Clean Charles 2005 Water Quality Report
2004 Core Monitoring Program
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Prepared By

US EPA

Office of Environmental Measurement and Evaluation

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EXECUTIVE SUMMARY

Purpose and Scope

In 1995, the U.S. Environmental Protection Agency - New England (EPA) established the Clean Charles 2005 Initiative to restore the lower Charles River (from Watertown to Boston harbor) to a swimmable and fishable condition by Earth Day in the year 2005. The initiative incorporated a comprehensive approach for improving water quality through: Combined Sewer Overflow (CSO) controls, illicit sanitary connection removals, stormwater management, public outreach, education, monitoring, enforcement, technical assistance, and the development of a Total Maximum Daily Load (TMDL) for the Lower Charles.

In 1998, EPA's Office of Environmental Measurement and Evaluation (OEME) initiated the Clean Charles 2005 Core Monitoring Program. The purpose of the program was to track water quality improvements in the lower Charles River and to identify where further pollution reductions or remediation actions were necessary to meet the Clean Charles 2005 Initiative goals. The program was designed to sample during the summer months coinciding with peak recreational uses.

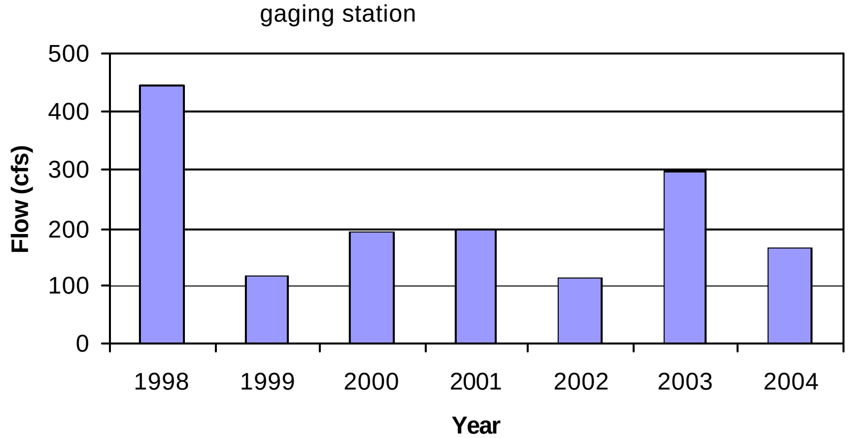
The program monitored twelve "Core" stations. Ten of these twelve stations were located between the Watertown Dam and the New Charles River Dam, one station was located on the upstream side of the Watertown Dam and another was located immediately downstream of the South Natick Dam (to establish upstream boundary conditions). Five sampling stations were located in priority resource areas, which were identified as potential wading and swimming locations (see attachment). Six of the twelve stations were monitored during wet weather conditions. The Core Monitoring Program measured the following parameters: dissolved oxygen, temperature, pH, specific conductance, turbidity, clarity, transmissivity, chlorophyll a, total organic carbon, total suspended solids, apparent and true color, nutrients, bacteria, and dissolved metals.

Conclusions of the 2004 Core Monitoring Program

The summary below reflects the 2004 Core Monitoring Program data and the water quality conditions from 1998 to 2004.

In addition to point source and non-point source pollutant loadings, water quality was influenced by yearly fluctuations in weather and river flows, making short-term trends difficult to determine. The weather conditions and river flow affect the transport of pollutants in the watershed. The summertime flow data collected at the Waltham USGS gaging station revealed that in 2004, from July to the beginning of September flows were higher than the drier years of 1999 and 2002. In general, the 2004 summer flows were less than the flows recorded during 1998. In 1998, the summer conditions were generally wetter with correspondingly higher flows (Figure 1a).

Figure 1a: Mean Summer Stream Flow at USGS Waltham, MA gaging station



Mean summer stream flow = the average of June through September

When comparing the 2004 data to the past six years of data, the following conclusions can be made. The best

water quality occurred near the mouth of the River (Mass Ave. Bridge to the New Charles River Dam; CRBL07- CRBL12). This part of the river met the swimming standards more often than any other part of the lower Charles River.
The greatest clarity was recorded during the lower flow years of 1999 and 2002 at the stations near the mouth of the River. Although, 2004 was not as dry as the summers' of 1999 and 2002, the clarity was similar to those years near the mouth of the River. In 2004, the measured bacteria levels were generally less than those of previous years. When examining nutrient concentrations, the mean total phosphorus values show a slight decreasing trend over the past seven years. During 2002, elevated nutrient concentrations were measured in the water below the pycnocline (the interface between water of different densities).

Clarity, Color and Transmissivity

Water clarity was directly measured in the field using a Secchi disk. In 2004, at most of the stations downstream of the Mass Ave Bridge the mean Secchi disk readings were similar to the drier years of 1999 and 2002. In 2004, generally, the greatest clarity was recorded in this area and 67% of samples in this area met the Massachusetts Department of Environmental Protection primary contact (swimming) use support criterion of greater than or equal to 1.2 meters. The lowest clarity was measured at all stations during September. Based on the data collected over the last seven years, the most downstream station (upstream of the New Charles River Dam) met the MA DEP clarity swimming criterion over 85% of the time, while the station at Magazine beach met the criterion less than 15% of the time.

Transmissivity, a measurement of water clarity which is independent of external light, was measured at all stations during 2004. As with Secchi disk readings, transmissivity was the lowest from Herter Park East to the Boston University Bridge (CRBL04 - CRBL06).

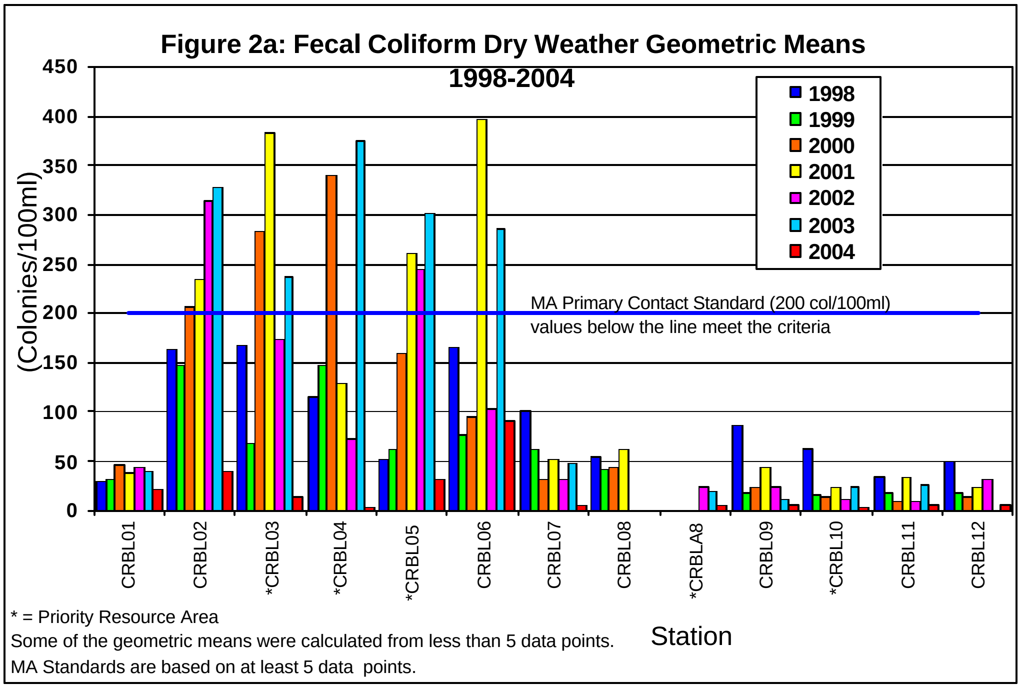
True and apparent color were additional measurements used to evaluate water clarity. In 2004, mean dry weather true color values were generally lower than dry weather mean values from previous years. As identified in a previous report (EPA 2004), it appears that part of the color was associated with particulate matter. This implies that controlling algae growth and preventing particulates from being discharged could enhance the water clarity.

Bacteria

In 2004, during dry weather, approximately 8% of the core monitoring fecal coliform samples exceeded the swimming criterion[1] of less than 200 colonies/100ml (compared to 35%, 31%, 35%, 23%, 8%, and 17% in 2003, 2002, 2001, 2000, 1999 and 1998, respectively). During wet weather, approximately 17 % of the core monitoring fecal coliform samples exceeded the swimming criterion[1] (compared to 46%, 44%, 63%, and 50% in 2002, 2001, 2000, and 1999, respectively). Fecal coliform concentrations were generally lower near the mouth of the River (Mass Ave. Bridge to the New Charles River Dam; CRBL07 - CRBL12). This is a consistent trend, which has occurred in the previous six years of data collection (Figure 2a). During 2004, there were no samples that exceeded the swimming criterion[1] at stations CRBL07 - CRBL12 for dry or wet weather conditions. The area from station CRBL07 - CRBL12 is the most heavily recreated part of the River. This area contains the MIT (Massachusetts Institute of Technology) Sailing Pavilion and Community Boating where much sailing, kayaking, windsurfing, and occasional contact with the water occurs. From the Watertown Dam to the Mass Ave. Bridge (CRBL02 - CRBL06) the criterion[1] was exceeded 28% of the time during dry and wet weather.

1 The Massachusetts fecal coliform swimming criterion of less than 200 colonies/100ml is actually based on a geometric mean of five samples or more. For this report, individual concentrations were compared to this criterion.

The 2004 dry weather fecal coliform geometric means[1] were generally less than those from previous years. At eleven of the twelve stations the geometric means[1] were less than those of all previous years (Figure 2a). It should be noted that the 2004 geometric means were calculated from 2 to 4 data points.



E. coli bacteria was sampled during all sampling events. Of all the dry and wet weather samples, two exceeded the single sample Department of Public Health (DPH) Bathing Beach criterion[2] and none of the calculated geometric means[1] exceeded the geometric mean DPH Bathing Beach criterion[2].

One or approximately 3% of all dry weather core monitoring samples exceeded the E. coli DPH Bathing Beach criterion[2] for a single sample (compared to 14%, 17%, 19%, and 35% in 2003, 2002, 2001, and 1998, respectively).

Dissolved Oxygen (DO), pH and Temperature

Dissolved Oxygen (DO) is required for a healthy ecosystem. Fish and other aquatic organisms require DO for survival. Massachusetts has established DO criterion[3] for class B waters. No DO violations were measured during 2004 in the surface water (compared to 0%, 1%, 0%, 0%, 3%, and 0% in 2003, 2002, 2001, 2000, 1999, and 1998, respectively). As identified in previous reports, bottom DO levels (EPA 2002) fail to meet the state DO criterion[3].

The pH of an aquatic system is an important parameter in evaluating toxicity. High acidity (a low pH) can convert insoluble metal sulfides to soluble forms, which increases the bioavailability. A high pH can also cause ammonia toxicity (EPA 1998). The data from all the dry and wet weather core monitoring surface measurements showed pH violated the criterion[3] ten times or approximately 12% of all field measurements (compared to 14%, 22%, 18%, 20%, 8%, and 4% in 2003, 2002, 2001, 2000, 1999, and 1998, respectively). All but one surface violation were greater than 8.3.

Temperature is a crucial factor in maintaining a natural ecosystem. Changes in the temperature can alter the existing or natural aquatic community (EPA 1986). Temperature also governs many biochemical and

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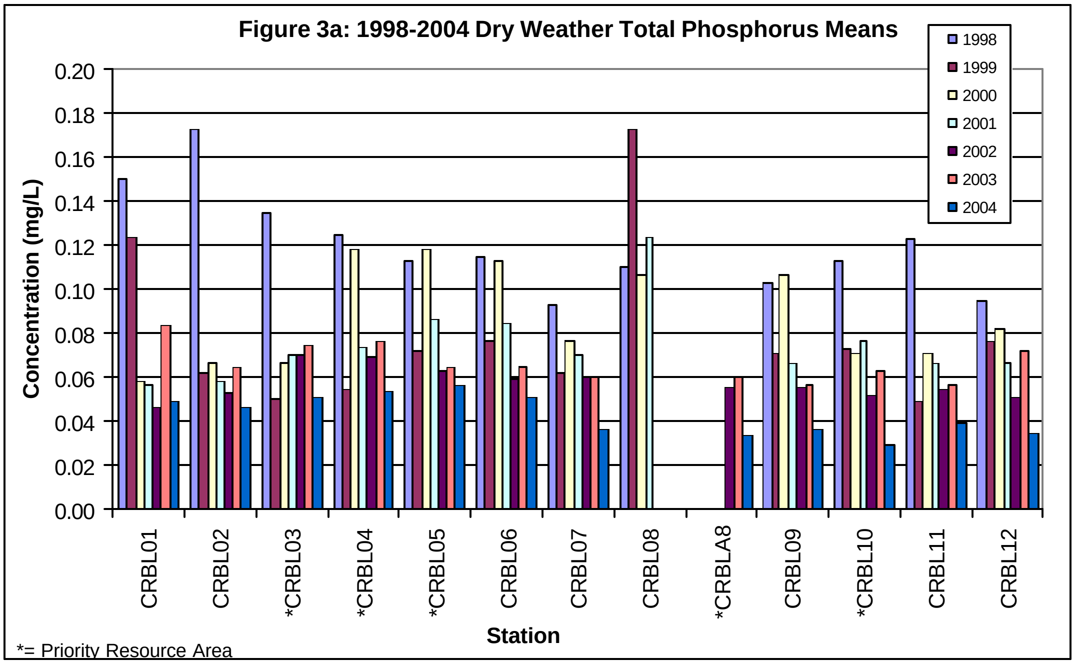
[1]Some of the dry weather geometric means were calculated from less than five data points; the actual criterion is based on a geometric mean of five samples or more.

[2]The Massachusetts DPH E. coli Bathing Beach criterion for as single sample is less than or equal to 235 colonies/100ml. The geometric mean criterion is less than or equal to 126 colonies/100ml and is based on a geometric mean of the most recent five samples within the same bathing season.

[3] The Massachusetts water quality criteria for Class B water for DO is $\geq$ 5 mg/l and $\geq$60% saturation, for pH is in the range of 6.5 through 8.3, and for temperature is $\leq$ 28.3°C (83°F).

physiological processes in cold-blooded aquatic organisms (such as fish and the organisms they feed on). Increased temperature decreases the oxygen solubility in water and this can exacerbate the impact of oxygen-demanding waste. The highest surface water temperature was recorded on August 30 between the Longfellow Bridge and the Old Dam (CRBL11) at 27.7 °C (81.9°F). During 2004, there were no recorded temperature measurements above the state criterion[1].

Nutrients



Elevated levels of nutrients in the water can lead to excessive growth of algae and other instream plants. This can cause nuisance conditions and reduce oxygen in the water during times of respiration. Phosphorus was the most significant nutrient in this system. Elevated phosphorus concentrations at many of the sampling stations indicated highly eutrophic conditions. All except four sample results exceeded the EPA recommended Ambient Water Quality Criterion (AWQC) for rivers and streams and all sample results exceeded the recommended criterion for lakes and reservoirs (EPA, 2001). In 2004, eight of the twelve stations recorded the lowest dry weather mean compared to all previous years. There appears to be a slight decreasing trend in phosphorus levels at most of the stations over the past seven years (Figure 3a).

In 2002, additional nutrient samples were collected at selected stations from various depths to support the development of a water quality model for the Total Maximum Daily Load (TMDL). The results from this sampling showed elevated concentrations of total phosphorus, ortho-phosphorous, total kjeldahl nitrogen, and ammonia below the pycnocline (the interface between water of different densities).

Metals

Metals concentrations were compared to the acute and chronic AWQC. These criteria set forth by Section 304(a)(1) of the Clean Water Act are established for the protection of aquatic life as well as for human health. The acute criterion is established to be protective of short term effects while the chronic criterion is protective of a long term exposure. Copper concentrations measured at two stations exceeded the copper acute AWQC. These two measurements were measured on August 10. No other acute AWQC were exceeded.

Lead and copper were the only metals that had measured concentrations that exceeded the chronic AWQC. For copper, the criterion was exceeded twice (these are described above in the acute exceedences) and for lead

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[1] Massachusetts water quality criteria for Class B water for DO is $\geq$ 5 mg/l and $\geq$60% saturation, for pH is in the range of 6.5 through 8.3, and for temperature is $\leq$ 28.3°C (83°F).

the criterion was exceeded 17 times. Twelve of these lead exceedences occurred during wet weather. Approximately, 12% of the dry weather lead samples exceeded the chronic criteria (compared to 50%, 21%, 33%, 27%, and 8% in 2003, 2002, 2001, 2000, and 1999, respectively). Sources of lead and copper can include, domestic plumbing, pesticides and herbicides, automobiles, and industrial waste. The other measured priority pollutants metals (arsenic, cadmium, chromium, copper, mercury, nickel, selenium, silver, and zinc) did not exceed the AWQC.

