ICR TREATMENT STUDY ANALYSIS

Base Analysis and Data Review Comments

Treatment Study ID 1030

Study Protocol GAC pilot-scale treatment study

Plant ICR Number 618

PWS Name City of Dallas Water Utilities Department

City, State, Zip Dallas, TX 75201

General Comments:

1. This pilot-scale treatment study evaluated DBP precursor removal at 10 and 20 minute EBCTs, using Calgon Filtrasorb 820, a bituminous coal-based 8x20 mesh size GAC. During the study, the coagulant dosage was varied to evaluate the impact of enhanced coagulation on GAC performance after 55 days of operation. This change only affected the 20 minute EBCT run, as the 10 minute EBCT run had already reached 70 percent TOC breakthrough and sampling had been discontinued. Table 4-1 in the Summary Report summarizes chemical doses applied during the entire run. The primary ferric sulfate dose ranged from 10 to 100 mg/L, and the primary calcium hydroxide dose ranged from 0 to 120 mg/L. Figure 1 in this document shows graphically the variation in chemical doses applied during the treatment study. At times during the remainder of run, the calcium hydroxide feed was shut off completely, to investigate the impact of lower influent pH values on GAC performance. However, since GAC is an unsteady-state process, the impact of varying these parameters on GAC performance during one run may be difficult to determine. In general, increasing the ferric sulfate dose decreased the concentration of TOC and DBP precursors in the GAC influent, resulting in lower GAC effluent concentrations. An ambient pH was targeted for SDS chlorination.

2. The data in the Data Collection Spreadsheets have been separated to differentiate between the two halves of the run (in terms of pretreatment). The "first" run (up to 55 days of operation) utilized chemical pretreatment doses similar to the full-scale plant. The weighted average ferric sulfate dose was 30 mg/L (range: 10 to 40 mg/L). The weighted average calcium hydroxide dose was 55 mg/L (range: 40 to 60 mg/L). During the "second" run (changing pretreatment conditions which affected the second half of the 20 minute EBCT run, after 55 days of operation), the average ferric sulfate dose was 40 mg/L (range: 10 to 100 mg/L) and the average calcium hydroxide dose was 13 mg/L (range: 0 to 100 mg/L). The original data has been included as a third sheet for reference, but should not be used for further data analysis. It should be noted when interpreting the results of the second half of the run in terms of pretreatment, that the first half of the run was conducted under conventional coagulant doses (similar to the full-scale plant). The GAC influent data

collected during the entire run has been included with the GAC effluent data from the second half of the run.

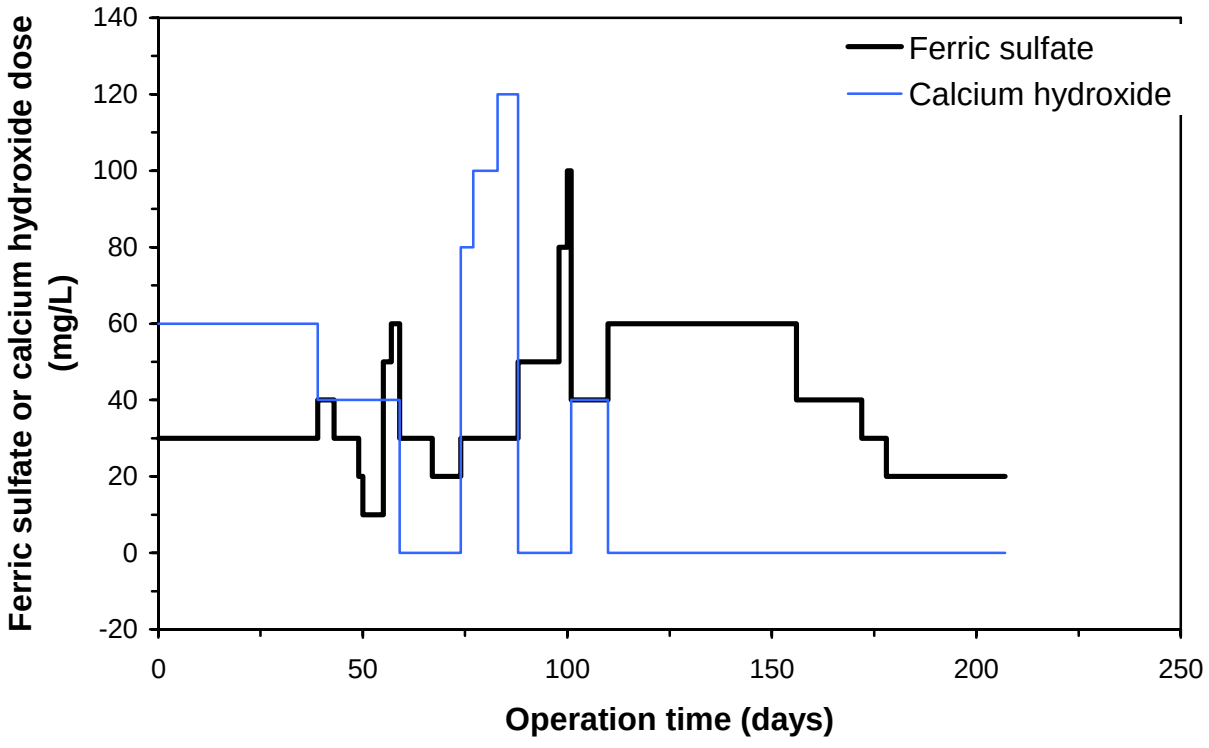
3. Due to the variation in calcium hydroxide dose applied during the study (0 to 120 mg/L), the GAC effluent pH varied widely, and therefore so did the SDS chlorination pH, which varied from 4.3 to 10.9. This variability in SDS chlorination pH may have had a significant effect on DBP formation and speciation.

4. Due to chlorine addition in the raw water pipelines, full-scale pretreatment was simulated by the pilot plant. Normally, two water sources are blended for treatment at the East Side Water Treatment Plant: Lake Tawakoni, and Lake Ray Hubbard. The blend ratio is usually about 60 percent Lake Tawakoni and 40 percent Lake Ray Hubbard. Pilot testing was conducted at Lake Ray Hubbard, and the source water treated was not blended with Lake Tawakoni, whose pump station is located 20 miles away. Historically, the TOC concentration at Lake Ray Hubbard averages 4 mg/L, while that at Lake Tawakoni averages slightly higher, 6 mg/L.

5. The bromide concentration increased steadily throughout the treatment study run, from 74 to 130 µg/L. This 76 percent increase in the bromide concentration may have impacted DBP speciation, increasing the formation of brominated DBPs during the latter stages of the 20 minute EBCT run. Coupled with changes in TOC concentration and SDS chlorination pH, DBP speciation trends may be difficult to interpret.

Outlier Data:

Five outliers were removed.



