2007

MARK TWAIN LAKE

WATER QUALITY

REPORT

U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT
ENVIRONMENTAL QUALITY SECTION – WATER QUALITY

Table of Contents

Water Quality Report-Mark Twain Lake

Section and Page No.

List of Figures & Tables

Appendix

WATER QUALITY MONITORING PROGRAM

1.0 GENERAL OVERVIEW

This report summarizes water quality activities of the St. Louis District for Fiscal Year 2007 in accordance with ER 1110-2-8154 Water Quality & Environmental management for Corps Civil Works Projects and ETL 1110-2-362 Environmental Engineering Initiatives for Water Management.

Water quality monitoring remains one of the Sections major responsibilities. The objective is to maintain a reasonable environmental monitoring program for the Mississippi River and the 5 lakes under the St. Louis District's control. The District's reservoirs consist of Mark Twain and Wappapello Lakes in Missouri, and Shelbyville, Carlyle and Rend Lakes in Illinois. Water quality sampling is conducted within the lakes and their tributaries to establish trend analysis and maintain water quality at or above state and federal regulations.

The main objective is to provide technical expertise of an environmental nature to all Corps elements requesting assistance in accordance with ER 1110-2-8154. This would include updating the water quality management priorities for the district's projects to ensure water quality meets the state and federal regulations, for protection of human health and the environment, and for the safety and economic welfare of those at Corps projects. Ongoing goals include ensuring that downstream water quality meets all state and federal regulations, is suitable for aquatic and human life, and continue to evaluate trend analysis in relation to baseline conditions at all projects.

Water quality data is provided to the Missouri Department of Natural Resources (MDNR) to be used as a screening mechanism for the Missouri Water Quality Report which is required every two years by the Clean Water Act Sections 303(d) and 305(b). MDNR does not routinely monitor Mark Twain Lake, however the Lakes of Missouri Volunteer Program (LMVP) through the University of Missouri-Columbia has been taking samples at 3 sites 4 times a year since 1989. The LMVP only analyze for Nutrients and Chlorophyll.

The National Water Quality Inventory Report to Congress (305(b) report) is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters.

Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop a list of water quality limited segments. These waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called as Total Maximum Daily Loads (TMDL), to improve water quality.

The 2004 water quality report compiled by the Missouri Department of Natural Resources has listed the Salt River below the Cannon Dam and Mark Twain Lake as impaired. The Salt River is impaired by low Dissolved Oxygen and Manganese. Mark Twain Lake is impaired by Mercury, and Atrazine. Mark Twain Lake is listed as eutrophic. Continued monitoring of the lake and its tributaries is vital in assisting the future assessment of the lake for these and other possible impairments. The water quality monitoring program represents the single metric that encompasses the overall health of the watershed as it is a direct measure of how well the environmental stewardship programs are working.

1.1 INTRODUCTION

Mark Twain Lake is located in northeast Missouri. The land surrounding the lake is used predominately for agriculture. The main agricultural contaminants into the watershed include pesticides and fertilizers. Also a concern is the high sediment loading into the lake and the colloidal characteristic of the sediments as well as low dissolved oxygen levels related to turbine generation. The lake is also susceptible to fish kills due to algal decay in the lake arms.

The operating purposes for Mark Twain Lake are fish/wildlife, hydroelectric power, flood control, recreation, navigation and water supply. The water quality management program for the lake includes monitoring of baseline parameters, ecological trends and investigation of problem areas to keep the lake within state and federal standards.

Water quality monitoring was conducted during 2007 to assure safe conditions for human recreation, wildlife and aquatic life as maintained and managed within the lake system. The 2007 water quality monitoring program was only funded to conduct one sampling event. During the sampling event one site was selected for quality control duplication and denoted as MTL-15. The locations of the ten sampling sites are depicted on the lake map in Figure 1.

As mentioned above, LMVP collects samples at Mark Twain Lake. This year they conducted 7 sampling events at 3 sites. Their data is in Appendix D. We have also included data from the United Water Services Clarence Cannon WTP in Appendix E.

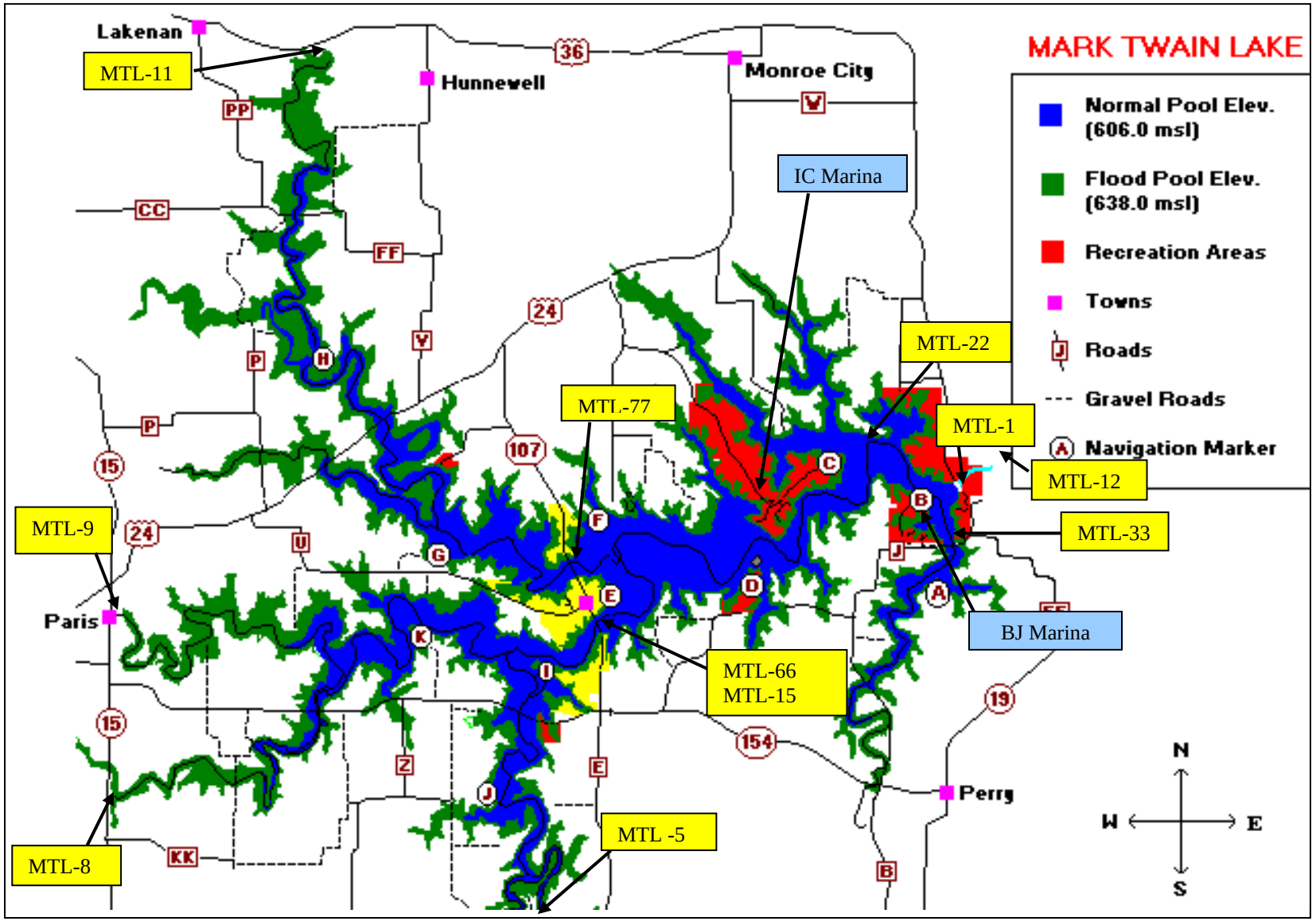


Figure 1
Location of sample sites

2.0 WATER QUALITY ASSESSMENT CRITERIA

2.1 Water Quality

The water quality assessment criteria were based upon the State of Missouri regulatory limits for certain contaminants, which has been generally accepted criteria for sustaining adequate aquatic plant and animal growth. The samplings and analysis which were conducted at the Mark Twain Lake sites reflect the minimal set of parameters needed to analyze the current status of water quality for the Mark Twain Lake system.

The following parameters were analyzed in the Fiscal Year 2007 samplings at Mark Twain Lake: Total Organic Carbon (TOC), iron, manganese, ammonia-nitrogen, nitrate-nitrogen, orthophosphate, total phosphate, Total Suspended Solids (TSS), Total Volatile Suspended Solids (TVSS), fecal coliform, pH, temperature, dissolved oxygen, specific conductance, oxidation-reduction potential (ORP), chlorophyll, pheophytin-a, atrazine and alachlor,

The Missouri Department of Natural Resources, Code of State Regulations, Division 20, Chapter 7 classifies water quality criteria based on designated usage. These standards are used to determine the aquatic water quality of the lake. Table 2.1 provides a listing of the regulatory limits for the parameters analyzed where a limit has been established.

TABLE 2.1

State of Missouri
Water Quality Standards

PARAMETER	LIMIT
Temperature	20.5^{o}C - 33^{o}C (68^{o}F - 90^{o}F)
Ammonia Nitrogen	< 15 mg/L
Nitrate Nitrogen	10 mg/L
Iron	1.0 mg/L (Aquatic Life)
Manganese	0.05 mg/L (Drinking Water & GW)
Phosphorous as Phosphate	0.05 mg/L
Fecal Coliform	< 200 colonies/100 ml (geometric mean)
pH	Range: 6.5 to 9.0
DO	> 5.0 mg/L
Atrazine	0.003 mg/L (Drinking Water Standard)
Alachlor	0.002 mg/L (Drinking Water Standard)

Nitrogen is an essential component of proteins, genetic material, chlorophyll, and other key organic molecules. All organisms require nitrogen in order to survive. Nitrogen exists in several forms. These forms include gaseous nitrogen (N_2), nitrites (NO_2), nitrate (NO_3), ammonia nitrogen (NH_3-N), and ammonium (NH_4). Ammonia can be toxic to fish and other aquatic organisms at certain levels. Unlike ammonia, ammonium (NH4) is not toxic to aquatic organisms and is readily available for uptake by plankton and macrophytes. Nitrogen levels have increased as human activities have accelerated the rate of fixed nitrogen being put into

circulation. High nitrogen levels can cause eutrophication. Eutrophication increases biomass of phytoplankton, decrease water transparency, and causes oxygen depletion. Ammonia nitrogen is monitored so that the effects on fish spawning, hatching, growth rate and pathologic changes in gills, liver and kidney tissue can be related to the detected levels of ammonia nitrogen. Nitrate-nitrogen degrades to nitrite or produces ammonia which has a detrimental effect on aquatic life and, therefore, has been monitored to assure levels are below the regulatory "safe" limit.

Phosphate has been analyzed as phosphorus and has been monitored due to the potential for uptake by nuisance algae. Levels of phosphate can indicate the potential for rapid growth of algae (algae bloom) which can cause serious oxygen depletion during the algae decay process. Phosphorous is typically the limiting nutrient in a water body. Therefore, addition of phosphorous to the ecosystem stimulates the growth of plants and algae. Phosphorous is delivered to lakes and streams by way of storm water runoff from agricultural fields, residential property, and construction sites. Other sources of phosphorous are anaerobic decomposition of organic matter, leaking sewer systems, waterfowl, and point source pollution. The general standard for phosphorous in lake water is 0.05mg/L. Dissolved phosphorous also called ortho-phosphorous is generally found in much smaller concentrations than total phosphorous and is readily available for uptake. For this reason dissolved phosphorous concentrations are variable and difficult to use as an indicator of nutrient availability.

The metals manganese and iron are nutrients for both plants and animals. Living organisms require trace amounts of metals. However, excessive amounts can be harmful to the organism. Heavy metals exist in surface waters in three forms, colloidal, particulate, and dissolved. Water chemistry determines the rate of adsorption and desorption of metals to and from sediment. Metals are desorbed from the sediment if the water experiences increases in salinity, decreases in redox potential, or decreases in pH. Metals in surface waters can be from natural or human sources. Currently human sources contribute more metals than natural sources. Metals levels in surface water may pose a health risk to humans and the environment.

Photosynthetic activity can be hindered by the levels of total suspended solids. Total suspended solids concentrations, which cause the photosynthetic activity to be reduced by more than 10% from the seasonably established norm, can have a detrimental effect on aquatic life. Soil particles, organic material, and other debris comprise suspended solids in the water column. Secchi disk measurements are inverse to suspended solid measurements. As the total suspended solids (TSS) increase, the secchi disk depth or water transparency decreases. Total suspended solids can be an important indicator of the type and degree of turbidity. TSS measurements represent a combination of organic (volatile) and inorganic (non-volatile) particles in the water. In order to more accurately determine the types and amounts of suspended solids, volatile suspended solids (VSS) are analyzed. VSS concentration represents the organic portion of the total suspended solids. Organic material often includes plankton and additional plant and animal debris that is present in water. Total volatile solids indicate the presence of organics in suspension and, therefore, show additional demand levels of oxygen.

Chlorophyll and pheophytin-a are monitored to provide indicators of algae growth and, therefore, potential oxygen depletion activity. Chlorophyll is measured in lakes to estimate the type and amount of algal productivity in the water column. Chlorophyll a is present in green

algae, blue-green algae, and in diatoms. Chlorophyll a is often used to indicate the degree of eutrophication. Chlorophyll b and c are used to estimate the extent of algal diversity and productivity. Chlorophyll b is common in green algae and is used as an auxiliary pigment for photosynthesis. Chlorophyll c is most common in diatom species and serves as an auxiliary pigment. Algal productivity and diversity can be determined by the concentrations of the individual pigments. For example high concentrations of chlorophyll a and b would indicate that green algae is abundant. High concentrations of chlorophyll a would indicate abundance of blue-green algae and concentrations of chlorophyll a and c would indicate diatoms are the dominant species. Chlorophyll production is currently being connected with hypoxia.

Fecal coliform bacteria is monitored for the protection of human health as it relates to full body contact of recreational waters. People can be exposed to disease-causing organisms, such as bacteria, viruses and protozoa in beach and recreational waters mainly through accidental ingestion of contaminated water or through skin contact. These organisms, called pathogens, usually come from the feces of humans and other warm-blooded animals. If taken into the body, pathogens can cause various illnesses and on rare occasions, even death. Waterborne illnesses include diseases resulting from bacteria infection such as cholera, salmonellosis, and gastroenteritis, viral infections such as hepatitis, gastroenteritis, and intestinal diseases, and protozoan infections such as ameobic dysentery and giardiasis. The most commonly monitored recreational water indicator organisms are fecal coliform, Escherichia coli, (E. coli) and enterococci. Fecal coliform are bacteria that live in the intestinal tracts of warm-blooded animals. The Missouri standard for fecal coliform is less than 200 colonies per 100ml of sample water calculated as a geometric mean. Fecal coliform was originally recommended in 1968 by the Federal Water Pollution Control Administration (predecessor to EPA) as an effective water quality indicator organism for recreational waters. Recent studies indicate that fecal coliform show less correlation to illness than other indicator organisms such as E. coli and enterococci. The Environmental Protection Agency (EPA) currently recommends E. coli or enterococci as an indicator organism for fresh waters. Although E. coli and enterococci are more costly they may become the standard in the near furure.

Atrazine and Alachlor herbicides are commonly used agricultural chemicals which can be readily transported by rainfall runoff. Both compounds are suspected of causing cancer and, therefore, were monitored for the protection of human and aquatic health. Organic compounds include many pesticides. A pesticide can be any substance that is intended to prevent, destroy, repel, or mitigate any pest. This includes insecticides, herbicides, fungicides, fumigants, algaecides and other substances. Herbicides which are pesticides used to kill vegetation are the most widely used and sampled. Ten of the most frequently used herbicides and detected in water are Atrazine, Metolachlor, Alachlor, 2,4-D, Trifluralin, Glyphosate, Dicamba, Cyanazine, Simazine, and 2,4,5-T. Two of the most widely used pesticides are Atrazine and Alachlor. Atrazine is a preemergence or postemergence herbicide use to control broadleaf weeds and annual grasses. Atrazine is most commonly detected in ground and surface water due to its wide use, and its ability to persist in soil and move in water. Alachlor is a Restricted Use Pesticide (RUP) due to the potential to contaminate groundwater. The drinking water standard for Atrazine is 0.003mg/L and 0.002 mg/L for Alachlor.

Temperature, dissolved oxygen and pH are monitored for the protection of aquatic life.

Temperature is important because it controls several aspects of water quality. Colder water hold more dissolved oxygen which is required by aquatic organisms. Plants grow more rapidly and use more oxygen in warmer water. Decomposition of organic matter which uses oxygen is accelerated in warmer water. Temperature can also determine the availability of toxic compounds such as ammonia. Since aquatic organisms are cold blooded, water temperature regulates their metabolism and ability to survive. The number and kinds of organisms that are found in streams or lakes is directly related to temperature. Certain organisms require a specific temperature range, such as trout, which require water temperatures below 20^{o}C. Most aquatic organisms require a minimum concentration of dissolved oxygen to survive. In spring, surface waters of the lake mix with the water below through wind and thermal action. This mixing diminishes as the upper layer of water becomes warmer and less dense. Solar insulation during the summer months stratifies the lake into three zones. The upper warmer water zone is called the epilimnion and the lower cooler water zone is called the hypolimnion. The epilimnion and the hypolimnion zones are divided by a transition zone known as the metalimnion. The thermocline located within the metalimnion exhibits a rapid change in water temperature. During the summer months the hypolimnion may become anaerobic. In this anaerobic zone, chemical reduction of iron and manganese, or the production of methane and sulfides can occur. Iron rapidly oxidizes in aerobic environments, but manganese oxidizes slowly and can remain in the reduced state for long distances down stream even in aerobic environments. The degree of acidity of water is measured by a logarithmetic scale ranging from 0 to 14 and is known as the pH scale. A reading of 7 indicates neutrality and readings below seven are acidic and above are alkaline. Most Illinois lakes range from 6 to 9 on the pH scale. The buffering capacity of water is the ability to neutralize acid better known as alkalinity. A high alkalinity concentration indicates an increased ability to neutralize pH and resist changes, whereas a low alkalinity concentration indicates that a water body is vulnerable to changes in pH.

Conductivity is a measure of a water's ability to conduct an electrical current. The ability to carry a current is often driven by the dissolved materials present in a water column. These materials can include dissolved ions and other materials in the water and thus are directly proportional to the concentration of total dissolved solids (TDS) present in the water column. Typically TDS concentrations represent 50-60% of the conductivity measurements. Conductivity is also affected by water temperature. The warmer the water, the higher the conductivity. Conductivity in streams and rivers is affected by the geology of the area. Streams running through granite areas tend to have lower conductivity due to granite being composed of inert material, materials that do not ionize or dissolve into ionic compounds in water. On the other hand streams that run through areas of limestone or clay soils tend to have higher conductivity readings because of the presence of materials that ionize. Conductivity is useful as a general measure of water quality. A stream tends to have a relatively constant range of conductivity that once establish can be used as a baseline. Significant changes either high or low might indicate a source of pollution has been introduced into the water. The pollution source could be a treatment plant which raises the conductivity or an oil spill which would lower the conductivity.

Redox or Oxidation-Reduction Potential (ORP) is a measure of a water system's capacity to either release or gain electrons. Oxidation involves an exchange of electrons between 2 atoms. The atom that loses an electron is oxidized and the one that gains an electron is reduced.

ORP sensors measure the electrochemical potential between the solution and a reference electrode. Readings are expressed in millivolts with positive readings indicating increased oxidizing potential and negative readings being increased reduction. The ORP probe is essentially a millivolt meter, measuring the voltage across 2 electrodes with the water in between. ORP values are used much like pH values to determine water quality. While pH readings characterize the state of a system relative to the receiving or donating hydrogen ions (base or acid), ORP readings characterize the relative state of losing or gaining electrons. The conversion of ammonia (NH_3) requires an oxidating environment to convert it into nitrites (NO_2) and nitrates (NO_3). Ammonia levels as low as 0.002mg/L can be harmful to fish. Generally ORP readings above 400mV are harmful to aquatic life. However, ORP is a non-specific measurement which is a reflection of a combination of effects of all the dissolved materials in the water. Therefore, the measurement of ORP in relatively clean water has only limited utility unless a predominant redox-active material is known to be present.

Water clarity is intuitively used by the public to judge water quality. Secchi depth has been used for many years as a limnological characterization tool for characterizing water clarity. Secchi depth is a measure of light penetration into a waterbody and is a function of the absorption and scattering of light in the water. There are three characteristics of water which affect the penetration of light. The three factors are the color of water, amount of phytoplankton in the water column, and amount of inorganic material in the water column. Secchi depth integrates the combined impacts of all the factors which influence water clarity. Water transparency was measured using a Secchi disk. Secchi disk readings were taken at all lake sites.

