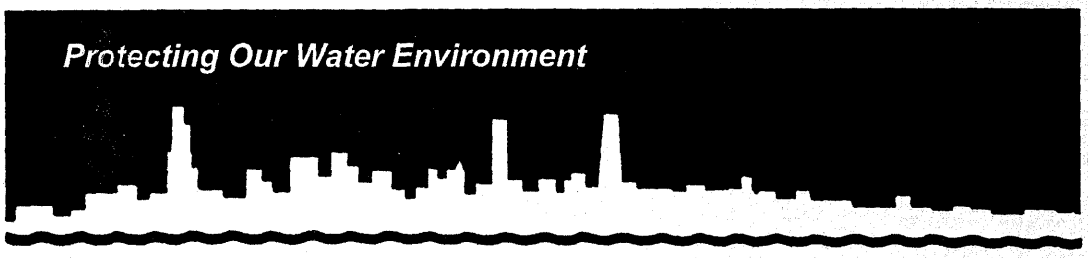

Metropolitan Water Reclamation District of Greater Chicago

RESEARCH AND DEVELOPMENT DEPARTMENT

REPORT NO. 04-8

2003 BUBBLY CREEK WATER QUALITY IMPROVEMENT DEMONSTRATION PROJECT

June 2004

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

2003 BUBBLY CREEK WATER QUALITY IMPROVEMENT DEMONSTRATION PROJECT

By

Michael Sopcak
Biologist III

Research and Development Department
Richard Lanyon, Director

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Special thanks to Ms. Joan Scrima for formatting and typing this report.

DISCLAIMER

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

SUMMARY AND CONCLUSIONS

Residential redevelopment of properties surrounding the South Fork of the South Branch of the Chicago River (Bubbly Creek) has made improvement of its historically poor water quality important. The Racine Avenue Pumping Station (RAPS), operated by the Metropolitan Water Reclamation District of Greater Chicago (District) is the major contributor of combined sewer overflow (CSO) to this waterway. Periodic wet weather discharges from RAPS and nine city of Chicago (city) gravity CSOs are the only flows seen in this waterway. The absence of dry weather flow due to truncated headwater reaches does not allow natural self-purification to occur, resulting in periods of low dissolved oxygen (DO). Floating debris of sanitary origin occasionally makes the waterway aesthetically unpleasing.

A demonstration project in 2002 assessed the impact on DO of the creation of artificial flow in Bubbly Creek (Lanyon, 2003). Flow was created by continuously diverting Bubbly Creek water through a sluice gate at RAPS to the Stickney Water Reclamation Plant (WRP) by means of the intercepting sewer system. The 2002 demonstration project lasted for 105 days from June 20 to October 20. Cost to the District for treatment of

the additional Bubbly Creek flow (2.5 billion gallons) at the Stickney WRP was $625,000 during this demonstration project.

The 2003 demonstration project described in this report, was conducted from May 1 to October 31, and incorporated a wider range of flows into the experimental plan. Instead of evaluating the effect of relatively low continuous flow on Bubbly Creek water quality, a more controlled test was designed to evaluate the effects of 38 million gallons per day (mgd) and 75 mgd flow rates under wet and dry weather conditions. Bubbly Creek flow would be maintained at 38 mgd for six days or 75 mgd for five days during each demonstration event. During the 2003 project approximately 2.1 billion gallons of water from Bubbly Creek were diverted to the Stickney WRP. Total cost to the District for treating this additional flow at the Stickney WRP was $525,000. Eight rainstorms occurred during the demonstration project, slightly more than would be expected in an average year. Continuous in-situ monitoring of DO was used to assess the impact of the artificially-created flow during both dry weather and wet weather periods.

Conclusions of the 2003 Bubbly Creek Demonstration Project are as follows:

1. Artificial flow creation in Bubbly Creek appears to reduce diel DO range and provides more stable DO conditions in dry weather and wet weather situations.

1. Under dry weather conditions with no artificial flow, Bubbly Creek mimics conditions in a eutrophic lake. Photosynthetic activity can cause dissolved oxygen levels to rise above saturation levels (16 mg/L) during the day and fall to near 0 mg/L at night.

3. During most demonstration events, low DO at Interstate Highway 55 (I-55) and 36th Street increased almost immediately after 38 mgd and 75 mgd flows were started.

4. During the 38 mgd dry weather demonstration event, DO at I-55 and 36th Street met the Illinois Pollution Control Board (IPCB) standards over 80 percent of the time, and DO values never fell below 1.0 mg/L

5. During the two 75 mgd dry weather demonstration events, DO levels at I-55 and 36th Street met IPCB standards over 90 percent of the time. DO levels never fell below 1.0 mg/L.

6. During the two 38 mgd wet weather demonstration events DO levels at I-55 met IPCB standards over 70 percent of the time, but DO levels at 36th Street met IPCB standards less than 5 percent of the time. For short periods of time DO values of 0.0 mg/L were observed. During these two tests recovery of DO levels was observed over a period ranging from 10 hours to 48 hours after initiation of flow diversion to the Stickney WRP. This was 3 to 4 days after the discharge of CSOs from RAPS ended, as there is a lag before the Stickney WRP can start accepting Bubbly Creek flows after a rain.

7. During the two 75 mgd wet weather demonstration events DO levels at I-55 met IPCB standards over 80 percent of the time. However, for short periods of time, DO values of 0.0 mg/L were observed at I-55. For the 36th Street location, contradictory results were found. During one test, DO levels met IPCB standards 81.7 percent of the time, while during the second test, DO levels never met IPCB standards. Many DO readings of 0.0 mg/L were observed during this second test.

Not enough information is available to determine the cause of these contradictory results. During these two tests recovery of DO levels was observed over a period ranging from 12 hours to 27 hours after initiation of flow diversion to the Stickney WRP. This was 28 hours to 4 days after the discharge of CSOs from RAPS ended, as there is a lag before the Stickney WRP can start accepting Bubbly Creek flows after a rain.

8. Periods of low DO following CSO discharges to Bubbly Creek, which can range from 1-2 weeks in length when there is zero flow being induced, can be reduced to as little as 1-2 days by initiating the artificial flows used during this study.

9. Diversion of Bubbly Creek water to the Stickney WRP cannot be used as a tool to meet IPCB DO standards in wet weather because capacity to accept wet weather flows may be limited. In addition, operational costs to treat the river water are substantial.

RECOMMENDATIONS

1. Additional demonstration projects should be conducted to verify the effect of various artificial flow rates on DO recovery in Bubbly Creek.
2. The method of artificial flow creation used in this project cannot be used as a long-term solution for water quality improvement in Bubbly Creek since it requires capacity at the Stickney WRP that may not be available in wet weather, and entails significant operating costs for the District.
3. Since sediment composition varies throughout this waterway, sediment oxygen uptake should be evaluated. Also, it would be important to better quantify the impact of algal respiration on waterway DO levels.

INTRODUCTION

Project History

This project was initiated by the District during the summer of 2002 to determine whether water quality in Bubbly Creek could be improved by drawing water into the normally stagnant Bubbly Creek from the South Branch of the Chicago River (SBCR). Flow was artificially created during dry weather by drawing Bubbly Creek water through a sluice gate at RAPS and conveying it to the Stickney WRP by means of the interceptor sewer system. The cost associated with handling this additional flow for the 2002 study at the Stickney WRP was approximately $625,000. Results of the first year study indicated that artificial flow creation improved DO concentrations during dry weather and shortened the duration of low DO conditions following a CSO from RAPS (Lanyon, 2003).

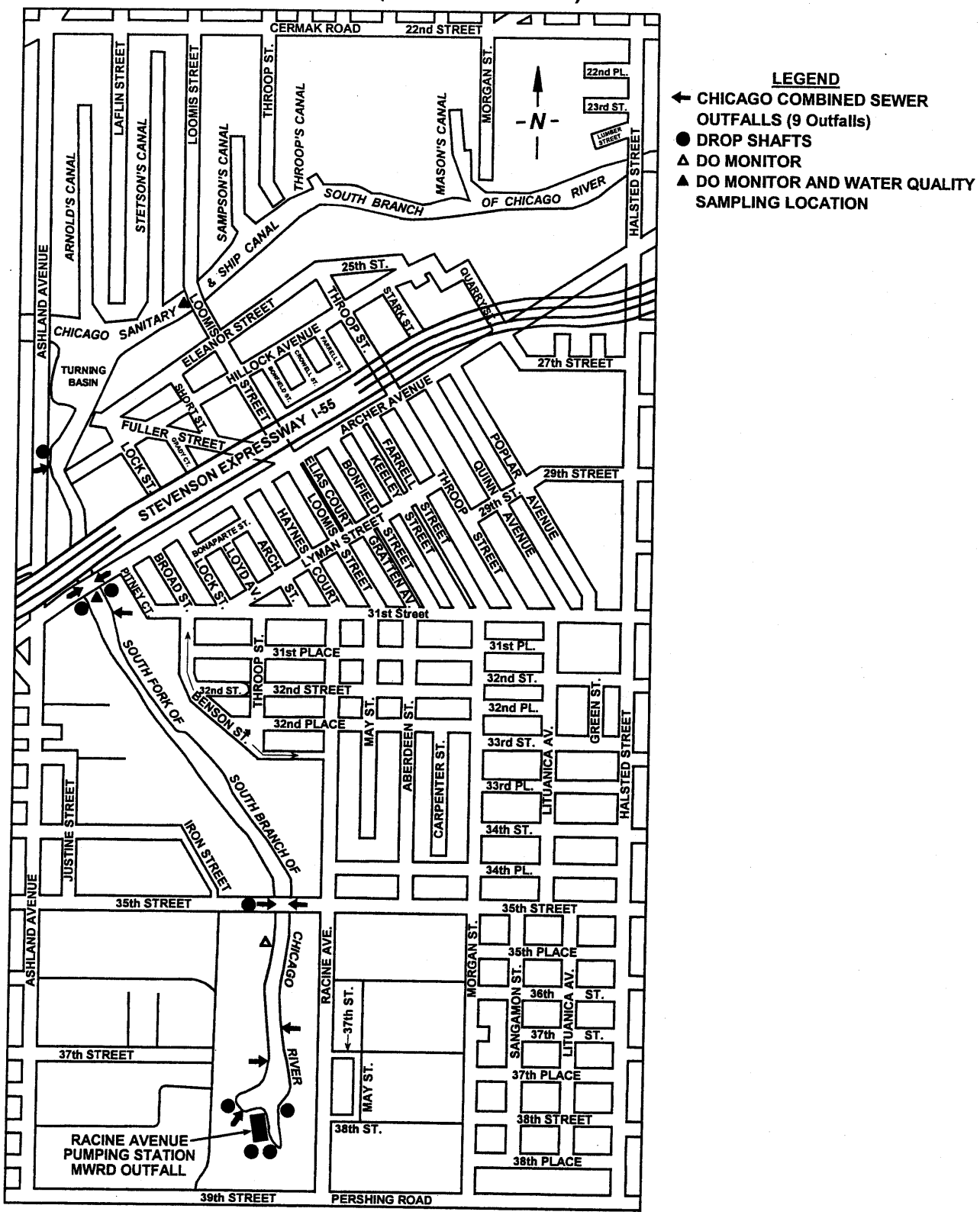
Description of Study Area

Bubbly Creek, the common name for the 1.25-mile long South Fork of the SBCR, originates at RAPS and ends at its confluence with the SBCR (Figure 1). Based on measurements taken from aerial photographs and field depth surveys, Bubbly Creek has an estimated volume of 70 million gallons (MG) (Lanyon, 2003).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 1

SOUTH FORK OF SOUTH BRANCH OF CHICAGO RIVER (BUBBLY CREEK)



LEGEND

- ← CHICAGO COMBINED SEWER OUTFALLS (9 Outfalls)
- ● DROP SHAFTS
- △ DO MONITOR
- ▲ DO MONITOR AND WATER QUALITY SAMPLING LOCATION

Primary land use adjacent to Bubbly Creek is light industrial and commercial. In recent years, residential use has expanded as abandoned industrial properties are redeveloped for single-family housing. Currently, most residential redevelopment is occurring east of the waterway between Archer Avenue and 35th Street.

Historically, this waterway was used to convey drainage and waste from the Union Stockyards to the SBCR. The east and west arms of Bubbly Creek were filled in by the city in the early part of the 20th century, when intercepting sewers constructed by the Sanitary District of Chicago eliminated their use as sewage conduits (Hill, 2000). Channel orientation is north-south and is fairly straight throughout its length. Channel width varies from 120 to 400 feet. Current outfalls to Bubbly Creek include nine city CSO outfalls and RAPS.

Flow in Bubbly Creek occurs only during rain events large enough to result in CSOs from gravity sewers, pumpage from RAPS, and/or surface runoff from surrounding impervious areas. The absence of dry weather flow does not allow for flushing or self-purification of wastewater overflows. Extremely high algal production and respiration can result in large daily ranges of DO concentration. The IPCB has classified Bubbly Creek as a Secondary Contact waterway. In Secondary Contact

waterways, the DO shall not be less than 4.0 mg/L at any time. Continuous DO monitoring, begun in 1998 at two locations in the waterway, showed that oxygen levels in Bubbly Creek were often below 4 mg/L for extended periods.

Project Objective

During the 2002 portion of this demonstration project, water from Bubbly Creek was withdrawn continuously during dry weather conditions and the effects on waterway DO studied. The experimental plan was modified in 2003 so that water was withdrawn from Bubbly Creek only during specific wet and dry weather conditions, so that a more controlled experimental program could be conducted.

Scope of Report

This report will compare DO data collected during zero flow and during various demonstration event flow rates. Demonstration event effects on odor and waterway floatables quantities are discussed. A summary of the abundance and distribution of fish collected during 2002 and 2003 are presented, as well as chlorophyll data collected in 2003.

METHODS AND MATERIALS

Demonstration Event Procedures

During April 2003, the Environmental Monitoring and Research (EM&R) Division of the Research and Development (R&D) Department, in consultation with the Maintenance and Operations (M&O) Department, developed an experimental plan for implementing eight demonstration project testing events. Water would be withdrawn from Bubbly Creek at two flow rates during both wet and dry weather conditions. The water would be diverted into RAPS through a sluice gate on the north wall of the station. Demonstration events were scheduled between May 1 and October 31 as detailed below.

- Dry Weather, 38 mgd flow rate from Bubbly Creek into RAPS, two demonstration events. (Due to scheduling problems only one event was conducted.)
- Dry Weather, 75 mgd flow rate from Bubbly Creek into RAPS, two demonstration events.
- Wet Weather, 38 mgd flow rate from Bubbly Creek into RAPS, two demonstration events.
- Wet Weather, 75 mgd flow rate from Bubbly Creek into RAPS, two demonstration events.

Details of the operational procedures for each demonstration event are provided below.

DRY WEATHER, 38 MGD FLOW RATE

Two dry weather periods when water would be withdrawn from Bubbly Creek at a rate of 38 mgd were scheduled. Dry weather was defined as a period of at least five days when no CSO was recorded from RAPS to Bubbly Creek. The intake gate at RAPS was opened to a flow rate of 38 mgd and remained open continuously for six days. One demonstration event was scheduled for completion during May and another during August.

DRY WEATHER, 75 MGD FLOW RATE

Two dry weather periods when water would be withdrawn from Bubbly Creek at a rate of 75 mgd were scheduled. Dry weather was defined as a period of at least five days when no CSO was recorded from RAPS to Bubbly Creek. To achieve the 75 mgd flow rate the sluice gate at RAPS was opened in a series of three increments over a period of approximately 24 hours. The intake gate remained open continuously for five days. One demonstration event was scheduled for completion during June and another during September.

WET WEATHER, 38 MGD FLOW RATE

Two wet weather periods when water would be withdrawn from Bubbly Creek at a rate of 38 mgd were scheduled. Wet weather was defined as discharge of CSO from RAPS to Bubbly Creek. The intake gate at RAPS was opened to a flow rate of 38 mgd as soon after the rain ended as the Stickney WRP could receive additional flow and remained open continuously for six days.

WET WEATHER, 75 MGD FLOW RATE

Two wet weather periods when water would be withdrawn from Bubbly Creek at a rate of 75 mgd were scheduled. Wet weather was defined as discharge of CSO from RAPS to Bubbly Creek. To achieve the 75 mgd flow rate, the intake gate at RAPS was opened in a series of three increments over a period of 24 hours as soon as the Stickney WRP could receive additional flow. The sluice gate remained open continuously for five days.

In the event of precipitation during a demonstration event, the RAPS sluice gate was closed and the event was rescheduled. Following each demonstration event continuous DO monitoring data at Loomis Street on the SBCR were reviewed. If DO at Loomis Street was less than 3.0 mg/L during the

demonstration event, the event was not considered a valid test and was rescheduled. This assured that water coming from the SBCR had sufficient DO to cause a recovery in Bubbly Creek.

Water Quality Monitoring Locations

Monitoring by both EM&R and the Industrial Waste Division (IWD) field crews was conducted at three locations on the SBCR and Bubbly Creek. Loomis Street on the SBCR was located approximately 1000 feet upstream of the confluence of Bubbly Creek. This location served to monitor the quality of the water being drawn into Bubbly Creek during each demonstration event. Archer Avenue on Bubbly Creek was located approximately 0.4 miles from the confluence with the SBCR and 0.8 miles from the RAPS intake gate. Thirty-sixth Street was located approximately 1.1 mile from the confluence of the SBCR and 0.2 miles from the RAPS intake gate. A monitoring location at RAPS was located near the intake sluice gate on the north wall of the station.

Water Quality Monitoring Procedures

GRAB SAMPLING, ODOR, AND FLOTABLES OBSERVATIONS

Grab samples for DO analysis were collected by IWD field crews daily, Monday through Friday, at Archer Avenue, the 36th Street in-situ DO monitor location, and near the RAPS Sluice

Gate No. 1. These acted as a backup and check, as needed, for the continuous DO monitors. Water samples for chlorophyll *a* were collected daily by IWD at the 36th Street monitoring location. All water samples were analyzed by EM&R. Daily Winkler DO, chlorophyll *a*, and average flow data are presented in Appendix AI.

IWD field crews also recorded daily odor observations near the waterway, waterway floatables, and wind-direction observations at Archer Avenue, 36th Street, and RAPS. Ambient odor was summarized into four categories: septic/sewage, oily, musty, and earthy. Daily observations of ambient odor are presented in Appendix AII. Waterway floatables were summarized into four categories: sanitary waste, street litter, oil, and dead fish. Daily observations of waterway floatables are presented in Appendix AIII.

IN-SITU CONTINUOUS DO MONITORING

Throughout the project, EM&R recorded hourly DO readings using in-situ continuous DO monitors (monitors) installed at Loomis Street (SBCR), I-55 (Bubbly Creek), and 36th Street (Bubbly Creek). Monitors located in Bubbly Creek were deployed and maintained using procedures similar to those used to service monitors in the District's current DO monitoring network

(Lanyon et al., 2000). DO monitors were enclosed in an 8-inch stainless steel pipe housing mounted near the side of the waterway at each of the three monitoring locations. A schematic of a typical monitoring installation is shown in Figure 2. Laboratory-calibrated DO monitors were deployed weekly at each monitoring location and retrieved monitors were returned to the laboratory for maintenance and data retrieval. Grab samples for Winkler DO analysis were collected at each monitoring location at the time of monitor deployment. Upon return to the laboratory, DO data recorded during the previous week were downloaded from the monitor to a specially configured Microsoft Access® database. DO values logged by the monitors were adjusted for instrument drift by an algorithm contained in the Access® program. This algorithm applies a linear correction to each data set based on DO reading logged by each monitor before and after deployment in a water-filled holding tank. After careful review of the data, line plots and statistical summaries of DO were generated weekly for each monitoring location for the duration of the project. Line plots of DO recorded at each of the in-situ monitoring locations are presented in Appendices AIV-1 through AIV-27.

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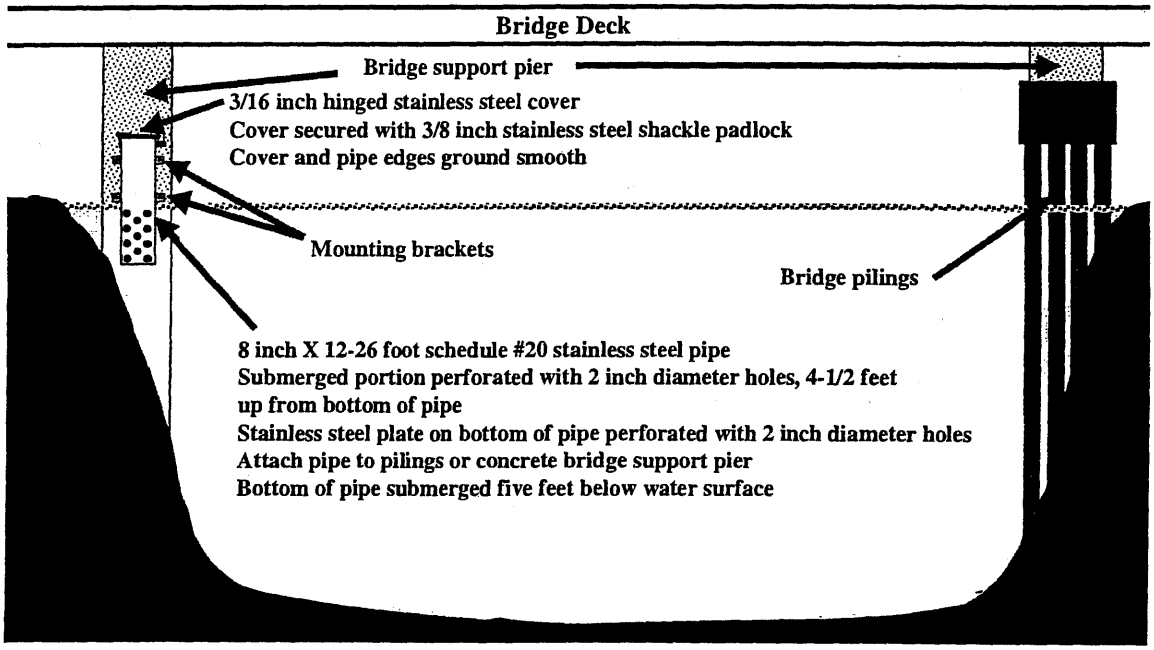
FIGURE 2

SCHEMATIC OF A TYPICAL IN-SITU CONTINUOUS DO MONITORING INSTALLATION IN BUBBLY CREEK



To verify that the DO data recorded by the monitors was representative of the waterway DO at each monitoring location, cross-sectional DO surveys were conducted in August. Results of the cross-sectional DO surveys are provided in Table 1. Monitor DO reading at each location are considered representative of the waterway DO if the hourly DO recorded by the monitor at the time of the cross-sectional survey is within 1 mg/l of the average cross-sectional DO.

FISH SURVEY

EM&R Division personnel collected fish on September 30, 2003, at locations near I-55, 35th Street, and RAPS. A pulsed DC-current electrofishing boat was used for these collections. Approximately 400 meters of shoreline habitat was sampled at each location. All fish collected were identified to species.

METROPOLITAN WATR RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1

CROSS-SECTIONAL DO VALUES MEASURED IN BUBBLY CREEK
ON AUGUST 22, 2003

Monitoring Station	Cross-Sectional DO Values					
	Depth	Left	Center	Right	Mean	Monitor
Interstate-55[1]	surface	4.90	4.94	4.93	4.89	5.00
	3 feet	4.89	4.92	4.92		
	bottom	4.87	4.83	4.80		
36th Street[2]	surface	3.90	4.00	3.49	3.64	3.63
	3 feet	NA	3.80	3.25		
	bottom	3.78	3.62	3.31		

[1]Cross-sectional survey conducted between 11:10 and 11:23 a.m.
[2]Cross-sectional survey conducted between 10:50 and 11:04 a.m.
NA = No analysis.

RESULTS AND DISCUSSION

Waterway Conditions During Static Flow

A period of zero flow conditions during dry weather occurred in Bubbly Creek between May 20 and June 10. This type of period can be thought of as baseline control conditions. Prior to this time, rain events occurred on May 1, May 5, May 9, and May 11. Total CSO discharge to the waterway from RAPS due to these rain events totaled almost 1.8 billion gallons. Continuous DO monitoring statistics for this zero flow period are presented in Table 2.

Approximately 99 percent of the hourly DO readings at Loomis Street (SBCR) met or exceeded the IPCB DO standard. Standard deviation of the readings was relatively low indicating that DO values remained close to the mean value of 5.72 mg/L.

At I-55 and 36th Street, however, only 21 percent and 27 percent of the DO readings, respectively, exceeded the IPCB standard. Means of the hourly DO data at these two locations were nearly 2 mg/L below the IPCB standard. Higher standard deviations indicated much greater variability around the mean DO. Mean water temperature at I-55 and 36th Street during this period was 19.0°C, which meant that maximum DO values exceeded

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2

DO SUMMARY STATISTICS DURING A ZERO FLOW PERIOD
IN BUBBLY CREEK, MAY 20 THROUGH JUNE 10, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	5.72	2.34	2.50
Minimum DO (mg/L)	2.42	0.00	0.12
Maximum DO (mg/L)	8.27	9.69	12.46
Standard Deviation (mg/L)	0.80	1.87	3.08
Percent DO values ≥4.0 mg/L	99.6	20.7	27.2
Percent DO values <1.0 mg/L	0	31.0	51.0

the saturation value of 9.27 mg/L at these two locations indicating high photosynthetic activity during daylight. Minimum DO was less than 1 mg/L for 31 percent and 51 percent of the time at I-55 and 36th Street, respectively. The highest chlorophyll *a* values recorded during the project were seen at 36th Street during this zero flow period, ranging from 6.4 µg/L to 225.6 µg/L, and averaging 75.8 µg/L. It is likely that elevated chlorophyll *a* levels accounted for the large diel DO ranges seen at I-55 and 36th Street during this time (Figure 3). The apparent decrease in photosynthetic activity between May 29 and June 6 coincided with cloudy, cool weather.