Cell: A1
Comment: 1030-SAS.xls 2/16/00 19:38

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

Cell: C5
Comment: 1030-10-01 - Run 1 (CHBr3) 2/16/00 19:09
Original value (CoefA0) = -0.7157 New value = 0.2472
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D5
Comment: 1030-10-01 - Run 1 (CHBr3) 2/16/00 19:09
Original value (CoefAf) = 5.6888 New value = 8.6772
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E5
Comment: 1030-10-01 - Run 1 (CHBr3) 2/16/00 19:09
Original value (CoefB) = 1.8498 New value = 20.0723
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F5
Comment: 1030-10-01 - Run 1 (CHBr3) 2/16/00 19:09
Original value (CoefD) = 0.1477 New value = 0.8403
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J5
Comment: 1030-10-01 - Run 1 (CHBr3) 2/16/00 19:09
Original value (S) = 0 New value = -0.1013
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C90
Comment: 1030-20-01 - Run 2 (BCAA) 2/16/00 19:11
Original value (CoefA0) = 0 New value = -0.1007
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D90
Comment: 1030-20-01 - Run 2 (BCAA) 2/16/00 19:11
Original value (CoefAf) = 0 New value = 2.2999
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E90
Comment: 1030-20-01 - Run 2 (BCAA) 2/16/00 19:11
Original value (CoefB) = 0 New value = 272.9704
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F90
Comment: 1030-20-01 - Run 2 (BCAA) 2/16/00 19:11
Original value (CoefD) = 0 New value = 0.1748
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J90
Comment: 1030-20-01 - Run 2 (BCAA) 2/16/00 19:11
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C91
Comment: 1030-20-01 - Run 2 (BDCM) 2/16/00 19:13
Original value (CoefA0) = 0 New value = -1.1127
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D91
Comment: 1030-20-01 - Run 2 (BDCM) 2/16/00 19:13
Original value (CoefAf) = 0 New value = 18.0123
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E91
Comment: 1030-20-01 - Run 2 (BDCM) 2/16/00 19:13
Original value (CoefB) = 0 New value = 26.6389
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F91
Comment: 1030-20-01 - Run 2 (BDCM) 2/16/00 19:13
Original value (CoefD) = 0 New value = 0.0562
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J91
Comment: 1030-20-01 - Run 2 (BDCM) 2/16/00 19:13
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C96
Comment: 1030-20-01 - Run 2 (DBAA) 2/16/00 19:15
Original value (CoefA0) = 0 New value = -0.0683
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D96
Comment: 1030-20-01 - Run 2 (DBAA) 2/16/00 19:15
Original value (CoefAf) = 0 New value = 2.3504
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E96
Comment: 1030-20-01 - Run 2 (DBAA) 2/16/00 19:15
Original value (CoefB) = 0 New value = 1576.8005
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F96
Comment: 1030-20-01 - Run 2 (DBAA) 2/16/00 19:15
Original value (CoefD) = 0 New value = 0.2478
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J96

Comment: 1030-20-01 - Run 2 (DBAA) 2/16/00 19:15
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C98
Comment: 1030-20-01 - Run 2 (DCAA) 2/16/00 18:57
Original value (CoefA0) = 0 New value = 1.1833
Fewer than 6 points above MRL. Step function applied.

Cell: D98
Comment: 1030-20-01 - Run 2 (DCAA) 2/16/00 18:57
Original value (CoefAf) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: E98
Comment: 1030-20-01 - Run 2 (DCAA) 2/16/00 18:57
Original value (CoefB) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: F98
Comment: 1030-20-01 - Run 2 (DCAA) 2/16/00 18:57
Original value (CoefD) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: J98
Comment: 1030-20-01 - Run 2 (DCAA) 2/16/00 18:57
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: K98
Comment: 1030-20-01 - Run 2 (DCAA) 2/16/00 18:57
Original value (t0) = 0 New value = 35.2
Fewer than 6 points above MRL. Step function applied.

Cell: C100
Comment: 1030-20-01 - Run 2 (HAA5) 2/16/00 19:12
Original value (CoefA0) = 0 New value = 0.2455
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D100
Comment: 1030-20-01 - Run 2 (HAA5) 2/16/00 19:12
Original value (CoefAf) = 0 New value = 17.9982
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E100
Comment: 1030-20-01 - Run 2 (HAA5) 2/16/00 19:12
Original value (CoefB) = 0 New value = 57.3129
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F100
Comment: 1030-20-01 - Run 2 (HAA5) 2/16/00 19:12

Original value (CoefD) = 0 New value = 0.0595
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J100
Comment: 1030-20-01 - Run 2 (HAA5) 2/16/00 19:12
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C101
Comment: 1030-20-01 - Run 2 (HAA6) 2/16/00 19:16
Original value (CoefA0) = 0 New value = 0.4837
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D101
Comment: 1030-20-01 - Run 2 (HAA6) 2/16/00 19:16
Original value (CoefAf) = 0 New value = 7.3721
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E101
Comment: 1030-20-01 - Run 2 (HAA6) 2/16/00 19:16
Original value (CoefB) = 0 New value = 118.9873
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F101
Comment: 1030-20-01 - Run 2 (HAA6) 2/16/00 19:16
Original value (CoefD) = 0 New value = 0.1359
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J101
Comment: 1030-20-01 - Run 2 (HAA6) 2/16/00 19:16
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C106
Comment: 1030-20-01 - Run 2 (TCAA) 2/16/00 19:14
Original value (CoefA0) = 0 New value = -0.0972
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D106
Comment: 1030-20-01 - Run 2 (TCAA) 2/16/00 19:14
Original value (CoefAf) = 0 New value = 1.3703
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E106
Comment: 1030-20-01 - Run 2 (TCAA) 2/16/00 19:14
Original value (CoefB) = 0 New value = 134.6071
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F106
Comment: 1030-20-01 - Run 2 (TCAA) 2/16/00 19:14
Original value (CoefD) = 0 New value = 0.1699

Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J106
Comment: 1030-20-01 - Run 2 (TCAA) 2/16/00 19:14
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C109
Comment: 1030-20-01 - Run 2 (TOX) 2/16/00 19:19
Original value (CoefA0) = 0 New value = 22.8448
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D109
Comment: 1030-20-01 - Run 2 (TOX) 2/16/00 19:19
Original value (CoefAf) = 53 New value = 45.0476
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E109
Comment: 1030-20-01 - Run 2 (TOX) 2/16/00 19:19
Original value (CoefB) = 10 New value = 32.549
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F109
Comment: 1030-20-01 - Run 2 (TOX) 2/16/00 19:19
Original value (CoefD) = 0.15 New value = 0
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J109
Comment: 1030-20-01 - Run 2 (TOX) 2/16/00 19:19
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: C110
Comment: 1030-20-01 - Run 2 (TSUVA) 2/16/00 19:10
Original value (CoefA0) = 99999 New value = -0.0889
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D110
Comment: 1030-20-01 - Run 2 (TSUVA) 2/16/00 19:10
Original value (CoefAf) = 99999 New value = 1.5797
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E110
Comment: 1030-20-01 - Run 2 (TSUVA) 2/16/00 19:10
Original value (CoefB) = 99999 New value = 21.2403
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F110
Comment: 1030-20-01 - Run 2 (TSUVA) 2/16/00 19:10
Original value (CoefD) = 99999 New value = 0.1813
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J110
Comment: 1030-20-01 - Run 2 (TSUVA) 2/16/00 19:10
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C112
Comment: 1030-20-02 - Run 4 (BCAA) 2/16/00 19:24
Original value (CoefA0) = 0 New value = 0.6425
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D112
Comment: 1030-20-02 - Run 4 (BCAA) 2/16/00 19:24
Original value (CoefAf) = 0 New value = 12.1225
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E112
Comment: 1030-20-02 - Run 4 (BCAA) 2/16/00 19:24
Original value (CoefB) = 0 New value = 24.0085
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F112
Comment: 1030-20-02 - Run 4 (BCAA) 2/16/00 19:24
Original value (CoefD) = 0 New value = 0.012
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J112
Comment: 1030-20-02 - Run 4 (BCAA) 2/16/00 19:24
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C113
Comment: 1030-20-02 - Run 4 (BDCM) 2/16/00 19:27
Original value (CoefA0) = 0 New value = 4.8013
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D113
Comment: 1030-20-02 - Run 4 (BDCM) 2/16/00 19:27
Original value (CoefAf) = 0 New value = 22.8459
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E113
Comment: 1030-20-02 - Run 4 (BDCM) 2/16/00 19:27
Original value (CoefB) = 0 New value = 26.8843
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F113
Comment: 1030-20-02 - Run 4 (BDCM) 2/16/00 19:27
Original value (CoefD) = 0 New value = 0.0111
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J113

