

APPENDIX D:

DATA, FIGURES, AND TABLES  
FROM MANUSCRIPT #2:

MEASURING NITRIFYING POPULATIONS IN A  
BIOLOGICAL AERATED FILTER SYSTEM USING QUANTITATIVE  
DOT BLOTTING

PROFILE # 3

### 3rd Column Profile

Date: 9/1/98

Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr

Quantification of Mass Standards - Set run with C Column samples\*

Dilutions of *E.coli* and *N. europaea* probed with Universal Probe EUB338

\*C column and N column samples were done on different days, so there are two sets of standards: one set for the C samples and one set for the N samples.

Mass blotted	<i>E. coli</i> signal	<i>N.europaea</i> signal
667.7	171030.3	341118.4
267.1	101223.0	213504.3
133.5	67227.2	148814.0
26.7	10109.3	53999.3
2.7		6725.0

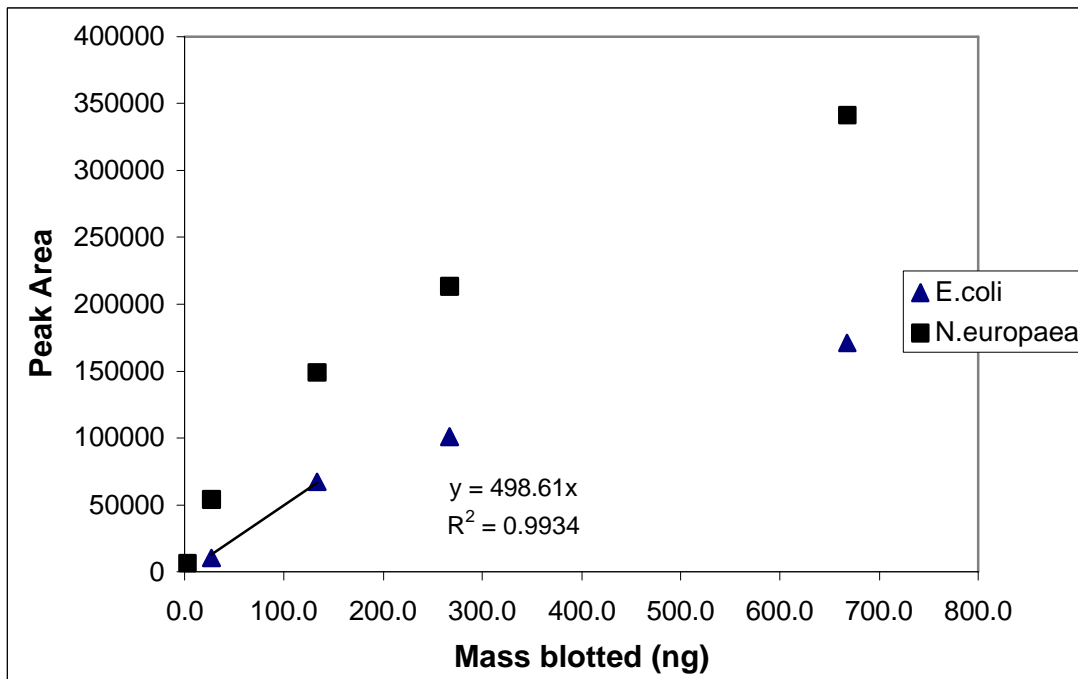


Figure D-1. EUB338 Mass Standard Fit, Profile 3, 9/1/98, 9.4 & 8.2 m/hr. Standard set run with C Column Samples

### 3rd Column Profile

Date: 9/1/98

Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr

Quantification of Mass Standards - Set run with C Column samples\*

Dilutions of *E.coli* and *N. europaea* probed with Universal Probe Nso190

\*C column and N column samples were done on different days, so there are two sets of standards: one set for the C samples and one set for the N samples.

Mass blotted	E. coli signal	N.europaea signal
667.7	14895.9	785253.5
267.1	3036.5	514525.4
133.5		321014.6
26.7		109546.8
2.7		7859.1