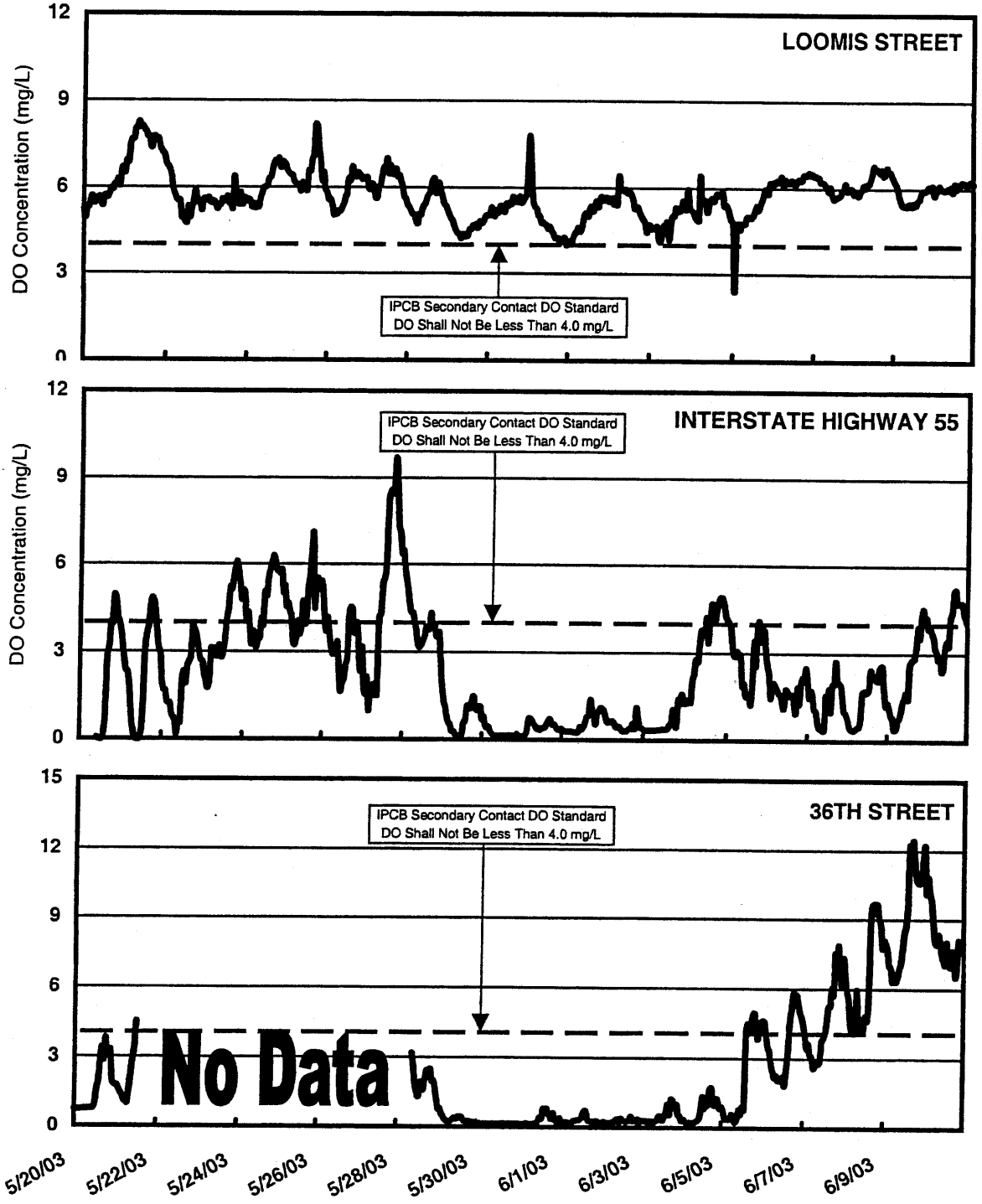
Another period of zero flow during dry weather occurred between July 27 and August 3. Table 3 summarizes DO conditions in the waterway during this period.

During this period water temperature at Loomis Street (SBCR) averaged 26.2°C. Even at this elevated temperature, Loomis Street met the IPCB DO standard 100 percent of the time. Average water temperature at I-55 and 36th Street during this period was approximately 25.0°C. During this same period, however, DO exceeded the standard only 52 percent and 60 percent of the time, respectively, at these two locations. Maximum DO readings at I-55 and 36th Street exceeded the DO

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 3

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING A PERIOD OF ZERO FLOW, MAY 20 THROUGH JUNE 10, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 3

DO SUMMARY STATISTICS DURING A ZERO FLOW PERIOD
IN BUBBLY CREEK, JULY 27 THROUGH AUGUST 3, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	5.93	4.42	5.60
Minimum DO (mg/L)	4.91	0.32	1.38
Maximum DO (mg/L)	6.94	15.62	12.56
Standard Deviation (mg/L)	0.83	2.95	2.91
Percent DO values ≥4.0 mg/L	100.0	51.8	59.7
Percent DO values <1.0 mg/L	0	8.4	15.7

saturation value of 8.26 mg/L, indicating photosynthetic activity during daylight. Minimum DO readings were less than 1.0 mg/L for 8 percent and 16 percent of the time, respectively, at I-55 and 36th Street. Chlorophyll *a* values at 36th Street were extremely elevated, ranging from 21.0 µg/L to 184.1 µg/L, averaging 100.8 µg/L. Increases in diel DO range after July 30 may be due to an increasing algal cell population (Figure 4).

WATERWAY CONDITIONS DURING THE FIRST 38 MGD DRY WEATHER DEMONSTRATION EVENT

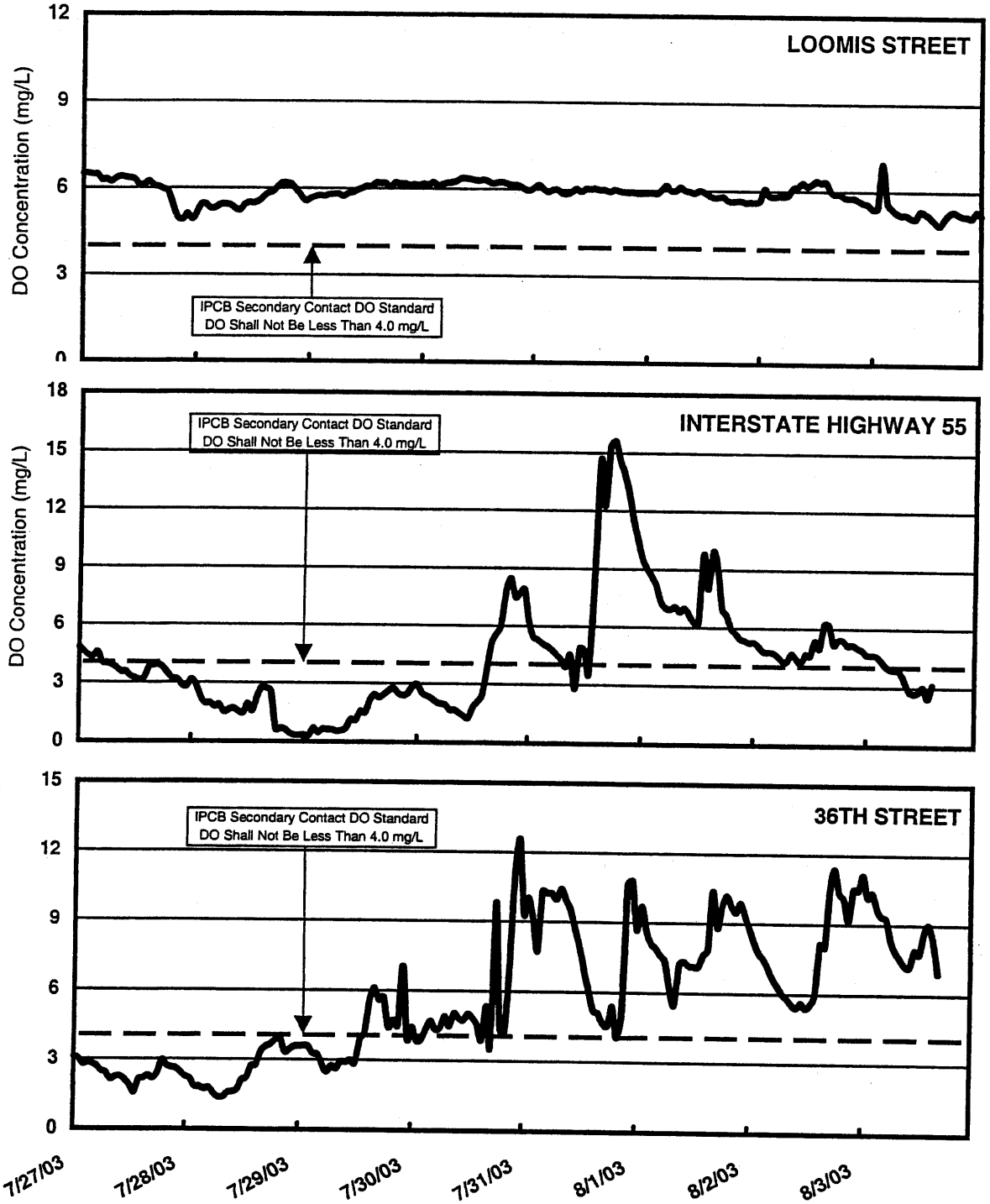
Due to scheduling difficulties, only one of two 38 mgd dry weather demonstration events scheduled for the project was completed. This demonstration event was conducted between June 11 and June 17. The RAPS intake gate was opened at 2:30 p.m. on June 11 and closed at 2:30 p.m. on June 17. Continuous DO monitoring data for the period are summarized in Table 4.

Means of the hourly DO readings were above the IPCB standard at all three monitoring stations. At I-55 and 36th Street, 97 percent and 83 percent of the hourly DO readings, respectively, met the IPCB standard. Maximum DO values at the two Bubbly Creek continuous monitoring locations did not exceed the saturation value of 9.50 mg/L. No DO values below 1 mg/L were observed at any of the three continuous monitoring

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 4

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING A PERIOD OF ZERO FLOW, JULY 27 THROUGH AUGUST 3, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 4

DO SUMMARY STATISTICS DURING THE 38 MGD DRY WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, JUNE 11 TO JUNE 17, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	6.93	6.30	4.95
Minimum DO (mg/L)	5.26	3.58	1.82
Maximum DO (mg/L)	8.17	7.52	8.56
Standard Deviation (mg/L)	0.90	2.48	2.96
Percent DO values ≥4.0 mg/L	100.0	97.2	83.3
Percent DO values <1.0 mg/L	0.0	0.0	0.0

locations. Chlorophyll *a* values at 36th Street were highly elevated, ranging from 7.1 µg/L to 161.7 µg/L, averaging 41.6 µg/L. Hourly DO readings at the two Bubbly Creek monitoring locations indicated greatly increased photosynthetic activity both before and after the demonstration period (Figure 5). Flow during the demonstration event probably removed algal cells from the water column dampening the increase in diel DO range.

WATERWAY CONDITIONS DURING THE FIRST 75 MGD DRY WEATHER DEMONSTRATION EVENT

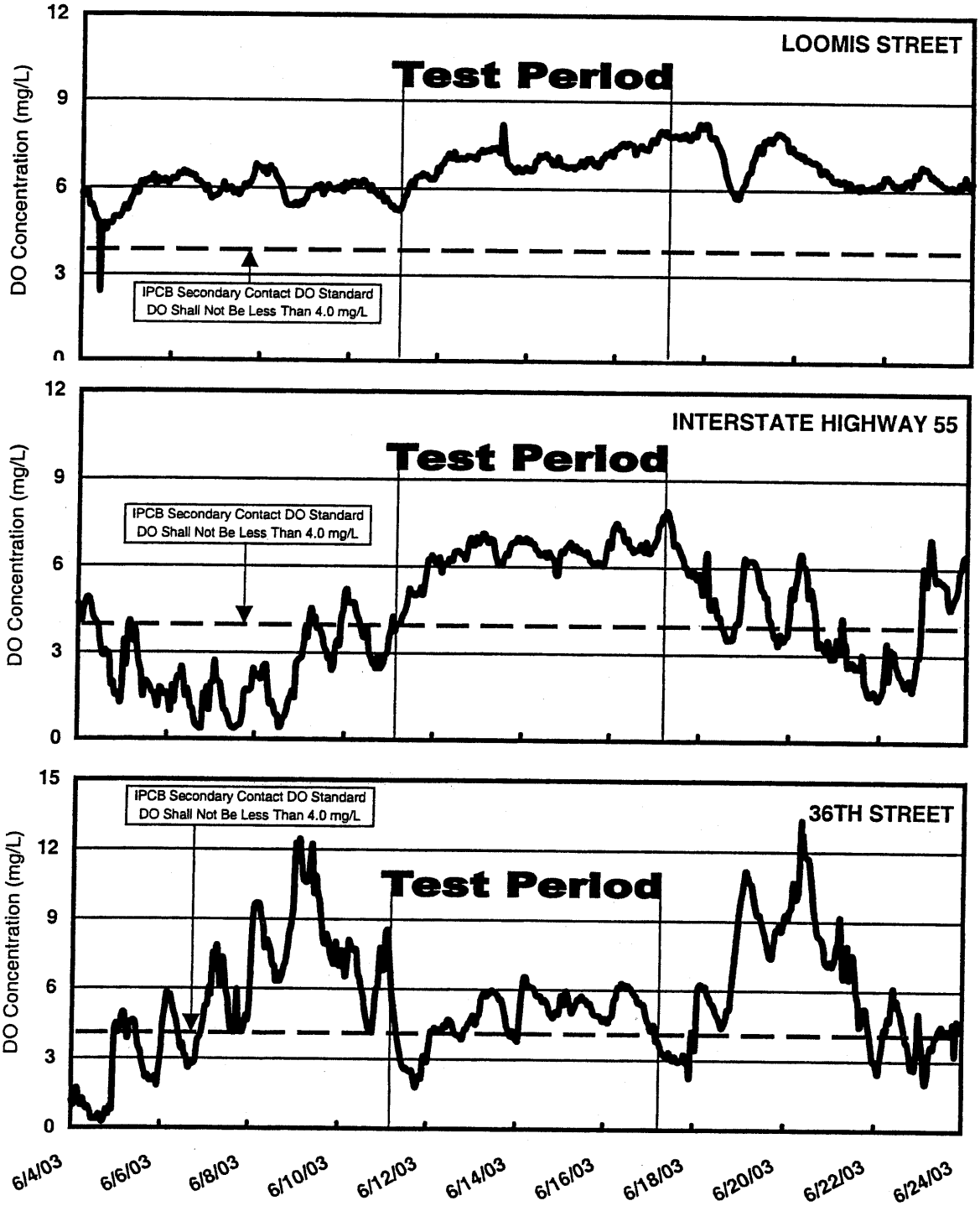
The first 75 mgd, dry weather demonstration event was conducted between June 23 and June 28. The intake gate at RAPS was opened at 1:30 p.m. on June 23 and closed at 1:30 p.m. on June 28. Continuous DO monitoring data for the period are summarized in Table 5.

Means of the hourly DO readings at all three monitoring locations were above the IPCB standard. No hourly DO values fell below the IPCB standard at Loomis Street. The range and standard deviation of the hourly DO readings at I-55 and 36th Street was considerably reduced compared to zero flow periods, indicating more stability around the mean DO. Overall, 99 percent and 88 percent of the hourly DO readings at I-55 and 36th Street, respectively, met or exceeded the IPCB standard.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 5

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
DURING FIRST 38 MGD DRY WEATHER TEST PERIOD



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 5

DO SUMMARY STATISTICS DURING THE FIRST 75 MGD DRY WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, JUNE 23 TO JUNE 28, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	6.16	6.07	4.76
Minimum DO (mg/L)	5.52	3.97	2.04
Maximum DO (mg/L)	6.76	6.98	6.04
Standard Deviation (mg/L)	0.30	0.51	0.74
Percent DO values ≥4.0 mg/L	100.0	99.1	88.3
Percent DO values <1.0 mg/L	0.0	0.0	0.0

Maximum DO values did not exceed the saturation value of 8.26 mg/L. No hourly DO values below 1 mg/L were observed at any of the in-situ monitoring locations during the demonstration period. Chlorophyll *a* values at 36th Street were moderately elevated, ranging from 3.14 µg/L to 36.4 µg/L, and averaging 12.5 µg/L. The introduction of flow into the waterway again resulted in a decrease in diel DO range (Figure 6).

WATERWAY CONDITIONS DURING THE SECOND 75 MGD DRY WEATHER DEMONSTRATION EVENT

The second 75 mgd, dry weather demonstration event was conducted between September 2 and September 7. The RAPS intake gate was opened at 2:00 p.m. on September 2 and closed at 2:00 p.m. on September 7. Continuous DO monitoring data for the period are summarized in Table 6.

Hourly DO values at Loomis Street and I-55 were all above the IPCB standard during the test period. Data at Loomis Street were not available for the latter portion of the demonstration period, due to a probe malfunction. Ninety-two percent of the hourly DO values at 36th Street were above the IPCB standard. None of the hourly DO values at I-55 or 36th Street exceeded the saturation level of 8.26 mg/L and none were less than 1 mg/L. Chlorophyll *a* values at 36th Street were very low,

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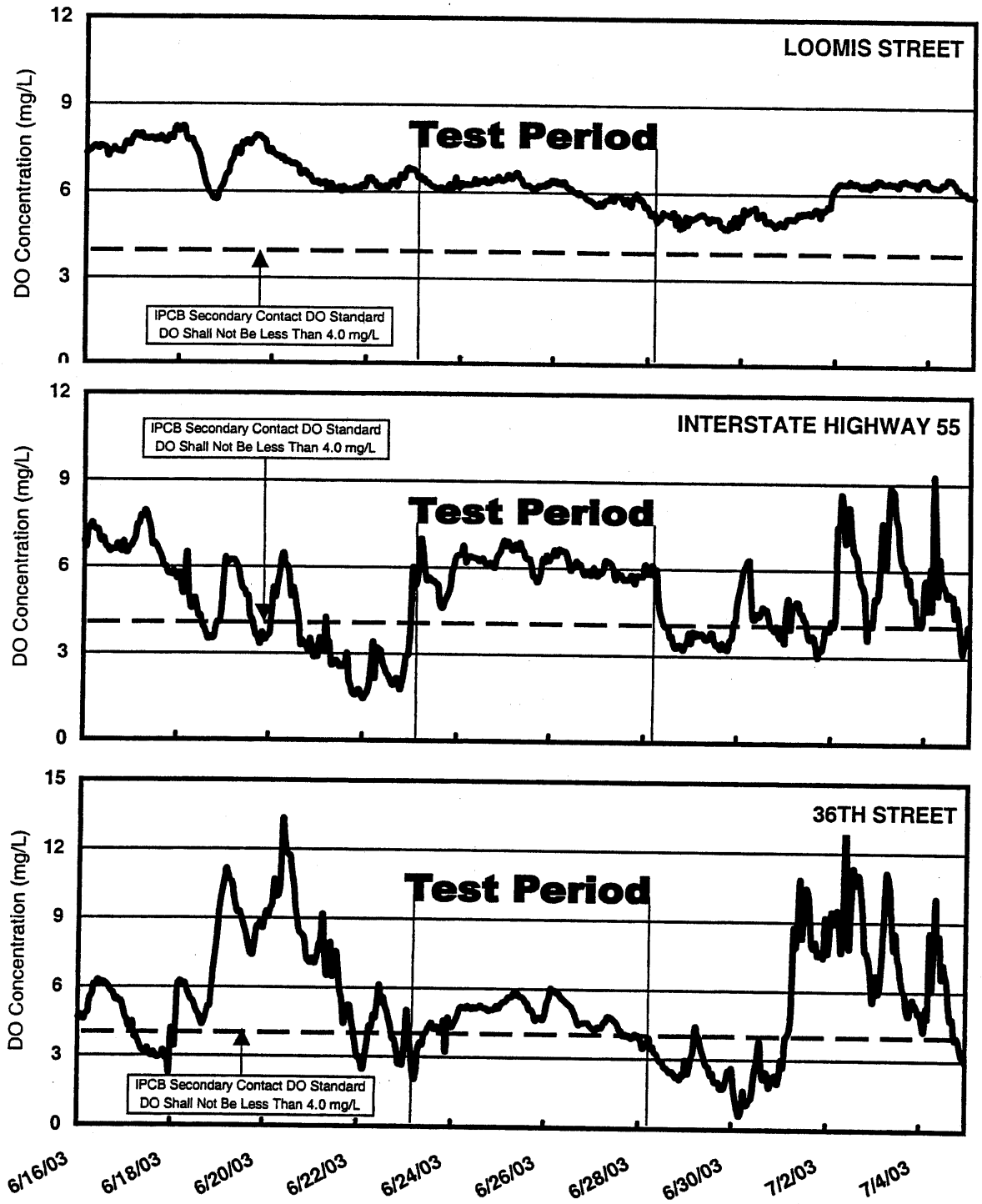
FIGURE 6

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING FIRST 75 MGD DRY WEATHER TEST PERIOD



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 6

DO SUMMARY STATISTICS DURING THE SECOND 75 MGD DRY WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, SEPTEMBER 2 TO SEPTEMBER 7, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	5.87	5.53	4.61
Minimum DO (mg/L)	5.23	4.42	1.62
Maximum DO (mg/L)	6.63	6.48	6.05
Standard Deviation (mg/L)	0.27	0.45	1.03
Percent DO values ≥4.0 mg/L	100.0	100.0	92.0
Percent DO values <1.0 mg/L	0.0	0.0	0.0

ranging from 1.31 µg/L to 3.96 µg/L, averaging 2.59 µg/L. Flow created by this demonstration event reduced chlorophyll levels and dampened diel DO range (Figure 7).

WATERWAY CONDITIONS DURING THE FIRST 38 MGD WET WEATHER DEMONSTRATION EVENT

The first 38 mgd, wet weather demonstration event was conducted between May 13 and May 19 after a rainstorm on May 10 resulted in a 136.6 MG CSO at RAPS. Pumpage of CSO from RAPS to Bubbly Creek ended at 3:40 a.m. on May 11. The RAPS intake gate was opened at 9:00 a.m. on May 13 (the earliest time at which the Stickney WRP could accept extra flow) and was closed at 9:00 a.m. on May 19. Continuous DO monitoring data from this event are summarized in Table 7.

All of the hourly DO readings at Loomis Street were above the DO standard. Unfortunately, due to a probe malfunction, no hourly DO readings were obtained at I-55 during the test period. Daily grab samples, taken at Archer Avenue on Bubbly Creek by IWD personnel, had DO values of 0.47, 3.39, 5.58, and 4.80 mg/L, respectively, on May 13 through May 16. These readings suggest that DO recovery at I-55 began to occur sometime between May 13 and May 14, approximately three days after RAPS CSO pumpage ceased and one day after 38 mgd demonstration

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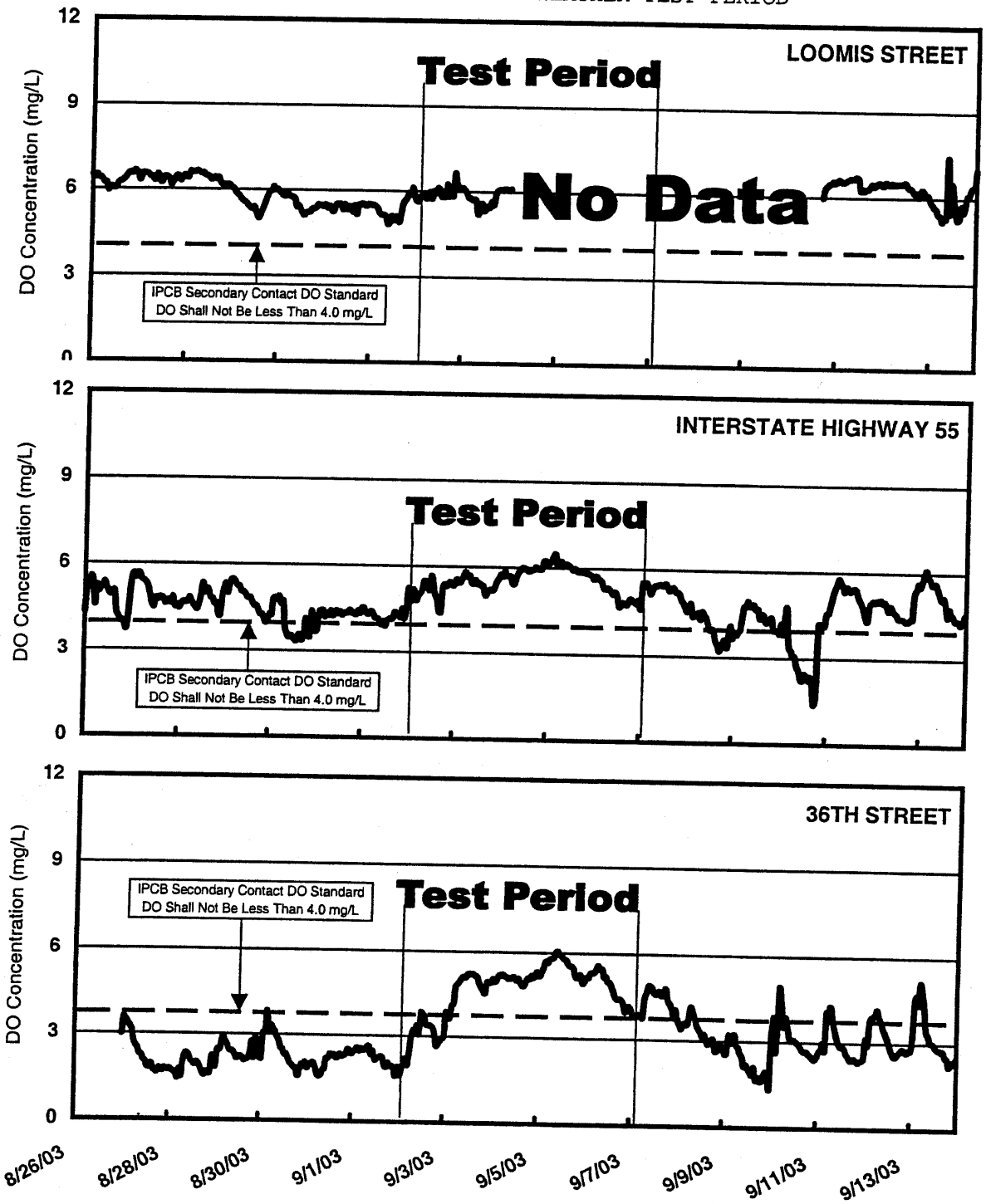
FIGURE 7

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING SECOND 75 MGD DRY WEATHER TEST PERIOD



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 7

DO SUMMARY STATISTICS DURING THE FIRST 38 MGD WET WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, MAY 13 TO MAY 19, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	6.11	No Data	1.2
Minimum DO (mg/L)	4.56	No Data	0.00
Maximum DO (mg/L)	7.22	No Data	4.29
Standard Deviation (mg/L)	0.69	No Data	1.11
Percent DO values ≥4.0 mg/L	100.0	No Data	2.5
Percent DO values <1.0 mg/L	0.0	No Data	57.5

flow began. Only 3 percent of the hourly DO readings at 36th Street were above the IPCB standard and nearly 58 percent of the readings were below 1 mg/L. Daily grab samples (Table 7) and hourly readings (Figure 8) indicated that DO began to improve at 36th Street, exceeding 2 mg/L, approximately four days after CSO pumpage stopped and two days after 38 mgd demonstration flow started. Chlorophyll *a* values at 36th Street were much lower ranging from 1.9 µg/L to 30.6 µg/L, averaging 16.3 µg/L. Due to lack of hourly DO data at I-55 and 36th Street prior to the demonstration event, diel DO ranges could not be assessed. Increases in chlorophyll (>200 µg/L) in the stagnant system after May 22 explain the increase in diel DO range at I-55 (Figure 8).