2.0 BACKGROUND

The Charles River watershed is located in eastern Massachusetts and drains 311 square miles from a total of 24 cities and towns. Designated as a Massachusetts class B water, the Charles is the longest river in the state and meanders 80 miles from its headwaters at Echo Lake in Hopkinton to its outlet in Boston Harbor. From Echo Lake to the Watertown Dam, the River flows over many dams and drops approximately 340 feet. From the Watertown Dam to the New Charles River Dam in Boston, the River is primarily flat water (EPA 1997). This section, referred to as "the Basin" or the “Lower Charles”, is the most urbanized part of the River and is used extensively by rowers, sailors and anglers. A Metropolitan District Commission (MDC) park encompasses the banks of the River and creates excellent outdoor recreational opportunities with its open space and bicycle paths.

The section between the Boston University Bridge and the New Charles River Dam, once a tidal estuary, is now a large impoundment. During low flow conditions of the summer, this section consists of fresh water overlying a wedge of saltwater. Sea walls define a major portion of the banks and shoreline of this section.

The Charles River shows the effects of pollution and physical alteration that has occurred over the past century. The water quality in the Basin is influenced by point sources, storm water runoff and CSO's. An EPA survey identified over 100 outfall pipes in the Basin (EPA 1996).

3.0 INTRODUCTION

In 1995, EPA established the Clean Charles 2005 Initiative, with a taskforce and numerous subcommittees, to restore the Charles River to a swimmable and fishable condition by Earth Day in the year 2005. The Initiative’s strategy was developed to provide a comprehensive approach for improving water quality through CSO controls, removal of illicit sanitary connections, stormwater management planning and implementation, public outreach, education, monitoring, enforcement, technical assistance, and scientific studies.

In 1998, EPA’s Office of Environmental Measurement and Evaluation (OEME) implemented a water quality monitoring program (Core Monitoring Program) in the Charles River. EPA and its partners on the Taskforce’s water quality subcommittee developed a study design to track improvements in the Basin and to identify where further pollution reductions or remediation actions were necessary to meet the swimmable and fishable goals. Members of the subcommittee included EPA-New England, U.S. Geological Survey (USGS), U.S. Army Corps of Engineers - New England District (ACE), Massachusetts Executive Office of Environmental Affairs (EOEA), Massachusetts Department of Environmental Protection (DEP), Massachusetts Department of Environmental Management (DEM), Massachusetts Water Resources Authority (MWRA), Boston Water and Sewer Commission (BWS), Charles River Watershed Association (CRWA) and the MDC. In addition to the Core Monitoring Program, EPA and its partners continue to support other water quality studies in the Charles River to further identify impairment areas and to evaluate management techniques.

EPA’s Core Monitoring Program was designed to sample twelve stations during three dry weather periods and six (of the twelve) stations during three different wet weather events. The monitoring was focused in the Boston and Cambridge areas of the River during peak recreational usage in July, August and September. To establish a boundary condition, one station was located immediately downstream from the South Natick Dam or 30.5 miles upstream from the Watertown Dam. One station was located above the Watertown Dam and the other ten stations were located in the Basin. Five of these ten sampling stations were located in priority resource areas (potential wading and swimming locations). The project map (Figure 1) shows the locations of the: dry and wet weather core monitoring sampling stations, priority resource areas, CSO's, and stormwater discharge pipes. Table 1 describes the stations monitored in 2004.

The 1998 monitoring program included measurements of dissolved oxygen (DO), temperature, pH, specific conductance, chlorophyll a, total organic carbon (TOC), total suspended solids (TSS), apparent color, clarity, turbidity, nutrients, bacteria and total metals. Chronic toxicity was also tested during dry weather conditions. In 1999, dissolved metals and true color were added to the analyte list. Dissolved metals were added to better assess the metals concentration in relationship to the AWQC, which are based on the dissolved metals fraction. True color was added to help determine the causes of reduced clarity. In 2000, the analyte list was unchanged.

In 2001, transmissivity was added as an additional measurement of water clarity. In addition, E. coli bacteria was added and enterococcus bacteria was discontinued. This modification was made to reflect the changes to the Massachusetts Department of Public Health (DPH) Minimum Standards for Bathing Beaches regulations, which allowed the use of E. coli bacteria for determining compliance in freshwater.

In 2002, the Core Monitoring station inside the pond at the esplanade (CRBL08) was relocated to the main stem of the Charles and designated as CRBLA8. This station was repositioned to evaluate an alternative priority resource area. The previous station consistently measured poor water quality and did not meet the initiatives goals. In addition, modifications were made to the Program to support the development of a three-dimensional hydro-dynamic linked water quality model. The model will be used for the development of a eutrophication Total Maximum Daily Load (TMDL) to address low dissolved oxygen, numerous aesthetic impairments, algae blooms and pH violations in the Basin. Sampling stations, sampling parameters, and additional sampling dates were added to provide data for the model development. Seven additional (TMDL) stations were added between the BU Bridge and the Museum of Science.

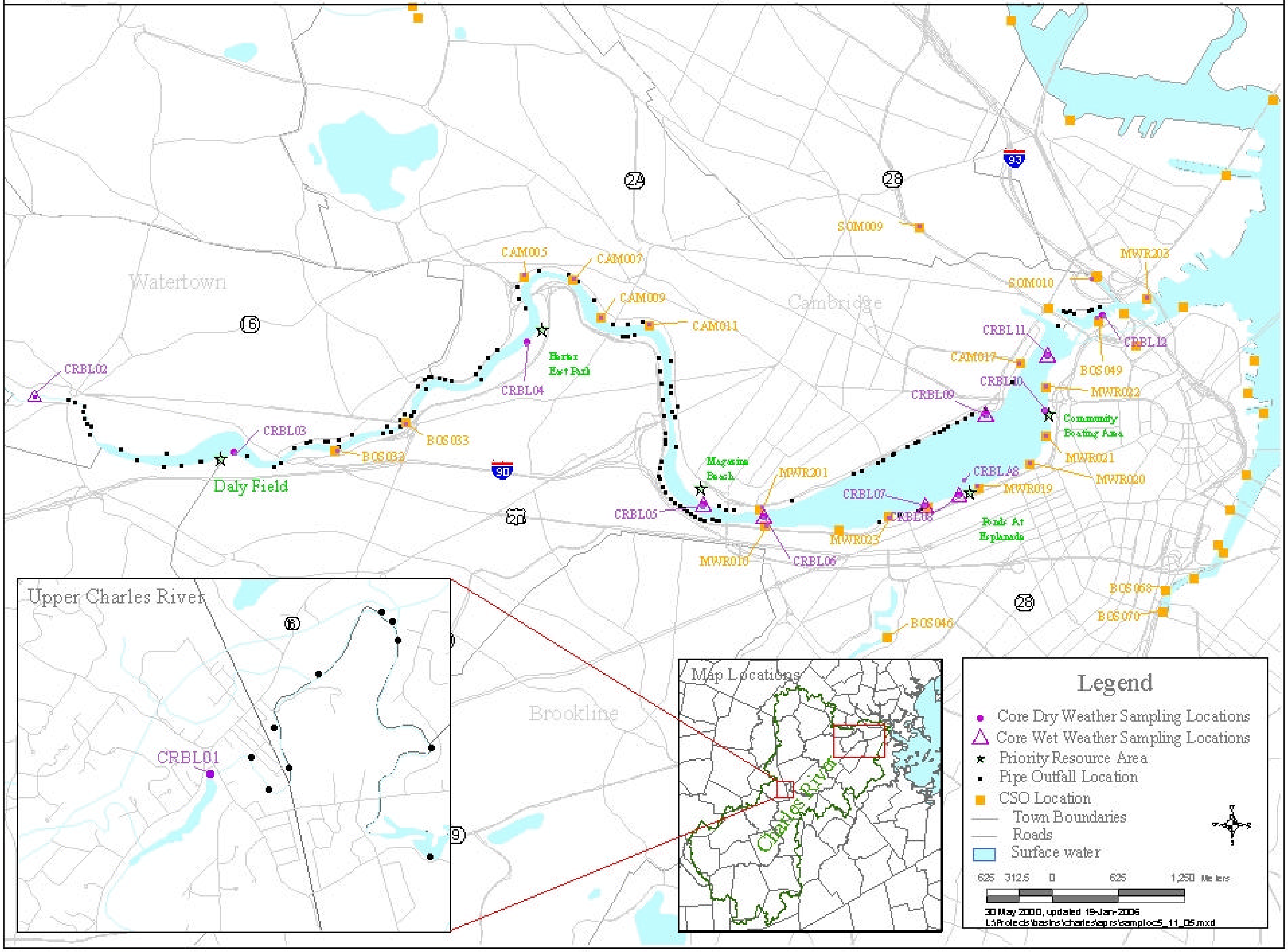
In 2003, having completed the data collection phase of the TMDL, the additional parameters and stations added to the sampling program in 2002 were discontinued. No other changes were made to the program in 2003. In 2004, there were no changes made to the analyte list. The description of the Core Monitoring sampling stations are presented in Table 1 and a location map is shown in Figure 1.

Table 1: Sampling Station Description

PRIMARY CORE MONITORING STATION DESCRIPTIONS	STATION #
Downstream of S. Natick Dam	CRBL01
Upstream of Watertown Dam	CRBL02 WW
Daly Field, 10 m off south bank	**CRBL03**
Herter East Park, 10 m off south bank	**CRBL04**
Magazine Beach, 10 m off north bank	**CRBL05 WW**
Downstream of BU Bridge – center channel	CRBL06 WW
Downstream of Stony Brook & Mass Ave, 10 m off South shore	CRBL07 WW
~~Pond at Esplanade~~	**~~CRBL08~~**
Off the Esplanade (new station in 2002)	**CRBLA8**
Upstream of Longfellow Bridge, Cam. Side	CRBL09 WW
Community boating area	**CRBL10**
Between Longfellow Bridge & Old Dam – center channel	CRBL11 WW
Upstream of Railroad Bridge – center channel	CRBL12

Bold = Priority resource area station
WW = Wet weather sampling station
~~CRBL08~~ = Discontinued station

Figure 1: EPA Core Monitoring Locations and Priority Resource Areas



1.0 PROJECT DESCRIPTION

The Core Monitoring Program targets one dry weather sampling event for each month of July, August, and September and three wet weather events between July and September. If no significant storms are sampled between July and September the wet weather sampling season is extended into October.

The dry weather sampling goal was to sample on days that were preceded by three days during which a total of less than 0.20 inches of rain occurs. Dry weather sampling was conducted on July 13, August 10, and September 14. In addition to these sampling days a pre-storm sampling was conducted on August 30. This pre-storm sampling event met the dry weather criterion and is included in the dry weather sample analysis.

The approach for each wet weather event was to sample six stations during four storm periods; pre-storm, first flush, peak flow and post-storm. The pre-storm was sampled before the rain began. The first flush sampling began when the rain became steady and one hour after the measured stage in the Laundry Brook culvert increased by at least 0.5 inches. The peak flow sampling began when rain intensity peaked and the stage reading was greatest in the Laundry Brook culvert. In previous sampling years, it was identified that peak rain intensity coincides with maximum stage or peak flow in Laundry Brook (EPA 2001). Post-storm sampling occurred when the rain ceased and the flow at Laundry Brook returned to near pre-storm conditions.

The Core Monitoring Program was designed to sample three wet weather events. In 2004, weather conditions and the timing of the storms only allowed for two wet weather event to be sampled. The first wet weather sampling occurred on September 8. The associated storm dropped 1.84 inches of rainfall[1]. The second event occurred on September 18 and the associated storm dropped 2.17 inches of rainfall[1]

The parameters analyzed during 2004 Core Monitoring Program are listed in Table 2. The EPA's OEME and Office of Ecosystem Protection (OEP) field staff conducted all the sampling and field measurements. Samples were analyzed by OEME and contract laboratories.

Table 2: Parameters Analyzed During the 2004 Sampling Events

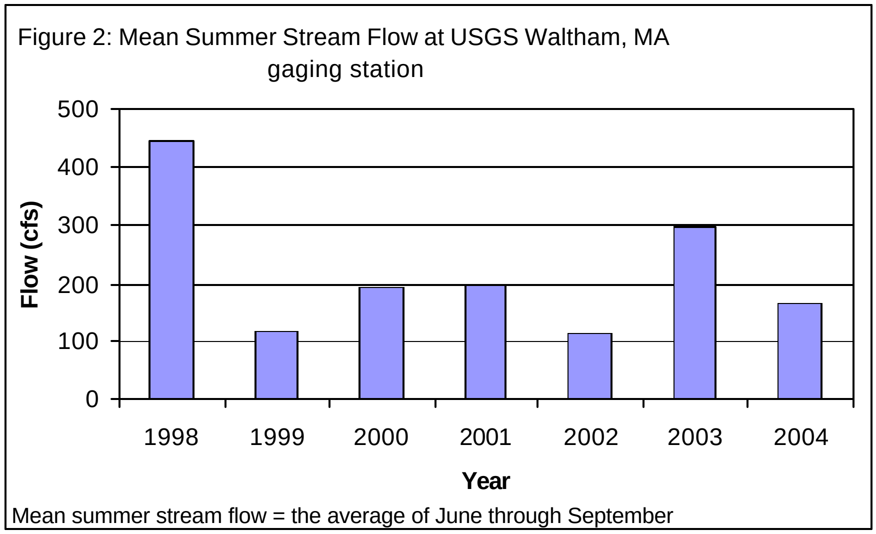
Field Measurements	Bacteria	Nutrients	Total Metal	Dissolved Metals	Other Parameters
dissolved oxygen, temperature, pH, specific conductance, turbidity, Secchi disk, transmissivity	fecal coliform E. coli.	total phosphorus (TP), ortho-phosphorus (OP), nitrate (NO_2), nitrite (NO_3), ammonia (NH_3)	Hg	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn	TSS, TOC, chlorophyll a, apparent + true color,

5.0 DATA ANALYSIS

The seventh year of the Core Monitoring Program was completed in 2004. In addition to point source and non-point source pollutant loadings, water quality was influenced by yearly fluctuations in weather and river flows, making short-term trends difficult to determine. The weather conditions and river flow affect the transport of pollutants in the watershed. Rain events can cause pollutants to be transported from the landscape and can cause an increase in river flow. Increased flow can lead to greater channel loads from the erosion and resuspension of sediments and particulates.

[1] Rainfall data was collected at the USGS Muddy River gaging station.

The summertime flow data collected at the Waltham USGS gaging station revealed that in 2004, from July to the beginning of September flows were higher than the drier years of 1999 and 2002. In general, the 2004 summer flows were less than the flows recorded during 1998. In 1998, the summer conditions were generally wetter with correspondingly higher flows (Figure 2).

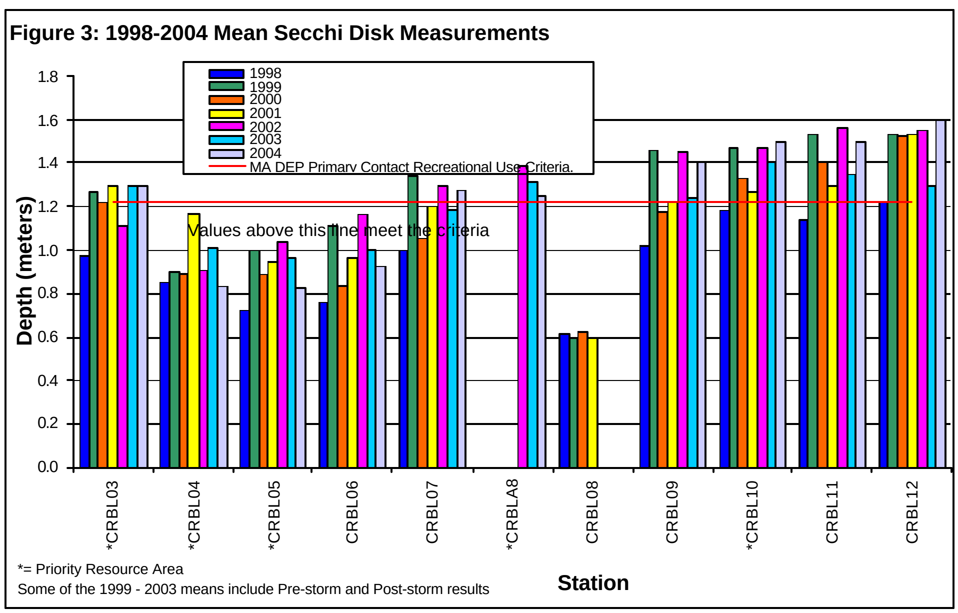


When comparing the 2004 data to the past six years of data, the following conclusions can be made. The best water quality occurred near the mouth of the River (Mass Ave. Bridge to the New Charles River Dam; CRBL07- CRBL12). This part of the river met the swimming standards more often than any other part of the lower Charles River.

The greatest clarity was recorded during the lower flow years of 1999 and 2002 at the stations near the mouth of the River. Although, 2004 was not as dry as the summers' of 1999 and 2002 the clarity was similar to those years near the mouth of the River. In 2004, the measured bacteria levels were generally less than those of previous years. When examining nutrient concentrations, the mean total phosphorus values show a slight decreasing trend over the past seven years. During 2002, elevated nutrient concentrations were measured in the water below the pycnocline (the interface between water of different densities).

