United States Environmental Protection Agency

Office of Water (4601)

EPA 815-B-06-002
January 2006

INITIAL DISTRIBUTION SYSTEM EVALUATION GUIDANCE MANUAL

FOR THE FINAL STAGE 2 DISINFECTANTS AND DISINFECTION BYPRODUCTS RULE

APPENDIX F

http://www.epa.gov/safewater/disinfection/stage2/compliance.html

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Appendix F

Example IDSE System Specific Study Using a Hydraulic Model for a Surface Water System Serving 57,000 People

This appendix is provided as an example IDSE plan and report for a surface water system serving 57,000 people and opting to complete a System Specific Study (SSS) using a water distribution system model. For this example, the state did not require any modifications to the study plan and the system did not deviate from the approved study plan.

Chapter 6 presents detailed guidance on the requirements for performing a modeling SSS, selecting Stage 2 DBPR compliance monitoring locations using modeling SSS data, and preparing a modeling SSS report. The application of the basic guidance on preliminary location selection and Stage 2 DBPR compliance monitoring location selection is shown in this example, along with several instances of the use of best professional judgement being applied.

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Form 4: Modeling Study Plan

I. GENERAL INFORMATION

A. PWS Information*

B. Date Submitted* 3/8/07

PWSID: US1111111

PWS Name: Big City Water System

PWS Address: 1234 Main Street

City: Big City State: US Zip: 99999

Population Served: 57,000

System Type:	Source Water Type:	Buying / Selling Relationships:
☒ CWS	☒ Subpart H	☐ Consecutive System
☐ NTNCWS	☐ Ground	☐ Wholesale System
		☒ Neither

C. PWS Operations

Residual Disinfectant Type: ☒ Chlorine ☐ Chloramines ☐ Other:_____

Number of Disinfected Sources: 1 Surface ___GWUDI ____ Ground ___ Purchased

D. Contact Person*

Name: Mr. John Smith, P.E.

Title: Water System Manager

Phone #: 123-555-0000 Fax #: 123-555-0001

E-mail: jsmith@ci.bigcity.us

II. IDSE REQUIREMENTS*

A. SSS Monitoring		B. Schedule	C. SSS Monitoring Frequency
Number of Samples per Monitoring Period:	16	☐ Schedule 1	☒ During peak month of TTHM formation (1 monitoring period)
Number of Monitoring Periods:	1	☒ Schedule 2	☐ Additional (describe) _____
Total:	16	☐ Schedule 3	_____
		☐ Schedule 4	

Form 4: Modeling Study Plan

III. MODEL DESCRIPTION

A. Answer Yes or No to the following questions* ***(provide documentation in attached sheets)***

1. Is your model an Extended Period Simulation model? (Y) / N

2. Does your model meet the minimum requirements described below? Attach tables or spreadsheets to demonstrate that your model meets these requirements.

Include 75% of pipe volume	(Y) / N
Include 50% of pipe length	(Y) / N
Include all pressure zones	(Y) / N
Include all pipes 12" and larger	(Y) / N
Include all 8" and larger pipes that connect pressure zones, influence zones from different sources, storage facilities, major demand areas, pumps, and control valves, or are known or expected to be significant conveyors of water	(Y) / N
Include all 6" and larger pipes that connect remote areas of a distribution system to the main portion of the system	(Y) / N
Include all storage facilities with standard operations represented in the model	(Y) / N
Include all active pump stations with realistic controls	(Y) / N
Include all active control valves	(Y) / N

3. Is your model (or will it be) calibrated to simulate actual water levels at all storage facilities and represent the current distribution system configuration during the period of high TTHM formation? (Y) / N

4. If calibration is complete, does the model simulate 24 hour variation in demand and show a consistently repeating 24 hour pattern of residence time? (Y) / N

B. Provide a history of your model development and calibration*, including dates (*attach additional sheets if needed*)

See attached sheet.

Form 4: Modeling Study Plan

III. MODEL DESCRIPTION (Continued)

C. How was demand data assigned to the model? (*attach additional sheets if needed*)

1.	What method was used to assign demands throughout the system?	Customer accounts were geocoded and assigned to each node using Thiessen polygons.
2.	How did you estimate diurnal demand variation? How did you determine total system demand?	Diurnal demand patterns were calculated using a mass balance into/out of each pressure zone using the calibration data. Total system demand was calculated based on water production records from the WTP.
3.	How many demand categories did you use?	6 different demand categories were used: residential (based on calculation described above), industrial, school, golf course, swimming pool, and one for a specific industry.
4.	How did you address large water users?	Large water users were asked about their demand patterns. One industry had a usage pattern that was much different than the others so it was assigned an individual pattern.

D. Describe all calibration activities* If your model is not currently calibrated, describe how calibration will be completed within 12 months of plan submission using the questions 1-8 as guidance *(attach additional sheets if needed)*

1.	When was the model last calibrated?	The model was calibrated in 2003 to conditions in July 2002.
2.	What types of data were used in the calibration?	SCADA readings for tank levels, pump flows, and pump discharge pressures were collected on 5 minute intervals. 6 pressure recorders with dataloggers were installed in system for 1 week.
3.	When was the calibration data collected?	July 12 to July 19, 2002
4.	What field tests have been performed to collect calibration data?	No field tests were performed.

Form 4: Modeling Study Plan

III. MODEL DESCRIPTION (Continued)

D. (Continued)

5.	How did you determine friction factors (C-factors)?	C-factors were determined through trial and error simulations to fit the calibration data as closely as possible. Pipe material and pipe diameter were also considered when determining C-factors.
6.	Was the calibration completed for the peak month for TTHM formation? If not, was the model performance verified for the peak month for TTHM formation?	The peak month is August. The model calibration was verified using SCADA data for tank levels in August 2006.
7.	How well do actual tank levels correlate with predicted tank levels during the peak month for TTHM formation? **See Attachments (Section VIII) for additional submission requirements.**	The August 2006 actual tank levels are predicted well (within 2 feet) by the model. See attached graphs.
8.	If you are using a water quality model, what parameters are modeled? How was the model calibrated?	n/a

IV. PEAK MONTH FOR TTHM FORMATION

A. Peak Month For TTHM Formation* August

B. Justification of Peak Month for TTHM Formation

Describe how your system determined which month is the peak month for TTHM formation (*attach additional sheets if needed*):

High temperature and high source water TOC, based on past 5 years of data

Form 4: Modeling Study Plan

V. MODELING INFORMATION *

How was the SSS modeling performed? *(attach additional sheets as needed)*

1.	Was modeling done for the operating conditions during the peak month for TTHM formation?	Yes, modeling was done for August 2006 conditions.
2.	How were operational controls represented in the model?	Logical controls for all pump stations were set using tank level set points for summer operation.
3.	How was water age simulated during the peak month for TTHM formation (time steps, length of simulation, etc.)? If not yet done, indicate how this will be addressed in the IDSE report.	The water age simulation was run for 960 hours to ensure full turnover of all tanks. Tank #2 had the high average water age.
4.	What are the average water age results for your distribution system? **See Attachments (Section VIII) for additional submission requirements.**	The average water age (for the final 24 hours of the 960 hour simulation) is given in the attached table. Nodes with zero demand have a water age approximately equal to 960 hours and were not considered in the analysis for site selection. Table is attached.

VI. PLANNED STAGE 1 DBPR COMPLIANCE MONITORING SCHEDULE*

Stage 1 DBPR Monitoring Site ID (from map) [1]	Projected Sampling Date (date or week) [2]			
	Period 1	Period 2	Period 3	Period 4
Stage 1 #1	3/12/2008	6/7/2008	8/22/2008	10/1/2008
Stage 1 #2	3/12/2008	6/7/2008	8/22/2008	10/1/2008
Stage 1 #3	3/12/2008	6/7/2008	8/22/2008	10/1/2008
Stage 1 #4	3/12/2008	6/7/2008	8/22/2008	10/1/2008

[1] Verify that site IDs match IDs on your distribution system schematic (See Section VII of this form). Attach additional copies if you are required to monitor at more than 8 Stage 1 DBPR sites.

[2] period = monitoring period. Complete for the number of periods in which you must conduct Stage 1 DBPR monitoring during IDSE monitoring. Can list exact date or week (e.g., week of 7/9/07)

Form 4: Modeling Study Plan

VII. DISTRIBUTION SYSTEM SCHEMATIC*

ATTACH a schematic of your distribution system.

Distribution system schematics are not confidential and should not contain information that poses a ***security risk*** to your system. EPA recommends that you submit the following:

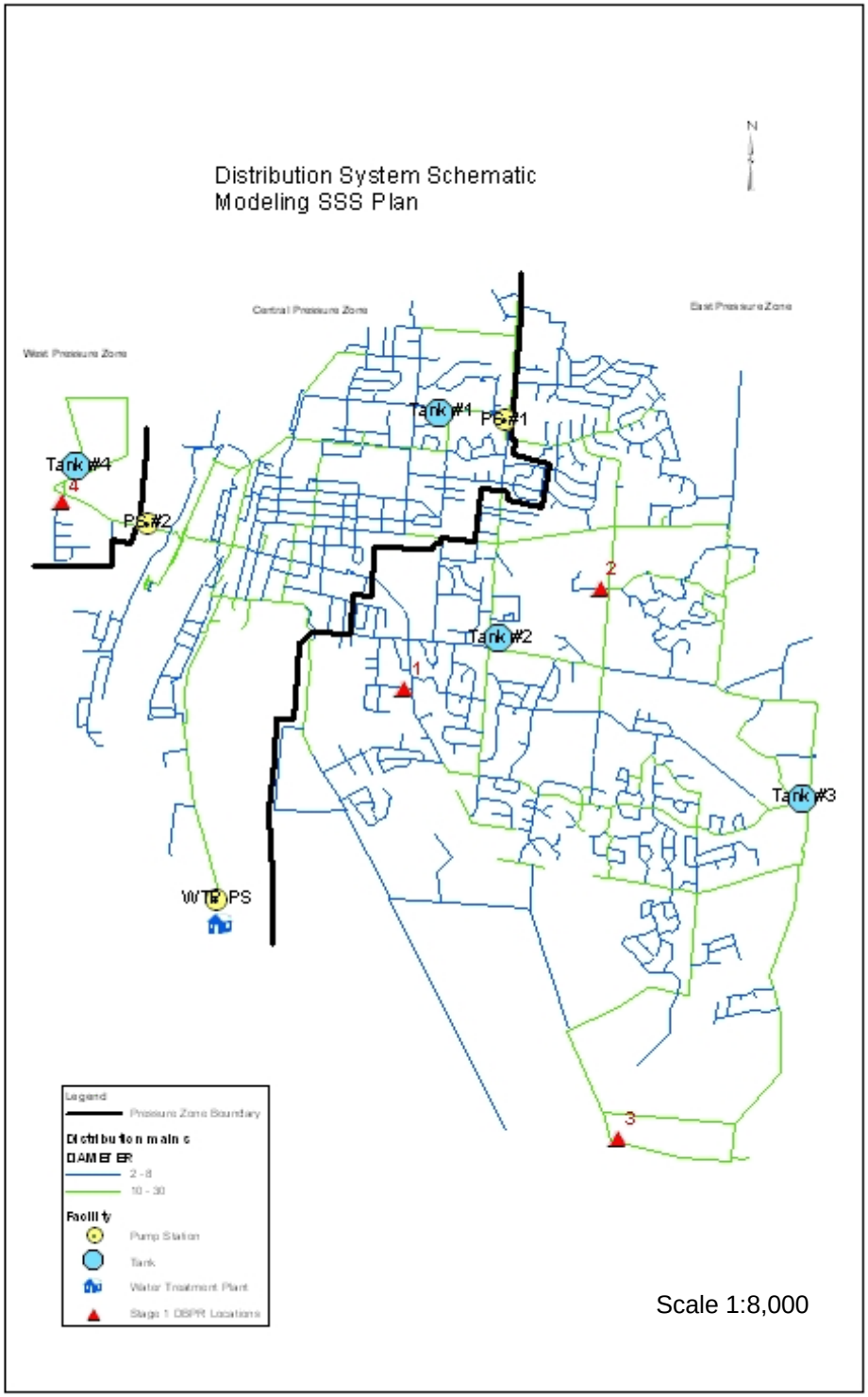
Distribution system schematic with no landmarks or addresses indicated. Show locations of sources, entry points, storage facilities, locations of completed monitoring, and Stage 1 compliance monitoring locations (required). Also include pressure zone boundaries and locations of pump stations. Provide map scale.

VIII. ATTACHMENTS

- ☒ Distribution System Schematic* (Section VII).
- ☒ Tabular or spreadsheet documentation that your model meets minimum requirements* (Section III.A).
- ☒ Additional sheets for explaining your model (Section III.B).
- ☒ Graph of predicted tank levels vs. measured tank levels for the storage facility with the high residence time in each pressure zone* (Section III.D). **Required if calibration is complete**.
- ☒ Time series graph of water age at the longest residence time storage facility in the distribution system showing the predictions for the entire EPS simulation period* (Section V). **Required if calibration is complete**
- ☐ Additional sheets for explaining how you selected the peak historic month for TTHM formation (Section V).
- ☒ Model output showing preliminary 24 hour water age predictions for all nodes throughout the distribution system* (Required for all submissions. If your model is calibrated, this should be your final water age predictions)(Section V).
- ☐ Additional sheets describing the planned Stage 1 DBPR Compliance Monitoring Schedule (Section VI).