WATERWAY CONDITIONS DURING THE SECOND 38 MGD WET WEATHER DEMONSTRATION EVENT

The second 38 mgd, wet weather demonstration event was conducted between August 5 and August 11, after rainstorms resulted in a 65.9 MG CSO at RAPS on August 3. Pumpage of CSO from RAPS to Bubble Creek ended at 8:35 p.m. on August 3. The RAPS intake gate was opened at 2:30 p.m. on August 5 and closed at 2:30 p.m. on August 11. Continuous DO monitoring data for this period are summarized in Table 8.

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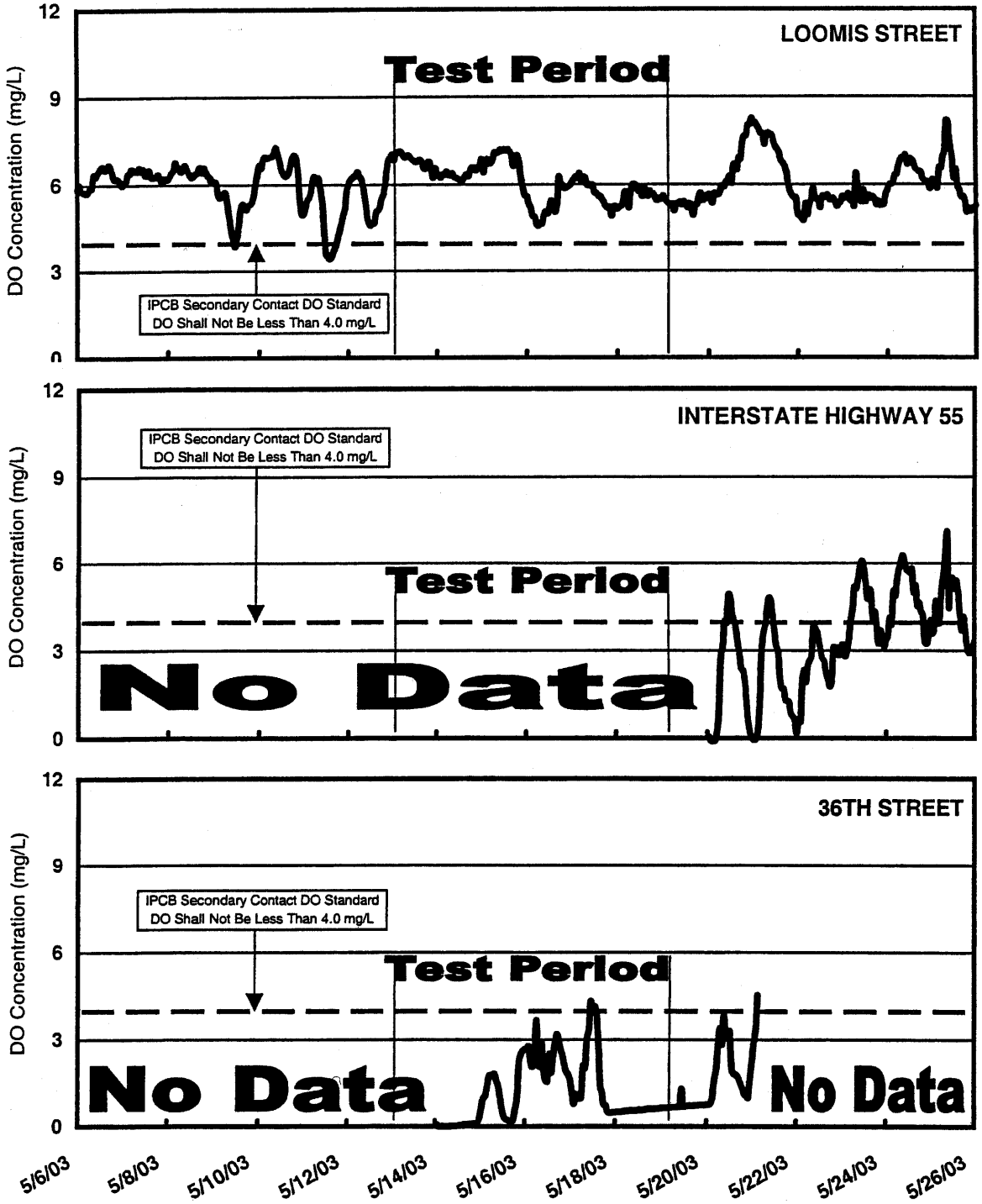
FIGURE 8

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING FIRST 38 MGD WET WEATHER TEST PERIOD



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8

DO SUMMARY STATISTICS DURING THE SECOND 38 MGD WET WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, AUGUST 5 TO AUGUST 11, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	5.34	4.20	2.31
Minimum DO (mg/L)	4.94	0.00	0.00
Maximum DO (mg/L)	5.58	5.33	4.48
Standard Deviation (mg/L)	0.35	1.01	1.31
Percent DO values ≥4.0 mg/L	100.0	71.5	4.9
Percent DO values <1.0 mg/L	0.0	3.5	22.2

Only 3 hourly DO readings were obtained from the monitor at Loomis Street, but hourly data from an upstream monitor at Jackson Boulevard indicated that DO probably did not fall below 5 mg/L at Loomis Street during the demonstration period. The mean of the hourly DO readings at I-55 was above the IPCB standard during the demonstration period, but only 72 percent of the readings were 4 mg/L or greater and nearly 4 percent were less than 1 mg/L. Minimum DO readings at both I-55 and 36th Street fell to 0 mg/L at some points during the period. DO at 36th Street was only above the IPCB standard for two brief periods on August 7 and 9. Only 5 percent of the DO readings at 36th Street were above the IPCB standard during the demonstration period. In contrast, 100 percent and 72 percent of the DO readings, respectively, at Loomis Street and I-55, were above the DO standard. Almost one-quarter of the readings at 36th Street were below 1 mg/L. Hourly DO reading at I-55 indicate that DO recovered to near 4 mg/L approximately two days after RAPS CSO pumpage ended and ten hours after 38 mgd demonstration flow began (Figure 9). Hourly DO readings at 36th Street showed slower DO recovery beginning approximately three days (74 hours) after cessation of RAPS CSO pumpage and 1.3 days (32 hours) after 38 mgd demonstration flow began (Figure 9). Chlorophyll *a* values at 36th Street were much closer to levels

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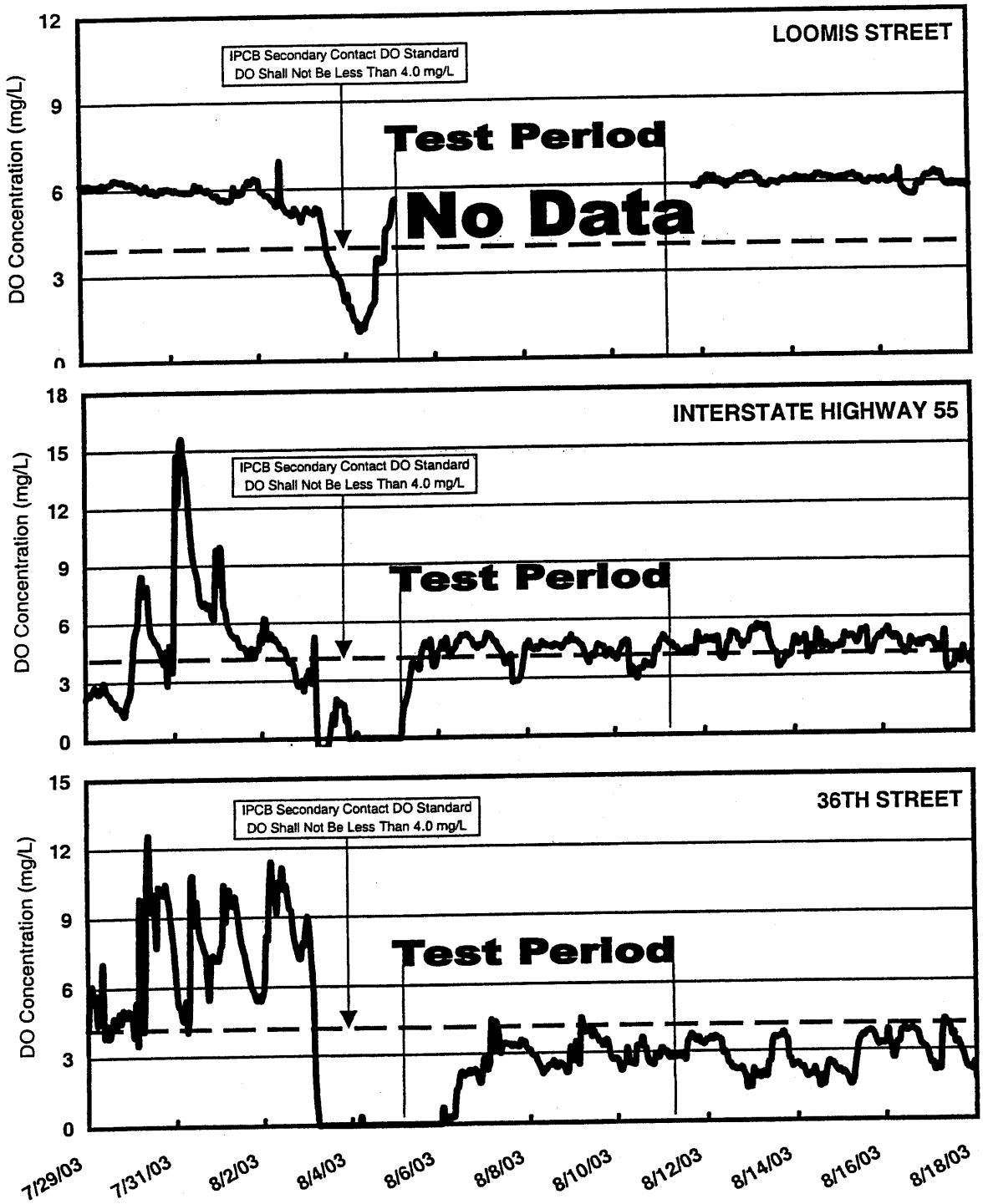
FIGURE 9

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING SECOND 38 MGD WET WEATHER TEST PERIOD



at Loomis Street ranging from 5.3 µg/L to 13.2 µg/L, averaging 9.9 µg/L. Diel DO ranges were characteristically large before the demonstration event (Figure 9). After the conclusion of this demonstration event (August 12), a change was made in the baseline operational protocol for the study. Due to concerns about overall water quality during the summer months, the RAPS sluice gate was kept open continuously at flow rates varying from 18-38 mgd for the remainder of the project whenever a demonstration event was not in progress.

WATERWAY CONDITIONS DURING THE FIRST 75 MGD WET WEATHER DEMONSTRATION EVENT

The first 75 mgd, wet weather demonstration event was conducted between July 21 and July 26. This demonstration event followed two rainstorms on July 15 and July 17. The July 15 storm resulted in a RAPS CSO of 273.2 MG. The July 17 storm caused a 639.7 MG RAPS CSO over July 17 and 18. Pumpage of CSO to Bubbly Creek from RAPS ended at 4.35 a.m. on July 18. The RAPS intake gate was opened at 1:30 p.m. on July 21 (the earliest time that the Stickney WRP could accept extra flow) and closed at 1:30 p.m. on July 26. In-situ continuous DO monitoring data are summarized in Table 9.

Low DO at I-55 in Bubbly Creek prior to the start of this demonstration event may be explained by three large CSO events

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TABLE 9

DO SUMMARY STATISTICS DURING THE FIRST 75 MGD WET WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, JULY 21 TO JULY 26, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	6.29	4.59	4.36
Minimum DO (mg/L)	5.19	0.00	3.51
Maximum DO (mg/L)	6.78	6.19	4.83
Standard Deviation (mg/L)	0.39	1.73	0.30
Percent DO values ≥4.0 mg/L	100.0	81.7	88.9
Percent DO values <1.0 mg/L	0.0	7.5	0.0

at RAPS. These events, occurring on July 15, 17, and 18, discharged a total of 912.9 MG of wastewater to Bubbly Creek. The effect of upstream CSO discharges to the SBCR on Loomis Street DO is also evident (Figure 10). However, DO levels at Loomis Street were above IPCB standards at the start of the demonstration test period, and remained in compliance throughout this test period. Over 80 percent and 89 percent of the hourly DO readings at I-55 and 36th Street, respectively, were in compliance with the IPCB standard during the demonstration event. However, a probe malfunction at 36th Street during the start of the test period, may have hidden low DO values there. Grab samples collected by IWD in Bubbly Creek at RAPS had DO values of 1.51, 0.99, 4.59, and 5.28 mg/L July 21, 22, 24, and 25, respectively. Hourly DO readings at I-55 recovered to the 4 mg/L level 4.5 days after RAPS CSO pumpage stopped and almost one day (21 hours) after 75 mgd demonstration flow began (Figure 10). Based on daily grab samples, DO at 36th Street showed recovery to 3.4 mg/L three days after RAPS CSO pumpage ceased and one day after 75 mgd demonstration flow started. Chlorophyll *a* values at 36th Street were moderately elevated ranging from 4.0 µg/L to 160.9 µg/L, and averaging 40.0 µg/L. Elevated chlorophyll levels produced characteristically high diel DO ranges at I-55 and 36th Street following the demonstration

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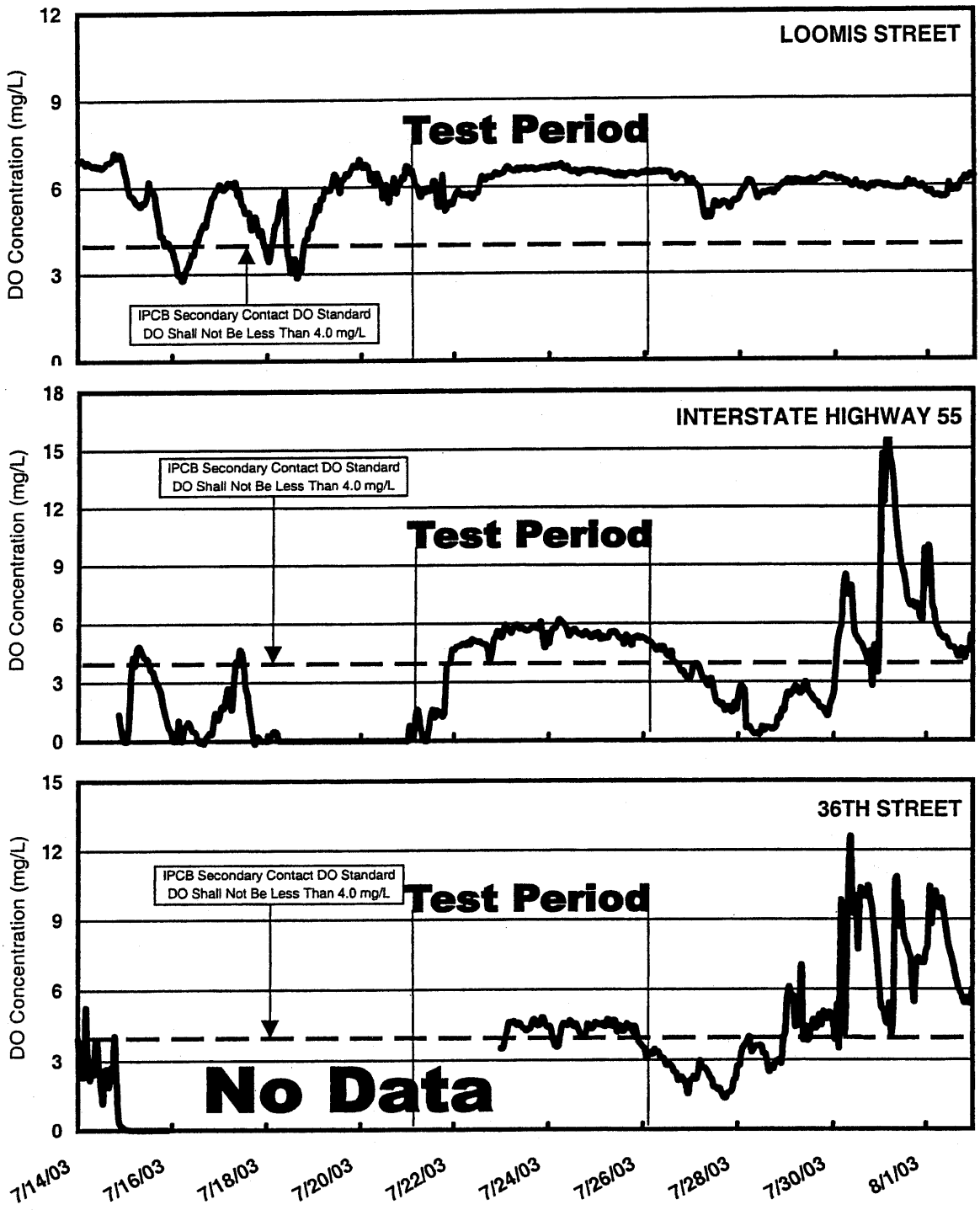
FIGURE 10

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING FIRST 75 MGD WET WEATHER TEST PERIOD



event, but a somewhat longer period elapsed before the effect became apparent (Figure 10).

WATERWAY CONDITIONS DURING THE SECOND 75 MGD WET WEATHER DEMONSTRATION EVENT

The second 75 mgd, wet weather demonstration event was conducted between October 15 and October 20. This demonstration event followed a rain event on October 14 which resulted in a 118.5 MG CSO at RAPS. Pumpage of CSO from RAPS to Bubbly Creek ended at 4:25 p.m. on October 14. The RAPS intake gate was opened at 9:00 a.m. on October 15 and closed at 9:00 a.m. on October 20. Continuous DO monitoring data during the period are summarized in Table 10.

All of the DO readings at Loomis Street were above the DO standard during the period. Average DO at I-55 was above the standard for most of the period, over 84 percent of the hourly readings were greater than 4 mg/L. After some unexplained oscillation in hourly DO values, consistent DO recovery began at I-55 approximately one day (28 hours) after RAPS CSO pumpage ended and 12 hours after 75 mgd demonstration flow began (Figure 11). Recovery of DO was less pronounced at 36th Street. Hourly readings there began to improve to near 2 mg/L approximately 2 days (44 hours) after RAPS CSO pumpage ended and one day (27 hours) after 75 mgd demonstration flow began (Figure 11).

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TABLE 10

DO SUMMARY STATISTICS DURING THE SECOND 75 MGD WET WEATHER DEMONSTRATION EVENT IN BUBBLY CREEK, OCTOBER 15 TO OCTOBER 20, 2003

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Mean DO (mg/L)	5.98	4.50	1.47
Minimum DO (mg/L)	4.88	0.17	0.00
Maximum DO (mg/L)	7.13	6.13	3.17
Standard Deviation (mg/L)	0.70	1.05	1.00
Percent DO values ≥4.0 mg/L	100.0	84.3	0.0
Percent DO values <1.0 mg/L	0.0	2.0	33.9

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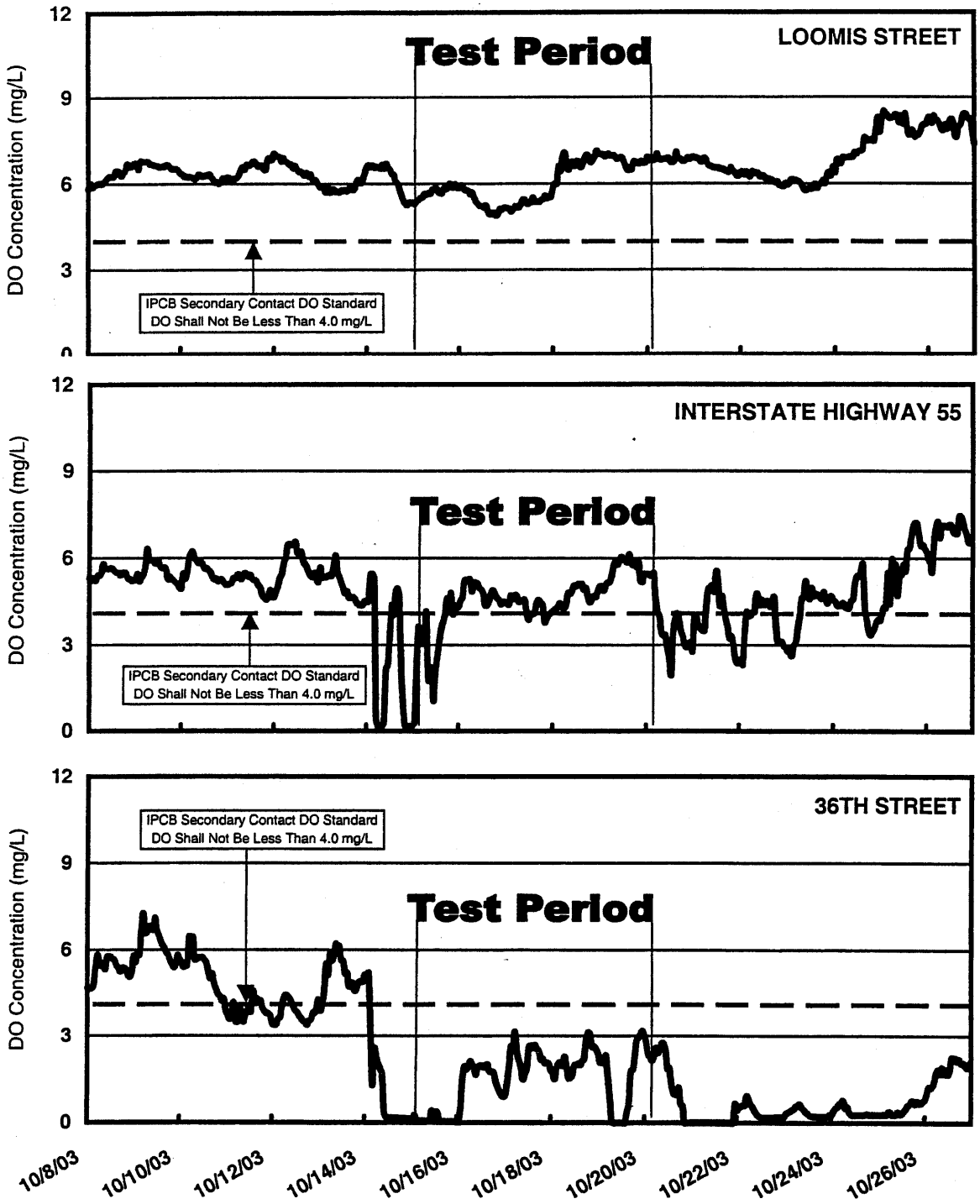
FIGURE 11

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK DURING SECOND 75 MGD WET WEATHER TEST PERIOD



DO at 36th Street was below the IPCB standard for the entire demonstration event and fell to 0 mg/L on October 15 and 19. DO at Loomis Street remained in the 5-7 mg/L range during this period, so it is unclear why the DO remained low at 36th Street during the demonstration event. Elevated DO levels at I-55 and 36th Street prior to the demonstration event were caused by a 38 mgd dry weather demonstration event started on October 10 but stopped on October 14 due to a rain warning. DO at 36th Street declined to near 0 mg/L even though the RAPS sluice gate remained open at an 18 mgd flow rate. Chlorophyll *a* values at 36th Street were comparable to those at Loomis Street and Archer Avenue, ranging from 2.7 µg/L to 6.17 µg/L, and averaging 4.0 µg/L. DO at I-55 showed improvement after the demonstration period, possibly due to the continued flow and increased photosynthetic activity (Figure 11). DO at 36th Street did not show a recovery comparable to I-55.

COMPARISON OF WATER QUALITY DURING DEMONSTRATION EVENTS

Both zero flow periods showed characteristic increases in photosynthetic activity which produced increases in diel DO ranges. Lack of flow, especially following a CSO event at RAPS produced nutrient-rich conditions under which algal cells proliferated in the water column producing an abundance of DO

during daylight. At night, oxygen was consumed by algal and benthic respiration resulting in DO levels that reached 0 mg/L.

The three dry weather demonstration events indicated that the 38 and 75 mgd flow rates were effective in reducing diel DO range and stabilizing DO at or above the IPCB standard, during normal dry weather conditions.

The two 38 mgd wet weather demonstration events showed that this flow rate elevated DO at I-55 to near the IPCB standard, however, 36th Street did not reliably meet the IPCB standard at this flow rate under summer wet weather conditions.

Both 75 mgd wet weather demonstration events allowed I-55 to meet the IPCB Standard most of the time. This flow rate did not result in the DO at 36th Street meeting the IPCB standard more reliably than at the 38 mgd rate. DO readings of 0 mg/L were still observed at 36th Street for brief periods during the 75 mgd wet weather demonstration events.

For the period from August 12 to October 31 when some flow (varying from 18 to 38 mgd) was maintained in Bubbly Creek at all times, DO readings at I-55 and 36th Street were greater than 1 mg/L at all times, but did not reliably meet the IPCB standard of 4.0 mg/L.