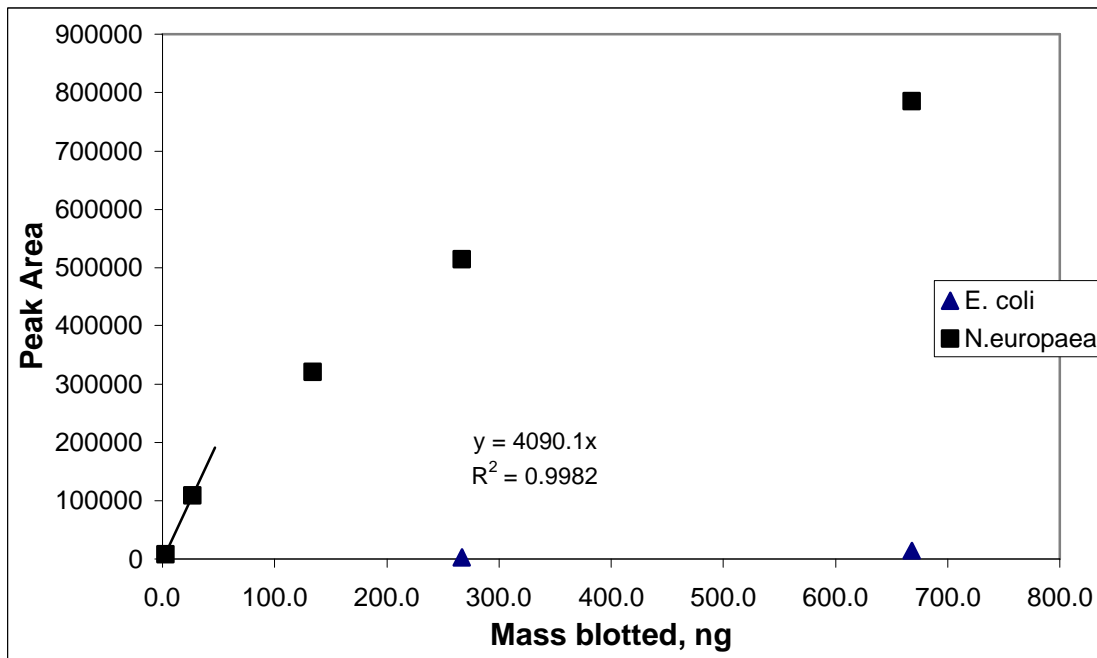


Figure D-2. Nso190 Mass Standard Fit, Profile 3, 9/1/98, 9.4 & 8.2 m/hr. Standard set run with C Column Samples

### 3rd Column Profile

Date: 9/1/98  
 Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr

Dilutions of *E.coli* and *N. europaea* probed with Universal Probe EUB338

Quantification of Mass Standards - Set run with N Column samples\*

\*C column and N column samples were done on different days, so there are two sets of standards: one set for the C samples and one set for the N samples.

Mass blotted	E. coli signal	N.europaea signal
667.7	148234.2	319842.4
267.1	80211.8	160742.3
133.5	50682.8	80892.2
26.7	10292.9	26748.8
2.7		2660.5

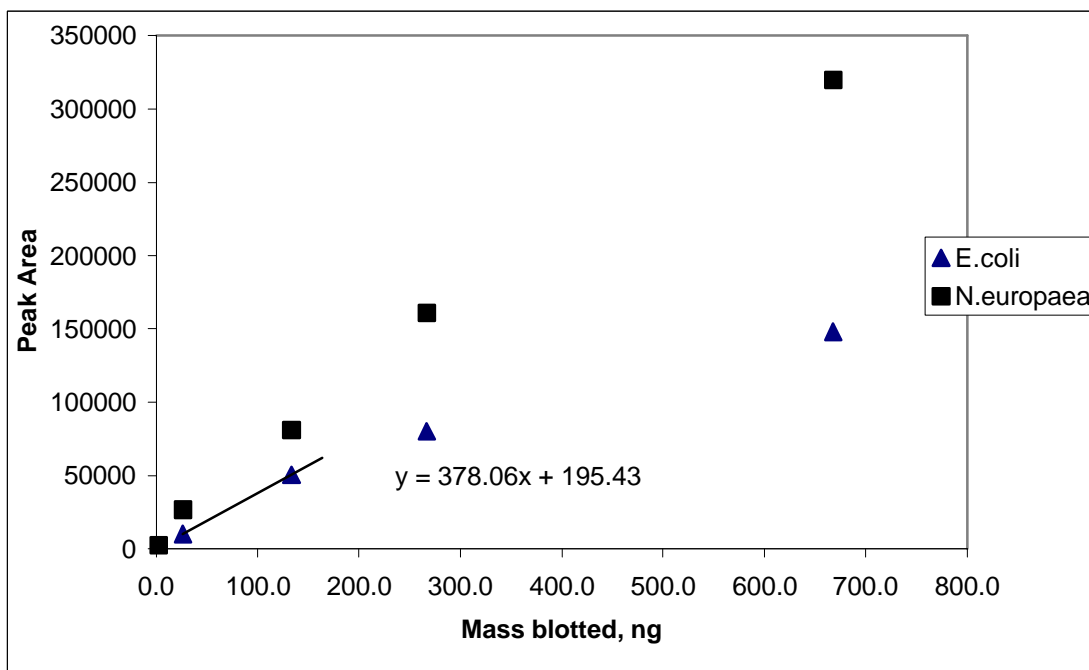


Figure D-3. EUB338 Mass Standard Fit, Profile 3, 9/1/98, 9.4 & 8.2 m/hr. Standard set run with N Column Samples

### 3rd Column Profile

Date: 9/1/98  
 Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr

Dilutions of *E.coli* and *N. europaea* probed with Universal Probe Nso190

Quantification of Mass Standards - Set run with N Column samples\*

\*C column and N column samples were done on different days, so there are two sets of standards: one set for the C samples and one set for the N samples.

Mass blotted	N.europaea signal
667.7	748326.2
267.1	445414.4
133.5	336111.1
26.7	143232.4
2.7	16797.4

Only N. europaea samples were quantified.

