BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

PROPOSED SITE SPECIFIC	)	
RULE FOR CITY OF SPRINGFIELD,	)	
ILLINOIS, OFFICE OF PUBLIC	)	
UTILITIES, CITY WATER, LIGHT	)	R09-8
AND POWER AND SPRINGFIELD	)	(Site Specific Rulemaking – Water)
METRO SANITARY DISTRICT	)	
FROM 35 ILL. ADM. CODE	)	
SECTION 302.208(g)	)	

NOTICE OF FILING

TO: Mr. John Therriault
Assistant Clerk of the Board
Illinois Pollution Control Board
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601
(VIA ELECTRONIC MAIL)

Marie E. Tipsord
Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph, Suite 11-500
Chicago, Illinois 60601
(VIA U. S. MAIL)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board PETITIONERS' ADDITIONAL POST-HEARING DOCUMENT SUBMITTAL, a copy of which are herewith served upon you.

Respectfully submitted,

CITY OF SPRINGFIELD, ILLINOIS,
OFFICE OF PUBLIC UTILITIES,
CITY WATER, LIGHT AND POWER,

and

SPRINGFIELD METRO SANITARY
DISTRICT,

Date: December 3, 2008

By: /s/ Christine G. Zeman
One of Their Attorneys

Katherine D. Hodge
Christine G. Zeman
HODGE DWYER ZEMAN
3150 Roland Avenue
Post Office Box 5776
Springfield, Illinois 62705-5776
(217) 523-4900

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:

PROPOSED SITE SPECIFIC	)	
RULE FOR CITY OF SPRINGFIELD,	)	
ILLINOIS, OFFICE OF PUBLIC	)	
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METRO SANITARY DISTRICT	)	
FROM 35 ILL. ADM. CODE	)	
SECTION 302.208(g)	)	

PETITIONERS' ADDITIONAL POST-HEARING DOCUMENT SUBMITTAL

NOW COME the Petitioners, City of Springfield, Illinois, Office of Public Utilities, City Water, Light and Power ("CWLP") and Springfield Metro Sanitary District (collectively "Petitioners"), by and through their attorneys, HODGE DWYER ZEMAN, and voluntarily submit to the Illinois Pollution Control Board ("Board") the following report entitled:

- Investigation of Mitigation Strategies for Boron Increase at Outfall 004, prepared for CWLP by Hanson Professional Services Inc. ("Investigation Report").

This Investigation Report was requested by Ms. Traci Barkley of Prairie Rivers Network by e-mail; the undersigned provided it to her by e-mail attachment on Monday, December 1, 2008. Said Investigation Report is attached hereto as Attachment A, and is provided to the Board for a record of all documents provided to participants in this proceeding.

This Investigation Report is listed in Exhibit 1 to the "Petition for Site Specific Rule" at Section 8.0 "References." See, Technical Support Document for Site-Specific Boron Standard for the Springfield Metro Sanitary District Spring Creek Plant, Sangamon County, Illinois, August 13, 2008, at page 8-3. It is also referenced generally as having been developed as part of CWLP's Compliance Commitment Agreement (Pet. at ¶ 27).

WHEREFORE, Petitioners, City of Springfield, Illinois, Office of Public Utilities, City Water, Light and Power and Springfield Metro Sanitary District respectfully submit this Investigation Report as documentation provided to Prairie Rivers Network.

Respectfully submitted,

CITY OF SPRINGFIELD, ILLINOIS,
OFFICE OF PUBLIC UTILITIES,
CITY WATER, LIGHT AND POWER,

and

SPRINGFIELD METRO SANITARY DISTRICT,

Date: December 3, 2008

By: /s/ Christine G. Zeman
One of Their Attorneys

Katherine D. Hodge
Christine G. Zeman
HODGE DWYER ZEMAN
3150 Roland Avenue
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Springfield, Illinois 62705
(217) 523-4900

CWLP:002/Fil/Additional Post-Hearing Document Submittal

CERTIFICATE OF SERVICE

I, Christine G. Zeman, the undersigned, certify that I have served the attached PETITIONERS' ADDITIONAL POST-HEARING DOCUMENT SUBMITTAL, upon:

Mr. John Therriault
Assistant Clerk of the Board
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street
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Chicago, Illinois 60601

Albert F. Ettinger, Esq.
for Prairie Rivers Network
c/o Environmental Law and Policy Center
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Illinois Environmental Protection Agency
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via electronic mail on December 3, 2008; and upon:

Matthew Dunn, Chief
Environmental Bureau
Office of the Attorney General
69 West Washington Street, 18th Floor
Chicago, Illinois 60602

Marie E. Tipsord
Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph, Suite 11-500
Chicago, Illinois 60601

Bill Richardson, Chief Legal Counsel
Illinois Department of Natural Resources
One Natural Resources Way
524 S. Second Street
Springfield, Illinois 62702-1271

by depositing said documents in the United States Mail, postage prepaid, in Springfield, Illinois on December 3, 2008.

By: /s/ Christine G. Zeman
Christine G. Zeman

CWLP:002/Filings/ NOF-COS -- Additional Post Hearing Doc Submittal

ATTACHMENT
A

Investigation of Mitigation Strategies for Boron Increase at Outfall 004

INVESTIGATION OF MITIGATION STRATEGIES

FOR BORON INCREASE AT OUTFALL 004

Prepared For:

CITY WATER, LIGHT AND POWER

Springfield, Illinois

Prepared By:

HANSON PROFESSIONAL SERVICES INC.

1525 South Sixth Street

Springfield, Illinois

MARCH 2004

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SECTION 1.0
PROJECT SUMMARY

City Water, Light and Power (CWLP) owns and operates two power stations and a potable water treatment plant at 3100 Stevenson Drive, Springfield, Sangamon County, Illinois. CWLP's National Pollutant Discharge Elimination System (NPDES) permit IL0024767 regulates industrial process and storm water discharges at this facility. In 1994, CWLP was granted an adjusted standard for boron of 11.0 mg/l for process discharges into Sugar Creek. The discharge of concern is Outfall 004, which is the discharge from the ash pond system into Sugar Creek.

From 1994 when the adjusted standard of boron was granted until April 2003, CWLP operated within general compliance of the NPDES permit IL0024767. However, beginning in April 2003, CWLP observed an increase in the boron concentrations at Outfall 004. It was observed that the boron concentration increase at Outfall 004 seemed to correlate with the testing and start up of Selective Catalytic Reduction (SCR) air pollution control systems for nitrous oxide removal that were added to the three Dallman Power Station units in 2003. It was theorized that trace ammonia concentration being added to the fly ash was causing increased leaching of boron from the fly ash and/or increasing boron solubility in the ash ponds. This study was commissioned to identify the source of the boron concentration increase in the CWLP ash pond system.

Influent and effluent samples throughout the CWLP ash pond system were collected while the SCRs at the Dallman Power Station were operating and also while the SCRs were shutdown. Analyses of the samples demonstrated that, while the boron concentrations associated with the fly ash sluicing may have been increased during SCR operation, the significant boron contributor to the ash pond system was the gypsum dewatering stream from the Dallman Power Station flue gas desulfurization system (FGDS). Apparently, trace ammonia concentration from SCR operation resulted in increased leaching of boron and/or increased boron solubility in the FGDS effluent water generated during gypsum dewatering. This water, combined with seal water from the Dallman Power Station, is then mixed with Water Treatment Plant (Filter Plant) sludge and transferred to the ash pond system. Water samples from the Dallman Power Station and the Filter Plant were also collected after the SCRs were shut down for the 2003 season. Therefore, it is suggested that conclusions of this report regarding the FGDS effluent water and the Filter Plant sludge be verified in May 2004 when SCR operation is resumed.

SECTION 2.0
FACILITY DESCRIPTION

2.1 CWLP Plant Descriptions

City Water, Light and Power (CWLP) owns and operates the V.Y. Dallman Power Station and the Lakeside Power Station at 3100 Stevenson Drive, Springfield, Sangamon County, Illinois. CWLP also operates a potable water treatment plant (filter plant) at this site. These plants generate electricity for the residents and businesses in Springfield and provide potable water to Springfield and surrounding communities. Approximately 220 people are employed at the power generating stations and an additional 21 people are employed at the water treatment plant. The facilities are staffed 24 hours per day, seven days per week. Layout of the CWLP site is shown in Figure 2-1.

