

Table I.1. Benzene column DO profile on day 226.

Day 226	
port	DO (mg/l)
1	9.3
2	1.8
3	1.3
4	0.7
5	0.4
6	0.5

Table I.2. HRT calculations per port during set B of perturbation experiments.

All Columns	Length (in.)	Diam (in.)	Volume (in <sup>3</sup> )	Vol (mL)
glass tubing	18	0.125	0.22089323	3.6198
viton tubing (bottle to pump)	50	0.1875	1.38058271	22.62375
L/S 14 pump tubing	13	0.060	0.03675663	0.602335
viton tubing (pump to T before column)	90	0.1875	2.48504888	40.72274
t-connector - part a	1.5	0.15625	0.02876214	0.471328
t-connector - part b	0.5	0.3125	0.03834952	0.628437
teflon tubing	4.5	0.3125	0.34514568	5.655937
Influent endcap				<b>50</b>
Total Influent Vol (mL)				<b>124.3243</b>

Q (mL/min)
2.8

Sand porosity	0.44
Column Inner radius (m)	0.01905
Column Surface area (m <sup>2</sup> )	0.00114
Length of sand zone (m)	0.3
Column liquid vol w/sand (m <sup>3</sup> )	0.00015
Column liquid vol w/sand (m <sup>3</sup> )	<b>150.4921</b>

Sand Zone Lengths	Length (cm)	Vol between locations (mL)	Liquor vol Removed Before Port (mL)	Port Location	HRTmean					
					Benzene -1	Benzene-2	PCP-1	PCP-2	Cd-1	Cd-2
L6 to eff (cm)	3.25	<b>16.30331</b>	12	<b>6</b>	2.03	2.52	1.91	2.04	2.07	2.04
L5 to L6 (cm)	6	<b>30.09842</b>	24	<b>5</b>	1.85	2.34	1.73	1.86	1.89	1.86
L4 to L5 (cm)	6	<b>30.09842</b>	24	<b>4</b>	1.67	2.16	1.55	1.68	1.71	1.68
L3 to L4 (cm)	6	<b>30.09842</b>	24	<b>3</b>	1.49	1.98	1.38	1.50	1.53	1.50
L2 to L3 (cm)	5.5	<b>27.59022</b>	12	<b>2</b>	1.32	1.82	1.21	1.34	1.36	1.34
SS mesh to L2 (cm)	3.25	<b>16.30331</b>	12	<b>1</b>	1.23	1.72	1.11	1.24	1.27	1.24
Subtract time from HRTmean (hr)					0.3946626	0.5738199	0.7529772	0.9321344	1.096362	1.1934055

Check Pore water vol

150.4921

Calculations for HRT<sub>calc</sub>:

**1. Determine the liquid volume of influent tubing components located before port L1 .**

where

$$V = \pi r^2 h$$

V = volume (cm<sup>3</sup>)

r = radius

h = height or length (cm)

**2. Determine the liquid volume within the sand column which accounted for porosity.**

$$V = \pi r^2 h * 0.44$$

where

porosity = 0.44

**3. Determine the liquid volume between ports.**

$$V = \pi r^2 h * 0.44$$

**4. Use HRT<sub>mean</sub> data to back calculate the expected HRT to each port.**

$$HRT_{\text{mean Lx}} = HRT_{\text{mean}} - HRT_{\text{portLx}}$$

**5. HRTport:**

$$HRT_{\text{portLx}} = \frac{V}{Q * 60}$$

where

HRTport = time between ports (hr)

Q = flow rate (mL/min)

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I.3. Benzene OUR data.

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)
0.000	7.987	1.000
0.100	7.968	0.998
0.201	7.968	0.998
0.300	7.960	0.997
0.401	7.917	0.991
0.501	7.867	0.985
0.600	7.841	0.982
0.701	7.813	0.978
0.801	7.782	0.974
0.901	7.755	0.971
1.002	7.716	0.966
1.101	7.682	0.962
1.202	7.647	0.957
1.302	7.611	0.953
1.401	7.566	0.947
1.502	7.522	0.942
1.602	7.498	0.939
1.703	7.456	0.934
1.803	7.432	0.931
1.903	7.392	0.926
2.003	7.373	0.923
2.103	7.326	0.917
2.204	7.282	0.912
2.303	7.250	0.908
2.404	7.218	0.904
2.504	7.184	0.899
2.603	7.126	0.892
2.704	7.091	0.888
2.804	7.047	0.882
2.905	7.016	0.878

