

ICR TREATMENT STUDY ANALYSIS

Base Analysis and Data Review Comments

| | |
|---------------------------|---------------------------------|
| Treatment Study ID | 1031 |
| Study Protocol | GAC pilot-scale treatment study |
| Plant ICR Number | 647 |
| PWS Name | Fort Worth Water Department |
| City, State, Zip | Fort Worth, TX 76101-0870 |

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

Major comments:

None.

General Comments:

1. Due to various problems during the pilot study (summarized in Table 4-2 of the Summary Report) flow to the GAC contactors was interrupted and the GAC went dry. This occurred during 6 separate instances during the run. No direct impact on the study results was observed. The GAC columns were backwashed on 10 occasions, also summarized in Table 4-2 of the Summary Report.
2. At the start of the study, the filtered water reservoir (influent to GAC) was exposed to sunlight. Algae growth occurred, and formed a coating over the surface of the GAC, limiting flow, and eventually requiring that the columns be backwashed, according to Section 4.1 in the Summary Report. The reservoir was covered to control the growth of algae.
3. Due to slow TOC analysis turnaround time, GAC effluent sampling was determined based on breakthrough of UV-254. This method worked well, end of run criteria based on TOC were reached for both EBCT columns. Later in the run, when UV-254 effluent data was more variable, the last few samples were taken based on spacing in time to capture breakthrough.

Outlier Data:

No outliers removed.

Cell: A1

Comment: 1031-SAS.xls 2/10/00 14:31

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

Cell: C16

Comment: 1031-10-01 - Run 1 (MCAA) 2/10/00 14:13

Original value (CoefA0) = 0 New value = 0

Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: D16

Comment: 1031-10-01 - Run 1 (MCAA) 2/10/00 14:13

Original value (CoefAf) = 0 New value = 2.15

Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: E16

Comment: 1031-10-01 - Run 1 (MCAA) 2/10/00 14:13

Original value (CoefB) = 0 New value = 0

Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: F16

Comment: 1031-10-01 - Run 1 (MCAA) 2/10/00 14:13

Original value (CoefD) = 0 New value = 0

Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: J16

Comment: 1031-10-01 - Run 1 (MCAA) 2/10/00 14:13

Original value (S) = 0 New value = -0.1128

Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: C22

Comment: 1031-10-01 - Run 1 (TSUVA) 2/10/00 14:12

Original value (CoefA0) = -0.9706 New value = -0.1234

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

Cell: D22

Comment: 1031-10-01 - Run 1 (TSUVA) 2/10/00 14:12

Original value (CoefAf) = 2.9118 New value = 1.747

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

Cell: E22

Comment: 1031-10-01 - Run 1 (TSUVA) 2/10/00 14:12

Original value (CoefB) = 1.6856 New value = 15.4873

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

Cell: F22

Comment: 1031-10-01 - Run 1 (TSUVA) 2/10/00 14:12

Original value (CoefD) = 0.0986 New value = 0.2633

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

Cell: J22

Comment: 1031-10-01 - Run 1 (TSUVA) 2/10/00 14:12

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: C91

Comment: 1031-20-01 - Run 2 (BDCM) 2/10/00 14:24

Original value (CoefA0) = -0.8455 New value = -1.1274

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

Cell: D91

Comment: 1031-20-01 - Run 2 (BDCM) 2/10/00 14:24

Original value (CoefAf) = 45 New value = 47.0463

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

Cell: E91

Comment: 1031-20-01 - Run 2 (BDCM) 2/10/00 14:24

Original value (CoefB) = 47.7016 New value = 75.9863

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

Cell: F91

Comment: 1031-20-01 - Run 2 (BDCM) 2/10/00 14:24

Original value (CoefD) = 0.0471 New value = 0.0559

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

Cell: J91

Comment: 1031-20-01 - Run 2 (BDCM) 2/10/00 14:25

Original value (S) = -0.1112 New value = -0.1285

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

Cell: C98

Comment: 1031-20-01 - Run 2 (DCAA) 2/10/00 14:21

Original value (CoefA0) = -0.1648 New value = -0.622

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

Cell: D98

Comment: 1031-20-01 - Run 2 (DCAA) 2/10/00 14:21

Original value (CoefAf) = 6.4098 New value = 10.9674

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

Cell: E98

Comment: 1031-20-01 - Run 2 (DCAA) 2/10/00 14:21

Original value (CoefB) = 24.2658 New value = 23.8649

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

Cell: F98

Comment: 1031-20-01 - Run 2 (DCAA) 2/10/00 14:21

Original value (CoefD) = 0.0444 New value = 0.0375

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

Cell: J98

Comment: 1031-20-01 - Run 2 (DCAA) 2/10/00 14:21
Original value (S) = 0 New value = -0.0241
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C102

Comment: 1031-20-01 - Run 2 (HAA9) 2/10/00 14:22
Original value (CoefA0) = -0.8674 New value = -7.5394
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D102

