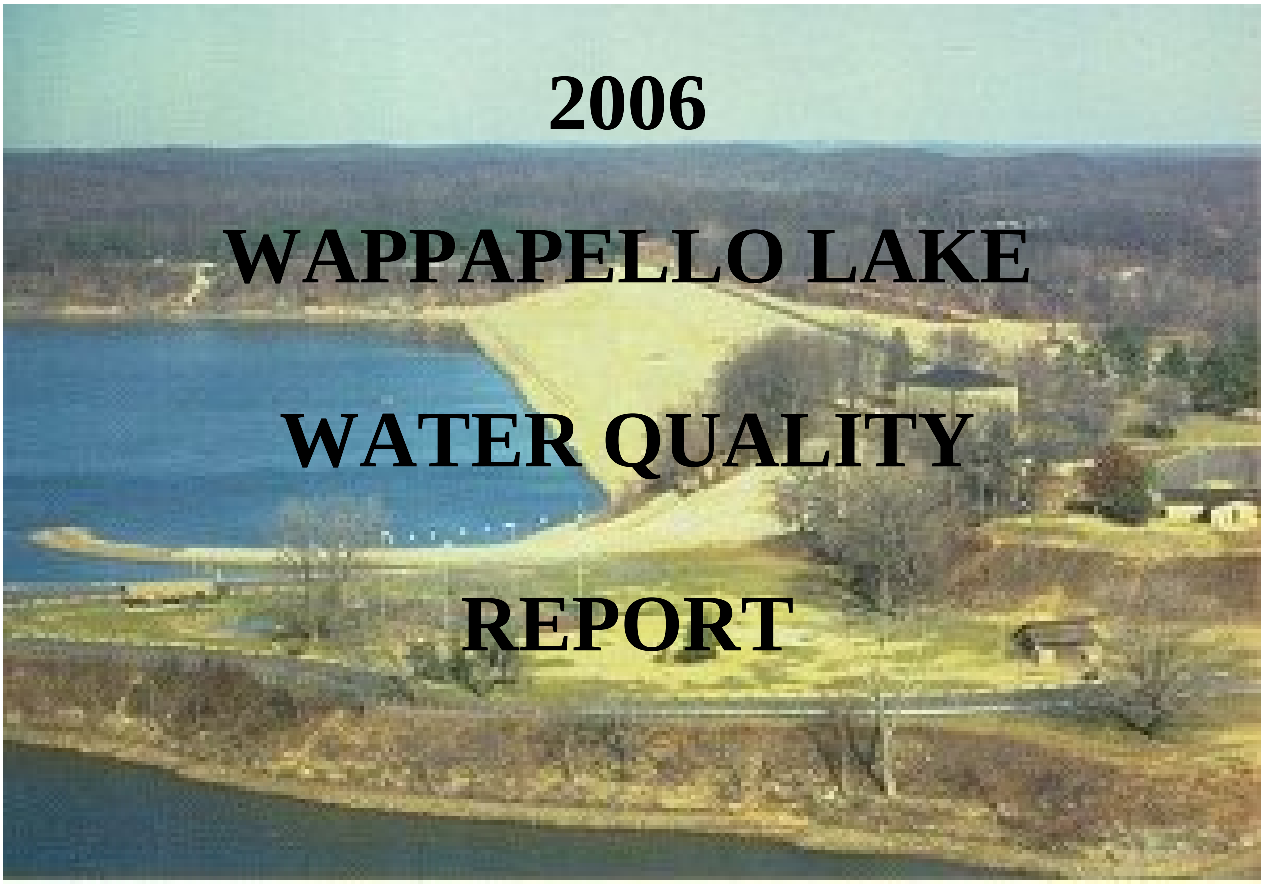

2006

WAPPAPELLO LAKE

WATER QUALITY

REPORT

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

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WATER QUALITY MONITORING PROGRAM

1.0 GENERAL OVERVIEW

This report summarizes water quality activities of the St. Louis District for Fiscal Year 2005 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 in the area of environmental stewardship. 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 Wappapello Lake, however the University of Missouri-Columbia has been taking 4 samples per year in the forebay at the lake since 1989.

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 upper St. Francis River near Farmington, Saline and Big Creeks impaired. The St. Francis is impaired by Biochemical Oxygen Demand (BOD), and ammonia. Saline and Big Creek are impaired by Nickel, and Lead. Wappapello 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

Wappapello Lake is located in southeastern Missouri and is primarily utilized as a recreational lake. The surrounding lands are residential with little agricultural use due to the terrain.

Nestled in the foothills of the Ozark Mountains, Wappapello Lake offers activities for all walks of life. Over 44,000 acres of public lands and water welcome hunting, fishing, swimming, boating, camping and picnicking. Interpretation of the natural resources through trails, Visitor Center exhibits and various programs highlight the natural beauty found in Southeast Missouri.

The operating purposes of Wappapello Lake are fishing, hunting and other wildlife activities as well as recreation uses, such as boating and swimming. The area around the lake has camping sites and nature trails. The water quality management program for the lake includes monitoring baseline parameters and ecological trends as well as investigating problem areas to keep the lake within state and federal standards.

The water quality monitoring program was conducted during 2006 at five lake sites to assure that safe conditions were maintained for human recreation, wildlife and aquatic life. One of the five sites was selected as a quality control duplicate site during each sampling event and was denoted as WAP-15. Sampling events took place three times from March through August 2006. The locations of the 5 sampling sites are depicted on the lake map in Figure 1.

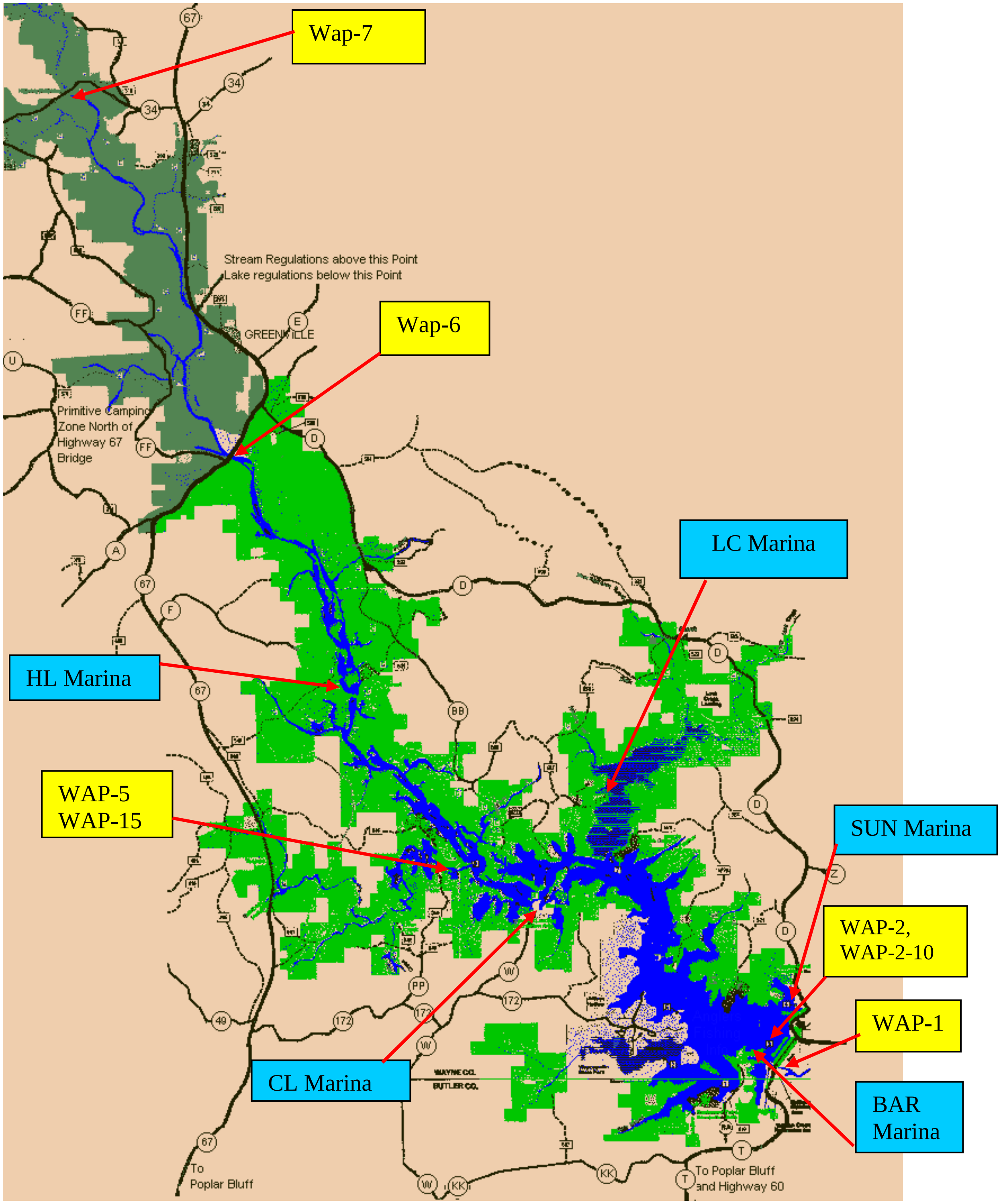


Figure 1
Location of sample sites

2.0 WATER QUALITY ASSESSMENT CRITERIA

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 Wappapello Lake sites reflect the minimal set of parameters needed to analyze the current status of water quality for the Wappapello Lake system.

The following parameters were analyzed in the Fiscal Year 2006 samplings at Wappapello 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, and pheophytin-a.

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^oC - 33^oC (68^oF - 90^oF)
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 standard for fecal coliform is less than a geometric mean of 200 colonies per 100ml of sample water. 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 future.

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 Missouri 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 measurement to oxidize materials. 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.

3.0 SUMMARY OF MONITORING RESULTS

The seasonal change brought on gradual lake stratification during the summer months. 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 all the marinas were below the Missouri standard of 200 colonies/100ml of sample. We currently do not take enough samples in a month to calculate a geometric mean, so we mainly look at a high mark of 200 colonies/100ml of sample to trigger additional investigations.

Total iron and total manganese are sampled above the dam near the bottom of the channel (WAP-2-10), and in the spillway area (WAP-1). As was previously stated living organisms require trace amounts of metals, however excessive amounts can be harmful to the organism. Iron exceeded the Missouri Water Quality Standard at site WAP-2-10 for the August sampling event. Iron cycling is a function of oxidation-reduction processes. This elevated level of iron near the bottom of the lake 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. Missouri's standard for manganese is for drinking water and groundwater. Missouri does not have a manganese standard for aquatic life. Elevated levels of manganese were detected during June and August. However, according to MDNR high levels of manganese are common due to the geologic nature of the area.

Nitrogen and phosphates are sampled at all sites. The 2006 phosphate results at all sites exceeded or nearly exceeded the 0.05 mg/L standard, with the highest readings normally occurring in August. 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. However, 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 throughout 2006.

Chlorophyll *a* was sampled at 3 sites, WAP-2, WAP-5, WAP-6 and WAP15. WAP-15 is a duplicate sample of WAP-5. 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. The data indicates a normal increase in chlorophyll levels during the warmer summer months, which is not a concern.

Due to the limited amount of agriculture in the Wappapello watershed and the government chemical restrictions on the use of Atrazine and Alachlor on leased cropland, these chemicals were not sampled.

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 except site 2 were within the 6 to 9 pH range. The increase at site 2 in June may have a correlation to the increase levels of manganese during this same time period.

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. A malfunctioning probe on the sonde produced extremely negative readings during the August sampling event.

The monitoring program for Wappapello Lake during Fiscal Year 2006 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. 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.

4.0 PLANNED 2007 STUDIES

The Wappapello Lake water quality monitoring will continue in Fiscal Year 2007. A total of five sampling events will be conducted between February and September in 2007. Wappapello Lake 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.

The sampling plan will involve an intensive trend analysis of the contaminants entering Wappapello Lake. The sampling sites include the following: WAP-1 Spillway, WAP-2 lake side of dam, WAP-5 Otter Creek, WAP-6 Greenville, WAP-7 Hwy 34 bridge and all 5 marinas. This combination of sites effectively represents the incoming contaminants and their effects on the lake.

APPENDIX A

DATA

LAB DATA

SITE	DEPTH (m)	DATE	TIME	TOC (mg/L)	Total Fe (mg/L)	Total Mn (mg/L)	NH_3N (mg/L)	NO_{3-} NO_2 (mg/L)	Ortho-phosphate (mg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	Total Volatile Suspended Solids (mg/L)
WAP-1	0	3/7/2006	1240	5.0	0.45	0.14	0.03	0.41	0.01	0.07	13	3
WAP-1	0	4/27/2006	1216	5.0	0.57	0.15	0.08	0.10	0.01	0.10	16	3
WAP-1	0	5/16/2006	1252	5.0	0.40	0.07	0.03	0.04	0.01	0.07	10	2
WAP-1	0	6/20/2006	1305	5.0	0.28	0.88	0.10	0.06	0.01	0.07	11	3
WAP-1	0	8/22/2006	1256	6.0	0.34	0.90	0.39	0.11	0.01	0.12	13	6
WAP-15-0	0	3/7/2006	1142	5.0			0.03	58.00	0.01	0.15	27	4
WAP-15-0	0	4/27/2006	1036	5.0			0.04	0.07	0.01	0.12	17	3
WAP-15-0	0	5/16/2006	1126	5.0			0.03	0.11	0.01	0.09	10	2
WAP-15-0	0	6/20/2006	1031	5.0			0.03	0.05	0.01	0.06	6	2
WAP-15-0	0	8/22/2006	1048	5.0			0.03	0.03	0.01	0.12	17	5
WAP-2-0	0	3/7/2006	1036	5.0			0.05	0.03	0.02	0.06	12	3
WAP-2-0	0	4/27/2006	1101	5.0			0.03	0.02	0.01	0.07	11	2
WAP-2-0	0	5/16/2006	1203	5.0			0.03	0.02	0.01	0.07	9	2
WAP-2-0	0	6/20/2006	1255	5.4			0.06	0.02	0.01	0.04	5	4
WAP-2-0	0	8/22/2006	1143	5.0			0.12	0.03	0.01	0.10	11	7
WAP-2-10	10	3/7/2006	1040	5.0	0.45	0.12	0.03	0.05	0.01	0.07	14	3
WAP-2-10	10	4/27/2006	1111	5.0	1.00	0.22	0.03	0.10	0.01	0.12	31	4
WAP-2-10	10	5/16/2006	1157	5.0	0.61	0.09	0.03	0.05	0.01	0.07	14	2
WAP-2-10	10	6/20/2006	1156	5.0	1.10	5.00	0.76	0.03	0.05	0.13	13	4
WAP-2-10	10	8/22/2006	1149	5.0	1.10	4.60	1.40	0.04	0.06	0.31	13	5
WAP-5	0	3/7/2006	1135	5.0			0.04	0.11	0.01	0.13	32	4
WAP-5	0	4/27/2006	1031	5.0			0.04	0.08	0.01	0.12	19	3
WAP-5	0	5/16/2006	1123	5.6			0.06	0.07	0.01	0.10	10	2
WAP-5	0	6/20/2006	1027	5.0			0.03	0.02	0.01	0.05	5	2
WAP-5	0	8/22/2006	1041	5.0			0.03	0.02	0.01	0.12	17	5
WAP-6	0	3/7/2006	0958	5.0			0.03	0.10	0.01	0.02	2	1
WAP-6	0	4/27/2006	1001	5.0			0.03	0.10	0.01	0.04	5	1
WAP-6	0	5/16/2006	1049	6.1			0.03	0.02	0.01	0.04	4	1
WAP-6	0	6/20/2006	1005	5.0			0.03	0.10	0.01	0.03	3	1
WAP-6	0	8/22/2006	1004	5.0			0.03	0.04	0.01	0.03	4	1
WAP-7	0	3/7/2006	0924	5.0			0.03	0.06	0.01	0.02	1	1
WAP-7	0	4/27/2006	0922	5.0			0.03	0.12	0.01	0.04	4	1