The water treatment plant has a capacity of 48 million gallons per day (Mgal/day). A conventional lime-softening/filtration/disinfection process is employed to produce potable water. Five clarifiers and 12 filters in the treatment process remove sediment and particulate matter from the raw lake water. Thickened sludge from the clarifiers and backwash water from the filters is discharged to the ash ponds located north of Spaulding Dam. The volume of sludge and backwash water discharged to the ash pond system varies and is dependent upon production volume and raw water characteristics. During periods of warm weather, powdered activated carbon (PAC) is added to the incoming lake water for control of various pesticides and herbicides. The PAC also assists with taste and odor control. The majority of the PAC is removed in the clarifiers and disposed in the ash ponds.

The Dallman Power Station has an electric generating capacity of 352 megawatts and is comprised of three coal-fired units: Units 31, 32, and 33. The Dallman units were placed into service in 1968, 1972, and 1978, respectively. Units 31 and 32 are identical, each having 80 megawatts of generating capacity. The cyclone boilers in Units 31 and 32 operate at 1,250 psig and 950°F. Unit 33 includes a tangentially-fired boiler and has a generating capacity of 192 megawatts. Unit 33 operates at 2,400 psig and 1,000°F and is equipped with a FGDS that removes over 80

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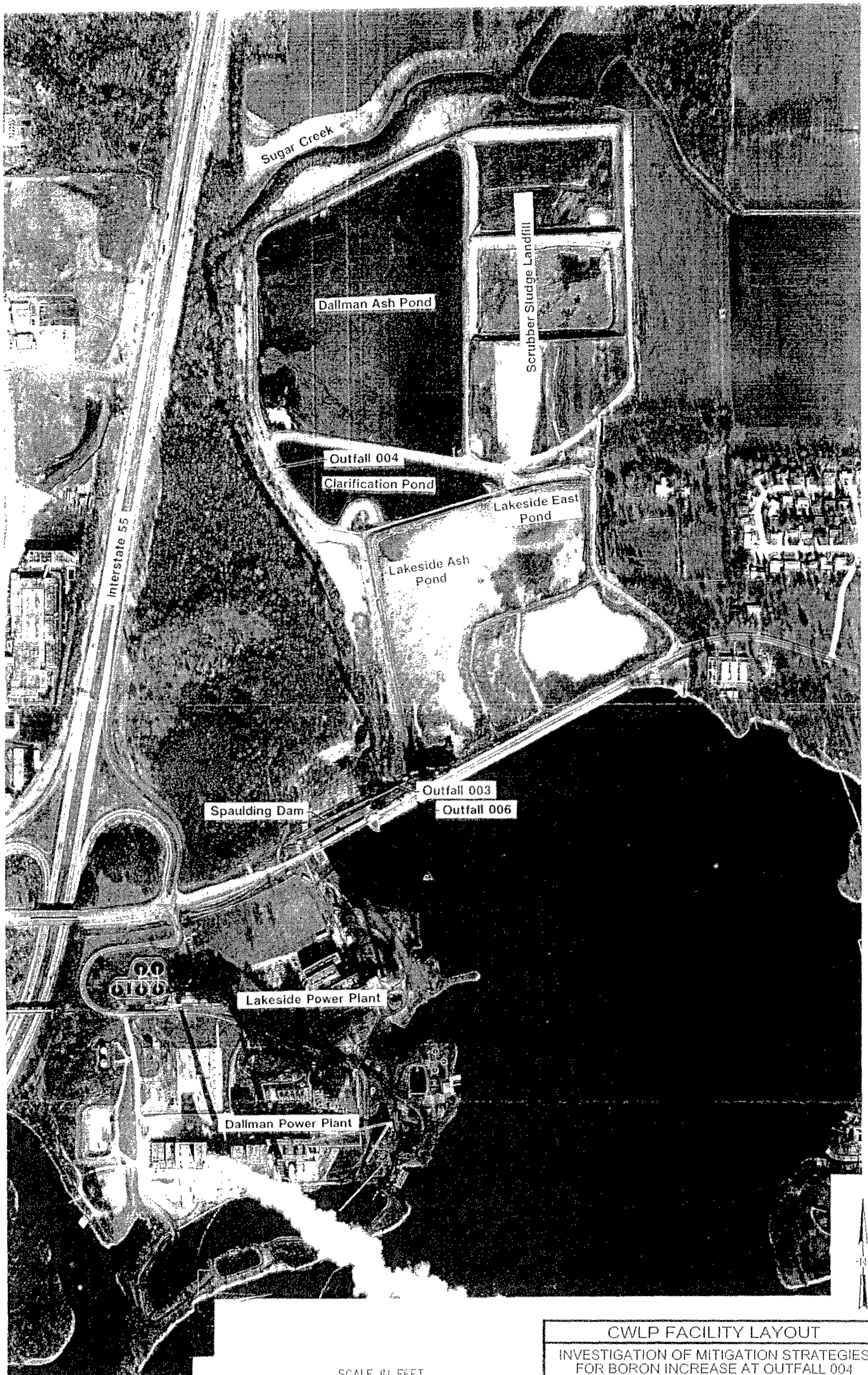

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CWLP FACILITY LAYOUT

INVESTIGATION OF MITIGATION STRATEGIES
FOR BORON INCREASE AT OUTFALL 004
CITY WATER, LIGHT AND POWER
SPRINGFIELD, ILLINOIS

JOB NO. 03S5019 FIGURE 2-1

percent of the sulfur dioxide from the unit's flue gases. SCR air pollution control systems for nitrous oxide removal were added to all three Dallman Units in 2003. The SCRs are operated from May 1 through September 30.

The Lakeside Power Station began operation in 1935. Originally, there were eight boilers and seven turbine generators at the Lakeside plant. Only two boilers and two turbine generators are still in operation. Boilers 7 and 8 are identical 33-megawatt cyclone coal-fired units. Boiler 7-Turbine 6 went into operation in 1959 and Boiler 8-Turbine 7 began operation in 1964. Both units operate at 850 psig and 900°F.

2.2 CWLP Ash Handling Systems

Coal consumption at the CWLP facility is in excess of 1 million tons per year. The ash handling practices at CWLP are typical for a coal-fired power plant. Bottom ash and fly ash from all units are sluiced to ash ponds. The raw lake water used for sluicing is obtained from the once-through cooling water systems for the generator condensers. Three separate ash transport systems serve Dallman Units 31 and 32, Dallman Unit 33, and Lakeside. The monthly service hours of sluice pump operation and associated water usage are detailed in Table 2-1.

CWLP operates two ash ponds, and has operating flexibility to determine which pond will receive ash. Typically, the Dallman fly ash and bottom ash sluice water is pumped to the north ash pond, which is commonly known as the Dallman Ash pond. This ash pond also receives wastewater treatment plant sludge and leachate collected from the scrubber sludge landfill adjacent to the ash ponds. The south ash pond, known as the Lakeside Ash Pond, has an earthen berm dividing it into an east portion and west portion. The Lakeside fly ash and bottom ash sluice water is normally discharged to the west portion of the Lakeside Ash Pond. The east portion of this pond, referred to as the Lakeside East Pond, receives lime sludge from the filter plant and miscellaneous water streams from the Dallman Power Station including the FGDS effluent water. Flow rates into the ash ponds vary, but depend principally upon the generating units in service.

TABLE 2-1

WATER USAGE FOR ASH SLUICING

Date	DALLMAN			LAKESIDE		DALLMAN	LAKESIDE	AVERAGE
	Sluice Pump 33 West[1] (Hours)	Sluice Pump 33 East[1] (Hours)	Sluice Pumps 31 and 32[2] (Hours)	Sluice Pump Unit 8/7[3] (Hours)	Sluice Pump Unit 7/6[3] (Hours)	Sluice Water Volume (Mgal)	Sluice Water Volume (Mgal)	Sluice Water Volume (Mgal/day)
January 2003	586.1	745	745	360	504	187.0	73.8	8.41
February 2003	141.0	672	673	600	576	142.6	100.5	8.68
March 2003	210.9	743	742	192	672	161.2	73.8	7.58
April 2003	0.0	720	720	720	648	142.5	116.9	8.65
May 2003	253.6	744	744	408	552	164.4	82.0	7.95
June 2003	701.6	719	719	72	72	189.7	12.3	6.73
July 2003	735.1	744	744	624	624	196.9	106.6	9.79
August 2003	261.0	744	745	720	624	165.0	114.8	9.03
September 2003	0.0	720	719	0	0	142.4	0	4.75
October 2003	439.3	745	745	216	288	177.0	43.1	7.10
November 2003	446.2	720	721	24	72	175.7	8.2	6.13
December 2003	623.1	744	744	0	168	189.3	14.4	6.57

[1] Pump rate of 1.62 Mgal/day

[2] Pump rate of 3.13 Mgal/day

[3] Pump rate of 2.05 Mgal/day

Supernatant from the Dallman Ash Pond, The Lakeside Ash Pond and the Lakeside East Ash Pond overflows into the Clarification Pond. Combining wastewater from the various sources provides for settling and neutralization in the Clarification Pond. The ash sluice waters are typically acidic with floating suspended solids; the filter plant wastes are normally basic with excess lime availability; and the wastewater plant sludge contains polymer and coagulants for flocculation. Additional polymer is fed in the Clarification Pond at the inflow point for water from the Dallman Ash Pond. A carbon dioxide feed system, located at the Clarification Pond outfall (Outfall 004), is used to adjust pH of the Clarification Pond effluent.

