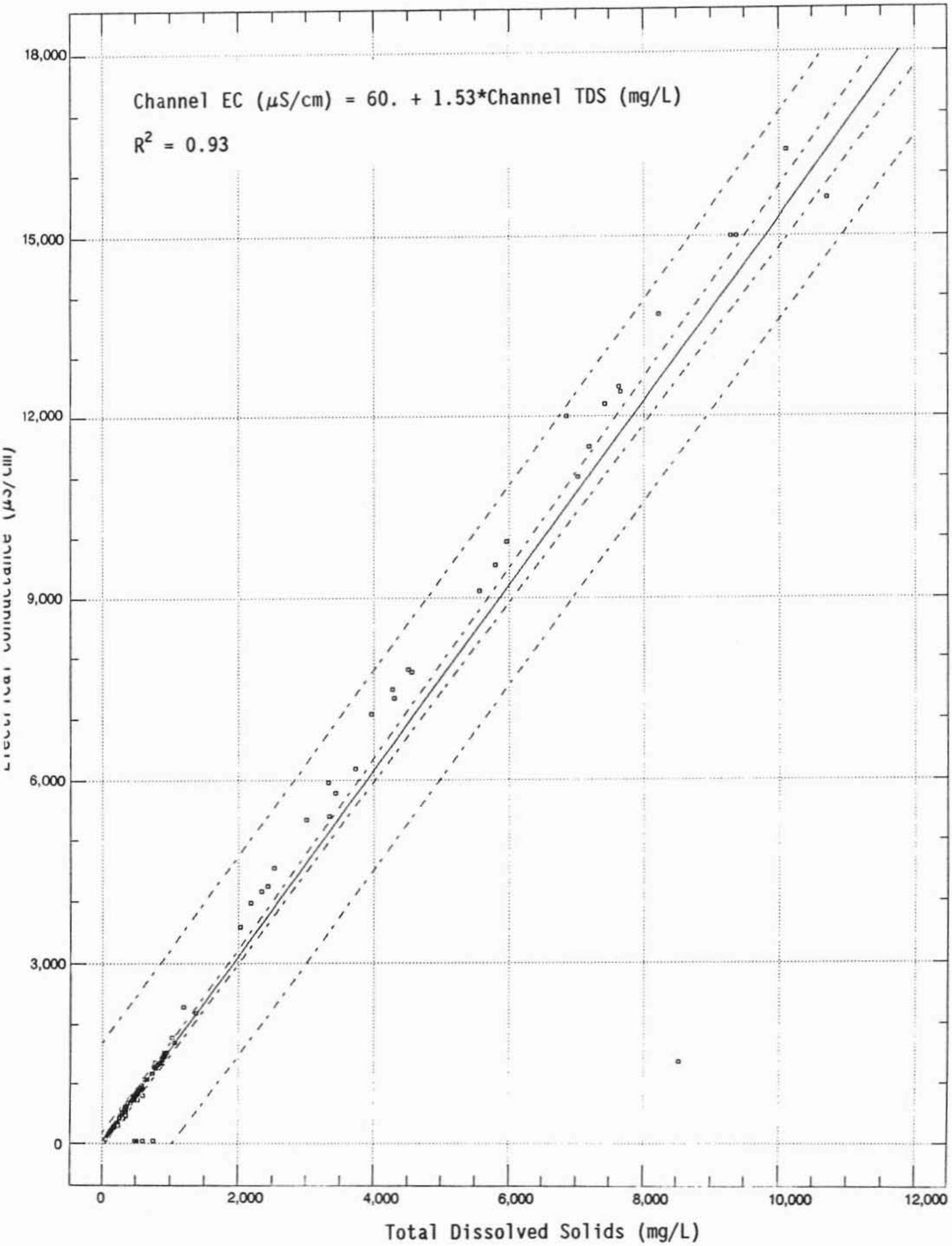
# Figure 15. EC - Chloride Relationship - Delta Channel Water



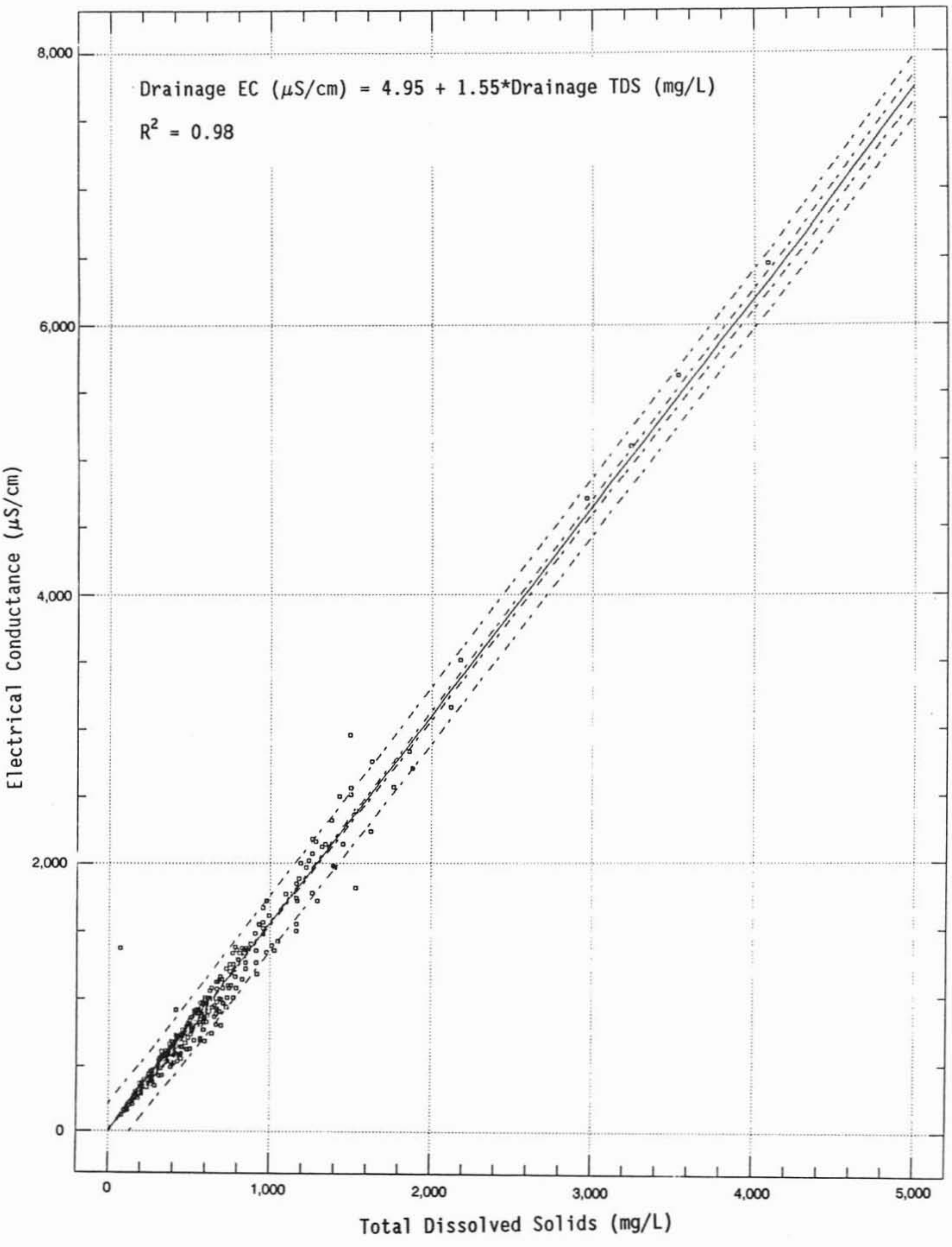
## Figure 16. EC - Chloride Relationship - Delta Island Drainage



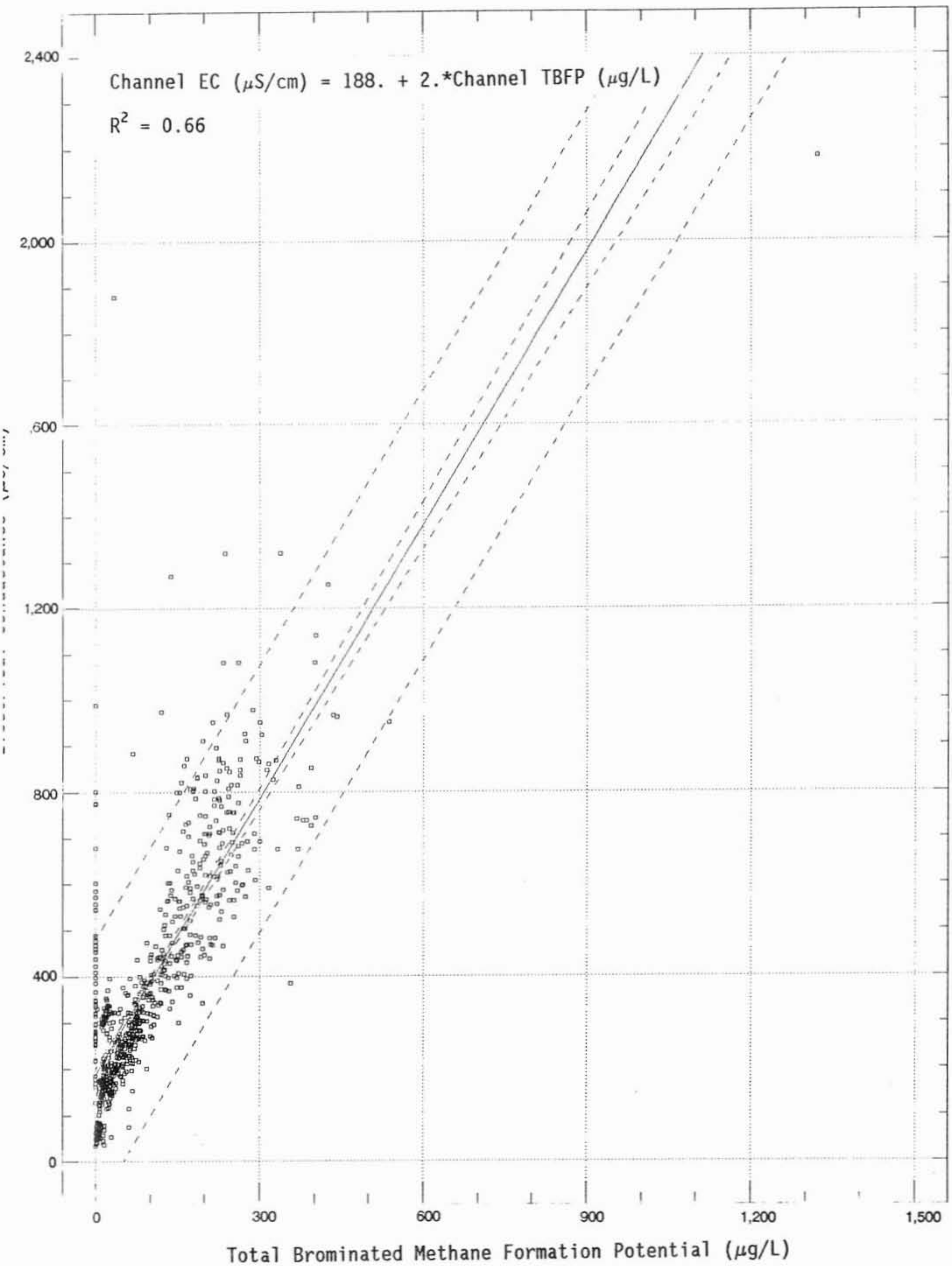
## Figure 17. EC - TDS Relationship - Delta Channel Water



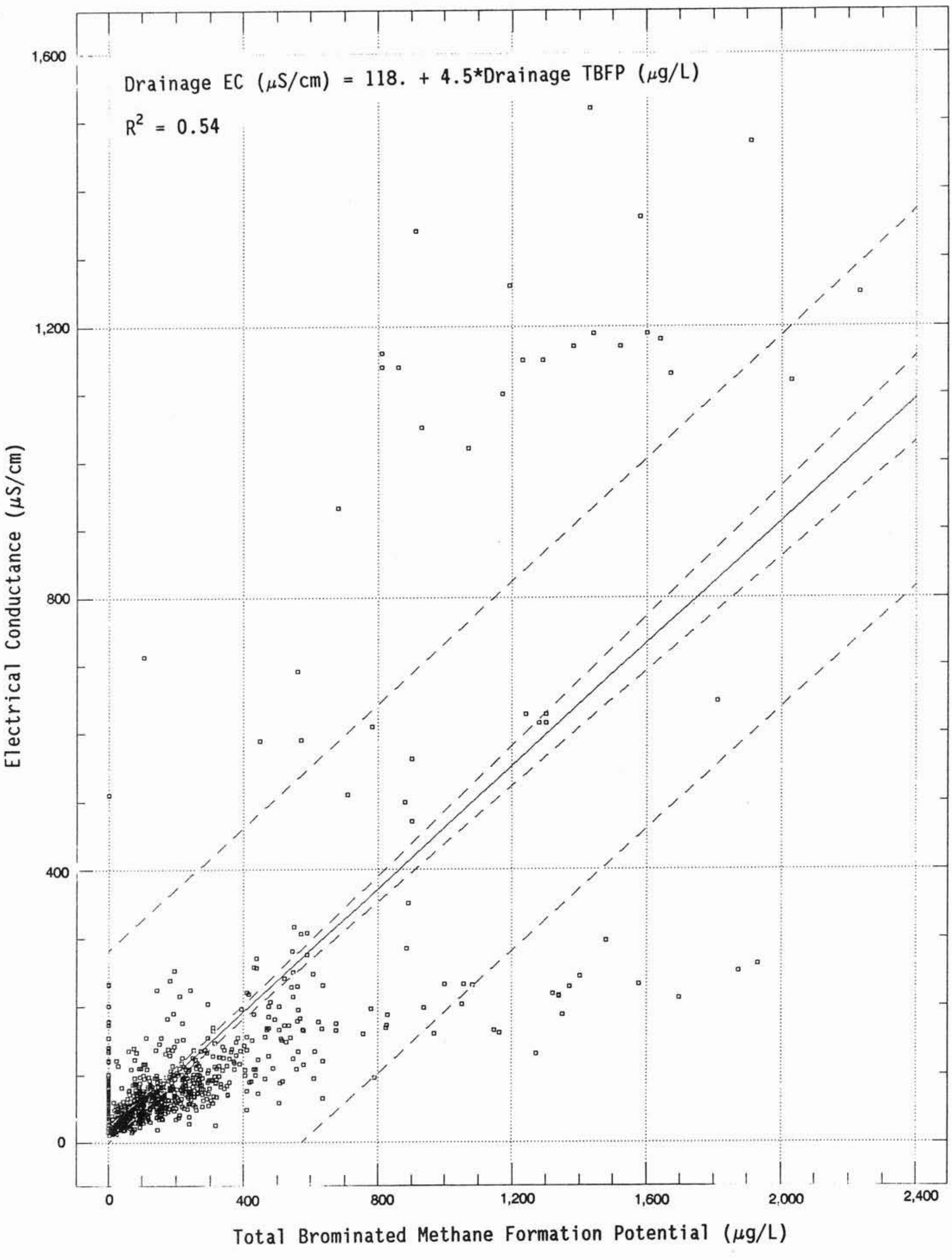
## Figure 18. EC - TDS Relationship - Delta Island Drainage



## Figure 19. EC - TBFP Relationship - Delta Channel Water



## Figure 20. EC - TBFP Relationship - Delta Island Drainage



## C. Drainage Volume

1. 1988 DIDI Survey

Power consumption and pump efficiency data were released to DWR for twenty six pumps, representing twelve islands in the Delta. We found that on islands where data from more than one drain were available, data from any one drain did not represent the activities on the entire island. Power data differed among some island pump stations for the same month, because farmers flooded one area, then another a few weeks later.

Billing cycles for power consumption usually do not follow calendar months. Since much of our analysis follows calendar months, we attempted to allocate power consumption data on a calendar month basis. Billing records which spanned two months, with approximately two weeks in each month, were divided so that half of the billed power was assumed to have been consumed in each month.

For example, if the billing cycle ended on the 15th of each month, the power consumption for February was assumed to be half that on the January 15 to February 15 bill, plus half of that on the February 15 to March 15 bill. When billing extended over three or more weeks within a month, the entire power consumption was credited to the month.

Power data for SMUD (Sacramento Municipal Utility District) customers were available only in two-month blocks. Power consumption was handled in a similar fashion to single-month billings. For example, a January 15 to March 15 bill was assumed to be distributed as 1/4th each January, and March, and 1/2 February. SMUD bills spanning two complete months were simply divided by two for each month.

The agricultural drainage systems were examined for information concerning pipe diameter, type and length; static head; and pump horsepower and efficiency. The available pump efficiencies were for pumps up to 50 years old. The pumps have aged so much that their efficiencies have probably changed significantly. Rather than deal with a wide range of questionable efficiencies, an overall 50% pump system efficiency was assumed. New pump tests requested by the pump owners may be needed to obtain more recent efficiency data on older pumps.

Friction head losses and other losses were ignored because they were assumed to be within the limit of uncertainty built into the assumed pump efficiencies, and pipe lengths were assumed to be short enough to make frictional head losses very small.

The volume of drainage water discharged was calculated in acre-feet using the constants and equations shown below.

Volume of water pumped in AC-FT:

$$Q = (KWhr)(Eff.)(2.65*10^6)/(Hs)(2.72*10^6)$$

$$Q = (0.974)(KWhr)(Eff.)/Hs$$

Where: Q = volume of water in acre-feet.
Hs = Static head in feet.
Eff. = Efficiency (assumed to be 50%)

Kilowatt = KW = 737 ft-lbs of work in one second.
Kilowatt-hour = KWhr = $60*60*737 = 2.65*10^6$ ft-lbs of work in one hour

Weight of Water:
Acre-foot = AC-FT = 325,872 gallons
Gallon of Water = 8.34 pounds
Acre-foot = $325{,}872*8.34 = 2.72*10^6$ pounds of water

Estimates of monthly drainage volumes based on power consumption data are shown in Table 8.

Table 8 shows the seasonality of agricultural operations and the variability between islands and between drains on individual islands. Winter leaching activities can be seen on some islands or tracts, including Bouldin, Egbert, Rindge, and Terminous. Other tracts, including Mossdale, Netherlands and Upper Egbert apparently had no winter discharges.

Quantities of estimated drainage also varied widely between islands. Some areas discharged more than others. For example, the estimated volume of drainage from Terminous Island was 44% to 48% of the total estimated for the surveyed islands during July and August 1987. Terminous and Rindge Tracts, combined, accounted for nearly two-thirds of the estimated discharge during the same period.

The power consumption data gathered represents widely separated areas along the northern and eastern periphery of the Delta. These data cannot be extrapolated to estimate total drainage volumes for the entire Delta. The results of this work showed the variability in drainage on an island due to farm activities.

## Table 8. Estimated Pump Station Drainage Volume

Units in acre-feet per month

| PUMP STATION | JAN87 | FEB87 | MAR87 | APR87 | MAY87 | JUN87 | JUL87 | AUG87 | SEP87 | OCT87 | NOV87 | DEC87 | JAN88 | FEB88 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BOULDIN 01 | 752 | 1368 | 524 | 297 | 444 | 228 | 355 | 457 | 287 | 90 | 698 | | 2543 | |
| EGBERT PP1 | 79 | 129 | 167 | 146 | 280 | 478 | 565 | 1613 | 1370 | 51 | 54 | 64 | 83 | 51 |
| EGBERT PP2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| KINGISPP01 | 0 | 22 | 0 | 5 | 17 | 18 | 2 | 176 | 0 | 1 | | | | |
| KINGISPP02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| MCCORWILL01 | 62 | 43 | 67 | 75 | 101 | 110 | 56 | 24 | 10 | 2 | 7 | 10 | 10 | |
| MCCORWILL02 | 0 | 0 | 17 | 25 | 146 | 205 | 151 | 117 | 42 | 1 | 5 | 7 | 6 | |
| MOSSDALE01 | 0 | 0 | 0 | 17 | 8 | 13 | 9 | 1 | 0 | 0 | | | | |
| MOSSDALE02 | 0 | 0 | 0 | 159 | 103 | 176 | 110 | 27 | 9 | 0 | | | | |
| MOSSDALE03 | 0 | 0 | 0 | 0 | 3 | 8 | 0 | 16 | 0 | 0 | | | | |
| MOSSDALE04 | 0 | 2 | 1 | 0 | 7 | 30 | 39 | 40 | 9 | 0 | | | | |
| MOSSDALE05 | 0 | 0 | 152 | 0 | 153 | 294 | 189 | 182 | 0 | 0 | | | | |
| MOSSDALE11 | 0 | 0 | 0 | 82 | 70 | 248 | 285 | 102 | 17 | 1 | | | | |
| NETHERLAND01 | | | | 387 | 431 | 382 | 15 | 370 | 614 | 1101 | 278 | 694 | 1383 | |
| NETHERLAND02 | | | | 219 | 65 | 0 | 0 | 0 | 33 | 143 | 201 | 97 | 97 | |
| PROSPECTPP01 | 0 | 0 | 353 | 353 | 0 | 0 | 0 | 153 | 157 | 10 | 20 | 14 | 55 | 110 |
| RINDGEPP01 | 3135 | 573 | 203 | 177 | 32 | 218 | 567 | 429 | 284 | 54 | | | | |
| RINDGEPP02 | 0 | 1844 | 5984 | 353 | 416 | 2899 | 2119 | 2841 | 699 | 278 | | | | |
| RIOBLANCO01 | 128 | | 128 | 330 | 13 | 210 | 269 | 200 | 39 | 0 | | | | |
| RIOBLANCO02 | 0 | 37 | | | 280 | 277 | 204 | 34 | 6 | 50 | 62 | 77 | 83 | 19 |
| TERMPP01 | 0 | 13992 | 1741 | 170 | 2 | 2067 | 4079 | 3363 | 114 | 0 | | | | |
| TERMPP02 | 3006 | 3742 | 3262 | 1826 | 2412 | 1854 | 2448 | 2442 | 1287 | 606 | 706 | | | |
| UPEGBERTPP01 | | | 1230 | 1161 | 1307 | 778 | 488 | 340 | 155 | 104 | 88 | 71 | 56 | |
| UPEGBERTPP02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 |
| UPJONESPP01 | 1 | 31 | 0 | 19 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| UPJONESPP02 | | | 704 | 704 | 677 | 1047 | 1112 | 1215 | 760 | 385 | | | | |

Estimates based on assumption of 50% pump efficiency rating.

2. <u>1954-55 Drainage</u>

Monthly estimates of the 1954-55 drainage volumes by study unit (groups of tracts and islands) are shown in Table 9. The estimates were based on pump test data and power use from 162 pumping plants involving 255 pumps that pumped 82 percent of the Lowlands. Estimates for 64 pumps at 14 pumping plants that drained 16 percent of the Lowlands had to be estimated by assuming pump efficiency rating factors were similar to comparable measured sites or by correlation with drainage rates in adjacent areas. The remaining 2 percent of land either drained by gravity or was urbanized. These estimates were then based on drainage rates in adjacent areas.

Drainage volumes can differ significantly among the study units depending on acreage, location, crops, and soil type. The 1954-55 data show that a specific area (14%) of the Delta Lowlands discharged 45% to 48% of the total estimated drainage during June through August and 31% to 34% in December-January. This area, consisting of study units 18, 20, and 22, is shown in Figure 21 and the volumes in Table 10.

## Table 9. Monthly 1954–55 Drainage Volume Estimates

(acre-feet)

| UNIT NO. | ACREAGE | M 1954 | J 1954 | J 1954 | A 1954 | S 1954 | O 1954 | N 1954 | D 1954 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 11,202 | 45 | 0 | 0 | 0 | 0 | 179 | 0 | 672 |
| 3 | 5,465 | 639 | 552 | 662 | 526 | 234 | 147 | 225 | 387 |
| 6 | 33,027 | 617 | 388 | 339 | 299 | 359 | 358 | 1,480 | 2,541 |
| 7 | 7,510 | 510 | 117 | 104 | 60 | 64 | 44 | 183 | 379 |
| 8 | 22,103 | 4,126 | 2,984 | 2,227 | 2,935 | 2,997 | 3,932 | 2,867 | 1,917 |
| 9 | 16,085 | 1,238 | 1,628 | 2,074 | 2,081 | 1,495 | 952 | 696 | 979 |
| 10 | 11,085 | 395 | 865 | 1,057 | 975 | 350 | 261 | 313 | 486 |
| 11 | 14,365 | 1,620 | 1,697 | 1,337 | 1,350 | 770 | 530 | 753 | 1,383 |
| 12 | 16,877 | 2,408 | 3,144 | 3,559 | 2,971 | 1,450 | 1,029 | 1,481 | 2,916 |
| 13 | 16,641 | 886 | 1,529 | 2,022 | 1,602 | 357 | 459 | 529 | 1,288 |
| 14 | 14,671 | 1,730 | 2,131 | 2,053 | 926 | 648 | 1,227 | 1,483 | 2,166 |
| 15 | 26,424 | 2,583 | 2,463 | 3,005 | 2,879 | 2,055 | 2,957 | 3,425 | 4,851 |
| 16 | 18,343 | 2,114 | 2,434 | 2,321 | 3,181 | 2,147 | 1,521 | 1,076 | 2,804 |
| 17 | 10,191 | 992 | 955 | 1,379 | 1,013 | 739 | 1,159 | 1,185 | 3,597 |
| 18 | 18,504 | 4,710 | 8,676 | 11,051 | 8,210 | 6,748 | 6,994 | 4,025 | 5,759 |
| 19 | 17,917 | 2,507 | 3,570 | 4,636 | 4,307 | 2,688 | 1,516 | 1,268 | 2,753 |
| 20 | 21,302 | 5,456 | 9,197 | 10,223 | 10,410 | 4,627 | 4,582 | 5,639 | 10,209 |
| 21 | 14,846 | 3,154 | 4,000 | 5,245 | 4,705 | 2,698 | 2,691 | 3,792 | 7,388 |
| 22 | 19,357 | 12,368 | 15,756 | 15,252 | 12,942 | 8,629 | 9,306 | 8,637 | 10,635 |
| 23 | 24,493 | 2,396 | 3,032 | 3,917 | 3,259 | 1,974 | 3,790 | 3,514 | 9,308 |
| 24 | 32,879 | 2,125 | 2,500 | 2,964 | 2,839 | 1,849 | 2,103 | 2,795 | 8,907 |
| 25 | 33,212 | 2,335 | 2,197 | 3,773 | 2,289 | 1,237 | 892 | 971 | 3,812 |
| 26 | 2,810 | 96 | 131 | 144 | 149 | 99 | 88 | 140 | 399 |
| 27 | 10,148 | 669 | 627 | 1,231 | 949 | 343 | 100 | 60 | 195 |
| TOTAL | 419,457 | 55,719 | 70,573 | 80,575 | 70,857 | 44,557 | 46,817 | 46,537 | 85,731 |
| AC-FT/DAY | | 1,857 | 2,352 | 2,686 | 2,362 | 1,485 | 1,561 | 1,551 | 2,858 |
| EQUIV CFS | | 938 | 1,188 | 1,356 | 1,193 | 750 | 788 | 783 | 1,443 |
| AC-FT/ACRE | | 0.13 | 0.17 | 0.19 | 0.17 | 0.11 | 0.11 | 0.11 | 0.20 |
| MIN | 2,810 | 45 | 0 | 0 | 0 | 0 | 44 | 0 | 195 |
| AVG | 17,477 | 2,322 | 2,941 | 3,357 | 2,952 | 1,857 | 1,951 | 1,939 | 3,572 |
| MAX | 33,212 | 12,368 | 15,756 | 15,252 | 12,942 | 8,629 | 9,306 | 8,637 | 10,635 |

| UNIT NO. | J 1955 | F 1955 | M 1955 | A 1955 | M 1955 | J 1955 | J 1955 | A 1955 | S 1955 | O 1955 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 582 | 90 | 0 | 90 | 0 | 0 | 0 | 0 | 0 | 134 | 739,285 |
| 3 | 594 | 558 | 475 | 403 | 541 | 401 | 667 | 573 | 299 | 43 | 741,223 |
| 6 | 2,944 | 2,159 | 771 | 401 | 293 | 235 | 314 | 269 | 227 | 320 | 739,975 |
| 7 | 669 | 367 | 221 | 229 | 259 | 189 | 214 | 120 | 122 | 59 | 738,677 |
| 8 | 1,046 | 1,086 | 1,752 | 2,018 | 2,354 | 3,267 | 3,817 | 2,830 | 2,411 | 1577 | 751,724 |
| 9 | 841 | 252 | 401 | 1,057 | 742 | 1,301 | 1,408 | 1,647 | 1,067 | 710 | 742,588 |
| 10 | 637 | 352 | 245 | 443 | 535 | 757 | 874 | 860 | 624 | 450 | 737,637 |
| 11 | 1,516 | 865 | 637 | 889 | 792 | 1,349 | 1,433 | 1,411 | 591 | 417 | 739,196 |
| 12 | 3,105 | 1,689 | 1,690 | 2,582 | 2,171 | 3,921 | 3,927 | 3,690 | 971 | 621 | 745,552 |
| 13 | 1,303 | 777 | 767 | 1,081 | 964 | 1,575 | 2,356 | 2,022 | 1,049 | 435 | 739,457 |
| 14 | 1,961 | 1,645 | 1,983 | 2,307 | 1,614 | 1,773 | 2,264 | 846 | 545 | 891 | 739,380 |
| 15 | 5,721 | 2,871 | 2,782 | 2,544 | 1,801 | 2,425 | 2,805 | 3,398 | 2,079 | 2021 | 744,620 |
| 16 | 4,008 | 1,470 | 1,041 | 1,854 | 1,707 | 2,457 | 2,336 | 2,044 | 1,811 | 1511 | 741,794 |
| 17 | 3,198 | 1,039 | 1,291 | 1,823 | 1,585 | 1,613 | 2,000 | 1,499 | 1,153 | 603 | 736,465 |
| 18 | 4,836 | 2,425 | 1,942 | 1,439 | 3,509 | 5,603 | 10,156 | 8,081 | 3,432 | 2884 | 761,543 |
| 19 | 2,454 | 1,221 | 826 | 1,301 | 2,618 | 3,160 | 3,759 | 3,282 | 1,963 | 1275 | 735,587 |
| 20 | 14,637 | 3,840 | 2,016 | 3,533 | 6,521 | 10,456 | 11,726 | 11,870 | 8,521 | 3505 | 763,957 |
| 21 | 7,472 | 2,765 | 1,935 | 2,350 | 3,873 | 5,340 | 5,398 | 4,576 | 3,392 | 2175 | 744,925 |
| 22 | 12,773 | 7,385 | 5,127 | 3,949 | 10,734 | 16,862 | 15,557 | 12,826 | 6,142 | 5302 | 781,812 |
| 23 | 11,828 | 3,229 | 2,103 | 1,843 | 2,018 | 2,481 | 2,056 | 2,818 | 1,663 | 1981 | 727,864 |
| 24 | 9,189 | 3,410 | 2,053 | 2,135 | 2,355 | 2,649 | 2,862 | 2,929 | 2,285 | 1974 | 725,985 |
| 25 | 3,678 | 2,188 | 1,958 | 2,540 | 2,233 | 2,553 | 3,574 | 3,217 | 2,068 | 922 | 726,042 |
| 26 | 412 | 150 | 92 | 95 | 107 | 133 | 155 | 153 | 113 | 93 | 714,858 |
| 27 | 264 | 127 | 311 | 722 | 487 | 584 | 948 | 1,209 | 588 | 114 | 717,682 |
| TOTAL | 95,668 | 41,960 | 32,419 | 37,628 | 49,813 | 71,084 | 80,606 | 72,170 | 43,116 | 30017 | 1,010,856 |
| AC-FT/DAY | 3,189 | 1,399 | 1,081 | 1,254 | 1,660 | 2,369 | 2,687 | 2,406 | 1,437 | 1,001 | 698,475 |
| EQUIV CFS | 1,611 | 706 | 546 | 633 | 839 | 1,197 | 1,357 | 1,215 | 726 | 505 | 692,732 |
| AC-FT/ACR | 0.23 | 0.10 | 0.08 | 0.09 | 0.12 | 0.17 | 0.19 | 0.17 | 0.10 | 0.07 | |
| MIN | 264 | 90 | 0 | 90 | 0 | 0 | 0 | 0 | 0 | 43 | |
| AVG | 3,986 | 1,748 | 1,351 | 1,568 | 2,076 | 2,962 | 3,359 | 3,007 | 1,797 | 1,251 | |
| MAX | 14,637 | 7,385 | 5,127 | 3,949 | 10,734 | 16,862 | 15,557 | 12,826 | 8,521 | 5,302 | |

Refer to DWR Report No. 4 Plate 2 for location of subareas (unit nos.).

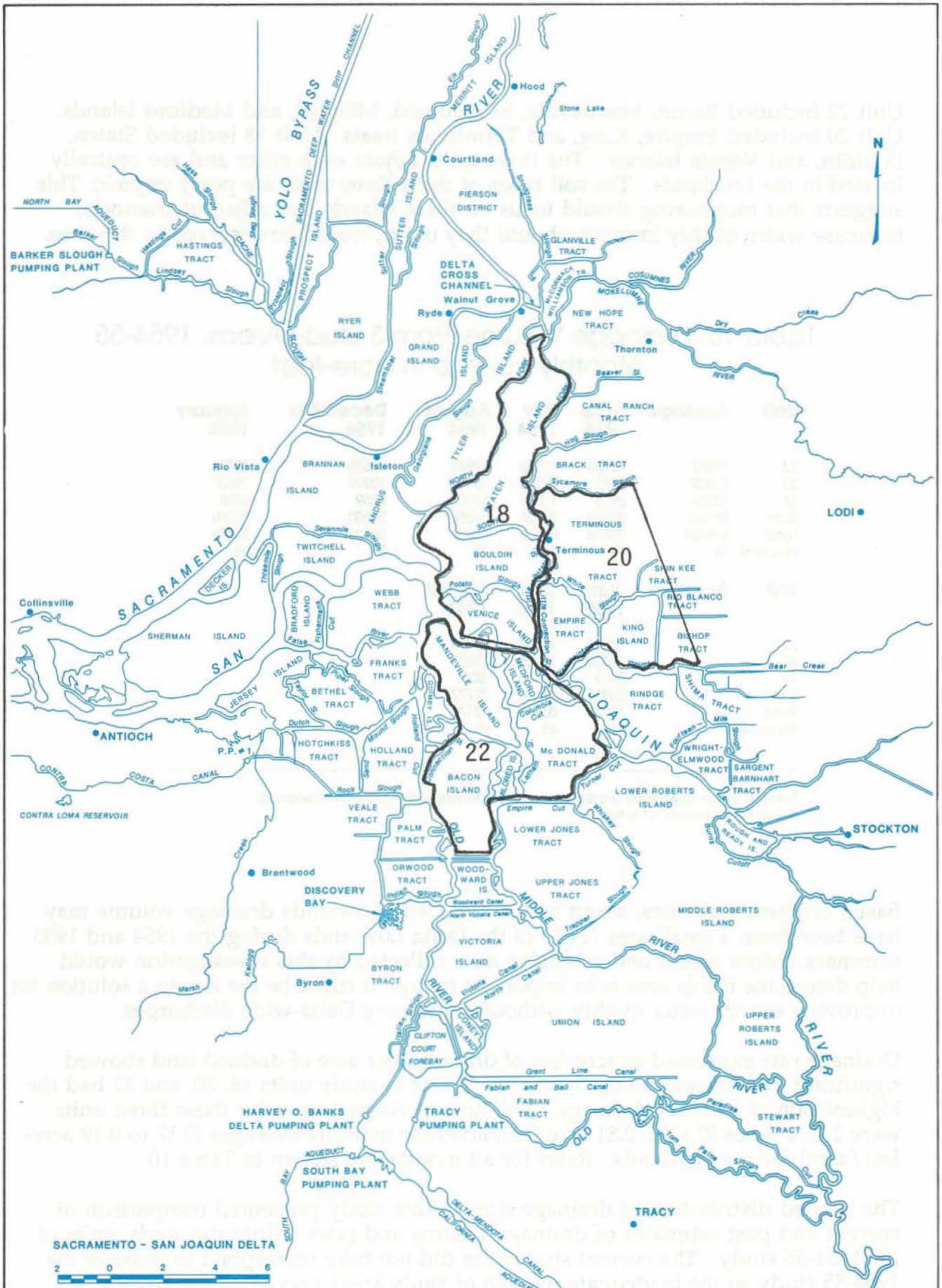



**Figure 21. High Drainage Area, 1954-55**

Unit 22 included Bacon, Mandeville, MacDonald, Mildred, and Medford islands. Unit 20 included Empire, King, and Terminous tracts. Unit 18 included Staten, Bouldin, and Venice Islands. The three units adjoin each other and are centrally located in the Lowlands. The soil types of these three units are peaty organic. This suggests that monitoring should focus on these islands and adjacent channels, becasuse water quality impacts, should they occur, would be observed in this area.

Table 10. Drainage Volume From 3 Study Areas, 1954-55
Monthly volume in acre-feet

| **Unit** | **Acreage** | **June 1954** | **July 1954** | **August 1954** | **December 1954** | **January 1955** |
|---|---|---|---|---|---|---|
| 22 | 19357 | 15756 | 15252 | 12942 | 10635 | 12773 |
| 20 | 21302 | 9197 | 10223 | 10410 | 10209 | 14637 |
| 18 | 18504 | 8676 | 11051 | 8210 | 5759 | 4836 |
| Sum | 59163 | 33629 | 36526 | 31562 | 26603 | 32246 |
| Total | 419457 | 70573 | 80575 | 70857 | 85731 | 95668 |
| Percent | 14 | 48 | 45 | 45 | 31 | 34 |

| **Unit** | **Acreage** | **June 1955** | **July 1955** | **August 1955** |
|---|---|---|---|---|
| 22 | | 16862 | 15557 | 12826 |
| 20 | | 10456 | 11726 | 11870 |
| 18 | | 5603 | 10156 | 8081 |
| Sum | | 32921 | 37439 | 32777 |
| Total | | 71084 | 80606 | 72170 |
| Percent | | 46 | 46 | 45 |

Total is Delta Lowlands acreage or total drainage from Delta Lowlands.
Percent is percent of total.

Based on these estimates, about half of the Delta Lowlands drainage volume may have been from a small area (14%) of the Delta Lowlands during the 1954 and 1955 summers. More recent and extensive data collected by this investigation would help determine if this area is as important today. It could be the key to a solution for improving export water quality without addressing Delta-wide discharges.

Drainage rate expressed as acre-feet of drainage per acre of drained land showed significant differences among the tracts. Tracts in study units 18, 20, and 22 had the highest rate of summer drainage. The June to August rates for these three units were 2 to 4 times (0.43 to 0.81 acre-feet/acre) the monthly averages (0.17 to 0.19 acre-feet/acre) for the Lowlands. Rates for all months are shown in Table 10.

The limited distribution of drainage sites in this study prevented comparison of current and past estimates of drainage volume and rates within the study units of the 1954-55 study. The current study sites did not fully correspond to those of the 1954-55 study so the inadequate overlap of study areas prevented a complete comparison.

Although power use and pump test data were available to compute volume for a particular pump station, the amount of acreage drained by each station was uncertain. At best, only about half the number of pump stations within a given 1954-55 study unit could be sampled in this study. Drained areas are not equally divided among the number of pumps or pump stations on an island. As a result, extrapolation to Delta-wide conditions based on the limited DIDI data is subject to error.

To estimate total Delta drainage volume would require a comprehensive study such as the DWR 1954-55 study. Since we were limited to 54 drains, we then examined the 1954-55 drainage volume estimates to make some present-day estimates.

Table 11. Drainage Rates in the Delta Lowlands, 1954-55
(Units in acre-feet of drainage per acre of land drained)

| | | 1954 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UNIT NO. | ACREAGE | May | June | July | Aug | Sept | Oct | Nov | Dec |
| 2 | 11,202 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.016 | 0.000 | 0.060 |
| 3 | 5,465 | 0.117 | 0.101 | 0.121 | 0.096 | 0.043 | 0.027 | 0.041 | 0.071 |
| 6 | 33,027 | 0.019 | 0.012 | 0.010 | 0.009 | 0.011 | 0.011 | 0.045 | 0.077 |
| 7 | 7,510 | 0.068 | 0.016 | 0.014 | 0.008 | 0.009 | 0.006 | 0.024 | 0.050 |
| 8 | 22,103 | 0.187 | 0.135 | 0.101 | 0.133 | 0.136 | 0.178 | 0.130 | 0.087 |
| 9 | 16,085 | 0.077 | 0.101 | 0.129 | 0.129 | 0.093 | 0.059 | 0.043 | 0.061 |
| 10 | 11,085 | 0.036 | 0.078 | 0.095 | 0.088 | 0.032 | 0.024 | 0.028 | 0.044 |
| 11 | 14,365 | 0.113 | 0.1 | 0.093 | 0.094 | 0.054 | 0.037 | 0.052 | 0.096 |
| 12 | 16,877 | 0.143 | 0.186 | 0.211 | 0.176 | 0.086 | 0.061 | 0.088 | 0.173 |
| 13 | 16,641 | 0.053 | 0.092 | 0.122 | 0.096 | 0.021 | 0.028 | 0.032 | 0.077 |
| 14 | 14,671 | 0.118 | 0.145 | 0.140 | 0.063 | 0.044 | 0.084 | 0.101 | 0.148 |
| 15 | 26,424 | 0.098 | .093 | 0.114 | 0.109 | 0.078 | 0.112 | 0.130 | 0.184 |
| 16 | 18,343 | 0.115 | .133 | 0.127 | 0.173 | 0.117 | 0.083 | 0.059 | 0.153 |
| 17 | 10,191 | 0.097 | .094 | 0.135 | 0.099 | 0.073 | 0.114 | 0.116 | 0.353 |
| 18 | 18,504 | 0.255 | .469 | 0.597 | 0.444 | 0.365 | 0.378 | 0.218 | 0.311 |
| 19 | 17,917 | 0.140 | .199 | 0.259 | 0.240 | 0.150 | 0.085 | 0.071 | 0.154 |
| 20 | 21,302 | 0.256 | .432 | 0.480 | 0.489 | 0.217 | 0.215 | 0.265 | 0.479 |
| 21 | 14,846 | 0.212 | .269 | 0.353 | 0.317 | 0.182 | 0.181 | 0.255 | 0.498 |
| 22 | 19,357 | 0.639 | .814 | 0.788 | 0.669 | 0.446 | 0.481 | 0.446 | 0.549 |
| 23 | 24,493 | 0.098 | .124 | 0.160 | 0.133 | 0.081 | 0.155 | 0.143 | 0.380 |
| 24 | 32,879 | 0.065 | .076 | 0.090 | 0.086 | 0.056 | 0.064 | 0.085 | 0.271 |
| 25 | 33,212 | 0.070 | .066 | 0.114 | 0.069 | 0.037 | 0.027 | 0.029 | 0.115 |
| 26 | 2,810 | 0.034 | .047 | 0.051 | 0.053 | 0.035 | 0.031 | 0.050 | 0.142 |
| 27 | 10,148 | 0.066 | .062 | 0.121 | 0.094 | 0.034 | 0.010 | 0.006 | 0.019 |
| TOTAL | 419,457 | | | | | | | | |
| ROUNDED AVG. | | 0.13 | 0.17 | 0.19 | 0.17 | 0.11 | 0.11 | 0.11 | 0.20 |
| MIN | 2,810 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.000 | 0.019 |
| MAX | 33,212 | 0.639 | 0.814 | 0.788 | 0.669 | 0.446 | 0.481 | 0.446 | 0.549 |

## Table 11 (Cont.) Drainage Rates in the Delta Lowlands, 1954-55
(Units in acre-feet of drainage per acre of land drained)

| Unit No | Jan | Feb | Mar | Apr | May | June | 1955 July | Aug | Sept | Oct | Total | Min | Avg | Max |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.052 | 0.008 | 0.000 | 0.008 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.012 | 0.160 | 0.000 | 0.005 | 0.060 |
| 3 | 0.109 | 0.102 | 0.087 | 0.074 | 0.099 | 0.073 | 0.122 | 0.105 | 0.055 | 0.008 | 1.451 | 0.000 | 0.041 | 0.122 |
| 6 | 0.089 | 0.065 | 0.023 | 0.012 | 0.009 | 0.007 | 0.010 | 0.008 | 0.007 | 0.010 | 0.433 | 0.000 | 0.012 | 0.089 |
| 7 | 0.089 | 0.049 | 0.029 | 0.030 | 0.034 | 0.025 | 0.028 | 0.016 | 0.016 | 0.008 | 0.521 | 0.000 | 0.015 | 0.089 |
| 8 | 0.047 | 0.049 | 0.079 | 0.091 | 0.107 | 0.148 | 0.173 | 0.128 | 0.109 | 0.071 | 2.088 | 0.000 | 0.060 | 0.187 |
| 9 | 0.052 | 0.016 | 0.025 | 0.066 | 0.046 | 0.081 | 0.088 | 0.102 | 0.066 | 0.044 | 1.279 | 0.000 | 0.037 | 0.129 |
| 10 | 0.057 | 0.032 | 0.022 | 0.040 | 0.048 | 0.068 | 0.079 | 0.078 | 0.056 | 0.041 | 0.945 | 0.000 | 0.027 | 0.095 |
| 11 | 0.106 | 0.060 | 0.044 | 0.062 | 0.055 | 0.094 | 0.100 | 0.098 | 0.041 | 0.029 | 1.346 | 0.000 | 0.038 | 0.118 |
| 12 | 0.184 | 0.100 | 0.100 | 0.153 | 0.129 | 0.232 | 0.233 | 0.219 | 0.058 | 0.037 | 2.567 | 0.000 | 0.073 | 0.233 |
| 13 | 0.078 | 0.047 | 0.046 | 0.065 | 0.058 | 0.095 | 0.142 | 0.122 | 0.063 | 0.026 | 1.262 | 0.000 | 0.036 | 0.142 |
| 14 | 0.134 | 0.112 | 0.135 | 0.157 | 0.110 | 0.121 | 0.154 | 0.058 | 0.037 | 0.061 | 1.922 | 0.000 | 0.055 | 0.157 |
| 15 | 0.217 | 0.109 | 0.105 | 0.096 | 0.068 | 0.092 | 0.106 | 0.129 | 0.079 | 0.076 | 1.993 | 0.000 | 0.057 | 0.217 |
| 16 | 0.219 | 0.080 | 0.057 | 0.101 | 0.093 | 0.134 | 0.127 | 0.111 | 0.099 | 0.082 | 2.063 | 0.000 | 0.059 | 0.219 |
| 17 | 0.314 | 0.102 | 0.127 | 0.179 | 0.156 | 0.158 | 0.196 | 0.147 | 0.113 | 0.059 | 2.632 | 0.000 | 0.075 | 0.353 |
| **18** | **0.261** | **0.131** | **0.105** | **0.078** | **0.190** | **0.303** | **0.549** | **0.437** | **0.185** | **0.156** | **5.430** | **0.000** | **0.155** | **0.597** |
| 19 | 0.137 | 0.068 | 0.046 | 0.073 | 0.146 | 0.176 | 0.210 | 0.183 | 0.110 | 0.071 | 2.518 | 0.000 | 0.072 | 0.259 |
| **20** | **0.687** | **0.180** | **0.095** | **0.166** | **0.306** | **0.491** | **0.550** | **0.557** | **0.400** | **0.165** | **6.430** | **0.000** | **0.184** | **0.687** |
| 21 | 0.503 | 0.186 | 0.130 | 0.158 | 0.261 | 0.360 | 0.364 | 0.308 | 0.228 | 0.147 | 4.914 | 0.000 | 0.140 | 0.503 |
| **22** | **0.660** | **0.382** | **0.265** | **0.204** | **0.555** | **0.871** | **0.804** | **0.663** | **0.317** | **0.274** | **9.825** | **0.000** | **0.281** | **0.871** |
| 23 | 0.483 | 0.132 | 0.086 | 0.075 | 0.082 | 0.101 | 0.084 | 0.115 | 0.068 | 0.081 | 2.581 | 0.000 | 0.074 | 0.483 |
| 24 | 0.279 | 0.104 | 0.062 | 0.065 | 0.072 | 0.081 | 0.087 | 0.089 | 0.069 | 0.060 | 1.762 | 0.000 | 0.050 | 0.279 |
| 25 | 0.111 | 0.066 | 0.059 | 0.076 | 0.067 | 0.077 | 0.108 | 0.097 | 0.062 | 0.028 | 1.278 | 0.000 | 0.037 | 0.115 |
| 26 | 0.147 | 0.053 | 0.033 | 0.034 | 0.038 | 0.047 | 0.055 | 0.054 | 0.040 | 0.033 | 0.979 | 0.000 | 0.028 | 0.147 |
| 27 | 0.026 | 0.013 | 0.031 | 0.071 | 0.048 | 0.058 | 0.093 | 0.119 | 0.058 | 0.011 | 0.939 | 0.000 | 0.027 | 0.121 |
| ROUNDED | | | | | | | | | | | | | | |
| AVG. | **0.23** | 0.10 | 0.08 | 0.09 | 0.12 | **0.17** | **0.19** | **0.17** | 0.10 | 0.07 | 2.39 | 0.00 | 0.07 | 0.26 |
| MIN | 0.026 | 0.008 | 0.000 | 0.008 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.160 | 0.000 | 0.005 | 0.060 |
| MAX | **0.687** | 0.382 | 0.265 | 0.204 | 0.555 | **0.871** | **0.804** | **0.663** | 0.400 | 0.274 | 9.825 | 0.000 | 0.281 | 0.871 |

Refer to DWR Report No. 4, Plate 2 for location of subareas (unit nos.).
Note: Irrigated acreage was 291,667. Rates derived by dividing volume by total acreage of subunits, not irrigated acres. Highest monthly drainage rates observed at units 18, 20, and 22 (in bold print).

3. Present Conditions

To make present-day estimates of the current drainage volume in the Delta, the historic conditions of the 1954-55 study were compared to current conditions. These conditions included:

- Crop acreage
- Consumptive Use
- River Flows
- Precipitation

There were no recent applied water data to compare estimates made in 1954-55.

If historic and current conditions were similar, then drainage volumes could be assumed to be unchanged from the 1954-55 estimates. If conditions differed, then the 1954-55 drainage volume estimates could be higher or lower than present. If changes could not be determined because of lack of data, then the 1954-55 drainage volume data could serve as an indicator of the relative volume of drainage that might be expected under certain stated assumptions. In all cases, the 1954-55 data served as a benchmark for estimating present-day drainage volumes.

Based on the following comparisons of historic data, we believe a reasonable estimate of the current Delta Lowlands drainage volume during dry year conditions (W.Y. 1986-1990) to be 90 to 110% of the 1954-55 estimates given in DWR Report No. 4. This estimate is based on irrigated and total crop acreages, consumptive use model results, hydrology, and precipitation, which were similar in 1986-87 to those in 1954-55.

a. Crop Acreage

Crop acreage data were obtained from numerous DWR sources for comparison. We saw differences in the classification or grouping of some crops. For example, grain and hay were predominantly dry farmed prior to 1970. Spring rainfall and subsurface water were the main water supply. In the 1970s and thereafter, farmers irrigated to increase yield because studies showed this increases production. This irrigation usually occurs in April to July but varies annually and may begin as early as February (G. Sato, pers. comm.). This change affected the non-irrigated and irrigated crop acreage totals and may therefore also affect applied water and drainage estimates. Report No. 4 gave a total Delta Lowlands irrigated crop acreage of 291,667. However, this excluded 79,709 acres of grain and hay, which apparently were dry farmed. When grain and hay are included, the total Lowlands crop acreage is 371,376 acres.

Other differences in the grouping of crop acreages were related to the tabulator of the data. Some land use analysts lumped small acreages as miscellaneous while others kept them separate.

In June 1985, DWR revised their annual crop acreage data for their Consumptive Use Model. These annual estimates are shown in Table 12 and were used to make our comparisons of land use in the Delta Lowlands.

Based on the total irrigated crop acreage (1954 vs. 1984), there has been about a 7% increase (22,000 acres). The total farmed acreage has decreased by about 6 percent.

If drainage volume follows irrigated crop acreage or total crop acreage, we might expect changes to be proportionately related to those acreages.

## Table 12. Delta Lowlands Land Use Summary

DWR tabulation (J. Kono, 6/85)
Units in thousands of gross acres

| YEAR | PASTURE | ALFALFA | GENERAL FIELD | SUGAR BEET | GRAIN | RICE | MISC. TRUCK | TOMA-TOES | ORCHARD | VINEYRD | TOT-IRIG | DRY-GRAIN | TOT-FARM | URBAN | NATIVE VEG | RIPARIAN | H2O-SURF | TOT-V-W | TOT-AC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955 | 23.0 | 34.5 | 71.5 | 30.2 | 32.0 | 2.1 | 94.8 | 30.1 | 5.1 | 0.1 | 323.4 | 47.7 | 371.1 | 6.9 | 34.5 | 7.6 | 45.9 | 88.0 | 466.0 |
| 1956 | 22.2 | 34.4 | 74.6 | 30.8 | 31.9 | 1.9 | 93.3 | 30.5 | 5.4 | 0.0 | 325.0 | 46.3 | 371.3 | 6.9 | 34.1 | 7.6 | 45.9 | 87.6 | 465.8 |
| 1957 | 21.4 | 34.2 | 77.8 | 31.4 | 31.8 | 1.6 | 91.8 | 30.8 | 5.7 | 0.0 | 326.5 | 44.8 | 371.3 | 6.9 | 34.5 | 7.6 | 45.9 | 88.0 | 466.2 |
| 1958 | 20.5 | 34.2 | 80.9 | 32.0 | 31.7 | 1.5 | 90.4 | 31.2 | 5.9 | 0.0 | 328.3 | 43.4 | 371.7 | 6.9 | 34.0 | 7.6 | 45.9 | 87.5 | 466.1 |
| 1959 | 19.7 | 34.2 | 84.1 | 32.7 | 31.5 | 1.2 | 88.8 | 31.5 | 6.1 | 0.0 | 329.8 | 41.8 | 371.6 | 6.9 | 34.1 | 7.6 | 45.9 | 87.6 | 466.1 |
| 1960 | 18.8 | 34.2 | 87.2 | 33.4 | 31.3 | 0.9 | 87.2 | 31.8 | 6.3 | 0.0 | 331.1 | 40.3 | 371.4 | 6.9 | 34.2 | 7.6 | 45.9 | 87.7 | 466.0 |
| 1961 | 18.0 | 34.1 | 90.2 | 34.0 | 31.2 | 0.7 | 85.6 | 32.2 | 6.5 | 0.0 | 332.5 | 38.6 | 371.1 | 6.9 | 34.5 | 7.6 | 45.9 | 88.0 | 466.0 |
| 1962 | 18.1 | 34.6 | 89.7 | 32.5 | 33.5 | 0.2 | 85.0 | 33.1 | 6.9 | 0.0 | 333.6 | 37.9 | 371.5 | 7.1 | 33.7 | 7.6 | 45.9 | 87.2 | 465.8 |
| 1963 | 17.4 | 35.1 | 92.5 | 30.8 | 35.7 | 0.2 | 79.4 | 34.2 | 7.2 | 0.0 | 332.5 | 37.3 | 369.8 | 7.3 | 35.4 | 7.6 | 45.9 | 88.9 | 466.0 |
| 1964 | 17.7 | 35.3 | 94.6 | 28.1 | 38.0 | 0.2 | 76.1 | 34.9 | 7.6 | 0.1 | 332.6 | 36.6 | 369.2 | 7.5 | 35.8 | 7.6 | 45.9 | 89.3 | 466.0 |
| 1965 | 17.7 | 35.7 | 96.7 | 25.4 | 40.2 | 0.2 | 72.7 | 36.0 | 7.9 | 0.2 | 332.7 | 36.0 | 368.7 | 7.6 | 36.3 | 7.6 | 45.9 | 89.8 | 466.1 |
| 1966 | 18.0 | 36.3 | 98.8 | 22.9 | 42.5 | 0.2 | 68.6 | 36.1 | 8.2 | 0.3 | 331.9 | 35.3 | 367.2 | 7.8 | 37.1 | 7.6 | 45.9 | 90.6 | 465.6 |
| 1967 | 17.7 | 36.6 | 101.2 | 20.2 | 44.8 | 0.2 | 64.5 | 38.0 | 8.6 | 0.4 | 332.2 | 34.6 | 366.8 | 8.0 | 37.7 | 7.6 | 45.9 | 91.2 | 466.0 |
| 1968 | 17.8 | 36.9 | 103.3 | 17.3 | 47.0 | 0.2 | 60.4 | 39.1 | 8.8 | 0.4 | 331.2 | 33.9 | 365.1 | 8.2 | 39.2 | 7.6 | 45.9 | 92.7 | 466.0 |
| 1969 | 18.4 | 36.9 | 106.0 | 17.7 | 48.2 | 0.0 | 58.4 | 37.1 | 8.9 | 0.5 | 332.1 | 29.7 | 361.8 | 8.6 | 41.5 | 7.6 | 45.9 | 95.0 | 465.4 |
| 1970 | 18.0 | 36.4 | 107.3 | 17.7 | 51.7 | 0.4 | 58.0 | 35.1 | 8.9 | 0.7 | 334.2 | 25.4 | 359.6 | 9.0 | 43.9 | 7.6 | 45.9 | 97.4 | 466.0 |
| 1971 | 17.7 | 35.1 | 108.2 | 17.8 | 59.4 | 0.4 | 54.0 | 33.1 | 8.9 | 1.1 | 335.7 | 20.6 | 356.3 | 9.4 | 46.8 | 7.6 | 45.9 | 100.3 | 466.0 |
| 1972 | 17.7 | 34.4 | 109.8 | 17.9 | 71.3 | 0.4 | 44.0 | 31.1 | 8.9 | 1.6 | 337.1 | 19.9 | 357.0 | 9.8 | 45.7 | 7.6 | 45.9 | 99.2 | 466.0 |
| 1973 | 17.6 | 33.7 | 111.4 | 18.0 | 81.6 | 0.4 | 39.9 | 29.1 | 8.9 | 2.2 | 342.8 | 14.2 | 357.0 | 10.2 | 45.3 | 7.6 | 45.9 | 98.8 | 466.0 |
| 1974 | 18.0 | 33.1 | 112.9 | 18.1 | 87.1 | 0.4 | 35.7 | 26.9 | 9.0 | 2.8 | 344.0 | 14.8 | 358.8 | 10.8 | 33.0 | 7.6 | 47.7 | 88.3 | 457.9 |
| 1975 | 17.1 | 31.0 | 119.8 | 22.0 | 90.0 | 0.4 | 30.6 | 26.2 | 9.0 | 2.9 | 349.0 | 9.8 | 358.8 | 11.7 | 40.5 | 7.3 | 47.7 | 95.5 | 466.0 |
| 1976 | 16.0 | 29.1 | 126.8 | 26.0 | 93.0 | 0.3 | 25.6 | 25.5 | 9.1 | 2.9 | 354.3 | 1.5 | 355.8 | 12.8 | 42.4 | 7.3 | 47.7 | 97.4 | 466.0 |
| 1977 | 17.3 | 34.6 | 118.8 | 16.4 | 105.8 | 0.2 | 23.0 | 30.5 | 9.1 | 2.9 | 358.6 | 0.2 | 358.8 | 12.9 | 39.3 | 7.3 | 47.7 | 94.3 | 466.0 |
| 1978 | 15.6 | 28.4 | 128.5 | 16.3 | 102.8 | 0.2 | 26.7 | 27.1 | 8.9 | 3.1 | 357.6 | 2.0 | 359.6 | 13.4 | 38.0 | 7.3 | 47.7 | 93.0 | 466.0 |
| 1979 | 15.5 | 26.6 | 129.9 | 16.6 | 100.5 | 0.0 | 25.3 | 26.0 | 8.9 | 3.3 | 352.6 | 2.0 | 354.6 | 13.8 | 42.6 | 7.3 | 47.7 | 9Sw6 | 466.0 |
| 1980 | 15.4 | 24.8 | 130.7 | 17.0 | 98.6 | 0.0 | 23.8 | 24.8 | 8.9 | 3.4 | 347.4 | 2.0 | 349.4 | 14.2 | 47.3 | 7.3 | 47.7 | 102.3 | 465.9 |
| 1981 | 15.4 | 24.8 | 130.7 | 17.1 | 98.3 | 0.0 | 23.9 | 24.8 | 8.9 | 3.5 | 347.4 | 2.0 | 349.4 | 14.6 | 47.0 | 7.3 | 47.7 | 102.0 | 466.0 |
| 1982 | 15.4 | 24.7 | 130.6 | 17.1 | 98.2 | 0.0 | 24.0 | 24.7 | 8.8 | 3.6 | 347.1 | 2.0 | 349.1 | 15.1 | 46.8 | 7.3 | 47.7 | 101.8 | 466.0 |
| 1983 | 15.4 | 24.7 | 130.6 | 17.1 | 98.1 | 0.0 | 24.0 | 24.6 | 8.7 | 3.7 | 346.9 | 2.0 | 348.9 | 15.5 | 46.6 | 7.3 | 47.7 | 101.6 | 466.0 |
| 1984 | 15.4 | 24.7 | 130.6 | 17.1 | 97.9 | 0.0 | 24.0 | 24.6 | 8.6 | 3.8 | 346.7 | 2.0 | 348.7 | 16.0 | 46.3 | 7.3 | 47.7 | 101.3 | 466.0 |

GENFIELD general field crops
SUGRBEET sugarbeets
MISCTRUK miscellaneous truck crops
TOT-IRIG total irrigated crop acreage
DRY-GRAN dry farmed grains
TOT-FARM total farmed crop acreage
NATIV-VG native vegetation
H2O-SURF water surface
TOT-V-W total of native vegetation, riparian, and water surface acreages
TOTAL-AC total acreage

b. <u>Consumptive Use</u>

Consumptive use is the total amount of water from transpiration, and evaporation losses from lands on which there is vegetation, plus evaporation from bare lands and water surfaces. Consumptive use requirements will vary with location and climate, especially with temperature and precipitation. Generally, consumptive use is estimated for large areas based on measurements from sample or representative plots of land. Consumptive use can be based on measurements of pan evaporation, which is the amalgamation of various climatic factors such as wind, temperature, and relative humidity. Consumptive use can also be estimated by daylight hours, and available moisture from precipitation, irrigation, or natural ground water.

Total consumptive use estimates shown in the Consumptive Use Model developed by the Department's Division of Planning (model run of November 6, 1985) are listed in Table 13.

The DWR Consumptive Use Model data for water years 1954, 1955, 1981, and 1983 are estimates of the total consumptive use for crop acreage and patterns surveyed respectively for each of those years. The data for water year 1981 were selected to compare consumptive use of present-day crop acreage under water year conditions similar to that occurring in the 1954-55 study. Water years 1955 and 1981 were classified as dry under SWRCB Decision 1485 criteria. The Four-Basin Indices were 10.98 and 11.1 million acre-feet for water years 1955 and 1981, respectively. For comparison, data for water year 1983, a classified wet year, are also shown.

The annual total consumptive use comparison suggests that water demands have not changed significantly between the mid-1950s and early 1980s. If drainage volumes relate well to consumptive use, then present-day drainage volume estimates are close to those estimated for 1954-55.

The table also includes precipitation and net consumptive use estimates. Net consumptive use is calculated by subtracting the precipitation values from the total consumptive use values. When the net consumptive use values are negative, there is excess water resulting in Delta runoff or drainage. When net consumptive use values are positive, then water must be applied or siphoned from the Delta channels to meet the year's crop demands.

The net consumptive use for water years 1954 and 1981 was nearly equal at 871 and 883 thousand acre feet, respectively. The model results should be used and interpreted with caution as with any other modeling results. Different assumptions will affect the model estimates. For example, the DWR Division of Planning Consumptive Use Model uses estimated leach water adjustments for the Delta Lowlands. These estimated values are fixed for each calendar month and used in the model for all water years regardless of hydrology. They are estimates of the amount of water applied for soil leaching from the surrounding channels.

The results of this model are shown only to compare estimated changes in consumptive use demands for 1954-56 to present which may have affected drainage volume. At this time, the historic consumptive use estimates indicate that present-day drainage volumes are at least equal to those reported in the 1954-55 study.