LAB DATA

SITE	DEPTH (m)	DATE	TIME	TOC (mg/L)	Total Fe (mg/L)	Total Mn (mg/L)	NH_3N (mg/L)	NO_{3}-NO_2 (mg/L)	Ortho-phosphate (mg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	Total Volatile Suspended Solids (mg/L)
WAP-7	0	5/16/2006	1000	5.0			0.09	0.02	0.01	0.04	3	1
WAP-7	0	6/20/2006	0919	5.0			0.04	0.10	0.01	0.03	7	1
WAP-7	0	8/22/2006	0941	5.0			0.03	0.04	0.01	0.02	4	1

LAB DATA

SITE	DEPTH	DATE	TIME	Chlorophyll (mg/m^3)	Pheophytin (mg/m3)
WAP-1	0	3/7/2006	1240		
WAP-1	0	4/27/2006	1216		
WAP-1	0	5/16/2006	1252		
WAP-1	0	6/20/2006	1305		
WAP-1	0	8/22/2006	1256		
WAP-15-0	0	3/7/2006	1142	5.0	6.5
WAP-15-0	0	4/27/2006	1036	5.0	5.0
WAP-15-0	0	5/16/2006	1126	5.0	5.0
WAP-15-0	0	6/20/2006	1031	5.0	5.0
WAP-15-0	0	8/22/2006	1048	15.2	5.0
WAP-2-0	0	3/7/2006	1036	5.0	6.3
WAP-2-0	0	4/27/2006	1101	8.3	5.0
WAP-2-0	0	5/16/2006	1203	8.2	5.0
WAP-2-0	0	6/20/2006	1255	10.7	5.0
WAP-2-0	0	8/22/2006	1143	40.2	8.6
WAP-2-10	10	3/7/2006	1040		
WAP-2-10	10	4/27/2006	1111		
WAP-2-10	10	5/16/2006	1157		
WAP-2-10	10	6/20/2006	1156		
WAP-2-10	10	8/22/2006	1149		
WAP-5	0	3/7/2006	1135	5.1	7.4
WAP-5	0	4/27/2006	1031	5.0	5.0
WAP-5	0	5/16/2006	1123	5.0	5.0
WAP-5	0	6/20/2006	1027	5.2	5.0
WAP-5	0	8/22/2006	1041	16.1	5.1
WAP-6	0	3/7/2006	0958	5.0	5.0
WAP-6	0	4/27/2006	1001	5.0	5.0
WAP-6	0	5/16/2006	1049	5.0	5.0
WAP-6	0	6/20/2006	1005	5.0	5.0
WAP-6	0	8/22/2006	1004	5.0	5.0
WAP-7	0	3/7/2006	0924		
WAP-7	0	4/27/2006	0922		
WAP-7	0	5/16/2006	1000		
WAP-7	0	6/20/2006	0919		
WAP-7	0	8/22/2006	0941		

LAB DATA

Site	Depth	Date	Time	FECALCOL (colonies/100ml)
BAR MARINA	0	5/16/2006	1230	6
BAR MARINA	0	6/20/2006	1210	86
BAR MARINA	0	8/22/2006	1205	2
CL MARINA	0	5/16/2006	1135	24
CL MARINA	0	6/20/2006	1037	3
CL MARINA	0	8/22/2006	1104	4
HL MARINA	0	5/16/2006	1107	46
HL MARINA	0	6/20/2006	1018	3
HL MARINA	0	8/22/2006	1018	2
LC MARINA	0	5/16/2006	1140	30
LC MARINA	0	6/20/2006	1102	8
LC MARINA	0	8/22/2006	1115	2
SUN MARINA	0	5/16/2006	1235	2
SUN MARINA	0	6/20/2006	1214	4
SUN MARINA	0	8/22/2006	1140	12

FIELD DATA

Site	Date	Depth	H2OTemp (°C)	Redox (mV)	Cond (uS/cm)	pH	D.0.%	D.O.(mg/L)	Time	Seechi (in)	Air Temp (°F)	Weather	Wind
1	3/7/06	0.22	10.02	327	199.0	8.22	104.3	11.68	1240				
1	4/27/06	0.29	21.88	358	176	8.18	103.7	9.04	1216				
1	5/16/06	0.44	18.45	356	154.6	7.97	106.5	9.91	1252				
1	6/20/06	0.72	26.47	281	187.5	8.0	86.2	6.75	1305				
1	8/22/06	1.138	28.53	55.2	218	7.98	81	6.27	1256		89 F		
2	3/7/06	0.54	9.85	354	201.3	8.01	100.3	11.27	1036	24	50		
2	3/7/06	1.27	9.79	347	201.3	8.11	99.9	11.22					
2	3/7/06	2.04	9.73	339	200.9	8.22	99.1	11.17					
2	3/7/06	3.02	9.70	333	200.9	8.30	98.7	11.15					
2	3/7/06	4.14	9.71	329	201.0	8.39	98.9	11.15					
2	3/7/06	5.12	9.72	326	200.6	8.42	99.0	11.18					
2	3/7/06	6.06	9.60	326	200.3	8.40	98.1	11.06					
2	3/7/06	7.06	9.53	327	201.2	8.37	96.5	10.92					
2	3/7/06	8.15	9.40	327	200.6	8.35	95.2	10.81					
2	4/27/06	0.44	21.62	378	179.1	8.11	94.2	8.25	1101				
2	4/27/06	1.0	20.71	378	177.7	8.10	89.0	7.94	1103				
2	4/27/06	2.09	20.55	376	177.2	8.12	85.6	7.65	1104				
2	4/27/06	3.8	20.43	377	177.5	8.11	83.4	7.46	1105				
2	4/27/06	4.0	20.37	377	178.4	8.11	83.9	7.54	1106				
2	4/27/06	5.0	20.27	377	178.7	8.1	83.8	7.57	1106				
2	4/27/06	6.0	20.19	376	178.7	8.13	84.2	7.58	1108				
2	4/27/06	7.0	20.1	376	179.9	8.17	84.3	7.6	1109				
2	4/27/06	8.0	19.84	375	180.6	8.18	84.3	7.6	1110				
2	4/27/06	9.0	19.75	381	180.9	8.08	83.5	7.57	1112				
2	4/27/06	10.0	19.7	334	181.3	8.1	80.3	7.39	1114	19	82		
2	5/16/06	0.2	18.6	388	152.7	7.81	100.6	9.34	1203	20			
2	5/16/06	1.0	18.59	378	152.6	8.09	100.6	9.34	1235				

FIELD DATA

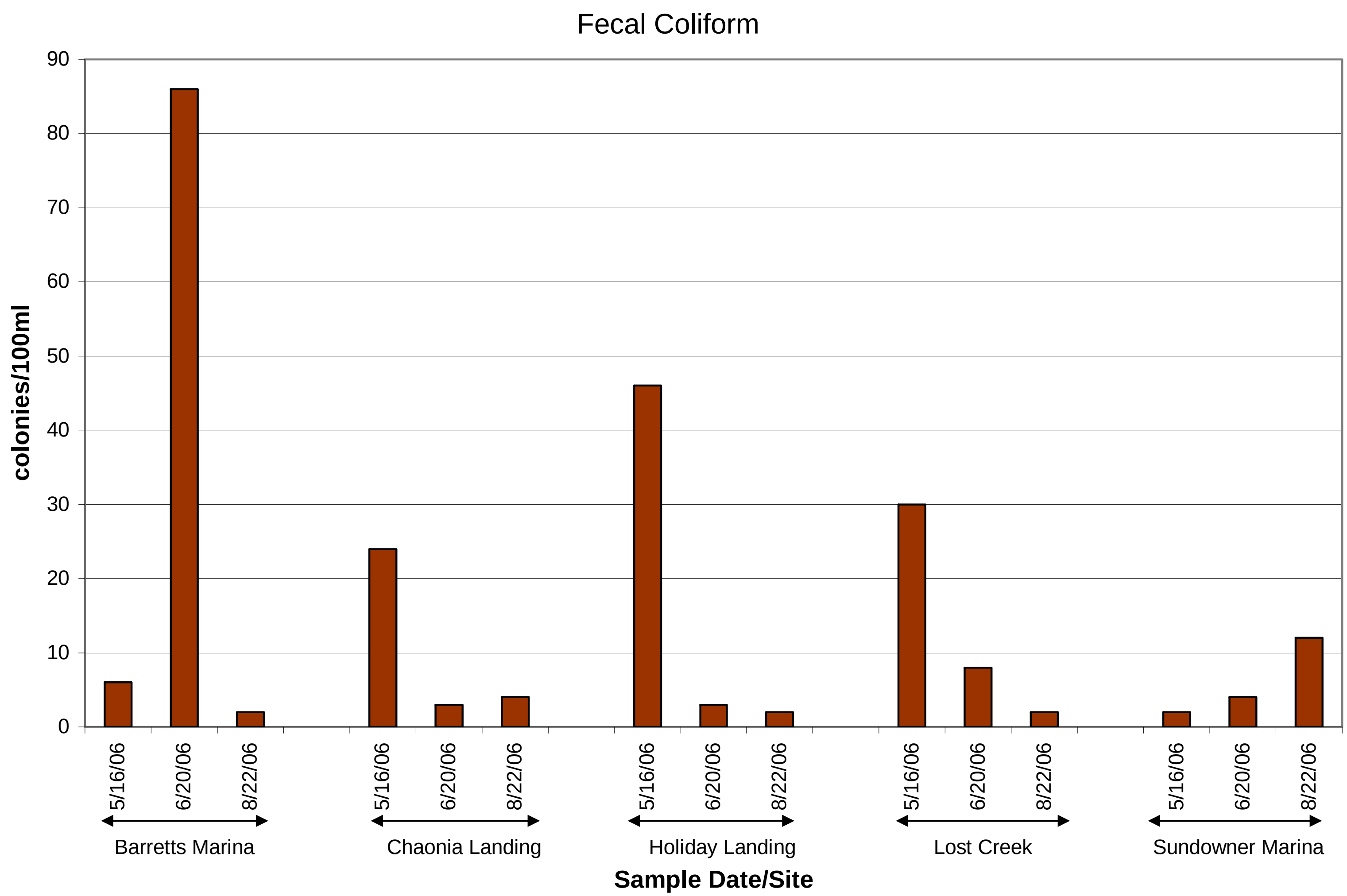
Site	Date	Depth	H2OTemp (°C)	Redox (mV)	Cond (uS/cm)	pH	D.0.%	D.O.(mg/L)	Time	Seechi (in)	Air Temp (°F)	Weather	Wind
2	5/16/06	1.9	18.41	377	152.4	8.16	99.5	9.26	1206				
2	5/16/06	3.07	18.36	369	151.9	8.19	99.1	9.2	1209				
2	5/16/06	4.15	17.9	377	150	8.0	97.0	8.7	1213				
2	5/16/06	5.0	17.8	375	150	7.95	89.2	8.37	1213				
2	5/16/06	6.1	17.73	375	149.6	7.89	87.8	8.28	1215				
2	5/16/06	6.9	17.7	387	149.5	7.79	86.8	8.21	1216				
2	5/16/06	8.08	17.66	379	148	7.9	86.7	8.2	1218				
2	5/16/06	9.1	17.6	385	147.4	7.83	86.3	8.16	1220				
2	5/16/06	10.5	17.6	379	147.8	7.9	85.6	8.1	1221				
2	5/16/06	11.3	17.6	383	147.7	7.84	84.6	8.0	1222				
2	6/20/06	0.15	30.76	277	171.7	9.11	134.2	9.76	1156	24			
2	6/20/06	1.06	29.04	271	171.1	9.23	113.5	8.49	1157				
2	6/20/06	2.09	28.18	273	171.0	9.12	102.8	7.76	1158				
2	6/20/06	3.04	26.43	305	176.3	8.31	86.4	6.75	1159				
2	6/20/06	4.00	25.00	316	187.1	8.00	74.2	5.98	1159				
2	6/20/06	5.08	23.46	175	210.5	7.82	60.4	5.02	1200				
2	6/20/06	6.07	21.81	104	216.6	7.72	40.3	4.23	1201				
2	6/20/06	7.09	20.98	70	218.4	7.71	40.8	3.73	1201				
2	6/20/06	8.08	20.28	46	214.8	7.71	39.3	3.47	1202				
2	6/20/06	9.17	19.64	24	212.3	7.71	35.3	3.15	1203				
2	6/20/06	10.19	19.11	-16	227.1	7.71	31.9	2.89	1203				
2	8/22/06	0.245	28.79	7.3	200	8.17	86.1	6.59	1143	16			
2	8/22/06	1.611	28.73	-9.8	200	8.24	77.7	6.00					
2	8/22/06	2.568	28.68	-16.0	200	8.28	71.7	5.53					
2	8/22/06	3.768	28.46	-20.8	201	8.27	66.4	5.15					
2	8/22/06	4.790	27.39	-299.4	223	8.69	5.7	0.43					
2	8/22/06	5.734	24.42	-348.4	279	8.61	3.6	0.30					
2	8/22/06	6.546	22.83	-342.5	299	8.48	4.5	0.38					
2	8/22/06	7.579	22.29	-344.8	304	8.38	4.7	0.41					
2	8/22/06	8.620	21.93	-338.6	305	8.24	4.5	0.39					
2	8/22/06	9.648	21.54	-323.4	310	8.12	4.1	0.36					
2	8/22/06	10.304	21.26	-318.6	331	7.91	3.9	0.28					

