

ICR TREATMENT STUDY ANALYSIS

Base Analysis and Data Review Comments

Treatment Study ID	1067
Study Protocol	GAC RSSCT treatment study
Plant ICR Number	341
PWS Name	Iowa-American Water Company
City, State, Zip	Davenport, IA 52803

These are general comments that do not need to be responded to directly.

Major comments:

None

General Comments:

1. The MRL for UV-254 is reported at 0.009 1/cm, but values as low as 0.001 1/cm are reported in the Data Collection Spreadsheets. The MRL for TOC is reported as 0.5 mg/L, but values as low as 0.25 are reported in Data Collection Spreadsheets. The MRL for TOX is reported as 25 ug/L, but values as low as 13 ug/L are reported in Data Collection Spreadsheets. It is acceptable to use these measured values below the MRL, but comments should be included that indicate these values are BMRL. Alternatively, the MRL could be revised if it was determined according to acceptable procedures.

Values below the MRL in the Data Collection Spreadsheets are estimates. A comment indicating this has been added to the Data Collection Spreadsheets.

2. Seasonal variability was evaluated over three quarters (March, September and November). During the November session, in addition to seasonal testing using 10- and 20-minute contactors, two 10-minute contactors were operated at influent pH values of 6.5 and 7.5 to evaluate the impact of pH on GAC performance.
3. During the first session (March), influent water was sampled from Train #1, prior to chlorine addition in the sedimentation basin (see Figure 1 in the report). A chlorine residual was not detected in the influent during sampling; thus, samples were not analyzed for instantaneous DBPs. During the second session (September), a chlorine residual was measured during an initial sampling attempt, but a new location in which no chlorine residual was detected was used. Analysis of instantaneous DBPs showed THM4 concentrations of 25 µg/L in this

influent sample. The influent was resampled from Train #2 from the superpulsator effluent (see Figure 2 in the report), and no instantaneous DBPs were measured in the sample from Train #2. The influent sample for the third session (November) was collected from the same location in Train #2. See Sections 6.1 and 7.2 of the Summary Report for additional details.

4. Sections 6.6 and 7.2 of the Summary Report discussed the method for selecting SDS conditions. During the first session, a target SDS incubation time of 3.0 hours was used – this time is an approximation of the average residence time in the distribution system. After this first session, the incubation time was reevaluated, and a holding time of 24 hours was used for all subsequent sessions – this time is an approximation of the maximum residence time in the distribution system. This fact should be kept in mind when comparing the DBP results from the first session to the results from subsequent sessions.
5. FYI, Figures 218 and 219 are missing from my copy of the Summary Report.

Response: Note that due to a systematic error, QA/QC data reported in Table 60 of the Treatment Study Summary Report were incorrect. The values have been corrected, and the updated version of Table 60 has been added to the hard copy and to the electronic version (PDF) of the report.

Outlier Data:

No outliers were removed.

Cell: A1

Comment: 1067_SAS.xls 2/1/00 14:20

All curve fits reviewed and approved. See below for log of refit datasets.

1067_SAS.xls 2/2/00 22:12

Curve fit review updated and approved. See below for log of refit datasets.

Cell: C10

Comment: 1067-10-01 - Run 1 (DCAA) 2/1/00 14:11

Original value (CoefA0) = -1.3143 New value = -0.7601

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D10

Comment: 1067-10-01 - Run 1 (DCAA) 2/1/00 14:11

Original value (CoefAf) = 11.6032 New value = 7.2126

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E10

Comment: 1067-10-01 - Run 1 (DCAA) 2/1/00 14:11

Original value (CoefB) = 9.4838 New value = 19.7839

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F10

Comment: 1067-10-01 - Run 1 (DCAA) 2/1/00 14:11

Original value (CoefD) = 0.1329 New value = 0.2765

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J10

Comment: 1067-10-01 - Run 1 (DCAA) 2/1/00 14:11

Original value (S) = 0 New value = 0

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: C11

Comment: 1067-10-01 - Run 1 (DCBAA) 2/1/00 14:02

Original value (CoefA0) = 1 New value = 1

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

1067-10-01 - Run 1 (DCBAA) 2/2/00 22:11

Original value (CoefA0) = 1 New value = 1.4147

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: D11

Comment: 1067-10-01 - Run 1 (DCBAA) 2/1/00 14:02

Original value (CoefAf) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

1067-10-01 - Run 1 (DCBAA) 2/2/00 22:11

Original value (CoefAf) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: E11