Comment: 1031-20-01 - Run 2 (HAA9) 2/10/00 14:22
Original value (CoefAf) = 67.2663 New value = 74.846
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E102

Comment: 1031-20-01 - Run 2 (HAA9) 2/10/00 14:22
Original value (CoefB) = 31.2494 New value = 12.4227
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F102

Comment: 1031-20-01 - Run 2 (HAA9) 2/10/00 14:22
Original value (CoefD) = 0.0661 New value = 0.0538
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J102

Comment: 1031-20-01 - Run 2 (HAA9) 2/10/00 14:22
Original value (S) = 0 New value = -0.1308
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C105

Comment: 1031-20-01 - Run 2 (TBAA) 2/10/00 14:26
Original value (CoefA0) = -0.3302 New value = -2.5144
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D105

Comment: 1031-20-01 - Run 2 (TBAA) 2/10/00 14:26
Original value (CoefAf) = 15.9226 New value = 16.5868
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E105

Comment: 1031-20-01 - Run 2 (TBAA) 2/10/00 14:26
Original value (CoefB) = 16.684 New value = 8.9519
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F105

Comment: 1031-20-01 - Run 2 (TBAA) 2/10/00 14:26
Original value (CoefD) = 0.0473 New value = 0.0496
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J105

Comment: 1031-20-01 - Run 2 (TBAA) 2/10/00 14:26

Original value (S) = 0 New value = -0.0376
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C110

Comment: 1031-20-01 - Run 2 (TSUVA) 2/10/00 14:20
Original value (CoefA0) = -0.9722 New value = -0.082
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D110

Comment: 1031-20-01 - Run 2 (TSUVA) 2/10/00 14:20
Original value (CoefAf) = 2.9167 New value = 1.5275
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E110

Comment: 1031-20-01 - Run 2 (TSUVA) 2/10/00 14:20
Original value (CoefB) = 1.1358 New value = 19.9966
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F110

Comment: 1031-20-01 - Run 2 (TSUVA) 2/10/00 14:20
Original value (CoefD) = 0.024 New value = 0.122
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J110

Comment: 1031-20-01 - Run 2 (TSUVA) 2/10/00 14:20
Original value (S) = 0 New value = -0.0021
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C111

Comment: 1031-20-01 - Run 2 (UV254) 2/10/00 14:23
Original value (CoefA0) = -0.0003 New value = 0.0004
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D111

Comment: 1031-20-01 - Run 2 (UV254) 2/10/00 14:23
Original value (CoefAf) = 0.0451 New value = 0.0615
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E111

Comment: 1031-20-01 - Run 2 (UV254) 2/10/00 14:23
Original value (CoefB) = 15.1552 New value = 20.0001
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F111

Comment: 1031-20-01 - Run 2 (UV254) 2/10/00 14:23
Original value (CoefD) = 0.0432 New value = 0.0389
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J111

Comment: 1031-20-01 - Run 2 (UV254) 2/10/00 14:24
Original value (S) = 0 New value = -0.0001

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

ICR Information

ID / ICR#: TX2200012 / 647
 ICR Contact: Mr. Richard S. Talley
 Phone No.: 817/572-7008
 Period: 4/14/98 - 11/14/98 (214 days)