**Table 13. DWR Consumptive Use Model Estimates**

Delta Lowlands

In thousands of acre-feet

| | W.Y. 1954 | | | W.Y. 1955 | | | W.Y. 1981 | | | W.Y. 1983 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TCU | Ppt. | NCU | TCU | Ppt. | NCU | TCU | Ppt. | NCU | TCU | Ppt. | NCU |
| Oct | 63 | 3.9 | 59.1 | 60.5 | 0 | 60.5 | 52.3 | 2.3 | 50 | 105.5 | 66.2 | 39.3 |
| Nov | 73.7 | 40.8 | 32.9 | 103.8 | 75.1 | 28.7 | 39.5 | 4.2 | 35.3 | 140.1 | 199.1 | -59 |
| Dec | 63.3 | 33.1 | 30.2 | 122.6 | 133.2 | -10.6 | 80.8 | 59.3 | 21.5 | 48.1 | 100.1 | -52 |
| Jan | 90.7 | 76.6 | 14.1 | 46.8 | 118.6 | -71.8 | 129.1 | 147.5 | -18.4 | 22.7 | 207.9 | -185.2 |
| Feb | 77.6 | 68.9 | 8.7 | 59.2 | 43.5 | 15.7 | 65.9 | 37 | 28.9 | 41.2 | 187.9 | -146.7 |
| Mar | 92.4 | 92 | 0.4 | 67.4 | 19.6 | 47.8 | 90.3 | 112.4 | -22.1 | 52.5 | 279.2 | -226.7 |
| Apr | 87.7 | 51.2 | 36.5 | 97.1 | 72 | 25.1 | 77.6 | 21.2 | 56.4 | 95.8 | 107.8 | -12 |
| May | 106.8 | 9.2 | 97.6 | 112.9 | 23.1 | 89.8 | 103.3 | 4.2 | 99.1 | 87.1 | 11.6 | 75.5 |
| Jun | 183.3 | 5.4 | 177.9 | 182.3 | 0 | 182.3 | 222.7 | 0 | 222.7 | 170.7 | 0.8 | 169.9 |
| Jul | 200.3 | 0 | 200.3 | 203.4 | 0 | 203.4 | 209.9 | 0 | 209.9 | 198.3 | 0 | 198.3 |
| Aug | 134 | 1.5 | 132.5 | 134.9 | 0 | 134.9 | 125.5 | 0 | 125.5 | 131.9 | 1.5 | 130.4 |
| Sep | 80.5 | 0 | 80.5 | 84.8 | 7.3 | 77.5 | 86.2 | 12.3 | 73.9 | 99.5 | 28.1 | 71.4 |
| Total | 1253.3 | 382.6 | 870.7 | 1275.7 | 492.4 | 783.3 | 1283.1 | 400.4 | 882.7 | 1193.4 | 1190.2 | 3.2 |

c. River Flows

Mean daily river flows in 1954-55 and 1987-88 are shown in Table 14 for the Sacramento River at Sacramento and San Joaquin River near Vernalis. The difference between the 1987 and 1954 monthly mean daily flows are shown in the row labeled "1987-1954." The difference between the 1988 and 1955 values are shown in the row labeled "1988-1955."

Water year 1954 (October 1, 1953 to September 30, 1954) was an "above normal" water year for the Sacramento-San Joaquin Delta according to criteria set in SWRCB Decision 1485. The unimpaired runoff for the Sacramento River Basin by the Sacramento Valley Four-Basin Index was 17.43 million acre-feet. The following water year 1955 (October 1, 1954 to September 30, 1955) was a "dry" year with total unimpaired runoff at 10.98 million acre-feet.

Water year 1987 (October 1, 1986 to September 30, 1987) was classified as a "critically dry" year with a Four-Basin Index of 9.14 million acre-feet. Rainfall was 65 percent of average. The 1987 water year was the ninth driest of this century. Water year 1988 (October 1, 1987 to September 30, 1988) was also "critically dry," with a Four-Basin Index of 9.17 million acre-feet.

Because water years 1987 and 1988 were drier than water year 1955, mean daily river flows in some months during 1987 and 1988 were lower than during 1954 and 1955. This is shown by the negative values (parenthesized) in rows labelled "1987-1954" and 1988-1955."

Sacramento River mean daily flows in May, June, October, November, and December of 1987 were less than for the same months in 1954. February, March, May, and June 1988 flows in the Sacramento River were also lower than the corresponding months of 1955. Both Sacramento and San Joaquin River flows were higher in July and August 1987 and 1988 than in 1954 and 1955. July and August are typically peak months of applied water and drainage as well as low river flows. The ratio of drainage to river flow is normally higher in the summer.

The summer river flows and dry water year during the 1954-55 drainage study and that of the 1987-88 investigation were similar enough for comparison and use in estimating the present-day drainage volumes during the growing season or seasonal irrigation period.

## Table 14. Sacramento and San Joaquin River Flows
### Mean Daily Flow in cubic feet per second

| Sacramento River | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|
| 1954 | 24,830 | 11,030 | 8,097 | 9,236 | 11,130 | 10,580 | 14,550 | 23,690 |
| 1987 | 9,996 | 10,067 | 15,142 | 14,439 | 11,625 | 9,509 | 8,129 | 15,744 |
| 1987-1954 | (14,834) | (963) | 7,045 | 5,203 | 495 | (1,071) | (6,421) | (7,946) |
| **San Joaquin River** | | | | | | | | |
| 1954 | 6,716 | 1,286 | 542 | 546 | 754 | 1,043 | 1,386 | 1,814 |
| 1987 | 2,178 | 1,990 | 1,632 | 1,627 | 1,597 | 1,370 | 1,548 | 1,278 |
| 1987-1954 | (4,538) | 704 | 1,090 | 1,081 | 843 | 327 | 162 | (536) |

| Sacramento River | Jan | Feb | March | April | May | June | July | Aug | Sept |
|---|---|---|---|---|---|---|---|---|---|
| 1955 | 22,770 | 15,110 | 13,650 | 13,780 | 21,600 | 12,190 | 8,990 | 9,025 | 9,845 |
| 1988 | 25,400 | 12,188 | 11,348 | 16,887 | 10,974 | 10,578 | 14,642 | 13,287 | 11,537 |
| 1988-1955 | 2,630 | (2,922) | (2,302) | 3,107 | (10,626) | (1,612) | 5,652 | 4,262 | 1,692 |
| **San Joaquin River** | | | | | | | | | |
| 1955 | 2,965 | 2,451 | 1,561 | 917 | 1,150 | 1,496 | 416 | 431 | 610 |
| 1988 | 1,483 | 1,389 | 2,241 | 2,146 | 1,781 | 1,711 | 1,357 | 1,557 | 1,452 |
| 1988-1955 | (1,482) | (1,062) | 680 | 1,229 | 631 | 215 | 941 | 1,126 | 842 |

Source: U.S. Geological Survey
Values in parentheses are negative.

d. Precipitation

Precipitation data are not critical for examining year to year differences in drainage during the summer peak drainage months, July and August, as precipitation is negligible (Table 14). However, for other months when heavy precipitation occurs, total consumptive use, applied water, and drainage volume will vary significantly among years, and precipitation can directly and indirectly affect drainage quality and quantity.

Precipitation in the Delta Lowlands by month in thousands of acre-feet for water years 1955, 1956, and the average for each month for water years 1921 to 1983 (October 1, 1920 to September 30, 1983) are shown in Table 15. The data show that, in general, summer (June - September) precipitation does not contribute to drainage volume. During water years 1987 and 1988 summer rainfall also agreed with historic trends, as these were two critically dry water years.

The precipitation data suggest that comparisons of the summer data in the 1954-55 drainage study to that of the summer 1987-88 drainage data can be made, as summer rainfalls were about the same.

## Table 15. Precipitation on Delta Lowlands
In thousands of acre-feet

| MONTH | W.Y. 1954 | W.Y. 1955 | W.Y. 1921-83 average |
|---|---|---|---|
| Oct | 3.9 | 75.1 | 67.6 |
| Dec | 33.1 | 133.2 | 105.8 |
| Jan | 76.6 | 118.6 | 120 |
| Feb | 68.9 | 43.5 | 99.4 |
| Mar | 92 | 19.6 | 80 |
| Apr | 51.2 | 72 | 47.9 |
| May | 9.2 | 23.1 | 15 |
| Jun | 5.4 | 0 | 4.5 |
| Jul | 0 | 0 | 0.8 |
| Aug | 1.5 | 0 | 1.5 |
| Sep | 0 | 7.3 | 6.6 |
| Total | 382.6 | 492.4 | 580.4 |

Source: DWR Consumptive Use Study 10/2/85 Total Basin Precipitation, Delta Lowlands Basin area 462,100 acres.

## D. Estimating Drainage Impacts

1. South Delta Flow Patterns

To study the flow patterns in the Delta, we monitored selenium entering the Delta from the San Joaquin River and we conducted synoptic water quality sampling at major channels throughout the Delta.

The Central Valley Regional Water Quality Control Board has documented that selenium-laden waters enter the San Joaquin River from Mud and Salt Sloughs during a period of winter low river flows and field leaching of salts. Selenium levels in the San Joaquin River are typically elevated for a period of 6 to 8 weeks between February and March each year. During this period, elevated selenium levels can be traced down the San Joaquin River and through the southern Delta.

The selenium data collected in this study showed that under the low flow conditions, San Joaquin River water was flowing westward toward the Delta Mendota Canal intake via Old River and Fabian-Grant Line Canals. The selenium distribution for the March 2, 1989 selenium sampling is shown in Figure 22. The hydrologic conditions are shown in Table 16.

On some occasions, selenium has been actually detected at the DMC intake at Lindemann Road but not at the Clifton Court intake on Old River or at the Banks Headworks (Figure 23). This indicates SJR water is being diverted to the DMC intake. Mineral data from over 20 additional sampling runs from 12/18/89 to 3/20/90 confirm these observations more strongly as concentrations of major ions (e.g. sodium, TDS) are much higher and easier to detect than selenium levels (mg/L vs. µg/L) and are more conservative (not biologically removed) than selenium.

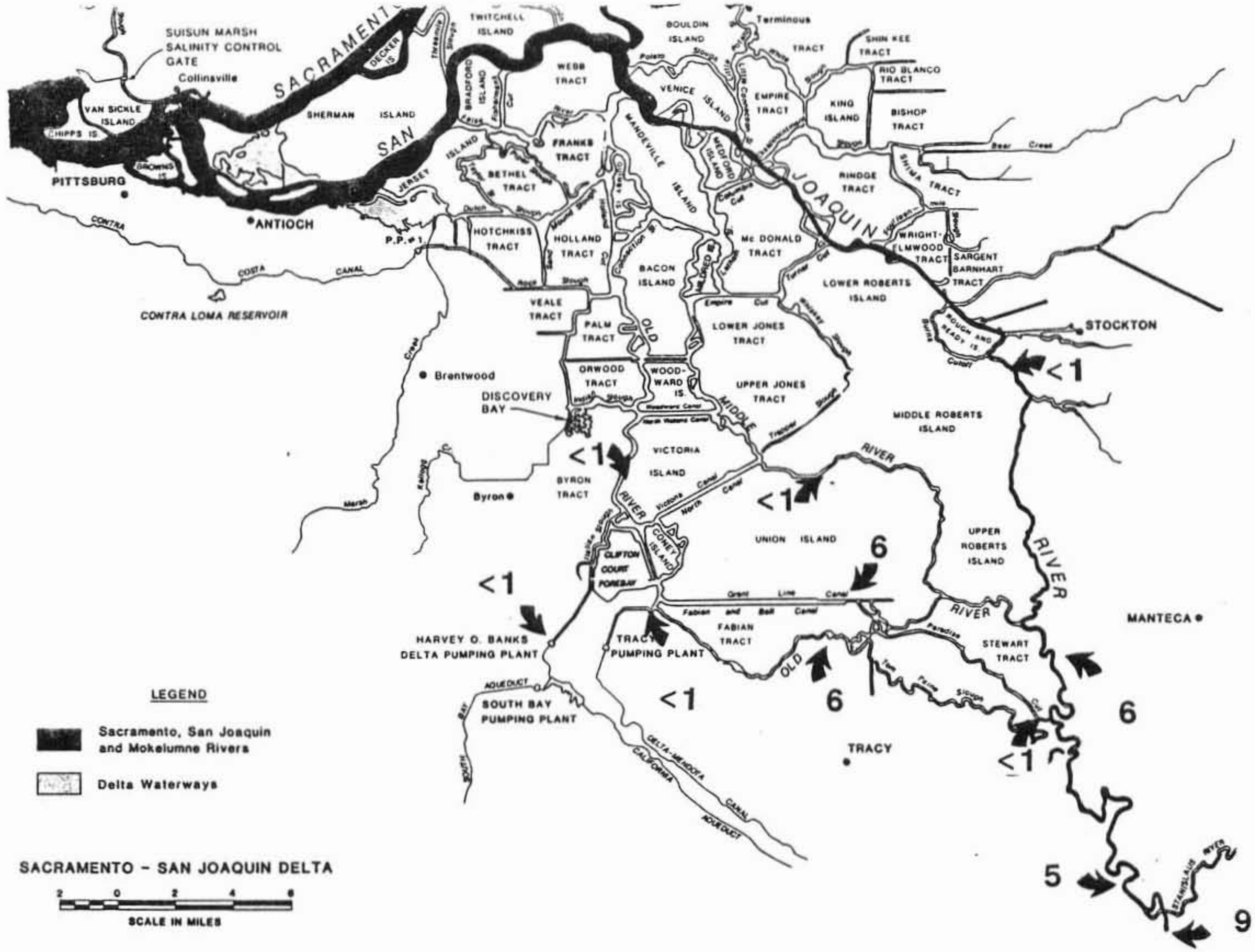



Figure 22. Delta Selenium Distribution ($\mu$g/L), March 2, 1989

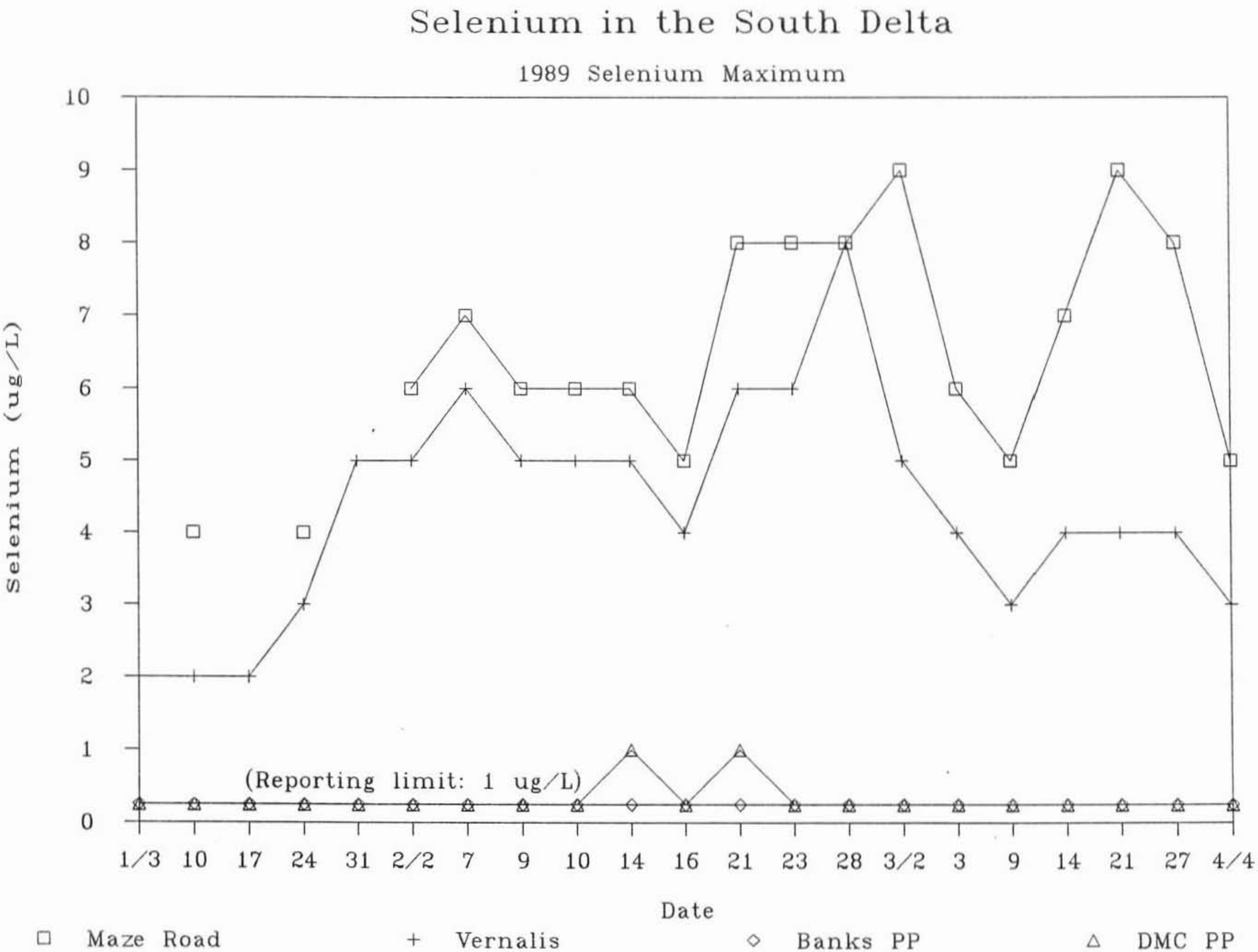



**Figure 23. Selenium in the South Delta**

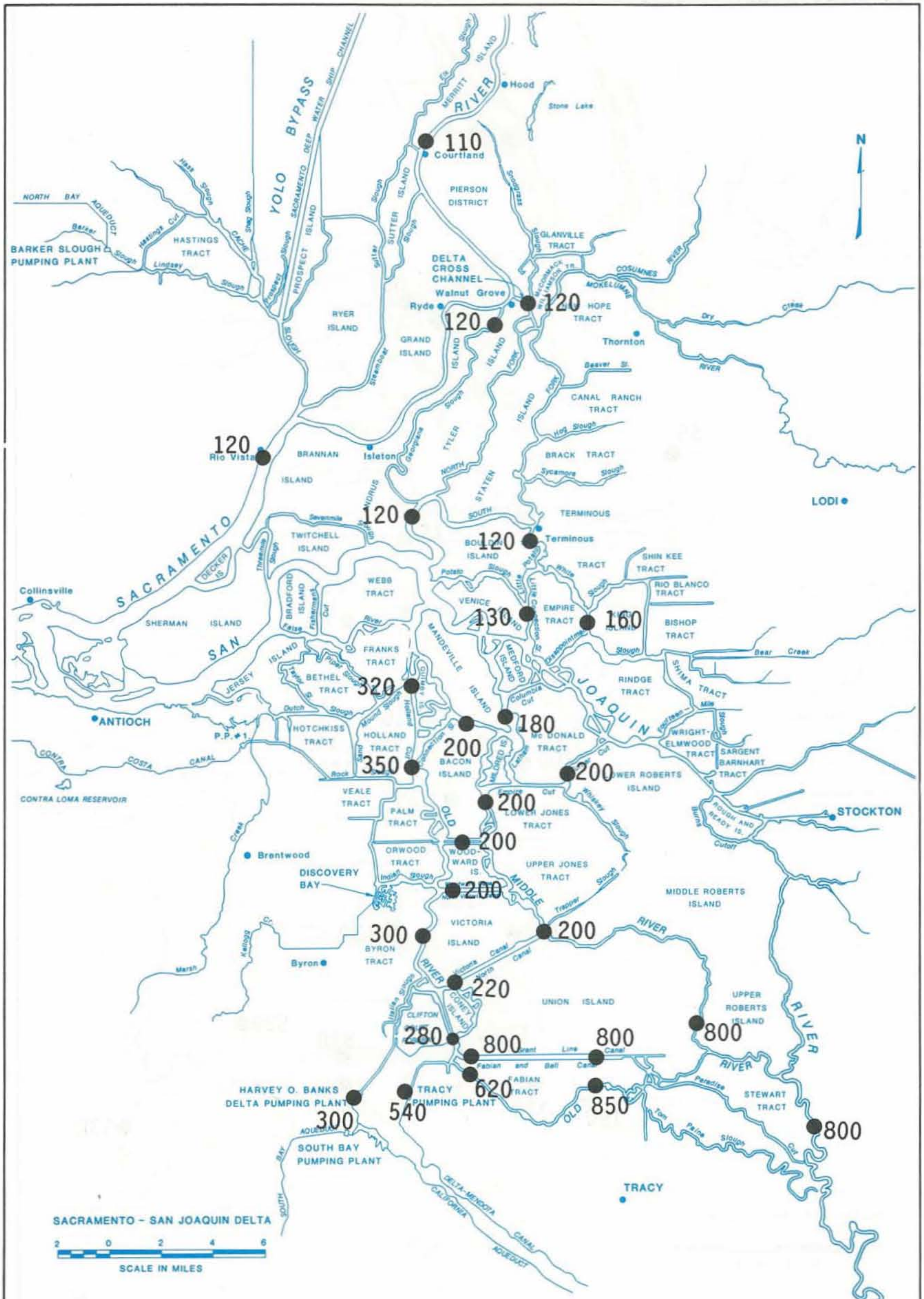



**Figure 24. Deltawide EC ($\mu$S/cm) July 25, 1989**

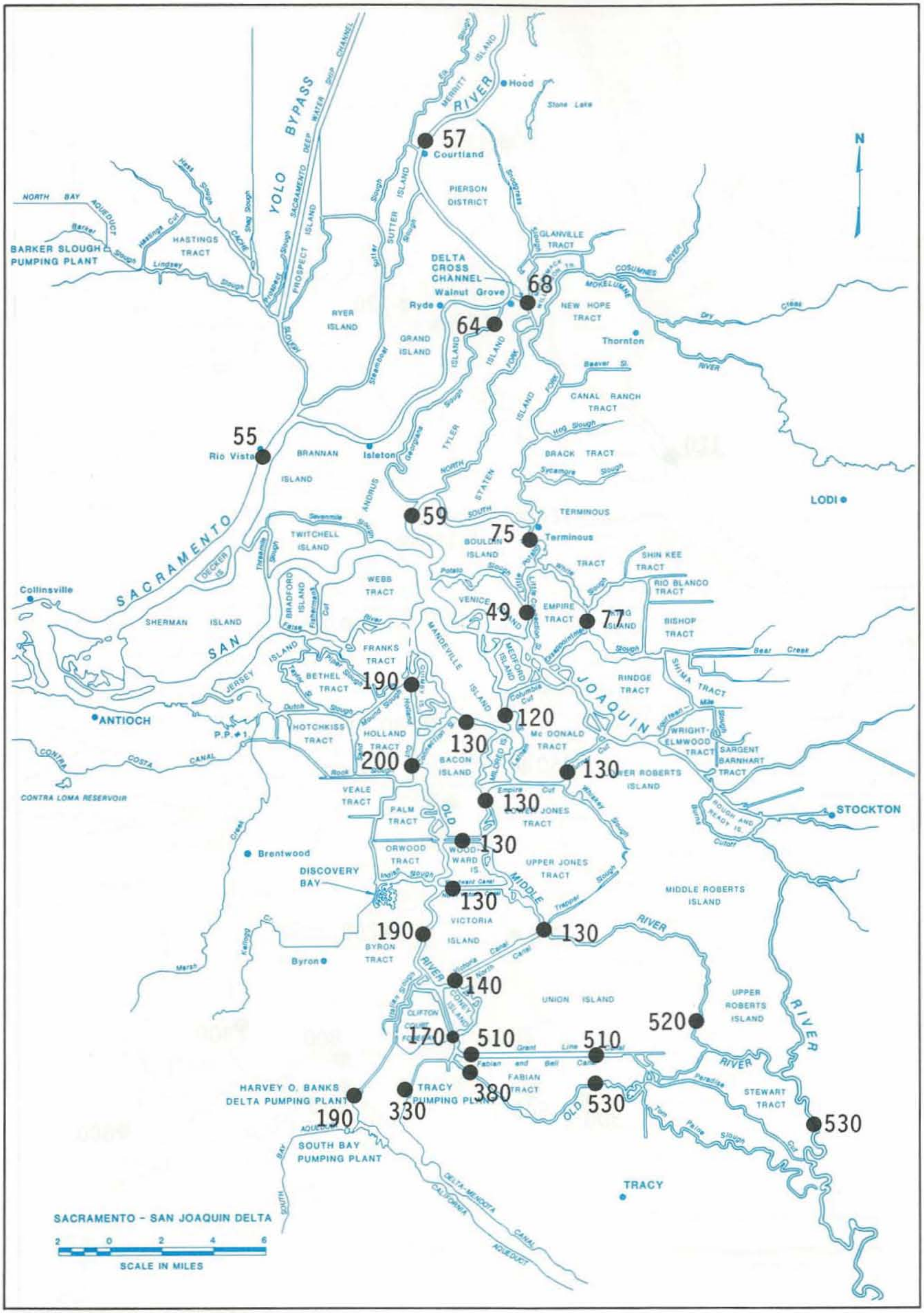



Figure 25. Deltawide TDS (mg/L) July 25, 1989

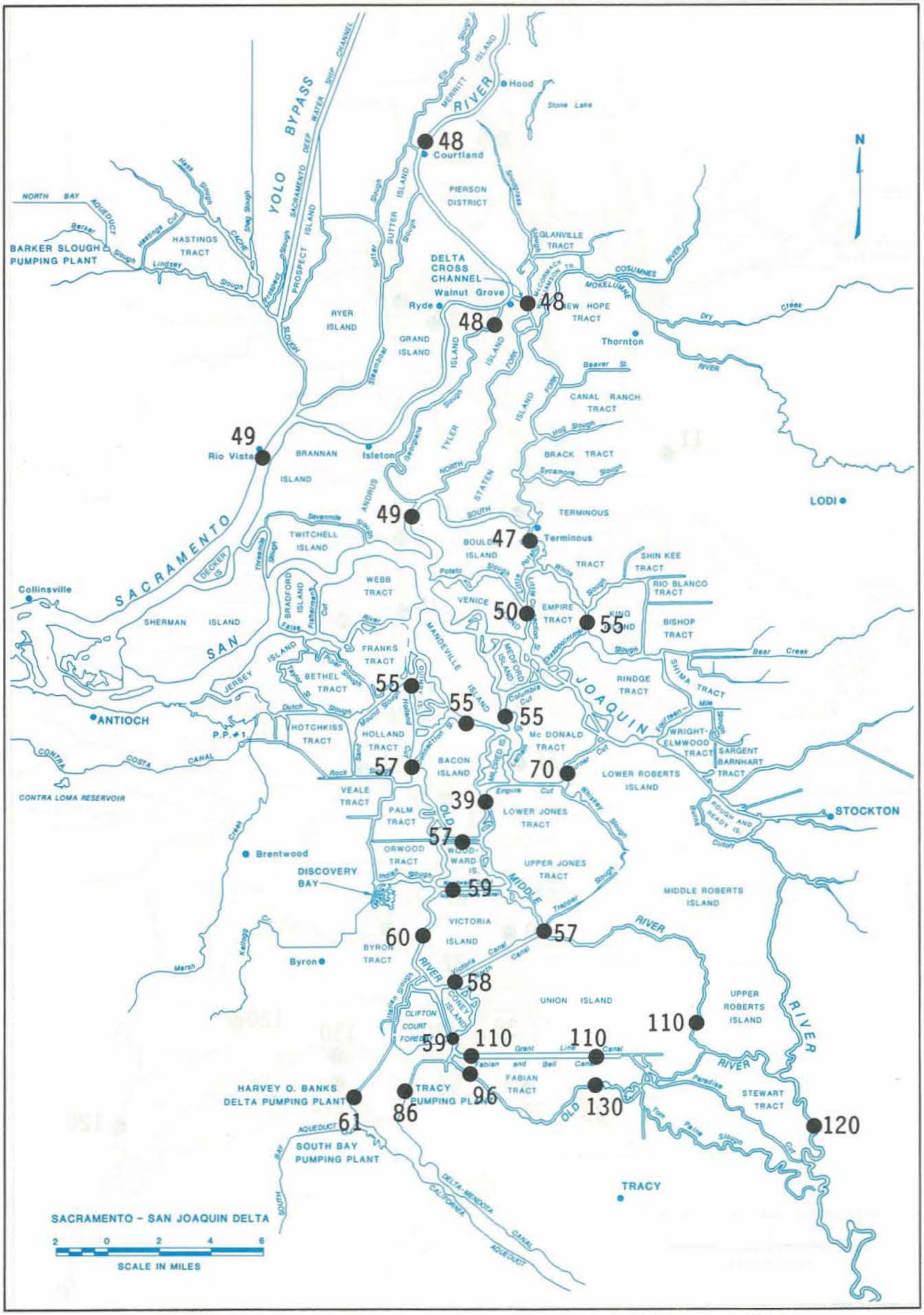



**Figure 26. Deltawide Alkalinity (mg/L) July 25, 1989**

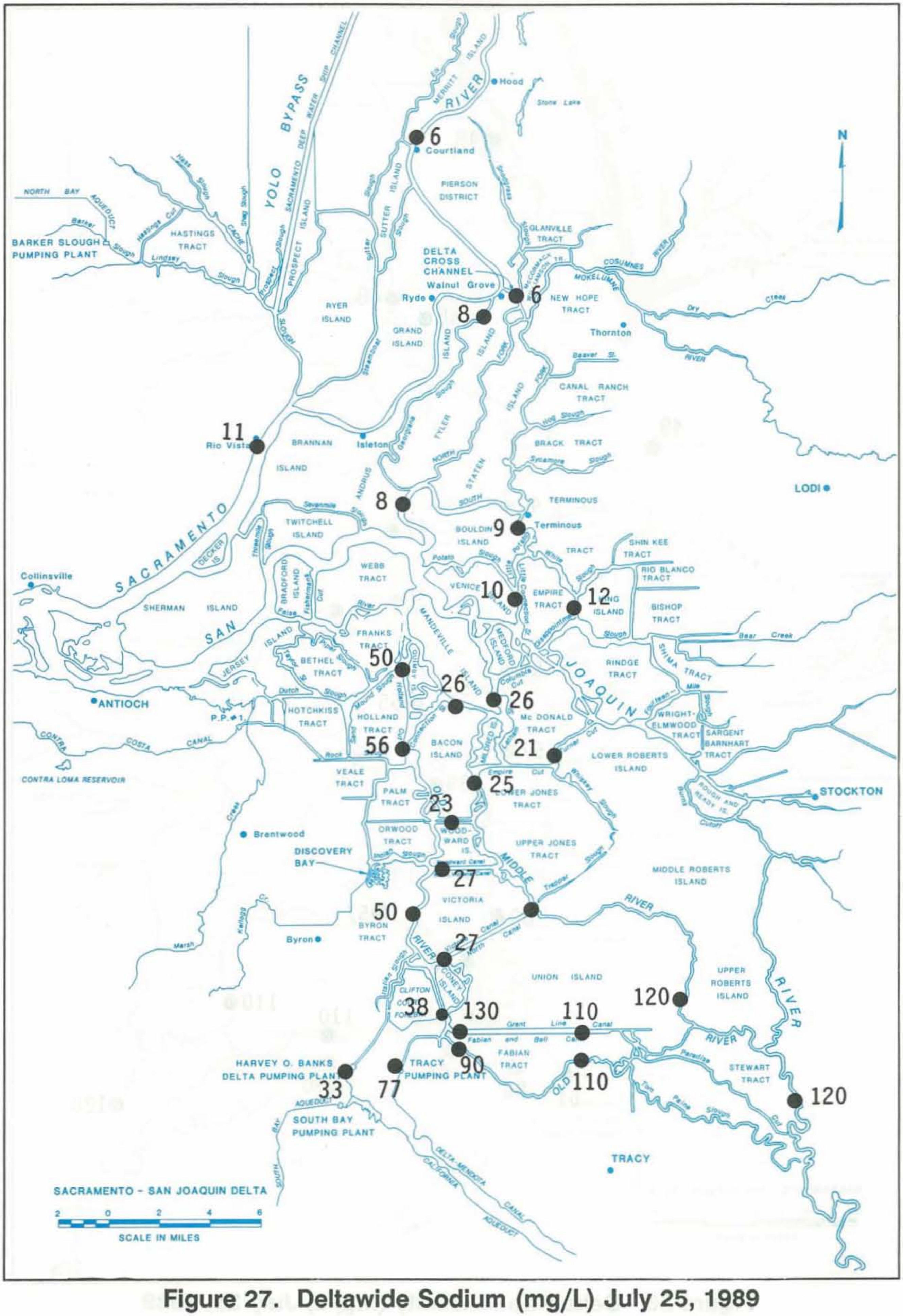



**Figure 27. Deltawide Sodium (mg/L) July 25, 1989**

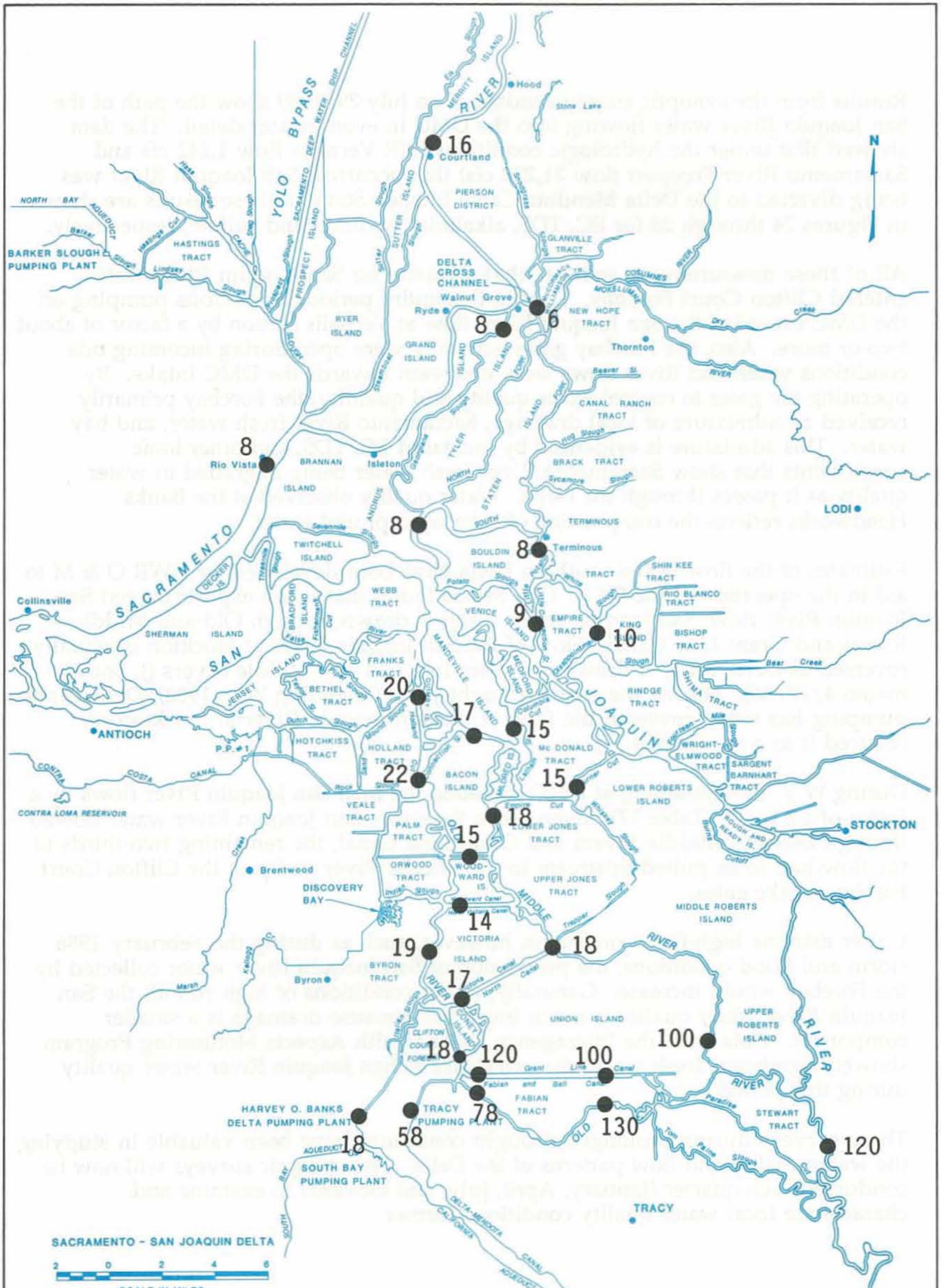



**Figure 28. Deltawide Sulfate (mg/L) July 25, 1989**

Results from the synoptic survey conducted on July 29, 1989 show the path of the San Joaquin River water flowing into the DMC in even greater detail. The data showed that under the hydrologic conditions (SJR Vernalis flow 1,242 cfs and Sacramento River Freeport flow 21,278 cfs) that occurred, San Joaquin River was being diverted to the Delta Mendota Canal intake. Some of these results are shown in Figures 24 through 28 for EC, TDS, alkalinity, sodium, and sulfate, respectively.

All of these measurements indicate that virtually no San Joaquin River water entered Clifton Court Forebay. During this entire period, continuous pumping on the DMC exceeded the San Joaquin River flow at Vernalis station by a factor of about two or more. Also, the Forebay gates generally were open during incoming tide conditions when Old River flows were upstream towards the DMC intake. By operating the gates to control water quality and quantity, the Forebay primarily received an admixture of local drainage, Sacramento River fresh water, and bay water. This admixture is evidenced by increased EC, TDS, and other ionic constituents that show Sacramento River fresh water being degraded in water quality as it passes through the Delta. Water quality observed at the Banks Headworks reflects the compositing of Forebay captured water.

Estimates of the flow in the southern Delta have been developed by DWR O & M to aid in the operation of the SWP. O & M has found that when exports exceed San Joaquin River flow, San Joaquin River water is drawn through Old and Middle Rivers and Grant Line Canal. Flow of the San Joaquin River at Stockton is actually reversed as Delta water is drawn upstream into Old and Middle Rivers (J. Snow, memo 4/17/86). During the recent drought years (including W.Y. 1988), Delta export pumping has either reversed the flow of the San Joaquin River at Stockton or reduced it to a net "trickle."

During W.Y. 1988 pumping at DMC exceeded the total San Joaquin River flows by a factor of 1.8 to 3.2 (Table 17). Even when the entire San Joaquin River water flowed through Old and Middle Rivers and Grant Line Canal, the remaining two-thirds of the flow had to be pulled upstream in the Middle River and past the Clifton Court Forebay intake gates.

Under extreme high-flow conditions, however, such as during the February 1986 storm and flood conditions, the proportion of San Joaquin River water collected by the Forebay would increase. Generally, under conditions of high runoff, the San Joaquin River water quality is much improved because drainage is a smaller component. Data from the Interagency Delta Health Aspects Monitoring Program showed significant fresh water characteristics in San Joaquin River water quality during this period.

These surveys during prolonged drought conditions have been valuable in studying the water quality and flow patterns of the Delta. The synoptic surveys will now be conducted each quarter (January, April, July, and October) to examine and characterize local water quality conditions further.

## Table 16. Hydrology During Synoptic Surveys

| Date | Delta Inflow avg. cfs | Old Middle River avg. cfs | Rio Vista avg. cfs | Cross Channel | Delta Outflow avg. cfs | Antioch Estimated avg. cfs | Stockton avg. cfs | Banks Headworks acre-ft | Tracy Plant acre-ft |
|---|---|---|---|---|---|---|---|---|---|
| 3/1/89 | 13,339 | -6,531 | 6,677 | open 2 | 5,888 | -613 | -337 | 6,863 | 8,126 |
| 3/2/89 | 13,980 | -5,778 | 6,987 | open 2 | 7,230 | 211 | -193 | 5,729 | 7,917 |
| 3/3/89 | 15,197 | -7,049 | 7,617 | open 2 | 6,851 | -595 | -199 | 7,269 | 8,221 |
| 7/23/89 | 23,573 | -9,337 | 12,085 | open 2 | 8,084 | -3,221 | -541 | 12,583 | 9,376 |
| 7/24/89 | 23,960 | -9,988 | 12,251 | open 2 | 7,595 | -3,746 | -566 | 11,994 | 9,148 |
| 7/25/89 | 23,531 | -9,788 | 11,989 | open 2 | 7,463 | -3,677 | -567 | 11,820 | 9,460 |

avg. cfs is average cfs
Negative values indicate reverse flow (upstream).
1 cfs for 24 hrs. = 1.983 acre-ft.
The number of cross channel gates that were open are noted (0, 1, or 2).

## Table 17. W.Y. 1988 Flows at DMC, Vernalis and Stockton

| Month | Daily Avg Pumping @ DMC (CFS) | Daily Avg Flow @ Vernalis (CFS) | Ratio: DMC to Vernalis | San Joaquin River Calculated Daily Avg Flow at Stockton (CFS) | Stockton #Days +flow/ -flow |
|---|---|---|---|---|---|
| 10/87 | 3998 | 1273 | 3.1:1 | -83. | +3/-28 |
| 11/87 | 3930 | 1573 | 2.5:1 | 83. | +29/-1 |
| 12/87 | 4033 | 1361 | 3.0:1 | -313. | +5/-26 |
| 1/88 | 4063 | 1521 | 2.7:1 | -371. | +2/-29 |
| 2/88 | 4098 | 1374 | 3.0:1 | -403. | +0/-29 |
| 3/88 | 4083 | 2294 | 1.8:1 | 153. | +27/-4 |
| 4/88 | 4083 | 2120 | 1.9:1 | 37. | +18/-12 |
| 5/88 | 2971 | 1649 | 1.8:1 | 41. | +18/-13 |
| 6/88 | 2993 | 1526 | 2.0:1 | 37. | +18/-12 |
| 7/88 | 4479 | 1379 | 3.2:1 | -283. | +0/-31 |
| 8/88 | 4531 | 1604 | 2.8:1 | -238. | +5/-26 |
| 9/88 | 4592 | 1464 | 3.1:1 | -194. | +1/-29 |

Stockton cfs calculated using flows from Vernalis, Channel Depletion, and Exports.

2. Volume Comparisons

The monthly volumes of 1954-55 drainage were compared against river inflow to the Delta (Table 18). The ratio between drainage and river volumes provides a theoretical estimate of the fraction (shown as percentage in Table 19) of recycled drain water in water flowing through the Delta and theoretical maximum dilution of drainage by river water. These comparisons are based on the assumption that 1954-55 and 1987-88 applied water use, drainage volume, and hydrology are similar.

During June and July 1954, the total drainage volumes were 9.5 and 15.6 percent, respectively, of the combined fresh water flowing into the Delta from the Sacramento and San Joaquin rivers and east side streams in June and July of 1954. In June and July 1955 drainage volumes were equal to 8.6 and 14.3 percent of the total river volume for these two months, respectively during June and July of 1955.

When June and July 1954 and 1955 drainage volumes are compared to 1987 and 1988 hydrology, these drainage volumes would have comprised 8% to 9.9 % of the total June and July river volumes. This is because the June and July 1987 and 1988 river flows were about 1.5 to 2 times greater than the June and July 1954 and 1955 river flows.

## Table 18. Comparisons of Drainage to River Flows

Delta acreage 419,457 (1954-55)

| | 1954 M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|
| Total 1954-55 | | | | | | | | |
| Monthly Drainage (ac-ft) | 55,719 | 70,573 | 80,575 | 70,857 | 44,557 | 46,817 | 46,537 | 85,731 |
| Drainage 1954-55 (ac-ft/day) | 1,857 | 2,352 | 2,686 | 2,362 | 1,485 | 1,561 | 1,551 | 2,858 |
| Drainage 1954-55 (cfs) | 938 | 1,188 | 1,356 | 1,193 | 750 | 788 | 783 | 1,443 |
| Average Daily River Flows | | | | | | | | |
| Sacramento River 1954-55 cfs | 25,149 | 11,061 | 8,117 | 9,321 | 11,279 | 10,639 | 14,826 | 24,678 |
| San Joaquin River 1954-55 cfs | 6,718 | 1,294 | 537 | 553 | 756 | 1,041 | 1,378 | 1,822 |
| East side streams 1954-55 cfs | 1,269 | 185 | 65 | 81 | 185 | 293 | 538 | 1,610 |
| Total 1954-55 cfs | 33,136 | 12,540 | 8,719 | 9,955 | 12,220 | 11,973 | 16,742 | 28,110 |
| Total 1954-55 ac-ft/month | 1,968,278 | 744,876 | 517,909 | 591,327 | 725,868 | 711,196 | 994,475 | 1,669,734 |
| Total Monthly Drainage (as % Total 1954-55 River Flow) | 2.83% | 9.47% | 15.56% | 11.98% | 6.14% | 6.58% | 4.68% | 5.13% |
| Sacramento River 1987-88 cfs | 9,996 | 10,067 | 15,142 | 14,439 | 11,625 | 9,509 | 8,129 | 15,744 |
| San Joaquin River 1987-88 cfs | 2,178 | 1,990 | 1,632 | 1,627 | 1,597 | 1,370 | 1,548 | 1,278 |
| Sacramento and San Joaquin River Total ac-ft/month | 723,128 | 716,205 | 996,368 | 954,290 | 785,367 | 646,195 | 574,834 | 1,011,103 |
| Computed Delta Outflow 1987-88 cfs (DAYFLO) | 4,951 | 3,496 | 3,829 | 2,851 | 1,790 | 3,789 | 4,291 | 9,455 |
| Computed Delta Outflow 1987-88 ac-ft/month | 294,116 | 207,647 | 227,445 | 169,353 | 106,350 | 225,055 | 254,897 | 561,600 |
| Total 1954-55 Monthly Drainage (as % Total 1987-88 River Flow) | 7.71% | 9.85% | 8.09% | 7.43% | 5.67% | 7.25% | 8.10% | 8.48% |

1 CFS * 1.98 = # Acre Ft. Per Day
# CFS * 1.98 * 30 = TOTAL ACRE-FT PER MONTH (30 DAY MONTH)

Table 18 (cont). Comparisons of Drainage to River Flows

Delta acreage 419,457 (1954-55)

| | 1955 J | F | M | A | M | J | J | A | S |
|---|---|---|---|---|---|---|---|---|---|
| Total 1954-55 | | | | | | | | | |
| Monthly Drainage (ac-ft) | 95,668 | 41,960 | 32,419 | 37,628 | 49,813 | 71,084 | 80,606 | 72,170 | 43,116 |
| Drainage 1954-55 (ac-ft/day) | 3,189 | 1,399 | 1,081 | 1,254 | 1,660 | 2,369 | 2,687 | 2,406 | 1,437 |
| Drainage 1954-55 (cfs) | 1,611 | 706 | 546 | 633 | 839 | 1,197 | 1,357 | 1,215 | 726 |
| Average Daily River Flows | | | | | | | | | |
| Sacramento River 1954-55 cfs | 23,230 | 15,381 | 13,860 | 14,154 | 21,749 | 12,204 | 9,012 | 9,045 | 9,918 |
| San Joaquin River 1954-55 cfs | 2,977 | 2,449 | 1,562 | 925 | 1,155 | 1,496 | 423 | 423 | 605 |
| East side streams 1954-55 cfs | 3,823 | 1,387 | 748 | 689 | 667 | 151 | 33 | 16 | 101 |
| Total 1954-55 cfs | 30,030 | 19,217 | 16,170 | 15,768 | 23,571 | 13,851 | 9,468 | 9,484 | 10,624 |
| Total 1954-55 ac-ft/month | 1,783,782 | 1,141,490 | 960,498 | 936,619 | 1,400,117 | 822,749 | 562,399 | 563,350 | 631,066 |
| Total Monthly Drainage (as % Total 1954-55 River Flow) | 5.36% | 3.68% | 3.38% | 4.02% | 3.56% | 8.64% | 14.33% | 12.81% | 6.83% |
| Sacramento River 1987-88 cfs | 25,400 | 12,188 | 11,348 | 16,887 | 10,974 | 10,578 | 14,642 | 13,287 | 11,537 |
| San Joaquin River 1987-88 cfs | 1,483 | 1,389 | 2,241 | 2,146 | 1,781 | 1,711 | 1,357 | 1,557 | 1,452 |
| Sacramento and San Joaquin River Total ac-ft/month | 1,596,825 | 806,468 | 807,189 | 1,130,521 | 757,657 | 729,986 | 950,324 | 881,764 | 771,527 |
| Computed Delta Outflow 1987-88 cfs (DAYFLO) | 19,593 | 3,045 | 4,542 | 3,496 | 3,829 | 2,851 | 1,790 | 3,789 | 4,291 |
| Computed Delta Outflow 1987-88 ac-ft/month | 1,163,805 | 180,863 | 269,770 | 207,647 | 227,445 | 169,353 | 106,350 | 225,055 | 254,897 |
| Tot 1954-55 Monthly Drainage (as % Total 1987-88 River Flow) | 5.99% | 5.20% | 4.02% | 3.33% | 6.57% | 9.74% | 8.48% | 8.18% | 5.59% |

1 CFS * 1.98 = # Acre Ft. Per Day
# CFS * 1.98 * 30 = TOTAL ACRE-FT PER MONTH (30 DAY MONTH)

The theoretical maximum fraction of Delta drainage that could be diverted by the State and Federal Water Projects and Contra Costa Water District was calculated by dividing the 1954-55 drainage volume by the 1987-88 total export volume for each month (Table 19). These values assume that all Delta drainage is being diverted by these three major water facilities. However, this would not be true for two reasons: (1) an unknown proportion of drainage is transported out of the Delta with outflow from rivers and the daily ebb tides and (2) the relative fraction of drainage received at each water facility may vary significantly depending upon the facility's location and the manner of diversion (e.g. forebay versus continuous pumping). The values also assume that present-day drainage volumes are about the same (90% to 110%) as in 1954-55. The proportion varies with each month.

The proportions were calculated to examine a hypothetical extreme. These values might actually be approached for short periods under prolonged low Delta inflow and outflow conditions and strong flood tides.

Based on these comparisons, the June 1954 and 1955 drainage volumes were equal in volume to 23 and 20 percent of the total June 1987 and 1988 export volumes, respectively. These comparisons are useful in understanding the relative volumes of water in the Delta that are being transported and recycled.

Table 19. Volume Comparisons of Monthly River Flows, Drainage, and Total Exports
Units in acre-feet

| | 1987 M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|
| Total 1987-88 Monthly Sacramento and San Joaquin River flows | 723,128 | 716,205 | 996,368 | 954,290 | 785,367 | 646,195 | 574,834 | 1,011,103 |
| 1954-55 Monthly Drainage | 55,719 | 70,573 | 80,575 | 70,857 | 44,557 | 46,817 | 46,537 | 85,731 |
| Total Exports | 326,118 | 307,888 | 549,482 | 601,514 | 538,742 | 362,617 | 324,308 | 551,547 |
| Drainage volume as % of Total Exports | 17.09% | 22.92% | 14.66% | 11.78% | 8.27% | 12.91% | 14.35% | 15.54% |

| | 1988 J | F | M | A | M | J | J | A | S |
|---|---|---|---|---|---|---|---|---|---|
| Total 1987-88 Monthly Sacramento and San Joaquin River flows | 1,596,825 | 806,468 | 807,189 | 1,130,521 | 757,657 | 729,986 | 950,324 | 881,764 | 771,527 |
| 1954-55 Monthly Drainage | 95,668 | 41,960 | 32,419 | 37,628 | 49,813 | 71,084 | 80,606 | 72,170 | 43,116 |
| Total Exports | 639,451 | 575,509 | 518,115 | 509,074 | 384,413 | 350,444 | 489,009 | 539,764 | 482,269 |
| Drainage volume as % of Total Exports | 14.96% | 7.29% | 6.26% | 7.39% | 12.96% | 20.28% | 16.48% | 13.37% | 8.94% |

3. <u>THM Precursor Contributions</u>

An estimate was made of the contribution of THM precursor material from Delta islands to the Delta channels. The calculations were performed to determine the effect that Delta island drainage might have on export water quality.

The calculations focused on the TTHMFP carbon (TFPC) concentrations in the Delta during water year 1988 (October 1, 1987 through September 30, 1988). Certain types of naturally occurring organic materials are the basic and essential precursors in the formation of trihalomethanes and other disinfection by-products (DBPs) during water treatment. The TTHMFP test is a measure of the fraction or concentration of materials in the water that have the propensity to form THMs. Therefore, TTHMFP results are a good basis for assessing the amount of organic THM precursors present.

If all natural organic matter in water readily formed THM then DOC would be a good surrogate indicator. However, our comparisons of Delta water DOC versus TTHMFP show unclear and poorly defined relationships. This may be due to the seasonal and geographical variations in the type and forms of DOC compounds in the water and bromide levels as shown by Amy et al (1990). Bromide from sea water intrusion and soils also contributes to the formation of brominated DBPs during disinfection.

TTHMFP is the sum total of chloroform ($CHCl_3$), bromodichloro-methane ($CHBrCl_2$), dibromochloromethane ($CHBr_2Cl$), and bromoform ($CHBr_3$) concentrations produced during a formation potential test. Because the atomic weight of bromine is more than twice the atomic weight of chlorine, waters containing equal amounts of THM but varying amounts of bromide exhibit different TTHMFP concentrations by weight. Therefore, to assess the various sources (drainages and rivers) of organic THM precursors, the concentrations of TTHMFP organic carbon in the water were compared.

To make these comparisons, the percent of carbon in each of the four THM species that were formed in the TTHMFP test was first calculated. The percentages by weight of carbon were 10% ($CHCl_3$), 7.3% ($CHBrCl_2$), 5.8% ($CHBr_2Cl$), and 4.8% ($CHBr_3$). Then the concentrations of each of the 4 THM compounds in the data set were multiplied by their respective percentage of carbon content to obtain the concentrations of THM carbon. These carbon concentrations were then summed to yield the total amount of TFPC.

Water year 1988 river volumes and THM carbon concentrations and 1954-55 drainage volume estimates were then used to compute their respective carbon loads. River volumes used in the calculations included the Sacramento (Freeport), San Joaquin (Vernalis), Mokelumne and Cosumnes. Volumes for the Sacramento and San Joaquin rivers were adjusted to better reflect the actual volumes that are available for mixing in the Delta channels. The adjustments for San Joaquin River flows were based on DWR SWP Operations and Maintenance Dispatcher Daily Reports. All of the flow in the Mokelumne and Cosumnes Rivers was used because of their eastern Delta location and distance from the export pumps. Tidal action should make most of these flows available for mixing in the Delta channels.

For these calculations an assumption was made that all of the net Delta outflow to the bay was from the Sacramento River. This assumption, while not entirely correct, was made because most of the San Joaquin River water is pumped through Tracy Pumping Plant and would not exert enough hydraulic head to contribute significantly to the outflow. During outgoing tides most of the Sacramento River flow apparently goes out to the estuary because of the direct channel connection. Since outgoing tides occur half the time, a large proportion of the flow would be lost to mixing in the Delta. Therefore, the total net Delta outflow for the month was subtracted from the total Sacramento River flow for each month to represent Sacramento River water in the Delta.

Three estimates of present-day Lowlands drainage volumes based on estimated Lowlands crop acreages were used to compute TFPC contributions. These were 90%, 100%, and 110% of the 1954-55 drainage volume estimates given in DWR Report No. 4. The adjusted river flows and 1954-55 island drainage volumes are shown in Table 20.

Table 20. River Volumes and Estimated Island Drainage (Ac-Ft)

| Month W.Y. 1988 | Adjusted Sacramento | Adjusted San Joaquin | Mokelumne River | Cosumnes River | 1954-55 Drainage |
|---|---|---|---|---|---|
| OCT | 351639 | 0 | 3968 | 598 | 46820 |
| NOV | 228331 | 4938 | 2834 | 1769 | 46540 |
| DEC | 386624 | 0 | 3091 | 4012 | 85730 |
| JAN | 356994 | 0 | 3084 | 13229 | 95670 |
| FEB | 525792 | 0 | 2227 | 6280 | 41960 |
| MAR | 418435 | 9405 | 1767 | 9159 | 32420 |
| APR | 320506 | 2201 | 1290 | 8727 | 37630 |
| MAY | 382757 | 2520 | 906 | 6449 | 49800 |
| JUN | 439137 | 2201 | 990 | 2068 | 71080 |
| JUL | 659114 | 0 | 1138 | 304 | 80610 |
| AUG | 664809 | 0 | 675 | 0 | 72170 |
| SEP | 544096 | 0 | 1053 | 0 | 43120 |

Equations used for the following discussion are listed in Table 22.

# Table 21. Equations for Tables 22-24

The following equations were used to calculate the percent of carbon in each of the 4 THMs:

| Compound, formula, and equation | Percent carbon by wt. |
|---|---|
| Chloroform, CHCl3, {C/(C+H+(3xCl))}x100 | 10.05% |
| Bromodichloromethane, CHBrCl2, {C/(C+H+Br+(2xCl))}x100 | 7.33% |
| Dibromochloromethane, CHBr2Cl, {C/(C+H+Cl+(2xBr))}x100 | 5.76% |
| Bromoform, CHBr3, {C/(C+H+(3xBr))}x100 | 4.75% |

Where: C=12, H=1, Cl=35.45 and Br=79.91

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# Table 22.

The equation used for the calculations was:
Dc= ((Sv)(Sc)+(SJRv)(SJRc)+(Mv)(Mc)+(Cv)(Cc))/(Sv+SJRv+Mv+Cv)

Where: Dc = Theoretical THMFP organic carbon concentration (TFPC) in Delta water in µg/L
Sv = Sacramento River volume in ac-ft
Sc = Sacramento River TFPC concentration in µg/L
SJRv = San Joaquin River volume in ac-ft
SJRc = San Joaquin River TFPC concentration in µg/L
Mv = Mokelumne River volume in ac-ft
Mc = Mokelumne River TFPC concentration in µg/L
Cv = Cosumnes River volume in ac-ft
Cc = Cosumnes River TFPC concentration in µg/L

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# Table 23.

The following equations were used to compute the proportioned values shown in Table 25:

For June through August estimates:
Cw=((.465)(Cm)+(.535)(Cns))

For September through May estimates:
Cw=((.325)(Cm)+(.675)(Cns))

Where:
Cw = Flow weighted TFPC concentration in µg/L
Cm = TFPC concentration from middle Delta island group in µg/L
Cns = TFPC concentration from north-south Delta island group in µg/L

---

# Tables 24.

The equations used in these calculations are shown below.

River plus drainage:
Crd=((Fd)(Cw)+(Fr)(Cr))/(Fd+Fr)) using 1954-55 drainage volume
Crd=((0.9)(Fd)(Cw)+(Fr)(Cr))/((0.9)(Fd)+(Fr)) using 90% drainage volume
Crd=((1.1)(Fd)(Cw)+(Fr)(Cr))/((1.1)(Fd)+(Fr)) using 110% drainage volume
Concentration of river TFPC:
Conct=(2.63)(Cr)

Where:
Crd = TFPC concentration of river and drainage mixed in µg/L
Fd = Total Drainage volume in ac-ft
Fr = Total river volume in ac-ft
Cw = Flow weighted TFPC concentration of all drains in µg/L
Cr = Flow weighted TFPC concentration of rivers in µg/L
Conct = Concentration of river TFPC

TFPC concentrations in the Sacramento, Mokelumne, Cosumnes and San Joaquin rivers were flow weighted to provide a single theoretical mixed concentration in the Delta. TTHMFP data for the Mokelumne and Cosumnes rivers were not available for the 1988 water year. Instead, data collected during the 1984 water year were used. Because of the generally good quality of these rivers and their relatively low flow, monitoring of these two stations under IDHAMP was discontinued after 1984. The results are shown below in Table 22.

## Table 22. River TTHMFP Carbon (TFPC)
(µg/L)

| Month | Sacramento | San Joaquin | Mokelumne | Cosumnes | Flow Weighted /1 |
|---|---|---|---|---|---|
| OCT | 24.82 | 26.71 | 24.31 | 15.41 | 24.79 |
| NOV | 31.14 | 52.22 | 19.21 | 17.35 | 31.33 |
| DEC | 29.13 | 42.73 | 19.21 | 83.82 | 29.61 |
| JAN | 38.88 | 45.37 | 22.22 | 16.27 | 37.94 |
| FEB | 24.26 | 55.65 | 11.32 | 14.33 | 24.09 |
| MAR | 26.16 | 35.16 | 26.39 | 19.80 | 26.22 |
| APR | 16.43 | 35.34 | 23.38 | 20.65 | 16.69 |
| MAY | 22.20 | 35.72 | 20.29 | 13.33 | 22.14 |
| JUN | 26.91 | 39.44 | 23.52 | 23.93 | 26.95 |
| JUL | 21.10 | 54.14 | 36.44 | 24.67 | 21.13 |
| AUG | 19.25 | 48.57 | 31.42 | 32.71 | 19.27 |
| SEP | 31.95 | 43.29 | 42.47 | 30.85 | 31.97 |

/1 Flow weighted TTHMFP carbon concentration of Delta inflow represents the theoretical THMFP carbon concentration in Delta channels.

The Department conducted a study from September 1981 through January 1982 to determine the sources of THM precursors in the Sacramento-San Joaquin Delta, Sacramento River and State Water Project. Conclusions from this investigation were that (1) agricultural drainage appears to be a significant source of precursors, (2) effluent of waste water treatment plants do not appear to be a major source and (3) aquatic vegetation was not a significant source at the places and times of sampling.

There has been research on the reaction of aqueous chlorine with proteins produced by algae in natural waters (Scully et al, 1988). The study was conducted on reservoirs in Colorado and Pennsylvania. One of the conclusions points out that algae may contribute about ten percent of the TTHMFP and the contribution may be higher during months of high algal growth. Obviously, algal growth does contribute THM precursors to Delta waters. The river water flowing into the Delta contains algae and additional algal growth occurs within the Delta. For this study, there are no data available to discriminate between the THM precursors that result from algal growth in the rivers or in the Delta.

Delta channel water losses due to evaporation and additions due to precipitation were not included in this analysis because of the broad assumptions required for the analysis. We believe that employing evaporation and precipitation factors would not significantly improve the calculations because these two factors have a somewhat countering effect.

The Delta islands or tracts were divided into two groups for comparison of organic carbon concentrations. One group consisted of the middle Delta peat soil islands and the other included the north and south areas overlying mineral and intermediate organic soil areas. Data from the 1954-55 report showed that the drainage volume from the middle Delta group (study units 18, 20 and 22) contributed about 46% of the total Delta drainage volume during the period June through August and about 32.5% from September through May. These percentages were used to proportion the carbon concentration of each group and provide a single value for each month (far right column of Table 23).

Islands or tracts in the middle Delta "peat" group included Empire, Bouldin, King, Rindge and Terminous. The north-south "mineral-intermediate organic" group included Grand, Tyler, Brannan, Egbert, Upper Egbert, McCormack-Williamson, Pescadero, Prospect, Rio Blanco and Upper Jones.

TFPC data for the island drainages were categorized by group and month. All data collected from any island in the group for the same year and month were averaged to provide a single TFPC value for that group, year and month.

Table 23 calculations show peat island drains generally contain more THMFP carbon than the mineral-intermediate organic island drainages. This agrees with the higher TTHMFP concentrations observed in drainages from peat areas than from the mineral-intermediate organic areas, earlier DWR soil extract analyses for TTHMFP, and existing knowledge about the organic content of Delta soils.

Table 23. Delta Drainage TTHMFP Carbon (TFPC)
(µg/L)

| Month | Delta Island Groups | | Proportioned Carbon |
|---|---|---|---|
| W.Y. 1988 | Peat | Mineral-Intermed. Org. | |
| OCT | 123.69 | 95.40 | 104.59 |
| NOV | 148.73 | 170.21 | 163.23 |
| DEC | 209.98 | 130.36 | 156.24 |
| JAN | 250.49 | 164.08 | 192.16 |
| FEB | 309.86 | 218.81 | 248.40 |
| MAR | 217.77 | 140.54 | 165.64 |
| APR | 212.24 | 105.42 | 140.14 |
| MAY | 217.64 | 143.04 | 167.29 |
| JUN | 392.24 | 111.48 | 242.03 |
| JUL | 198.97 | 84.30 | 137.62 |
| AUG | 242.01 | 97.77 | 164.84 |
| SEP | 338.92 | 114.45 | 187.40 |

Monthly TFPC concentrations, drainage volumes, and Sacramento, Mokelumne, Cosumnes and San Joaquin River volume data were used to compute the TFPC concentrations resulting from the addition of Delta drainage to the river water (Table 24).

## Table 24. Delta TTHMFP Carbon (TFPC) Concentrations from Drainage

Estimates for W.Y. 1988

| Month | Drainage /1 µg/L | Rivers /2 µg/L | Drainage Plus River /3 µg/L | 1954-55 Drainage 90% /4 µg/L | 1954-55 Drainage 110% /5 µg/L |
|---|---|---|---|---|---|
| OCT | 104.59 | 24.79 | 34.07 | 33.24 | 34.87 |
| NOV | 163.23 | 31.33 | 52.91 | 51.08 | 54.69 |
| DEC | 156.24 | 29.61 | 52.25 | 50.36 | 54.08 |
| JAN | 192.16 | 37.94 | 69.40 | 66.85 | 71.86 |
| FEB | 248.40 | 24.09 | 40.42 | 38.89 | 41.92 |
| MAR | 165.64 | 26.22 | 35.81 | 34.91 | 36.70 |
| APR | 140.14 | 16.69 | 29.24 | 28.10 | 30.35 |
| MAY | 167.29 | 22.14 | 38.47 | 37.01 | 39.91 |
| JUN | 242.03 | 26.95 | 56.61 | 54.02 | 59.13 |
| JUL | 137.62 | 21.13 | 33.80 | 32.66 | 34.92 |
| AUG | 164.84 | 19.27 | 33.51 | 32.21 | 34.78 |
| SEP | 187.40 | 31.97 | 43.37 | 42.30 | 44.42 |
| Avg. | 172.47 | 26.01 | 43.32 | 41.80 | 44.80 |
| Min. | 104.59 | 16.69 | 29.24 | 28.10 | 30.35 |
| Max. | 248.40 | 37.94 | 69.40 | 66.85 | 71.86 |

/1 Flow weighted TPFC concentration for island drainage (Table 23).
/2 Flow weighted TPFC concentration for Sacramento, Mokelumne, Cosumnes and San Joaquin rivers (Table 22).
/3 Flow weighted TPFC concentrations using 1954-55 island drainage volume and rivers.
/4 Flow weighted TPFC concentrations using 90% of 1954-55 island drainage volume and rivers.
/5 Flow weighted TPFC concentrations using 110% of 1954-55 island drainage volume and rivers.

The computed amount of TPFC using 90, 100, and 110% of the 1954-55 drainage volume estimates in DWR Report No. 4 were not significantly different. The exact drainage volume, therefore, is not critical in this analysis to determine the increase of TTHMFP carbon from island drains.

The estimates show that in 1988, island drainage increased the TTHMFP carbon content of the river inflows by 35% to 110% (average 66%) depending on the month (Table 25). The highest estimated increase (100-119%) occurred in June and lowest in September (32-39%).