Total Number of Pages in Your Plan: 19

Note: All items marked with an asterisk (*) are required by the rule.


Distribution System Schematic
Modeling SSS Plan
N
Central Pressure Zone
East Pressure Zone
West Pressure Zone
Tank #4
4
PS #2
Tank #1
PS #1
2
Tank #2
1
Tank #3
WTP
PS
3
Legend
Pressure Zone Boundary
Distribution mains
DIAMETER
2 - 8
10 - 30
Facility
Pump Station
Tank
Water Treatment Plant
Stage 1 DBPR Locations
Scale 1:8,000

MINIMUM MODEL REQUIREMENTS

No GIS system for the water mains exists. Using information from the paper water atlas sheets for the City and the model input data, the following characteristics were estimated. There are no active control valves in the distribution system.

	Length (ft)				Volume (cf)			
Pipe Diameter (in)	Total	Not In Model	In Model	% in Model	Total	Not In Model	In Model	% in Model
4	15,142	10,400	4,472	31.3	1,321	908	414	31.3
6	234,996	4,000	230,996	98.3	46,141	785	45,356	98.3
8	156,720	0	156,720	100.0	54,706	0	54,706	100.0
10	15,505	0	15,505	100.0	8,457	0	8,457	100.0
12	136,404	0	136,404	100.0	107,131	0	107,131	100.0
16	26,815	0	26,815	100.0	37,441	0	37,441	100.0
20	12,832	0	12,832	100.0	27,995	0	27,995	100.0
24	1,761	0	1,761	100.0	5,532	0	5,532	100.0
Total	600,175	14,400	585,775	97.6	288,725	1,693	287,032	99.4

HISTORY OF MODEL DEVELOPMENT AND CALIBRATION

Model was developed in 2003 and calibrated to conditions in July 2002 (maximum demand day). No new major facilities have been constructed in the system since 2003. The model was used to determine new pipe sizes for future construction, to adjust operation of the pumps, to examine water age, and to identify fire flow improvements. New mains that were constructed since 2003 have been added to the model.

ADDITIONAL MODEL INFORMATION

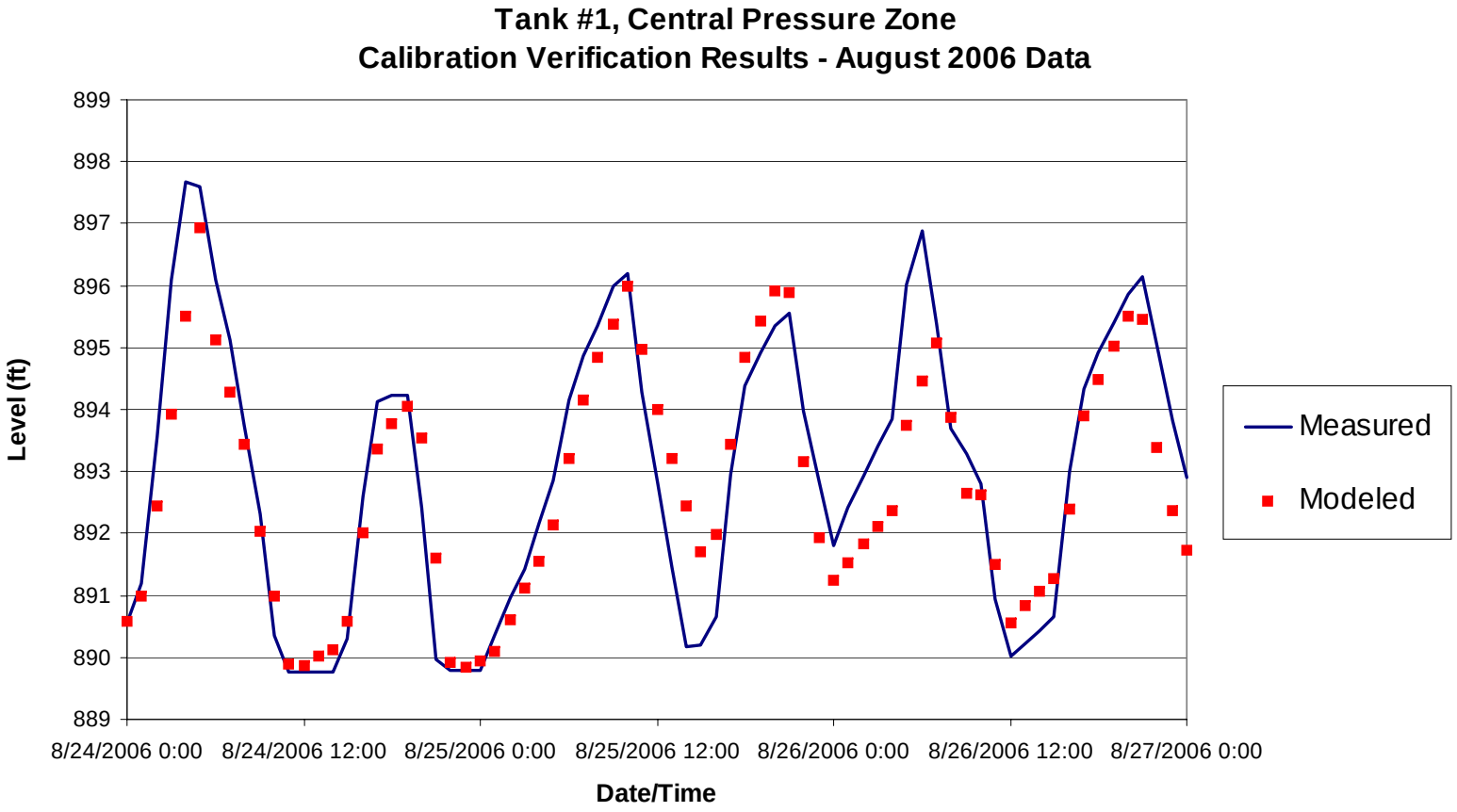
Pump Station Controls

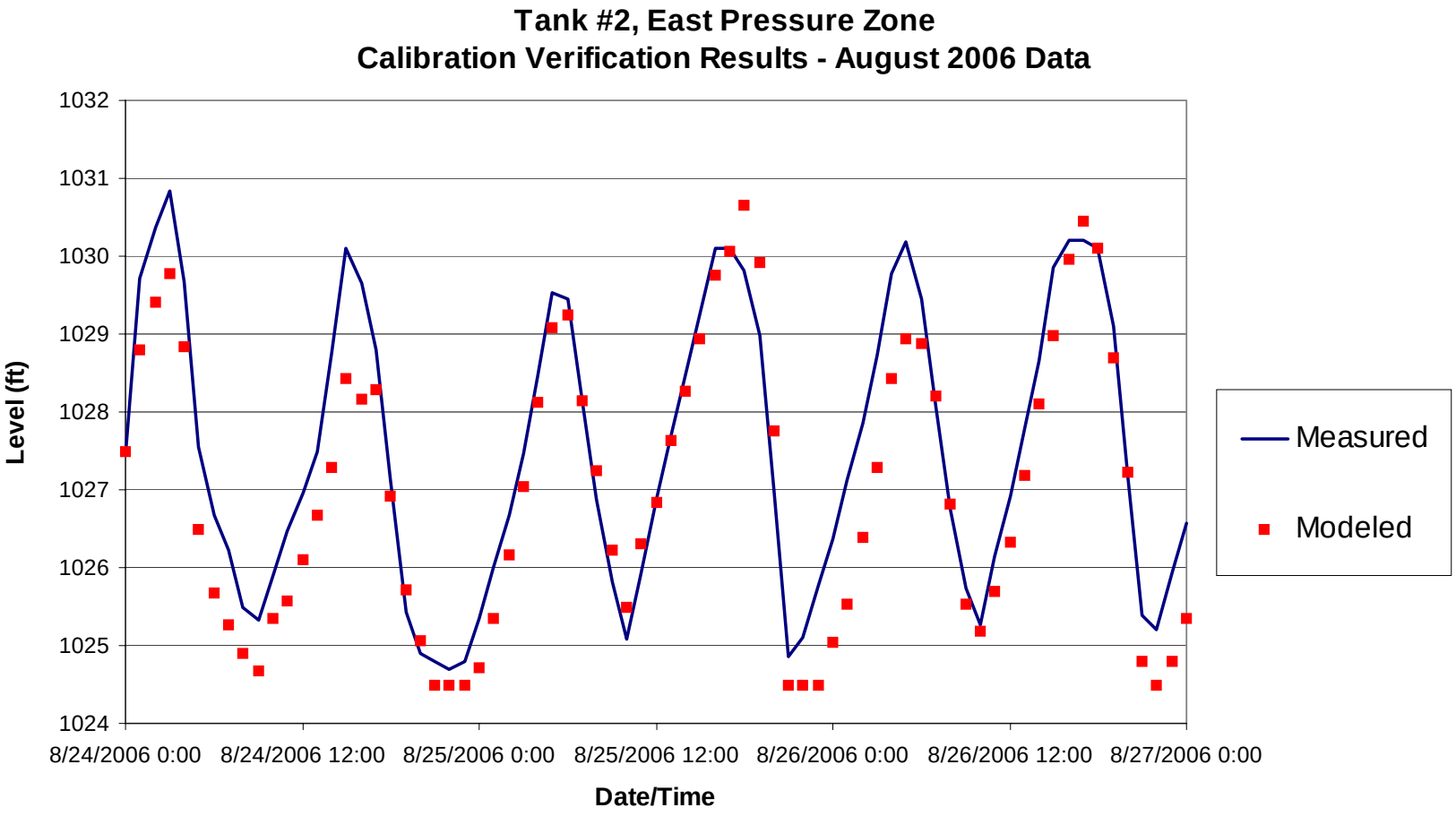
Pump Station	Controlling Tank	Pump Number	Pump ON Level (ft)	Pump OFF Level (ft)
WTP High Service	Tank #1	1 (Lead)	27.0	28.5
		2 (Lag 1)	26.0	28.5
		3 (Lag 2)	24.0	28.0
		4 (Lag 3)	20.0	26.5
PS #1	Tank #3	1 (Lead)	25.0	29.0
		2 (Lag 1)	24.0	28.0
		3 (Lag 2)	23.5	27.0
PS #2	Tank #4	1 (Lag 1)	28.0	33.0
		2 (Lead)	30.0	35.0
		3 (Lag 2/Fire)	20.0	30.0

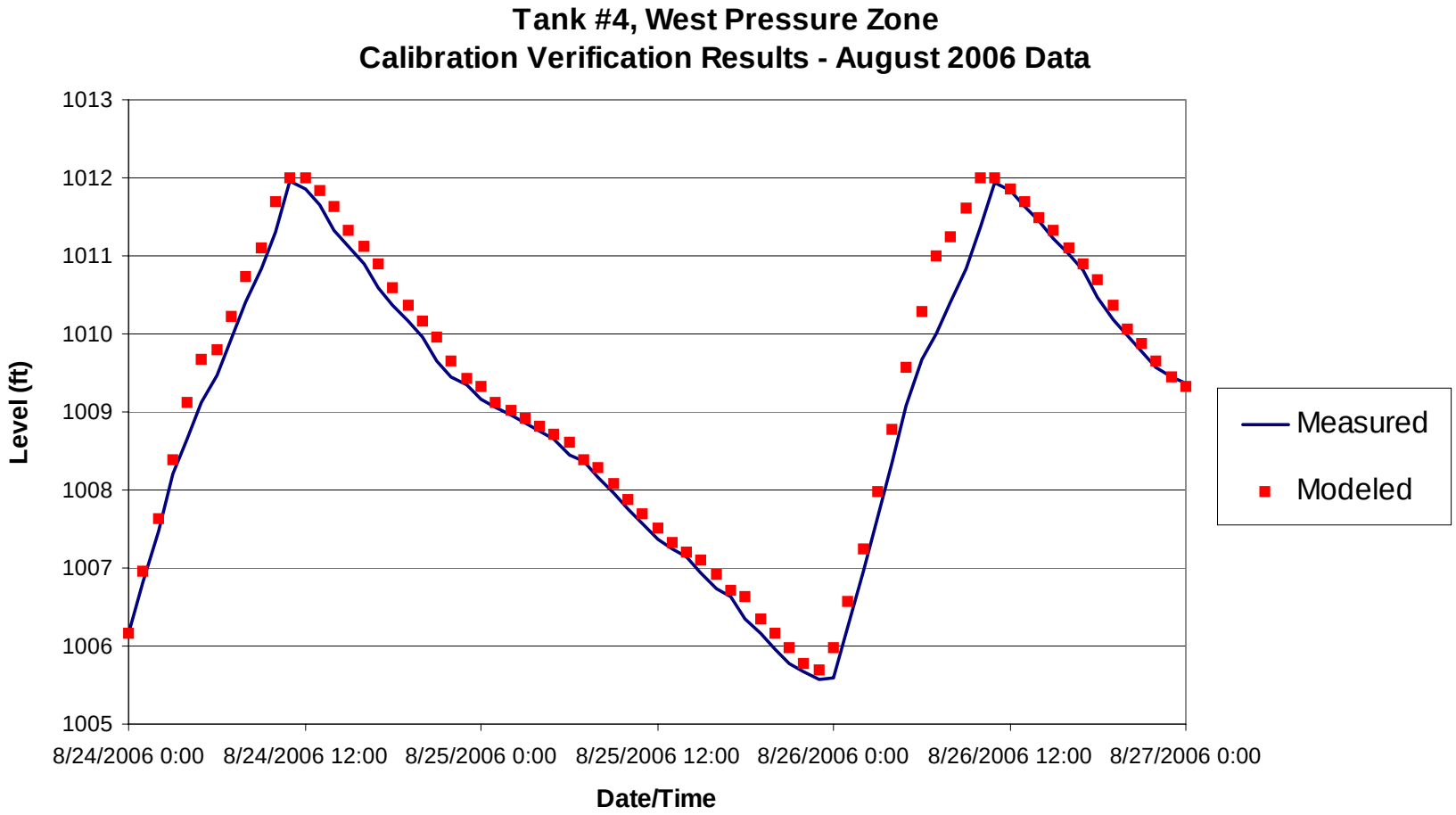
Tank Information

Tank	Pressure Zone	Average Water Age (hrs)
1	Central	120.08
2	East	134.19
3	East	77.33
4	West	60.89

