BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	R08-9
CHICAGO AREA WATERWAY SYSTEM	)	(Rulemaking - Water)
AND THE LOWER DES PLAINES RIVER:	)	
PROPOSED AMENDMENTS TO 35 Ill.	)	
Adm. Code Parts 301, 302, 303 and 304	)	

PRE-FILED TESTIMONY OF SAMUEL G. DENNISON ON BEHALF OF THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO CONCERNING JUSTIFICATION FOR AN ADDITIONAL AQUATIC LIFE USE TIER FOR BUBBLY CREEK (SOUTH FORK OF THE SOUTH BRANCH CHICAGO RIVER)

My name is Samuel G. Dennison. I am a Biologist IV in the Environmental Monitoring and Research Division of the Research and Development Department of the Metropolitan Water Reclamation District of Greater Chicago (District). I received a Bachelor of Arts degree with a major in Biology from Saint Mary's University in Winona, Minnesota, a Master of Science degree in Fisheries Biology from Iowa State University in Ames, Iowa, and a Doctor of Philosophy degree in Biology from the Illinois Institute of Technology in Chicago, Illinois. I am a Certified Fisheries Professional with the American Fisheries Society and also a Past President of the Illinois Chapter of the American Fisheries Society.

I have been employed by the District since 1971. My primary responsibility from 1974 through 2003 was monitoring the fish populations in Chicago area waterways. Since 2003, I have served as Head of the Aquatic Ecology and Water Quality Section within the Environmental Monitoring and Research Division, where I supervise a staff of ten persons.

My testimony today focuses on deficiencies and flaws in the IEPA's approach for aquatic life use designation and subsequent development of standards for the South Fork of the South Branch Chicago River, which I will refer to as Bubbly Creek. The District's position is that the IEPA did not adequately or properly consider Bubbly Creek in its Use Attainability Study and

that Bubbly Creek should have been placed into an Aquatic Life Use tier that is lower than Aquatic Life Use B.

In pre-settlement Chicago, Bubbly Creek was once a meandering creek that slowly drained a five square mile area of marshland. This portion of the Chicago Area Waterway System has been severely altered by human development. In the early 1860s, the Union Stock Yards were constructed along the banks of Bubbly Creek and this small stream became an open sewer for the meatpacking industry for nearly a century. The channel of Bubbly Creek has been systematically straightened, deepened, and widened to allow for more efficient urban drainage and some commercial navigation. The extensive wetlands that were formerly drained by the stream have been entirely filled in, resulting in complete loss of dry weather flow in present day Bubbly Creek.

Today, Bubbly Creek is a relatively straight 1.3 mile channel that originates at the Racine Avenue Pumping Station (RAPS) and flows north (Photograph Exhibit 1 and 2), during overflow events, to its confluence with the South Branch of the Chicago River (Photograph Exhibit 3). The channel depth varies from approximately six-feet near RAPS to fourteen-feet at Bubbly Creek's junction with the South Branch of the Chicago River (Photograph Exhibit 4). The channel width varies between 120 to 200-feet wide. The major physical alterations caused by development of Bubbly Creek's historical drainage area have severely degraded the once natural ecosystem and eliminated most of the natural aquatic and riparian habitats. Flow in the system varies considerably, almost exclusively due to combined sewer overflow (CSO) input from RAPS and gravity sewers. However, water level variations in the South Branch Chicago River that occur during dry weather can cause minor north-south flow oscillations in Bubbly Creek.

Despite Bubbly Creek's unique flow conditions, as compared to other reaches in the Chicago Area Waterway System, the Use Attainability Analysis (UAA) did not assess any physical habitat and fish data specifically for Bubbly Creek. Figure 5-2 on page 5-9 of the UAA report is used to classify various reaches of the Chicago Area Waterway System into Aquatic Life Use categories using Index of Biotic Integrity (IBI) and Qualitative Habitat Evaluation (QHEI) scores. However, this Figure 5-2 does not include any sampling stations in Bubbly Creek. As such, it is indeterminable how an Aquatic Life Use was designated for Bubbly Creek. On page 4-69 of the UAA report, Bubbly Creek is characterized as being "similar to the South Branch," but in reality, these are two very different waterways. During the R08-9 proceeding the IEPA admitted that it did not consider any data in its evaluation of Bubbly Creek (April 24, 2008 hearing transcript at pages 66-67). Upon questioning the IEPA regarding exactly how it did develop the aquatic life use designation it ultimately made for Bubbly Creek, it was obvious that the Agency merely dismissed it as being equivalent to the Chicago Sanitary and Ship Canal (April 24, 2008 transcript at pages 67-69), on the basis of the similarity of its side walls and riparian zone land use. The IEPA did not take into account that in addition to having the same highly degraded aquatic habitat as the Chicago Sanitary and Ship Canal, Bubbly Creek also is stagnant during dry weather and has very unique sediments that impose a significant oxygen demand on the creek which is much shallower than the Chicago Sanitary and Ship Canal. These factors cause Bubbly Creek to consistently have very low DO levels even during dry weather; a phenomenon not observed to occur in the Chicago Sanitary and Ship Canal.

During significant precipitation when RAPS discharges to Bubbly Creek, the water elevation can rise over three feet and flow velocity in the narrow creek can reach in excess of five feet per second, which can damage aquatic habitat and, as will be discussed by Dr. Garcia,

can resuspend bottom sediments. Following a CSO discharge from RAPS, the organic content of the flow from RAPS and the resuspended sediment settles into Bubbly Creek and exhibits an oxygen demand for a number of days, severely impacting the dissolved oxygen (DO) in the channel. The District's continuous DO data indicate that DO recovery at Bubbly Creek stations sometimes takes several days longer than at other stations in the Chicago Area Waterway System. ATTACHMENT 1 shows DO at various stations in the Chicago Area Waterway System during an example rain event in August, 2006. Figure 5 in ATTACHMENT 1 indicates that DO at 36th Street on Bubbly Creek declines to 0 mg/L for over 3 days following rain events.

During dry weather, Bubbly Creek is stagnant and its DO can often plummet to zero. The fine sediments deposited throughout most of the creek exhibit a heavy oxygen demand. In 2001, the District measured a sediment oxygen demand (SOD) of 3.64 g/m^2/day at Interstate Highway 55 on Bubbly Creek, which was the 2nd highest value measured in the Chicago Area Waterway System. District field measurements near the Archer Avenue Bridge over Bubbly Creek have shown that fine sediments extend to a depth of 54 inches below the top of the sediment. In addition, chemical analyses of the sediments in Bubbly Creek have detected legacy organic contaminants, such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and heavy metals (USACE, Chicago District, 2006, ATTACHMENT 2). High phytoplankton levels, sustained by abundant nutrient loads from CSOs and stagnant waterway conditions, also contribute to oxygen demand as they respire and eventually decay. During 2006, DO was below the IPCB Secondary Contact DO standard of 4.0 mg/L in Bubbly Creek for 72 percent of the time at 36th Street and 23 percent of the time at Interstate Highway 55 (Minarik et al., 2007 – ATTACHMENT 3). Figures 9 and 10

on pages 22 and 23 of ATTACHMENT 3, display DO concentrations throughout the year in Bubbly Creek.

These low DO concentrations prevailed in Bubbly Creek during 2006 in spite of the District's efforts to limit stagnation by drawing Bubbly Creek water back through RAPS. Between April and September, the District pumped 3.7 billion gallons of Bubbly Creek water back through RAPS to the Stickney Water Reclamation Plant for treatment. RAPS drawback data are outlined in ATTACHMENT 4, which includes date, duration, and volume of drawback events during 2005 and 2006. More information about the District's efforts to reduce stagnation in Bubbly Creek by drawback through RAPS can be found in Research and Development Department Reports No. 03-1 (Lanyon, 2003) and No. 04-8 (Sopcak, 2004). This information suggests that it does not appear that flow augmentation will enable Bubbly Creek to attain the DO standard that IEPA proposed for it in R08-9 even under dry weather conditions.

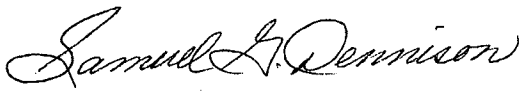
The District also assessed the use of supplemental aeration to help meet the proposed DO water quality standards for Bubbly Creek. Technical concerns, environmental impacts, and compliance costs involved in that option are discussed in the testimony of Dr. Zenz, Mr. McGowan, Mr. Mastracchio, and Dr. Garcia.

Increasing DO in Bubbly Creek by the use of artificial controls could make the waterway an "attractive nuisance" to fish. Higher DO levels and relatively low flow velocities resulting from diversion may increase fish populations in Bubbly Creek. These increased populations which would result from fish entering Bubbly Creek from the connecting South Branch of the Chicago River would be at risk from sudden, high volume, low DO, CSOs from RAPS. Resulting fish-kills could create an odor problem that would be offensive to the area residents and would be very difficult to rectify. The proposed high-volume pump station that would be

required to transfer South Branch Chicago River water to the south end of Bubbly Creek may create a situation of fish colliding with screens (impingement) and/or being sucked into pumps (entrainment), as well.

On page 1-8 of the UAA report, it states, "The South Fork is a stagnant waterbody that receives no flow unless the Racine Avenue Pump Station, storm sewers or other CSOs are discharging." It further describes the extensive DO compliance issues in Bubbly Creek. IEPA has acknowledged the unusual conditions in Bubbly Creek, however they have not accounted for them in their UAA proposal for the Chicago Area Waterway System. In light of the impaired sediment, wet-weather characteristics, and the extreme flow variations, the District suggests that Bubbly Creek be classified as Aquatic Life Use C. Bubbly Creek is unique in that it is a side fork and it is not even necessary to maintain DO for fish passage through the Chicago Area Waterway System. To this end the District recommends a narrative DO standard be developed that prevents fish kills and maintains aesthetics (prevents nuisance odors). This would be appropriate until such time as the sediments are capped, removed or remediated and the frequency of discharge at RAPS is diminished sometime after 2024. If a numerical DO standard is deemed imperative, then the IPCB should consider the testimonies of Mr. Paul Freedman and Dr. Marcelo Garcia as a basis for such a standard.

Respectfully submitted,



By: Samuel G. Dennison

Testimony Attachments

1. DO Recovery Graphs
2. USACE (U.S. Army Corps of Engineers), Reconnaissance Study, Section 905(b) (WRDA 86) Analysis, Bubbly Creek, South Branch of the Chicago River, 18 August 2006
3. District R&D Report No. 07-25 Continuous Dissolved Oxygen Monitoring in the Deep Draft Chicago Waterway System During 2006, The Metropolitan Water Reclamation District of Greater Chicago, May 2007.
4. 2005-2006 RAPS Drawback Data

References

Lanyon, R., "Bubbly Creek Water Quality Improvement, A Demonstration Project in 2002," Research and Development Department Report No. 03-1, Metropolitan Water Reclamation District of Greater Chicago, January 2003.

Sopcak, M., "2003 Bubbly Creek Water Quality Improvement Demonstration Project," Research and Development Department Report No. 04-8, Metropolitan Water Reclamation District of Greater Chicago, June 2004.

Metropolitan Water Reclamation District of Greater Chicago, 2007. "Technical Memorandum 6WQ: Flow Augmentation and Supplemental Aeration of the South Fork of the South Branch of the Chicago River (Bubbly Creek)." Prepared by CTE.

UAA Report (Attachment B of proposed rule R08-9)

Photograph Exhibits

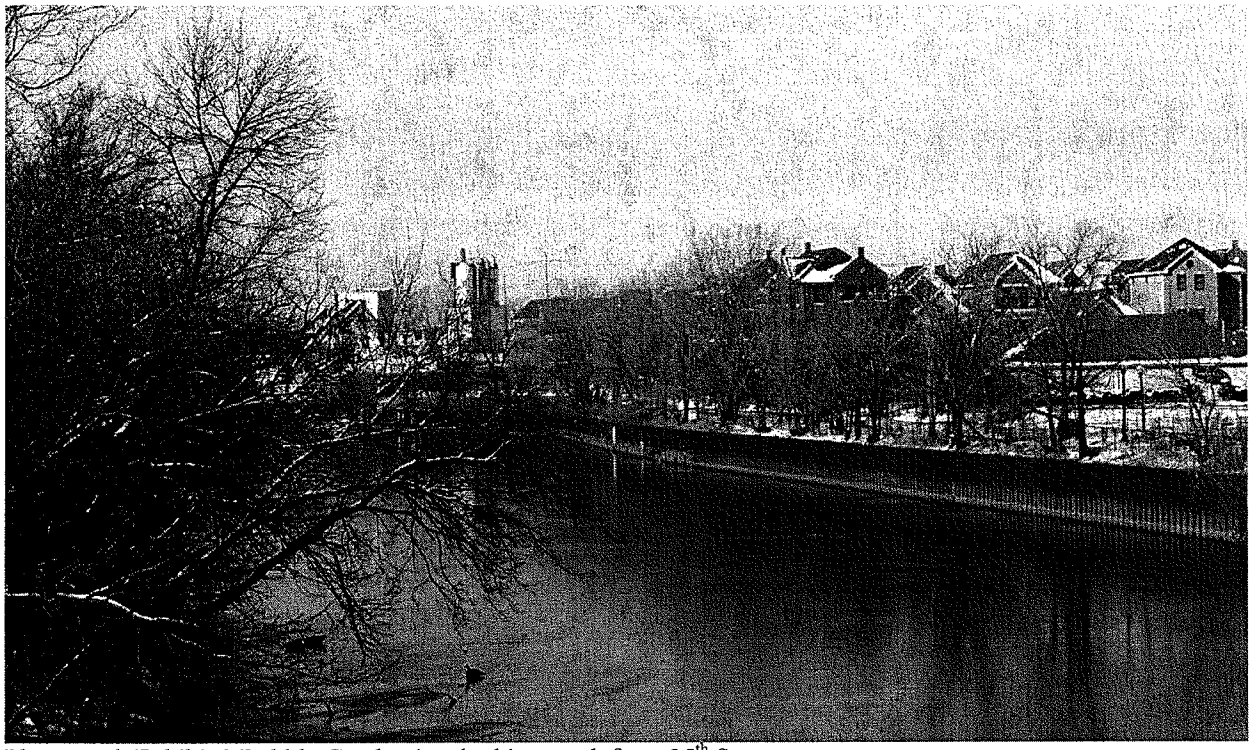
Photograph Exhibit 1. Bubbly Creek, looking north. Racine Avenue Pumping Station in foreground.

Photograph Exhibit 2 Bubbly Creek, view looking north from 35th Street

Photograph Exhibit 3 Bubbly Creek Looking South. Racine Avenue Pumping Station in background (in yellow rectangle)

Photograph Exhibit 4 View looking north, junction of South Branch Chicago River with Bubbly Creek.

Photograph Exhibit 1. Bubbly Creek, looking north. Racine Avenue Pumping Station in foreground.



Photograph Exhibit 2 Bubbly Creek, view looking north from 35th Street

Photograph Exhibit 3 Bubbly Creek Looking South. Racine Avenue Pumping Station in background (in yellow rectangle).

Photograph Exhibit 4 View looking north, junction of South Branch Chicago River with Bubbly Creek.

Attachment 1

FIGURE 1: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT ADDISON STREET ON THE NORTH BRANCH CHICAGO RIVER
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006

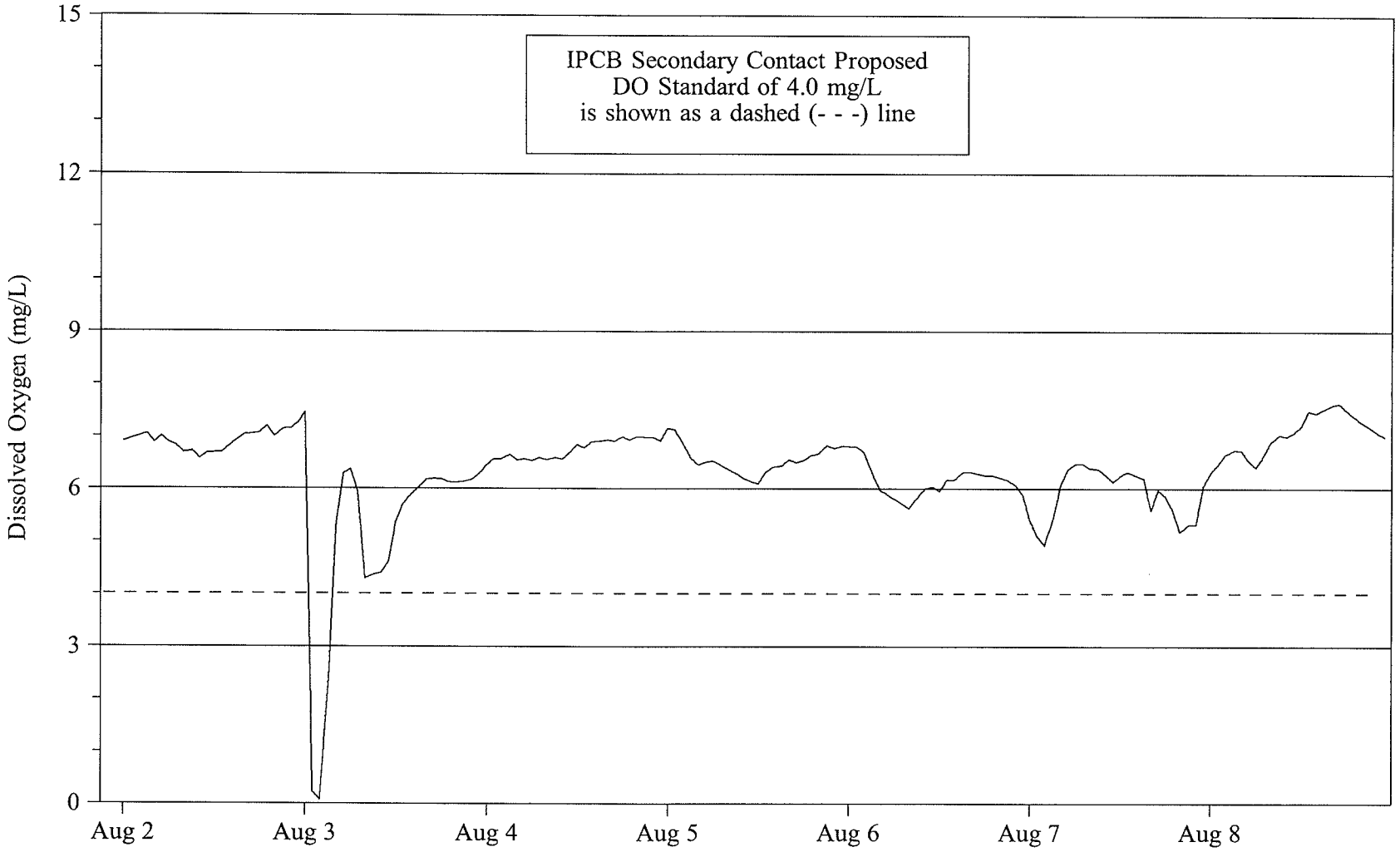


FIGURE 2: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT FULLERTON AVENUE ON THE NORTH BRANCH CHICAGO RIVER
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006

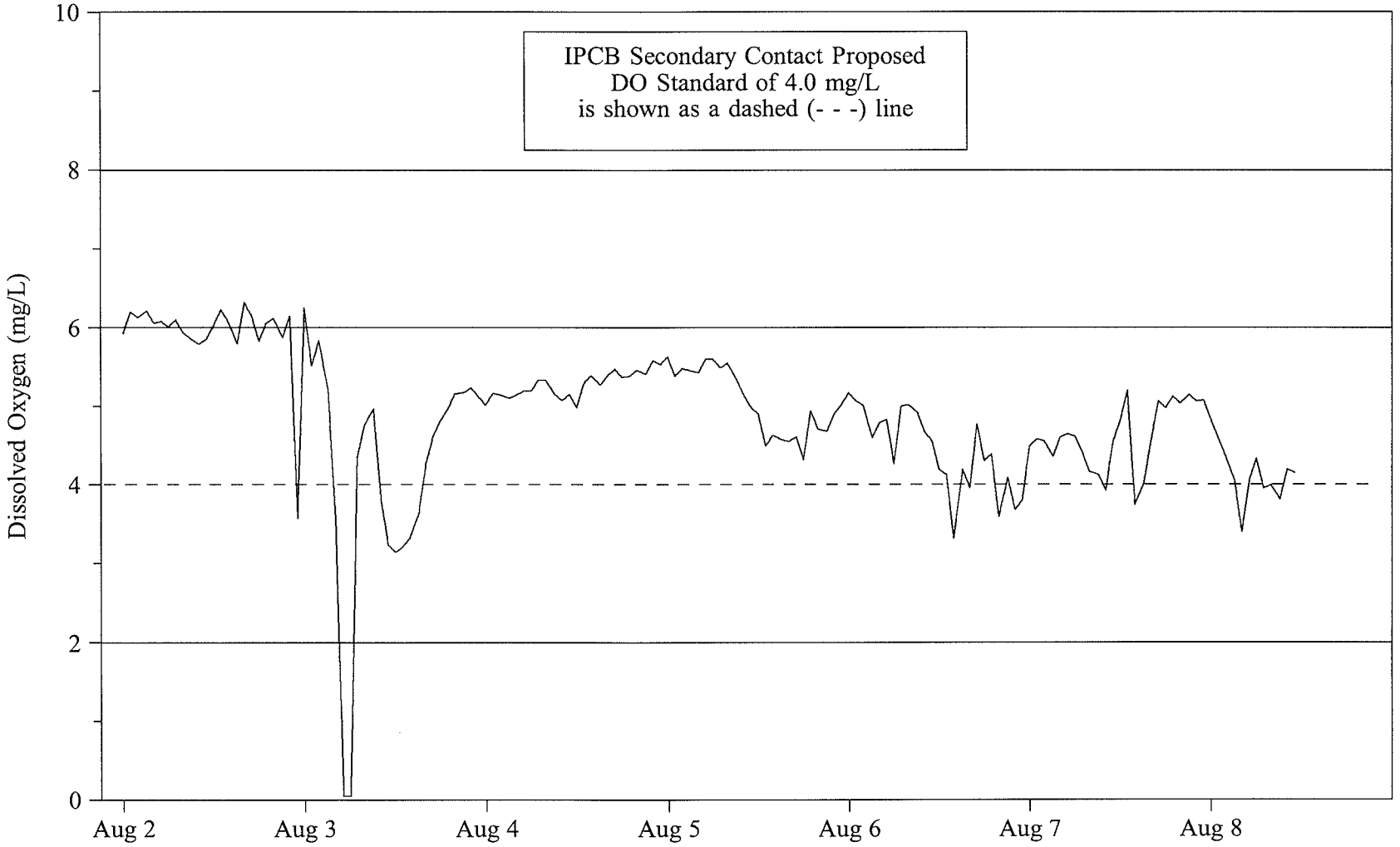


FIGURE 3: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT KINZIE STREET ON THE NORTH BRANCH CHICAGO RIVER
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006

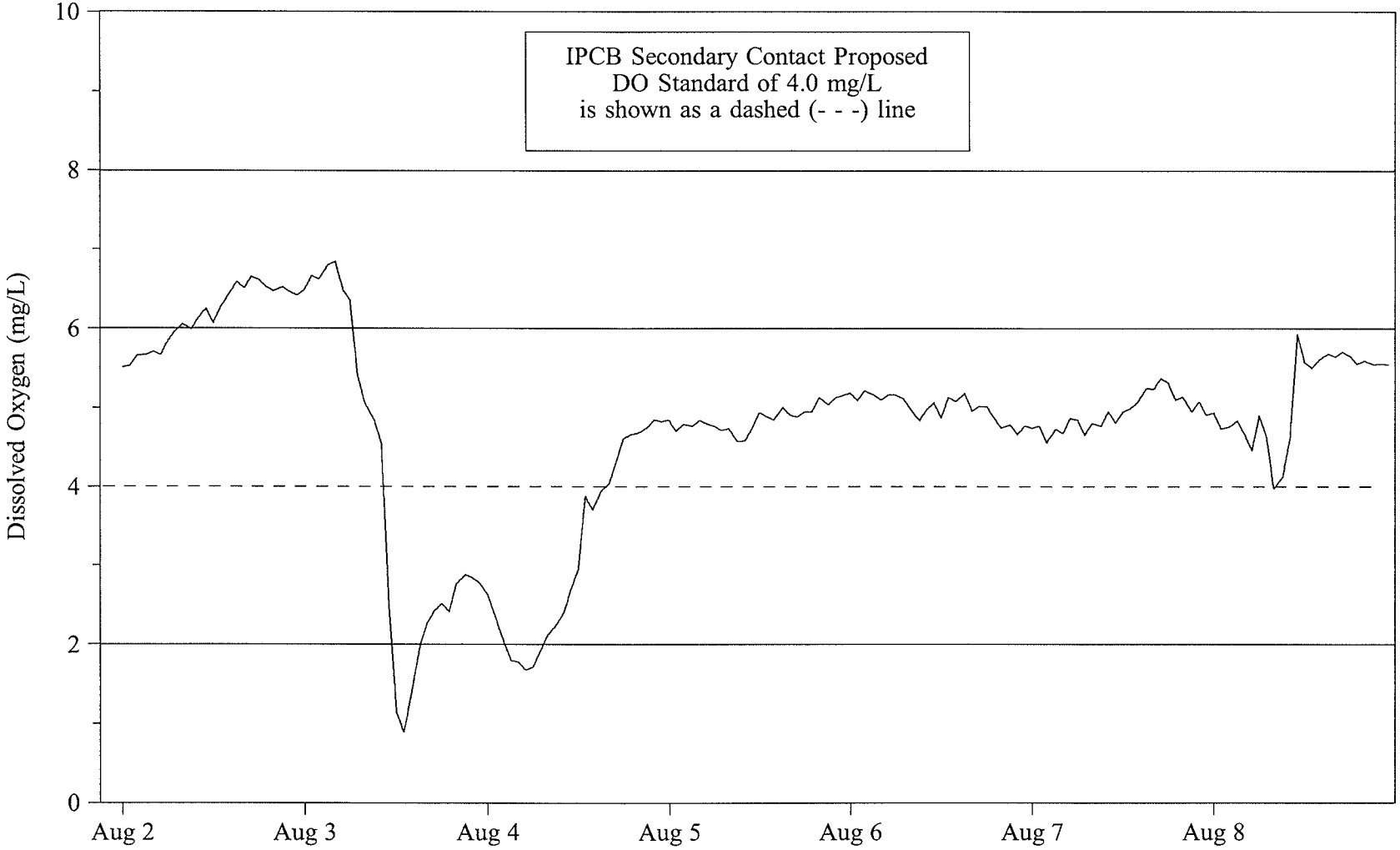


FIGURE 4: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT LOOMIS STREET ON THE SOUTH BRANCH CHICAGO RIVER
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006

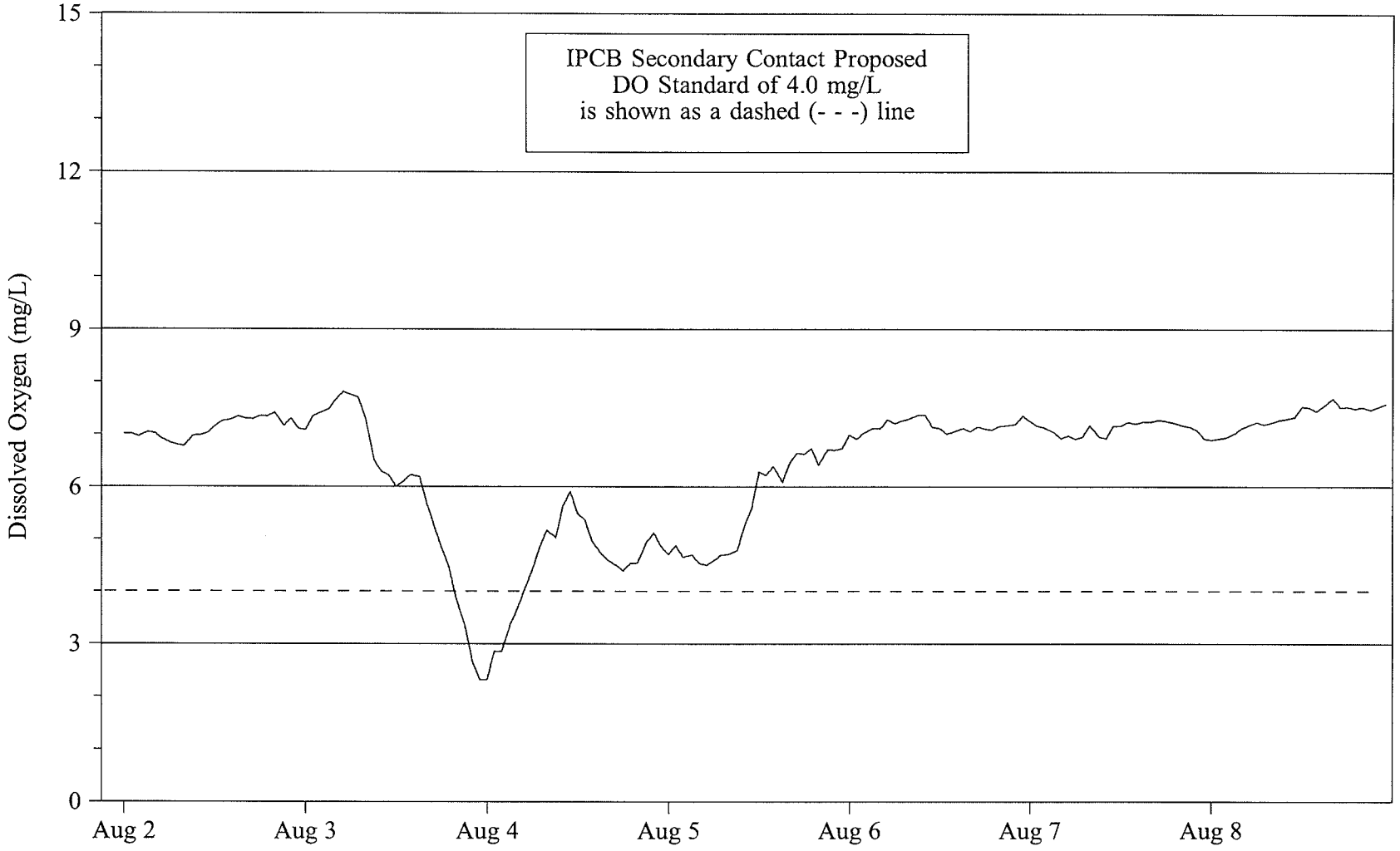


FIGURE 5: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT 36TH STREET ON BUBBLY CREEK
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006

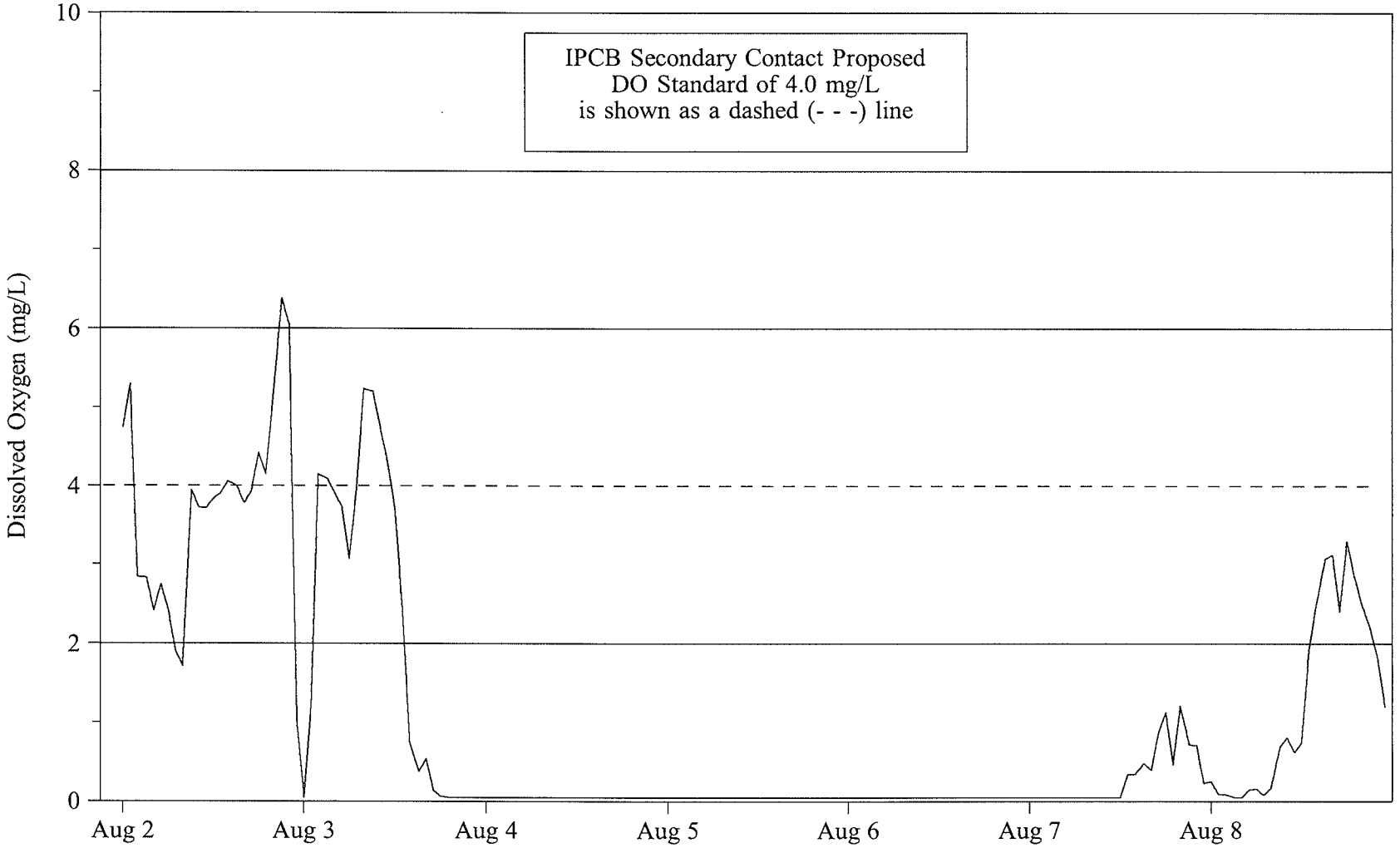


FIGURE 6: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT INTERSTATE HIGHWAY 55 ON BUBBLY CREEK
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006

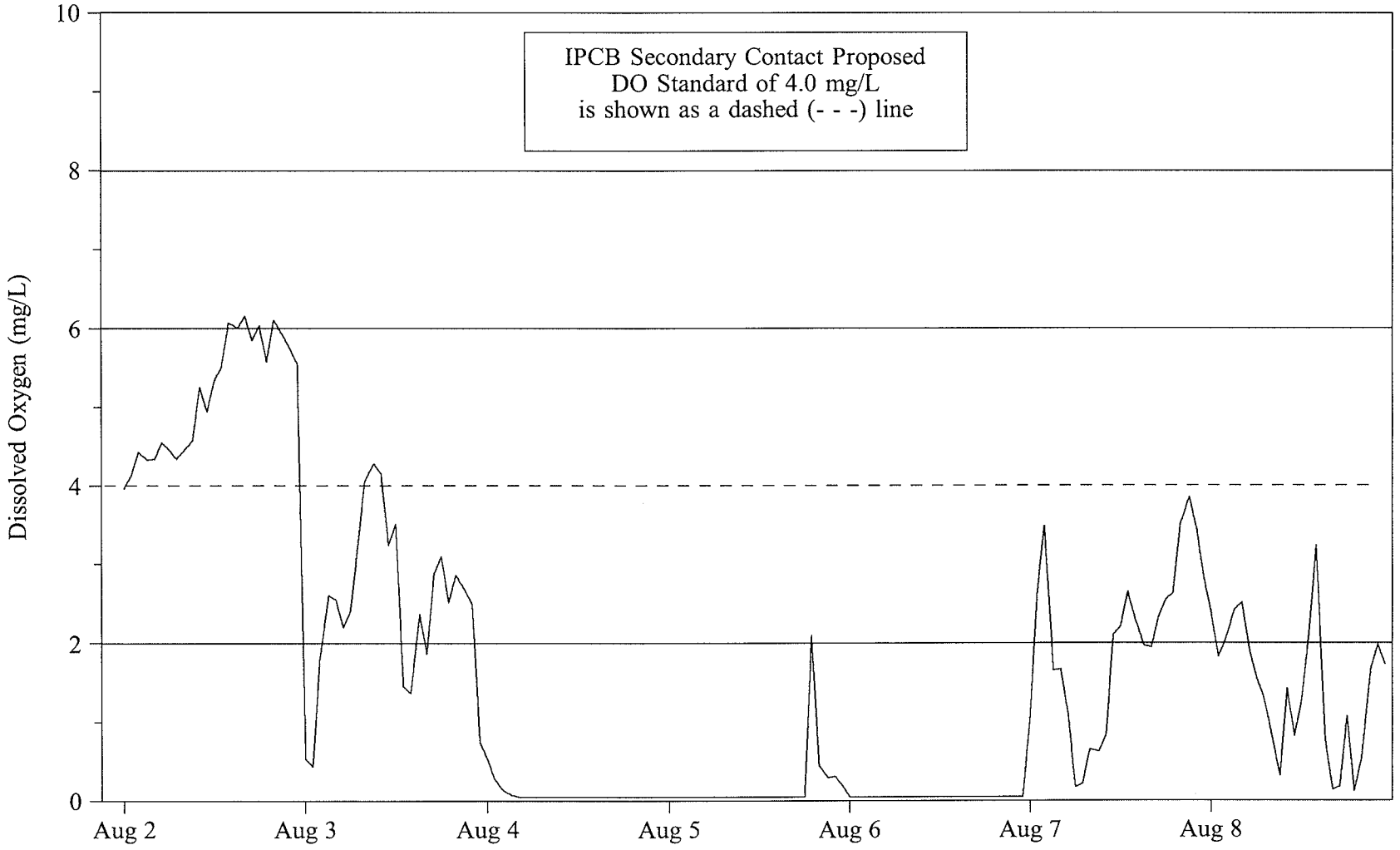
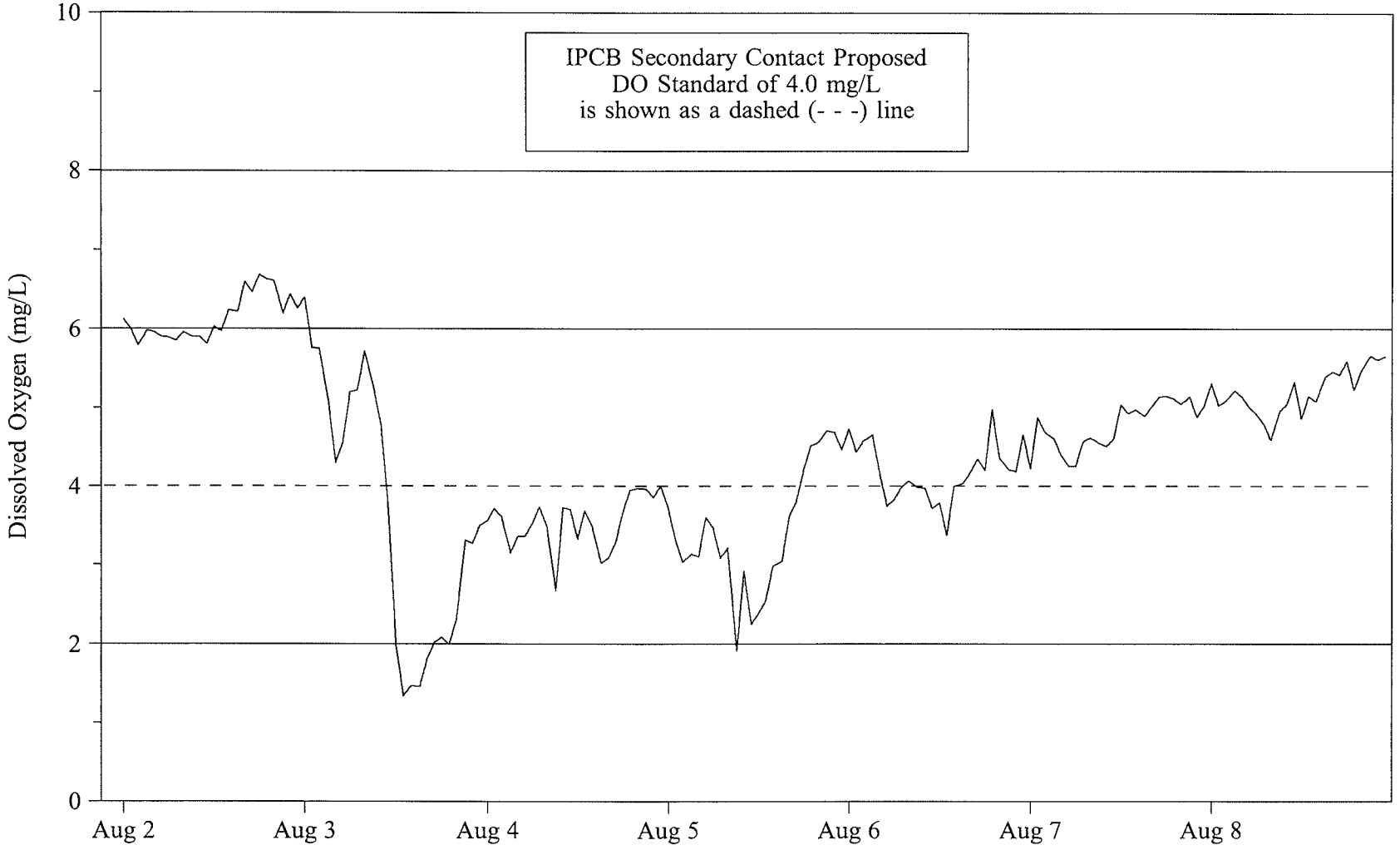


FIGURE 7: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY
AT B&O CENTRAL RAILROAD ON THE CHICAGO SANITARY AND SHIP CANAL
FROM AUGUST 2, 2006 THROUGH AUGUST 8, 2006



Attachment 2

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DIVISION, GREAT LAKES AND OHIO RIVER
CORPS OF ENGINEERS
550 MAIN ST.
CINCINNATI, OH 45202

CELRD-PDS-P (1105) 20 April 2007

MEMORANDUM FOR Commander, Chicago District

SUBJECT: Bubbly Creek, South Branch of the Chicago River, Illinois; Reconnaissance Study Section 905 (b) Analysis (WRDA 86)

1. References:
   a. CELRC-PM-PL memorandum, subject as above, dated 29 Aug 06
   b. CECW-MVD memorandum, subject "Delegation of Approval Authority for Section 905(b) Reports," dated 3 May 04

2. Policy compliance and quality management verification for the subject report have been completed in coordination with the HQUSACE Planning and Policy Division. There was joint agreement by HQUSACE Planning and Policy Division and this Division office that the 905(b) should be approved and the study can proceed into the feasibility phase upon preparation of a project management plan and preparation and execution of a FCSA.