2.3 CWLP Outfalls and Discharge Descriptions

CWLP's NPDES permit IL0024767 regulates discharges from 16 outfalls at the CWLP facility. Outfall numbers 001 through 011 apply to process discharges at the facility and are shown in Figure 2-2. Outfall numbers 012 through 016 apply to storm water runoff from the industrial site. Outfalls 003, 004, and 016 discharge into Sugar Creek; all of the other outfalls discharge into Lake Springfield. Discharge from Outfall 003 consists mainly of potable water and raw water collected from various equipment drains, floor drains, and roof drains at the Lakeside Power Station. The effluent is routed from the power plant through an underground pipe that outfalls into the Sugar Creek channel near the east side of the spillway at Spaulding Dam. Discharge from Outfall 003 has been identified as intermittently containing high concentration of boron, probably the result of contact with accumulations of ash in the discharge area. Effluent from the Ash Clarification Pond discharges into Sugar Creek through Outfall 004. This discharge also contains boron.

NPDES permit IL0024767, reissued September 29, 1993, required CWLP to limit and monitor the concentrations of boron in its outfall discharges to Sugar Creek. The permit limit for boron was 1.0 mg/l, with compliance to be achieved by December 14, 1994. In response, CWLP commissioned a study to evaluate the ecological and water quality impacts of boron levels discharged into Sugar Creek and associated sections of the Sangamon River and the South Fork of the Sangamon River (*Technical Support Document for Petition for Adjusted Boron Standards for*

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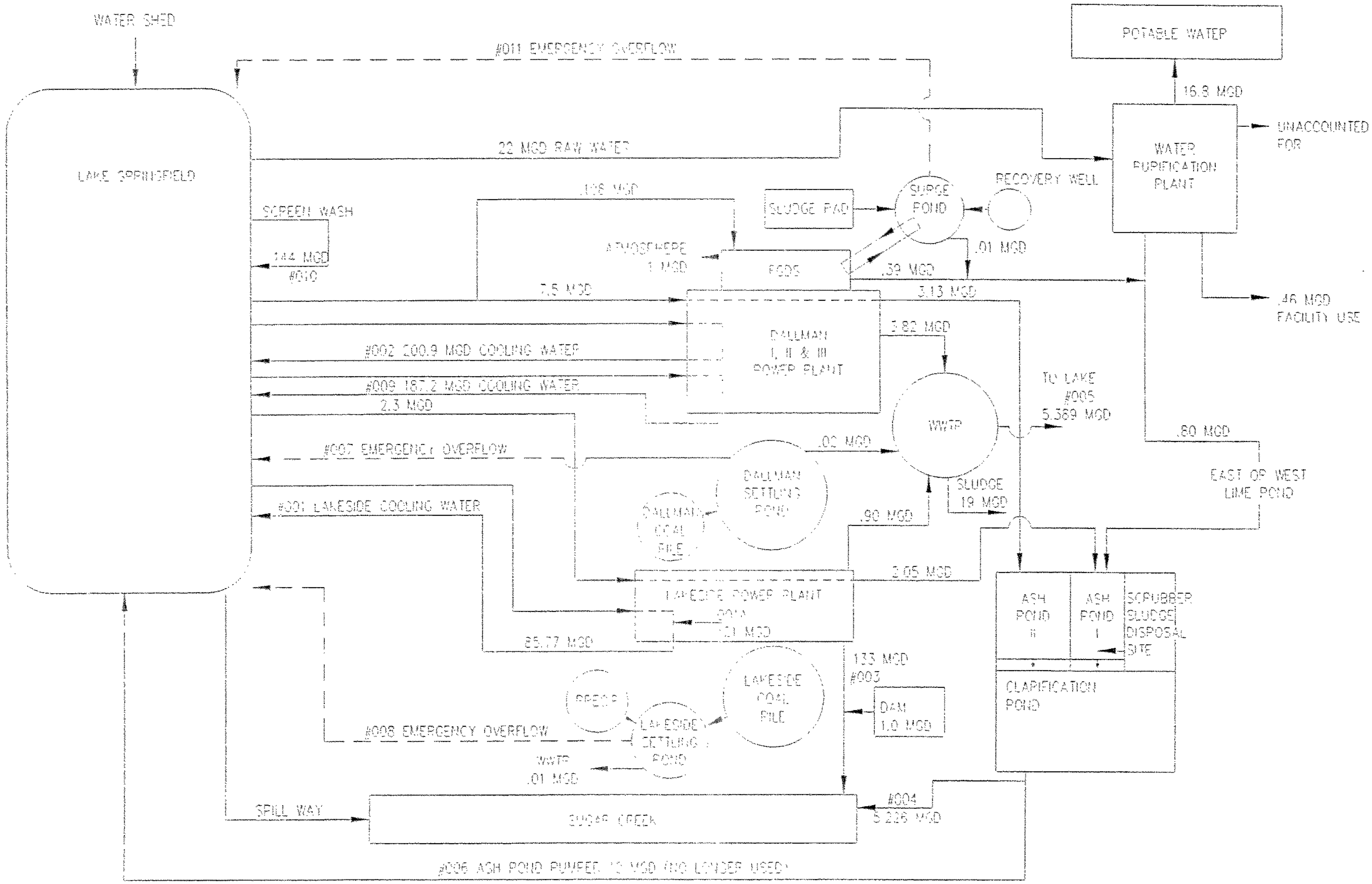