Table 11 presents an overall summary of DO levels in Bubbly Creek during the period of May 1 to October 31, 2003.

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TABLE 11

SUMMARY OF HOURLY DO VALUES MEASURED DURING THE
2003 BUBBLY CREEK DEMONSTRATION EVENTS

Metric	Monitoring Location		
	Loomis St. (SBCR)	Interstate-55	36th St.
Zero Flow Period - Mean DO (mg/L)	5.78	2.92	3.61
38 mgd Dry Weather - Mean DO (mg/L)	6.93	6.30	4.95
75 mgd Dry Weather - Mean DO (mg/L)	6.07	5.79	1.80
38 mgd Wet Weather - Mean DO (mg/L)	6.10	4.20	4.77
75 mgd Wet Weather - Mean DO (mg/L)	6.14	4.55	2.55
Post August 12 Variable Flow - Mean DO (mg/L)	5.94	4.66	2.82
Zero Flow Period - Percent DO ≥4.0 mg/L	99.7	29.0	38.1
38 mgd Dry Weather - Percent DO ≥4.0 mg/L	100.0	97.2	83.3
75 mgd Dry Weather - Percent DO ≥4.0 mg/L	100.0	99.6	82.2
38 mgd Wet Weather - Percent DO ≥4.0 mg/L	100.0	71.5	3.8
75 mgd Wet Weather - Percent DO ≥4.0 mg/L	100.0	83.1	32.8
Post August 12 Variable Flow - Percent DO ≥4.0 mg/L	100.0	88.9	31.7

Overall, hourly DO readings at I-55 and 36th Street recorded during the 38 mgd and 75 mgd dry weather demonstration flows resulted in the highest mean DO and highest compliance with the IPCB DO standard observed during the project. Between 79 percent and 97 percent of the hourly values at these two locations were at or above 4.0 mg/L. Mean DO values were also above 4.0 mg/L at both locations. It should be noted that 75 mgd dry weather demonstration flows did not produce better compliance with the IPCB standard or higher mean DO at I-55 or 36th Street than 38 mgd dry weather flows.

At I-55, the 75 mgd wet weather demonstration flows increased mean DO and compliance with the IPCB DO standard only slightly more than the 38 mgd demonstration flows. At 36th Street, 38 mgd wet weather demonstration flows resulted in the lowest mean DO and poorest compliance with the IPCB DO standard seen during the project. Seventy-five mgd wet weather demonstration flows improved mean DO at 36th Street slightly more than the 38 mgd flow but both mean values remained well below 4.0 mg/L. Seventy-five mgd wet weather demonstration flows improved the percentage of hourly values in compliance with the IPCB standard at 36th Street, but only one-third of the values equaled or exceeded 4.0 mg/L. This is similar to

the percent compliance of the hourly DO values measured there during the zero flow and variable flow periods of the project.

Mean DO at I-55 during the post August 12 variable flow period was 4.66 mg/L with nearly 89 percent of the hourly DO readings equaling or exceeding 4.0 mg/L. During this same time period at 36th Street, however, mean DO remained below 4.0 mg/L and percent compliance with IPCB standards was similar to that observed during the zero flow period.

QUALITATIVE DISCUSSION OF WATERWAY FLOATABLES AND ODORS

"Sanitary Waste" floatables and "Oil" increased during and after some CSO events but they were also observed during dry weather periods. As expected, the largest total number of sanitary waste floatable observations (90) occurred at RAPS.

This may have resulted from material being trapped in the large embayment north of the pump station and moved around by wind. Presence of this material during dry weather may also be due to material deposited on the waterway bottom during CSO events later made buoyant by trapped gas. A similar phenomenon causes clumps of bottom sediment to rise to the surface, mostly in areas downstream of Archer Avenue. "Dead Fish," although few in number, correlate to CSO events and periods of low DO. Overall, the largest total number of dead fish (7) was

observed at Archer Avenue. "Street Litter" represented a total of 261 observations during the study at the three locations. The largest total number of "Street Litter" observations (103) occurred at RAPS.

Odor observations at Archer Avenue occurred on six days during the study and were associated with east, west or south-west winds. Odor observations at 36th Street occurred on 14 days during the study and were associated with north, east, south, southwest, and west winds. The greatest number of odor observations occurred at RAPS (30) and were associated with north, northeast, east, south, southwest, and west winds. Odors at the RAPS location may be associated with the pump station or with the Tunnel and Reservoir Plan (TARP) drop shafts nearby. As some odors were noticeable at a variety of wind directions, it is difficult to determine whether odors were actually emanating from Bubbly Creek or from other sources in the surrounding area.

FISH DATA

Table 12 presents the results of fish surveys conducted at Loomis Street (SBCR) and in Bubbly Creek in 2002 and 2003. A total of 15 fish species or hybrids were found, but no more than 9 species were collected at any one location. Five

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TABLE 12

NUMBER OF FISH COLLECTED FROM BUBBLY CREEK AND THE SOUTH BRANCH CHICAGO RIVER DURING AUGUST 2002 AND SEPTEMBER 2003

Fish Species or Hybrid (X)	SBCR[1]	BUBBLY CREEK			
	Loomis Street	Interstate-55		35th Street	RAPS[2]
	2002	2002	2003	2003	2003
	Number of Fish				
Gizzard shad	20	9	6	15	97
Coho salmon	0	0	0	0	1
Goldfish	2	0	0	0	0
Carp	31	4	1	9	28
Carp X Goldfish hybrid	2	0	0	0	10
Golden shiner	0	0	3	6	8
Emerald shiner	1	2	0	0	0
Spotfin shiner	0	0	5	4	0
Bluntnose minnow	0	0	4	2	51
Mosquitofish	0	0	0	2	0
Green sunfish	2	0	4	0	0
Pumpkinseed sunfish	1	3	11	11	11

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TABLE 12 (Continued)

NUMBER OF FISH COLLECTED FROM BUBBLY CREEK AND THE SOUTH BRANCH CHICAGO RIVER DURING AUGUST 2002 AND SEPTEMBER 2003

Fish Species or Hybrid (X)	SBCR[1]	BUBBLY CREEK			
	Loomis Street	Interstate-55		35th Street	RAPS[2]
	2002	2002	2003	2003	2003
	Number of Fish				
Green sunfish X Pumpkinseed hybrid	4	0	0	0	0
Bluegill sunfish	6	0	7	3	5
Largemouth bass	7	3	2	1	1
Total Number of Fish	76	21	43	53	212
Total Number of Species	8	5	9	9	9

[1]South Branch Chicago River.
[2]Racine Avenue Pumping Station.

species of game fish were collected including coho salmon, green sunfish, bluegill sunfish, pumpkinseed sunfish, and largemouth bass.

The fish collection program was not specifically linked to the Bubbly Creek experimental plan, and therefore, is only useful for giving a general overview of fish populations in the area.

Discharges of CSO from RAPS may put resident fish populations in Bubbly Creek at risk as they may not be able to escape rapidly increasing flows of wastewater.

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APPENDIX I

DAILY WINKLER DO AND CHLOROPHYLL *a*, AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEMONSTRATION PROJECT

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll a	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
05/01/03	7.53	7.67	NA	0.716	None	639.7
05/02/03	1.13	0.15	NA	0.955	None	
05/03/03	NS	NS	NS	NS	None	
05/04/03	NS	NS	NS	NS	None	94.1
05/05/03	6.44	5.84	NA	0.684	None	329.4
05/06/03	3.60	2.69	NA	0.46	None	
05/07/03	3.55	0.55	NA	1.105	None	
05/08/03	5.81	0.81	NA	1.207	None	569
05/09/03	6.72	6.27	NA	1.518	None	
05/10/03	NS	NS	NS	NS	None	12
05/11/03	NS	NS	NS	NS	None	124.5
05/12/03	1.70	0.42	NA	3.507	None	
05/13/03	0.47	0.00	NA	1.996	Start 38 mgd (wet weather)	
05/14/03	3.39	0.43	NA	6.505	Continue 38 mgd (wet weather)	
05/15/03	5.58	1.93	NA	30.599	Continue 38 mgd (wet weather)	
05/16/03	4.80	3.49	NA	19.185	Continue 38 mgd (wet weather)	
05/17/03	NS	NS	NS	NS	Continue 38 mgd (wet weather)	
05/18/03	NS	NS	NS	NS	Continue 38 mgd (wet weather)	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
05/19/03	3.77	1.12	NA	22.983	End 38 mgd (wet weather)	
05/20/03	0.65	1.19	1.94	22.751	None	
05/21/03	3.23	8.29	7.05	81.521	None	
05/22/03	2.94	16.95	14.38	225.614	None	
05/23/03	5.51	17.47	17.09	200.326	None	
05/24/03	NS	NS	NS	NS	None	
05/25/03	NS	NS	NS	NS	None	
05/26/03	NS	NS	NS	NS	None	
05/27/03	7.87	9.40	8.35	115.713	None	
05/28/03	4.41	4.08	4.01	67.687	None	
05/29/03	2.64	2.91	2.74	44.845	None	
05/30/03	1.88	1.16	1.52	19.672	None	
05/31/03	NS	NS	NS	NS	None	
06/01/03	NS	NS	NS	NS	None	
06/02/03	1.20	2.69	2.01	6.445	None	
06/03/03	0.57	2.10	2.34	11.058	None	
06/04/03	4.80	3.80	2.20	20.829	None	
06/05/03	2.41	4.39	4.63	18.885	None	
06/06/03	2.14	3.71	4.01	115.631	None	
06/07/03	NS	NS	NS	NS	None	
06/08/03	NS	NS	NS	NS	None	
06/09/03	4.87	11.23	13.40	79.018	None	
06/10/03	4.81	8.49	13.06	107.234	None	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
06/11/03	3.39	8.47	9.53	161.675	Start 38 MGD (dry weather)	
06/12/03	6.26	3.02	1.80	18.225	Continue 38 mgd (dry weather)	
06/13/03	6.99	4.39	3.60	7.111	Continue 38 mgd (dry weather)	
06/14/03	NS	NS	NS	NS	Continue 38 mgd (dry weather)	
06/15/03	NS	NS	NS	NS	Continue 38 mgd (dry weather)	
06/16/03	7.57	5.03	5.49	9.39	Continue 38 mgd (dry weather)	
06/17/03	6.62	5.27	6.11	11.81	End 38 mgd (dry weather)	
06/18/03	5.09	4.50	5.99	27.98	None	
06/19/03	4.05	8.30	8.70	72.918	None	
06/20/03	3.85	10.89	7.72	135.071	None	
06/21/03	NS	NS	NS	NS	None	
06/22/03	NS	NS	NS	NS	None	
06/23/03	6.76	5.39	7.42	36.368	Start 75 mgd (dry weather)	
06/24/03	5.91	4.98	4.78	12.986	Continue 75 mgd (dry weather)	
06/25/03	6.70	5.54	5.69	5.562	Continue 75 mgd (dry weather)	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
06/26/03	6.42	4.60	5.01	4.407	Continue 75 mgd (dry weather)	
06/27/03	5.44	4.52	4.79	3.139	Continue 75 mgd (dry weather)	
06/28/03	NS	NS	NS	NS	End 75 mgd (dry weather)	
06/29/03	NS	NS	NS	NS	None	
06/30/03	4.03	6.22	3.90	35.705	None	
07/01/03	4.74	8.39	6.93	78.601	None	
07/02/03	6.68	14.10	12.38	242.833	None	
07/03/03	6.90	9.42	11.50	131.208	None	
07/04/03	NS	NS	NS	NS	None	
07/05/03	NS	NS	NS	NS	None	
07/06/03	NS	NS	NS	NS	None	
07/07/03	3.40	3.78	4.63	53.993	None	
07/08/03	3.27	5.85	5.74	83.149	None	
07/09/03	3.29	5.70	5.77	54.386	None	
07/10/03	4.41	3.40	3.78	48.943	None	
07/11/03	4.60	6.14	5.03	118.935	None	
07/12/03	NS	NS	NS	NS	None	
07/13/03	NS	NS	NS	NS	None	
07/14/03	6.82	7.47	6.93	80.775	None	
07/15/03	0.65	1.02	NS	21.772	None	273.2
07/16/03	2.81	0.40	0.61	2.9	Start 75 mgd (wet weather)	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
07/17/03	2.36	0.65	0.60	7.493	Cancel 75 mgd (wet weather)	456.6
07/18/03	2.04	1.17	0.65	0.767	None	183.1
07/19/03	NS	NS	NS	NS	None	
07/20/03	NS	NS	NS	NS	None	
07/21/03	4.77	3.40	1.51	160.915	Start 75 mgd (wet weather)	
07/22/03	5.15	1.30	0.99	13.361	Continue 75 mgd (wet weather)	
07/23/03	6.19	4.11	NS	4.345	Continue 75 mgd (wet weather)	
07/24/03	6.39	5.39	4.99	4.04	Continue 75 mgd (wet weather)	
07/25/03	6.28	5.20	5.28	17.461	Continue 75 mgd (wet weather)	
07/26/03	NS	NS	NS	NS	End 75 mgd (wet weather)	
07/27/03	NS	NS	NS	NS	None	
07/28/03	4.02	2.98	2.87	21.023	None	
07/29/03	3.20	5.48	8.33	42.155	None	
07/30/03	3.09	10.89	10.09	163.192	None	
07/31/03	7.20	6.60	11.69	184.124	None	
08/01/03	9.20	7.88	9.57	93.708	None	
08/02/03	NS	NS	NS	NS	None	
08/03/03	NS	NS	NS	NS	None	65.9

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
08/04/03	3.13	0.39	0.41	6.802	None	
08/05/03	1.75	0.50	0.52	9.73	Start 38 mgd (wet weather)	
08/06/03	5.59	1.51	1.19	13.193	Continue 38 mgd (wet weather)	
08/07/03	5.89	4.50	4.03	8.195	Continue 38 mgd (wet weather)	
08/08/03	5.98	3.50	3.62	12.906	Continue 38 mgd (wet weather)	
08/09/03	NS	NS	NS	NS	Continue 38 mgd (wet weather)	
08/10/03	NS	NS	NS	NS	Continue 38 mgd (wet weather)	
08/11/03	5.31	3.68	3.46	5.263	End 38 mgd (wet weather)	
08/12/03	5.60	4.54	3.63	6.506	Continue 38 mgd	
08/13/03	5.09	2.84	3.61	3.499	Continue 38 mgd	
08/14/03	5.70	3.41	3.13	4.068	Continue 38 mgd	
08/15/03	5.70	3.62	4.19	2.745	Continue 38 mgd	
08/16/03	NS	NS	NS	NS	Continue 38 mgd	
08/17/03	NS	NS	NS	NS	Continue 38 mgd	
08/18/03	6.06	3.08	3.28	0.387	Continue 38 mgd	
08/19/03	5.82	4.60	3.79	2.086	Continue 38 mgd	
08/20/03	4.76	3.86	4.00	3.367	Continue 38 mgd	
08/21/03	5.42	4.20	3.81	2.828	Continue 38 mgd	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
08/22/03	5.25	4.68	4.17	3.556	Continue 38 mgd	
08/23/03	NS	NS	NS	NS	Change to 18 mgd	
08/24/03	NS	NS	NS	NS	Continue 18 mgd	
8/25/03	5.72	3.49	3.58	4.572	Continue 18 mgd	
8/26/03	5.20	3.10	3.50	7.079	Continue 18 mgd	
8/27/03	5.27	4.37	4.17	6.033	Continue 18 mgd	
8/28/03	4.37	3.01	3.42	6.396	Continue 18 mgd	
8/29/03	4.83	2.86	2.66	10.395	Continue 18 mgd	
8/30/03	NS	NS	NS	NS	Continue 18 mgd	
8/31/03	NS	NS	NS	NS	Continue 18 mgd	
9/1/03	NS	NS	NS	NS	Continue 18 mgd	
09/02/03	5.61	2.79	2.80	2.235	Start 75 mgd (dry weather)	
09/03/03	6.20	4.56	4.61	1.306	Continue 75 mgd (dry weather	
09/04/03	5.40	5.00	5.00	3.961	Continue 75 mgd (dry weather	
09/05/03	6.60	5.41	5.04	2.868	Continue 75 mgd (dry weather	
09/06/03	NS	NS	NS	NS	Continue 75 mgd (dry weather	
09/07/03	NS	NS	NS	NS	End 75 mgd (dry weather)	
09/08/03	5.38	5.00	4.26	4.293	Continue 21 mgd	
09/09/03	4.59	4.01	3.91	6.018	Continue 21 mgd	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
09/10/03	5.49	3.15	4.14	17.809	Continue 21 mgd	
09/11/03	4.42	4.21	4.62	19.704	Continue 21 mgd	
09/12/03	5.12	3.14	4.91	17.358	Continue 21 mgd	
09/13/03	NS	NS	NS	NS	Continue 21 mgd	
09/14/03	NS	NS	NS	NS	Continue 21 mgd	
09/15/03	4.20	4.01	5.19	17.815	Continue 21 mgd	
09/16/03	4.44	3.37	4.20	19.791	Continue 21 mgd	
09/17/03	5.01	3.02	4.79	19.104	Continue 21 mgd	
09/18/03	2.79	3.40	4.61	12.299	Continue 21 mgd	
09/19/03	5.09	3.64	4.77	12.1	Continue 21 mgd	
09/20/03	NS	NS	NS	NS	Continue 21 mgd	
09/21/03	NS	NS	NS	NS	Continue 21 mgd	
09/22/03	7.29	4.09	4.74	14.538	Continue 21 mgd	
09/23/03	6.02	4.62	4.90	18.596	Continue 21 mgd	
09/24/03	5.89	4.84	4.87	7.609	Continue 21 mgd	
09/25/03	6.69	5.03	5.05	17.841	Continue 21 mgd	
09/26/03	5.15	5.12	4.48	11.551	Continue 21 mgd	
09/27/03	NS	NS	NS	NS	Continue 21 mgd	
09/28/03	NS	NS	NS	NS	Continue 21 mgd	
09/29/03	7.43	4.11	4.66	16.023	Continue 21 mgd	
09/30/03	5.75	5.27	5.60	6.885	Continue 21 mgd	
10/01/03	7.30	5.60	5.82	10.431	Continue 21 mgd	
10/02/03	6.07	5.95	5.81	8.597	Continue 21 mgd	
10/03/03	5.76	5.78	5.88	13.584	Continue 21 mgd	
10/04/03	NS	NS	NS	NS	Continue 21 mgd	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
10/05/03	NS	NS	NS	NS	Continue 21 mgd	
10/06/03	5.79	5.30	5.90	15.185	Continue 21 mgd	
10/07/03	6.75	4.74	5.20	8.221	Continue 21 mgd	
10/08/03	5.60	5.91	5.68	23.648	None	
10/09/03	6.37	7.41	8.48	54.856	None	
10/10/03	6.39	7.20	8.43	66.354	Start 38 mgd (dry weather)	
10/11/03	NS	NS	NS	NS	Continue 38 mgd (dry weather)	
10/12/03	NS	NS	NS	NS	Continue 38 mgd (dry weather)	
10/13/03	6.18	6.42	4.03	17.84	Continue 38 mgd (dry weather)	
10/14/03	3.16	0.41	4.46	5.176	Cancel 38 mgd (dry weather)	118.5
10/15/03	4.91	0.54	0.37	2.661	Start 75 mgd (wet weather)	
10/16/03	5.13	2.33	0.79	6.173	Continue 75 mgd (wet weather)	
10/17/03	5.35	2.76	1.33	2.658	Continue 75 mgd (wet weather)	
10/18/03	NS	NS	NS	NS	Continue 75 mgd (wet weather)	
10/19/03	NS	NS	NS	NS	Continue 75 mgd (wet weather)	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1 (Continued)

DAILY WINKLER DO AND CHLOROPHYLL *a* AVERAGE FLOW TO STICKNEY WRP AND RAPS PUMPAGE, DURING 2003 BUBBLY CREEK DEOMONSTRATION PROJECT

Date	Archer Ave. DO	36th St. DO	RAPS DO	Chlorophyll *a*	Bubbly Creek Flow to Stickney WRP	CSO Volume Pumped to Bubbly Creek
10/20/03	5.80	3.99	3.36	4.653	Start 18 mgd	
10/21/03	3.25	2.64	0.81	7.556	Continue 18 mgd	
10/22/03	3.54	1.52	0.68	7.868	Continue 18 mgd	
10/23/03	3.77	1.48	0.92	9.236	Continue 18 mgd	
10/24/03	5.00	0.60	0.40	16.904	Continue 18 mgd	
10/25/03	NS	NS	NS	NS	None	
10/26/03	NS	NS	NS	NS	None	
10/27/03	6.65	2.87	0.85	22.738	None	
10/28/03	5.62	2.84	0.79	25.865	None	
10/29/03	6.31	4.01	0.82	37.129	None	
10/30/03	5.94	4.03	1.43	25.898	None	
10/31/03	5.21	4.43	2.42	34.779	None	

NA = Not Available.
NS = No Sample.

APPENDIX II

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station														
	Archer Ave.					36th Street					Racine Ave. Pumping Station				
	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction
5/1/03					NE					NE					NE
5/2/03					NE					NE					NE
5/5/03					W					W					W
5/6/03					NE					NE					NE
5/7/03					NE					NE					NE
5/8/03					NE					NE					NE
5/9/03					S					S					S
5/12/03					NE					NE					NE
5/13/03					NW					NW					NW
5/14/03					NE					NE					NE
5/15/03					NE					NE					NE
5/16/03					N					N					N
5/19/03					S					S	X				S
5/20/03					NE					NE					NE
5/21/03					NE					NE					NE
5/22/03					NE					NE					NE
5/23/03					NE					NE					NE
5/27/03					E					E					E
5/28/03					N	X				N	X				N
5/29/03					NE					NE					NE
5/30/03					SW	X				SW	X				SW
6/2/03					E					E					E
6/3/03					NE					NE					NE
6/4/03					NE					NE					NE

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station														
	Archer Ave.					36th Street					Racine Ave. Pumping Station				
	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction
6/5/03					W					W					W
6/6/03					SW					SW					SW
6/9/03					W					W					W
6/10/03					S					S					S
6/11/03					NE					NE					NE
6/12/03					NE					NE					NE
6/13/03					NE					NE	X				NE
6/16/03					E					E					E
6/17/03					N					N					N
6/18/03	X	X			N	X				N	X				N
6/19/03					NE					NE					NE
6/20/03					NE					NE					NE
6/23/03					SW					SW					SW
6/24/03					SW					SW					SW
6/25/03					SW					SW					SW
6/26/03					SW					SW					SW
6/27/03					SW					SW					SW
6/30/03					NE					NE					NE
7/1/03	X				W	X				W	X				W
7/2/03					NE					NE					NE
7/3/03					SW					SW					SW
7/7/03	X				SW	X				SW	X				SW
7/8/03					NE					NE					NE

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station														
	Archer Ave.					36th Street					Racine Ave. Pumping Station				
	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction
7/9/03					W					W					W
7/10/03					W					W	X				W
7/11/03					W					W					W
7/14/03					SW					SW					SW
7/15/03					W					W					W
7/16/03					N					N					N
7/17/03					WSW					WSW	X				WSW
7/18/03					NE					NE					NE
7/21/03					NE					NE					NE
7/22/03					NE					NE					NE
7/23/03					E					E					E
7/24/03					N					N					N
7/25/03					SW					SW					SW
7/28/03					SW					SW					SW
7/29/03					N					N					N
7/30/03					SW					SW			X		SW
7/31/03					SW					SW					SW
8/1/03					SW					SW					SW
8/4/03					N					N					N
8/5/03					E	X				E	X				E
8/6/03					N					N			X		N
8/7/03					E					E	X				E
8/8/03					NE					NE	X				NE

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station														
	Archer Ave.					36th Street					Racine Ave. Pumping Station				
	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction
8/11/03					SW					SW	X				SW
8/12/03					NE					NE	X				NE
8/13/03					W					W	X				W
8/14/03					N					N					N
8/15/03					SW	X		X		SW	X		X		SW
8/18/03					SW					SW	X				SW
8/19/03					N					N	X				N
8/20/03					S	X				S	X				S
8/21/03					S					S	X				S
8/22/03					NE					NE					NE
8/25/03					E					E	X				E
8/26/03	X				WSW	X				S	X				W
8/27/03					NE					NE					NE
8/28/03					SW					SW					SW
8/29/03					N					N					N
9/2/03					NE					NE					NE
9/3/03					S					S					S
9/4/03					SW					SW					SW
9/5/03					NE					NE					NE
9/8/03					SW					SW					SW
9/9/03					N					N	X				N
9/10/03					E	X				E	X				E
9/11/03					SW					SW					SW

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station														
	Archer Ave.					36th Street					Racine Ave. Pumping Station				
	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction
9/12/03	X				E	X				E	X				E
9/15/03					W					W					W
9/16/03					SW					SW					SW
9/17/03					SW					SW					SW
9/18/03	X				E	X				E	X				E
9/19/03					NE					NE					NE
9/22/03					S					S					S
9/23/03					S					S					S
9/24/03					SW					SW					SW
9/25/03					W	X				W	X				WSW
9/26/03					SW					SW					SW
9/29/03					W					W					W
9/30/03					SW					SW					SW
10/1/03					SW					SW					SW
10/2/03					N					N					N
10/3/03					S					S					S
10/6/03					NE					NE					NE
10/7/03					S					S					S
10/8/03					S					S					S
10/9/03					SW					SW					SW
10/10/03					SW					SW					SW
10/13/03					SW					SW					SW
10/14/03					NE					NE					NE

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

AMBIENT ODOR OBSERVATIONS AT THREE LOCATIONS NEAR BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station														
	Archer Ave.					36th Street					Racine Ave. Pumping Station				
	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction	Septic/ Sewage	Oily	Musty	Earthy	Wind Direction
10/15/03					S					S					S
10/16/03					NE					NE					NE
10/17/03					NW					NW					NW
10/20/03					SW					SW					SW
10/21/03					NW					NW					NW
10/22/03					N					N					N
10/23/03					W	X				W	X				W
10/24/03					SW					SW					SW
10/27/03					S					S					S
10/28/03					W					W					W
10/29/03					SW					SW					SW
10/30/03					S					S					S
10/31/03					SW					SW					SW

APPENDIX III

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING THE PERIOD MAY 1 TO OCTOBER 31, 2003