2.2 Sediment

In accordance with EM-1110-2-1201, sediment samples should be taken to monitor and assess potential impacts to aquatic and human health. To assess ecological risk, sample values were compared against toxicity information published in the National Oceanic Atmospheric Administrations (NOAA) Screening Quick Reference Tables (SQRT) or similar references for ecological receptors in freshwater sediment. Without standards or other widely applicable numerical tools, NOAA scientists found it difficult to estimate the possible toxicological significance of chemical concentrations in sediment. Therefore, numerical sediment quality guidelines (SQG's) were developed as informal, interpretive tools. The SQGs were not promulgated as regulatory standards, but rather as informal, non-regulatory guidelines for interpreting chemical data from analyses of sediments. For potential ecological risk from inorganic contaminants, seven metals are typically of "most concern" with regards to fish and wildlife: Arsenic, Copper, Cadmium, Selenium, Mercury, Lead, and Zinc. Avian species are thought to be particularly sensitive to arsenic, but is also considered a carcinogenic, mutagenic, and teratogenic contaminant in a variety of species in elevated doses over time. Avian species are also known to be particularly sensitive to lead in the environment with effects ranging from mortality, reduced growth and reproductive output, behavior changes, blood chemistry alterations, and lesions of major organs. Finally, the embryo stages in fish and avian species are known to be the most sensitive life stage to selenium effecting reproductive success.

It is recommended that the next round of sediment samples focus on organochlorines in freshwater sediment to assess potential chronic aquatic impacts (e.g. aldrin, chlordane, endrin, endosulfan, DDT, methoxychlor).

For potential human health risk, there are no known values in Missouri for sediments. While not a direct correlation, sample results were compared against Missouri Risk Based Corrective Action (MRBCA) lowest default target levels for all soil types and exposure pathways for soils. Because of a limited budget, metals were only analyzed at site 22, pesticides were analyzed for all lake sites.

3.0 SUMMARY OF MONITORING RESULTS

3.1 Water Quality Summary

Normally seasonal change brings on gradual lake stratification during the summer months. However, since only 1 sampling event took place this during 2007 trends such as this can not be verified. Fecal coli are sampled at the marinas to ensure that the marina areas are not being contaminated by boats with restroom facilities. Bacteria levels for both marinas were below the Missouri standard of 200 colonies/100ml of sample water.

Total iron and total manganese are sampled above the dam near the bottom of the channel (MTL-22-15), below the re-regulation dam (MTL-12), and in the spillway area (MTL-1). As was previously stated living organisms require trace amounts of metals, however excessive amounts can be harmful to the organism. Iron did not exceed the Missouri Water Quality Standard at any of the sites. However, manganese did exceed the drinking water and ground water standard of 0.05 mg/L at all sites on September 6. Iron cycling is a function of oxidation-reduction processes. This elevated level of manganese below the re-regulation dam is not detrimental to the overall lake system at this time. Iron oxidizes relatively rapidly (minutes to hours); therefore any iron released through the spillway will normally be oxidized in a short period of time. Manganese oxidizes slower and can persist in the reduced state long distances downstream even in aerobic environments. Missouri's standard for manganese is for drinking water and groundwater. Missouri does not have a manganese standard for aquatic life.

Nitrogen and phosphates are sampled at all sites. The 2007 total phosphate results at all sites are above the 0.05 mg/L standard. Because phosphorous in water is not considered directly toxic to humans and animals no drinking water standards have been established for phosphorous. However, phosphorous can cause health threats through the stimulation of toxic algal blooms and the resulting oxygen depletion. Nitrates can pose a threat to human and animal health. Nitrate in water is toxic at high levels and has been linked to toxic effects of livestock and to blue baby disease (methemoglobinemia) in infants. The Maximum Contaminant Level (MCL) for nitrate-N in drinking water is 10mg/L to protect babies 3 to 6 months of age. The Missouri Water Quality Standard for ammonia nitrogen (NH_3-N) is 15mg/L. The increased levels of phosphate in combination with nitrogen and other lake conditions, such as temperature, pH and stagnant lake conditions, can lead to increased algae growth. Eutrophication is currently the most widespread water quality problem in the U.S. and many other countries. Restoration of eutrophic waters requires the reduction of nonpoint inputs of phosphorous and nitrogen. The resulting detrimental effects of algae toxins and oxygen depletion could result in health problems for fish and other aquatic species as well as land animals utilizing the water supply. There were no signs of any of these effects during the site visit in 2007.

Chlorophyll *a* was sampled at 4 sites, MTL-22, MTL-33, MTL-66 and MTL-77. MTL-15 is a duplicate sample of MTL-66. Chlorophyll a is a green pigment found in plants. Chlorophyll *a* concentrations are an indicator of phytoplankton abundance and biomass. They can be an effective measure of trophic status, and used as a measure of water quality. High levels often indicate poor water quality and low levels suggest good conditions. However, elevated levels are not necessarily bad. It is the long term persistence of elevated levels that is the problem. It is natural for chlorophyll *a* levels to fluctuate over time. Chlorophyll *a* tends to be higher after storm events and during the summer months when water temperatures and light levels are elevated. Chlorophyll can reduce the clarity of the water and the amount of oxygen available to other organisms. Missouri does not currently have a standard for chlorophyll. A trend could not be determined since only 1 sampling event was conducted.

Seventy percent of the Mark Twain Lake watershed is used for agriculture and 50% of this is used for cropland. Atrazine and Alachlor are pesticides that were sampled at all sites. These chemicals are herbicides used to control weed growth. All sites were below the Missouri atrazine standard. These substances can enter water bodies as a result of drift during spraying, surface runoff, and leaching through soil. In order to eliminate pesticide contamination of waters it is important for the public to be educated and institute best manage practices when using these chemicals.

Total Suspended Solids (TSS) and Total Volatile Suspended Solids (TVSS) samples are collected at all sites. Solids can affect water quality by increasing temperature through the absorption of sunlight by the particles in the water, which also effects the clarity of the water. This can then effect the amount of oxygen in the water. Missouri does not currently have a standard for TSS or TVSS.

Total Organic Carbon (TOC) is collected at all sites. TOC is an indicator of the organic character of water. The larger the carbon or organic content, the more oxygen is consumed. TOC tends to be higher in the summer months which may be a result of plant material, which had grown all summer and begins to decay. Missouri does not currently have a standard for TOC.

Temperature and dissolved oxygen levels were taken at all sites. Measurements were taken at 1 meter intervals at the lake sites. During the summer months the lake stratifies and a boundary is formed between the upper warmer water and the lower cooler water. This transition area is known as the thermocline, the area where the temperature drops significantly. Oxygen levels can also change drastically as a function of depth. This area where the oxygen level significantly drops is called the oxycline. The depth of the thermocline and oxycline can have an effect on the aquatic organisms. Occasionally the thermocline and oxycline are at or near the same depth.

pH is taken at all sites and at 1 meter intervals at lake sites. All sites were within the 6 to 9 pH range. Variances in pH can be caused by a rainfall event.

Conductivity and redox are taken at all sites and at 1 meter intervals at lake sites. Missouri does not currently have a standard for conductivity or redox.

Seechi disk readings at sites 22 (above dam) and 33 (Lick Creek Arm near Hwy J) indicate that these sites tend to have better water clarity than the rest of the lake. This would seem to be reasonable since these sites are located closer to the dam which allows solids time to settle out of the water column.

The monitoring program for Mark Twain Lake during Fiscal Year 2007 revealed good water quality when compared to limits established by the Missouri Department of Natural Resources for general use, secondary contact, and indigenous aquatic life. Agricultural nutrient runoffs were primary concerns for the lake's water quality. Better land management practices, erosion control and buffering zones are methods used to reduce such contaminants from entering the lake. The St. Louis District personnel have been working continuously with lake personnel, area communities and other agencies in the implementation of educational programs and implementation planning to bring about the use of better management techniques to improve the lake's water quality.

3.2 Sediment Summary

Arsenic, barium, lead, and manganese were detected above ecological thresholds at site 22, the only site analyzed for metals. These levels warrant further monitoring considerations in front and below the dam. The source of these contaminants has not been established, though all occur naturally in rocks and can be widespread in the environment; anthropogenic sources can include industrial and agricultural operations. Background concentrations of total metals were not determined as no data was readily available for concentrations of inorganic chemicals in background soils or sediments for Missouri. Whether ubiquitous (naturally occurring) or anthropogenic (man made) in nature, continued investigation appears warranted based on levels present and ecological risk potential, particularly in the area of the dam where contaminants may collect and be released down stream. For potential ecological risk from organic contaminants, the organophosphates (particularly atrazine and chloropyrifos) were below laboratory reporting limits.

For potential human health risk, there are no know values in Missouri for sediments. While not a direct correlation, sample results were compared against Missouri Risk Based Corrective Action (MRBCA) lowest default target levels for all soil types and exposure pathways for soils. Arsenic, barium, lead, and manganese exceeded MRBCA levels at site 22 which provides additional justification for continued sediment monitoring for inorganics.

4.0 PLANNED 2008 STUDIES

The Mark Twain Lake water quality monitoring will continue in Fiscal Year 2008. Due to budgetary constraints only 1 sampling event will be conducted between April and September in 2008. Mark Twain Lake provides water supplies to many communities and is a high usage recreational lake. The monitoring of water quality is imperative to assure the water quality is within acceptable limits for the designated usage.

Since there will only be 1 sampling event a trend analysis of the contaminants entering Mark Twain Lake will not be possible. The sampling sites include the following: Site 1 MTL-1 Spillway, Site 5 MTL-5 South Fork at Hwy D, Site 8 Elk Fork at Hwy 15, Site 9 Middle Fork at Hwy 15, Site 11 North Fork at Hwy 36, Site 12 below re-regulation dam, Site 22 MTL-22 old river channel 1mile up lake from dam, Site 33 Lick Creek at Hwy J, Site 66 South Fork at Hwy 107 bridge, and Site 77 North Fork at Hwy 107 bridge. This combination of sites effectively represents the incoming contaminants and their effects on the lake.

A remote sensor was installed a year ago in the spillway to allow the project as well as water quality personnel to remotely monitor temperature and oxygen readings to avoid fish kills. During low flow, water is discharged through the afterbay. This water is low in oxygen and can create a low oxygen area below the dam. The sensor will allow the project to track oxygen levels below the dam and make appropriate adjustments to avoid a possible fish kill. Normally allowing water to spill through the tainter gates will alleviate low oxygen levels below the dam.

APPENDIX A

DATA

LAB DATA
Sediment

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Acetochlor	175	20
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Alachlor	175	30
MTL-22	09/06/2007	12:28	S	18		mg/kg	Arsenic, Total	8	0.7
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Atrazine	175	30
MTL-22	09/06/2007	12:28	S	407		mg/kg	Barium, Total	3	0.09
MTL-22	09/06/2007	12:28	S	34	U	mg/kg	Boron, Total	34	10
MTL-22	09/06/2007	12:28	S	300	U	ug/kg	Bromacil	300	70
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Butachlor	175	40
MTL-22	09/06/2007	12:28	S	1.7	U	mg/kg	Cadmium, Total	1.7	0.2
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Chlorpyrifos	175	70
MTL-22	09/06/2007	12:28	S	50.5		mg/kg	Chromium, Total	3.4	0.8
MTL-22	09/06/2007	12:28	S	29		mg/kg	Copper, Total	7	0.3
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Cyanizine	175	40
MTL-22	09/06/2007	12:28	S	42400		mg/kg	Iron, Total	34	9
MTL-22	09/06/2007	12:28	S	21		mg/kg	Lead, Total	7	1
MTL-22	09/06/2007	12:28	S	3270		mg/kg	Manganese, Total	3.4	0.3
MTL-22	09/06/2007	12:28	S	0.84	U	mg/kg	Mercury, Total	0.84	0.2
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Metolachlor	175	30
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Metribuzin	175	40
MTL-22	09/06/2007	12:28	S	80.2		%	Moisture	0.1	0.1
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Molinate	175	20
MTL-22	09/06/2007	12:28	S	40		mg/kg	Nickel, Total	7	0.8
MTL-22	09/06/2007	12:28	S	25.3	U	mg/kg	Nitrate-N	25.3	2
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Pendimethalin(Prowl)	175	40
MTL-22	09/06/2007	12:28	S	1550		mg/kg	Phosphorus, Total	49	0.05
MTL-22	09/06/2007	12:28	S	300	U	ug/kg	Prometon	300	30
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Propachlor	175	20
MTL-22	09/06/2007	12:28	S	17	U	mg/kg	Selenium, Total	17	2
MTL-22	09/06/2007	12:28	S	1.7	U	mg/kg	Silver, Total	1.7	0.4
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Simazine	175	30
MTL-22	09/06/2007	12:28	S	4950		mg/kg	Total Kjeldahl Nitrogen	37.8	5
MTL-22	09/06/2007	12:28	S	30700		mg/kg	Total Organic Carbon	4110	200
MTL-22	09/06/2007	12:28	S	19.8		%	Total Solids	0.1	0.1

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-22	09/06/2007	12:28	S	175	U	ug/kg	Trifluralin	175	20
MTL-22	09/06/2007	12:28	S	118		mg/kg	Zinc, Total	7	1
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Acetochlor	129	10
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Alachlor	129	20
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Atrazine	129	20
MTL-33	09/06/2007	11:50	S	220	U	ug/kg	Bromacil	220	50
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Butachlor	129	30
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Chlorpyrifos	129	50
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Cyanizine	129	30
MTL-33	09/06/2007	11:50	S	0.61	U	mg/kg	Mercury, Total	0.61	0.2
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Metolachlor	129	20
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Metribuzin	129	30
MTL-33	09/06/2007	11:50	S	72.9		%	Moisture	0.1	0.1
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Molinate	129	10
MTL-33	09/06/2007	11:50	S	18.5	U	mg/kg	Nitrate-N	18.5	1
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Pendimethalin(Prowl)	129	30
MTL-33	09/06/2007	11:50	S	1490		mg/kg	Phosphorus, Total	36	0.04
MTL-33	09/06/2007	11:50	S	220	U	ug/kg	Prometon	220	20
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Propachlor	129	10
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Simazine	129	20
MTL-33	09/06/2007	11:50	S	1490		mg/kg	Total Kjeldahl Nitrogen	27.7	4
MTL-33	09/06/2007	11:50	S	27100		mg/kg	Total Organic Carbon	3520	200
MTL-33	09/06/2007	11:50	S	27.1		%	Total Solids	0.1	0.1
MTL-33	09/06/2007	11:50	S	129	U	ug/kg	Trifluralin	129	10
MTL-66	09/06/2007	14:53	S	330		ug/kg	Acetochlor	124	10
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Alachlor	124	20
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Atrazine	124	20
MTL-66	09/06/2007	14:53	S	212	U	ug/kg	Bromacil	212	50
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Butachlor	124	30
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Chlorpyrifos	124	50
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Cyanizine	124	30
MTL-66	09/06/2007	14:53	S	0.64	U	mg/kg	Mercury, Total	0.64	0.2
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Metolachlor	124	20
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Metribuzin	124	20

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-66	09/06/2007	14:53	S	72.5		%	Moisture	0.1	0.1
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Molinate	124	10
MTL-66	09/06/2007	14:53	S	18.1	U	mg/kg	Nitrate-N	18.1	1
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Pendimethalin(Prowl)	124	30
MTL-66	09/06/2007	14:53	S	1290		mg/kg	Phosphorus, Total	33	0.03
MTL-66	09/06/2007	14:53	S	212	U	ug/kg	Prometon	212	20
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Propachlor	124	10
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Simazine	124	20
MTL-66	09/06/2007	14:53	S	3950		mg/kg	Total Kjeldahl Nitrogen	27.2	4
MTL-66	09/06/2007	14:53	S	23100		mg/kg	Total Organic Carbon	2920	100
MTL-66	09/06/2007	14:53	S	27.5		%	Total Solids	0.1	0.1
MTL-66	09/06/2007	14:53	S	124	U	ug/kg	Trifluralin	124	10
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Acetochlor	142	20
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Alachlor	142	20
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Atrazine	142	20
MTL-77	09/06/2007	14:33	S	244	U	ug/kg	Bromacil	244	60
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Butachlor	142	30
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Chlorpyrifos	142	50
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Cyanizine	142	30
MTL-77	09/06/2007	14:33	S	0.7	U	mg/kg	Mercury, Total	0.70	0.2
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Metolachlor	142	20
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Metribuzin	142	30
MTL-77	09/06/2007	14:33	S	75.5		%	Moisture	0.1	0.1
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Molinate	142	20
MTL-77	09/06/2007	14:33	S	20.5	U	mg/kg	Nitrate-N	20.5	1
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Pendimethalin(Prowl)	142	30
MTL-77	09/06/2007	14:33	S	1230		mg/kg	Phosphorus, Total	38	0.04
MTL-77	09/06/2007	14:33	S	244	U	ug/kg	Prometon	244	20
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Propachlor	142	20
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Simazine	142	20
MTL-77	09/06/2007	14:33	S	3710		mg/kg	Total Kjeldahl Nitrogen	30.7	4
MTL-77	09/06/2007	14:33	S	26100		mg/kg	Total Organic Carbon	3190	200
MTL-77	09/06/2007	14:33	S	24.5		%	Total Solids	0.1	0.1
MTL-77	09/06/2007	14:33	S	142	U	ug/kg	Trifluralin	142	20

Water

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Acetochlor	1.1	0.3
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Acetochlor	1.1	0.3
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Acetochlor	1.1	0.3
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Acetochlor	1.0	0.3
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Alachlor	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Alachlor	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Alachlor	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Alachlor	1.0	0.2
MTL-1	09/06/2007	11:40	WT	0.1		mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-11	09/06/2007	13:45	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-12	09/06/2007	12:38	WT	0.1		mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-15	09/06/2007	13:00	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-22	09/06/2007	12:28	WT	0.1		mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-22-15	09/06/2007	12:40	WT	0.2		mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-33	09/06/2007	11:50	WT	0.27		mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-5	09/06/2007	15:30	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-66	09/06/2007	14:53	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-77	09/06/2007	14:33	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-8	09/06/2007	14:45	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-9	09/06/2007	14:20	WT	0.1	U	mg/L	Ammonia-nitrogen, Total	0.10	0.03
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Atrazine	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Atrazine	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Atrazine	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1.1		ug/L	Atrazine	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1		ug/L	Atrazine	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1.1		ug/L	Atrazine	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Atrazine	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Atrazine	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Atrazine	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Atrazine	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Atrazine	1.0	0.2
MTL-1	09/06/2007	11:40	WT	2.2	U	ug/L	Bromacil	2.2	0.3
MTL-11	09/06/2007	13:45	WT	2	U	ug/L	Bromacil	2.0	0.3
MTL-12	09/06/2007	12:38	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-15	09/06/2007	13:00	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-22	09/06/2007	12:28	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-33	09/06/2007	11:50	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-5	09/06/2007	15:30	WT	2	U	ug/L	Bromacil	2.0	0.3
MTL-66	09/06/2007	14:53	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-77	09/06/2007	14:33	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-8	09/06/2007	14:45	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-9	09/06/2007	14:20	WT	2.1	U	ug/L	Bromacil	2.1	0.3
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Butachlor	1.1	0.3
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Butachlor	1.1	0.3
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Butachlor	1.0	0.3

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Butachlor	1.1	0.3
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Butachlor	1.0	0.3
MTL-15	09/06/2007	13:00	WT	4.51		mg/m3	Chlorophyll a		
MTL-22	09/06/2007	12:28	WT	3.7		mg/m3	Chlorophyll a		
MTL-33	09/06/2007	11:50	WT	3.46		mg/m3	Chlorophyll a		
MTL-66	09/06/2007	14:53	WT	4.63		mg/m3	Chlorophyll a		
MTL-77	09/06/2007	14:33	WT	5.02		mg/m3	Chlorophyll a		
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Chlorpyrifos	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Chlorpyrifos	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Chlorpyrifos	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Chlorpyrifos	1.0	0.2
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Cyanizine	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Cyanizine	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Cyanizine	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Cyanizine	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Cyanizine	1.0	0.2