3. Early and continued coordination with higher headquarters is strongly recommended to address potential policy issues related to proposed project features including remediation of contaminated sediments.

4. Per the amended guidance on Peer Review (EC 1105-2-408), the District is directed to coordinate with the MVD Planning Center of Expertise on Ecosystem Restoration and this office on the development of a Peer Review Plan.

5. The subject report is hereby approved and the District may proceed with negotiation and execution of a Feasibility Cost Sharing Agreement.

FOR THE COMMANDER:

Theodore A. Brown, PE, MBA
for MICHAEL B. WHITE, P. E.
Director of Civil Works & Management

cf: CELRD-PDC (Sadri)
CELRD-PDS-G (Miller)

RECONNAISSANCE STUDY
Section 905(b) (WRDA 86) Analysis
Bubbly Creek, South Branch of the Chicago River
18 August 2006

1. STUDY AUTHORITY:

a) This study is being conducted in accordance with the study resolution adopted by the Committee on Environment and Public Works, United States Senate, July 20, 2005. The study resolution authority reads as follows:

"Resolved by the Committee on Environment and Public Works of the United States Senate, that, the Secretary of the Army, is requested to review the report of the Chief of Engineers on the Illinois River, Illinois submitted in Senate Document Numbered 126, Seventy-first Congress, second session, and other pertinent reports, to determine whether any modifications to the South Fork of the South Branch of the Chicago River (commonly known as Bubbly Creek) for ecosystem restoration is advisable at this time."

b) Funds in the amount of $200,000 were appropriated by Congress in Fiscal Year 2006 to conduct the reconnaissance phase of the study. Any remaining funds will be carried over to FY07 to initiate feasibility once approval is received.

2. STUDY PURPOSE:

The purpose of this reconnaissance study is to identify ecosystem restoration opportunities that the Federal Government would have an interest in studying further based on policy guidance for the Corps of Engineers. In response to the study authority, the reconnaissance study was initiated in January 2006. The reconnaissance study has resulted in the finding that there is a Federal interest in participating in a cost-shared feasibility phase study to investigate ecosystem restoration improvements to the South Fork of the South Branch of the Chicago River. The purpose of this Section 905(b) Analysis is to document the basis for this finding and establish the scope of the feasibility phase. As the document that establishes the scope of the feasibility study, the Section 905(b) Analysis is used as the chapter of the Project Management Plan that presents the reconnaissance overview and formulation rationale. Further detailed analysis to determine ecosystem restoration measures will be provided in the feasibility phase.

3. LOCATION OF STUDY, NON-FEDERAL SPONSOR AND CONGRESSIONAL DISTRICT:

a) Study Area: The study area includes the entire 1.25 mile channel of the South Fork of the South Branch of the Chicago River, colloquially referred to as "Bubbly Creek" located entirely within the City of Chicago, Cook County, Illinois. A once sluggishly

flowing channel that drained an area of 5 square miles of wetlands has since been severely altered by human development. Bubbly Creek was once a pristine wetland system that provided natural aquatic and terrestrial habitats for fish, bird, and mammal species. Bubbly Creek has endured major physical alterations including deepening and widening of the channel, creation of sheet pile banks, complete filling of wetlands within the original drainage area, severe hydrologic alterations, and introduction of polluted sediments and runoff. Today, the Bubbly Creek channel begins near Racine Avenue and 38th Street at the Racine Avenue Pumping Station (RAPS) and flows north into the South Branch of the Chicago River near Ashland Avenue as shown in *Figure 1* below.

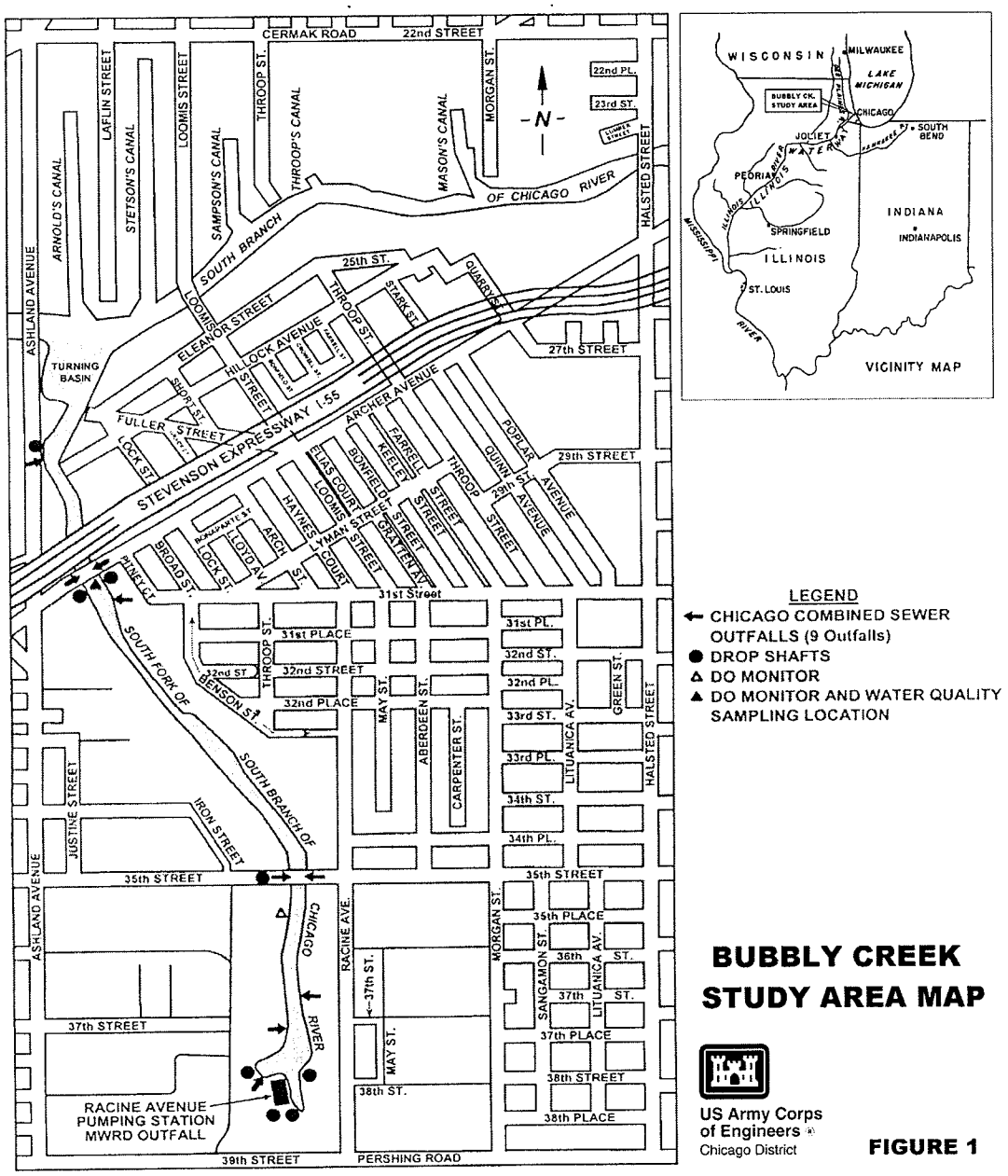


Figure 1: Bubbly Creek Study Area Map

b) Non-Federal Sponsor: City of Chicago, Department of Environment (DOE)

c) Congressional District: 3rd Congressional District, Congressman Daniel Lipinski
4th Congressional District, Congressman Luis Gutierrez

U.S. Senators Richard Durbin and Barack Obama

4. PRIOR REPORTS AND EXISTING PROJECTS:

a) Corps of Engineers reports:

- USACE, Chicago District, *Section 206 Preliminary Restoration Plan for the South Fork of the South Branch of the Chicago River (Bubbly Creek), Chicago Illinois*, 2003.

  The Chicago District received a letter from the City of Chicago, Department of Environment in July 2002 requesting assistance under Section 206 of the Continuing Authorities Program (CAP) to address problems with degraded aquatic habitat in the Chicago River in the vicinity of Bubbly Creek. The District produced a preliminary restoration plan for Bubbly Creek recommending further study under the CAP Section 206 authority. During the feasibility phase of the Section 206 study, the estimated costs of the project were determined to exceed the Section 206 authority project limits and the project was converted to a general investigation study.

- USACE, Chicago District, *Collection and Analysis of Sediment Samples from the South Fork South Branch, Chicago River, Draft Final Report*, 2004.

  One of the first activities performed by the CAP Section 206 feasibility phase was to characterize the existing sediments within Bubbly Creek. Limited sediment characterization was available by the Illinois Environmental Protection Agency (IEPA) and the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). The Chicago District contracted with Camp Dresser and McKee Engineers (CDM) to perform sediment core sampling and analysis of the bottom sediments. Thirteen core samples and five grab samples along the entire length of Bubbly Creek were sampled and analyzed. Results from the analysis concluded that the material was not found to be characteristically toxic, corrosive or reactive under RCRA, but further analysis of ignitability is required.

b) Other studies and reports pertaining to the study area:

- City of Chicago, Department of Planning and Development, *Chicago River Corridor Development Plan*, 1999.

The Chicago River Corridor Development Plan and Design Guidelines are the result of a collaborative effort among government agencies, private sector developers, and non-profit organizations to create a blueprint for the future of the Chicago River. The goal of the plan is to enhance the river's attractiveness as a natural and recreational resource while respecting the needs of residential and business developments. Approved by the Chicago Planning Commission in 1998, the plan sets forth a shared vision for the river and outlines specific recommendations to be completed over the next 10 years. Components of the plan include specific recommendations for improvements to public and private land that support the goals of the plan, and strategies for preserving and enhancing the river's natural areas.

- MWRDGC, Research and Development Department, *Bubbly Creek Water Quality Improvement Demonstration Project in 2002*, Report 03-01, 2003.

  This report provides results of a demonstration project performed in the summer of 2002 by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) with the goal of improving water quality in Bubbly Creek. The demonstration project involved opening a gate at the Racine Avenue Pumping Station (RAPS) to allow water from Bubbly Creek to discharge through the intercepting sewer system, thereby establishing a flow in the creek when otherwise it would have been stagnant. The demonstration project lasted about 3 months where approximately 2.5 billion gallons were drawn through the creek and treated at their water reclamation plant (WRP) at an estimated cost of $625,000. Water quality monitoring showed a marked improvement to dissolved oxygen (DO) during dry weather flows and recommendations for further demonstration project operations were made.

- MWRDGC, Research and Development Department, 2003 *Bubbly Creek Water Quality Improvement Demonstration Project*, Report 04-08, 2004.

  This report provides results of a second-year demonstration project performed by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) with the goal of improving water quality in Bubbly Creek. This additional demonstration project investigated a wider range of flows than the initial study. The demonstration project lasted 6 months where approximately 2.1 billion gallons were drawn through the creek at an estimated cost of $525,000. Hydrologic conditions varied greatly in the second-year demonstration project over the first-year project in that combined sewer overflow (CSO) discharges numbered eight overflow events versus two the previous year. Water quality monitoring showed marked improvements to dissolved oxygen (DO) during dry weather flows and reductions in periods of low DO following CSO events. Recommendations for further study of sediment oxygen uptake and the impact of algal respiration on DO levels were made. The report also states that the method of artificial flow creation used in this demonstration project cannot be used as a long-term solution for the water quality improvements in Bubbly Creek since it

requires capacity at the WRP that may not be available in wet weather along with significant additional operating costs.

- IEPA, Use Attainability Analysis for the Chicago Area Waterway System, Draft Report, 2004.

  The Illinois Environmental Protection Agency (IEPA) has the responsibility to establish standards for the waterways in Illinois. Part of the standard-setting process is based on how the waterways are being used and by what entities. IEPA performed a Use Attainability Analysis (UAA) of the Chicago Area Waterway System (CAWS) to help understand the changing circumstances of the waterways in order to better set the standards. The Illinois Pollution Control Board (IPCB) recently upgraded three reaches of CAWS due to water quality improvements without going through the rigors of a UAA study. This study analyzed whether a use upgrade for currently designated *Secondary Use* reaches are achievable, by what means could limiting factors be controlled, and to determine whether the recent upgrades of *General Use* reaches in CAWS were appropriate. This study involved comprehensive data gathering in terms of water quality, sediment chemistry, biological, habitat, hydrological, waterway use, recreational, and aesthetics. The UAA study recommends Bubbly Creek remain a *Secondary Use* reach along with a suite of management strategies to be implemented in order to control limiting factors. The report recommends several strategies for Bubbly Creek including flow augmentation and aeration to address low dissolved oxygen levels, in stream habitat to improve fish communities, sediment removal to improve aquatic life conditions, and disinfection to protect for water recreation.

5. PLAN FORMULATION:

Overall Planning Process:

The six-step planning process laid out in the Water Resources Council's Principles and Guidelines was used to guide the planning process and to identify and select alternatives to pursue in more detail during the feasibility phase. The six planning steps are: 1) identify problems and opportunities, 2) inventory and forecast conditions, 3) formulate alternative plans, 4) evaluate effects of alternative plans, 5) compare alternative plans, and 6) select recommended plan. Identifying problems and opportunities are emphasized for this reconnaissance study. Due to time and funding constraints, the scope of work to formulate, evaluate, compare and select a recommended plan are limited to existing information. This reconnaissance study will provide a preliminary investigation of potential solutions for ecosystem restoration. This information will be refined through future iterations of the planning steps that will be accomplished during the feasibility phase.

a) National Objective:

The Corps has a national objective for ecosystem restoration in response to legislation and administration policy. The National Ecosystem Restoration (NER) objective is to contribute to the restoration of the Nation's ecosystems through implementation of ecosystem restoration projects, with contributions measured by changes in the amounts of ecological outputs.

b) Public Concerns:

During the preparation of this report, several meetings were held with the potential sponsor and several other federal, state, regional, and local stakeholders including:

- City of Chicago, Department of the Environment (DOE); potential local sponsor
- U.S. Environmental Protection Agency, Region V (USEPA)
- Illinois Environmental Protection Agency (IEPA)
- City of Chicago, Department of Planning and Development (DPD)
- City of Chicago, Mayor's Office (MO)
- City of Chicago, Department of Water Management (DWM)
- Metropolitan Water Reclamation District of Greater Chicago District (MWRDGC)
- Friends of the Chicago River (FCR)
- The Wetlands Initiative (TWI)

A number of public concerns regarding Bubbly Creek have been identified during these discussions. The public concerns are related to the establishment of planning objectives and planning constraints. The following public concerns were identified:

- Majority of the time Bubbly Creek is stagnant due to major hydrologic alterations, which contribute to low water quality and aquatic habitat degradation.
- Bubbly Creek receives combined sewer overflows from RAPS and other CSO outfalls along the channel during major rain events. These CSOs contribute to water quality degradation, aquatic habitat degradation, increased solids loadings, and the introduction of floating debris.
- The sediments contained within Bubbly Creek are the remnants of raw sewage and waste from previous meatpacking industries that lined its banks. These sediments contain high levels of organics that continually decompose anaerobically producing methane and hydrogen sulfide gas in bubble form thus contributing to water quality and aquatic habitat degradation.
- Bubbly Creek is critical for providing flood relief to a 30 square mile area of the south side of Chicago by receiving overflows. The conveyance capacity of the channel must remain viable to accept the 6,000-cfs maximum overflows from RAPS and additional overflow capacity from nine CSO overflows along the channel. Maintaining existing channel conveyance capacity in order to not induce additional flooding must be taken into account throughout the planning process.

- Due to water quality problems, Bubbly Creek is classified as a secondary use water body for limited contact. Plans to revitalize the surrounding area are limited by its current degraded state.
- Bubbly Creek offers limited recreational opportunities for millions of residents of the local surrounding community.
- Currently, Bubbly Creek is not aesthetically pleasing as the channel produces frequent foul odors and collects unsightly floating debris following a CSO event.

c) Problem Identification:

General / Background -

Historically, the Chicago River system was essentially a wetland complex that sluggishly flowed east into Lake Michigan. The drainage area of the Chicago River was unique in that its boundary with the Des Plaines River to the west formed a continental divide separating the Great Lakes and St. Lawrence River watershed from the Mississippi River drainage basin. One location of the continental divide called Mud Lake, just two miles west of Bubbly Creek, was quite low and ill-defined allowing sporadic overflows to the Mississippi River basin during spring floods, which periodically connected these great basins. This unique topographic characteristic allowed for a permanent connection between the two basins possible. In 1848 the completion of the Illinois and Michigan Canal, which originated at the confluence of Bubbly Creek and the South Branch of the Chicago River, created an efficient water trade route between the basins sparking the rapid growth and development of the Chicago area. In 1900, a larger connection was created with the completion of the Chicago Sanitary and Ship Canal, which in turn permanently reversed the flow of the Chicago River and its drainage from Lake Michigan to the Illinois River and down the Mississippi River.

The South Fork of the South Branch of the Chicago River and its tributaries were once clear meandering creeks that slowly drained the vast marshland that occurred within its original 5 square mile drainage area. This once pristine ecosystem provided natural aquatic and terrestrial habitats for many fish, bird, and mammal species. Over a period of several decades, this pristine ecosystem was severely altered by human development. In the early 1860's the Union Stock Yards were constructed along the banks of the South Fork and this small stream became an open sewer and disposal site for large quantities of blood, offal, hair, and other animal wastes from the meatpacking industry. The channel was systematically deepened and widened to allow for drainage and disposal of wastes from the nearby meatpacking industries. Biochemical reactions caused by decomposing animal waste continuously produce methane and hydrogen sulfide bubbles. To this day these bubbles constantly float to and break at the water surface, for which the name "Bubbly Creek" is colloquially given. In 1923, the last tributary to Bubbly Creek, West Arm of the South Fork, was completely filled in as a remediation solution to the vast quantities of waste dumped in that channel. The Union Stockyards closed in 1971 after 105 years of meat production. The impact which the Union Stockyards have on the landscape and its vast physical alterations to Bubbly Creek and the surrounding area remains today.

During the development of Chicago in the late 1800s and early 1900s, a vast sewer system was constructed to collect sanitary waste and storm runoff and convey it via massive underground combined sewers to the areas river system. A 30-square mile area of the central and south side of the City of Chicago originally drained to Bubbly Creek by gravity. Conditions in the channel degraded to a point where a bypass connection was constructed to pump fresh water from Lake Michigan to flush the system during dry weather. In 1939, the worlds largest pump station, Racine Avenue Pumping Station (RAPS), was constructed and dry weather flows were diverted to the Stickney Water Reclamation Plant (WRP) for treatment instead of directly discharging raw sewage to Bubbly Creek. Over the years, increases to treatment capacity at the WRP have reduced the amount of overflows that occur. The construction of the Tunnel and Reservoir Plan (TARP), which encompasses a system of deep tunnels and massive reservoirs used to store overflows, have drastically reduced the amount of combined sewer overflows (CSOs) to area rivers. Currently the tunnel portion of the project is complete, thus reducing the number of CSOs at RAPS to approximately 17 times per year. Unfortunately, even with the TARP project completed, with construction of the McCook reservoir currently scheduled for 2023 completion, overflow capacity will still be required at RAPS, albeit less frequently, in order to prevent local flooding and basement backup during large storm events.

Today, Bubbly Creek is a relatively straight 6,600-foot channel that originates at the RAPS and flows north during overflow events to its confluence with the South Branch of the Chicago River. The channel is mostly lined with vertical walls made of steel sheet pile, concrete, or wood and few areas of steep rocky soils as shown in *Figure 2* below. A mix of land uses are found along the banks of Bubbly Creek including industrial plants, trucking terminals, rail yards, and construction material yards which are giving way to new commercial and residential development. Channel depths vary from approximately 6-feet near RAPS to 14-feet at its mouth and channel widths vary between 120 to 200-feet wide. The major physical alterations caused by development has severely degraded the natural ecosystem and eliminated most of the natural aquatic and terrestrial habitats. Due to hydrologic alterations, existing bottom sediments, combined sewer overflows, and lack of riparian and in-stream habitats, Bubbly Creek remains a severely impaired ecosystem with vast opportunities for restoration. Unfortunately, Bubbly Creek has been altered and degraded so severely that simply restoring aquatic and terrestrial vegetation, reintroducing natural bottom substrates, altering the channel form, and creating wetlands will not work on their own. Sustainable conditions must be met in order for ecosystem restoration to take hold and succeed.

Below is a discussion of specific problems that contribute to the degradation of Bubbly Creek and which must be solved in order to allow for successful ecosystem restoration. The first four problems identified below including stagnant flow conditions, combined sewer overflows, poor sediment quality and poor water quality all contribute to the degradation of habitat and biological integrity and must be addressed in order to provide sustainable conditions for ecosystem restoration. Successful ecosystem restoration is dependent upon restoring the conditions needed for sustainability. Bubbly Creek faces a

complex series of problems, which in turn will require an equally complex set of restoration solutions.

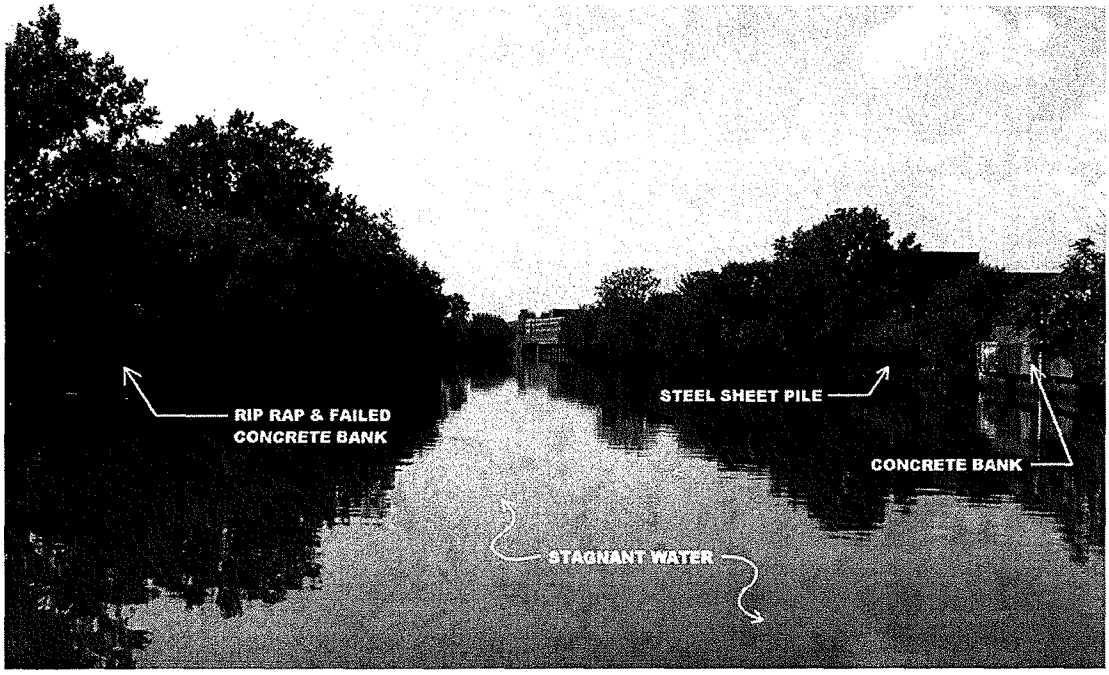


Figure 2: Bubbly Creek Looking Upstream from 35th Street

(1) *Stagnant Flow Conditions* -

During dry weather periods Bubbly Creek is stagnant, except for the occasional movement of water caused by a passing boat or slight surge from the South Branch. Following light to moderate rainstorms, flow in Bubbly Creek is not noticeably changed since most rainfall runoff is captured in the combined sewer system and conveyed for treatment and released downstream. Only small areas adjacent to the channel drain directly to Bubbly Creek and runoff is too limited to significantly impact flows. Due to this short-circuiting affect on drainage, Bubbly Creek functions more like a lake system than a river system the majority of the time. During stagnant periods, severely degraded water quality in Bubbly Creek can be attributed to several factors including the biochemical interaction between the sediment and the water column, residual water quality from CSOs, and photosynthetic activity. Levels of dissolved oxygen (DO), which are good indicators of water quality impairment, typically plummet during stagnant periods and often reach zero.

Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) which operates RAPS conducted a demonstration project where flows were artificially introduced to Bubbly Creek during dry weather by opening a gate at RAPS to allow water to enter the interceptor sewers and be pumped for treatment, thereby establishing a reverse flow in the creek when otherwise it would have been stagnant. MWRDGC performed this demonstration project for two summers with success in improving dry

weather water quality at a cost of nearly $1.2 million dollars in added operating costs. It was determined that the creation of an artificial flow during dry weather flows can drastically improve water quality, but the method of artificial flow creation used in this project cannot be used as a long-term solution for the water quality improvements in Bubbly Creek since it requires additional treatment capacity that may not be available in wet weather and entails significant additional operating costs.

(2) *Combined Sewer Overflows* -

During excessively heavy rainfall events, the combined sewer system that drains surface water runoff and sanitary waste by gravity to RAPS can become overwhelmed. In order to prevent local flooding and basement backup within the sewershed, pumps at RAPS are turned on to discharge CSO to Bubbly Creek when the capacity of the sewer system is reached. When this occurs, the water level in the creek rises forcing the CSO to flow north toward the South Branch of the Chicago River. At maximum overflow capacity, RAPS can discharge approximately 6,000 cubic feet per second. Combined with additional flow from adjacent CSO overflows along the channel, the upstream water levels near RAPS can rise over 3 feet and velocities in the channel can reach in excess of 5 feet per second. During overflow events the water quality in the channel is severely degraded as CSO contains significant quantities of fresh sewage, street runoff solids, and some floatable materials as shown in *Figure 3* below. In addition to water quality degradation, riverine habitats are severely impacted due to high channel velocities caused by CSO discharges.

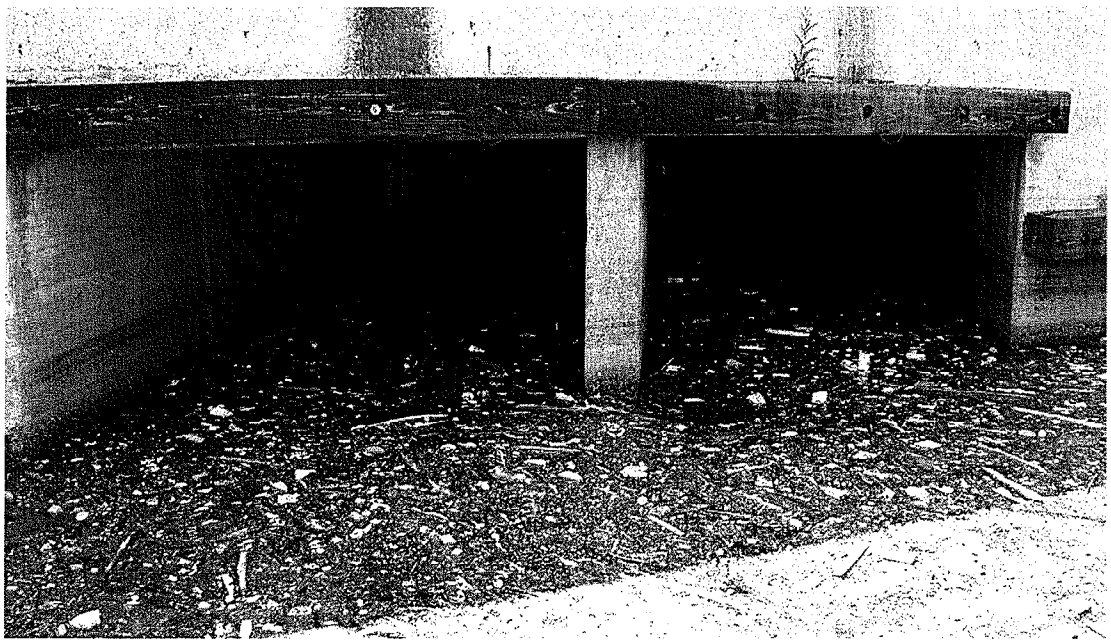


Figure 3: Floatable Debris Collected at RAPS Following a CSO Event

In the ten-year period between 1996 through 2005, overflow pumping to Bubbly Creek at RAPS had occurred 14 times per year on average. The highest was 21 times in 2001 and

the lowest was 9 times in 2005. The duration of pumping varied from a few hours to a day or more, depending on the amount and duration of rainfall. The completion of the Tunnel and Reservoir Plan (TARP), which encompasses a system of deep tunnels and massive reservoirs used to store overflows, will reduce the frequency of overflows to Bubbly Creek. In the interim period before the completion of TARP, the City of Chicago is implementing a plan to reduce the volume of stormwater entering the combined sewer system by utilizing Best Management Practices (BMPs) citywide. Unfortunately, the TARP project will not eliminate all CSOs, therefore pumping from RAPS will continue to occur when intense storms with large rainfall amounts hit the south side of Chicago.

(3) *Sediment Quality* -

The sediments within the Bubbly Creek channel contain remnants of animal wastes such as carcasses, hair, and offal from the meat processing plants that previously lined its banks, raw sewage once directly dumped into the channel, and solids contained in combined sewer overflows still released by RAPS and other CSO outfalls along the channel. The Illinois Environmental Protection Agency (IEPA), U.S. Environmental Protection Agency (USEPA), Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), and USACE have all performed past sediment sampling and bulk chemistry analyses are consistent among these sampling events. The Chicago District collected the bulk of sediment information available in the spring of 2004. Thirteen core samples and five grab samples along the entire length of Bubbly Creek were sampled and analyzed. Sediment depths ranged between 5.5 and 16.8 feet and consisted primarily of sand and clay. Results of bulk chemistry and Toxicity Characteristic Leaching Procedure (TCLP) testing show that sampled sediment does not exceed toxicity criteria established under the Resource Conservation and Recovery Act (RCRA), or maximum allowable polychlorinated biphenyl (PCB) concentrations established under Toxic Substances Control Act (TSCA).

Sediment samples all showed elevated levels of polycyclic aromatic hydrocarbons (PAHs) and heavy metals. Other detected contaminants included semi volatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), oil and grease, and nutrients. A close examination of existing sediment quality will be completed during the feasibility study as disposal locations and costs can significantly alter the feasibility of measures addressing sediment quality. Additional sediment sampling may be needed depending on measures considered during the feasibility study. Biochemical reactions within the sediment caused by anaerobic organic decomposition produce methane and hydrogen sulfide bubbles that constantly float to the surface sometimes carrying clumps of sediment when made buoyant by entrapped gas bubbles as shown in *Figure 4* below. These clumps eventually sink when entrained gas vents to the atmosphere. Odors produced by the gases and the appearance of these clumps is aesthetically unpleasant.

The City of Chicago, in partnership with The Wetlands Initiative, the University of Illinois at Chicago, and MWRDGC, is pursuing an active capping demonstration project for the turning basin at the confluence of Bubbly Creek and the South Branch to

demonstrate contaminant sequestration and reduction of exposure to the contaminated sediments. Results from this project could provide invaluable information that would be used in the formulation and evaluation of sediment remediation measures for the entire channel during feasibility phase.

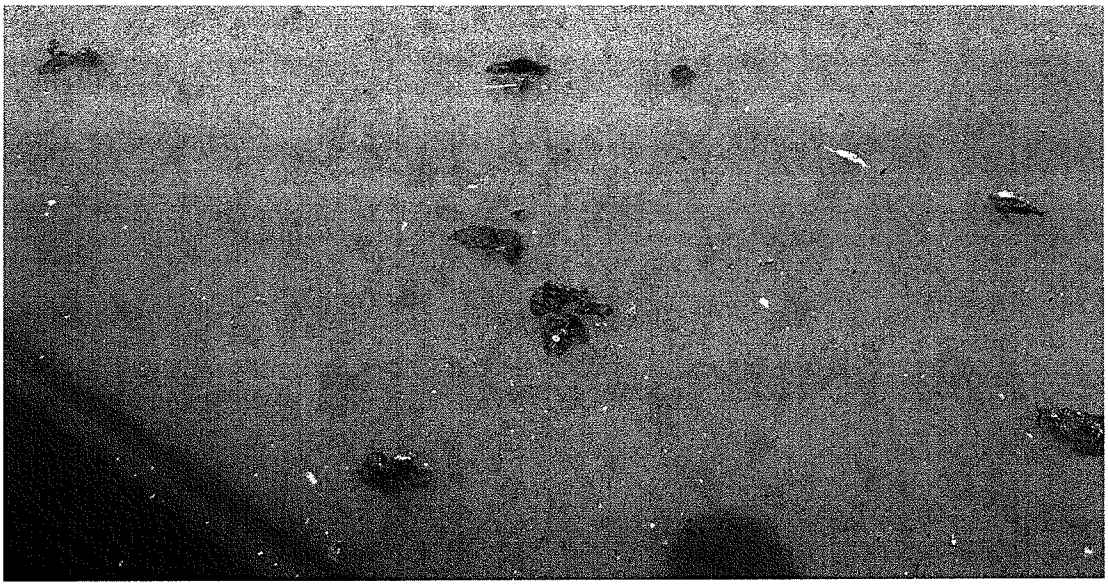


Figure 4: Clumps of Sediment and Gas Bubbles at the Surface of Bubbly Creek

(4) *Water Quality* -

In general, the water quality in the Chicago Waterway system is marginal, but constantly improving. Bubbly Creek is classified for *Secondary Use* by the Illinois Pollution Control Board (IPCB), which indicates the water is only suitable for limited contact activities such as boating and fishing. Bubbly Creek is also listed as an impaired stream by IEPA according the Section 303(d) of the Clean Water Act. The listed causes of impairment include high pH, low dissolved oxygen, and high total phosphorus with combined sewer overflows as the primary source of impairment. Stagnant flow conditions and the biochemical interaction with contaminated sediments also contribute to water quality degradation. Water quality is critical to maintaining high quality habitats needed to support diverse fish and wildlife populations. Poor water quality severely limits the aquatic habitat and communities within Bubbly Creek

(5) *Habitat and Biological Integrity* -

Currently, Bubbly Creek no longer maintains hydro-geomorphic function that historically provided the means for a broad diversity of habitats to exist. Thus, this system no longer supports healthy and rich plant and animal communities. The health of the Bubbly Creek ecosystem has severely declined in response to a loss of habitat to support various life stages of aquatic and terrestrial biota and a reduction in habitat quality due to several factors. The lack of flow diversity caused stagnant flow conditions and high velocities from combined sewer overflows has resulted in severe habitat degradation. Poor

sediment quality and the biochemical reactions from organic decomposition further degrade the aquatic habitat for fish and macroinvertebrates. Poor water quality caused by combined sewer overflows, hydrologic alterations, and reactions with underlying sediments also contribute to habitat degradation. The channel is absent of any aquatic vegetation, physical structure, or lotic characteristics, which would provide the basis for healthy and diverse riverine communities.

An Index of Biotic Integrity (IBI) was used to assess the status and probable improvements to the riverine ecosystem of Bubbly Creek in lieu of ecological restoration. This IBI may be viewed as a quantitative empirical index for rating the health of a riverine ecosystem with a scale between 0 and 60. A spring fish survey was performed where six species were collected, all consisting of tolerant and / or non-native species. Based on structural, compositional, and functional components of the fish community surveyed, Bubbly Creek received an IBI score of 10. This score corresponds to a very poor rating and is characterized as an imperiled aquatic ecosystem in which biotic integrity has been severely reduced.

(6) *Recreation* -

Limited recreational activities occur along Bubbly Creek. At the confluence with the South Branch of the Chicago River, the South Chicago Rowing Center has a small boat launch. Bank fishing is also common at the confluence of Bubbly Creek. Many new developments that are being constructed along the Chicago River including Bridgeport Village, a new single-family residential development area along a portion of the east bank of Bubbly Creek. Many of these developments are creating river walks to connect the waterways to residents. Due to the poor water quality and the lack of aquatic habitat and biological integrity, additional recreational opportunities are limited. Foul odors and unsightly floating debris can also limit recreational user of from Bubbly Creek.

d) Opportunities:

Improve Stagnant Flow Conditions – Feasibility phase and other studies can provide opportunities to restore flow to the channel during normal and dry weather conditions. The introduction of flows to the channel can significantly improve water quality, increase and improve riverine habitat, provide environmental benefits for fish and wildlife, and improve the aesthetics of the channel.

Reduce Combined Sewer Overflows – Feasibility phase and other studies can provide opportunities to reduce impacts of combined sewer overflows. Reduced combined sewer overflows can significantly improve water quality by helping to control point sources of pollution and provide environmental benefits for fish and wildlife. In addition, reducing extremely high flow velocities experienced during overflow events can greatly benefit the aquatic ecosystem by allowing natural structure to establish and remain intact.

Improve Sediment Quality – Feasibility phase and other studies can provide opportunities to reduce contaminant migration from existing sediments. Removal or capping of bottom

sediments can significantly improve water quality by controlling contaminant migration, increase and improve substrates and macroinvertebrate habitats, and provide environmental benefits for fish and wildlife.

Improve Water Quality – Feasibility phase and other studies can provide opportunities to benefit water quality. Increased water quality can significantly increase and improve fish community habitat, provide environmental benefits for fish and wildlife, and improve the aesthetics of the channel.

Increase Habitat and Biological Integrity – Feasibility phase and other studies can provide opportunities to increase or improve riverine habitat, improve riparian habitat along the channel, restore native plant communities within the river corridor, restore wetlands, and restore stream processes to a more natural condition allowing for increased biological integrity.

Increase Recreational Opportunities – A future ecosystem restoration project would provide important opportunities for development of public recreation. Both land-based and water based facilities could be incorporated into a restoration plan and would provide an opportunity for State, city, and local entities to implement some of their recreation plans and ideas. The project could also provide the opportunity for cultural, historic, and scenic preservation.

e) Expected Future Without-Project Conditions:

The future without-project condition of Bubbly Creek is expected to remain in a highly degraded state. Stagnant conditions, combined sewer overflows, and contaminated sediments will continue to contribute to poor water quality, severe habitat degradation, and continued loss of habitats that support various life stages of aquatic and terrestrial biota. Water quality is projected to slightly improve once the TARP system is fully operational due to less frequent CSO events. Since overflows will not be completely eliminated by TARP, water quality degradation from CSO discharges will continue. Without major restoration, Bubbly Creek will remain classified as a limited contact water body also contributing to major limitations on recreational opportunities.

f) Planning Objectives:

The following planning objectives are specific to Bubbly Creek:

- Improve normal flow conditions
- Reduce impacts of combined sewer overflows
- Reduce exposure to and environmental impacts from bottom sediments
- Improve water quality since it is the limiting factor to habitat restoration
- Provide diverse aquatic and related habitats
- Improve river corridor aesthetics
- Provide recreational opportunities

g) Planning Constraints:

- Bubbly Creek provides conveyance to combined sewer overflows from RAPS and adjacent sewers. These overflows provide additional capacity to the combined sewer system that drains a major portion of the central and south sides of Chicago, thus eliminating local flooding and basement backups. The conveyance capacity of Bubbly Creek must be maintained so that additional flooding is not induced.
- Flow velocities during CSO events can reach high levels thus limiting the design of in-channel measures. Channel improvements, sediment capping, aquatic vegetation, and other restoration activities must be designed to withstand these flow velocities unless a separate conveyance for CSOs is developed.
- In many areas, development exists right up to the edge of the channel. Restoration efforts will be constrained in many locations mentioned above unless land titles or easements are purchased.
- Many properties surrounding Bubbly Creek either house current businesses or once did. Impacts to current businesses should be minimized where possible. Due to the historic nature of businesses along Bubbly Creek, a high potential for brownfield contamination exists and should be avoided where possible.
- The City of Chicago is currently in the process of developing an urban renewal plan for the neighborhood that surrounds Bubbly Creek. Project features should be planned in accordance with local land use and development plans.
- Numerous laws, regulations, Executive Orders, and policies must be considered, such as National Environmental Protection Act (NEPA), Endangered Species Act (ESA), Clean Water Act (CWA), Clean Air Act (CAA), National Historic Preservation Act (NHPA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), and Corps of Engineers Planning and Engineering guidance.

h) Measures to Address Identified Planning Objectives:

A management measure is a feature or activity at a site, which addresses one or more of the planning objectives. A wide variety of measures were considered, some of which were found to be infeasible due to technical, economic or environmental constraints. Each measure was assessed and a determination made regarding whether it should be retained for future consideration in the formulation of alternative plans. The potential measures that were considered are listed in *Table 1* below.