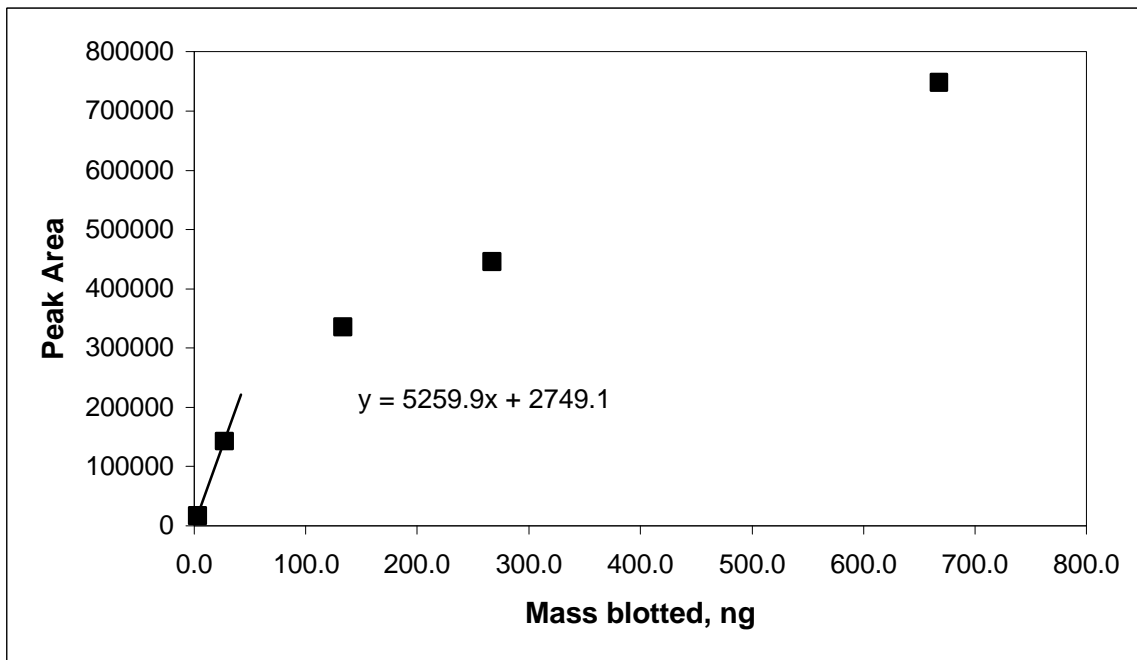


Figure D-4. Nso190 Mass Standard Fit, Profile 3, 9/1/98, 9.4 & 8.2 m/hr. Standard set run with N Column Samples

Table D-1. Profile 3 C Column EUB338 Densitometry Analysis Data

9/1/98

Flows: C column: 12.0 gpm N column: 10.5 gpm  
 9.4 m/hr 8.2 m/hr

Sample	Peak Area	Mass, per standard fit	Volume blotted, ul	Actual conc. ng/ul	Total Average concentration
C1a	33894.1	67.98	8.6		13.38
	48296.7	96.86	8.6		
	<b>17408.9</b>	<b>34.91</b>	<b>2.87</b>	<b>12.17</b>	
	<b>20894.8</b>	<b>41.91</b>	<b>2.87</b>	<b>14.60</b>	
			0.57		
	2567.4	5.15	0.57		
C1b	<b>90063.5</b>	<b>180.63</b>	<b>25.9</b>	<b>6.97</b>	6.56
	<b>79272.7</b>	<b>158.99</b>	<b>25.9</b>	<b>6.14</b>	
	<i>58634.1</i>	<i>117.60</i>	8.6		
	<i>44245.3</i>	<i>88.74</i>	8.6		
	<i>29779.7</i>	<i>59.73</i>	1.72		
	<i>13537.32</i>	<i>27.15</i>	1.72		
C2a	<b>61253.8</b>	<b>122.85</b>	<b>7.6</b>	<b>16.16</b>	18.08
	<b>75783.9</b>	<b>151.99</b>	<b>7.6</b>	<b>20.00</b>	
	<i>33113.2</i>	<i>66.41</i>	2.5		
	<i>36344.0</i>	<i>72.89</i>	2.5		
	<i>12423.9</i>	<i>24.92</i>	0.51		
	<i>13172.0</i>	<i>26.42</i>	0.51		
C2b	<b>88518.8</b>	<b>177.53</b>	<b>8.82</b>	<b>20.13</b>	23.94
	<b>88381.1</b>	<b>177.25</b>	<b>8.82</b>	<b>20.10</b>	
	<b>38120.4</b>	<b>76.45</b>	<b>2.94</b>	<b>26.00</b>	
	<b>43312.5</b>	<b>86.87</b>	<b>2.94</b>	<b>29.55</b>	
	<i>7405.6</i>	<i>14.85</i>	0.59		
	<i>5201.5</i>	<i>10.43</i>	0.59		
C3a	<b>45337.7</b>	<b>90.93</b>	<b>15</b>	<b>6.06</b>	5.52
	<b>37238.8</b>	<b>74.69</b>	<b>15</b>	<b>4.98</b>	
	<i>30124.3</i>	<i>60.42</i>	5		
	<i>27693.6</i>	<i>55.54</i>	5		
	<i>22583.89</i>	<i>45.29</i>	1		
	<i>6709.1</i>	<i>13.46</i>	1		
C3b	<i>239133.0</i>	<i>479.60</i>	28.8		13.47
	<b>117477.2</b>	<b>235.61</b>	<b>28.8</b>	<b>8.18</b>	
	<b>74046.9</b>	<b>148.51</b>	<b>9.6</b>	<b>15.47</b>	
	<b>80219.8</b>	<b>160.89</b>	<b>9.6</b>	<b>16.76</b>	
	<i>8175.3</i>	<i>16.40</i>	1.92		
	<i>31507.1</i>	<i>63.19</i>	1.92		
C4a	<b>34551.2</b>	<b>69.30</b>	<b>15</b>	<b>4.62</b>	5.57
	<b>30443.0</b>	<b>61.06</b>	<b>15</b>	<b>4.07</b>	
	<b>18985.5</b>	<b>38.08</b>	<b>5</b>	<b>7.62</b>	
	<b>14932.7</b>	<b>29.95</b>	<b>5</b>	<b>5.99</b>	
	<i>7897.9</i>	<i>15.84</i>	1		
	<i>12730.1</i>	<i>25.53</i>	1		
C4b	<i>75095.8</i>	<i>150.61</i>	15		15.30
	<i>82082.6</i>	<i>164.62</i>	15		
	<b>36823.6</b>	<b>73.85</b>	<b>5</b>	<b>14.77</b>	
	<b>39476.2</b>	<b>79.17</b>	<b>5</b>	<b>15.83</b>	
	<i>15383.0</i>	<i>30.85</i>	1		
	<i>20925.6</i>	<i>41.97</i>	1		

Dilutions in bold print were selected for analysis based on quality of signal obtained on detection film. Italics indicate poor sample signal quality.