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-1	09/06/2007	11:40	WT	0.07		mg/L	Iron, Total	0.03	0.007
MTL-12	09/06/2007	12:38	WT	0.49		mg/L	Iron, Total	0.03	0.007
MTL-22-15	09/06/2007	12:40	WT	0.17		mg/L	Iron, Total	0.03	0.007
MTL-1	09/06/2007	11:40	WT	0.078		mg/L	Manganese, Total	0.002	0.0001
MTL-12	09/06/2007	12:38	WT	0.184		mg/L	Manganese, Total	0.002	0.0001
MTL-22-15	09/06/2007	12:40	WT	0.415		mg/L	Manganese, Total	0.002	0.0001
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Metolachlor	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Metolachlor	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Metolachlor	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Metolachlor	1.0	0.2
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Metribuzin	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Metribuzin	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Metribuzin	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Metribuzin	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Metribuzin	1.0	0.2

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Molinate	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Molinate	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Molinate	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Molinate	1.0	0.2
MTL-1	09/06/2007	11:40	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-11	09/06/2007	13:45	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-12	09/06/2007	12:38	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-15	09/06/2007	13:00	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-22	09/06/2007	12:28	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-22-15	09/06/2007	12:40	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-33	09/06/2007	11:50	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-5	09/06/2007	15:30	WT	0.2	U	mg/L	Nitrate-N	0.20	0.04
MTL-66	09/06/2007	14:53	WT	0.2	U	mg/L	Nitrate-N	0.20	0.04
MTL-77	09/06/2007	14:33	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-8	09/06/2007	14:45	WT	0.2	U	mg/L	Nitrate-N	0.20	0.04
MTL-9	09/06/2007	14:20	WT	0.2	U	mg/L	Nitrate-N	0.20	0.06
MTL-1	09/06/2007	11:40	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-11	09/06/2007	13:45	WT	0.04		mg/L	Orthophosphate	0.02	0.007
MTL-12	09/06/2007	12:38	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-15	09/06/2007	13:00	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-22	09/06/2007	12:28	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-22-15	09/06/2007	12:40	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-33	09/06/2007	11:50	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-5	09/06/2007	15:30	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-66	09/06/2007	14:53	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-77	09/06/2007	14:33	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-8	09/06/2007	14:45	WT	0.02		mg/L	Orthophosphate	0.02	0.007
MTL-9	09/06/2007	14:20	WT	0.02	U	mg/L	Orthophosphate	0.02	0.007
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Pendimethalin(Prowl)	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Pendimethalin(Prowl)	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Pendimethalin(Prowl)	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Pendimethalin(Prowl)	1.0	0.2
MTL-15	09/06/2007	13:00	WT	13.56		mg/m3	Pheophytin		
MTL-22	09/06/2007	12:28	WT	6.92		mg/m3	Pheophytin		
MTL-33	09/06/2007	11:50	WT	5.2		mg/m3	Pheophytin		
MTL-66	09/06/2007	14:53	WT	12.57		mg/m3	Pheophytin		
MTL-77	09/06/2007	14:33	WT	8.11		mg/m3	Pheophytin		
MTL-1	09/06/2007	11:40	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-11	09/06/2007	13:45	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-12	09/06/2007	12:38	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-15	09/06/2007	13:00	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-22	09/06/2007	12:28	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-22-15	09/06/2007	12:40	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-33	09/06/2007	11:50	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-5	09/06/2007	15:30	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-66	09/06/2007	14:53	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-77	09/06/2007	14:33	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-8	09/06/2007	14:45	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01
MTL-9	09/06/2007	14:20	WT	0.1	U	mg/L	Phosphorus, Total	0.10	0.01

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Prometon	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Prometon	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Prometon	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Prometon	1.0	0.2
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Propachlor	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Propachlor	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Propachlor	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Propachlor	1.0	0.2
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Simazine	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Simazine	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Simazine	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Simazine	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Simazine	1.0	0.2

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-1	09/06/2007	11:40	WT	6.5		mg/L	Total Organic Carbon	5.0	1
MTL-11	09/06/2007	13:45	WT	15.4		mg/L	Total Organic Carbon	1.0	0.2
MTL-12	09/06/2007	12:38	WT	17.4		mg/L	Total Organic Carbon	1.0	0.2
MTL-15	09/06/2007	13:00	WT	13.5		mg/L	Total Organic Carbon	1.0	0.2
MTL-22	09/06/2007	12:28	WT	18.1		mg/L	Total Organic Carbon	1.0	0.2
MTL-22-15	09/06/2007	12:40	WT	16.1		mg/L	Total Organic Carbon	1.0	0.2
MTL-33	09/06/2007	11:50	WT	16.6		mg/L	Total Organic Carbon	1.0	0.2
MTL-5	09/06/2007	15:30	WT	15.4		mg/L	Total Organic Carbon	1.0	0.2
MTL-66	09/06/2007	14:53	WT	17.3		mg/L	Total Organic Carbon	1.0	0.2
MTL-77	09/06/2007	14:33	WT	14.4		mg/L	Total Organic Carbon	1.0	0.2
MTL-8	09/06/2007	14:45	WT	16.1		mg/L	Total Organic Carbon	1.0	0.2
MTL-9	09/06/2007	14:20	WT	13.7		mg/L	Total Organic Carbon	1.0	0.2
MTL-1	09/06/2007	11:40	WT	5		mg/L	Total Suspended Solids	5	5
MTL-11	09/06/2007	13:45	WT	50		mg/L	Total Suspended Solids	5	5
MTL-12	09/06/2007	12:38	WT	10		mg/L	Total Suspended Solids	5	5
MTL-15	09/06/2007	13:00	WT	8		mg/L	Total Suspended Solids	5	5
MTL-22	09/06/2007	12:28	WT	5		mg/L	Total Suspended Solids	5	5
MTL-22-15	09/06/2007	12:40	WT	10		mg/L	Total Suspended Solids	5	5
MTL-33	09/06/2007	11:50	WT	5		mg/L	Total Suspended Solids	5	5
MTL-5	09/06/2007	15:30	WT	24		mg/L	Total Suspended Solids	5	5
MTL-66	09/06/2007	14:53	WT	8		mg/L	Total Suspended Solids	5	5
MTL-77	09/06/2007	14:33	WT	8		mg/L	Total Suspended Solids	5	5
MTL-8	09/06/2007	14:45	WT	18		mg/L	Total Suspended Solids	5	5
MTL-9	09/06/2007	14:20	WT	46		mg/L	Total Suspended Solids	5	5

Site	Date	Time	Matrix	Result	Qualifer	Unit	Analyte Name	Reporting Limit	mdl
MTL-1	09/06/2007	11:40	WT	1.1	U	ug/L	Trifluralin	1.1	0.2
MTL-11	09/06/2007	13:45	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-12	09/06/2007	12:38	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-15	09/06/2007	13:00	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-22	09/06/2007	12:28	WT	1.1	U	ug/L	Trifluralin	1.1	0.2
MTL-33	09/06/2007	11:50	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-5	09/06/2007	15:30	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-66	09/06/2007	14:53	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-77	09/06/2007	14:33	WT	1.1	U	ug/L	Trifluralin	1.1	0.2
MTL-8	09/06/2007	14:45	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-9	09/06/2007	14:20	WT	1	U	ug/L	Trifluralin	1.0	0.2
MTL-1	09/06/2007	11:40	WT	5		mg/L	Volatile Suspended Solids	5	
MTL-11	09/06/2007	13:45	WT	15		mg/L	Volatile Suspended Solids	5	
MTL-12	09/06/2007	12:38	WT	5		mg/L	Volatile Suspended Solids	5	
MTL-15	09/06/2007	13:00	WT	7		mg/L	Volatile Suspended Solids	5	
MTL-22	09/06/2007	12:28	WT	5	U	mg/L	Volatile Suspended Solids	5	
MTL-22-15	09/06/2007	12:40	WT	8		mg/L	Volatile Suspended Solids	5	
MTL-33	09/06/2007	11:50	WT	5		mg/L	Volatile Suspended Solids	5	
MTL-5	09/06/2007	15:30	WT	9		mg/L	Volatile Suspended Solids	5	
MTL-66	09/06/2007	14:53	WT	8		mg/L	Volatile Suspended Solids	5	
MTL-77	09/06/2007	14:33	WT	7		mg/L	Volatile Suspended Solids	5	
MTL-8	09/06/2007	14:45	WT	6		mg/L	Volatile Suspended Solids	5	
MTL-9	09/06/2007	14:20	WT	13		mg/L	Volatile Suspended Solids	5	

Fecal

MTL-BJ-Mar	09/06/2007	12:20	WT	10	cfu/100ml	Fecal Coliform
MTL-IC-Mar	09/06/2007	15:15	WT	10	cfu/100ml	Fecal Coliform

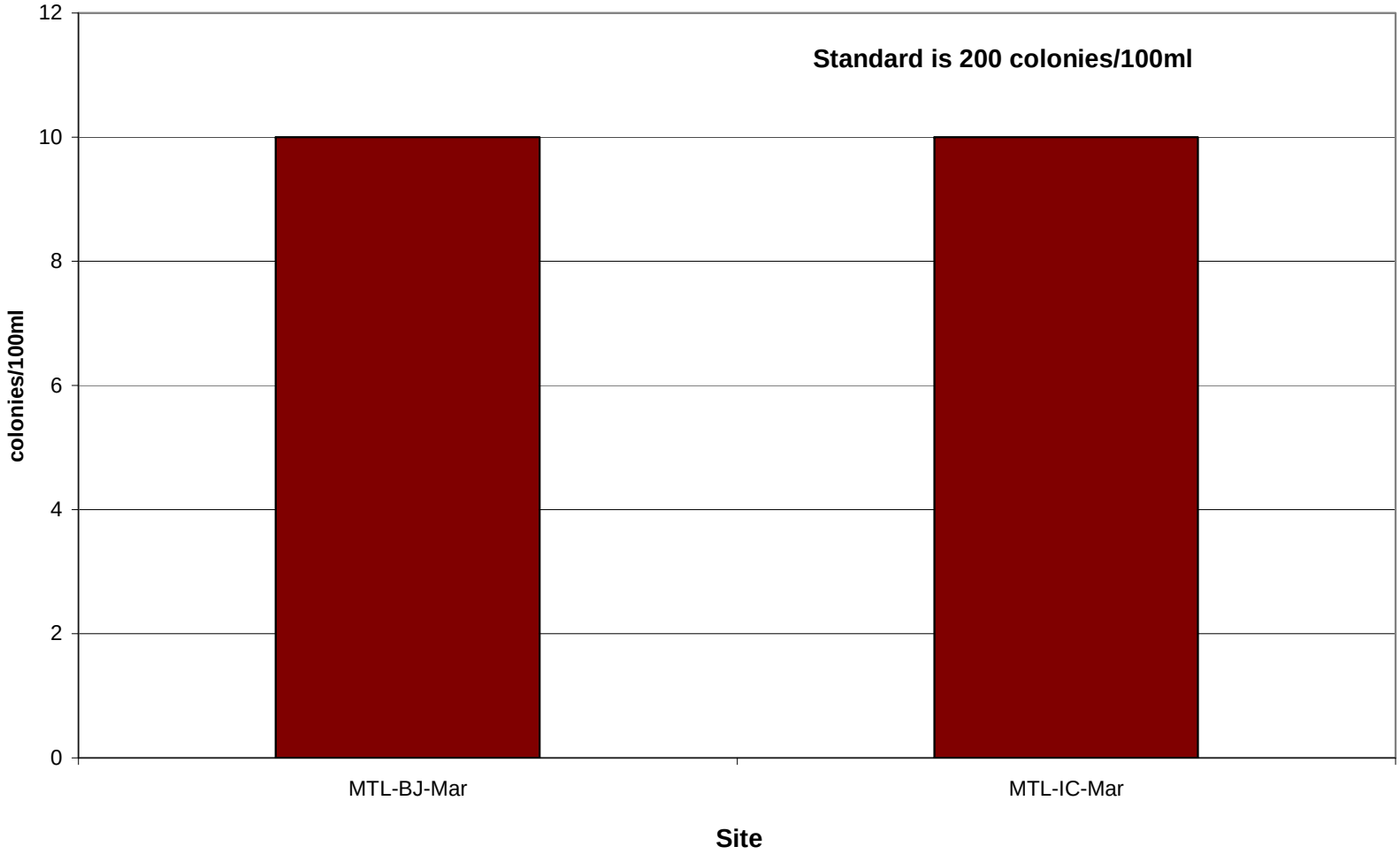
FIELD DATA

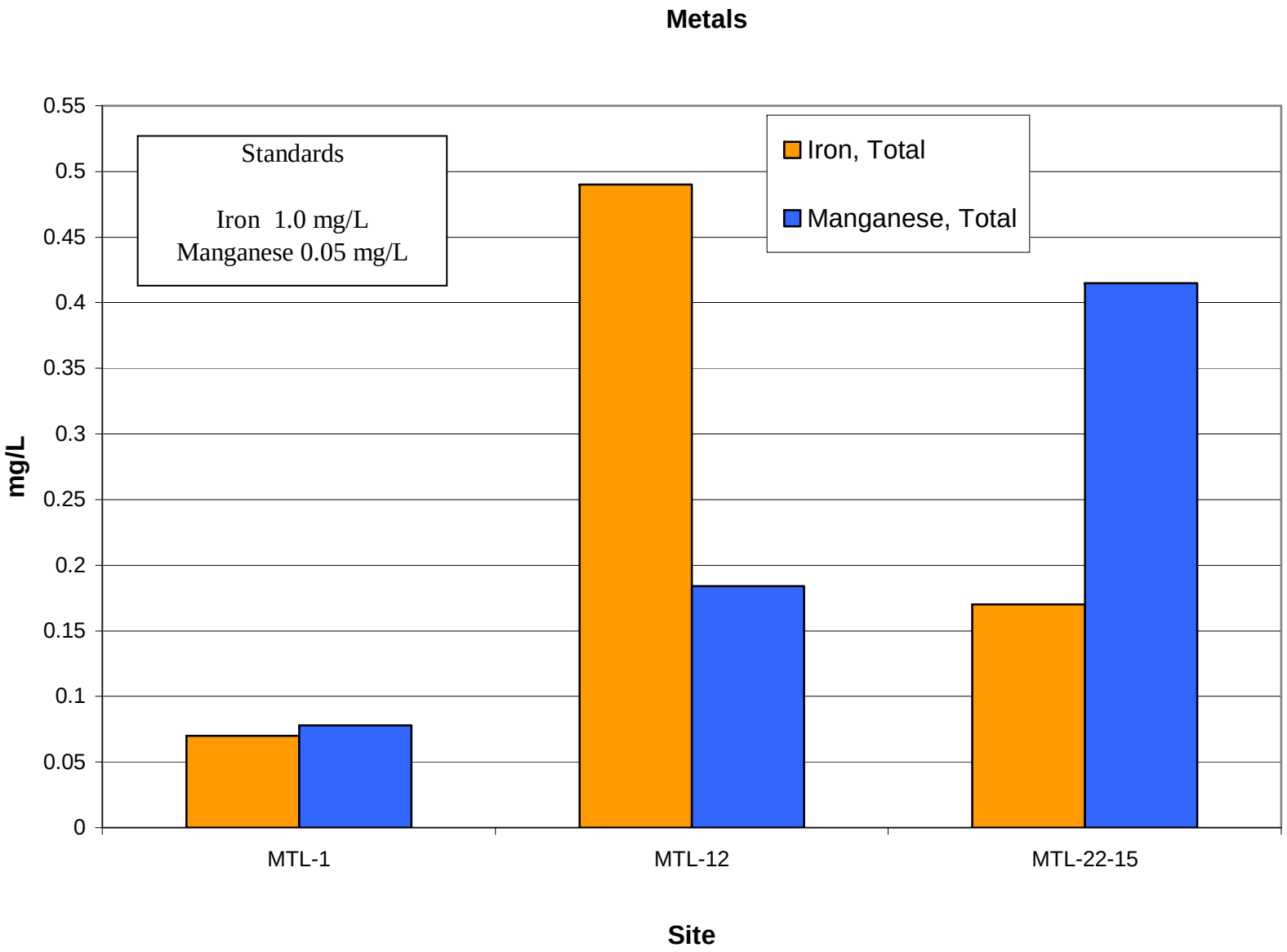
Site	Date	Depth	H2OTemp	Redox	Cond	pH	D.0.%	D.O.(mg/L)	Time	Seechi	Air Temp	Weather
MTL 1	9/6/2007	1.99	25.62	355	233	8.01	71.6	5.83	1140			
MTL 12	9/6/2007	1.94	26.93	342	231	7.95	86.3	6.78	1238			
MTL 11	9/6/2007	1.85	26.25	248	322	7.68	81.9	6.53	1345			
MTL 9	9/6/2007	1.74	25.41	321	211	8.25	117.2	9.51	1420			
MTL 8	9/6/2007	1.91	25.71	336	540	8.05	108.9	8.78	1445			
MTL 5	9/6/2007	1.78	27.71	314	496	8.32	149	11.78	1530			
MTL 33	9/6/2007	0.26	26.6	262	227	8.1	75.2	5.9	1150	50	82	cloudy
33	9/6/2007	1	26.6	263	226	8.1	73.8	5.8				
33	9/6/2007	2	26.6	264	227	8.1	71.5	5.6				
33	9/6/2007	3	26.6	265	227	8	71.2	5.6				
33	9/6/2007	4	26.5	272	226	7.9	59.4	4.7				
33	9/6/2007	5	25.1	290	225	7.3	13.5	1				
33	9/6/2007	6	24.2	296	224	7.2	2.5	0.2				
33	9/6/2007	7	20.1	272	224	7	1.6	0.15				
33	9/6/2007	8	15.7	264	216	6.9	1.5	0.15				
33	9/6/2007	9	12.7	266	214	6.9	1.3	0.13				
33	9/6/2007	10	11	267	214	6.8	1.2	0.13				
MTL 22	9/6/2007	0.35	27	227	225	8.4	91.6	7.2	1228	58	84	
22	9/6/2007	1	27	226	225	8.5	91.3	7.1				
22	9/6/2007	2	27	227	224	8.5	90.7	7.1				
22	9/6/2007	3	27	229	224	8.5	90.3	7.1				
22	9/6/2007	4	26.9	232	225	8.4	87.1	6.8				
22	9/6/2007	5	26.9	234	225	8.4	85.2	6.7				
22	9/6/2007	6	24.4	254	226	7.4	13.2	0.91				
22	9/6/2007	7	18.3	210	218	7.1	2.2	0.19				
22	9/6/2007	8	14.9	175	216	6.9	1.7	0.17				