5.1 Clarity, Apparent color, True color, TSS, Turbidity, TOC, Transmissivity and Chlorophyll a

Water clarity was directly measured in the field using a Secchi disk. In 2004, at most of the stations downstream of the Mass Ave Bridge the mean Secchi disk readings were similar to the drier years of 1999 and 2002 (Figure 3). In 2004, generally, the greatest clarity was recorded in this area and 67% of samples in this area met the Massachusetts Department of Environmental Protection primary contact (swimming) use support criterion of greater than or equal to 1.2 meters. The lowest clarity was measured at all stations during September. Based on the data collected over the last seven years, the most downstream station (upstream of the New Charles River Dam) met the MA DEP swimming criterion over 85% of the time, while the station at Magazine beach met the criterion less than 15% of the time.



True and apparent color were additional measurements used to evaluate water clarity. In 2004, mean dry weather true color values were generally lower than dry weather mean values from previous years. As identified in the 1999 Core Monitoring Program Report (EPA 2000) it appears that part of the color was associated with suspended matter. This implies that reducing suspended matter and nutrients that stimulate algae growth could enhance the clarity of the water. Other sources of suspended matter include non-point, point sources (such as storm water and CSO's), resuspended bottom sediments, bank erosion, and other natural sources.

All measured TSS concentrations were less than the Massachusetts water quality standard (Table 3). Total suspended solids dry weather mean values were generally highest at the station above and below the BU Bridge; station CRBL05 and CRBL06, respectively. During previous years, the highest dry weather mean values were recorded at these locations and the stations at Herter East Park (CRBL04) and in the Lagoon (CRBL08).

Turbidity and Total Organic Carbon (TOC) were additional measurements of suspended and dissolved matter in the water. All turbidity values were recorded as estimated data because the proper probe guard was not used, which may have caused interference with the measurements. The highest turbidity measurements were measured at the stations at and above CRBL06 (Downstream of the BU Bridge). At each station, the highest TOC values were recorded at the end of August or in the beginning of September.

Transmissivity, a measurement of water clarity which is independent of external light, was measured at all stations during dry weather. As with Secchi disk readings, transmissivity was the lowest from Herter Park East to the Boston University Bridge (CRBL04 - CRBL06).

Chlorophyll a was one of the parameters measured to assess eutrophication in the Basin. Because Massachusetts does not have numeric nutrient or chlorophyll a criteria for assessing eutrophication of lakes and rivers, the total phosphorus and chlorophyll a concentrations were compared to regional criteria. Since ten of the twelve stations are located in the basin, which is a large impounded body of water with characteristics more similar to a lake than a river, criterion for lakes, ponds, and reservoirs were used for assessing water quality. For lakes, ponds and reservoirs in the North Eastern Coastal Zone the recommended criterion for chlorophyll a is approximately 2.5 ug/l (NEIWPCC, 2000). All measured values were reported above this criterion.

Table 3: Massachusetts Class B Surface Water Quality Standards and Guidelines for Warm Waters

Parameter	MA Surface Water Quality Standards (314 CMR 4.00) and Guidelines
Dissolved oxygen	$\geq$ 5 mg/l and $\geq$ 60% saturation
Temperature	$\leq$ 83°F (28.3°C) and ?3°F (1.7°C) in Lakes, ?5°F (2.8°C) in Rivers
pH	Between 6.5 and 8.3
Bacteria	See Table 4
Secchi disk depth	Lakes $\geq$ 1.2 meters (for primary contact recreation use support)
Solids	Narrative and TSS $\leq$ 25.0 mg/l (for aquatic life use support)
Color and turbidity	Narrative Standard
Nutrients	Narrative "Control of Eutrophication" Site Specific

5.2 Bacteria

The Massachusetts Department of Public Health (DPH) Minimum Standards for Bathing Beaches and the DEP Surface Water Quality Standards (314 CMR 4.00) establish maximum allowable bacteria criteria. These are summarized in Table 4.

Table 4: Massachusetts Freshwater Bacteria Criteria

Indicator Organism	MA DPH Minimum Criteria for Bathing Beaches (105 CMR 445.00)	MA DEP Surface Water Quality Standards (314 CMR 4.00) and water quality guidelines	
	Bathing beaches	Primary contact	Secondary contact
E. coli or	≤235 colonies/100ml and a geometric mean of most recent five samples ≤126 col/100ml	NA	NA
Enterococci	≤61 colonies/100ml and a geometric mean of most recent five samples≤33 col/100ml	NA	NA
Fecal coliform	NA	a geometric mean ≤200 col/100ml for ≥5 samples ≤400/100ml for not more than 10 % of the samples	a geometric mean ≤1000 col/100ml for ≥5 samples ≤2000/100ml for not more than 10 % of the samples
		≤400 col/100ml for <5 samples	≤2000 col/100ml for <5 samples

Note: NA = not applicable

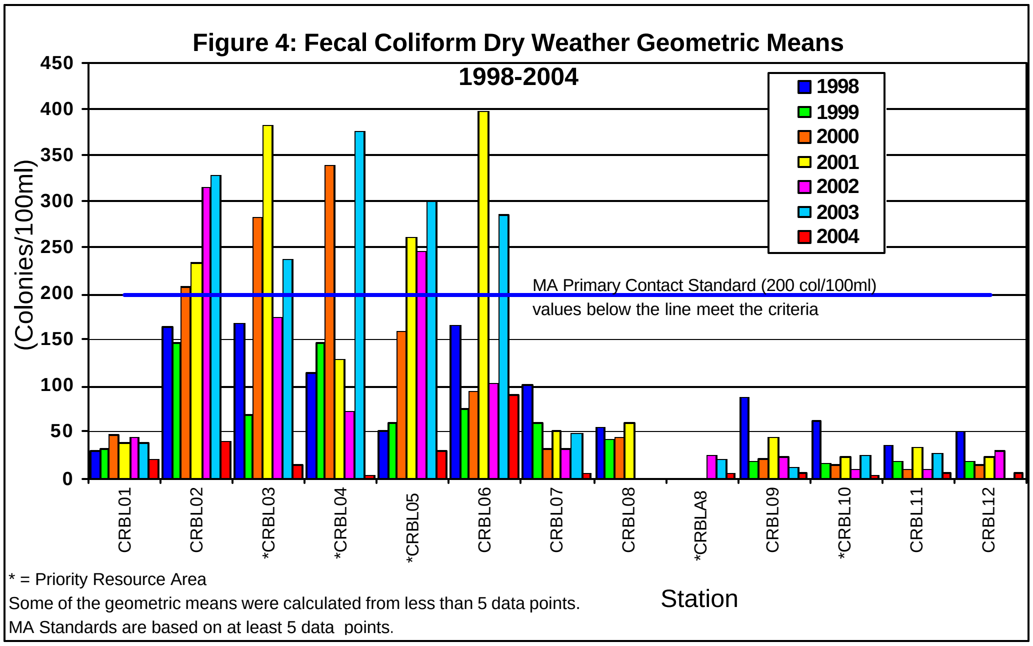
In 2004, during dry weather, approximately 8% of the core monitoring fecal coliform samples exceeded the swimming criterion[1] of less than 200 colonies/100ml (compared to 35%, 31%, 35%, 23%, 8%, and 17% in 2003, 2002, 2001, 2000, 1999 and 1998, respectively). During wet weather, approximately 17 % of the core monitoring fecal coliform samples exceeded the swimming criterion[1] (compared to 46%, 44%, 63%, and 50% in 2002, 2001, 2000, and 1999, respectively). Fecal coliform concentrations were generally lower near the mouth of the River (Mass Ave. Bridge to the New Charles River Dam; CRBL07 - CRBL12). This is a consistent trend, which has occurred in the previous six years of data collection (Figure 4). During 2004, there were no samples that exceeded the swimming criterion[1] at stations CRBL07 - CRBL12 for dry or wet weather conditions. The area from station CRBL07 - CRBL12 is the most heavily recreated part of the River. This area contains the MIT (Massachusetts Institute of Technology) Sailing Pavilion and Community Boating where much sailing, kayaking, windsurfing, and occasional contact with the water occurs. From the Watertown Dam to the Mass Ave. Bridge (CRBL02 - CRBL06) the criterion[1] was exceeded 28% of the time during dry and wet weather.

The 2004 dry weather fecal coliform geometric means[2] were generally less than those from previous years. At eleven of the twelve stations the geometric means[2] were less than those of all previous years (Figure 4). It should be noted that the 2004 geometric means[2] were calculated from 2 to 4 data points.

1 The Massachusetts fecal coliform swimming criterion of less than 200 colonies/100ml is actually based on a geometric mean of five samples or more. For this report, individual concentrations were compared to this criterion.

2 Some of the dry weather geometric means were calculated from less than five data points; the actual criterion is based on a geometric mean of five samples or more.

E. coli bacteria was sampled during all sampling events. Of all the dry and wet weather samples, two exceeded the single sample Department of Public Health (DPH) Bathing Beach criterion[1] and none of the calculated geometric means[2] exceeded the geometric mean DPH Bathing Beach criterion[1].



One or approximately 3% of all dry weather core monitoring samples exceeded the E. coli DPH Bathing Beach criterion for a single sample[1] (compared to 14%, 17%, 19%, and 35% in 2003, 2002, 2001, and 1998, respectively).

5.3 Dissolved Oxygen, pH, and Temperature

Dissolved Oxygen (DO) is required for a healthy ecosystem. Fish and other aquatic organisms require DO for survival. Massachusetts has established DO criterion[3] for class B waters. No DO violations were measured during 2004 in the surface water (compared to 0%, 1%, 0%, 0%, 3%, and 0% in 2003, 2002, 2001, 2000, 1999, and 1998, respectively). As identified in previous reports, bottom DO levels (EPA 2002) fail to meet the state DO criterion[3].

The pH of an aquatic system is an important parameter in evaluating toxicity. High acidity (a low pH) can convert insoluble metal sulfides to soluble forms, which increases their bioavailability. A high pH can also cause ammonia toxicity (EPA 1998). The data from all the dry and wet weather core monitoring surface measurements showed pH violated the criterion[3] ten times, or approximately 12% of all field measurements (compared to 14%, 22%, 18%, 20%, 8%, and 4% in 2003, 2002, 2001, 2000, 1999, and 1998, respectively). All but one surface violation were greater than 8.3.

Temperature is a crucial factor in maintaining a natural ecosystem. Changes in the temperature can alter the existing or natural aquatic community (EPA 1986). Temperature also governs many biochemical and physiological processes in cold-blooded aquatic organisms (such as fish and the organisms they feed on). Increased temperature decreases the oxygen solubility in water and this can exacerbate the impact of oxygen-demanding waste. The highest surface water temperature was recorded on August 30 between the Longfellow

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[1] The Massachusetts DPH E. coli Bathing Beach criterion for as single sample is less than or equal to 235 colonies/100ml. The geometric mean criterion is less than or equal to 126 colonies/100ml and is based on a geometric mean of the most recent five samples within the same bathing season.

[2] Some of the dry weather geometric means were calculated from less than five data points; the actual criterion is based on a geometric mean of five samples or more.

[3] The Massachusetts water quality criteria for Class B water for DO is $\geq$ 5 mg/l and $\geq$60% saturation, for pH is in the range of 6.5 through 8.3, and for temperature is $\leq$ 28.3^{o}C (83^{o}F).

Bridge and the Old Dam (CRBL11) at 27.7 °C (81.9°F). During 2004, there were no recorded temperature measurements above the state criterion[1].

5.4 Nutrients

Elevated levels of nutrients in the water can lead to excessive growth of algae and other instream plants. This can cause nuisance conditions and reduce oxygen in the water during times of respiration. Phosphorus was the most significant nutrient in this system. Elevated phosphorus concentrations at many of the sampling stations indicated highly eutrophic conditions. All except four sample results exceeded the EPA recommended Ambient Water Quality Criterion (AWQC) for Rivers and Streams and all sample results exceeded the recommended criterion for lakes and reservoirs (EPA, 2001). In 2004, eight of the twelve stations recorded the lowest dry weather means compared to all previous years. Based on these data, there appears to be a slight decreasing trend in phosphorus levels at most of the stations over the past seven years (Figure 5).

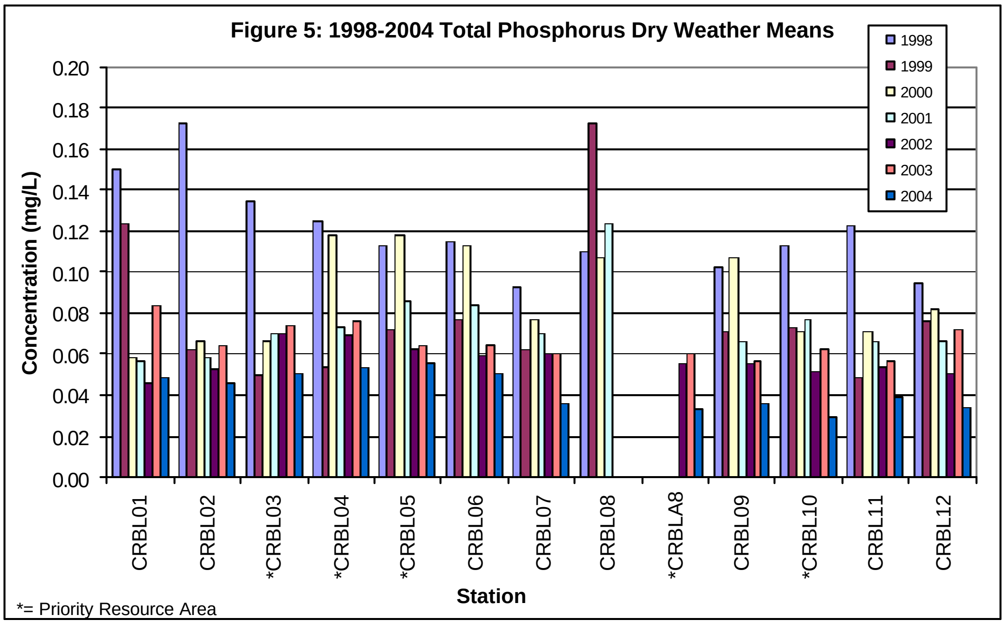

Figure 5: 1998-2004 Total Phosphorus Dry Weather Means

In 2002, additional samples were collected at selected stations from various depths to support the development of a water quality model for the Total Maximum Daily Load (TMDL). The results from this sampling showed elevated concentrations of total phosphorus, ortho-phosphorous, total kjeldahl nitrogen, and ammonia below the pycnocline (the interface between water of different densities).

Approximately 85% of the ortho-phosphate results were reported less the reporting limit (5ug/l). During each of the dry weather sampling events the highest concentration of nitrate was recorded at the station located at the South Natick Dam (CRBL01).

5.5 Metals

Twenty-one elements were included in the dissolved metal analyses. In addition, total recoverable mercury was analyzed. Ten of these 22 were EPA priority metals and have associated Ambient Water Quality Criteria (AWQC)[2]. Seven of these AWQC's were dependent on the water hardness. Hardness dependent AWQC were calculated using the hardness of the water at the time of sampling. Except for mercury, all AWQC's were based on the dissolved metals fraction. Because only total recoverable mercury was measured, the AWQC's for mercury were presented as total recoverable.

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[1] Massachusetts water quality criteria for Class B water for DO is ≥ 5 mg/l and ≥60% saturation, for pH is in the range of 6.5 through 8.3, and for temperature is ≤ 28.3°C (83°F).

[2] EPA=s Clean Water Act Section 304(a) Criteria for Priority toxic Pollutants (40 CFR Part 131.36)

Copper concentrations measured at two stations exceeded the copper acute AWQC. These two measurements were measured on August 10. No other acute AWQC were exceeded. Lead and copper were the only metals that had measured concentrations that exceeded the chronic AWQC. For copper, the criterion was exceeded twice (these are described above in the acute exceedences) and for lead the criterion was exceeded 17 times. Twelve of these lead exceedences occurred during wet weather. Approximately, 12% of the dry weather lead samples exceeded the chronic criteria (compared to 50%, 21%, 33%, 27%, and 8% in 2003, 2002, 2001, 2000, and 1999, respectively). Sources of lead and copper can include, domestic plumbing, pesticides and herbicides, automobiles, and industrial waste. The other measured priority pollutants metals (arsenic, cadmium, chromium, copper, mercury, nickel, selenium, silver, and zinc) did not exceed the AWQC. The metals concentrations and the associated criteria are presented in Tables 5. The concentrations of all the metals analyzed are presented in the Appendix.