The 90% and 110% drainage volumes bracket the estimated 1988 drainage volumes and show the greatest TFPC increase of 119% and the lowest to be 32 % with an average range of 60% to 72%. Impact on export waters would depend on the month and the volume exported. The 1988 water year was classified as "critically dry", so the impact of Delta drainage is then expected to be greater than in "normal" runoff years.

Table 25. Estimated Delta TTHMFP Carbon (TFPC) Increases from Drainage

| | 1954-55 Drainage Volumes | | |
|---|---|---|---|
| | 100% | 90% | 110% |
| Month | Percent Increase | Percent Increase | Percent Increase |
| OCT | 37.39% | 34.05% | 40.66% |
| NOV | 68.89% | 63.03% | 74.56% |
| DEC | 76.47% | 70.08% | 82.64% |
| JAN | 82.91% | 76.17% | 89.38% |
| FEB | 67.81% | 61.48% | 74.06% |
| MAR | 36.59% | 33.16% | 39.98% |
| APR | 75.14% | 68.32% | 81.82% |
| MAY | 73.81% | 67.18% | 80.28% |
| JUN | 110.03% | 100.41% | 119.38% |
| JUL | 59.97% | 54.56% | 65.25% |
| AUG | 73.93% | 67.19% | 80.53% |
| SEP | 35.63% | 32.30% | 38.91% |
| AVG | 66.55% | 60.66% | 72.29% |
| MIN | 35.63% | 32.30% | 38.91% |
| MAX | 110.03% | 100.41% | 119.38% |

These estimated TFPC increases to river waters from drainage are shown in Table 26 which estimates the proportion of TFPC in Delta waters that came from drainage.

Table 26. Estimated Proportion of Drainage TFPC in Delta Waters

Estimated values in percent for drought year W.Y. 1988

| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 41 | 43 | 45 | 40 | 27 | 43 | 27 | 52 | 38 | 43 | 26 |

The estimates show that drainage contributed 40% to 45% of the TFPC in the Delta during the irrigation months (April August) and 38% to 52% during the winter leaching period (November February) during W.Y. 1988.

An important question is whether island soils actually contribute TTHMFP carbon, or whether increased THM carbon in drainage only reflects concentration due to evaporation and transpiration (ET) of the water as it passes through the agricultural cycle.

During the growing season, water losses from ET occur and therefore, salt concentrations in some drains (assuming no island salt source) are expected to increase due to these concentration effects. However, to date there are no data to indicate that organic THM precursor material behaves similarly to inorganic salts. Organic compounds exhibit different chemical behavior and physical properties than salts and, therefore, cannot be adequately modeled using salinity models developed for TDS and mineral ions. The distinct characteristics between drain and riverine humics as discussed previously (Amy et al 1990) support these conclusions.

TTHMFP carbon concentrations based on measured TTHMFP data were averaged for selected Delta monitoring stations to provide a comparison with the estimated TTHMFP carbon values. The stations included the Banks Headworks, Sacramento River at Mallard Island, Clifton Court Forebay intake, and Middle River at Borden Highway. They were selected with the thought that when the values were averaged, they would be representative of the average Delta channel TTHMFP carbon concentrations. The results are shown in Table 27. A comparison of the estimated TFPC values and the observed average TFPC values is presented in Table 28.

## Table 27. Measured TTHMFP Carbon (TFPC) at Selected Delta Stations

| Monthly | Banks Headworks (µg/L) | Mallard Isl. at Sac. Rv. (µg/L) | Clifton Court Intake (µg/L) | Middle River at Borden Highway (µg/L) | Monthly Average (µg/L) |
|---|---|---|---|---|---|
| OCT | 28.99 | 32.28 | 38.31 | 35.88 | 33.86 |
| NOV | 36.32 | 45.58 | 33.34 | 42.01 | 39.32 |
| DEC | 50.12 | 47.13 | 43.51 | 56.60 | 49.34 |
| JAN | 56.29 | 47.09 | 62.32 | 73.04 | 59.68 |
| FEB | 79.33 | 70.41 | 78.10 | 29.24 | 64.27 |
| MAR | 41.18 | 58.04 | 40.64 | 33.64 | 43.38 |
| APR | 29.71 | 34.69 | 38.41 | 45.36 | 37.04 |
| MAY | 54.40 | 44.98 | 56.48 | 47.40 | 50.82 |
| JUN | 39.53 | 37.43 | 48.02 | 37.67 | 40.66 |
| JUL | 62.38 | 52.04 | 52.64 | 58.14 | 56.30 |
| AUG | 57.08 | 65.76 | 37.74 | 44.63 | 51.30 |
| SEP | 38.47 | 38.07 | 39.34 | 39.22 | 38.77 |
| AVG | 48.67 | 48.67 | 48.14 | 45.78 | 47.82 |
| MIN | 28.99 | 32.28 | 33.34 | 29.24 | 33.86 |
| MAX | 79.33 | 70.41 | 78.10 | 73.04 | 64.27 |

## Table 28. Comparison of Estimated Drainage THMFP Carbon (TFPC) Impact to Observed Data

| Month | Estimated Rivers plus Drainages /1 (µg/L) | Station Monthly Average /2 (µg/L) | Differences /3 (µg/L) | Percent of Station Averages /4 |
|---|---|---|---|---|
| OCT | 34.07 | 33.86 | -0.20 | 99.41% |
| NOV | 52.91 | 39.32 | -13.60 | 74.30% |
| DEC | 52.25 | 49.34 | -2.91 | 94.43% |
| JAN | 69.40 | 59.68 | -9.72 | 86.00% |
| FEB | 40.42 | 64.27 | 23.85 | 159.00% |
| MAR | 35.81 | 43.38 | 7.57 | 121.13% |
| APR | 29.24 | 37.04 | 7.81 | 126.71% |
| MAY | 38.47 | 50.82 | 12.34 | 132.08% |
| JUN | 56.61 | 40.66 | -15.95 | 71.82% |
| JUL | 33.80 | 56.30 | 22.50 | 166.57% |
| AUG | 33.51 | 51.30 | 17.79 | 153.10% |
| SEP | 43.37 | 38.77 | -4.59 | 89.41% |
| ANNUAL | | | | |
| AVG | 43.32 | 47.82 | 4.50 | |
| MIN | 29.24 | 33.86 | 4.62 | |
| MAX | 69.40 | 64.27 | 5.13 | |

/1 Estimated Delta TFPC levels from river plus drainage data using the 1954-55 drainage volume (Table 24)
/2 Delta monitoring stations, average TFPC levels from Table 27
/3 Computed difference of monitoring station average (Table 27) minus estimated river + drainage TFPC levels (Table 24). Numbers are rounded off values.
/4 Percent estimated is computed by dividing the observed monthly station average by the river + drainage estimate.

The estimates appear to be reasonable as the annual average, minimum, and maximum estimates were 4 µg/L to 5 µg/L of their respective observed values. Overall, the estimates averaged 14.5% higher than the observed mean values based on data from the four Delta stations.

Figures 29 and 30 are plots of the estimated and measured TTHMFP carbon (TFPC) concentrations for the Delta. The measured values are based on the average of monthly observations recorded at 4 IDHAMP Delta stations (Banks Headworks, Clifton Court Forebay intake, Sacramento River at Mallard Island, and Middle River at Borden Highway). Also included on the plots are the flow weighted river TTHMFP carbon (TFPC) values based on data from the Sacramento River at Greenes Landing, San Joaquin River near Vernalis, Cosumnes, and Mokelumne rivers. The estimated Delta TFPC concentrations are based on the previously described calculations for drainage concentrations mixed with flow weighted river values.

One problem of comparing the estimated data with the measured data is that the samples for island drainage, river water and Delta channel water were collected at different times of the month. Although all of the data being compared was collected in the same month, in some cases, but not all, the data used to make the estimates may have been collected one to three weeks prior to the measured data.

Figure 29 shows the data plotted on a regular monthly basis. In order to compare the effects of a time delay, Figure 30 shows the estimated TTHMFP carbon concentration plotted on the month in which the data were collected but the measured TTHMFP carbon concentration is offset by one month. This means that the measured value plotted for October in Figure 30 is the value that was actually measured in November.

Figure 31 is the same plot as Figure 29 but the "Y" scale is TFPC as chloroform. In this figure, the TTHMFP carbon (TFPC) was computed to equivalent chloroform by weight.

In summary, the figures indicate a good start in the approach of estimating the potential contribution of TTHMFP carbon from Delta island drainages and from the rivers during drought year hydrology. Further work is needed to improve the method of determining the level of impact that drainage has on diverted Delta waters used for drinking water supplies. This work is described in the Recommendations section of this report.

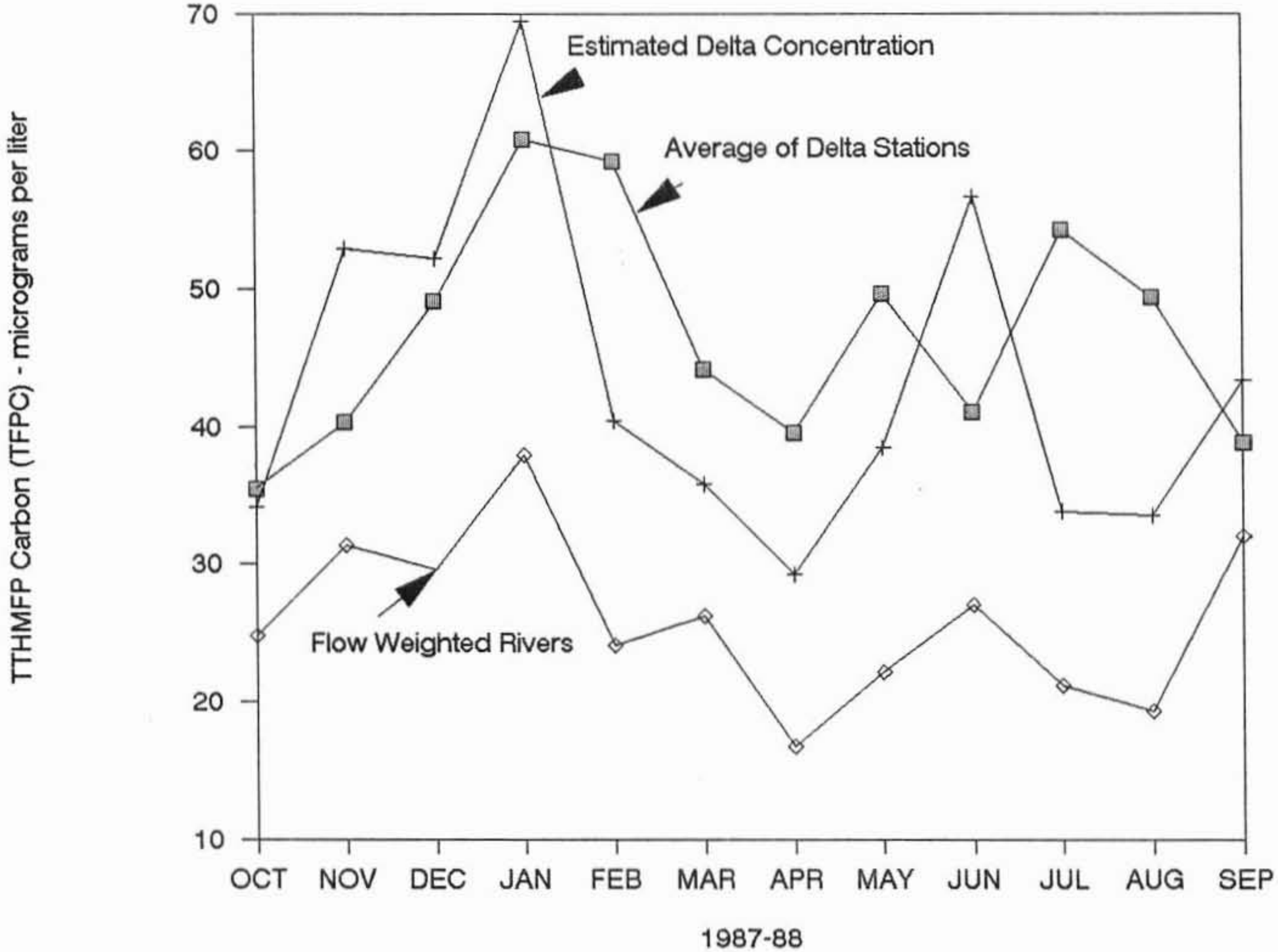


**Figure 29. Estimated vs. Measured THMFP Carbon (TFPC) Values**

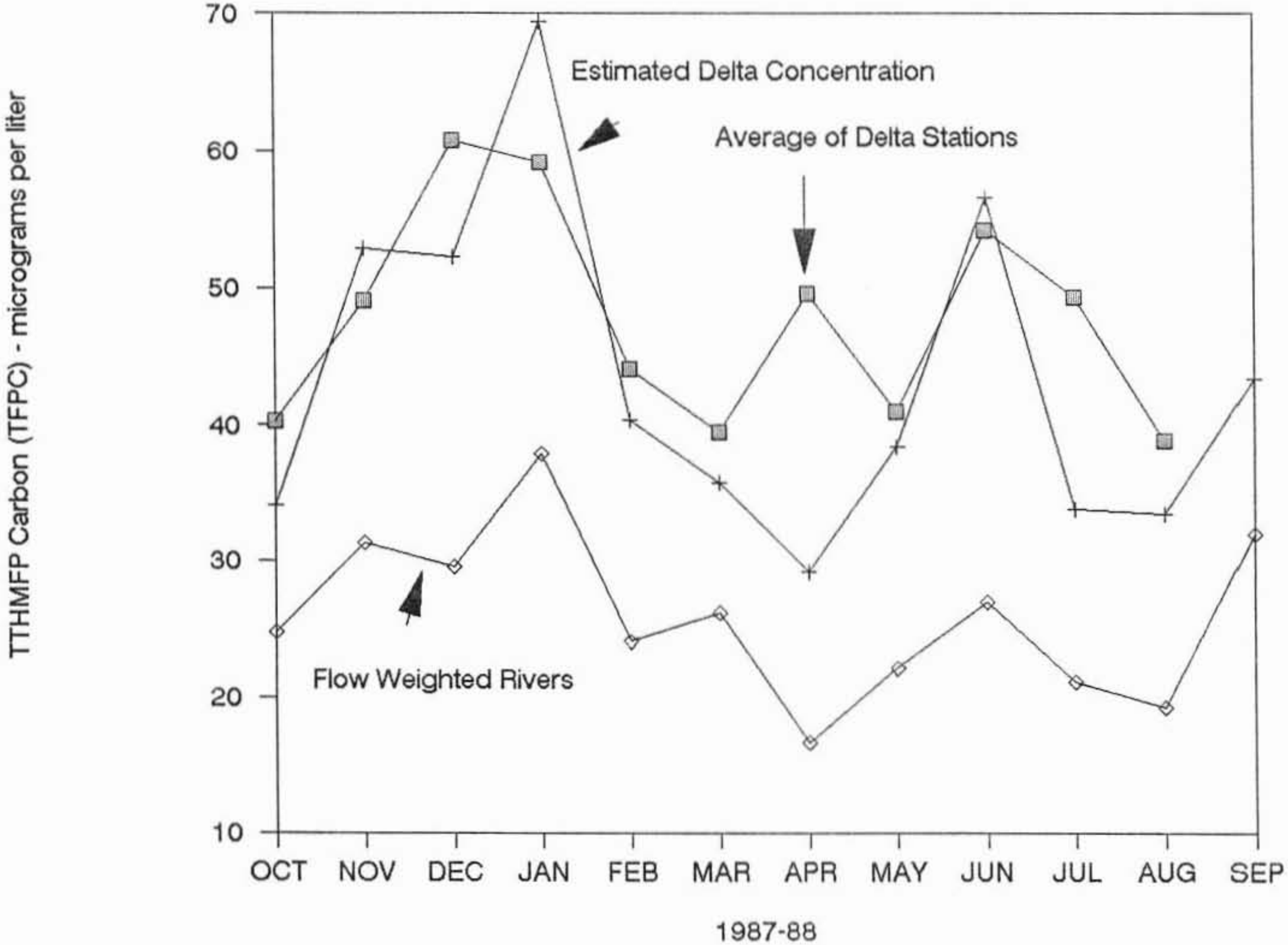


**Figure 30. Time Adjusted Estimated vs. Measured TFPC**

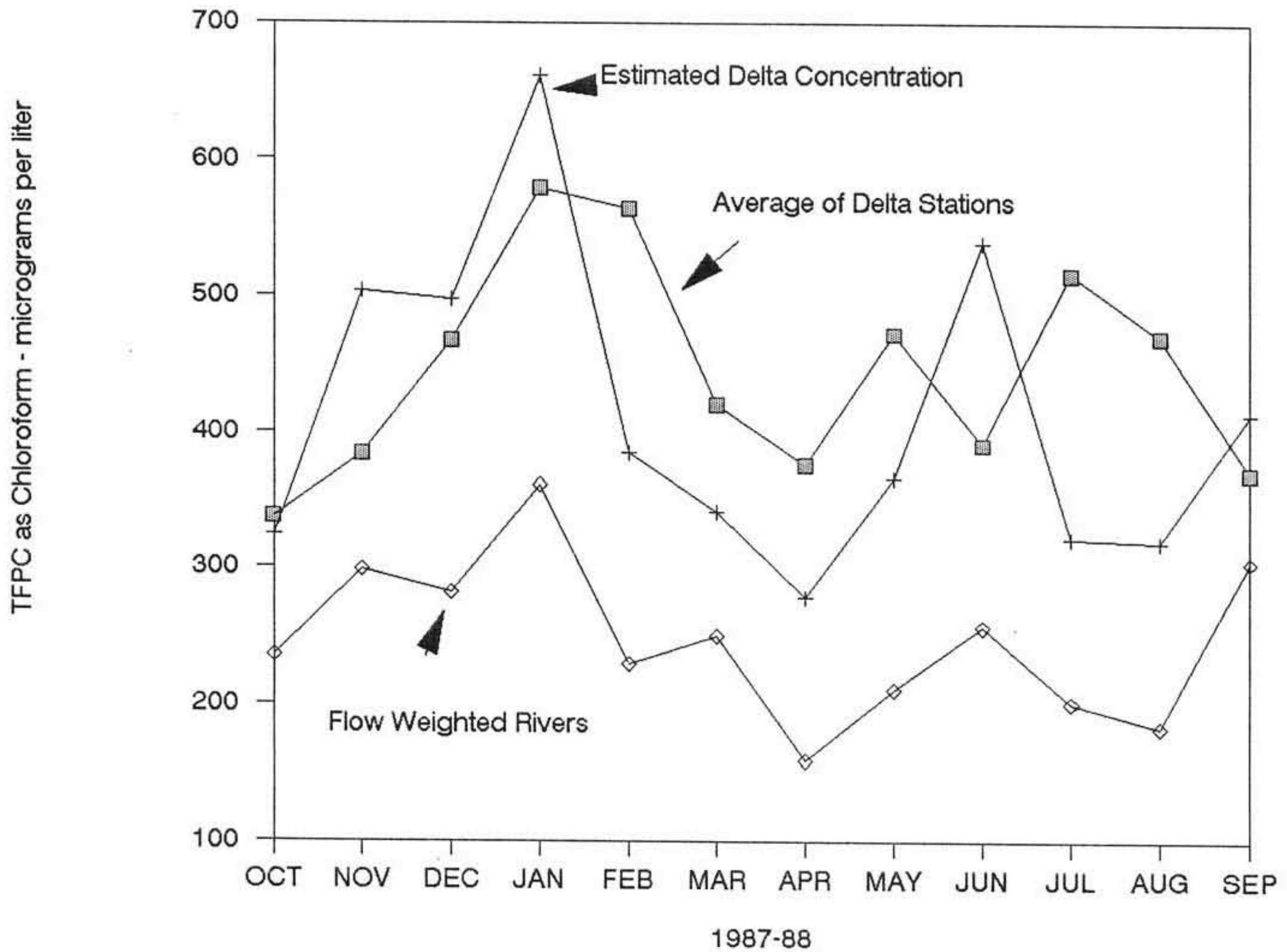


**Figure 31. Estimated vs. Measured Chloroform ($CHCl_3$) Values**

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# Appendices

## Appendix to Follow
## Glossary of Acronyms
## DADI Monitoring Data

# Glossary of Acronyms

| | |
|---|---|
| IDHAMP | Interagency Delta Health Aspects Monitoring Program |
| DIDI | Delta Islands Drainage Investigation |
| TTHMFP | Total Trihalomethane Formation Potential |
| DBP | Disinfection By-products |
| THM | Trihalomethanes |
| MCL | Maximum Contaminant Level |
| EPA | U.S. Environmental Protection Agency |
| MWDSC | Metropolitan Water District of Southern California |
| CCWD | Contra Costa Water District |
| SWP | State Water Project |
| CVP | Central Valley Project |
| TFPC | TTHMFP carbon |

## Appendix A

### Delta Island Drainage Investigation Station Names

| Short Name | Full Name |
|---|---|
| AGDCLIFTON | Ag Drain on Clifton Court |
| AGDEMPIRE | Ag Drain on Empire Tract, W.end 8-Mi.Rd. |
| AGDGRAND | Ag Drain on Grand Island |
| AGDTYLER | Ag Drain on Tyler Island |
| BOULDIN1 | Ag Drain on Bouldin Tract, PP. No. 1 |
| BOULDIN2 | Ag Drain on Bouldin Tract, PP. No. 2 |
| BRANNANPP01 | Ag Drain on Brannan Island, PP. No. 1 |
| BRANNANPP02 | Ag Drain on Brannan Island, PP. No. 2 |
| BRANNANPP03 | Ag Drain on Brannan Island, PP. No. 3 |
| BRANNANPP04 | Ag Drain on Brannan Island, PP. No. 4 |
| EGBERTPP01 | Ag Drain on Egbert Tract, PP. No. 1 |
| EGBERTPP02 | Ag Drain on Egbert Tract, PP. No. 2 |
| KINGISPP01 | Ag Drain on King Island, PP. No. 1 |
| KINGISPP02 | Ag Drain on King Island, PP. No. 2 |
| KINGISPP03 | Ag Drain on King Island, PP. No. 3 |
| MCCORWIL01 | Ag Drain on McCormack/Williams Tr. No.1 |
| MCCORWIL02 | Ag Drain on McCormack/Williams Tr. No.2 |
| MOSSDALE01 | Ag Drain on Mossdale Tract, PP. No. 1 |
| MOSSDALE02 | Ag Drain on Mossdale Tract, PP. No. 2 |
| MOSSDALE03 | Ag Drain on Mossdale Tract, PP. No. 3 |
| MOSSDALE04 | Ag Drain on Mossdale Tract, PP. No. 4 |
| MOSSDALE05 | Ag Drain on Mossdale Tract, PP. No. 5 |
| MOSSDALE06 | Ag Drain on Mossdale Tract, PP. No. 6 |
| MOSSDALE08 | Ag Drain on Mossdale Tract, PP. No. 8 |
| MOSSDALE09 | Ag Drain on Mossdale Tract, PP. No. 9 |
| MOSSDALE10 | Ag Drain on Mossdale Tract, PP. No. 10 |
| MOSSDALE11 | Ag Drain on Mossdale Tract, PP. No. 11 |
| MOSSTRPP01 | Ag Drain on Moss Tract, PP. No. 1 |
| MOSSTRPP02 | Ag Drain on Moss Tract, PP. No. 2 |
| MOSSTRPP03 | Ag Drain on Moss Tract, PP. No. 3 |
| NETHERLAND01 | Ag Drain on Netherland Tr., PP. No. 1 |
| NETHERLAND02 | Ag Drain on Netherland Tr., PP. No. 2 |
| PESCADERO01 | Ag Drain on Pescadero Tr., PP. No. 1 |
| PESCADERO02 | Ag Drain on Pescadero Tr., PP. No. 2 |
| PESCADERO03 | Ag Drain on Pescadero Tr., PP. No. 3 |
| PESCADERO04 | Ag Drain on Pescadero Tract, PP. No. 4 |
| PIERSONPP01 | Ag Drain on Pierson Tr., PP. No. 1 |
| PROSPECTPP01 | Ag Drain on Prospect Island, PP. No. 1 |
| PROSPECTPP02 | Ag Drain on Prospect Island, PP. No. 2 |
| RINDGEPP01 | Ag Drain on Rindge Tract, PP. No. 1 |
| RINDGEPP02 | Ag Drain on Rindge Tract, PP. NO. 2 |
| RIOBLANCO01 | Ag Drain on Rio Blanco Tr., PP. No. 1 |
| RIOBLANCO02 | Ag Drain on Rio Blanco Tr., PP. No. 2 |
| SHIMATR | Ag Drain on Shima Tract |
| TERMPP01 | Ag Drain on Terminous Tract, PP. No. 1 |
| TERMPP02 | Ag Drain on Terminous Tract, PP. No. 2 |
| UPEGBERTPP01 | Ag Drain on Upper Egbert Tr., PP. No. 1 |
| UPEGBERTPP02 | Ag Drain on Upper Egbert Tr., PP. No. 2 |
| UPEGBERTPP03 | Ag Drain on Upper Egbert Tr., PP. No. 3 |
| UPJONESPP01 | Ag Drain on Upper Jones Tr., PP. No. 1 |
| UPJONESPP02 | Ag Drain on Upper Jones Tr., PP. No. 2 |