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING
THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station											
	Archer Ave.				36th Street				Racine Ave. Pumping Station			
	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish
5/1/03	X	X			X	X			X	X		
5/2/03	X	X			X				X	X		
5/5/03	X	X			X							
5/6/03	X	X				X			X	X		
5/7/03	X	X			X	X			A	X		
5/8/03	X	X			A	X			X	X		
5/9/03	X	X			X	X	X		X	X	X	
5/13/03	X	X			X	X			X			
5/14/03		X			X	X			x	X	X	
5/15/03	X	X							X	X	X	
5/16/03	X	X				X			X	X		
5/19/03	X				X	X			X	X		
5/20/03		X							X	X		
5/21/03	X	X							X	X		
5/22/03	X	X							X	X		
5/23/03	X	X			X				X	X		
5/27/03	X	X							X	X	X	
5/28/03	X	X								X		
5/29/03		X				X			X	X		
5/30/03	X	X				X				X		
6/2/03		X							X	X		
6/3/03		X	X			X			X	X		
6/4/03		X				X			X	X		

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING
THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station											
	Archer Ave.				36th Street				Racine Ave. Pumping Station			
	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish
6/5/03	X	X			X	X			X	X		
6/6/03	X	X			X	X			X	X		
6/9/03	X	X			X	X				X		
6/10/03	X	X				X			X	X		
6/11/03		X							X	X		
6/12/03	X	X			X	X			X	X		
6/13/03	X	X				X			X	X	X	
6/16/03		X							X	X	X	
6/17/03	X	X			X	X			X	X		
6/18/03	X	X		X	X	X			X	X		
6/19/03	X	X			X				X	X		
6/20/03	X	X				X			X	X	X	
6/23/03	X				X				X			
6/24/03	X	X			X				X	X		
6/25/03	X	X			X	X			X	X		
6/26/03		X			X	X			X	X		
6/27/03		X							X	X		
6/30/03	X				X	X	X		X	X		
7/1/03	X	X			X	X			X	X		
7/2/03	X	X			X				X	X		
7/7/03		X				X	X		X			
7/8/03	X	X			X		X		X		X	
7/9/03	X	X					X		X	X	X	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING
THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station											
	Archer Ave.				36th Street				Racine Ave. Pumping Station			
	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish
7/10/03		X					X				X	
7/11/03										X		
7/14/03		X				X				X		X
7/15/03	X	X		X	X	X	X		*	*	*	*
7/16/03	X	X			X	X		X	X	X	X	
7/17/03		X	X			X			X	X	X	
7/18/03	X	X	X		X				X	X		
7/21/03	X	X			X	X				X	X	
7/22/03		X				X			X	X		
7/23/03	X	X			X	X			X	X		
7/24/03	X	X				X			X	X		
7/25/03		X							X	X		
7/28/03	X	X			X				X	X		
7/29/03	X								X	X		
7/30/03	X	X				X			X	X		
7/31/03	X	X			X	X			X	X		
8/1/03	X	X										
8/4/03	X	X			X				X			
8/5/03	X	X		X	X	X		X	X	X	X	
8/6/03	X	X							X	X		X
8/7/03	X	X			X	X			X	X	X	
8/8/03		X							X	X	X	
8/11/03	X	X			X	X			X	X	X	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING
THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station											
	Archer Ave.				36th Street				Racine Ave. Pumping Station			
	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish
8/12/03									X	X		
8/13/03									X	X		
8/14/03	X	X							X	X		
8/15/03	X	X	X		X	X			X	X		
8/18/03	X	X							X	X	X	
8/19/03		X							X	X		
8/20/03						X			X	X		
8/21/03	X	X							X	X		
8/22/03		X							X	X		
8/25/03		X	X			X			X	X		
8/26/03									X	X		
8/27/03									X	X		
8/28/03					X	X			X	X		
8/29/03		X		X	X	X	X		X	X		
9/2/03		X				X			X	X		
9/3/03	X	X							X	X		
9/4/03		X							X	X		
9/5/03		X							X	X		
9/8/03	X	X			X	X			X	X		
9/9/03		X			X	X	X		X	X	X	
9/10/03					X				X	X	X	
9/11/03		X			X	X			X	X	X	
9/12/03	X	X			X	X			X	X	X	

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING
THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station											
	Archer Ave.				36th Street				Racine Ave. Pumping Station			
	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish
9/15/03		X							X	X		
9/16/03						X			X	X		
9/17/03					X	X			X	X	X	
9/18/03	X	X			X				X			
9/19/03						X				X		
9/22/03										X		
9/23/03		X										
9/24/03		X								X		
9/26/03		X								X		
9/29/03										X		
9/30/03		X					X					
10/1/03							X					
10/3/03									X	X		
10/6/03		X							X	X		
10/8/03												
10/9/03						X				X		
10/10/03										X		
10/13/03										X		
10/14/03	X	X			X	X				X		
10/15/03	X	X			X			X				
10/16/03				X								X
10/17/03										X		
10/20/03		X			X	X			X	X		X

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

FLOATABLES AT THREE LOCATIONS IN BUBBLY CREEK DURING
THE PERIOD MAY 1 TO OCTOBER 31, 2003

Date	Bubbly Creek Monitoring Station											
	Archer Ave.				36th Street				Racine Ave. Pumping Station			
	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish	Sanitary Waste	Street Litter	Oil	Dead Fish
10/21/03					X			X				
10/22/03		X			X	X			X	X		
10/23/03	X	X		X		X	X		X	X	X	X
10/24/03					X	X				X		X
10/27/03		X			X	X						
10/28/03		X				X						
10/29/03						X				X		
10/30/03		X			X							
10/31/03	X	X		X								

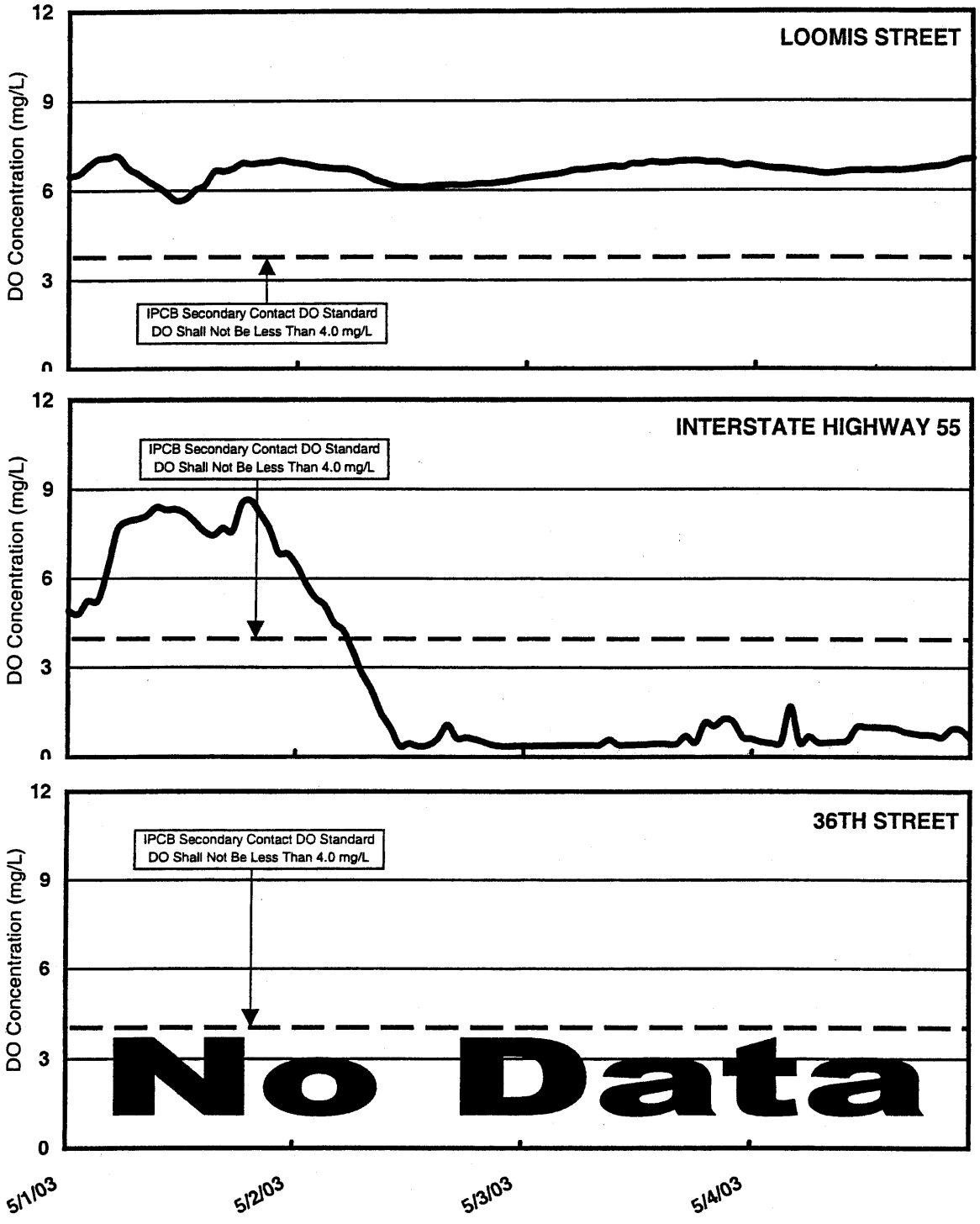
APPENDIX IV

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-1

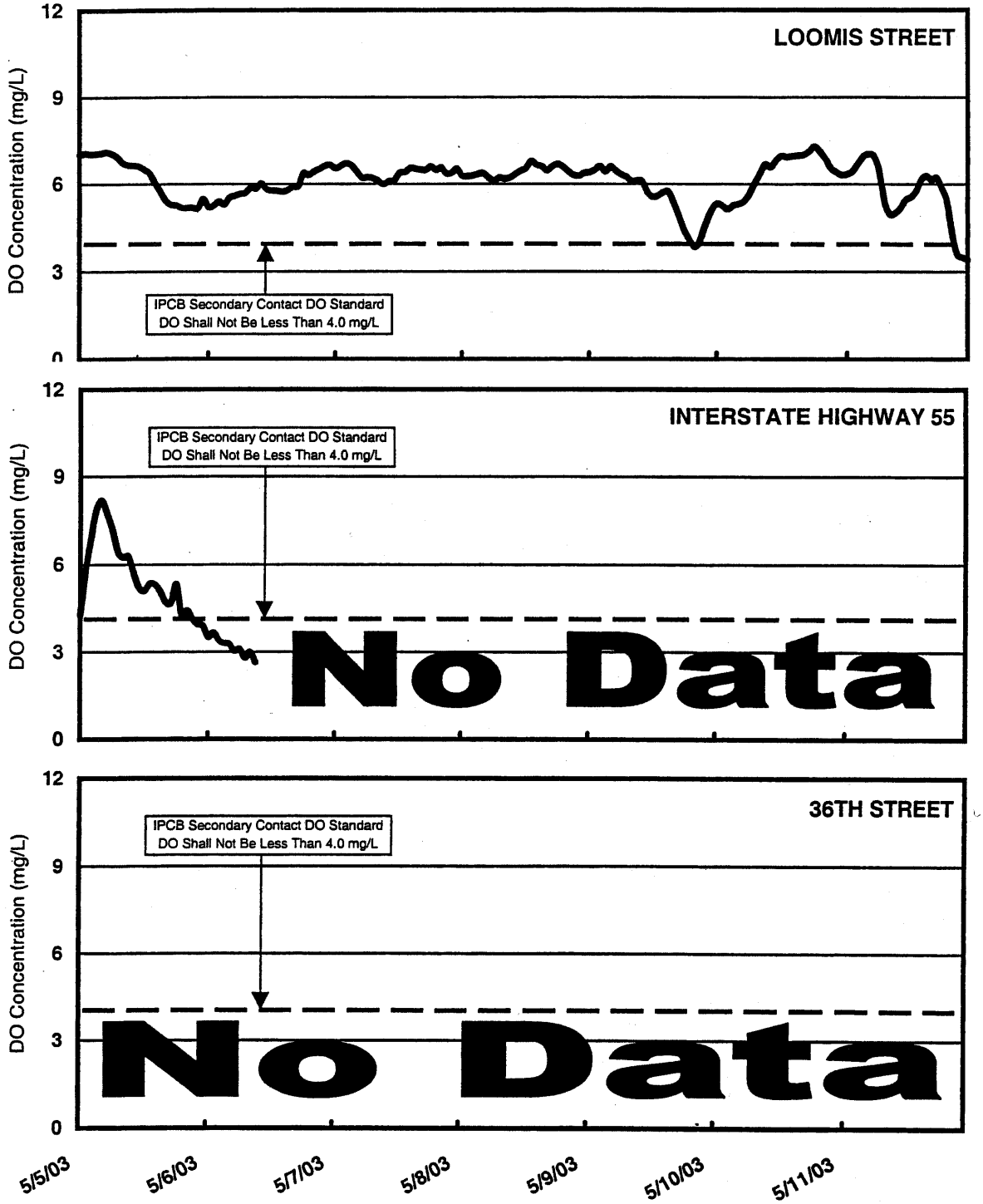
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
MAY 1 THROUGH MAY 4, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-2

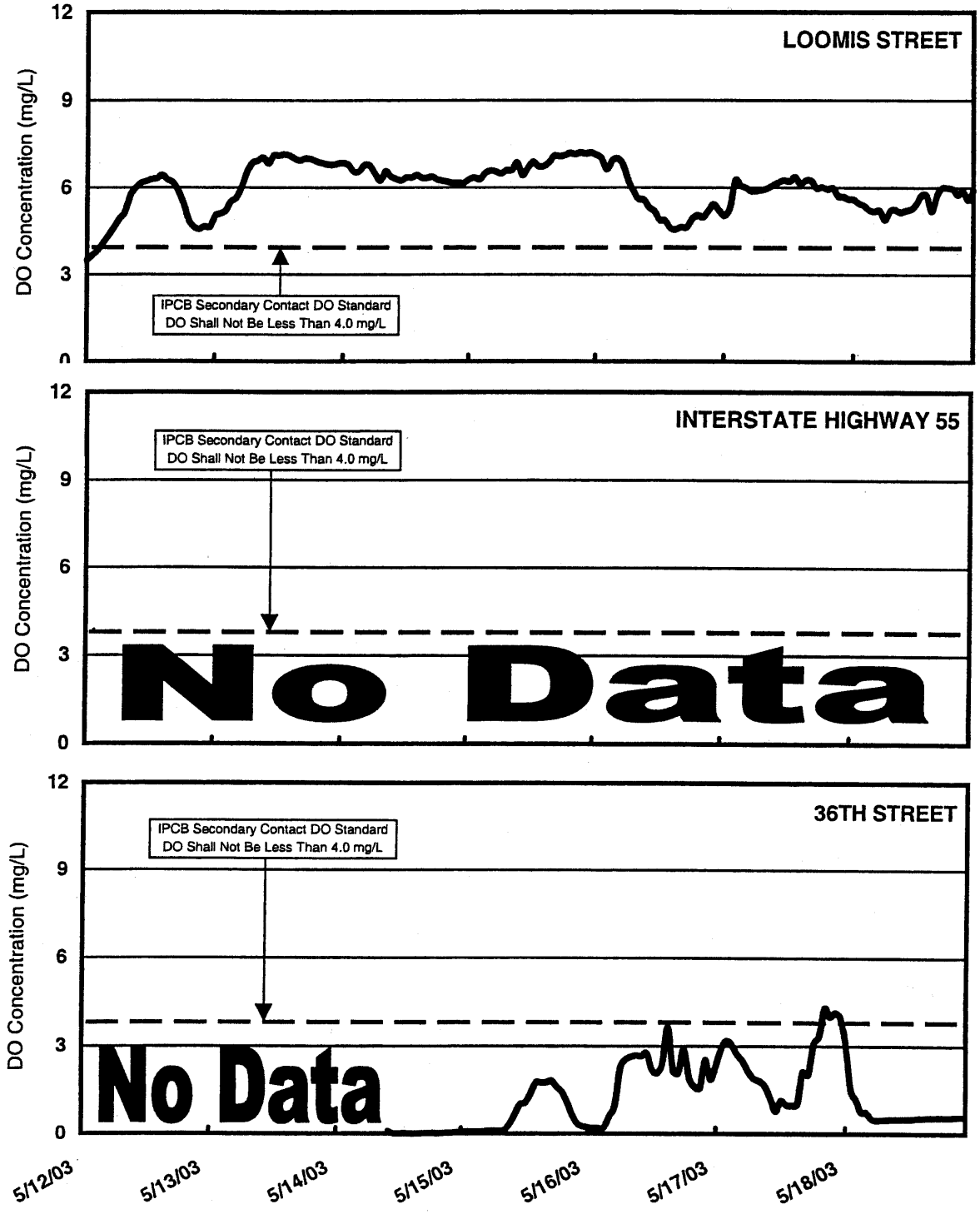
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
MAY 5 THROUGH MAY 11, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-3

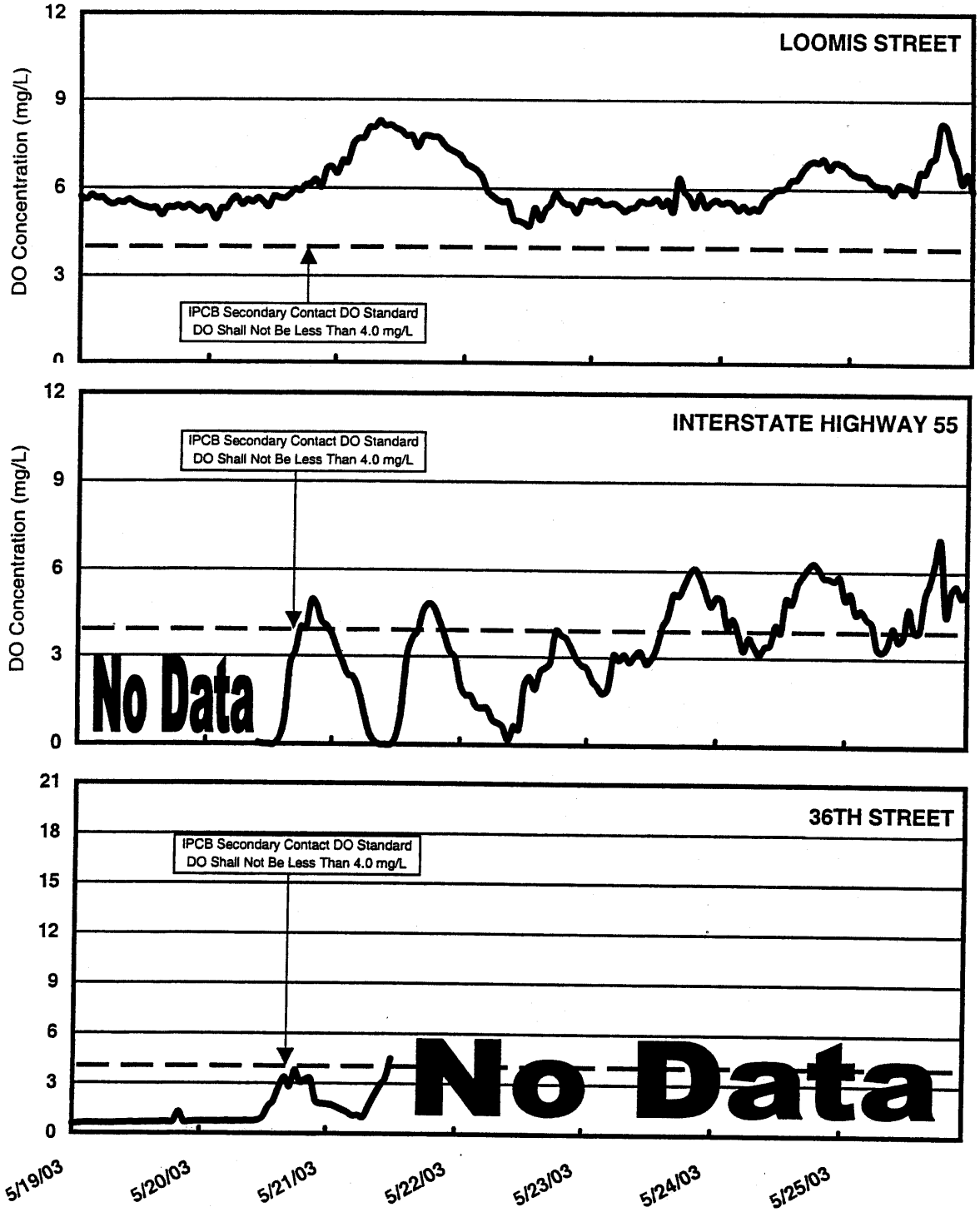
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
MAY 12 THROUGH MAY 18, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-4

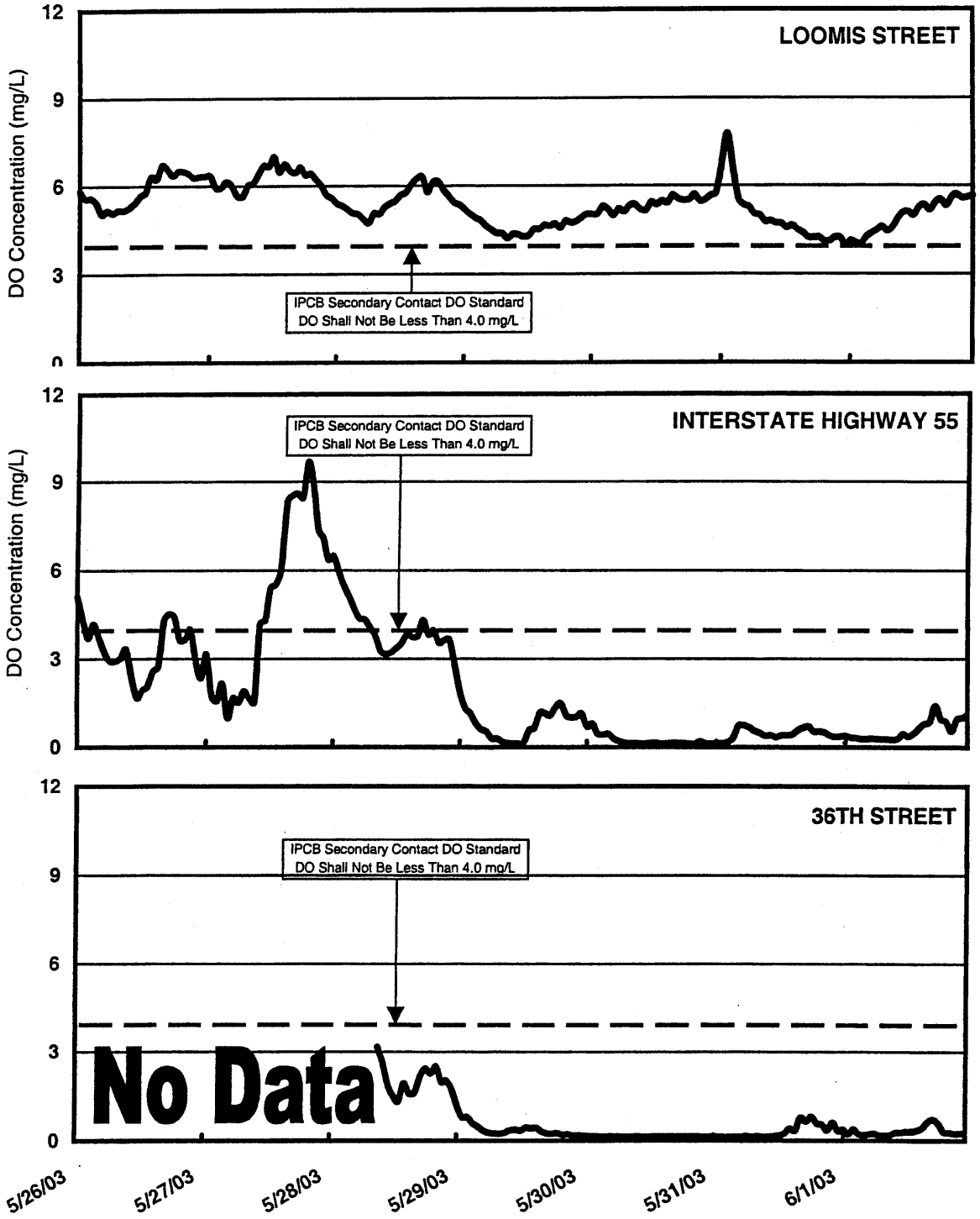
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
MAY 19 THROUGH MAY 25, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-5