Comment: 1030-20-02 - Run 4 (BDCM) 2/16/00 19:27
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C115
Comment: 1030-20-02 - Run 4 (CHBr3) 2/16/00 19:28
Original value (CoefA0) = 0 New value = 2.2865
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: D115
Comment: 1030-20-02 - Run 4 (CHBr3) 2/16/00 19:28
Original value (CoefAf) = 0 New value = 739.4763
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: E115
Comment: 1030-20-02 - Run 4 (CHBr3) 2/16/00 19:28
Original value (CoefB) = 0 New value = 831.467
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: F115
Comment: 1030-20-02 - Run 4 (CHBr3) 2/16/00 19:28
Original value (CoefD) = 0 New value = 0.0204
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: J115
Comment: 1030-20-02 - Run 4 (CHBr3) 2/16/00 19:28
Original value (S) = 0 New value = -0.1195
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: C116
Comment: 1030-20-02 - Run 4 (CHCl3) 2/16/00 19:20
Original value (CoefA0) = 0 New value = 1.1196
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D116
Comment: 1030-20-02 - Run 4 (CHCl3) 2/16/00 19:20
Original value (CoefAf) = 0 New value = 23.7835
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E116
Comment: 1030-20-02 - Run 4 (CHCl3) 2/16/00 19:20
Original value (CoefB) = 0 New value = 43.7855
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F116
Comment: 1030-20-02 - Run 4 (CHCl3) 2/16/00 19:20
Original value (CoefD) = 0 New value = 0.0123
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J116
Comment: 1030-20-02 - Run 4 (CHCl3) 2/16/00 19:20

Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C117
Comment: 1030-20-02 - Run 4 (Cl2-D) 2/16/00 19:26
Original value (CoefA0) = 0 New value = 0.5577
Poor type -1 or 1 curve fit. Data was refit by iterative curve fit procedure.

Cell: D117
Comment: 1030-20-02 - Run 4 (Cl2-D) 2/16/00 19:26
Original value (CoefAf) = 0 New value = 2.8581
Poor type -1 or 1 curve fit. Data was refit by iterative curve fit procedure.

Cell: E117
Comment: 1030-20-02 - Run 4 (Cl2-D) 2/16/00 19:26
Original value (CoefB) = 0 New value = 20.2723
Poor type -1 or 1 curve fit. Data was refit by iterative curve fit procedure.

Cell: F117
Comment: 1030-20-02 - Run 4 (Cl2-D) 2/16/00 19:26
Original value (CoefD) = 0 New value = 0.0204
Poor type -1 or 1 curve fit. Data was refit by iterative curve fit procedure.

Cell: J117
Comment: 1030-20-02 - Run 4 (Cl2-D) 2/16/00 19:26
Original value (S) = 0 New value = 0
Poor type -1 or 1 curve fit. Data was refit by iterative curve fit procedure.

Cell: C118
Comment: 1030-20-02 - Run 4 (DBAA) 2/16/00 19:30
Original value (CoefA0) = 0 New value = 1.1785
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D118
Comment: 1030-20-02 - Run 4 (DBAA) 2/16/00 19:30
Original value (CoefAf) = 0 New value = 6.7696
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E118
Comment: 1030-20-02 - Run 4 (DBAA) 2/16/00 19:30
Original value (CoefB) = 0 New value = 21.1456
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F118
Comment: 1030-20-02 - Run 4 (DBAA) 2/16/00 19:30
Original value (CoefD) = 0 New value = 0.0159
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J118
Comment: 1030-20-02 - Run 4 (DBAA) 2/16/00 19:30
Original value (S) = 0 New value = 0

Fewer than 6 points. Logistic function (type 1) applied.

Cell: C119
Comment: 1030-20-02 - Run 4 (DBCM) 2/16/00 19:21
Original value (CoefA0) = 0 New value = 11.2536
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D119
Comment: 1030-20-02 - Run 4 (DBCM) 2/16/00 19:21
Original value (CoefAf) = 0 New value = 3.0972
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E119
Comment: 1030-20-02 - Run 4 (DBCM) 2/16/00 19:21
Original value (CoefB) = 0 New value = 11.9259
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F119
Comment: 1030-20-02 - Run 4 (DBCM) 2/16/00 19:21
Original value (CoefD) = 0 New value = 0.0411
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J119
Comment: 1030-20-02 - Run 4 (DBCM) 2/16/00 19:21
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C120
Comment: 1030-20-02 - Run 4 (DCAA) 2/16/00 19:23
Original value (CoefA0) = 0 New value = -0.1872
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D120
Comment: 1030-20-02 - Run 4 (DCAA) 2/16/00 19:23
Original value (CoefAf) = 0 New value = 5.8437
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E120
Comment: 1030-20-02 - Run 4 (DCAA) 2/16/00 19:23
Original value (CoefB) = 0 New value = 20.3137
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F120
Comment: 1030-20-02 - Run 4 (DCAA) 2/16/00 19:23
Original value (CoefD) = 0 New value = 0.0159
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J120
Comment: 1030-20-02 - Run 4 (DCAA) 2/16/00 19:23
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C122
Comment: 1030-20-02 - Run 4 (HAA5) 2/16/00 19:25
Original value (CoefA0) = 0 New value = -0.5132
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D122
Comment: 1030-20-02 - Run 4 (HAA5) 2/16/00 19:25
Original value (CoefAf) = 0 New value = 11.1247
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E122
Comment: 1030-20-02 - Run 4 (HAA5) 2/16/00 19:25
Original value (CoefB) = 0 New value = 13.6595
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F122
Comment: 1030-20-02 - Run 4 (HAA5) 2/16/00 19:25
Original value (CoefD) = 0 New value = 0.0306
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J122
Comment: 1030-20-02 - Run 4 (HAA5) 2/16/00 19:25
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C123
Comment: 1030-20-02 - Run 4 (HAA6) 2/16/00 19:31
Original value (CoefA0) = 0 New value = 0.8978
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D123
Comment: 1030-20-02 - Run 4 (HAA6) 2/16/00 19:31
Original value (CoefAf) = 0 New value = 14.2249
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E123
Comment: 1030-20-02 - Run 4 (HAA6) 2/16/00 19:31
Original value (CoefB) = 0 New value = 18.7693
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F123
Comment: 1030-20-02 - Run 4 (HAA6) 2/16/00 19:31
Original value (CoefD) = 0 New value = 0.0324
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J123
Comment: 1030-20-02 - Run 4 (HAA6) 2/16/00 19:31
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C125

Comment: 1030-20-02 - Run 4 (MBAA) 2/16/00 19:01
Original value (CoefA0) = 99999 New value = 0
Fewer than 6 points. Step function applied.

Cell: D125
Comment: 1030-20-02 - Run 4 (MBAA) 2/16/00 19:01
Original value (CoefAf) = 99999 New value = 0
Fewer than 6 points. Step function applied.

Cell: E125
Comment: 1030-20-02 - Run 4 (MBAA) 2/16/00 19:01
Original value (CoefB) = 99999 New value = 0
Fewer than 6 points. Step function applied.

Cell: F125
Comment: 1030-20-02 - Run 4 (MBAA) 2/16/00 19:01
Original value (CoefD) = 99999 New value = 0
Fewer than 6 points. Step function applied.