TABLE 5: Priority Pollutant Metals Concentrations and the Ambient Water Quality Criteria (AWQC)

STATION	Arsenic conc. (ug/l)	Arsenic AWQC Acute (ug/l)	Arsenic AWQC Chronic (ug/l)	Cadmium conc. (ug/l)	Cadmium AWQC Acute (ug/l)	Cadmium AWQC Chronic (ug/l)	Chromium (III) conc. (ug/l)	Chromium (III) AWQC Acute (ug/l)	Chromium AWQC Chronic (ug/l)	Copper conc. (ug/l)	Copper AWQC Acute (ug/l)	Copper AWQC Chronic (ug/l)	Lead conc. (ug/l)	Lead AWQC Acute (ug/l)	Lead AWQC Chronic (ug/l)
7/13/04 Dry Weather Sampling															
CRBL01	ND(0.50)	340	150	ND(0.20)	1.2	0.17	ND(0.50)	380	49	3ND	8	5.9	1	38	1.5
CRBL02	0.63	340	150	ND(0.20)	1.6	0.21	ND(0.50)	465	60	3ND	11	7.2	0.89	49	1.9
CRBL03	0.66	340	150	ND(0.20)	1.6	0.21	ND(0.50)	470	61	3ND	11	7.3	0.95	50	1.9
CRBL04	0.73	340	150	ND(0.20)	1.6	0.21	ND(0.50)	475	62	3ND	11	7.4	1.1	51	2.0
CRBL05	0.63	340	150	ND(0.20)	1.6	0.21	ND(0.50)	475	62	3ND	11	7.4	1	51	2.0
CRBL06	0.76	340	150	ND(0.20)	1.8	0.23	ND(0.50)	527	69	4ND	12	8.3	0.82	58	2.3
CRBL07	0.89	340	150	ND(0.20)	2.5	0.29	ND(0.50)	684	89	5ND	17	10.8	0.31	82	3.2
CRBLA8	0.93	340	150	ND(0.20)	2.6	0.29	ND(0.50)	702	91	5ND	17	11.1	0.31	85	3.3
CRBL09	0.98	340	150	ND(0.20)	2.7	0.30	ND(0.50)	733	95	5ND	18	11.6	0.29	90	3.5
CRBL10	0.98	340	150	ND(0.20)	2.8	0.31	ND(0.50)	751	98	6ND	18	11.9	0.23	93	3.6
CRBL11	0.92	340	150	ND(0.20)	2.9	0.32	ND(0.50)	768	100	7ND	19	12.2	0.32	96	3.7
CRBL12	1	340	150	ND(0.20)	3.1	0.33	ND(0.50)	816	106	6ND	20	13.0	0.21	104	4.0
8/10/04 Dry Weather Sampling															
CRBL01	ND(0.50)	340	150	ND(0.20)	1.5	0.20	ND(0.50)	445	58	~3ND	10	6.9	0.24	46	1.8
CRBL02	0.58	340	150	ND(0.20)	1.6	0.21	ND(0.50)	475	62	~3ND	11	7.4	0.66	51	2.0
CRBL03	0.56	340	150	ND(0.20)	1.7	0.22	ND(0.50)	489	64	~3ND	11	7.6	0.75	53	2.1
CRBL04	0.61	340	150	ND(0.20)	1.7	0.22	ND(0.50)	494	64	~3ND	11	7.7	0.61	53	2.1
CRBL05	0.73	340	150	ND(0.20)	1.8	0.23	ND(0.50)	518	67	~73	12	8.1	0.4	57	2.2
CRBL06	0.83	340	150	ND(0.20)	2.2	0.26	ND(0.50)	607	79	~4ND	14	9.6	0.44	70	2.7
CRBL07	1.1	340	150	ND(0.20)	2.9	0.32	ND(0.50)	781	102	~6ND	19	12.4	0.46	98	3.8
CRBLA8	1.2	340	150	ND(0.20)	3.1	0.33	ND(0.50)	811	106	~7ND	20	13.0	0.44	103	4.0
CRBL09	1.3	340	150	ND(0.20)	3.5	0.37	ND(0.50)	918	119	~8ND	23	14.7	0.41	121	4.7
CRBL10	1.4	340	150	ND(0.20)	3.7	0.38	ND(0.50)	947	123	~8ND	24	15.2	0.43	126	4.9
CRBL11	1.5	340	150	ND(0.20)	3.6	0.37	ND(0.50)	930	121	~9ND	24	14.9	0.4	123	4.8
CRBL12	1.4	340	150	ND(0.20)	3.8	0.39	ND(0.50)	976	127	~51	25	15.7	0.32	131	5.1
8/30/04 Dry Weather Pre-storm Sampling															
CRBL02	0.57	340	150	ND(0.20)	1.4	0.19	ND(0.50)	415	54	4ND	9	6.4	1.8	42	1.6
CRBL05	0.72	340	150	ND(0.20)	1.4	0.19	ND(0.50)	410	53	4ND	9	6.4	2.3	42	1.6
CRBL06	0.73	340	150	ND(0.20)	1.4	0.19	ND(0.50)	430	56	4ND	10	6.7	2.1	44	1.7
CRBL07	0.86	340	150	ND(0.20)	1.8	0.22	ND(0.50)	508	66	4ND	12	8.0	2	55	2.2
CRBL09	0.87	340	150	ND(0.20)	1.9	0.24	ND(0.50)	542	70	4ND	13	8.5	1.3	60	2.4
CRBL11	0.87	340	150	ND(0.20)	2.0	0.24	ND(0.50)	560	73	5ND	13	8.8	1.3	63	2.5
9/8/04 Wet Weather First Flush Sampling															
CRBL02	0.62	340	150	ND(0.20)	1.1	0.16	0.88	344	45	5ND	8	5.3	1.8	33	1.3
CRBL05	0.75	340	150	ND(0.20)	1.5	0.20	0.5	435	57	4ND	10	6.8	2	45	1.8
CRBL06	0.76	340	150	ND(0.20)	1.4	0.19	0.64	420	55	6ND	9	6.5	2.7	43	1.7
CRBL07	1.1	340	150	ND(0.20)	2.3	0.27	ND(0.50)	639	83	5ND	15	10.1	1.5	75	2.9
CRBL09	1.1	340	150	ND(0.20)	2.5	0.28	ND(0.50)	675	88	6ND	16	10.7	1.4	81	3.2
CRBL11	1.2	340	150	ND(0.20)	2.8	0.31	ND(0.50)	755	98	6ND	19	12.0	1.3	94	3.7
9/9/04 Wet Weather Peak Flow Sampling															
CRBL02	0.67	340	150	ND(0.20)	0.9	0.14	ND(0.50)	291	38	4ND	6	4.4	2	26	1.0
CRBL05	0.69	340	150	ND(0.20)	1.4	0.19	0.5	420	55	5ND	9	6.5	2.4	43	1.7
CRBL06	0.73	340	150	ND(0.20)	1.5	0.20	ND(0.50)	440	57	5ND	10	6.8	2.3	46	1.8
CRBL07	1.1	340	150	ND(0.20)	2.3	0.27	ND(0.50)	639	83	5ND	15	10.1	1.6	75	2.9
CRBL09	1.2	340	150	ND(0.20)	2.8	0.31	ND(0.50)	755	98	5ND	19	12.0	1.4	94	3.7
CRBL11	1.2	340	150	ND(0.20)	2.5	0.29	ND(0.50)	693	90	6ND	17	11.0	1.4	84	3.3
9/14/04 Dry Weather Sampling															
CRBL01	ND(0.50)	340	150	ND(0.20)	1.5	0.20	ND(0.50)	435	57	2ND	10	6.8	0.39	45	1.8
CRBL02	0.58	340	150	ND(0.20)	1.4	0.19	ND(0.50)	420	55	3ND	9	6.5	1.2	43	1.7
CRBL03	0.62	340	150	ND(0.20)	1.5	0.20	ND(0.50)	435	57	3ND	10	6.8	1.2	45	1.8
CRBL04	0.66	340	150	ND(0.20)	1.5	0.20	ND(0.50)	455	59	4ND	10	7.1	1.7	48	1.9
CRBL05	0.69	340	150	ND(0.20)	1.2	0.17	ND(0.50)	375	49	4ND	8	5.8	1.6	37	1.4
CRBL06	0.71	340	150	ND(0.20)	1.3	0.18	ND(0.50)	385	50	4ND	9	6.0	1.6	38	1.5
CRBL07	1.2	340	150	ND(0.20)	2.9	0.32	ND(0.50)	777	101	5ND	19	12.4	0.83	97	3.8
CRBLA8	1.2	340	150	ND(0.20)	3.1	0.34	ND(0.50)	824	107	5ND	21	13.2	0.76	105	4.1
CRBL09	1.2	340	150	ND(0.20)	3.1	0.34	ND(0.50)	824	107	6ND	21	13.2	0.86	105	4.1
CRBL10	1.2	340	150	ND(0.20)	3.4	0.36	ND(0.50)	897	117	6ND	23	14.4	0.65	117	4.6

STATION	Arsenic conc. (ug/l)	Arsenic AWQC Acute (ug/l)	Arsenic AWQC Chronic (ug/l)	Cadmium conc. (ug/l)	Cadmium AWQC Acute (ug/l)	Cadmium AWQC Chronic (ug/l)	Chromium (III) conc. (ug/l)	Chromium (III) AWQC Acute (ug/l)	Chromium AWQC Chronic (ug/l)	Copper conc. (ug/l)	Copper AWQC Acute (ug/l)	Copper AWQC Chronic (ug/l)	Lead conc. (ug/l)	Lead AWQC Acute (ug/l)	Lead AWQC Chronic (ug/l)
CRBL11	1.3	340	150	ND(0.20)	3.4	0.35	ND(0.50)	876	114	6ND	22	14.0	0.86	114	4.4
CRBL12	1.5	340	150	ND(0.20)	3.0	0.33	ND(0.50)	799	104	9.7	20	12.7	0.88	101	3.9
9/18/04 Wet Weather First Flush Sampling															
CRBL02	0.64	340	150	ND(0.20)	1.4	0.19	ND(0.50)	425	55	~3ND	10	6.6	1.1	44	1.7
CRBL05	0.71	340	150	ND(0.20)	1.5	0.20	ND(0.50)	440	57	~4ND	10	6.8	1.9	46	1.8
CRBL06	0.72	340	150	ND(0.20)	1.5	0.20	ND(0.50)	440	57	~4ND	10	6.8	1.8	46	1.8
CRBL07	1.2	340	150	ND(0.20)	2.4	0.28	ND(0.50)	657	85	~6ND	16	10.4	0.57	78	3.0
CRBL09	1.2	340	150	ND(0.20)	2.3	0.27	ND(0.50)	630	82	~5ND	15	9.9	0.72	74	2.9
CRBL11	1.2	340	150	ND(0.20)	2.6	0.30	ND(0.50)	706	92	~6ND	17	11.2	0.51	86	3.3
9/18/04 Wet Weather Peak Flow Sampling															
CRBL02	0.67	340	150	ND(0.20)	0.9	0.14	ND(0.50)	296	39	4ND	6	4.5	1.9	27	1.0
CRBL05	0.75	340	150	ND(0.20)	1.3	0.18	0.51	405	53	4ND	9	6.3	2.5	41	1.6
CRBL06	0.72	340	150	ND(0.20)	1.4	0.19	ND(0.50)	425	55	4ND	10	6.6	2.5	44	1.7
CRBL07	1.2	340	150	ND(0.20)	2.5	0.28	ND(0.50)	675	88	10	16	10.7	0.9	81	3.2
CRBL09	1.2	340	150	ND(0.20)	2.6	0.30	ND(0.50)	715	93	8ND	17	11.4	1.1	87	3.4
CRBL11	1.2	340	150	ND(0.20)	2.8	0.31	ND(0.50)	742	96	5ND	18	11.8	0.51	92	3.6
9/21/04 Wet Weather Post-storm Sampling															
CRBL02	ND(0.50)	340	150	ND(0.20)	1.4	0.19	ND(0.50)	420	55	3ND	9	6.5	0.92	43	1.7
CRBL05	0.58	340	150	ND(0.20)	1.4	0.19	0.93	410	53	4ND	9	6.4	1.5	42	1.6
CRBL06	0.53	340	150	ND(0.20)	1.3	0.18	ND(0.50)	390	51	3ND	9	6.0	1.6	39	1.5
CRBL07	0.86	340	150	ND(0.20)	1.8	0.22	ND(0.50)	508	66	5ND	12	8.0	1.2	55	2.2
CRBL09	0.99	340	150	ND(0.20)	2.5	0.29	ND(0.50)	684	89	6ND	17	10.8	0.7	82	3.2
CRBL11	1.1	340	150	ND(0.20)	2.9	0.32	ND(0.50)	768	100	6ND	19	12.2	0.62	96	3.7

= meets or exceeds the chronic criterion
= meets or exceeds the acute criterion
ND=not detected above the associated detection limit – the "ND" is followed by the reporting limit
A number prior to ND indicates that the value did not meet the blank criteria

TABLE 5: Priority Pollutant Metals Concentrations and the Ambient Water Quality Criteria (AWQC) - continued

STATION	Mercury Total conc. (ug/l)	Mercury Total AWQC Acute (ug/l)	Mercury Total AWQC Chronic (ug/l)	Nickel conc. (ug/l)	Nickel AWQC Acute (ug/l)	Nickel AWQC Chronic (ug/l)	Selenium conc. (ug/l)	Selenium Total AWQC Chronic (ug/l)	Silver conc. (ug/l)	Silver AWQC Acute (ug/l)	Zinc conc. (ug/l)	Zinc AWQC Acute (ug/l)	Zinc AWQC Chronic (ug/l)
7/13/04 Dry Weather Sampling													
CRBL01	0.0044	1.4	0.77	1.4	308	34	ND(1.0)	5.0	ND(0.20)	1.4	6.2	77	78
CRBL02	0.0022	1.4	0.77	1.6	379	42	ND(1.0)	5.0	ND(0.20)	2.1	ND(5.0)	95	96
CRBL03	0.0034	1.4	0.77	1.6	384	43	ND(1.0)	5.0	ND(0.20)	2.1	5.7	96	97
CRBL04	0.0127	1.4	0.77	1.7	388	43	ND(1.0)	5.0	ND(0.20)	2.2	ND(5.0)	97	98
CRBL05	0.009	1.4	0.77	1.8	388	43	ND(1.0)	5.0	ND(0.20)	2.2	ND(5.0)	97	98
CRBL06	0.006	1.4	0.77	1.9	432	48	ND(1.0)	5.0	ND(0.20)	2.7	5.3	108	109
CRBL07	0.0027	1.4	0.77	1.9	566	63	1.3	5.0	ND(0.20)	4.7	ND(5.0)	142	143
CRBLA8	0.0036	1.4	0.77	1.9	581	65	1.3	5.0	ND(0.20)	5.0	7	145	147
CRBL09	0.0026	1.4	0.77	1.9	607	67	1.6	5.0	ND(0.20)	5.5	5.1	152	153
CRBL10	0.0021	1.4	0.77	1.6	622	69	1.5	5.0	ND(0.20)	5.7	ND(5.0)	156	157
CRBL11	0.0026	1.4	0.77	1.8	637	71	1.5	5.0	ND(0.20)	6.0	ND(5.0)	160	161
CRBL12	0.002	1.4	0.77	1.9	678	75	1.6	5.0	ND(0.20)	6.8	6.5	170	171
8/10/04 Dry Weather Sampling													
CRBL01	0.0014	1.4	0.77	1.7	363	40	ND(1.0)	5.0	ND(0.20)	1.9	6.4	91	92
CRBL02	0.0017	1.4	0.77	1.3	388	43	ND(1.0)	5.0	ND(0.20)	2.2	ND(5.0)	97	98
CRBL03	0.0048	1.4	0.77	1.6	400	44	ND(1.0)	5.0	ND(0.20)	2.3	ND(5.0)	100	101
CRBL04	0.005	1.4	0.77	1.5	404	45	ND(1.0)	5.0	ND(0.20)	2.4	ND(5.0)	101	102
CRBL05	0.0017	1.4	0.77	1.5	424	47	ND(1.0)	5.0	ND(0.20)	2.6	ND(5.0)	106	107
CRBL06	0.0025	1.4	0.77	1.6	500	56	ND(1.0)	5.0	ND(0.20)	3.7	ND(5.0)	125	126
CRBL07	0.0021	1.4	0.77	1.8	649	72	1.9	5.0	ND(0.20)	6.2	ND(5.0)	162	164
CRBLA8	0.0018	1.4	0.77	1.9	675	75	2	5.0	ND(0.20)	6.8	ND(5.0)	169	170
CRBL09	0.0016	1.4	0.77	1.9	766	85	2.7	5.0	ND(0.20)	8.8	ND(5.0)	192	193
CRBL10	0.0024	1.4	0.77	1.9	792	88	2.9	5.0	ND(0.20)	9.4	ND(5.0)	198	200
CRBL11	0.0022	1.4	0.77	1.9	777	86	3	5.0	ND(0.20)	9.0	ND(5.0)	195	196
CRBL12	0.0018	1.4	0.77	2	817	91	3.1	5.0	ND(0.20)	10.0	ND(5.0)	205	206
8/30/04 Dry Weather Pre-storm Sampling													
CRBL02	0.0036	1.4	0.77	1.3	338	38	ND(1.0)	5.0	ND(0.20)	1.7	ND(5.0)	85	85
CRBL05	0.0036	1.4	0.77	1.6	334	37	ND(1.0)	5.0	ND(0.20)	1.6	ND(5.0)	83	84
CRBL06	0.0034	1.4	0.77	1.8	350	39	ND(1.0)	5.0	ND(0.20)	1.8	ND(5.0)	88	88
CRBL07	0.002	1.4	0.77	1.4	416	46	ND(1.0)	5.0	ND(0.20)	2.5	ND(5.0)	104	105
CRBL09	0.0023	1.4	0.77	1.6	444	49	ND(1.0)	5.0	ND(0.20)	2.9	ND(5.0)	111	112
CRBL11	0.0028	1.4	0.77	1.4	460	51	1.1	5.0	ND(0.20)	3.1	ND(5.0)	115	116
9/8/04 Wet Weather First Flush Sampling													
CRBL02	0.0081	1.4	0.77	1.3	278	31	ND(1.0)	5.0	ND(0.20)	1.1	9.9	70	70
CRBL05	0.0042	1.4	0.77	1.5	355	39	ND(1.0)	5.0	ND(0.20)	1.8	ND(5.0)	89	89
CRBL06	0.0065	1.4	0.77	1.6	342	38	ND(1.0)	5.0	ND(0.20)	1.7	6.3	86	86
CRBL07	0.0034	1.4	0.77	1.6	527	59	1.5	5.0	ND(0.20)	4.1	ND(5.0)	132	133
CRBL09	0.0037	1.4	0.77	1.6	558	62	1.6	5.0	ND(0.20)	4.6	ND(5.0)	140	141
CRBL11	0.0033	1.4	0.77	1.7	626	70	1.9	5.0	ND(0.20)	5.8	ND(5.0)	157	158
9/9/04 Wet Weather Peak Flow Sampling													
CRBL02	0.0109	1.4	0.77	1.2	234	26	ND(1.0)	5.0	ND(0.20)	0.8	10	58	59
CRBL05	0.0058	1.4	0.77	1.6	342	38	ND(1.0)	5.0	ND(0.20)	1.7	5.7	86	86
CRBL06	NA	1.4	0.77	1.8	359	40	ND(1.0)	5.0	ND(0.20)	1.9	11	90	90
CRBL07	0.0029	1.4	0.77	1.7	527	59	2	5.0	ND(0.20)	4.1	ND(5.0)	132	133
CRBL09	0.0036	1.4	0.77	1.7	626	70	2.5	5.0	ND(0.20)	5.8	ND(5.0)	157	158
CRBL11	~0.0034	1.4	0.77	1.7	573	64	2.5	5.0	ND(0.20)	4.9	ND(5.0)	143	145
9/14/04 Dry Weather Sampling													
CRBL01	0.0019	1.4	0.77	1.4	355	39	ND(1.0)	5.0	ND(0.20)	1.8	ND(5.0)	89	89
CRBL02	0.0021	1.4	0.77	1.4	342	38	ND(1.0)	5.0	ND(0.20)	1.7	32	86	86
CRBL03	0.0033	1.4	0.77	1.5	355	39	ND(1.0)	5.0	ND(0.20)	1.8	ND(5.0)	89	89
CRBL04	0.0049	1.4	0.77	1.5	371	41	ND(1.0)	5.0	ND(0.20)	2.0	ND(5.0)	93	94
CRBL05	0.007	1.4	0.77	1.3	304	34	ND(1.0)	5.0	ND(0.20)	1.3	ND(5.0)	76	77
CRBL06	0.0058	1.4	0.77	1.6	312	35	ND(1.0)	5.0	ND(0.20)	1.4	6.8	78	79
CRBL07	0.0032	1.4	0.77	1.8	645	72	2.3	5.0	ND(0.20)	6.2	ND(5.0)	161	163
CRBLA8	0.0032	1.4	0.77	1.8	686	76	2.3	5.0	ND(0.20)	7.0	5.9	172	173
CRBL09	0.0069	1.4	0.77	2	686	76	2.2	5.0	ND(0.20)	7.0	7	172	173
CRBL10	0.0026	1.4	0.77	1.7	748	83	2.5	5.0	ND(0.20)	8.3	8	187	189
CRBL11	0.0031	1.4	0.77	1.9	730	81	2.5	5.0	ND(0.20)	7.9	5.6	183	184
CRBL12	0.0024	1.4	0.77	2.1	664	74	3.6	5.0	ND(0.20)	6.5	23	166	168
9/18/04 Wet Weather First Flush Sampling													
CRBL02	0.0041	1.4	0.77	1.4	346	38	ND(1.0)	5.0	ND(0.20)	1.7	6.7	87	87
CRBL05	0.0063	1.4	0.77	1.5	359	40	ND(1.0)	5.0	ND(0.20)	1.9	~8	90	90
CRBL06	0.0096	1.4	0.77	1.5	359	40	ND(1.0)	5.0	ND(0.20)	1.9	ND(5.0)	90	90
CRBL07	0.0044	1.4	0.77	1.5	542	60	2.1	5.0	ND(0.20)	4.3	ND(5.0)	136	137