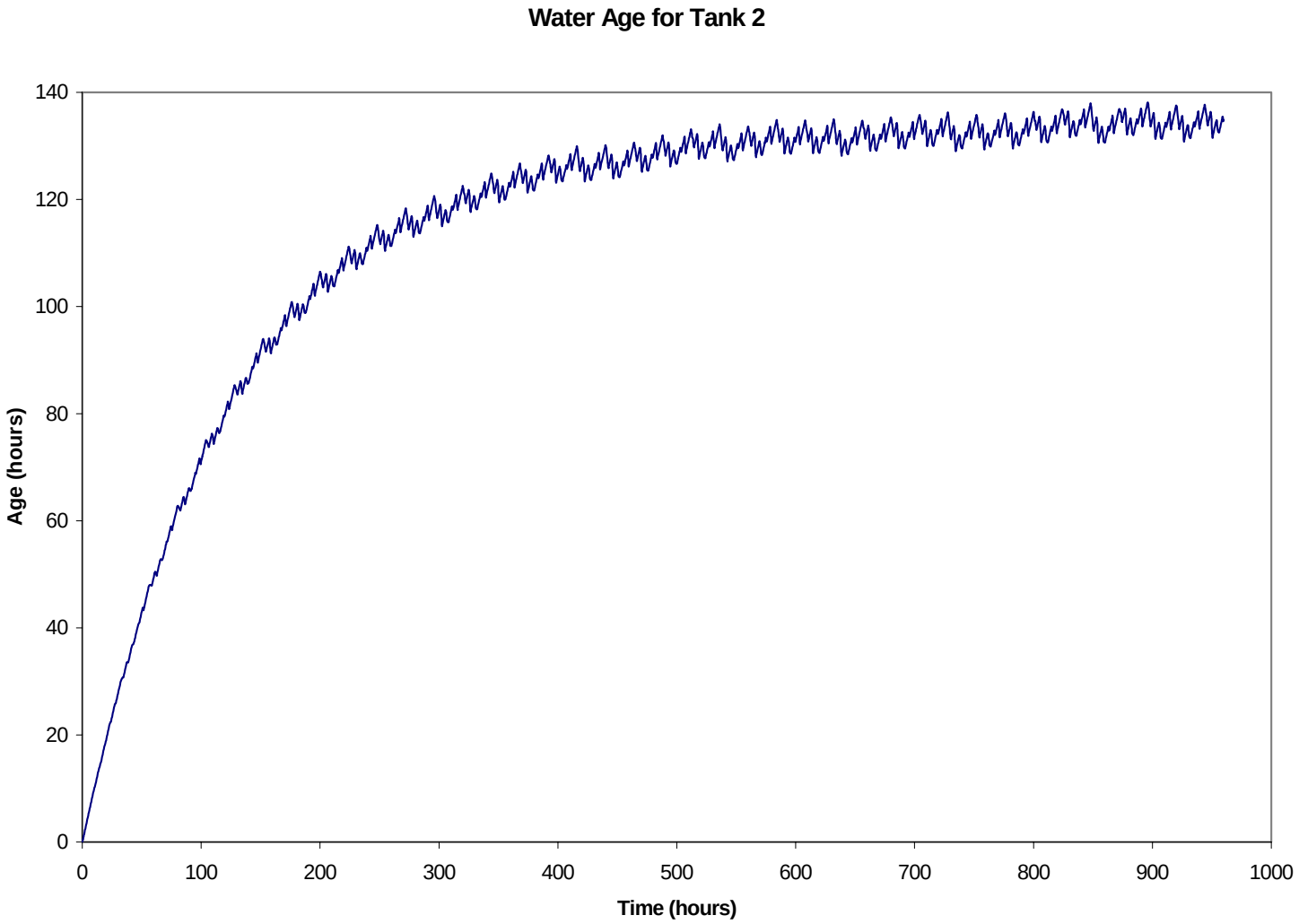
CALIBRATION RESULTS




Tank #2, East Pressure Zone
Calibration Verification Results - August 2006 Data
Level (ft)
1032
1031
1030
1029
1028
1027
1026
1025
1024
8/24/2006 0:00
8/24/2006 12:00
8/25/2006 0:00
8/25/2006 12:00
8/26/2006 0:00
8/26/2006 12:00
8/27/2006 0:00
Date/Time
Measured
Modeled


Tank #4, West Pressure Zone
Calibration Verification Results - August 2006 Data
Level (ft)
1013
1012
1011
1010
1009
1008
1007
1006
1005
8/24/2006 0:00
8/24/2006 12:00
8/25/2006 0:00
8/25/2006 12:00
8/26/2006 0:00
8/26/2006 12:00
8/27/2006 0:00
Date/Time
Measured
Modeled

MODELING ANALYSIS RESULTS



MODELING ANALYSIS RESULTS

Average Water Age for All Nodes (Hour 936 to Hour 960 of Simulation)

ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)
10	263.32	96	0.76	182	1.47	268	6.57
12	3.05	98	0.83	184	18.37	270	13.57
14	21.28	100	0.95	186	16.35	272	79.19
16	4.68	102	947.88	188	9.42	274	172.01
18	581.18	104	947.88	190	48.29	276	280.49
20	5	106	333.21	192	34.8	278	35.64
22	947.93	108	264.09	194	58.32	280	947.93
24	947.81	110	270.36	196	52.38	282	27.33
26	246.72	112	33.79	198	44.4	284	947.93
28	16.64	114	947.93	200	46.24	286	27.3
30	947.76	116	947.93	202	44.64	288	947.93
32	947.76	118	419.19	204	40.19	292	26.54
34	32.95	120	331.35	206	46.77	294	947.93
36	18.67	122	288.94	208	947.93	296	25.95
38	0.04	124	65.68	210	47.64	298	54.63
40	0.38	126	174.07	212	48.59	300	76.66
42	183.79	128	40.42	214	45.22	302	23.47
44	2.96	130	0.05	216	41.58	304	28.74
46	0.09	132	847.23	218	49.83	306	22.85
48	0.16	134	947.93	220	43.94	308	8.04
50	0.25	136	290.74	222	8.77	310	21.75
52	0.33	138	1.12	224	947.93	312	27.97
54	0.16	140	20.57	226	947.93	314	23.31
56	0.31	142	1.36	228	34.13	316	22.94
58	0.15	144	497.02	230	39.62	318	4.14
60	894.92	146	21.59	232	42.32	320	6.65
62	2.84	148	0.12	234	35.18	322	4.5
64	886.42	150	751.59	236	36.64	324	947.93
66	0.15	152	947.93	238	11.73	326	3.71
68	0.24	154	947.93	240	947.93	328	1.98
70	0	156	355.98	242	11.4	330	3.43
72	894.96	158	18.04	244	947.93	332	3.19
74	934.2	160	0.08	246	9.9	334	947.93
76	889.41	162	491.68	248	46	336	947.93
78	0.81	164	947.93	250	947.93	338	2.9
80	0.68	166	947.93	252	17.1	340	2.5
82	0.63	168	230.29	254	15.64	342	3.12
84	947.93	170	24.57	256	25.88	344	947.93
86	579.20	172	549.5	258	947.93	346	3.64
88	0.4	174	587.53	260	4.89	348	34.98
90	93.09	176	947.93	262	5.02	350	947.93
92	14.19	178	947.93	264	947.93	352	99.19
94	19.75	180	1.45	266	947.93	354	947.93

MODELING ANALYSIS RESULTS (CONTINUED)

Average Water Age for All Nodes (Hour 936 to Hour 960 of Simulation)

ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)
356	17.38	446	5.61	1028	8.26	1071	0.24
358	947.93	448	2.07	1029	6.64	1072	14.53
360	947.93	450	8.73	1030	6.57	1073	3.55
362	947.93	452	12.94	1031	9.37	1074	9.89
364	83.58	454	2.38	1032	9.09	1075	947.93
366	947.93	470	0.49	1033	8.06	1076	4.37
368	947.93	472	0.49	1034	9.44	1077	1.99
370	7.49	474	0.41	1035	7.56	1078	3.36
372	12.99	476	0.55	1036	5.78	1079	5.48
374	29.83	480	947.93	1037	7.12	1080	10.56
376	6.76	482	130.78	1038	10.42	1081	3.82
378	919.41	484	0.11	1039	9.59	1082	3.6
380	223.06	486	588.10	1040	10.82	1083	947.93
384	20.56	488	947.93	1041	8.56	1084	3.54
388	12.38	490	18.14	1042	7.71	1085	947.93
390	13.03	1000	62.06	1043	10.54	1086	15.45
392	1.53	1001	0.16	1044	12.2	1087	28.45
394	45.29	1002	7.11	1045	11.08	1088	3.18
396	45.07	1003	95.1	1046	6.31	1089	2.68
398	2.91	1004	108.24	1047	0.78	1090	13.68
400	16.09	1005	947.93	1048	8.91	1091	4
402	7.69	1006	93.84	1049	5.99	1092	40.09
404	8.21	1007	947.93	1050	5.54	1093	12.76
406	11.3	1008	7.58	1051	5.67	1094	0.32
408	15.69	1009	947.93	1052	4.38	1095	15.78
410	11.36	1010	947.93	1053	4.94	1096	0.86
412	33.78	1011	8.11	1054	4.86	1097	23.18
414	34.6	1012	13.93	1055	11.25	1098	5.46
416	35.59	1013	5.64	1056	947.93	1099	2.26
418	38.42	1014	12	1057	4.74	1100	947.93
420	36.09	1015	0	1058	10.28	1101	9.96
422	77.88	1016	6.17	1059	9.12	1102	9.65
424	70.07	1017	155.01	1060	5.08	1103	2.62
426	66.5	1018	7.2	1061	6.25	1104	2.84
428	59.04	1019	20.33	1062	4.38	1105	2.87
430	34.85	1020	23.77	1063	7.17	1106	3.17
432	39.89	1021	16.59	1064	3.98	1107	2.49
434	37.1	1022	5.61	1065	5.3	1108	947.93
436	29.81	1023	6.3	1066	4.24	1109	2.58
438	11.31	1024	0.63	1067	6.25	1110	947.93
440	4.39	1025	7.06	1068	62.36	1111	13.53
442	8.26	1026	11.19	1069	9.19	1112	0.55
444	6.1	1027	6.53	1070	5.27	1113	19.15

MODELING ANALYSIS RESULTS (CONTINUED)

Average Water Age for All Nodes (Hour 936 to Hour 960 of Simulation)

ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)
1114	7.76	1157	11.18	1200	16.11	1243	947.93
1115	3.33	1158	11.08	1201	22.86	1244	44.19
1116	947.93	1159	12.28	1202	24.73	1245	28.38
1117	3.39	1160	12.71	1203	7.42	1246	20.8
1118	2.96	1161	9.74	1204	17.71	1247	13.59
1119	3.54	1162	6.69	1205	4.75	1248	17.77
1120	3.11	1163	16.61	1206	21.63	1249	15.55
1121	12.42	1164	7.23	1207	8.88	1250	15.21
1122	11.1	1165	21.24	1208	947.93	1251	93.45
1123	947.93	1166	55.84	1209	30.85	1252	334.45
1124	91.17	1167	4.14	1210	20.75	1253	47.35
1125	3.9	1168	4.01	1211	24.67	1254	44.01
1126	4.03	1169	26.65	1212	19.74	1255	73.19
1127	947.93	1170	11.46	1213	19.27	1256	180.69
1128	5.77	1171	13.53	1214	16.71	1257	14.57
1129	33.29	1172	10.92	1215	21.05	1258	13.66
1130	4.15	1173	15.57	1216	947.93	1259	128.65
1131	3.66	1174	30.07	1217	18.78	1260	5.87
1132	4.33	1175	9	1218	17.59	1261	5.25
1133	4.38	1176	12.33	1219	37.14	1262	3.38
1134	9.14	1177	0.55	1220	10.53	1263	55.17
1135	0.55	1178	947.93	1221	15.7	1264	947.93
1136	35.4	1179	30.74	1222	25.96	1265	57.91
1137	4.25	1180	13.37	1223	28.42	1266	16.04
1138	4.85	1181	34.46	1224	28.09	1267	15.39
1139	4.42	1182	21.7	1225	16.94	1268	9.4
1140	62.47	1183	13.97	1226	15.21	1269	5.49
1141	4.6	1184	29.7	1227	21.73	1270	10.51
1142	947.93	1185	23.94	1228	43.29	1271	13.76
1143	947.93	1186	9.61	1229	11.98	1272	9.59
1144	4.28	1187	8.47	1230	17.13	1273	28.08
1145	4.93	1188	23.68	1231	9.13	1274	173.08
1146	6.34	1189	21.97	1232	17.52	1275	15.82
1147	6.08	1190	21.6	1233	16.95	1276	183.99
1148	16.55	1191	21.85	1234	17.2	1277	154.62
1149	8.71	1192	22	1235	16.81	1278	172.86
1150	4.67	1193	18	1236	20.4	1279	35.13
1151	7.07	1194	22.54	1237	947.93	1280	155.92
1152	7.82	1195	20.72	1238	947.93	1281	29.41
1153	7.42	1196	947.93	1239	14.17	1282	8.24
1154	19.91	1197	33.84	1240	14.04	1283	25.69
1155	9.08	1198	37.03	1241	62.71	1284	947.93
1156	0.4	1199	23.58	1242	13.92	1285	947.93

MODELING ANALYSIS RESULTS (CONTINUED)

Average Water Age for All Nodes (Hour 936 to Hour 960 of Simulation)

ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)
1286	15.41	1329	947.93	1372	36.44	1415	30.44
1287	13.2	1330	27.25	1373	947.93	1416	15.56
1288	947.93	1331	12.31	1374	38.16	1417	36.91
1289	13.18	1332	64.6	1375	47.25	1418	947.93
1290	947.93	1333	10.2	1376	32.22	1419	20.34
1291	44.01	1334	35.3	1377	38.87	1420	1.71
1292	30.5	1335	107.16	1378	31.36	1421	947.93
1293	10.47	1336	30.62	1379	15.1	1422	21.62
1294	39.4	1337	947.93	1380	31.67	1423	22.44
1295	64.59	1338	46.6	1381	32.44	1424	27.88
1296	90.1	1339	26.67	1382	28.03	1425	27.93
1297	66.63	1340	6.72	1383	28.28	1426	22.1
1298	22.13	1341	25.72	1384	31.44	1427	33.81
1299	69.96	1342	26.8	1385	28.46	1428	1.71
1300	67.85	1343	9.95	1386	21.36	1429	5.35
1301	80.4	1344	26.07	1387	28.67	1430	18.02
1302	61.48	1345	25.99	1388	54.41	1431	5.3
1303	4.7	1346	25.39	1389	27.44	1432	8.3
1304	67.69	1347	23.62	1390	13.34	1433	9.92
1305	64.22	1348	947.93	1391	13.05	1434	18.12
1306	73.64	1349	947.93	1392	12.04	1435	57.1
1307	68.43	1350	25.09	1393	947.93	1436	15.31
1308	28.44	1351	22.99	1394	14.01	1437	18.75
1309	28.17	1352	23.95	1395	15.85	1438	58.41
1310	28.4	1353	9.39	1396	31.76	1439	81.12
1311	30.9	1354	22.1	1397	14.79	1440	65.54
1312	61.1	1355	947.93	1398	56.36	1441	26.22
1313	11.5	1356	106.7	1399	16.5	1442	24.87
1314	14.01	1357	45.02	1400	34.68	1443	26.12
1315	28.05	1358	947.93	1401	947.93	1444	27.32
1316	27.83	1359	51.76	1402	20.62	1445	947.93
1317	43.49	1360	54.77	1403	30.51	1446	2.98
1318	35.48	1361	48.44	1404	30.37	1447	26.42
1319	26.95	1362	30.27	1405	947.93	1448	22.2
1320	27.3	1363	947.93	1406	947.93	1449	10.38
1321	20.57	1364	27.34	1407	29.74	1450	4.93
1322	9.35	1365	32.52	1408	30.68	1451	20.56
1323	60.46	1366	67.84	1409	28.82	1452	20.09
1324	36.99	1367	38.08	1410	39.05	1453	2.8
1325	13.44	1368	32.98	1411	1.69	1454	3.84
1326	67.16	1369	947.93	1412	28.82	1455	6.55
1327	48.75	1370	34.52	1413	4.52	1456	21.22
1328	947.93	1371	30.84	1414	28.66	1457	2.15

MODELING ANALYSIS RESULTS (CONTINUED)

Average Water Age for All Nodes (Hour 936 to Hour 960 of Simulation)

ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)
1458	12.74	1501	27.28	1544	2.94	1587	17.62
1459	1.94	1502	21.53	1545	947.93	1588	54.87
1460	1.83	1503	15.63	1546	1.49	1589	45.46
1461	1.63	1504	16.98	1547	1.62	1590	11.65
1462	1.91	1505	24.66	1548	947.93	1591	947.93
1463	33.73	1506	947.93	1549	9.1	1592	62.9
1464	29.76	1507	11.1	1550	7.02	1593	44.65
1465	947.93	1508	12.54	1551	5.53	1594	32.05
1466	4.96	1509	26.33	1552	8.93	1595	43.9
1467	4.86	1510	947.93	1553	5.51	1596	3.47
1468	5.17	1511	23.21	1554	947.93	1597	947.93
1469	5.39	1512	947.93	1555	29.7	1598	4.1
1470	28.36	1513	18.48	1556	7.21	1599	229.18
1471	7.62	1514	17.66	1557	8.33	1600	4.68
1472	947.93	1515	17.77	1558	16.13	1601	121.33
1473	6.88	1516	8.21	1559	21.2	1602	28.19
1474	9.07	1517	8.07	1560	4.41	1603	124.75
1475	14.69	1518	6.18	1561	35.53	1604	24.75
1476	7.97	1519	4.67	1562	18.2	1605	17.01
1477	14.39	1520	4.39	1563	53.95	1606	16.78
1478	17.08	1521	4.33	1564	21.74	1607	9.42
1479	16.1	1522	5.45	1565	18.58	1608	74.9
1480	11.46	1523	4.6	1566	17.41	1609	6.61
1481	947.93	1524	4.82	1567	17.39	1610	9.45
1482	12.63	1525	947.93	1568	20.31	1611	9.54
1483	35.05	1526	947.93	1569	24.61	1612	10.05
1484	8.09	1527	6.23	1570	18.49	1613	12.7
1485	6.71	1528	31.31	1571	33.57	1614	10.52
1486	34.93	1529	75.19	1572	21.88	1615	9.56
1487	5.47	1530	1.51	1573	22.31	1616	6.49
1488	13.62	1531	3.88	1574	27.95	1617	51.88
1489	26.17	1532	19.37	1575	15.85	1618	11.17
1490	947.93	1533	324.34	1576	947.93	1619	11
1491	26.13	1534	39.59	1577	18.55	1620	12.65
1492	26.9	1535	10.21	1578	18.16	1621	23.87
1493	26.12	1536	947.93	1579	17.63	1622	30.62
1494	21.46	1537	28.04	1580	21	1623	26.81
1495	29.26	1538	26.12	1581	52.83	1624	6.86
1496	109.84	1539	947.93	1582	947.93	1625	6.32
1497	31.54	1540	947.93	1583	19.81	1626	7.54
1498	90.57	1541	32.43	1584	26.65	1627	63.75
1499	24.39	1542	318.95	1585	26.24	1628	11.24
1500	16.31	1543	947.93	1586	947.93	1629	947.93

MODELING ANALYSIS RESULTS (CONTINUED)

Average Water Age for All Nodes (Hour 936 to Hour 960 of Simulation)

ID	Average (hrs)	ID	Average (hrs)	ID	Average (hrs)
1630	14.57	1673	4.33	1716	2.6
1631	11.29	1674	4.37	1717	2.43
1632	11.45	1675	4.2	1718	2.5
1633	12.1	1676	5.36	1719	113.62
1634	11.92	1677	6.02	1720	1.79
1635	12.35	1678	5.67	1721	20.44
1636	233.36	1679	29.71	1722	1.47
1637	947.93	1680	5.57	1723	1.15
1638	13.44	1681	5.95	1724	5.27
1639	30.77	1682	6.27	1725	947.93
1640	30.78	1683	6.75	1726	1.07
1641	3.38	1684	6.19	1727	2.37
1642	35.68	1685	6.48	1728	42.65
1643	14.93	1686	14.02	1729	112.12
1644	50.93	1687	14.57	1730	947.93
1645	32.32	1688	18.25	1731	33.5
1646	33.81	1689	15.42	1732	42.95
1647	25.23	1690	5.34	1733	116.37
1648	26.59	1691	6.78	1734	123.36
1649	25.16	1692	4.34	1735	9.67
1650	29.32	1693	6.02	1736	117.02
1651	21.69	1694	8.44	1737	5.31
1652	41.66	1695	23.73	1738	8.1
1653	9.53	1696	5.29	1739	947.93
1654	5.65	1697	5.87	1740	125.05
1655	19.64	1698	4.97	1741	166.46
1656	14.9	1699	4.23	1742	100.57
1657	5.55	1700	5.17	1743	112.85
1658	5.71	1701	4.52	1744	176.36
1659	5.14	1702	3.83	1745	169.74
1660	4.96	1703	5.99	1746	947.93
1661	947.93	1704	3.09	1747	947.93
1662	8.48	1705	3.6		
1663	5.4	1706	3.33		
1664	4.46	1707	5.83		
1665	6.13	1708	3.46		
1666	6.32	1709	3.19		
1667	5.25	1710	3.93		
1668	7.75	1711	18.99		
1669	103.99	1712	5.16		
1670	4.93	1713	947.93		
1671	4.64	1714	2.68		
1672	6.97	1715	2.37		

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Form 5: IDSE Report for a Modeling SSS

I. GENERAL INFORMATION

(Skip this section if you are submitting the plan and report at the same time)

A. PWS Information*

PWSID: US1111111

PWS Name: Big City Water System

PWS Address: 1234 Main Street

City: Big City State: US Zip: 99999

Population Served: 57,000

B. Date Submitted*

2/17/09

System Type:	Source Water Type:	Buying / Selling Relationships:
☒ CWS	☒ Subpart H	☐ Consecutive System
☐ NTNCWS	☐ Ground	☐ Wholesale System
		☒ Neither

C. PWS Operations

Residual Disinfectant Type: ☒ Chlorine ☐ Chloramines ☐ Other:_____

Number of Disinfected Sources: __1__ Surface ___GWUDI ____ Ground ___ Purchased

D. Contact Person*

Name: Mr. John Smith, P.E.

Title: Water System Manager

Phone Number: 123-555-0000 Fax: 123-555-0001

E-mail: jsmith@ci.bigcity.us

II. SSS AND STAGE 2 DBPR REQUIREMENTS*

A. Number of Required Stage 2 DBPR Compliance Monitoring Sites __8__ TOTAL

__3__ Highest TTHM __2__ Stage 1 DBPR

__3__ Highest HAA5

B. IDSE Schedule

☐ Schedule 1

☒ Schedule 2

☐ Schedule 3

☐ Schedule 4

C. Required Stage 2 DBPR Monitoring Frequency

☐ Once during peak historical month

☒ Every 90 days (4 monitoring periods)

D. Number of Required SSS Samples

__16__ TOTAL

Form 5: IDSE Report for a Modeling SSS

III. MODELING INFORMATION

(Skip this section if you submitted a modeling study plan with an approved model calibration and your information has not changed, or if you are submitting your plan and report at the same time)

A. How was demand data assigned to the model? (*attach additional sheets if needed*)

1.	What method was used to assign demands throughout the system?	
2.	How did you estimate diurnal demand variation? How did you determine total system demand?	
3.	How many demand categories did you use?	
4.	How did you address large water users?	

B. Describe all calibration activities undertaken* (*attach additional sheets if needed*)

1.	When was the model last calibrated?	
2.	What types of data were used in the calibration?	
3.	When was the calibration data collected?	
4.	What field tests have been performed to collect calibration data?	