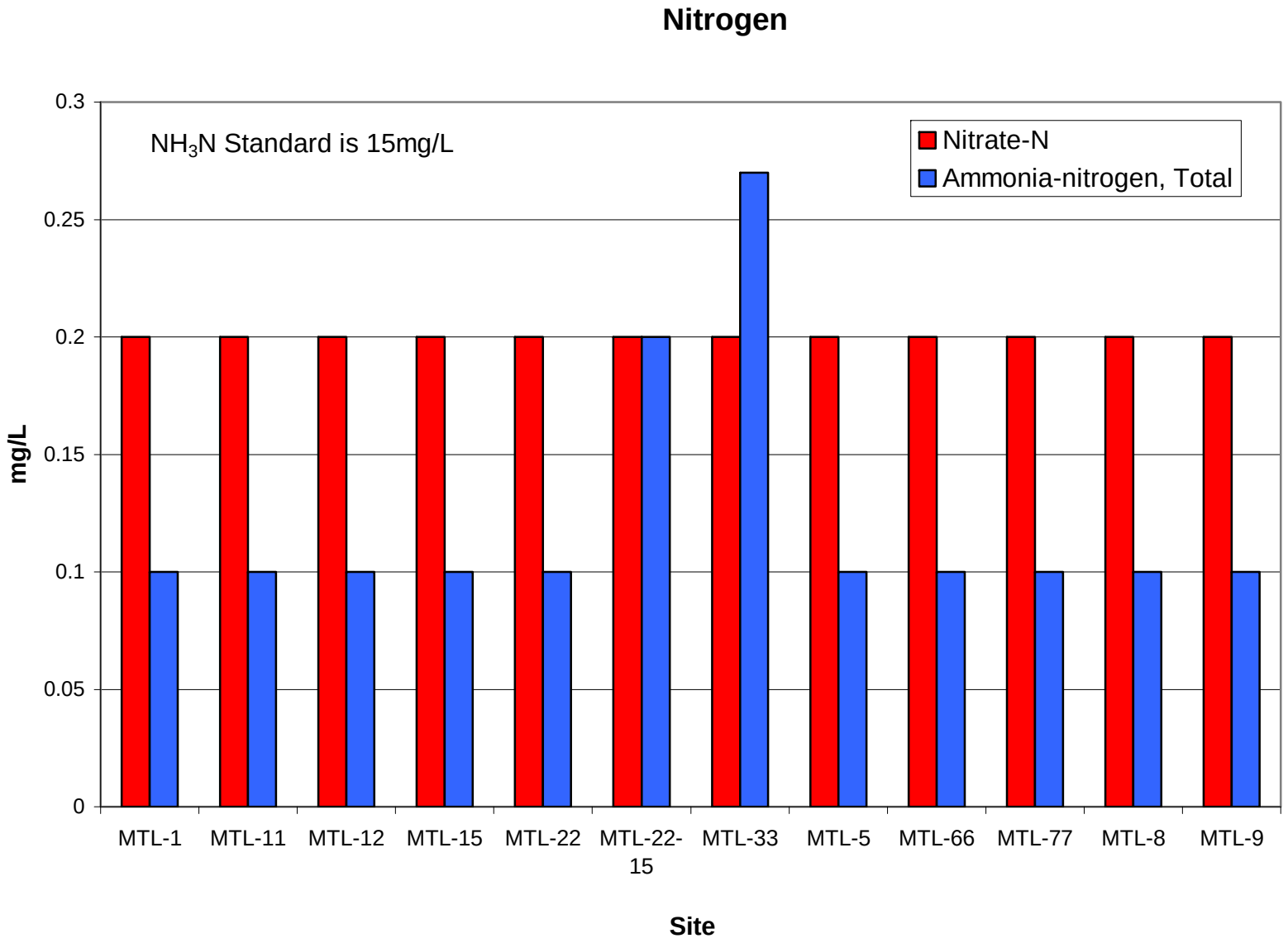
Site	Date	Depth	H2OTemp	Redox	Cond	pH	D.0.%	D.O.(mg/L)	Time	Seechi	Air Temp	Weather
MTL 77	9/6/2007	0.15	27	233	224	8.44	88	6.93	1433	42		
77	9/6/2007	1	26.9	235	224	8.42	86.3	6.8				
77	9/6/2007	2	26.8	237	224	8.3	85.2	6.7				
77	9/6/2007	3	26.7	238	224	8.3	84.7	6.6				
77	9/6/2007	4	26.7	240	225	8.3	83	6.5				
77	9/6/2007	5	26.2	267	227	7.4	23.4	1.7				
77	9/6/2007	6	22	-22	246	7.1	2.3	0.19				
77	9/6/2007	7	17.5	-51	249	7	1.9	0.17				
77	9/6/2007	8	14.9	-62	249	7	1.4	0.14				
77	9/6/2007	9	12.8	-75	249	6.9	1.3	0.13				
77	9/6/2007	10	12.3		249	6.9	1.2	0.13				
MTL 66	9/6/2007	0.13	26.9	154	227	8.1	78.6	6.21	1453	36	85	
66	9/6/2007	1	26.9	157	227	8.1	77.1	6.1				
66	9/6/2007	2	26.7	162	227	8	70	5.6				
66	9/6/2007	3	26.4	167	227	7.8	59.6	4.7				
66	9/6/2007	4	26.4	166	227	7.7	55.5	4.4				
66	9/6/2007	5	25.5	139	227	7.3	18.8	1.5				
66	9/6/2007	6	22.3	13	238	7.2	1.7	0.14				
66	9/6/2007	7	17.8	-62	250	7	1.2	0.11				

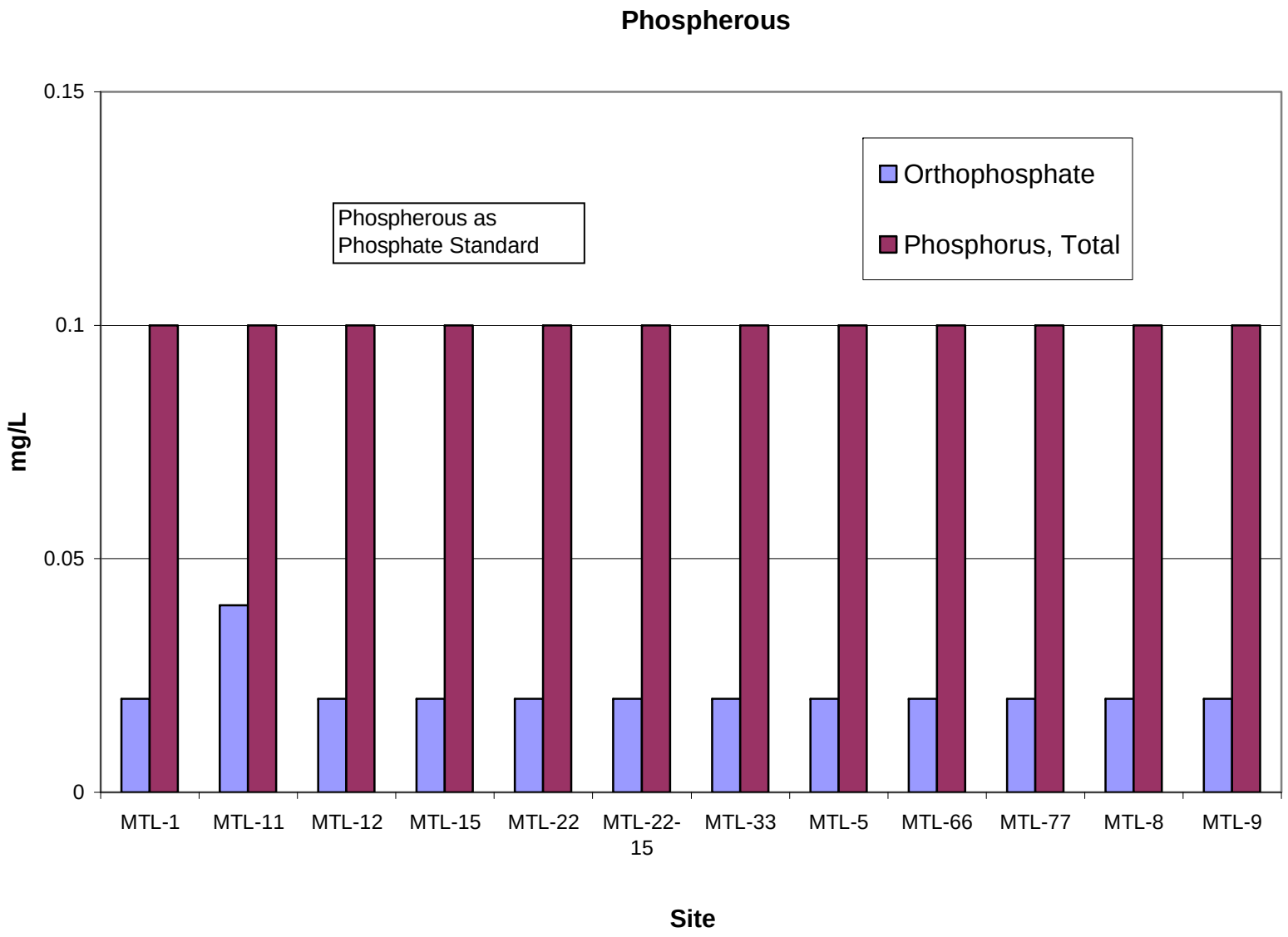
APPENDIX B

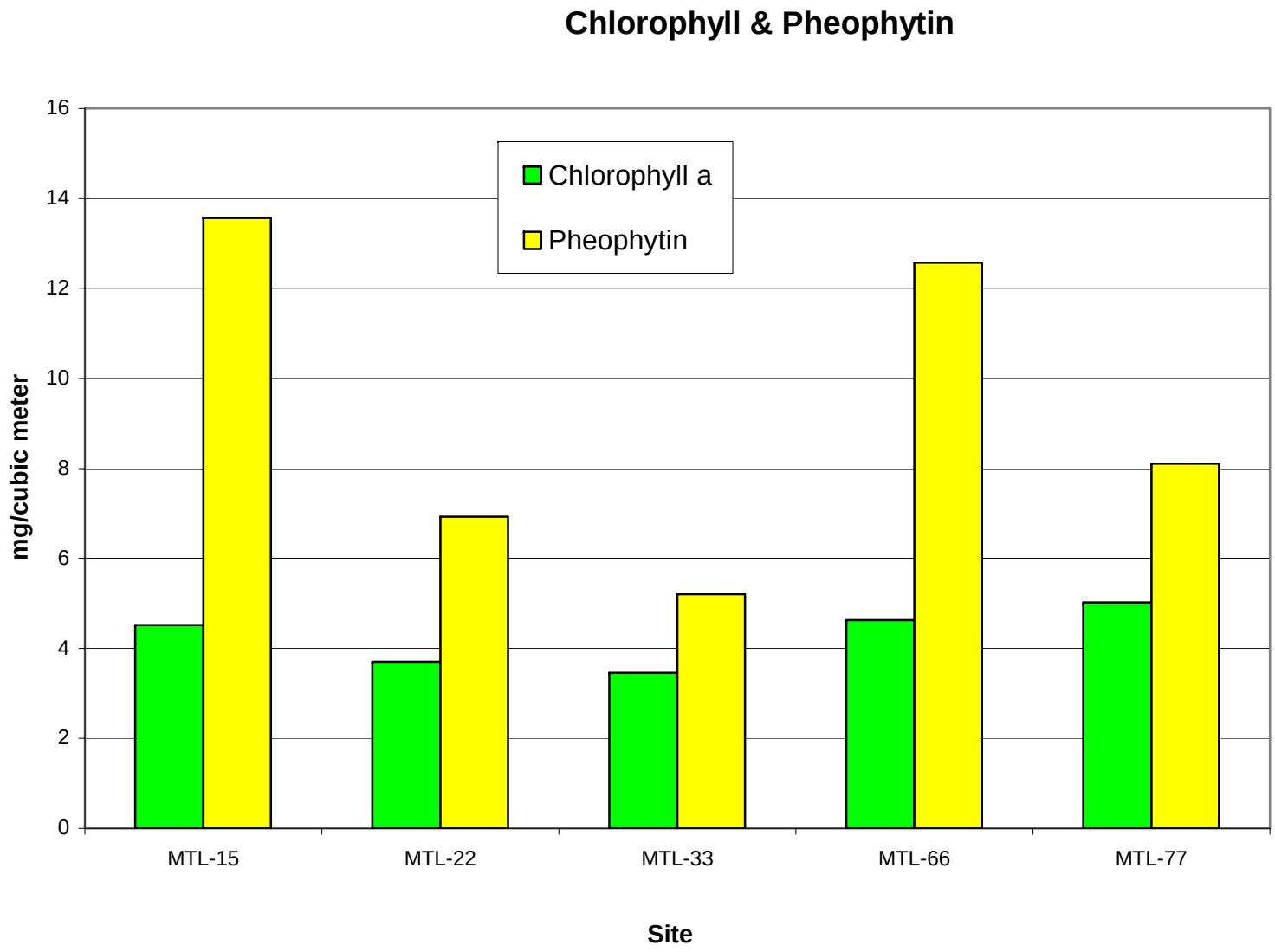
LAB DATA
GRAPHS

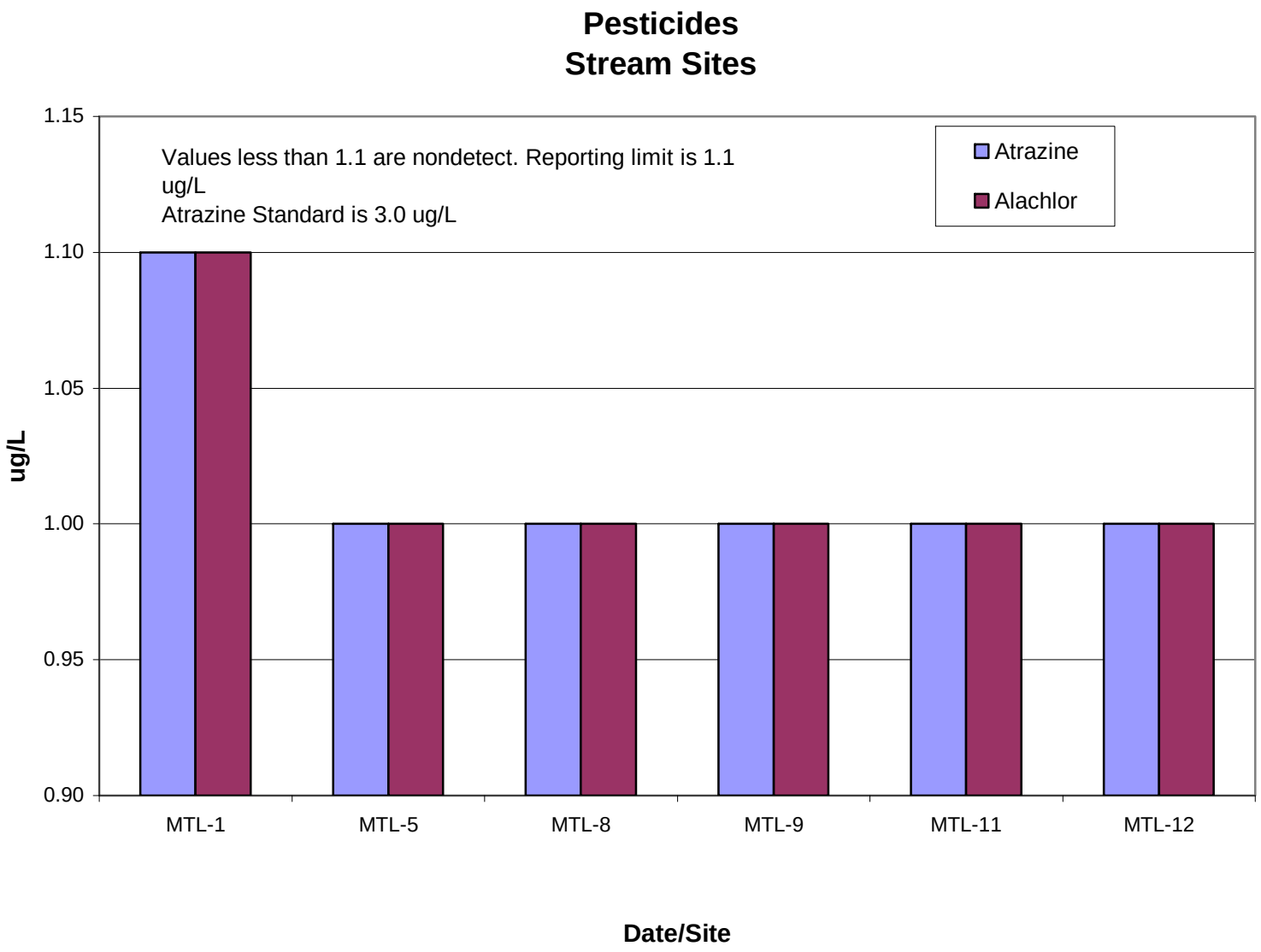

Fecal Coli at Marinas
Standard is 200 colonies/100ml
colonies/100ml
12
10
8
6
4
2
0
MTL-BJ-Mar
MTL-IC-Mar
Site

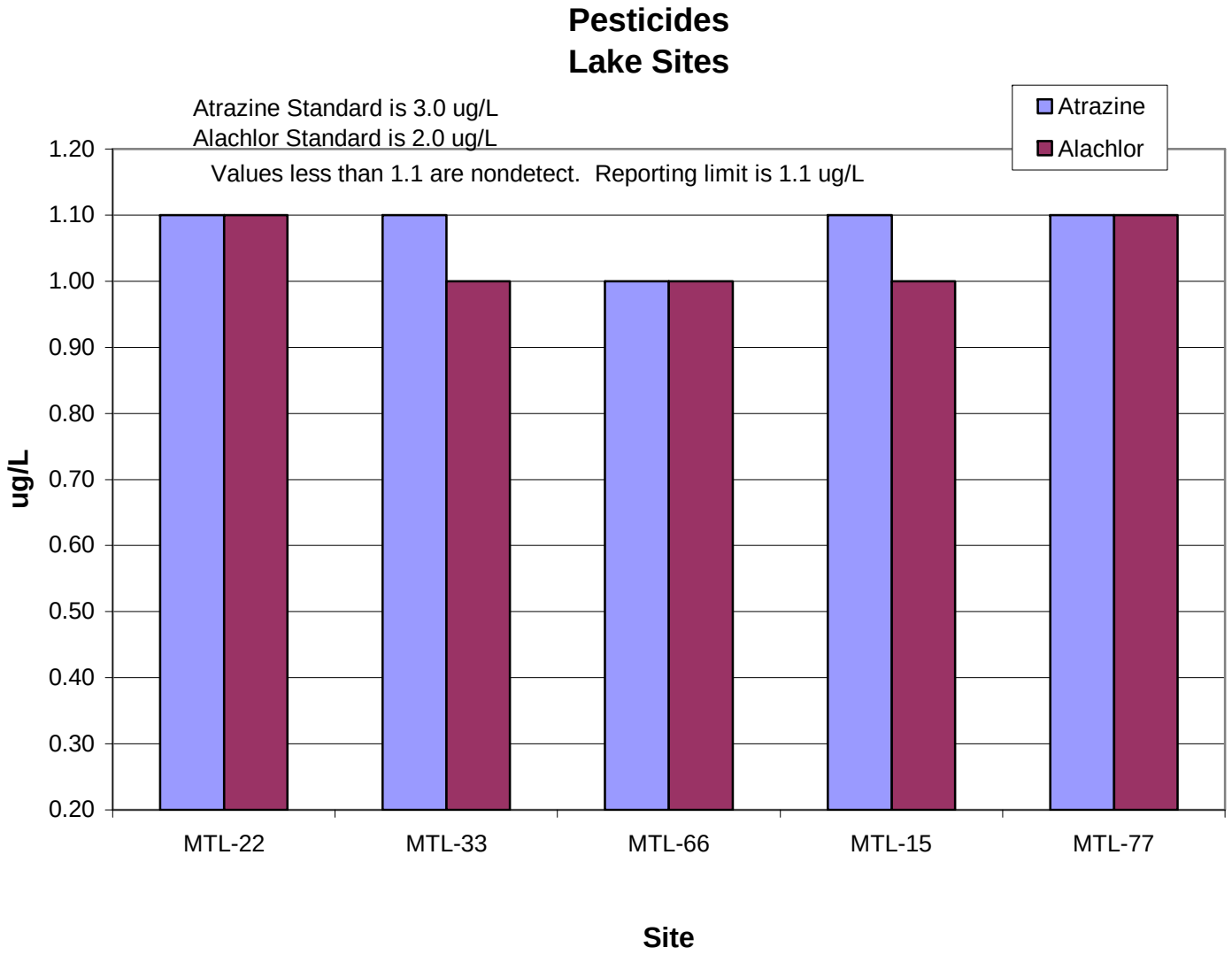

Metals
Standards
Iron 1.0 mg/L
Manganese 0.05 mg/L
Iron, Total
Manganese, Total
mg/L
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
MTL-1
MTL-12
MTL-22-15
Site