Table D-2.

## Profile 3 C Column Nso190 Densitometry Analysis Data

9/1/98

Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr

Sample	Peak Area	Mass, per standard fit	Volume blotted, ul	Actual conc ng/ul	Total Average concentration	Fraction of nitrifier	Overall average
C1a	38856.2	9.50	17.2	0.55	0.57	4.3%	4.2%
	41934.4	10.25	17.2	0.60			
	26843.5	6.56	5.75				
	25551.2	6.25	5.75				
	7861.6	1.92	1.14				
	10972.4	2.68	1.14				
C1b	65599.5	16.04	51.7	0.31	0.27	4.2%	
	49649.6	12.14	51.7	0.23			
	<b>52529.9</b>	<b>12.84</b>	<b>17.2</b>				
	<b>30641.8</b>	<b>7.49</b>	<b>17.2</b>				
	<b>17376.8</b>	<b>4.25</b>	<b>3.45</b>				
	<b>16629.4</b>	<b>4.07</b>	<b>3.45</b>				
C2a	21848.6	5.34	15.2		0.74	4.1%	4.1%
	27747.9	6.78	15.2				
	<b>15463.0</b>	<b>3.78</b>	<b>5.08</b>	<b>0.74</b>			
	<b>15132.4</b>	<b>3.70</b>	<b>5.08</b>	<b>0.73</b>			
	5759.1	1.41	1.02				
	2535.4	0.62	1.02				
C2b	28459.7	6.96	17.6		0.98	4.1%	
	54778.4	13.39	17.6				
	<b>12373.9</b>	<b>3.03</b>	<b>5.88</b>	<b>0.51</b>			
	<b>11895.4</b>	<b>2.91</b>	<b>5.88</b>	<b>0.49</b>			
	<b>8156.6</b>	<b>1.99</b>	<b>1.18</b>	<b>1.69</b>			
	<b>5838.8</b>	<b>1.43</b>	<b>1.18</b>	<b>1.21</b>			
C3a	<b>17189.3</b>	<b>4.20</b>	<b>30</b>	<b>0.14</b>	0.18	3.3%	2.2%
	<b>11124.7</b>	<b>2.72</b>	<b>30</b>	<b>0.09</b>			
	<b>10798.6</b>	<b>2.64</b>	<b>10</b>	<b>0.26</b>			
	<b>9118.0</b>	<b>2.23</b>	<b>10</b>	<b>0.22</b>			
			2				
			2				
C3b	<b>38454.8</b>	<b>9.40</b>	<b>57.7</b>	<b>0.16</b>	0.16	1.2%	
	<b>25145.9</b>	<b>6.15</b>	<b>57.7</b>	<b>0.11</b>			
	36500.5	8.92	19.2				
	<b>17087.6</b>	<b>4.18</b>	<b>19.2</b>	<b>0.22</b>			
	15567.5	3.81	3.85				
	17268.9	4.22	3.85				
C4a	<b>11900.0</b>	<b>2.91</b>	<b>30</b>	<b>0.10</b>	0.09	1.6%	1.3%
	<b>10569.1</b>	<b>2.58</b>	<b>30</b>	<b>0.09</b>			
	11981.7	2.93	10				
	8669.7	2.12	10				
	521.4	0.13	2				
			2				
C4b	<b>19829.5</b>	<b>4.85</b>	<b>30</b>	<b>0.16</b>	0.14	0.9%	
	<b>14487.5</b>	<b>3.54</b>	<b>30</b>	<b>0.12</b>			
	13603.5	3.33	10				
	12435.3	3.04	10				
	5487.5	1.34	2				
	7204.3	1.76	2				

Dilutions in bold print were selected for analysis based on quality of signal obtained on detection film. Italics indicate poor sample signal quality.