Cell: J125
Comment: 1030-20-02 - Run 4 (MBAA) 2/16/00 19:01
Original value (S) = 0 New value = 0
Fewer than 6 points. Step function applied.

Cell: C126
Comment: 1030-20-02 - Run 4 (MCAA) 2/16/00 19:04
Original value (CoefA0) = 99999 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: D126
Comment: 1030-20-02 - Run 4 (MCAA) 2/16/00 19:04
Original value (CoefAf) = 99999 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: E126
Comment: 1030-20-02 - Run 4 (MCAA) 2/16/00 19:04
Original value (CoefB) = 99999 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: F126
Comment: 1030-20-02 - Run 4 (MCAA) 2/16/00 19:04
Original value (CoefD) = 99999 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: J126
Comment: 1030-20-02 - Run 4 (MCAA) 2/16/00 19:04
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: C128
Comment: 1030-20-02 - Run 4 (TCAA) 2/16/00 19:29

Original value (CoefA0) = 0 New value = 0.211
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D128
Comment: 1030-20-02 - Run 4 (TCAA) 2/16/00 19:29
Original value (CoefAf) = 0 New value = 7.292
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E128
Comment: 1030-20-02 - Run 4 (TCAA) 2/16/00 19:29
Original value (CoefB) = 0 New value = 21.5996
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F128
Comment: 1030-20-02 - Run 4 (TCAA) 2/16/00 19:29
Original value (CoefD) = 0 New value = 0.0124
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J128
Comment: 1030-20-02 - Run 4 (TCAA) 2/16/00 19:29
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C129
Comment: 1030-20-02 - Run 4 (THM4) 2/16/00 19:22
Original value (CoefA0) = 0 New value = 23.3496
Fewer than 6 points. Logistic function (type 1) applied.

Cell: D129
Comment: 1030-20-02 - Run 4 (THM4) 2/16/00 19:22
Original value (CoefAf) = 0 New value = 14.8185
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E129
Comment: 1030-20-02 - Run 4 (THM4) 2/16/00 19:22
Original value (CoefB) = 0 New value = 29.2949
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F129
Comment: 1030-20-02 - Run 4 (THM4) 2/16/00 19:22
Original value (CoefD) = 0 New value = 0.0421
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J129
Comment: 1030-20-02 - Run 4 (THM4) 2/16/00 19:22
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

Cell: C131
Comment: 1030-20-02 - Run 4 (TOX) 2/16/00 19:32
Original value (CoefA0) = 0 New value = 25.7713

Fewer than 6 points. Logistic function (type 1) applied.

Cell: D131
Comment: 1030-20-02 - Run 4 (TOX) 2/16/00 19:32
Original value (CoefAf) = 0 New value = 1031.0251
Fewer than 6 points. Logistic function (type 1) applied.

Cell: E131
Comment: 1030-20-02 - Run 4 (TOX) 2/16/00 19:32
Original value (CoefB) = 0 New value = 1374.9694
Fewer than 6 points. Logistic function (type 1) applied.

Cell: F131
Comment: 1030-20-02 - Run 4 (TOX) 2/16/00 19:32
Original value (CoefD) = 0 New value = 0.0242
Fewer than 6 points. Logistic function (type 1) applied.

Cell: J131
Comment: 1030-20-02 - Run 4 (TOX) 2/16/00 19:32
Original value (S) = 0 New value = 0
Fewer than 6 points. Logistic function (type 1) applied.

City of Dallas Water Utilities Department **Pilot-Scale GAC Treatment Study Summary** **Session:** 1

ICR Information

ID / ICR#: TX0570004 / Two-stage softening
ICR Contact: Mr. Ted Kilpatrick
Phone No.: Sunnyvale, TX 75182
Period: 4/13/98 - 6/30/98 (78 days)

Design Information

Design TOC: 4.5 mg/L
Col Diameter: 101.6 mm
Full-Scale GAC Size: 8x20 US Std Mesh
Full-Scale particle dia.: 1.605 mm
Meas Dry Bed Density: 549.1 kg/m3

Water Quality Summary

	Influent							
Influent	Mean	SD	Count	Min/Max				
TOC	2.8	0.1	9	2.6 - 3.1				
pH	8.3	0.5	9	7.5 - 9.2				
UV254	0.054	0.004	9	0.048 - 0.060				
SUVA	1.96	0.10	9	1.8 - 2.1				
Bromide	78	3	9	73 - 83				
SDS-TOX	193	20	8	160 - 220				
SDS-THM4	73	8	9	61 - 90				
SDS-HAA6	32	4	9	26 - 41				
Ammonia	0.00	0.00	9	0.00 - 0.00				
Effluent	**10 Min EBCT**			(78 days)	**20 Min EBCT**			(52 days)
Effluent pH	8.2	0.6	16	7.3 - 9.2	7.8	0.5	9	7.3 - 8.6
Effluent Temp	23.9	3.2	16	19.5 - 31.0	24.4	2.4	9	22.0 - 29.0