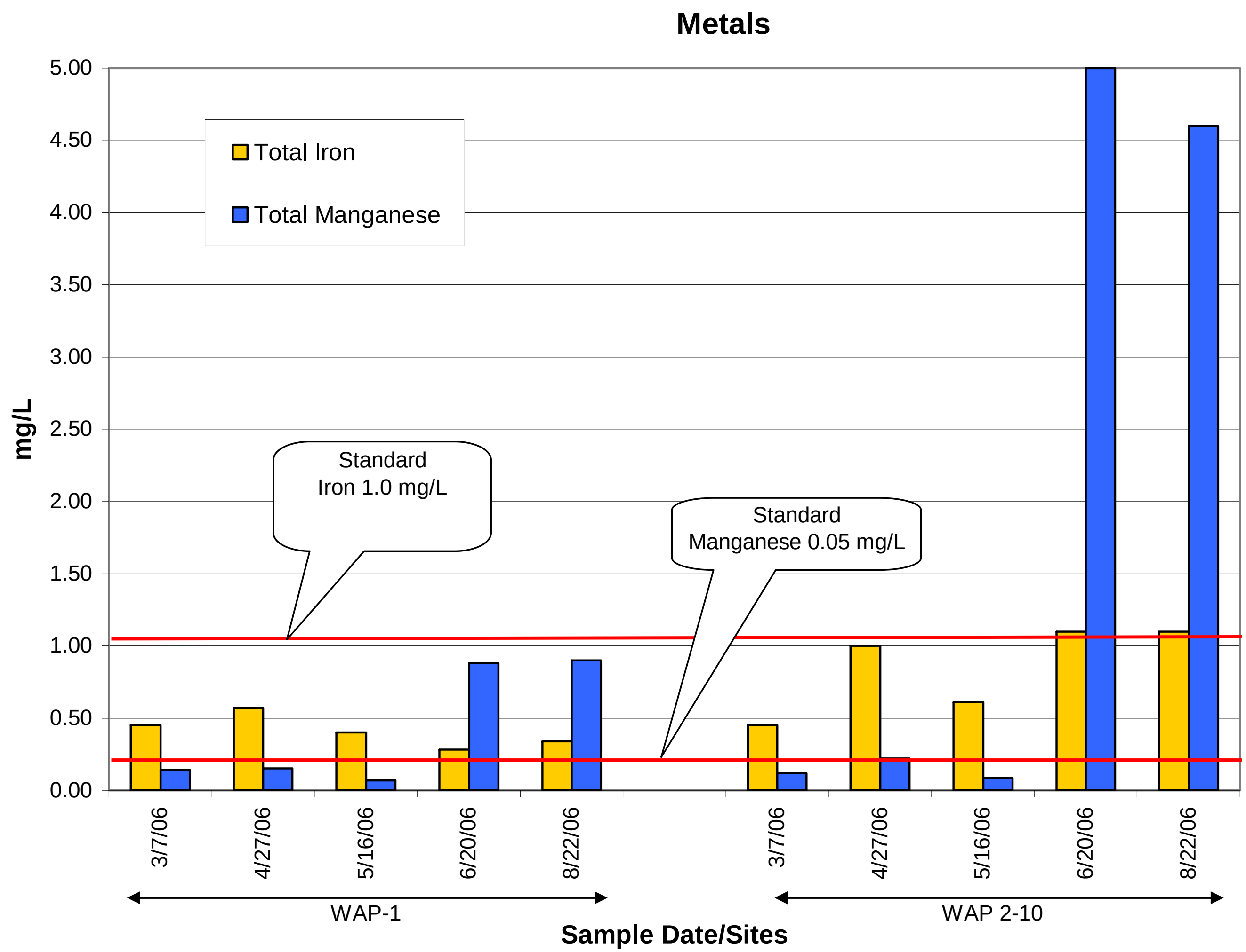
Site	Date	Depth	H2OTemp (oC)	Redox (mV)	Cond (uS/cm)	pH	D.0.%	D.O.(mg/L)	Time	Seechi (in)	Air Temp (oF)	Weather	Wind
5	3/7/06	0.55	10.71	351	175.0	7.90	97.7	10.76	1135	6			
5	3/7/06	1.14	9.82	348	171.3	7.72	94.7	10.50			66		
5	3/7/06	2.06	9.59	343	170.5	7.62	84.5	9.56					
5	4/27/06	0.33	20.52	383	216.3	7.75	83.2	7.47	1031				
5	4/27/06	1.05	19.67	381	208.9	7.75	77.1	7.02	1033				
5	4/27/06	2.08	18.47	378	199	7.77	72	6.68	1034	13	82		
5	5/16/06	0.6	17.14	389	93.3	7.42	85.2	8.15	1123	12			
5	5/16/06	2.0	16.8	389	95	7.47	81	7.8	1125				
5	5/16/06	3.0	16.7	381	97.4	7.4	79.0	7.6	1127				
5	5/16/06	4.1	16.44	385	139.5	7.4	72	6.94	1130				
5	5/16/06	4.9	16.3	379	142.1	7.4	71	6.85	1131				
5	6/20/06	0.07	31.77	319	201.9	8.74	145.6	10.39	1025	24			
5	6/20/06	1.12	29.20	321	222.7	8.55	112.4	8.42	1026				
5	6/20/06	2.11	27.15	344	206.0	8.10	93.0	7.20	1027				
5	6/20/06	3.14	25.41	68	182.4	7.82	78.4	6.26	1028				
5	8/22/06	0.276	29.58	49.3	246	8.12	93.8	7.12	1041	14			
5	8/22/06	1.603	28.78	42.0	237	7.97	54.1	4.00					
5	8/22/06	2.309	28.47	33.5	235	7.87	40.5	3.14					
5	8/22/06	3.789	28.15	-17.9	240	7.76	10.0	0.67					
6	3/7/06	0.41	8.57	355	233	7.57	96.2	11.15	958	108	40		
6	3/7/06	1.2	8.54	347	234	7.74	96.4	11.19					
6	3/7/06	2.1	8.50	335	234	7.95	96.2	11.18					
6	4/27/06	0.31	18.49	391	230.5	7.87	86.5	8.05	1001				
6	4/27/06	1.16	18.48	385	230.7	7.97	86.4	8.04	1003				
6	4/27/06	2.06	18.46	382	230.4	8.06	86.3	8.03	1005	72	76		
6	5/16/06	0.22	15.27	389	173.1	7.54	86.2	8.59	1049	58			
6	5/16/06	1.1	15.26	379	173.1	7.73	87	8.65	1051				

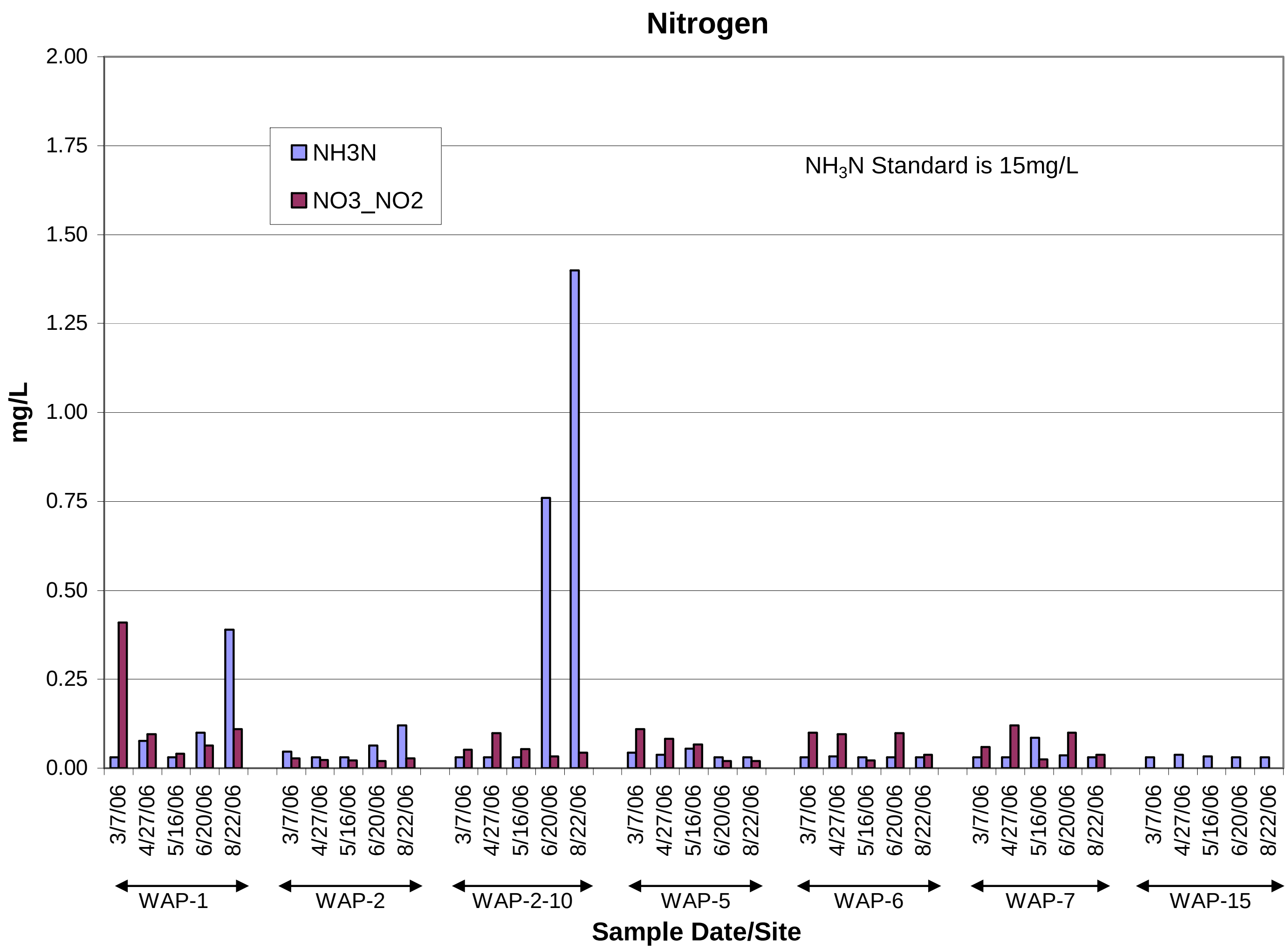
Site	Date	Depth	H2OTemp (oC)	Redox (mV)	Cond (uS/cm)	pH	D.0.%	D.O.(mg/L)	Time	Seechi (in)	Air Temp (oF)	Weather	Wind
6	5/16/06	2.0	15.21	368	173.4	7.85	86.6	8.63	1053				
6	5/16/06	3.0	15.15	364	173.6	7.74	85.7	8.55	1055				
6	5/16/06	4.0	15.19	364	173.6	7.9	86.1	8.5	1056				
6	5/16/06	5.11	15.14	364	173.4	7.91	85.7	8.53	1057				
6	6/20/06	0.31	28.19	320	266.1	8.17	93.6	7.10	1005	38			
6	6/20/06	1.06	26.05	330	266.0	8.12	83.4	6.57	1006				
6	6/20/06	2.02	19.01	345	231.8	7.79	29.7	2.84	1007				
6	6/20/06	3.05	16.73	354	232.2	7.67	20.0	1.89	1008				
6	8/22/06	0.259	27.07	52.2	281	7.89	92.3	7.34	1004	36			
6	8/22/06	1.471	22.93	43.9	280	7.68	84.6	7.31					
6	8/22/06	2.384	18.68	43.9	278	7.57	64.1	5.93					
6	8/22/06	3.004	17.84	46.5	277	7.53	47.6	4.4					
7	3/7/06	0.65	8.55	332	227	8.23	99.5	11.54	924		38	Cloudy	Light
7	4/27/06	0.71	18.5	416	223.7	7.86	92.3	8.0	922		64	sunny/clear	0-5 mph
7	5/16/06	0.45	15.04	386	175.8	7.59	91	9.15	1000		78		
7	6/20/06	0.28	26.44	320	260	8.07	86.1	6.76	919		88	Clear	
7	8/22/06	0.455	26.11	51	272	7.90	89.4	7.24	941			PC	