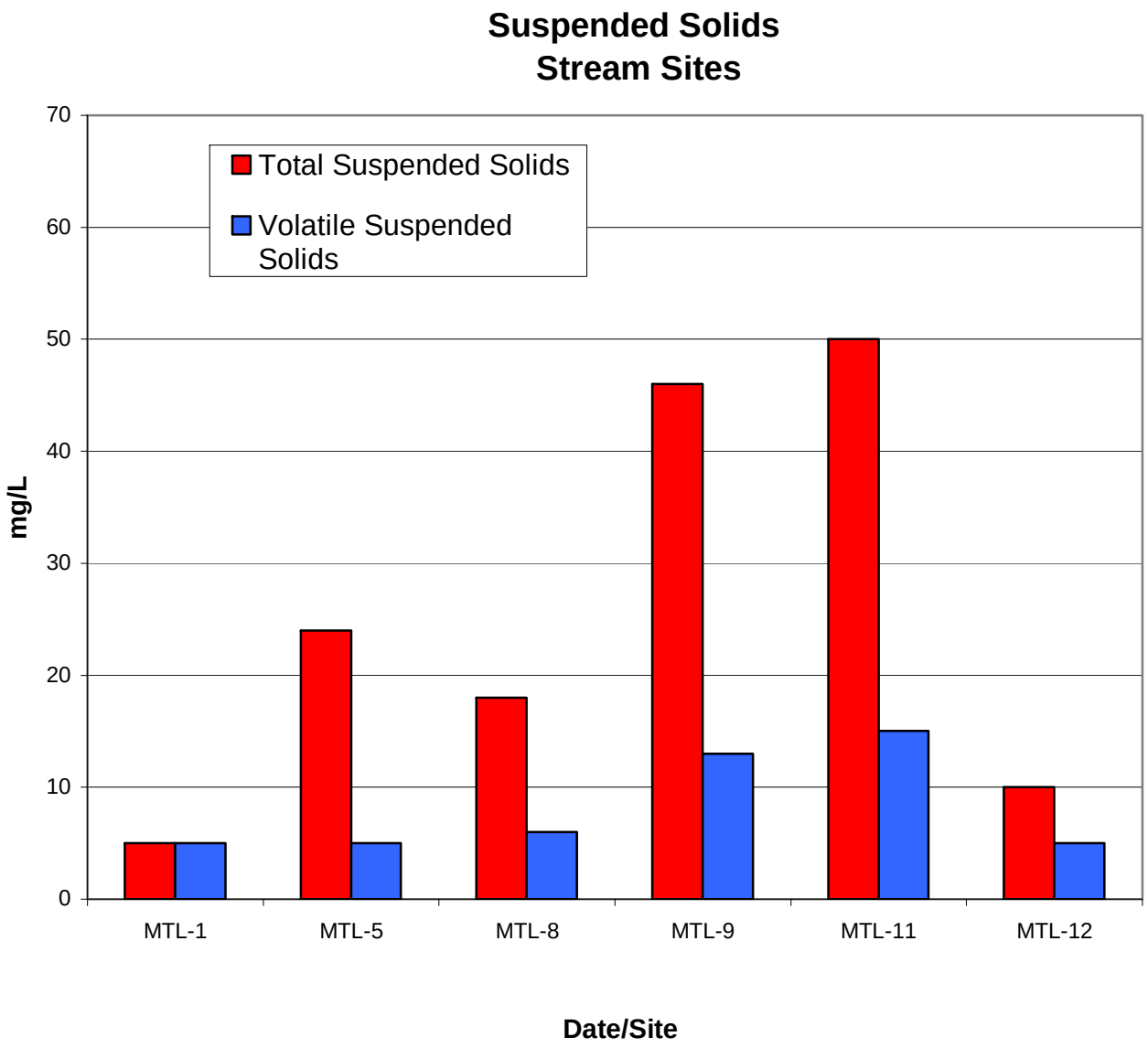

Nitrogen
NH3N Standard is 15mg/L
Nitrate-N
Ammonia-nitrogen, Total
mg/L
0.3
0.25
0.2
0.15
0.1
0.05
0
MTL-1
MTL-11
MTL-12
MTL-15
MTL-22
MTL-22-15
MTL-33
MTL-5
MTL-66
MTL-77
MTL-8
MTL-9
Site

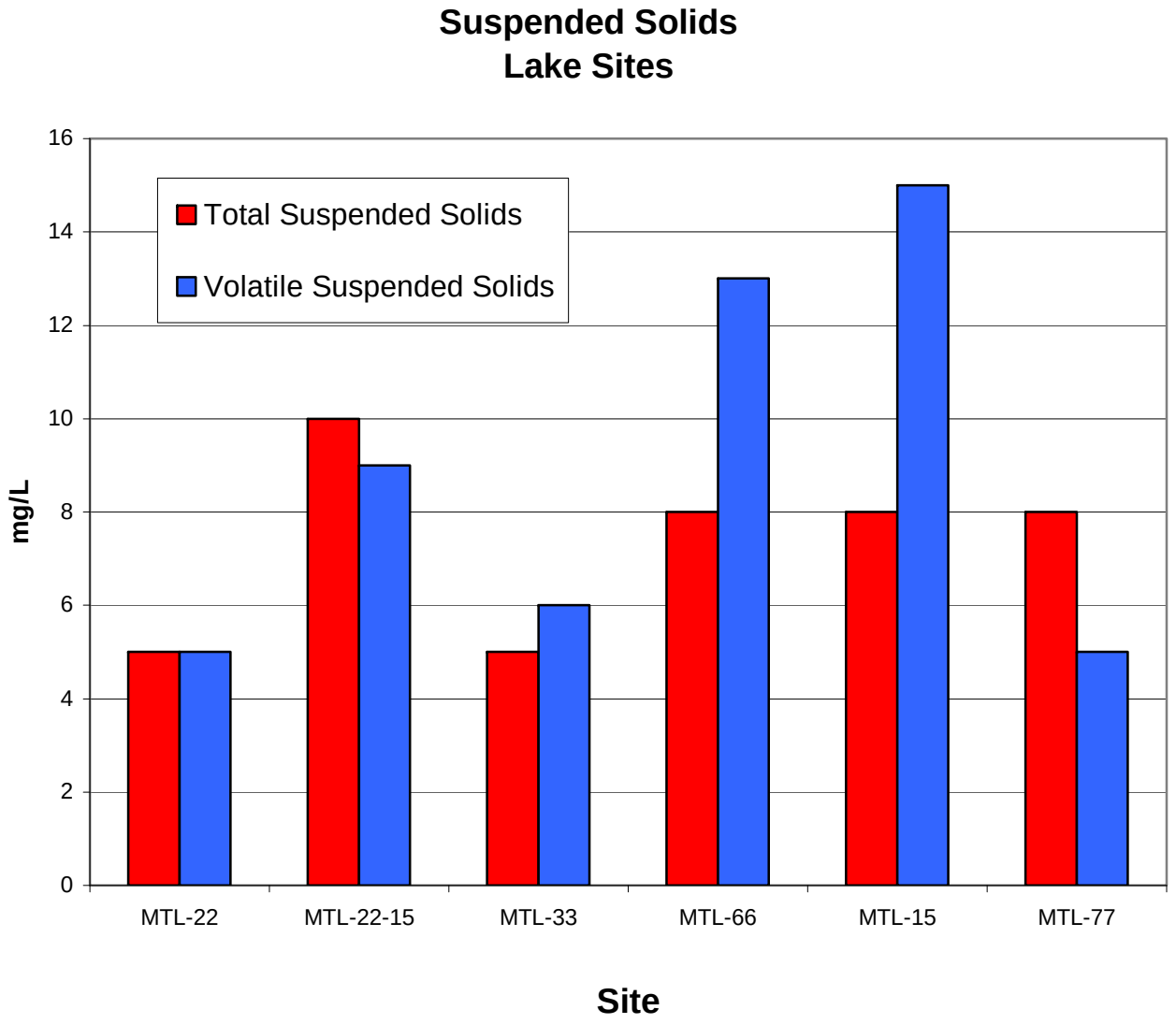

Phospherous
0.15
0.1
0.05
0
mg/L
Phospherous as Phosphate Standard
Orthophosphate
Phosphorus, Total
MTL-1
MTL-11
MTL-12
MTL-15
MTL-22
MTL-22-15
MTL-33
MTL-5
MTL-66
MTL-77
MTL-8
MTL-9
Site

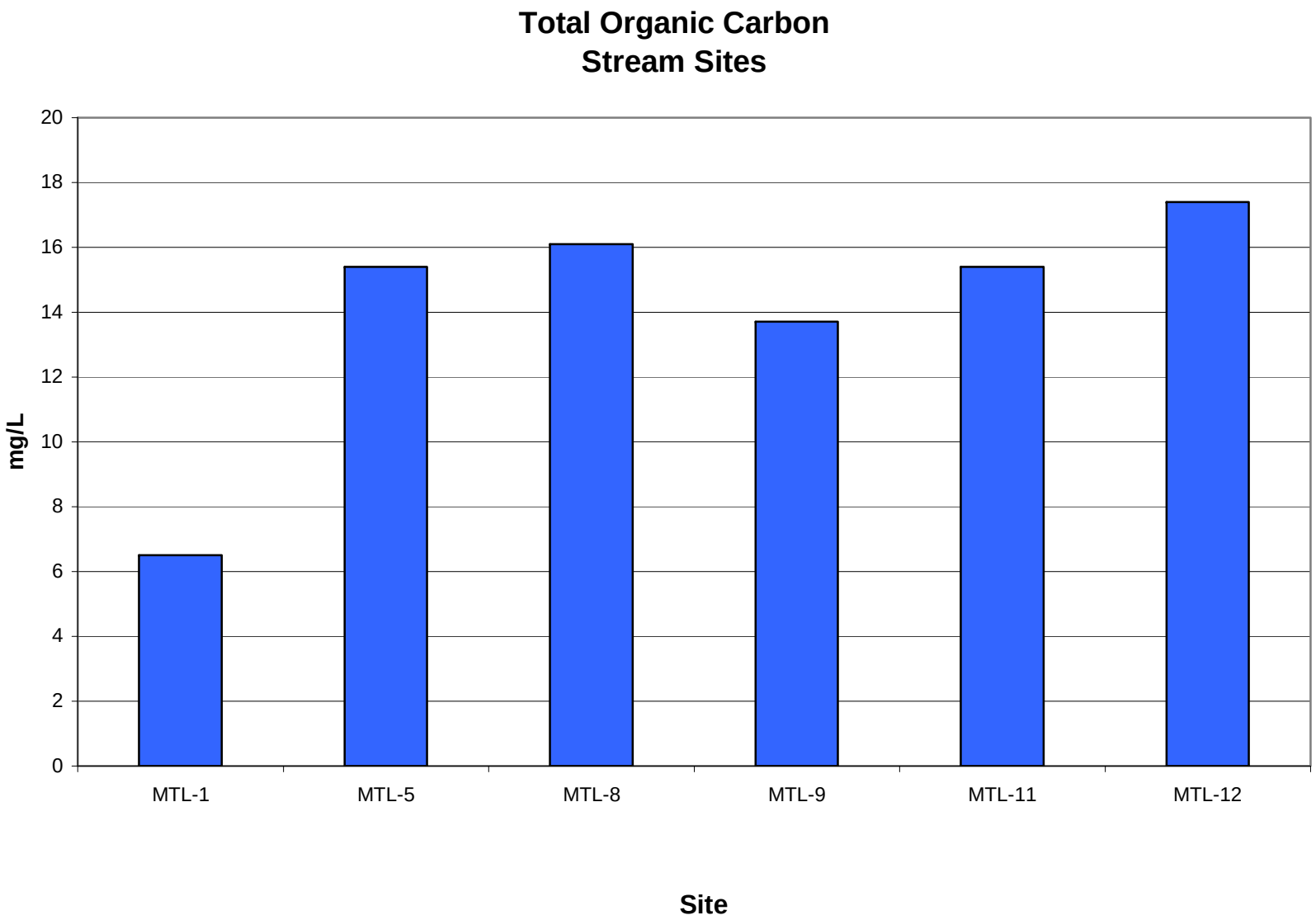

Chlorophyll & Pheophytin
16
14
12
10
8
6
4
2
0
mg/cubic meter
Chlorophyll a
Pheophytin
MTL-15
MTL-22
MTL-33
MTL-66
MTL-77
Site

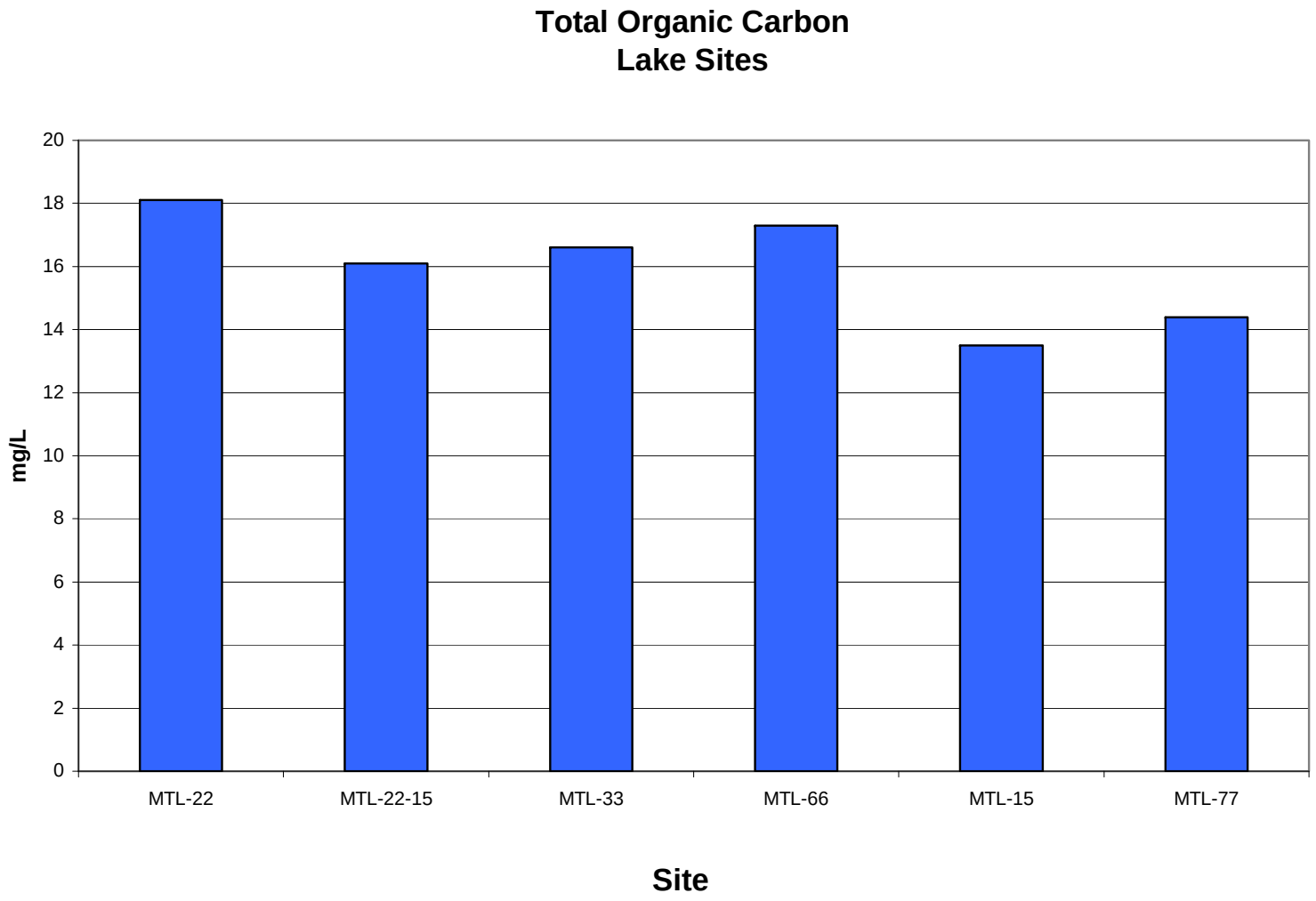

Pesticides
Stream Sites
Values less than 1.1 are nondetect. Reporting limit is 1.1 ug/L
Atrazine Standard is 3.0 ug/L
Atrazine
Alachlor
1.15
1.10
1.05
1.00
0.95
0.90
ug/L
MTL-1
MTL-5
MTL-8
MTL-9
MTL-11
MTL-12
Date/Site


Pesticides
Lake Sites
Atrazine Standard is 3.0 ug/L
Alachlor Standard is 2.0 ug/L
Values less than 1.1 are nondetect. Reporting limit is 1.1 ug/L
Atrazine
Alachlor
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
ug/L
MTL-22
MTL-33
MTL-66
MTL-15
MTL-77
Site


Suspended Solids
Stream Sites
70
60
50
40
30
20
10
0
mg/L
Total Suspended Solids
Volatile Suspended Solids
MTL-1
MTL-5
MTL-8
MTL-9
MTL-11
MTL-12
Date/Site

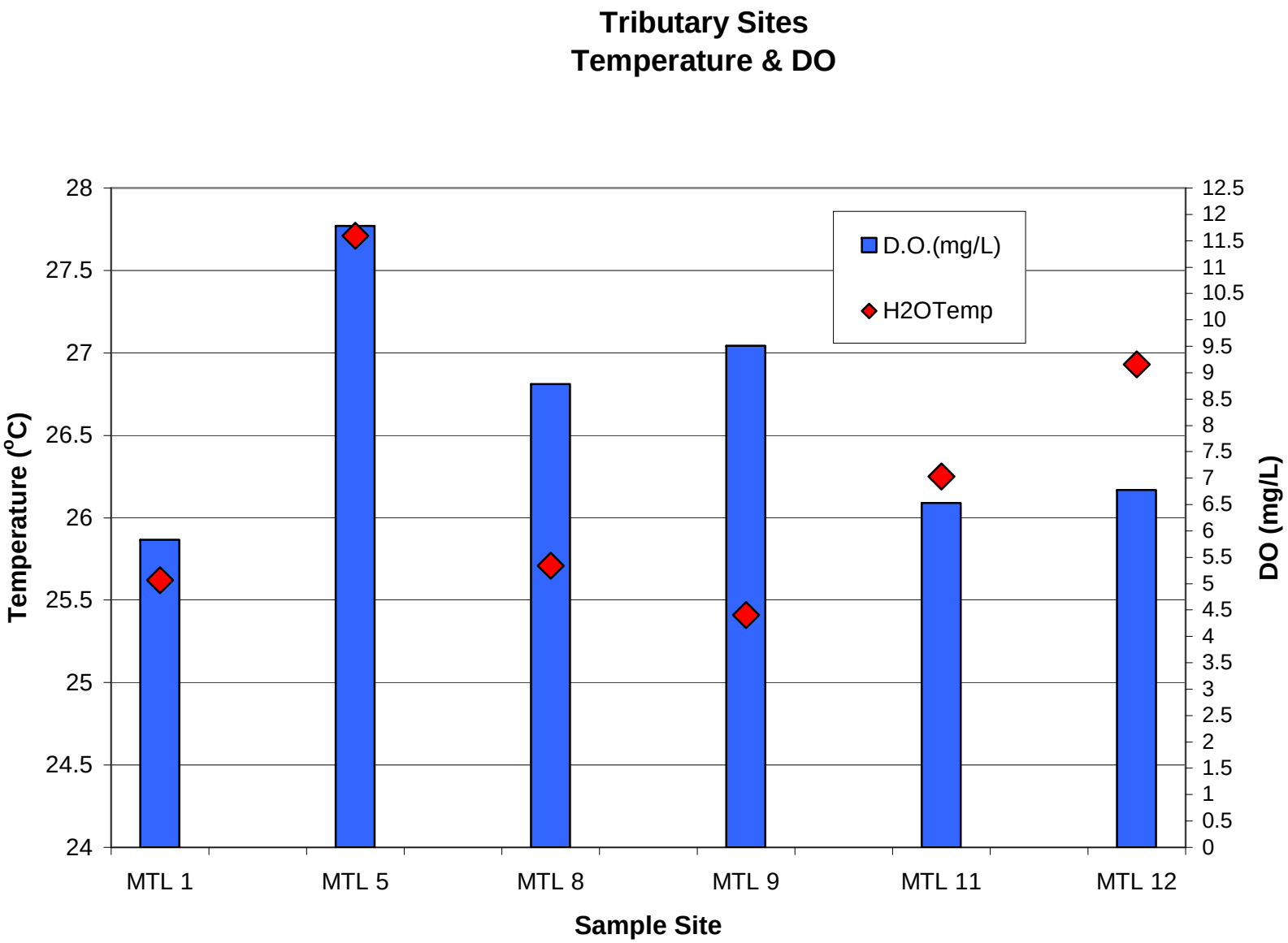

Suspended Solids
Lake Sites
Total Suspended Solids
Volatile Suspended Solids
mg/L
16
14
12
10
8
6
4
2
0
MTL-22
MTL-22-15
MTL-33
MTL-66
MTL-15
MTL-77
Site