50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>
7.892	1.000
7.866	0.997
7.841	0.994
7.814	0.990
7.795	0.988
7.750	0.982
7.718	0.978
7.677	0.973
7.645	0.969
7.597	0.963
7.562	0.958
7.533	0.955
7.484	0.948
7.462	0.946
7.415	0.940
7.378	0.935
7.359	0.932
7.324	0.928
7.288	0.923
7.263	0.920
7.217	0.914
7.200	0.912
7.165	0.908
7.121	0.902
7.092	0.899
7.062	0.895
7.014	0.889
6.983	0.885
6.970	0.883
6.939	0.879

250 ppm Benzene DO	250 ppm Benzene DO/DO <sub>0</sub>
7.471	1.000
7.378	0.988
7.267	0.973
7.174	0.960
7.109	0.952
6.997	0.937
6.946	0.930
6.887	0.922
6.811	0.912
6.779	0.907
6.639	0.889
6.644	0.889
6.608	0.884
6.510	0.871
6.441	0.862
6.409	0.858
6.370	0.853
6.304	0.844
6.226	0.833
6.204	0.830
6.144	0.822
6.081	0.814
6.039	0.808
5.969	0.799
5.937	0.795
5.876	0.787
5.799	0.776
5.765	0.772
5.719	0.765
5.658	0.757

100 ppm Benzene DO	100 ppm Benzene DO/DO <sub>0</sub>
7.721	1.000
7.689	0.996
7.621	0.987
7.581	0.982
7.567	0.980
7.540	0.977
7.540	0.977
7.503	0.972
7.472	0.968
7.425	0.962
7.379	0.956
7.344	0.951
7.307	0.946
7.266	0.941
7.236	0.937
7.204	0.933
7.173	0.929
7.123	0.923
7.075	0.916
7.046	0.913
7.006	0.907
6.983	0.904
6.946	0.900
6.909	0.895
6.867	0.889
6.823	0.884
6.794	0.880
6.758	0.875
6.706	0.869
6.665	0.863

400 mg/L Benzene DO	400 mg/L Benzene DO/DO <sub>0</sub>
8.002	1.000
7.924	0.990
7.853	0.981
7.802	0.975
7.716	0.964
7.615	0.952
7.545	0.943
7.446	0.931
7.336	0.917
7.268	0.908
7.152	0.894
7.099	0.887
7.010	0.876
6.946	0.868
6.884	0.860
6.816	0.852
6.757	0.844
6.688	0.836
6.630	0.829
6.591	0.824
6.527	0.816
6.458	0.807
6.409	0.801
6.323	0.790
6.289	0.786
6.203	0.775
6.140	0.767
6.088	0.761
6.040	0.755
5.978	0.747

Final Control DO	Final Control DO/DO <sub>0</sub>
8.997	1.000
8.923	0.992
8.855	0.984
8.806	0.979
8.742	0.972
8.698	0.967
8.642	0.961
8.585	0.954
8.527	0.948
8.466	0.941
8.436	0.938
8.356	0.929
8.307	0.923
8.257	0.918
8.221	0.914
8.184	0.910
8.127	0.903
8.071	0.897
8.027	0.892
7.968	0.886
7.903	0.878
7.859	0.874
7.814	0.869
7.775	0.864
7.719	0.858
7.679	0.854
7.623	0.847
7.596	0.844
7.53	0.837
7.496	0.833

## I.3. Benzene OUR data. (cont')

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)
3.004	6.982	0.874
3.104	6.926	0.867
3.205	6.896	0.863
3.305	6.872	0.860
3.405	6.821	0.854
3.505	6.789	0.850
3.605	6.750	0.845
3.706	6.720	0.841
3.806	6.666	0.835
3.906	6.657	0.833
4.006	6.613	0.828
4.107	6.541	0.819
4.207	6.502	0.814
4.306	6.483	0.812
4.407	6.422	0.804
4.507	6.387	0.800
4.607	6.375	0.798
4.707	6.309	0.790
4.807	6.280	0.786
4.908	6.218	0.779
5.008	6.160	0.771
5.108	6.127	0.767
5.208	6.076	0.761
5.309	6.062	0.759
5.408	6.005	0.752
5.508	5.985	0.749
5.609	5.956	0.746
5.709	5.863	0.734
5.809	5.839	0.731
5.909	5.811	0.728
6.009	5.775	0.723
6.110	5.760	0.721
6.209	5.689	0.712

50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>
6.905	0.875
6.867	0.870
6.828	0.865
6.794	0.861
6.762	0.857
6.725	0.852
6.692	0.848
6.674	0.846
6.627	0.840
6.594	0.836
6.562	0.831
6.529	0.827
6.498	0.823
6.459	0.818
6.439	0.816
6.414	0.813
6.366	0.807
6.326	0.802
6.297	0.798
6.258	0.793
6.223	0.789
6.185	0.784
6.163	0.781
6.116	0.775
6.074	0.770
6.048	0.766
6.016	0.762
5.986	0.758
5.959	0.755
5.918	0.750
5.886	0.746
5.851	0.741
5.825	0.738