Measure Description	Evaluation / Rationale for Decision	Decision
- Measures to improve normal flow conditions		
Separate sewers and collect stormwater from adjacent properties for controlled release during low-flow conditions	Numerous small sewersheds at one time drained directly into Bubbly Creek via the nine CSO outfalls currently along the channel. These sewersheds currently drain into interceptors and pumped for treatment. Due to the small size of these sewersheds, the possibility of sewer separation and collection of stormwater for controlled release exists.	retain
Take Bubbly Creek water in at RAPS for treatment at Stickney WRP	This measure was implemented during a two-year demonstration project by MWRDGC that concluded although water quality showed marked improvements this method cannot be used as a long term solution due to increased wet-weather capacity requirements at the WRP and significant additional operating costs.	not retained
Pumping water from the South Branch to the upstream end of Bubbly Creek near RAPS to restore low-flow conditions	The possibility of pumping water from the South Branch and discharging it at the upstream end of Bubbly Creek to restore low-flow conditions exists.	retain
Pumping water from Lake Michigan to the upstream end of Bubbly Creek near RAPS to restore low-flow conditions	A pump station at the lake and a tunnel along 39th street was constructed in the early 1900's and this measure was utilized for many years to flush raw sewage out of Bubbly Creek. This method was abandoned by the introduction of sewage treatment practices and the construction of RAPS to convey sewage to WRP. According to Section 1109(b)(4) of WRDA 1986 as amended, any Federal agency is prohibited from undertaking any studies that would involve the transfer of Great Lakes water for any purpose for use outside the Great Lakes basin, therefore this measure was not retained.	not retained
- Measures to reduce impacts of combined sewer overflows		
Separating sewers within the RAPS sewershed	During the comprehensive feasibility study that justified the Chicago Underflow Plan this measure was found too costly and infeasible.	not retained
Diverting stormwater within the RAPS sewershed to another sewershed	During the comprehensive feasibility study that justified the Chicago Underflow Plan this measure was found too costly and infeasible.	not retained
Local sewer separation and elimination of CSOs in areas adjacent to Bubbly Creek	As stated above, due to the small size of adjacent sewersheds, the possibility of sewer separation exists. In addition, CSO outfalls along the channel could possibly be bulkheaded or removed.	retain
Creation of detention storage for the RAPS sewershed	This measure was recommended and approved under the Chicago Underflow Plan. The McCook reservoir, currently under construction, along with the completed TARP tunnel system has created detention storage for large areas of the Chicago area including the RAPS sewershed. Additional storage in the RAPS sewershed is not feasible.	not retained
Creation of detention storage for areas adjacent to Bubbly Creek	As stated above, due to the small size of adjacent sewersheds, the possibility of creating additional detention storage exists.	retain
Water treatment/disinfectant of CSOs from RAPS	This measure would involve treatment of CSO discharges by such means as chlorination/dechlorination, filtration, ultraviolet disinfection, or other means. Due to the large volume of CSOs experienced at RAPS this measure is not feasible.	not retained
Water treatment/disinfectant of CSOs from areas adjacent to Bubbly Creek	As stated above, this measure would involve treatment of CSO discharges by a variety of means. Since CSO discharges from areas adjacent to Bubbly Creek are minimal in comparison to RAPS the possibility of treating the CSOs prior to contact with Bubbly creek exists.	retain
Bypass discharge directly to South Branch	The possibility of diverting CSO discharge from RAPS directly to the South Branch via diversion pipes exists. The large costs to implement this measure must be weighed against the ecological benefits from the elimination of CSOs from RAPS.	retain
- Measures to manage contamination from bottom sediments		
Remove contaminated sediments	The possibility of removing contaminated bottom sediments through dredging and disposal of Bubbly Creek exists.	retain
Cap existing sediments	The possibility of capping bottom sediments Bubbly Creek exists. The City of Chicago is currently pursuing a demonstration project to test the feasibility of capping sediments along Bubbly Creek.	retain

Table 1: Measures considered for further evaluation

- Measures to improve water quality (in addition to other Measures that also address objective)		
In-stream aeration	The possibility of creating in-stream aeration to improve the water quality of Bubbly Creek exists. MWRDGC has constructed several sidestream elevated pool aeration (SEPA) stations along the Chicago Waterway System to improve water quality by lifting canal water and allowing it to drop over a series of weirs to create a waterfall and add oxygen to the waterway.	retain
Implementation of Best Management Practices (BMPs)	The possibility of implementing BMPs such as bioswales, bio-infiltration basins, and wetponds to divert clean stormwater into Bubbly Creek exists. The City of Chicago has established a 60-foot stormwater setback to allow implementation of stormwater BMPs along the channel.	retain
- Measures to restore aquatic and terrestrial habitats		
Reconfigure channel cross-sectional form	The possibility of reconfiguring the channel geometry to create flow diversity exists. Special attention in regards to sediment disturbance, handling, and disposal must be carefully considered with this measure.	retain
Streambank recontouring, native plantings, and restoration	The possibility of streambank restoration through recontouring and establishment of native plant communities exist.	retain
In-channel wetland restoration	The possibility of restoring wetlands within the channel exists. Current high flow conditions caused by CSOs from RAPS constrain the restoration of in-channel wetlands.	retain
Substrate introduction and streambed restoration	The possibility of restoring the natural substrate diversity exists. This measure could be incorporated with sediment removal or capping measures stated above.	retain
Placement of snags and large woody debris	The possibility of restoring natural structure diversity in the form of snags or large woody debris exists.	retain
Riparian native plant restoration	The possibility of restoring natural plant communities along the riparian areas of Bubbly Creek exists.	retain
- Measures to improve river corridor aesthetics (in addition to other Measures that also address objective)		
Screen floatable debris from channel	The possibility of screening and removing floatable debris introduced by CSO discharges into Bubbly Creek exists.	retain
Repair or replace deteriorated bank treatments	Due to the ecosystem restoration authority of this project, repair or replacement of existing deteriorated bank treatments such as steel sheet pile and concrete walls is not considered appropriate. Measures to restore streambanks through recontouring and native plant restoration as stated above are recommended.	not retained
- Measures to provide additional recreational opportunities		
Small boat and canoe launch	The possibility of providing compatible water access points to Bubbly Creek in the form of a small boat and canoe launch exists.	retain
River access walking trail	The possibility of providing compatible recreational opportunities through walking trails along the banks of Bubbly Creek exists.	retain
Interpretive signage	The possibility of providing compatible recreational opportunities by constructing interpretive displays featuring the rich history of Bubbly Creek and surrounding areas and the urban restoration initiatives currently underway.	retain

Table 1: Measures considered for further evaluation (continued)

i) Preliminary Plans for further consideration:

Preliminary plans are formulated by combining the various retained measures that meet the objectives of the study. During the feasibility study these plans will be evaluated and the most cost effective and best-buy plans will be developed in further detail. Preliminary plans include:

No action. The Corps is required to consider the option of "No Action" as one of the alternatives. No Action assumes that no project would be implemented by the Federal Government (Corps of Engineers) to achieve the planning objectives. No Action, which is synonymous with the "Without Project Condition", forms the basis from which all other alternative plans are measured.

Low-Flow Restoration. This plan would consider measures to restore low flows to Bubbly Creek during normal and dry weather periods. The restoration of low flows could be accomplished by pumping water from the South Branch and introducing that flow to the upstream end of Bubbly Creek near RAPS. The introduction of low flows would improve water quality, a limiting factor in the restoration of the Bubbly Creek ecosystem, as shown by the demonstration projects performed by MWRDGC. Without addressing the other limiting factors, few opportunities for aquatic habitat restoration would exist due to contamination by CSO and bottom sediments. Major aesthetic improvements can be achieved by reducing the amount of floatable debris that collects within the channel and by reducing foul odors that stagnant waters now produce.

Low-Flow Restoration and Sediment Remediation with Ecosystem Restoration. This plan would consider measures to restore low flows to Bubbly Creek during normal periods and reduce contamination from bottom sediments along with the restoration of aquatic and associated habitats. Low flow restoration would be accomplished in the same manner as the plan above. Sediment remediation measures for consideration include removal and capping. Since anaerobic decomposition of the bottom sediments produce large amounts of gas and high velocities occur in the channel during overflows, challenges exist with sediment capping at this site. Field demonstrations are recommended to assist or provide valuable information in the selection of capping materials, placement methods, and gas collection and treatment systems. Alterations to channel cross sections could be configured to allow for areas of low velocities that could sustain aquatic vegetation necessary for ecosystem restoration. Major alterations to the channel could include reconfiguring the channel to mimic natural streams where deeper portions of the channel provide the main flow conveyance, while shallow edges and floodplain areas provide calmer waters for fish spawning, rearing, and feeding. Stream bank alterations including riparian habitat restoration along with river access points, trails, and other recreational features could be part of the channel alterations. A rendering of Bubbly Creek restored following this plan is shown in *Figure 5* below.

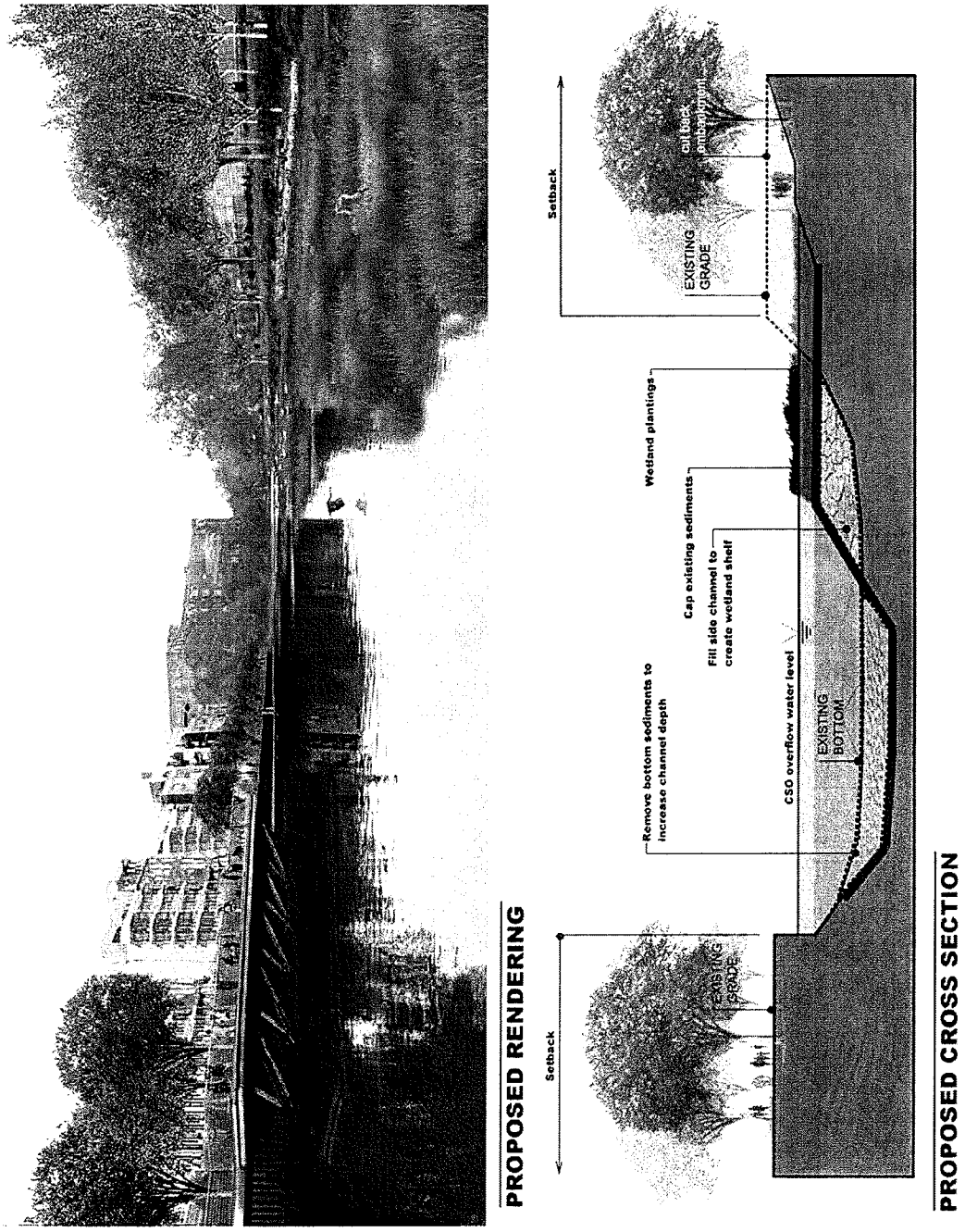


Figure 5: Low-Flow Restoration and Sediment Remediation with Ecosystem Restoration Preliminary Plan (figure provided by Chicago Department of Planning and Development)

Low-Flow Restoration, Combined Sewer Overflow Elimination, and Sediment Remediation with Ecosystem Restoration. This plan would consider measures to restore low flows to Bubbly Creek during normal periods, eliminate combined sewer overflow discharges and reduce contamination from bottom sediments along with the restoration of aquatic and terrestrial habitats. This ambitious plan would allow for complete restoration of Bubbly Creek to mimic a natural meandering stream with associate wetland margins. Low flow restoration would be accomplished in the same manner as the plans above, but to less of a scale since this plan involves significantly reducing the size of the stream channel. The amount of flow needed to maintain water quality would be less when channel size is reduced. Elimination of CSO discharge could be accomplished by diverting overflows directly to the South Branch via large pipes. An inlet manifold would be necessary at RAPS in order to direct flow into the diversion pipes. Other connections between adjacent CSOs along the channel, if not eliminated, and the diversion pipe may be required. At the downstream end, where discharges are reintroduced to the South Branch, an energy dissipating plunge pool would be necessary to control erosion. The diversion pipes could be placed in the existing channel in order to reduce excavation and land acquisition costs. Once CSOs are diverted from Bubbly Creek, complete ecosystem restoration would be possible. Since maintaining channel overflow conveyance capacity would be unnecessary, the cross-sectional area of the channel can be drastically reduced and reconfigured. The existing channel could be replaced with several wetland areas connected by a small meandered stream containing a series of riffle and pool complexes. The riparian area would also be drastically increased by reducing the width of the channel. Diverse aquatic and riparian habitats can be restored by this plan. Sediment remediation would be accomplished by capping and filling. Since bottom sediments can be capped with a thicker layer and substrate materials due to the removal of channel conveyance limitations and high channel velocities, sediment remediation under this plan is considered less complicated. A sketch of Bubbly Creek restored following this plan is shown in *Figure 6* below.

j) Conclusions from Preliminary Screening:

At this time, limited information is available at the reconnaissance level to screen alternatives. More in-depth conclusions for the preliminary screening will be drawn in the feasibility phase when more information is available for further analysis and alternatives have been reformulated and screened out. Due to funding and time constraints of the reconnaissance phase, only limited and informal coordination has been conducted with other agencies.

The preliminary screening indicates the plan that provides low flow restoration and sediment remediation with ecosystem restoration has the greatest potential for implementation. The low-flow restoration plan does not address other limiting factors caused by contamination from CSOs and bottom sediments leaving few opportunities for aquatic habitat restoration. Inclusion of a separate means of conveyance for CSOs to bypass Bubbly Creek as included in the low-flow restoration, combined sewer overflow elimination, and sediment remediation with ecosystem restoration is expected to be cost prohibitive. Benefits to ecosystem restoration would include increased habitat quantity

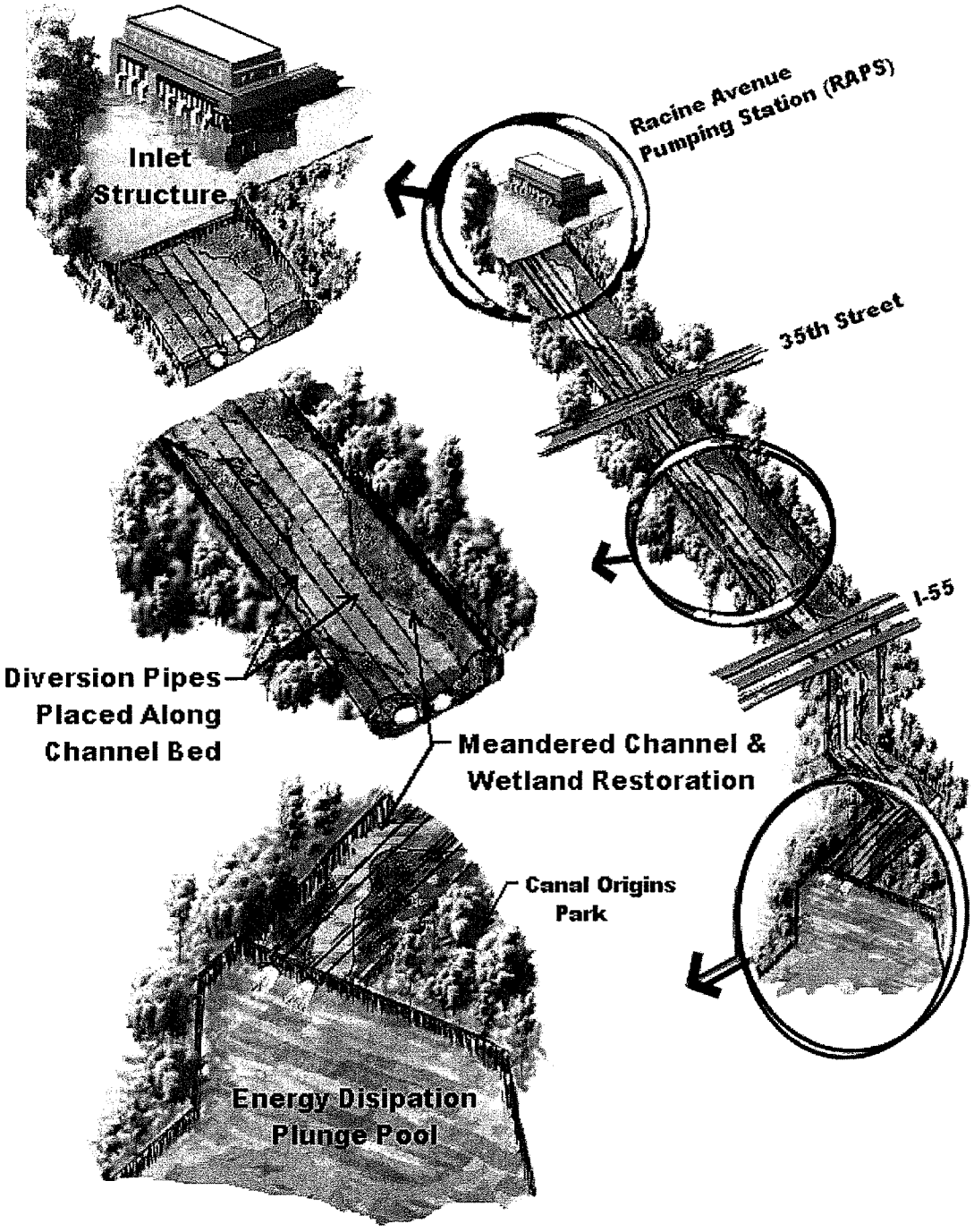


Figure 6: Low-Flow Restoration, Combined Sewer Overflow Elimination, and Sediment Remediation with Ecosystem Restoration Preliminary Plan

and improved habitat quality of a significant area of metropolitan Chicago which would benefit millions of local area residents. Ecosystem restoration benefits would likely be quantified in terms of increases in the quantity and quality of lotic stream, riparian, and wetland habitats. The restoration of Bubbly Creek would provide a source for aquatic plants and animals and benefit an area several miles upstream and downstream of the project area. Currently, very few locations for native aquatic species to reproduce exist, thus severely impairing the abundance within the Chicago River System. Because the entire area that would be considered for restoration is currently highly degraded and has extremely low habitat value, improvements in habitat quality due to restoration could be very high. A preliminary table of potential ecological outputs as related to quality and function of with and without project habitats is shown in *Table 2* below. These numbers are based solely on professional judgment and should only be used as a relative guide in displaying restoration potential for Bubbly Creek. Actual restoration outputs will be determined during the feasibility study based on measured data and sound scientific methodology.

	Habitat Type	Area of Habitat (acres)	Quality of Habitat (1-5)	Function of Habitat (0-10)	Ecological Output (HUs)
Without Project / No Action	Lotic[1]	25	1	1	25
	Riparian[2]	21	1	3	63
	Wetland	0	0	0	0
	Total	*46*			*88*
				Net Improvement:	**0**
Low-Flow Restoration	Lotic	25	2	3	150
	Riparian	21	1	3	63
	Wetland	0	0	0	0
	Total	*46*			*213*
				Net Improvement:	**125**
Low-Flow, Sediment Remediation, Ecosystem Restoration	Lotic	20	3	6	360
	Riparian	21	4	8	672
	Wetland	15	3	6	270
	Total	*56*			*1,302*
				Net Improvement:	**1,214**
Low-Flow Rest., CSO Elimination, Sed. Remed., Eco. Rest.	Lotic	10	4	8	320
	Riparian	21	4	8	672
	Wetland	25	4	8	800
	Total	*56*			*1,792*
				Net Improvement:	**1,704**

[1] Lotic stream length of 6,600 linear feet and an average channel width of 165-feet was used to calculate habitat footprint area

[2] Riparian length of 15,000 linear feet and a setback width of 60-feet used to calculate habitat footprint area

Table 2: Estimated Ecological Outputs of Preliminary Restoration Plans

Preliminary implementation costs have been developed based on other ecosystem restoration projects in the area and professional judgment. Since the causes of degradation facing Bubbly Creek are quite unique, complex solutions are necessary for restoration. Many unit cost values from other projects were not available for use because some technologies proposed for Bubbly Creek are new and have not been implemented elsewhere. For example, sediment capping costs can vary greatly depending on the materials used and thickness required for this application. The preliminary implementation costs as shown in *Table 3* below are meant to provide a relative basis for comparison only. A detailed and more reliable cost estimate will be developed during the feasibility phase.

Plan	Construction Activity	Cost (x $1,000)
Low-Flow Restoration	Low Flow Restoration (Pump, Conveyance Pipe, and Inlet/Outlet Structures)	2,500
	Sub-Total	2,500
	Contingency (25%)	625
	Estimated Total Construction	**3,125**
Low-Flow Restoration, Sediment Remediation, and Ecosystem Restoration	Low Flow Restoration (Pump, Conveyance Pipe, and Inlet/Outlet Structures)	2,500
	Sediment Capping	15,000
	Limited Sediment Dredging and Disposal	2,000
	Riparian Site Prep and Earthwork	1,500
	Riparian and Wetland Vegetation	3,000
	Sub-Total	24,000
	Contingency (25%)	6,000
	Estimated Total Construction	**30,000**
Low-Flow Restoration, CSO Elimination, Sediment Remediation, and Ecosystem Restoration	Low Flow Restoration (Pump, Conveyance Pipe, and Inlet/Outlet Structures)	1,500
	CSO Diversion Structures (Channel Diversion Pipes and Inlet/Outlet Structures)	84,000
	Sediment Capping and Meander Channel Construction	10,000
	Riparian Site Prep and Earthwork	1,500
	Riparian and Wetland Vegetation	3,000
	Sub-Total	100,000
	Contingency (25%)	25,000
	Estimated Total Construction	**125,000**

Table 3: Estimated Construction Costs of Preliminary Restoration Plans

k) Project Significance:

Statements of significance provide qualitative information and help decision makers evaluate whether the value of the resources restored are worth the costs necessary to restore them. The Bubbly Creek ecosystem restoration project will provide substantial benefits of local, regional, and national significance. The significance of restoration outputs are recognized in terms of institutional, public, and/or technical importance as discussed below.

Institutional Recognition – The Bubbly Creek ecosystem restoration project is significant based on institutional recognition meaning that the importance of the environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups as listed below:

- *Fish and Wildlife Conservation Act of 1958, as amended* - All Federal departments and agencies to the extent practicable and consistent with the agencies authorities should conserve and promote conservation of non-game fish and wildlife. The Bubbly Creek project will help conserve Chicago River ecosystems including the non-game fish and wildlife within the existing authorities of the Corps of Engineers.

- *National Environmental Policy Act of 1969, as amended* – It is national policy to promote efforts, which will prevent or eliminate damage to the environment. The Bubbly Creek project will restore damaged aquatic habitat and enhance the public use of the natural resource.

- *North American Wetlands Conservation Act of 1968, as amended* - Provides for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico. The Chicago River and Bubbly Creek are along the Illinois River segment of the Mississippi River migratory bird flyway. Over 300 species of birds migrate through these river valleys in spring and fall and is used by more than 40 percent of the migratory waterfowl traversing the United States and 60 percent of all bird species in North America. The proposed project will increase and restore wetland and riparian habitats that are used by migratory birds along the flyway.

- *National Historic Preservation Act of 1966, as amended* - Preservation of significant historical features (buildings, objects and sites) through grants and establishment of the National Register of Historic Places. Two historic landmarks are located within the project area. The Old Stone Gate of Chicago Union Stockyards, which is the last remaining feature of the Union Stockyards, is listed on the National Register and the Canal Origins Park located at the mouth of Bubbly Creek is the site where the I&M Canal began and is designated as a Chicago landmark. The Bubbly Creek project would help to restore areas adjacent to historic landmarks, thus aiding in cultural heritage of the area.

- *Illinois and Michigan Canal National Heritage Corridor Act of 1984, as amended* - Creation of the nation's first national heritage area, the I&M National Heritage Corridor has goals of preservation, conservation, recreation, and economic development. The Bubbly Creek project falls within the corridor and would help to restore and preserve the area in concert with national heritage goals.

- *Executive Order 11514: Protection and Enhancement of Environmental Quality* - Federal policy aimed at protecting and enhancing the quality of the Nation's environment. The Bubbly Creek project will restore a polluted and stagnant section of the Chicago River System.

- *Executive Order 11593: Protection and Enhancement of the Cultural Environment* - Federal policy aimed at preserving, restoring and maintaining the historic and cultural environment of the Nation. The Bubbly Creek project will help restore an area rich in historic and cultural significance. As stated above, the project area is the site of the Union Stockyards, origin of the I&M canal, and falls within the I&M Canal National Heritage Corridor.

- *Executive Order 12962: Recreational Fisheries* - Federal policy aimed to conserve, restore, and enhance aquatic ecosystems to provide for increased recreational fishing opportunities nationwide. The Bubbly Creek project will enhance the local fisheries by providing spawning and foraging habitat for yellow perch, large mouth bass, sunfishes and other various non-game species.

- *Memorandum of Understanding: Urban Rivers Restoration Initiative* - The purpose of the URRI is meant to facilitate collaborative efforts between government agencies, states and stakeholders to improve water quality and habitat of degraded urban rivers. The agreement was signed between the USEPA and USACE. The Chicago Area Rivers Restoration Initiative (CARRI) was nominated for national pilot status. Bubbly Creek and the Chicago River Corridor Development plan are specifically mentioned in CARRI.

- *City of Chicago: Chicago River Corridor Development Plan* - The Chicago River Corridor Development Plan is the result of a collaborative effort among government agencies, private sector developers, and non-profit organizations to create a blueprint for the future of the Chicago River. Approved by the Chicago Plan Commission in 1998, the plan sets forth a shared vision for the river and outlines specific recommendations to be completed over the next 10 years. The Bubbly Creek project supports the goals of the plan to enhance the river's attractiveness as a natural and recreational resource.

- *Friends of the Chicago River: Clean Water Campaign* - The Clean Water Campaign has the goal of developing a strategy for how to improve the water quality of the Chicago River to the highest possible standard. Improving water quality has the biggest impact on the overall health of the Chicago River. Without clean water, the establishment of healthy wildlife populations and the potential of

the Chicago River for recreation will not be realized. The Bubbly Creek project supports the Clean Water Campaign by improving water quality and restoring natural aquatic and related habitats.

- *City of Chicago: Bubbly Creek Vision Plan* - The Bubbly Creek Vision Plan, which is currently being developed by the City of Chicago and the Bridgeport neighborhood, aims at creating a development and restoration plan for the neighborhood surrounding and including Bubbly Creek. The Bubbly Creek project is the cornerstone of this plan.

Public Recognition – The Bubbly Creek ecosystem restoration project is significant based on public recognition meaning a segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect an interest or concern for that particular resource as listed below:

- The Bubbly Creek project is locally significant for its ecological value to the City of Chicago and surrounding neighborhoods. Bubbly Creek is located within a heavily populated area of metropolitan Chicago. Based on 2000 U.S. Census data, over 104 thousand people live within 1 mile of the project area that would directly benefit from the proposed project. Additionally, over 1.4 million people live within 5 miles of Bubbly Creek that would benefit from additional natural space, which is severely lacking in this area.

- The Friends of the Chicago River (FCR) is the only organization solely dedicated to the Chicago River. Since 1979, FCR has been working to improve the health of the Chicago River for the benefit of people and wildlife and by doing so, has laid the foundation for the river to be a beautiful, continuous, easily accessible corridor of open space in Metropolitan Chicago. FCR has conducted numerous river rescue days and other activities that benefit the Chicago River. FCR are solely funded by private donations and have been actively involved in the Bubbly Creek project and will continue to provide support during the feasibility study.

- The Chicago River Rowing and Paddling Club (CRRPC) is the oldest boat club on the Chicago River. Founded in 1979, CRRPC has pioneered recreational use of the Chicago River by demonstrating and promoting the potential of the river for canoeing, rowing and kayaking. CRRPC currently maintains a canoe launch at the mouth of Bubbly Creek and supports the Bubbly Creek project and will be involved in formulating compatible water access and recreational opportunities.

Technical Recognition – The Bubbly Creek ecosystem restoration project is significant based on technical recognition. This means the resource qualifies as significant based on its "technical" merits, which are based on scientific knowledge or judgment of critical resource characteristics as listed below:

- Scarcity - The Bubbly Creek project would restore in-stream habitat, side stream wetlands, and naturalized hydraulic regimes, which are extremely rare within the Chicago River system.

- Representation - The Bubbly Creek project aims to restore stream and wetland features that are representative of what was present nearly 200 years ago. The project area was once comprised of a series of sluggishly flowing channels and connected wetlands.

- Connectivity – The restoration of Bubbly Creek would begin the process of reconnecting sustainable habitats within the Chicago River. Habitats restored with this project would connect with other ecosystem restoration projects currently being developed within the Chicago River system.

- Status and Trends - Bubbly Creek has been severely altered by human intervention, which has caused serious degradation to the ecosystem. Without intervention, the project area will remain in an imperiled state. The Bubbly Creek project has the ability to recover and restore this unique and important resource.

- Limiting Habitat - Bubbly Creek is currently devoid of any natural habitat. This project would restore in-stream habitat, side stream wetlands, and native riparian plant communities, which are currently extirpated from the project area.

- Biodiversity - The Bubbly Creek restoration project would significantly increase the biodiversity of flora and fauna within the project area. The project will increase the biodiversity of macroinvertebrate, fish, and bird species. Restoration of Bubbly Creek would provide a natural area to allow for fish species to spawn and disperse throughout the Chicago River system, which is currently devoid of quality spawning habitat. This project will also increase the biodiversity and abundance of fish outside the project area within the Chicago River system.

In summary, the proposed Bubbly Creek ecosystem restoration project is significant in terms of institutional, public, and technical recognition. The significance and high value of the resources to be restored lay the foundation for Federal interest in conducting a feasibility study.

l) Establishment of a Plan Formulation Rationale:

The Corps is required to consider the option of "No Action" as one of the alternatives in order to comply with the requirements of the National Environmental Policy Act (NEPA). No Action assumes that no project would be implemented by the Federal Government (Corps of Engineers) to achieve the planning objectives. No Action, which is synonymous with the "Without Project Condition", forms the basis from which all other alternative plans are measured.

The conclusions from the preliminary screening form the basis for the next iteration of the planning steps that will be conducted in the feasibility phase. The likely array of alternatives that will be considered in the next iteration includes: no action; pumping from South Branch to provide low-flow restoration; low-flow restoration along with sediment capping with channel, wetland, and riparian restoration; low-flow restoration along with combined sewer overflow diversion, sediment remediation by capping and filling with channel remeandering, wetland, and riparian restoration; and locally-developed plans. Future screening and reformulation will be based on the following factors: priorities of the non-Federal sponsor regarding project purposes; input from stakeholders including landowners, interest groups and other government agencies, during the public scoping process for the feasibility phase; and the results of detailed investigations conducted during the feasibility phase.

6. FEDERAL INTEREST:

Since ecosystem restoration is a high priority budget output and the primary outputs of the alternatives are ecosystem restoration, there is strong Federal interest in conducting a feasibility study. Based on preliminary information, there are potential project alternatives that would be consistent with current Corps policies regarding costs, benefits, and environmental impacts. There are opportunities within the study area to develop a cost effective environmentally justified project that would achieve well-integrated ecosystem restoration within a complicated system and provide limited compatible recreation to the extent possible within an area that could directly benefit millions of local area residents.

7. PRELIMINARY FINANCIAL ANALYSIS:

As the potential non-Federal sponsor, the City of Chicago Department of Environment (DOE) would be required to provide 50 percent of the cost of the feasibility phase. DOE is also aware of the cost sharing requirements for potential project implementation. A letter of intent from DOE stating a willingness to pursue the feasibility study and to share in its costs is included as Enclosure A.

8. SUMMARY OF FEASIBILITY STUDY ASSUMPTIONS:

a) Feasibility Phase Assumptions:

- The without-project conditions serve as the baseline for estimating and evaluating the beneficial and adverse effects of a potential water resource project. Since the Bubbly Creek watershed is fully developed and the future without project condition can be reasonably predicted with confidence, the planning period for the environmental analysis will be over a 50-year period.

- The feasibility study will address a project that is complete in itself and does not rely on and dependent upon other projects for justification. Other ecosystem restoration projects within the area will provide additional environmental outputs.
- An MCACES cost estimate will be performed on the selected plan providing and analysis suitable for a feasibility level study.
- The feasibility study will contain ecosystem restoration outputs as the basis for justification and will not contained a detailed economic analysis. Incidental economic benefits maybe included.
- Additional and expanded assumptions may be identified during development of the project management plan (PMP). Any critical assumptions and sensitive policy areas will be coordinated with Corps vertical team.

b) Policy Exceptions and Streamlining Initiatives:

The study will be conducted in accordance with the Principles and Guidelines and Corps of Engineers regulations. No exceptions to established guidance have been identified at this time.

c) Other Approvals Required:

The non-Federal Sponsor will need to have the necessary funding and authority to participate in the feasibility phase.

9. FEASIBILITY PHASE MILESTONES:

The feasibility phase schedule will be developed in detail during the preparation of the Project Management Plan (PMP) and the Feasibility Cost Sharing Agreement (FCSA). The feasibility study is expected to be conducted over a 36-month period. A preliminary schedule of the major feasibility study milestones has been provided in *Table 4*.

Milestone	Description	Duration (mo)	Cumulative (mo)
Milestone F1	Initiate Study	0	0
Milestone F2	Public Workshop and NEPA Scoping	2	2
Milestone F3	Feasibility Scoping Meeting	11	13
Milestone F4	Alternative Formulation Briefing	14	27
Milestone F5	Draft Feasibility Report and EA or EIS	3	30
Milestone F6	Final Public Meeting	1	31
Milestone F7	Feasibility Review Conference	1	32
Milestone F8	Final Report to LRD	3	35
Milestone F9	DE's Public Notice	1	36
-	Chief's Report	4	40
-	Project Authorization	4	44

Table 4: Preliminary Feasibility Phase Milestones

10. FEASIBILITY PHASE COST ESTIMATE:

The following feasibility phase cost estimate, as shown in *Table 5*, is preliminary pending negotiation of a detailed scope of work for the feasibility study with the local sponsor. A revised cost estimate will be presented in the Project Management Plan.

Feasibility Study Task Description	Cost
Surveys and Mapping except Real Estate	$100,000
Hydrology and Hydraulics Studies/Report	$100,000
Geotechnical Studies/Report	$150,000
Engineering and Design Analysis Report	$250,000
Socioeconomics Studies	$25,000
Real Estate Analysis/Report	$50,000
Environmental Studies/Report (Except USF&WL)	$200,000
Fish and Wildlife Coordination Act Report	$50,000
HTRW Studies/Report	$100,000
Cultural Resources Studies/Report	$50,000
Cost Estimates	$75,000
Public Involvement Documents	$75,000
Plan Formulation and Evaluation	$250,000
Final Report Documentation	$50,000
Technical Review Documents	$100,000
Washington Level Report Approval (Review Support)	$75,000
Management and Budget Documents	$200,000
Contingencies	$500,000
Project Management Plan (PMP)	$50,000
PED Cost Sharing Agreement	$50,000
TOTAL:	$2,500,000

Table 5: Preliminary Feasibility Phase Cost Estimate

11. VIEWS OF OTHER RESOURCE AGENCIES:

This project contributes to a multi-agency regional watershed plan. The Urban River Restoration Initiative is a partnership between Federal, State, and local agencies in a collaborative effort to improve water quality, manage contaminated sediment, and restore habitat in the Chicago Area Rivers. The partnership is working to achieve common goals of protecting public health, restoring habitat and revitalizing economic development. In addition, this Bubbly Creek study is a high priority for the City of Chicago and the Mayor's Office, and supports the Friends of the Chicago River biodiversity recovery plan.

12. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE:

Continuation of this study into the cost-shared feasibility phase is contingent upon an executed Feasibility Cost Sharing Agreement (FCSA). Issues that could impact the initiation of the feasibility phase include the lack of funds by the Federal government. The City of Chicago Department of Environment provided a letter dated August 1, 2006, as attached, noting their intention to be a local sponsor and willingness to enter into a feasibility cost sharing agreement.

The tentative schedule for signing the FCSA is July 2007. Based on the schedule of milestones laid out in Section 9 above; completion of the feasibility report would be in August 2010, with a potential Congressional Authorization in WRDA 2012.

13. PROJECT AREA MAP:

A map of the study area is provided as Figure 1.

14. RECOMMENDATIONS:

It is recommended that this 905(b) Preliminary Analysis report be approved as a basis for developing the Project Management Plan (PMP) for the Bubbly Creek feasibility study, finalizing the Feasibility Cost Sharing Agreement (FCSA) with the non-Federal sponsor, and proceeding with more detailed planning and engineering study to determine an appropriate, coordinated, implementable solution to the identified water resources problems and opportunities.

25 Aug 06
Date

John D. Drolet
Colonel, Corps of Engineers
District Engineer

City of Chicago
Richard M. Daley, Mayor

Department of Environment

Sadhu A. Johnston
Commissioner

Twenty-fifth Floor
30 North LaSalle Street
Chicago, Illinois 60602-2575
(312) 744-7606 (Voice)
(312) 744-6451 (FAX)
(312) 744-3586 (TTY)
http://www.cityofchicago.org

August 1, 2006

John D. Drolet
Colonel, U.S. Army
District Commander
111 N. Canal Street, Suite 600
Chicago, IL 60606-7206

SUBJECT: Bubbly Creek Feasibility Study – Letter of Intent

Dear Colonel Drolet:

The U.S. Army Corps of Engineers, Chicago District is currently conducting a reconnaissance study of the South Fork of the South Branch of the Chicago River. The primary focus of the study is ecosystem restoration. We have met several times with representatives of the Chicago District to discuss this study.

Overall, water quality in the Chicago River has been improving and land along the river is currently being redeveloped. Several activities are currently underway or planned to improve the water quality. However, additional work is needed to improve nuisance conditions caused by sewer overflows, to restore habitat, and to continue to improve general appearance and water quality which is jeopardized by a century of slaughter house pollution resting on the creek bottom. Ecosystem restoration will improve water quality, protect public health, restore habitat and revitalize economic development.

We understand that participation by the Corps of Engineers to conduct a more detailed feasibility study of the SFSB of the Chicago River requires a local sponsor capable and willing to enter into a feasibility cost sharing agreement. Our understanding is that under current regulations, cost sharing of the study is 50% federal and 50% local. By this letter, the City of Chicago intends to be a local sponsor for this ecosystem restoration feasibility study project.

We look forward to working with the Army Corps on this important project. If you have any questions, please call Renante Marante at 312 742-0123.

Sincerely,

Sadhu A. Johnston (KS)

Sadhu A. Johnston
Commissioner
Chicago Department of Environment

cc: Cathy Hudzik (M.O.)
Kirston Buczak (A.C.O.E.)
David Bucaro (A.C.O.E.)

NEIGHBORHOODS Alive!
BUILDING CHICAGO TOGETHER

CHICAGO WORKS TOGETHER

Attachment 3

Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 07-25

CONTINUOUS DISSOLVED OXYGEN MONITORING IN THE DEEP-DRAFT CHICAGO WATERWAY SYSTEM DURING 2006

May 2007

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street Chicago, Illinois 60611-2803 312-751-5600

CONTINUOUS DISSOLVED OXYGEN MONITORING IN THE DEEP-DRAFT CHICAGO WATERWAY SYSTEM DURING 2006

By

Thomas A. Minarik, Jr.
Biologist I

Jennifer L. Wasik
Biologist II

Michael Sopcak
Biologist III

Samuel G. Dennison
Biologist IV

Research and Development Department
Louis Kollias, Director

May 2007

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

ACKNOWLEDGMENT

Thanks are extended to staff from the Industrial Waste Division who deployed and retrieved the water quality monitors weekly during the study. Special thanks to Richard Schackart, Justin Vick, Dustin Gallagher, Donald Rohe, Angel Whitington, Panu Lansiri, and Colleen Joyce for downloading and servicing the monitors.

Thanks are also extended to Dr. Thomas Granato, Assistant Director of Research and Development, Environmental Monitoring and Research Division, for his helpful review comments.

We thank Robert Larson, Illinois State Water Survey, for designing the Access® database program, and Roger Smith, Senior Program Analyst, Information Technology Department for modifying the database program. Their help with the Access® program is greatly appreciated.