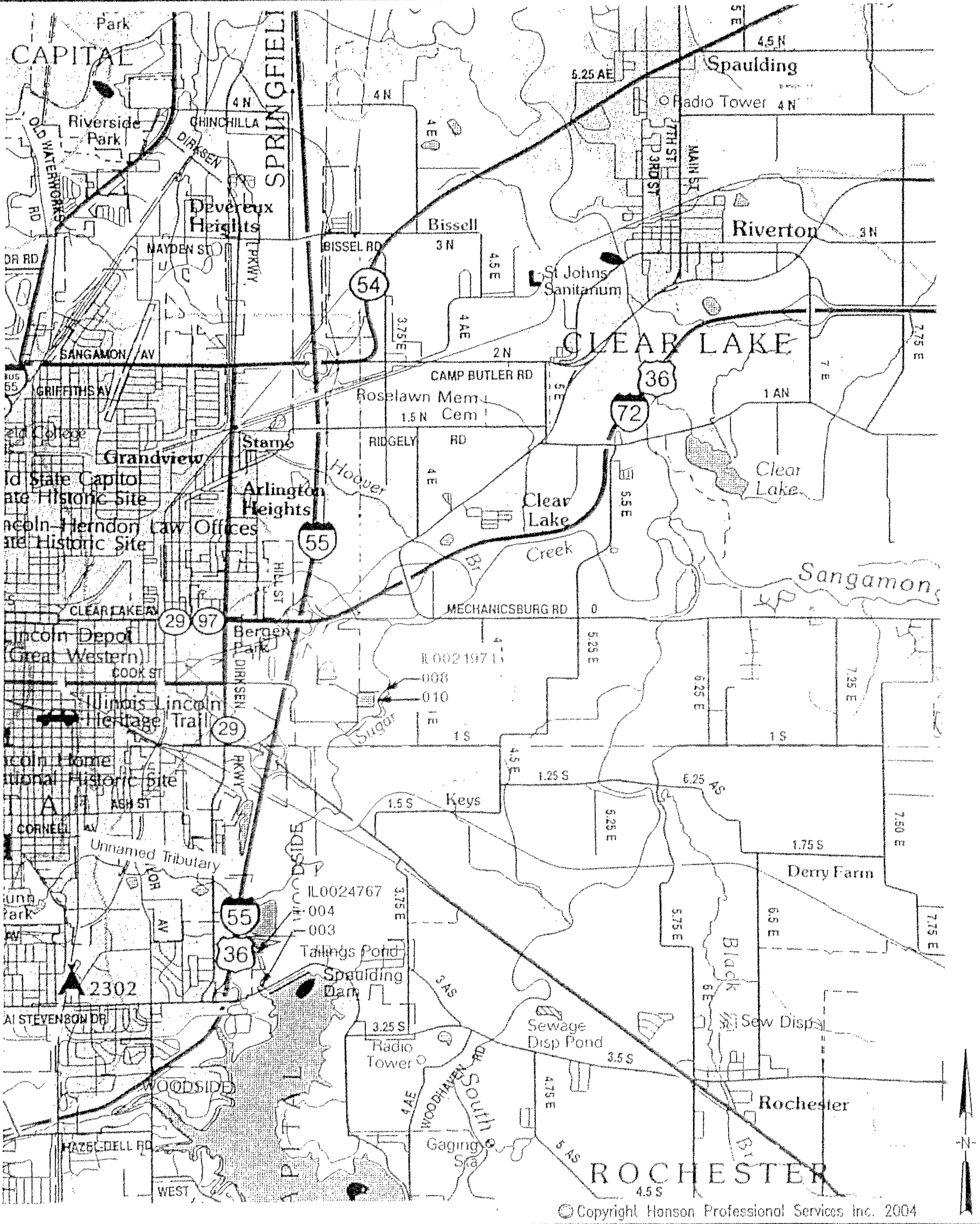
CWLP COMPLEX WATER FLOW SCHEMATIC

INVESTIGATION OF MITIGATION STRATEGIES
FOR BORON INCREASE AT OUTFALL 004
CITY WATER, LIGHT AND POWER
SPRINGFIELD, ILLINOIS

JOB NO. 03S5019 FIGURE 2-2

Sugar Creek and the Sangamon River, Hanson Engineers Incorporated, March 1994). Ultimately, CWLP petitioned the Illinois Pollution Control Board and was granted an adjusted standard for boron. The following standards for boron are now applicable: 11.0 mg/l from CWLP's Outfall 003 at Spaulding Dam on Sugar Creek to its confluence with Springfield Metropolitan Sanitary District's (SMSD's) Sugar Creek Plant Outfall 008; 5.5 mg/l from SMSD's Outfall 008 to its confluence with the South Fork of the Sangamon River; and 2.0 mg/l from the confluence of Sugar Creek and the South Fork of the Sangamon River to 100 yards downstream of the confluence of the Sangamon River with Spring Creek, a total distance of approximately 20 river miles.

The locations of Outfalls 003 and 004 into Sugar Creek are illustrated in Figure 2-3. A summary of flow and water quality data for Outfall 004, obtained from Discharge Monitoring Reports (DMRs) and other information provided by CWLP, is presented in Table 2-2.



NPDES DISCHARGE POINTS

INVESTIGATION OF MITIGATION STRATEGIES
FOR BORON INCREASE AT OUTFALL 004
CITY WATER, LIGHT AND POWER
SPRINGFIELD, ILLINOIS

JOB NO. 03S5019 FIGURE 2-3

TABLE 2-2

OUTFALL 004 MONTHLY FLOW AND BORON CONCENTRATION DATA

Date	Flow at CWLP Outfall 004 (Mgal/day)			Boron Concentration at CWLP Outfall 004 (mg/l)		
	Minimum	Average	Maximum	Minimum	Average	Maximum
January 2003	2.64	5.54	7.70	2.9	6.0	9.0
February 2003	4.69	5.30	5.92	0.2	3.7	8.4
March 2003	3.61	5.04	5.92	6.2	7.9	9.9
April 2003	3.12	5.60	8.67	8.5	9.4	10.6
May 2003	4.69	5.78	6.57	8.5	9.5	11.6
June 2003	3.61	4.93	7.25	11.8	11.9	11.9
July 2003	3.12	8.00	13.42	9.8	11.6	15.4
August 2003	4.69	5.79	7.25	10.1	11.1	11.6
September 2003	5.92	7.05	8.67	14.7	15.1	15.9
October 2003	3.61	4.88	5.92	10.0	12.4	15.7
November 2003	4.69	5.94	6.57	9.3	10.8	12.0
December 2003	3.61	4.52	6.57	11.1	11.6	12.0

SECTION 3.0
IDENTIFICATION OF BORON SOURCES IN THE ASH POND SYSTEM

3.1 Boron Contribution from Ash Sources with SCRs Operating

Influent and effluent samples throughout the CWLP ash pond system were collected while the SCRs at the Dallman Power Station were in operation. These samples were deliberately collected while the SCRs were operating because it was hypothesized that trace amounts of ammonia, added to the fly ash during SCR operation, were increasing boron solubility in the ash pond system. The pH of water and slurry samples and the percent solids of slurry samples were determined at the CWLP laboratory after collection. Then, the water samples and the solid and liquid portions of the slurry samples were transferred under chain-of-custody to Prairie Analytical Laboratories (Prairie Analytical) for boron and ammonia analyses. Prairie Analytical is an Illinois Environmental Protection Agency (Illinois EPA) accredited laboratory that normally performs boron analyses for CWLP.

Samples were collected on nine dates in August and September 2003 while the SCRs were in operation: August 28, September 3, September 4, September 5, September 8, September 11, September 12, September 15, and September 18. The samples collected on these dates were identified as follows:

1-1. Dallman Unit 31 Fly Ash,
1-2. Dallman Unit 31 Fly Ash/Sluice Water,
1-3. Dallman Unit 31 Bottom Ash,
1-4. Dallman Unit 31 Bottom Ash/Sluice Water,
2-1. Dallman Unit 32 Fly Ash,
2-2. Dallman Unit 32 Fly Ash/Sluice Water,
2-3. Dallman Unit 32 Bottom Ash,
2-4. Dallman Unit 32 Bottom Ash/Sluice Water,

3-1. Dallman Unit 33 Fly Ash,

3-2. Dallman Unit 33 Fly Ash/Sluice Water,

3-3. Dallman Unit 33 Bottom Ash,

3-4. Dallman Unit 33 Bottom Ash/Sluice Water,

4-1. Lakeside Fly Ash,

4-2. Lakeside Fly Ash/Sluice Water,

4-3. Lakeside Bottom Ash,

4-4. Lakeside Bottom Ash/Sluice Water,

5. Dallman Ash Pond effluent,

6. Lakeside Ash Pond effluent,

7. Clarification Pond effluent,

8. Lakeside East influent,

9. WWTP Sludge,

10. Lakeside East effluent

11. Coal,

12. Raw Water,

13. Scrubber Surge Pond effluent, and

14. Landfill Leachate.

Sample no. 13, Scrubber Surge Pond effluent, was not tributary to the ash pond system during the sampling period. However, data regarding this stream were collected because CWLP was considering adding this effluent stream to the Lakeside East Pond.

Boron concentration results from water samples and the liquid portion of the slurry samples are detailed in Table 3-1. These same boron concentrations are illustrated graphically in Figure 3-1. Eight of these liquid samples have an average boron concentration of greater than 11.0 mg/l, the adjusted standard for boron at Outfall 004: the Dallman Units 31, 32, and 33 Fly Ash/Sluice Water (samples nos. 1-2, 2-2, and 3-2), the Clarification Pond effluent (sample no. 7), the Lakeside East influent (sample no. 8), the Lakeside East effluent (sample no. 10), the Scrubber Surge Pond effluent (sample no. 13), and the Landfill Leachate (sample no. 14). Essentially, the Clarification Pond effluent (sample no. 7) is Outfall 004.