APPENDIX B

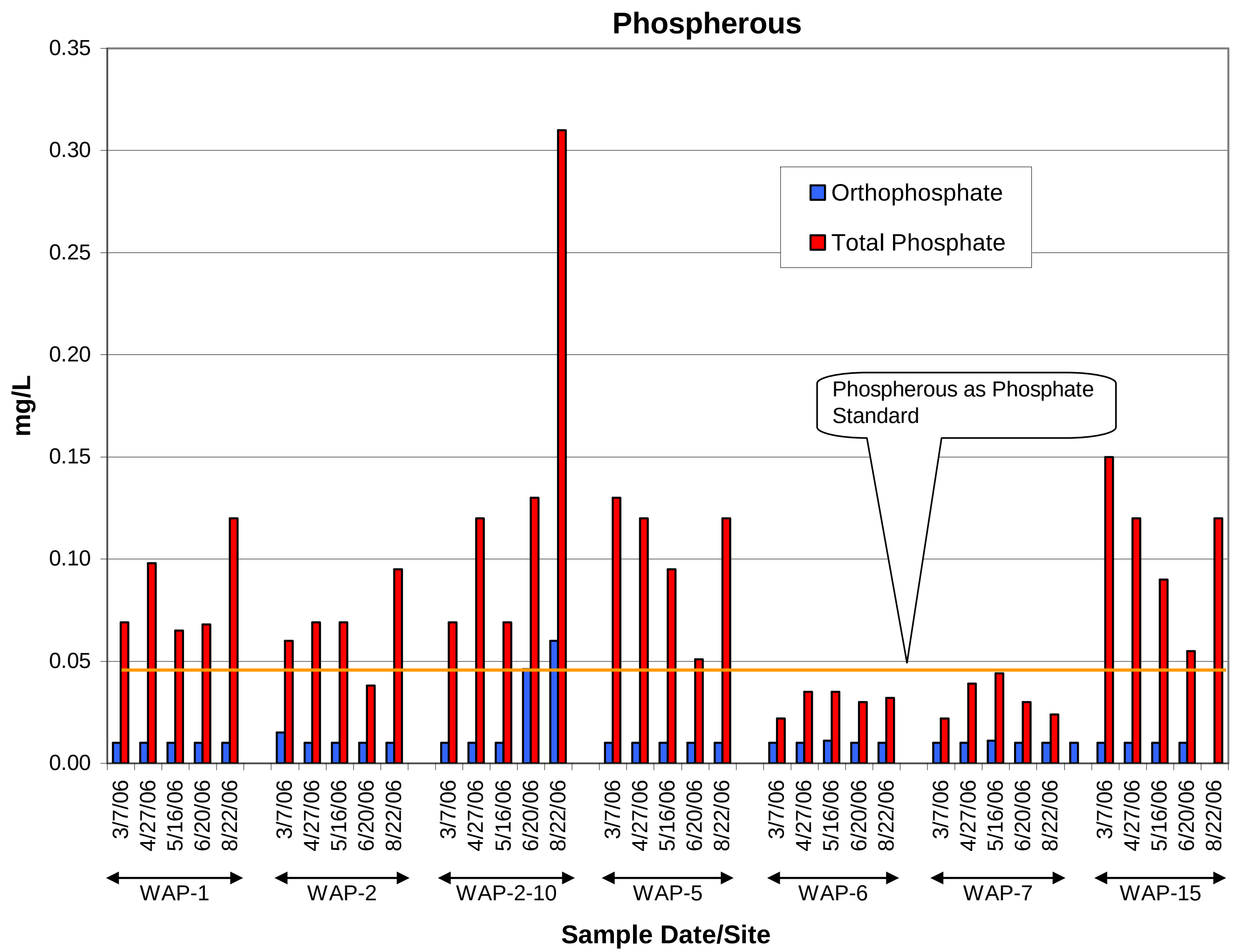
LAB DATA
GRAPHS

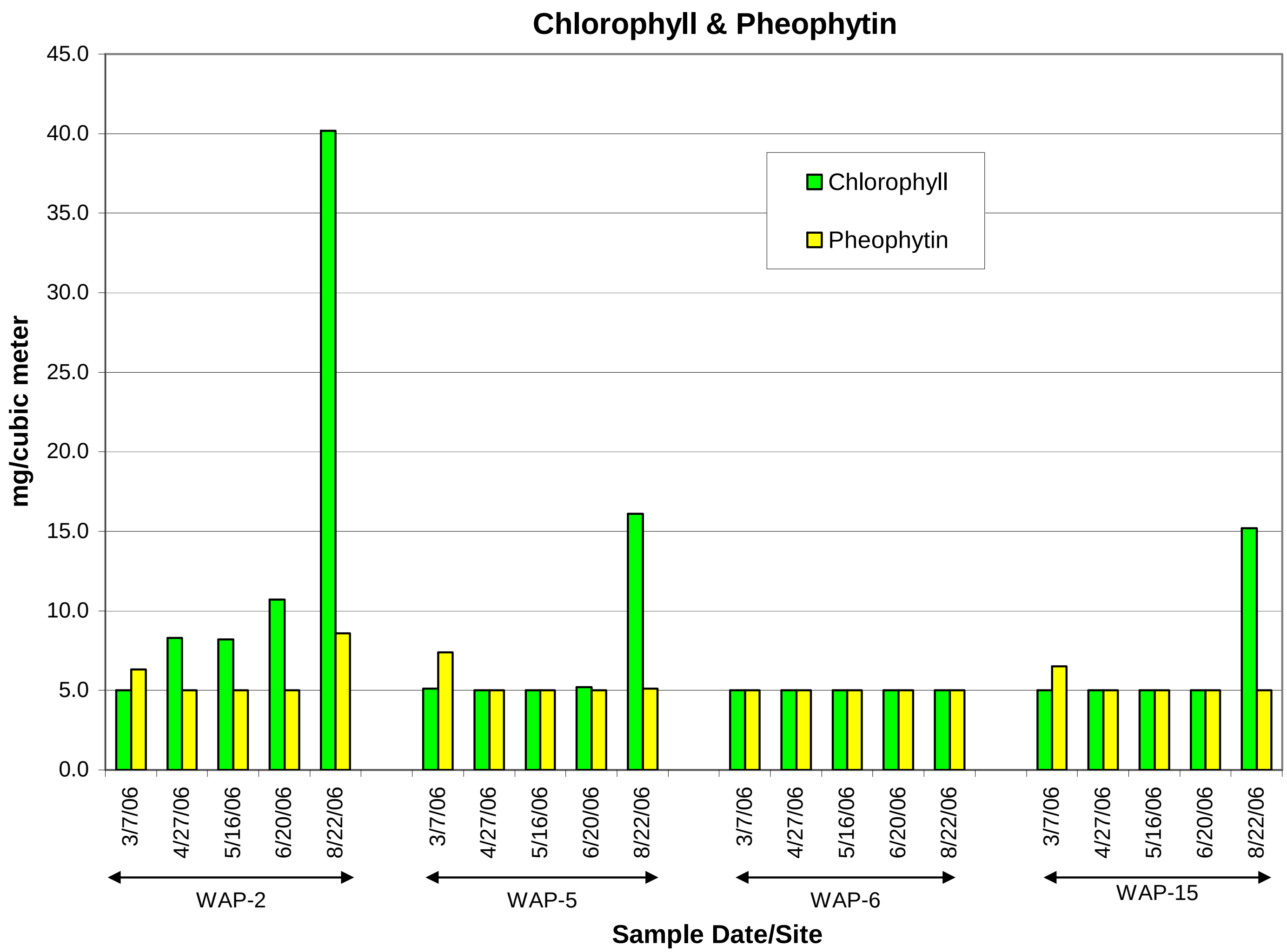

Fecal Coliform
colonies/100ml
90
80
70
60
50
40
30
20
10
0
5/16/06
6/20/06
8/22/06
Barretts Marina
Chaonia Landing
Holiday Landing
Lost Creek
Sundowner Marina
Sample Date/Site


Metals
mg/L
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Total Iron
Total Manganese
Standard
Iron 1.0 mg/L
Standard
Manganese 0.05 mg/L
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
WAP-1
WAP 2-10
Sample Date/Sites

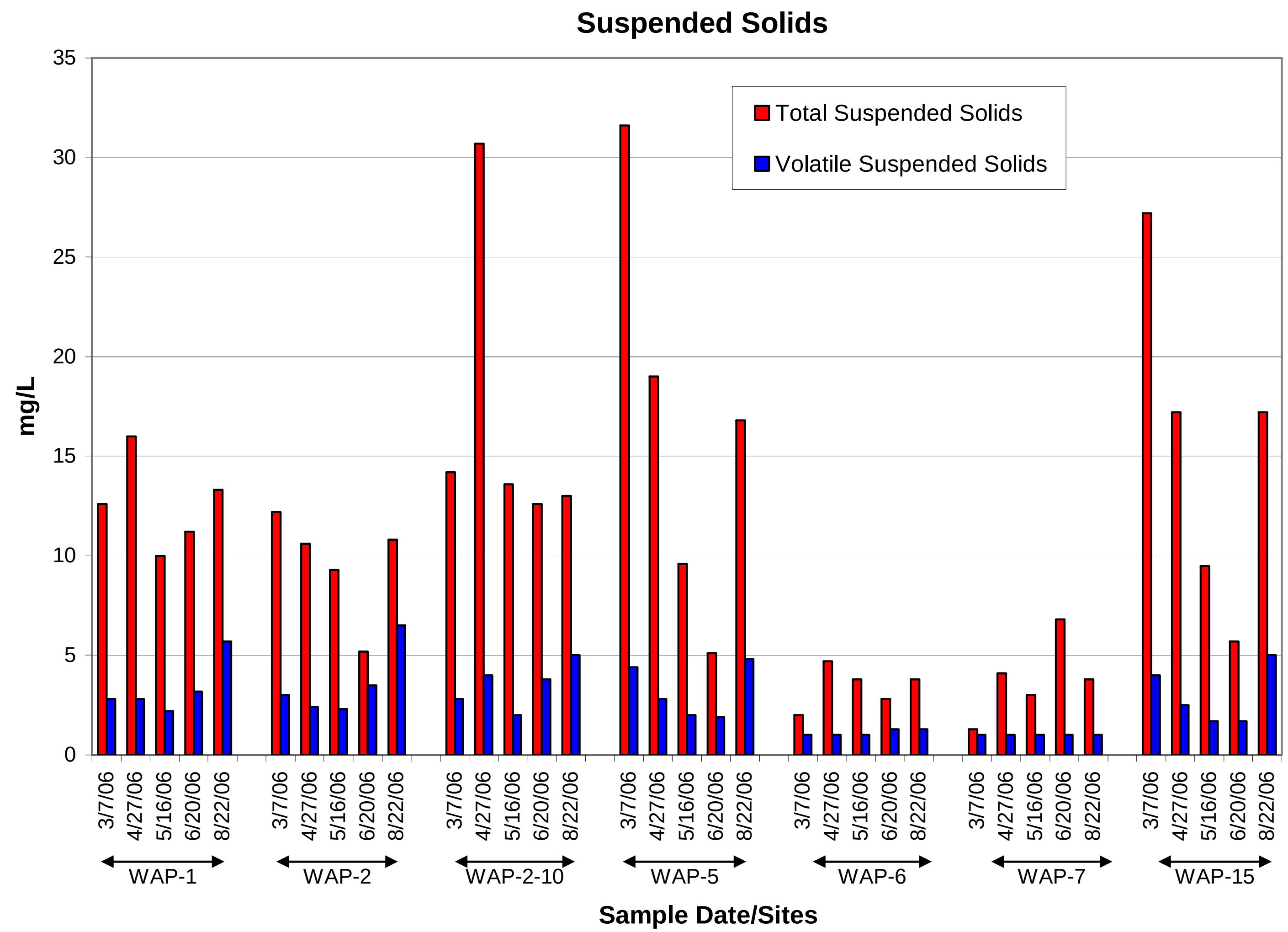


Nitrogen
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
mg/L
NH3N
NO3_NO2
NH3N Standard is 15mg/L
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
WAP-1
WAP-2
WAP-2-10
WAP-5
WAP-6
WAP-7
WAP-15
Sample Date/Site

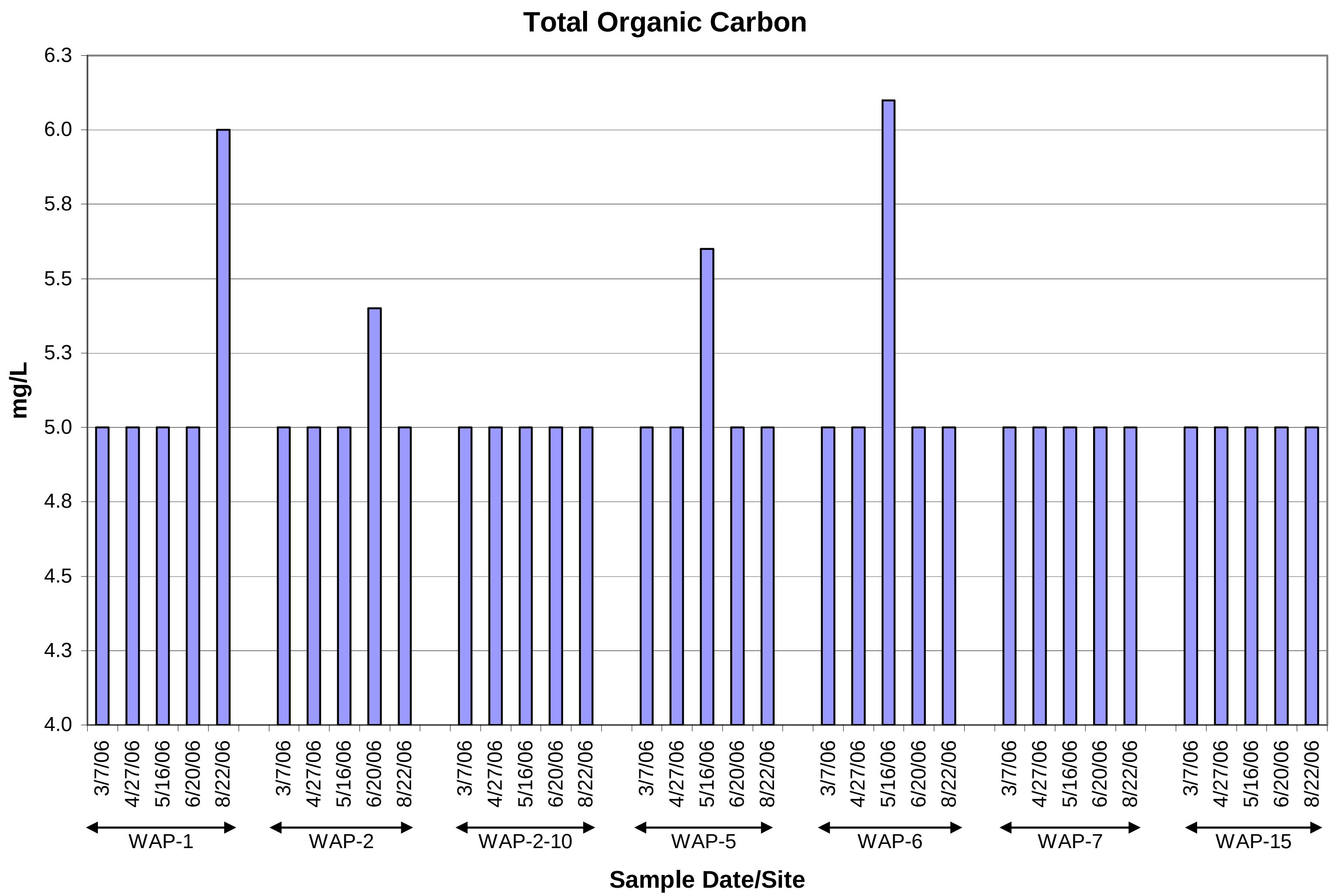

Phospherous
mg/L
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Orthophosphate
Total Phosphate
Phospherous as Phosphate Standard
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
WAP-1
WAP-2
WAP-2-10
WAP-5
WAP-6
WAP-7
WAP-15
Sample Date/Site



Chlorophyll & Pheophytin
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
mg/cubic meter
Chlorophyll
Pheophytin
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
WAP-2
WAP-5
WAP-6
WAP-15
Sample Date/Site