We thank Dr. Zainul Abedin, Biostatistician, for modifying the database program and for performing the calculations for the data summaries used in this report.

Particular thanks are due to Joan Scrima for reviewing, formatting, and typing the report.

DISCLAIMER

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

INTRODUCTION

The Chicago Waterway System (CWS) consists of 78 miles of canals, which serve the Chicago area for two principal purposes, the drainage of urban storm water runoff and treated municipal wastewater effluent and the support of commercial navigation. Approximately 75 percent of the length is composed of man-made canals where no waterway existed previously, and the remainder is composed of natural streams that have been deepened, straightened and/or widened to such an extent that reversion to the natural state is not possible. The flow of water in the CWS is artificially controlled by hydraulic structures. The CWS has two river systems, the Calumet River System and the Chicago River System (Lanyon, 2002).

Over the years, increased pollutant loading from urbanization throughout the Chicago metropolitan area and low stream velocities in Chicago area deep-draft waterways have caused dissolved oxygen (DO) concentrations to fall below DO standards established by the Illinois Pollution Control Board (IPCB). More than 30 years ago, the Metropolitan Water Reclamation District of Greater Chicago (District) determined that applicable IPCB DO standards for Chicago area waterways could not be met exclusively by advanced wastewater treatment at its three major regional water reclamation plants (WRPs), Calumet, North Side, and Stickney, and by the capture and treatment of combined sewer overflows (CSOs). In order to increase the DO concentration in the Chicago and Calumet River Systems, the District designed and constructed artificial aeration systems (instream diffuser and sidestream elevated pool aeration [SEPA] stations) during the late 1970s and early 1990s, respectively.

From October 1994 through May 1996, the Research and Development Department (R&D) conducted weekly DO surveys in the Chicago River System. Water samples were collected manually, chemically fixed in the field, and returned to the laboratory for titration. The results from these surveys showed that DO concentrations in selected waterway reaches were less than IPCB DO standards applicable to these reaches.

In August 1996, R&D began developing a comprehensive field-monitoring program in order to locate and identify reaches in the Chicago River System where the DO concentration is less than the applicable IPCB DO standard. Initially, the program was to focus on the Chicago River System for a two-year period and has since been extended. Subsequently, the scope of the monitoring program was first expanded to include the Calumet River System, and then later the Chicago area wadeable streams. The resulting data have been used for the calibration and verification of a water quality model for the CWS.

Data in this report are from the 20 deep-draft continuous DO monitoring stations of the District's Continuous Dissolved Oxygen Monitoring (CDOM) Program. This report covers the monitoring results for the period January 2006 through December 2006 for the deep-draft waterways of the Chicago River System, Des Plaines River System, and Calumet River System.

MONITORING STATIONS

Locations and Descriptions

The CDOM Program and the Ambient Water Quality Monitoring (AWQM) Program supply the District with water quality data throughout the year for both the wadeable and deep-draft waterways within its jurisdiction. All stations for both programs are shown in Figure 1. Descriptions of the locations for the deep-draft monitoring stations are listed in Table 1.

Designated Uses

The IPCB has assigned water uses for specific water bodies within the state of Illinois. All waters in Illinois are designated for General Use, except those selected as Secondary Contact and Indigenous Aquatic Life Waters (Secondary Contact)

In the Chicago and Calumet River Systems, General Use Waters include the North Shore Channel from Lake Michigan to the North Side WRP, and the Chicago and Calumet Rivers.

Secondary Contact Waters include the North Shore Channel from the North Side WRP to the North Branch of the Chicago River, the North Branch of the Chicago River from the North Shore Channel to the Chicago River, the South Branch of the Chicago River, Bubbly Creek, the Chicago Sanitary and Ship Canal, the Grand Calumet River, the deep-draft portion of the Little Calumet River, the Calumet-Sag Channel, and the Des Plaines River from its confluence with the Chicago Sanitary and Ship Canal to the Interstate Highway 55 bridge southwest of Joliet.

Water Quality Standards

The IPCB has established water quality standards for DO in both General Use and Secondary Contact Waters. In General Use Waters, the DO shall not be less than 6.0 mg/L during 16 hours of any 24-hour period, nor less than 5.0 mg/L at any time. In Secondary Contact Waters, the DO shall not be less than 4.0 mg/L at any time, except in the Calumet-Sag Channel where the DO shall not be less than 3.0 mg/L at any time. For this report, we have selected the 5.0 mg/L DO standard when calculating percent compliance for General Use Waters.

MATERIALS AND METHODS

Water Quality Monitor

The continuous water quality monitors (monitor) used to collect this data were manufactured by YSI Incorporated (YSI) of Yellow Springs, Ohio. DO was measured hourly using the YSI Model 6920 or Model 6600 monitor. In order to protect and safeguard the monitors from marine navigation and vandalism, the monitors were deployed in the field in stainless steel pipes. Two different installation designs were employed: (1) a 3-foot stainless steel pipe was positioned on the bottom of the waterway and oriented downstream such that the water passed through the pipe, and (2) a fixed length of pipe, with multiple 2-inch circular openings, was vertically mounted on the side of a bridge abutment.

Servicing the monitors followed a weekly schedule. Industrial Waste Division personnel retrieved each monitor from the field following seven days of continuous monitoring. Prior to retrieval, a water sample for DO analysis was collected next to the protective housing. An additional monitor, that had been previously calibrated and serviced in the laboratory, was then deployed to replace the retrieved monitor. The retrieved monitors were returned to the laboratory for data downloading, exterior cleaning, servicing, and calibration of the DO sensors. The monitors were temporarily stored in holding tanks containing tap water for subsequent deployment during the following week.

Data Management and Review

Hourly DO data were directly exported electronically from individual monitors to a specially designed Access® database for data processing and storage. Following data downloading, the weekly DO data were carefully reviewed for accuracy.

The review process included the following:

1. Comparing a grab sample DO concentration measured in the field with a DO concentration recorded by a retrieved monitor (DO rejection criteria = difference greater than 2.0 mg/L).

2. Comparing the last hourly DO concentration measured by a retrieved monitor with the first hourly DO concentration recorded by a deployed monitor (DO rejection criteria = difference greater than 2.0 mg/L).

3. Comparing a DO concentration measured in a laboratory holding tank and a DO concentration recorded by a retrieved monitor (DO rejection criteria = difference greater than 1.0 mg/L).

Criterion 3 would entail rejection of all hourly readings; criteria 1 and 2 may or may not reject all readings.

After careful review of the DO data, weekly summary statistics (mean, minimum, maximum, and percent observations above DO standard) and individual line drawings for each monitoring station showing hourly DO concentrations were prepared.

Verification of Representative Data

During the spring, summer, and fall of 2006, cross-sectional DO surveys were conducted in the CWS to determine if a fixed continuous monitoring location represented the DO concentration across the waterway. Verification was achieved by comparing the DO concentrations measured in grab samples at multiple fixed locations and depths across the waterway with the fixed monitor measurements. The results from the cross-sectional surveys clearly showed that the differences across the waterway were minimal and equivalent to the DO concentration measured by the monitor at the fixed locations.

RESULTS

The annual minimum, maximum, and mean DO concentrations measured at all 20 stations during 2006 are shown in Table 2.

The number and percent of measured DO concentrations rejected and removed from the Access® database following review during 2006 are summarized in Table 3.

The number and percent of DO concentrations above the applicable IPCB DO standard for each waterway during 2006 are presented in Table 4. The DO data shown in Table 4 do not include the DO concentrations rejected during the data review.

Table 5 shows the percent distribution of DO concentrations from <1.0 mg/L to >5.0 mg/L at the 20 monitoring stations during 2006. The current national one-day minimum DO criterion for adult life stages of fish is 3.0 mg/L (Chapman, 1986).

Individual line drawings showing hourly DO concentrations at each monitoring station are indicated in Figures 2 through 21.

Weekly DO summary statistics during 2006 are presented for each monitoring station in Appendix A, Tables A-1 through A-20.

DO Fluctuations

DO concentrations fluctuate seasonally and daily in the aquatic environment. Cold water holds more DO than warm water, a trend that can typically be seen in annual DO graphs where the colder months have higher mean DO concentrations than the warmer months. Daily fluctuations in DO can be caused by photosynthesis during daylight hours causing a surplus of DO, and, conversely, respiration by aquatic plants and algae during the night, resulting in a deficiency of DO. Other deficiencies of DO can occur when oxygen demanding materials are introduced into a waterway or by thermal discharges. Oxygen demanding materials enter the CWS most often through wastewater treatment effluents, stormwater run-off, and CSOs. Wastewater treatment effluents and CSOs contain organic materials that are decomposed by microorganisms which consume DO in the process. Stormwater run-off also can flush organic materials into the waterway either directly from the land adjacent to the CWS, or indirectly through the combined sewer system. This is most evident during heavy rain storms that result in CSO events containing untreated waste and stormwater. The District Web site (mwrd.org) has information regarding CSO events which can be found in the Public Interest Section under the titles "CSO Event Synopsis Report" and "Combined Sewer Overflow." Most low DO excursions reported for the deep-draft sections of the CWS in this report are associated with the occurrence of a CSO event during 2006.

TABLE 1: DEEP-DRAFT CONTINUOUS DISSOLVED OXYGEN MONITORING STATIONS

Monitoring Station	Waterway	Description of Monitoring Station
	Chicago River System	
Main Street	North Shore Channel	3.5 miles below Wilmette Pumping Station, 0.8 mile above North Side WRP outfall, water quality monitor under Main Street bridge, center of channel, 6 inches above bottom.
Foster Avenue	North Shore Channel	3.2 miles below North Side WRP outfall, 1.5 miles below Devon Aeration Station, 0.1 mile above junction with North Branch Chicago River, water quality monitor on northwest side Foster Avenue bridge, 3 feet below water surface.
Addison Street	North Branch Chicago River	5.2 miles below North Side WRP outfall, water quality monitor on northwest side Addison Street bridge, 3 feet below water surface.
Fullerton Avenue	North Branch Chicago River	7.2 miles below North Side WRP outfall, 0.4 mile above Webster Aeration Station, water quality monitor on northwest side Fullerton Avenue bridge, 3 feet below water surface.
Kinzie Street	North Branch Chicago River	9.9 miles below North Side WRP outfall, 3.1 miles below Webster Aeration Station, 0.2 mile above junction with Chicago River, water quality monitor on northeast side Kinzie Street bridge, 3 feet below water surface.

TABLE 1 (Continued): DEEP-DRAFT CONTINUOUS DISSOLVED OXYGEN MONITORING STATIONS

Monitoring Station	Waterway	Description of Monitoring Station
	Chicago River System (Continued)	
Loomis Street	South Branch Chicago River	3.6 miles below junction with Chicago River, water quality monitor on northeast side Loomis Street bridge, 3 feet below water surface.
36th Street	Bubbly Creek	0.2 mile below Racine Avenue Pumping Station, 1.2 miles above junction with South Branch of the Chicago River, water quality monitor attached to concrete wall on west side of river, 3 feet below water surface.
Interstate Highway 55	Bubbly Creek	1.0 mile below Racine Avenue Pumping Station, 0.4 mile above junction with South Branch of the Chicago River, water quality monitor on northeast side I-55 bridge, 3 feet below water surface.
Cicero Avenue	Chicago Sanitary and Ship Canal	1.5 miles above Stickney WRP outfall, 1.1 miles below Crawford Generating Station cooling water discharge, water quality monitor on northeast side Cicero Avenue bridge, 3 feet below water surface.
B&O Central Railroad	Chicago Sanitary and Ship Canal	3.6 miles below Stickney WRP outfall, water quality monitor in center of canal, east side B&O Central RR bridge, 3 feet below water surface.
Route 83	Chicago Sanitary and Ship Canal	1.2 miles above junction with Calumet-Sag Channel, 1.1 miles above Canal Junction SEPA Station, water quality monitor 0.6 mile above Route 83 bridge, center of canal, 6 inches above bottom.

TABLE 1 (Continued): DEEP-DRAFT CONTINUOUS DISSOLVED OXYGEN MONITORING STATIONS

Monitoring Station	Waterway	Description of Monitoring Station
	Chicago River System (Continued)	
Lockport Powerhouse	Chicago Sanitary and Ship Canal	0.1 mile above Lockport Powerhouse, 1.1 miles above junction with Des Plaines River, water quality monitor on north side of canal, in forebay area on fender wall, 3 feet below water surface.
	Des Plaines River System	
Jefferson Street	Des Plaines River	3.0 miles below Lockport Lock, 2.1 miles below junction with Chicago Sanitary and Ship Canal, water quality monitor on southeast side Jefferson Street bridge, 3 feet below water surface.
	Calumet River System	
Torrence Avenue	Grand Calumet River	150 feet above junction with Calumet River, 100 feet below Torrence Avenue bridge, water quality monitor attached to bridge abutment on southeast side of river, 2 feet below water surface.
C&W Indiana Railroad	Little Calumet River	5.2 miles below SEPA 1, 1.5 miles above SEPA 2, 3.6 miles below Thomas J. O'Brien Lock and Dam, 1.3 miles above Calumet WRP outfall, water quality monitor attached to northeast side C&W Indiana RR bridge, 3 feet below water surface.
Halsted Street	Little Calumet River	7.7 miles below SEPA 1, 1.0 mile below SEPA 2, 1.2 miles below Calumet WRP, 0.5 mile above junction with Calumet-Sag Channel, water quality monitor attached to southeast side Halsted Street bridge, 3 feet below water surface.

TABLE 1 (Continued): DEEP-DRAFT CONTINUOUS DISSOLVED OXYGEN MONITORING STATIONS

Monitoring Station	Waterway	Description of Monitoring Station
	Calumet River System (Continued)	
Cicero Avenue	Calumet-Sag Channel	3.1 miles below SEPA 3, 3.3 miles above SEPA 4, water quality monitor attached to northwest side Cicero Avenue bridge, 3 feet below water surface.
104th Avenue	Calumet-Sag Channel	4.6 miles below SEPA 4, 3.2 miles above Canal Junction SEPA Station, water quality monitor in center of channel, 6 inches above bottom.
Route 83	Calumet-Sag Channel	0.4 mile above junction with Chicago Sanitary and Ship Canal, 0.3 mile above Canal Junction SEPA Station, water quality monitor on southwest side Illinois Central-Gulf RR bridge, 3 feet below water surface.

TABLE 2: MINIMUM, MAXIMUM, AND MEAN HOURLY DISSOLVED OXYGEN CONCENTRATIONS[1]

Monitoring Station	Waterway	DO Concentration (mg/L) Minimum	Maximum	Mean
	Chicago River System			
Main Street	North Shore Channel	0.0	33.4	9.7
Foster Avenue	North Shore Channel	4.0	11.2	7.7
Addison Street	North Branch Chicago River	0.0	12.0	7.8
Fullerton Avenue	North Branch Chicago River	0.0	11.0	7.1
Kinzie Street	North Branch Chicago River	0.8	11.7	7.0
Clark Street	Chicago River	5.8	12.8	9.0
Loomis Street	South Branch Chicago River	2.2	12.5	7.6
36th Street	Bubbly Creek	0.0	15.6	3.2
Interstate Highway 55	Bubbly Creek	0.0	12.0	5.4
Cicero Avenue	Chicago Sanitary and Ship Canal	0.0	10.8	6.3
B&O Central Railroad	Chicago Sanitary and Ship Canal	1.3	10.1	6.8
Route 83	Chicago Sanitary and Ship Canal	0.0	9.0	5.6
Lockport Powerhouse	Chicago Sanitary and Ship Canal	0.3	9.0	5.6
	Des Plaines River System			
Jefferson Street	Des Plaines River	2.4	12.8	7.3
	Calumet River System			
Torrence Avenue	Grand Calumet River	0.0	30.2	8.2
C&W Indiana Railroad	Little Calumet River	1.9	21.9	9.5
Halsted Street	Little Calumet River	3.5	12.9	6.9
Cicero Avenue	Calumet-Sag Channel	3.2	13.1	7.0
104th Avenue	Calumet-Sag Channel	2.9	13.0	7.0
Route 83	Calumet-Sag Channel	2.7	13.9	6.8

[1]Dissolved oxygen was measured hourly using a YSI Model 6920 or Model 6600 continuous water quality monitor.

TABLE 3: NUMBER AND PERCENT OF DISSOLVED OXYGEN VALUES NOT MEETING ACCEPTANCE CRITERIA[1]

Monitoring Station	Waterway	Number of DO Values Rejected	Percent of DO Values Rejected
	Chicago River System		
Main Street	North Shore Channel	627	7
Foster Avenue	North Shore Channel	336	4
Addison Street	North Branch Chicago River	165	2
Fullerton Avenue	North Branch Chicago River	338	4
Kinzie Street	North Branch Chicago River	2	0
Clark Street	Chicago River	361	4
Loomis Street	South Branch Chicago River	2	0
36th Street	Bubbly Creek	352	4
Interstate Highway 55	Bubbly Creek	547	6
Cicero Avenue	Chicago Sanitary and Ship Canal	169	2
B&O Central Railroad	Chicago Sanitary and Ship Canal	4	0
Route 83	Chicago Sanitary and Ship Canal	1,861	21
Lockport Powerhouse	Chicago Sanitary and Ship Canal	344	4
	Des Plaines River System		
Jefferson Street	Des Plaines River	171	2
	Calumet River System		
Torrence Avenue	Grand Calumet River	485	6
C&W Indiana Railroad	Little Calumet River	174	2
Halsted Street	Little Calumet River	343	4
Cicero Avenue	Calumet-Sag Channel	173	2
104th Avenue	Calumet-Sag Channel	1,575	18
Route 83	Calumet-Sag Channel	4	0

[1]Dissolved oxygen was measured hourly using a YSI Model 6920 or Model 6600 continuous water quality monitor. DO values were rejected based on quality control check and/or operational problems with monitor.

TABLE 4: NUMBER AND PERCENT OF DISSOLVED OXYGEN VALUES MEASURED ABOVE THE ILLINOIS POLLUTION CONTROL BOARD'S WATER QUALITY STANDARD[1]

Monitoring Station	Waterway	IPCB DO Standard	Number of DO Values	Number Above Standard	Percent Above Standard
	Chicago River System				
Main Street	North Shore Channel	5	8,133	7,362	91
Foster Avenue	North Shore Channel	4	8,424	8,423	100
Addison Street	North Branch Chicago River	4	8,595	8,587	>99
Fullerton Avenue	North Branch Chicago River	4	8,422	8,362	>99
Kinzie Street	North Branch Chicago River	4	8,758	8,645	99
Clark Street	Chicago River	5	8,399	8,399	100
Loomis Street	South Branch Chicago River	4	8,758	8,732	>99
36th Street	Bubbly Creek	4	8,408	2,338	28
Interstate Highway 55	Bubbly Creek	4	8,213	6,281	77
Cicero Avenue	Chicago Sanitary and Ship Canal	4	8,591	8,223	96
B&O Central Railroad	Chicago Sanitary and Ship Canal	4	8,756	8,612	98
Route 83	Chicago Sanitary and Ship Canal	4	6,899	5,874	85
Lockport Powerhouse	Chicago Sanitary and Ship Canal	4	8,416	6,766	80
	Des Plaines River System				
Jefferson Street	Des Plaines River	4	8,589	8,148	95
	Calumet River System				
Torrence Avenue	Grand Calumet River	4	8,275	6,197	75
C&W Indiana Railroad	Little Calumet River	4	8,586	8,448	98
Halsted Street	Little Calumet River	4	8,417	8,412	>99
Cicero Avenue	Calumet-Sag Channel	3	8,587	8,587	100
104th Avenue	Calumet-Sag Channel	3	7,185	7,182	100
Route 83	Calumet-Sag Channel	3	8,756	8,729	>99

[1]Dissolved oxygen was measured hourly using a YSI Model 6920 or Model 6600 continuous water quality monitor.

TABLE 5: PERCENT OF DISSOLVED OXYGEN VALUES IN SELECTED RANGES

Monitoring Station	Waterway	Percent of DO Values in Range (mg/L)					
		0-<1	1-<2	2-<3	3-<4	4-<5	≥5
	Chicago River System						
Main Street	North Shore Channel	1	<1	<1	2	6	91
Foster Avenue	North Shore Channel	0	0	0	0	<1	>99
Addison Street	North Branch Chicago River	0	0	0	0	<1	>99
Fullerton Avenue	North Branch Chicago River	0	0	<1	<1	5	94
Kinzie Street	North Branch Chicago River	0	<1	<1	<1	6	93
Clark Street	Chicago River	0	0	0	0	0	100
Loomis Street	South Branch Chicago River	0	0	<1	<1	1	99
36th Street	Bubbly Creek	33	18	13	7	4	24
Interstate Highway 55	Bubbly Creek	6	4	5	9	16	61
Cicero Avenue	Chicago Sanitary and Ship Canal	<1	<1	<1	3	18	78
B&O Central Railroad	Chicago Sanitary and Ship Canal	0	<1	<1	1	6	92
Route 83	Chicago Sanitary and Ship Canal	<1	<1	2	11	23	62
Lockport Powerhouse	Chicago Sanitary and Ship Canal	<1	1	4	15	16	65
	Des Plaines River System						
Jefferson Street	Des Plaines River	0	0	<1	5	12	83
	Calumet River System						
Torrence Avenue	Grand Calumet River	4	4	7	9	8	67
C&W Indiana Railroad	Little Calumet River	0	0	<1	1	5	93
Halsted Street	Little Calumet River	0	0	0	<1	1	99
Cicero Avenue	Calumet-Sag Channel	0	0	0	<1	7	92
104th Avenue	Calumet-Sag Channel	0	0	0	1	10	89
Route 83	Calumet-Sag Channel	0	0	<1	2	15	83

FIGURE 1: CONTINUOUS DISSOLVED OXYGEN MONITORING AND AMBIENT WATER QUALITY MONITORING SAMPLE STATIONS

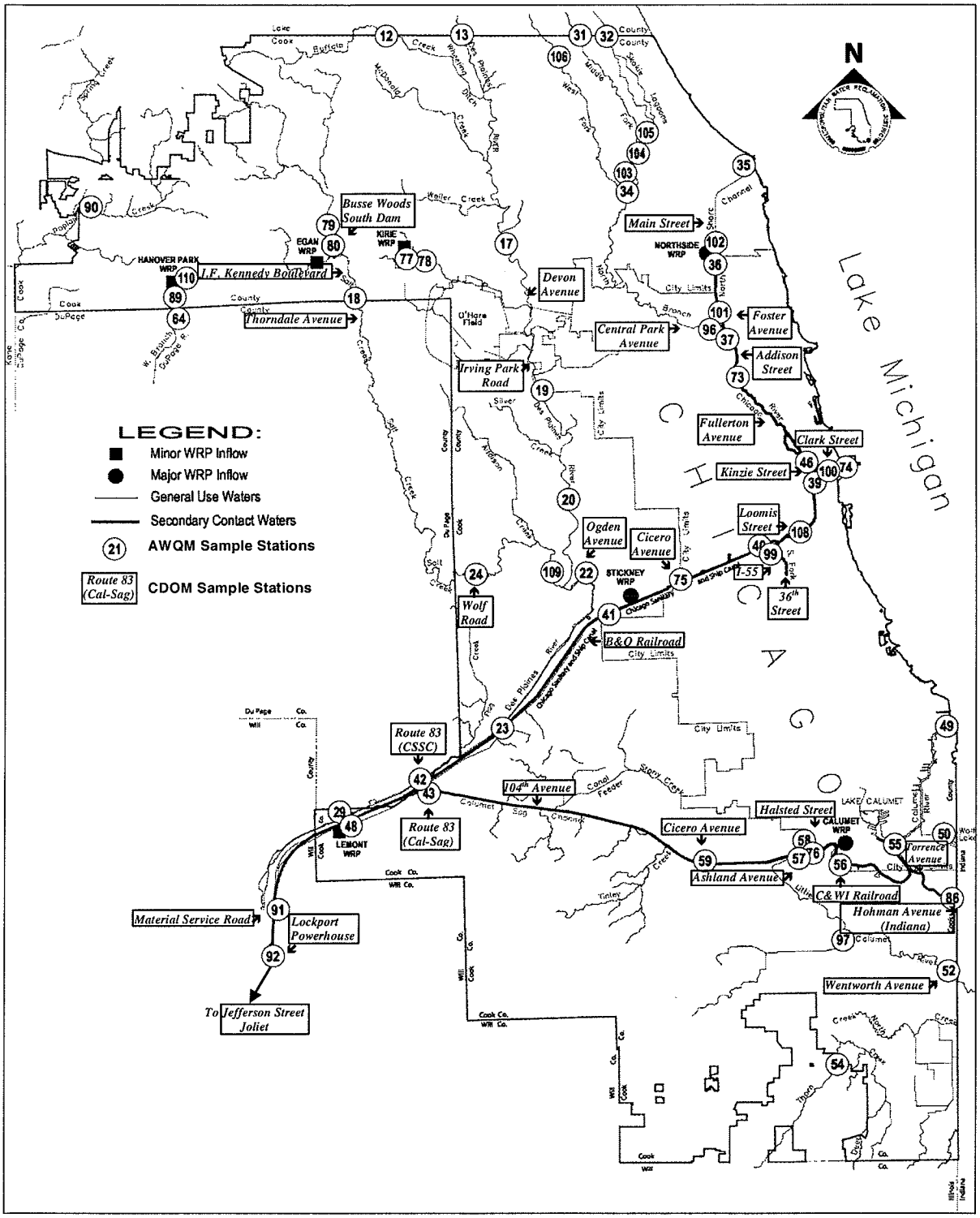


FIGURE 2: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT MAIN STREET
ON THE NORTH SHORE CHANNEL FROM JANUARY 2006 THROUGH DECEMBER 2006

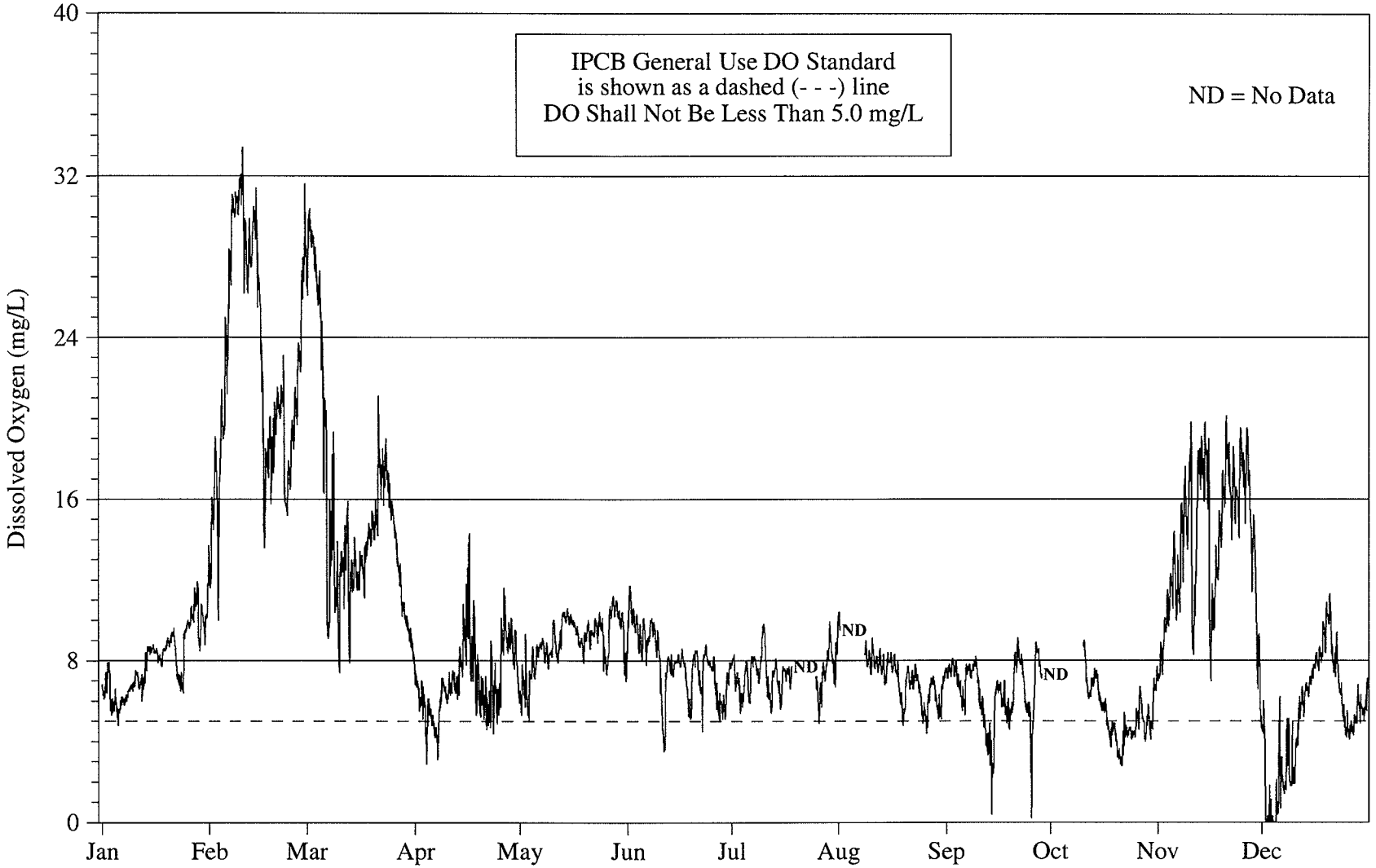


FIGURE 3: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT FOSTER AVENUE
ON THE NORTH SHORE CHANNEL FROM JANUARY 2006 THROUGH DECEMBER 2006

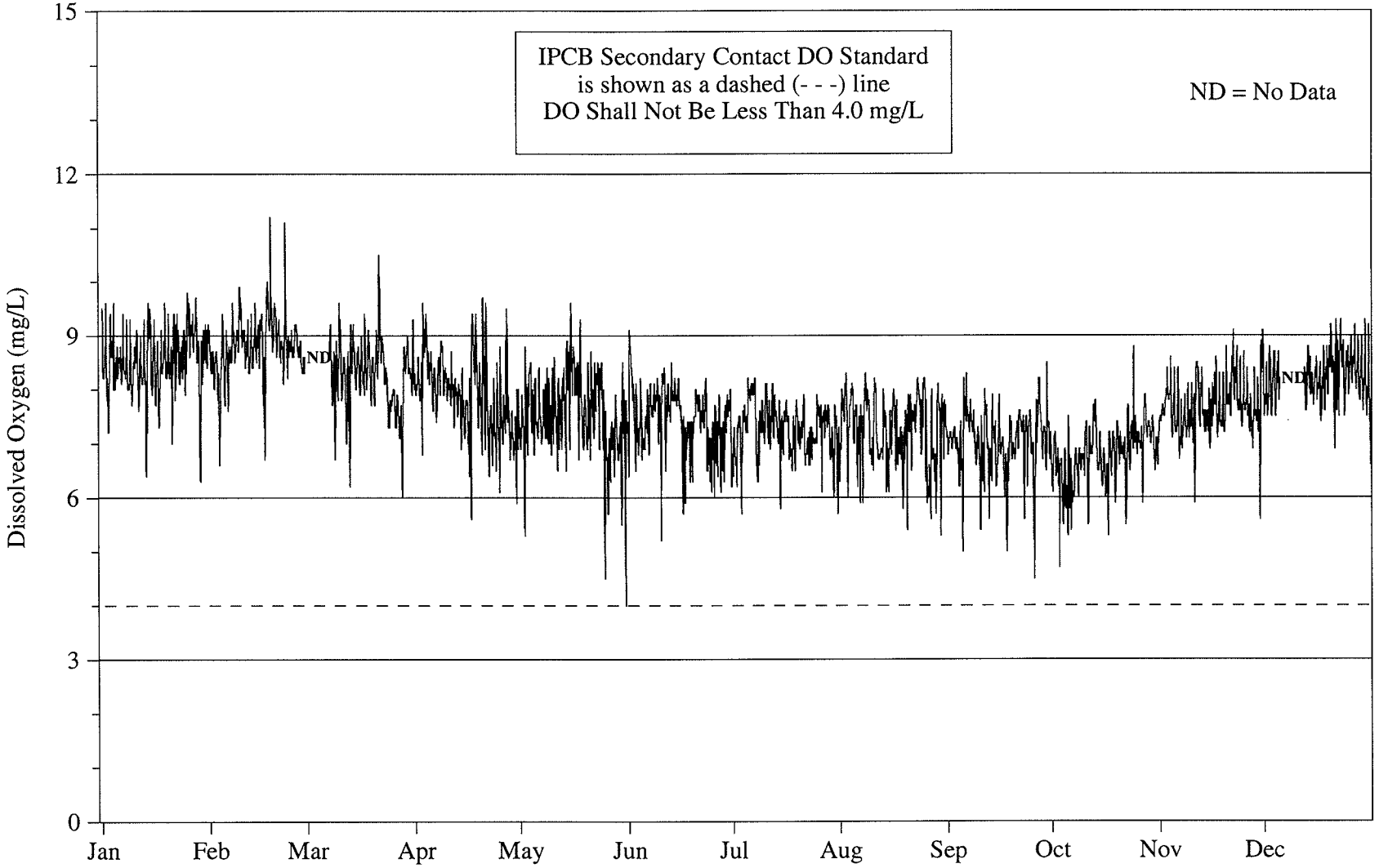


FIGURE 4: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT ADDISON STREET ON THE NORTH BRANCH CHICAGO RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

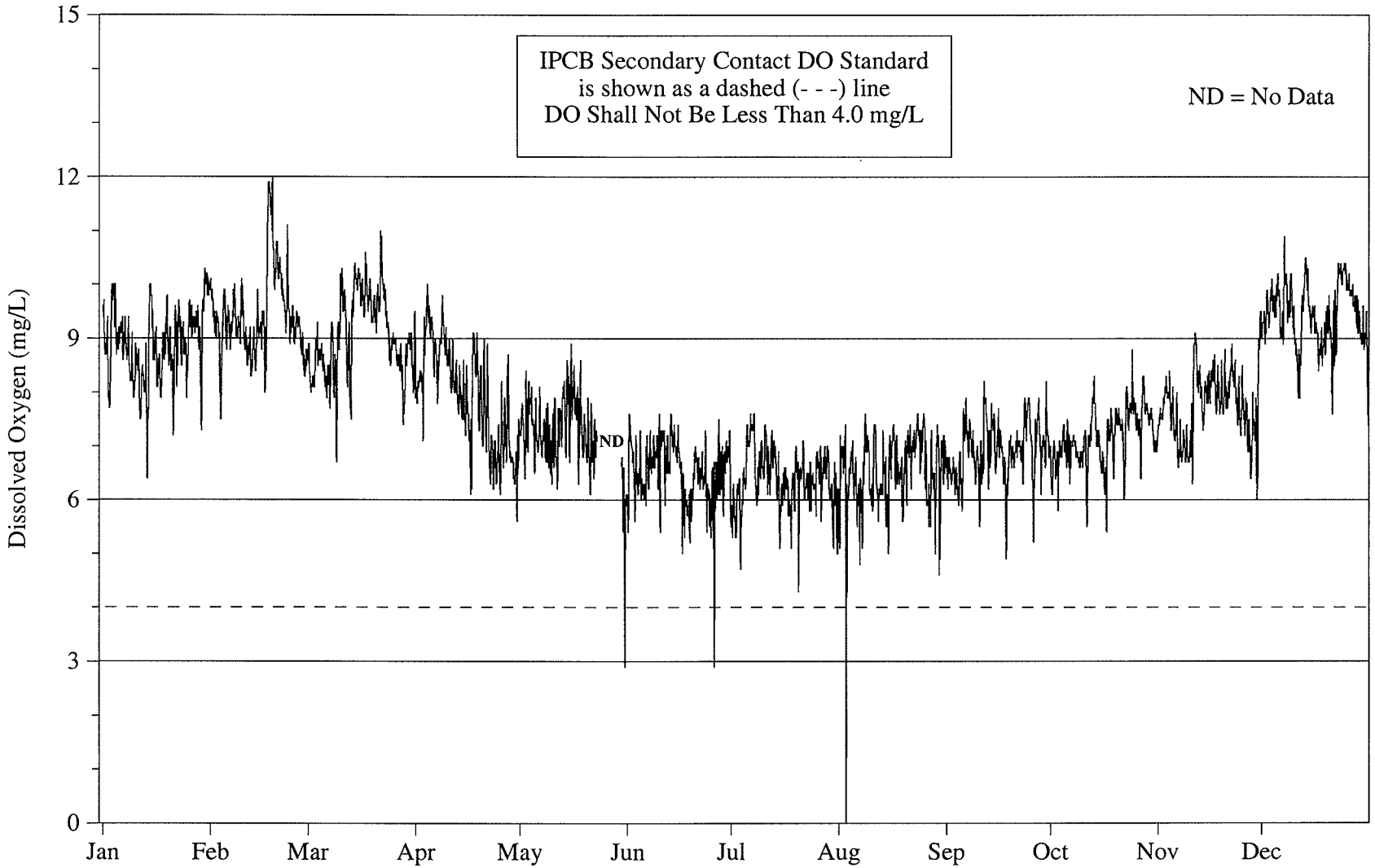


FIGURE 5: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT FULLERTON AVENUE ON THE NORTH BRANCH CHICAGO RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

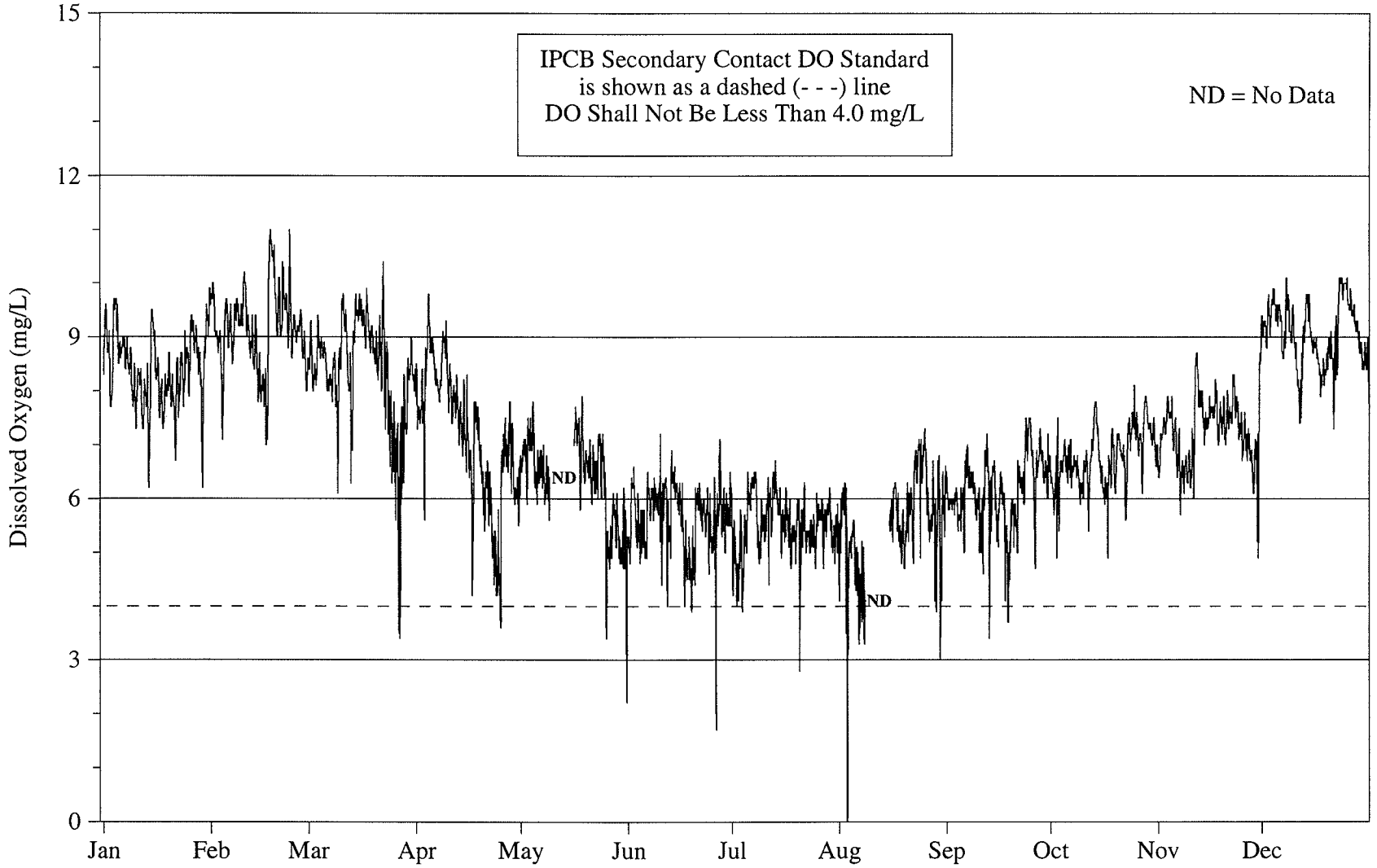


FIGURE 6: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT KINZIE STREET ON THE NORTH BRANCH CHICAGO RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