Comment: 1067-10-01 - Run 1 (DCBAA) 2/1/00 14:02

Original value (CoefB) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

1067-10-01 - Run 1 (DCBAA) 2/2/00 22:11

Original value (CoefB) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: F11

Comment: 1067-10-01 - Run 1 (DCBAA) 2/1/00 14:02

Original value (CoefD) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

1067-10-01 - Run 1 (DCBAA) 2/2/00 22:11

Original value (CoefD) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: J11

Comment: 1067-10-01 - Run 1 (DCBAA) 2/1/00 14:02

Original value (S) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

1067-10-01 - Run 1 (DCBAA) 2/2/00 22:11

Original value (S) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: K11

Comment: 1067-10-01 - Run 1 (DCBAA) 2/1/00 14:02

Original value (t0) = 0 New value = 40.2314

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

1067-10-01 - Run 1 (DCBAA) 2/2/00 22:11

Original value (t0) = 40.2314 New value = 40.2314

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: C12

Comment: 1067-10-01 - Run 1 (HAA5) 2/1/00 14:12

Original value (CoefA0) = -4.1405 New value = -4.7025

Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D12

Comment: 1067-10-01 - Run 1 (HAA5) 2/1/00 14:12

Original value (CoefAf) = 22.4946 New value = 32.5785

Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E12

Comment: 1067-10-01 - Run 1 (HAA5) 2/1/00 14:12
Original value (CoefB) = 3.2293 New value = 4.6078
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F12

Comment: 1067-10-01 - Run 1 (HAA5) 2/1/00 14:12
Original value (CoefD) = 0.0424 New value = 0.0341
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J12

Comment: 1067-10-01 - Run 1 (HAA5) 2/1/00 14:12
Original value (S) = 0 New value = -0.0836
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C13

Comment: 1067-10-01 - Run 1 (HAA6) 2/1/00 14:15
Original value (CoefA0) = -4.7866 New value = -0.738
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D13

Comment: 1067-10-01 - Run 1 (HAA6) 2/1/00 14:15
Original value (CoefAf) = 24.6775 New value = 23.5861
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E13

Comment: 1067-10-01 - Run 1 (HAA6) 2/1/00 14:15
Original value (CoefB) = 3.2853 New value = 8.6252
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F13

Comment: 1067-10-01 - Run 1 (HAA6) 2/1/00 14:15
Original value (CoefD) = 0.0441 New value = 0.055
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J13

Comment: 1067-10-01 - Run 1 (HAA6) 2/1/00 14:15
Original value (S) = 0 New value = -0.0938
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C14

Comment: 1067-10-01 - Run 1 (HAA9) 2/1/00 14:13
Original value (CoefA0) = -1.0751 New value = 0.4613
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D14

Comment: 1067-10-01 - Run 1 (HAA9) 2/1/00 14:13
Original value (CoefAf) = 22.0849 New value = 21.3526
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E14

Comment: 1067-10-01 - Run 1 (HAA9) 2/1/00 14:13
Original value (CoefB) = 9.7961 New value = 18.7744
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F14

Comment: 1067-10-01 - Run 1 (HAA9) 2/1/00 14:13
Original value (CoefD) = 0.0674 New value = 0.0799
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J14

Comment: 1067-10-01 - Run 1 (HAA9) 2/1/00 14:13
Original value (S) = 0 New value = -0.1084
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C18

Comment: 1067-10-01 - Run 1 (TCAA) 2/1/00 14:14
Original value (CoefA0) = -0.7441 New value = -2.0384
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D18

Comment: 1067-10-01 - Run 1 (TCAA) 2/1/00 14:14
Original value (CoefAf) = 9.9196 New value = 22.0811
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E18

Comment: 1067-10-01 - Run 1 (TCAA) 2/1/00 14:14
Original value (CoefB) = 130.002 New value = 30.86
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F18

Comment: 1067-10-01 - Run 1 (TCAA) 2/1/00 14:14
Original value (CoefD) = 0.1206 New value = 0.0572
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J18

Comment: 1067-10-01 - Run 1 (TCAA) 2/1/00 14:14
Original value (S) = -0.0177 New value = -0.0248
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C98

Comment: 1067-20-01 - Run 2 (DCAA) 2/1/00 14:19
Original value (CoefA0) = -0.1756 New value = -0.0949
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: D98

Comment: 1067-20-01 - Run 2 (DCAA) 2/1/00 14:19
Original value (CoefAf) = 6.335 New value = 3.82
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: E98

Comment: 1067-20-01 - Run 2 (DCAA) 2/1/00 14:19

Original value (CoefB) = 20 New value = 19.847

Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: F98

Comment: 1067-20-01 - Run 2 (DCAA) 2/1/00 14:19

Original value (CoefD) = 0.0741 New value = 0.1654

Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: J98

Comment: 1067-20-01 - Run 2 (DCAA) 2/1/00 14:19

Original value (S) = -0.0102 New value = 0

Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

ICR Information

ID / ICR#: IA8222001 / 341
 ICR Contact: Joel Mohr
 Phone No.: (319) 322-0161
 Period: 3/17/98 - 4/4/98 (17 B-S days)