APPENDIX B

Page 1

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential | | ug/L | | ----> |
| 8157 | AGDCLIFTON | 03/08/88 | 14:15 | 18.7 | 6.0 | 9.2 | 3510 | 33 | 80 | 9.1 | | 460 | 480 | 300 | 110 | 1400 |
| 8258 | AGDCLIFTON | 04/18/88 | 13:45 | 17.6 | 7.1 | 4.7 | 5100 | 30 | 50 | 6.0 | | | | | | |
| 8342 | AGDCLIFTON | 05/09/88 | 11:04 | 18.9 | 7.4 | 6.9 | 6460 | 26 | 80 | | 7.6 | 210 | 540 | 840 | 430 | 2000 |
| 5011 | AGDEMPIRE | 02/06/85 | 9:05 | 6.0 | 7.3 | 9.8 | 2610 | 26 | 25 | | | 1500 | 920 | 930 | 81 | 3400 |
| 5027 | AGDEMPIRE | 03/06/85 | 9:45 | 10.5 | 7.3 | 7.6 | 2330 | 14 | | | | | | | | |
| 5045 | AGDEMPIRE | 04/05/85 | 8:50 | 21.5 | 7.3 | 3.9 | 2180 | 10 | 75 | | | 1800 | 920 | 370 | 31 | 3100 |
| 5061 | AGDEMPIRE | 05/01/85 | 8:30 | 20.0 | 7.6 | 6.5 | 2280 | 14 | 160 | | | 1800 | 900 | 440 | 29 | 3200 |
| 5077 | AGDEMPIRE | 06/05/85 | 8:07 | 20.0 | 7.3 | 4.0 | 629 | 15 | 75 | | | 1800 | 280 | 25 | -1 | 2100 |
| 5107 | AGDEMPIRE | 07/24/85 | 9:07 | 23.0 | 6.8 | 4.1 | 472 | 10 | 40 | | | 2100 | 140 | 19 | -1 | 2300 |
| 5112 | AGDEMPIRE | 08/01/85 | 8:25 | 22.0 | 6.8 | 5.5 | 360 | 8 | 100 | | | 2100 | 150 | 10 | -1 | 2300 |
| 5128 | AGDEMPIRE | 09/11/85 | 10:20 | 19.5 | 6.9 | 4.5 | 886 | 4 | 150 | | | 3000 | 460 | 48 | 2 | 3500 |
| 5138 | AGDEMPIRE | 10/02/85 | 7:00 | 18.0 | 7.6 | 7.6 | 1640 | 10 | 50 | | | 2200 | 790 | 330 | 26 | 3300 |
| 5162 | AGDEMPIRE | 11/13/85 | 8:00 | 7.0 | 7.3 | 9.0 | 1880 | 4 | 80 | | | 2100 | 920 | 390 | 40 | 3500 |
| 5181 | AGDEMPIRE | 12/03/85 | 17:10 | 14.0 | 7.0 | 5.4 | 1070 | 8 | 200 | | | 2900 | 360 | 44 | 1 | 3300 |
| 6003 | AGDEMPIRE | 01/16/86 | 11:45 | 12.0 | 6.8 | 5.8 | 1087 | 3 | 160 | | | 6900 | 490 | 67 | 1 | 7500 |
| 6017 | AGDEMPIRE | 02/13/86 | 12:00 | 14.0 | 6.8 | 6.7 | 1880 | 11 | 150 | | | 2600 | 650 | 170 | 8 | 3400 |
| 6028 | AGDEMPIRE | 03/04/86 | 13:30 | 19.5 | 7.3 | 8.0 | 2840 | 7 | 200 | | | 1500 | 660 | 210 | 14 | 2400 |
| 6046 | AGDEMPIRE | 04/17/86 | 9:15 | 15.0 | 7.4 | 8.8 | 1610 | 10 | 160 | | | 1900 | 830 | 320 | 13 | 3100 |
| 6081 | AGDEMPIRE | 05/13/86 | 10:00 | 21.5 | 7.5 | 6.6 | 2000 | 15 | 150 | | | 570 | 330 | 160 | 15 | 1100 |
| 6112 | AGDEMPIRE | 06/11/86 | 8:00 | 22.0 | 8.1 | 5.7 | 2760 | 14 | 80 | | | 410 | 310 | 230 | 48 | 1000 |
| 6131 | AGDEMPIRE | 07/09/86 | 8:05 | 20.5 | 6.9 | 5.4 | 283 | 10 | 100 | | | 1400 | 94 | 4 | -1 | 1500 |
| 6198 | AGDEMPIRE | 09/11/86 | 7:50 | 20.5 | 7.3 | 5.2 | 2120 | 10 | 80 | | | 1400 | 1000 | 620 | 78 | 3100 |
| 6283 | AGDEMPIRE | 11/19/86 | 10:30 | 16.0 | 6.3 | 2.3 | 808 | 3 | 360 | | 56.0 | 5300 | 120 | 5 | -1 | 5400 |
| 6300 | AGDEMPIRE | 12/10/86 | 11:30 | 12.0 | 6.3 | 3.0 | 866 | 4 | 280 | 48.0 | | | | | | |
| 7008 | AGDEMPIRE | 01/13/87 | 11:15 | 7.5 | 6.3 | 1.7 | 996 | 3 | 300 | 60.0 | | 3200 | 190 | 23 | 15 | 3400 |
| 7046 | AGDEMPIRE | 02/10/87 | 10:00 | 11.5 | 6.6 | 3.5 | 1660 | 8 | 200 | 54.0 | | 2900 | 410 | 160 | 6 | 3500 |
| 7069 | AGDEMPIRE | 03/10/87 | 10:50 | 13.5 | 6.8 | 3.0 | 2390 | 124 | 120 | 33.0 | | 1100 | 72 | 95 | 15 | 1300 |
| 7172 | AGDEMPIRE | 04/16/87 | 8:30 | 21.5 | 7.5 | 7.2 | 2510 | 17 | 125 | 28.0 | | 2900 | 1300 | 500 | 74 | 4800 |
| 7196 | AGDEMPIRE | 05/06/87 | 6:15 | 23.0 | 7.9 | 7.5 | | | | 28.0 | | 1200 | 740 | 570 | 200 | 2700 |
| 7207 | AGDEMPIRE | 05/27/87 | 8:30 | 19.5 | 6.6 | 5.3 | 408 | 14 | 200 | 20.0 | | 2900 | 200 | 12 | -1 | 3100 |
| 7245 | AGDEMPIRE | 06/11/87 | 9:30 | 21.0 | 6.9 | 6.4 | 503 | 19 | 60 | 10.0 | | 960 | 130 | 17 | -1 | 1100 |
| 7406 | AGDEMPIRE | 09/24/87 | 8:15 | 19.3 | 7.3 | 3.6 | 2960 | 9 | 100 | | 18.0 | 1200 | 780 | 570 | 130 | 2700 |
| 7478 | AGDEMPIRE | 10/19/87 | 7:00 | 16.0 | 7.1 | 2.0 | 1720 | 9 | 60 | 16.0 | | 960 | 560 | 230 | 36 | 1800 |
| 7450 | AGDEMPIRE | 10/28/87 | 9:10 | | | | | | | | 20.0 | 1320 | 638 | 183 | 25 | 2200 |
| 7449 | AGDEMPIRE | 10/28/87 | 9:10 | 19.0 | 7.2 | 2.1 | 1340 | 16 | 80 | 22.0 | | 1010 | 471 | 119 | 22 | 1600 |
| 7547 | AGDEMPIRE | 11/24/87 | 9:30 | 12.5 | 7.2 | 8.1 | 312 | 24 | 60 | 12.0 | | 1500 | 39 | 1 | 1 | 1500 |
| 7548 | AGDEMPIRE | 11/24/87 | 9:30 | | | | | | | | 12.0 | 1400 | 41 | 1 | 1 | 1400 |
| 7578 | AGDEMPIRE | 12/10/87 | 9:54 | 13.5 | 6.2 | 4.9 | 594 | 5 | 250 | 58.0 | | 2590 | 139 | 3 | -1 | 2700 |
| 7606 | AGDEMPIRE | 12/16/87 | 8:45 | | | | | | | | 94.0 | 2400 | 140 | 6 | -1 | 2500 |
| 7607 | AGDEMPIRE | 12/16/87 | 8:45 | 8.2 | 6.5 | 6.2 | 695 | 11 | 250 | 65.0 | | 2790 | 130 | 6 | -1 | 2900 |
| 8026 | AGDEMPIRE | 01/12/88 | 9:00 | 9.2 | 6.3 | 4.7 | 1010 | 8 | 350 | 59.0 | | 3300 | 240 | 14 | -1 | 3600 |
| 8075 | AGDEMPIRE | 01/21/88 | 9:05 | 8.6 | 6.4 | 6.5 | 1720 | 4 | 250 | 55.0 | | 3400 | 480 | 55 | -1 | 3900 |
| 8074 | AGDEMPIRE | 01/21/88 | 9:05 | 8.6 | 6.4 | 6.5 | | | | | 56.0 | 3800 | 490 | 35 | -1 | 4300 |
| 8132 | AGDEMPIRE | 02/23/88 | 8:50 | | | | | | | | 62.0 | 1800 | 400 | 85 | 4 | 2300 |
| 8133 | AGDEMPIRE | 02/23/88 | 8:50 | 11.3 | 6.8 | 5.4 | 1980 | 14 | 350 | 72.0 | | 3100 | 790 | 140 | 6 | 4000 |
| 8161 | AGDEMPIRE | 03/09/88 | 9:35 | 13.7 | 7.1 | | 1970 | 13 | 200 | 48.0 | | 2700 | 650 | 120 | 8 | 3500 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <------------- | ug/L | | -----------> | |
| 8224 | AGDEMPIRE | 03/23/88 | 8:30 | | | | | | | | 47.0 | 4300 | 220 | 16 | -1 | 4500 |
| 8223 | AGDEMPIRE | 03/23/88 | 8:30 | 16.8 | 7.0 | 9.1 | 811 | 9 | 320 | 49.0 | | 2600 | 170 | 14 | -1 | 2800 |
| 8322 | AGDEMPIRE | 04/28/88 | 8:25 | 16.1 | 6.6 | 5.3 | 631 | 7 | 300 | 64.0 | | 2000 | 73 | 4 | -1 | 2100 |
| 8323 | AGDEMPIRE | 04/28/88 | 8:25 | | | | | | | | 63.0 | 2100 | 92 | 5 | -1 | 2200 |
| 8346 | AGDEMPIRE | 05/09/88 | 7:12 | 20.1 | 7.2 | 6.5 | 926 | 4 | 400 | | 59.0 | 3900 | 270 | -1 | -1 | 4200 |
| 8400 | AGDEMPIRE | 05/26/88 | 7:30 | | | | | | | | 46.0 | 3600 | 460 | 27 | -1 | 4100 |
| 8399 | AGDEMPIRE | 05/26/88 | 7:30 | 18.8 | 7.5 | 1.1 | 1000 | 9 | 400 | 44.0 | | 2900 | 400 | 28 | 8 | 3300 |
| 8431 | AGDEMPIRE | 06/22/88 | 6:27 | 22.3 | 7.3 | 2.6 | 674 | 7 | 240 | 24.0 | | 3400 | 310 | 11 | -1 | 3700 |
| 8432 | AGDEMPIRE | 06/22/88 | 6:27 | 23.0 | 6.8 | 0.6 | | | | | 31.0 | 3900 | 370 | 11 | -1 | 4300 |
| 8467 | AGDEMPIRE | 07/14/88 | 8:55 | 23.0 | 6.8 | 0.6 | 1420 | | | | 35.0 | 3900 | 320 | 17 | 1 | 4200 |
| 8466 | AGDEMPIRE | 07/14/88 | 8:55 | 23.0 | 6.8 | 0.6 | 1420 | 6 | 400 | 71.0 | | 3600 | 180 | 15 | -1 | 3800 |
| 8482 | AGDEMPIRE | 07/18/88 | 6:40 | 22.5 | 7.0 | 0.4 | 792 | 3 | 240 | | 35.0 | 2500 | 260 | 16 | -1 | 2800 |
| 8589 | AGDEMPIRE | 08/16/88 | 7:59 | 21.3 | 6.9 | 2.3 | 537 | | | | 36.0 | 3100 | 270 | 9 | -1 | 3400 |
| 8588 | AGDEMPIRE | 08/16/88 | 7:59 | 21.3 | 6.9 | 2.3 | 537 | 7 | 280 | 34.0 | | 3400 | 250 | 8 | -1 | 3700 |
| 8701 | AGDEMPIRE | 09/22/88 | 6:35 | 16.6 | 7.2 | 2.0 | | | | | 32.4 | 2500 | 1000 | 330 | 15 | 3800 |
| 8700 | AGDEMPIRE | 09/22/88 | 6:35 | 16.6 | 7.2 | 2.0 | 2140 | 7 | 140 | 33.5 | | 2400 | 1000 | 320 | 18 | 3700 |
| 8730 | AGDEMPIRE | 10/20/88 | 7:45 | 19.2 | 5.9 | 2.4 | 1180 | | | | 75.0 | 2300 | 200 | 17 | -1 | 2500 |
| 8729 | AGDEMPIRE | 10/20/88 | 7:45 | 19.2 | 5.9 | 2.4 | 1180 | 5 | 280 | 77.0 | | 1600 | 250 | 14 | -1 | 1900 |
| 8752 | AGDEMPIRE | 11/10/88 | 8:25 | 16.0 | 6.8 | 4.2 | | | | | 66.0 | 2400 | 440 | 56 | -2 | 2900 |
| 8751 | AGDEMPIRE | 11/10/88 | 8:25 | 16.0 | 6.8 | 4.2 | 1350 | 4 | 320 | 69.0 | | 1800 | 330 | 64 | -1 | 2200 |
| 8835 | AGDEMPIRE | 12/20/88 | 9:00 | 14.7 | 6.8 | 3.9 | | | | | 60.0 | 2600 | 140 | 6 | -1 | 2700 |
| 8834 | AGDEMPIRE | 12/20/88 | 9:00 | 14.7 | 6.8 | 3.9 | 585 | 4 | 320 | 61.0 | | 2600 | 140 | 5 | -1 | 2700 |
| 5012 | AGDGRAND | 02/06/85 | 10:30 | 11.5 | 7.1 | 7.5 | 576 | 34 | 25 | | | 2100 | 32 | 4 | -1 | 2100 |
| 5028 | AGDGRAND | 03/06/85 | 11:00 | 12.5 | 6.9 | 5.3 | 468 | 21 | | | | | | | | |
| 5046 | AGDGRAND | 04/05/85 | 10:00 | 18.5 | 7.3 | 5.0 | 625 | 30 | 80 | | | 2000 | 100 | 4 | -1 | 2100 |
| 5062 | AGDGRAND | 05/01/85 | 9:45 | 18.5 | 6.9 | 5.7 | 310 | 26 | 50 | | | 1000 | 41 | -1 | -1 | 1000 |
| 5078 | AGDGRAND | 06/05/85 | 9:15 | 21.0 | 7.3 | 6.6 | 265 | 22 | 35 | | | 840 | 37 | -1 | -1 | 880 |
| 5108 | AGDGRAND | 07/24/85 | 7:15 | 22.5 | 7.2 | 5.5 | 267 | 70 | 80 | | | 1800 | 60 | 2 | -1 | 1900 |
| 5113 | AGDGRAND | 08/01/85 | 9:45 | 21.5 | 7.1 | 6.5 | 273 | 30 | 50 | | | 1300 | 49 | 1 | -1 | 1400 |
| 5126 | AGDGRAND | 09/11/85 | 11:50 | 19.5 | 7.2 | 6.1 | 451 | 28 | 30 | | | 1100 | 94 | 8 | -1 | 1200 |
| 5139 | AGDGRAND | 10/02/85 | 9:00 | 19.0 | 7.2 | 6.0 | 327 | 25 | 30 | | | 820 | 56 | 3 | -1 | 880 |
| 5164 | AGDGRAND | 11/13/85 | 9:45 | 12.5 | 7.3 | 4.5 | 368 | 16 | 35 | | | 890 | 69 | 3 | -1 | 960 |
| 5183 | AGDGRAND | 12/03/85 | 18:45 | 13.0 | 7.0 | 3.8 | 735 | 31 | 100 | | | 2800 | 160 | 5 | -1 | 3000 |
| 6005 | AGDGRAND | 01/16/86 | 13:15 | 13.5 | 7.3 | 7.3 | 716 | 26 | 80 | | | 3500 | 130 | 6 | -1 | 3600 |
| 6020 | AGDGRAND | 02/27/86 | 11:30 | 17.5 | 7.0 | 4.4 | 602 | 24 | 100 | | | 1700 | 83 | 2 | -1 | 1800 |
| 6036 | AGDGRAND | 03/13/86 | 13:00 | 14.5 | 6.6 | 5.8 | 1060 | 22 | 160 | | | 3200 | 180 | 5 | -1 | 3400 |
| 6051 | AGDGRAND | 04/23/86 | 12:00 | 18.5 | 7.3 | 7.6 | 513 | 54 | 50 | | | 1700 | 82 | 2 | -1 | 1800 |
| 6086 | AGDGRAND | 05/28/86 | 11:15 | 22.5 | 7.3 | 7.4 | 323 | 36 | 50 | | | 640 | 29 | 3 | 1 | 670 |
| 6118 | AGDGRAND | 06/25/86 | 12:00 | 24.5 | 7.2 | 6.8 | 290 | 35 | 40 | | | 450 | 30 | 2 | 1 | 480 |
| 6138 | AGDGRAND | 07/23/86 | 11:15 | 22.5 | 7.1 | 6.0 | 210 | 24 | 40 | | | | | | | |
| 6159 | AGDGRAND | 08/27/86 | 11:45 | 23.5 | 7.2 | 7.6 | 250 | 24 | 50 | | | 1400 | 35 | -1 | -1 | 1400 |
| 6206 | AGDGRAND | 09/09/86 | 11:00 | 18.5 | 7.1 | 3.0 | 378 | 18 | 15 | | | 240 | 30 | 3 | -1 | 270 |
| 6286 | AGDGRAND | 11/19/86 | 7:50 | 14.5 | 7.3 | 5.8 | 237 | 14 | 5 | | 1.7 | 320 | 16 | 2 | -1 | 340 |
| 6302 | AGDGRAND | 12/10/86 | 8:00 | 10.0 | 7.1 | 8.1 | 366 | 30 | 50 | 11.0 | | 1400 | 30 | -1 | -1 | 1400 |
| 7013 | AGDGRAND | 01/13/87 | 8:05 | 7.0 | 7.1 | 7.9 | 458 | 21 | 80 | | 14.0 | 1900 | 56 | 2 | 2 | 2000 |
| 7041 | AGDGRAND | 02/10/87 | 7:30 | 14.5 | 7.2 | 7.4 | 559 | 38 | 75 | 20.0 | | 2400 | 77 | -1 | -1 | 2500 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> ug/L | | | | |
| 7076 | AGDGRAND | 03/10/87 | 7:45 | 13.0 | 7.1 | 6.6 | 852 | 76 | 120 | 28.0 | | 1300 | 74 | 2 | 3 | 1400 |
| 7079 | AGDGRAND | 03/10/87 | 7:45 | | | | 853 | 66 | 120 | 28.0 | | 1400 | 67 | 2 | 3 | 1500 |
| 7179 | AGDGRAND | 04/16/87 | 6:30 | 17.0 | 7.0 | 6.2 | 358 | 28 | 30 | 7.8 | | 1400 | 79 | 5 | -1 | 1500 |
| 7214 | AGDGRAND | 05/20/87 | 6:30 | 17.0 | 7.3 | 8.2 | 251 | 38 | 30 | 5.4 | | 800 | 30 | -1 | -1 | 830 |
| 7213 | AGDGRAND | 05/20/87 | 6:30 | 17.0 | 7.3 | 8.2 | 251 | 38 | 30 | | 5.4 | 650 | 34 | -1 | -1 | 830 |
| 7252 | AGDGRAND | 06/11/87 | 6:40 | 20.0 | 7.3 | 6.3 | 398 | 29 | 30 | 5.5 | | 920 | 62 | 5 | -1 | 990 |
| 7390 | AGDGRAND | 09/03/87 | 9:30 | 23.1 | 7.3 | 5.0 | 499 | 22 | 35 | 7.8 | | 1200 | 58 | 7 | -1 | 1300 |
| 7437 | AGDGRAND | 10/08/87 | 6:30 | | | | | | | | 6.8 | 980 | 45 | 1 | -1 | 1000 |
| 7431 | AGDGRAND | 10/08/87 | 6:30 | 16.5 | 7.3 | 7.2 | 364 | 30 | 40 | 6.3 | | 810 | 47 | 1 | 2 | 860 |
| 7435 | AGDGRAND | 10/08/87 | 6:30 | | | | 340 | 30 | 40 | 6.3 | | 1200 | 38 | -1 | -1 | 1200 |
| 7433 | AGDGRAND | 10/08/87 | 6:30 | | | | | | | | 6.9 | 840 | 31 | 1 | -1 | 870 |
| 7534 | AGDGRAND | 11/03/87 | 7:20 | 13.5 | 7.2 | 7.0 | 441 | 29 | 60 | 13.0 | | 2400 | 73 | 1 | -1 | 2500 |
| 7535 | AGDGRAND | 11/03/87 | 7:20 | | | | | | | | 15.0 | 890 | 61 | 1 | -1 | 950 |
| 7557 | AGDGRAND | 12/01/87 | 7:30 | 10.6 | 7.3 | 9.1 | 436 | 26 | 60 | 15.0 | | 1900 | 43 | 2 | 3 | 1900 |
| 7558 | AGDGRAND | 12/01/87 | 7:30 | | | | | | | | 14.0 | 1600 | 49 | 3 | -1 | 1700 |
| 8007 | AGDGRAND | 01/06/88 | 8:25 | 9.2 | 7.1 | 8.1 | 832 | 56 | 160 | 29.0 | | 2500 | 86 | 4 | 2 | 2600 |
| 8006 | AGDGRAND | 01/06/88 | 8:25 | | | | | | | | 30.0 | 2300 | 80 | 3 | -1 | 2400 |
| 8114 | AGDGRAND | 02/18/88 | 7:30 | 9.3 | 7.2 | 8.8 | 642 | 26 | 100 | 17.0 | | 2100 | 110 | 4 | -1 | 2200 |
| 8113 | AGDGRAND | 02/18/88 | 7:30 | | | | | | | | 17.0 | 2100 | 98 | 4 | -1 | 2200 |
| 8212 | AGDGRAND | 03/18/88 | 7:19 | | | | | | | | 5.4 | 720 | 25 | 25 | -1 | 770 |
| 8211 | AGDGRAND | 03/18/88 | 7:19 | 13.0 | 7.1 | 8.0 | 324 | 31 | 60 | 6.3 | | 960 | 30 | 1 | -1 | 990 |
| 8248 | AGDGRAND | 04/14/88 | 7:40 | | | | | | | | 7.2 | 940 | 33 | 3 | -1 | 980 |
| 8247 | AGDGRAND | 04/14/88 | 7:40 | 15.1 | 6.9 | 7.3 | 361 | | | 7.1 | | 1100 | 41 | 3 | 3 | 1100 |
| 8393 | AGDGRAND | 05/19/88 | 6:50 | | | | | | | | 5.6 | 760 | 31 | 1 | -1 | 790 |
| 8392 | AGDGRAND | 05/19/88 | 6:50 | 18.2 | 7.4 | 6.7 | 278 | 27 | 80 | 6.0 | | 1100 | 35 | 1 | 1 | 1100 |
| 8415 | AGDGRAND | 06/07/88 | 6:17 | 15.8 | 7.1 | 6.5 | 308 | | | | 5.9 | 820 | 34 | 1 | 2 | 860 |
| 8414 | AGDGRAND | 06/07/88 | 6:17 | 15.8 | 7.1 | 6.5 | 308 | 38 | 60 | 5.8 | | 1400 | 29 | -4 | -4 | 1400 |
| 8450 | AGDGRAND | 07/06/88 | 6:54 | 20.0 | 7.0 | 5.7 | 276 | | | | 8.0 | 890 | 23 | -1 | -1 | 910 |
| 8449 | AGDGRAND | 07/06/88 | 6:54 | 20.0 | 7.0 | 5.7 | 276 | 27 | 60 | 1.4 | | 1200 | 19 | -1 | -1 | 1200 |
| 8571 | AGDGRAND | 08/02/88 | 8:10 | 18.8 | 7.4 | 6.4 | | | 60 | 5.6 | | 740 | 22 | -1 | -1 | 760 |
| 8572 | AGDGRAND | 08/02/88 | 8:10 | | | | | | | | 6.1 | 720 | 24 | -1 | -1 | 740 |
| 8692 | AGDGRAND | 09/15/88 | 6:55 | 18.8 | 6.9 | 5.2 | | | | | 10.8 | 1100 | 52 | 2 | -1 | 1200 |
| 8691 | AGDGRAND | 09/15/88 | 6:55 | 18.8 | 6.9 | 5.2 | 363 | 24 | 70 | | | 1100 | 50 | 6 | -1 | 1200 |
| 8721 | AGDGRAND | 10/13/88 | 7:00 | 15.6 | 7.2 | 6.7 | | | | | 17.4 | 1400 | 41 | -1 | -1 | 1400 |
| 8720 | AGDGRAND | 10/13/88 | 7:00 | 15.6 | 7.2 | 6.7 | 409 | 32 | 150 | 19.6 | | 2100 | 47 | -1 | -1 | 2100 |
| 8759 | AGDGRAND | 11/17/88 | 8:09 | 9.9 | 7.2 | 8.6 | | | | | 12.0 | 1200 | 60 | 7 | -1 | 1300 |
| 8758 | AGDGRAND | 11/17/88 | 8:09 | 9.9 | 7.2 | 8.6 | 398 | 28 | 120 | 14.0 | | 1500 | 54 | 6 | -1 | 1600 |
| 8804 | AGDGRAND | 12/06/88 | 7:40 | 10.8 | 7.2 | 9.2 | 370 | 23 | 100 | 12.0 | | 1400 | 63 | 1 | -1 | 1500 |
| 8805 | AGDGRAND | 12/06/88 | 7:40 | 10.8 | 7.2 | 9.2 | | | | | 14.0 | 1300 | 35 | 1 | -1 | 1300 |
| 5038 | AGDTYLER | 03/27/85 | 12:45 | 11.5 | 6.8 | 7.8 | 743 | 29 | | | | | | | | |
| 5053 | AGDTYLER | 04/24/85 | 12:30 | 19.5 | 7.3 | 5.8 | 743 | 28 | 100 | | | 2100 | 260 | 27 | -1 | 2400 |
| 5074 | AGDTYLER | 05/22/85 | 11:30 | 21.5 | 7.2 | 4.7 | 320 | 17 | 70 | | | 1800 | 91 | 4 | -1 | 1900 |
| 5090 | AGDTYLER | 06/26/85 | 11:15 | 24.0 | 6.8 | 5.5 | 188 | 18 | 50 | | | 1400 | 45 | 3 | -1 | 1400 |
| 5105 | AGDTYLER | 07/10/85 | 12:00 | 25.5 | 7.0 | 4.5 | 189 | 17 | 100 | | | 1600 | 51 | 1 | -1 | 1700 |
| 5124 | AGDTYLER | 08/28/85 | 12:00 | 23.5 | 7.3 | 6.7 | 299 | 9 | 100 | | | 2100 | 78 | 3 | -1 | 2200 |
| 5135 | AGDTYLER | 09/11/85 | 11:15 | 19.5 | 7.2 | 6.1 | 354 | 10 | 50 | | | 2200 | -1 | 6 | -1 | 2200 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> | | | | |
| | | | | | | | | | | | | <---- ug/L ----> | | | | |
| 5150 | AGDTYLER | 10/02/85 | 8:00 | 17.5 | 6.9 | 3.2 | 289 | 14 | 100 | | | 1200 | 70 | 2 | -1 | 1300 |
| 5163 | AGDTYLER | 11/13/85 | 9:00 | 6.0 | 6.8 | 8.1 | 376 | 11 | 160 | | | 2000 | 120 | 2 | -1 | 2100 |
| 5182 | AGDTYLER | 12/03/85 | 18:00 | 12.5 | 7.0 | 3.7 | 587 | 12 | 100 | | | 2100 | 85 | 2 | -1 | 2200 |
| 6004 | AGDTYLER | 01/16/86 | 12:45 | 11.0 | 6.9 | 4.6 | 476 | 9 | 120 | | | 3500 | 83 | 8 | -1 | 3600 |
| 6127 | AGDTYLER | 06/11/86 | 9:15 | 19.5 | 7.3 | 7.9 | 158 | 768 | 240 | | | 1300 | 66 | 4 | 1 | 1400 |
| 6133 | AGDTYLER | 07/09/86 | 9:30 | 23.5 | 7.3 | 0.5 | 966 | 18 | 400 | | | 1400 | 160 | 13 | -1 | 1600 |
| 6200 | AGDTYLER | 09/11/86 | 9:45 | 20.5 | 7.3 | 5.5 | 369 | 38 | 100 | | | 2200 | 100 | 3 | -1 | 2300 |
| 6284 | AGDTYLER | 11/19/86 | 8:45 | 14.0 | 7.1 | 4.4 | 804 | 21 | 150 | | 26.0 | 4100 | 180 | 13 | -1 | 4300 |
| 6304 | AGDTYLER | 12/10/86 | 8:55 | 9.0 | 7.3 | 10.4 | 829 | 26 | 60 | 23.0 | | 3700 | 310 | 23 | -1 | 4000 |
| 7010 | AGDTYLER | 01/13/87 | 9:00 | 6.0 | 7.1 | 7.6 | 746 | 29 | 120 | 20.0 | | 2100 | 100 | 5 | -1 | 2200 |
| 7043 | AGDTYLER | 02/10/87 | 8:30 | 12.5 | 6.9 | 5.5 | 647 | 25 | 100 | 24.0 | | 2200 | 97 | -1 | -1 | 2300 |
| 7072 | AGDTYLER | 03/10/87 | 9:00 | 12.5 | 6.8 | 6.4 | 1100 | 60 | 100 | 36.0 | | 1300 | 80 | 2 | 8 | 1400 |
| 7175 | AGDTYLER | 04/16/87 | 7:15 | 17.0 | 7.2 | 6.8 | 310 | 72 | 35 | 7.5 | | 1300 | 95 | 2 | -1 | 1400 |
| 7293 | AGDTYLER | 06/24/87 | 7:00 | 22.5 | 6.8 | 5.6 | | | | 6.4 | | 1000 | 59 | 5 | -1 | 1100 |
| 7294 | AGDTYLER | 06/24/87 | 7:00 | 22.5 | 6.8 | 5.6 | | | | | 7.6 | 790 | 58 | 3 | -1 | 850 |
| 5017 | AMERICAN | 02/13/85 | 13:20 | 10.0 | 7.3 | 11.9 | 63 | 2 | 15 | | | 230 | 6 | -1 | -1 | 240 |
| 5033 | AMERICAN | 03/13/85 | 12:15 | 12.0 | 7.3 | 11.2 | 63 | 5 | | | | | | | | |
| 5057 | AMERICAN | 04/10/85 | 11:30 | 14.5 | 7.3 | 10.5 | 67 | 2 | 0 | | | 180 | 6 | -1 | -1 | 190 |
| 5067 | AMERICAN | 05/08/85 | 11:20 | 14.0 | 7.3 | 10.7 | 62 | 1 | 5 | | | 240 | 3 | -1 | -1 | 240 |
| 5084 | AMERICAN | 06/12/85 | 12:00 | 18.5 | 7.3 | 9.9 | 60 | 2 | 0 | | | 290 | 5 | 1 | -1 | 300 |
| 5118 | AMERICAN | 08/14/85 | 11:15 | 20.0 | 7.2 | 9.1 | 56 | 1 | 2 | | | 210 | 8 | -1 | -1 | 220 |
| 5144 | AMERICAN | 10/09/85 | 11:30 | 16.5 | 7.2 | 9.2 | 52 | 1 | 0 | | | 180 | 5 | -1 | -1 | 190 |
| 5188 | AMERICAN | 12/03/85 | 20:30 | 12.5 | 7.2 | 10.5 | 64 | 6 | 5 | | | 260 | 6 | -1 | -1 | 270 |
| 6031 | AMERICAN | 03/11/86 | 13:15 | 12.0 | 7.1 | 12.0 | 56 | 76 | 25 | | | 370 | 5 | -1 | -1 | 380 |
| 6047 | AMERICAN | 04/17/86 | 11:30 | 14.5 | 7.3 | 11.2 | 55 | 6 | 15 | | | 300 | 5 | -1 | -1 | 310 |
| 6082 | AMERICAN | 05/13/86 | 11:45 | 16.5 | 7.3 | 10.0 | 53 | 3 | 25 | | | 190 | 6 | 1 | -1 | 200 |
| 6113 | AMERICAN | 06/11/86 | 11:30 | 16.5 | 7.3 | 10.0 | 46 | 3 | 15 | | | 150 | 9 | 4 | 2 | 170 |
| 6132 | AMERICAN | 07/09/86 | 11:50 | 17.5 | 7.1 | 9.7 | 46 | 2 | 5 | | | 210 | 4 | -1 | -1 | 210 |
| 6153 | AMERICAN | 08/13/86 | 13:30 | 20.5 | 7.2 | 9.3 | 50 | | 5 | | | | | | | |
| 6202 | AMERICAN | 09/11/86 | 11:30 | 22.0 | 7.3 | 8.5 | 52 | 2 | 5 | | | 160 | 4 | -1 | -1 | 160 |
| 6271 | AMERICAN | 11/05/86 | 6:30 | 16.0 | 6.9 | 10.2 | 46 | 1 | 5 | 1.8 | | 240 | 4 | -1 | -1 | 240 |
| 6292 | AMERICAN | 12/03/86 | 6:45 | 12.5 | 7.3 | 9.2 | 51 | 1 | 0 | 1.2 | | 250 | 6 | -1 | -1 | 260 |
| 7004 | AMERICAN | 01/08/87 | 6:50 | 9.0 | 7.1 | 12.0 | 64 | 3 | 0 | 1.0 | | 230 | 6 | -1 | -1 | 240 |
| 7026 | AMERICAN | 02/05/87 | 6:30 | 10.0 | 6.9 | 11.2 | 70 | 2 | 0 | 1.1 | | 190 | 4 | -1 | -1 | 190 |
| 7064 | AMERICAN | 03/03/87 | 6:45 | 11.0 | 7.5 | 11.3 | 69 | 1 | 0 | 1.7 | | 250 | 19 | -1 | -1 | 270 |
| 7162 | AMERICAN | 04/09/87 | 5:30 | 16.0 | 7.2 | 9.2 | 69 | 2 | 5 | 1.2 | | 240 | 9 | -1 | -1 | 250 |
| 7201 | AMERICAN | 05/13/87 | 5:15 | 19.5 | 7.2 | 8.5 | 80 | 2 | 5 | 1.8 | | 240 | 10 | 1 | -1 | 250 |
| 7237 | AMERICAN | 06/04/87 | 5:15 | 18.0 | 7.3 | 9.4 | 85 | 3 | 5 | 1.2 | | 170 | 6 | -1 | -1 | 180 |
| 7409 | AMERICAN | 09/24/87 | 5:45 | 17.0 | 6.8 | 8.3 | 78 | 2 | 5 | 1.6 | | 370 | 12 | 4 | 1 | 390 |
| 7452 | AMERICAN | 10/28/87 | 6:30 | 20.0 | 7.1 | 8.2 | 73 | 2 | 0 | 2.3 | | 193 | 5 | -1 | -1 | 200 |
| 7549 | AMERICAN | 11/24/87 | 6:30 | 10.5 | 8.0 | 9.5 | 66 | 1 | 0 | 1.6 | | 140 | 4 | -1 | -1 | 140 |
| 7608 | AMERICAN | 12/16/87 | 10:00 | 11.0 | 7.1 | 9.3 | 81 | 2 | | 1.7 | | 120 | 5 | -1 | -1 | 130 |
| 8076 | AMERICAN | 01/21/88 | 11:00 | 9.8 | 7.2 | 12.5 | 87 | 10 | 25 | 2.1 | | 320 | 5 | -1 | -1 | 330 |
| 8134 | AMERICAN | 02/23/88 | 10:30 | 12.9 | 7.2 | 10.8 | 85 | 1 | 5 | 1.7 | | 110 | 5 | -1 | -1 | 120 |
| 8225 | AMERICAN | 03/24/88 | 11:00 | 19.1 | 7.2 | 10.8 | 78 | 1 | 5 | 1.2 | | 160 | 6 | -1 | -1 | 170 |
| 8324 | AMERICAN | 04/28/88 | 5:25 | 14.7 | 8.0 | 9.3 | 77 | 2 | 10 | 1.7 | | 96 | 11 | 1 | -1 | 110 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 (<---- THMFormation Potential ----> ug/L) | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8401 | AMERICAN | 05/26/88 | 5:50 | 16.5 | 8.2 | 8.8 | 75 | 2 | 5 | 2.0 | | 180 | 6 | 1 | -1 | 190 |
| 8433 | AMERICAN | 06/22/88 | 9:19 | 19.9 | 7.2 | 8.9 | 76 | 1 | 5 | 2.3 | | 110 | 4 | -1 | -1 | 110 |
| 8471 | AMERICAN | 07/14/88 | 5:50 | 17.8 | 6.7 | 8.5 | | | 5 | 1.5 | | 230 | 5 | -1 | -1 | 240 |
| 8590 | AMERICAN | 08/16/88 | 5:45 | 20.5 | 7.0 | 7.6 | 72 | 1 | 5 | 1.8 | | 180 | 6 | -1 | -1 | 180 |
| 8702 | AMERICAN | 09/22/88 | 9:00 | 20.4 | 7.0 | 7.9 | 70 | 1 | 5 | 1.2 | | 170 | 7 | -1 | -1 | 180 |
| 8731 | AMERICAN | 10/20/88 | 5:30 | 19.5 | 6.6 | 8.4 | 74 | 1 | 5 | 1.3 | | 110 | 64 | -1 | -1 | 170 |
| 8753 | AMERICAN | 11/10/88 | 6:15 | 16.2 | 6.5 | 9.1 | 68 | 2 | 5 | 1.6 | | 210 | 11 | -1 | -1 | 220 |
| 8836 | AMERICAN | 12/20/88 | 7:00 | 11.4 | 6.8 | 10.8 | 82 | 3 | 10 | 2.7 | | 330 | 9 | -1 | -1 | 340 |
| 5019 | BANKS | 02/27/85 | 9:45 | 13.5 | 7.5 | 9.5 | 335 | 8 | 35 | | | 310 | 71 | 10 | -1 | 390 |
| 5035 | BANKS | 03/27/85 | 9:00 | 12.5 | 7.4 | 10.1 | 367 | 11 | | | | | | | | |
| 5049 | BANKS | 04/24/85 | 9:15 | 17.5 | 7.6 | 8.7 | 351 | 11 | 5 | | | 410 | 81 | 17 | -1 | 510 |
| 5070 | BANKS | 05/22/85 | 8:15 | 19.5 | 8.1 | 8.6 | 351 | 26 | 5 | | | 580 | 90 | 17 | -1 | 690 |
| 5098 | BANKS | 06/07/85 | 8:50 | 23.5 | 7.5 | 7.4 | 322 | 30 | | | | | | | | |
| 5086 | BANKS | 06/26/85 | 8:00 | 23.5 | 7.7 | 7.5 | 370 | 32 | 20 | | | 550 | 110 | 24 | 1 | 690 |
| 5101 | BANKS | 07/10/85 | 8:00 | 24.5 | 7.5 | 7.5 | 343 | 16 | 15 | | | 590 | 160 | 35 | 2 | 790 |
| 5120 | BANKS | 08/28/85 | 8:30 | 22.5 | 7.4 | 7.8 | 466 | 10 | 10 | | | 390 | 140 | 69 | 5 | 600 |
| 5131 | BANKS | 09/25/85 | 8:20 | 22.5 | 7.5 | 7.9 | 588 | 6 | 10 | | | 340 | 89 | 40 | 10 | 480 |
| 5146 | BANKS | 10/23/85 | 8:00 | 17.0 | 7.6 | 8.9 | 527 | 7 | 5 | | | 290 | 150 | 90 | 13 | 540 |
| 5173 | BANKS | 11/15/85 | 9:30 | 12.0 | 7.4 | 9.5 | 586 | 6 | 10 | | | 260 | 160 | 100 | -1 | 520 |
| 5167 | BANKS | 12/03/85 | 14:15 | 11.5 | 7.4 | 10.1 | 676 | 10 | 10 | | | 240 | 210 | 150 | 10 | 610 |
| 6008 | BANKS | 01/23/86 | 9:20 | 12.0 | 7.3 | 9.2 | 482 | 12 | 25 | | | 1700 | 170 | 47 | 2 | 1900 |
| 6013 | BANKS | 02/13/86 | 8:45 | 11.5 | 7.7 | 10.5 | 444 | 17 | 25 | | | 780 | 140 | 28 | 1 | 950 |
| 6024 | BANKS | 03/04/86 | 9:30 | 16.5 | 7.3 | 8.2 | 332 | 14 | 30 | | | 600 | 70 | 6 | -1 | 680 |
| 6039 | BANKS | 04/09/86 | 9:15 | 17.5 | 7.5 | 9.4 | 265 | 13 | 20 | | | 630 | 76 | 10 | -1 | 720 |
| 6074 | BANKS | 05/07/86 | 7:45 | 15.5 | 7.3 | 8.9 | 284 | 11 | 15 | | | 460 | 74 | 10 | -1 | 540 |
| 6105 | BANKS | 06/04/86 | 8:15 | 19.5 | 7.5 | 8.6 | 312 | 32 | 20 | | | 340 | 45 | 9 | -1 | 390 |
| 6123 | BANKS | 07/02/86 | 8:05 | 24.0 | 7.3 | 6.4 | 305 | 25 | 15 | | | 470 | 78 | 17 | -1 | 570 |
| 6142 | BANKS | 08/14/86 | 8:45 | 24.0 | 7.3 | 7.7 | 280 | 22 | 15 | | | | | | | |
| 6172 | BANKS | 09/24/86 | 8:30 | 19.5 | 7.5 | 8.6 | 297 | 22 | 10 | | | 360 | 89 | 19 | -1 | 470 |
| 6277 | BANKS | 11/12/86 | 9:30 | 14.0 | 7.4 | 9.7 | 236 | 13 | 15 | 1.9 | | 340 | 35 | 9 | -1 | 380 |
| 6308 | BANKS | 12/17/86 | 10:00 | 10.0 | 7.3 | 10.1 | 278 | 9 | 15 | 1.6 | | 350 | 58 | 7 | -1 | 420 |
| 7017 | BANKS | 01/22/87 | 9:45 | 6.5 | 7.3 | 12.0 | 309 | 14 | 20 | 3.8 | | 650 | 68 | 7 | -1 | 730 |
| 7055 | BANKS | 02/24/87 | 9:45 | 11.5 | 7.3 | 10.7 | 446 | 9 | 20 | 4.3 | | 630 | 160 | 41 | -1 | 830 |
| 7107 | BANKS | 03/24/87 | 9:30 | 13.0 | 7.5 | 9.7 | 568 | 8 | 25 | 5.0 | | 470 | 120 | 18 | 8 | 620 |
| 7184 | BANKS | 04/30/87 | 8:40 | 18.5 | 8.4 | 10.0 | 396 | 10 | 15 | 3.2 | | 240 | 57 | 8 | -1 | 310 |
| 7219 | BANKS | 05/28/87 | 10:30 | 18.0 | 7.4 | 11.0 | 397 | 28 | 15 | 2.5 | | 450 | 120 | 30 | -1 | 600 |
| 7229 | BANKS | 06/02/87 | 9:00 | 21.5 | 7.5 | 8.1 | | | | | | 450 | 120 | 33 | -1 | 600 |
| 7281 | BANKS | 06/23/87 | 10:30 | 22.5 | 7.6 | 8.3 | 487 | 19 | 15 | | | | | | | |
| 7399 | BANKS | 09/09/87 | 8:45 | 21.5 | 7.2 | 7.4 | 626 | 12 | 5 | 4.0 | | 250 | 140 | 82 | 20 | 490 |
| 7442 | BANKS | 10/22/87 | 8:00 | 19.5 | 7.4 | 7.9 | 814 | 5 | 0 | 3.9 | | 130 | 120 | 100 | 29 | 380 |
| 7540 | BANKS | 11/05/87 | 9:00 | 17.5 | 7.4 | 8.7 | 703 | 6 | 5 | 2.7 | | 250 | 100 | 50 | 21 | 420 |
| 7567 | BANKS | 12/08/87 | 9:00 | 11.3 | 7.7 | 10.8 | 835 | 5 | 15 | 2.7 | | 190 | 130 | 110 | 25 | 460 |
| 8011 | BANKS | 01/07/88 | 9:24 | 8.2 | 7.3 | 11.8 | 574 | 11 | 30 | 4.6 | | 410 | 150 | 68 | 4 | 630 |
| 8091 | BANKS | 02/10/88 | 8:55 | 11.4 | 7.3 | 9.5 | 392 | 13 | 40 | | | 710 | 94 | 20 | -1 | 820 |
| 8146 | BANKS | 03/03/88 | 9:00 | 13.7 | 7.6 | 10.5 | 593 | 5 | 25 | 3.3 | | 300 | 100 | 57 | 9 | 470 |
| 8235 | BANKS | 04/05/88 | 7:50 | 15.4 | 7.5 | 9.3 | 661 | 5 | 20 | 3.4 | | 180 | 100 | 64 | 13 | 360 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| | | | | | | | | | | | | <---- THMFormation Potential ----> | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TEMP | pH | DO | EC | TURB | COLOR | TOC | DOC | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
| LAB# | STA. NAME | SAMP.DATE | TIME | oC | | mg/L | uS/cm | T.U. | C.U. | mg/L | mg/L | <------------ | | ug/L | | ------------> |
| 8330 | BANKS | 05/03/88 | 8:35 | 16.6 | 7.9 | 8.9 | 372 | 9 | 30 | 2.8 | | 440 | 90 | 35 | 5 | 570 |
| 8422 | BANKS | 06/14/88 | 8:27 | 23.0 | 7.5 | 6.7 | 457 | 30 | 60 | 2.4 | | 310 | 87 | 34 | 1 | 430 |
| 8457 | BANKS | 07/12/88 | 8:30 | 21.5 | 7.8 | 8.0 | 575 | 33 | 60 | 2.6 | | 420 | 150 | 72 | 5 | 650 |
| 8579 | BANKS | 08/09/88 | 10:15 | 22.0 | 7.4 | 7.9 | 675 | 16 | 20 | 2.4 | | 380 | 150 | 120 | 21 | 670 |
| 8682 | BANKS | 09/06/88 | 8:20 | 24.2 | 7.8 | 6.7 | 721 | 11 | 25 | 2.7 | | 210 | 130 | 83 | 32 | 460 |
| 8714 | BANKS | 10/04/88 | 8:35 | 20.1 | 7.4 | 8.0 | 689 | 8 | 20 | 2.9 | | 230 | 150 | 70 | 12 | 460 |
| 8744 | BANKS | 11/01/88 | 9:45 | 17.6 | 6.7 | 8.8 | 692 | 6 | 15 | 3.0 | | 150 | 150 | 130 | 20 | 450 |
| 8813 | BANKS | 12/13/88 | 10:02 | 11.3 | 7.1 | 10.7 | 739 | 7 | 25 | 4.1 | | 310 | 210 | 150 | 19 | 690 |
| 9054 | BANKS | 01/10/89 | 9:20 | 12.5 | 7.0 | 11.4 | 610 | 8 | 30 | 4.8 | | 390 | 150 | 66 | 7 | 610 |
| 9132 | BANKS | 02/07/89 | 9:00 | 5.9 | 6.8 | 12.1 | 748 | 6 | 30 | 4.1 | | 160 | 110 | 71 | 21 | 360 |
| 9213 | BANKS | 03/07/89 | 8:50 | 13.6 | 7.3 | 10.0 | 646 | 6 | 25 | 3.3 | | 180 | 130 | 78 | 16 | 400 |
| 9248 | BANKS | 04/04/89 | 8:24 | 16.2 | 8.2 | 7.9 | 286 | 11 | 40 | 4.4 | | 510 | 68 | 14 | -1 | 590 |
| 9346 | BANKS | 05/02/89 | 8:30 | 18.4 | 7.8 | 8.0 | 237 | 8 | 25 | 3.2 | | 330 | 44 | 6 | -1 | 380 |
| 9428 | BANKS | 06/06/89 | 8:20 | 20.5 | 8.1 | 7.9 | 300 | 27 | 50 | 3.7 | | 440 | 70 | 13 | -1 | 520 |
| 9548 | BANKS | 07/05/89 | 10:18 | 23.0 | 7.7 | 8.2 | 291 | 18 | 40 | | 3.1 | 330 | 60 | 13 | 0 | 400 |
| 9587 | BANKS | 07/25/89 | 9:00 | 23.8 | 7.7 | 9.2 | 300 | 14 | | | | 360 | 120 | 32 | 1 | 510 |
| 7395 | BARKER | 09/03/87 | 8:00 | 20.5 | 7.3 | 5.5 | 734 | 65 | | 6.7 | | 1100 | 48 | 1 | -1 | 1100 |
| 7438 | BARKER | 10/08/87 | 10:40 | 19.8 | 7.4 | 7.6 | 561 | 36 | 25 | 4.2 | | 750 | 32 | 1 | -1 | 780 |
| 7530 | BARKER | 11/03/87 | 8:50 | 15.0 | 7.3 | 7.1 | 568 | 18 | 10 | 6.1 | | 1000 | 56 | 3 | 2 | 1100 |
| 7561 | BARKER | 12/01/87 | 9:15 | | | | 599 | 16 | 15 | 5.8 | | 590 | 39 | 3 | 2 | 630 |
| 8002 | BARKER | 01/06/88 | 12:10 | 9.3 | 7.3 | 10.4 | 387 | 84 | 80 | 9.3 | | 1200 | 31 | 1 | -1 | 1200 |
| 8109 | BARKER | 02/18/88 | 12:15 | 10.3 | 7.5 | 10.1 | 540 | 52 | 50 | 6.8 | | 1300 | 57 | 4 | -1 | 1400 |
| 8216 | BARKER | 03/17/88 | 9:00 | 13.7 | 7.6 | 10.2 | 639 | 22 | 60 | 6.7 | | 1000 | 64 | 6 | -1 | 1100 |
| 8251 | BARKER | 04/14/88 | 8:57 | 16.3 | 7.4 | 8.4 | 539 | | | 7.8 | | 1200 | 61 | 5 | 4 | 1300 |
| 8396 | BARKER | 05/19/88 | 10:05 | 24.3 | 7.9 | 5.6 | 673 | 21 | 60 | 6.6 | | 920 | 100 | 7 | -1 | 1000 |
| 8419 | BARKER | 06/07/88 | 7:52 | 18.1 | 7.7 | 6.8 | 590 | 31 | 60 | 5.1 | | 820 | 79 | 13 | 1 | 910 |
| 8452 | BARKER | 07/06/88 | 8:30 | 21.6 | 7.5 | 7.5 | 366 | 50 | 80 | 3.8 | | 760 | 39 | 4 | -1 | 800 |
| 8574 | BARKER | 08/02/88 | 12:30 | 21.8 | 7.9 | 8.0 | 241 | 60 | 60 | 3.0 | | 530 | 31 | 1 | 1 | 560 |
| 8694 | BARKERNOBAY | 09/15/88 | 8:18 | 17.9 | 7.3 | 8.5 | 274 | 30 | 50 | 4.0 | | 500 | 32 | 4 | -1 | 540 |
| 8723 | BARKERNOBAY | 10/13/88 | 9:05 | 16.9 | 7.5 | 7.6 | 323 | 23 | 50 | 4.4 | | 470 | 27 | 3 | -1 | 500 |
| 8761 | BARKERNOBAY | 11/17/88 | 9:36 | 12.4 | 7.4 | 9.0 | 298 | 19 | 35 | 3.2 | | 410 | 37 | 6 | -1 | 450 |
| 8807 | BARKERNOBAY | 12/06/88 | 10:15 | 9.9 | 7.1 | 10.8 | 283 | 18 | 30 | 3.2 | | 360 | 34 | 2 | -1 | 400 |
| 7111 | BOULDIN1 | 03/26/87 | 8:30 | 13.5 | 7.2 | 8.3 | 591 | 17 | 120 | 32.0 | | 2100 | 120 | 16 | -1 | 2200 |
| 7299 | BOULDIN1 | 08/06/87 | 11:40 | 23.6 | 7.3 | 7.2 | 262 | 12 | | | 7.9 | 1300 | 56 | 5 | -1 | 1400 |
| 7470 | BOULDIN1 | 10/16/87 | 10:15 | 18.0 | 6.9 | 2.4 | 688 | 7 | 500 | 96.0 | | 1800 | 210 | 25 | -1 | 2000 |
| 7572 | BOULDIN1 | 12/10/87 | 8:15 | 11.5 | 6.7 | 3.6 | 430 | 8 | 200 | 42.0 | | 1700 | 45 | 2 | 1 | 1700 |
| 8017 | BOULDIN1 | 01/12/88 | 7:50 | 10.1 | 6.4 | 4.5 | 937 | 9 | 350 | 66.0 | | 2600 | 240 | 11 | -1 | 2900 |
| 8151 | BOULDIN1 | 03/08/88 | 8:51 | 9.1 | 7.3 | | 936 | 16 | 350 | 45.0 | | 2700 | 300 | 20 | -1 | 3000 |
| 8336 | BOULDIN1 | 05/09/88 | 8:37 | 18.6 | 7.1 | 8.5 | 201 | 14 | 100 | | 8.8 | 1000 | 72 | 7 | -1 | 1100 |
| 8472 | BOULDIN1 | 07/18/88 | 8:57 | 23.3 | 7.0 | 5.3 | 178 | 11 | 60 | | 6.8 | 840 | 14 | -1 | -1 | 850 |
| 8598 | BOULDIN1 | 08/10/88 | 11:18 | 23.1 | 7.2 | 7.3 | | | 60 | | 5.9 | 710 | 33 | 1 | -1 | 740 |
| 8621 | BOULDIN1 | 08/17/88 | 9:16 | 21.5 | 7.2 | 3.5 | 338 | 5 | 160 | | 19.0 | 2000 | 98 | 4 | -1 | 2100 |
| 8657 | BOULDIN1 | 08/24/88 | 9:31 | 21.6 | 7.4 | 3.4 | 323 | 8 | 140 | | 19.0 | 2000 | 110 | 2 | -1 | 2100 |
| 8673 | BOULDIN1 | 08/31/88 | 9:13 | 21.5 | 7.0 | 3.0 | | | 200 | | 25.0 | 2000 | 120 | 3 | -1 | 2100 |
| 8786 | BOULDIN1 | 11/30/88 | 11:15 | 9.3 | 7.0 | 5.3 | 471 | 4 | 240 | | 47.0 | 2600 | 170 | 14 | -1 | 2800 |
| 8800 | BOULDIN1 | 12/07/88 | 11:04 | 10.9 | 7.8 | 7.1 | 418 | 11 | 280 | | 43.0 | 2500 | 170 | 15 | -1 | 2700 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> | | | | |
| | | | | | | | | | | | | <------ ug/L ------> | | | | |
| 8829 | BOULDIN1 | 12/20/88 | 9:00 | 8.1 | 7.2 | 6.5 | 574 | 10 | 240 | | 51.0 | 3100 | 130 | 22 | -4 | 3200 |
| 8856 | BOULDIN1 | 12/28/88 | 9:25 | 5.0 | 7.3 | 7.8 | 584 | 12 | 240 | | 56.0 | 2500 | 190 | 23 | -1 | 2700 |
| 7112 | BOULDIN2 | 03/26/87 | 9:00 | 13.5 | 7.0 | 6.2 | 504 | 13 | 350 | 55.0 | | 2800 | 210 | 26 | -1 | 3000 |
| 7300 | BOULDIN2 | 08/06/87 | 12:20 | 25.5 | 7.1 | 7.1 | 182 | 18 | | | 5.4 | 830 | 74 | -1 | -1 | 900 |
| 7471 | BOULDIN2 | 10/16/87 | 9:45 | 17.4 | 6.8 | 5.4 | 342 | 7 | 250 | 39.0 | | 1700 | 75 | 1 | -1 | 1800 |
| 7573 | BOULDIN2 | 12/10/87 | 8:55 | 12.5 | 6.9 | 5.3 | 533 | 6 | 400 | 60.0 | | 2970 | 126 | 2 | -1 | 3100 |
| 8018 | BOULDIN2 | 01/12/88 | 8:25 | 5.8 | 6.0 | 5.5 | 698 | 13 | 200 | 39.0 | | 2700 | 110 | 3 | -1 | 2800 |
| 8152 | BOULDIN2 | 03/08/88 | 8:39 | 11.1 | 6.5 | | 553 | 16 | 400 | 51.0 | | 2700 | 110 | -1 | -1 | 2800 |
| 8253 | BOULDIN2 | 04/18/88 | 8:00 | 17.0 | 6.7 | 4.2 | 494 | 11 | 400 | 39.0 | | | | | | |
| 8337 | BOULDIN2 | 05/09/88 | 7:52 | 18.9 | 7.4 | 7.7 | 279 | 12 | 160 | | 18.0 | 2200 | 67 | -1 | -1 | 2300 |
| 8473 | BOULDIN2 | 07/18/88 | 8:26 | 23.9 | 6.5 | 3.3 | 202 | 18 | 120 | | 10.0 | 1100 | 19 | -1 | -1 | 1100 |
| 8599 | BOULDIN2 | 08/10/88 | 10:44 | 21.2 | 7.1 | 5.5 | | | 140 | | 14.0 | 1600 | 56 | -1 | -1 | 1700 |
| 8622 | BOULDIN2 | 08/17/88 | 9:44 | 22.7 | 6.8 | 5.0 | 440 | 7 | 320 | | 39.0 | 1800 | 170 | 1 | -1 | 2000 |
| 8658 | BOULDIN2 | 08/24/88 | 9:55 | 22.6 | 7.3 | 4.2 | 350 | 5 | 280 | | 32.0 | 3200 | 150 | 2 | -1 | 3400 |
| 8674 | BOULDIN2 | 08/31/88 | 9:36 | 22.7 | 7.3 | 2.5 | | | 240 | | 25.0 | 2000 | 91 | 2 | -1 | 2100 |
| 8787 | BOULDIN2 | 11/30/88 | 11:52 | 9.9 | 7.2 | 3.2 | 467 | 8 | 280 | | 27.0 | 2700 | 170 | 4 | -1 | 2900 |
| 8801 | BOULDIN2 | 12/07/88 | 11:41 | 11.9 | 7.4 | 5.0 | 412 | 7 | 320 | | 56.0 | 2600 | 170 | 19 | -1 | 2800 |
| 8830 | BOULDIN2 | 12/20/88 | 8:30 | 8.6 | 6.7 | 3.8 | 597 | 7 | 240 | | 56.0 | 2700 | 120 | 23 | -4 | 2800 |
| 8857 | BOULDIN2 | 12/28/88 | 10:30 | 7.7 | 7.3 | 4.6 | 745 | 10 | 400 | | 85.0 | 2800 | 67 | 25 | -1 | 2900 |
| 8614 | BOULDSIPH01 | 08/10/88 | 11:53 | 23.0 | 7.1 | 8.9 | 175 | 8 | 30 | | 3.1 | 420 | 17 | -1 | -1 | 440 |
| 8630 | BOULDSIPH01 | 08/17/88 | 8:54 | 22.3 | 7.4 | 5.5 | 179 | 15 | 60 | | 2.8 | 310 | 19 | -1 | -1 | 330 |
| 8659 | BOULDSIPH01 | 08/24/88 | 9:08 | 22.8 | 7.9 | 7.8 | 194 | 6 | 15 | | 2.2 | 260 | 21 | 2 | -1 | 280 |
| 8675 | BOULDSIPH01 | 08/31/88 | 8:50 | 22.7 | 7.0 | 7.0 | | | 40 | | 2.9 | 290 | 21 | 1 | -1 | 310 |
| 8785 | BOULDSIPH01 | 11/30/88 | 10:27 | 9.8 | 7.0 | 3.6 | 293 | 13 | 160 | | 25.0 | 2100 | 97 | 9 | 3 | 2200 |
| 8799 | BOULDSIPH01 | 12/07/88 | 10:28 | 12.5 | 7.3 | 6.7 | 267 | 54 | 200 | | 6.9 | 580 | 41 | 5 | -1 | 630 |
| 8828 | BOULDSIPH01 | 12/20/88 | 8:00 | 10.5 | 6.4 | 6.3 | 263 | 104 | 160 | | 3.5 | 320 | 30 | 2 | -1 | 350 |
| 8855 | BOULDSIPH01 | 12/28/88 | 7:50 | 6.4 | 7.2 | 12.0 | 196 | 9 | 20 | | 3.0 | 350 | 28 | 3 | -1 | 380 |
| 7087 | BRANNANPP01 | 03/16/87 | 10:30 | | | | | | | | | 2300 | 180 | 16 | -1 | 2500 |
| 7301 | BRANNANPP01 | 08/06/87 | 11:05 | 22.1 | 6.9 | 5.5 | 294 | 13 | | | 5.5 | 1200 | 60 | 8 | -1 | 1300 |
| 7472 | BRANNANPP01 | 10/16/87 | 9:00 | 15.7 | 6.9 | 4.9 | 361 | 15 | 50 | 8.2 | | 900 | 92 | 6 | -1 | 1000 |
| 7574 | BRANNANPP01 | 12/10/87 | 9:30 | 11.5 | 6.7 | 6.1 | 595 | 13 | 120 | 26.0 | | 1740 | 138 | 5 | -1 | 1900 |
| 8019 | BRANNANPP01 | 01/12/88 | 10:00 | 7.5 | 6.5 | 8.1 | 854 | 17 | 200 | 34.0 | | 2600 | 120 | 5 | -1 | 2700 |
| 8153 | BRANNANPP01 | 03/08/88 | 8:11 | 10.2 | 6.8 | | 538 | 28 | 160 | 23.0 | | 1800 | 120 | 4 | -1 | 1900 |
| 8254 | BRANNANPP01 | 04/18/88 | 7:50 | 15.0 | 6.7 | 4.2 | 356 | 20 | 300 | 22.0 | | | | | | |
| 8338 | BRANNANPP01 | 05/09/88 | 7:19 | 20.2 | 7.1 | 4.2 | 378 | 14 | 240 | | 20.0 | 2200 | 120 | -1 | -1 | 2300 |
| 8474 | BRANNANPP01 | 07/18/88 | 7:37 | 21.1 | 6.9 | 4.6 | 292 | 13 | 100 | 7.3 | | 890 | 95 | 3 | -1 | 990 |
| 8474 | BRANNANPP01 | 07/18/88 | 7:37 | 21.1 | 6.9 | 4.6 | 292 | 13 | 100 | 7.3 | | 890 | 95 | 3 | -1 | 990 |
| 8474 | BRANNANPP01 | 07/18/88 | 7:37 | 21.1 | 6.9 | 4.6 | 292 | 13 | 100 | 7.3 | | 890 | 95 | 3 | -1 | 990 |
| 8474 | BRANNANPP01 | 07/18/88 | 7:37 | 21.1 | 6.9 | 4.6 | 292 | 13 | 100 | 7.3 | | 890 | 95 | 3 | -1 | 990 |
| 8474 | BRANNANPP01 | 07/18/88 | 7:37 | 21.1 | 6.9 | 4.6 | 292 | 13 | 100 | 7.3 | | 890 | 95 | 3 | -1 | 990 |
| 7302 | BRANNANPP02 | 08/06/87 | 9:45 | 22.6 | 6.9 | 3.0 | 505 | 25 | | | 11.0 | 1700 | 180 | 21 | -1 | 1900 |
| 7473 | BRANNANPP02 | 10/16/87 | 8:00 | 15.9 | 6.7 | 0.6 | 597 | 35 | 35 | 13.0 | | 310 | 48 | 9 | -1 | 370 |
| 7575 | BRANNANPP02 | 12/10/87 | 9:45 | 13.0 | 6.4 | 1.7 | 649 | | 80 | 11.0 | | 453 | 134 | 27 | -1 | 610 |
| 8020 | BRANNANPP02 | 01/12/88 | 8:50 | 8.3 | 6.8 | 7.4 | 974 | 16 | 200 | 37.0 | | 2000 | 87 | 5 | 2 | 2100 |
| 8154 | BRANNANPP02 | 03/08/88 | 7:24 | 12.8 | 6.7 | | 643 | 90 | 60 | 15.0 | | 790 | 220 | 26 | -1 | 1000 |
| 8255 | BRANNANPP02 | 04/18/88 | 6:37 | 15.5 | 6.7 | 0.1 | 602 | 22 | 300 | 26.0 | | | | | | |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> ug/L | | | | |
| 8339 | BRANNANPP02 | 05/09/88 | 6:17 | 17.1 | 6.8 | | 585 | 17 | 280 | | 30.0 | 1600 | 200 | 15 | -1 | 1800 |
| 7303 | BRANNANPP03 | 08/06/87 | 10:15 | 22.0 | 7.3 | 7.2 | 671 | 32 | | | 8.2 | 1400 | 170 | 26 | -1 | 1600 |
| 7474 | BRANNANPP03 | 10/16/87 | 8:20 | 15.8 | 6.5 | 1.2 | 1330 | 84 | 15 | 11.0 | | 78 | 50 | 24 | 9 | 160 |
| 8021 | BRANNANPP03 | 01/12/88 | 9:05 | 8.3 | 6.6 | 2.5 | 1000 | 32 | 200 | 26.0 | | 1500 | 130 | 15 | -1 | 1600 |
| 8155 | BRANNANPP03 | 03/08/88 | 7:39 | 13.8 | 6.8 | | 1380 | 150 | 40 | 14.0 | | 260 | 130 | 49 | -1 | 440 |
| 8256 | BRANNANPP03 | 04/18/88 | 7:00 | 16.0 | 6.5 | 0.0 | 1370 | 156 | 40 | 11.0 | | | | | | |
| 8340 | BRANNANPP03 | 05/09/88 | 6:38 | 17.8 | 6.8 | | 1250 | 230 | 100 | | 13.0 | 730 | 190 | 52 | 8 | 980 |
| 8476 | BRANNANPP03 | 07/18/88 | 6:49 | 20.0 | 6.6 | 0.0 | 1010 | 31 | 600 | | 16.0 | 1600 | 180 | 11 | 1 | 1800 |
| 7304 | BRANNANPP04 | 08/06/87 | 10:45 | 22.4 | 7.1 | 6.3 | 328 | 14 | | | 5.0 | 860 | 79 | 14 | -1 | 950 |
| 7475 | BRANNANPP04 | 10/16/87 | 8:40 | 16.4 | 6.9 | 3.3 | 599 | 38 | 60 | 13.0 | | 1500 | 180 | 20 | -1 | 1700 |
| 7577 | BRANNANPP04 | 12/10/87 | 10:05 | 11.5 | 7.0 | 6.5 | 780 | 15 | 140 | 25.0 | | 1800 | 160 | 14 | -1 | 2000 |
| 9022 | BRANNANPP04 | 01/12/88 | 9:40 | 11.2 | 6.8 | 7.1 | 889 | 12 | 200 | 32.0 | | 3000 | 140 | 7 | -1 | 3100 |
| 8156 | BRANNANPP04 | 03/08/88 | 7:54 | 11.9 | 7.3 | | 1000 | 17 | 140 | 30.0 | | 2900 | 98 | 6 | -1 | 3000 |
| 8257 | BRANNANPP04 | 04/18/88 | 7:24 | 15.5 | 6.7 | 6.0 | 662 | 24 | 120 | 14.0 | | | | | | |
| 8341 | BRANNANPP04 | 05/09/88 | 6:57 | 17.4 | 7.5 | 8.0 | 403 | 18 | 100 | | 9.1 | 1200 | 86 | 7 | -1 | 1300 |
| 8477 | BRANNANPP04 | 07/18/88 | 7:15 | 20.7 | 6.6 | 3.9 | 579 | 15 | 140 | | 17.0 | 1500 | 130 | 8 | -1 | 1600 |
| 5003 | CLIFTON | 01/30/85 | 9:25 | 7.0 | 7.1 | 10.5 | 348 | 8 | | | | | | | | |
| 5021 | CLIFTON | 02/27/85 | 11:00 | 13.0 | 7.3 | 9.8 | 303 | 14 | 40 | | | 410 | 64 | 8 | -1 | 480 |
| 5037 | CLIFTON | 03/27/85 | 10:30 | 12.5 | 7.4 | 9.6 | 334 | 8 | | | | | | | | |
| 5051 | CLIFTON | 04/24/85 | 10:30 | 18.0 | 7.6 | 9.6 | 277 | 8 | 8 | | | 470 | 56 | 7 | -1 | 530 |
| 5072 | CLIFTON | 05/22/85 | 9:30 | 21.5 | 8.1 | 9.2 | 264 | 21 | 15 | | | 610 | 65 | 11 | -1 | 690 |
| 5088 | CLIFTON | 06/26/85 | 9:15 | 24.5 | 7.5 | 7.7 | 314 | 17 | 15 | | | 550 | 88 | 24 | 1 | 660 |
| 5103 | CLIFTON | 07/10/85 | 9:00 | 25.5 | 7.5 | 6.5 | 386 | 15 | | | | | | | | |
| 5122 | CLIFTON | 08/28/85 | 10:00 | 23.5 | 7.4 | 7.7 | 458 | 10 | 10 | | | 460 | 110 | 47 | 3 | 620 |
| 5133 | CLIFTON | 09/25/85 | 9:40 | 22.5 | 7.4 | 6.6 | 602 | 12 | | | | | | | | |
| 5148 | CLIFTON | 10/23/85 | 9:15 | 17.5 | 7.5 | 8.9 | 484 | 9 | 10 | | | 330 | 130 | 59 | 4 | 520 |
| 5175 | CLIFTON | 11/15/85 | 10:45 | 12.0 | 7.4 | 10.2 | 679 | 12 | | | | | | | | |
| 5169 | CLIFTON | 12/03/85 | 13:05 | 12.0 | 7.4 | 10.1 | 744 | 10 | 8 | | | 310 | 220 | 170 | 13 | 710 |
| 6010 | CLIFTON | 01/23/86 | 10:45 | 11.5 | 7.3 | 9.0 | 410 | 8 | | | | | | | | |
| 6015 | CLIFTON | 02/13/86 | 9:50 | 11.5 | 7.3 | 10.4 | 423 | 17 | | | | | | | | |
| 6026 | CLIFTON | 03/04/86 | 10:45 | 16.5 | 7.3 | 7.8 | 306 | 21 | 20 | | | 520 | 64 | 7 | -1 | 590 |
| 6041 | CLIFTON | 04/09/86 | 11:00 | 16.5 | 7.2 | 8.8 | 197 | 14 | 20 | | | 570 | 62 | 5 | -1 | 640 |
| 6076 | CLIFTON | 05/07/86 | 8:50 | 15.5 | 7.3 | 8.8 | 280 | 13 | 20 | | | 350 | 51 | 7 | -1 | 410 |
| 6107 | CLIFTON | 06/04/86 | 9:45 | 20.5 | 7.3 | 8.2 | 303 | 26 | | | | 140 | 28 | 6 | -1 | 170 |
| 6125 | CLIFTON | 07/02/86 | 9:20 | 24.5 | 7.3 | 6.5 | 534 | 11 | 10 | | | 310 | 91 | 36 | 2 | 440 |
| 6144 | CLIFTON | 08/14/86 | 10:45 | 24.5 | 7.4 | 7.4 | 571 | 15 | 5 | | | | | | | |
| 6174 | CLIFTON | 09/24/86 | 9:45 | 19.5 | 7.3 | 8.3 | 292 | 19 | 15 | | | 350 | 86 | 18 | -1 | 450 |
| 6279 | CLIFTON | 11/12/86 | 10:30 | 14.0 | 7.3 | 9.7 | 276 | 13 | 10 | 2.2 | | 350 | 43 | 14 | -1 | 410 |
| 6310 | CLIFTON | 12/17/86 | 8:40 | 10.0 | 7.3 | 10.0 | 285 | 11 | 5 | 2.1 | | 430 | 60 | 7 | -1 | 500 |
| 7019 | CLIFTON | 01/22/87 | 8:30 | 6.5 | 7.3 | 11.5 | 300 | 19 | 15 | 4.1 | | 730 | 26 | 2 | -1 | 760 |
| 7053 | CLIFTON | 02/24/87 | 8:45 | 11.5 | 7.3 | 10.1 | 435 | 11 | 20 | 4.7 | | 780 | 96 | 34 | -1 | 910 |
| 7109 | CLIFTON | 03/24/87 | 8:30 | 13.5 | 7.3 | 9.6 | 730 | 10 | 10 | 4.2 | | 400 | 140 | 27 | -1 | 570 |
| 7186 | CLIFTON | 04/30/87 | 7:30 | 20.0 | 8.3 | 11.1 | 365 | 12 | 10 | 3.2 | | 270 | 49 | 7 | -1 | 330 |
| 7221 | CLIFTON | 05/28/87 | 8:45 | 19.5 | 7.4 | 9.0 | 401 | 20 | 10 | 2.4 | | 420 | 140 | 36 | -1 | 600 |
| 7283 | CLIFTON | 06/23/87 | 8:45 | 23.0 | 8.3 | 7.4 | 483 | 22 | 15 | | | | | | | |
| 7401 | CLIFTON | 09/09/87 | 9:45 | 22.4 | 7.4 | 8.1 | 646 | 17 | 5 | 2.8 | | 340 | 130 | 73 | 21 | 560 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <------------- | | ug/L | | -----------> |
| 7444 | CLIFTON | 10/22/87 | 8:45 | 19.5 | 7.4 | 7.3 | 777 | 6 | 0 | 3.1 | | 210 | 140 | 120 | 1 | 470 |
| 7542 | CLIFTON | 11/05/87 | 10:30 | 17.5 | 7.4 | 8.3 | 616 | 6 | 5 | 2.9 | | 240 | 130 | 76 | 12 | 460 |
| 7569 | CLIFTON | 12/08/87 | 10:00 | 11.3 | 7.4 | 10.2 | 847 | 7 | 20 | 3.3 | | 260 | 150 | 93 | 22 | 530 |
| 8013 | CLIFTON | 01/07/88 | 10:36 | 7.3 | 7.3 | 12.0 | 588 | 13 | 25 | 4.6 | | 460 | 170 | 60 | 4 | 690 |
| 8093 | CLIFTON | 02/10/88 | 9:25 | 11.2 | 7.1 | 9.8 | 364 | 12 | 40 | 4.6 | | 720 | 65 | 18 | -1 | 800 |
| 8148 | CLIFTON | 03/15/88 | 10:20 | 13.6 | 7.5 | 10.7 | 574 | 6 | 20 | 2.9 | | 320 | 110 | 79 | 8 | 520 |
| 8237 | CLIFTON | 04/05/88 | 8:30 | 16.4 | 7.5 | 9.4 | 672 | 6 | 20 | 3.9 | | 280 | 95 | 51 | 8 | 430 |
| 8332 | CLIFTON | 05/03/88 | 9:25 | 17.7 | 7.7 | 8.8 | 337 | 15 | 35 | 2.8 | | 490 | 79 | 22 | 4 | 600 |
| 8424 | CLIFTON | 06/14/88 | 9:39 | 22.9 | 7.5 | 6.9 | 416 | 25 | 60 | 2.6 | | 390 | 100 | 27 | -1 | 520 |
| 8459 | CLIFTON | 07/12/88 | 9:23 | 23.0 | 7.5 | | 560 | 19 | 30 | 2.6 | | 390 | 120 | 76 | 6 | 590 |
| 8581 | CLIFTON | 08/09/88 | 11:30 | 23.8 | 7.6 | 7.4 | 616 | 12 | 20 | 2.4 | | 230 | 120 | 89 | 15 | 450 |
| 8684 | CLIFTON | 09/06/88 | 9:15 | 24.6 | 7.6 | 7.2 | 713 | 10 | 20 | 2.5 | | 240 | 150 | 62 | 14 | 470 |
| 8716 | CLIFTON | 10/04/88 | 9:36 | 20.8 | 7.8 | 7.9 | 617 | 7 | 20 | 4.3 | | 230 | 110 | 51 | 6 | 400 |
| 8746 | CLIFTON | 11/01/88 | 10:34 | 17.5 | 7.6 | 8.3 | 844 | 11 | 20 | 3.0 | | 150 | 130 | 110 | 5 | 400 |
| 8815 | CLIFTON | 12/13/88 | 10:45 | 11.5 | 7.1 | 10.6 | 726 | 12 | 30 | 4.4 | | 540 | 230 | 150 | 15 | 940 |
| 5002 | DMC | 01/30/85 | 8:50 | 7.5 | 7.3 | 10.6 | 398 | 7 | | | | | | | | |
| 5020 | DMC | 02/27/85 | 10:15 | 13.0 | 7.5 | 9.9 | 336 | 11 | 35 | | | 410 | 75 | 12 | -1 | 500 |
| 5036 | DMC | 03/27/85 | 9:45 | 12.0 | 7.4 | 9.8 | 315 | 8 | | | | | | | | |
| 5050 | DMC | 04/24/85 | 10:00 | 17.5 | 7.5 | 9.5 | 280 | 9 | 5 | | | 340 | 57 | 5 | -1 | 400 |
| 5071 | DMC | 05/22/85 | 9:00 | 20.5 | 8.3 | 9.1 | 265 | 22 | 20 | | | 550 | 71 | 10 | -1 | 630 |
| 5087 | DMC | 06/26/85 | 8:30 | 24.5 | 7.6 | 7.1 | 710 | 23 | 10 | | | 580 | 180 | 9 | 10 | 780 |
| 5102 | DMC | 07/10/85 | 8:30 | 24.5 | 7.4 | 6.7 | 544 | 24 | | | | | | | | |
| 5121 | DMC | 08/28/85 | 9:20 | 23.0 | 7.4 | 7.7 | 441 | 17 | 20 | | | 410 | 120 | 70 | 3 | 600 |
| 5147 | DMC | 10/23/85 | 8:40 | 16.5 | 7.4 | 7.2 | 592 | 13 | 5 | | | 270 | 110 | 58 | 5 | 440 |
| 5174 | DMC | 11/15/85 | 10:15 | 12.0 | 7.4 | 10.5 | 545 | 11 | | | | | | | | |
| 5168 | DMC | 12/03/85 | 13:05 | 12.0 | 7.4 | 10.1 | 591 | 10 | 15 | | | 360 | 190 | 120 | 6 | 680 |
| 6009 | DMC | 01/23/86 | 10:00 | 11.5 | 7.3 | 8.8 | 439 | 8 | | | | | | | | |
| 6014 | DMC | 02/13/86 | 9:15 | 11.5 | 7.5 | 10.2 | 460 | 16 | | | | | | | | |
| 6025 | DMC | 03/04/86 | 10:15 | 16.5 | 7.3 | 7.9 | 288 | 25 | 25 | | | 580 | 61 | 6 | -1 | 650 |
| 6040 | DMC | 04/09/86 | 9:45 | 16.0 | 7.3 | 9.0 | 229 | 22 | 25 | | | 600 | 58 | 7 | -1 | 670 |
| 6075 | DMC | 05/07/86 | 8:15 | 16.0 | 7.2 | 8.3 | 278 | 15 | 10 | | | 260 | 40 | 5 | -1 | 310 |
| 6106 | DMC | 06/04/86 | 9:00 | 21.5 | 7.3 | 7.7 | 362 | 31 | | | | 250 | 54 | 8 | -1 | 310 |
| 6124 | DMC | 07/02/86 | 8:45 | 24.5 | 7.3 | 7.0 | 530 | 13 | 10 | | | 340 | 120 | 34 | 2 | 500 |
| 6143 | DMC | 08/14/86 | 9:30 | 24.5 | 7.3 | 6.6 | 586 | 27 | 5 | | | | | | | |
| 6173 | DMC | 09/24/86 | 9:10 | 18.5 | 7.3 | 8.1 | 320 | 18 | 10 | | | 340 | 81 | 20 | -1 | 440 |
| 6278 | DMC | 11/12/86 | 10:00 | 13.5 | 7.4 | 9.4 | 545 | 13 | 5 | 1.9 | | 230 | 64 | 53 | 2 | 350 |
| 6309 | DMC | 12/17/86 | 9:15 | 10.0 | 7.2 | 9.6 | 299 | 11 | 5 | 2.1 | | 400 | 66 | 9 | -1 | 480 |
| 7018 | DMC | 01/22/87 | 9:00 | 6.5 | 7.3 | 11.5 | 356 | 18 | 20 | 4.1 | | 670 | 79 | 9 | -1 | 760 |
| 7054 | DMC | 02/24/87 | 9:15 | 10.5 | 7.3 | 9.7 | 860 | 11 | 10 | 3.6 | | 480 | 190 | 120 | 7 | 800 |
| 7108 | DMC | 03/24/87 | 8:45 | 13.0 | 7.5 | 9.6 | 804 | 13 | 15 | 3.9 | | 340 | 140 | 33 | 6 | 520 |
| 7185 | DMC | 04/30/87 | 8:00 | 20.0 | 8.3 | 10.3 | 359 | 18 | 10 | 3.1 | | 280 | 51 | 8 | -1 | 340 |
| 7220 | DMC | 05/28/87 | 8:30 | 18.5 | 7.5 | 8.6 | 405 | 17 | 10 | 2.5 | | 420 | 130 | 34 | -1 | 580 |
| 7282 | DMC | 06/23/87 | 8:15 | 23.0 | 7.5 | 7.5 | 466 | 22 | 10 | | | | | | | |
| 7400 | DMC | 09/09/87 | 9:20 | 22.0 | 7.4 | 7.7 | 503 | 21 | 5 | 3.5 | | 410 | 110 | 43 | 8 | 570 |
| 7443 | DMC | 10/22/87 | 8:30 | 19.0 | 7.4 | 7.2 | 751 | 7 | 0 | 3.3 | | 87 | 68 | 34 | 33 | 220 |
| 7541 | DMC | 11/05/87 | 10:00 | 18.0 | 7.3 | 8.5 | 620 | 8 | 5 | 2.6 | | 280 | 110 | 77 | 14 | 480 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential----> ug/L | | | | |
| 7568 | DMC | 12/08/87 | 9:45 | 11.3 | 7.3 | 10.2 | 847 | 8 | 20 | 3.2 | | 240 | 160 | 120 | 33 | 550 |
| 8012 | DMC | 01/07/88 | 10:05 | 7.6 | 7.1 | 12.0 | 488 | 13 | 35 | 5.0 | | 490 | 100 | 30 | -1 | 620 |
| 8092 | DMC | 02/10/88 | 8:55 | 11.1 | 7.2 | 9.5 | 376 | 14 | 40 | 4.8 | | 730 | 36 | 15 | -1 | 780 |
| 8147 | DMC | 03/03/88 | 9:45 | 13.3 | 7.4 | 10.5 | 575 | 8 | 20 | 3.0 | | 370 | 96 | 39 | 3 | 510 |
| 8236 | DMC | 04/05/88 | 8:10 | 15.0 | 7.5 | 9.6 | 635 | 8 | 15 | 2.8 | | 230 | 110 | 70 | 12 | 420 |
| 8331 | DMC | 05/03/88 | 8:57 | 17.4 | 7.7 | 9.0 | 344 | 16 | 30 | 2.7 | | 410 | 89 | 25 | 4 | 530 |
| 8423 | DMC | 06/14/88 | 8:56 | 22.3 | 7.5 | 6.8 | 441 | 28 | 40 | 2.4 | | 330 | 90 | 28 | -1 | 450 |
| 8458 | DMC | 07/12/88 | 8:55 | 23.0 | 7.6 | 7.8 | 571 | 15 | 30 | 2.5 | | 190 | 130 | 120 | 25 | 470 |
| 8580 | DMC | 08/09/88 | 10:50 | 23.2 | 7.7 | 7.9 | 710 | 25 | 25 | 2.7 | | 210 | 110 | 82 | 11 | 410 |
| 8683 | DMC | 09/06/88 | 8:45 | 24.7 | 7.7 | 6.9 | 814 | 28 | 25 | 2.1 | | 300 | 160 | 81 | 18 | 560 |
| 8715 | DMC | 10/04/88 | 8:59 | 19.7 | 7.4 | 7.6 | 783 | 13 | 25 | 3.4 | | 290 | 150 | 71 | 7 | 520 |
| 8745 | DMC | 11/01/88 | 10:11 | 17.0 | 7.4 | 8.2 | 883 | 18 | 20 | 3.1 | | 180 | 34 | 20 | 15 | 250 |
| 8814 | DMC | 12/13/88 | 10:22 | 11.4 | 7.1 | 10.6 | 675 | 11 | 30 | 4.4 | | 400 | 190 | 130 | 12 | 730 |
| 9055 | DMC | 01/10/89 | 9:55 | 13.0 | 6.7 | 11.2 | 563 | 8 | 35 | 5.0 | | 440 | 110 | 41 | 4 | 600 |
| 9133 | DMC | 02/07/89 | 9:30 | 6.4 | 6.9 | 11.9 | 662 | 7 | 25 | 4.3 | | 200 | 120 | 74 | 8 | 400 |
| 9214 | DMC | 03/07/89 | 9:10 | 13.2 | 7.3 | 9.9 | 567 | 8 | 25 | 3.7 | | 280 | 130 | 68 | 5 | 480 |
| 9249 | DMC | 04/04/89 | 8:46 | 16.2 | 8.0 | 7.8 | 313 | 12 | | 4.6 | | 580 | 62 | 14 | -1 | 660 |
| 9347 | DMC | 05/02/89 | 8:55 | 18.9 | 7.5 | 8.5 | 265 | 12 | 30 | 3.3 | | 400 | 46 | 8 | -1 | 450 |
| 9429 | DMC | 06/06/89 | 9:10 | 21.8 | 8.0 | 7.9 | 270 | 20 | 40 | 3.4 | | 470 | 55 | 9 | -1 | 530 |
| 9549 | DMC | 07/05/89 | 10:42 | 23.4 | 7.8 | 7.7 | 276 | 20 | 40 | | 3.3 | 330 | 58 | 10 | 0 | 400 |
| 9586 | DMC | 07/25/89 | 8:30 | 24.8 | 7.3 | 8.1 | 540 | 23 | | | | 350 | 160 | 67 | 4 | 580 |
| 7113 | EGBERTPP01 | 03/30/87 | 8:45 | 13.5 | 7.3 | 5.9 | 1100 | 105 | 100 | 33.0 | | 2200 | 250 | 11 | -1 | 2500 |
| 7306 | EGBERTPP01 | 08/13/87 | 10:05 | 19.3 | 7.0 | 6.5 | 305 | 120 | | | 7.1 | 1300 | 23 | -1 | -1 | 1300 |
| 7476 | EGBERTPP01 | 10/20/87 | 10:00 | 15.0 | 7.4 | 6.6 | 667 | 172 | 40 | 14.0 | | 1600 | 89 | -1 | -1 | 1700 |
| 8024 | EGBERTPP01 | 01/12/88 | 9:10 | 6.3 | 7.1 | 9.3 | 968 | 56 | 100 | 32.0 | | 2000 | 120 | 2 | -1 | 2100 |
| 8159 | EGBERTPP01 | 03/08/88 | 8:38 | 6.1 | 7.3 | | 1080 | 46 | 120 | 25.0 | | 2300 | 110 | 5 | -1 | 2400 |
| 8260 | EGBERTPP01 | 04/18/88 | 8:30 | 14.0 | 7.1 | 6.5 | 337 | 66 | 50 | 9.0 | | | | | | |
| 8344 | EGBERTPP01 | 05/09/88 | 8:30 | 15.5 | 7.4 | 3.2 | 903 | 52 | 160 | | 32.0 | 3200 | 200 | 28 | -1 | 3400 |
| 8480 | EGBERTPP01 | 07/18/88 | 8:34 | 21.5 | 7.0 | 6.6 | 297 | 60 | 100 | | 8.2 | 910 | 16 | -1 | -1 | 920 |
| 7114 | EGBERTPP02 | 03/30/87 | 9:15 | 14.0 | 7.8 | 11.7 | 1760 | 60 | 80 | 37.0 | | 2800 | 200 | 19 | -1 | 3000 |
| 7477 | EGBERTPP02 | 10/20/87 | 10:20 | 16.0 | 7.6 | 5.7 | 1220 | 183 | 100 | 66.0 | | 3500 | 77 | 2 | -1 | 3600 |
| 8025 | EGBERTPP02 | 01/12/88 | 9:50 | 7.0 | 7.2 | 9.0 | 1350 | 64 | 60 | 10.0 | | 1200 | 58 | 2 | -1 | 1300 |
| 8160 | EGBERTPP02 | 03/08/88 | 9:04 | 8.5 | 8.1 | | 1820 | 26 | 160 | 52.0 | | 3600 | 170 | 5 | -1 | 3800 |
| 8261 | EGBERTPP02 | 04/18/88 | 9:07 | 16.0 | 8.1 | 9.5 | 875 | 93 | 140 | 30.0 | | | | | | |
| 8345 | EGBERTPP02 | 05/09/88 | 8:55 | 17.1 | 8.2 | 4.5 | 1140 | 25 | 280 | | 54.0 | 5000 | 30 | -1 | -1 | 5000 |
| 8481 | EGBERTPP02 | 07/18/88 | 9:01 | 22.9 | 7.0 | 3.7 | 484 | 62 | 120 | 13.0 | | 1400 | 20 | -1 | -1 | 1400 |
| 5005 | GREENES | 01/30/85 | 11:45 | 9.0 | 7.4 | 11.9 | 186 | 3 | | | | | | | | |
| 5013 | GREENES | 02/06/85 | 11:30 | 8.0 | 7.5 | 12.1 | 174 | 8 | 10 | | | 360 | 14 | 1 | -1 | 380 |
| 5029 | GREENES | 03/06/85 | 12:00 | 11.0 | 7.4 | 10.5 | 180 | 5 | | | | | | | | |
| 5047 | GREENES | 04/05/85 | 10:35 | 19.0 | 7.4 | 9.3 | 176 | 7 | 2 | | | 160 | 13 | -1 | -1 | 170 |
| 5063 | GREENES | 05/01/85 | 10:30 | 19.0 | 7.3 | 8.8 | 167 | 11 | 10 | | | 210 | 12 | 1 | -1 | 220 |
| 5091 | GREENES | 05/29/85 | 5:10 | 18.0 | 7.4 | 9.5 | 178 | 10 | | | | | | | | |
| 5079 | GREENES | 06/05/85 | 9:55 | 21.0 | 7.4 | 8.5 | 173 | 9 | 10 | | | 290 | 19 | 1 | -1 | 310 |
| 5109 | GREENES | 07/24/85 | 8:00 | 22.5 | 7.3 | 8.0 | 163 | 8 | | | | | | | | |
| 5114 | GREENES | 08/01/85 | 10:35 | 22.5 | 7.5 | 7.9 | 163 | 10 | 10 | | | 480 | 14 | 2 | -1 | 500 |
| 5154 | GREENES | 09/04/85 | 9:30 | 22.0 | 7.3 | 7.8 | 207 | 8 | 5 | | | 220 | 22 | 2 | -1 | 240 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <------ ug/L ------> | | | | |
| 5140 | GREENES | 10/02/85 | 10:15 | 21.5 | 7.5 | 8.2 | 168 | 7 | 5 | | | 200 | 14 | 1 | -1 | 220 |
| 5165 | GREENES | 11/13/85 | 10:40 | 12.0 | 7.3 | 9.7 | 163 | 6 | 5 | | | 290 | 20 | 1 | -1 | 310 |