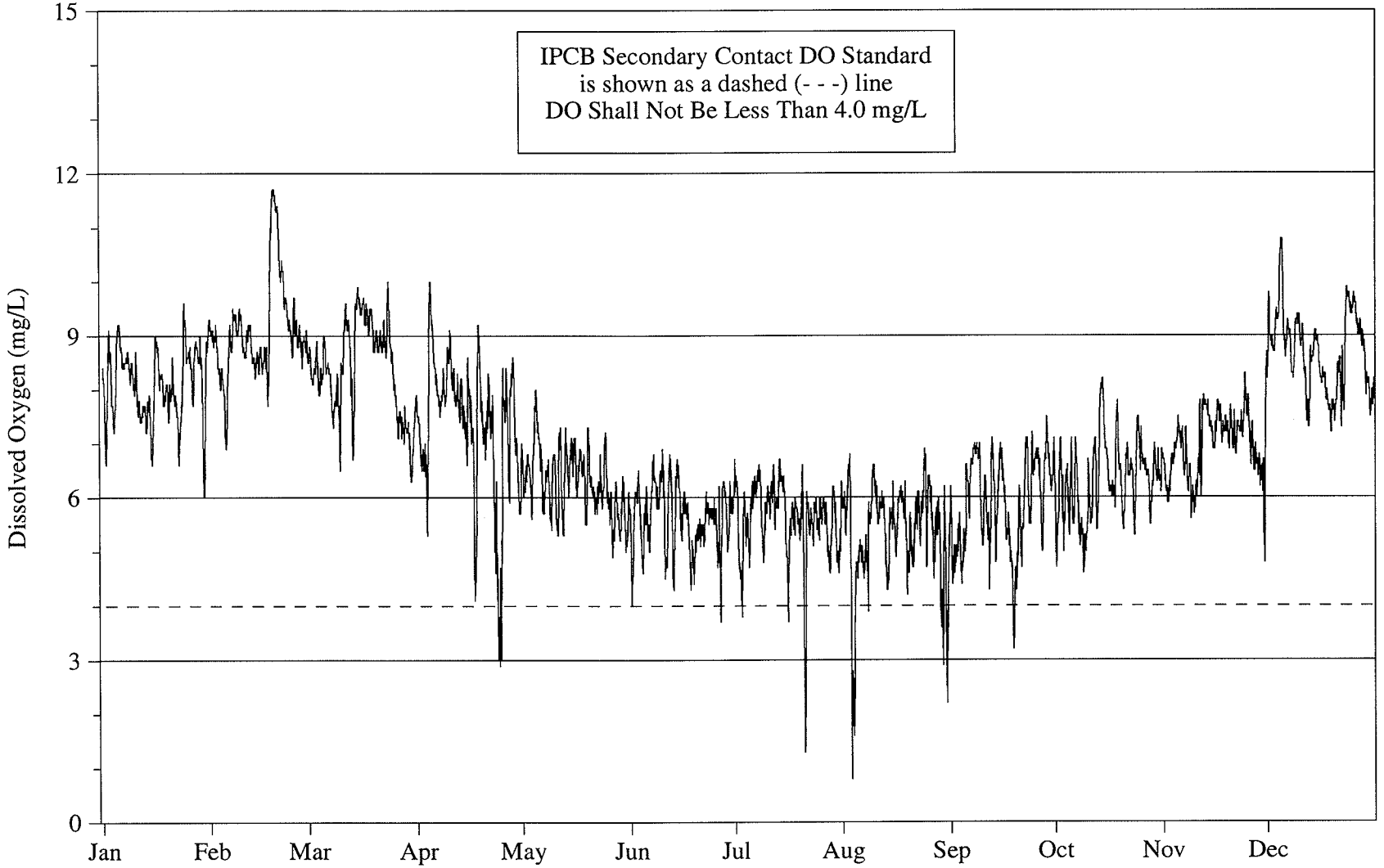


FIGURE 7: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT CLARK STREET
ON THE CHICAGO RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

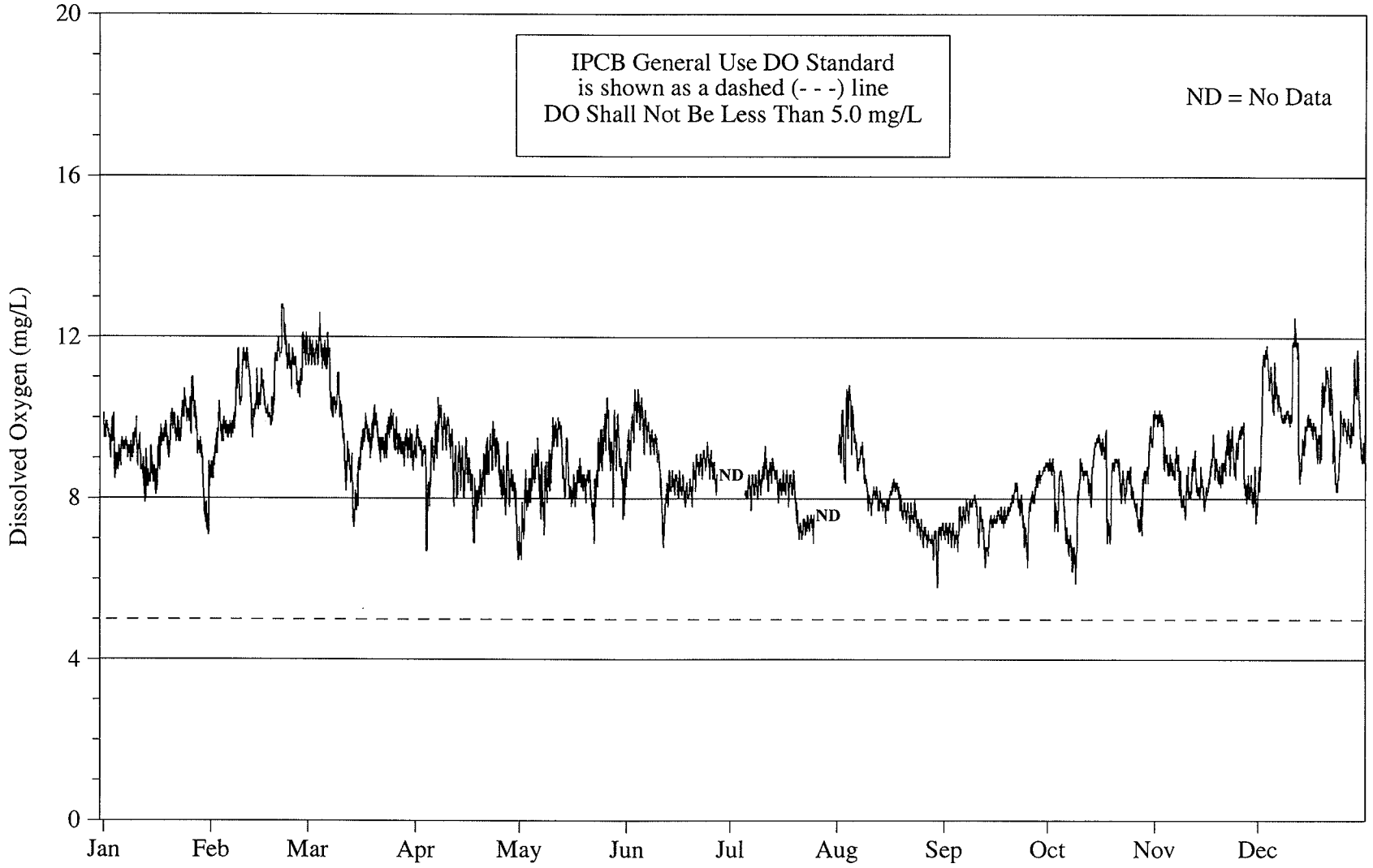


FIGURE 8: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET ON THE SOUTH BRANCH CHICAGO RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

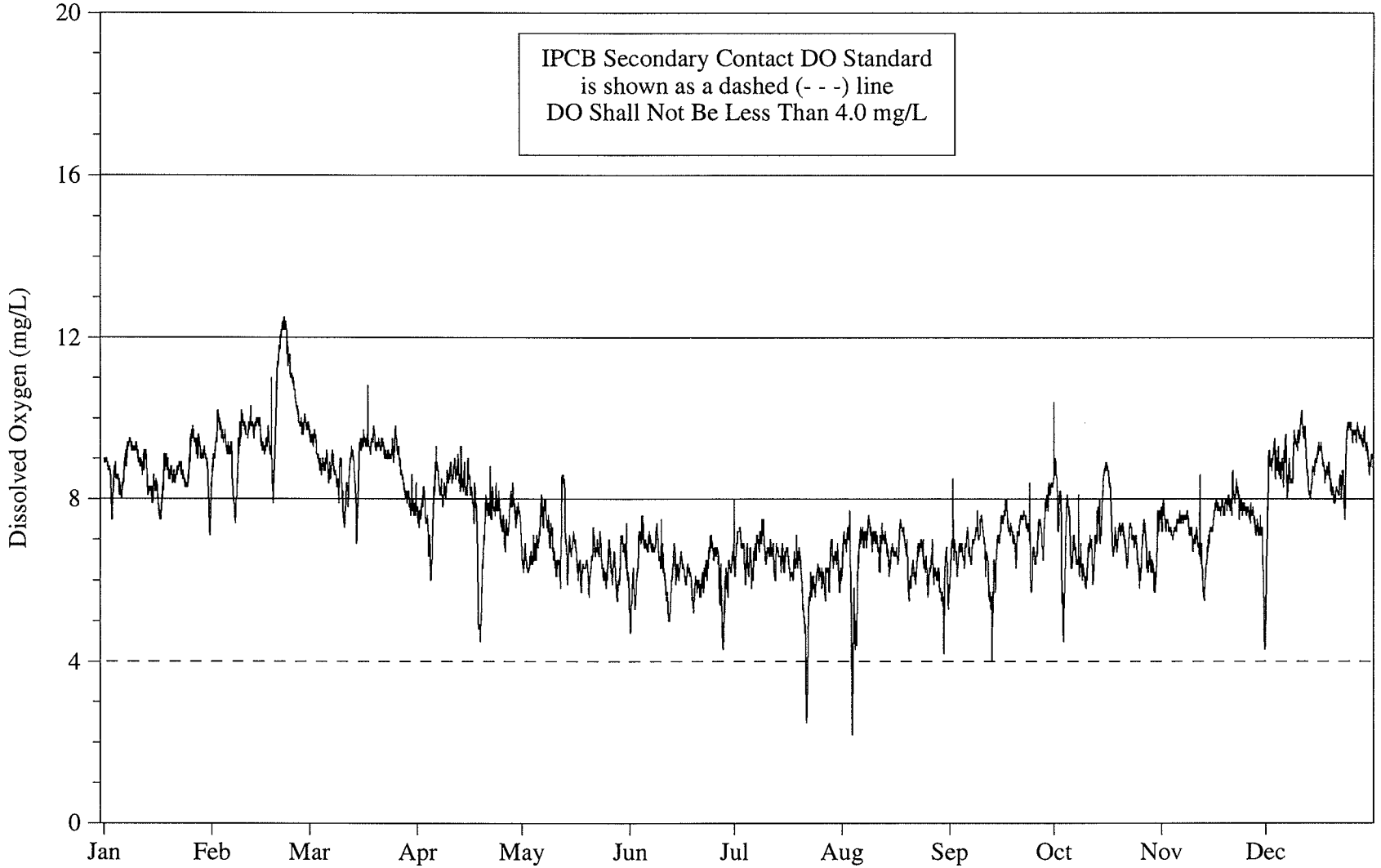


FIGURE 9: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT 36TH STREET ON BUBBLY CREEK FROM JANUARY 2006 THROUGH DECEMBER 2006

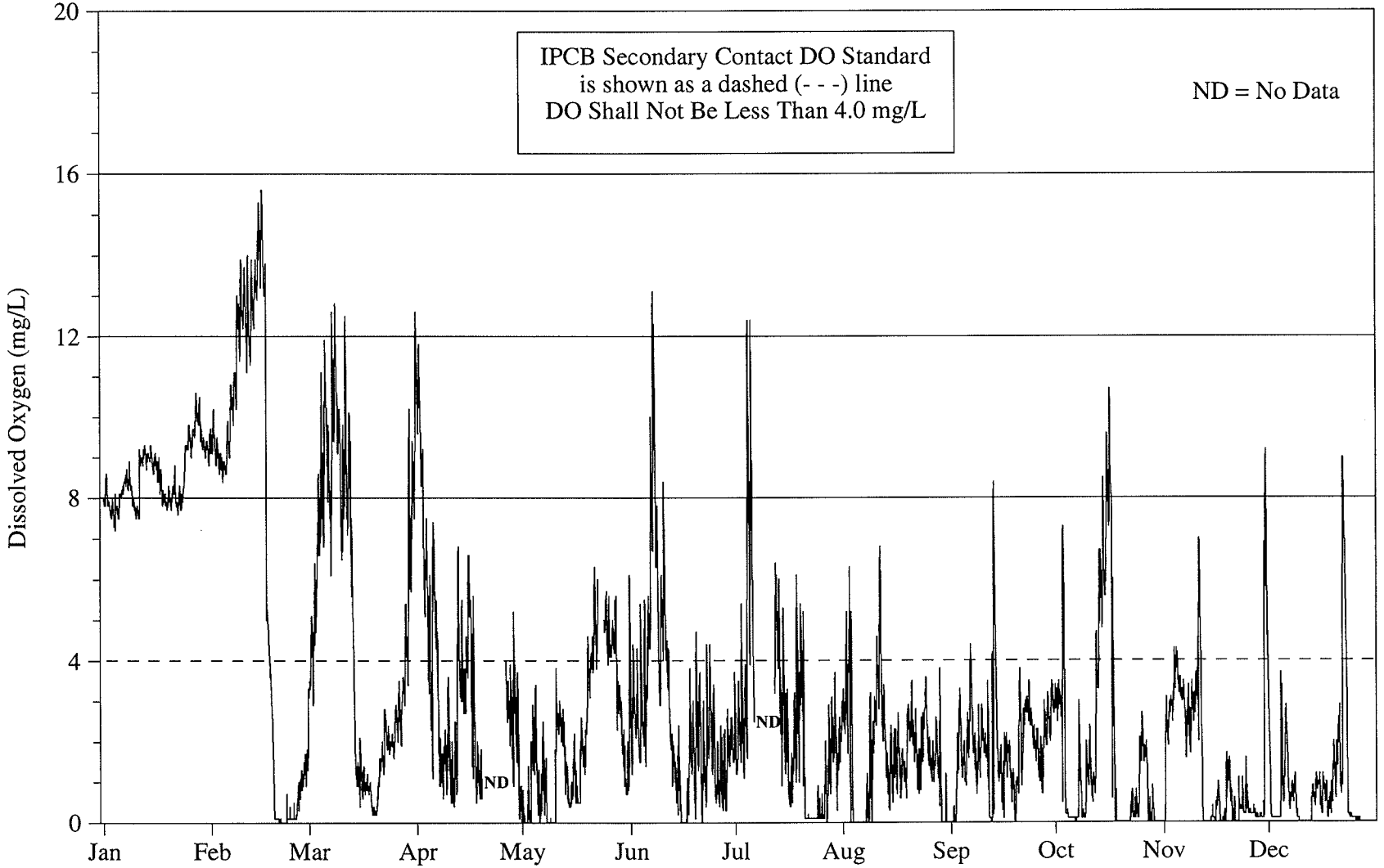


FIGURE 10: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT INTERSTATE HIGHWAY 55 ON BUBBLY CREEK FROM JANUARY 2006 THROUGH DECEMBER 2006

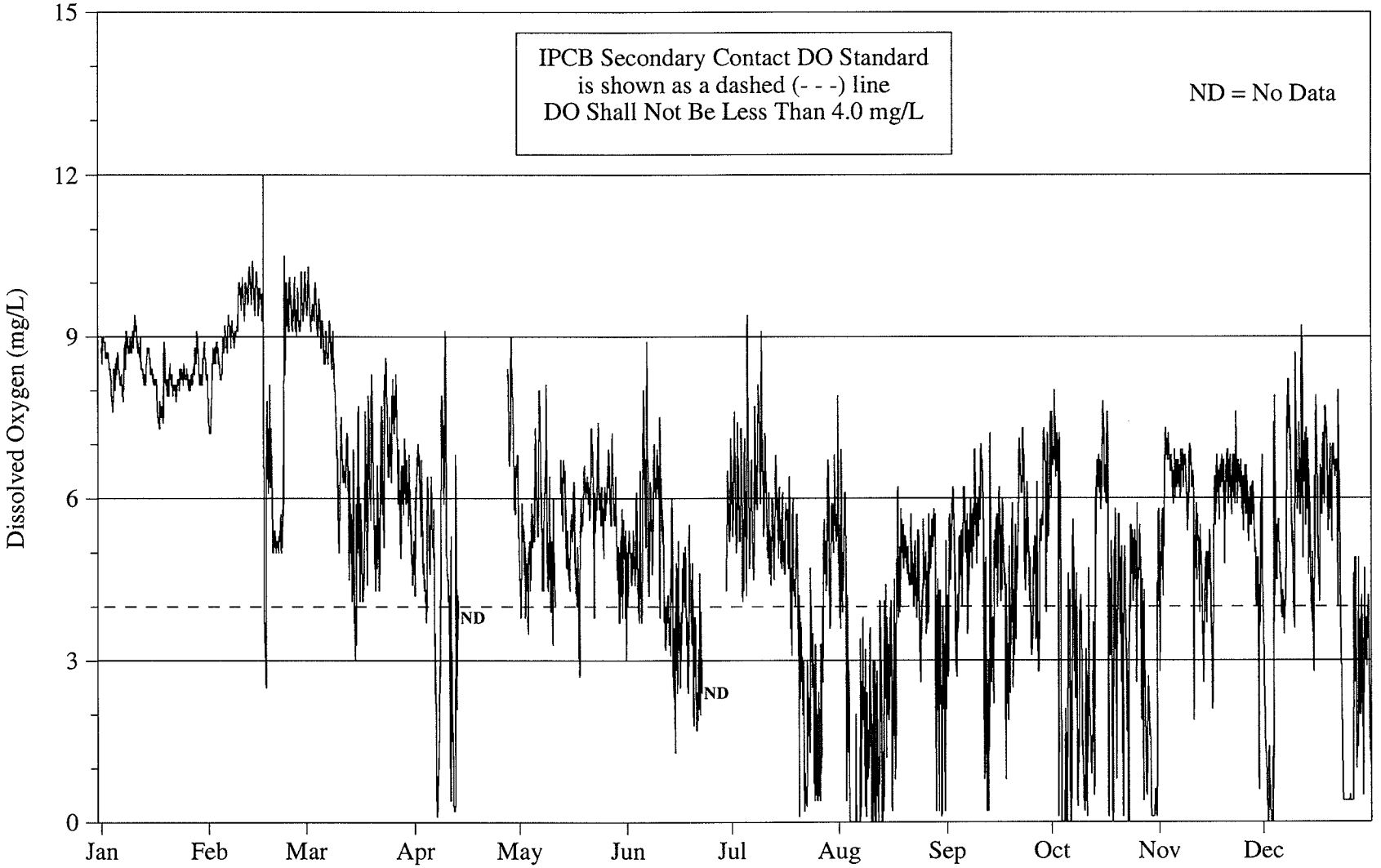


FIGURE 11: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT CICERO AVENUE ON THE CHICAGO SANITARY AND SHIP CANAL FROM JANUARY 2006 THROUGH DECEMBER 2006

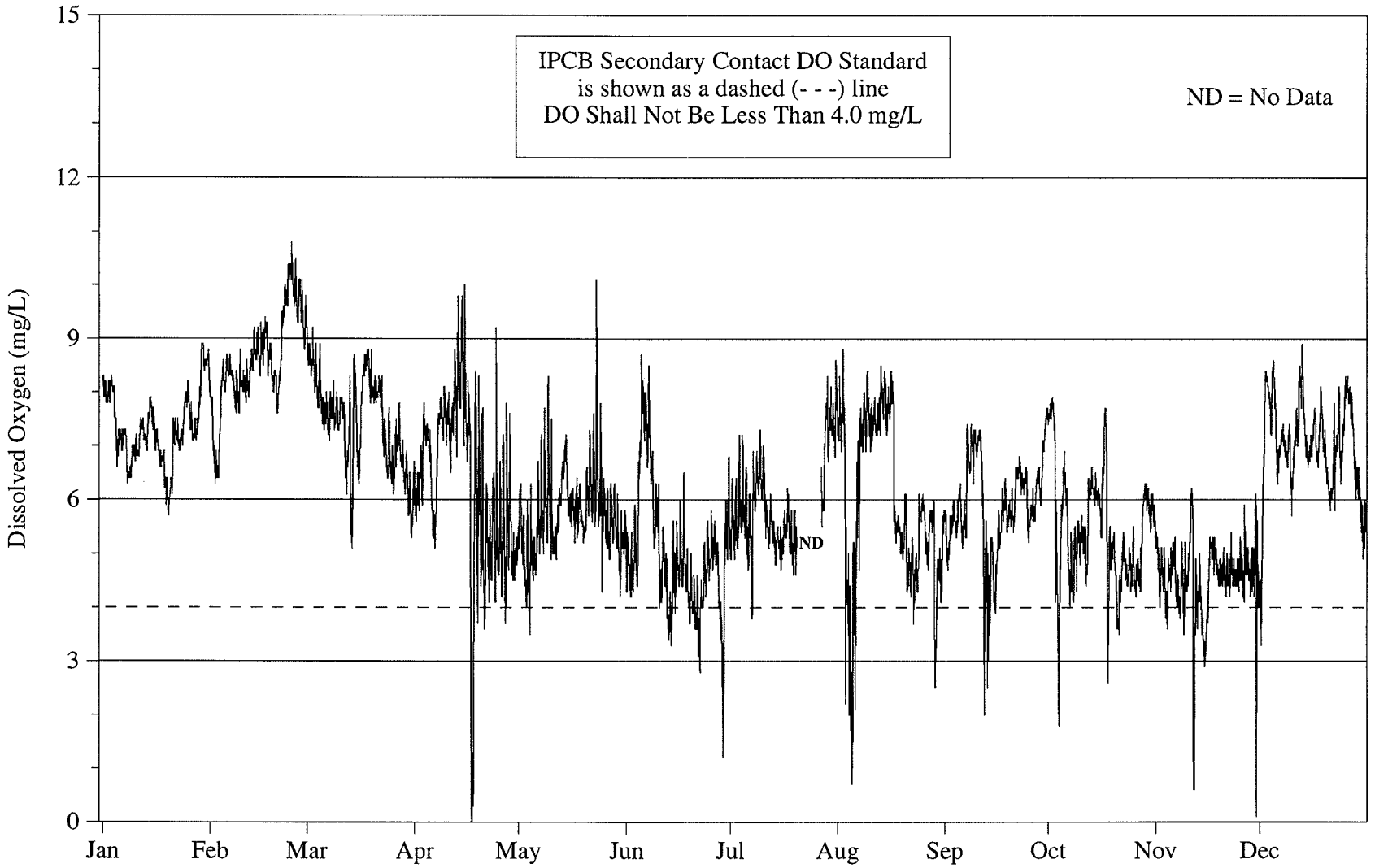


FIGURE 12: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT B&O CENTRAL RAILROAD ON THE CHICAGO SANITARY AND SHIP CANAL FROM JANUARY 2006 THROUGH DECEMBER 2006

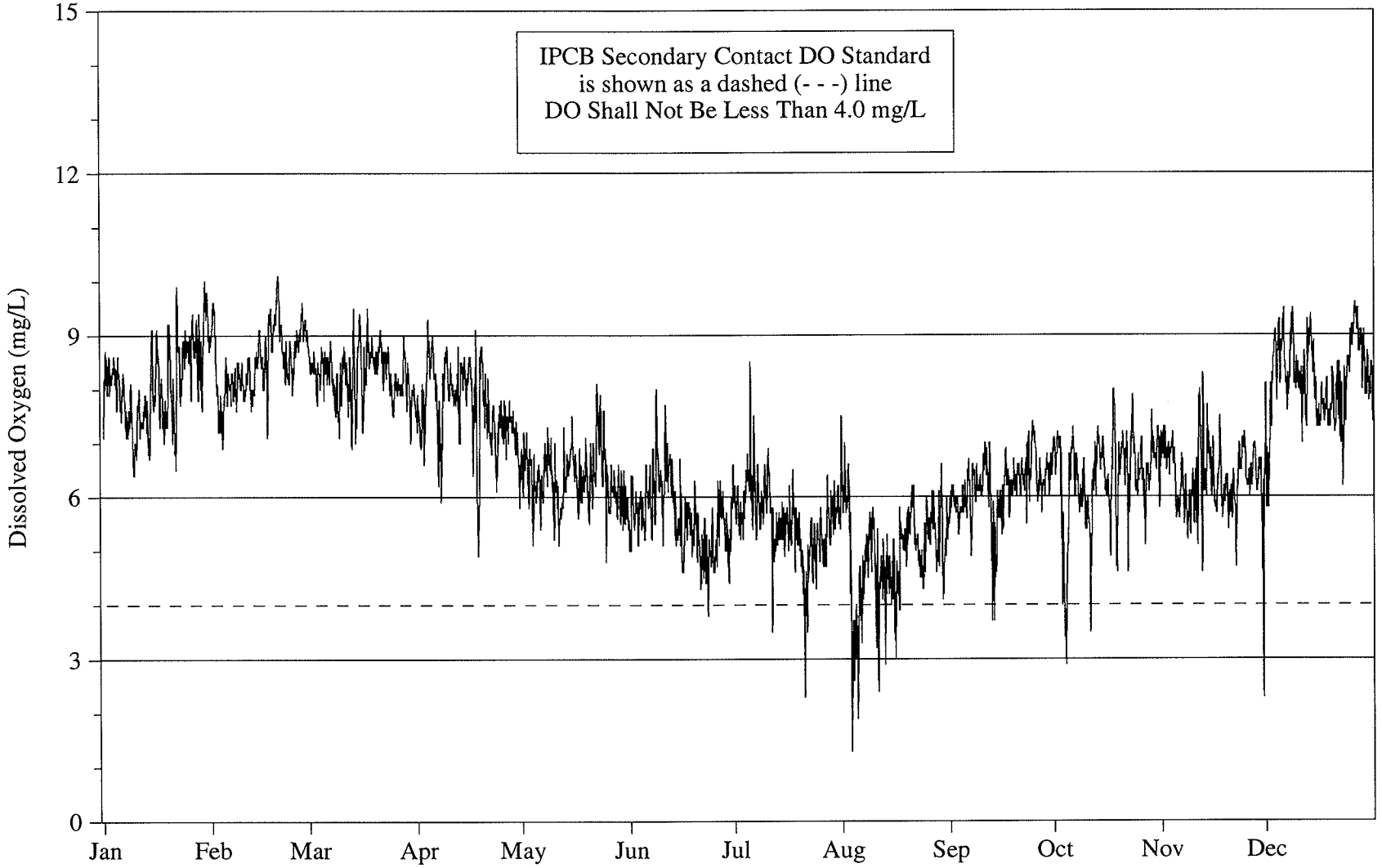


FIGURE 13: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT ROUTE 83
ON THE CHICAGO SANITARY AND SHIP CANAL FROM JANUARY 2006 THROUGH DECEMBER 2006

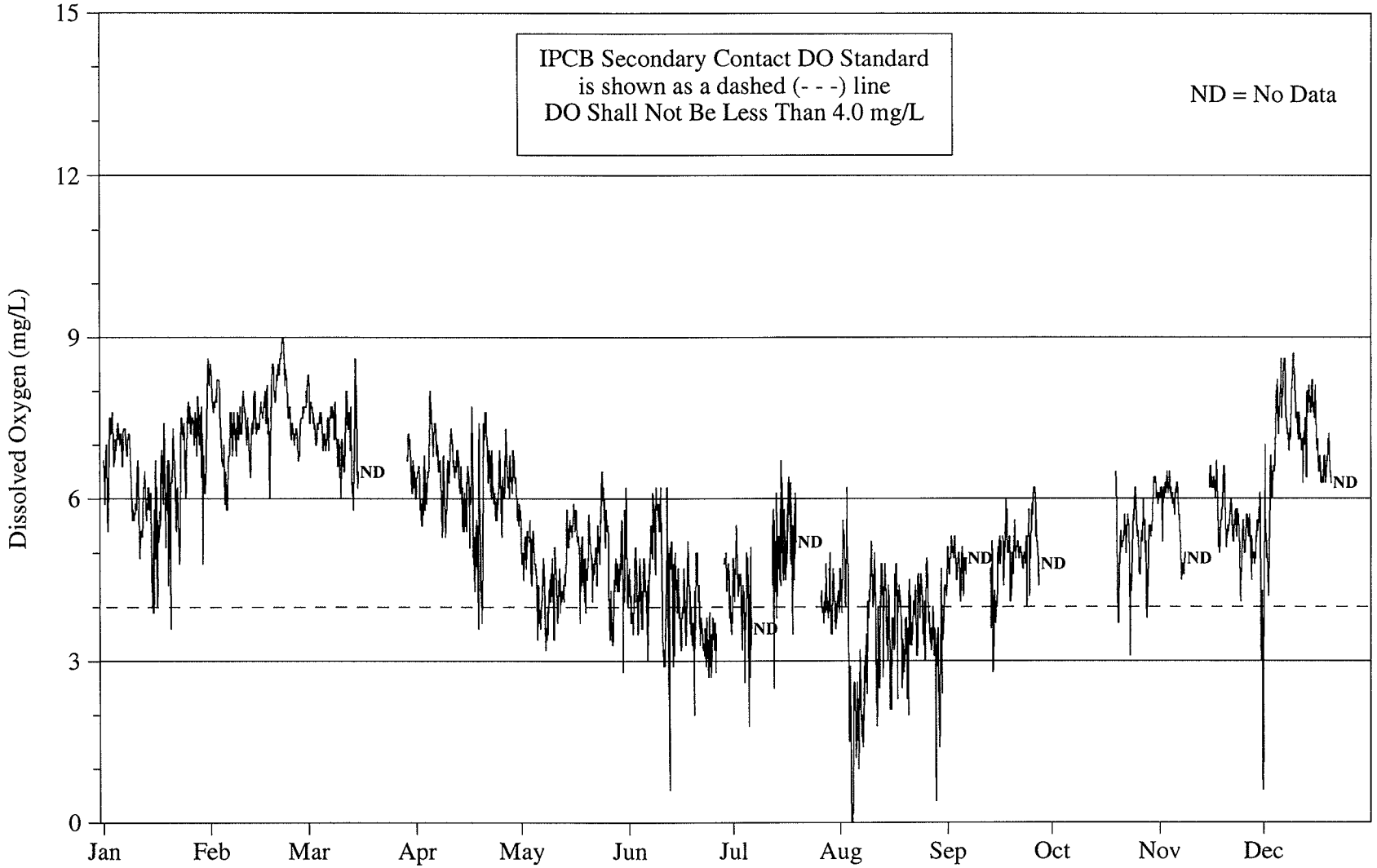


FIGURE 14: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOCKPORT POWERHOUSE ON THE CHICAGO SANITARY AND SHIP CANAL FROM JANUARY 2006 THROUGH DECEMBER 2006

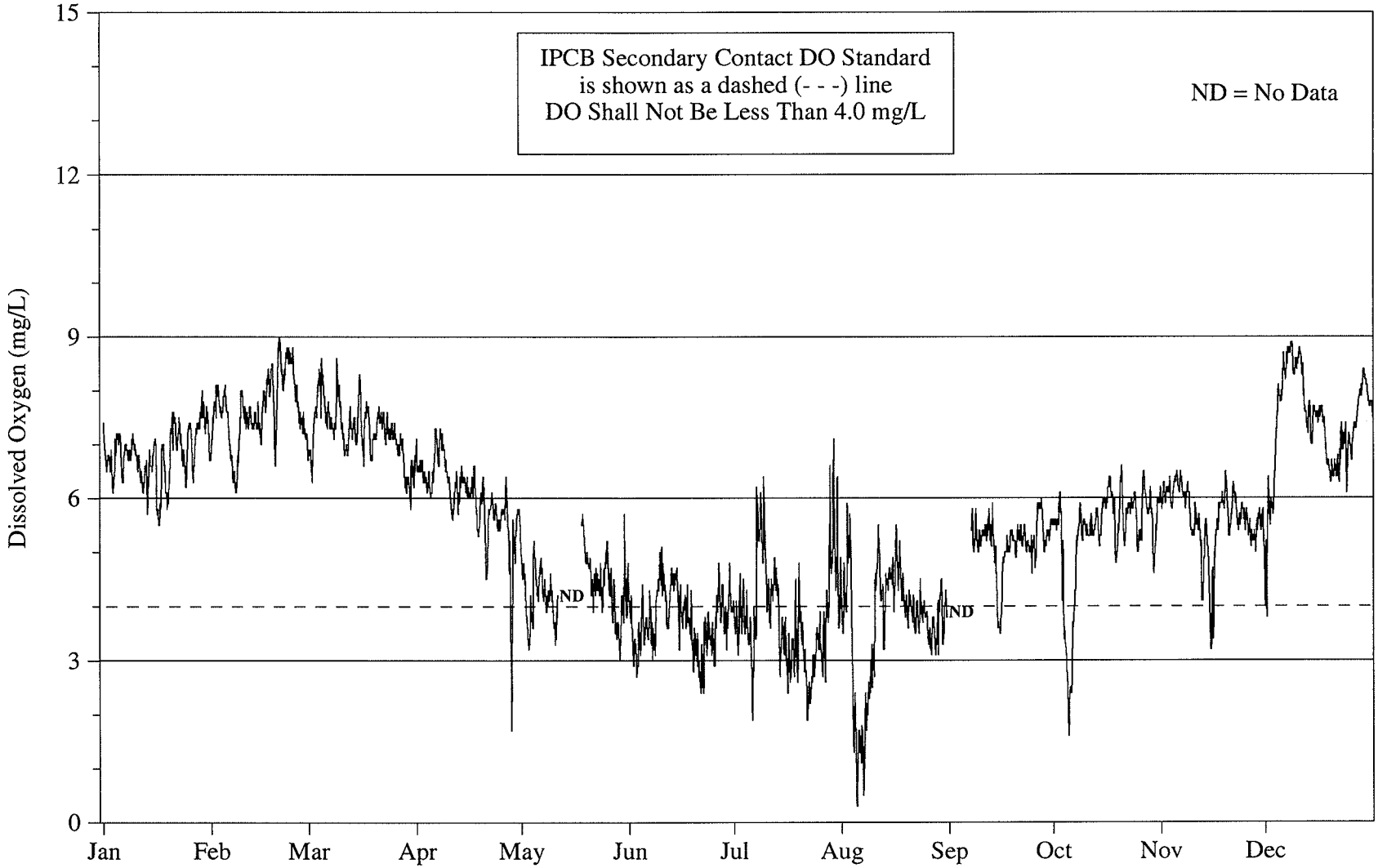


FIGURE 15: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT JEFFERSON STREET ON THE DES PLAINES RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

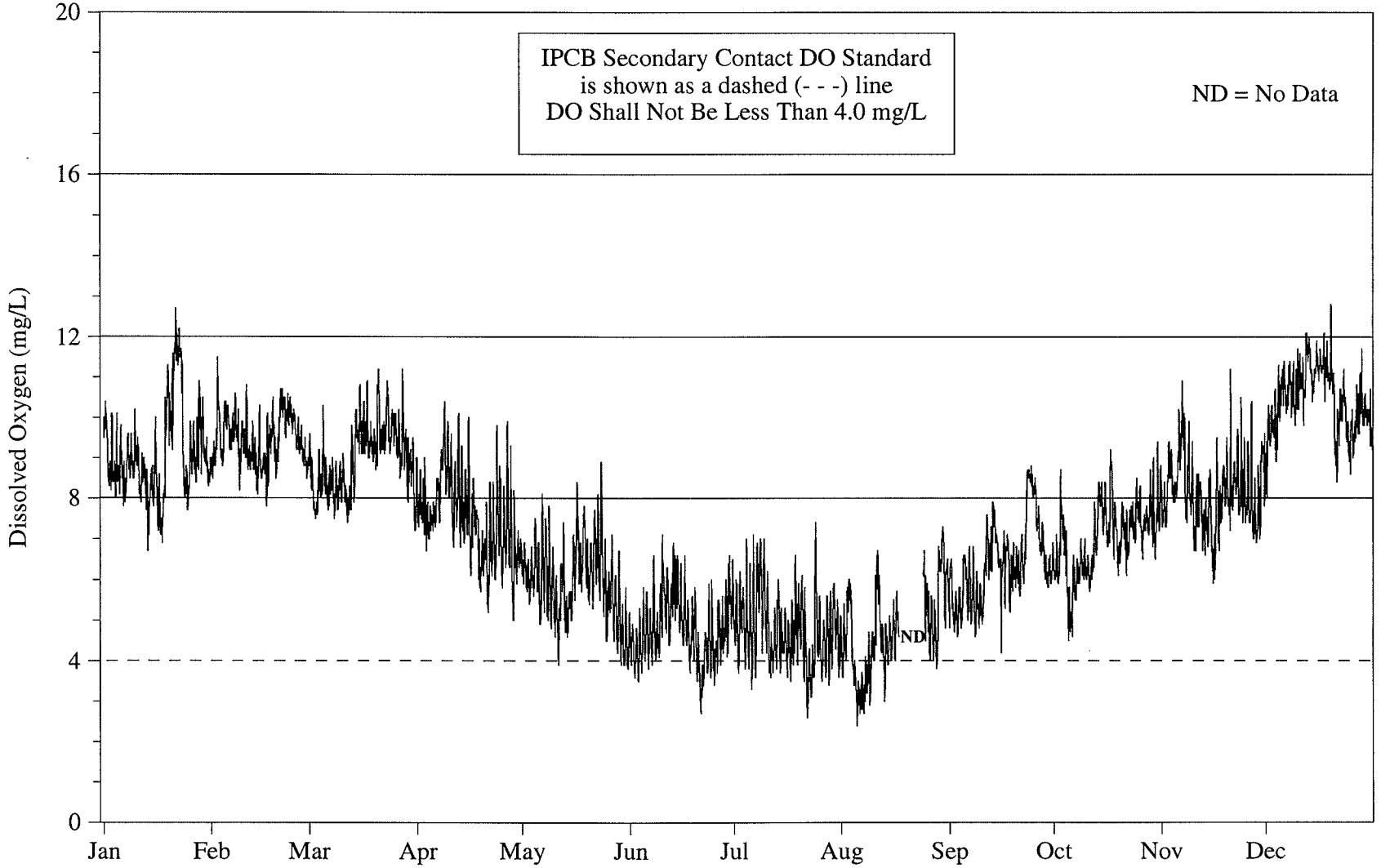


FIGURE 16: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT TORRENCE AVENUE ON THE GRAND CALUMET RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

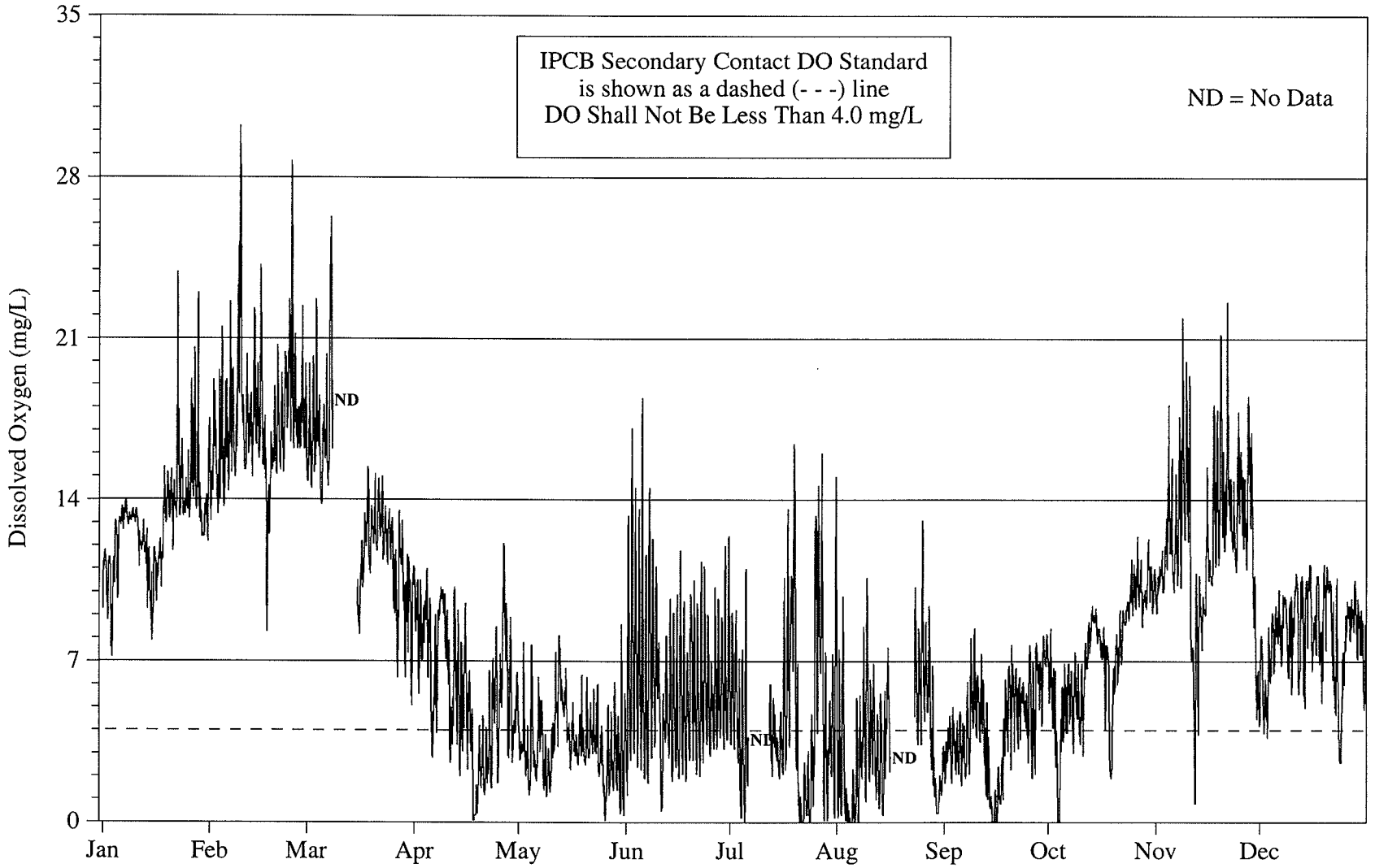


FIGURE 17: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT C&W INDIANA RAILROAD ON THE LITTLE CALUMET RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