250 ppm Benzene DO	250 ppm Benzene DO/DO <sub>0</sub>	100 ppm Benzene DO	100 ppm Benzene DO/DO <sub>0</sub>
5.611	0.751	6.611	0.856
5.530	0.740	6.552	0.849
5.488	0.735	6.517	0.844
5.434	0.727	6.481	0.839
5.378	0.720	6.447	0.835
5.329	0.713	6.398	0.829
5.287	0.708	6.373	0.825
5.256	0.704	6.334	0.820
5.190	0.695	6.290	0.815
5.131	0.687	6.212	0.805
5.090	0.681	6.175	0.800
5.040	0.675	6.128	0.794
5.016	0.671	6.077	0.787
4.943	0.662	6.033	0.781
4.889	0.654	5.979	0.774
4.852	0.649	5.937	0.769
4.793	0.642	5.876	0.761
4.773	0.639	5.808	0.752
4.717	0.631	5.732	0.742
4.658	0.623	5.660	0.733
4.619	0.618	5.602	0.726
4.561	0.610	5.546	0.718
4.522	0.605	5.499	0.712
4.482	0.600	5.452	0.706
4.446	0.595	5.406	0.700
4.401	0.589	5.367	0.695
4.338	0.581	5.306	0.687
4.282	0.573	5.274	0.683
4.242	0.568	5.225	0.677
4.196	0.562	5.169	0.669
4.159	0.557	5.120	0.663
4.115	0.551	5.056	0.655
4.061	0.544	5.026	0.651

400 mg/L Benzene DO	400 mg/L Benzene DO/DO <sub>0</sub>
5.912	0.739
5.854	0.732
5.807	0.726
5.760	0.720
5.701	0.712
5.643	0.705
5.574	0.697
5.503	0.688
5.471	0.684
5.420	0.677
5.346	0.668
5.285	0.660
5.246	0.656
5.194	0.649
5.128	0.641
5.087	0.636
5.023	0.628
4.982	0.623
4.932	0.616
4.883	0.610
4.842	0.605
4.773	0.596
4.734	0.592
4.686	0.586
4.604	0.575
4.563	0.570
4.500	0.562
4.460	0.557
4.409	0.551
4.340	0.542
4.303	0.538
4.235	0.529
4.169	0.521

Final Control DO	Final Control DO/DO <sub>0</sub>
7.467	0.830
7.406	0.823
7.341	0.816
7.308	0.812
7.275	0.809
7.214	0.802
7.148	0.794
7.111	0.790
7.087	0.788
7.048	0.783
6.997	0.778
6.963	0.774
6.911	0.768
6.863	0.763
6.816	0.758
6.752	0.750
6.72	0.747
6.677	0.742
6.635	0.737
6.589	0.732
6.534	0.726
6.481	0.720
6.425	0.714
6.41	0.712
6.361	0.707
6.275	0.697
6.241	0.694
6.192	0.688
6.145	0.683
6.106	0.679
6.06	0.674
6.018	0.669
5.959	0.662

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## 1.3. Benzene OUR data. (cont')