STATION	Mercury Total conc. (ug/l)	Mercury Total AWQC Acute (ug/l)	Mercury Total AWQC Chronic (ug/l)	Nickel conc. (ug/l)	Nickel AWQC Acute (ug/l)	Nickel AWQC Chronic (ug/l)	Selenium conc. (ug/l)	Selenium Total AWQC Chronic (ug/l)	Silver conc. (ug/l)	Silver AWQC Acute (ug/l)	Zinc conc. (ug/l)	Zinc AWQC Acute (ug/l)	Zinc AWQC Chronic (ug/l)
CRBL09	0.0026	1.4	0.77	1.6	519	58	2	5.0	ND(0.20)	4.0	ND(5.0)	130	131
CRBL11	0.0064	1.4	0.77	1.8	585	65	2.3	5.0	ND(0.20)	5.1	6.9	146	148
9/18/04 Wet Weather Peak Flow Sampling													
CRBL02	NA	1.4	0.77	~1.2	238	26	ND(1.0)	5.0	ND(0.20)	0.8	~11	60	60
CRBL05	NA	1.4	0.77	~1.8	329	37	ND(1.0)	5.0	ND(0.20)	1.6	~7.5	82	83
CRBL06	NA	1.4	0.77	~1.8	346	38	ND(1.0)	5.0	ND(0.20)	1.7	~7.2	87	87
CRBL07	NA	1.4	0.77	~1.9	558	62	1.9	5.0	ND(0.20)	4.6	~7	140	141
CRBL09	NA	1.4	0.77	~1.8	592	66	2.1	5.0	ND(0.20)	5.2	~6.5	148	149
CRBL11	NA	1.4	0.77	~1.8	615	68	2.5	5.0	ND(0.20)	5.6	~ND(5.0)	154	155
9/21/04 Wet Weather Post-storm Sampling													
CRBL02	NA	1.4	0.77	1.5	342	38	ND(1.0)	5.0	ND(0.20)	1.7	6	86	86
CRBL05	NA	1.4	0.77	1.7	334	37	ND(1.0)	5.0	0.22	1.6	6.1	83	84
CRBL06	NA	1.4	0.77	1.7	317	35	ND(1.0)	5.0	ND(0.20)	1.5	5.6	79	80
CRBL07	NA	1.4	0.77	1.6	416	46	1.3	5.0	ND(0.20)	2.5	5.9	104	105
CRBL09	NA	1.4	0.77	1.8	566	63	2	5.0	ND(0.20)	4.7	6	142	143
CRBL11	NA	1.4	0.77	1.9	637	71	2.4	5.0	ND(0.20)	6.0	5.1	160	161

= meets or exceeds the chronic criterion
= meets or exceeds the acute criterion
ND=not detected above the associated detection limit – the "ND" is followed by the reporting limit
A number prior to ND indicates that the value did not meet the blank criteria

5.7 Data Usability

Quality control criteria were established to insure data quality. Criteria were specified for holding times, sample preservation, and precision and accuracy goals. The quality control requirements for this project were documented in the Project Work/QA Plan - Charles River Clean 2005 Water Quality Study June 2, 1999 and in the addendum dated June 10, 2002. Laboratory generated data that did not meet laboratory quality control parameters were reported as estimated in this report. All estimated data are identified with a swung dash (~) preceding the value. All data that did not meet other quality control parameters are described below.

Chlorophyll a samples collected on October 7, were not filtered immediately, therefore the values were reported as estimated values. All other specified holding times were met for all samples.

Instruments used in the field to measure temperature, DO, pH, specific conductance, salinity, turbidity, and transmissivity were calibrated prior to sampling and checked after use. All turbidity values were recorded as estimated because the proper probe guard was not used, which may have caused interference with the measurements. Field monitoring data that did not meet all the established quality control criteria were not presented in this report.

Duplicate field measurements (temperature, DO, pH, specific conductance, salinity, turbidity, and transmissivity) were collected during the sampling events. The Project Work/QA Plan did not specify Relative Percent Difference (RPD) goals between the regular and duplicate samples for any of these measurements. The highest RPD between the regular and duplicate field samples was 35.3% for turbidity. All turbidity results were marked as estimated (as specified above); therefore it was not necessary to make any additional qualifications to these data. Excluding turbidity differences, the highest RPD between the regular and duplicate samples for all field measurements was 3.8%. None of the field measurement data were qualified based on duplicate sampling results.

Chemistry data that partially met laboratory quality control criteria or concentrations that were less than the associated reporting limit were reported as estimated values. Field duplicate chemistry samples were collected during each of the six sampling events to evaluate sampling and analytical precision. Eleven of the 104 duplicate samples (excluding metals, field measurements, anions and cations) analyzed during the sampling events did not meet the precision quality control goal of less than 35 relative percent difference established in the Project Work/QA Plan. The data not meeting the criteria are described below. Ten of the eleven duplicate samples were for fecal coliform and E. coli. The use of these data was not limited for this project because large variations of bacteria often exist in the environment which can lead to these differences measured. The other RPD that did not meet the quality control limit of 35 was for total phosphorus. This RPD was calculated at 46% during the October 10 sampling event. The data associated with this elevated RPD were reported as estimated data.

Sixteen of 196 field duplicate samples for dissolved metals and total mercury analyzed during the six sampling events did not meet the precision quality control goal of less than 35 relative percent difference.
Four duplicate samples results did not meet the criterion for antimony. The antimony results that exceeded the goal were all near the reporting limit, where a greater percent of drift may occur. Therefore, the use of these data was not limited for this report. Six of the duplicate sample results did not meet the criterion for cobalt. Two of these results reported an RPD less than 40% and were near the reporting limit; therefore the use of these data was not limited for this report. The other four duplicate results that did not meet the criterion for cobalt could not be explained therefore the associated data with these results were reported as estimated. Two of the duplicated sample results not meeting the precision quality control goal of less than 35 relative percent difference were for copper. The associated data with these results were reported as estimated. Two of the duplicated sample results did not meet the criterion for manganese. The associated data with these results were reported as estimated. One duplicate sampling result for nickel and vanadium did not meet the criterion. The associated data with these results were reported as estimated.

The anion and cations results have been presented in this report as additional information. Although there were no duplicate sample precision quality control goals establish in the QAPP, all of the calculated RPD's were less than 35%.

For the chemistry analyses, trip blanks were used to evaluate any contamination caused by: the sample container, sample preservation, sampling method, and/or transportation to the laboratory. A filter blank was used to evaluate contamination to the dissolved metal samples from the filter, sampling equipment, sample container, sample preservation, sampling method, and/or transportation to the laboratory. Sample results were evaluated using the results of the associated blank for that sampling day. If the blank result was reported as "ND" (non detect) the use of the data was not limited in any way. If a sample result was less than or equal to five times the associated positive blank value, the sample result was denoted by an "ND" following the sample result. For the purpose of this report these data were evaluated as estimated values.

The non-metals chemistry sample trip blanks were collected during all three monthly dry weather sampling days. With the exception of one chlorophyll a sample collected on September 14, all non-metals trip blanks were reported as not detected above the reporting limit. On September 14, all the reported chlorophyll a concentrations were greater than five times the blank value, therefore none of these chlorophyll a data were reported as estimated.

A mercury trip blank was collected during each of the six sampling events. All of these trip blanks were reported as not detected above the reporting limit. A dissolved metals filter blank was collected during each sampling event. Copper, manganese, and cobalt where the only metals that had detectable concentration in the blanks samples. The manganese and cobalt sample data that were less than or equal to five times the associated positive blank value, were denoted by an "ND" following the sample result. All of the copper sample results associated with the positive field blanks were reported by the laboratory as estimated values because of laboratory blank contamination. An "ND" following the sample result denoted this qualified data. No additional qualifications were made to these copper results, since the reported data were already qualified from the laboratory. The laboratory qualified these data if the concentration in the sample was less than 10 times the concentration in the associated laboratory blank.

Mercury samples were collected using two different methods two evaluate how sample results may be affected by different bottles and preservative. Fifteen mercury samples were collected in HDPE plastic bottles and preserved in the field with ultrex grade nitric acid. (This method has been used for all previous Core Monitoring mercury sampling.) In addition, at these same locations, fifteen mercury samples were collected in a fluoropolymer plastic bottles and hydrochloric acid (preservative) was added in the laboratory prior to sampling. The fluoropolymer bottles and hydrochloric acid are required by EPA method 1631. When EPA's core monitoring program began this method was not in final form so the previous technique was used. The sampling results from the method using the fluoropolymer bottle and hydrochloric acid as a preservative were on average 1.7% greater than the results from using the HDPE bottle that were preserved in the field. One of the reasons for this difference may be the adsorption of mercury on the HDPE plastic bottle.

In 2004, we began filtering the ortho-phosphate samples in the field through a 0.45um filter. In previous years these samples were only filtered on a course filter on the analytical instrument. In order to compare how filtering may change the results of the ortho-phosphate samples, filtered and unfiltered samples were collected at selected stations during the three dry weather sampling events. Of these 15 samples, only two samples recorded measured concentrations above the reporting limit for both the unfiltered and filtered concentrations. This did not provide enough data to properly evaluate the two methods. These two samples results showed the unfiltered sample was 8% and 36% greater. Except for the August 30 sampling event, all sample results for ortho-phosphate were filtered in the field using a 0.45 um filter. The Appendix contains all the validated data for this report.

6.0 2005 STUDY DESIGN

The year 2005 was established as the EPA Charles River initiative goal date. In 2005 the monitoring program was altered to reflect initiatives changes and to refine the monitoring program to focus on critical parameters. In 2005, five dry weather sampling events were conducted at a reduced number of core monitoring locations. During each sampling event field parameters (temperature, DO, pH, specific conductance, salinity, turbidity, Secchi disk transparency, and transmissivity) were measured and samples were analyzed for fecal coliform, E.coli, total phosphorus, ortho-phosphate, and Chlorophyll a. Future monitoring may change as different data needs arise.

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Appendix

Table A-1: Results from 7/13/04 Dry Weather Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL01	1010	22.8	405	0.19	NA	NA	6.2	~3	N/A	63.3	50	55	7.1	5	16	4	7	26	68	0.13	0.68	ND(0.03)
CRBL02	1120	22.7	495	0.24	NA	NA	6.7	~4	N/A	69.3	35	40	6.4	3.5	36	28	10	7.4	29	0.117	0.36	ND(0.03)
CRBL03	1340	22.6	535	0.26	75.5	6.5	7.0	~4	1.4	63.6	40	45	7.1	5	52	48	12	5.2	47	0.076	0.36	ND(0.03)
CRBL04	1300	23.5	539	0.26	99.6	8.4	7.2	~9	0.8	34.4	40	50	7.5	14	4	4	46	ND(5)	43	ND(0.075)	0.1	ND(0.03)
CRBL05	1215	23.5	554	0.27	103.8	8.8	7.2	~8	0.8	36.1	45	55	7.6	13	36	36	33	ND(5)	37	ND(0.075)	0.17	ND(0.03)
CRBL06	1135	23.4	661	0.32	90.1	7.7	7.1	~7	1.1	42.2	40	45	6.7	11	NA	NA	9	ND(5)	38	0.113	0.22	ND(0.03)
CRBL07	1110	23.7	1032	0.51	95.9	8.1	7.2	~2	1.6	64.1	20	30	6.7	4.5	ND(4)	ND(4)	19	ND(5)	25	0.086	0.29	ND(0.03)
CRBLA8	1045	23.7	1068	0.53	96	8.1	7.2	~4	1.5	60.2	30	30	6.1	5.8	4	4	20	ND(5)	21	0.094	0.25	ND(0.03)
CRBL09	1015	24.2	1118	0.55	95.8	8.0	7.3	~3	1.6	64.5	25	30	6	3.5	24	24	18	ND(5)	25	ND(0.075)	0.27	ND(0.03)
CRBL10	940	25.3	1177	0.58	NA	NA	7.2	~3	1.7	65.7	20	20	6.3	4	4	4	21	ND(5)	20	ND(0.075)	0.29	ND(0.03)
CRBL11	915	25.4	1207	0.6	NA	NA	7.2	~3	1.8	65.4	20	30	6.9	3.8	8	8	20	ND(5)	18	ND(0.075)	0.27	ND(0.03)
CRBL12	840	25.1	1298	0.65	NA	NA	6.9	~3	1.8	67.4	20	30	6.8	2.8	4	4	17	ND(5)	21	0.086	0.27	ND(0.03)
CRBL09 (dup)	1015	24.2	1117	0.55	99.5	8.3	7.3	~3	1.7	64.4	25	30	6.8	4.3	20	20	18	ND(5)	20	ND(0.075)	0.27	ND(0.03)
CRBL00 (blank)	1600*	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	ND(5.0)	ND(2.5)	ND(4)	ND(4)	ND(2.0)	ND(5)	ND(5)	ND(0.075)	ND(0.02)	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL01	1010	21	ND(0.50)	ND(0.50)	39	ND(0.20)	ND(0.20)	16	ND(0.50)	1.1	3ND	370	1	~4	130	1.3	1.4	ND(1.0)	ND(0.20)	ND(0.50)	0.62	6.2	4.4
CRBL02	1120	9	ND(0.50)	0.63	45	ND(0.20)	ND(0.20)	20	ND(0.50)	0.96	3ND	210	0.89	~5	120	1.6	1.6	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	2.2
CRBL03	1340	8.5	ND(0.50)	0.66	45	ND(0.20)	ND(0.20)	21	ND(0.50)	1.2	3ND	180	0.95	~5	120	1.6	1.6	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.50)	5.7	3.4
CRBL04	1300	12	ND(0.50)	0.73	39	ND(0.20)	ND(0.20)	21	ND(0.50)	1.2	3ND	140	1.1	~5	33	1.6	1.7	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	12.7
CRBL05	1215	10	ND(0.50)	0.63	40	ND(0.20)	ND(0.20)	21	ND(0.50)	1.1	3ND	140	1	~5	8.7	1.6	1.8	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	9
CRBL06	1135	7.3	ND(0.50)	0.76	41	ND(0.20)	ND(0.20)	22	ND(0.50)	1.6	4ND	110	0.82	~7	11	1.6	1.9	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.50)	5.3	6
CRBL07	1110	ND(5.0)	0.52	0.89	43	ND(0.20)	ND(0.20)	25	ND(0.50)	1.2	5ND	ND(50)	0.31	~13	6.8	1.5	1.9	1.3	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	2.7
CRBLA8	1045	ND(5.0)	0.57	0.93	43	ND(0.20)	ND(0.20)	25	ND(0.50)	1.6	5ND	ND(50)	0.31	~13	5.8	1.5	1.9	1.3	ND(0.20)	ND(0.50)	ND(0.50)	7	3.6
CRBL09	1015	ND(5.0)	0.51	0.98	44	ND(0.20)	ND(0.20)	26	ND(0.50)	1.3	5ND	ND(50)	0.29	~14	4.3	1.5	1.9	1.6	ND(0.20)	ND(0.50)	ND(0.50)	5.1	2.6
CRBL10	940	ND(5.0)	0.67	0.98	43	ND(0.20)	ND(0.20)	26	ND(0.50)	0.21	6ND	ND(50)	0.23	~15	2.1	1.6	1.6	1.5	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	2.1
CRBL11	915	ND(5.0)	0.5	0.92	44	ND(0.20)	ND(0.20)	26	ND(0.50)	0.87	7ND	ND(50)	0.32	~15	2.6	1.6	1.8	1.5	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	2.6
CRBL12	840	ND(5.0)	0.55	1	44	ND(0.20)	ND(0.20)	27	ND(0.50)	1.7	6ND	ND(50)	0.21	~18	3.6	1.6	1.9	1.6	ND(0.20)	ND(0.50)	ND(0.50)	6.5	2
CRBL09 (dup)	1015	ND(5.0)	0.52	0.95	43	ND(0.20)	ND(0.20)	26	ND(0.50)	1.9	6ND	ND(50)	0.31	~14	5.4	1.5	2	1.3	ND(0.20)	ND(0.50)	ND(0.50)	7.2	2.2
CRBL00 (blank)	1600*	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	ND(0.20)	1ND	ND(50)	ND(0.20)	~ND(0.10)	ND(0.20)	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.50)	ND(5.0)	ND(1.0)