Table D-3. Profile 3 N Column EUB338 Densitometry Analysis Data

9/1/98

Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr

Sample	Peak Area	Mass, per standard fit	Volume blotted, ul	Actual conc. ng/ul	Total Average concentration
N1a	<b>66733.6</b>	<b>175.73</b>	<b>7</b>	<b>25.10</b>	<b>25.71</b>
	<b>69969.4</b>	<b>184.25</b>	<b>7</b>	<b>26.32</b>	
	37759.4	99.43	3	33.14	
	33215.2	87.47	3	29.16	
	14737.8	38.81	1	38.81	
	17789.2	46.84	1	46.84	
N1b	113314.1	298.39	50	5.97	
			50		
	<b>72503.2</b>	<b>190.92</b>	<b>25</b>	<b>7.64</b>	<b>9.60</b>
	<b>109860.8</b>	<b>289.30</b>	<b>25</b>	<b>11.57</b>	
	21866.8	57.58	5	11.52	
28221.8	74.32	5	14.86		
N2a	<b>129267.2</b>	<b>340.40</b>	<b>50</b>	<b>6.81</b>	<b>6.81</b>
			50		
	<b>120658.8</b>	<b>317.73</b>	<b>25</b>	<b>12.71</b>	
	<b>155622.2</b>	<b>409.80</b>	<b>25</b>	<b>16.39</b>	
	54264.1	142.89	5	28.58	
	58089.6	152.97	5	30.59	
N2b	89296.2	235.14	50	4.70	
			50		
	<b>54186.4</b>	<b>142.69</b>	<b>25</b>	<b>5.71</b>	<b>5.10</b>
	<b>42692.2</b>	<b>112.42</b>	<b>25</b>	<b>4.50</b>	
	13185.3	34.72	5		
11101.1	29.23	5	5.85		
N3a	70535.1	185.74	50	3.71	
			50		
	<b>63683.2</b>	<b>167.70</b>	<b>25</b>	<b>6.71</b>	<b>5.85</b>
	<b>47311.9</b>	<b>124.59</b>	<b>25</b>	<b>4.98</b>	
	21222.4	55.89	5	11.18	
16108.6	42.42	5	8.48		
N3b	92068.2	242.44	50	4.85	
			50		
	<b>55091.1</b>	<b>145.07</b>	<b>25</b>	<b>5.80</b>	<b>5.07</b>
	<b>41237.4</b>	<b>108.59</b>	<b>25</b>	<b>4.34</b>	
	26613.4	70.08	5	14.02	
24700.4	65.04	5	13.01		
N4a	No signals detected				
N4b	33859.8	89.16	50	1.78	
			50		
	<b>20226.1</b>	<b>53.26</b>	<b>25</b>	<b>2.13</b>	<b>2.60</b>
	<b>29177.3</b>	<b>76.83</b>	<b>25</b>	<b>3.07</b>	
	10707.5	28.20	5	5.64	
5076.2	13.37	5	2.67		

Dilutions in bold print were selected for analysis based on quality of signal obtained on detection film. Italics indicate poor sample signal quality.

Table D-4. Profile 3 N Column Nso190 Densitometry Analysis Data

9/1/98

Flows: C column: 12.0 gpm N column: 10.5 gpm  
 9.4 m/hr 8.2 m/hr

Sample	Peak Area	Mass, per standard fit	Volume blotted, ul	Actual conc. ng/ul	Total Average concentration	Fraction of nitrifier	Overall average	
N1a	<b>55192.8</b>	9.97	<b>14</b>	<b>0.712</b>	<b>0.89</b>	<b>3.4%</b>	3.5%	
	<b>80706.8</b>	14.82	<b>14</b>	<b>1.059</b>				
	47631.5	8.53	7	1.219				
	33066.0	5.76	7	0.823				
	12636.0	1.88	2	0.940				
	12049.4	1.77	2	0.884				
N1b	86371.3	15.90	100	0.159				
			100					
	<b>97138.5</b>	17.95	<b>50</b>	<b>0.359</b>	<b>0.34</b>	<b>3.5%</b>		
	<b>87356.7</b>	16.09	<b>50</b>	<b>0.322</b>				
	33160.0	5.78	20	0.289				
32614.6	5.68	20	0.284					
N2a	<b>97699.7</b>	18.05	<b>100</b>	<b>0.181</b>	<b>0.18</b>	<b>2.7%</b>	3.0%	
			100					
	<b>58082.7</b>	10.52	<b>50</b>	<b>0.210</b>				
	<b>69380.7</b>	12.67	<b>50</b>	<b>0.253</b>				
	26208.2	4.46	20	0.223				
	23943.9	4.03	20	0.201				
N2b	61609.8	11.19	100	0.112				
			100					
	<b>49277.4</b>	8.85	<b>50</b>	<b>0.177</b>	<b>0.17</b>	<b>3.4%</b>		
	<b>48117.8</b>	8.63	<b>50</b>	<b>0.173</b>				
			20					
7887.0	0.98	20	0.049					
N3a	48168.2	8.63	100	0.086			1.9%	
			100					
	<b>20102.4</b>	3.30	<b>50</b>	<b>0.066</b>	<b>0.08</b>	<b>1.4%</b>		
	<b>28056.6</b>	4.81	<b>50</b>	<b>0.096</b>				
	14456.1	2.23	20	0.111				
12798.2	1.91	20	0.096					
N3b	54351.9	9.81	100	0.098				
			100					
	<b>58495.2</b>	10.60	<b>50</b>	<b>0.212</b>	<b>0.17</b>	<b>3.3%</b>		
	<b>34770.6</b>	6.09	<b>50</b>	<b>0.122</b>				
	7191.6	0.84	20	0.042				
3108.3	0.07	20	0.003					
N4a							3.6%	
No signals detected								
N4b	20571.9	7.83	100	0.078				
			100					
	<b>9248.7</b>	<b>3.52</b>	<b>50</b>	<b>0.070</b>	<b>0.09</b>	<b>3.6%</b>		
	<b>15360.4</b>	<b>5.85</b>	<b>50</b>	<b>0.117</b>				
	8757.0	3.33	20	0.167				
2821.6	1.07	20	0.054					

Dilutions in bold print were selected for analysis based on quality of signal obtained on detection film. Italics indicate poor sample signal quality.