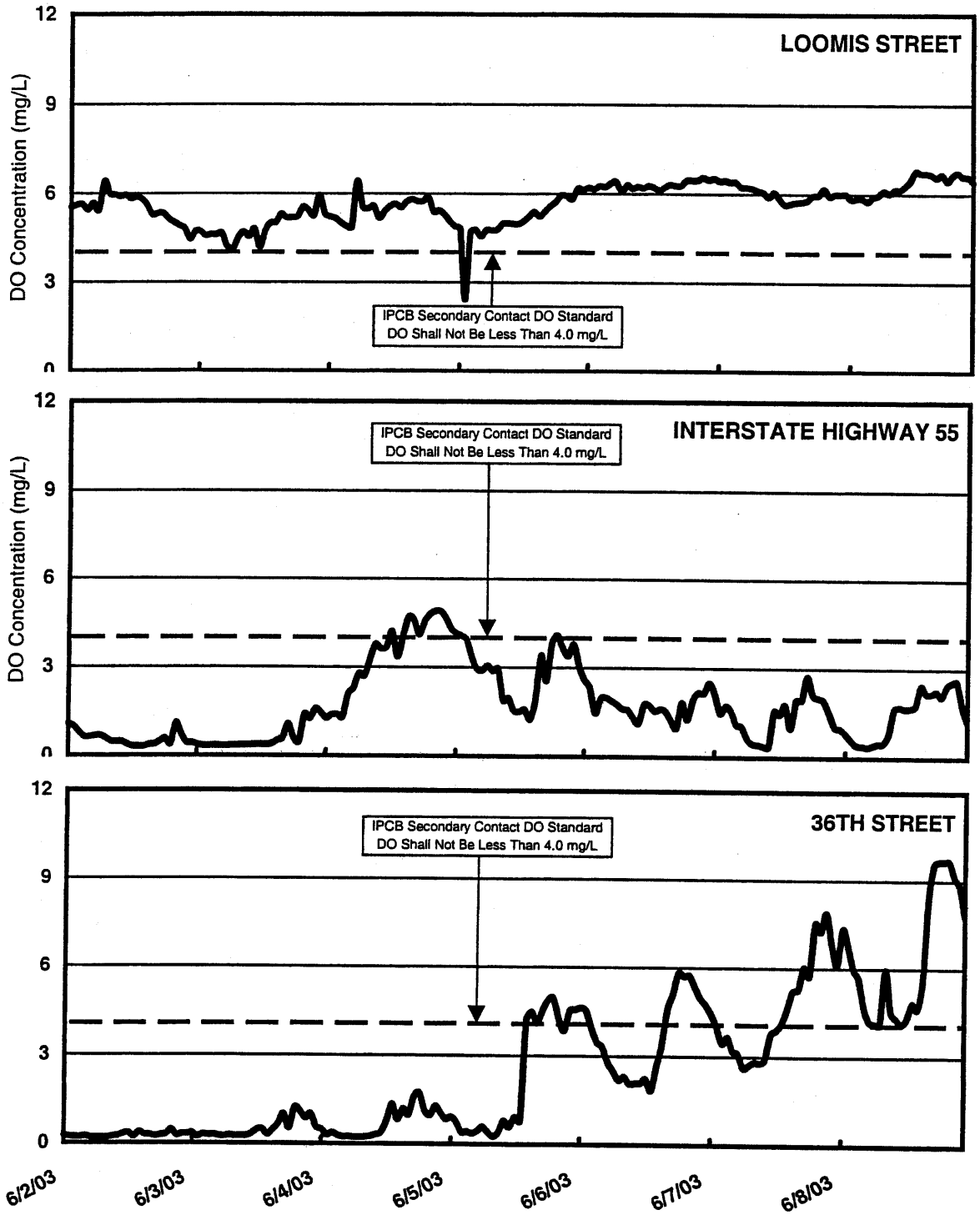
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
MAY 26 THROUGH JUNE 1, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-6

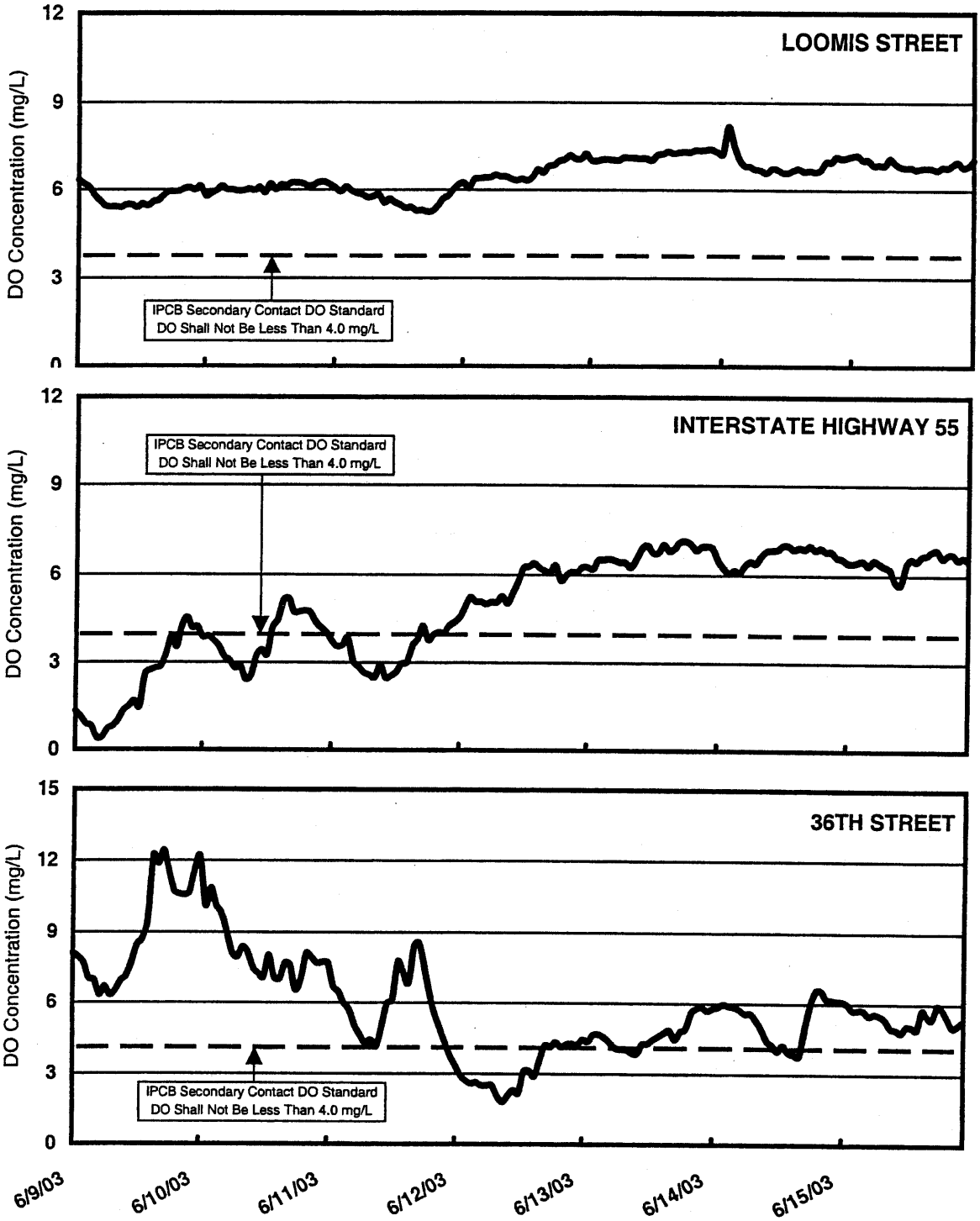
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JUNE 2 THROUGH JUNE 8, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-7

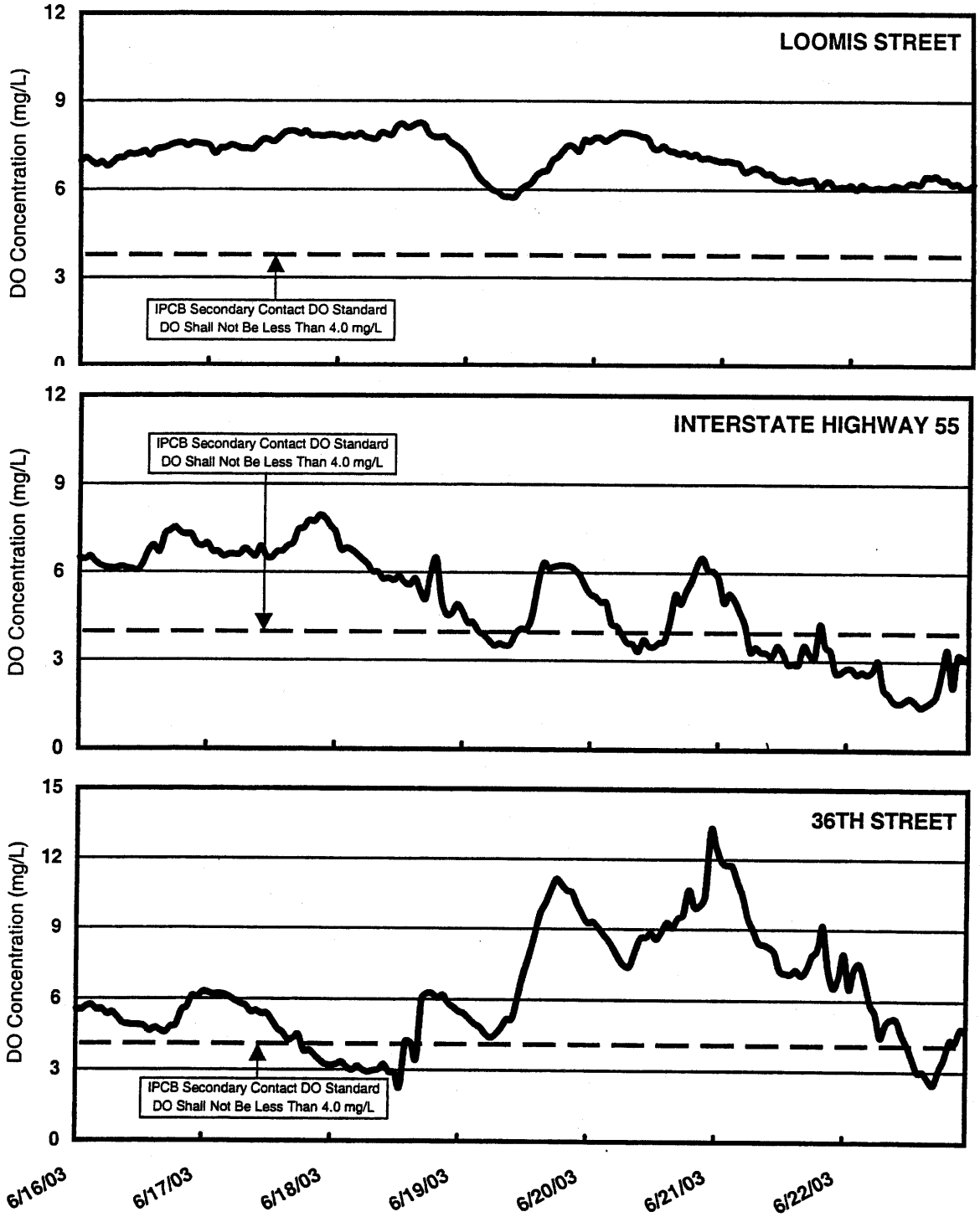
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JUNE 9 THROUGH JUNE 15, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-8

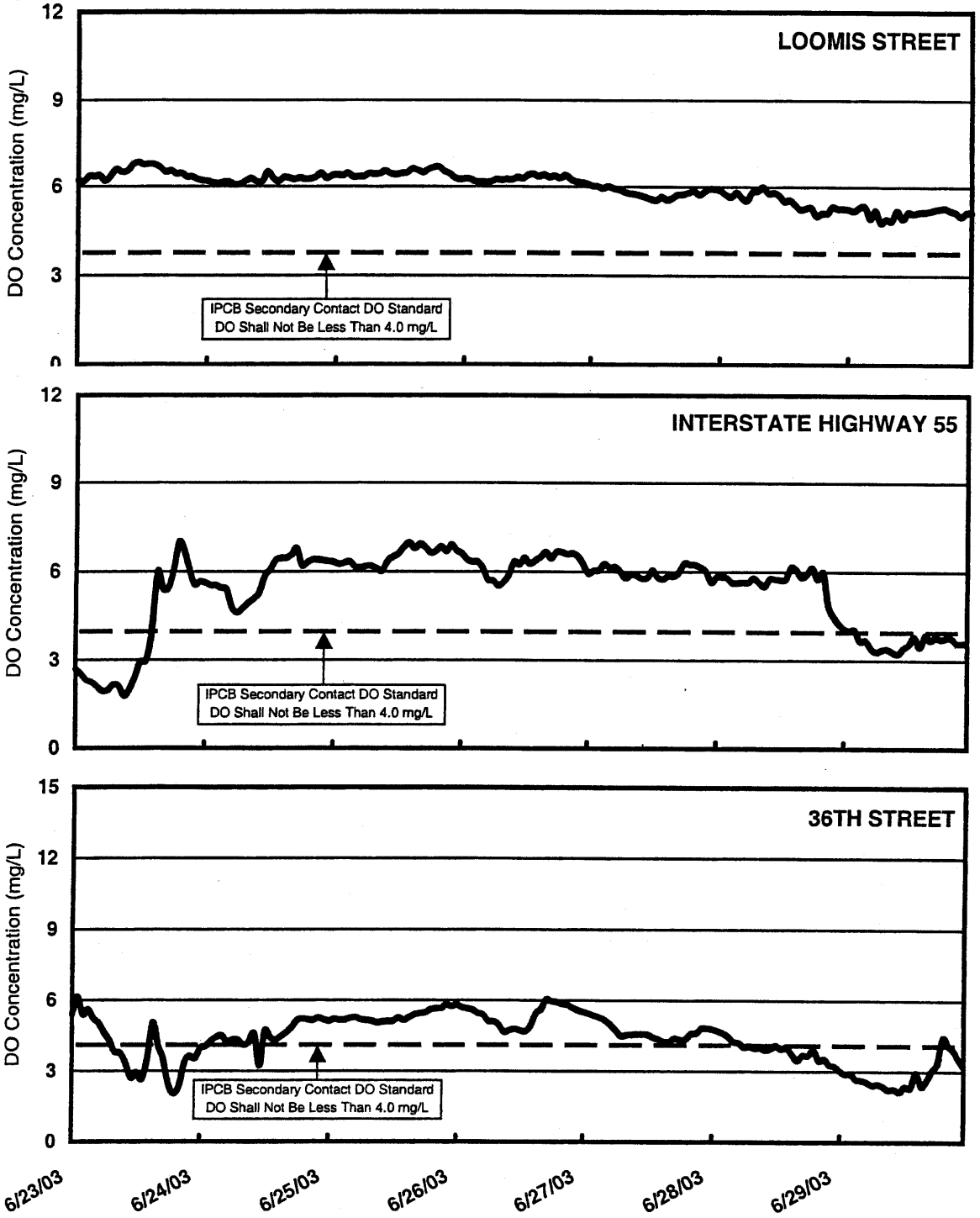
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JUNE 16 THROUGH JUNE 22, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-9

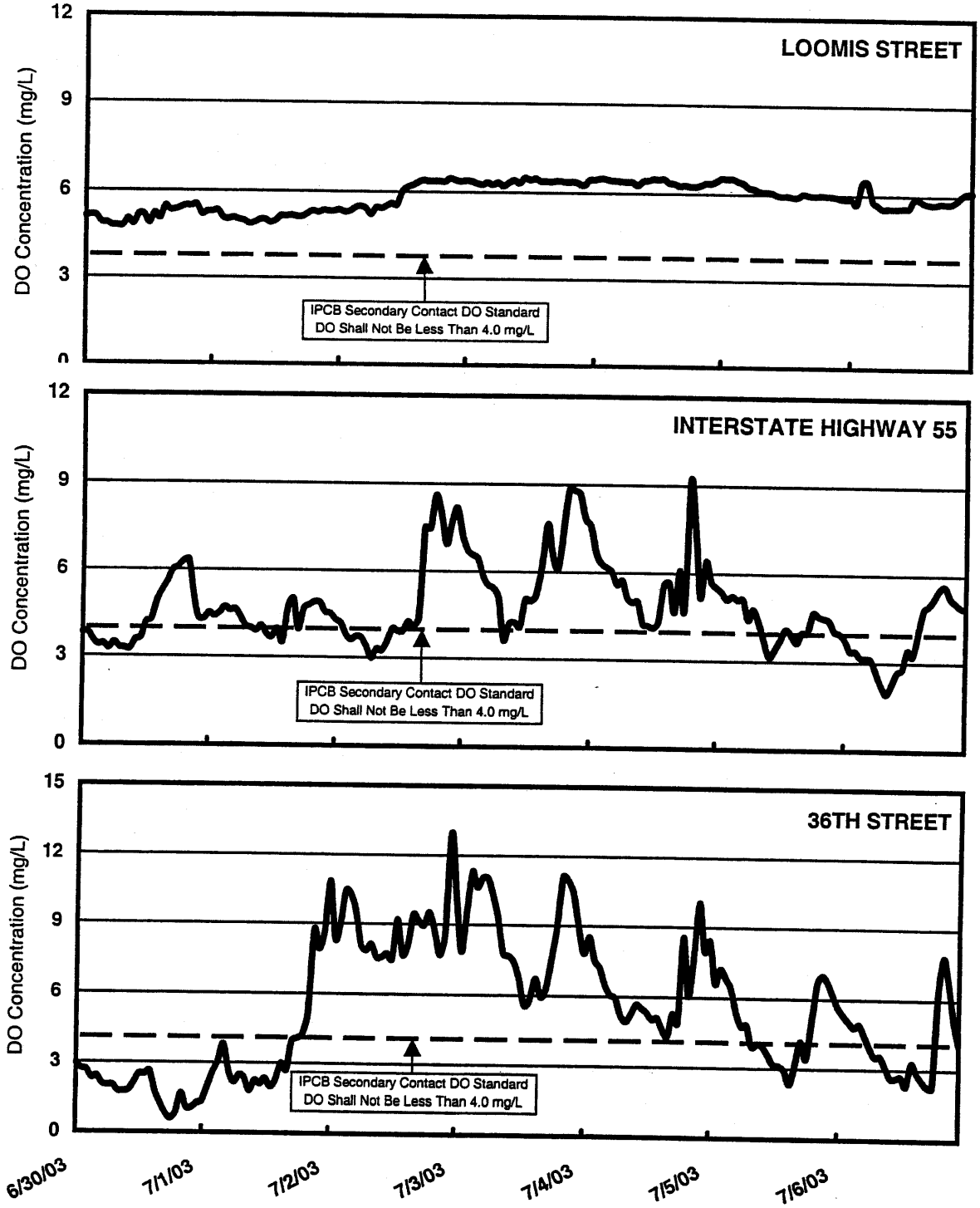
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JUNE 23 THROUGH JUNE 29, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-10

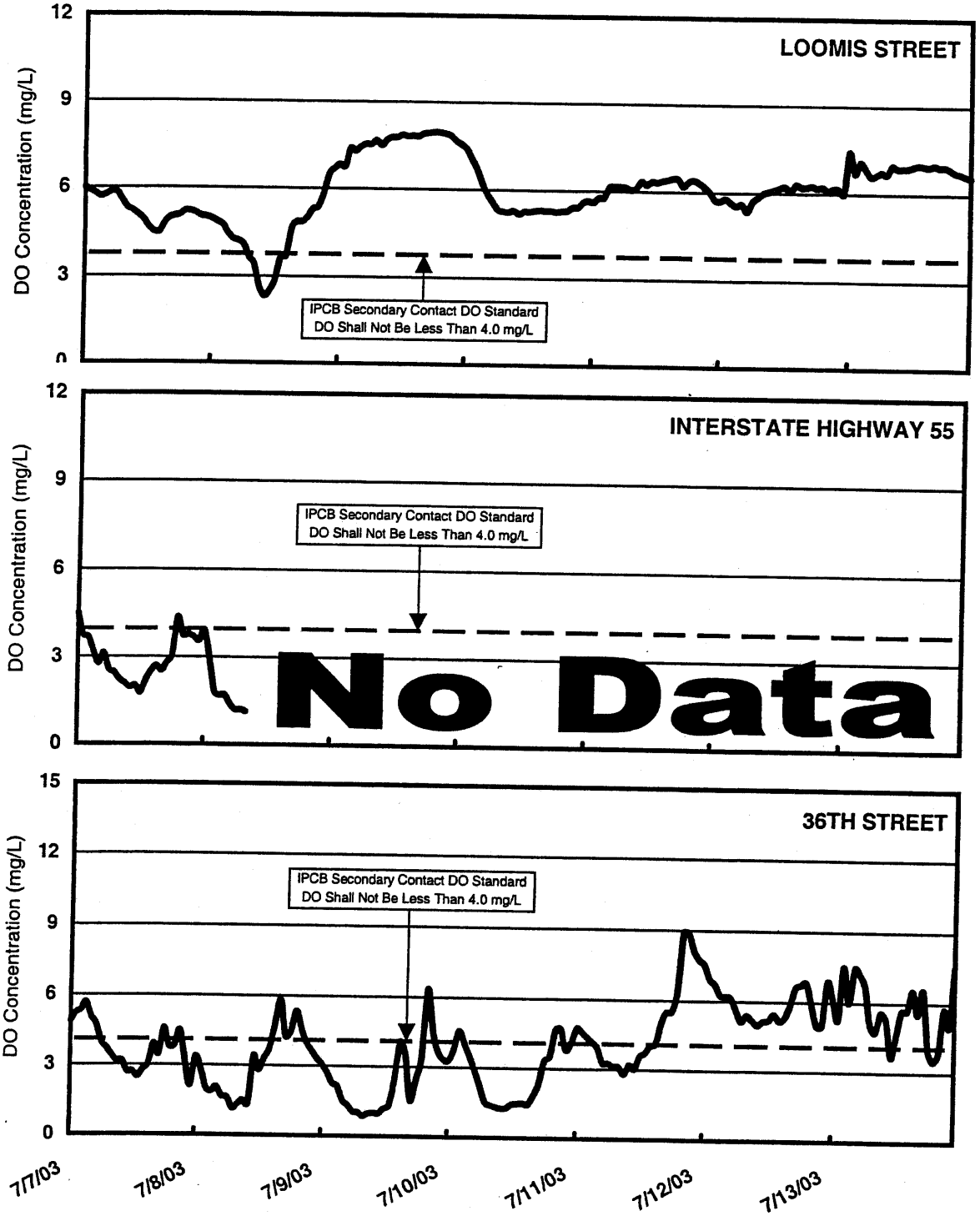
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36thSTREET IN BUBBLY CREEK
JUNE 30 THROUGH JULY 6, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-11

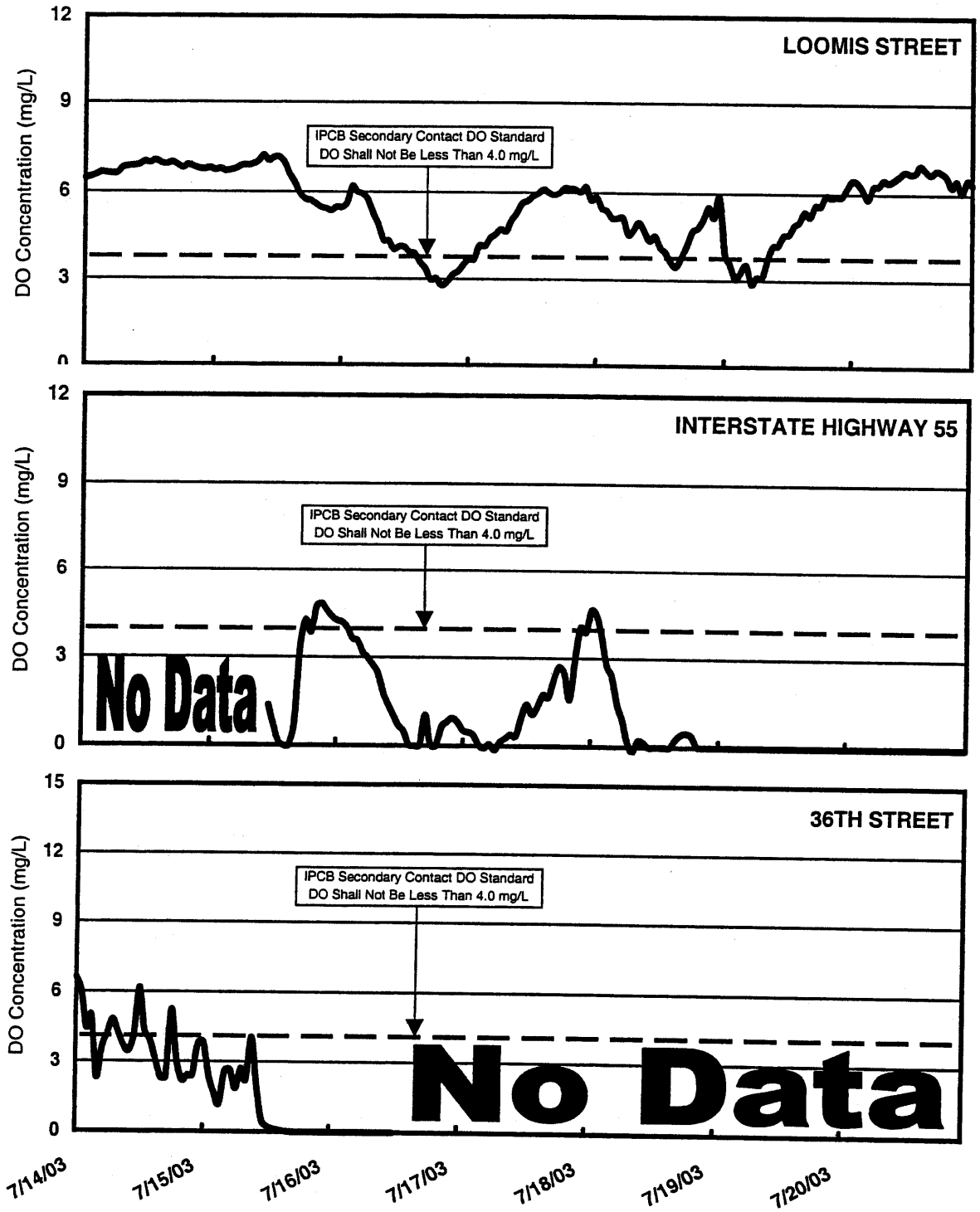
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JULY 7 THROUGH JULY 13, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-12