TABLE 3-1

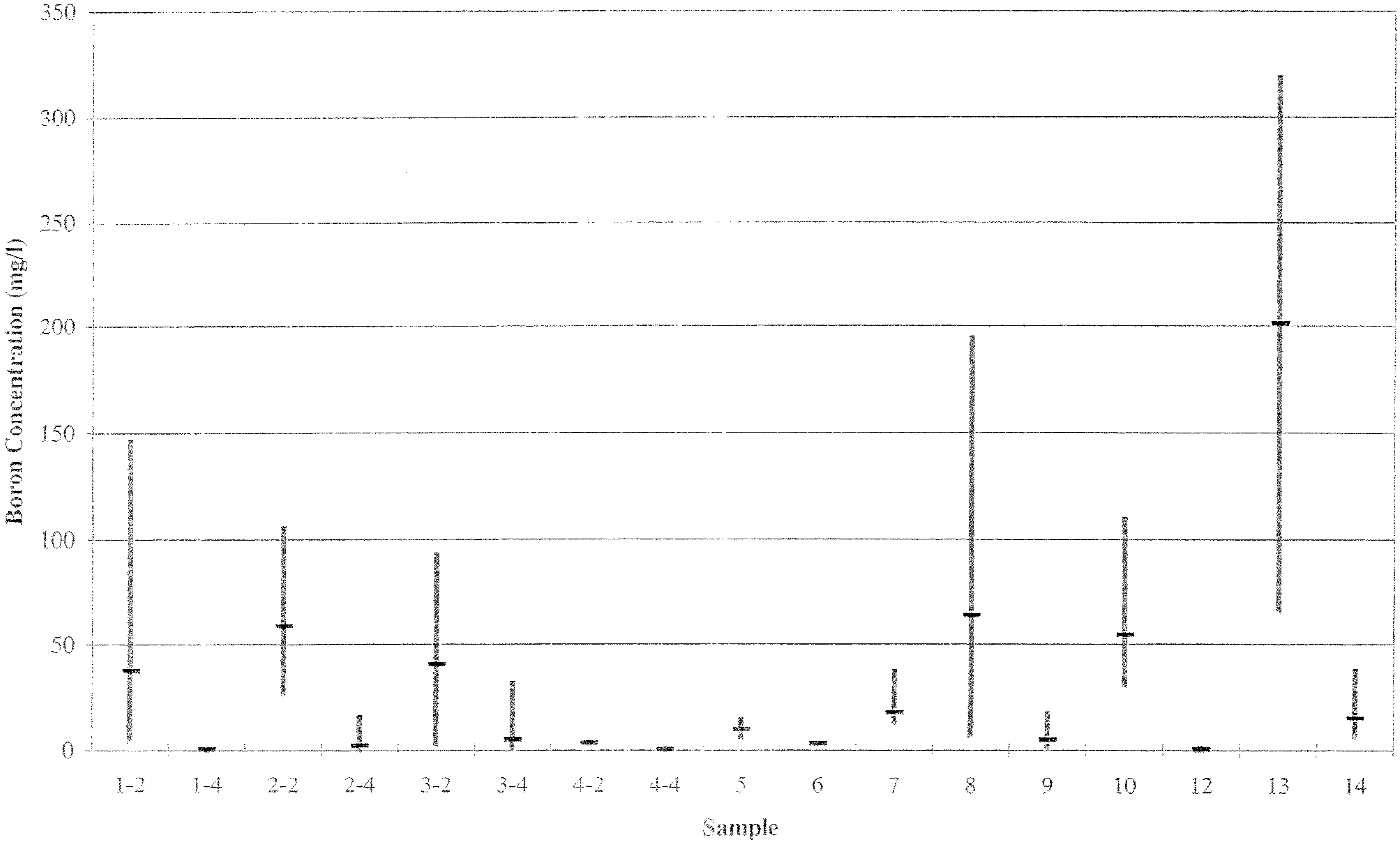
BORON CONCENTRATIONS OF WATER SAMPLES AND THE LIQUID PORTION OF SLURRY SAMPLES WITH THE SCRs OPERATING

(All Concentrations in mg/l)

Sample No. / Date	1-2	1-4	2-2	2-4	3-2	3-4	4-2	4-4	5	6	7	8	9	10	12	13	14
8/28/03	43.8	0.288	30.5	0.356	92.7	1.88	3.38	0.352	14.8	3.15	13.9	40.0	4.02	49.9	—	224	21.3
9/3/03	22.4	0.317	41.0	0.348	69.4	2.26	—	—	8.98	—	17.0	64.3	17.6	47.2	0.325	69.1	11.9
9/4/03	11.7	0.235	88.3	15.6	15.5	1.39	—	—	5.66	—	15.5	48.6	3.12	30.9	0.270	65.6	10.4
9/5/03	146	0.294	86.4	0.348	3.38	31.9	—	—	10.6	—	37.6	91.1	2.73	109	1.05	318	37.7
9/8/03	55.0	0.303	52.6	0.381	79.2	1.13	—	—	8.86	—	15.4	13.5	2.20	96.8	0.490	171	6.74
9/11/03	4.32	0.310	69.6	0.306	21.6	1.36	—	—	8.95	—	12.4	49.5	1.16	39.1	0.284	259	6.41
9/12/03	13.4	0.344	27.4	0.367	11.0	1.12	—	—	9.24	—	14.5	194	4.21	37.5	0.224	249	7.34
9/15/03	38.0	0.285	27.3	0.306	49.3	1.49	—	—	7.83	—	15.1	64.6	2.12	37.7	0.277	270	15.5
9/18/03	7.63	0.329	105	0.343	27.4	0.964	—	—	11.2	—	19.8	6.75	4.16	39.9	0.231	185	17.7
Minimum	**4.32**	**0.235**	**27.3**	**0.306**	**3.38**	**0.964**	—	—	**5.66**	—	**12.4**	**6.75**	**1.16**	**30.9**	**0.224**	**65.6**	**6.41**
Maximum	**146**	**0.344**	**105**	**15.6**	**92.7**	**31.9**	—	—	**14.8**	—	**37.6**	**194**	**17.6**	**109**	**1.05**	**318**	**37.7**
Average	**38.0**	**0.301**	**58.7**	**2.039**	**41.1**	**4.83**	**3.38**	**0.352**	**9.57**	**3.15**	**17.9**	**63.6**	**4.59**	**54.2**	**0.394**	**201**	**15.0**

FIGURE 3-1

BORON CONCENTRATIONS OF WATER SAMPLES AND THE LIQUID PORTION OF SLURRY SAMPLES



The Scrubber Surge Pond effluent (sample no. 13) is not relevant to this study because it was not tributary to the ash pond system during the sampling period. The boron concentration in the Dallman Ash Pond effluent (sample no. 5) ranged between 5.7 and 14.8 mg/l and averaged 9.6 mg/l. Therefore, it can be concluded that the Dallman Fly Ash/Sluice Water samples (samples nos. 1-2, 2-2, and 3-2) and the Landfill Leachate (sample no. 14), which are tributary to the Dallman Ash Pond, are not the primary cause of boron exceedences at Outfall 004. Despite the relatively high boron concentrations of these streams, their relatively small flow volume results in an average boron concentration less than 11.0 mg/l in the Dallman Ash Pond effluent, which flows into the Clarification Pond.

Boron concentration in the Clarification Pond effluent ranged from 12.4 to 37.6 mg/l and averaged 17.9 mg/l. The relationship of ash pond boron concentrations in the CWLP ash pond system is illustrated in Figure 3-2. It appears that the significant boron contributor to the Clarification Pond is the Lakeside East effluent, which had boron concentrations ranging between 30.9 and 109 mg/l and had an average boron concentration of 54 mg/l. The relationship of boron concentrations in the Lakeside East effluent and the Clarification Pond effluent is illustrated in Figure 3-3. This graph shows similar trends in boron concentrations between the Lakeside East effluent and the Clarification Pond effluent, which is further evidence that the Lakeside East Pond is the significant boron contributor to the Clarification Pond.

The relationship of boron concentrations in the Dallman Pond effluent and the Landfill Leachate is illustrated in Figure 3-4. As stated above, it is not believed that the Landfill Leachate is the primary cause of boron exceedences at Outfall 004 in 2003. However, the impact of the Landfill Leachate on the boron concentration in the Dallman Ash Pond is evident in Figure 3-4. Boron concentrations in the Landfill Leachate ranged from 6.4 to 37.7 mg/l and averaged 15.0 mg/l. In the event that water is removed in the Dallman Ash Pond by converting one or more of the Dallman Power Station Units to a dry fly ash handling system or through general water conservation efforts, the effect of the Landfill Leachate inflow to the Dallman Ash Pond will be enhanced. Relatively high boron concentrations and flow volumes of Landfill Leachate have been observed to occur following significant precipitation events.

