

## COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY FOR THE HGB AREA

### INTRODUCTION

In August of 2007, the Texas Commission on Environmental Quality (TCEQ) conducted a survey to determine the current level of monitoring being performed on cooling tower heat exchange systems in the Houston-Galveston-Brazoria (HGB) ozone nonattainment area. Surveys were sent to 126 industry accounts and the TCEQ received information on 361 cooling tower heat exchange systems currently in volatile organic compound service. Not all surveys contained complete answers to every question and in order to avoid any misinterpretation of the survey responses, the summary presents the results as provided. The TCEQ greatly appreciates the strong industry participation during this survey and the information provided by industry to assist the TCEQ in better understanding how cooling tower heat exchange systems are being used and monitored in the HGB area.

The results of the Cooling Tower Heat Exchange System Survey for the HGB area are presented below. The original questions from the survey appear in blue font; the responses received to each question are summarized in the tables that follow each question and appear in italics.

### COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY RESULTS

<i>Cooling Towers Subject to the HRVOC Rules</i>	
<i>TOTAL</i>	<i>196</i>
<i>HARRIS COUNTY</i>	<i>131</i>
<i>PERIMETER COUNTIES</i>	<i>65</i>
<i>Cooling Towers NOT Subject to the HRVOC Rules</i>	
<i>TOTAL</i>	<i>165</i>
<i>HARRIS COUNTY</i>	<i>84</i>
<i>PERIMETER COUNTIES</i>	<i>81</i>

1. Please specify the cooling tower heat exchange system design capacity to circulate cooling water (in gallons per minute (gpm)).

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>gpm</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>0 - 7,999</i>	<i>23</i>	<i>18</i>	<i>5</i>
<i>8,000 - 25,000</i>	<i>71</i>	<i>46</i>	<i>25</i>
<i>25,000 - 49,999</i>	<i>52</i>	<i>35</i>	<i>17</i>
<i>50,000 - 74,999</i>	<i>18</i>	<i>12</i>	<i>6</i>
<i>75,000 - 99,999</i>	<i>10</i>	<i>7</i>	<i>3</i>
<i>100,000 +</i>	<i>22</i>	<i>13</i>	<i>9</i>
<i>Range: 0 gpm - 288,000 gpm</i>			

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>gpm</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>0 - 7,999</i>	<i>72</i>	<i>39</i>	<i>33</i>
<i>8,000 - 25,000</i>	<i>49</i>	<i>20</i>	<i>29</i>
<i>25,000 - 49,999</i>	<i>30</i>	<i>18</i>	<i>12</i>
<i>50,000 - 74,999</i>	<i>9</i>	<i>6</i>	<i>3</i>

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<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>gpm</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
75,000 - 99,999	3	1	2
100,000 +	0	0	0
No Response	2	0	2
Range: 50 gpm - 96,000 gpm			

**2. Please identify the applicable heat exchange system design.**

**Check all that apply:**

- Conventional tube and shell design
- Wet surface evaporator
- Finite volume system
- Jacketed reactor
- Other—please describe:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Design</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Conventional tube and shell design</i>	142	98	44
<i>Wet surface evaporator</i>	9	1	8
<i>Finite volume system</i>	0	0	0
<i>Jacketed reactor</i>	0	0	0
<i>Conventional tube and shell design + Other</i>	11	10	1
<i>Conventional tube and shell design + Jacketed reactor + Other</i>	4	0	4
<i>Conventional tube and shell design + Finite volume system</i>	7	7	0
<i>Conventional tube and shell design + Wet surface evaporator</i>	4	1	3
<i>Finite volume system + Other</i>	1	0	1
<i>Conventional tube and shell design + Finite volume system + Jacketed reactor</i>	1	1	0
<i>Conventional tube and shell design + Wet surface evaporator + Jacketed reactor + Other</i>	1	1	0
<i>Conventional tube and shell design + Jacketed reactor</i>	16	9	7

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Design</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Conventional tube and shell design</i>	94	58	36
<i>Wet surface evaporator</i>	15	2	13
<i>Finite volume system</i>	0	0	0
<i>Jacketed reactor</i>	0	0	0
<i>Other</i>	6	6	0
<i>Conventional tube and shell design + Jacketed reactor</i>	20	11	9
<i>Conventional tube and shell design + Other</i>	20	1	19
<i>Jacketed reactor + Other</i>	4	3	1
<i>Conventional tube and shell design + Finite volume system + Other</i>	2	2	0
<i>Conventional tube and shell design + Wet surface evaporator</i>	1	1	0

## COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY FOR THE HGB AREA

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Design</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Finite volume system + Other</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>No Response</i>	<i>2</i>	<i>0</i>	<i>2</i>

### 3. What type of process units does the cooling tower heat exchange system service?

Choose one:

- No units containing VOC
- VOC units only (no HRVOC)
- HRVOC units only
- Combination of HRVOC and other VOC units

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Process Unit Type</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>HRVOC units only</i>	<i>68</i>	<i>48</i>	<i>20</i>
<i>Combination of HRVOC and other VOC units</i>	<i>128</i>	<i>83</i>	<i>45</i>

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Process Unit Type</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>No units containing VOC</i>	<i>5</i>	<i>3</i>	<i>2</i>
<i>VOC units only (no HRVOC)</i>	<i>139</i>	<i>65</i>	<i>74</i>
<i>HRVOC units only</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>Combination of HRVOC and other VOC units</i>	<i>18</i>	<i>14</i>	<i>4</i>
<i>No VOC + No HRVOC</i>	<i>2</i>	<i>2</i>	<i>0</i>

### 4. Please list all HRVOC present in the heat exchange system at a concentration of 100 ppmw or greater and list all other VOC present in the heat exchange system at a concentration of 1.0 weight percent or greater.