Design Information

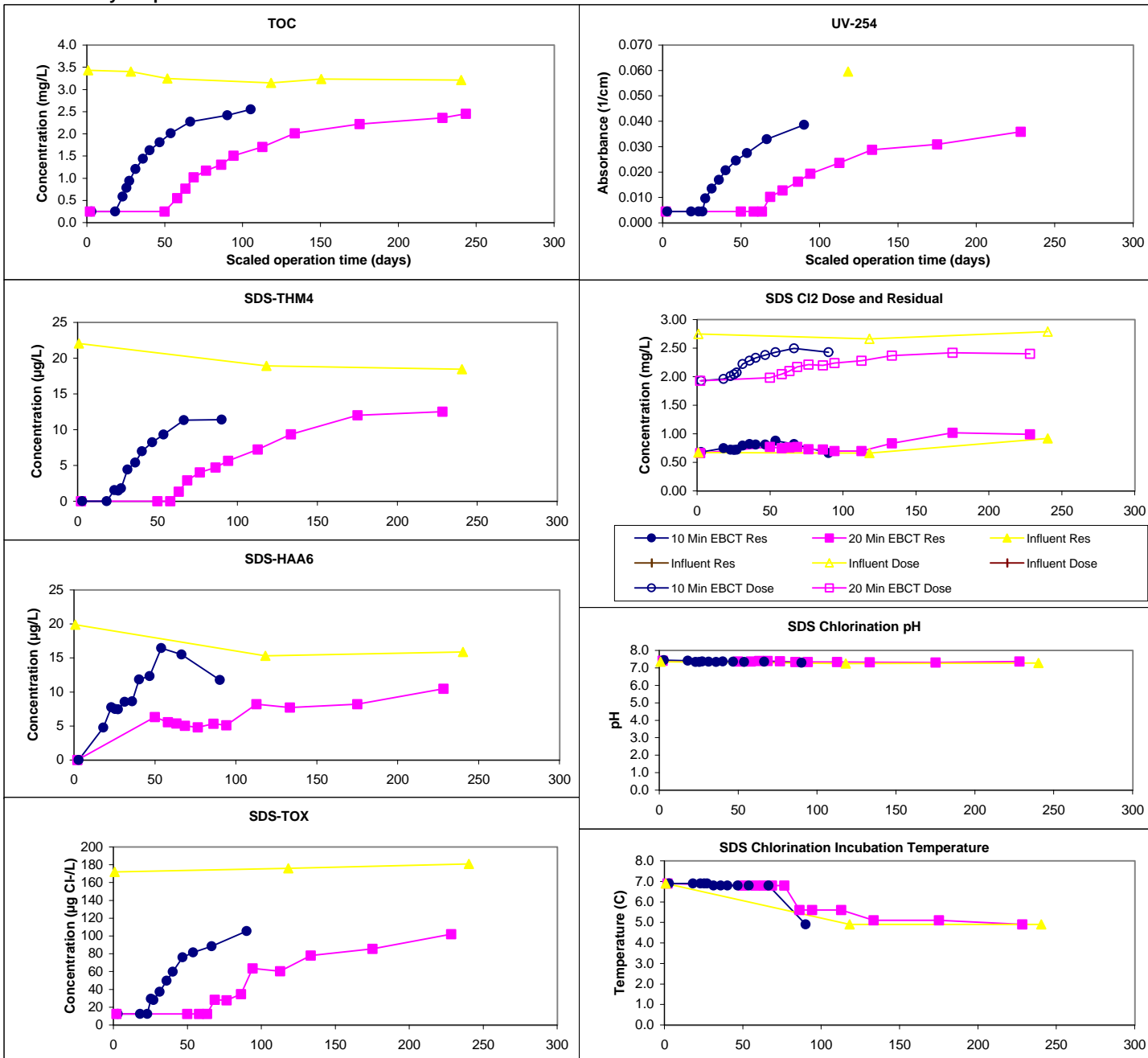
Design TOC: 3.5 mg/L
 Col Diameter: 11.0 mm
 Min Reynolds#: 0.31
 Full-Scale Temp: 3.0 C

Full-Scale GAC Size: 8x26 Bituminous
 Bench-Scale GAC Size: 100x200
 Scaling Factor: 13.52
 Meas Dry Bed Density: 0.48 g/cm3