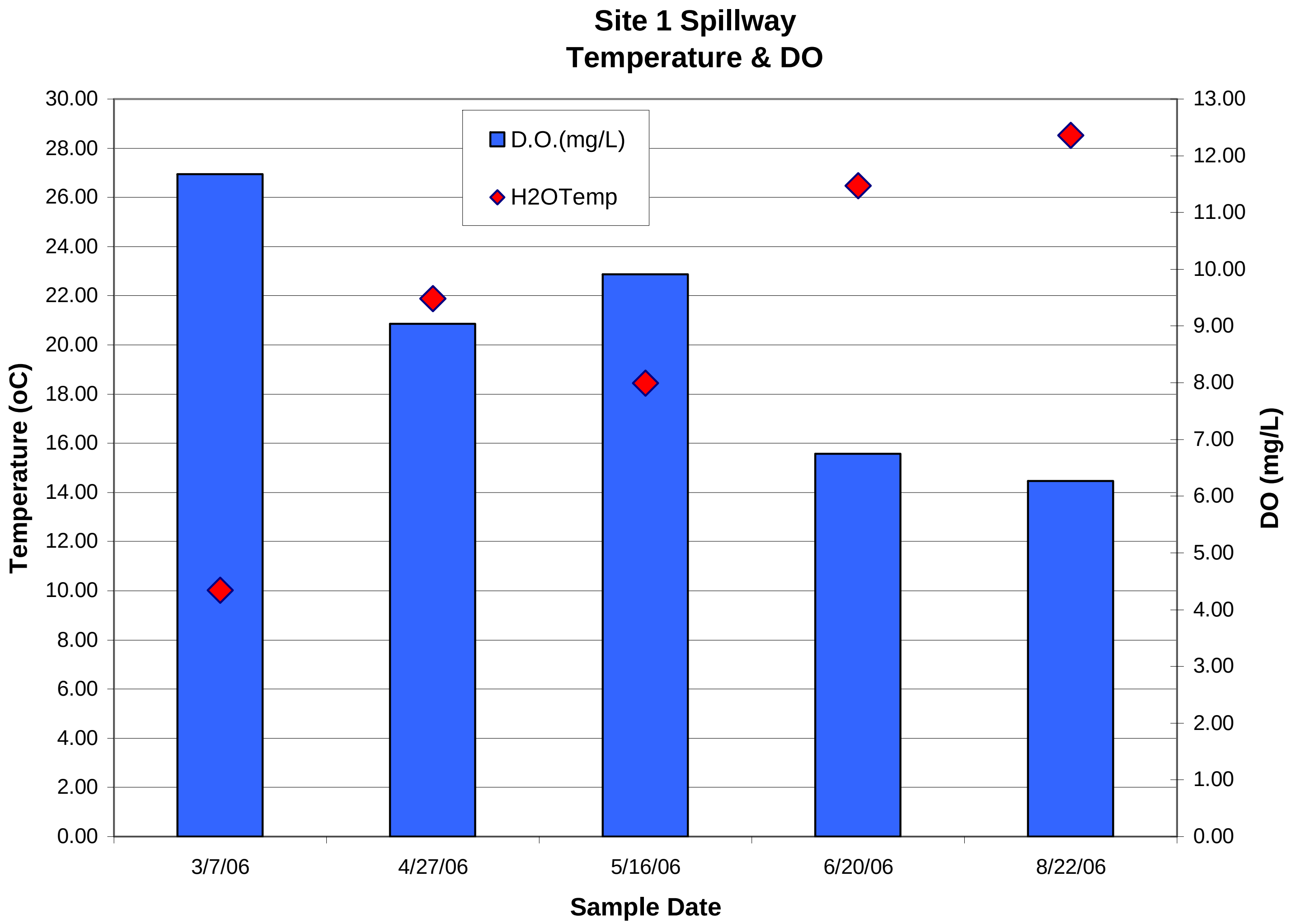


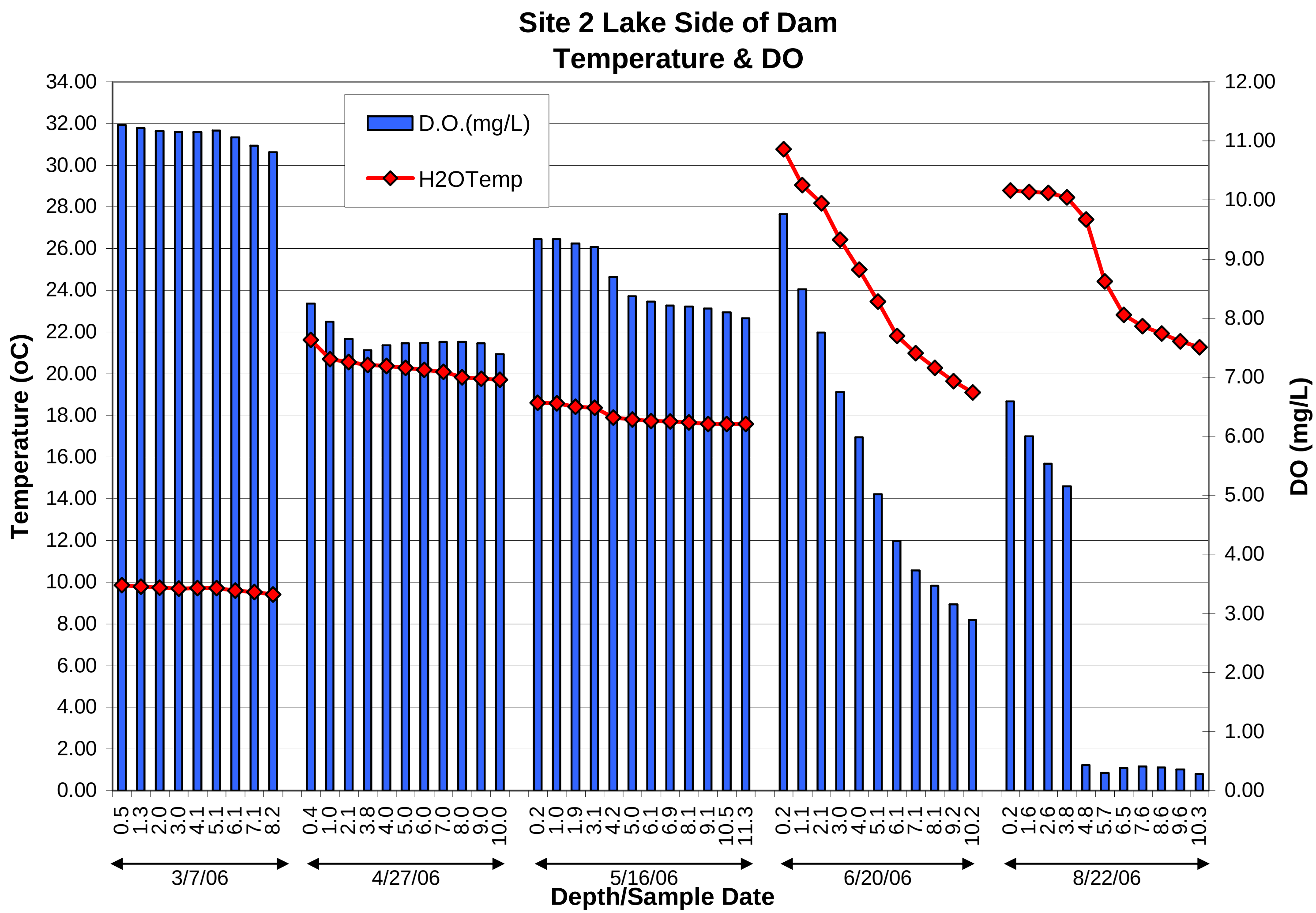
Suspended Solids
35
30
25
20
15
10
5
0
mg/L
Total Suspended Solids
Volatile Suspended Solids
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
WAP-1
WAP-2
WAP-2-10
WAP-5
WAP-6
WAP-7
WAP-15
Sample Date/Sites


Total Organic Carbon
mg/L
6.3
6.0
5.8
5.5
5.3
5.0
4.8
4.5
4.3
4.0
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
WAP-1
WAP-2
WAP-2-10
WAP-5
WAP-6
WAP-7
WAP-15
Sample Date/Site

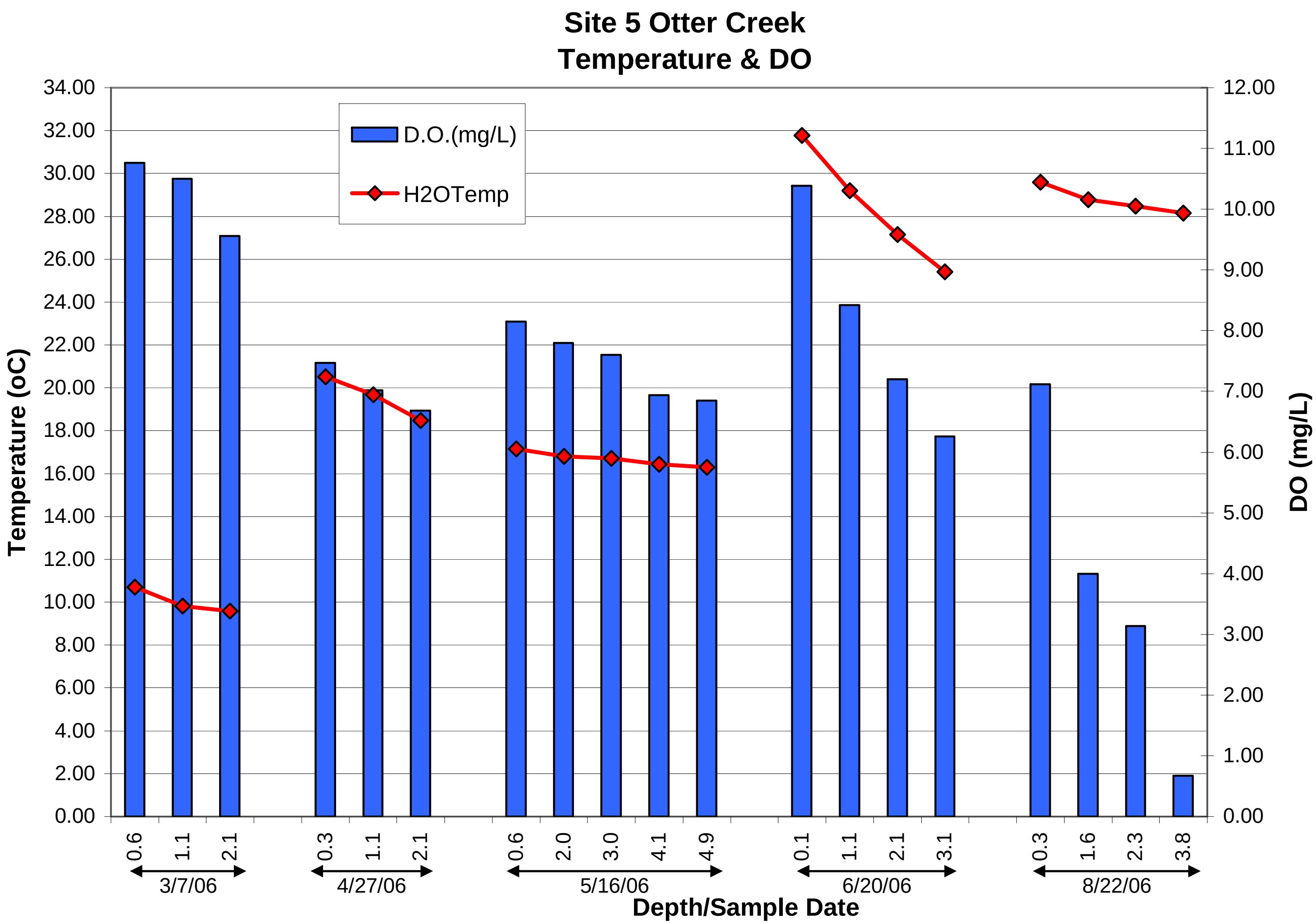
APPENDIX C

FIELD DATA
GRAPHS

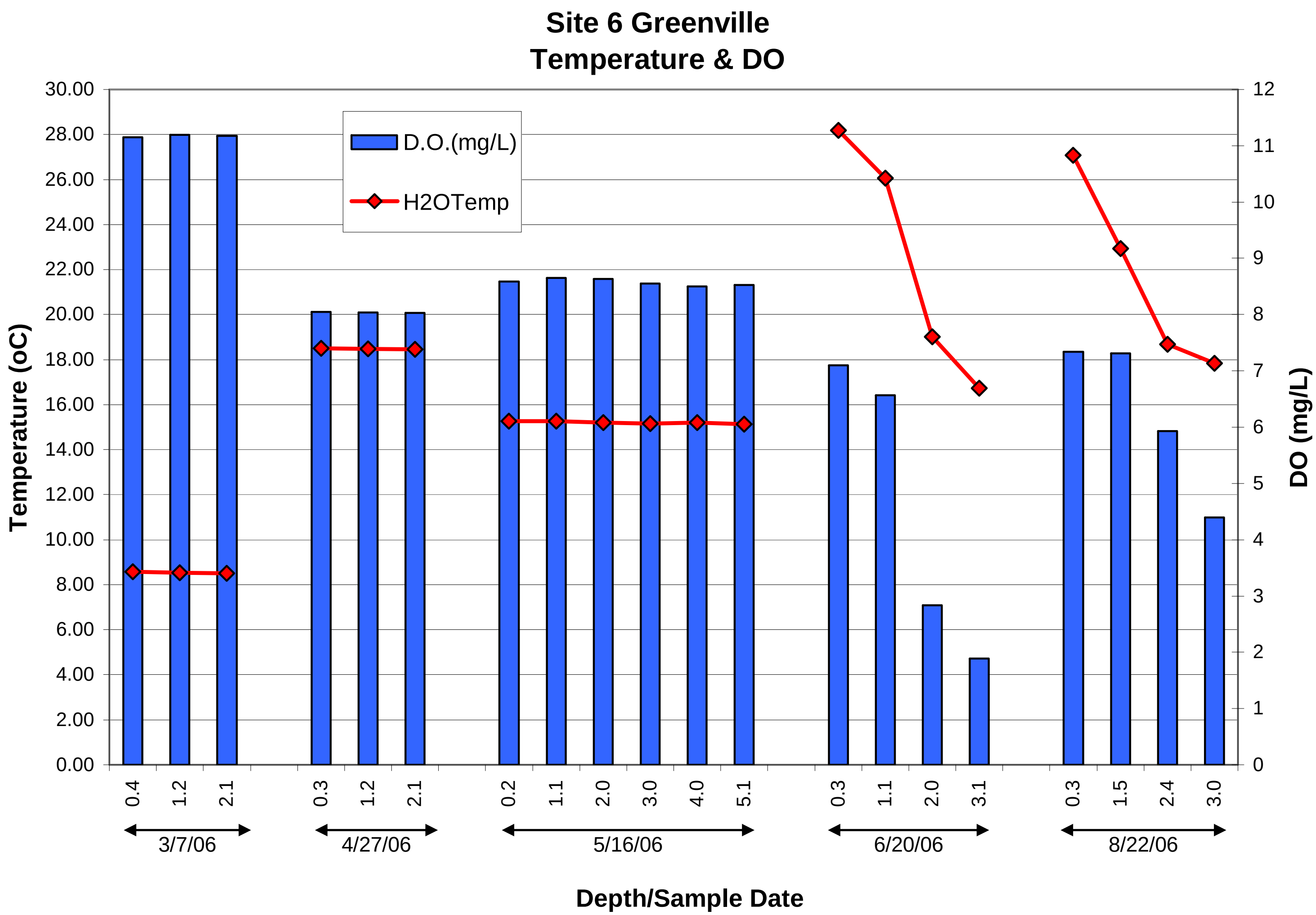

Site 1 Spillway
Temperature & DO
D.O.(mg/L)
H2OTemp
Temperature (oC)
DO (mg/L)
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample Date



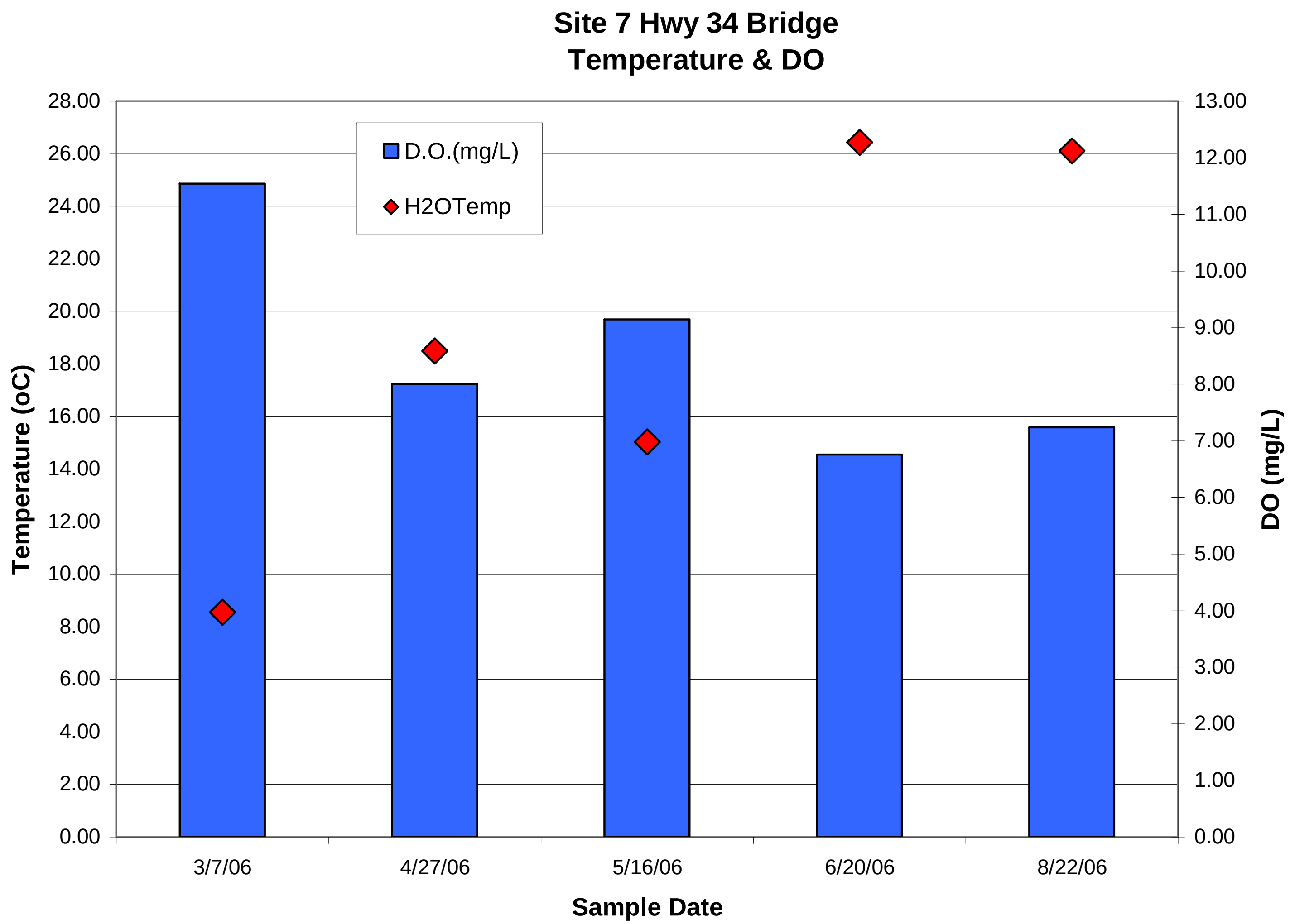
Site 2 Lake Side of Dam
Temperature & DO
D.O.(mg/L)
H2OTemp
Temperature (oC)
DO (mg/L)
Depth/Sample Date
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06