Additional anions and cations										
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL01	1010	ND(0.50)	105	ND(0.50)	9.4	18	3.9	4.2	51	61
CRBL02	1120	ND(0.50)	135	ND(0.50)	12	23	5.1	4.6	63	78
CRBL03	1340	ND(0.50)	137	ND(0.50)	12	23	5.2	4.5	65	79
CRBL04	1300	ND(0.50)	120	ND(0.50)	12	23	5.4	4.3	65	80
CRBL05	1215	ND(0.50)	112	ND(0.50)	12	23	5.6	4.3	67	80
CRBL06	1135	ND(0.50)	166	ND(0.50)	15	24	7.5	4	83	91
CRBL07	1110	ND(0.50)	263	ND(0.50)	29	27	14	6.2	133	125
CRBLA8	1045	ND(0.50)	294	ND(0.50)	30	27	15	6.3	141	129
CRBL09	1015	ND(0.50)	307	ND(0.50)	32	28	16	6.7	151	136
CRBL10	940	ND(0.50)	321	ND(0.50)	34	28	17	6.9	158	140
CRBL11	915	ND(0.50)	294	ND(0.50)	35	28	18	7.1	162	144
CRBL12	840	ND(0.50)	371	ND(0.50)	39	29	20	7.6	182	155
CRBL09 (dup)	1015	ND(0.50)	297	ND(0.50)	32	28	16	6.7	150	136
CRBL00 (blank)	1600*	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	0	0	0	0	ND(0.20)

Note:
* Blank samples were collected in the laboratory at 16:00 on 7/12/04, the dissolved metals filter blank was filtered in the boat at 16:30 on 7/13/04
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-2: Results from 8/10/04 Dry Weather Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL01	9:50	23.5	484	0.23	96.6	8.2	7.2	~3	NA	77.1	20	25	6.3	2.8	72	60	13	~4.4	37	0.102	0.63	ND(0.03)
CRBL02	11:00	23.1	531	0.26	63.2	5.4	6.9	~5	NA	81.3	20	25	5.5	ND(2.5)	220	180	6	~4.92	38	ND(0.075)	0.28	ND(0.03)
CRBL03	13:43	24.4	568	0.27	125.6	10.5	7.7	~4	>1.5	69.1	20	25	5.4	3.8	NA	NA	10	ND(5)	34	ND(0.075)	0.25	ND(0.03)
CRBL04	13:00	24.1	562	0.27	128.4	10.8	7.5	~5	1.1	49	25	30	5.5	6.8	NA	NA	25	ND(5)	39	ND(0.075)	0.18	ND(0.03)
CRBL05	12:15	25.5	632	0.31	135.3	11.1	8.0	~5	1.1	47.3	25	30	5.6	7.8	NA	NA	31	ND(5)	46	ND(0.075)	0.13	ND(0.03)
CRBL06	11:40	24.3	858	0.42	126.7	10.6	7.9	~5	1.1	48.8	25	35	6.4	7.5	460	270	35	ND(5)	43	ND(0.075)	0.15	ND(0.03)
CRBL07	11:10	25.0	1364	0.68	129.3	10.7	8.5	~4	1.5	61.5	20	25	6	4.8	36	20	24	ND(5)	30	ND(0.075)	0.16	ND(0.03)
CRBLA8	10:45	24.7	1429	0.71	124.5	10.3	8.4	~5	1.4	59.5	15	20	5.1	4.8	8	4	6	ND(5)	29	ND(0.075)	0.15	ND(0.03)
CRBL09	9:45	25.4	1662	0.84	122.2	10.0	8.5	~4	1.5	60.7	20	25	6	4.8	ND(4)	ND(4)	21	ND(5)	25	ND(0.075)	0.16	ND(0.03)
CRBL10	9:30	25.7	1731	0.87	114.5	9.3	8.2	~4	1.6	61.6	15	20	ND(5.0)	4	ND(4)	ND(4)	22	ND(5)	26	ND(0.075)	0.17	ND(0.03)
CRBL11	9:05	26.0	1742	0.88	113.9	9.2	8.2	~4	1.7	62.9	15	20	5	4.8	12	12	24	ND(5)	25	ND(0.075)	0.17	ND(0.03)
CRBL12	8:40	25.2	1852	0.94	108.9	8.9	8.1	~4	1.8	65.8	15	20	5.1	4.3	20	8	19	ND(5)	24	ND(0.075)	0.19	ND(0.03)
CRBL03 (dup)	13:43	24.4	568	0.27	125.1	10.4	7.7	~4	NA	NA	15	20	5.1	3.8	NA	NA	10	ND(5)	33	ND(0.075)	0.25	ND(0.03)
CRBL00 (blank)	15:30	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	ND(5.0)	ND(2.5)	NA	NA	ND(2.0)	ND(5)	ND(5)	ND(0.075)	ND(0.02)	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL01	9:50	13	ND(0.50)	ND(0.50)	34	ND(0.20)	ND(0.20)	21	ND(0.50)	1.5	~3ND	81	0.24	4.2	24	2.4	1.7	ND(1.0)	ND(0.20)	ND(0.50)	0.36	6.4	1.4
CRBL02	11:00	5.8	ND(0.50)	0.58	49	ND(0.20)	ND(0.20)	22	ND(0.50)	0.25	~3ND	180	0.66	5	68	1.1	1.3	ND(1.0)	ND(0.20)	ND(0.50)	0.3	ND(5.0)	1.7
CRBL03	13:43	13	ND(0.50)	0.56	40	ND(0.20)	ND(0.20)	23	ND(0.50)	0.97	~3ND	150	0.75	5.1	68	1.2	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.37	ND(5.0)	4.8
CRBL04	13:00	10	ND(0.50)	0.61	39	ND(0.20)	ND(0.20)	23	ND(0.50)	0.92	~3ND	77	0.61	5.2	5.3	1.4	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.38	ND(5.0)	5
CRBL05	12:15	5.7	ND(0.50)	0.73	41	ND(0.20)	ND(0.20)	23	ND(0.50)	0.21	~73	ND(50)	0.4	6.2	3.8	1.5	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.25	ND(5.0)	1.7
CRBL06	11:40	11	ND(0.50)	0.83	41	ND(0.20)	ND(0.20)	24	ND(0.50)	0.82	~4ND	50	0.44	9.9	3.5	1.6	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.29	ND(5.0)	2.5
CRBL07	11:10	5.8	ND(0.50)	1.1	39	ND(0.20)	ND(0.20)	27	ND(0.50)	0.84	~6ND	ND(50)	0.46	19	5.6	1.7	1.8	1.9	ND(0.20)	ND(0.50)	0.4	ND(5.0)	2.1
CRBLA8	10:45	5.2	ND(0.50)	1.2	40	ND(0.20)	ND(0.20)	27	ND(0.50)	0.98	~7ND	ND(50)	0.44	20	3.5	1.8	1.9	2	ND(0.20)	ND(0.50)	0.31	ND(5.0)	1.8
CRBL09	9:45	ND(5.0)	ND(0.50)	1.3	40	ND(0.20)	ND(0.20)	28	ND(0.50)	0.97	~8ND	ND(50)	0.41	~24	3	1.8	1.9	2.7	ND(0.20)	ND(0.50)	0.33	ND(5.0)	1.6
CRBL10	9:30	ND(5.0)	ND(0.50)	1.4	40	ND(0.20)	ND(0.20)	29	ND(0.50)	1	~8ND	ND(50)	0.43	~25	2.7	1.8	1.9	2.9	ND(0.20)	ND(0.50)	0.25	ND(5.0)	2.4
CRBL11	9:05	ND(5.0)	ND(0.50)	1.5	42	ND(0.20)	ND(0.20)	29	ND(0.50)	0.78	~9ND	ND(50)	0.4	~25	2.6	1.8	1.9	3	ND(0.20)	ND(0.50)	0.36	ND(5.0)	2.2
CRBL12	8:40	ND(5.0)	ND(0.50)	1.4	42	ND(0.20)	ND(0.20)	29	ND(0.50)	1	~51	ND(50)	0.32	~26	2.5	1.9	2	3.1	ND(0.20)	ND(0.50)	0.25	ND(5.0)	1.8
CRBL03 (dup)	13:43	14	ND(0.50)	0.58	41	ND(0.20)	ND(0.20)	24	ND(0.50)	1	~5ND	150	0.82	~5	66	1.2	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.37	ND(5.0)	4
CRBL00 (blank)	15:30	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	ND(0.20)	~1ND	ND(50)	ND(0.20)	~ND(0.10)	ND(0.20)	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	ND(1.0)

Additional anions and cations										
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL01	9:50	ND(0.50)	108	ND(0.50)	12	22	4.7	6.6	58	74
CRBL02	11:00	ND(0.50)	123	ND(0.50)	11	23	5.5	3.9	65	80
CRBL03	13:43	ND(0.50)	131	ND(0.50)	12	24	5.7	3.9	69	83
CRBL04	13:00	ND(0.50)	127	ND(0.50)	12	24	5.8	3.7	69	84
CRBL05	12:15	ND(0.50)	130	ND(0.50)	15	24	7.1	4	79	89
CRBL06	11:40	ND(0.50)	204	ND(0.50)	23	25	11	5.2	110	108
CRBL07	11:10	ND(0.50)	366	ND(0.50)	48	27	21	8.7	200	147
CRBLA8	10:45	ND(0.50)	343	ND(0.50)	45	26	20	8.1	184	154
CRBL09	9:45	ND(0.50)	409	ND(0.50)	57	29	26	10	199	179
CRBL10	9:30	ND(0.50)	466	ND(0.50)	60	30	27	10	246	186
CRBL11	9:05	ND(0.50)	478	ND(0.50)	60	30	26	10	242	182
CRBL12	8:40	ND(0.50)	497	ND(0.50)	64	31	28	11	249	193
CRBL03 (dup)	13:43	ND(0.50)	129	ND(0.50)	12	24	5.6	3.8	69	83
CRBL00 (blank)	15:30	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.10)	0	0	0	0	ND(0.20)

Note:
* Blank samples were collected in the laboratory at 15:30 on 8/9/04, the dissolved metals filter blank was filtered in the boat 10:10 on 8/10/04
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-3: Results from 8/30/04 Dry Weather Pre-storm Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (unfiltered) (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL02	1030	25.0	436	NA	83.8	7.0	7.4	~2	NA	NA	70	80	11	3.3	80	48	13	8.4	69	0.118	0.34	ND(0.03)
CRBL05	1340	27.3	447	0.21	133.3	10.6	8.5	~4	NA	NA	60	80	9.3	7.3	16	8	43	5	82	ND(0.075)	0.28	ND(0.03)
CRBL06	1325	25.0	514	0.25	99.9	8.2	7.6	~5	NA	NA	60	80	9.3	7.5	28	24	41	5.3	70	ND(0.075)	0.31	ND(0.03)
CRBL07	1305	25.8	627	0.3	128.9	10.5	8.8	~8	NA	NA	30	55	7.8	7	ND(4)	ND(4)	40	ND(5)	49	ND(0.075)	0.12	ND(0.03)
CRBLA8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1240	26.1	674	0.33	135.4	10.9	9.1	~12	NA	NA	30	50	6.8	8	10	10	46	ND(5)	52	ND(0.075)	0.05	ND(0.03)
CRBL11	1215	27.7	710	0.34	129.6	10.1	8.9	~6	NA	NA	35	40	6.7	7.5	ND(4)	ND(4)	50	ND(5)	51	ND(0.075)	0.05	ND(0.03)
CRBL09 (dup)	12:40	26.6	673	0.33	136.3	10.9	9.1	~8	NA	NA	35	50	7.3	7.8	17	17	48	ND(5)	44	ND(0.075)	0.05	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL02	1030	18	ND(0.50)	0.57	41	ND(0.20)	ND(0.20)	17	ND(0.50)	0.4	4ND	460	1.8	3.6	71	1	1.3	ND(1.0)	ND(0.20)	ND(0.50)	0.69	ND(5.0)	3.6
CRBL05	1340	18	ND(0.50)	0.72	36	ND(0.20)	ND(0.20)	17	ND(0.50)	0.96	4ND	380	2.3	3.7	6.6	1.2	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.9	ND(5.0)	3.6
CRBL06	1325	15	ND(0.50)	0.73	37	ND(0.20)	ND(0.20)	17	ND(0.50)	1	4ND	340	2.1	4.5	7.9	1.2	1.8	ND(1.0)	ND(0.20)	ND(0.50)	0.8	ND(5.0)	3.4
CRBL07	1305	9.2	ND(0.50)	0.86	35	ND(0.20)	ND(0.20)	19	ND(0.50)	0.52	4ND	160	2	7.8	4.2	1.2	1.4	ND(1.0)	ND(0.20)	ND(0.50)	0.77	ND(5.0)	2
CRBLA8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1240	8.6	ND(0.50)	0.87	33	ND(0.20)	ND(0.20)	18	ND(0.50)	0.29	4ND	120	1.3	8.8	2.7	1.3	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.73	ND(5.0)	2.3
CRBL11	1215	8.7	ND(0.50)	0.87	33	ND(0.20)	ND(0.20)	19	ND(0.50)	0.45	5ND	110	1.3	10	2.9	1.3	1.4	1.1	ND(0.20)	ND(0.50)	0.77	ND(5.0)	2.8
CRBL09 (dup)	12:40	8.2	ND(0.50)	0.89	33	ND(0.20)	ND(0.20)	19	ND(0.50)	ND(0.20)	4ND	120	1.4	8.8	2.5	1.2	1.3	ND(1.0)	ND(0.20)	ND(0.50)	0.72	ND(5.0)	2.5
CRBL00 (blank)	9:00	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	ND(0.20)	0.9ND	ND(50)	ND(0.20)	ND(0.10)	ND(0.20)	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	ND(1.0)

Additional anions and cations									
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL02	1030	ND(0.50)	91	ND(0.50)	9.9	20	4.3	3.6	52	68
CRBL05	1340	ND(0.50)	117	ND(0.50)	11	20	4.2	3.4	56	67
CRBL06	1325	ND(0.50)	113	ND(0.50)	12	20	5	3.5	62	71
CRBL07	1305	ND(0.50)	185	ND(0.50)	20	20	8.9	4.9	94	87
CRBLA8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1240	ND(0.50)	197	ND(0.50)	22	21	10	5.4	104	94
CRBL11	1215	ND(0.50)	209	ND(0.50)	24	21	~11	5.5	120	98
CRBL09 (dup)	12:40	ND(0.50)	205	ND(0.50)	22	21	10	5.4	104	94