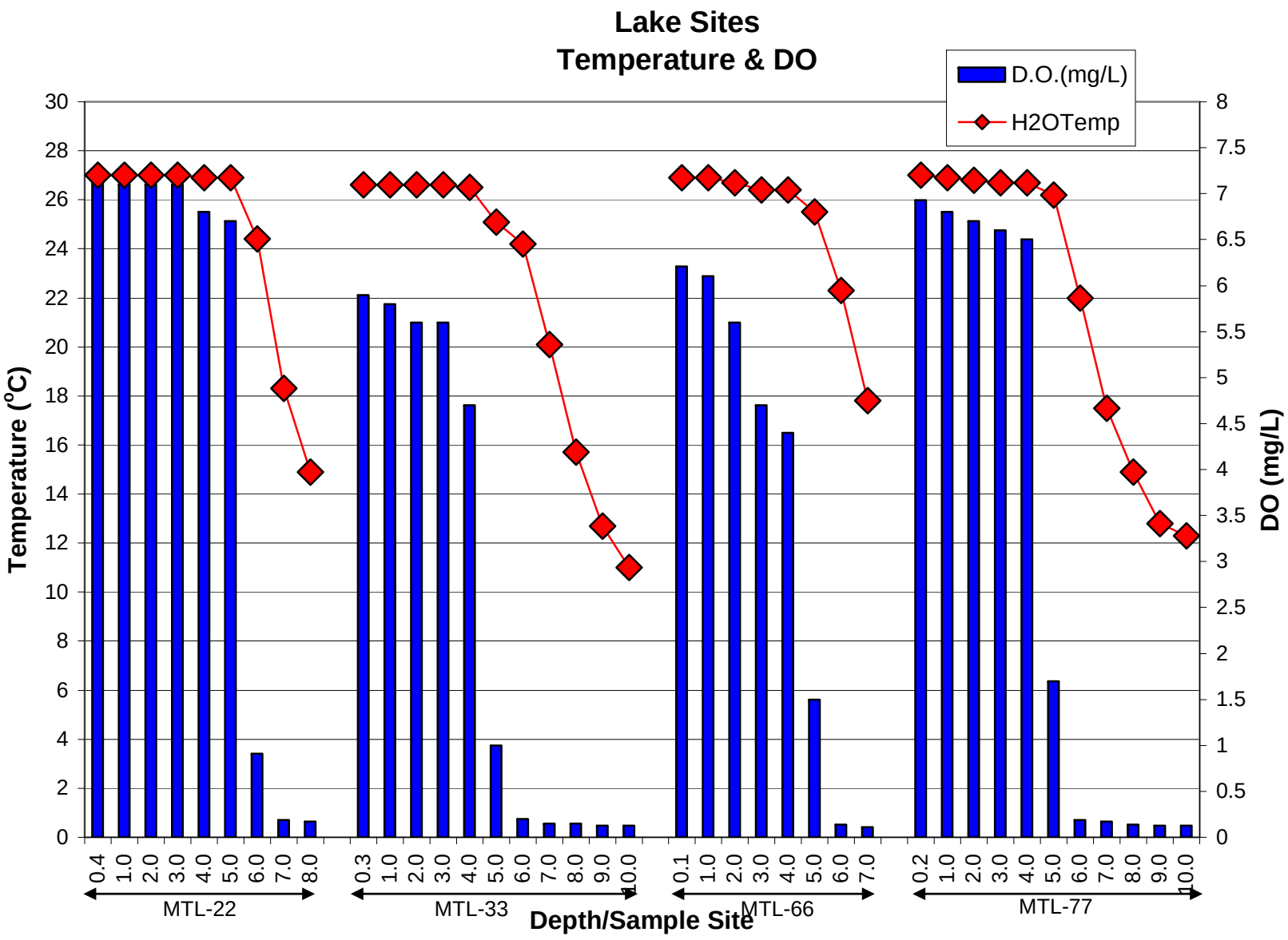

Total Organic Carbon
Stream Sites
mg/L
20
18
16
14
12
10
8
6
4
2
0
MTL-1
MTL-5
MTL-8
MTL-9
MTL-11
MTL-12
Site

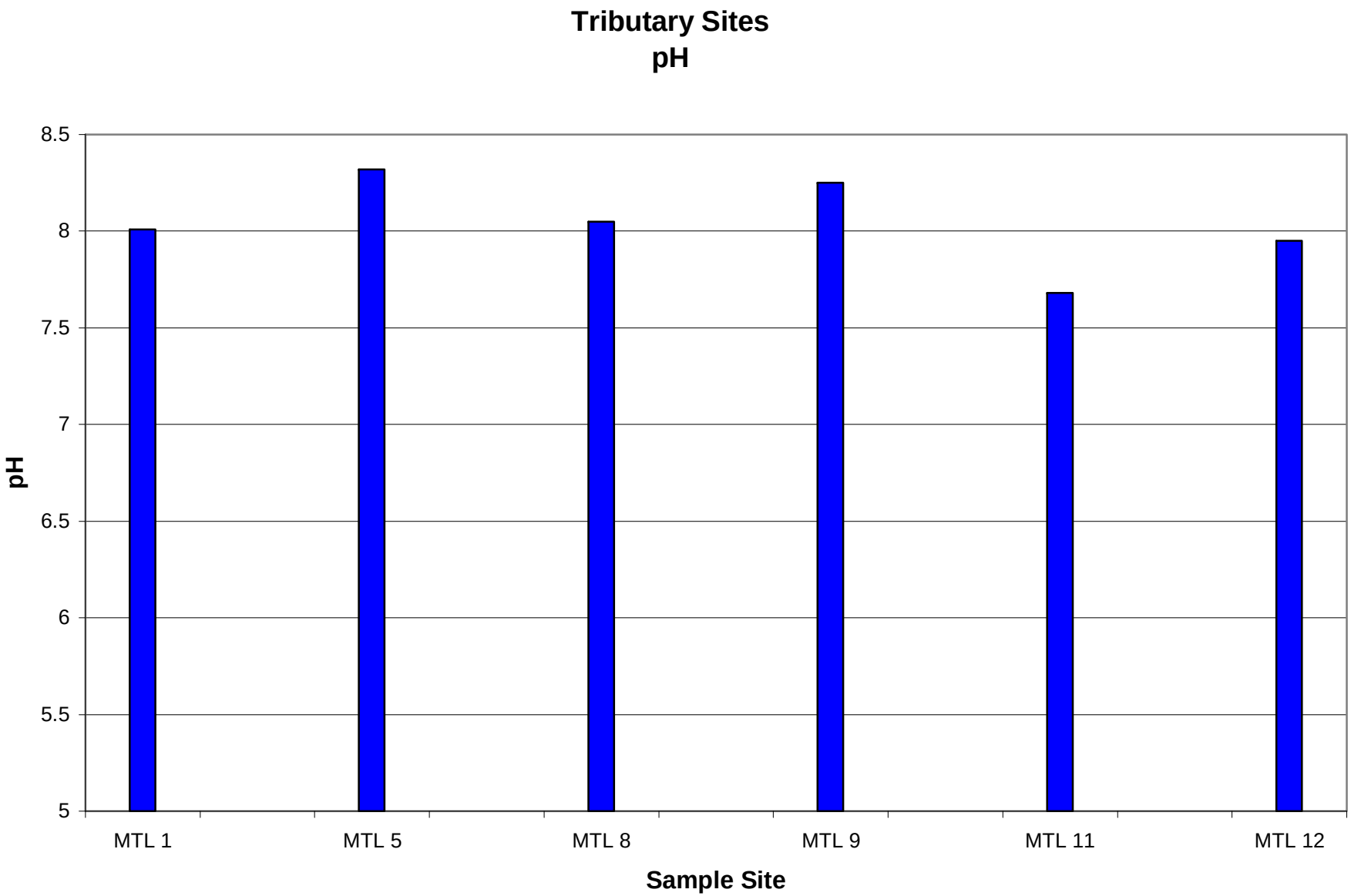

Total Organic Carbon
Lake Sites
mg/L
20
18
16
14
12
10
8
6
4
2
0
MTL-22
MTL-22-15
MTL-33
MTL-66
MTL-15
MTL-77
Site

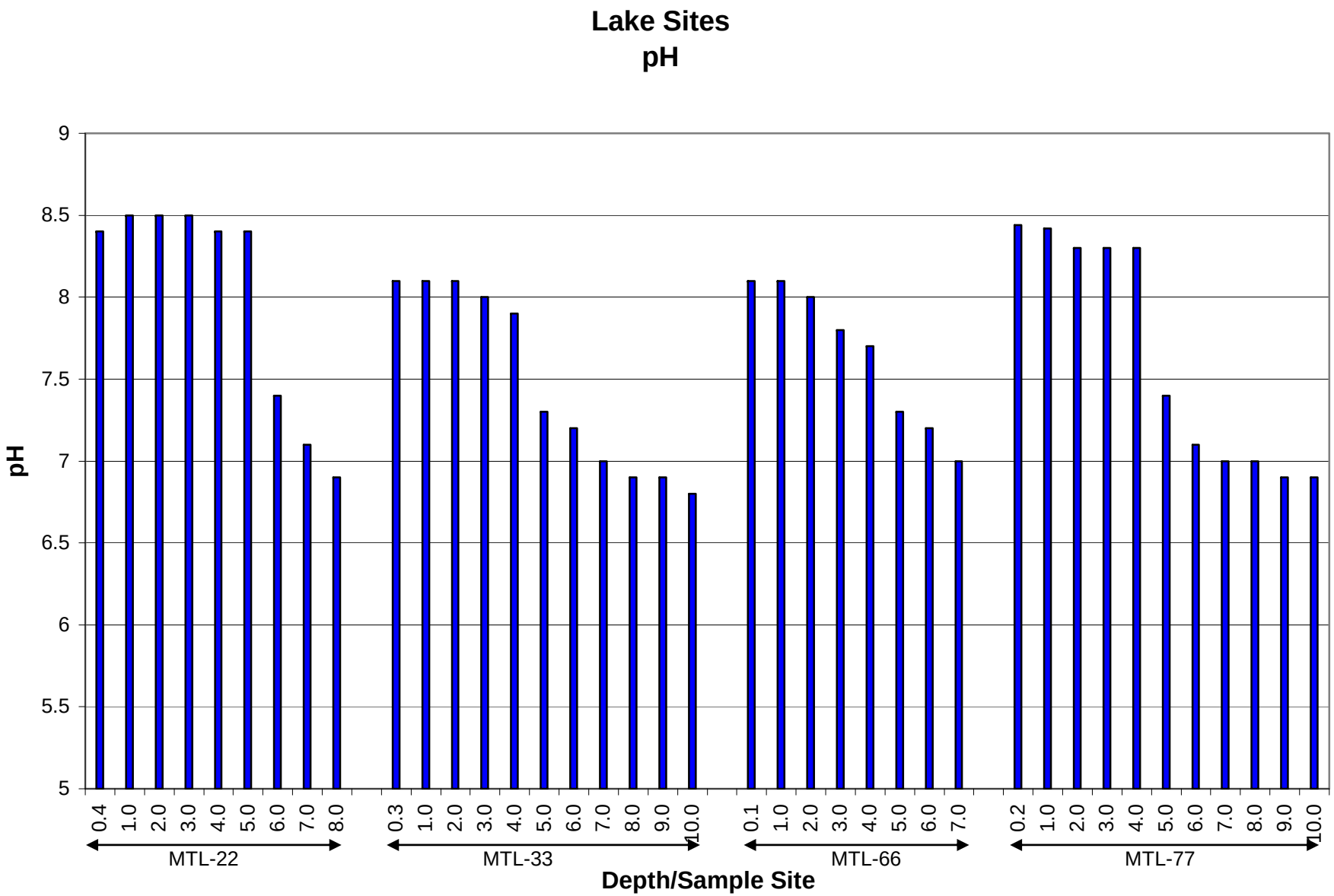
APPENDIX C

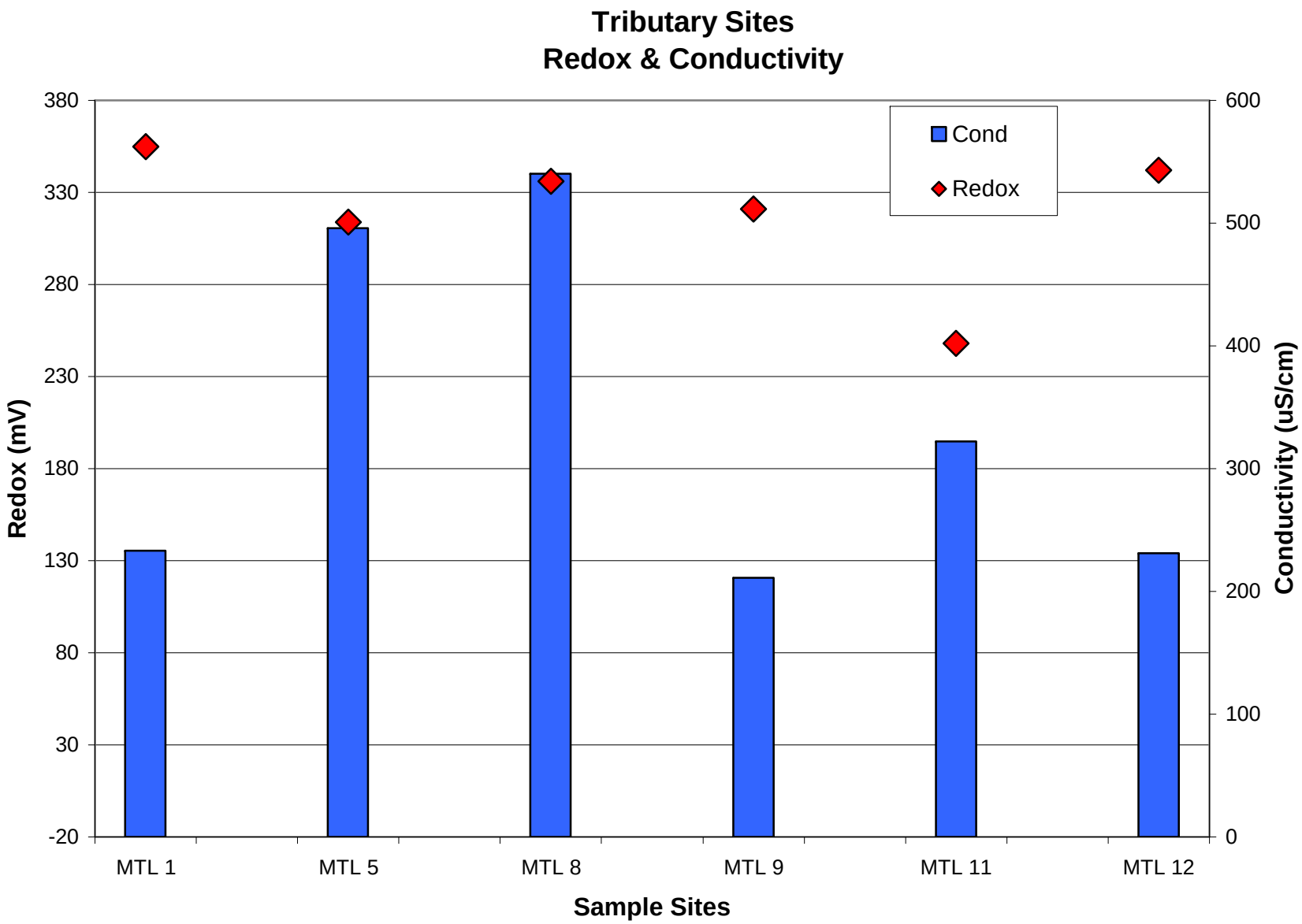
FIELD DATA
GRAPHS

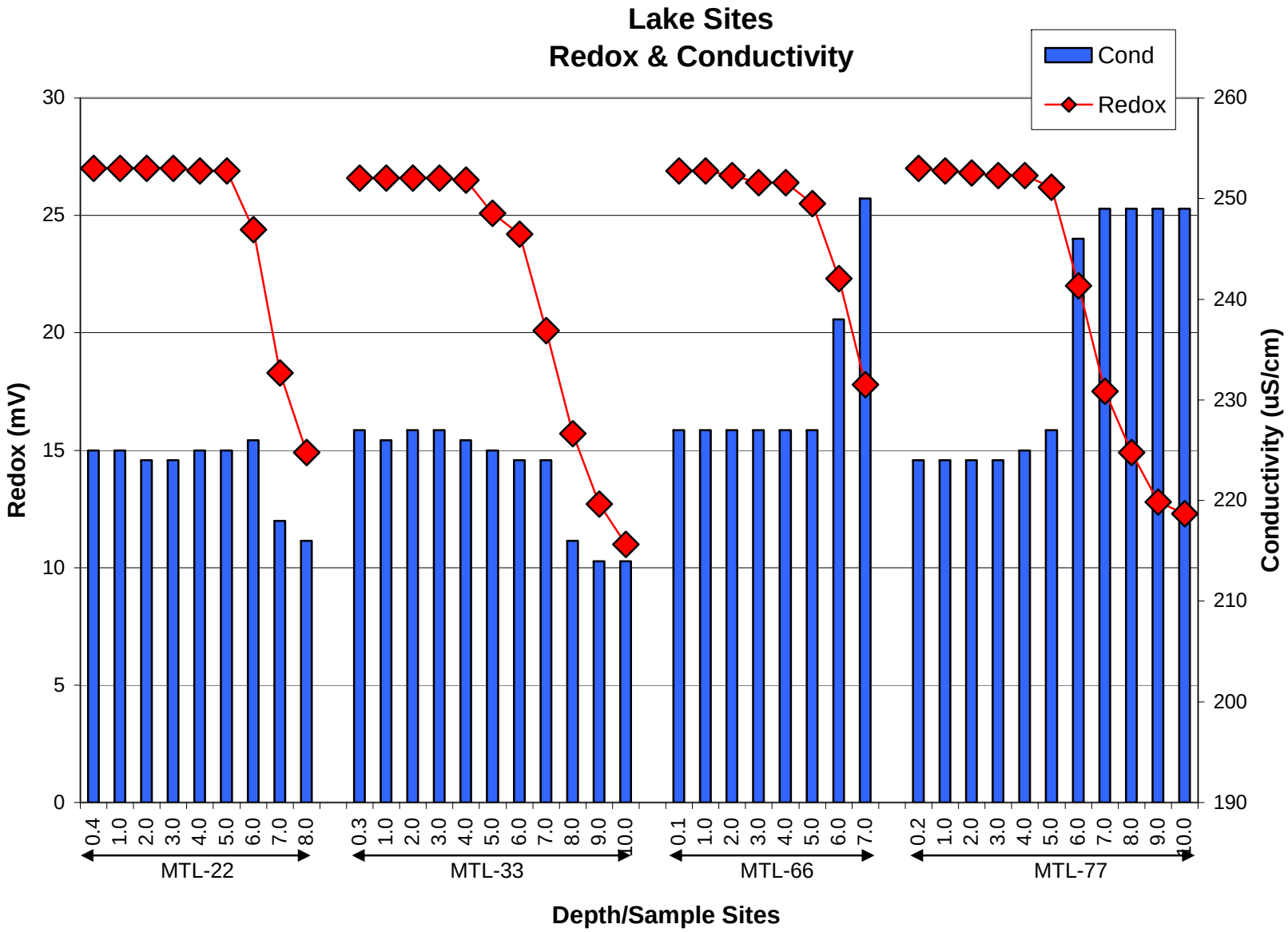

Tributary Sites
Temperature & DO
28
27.5
27
26.5
26
25.5
25
24.5
24
Temperature (°C)
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
DO (mg/L)
D.O.(mg/L)
H2OTemp
MTL 1
MTL 5
MTL 8
MTL 9
MTL 11
MTL 12
Sample Site

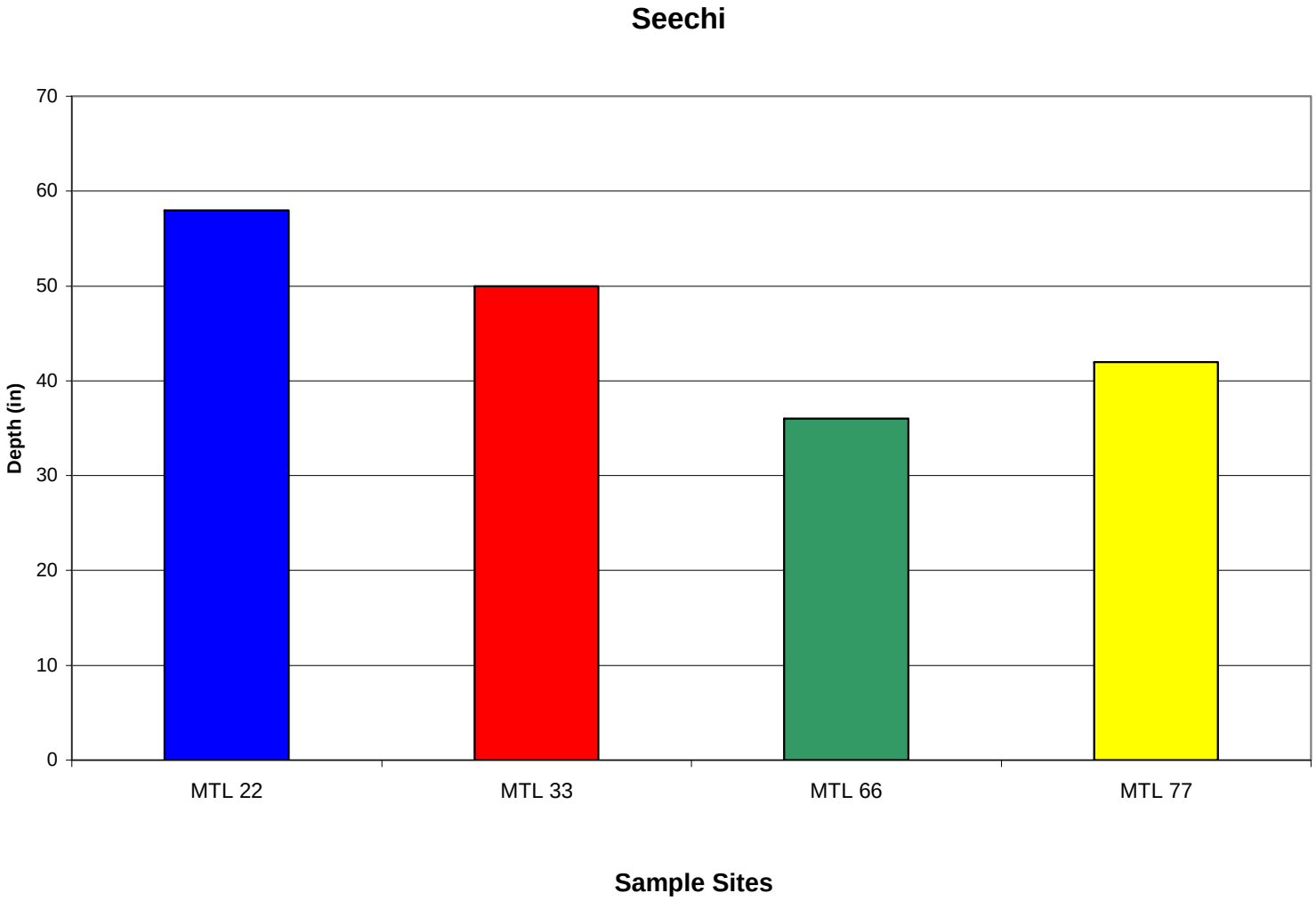

Lake Sites
Temperature & DO
D.O.(mg/L)
H2OTemp
Temperature (°C)
DO (mg/L)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0.4 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0
MTL-22
0.3 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
MTL-33
0.1 1.0 2.0 3.0 4.0 5.0 6.0 7.0
MTL-66
0.2 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
MTL-77
Depth/Sample Site