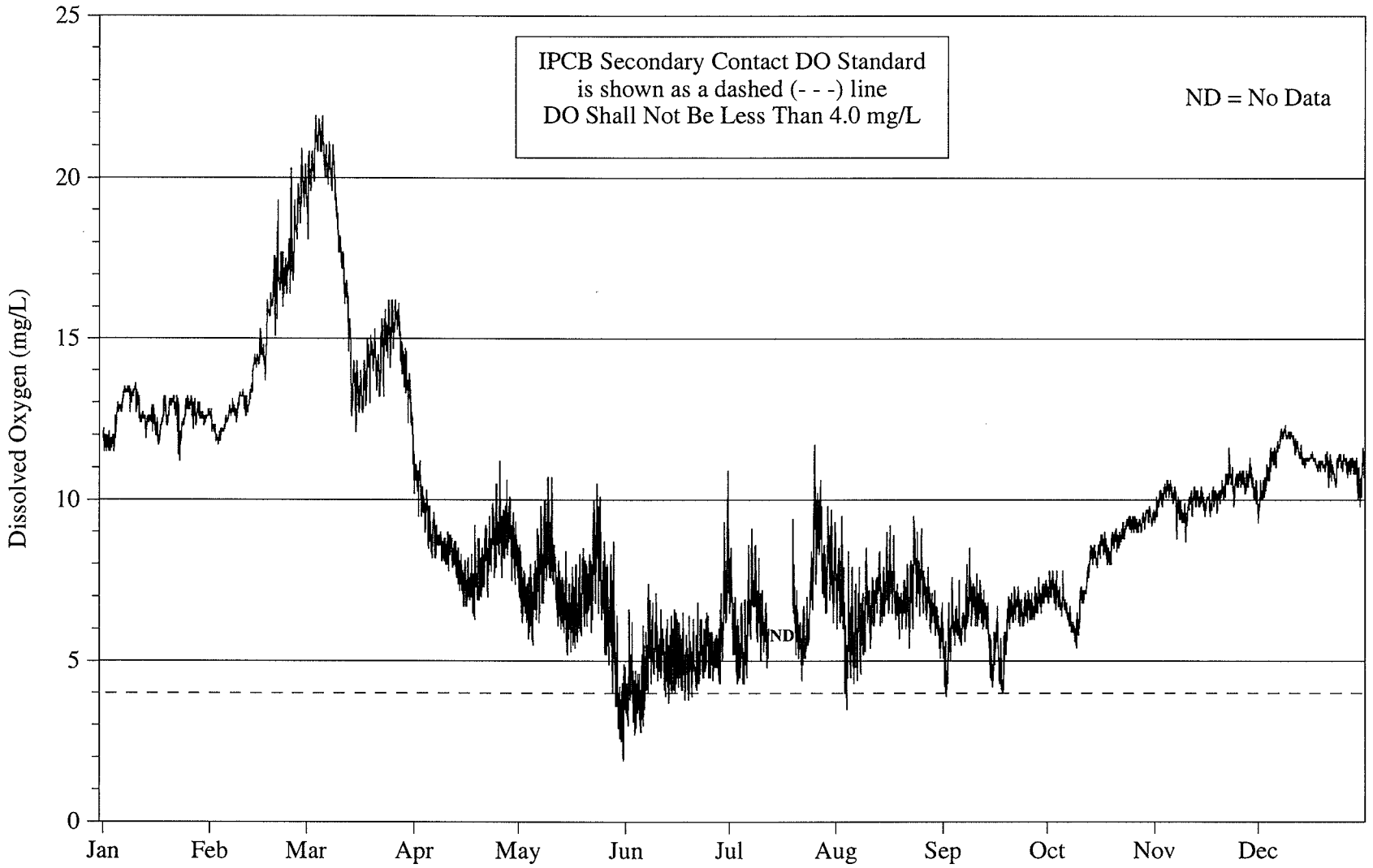


FIGURE 18: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT HALSTED STREET
ON THE LITTLE CALUMET RIVER FROM JANUARY 2006 THROUGH DECEMBER 2006

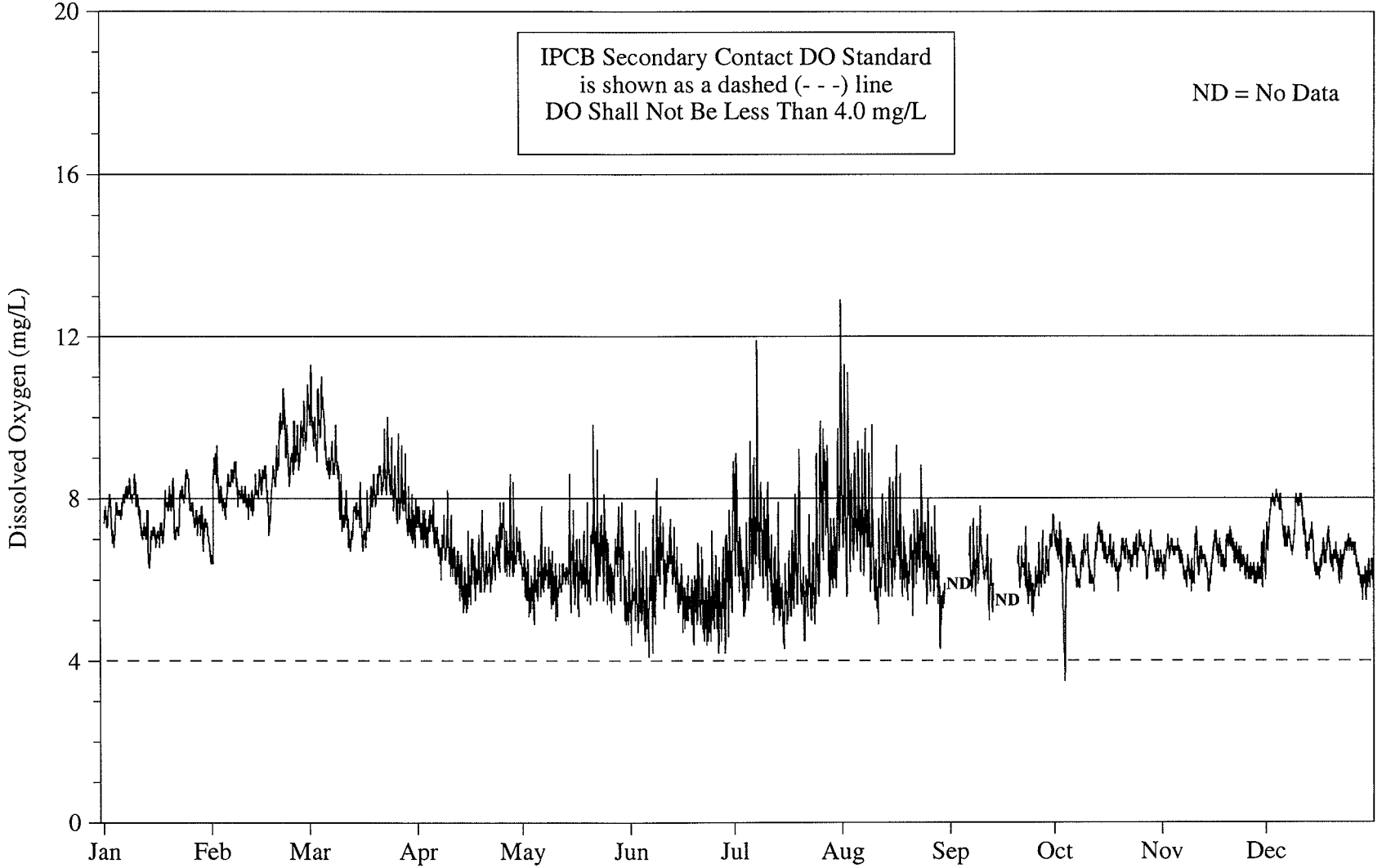


FIGURE 19: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT CICERO AVENUE ON THE CALUMET-SAG CHANNEL FROM JANUARY 2006 THROUGH DECEMBER 2006

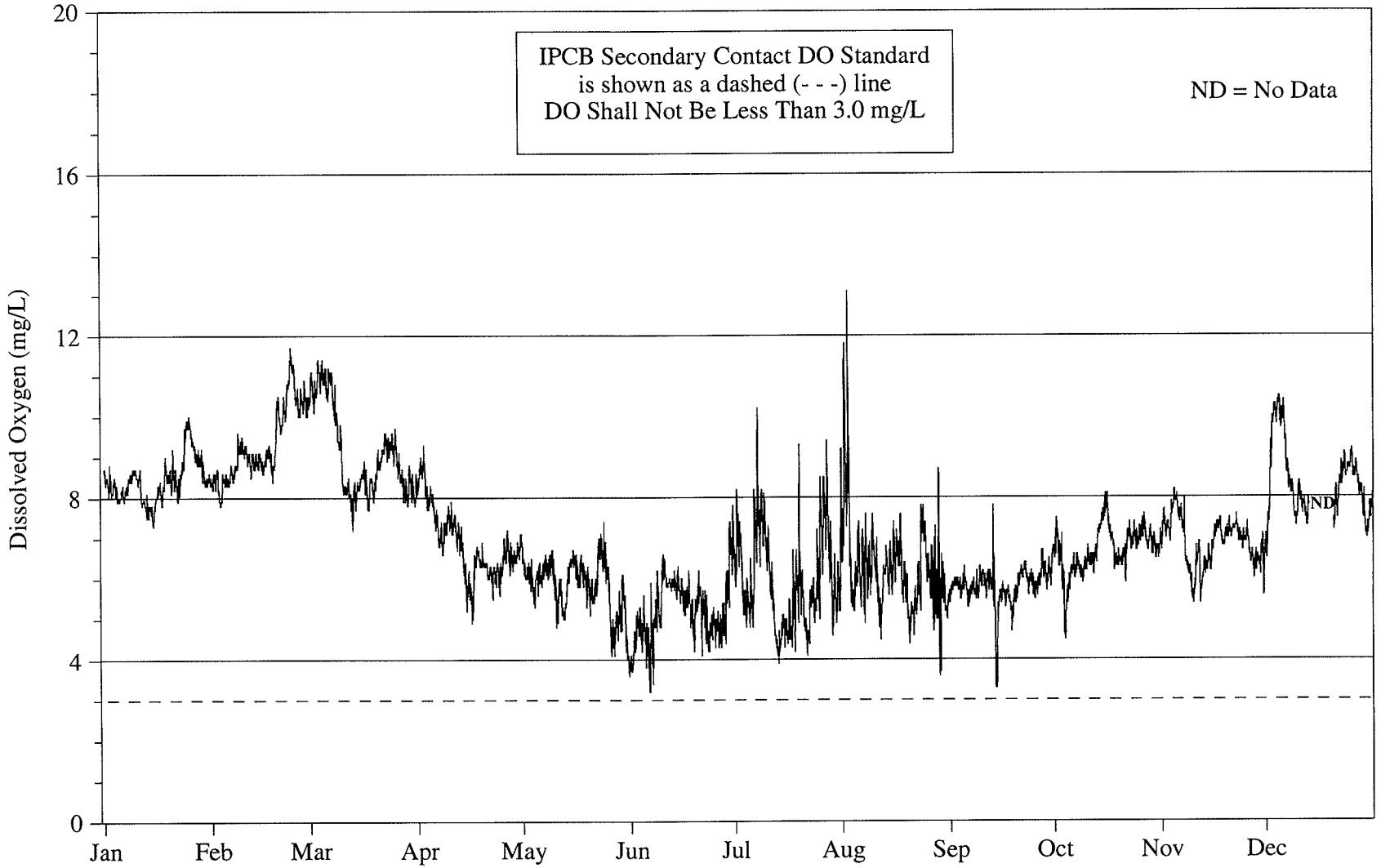
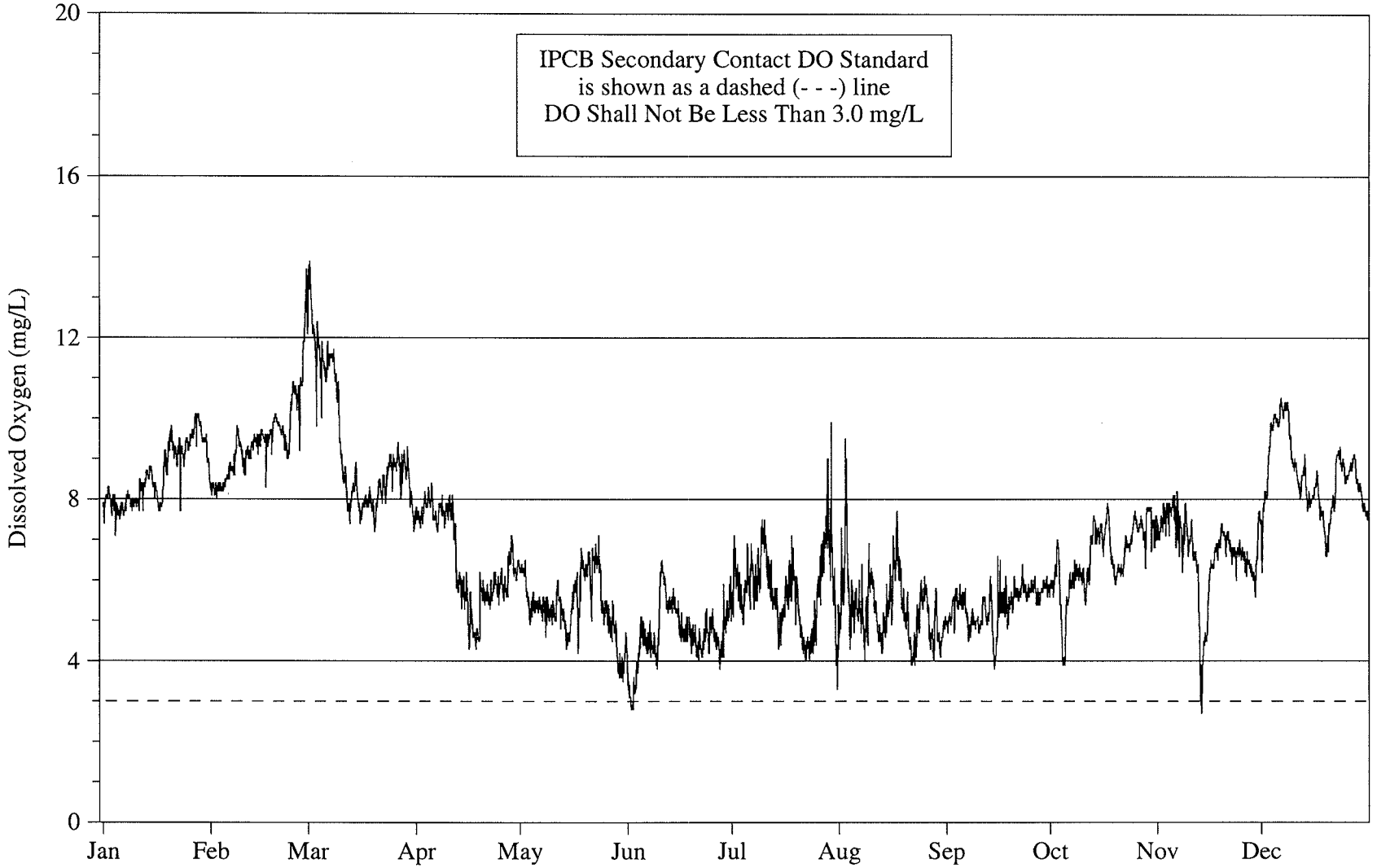


FIGURE 20: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT 104TH AVENUE ON THE CALUMET-SAG CHANNEL FROM JANUARY 2006 THROUGH DECEMBER 2006

FIGURE 21: DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT ROUTE 83
ON THE CALUMET-SAG CHANNEL FROM JANUARY 2006 THROUGH DECEMBER 2006



REFERENCES

Chapman, G., "Water Quality Criteria for Dissolved Oxygen," EPA 440/5-86-003, United States Environmental Protection Agency, Office of Water Regulations and Standards, Washington, D.C., 1986.

Lanyon, R., "Description of the Chicago Waterway System," Use Attainability Analysis Study Conducted by Illinois Environmental Protection Agency in Cooperation with Metropolitan Water Reclamation District of Greater Chicago, Illinois, May 2002.

APPENDIX A

WEEKLY DO SUMMARY STATISTICS AT ALL DEEP-DRAFT MONITORING STATIONS DURING 2006

TABLE A-1: WEEKLY DO SUMMARY STATISTICS AT MAIN STREET
ON THE NORTH SHORE CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	6.1	6.8	6.4	100
01/02/06 - 01/08/06	168	4.8	7.9	6.2	98
01/09/06 - 01/15/06	168	6.0	8.8	7.5	100
01/16/06 - 01/22/06	168	7.0	9.6	8.5	100
01/23/06 - 01/29/06	168	6.4	11.9	9.4	100
01/30/06 - 02/05/06	167	8.8	25.0	15.3	100
02/06/06 - 02/12/06	168	21.2	33.4	29.0	100
02/13/06 - 02/19/06	168	13.6	31.4	22.7	100
02/20/06 - 02/26/06	168	15.2	23.7	19.5	100
02/27/06 - 03/05/06	168	16.3	31.6	26.7	100
03/06/06 - 03/12/06	168	7.4	21.0	13.3	100
03/13/06 - 03/19/06	168	7.9	15.4	12.7	100
03/20/06 - 03/26/06	168	13.3	21.1	16.1	100
03/27/06 - 04/02/06	167	5.5	13.1	9.1	100
04/03/06 - 04/09/06	167	2.9	7.1	5.4	64
04/10/06 - 04/16/06	168	5.9	14.3	8.0	100
04/17/06 - 04/23/06	168	4.4	11.0	6.7	94
04/24/06 - 04/30/06	168	4.9	11.6	8.2	99
05/01/06 - 05/07/06	168	5.0	9.3	7.5	100
05/08/06 - 05/14/06	167	7.6	10.6	9.1	100
05/15/06 - 05/21/06	168	7.9	10.3	9.4	100
05/22/06 - 05/28/06	168	7.3	11.2	9.6	100
05/29/06 - 06/04/06	168	7.0	11.7	9.7	100
06/05/06 - 06/11/06	168	3.5	10.1	8.2	88
06/12/06 - 06/18/06	168	5.2	8.6	7.6	100
06/19/06 - 06/25/06	169	4.5	8.8	7.6	99
06/26/06 - 07/02/06	168	5.0	8.3	6.7	100
07/03/06 - 07/09/06	168	5.4	9.1	7.2	100
07/10/06 - 07/16/06	168	5.4	9.8	7.3	100
07/17/06 - 07/23/06	37	6.6	7.7	7.3	100
07/24/06 - 07/30/06	131	4.9	9.9	7.4	99
07/31/06 - 08/06/06	37	6.7	10.4	8.9	100
08/07/06 - 08/13/06	130	7.3	9.1	8.1	100

TABLE A-1 (Continued): WEEKLY DO SUMMARY STATISTICS AT MAIN STREET ON THE NORTH SHORE CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	4.8	8.4	7.1	98
08/21/06 - 08/27/06	168	4.4	7.8	6.4	93
08/28/06 - 09/03/06	168	5.1	8.1	6.9	100
09/04/06 - 09/10/06	168	5.3	8.2	7.0	100
09/11/06 - 09/17/06	168	0.4	7.0	5.2	58
09/18/06 - 09/24/06	168	4.6	9.1	6.6	97
09/25/06 - 10/01/06	85	0.2	8.9	6.6	75
10/02/06 - 10/08/06			NO DATA		
10/09/06 - 10/15/06	131	5.5	9.0	6.9	100
10/16/06 - 10/22/06	168	2.8	6.1	4.4	21
10/23/06 - 10/29/06	168	4.0	6.7	4.9	39
10/30/06 - 11/05/06	169	4.6	14.4	8.9	93
11/06/06 - 11/12/06	168	8.3	19.8	13.9	100
11/13/06 - 11/19/06	168	7.0	19.8	14.5	100
11/20/06 - 11/26/06	168	14.0	20.1	17.2	100
11/27/06 - 12/03/06	168	0.0	18.4	7.4	59
12/04/06 - 12/10/06	168	0.0	6.2	2.1	5
12/11/06 - 12/17/06	168	3.7	8.7	6.7	91
12/18/06 - 12/24/06	168	4.7	11.3	8.2	98
12/25/06 - 12/31/06	168	4.1	7.1	5.3	58

TABLE A-2: WEEKLY DO SUMMARY STATISTICS AT FOSTER AVENUE ON THE NORTH SHORE CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	8.2	9.5	8.6	100
01/02/06 - 01/08/06	168	7.2	9.6	8.4	100
01/09/06 - 01/15/06	168	6.4	9.6	8.4	100
01/16/06 - 01/22/06	168	7.0	9.6	8.5	100
01/23/06 - 01/29/06	168	6.3	9.8	8.7	100
01/30/06 - 02/05/06	168	6.6	9.4	8.5	100
02/06/06 - 02/12/06	168	7.6	9.9	8.8	100
02/13/06 - 02/19/06	168	6.7	11.2	9.0	100
02/20/06 - 02/26/06	168	8.1	11.1	8.9	100
02/27/06 - 03/05/06	38	8.3	8.9	8.5	100
03/06/06 - 03/12/06	131	6.7	9.6	8.3	100
03/13/06 - 03/19/06	168	6.2	9.4	8.4	100
03/20/06 - 03/26/06	168	7.3	10.5	8.2	100
03/27/06 - 04/02/06	167	6.0	9.3	8.1	100
04/03/06 - 04/09/06	167	6.8	9.6	8.3	100
04/10/06 - 04/16/06	168	6.4	8.7	7.8	100
04/17/06 - 04/23/06	168	5.6	9.7	7.9	100
04/24/06 - 04/30/06	168	5.9	9.5	7.4	100
05/01/06 - 05/07/06	168	5.3	8.8	7.5	100
05/08/06 - 05/14/06	168	6.5	8.9	7.7	100
05/15/06 - 05/21/06	168	6.7	9.6	8.0	100
05/22/06 - 05/28/06	168	4.5	8.5	7.3	100
05/29/06 - 06/04/06	168	4.0	9.1	7.4	99
06/05/06 - 06/11/06	168	5.2	8.4	7.5	100
06/12/06 - 06/18/06	168	5.7	8.5	7.5	100
06/19/06 - 06/25/06	168	6.0	8.2	7.3	100
06/26/06 - 07/02/06	168	6.1	8.0	7.1	100
07/03/06 - 07/09/06	168	5.7	8.2	7.4	100
07/10/06 - 07/16/06	168	5.8	8.1	7.4	100
07/17/06 - 07/23/06	168	6.5	7.9	7.1	100
07/24/06 - 07/30/06	168	6.0	7.9	7.2	100
07/31/06 - 08/06/06	168	5.7	8.3	7.3	100
08/07/06 - 08/13/06	168	5.9	8.3	7.3	100

TABLE A-2 (Continued): WEEKLY DO SUMMARY STATISTICS AT FOSTER AVENUE ON THE NORTH SHORE CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	5.4	8.0	7.1	100
08/21/06 - 08/27/06	168	5.6	8.2	7.3	100
08/28/06 - 09/03/06	168	5.3	8.1	7.1	100
09/04/06 - 09/10/06	167	5.0	8.3	7.1	100
09/11/06 - 09/17/06	168	5.6	8.0	6.9	100
09/18/06 - 09/24/06	168	5.0	7.6	7.0	100
09/25/06 - 10/01/06	168	4.5	8.5	7.0	100
10/02/06 - 10/08/06	168	4.7	7.5	6.4	100
10/09/06 - 10/15/06	168	5.5	7.8	6.9	100
10/16/06 - 10/22/06	168	5.3	7.7	6.7	100
10/23/06 - 10/29/06	168	5.9	8.8	7.2	100
10/30/06 - 11/05/06	169	6.5	8.6	7.4	100
11/06/06 - 11/12/06	168	5.9	8.5	7.5	100
11/13/06 - 11/19/06	168	6.9	8.6	7.6	100
11/20/06 - 11/26/06	168	7.2	9.1	7.9	100
11/27/06 - 12/03/06	168	5.6	9.1	7.8	100
12/04/06 - 12/10/06	37	7.5	8.7	8.1	100
12/11/06 - 12/17/06	132	7.4	8.8	8.1	100
12/18/06 - 12/24/06	168	6.9	9.3	8.4	100
12/25/06 - 12/31/06	168	6.6	9.3	8.2	100

TABLE A-3: WEEKLY DO SUMMARY STATISTICS AT ADDISON STREET
ON THE NORTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	8.7	9.7	9.1	100
01/02/06 - 01/08/06	168	7.7	10.0	9.0	100
01/09/06 - 01/15/06	168	6.4	10.0	8.5	100
01/16/06 - 01/22/06	168	7.2	9.8	8.7	100
01/23/06 - 01/29/06	168	7.3	9.7	9.0	100
01/30/06 - 02/05/06	168	7.5	10.3	9.4	100
02/06/06 - 02/12/06	168	8.3	10.1	9.2	100
02/13/06 - 02/19/06	168	8.0	12.0	9.8	100
02/20/06 - 02/26/06	167	8.8	11.1	9.6	100
02/27/06 - 03/05/06	168	8.0	9.3	8.6	100
03/06/06 - 03/12/06	168	6.7	10.3	8.8	100
03/13/06 - 03/19/06	168	7.5	10.6	9.7	100
03/20/06 - 03/26/06	168	8.5	11.0	9.4	100
03/27/06 - 04/02/06	168	7.4	9.5	8.4	100
04/03/06 - 04/09/06	168	7.1	10.0	9.0	100
04/10/06 - 04/16/06	168	6.1	9.0	8.0	100
04/17/06 - 04/23/06	168	6.2	9.1	7.7	100
04/24/06 - 04/30/06	167	5.6	8.7	6.9	100
05/01/06 - 05/07/06	168	6.4	8.4	7.4	100
05/08/06 - 05/14/06	168	6.2	8.6	7.3	100
05/15/06 - 05/21/06	168	6.1	8.9	7.5	100
05/22/06 - 05/28/06	36	6.4	7.5	7.0	100
05/29/06 - 06/04/06	133	2.9	7.6	6.3	97
06/05/06 - 06/11/06	168	5.4	7.6	6.7	100
06/12/06 - 06/18/06	168	5.0	7.6	6.6	100
06/19/06 - 06/25/06	168	5.2	7.3	6.3	100
06/26/06 - 07/02/06	169	2.9	7.5	6.3	99
07/03/06 - 07/09/06	168	4.7	7.6	6.6	100
07/10/06 - 07/16/06	168	5.1	7.4	6.5	100
07/17/06 - 07/23/06	168	4.3	7.1	6.2	100
07/24/06 - 07/30/06	168	5.1	7.0	6.4	100
07/31/06 - 08/06/06	169	0.0	7.4	6.2	98
08/07/06 - 08/13/06	168	4.8	7.6	6.4	100

TABLE A-3 (Continued): WEEKLY DO SUMMARY STATISTICS AT ADDISON STREET ON THE NORTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	5.0	7.4	6.5	100
08/21/06 - 08/27/06	168	5.5	7.6	6.9	100
08/28/06 - 09/03/06	168	4.6	7.4	6.5	100
09/04/06 - 09/10/06	168	5.5	7.9	6.8	100
09/11/06 - 09/17/06	168	6.2	8.2	7.1	100
09/18/06 - 09/24/06	168	4.9	7.9	6.9	100
09/25/06 - 10/01/06	168	5.2	8.2	6.9	100
10/02/06 - 10/08/06	168	5.8	7.5	6.9	100
10/09/06 - 10/15/06	168	5.5	8.3	7.0	100
10/16/06 - 10/22/06	168	5.4	8.0	7.1	100
10/23/06 - 10/29/06	168	6.4	8.8	7.6	100
10/30/06 - 11/05/06	169	6.9	8.4	7.6	100
11/06/06 - 11/12/06	168	6.3	9.1	7.4	100
11/13/06 - 11/19/06	168	7.3	8.7	8.0	100
11/20/06 - 11/26/06	168	7.2	8.9	7.9	100
11/27/06 - 12/03/06	168	6.0	10.1	8.4	100
12/04/06 - 12/10/06	168	8.7	10.9	9.6	100
12/11/06 - 12/17/06	169	7.9	10.5	9.3	100
12/18/06 - 12/24/06	168	7.6	10.4	9.4	100
12/25/06 - 12/31/06	168	7.4	10.4	9.4	100

TABLE A-4: WEEKLY DO SUMMARY STATISTICS AT FULLERTON AVENUE ON THE NORTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	8.3	9.6	9.1	100
01/02/06 - 01/08/06	168	7.7	9.7	8.8	100
01/09/06 - 01/15/06	168	6.2	9.5	8.1	100
01/16/06 - 01/22/06	168	6.7	8.7	8.0	100
01/23/06 - 01/29/06	168	6.2	9.4	8.5	100
01/30/06 - 02/05/06	167	7.1	10.0	9.1	100
02/06/06 - 02/12/06	168	8.5	10.2	9.3	100
02/13/06 - 02/19/06	168	7.0	11.0	9.0	100
02/20/06 - 02/26/06	168	8.6	11.0	9.4	100
02/27/06 - 03/05/06	168	8.0	9.4	8.6	100
03/06/06 - 03/12/06	168	6.1	9.8	8.4	100
03/13/06 - 03/19/06	168	6.3	9.9	9.1	100
03/20/06 - 03/26/06	168	4.2	10.4	8.0	100
03/27/06 - 04/02/06	168	3.4	9.0	7.6	98
04/03/06 - 04/09/06	167	5.6	9.8	8.5	100
04/10/06 - 04/16/06	168	6.1	8.5	7.5	100
04/17/06 - 04/23/06	168	4.2	7.8	6.2	100
04/24/06 - 04/30/06	168	3.6	7.8	6.2	97
05/01/06 - 05/07/06	168	5.9	7.8	6.7	100
05/08/06 - 05/14/06	36	5.6	6.8	6.2	100
05/15/06 - 05/21/06	132	5.8	7.9	6.8	100
05/22/06 - 05/28/06	168	3.4	7.2	6.0	98
05/29/06 - 06/04/06	168	2.2	6.6	5.4	97
06/05/06 - 06/11/06	168	4.4	7.2	5.8	100
06/12/06 - 06/18/06	168	4.0	6.9	5.6	100
06/19/06 - 06/25/06	168	3.9	6.3	5.5	99
06/26/06 - 07/02/06	168	1.7	7.1	5.5	98
07/03/06 - 07/09/06	168	3.9	6.5	5.6	99
07/10/06 - 07/16/06	168	4.4	6.7	5.8	100
07/17/06 - 07/23/06	167	2.8	6.3	5.4	98
07/24/06 - 07/30/06	168	4.7	6.2	5.5	100
07/31/06 - 08/06/06	168	0.0	6.3	5.1	91
08/07/06 - 08/13/06	36	3.3	5.2	4.4	78

TABLE A-4 (Continued): WEEKLY DO SUMMARY STATISTICS AT FULLERTON AVENUE ON THE NORTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	132	4.7	6.3	5.6	100
08/21/06 - 08/27/06	168	4.8	7.3	6.2	100
08/28/06 - 09/03/06	168	3.0	6.8	5.8	98
09/04/06 - 09/10/06	167	5.0	7.0	6.0	100
09/11/06 - 09/17/06	168	3.4	7.2	6.0	99
09/18/06 - 09/24/06	168	3.7	7.5	6.0	98
09/25/06 - 10/01/06	168	4.7	7.5	6.5	100
10/02/06 - 10/08/06	168	4.9	7.5	6.5	100
10/09/06 - 10/15/06	168	5.4	7.8	6.7	100
10/16/06 - 10/22/06	168	4.9	7.3	6.5	100
10/23/06 - 10/29/06	168	6.1	8.1	7.3	100
10/30/06 - 11/05/06	169	6.4	7.9	7.2	100
11/06/06 - 11/12/06	168	5.7	8.7	7.0	100
11/13/06 - 11/19/06	168	7.0	8.2	7.6	100
11/20/06 - 11/26/06	168	6.7	8.3	7.4	100
11/27/06 - 12/03/06	168	4.9	9.8	8.0	100
12/04/06 - 12/10/06	168	8.4	10.1	9.3	100
12/11/06 - 12/17/06	169	7.4	9.8	8.8	100
12/18/06 - 12/24/06	168	7.3	10.1	8.9	100
12/25/06 - 12/31/06	168	7.5	10.1	9.1	100

TABLE A-5: WEEKLY DO SUMMARY STATISTICS AT KINZIE STREET
ON THE NORTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	6.6	8.4	7.6	100
01/02/06 - 01/08/06	168	6.9	9.2	8.4	100
01/09/06 - 01/15/06	167	6.6	8.7	7.7	100
01/16/06 - 01/22/06	168	6.6	9.0	8.0	100
01/23/06 - 01/29/06	168	6.6	9.6	8.4	100
01/30/06 - 02/05/06	168	6.0	9.3	8.3	100
02/06/06 - 02/12/06	168	8.1	9.5	9.0	100
02/13/06 - 02/19/06	168	7.7	11.7	9.3	100
02/20/06 - 02/26/06	168	8.6	11.4	9.6	100
02/27/06 - 03/05/06	168	7.9	9.1	8.5	100
03/06/06 - 03/12/06	168	6.5	9.6	8.3	100
03/13/06 - 03/19/06	168	6.7	9.9	9.1	100
03/20/06 - 03/26/06	168	7.1	10.0	8.6	100
03/27/06 - 04/02/06	168	6.3	7.9	7.2	100
04/03/06 - 04/09/06	167	5.3	10.0	8.0	100
04/10/06 - 04/16/06	168	6.6	9.1	7.9	100
04/17/06 - 04/23/06	168	4.1	9.2	7.0	100
04/24/06 - 04/30/06	168	2.9	8.6	6.6	86
05/01/06 - 05/07/06	168	5.6	8.0	6.6	100
05/08/06 - 05/14/06	168	5.3	7.3	6.3	100
05/15/06 - 05/21/06	168	5.5	7.3	6.5	100
05/22/06 - 05/28/06	168	4.9	7.2	6.0	100
05/29/06 - 06/04/06	168	4.0	6.5	5.5	100
06/05/06 - 06/11/06	168	4.5	6.9	5.9	100
06/12/06 - 06/18/06	168	4.3	6.8	5.7	100
06/19/06 - 06/25/06	168	4.4	6.1	5.5	100
06/26/06 - 07/02/06	168	3.7	6.7	5.6	98
07/03/06 - 07/09/06	168	3.8	6.6	5.7	99
07/10/06 - 07/16/06	168	3.7	6.7	5.8	99
07/17/06 - 07/23/06	168	1.3	6.6	5.3	92
07/24/06 - 07/30/06	168	4.6	6.2	5.5	100
07/31/06 - 08/06/06	168	0.8	6.8	4.9	82
08/07/06 - 08/13/06	168	3.9	6.6	5.5	99

TABLE A-5 (Continued): WEEKLY DO SUMMARY STATISTICS AT KINZIE STREET ON THE NORTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	4.2	6.3	5.5	100
08/21/06 - 08/27/06	168	4.5	6.9	5.7	100
08/28/06 - 09/03/06	168	2.2	6.2	4.8	84
09/04/06 - 09/10/06	168	4.4	7.0	6.1	100
09/11/06 - 09/17/06	168	4.3	7.1	5.9	100
09/18/06 - 09/24/06	168	3.2	7.2	5.5	93
09/25/06 - 10/01/06	168	4.7	7.5	6.3	100
10/02/06 - 10/08/06	168	4.7	7.1	6.0	100
10/09/06 - 10/15/06	168	4.6	8.2	6.4	100
10/16/06 - 10/22/06	168	5.4	7.8	6.4	100
10/23/06 - 10/29/06	168	5.3	7.5	6.5	100
10/30/06 - 11/05/06	169	5.9	7.5	6.6	100
11/06/06 - 11/12/06	168	5.6	7.9	6.6	100
11/13/06 - 11/19/06	168	6.9	7.8	7.4	100
11/20/06 - 11/26/06	168	6.6	8.3	7.3	100
11/27/06 - 12/03/06	167	4.8	9.8	7.7	100
12/04/06 - 12/10/06	168	8.2	10.8	9.2	100
12/11/06 - 12/17/06	168	7.3	9.2	8.4	100
12/18/06 - 12/24/06	168	7.2	9.9	8.3	100
12/25/06 - 12/31/06	168	7.5	9.8	8.7	100

TABLE A-6: WEEKLY DO SUMMARY STATISTICS AT CLARK STREET ON THE CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	9.5	10.1	9.8	100
01/02/06 - 01/08/06	168	8.5	10.1	9.3	100
01/09/06 - 01/15/06	168	7.9	10.0	8.9	100
01/16/06 - 01/22/06	168	8.1	10.2	9.5	100
01/23/06 - 01/29/06	168	8.1	11.0	9.9	100
01/30/06 - 02/05/06	168	7.1	10.4	9.0	100
02/06/06 - 02/12/06	168	9.5	11.7	10.6	100
02/13/06 - 02/19/06	168	9.5	11.6	10.4	100
02/20/06 - 02/26/06	168	10.5	12.8	11.5	100
02/27/06 - 03/05/06	168	10.8	12.6	11.6	100
03/06/06 - 03/12/06	168	8.2	12.1	10.3	100
03/13/06 - 03/19/06	168	7.3	10.1	9.0	100
03/20/06 - 03/26/06	168	8.9	10.3	9.6	100
03/27/06 - 04/02/06	168	8.7	9.8	9.3	100
04/03/06 - 04/09/06	167	6.7	10.5	9.2	100
04/10/06 - 04/16/06	168	7.8	10.0	9.0	100
04/17/06 - 04/23/06	168	6.9	9.9	8.6	100
04/24/06 - 04/30/06	168	6.5	9.5	8.4	100
05/01/06 - 05/07/06	168	6.5	9.5	8.1	100
05/08/06 - 05/14/06	168	7.1	10.0	8.9	100
05/15/06 - 05/21/06	168	7.8	9.5	8.4	100
05/22/06 - 05/28/06	168	6.9	10.5	9.0	100
05/29/06 - 06/04/06	168	7.5	10.7	9.3	100
06/05/06 - 06/11/06	168	6.8	10.5	9.3	100
06/12/06 - 06/18/06	168	7.1	8.7	8.2	100
06/19/06 - 06/25/06	168	7.8	9.4	8.7	100
06/26/06 - 07/02/06	35	8.1	8.9	8.5	100
07/03/06 - 07/09/06	109	7.7	8.7	8.3	100
07/10/06 - 07/16/06	168	7.9	9.3	8.6	100
07/17/06 - 07/23/06	168	7.0	8.7	7.8	100
07/24/06 - 07/30/06	35	6.9	7.6	7.4	100
07/31/06 - 08/06/06	134	8.4	10.8	9.6	100
08/07/06 - 08/13/06	167	7.6	9.4	8.3	100

TABLE A-6 (Continued): WEEKLY DO SUMMARY STATISTICS AT CLARK STREET ON THE CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	167	7.4	8.5	8.0	100
08/21/06 - 08/27/06	168	6.8	8.0	7.4	100
08/28/06 - 09/03/06	168	5.8	7.4	7.1	100
09/04/06 - 09/10/06	168	6.7	8.1	7.6	100
09/11/06 - 09/17/06	168	6.3	7.8	7.3	100
09/18/06 - 09/24/06	168	6.7	8.4	7.7	100
09/25/06 - 10/01/06	168	6.3	9.0	8.3	100
10/02/06 - 10/08/06	168	6.2	9.0	7.6	100
10/09/06 - 10/15/06	168	5.9	9.6	8.5	100
10/16/06 - 10/22/06	168	6.9	9.7	8.6	100
10/23/06 - 10/29/06	168	7.1	8.8	8.1	100
10/30/06 - 11/05/06	169	8.4	10.2	9.5	100
11/06/06 - 11/12/06	168	7.5	9.3	8.5	100
11/13/06 - 11/19/06	168	7.7	9.6	8.5	100
11/20/06 - 11/26/06	168	8.3	9.9	9.2	100
11/27/06 - 12/03/06	168	7.4	11.8	9.2	100
12/04/06 - 12/10/06	168	9.8	11.9	10.4	100
12/11/06 - 12/17/06	168	8.4	12.5	10.0	100
12/18/06 - 12/24/06	168	8.2	11.3	9.8	100
12/25/06 - 12/31/06	168	8.9	11.7	9.9	100