Form 5: IDSE Report for a Modeling SSS

III. MODELING INFORMATION (Continued)

5.	How did you determine friction factors (C-factors)?	
6.	Was the calibration completed for the peak month for TTHM formation? If not, was the model performance verified for the peak month for TTHM formation?	
7.	How well do actual tank levels correlate with predicted tank levels during the peak month for TTHM formation? **Submit a graph of predicted tank levels vs. measured tank levels for the storage facility with the highest water age in each pressure zone*.**	
8.	If you are using a water quality model, what parameters are modeled? How was the model calibrated?	

Form 5: IDSE Report for a Modeling SSS

III. MODELING INFORMATION (Continued)

C. How was the SSS modeling performed?* (*attach additional sheets as needed*)

1.	Was modeling done for the operating conditions during the peak month for TTHM formation*?	
2.	How were operational controls represented in the model?	
3.	How was water age simulated during the peak month for TTHM formation (time steps, length of simulation, etc.)?	
4.	What are the average water age results for your distribution system? **Submit final model output showing 24-hour average residence time throughout the distribution system*.** **Submit graph of water age at the longest residence time storage facility in the distribution system showing the predictions for the entire EPS simulation period*.**	

Form 5: IDSE Report for a Modeling SSS

IV. SSS MONITORING LOCATION SELECTION

How were the SSS monitoring locations selected? *(attach additional sheets as needed)*

1.	What model results were used as the basis for selection?	The average water age results from the last 24 hours of the 960 hour simulation were analyzed. Nodes were ranked by age and a histogram of water age ranges was created.
2.	What criteria were used in selecting average residence time, high TTHM, and high HAA5 sites?	The high TTHM and high HAA5 sites were selected with water ages in the range of 300 - 500 hours. These were the high results from the modeling (excluding zero demand nodes). The average water age was determined to be 20 hours based on the most frequently occurring age in the histogram.
3.	What additional data was used in the analysis, and how was it used?	TCR data for chlorine residual was examined for each potential sampling site. High water age locations with measurable residual were selected for high HAA5 sites. High water age locations with low residual chlorine were selected for high TTHM sites.
4.	How did you look at practical considerations like accessibility of sampling locations?	Once model nodes were identified, the proposed location was found on the paper water atlas sheets and an accessible sampling point was determined in the vicinity of the original node. Accessible locations served by the same water main as the model node were targeted. If the targeted water main was not accessible, an alternate location on a water main of the same diameter was found in the vicinity.
5.	How did you verify that your selected sampling locations corresponded to the selected node in your model?	Using the paper water atlas sheets and comparing the locations to the information in the hydraulic model, locations were verified.

Form 5: IDSE Report for a Modeling SSS

V. SSS AND STAGE 1 DBPR MONITORING RESULTS*

A. TTHM Results

Site ID & Category	Data Type	TTHM (mg/L)				LRAA
Stage 1 Site 1	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.041	0.048	0.062	0.050	0.050
Stage 1 Site 2	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.045	0.046	0.058	0.053	0.051
Stage 1 Site 3	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.051	0.055	0.075	0.059	0.060
Stage 1 Site 4	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.048	0.052	0.068	0.053	0.055
SSS-1 Entry	Sample Date			8/5/08		
	Sample Result			0.028		0.028
SSS-2 Average	Sample Date			8/5/08		
	Sample Result			0.048		0.048
SSS-3 Average	Sample Date			8/5/08		
	Sample Result			0.058		0.058
SSS-4 Average	Sample Date			8/5/08		
	Sample Result			0.067		0.067
SSS-5 Average	Sample Date			8/5/08		
	Sample Result			0.033		0.033
SSS-6 High TTHM	Sample Date			8/5/08		
	Sample Result			0.056		0.056
SSS-7 High TTHM	Sample Date			8/5/08		
	Sample Result			0.059		0.059
SSS-8 High TTHM	Sample Date			8/5/08		
	Sample Result			0.055		0.055

Attach additional sheets as needed for SSS and Stage 1 DBPR results.

Form 5: IDSE Report for a Modeling SSS

V. SSS AND STAGE 1 DBPR MONITORING RESULTS* (Continued)

B. HAA5 Results

Site ID & Category	Data Type	HAA5 (mg/L)				LRAA
Stage 1 Site 1	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.034	0.046	0.006	0.042	0.032
Stage 1 Site 2	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.030	0.045	0.044	0.042	0.040
Stage 1 Site 3	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.032	0.038	0.037	0.040	0.037
Stage 1 Site 4	Sample Date	3/12/08	6/7/08	8/22/08	10/1/08	
	Sample Result	0.040	0.004	0.012	0.044	0.025
SSS-1 Entry	Sample Date			8/5/08		
	Sample Result			0.018		0.018
SSS-2 Average	Sample Date			8/5/08		
	Sample Result			0.020		0.020
SSS-3 Average	Sample Date			8/5/08		
	Sample Result			0.019		0.019
SSS-4 Average	Sample Date			8/5/08		
	Sample Result			0.026		0.026
SSS-5 Average	Sample Date			8/5/08		
	Sample Result			0.033		0.033
SSS-6 High TTHM	Sample Date			8/5/08		
	Sample Result			0.048		0.048
SSS-7 High TTHM	Sample Date			8/5/08		
	Sample Result			0.057		0.055
SSS-8 High TTHM	Sample Date			8/5/08		
	Sample Result			0.046		0.046

Attach additional sheets as needed for SSS and Stage 1 DBPR results.

Form 5: IDSE Report for a Modeling SSS

V. SSS AND STAGE 1 DBPR MONITORING RESULTS* (Continued)

C. Where were your TTHM and HAA5 samples analyzed?

☒ In-House

Is your in-house laboratory certified? ☒ Yes ☐ No

☐ Certified Laboratory

Name of certified laboratory: _____

D. What method(s) was used to analyze your TTHM and HAA5 samples?

TTHM	HAA5	
☒ EPA 502.2	☒ EPA 552.1	☐ EPA 552.2
☐ EPA 524.2	☐ EPA 552.3	☐ SM 6251 B
☐ EPA 551.1		

VI. SELECTION OF STAGE 2 DBPR COMPLIANCE MONITORING LOCATIONS

Describe the comparison of sampling and modeling results (*attach additional sheets as needed*):

1.	How well did the sampling results correspond to the modeling results?	For most SSS monitoring sites, the results were in accordance with the modeling results. Discrepancies were found at 2 sites: SSS-4 and SSS-11. SSS-4 was an average residence time site with TTHM results that were more typical of a high TTHM site. SSS-11 was a high TTHM site with TTHM results that were more typical of an average site.
2.	For samples that did not match well with model results, what follow-up investigations were performed?	At sites SSS-4 and SSS-11, data for chlorine residual was reviewed from TCR sampling. The time of sample collection was compared to the water age graph. The model results for water age at SSS-11 are highly variable and therefore that site was eliminated from further consideration. The discrepancy at SSS-4 could have been related to variation over time, although the model results are less conclusive at that site. SSS-4 was also eliminated from further consideration.
3.	Were additional samples collected? (Include data on table in section IV)	No
4.	**Submit a graph of water age versus time for each selected sampling location*.**	Graphs are attached.

Form 5: IDSE Report for a Modeling SSS

VII. JUSTIFICATION OF STAGE 2 DBPR COMPLIANCE MONITORING SITES*

Compliance Monitoring Site ID	Site Type	Justification
Stage 2 Site 1	☒ Highest TTHM ☐ Highest HAA5 ☐ Stage 1 DBPR	SSS-12 High average water age, high TTHM results during monitoring, located in East Pressure Zone
Stage 2 Site 2	☐ Highest TTHM ☒ Highest HAA5 ☐ Stage 1 DBPR	SSS-14 High average water age, high HAA5 results during monitoring, measurable residual in historical TCR data, located in East Pressure Zone
Stage 2 Site 3	☐ Highest TTHM ☐ Highest HAA5 ☒ Stage 1 DBPR	Stage 1 Site 2 Average residence time Stage 1 DBPR site with high HAA5 LRAA, relatively high water age, located in East Pressure Zone
Stage 2 Site 4	☒ Highest TTHM ☐ Highest HAA5 ☐ Stage 1 DBPR	SSS-9 High average water age, high TTHM results during monitoring, located in East Pressure Zone
Stage 2 Site 5	☒ Highest TTHM ☐ Highest HAA5 ☐ Stage 1 DBPR	SSS-15 High average water age, high TTHM results during monitoring, located in East Pressure Zone
Stage 2 Site 6	☐ Highest TTHM ☒ Highest HAA5 ☐ Stage 1 DBPR	SSS-10 High average water age, high HAA5 results during monitoring, measurable residual in historical TCR data, located in Central Pressure Zone
Stage 2 Site 7	☐ Highest TTHM ☐ Highest HAA5 ☒ Stage 1 DBPR	Stage 1 Site 4 High average water age, high TTHM historical data, located in West Pressure Zone
Stage 2 Site 8	☐ Highest TTHM ☒ Highest HAA5 ☐ Stage 1 DBPR	SSS-13 High average water age, high HAA5 results during monitoring, measurable residual in historical TCR data, located in East Pressure Zone

Attach additional copies of this sheet if you need more room.

Form 5: IDSE Report for a Modeling SSS

VIII. PEAK HISTORICAL MONTH

A. Peak Historical Month* August

B. Is Your Peak Historical Month the Same as your Peak Month for TTHM Formation in your Model Study Plan?

☒ Yes ☐ No

If no, explain how you selected your new peak month for TTHM formation *(attach additional sheets if needed*):

IX. PROPOSED STAGE 2 COMPLIANCE MONITORING SCHEDULE*

Stage 2 Compliance Monitoring Site ID	Projected Sampling Date (date or week)[1]			
	period 1	period 2	period 3	period 4
Stage 2 Site 1	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 2	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 3	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 4	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 5	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 6	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 7	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1
Stage 2 Site 8	11/2012, wk 1	2/2013, wk 1	5/2013, wk 1	8/2013, wk 1

[1] period = monitoring period. Complete for the number of monitoring periods from Section II.C.

Attach additional copies of this sheet if you need more room.

Form 5: IDSE Report for a Modeling SSS

X. DISTRIBUTION SYSTEM SCHEMATIC*

*(Skip this section if you submitted a modeling study plan and your distribution system schematic **was complete** and has not changed from your approved modeling study plan, or if you are submitting the plan and report at the same time*)

ATTACH a schematic of your distribution system. If your schematic has changed or if you did not show your SSS monitoring locations on the distribution system schematic you submitted with your model study plan (Form 4), you must submit a revised distribution system schematic.

XI. ATTACHMENTS

- ☐ Tabular or spreadsheet documentation that your model meets minimum calibration requirements if updated since approved modeling study plan* (Section III).
- ☐ Additional sheets for explaining model information/results, including required graphs if not submitted as part of an approved modeling study plan* (Section III).
- ☒ Additional sheets for sampling results, if needed (Section V).
- ☒ Additional sheets for selection of Stage 2 DBPR compliance monitoring sites (Section VI).
- ☒ Graph of water age versus time for all Stage 2 DBPR sites selected* (Section VI).
- ☐ Additional sheets for justification of Stage 2 DBPR Monitoring Sites, if needed (Section VII). **REQUIRED if you are a subpart H system serving more than 249,999 people**.
- ☐ Additional sheets for explaining how you selected the peak historical month (Section VIII).
- ☐ Additional sheets for proposed compliance monitoring schedule (Section IX). **REQUIRED if you are a subpart H system serving more than 249,999 people**.
- ☐ Explanation of deviations from approved study plan.
- ☒ Distribution system schematic* (Section X). **REQUIRED if it has changed from your approved model study plan or if monitoring locations were not shown**.
- ☐ Compliance calculation procedures (for Stage 2 Compliance Monitoring Plan).

Total Number of Pages in Your Report: 25

Note: All items marked with an asterisk (*) are required by the rule.