FIGURE 3-2

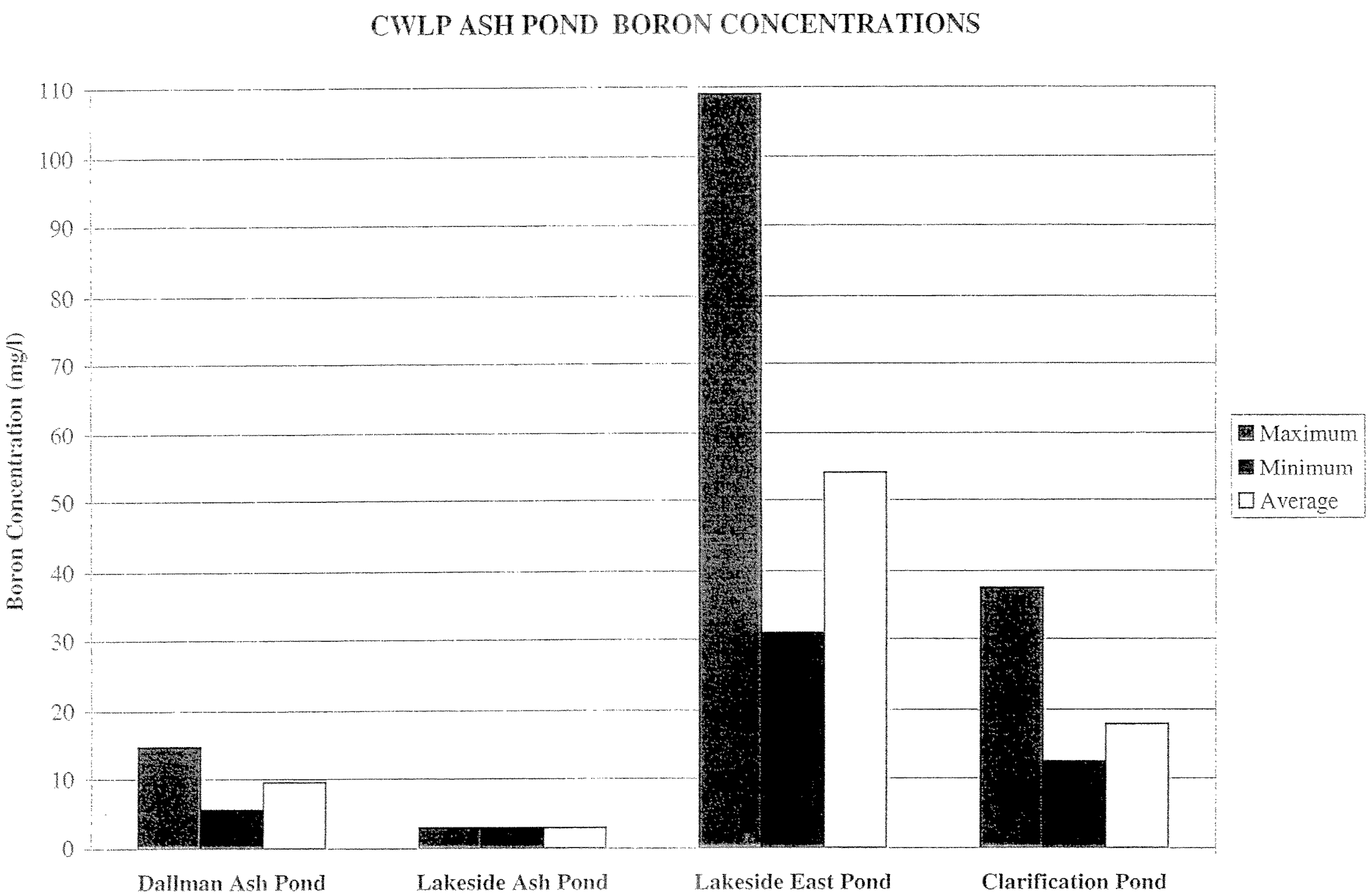

CWLP ASH POND BORON CONCENTRATIONS
Boron Concentration (mg/l)
110
100
90
80
70
60
50
40
30
20
10
0
Maximum
Minimum
Average
Dallman Ash Pond
Lakeside Ash Pond
Lakeside East Pond
Clarification Pond

FIGURE 3-3

BORON CONCENTRATIONS - CLARIFICATION POND EFFLUENT AND LAKESIDE EAST EFFLUENT

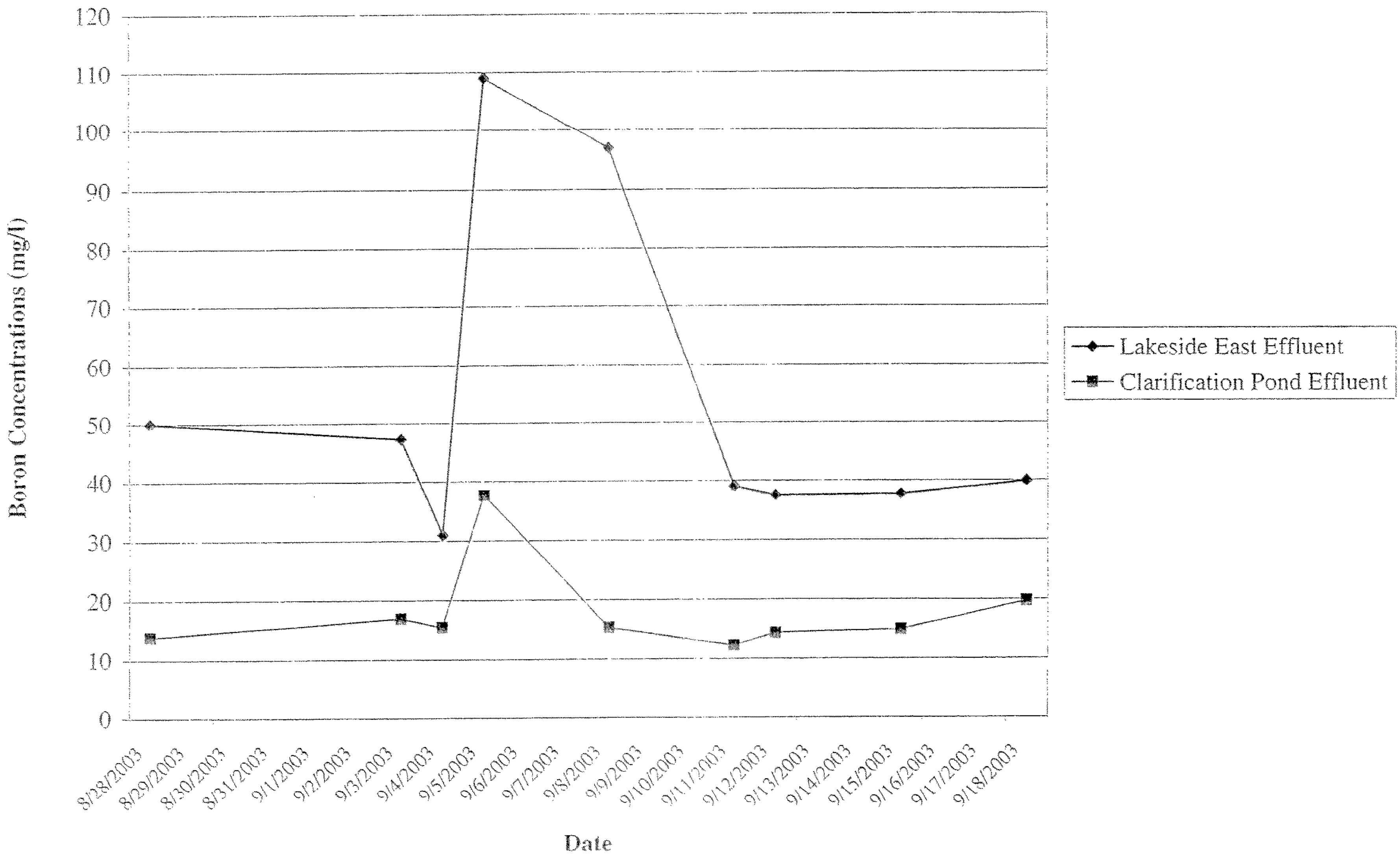
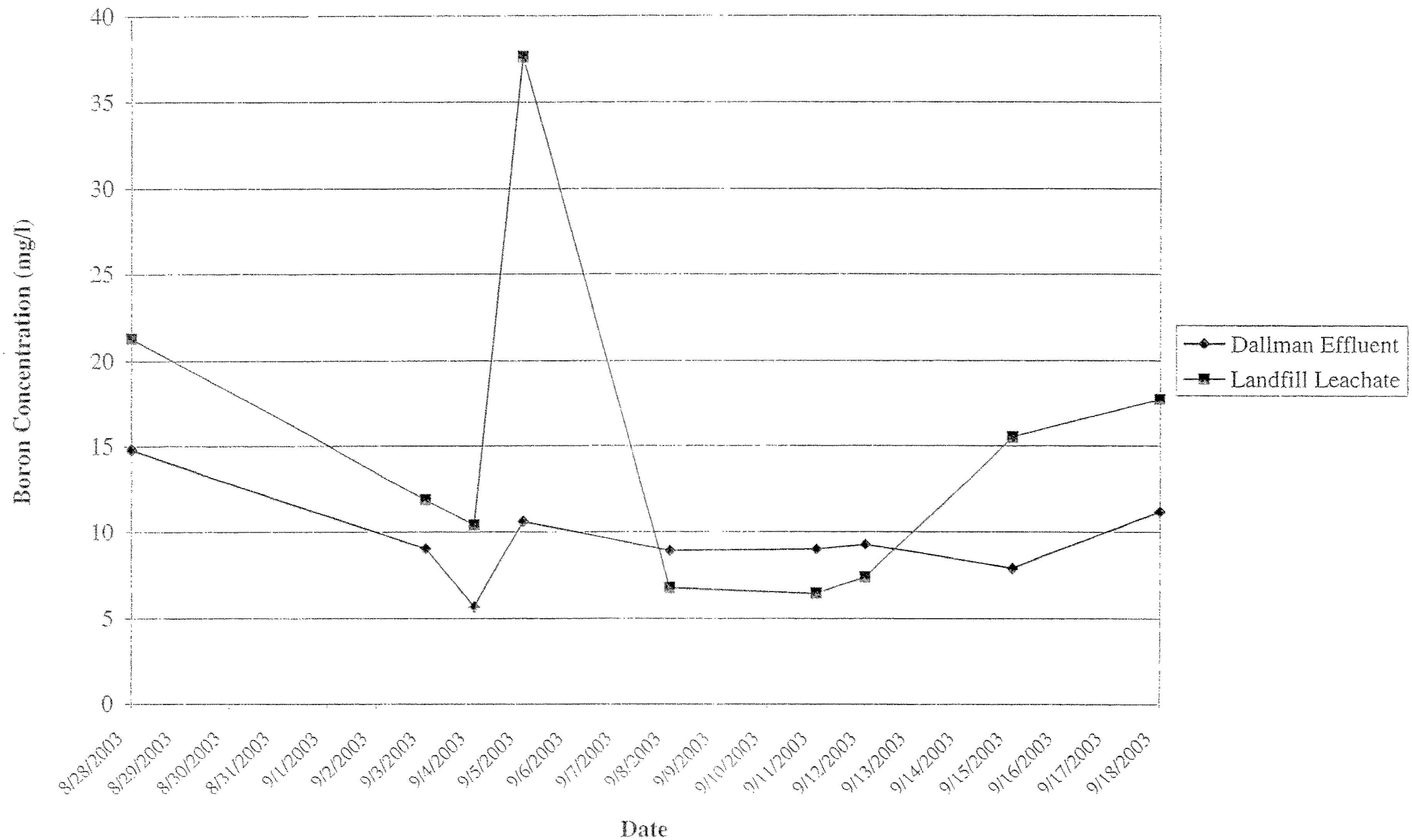