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)	50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>	250 ppm Benzene DO	250 ppm Benzene DO/DO <sub>0</sub>	100 ppm Benzene DO	100 ppm Benzene DO/DO <sub>0</sub>	400 mg/L Benzene DO	400 mg/L Benzene DO/DO <sub>0</sub>	Final Control DO	Final Control DO/DO <sub>0</sub>
6.310	5.672	0.710	5.785	0.733	4.032	0.540	4.990	0.646	4.125	0.515	5.915	0.657
6.410	5.638	0.706	5.749	0.728	3.976	0.532	4.936	0.639	4.073	0.509	5.871	0.653
6.510	5.581	0.699	5.712	0.724	3.939	0.527	4.886	0.633	4.031	0.504	5.807	0.645
6.610	5.559	0.696	5.670	0.718	3.884	0.520	4.835	0.626	3.966	0.496	5.77	0.641
6.710	5.499	0.688	5.634	0.714	3.835	0.513	4.781	0.619	3.909	0.489	5.736	0.638
6.811	5.483	0.686	5.607	0.710	3.814	0.511	4.730	0.613	3.858	0.482	5.7	0.634
6.911	5.462	0.684	5.565	0.705	3.757	0.503	4.684	0.607	3.802	0.475	5.641	0.627
7.011	5.412	0.678	5.536	0.701	3.709	0.496	4.642	0.601	3.757	0.470	5.575	0.620
7.111	5.396	0.676	5.509	0.698	3.655	0.489	4.590	0.594	3.709	0.464	5.533	0.615
7.211	5.364	0.672	5.470	0.693	3.620	0.485	4.537	0.588	3.649	0.456	5.502	0.612
7.312	5.305	0.664	5.430	0.688	3.591	0.481	4.497	0.582	3.598	0.450	5.435	0.604
7.411	5.287	0.662	5.391	0.683	3.535	0.473	4.443	0.575	3.542	0.443	5.401	0.600
7.512	5.210	0.652	5.371	0.681	3.495	0.468	4.390	0.569	3.495	0.437	5.362	0.596
7.612	5.166	0.647	5.325	0.675	3.469	0.464	4.351	0.564	3.442	0.430	5.305	0.590
7.713	5.129	0.642	5.279	0.669	3.420	0.458	4.304	0.557	3.368	0.421	5.257	0.584
7.812	5.087	0.637	5.251	0.665	3.400	0.455	4.269	0.553	3.327	0.416	5.203	0.578
7.912	5.046	0.632	5.215	0.661	3.349	0.448	4.228	0.548	3.283	0.410	5.163	0.574
8.013	5.006	0.627	5.173	0.655	3.304	0.442	4.169	0.540	3.228	0.403	5.109	0.568
8.113	4.959	0.621	5.153	0.653	3.273	0.438	4.128	0.535	3.169	0.396	5.051	0.561
8.213	4.910	0.615	5.112	0.648	3.216	0.430	4.074	0.528	3.111	0.389	5.021	0.558
8.313	4.855	0.608	5.083	0.644	3.169	0.424	4.045	0.524	3.069	0.384	4.958	0.551
8.413	4.825	0.604	5.043	0.639	3.135	0.420	3.995	0.517	3.015	0.377	4.897	0.544
8.514	4.771	0.597	5.002	0.634	3.081	0.412	3.937	0.510	2.957	0.370	4.852	0.539
8.613	4.725	0.592	4.970	0.630	3.035	0.406	3.907	0.506	2.918	0.365	4.793	0.533
8.714	4.707	0.589	4.926	0.624	2.989	0.400	3.854	0.499	2.841	0.355	4.774	0.531
8.814	4.673	0.585	4.907	0.622	2.934	0.393	3.816	0.494	2.800	0.350	4.735	0.526
8.913	4.636	0.580	4.867	0.617	2.910	0.390	3.765	0.488	2.736	0.342	4.667	0.519
9.014	4.560	0.571	4.825	0.611	2.863	0.383	3.723	0.482	2.702	0.338	4.639	0.516
9.114	4.536	0.568	4.801	0.608	2.836	0.380	3.684	0.477	2.653	0.332	4.559	0.507
9.215	4.495	0.563	4.757	0.603	2.792	0.374	3.618	0.469	2.595	0.324	4.514	0.502
9.314	4.460	0.558	4.728	0.599	2.734	0.366	3.547	0.459	2.525	0.316	4.466	0.496