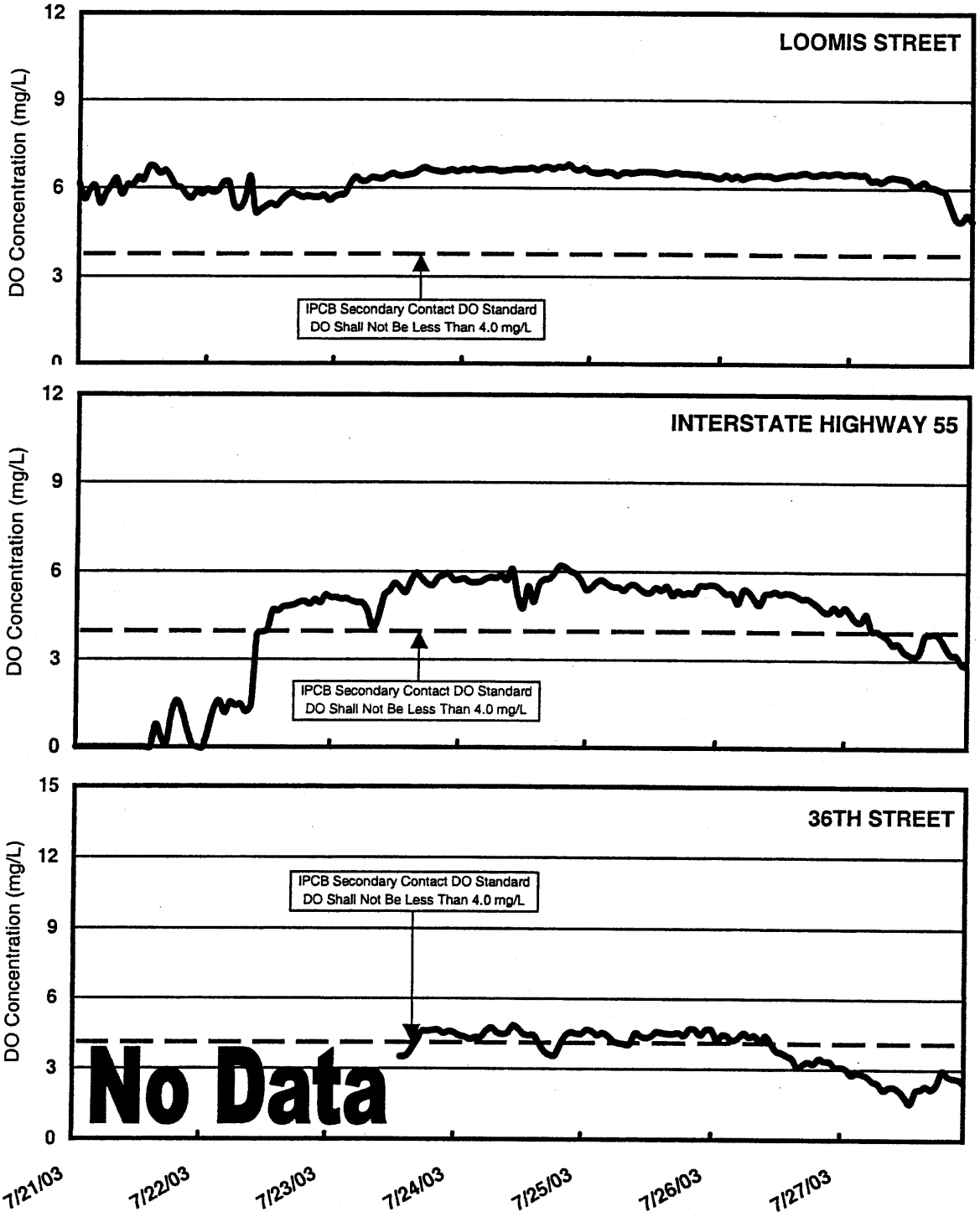
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JULY 14 THROUGH JULY 20, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-13

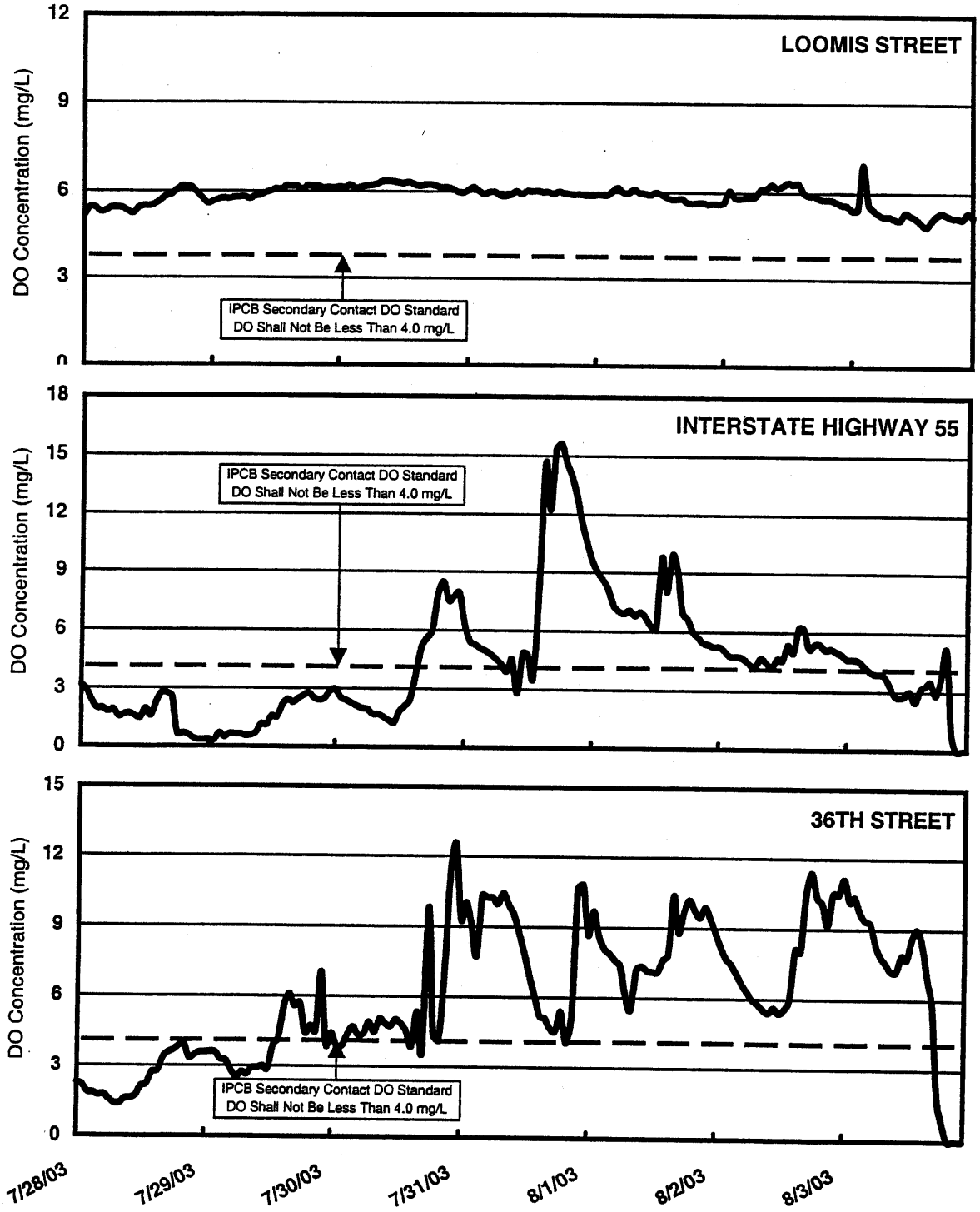
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JULY 21 THROUGH JULY 27, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-14

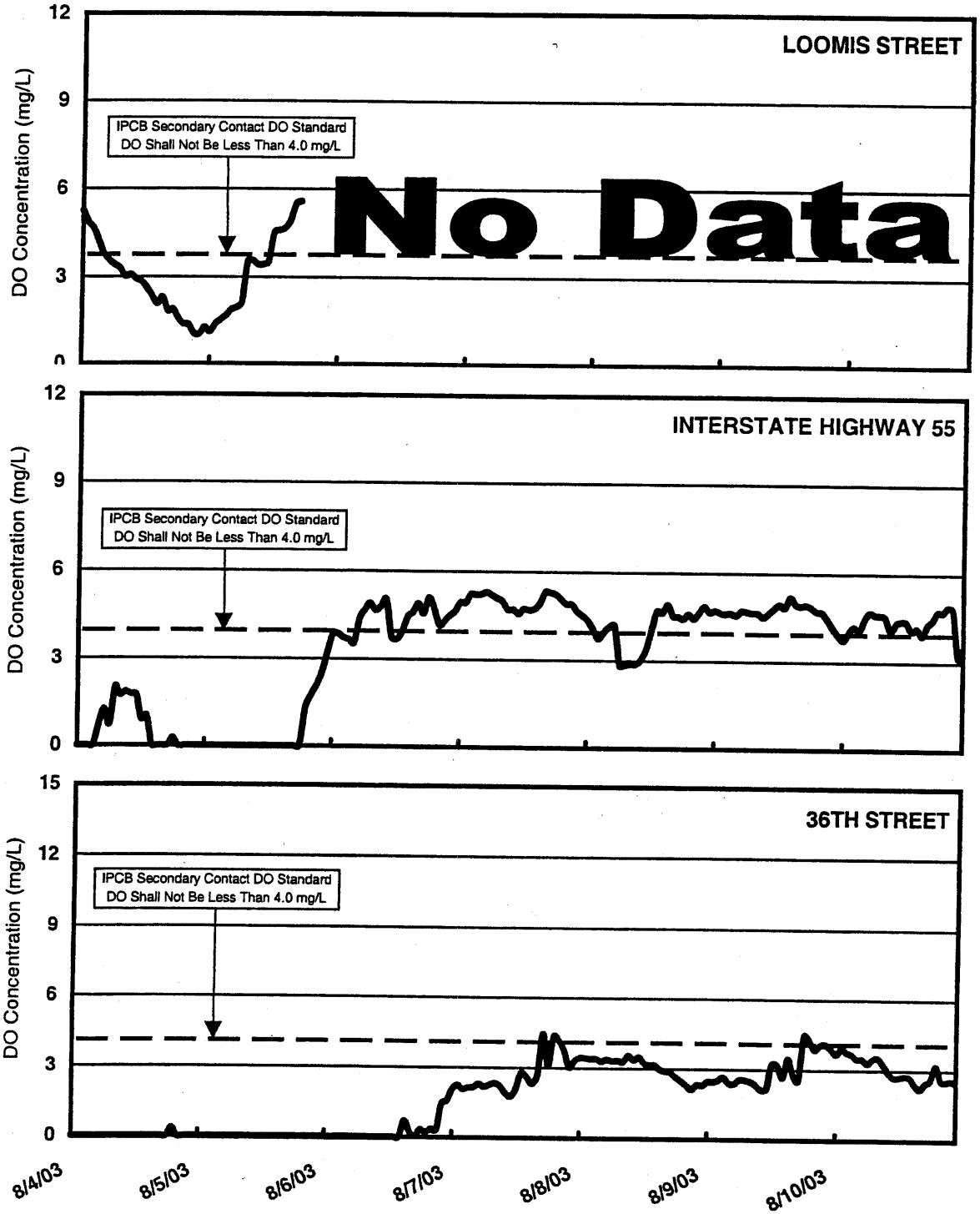
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
JULY 28 THROUGH AUGUST 3, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-15

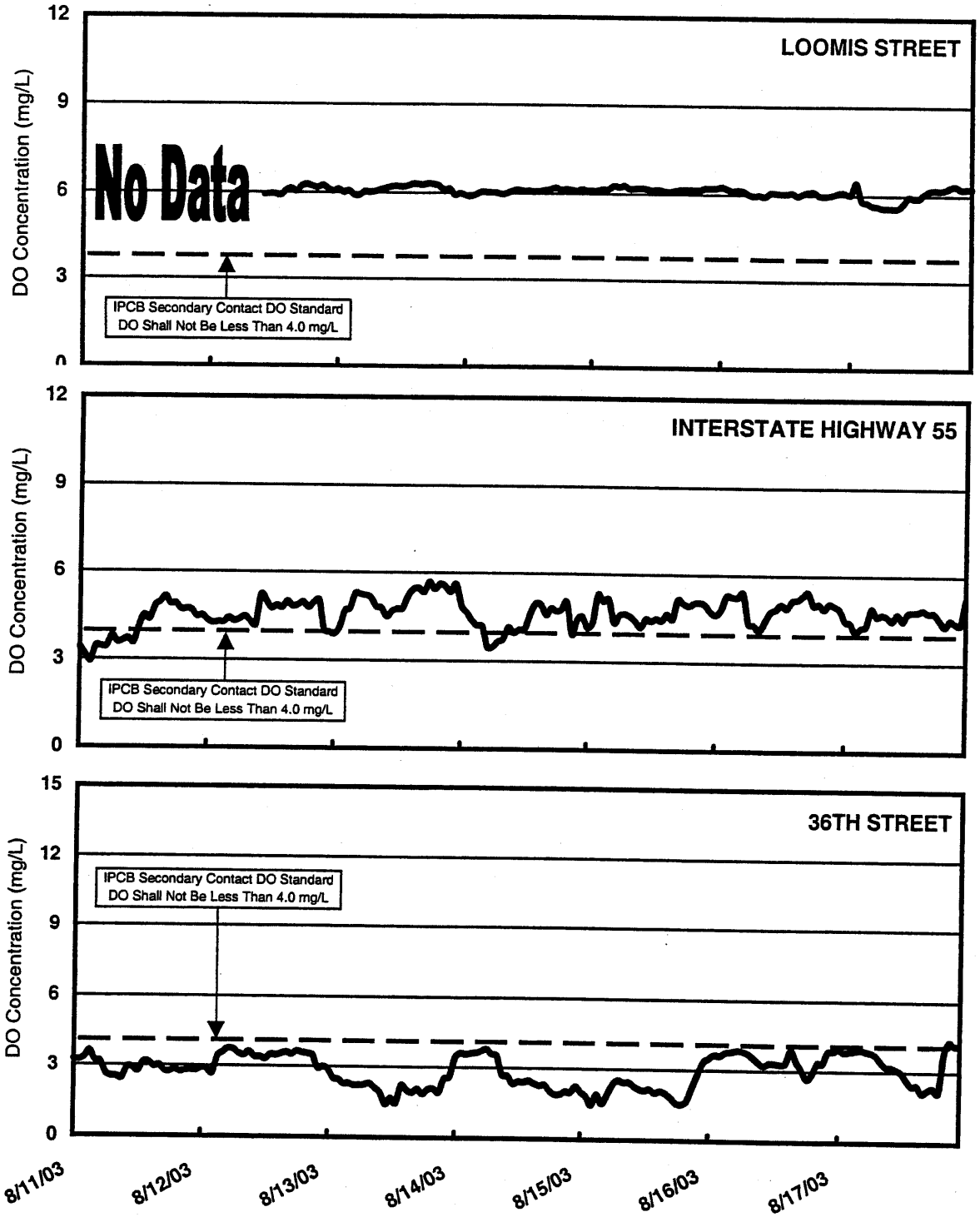
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
AUGUST 4 THROUGH AUGUST 10, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-16

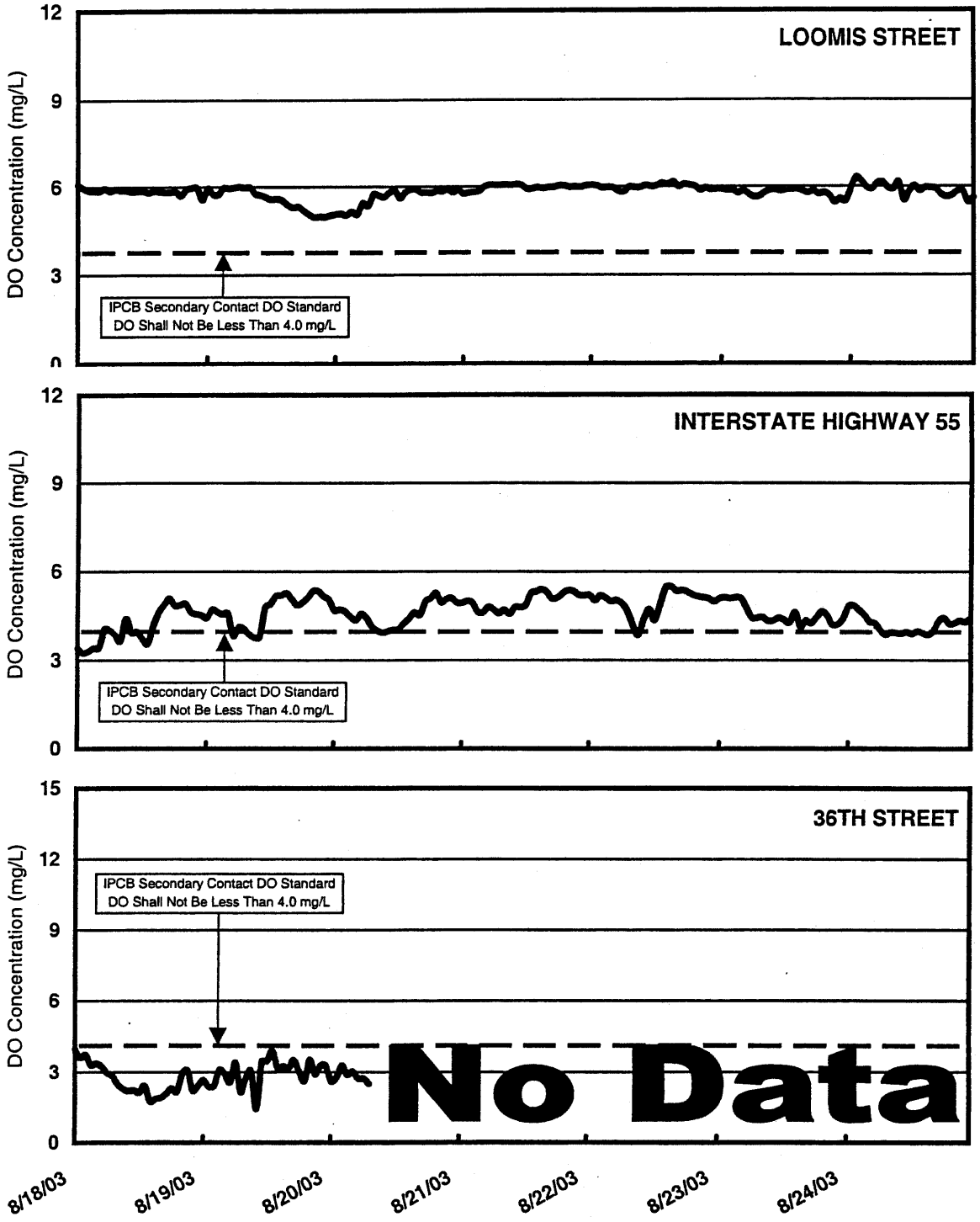
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
AUGUST 11 THROUGH AUGUST 17, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-17

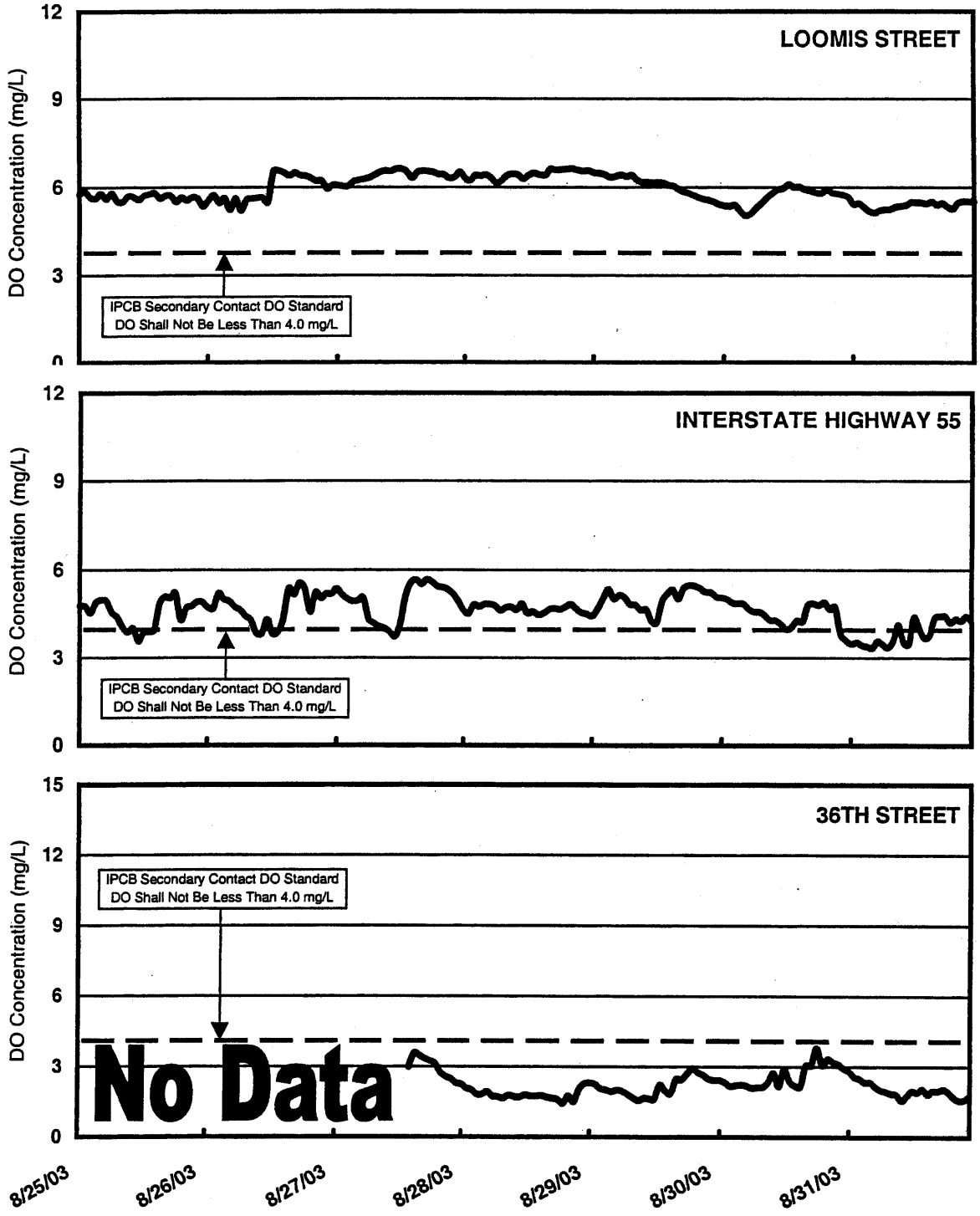
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
AUGUST 18 THROUGH AUGUST 24, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-18

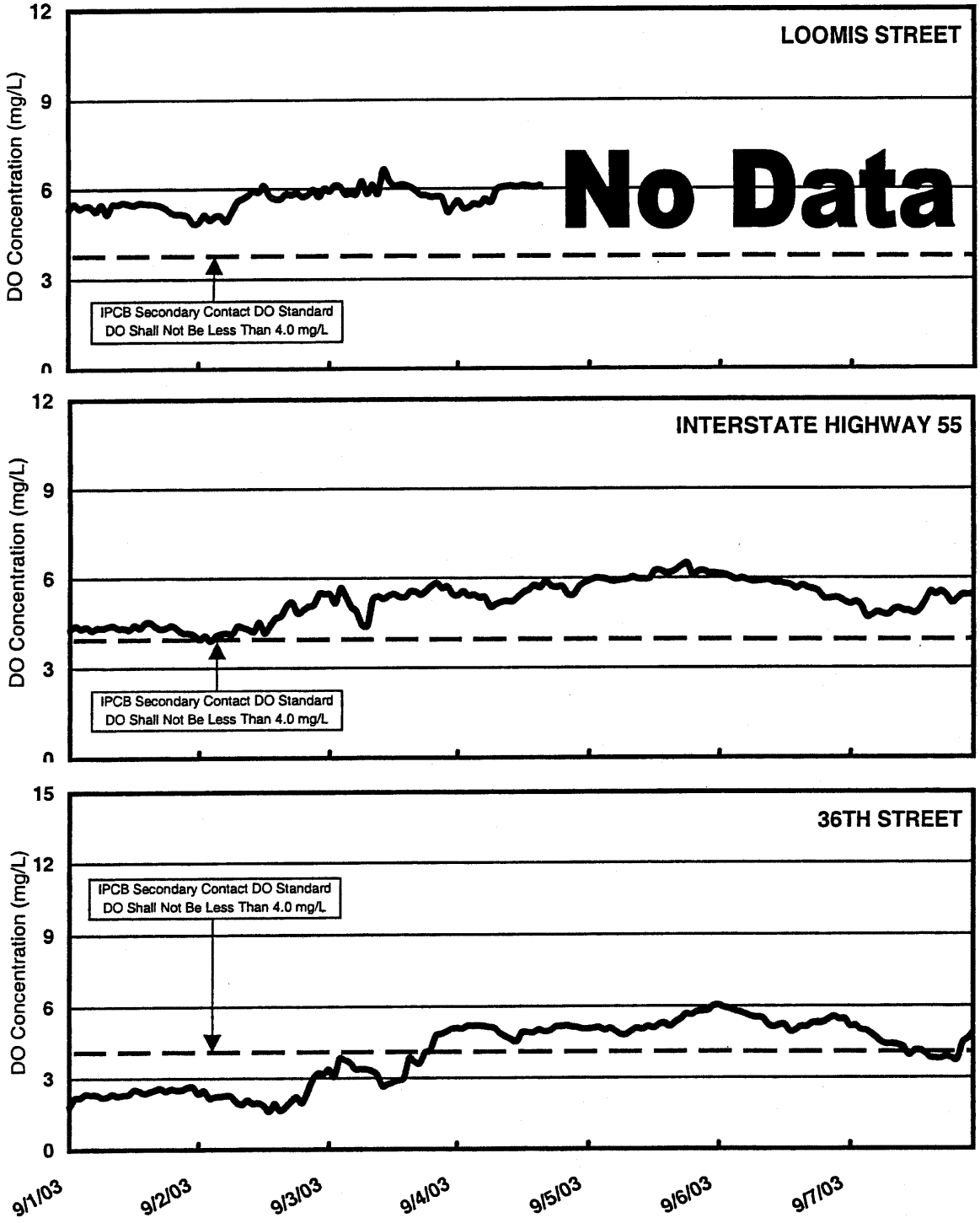
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
AUGUST 25 THROUGH AUGUST 31, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-19