**Table D-5. Profile 3 C Column Sample Concentration Determination Spectrophotometry Method**

9/1/98

**Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr**

Sample	Absorbance A <sub>260</sub>	Average A260	Absorbance A <sub>280</sub>	Average A280	Conc., ng/ul
C1a	0.029	0.0227	0.0152	0.012	181.6
	0.021		0.0112		
	0.0205		0.0109		
	0.0203		0.0107		
C1b	0.0081	0.0078	0.0041	0.003675	62.4
	0.0082		0.0041		
	0.0075		0.0034		
	0.0074		0.0031		
C2a	0.0316	0.02625	0.0169	0.0131	210
	0.0337		0.0154		
	0.0199		0.0099		
	0.0198		0.0102		
C2b	0.0382	0.0219333	0.0231	0.012033	175.4667
	0.0279		0.0148		
	0.0171		0.0091		
	0.0164		0.0088		
	0.0159		0.0081		
	0.0161		0.0083		
C3a	0.053	0.0326833	0.0342	0.01795	261.4667
	0.0529		0.034		
	0.0229		0.0118		
	0.023		0.0117		
	0.0223		0.0081		
	0.022		0.0079		
C3b	0.0083	0.0068	0.0045	0.003575	54.4
	0.0087		0.0053		
	0.0052		0.0022		
	0.005		0.0023		
C4a	0.07	0.057575	0.0398	0.031275	460.6
	0.0684		0.039		
	0.0459		0.0231		
	0.046		0.0232		
C4b	0.0322	0.031025	0.0166	0.015625	248.2
	0.0322		0.0165		
	0.0301		0.0147		
	0.0296		0.0147		

Concentration determined by:  $C = A_{260} \cdot 62.9 - A_{280} \cdot 36$

Table D-6. Profile 3 C Column Nso190 Densitometry Analysis Data Spectrophotometry Method

9/1/98

Flows: C column: 12.0 gpm N column: 10.5 gpm  
 9.4 m/hr 8.2 m/hr

Sample	Dilution Made	Diluted Conc., ng/u	Denatured Conc., ng/ul	vol. Blotted ul	Blot Mass ng	Peak Area	Area/mass	Overall port averages	Standard deviation
C1a	1	181.60	45.40	17.2	780.9	38856.2	49.76	61.59	14.05
			45.40	17.2	780.9	41934.4	53.70		
			45.40	5.75	261.1	26843.5			
			45.40	5.75	261.1	25551.2			
			45.40	1.14	51.8	7861.6			
			45.40	1.14	51.756	10972.4			
C1b	1	62.40	15.60	51.7	806.5	65599.5	81.34		
			15.60	51.7	806.5	49649.6	61.56		
			15.60	<b>17.2</b>	268.3	52529.9			
			15.60	<b>17.2</b>	268.3	30641.8			
			15.60	<b>3.45</b>	53.8	17376.8			
			15.60	<b>3.45</b>	53.8	16629.4			
C2a	1	210.00	52.50	15.2	798.0	21848.6	27.38	39.06	9.73
			52.50	15.2	798.0	27747.9	34.77		
			52.50	<b>5.08</b>	266.7	15463.0			
			52.50	<b>5.08</b>	266.7	15132.4			
			52.50	1.02	53.6	5759.1			
			52.50	1.02	53.6	2535.4			
C2b	1	175.47	43.87	17.6	772.1	28459.7			
			43.87	17.6	772.1	54778.4			
			43.87	<b>5.88</b>	257.9	<b>12373.9</b>	47.97		
			43.87	<b>5.88</b>	257.9	<b>11895.4</b>	46.12		
			43.87	<b>1.18</b>	51.8	8156.6			
			43.87	<b>1.18</b>	51.8	5838.8			
C3a	0.395	103.28	25.82	<b>30</b>	774.6	<b>17189.3</b>	22.19	32.46	12.67
			25.82	<b>30</b>	774.6	<b>11124.7</b>	14.36		
			25.82	<b>10</b>	258.2	<b>10798.6</b>	41.82		
			25.82	<b>10</b>	258.2	<b>9118.0</b>	35.31		
			25.82	2	51.6				
			25.82	2	51.6				
C3b	1	54.40	13.60	<b>57.7</b>	784.7	<b>38454.8</b>	49.00		
			13.60	<b>57.7</b>	784.7	<b>25145.9</b>	32.04		
			13.60	19.2	261.1	36500.5			
			13.60	19.2	261.1	17087.6			
			13.60	3.85	52.4	15567.5			
			13.60	3.85	52.4	17268.9			
C4a	0.225	103.64	25.91	<b>30</b>	777.3	<b>11900.0</b>	15.31	17.97	4.94
			25.91	<b>30</b>	777.3	<b>10569.1</b>	13.60		
			25.91	10	259.1	11981.7			
			25.91	10	259.1	8669.7			
			25.91	2	51.8	521.4			
			25.91	2	51.8				
C4b	0.429	106.48	26.62	<b>30</b>	798.6	<b>19829.5</b>	24.83		
			26.62	<b>30</b>	798.6	<b>14487.5</b>	18.14		
			26.62	10	266.2	13603.5			
			26.62	10	266.2	12435.3			
			26.62	2	53.2	5487.5			
			26.62	2	53.2	7204.3			

Table D-7.