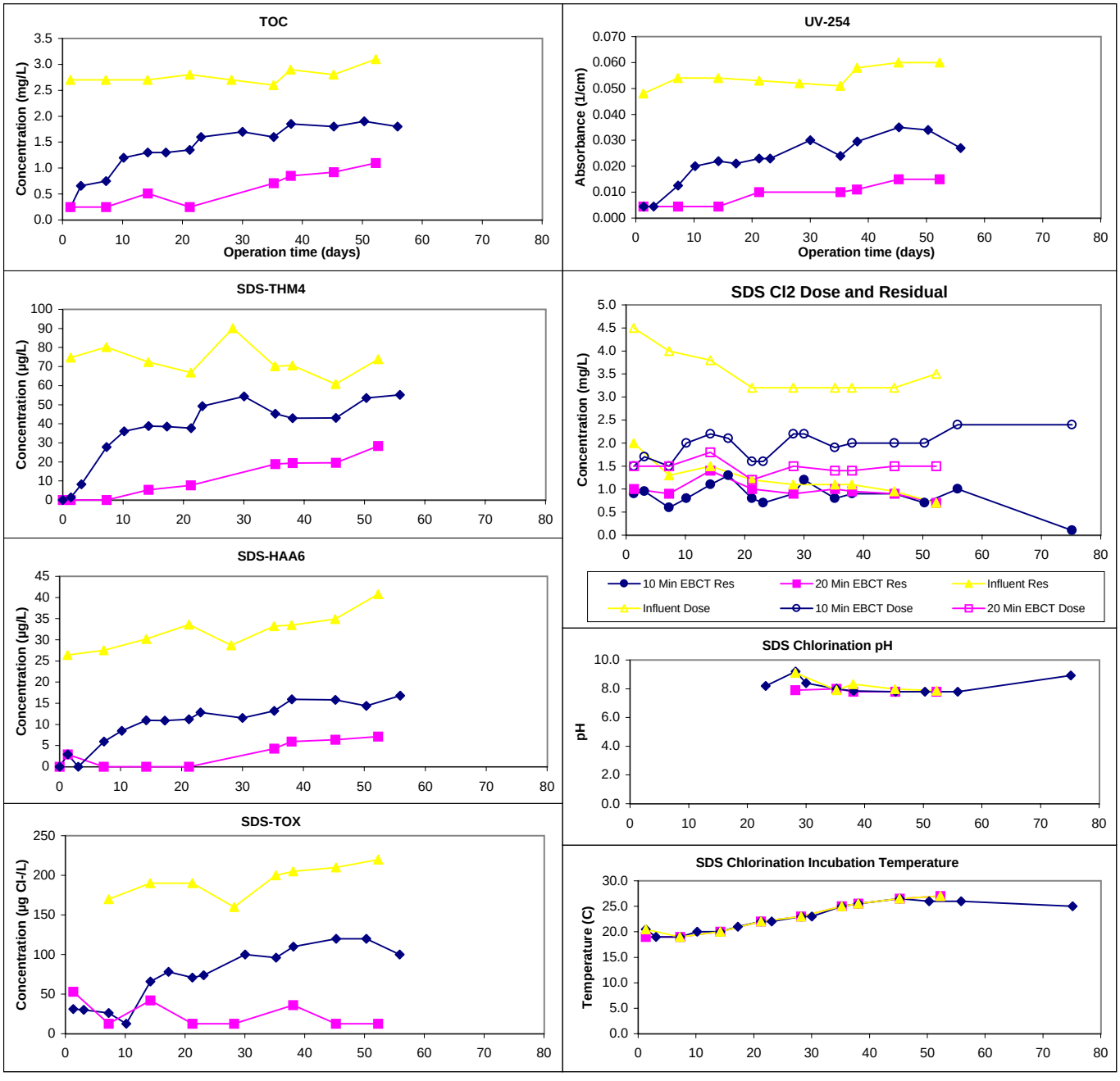
Cumulative SDS Conditions

	Mean	SD	Count	Min/Max
Res (0)	0.98	0.31	34	0.10 - 2.00
Temp	22.9	2.8	34	19.0 - 27.0
pH	8.1	0.5	19	7.8 - 9.2
Time	24.1	0.2	34	23.5 - 24.5

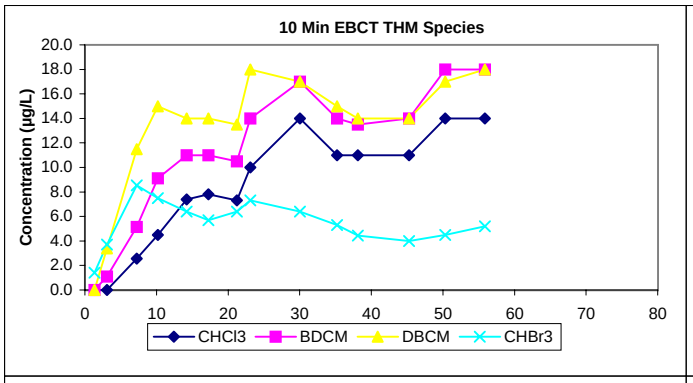
Comments:

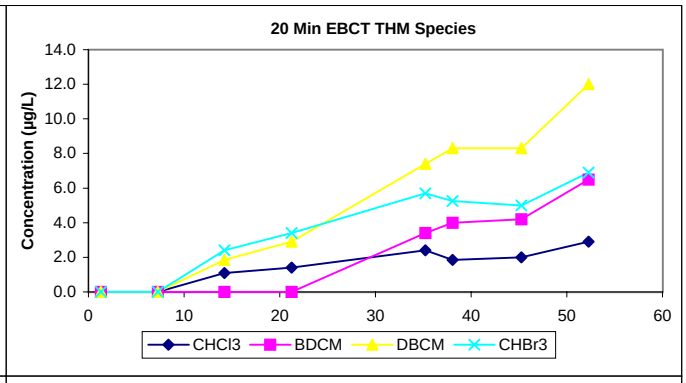
Chart Legend: 10 Min EBCT; 20 Min EBCT; Influent

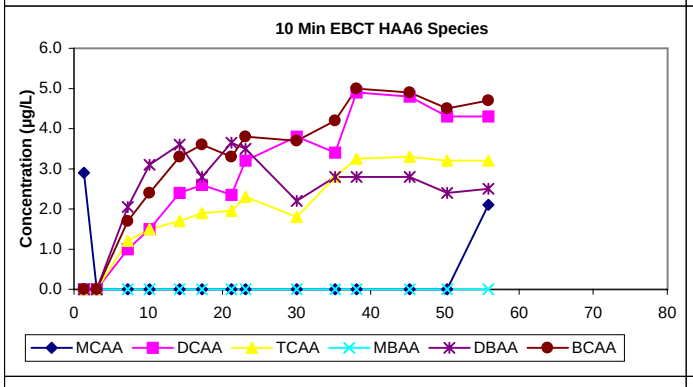
Water Quality Parameter Graphs

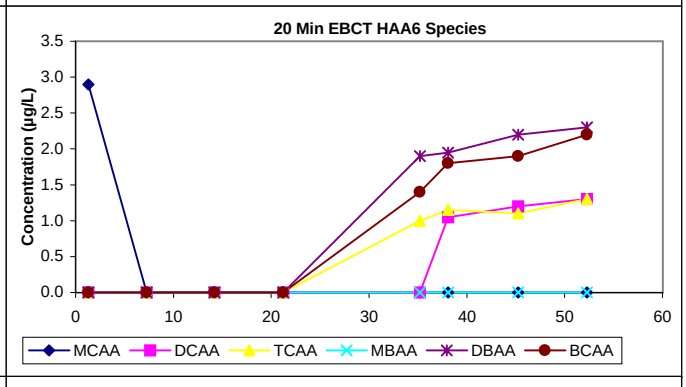


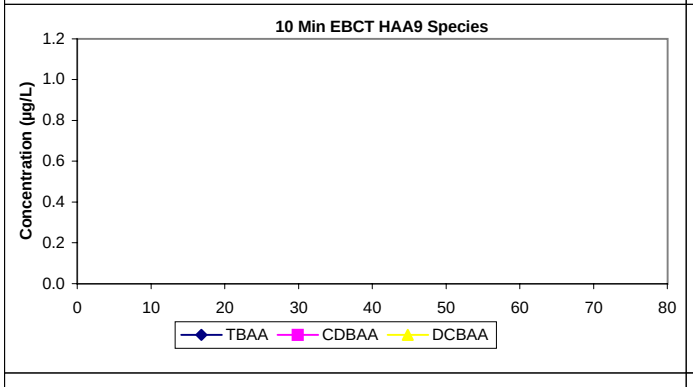
Water Quality Parameter Graphs (Continued)