## 1.3. Benzene OUR data. (cont')

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)	50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>	250 ppm Benzene DO	250 ppm Benzene DO/DO <sub>0</sub>	100 ppm Benzene DO	100 ppm Benzene DO/DO <sub>0</sub>	400 mg/L Benzene DO	400 mg/L Benzene DO/DO <sub>0</sub>	Final Control DO	Final Control DO/DO <sub>0</sub>
9.414	4.396	0.550	4.681	0.593	2.699	0.361	3.510	0.455	2.489	0.311	4.443	0.494
9.515	4.367	0.547	4.639	0.588	2.658	0.356	3.457	0.448	2.428	0.303	4.395	0.488
9.615	4.337	0.543	4.612	0.584	2.617	0.350	3.410	0.442	2.374	0.297	4.316	0.480
9.715	4.306	0.539	4.569	0.579	2.577	0.345	3.368	0.436	2.322	0.290	4.279	0.476
9.815	4.238	0.531	4.529	0.574	2.533	0.339	3.315	0.429	2.273	0.284	4.235	0.471
9.915	4.178	0.523	4.502	0.570	2.496	0.334	3.273	0.424	2.227	0.278	4.191	0.466
10.016	4.122	0.516	4.465	0.566	2.447	0.328	3.232	0.419	2.171	0.271	4.135	0.460
10.116	4.091	0.512	4.433	0.562	2.403	0.322	3.188	0.413	2.129	0.266	4.081	0.454
10.216	4.080	0.511	4.399	0.557	2.361	0.316	3.131	0.406	2.065	0.258	4.042	0.449
10.316	4.039	0.506	4.351	0.551	2.323	0.311	3.079	0.399	2.006	0.251	3.976	0.442
10.416	3.995	0.500	4.328	0.548	2.286	0.306	3.038	0.393	1.970	0.246	3.939	0.438
10.517	3.960	0.496	4.279	0.542	2.239	0.300	2.982	0.386	1.926	0.241	3.895	0.433
10.616	3.912	0.490	4.248	0.538	2.193	0.294	2.943	0.381	1.874	0.234	3.841	0.427
10.717	3.872	0.485	4.206	0.533	2.168	0.290	2.899	0.375	1.808	0.226	3.77	0.419
10.817	3.826	0.479	4.157	0.527	2.122	0.284	2.852	0.369	1.749	0.219	3.738	0.415
10.917	3.784	0.474	4.135	0.524	2.085	0.279	2.813	0.364	1.695	0.212	3.684	0.409
11.017	3.752	0.470	4.103	0.520	2.046	0.274	2.771	0.359	1.646	0.206	3.645	0.405
11.117	3.696	0.463	4.072	0.516	1.992	0.267	2.715	0.352	1.593	0.199	3.594	0.399
11.218	3.625	0.454	4.020	0.509	1.953	0.261	2.680	0.347	1.534	0.192	3.533	0.393
11.318	3.596	0.450	3.981	0.504	1.911	0.256	2.626	0.340	1.476	0.184	3.469	0.386
11.418	3.559	0.446	3.958	0.502	1.875	0.251	2.590	0.335	1.434	0.179	3.425	0.381
11.518	3.513	0.440	3.919	0.497	1.828	0.245	2.549	0.330	1.368	0.171	3.393	0.377
11.618	3.466	0.434	3.888	0.493	1.786	0.239	2.504	0.324	1.326	0.166	3.334	0.371
11.718	3.432	0.430	3.839	0.486	1.747	0.234	2.468	0.320	1.282	0.160	3.285	0.365
11.818	3.393	0.425	3.805	0.482	1.708	0.229	2.413	0.313	1.223	0.153	3.248	0.361
11.919	3.327	0.417	3.770	0.478	1.669	0.223	2.372	0.307	1.187	0.148	3.18	0.353
12.019	3.275	0.410	3.731	0.473	1.622	0.217	2.315	0.300	1.123	0.140	3.136	0.349
12.118	3.233	0.405	3.685	0.467	1.581	0.212	2.269	0.294	1.057	0.132	3.07	0.341
12.219	3.204	0.401	3.648	0.462	1.553	0.208	2.238	0.290	1.015	0.127	3.026	0.336
12.319	3.172	0.397	3.609	0.457	1.502	0.201	2.179	0.282	0.963	0.120	2.982	0.331
12.420	3.123	0.391	3.572	0.453	1.461	0.196	2.142	0.277	0.920	0.115	2.926	0.325
12.519	3.072	0.385	3.535	0.448	1.424	0.191	2.095	0.271	0.853	0.107	2.86	0.318

1.3. Benzene OUR data. (cont)

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)	50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>	250 ppm Benzene DO	250 ppm Benzene DO/DO <sub>0</sub>	100 ppm Benzene DO	100 ppm Benzene DO/DO <sub>0</sub>	400 mg/L Benzene DO	400 mg/L Benzene DO/DO <sub>0</sub>	Final Control DO	Final Control DO/DO <sub>0</sub>
12.619	3.023	0.378	3.501	0.444	1.387	0.186	2.053	0.266	0.802	0.100	2.827	0.314
12.720	2.971	0.372	3.472	0.440	1.356	0.182	2.019	0.261	0.756	0.094	2.781	0.309
12.820	2.939	0.368	3.430	0.435	1.306	0.175	1.963	0.254	0.702	0.088	2.737	0.304
12.920	2.898	0.363	3.391	0.430	1.260	0.169	1.919	0.249	0.662	0.083	2.661	0.296
13.020	2.849	0.357	3.351	0.425	1.230	0.165	1.882	0.244	0.603	0.075	2.607	0.290
13.120	2.800	0.351	3.305	0.419	1.177	0.158	1.828	0.237	0.547	0.068	2.57	0.286
13.221	2.766	0.346	3.275	0.415	1.137	0.152	1.782	0.231	0.499	0.062	2.512	0.279
13.320	2.722	0.341	3.229	0.409	1.088	0.146	1.736	0.225	0.447	0.056	2.467	0.274
13.421	2.665	0.334	3.205	0.406	1.047	0.140	1.681	0.218	0.396	0.049	2.406	0.267
13.521	2.616	0.328	3.166	0.401	1.018	0.136	1.655	0.214	0.354	0.044	2.362	0.263
13.622	2.577	0.323	3.122	0.396	0.978	0.131	1.603	0.208	0.300	0.037	2.294	0.255
13.721	2.525	0.316	3.090	0.392	0.925	0.124	1.564	0.203	0.261	0.033	2.238	0.249
13.821	2.494	0.312	3.041	0.385	0.895	0.120	1.512	0.196	0.217	0.027	2.205	0.245
13.922	2.448	0.306	3.004	0.381	0.851	0.114	1.466	0.190	0.194	0.024	2.157	0.240
14.022	2.388	0.299	2.965	0.376	0.814	0.109	1.432	0.185			2.091	0.232
14.122	2.367	0.296	2.926	0.371	0.772	0.103	1.376	0.178			2.032	0.226
14.222	2.313	0.290	2.896	0.367	0.728	0.097	1.344	0.174			1.985	0.221
14.322	2.261	0.283	2.857	0.362	0.701	0.094	1.292	0.167			1.944	0.216
14.422	2.224	0.278	2.818	0.357	0.660	0.088	1.238	0.160			1.887	0.210
14.522	2.188	0.274	2.788	0.353	0.621	0.083	1.197	0.155			1.816	0.202
14.623	2.139	0.268	2.744	0.348	0.569	0.076	1.143	0.148			1.769	0.197
14.723	2.083	0.261	2.702	0.342	0.525	0.070	1.119	0.145			1.73	0.192
14.823	2.036	0.255	2.656	0.337	0.493	0.066	1.069	0.138			1.671	0.186
14.923	1.984	0.248	2.617	0.332	0.457	0.061	1.013	0.131			1.618	0.180
15.023	1.941	0.243	2.583	0.327	0.423	0.057	0.974	0.126			1.557	0.173
15.124	1.872	0.234	2.543	0.322	0.378	0.051	0.928	0.120			1.523	0.169
15.224	1.825	0.228	2.499	0.317	0.341	0.046	0.881	0.114			1.459	0.162