Note:
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-4: Results from 9/08/04 Wet Weather Core Monitoring First Flush Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL02	1145	22.1	357	0.17	98.6	8.6	6.9	~11	NA	NA	35	40	10.8	10	88	32	NA	33	94	0.171	0.27	ND(0.03)
CRBL05	1520	23.5	470	0.23	137.2	11.7	8.3	~11	NA	NA	50	55	10.9	12	156	88	NA	ND(5)	50	ND(0.075)	0.03	ND(0.03)
CRBL06	1450	23.4	453	0.22	131.4	11.2	8.0	~11	NA	NA	45	55	11.6	14	316	130	NA	ND(5)	65	ND(0.075)	0.07	ND(0.03)
CRBL07	1420	23.8	996	0.49	126.5	10.7	8.4	~6	NA	NA	30	35	9.9	5	72	72	NA	ND(5)	44	ND(0.075)	0.07	ND(0.03)
CRBLA8	1410	24.1	1038	0.51	131.3	11.0	8.5	~6	NA	NA	NA	NA	NA	NA	ND(4)	ND(4)	NA	NA	NA	NA	NA	NA
CRBL09	1340	23.9	1060	0.52	121.8	10.2	8.2	~6	NA	NA	30	40	9.5	5.8	4	4	NA	ND(5)	41	ND(0.075)	0.07	ND(0.03)
CRBL11	1315	24.6	1146	0.57	122.3	10.2	8.1	~6	NA	NA	30	35	9.5	5.3	ND(4)	ND(4)	NA	ND(5)	~30	ND(0.075)	0.07	ND(0.03)
CRBL06 (dup)	1450	23.4	453	0.22	130	11.1	8.0	~11	NA	NA	50	55	10.8	14	240	200	NA	ND(5)	62	ND(0.075)	0.09	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL02	1145	14	ND(0.50)	0.62	35	ND(0.20)	ND(0.20)	16	0.88	0.27	5ND	260	1.8	~3	110	0.89	1.3	ND(1.0)	ND(0.20)	ND(0.50)	0.69	9.9	8.1
CRBL05	1520	14	ND(0.50)	0.75	35	ND(0.20)	ND(0.20)	20	0.5	0.24	4ND	250	2	~5	2.5	1.5	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.71	ND(5.0)	4.2
CRBL06	1450	16	ND(0.50)	0.76	33	ND(0.20)	ND(0.20)	20	0.64	1	6ND	260	2.7	~5	9.2	1.4	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.74	6.3	6.5
CRBL07	1420	7.1	0.52	1.1	35	ND(0.20)	ND(0.20)	22	ND(0.50)	1.4	5ND	110	1.5	~14	4.7	1.5	1.6	1.5	ND(0.20)	ND(0.50)	0.77	ND(5.0)	3.4
CRBLA8	1410	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1340	8.3	ND(0.50)	1.1	36	ND(0.20)	ND(0.20)	23	ND(0.50)	0.7	6ND	110	1.4	~15	4	1.5	1.6	1.6	ND(0.20)	ND(0.50)	0.74	ND(5.0)	3.7
CRBL11	1315	7.4	0.54	1.2	36	ND(0.20)	ND(0.20)	24	ND(0.50)	1.3	6ND	98	1.3	~16	3.4	1.5	1.7	1.9	ND(0.20)	ND(0.50)	0.66	ND(5.0)	3.3
CRBL06 (dup)	1450	14	ND(0.50)	0.74	33	ND(0.20)	ND(0.20)	19	0.62	0.77	5ND	260	2.7	~5	8.2	1.4	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.71	ND(5.0)	9.1
CRBL00 (blank)	1420*	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	ND(0.20)	1ND	ND(50)	ND(0.20)	~ND(0.10)	ND(0.20)	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	ND(1.0)

Additional anions and cations										
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL02	1145	ND(0.50)	75	ND(0.50)	7.5	16	3.4	2.9	44	54
CRBL05	1520	ND(0.50)	84	ND(0.50)	11	21	4.8	3.7	59	72
CRBL06	1450	ND(0.50)	85	ND(0.50)	10	20	4.7	3.7	57	69
CRBL07	1420	ND(0.50)	241	ND(0.50)	30	23	14	6.8	151	115
CRBLA8	1410	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1340	ND(0.50)	269	ND(0.50)	33	23	16	7.1	162	123
CRBL11	1315	ND(0.50)	241	ND(0.50)	36	25	19	7.7	173	141
CRBL06 (dup)	1450	ND(0.50)	86	ND(0.50)	10	20	4.7	3.8	57	69

Note:
* Blank samples were collected in the laboratory at 0949 on 9/08/04, the dissolved metals filter blank was filtered in the boat at 1420 on 9/08/04
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-5: Results from 9/09/04 Wet Weather Core Monitoring Peak Flow Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL02	725	20.9	296	0.14	80.6	7.2	6.8	~14	NA	NA	30	35	8.7	16	180	180	NA	24	93	ND(0.075)	0.15	ND(0.03)
CRBL05	1040	23.2	447	0.21	124.2	10.6	7.7	~12	NA	NA	45	50	10.7	14	250	250	NA	ND(5)	56	ND(0.075)	0.03	ND(0.03)
CRBL06	1020	23.4	476	0.23	122.3	10.4	7.8	~11	NA	NA	45	50	11.2	13	377	30	NA	ND(5)	69	ND(0.075)	0.02	ND(0.03)
CRBL07	1000	23.3	974	0.48	96.4	8.2	7.4	~6	NA	NA	30	35	9.1	~4.8	180	160	NA	ND(5)	44.9	ND(0.075)	0.09	ND(0.03)
CRBLA8	945	23.5	1045	0.52	99.8	8.5	7.5	~6	NA	NA	NA	NA	NA	NA	24	20	NA	NA	NA	NA	NA	NA
CRBL09	920	23.6	1116	0.55	93.7	7.9	7.4	~6	NA	NA	25	35	8.6	~4.8	44	44	NA	ND(5)	33	ND(0.075)	0.09	ND(0.03)
CRBL11	900	24.1	1148	0.57	90.8	7.6	7.3	~6	NA	NA	30	35	9.1	5.3	188	156	NA	ND(5)	45	0.076	0.09	ND(0.03)
CRBL07 (dup)	1000	23.2	977	0.48	96.8	8.3	7.4	~6	NA	NA	30	35	9.6	5	ND(4)	ND(4)	NA	ND(5)	44	ND(0.075)	0.1	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL02	725	16	0.55	0.67	27	ND(0.20)	ND(0.20)	12	ND(0.50)	1.3	4ND	240	2	2.6	74	0.82	1.2	ND(1.0)	ND(0.20)	ND(0.50)	0.81	10	10.9
CRBL05	1040	15	0.63	0.69	34	ND(0.20)	ND(0.20)	19	0.5	0.65	5ND	220	2.4	4.2	3.6	1.5	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.82	5.7	5.8
CRBL06	1020	15	0.6	0.73	35	ND(0.20)	ND(0.20)	20	ND(0.50)	1.6	5ND	230	2.3	4.4	6.4	1.6	1.8	ND(1.0)	ND(0.20)	ND(0.50)	0.81	11	NA
CRBL07	1000	9.2	0.68	1.1	38	ND(0.20)	ND(0.20)	23	ND(0.50)	0.88	5ND	120	1.6	13	7.6	1.5	1.7	2	ND(0.20)	ND(0.50)	0.84	ND(5.0)	2.9
CRBLA8	945	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	920	8.4	0.65	1.2	39	ND(0.20)	ND(0.20)	24	ND(0.50)	0.73	5ND	98	1.4	16	5.9	1.5	1.7	2.5	ND(0.20)	ND(0.50)	0.85	ND(5.0)	3.6
CRBL11	900	8.5	0.63	1.2	38	ND(0.20)	ND(0.20)	24	ND(0.50)	0.69	6ND	95	1.4	17	10	1.5	1.7	2.5	ND(0.20)	ND(0.50)	0.79	ND(5.0)	~3.4
CRBL07 (dup)	1000	9.8	0.76	1.1	37	ND(0.20)	ND(0.20)	22	ND(0.50)	0.98	5ND	120	1.5	13	6.2	1.6	1.7	1.7	ND(0.20)	ND(0.50)	0.86	ND(5.0)	2.9
CRBL00 (blank	1025*	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	ND(0.20)	0.9ND	ND(50)	ND(0.20)	ND(0.10)	0.21	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	ND(1.0)

Additional anions and cations										
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL02	725	ND(0.50)	~56	ND(0.50)	6.2	13	2.8	2.7	35	44
CRBL05	1040	ND(0.50)	88	ND(0.50)	9.8	20	4.6	3.5	55	69
CRBL06	1020	ND(0.50)	97	ND(0.50)	11	21	5	3.8	59	73
CRBL07	1000	ND(0.50)	264	ND(0.50)	25	23	14	6.7	151	115
CRBLA8	945	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	920	ND(0.50)	308	ND(0.50)	30	25	19	7.5	165	141
CRBL11	900	ND(0.50)	326	ND(0.50)	31	23	17	7.9	178	127
CRBL07 (dup)	1000	ND(0.50)	256	ND(0.50)	25	24	16	6.6	146	126

Note:
* Blank samples were collected in the laboratory at 18:10 on 9/08/04, the dissolved metals filter blank was filtered in the boat at 10:25 on 9/09/04
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-6: Results from 9/14/04 Dry Weather Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL01	1010	20.1	451	0.22	108.1	9.8	7.8	~13	NA	40.6	35	40	7.7	11	8	8	63	ND(5)	41	ND(0.075)	0.81	ND(0.03)
CRBL02	1125	20.4	448	0.22	89.3	8.1	7.1	~11	NA	48.3	30	35	7.9	8	4	4	33	ND(5)	48	ND(0.075)	ND(0.02)	ND(0.03)
CRBL03	1245	21.1	457	0.22	108.4	9.6	7.5	~9	1	45.2	30	35	9.3	9.5	4	4	40	ND(5)	71	ND(0.075)	ND(0.02)	ND(0.03)
CRBL04	1215	21.8	493	0.24	139.9	12.3	8.3	~13	0.6	32.8	35	40	7.2	12	ND(4)	ND(4)	59	ND(5)	78	ND(0.075)	ND(0.02)	ND(0.03)
CRBL05	1125	22.0	385	0.18	125	10.9	8.0	~12	0.7	32.8	35	40	8.4	15	52	17	67	ND(5)	58	ND(0.075)	ND(0.02)	ND(0.03)
CRBL06	1105	21.8	417	0.2	118.8	10.4	7.7	~12	0.8	32.1	35	40	6.8	16	60	8	71	ND(5)	52	ND(0.075)	ND(0.02)	ND(0.03)
CRBL07	1050	22.2	1075	0.53	117	10.2	8.2	~8	1.1	52.2	30	35	7.9	7.8	ND(4)	ND(4)	45	ND(5)	40	ND(0.075)	ND(0.02)	ND(0.03)
CRBLA8	1025	22.4	1111	0.55	117.1	10.1	8.1	~7	1.2	53.5	25	30	7.6	6.8	4	ND(4)	43	ND(5)	50	ND(0.075)	ND(0.02)	ND(0.03)
CRBL09	950	22.4	1106	0.55	108.8	9.4	7.8	~7	1.2	52.6	25	30	7.5	7.5	ND(4)	ND(4)	39	ND(5)	43	ND(0.075)	ND(0.02)	ND(0.03)
CRBL10	925	22.7	1198	0.6	104.7	9.0	7.6	~7	1.2	55.4	25	30	6.8	6.8	ND(4)	ND(4)	41	ND(5)	43	ND(0.075)	0.04	ND(0.03)
CRBL11	900	23.4	1171	0.58	108.7	9.2	7.7	~7	1.2	55.9	25	30	8.3	6.3	8	8	35	ND(5)	64	ND(0.075)	ND(0.02)	ND(0.03)
CRBL12	845	23.0	1584	0.8	102.2	8.7	7.4	~7	1.2	57.8	25	30	7.1	6	4	ND(4)	37	ND(5)	57.5	ND(0.075)	ND(0.02)	ND(0.03)
CRBLA8 (dup)	1050*	22.4	1112	0.55	116	10.0	8.1	~7	1	53.6	25	30	7.3	7.8	4	3	36	ND(5)	53	ND(0.075)	ND(0.02)	ND(0.03)
CRBL00 (blank)	1005	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND(0)	ND(0)	ND(5.0)	ND(5.0)	NA	NA	4	ND(5)	ND(5)	ND(0.075)	ND(0.02)	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL01	1010	23	ND(0.50)	ND(0.50)	32	ND(0.20)	ND(0.20)	~19	ND(0.50)	~0.49	2ND	160	0.39	3.8	~61	1.5	1.4	ND(1.0)	ND(0.20)	ND(0.50)	0.48	ND(5.0)	1.9
CRBL02	1125	10	ND(0.50)	0.58	41	ND(0.20)	ND(0.20)	~19	ND(0.50)	~0.41	3ND	520	1.2	4	~100	1.2	1.4	ND(1.0)	ND(0.20)	ND(0.50)	0.52	32	2.1
CRBL03	1245	11	ND(0.50)	0.62	42	ND(0.20)	ND(0.20)	~20	ND(0.50)	~0.91	3ND	290	1.2	4.4	~120	1.2	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.49	ND(5.0)	3.3
CRBL04	1215	16	ND(0.50)	0.66	41	ND(0.20)	ND(0.20)	~22	ND(0.50)	~0.97	4ND	300	1.7	4.8	~51	1.4	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.59	ND(5.0)	4.9
CRBL05	1125	13	ND(0.50)	0.69	30	ND(0.20)	ND(0.20)	~16	ND(0.50)	~0.55	4ND	200	1.6	3.6	~7.4	1.2	1.3	ND(1.0)	ND(0.20)	ND(0.50)	0.65	ND(5.0)	7
CRBL06	1105	12	0.51	0.71	31	ND(0.20)	ND(0.20)	~17	ND(0.50)	~1.8	4ND	210	1.6	4.2	~20	1.2	1.6	ND(1.0)	ND(0.20)	ND(0.50)	0.67	6.8	5.8
CRBL07	1050	8.1	0.59	1.2	37	ND(0.20)	ND(0.20)	~24	ND(0.50)	~0.76	5ND	72	0.83	15	~2.7	1.5	1.8	2.3	ND(0.20)	ND(0.50)	0.71	ND(5.0)	3.2
CRBLA8	1025	9.1	ND(0.50)	1.2	36	ND(0.20)	ND(0.20)	~23	ND(0.50)	~0.72	5ND	62	0.76	16	~2.4	1.6	1.8	2.3	ND(0.20)	ND(0.50)	0.73	5.9	3.2
CRBL09	950	8.7	0.63	1.2	36	ND(0.20)	ND(0.20)	~23	ND(0.50)	~1.3	6ND	66	0.86	16	~4.2	1.6	2	2.2	ND(0.20)	ND(0.50)	0.76	7	6.9
CRBL10	925	13	0.54	1.2	37	ND(0.20)	ND(0.20)	~24	ND(0.50)	~0.23	6ND	56	0.65	17	~1.5	1.6	1.7	2.5	ND(0.20)	ND(0.50)	0.7	8	2.6
CRBL11	900	7.4	0.73	1.3	38	ND(0.20)	ND(0.20)	~25	ND(0.50)	~2.5	6ND	71	0.86	18	~5.1	1.6	1.9	2.5	ND(0.20)	ND(0.50)	0.64	5.6	3.1
CRBL12	845	7.6	2.8	1.5	38	ND(0.20)	ND(0.20)	~26	ND(0.50)	~3.7	9.7	59	0.88	25	~14	1.6	2.1	3.6	ND(0.20)	ND(0.50)	0.83	23	2.4
CRBLA8 (dup)	1050*	7.6	0.74	1.2	37	ND(0.20)	ND(0.20)	~24	ND(0.50)	~3	6ND	68	0.86	16	~5.3	1.6	1.8	2.3	ND(0.20)	ND(0.50)	0.69	ND(5.0)	2.6
CRBL00 (blank)	1005	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	~ND(0.10)	ND(0.50)	~ND(0.20)	1ND	ND(50)	ND(0.20)	ND(0.10)	~0.2	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	ND(1.0)

Additional anions and cations										
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL01	1010	ND(0.50)	95	ND(0.50)	11	21	4.8	6.9	53	72
CRBL02	1125	ND(0.50)	100	ND(0.50)	10	20	4.7	3.5	54	69
CRBL03	1245	ND(0.50)	96	ND(0.50)	10	21	4.8	3.4	56	72
CRBL04	1215	ND(0.50)	106	ND(0.50)	11	22	5.2	3.4	61	76
CRBL05	1125	ND(0.50)	87	ND(0.50)	9	17	4.3	3	48	60
CRBL06	1105	ND(0.50)	96	ND(0.50)	10	17	4.7	3.2	53	62
CRBL07	1050	0.61	306	ND(0.50)	33	24	21	6.9	144	146
CRBLA8	1025	0.63	290	ND(0.50)	35	25	23	7.2	154	157
CRBL09	950	ND(0.50)	298	ND(0.50)	34	25	23	7.2	160	157
CRBL10	925	0.71	326	ND(0.50)	38	25	27	7.7	179	174
CRBL11	900	0.68	318	ND(0.50)	37	25	26	7.5	173	169
CRBL12	845	ND(0.50)	451	ND(0.50)	55	29	19	10	243	151
CRBLA8 (dup)	1050*	ND(0.50)	301	ND(0.50)	34	~25	25	7.2	160	165
CRBL00 (blank)	1005	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.10)	0	0	0	0	ND(0.20)