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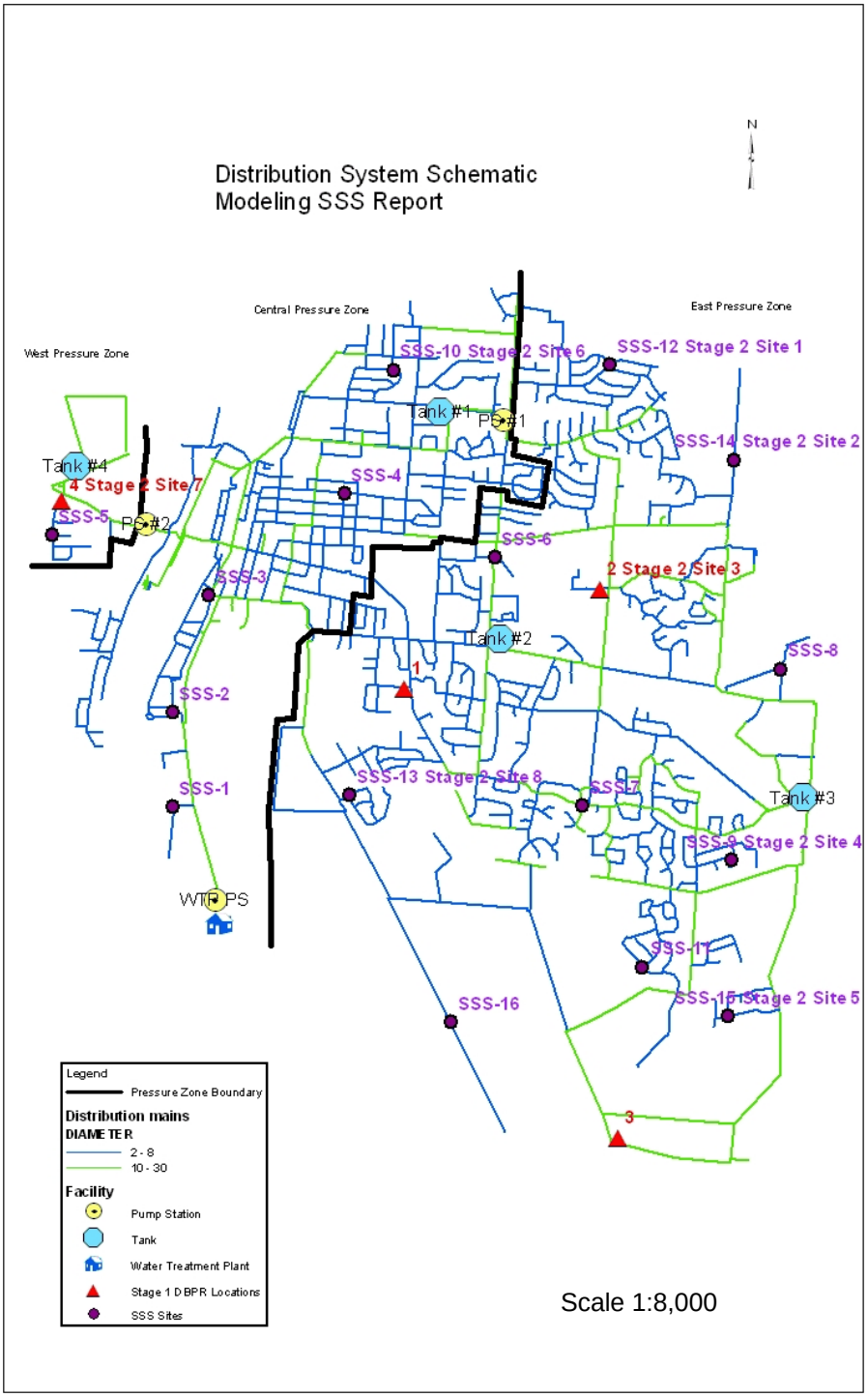
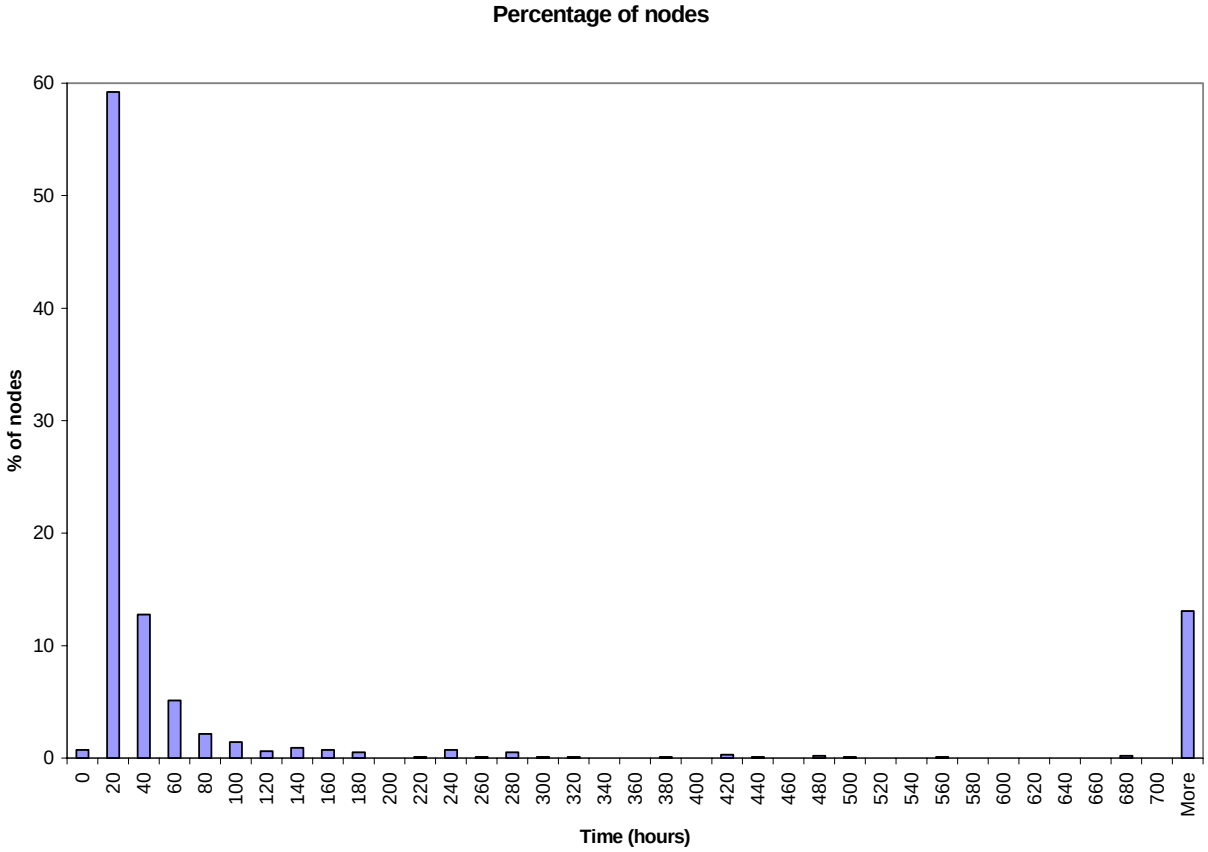

Distribution System Schematic
Modeling SSS Report
N
Central Pressure Zone
East Pressure Zone
West Pressure Zone
SSS-10 Stage 2 Site 6
SSS-12 Stage 2 Site 1
Tank #1
PS #1
SSS-14 Stage 2 Site 2
Tank #4
4 Stage 2 Site 7
SSS-4
SSS-5
PS #2
SSS-6
SSS-3
2 Stage 2 Site 3
Tank #2
SSS-8
1
SSS-2
SSS-13 Stage 2 Site 8
SSS-7
SSS-1
Tank #3
SSS-9 Stage 2 Site 4
WTP
PS
SSS-11
SSS-16
SSS-15 Stage 2 Site 5
3
Legend
Pressure Zone Boundary
Distribution mains
DIAMETER
2 - 8
10 - 30
Facility
Pump Station
Tank
Water Treatment Plant
Stage 1 DBPR Locations
SSS Sites
Scale 1:8,000

SSS MONITORING LOCATION SELECTION

Histogram of Water Age Results
Average Age = midpoint of most frequently occurring range
= midpoint of 20 - 40 hour range = 30 hours



SSS MONITORING LOCATION SELECTION (CONTINUED)

Average Water Age Results for SSS monitoring locations (Hour 936 to Hour 960 of Simulation)

Node	Average Water Age (hrs)	Preliminary Category	ID
1411	1.69	Entry	SSS-1
1362	30.27	Average	SSS-2
1336	30.62	Average	SSS-3
1639	30.77	Average	SSS-4
1640	30.78	Average	SSS-5
276	280.49	High TTHM	SSS-6
1533	324.34	High TTHM	SSS-7
144	497.02	High TTHM	SSS-8
18	581.18	High TTHM	SSS-9
174	587.53	High TTHM	SSS-10
486	588.10	High TTHM	SSS-11
122	288.94	High HAA5	SSS-12
120	331.35	High HAA5	SSS-13
106	333.21	High HAA5	SSS-14
162	491.68	High HAA5	SSS-15
86	579.20	High HAA5	SSS-16

SSS MONITORING LOCATION SELECTION (CONTINUED)

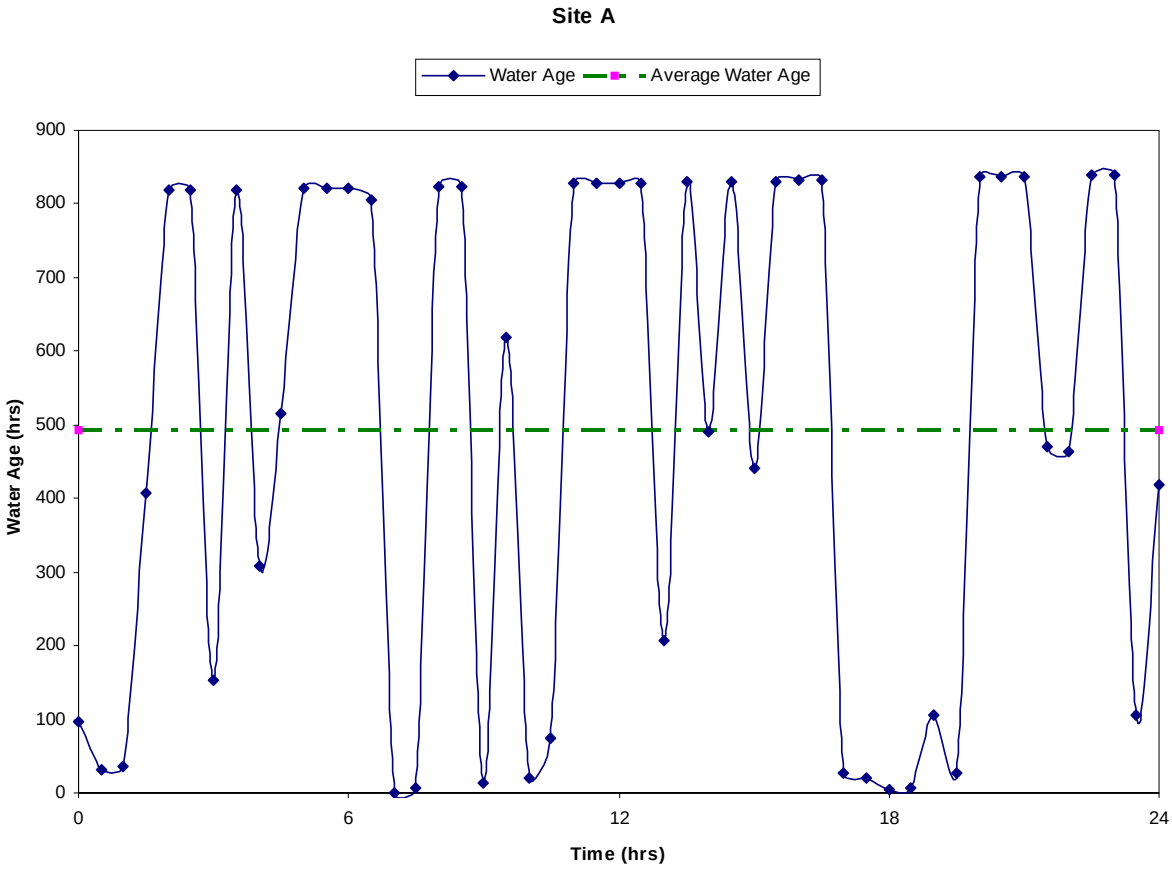
Selection of Stage 2 DBPR Compliance Monitoring Sites

SSS Sites	TTHM LRAA Results	TTHM Rank*	HAA5 LRAA Results	HAA5 Rank*	Preliminary Category	Water Age	Zone	Stage 2 DBPR Selected Sites	Stage 2 DBPR Site Type
SSS-1	0.028	20	0.018	20	Entry	1.69	Central		
SSS-2	0.048	17	0.020	18	Average	30.27	Central		
SSS-3	0.058	10	0.019	19	Average	30.62	Central		
SSS-4	0.067	4	0.026	16	Average	30.77	Central	Rejected	
SSS-5	0.033	19	0.033	12	Average	30.78	West		
SSS-6	0.056	11	0.048	7	High TTHM	280.49	East		
SSS-7	0.059	9	0.055	3	High TTHM	324.34	East		
SSS-8	0.055	12	0.046	8	High TTHM	497.02	East		
SSS-9	0.068	3	0.029	15	High TTHM	581.18	East	Site 4	TTHM
SSS-10	0.064	6	0.057	4	High TTHM	587.53	Central	Site 6	HAA5
SSS-11	0.043	18	0.030	14	High TTHM	588.10	East	Rejected	
SSS-12	0.073	1	0.050	6	High HAA5	288.94	East	Site 1	TTHM
SSS-13	0.061	7	0.052	5	High HAA5	331.35	East	Site 8	HAA5
SSS-14	0.069	2	0.060	1	High HAA5	333.21	East	Site 2	HAA5
SSS-15	0.064	5	0.058	2	High HAA5	491.68	East	Site 5	TTHM
SSS-16	0.048	16	0.046	9	High HAA5	579.20	East		
Stage 1, Site 1	0.050	15	0.032	13	Stage 1	203.22	East		
Stage 1, Site 2	0.051	14	0.040	10	Stage 1	31.05	East	Site 3	Stage 1
Stage 1, Site 3	0.060	8	0.037	11	Stage 1	423.44	East		
Stage 1, Site 4	0.055	13	0.025	17	Stage 1	496.81	West	Site 7	Stage 1 - Not highest but representative high site and located in West zone