I.3. Benzene OUR data. (cont)

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)
15.324	1.796	0.225
15.424	1.774	0.222
15.524	1.706	0.214
15.625	1.662	0.208
15.724	1.610	0.202
15.825	1.556	0.195
15.925	1.505	0.188
16.024	1.475	0.185
16.125	1.429	0.179
16.225	1.373	0.172
16.326	1.309	0.164
16.426	1.277	0.160
16.525	1.235	0.155
16.626	1.179	0.148
16.726	1.132	0.142
16.826	1.106	0.138
16.926	1.066	0.133
17.027	1.003	0.126
17.127	0.944	0.118
17.226	0.903	0.113
17.327	0.836	0.105
17.427	0.790	0.099
17.528	0.753	0.094
17.628	0.707	0.089
17.727	0.667	0.084
17.828	0.613	0.077
17.928	0.582	0.073
18.028	0.533	0.067
18.128	0.479	0.060
18.229	0.442	0.055
18.329	0.396	0.050
18.428	0.341	0.043

50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>
2.465	0.312
2.424	0.307
2.397	0.304
2.350	0.298
2.296	0.291
2.264	0.287
2.237	0.283
2.201	0.279
2.154	0.273
2.107	0.267
2.071	0.262
2.027	0.257
1.993	0.253
1.949	0.247
1.904	0.241
1.872	0.237
1.828	0.232
1.782	0.226
1.747	0.221
1.699	0.215
1.665	0.211
1.625	0.206
1.578	0.200
1.542	0.195
1.496	0.190
1.463	0.185
1.419	0.180
1.378	0.175
1.348	0.171
1.297	0.164
1.258	0.159
1.217	0.154

250 ppm Benzene DO	250 ppm Benzene DO/DO <sub>0</sub>
0.307	0.041
0.278	0.037
0.241	0.032
0.219	0.029
0.195	0.026

100 ppm Benzene DO	100 ppm Benzene DO/DO <sub>0</sub>
0.854	0.111
0.810	0.105
0.770	0.100
0.717	0.093
0.677	0.088
0.644	0.083
0.597	0.077
0.558	0.072
0.516	0.067
0.470	0.061
0.438	0.057
0.394	0.051
0.337	0.044
0.310	0.040
0.261	0.034
0.227	0.029
0.190	0.025
0.149	0.019
0.119	0.015
0.083	0.011
0.051	0.007
0.014	0.002

Time (min)
15.324
15.424
15.524
15.625
15.724
15.825
15.925
16.024
16.125
16.225
16.326
16.426
16.525
16.626
16.726
16.826
16.926
17.027
17.127
17.226
17.327
17.427
17.528
17.628
17.727
17.828
17.928
18.028

Final Control DO	Final Control DO/DO <sub>0</sub>
1.415	0.157
1.353	0.150
1.288	0.143
1.25	0.139
1.204	0.134
1.136	0.126
1.089	0.121
1.047	0.116
0.981	0.109
0.944	0.105
0.878	0.098
0.829	0.092
0.776	0.086
0.717	0.080
0.672	0.075
0.624	0.069
0.575	0.064
0.531	0.059
0.469	0.052
0.421	0.047
0.36	0.040
0.32	0.036
0.249	0.028
0.18	0.020
0.142	0.016
0.088	0.010
0.049	0.005
0.017	0.002