| 5184 | GREENES | 12/03/85 | 19:30 | 11.5 | 7.3 | 9.3 | 149 | 28 | 35 | | | 690 | 21 | 1 | -1 | 710 |
| 6006 | GREENES | 01/16/86 | 14:00 | 10.0 | 7.3 | 10.6 | 218 | 9 | 15 | | | 660 | 22 | 1 | -1 | 680 |
| 6021 | GREENES | 02/27/86 | 12:40 | 12.5 | 7.1 | 10.5 | 84 | 64 | 20 | | | 340 | 7 | -1 | -1 | 350 |
| 6037 | GREENES | 03/13/86 | 13:45 | 11.5 | 7.3 | 11.0 | 70 | 58 | 10 | | | 430 | 8 | -1 | -1 | 440 |
| 6052 | GREENES | 04/23/86 | 12:45 | 18.5 | 7.3 | 8.5 | 179 | 14 | 10 | | | 310 | 22 | 1 | -1 | 330 |
| 6087 | GREENES | 05/28/86 | 12:00 | 23.5 | 7.3 | 7.5 | 188 | 14 | 10 | | | 170 | 12 | 2 | 1 | 190 |
| 6119 | GREENES | 06/25/86 | 12:50 | 24.5 | 7.3 | 7.8 | 161 | 13 | 15 | | | 990 | 10 | 3 | 2 | 1000 |
| 6139 | GREENES | 07/23/86 | 12:15 | 22.5 | 7.3 | 7.8 | 128 | 13 | 5 | | | | | | | |
| 6161 | GREENES | 08/27/86 | 12:45 | 24.5 | 7.6 | 7.3 | 179 | 10 | 10 | | | 220 | 17 | 1 | -1 | 240 |
| 6208 | GREENES | 09/09/86 | 11:55 | 22.5 | 7.3 | 7.7 | 182 | 12 | 5 | | | 220 | 17 | 1 | -1 | 240 |
| 6285 | GREENES | 11/19/86 | 7:00 | 14.5 | 7.3 | 10.0 | 146 | 7 | 10 | 1.5 | | 180 | 7 | -1 | -1 | 190 |
| 6306 | GREENES | 12/10/86 | 7:10 | 11.0 | 7.3 | 10.7 | 152 | 8 | 0 | 1.5 | | 210 | 13 | -1 | -1 | 220 |
| 7012 | GREENES | 01/13/87 | 7:15 | 7.5 | 7.3 | 11.0 | 178 | 8 | 5 | 1.7 | | 200 | 12 | -1 | -1 | 210 |
| 7040 | GREENES | 02/10/87 | 6:45 | 12.0 | 7.3 | 9.4 | 193 | 15 | 10 | 2.3 | | 470 | 19 | -1 | -1 | 490 |
| 7075 | GREENES | 03/10/87 | 6:45 | 13.5 | 7.1 | 8.4 | 128 | 72 | 25 | 3.4 | | 1100 | 10 | -1 | -1 | 1100 |
| 7177 | GREENES | 04/16/87 | 5:45 | 16.5 | 7.2 | 5.6 | 178 | 8 | 5 | 1.4 | | 260 | 18 | 2 | -1 | 280 |
| 7212 | GREENES | 05/20/87 | 5:45 | 20.0 | 7.4 | 7.7 | 172 | 11 | 10 | 1.5 | | 120 | 11 | -1 | -1 | 130 |
| 7250 | GREENES | 06/11/87 | 5:50 | 21.0 | 7.3 | 7.6 | 176 | 6 | 5 | 1.4 | | 180 | 11 | -1 | -1 | 190 |
| 7374 | GREENES | 08/25/87 | | | | | | | | | | 250 | 13 | 13 | -1 | 280 |
| 7393 | GREENES | 09/03/87 | 10:15 | 23.7 | 7.1 | 9.0 | 204 | 11 | 5 | 4.9 | | 430 | 17 | -1 | -1 | 450 |
| 7434 | GREENES | 10/08/87 | 5:35 | 20.0 | 7.2 | 8.7 | 159 | 7 | 5 | 1.6 | | 240 | 11 | -1 | -1 | 250 |
| 7529 | GREENES | 11/03/87 | 6:40 | 16.5 | 7.1 | 8.1 | 180 | 4 | 0 | 2.8 | | 300 | 15 | -1 | -1 | 320 |
| 7559 | GREENES | 12/01/87 | 6:45 | 11.5 | 7.2 | 10.4 | 210 | 7 | 0 | 3.2 | | 280 | 15 | -1 | -1 | 300 |
| 8001 | GREENES | 01/06/88 | 7:45 | 8.6 | 7.3 | 10.5 | 172 | 44 | 35 | 3.3 | | 380 | 11 | -1 | -1 | 390 |
| 8108 | GREENES | 02/18/88 | 6:30 | 10.5 | 7.4 | 10.5 | 224 | 7 | 10 | 2.0 | | 250 | 15 | 1 | -1 | 270 |
| 8213 | GREENES | 03/17/88 | 6:50 | 13.4 | 7.2 | 10.3 | 219 | 7 | 10 | 1.9 | | 250 | 14 | 1 | -1 | 270 |
| 8249 | GREENES | 04/14/88 | 6:23 | 14.6 | 7.2 | 9.4 | 146 | | | 1.8 | | 96 | 9 | -1 | -1 | 110 |
| 8394 | GREENES | 05/19/88 | 5:50 | 18.1 | 7.7 | 7.9 | 196 | 6 | 10 | 2.0 | | 210 | 16 | -1 | -1 | 230 |
| 8416 | GREENES | 06/07/88 | 5:30 | 18.0 | 7.1 | 8.5 | 211 | 8 | 15 | 1.9 | | 250 | 22 | 4 | -1 | 280 |
| 8448 | GREENES | 07/06/88 | 6:08 | 20.8 | 7.3 | 7.5 | 142 | 10 | 10 | 2.0 | | 200 | 7 | 1 | -1 | 210 |
| 8570 | GREENES | 08/02/88 | 7:00 | 21.5 | 7.2 | 7.3 | | | 10 | 1.9 | | 170 | 10 | -1 | -1 | 180 |
| 8690 | GREENES | 09/15/88 | 6:25 | 20.0 | 7.3 | 7.6 | 226 | 9 | 15 | 2.5 | | 300 | 23 | 3 | -1 | 330 |
| 8719 | GREENES | 10/13/88 | 6:00 | 18.2 | 7.3 | 7.1 | 154 | 5 | 10 | 1.6 | | 130 | 9 | -1 | -1 | 140 |
| 8757 | GREENES | 11/17/88 | 7:29 | 12.2 | 8.3 | 9.1 | 203 | 6 | 10 | 2.2 | | 210 | 16 | 1 | -1 | 230 |
| 8803 | GREENES | 12/06/88 | 7:00 | 10.6 | 7.0 | 10.5 | 198 | 8 | 10 | 2.8 | | 240 | 24 | 1 | -1 | 260 |
| 7115 | KINGISPP01 | 03/26/87 | 11:30 | 12.5 | 6.0 | 1.0 | 757 | 26 | 40 | 16.0 | | 620 | 120 | 21 | 5 | 770 |
| 7309 | KINGISPP01 | 08/07/87 | 6:15 | 19.8 | 7.1 | 3.2 | 555 | 4 | | | 15.0 | 2100 | 270 | 26 | -1 | 2400 |
| 7480 | KINGISPP01 | 10/19/87 | 7:40 | 15.8 | 7.1 | 4.2 | 546 | 9 | 15 | 8.2 | | 670 | 130 | 24 | -1 | 820 |
| 7579 | KINGISPP01 | 12/10/87 | 10:48 | 14.0 | 7.3 | 7.3 | 619 | 90 | 80 | 14.0 | | 1020 | 144 | 14 | -1 | 1200 |
| 8027 | KINGISPP01 | 01/12/88 | 9:20 | 10.7 | 7.3 | 5.1 | 673 | 13 | 35 | 8.5 | | 840 | 170 | 34 | -1 | 1000 |
| 8162 | KINGISPP01 | 03/08/88 | 10:18 | 13.3 | 7.1 | | 420 | 17 | 40 | 8.6 | | 810 | 84 | 5 | -1 | 900 |
| 8263 | KINGISPP01 | 04/18/88 | 7:33 | 60.0 | 14.6 | 7.1 | 390 | 7 | 60 | 9.0 | | | | | | |
| 8348 | KINGISPP01 | 05/09/88 | 7:52 | 18.8 | 7.5 | 4.7 | 403 | 9 | 80 | | 9.6 | 1100 | 59 | 19 | -1 | 1200 |
| 8484 | KINGISPP01 | 07/18/88 | 7:09 | 20.5 | 7.4 | 3.1 | 439 | 7 | 100 | | 8.9 | 930 | 52 | 9 | -1 | 990 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 (THMFormation Potential, ug/L) | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7116 | KINGISPP02 | 03/26/87 | 11:45 | 14.5 | 7.3 | 5.8 | 1510 | 7 | 35 | 11.0 | | 480 | 230 | 160 | 36 | 910 |
| 7310 | KINGISPP02 | 08/07/87 | 7:20 | 20.4 | 6.7 | 2.1 | 503 | 20 | | | 4.7 | 2000 | 130 | 23 | -1 | 2200 |
| 7481 | KINGISPP02 | 10/19/87 | 8:00 | 15.0 | 6.9 | 2.0 | 500 | 7 | 35 | 8.9 | | 740 | 55 | 6 | -1 | 800 |
| 7580 | KINGISPP02 | 12/10/87 | 11:48 | 14.0 | 7.0 | 4.6 | 652 | 9 | 160 | 26.0 | | 1580 | 123 | 15 | -1 | 1700 |
| 8028 | KINGISPP02 | 01/12/88 | 10:00 | 8.7 | 7.0 | 6.2 | 508 | | 50 | 9.8 | | 1400 | 100 | 8 | -1 | 1500 |
| 8163 | KINGISPP02 | 03/08/88 | 10:59 | 13.9 | 7.2 | | 572 | 45 | 100 | 13.0 | | 1300 | 82 | 9 | -1 | 1400 |
| 8264 | KINGISPP02 | 04/18/88 | 8:18 | 14.0 | 7.1 | 3.5 | 506 | 10 | 80 | 12.0 | | | | | | |
| 8349 | KINGISPP02 | 05/09/88 | 8:29 | 20.6 | 7.9 | 5.8 | 496 | 16 | 100 | | 11.0 | 1300 | 140 | 31 | 12 | 1500 |
| 8485 | KINGISPP02 | 07/18/88 | 7:57 | 23.0 | 7.1 | 2.3 | 652 | 6 | 140 | | 21.0 | 1900 | 140 | 6 | -1 | 2000 |
| 7117 | KINGISPP03 | 03/26/87 | 12:15 | 17.5 | 7.1 | 3.5 | 443 | 4 | 50 | 11.0 | | 780 | 100 | 8 | -1 | 890 |
| 7311 | KINGISPP03 | 08/07/87 | 7:00 | 20.1 | 7.1 | 3.1 | 945 | 12 | | | 14.0 | 2000 | 450 | 160 | -1 | 2600 |
| 7482 | KINGISPP03 | 10/19/87 | 7:20 | 16.0 | 7.1 | 3.9 | 689 | 5 | 30 | 8.3 | | 1100 | 200 | 53 | -1 | 1400 |
| 7581 | KINGISPP03 | 12/10/87 | 11:18 | 13.0 | 7.2 | 7.9 | 598 | 220 | 200 | 23.0 | | 1840 | 127 | 16 | -1 | 2000 |
| 8029 | KINGISPP03 | 01/12/88 | 9:40 | 9.2 | 7.3 | 6.8 | 1140 | 13 | 60 | 9.8 | | 1000 | 260 | 79 | 12 | 1400 |
| 8164 | KINGISPP03 | 03/08/88 | 10:39 | 15.1 | 7.3 | | 848 | 32 | 60 | 8.1 | | 640 | 250 | 95 | 6 | 990 |
| 8265 | KINGISPP03 | 04/18/88 | 7:51 | | 7.3 | 5.2 | 900 | 15 | 60 | 7.9 | | | | | | |
| 8350 | KINGISPP03 | 05/09/88 | 8:13 | 21.0 | 7.9 | 6.8 | 960 | 7 | 80 | | 12.0 | 1000 | 560 | 210 | 18 | 1800 |
| 8486 | KINGISPP03 | 07/18/88 | 7:30 | 23.0 | 7.4 | 4.8 | 895 | 14 | 140 | 14.0 | | 1200 | 320 | 95 | 2 | 1600 |
| 5010 | LCONNECT | 02/06/85 | 8:45 | 7.0 | 7.4 | 11.2 | 252 | 5 | 15 | | | 660 | 46 | 6 | -1 | 710 |
| 5026 | LCONNECT | 03/06/85 | 9:15 | 11.0 | 7.4 | 10.0 | 218 | 7 | | | | | | | | |
| 5044 | LCONNECT | 04/05/85 | 8:15 | 21.5 | 7.3 | 3.9 | 2180 | 10 | 75 | | | 1800 | 920 | 370 | 31 | 3100 |
| 5060 | LCONNECT | 05/01/85 | 8:00 | 19.0 | 7.4 | 9.1 | 175 | 5 | 5 | | | 280 | 27 | 2 | -1 | 310 |
| 5076 | LCONNECT | 06/05/85 | 7:45 | 20.5 | 7.5 | 8.7 | 180 | 7 | 5 | | | 300 | 26 | 2 | -1 | 330 |
| 5111 | LCONNECT | 08/01/85 | 8:00 | 22.5 | 7.4 | 8.0 | 186 | 5 | 10 | | | 360 | 32 | 2 | -1 | 390 |
| 5137 | LCONNECT | 10/02/85 | 6:40 | 20.0 | 7.5 | 7.8 | 209 | 4 | 5 | | | 240 | 26 | 3 | -1 | 270 |
| 5161 | LCONNECT | 11/13/85 | 7:30 | 7.0 | 7.3 | 9.0 | 1880 | 4 | 80 | | | 340 | 34 | 2 | -1 | 380 |
| 5180 | LCONNECT | 12/03/85 | 16:45 | 11.5 | 7.3 | 10.2 | 204 | 5 | 15 | | | 380 | 36 | 3 | -1 | 420 |
| 6030 | LCONNECT | 03/11/86 | 11:45 | 14.5 | 7.3 | 9.0 | 192 | 22 | 25 | | | 650 | 51 | 3 | -1 | 700 |
| 6045 | LCONNECT | 04/17/86 | 9:45 | 15.5 | 7.2 | 8.5 | 195 | 11 | 20 | | | 440 | 51 | 7 | -1 | 500 |
| 6080 | LCONNECT | 05/13/86 | 9:45 | 19.5 | 7.3 | 8.4 | 162 | 14 | 25 | | | 150 | 16 | 2 | -1 | 170 |
| 6111 | LCONNECT | 06/11/86 | 7:45 | 21.5 | 7.3 | 7.9 | 136 | 12 | 25 | | | 310 | 15 | 2 | -1 | 330 |
| 6130 | LCONNECT | 07/09/86 | 7:15 | 23.0 | 7.3 | 7.7 | 154 | 9 | 10 | | | 280 | 30 | 1 | -1 | 310 |
| 6150 | LCONNECT | 08/13/86 | 7:35 | 20.5 | 7.1 | 5.1 | 281 | 9 | 50 | | | | | | | |
| 6197 | LCONNECT | 09/11/86 | 7:30 | 21.5 | 7.4 | 7.6 | 181 | 12 | 10 | | | 280 | 24 | 3 | -1 | 310 |
| 6282 | LCONNECT | 11/19/86 | 10:00 | 13.5 | 7.2 | 9.1 | 156 | 5 | 20 | 3.1 | | 600 | 19 | 1 | -1 | 620 |
| 6299 | LCONNECT | 12/10/86 | 11:00 | 11.0 | 7.3 | 10.0 | 168 | 5 | 10 | 2.8 | | | | | | |
| 7007 | LCONNECT | 01/13/87 | 10:30 | 7.5 | 7.1 | 10.1 | 209 | 6 | 30 | | 4.8 | 700 | 49 | 2 | -1 | 750 |
| 7045 | LCONNECT | 02/10/87 | 10:30 | 11.5 | 7.2 | 9.6 | 235 | 10 | 15 | 4.8 | | 630 | 41 | -1 | -1 | 670 |
| 7068 | LCONNECT | 03/10/87 | 10:30 | 13.5 | 7.1 | 9.1 | 261 | 14 | 35 | 4.7 | | 1400 | 38 | 2 | -1 | 1400 |
| 7170 | LCONNECT | 04/16/87 | 9:15 | 19.5 | 7.2 | 6.8 | 228 | 6 | 5 | 2.3 | | 290 | 35 | 5 | -1 | 330 |
| 7205 | LCONNECT | 05/20/87 | 8:30 | 21.5 | 7.4 | 8.5 | 194 | 9 | 5 | 1.7 | | 280 | 28 | 3 | -1 | 310 |
| 7243 | LCONNECT | 06/11/87 | 9:15 | 22.5 | 7.8 | 8.0 | 241 | 6 | 10 | 2.1 | | 250 | 32 | 5 | -1 | 290 |
| 7405 | LCONNECT | 09/24/87 | 8:30 | 20.5 | 7.4 | 7.9 | 270 | 6 | 10 | 2.3 | | 240 | 25 | 3 | -1 | 270 |
| 7448 | LCONNECT | 10/28/87 | 8:50 | 20.0 | 7.2 | 7.4 | 244 | 5 | 5 | 2.8 | | 192 | 53 | 17 | 1 | 260 |
| 7546 | LCONNECT | 11/24/87 | 10:50 | 14.0 | 7.2 | 8.2 | 215 | 3 | 5 | 3.4 | | 340 | 30 | 1 | -1 | 370 |
| 7605 | LCONNECT | 12/16/87 | 8:30 | 8.2 | 7.3 | 11.3 | 178 | 18 | 40 | 4.4 | | 800 | 19 | 1 | -1 | 820 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <----- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <-------------- | | ug/L | | ------------> |
| 8073 | LCONNECT | 01/21/88 | 8:42 | 8.8 | 7.2 | 10.4 | 262 | 14 | 40 | 4.7 | | 670 | 63 | 4 | -1 | 740 |
| 8131 | LCONNECT | 02/23/88 | 8:20 | 11.5 | 7.3 | 10.1 | 240 | 6 | 10 | 2.4 | | 930 | 23 | 1 | -1 | 950 |
| 8222 | LCONNECT | 03/24/88 | 8:45 | 15.3 | 7.4 | 9.6 | 225 | 3 | 10 | 1.9 | | 220 | 22 | 3 | -1 | 250 |
| 8321 | LCONNECT | 04/28/88 | 9:05 | 16.6 | 7.7 | 8.8 | 174 | 6 | 25 | 2.8 | | 370 | 18 | -1 | -1 | 390 |
| 8398 | LCONNECT | 05/26/88 | 7:50 | 20.5 | 8.0 | 9.6 | 226 | 9 | 25 | 2.3 | | 260 | 37 | 3 | -1 | 300 |
| 8430 | LCONNECT | 06/22/88 | 6:08 | 21.9 | 7.4 | 7.4 | 261 | 7 | 35 | 5.0 | | 630 | 46 | 4 | -1 | 680 |
| 8465 | LCONNECT | 07/14/88 | 9:15 | 22.4 | 7.3 | 7.2 | | | 20 | 3.0 | | 450 | 20 | 1 | -1 | 470 |
| 8587 | LCONNECT | 08/16/88 | 8:30 | 22.0 | 7.5 | 7.4 | 184 | 6 | 15 | 2.1 | | 240 | 24 | 24 | -1 | 290 |
| 8699 | LCONNECT | 09/22/88 | 6:09 | 18.7 | 7.6 | 8.0 | 275 | 4 | 15 | 2.3 | | 300 | 33 | 16 | 6 | 360 |
| 8728 | LCONNECT | 10/20/88 | 8:10 | 19.4 | 7.1 | 7.7 | 386 | 3 | 20 | 4.0 | | 400 | 57 | 35 | 1 | 490 |
| 8750 | LCONNECT | 11/10/88 | 8:15 | 16.1 | 6.8 | 8.4 | 206 | 4 | 15 | 4.0 | | 310 | 28 | 3 | -1 | 340 |
| 8839 | LCONNECT | 12/20/88 | 9:30 | 11.2 | 7.3 | 10.1 | 245 | 5 | 40 | 7.5 | | 830 | 42 | 2 | -1 | 870 |
| 9097 | LCONNECT | 01/31/89 | 8:45 | 9.9 | 7.0 | 10.6 | 255 | 4 | 20 | 3.1 | | 200 | 32 | 5 | -1 | 240 |
| 9187 | LCONNECT | 02/28/89 | 8:20 | 13.0 | 6.8 | 9.8 | 228 | 4 | 15 | 2.6 | | 190 | 33 | 7 | -1 | 230 |
| 9240 | LCONNECT | 03/28/89 | 8:40 | 14.8 | 7.4 | 8.1 | 148 | 10 | 30 | 4.3 | | 520 | 28 | 3 | -1 | 550 |
| 9337 | LCONNECT | 04/25/89 | 8:02 | 16.8 | 8.1 | 8.5 | 163 | 5 | 15 | 2.1 | | 220 | 21 | 2 | -1 | 240 |
| 9367 | LCONNECT | 05/23/89 | 8:07 | 18.7 | 8.1 | 8.7 | 165 | 6 | 20 | 2.8 | | 310 | 21 | 1 | -1 | 330 |
| 9487 | LCONNECT | 06/21/89 | 7:50 | 21.5 | 7.5 | 8.1 | 204 | 7 | 20 | | 3.5 | 390 | 45 | 3 | 0 | 440 |
| 9561 | LCONNECT | 07/18/89 | 8:15 | 23.9 | 7.1 | 7.4 | 176 | 7 | 35 | | 6.0 | 580 | 27 | 3 | 0 | 610 |
| 9599 | LCONNECT | 07/25/89 | 9:16 | 25.1 | 7.4 | 7.9 | 130 | 6 | | | | 360 | 24 | 1 | 0 | 390 |
| 5016 | LINDSEY | 02/13/85 | 11:50 | 10.5 | 7.3 | 6.7 | 381 | 110 | 50 | | | 1200 | 65 | 3 | -1 | 1300 |
| 5032 | LINDSEY | 03/13/85 | 11:45 | 12.5 | 7.6 | 9.1 | 482 | 60 | | | | | | | | |
| 5056 | LINDSEY | 04/10/85 | 10:15 | 18.0 | 7.7 | 8.6 | 531 | 20 | 15 | | | 580 | 86 | 9 | -1 | 680 |
| 5066 | LINDSEY | 05/08/85 | 10:00 | 17.0 | 8.1 | 8.8 | 574 | 18 | 20 | | | 660 | 88 | 4 | -1 | 750 |
| 5095 | LINDSEY | 05/29/85 | 10:30 | 20.0 | 7.9 | 8.6 | 571 | 27 | | | | | | | | |
| 5083 | LINDSEY | 06/12/85 | 10:45 | 25.0 | 7.9 | 7.1 | 541 | 28 | 30 | | | 900 | 97 | 6 | -1 | 1000 |
| 5106 | LINDSEY | 07/24/85 | 6:10 | 22.0 | 7.6 | 7.0 | 421 | 36 | | | | | | | | |
| 5117 | LINDSEY | 08/14/85 | 9:55 | 21.0 | 7.8 | 8.6 | 405 | 48 | 30 | | | 750 | 69 | 5 | -1 | 820 |
| 5125 | LINDSEY | 09/11/85 | 9:00 | 19.5 | 7.7 | 7.5 | 443 | 30 | 25 | | | 820 | 54 | 4 | -1 | 880 |
| 5143 | LINDSEY | 10/09/85 | 10:05 | 16.5 | 7.6 | 8.1 | 496 | 31 | 38 | | | 1500 | 66 | 3 | -1 | 1600 |
| 5178 | LINDSEY | 11/19/85 | 8:20 | 8.5 | 7.5 | 10.0 | 442 | 18 | 15 | | | | | | | |
| 5187 | LINDSEY | 12/03/85 | 7:20 | 11.5 | 7.4 | 8.7 | 569 | 25 | 60 | | | 1300 | 70 | 2 | -1 | 1400 |
| 6001 | LINDSEY | 01/16/86 | 7:45 | 10.5 | 7.3 | 6.7 | 458 | 38 | 80 | | | 2200 | 56 | 2 | -1 | 2300 |
| 6018 | LINDSEY | 02/27/86 | 7:50 | 16.5 | 6.8 | 3.0 | 208 | 46 | 60 | | | 790 | 26 | -1 | -1 | 820 |
| 6033 | LINDSEY | 03/13/86 | 7:30 | 13.5 | 7.1 | 6.2 | 221 | 68 | 100 | | | 1300 | 47 | 1 | -1 | 1300 |
| 6048 | LINDSEY | 04/23/86 | 7:30 | 18.5 | 7.6 | 5.3 | 387 | 48 | 70 | | | 1100 | 84 | 6 | -1 | 1200 |
| 6083 | LINDSEY | 05/28/86 | 6:00 | 20.0 | 8.0 | 6.0 | 528 | 26 | 25 | | | 380 | 38 | 5 | 2 | 430 |
| 6115 | LINDSEY | 06/25/86 | 6:35 | 21.5 | 8.0 | 7.2 | 461 | 38 | 20 | | | 350 | 36 | 4 | 1 | 390 |
| 6135 | LINDSEY | 07/23/86 | 6:35 | 20.5 | 7.7 | 7.4 | 431 | 32 | 30 | | | | | | | |
| 6156 | LINDSEY | 08/27/86 | 6:45 | 20.5 | 7.6 | 6.7 | 514 | 50 | 40 | | | 930 | 65 | 4 | -1 | 1000 |
| 6203 | LINDSEY | 09/09/86 | 6:35 | 18.5 | 7.8 | 7.6 | 466 | 37 | 40 | | | 860 | 71 | 5 | -1 | 940 |
| 6273 | LINDSEY | 11/05/86 | 9:15 | 14.5 | 7.5 | 8.5 | 490 | 25 | 25 | 5.2 | | 780 | 59 | 5 | -1 | 840 |
| 6295 | LINDSEY | 12/03/86 | 8:25 | | | | 496 | 22 | 25 | 5.4 | | 800 | 80 | 4 | -1 | 880 |
| 7001 | LINDSEY | 01/08/87 | 8:30 | 7.5 | 7.3 | 10.1 | 492 | 24 | 20 | 4.4 | | 520 | 66 | -1 | -1 | 590 |
| 7023 | LINDSEY | 02/05/87 | 8:50 | 10.0 | 7.5 | 9.6 | 547 | 24 | 20 | 4.7 | | 550 | 76 | -1 | -1 | 630 |
| 7061 | LINDSEY | 03/03/87 | 8:15 | 11.0 | 8.0 | 9.9 | 518 | 37 | 20 | 6.3 | | 1200 | 62 | -1 | -1 | 1300 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> ug/L | | | | |
| 7164 | LINDSEY | 04/09/87 | 7:00 | 16.5 | 7.9 | 8.7 | 606 | 25 | 20 | 5.8 | | 870 | 120 | 9 | -1 | 1000 |
| 7198 | LINDSEY | 05/13/87 | 7:00 | 23.5 | 7.9 | 7.3 | 530 | 24 | 20 | 5.0 | | 160 | 85 | 12 | -1 | 260 |
| 7234 | LINDSEY | 06/04/87 | 7:15 | 19.5 | 7.9 | 7.7 | 593 | 38 | 25 | 6.2 | | 800 | 67 | 6 | -1 | 870 |
| 7387 | LINDSEY | 09/03/87 | 8:30 | 21.2 | 7.5 | 6.5 | 461 | 90 | 25 | 7.2 | | 1200 | 63 | 2 | -1 | 1300 |
| 7428 | LINDSEY | 10/08/87 | 11:55 | 20.0 | 7.4 | 8.1 | 523 | 21 | 25 | 5.7 | | 630 | 62 | 3 | -1 | 700 |
| 7531 | LINDSEY | 11/03/87 | 8:25 | 15.5 | 7.6 | 8.2 | 513 | 19 | 20 | 7.2 | | 1200 | 63 | 4 | -1 | 1300 |
| 7554 | LINDSEY | 12/01/87 | 8:30 | 10.9 | 7.4 | 9.7 | 509 | 19 | 25 | 6.0 | | 720 | 47 | 3 | -1 | 770 |
| 8003 | LINDSEY | 01/06/88 | 12:34 | 11.2 | 7.3 | 10.0 | 723 | 20 | 60 | 8.6 | | 950 | 72 | 5 | -1 | 1000 |
| 8110 | LINDSEY | 02/18/88 | 12:30 | 11.7 | 7.3 | 9.7 | 551 | 50 | 50 | 7.8 | | 1500 | 48 | 4 | 2 | 1600 |
| 8208 | LINDSEY | 03/17/88 | 8:39 | 14.1 | 7.5 | 10.1. | 547 | | 60 | 5.4 | | 680 | 52 | 5 | -1 | 740 |
| 8245 | LINDSEY | 04/14/88 | 9:36 | 18.4 | 7.8 | 8.9 | 593 | | | 5.6 | | 850 | 56 | 7 | 3 | 920 |
| 8389 | LINDSEY | 05/19/88 | 10:27 | 20.2 | 7.8 | 4.6 | 605 | 29 | 60 | 6.0 | | 810 | 66 | 6 | -1 | 880 |
| 8412 | LINDSEY | 06/07/88 | 7:30 | 17.7 | 7.6 | 4.3 | 525 | 37 | 80 | 5.2 | | 660 | 53 | 5 | 1 | 720 |
| 8451 | LINDSEY | 07/06/88 | 8:04 | 21.2 | 7.6 | 7.6 | 325 | 42 | 60 | 3.2 | | 570 | 36 | 4 | -1 | 610 |
| 8573 | LINDSEY | 08/02/88 | 12:48 | 21.7 | 8.1 | 8.3 | 287 | 42 | 60 | 3.9 | | 590 | 45 | 2 | -1 | 640 |
| 8693 | LINDSEY | 09/15/88 | 7:55 | 18.7 | 7.5 | 8.6 | 259 | 25 | 40 | 3.2 | | 380 | 29 | 2 | -1 | 410 |
| 8722 | LINDSEY | 10/13/88 | 8:35 | 17.0 | 8.0 | 9.1 | 274 | 20 | 50 | 3.0 | | 370 | 33 | 3 | -1 | 410 |
| 8760 | LINDSEY | 11/17/88 | 9:16 | 12.8 | 7.8 | 9.5 | 258 | 19 | 35 | 2.8 | | 320 | 34 | 3 | -1 | 360 |
| 8806 | LINDSEY | 12/06/88 | 9:15 | 10.2 | 7.2 | 11.0 | 249 | 17 | 30 | 3.1 | | 330 | 39 | 3 | -1 | 370 |
| 8554 | LPOTATOWHITE | 07/19/88 | 11:10 | 25.5 | 7.4 | 7.0 | 159 | 10 | 15 | | 1.7 | 360 | 17 | -1 | -1 | 380 |
| 8612 | LPOTATOWHITE | 08/10/88 | 8:33 | 21.9 | 7.8 | | 167 | 10 | 10 | | 2.3 | 240 | 16 | -1 | -1 | 250 |
| 8627 | LPOTATOWHITE | 08/17/88 | 8:40 | 22.2 | 7.7 | | 189 | 8 | 15 | | 2.2 | 220 | 22 | 1 | -1 | 240 |
| 8654 | LPOTATOWHITE | 08/24/88 | 8:25 | 21.8 | 8.1 | | 192 | 12 | 15 | | 3.6 | 340 | 20 | 2 | -1 | 360 |
| 8670 | LPOTATOWHITE | 08/31/88 | 8:30 | 24.0 | 8.0 | | | | 10 | | 3.7 | 310 | 26 | 2 | -1 | 340 |
| 8777 | LPOTATOWHITE | 11/30/88 | 11:48 | 10.6 | 8.2 | 8.5 | 177 | 22 | | | 4.8 | 600 | 29 | 2 | -1 | 630 |
| 8791 | LPOTATOWHITE | 12/07/88 | 9:55 | 10.0 | 8.3 | 9.6 | 203 | 9 | 20 | | 4.5 | 400 | 28 | 4 | -1 | 430 |
| 8821 | LPOTATOWHITE | 12/20/88 | 9:55 | 8.6 | 8.0 | 10.3 | 209 | 7 | 15 | | 2.5 | 310 | 27 | 2 | -1 | 340 |
| 8848 | LPOTATOWHITE | 12/28/88 | 8:50 | 6.5 | 7.6 | 11.4 | 194 | 9 | 20 | | 2.6 | 340 | 25 | 1 | -1 | 370 |
| 8553 | LPOTTERM | 07/19/88 | 10:25 | 25.0 | 7.5 | 7.2 | 158 | 9 | 20 | | 1.8 | 370 | 15 | -1 | -1 | 380 |
| 8611 | LPOTTERM | 08/10/88 | 8:14 | 22.0 | 7.7 | | 169 | 10 | 10 | | 2.2 | 250 | 17 | -1 | -1 | 270 |
| 8626 | LPOTTERM | 08/17/88 | 8:19 | 21.8 | | | 175 | 8 | 10 | | 2.3 | 430 | 18 | -1 | -1 | 450 |
| 8653 | LPOTTERM | 08/24/88 | 8:10 | 21.2 | 7.7 | | 198 | 10 | 15 | | 4.0 | 260 | 20 | 2 | -1 | 280 |
| 8669 | LPOTTERM | 08/31/88 | 8:15 | 23.9 | 7.3 | | | | 10 | | 3.1 | 370 | 17 | -1 | -1 | 390 |
| 8776 | LPOTTERM | 11/30/88 | 10:18 | 10.0 | 8.1 | 8.8 | 173 | 22 | 50 | | 4.9 | 710 | 19 | 2 | -1 | 730 |
| 8790 | LPOTTERM | 12/07/88 | 8:30 | 10.0 | 7.5 | | 221 | 12 | 25 | | 5.4 | 440 | 35 | 6 | -1 | 480 |
| 8818 | LPOTTERM | 12/20/88 | 9:00 | 8.7 | 7.4 | 10.7 | 216 | 9 | 15 | | 3.3 | 330 | 31 | 4 | -1 | 360 |
| 8845 | LPOTTERM | 12/28/88 | 8:20 | 6.7 | 7.6 | 11.8 | 196 | 9 | 25 | | 3.0 | 370 | 22 | 3 | -1 | 390 |
| 9059 | LPOTTERM | 01/11/89 | 8:40 | 6.6 | 7.6 | | 217 | 10 | 20 | | 3.6 | 390 | 31 | 2 | -1 | 420 |
| 9079 | LPOTTERM | 01/18/89 | 8:41 | 6.9 | 8.3 | 11.5 | 212 | 8 | 30 | | 3.8 | 320 | 26 | 2 | -1 | 350 |
| 9104 | LPOTTERM | 01/26/89 | 10:01 | 8.6 | 6.6 | 11.0 | 234 | 6 | 10 | | | 150 | 13 | 2 | -1 | 160 |
| 9117 | LPOTTERM | 02/02/89 | 8:50 | 8.3 | 7.3 | 10.3 | 249 | 6 | 20 | | 3.8 | 350 | 23 | 4 | -1 | 380 |
| 9374 | LPOTTERM | 06/01/89 | 7:50 | 19.8 | 8.1 | 8.1 | 169 | 7 | 10 | | 3.9 | 580 | 220 | 80 | 6 | 890 |
| 9387 | LPOTTERM | 06/08/89 | 7:30 | 19.8 | 8.3 | 10.0 | 161 | 8 | 5 | | 2.4 | 260 | 15 | -1 | -1 | 270 |
| 9400 | LPOTTERM | 06/15/89 | 8:15 | 21.6 | 7.6 | 8.4 | 181 | 11 | 15 | | 2.3 | 320 | 24 | 2 | -1 | 350 |
| 9413 | LPOTTERM | 06/19/89 | 8:35 | 21.1 | 8.0 | 8.3 | 181 | 9 | 15 | | 2.1 | 250 | 18 | 2 | -1 | 270 |
| 9494 | LPOTTERM | 07/06/89 | 7:30 | 20.5 | 8.2 | 8.9 | 143 | 7 | 20 | | 2.7 | 260 | 15 | 0 | 0 | 280 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> | | | | |
| | | | | | | | | | | | | <---------- ug/L ----------> | | | | |
| 9507 | LPOTTERM | 07/13/89 | 8:18 | 23.2 | 7.9 | 8.9 | 170 | 7 | 15 | | 1.9 | 260 | 27 | 38 | 1 | 330 |
| 9520 | LPOTTERM | 07/20/89 | 6:45 | 22.5 | 7.3 | 8.6 | 133 | 8 | 15 | | 2.1 | 300 | 12 | 0 | 0 | 310 |
| 9597 | LPOTTERM | 07/25/89 | 8:24 | 22.3 | 7.8 | 9.2 | 120 | 13 | | | | 360 | 22 | 1 | 0 | 380 |
| 9533 | LPOTTERM | 07/27/89 | 6:25 | 21.6 | 8.3 | 8.7 | 132 | 13 | 10 | | 2.0 | 230 | 21 | 1 | 0 | 250 |
| 5064 | MALLARDIS | 05/08/85 | 7:00 | 16.0 | 7.8 | 8.7 | 9290 | 14 | 10 | | | 12 | 84 | 330 | 650 | 1100 |
| 5093 | MALLARDIS | 05/29/85 | 8:35 | 17.0 | 7.7 | 8.7 | 2720 | 26 | | | | | | | | |
| 5080 | MALLARDIS | 06/12/85 | 7:00 | 21.5 | 7.8 | 8.0 | 2980 | 19 | 5 | | | 65 | 170 | 340 | 300 | 880 |
| 5115 | MALLARDIS | 08/14/85 | 7:30 | 19.0 | 8.0 | 8.5 | 8480 | 19 | 5 | | | 61 | 54 | 250 | 680 | 1000 |
| 5129 | MALLARDIS | 09/11/85 | 7:35 | 18.5 | 7.9 | 8.2 | 7320 | 12 | 5 | | | 21 | 94 | 370 | 500 | 990 |
| 5141 | MALLARDIS | 10/09/85 | 7:35 | 17.0 | 8.0 | 8.4 | 6330 | 10 | 5 | | | 21 | 140 | 340 | 520 | 1000 |
| 5179 | MALLARDIS | 11/19/85 | 10:15 | 11.5 | 8.1 | 9.6 | 13100 | 9 | 5 | | | | | | | |
| 5185 | MALLARDIS | 12/03/85 | 10:10 | 12.0 | 7.5 | 9.9 | 9970 | 8 | 8 | | | 11 | 72 | 340 | 640 | 1100 |
| 6002 | MALLARDIS | 01/16/86 | 9:40 | 10.0 | 7.7 | 10.2 | 10700 | 16 | 20 | | | 5 | 44 | 320 | 990 | 1400 |
| 6019 | MALLARDIS | 02/27/86 | 9:55 | 14.5 | 7.0 | 8.8 | 169 | 58 | 25 | | | 490 | 29 | 1 | -1 | 520 |
| 6035 | MALLARDIS | 03/13/86 | 11:30 | 13.0 | 7.3 | 9.4 | 161 | 51 | 30 | | | 670 | 38 | 2 | -1 | 710 |
| 6050 | MALLARDIS | 04/23/86 | 9:15 | 16.5 | 7.3 | 8.9 | 226 | 22 | 20 | | | 440 | 64 | 8 | -1 | 510 |
| 6085 | MALLARDIS | 05/28/86 | 8:15 | 17.0 | 7.6 | 8.6 | 4160 | 26 | 15 | | | 39 | 88 | 260 | 350 | 740 |
| 6117 | MALLARDIS | 06/25/86 | 10:35 | 21.0 | 7.7 | 8.1 | 4250 | 36 | 10 | | | 24 | 84 | 78 | 320 | 510 |
| 6158 | MALLARDIS | 08/27/86 | 8:45 | 20.5 | 7.8 | 8.9 | 3970 | 36 | 5 | | | 44 | 150 | 350 | 300 | 840 |
| 6205 | MALLARDIS | 09/09/86 | 8:15 | 18.5 | 7.9 | 8.7 | 6180 | 63 | 5 | | | 28 | 130 | 440 | 690 | 1300 |
| 6275 | MALLARDIS | 11/05/86 | 11:45 | 17.5 | 7.7 | 9.5 | 4550 | 13 | 5 | 1.5 | | 25 | 80 | 160 | 280 | 550 |
| 6297 | MALLARDIS | 12/03/86 | 11:45 | 13.0 | 7.5 | 9.7 | 7330 | 13 | 5 | 1.4 | | 400 | 20 | -1 | -1 | 420 |
| 7003 | MALLARDIS | 01/08/87 | 11:45 | 9.0 | 7.5 | 10.5 | 7800 | 21 | 5 | 1.7 | | 16 | 75 | 180 | 400 | 670 |
| 7025 | MALLARDIS | 02/05/87 | 11:30 | 11.0 | 7.7 | 10.6 | 5780 | 18 | 10 | 2.0 | | 30 | 88 | 73 | 280 | 470 |
| 7063 | MALLARDIS | 03/03/87 | 11:15 | 11.5 | 7.4 | 9.9 | 2280 | 30 | 15 | 3.3 | | 160 | 250 | 220 | 270 | 900 |
| 7167 | MALLARDIS | 04/09/87 | 10:00 | 18.0 | 7.6 | 9.2 | 1780 | 45 | 10 | 3.2 | | 230 | 370 | 340 | 210 | 1200 |
| 7200 | MALLARDIS | 05/13/87 | 9:30 | 23.0 | 8.2 | 5.0 | 7480 | 20 | 5 | 2.3 | | 26 | 140 | 290 | 480 | 940 |
| 7236 | MALLARDIS | 06/04/87 | 10:30 | 20.5 | 7.9 | 8.5 | 12000 | 12 | 10 | 1.9 | | 10 | 57 | 250 | 500 | 820 |
| 7430 | MALLARDIS | 10/08/87 | 8:15 | 20.8 | 7.9 | 7.4 | 12200 | 12 | 10 | 1.7 | | 3 | 19 | 160 | 450 | 630 |
| 7533 | MALLARDIS | 11/03/87 | 11:20 | 18.8 | 7.8 | 7.8 | 13700 | 13 | 5 | 2.1 | | 1 | 28 | 210 | 660 | 900 |
| 7556 | MALLARDIS | 12/01/87 | 11:40 | 13.2 | 7.9 | 8.2 | 15600 | 22 | 5 | 1.7 | | -1 | -1 | 170 | 790 | 960 |
| 8005 | MALLARDIS | 01/06/88 | 10:00 | 7.8 | 8.0 | 11.4 | 7070 | 18 | 15 | 3.7 | | 17 | 73 | 250 | 540 | 880 |
| 8112 | MALLARDIS | 02/18/88 | 9:45 | 12.0 | 8.0 | 11.5 | 5400 | 28 | 20 | 2.6 | | 35 | 170 | 500 | 540 | 1200 |
| 8210 | MALLARDIS | 03/17/88 | 11:09 | 15.0 | 7.8 | 9.0 | 7760 | 18 | 20 | 2.0 | | 18 | 110 | 350 | 590 | 1100 |
| 8246 | MALLARDIS | 04/14/88 | 11:16 | 17.5 | 7.8 | 8.7 | 3590 | | | 2.3 | | 35 | 110 | 220 | 220 | 590 |
| 8391 | MALLARDIS | 05/19/88 | 8:38 | 18.4 | 7.8 | 8.4 | 9110 | 28 | 35 | 1.6 | | 8 | 50 | 250 | 550 | 860 |
| 8413 | MALLARDIS | 06/07/88 | 9:26 | 8.3 | 8.4 | 7.9 | 9540 | 21 | 40 | 1.5 | | 8 | 64 | 200 | 430 | 700 |
| 8453 | MALLARDIS | 07/06/88 | 10:00 | 23.4 | 7.9 | 7.5 | 11500 | 11 | 20 | 0.8 | | 8 | 44 | 240 | 720 | 1000 |
| 8575 | MALLARDIS | 08/02/88 | 10:30 | 21.7 | 7.9 | 8.0 | | | 25 | 1.9 | | 160 | 91 | 310 | 530 | 1100 |
| 8696 | MALLARDIS | 09/15/88 | 9:55 | 19.9 | 7.6 | 8.3 | 11000 | 22 | 20 | 2.4 | | 14 | 40 | 190 | 480 | 720 |
| 8725 | MALLARDIS | 10/13/88 | 10:40 | 18.2 | 7.8 | 8.4 | 9930 | 15 | 35 | 2.4 | | 7 | 47 | 150 | 330 | 530 |
| 8763 | MALLARDIS | 11/17/88 | 11:20 | 15.0 | 7.9 | 9.2 | 15000 | 20 | 15 | 2.2 | | 7 | 41 | 180 | 670 | 900 |
| 8809 | MALLARDIS | 12/06/88 | 11:15 | 12.9 | 7.4 | 10.4 | 16400 | 19 | 15 | 2.1 | | 4 | 42 | 190 | 600 | 840 |
| 8335 | MAZE | 05/03/88 | 7:38 | 15.7 | 7.8 | 8.3 | 1480 | 28 | 25 | 3.8 | | 390 | 160 | 120 | 41 | 710 |
| 8427 | MAZE | 06/14/88 | 7:20 | | | | | | | | 4.1 | 250 | 160 | 120 | 20 | 550 |
| 8426 | MAZE | 06/14/88 | 7:20 | 23.0 | 7.8 | 6.9 | 1350 | 52 | 40 | 3.6 | | 370 | 190 | 100 | 18 | 680 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <------------- | | ug/L | | -----------> |
| 8462 | MAZE | 07/12/88 | 7:19 | | | | | | | | 4.2 | 440 | 280 | 160 | 34 | 910 |
| 8461 | MAZE | 07/12/88 | 7:19 | 23.5 | 7.9 | 7.1 | 1530 | 64 | 35 | 4.0 | | 650 | 240 | 160 | 26 | 1100 |
| 8584 | MAZE | 08/09/88 | 9:00 | 22.4 | 7.8 | 6.8 | 1360 | | | | 4.3 | 310 | 180 | 120 | 27 | 640 |
| 8583 | MAZE | 08/09/88 | 9:00 | 22.4 | 7.8 | 6.8 | 1360 | 96 | 40 | 4.0 | | 530 | 160 | 98 | 16 | 800 |
| 8687 | MAZE | 09/06/88 | 7:20 | 24.6 | 7.8 | 6.1 | | | | | 4.2 | 270 | 210 | 150 | 42 | 670 |
| 8686 | MAZE | 09/06/88 | 7:20 | 24.6 | 7.8 | 6.1 | 1480 | 33 | 40 | 4.1 | | 390 | 220 | 120 | 41 | 770 |
| 8712 | MAZE | 10/04/88 | 7:34 | 18.5 | 8.0 | 8.8 | | | 25 | 4.6 | | 310 | 230 | 170 | 25 | 740 |
| 8713 | MAZE | 10/04/88 | 7:34 | 18.5 | 8.0 | 8.8 | | | | | 4.4 | 260 | 190 | 140 | 30 | 620 |
| 8712 | MAZE | 10/04/88 | 7:34 | 18.5 | 8.0 | 8.8 | 1530 | 22 | 25 | 4.6 | | 310 | 230 | 170 | 25 | 740 |
| 8743 | MAZE | 11/01/88 | 8:54 | 15.8 | 7.5 | 8.3 | | | | | 3.6 | 140 | 150 | 120 | 18 | 430 |
| 8742 | MAZE | 11/01/88 | 8:54 | 15.8 | 7.5 | 8.3 | 1290 | 21 | 25 | 4.4 | | 260 | 150 | 110 | -1 | 520 |
| 8812 | MAZE | 12/13/88 | 8:57 | 10.4 | 7.4 | 9.3 | 1280 | 14 | 20 | 4.6 | | 310 | 240 | 130 | 16 | 700 |
| 7118 | MCCORWIL01 | 03/25/87 | 12:00 | 15.0 | 7.2 | 9.2 | 494 | 44 | 15 | 4.3 | | 460 | 40 | 4 | -1 | 500 |
| 7312 | MCCORWIL01 | 08/07/87 | 12:10 | 22.0 | 6.9 | 6.5 | 186 | 60 | | | | 400 | 11 | -1 | -1 | 410 |
| 7483 | MCCORWIL01 | 10/20/87 | 7:00 | 16.4 | 7.3 | 5.5 | 337 | 34 | 5 | 6.7 | | 1000 | 40 | 10 | -1 | 1100 |
| 8165 | MCCORWIL01 | 03/08/88 | 10:28 | 12.5 | 7.3 | | 386 | 10 | 25 | 6.9 | | 750 | 25 | 2 | -1 | 780 |
| 8266 | MCCORWIL01 | 04/18/88 | 11:23 | 17.5 | 6.9 | 6.1 | 333 | 22 | 60 | 7.3 | | | | | | |
| 8375 | MCCORWIL01 | 05/09/88 | 10:02 | | | | 250 | 16 | 60 | | 6.4 | 670 | 47 | 1 | -1 | 720 |
| 8351 | MCCORWIL01 | 05/09/88 | 10:27 | 22.2 | 7.1 | 4.8 | 250 | 16 | 60 | | 6.6 | 610 | 41 | 7 | -1 | 660 |
| 8487 | MCCORWIL01 | 07/18/88 | 10:48 | 25.5 | 7.0 | 4.9 | 166 | 32 | 80 | | 3.3 | 380 | 8 | -1 | -1 | 390 |
| 9016 | MCCORWIL01 | 01/03/89 | 12:35 | 7.6 | 7.6 | 10.6 | 311 | 16 | 40 | | 8.0 | 390 | 20 | 3 | -1 | 410 |
| 7119 | MCCORWIL02 | 03/25/87 | 12:45 | 17.0 | 7.2 | 9.8 | 487 | 23 | 5 | 4.2 | | 370 | 36 | 3 | -1 | 410 |
| 7313 | MCCORWIL02 | 08/07/87 | 12:45 | 25.3 | 7.7 | 7.1 | 173 | 54 | | | 2.3 | 380 | 9 | -1 | -1 | 390 |
| 7484 | MCCORWIL02 | 10/20/87 | 7:20 | 15.0 | 7.2 | 4.9 | 355 | 96 | 0 | 4.7 | | 82 | 16 | -1 | -1 | 98 |
| 8166 | MCCORWIL02 | 03/08/88 | 10:44 | 9.5 | 7.3 | | 458 | 20 | 25 | 6.2 | | 760 | 30 | -1 | 1 | 790 |
| 8267 | MCCORWIL02 | 04/18/88 | 11:54 | 17.5 | 6.9 | 6.6 | 153 | 29 | 80 | 8.1 | | | | | | |
| 8352 | MCCORWIL02 | 05/09/88 | 10:52 | 21.7 | 7.4 | 6.2 | 204 | 31 | 30 | | 4.7 | 650 | 14 | -1 | -1 | 660 |
| 8488 | MCCORWIL02 | 07/18/88 | 11:13 | 25.4 | 6.9 | 4.9 | 167 | 56 | 100 | 3.6 | | 430 | 8 | -1 | -1 | 440 |
| 5009 | MIDDLER | 02/06/85 | 8:30 | 6.5 | 7.3 | 11.2 | 391 | 13 | 25 | | | 780 | 84 | 20 | -1 | 880 |
| 5025 | MIDDLER | 03/06/85 | 9:00 | 10.0 | 7.4 | 10.0 | 339 | 12 | | | | | | | | |
| 5043 | MIDDLER | 04/05/85 | 7:30 | 17.0 | 7.5 | 8.9 | 378 | 6 | 5 | | | 300 | 76 | 16 | -1 | 390 |
| 5059 | MIDDLER | 05/01/85 | 6:50 | 19.0 | 7.6 | 9.3 | 303 | 9 | 10 | | | 410 | 68 | 10 | -1 | 490 |
| 5075 | MIDDLER | 06/05/85 | 6:40 | 20.0 | 7.8 | 9.0 | 252 | 17 | 5 | | | 550 | 67 | 8 | -1 | 630 |
| 5097 | MIDDLER | 06/07/85 | 8:05 | 23.5 | 7.7 | 8.9 | 256 | 16 | | | | | | | | |
| 5110 | MIDDLER | 08/01/85 | 7:00 | 22.0 | 7.4 | 7.8 | 331 | 12 | 20 | | | 660 | 110 | 26 | 1 | 800 |
| 5136 | MIDDLER | 10/23/85 | 11:15 | 18.0 | 7.5 | 9.4 | 396 | 7 | 10 | | | 380 | 120 | 45 | 2 | 550 |
| 5171 | MIDDLER | 12/03/85 | 12:15 | 11.5 | 7.4 | 10.3 | 464 | 8 | 12 | | | 340 | 160 | 68 | 5 | 570 |
| 6029 | MIDDLER | 03/11/86 | 10:30 | 14.5 | 7.3 | 8.2 | 343 | 24 | 25 | | | 530 | 110 | 12 | -1 | 650 |
| 6044 | MIDDLER | 04/17/86 | 7:30 | 14.0 | 7.3 | 8.8 | 213 | 12 | 25 | | | 440 | 60 | 9 | -1 | 510 |
| 6079 | MIDDLER | 05/13/86 | 8:30 | 19.5 | 7.3 | 8.1 | 270 | 13 | 30 | | | 480 | 76 | 11 | -1 | 570 |
| 6110 | MIDDLER | 06/11/86 | 6:15 | 22.5 | 7.3 | 7.8 | 272 | 14 | 20 | | | 380 | 35 | 6 | -1 | 420 |
| 6129 | MIDDLER | 07/09/86 | 6:30 | 23.5 | 7.3 | 7.7 | 263 | 14 | 15 | | | 320 | 52 | 5 | -1 | 380 |
| 6149 | MIDDLER | 08/13/86 | 6:30 | 23.0 | 7.3 | 7.3 | 260 | 16 | 10 | | | | | | | |
| 6196 | MIDDLER | 09/11/86 | 6:30 | 21.5 | 7.3 | 7.5 | 284 | 16 | 20 | | | 340 | 68 | 13 | -1 | 420 |
| 6281 | MIDDLER | 11/19/86 | 11:55 | 14.5 | 7.4 | 9.1 | 230 | 9 | 15 | 2.4 | | 380 | 41 | 6 | -1 | 430 |
| 6298 | MIDDLER | 12/10/86 | 12:50 | 10.0 | 7.2 | 9.6 | 255 | 12 | 10 | 2.8 | | | | | | |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> ug/L | | | | |
| 7006 | MIDDLER | 01/13/87 | 12:15 | 8.5 | 7.3 | 10.0 | 333 | 6 | 20 | 4.6 | | 310 | 74 | 7 | -1 | 390 |
| 7048 | MIDDLER | 02/10/87 | 11:45 | 11.5 | 7.2 | 9.8 | 384 | 9 | 20 | 5.3 | | 520 | 78 | 280 | -1 | 880 |
| 7067 | MIDDLER | 03/10/87 | 12:00 | 13.5 | 7.1 | 8.8 | 436 | 11 | 20 | 5.1 | | 340 | 68 | 9 | -1 | 420 |
| 7169 | MIDDLER | 04/16/87 | 10:00 | 20.0 | 7.2 | 7.8 | 440 | 8 | 10 | 4.1 | | 540 | 100 | 15 | -1 | 660 |
| 7204 | MIDDLER | 05/20/87 | 9:30 | 21.5 | 7.2 | 6.8 | 293 | 10 | 10 | 2.4 | | 320 | 61 | 12 | -1 | 390 |
| 7242 | MIDDLER | 06/11/87 | 10:45 | 23.0 | 6.9 | 8.9 | 404 | 9 | 15 | 2.8 | | 290 | 82 | 21 | -1 | 390 |
| 7404 | MIDDLER | 09/24/87 | 10:00 | 21.6 | 7.3 | 7.1 | 603 | 8 | 15 | 3.0 | | 210 | 89 | 41 | 4 | 340 |
| 7447 | MIDDLER | 10/28/87 | 10:15 | 20.5 | 7.3 | 7.3 | 565 | 6 | 5 | 2.9 | | 194 | 151 | 85 | 9 | 440 |
| 7545 | MIDDLER | 11/24/87 | 11:45 | 14.5 | 7.2 | 8.5 | 645 | 5 | 10 | 3.5 | | 290 | 120 | 66 | 6 | 480 |
| 7604 | MIDDLER | 12/16/87 | 7:45 | 9.6 | 7.5 | 11.1 | 581 | 12 | 25 | 4.7 | | 460 | 130 | 40 | 3 | 630 |
| 8072 | MIDDLER | 01/21/88 | 7:39 | 7.8 | 7.2 | 10.8 | 445 | 13 | 50 | 5.9 | | 620 | 130 | 22 | -1 | 770 |
| 8130 | MIDDLER | 02/23/88 | 7:15 | 12.0 | 7.2 | 10.8 | 321 | 9 | 20 | 3.7 | | 260 | 40 | 4 | -1 | 300 |
| 8221 | MIDDLER | 03/24/88 | 7:30 | 17.9 | 7.2 | 9.4 | 472 | 4 | 20 | 2.9 | | 270 | 68 | 25 | 2 | 370 |
| 8320 | MIDDLER | 04/28/88 | 7:35 | 17.5 | 7.7 | 8.7 | 324 | 9 | 25 | 2.9 | | 390 | 70 | 19 | -1 | 480 |
| 8397 | MIDDLER | 05/26/88 | 9:30 | 19.5 | 8.2 | 8.6 | 340 | 25 | 40 | 2.7 | | 380 | 59 | 15 | -1 | 450 |
| 8429 | MIDDLER | 06/22/88 | 7:34 | 23.0 | 7.0 | 6.8 | 396 | 15 | 40 | 3.9 | | 360 | -1 | 28 | -1 | 390 |
| 8464 | MIDDLER | 07/14/88 | 10:00 | 22.4 | 7.4 | 7.4 | | | 35 | 3.9 | | 500 | 83 | 30 | 2 | 620 |
| 8602 | MIDDLER | 08/10/88 | 8:23 | 22.7 | 7.9 | | | | 25 | | 3.1 | 350 | 130 | 41 | 2 | 520 |
| 8586 | MIDDLER | 08/16/88 | 9:40 | 22.9 | 7.4 | 7.5 | 401 | 9 | 25 | 2.3 | | 270 | 90 | 50 | 4 | 410 |
| 8620 | MIDDLER | 08/17/88 | 9:46 | 23.4 | 7.6 | | 401 | 11 | 25 | | 3.1 | 200 | 81 | 45 | 2 | 330 |
| 8628 | MIDDLER | 08/17/88 | 9:34 | 23.4 | 7.7 | | 398 | 9 | 20 | | 2.9 | 270 | 82 | 49 | 2 | 400 |
| 8650 | MIDDLER | 08/24/88 | 9:25 | 22.8 | 7.8 | | 373 | 8 | 20 | | 3.0 | 760 | 84 | 39 | 3 | 890 |
| 8649 | MIDDLER | 08/24/88 | 9:35 | 22.8 | 7.8 | | 373 | 10 | 20 | | 3.3 | 220 | 81 | 37 | 3 | 340 |
| 8665 | MIDDLER | 08/31/88 | 9:35 | 23.6 | 8.5 | | | | 20 | | 4.7 | 370 | 110 | 51 | 6 | 540 |
| 8698 | MIDDLER | 09/22/88 | 7:32 | 20.3 | 7.3 | 7.6 | 442 | 6 | 20 | 2.7 | | 320 | 68 | 24 | 8 | 420 |
| 8727 | MIDDLER | 10/20/88 | 8:55 | 19.8 | 7.3 | 8.0 | 501 | 36 | 25 | 4.9 | | 660 | 66 | 55 | 4 | 790 |
| 8749 | MIDDLER | 11/10/88 | 9:05 | 16.7 | 8.0 | 8.5 | 660 | 5 | 30 | 3.6 | | 280 | 140 | 110 | 11 | 540 |
| 8780 | MIDDLER | 11/30/88 | 12:10 | 11.8 | 7.9 | 9.9 | 596 | 5 | 25 | | 4.7 | 370 | 180 | 82 | 6 | 640 |
| 8794 | MIDDLER | 12/07/88 | 11:00 | 10.6 | 8.2 | 9.4 | 529 | 11 | 25 | | 5.1 | 410 | 110 | 32 | 4 | 560 |
| 8823 | MIDDLER | 12/20/88 | 10:55 | 8.5 | 7.9 | 10.0 | 603 | 9 | 35 | | 5.5 | 660 | 190 | 64 | 3 | 920 |
| 8832 | MIDDLER | 12/20/88 | 10:20 | 10.7 | 7.3 | 10.7 | 608 | 8 | 35 | 5.7 | | 590 | 200 | 87 | 5 | 880 |
| 8850 | MIDDLER | 12/28/88 | 9:59 | 7.0 | 7.7 | 11.4 | 564 | 7 | 35 | | 5.8 | 570 | 140 | 48 | 3 | 760 |
| 9064 | MIDDLER | 01/11/89 | 10:15 | 6.2 | 8.0 | | 469 | 9 | 35 | | 5.7 | 590 | 130 | 44 | 1 | 770 |
| 9084 | MIDDLER | 01/18/89 | 10:15 | 6.9 | 7.2 | 10.6 | 414 | 8 | 35 | | 5.7 | 520 | 100 | 26 | -1 | 650 |
| 9109 | MIDDLER | 01/26/89 | 9:40 | 7.5 | | 11.2 | 434 | 7 | 30 | | | 330 | 84 | 16 | 1 | 430 |
| 9096 | MIDDLER | 01/31/89 | 9:45 | 9.6 | 7.0 | 10.9 | 428 | 6 | 35 | 4.6 | | 320 | 99 | 25 | 2 | 450 |
| 9122 | MIDDLER | 02/02/89 | 10:45 | 8.1 | 7.6 | 10.3 | 449 | 5 | 25 | | 4.8 | 320 | 94 | 29 | 2 | 450 |
| 9186 | MIDDLER | 02/28/89 | 9:20 | 13.1 | 6.8 | 10.4 | 438 | 6 | 20 | 3.6 | | 700 | 150 | 58 | 2 | 910 |
| 9239 | MIDDLER | 03/28/89 | 7:49 | 15.5 | 7.0 | 7.7 | 271 | 10 | 35 | 4.9 | | 570 | 83 | 18 | -1 | 670 |
| 9336 | MIDDLER | 04/25/89 | 7:12 | 16.7 | 8.4 | 8.5 | 200 | 8 | 25 | 3.3 | | 370 | 34 | 3 | -1 | 410 |
| 9366 | MIDDLER | 05/23/89 | 7:03 | 19.4 | 8.3 | 8.0 | 259 | | 25 | 3.1 | | 340 | 44 | 6 | -1 | 390 |
| 9379 | MIDDLER | 06/01/89 | 9:50 | 20.5 | 8.0 | 11.2 | 255 | 13 | 30 | | 4.3 | 330 | 40 | 5 | -1 | 370 |
| 9392 | MIDDLER | 06/08/89 | 9:15 | 21.3 | 7.8 | 9.5 | 240 | 17 | 35 | | 3.2 | 290 | 27 | 2 | -1 | 320 |
| 9405 | MIDDLER | 06/15/89 | 7:15 | 24.3 | 7.5 | 7.1 | 271 | 16 | 30 | | 2.9 | 400 | 60 | 13 | -1 | 470 |
| 9418 | MIDDLER | 06/19/89 | 8:11 | 22.4 | 7.5 | 7.1 | 255 | 16 | 40 | | 2.6 | 330 | 55 | 9 | -1 | 390 |
| 9486 | MIDDLER | 06/21/89 | 8:45 | 22.7 | 7.4 | 7.3 | 257 | 17 | 35 | | 2.8 | 211 | 49 | 8 | 0 | 270 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 (ug/L) | CHBrCl2 (ug/L) | CHBr2Cl (ug/L) | CHBr3 (ug/L) | TTHMFP (ug/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential----> | | | | |
| 9499 | MIDDLER | 07/06/89 | 6:30 | 23.6 | 7.6 | 7.2 | 248 | 12 | 35 | | 3.1 | 480 | 53 | 8 | 0 | 540 |
| 9512 | MIDDLER | 07/13/89 | 9:10 | 24.2 | 8.0 | 8.0 | 229 | 9 | 25 | | 2.8 | 360 | 49 | 8 | 0 | 420 |
| 9560 | MIDDLER | 07/18/89 | 9:15 | 26.6 | 7.2 | 7.8 | 244 | 12 | 25 | | 2.8 | 310 | 44 | 1 | 0 | 360 |
| 9525 | MIDDLER | 07/20/89 | 9:17 | 24.8 | 6.5 | 7.9 | 248 | 11 | 35 | | 3.2 | 370 | 55 | 10 | 0 | 440 |
| 9588 | MIDDLER | 07/25/89 | 9:50 | 25.7 | 7.8 | 8.2 | 200 | 10 | | | | 360 | 84 | 11 | 0 | 460 |
| 9538 | MIDDLER | 07/27/89 | 9:05 | 24.2 | 7.4 | 8.1 | 229 | 10 | 20 | | 2.7 | 320 | 50 | 10 | 0 | 380 |
| 8603 | MIDWOODWARD | 08/10/88 | 8:10 | 22.6 | 7.8 | | | | 20 | | 2.8 | 230 | 94 | 40 | 2 | 370 |
| 8644 | MIDWOODWARD | 08/10/88 | 8:10 | | | | | | | | | 210 | 86 | 33 | 2 | 330 |
| 8643 | MIDWOODWARD | 08/17/88 | 9:34 | | | | | | | 2.5 | | 230 | 94 | 49 | 2 | 380 |
| 8651 | MIDWOODWARD | 08/24/88 | 9:25 | | | | | | | 2.4 | | 1200 | 73 | 41 | 4 | 1300 |
| 8666 | MIDWOODWARD | 08/31/88 | 9:25 | 23.7 | 8.4 | | | | 20 | | 3.5 | 300 | 93 | 50 | 3 | 450 |
| 8667 | MIDWOODWARD | 08/31/88 | 9:25 | 23.7 | 8.4 | | | | | 2.9 | | 260 | 89 | 46 | 3 | 400 |
| 8793 | MIDWOODWARD | 12/07/88 | 10:45 | 10.5 | 8.0 | 9.2 | 511 | 10 | 30 | | 5.0 | 410 | 150 | 54 | 3 | 620 |
| 8822 | MIDWOODWARD | 12/20/88 | 10:40 | 8.5 | 7.8 | 9.9 | 611 | 9 | 30 | | 5.3 | 440 | 170 | 69 | 3 | 680 |
| 8849 | MIDWOODWARD | 12/28/88 | 9:02 | 6.5 | 7.5 | 11.1 | 586 | 10 | 40 | | 7.2 | 780 | 180 | 32 | -1 | 990 |
| 8551 | MOKGEORGIANA | 07/19/88 | 9:50 | 24.0 | 7.6 | 7.5 | 151 | 7 | 10 | | 1.5 | 370 | 15 | -1 | -1 | 380 |
| 8610 | MOKGEORGIANA | 08/10/88 | 7:56 | 21.8 | 7.6 | | 164 | 8 | 10 | | 2.2 | 290 | 37 | 9 | -1 | 340 |
| 8625 | MOKGEORGIANA | 08/17/88 | 7:53 | 21.8 | | | 175 | 9 | 15 | | 1.9 | 300 | 15 | -1 | -1 | 310 |
| 8652 | MOKGEORGIANA | 08/24/88 | 7:52 | 21.8 | 7.9 | | 187 | 8 | 10 | | 2.4 | 1200 | 16 | -1 | -1 | 1200 |
| 8668 | MOKGEORGIANA | 08/31/88 | 8:00 | 24.0 | 6.8 | | | | 10 | | 3.0 | 290 | -1 | 15 | -1 | 310 |
| 8775 | MOKGEORGIANA | 11/30/88 | 9:47 | 9.9 | 8.4 | 8.9 | 175 | 29 | 50 | | 6.4 | 620 | 27 | 2 | -1 | 650 |
| 8789 | MOKGEORGIANA | 12/07/88 | 9:00 | 10.2 | 8.0 | 10.3 | 196 | 9 | 15 | | 5.4 | 290 | 28 | 3 | -1 | 320 |
| 8819 | MOKGEORGIANA | 12/20/88 | 9:20 | 8.5 | 7.9 | 11.0 | 179 | 8 | 10 | | 2.0 | 210 | 15 | 1 | -1 | 230 |
| 9060 | MOKGEORGIANA | 01/11/89 | 8:55 | 6.4 | 8.1 | | 200 | 13 | 30 | | 3.7 | 360 | 19 | 1 | -1 | 380 |
| 9080 | MOKGEORGIANA | 01/18/89 | 10:43 | 7.9 | 6.9 | 11.4 | 201 | 14 | 30 | | 3.2 | 380 | 18 | 1 | -1 | 400 |
| 9105 | MOKGEORGIANA | 01/26/89 | 7:50 | 7.3 | 7.4 | 11.2 | 261 | 6 | 20 | | | 200 | 18 | 4 | -1 | 220 |
| 9118 | MOKGEORGIANA | 02/02/89 | 9:50 | 8.4 | 7.6 | 10.4 | 213 | 6 | 20 | | 2.7 | 250 | 20 | 2 | -1 | 270 |
| 9375 | MOKGEORGIANA | 06/01/89 | 8:10 | 19.6 | 7.8 | 8.7 | 157 | 7 | 5 | | 2.6 | 210 | 12 | -1 | -1 | 220 |
| 9388 | MOKGEORGIANA | 06/08/89 | 7:55 | 20.4 | 7.9 | 9.3 | 152 | 7 | 5 | | 2.1 | 250 | 12 | -1 | -1 | 260 |
| 9401 | MOKGEORGIANA | 06/15/89 | 6:45 | 21.5 | 8.5 | 8.2 | 164 | 9 | 10 | | 3.0 | 480 | 41 | 5 | -1 | 530 |
| 9414 | MOKGEORGIANA | 06/19/89 | 6:39 | 20.6 | 7.9 | 8.5 | 155 | 6 | 10 | | 2.0 | 250 | 11 | -1 | -1 | 260 |
| 9495 | MOKGEORGIANA | 07/06/89 | 7:15 | 21.2 | 7.8 | 9.2 | 145 | 7 | 10 | | 2.2 | 360 | 100 | 7 | 0 | 470 |
| 9508 | MOKGEORGIANA | 07/13/89 | 6:33 | 21.5 | 7.9 | 8.7 | 144 | 10 | 10 | | 3.0 | 280 | 25 | 12 | 0 | 320 |
| 9521 | MOKGEORGIANA | 07/20/89 | 8:20 | 22.5 | 6.6 | 9.1 | 127 | 8 | 10 | | 1.8 | 270 | 9 | 0 | 0 | 280 |
| 9596 | MOKGEORGIANA | 07/25/89 | 8:00 | 21.4 | 7.7 | 9.1 | 120 | 10 | | | | 350 | 10 | 0 | 0 | 360 |
| 9534 | MOKGEORGIANA | 07/27/89 | 8:09 | 21.3 | 7.3 | 9.2 | 120 | 20 | 5 | | 1.7 | 220 | 8 | 0 | 0 | 230 |
| 7123 | MOSSDALE01 | 03/31/87 | 7:15 | 14.0 | 7.2 | 6.0 | 1650 | 6 | 25 | 12.0 | | 800 | 250 | 59 | -1 | 1100 |
| 7317 | MOSSDALE01 | 08/14/87 | 9:20 | 18.9 | 6.9 | 2.9 | 842 | 72 | | | 7.2 | 860 | 110 | 16 | -1 | 990 |
| 7488 | MOSSDALE01 | 10/15/87 | 12:10 | 17.4 | 7.5 | 4.7 | 630 | 4 | 0 | 2.5 | | 120 | 76 | 29 | 5 | 230 |
| 8355 | MOSSDALE01 | 05/09/88 | 8:32 | 16.4 | 7.1 | 2.8 | 680 | 23 | 30 | | 3.4 | 290 | 120 | 46 | -1 | 460 |
| 8492 | MOSSDALE01 | 07/18/88 | 7:02 | 24.0 | 7.6 | 8.1 | 1000 | 260 | 100 | | 6.8 | 420 | 150 | 44 | 2 | 620 |
| 7124 | MOSSDALE02 | 03/31/87 | 7:30 | 15.0 | 7.6 | 2.4 | 722 | 50 | 5 | 3.3 | | 220 | 94 | 29 | -1 | 340 |
| 7318 | MOSSDALE02 | 08/14/87 | 9:05 | 20.0 | 7.3 | 3.6 | 690 | 22 | | | 3.7 | 520 | 120 | 27 | -1 | 670 |
| 8036 | MOSSDALE02 | 01/12/88 | 9:30 | 10.7 | 7.3 | 5.0 | 667 | 88 | 15 | 2.5 | | 210 | 80 | 24 | 3 | 320 |
| 8173 | MOSSDALE02 | 03/08/88 | 9:30 | 14.7 | 7.5 | 5.0 | 699 | 9 | 15 | 3.3 | | 390 | 150 | 40 | 7 | 590 |
| 8271 | MOSSDALE02 | 04/18/88 | 9:29 | 14.9 | 7.3 | 4.2 | 1770 | 13 | 50 | 10.0 | | | | | | |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <------------- | ug/L | | | ----------> |
| 8356 | MOSSDALE02 | 05/09/88 | 8:46 | 18.3 | 8.5 | 9.0 | 923 | 4 | 15 | | 3.4 | 350 | 150 | 130 | 17 | 650 |
| 8493 | MOSSDALE02 | 07/18/88 | 7:18 | 24.0 | 7.6 | 6.7 | 942 | 46 | 70 | 5.4 | | 400 | 140 | 77 | 5 | 620 |
| 7125 | MOSSDALE03 | 03/31/87 | 8:15 | 13.5 | 7.0 | 4.6 | 513 | 22 | 5 | 2.4 | | 190 | 78 | 16 | -1 | 280 |
| 7319 | MOSSDALE03 | 08/14/87 | 8:45 | 16.5 | 6.9 | 3.5 | 980 | 52 | | | 8.4 | 1100 | 160 | 22 | -1 | 1300 |
| 7126 | MOSSDALE04 | 03/31/87 | 8:35 | 16.0 | 7.5 | 3.0 | 519 | 4 | 0 | 1.5 | | 150 | 68 | 19 | -1 | 240 |
| 7158 | MOSSDALE04 | 03/31/87 | 8:35 | 16.0 | 7.5 | 3.0 | 7126 | | | 1.6 | | 170 | 87 | 19 | -1 | 280 |
| 7320 | MOSSDALE04 | 08/14/87 | 8:10 | 17.8 | 7.3 | 4.3 | 1970 | 13 | | | 5.9 | 690 | 300 | 78 | 16 | 1100 |
| 7491 | MOSSDALE04 | 10/15/87 | 11:30 | 15.4 | 7.9 | 4.1 | 1330 | 24 | 50 | 8.0 | | 590 | 210 | 72 | 9 | 880 |
| 8038 | MOSSDALE04 | 01/12/88 | 10:00 | 6.4 | 7.6 | 6.3 | 689 | 80 | 80 | 5.9 | | 620 | 97 | 29 | -1 | 750 |
| 8175 | MOSSDALE04 | 03/08/88 | 10:07 | 13.0 | 7.5 | 4.7 | 1080 | 46 | 60 | 7.6 | | 680 | 170 | 56 | 4 | 910 |
| 8273 | MOSSDALE04 | 04/18/88 | 10:00 | 15.7 | 8.3 | 11.5 | 1540 | 16 | 80 | 9.4 | | | | | | |
| 8358 | MOSSDALE04 | 05/09/88 | 9:15 | 17.6 | 7.5 | 5.0 | 2070 | 51 | 40 | | 6.0 | 490 | 270 | 170 | 39 | 970 |
| 8495 | MOSSDALE04 | 07/18/88 | 8:00 | 25.0 | 7.7 | 6.9 | 1120 | 25 | 90 | | 9.1 | 840 | 240 | 73 | 2 | 1200 |
| 7127 | MOSSDALE05 | 03/31/87 | 9:00 | 13.5 | 7.0 | 5.6 | 1370 | 15 | 20 | 16.0 | | 930 | 130 | 11 | -1 | 1100 |
| 7321 | MOSSDALE05 | 08/14/87 | 7:20 | 17.9 | 7.2 | 3.4 | 922 | 7 | | | 7.1 | 950 | 130 | 24 | -1 | 1100 |
| 7128 | MOSSDALE06 | 03/31/87 | 9:20 | 16.0 | 8.0 | 1.8 | 2410 | 34 | 30 | 14.0 | | 640 | 330 | 170 | 23 | 1200 |
| 7322 | MOSSDALE06 | 08/05/87 | 10:45 | 23.5 | 7.1 | 1.0 | 969 | 12 | | | 18.0 | 2300 | 210 | 14 | -1 | 2500 |
| 7129 | MOSSDALE08 | 03/31/87 | 10:00 | 13.0 | 7.3 | 0.6 | 1100 | 28 | 75 | 37.0 | | 1500 | 290 | 30 | -1 | 1800 |
| 7324 | MOSSDALE08 | 08/05/87 | 10:05 | 24.6 | 7.3 | 6.1 | 886 | 32 | | | 4.4 | 500 | 200 | 110 | 7 | 820 |
| 7521 | MOSSDALE08 | 10/15/87 | 10:40 | 15.2 | 7.0 | 2.8 | 897 | 230 | 40 | 10.0 | | 730 | 150 | 39 | -1 | 920 |
| 7495 | MOSSDALE08 | 10/15/87 | 8:40 | 14.9 | 7.1 | 2.5 | 914 | 140 | 40 | 8.1 | | 520 | 140 | 37 | -1 | 700 |
| 8275 | MOSSDALE08 | 04/18/88 | 10:48 | 15.4 | 7.5 | 11.5 | 896 | 7 | 80 | 10.0 | | | | | | |
| 7131 | MOSSDALE09 | 03/31/87 | 11:45 | 15.5 | 8.1 | 7.5 | 2470 | 2 | 25 | 10.0 | | 330 | 320 | 240 | 47 | 940 |
| 7325 | MOSSDALE09 | 08/05/87 | 9:50 | 22.1 | 7.4 | 7.1 | 917 | 7 | | | 9.1 | 1200 | 190 | 46 | 2 | 1400 |
| 7496 | MOSSDALE09 | 10/15/87 | 8:50 | 14.5 | 7.3 | 6.2 | 971 | 38 | 15 | 7.2 | | 310 | 150 | 93 | 6 | 560 |
| 7522 | MOSSDALE09 | 10/15/87 | 10:10 | 14.1 | 7.1 | 5.8 | 958 | 38 | 10 | 8.8 | | 450 | 150 | 81 | 3 | 680 |
| 8276 | MOSSDALE09 | 04/18/88 | 10:37 | 15.6 | 7.3 | 3.9 | 1010 | 8 | 25 | 6.0 | | | | | | |
| 7132 | MOSSDALE10 | 03/31/87 | 12:10 | 19.5 | 7.3 | 10.2 | 773 | 9 | 25 | 13.0 | | 470 | 74 | 7 | -1 | 550 |
| 7326 | MOSSDALE10 | 08/14/87 | 10:05 | 18.3 | 7.3 | 2.0 | 1370 | 3 | | | 5.6 | 640 | 180 | 67 | 4 | 890 |
| 7497 | MOSSDALE10 | 10/15/87 | 12:35 | 14.8 | 7.3 | 1.8 | 1290 | 4 | 20 | 5.7 | | 300 | 140 | 42 | 1 | 480 |
| 8043 | MOSSDALE10 | 01/12/88 | 8:50 | 9.3 | 7.1 | 2.1 | 1520 | 5 | 50 | 13.0 | | 1300 | 190 | 29 | 1 | 1500 |
| 8171 | MOSSDALE10 | 03/08/88 | 8:45 | 11.9 | 6.0 | 1.6 | 1360 | 7 | 80 | 12.0 | | 1000 | 240 | 45 | 1 | 1300 |
| 8277 | MOSSDALE10 | 04/18/88 | 8:49 | 14.0 | 7.3 | 1.6 | 1340 | 4 | 80 | 17.0 | | | | | | |
| 8362 | MOSSDALE10 | 05/09/88 | 7:54 | 16.8 | 7.2 | 2.5 | 900 | 2 | 60 | | 10.0 | 980 | 200 | 31 | -1 | 1200 |
| 8499 | MOSSDALE10 | 07/18/88 | 5:27 | 22.5 | 7.5 | 2.0 | 992 | 9 | 50 | | 6.7 | 490 | 150 | 55 | 2 | 700 |
| 7327 | MOSSDALE11 | 08/14/87 | 9:45 | 18.2 | 7.5 | 9.2 | 268 | 34 | | | 5.0 | 730 | 36 | 3 | -1 | 770 |
| 8044 | MOSSDALE11 | 01/12/88 | 9:10 | 6.8 | 7.3 | 5.5 | 605 | 250 | 20 | 3.4 | | 460 | 83 | 20 | -1 | 560 |
| 8172 | MOSSDALE11 | 03/08/88 | 9:00 | 11.4 | 7.3 | 2.0 | 653 | 170 | 40 | 4.5 | | 110 | 120 | 30 | -1 | 260 |
| 8278 | MOSSDALE11 | 04/18/88 | 9:09 | 15.5 | 7.3 | 4.9 | 564 | 15 | 80 | 12.0 | | | | | | |
| 8363 | MOSSDALE11 | 05/09/88 | 8:14 | 17.8 | 8.0 | 6.1 | 589 | 19 | 120 | | 17.0 | 1600 | 100 | 5 | -1 | 1700 |
| 8500 | MOSSDALE11 | 07/18/88 | 6:00 | 23.0 | 7.4 | 3.2 | 1080 | 14 | 70 | | 7.1 | 440 | 190 | 77 | 7 | 710 |
| 7120 | MOSSTRPP01 | 03/30/87 | 12:00 | 21.5 | 6.8 | 8.8 | 1130 | 7 | 0 | 4.4 | | 230 | 140 | 38 | 12 | 420 |
| 7121 | MOSSTRPP02 | 03/30/87 | 13:15 | 19.0 | 7.2 | 4.8 | 1040 | 2 | 10 | 5.8 | | 290 | 190 | 77 | 27 | 580 |
| 7315 | MOSSTRPP02 | 08/14/87 | 11:05 | 22.6 | 7.5 | 6.2 | 838 | 21 | | | 5.9 | 1200 | 150 | 75 | 4 | 1400 |
| 7486 | MOSSTRPP02 | 10/19/87 | 11:30 | 20.3 | 7.5 | 7.5 | 681 | 19 | 5 | 5.3 | | 620 | 94 | 43 | -1 | 760 |
| 8033 | MOSSTRPP02 | 01/12/88 | 8:00 | 8.1 | 7.5 | 10.6 | 670 | 18 | 40 | 6.0 | | 490 | 110 | 36 | 1 | 640 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> ug/L | | | | |
| 8168 | MOSSTRPP02 | 03/08/88 | 12:40 | 16.9 | 7.4 | 13.1 | 803 | 16 | 50 | 8.8 | | 950 | 180 | 46 | 2 | 1200 |
| 8268 | MOSSTRPP02 | 04/18/88 | 11:50 | 19.0 | 8.1 | 9.0 | 917 | 15 | 40 | 11.0 | | | | | | |
| 8353 | MOSSTRPP02 | 05/09/88 | 9:17 | 17.7 | 8.3 | 10.5 | 918 | 20 | 60 | | 9.6 | 680 | 210 | 89 | 10 | 990 |
| 9019 | MOSSTRPP02 | 01/03/89 | 10:24 | 6.4 | 8.0 | 12.5 | 806 | 7 | 35 | | 7.9 | 610 | 180 | 76 | 6 | 870 |
| 7122 | MOSSTRPP03 | 03/30/87 | 12:45 | 19.0 | 7.8 | 8.9 | 465 | 10 | 15 | 6.5 | | 510 | 92 | 11 | -1 | 610 |
| 7316 | MOSSTRPP03 | 08/14/87 | 10:45 | 22.8 | 7.5 | 7.0 | 601 | 26 | | 9.4 | | 630 | 70 | 27 | -1 | 730 |
| 7487 | MOSSTRPP03 | 10/19/87 | 11:00 | 20.5 | 7.4 | 7.0 | 584 | 23 | 5 | 3.1 | | 460 | 86 | 38 | 2 | 590 |
| 8034 | MOSSTRPP03 | 01/12/88 | 8:20 | 8.2 | 7.3 | 8.2 | 779 | 20 | 60 | 13.0 | | 830 | 78 | 16 | 1 | 930 |
| 8169 | MOSSTRPP03 | 03/08/88 | 13:00 | 17.3 | 7.3 | 17.3 | 951 | 14 | 80 | 10.0 | | 1100 | 220 | 55 | 2 | 1400 |
| 8269 | MOSSTRPP03 | 04/18/88 | 11:33 | 6.6 | 7.7 | 8.9 | 740 | 21 | 40 | 7.3 | | | | | | |
| 8354 | MOSSTRPP03 | 05/09/88 | 8:57 | 16.9 | 8.0 | 8.5 | 512 | 23 | 80 | | 12.0 | 870 | 190 | 34 | -1 | 1100 |
| 7134 | NETHERLAND01 | 03/25/87 | 15:45 | 17.5 | 8.0 | 9.9 | 1550 | 24 | | 5.7 | | 270 | 200 | 76 | 18 | 560 |
| 7328 | NETHERLAND01 | 08/13/87 | 7:30 | 17.6 | 7.5 | 8.1 | 289 | 132 | | | 5.5 | 650 | 32 | 3 | -1 | 690 |
| 7499 | NETHERLAND01 | 10/20/87 | 8:30 | 16.5 | 7.4 | 8.6 | 270 | 106 | 0 | 3.4 | | 180 | 32 | 3 | -1 | 220 |
| 8045 | NETHERLAND01 | 01/12/88 | 8:00 | 5.9 | 7.5 | 10.2 | 825 | 51 | 60 | 6.4 | | 750 | 120 | 30 | -1 | 900 |
| 8180 | NETHERLAND01 | 03/08/88 | 7:38 | 9.1 | 8.1 | | 1250 | 23 | 30 | 5.2 | | 520 | 150 | 62 | 5 | 740 |
| 8301 | NETHERLAND01 | 04/18/88 | 7:09 | 14.0 | 7.3 | 8.3 | 270 | 102 | 20 | 3.3 | | | | | | |
| 8364 | NETHERLAND01 | 05/09/88 | 7:10 | 18.4 | 7.8 | 8.0 | 396 | 80 | 40 | | 3.5 | 430 | 54 | 9 | -1 | 490 |
| 8501 | NETHERLAND01 | 07/18/88 | 7:16 | 21.8 | 7.4 | 7.6 | 222 | 190 | 35 | | 3.1 | 470 | 14 | -1 | -1 | 480 |
| 7135 | NETHERLAND02 | 03/25/87 | 16:15 | 19.5 | 8.0 | 12.0 | 1030 | 125 | 15 | 6.5 | | 750 | 170 | 34 | -1 | 950 |
| 7329 | NETHERLAND02 | 08/13/87 | 7:00 | 18.6 | 7.3 | 5.0 | 243 | 100 | | | 4.1 | 860 | 17 | -1 | -1 | 880 |
| 7500 | NETHERLAND02 | 10/20/87 | 8:00 | 15.7 | 7.3 | 5.6 | 303 | 125 | 5 | 4.4 | | 320 | 38 | -1 | -1 | 360 |
| 8046 | NETHERLAND02 | 01/12/88 | 7:30 | 5.4 | 7.5 | 10.1 | 819 | 54 | 60 | 6.4 | | 740 | 130 | 28 | -1 | 900 |
| 8181 | NETHERLAND02 | 03/08/88 | 7:24 | 7.3 | 8.1 | | 1480 | 44 | 35 | 6.3 | | 630 | 260 | 110 | 8 | 1000 |
| 8279 | NETHERLAND02 | 04/18/88 | 6:37 | 14.0 | 7.1 | 7.0 | 261 | 108 | 60 | 3.5 | | | | | | |
| 8365 | NETHERLAND02 | 05/09/88 | 6:46 | 17.6 | 7.7 | 6.8 | 376 | 92 | 40 | | 5.2 | 380 | 62 | 9 | -1 | 450 |
| 8502 | NETHERLAND02 | 07/18/88 | 6:48 | 22.4 | 7.2 | 4.8 | 206 | 92 | 35 | | 3.2 | 430 | 10 | -1 | -1 | 440 |
| 7136 | PESCADER001 | 04/01/87 | 10:00 | 15.5 | 7.3 | 7.5 | 2040 | 9 | 0 | 4.2 | | 140 | 180 | 90 | 23 | 430 |
| 7330 | PESCADER001 | 08/05/87 | 7:30 | 22.2 | 7.3 | 3.1 | 1480 | 32 | | | 7.3 | 930 | 360 | 160 | 8 | 1500 |
| 7501 | PESCADER001 | 10/15/87 | 6:30 | 16.2 | 7.3 | 6.3 | 2570 | 28 | 5 | 6.3 | | 99 | 194 | 159 | 78 | 530 |
| 8047 | PESCADER001 | 01/12/88 | 6:40 | 8.9 | 7.5 | 7.5 | 2140 | 52 | 20 | 6.8 | | 380 | 340 | 180 | 29 | 930 |
| 8280 | PESCADER001 | 04/18/88 | 7:06 | 16.3 | 7.3 | 6.5 | 1360 | 23 | 25 | 4.7 | | | | | | |
| 8366 | PESCADER001 | 05/09/88 | 11:46 | 18.5 | 8.2 | 10.0 | 1250 | 20 | 35 | | 4.5 | 240 | 210 | 110 | 20 | 580 |
| 8503 | PESCADER001 | 07/18/88 | 13:28 | 32.5 | 7.9 | 7.6 | 1280 | 51 | 50 | | 5.6 | 340 | 180 | 110 | 18 | 650 |
| 7137 | PESCADER002 | 04/01/87 | 8:30 | 16.0 | 7.4 | 8.6 | 1700 | 16 | 5 | 3.8 | | 160 | 180 | 100 | 29 | 470 |
| 7331 | PESCADER002 | 08/05/87 | 8:00 | 22.4 | 7.3 | 5.4 | 1750 | 26 | | | 9.0 | 820 | 450 | 210 | 15 | 1500 |
| 7502 | PESCADER002 | 10/15/87 | 7:00 | 15.3 | 7.3 | 4.0 | 2710 | 95 | 5 | 8.3 | | 110 | 178 | 164 | 97 | 550 |
| 8048 | PESCADER002 | 01/12/88 | 7:00 | 7.4 | 7.5 | 7.5 | 2180 | 52 | 60 | 7.2 | | 350 | 260 | 130 | 25 | 770 |
| 8504 | PESCADER002 | 07/18/88 | 13:56 | 34.5 | 7.7 | 9.0 | 1560 | 44 | 120 | | 8.7 | 560 | 260 | 130 | 21 | 970 |
| 7138 | PESCADER003 | 04/01/87 | 9:30 | 16.5 | 7.6 | 4.8 | 2810 | 19 | 15 | 4.9 | | 110 | 260 | 190 | 96 | 660 |
| 7332 | PESCADER003 | 08/05/87 | 8:30 | 22.2 | 7.3 | 5.9 | 1770 | 57 | | | 5.9 | 460 | 370 | 230 | 24 | 1100 |
| 7503 | PESCADER003 | 10/15/87 | 7:30 | 15.7 | 7.1 | 5.4 | 3160 | 80 | 5 | 7.5 | | 78 | 190 | 210 | 150 | 630 |
| 8049 | PESCADER003 | 01/12/88 | 7:15 | 6.8 | 7.5 | 8.7 | 2560 | 33 | 40 | 9.2 | | 330 | 270 | 140 | 28 | 770 |
| 8282 | PESCADER003 | 04/18/88 | 7:26 | 14.8 | 7.5 | 7.2 | 1200 | 42 | 80 | 12.0 | | | | | | |
| 8367 | PESCADER003 | 05/09/88 | 12:03 | 19.6 | 8.4 | 12.0 | 1370 | 24 | 40 | | 4.5 | 430 | 220 | 150 | 41 | 840 |
| 8505 | PESCADER003 | 07/18/88 | 14:14 | 32.5 | 8.1 | 10.1 | 1850 | 27 | 70 | | 5.9 | 290 | 250 | 180 | 44 | 760 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