Design Information

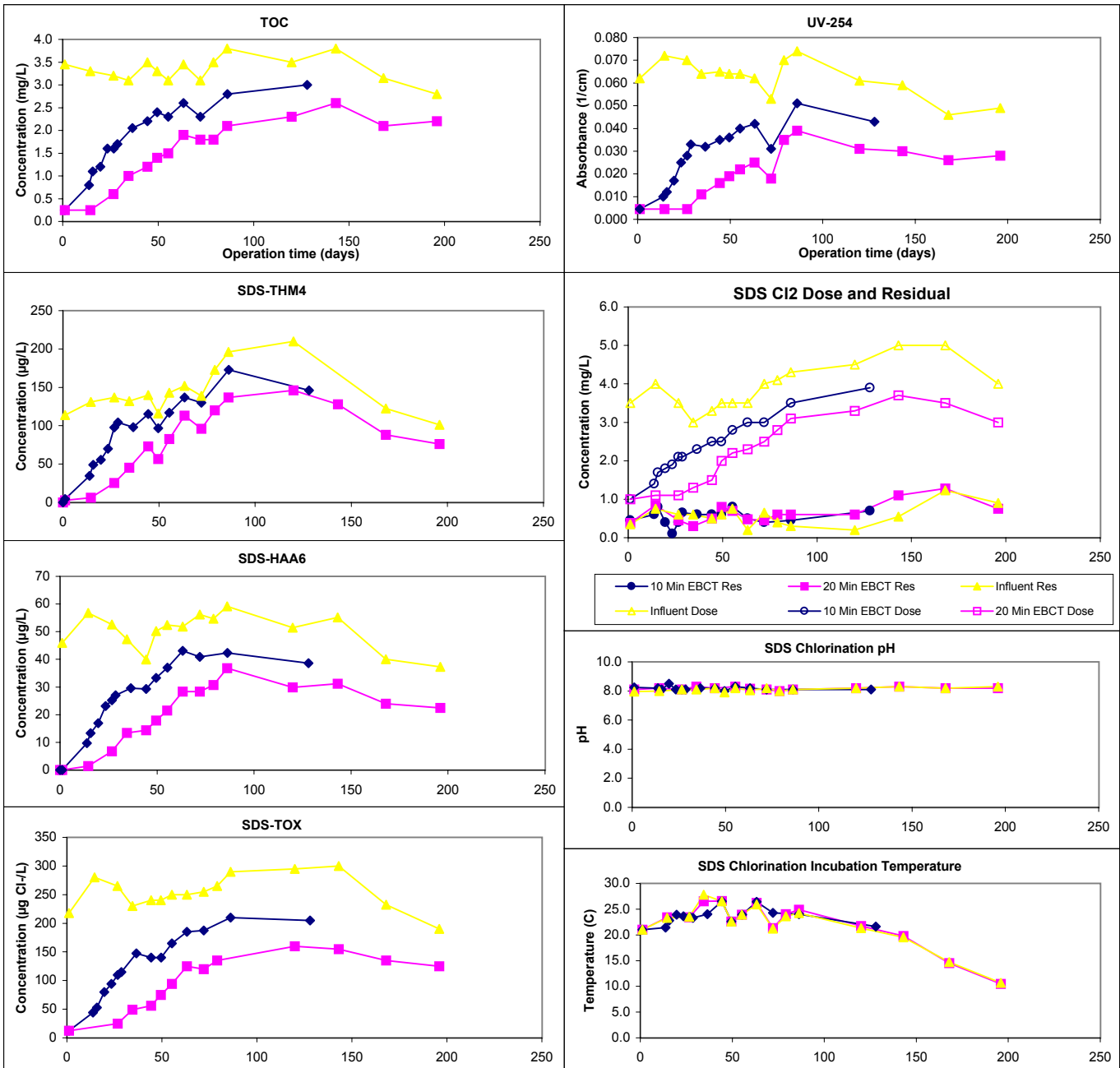
Design TOC: 3.3 mg/L
 Col Diameter: 76.2 mm

Full-Scale GAC Size: 8x20 US Std Mesh
 Full-Scale particle dia.: 1.605 mm
 Meas Dry Bed Density: 505.7 kg/m3

Water Quality Summary

| Influent | | | | | | | | | | | | | | | | | | |
|---------------|------------------------|-------|-------|---------------|------------------------|-----|----|-------------|--|--|------|-------|---------|-------------|--|--|--|--|
| Influent | Mean | SD | Count | Min/Max | | | | | | Mean | SD | Count | Min/Max | | | | | |
| TOC | 3.3 | 0.3 | 15 | 2.8 - 3.8 | | | | | | Res (0) | 0.59 | 0.24 | 45 | 0.10 - 1.28 | | | | |
| pH | 7.8 | 0.1 | 15 | 7.5 - 8.1 | | | | | | Temp | 22.5 | 3.7 | 45 | 10.5 - 27.8 | | | | |
| UV254 | 0.062 | 0.008 | 15 | 0.046 - 0.074 | | | | | | pH | 8.2 | 0.1 | 44 | 7.9 - 8.5 | | | | |
| SUVA | 1.87 | 0.21 | 15 | 1.5 - 2.2 | | | | | | Time | 24.0 | 0.3 | 45 | 23.5 - 24.8 | | | | |
| Bromide | 245 | 35 | 13 | 210 - 310 | | | | | | Comments: | | | | | | | | |
| SDS-TOX | 253 | 30 | 15 | 190 - 300 | | | | | | | | | | | | | | |
| SDS-THM4 | 143 | 31 | 14 | 101 - 210 | | | | | | | | | | | | | | |
| SDS-HAA6 | 50 | 7 | 15 | 37 - 59 | | | | | | | | | | | | | | |
| Ammonia | 0.03 | 0.04 | 15 | 0.00 - 0.13 | | | | | | Chart Legend: <div><div>10 Min EBCT</div><div>20 Min EBCT</div><div>Influent</div></div> | | | | | | | | |
| Effluent | 10 Min EBCT (143 days) | | | | 20 Min EBCT (214 days) | | | | | | | | | | | | | |
| Effluent pH | 7.7 | 0.2 | 15 | 7.4 - 8.4 | 7.7 | 0.2 | 15 | 7.4 - 8.3 | | | | | | | | | | |
| Effluent Temp | 25.2 | 2.6 | 15 | 20.3 - 29.5 | 23.9 | 4.6 | 15 | 12.4 - 29.9 | | | | | | | | | | |

Water Quality Parameter Graphs



Water Quality Parameter Graphs (Continued)