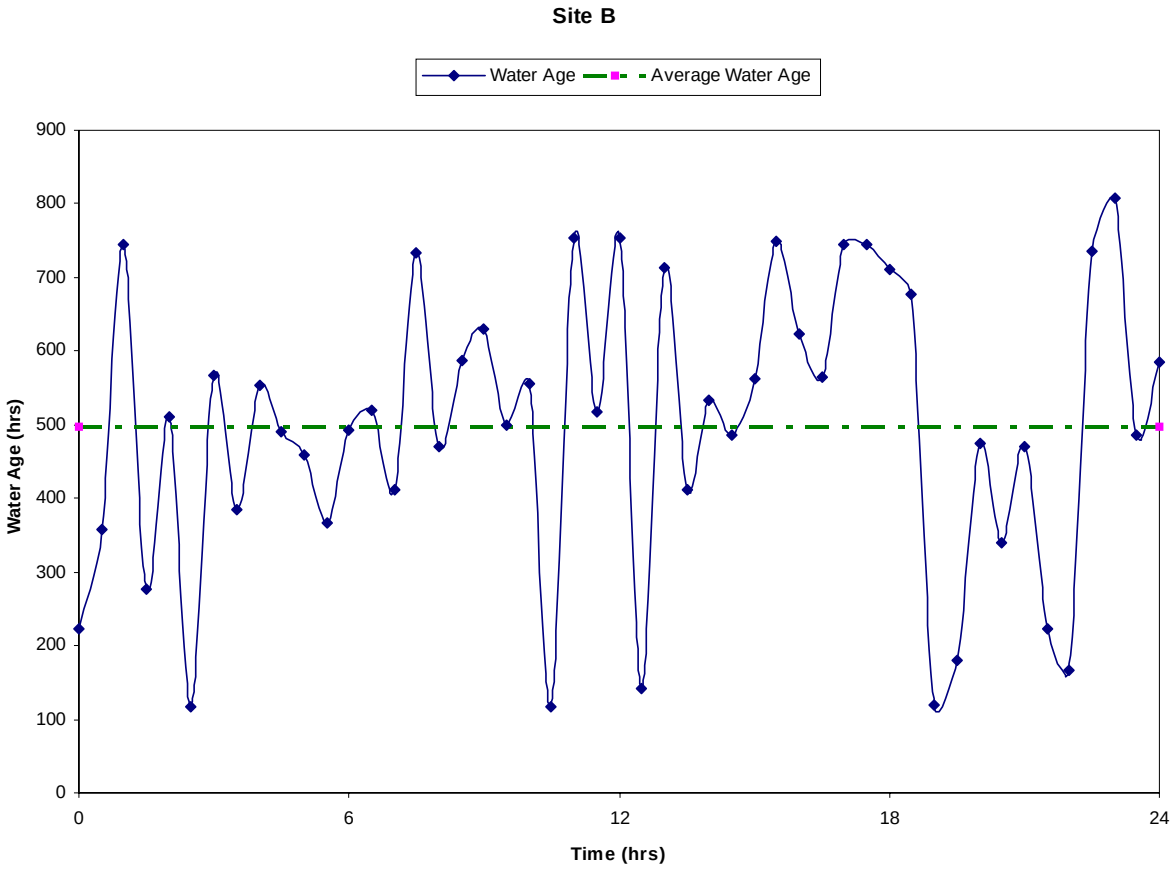
*Ranked from highest(1) to lowest (20)

SSS MONITORING LOCATION SELECTION (CONTINUED)

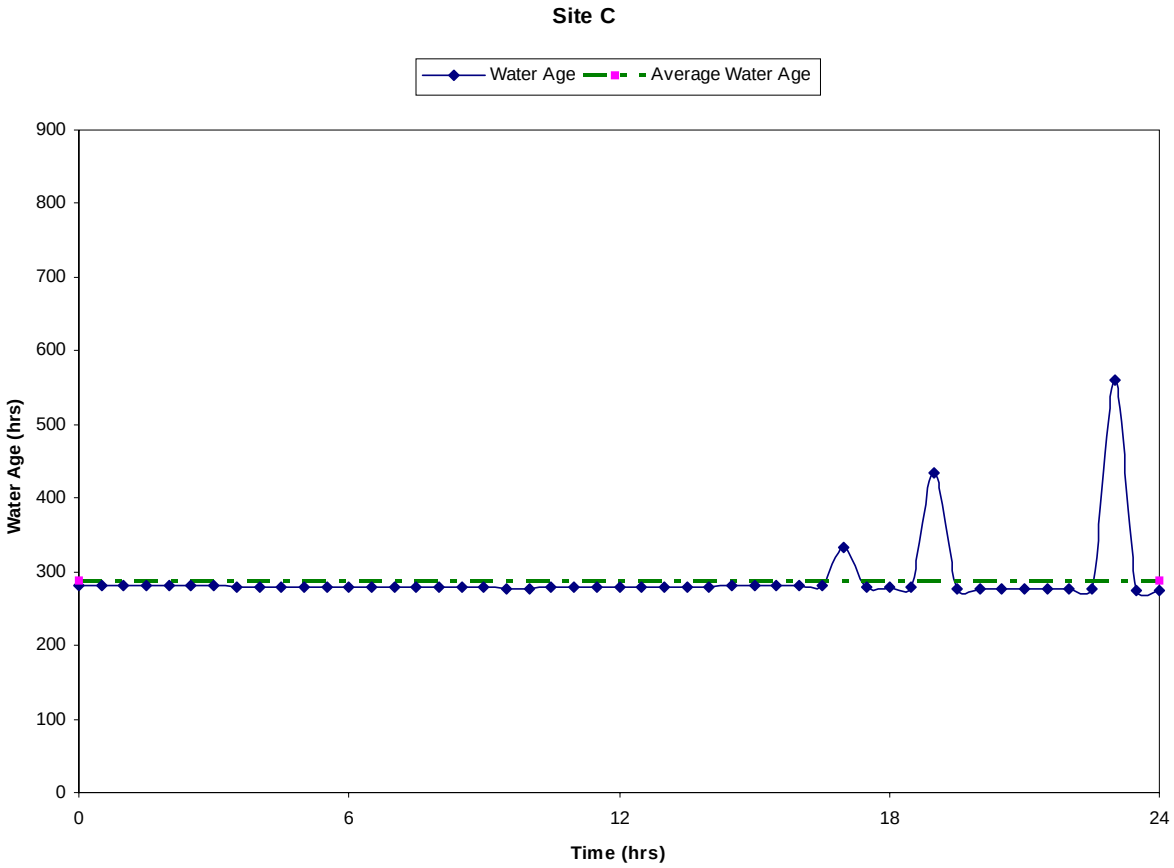
WATER AGE RESULTS GRAPHS



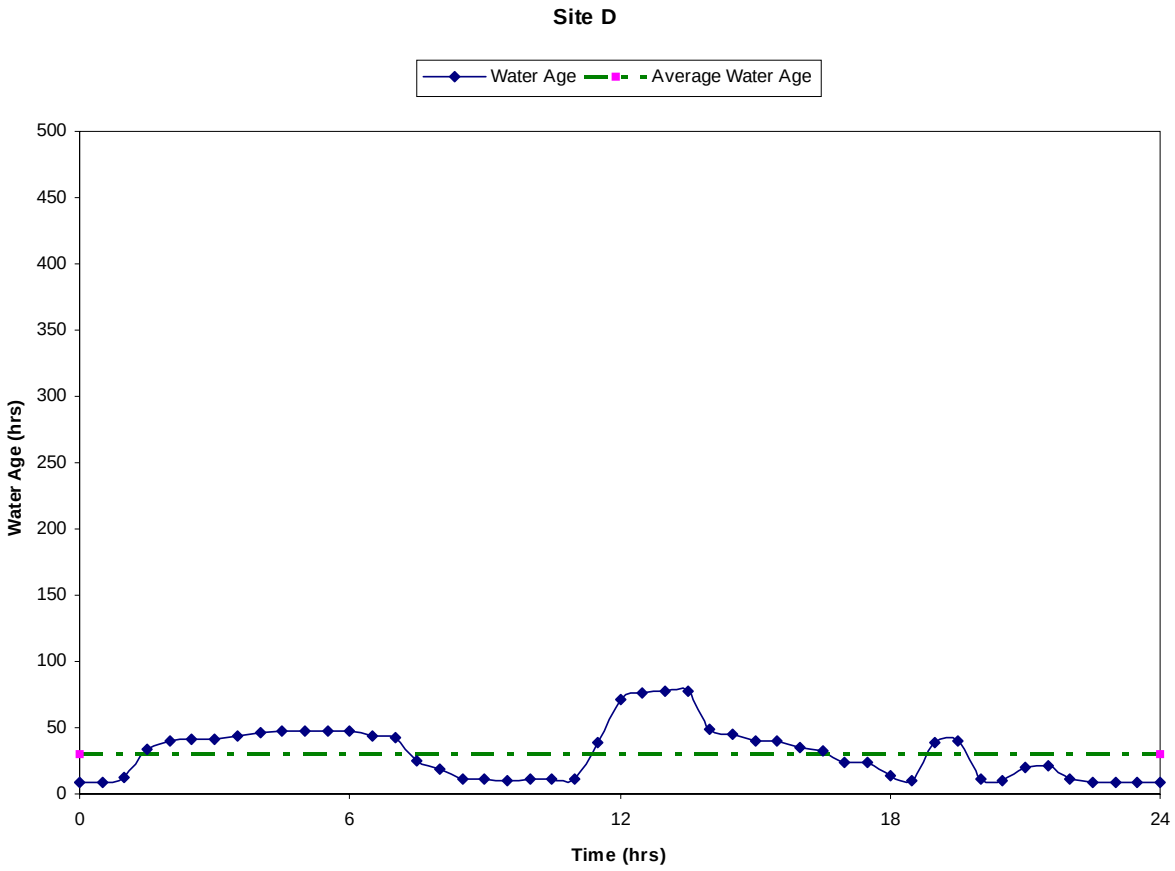
STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS



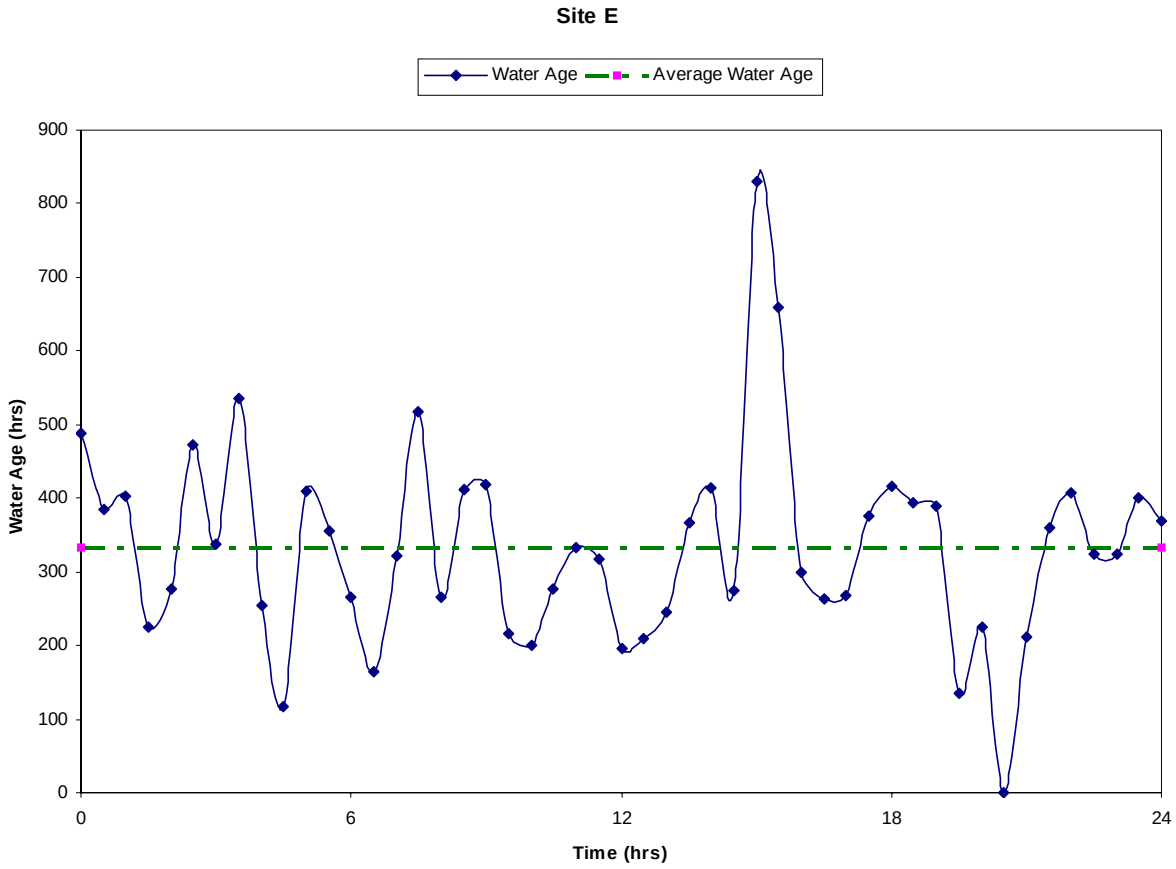
STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS (CONTINUED)