Note:
* Blank samples were collected in the laboratory at 10:50 on 9/13/04, the dissolved metals filter blank was filtered in the boat at 09:55 on 9/14/04.
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-7: Results from 9/18/04 Wet Weather First Flush Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL02	520	21.2	464	0.22	72.7	6.5	6.8	~13	NA	NA	30	35	6.5	11	42	42	NA	ND(5)	57	0.088	ND(0.02)	ND(0.03)
CRBL05	745	21.6	493	0.24	112.6	9.9	8.0	~16	NA	NA	30	35	7.1	20	228	216	NA	ND(5)	54	ND(0.075)	ND(0.02)	ND(0.03)
CRBL06	805	21.3	494	0.24	106.6	9.4	7.6	~16	NA	NA	30	35	6	17	53	50	NA	ND(5)	57	ND(0.075)	ND(0.02)	ND(0.03)
CRBL07	825	21.9	1067	0.53	105.6	9.2	7.7	~7	NA	NA	25	30	6.2	7.3	25	11	NA	ND(5)	39	ND(0.075)	ND(0.02)	ND(0.03)
CRBLA8	840	22.0	1057	0.52	105.2	9.2	7.7	~7	NA	NA	NA	NA	NA	NA	4	4	NA	NA	NA	NA	NA	NA
CRBL09	900	21.8	1015	0.5	99.6	8.7	7.5	~8	NA	NA	25	30	6	7.5	196	132	NA	ND(5)	47	ND(0.075)	ND(0.02)	ND(0.03)
CRBL11	910	22.7	1227	0.61	102.8	8.8	7.7	~7	NA	NA	25	30	6.7	6.8	17	14	NA	ND(5)	35	ND(0.075)	ND(0.02)	ND(0.03
CRBL07 (dup)	825	21.9	1066	0.53	105.3	9.2	7.7	~7	NA	NA	30	35	6.7	7.3	17	8	NA	ND(5)	37	ND(0.075)	ND(0.02)	ND(0.03)

Dissolved Metals

Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL02	520	8.8	ND(0.50)	0.64	46	ND(0.20)	ND(0.20)	20	ND(0.50)	~0.84ND	~3ND	300	1.1	~4	~130	1.4	1.4	ND(1.0)	ND(0.20)	ND(0.50)	0.49	6.7	4.1
CRBL05	745	16	0.74	0.71	36	ND(0.20)	ND(0.20)	21	ND(0.50)	~1.6	~4ND	250	1.9	~5	~19	1.6	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.69	~8	6.3
CRBL06	805	16	0.67	0.72	35	ND(0.20)	ND(0.20)	21	ND(0.50)	~0.44ND	~4ND	240	1.8	~5	~14	1.5	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.69	ND(5.0)	9.6
CRBL07	825	8.1	0.51	1.2	36	ND(0.20)	ND(0.20)	23	ND(0.50)	~0.2	~6ND	ND(50)	0.57	~16	~6.4	1.5	1.5	2.1	ND(0.20)	ND(0.50)	0.67	ND(5.0)	4.4
CRBLA8	840	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	900	10	0.72	1.2	34	ND(0.20)	ND(0.20)	22	ND(0.50)	~0.36ND	~5ND	57	0.72	~14	~14	1.5	1.6	2	ND(0.20)	ND(0.50)	0.69	ND(5.0)	2.6
CRBL11	910	6.4	1	1.2	36	ND(0.20)	ND(0.20)	24	ND(0.50)	~3.8	~6ND	ND(50)	0.51	~17	~10	1.6	1.8	2.3	ND(0.20)	ND(0.50)	0.68	6.9	6.4
CRBL07 (dup)	825	6.9	0.87	1.1	35	ND(0.20)	ND(0.20)	23	ND(0.50)	~2.1	~4ND	ND(50)	0.55	~15	~9	1.5	1.7	1.9	ND(0.20)	ND(0.50)	0.64	6.5	4
CRBL00 (blank)	810	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	~0.27	~1ND	ND(50)	ND(0.20)	~ND(0.10)	~0.5	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	ND(1.0)

Additional anions and cations

Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL02	520	ND(0.50)	95	ND(0.50)	10	20	4.8	3.7	56	70
CRBL05	745	ND(0.50)	107	ND(0.50)	11	21	4.9	3.4	59	73
CRBL06	805	ND(0.50)	109	ND(0.50)	11	21	5.1	3.4	60	73
CRBL07	825	ND(0.50)	280	ND(0.50)	34	23	15	6.7	149	119
CRBLA8	840	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	900	ND(0.50)	278	ND(0.50)	32	22	14	6.4	137	113
CRBL11	910	ND(0.50)	327	ND(0.50)	39	24	17	7.6	174	130
CRBL07 (dup)	825	0.65	292	ND(0.50)	34	23	16	6.7	158	123

Note:
* Blank samples were collected in the laboratory at 14:40 on 9/17/04, the dissolved metals filter blank was filtered in the boat at 08:10 on 9/18/04.
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-8: Results from 9/18/04 Wet Weather Peak Flow Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL02	1040	19.5	314	0.15	82.8	7.6	6.9	~13	NA	NA	25	30	5.6	14	144	135	NA	20	81	ND(0.075)	0.19	ND(0.03)
CRBL05	1130	20.7	443	0.21	109.4	9.8	7.5	~17	NA	NA	30	35	7.5	18	208	191	NA	ND(5)	77	ND(0.075)	ND(0.02)	ND(0.03)
CRBL06	1145	21.0	462	0.22	109.8	9.8	7.5	~17	NA	NA	30	35	6.2	22	220	172	NA	ND(5)	79	ND(0.075)	ND(0.02)	ND(0.03)
CRBL07	1225	21.4	1046	0.52	100.7	8.9	7.6	~7	NA	NA	30	35	8.7	8	14	11	NA	ND(5)	55	ND(0.075)	0.06	ND(0.03)
CRBLA8	1235	21.4	1055	0.52	99.8	8.8	7.5	~7	NA	NA	NA	NA	NA	NA	8	8	NA	NA	NA	NA	NA	NA
CRBL09	1255	21.3	1130	0.56	89.6	7.9	7.3	~8	NA	NA	25	30	6.3	7	66	55	NA	ND(5)	53	0.128	ND(0.02)	ND(0.03)
CRBL11	1315	22.6	1219	0.61	105	9.1	7.7	~7	NA	NA	25	30	6.2	6.3	6	6	NA	ND(5)	50	ND(0.075)	ND(0.02)	ND(0.03)
CRBL05 (dup)	1130	20.7	438	0.21	109.4	9.8	7.4	~17	NA	NA	30	35	6.5	18	326	326	NA	ND(5)	87	ND(0.075)	ND(0.02)	ND(0.03)

Dissolved Metals																							
Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL02	1040	13	ND(0.50)	0.67	31	ND(0.20)	ND(0.20)	14	ND(0.50)	~0.7ND	4ND	260	1.9	~3	130	1.1	~1.2	ND(1.0)	ND(0.20)	ND(0.50)	0.73	~11	NA
CRBL05	1130	17	0.84	0.75	34	ND(0.20)	ND(0.20)	19	0.51	~9	4ND	230	2.5	~4	27	1.4	~1.8	ND(1.0)	ND(0.20)	ND(0.50)	0.72	~7.5	NA
CRBL06	1145	17	0.89	0.72	35	ND(0.20)	ND(0.20)	20	ND(0.50)	~9.5	4ND	250	2.5	~4	24	1.5	~1.8	ND(1.0)	ND(0.20)	ND(0.50)	0.77	~7.2	NA
CRBL07	1225	7.7	0.91	1.2	36	ND(0.20)	ND(0.20)	23	ND(0.50)	~6.3	10	54	0.9	~15	32	1.5	~1.9	1.9	ND(0.20)	ND(0.50)	0.66	~7	NA
CRBLA8	1235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1255	11	0.79	1.2	33	ND(0.20)	ND(0.20)	23	ND(0.50)	~4.3	8ND	76	1.1	~16	79	1.5	~1.8	2.1	ND(0.20)	ND(0.50)	0.75	~6.5	NA
CRBL11	1315	7.3	0.87	1.2	34	ND(0.20)	ND(0.20)	24	ND(0.50)	~4	5ND	ND(50)	0.51	~18	19	1.6	~1.8	2.5	ND(0.20)	ND(0.50)	0.66	~ND(5.0)	NA
CRBL05 (dup)	1130	17	ND(0.50)	0.75	34	ND(0.20)	ND(0.20)	19	0.51	~0.79ND	4ND	250	2.6	~4	18	1.4	~1.2	ND(1.0)	ND(0.20)	ND(0.50)	0.74	~ND(5.0)	NA
CRBL00 (blank)	1150	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	~0.26	1ND	ND(50)	ND(0.20)	~ND(0.10)	0.45	ND(0.50)	~ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	~ND(5.0)	NA

Additional anions and cations										
Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL02	1040	ND(0.50)	70	ND(0.50)	7.4	13	3.1	2.8	37	45
CRBL05	1130	ND(0.50)	100	ND(0.50)	9.6	19	4.4	3.2	54	66
CRBL06	1145	ND(0.50)	106	ND(0.50)	10	20	4.8	3.4	57	70
CRBL07	1225	ND(0.50)	281	ND(0.50)	33	23	~16	6.7	148	123
CRBLA8	1235	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1255	ND(0.50)	307	ND(0.50)	36	23	18	7.2	161	132
CRBL11	1315	ND(0.50)	334	ND(0.50)	40	24	19	7.6	181	138
CRBL05 (dup)	1130	ND(0.50)	105	ND(0.50)	9.6	19	4.6	3.2	54	66

Note:

* Blank samples were collected in the laboratory at 16:20 on 9/17/04, the dissolved metals filter blank was filtered in the boat at 11:50 on 9/18/04.

ND = not detected above the associated detection limit

A number prior to ND indicates that the value did not meet the blank criteria

NA = not available

~ = estimated data

Table A-9: Results from 9/21/04 Post-storm Core Monitoring Sampling

Station	Time	Temp (Deg C)	Sp Cond. (uS/cm)	Salinity (ppth)	DO (%)	DO (mg/l)	pH	Turbidity (NTU)	Secchi (meters)	Transmissivity (%)	True Color (color units)	Apparent Color (color units)	TOC (mg/L)	TSS (mg/L)	Fecal coliform (cfu/100ml)	E.coli (cfu/100ml)	Chlorophyll a (ug/L)	Orthophosphate as P (ug/L)	Total Phosphorus (ug/L)	NH3 as N (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)
CRBL02	720	16.9	NA	NA	NA	NA	7.0	~14	NA	36.4	35	40	8.2	14	22	17	52	ND(5)	52	ND(0.075)	ND(0.02)	ND(0.03)
CRBL05	855	17.3	NA	NA	NA	NA	7.3	~16	0.7	31	35	40	7.1	16	19	17	68	ND(5)	50	ND(0.075)	ND(0.02)	ND(0.03)
CRBL06	920	17.6	NA	NA	115.9	11.1	7.3	~15	0.7	31.1	35	40	6.8	15	94	94	51	ND(5)	~96	ND(0.075)	ND(0.02)	ND(0.03)
CRBL07	940	18.8	NA	NA	107.2	10.0	7.4	~10	0.9	41.4	30	35	6.7	11	92	88	43	ND(5)	83	ND(0.075)	ND(0.02)	ND(0.03)
CRBLA8	1000	19.2	NA	NA	112.2	10.3	7.5	~10	0.9	42.1	NA	NA	NA	NA	42	36	NA	NA	NA	NA	NA	NA
CRBL09	1020	19.6	NA	NA	109.6	10.0	7.5	~6	1.3	51.5	30	35	6.5	7.3	55	47	41	ND(5)	77	ND(0.075)	0.06	ND(0.03)
CRBL11	1045	20.5	NA	NA	103.7	9.3	7.4	~6	1.3	55.7	30	35	5.8	6.8	8	4	35	~4	56	ND(0.075)	0.07	ND(0.03)
CRBL07 (dup)	940	18.8	NA	NA	108	10.0	7.4	~11	0.9	41.4	25	30	5.9	11	47	47	49	ND(5)	69	ND(0.075)	ND(0.02)	ND(0.03)

Dissolved Metals

Station	Time	Aluminum (ug/L)	Antimony (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chromium (ug/L)	Cobalt (ug/L)	Copper (ug/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Molybdenum (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Silver (ug/L)	Thallium (ug/L)	Vanadium (ug/L)	Zinc (ug/L)	Mercury (ng/l)
CRBL02	720	15	ND(0.50)	ND(0.50)	39	ND(0.20)	ND(0.20)	19	ND(0.50)	~3.7	3ND	250	0.92	4	100	1.3	1.5	ND(1.0)	ND(0.20)	ND(0.50)	0.52	6	NA
CRBL05	855	15	0.74	0.58	38	ND(0.20)	ND(0.20)	19	0.93	~6.7	4ND	280	1.5	4	89	2.1	1.7	ND(1.0)	0.22	ND(0.50)	0.67	6.1	NA
CRBL06	920	14	0.76	0.53	35	ND(0.20)	ND(0.20)	18	ND(0.50)	~7.2	3ND	260	1.6	3.8	86	1.3	1.7	ND(1.0)	ND(0.20)	ND(0.50)	0.6	5.6	NA
CRBL07	940	9	0.56	0.86	33	ND(0.20)	ND(0.20)	20	ND(0.50)	~3.3	5ND	100	1.2	8.9	14	1.4	1.6	1.3	ND(0.20)	ND(0.50)	0.72	5.9	NA
CRBLA8	1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1020	7.8	0.78	0.99	34	ND(0.20)	ND(0.20)	22	ND(0.50)	~5.5	6ND	53	0.7	13	14	1.5	1.8	2	ND(0.20)	ND(0.50)	0.76	6	NA
CRBL11	1045	8.3	0.78	1.1	34	ND(0.20)	ND(0.20)	23	ND(0.50)	~6.1	6ND	ND(50)	0.62	15	14	1.5	1.9	2.4	ND(0.20)	ND(0.50)	0.76	5.1	NA
CRBL07 (dup)	940	8.6	0.8	0.78	32	ND(0.20)	ND(0.20)	20	0.59	~7.8	4ND	100	1.1	8.7	19	1.4	1.8	1.2	ND(0.20)	ND(0.50)	0.78	8.2	NA
CRBL00 (blank)	1025*	ND(5.0)	ND(0.50)	ND(0.50)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.10)	ND(0.50)	~'ND(0.20)	3ND	ND(50)	ND(0.20)	ND(0.10)	0.21	ND(0.50)	ND(0.20)	ND(1.0)	ND(0.20)	ND(0.50)	ND(0.20)	ND(5.0)	NA

Additional anions and cations

Station	Time	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Hardness mg CaCO3/L
CRBL02	720	ND(0.50)	96	ND(0.50)	9.9	20	4.7	3.7	54	69
CRBL05	855	ND(0.50)	95	ND(0.50)	9.7	19	4.7	3.5	52	67
CRBL06	920	ND(0.50)	83	ND(0.50)	9	18	4.4	3.3	49	63
CRBL07	940	ND(0.50)	157	ND(0.50)	19	20	9	4.7	94	87
CRBLA8	1000	NA	NA	NA	NA	NA	NA	NA	NA	NA
CRBL09	1020	ND(0.50)	237	ND(0.50)	28	22	17	6	127	125
CRBL11	1045	ND(0.50)	287	ND(0.50)	34	23	21	6.7	146	144
CRBL07 (dup)	940	ND(0.50)	175	ND(0.50)	19	20	9.5	4.8	94	89

Note:
* Blank samples were collected in the laboratory at on 9/20/04, the dissolved metals filter blank was filtered in the boat at 10:25 on 9/21/04.
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data

Table A-10: Results from 10/07/04 Supplemental Core Monitoring Sampling

Station	Time	Temp (Deg C)	DO (%)	DO (mg/l)	pH	Secchi (meters)	Transmissivity (%)	Chlorophyll a (ug/L)	Total Phosphorus (ug/L)
CRBL02	1410	15.0	103.4	10.4	7.0	NA	NA	~6	~56
CRBL05	1300	14.9	NA	NA	7.0	1.3	56.4	~5	~78
CRBLA8	1225	17.8	NA	NA	7.1	1.8	61.6	~14	~70
CRBL11	1200	17.6	NA	NA	7.0	1.8	67.2	~10	~60
CRBL05 (dup)	1300	15.1	NA	NA	7.0	1.3	55.8	~6	~49

Note:
ND = not detected above the associated detection limit
A number prior to ND indicates that the value did not meet the blank criteria
NA = not available
~ = estimated data