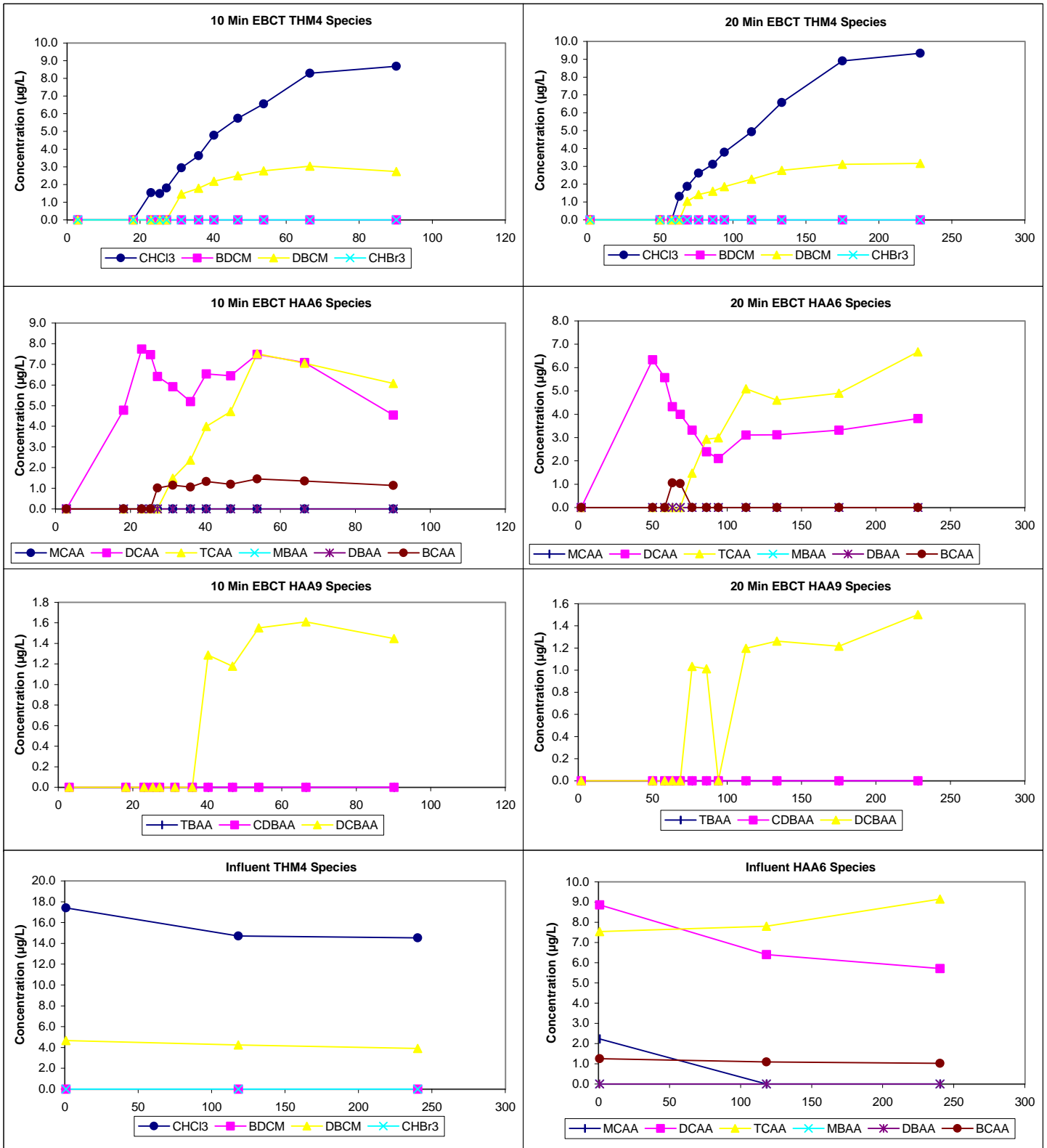
Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	3.3	0.1	6	3.1 - 3.4									
pH	7.1	0.0	6	7.0 - 7.1									
UV254	0.060	0.000	1	0.060 - 0.060									
SUVA	1.89	0.00	1	1.89 - 1.89									
Bromide	10	0	2	10 - 10									
SDS-TOX	176	4	3	172 - 181									
SDS-THM4	20	2	3	18 - 22									
SDS-HAA6	17	2	3	15 - 20									
Effluent	10 Min EBCT (8 B-S days)				20 Min EBCT (18 B-S days)				Chart Legend:	<div><div><div></div><div>10 Min EBCT</div></div><div><div></div><div>20 Min EBCT</div></div><div><div></div><div>Influent</div></div><div><div></div><div>Influent</div></div></div>			
	Effluent pH	7.7	0.1	13	7.4 - 7.9	7.9	0.4	13					
Effluent Temp	21.9	0.8	13	21.1 - 23.4	22.3	1.3	13	21.0 - 25.4					

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information

ID / ICR#: IA8222001 / 341
 ICR Contact: Joel Mohr
 Phone No.: (319) 322-0161
 Period: 9/30/98 - 10/14/98 (13 B-S days)