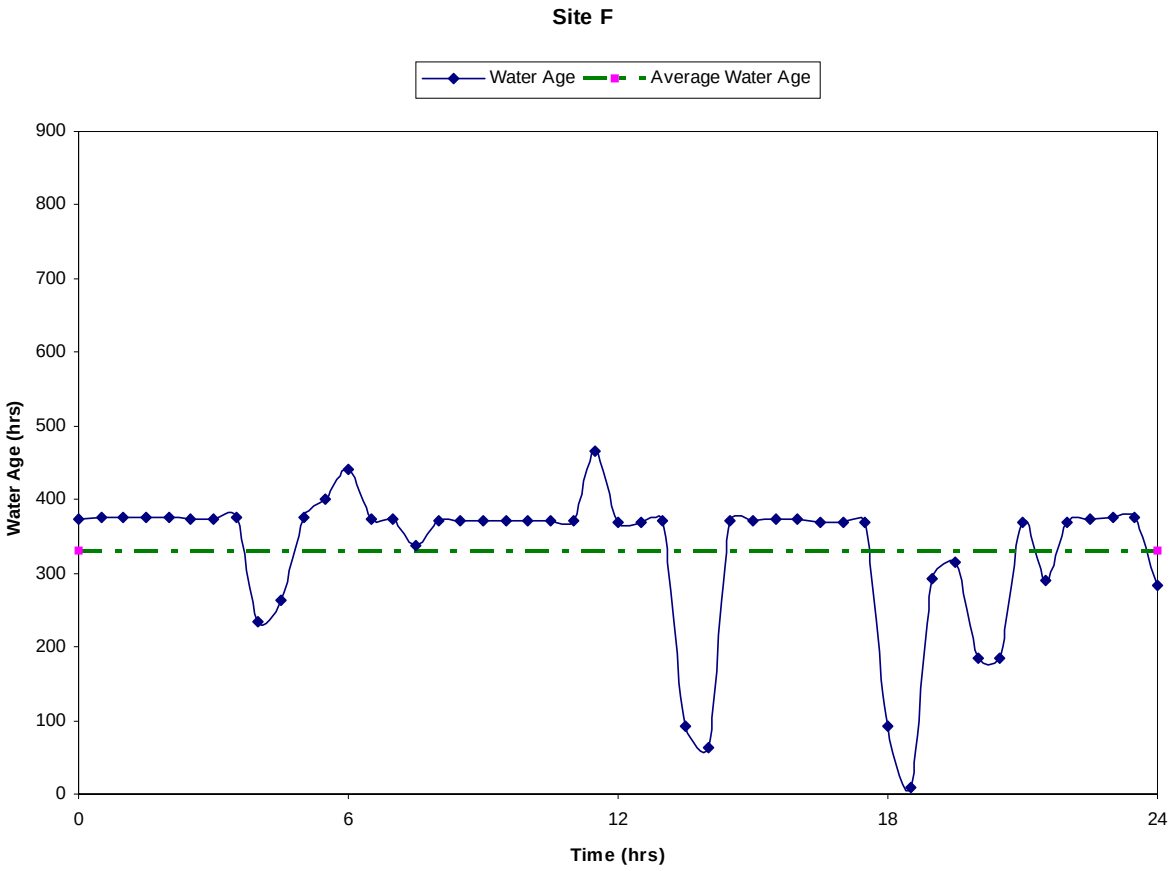
STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS (CONTINUED)



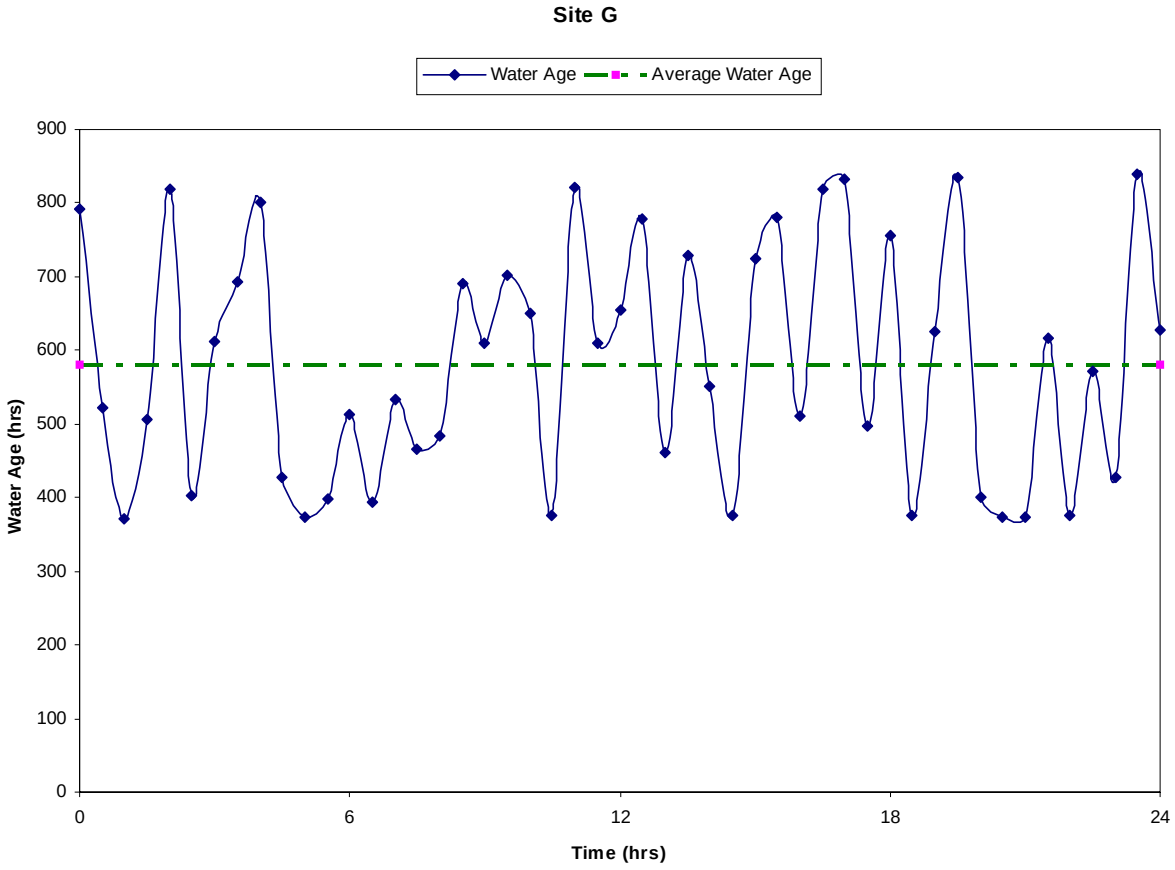
STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS (CONTINUED)



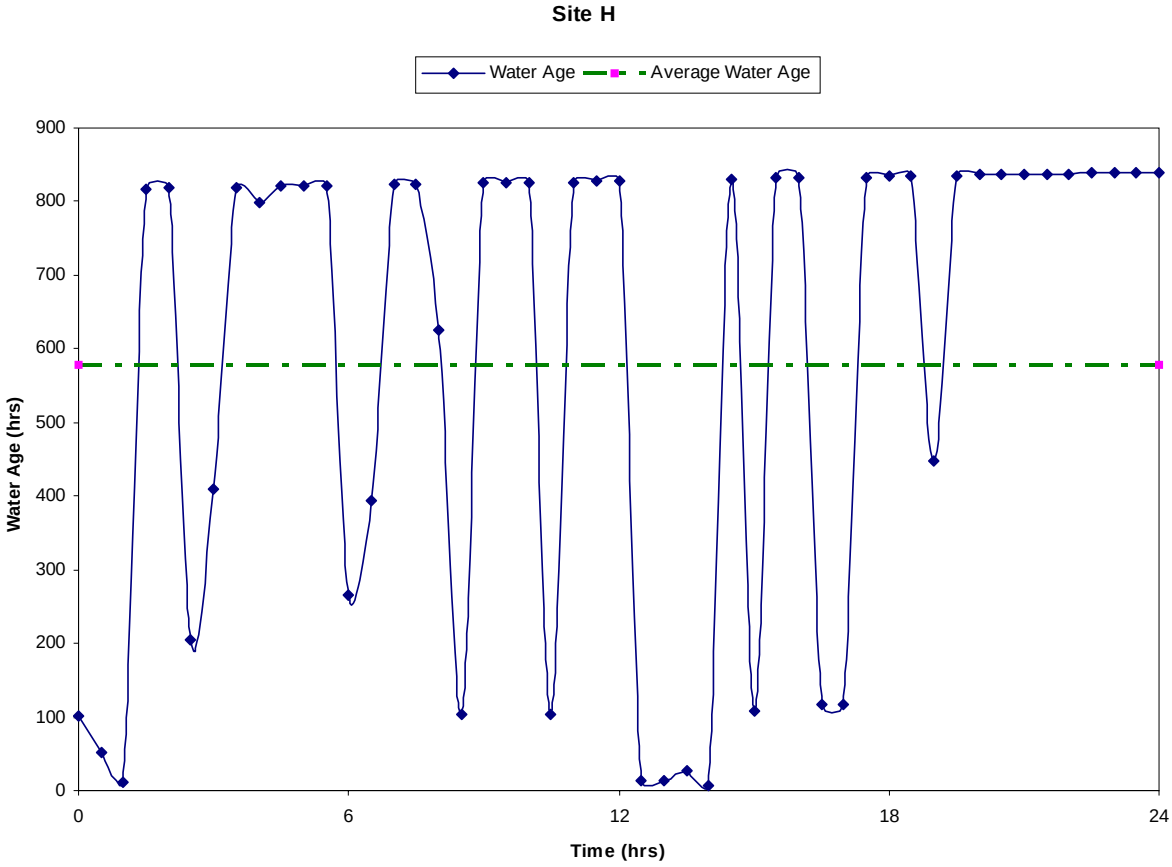
STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS (CONTINUED)



STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS (CONTINUED)



STAGE 2 DBPR MONITORING LOCATIONS
WATER AGE RESULTS (CONTINUED)



Form 5: IDSE Report for a Modeling SSS

V. SSS AND STAGE 1 DBPR COMPLIANCE MONITORING RESULTS

A. TTHM Results*

Site ID	Data Type	TTHM (mg/L)				LRAA
SSS-9 High TTHM	Sample Date			8/6/08		
	Sample Result			0.068		0.068
SSS-10 High TTHM	Sample Date			8/6/08		
	Sample Result			0.064		0.064
SSS-11 High TTHM	Sample Date			8/6/08		
	Sample Result			0.043		0.043
SSS-12 High HAA5	Sample Date			8/6/08		
	Sample Result			0.073		0.073
SSS-13 High HAA5	Sample Date			8/6/08		
	Sample Result			0.061		0.061
SSS-14 High HAA5	Sample Date			8/6/08		
	Sample Result			0.069		0.069
SSS-15 High HAA5	Sample Date			8/6/08		
	Sample Result			0.064		0.064
SSS-16 High HAA5	Sample Date			8/6/08		
	Sample Result			0.048		0.048
	Sample Result					
	Sample Date					
	Sample Result					
	Sample Date					
	Sample Result					
	Sample Date					
	Sample Result					
	Sample Date					

Attach additional sheets as needed for SSS and Stage 1 DBPR results.

Form 5: IDSE Report for a Modeling SSS

V. SSS AND STAGE 1 DBPR COMPLIANCE MONITORING RESULTS

A. HAA5 Results*

Site ID	Data Type	HAA5 (mg/L)				LRAA
SSS-9 High TTHM	Sample Date			8/6/08		
	Sample Result			0.029		0.029
SSS-10 High TTHM	Sample Date			8/6/08		
	Sample Result			0.057		0.057
SSS-11 High TTHM	Sample Date			8/6/08		
	Sample Result			0.030		0.030
SSS-12 High HAA5	Sample Date			8/6/08		
	Sample Result			0.050		0.050
SSS-13 High HAA5	Sample Date			8/6/08		
	Sample Result			0.052		0.052
SSS-14 High HAA5	Sample Date			8/6/08		
	Sample Result			0.060		0.060
SSS-15 High HAA5	Sample Date			8/6/08		
	Sample Result			0.058		0.058
SSS-16 High HAA5	Sample Date			8/6/08		
	Sample Result			0.046		0.046
	Sample Date					
	Sample Result					
	Sample Date					
	Sample Result					
	Sample Date					
	Sample Result					
	Sample Date					
	Sample Result					

Attach additional sheets as needed for SSS and Stage 1 DBPR results.