Tributary Sites
pH
8.5
8
7.5
7
6.5
6
5.5
5
pH
MTL 1
MTL 5
MTL 8
MTL 9
MTL 11
MTL 12
Sample Site


Lake Sites
pH
9
8.5
8
7.5
7
6.5
6
5.5
5
pH
0.4 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0
0.3 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
0.1 1.0 2.0 3.0 4.0 5.0 6.0 7.0
0.2 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
MTL-22
MTL-33
MTL-66
MTL-77
Depth/Sample Site


Tributary Sites
Redox & Conductivity
Cond
Redox
380
330
280
230
180
130
80
30
-20
600
500
400
300
200
100
0
Redox (mV)
Conductivity (uS/cm)
MTL 1
MTL 5
MTL 8
MTL 9
MTL 11
MTL 12
Sample Sites


Lake Sites
Redox & Conductivity
Cond
Redox
Redox (mV)
Conductivity (uS/cm)
30
25
20
15
10
5
0
260
250
240
230
220
210
200
190
0.4 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0
0.3 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
0.1 1.0 2.0 3.0 4.0 5.0 6.0 7.0
0.2 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0
MTL-22
MTL-33
MTL-66
MTL-77
Depth/Sample Sites


Seechi
70
60
50
40
30
20
10
0
Depth (in)
MTL 22
MTL 33
MTL 66
MTL 77
Sample Sites

APPENDIX D

Lakes of Missouri Volunteer Program (LMVP) Data

Lake Name	Date	Julian	Site	Temp	Secchi	TP	TN	CHL	NVSS	Lat	Long
Mark Twain	5/13/07	133	1	71	14	134	1440	22.5	6.3	39.5240	-91.6478
Mark Twain	6/23/07	174	1	84	47	52	970	24.5	1.3	39.5240	-91.6478
Mark Twain	7/15/07	196	1	85	56	35	800	22.7	0.4	39.5240	-91.6478
Mark Twain	8/7/07	219	1	90	41	19	810	4.72	1.1	39.5240	-91.6478
Mark Twain	8/28/07	240	1	80	49	26	560	16.6	1	39.5240	-91.6478
Mark Twain	9/22/07	265	1	74	78	13	380	8.5		39.5240	-91.6478
Mark Twain	10/6/07	279	1	66	82	11	420	1.3	0.2	39.5240	-91.6478
Mark Twain	5/13/07	133	2	70	20	137	1420	44.2	9.5	39.5395	-91.6972
Mark Twain	6/23/07	174	2	83	46	45	920	25.5	1.8	39.5395	-91.6972
Mark Twain	7/15/07	196	2	83	56	35	1050	23.1	1.2	39.5395	-91.6972
Mark Twain	8/7/07	219	2	89	32	29	950	2.2	1.7	39.5395	-91.6972
Mark Twain	8/28/07	240	2	80	41	24	550	18.9	0.2	39.5395	-91.6972
Mark Twain	9/22/07	265	2	74	60	18	380	11.6		39.5395	-91.6972
Mark Twain	10/6/07	279	2	67	66	12	500	0.9	0.5	39.5395	-91.6972
Mark Twain	5/13/07	133	5	70	14	154	1550	13	5	39.5066	-91.7679
Mark Twain	6/23/07	174	5	82	38	53	1100	39.9	3.4	39.5066	-91.7679
Mark Twain	7/15/07	196	5	82	62	37	1130	26.9	1.1	39.5066	-91.7679
Mark Twain	8/7/07	219	5	91	38	19	910	2.3	1	39.5066	-91.7679
Mark Twain	8/28/07	240	5	80	45	26	490	19.1	0.1	39.5066	-91.7679
Mark Twain	9/22/07	265	5	75	70	15	410	11.3		39.5066	-91.7679
Mark Twain	10/6/07	279	5	68	76	10	370	0.9	0.2	39.5066	-91.7679

APPENDIX E

United Water Services
Clarence Cannon WTP Data

UNITED WATER SERVICES
CLARENCE CANNON WTP
Monthly Water Quality Report
Date: June, 2007
PWS #2020421

SOUTH PLANT

	RAW WATER								FILTER EFFLUENT			CLEARWELL	
DATE	Flow (mgd)	pH	Alk (mg/l)	Turb (mgll)	Hard (mgll)	Iron (mgll)	Mn (mgll)	Temp (OC)	pH	Turb (mgll)	Free Cl2 (mgll)	Turb (mgll)	Free Cl2 (mgll)
1	3.38	7.51	73	39	89	0.49	0.10	22	7.37	0.11	0.45	0.10	1.03
2	3.66	7.38	76	44	97	0.54		22	7.38	0.10	0.48	0.09	1.02
3	3.13	7.44	76	44	89	0.51		22	7.25	0.10	0.43	0.10	0.91
4	3.00	7.46	75	42	93	0.48		22	7.44	0.11	0.48	0.10	1.03
5	3.77	7.33	75	50	90	0.50		20	7.32	0.10	0.56	0.10	1.18
6	3.08	7.33	77	45	92	0.49		21	7.27	0.10	0.48	0.10	0.95
7	3.64	7.47	77	40	98	0.47	0.18	22	7.35	0.11	0.43	0.10	0.98
8	3.35	7.62	83	38	93	0.40		22	7.26	0.11	0.40	0.10	0.87
9	3.14	7.47	79	38	88	0.40		22	7.24	0.11	0.55	0.10	1.17
10	3.32	7.62	79	34	95	0.38		22	7.24	0.11	0.54	0.11	1.08
11	2.95	7.64	80	32	97	0.40		23	7.25	0.11	0.52	0.11	0.93
12	3.52	7.72	80	29	91	0.34		23	7.25	0.10	0.48	0.10	0.95
13	3.78	7.69	77	28	93	0.34	0.10	23	7.25	0.10	0.46	0.09	1.02
14	3.51	7.62	80	32	91	0.38		24	7.19	0.10	0.40	0.09	0.92
15	3.73	7.43	81	36	92	0.42		23	7.23	0.10	0.36	0.10	0.93
16	3.28	7.42	80	34	84	0.44		24	7.24	0.12	0.35	0.10	0.94
17	4.82	7.33	78	36	93	0.47		23	7.24	0.10	0.48	0.09	1.07
18	3.67	7.28	81	34	94	0.43		23	7.34	0.10	0.52	0.09	1.05
19	3.26	7.35	79	33	92	0.43		23	7.32	0.10	0.48	0.10	1.10
20	4.34	7.34	81	34	94	0.44	0.13	23	7.26	0.09	0.49	0.10	1.02
21	3.43	7.27	82	36	95	0.45		23	7.21	0.09	0.43	0.09	0.98
22	4.01	7.26	73	32	96	0.41		22	7.24	0.09	0.43	0.09	1.05
23	3.37	7.28	80	34	92	0.40		23	7.33	0.10	0.49	0.10	1.09
24	3.55	7.27	79	30	94	0.37		23	7.28	0.09	0.54	0.10	1.14
25	2.39	7.35	79	24	93	0.29		24	7.25	0.10	0.49	0.10	0.87
26	3.32	7.30	79	29	91	0.37		24	7.29	0.10	0.47	0.10	1.10
27	4,54	7.26	79	41	91	0.42		24	7.29	0.11	0.48	0.10	1.26
28	3.76	7.29	'77	29	92	0.39	0.10	24	7.28	0.11	0.55	0.09	1.20
29	3.59	7.72	74	28	91	0.32		25	7.37	0.10	0.53	0.09	1.11
30	3.03	8.08	69	27	85	0.22		25	7.27	0.11	0.48	0.10	0.98
AVG	3.51	**7.45**	**78**	**35**	**92**	**0.41**	**0.12**	**23**	**7.28**	**0.10**	**0.47**	**0.10**	**1.03**
TOTA	105.32												

UNITED WATER SERVICES
CLARENCE CANNON WTP
Monthly Water Quality Report
Date: June, 2007
PWS #2020421

NORTH PLANT

	RAW WATER								FILTER EFFLUENT			CLEARWELL	
DATE	Flow (mgd)	pH	Alk *(mg/l)*	Turb *(mg/l)*	Hard *(mg/l)*	Iron *(mg/l)*	Mn (mgll)	Temp (OC)	pH	Turb *(mg/l)*	Free Cl2 (mgll)	Turb (mgll)	Free Cl2 (mgll)
1	0.88								7.43	0.13	0.22	0.12	1.00
2	0.76								7.32	0.19	0.38	0.11	1.01
3	0.00								7.26	0.11	0.36	0.10	1.37
4	0.91	7.53	75	38	93	0.48		22	7.28	0.11	0.25	0.10	1.22
5	1.92	7.39	78	47	90	0.50		20	7.35	0.10	0.31	0.15	1.05
6	0.72								7.28	0.28	0.43	0.15	1.34
7	1.13								7.28	0.22	0.34	0.18	1.27
8	0.85								7.27	0.10	0.33	0.15	1.22
9	115								7.35	0.12	0.30	0.18	1.13
10	0.92	7.60	80	33	92	0.40		22	7.36	0.10	0.29	0.20	1.15
11	0.90								7.46	0.17	0.26	0.12	1.25
12	0.84								7.43	0.20	0.31	0.13	0.94
13	1.21								7.49	0.11	0.42	0.13	1.41
14	1.10	7.60	80	31	88	0.38		23	7.45	0.10	0.21	0.10	1.05
15	0.91								7.43	0.10	0.24	0.10	0.66
16	0.80								7.40	0.26	0.20	0.16	1.04
17	0.93								7.35	0.23	0.25	0.11	0.88
18	1.27	7.24	82	33	92	0.40		23	7.38	0.10	0.43	0.11	1.17
19	1.05	7.36	80	32	92	0.44		23	7.30	0.10	0.29	0.09	1.21
20	0.75								7.39	0.06	0.39	0.09	0.98
21	102								7.37	0.07	0.29	0.11	1.01
22	1.09								7.44	0.07	0.35	0.11	0.75
23	1.43	7.32	80	32	92	0.37		23	7.46	0.09	0.30	0.09	1.12
24	1.11								7.45	0.08	0.35	0.08	1.10
25	1.14								7.32	0.05	0.25	0.09	0.92
26	1.68								7.33	0.07	0.50	0.11	1.11
27	1.55								7.46	0.15	0.50	0.16	1.27
28	0.00												
29	0.65	7.28	78	30	90	0.38		24	7.30	0.11	0.34	0.09	0.50
30	1.55								7.40	0.14	0.33	0.14	1.29
AVG	1.01	**7.415**	**79**	**35**	**91**	**0.41875**	**#DIV/OI**	**23**	**7.3711494**	**0.1278161**	**0.3238218**	**0.1222701**	**1.0823563**
TOTA	30.22												

UNITED WATER SERVICES
CLARENCE CANNON WTP
Monthly Water Quality Report
Date: May, 2007
PWS #2020421

	RAW WATER								FILTER EFFLUENT			. CLEARWELL		HIGH SERVICE LINE EFFIUENT														
	Flow	pH	Alk	Turb	Hard	Iron	Mn	Temp.	pH	Turb	Free el2	,Turb	Free el2	Flow	pH	Alk	Turb	Free el2	Total el2	Hard	Iron	Mn	NH3	Fl	TDS	Color	Temp	Total Coliforms
DATE	/rnfld}		(moll)	(moll	(moll)	Imofll	(mofll	I'CI		Imofll	(moll\	Imam	Imoll\	(mod)		Imolll	Imoll	'mnll	'mnfll	Imnfll	Imnlll	Imnlll	Imofll	Imofll	Imnfll	lu	('C)	
1	4.34	7.22	66	83	80	0.52		14	7.23	0,11	0.41	0.10	0.90	4.25	7.80	107	0.10	0.10	3.00	160	0.005				199	00	17	
2	3.66	7.23	68	82	80	0.53		15	7.27	0.11	0.32	0.10	0.88	3.20	7.86	110	0.10	0.06	2.81	160	0.012						17	A
3	4.28	7.30	68	69	81	0.47		17	7.25	0.12	0.37	0.12	0.94	3.63	7.88	109	0.11	0.07	2.84	159	0.018				200	0.0	18	
4	3.50	7.39	68	61	86	0.41		18	7.32	0.10	0.57	0.09	1.10	3.29	7.90	110	0.11	0.05	2.89	162	0.015		0.090		192	0.0	18	A
5	3.81	7.35	68	66	85	0.40		18	7.29	0.10	0.55	0.10	1.14	3.88	7.87	108	0.10	0.06	3.09	166	0.008		0.090		192	0.0	18	
6	3.80	7.42	64	70	86	0,41		18	7.27	0.10	0.54	0.10	1.11	3.52	7.76	105	0.10	006	3.03	165	0.008		0.080		188	0,0	18	
7	4.10	7.47	68	29	86	0.43		19	7.27	0.10	0.48	0.10	1.10	3.94	7.59	106	0.10	0.06	2.99	159	0.011				196	0,0	19	A
8	4.19	7.46	67	59	83	0,45		19	7.27	0.11	0.46	0.10	1.06	4.13	7.75	107	0.10	0.08	3.04	159	0.010		0.090		200	0.0	19	
9													0.99	4.01				0.05	2.92	163	0.003		0.070		:			A
	4.21	7.44	68	61	84	OA7		18	7.25	0.10	0.44	" 0.10			7.78	106	0.10									0.0	19	
10	4.31	7.36	67	59	82	0.48		19	7.26	0.09	0.53	0.09	1.09	3.88	7.79	106	0.10	0.06	3.08	165	0.005		0.100			0.0	19	
11	4.15	7.30	66	59	85	0,46		18	7.19	0.09	OA2	0.09	0.93	4.14	7.64	107	0.09	0.07	2.96	162	0.007		0.070		200	0.0	19	A
12	3.90	7.33	65	54	80	0.42		19	7.25	0.09	0.42	0.08	0.86	3.61	7.78	109	0.08	0.06	3.01	161	0.003		0.070			00	19	
13	4.82	7.24	66	58	86	OAO		19	7.16	0.10	0.34	0.10	1.02	4.30	7.73	109	0.09	0.06	3.00	160	0.004			0.07		00	20	
14	3.90	7.18	75	66	89	0.61		19	7.16	0.11	0.22	0.10	0.82	4.10	7.68	113	0.10	0.07	3.08	162	0.005		0.060			00	21	A
15	3,46	7.23	72	63	89	0.57		18	7.20	0.11	0.37	0.12	0.98	3.56	7.66	114	0.10	0.12	2.86	165	0.012		0.060		197	00	20	
16	4.81	7.27	70	60	70	0.51		17	7.22	0.11	0.72	0.11	1.30	4.30	7.77	116	0.11	0.07	3.11	162	0.015		0.060		200	0.0	20	A
17	3.77	7.25	68	56	88	0.45		17	7.20	0.18	0.63	0.15	1.16	3.55	7.80	115	0.12	0.06	3.09	158	0.011				200	00	19	
18	4.11	7.37	70	55	88	0.51		19	7.23	0.10	0.55	0.10	1.07	4.09	7.81	112	0.12	0.07	3.11	161	0.011				197	00	19	A
19	3.65	7.30	76	58	91	0.53		19	7.23	0.12	0.42	0.12	0.84	3.94	7.83	110	0.12	0.06	2.86	166	0.011		0.060		194	00	22	
20	4.87	7.30	75	58	88	0.57		18	7.25	0.11	0.47	0.10	0.91	4.35	7.81	114	0.11	0.07	2.95	165	0.007				199		23	
21	4,45	7.33	74	55	90	0.49		19	7.32	0.11	0.51	0.12	0.89	4.01	7.85	116	0.11	0.08	3.08	161	0.010				·200	00	22	A
22	4.85	7.38	74	60	93	0.54		19	7.31	0.11	0.47	0.10	0.89	4.36	7.74	113	0.11	0.07	2.80	165	0.013		0.060	1.19	200	00	21	
23	3.27	7.46	76	49	91	0.49		20	7.34	0.12	0.46	0.11	0.78	3.84	7.66	112	0.12	0.06	2.91	169	0.008		0.070	1.33	196	0.0	23	A
24	3.78	7.56	75	47	89	0.50		21	7.33	0.11	0.45	0.11	0.86	3.91	7.78	111	0.12	0.08	2.95	166	0.014		0.080	0.93	200	0.0	20	
25	2.95	7.64	79	49	88	0.52		21	7.27	0.12	0.66	| 0.12	1.03	2.84	7.83	110	0.13	0.09	2.99	165	0.a05			0.65	196	0.0	22	A
26	3.26	7.60	75	45	87	0.48		21	7.27	0.12	0.60	0.11	1.01	3.86	7.84	110	0.12	0.07	2.83	162	0.014		0.080			00	21	
27	4.56	7.48	75	51	88	0.45		20	7.27	0.12	0.58	0.10	1.07	4.05	7.73	109	0.11	0.06	2.96	162	0.010				199	00	22	
28	3.22	7.46	73	46	89	OA9		21	7.24	0.11	0.62	0.10	1.07	3.27	7.71	110	0.11	0.07	2.94	164	0.007		0.000	0.77	197	00	22	A
29	4.81	7.45	76	44	91	0.48		21	7.38	0.11	0.51	0.10	1.04	4.61	7.79	113	0.10	0.07	3.03	171	0.010			1.12	196	00	22	
30	3.97	7.46	72	45	90	0.47		21	7.32	0.10	0.45	0.10	0.97	3.77	7.82	114	0.10	0.06	2.85	168	0.005			0.84	197	00	22	A
31	4.06	7.57	74	43	90	0,48		22	7.27	0.11	0.48	0.10	0.99	3.08	7.75	114	0.10	0.06	2.88	168	0.005				196	0.0	22	
AVG	4.03	7.38	71	57	86	0.48		19	7.26	0.11	0.48	0.10	0.99	3.85	7.77	111	0.11	0,07	2,97	163	0.009		0.069	0.86	197	0.0	20	
TOTAL	124.82													119.27														

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UNITED WATER SERVICES
CLARENCE CANNON WTP
Monthly Water Quality Report
Date: April, 2007
PWS #2020421