**Profile 3 N Column Sample Concentration Determination  
Spectrophotometry Method**

9/1/98

**Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr**

Sample	Absorbance $A_{260}$	Average A260	Absorbance $A_{280}$	Average A280	Conc., ng/ul	
N1a	0.0313	0.027875	0.018		223	
	0.0312		0.0177			
	0.0244		0.0129			
	0.0246		0.0129			
N1b	0.0013	0.001225	0.0006		9.8	
	0.0012		0.0008			
	0.0012		0.0005			poor mass quantification sample not used
	0.0012		0.0004			
N2a	0.0031	0.005575	0.0016		44.6	
	0.0031		0.0016			
	0.0087		0.0063			
	0.0074		0.0052			
N2b	0.0002	0.0004	0.0001		3.2	
	0.0001		mass numbers too low to quantify			
	0.0004					
	0.0009					
N3a	0.0039	0.0035	0.0021		28	
	0.0039		0.0022			
	0.0031		0.0013			
	0.0031		0.0011			
N3b	0.0061	0.005525	0.0034		44.2	
	0.0062		0.0038			
	0.005		0.003			
	0.0048		0.0028			
N4a						
N4b	0.0007	0.0007	0.0001		5.6	
	0.0007		0.0002			

Concentration determined by:  $C = A_{260} \cdot 62.9 - A_{280} \cdot 36$

**Table D-8. Profile 3 N Column Nso190 Densitometry Analysis Data Spectrophotometry Method**

9/1/98

**Flows: C column: 12.0 gpm 9.4 m/hr N column: 10.5 gpm 8.2 m/hr**

Sample	Dilution Made	Diluted Conc., ng/u	Denatured Conc., ng/ul	vol. Blotted ul	Blot Mass ng	Peak Area	Area/mass	Overall port averages	Standard deviation
N1a	1	223.00	55.75	14	780.5	<b>55192.8</b>	70.71467	100.4	19.13
			55.75	14	780.5	<b>80706.8</b>	103.404		
			55.75	7	390.25	47631.5	122.0538		
			55.75	7	390.25	33066.0	84.7303		
			55.75	2	111.5	12636.0	113.3274		
			55.75	2	111.5	12049.4	108.0664		
N1b	1	9.80	2.45	100	245	86371.3		105.4	18.44
			2.45	100	245				
			2.45	<b>50</b>	122.5	<b>97138.5</b>			
			2.45	<b>50</b>	122.5	<b>87356.7</b>			
			2.45	20	49	33160.0			
			2.45	20	49	32614.6			
N2a	1	44.60	11.15	<b>100</b>	1115	<b>97699.7</b>	87.62305	105.4	18.44
			11.15	100	1115				
			11.15	<b>50</b>	557.5	<b>58082.7</b>	104.1842		
			11.15	<b>50</b>	557.5	<b>69380.7</b>	124.4497		
			11.15	20	223	26208.2			
			11.15	20	223	23943.9			
N2b	1	3.20	0.8	100	80	61609.8		71.1	22.50
			0.8	100	80				
			0.8	<b>50</b>	40	<b>49277.4</b>			
			0.8	<b>50</b>	40	<b>48117.8</b>			
			0.8	20	16				
			0.8	20	16	7887.0			
N3a	1	28.00	7	100	700	48168.2		71.1	22.50
			7	100	700				
			7	<b>50</b>	350	<b>20102.4</b>	57.43543		
			7	<b>50</b>	350	<b>28056.6</b>	80.16171		
			7	20	140	14456.1			
			7	20	140	12798.2			
N3b	1	44.20	11.05	100	1105	54351.9	49.18724	149.8	50.24
			11.05	100	1105				
			11.05	<b>50</b>	552.5	<b>58495.2</b>	105.8737		
			11.05	<b>50</b>	552.5	<b>34770.6</b>	62.93321		
			11.05	20	221	7191.6			
			11.05	20	221	3108.3			
N4a									
N4b	1	5.60	1.4	100	140	20571.9	146.9421	149.8	50.24
			1.4	100	140				
			1.4	<b>50</b>	70	<b>9248.7</b>	132.1243		
			1.4	<b>50</b>	70	<b>15360.4</b>	219.4343		
			1.4	20	28	8757.0			
			1.4	20	28	2821.6	100.7714		