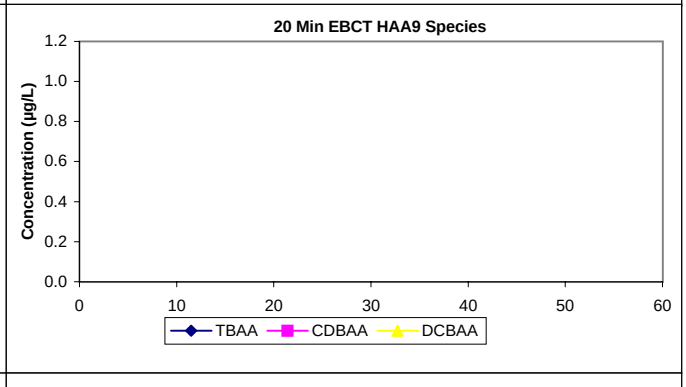


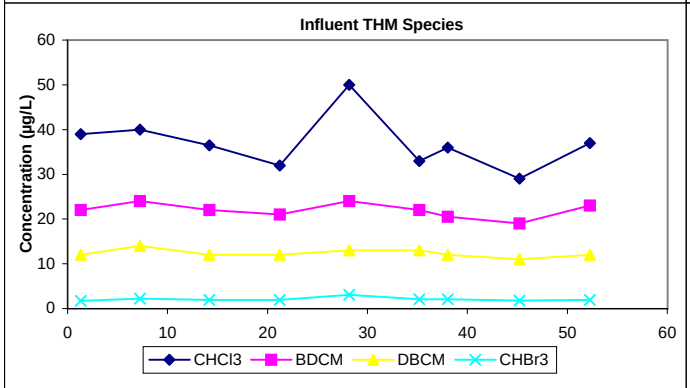


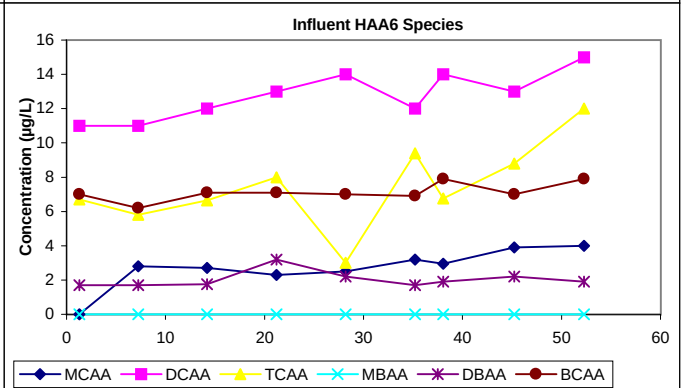


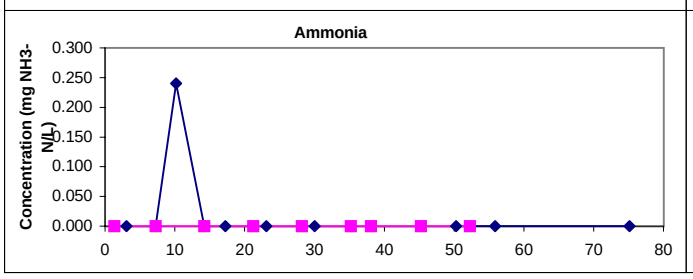


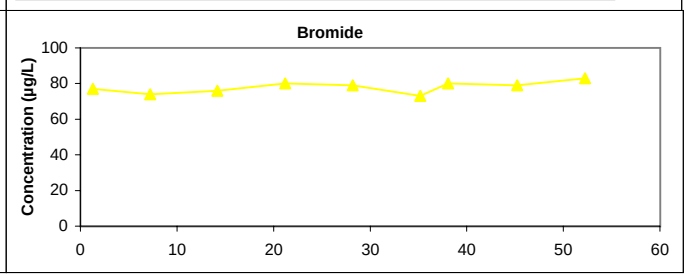












City of Dallas Water Utilities Department **Pilot-Scale GAC Treatment Study Summary** **Session:** 2

ICR Information

ID / ICR#: TX0570004 / Two-stage softening
ICR Contact: Mr. Ted Kilpatrick
Phone No.: Sunnyvale, TX 75182
Period: 4/13/98 - 10/29/98 (199 days)

Design Information

Design TOC: 4.5 mg/L
Col Diameter: 101.6 mm
Full-Scale GAC Size: 8x20 US Std Mesh
Full-Scale particle dia.: 1.605 mm
Meas Dry Bed Density: 549.1 kg/m3

Water Quality Summary

Influent	Mean	SD	Count	Min/Max
TOC	2.5	0.4	21	1.5 - 3.1
pH	7.2	1.5	21	3.8 - 10.1
UV254	0.046	0.010	21	0.030 - 0.060
SUVA	1.84	0.24	21	1.4 - 2.3
Bromide	97	21	21	73 - 130
SDS-TOX	185	29	12	110 - 220
SDS-THM4	67	12	14	47 - 90
SDS-HAA6	29	7	14	14 - 41
Ammonia	0.00	0.00	21	0.00 - 0.00

Effluent	10 Min EBCT		(0 days)		20 Min EBCT			(199 days)
Effluent pH	NA	NA	0	0.0 - 0.0	6.7	1.4	12	5.4 - 10.5
Effluent Temp	NA	NA	0	0.0 - 0.0	29.3	2.6	12	23.5 - 32.0

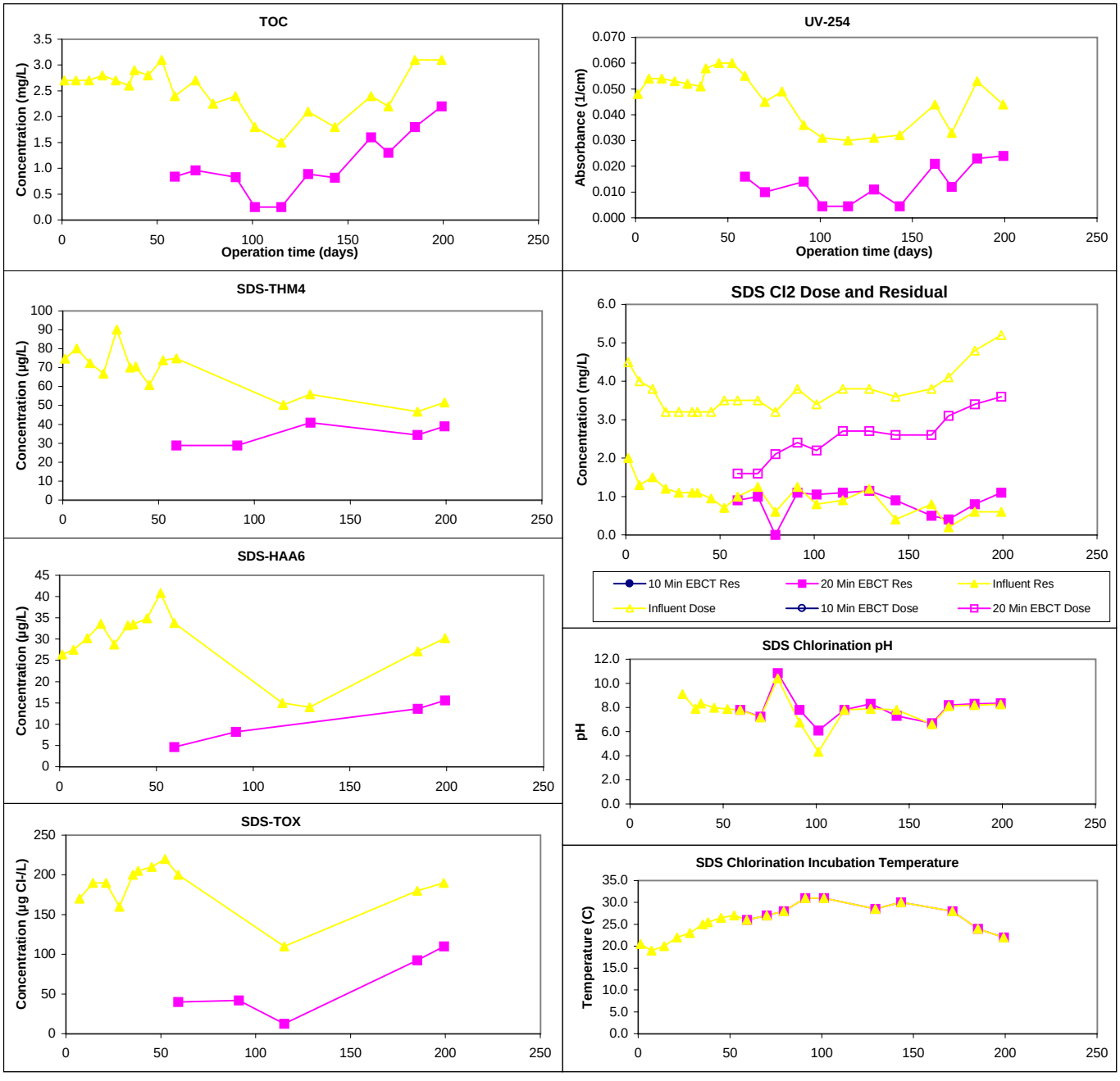
Cumulative SDS Conditions

	Mean	SD	Count	Min/Max
Res (1)	0.97	0.37	30	0.00 - 2.00
Temp	26.4	3.6	26	19.0 - 31.0
pH	7.8	1.2	26	4.3 - 10.9
Time	24.0	0.1	30	24.0 - 24.5