	RAW WATER								FILTER EFFLUENT			CLEARWELL		HIGH SERVICE LINE EFFLUENT													
DATE	Flow (mgd)	pH -	Alk (mg/l)	Turb (mg/l)	Hard (mg/l)	Iron (mg/l)	Mn (mg/l)	Temp (°C)	pH -	Turb (mg/l)	Free Cl2 (mg/l)	Turb (mg/l)	Free Cl2 (mg/l)	Flow (mgd)	pH -	Alk (mg/l)	Turb (mg/l)	Free Cl2 (mg/l)	Total Cl2 (mg/l)	Hard (mg/l)	Iron (mg/l)	Mn (mg/l)	NH3 (mg/l)	Fl (mg/l)	TDS (mg/l)	Color (u)	Temp (°C)	Total Coliforms
1	3.83	7.45	65	69	83	0.41		16	7.28	0.11	0.65	0.11	1.21	3.36	7.78	108	0.10	0.06	3.07	159	0.020				192	0.0	18	
2	4.03	7.36	73	75	88	0.49		16	7.31	0.14	0.48	0.13	1.07	3.86	7.60	110	0.12	0.07	3.11	171	0.016		0.070		203	0.0	17	A
3	3.32	7.37	69	78	87	0.51		16	7.32	0.13	0.44	0.13	0.96	3.53	7.64	111	0.13	0.08	3.07	170	0.018				201	0.0	18	
4	3.90	7.40	67	108	83	0.54		14	7.26	0.17	0.48	0.18	1.02	3.44	7.66	110	0.17	0.05	2.95	165	0.027				200	0.0	17	A
5	3.78	7.42	65	156	88	0.61		13	7.26	0.13	0.56	0.14	1.10	3.47	7.63	106	0.16	0.06	3.06	164	0.024				200	0.0	16	
6	3.88	7.35	62	162	75	0.60		13	7.30	0.10	0.53	0.10	1.10	3.82	7.80	105	0.13	0.05	3.08	164	0.016		0.080		197	0.0	15	A
7	3.54	7.43	66	148	74	0.60		11	7.26	0.09	0.41	0.08	0.86	3.61	7.78	108	0.10	0.05	3.09	164	0.009		0.070		190	0.0	13	
8	4.27	7.40	63	150	75	0.63		11	7.26	0.09	0.34	0.09	0.91	3.89	7.75	106	0.09	0.05	3.07	165	0.011		0.080		188	0.0	13	
9	3.29	7.42	58	136	71	0.53		12	7.19	0.10	0.63	0.10	1.07	3.28	7.69	100	0.10	0.05	3.01	161	0.013		0.060		200	0.0	15	A
10	4.05	7.44	60	122	70	0.50		12	7.19	0.09	0.56	0.09	1.13	3.93	7.70	101	0.10	0.04	3.07	157	0.011		0.060		190	0.0	13	
11	3.66	7.40	65	125	73	0.56	0.384	10	7.19	0.10	0.42	0.10	0.92	3.18	7.75	104	0.09	0.06	3.15	158	0.007	0.012			181	0.0	13	A
12	3.38	7.43	63	129	71	0.61		10	7.17	0.10	0.42	0.10	0.94	3.55	7.77	106	0.10	0.06	3.02	155	0.007				173	0.0	13	
13	3.86	7.43	60	138	69	0.58		10	7.16	0.11	0.39	0.11	0.93	3.78	7.72	107	0.10	0.05	3.01	144	0.007				178	0.0	12	A
14	3.82	7.50	60	113	73	0.52		10	7.21	0.11	0.42	0.11	0.92	3.36	7.82	102	0.11	0.06	2.99	148	0.007				178	0.0	12	
15	3.67	7.45	60	123	70	0.51		11	7.25	0.09	0.44	0.09	0.92	3.46	7.90	102	0.10	0.04	2.92	148	0.009				178	0.0	13	
16	3.75	7.41	62	132	72	0.57		11	7.20	0.11	0.58	0.09	1.16	3.84	7.86	105	0.10	0.06	3.22	149	0.005		0.060		180	0.0	14	A
17	3.83	7.37	61	123	71	0.60		11	7.21	0.09	0.61	0.09	1.11	3.50	7.79	104	0.09	0.05	3.16	149	0.004				181	0.0	15	
18	4.04	7.42	60	117	72	0.52		12	7.26	0.08	0.51	0.08	1.00	3.74	7.88	102	0.08	0.05	3.11	148	0.004				190	0.0	14	A
19	4.49	7.41	60	117	67	0.51		12	7.24	0.09	0.54	0.08	1.01	4.04	7.87	103	0.09	0.06	3.03	148	0.003				192	0.0	14	
20	3.66	7.41	60	106	73	0.53		12	7.24	0.09	0.51	0.09	1.01	3.55	7.79	103	0.10	0.05	2.67	151	0.004		0.060		185	0.0	14	A
21	4.16	7.41	63	96	78	0.52		13	7.25	0.09	0.62	0.09	1.13	4.20	7.77	103	0.09	0.04	3.03	157	0.005		0.060		185	0.0	15	
22	4.11	7.47	63	85	75	0.50		14	7.28	0.10	0.51	0.10	1.04	3.73	7.82	106	0.10	0.06	3.18	157	0.005		0.090		181	0.0	16	
23	4.28	7.53	60	87	74	0.49		15	7.28	0.09	0.58	0.10	1.05	3.92	7.82	102	0.09	0.07	3.22	155	0.006				189	0.0	16	A
24	3.63	7.48	60	95	78	0.43		15	7.19	0.11	0.42	0.10	0.91	3.52	7.72	100	0.10	0.06	2.97	151	0.008		0.070		184	0.0	16	
25	3.83	7.50	60	94	74	0.47		15	7.19	0.09	0.58	0.09	1.06	3.49	7.72	99	0.10	0.05	3.01	152	0.005				179	0.0	16	A
26	3.55	7.52	60	98	74	0.55	0.270	15	7.19	0.09	0.64	0.09	1.07	3.91	7.79	101	0.09	0.05	3.10	158	0.006	0.008	0.070		186	0.0	16	
27	4.08	7.50	63	86	84	0.57		16	7.23	0.13	0.40	0.12	0.90	3.23	7.77	100	0.10	0.05	2.98	161	0.004		0.070		197	0.0	17	A
28	4.24	7.44	72	84	87	0.52		16	7.13	0.13	0.34	0.13	0.88	3.96	7.72	107	0.12	0.05	2.87	160	0.004				199	0.0	17	
29	4.22	7.31	64	87	82	0.52		14	7.22	0.10	0.61	0.10	1.08	3.84	7.69	109	0.12	0.06	3.07	158	0.010		0.000		200	0.0	17	
30	3.74	7.26	67	81	82	0.52		14	7.23	0.09	0.63	0.09	1.03	3.90	7.86	110	0.10	0.06	3.08	160	0.008		0.110		194	0.0	17	A
AVG	3.86	7.42	63	110	76	0.53	0.327	13	7.23	0.10	0.51	0.10	1.02	3.66	7.76	105	0.10	0.06	3.04	157	0.009	0.010	0.067		189	0.0	15	
TOTAL	115.89													109.89														

UNITED WATER SERVICES
CLARENCE CANNON WTP
Monthly Water Quality Report
Date: February, 2007
PWS #2020421

	RAW WATER								FILTER EFFLUENT			CLEARWELl		HIGH SERVICE LINE EFFLUENT													
	Flow	pH	Alk	Turb	Hard	Iron	Mn	Temp	pH	Turb	Free Cl2	Turb	Free Cl2	Flow	pH	Alk	Turb	Free Cl2	Total Cl2	Hard	Iron	Mn	NH3	Fl	TOS	Color	Tomp	Total Coliforms
DATE	Imodl		Imolll	Imolll	Imo/ll	Imolll	Imoll	I'CI		Imo/ll	Imo/ll	Imo/ll	Imo/ll	Imodl		Imolll	Ima/ll	Ima/ll	Imo/ll	Imolll	Imo/ll	Imolll	Imo/ll	Imalll	Ima/ll	lul	I"CI	
1	2.34	7.79	78	23	94	0.26		3	7.33	0.06	0.54	0.06	0.99	3.51	7.69	120	0.07	0.10	2.97	184	0.001				204	00	4	
2	4.98	7.80	78	23	97	0.26		3	7.36	0.06	0.44	0.06	0.98	3.90	7.84	117	0.06	0.07	2.90	166	0.003				200	0.0	4	A
3	4.90	7.81	78	23	98	0.27		3	7.33	0.06	0.55	0.06	1.15	3.94	7.82	119	0.D7	0.07	3.05	184	0.004		0.000		194	0.0	4	
4	3.92	7.82	77	22	97	0.26		3	7.36	0.06	0.55	I106	1.07	3.76	7.79	119	0.14	0.06	3.07	162	0.003		0.000		190	00	4	
5	3.9B	7.78	81	22	103	0.26		4	7.37	0.06	0.55	0.06	1.11	4.03	7.83	123	0.06	0.07	3.19	176	0.009		0.135		205	0.0	5	A
6	3.24	7.74	88	22	106	0.27		3	7.38	0.06	0.58	0.05	1.06	3.71	7.81	125	0.05	0.10	3.18	178	0.001					0.0	5	
7	5.00	7.78	80	21	96	0.26	0.090	3	7.36	0.06	0.51	0.06	1.06	4.48	7.76	120	0.06	0.07	3.19	169	0.001		0.000		200	0.0	4	A
8	4.75	7.78	80	22	96	0.26		3	7.32	0.06	0.59	0.06	1.11	4.18	7.73	120	0.06	0.05	3.10	166	0.004		0.000		197	00	4	
9	4.22	7.78	80	22	95	0.25		4	7.30	0.07	0.59	0.06	1.10	3.87	7.72	119	0.06	0.06	3.11	167	0.006		0.060		199	0.0	4	A
10	4.27	7.72	82	21	106	0.25		3	7.25	0.07	0.60	0.06	1.19	4.07	7.69	121	0.06	0.08	3.24	172	0.004		0.110		200	0.0	5	
11	3.95	7.72	87	20	100	0.25		4	7.32	0.07	0.57	0.06	1.13	3.92	7.73	121	0.06	0.08	3.15	174	0.001		0.010		204	0.0	6	
12	4.71	7.73	78	20	96	0.24		5	7.31	0.06	0.61	0.06	1.12	4.22	7.77	120	0.06	0.06	3.11	167	0.003				200	0.0	5	A
13	3.70	7.77	81	19	94	0.22		4	7.34	0.06	0.60	0.06	1.12	3.71	7.79	121	0.06	0.05	3.13	170	0.001		0.120		208	0.0	6	
14	4.50	7.71	85	19	101	0.22	0.135	4	7.32	0.06	0.52	0.05	1.09	4.22	7.79	124	0.06	0.05	3.12	169	0.004	0.031	0.100		206	0.0	6	A
15	3.53	7.73	83	17	100	0.21		4	7.30	0.05	0.59	0.06	1.05	3.50	7.76	124	0.05	0.06	3.07	172	0.001		0.090		202	0.0	8	
16	4.24	7.68	84	17	99	0.21		3	7.29	0.06	0.56	0.05	1.15	3.71	7.74	125	0.05	0.09	3.15	172	0.002				197	0.0	7	A
17	4.18	7.72	82	18	96	0.21		4	7.32	0.06	0.59	0.06	1.11	4.47	7.79	122	0.06	0.06	3.07	168	0.002				200	0.0	6	
18	4.26	7.75	81	18	95	0.21		4	7.35	0.06	0.84	0.06	1.12	3.77	7.83	124	0.06	0.06	3.13	168	0.003		0.120		198	0.0	6	
19	4.22	7.73	86	17	102	0.21		4	7.42	0.05	0.59	0.05	1.10	4.11	7.89	127	0.05	0.08	3.10	173	0.001		0.120		203	0.0	8	A
20	4.10	7.70	83	16	100	0.21		4	7.31	0.06	0.50	0.05	1.02	4.03	7.91	127	0.05	0.08	3.09	172	0.003				203	0.0	9·	
21	4.39	7.74	79	16	91	0.19		5	7.28	0.06	0.54	0.06	1.02	4.10	7.77	122	0.06	0.06	3.10	165	0.002				200	0.0	6	A
22	3.96	7.73	84	16	96	0.19		5	7.28	0.07	0.53	0.06	0.98	3.87	7.74	122	0.06	0.04	3.05	165	0.009				202	00	6	
23	3.97	7.74	80	17	95	0.19		5	7.28	0.06	0.49	0.06	1.00	3.90	7.74	121	0.06	0.07	3.05	166	0.004		0.000		110	0.0	7	A
24	4.18	7.65	84	18	96	0.22		5	7.29	0.06	0.47	0.06	0.97	4.04	7.75	124	0.05	0.08	2.99	173	0.001		0.110		200	0.0	9	
25	3.47	7.40	77	29	94	0.39		4	7.22	0.06	0.38	0.05	0.91	3.32	7.71	122	0.06	0.08	2.94	168	0.001		0.140		205	00	9	
26	3.76	7.40	62	82	76	0.58		4	7.33	0.07	0.47	0.08	1.08	3.75	7.75	118	0.Q7	0.07	3.04	162	0.008				210	0.0	7	A
27	4.60	7.39	49	204	66	0.72		3	7.40	0.10	0.40	0.10	1.02	4.26	7.90	109	0.09	0.07	3.18	160	0.052		0.090		196	0.0	6	
28	4.31	7.23	50	225	66	1.00	0.924	3	7.30	0.14	0.44	0.14	1.10	3.70	7.75	103	0.12	0.08	3.09	162	0.010	0.037	0.020		195	1.0	4	A
AVG	4.13	7.69	78	36	95	0.29	0.383	4	7.32	0.06	0.54	0.06	1.07	3.93	7.78	121	0.07	0.07	3.09	168	0.005	0.034	0.068	#DIVIOI	197	0.0	6	
TOTA	115.63													110.05														

UNITED WATER SERVICES
CLARENCE CANNON WTP
Monthly Water Quality Report
Date: January, 2007
PWS #2020421

	RAW WATER								FILTER EFFLUENT			CLEARWELL		HIGH SERVICE LINE EFFLueNT													
	Flow	Alk		Turb	Hard	Iron	Mn	Temp	pH	Turb	Free Cl2	TUl"b	Free Cl2	Flow	pH	Alk	Turb	Free Cl2	Total Cl2	Hard	Iron	Mn	NH3	FI	TOS	Color	Temp	Total Coliforms
DATE	(modi	• (mom		(mom	(moll	(mom	(mom	('CI		(mom	(mom	(mom	(mom	(modi		(moll)	(mOm	(mom	(mom	(mom	(moll)	(mom	(mon)	(moll	(mom	(ul	I'CI	
1	3.65	7.73	62	21	97	0.27		7	7.30	0.06	0.64	0.06	1.21	3.67	7.75	121	0.05	0.06	3.04	166	0.002		0.150	1.00	196	0.0	11	A
2	3.92	7.46	60	21	94	0.26		7	7.26	0.06	0.53	0.06	1.14	3.46	7.70	117	0.06	0.06	3.06	165	0.006		0.150	0.96	197	0.0	10	
3	3.78	7.72	79	20	92	0.26	0.100	7	7.26	0.06	0.57	0.07	1.08	3.53	7.73	119	0.06	0.04	3.10	166	0.004	0.020			203	00	10	A
4	3.51	7.70	63	20	94	0.26		7	7.25	0.07	0.55	0.06	1.06	3.28	7.71	120	0.07	0.08	3.00	167	0.001		0.110	1.13	191	00	9	
5	3.36	7.66	65	20	92	0.24		7	7.27	0.06	0.46	0.06	1.02	3.46	7.70	121	0.07	0.06	2.92	169	0.003		0.100	1.03	200 .	0.0	6	A
6	3.70	7.75	77	20	67	0.27		6	7.34	0.07	0.58	0.06	1.11	3.36	7.76	12'	0.07	0.06	2.91	165	0.004			1.01	196	ou	9	
7	3.66	7.74	75	20	69	0.27		7	7.35	0.06	0.58	0.06	1.13	3.42	7.62	122	0.06	0.06	2.98	164	0.003		0.110	0.99	196	00	9	
8	3.55	7.72	64	22	94	0.26		6	7.33	0.07	**0.47**	0.07	1.06	3.71	7.81	123	0.07	0.07	3.00	166	0.004		0.000	1.10	196	0.1l	6	A
9	3.57	7.73	65	24	91	0.30		7	7.30	0.06	0.47	0.07	1.09	3.11	7.79	123	0.07	0.07	3.09	166	0.004		0.000	1.10	194	Oil	7	
10	3.75	7.77	79	24	87	0.28		6	7.32	0.06	0.46	0.06	1.11	3.57	7.78	123	0.06	0.06	3.07	165	0.004			1.05	204	0.0	9	A
11	3.36	7.79	64	22	64	0.22		7	7.30	0.06	0.50	0.06	1.07	3.24	7.77	'20	0.06	0.05	3.01	164	0.002			1.00	196	O.ll	6	
12	3.65	7.79	60	22	66	0.24		7	7.30	0.06	0.62	0.06	1.19	3.58	7.76	'05	0.06	0.05	3.03	163	0.006		0.000	0.97	196	0.0	8	A
13	3.26	7.76	63	23	93	0.26		6	7.30	0.05	**0.47**	0.05	1.09	3.46	7.76	120	0.06	0.07	3.10	169	0.002		0.000	0.96	199	00	7	
14	3.72	7.76	60	24	97	0.26		6	7.34	0.05	0.49	0.05	1.06	3.06	7.76	116	0.06	0.06	3.03	167	0.001		0.000	1.01	198	0.0	7	
15	3.61	7.75	75	24	86	0.28		5	7.36	0.06	0.39	0.06	1.05	3.74	7.67	119	0.06	0.06	3.01	'65	0.002			1.03	200	00	7	A
16	3.62	7.81	77	25	66	0.26		5	7.32	0.06	0.31	0.06	0.96	3.44	7.64	119	0.06	0.05	2.94	165	0.005		0.000	0.94	199	0.0	6	
17	3.31	7.77	66	24	53	0.26	0.212	4	7.26	0.06	0.36	0.06	1.00	3.41	7.76	121	0.06	0.07	3.11	173	0.001	0.021		1.01	200	0.0	6	A
18	3.83	7.77	66	22	104	0.26		4	7.23	0.06	0.51	0.05	1.15	3.76	7.69	124	0.06	0.05	3.13	171	0.001		0.040	0.99	204	0.0	7	
19	3.58	7.75	62	25	96	0.31		4	7.28	0.06	0.34	0.07	1.04	3.50	7.69	123	0.06	0.09	3.14	172	0.002			1.14	197	0.0	7	A
20	3.66	7.79	74	24	89	0.29	0.060	4	7.30	0.06	0.40	0.06	1.03	3.33	7.77	120	0.06	0.06	2.96	166	0.002			1.09	198	0.0	6	
21	4.00	7.75	76	25	66	0.28		4	7.31	0.07	0.35	0.07	1.01	3.80	7.77	120	0.07	0.04	2.96	164	0.002		0.040	1.06	197	0.0	6	
22	3.99	7.75	61	24	93	0.26		4	7.31	0.05	0.45	0.06	1.12	3.99	7.60	123	0.06	0.06	3.06	172	0.002		0.030	1.02	200	0.0	7	A
23	3.72	7.77	6'	23	97	0.26		4	7.29	0.06	0.55	0.05	1.16	3.41	7.73	124	0.05	0.06	3.15	177	0.001			1.36	206	0.0	7	
~4	3.69	7.74	61	24	92	0.26	0.069	4	7.28	0.06	0.56	0.07	1.16	3.55	7.61	120	0.07	0.05	3.15	170	0.003	0.006 .	0.010	1.10	202	00	6	A
"5	3.62	7.76	79	24	92	0.27		4	7.23	0.06	0.51	0.06	1.18	3.70	7.69	119	0.06	0.07	3.10	165	0.001			0.91	200	0.0	6	
26	3.55	7.81	76	22	91	0.26		4	7.26	0.06	0.55	0.06	1.13	3.64	7.71	118	0.06	0.07	3.03	162	0.004		0.060	0.65	201	0.0	6	A
27	3.62	7.79	64	20	100	0.25		4	7.32	0.05	0.46	0.05	1.06	3.61	7.64	120	0.06	0.07	3.13	165	0.004		0.000		196	00	5	
28	3.72	7.60	60	22	97	0.27		3	7.35	0.06	0.49	0.06	1.15	3.51	7.69	119	0.06	0.07	3.11	169	0.002				202	0.0	5	
29	4.27	7.62	60	23	69	O.2~		3	7.31	0.06	0.56	0.06	1.19	3.92	7.85	116	0.06	0.07	3.14	164	0.001				196	0.0	5	A
30	3.60	7.81	76	23	92	0.25		4	7.3'	0.06	0.37	0.07	0.92	3.65	7.61	119	1.67	0.05	3.01	165	0.002		0.000		199	00	5	
31	3.46	7.75	61	23	100	0.26	0.205	3	7.27	0.06	0.36	_0.06	0.86	3.76	7.76	119	0.06	0.07	2.93	169	0.001	0.046	0.000		205	0.0	4	A
AVG	3.67	7.75	80	22	91	0.27	0.133	5	7.30	0.06	**0.48**	0.06	1.08	3.55	7.77	120	0.12	0.06	3.04	167	0.002	0.023	0.042	1.03	199	0.0	7	
TOTA	113.75													109.91														