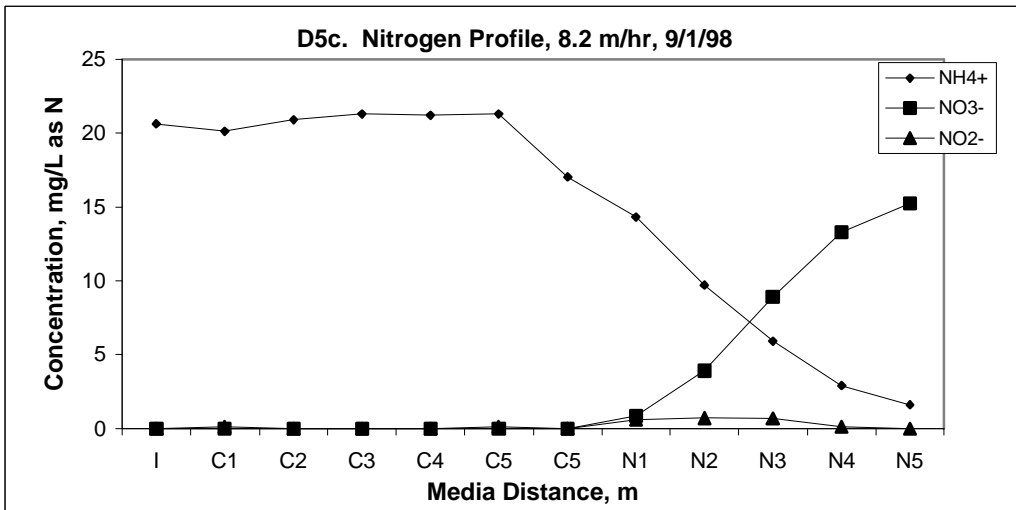
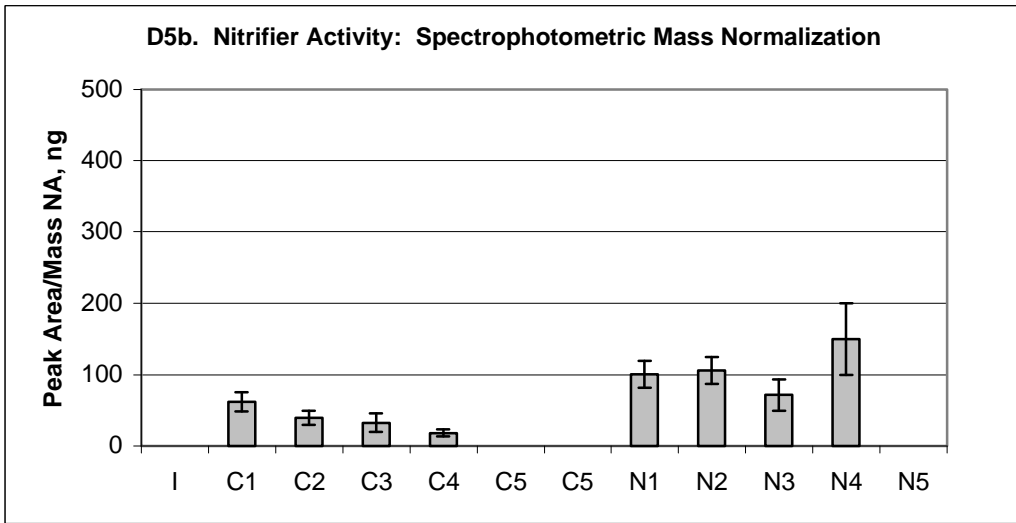
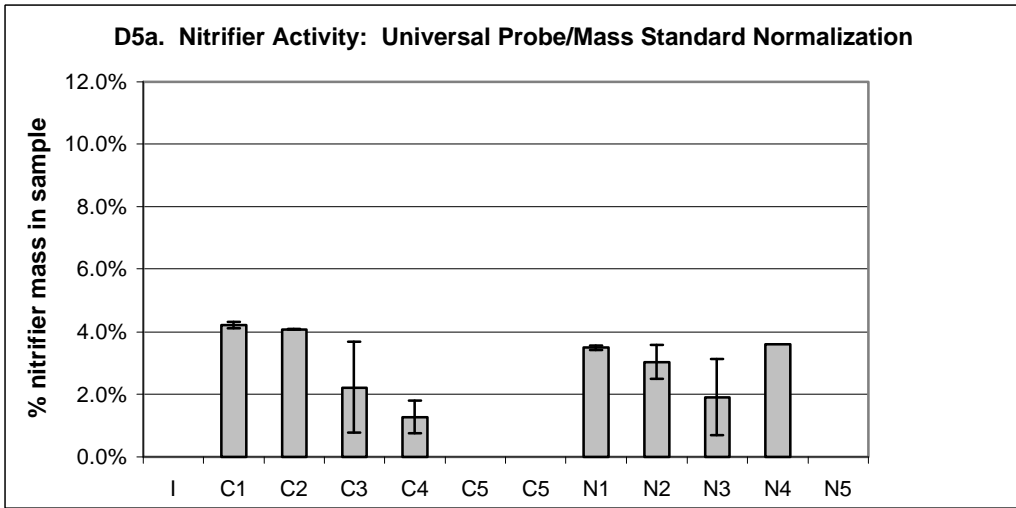
Table D-5.

## Profile 3. Nitrogen Species and Ammonia Oxidizer Activity

9/1/98

Flows: C column: 12.0 gpm N column: 10.5 gpm  
 9.4 m/hr 8.2 m/hr

Sample	Chemical Nitrogen Species				Ammonia Oxidizer Activity			
	Media Distance, m	NH <sub>3</sub> mg/L-N	Nitrate mg/L - N	Nitrite mg/L -N	Mass Standard Method		Spectrophotometry Method	
					Nitrifier Fraction	Standard Deviation	Peak Area/ Mass	Standard Deviation
I (grab)	0	20.6	0	0				
C1	0.58	20.1	0	0.1	4.2%	0.095%	61.59	14.05
C2	1.42	20.9	0	0	4.1%	0.007%	39.06	9.73
C3	2.26	21.3	0	0	2.2%	1.446%	32.46	12.67
C4	3.07	21.2	0	0	1.3%	0.515%	17.97	4.94
C5	3.91	21.3	0	0.1				
C5	3.91	17.0	0	0				
N1	4.39	14.3	0.86	0.6	3.5%	0.07%	100.38	19.13
N2	5.28	9.7	3.92	0.71	3.0%	0.55%	105.42	18.44
N3	6.10	5.9	8.93	0.68	1.9%	1.21%	71.12	22.50
N4	6.91	2.9	13.32	0.13	3.6%		149.82	50.24
N5	7.75	1.6	15.2	0				



**Figure D-5. Column Profiles at 9.4 & 8.2 m/hr, 8/6/98. a. Nitrifier activity normalized to mass standards; b. Nitrifier activity normalized to nucleic acid mass; c. Chemical nitrogen species.**