APPENDIX B



THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---------- | ug/L | | | ---------> |
| 8283 | PESCADER004 | 04/18/88 | 8:00 | 14.7 | 7.1 | 4.1 | 1400 | 34 | 80 | 16.0 | | | | | | |
| 8506 | PESCADER004 | 07/18/88 | 14:46 | 30.5 | 8.1 | 7.8 | 1890 | 10 | 60 | | 6.7 | 360 | 250 | 140 | 42 | 790 |
| 7140 | PIERSONPP01 | 03/25/87 | 13:45 | 19.5 | 7.2 | 8.8 | 638 | 21 | 50 | 18.0 | | 780 | 160 | 17 | -1 | 960 |
| 7335 | PIERSONPP01 | 08/06/87 | 7:30 | 22.5 | 7.1 | 5.8 | 248 | 26 | | | 3.1 | 580 | 38 | 20 | 2 | 640 |
| 7506 | PIERSONPP01 | 10/16/87 | 6:30 | 15.2 | 7.2 | 6.0 | 337 | 30 | 25 | 8.0 | | 630 | 45 | 2 | -1 | 680 |
| 8052 | PIERSONPP01 | 01/12/88 | 7:00 | 7.4 | 6.7 | 8.2 | 826 | 30 | 80 | 24.0 | | 2500 | 110 | 8 | -1 | 2600 |
| 8187 | PIERSONPP01 | 03/08/88 | 6:58 | 8.2 | 7.4 | | 543 | 60 | 60 | 12.0 | | 2400 | 180 | 5 | -1 | 2600 |
| 8284 | PIERSONPP01 | 04/18/88 | 6:00 | 14.5 | 7.1 | 5.4 | 635 | 19 | 100 | 14.0 | | | | | | |
| 8369 | PIERSONPP01 | 05/09/88 | 6:07 | 16.8 | 7.4 | 6.0 | 463 | 23 | 80 | | 10.0 | 1600 | 72 | 8 | -1 | 1700 |
| 8507 | PIERSONPP01 | 07/18/88 | 6:15 | 22.1 | 6.9 | 4.5 | 268 | 40 | 60 | | 5.5 | 700 | 44 | 2 | -1 | 750 |
| 9035 | PIERSONPP01 | 01/03/89 | 7:33 | 8.0 | | 9.2 | 476 | 19 | 70 | | 10.0 | 880 | 51 | 7 | -1 | 940 |
| 8645 | POTNODE252 | 08/10/88 | 8:51 | | | | | | | | | 230 | 29 | 3 | -1 | 260 |
| 8613 | POTNODE252 | 08/10/88 | 8:51 | 22.0 | 7.9 | | 193 | 8 | 15 | | 2.4 | 230 | 31 | 2 | -1 | 260 |
| 8642 | POTNODE252 | 08/17/88 | 8:57 | | | | | | | 2.0 | | 270 | 36 | 6 | -1 | 310 |
| 8629 | POTNODE252 | 08/17/88 | 8:57 | 22.4 | 7.4 | | 222 | 7 | 15 | | 2.2 | 240 | 39 | 6 | -1 | 280 |
| 8656 | POTNODE252 | 08/24/88 | 8:40 | | | | | | | 2.0 | | 250 | 33 | 5 | -1 | 290 |
| 8655 | POTNODE252 | 08/24/88 | 8:40 | 21.8 | 7.8 | | 207 | 7 | 10 | | 2.5 | 310 | 34 | 3 | -1 | 350 |
| 8671 | POTNODE252 | 08/31/88 | 8:45 | 23.2 | 8.4 | | | | 10 | | 3.0 | 200 | 68 | 29 | 3 | 300 |
| 8672 | POTNODE252 | 08/31/88 | 8:45 | 23.2 | 8.4 | | | | | 2.1 | | 160 | 60 | 27 | 3 | 250 |
| 8778 | POTNODE252 | 11/30/88 | 12:10 | 10.5 | 8.0 | 9.1 | 252 | 18 | 40 | | 4.9 | 560 | 62 | 5 | -1 | 630 |
| 8792 | POTNODE252 | 12/07/88 | 9:30 | 10.3 | 8.4 | 9.5 | 282 | 13 | 35 | | 5.1 | 480 | 58 | 17 | 1 | 560 |
| 8820 | POTNODE252 | 12/20/88 | 9:35 | 8.6 | 7.9 | 10.6 | 288 | 7 | 20 | | 4.1 | 400 | 53 | 13 | 1 | 470 |
| 8847 | POTNODE252 | 12/28/88 | 10:00 | 6.9 | 7.5 | 11.5 | 298 | 8 | 25 | | 4.1 | 430 | 69 | 13 | -1 | 510 |
| 7142 | PROSPECTPP01 | 03/25/87 | 15:00 | 19.5 | 7.8 | 8.0 | 187 | 12 | 5 | 1.9 | | 950 | 140 | 7 | -1 | 1100 |
| 7336 | PROSPECTPP01 | 08/13/87 | 8:45 | 19.4 | 6.9 | 4.8 | 200 | 19 | | | 3.4 | 640 | 12 | -1 | -1 | 650 |
| 7507 | PROSPECTPP01 | 10/20/87 | 9:00 | 16.0 | 7.4 | 4.8 | 821 | 52 | 50 | 14.0 | | 1100 | 42 | -1 | -1 | 1100 |
| 8053 | PROSPECTPP01 | 01/12/88 | 8:20 | 7.1 | 7.4 | 8.5 | 1390 | 20 | 100 | 24.0 | | 1900 | 74 | 3 | -1 | 2000 |
| 8188 | PROSPECTPP01 | 03/08/88 | 7:59 | 9.1 | 7.9 | | 1080 | 32 | 100 | 16.0 | | 1900 | 67 | 3 | -1 | 2000 |
| 8285 | PROSPECTPP01 | 04/18/88 | 7:38 | 14.0 | 7.3 | 5.3 | 539 | 57 | 80 | 10.0 | | | | | | |
| 8370 | PROSPECTPP01 | 05/09/88 | 7:43 | 16.9 | 7.6 | 7.0 | 222 | 72 | 60 | | 4.2 | 620 | 21 | -1 | -1 | 640 |
| 8508 | PROSPECTPP01 | 07/18/88 | 7:47 | 22.0 | 7.5 | 5.3 | 183 | 52 | 50 | | 3.0 | 370 | 7 | -1 | -1 | 380 |
| 7141 | PROSPECTPP02 | 03/25/87 | 15:30 | 14.5 | 7.2 | 4.2 | 1210 | 21 | 60 | 18.0 | | 440 | 25 | -1 | -1 | 470 |
| 7145 | RINDGEPP01 | 03/26/87 | 10:45 | 14.5 | 7.1 | 5.1 | 1550 | 14 | 50 | 16.0 | | 820 | 300 | 73 | 12 | 1200 |
| 7338 | RINDGEPP01 | 08/07/87 | 8:30 | 20.4 | 6.6 | 3.9 | 611 | 7 | | | 21.0 | 2700 | 130 | 5 | 2 | 2800 |
| 7509 | RINDGEPP01 | 10/19/87 | 9:25 | 17.0 | 6.7 | 2.1 | 933 | 18 | 40 | 14.0 | | 800 | 240 | 62 | 3 | 1100 |
| 7582 | RINDGEPP01 | 12/10/87 | 13:56 | 15.0 | 6.8 | 6.3 | 992 | 5 | 100 | 23.0 | | 1680 | 242 | 30 | -1 | 2000 |
| 8054 | RINDGEPP01 | 01/12/88 | 11:26 | 9.4 | 6.7 | 5.7 | 890 | 8 | 160 | 24.0 | | 2800 | 230 | 25 | -1 | 3100 |
| 8190 | RINDGEPP01 | 03/08/88 | 12:21 | 14.4 | 7.1 | | 1220 | 18 | 200 | 19.0 | | 1200 | 370 | 70 | 4 | 1600 |
| 8287 | RINDGEPP01 | 04/18/88 | 9:30 | 16.5 | 6.7 | 0.6 | 935 | 15 | 120 | 17.0 | | | | | | |
| 8371 | RINDGEPP01 | 05/09/88 | 9:39 | 20.7 | 7.5 | 5.8 | 910 | 13 | 160 | | 18.0 | 2100 | 360 | 63 | -1 | 2500 |
| 8509 | RINDGEPP01 | 07/18/88 | 10:06 | 23.0 | 6.7 | 2.6 | 748 | 7 | 140 | 19.0 | | 1700 | 180 | 17 | -1 | 1900 |
| 7144 | RINDGEPP02 | 03/26/87 | 10:00 | 14.5 | 7.0 | 6.7 | 1180 | 14 | 80 | 21.0 | | 1500 | 310 | 65 | -1 | 1900 |
| 7339 | RINDGEPP02 | 08/07/87 | 9:10 | 22.2 | 6.3 | 3.3 | 363 | 9 | | | 12.0 | 1900 | 84 | 3 | -1 | 2000 |
| 7510 | RINDGEPP02 | 10/19/87 | 9:55 | 17.0 | 7.1 | 3.8 | 595 | 19 | 60 | 13.0 | | 930 | 140 | 20 | -1 | 1100 |
| 7583 | RINDGEPP02 | 12/10/87 | 13:18 | 13.5 | 6.2 | 3.2 | 739 | 4 | 160 | 31.0 | | 1800 | 143 | 11 | -1 | 2000 |
| 8055 | RINDGEPP02 | 01/12/88 | 11:00 | 9.2 | 6.3 | 4.8 | 588 | 6 | 175 | 27.0 | | 2000 | 160 | 8 | -1 | 2200 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 (THMFormation Potential, ug/L) | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8191 | RINDGEPP02 | 03/08/88 | 11:53 | 14.3 | 7.1 | | 1100 | 24 | 120 | 15.0 | | 1200 | 380 | 100 | 8 | 1700 |
| 8288 | RINDGEPP02 | 04/18/88 | 10:04 | 16.5 | 7.3 | 8.1 | 236 | 15 | 25 | 3.4 | | | | | | |
| 8372 | RINDGEPP02 | 05/09/88 | 10:10 | 22.5 | 7.1 | 1.2 | 728 | 10 | 160 | | 23.0 | 1600 | 380 | 65 | -1 | 2000 |
| 8510 | RINDGEPP02 | 07/18/88 | 9:23 | 22.0 | 6.7 | 3.9 | 870 | 16 | 240 | | 27.0 | 2000 | 310 | 24 | -1 | 2300 |
| 7143 | RIOBLANC001 | 03/26/87 | 13:15 | 20.0 | 8.1 | 11.6 | 1160 | 15 | 10 | 6.0 | | 280 | 230 | 110 | 50 | 670 |
| 7340 | RIOBLANC001 | 08/07/87 | 10:15 | 21.1 | 7.3 | 8.6 | 1290 | 13 | | | 3.5 | 240 | 190 | 160 | 28 | 620 |
| 7511 | RIOBLANC001 | 10/19/87 | 8:40 | 16.5 | 7.5 | 8.7 | 1550 | 27 | 10 | 6.0 | | 170 | 260 | 200 | 81 | 710 |
| 7584 | RIOBLANC001 | 12/10/87 | 12:43 | 15.5 | 7.4 | 7.6 | 1140 | 8 | 20 | 5.5 | | 282 | 208 | 104 | 16 | 610 |
| 8056 | RIOBLANC001 | 01/12/88 | 10:30 | 9.6 | 7.3 | 9.2 | 2500 | 17 | 25 | 5.1 | | 170 | 260 | 190 | 99 | 720 |
| 8192 | RIOBLANC001 | 03/08/88 | 11:27 | 14.2 | 7.5 | | 731 | 8 | 35 | 5.6 | | 690 | 220 | 73 | 3 | 990 |
| 8289 | RIOBLANC001 | 04/18/88 | 8:45 | 14.5 | 7.5 | 7.6 | 1360 | 13 | 40 | 6.3 | | | | | | |
| 8373 | RIOBLANC001 | 05/09/88 | 9:07 | 20.2 | 7.6 | 7.5 | 647 | 6 | 40 | | 5.7 | 530 | 160 | 50 | 6 | 750 |
| 8511 | RIOBLANC001 | 07/18/88 | 8:42 | 21.5 | 7.5 | 3.4 | 739 | 16 | 40 | | 5.4 | 450 | 160 | 56 | 2 | 670 |
| 7146 | RIOBLANC002 | 03/26/87 | 13:45 | 17.0 | 7.6 | 4.0 | 1820 | 22 | 15 | 5.0 | | 260 | 370 | 150 | 49 | 830 |
| 7341 | RIOBLANC002 | 08/07/87 | 9:55 | 21.2 | 7.1 | 4.1 | 450 | 14 | | | | 620 | 59 | 8 | -1 | 690 |
| 7512 | RIOBLANC002 | 10/19/87 | 8:25 | 14.5 | 7.3 | 6.9 | 979 | 20 | 10 | 9.7 | | 380 | 220 | 93 | 15 | 710 |
| 7585 | RIOBLANC002 | 12/10/87 | 12:18 | 16.5 | 7.4 | 7.6 | 1160 | 13 | 25 | 5.8 | | 246 | 156 | 81 | 19 | 500 |
| 8057 | RIOBLANC002 | 01/12/88 | 10:15 | 9.9 | 7.3 | 6.0 | 880 | 8 | 15 | 4.7 | | 460 | 190 | 66 | 7 | 720 |
| 8193 | RIOBLANC002 | 03/08/88 | 11:15 | 14.2 | 7.5 | | 460 | 14 | 40 | 4.9 | | 900 | 140 | 19 | -1 | 1100 |
| 8290 | RIOBLANC002 | 04/18/88 | 8:39 | 15.0 | 7.3 | 3.9 | 457 | 16 | 40 | 5.7 | | | | | | |
| 8374 | RIOBLANC002 | 05/09/88 | 8:52 | 19.8 | 7.6 | 6.0 | 377 | 12 | 80 | | 6.9 | 800 | 64 | 8 | -1 | 870 |
| 8512 | RIOBLANC002 | 07/18/88 | 8:23 | 21.0 | 7.5 | 4.0 | 784 | 7 | 40 | | 5.8 | 520 | 180 | 72 | 3 | 780 |
| 5004 | ROCKSL | 01/30/85 | 10:15 | 8.0 | 7.2 | 10.8 | 284 | 3 | | | | | | | | |
| 5023 | ROCKSL | 02/27/85 | 11:45 | 14.0 | 7.5 | 10.3 | 258 | 6 | 25 | | | 350 | 45 | 5 | -1 | 400 |
| 5039 | ROCKSL | 03/27/85 | 11:15 | 12.0 | 7.4 | 10.1 | 269 | 6 | | | | | | | | |
| 5052 | ROCKSL | 04/24/85 | 11:23 | 18.0 | 7.8 | 10.1 | 232 | 7 | 2 | | | 430 | 42 | 5 | -1 | 480 |
| 5073 | ROCKSL | 05/22/85 | 10:20 | 21.5 | 8.2 | 9.2 | 225 | 17 | 15 | | | 520 | 56 | 11 | -1 | 590 |
| 5099 | ROCKSL | 06/07/85 | 9:30 | 23.0 | 7.9 | 9.1 | 252 | 16 | | | | | | | | |
| 5089 | ROCKSL | 06/26/85 | 10:00 | 23.0 | 7.6 | 8.0 | 360 | 19 | 10 | | | 600 | 110 | 60 | 3 | 770 |
| 5104 | ROCKSL | 07/10/85 | 9:55 | 25.0 | 7.3 | 7.6 | 453 | 8 | | | | | | | | |
| 5123 | ROCKSL | 08/28/85 | 10:45 | 23.5 | 7.6 | 8.1 | 630 | 8 | 10 | | | 340 | 160 | 100 | 19 | 620 |
| 5134 | ROCKSL | 09/25/85 | 10:32 | 22.5 | 7.6 | 8.1 | 776 | 8 | | | | | | | | |
| 5149 | ROCKSL | 10/23/85 | 10:15 | 17.5 | 7.8 | 10.0 | 738 | 7 | 5 | | | 210 | 210 | 140 | 36 | 600 |
| 5176 | ROCKSL | 11/15/85 | 11:40 | 12.5 | 7.5 | 10.4 | 988 | 4 | | | | | | | | |
| 5170 | ROCKSL | 12/03/85 | 11:25 | 11.5 | 7.4 | 10.5 | 965 | 6 | 10 | | | 140 | 200 | 210 | 24 | 570 |
| 6011 | ROCKSL | 01/23/86 | 11:45 | 11.0 | 7.3 | 9.6 | 476 | 6 | | | | | | | | |
| 6016 | ROCKSL | 02/13/86 | 10:45 | 11.5 | 7.4 | 10.2 | 319 | 13 | | | | | | | | |
| 6027 | ROCKSL | 03/04/86 | 11:40 | 17.5 | 7.3 | 6.2 | 342 | 16 | 35 | | | 670 | 67 | 6 | -1 | 740 |
| 6042 | ROCKSL | 04/09/86 | 12:15 | 17.0 | 7.3 | 8.5 | 262 | 11 | 20 | | | 520 | 81 | 11 | -1 | 610 |
| 6077 | ROCKSL | 05/07/86 | 9:45 | 17.0 | 7.2 | 7.4 | 227 | 13 | 20 | | | 510 | 48 | 5 | -1 | 560 |
| 6108 | ROCKSL | 06/04/86 | 10:40 | 22.5 | 7.3 | 7.6 | 225 | 21 | | | | 200 | 23 | 2 | -1 | 230 |
| 6126 | ROCKSL | 07/02/86 | 10:00 | 25.5 | 7.3 | 6.3 | 225 | 15 | 20 | | | 390 | 49 | 4 | -1 | 440 |
| 6145 | ROCKSL | 08/14/86 | 11:00 | 23.5 | 7.5 | 8.1 | 219 | 22 | 20 | | | | | | | |
| 6175 | ROCKSL | 09/24/86 | 10:25 | 20.0 | 7.5 | 8.1 | 285 | 17 | 5 | | | 300 | 62 | 18 | -1 | 380 |
| 6280 | ROCKSL | 11/12/86 | 11:15 | 14.5 | 7.3 | 9.4 | 180 | 15 | 5 | 1.8 | | 240 | 14 | 2 | -1 | 260 |
| 6311 | ROCKSL | 12/17/86 | 7:50 | 10.0 | 7.3 | 9.5 | 272 | 9 | 5 | 1.1 | | 290 | 59 | 11 | -1 | 360 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <----------- | | ug/L | | -----------> |
| 7020 | ROCKSL | 01/22/87 | 7:40 | 6.5 | 7.3 | 11.8 | 268 | 18 | 10 | 3.0 | | 480 | 58 | 7 | -1 | 550 |
| 7060 | ROCKSL | 02/24/87 | 7:45 | 11.0 | 7.3 | 10.5 | 355 | 12 | 20 | 4.0 | | 670 | 83 | 22 | -1 | 780 |
| 7110 | ROCKSL | 03/24/87 | 7:45 | 13.0 | 7.3 | 10.2 | 302 | 12 | 20 | 4.3 | | 480 | 58 | 5 | -1 | 540 |
| 7187 | ROCKSL | 04/30/87 | 6:30 | 19.5 | 8.3 | 9.8 | 314 | 13 | 10 | 2.6 | | 260 | 54 | 8 | -1 | 320 |
| 7222 | ROCKSL | 05/28/87 | 9:30 | 20.5 | 7.3 | 7.3 | 468 | 11 | 10 | 2.3 | | 320 | 140 | 72 | -1 | 530 |
| 7284 | ROCKSL | 06/23/87 | 9:45 | 23.5 | 7.3 | 7.3 | 488 | 15 | 5 | | | | | | | |
| 7402 | ROCKSL | 09/09/87 | 10:15 | 22.6 | 7.4 | 9.1 | 923 | 11 | 5 | 2.6 | | 190 | 140 | 120 | 44 | 490 |
| 7445 | ROCKSL | 10/22/87 | 9:30 | 19.0 | 7.4 | 8.2 | 871 | 5 | 0 | 2.8 | | 110 | 100 | 120 | 44 | 370 |
| 7543 | ROCKSL | 11/05/87 | 11:15 | 17.5 | 7.3 | 8.9 | 617 | 4 | 5 | 2.4 | | 390 | 91 | 84 | 34 | 600 |
| 7570 | ROCKSL | 12/08/87 | 10:45 | 11.3 | 7.3 | 10.1 | 1140 | 5 | 15 | 3.1 | | 250 | 190 | 160 | 53 | 650 |
| 8014 | ROCKSL | 01/07/88 | 11:20 | 9.9 | 7.4 | 13.2 | 755 | 10 | 25 | 4.2 | | 290 | 140 | 92 | 21 | 540 |
| 8094 | ROCKSL | 02/10/88 | 10:00 | 12.1 | 7.3 | 10.0 | 385 | 12 | 30 | 4.0 | | 640 | 81 | 20 | -1 | 740 |
| 8149 | ROCKSL | 03/03/88 | 11:05 | 13.6 | 7.8 | 10.7 | 711 | 5 | 20 | 3.2 | | 280 | 120 | 110 | 21 | 530 |
| 8238 | ROCKSL | 04/05/88 | 9:00 | 15.5 | 7.5 | 9.8 | 679 | 6 | 15 | 4.2 | | 180 | 120 | 91 | 16 | 410 |
| 8333 | ROCKSL | 05/03/88 | 10:05 | 18.6 | 7.8 | 9.2 | 315 | 12 | 30 | 2.6 | | 410 | 76 | 28 | 4 | 520 |
| 8425 | ROCKSL | 06/14/88 | 10:24 | 23.2 | 7.5 | 6.7 | 434 | 21 | 35 | 2.2 | | 280 | 100 | 48 | 2 | 430 |
| 8460 | ROCKSL | 07/12/88 | 10:03 | 25.0 | 7.3 | 7.1 | 787 | 10 | 25 | 2.2 | | 350 | 110 | 66 | 8 | 530 |
| 8582 | ROCKSL | 08/09/88 | 12:20 | 24.1 | 7.8 | 7.9 | 852 | 12 | 20 | 2.1 | | 130 | 100 | 100 | 41 | 370 |
| 8685 | ROCKSL | 09/06/88 | 9:50 | 25.0 | 7.5 | 7.3 | 950 | 9 | 20 | 2.2 | | 140 | 140 | 110 | 50 | 440 |
| 8717 | ROCKSL | 10/04/88 | 10:15 | 19.9 | 7.4 | 8.4 | 925 | 7 | 15 | 2.5 | | 140 | 130 | 110 | 32 | 410 |
| 8747 | ROCKSL | 11/01/88 | 11:10 | 17.7 | 7.6 | 9.0 | 1080 | 6 | 15 | 2.6 | | 120 | 150 | 190 | 61 | 520 |
| 8816 | ROCKSL | 12/13/88 | 11:24 | 12.0 | 7.1 | 10.7 | 950 | 9 | 25 | 3.8 | | 410 | 270 | 230 | 37 | 950 |
| 8695 | SACRRIOVISTA | 09/15/88 | 8:51 | 20.9 | 7.9 | 7.7 | 235 | 14 | 15 | 2.6 | | 270 | 25 | 5 | -1 | 300 |
| 8724 | SACRRIOVISTA | 10/13/88 | 8:00 | 18.0 | 7.7 | 8.1 | 183 | 12 | 20 | 1.8 | | 170 | 18 | 1 | -1 | 190 |
| 8762 | SACRRIOVISTA | 11/17/88 | 10:10 | 14.3 | 7.3 | 9.1 | 242 | 8 | 10 | 1.9 | | 210 | 37 | 12 | -1 | 260 |
| 8808 | SACRRIOVISTA | 12/06/88 | 8:30 | 10.3 | 7.1 | 10.3 | 204 | 18 | 30 | 3.6 | | 420 | 17 | 0 | -1 | 440 |
| 9076 | SACRRIOVISTA | 01/17/89 | 8:50 | 8.5 | 7.2 | 11.6 | 237 | 10 | 25 | 2.9 | | 300 | 27 | 2 | -1 | 330 |
| 9156 | SACRRIOVISTA | 02/14/89 | 8:05 | 8.3 | 6.9 | 11.5 | 207 | 7 | 15 | 1.9 | | 180 | 11 | 2 | -5 | 190 |
| 9231 | SACRRIOVISTA | 03/14/89 | 10:03 | 11.5 | 7.5 | 8.9 | 122 | 58 | 100 | 4.7 | | 540 | 12 | 3 | -1 | 550 |
| 9260 | SACRRIOVISTA | 04/11/89 | 6:45 | 16.8 | 7.4 | 8.2 | 183 | 10 | 15 | 2.5 | | 280 | 14 | -1 | -1 | 290 |
| 9356 | SACRRIOVISTA | 05/09/89 | 7:30 | 19.3 | 7.6 | 8.5 | 186 | 11 | 15 | 2.2 | | 190 | 19 | 1 | -1 | 210 |
| 9483 | SACRRIOVISTA | 06/13/89 | 7:25 | 19.3 | 7.1 | 8.5 | 173 | 13 | 20 | 3.0 | | 330 | 18 | 2 | -1 | 350 |
| 9557 | SACRRIOVISTA | 07/11/89 | 7:40 | 21.8 | 6.9 | 8.8 | 154 | 10 | 15 | | 1.8 | 250 | 15 | 0 | 0 | 270 |
| 9595 | SACRRIOVISTA | 07/25/89 | 7:36 | 21.0 | 7.0 | 7.5 | 120 | 9 | | | | 350 | 14 | 0 | 0 | 360 |
| 7147 | SHIMATR | 03/26/87 | 14:15 | 20.0 | 7.8 | 8.8 | 754 | 6 | 10 | 4.8 | | 360 | 110 | 21 | -1 | 490 |
| 7342 | SHIMATR | 08/07/87 | 11:05 | 21.8 | 7.1 | 4.4 | 631 | 7 | | | 5.9 | 860 | 89 | 9 | -1 | 960 |
| 7513 | SHIMATR | 10/19/87 | 10:30 | 17.5 | 7.3 | 4.8 | 559 | 13 | 15 | 7.9 | | 770 | 91 | 10 | -1 | 870 |
| 7588 | SHIMATR | 12/10/87 | 9:13 | 14.0 | 7.3 | 5.7 | 585 | 13 | 40 | 6.1 | | 513 | 299 | 11 | -1 | 820 |
| 8064 | SHIMATR | 01/12/88 | 8:30 | 9.0 | 7.3 | 7.1 | 763 | 20 | 20 | 4.9 | | 380 | 83 | 23 | -1 | 490 |
| 8196 | SHIMATR | 03/08/88 | 9:05 | 13.5 | 7.5 | 7.7 | 651 | 32 | 30 | 5.1 | | 530 | 85 | 16 | 1 | 630 |
| 8293 | SHIMATR | 04/18/88 | 6:33 | 5.1 | 7.2 | 4.2 | 640 | 72 | 40 | 6.3 | | | | | | |
| 8377 | SHIMATR | 05/09/88 | 6:24 | 19.2 | 7.6 | 4.2 | 696 | 11 | 40 | | 6.5 | 850 | 140 | 27 | -1 | 1000 |
| 8514 | SHIMATR | 07/18/88 | 5:57 | 23.7 | 7.3 | 5.2 | 577 | 20 | 120 | | 13.0 | 1100 | 120 | 6 | -1 | 1200 |
| 7343 | TERMPP01 | 08/06/87 | 13:15 | 24.7 | 7.0 | 6.1 | 472 | 7 | | | 6.5 | 1300 | 130 | 15 | -1 | 1400 |
| 7514 | TERMPP01 | 10/16/87 | 11:20 | 17.8 | 7.1 | 7.8 | 1310 | 6 | 35 | 9.3 | | 320 | 110 | 42 | 16 | 490 |
| 7589 | TERMPP01 | 12/10/87 | 7:10 | 11.5 | 6.3 | 4.5 | 646 | 5 | 140 | 33.0 | | 2020 | 97 | 539 | -1 | 2700 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 ug/L | CHBrCl2 ug/L | CHBr2Cl ug/L | CHBr3 ug/L | TTHMFP ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential----> | | | | |
| 8065 | TERMPP01 | 01/12/88 | 7:20 | 13.8 | 7.2 | 6.5 | 930 | 6 | 120 | 25.0 | | 2100 | 250 | 51 | -1 | 2400 |
| 8197 | TERMPP01 | 03/08/88 | 9:45 | 10.7 | 7.1 | | 889 | 10 | 140 | 18.0 | | 2200 | 230 | 38 | 2 | 2500 |
| 8294 | TERMPP01 | 04/18/88 | 10:05 | 17.0 | 7.3 | 7.3 | 961 | 14 | 60 | 8.5 | | | | | | |
| 8291 | TERMPP01 | 04/18/88 | 10:45 | 15.0 | 7.1 | 7.6 | 962 | 14 | 80 | 8.5 | | | | | | |
| 8378 | TERMPP01 | 05/09/88 | 9:34 | 21.4 | 7.4 | 5.0 | 910 | 11 | 100 | | 11.0 | 1100 | 390 | 120 | 7 | 1600 |
| 8515 | TERMPP01 | 07/18/88 | 10:00 | 23.5 | 6.9 | 4.6 | 425 | 11 | 120 | | 10.0 | 1200 | 140 | 14 | 1 | 1400 |
| 7153 | TERMPP02 | 03/26/87 | 7:45 | 12.5 | 7.2 | 4.4 | 850 | 8 | 40 | 8.9 | | 640 | 220 | 48 | 7 | 920 |
| 7344 | TERMPP02 | 08/06/87 | 13:30 | 23.6 | 7.2 | 6.5 | 587 | 6 | | | 4.8 | 770 | 170 | 45 | -1 | 990 |
| 7515 | TERMPP02 | 10/16/87 | 10:50 | 16.7 | 7.1 | 5.2 | 571 | 15 | 20 | 6.3 | | 710 | 190 | 46 | 2 | 950 |
| 7590 | TERMPP02 | 12/10/87 | 7:45 | 11.0 | 6.9 | 7.2 | 546 | 80 | 100 | 16.0 | | 1170 | 114 | 15 | -1 | 1300 |
| 8066 | TERMPP02 | 01/12/88 | 7:45 | 9.9 | 7.0 | 7.0 | 786 | 8 | 125 | 25.0 | | 1600 | 250 | 31 | -1 | 1900 |
| 8198 | TERMPP02 | 03/08/88 | 9:28 | 9.8 | 7.3 | | 716 | 12 | 80 | 9.9 | | 1100 | 220 | 55 | 4 | 1400 |
| 8295 | TERMPP02 | 04/18/88 | 9:36 | 16.7 | 6.9 | 7.0 | 798 | 12 | 80 | 12.0 | | | | | | |
| 8379 | TERMPP02 | 05/09/88 | 9:07 | 18.8 | 7.5 | 7.1 | 719 | 15 | 100 | | 8.7 | 1300 | 280 | 75 | -1 | 1700 |
| 8516 | TERMPP02 | 07/18/88 | 9:30 | 23.0 | 7.0 | 5.0 | 542 | 11 | 60 | | 5.1 | 580 | 170 | 48 | 1 | 800 |
| 8604 | UJONESSIPH01 | 08/10/88 | 12:01 | 22.6 | 6.7 | 2.2 | 417 | 4 | 20 | | 3.1 | 310 | 110 | 35 | 1 | 460 |
| 8636 | UJONESSIPH01 | 08/17/88 | 7:22 | 20.8 | 6.7 | 1.5 | 407 | 2 | 20 | | 3.2 | 220 | 65 | 26 | -1 | 310 |
| 8663 | UJONESSIPH02 | 08/24/88 | 7:47 | 22.0 | 7.1 | 3.0 | 378 | 21 | 60 | | 3.5 | 400 | 97 | 21 | -1 | 520 |
| 7345 | UPEGBERTPP01 | 08/13/87 | 10:40 | 18.6 | 7.5 | 7.3 | 382 | 124 | | | 6.2 | 1400 | 37 | 2 | -1 | 1400 |
| 7516 | UPEGBERTPP01 | 10/20/87 | 10:45 | 15.7 | 7.4 | 1.0 | 511 | 96 | 30 | 18.0 | | 930 | 26 | 1 | 1 | 960 |
| 8067 | UPEGBERTPP01 | 01/12/88 | 9:45 | 6.3 | 7.3 | 10.1 | 728 | 42 | 50 | 24.0 | | | | | | |
| 8199 | UPEGBERTPP01 | 03/08/88 | 9:14 | 10.5 | 7.9 | | 1160 | 22 | 60 | 11.0 | | 1500 | 100 | 8 | 1 | 1600 |
| 8296 | UPEGBERTPP01 | 04/18/88 | 9:26 | 15.8 | 7.8 | 7.3 | 704 | 36 | 100 | 10.0 | | | | | | |
| 8380 | UPEGBERTPP01 | 05/09/88 | 9:15 | 19.9 | 8.5 | 10.5 | 771 | 21 | 60 | | 9.3 | 2000 | 51 | 11 | -1 | 2100 |
| 8517 | UPEGBERTPP01 | 07/18/88 | 9:20 | 23.1 | 7.5 | 6.5 | 344 | 88 | 40 | | 5.1 | 720 | 33 | 1 | -1 | 750 |
| 7346 | UPEGBERTPP02 | 08/13/87 | 11:10 | 18.3 | 7.3 | 7.0 | 375 | 100 | | | 6.6 | 980 | 43 | 4 | -1 | 1000 |
| 7517 | UPEGBERTPP02 | 10/20/87 | 11:00 | 17.0 | 7.3 | 4.9 | 526 | 105 | 60 | 13.0 | | 648 | 77 | 2 | -1 | 730 |
| 8068 | UPEGBERTPP02 | 01/12/88 | 10:15 | 6.3 | 7.5 | 10.1 | 506 | 68 | 140 | 9.7 | | | | | | |
| 8297 | UPEGBERTPP02 | 04/18/88 | 9:48 | 15.5 | 7.2 | 7.3 | 637 | 68 | 80 | 8.3 | | | | | | |
| 8381 | UPEGBERTPP02 | 05/09/88 | 9:35 | 18.4 | 7.9 | 8.8 | 647 | 116 | 40 | | 5.3 | 800 | 48 | 10 | -1 | 860 |
| 8518 | UPEGBERTPP02 | 07/18/88 | 9:55 | 24.3 | 7.4 | 6.5 | 277 | 104 | 25 | | 3.8 | 500 | 240 | 1 | -1 | 740 |
| 7347 | UPEGBERTPP03 | 08/13/87 | 11:30 | 20.0 | 7.3 | 6.6 | 538 | 72 | | | 9.4 | 1000 | 47 | 2 | -1 | 1000 |
| 7518 | UPEGBERTPP03 | 10/20/87 | 11:25 | 16.7 | 7.5 | 5.9 | 781 | 68 | 25 | 22.0 | | 1500 | 53 | 10 | -1 | 1600 |
| 8201 | UPEGBERTPP03 | 03/08/88 | 9:37 | 7.6 | 7.5 | | 716 | 30 | 60 | 7.6 | | 1100 | 60 | 4 | -1 | 1200 |
| 8298 | UPEGBERTPP03 | 04/18/88 | 10:05 | 14.0 | 7.5 | 5.7 | 1780 | 280 | 60 | 13.0 | | | | | | |
| 8382 | UPEGBERTPP03 | 05/09/88 | 9:53 | 20.1 | 8.1 | 7.6 | 2240 | 72 | 40 | | 16.0 | 2300 | 120 | 23 | -1 | 2400 |
| 8519 | UPEGBERTPP03 | 07/18/88 | 10:15 | 25.9 | 7.3 | 4.2 | 331 | 128 | 50 | | 5.6 | 670 | 36 | 1 | -1 | 710 |
| 7148 | UPJONESPP01 | 03/30/87 | 10:45 | 17.5 | 6.8 | 5.0 | 1010 | 35 | 40 | 11.0 | | 960 | 190 | 27 | -1 | 1200 |
| 7149 | UPJONESPP02 | 03/30/87 | 11:15 | 17.0 | 7.0 | 5.4 | 507 | 33 | 200 | 27.0 | | 2600 | 160 | 10 | -1 | 2800 |
| 7349 | UPJONESPP02 | 08/12/87 | 8:50 | 20.4 | 6.9 | 3.8 | 626 | 29 | | | 7.7 | 1200 | 160 | 21 | -1 | 1400 |
| 7520 | UPJONESPP02 | 10/19/87 | 12:15 | 17.5 | 6.7 | 4.8 | 739 | 30 | 25 | 11.0 | | 800 | 120 | 24 | -1 | 940 |
| 7592 | UPJONESPP02 | 12/10/87 | 8:10 | 13.5 | 6.5 | 4.4 | 895 | 24 | 100 | 13.0 | | 1350 | 271 | 17 | 5 | 1600 |
| 8071 | UPJONESPP02 | 01/12/88 | 7:30 | 8.4 | 6.6 | 7.0 | 756 | 66 | 80 | 16.0 | | 1500 | 220 | 19 | -1 | 1700 |
| 8203 | UPJONESPP02 | 03/08/88 | 7:45 | 14.1 | 6.9 | 6.1 | 789 | 48 | 160 | | | 1300 | 180 | 25 | -1 | 1500 |
| 8300 | UPJONESPP02 | 04/18/88 | 12:40 | 18.4 | 6.9 | 2.9 | 960 | 20 | 120 | 14.0 | | | | | | |
| 8384 | UPJONESPP02 | 05/09/88 | 10:06 | 20.2 | 7.3 | 4.0 | 1120 | 46 | 120 | | 10.0 | 1200 | 180 | 45 | -1 | 1400 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | CHCl3 | CHBrCl2 | CHBr2Cl | CHBr3 | TTHMFP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | <---- THMFormation Potential ----> ug/L | | | | |
| 8520 | UPJONESPP02 | 07/18/88 | 10:30 | 27.0 | 7.1 | 0.0 | 860 | 60 | 120 | | 8.1 | 770 | 220 | 48 | 1 | 1000 |
| 8601 | UPJONESPP02 | 08/10/88 | 11:24 | 23.2 | 6.8 | 2.8 | | | 70 | | 8.3 | 920 | 210 | 28 | -1 | 1200 |
| 8624 | UPJONESPP02 | 08/17/88 | 7:45 | 19.9 | 6.9 | 3.1 | 721 | 27 | 140 | | 14.0 | 1200 | 210 | 19 | -1 | 1400 |
| 8661 | UPJONESPP02 | 08/24/88 | 8:15 | 20.6 | 7.0 | 3.7 | 766 | 28 | 100 | | 10.0 | 1200 | 200 | 26 | -1 | 1400 |
| 8677 | UPJONESPP02 | 08/31/88 | 7:45 | 23.3 | 6.6 | 5.2 | | | 50 | | 4.8 | 420 | 120 | 44 | 3 | 590 |
| 8784 | UPJONESPP02 | 11/30/88 | 9:26 | 11.4 | 7.1 | 5.6 | 718 | 28 | 80 | | 7.5 | 700 | 170 | 24 | 2 | 900 |
| 8798 | UPJONESPP02 | 12/07/88 | 9:20 | 11.4 | 7.1 | 7.3 | 799 | 32 | 80 | | 7.1 | 600 | 200 | 47 | 4 | 850 |
| 8854 | UPJONESPP02 | 12/28/88 | 8:20 | 5.0 | 7.1 | 10.4 | 728 | 64 | 60 | | 9.8 | 980 | 200 | 48 | 3 | 1200 |
| 5001 | VERNALIS | 01/30/85 | 7:50 | 8.0 | 7.4 | 10.5 | 483 | 3 | | | | | | | | |
| 5018 | VERNALIS | 02/27/85 | 8:15 | 12.5 | 7.4 | 9.6 | 629 | 8 | 25 | | | 220 | 97 | 48 | 6 | 370 |
| 5034 | VERNALIS | 03/27/85 | 8:45 | 12.0 | 7.4 | 9.0 | 801 | 17 | | | | | | | | |
| 5048 | VERNALIS | 04/24/85 | 7:45 | 17.0 | 7.4 | 7.9 | 667 | 19 | 5 | | | 360 | 140 | 61 | 3 | 560 |
| 5069 | VERNALIS | 05/22/85 | 7:00 | 20.5 | 7.4 | 7.2 | 756 | 31 | 10 | | | 400 | 160 | 68 | 12 | 640 |
| 5092 | VERNALIS | 05/29/85 | 6:45 | 18.0 | 7.7 | 7.9 | 774 | 28 | | | | | | | | |
| 5085 | VERNALIS | 06/26/85 | 6:45 | 23.0 | 7.5 | 7.3 | 717 | 52 | 10 | | | 540 | 160 | 66 | 7 | 770 |
| 5100 | VERNALIS | 07/10/85 | 6:45 | 22.5 | 7.4 | 7.1 | 490 | 28 | 5 | | | 520 | 130 | 41 | 3 | 690 |
| 5119 | VERNALIS | 08/28/85 | 7:15 | 19.5 | 7.7 | 7.4 | 487 | 18 | 5 | | | 410 | 100 | 34 | 2 | 550 |
| 5130 | VERNALIS | 09/25/85 | 7:07 | 21.5 | 7.4 | 6.8 | 563 | 21 | 5 | | | 380 | 98 | 30 | 4 | 510 |
| 5145 | VERNALIS | 10/23/85 | 7:00 | 15.5 | 7.4 | 7.4 | 519 | 12 | 5 | | | 320 | 110 | 29 | 2 | 460 |
| 5172 | VERNALIS | 11/15/85 | 8:20 | 8.5 | 7.5 | 9.7 | 706 | 7 | 15 | | | 220 | 130 | 71 | 7 | 430 |
| 5166 | VERNALIS | 12/03/85 | 15:30 | 13.5 | 7.4 | 8.9 | 604 | 18 | 18 | | | 590 | 140 | 32 | -1 | 760 |
| 6007 | VERNALIS | 01/23/86 | 7:45 | 12.0 | 7.5 | 8.8 | 790 | 18 | 15 | | | 930 | 160 | 76 | 7 | 1200 |
| 6012 | VERNALIS | 02/13/86 | 7:30 | 11.5 | 7.3 | 9.0 | 686 | 15 | 5 | | | 450 | 140 | 56 | 3 | 650 |
| 6023 | VERNALIS | 03/04/86 | 8:00 | 15.0 | 7.3 | 8.3 | 268 | 26 | 35 | | | 540 | 56 | 6 | -1 | 600 |
| 6038 | VERNALIS | 04/09/86 | 8:00 | 15.0 | 7.3 | 9.2 | 169 | 20 | 25 | | | 650 | 47 | 4 | -1 | 700 |
| 6073 | VERNALIS | 05/07/86 | 6:30 | 14.5 | 7.3 | 8.8 | 257 | 17 | 15 | | | 330 | 51 | 6 | -1 | 390 |
| 6104 | VERNALIS | 06/04/86 | 7:45 | 20.5 | 7.3 | 8.0 | 254 | 22 | 10 | | | 220 | 41 | 6 | -1 | 270 |
| 6122 | VERNALIS | 07/02/86 | 6:50 | 23.0 | 7.5 | 7.9 | 595 | 9 | 5 | | | 318 | 144 | 41 | 2 | 510 |
| 6141 | VERNALIS | 08/14/86 | 7:15 | 21.5 | 7.6 | 7.6 | 557 | 25 | 5 | | | | | | | |
| 6170 | VERNALIS | 09/24/86 | 7:00 | 17.5 | 7.3 | 8.2 | 317 | 20 | 15 | | | 320 | 85 | 23 | -1 | 430 |
| 6276 | VERNALIS | 11/12/86 | 7:45 | 13.5 | 7.3 | 9.7 | 447 | 10 | 5 | 2.0 | | 250 | 60 | 41 | 1 | 350 |
| 6307 | VERNALIS | 12/17/86 | 11:30 | 11.5 | 7.3 | 10.5 | 331 | 10 | 5 | | 1.4 | 160 | 38 | 9 | -1 | 210 |
| 7016 | VERNALIS | 01/22/87 | 11:20 | 8.5 | 7.3 | 11.1 | 679 | 10 | 5 | | 2.5 | 220 | 85 | 41 | 4 | 350 |
| 7056 | VERNALIS | 02/24/87 | 11:15 | 11.5 | 7.5 | 9.9 | 868 | 12 | 5 | 2.7 | | 310 | 200 | 120 | 9 | 640 |
| 7105 | VERNALIS | 03/24/87 | 10:45 | 13.0 | 7.3 | 9.6 | 831 | 16 | 5 | 3.8 | | 320 | 140 | 38 | 8 | 510 |
| 7182 | VERNALIS | 04/30/87 | 9:45 | 19.0 | 7.3 | 8.4 | 564 | 27 | 10 | 2.6 | | 200 | 90 | 40 | 4 | 330 |
| 7217 | VERNALIS | 05/28/87 | 6:45 | 18.0 | 7.4 | 8.2 | 622 | 25 | 15 | 2.6 | | 410 | 130 | 53 | -1 | 590 |
| 7280 | VERNALIS | 06/23/87 | 7:15 | 22.5 | 7.7 | 4.6 | 807 | 42 | 10 | 2.2 | | 250 | 110 | 61 | 9 | 430 |
| 7279 | VERNALIS | 06/23/87 | 7:15 | 22.5 | 7.7 | 4.6 | 807 | 42 | 10 | | 4.6 | 400 | 170 | 64 | 9 | 640 |
| 7292 | VERNALIS | 06/24/87 | 8:30 | 23.0 | 7.5 | 1.9 | | | | 2.9 | | 260 | 150 | 78 | 14 | 500 |
| 7373 | VERNALIS | 08/25/87 | 7:05 | 22.1 | 7.4 | 7.7 | | | | | | 370 | 130 | 63 | 4 | 570 |
| 7396 | VERNALIS | 09/09/87 | 7:00 | 21.5 | 6.8 | 7.2 | 734 | 21 | 5 | 5.5 | | 310 | 110 | 50 | 11 | 480 |
| 7398 | VERNALIS | 09/09/87 | 7:00 | | | | | | | | 4.0 | 240 | 120 | 55 | 4 | 420 |
| 7439 | VERNALIS | 10/22/87 | 6:50 | 18.5 | 7.4 | 8.2 | 807 | 13 | 0 | 3.3 | | 170 | 98 | 62 | 13 | 340 |
| 7440 | VERNALIS | 10/22/87 | 6:50 | | | | | | | | 3.5 | 140 | 89 | 62 | 17 | 310 |
| 7539 | VERNALIS | 11/05/87 | 7:20 | 15.0 | 7.6 | 8.7 | 951 | 17 | 5 | 4.2 | | 400 | 130 | 78 | 6 | 610 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

THM DATA REPORT

| LAB# | STA. NAME | SAMP.DATE | TIME | TEMP oC | pH | DO mg/L | EC uS/cm | TURB T.U. | COLOR C.U. | TOC mg/L | DOC mg/L | <---- THMFormation Potential----> CHCl3 (ug/L) | CHBrCl2 (ug/L) | CHBr2Cl (ug/L) | CHBr3 (ug/L) | TTHMFP (ug/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7538 | VERNALIS | 11/05/87 | 7:20 | | | | | | | | 3.7 | 360 | 120 | 80 | 8 | 570 |
| 7566 | VERNALIS | 12/08/87 | 8:00 | 13.6 | 7.4 | 9.4 | 974 | 12 | 10 | 2.6 | | 170 | 70 | 39 | 11 | 290 |
| 7565 | VERNALIS | 12/08/87 | 8:00 | | | | | | | | 4.9 | 410 | 190 | 85 | 10 | 700 |
| 8009 | VERNALIS | 01/07/88 | 8:05 | | | | | | | | 3.9 | 280 | 160 | 87 | 9 | 540 |
| 8010 | VERNALIS | 01/07/88 | 8:05 | 10.3 | 7.4 | 11.1 | 1080 | 11 | 15 | 4.0 | | 280 | 150 | 100 | 12 | 540 |
| 8090 | VERNALIS | 02/10/88 | 7:30 | 12.4 | 7.4 | 9.8 | 1320 | 16 | 20 | 4.1 | | 440 | 130 | 88 | 19 | 680 |
| 8089 | VERNALIS | 02/10/88 | 7:30 | | | | | | | | 7.1 | 320 | 170 | 110 | 14 | 610 |
| 8144 | VERNALIS | 03/15/88 | 7:45 | 12.3 | 7.6 | 10.0 | 800 | 19 | 20 | 3.0 | | 220 | 83 | 61 | 5 | 370 |
| 8145 | VERNALIS | 03/15/88 | 7:45 | | | | | | | | 2.4 | 250 | 140 | 48 | 5 | 440 |
| 8234 | VERNALIS | 04/05/88 | 6:40 | | | | | | | | 3.4 | 260 | 110 | 58 | 8 | 440 |
| 8233 | VERNALIS | 04/05/88 | 6:40 | 14.3 | 7.5 | 4.3 | 801 | 14 | 20 | 3.2 | | 310 | 110 | 59 | 9 | 490 |
| 8329 | VERNALIS | 05/03/88 | 7:11 | | | | | | | | 2.8 | 170 | 120 | 81 | 15 | 390 |
| 8328 | VERNALIS | 05/03/88 | 7:11 | 16.6 | 7.8 | 8.7 | 802 | 18 | 15 | 2.8 | | 270 | 110 | 68 | 23 | 470 |
| 8420 | VERNALIS | 06/14/88 | 6:35 | 21.6 | 7.7 | 8.3 | 738 | 21 | 25 | 2.6 | | 290 | 140 | 72 | 8 | 510 |
| 8421 | VERNALIS | 06/14/88 | 6:35 | | | | | | | | 5.4 | 220 | 120 | 64 | 8 | 410 |
| 8455 | VERNALIS | 07/12/88 | 6:18 | 22.0 | 7.8 | 7.7 | | | 35 | 3.1 | | 470 | 140 | 77 | 9 | 700 |
| 8456 | VERNALIS | 07/12/88 | 6:18 | | | | | | | | 3.2 | 320 | 120 | 77 | 12 | 530 |
| 8577 | VERNALIS | 08/09/88 | 8:00 | 20.8 | 7.2 | 8.2 | | | 20 | 3.1 | | 400 | 170 | 50 | 7 | 630 |
| 8578 | VERNALIS | 08/09/88 | 8:00 | 20.8 | 7.2 | 8.2 | | | | | 3.5 | 280 | 120 | 70 | 7 | 480 |
| 8689 | VERNALIS | 09/06/88 | 6:45 | 22.2 | 7.7 | 6.9 | | | | | 3.1 | 240 | 140 | 57 | 19 | 460 |
| 8681 | VERNALIS | 09/06/88 | 6:45 | 22.2 | 7.7 | 6.9 | 896 | 24 | 25 | 3.2 | | 330 | 150 | 55 | 15 | 550 |
| 8710 | VERNALIS | 10/04/88 | 6:58 | 18.1 | 8.0 | 8.0 | 911 | 15 | 20 | 3.3 | | 210 | 120 | 55 | 22 | 410 |
| 8711 | VERNALIS | 10/04/88 | 6:58 | 18.1 | 8.0 | 8.0 | 911 | | | | 6.5 | 270 | 190 | 75 | 9 | 540 |
| 8741 | VERNALIS | 11/01/88 | 8:15 | 15.3 | 7.3 | 8.9 | | | | | 2.8 | 110 | 84 | 58 | 10 | 260 |
| 8740 | VERNALIS | 11/01/88 | 8:15 | 15.3 | 7.3 | 8.9 | 857 | 17 | 15 | 3.3 | | 160 | 91 | 57 | 14 | 320 |
| 8811 | VERNALIS | 12/13/88 | 8:25 | 10.2 | 7.2 | 10.0 | 869 | 10 | 20 | 4.2 | | 300 | 140 | 79 | 7 | 530 |

Note: Negative values signify reporting limits. Concentration of analyte below reporting limit.

# Appendix C

## QUALITY ASSURANCE EVALUATION OF LABORATORIES PERFORMING ANALYSIS FOR THE DELTA AGRICULTURAL DRAINAGE INVESTIGATION PROGRAM

The performance of Clayton Environmental Consultants and Enseco, Inc. were evaluated for the period January, 1987 through July, 1989. Several parameters were used as a yardstick to evaluate performance including blind sample results, spiked matrix results, interlaboratory comparisons, and adherence to the standard methods for analyzing volatile organic hydrocarbons. This evaluation focuses on the analytical capabilities for THMFP and pesticides, although the laboratories also analyzed minerals and trace elements. The following is an assessment of each of these procedures:

**BLIND SAMPLES**

Blind samples were analyzed to help measure the variation induced by sampling procedures, as well as laboratory variability. Approximately one set of THMFP blind samples per batch were submitted to the laboratories (there were no pesticide blind samples). Table C-1 presents the results of the blind sample analyses for THMFP and $CHCl_3$. The relative percent difference was determined to assess the precision of blind duplicate measurements using the formula:

$$\text{Relative Percent Difference} = \frac{\text{Conc.1} - \text{Conc.2}}{\text{average}} \times 100$$

The quality control limit for estimating the precision of each of the THMs is <22%. All the blind duplicate results fell inside control limit.

Also presented in Table C-1 are the holding times for the blind duplicate samples. Holding time refers to the period after the samples have been both spiked and quenched. Theoretically, if the sample is held beyond the holding time, there could be loss of the volatiles. The holding time required by EPA in all the standard methods for analyzing volatile organic hydrocarbons is 14 days. Data shows that one set of blind duplicates was held 18 days before being analyzed.

The total data base for the 2-1/2 year period of study was also examined to determine the holding times of the THM samples (other than the duplicates). Samples sent to Enseco Laboratories were first spiked, incubated, and quenched by DWR Bryte Lab, so exact holding times could be calculated. However, THM samples sent to Clayton Environmental Consultants were generally spiked, incubated and quenched at Clayton, and dates of these procedures could not be obtained from Clayton.

Table C-2 lists the holding times of the THMFP samples. Since exact holding time data was unavailable from Clayton Labs, "worst case" holding times were estimated by subtracting the 7 day incubation period from the time between the receipt and analysis of samples (except for cases where DWR Bryte Lab spiked and quenched). Clayton Environmental Consultants may have held as many as 101 samples for up to 21 days (i.e. 7 days beyond the specified holding period, worst case). Enseco Laboratories exceeded the holding period for 289 samples, holding some of them for up to 49 days (i.e. 35 days beyond the specified holding period).