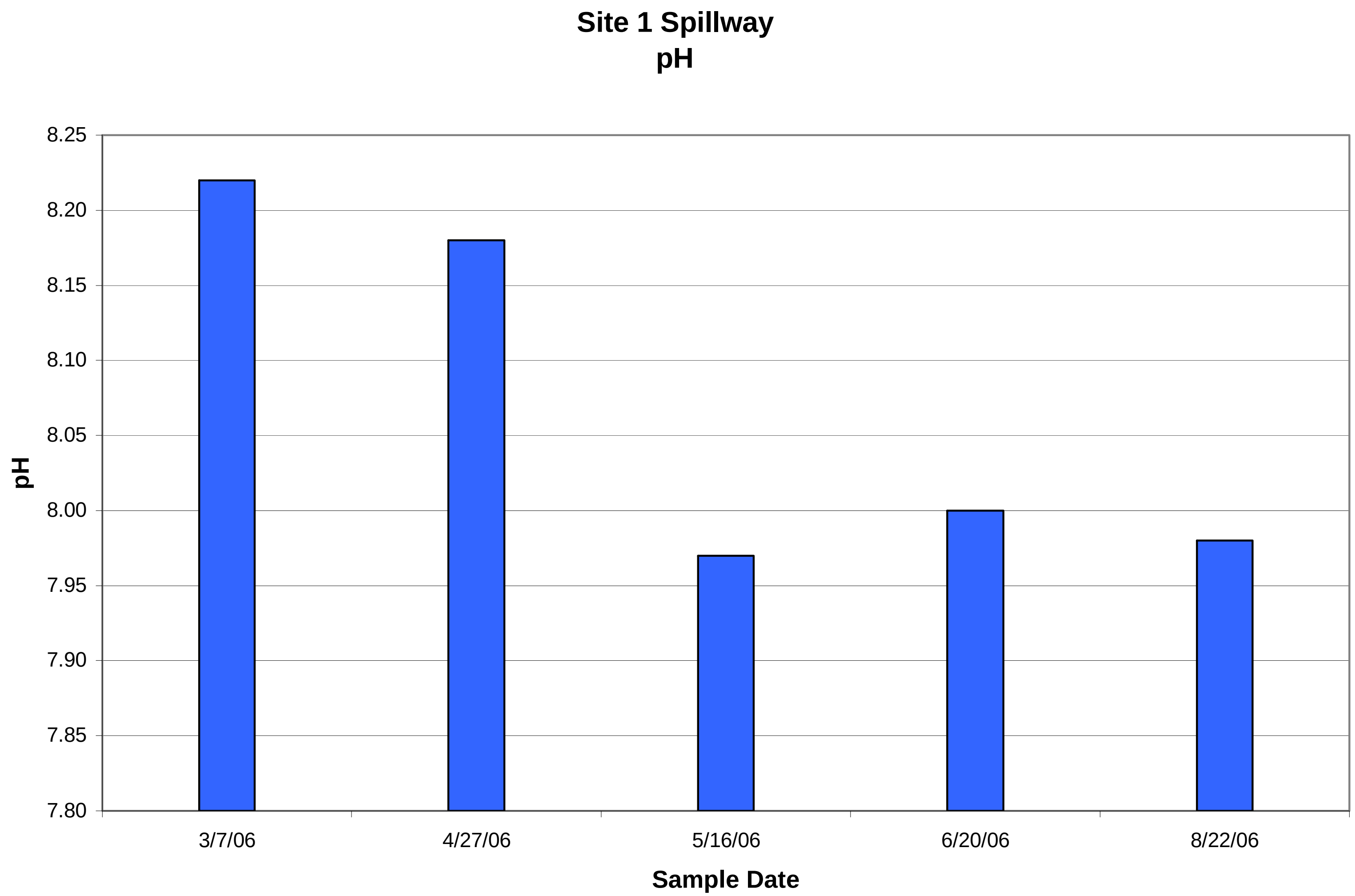
Site 5 Otter Creek
Temperature & DO
D.O.(mg/L)
H2OTemp
Temperature (oC)
DO (mg/L)
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.6
1.1
2.1
0.3
1.1
2.1
0.6
2.0
3.0
4.1
4.9
0.1
1.1
2.1
3.1
0.3
1.6
2.3
3.8
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date

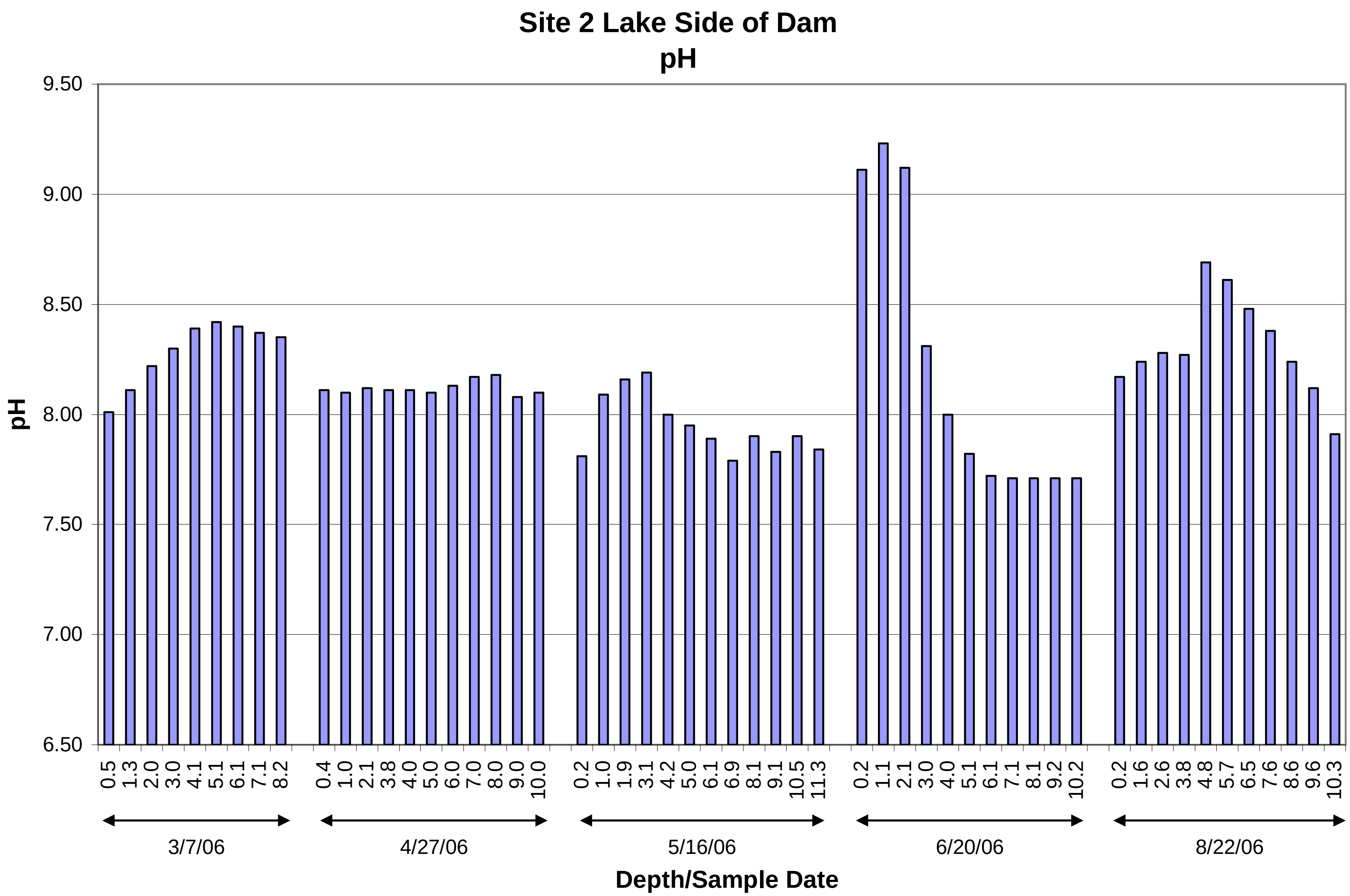


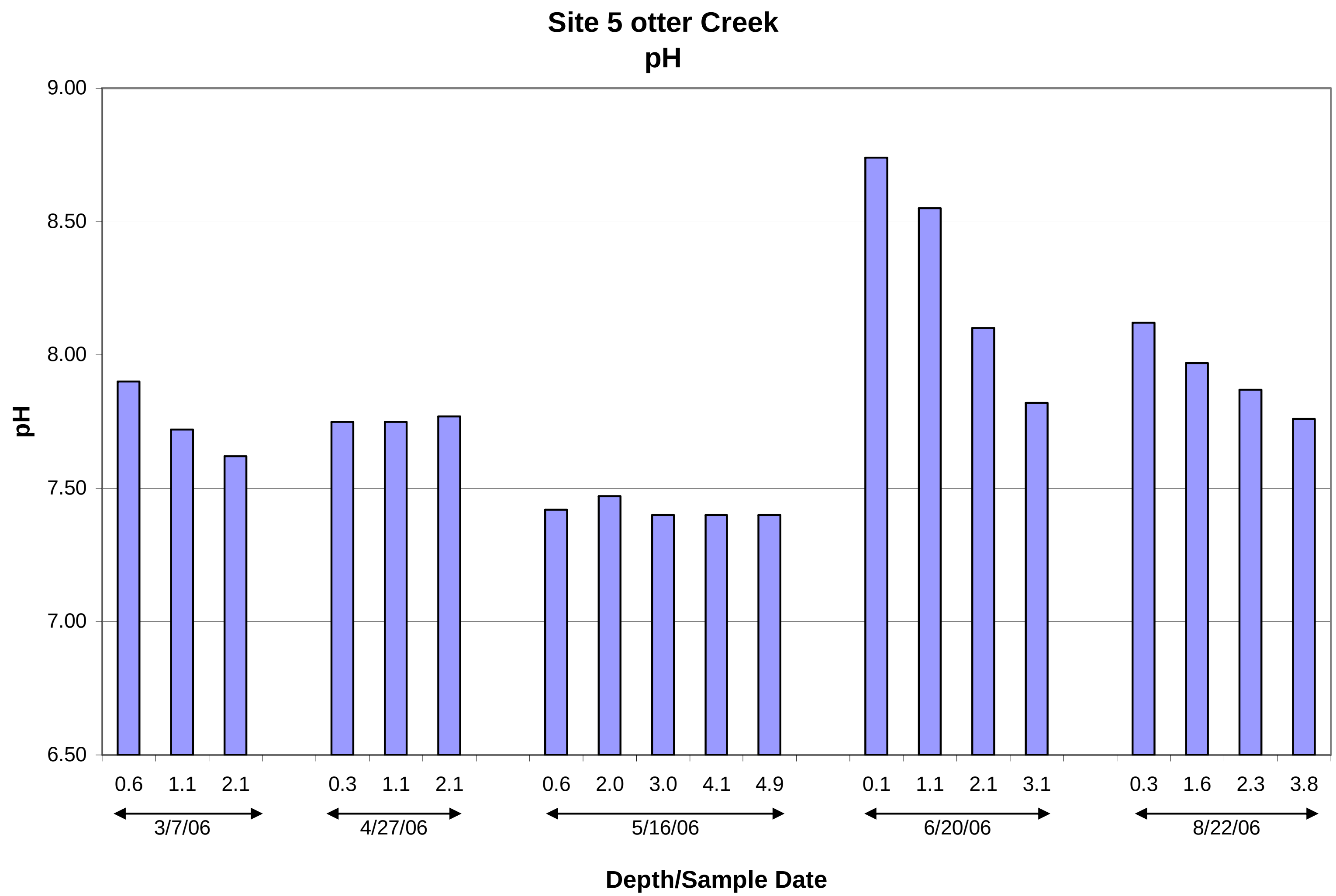
Site 6 Greenville
Temperature & DO
Temperature (oC)
DO (mg/L)
D.O.(mg/L)
H2OTemp
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
12
11
10
9
8
7
6
5
4
3
2
1
0
0.4
1.2
2.1
0.3
1.2
2.1
0.2
1.1
2.0
3.0
4.0
5.1
0.3
1.1
2.0
3.1
0.3
1.5
2.4
3.0
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date

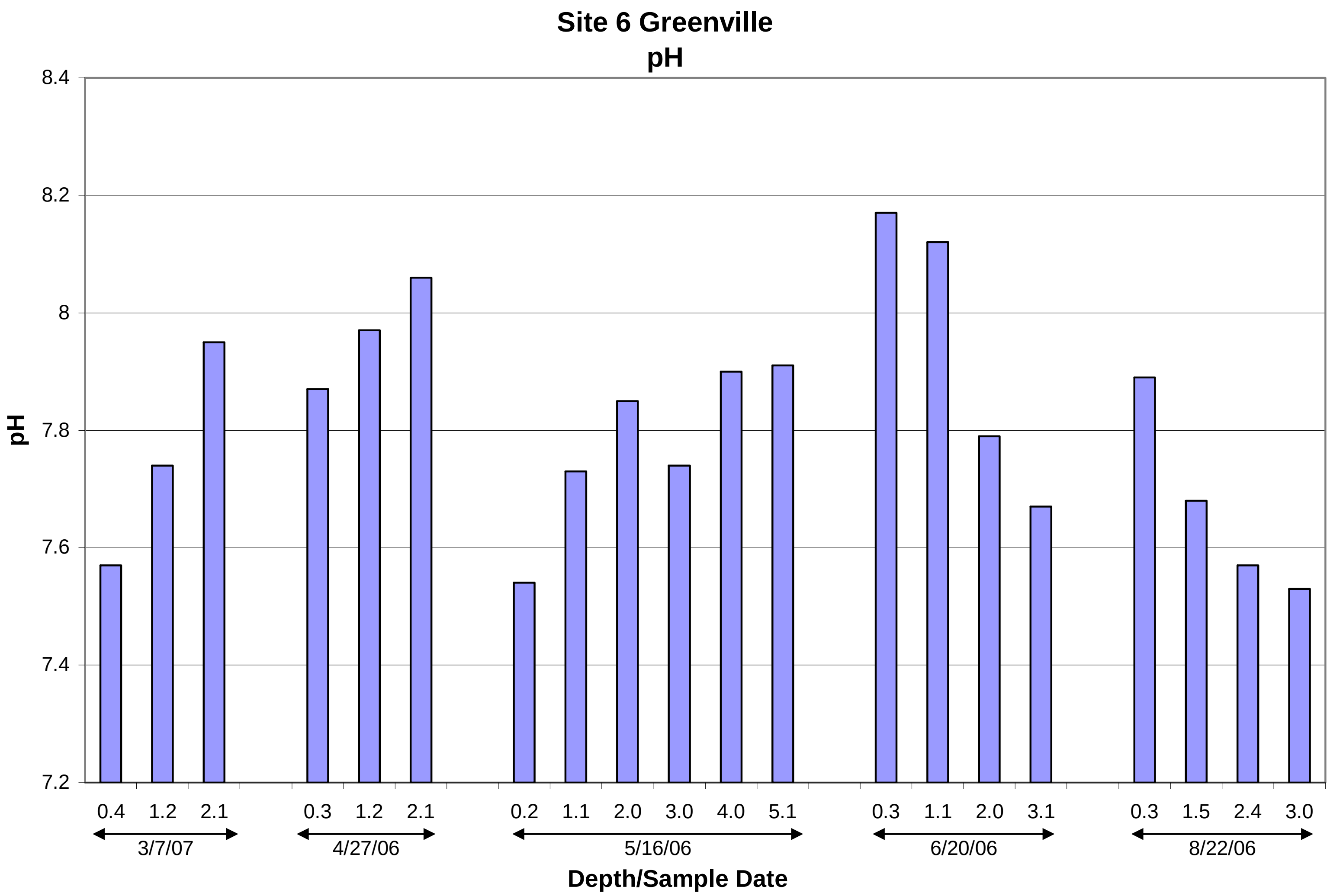


Site 7 Hwy 34 Bridge
Temperature & DO
D.O.(mg/L)
H2OTemp
Temperature (oC)
DO (mg/L)
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample Date