I.3. Benzene OUR data. (cont)

Time (min)	Control DO (mg/L)	Control DO/DO <sub>0</sub> (mg/L)	50 mg/L Benzene DO	50 mg/L Benzene DO/DO <sub>0</sub>
18.529	0.302	0.038	1.168	0.148
18.629	0.256	0.032	1.136	0.144
18.730	0.226	0.028	1.087	0.138
18.830	0.195	0.024	1.055	0.134
18.929	0.182	0.023	1.006	0.127
		19.030	0.961	0.122
		19.130	0.930	0.118
		19.230	0.886	0.112
		19.330	0.835	0.106
		19.430	0.802	0.102
		19.531	0.759	0.096
		19.631	0.726	0.092
		19.731	0.675	0.086
		19.831	0.628	0.080
		19.931	0.592	0.075
		20.031	0.546	0.069
		20.131	0.511	0.065
		20.232	0.467	0.059
		20.332	0.418	0.053
		20.431	0.377	0.048
		20.532	0.328	0.042
		20.632	0.284	0.036
		20.733	0.251	0.032
		20.832	0.205	0.026
		20.932	0.176	0.022
		21.033	0.129	0.016
		21.133	0.078	0.010
		21.233	0.044	0.006
		21.333	0.007	0.001

Table I.4. Benzene concentrations from benzene perturbation on day 227.

Location	Benzene Conc (mg/L)							
	Set A	Stdev Set A	Set B	Stdev Set B	Set C	Stdev Set C	Set D	Stdev Set D
1	2.011	0.219	17.141	1.260	17.054	0.879	21.231	0.260
2	0.000	0.060	8.318	0.082	12.307	0.254	15.018	0.141
3	0.000	0.004	10.568	0.492	12.950	0.236	15.530	0.410
4	0.000	0.000	10.840	0.246	13.364	0.081	15.514	0.105
5	0.000	0.000	11.814	0.131	13.505	0.066	15.692	0.002
6	0.000	0.000	11.157	0.439	12.999	0.132	15.565	0.010

Table I.4a-b. Benzene concentrations from benzene perturbation on day 227 -raw data.

Sample Name	Amount µg/ml Benzene FID	Avg of duplicate injections	Avg of duplicate samples	s of ave. duplicate samples
9_18_03_BL1a_A_1:1dil	1.8546	1.8558	2.0108	0.219169995
9_18_03_BL1a_A	1.8570			
9_18_03_BL1b_A	2.1839	2.1658		
9_18_03_BL1b_A	2.1476			
9_18_03_BL2a_A	-0.9351	-0.9430	0.0000	0.059937647
9_18_03_BL2a_A	-0.9509			
9_18_03_BL2b_A	-1.0224	-1.0277		
9_18_03_BL2b_A	-1.0331			
9_18_03_BL3a_A	n.a.	-1.0701	0.0000	0.003582711
9_18_03_BL3a_A	-1.0701			
9_18_03_BL3b_A	n.a.	-1.0751		
9_18_03_BL3b_A	-1.0751			
9_18_03_BL4a_A	-1.0767	-1.0767	0.0000	#DIV/0!
9_18_03_BL4a_A	n.a.			
9_18_03_BL4b_A	n.a.	#DIV/0!		
9_18_03_BL4b_A	n.a.			
9_18_03_BL5a_A	n.a.	#DIV/0!	0.0000	#DIV/0!
9_18_03_BL5a_A	n.a.			
9_18_03_BL5b_A	n.a.	#DIV/0!		
9_18_03_BL5b_A	n.a.			
9_18_03_BL6a_A	n.a.	#DIV/0!	0.0000	#DIV/0!
9_18_03_BL6a_A	n.a.			
9_18_03_BL6b_A	n.a.	#DIV/0!		
9_18_03_BL6b_A	n.a.			
9_18_03_BL7a_A	n.a.	#DIV/0!	0.0000	#DIV/0!
9_18_03_BL7a_A	n.a.			
9_18_03_BL7b_A	n.a.	#DIV/0!		
9_18_03_BL7b_A	n.a.			