Both Clayton and Enseco Laboratories was contacted about the excessive holding times. Enseco agreed to perform a degradation study to determine the usefulness of the THMFP data where holding times exceeded 14 days. The study was conducted using both Enseco, Inc. and DWR Bryte Labs. The study showed that THMs may be held up to 80 days before there is significant loss of sample. A description of this study and the results are presented in Appendix D.

Holding times for pesticide analyses were not available from either Enseco or Clayton. This deficiency will be corrected in future years. There was only one problem reported by Enseco where Dinoseb was destroyed by the hydrolysis step using the EPA Method 615. The samples had to be re-extracted and analyzed without the hydrolysis step and consequently holding times were missed due to the need for re-extraction and analysis.

**SPIKED MATRIX SAMPLES**

Spiked duplicate samples were performed by the laboratories to check on internal quality control procedures to help assess laboratory variability. Method blanks were also run to assess the degree to which laboratory operations and procedures cause false-positive analytical results for the samples. Method blanks can give information about background concentrations of the constituent in question.

The spiked duplicates were run once per batch analyzed. Spikes were performed on two matrices: one supplied by Central District (field matrix) and one generated by the laboratories (blank water). The results of the spiked duplicate analyses are shown in Table C-3 for THMFP: chloroform, bromodichloromethane, dibromochloromethane and bromoform. The percent accuracy and precision obtained for the spiked matrix analyses, as well as the range of acceptable control limits, are shown. For THMFP, the acceptable control limits for accuracy should range between 80-125% and for precision the control limit should be <22%.

The pound (#) or asterisk (*) values in Table C-3 identify sample recoveries outside standard control limits for accuracy or precision, respectively. The instances where recoveries fell outside of control limits are very few. However, when this occurs, the laboratory should re-analyze the samples and follow procedures to obtain acceptable control limits. If the spiked matrix results indicate that the laboratory was out of control, the sample results during this period may need to be re-examined.

Table C-4 shows the results of the spiked matrix analyses for pesticides for Clayton Environmental Consultants and Enseco, Inc. The acceptable control limits for pesticides varies and are dependent on the compound analyzed and the analytical method. The tagged values mark those results which fell outside quality control limits.

## INTERLABORATORY COMPARISONS

A round robin laboratory study was conducted January 20, 1988. Table C-5 shows the THMFP results the study. Participating laboratories included the DWR Bryte Laboratory, East Bay Municipal Utility District, Clayton Environmental Consultants, Department of Health Services, and Cal Analytical (Enseco, Inc.). All laboratory results fell within the control limits for accuracy (80-125%). This assumes that the true mean is the same as the mean of the replicates. None of the replicate measurements exceeded the control limit for precision (<22%).

## TABLE C-1 - BLIND SAMPLE QUALITY ASSURANCE RESULTS
## (January 1987 through June 1989)

| Station Location | Date Sampled | CHCL3 g/L | THMFP g/L | RPD CHCL3 % | RPD THMFP % | Control Limit % | Holding Time (days) |
|---|---|---|---|---|---|---|---|
| Bouldin1 | 1/26/89 | 1400 | 1600 | 0 | 0 | 22 | 6 |
| Bouldin1 | 1/26/89 | 1400 | 1600 | | | | |
| Bouldin1 | 2/3/89 | 1340 | 1600 | 5 | 5 | 22 | 3 |
| Bouldin1 | 2/3/89 | 1100 | 1300 | | | | |
| Bouldin2 | 8/24/88 | 3600 | 3700 | 3 | 2 | 22 | 2 |
| Bouldin2 | 8/24/88 | 3200 | 3400 | | | | |
| Bouldsiph01 | 8/31/88 | 280 | 300 | -1 | -1 | 22 | 5 |
| Bouldsiph01 | 8/31/88 | 290 | 310 | | | | |
| Upegbert01 | 3/8/88 | 1500 | 1600 | 6 | 5 | 22 | 18 |
| Upegbert01 | 3/8/88 | 1200 | 1300 | | | | |
| Upjonespp01 | 3/30/87 | 960 | 1200 | 16 | 13 | NC | 10 |
| Upjonespp01 | 3/30/87 | 1900 | 2100 | | | | |
| Upjonespp02 | 12/28/88 | 980 | 1200 | 3 | 2 | 22 | 13 |
| Upjonespp02 | 12/28/88 | 1100 | 1300 | | | | |

NC = Not Calculated by laboratory.

TABLE C-2 - THMFP HOLDING TIMES
(January 1987 through June 1989)

CLAYTON ENVIRONMENTAL CONSULTANTS

| DWR SAMPLE NO. | SAMPLES RECEIVED | SAMPLES ANALYZED | HOLDING TIME[1] (DAYS) |
|---|---|---|---|
| | **Holding Times: 0 - 14 Days** | | |
| 7239 | 06/08/87 | 06/08/87 | 0 |
| 7255-7256 | 06/08/87 | 06/08/87 | 0 |
| 7061-7066 | 03/03/87 | 03/13/87 | 3 |
| 7295-7298 | 07/07/87 | 07/17/87 | 3 |
| 7169-7179 | 04/16/87 | 04/28/87 | 5 |
| 7229-7232 | 06/02/87 | 06/15/87 | 6 |
| 7052-7060 | 02/24/87 | 03/10/87 | 7 |
| 7198-7203 | 05/13/87 | 05/27/87 | 7 |
| 7206-7207 | 05/28/87 | 06/11/87 | 7 |
| 7216-7223 | 05/28/87 | 06/11/87 | 7 |
| 7227-7228 | 05/28/87 | 06/11/87 | 7 |
| 7242-7254 | 06/11/87 | 06/25/87 | 7 |
| 7279-7284 | 06/23/87 | 07/08/87 | 8 |
| 7001-7005 | 01/08/87 | 01/24/87 | 9 |
| 7181-7193 | 04/30/87 | 05/18/87 | 12 |
| 7204-7205 | 05/20/87 | 06/09/87 | 13 |
| 7209-7214 | 05/20/87 | 06/09/87 | 13 |
| 7233-7238 | 06/04/87 | 06/24/87 | 13 |
| 7140-7157 | 03/30/87 | 04/20/87 | 14 |
| 7196-7197 | 05/06/87 | 05/27/87 | 14 |
| | **Holding Times: 15 - 21 Days** | | |
| 7040-7051 | 02/10/87 | 03/04/87 | 15 |
| 7111-7135 | 03/30/87 | 04/21/87 | 15 |
| 7123-7132 | 04/01/87 | 04/23/87 | 15 |
| 7104-7110 | 03/24/87 | 04/16/87 | 16 |
| 7067-7080 | 03/10/87 | 04/03/87 | 17 |
| 7082-7103 | 03/17/87 | 04/11/87 | 18 |
| 7292-7294 | 06/24/87 | 07/19/87 | 18 |
| 7022-7027 | 02/05/87 | 03/03/87 | 19 |
| 7006-7015 | 01/13/87 | 02/10/87 | 21 |
| 7016-7020 | 01/22/87 | 02/19/87 | 21 |

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[1] Holding times for Clayton calculated as "worst case" times; actual holding times could be shorter. Holding time estimated as: (date analyzed - date received) - 7 days.

TABLE C-2 - CONTINUED

ENSECO LABORATORIES

| DWR BATCH NO. | SAMPLES RECEIVED | SAMPLES ANALYZED | HOLDING TIME (DAYS) |
|---|---|---|---|
| **Holding Times: 1 - 14 Days** | | | |
| 9117-9129 | 02/13/89 | 02/13/89 | 0 |
| 9151-9158 | 02/23/89 | 02/23/89 | 0 |
| 9253-9254 | 04/14/89 | 04/14/89 | 0 |
| 8577-8585 | 08/18/88 | 08/19/88 | 1 |
| 8586-8593 | 08/24/88 | 08/25/88 | 1 |
| 8845-8858 | 01/17/89 | 01/18/89 | 1 |
| 9186-9193 | 03/08/89 | 03/09/89 | 1 |
| 9239-9245 | 04/06/89 | 04/07/89 | 1 |
| 8429-8436 | 06/30/88 | 07/01/88 | 2 |
| 8441-8443 | 07/12/88 | 07/13/88 | 2 |
| 8649-8664 | 09/07/88 | 09/09/88 | 2 |
| 9052-9058 | 03/06/89 | 03/08/89 | 2 |
| 9096-9103 | 02/08/89 | 02/10/89 | 2 |
| 9137-9144 | 02/15/89 | 02/17/89 | 2 |
| 9226-9233 | 03/21/89 | 03/23/89 | 2 |
| 8412-8419 | 06/21/88 | 06/24/88 | 3 |
| 8455-8471 | 07/22/88 | 07/25/88 | 3 |
| 8598-8614 | 08/22/88 | 08/25/88 | 3 |
| 8644-8645 | 08/22/88 | 08/25/88 | 3 |
| 8690-8697 | 09/23/88 | 09/26/88 | 3 |
| 8698-8705 | 10/03/88 | 10/06/88 | 3 |
| 8719-8726 | 10/24/88 | 10/27/88 | 3 |
| 9104-9116 | 02/06/89 | 02/09/89 | 3 |
| 9130-9136 | 02/15/89 | 02/18/89 | 3 |
| 8448-8454 | 07/14/88 | 07/18/88 | 4 |
| 8527-8529 | 07/22/88 | 07/26/88 | 4 |
| 8710-8718 | 10/13/88 | 10/17/88 | 4 |
| 8775-8788 | 12/12/88 | 12/16/88 | 4 |
| 8570-8576 | 08/11/88 | 08/16/88 | 5 |
| 8665-8680 | 09/15/88 | 09/20/88 | 5 |
| 8681-8689 | 09/16/88 | 09/21/88 | 5 |
| 9211-9217 | 03/15/89 | 03/20/89 | 5 |
| 9218-9219 | 03/16/89 | 03/21/89 | 5 |
| 7439-7446 | 11/03/87 | 11/09/87 | 6 |
| 7468-7469 | 10/27/87 | 11/02/87 | 6 |
| 8803-8808 | 12/15/88 | 12/21/88 | 6 |
| 9220-9225 | 03/15/89 | 03/21/89 | 6 |
| 7428-7438 | 10/27/87 | 11/03/87 | 7 |

TABLE C-2 - CONTINUED

ENSECO LABORATORIES (cont.)

| DWR BATCH NO. | SAMPLES RECEIVED | SAMPLES ANALYZED | | HOLDING TIME (DAYS) |
|---|---|---|---|---|
| **Holding Times: 1 -14 Days (continued)** | | | | |
| 8420-8428 | 06/23/88 | 06/30/88 | | 7 |
| 8541-8563 | 08/01/88 | 08/08/88 | | 7 |
| 8757-8764 | 11/29/88 | 12/05/88 | | 7 |
| 8818-8831 | 12/29/88 | 01/04/89 | | 7 |
| 8472-8522 | 08/03/88 | 08/11/88 | | 8 |
| 8740-8747 | 11/10/88 | 11/18/88 | | 8 |
| 8397-8403 | 06/07/88 | 06/16/88 | | 9 |
| 9351-9373 | 06/28/89 | 07/07/89 | | 9 |
| 9374-9399 | 06/29/89 | 07/08/89 | | 9 |
| 8749-8756 | 10/18/88 | 10/28/88 | | 10 |
| 9439-9477 | 06/27/89 | 07/07/89 | | 10 |
| 7299-7352 | 08/17/87 | 08/28/87 | | 11 |
| 7529-7544 | 11/16/87 | 11/27/87 | | 11 |
| 8620-8643 | 08/29/88 | 09/09/88 | | 11 |
| 8789-8802 | 12/16/88 | 12/27/88 | | 11 |
| 7373-7386 | 09/03/87 | 09/15/87 | | 12 |
| 7387-7395 | 09/11/87 | 09/23/87 | | 12 |
| 8320-8327 | 05/09/88 | 05/21/88 | | 12 |
| 9001-9051 | 01/20/89 | 02/01/89 | | 12 |
| 8233-8240 | 04/13/88 | 04/26/88 | | 13 |
| 8245-8251 | 04/25/88 | 05/08/88 | | 13 |
| 8727-8734 | 10/28/88 | 11/10/88 | | 13 |
| 7470-7526 | 11/03/87 | 11/06/87 | 11/17/87 | 3-14 |
| 7404-7426 | 10/02/87 | 10/16/87 | | 14 |
| 8809-8810 | 12/15/88 | 12/29/88 | | 14 |
| **Holding Times: 15 - 21 Days** | | | | |
| 7565-7571 | 12/22/87 | 01/08/88 | | 17 |
| 8336-8384 | 05/23/88 | 06/10/88 | | 18 |
| 8208-8216 | 03/25/88 | 04/13/88 | | 19 |
| 8389-8396 | 05/27/88 | 06/15/88 | | 19 |
| **Holding Times: 22 - 28 Days** | | | | |
| 7572-7592 | 12/21/87 | 01/12/88 | | 22 |
| 7554-7564 | 12/14/87 | 01/06/88 | | 23 |
| 8144-8150 | 03/23/88 | 04/18/88 | | 26 |

TABLE C-2 - CONTINUED

ENSECO LABORATORIES (cont.)

| DWR BATCH NO. | SAMPLES RECEIVED | SAMPLES ANALYZED | | HOLDING TIME (DAYS) |
|---|---|---|---|---|
| **Holding Times: 22 - 28 Days (continued)** | | | | |
| 7447-7456 | 11/09/87 | 11/24/87 | 12/06/87 | 15-27 |
| 8328-8335 | 05/12/88 | 06/08/88 | | 27 |
| **Holding Times: 29 - 35 Days** | | | | |
| 7596-7603 | 12/22/87 | 01/20/88 | | 29 |
| 8151-8203 | 03/21/88 | 04/06/88 | 04/20/88 | 16-30 |
| 7604-7611 | 12/28/87 | 01/27/88 | | 30 |
| 8130-8137 | 03/02/88 | 04/02/88 | | 31 |
| 8221-8228 | 04/01/88 | 05/02/88 | | 31 |
| 8108-8115 | 02/29/88 | 04/01/88 | | 32 |
| **Holding Times: 36 - 42 Days** | | | | |
| 8089-8095 | 02/18/88 | 03/26/88 | | 37 |
| 8001-8015 | 01/15/88 | 02/02/88 | 03/02/88 | 18-47 |
| 8017-8071 | 02/02/88 | 03/08/88 | 03/18/88 | 35-45 |
| **Holding Times: 43 - 49 Days** | | | | |
| 8072-8079 | 02/03/88 | 03/23/88 | | 49 |

## TABLE C-3 – RESULTS OF SPIKED MATRIX SAMPLES
### (January 1987 through June 1989)

### ENSECO LABORATORIES

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | Concentration LCS2 | Accuracy (%) LCS1 | Accuracy (%) LCS2 | Accuracy (%) Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 7299-7352 | | 08/17/87 | Not Found. | | | | | | | |
| 7373-7386 | 09/03/87 | $CHCl_3$ | 5.0 | 4.7 | 5.5 | 94 | 110 | 83-123 | 12 | 26 |
| | | $CHCl_2Br$ | 5.0 | 4.5 | 5.5 | 90 | 110 | 82-126 | 20 | 30 |
| | | Matrix: Water | | | | | | | | |
| 7387-7395 | 09/11/87 | $CHCl_3$ | 5.0 | 4.9 | 4.9 | 98 | 98 | 83-123 | 0 | 21 |
| | | $CHCl_2Br$ | 5.0 | 4.6 | 4.8 | 92 | 96 | 82-126 | 4.3 | 30 |
| | | Matrix: Water | | | | | | | | |
| 7404-7426 | 10/02/87 | $CHCl_3$ | 5.0 | 4.9 | 4.7 | | | | | |
| | | $CHCl_2Br$ | 5.0 | 5.1 | 5.2 | | | | | |
| | | Matrix: Water | | | | | | | | |
| 7428-7438 | 10/27/87 | $CHCl_3$ | 5.0 | 5.4 | 5.2 | 108 | 104 | 84-122 | 3.8 | 22 |
| | | $CHCl_2Br$ | 5.0 | 5.6 | 5.1 | 112 | 102 | 81-129 | 9.4 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7439-7446 | 11/03/87 | $CHCl_3$ | 5.0 | 4.2 | 4.6 | 84 | 92 | 84-122 | 9 | 22 |
| | | $CHCl_2Br$ | 5.0 | 4.4 | 5.2 | 88 | 104 | 81-129 | 17 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7447-7456 | 11/09/87 | $CHCl_3$ | 5.0 | 4.9 | 5.0 | 98 | 100 | 84-122 | 2 | 22 |
| | | $CHCl_2Br$ | 5.0 | 5.0 | 5.1 | 100 | 102 | 81-129 | 2 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7468-7469 | 10/27/87 | Not Found. | | | | | | | | |
| 7470-7526 | 11/03/87 | Not Found | | | | | | | | |
| 7529-7544 | 11/16/87 | $CHCl_3$ | 5.0 | 5.1 | 5.2 | 102 | 104 | 84-122 | 2 | 22 |
| | | $CHCl_2Br$ | 5.0 | 5.3 | 5.3 | 106 | 106 | 81-129 | 0 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7545-7553 | 11/24/87 | $CHCl_3$ | 5.0 | 4.6 | 5.1 | 92 | 102 | 84-122 | 10.3 | 22 |
| | | $CHCl_2Br$ | 5.0 | 5.1 | 4.5 | 102 | 90 | 81-129 | 12.5 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7554-7564 | 12/14/87 | $CHCl_3$ | 5.0 | 4.7 | 4.7 | 94 | 94 | 84-122 | 0 | 22 |
| | | $CHCl_2Br$ | 5.0 | 4.8 | 4.9 | 96 | 98 | 81-129 | 0 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7565-7571 | 12/22/87 | $CHCl_3$ | 5.0 | 5.0 | 5.6 | 100 | 112 | 84-122 | 11 | 22 |
| | | $CHCl_2Br$ | 5.0 | 5.0 | 5.7 | 100 | 114 | 81-129 | 13 | 27 |
| | | Matrix: Water | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | LCS2 | Accuracy (%) LCS1 | LCS2 | Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 7572-7592 | 12/21/87 | Not Found. | | | | | | | | |
| 7596-7603 | 12/22/87 | $CHCl_3$ | 2.5 | 2.2 | 2.6 | 88 | 104 | NC | 0 | NC |
| | | $CHCl_2Br$ | 5.0 | 4.9 | 4.7 | 98 | 94 | 81-129 | 4.2 | 27 |
| | | Matrix: Water | | | | | | | | |
| 7604-7611 | 12/28/87 | $CHCl_3$ | 2.5 | 2.35 | 2.14 | 94 | 86 | 83-124 | 8.9 | 18 |
| | | $CHCl_2Br$ | 5.0 | 4.51 | 4.34 | 90 | 87 | 78-132 | 3.4 | 21 |
| | | Matrix: Water | | | | | | | | |
| 8001-8015 | 01/15/88 | $CHCl_3$ | 2.5 | 2.2 | 2.6 | 88 | 104 | 83-124 | 17 | 18 |
| | | $CHCl_2Br$ | 5.0 | 4.9 | 4.7 | 98 | 94 | 78-132 | 4.2 | 21 |
| | | Matrix: Water | | | | | | | | |
| 8017-8071 | 02/02/88 | No THM's Done | | | | | | | | |
| 8072-8079 | 02/03/88 | $CHCl_3$ | 2.5 | 2.56 | 2.27 | 102 | 91 | 83-124 | 11 | 18 |
| | | $CHCl_2Br$ | 5.0 | 4.79 | 4.06 | 96 | 81 | 78-132 | 17 | 21 |
| | | Matrix: Water | | | | | | | | |
| 8089-8095 | 02/18/88 | $CHCl_3$ | 2.5 | 2.52 | 2.42 | 101 | 97 | 83-124 | 4.0 | 18 |
| | | $CHCl_2Br$ | 5.0 | 2.37 | 4.92 | 107 | 98 | 78-132 | 8.8 | 21 |
| | | Matrix: Water | | | | | | | | |
| 8108-8115 | 02/29/88 | $CHCl_3$ | 2.5 | 2.82 | 2.98 | 113 | 119 | 83-124 | 5.1 | 18 |
| | | $CHCl_2Br$ | 5.0 | 5.04 | 6.10 | 101 | 122 | 78-132 | 19 | 21 |
| | | $CHClBr_2$ | 5.0 | 5.12 | 6.12 | 102 | 122 | NC | 18 | NC |
| | | $CHBr_3$ | 10 | 11.3 | 14.6 | 113 | 146 | NC | 25 | NC |
| | | Matrix: Aqueous | | | | | | | | |
| 8130-8137 | 03/02/88 | $CHCl_3$ | 2.5 | 2.82 | 2.98 | 113 | 119 | 80-125 | 5.2 | 22 |
| | | $CHCl_2Br$ | 5.0 | 5.04 | 6.10 | 101 | 122 | 80-125 | 19.0 | 22 |
| | | $CHClBr_2$ | 5.0 | 5.12 | 6.12 | 102 | 122 | 80-125 | 18.0 | 22 |
| | | $CHBr_3$ | 10.0 | 11.3 | 14.6 | 113 | 146# | 80-125 | 25.0* | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits, * = RPD outside QC limits.) | | | | | | | | |
| 8144-8150 | 03/23/88 | $CHCl_3$ | 2.50 | 2.82 | 2.98 | 113 | 119 | 80-125 | 5.2 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.04 | 6.10 | 101 | 122 | 80-125 | 19.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.12 | 6.12 | 102 | 122 | 80-125 | 18.0 | 22 |
| | | $CHBr_3$ | 10 | 11.3 | 14.6 | 113 | 146# | 80-125 | 25.0* | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits, * = RPD outside QC limits.) | | | | | | | | |
| 8151-8203 | 03/21/88 | No THM's Done | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | Concentration LCS2 | Accuracy (%) LCS1 | Accuracy (%) LCS2 | Accuracy (%) Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 8208-8216 | 03/25/88 | $CHCl_3$ | 2.5 | 2.63 | 2.57 | 105 | 103 | 80-125 | 1.9 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.48 | 4.54 | 90 | 91 | 80-125 | 1.1 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.99 | 4.90 | 100 | 98 | 80-125 | 2.0 | 22 |
| | | $CHBr_3$ | 10.0 | 10.1 | 9.84 | 101 | 98 | 80-125 | 3.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8221-8228 | 04/01/88 | $CHCl_3$ | 2.50 | 2.38 | 2.69 | 95 | 108 | 80-125 | 13.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.35 | 4.87 | 87 | 97 | 80-125 | 11.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.37 | 5.25 | 87 | 105 | 80-125 | 19.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.73 | 10.2 | 87 | 102 | 80-125 | 16.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8233-8240 | 04/13/88 | $CHCl_3$ | 500 | 744 | 789 | NC | NC | NC | NC | NC |
| | | $CHCl_2Br$ | 1000 | 1090 | 1180 | NC | NC | NC | NC | NC |
| | | $CHClBr_2$ | 1000 | 1170 | 1210 | NC | NC | NC | NC | NC |
| | | $CHBr_3$ | 2000 | 2170 | 2090 | NC | NC | NC | NC | NC |
| | | Matrix: Aqueous | | | | | | | | |
| 8245-8251 | 04/25/88 | $CHCl_3$ | 2.50 | 2.64 | 2.53 | 106 | 101 | 80-125 | 4.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.68 | 4.41 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.06 | 4.67 | 101 | 93 | 80-125 | 8.2 | 22 |
| | | $CHBr_3$ | 10.0 | 9.94 | 10.1 | 99 | 101 | 80-125 | 2.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8320-8327 | 05/09/88 | $CHCl_3$ | 5.00 | 5.20 | 5.25 | 104 | 105 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.14 | 5.45 | 103 | 109 | 80-125 | 5.7 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.62 | 5.01 | 92 | 100 | 80-125 | 8.3 | 22 |
| | | $CHBr_3$ | 10.0 | 8.29 | 9.62 | 83 | 96 | 80-125 | 14.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8328-8335 | 05/12/88 | $CHCl_3$ | 5.00 | 5.12 | 5.04 | 102 | 101 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.17 | 5.14 | 103 | 103 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.53 | 5.23 | 111 | 105 | 80-125 | 5.6 | 22 |
| | | $CHBr_3$ | 10.0 | 10.8 | 10.6 | 108 | 106 | 80-125 | 1.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8336-8384 | 05/23/88 | $CHCl_3$ | 5.00 | 5.12 | 5.04 | 102 | 101 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.17 | 5.14 | 103 | 103 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.53 | 5.23 | 111 | 105 | 80-125 | 5.6 | 22 |
| | | $CHBr_3$ | 10.0 | 10.8 | 10.6 | 108 | 106 | 80-125 | 1.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | Concentration LCS2 | Accuracy (%) LCS1 | Accuracy (%) LCS2 | Accuracy (%) Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 8389-8396 | 05/27/88 | $CHCl_3$ | 5.00 | 5.12 | 5.4 | 102 | 101 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.17 | 5.14 | 103 | 103 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.53 | 5.23 | 111 | 105 | 80-125 | 5.6 | 22 |
| | | $CHBr_3$ | 10.0 | 10.8 | 10.6 | 108 | 106 | 80-125 | 1.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8397-8403 | 06/07/88 | $CHCl_3$ | 5.00 | 5.12 | 5.4 | 102 | 101 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.17 | 5.14 | 103 | 103 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.53 | 5.23 | 111 | 105 | 80-125 | 5.6 | 22 |
| | | $CHBr_3$ | 10.0 | 10.8 | 10.6 | 108 | 106 | 80-125 | 1.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8412-8419 | 06/21/88 | $CHCl_3$ | 5.00 | 4.59 | 4.41 | 92 | 88 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.51 | 4.27 | 90 | 85 | 80-125 | 5.7 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.60 | 4.54 | 92 | 91 | 80-125 | 1.1 | 22 |
| | | $CHBr_3$ | 10.0 | 11.3 | 11.0 | 113 | 110 | 80-125 | 2.7 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8420-8428 | 06/23/88 | $CHCl_3$ | 2.50 | 2.47 | 2.51 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.86 | 4.79 | 97 | 96 | 80-125 | 1.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 3.97 | 4.04 | 79# | 81 | 80-125 | 2.5 | 22 |
| | | $CHBr_3$ | 10.0 | 8.89 | 7.85 | 89 | 78# | 80-125 | 13.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits.) | | | | | | | | |
| 8429-8436 | 06/30/88 | $CHCl_3$ | 2.50 | 2.47 | 2.51 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.86 | 4.79 | 97 | 96 | 80-125 | 1.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 3.97 | 4.04 | 79# | 81 | 80-125 | 2.5 | 22 |
| | | $CHBr_3$ | 10.0 | 8.89 | 7.85 | 89 | 78# | 80-125 | 13.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits.) | | | | | | | | |
| 8441-8443 | 07/12/88 | $CHCl_3$ | 5.00 | 4.59 | 4.41 | 92 | 88 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.51 | 4.27 | 90 | 85 | 80-125 | 5.7 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.60 | 4.54 | 92 | 91 | 80-125 | 1.1 | 22 |
| | | $CHBr_3$ | 10.0 | 11.3 | 11.0 | 113 | 110 | 80-125 | 2.7 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8448-8454 | 07/14/88 | $CHCl_3$ | 5.00 | 4.59 | 4.41 | 92 | 88 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.51 | 4.27 | 90 | 85 | 80-125 | 5.7 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.60 | 4.54 | 92 | 91 | 80-125 | 1.1 | 22 |
| | | $CHBr_3$ | 10.0 | 11.3 | 11.0 | 113 | 110 | 80-125 | 2.7 | 22 |
| | | Matrix: Aqueous | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | LCS2 | Accuracy (%) LCS1 | LCS2 | Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 8455-8471 | 07/22/88 | No THM's Done | | | | | | | | |
| 8472-8522 | 08/03/88 | No THM's Done | | | | | | | | |
| 8527-8529 | 07/22/88 | No THM's Done | | | | | | | | |
| 8541-8563 | 08/01/88 | No THM's Done | | | | | | | | |
| 8570-8576 | 08/11/88 | $CHCl_3$ | 5.00 | 4.41 | 4.42 | 88 | 88 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.36 | 4.25 | 87 | 85 | 80-125 | 2.3 | 22 |
| | | $CHClBr_2$ | 5.00 | 3.79 | 3.77 | 76# | 75# | 80-125 | 1.3 | 22 |
| | | $CHBr_3$ | 10.0 | 7.60 | 7.80 | 76# | 78# | 80-125 | 2.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits.) | | | | | | | | |
| 8577-8585 | 08/18/88 | $CHCl_3$ | 5.00 | 4.54 | 4.53 | 91 | 91 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | 10.0 | 7.76 | 8.17 | 78# | 82 | 80-125 | 5.0 | 22 |
| | | $CHClBr_2$ | 10.0 | 7.92 | 8.19 | 79# | 82 | 80-125 | 3.8 | 22 |
| | | $CHBr_3$ | 20.0 | 15.9 | 16.5 | 80 | 82 | 80-125 | 2.5 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits.) | | | | | | | | |
| 8586-8593 | 08/24/88 | $CHCl_3$ | 5.00 | 4.94 | 5.01 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.94 | 4.96 | 99 | 99 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.19 | 4.20 | 84 | 84 | 80-125 | 0.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.63 | 9.43 | 86 | 94 | 80-125 | 8.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8598-8614 | 08/22/88 | $CHCl_3$ | 5.00 | 4.94 | 5.01 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.94 | 4.96 | 99 | 99 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.19 | 4.20 | 84 | 84 | 80-125 | 0.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.63 | 9.43 | 86 | 94 | 80-125 | 8.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8644-8645 | 08/22/88 | $CHCl_3$ | 5.00 | 4.94 | 5.01 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.94 | 4.96 | 99 | 99 | 80-125 | 0.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.19 | 4.20 | 84 | 84 | 80-125 | 0.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.63 | 9.43 | 86 | 94 | 80-125 | 8.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8620-8643 | 08/29/88 | $CHCl_3$ | 5.00 | 3.96 | 4.67 | 79# | 93 | 80-125 | 16.0 | 22 |
| | | $CHCl_2Br$ | 10.0 | 8.58 | 9.88 | 86 | 99 | 80-125 | 14.0 | 22 |
| | | $CHClBr_2$ | 10.0 | 7.14 | 8.72 | 71# | 87 | 80-125 | 20.0 | 22 |
| | | $CHBr_3$ | 20.0 | 15.0 | 19.6 | 75# | 98 | 80-125 | 27.0* | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| | | (# = Recovery outside standard QC limits, * = RPD outside QC limits.) | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | LCS2 | Accuracy (%) LCS1 | LCS2 | Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 8649-8664 | 09/07/88 | $CHCl_3$ | 5.00 | 5.99 | 5.25 | 120 | 105 | 80-125 | 13.0 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.82 | 5.03 | 116 | 101 | 80-125 | 14.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.90 | 4.52 | 98 | 90 | 80-125 | 8.5 | 22 |
| | | $CHBr_3$ | 10.0 | 9.77 | 9.00 | 98 | 90 | 80-125 | 8.5 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8665-8680 | 09/15/88 | $CHCl_3$ | 5.00 | 5.34 | 5.14 | 107 | 103 | 80-125 | 3.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.59 | 4.73 | 92 | 95 | 80-125 | 3.2 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.64 | 4.53 | 93 | 91 | 80-125 | 2.2 | 22 |
| | | $CHBr_3$ | 10.0 | 7.96 | 9.32 | 80 | 93 | 80-125 | 15.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8681-8689 | 09/16/88 | $CHCl_3$ | 5.00 | 5.34 | 5.14 | 107 | 103 | 80-125 | 3.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.59 | 4.73 | 92 | 95 | 80-125 | 3.2 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.64 | 4.53 | 93 | 91 | 80-125 | 2.2 | 22 |
| | | $CHBr_3$ | 10.0 | 7.96 | 9.32 | 80 | 93 | 80-125 | 15.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8690-8697 | 09/23/88 | $CHCl_3$ | 5.00 | 6.19 | 6.26 | 124 | 125 | 80-125 | 0.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.36 | 5.63 | 107 | 113 | 80-125 | 5.4 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.93 | 5.48 | 99 | 110 | 80-125 | 10.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.94 | 10.4 | 89 | 104 | 80-125 | 16.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8698-8705 | 10/03/88 | $CHCl_3$ | 5.00 | 6.19 | 6.26 | 124 | 125 | 80-125 | 0.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.36 | 5.63 | 107 | 113 | 80-125 | 5.4 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.93 | 5.48 | 99 | 110 | 80-125 | 10.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.94 | 10.4 | 89 | 104 | 80-125 | 16.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8710-8718 | 10/13/88 | $CHCl_3$ | 5.00 | 6.19 | 6.26 | 124 | 125 | 80-125 | 0.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.36 | 5.63 | 107 | 113 | 80-125 | 5.4 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.93 | 5.48 | 99 | 110 | 80-125 | 10.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.94 | 10.4 | 89 | 104 | 80-125 | 16.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8719-8726 | 10/24/88 | $CHCl_3$ | 5.00 | 5.58 | 5.60 | 112 | 112 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | 10.0 | 10.6 | 10.1 | 106 | 101 | 80-125 | 4.8 | 22 |
| | | $CHClBr_2$ | 10.0 | 9.64 | 9.72 | 96 | 97 | 80-125 | 1.0 | 22 |
| | | $CHBr_3$ | 20 | 19.8 | 19.9 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | LCS2 | Accuracy (%) LCS1 | LCS2 | Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 8727-8734 | 10/28/88 | $CHCl_3$ | 5.00 | 5.58 | 5.60 | 112 | 112 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | 10.0 | 10.6 | 10.1 | 106 | 101 | 80-125 | 4.8 | 22 |
| | | $CHClBr_2$ | 10.0 | 9.64 | 9.72 | 96 | 97 | 80-125 | 1.0 | 22 |
| | | $CHBr_3$ | 20 | 19.8 | 19.9 | 99 | 100 | 80-125 | 1.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8740-8747 | 11/10/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8749-8756 | 10/18/88 | $CHCl_3$ | 5.00 | 6.19 | 6.26 | 124 | 125 | 80-125 | 0.8 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.36 | 5.63 | 107 | 113 | 80-125 | 5.4 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.93 | 5.48 | 99 | 110 | 80-125 | 10.0 | 22 |
| | | $CHBr_3$ | 10.0 | 8.94 | 10.4 | 89 | 104 | 80-125 | 16.0 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8757-8764 | 11/29/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8775-8788 | 12/12/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8789-8802 | 12/16/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8803-8808 | 12/15/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | LCS2 | Accuracy (%) LCS1 | LCS2 | Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 8809-8810 | 12/15/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8818-8831 | 12/29/88 | $CHCl_3$ | 5.00 | 5.55 | 5.80 | 111 | 116 | 80-125 | 4.4 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.35 | 5.52 | 107 | 110 | 80-125 | 2.8 | 22 |
| | | $CHClBr_2$ | 5.00 | 6.07 | 5.93 | 121 | 119 | 80-125 | 1.7 | 22 |
| | | $CHBr_3$ | 10.0 | 12.5 | 11.7 | 125 | 117 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 8845-8858 | 01/17/89 | $CHCl_3$ | 5.00 | 5.26 | 5.16 | 105 | 103 | 80-125 | 1.9 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.83 | 5.40 | 117 | 108 | 80-125 | 8.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.21 | 4.95 | 104 | 99 | 80-125 | 4.9 | 22 |
| | | $CHBr_3$ | 10.0 | 10.5 | 9.84 | 105 | 98 | 80-125 | 6.9 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9001-9051 | 01/20/89 | $CHCl_3$ | 5.00 | 4.54 | 5.06 | 91 | 100 | 80-125 | 10 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.73 | 5.39 | 95 | 108 | 80-125 | 13 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.65 | 5.18 | 93 | 104 | 80-125 | 11 | 22 |
| | | $CHBr_3$ | 10.0 | 9.11 | 9.64 | 91 | 96 | 80-125 | 5.3 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9052-9058 | 03/06/89 | $CHCl_3$ | 5.00 | 5.12 | 5.26 | 102 | 105 | 80-125 | 2.9 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.97 | 4.37 | 99 | 93 | 80-125 | 6.2 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.98 | 4.68 | 100 | 94 | 80-125 | 6.2 | 22 |
| | | $CHBr_3$ | 10.0 | 9.44 | 8.85 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9096-9103 | 02/08/89 | $CHCl_3$ | 5.00 | 4.54 | 5.06 | 91 | 101 | 80-125 | 10 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.73 | 5.39 | 95 | 108 | 80-125 | 13 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.65 | 5.18 | 93 | 104 | 80-125 | 11 | 22 |
| | | $CHBr_3$ | 10.0 | 9.11 | 9.64 | 91 | 96 | 80-125 | 5.3 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9104-9116 | 02/06/89 | $CHCl_3$ | 5.00 | 4.54 | 5.06 | 91 | 101 | 80-125 | 10 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.73 | 5.39 | 95 | 108 | 80-125 | 13 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.65 | 5.18 | 93 | 104 | 80-125 | 11 | 22 |
| | | $CHBr_3$ | 10.0 | 9.11 | 9.64 | 91 | 96 | 80-125 | 5.3 | 22 |
| | | Matrix: Aqueous | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | Spiked Amount | Concentration LCS1 | Concentration LCS2 | Accuracy (%) LCS1 | Accuracy (%) LCS2 | Accuracy (%) Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| 9117-9129 | 02/13/89 | $CHCl_3$ | 5.00 | 5.24 | 5.62 | 105 | 112 | 80-125 | 6.5 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.39 | 5.85 | 108 | 117 | 80-125 | 8.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.26 | 5.97 | 105 | 119 | 80-125 | 12 | 22 |
| | | $CHBr_3$ | 10.0 | 9.73 | 11.5 | 97 | 115 | 80-125 | 17 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9130-9136 | 02/15/89 | $CHCl_3$ | 5.00 | 5.24 | 5.62 | 105 | 112 | 80-125 | 6.5 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.39 | 5.85 | 108 | 117 | 80-125 | 8.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.26 | 5.97 | 105 | 119 | 80-125 | 12 | 22 |
| | | $CHBr_3$ | 10.0 | 9.73 | 11.5 | 97 | 115 | 80-125 | 17 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9137-9144 | 02/15/89 | $CHCl_3$ | 5.00 | 5.24 | 5.62 | 105 | 112 | 80-125 | 6.5 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.39 | 5.85 | 108 | 117 | 80-125 | 8.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.26 | 5.97 | 105 | 119 | 80-125 | 12 | 22 |
| | | $CHBr_3$ | 10.0 | 9.73 | 11.5 | 97 | 115 | 80-125 | 17 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9151-9158 | 02/23/89 | $CHCl_3$ | 5.00 | 5.24 | 5.62 | 105 | 112 | 80-125 | 6.5 | 22 |
| | | $CHCl_2Br$ | 5.00 | 5.39 | 5.85 | 108 | 117 | 80-125 | 8.0 | 22 |
| | | $CHClBr_2$ | 5.00 | 5.26 | 5.97 | 105 | 119 | 80-125 | 12 | 22 |
| | | $CHBr_3$ | 10.0 | 9.73 | 11.5 | 97 | 115 | 80-125 | 17 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9186-9193 | 03/08/89 | $CHCl_3$ | 5.00 | 5.12 | 5.26 | 102 | 105 | 80-125 | 2.9 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.97 | 4.37 | 99 | 93 | 80-125 | 6.2 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.98 | 4.68 | 100 | 94 | 80-125 | 6.2 | 22 |
| | | $CHBr_3$ | 10.0 | 9.44 | 8.85 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9211-9217 | 03/15/89 | $CHCl_3$ | 5.00 | 5.12 | 5.26 | 102 | 105 | 80-125 | 2.9 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.97 | 4.37 | 99 | 93 | 80-125 | 6.2 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.98 | 4.68 | 100 | 94 | 80-125 | 6.2 | 22 |
| | | $CHBr_3$ | 10.0 | 9.44 | 8.85 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |
| 9218-9219 | 03/16/89 | $CHCl_3$ | 5.00 | 5.12 | 5.26 | 102 | 105 | 80-125 | 2.9 | 22 |
| | | $CHCl_2Br$ | 5.00 | 4.97 | 4.37 | 99 | 93 | 80-125 | 6.2 | 22 |
| | | $CHClBr_2$ | 5.00 | 4.98 | 4.68 | 100 | 94 | 80-125 | 6.2 | 22 |
| | | $CHBr_3$ | 10.0 | 9.44 | 8.85 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | Matrix: Aqueous | | | | | | | | |

TABLE C-3 - (CONTINUED)

| DWR Batch No. | Samples Received | Analyte | | Spiked Amount | Concentration LCS1 | LCS2 | Accuracy (%) LCS1 | LCS2 | Limits | RPD | Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9220-9225 | 03/15/89 | $CHCl_3$ | | 5.00 | 5.12 | 5.26 | 102 | 105 | 80-125 | 2.9 | 22 |
| | | $CHCl_2Br$ | | 5.00 | 4.97 | 4.37 | 99 | 93 | 80-125 | 6.2 | 22 |
| | | $CHClBr_2$ | | 5.00 | 4.98 | 4.68 | 100 | 94 | 80-125 | 6.2 | 22 |
| | | $CHBr_3$ | | 10.0 | 9.44 | 8.85 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |
| 9226-9233 | 03/21/89 | $CHCl_3$ | | 5.00 | 4.64 | 4.63 | 93 | 93 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | | 5.00 | 4.70 | 4.40 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | $CHClBr_2$ | | 5.00 | 4.74 | 4.67 | 95 | 93 | 80-125 | 2.1 | 22 |
| | | $CHBr_3$ | | 10.0 | 9.32 | 9.21 | 93 | 92 | 80-125 | 1.1 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |
| 9239-9245 | 04/06/89 | $CHCl_3$ | | 5.00 | 4.64 | 4.63 | 93 | 93 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | | 5.00 | 4.70 | 4.40 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | $CHClBr_2$ | | 5.00 | 4.74 | 4.67 | 95 | 93 | 80-125 | 2.1 | 22 |
| | | $CHBr_3$ | | 10.0 | 9.32 | 9.21 | 93 | 92 | 80-125 | 1.1 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |
| 9253-9254 | 04/14/89 | $CHCl_3$ | | 5.00 | 4.64 | 4.63 | 93 | 93 | 80-125 | 0.0 | 22 |
| | | $CHCl_2Br$ | | 5.00 | 4.70 | 4.40 | 94 | 88 | 80-125 | 6.6 | 22 |
| | | $CHClBr_2$ | | 5.00 | 4.74 | 4.67 | 95 | 93 | 80-125 | 2.1 | 22 |
| | | $CHBr_3$ | | 10.0 | 9.32 | 9.21 | 93 | 92 | 80-125 | 1.1 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |
| 9351-9373 | 06/28/89 | $CHCl_3$ | | 5.0 | 4.13 | 4.78 | | 89 | 80-125 | 15 | 22 |
| | | $CHCl_2Br$ | | 10.0 | 9.32 | 10.3 | | 98 | 80-125 | 10 | 22 |
| | | $CHClBr_2$ | | 10.0 | 9.24 | 10.2 | | 97 | 80-125 | 9.9 | 22 |
| | | $CHBr_3$ | | 20.0 | 21.0 | 24.0 | | 113 | 80-125 | 13 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |
| 9374-9399 | 06/29/89 | $CHCl_3$ | | 5.0 | 4.13 | 4.78 | | 89 | 80-125 | 15 | 22 |
| | | $CHCl_2Br$ | | 10.0 | 9.32 | 10.3 | | 98 | 80-125 | 10 | 22 |
| | | $CHClBr_2$ | | 10.0 | 9.24 | 10.2 | | 97 | 80-125 | 9.9 | 22 |
| | | $CHBr_3$ | | 20.0 | 21.0 | 24.0 | | 113 | 80-125 | 13 | 22 |
| 2nd Test | | $CHCl_3$ | | 5.0 | 4.67 | 4.54 | | 92 | 80-125 | 2.8 | 22 |
| | | $CHCl_2Br$ | | 10.0 | 9.97 | 9.51 | | 97 | 80-125 | 4.7 | 22 |
| | | $CHClBr_2$ | | 10.0 | 10.5 | 10.2 | | 104 | 80-125 | 2.9 | 22 |
| | | $CHBr_3$ | | 20.0 | 21.0 | 20.4 | | 104 | 80-125 | 2.9 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |
| 9439-9477 | 06/27/89 | $CHCl_3$ | | 5.0 | 4.74 | 4.87 | | 96 | 80-125 | 2.7 | 22 |
| | | $CHCl_2Br$ | | 10.0 | 10.1 | 10.5 | | 103 | 80-125 | 3.9 | 22 |
| | | $CHClBr_2$ | | 10.0 | 10.6 | 11.3 | | 110 | 80-125 | 6.4 | 22 |
| | | $CHBr_3$ | | 20.0 | 21.9 | 23.1 | | 113 | 80-125 | 5.3 | 22 |
| | | Matrix: | Aqueous | | | | | | | | |

TABLE C-4 - SPIKED DUPLICATE ANALYSES FOR PESTICIDES
(Clayton Environmental Consultants 1987-1988)

| Date | Chemical | Concentration (ug/L) Spiked | Test 1 | Test 2 | Accuracy (%) Test 1 | Test 2 | Limits | Precision (RPD) LCS | Limits |
|---|---|---|---|---|---|---|---|---|---|
| 10/09/87 | Methomyl | 50 | 43 | 43 | 86 | 86 | NC | 0.0 | NC |
| | Carbaryl | 50 | 42 | 42 | 84 | 84 | NC | 0.0 | NC |
| | Propham | 50 | 49 | 50 | 98 | 100 | NC | 1.0 | NC |
| | Atrazine | 2.0 | 1.7 | 2.0 | 85 | 100 | NC | 16.2 | NC |
| | Simazine | 2.0 | 1.5 | 1.9 | 75 | 95 | NC | 23.5 | NC |
| | Bentazon | 10 | 9.57 | 6.4 | 95.7 | 64.0 | NC | 39.7 | NC |
| | Diazinon | 20 | 19 | 18 | 95 | 90 | NC | 5.41 | NC |
| | Parathion,ethyl | 20 | 17 | 17 | 85 | 85 | 55-138 | 0.0 | 36 |
| | Ethion | 20 | 17 | 18 | 85 | 90 | NC | 5.71 | NC |
| | 2,4-D | 10 | 11.4 | 12.2 | 114 | 122 | NC | 6.78 | NC |
| | DNBP | 10 | 12.1 | 13.0 | 121 | 130 | NC | 7.17 | NC |
| | Alachlor | 2.0 | 2.1 | 2.0 | 105 | 100 | NC | 4.88 | NC |
| | Dacthal | 0.5 | 0.41 | 0.40 | 82 | 80 | NC | 0.25 | NC |
| | Captan | 4.0 | 3.9 | 3.8 | 98 | 95 | NC | 3.11 | NC |
| | Dicofol | 4.0 | 4.8 | 4.6 | 120 | 115 | NC | 4.26 | NC |
| | Propanil | 10 | 9.6 | 9.3 | 96 | 93 | NC | 3.17 | NC |
| 10/28/87 | Bentazon | 2.0 | 0.9 | 1.3 | 45 | 65 | NC | 36 | NC |
| | Diazinon | 20 | 19 | 18 | 95 | 90 | NC | 5.41 | NC |
| | Parathion,ethyl | 20 | 17 | 17 | 85 | 85 | 55-138 | 0.0 | 36 |
| | Ethion | 20 | 17 | 18 | 85 | 90 | NC | 5.71 | NC |
| | 2,4,5-TP/Silvex | 10 | 11.4 | 12.2 | 114 | 122 | 72-98 | 6.78 | 23 |
| | 2,4,5-T | 10 | 12.1 | 13.0 | 121 | 130 | NC | 7.17 | NC |
| | Alachlor | 2.0 | 2.1 | 2.0 | 105 | 100 | NC | 4.88 | NC |
| | Dacthal | 0.5 | 0.41 | 0.40 | 82 | 80 | NC | 0.25 | NC |
| | Captan | 4.0 | 3.9 | 3.8 | 98 | 95 | NC | 3.11 | NC |
| | Dicofol | 4.0 | 4.8 | 4.6 | 120 | 115 | NC | 4.26 | NC |
| | Propanil | 10.0 | 9.6 | 9.3 | 96 | 93 | NC | 3.17 | NC |
| 12/09/87 | Alachlor | 2.0 | 1.6 | 1.5 | 80 | 75 | NC | 6.4 | NC |
| | Dacthal | 0.5 | 0.40 | 0.39 | 80 | 78 | NC | 2.5 | NC |
| | Captan | 4.0 | 0.75 | 0.79 | 19 | 20 | NC | 5.0 | NC |
| | Dicofol | 4.0 | 3.0 | 3.3 | 75 | 85 | NC | 10 | NC |
| | Carbofuran | 100.0 | 144.0 | 102.0 | 144 | 102 | NC | 34.1 | NC |
| | Methylparathion | 20.0 | 22.5 | 14.9 | 112.5 | 74.5 | NC | 40.6 | NC |
| | Diazinon | 20.0 | 23.3 | 14.5 | 116.5 | 72.5 | NC | 46.6 | NC |
| | Parathion | 20.0 | 22.2 | 14.6 | 112.5 | 73.0 | NC | 42.6 | NC |
| | Molinate | 100.0 | 134 | 79.3 | 134.0 | 79.3 | NC | 51.2 | NC |
| | Thiobencarb | 100.0 | 119 | 86.6 | 119.0 | 86.6 | NC | 31.5 | NC |
| | 2,4-D | 10.0 | 10.0 | 9.60 | 100 | 96.0 | NC | 4.08 | NC |
| | DNBP | 10.0 | 11.7 | 10.80 | 117 | 108 | NC | 8.00 | NC |
| | Atrazine | 2.0 | 1.7 | 3.73 | 85 | 186 | NC | 74.5 | NC |
| | Simazine | 2.0 | 1.63 | 3.88 | 81.5 | 194 | NC | 81.5 | NC |
| | Carbaryl | 50.0 | 43 | 46 | 86 | 92 | 102-117 | 7.1 | 11 |
| | Bentazon | 10.0 | 9.3 | 6.2 | 93 | 62 | NC | 40 | NC |

NA = Not Applicable    NC = Not Calculated    * = Recovery Outside Standard QC Limits or RPD outside QC limits

## TABLE C-4 (Clayton cont.)

| Date | Chemical | Concentration (ug/L) | | | Accuracy (%) | | | Precision (RPD) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Spiked | Test 1 | Test 2 | Test 1 | Test 2 | Limits | LCS | Limits |
| 12/09/87 | Glyphosate | 6.0 | 5.7 | 5.6 | 95 | 93 | NC | 2.1 | NC |
| (cont.) | Propanil | 10.0 | 7.2 | 6.7 | 72 | 67 | NC | 7.1 | NC |
| 11/12/87 | Alachlor | 2.0 | 1.6 | 1.5 | 80 | 75 | NC | 6.4 | NC |
| | Dacthal | 0.5 | 0.4 | 0.39 | 80 | 78 | 60-130 | 2.5 | NC |
| | Captan | 4.0 | 0.75 | 0.79 | 19 | 20 | NC | 5.0 | NC |
| | Dicofol | 4.0 | 4.3 | 4.1 | 108 | 103 | NC | 4.7 | NC |
| | Carbofuran | 100.0 | 144.0 | 102 | 144 | 102 | 69-164 | 34.1 | NC |
| | Methylparathion | 20.0 | 22.5 | 14.9 | 112.5 | 74.5 | NC | 40.6 | NC |
| | Diazinon | 20.0 | 23.3 | 14.5 | 116.5 | 72.5 | NC | 46.6 | NC |
| | Parathion | 20.0 | 22.2 | 14.6 | 112.5 | 73.0 | NC | 42.6 | NC |
| | Molinate | 100.0 | 134.0 | 79.3 | 134.0 | 79.3 | NC | 51.2 | NC |
| | Thiobencarb | 100.0 | 119.0 | 86.6 | 119.0 | 86.6 | NC | 31.5 | NC |
| | 2,4,D | 10.0 | 10.0 | 9.60 | 100.0 | 96.0 | 75-125 | 4.08 | NC |
| | DNBP | 10.0 | 11.7 | 10.80 | 117.0 | 108.0 | NC | 8.00 | NC |
| | Carbaryl | 50.0 | 43.0 | 46.0 | 86.0 | 92.0 | 102-117 | 7.1 | 11 |
| | Bentazon | 10.0 | 9.3 | 6.2 | 93.0 | 62.0 | 22-119 | 40.0 | NC |
| | Glyphosate | 6.0 | 5.7 | 5.6 | 95 | 93 | NC | 2.1 | NC |
| | Propanil | 10.0 | 7.2 | 9.5 | 72.0 | 95.0 | NC | 28.0 | NC |
| 11/17/87 | Carbaryl | 50.0 | 43.0 | 46.0 | 86.0 | 92.0 | 102-117 | 7.1 | 11 |
| | Carbofuran | 100.0 | 144.0 | 102.0 | 144.0 | 102.0 | NC | 34.1 | NC |
| | Methylparathion | 20.0 | 225.0 | 14.9 | 112.5 | 74.5 | NC | 40.6 | NC |
| | Diazinon | 20.0 | 23.3 | 14.5 | 116.5 | 72.5 | 17-118 | 46.6 | 21 |
| | Ethylparathion | 20.0 | 22.2 | 14.6 | 112.5 | 73.0 | 19-125 | 42.6 | 30 |
| | Molinate | 100.0 | 134.0 | 79.3 | 134.0 | 79.3 | NC | 51.2 | NC |
| | Thiobencarb | 100.0 | 119.0 | 86.6 | 119.0 | 86.6 | NC | 31.5 | NC |
| | 2,4-D | 5.0 | 4.70 | 5.0 | 94.0 | 100.0 | NC | 6.18 | NC |
| | DNBP | 5.0 | 5.90 | 5.82 | 118 | 116 | NC | 1.71 | NC |
| | Alachlor | 2.0 | 1.60 | 1..50 | 80 | 75 | NC | 6.4 | NC |
| | Dacthal | 0.5 | 0.40 | 0.39 | 80 | 78 | NC | 2.5 | NC |
| | Captan | 4.0 | 0.75 | 0.79 | 19 | 20 | NC | 5.0 | NC |
| | Dicofol | [illegible].0 | 4.3 | 4.10 | 108 | 103 | NC | 4.7 | NC |
| | Propanil | 1[illegible].0 | 7.2 | 9.5 | 72 | 95 | NC | 28 | NC |
| | Atrazine | [illegible].0 | 1.7 | 3.73 | 85 | 186 | NC | 74.5 | NC |
| | Simazine | [illegible].0 | 1.63 | 3.88 | 81.5 | 194 | NC | 81.5 | NC |
| | Bentazon | 1[illegible].0 | 9.3 | 6.2 | 93 | 62 | NC | 40 | NC |

NA = Not Applicable

NC = Not Calculated

* = Recovery Outside Standard QC Limits or RPD outside QC limits

TABLE C-4 (cont.)

(Enseco Laboratory 1988 - 1989)

| Date | Chemical | Concentration (ug/L) Spiked | Test 1 | Test 2 | Accuracy (%) Test 1 | Test 2 | Limits | Precision (RPD) LCS | Limits |
|---|---|---|---|---|---|---|---|---|---|
| 08/24/88 | Ordram (Molinate) | 4.0 | 3.15 | 3.28 | 79 | 82 | 45-110 | 3.8 | <30 |
| | Bolero (Thiobencarb) | 4.0 | 3.39 | 3.44 | 85 | 86 | 55-110 | 1.2 | <30 |
| | Diazinon | 10.0 | 6.10 | 5.50 | 61 | 55 | 26-126 | 10.0 | <26 |
| | Ethyl parathion | 10.0 | 6.34 | 5.73 | 63 | 57 | 30-125 | 10 | <32 |
| | Ethion | 10.0 | 5.94 | 5.25 | 59 | 52 | 31-142 | 12.0 | <18 |
| | 2,4-D | 1.0 | 1.05 | 0.93 | 105 | 93 | 75-125 | 12.0 | <20 |
| | MCPA | 200.0 | 180.0 | 198.0 | 90 | 99 | 75-125 | 9.5 | <20 |
| | Alachlor | 1.0 | 1.98 | 1.86 | 198 | 186 | NC | 6.3 | NC |
| | Propanil | 1.0 | 1.92 | 1.42 | 192 | 142 | NC | 30.0 | NC |
| | Orthene | 50.0 | NA | NA | NA | NA | NC | NA | NC |
| | Methamidophos Monitor | 50.0 | 27.8 | 30.1 | 56 | 60 | NC | 6.9 | NC |
| | Diazinon | 10.0 | 6.10 | 5.50 | 61 | 55 | 26-126 | 10.0 | <26 |
| | Ethyl parathion | 10.0 | 6.34 | 5.73 | 63 | 57 | 30-125 | 10.0 | <32 |
| | Ethion | 10.0 | 5.94 | 5.24 | 59 | 52 | 31-142 | 12.0 | <18 |
| | Atrazine | 2.0 | 1.89 | 1.95 | 95 | 98 | NC | 3.1 | NC |
| | Simazine | 2.0 | 2.0 | 2.07 | 100 | 104 | NC | 3.9 | NC |
| | Carbofuran | 10.0 | 11.5 | 10.3 | 115 | 103 | 73-116 | 11.0 | <20 |
| | Bentazon | 10.0 | 8.60 | 9.0 | 86 | 90 | 65-120 | 4.5 | <30 |
| | Nudrin (Methomyl) | 20.0 | 18.1 | 18.5 | 90 | 92 | 52-118 | 2.2 | <37 |
| | Triforine | 200.0 | 196.0 | 193.0 | 98 | 96 | 51-127 | 2.1 | <33 |
| | **by HPLC** | | | | | | | | |
| | Carbaryl | 20.0 | 22.6 | 21.1 | 113* | 106 | 62-111 | 6.4 | <29 |
| | Propham | 20.0 | 18.3 | 19.4 | 92 | 97 | 57-122 | 5.3 | <41 |
| 08/25/88 | Ordram | 4.0 | 3.57 | 3.47 | 89 | 87 | 45-110 | 2.3 | <30 |
| | Bolero (Thiobencarb) | 4.0 | 3.79 | 3.68 | 95 | 92 | 55-110 | 3.2 | <30 |
| | Dinoseb | 50.0 | 61.8 | 63.4 | 124 | 127 | 75-125 | 2.4 | <20 |
| | 2,4-D | 1.0 | 1.02 | 0.920 | 102 | 92 | 75-125 | 10.0 | <20 |
| | Gamma-BHC (Lindane) | 0.200 | 0.156 | 0.144 | 78 | 72 | 56-123 | 8.0 | <15 |
| | Dieldrin | 0.500 | 0.412 | 0.421 | 82 | 84 | 52-126 | 2.4 | <18 |
| | Heptachlor | 0.200 | 0.146 | 0.130 | 73 | 65 | 40-131 | 12.0 | <20 |
| | Aldrin | 0.200 | 0.148 | 0.139 | 74 | 70 | 40-120 | 5.6 | <22 |
| | Endrin | 0.500 | 0.426 | 0.453 | 85 | 91 | 56-121 | 6.8 | <21 |
| | 4,4'DDT | 0.500 | 0.296 | 0.306 | 59 | 61 | 38-127 | 3.3 | <27 |
| | Diazinon | 10.0 | 8.07 | 7.33 | 81 | 73 | 26-126 | 10.0 | <26 |
| | Ethyl Parathion | 10.0 | 8.31 | 7.48 | 83 | 75 | 30-125 | 10.0 | <32 |

NA = Not Applicable NC = Not Calculated * = Recovery Outside Standard QC Limits or RPD outside QC limits

TABLE C-4 (Enseco cont.)

| Date | Chemical | Concentration (ug/L) Spiked | Test 1 | Test 2 | Accuracy (%) Test 1 | Test 2 | Limits | Precision (RPD) LCS | Limits |
|---|---|---|---|---|---|---|---|---|---|
| 08/25/88 | Ethion | 10.0 | 8.24 | 6.97 | 82 | 70 | 31-142 | 16.0 | <18 |
| | Atrazine | 2.0 | 1.79 | 1.74 | 90 | 87 | NC | 3.4 | NC |
| | Simazine | 2.0 | 1.85 | 1.79 | 93 | 90 | NC | 3.3 | NC |
| | Orthene | 50.0 | NA | NA | NA | NA | NC | NA | NC |
| | Methamidophos (Monitor) | 50.0 | 30.3 | 30.5 | 61 | 61 | NC | 0 | NC |
| | Carbofuran (Furadan) | 10.0 | 8.80 | 10.1 | 88 | 101 | 73-116 | 14.0 | <20 |
| | Bentazon | 10.0 | 8.60 | 7.63 | 86 | 76 | 65-120 | 12.0 | <30 |
| | Bentazon | 10.0 | 9.98 | 8.94 | 100 | 89 | 65-120 | 12.0 | <30 |
| | Carbaryl (Sevin) | 10.0 | 8.40 | 8.0 | 84 | 80 | 62-111 | 4.9 | <29 |
| | Propham | 10.0 | 9.10 | 9.0 | 91 | 90 | 57-122 | 1.1 | <41 |
| | Nudrin (Methomyl) | 10.0 | 7.60 | 7.40 | 76 | 74 | 52-118 | 2.7 | <37 |
| | Triforine | 100.0 | NA | NA | NC | NC | 51-127 | NC | <33 |
| | Propanil | 1.0 | 0.792 | 0.789 | 79 | 79 | NC | 0 | NC |
| | Alachlor | 1.0 | 0.926 | 0.949 | 93 | 95 | NC | 1.1 | NC |
| 08/30/89 | Alachlor | 2.0 | 2.23 | 2.03 | 112 | 102 | NC | 9.0 | NC |
| | Propanil | 2.0 | 1.69 | 1.71 | 85 | 86 | NC | 2.0 | NC |
| | Orthene | 50.0 | NA | NA | NA | NA | NC | NA | NC |
| | Methamidophos (Monitor) | 50.0 | 29.1 | 28.3 | 58 | 57 | NC | 1.7 | NC |
| | Atrazine | 2.0 | 1.36 | 1.44 | 68 | 72 | NC | 5.7 | NC |
| | Simazine | 2.0 | 1.45 | 1.53 | 73 | 77 | NC | 5.3 | NC |
| | Ordram | 4.0 | 3.38 | 3.02 | 84 | 76 | 45-110 | 10.0 | <30 |
| | Bolero | 4.0 | 3.86 | 3.52 | 96 | 88 | 55-110 | 8.7 | <30 |
| | Dinoseb | 50.0 | 72.0 | 73.6 | 144* | 147* | 75-125 | 2.0 | <20 |
| | 2,4-D | 1.0 | 1.04 | 1.25 | 104 | 125 | 75-125 | 18.0 | <20 |
| | Diazinon | 10.0 | 8.83 | 10.4 | 88 | 104 | 26-126 | 17.0 | <26 |
| | Ethyl parathion | 10.0 | 9.38 | 10.8 | 94 | 108 | 30-125 | 14.0 | <32 |
| | Methyl para. | 10.0 | 9.41 | 10.9 | 94 | 110 | 31-142 | 16.0 | <18 |
| | Carbofuran | 10.0 | 11.5 | 10.3 | 115 | 103 | 73-116 | 11.0 | <20 |
| | Bentazon | 10.0 | 8.60 | 9.0 | 86 | 90 | 65-120 | 4.5 | <30 |
| | Carbaryl | 20.0 | 14.2 | 14.8 | 71 | 74 | 62-111 | 4.2 | <29 |
| | Propham | 20.0 | 12.9 | 12.8 | 64 | 64 | 57-122 | 0.0 | <41 |
| | Nudrin | 20.0 | 13.4 | 12.5 | 67 | 62 | 52-118 | 7.8 | <37 |
| | Triforine | 200 | 133 | 139 | 66 | 70 | 51-127 | 5.9 | <33 |

NA = Not Applicable NC = Not Calculated * = Recovery Outside Standard QC Limits or RPD outside QC limits

TABLE C-5
Quality Control/Quality Assurance
Trihalomethane Interlaboratory Comparison
(Samples Distributed 1-20-88)

| Laboratory | $CHCl_3$ | $CHBrCl_2$ | $CHBr_2Cl$ | $CHBr_3$ | Total | Average % Deviation* |
|---|---|---|---|---|---|---|
| EBMUD | 130 | 170 | 190 | 60 | 550 | |
| | 130 | 170 | 180 | 59 | 540 | |
| | 130 | 170 | 190 | 63 | 550 | |
| | 130 | 170 | 200 | 64 | 560 | |
| Average | 130 | 170 | 190 | 62 | 550 | |
| Standard Deviation | 0 | 0 | 7 | 2 | 7 | |
| Percent Deviation from Overall Average | -6 | -3 | -2 | 9 | | 5 |
| CAL ANALYTICAL | 130 | 170 | 170 | 57 | 527 | |
| | 110 | 160 | 160 | 57 | 487 | |
| | 130 | 170 | 160 | 49 | 519 | |
| | 140 | 180 | 170 | 50 | 540 | |
| Average | 128 | 170 | 168 | 53 | 518 | |
| Standard Deviation | 11 | 7 | 4 | 4 | 20 | |
| Percent Deviation from Overall Average | -8 | -3 | -13 | -7 | | 8 |
| DWR - BRYTE | 140 | 210 | 230 | 60 | 640 | |
| | 150 | 220 | 240 | 61 | 670 | |
| Average | 145 | 215 | 235 | 61 | 655 | |
| Standard Deviation | 5 | 5 | 5 | 1 | 15 | |
| Percent Deviation from Overall Average | 4 | 22 | 22 | 7 | | 14 |

* - Average % deviation is an average of the 4 species "percent deviations" without consideration of their algebraic signs.