Design Information

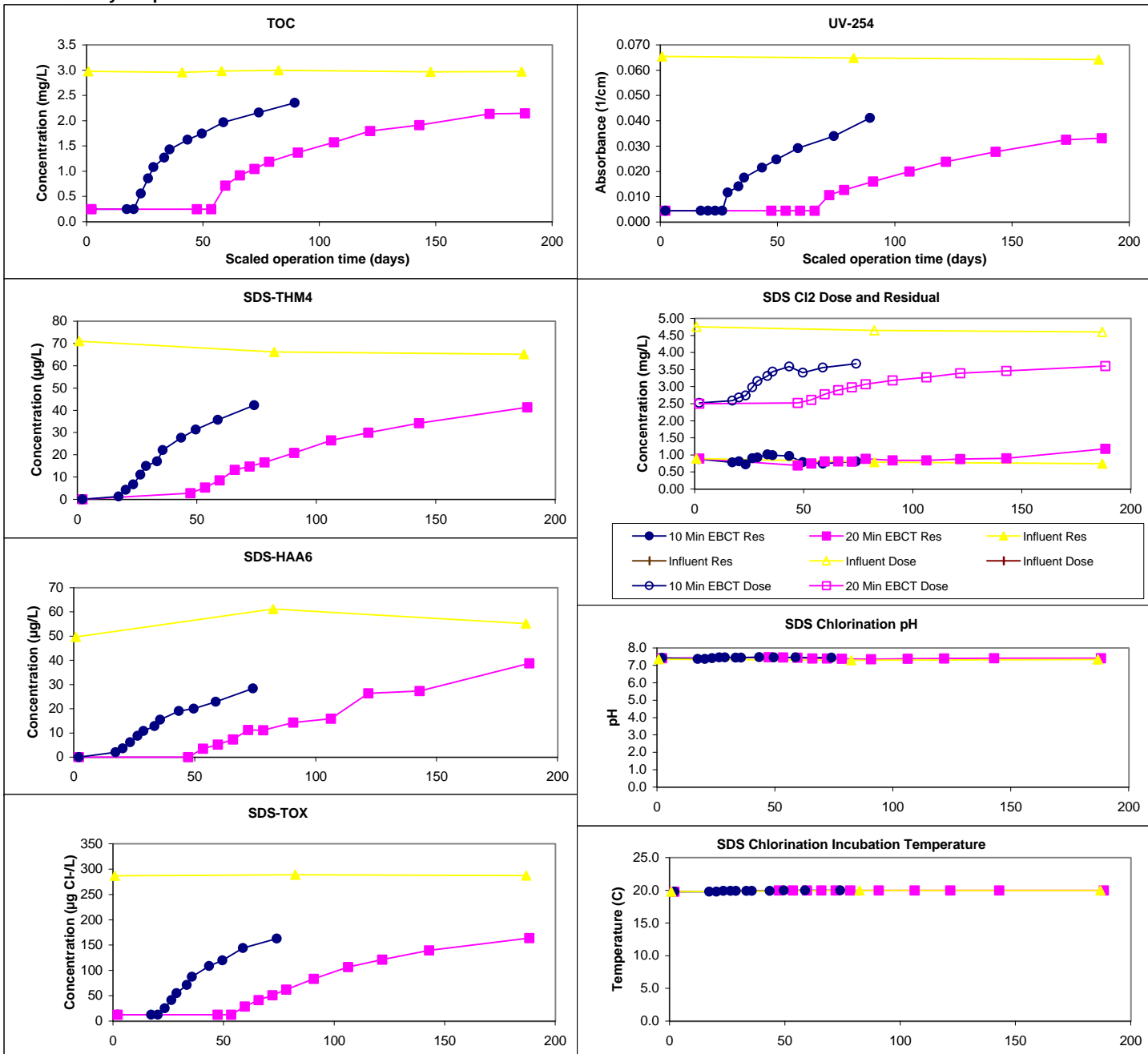
Design TOC: 3.0 mg/L
 Col Diameter: 10.0 mm
 Min Reynolds#: 0.59
 Full-Scale Temp: 24.0 C

Full-Scale GAC Size: 8x26 Bituminous
 Bench-Scale GAC Size: 100x200
 Scaling Factor: 13.52
 Meas Dry Bed Density: 0.47 g/cm3