  

Sample Name	Amount µg/ml Benzene FID	Avg of duplicate injections	Avg of duplicate samples	s of ave. duplicate samples
9_18_03_BL1a_B_1:1dil	16.2953	16.2503	17.1410	1.259629868
9_18_03_BL1a_B	16.2054			
9_18_03_BL1b_B	17.9955	18.0317		
9_18_03_BL1b_B	18.0680			
9_18_03_BL2a_B	8.4036	8.3756	8.3179	0.081571668
9_18_03_BL2a_B	8.3476			
9_18_03_BL2b_B	8.2755	8.2602		
9_18_03_BL2b_B	8.2449			
9_18_03_BL3a_B	10.8071	10.9160	10.5678	0.492477534
9_18_03_BL3a_B	11.0249			
9_18_03_BL3b_B	10.3045	10.2196		
9_18_03_BL3b_B	10.1346			
9_18_03_BL4a_B	10.6791	10.6659	10.8398	0.245886745
9_18_03_BL4a_B	10.6527			
9_18_03_BL4b_B	11.1417	11.0137		
9_18_03_BL4b_B	10.8857			
9_18_03_BL5a_B	11.8838	11.9066	11.8140	0.130846444
9_18_03_BL5a_B	11.9293			
9_18_03_BL5b_B	12.0636	11.7215		
9_18_03_BL5b_B	11.3795			
9_18_03_BL6a_B	11.4638	11.4674	11.1572	0.4386691
9_18_03_BL6a_B	11.4710			
9_18_03_BL6b_B	10.9360	10.8470		
9_18_03_BL6b_B	10.7580			

Table I.4c-d. Benzene concentrations from benzene perturbation on day 227 -raw data.

Sample Name	Amount µg/ml Benzene FID	Avg of duplicate injections	Avg of duplicate samples	s of ave. duplicate samples
9_18_03_BL1a_C_1:1dil	16.4901	16.4324	17.0541	0.879273975
9_18_03_BL1a_C	16.3746			
9_18_03_BL1b_C	17.7204	17.6758		
9_18_03_BL1b_C	17.6313			
9_18_03_BL2a_C	12.1627	12.1275	12.3068	0.253582075
9_18_03_BL2a_C	12.0923			
9_18_03_BL2b_C	12.3149	12.4861		
9_18_03_BL2b_C	12.6573			
9_18_03_BL3a_C	12.9452	13.1168	12.9502	0.235572147
9_18_03_BL3a_C	13.2883			
9_18_03_BL3b_C	12.8655	12.7836		
9_18_03_BL3b_C	12.7018			
9_18_03_BL4a_C	13.1955	13.3073	13.3644	0.080830685
9_18_03_BL4a_C	13.4191			
9_18_03_BL4b_C	13.3982	13.4216		
9_18_03_BL4b_C	13.4449			
9_18_03_BL5a_C	13.4464	13.4583	13.5049	0.065952436
9_18_03_BL5a_C	13.4702			
9_18_03_BL5b_C	13.5793	13.5516		
9_18_03_BL5b_C	13.5239			
9_18_03_BL6a_C	12.9505	12.9059	12.9993	0.1320629
9_18_03_BL6a_C	12.8612			
9_18_03_BL6b_C	13.0060	13.0926		
9_18_03_BL6b_C	13.1793			

  

Sample Name	Amount µg/ml Benzene FID	Avg of duplicate injections	Avg of duplicate samples	s of ave. duplicate samples
9_18_03_BL1a_D_1:1dil	21.0199	21.0469	21.2311	0.260422554
9_18_03_BL1a_D	21.0740			
9_18_03_BL1b_D	21.4466	21.4152		
9_18_03_BL1b_D	21.3838			
9_18_03_BL2a_D	14.9549	14.9179	15.0178	0.141334901
9_18_03_BL2a_D	14.8808			
9_18_03_BL2b_D	14.9746	15.1177		
9_18_03_BL2b_D	15.2609			
9_18_03_BL3a_D	15.2043	15.2403	15.5301	0.409877433
9_18_03_BL3a_D	15.2764			
9_18_03_BL3b_D	15.9563	15.8200		
9_18_03_BL3b_D	15.6836			
9_18_03_BL4a_D	15.7063	15.5687	15.5143	0.105293382
9_18_03_BL4a_D	15.4712			
9_18_03_BL4b_D	15.4167	15.4398		
9_18_03_BL4b_D	15.4630			
9_18_03_BL5a_D	15.7090	15.6899	15.6916	0.002401527
9_18_03_BL5a_D	15.6707			
9_18_03_BL5b_D	15.6701	15.6933		
9_18_03_BL5b_D	15.7164			
9_18_03_BL6a_D	15.6862	15.5581	15.5650	0.009737476
9_18_03_BL6a_D	15.4300			
9_18_03_BL6b_D	15.2550	15.5719		
9_18_03_BL6b_D	15.8888			
Spike_Bottle_a	29.2157	29.4878	28.9749	0.725320155
Spike_Bottle_a	29.7598			
Spike_Bottle_b	28.2774	28.4620		
Spike_Bottle_b	28.6466			