TABLE A-7: WEEKLY DO SUMMARY STATISTICS AT LOOMIS STREET
ON THE SOUTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	8.9	9.0	8.9	100
01/02/06 - 01/08/06	168	7.5	9.5	8.7	100
01/09/06 - 01/15/06	168	7.9	9.4	8.8	100
01/16/06 - 01/22/06	168	7.5	9.1	8.5	100
01/23/06 - 01/29/06	168	8.3	9.8	9.0	100
01/30/06 - 02/05/06	168	7.1	10.2	9.1	100
02/06/06 - 02/12/06	168	7.4	10.3	9.3	100
02/13/06 - 02/19/06	168	7.9	11.4	9.6	100
02/20/06 - 02/26/06	168	9.6	12.5	11.2	100
02/27/06 - 03/05/06	168	8.6	10.1	9.3	100
03/06/06 - 03/12/06	168	7.3	9.2	8.5	100
03/13/06 - 03/19/06	168	6.9	10.8	9.1	100
03/20/06 - 03/26/06	168	8.9	9.8	9.2	100
03/27/06 - 04/02/06	168	7.3	9.0	8.0	100
04/03/06 - 04/09/06	167	6.0	9.3	7.9	100
04/10/06 - 04/16/06	168	7.9	9.3	8.5	100
04/17/06 - 04/23/06	168	4.5	8.8	7.2	100
04/24/06 - 04/30/06	168	6.7	8.4	7.6	100
05/01/06 - 05/07/06	168	6.2	8.1	6.9	100
05/08/06 - 05/14/06	168	5.8	8.6	7.0	100
05/15/06 - 05/21/06	168	5.6	7.3	6.5	100
05/22/06 - 05/28/06	168	5.5	7.2	6.4	100
05/29/06 - 06/04/06	168	4.7	7.6	6.4	100
06/05/06 - 06/11/06	167	5.4	7.5	6.7	100
06/12/06 - 06/18/06	168	5.0	6.9	6.1	100
06/19/06 - 06/25/06	168	5.2	7.1	6.2	100
06/26/06 - 07/02/06	168	4.3	8.0	6.2	100
07/03/06 - 07/09/06	168	5.8	7.5	6.7	100
07/10/06 - 07/16/06	168	6.0	7.0	6.6	100
07/17/06 - 07/23/06	168	2.5	7.1	5.7	91
07/24/06 - 07/30/06	168	5.5	7.0	6.3	100
07/31/06 - 08/06/06	168	2.2	7.7	6.1	94
08/07/06 - 08/13/06	168	6.2	7.6	7.0	100

TABLE A-7 (Continued): WEEKLY DO SUMMARY STATISTICS AT LOOMIS STREET ON THE SOUTH BRANCH CHICAGO RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	5.5	7.5	6.7	100
08/21/06 - 08/27/06	168	5.6	7.0	6.4	100
08/28/06 - 09/03/06	168	4.2	8.5	6.2	100
09/04/06 - 09/10/06	168	6.3	7.7	7.0	100
09/11/06 - 09/17/06	168	4.0	8.0	6.7	99
09/18/06 - 09/24/06	168	5.7	8.4	7.1	100
09/25/06 - 10/01/06	168	6.4	10.4	7.7	100
10/02/06 - 10/08/06	168	4.5	8.2	6.8	100
10/09/06 - 10/15/06	168	5.8	8.9	7.0	100
10/16/06 - 10/22/06	168	6.3	8.9	7.3	100
10/23/06 - 10/29/06	168	5.7	7.5	6.7	100
10/30/06 - 11/05/06	169	5.7	8.0	7.3	100
11/06/06 - 11/12/06	168	5.9	8.6	7.2	100
11/13/06 - 11/19/06	168	5.5	8.0	7.3	100
11/20/06 - 11/26/06	168	7.4	8.7	7.9	100
11/27/06 - 12/03/06	168	4.3	9.5	7.5	100
12/04/06 - 12/10/06	167	8.0	9.9	9.0	100
12/11/06 - 12/17/06	168	8.0	10.2	9.0	100
12/18/06 - 12/24/06	168	7.5	9.9	8.5	100
12/25/06 - 12/31/06	168	8.6	9.9	9.4	100

TABLE A-8: WEEKLY DO SUMMARY STATISTICS AT 36TH STREET ON BUBBLY CREEK DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	7.8	8.6	8.1	100
01/02/06 - 01/08/06	168	7.2	8.9	8.0	100
01/09/06 - 01/15/06	168	7.5	9.3	8.6	100
01/16/06 - 01/22/06	168	7.6	9.0	8.1	100
01/23/06 - 01/29/06	168	7.7	10.6	9.3	100
01/30/06 - 02/05/06	168	8.4	10.2	9.1	100
02/06/06 - 02/12/06	168	9.0	14.0	11.7	100
02/13/06 - 02/19/06	168	0.1	15.6	8.5	66
02/20/06 - 02/26/06	168	0.0	1.3	0.3	0
02/27/06 - 03/05/06	168	0.9	11.9	5.3	63
03/06/06 - 03/12/06	168	6.1	12.8	9.2	100
03/13/06 - 03/19/06	168	0.2	9.4	1.5	11
03/20/06 - 03/26/06	168	0.2	3.5	1.9	0
03/27/06 - 04/02/06	168	1.9	12.6	7.0	76
04/03/06 - 04/09/06	167	0.6	7.5	3.6	45
04/10/06 - 04/16/06	168	0.4	6.8	3.1	30
04/17/06 - 04/23/06	58	0.5	5.6	1.7	9
04/24/06 - 04/30/06	110	0.0	5.2	2.2	4
05/01/06 - 05/07/06	168	0.0	3.4	0.9	0
05/08/06 - 05/14/06	168	0.0	3.8	1.2	0
05/15/06 - 05/21/06	168	0.5	6.3	2.4	18
05/22/06 - 05/28/06	127	2.3	6.0	4.3	75
05/29/06 - 06/04/06	168	0.7	6.1	2.4	14
06/05/06 - 06/11/06	168	1.4	13.1	5.7	75
06/12/06 - 06/18/06	168	0.0	3.8	1.1	0
06/19/06 - 06/25/06	168	0.0	4.7	1.9	5
06/26/06 - 07/02/06	168	0.3	5.4	1.8	3
07/03/06 - 07/09/06	82	1.1	12.4	5.4	54
07/10/06 - 07/16/06	111	0.4	6.4	3.0	32
07/17/06 - 07/23/06	168	0.1	6.1	1.6	13
07/24/06 - 07/30/06	168	0.0	3.7	1.1	0
07/31/06 - 08/06/06	168	0.0	6.3	1.6	10
08/07/06 - 08/13/06	168	0.0	6.8	2.1	11

TABLE A-8 (Continued): WEEKLY DO SUMMARY STATISTICS AT 36TH STREET ON BUBBLY CREEK DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	0.3	3.5	1.7	0
08/21/06 - 08/27/06	168	0.7	3.6	1.8	0
08/28/06 - 09/03/06	168	0.0	3.8	0.8	0
09/04/06 - 09/10/06	168	0.7	4.4	2.0	3
09/11/06 - 09/17/06	168	0.0	8.4	1.8	9
09/18/06 - 09/24/06	168	0.0	3.8	1.9	0
09/25/06 - 10/01/06	168	0.7	3.5	2.3	0
10/02/06 - 10/08/06	168	0.0	7.3	1.2	8
10/09/06 - 10/15/06	168	0.1	9.6	3.4	39
10/16/06 - 10/22/06	168	0.0	10.7	1.9	22
10/23/06 - 10/29/06	168	0.0	2.7	0.8	0
10/30/06 - 11/05/06	169	0.0	4.3	2.0	6
11/06/06 - 11/12/06	168	0.0	7.0	2.7	11
11/13/06 - 11/19/06	168	0.0	1.7	0.4	0
11/20/06 - 11/26/06	168	0.0	1.6	0.3	0
11/27/06 - 12/03/06	168	0.1	9.2	1.4	17
12/04/06 - 12/10/06	168	0.0	3.7	0.9	0
12/11/06 - 12/17/06	168	0.0	1.2	0.5	0
12/18/06 - 12/24/06	168	0.1	9.0	2.0	16
12/25/06 - 12/31/06	168	0.0	0.1	0.0	0

TABLE A-9: WEEKLY DO SUMMARY STATISTICS AT INTERSTATE HIGHWAY 55 ON BUBBLY CREEK DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	8.5	9.0	8.8	100
01/02/06 - 01/08/06	168	7.6	9.1	8.4	100
01/09/06 - 01/15/06	168	8.1	9.4	8.7	100
01/16/06 - 01/22/06	168	7.3	8.9	8.0	100
01/23/06 - 01/29/06	168	8.0	9.1	8.3	100
01/30/06 - 02/05/06	168	7.2	9.2	8.4	100
02/06/06 - 02/12/06	168	8.7	10.3	9.4	100
02/13/06 - 02/19/06	168	2.5	12.0	8.0	92
02/20/06 - 02/26/06	169	5.0	10.5	8.0	100
02/27/06 - 03/05/06	168	8.8	10.3	9.5	100
03/06/06 - 03/12/06	168	5.0	9.3	7.6	100
03/13/06 - 03/19/06	168	3.0	8.3	5.6	92
03/20/06 - 03/26/06	168	4.3	8.6	6.6	100
03/27/06 - 04/02/06	168	4.2	7.1	5.9	100
04/03/06 - 04/09/06	167	0.1	9.1	4.7	70
04/10/06 - 04/16/06	83	0.2	8.0	2.9	41
04/17/06 - 04/23/06			NO DATA		
04/24/06 - 04/30/06	79	4.9	9.0	6.9	100
05/01/06 - 05/07/06	168	3.5	8.0	5.3	95
05/08/06 - 05/14/06	132	3.3	8.1	5.5	95
05/15/06 - 05/21/06	168	2.7	7.3	5.5	93
05/22/06 - 05/28/06	168	3.8	7.4	6.0	98
05/29/06 - 06/04/06	168	3.0	6.5	4.8	90
06/05/06 - 06/11/06	168	3.2	8.9	5.8	90
06/12/06 - 06/18/06	168	1.3	6.0	3.8	43
06/19/06 - 06/25/06	82	1.7	4.8	3.1	13
06/26/06 - 07/02/06	86	4.3	7.6	6.0	100
07/03/06 - 07/09/06	168	4.1	9.4	6.2	100
07/10/06 - 07/16/06	168	4.4	7.2	5.5	100
07/17/06 - 07/23/06	168	0.1	6.4	3.4	46
07/24/06 - 07/30/06	167	0.4	6.8	3.6	49
07/31/06 - 08/06/06	168	0.0	7.9	2.6	42
08/07/06 - 08/13/06	168	0.0	4.1	1.5	1

TABLE A-9 (Continued): WEEKLY DO SUMMARY STATISTICS AT INTERSTATE HIGHWAY 55 ON BUBBLY CREEK DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	0.2	6.2	3.7	52
08/21/06 - 08/27/06	168	2.6	5.7	4.5	79
08/28/06 - 09/03/06	168	0.1	6.2	3.8	45
09/04/06 - 09/10/06	168	3.5	7.0	5.3	92
09/11/06 - 09/17/06	168	0.2	7.2	4.0	60
09/18/06 - 09/24/06	168	1.9	7.3	4.9	74
09/25/06 - 10/01/06	168	2.8	8.0	5.5	78
10/02/06 - 10/08/06	168	0.0	7.5	3.1	38
10/09/06 - 10/15/06	168	0.1	7.8	3.6	39
10/16/06 - 10/22/06	168	0.0	7.6	4.0	55
10/23/06 - 10/29/06	168	0.0	5.9	3.3	47
10/30/06 - 11/05/06	169	0.1	7.3	4.9	77
11/06/06 - 11/12/06	168	1.9	7.0	6.0	97
11/13/06 - 11/19/06	168	2.1	6.8	5.1	79
11/20/06 - 11/26/06	168	5.2	7.6	6.3	100
11/27/06 - 12/03/06	167	0.0	7.4	3.3	49
12/04/06 - 12/10/06	168	3.5	8.7	5.5	88
12/11/06 - 12/17/06	168	2.8	9.2	6.0	90
12/18/06 - 12/24/06	168	0.4	8.0	5.1	74
12/25/06 - 12/31/06	168	0.4	4.9	2.3	10

TABLE A-10: WEEKLY DO SUMMARY STATISTICS AT CICERO AVENUE ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	7.9	8.3	8.1	100
01/02/06 - 01/08/06	168	6.3	8.3	7.3	100
01/09/06 - 01/15/06	168	6.4	7.9	7.2	100
01/16/06 - 01/22/06	168	5.7	7.5	6.7	100
01/23/06 - 01/29/06	168	6.9	8.9	7.6	100
01/30/06 - 02/05/06	168	6.3	8.9	7.8	100
02/06/06 - 02/12/06	168	7.6	8.8	8.2	100
02/13/06 - 02/19/06	168	8.0	9.4	8.7	100
02/20/06 - 02/26/06	168	7.6	10.8	9.5	100
02/27/06 - 03/05/06	168	7.3	10.1	8.6	100
03/06/06 - 03/12/06	168	6.1	8.2	7.5	100
03/13/06 - 03/19/06	168	5.1	8.8	7.7	100
03/20/06 - 03/26/06	168	6.1	8.3	7.3	100
03/27/06 - 04/02/06	168	5.3	7.8	6.4	100
04/03/06 - 04/09/06	167	5.1	8.1	6.9	100
04/10/06 - 04/16/06	168	6.5	10.0	7.9	100
04/17/06 - 04/23/06	168	0.0	8.4	5.1	83
04/24/06 - 04/30/06	168	3.7	9.2	5.4	99
05/01/06 - 05/07/06	168	3.5	7.2	5.2	98
05/08/06 - 05/14/06	168	4.9	8.3	6.0	100
05/15/06 - 05/21/06	168	5.2	7.3	5.9	100
05/22/06 - 05/28/06	168	4.3	10.1	6.0	100
05/29/06 - 06/04/06	169	4.2	6.9	5.1	100
06/05/06 - 06/11/06	167	4.0	8.7	6.4	99
06/12/06 - 06/18/06	168	3.3	6.5	4.6	81
06/19/06 - 06/25/06	168	2.8	5.8	4.3	72
06/26/06 - 07/02/06	168	1.2	6.8	4.9	82
07/03/06 - 07/09/06	168	3.8	7.3	5.9	98
07/10/06 - 07/16/06	168	4.7	7.0	5.5	100
07/17/06 - 07/23/06	81	4.6	6.2	5.3	100
07/24/06 - 07/30/06	86	5.5	8.3	7.1	100
07/31/06 - 08/06/06	168	0.7	8.8	5.7	79
08/07/06 - 08/13/06	168	4.7	8.5	7.4	100

TABLE A-10 (Continued): WEEKLY DO SUMMARY STATISTICS AT CICERO AVENUE ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	4.9	8.4	6.6	100
08/21/06 - 08/27/06	168	3.7	6.1	5.1	99
08/28/06 - 09/03/06	168	2.5	6.0	5.1	92
09/04/06 - 09/10/06	168	5.1	7.4	6.3	100
09/11/06 - 09/17/06	168	2.0	7.3	5.1	84
09/18/06 - 09/24/06	168	5.4	6.8	6.1	100
09/25/06 - 10/01/06	168	5.2	7.8	6.5	100
10/02/06 - 10/08/06	168	1.8	7.9	5.4	90
10/09/06 - 10/15/06	168	4.3	6.6	5.6	100
10/16/06 - 10/22/06	168	2.6	7.7	5.1	85
10/23/06 - 10/29/06	168	4.2	6.3	5.0	100
10/30/06 - 11/05/06	169	3.6	6.1	5.0	93
11/06/06 - 11/12/06	168	0.6	6.2	4.5	81
11/13/06 - 11/19/06	168	2.9	5.3	4.4	70
11/20/06 - 11/26/06	168	4.1	5.9	4.7	100
11/27/06 - 12/03/06	168	0.1	8.4	5.5	94
12/04/06 - 12/10/06	168	5.7	8.6	7.1	100
12/11/06 - 12/17/06	168	6.6	8.9	7.3	100
12/18/06 - 12/24/06	168	5.8	8.1	6.8	100
12/25/06 - 12/31/06	168	4.9	8.3	6.8	100

TABLE A-11: WEEKLY DO SUMMARY STATISTICS AT B&O CENTRAL RAILROAD ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	7.1	8.7	8.2	100
01/02/06 - 01/08/06	168	7.1	8.6	8.0	100
01/09/06 - 01/15/06	168	6.4	9.1	7.5	100
01/16/06 - 01/22/06	168	6.5	9.9	8.0	100
01/23/06 - 01/29/06	168	7.6	9.4	8.6	100
01/30/06 - 02/05/06	168	6.9	10.0	8.5	100
02/06/06 - 02/12/06	168	7.6	8.6	8.1	100
02/13/06 - 02/19/06	167	7.1	9.7	8.7	100
02/20/06 - 02/26/06	168	7.9	10.1	8.8	100
02/27/06 - 03/05/06	168	7.7	9.6	8.6	100
03/06/06 - 03/12/06	168	7.1	8.9	8.2	100
03/13/06 - 03/19/06	168	6.9	9.5	8.4	100
03/20/06 - 03/26/06	168	7.5	9.1	8.3	100
03/27/06 - 04/02/06	168	6.9	9.0	7.8	100
04/03/06 - 04/09/06	167	5.9	9.3	8.0	100
04/10/06 - 04/16/06	168	7.0	8.8	8.1	100
04/17/06 - 04/23/06	168	4.9	9.1	7.4	100
04/24/06 - 04/30/06	167	5.8	7.8	7.2	100
05/01/06 - 05/07/06	168	5.1	7.2	6.4	100
05/08/06 - 05/14/06	168	5.1	7.3	6.3	100
05/15/06 - 05/21/06	168	5.5	7.5	6.4	100
05/22/06 - 05/28/06	168	4.8	8.1	6.5	100
05/29/06 - 06/04/06	168	5.0	6.5	5.8	100
06/05/06 - 06/11/06	168	5.1	8.0	6.2	100
06/12/06 - 06/18/06	168	4.6	6.8	5.7	100
06/19/06 - 06/25/06	168	3.8	6.3	5.0	97
06/26/06 - 07/02/06	168	4.4	6.6	5.6	100
07/03/06 - 07/09/06	168	5.2	8.5	6.1	100
07/10/06 - 07/16/06	168	3.5	6.9	5.6	99
07/17/06 - 07/23/06	168	2.3	6.5	5.0	92
07/24/06 - 07/30/06	168	4.3	6.4	5.4	100
07/31/06 - 08/06/06	168	1.3	7.5	4.7	61
08/07/06 - 08/13/06	168	2.4	5.8	4.7	90

TABLE A-11 (Continued): WEEKLY DO SUMMARY STATISTICS AT B&O CENTRAL RAILROAD ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	3.0	6.0	4.9	89
08/21/06 - 08/27/06	167	4.3	6.2	5.3	100
08/28/06 - 09/03/06	168	4.1	6.6	5.5	100
09/04/06 - 09/10/06	168	4.9	6.8	6.1	100
09/11/06 - 09/17/06	168	3.7	7.0	5.9	98
09/18/06 - 09/24/06	168	5.5	7.4	6.4	100
09/25/06 - 10/01/06	168	5.7	7.3	6.5	100
10/02/06 - 10/08/06	168	2.9	7.3	5.9	90
10/09/06 - 10/15/06	168	3.5	7.3	6.2	98
10/16/06 - 10/22/06	168	4.6	8.0	6.4	100
10/23/06 - 10/29/06	168	5.1	7.9	6.6	100
10/30/06 - 11/05/06	169	5.6	7.3	6.7	100
11/06/06 - 11/12/06	168	4.6	8.3	6.1	100
11/13/06 - 11/19/06	168	5.6	7.7	6.4	100
11/20/06 - 11/26/06	168	4.7	7.2	6.3	100
11/27/06 - 12/03/06	168	2.3	9.1	6.9	98
12/04/06 - 12/10/06	168	7.6	9.5	8.5	100
12/11/06 - 12/17/06	167	7.0	9.4	8.1	100
12/18/06 - 12/24/06	168	6.2	8.6	7.8	100
12/25/06 - 12/31/06	168	7.4	9.6	8.7	100

TABLE A-12: WEEKLY DO SUMMARY STATISTICS AT ROUTE 83
ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	5.9	7.0	6.6	100
01/02/06 - 01/08/06	168	5.4	7.6	7.0	100
01/09/06 - 01/15/06	168	3.9	6.7	5.6	99
01/16/06 - 01/22/06	168	3.6	7.4	6.0	99
01/23/06 - 01/29/06	168	4.8	7.9	7.1	100
01/30/06 - 02/05/06	168	5.8	8.6	7.3	100
02/06/06 - 02/12/06	168	6.4	8.0	7.3	100
02/13/06 - 02/19/06	168	6.0	8.5	7.6	100
02/20/06 - 02/26/06	168	6.7	9.0	7.8	100
02/27/06 - 03/05/06	168	6.9	8.3	7.5	100
03/06/06 - 03/12/06	168	6.0	8.0	7.2	100
03/13/06 - 03/19/06	59	5.8	8.6	6.9	100
03/20/06 - 03/26/06			NO DATA		
03/27/06 - 04/02/06	107	5.5	7.2	6.4	100
04/03/06 - 04/09/06	167	5.3	8.0	6.6	100
04/10/06 - 04/16/06	168	5.1	7.3	6.4	100
04/17/06 - 04/23/06	168	3.6	7.7	6.0	95
04/24/06 - 04/30/06	168	5.3	7.3	6.2	100
05/01/06 - 05/07/06	168	3.3	5.6	4.7	85
05/08/06 - 05/14/06	168	3.2	5.8	4.4	81
05/15/06 - 05/21/06	168	3.7	5.9	5.1	99
05/22/06 - 05/28/06	168	3.3	6.5	4.9	85
05/29/06 - 06/04/06	168	2.8	6.2	4.5	79
06/05/06 - 06/11/06	168	2.9	6.2	4.8	80
06/12/06 - 06/18/06	168	0.6	6.2	4.2	59
06/19/06 - 06/25/06	168	2.0	5.0	3.6	17
06/26/06 - 07/02/06	115	2.8	5.5	4.4	81
07/03/06 - 07/09/06	82	1.8	5.1	4.0	55
07/10/06 - 07/16/06	110	2.5	6.7	5.0	96
07/17/06 - 07/23/06	58	3.5	6.4	5.4	91
07/24/06 - 07/30/06	107	3.5	5.0	4.1	51
07/31/06 - 08/06/06	167	0.0	6.2	3.1	43
08/07/06 - 08/13/06	168	1.4	5.2	3.6	48

TABLE A-12 (Continued): WEEKLY DO SUMMARY STATISTICS AT ROUTE 83 ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	2.0	4.8	3.6	31
08/21/06 - 08/27/06	168	3.0	4.9	3.9	40
08/28/06 - 09/03/06	168	0.4	5.3	4.1	60
09/04/06 - 09/10/06	58	4.1	5.1	4.7	100
09/11/06 - 09/17/06	98	2.8	6.0	4.6	78
09/18/06 - 09/24/06	168	4.0	5.8	5.0	100
09/25/06 - 10/01/06	58	4.4	6.2	5.5	100
10/02/06 - 10/08/06			NO DATA		
10/09/06 - 10/15/06			NO DATA		
10/16/06 - 10/22/06	86	3.7	6.5	5.1	90
10/23/06 - 10/29/06	168	3.1	6.2	5.2	93
10/30/06 - 11/05/06	169	5.2	6.5	6.1	100
11/06/06 - 11/12/06	58	4.5	6.3	5.2	100
11/13/06 - 11/19/06	110	5.0	6.7	6.0	100
11/20/06 - 11/26/06	168	4.1	6.0	5.4	100
11/27/06 - 12/03/06	168	0.6	7.0	5.0	89
12/04/06 - 12/10/06	167	6.5	8.7	7.7	100
12/11/06 - 12/17/06	168	6.3	8.2	7.2	100
12/18/06 - 12/24/06	59	6.3	7.2	6.6	100

TABLE A-13: WEEKLY DO SUMMARY STATISTICS AT LOCKPORT POWERHOUSE ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	6.5	7.4	6.9	100
01/02/06 - 01/08/06	167	6.1	7.2	6.8	100
01/09/06 - 01/15/06	168	5.7	7.2	6.6	100
01/16/06 - 01/22/06	168	5.5	7.6	6.6	100
01/23/06 - 01/29/06	168	6.2	8.0	7.1	100
01/30/06 - 02/05/06	168	6.7	8.1	7.6	100
02/06/06 - 02/12/06	168	6.1	8.0	7.1	100
02/13/06 - 02/19/06	168	6.6	8.5	7.7	100
02/20/06 - 02/26/06	168	7.3	9.0	8.3	100
02/27/06 - 03/05/06	168	6.3	8.6	7.5	100
03/06/06 - 03/12/06	168	6.8	8.6	7.4	100
03/13/06 - 03/19/06	168	6.6	8.3	7.3	100
03/20/06 - 03/26/06	168	6.8	7.7	7.3	100
03/27/06 - 04/02/06	168	5.8	7.2	6.6	100
04/03/06 - 04/09/06	167	6.0	7.3	6.6	100
04/10/06 - 04/16/06	167	5.6	6.6	6.2	100
04/17/06 - 04/23/06	168	4.5	6.6	5.8	100
04/24/06 - 04/30/06	168	1.7	6.4	5.3	91
05/01/06 - 05/07/06	168	3.2	5.2	4.3	72
05/08/06 - 05/14/06	83	3.3	4.6	4.0	57
05/15/06 - 05/21/06	85	3.9	5.7	4.8	99
05/22/06 - 05/28/06	168	3.4	5.2	4.3	78
05/29/06 - 06/04/06	167	2.7	5.7	3.7	32
06/05/06 - 06/11/06	168	3.0	5.1	4.0	47
06/12/06 - 06/18/06	168	3.2	4.7	4.1	57
06/19/06 - 06/25/06	168	2.4	3.9	3.2	0
06/26/06 - 07/02/06	168	3.1	4.8	4.0	40
07/03/06 - 07/09/06	168	1.9	6.4	4.2	46
07/10/06 - 07/16/06	168	2.4	5.2	3.8	48
07/17/06 - 07/23/06	168	1.9	4.8	3.1	8
07/24/06 - 07/30/06	168	2.6	7.1	4.1	42
07/31/06 - 08/06/06	168	0.3	5.9	3.2	39
08/07/06 - 08/13/06	168	0.5	5.5	3.3	41

TABLE A-13 (Continued): WEEKLY DO SUMMARY STATISTICS AT LOCKPORT POWERHOUSE ON THE CHICAGO SANITARY AND SHIP CANAL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	3.6	5.5	4.4	88
08/21/06 - 08/27/06	167	3.1	4.5	3.7	17
08/28/06 - 09/03/06	78	3.1	4.5	3.8	35
09/04/06 - 09/10/06	85	5.0	5.8	5.3	100
09/11/06 - 09/17/06	168	3.5	5.9	4.9	82
09/18/06 - 09/24/06	168	4.6	5.5	5.2	100
09/25/06 - 10/01/06	169	4.7	6.0	5.4	100
10/02/06 - 10/08/06	168	1.6	6.1	4.2	57
10/09/06 - 10/15/06	168	5.1	6.0	5.5	100
10/16/06 - 10/22/06	168	4.8	6.6	5.8	100
10/23/06 - 10/29/06	168	4.6	6.5	5.7	100
10/30/06 - 11/05/06	169	4.7	6.5	6.0	100
11/06/06 - 11/12/06	168	4.1	6.5	5.7	100
11/13/06 - 11/19/06	168	3.2	6.5	5.1	87
11/20/06 - 11/26/06	168	5.1	6.3	5.7	100
11/27/06 - 12/03/06	168	3.8	7.0	5.5	99
12/04/06 - 12/10/06	168	7.1	8.9	8.3	100
12/11/06 - 12/17/06	168	7.0	8.7	7.7	100
12/18/06 - 12/24/06	168	6.1	7.4	6.7	100
12/25/06 - 12/31/06	168	6.7	8.4	7.7	100

TABLE A-14: WEEKLY DO SUMMARY STATISTICS AT JEFFERSON STREET ON THE DES PLAINES RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	9.5	10.4	9.9	100
01/02/06 - 01/08/06	168	7.8	10.1	8.8	100
01/09/06 - 01/15/06	167	6.7	10.2	8.5	100
01/16/06 - 01/22/06	168	6.9	12.7	9.7	100
01/23/06 - 01/29/06	168	7.7	11.7	9.4	100
01/30/06 - 02/05/06	168	8.3	11.5	9.4	100
02/06/06 - 02/12/06	168	8.2	10.8	9.5	100
02/13/06 - 02/19/06	168	7.8	10.5	9.1	100
02/20/06 - 02/26/06	168	8.9	10.7	9.9	100
02/27/06 - 03/05/06	168	7.5	10.3	8.6	100
03/06/06 - 03/12/06	168	7.4	9.1	8.2	100
03/13/06 - 03/19/06	168	7.7	10.9	9.4	100
03/20/06 - 03/26/06	168	8.7	11.2	9.7	100
03/27/06 - 04/02/06	168	7.1	11.2	8.6	100
04/03/06 - 04/09/06	167	6.7	10.4	8.1	100
04/10/06 - 04/16/06	168	6.1	10.1	8.0	100
04/17/06 - 04/23/06	168	5.2	9.8	7.0	100
04/24/06 - 04/30/06	167	5.0	9.9	7.0	100
05/01/06 - 05/07/06	168	4.9	8.1	6.2	100
05/08/06 - 05/14/06	168	3.9	7.8	5.5	99
05/15/06 - 05/21/06	168	5.0	8.4	6.5	100
05/22/06 - 05/28/06	168	4.2	8.9	6.0	100
05/29/06 - 06/04/06	167	3.5	6.1	4.5	77
06/05/06 - 06/11/06	168	3.8	7.1	5.0	95
06/12/06 - 06/18/06	168	3.7	6.9	5.2	99
06/19/06 - 06/25/06	168	2.7	6.0	4.2	58
06/26/06 - 07/02/06	168	3.7	6.6	5.0	96
07/03/06 - 07/09/06	168	3.3	7.1	5.3	89
07/10/06 - 07/16/06	168	3.6	6.3	4.6	79
07/17/06 - 07/23/06	168	2.6	6.6	4.4	66
07/24/06 - 07/30/06	168	3.4	7.4	4.7	76
07/31/06 - 08/06/06	168	2.4	6.0	4.2	50
08/07/06 - 08/13/06	168	2.7	6.7	4.3	61

TABLE A-14 (Continued): WEEKLY DO SUMMARY STATISTICS AT JEFFERSON STREET ON THE DES PLAINES RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	83	3.9	5.7	4.6	88
08/21/06 - 08/27/06	85	4.0	6.7	5.2	99
08/28/06 - 09/03/06	168	3.8	7.3	5.7	98
09/04/06 - 09/10/06	168	4.6	6.8	5.6	100
09/11/06 - 09/17/06	168	4.2	7.9	6.7	100
09/18/06 - 09/24/06	168	5.2	8.8	6.9	100
09/25/06 - 10/01/06	168	5.8	8.5	6.8	100
10/02/06 - 10/08/06	168	4.5	8.7	6.2	100
10/09/06 - 10/15/06	168	5.7	8.4	6.9	100
10/16/06 - 10/22/06	168	6.1	9.2	7.3	100
10/23/06 - 10/29/06	168	6.5	9.0	7.5	100
10/30/06 - 11/05/06	169	6.5	9.4	8.1	100
11/06/06 - 11/12/06	168	6.7	10.9	8.4	100
11/13/06 - 11/19/06	168	5.9	9.5	7.7	100
11/20/06 - 11/26/06	168	7.2	11.2	8.3	100
11/27/06 - 12/03/06	168	6.9	10.7	8.7	100
12/04/06 - 12/10/06	168	8.9	11.7	10.6	100
12/11/06 - 12/17/06	168	9.8	12.1	11.2	100
12/18/06 - 12/24/06	168	8.4	12.8	10.4	100
12/25/06 - 12/31/06	168	8.6	11.7	9.9	100

TABLE A-15: WEEKLY DO SUMMARY STATISTICS AT TORRENCE AVENUE ON THE GRAND CALUMET RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	9.3	11.8	11.2	100
01/02/06 - 01/08/06	167	7.2	14.0	12.0	100
01/09/06 - 01/15/06	168	7.9	13.6	11.8	100
01/16/06 - 01/22/06	168	9.6	23.9	13.3	100
01/23/06 - 01/29/06	168	12.4	23.0	14.8	100
01/30/06 - 02/05/06	168	12.2	21.5	15.5	100
02/06/06 - 02/12/06	167	14.4	30.2	18.2	100
02/13/06 - 02/19/06	168	8.3	24.2	16.5	100
02/20/06 - 02/26/06	168	15.1	28.7	18.3	100
02/27/06 - 03/05/06	168	13.8	22.7	16.9	100
03/06/06 - 03/12/06	58	14.6	26.3	18.4	100
03/13/06 - 03/19/06	109	8.2	15.4	11.6	100
03/20/06 - 03/26/06	168	8.7	15.1	12.4	100
03/27/06 - 04/02/06	168	5.1	13.5	9.7	100
04/03/06 - 04/09/06	167	2.8	11.0	7.9	95
04/10/06 - 04/16/06	168	2.0	10.2	5.9	79
04/17/06 - 04/23/06	168	0.1	7.1	2.7	23
04/24/06 - 04/30/06	168	1.7	12.1	5.9	79
05/01/06 - 05/07/06	168	1.2	7.8	3.6	29
05/08/06 - 05/14/06	168	1.1	8.1	4.1	50
05/15/06 - 05/21/06	168	2.3	6.4	3.5	23
05/22/06 - 05/28/06	168	0.1	6.1	2.9	20
05/29/06 - 06/04/06	168	0.3	17.1	5.4	52
06/05/06 - 06/11/06	168	0.5	18.4	6.2	70
06/12/06 - 06/18/06	168	1.8	11.8	5.2	61
06/19/06 - 06/25/06	168	2.0	11.3	5.7	64
06/26/06 - 07/02/06	168	3.2	12.4	6.2	77
07/03/06 - 07/09/06	83	0.0	11.0	3.4	30
07/10/06 - 07/16/06	110	1.9	10.6	3.9	35
07/17/06 - 07/23/06	168	0.0	16.4	4.4	39
07/24/06 - 07/30/06	168	0.0	16.0	5.3	55
07/31/06 - 08/06/06	168	0.0	15.0	2.5	23
08/07/06 - 08/13/06	168	0.0	10.6	3.8	44

TABLE A-15 (Continued): WEEKLY DO SUMMARY STATISTICS AT TORRENCE AVENUE ON THE GRAND CALUMET RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	59	0.3	7.6	3.6	44
08/21/06 - 08/27/06	110	3.4	13.1	6.7	92
08/28/06 - 09/03/06	168	0.4	6.8	2.5	14
09/04/06 - 09/10/06	168	1.6	8.4	4.2	50
09/11/06 - 09/17/06	167	0.0	7.3	2.3	20
09/18/06 - 09/24/06	168	1.0	7.7	5.1	85
09/25/06 - 10/01/06	165	1.9	8.4	6.1	87
10/02/06 - 10/08/06	168	0.0	7.4	4.4	65
10/09/06 - 10/15/06	168	2.9	9.4	7.1	94
10/16/06 - 10/22/06	168	1.9	9.2	6.6	88
10/23/06 - 10/29/06	168	8.5	12.4	9.9	100
10/30/06 - 11/05/06	169	9.1	18.1	11.2	100
11/06/06 - 11/12/06	168	0.8	21.9	12.1	95
11/13/06 - 11/19/06	168	3.8	21.2	11.8	98
11/20/06 - 11/26/06	168	10.9	22.6	14.0	100
11/27/06 - 12/03/06	168	3.7	18.5	8.8	98
12/04/06 - 12/10/06	168	5.6	10.1	8.3	100
12/11/06 - 12/17/06	168	5.0	11.2	9.0	100
12/18/06 - 12/24/06	168	2.6	11.2	7.6	88
12/25/06 - 12/31/06	168	4.9	10.5	8.2	100

TABLE A-16: WEEKLY DO SUMMARY STATISTICS AT C&W INDIANA RAILROAD ON THE LITTLE CALUMET RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	11.5	12.2	11.8	100
01/02/06 - 01/08/06	168	11.5	13.5	12.6	100
01/09/06 - 01/15/06	168	11.9	13.6	12.8	100
01/16/06 - 01/22/06	168	11.4	13.2	12.6	100
01/23/06 - 01/29/06	168	11.2	13.2	12.6	100
01/30/06 - 02/05/06	168	11.7	12.8	12.3	100
02/06/06 - 02/12/06	168	12.4	13.4	12.9	100
02/13/06 - 02/19/06	168	13.3	17.6	15.0	100
02/20/06 - 02/26/06	168	15.6	20.3	17.6	100
02/27/06 - 03/05/06	168	18.1	21.9	20.4	100
03/06/06 - 03/12/06	168	16.1	21.1	18.9	100
03/13/06 - 03/19/06	168	12.1	16.2	13.9	100
03/20/06 - 03/26/06	168	13.2	16.2	14.9	100
03/27/06 - 04/02/06	168	9.5	16.1	13.0	100
04/03/06 - 04/09/06	167	8.1	10.4	9.1	100
04/10/06 - 04/16/06	168	6.7	9.0	7.9	100
04/17/06 - 04/23/06	168	6.3	9.9	8.0	100
04/24/06 - 04/30/06	167	7.4	11.2	8.9	100
05/01/06 - 05/07/06	168	5.5	9.8	7.3	100
05/08/06 - 05/14/06	168	5.6	10.7	7.9	100
05/15/06 - 05/21/06	168	5.2	8.5	6.8	100
05/22/06 - 05/28/06	168	4.0	10.5	7.3	100
05/29/06 - 06/04/06	168	1.9	6.6	3.9	40
06/05/06 - 06/11/06	168	2.8	7.4	5.0	87
06/12/06 - 06/18/06	167	3.7	6.6	4.9	97
06/19/06 - 06/25/06	168	3.8	6.8	5.2	98
06/26/06 - 07/02/06	168	4.3	10.9	6.3	100
07/03/06 - 07/09/06	168	4.3	9.1	6.2	100
07/10/06 - 07/16/06	60	4.8	7.2	6.0	100
07/17/06 - 07/23/06	106	4.4	9.4	6.0	100
07/24/06 - 07/30/06	168	5.5	11.7	8.3	100
07/31/06 - 08/06/06	168	3.5	9.5	6.6	99
08/07/06 - 08/13/06	168	4.4	8.5	6.6	100

TABLE A-16 (Continued): WEEKLY DO SUMMARY STATISTICS AT
C&W INDIANA RAILROAD ON THE LITTLE CALUMET RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	5.7	9.2	7.1	100
08/21/06 - 08/27/06	168	5.4	9.5	7.3	100
08/28/06 - 09/03/06	168	3.9	7.6	5.9	99
09/04/06 - 09/10/06	167	5.5	8.5	6.5	100
09/11/06 - 09/17/06	169	4.1	7.5	5.8	100
09/18/06 - 09/24/06	168	4.0	7.3	6.3	98
09/25/06 - 10/01/06	168	6.2	7.8	6.9	100
10/02/06 - 10/08/06	168	5.6	7.8	6.7	100
10/09/06 - 10/15/06	168	5.4	8.6	7.4	100
10/16/06 - 10/22/06	168	8.0	9.3	8.6	100
10/23/06 - 10/29/06	167	8.8	9.7	9.3	100
10/30/06 - 11/05/06	169	9.2	10.6	9.9	100
11/06/06 - 11/12/06	167	8.7	10.4	9.8	100
11/13/06 - 11/19/06	168	9.5	10.4	10.0	100
11/20/06 - 11/26/06	168	9.8	11.6	10.6	100
11/27/06 - 12/03/06	168	9.3	11.3	10.4	100
12/04/06 - 12/10/06	168	10.6	12.3	11.7	100
12/11/06 - 12/17/06	168	11.0	12.0	11.4	100
12/18/06 - 12/24/06	168	10.4	11.5	11.0	100
12/25/06 - 12/31/06	168	9.8	11.6	11.0	100

TABLE A-17: WEEKLY DO SUMMARY STATISTICS AT HALSTED STREET ON THE LITTLE CALUMET RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	7.3	7.8	7.5	100
01/02/06 - 01/08/06	167	6.8	8.5	7.8	100
01/09/06 - 01/15/06	168	6.3	8.6	7.4	100
01/16/06 - 01/22/06	167	6.8	8.5	7.5	100
01/23/06 - 01/29/06	168	6.7	8.7	7.8	100
01/30/06 - 02/05/06	168	6.4	9.3	7.8	100
02/06/06 - 02/12/06	168	7.5	8.9	8.2	100
02/13/06 - 02/19/06	168	7.1	9.3	8.3	100
02/20/06 - 02/26/06	168	8.3	10.7	9.4	100
02/27/06 - 03/05/06	168	8.9	11.3	9.9	100
03/06/06 - 03/12/06	168	6.7	9.8	8.2	100
03/13/06 - 03/19/06	168	6.7	8.6	7.6	100
03/20/06 - 03/26/06	168	7.4	10.0	8.4	100
03/27/06 - 04/02/06	168	6.8	9.3	7.6	100
04/03/06 - 04/09/06	167	6.0	8.2	7.1	100
04/10/06 - 04/16/06	167	5.2	7.6	6.2	100
04/17/06 - 04/23/06	168	5.5	7.7	6.3	100
04/24/06 - 04/30/06	168	6.1	8.6	6.8	100
05/01/06 - 05/07/06	168	4.9	7.8	6.0	100
05/08/06 - 05/14/06	168	5.0	8.6	6.1	100
05/15/06 - 05/21/06	168	5.1	9.8	6.4	100
05/22/06 - 05/28/06	168	5.2	9.2	6.5	100
05/29/06 - 06/04/06	168	4.4	7.9	5.8	100
06/05/06 - 06/11/06	168	4.1	8.5	6.1	100
06/12/06 - 06/18/06	168	4.7	7.5	5.9	100
06/19/06 - 06/25/06	168	4.4	7.2	5.5	100
06/26/06 - 07/02/06	168	4.2	9.1	6.3	100
07/03/06 - 07/09/06	168	5.1	11.9	6.9	100
07/10/06 - 07/16/06	168	4.3	8.4	5.9	100
07/17/06 - 07/23/06	168	4.5	9.2	6.1	100
07/24/06 - 07/30/06	167	4.9	9.9	7.2	100
07/31/06 - 08/06/06	168	5.6	12.9	7.9	100
08/07/06 - 08/13/06	168	4.9	9.8	6.8	100