TABLE C-5 (Continued)
Quality Control/Quality Assurance
Trihalomethane Interlaboratory Comparison
(Samples Distributed 1-20-88)

| Laboratory Deviation* | $CHCl_3$ | $CHBrCl_2$ | $CHBr_2Cl$ | $CHBr_3$ | Total | Average % |
|---|---|---|---|---|---|---|
| DOHS | 130 | 160 | 180 | 50 | 520 | |
| | 130 | 170 | 190 | 48 | 540 | |
| | 130 | 160 | 180 | 47 | 520 | |
| | 120 | 160 | 180 | 47 | 510 | |
| | 130 | 160 | 190 | 48 | 530 | |
| Average | 128 | 162 | 180 | 50 | 522 | |
| Standard Deviation | 4 | 4 | 5 | 1 | 10 | |
| Percent Deviation from Overall Average | -8 | -8 | -5 | -16 | | 9 |
| CLAYTON | 180 | 180 | 200 | 64 | 620 | |
| | 150 | 150 | 180 | 59 | 540 | |
| (Trip Blank) | ND | ND | ND | ND | ND | |
| Average | 165 | 165 | 190 | 62 | 582 | |
| Standard Deviation | 15 | 15 | 10 | 3 | 40 | |
| Percent Deviation from Overall Average | 19 | -6 | -2 | 9 | | 9 |
| Overall Average (Exclusive of Trip Blank) | 139 | 176 | 193 | 57 | 565 | |

* - Average % deviation is an average of the 4 species "percent deviations" without consideration of their algebraic signs.

# Appendix D

## THM HOLDING TIME STUDY

EPA methods specify a two week holding time for all volatiles, including trihalomethanes. A review of laboratory QC revealed that one of our contract laboratories had held some THM samples up to seven weeks (see Appendix C). Normally, we would have rejected the data. However, in this case, it represented a significant fraction of the total data set.

A comparison of the data in question with data where the holding times were not violated revealed no apparent differences. All of the data appeared to be consistent according to station an time of year.

DWR consulted with our chemists at Bryte Laboratory and with representatives from the Department of Health Services, and with Enseco, Inc. The consensus was that the holding times specified in EPA methods were not based on actual studies, rather were set for entire classes of chemicals. Therefore, permissible holding times for THM's might be longer than the specified two weeks provided that the samples were stored properly.

Based on this preliminary assessment. DWR contacted Enseco Labs, Inc. and requested their assistance in conducting a holding time study for THMs. DWR Bryte Laboratory also agreed to participate in the study. Working with the two laboratories, the following protocol was developed.

### THM HOLDING TIME PROTOCOL

Three and a half gallons of water from the station at Harvey O. Banks Pumping Plant were collected and filtered through a 45 .m Millipore filter.

The water was transported to the DWR Bryte Laboratory and spiked to exactly 100 mg/L $Cl_2$ and incubated for seven days in a separatory funnel with no head space. After incubation, the water was quenched in bulk with sodium thiosulfate, and mixed thoroughly. The water was collected, spiked, and quenched in bulk in order to minimize sample-to-sample variations.

The quenched water was then dispensed from the bottom of the separatory funnel into 40 ml vials. Since some the volatile THMs might be lost to the increasing head space in the separatory funnel (and to the air in the laboratory) during the transfer process, there was the potential that the concentration of THMs in the last bottle filled would be slightly less than in the first. In order to compensate for this potential systematic loss during the transfer process, the vials were filled, and placed randomly into holding trays. Enough vials were prepared for an eight week study, one set for immediate analysis. Eighteen samples (54 vials) were sent to Enseco for analysis.

Both laboratories refrigerated the bottles, and handle them normally, as if they were normal THM samples, except for the extended holding times.

The first samples were to be analyzed as soon as possible, the remainder analyzed at a rate of two samples each 7 days, at days 7, 14, 21, 28, 35, 42, 49, and 56 (eight weeks). Bottles were selected at random for analysis.

Enseco, Inc. included duplicate control samples in their quality assurance procedures. DWR Bryte included surrogate recovery samples. Both types of samples are used as a check for accuracy and precision.

There were a few deviations from the weekly analysis of samples. The first analyses were conducted (on a single sample) by Bryte on March 12, 1990 (day 0). Enseco conducted its first analyses on day 3. Bryte was unable to analyzed the samples on day 21. Bryte did not analyze the samples on day 56, but analyzed them on day 59, and analyzed a single sample on day 60.

Enseco analyzed the samples according to a modified the EPA Method 601; the same method that they had used when they were under contract to DWR. Bryte laboratory analyzed their samples according to a modified EPA method 502.2.

Both methods use a purge and trap method of extraction. However, Method 601 calls for use of a packed column and a halide specific detector. Method 502.2 calls for use of a capillary column and photoionization detector in series with an electric conductivity detector. The accuracy interval for Method 601 as used by Enseco was 80-125%, whereas the specified range is 80-120% for Method 502.2.

Use of two different methodologies was seen as a drawback, however it was felt that both methods should be capable of detecting real losses of analyte over time. Bryte's analyses, based on Method 502.2, were expected to be more sensitive than Enseco's because of the improved methodology in EPA method 502.2.

Data collected in this study and QA/QC results are summarized at the end of this appendix in Tables D-7 through D-10.

## RESULTS

Statistical analysis of the data were performed with the aid of a statistical program called Statgraphics (no endorsement is implied). The data indicate that the holding time had little or no effect on the concentrations of the individual trihalomethanes. Figure D-1[1] is a graph of weekly average THM precursor concentrations vs time. Although the analyses varied from week to week, there is little discernable slope.

In many cases, analyses of the precursors appeared to increase or decrease together. For example the analyses for $CHCl_3$, $CHCl_2Br$, $CHClBr_2$, $CHBr_3$, all appear to decrease on day 28. This may be an artifact of variations in methodology, or other systematic source of variability. One possible factor was that Enseco used a different lot for it's

[1] *Analyses for days 0 and 3 (week 0) and for days 56 and 59 (week 8) are grouped together because of graphics software limitations. There was no grouping of data for the statistical analyses shown in Tables 1 through 6.*

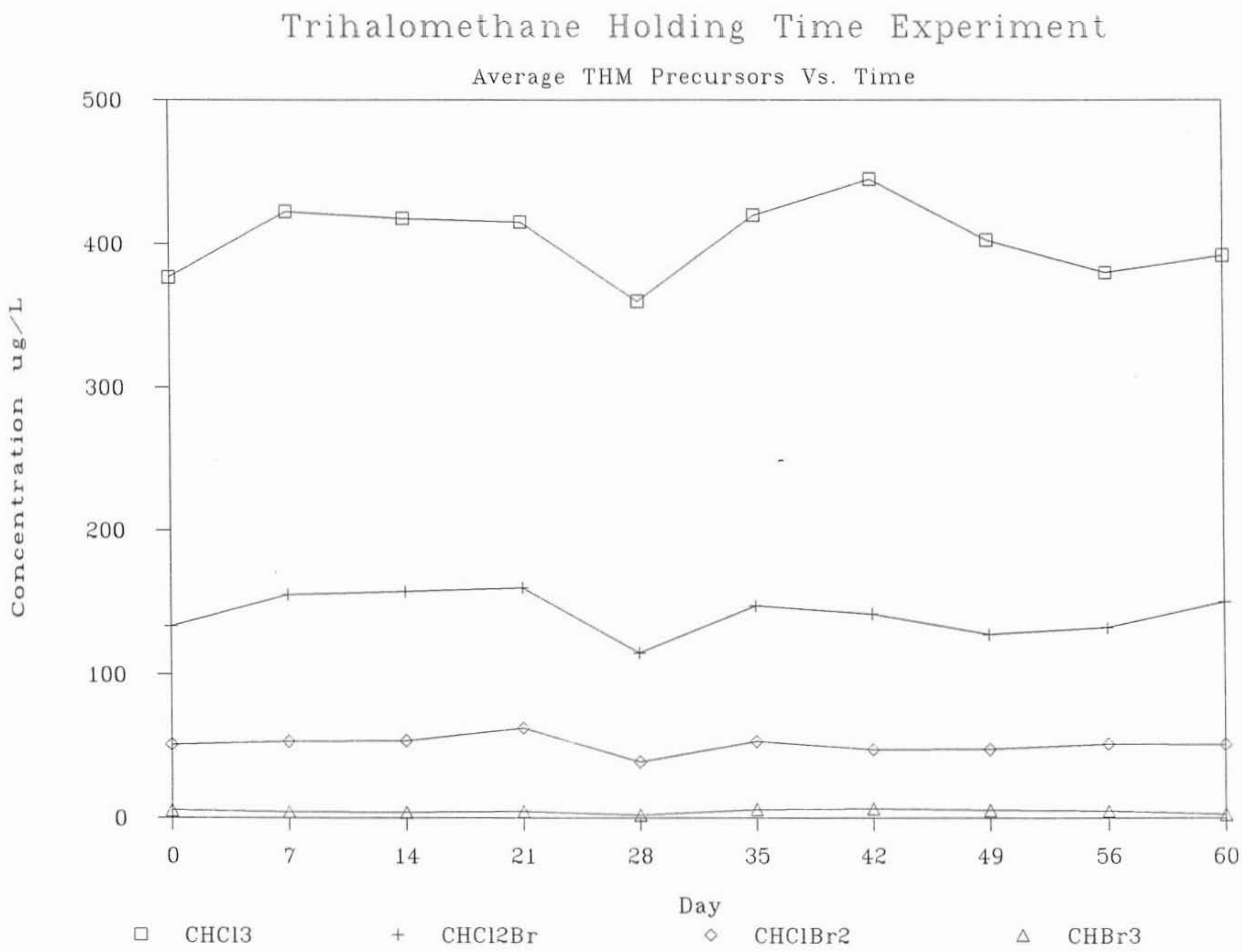

Trihalomethane Holding Time Experiment
Average THM Precursors Vs. Time
Concentration ug/L
500
400
300
200
100
0
0
7
14
21
28
35
42
49
56
60
Day
CHCl3
CHCl2Br
CHClBr2
CHBr3

Figure D-1

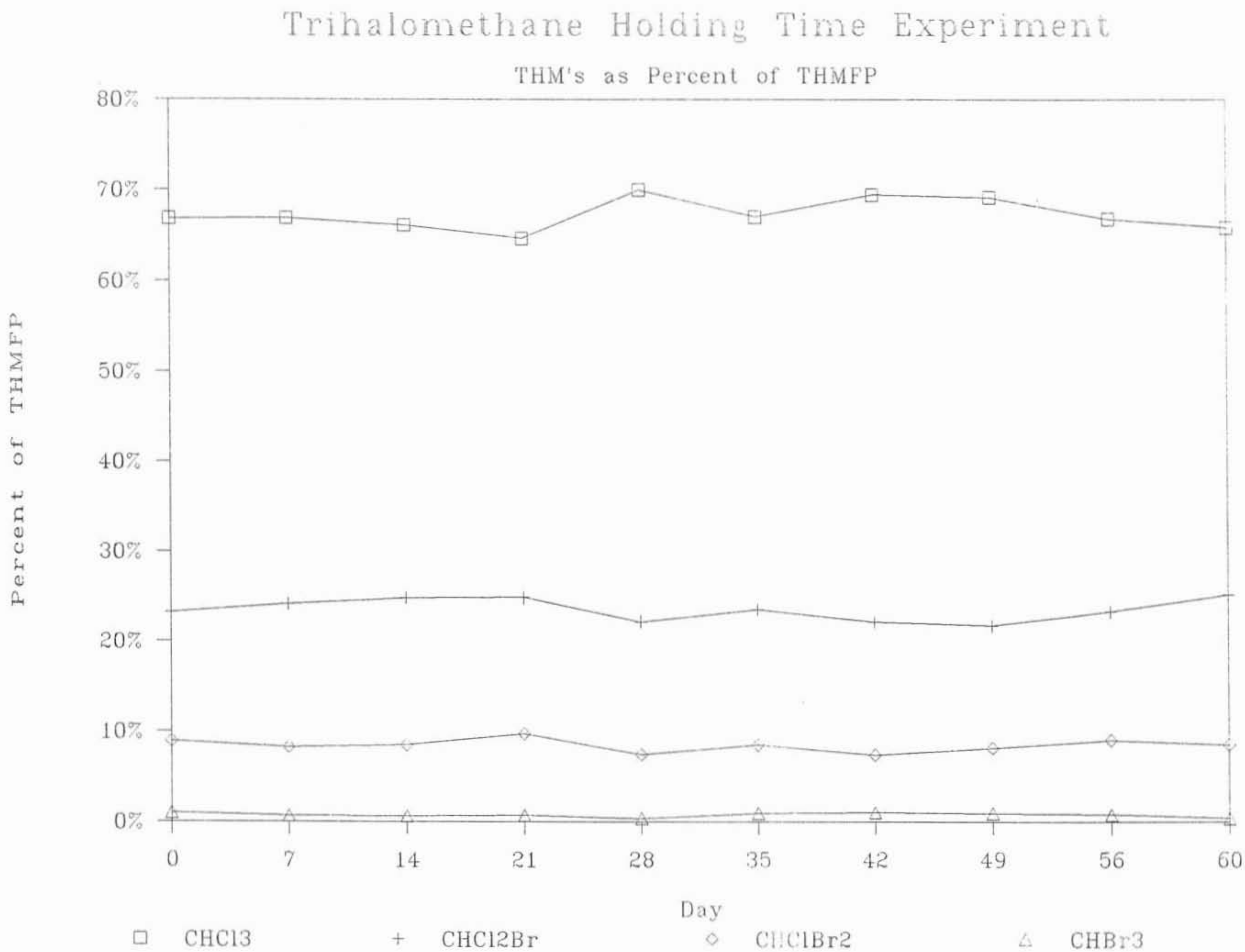

Trihalomethane Holding Time Experiment
THM's as Percent of THMFP
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of THMFP
0
7
14
21
28
35
42
49
56
60
Day
CHCl3
CHCl2Br
CHClBr2
CHBr3

Figure D-2

Table D-1

Statistical Comparison of $CHCL_3$ Analyses

Two-Sample Analysis Results

| | | Enseco | Bryte | Combined |
|---|---|---|---|---|
| Sample Statistics: | Number of Obs. | 18 | 16 | 34 |
| | Average | 392.222 | 417.5 | 404.118 |
| | Std. Deviation | 34.3949 | 33.7639 | 34.1005 |

Difference between Means = -25.2778

Hypothesis Test for H0: Diff = 0 vs Alt: NE at Alpha = 0.05

Computed t statistic = -2.15742
Sig. Level = 0.0385866
so reject H0.

Regression Analysis - Linear model: Y = a+bX
$CHCL_3$ vs Day

| Lab | Parameter | Estimate | Standard Error | T Value | Prob. Level |
|---|---|---|---|---|---|
| Combined | Intercept | 407.226 | 12.0153 | 33.8923 | .00000 |
| | Slope | -0.101732 | 0.335803 | -0.30295 | .76389 |
| Enseco | Intercept | 384.85 | 15.7038 | 24.5068 | .00000 |
| | Slope | 0.260192 | 0.470997 | 0.552428 | .58829 |
| Bryte | Intercept | 437.558 | 16.0984 | 27.1802 | .00000 |
| | Slope | -0.606657 | 0.419888 | -1.44481 | .17052 |

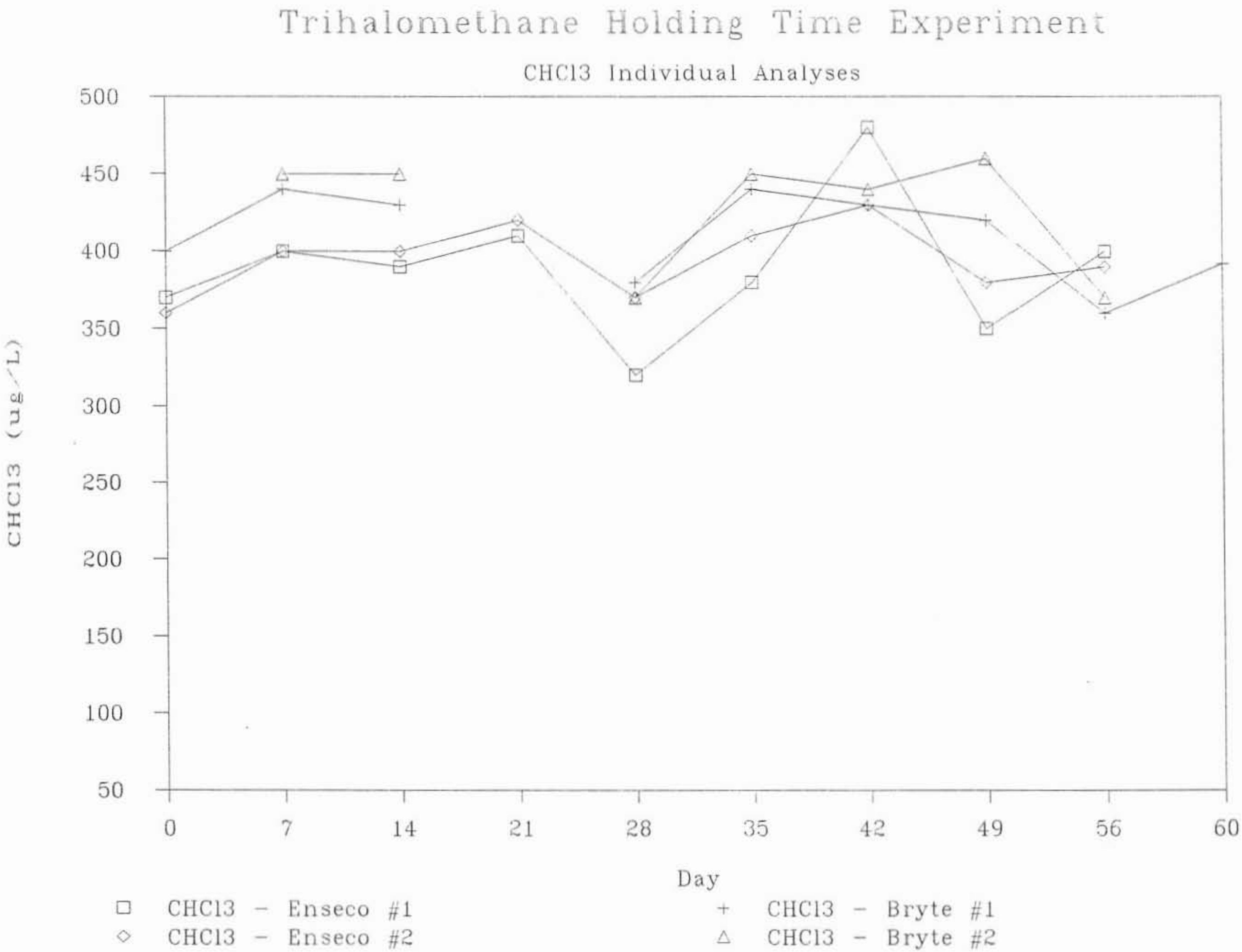

Trihalomethane Holding Time Experiment
CHCl3 Individual Analyses
CHCl3 (ug/L)
500
450
400
350
300
250
200
150
100
50
0
7
14
21
28
35
42
49
56
60
Day
CHCl3 - Enseco #1
CHCl3 - Enseco #2
CHCl3 - Bryte #1
CHCl3 - Bryte #2

Figure D-3

Table D-2

Statistical Comparison of $CHCL_2Br$ Analyses

Two-Sample Analysis Results

| | | Enseco | Bryte | Combined |
|---|---|---|---|---|
| Sample Statistics: | Number of Obs. | 18 | 16 | 34 |
| | Average | 126.611 | 155.625 | 140.265 |
| | Std. Deviation | 19.7845 | 19.3111 | 19.564 |

Difference between Means = -29.0139

Hypothesis Test for H0: Diff = 0 vs Alt: NE at Alpha = 0.05

Computed t statistic = -4.31623
Sig. Level = 1.42945E-4
so reject H0.

Regression Analysis - Linear model: Y = a+bX
$CHCL_2Br$ vs Day

| Lab | Parameter | Estimate | Standard Error | T Value | Prob. Level |
|---|---|---|---|---|---|
| Combined | Intercept | 149.483 | 7.88567 | 18.9563 | .00000 |
| | Slope | -0.301657 | 0.220388 | -1.36875 | .18061 |
| Enseco | Intercept | 128.546 | 9.10107 | 14.1243 | .00000 |
| | Slope | -0.0682854 | 0.272964 | -0.250163 | .80565 |
| Bryte | Intercept | 179.401 | 6.56639 | 27.3212 | .00000 |
| | Slope | -0.719136 | 0.171268 | -4.19888 | .00089 |

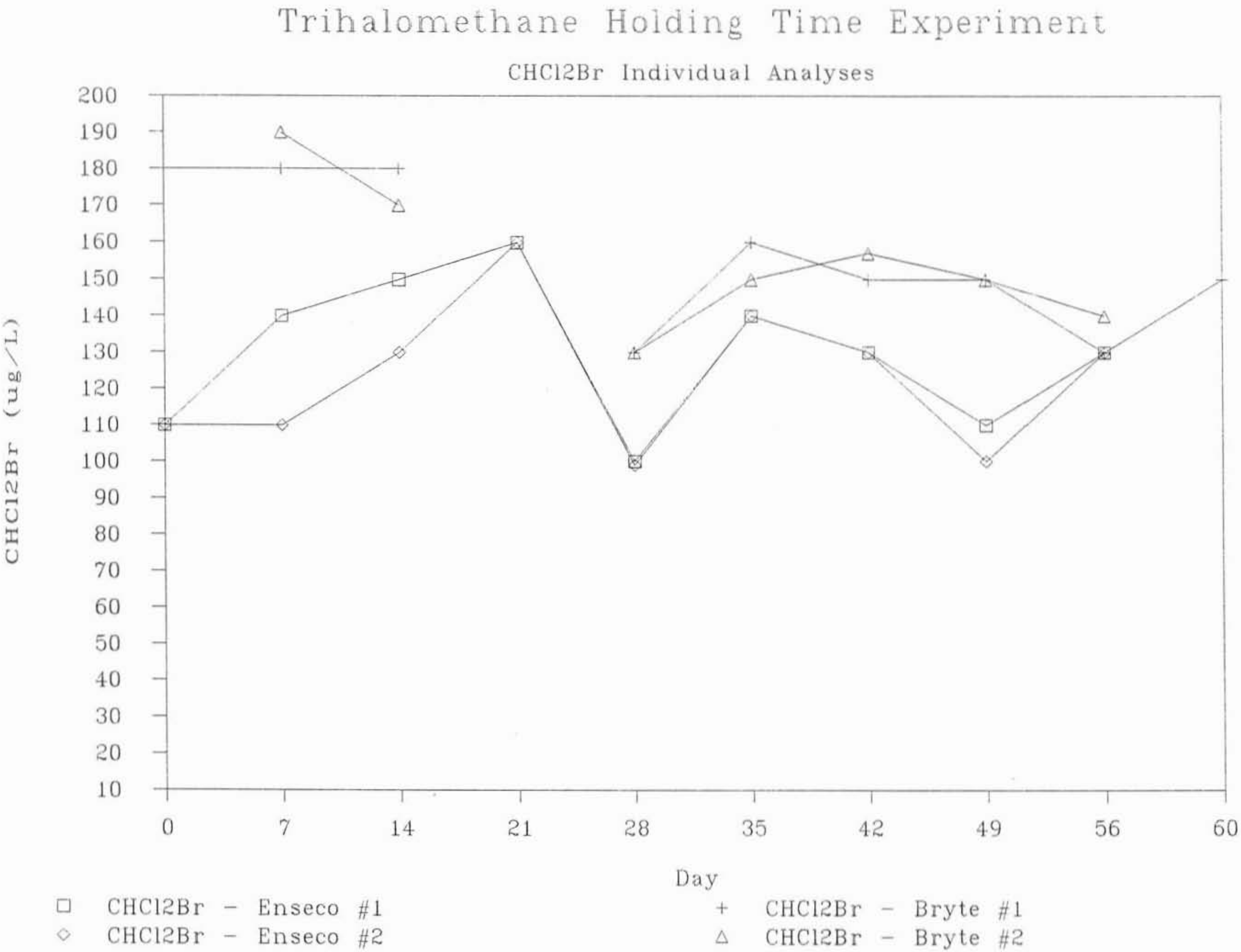

Trihalomethane Holding Time Experiment
CHCl2Br Individual Analyses
CHCl2Br (ug/L)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
7
14
21
28
35
42
49
56
60
Day
CHCl2Br - Enseco #1
CHCl2Br - Enseco #2
CHCl2Br - Bryte #1
CHCl2Br - Bryte #2

Figure D-4

standard on day 28, than for the remainder of the test. Perhaps by coincidence, the Bryte analyses were also lower than average on that date.

When the individual analyses are divided by the total THM's for that sample, and expressed as percent of total THMs, much of the variability from date to date is reduced (Figure D-2). This tends to support the idea that much of the variance seen is due to a systematic variability in the analyses.

Statistical analyses was performed for each of the THMs and for each of the laboratories. For each THM, there were 18 analyses provided by Enseco, and 16 provided by Bryte. The difference in the number of analyses is due to the fact that Bryte analyzed only one sample (instead of two) on day zero, none on day 21 and provided an extra analysis on day 60 (not in the original plan).

**$CHCl_3$**

Enseco reported an average 392 .g/L $CHCl_3$ (Table D-1, Figure A-3), Bryte reported an average 417 .g/L. Combined, the average was 404 .g/L. The standard deviation (s.d.) for all three averages was 34 .g/L. Analysis of the means revealed that the 25 .g/L difference between the means was significant at the 95% confidence level.

Regression analysis of $CHCl_3$ vs time showed a slight positive trend for the Enseco analyses and a slight negative trend for the Bryte analyses. Neither slope was significantly different from zero at the 95% probability level.

**$CHCl_2Br$**

Enseco reported an average 127 .g/L $CHCl_2Br$ (s.d. 20 .g/L) (Table D-2, Figure D-4) Bryte reported an average 156 .g/L (s.d. 19 .g/L). The combined average was 140 .g/L (s.d. 20 .g/L). Analysis of the means revealed that the 29 .g/L difference between the means was significant at better than the 99.9% confidence level.

Regression analysis of $CHCl_2Br$ data versus time showed a slight negative trend for both laboratories. The slope for the Enseco analyses was not significant at the 95% level. The Bryte analyses showed a loss of approximately 0.7 .g/L per day (0.4%/day), significant at the 95% level. However the combined data showed no significant slope.

**$CHClBr_2$**

The Enseco analysis of both $CHClBr_2$ and of $CHBr_3$ showed a high variability. Enseco reported an average 47 .g/L $CHClBr_2$ (s.d. 9.1 .g/L) (Table D-3, Figure D-5) Bryte reported an average 55 .g/L (s.d. 4.1 .g/L). The combined average was 50 .g/L (s.d. 7.3 .g/L). Analysis of the means revealed that the 8 .g/L difference between the means exceeded the 99% confidence level.

Regression analysis of the $CHClBr_2$ data versus time showed a slight negative trend for both laboratories. The slope for the Enseco analyses was not significant at the 95% level. The Bryte analyses showed a loss of approximately 0.15 .g/L per day (0.25%/day), significant at the 95% level. However the combined data showed no significant slope.

Table D-3

Statistical Comparison of $CHClBr_2$ Analyses

Two-Sample Analysis Results

| | | Enseco | Bryte | Combined |
|---|---|---|---|---|
| Sample Statistics: | Number of Obs. | 18 | 16 | 34 |
| | Average | 46.6667 | 54.5625 | 50.3824 |
| | Std. Deviation | 9.17157 | 4.14679 | 7.26279 |

Difference between Means = -7.89583

Hypothesis Test for H0: Diff = 0
vs Alt: NE
at Alpha = 0.05

Computed t statistic = -3.16411
Sig. Level = 3.40106E-3
so reject H0.

Regression Analysis - Linear model: Y = a+bX
$CHClBr_2$ vs Day

| | Parameter | Estimate | Standard Error | T Value | Prob. Level |
|---|---|---|---|---|---|
| Combined | Intercept | 52.4041 | 2.71149 | 19.3267 | .00000 |
| | Slope | −0.0661606 | 0.0757806 | -0.873054 | .38914 |
| Enseco | Intercept | 47.6502 | 4.21734 | 11.2986 | .00000 |
| | Slope | −0.0347122 | 0.126488 | -0.27443 | .78727 |
| Bryte | Intercept | 59.5121 | 1.46251 | 40.6918 | .00000 |
| | Slope | -0.149705 | 0.038146 | -3.92453 | .00153 |

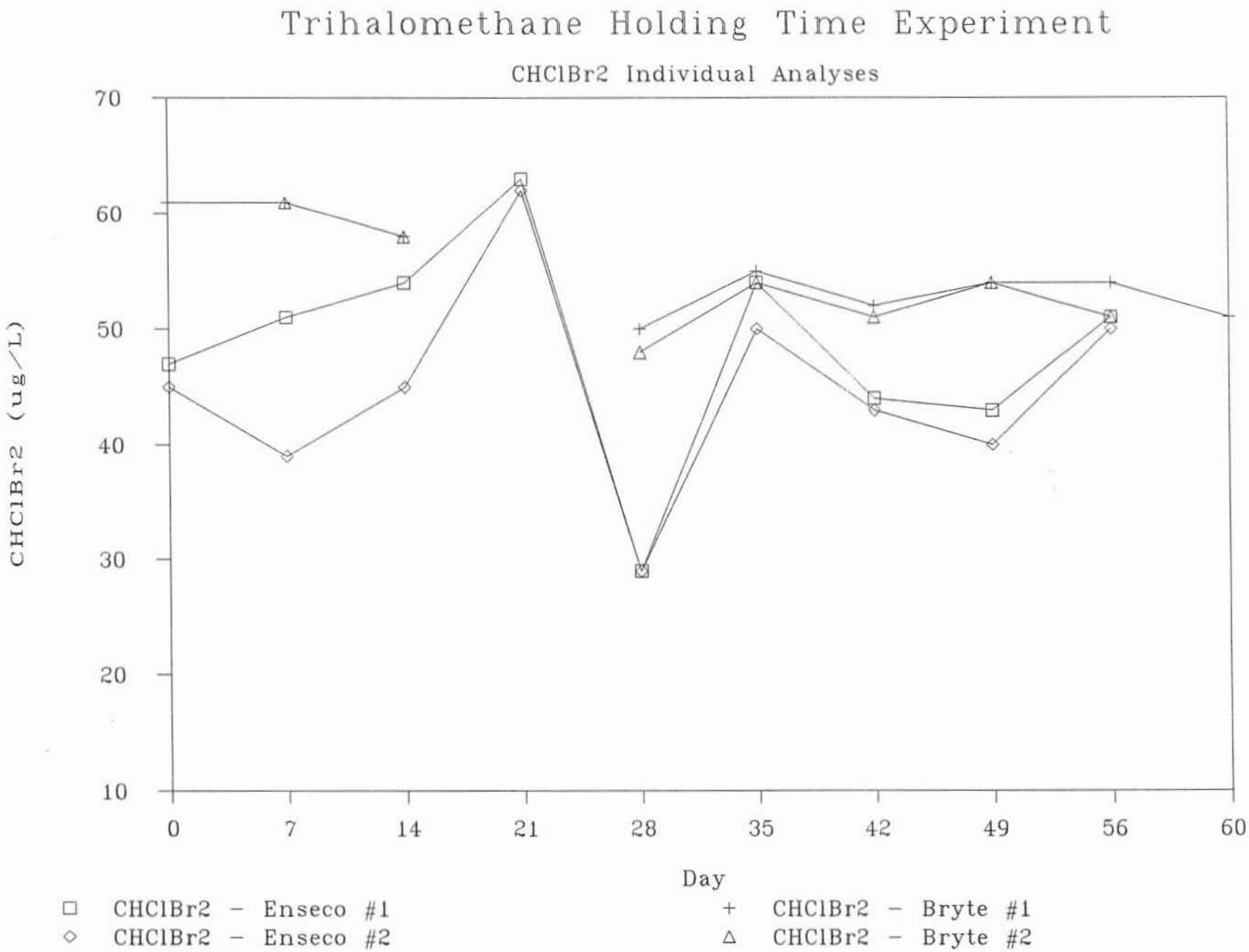

Trihalomethane Holding Time Experiment
CHClBr2 Individual Analyses
70
60
50
40
30
20
10
CHClBr2 (ug/L)
0
7
14
21
28
35
42
49
56
60
Day
CHClBr2 - Enseco #1
CHClBr2 - Enseco #2
CHClBr2 - Bryte #1
CHClBr2 - Bryte #2

Figure D-5

Table D-4

Statistical Comparison of $CHBr_3$ Analyses

Two-Sample Analysis Results

| | | Enseco | Bryte | Combined |
|---|---|---|---|---|
| Sample Statistics: | Number of Obs. | 18 | 16 | 34 |
| | Average | 6.08889 | 2.74375 | 4.51471 |
| | Std. Deviation | 2.57611 | 0.244864 | 1.88512 |

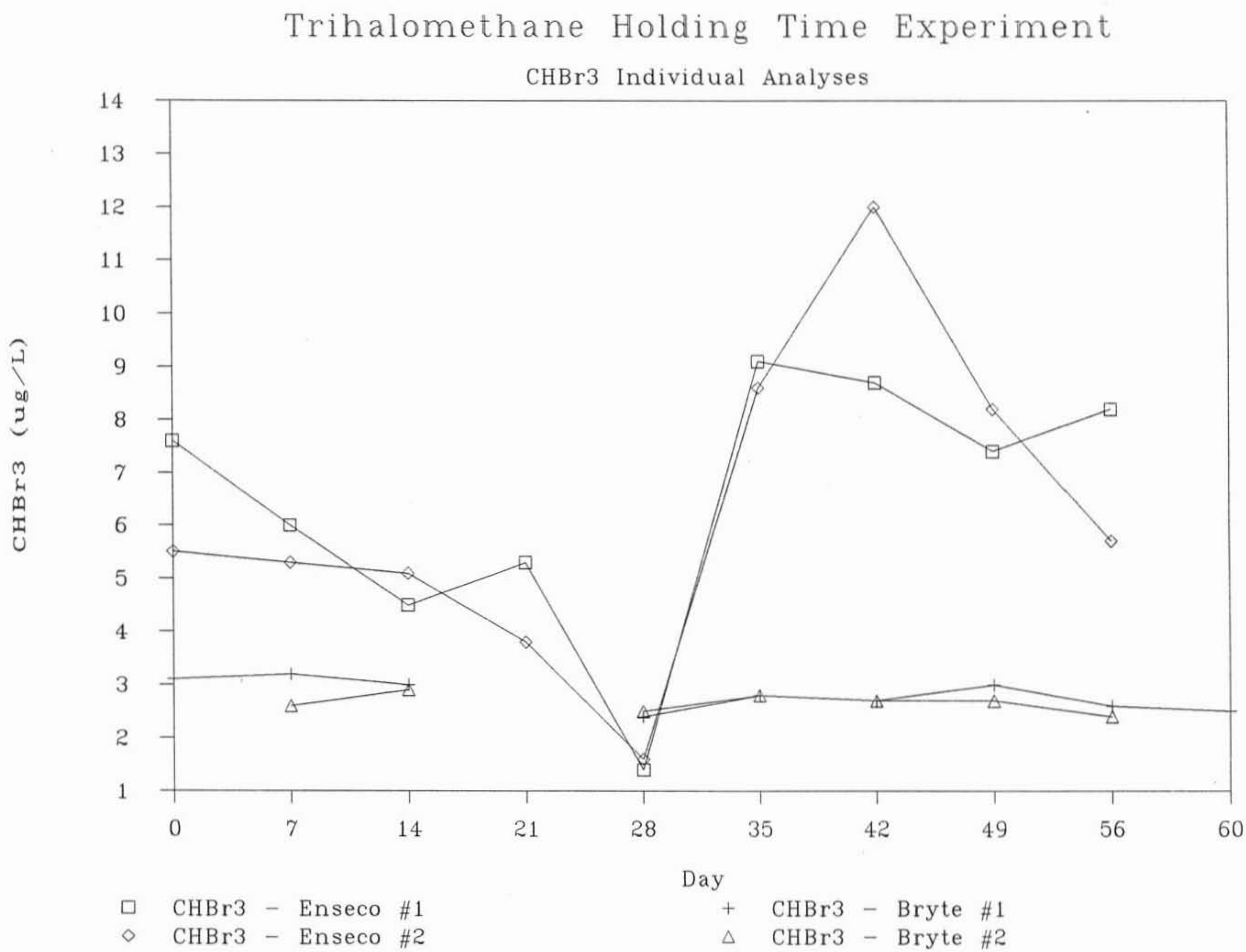
Difference between Means = 3.34514

Hypothesis Test for H0: Diff = 0 vs Alt: NE at Alpha = 0.05

Computed t statistic = 5.16456
Sig. Level = 1.2313E-5
so reject H0.

Regression Analysis - Linear model: Y = a+bX
$CHBr_3$ vs Day

| Lab | Parameter | Estimate | Standard Error | T Value | Prob. Level |
|---|---|---|---|---|---|
| Combined | Intercept | 4.28738 | 0.840249 | 5.10251 | .00001 |
| | Slope | 7.4391E-3 | 0.0234832 | 0.316783 | .75347 |
| Enseco | Intercept | 4.74781 | 1.11989 | 4.23955 | .00062 |
| | Slope | 0.0473321 | 0.0335882 | 1.40919 | .17792 |
| Bryte | Intercept | 2.97157 | 0.103332 | 28.7576 | .00000 |
| | Slope | -6.89072E-3 | 2.69516E-3 | -2.55671 | .02282 |



Trihalomethane Holding Time Experiment
CHBr3 Individual Analyses
CHBr3 (ug/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
7
14
21
28
35
42
49
56
60
Day
CHBr3 - Enseco #1
CHBr3 - Enseco #2
CHBr3 - Bryte #1
CHBr3 - Bryte #2


Figure D-6

## Table D-5

### Statistical Comparison of THMFP

#### Two-Sample Analysis Results

| | | Enseco | Bryte | Combined |
|---|---|---|---|---|
| Sample Statistics: | Number of Obs. | 18 | 16 | 34 |
| | Average | 571.589 | 630.431 | 599.279 |
| | Std. Deviation | 55.8271 | 51.3111 | 53.7575 |

Difference between Means = -58.8424

| | |
|---|---|
| Hypothesis Test for H0: Diff = 0 | Computed t statistic = -3.18572 |
| vs Alt: NE | Sig. Level = 3.21441E-3 |
| at Alpha = 0.05 | so reject H0. |

#### Regression Analysis - Linear model: Y = a+bX
THMFP vs Day

| Lab | Parameter | Estimate | Standard Error | T Value | Prob. Level |
|---|---|---|---|---|---|
| Combined | Intercept | 613.401 | 20.1295 | 30.4728 | .00000 |
| | Slope | -0.46211 | 0.562578 | -0.821415 | .41749 |
| Enseco | Intercept | 565.794 | 25.6746 | 22.0371 | .00000 |
| | Slope | 0.204526 | 0.770046 | 0.265603 | .79394 |
| Bryte | Intercept | 679.443 | 21.3786 | 31.7814 | .00000 |
| | Slope | -1.48239 | 0.557609 | -2.65847 | .01872 |

## $CHBr_3$

Enseco reported an average 6.1 .g/L $CHBr_3$ (s.d. 2.6 .g/L) (Table D-4, Figure D-6) Bryte reported an average 2.7 .g/L (s.d. 0.2 .g/L). The combined average was 4.5 .g/L (s.d. 1.9 .g/L). Analysis of the means revealed that the 3.3 .g/L difference between the means exceeded the 99.9% confidence level.

Regression analysis of the $CHBr_3$ data versus time showed a slight positive trend for Enseco and both laboratories combined. The slopes for the Enseco analyses and combined analyses were not significant at the 95% level. The Bryte analyses showed a loss of approximately .007 .g/L per day (0.2%/day), significant at the 95% level.

## THMFP

THMFP is the sum of the four THMs. THMFP is used for most of the interpretive analysis found in this report. A comparison of the mean THMFP reported by the two laboratories shows that Bryte reported an average 630 .g/L (s.d. 51 .g/L), Enseco reported and average 571 .g/L (s.d. 56 .g/L), and that the combined average THMFP was 599 .g/L (s.d. 54 .g/L) (Table D-5). The 59 .g/L difference between the two laboratories was significantly above the 99% confidence level. Regression analysis of THMFP versus time showed a slight negative trend for Enseco and combined data. The Bryte THMFP showed a loss of approximately 1.5 .g/L per day (0.2%/day), significant at the 95% level.

Table D-6

Estimation of Holding Time Limits
Based on Bryte Results

| THM | Starting Concentration (Intercept) | Loss Per Day L ( g/L/day) | Standard Deviation s ( g/L) | Estimated Holding Time Limit[2] 3s/L |
|---|---|---|---|---|
| $CHCl_3$ | 437 | no significant loss | 34 | not determined |
| $CHCl_2Br$ | 179 | 0.72 | 19.3 | 80 days |
| $CHClBr_2$ | 59.5 | 0.15 | 4.1 | 82 days |
| $CHBr_3$ | 3.0 | .007 | 0.24 | 103 days |

2 Based on John K. Taylor, Quality Assurance of Chemical Measurements, c.1987, Lewis Publishers, Inc.

## HOLDING TIME CALCULATIONS

Holding time estimates were calculated based on the methodology described in "Quality Assurance of Chemical Measurements" c.1987, by John K. Taylor. According to Taylor, the acceptable holding time (with 95% confidence) equals the period necessary for the concentration of the sample to change by 3 standard deviations (3s). This was calculated by comparing the calculated slope of the concentration to the calculated standard deviation.

Holding time estimates for this study were based entirely on Bryte analyses, since only those analyses showed a statistically significant loss over the period of the experiment. Calculated holding time estimates are summarized in table D-6.

Estimated holding time limits for $CHCL_3$ could not be determined in this study. However, they exceed the 49 day holding time in our field data. Estimated holding times for $CHCl_2Br$ and $CHClBr_2$ are approximately 80 days. The holding time for $CHClBr_3$ may exceed 100 days.

## DISCUSSION

The holding time experiment shows some significant differences between the different analytical protocols used, and perhaps some differences between the two participating laboratories. The modified EPA Method 502.2 used by Bryte laboratory appears to provide more consistent, less variable results, particularly for $CHCl_2Br$ and $CHBr_3$. Also, except for $CHBr_3$, Bryte reported higher average concentrations than Enseco. The average $CHBr_3$ reported by Enseco was higher, but the variance (as expressed by s.d.) exceeded the average. As we begin to take a more careful look at bromides in the Delta, EPA Method 502.2 will provide us with the best data.

As for the effect of holding time on THM's, the results vary by laboratory. There is no measurable loss of $CHCL_3$ over the period of the holding time experiment. However, we were able to measure a loss of brominated THMs over time.

When the Bryte analyses are considered alone, all of the brominated THM's appear to be losing from 0.2 to 0.4% per day. The calculated holding times for $CHCl_2Br$ and $CHClBr_2$ were about 80 days, and for $CHBr_3$ about 100 days. Analysis for THMFP sould be limited to an 80 day holding period.

## CONCLUSIONS

The primary objective of this holding time experiment was to validate or reject analytical results from samples which were held up to 49 days, as compared to the established 14 dy EPA holding time protocol for THM analyses. This study showed that holding times up to 80 days are permissible for analysis of THMFP. Therefore the analytical results which were held up to 49 days are valid.

DWR will continue to follow the recommended holding times specified by EPA Methodology. However, in cases where holding time requirements are unavoidably exceeded, samples held up to 80 days should produce valid data, as long as the samples are properly stored, as defined by EPA protocol.

Table D-7 THM Holding Time Data

Units: µg/L

| THM | Lab/Sample | Day 0 | 3 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 59 | 60 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $CHCl_3$ | Enseco 1 | | 370* | 400 | 390 | 410 | 320 | 380 | 480 | 350 | 400* | | |
| | Enseco 2 | | 360* | 400 | 400 | 420 | 370 | 410 | 430 | 380 | 390* | | |
| | Bryte 1 | 400* | | 440 | 430 | | 380 | 440 | 430 | 420 | | 360* | 392 |
| | Bryte 2 | | | 450 | 450 | | 370 | 450 | 440 | | | 460* | 370 |
| | Avg. | | 377* | 423 | 418 | 415 | 360 | 420 | 445 | 403 | 380* | | 392 |
| | High | | 400* | 450 | 450 | 420 | 380 | 450 | 480 | 460 | 400* | | 392 |
| | Low | | 360* | 400 | 390 | 410 | 320 | 380 | 430 | 350 | 360* | | 392 |
| | Bryte Avg | | 400* | 445 | 440 | | 375 | 445 | 435 | 440 | 365* | | 392 |
| | Enseco Avg | | 365* | 400 | 395 | 415 | 345 | 395 | 455 | 365 | 395* | | |
| $CHCl_2Br$ | Enseco 1 | | 110* | 140 | 150 | 160 | 100 | 140 | 130 | 110 | 130* | | |
| | Enseco 2 | | 110* | 110 | 130 | 160 | 99 | 140 | 130 | 100 | 130* | | |
| | Bryte 1 | 180* | | 180 | 180 | | 130 | 160 | 150 | 150 | | 130* | 150 |
| | Bryte 2 | | | 190 | 170 | | 130 | 150 | 157 | 150 | | 140* | |
| | Avg. | | 133* | 155 | 158 | 160 | 115 | 148 | 142 | 128 | 133* | | 150 |
| | High | | 180* | 190 | 180 | 160 | 130 | 160 | 157 | 150 | 140* | | 150 |
| | Low | | 110* | 110 | 130 | 160 | 99 | 140 | 130 | 100 | 130* | | 150 |
| | Bryte Avg | | 180* | 185 | 175 | | 130 | 155 | 153.5 | 150 | 135* | | 150 |
| | Enseco Avg | | 110* | 125 | 140 | 160 | 99.5 | 140 | 130 | 105 | 130* | | |
| $CHClBr_2$ | Enseco 1 | | 47* | 51 | 54 | 63 | 29 | 54 | 44 | 43 | 51* | | |
| | Enseco 2 | | 45* | 39 | 45 | 62 | 29 | 50 | 43 | 40 | 50* | | |
| | Bryte 1 | 61* | | 61 | 58 | | 50 | 55 | 52 | 54 | | 54* | 51 |
| | Bryte 2 | | | 61 | 58 | | 48 | 54 | 51 | 54 | | 51* | |
| | Avg. | | 51* | 53 | 54 | 63 | 39 | 53 | 48 | 48 | 52* | | 51 |
| | High | | 61* | 61 | 58 | 63 | 50 | 55 | 52 | 54 | 54* | | 51 |
| | Low | | 45* | 39 | 45 | 62 | 29 | 50 | 43 | 40 | 50* | | 51 |
| | Bryte Avg | | 61* | 61 | 58 | | 49 | 54.5 | 51.5 | 54 | 52.5* | | 51 |
| | Enseco Avg | | 46* | 45 | 49.5 | 62.5 | 29 | 52 | 43.5 | 41.5 | 50.5* | | |
| $CHBr_3$ | Enseco 1 | | 7.6* | 6 | 4.5 | 5.3 | 1.4 | 9.1 | 8.7 | 7.4 | 8.2* | | |
| | Enseco 2 | | 5.5* | 5.3 | 5.1 | 3.8 | 1.6 | 8.6 | 12 | 8.2 | 5.7* | | |
| | Bryte 1 | 3.1* | | 3.2 | 3 | | 2.4 | 2.8 | 2.7 | 3 | | 2.6* | 2.5 |
| | Bryte 2 | | | 2.6 | 2.9 | | 2.5 | 2.8 | 2.7 | 2.7 | | 2.4* | |
| | Avg. | | 5.4* | 4.3 | 3.9 | 4.6 | 2.0 | 5.8 | 6.5 | 5.3 | 4.7* | | 2.5 |
| | High | | 7.6* | 6.0 | 5.1 | 5.3 | 2.5 | 9.1 | 12.0 | 8.2 | 8.2* | | 2.5 |
| | Low | | 3.1* | 2.6 | 2.9 | 3.8 | 1.4 | 2.8 | 2.7 | 2.7 | 2.4* | | 2.5 |
| | Bryte Avg | | 3.1* | 2.9 | 3.0 | | 2.5 | 2.8 | 2.7 | 2.9 | 2.5* | | 2.5 |
| | Enseco Avg | | 6.6* | 5.7 | 4.8 | 4.6 | 1.5 | 8.9 | 10.4 | 7.8 | 7.0* | | |
| Total (THMFP) | Enseco 1 | | 535* | 597 | 599 | 638 | 450 | 583 | 663 | 510 | 589* | | |
| | Enseco 2 | | 521* | 554 | 580 | 646 | 500 | 609 | 615 | 528 | 576* | | |
| | Bryte 1 | 644* | | 684 | 671 | | 562 | 658 | 635 | 627 | | 547* | 596 |
| | Bryte 2 | | | 704 | 681 | | 551 | 657 | 651 | 667 | | 563* | |
| | Avg. | | 566* | 635 | 633 | 642 | 516 | 627 | 641 | 583 | 569* | | 596 |
| | High | | 644* | 704 | 681 | 646 | 562 | 658 | 663 | 667 | 589* | | 596 |
| | Low | | 521* | 554 | 580 | 638 | 450 | 583 | 615 | 510 | 547* | | 596 |
| | Bryte Avg | | 644* | 694 | 676 | | 556 | 657 | 643 | 647 | 555* | | 596 |
| | Enseco Avg | | 528* | 576 | 589 | 642 | 475 | 596 | 639 | 519 | 582* | | |

* Enseco Laboratory performed their first analyses on day 3, instead of day 0. Bryte Laboratory performed their last analyses on days 59 and 60. In order to simplify Figures 1 through 6 (caused by graphics software limitations), analyses for week 0 (days 0 and 3) and for week 8 (days 56 and 59) are grouped together. Missing values indicate that no analysis was performed. There was no grouping of data for the statistical analyses.

Table D-8 THM Holding Time Data
Units: Percent of Total THMFP

| THM | Lab/Sample | Day 0 | 3 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 59 | 60 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $CHCl_3$ | Enseco 1 | | 69.2%* | 67.0% | 65.2% | 64.2% | 71.0% | 65.2% | 72.4% | 68.6% | 67.9%* | | |
| | Enseco 2 | | 69.2%* | 72.2% | 69.0% | 65.0% | 74.1% | 67.4% | 69.9% | 71.9% | 67.7%* | | |
| | Bryte 1 | 62.1%* | | 64.3% | 64.1% | | 67.6% | 66.9% | 67.7% | 67.0% | | 65.9%* | 65.8% |
| | Bryte 2 | | | 64.0% | 66.1% | | 67.2% | 68.5% | 67.6% | 69.0% | | 65.7%* | |
| | Avg. | | 66.8%* | 66.9% | 66.1% | 64.6% | 70.0% | 67.0% | 69.4% | 69.1% | 66.8%* | | 65.8% |
| | High | | 69.2%* | 72.2% | 69.0% | 65.0% | 74.1% | 68.5% | 72.4% | 71.9% | 67.9%* | | 65.8% |
| | Low | | 62.1%* | 64.0% | 64.1% | 64.2% | 67.2% | 65.2% | 67.6% | 67.0% | 65.7%* | | 65.8% |
| | Bryte Avg | | 62.1%* | 64.1% | 65.1% | | 67.4% | 67.7% | 67.7% | 68.0% | 65.8%* | | 65.8% |
| | Enseco Avg | | 69.2%* | 69.6% | 67.1% | 64.6% | 72.6% | 66.3% | 71.2% | 70.3% | 67.8%* | | |
| $CHCl_2Br$ | Enseco 1 | | 20.6%* | 23.5% | 25.1% | 25.1% | 22.2% | 24.0% | 19.6% | 21.6% | 22.1%* | | |
| | Enseco 2 | | 21.1%* | 19.8% | 22.4% | 24.8% | 19.8% | 23.0% | 21.1% | 18.9% | 22.6%* | | |
| | Bryte 1 | 27.9%* | | 26.3% | 26.8% | | 23.1% | 24.3% | 23.6% | 23.9% | | 23.8%* | 25.2% |
| | Bryte 2 | | | 27.0% | 25.0% | | 23.6% | 22.8% | 24.1% | 22.5% | | 24.8%* | |
| | Avg. | | 23.2%* | 24.2% | 24.8% | 24.9% | 22.2% | 23.5% | 22.1% | 21.7% | 23.3%* | | 25.2% |
| | High | | 27.9%* | 27.0% | 26.8% | 25.1% | 23.6% | 24.3% | 24.1% | 23.9% | 24.8%* | | 25.2% |
| | Low | | 20.6%* | 19.8% | 22.4% | 24.8% | 19.8% | 23.0% | 19.6% | 18.9% | 22.1%* | | 25.2% |
| | Bryte Avg | | 27.9%* | 26.7% | 25.9% | | 23.4% | 23.6% | 23.9% | 23.2% | 24.3%* | | 25.2% |
| | Enseco Avg | | 20.9%* | 21.6% | 23.7% | 24.9% | 21.0% | 23.5% | 20.4% | 20.2% | 22.3%* | | |
| $CHClBr_2$ | Enseco 1 | | 8.8%* | 8.5% | 9.0% | 9.9% | 6.4% | 9.3% | 6.6% | 8.4% | 8.7%* | | |
| | Enseco 2 | | 8.6%* | 7.0% | 7.8% | 9.6% | 5.8% | 8.2% | 7.0% | 7.6% | 8.7%* | | |
| | Bryte 1 | 9.5%* | | 8.9% | 8.6% | | 8.9% | 8.4% | 8.2% | 8.6% | | 9.9%* | 8.6% |
| | Bryte 2 | | | 8.7% | 8.5% | | 8.7% | 8.2% | 7.8% | 8.1% | | 9.1%* | |
| | Avg. | | 9.0%* | 8.3% | 8.5% | 9.7% | 7.5% | 8.5% | 7.4% | 8.2% | 9.1%* | | 8.6% |
| | High | | 9.5%* | 8.9% | 9.0% | 9.9% | 8.9% | 9.3% | 8.2% | 8.6% | 9.9%* | | 8.6% |
| | Low | | 8.6%* | 7.0% | 7.8% | 9.6% | 5.8% | 8.2% | 6.6% | 7.6% | 8.7%* | | 8.6% |
| | Bryte Avg | | 9.5%* | 8.8% | 8.6% | | 8.8% | 8.3% | 8.0% | 8.4% | 9.5%* | | 8.6% |
| | Enseco Avg | | 8.7%* | 7.8% | 8.4% | 9.7% | 6.1% | 8.7% | 6.8% | 8.0% | 8.7%* | | |
| $CHBr_3$ | Enseco 1 | | 1.4%* | 1.0% | 0.8% | 0.8% | 0.3% | 1.6% | 1.3% | 1.4% | 1.4%* | | |
| | Enseco 2 | | 1.1%* | 1.0% | 0.9% | 0.6% | 0.3% | 1.4% | 2.0% | 1.6% | 1.0%* | | |
| | Bryte 1 | 0.5%* | | 0.5% | 0.4% | | 0.4% | 0.4% | 0.4% | 0.5% | | 0.5%* | 0.4% |
| | Bryte 2 | | | 0.4% | 0.4% | | 0.5% | 0.4% | 0.4% | 0.4% | | 0.4%* | |
| | Avg. | | 1.0%* | 0.7% | 0.6% | 0.7% | 0.4% | 1.0% | 1.0% | 1.0% | 0.8%* | | 0.4% |
| | High | | 1.4%* | 1.0% | 0.9% | 0.8% | 0.5% | 1.6% | 2.0% | 1.6% | 1.4%* | | 0.4% |
| | Low | | 0.5%* | 0.5% | 0.4% | 0.6% | 0.3% | 0.4% | 0.4% | 0.5% | 0.5%* | | 0.4% |
| | Bryte Avg | | 0.5%* | 0.4% | 0.4% | | 0.4% | 0.4% | 0.4% | 0.4% | 0.5%* | | 0.4% |
| | Enseco Avg | | 1.2%* | 1.0% | 0.8% | 0.7% | 0.3% | 1.5% | 1.6% | 1.5% | 1.2%* | | |
| Total (THMFP) | Enseco 1 | | 100.0%* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | |
| | Enseco 2 | | 100.0%* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | |
| | Bryte 1 | 100.0%* | | 100.0% | 100.0% | | 100.0% | 100.0% | 100.0% | 100.0% | | 100.0%* | 100.0% |
| | Bryte 2 | | | 100.0% | 100.0% | | 100.0% | 100.0% | 100.0% | 100.0% | | 100.0%* | |
| | Avg. | | 100.0%* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | 100.0% |
| | High | | 100.0%* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | 100.0% |
| | Low | | 100.0%* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | 100.0% |
| | Bryte Avg | | 100.0%* | 100.0% | 100.0% | | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | 100.0% |
| | Enseco Avg | | 100.0%* | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0%* | | |

* Enseco Laboratory performed their first analyses on day 3, instead of day 0. Bryte Laboratory performed their last analyses on days 59 and 60. In order to simplify Figures 1 through 6 (caused by graphics software limitations), analyses for week 0 (days 0 and 3) and for week 8 (days 56 and 59) are grouped together. Missing values indicate that no analysis was performed. There was no grouping of data for the statistical analyses.

TABLE D-9 - SPIKED DUPLICATE ANALYSES FOR THM
HOLDING TIME STUDY
(Enseco, Inc.)

| | | | Concentration µg/L | | | Accuracy (%) | | | Precision (RPD) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Day | Chemical | Spiked | Test 1 | Test 2 | Test 1 | Test 2 | Limits | LCS | Limits |
| 3/12/90 | 0 | Chloroform | 5.0 | 5.11 | 5.18 | 102 | 104 | 80-125 | 1.4 | <22 |
| | | Bromodichloromethane | 5.0 | 5.42 | 5.66 | 108 | 113 | 80-125 | 4.3 | <22 |
| | | Dibromochloromethane | 5.0 | 5.53 | 5.83 | 111 | 117 | 80-125 | 5.3 | <22 |
| | | Bromoform | 5.0 | 5.16 | 5.08 | 103 | 102 | 80-125 | 1.6 | <22 |
| 3/16/90 | 4 | Chloroform | 10.0 | 9.87 | 9.92 | 99 | 99 | 80-125 | 0.5 | <22 |
| | | Bromodichloromethane | 10.0 | 10.5 | 9.89 | 105 | 99 | 80-125 | 6.0 | <22 |
| | | Dibromochloromethane | 10.0 | 10.1 | 10.2 | 101 | 102 | 80-125 | 1.0 | <22 |
| | | Bromoform | 10.0 | 10.7 | 10.6 | 107 | 106 | 80-125 | 0.9 | <22 |
| 3/23/90 | 11 | Chloroform | 10.0 | 9.17 | 9.26 | 92 | 93 | 80-125 | 1.0 | <22 |
| | | Bromodichloromethane | 10.0 | 10.9 | 11.1 | 109 | 111 | 80-125 | 1.8 | <22 |
| | | Dibromochloromethane | 10.0 | 10.9 | 12.0 | 109 | 120 | 80-125 | 9.6 | <22 |
| | | Bromoform | 10.0 | 10.7 | 11.6 | 107 | 116 | 80-125 | 8.1 | <22 |
| 3/30/90 | 18 | Chloroform | 10.0 | 9.18 | 9.00 | 92 | 90 | 80-125 | 2.0 | <22 |
| | | Bromodichloromethane | 10.0 | 11.0 | 10.7 | 110 | 107 | 80-125 | 2.8 | <22 |
| | | Dibromochloromethane | 10.0 | 10.9 | 10.6 | 109 | 106 | 80-125 | 2.8 | <22 |
| | | Bromoform | 10.0 | 11.2 | 10.8 | 112 | 108 | 80-125 | 3.6 | <22 |
| 4-6-90 | 25 | Chloroform | 5.0 | 4.58 | 4.55 | 92 | 91 | 80-125 | 0.7 | <22 |
| | | Bromodichloromethane | 10.0 | 10.4 | 10.3 | 104 | 103 | 80-125 | 1.0 | <22 |
| | | Dibromochloromethane | 10.0 | 10.6 | 11.1 | 106 | 111 | 80-125 | 4.6 | <22 |
| | | Bromoform | 20.0 | 23.3 | 23.9 | 116 | 120 | 80-125 | 2.5 | <22 |
| 4/13/90 | 32 | Chloroform | 10.0 | 9.75 | 9.91 | 97 | 99 | 80-125 | 1.6 | <22 |
| | | Bromodichloromethane | 10.0 | 10.2 | 10.5 | 102 | 105 | 80-125 | 2.9 | <22 |
| | | Dibromochloromethane | 10.0 | 10.1 | 10.2 | 101 | 102 | 80-125 | 1.0 | <22 |
| | | Bromoform | 10.0 | 9.49 | 10.6 | 95 | 106 | 80-125 | 11 | <22 |
| 4/20/90 | 39 | Chloroform | 10.0 | 9.22 | 9.35 | 92 | 93 | 80-125 | 1.4 | <22 |
| | | Bromodichloromethane | 10.0 | 10.5 | 10.2 | 105 | 102 | 80-125 | 2.9 | <22 |
| | | Dibromochloromethane | 10.0 | 10.4 | 10.5 | 104 | 105 | 80-125 | 1.0 | <22 |
| | | Bromoform | 10.0 | 10.6 | 10.6 | 106 | 106 | 80-125 | 0.0 | <22 |
| 4/27/90 | 46 | Chloroform | 10.0 | 8.95 | 8.93 | 89 | 89 | 80-125 | 0.2 | <22 |
| | | Bromodichloromethane | 10.0 | 10.0 | 10.3 | 100 | 103 | 80-125 | 3.0 | <22 |
| | | Dibromochloromethane | 10.0 | 9.62 | 10.9 | 96 | 109 | 80-125 | 12 | <22 |
| | | Bromoform | 10.0 | 10.8 | 11.0 | 108 | 110 | 80-125 | 1.8 | <22 |
| 5/4/90 | 53 | Chloroform | 10.0 | 8.92 | 8.98 | 89 | 90 | 80-125 | 0.7 | <22 |
| | | Bromodichloromethane | 10.0 | 10.4 | 9.20 | 104 | 92 | 80-125 | 12 | <22 |
| | | Dibromochloromethane | 10.0 | 10.1 | 10.3 | 101 | 103 | 80-125 | 2.0 | <22 |
| | | Bromoform | 10.0 | 9.92 | 9.20 | 99 | 92 | 80-125 | 7.5 | <22 |

TABLE D-10

SURROGATE ANALYSES[1] FOR THM
HOLDING TIME STUDY

(DWR-Bryte Laboratory)

| Date | Day | Chemical | Concentration (µg/L) Spiked | Dil | Test 1 | Test 2 | Accuracy (%) Test 1 | Test 2 | Limits | Precision (RPD) LCS | Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/9/90 | 0 | Bromochloropropane | 5 | 0 | 5.16 | | 99.4 | | 80-120 | | |
| | | | | 1/5 | 4.97 | | 103 | | 80-120 | | |
| 3/16/90 | 7 | Bromochloropropane | 5 | 0 | 5.25 | 5.23 | 105 | 105 | 80-120 | 0 | <20% |
| | | | | 0 | 4.92 | 5.12 | 98 | 102 | 80-120 | 4.0 | <20% |
| | | | | 1/5 | 5.12 | 5.63 | 102 | 113 | 80-120 | 9.5 | <20% |
| | | | | 1/5 | 5.22 | 5.78 | 104 | 116 | 80-120 | 10.2 | <20% |
| 3/23/90 | 14 | Bromochloropropane | 5 | 0 | 4.80 | 4.60 | 96 | 92 | 80-120 | 4.3 | <20% |
| | | | | 1/5 | 5.15 | 5.12 | 103 | 102 | 80-120 | 0.58 | <20% |
| 3/30/90 | 21 | (No results: bad internal standard from supplier) | | | | | | | | | |
| 4-6-90 | 28 | Bromochloropropane | 5 | 0 | 5.46 | 4.99 | 109 | 100 | 80-120 | 9.0 | <20% |
| | | | | 1/5 | 5.71 | 5.51 | 114 | 110 | 80-120 | 3.6 | <20% |
| 4/13/90 | 35 | Bromochloropropane | 5 | 0 | 5.09 | 5.12 | 102 | 102 | 80-120 | 0.59 | <20% |
| | | | | 1/10 | 5.41 | 5.52 | 108 | 110 | 80-120 | 2.0 | <20% |
| 4/20/90 | 42 | Bromochloropropane | 5 | 0 | 4.98 | 5.03 | 100 | 101 | 80-120 | 1.0 | <20% |
| | | | | 1/10 | 5.27 | 5.41 | 105 | 108 | 80-120 | 2.6 | <20% |
| 4/27/90 | 49 | Bromochloropropane | 5 | 0 | 5.04 | 5.04 | 101 | 101 | 80-120 | 0 | <20% |
| | | | | 1/10 | 5.17 | 5.33 | 103 | 107 | 80-120 | 3.0 | <20% |
| 5/7/90 | 59 | Bromochloropropane | 5 | 0 | 4.83 | 4.80 | 97 | 96 | 80-120 | 0.6 | <20% |
| | | | | 1/10 | 4.87 | 4.83 | 97 | 97 | 80-120 | 0.8 | <20% |
| 5/8/90 | 60 | Bromochloropropane | (only % recovery given) | | | | 101 | 94 | 80-120 | | |

Dil = dilution

µg/L = micrograms per liter (ppb)

1 Surrogate recovery involved a surrogate analyte, bromochloropropane, which is extremely unlikely to be found in any sample, and which was added to sample aliquots in known amounts before extraction. It is measured using the same methods as used for THM precursors. The purpose of the surrogate is to monitor method performance with each sample.

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