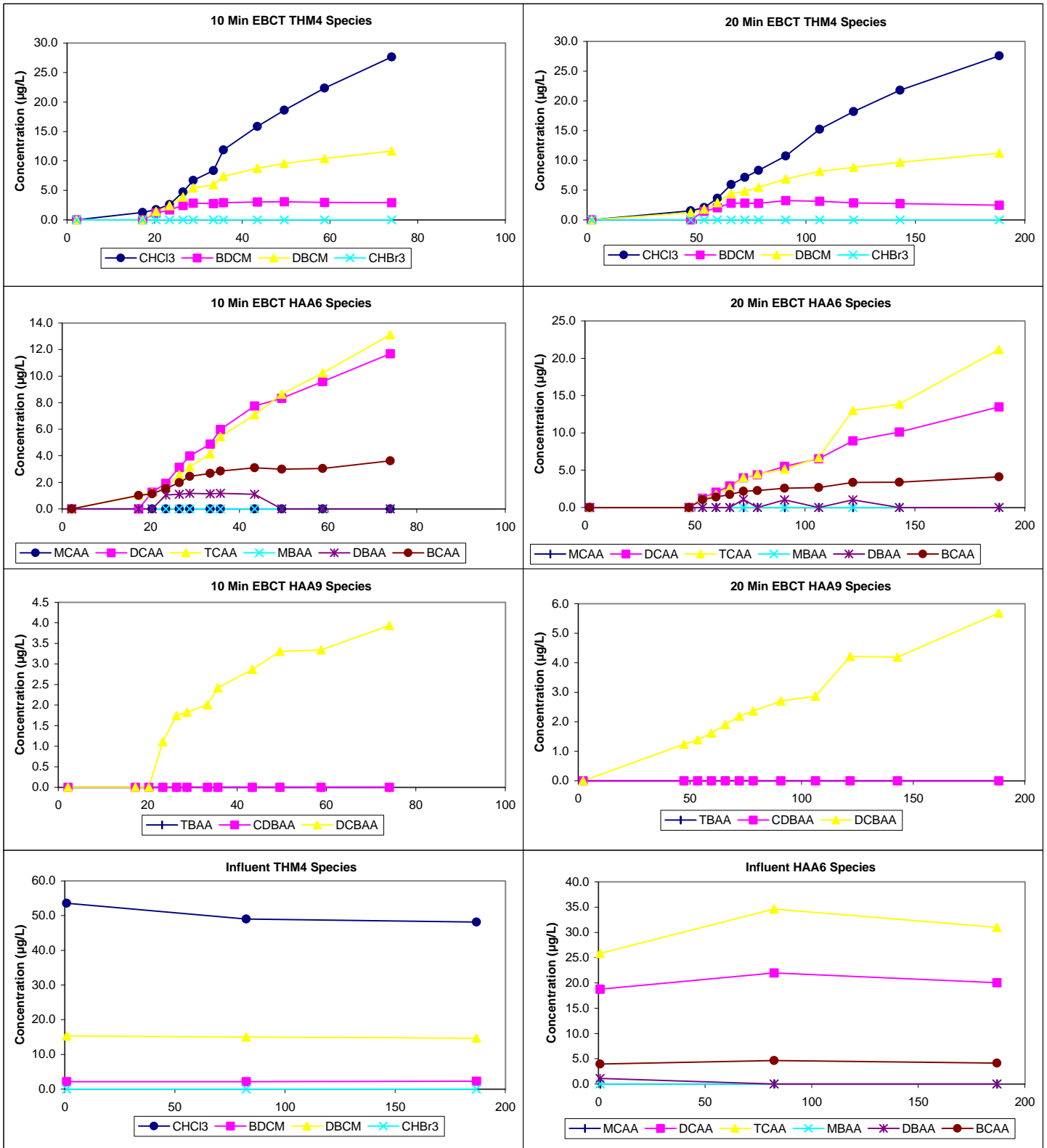
Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	3.0	0.0	6	3.0 - 3.0									
pH	7.2	0.0	6	7.2 - 7.3					Temp	19.9	0.1	27	19.8 - 20.0
UV254	0.065	0.001	3	0.064 - 0.065					pH	7.4	0.0	27	7.3 - 7.5
SUVA	2.17	0.02	3	2.16 - 2.19					Time	24.0	0.2	27	23.2 - 24.3
Bromide	29	1	2	28 - 29					Comments:				
SDS-TOX	288	1	3	287 - 289									
SDS-THM4	67	3	3	65 - 71									
SDS-HAA6	55	6	3	50 - 61									
Effluent	10 Min EBCT (7 B-S days)				20 Min EBCT (14 B-S days)				Chart Legend:	<div><div><div></div><div>10 Min EBCT</div></div><div><div></div><div>20 Min EBCT</div></div><div><div></div><div>Influent</div></div><div><div></div><div>Influent</div></div></div>			
Effluent pH	7.8	0.1	12	7.6 - 7.9	7.9	0.1	13	7.8 - 8.0					
Effluent Temp	21.6	0.4	13	21.1 - 22.2	21.3	0.4	13	20.4 - 21.9					

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information





ID / ICR#: IA8222001 / 341
 ICR Contact: Joel Mohr
 Phone No.: (319) 322-0161
 Period: 11/20/98 - 12/8/98 (17 B-S days)