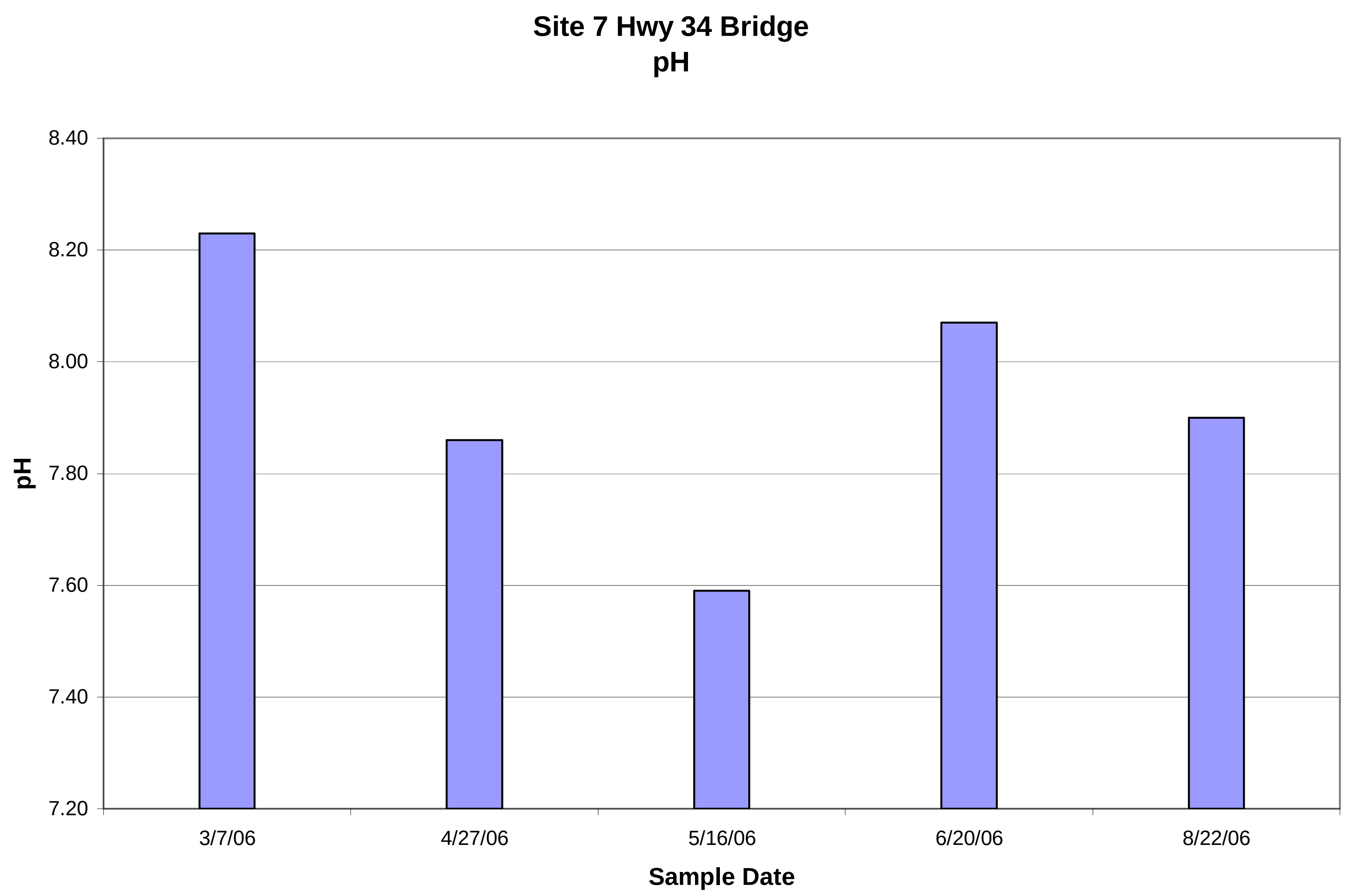

Site 1 Spillway
pH
8.25
8.20
8.15
8.10
8.05
8.00
7.95
7.90
7.85
7.80
pH
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample Date

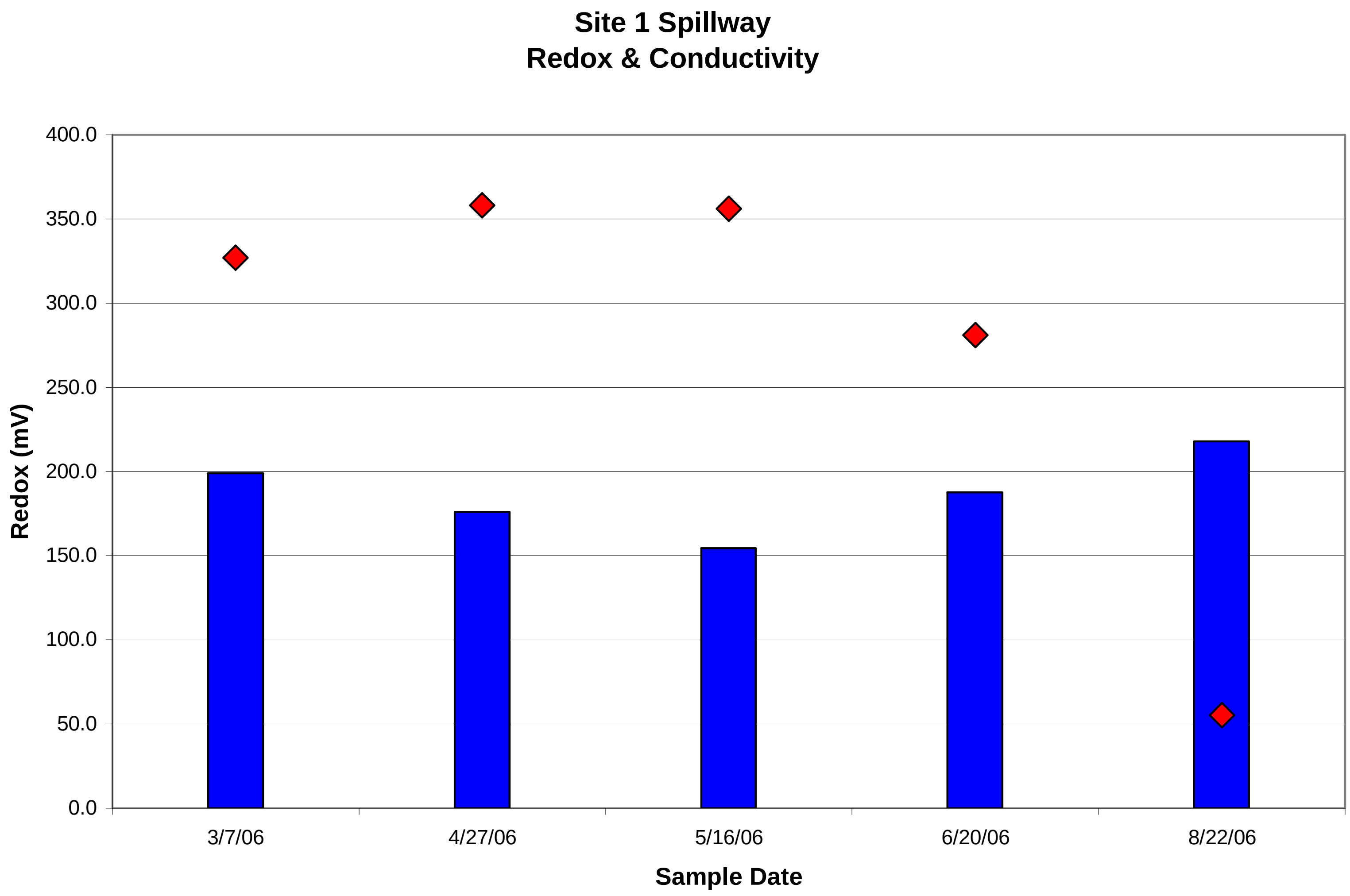

Site 2 Lake Side of Dam
pH
9.50
9.00
8.50
8.00
7.50
7.00
6.50
pH
0.5 1.3 2.0 3.0 4.1 5.1 6.1 7.1 8.2
0.4 1.0 2.1 3.8 4.0 5.0 6.0 7.0 8.0 9.0 10.0
0.2 1.0 1.9 3.1 4.2 5.0 6.1 6.9 8.1 9.1 10.5 11.3
0.2 1.1 2.1 3.0 4.0 5.1 6.1 7.1 8.1 9.2 10.2
0.2 1.6 2.6 3.8 4.8 5.7 6.5 7.6 8.6 9.6 10.3
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date

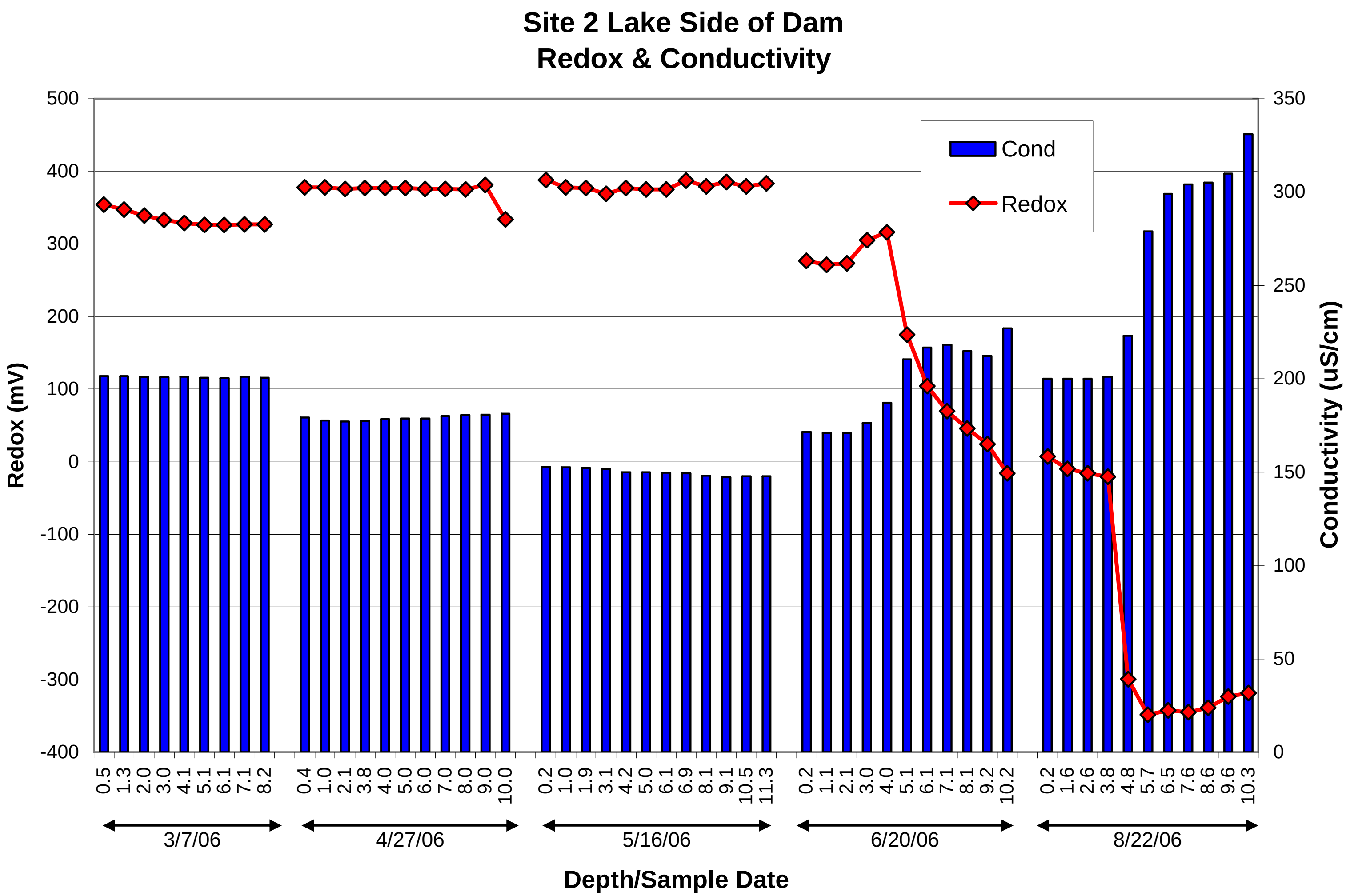

Site 5 otter Creek
pH
9.00
8.50
8.00
7.50
7.00
6.50
pH
0.6
1.1
2.1
0.3
1.1
2.1
0.6
2.0
3.0
4.1
4.9
0.1
1.1
2.1
3.1
0.3
1.6
2.3
3.8
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date



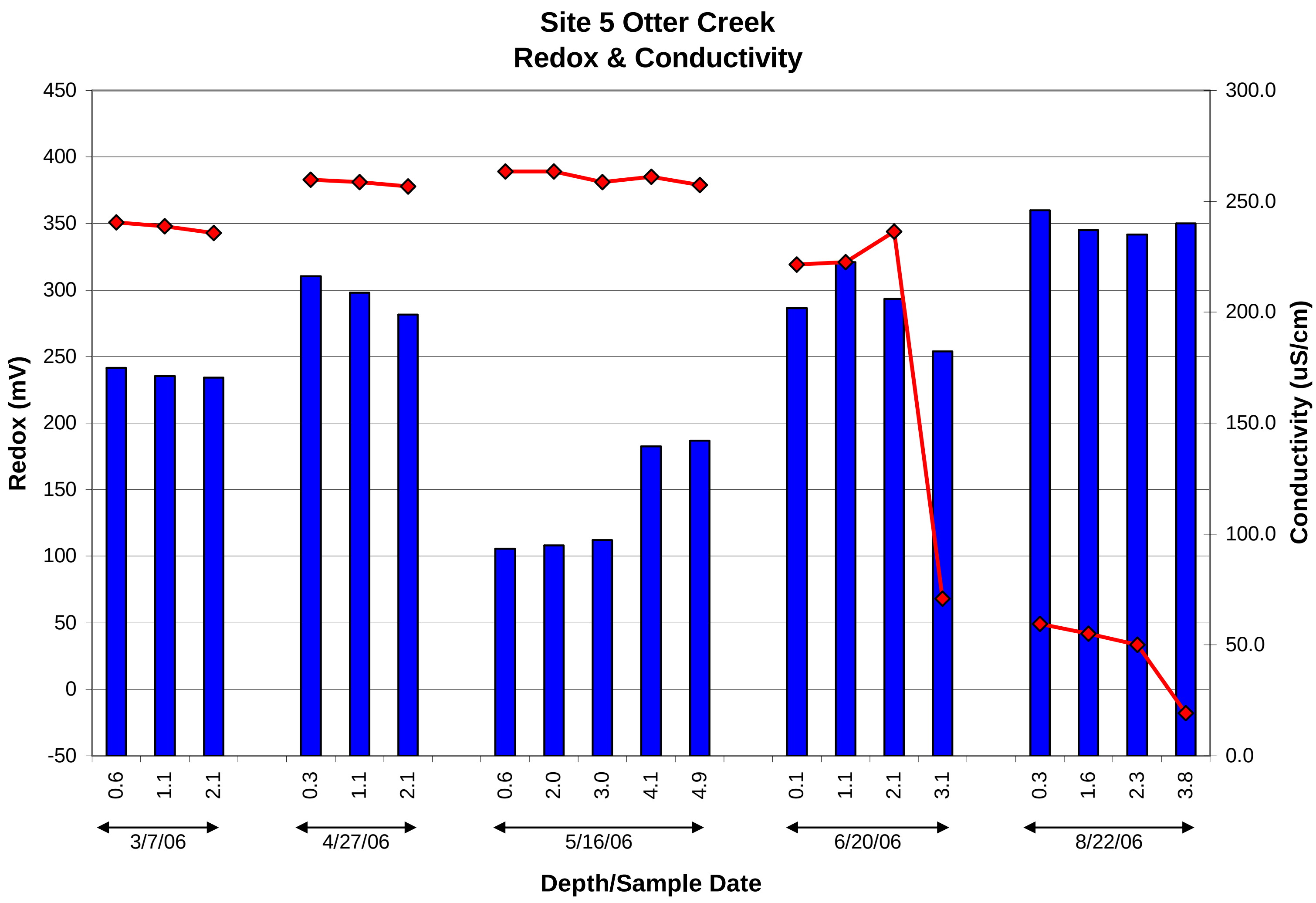
Site 6 Greenville
pH
8.4
8.2
8
7.8
7.6
7.4
7.2
pH
0.4
1.2
2.1
0.3
1.2
2.1
0.2
1.1
2.0
3.0
4.0
5.1
0.3
1.1
2.0
3.1
0.3
1.5
2.4
3.0
3/7/07
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date