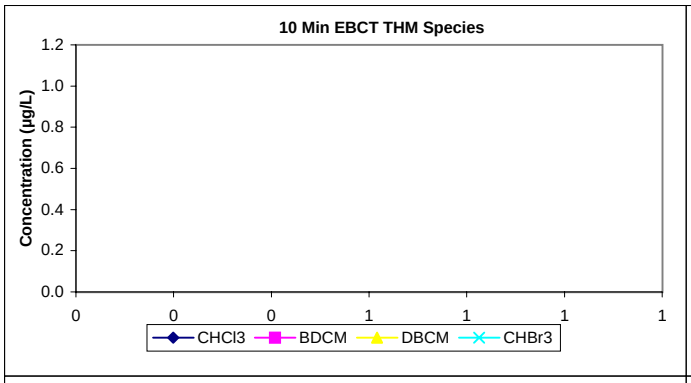
Comments:

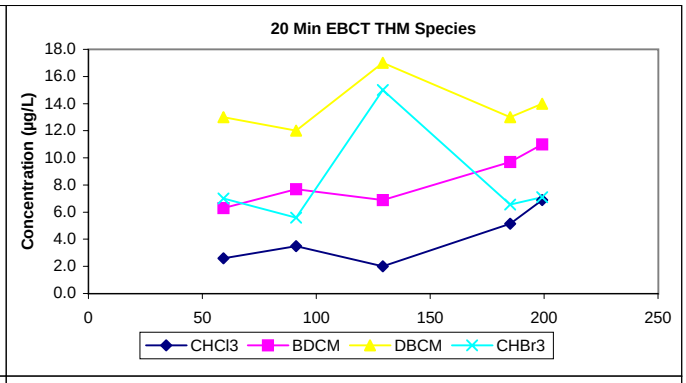
Chart Legend: 10 Min EBCT; 20 Min EBCT; Influent

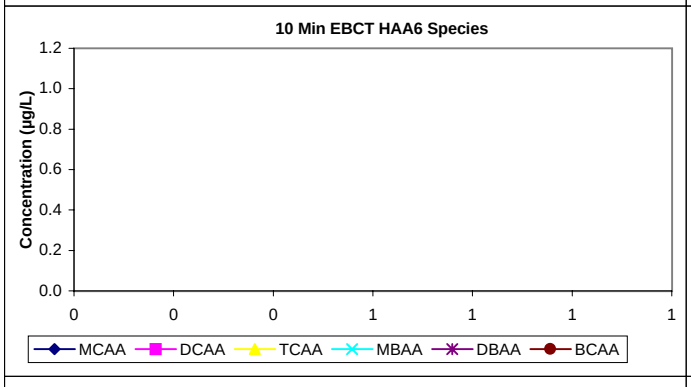
Water Quality Parameter Graphs

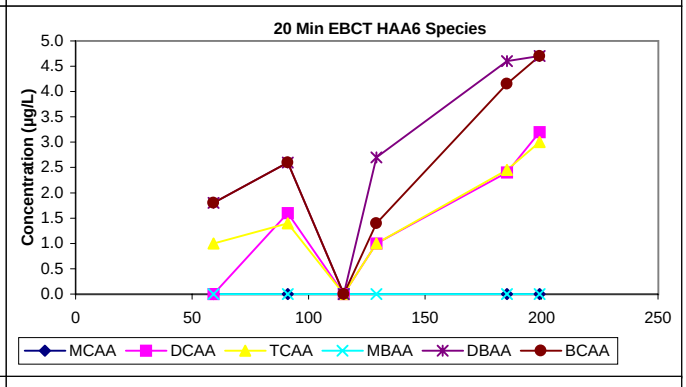


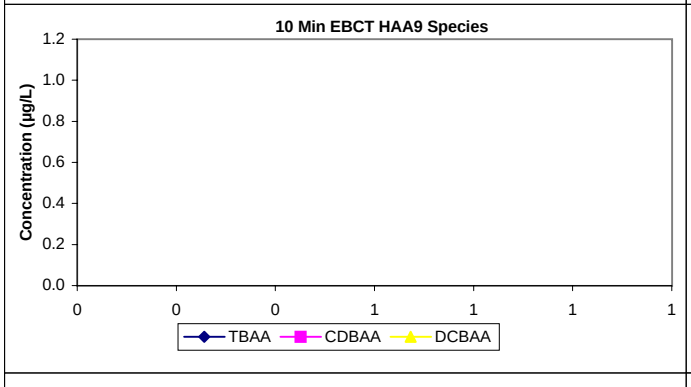
Water Quality Parameter Graphs (Continued)