TABLE A-17 (Continued): WEEKLY DO SUMMARY STATISTICS AT HALSTED STREET ON THE LITTLE CALUMET RIVER DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	5.5	9.3	6.7	100
08/21/06 - 08/27/06	168	5.1	8.8	6.7	100
08/28/06 - 09/03/06	59	4.3	6.6	5.6	100
09/04/06 - 09/10/06	108	5.6	7.8	6.5	100
09/11/06 - 09/17/06	60	5.0	7.1	6.0	100
09/18/06 - 09/24/06	108	5.1	7.3	6.1	100
09/25/06 - 10/01/06	168	5.3	7.6	6.5	100
10/02/06 - 10/08/06	168	3.5	7.4	6.2	97
10/09/06 - 10/15/06	168	5.7	7.4	6.6	100
10/16/06 - 10/22/06	167	5.7	7.1	6.6	100
10/23/06 - 10/29/06	168	6.0	7.2	6.7	100
10/30/06 - 11/05/06	169	6.0	7.1	6.6	100
11/06/06 - 11/12/06	168	5.7	7.3	6.4	100
11/13/06 - 11/19/06	167	5.7	7.2	6.5	100
11/20/06 - 11/26/06	168	6.0	7.3	6.6	100
11/27/06 - 12/03/06	168	5.8	8.2	6.9	100
12/04/06 - 12/10/06	168	6.6	8.1	7.4	100
12/11/06 - 12/17/06	168	6.0	8.1	6.8	100
12/18/06 - 12/24/06	168	5.9	7.3	6.6	100
12/25/06 - 12/31/06	168	5.5	7.0	6.3	100

TABLE A-18: WEEKLY DO SUMMARY STATISTICS AT CICERO AVENUE ON THE CALUMET-SAG CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	8.3	8.7	8.5	100
01/02/06 - 01/08/06	168	7.9	8.8	8.2	100
01/09/06 - 01/15/06	168	7.3	8.7	8.0	100
01/16/06 - 01/22/06	168	7.8	9.2	8.3	100
01/23/06 - 01/29/06	168	8.4	10.0	9.2	100
01/30/06 - 02/05/06	168	7.8	8.7	8.4	100
02/06/06 - 02/12/06	168	8.3	9.6	8.9	100
02/13/06 - 02/19/06	168	8.4	10.4	9.0	100
02/20/06 - 02/26/06	168	9.6	11.7	10.5	100
02/27/06 - 03/05/06	168	10.0	11.4	10.7	100
03/06/06 - 03/12/06	168	7.7	11.2	9.4	100
03/13/06 - 03/19/06	168	7.2	8.9	8.2	100
03/20/06 - 03/26/06	168	8.5	9.7	9.1	100
03/27/06 - 04/02/06	168	7.8	9.3	8.4	100
04/03/06 - 04/09/06	167	6.6	8.9	7.6	100
04/10/06 - 04/16/06	168	4.9	7.9	6.6	100
04/17/06 - 04/23/06	168	5.5	6.9	6.3	100
04/24/06 - 04/30/06	168	5.6	7.2	6.5	100
05/01/06 - 05/07/06	168	5.3	6.8	6.1	100
05/08/06 - 05/14/06	168	4.8	6.7	5.8	100
05/15/06 - 05/21/06	168	5.1	6.7	6.0	100
05/22/06 - 05/28/06	168	4.1	7.4	5.7	100
05/29/06 - 06/04/06	168	3.6	6.1	4.7	100
06/05/06 - 06/11/06	167	3.2	6.6	5.2	100
06/12/06 - 06/18/06	167	4.6	6.3	5.6	100
06/19/06 - 06/25/06	168	4.1	6.2	5.0	100
06/26/06 - 07/02/06	168	4.3	8.2	5.9	100
07/03/06 - 07/09/06	168	4.8	10.2	6.4	100
07/10/06 - 07/16/06	168	3.9	7.4	5.2	100
07/17/06 - 07/23/06	168	4.1	9.3	5.3	100
07/24/06 - 07/30/06	168	4.6	9.4	6.4	100
07/31/06 - 08/06/06	168	5.2	13.1	7.0	100
08/07/06 - 08/13/06	168	4.5	7.6	6.1	100

TABLE A-18 (Continued): WEEKLY DO SUMMARY STATISTICS AT CICERO AVENUE ON THE CALUMET-SAG CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	4.4	7.6	6.1	100
08/21/06 - 08/27/06	168	4.6	7.8	6.1	100
08/28/06 - 09/03/06	168	3.6	8.7	5.6	100
09/04/06 - 09/10/06	168	5.3	6.3	5.8	100
09/11/06 - 09/17/06	168	3.3	7.8	5.5	100
09/18/06 - 09/24/06	167	4.7	6.4	5.8	100
09/25/06 - 10/01/06	168	5.5	7.5	6.2	100
10/02/06 - 10/08/06	168	4.5	7.1	6.1	100
10/09/06 - 10/15/06	168	5.9	8.1	6.8	100
10/16/06 - 10/22/06	168	5.9	8.1	6.8	100
10/23/06 - 10/29/06	168	6.6	7.6	7.0	100
10/30/06 - 11/05/06	169	6.5	8.2	7.3	100
11/06/06 - 11/12/06	168	5.4	8.0	6.5	100
11/13/06 - 11/19/06	168	6.0	7.5	6.8	100
11/20/06 - 11/26/06	168	6.4	7.6	7.0	100
11/27/06 - 12/03/06	168	5.6	10.3	7.4	100
12/04/06 - 12/10/06	168	7.3	10.5	8.9	100
12/11/06 - 12/17/06	59	7.3	8.1	7.8	100
12/18/06 - 12/24/06	107	7.2	9.1	8.3	100
12/25/06 - 12/31/06	168	7.0	9.2	8.1	100

TABLE A-19: WEEKLY DO SUMMARY STATISTICS AT 104TH AVENUE
ON THE CALUMET-SAG CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	7.9	8.2	8.0	100
01/02/06 - 01/08/06	168	7.5	8.4	8.0	100
01/09/06 - 01/15/06	168	7.9	9.0	8.4	100
01/16/06 - 01/22/06	168	7.6	9.7	8.8	100
01/23/06 - 01/29/06	168	8.2	10.0	9.3	100
01/30/06 - 02/05/06	168	7.9	9.3	8.4	100
02/06/06 - 02/12/06	168	8.3	9.3	9.0	100
02/13/06 - 02/19/06	168	8.9	10.0	9.4	100
02/20/06 - 02/26/06	168	3.4	11.7	9.7	100
02/27/06 - 03/05/06	167	10.2	13.0	11.4	100
03/06/06 - 03/12/06	168	7.6	11.4	9.8	100
03/13/06 - 03/19/06	59	7.8	8.7	8.1	100
03/20/06 - 03/26/06	109	9.2	10.0	9.6	100
03/27/06 - 04/02/06	60	8.5	9.6	9.3	100
04/03/06 - 04/09/06	107	7.2	7.7	7.5	100
04/10/06 - 04/16/06	168	5.8	8.0	7.2	100
04/17/06 - 04/23/06	166	4.9	6.6	6.1	100
04/24/06 - 04/30/06	168	5.7	7.2	6.4	100
05/01/06 - 05/07/06	168	5.3	6.9	5.8	100
05/08/06 - 05/14/06	167	4.7	6.1	5.5	100
05/15/06 - 05/21/06	61	5.2	6.5	6.0	100
05/22/06 - 05/28/06	109	4.1	6.1	5.3	100
05/29/06 - 06/04/06	168	2.9	5.8	4.2	98
06/05/06 - 06/11/06	168	3.9	6.7	5.0	100
06/12/06 - 06/18/06	168	4.6	5.9	5.3	100
06/19/06 - 06/25/06	168	4.1	5.9	4.8	100
06/26/06 - 07/02/06	168	4.3	7.4	5.6	100
07/03/06 - 07/09/06	168	5.4	8.1	6.4	100
07/10/06 - 07/16/06	168	3.8	7.6	5.5	100
07/17/06 - 07/23/06	168	4.0	6.2	4.8	100
07/24/06 - 07/30/06	60	4.6	6.9	5.6	100
07/31/06 - 08/06/06			NO DATA		
08/07/06 - 08/13/06			NO DATA		

TABLE A-19 (Continued): WEEKLY DO SUMMARY STATISTICS AT 104TH AVENUE ON THE CALUMET-SAG CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06			NO DATA		
08/21/06 - 08/27/06	108	5.6	7.2	6.5	100
08/28/06 - 09/03/06	133	4.7	7.5	5.6	100
09/04/06 - 09/10/06	168	5.4	6.2	5.7	100
09/11/06 - 09/17/06	168	4.6	7.1	5.7	100
09/18/06 - 09/24/06	168	5.1	6.3	5.7	100
09/25/06 - 10/01/06	168	5.3	6.5	5.9	100
10/02/06 - 10/08/06	168	3.3	7.1	5.6	100
10/09/06 - 10/15/06	168	5.4	7.2	6.3	100
10/16/06 - 10/22/06	83	5.5	7.7	6.7	100
10/23/06 - 10/29/06	84	6.7	8.0	7.5	100
10/30/06 - 11/05/06	169	6.7	8.7	7.7	100
11/06/06 - 11/12/06	167	4.5	8.6	7.2	100
11/13/06 - 11/19/06	168	3.3	7.7	6.3	100
11/20/06 - 11/26/06	168	6.5	7.7	7.1	100
11/27/06 - 12/03/06	168	5.9	10.5	7.5	100
12/04/06 - 12/10/06	59	10.4	10.8	10.6	100
12/11/06 - 12/17/06	84	7.9	9.2	8.4	100
12/18/06 - 12/24/06	169	7.4	9.3	8.2	100
12/25/06 - 12/31/06	168	7.0	9.2	8.2	100

TABLE A-20: WEEKLY DO SUMMARY STATISTICS AT ROUTE 83
ON THE CALUMET-SAG CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
01/01/06 - 01/01/06	24	7.4	8.1	7.9	100
01/02/06 - 01/08/06	168	7.1	8.3	7.9	100
01/09/06 - 01/15/06	168	7.7	8.8	8.3	100
01/16/06 - 01/22/06	168	7.7	9.8	8.8	100
01/23/06 - 01/29/06	168	7.7	10.1	9.5	100
01/30/06 - 02/05/06	168	8.0	9.6	8.5	100
02/06/06 - 02/12/06	168	8.5	9.8	9.1	100
02/13/06 - 02/19/06	168	8.3	10.1	9.6	100
02/20/06 - 02/26/06	168	9.0	11.0	10.0	100
02/27/06 - 03/05/06	168	9.8	13.9	12.0	100
03/06/06 - 03/12/06	168	7.5	11.9	10.1	100
03/13/06 - 03/19/06	168	7.4	8.9	8.0	100
03/20/06 - 03/26/06	168	7.2	9.4	8.5	100
03/27/06 - 04/02/06	168	7.2	9.3	8.2	100
04/03/06 - 04/09/06	167	7.2	8.4	7.8	100
04/10/06 - 04/16/06	168	4.3	8.1	6.4	100
04/17/06 - 04/23/06	168	4.3	6.2	5.4	100
04/24/06 - 04/30/06	168	5.4	7.1	6.1	100
05/01/06 - 05/07/06	168	4.9	6.5	5.6	100
05/08/06 - 05/14/06	167	4.3	6.0	5.2	100
05/15/06 - 05/21/06	168	4.2	6.8	5.8	100
05/22/06 - 05/28/06	168	4.1	7.1	5.5	100
05/29/06 - 06/04/06	168	2.8	5.1	3.7	89
06/05/06 - 06/11/06	168	3.8	6.5	4.9	100
06/12/06 - 06/18/06	168	4.5	5.8	5.1	100
06/19/06 - 06/25/06	168	4.0	5.3	4.6	100
06/26/06 - 07/02/06	168	3.8	7.1	5.1	100
07/03/06 - 07/09/06	168	4.9	7.5	6.0	100
07/10/06 - 07/16/06	168	4.3	7.5	5.7	100
07/17/06 - 07/23/06	167	4.0	7.1	5.2	100
07/24/06 - 07/30/06	168	4.2	9.9	6.1	100
07/31/06 - 08/06/06	168	3.3	9.5	5.6	100
08/07/06 - 08/13/06	168	4.0	6.9	5.2	100

TABLE A-20 (Continued): WEEKLY DO SUMMARY STATISTICS AT ROUTE 83 ON THE CALUMET-SAG CHANNEL DURING 2006

Monitoring Dates	Number of DO Values	DO Concentration (mg/L)			Percent DO Values Above IPCB Standard
		Minimum	Maximum	Mean	
08/14/06 - 08/20/06	168	4.6	7.7	5.7	100
08/21/06 - 08/27/06	168	3.9	6.1	4.9	100
08/28/06 - 09/03/06	168	4.0	5.8	5.0	100
09/04/06 - 09/10/06	168	4.5	5.9	5.2	100
09/11/06 - 09/17/06	168	3.8	6.6	5.1	100
09/18/06 - 09/24/06	167	4.8	6.4	5.6	100
09/25/06 - 10/01/06	168	5.4	6.1	5.8	100
10/02/06 - 10/08/06	168	3.9	7.0	5.7	100
10/09/06 - 10/15/06	168	5.4	7.6	6.6	100
10/16/06 - 10/22/06	168	5.9	7.9	6.7	100
10/23/06 - 10/29/06	168	6.3	7.8	7.3	100
10/30/06 - 11/05/06	169	6.7	8.1	7.5	100
11/06/06 - 11/12/06	168	5.5	8.2	7.0	100
11/13/06 - 11/19/06	168	2.7	7.4	5.7	95
11/20/06 - 11/26/06	167	6.0	7.2	6.8	100
11/27/06 - 12/03/06	168	5.6	9.9	7.3	100
12/04/06 - 12/10/06	168	8.7	10.5	9.8	100
12/11/06 - 12/17/06	168	7.5	9.1	8.3	100
12/18/06 - 12/24/06	168	6.6	9.3	8.0	100
12/25/06 - 12/31/06	168	7.5	9.1	8.3	100

Attachment 4

Time Start	Time End	Minutes of Drawback	Gate Opening	Flow MGD	Total Drawback (MG)	Average Daily Flow (MG)
5/2/05 7:00 AM	5/3/05 12:00 AM	1020.00	3 inches	21.19	15.01	15.01
5/3/05 12:00 AM	5/4/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/4/05 12:00 AM	5/5/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/5/05 12:00 AM	5/6/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/6/05 12:00 AM	5/7/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/7/05 12:00 AM	5/8/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/8/05 12:00 AM	5/9/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/9/05 12:00 AM	5/10/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/10/05 12:00 AM	5/11/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/11/05 12:00 AM	5/12/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/12/05 12:00 AM	5/13/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/13/05 12:00 AM	5/14/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/14/05 12:00 AM	5/15/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/15/05 12:00 AM	5/16/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/16/05 12:00 AM	5/17/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/17/05 12:00 AM	5/18/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/18/05 12:00 AM	5/19/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/19/05 12:00 AM	5/19/05 7:00 AM	420.00	3 inches	21.19	6.18	
5/19/05 12:30 PM	5/20/05 12:00 AM	690.00	3 inches	21.19	10.15	16.33
5/20/05 12:00 AM	5/20/05 7:40 AM	460.00	3 inches	21.19	6.77	
5/20/05 7:40 AM	5/21/05 12:00 AM	980.00	6 inches	38.46	26.17	32.94
5/21/05 12:00 AM	5/22/05 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
5/22/05 12:00 AM	5/23/05 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
5/23/05 12:00 AM	5/24/05 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
5/24/05 12:00 AM	5/24/05 7:00 AM	420.00	6 inches	38.46	11.22	
5/24/05 7:00 AM	5/25/05 12:00 AM	1020.00	3 inches	21.19	15.01	26.23
5/25/05 12:00 AM	5/26/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/26/05 12:00 AM	5/27/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/27/05 12:00 AM	5/28/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/28/05 12:00 AM	5/29/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/29/05 12:00 AM	5/30/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/30/05 12:00 AM	5/31/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/31/05 12:00 AM	6/1/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/1/05 12:00 AM	6/2/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/2/05 12:00 AM	6/3/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/3/05 12:00 AM	6/4/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/4/05 12:00 AM	6/4/05 3:30 PM	930.00	3 inches	21.19	13.69	13.69
6/5/05 12:00 AM	6/6/05 12:00 AM	0.00		0.00	0.00	0.00
6/6/05 8:30 AM	6/7/05 12:00 AM	930.00	3 inches	21.19	13.69	13.69
6/7/05 12:00 AM	6/8/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/8/05 12:00 AM	6/9/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/9/05 12:00 AM	6/10/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/10/05 12:00 AM	6/11/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/11/05 12:00 AM	6/12/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19

6/12/05 12:00 AM	6/13/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/13/05 12:00 AM	6/14/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/14/05 12:00 AM	6/15/05 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/15/05 12:00 AM	6/15/05 7:15 AM	435.00	3 inches	21.19	6.40	
6/15/05 7:15 AM	6/16/05 12:00 AM	1005.00	5 inches	32.7	22.82	29.22
6/16/05 12:00 AM	6/17/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/17/05 12:00 AM	6/18/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/18/05 12:00 AM	6/19/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/19/05 12:00 AM	6/20/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/20/05 12:00 AM	6/21/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/21/05 12:00 AM	6/22/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/22/05 12:00 AM	6/23/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/23/05 12:00 AM	6/24/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/24/05 12:00 AM	6/25/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/25/05 12:00 AM	6/26/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/26/05 12:00 AM	6/27/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/27/05 12:00 AM	6/28/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/28/05 12:00 AM	6/29/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
6/29/05 12:00 AM	6/29/05 2:15 PM	855.00	5 inches	32.7	19.42	
6/29/05 2:15 PM	6/29/05 9:30 PM	435.00	3 inches	21.19	6.40	
6/29/05 9:30 PM	6/30/05 12:00 AM	150.00	5 inches	32.7	3.41	29.22
6/30/05 12:00 AM	7/1/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/1/05 12:00 AM	7/2/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/2/05 12:00 AM	7/3/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/3/05 12:00 AM	7/4/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/4/05 12:00 AM	7/5/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/5/05 12:00 AM	7/6/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/6/05 12:00 AM	7/7/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/7/05 12:00 AM	7/8/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/8/05 12:00 AM	7/9/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/9/05 12:00 AM	7/10/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/10/05 12:00 AM	7/11/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/11/05 12:00 AM	7/12/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/12/05 12:00 AM	7/13/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/13/05 12:00 AM	7/14/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/14/05 12:00 AM	7/15/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/15/05 12:00 AM	7/16/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/16/05 12:00 AM	7/17/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/17/05 12:00 AM	7/18/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/18/05 12:00 AM	7/19/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/19/05 12:00 AM	7/20/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/20/05 12:00 AM	7/21/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/21/05 12:00 AM	7/22/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/22/05 12:00 AM	7/23/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/23/05 12:00 AM	7/24/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/24/05 12:00 AM	7/25/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70

7/25/05 12:00 AM	7/25/05 11:35 AM	695.00	5 inches	32.70	15.78	
7/25/05 11:35 AM	7/25/05 4:20 PM	285.00	0 inches	0.00	0.00	
7/25/05 4:20 PM	7/26/05 12:00 AM	460.00	5 inches	32.70	10.45	26.23
7/26/05 12:00 AM	7/26/05 6:25 PM	1105.00	5 inches	32.70	25.09	
7/26/05 6:25 PM	7/27/05 12:00 AM	335.00	0 inches	0.00	0.00	25.09
7/27/05 12:00 AM	7/27/05 3:10 AM	190.00	0 inches	0.00	0.00	
7/27/05 3:10 AM	7/28/05 12:00 AM	1250.00	5 inches	32.70	28.39	28.39
7/28/05 12:00 AM	7/29/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/29/05 12:00 AM	7/30/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/30/05 12:00 AM	7/31/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
7/31/05 12:00 AM	8/1/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/1/05 12:00 AM	8/2/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/2/05 12:00 AM	8/3/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/3/05 12:00 AM	8/4/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/4/05 12:00 AM	8/5/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/5/05 12:00 AM	8/6/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/6/05 12:00 AM	8/7/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/7/05 12:00 AM	8/8/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/8/05 12:00 AM	8/9/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/9/05 12:00 AM	8/10/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/10/05 12:00 AM	8/11/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/11/05 12:00 AM	8/11/05 11:25 AM	685.00	5 inches	32.7	15.56	
8/11/05 11:25 AM	8/12/05 12:00 AM	755.00	0	0	0.00	15.56
8/12/05 12:00 AM	8/12/05 1:20 AM	80.00	0	0	0.00	
8/12/05 10:20 AM	8/13/05 12:00 AM	820.00	5 inches	32.7	18.62	18.62
8/13/05 12:00 AM	8/13/05 1:00 PM	780.00	5 inches	32.7	17.71	
8/13/05 1:00 PM	8/14/05 12:00 AM	660.00	0	0	0.00	17.71
8/14/05 12:00 AM	8/14/05 6:00 AM	360.00	0	0	0.00	
8/14/05 6:00 AM	8/15/05 12:00 AM	1080.00	5 inches	32.7	24.53	24.53
8/15/05 12:00 AM	8/16/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/16/05 12:00 AM	8/17/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/17/05 12:00 AM	8/18/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/18/05 12:00 AM	8/18/05 1:50 PM	830.00	5 inches	32.7	18.85	
8/18/05 1:50 PM	8/19/05 12:00 AM	610.00	0	0	0.00	18.85
8/19/05 12:00 AM	8/19/05 3:10 PM	910.00	0	0	0.00	
8/19/05 3:10 PM	8/20/05 12:00 AM	530.00	5 inches	32.7	12.04	12.04
8/20/05 12:00 AM	8/20/05 1:20 AM	80.00	5 inches	32.7	1.82	
8/20/05 1:20 AM	8/21/05 12:00 AM	1360.00	0	0	0.00	1.82
8/21/05 12:00 AM	8/21/05 10:45 AM	645.00	0	0	0.00	
8/21/05 10:45 AM	8/22/05 12:00 AM	795.00	5 inches	32.7	18.05	18.05
8/22/05 12:00 AM	8/23/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/23/05 12:00 AM	8/24/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/24/05 12:00 AM	8/25/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/25/05 12:00 AM	8/26/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/26/05 12:00 AM	8/27/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/27/05 12:00 AM	8/28/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70

8/28/05 12:00 AM	8/29/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/29/05 12:00 AM	8/30/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/30/05 12:00 AM	8/31/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
8/31/05 12:00 AM	9/1/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/1/05 12:00 AM	9/2/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/2/05 12:00 AM	9/3/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/3/05 12:00 AM	9/4/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/4/05 12:00 AM	9/5/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/5/05 12:00 AM	9/6/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/6/05 12:00 AM	9/7/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/7/05 12:00 AM	9/8/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/8/05 12:00 AM	9/9/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/9/05 12:00 AM	9/10/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/10/05 12:00 AM	9/11/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/11/05 12:00 AM	9/12/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/12/05 12:00 AM	9/13/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/13/05 12:00 AM	9/14/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/14/05 12:00 AM	9/15/05 12:00 AM	1440.00	5 inches	32.7	32.70	32.70
9/15/05 12:00 AM	9/16/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/16/05 12:00 AM	9/17/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/17/05 12:00 AM	9/18/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/18/05 12:00 AM	9/19/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/19/05 12:00 AM	9/20/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/20/05 12:00 AM	9/21/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/21/05 12:00 AM	9/22/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/22/05 12:00 AM	9/23/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/23/05 12:00 AM	9/24/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/24/05 12:00 AM	9/25/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/25/05 12:00 AM	9/26/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/26/05 12:00 AM	9/27/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/27/05 12:00 AM	9/28/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
9/28/05 12:00 AM	9/28/05 6:15 PM	1095.00	5 inches	32.70	24.87	
9/28/05 6:15 PM	9/29/05 12:00 AM	345.00	0 inches	0.00	0.00	24.87
9/29/05 12:00 AM	9/29/05 7:25 AM	445.00	0 inches	0.00	0.00	
9/29/05 7:25 AM	9/30/05 12:00 AM	995.00	5 inches	32.70	22.59	22.59
9/30/05 12:00 AM	10/1/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/1/05 12:00 AM	10/2/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/2/05 12:00 AM	10/3/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/3/05 12:00 AM	10/4/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/4/05 12:00 AM	10/5/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/5/05 12:00 AM	10/6/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/6/05 12:00 AM	10/7/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/7/05 12:00 AM	10/8/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/8/05 12:00 AM	10/9/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/9/05 12:00 AM	10/10/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/10/05 12:00 AM	10/11/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70

10/11/05 12:00 AM	10/12/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/12/05 12:00 AM	10/13/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/13/05 12:00 AM	10/14/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/14/05 12:00 AM	10/15/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/15/05 12:00 AM	10/16/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/16/05 12:00 AM	10/17/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/17/05 12:00 AM	10/18/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/18/05 12:00 AM	10/19/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/19/05 12:00 AM	10/20/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/20/05 12:00 AM	10/21/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/21/05 12:00 AM	10/22/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/22/05 12:00 AM	10/23/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/23/05 12:00 AM	10/24/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/24/05 12:00 AM	10/24/05 3:00 AM	180.00	5 inches	32.70	4.09	
10/24/05 3:00 AM	10/25/05 12:00 AM	1260.00	0 inches	0.00	0.00	4.09
10/25/05 12:00 AM	10/25/05 2:00 PM	840.00	0 inches	0.00	0.00	
10/25/05 2:00 PM	10/26/05 12:00 AM	600.00	5 inches	32.70	13.62	13.62
10/26/05 12:00 AM	10/27/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/27/05 12:00 AM	10/28/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/28/05 12:00 AM	10/29/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/29/05 12:00 AM	10/30/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/30/05 12:00 AM	10/31/05 12:00 AM	1440.00	5 inches	32.70	32.70	32.70
10/31/05 12:00 AM	10/31/05 3:00 PM	900.00	5 inches	32.70	20.44	
10/31/05 3:00 PM		****CLOSED FOR THE SEASON****			**5,261.35**	

Time Start	Time End	Minutes of Drawback	Gate Opening	Flow MGD	Total Drawback (MG)	Average Daily Flow (MG)
4/14/06 7:00 AM	4/15/06 12:00 AM	1020.00	3 inches	21.19	15.01	15.01
4/15/06 12:00 AM	4/16/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/16/06 12:00 AM	4/16/06 4:15 PM	975.00	3 inches	21.19	14.35	
4/16/06 4:15 PM	4/17/06 12:00 AM	465.00	0 inches	0.00	0.00	14.35
4/17/06 12:00 AM	4/17/06 7:00 AM	420.00	0 inches	0.00	0.00	
4/17/06 7:00 AM	4/18/06 12:00 AM	1020.00	6 inches	38.46	27.24	27.24
4/18/06 12:00 AM	4/19/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
4/19/06 12:00 AM	4/20/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
4/20/06 12:00 AM	4/20/06 5:15 AM	315.00	6 inches	38.46	8.41	
4/20/06 5:15 AM	4/20/06 1:00 PM	465.00	0 inches	0.00	0.00	
4/20/06 1:00 PM	4/21/06 12:00 AM	660.00	6 inches	38.46	17.63	26.04
4/21/06 12:00 AM	4/21/06 1:30 PM	810.00	6 inches	38.46	21.63	
4/21/06 1:30 PM	4/22/06 12:00 AM	630.00	3 inches	21.19	9.27	30.90
4/22/06 12:00 AM	4/23/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/23/06 12:00 AM	4/24/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/24/06 12:00 AM	4/25/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/25/06 12:00 AM	4/26/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/26/06 12:00 AM	4/27/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/27/06 12:00 AM	4/28/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/28/06 12:00 AM	4/29/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/29/06 12:00 AM	4/30/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
4/30/06 12:00 AM	4/30/06 8:15 AM	495.00	3 inches	21.19	7.28	
4/30/06 8:15 AM	5/1/06 12:00 AM	945.00	0 inches	0.00	0.00	7.28
5/1/06 12:00 AM	5/1/06 9:50 AM	590.00	0 inches	0.00	0.00	
5/1/06 9:50 AM	5/2/06 12:00 AM	850.00	3 inches	21.19	12.51	12.51
5/2/06 12:00 AM	5/3/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/3/06 12:00 AM	5/4/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/4/06 12:00 AM	5/5/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/5/06 12:00 AM	5/6/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/6/06 12:00 AM	5/7/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/7/06 12:00 AM	5/8/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/8/06 12:00 AM	5/9/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/9/06 12:00 AM	5/10/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/10/06 12:00 AM	5/11/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/11/06 12:00 AM	5/11/06 12:45 AM	45.00	3 inches	21.19	0.66	
5/11/06 12:45 AM	5/12/06 12:00 AM	1395.00	0 inches	0.00	0.00	0.66
5/12/06 12:00 AM	5/12/06 7:45 AM	465.00	0 inches	0.00	0.00	
5/12/06 7:45 AM	5/13/06 12:00 AM	975.00	3 inches	21.19	14.35	14.35
5/13/06 12:00 AM	5/14/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/14/06 12:00 AM	5/15/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/15/06 12:00 AM	5/16/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/16/06 12:00 AM	5/17/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/17/06 12:00 AM	5/17/06 6:05 PM	1085.00	3 inches	21.19	15.97	
5/17/06 6:05 PM	5/18/06 12:00 AM	355.00	0 inches	0.00	0.00	15.97

5/18/06 12:00 AM	5/18/06 7:10 AM	430.00	0 inches	0.00	0.00	
5/18/06 7:10 AM	5/19/06 12:00 AM	1010.00	3 inches	21.19	14.86	14.86
5/19/06 12:00 AM	5/20/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/20/06 12:00 AM	5/21/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/21/06 12:00 AM	5/22/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/22/06 12:00 AM	5/23/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/23/06 12:00 AM	5/24/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/24/06 12:00 AM	5/24/06 11:10 PM	1390.00	3 inches	21.19	20.45	
5/24/06 11:10 PM	5/25/06 12:00 AM	50.00	0 inches	0.00	0.00	20.45
5/25/06 12:00 AM	5/25/06 11:00 AM	660.00	0 inches	0.00	0.00	
5/25/06 11:00 AM	5/26/06 12:00 AM	780.00	3 inches	21.19	11.48	11.48
5/26/06 12:00 AM	5/27/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/27/06 12:00 AM	5/28/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/28/06 12:00 AM	5/29/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/29/06 12:00 AM	5/30/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
5/30/06 12:00 AM	5/30/06 9:45 PM	1305.00	3 inches	21.19	19.20	
5/30/06 9:45 PM	5/31/06 12:00 AM	135.00	0 inches	0.00	0.00	19.20
5/31/06 12:00 AM	5/31/06 7:10 AM	430.00	0 inches	0.00	0.00	
5/31/06 7:10 AM	6/1/06 12:00 AM	1010.00	3 inches	21.19	14.86	14.86
6/1/06 12:00 AM	6/2/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/2/06 12:00 AM	6/3/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/3/06 12:00 AM	6/4/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/4/06 12:00 AM	6/5/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/5/06 12:00 AM	6/6/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/6/06 12:00 AM	6/7/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/7/06 12:00 AM	6/8/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/8/06 12:00 AM	6/9/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/9/06 12:00 AM	6/10/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/10/06 12:00 AM	6/10/06 7:15 AM	435.00	3 inches	21.19	6.40	
6/10/06 7:15 AM	6/10/06 9:00 PM	825.00	0 inches	0.00	0.00	
6/10/06 9:00 PM	6/11/06 12:00 AM	180.00	6 inches	38.46	4.81	11.21
6/11/06 12:00 AM	6/12/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
6/12/06 12:00 AM	6/13/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
6/13/06 12:00 AM	6/14/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
6/14/06 12:00 AM	6/15/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
6/15/06 12:00 AM	6/15/06 9:30 AM	570.00	6 inches	38.46	15.22	
6/15/06 9:30 AM	6/16/06 12:00 AM	870.00	3 inches	21.19	12.80	28.03
6/16/06 12:00 AM	6/17/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/17/06 12:00 AM	6/18/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/18/06 12:00 AM	6/19/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/19/06 12:00 AM	6/20/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/20/06 12:00 AM	6/21/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/21/06 12:00 AM	6/22/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/22/06 12:00 AM	6/23/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/23/06 12:00 AM	6/24/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/24/06 12:00 AM	6/25/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19

6/25/06 12:00 AM	6/26/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/26/06 12:00 AM	6/27/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/27/06 12:00 AM	6/28/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/28/06 12:00 AM	6/29/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/29/06 12:00 AM	6/30/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
6/30/06 12:00 AM	7/1/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/1/06 12:00 AM	7/2/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/2/06 12:00 AM	7/3/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/3/06 12:00 AM	7/3/06 8:30 AM	510.00	3 inches	21.19	7.50	
7/3/06 8:30 AM	7/4/06 12:00 AM	930.00	0 inches	0.00	0.00	7.50
7/4/06 12:00 AM	7/5/06 12:00 AM	1440.00	0 inches	0.00	0.00	0.00
7/5/06 12:00 AM	7/5/06 7:30 AM	450.00	0 inches	0.00	0.00	
7/5/06 7:30 AM	7/6/06 12:00 AM	990.00	3 inches	21.19	14.57	14.57
7/6/06 12:00 AM	7/7/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/7/06 12:00 AM	7/8/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/8/06 12:00 AM	7/9/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/9/06 12:00 AM	7/10/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/10/06 12:00 AM	7/11/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/11/06 12:00 AM	7/11/06 12:25 PM	745.00	3 inches	21.19	10.96	
7/11/06 12:25 PM	7/12/06 12:00 AM	695.00	0 inches	0.00	0.00	10.96
7/12/06 12:00 AM	7/13/06 12:00 AM	1440.00	0 inches	0.00	0.00	0.00
7/13/06 12:00 AM	7/14/06 12:00 AM	1440.00	0 inches	0.00	0.00	
7/14/06 12:00 AM	7/14/06 2:30 PM	870.00	0 inches	0.00	0.00	
7/14/06 2:30 PM	7/15/06 12:00 AM	570.00	3 inches	21.19	8.39	8.39
7/15/06 12:00 AM	7/16/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/16/06 12:00 AM	7/17/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/17/06 12:00 AM	7/18/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/18/06 12:00 AM	7/19/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/19/06 12:00 AM	7/20/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/20/06 12:00 AM	7/20/06 7:00 AM	420.00	3 inches	21.19	6.18	
7/20/06 7:00 AM	7/21/06 12:00 AM	1020.00	0 inches	0.00	0.00	6.18
7/21/06 12:00 AM	7/21/06 9:05 AM	545.00	0 inches	0.00	0.00	
7/21/06 9:05 AM	7/22/06 12:00 AM	895.00	6 inches	38.46	23.90	23.90
7/22/06 12:00 AM	7/23/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
7/23/06 12:00 AM	7/24/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
7/24/06 12:00 AM	7/25/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
7/25/06 12:00 AM	7/25/06 9:00 AM	540.00	6 inches	38.46	14.42	
7/25/06 9:00 AM	7/26/06 12:00 AM	900.00	3 inches	21.19	13.24	27.67
7/26/06 12:00 AM	7/26/06 12:25 AM	25.00	3 inches	21.19	0.37	
7/26/06 12:25 AM	7/26/06 1:50 PM	805.00	0 inches	0.00	0.00	
7/26/06 1:50 PM	7/27/06 12:00 AM	610.00	3 inches	21.19	8.98	9.34
7/27/06 12:00 AM	7/28/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/28/06 12:00 AM	7/29/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/29/06 12:00 AM	7/30/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/30/06 12:00 AM	7/31/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
7/31/06 12:00 AM	8/1/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19

8/1/06 12:00 AM	8/2/06 8:40 PM	2680.00	3 inches	21.19	39.44	
8/2/06 8:40 PM	8/3/06 12:00 AM	200.00	0 inches	0.00	0.00	39.44
8/3/06 12:00 AM	8/4/06 12:00 AM	1440.00	0 inches	0.00	0.00	0.00
8/4/06 12:00 AM	8/4/06 1:20 PM	800.00	0 inches	0.00	0.00	
8/4/06 1:20 PM	8/5/06 12:00 AM	640.00	6 inches	38.46	17.09	17.09
8/5/06 12:00 AM	8/6/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
8/6/06 12:00 AM	8/7/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
8/7/06 12:00 AM	8/8/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
8/8/06 12:00 AM	8/8/06 8:00 AM	480.00	6 inches	38.46	12.82	
8/8/06 8:00 AM	8/9/06 12:00 AM	960.00	3 inches	21.19	14.13	26.95
8/9/06 12:00 AM	8/10/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/10/06 12:00 AM	8/10/06 9:45 AM	585.00	3 inches	21.19	8.61	
8/10/06 9:45 AM	8/11/06 12:00 AM	855.00	0 inches	0.00	0.00	8.61
8/11/06 12:00 AM	8/11/06 9:35 AM	575.00	0 inches	0.00	0.00	
8/11/06 9:35 AM	8/12/06 12:00 AM	865.00	3 inches	21.19	12.73	12.73
8/12/06 12:00 AM	8/13/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/13/06 12:00 AM	8/14/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/14/06 12:00 AM	8/15/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/15/06 12:00 AM	8/16/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/16/06 12:00 AM	8/17/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/17/06 12:00 AM	8/18/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/18/06 12:00 AM	8/19/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/19/06 12:00 AM	8/20/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/20/06 12:00 AM	8/21/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/21/06 12:00 AM	8/22/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/22/06 12:00 AM	8/23/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/23/06 12:00 AM	8/24/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/24/06 12:00 AM	8/24/06 7:35 AM	455.00	3 inches	21.19	6.70	
8/24/06 7:35 AM	8/24/06 1:30 PM	355.00	0 inches	0.00	0.00	
8/24/06 1:30 PM	8/25/06 12:00 AM	630.00	3 inches	21.19	9.27	15.97
8/25/06 12:00 AM	8/26/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/26/06 12:00 AM	8/27/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/27/06 12:00 AM	8/28/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
8/28/06 12:00 AM	8/28/06 12:15 PM	735.00	3 inches	21.19	10.82	
8/28/06 12:15 PM	8/29/06 12:00 AM	705.00	0 inches	0.00	0.00	10.82
8/29/06 12:00 AM	8/29/06 9:30 AM	570.00	0 inches	0.00	0.00	
8/29/06 9:30 AM	8/30/06 12:00 AM	870.00	6 inches	38.46	23.24	23.24
8/30/06 12:00 AM	8/31/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
8/31/06 12:00 AM	9/1/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
9/1/06 12:00 AM	9/2/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
9/2/06 12:00 AM	9/2/06 9:30 AM	570.00	6 inches	38.46	15.22	
9/2/06 9:30 AM	9/3/06 12:00 AM	870.00	3 inches	21.19	12.80	28.03
9/3/06 12:00 AM	9/4/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/4/06 12:00 AM	9/5/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/5/06 12:00 AM	9/6/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/6/06 12:00 AM	9/7/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19

9/7/06 12:00 AM	9/8/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/8/06 12:00 AM	9/9/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/9/06 12:00 AM	9/10/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/10/06 12:00 AM	9/11/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/11/06 12:00 AM	9/11/06 10:00 AM	600.00	3 inches	21.19	8.83	
9/11/06 10:00 AM	9/12/06 7:25 PM	2005.00	6 inches	38.46	53.55	62.38
9/12/06 7:25 PM	9/13/06 12:00 AM	275.00	0 inches	0.00	0.00	0.00
9/13/06 12:00 AM	9/14/06 12:00 AM	1440.00	0 inches	0.00	0.00	0.00
9/14/06 12:00 AM	9/14/06 10:00 AM	600.00	0 inches	0.00	0.00	
9/14/06 10:00 AM	9/15/06 12:00 AM	840.00	6 inches	38.46	22.44	22.44
9/15/06 12:00 AM	9/16/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
9/16/06 12:00 AM	9/17/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
9/17/06 12:00 AM	9/17/06 8:25 PM	1225.00	6 inches	38.46	32.72	
9/17/06 8:25 PM	9/18/06 12:00 AM	215.00	0 inches	0.00	0.00	32.72
9/18/06 12:00 AM	9/18/06 7:30 AM	450.00	0 inches	0.00	0.00	
9/18/06 7:30 AM	9/19/06 12:00 AM	990.00	6 inches	38.46	26.44	26.44
9/19/06 12:00 AM	9/20/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
9/20/06 12:00 AM	9/21/06 12:00 AM	1440.00	6 inches	38.46	38.46	38.46
9/21/06 12:00 AM	9/21/06 7:30 AM	450.00	6 inches	38.46	12.02	
9/21/06 7:30 AM	9/22/06 12:00 AM	990.00	3 inches	21.19	14.57	26.59
9/22/06 12:00 AM	9/23/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/23/06 12:00 AM	9/23/06 5:25 PM	1045.00	3 inches	21.19	15.38	
9/23/06 5:25 PM	9/24/06 12:00 AM	395.00	0 inches	0.00	0.00	15.38
9/24/06 12:00 AM	9/25/06 12:00 AM	1440.00	0 inches	0.00	0.00	0.00
9/25/06 12:00 AM	9/25/06 11:55 AM	715.00	0 inches	0.00	0.00	
9/25/06 11:55 AM	9/26/06 12:00 AM	725.00	3 inches	21.19	10.67	10.67
9/26/06 12:00 AM	9/27/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/27/06 12:00 AM	9/28/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/28/06 12:00 AM	9/29/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/29/06 12:00 AM	9/30/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
9/30/06 12:00 AM	10/1/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
10/1/06 12:00 AM	10/2/06 12:00 AM	1440.00	3 inches	21.19	21.19	21.19
10/2/06 12:00 AM	10/2/06 2:45 PM	885.00	3 inches	21.19	13.02	
10/2/06 2:45 PM	10/3/06 12:00 AM	555.00	0 inches	0.00	0.00	13.02
	****CLOSED FOR THE SEASON****				**3,698.72**	