Site 7 Hwy 34 Bridge
pH
8.40
8.20
8.00
7.80
7.60
7.40
7.20
pH
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample Date

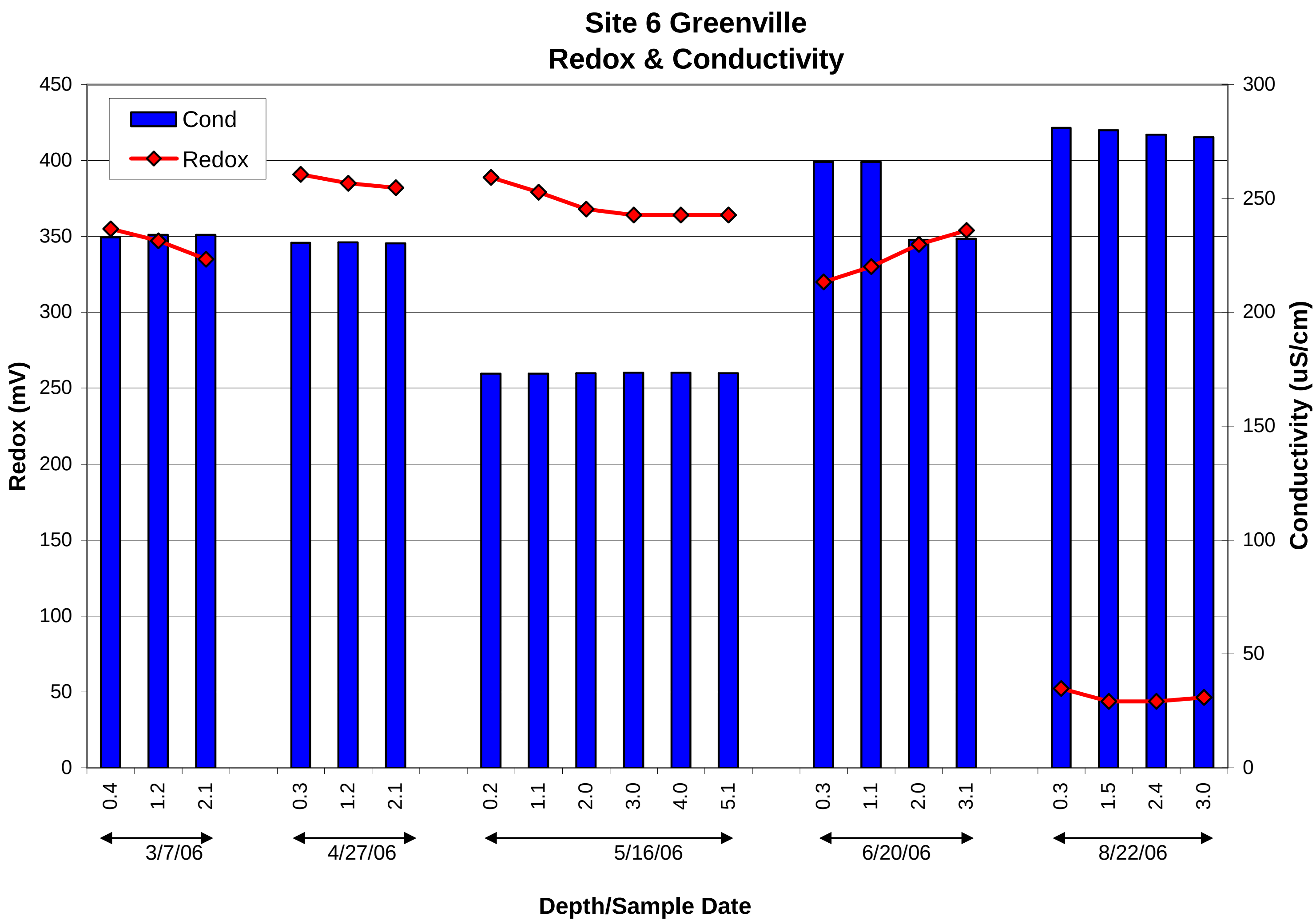

Site 1 Spillway
Redox & Conductivity
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Redox (mV)
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample Date

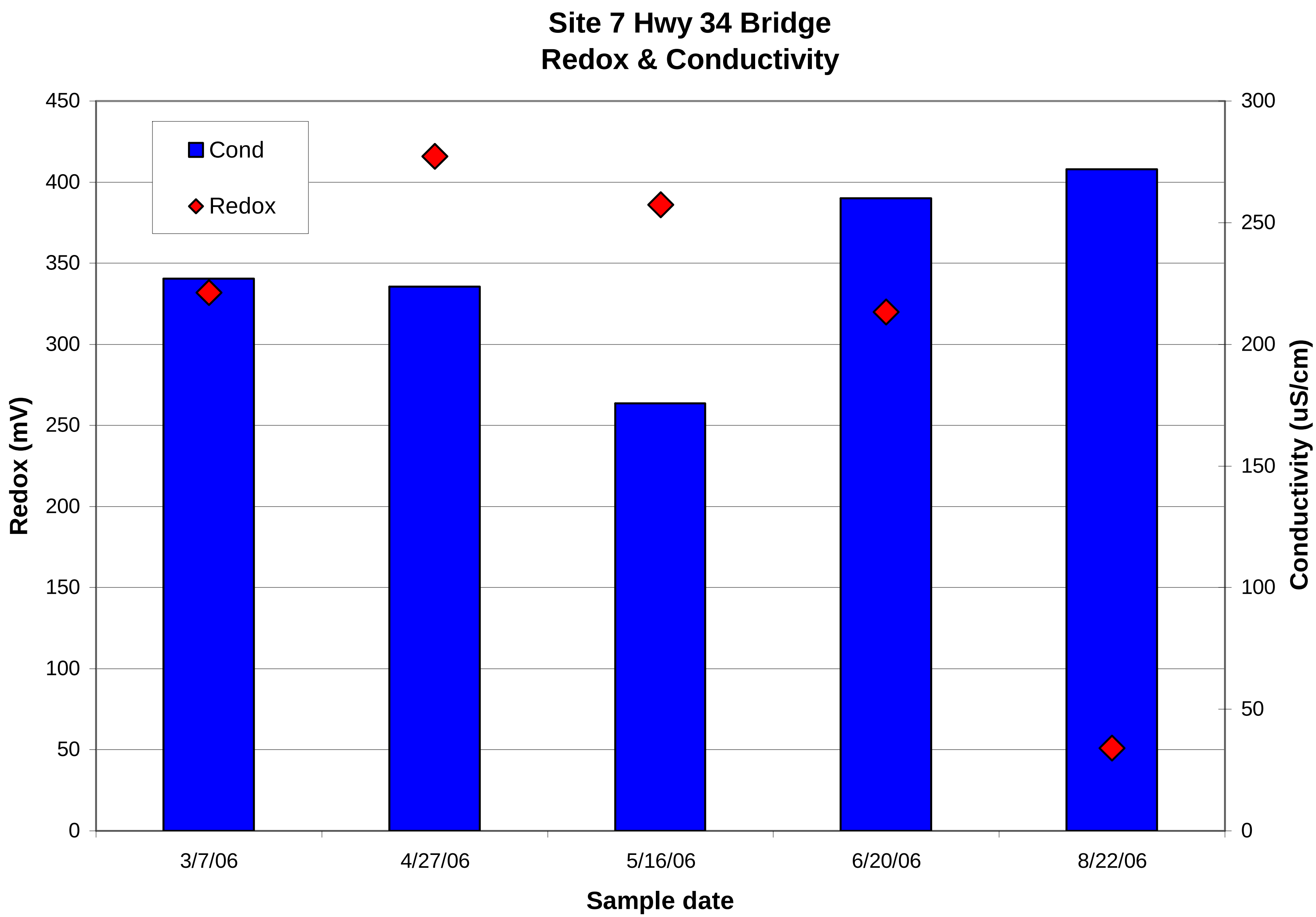


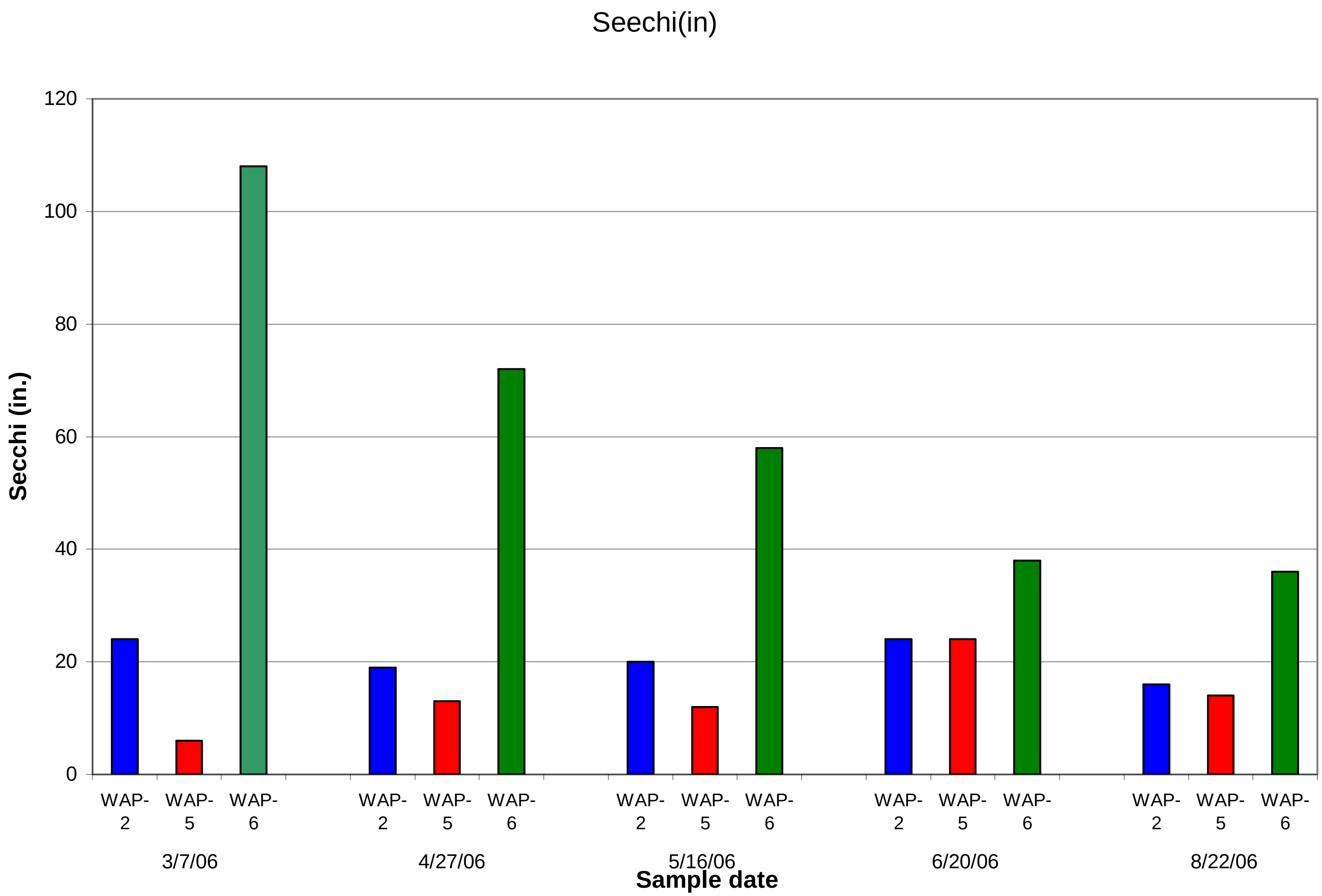
Site 2 Lake Side of Dam
Redox & Conductivity
Redox (mV)
Conductivity (uS/cm)
Cond
Redox
500
400
300
200
100
0
-100
-200
-300
-400
350
300
250
200
150
100
50
0
0.5 1.3 2.0 3.0 4.1 5.1 6.1 7.1 8.2
0.4 1.0 2.1 3.8 4.0 5.0 6.0 7.0 8.0 9.0 10.0
0.2 1.0 1.9 3.1 4.2 5.0 6.1 6.9 8.1 9.1 10.5 11.3
0.2 1.1 2.1 3.0 4.0 5.1 6.1 7.1 8.1 9.2 10.2
0.2 1.6 2.6 3.8 4.8 5.7 6.5 7.6 8.6 9.6 10.3
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date



Site 5 Otter Creek
Redox & Conductivity
Redox (mV)
Conductivity (uS/cm)
450
400
350
300
250
200
150
100
50
0
-50
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0.6
1.1
2.1
0.3
1.1
2.1
0.6
2.0
3.0
4.1
4.9
0.1
1.1
2.1
3.1
0.3
1.6
2.3
3.8
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date


Site 6 Greenville
Redox & Conductivity
Cond
Redox
Redox (mV)
Conductivity (uS/cm)
450
400
350
300
250
200
150
100
50
0
300
250
200
150
100
50
0
0.4
1.2
2.1
0.3
1.2
2.1
0.2
1.1
2.0
3.0
4.0
5.1
0.3
1.1
2.0
3.1
0.3
1.5
2.4
3.0
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Depth/Sample Date


Site 7 Hwy 34 Bridge
Redox & Conductivity
Cond
Redox
Redox (mV)
Conductivity (uS/cm)
450
400
350
300
250
200
150
100
50
0
300
250
200
150
100
50
0
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample date



Seechi(in)
Secchi (in.)
0
20
40
60
80
100
120
WAP-2
WAP-5
WAP-6
3/7/06
4/27/06
5/16/06
6/20/06
8/22/06
Sample date