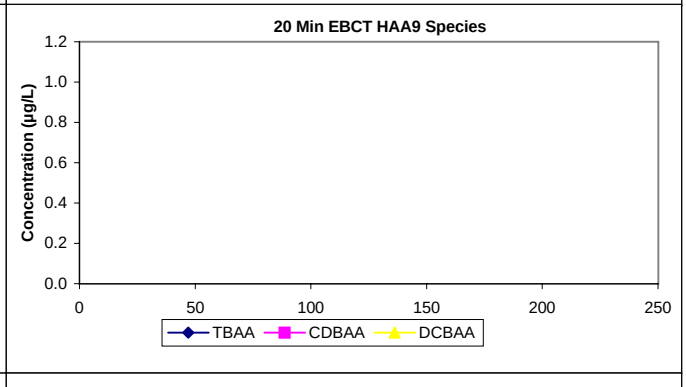


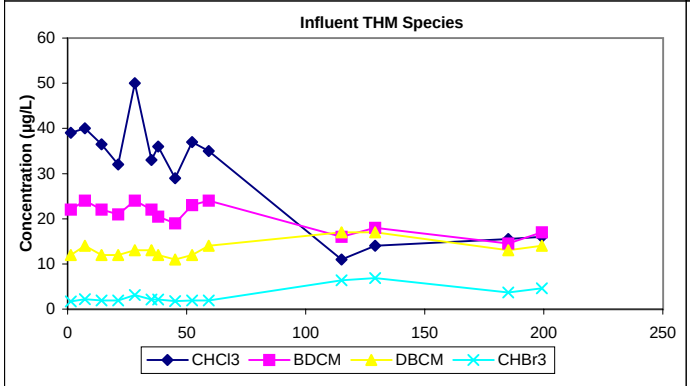


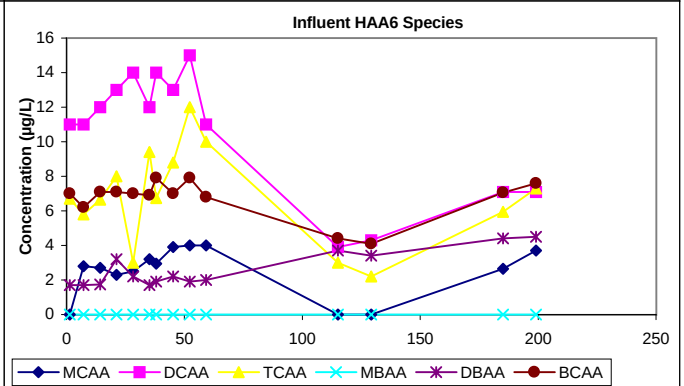


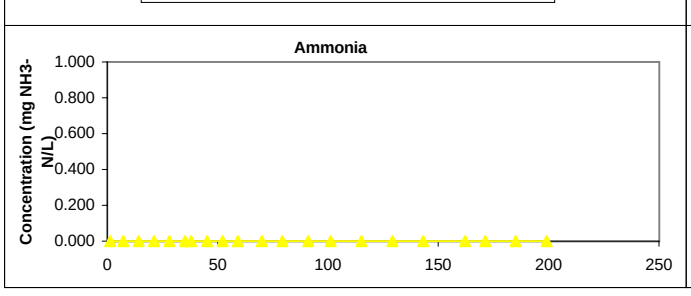


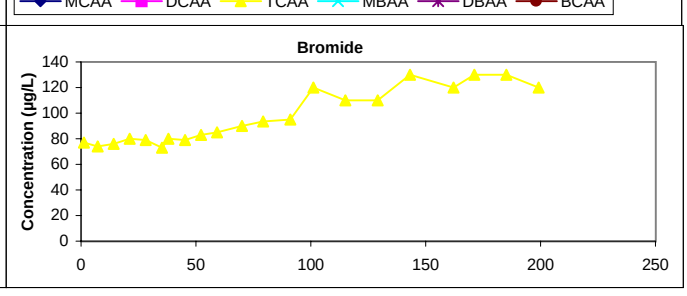












City of Dallas Water Utilities Department **Pilot-Scale GAC Treatment Study Summary** **Session:** 3

ICR Information

ID / ICR#: TX0570004 / Two-stage softening
ICR Contact: Mr. Ted Kilpatrick
Phone No.: Sunnyvale, TX 75182
Period: 4/13/98 - 8/20/98 (129 days)

Design Information

Design TOC: 4.5 mg/L
Col Diameter: 101.6 mm
Full-Scale GAC Size: 8x20 US Std Mesh
Full-Scale particle dia.: 1.605 mm
Meas Dry Bed Density: 549.1 kg/m3

Water Quality Summary

	Influent							
Influent	Mean	SD	Count	Min/Max				
TOC	2.5	0.4	21	1.5 - 3.1				
pH	7.2	**1.5**	21	3.8 - 10.1				
UV254	0.046	**0.010**	21	0.030 - 0.060				
SUVA	1.84	0.24	21	1.4 - 2.3				
Bromide	97	**21**	21	73 - 130				
SDS-TOX	185	29	12	110 - 220				
SDS-THM4	67	12	14	47 - 90				
SDS-HAA6	29	7	14	14 - 41				
Ammonia	0.00	0.00	21	0.00 - 0.00				
Effluent	**10 Min EBCT**			(78 days)	**20 Min EBCT**			(199 days)
Effluent pH	8.2	0.6	16	7.3 - 9.2	7.2	1.2	21	5.4 - 10.5
Effluent Temp	23.9	3.2	16	19.5 - 31.0	27.2	3.4	21	22.0 - 32.0

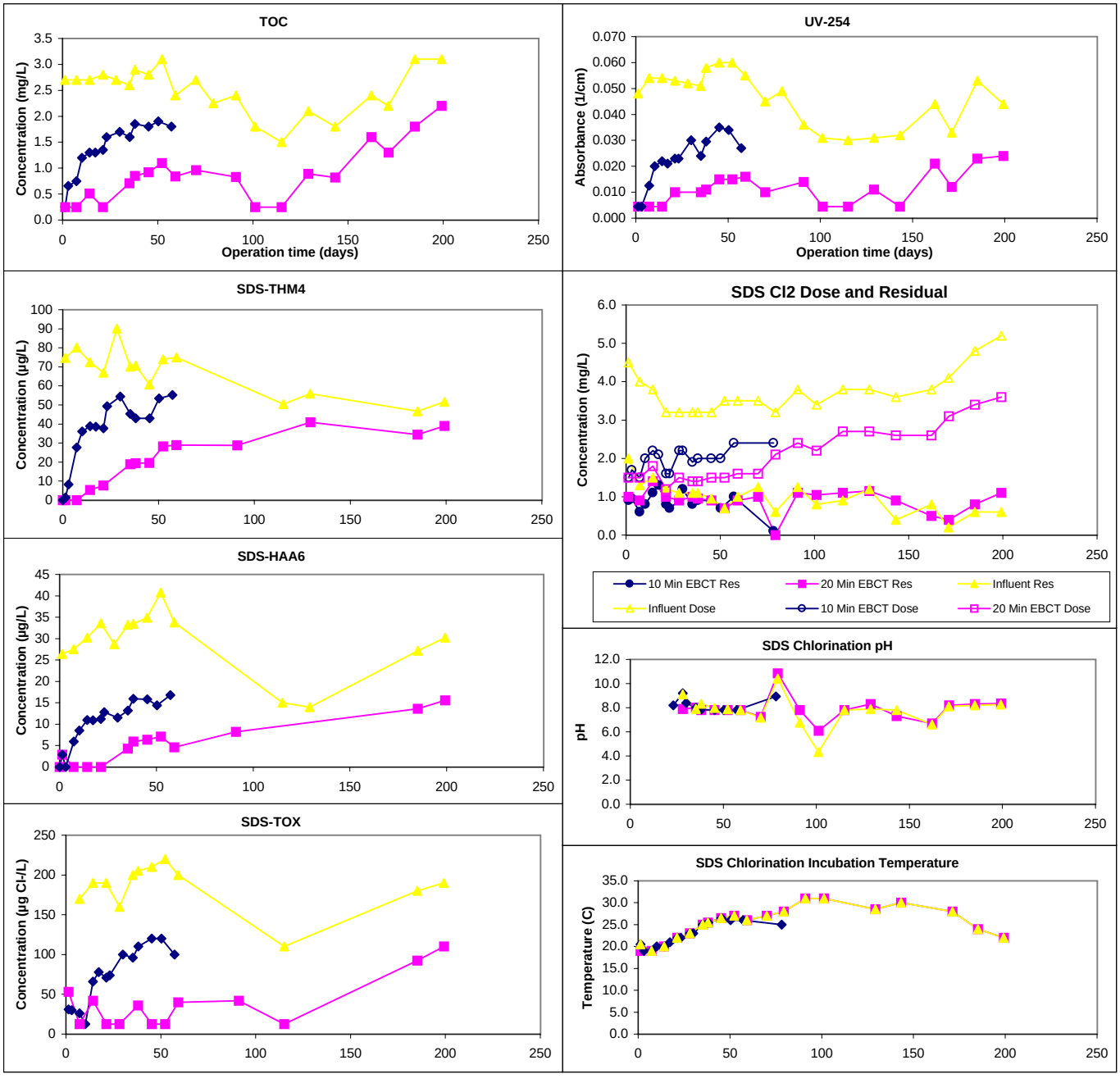
Cumulative SDS Conditions

	Mean	SD	Count	Min/Max
Res (1)	0.95	0.32	52	0.00 - 2.00
Temp	24.6	3.7	48	19.0 - 31.0
pH	7.9	1.1	37	4.3 - 10.9
Time	24.1	0.2	52	23.5 - 24.5

Comments:

Chart Legend: 10 Min EBCT; 20 Min EBCT; Influent

Water Quality Parameter Graphs



Water Quality Parameter Graphs (Continued)