Design Information

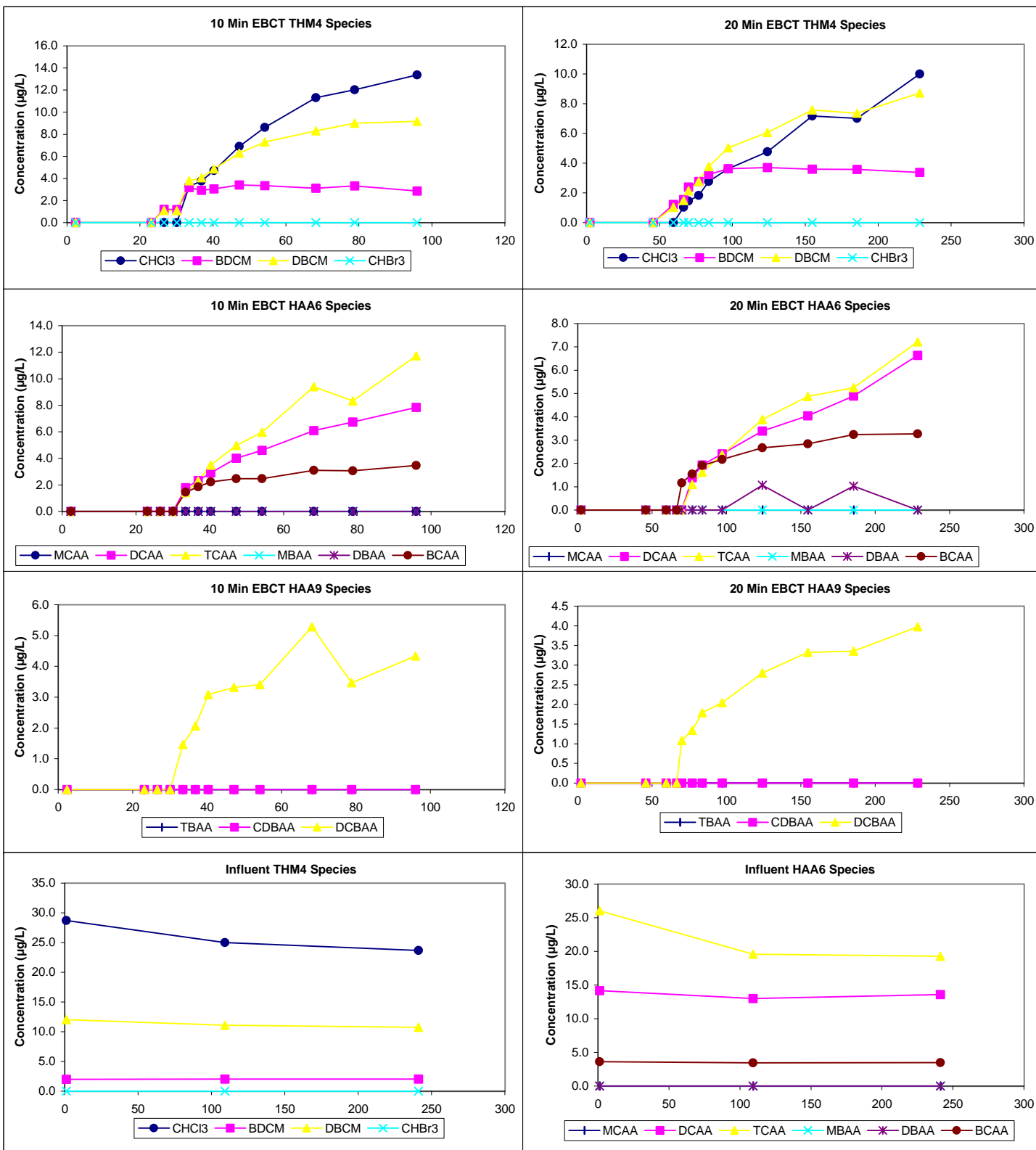
Design TOC: 2.8 mg/L
 Col Diameter: 10.0 mm
 Min Reynolds#: 0.33
 Full-Scale Temp: 7.0 C

Full-Scale GAC Size: 8x26 Bituminous
 Bench-Scale GAC Size: 100x200
 Scaling Factor: 13.52
 Meas Dry Bed Density: 0.48 g/cm3

Water Quality Summary

Influent	Influent				Influent								
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max		Mean	SD	Count	Min/Max
TOC	2.8	0.1	6	2.7 - 2.9					Res (0)	0.88	0.15	27	0.57 - 1.13
pH	7.0	0.1	6	7.0 - 7.3					Temp	7.6	0.3	27	7.2 - 8.0
UV254	0.060	0.000	3	0.060 - 0.060					pH	7.4	0.0	27	7.3 - 7.5
SUVA	2.12	0.04	3	2.07 - 2.15					Time	24.2	0.2	27	23.8 - 24.5
Bromide	34	1	2	33 - 34					Comments:				
SDS-TOX	207	6	3	202 - 213									
SDS-THM4	39	3	3	36 - 43									
SDS-HAA6	39	4	3	36 - 44									
Effluent	10 Min EBCT (8 B-S days)				20 Min EBCT (18 B-S days)				Chart Legend:	 10 Min EBCT  20 Min EBCT  Influent  Influent			
Effluent pH	7.8	0.1	13	7.6 - 8.0	7.8	0.1	13	7.7 - 8.0					
Effluent Temp	23.5	0.6	13	22.7 - 24.6	22.4	0.7	13	21.2 - 23.5					

Water Quality Graphs (Continued)



ICR Information

ID / ICR#: IA8222001 / 341
 ICR Contact: Joel Mohr
 Phone No.: (319) 322-0161
 Period: 11/30/98 - 12/8/98 (7 B-S days)

Design Information

Design TOC: 2.8 mg/L
 Col Diameter: 10.0 mm
 Min Reynolds#: 0.33
 Full-Scale Temp: 7.0 C

Full-Scale GAC Size: 8x26 Bituminous
 Bench-Scale GAC Size: 100x200
 Scaling Factor: 13.52
 Meas Dry Bed Density: 0.48 g/cm3