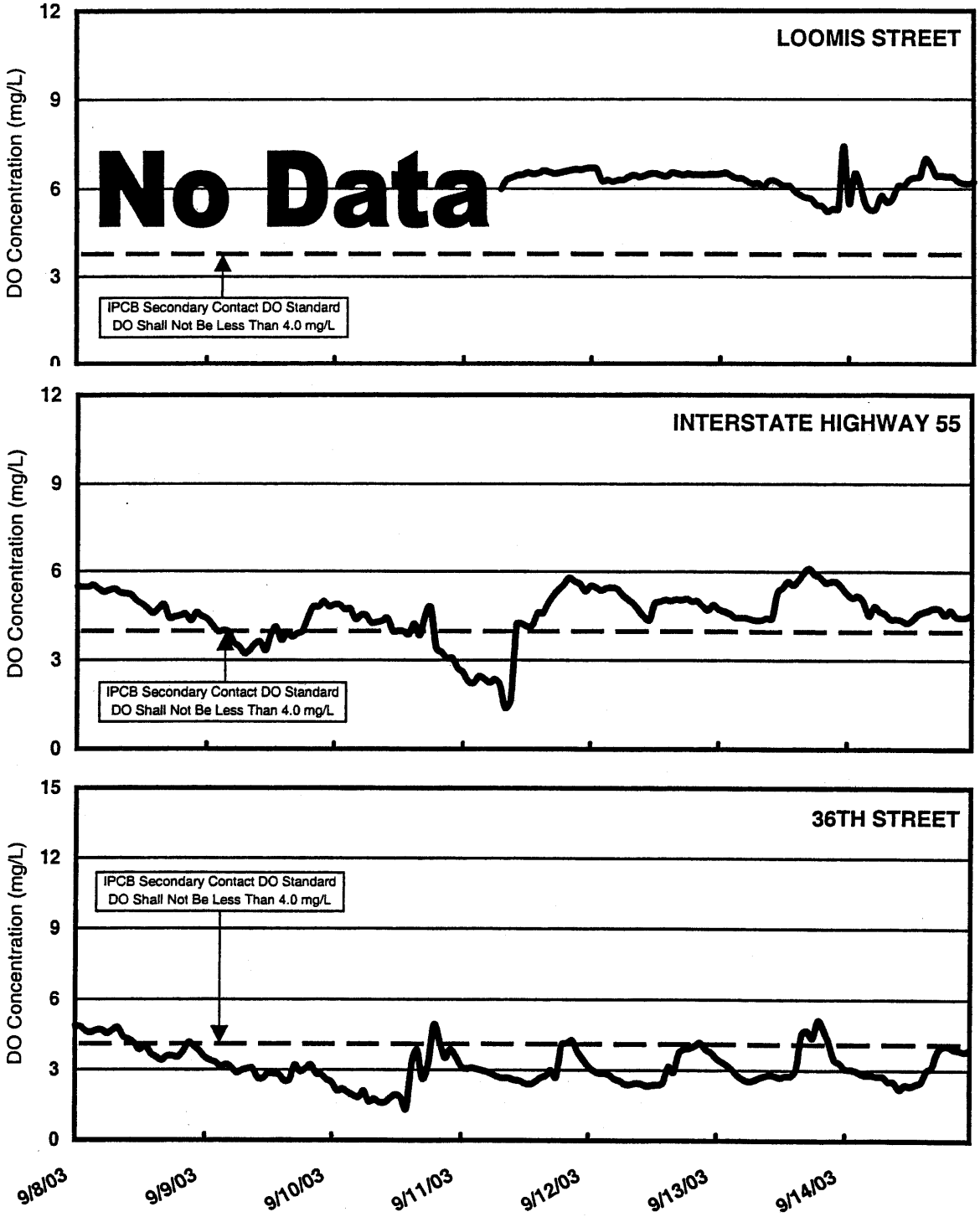
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
SEPTEMBER 1 THROUGH SEPTEMBER 7, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-20

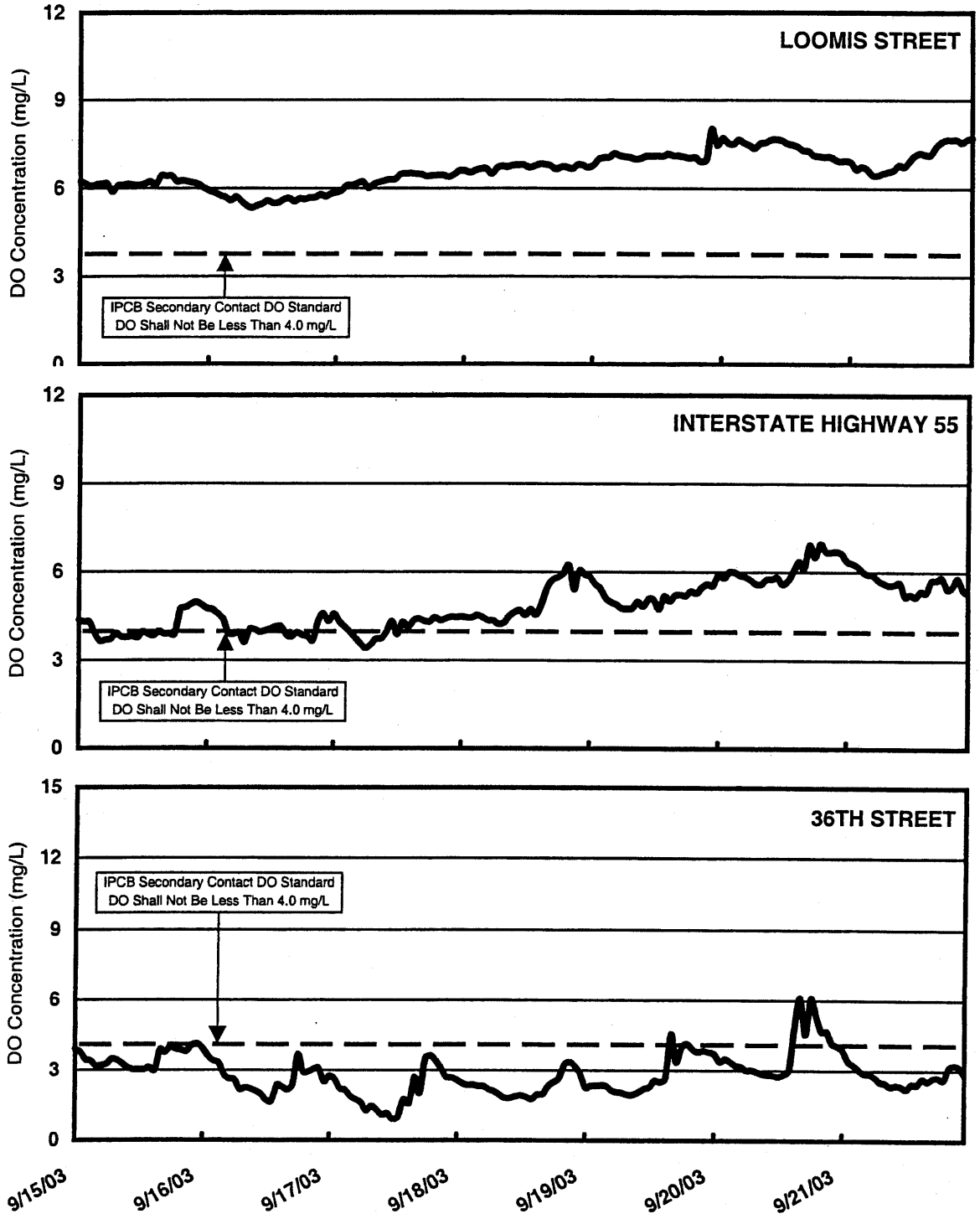
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
SEPTEMBER 8 THROUGH SEPTEMBER 14, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-21

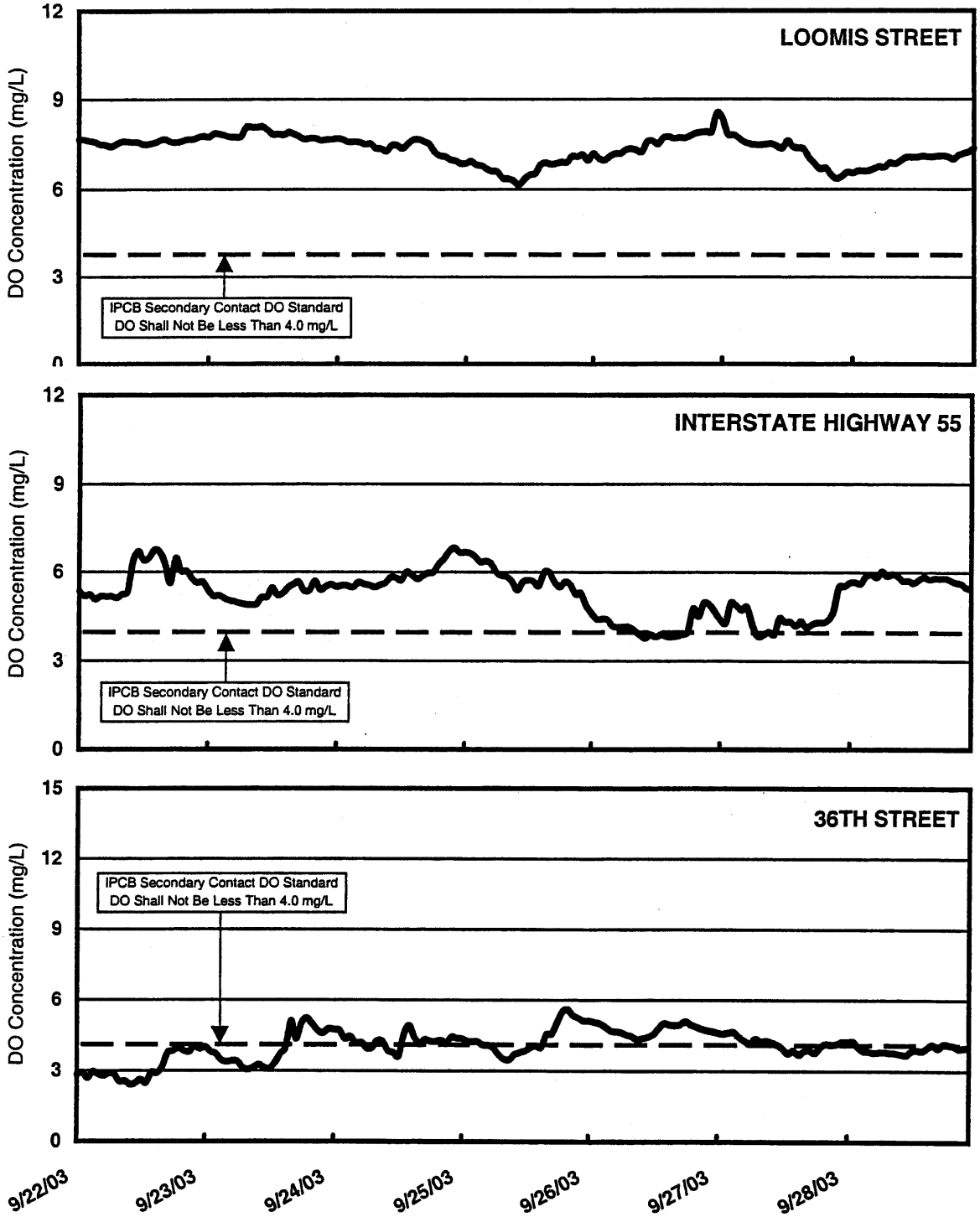
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
SEPTEMBER 15 THROUGH SEPTEMBER 21, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-22

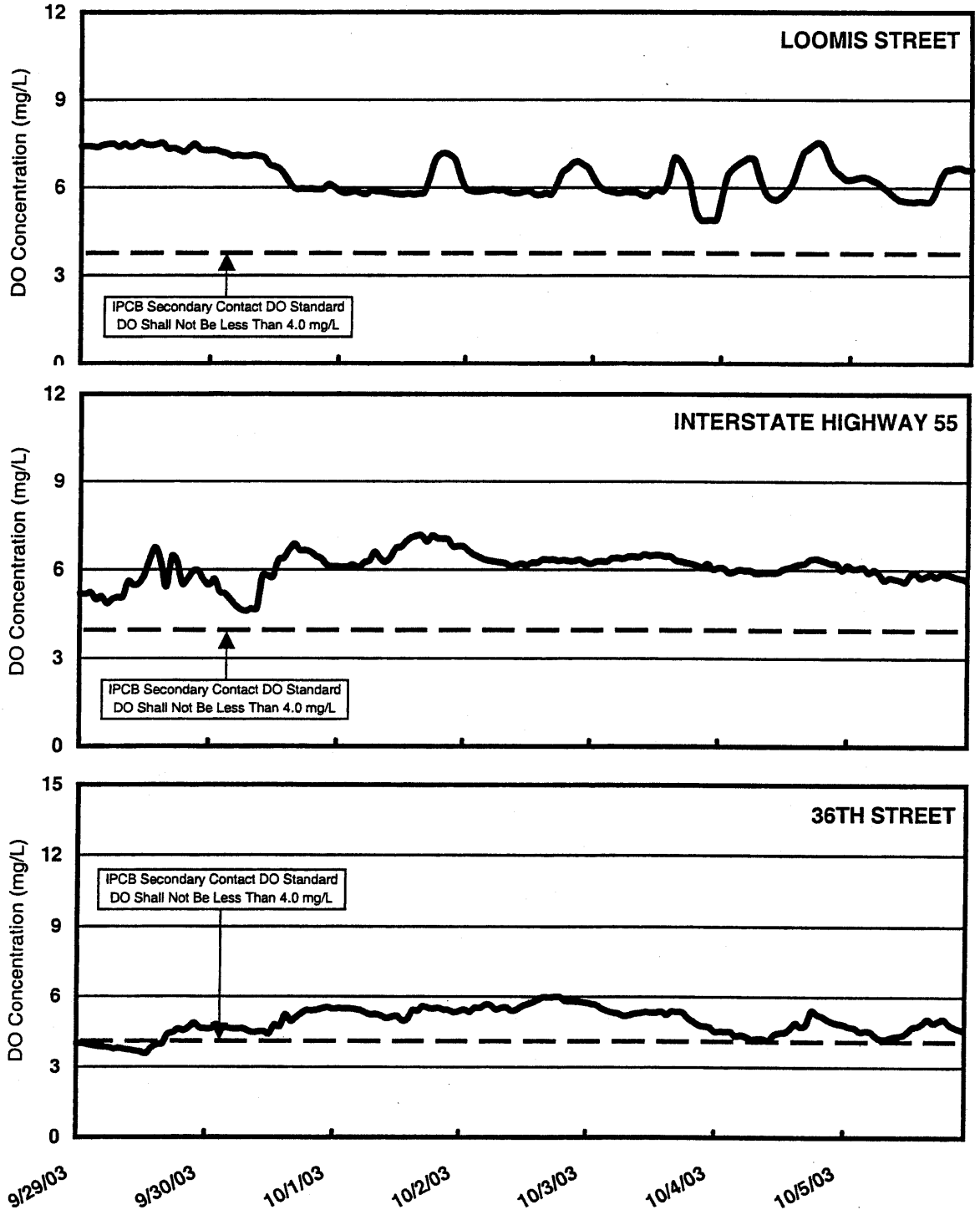
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
SEPTEMBER 22 THROUGH SEPTEMBER 28, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-23

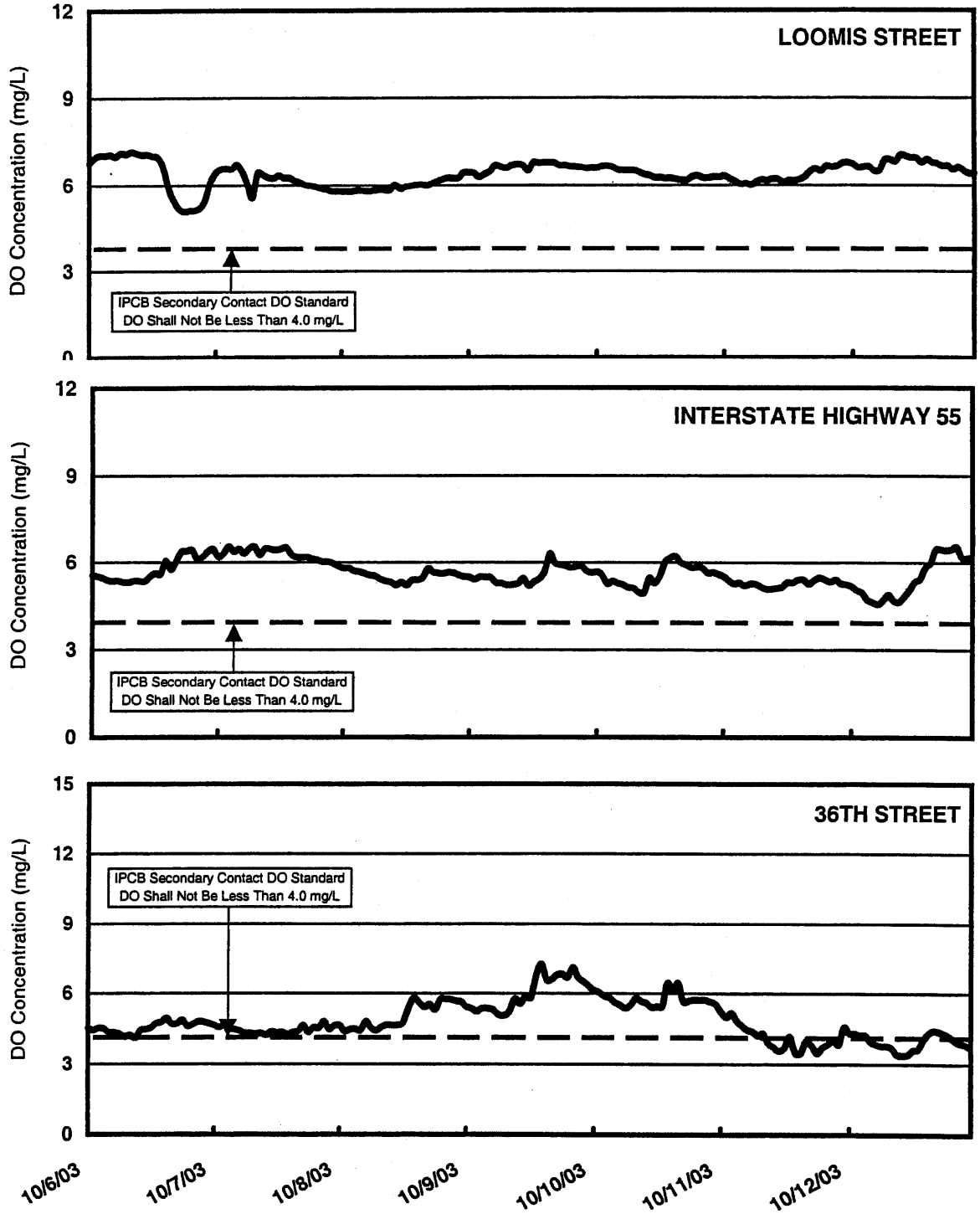
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
SEPTEMBER 29 THROUGH OCTOBER 5, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-24

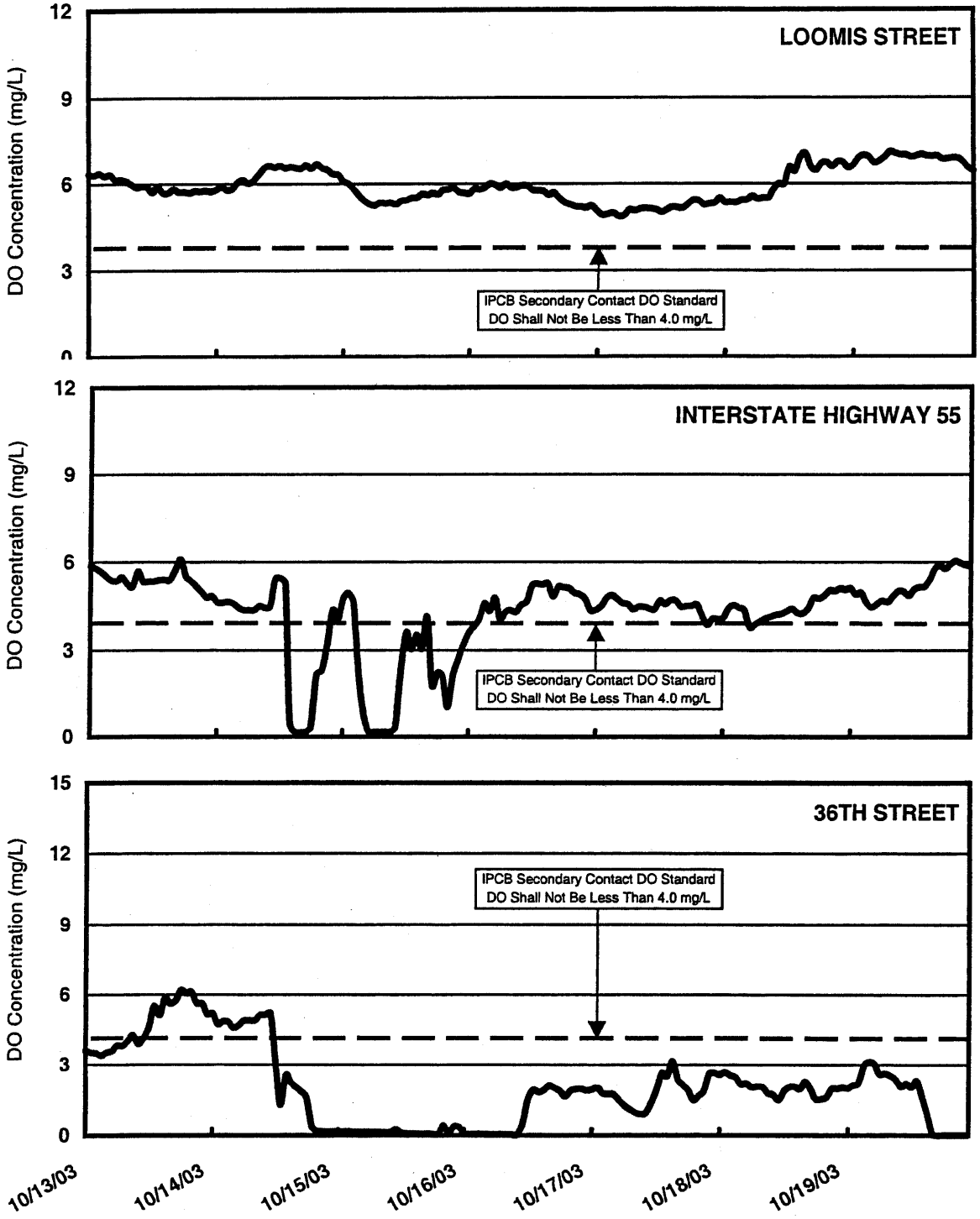
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
OCTOBER 6 THROUGH OCTOBER 12, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-25

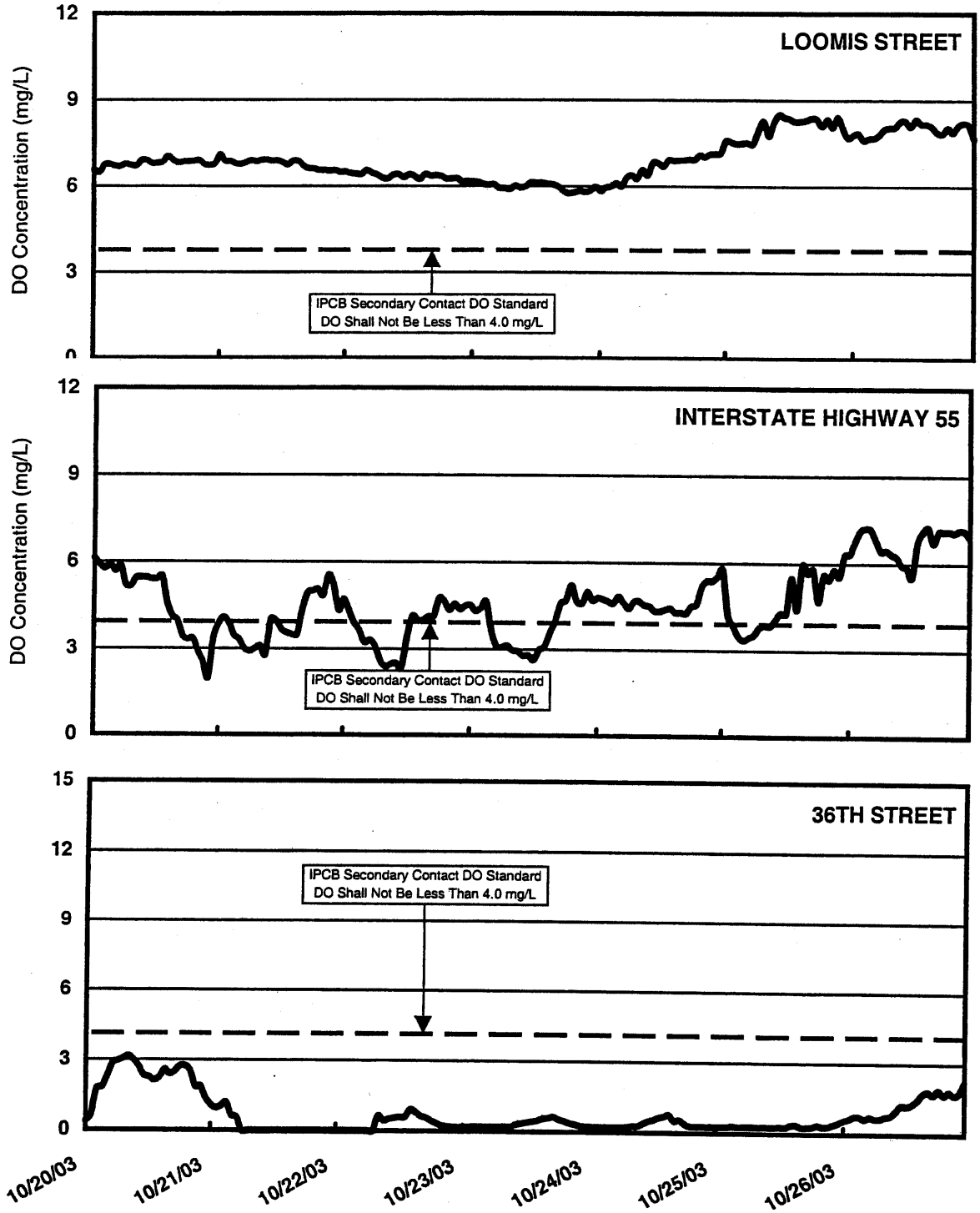
DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
OCTOBER 13 THROUGH OCTOBER 19, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-26

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
OCTOBER 20 THROUGH OCTOBER 26, 2003



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE AIV-27

DISSOLVED OXYGEN CONCENTRATION MEASURED HOURLY AT
LOOMIS STREET IN THE SOUTH BRANCH OF THE CHICAGO RIVER AND
INTERSTATE HIGHWAY 55 AND 36th STREET IN BUBBLY CREEK
OCTOBER 27 THROUGH OCTOBER 31, 2003