FIGURE 3-4

BORON CONCENTRATIONS - DALLMAN POND EFFLUENT AND LANDFILL LEACHATE



3.2 Boron Contribution from Ash Sources with SCRs Shut Down

Samples were collected throughout the CWLP ash pond system on October 15 and December 9, 2003 (after the SCRs were shut down) for comparison to the August and September 2003 boron concentration data. Boron concentration results from water samples and the liquid portion of the slurry samples are presented in Table 3-2. While it is difficult to develop a reliable comparison based on only two sets of samples, it appears that the boron concentrations at many of the sample locations have decreased in the absence of trace ammonia from SCR operation.

3.3 Investigation of Lakeside East Pond Influent Streams

After analytical results were available for the samples collected in September 2003, additional samples associated with the Lakeside East Pond were obtained. Samples were collected on nine dates in October and December 2003: October 1, October 2, October 15, December 5, December 9, December 11, December 15, December 18, and December 23. The samples collected on these dates were identified as follows:

8. Lakeside East influent
10. Lakeside East effluent
15. Filter Plant Sludge
16. FGDS Pump effluent

The Filter Plant Sludge (sample no. 15) and the FGDS Pump effluent (sample no. 16) from Dallman Power Station comprise the Lakeside East influent stream (sample no. 8). The flow and boron concentration in both the Filter Plant Sludge (sample no. 15) and the FGDS Pump effluent (sample no. 16) are functions of the operations occurring in the Filter Plant and Dallman Power Station at the time of sample collection.

Boron concentration results from water samples and the liquid portions of the Filter Plant Sludge samples are detailed in Table 3-3. Boron concentrations in the Lakeside East influent (sample no. 8) ranged between 3.6 and 135 mg/l and averaged 46.4 mg/l. Analytical results for the Lakeside East effluent (sample no. 10), which had boron concentrations ranging between 24.4 and

TABLE 3-2

BORON CONCENTRATIONS OF WATER SAMPLES AND THE LIQUID PORTION OF SLURRY SAMPLES WITH THE SCRs SHUT DOWN
(All Concentrations in mg/l)

Date \ Sample No.	1-2	1-4	2-2	2-4	3-2	3-4	4-2	4-4	5	6	7	8	9	10	12	13	14
10/15/03	47.0	0.375	6.99	0.327	24.3	0.960	—	—	4.78	—	8.74	7.31	4.34	24.4	0.317	195	22.3
12/9/03	48.2	0.506	54.7	0.447	14.1	0.800	—	—	7.90	—	11.6	3.61	15.6	41.8	0.463	240	6.57
Minimum	**47.0**	**0.375**	**6.99**	**0.327**	**14.1**	**0.800**	—	—	**4.78**	—	**8.74**	**3.61**	**4.34**	**24.4**	**0.317**	**195**	**6.57**
Maximum	**48.2**	**0.506**	**54.7**	**0.447**	**24.3**	**0.960**	—	—	**7.90**	—	**11.6**	**7.31**	**15.6**	**41.8**	**0.463**	**240**	**22.3**
Average	**47.6**	**0.441**	**30.8**	**0.387**	**19.2**	**0.880**	—	—	**6.34**	—	**10.1**	**5.46**	**9.97**	**33.1**	**0.390**	**218**	**14.4**

TABLE 3-3

BORON CONCENTRATIONS OF SAMPLES ASSOCIATED WITH THE LAKESIDE EAST POND
(All Concentrations in mg/l)

Date \ Sample	Lakeside East Influent (Sample No. 8)	Lakeside East Effluent (Sample No. 10)	Filter Plant Sludge (Sample No. 15)	FGDS Pump Effluent (Sample No. 16)
10/1/03	–	–	0.253	–
10/2/03	–	–	0.229	81.1
10/15/03	7.31	24.4	0.219	16.4
12/5/03	65.9	35.2	0.212	414
12/9/03	3.61	41.8	0.345	210
12/11/03	34.3	46.3	0.225	220
12/15/03	135	45.1	0.231	301
12/18/03	34.8	53.5	0.245	126
12/23/03	44.2	29.6	0.254	235
Minimum	3.61	24.4	0.212	16.4
Maximum	135	53.5	0.345	414
Average	46.4	39.4	0.246	200

53.5 mg/l and had an average boron concentration of 39.4 mg/l, appear to indicate that there is neither substantial removal nor addition of boron in the Lakeside East Pond. However, equalization of the influent stream does occur.

It appears that the significant boron contributor to the Lakeside East Pond is the FGDS Pump effluent (sample no. 16), which had boron concentrations ranging between 16.4 and 414 mg/l and had an average boron concentration of 200 mg/l. The FGDS Pump effluent flow rate has been estimated to be about 400,000 gallons per day (gpd). This stream is comprised of water from three sources: return water from gypsum dewatering, Dallman pump seal water, and vacuum pump seal water. Water samples collected on January 8, January 9, and January 12, 2004 confirmed that the boron present in the FGDS Pump effluent is from gypsum dewatering. The flow rate of the liquid stream from gypsum dewatering is estimated to be about 200,000 gpd. The January 2004 gypsum dewatering samples had boron concentrations ranging between 186 and 837 mg/l. In order to maintain compliance with the boron limits required in NPDES permit IL0024767 at Outfall 004, CWLP should consider eliminating the gypsum dewatering stream from the ash pond system.

The boron concentration in the liquid portion of the Filter Plant Sludge samples (sample no. 15) was insignificant, being consistently less than 0.4 mg/l. However, the boron concentration in the solid portion of the Filter Plant Sludge samples was higher, ranging from 21.3 to 175 mg/kg and having an average boron concentration of 86.8 mg/kg. It is believed that the Filter Plant Sludge is mainly comprised of powered activated carbon (PAC) that is added to the raw water for removal of various pesticides and herbicides and to assist with taste and odor control. Analysis of the solid PAC has shown boron concentrations as high as 512 mg/kg. Although tests conducted in December 2003 did not show any indication that the boron in the PAC was leaching to the liquid potion of the sample, it is suggested that additional samples from the filter plant be collected and analyzed for boron in 2004 when PAC addition rates are higher.