Water Quality Summary

Influent	10 Min Influent				Effluent	10 Min EBCT (8 B-S days)			
	Mean	SD/RD	Count	Min/Max		Mean	SD/RD	Count	Min/Max
TOC	2.8	0.0	3	2.7 - 2.8	Effluent TOC	2.8	0.0	4	2.8 - 2.8
pH	6.5	0.1	3	6.5 - 6.7	Effluent pH	8.1	0.1	13	8.1 - 8.4
UV254	0.060	0.000	1	0.060 - 0.060	Effluent Temp	22.8	0.9	13	20.9 - 24.1
SUVA	2.14	0.00	1	2.14 - 2.14					
Bromide	32	1	2	31 - 32					
SDS-TOX	221	0	1	221 - 221					
SDS-THM4	35	0	1	35 - 35					
SDS-HAA6	32	0	1	32 - 32					

Cumulative SDS Conditions

	Mean	SD	Count	Min/Max
Res (0)	0.58	0.30	28	0.14 - 1.38
Temp	7.4	0.1	28	7.3 - 7.5
pH	7.3	0.0	28	7.2 - 7.4
Time	23.9	0.2	28	23.6 - 24.3

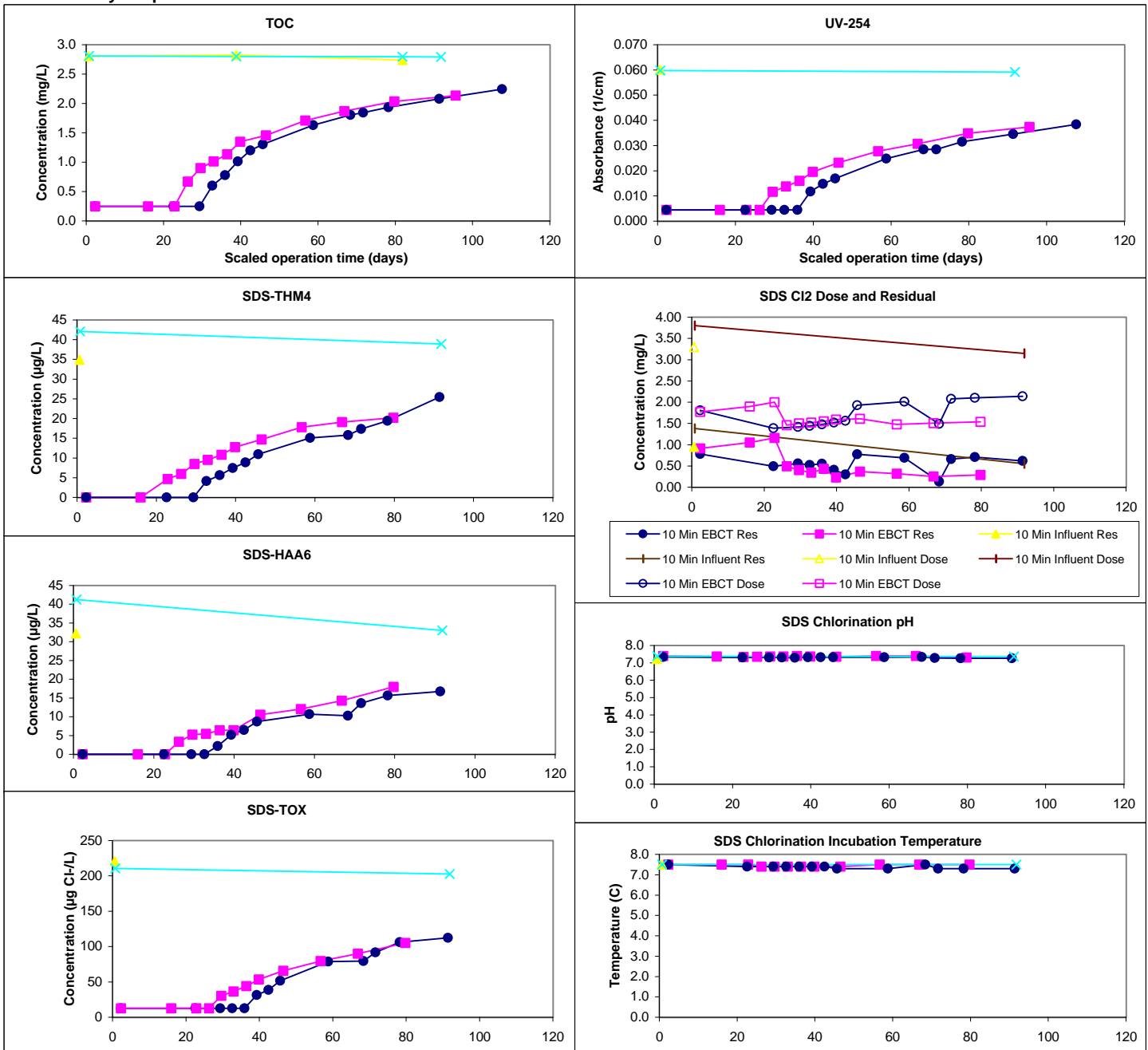
Comments:

Chart

Legend:

- 10 Min EBCT
- 10 Min EBCT
- ▲ 10 Min Influent
- ✕ 10 Min Influent

Water Quality Graphs



Water Quality Graphs (Continued)