SECTION 4.0

POTENTIAL SOLUTIONS TO OUTFALL 004 EXCEEDENCES

January 2004 samples of the FGDS effluent water generated during gypsum dewatering had boron concentrations ranging between 186 and 837 mg/l. The flow rate of this stream is estimated to be about 200,000 gallons per day. Addition of 200,000 gpd of water containing 200 mg/l of boron to the CWLP ash pond system would increase the boron concentration at Outfall 004 by 5 mg/l if the outfall flow rate was 8 Mgal/day. It is recommended that CWLP conduct further investigation of the boron concentrations and attempt to determine the maximum and minimum flow rates associated with the FGDS dewatering stream. It is likely that the FGDS dewatering stream will have to be removed from the ash pond system for Outfall 004 to maintain compliance with NPDES permit IL0024797 requirements.

CWLP should consider both on-site and off-site treatment of the FGDS dewatering stream. It is suggested that CWLP consult with the Springfield Metro Sanitary District (SMSD) to see if the sewage collection system and Sugar Creek Plant has the capacity to accept and treat the FGDS dewatering stream. It is likely that, if SMSD can accept this waste stream, significant surcharges may be imposed due to the relatively high total dissolved solids (TDS), chlorides and sulfates present in the FGDS dewatering stream.

There are several potential treatment on-site alternatives that could be used alone or in combination for removing boron from the FGDS gypsum dewatering stream. These alternative technologies are listed below.

- Activated carbon adsorption. Activated carbon has been widely used for the removal of organics and residual chlorine and has been reported to be successful in removing some trace metals. At least one grade of activated carbon has been demonstrated to remove boron in both deionized and high total dissolved solid (TDS) water. However, this demonstration was conducted for relatively low boron concentrations (<5 mg/l) and would probably not be an effective treatment alternative for CWLP.

- Ion exchange. There is at least one commercially available ion exchange resin that is selective for boron removal (Rohm & Haas Company Amberlite IRA-743). Selective ion exchange would be expected to generate a significant volume of regenerant waste with a high boron content that would possibly require volume reduction. Conventional ion exchange could also be used to remove most of the dissolved solids, including boron, from the FGDS gypsum dewatering stream. However, since boron would compete with other species for ion exchange sites, nonselective ion exchange would require multiple treatment trains, utilize excessive regenerant chemicals, and generate a quantity of regenerant waste that could not be disposed of economically. Therefore, nonselective ion exchange is probably not a good alternative for CWLP.

- Mechanical evaporation. Mechanical evaporators are currently being used for zero discharge water management in a number of power plants in the United States. They are generally reliable although some systems are reported to have scaling problems and periodic mechanical maintenance is required.

- Reverse osmosis. Reverse osmosis (RO) systems are widely used for water and wastewater treatment in the power industry as well as in industrial applications. However, a conventional two-stage RO system without addition treatment would not be practical since recovery of product water is typically in the range of 70-80 percent. The remaining 20-30 percent, or RO reject, could not be disposed of economically without some type of mechanical evaporation.

- Chemical precipitation. Boron compounds are extremely soluble in aqueous solutions and therefore are difficult to remove by chemical precipitation. However, a proprietary commercial product manufactured by Environmental Technology, known as Boron-X, is available for the removal of boron from wastewater. Boron-X has been used in applications where the wastewater boron levels are relatively high (e.g., 500-5000 mg/l).

If CWLP elects to conduct on-site treatment of the high boron waste stream, it is recommended that they seek the assistance of a firm that specializes in designing and providing custom wastewater treatment systems to perform a pilot study on a representative FGDS gypsum dewatering sample and provide a recommendation and a cost estimate for treatment.

SECTION 5.0

POTENTIAL EFFECTS OF INSTALLING UNIT 33 DRY ASH SYSTEM

CWLP operational records show that during 2003 a total of 2,780 Mgal of sluice water was added to the ash pond system. Specifically, Unit 31/32 sluice pumps added 1,143 Mgal of sluice water (41 percent of total sluice water added), Unit 33 sluice pumps added 888 Mgal of sluice water (32 percent of the total sluice water added), and Lakeside sluice pumps added 746 Mgal of sluice water (27 percent of the total sluice water added) to the ash pond system in 2003. These figures can be used to predict that, if a dry ash system was installed for unit 33, the effect of boron in the Landfill Leachate would be increased by 78 percent in Dallman Ash Pond and increased by 47 percent in the Clarification Pond. In other words, if the addition of Landfill Leachate is currently increasing the boron concentration in the Dallman Ash Pond by 2.0 mg/l, without Unit 33 sluice water the same Landfill Leachate stream will increase the boron concentration in the Dallman Ash Pond by 3.56 mg/l (1.78 x 2.0).

Leachate in the Landfill is derived from two sources: precipitation onto the Landfill surface and water included in the landfilled Filter Plant sludge or power station ash. No data exist regarding the percentage moisture in the landfilled materials. However, daily precipitation records for the site are maintained by CWLP. During 2003, 32.73 inches of total precipitation were recorded. Assuming that all of the precipitation that falls on the 33.9 acre landfill is eventually pumped into Dallman Ash Pond, this equates to 30.1 Mgal of water. While this flow is relatively insignificant compared to the 2,031 Mgal of sluice water added to the Dallman Ash Pond during 2003, it is important to note that significant amounts of precipitation can occur in a short time frame. For example, 3.75 inches of rain was recorded on August 31, 2003 and 1.0 inch of rain was recorded on the next day, which equates to about 4.4 Mgal of water tributary to Dallman Ash Pond. The Landfill Leachate sample collected on September 5, 2003 had a boron concentration of 37.7 mg/l. Assuming that Dallman Units 31, 32, and 33 were all operational and adding about 6.4 Mgal/day of sluice water to the Dallman Ash Pond and that the leachate is added to the Dallman Ash over a period of one week, then the effect of the Landfill Leachate would be to increase the boron concentration in Dallman Ash Pond by 3.7 mg/l. This relationship can be seen graphically on Figure 3-4. If Dallman Unit 33 was not contributing any sluice wat3er to the ash ponds, the effect of the Landfill Leachate would have been to increase the boron concentration in Dallman Ash Pond by 7.6 mg/l.

It is suggested that CWLP consider the added effect that boron in the Landfill Leachate may have to boron concentrations in the ash ponds when contemplating operational changes that will reduce water inflow to the ash pond system.

SECTION 6.0
CONCLUSIONS

This report provides a summary of sample data which identifies the significant sources of the boron in the CWLP ash pond system as the effluent from Lakeside East Pond and the Landfill Leachate. Boron in the Lakeside East Pond is apparently the result of water from the FGDS gypsum dewatering at the Dallman Power Station. Although significant concentrations of boron have been identified in the Filter Plant sludge, there are no data suggesting that this boron is leaching to the water. Boron in the Filter Plant sludge is believed to be the result of PAC addition to the raw water early in the water treatment process.

This report also discusses possible treatment alternatives for the major boron source identified above and advises CWLP about the potential effects to boron concentrations in the Dallman Ash Pond that could result following installation of a dry ash system for Dallman Unit 33.

A list of suggested activities for continued investigation, control, possible treatment, and future prevention of unacceptably high levels of boron in the CWLP ash pond system is presented below for CWLP consideration.

1. Define the maximum and average flow rate of the FGDS gypsum dewatering stream.
2. Investigate the concentrations of boron and other ions in the FGDS gypsum dewatering stream with the SCRs running and with the SCRs turned off.
3. Collect additional samples from the Filter Plant Sludge for boron analyses after the SCRs resume operation in 2004 to ensure that significant quantities of boron are not leaching from PAC in the sludge.
4. Consider consulting with a firm that specializes in designing and providing custom wastewater treatment systems to perform a pilot study on representative FGDS gypsum dewatering samples.

5. It is suggested that any dewatering of the filter plant sludge into the Lakeside East Pond be closely coordinated with CWLP Environmental Health and Safety personnel to minimize the potential for boron exceedences at Outfall 004.

6. Consider the impact that water conservation efforts, including switching power station units to dry fly ash, will have on boron concentrations in the ash pond system prior to making any modifications to ash pond influent streams.