*Note: Many additional compounds were listed in the survey results. The tables show the proportion of responses that included compounds originally considered as part the HRVOC rules plus some additional compounds of interest.*

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Compound</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Ethylene</i>	<i>128</i>	<i>88</i>	<i>40</i>
<i>Propylene</i>	<i>140</i>	<i>92</i>	<i>48</i>
<i>1,3-Butadiene</i>	<i>68</i>	<i>52</i>	<i>16</i>
<i>Butenes</i>	<i>101</i>	<i>76</i>	<i>25</i>
<i>Xylene</i>	<i>19</i>	<i>16</i>	<i>3</i>
<i>Toluene</i>	<i>24</i>	<i>14</i>	<i>10</i>
<i>Butane</i>	<i>87</i>	<i>57</i>	<i>30</i>
<i>Pentane</i>	<i>40</i>	<i>30</i>	<i>10</i>

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<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Compound</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Trimethyl Benzenes</i>	5	3	2
<i>Ethyl Toluenes</i>	1	0	1
<i>Formaldehyde</i>	0	0	0
<i>Pentenes</i>	9	1	8
<i>Isoprene</i>	4	2	2
<i>C3+ Aldehydes</i>	9	0	9
<i>Acetaldehyde</i>	4	3	1
<i>Styrene</i>	14	8	6

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Compound</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Butenes</i>	18	15	3
<i>Butane</i>	12	5	7
<i>Propylene</i>	10	6	4
<i>Xylene</i>	9	4	5
<i>Toluene</i>	8	6	2
<i>Ethylene</i>	5	4	1
<i>Pentane</i>	5	2	3
<i>Formaldehyde</i>	4	1	3
<i>Styrene</i>	4	3	1
<i>C3+ Aldehydes</i>	2	0	2
<i>Acetaldehyde</i>	2	1	1
<i>1,3-Butadiene</i>	1	1	0
<i>Trimethyl Benzenes</i>	0	0	0
<i>Ethyl Toluenes</i>	0	0	0
<i>Pentenes</i>	0	0	0
<i>Isoprene</i>	0	0	0

**5. Is the cooling water flow rate monitored?**

Choose one:

Yes

No

To be monitored in the future—please provide the date:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Response</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Yes</i>	177	124	53
<i>No</i>	19	7	12
<i>Future</i>	0	0	0

**COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY FOR THE HGB AREA**

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Response</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Yes</i>	67	27	40
<i>No</i>	98	56	42
<i>Future</i>	0	0	0
<i>No Response</i>	1	0	1

**(A) If yes, why is the flow rate monitored?**

- Chapter 115, Subchapter H, Division 2, HRVOC rules
- Permit requirement
- Non-regulatory/process monitoring
- Other—please specify:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Reason</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Chapter 115, Subchapter H, Division 2, HRVOC rules</i>	162	114	48
<i>Permit requirement</i>	0	0	0
<i>Non-regulatory/process monitoring</i>	5	3	2
<i>Other</i>	1	0	1
<i>Chapter 115, Subchapter H, Division 2, HRVOC rules + Non-regulatory/process monitoring</i>	5	5	0
<i>Chapter 115, Subchapter H, Division 2, HRVOC rules + Permit requirement</i>	3	1	2
<i>No Response</i>	1	1	0

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Reason</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Chapter 115, Subchapter H, Division 2, HRVOC rules</i>	0	0	0
<i>Permit requirement</i>	14	11	3
<i>Non-regulatory/process monitoring</i>	51	18	33
<i>Other</i>	3	0	3
<i>No Response</i>	98	55	43

\* One participant who answered No to question #5 answered Non-regulatory/process monitoring for question #5A.

**(B) If yes, please identify the method used to monitor the flow.**

**Choose one:**

- Continuous on-line flow monitor
- Manufacturer's pump performance data
- Pump pressure discharge monitor
- Other—please describe:

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<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Method</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Continuous on-line flow monitor</i>	162	112	50
<i>Manufacturer's pump performance data</i>	9	8	1
<i>Pump pressure discharge monitor</i>	4	3	1
<i>Other</i>	1	0	1
<i>Continuous on-line flow monitor + Manufacturer's pump performance data</i>	1	1	0
<i>Manufacturer's pump performance data + Pump pressure discharge monitor</i>	3	3	0

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Method</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Continuous on-line flow monitor</i>	33	8	25
<i>Manufacturer's pump performance data</i>	19	15	4
<i>Pump pressure discharge monitor</i>	8	0	8
<i>Other</i>	1	0	1
<i>Continuous on-line flow monitor + Other</i>	1	0	1
<i>No Response</i>	5	5	0

**(C) If yes, where is the flow monitored on the cooling tower?**

Choose one:

- Cooling tower inlet
- Downstream of the cooling tower inlet
- A location representative of the total flow rate to the cooling tower
- If subject to the HRVOC rules, a location representative of the flow of cooling water from only the HRVOC-containing process units
- Other—please describe:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Location</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Cooling tower inlet</i>	110	69	41
<i>Downstream of the cooling tower inlet</i>	4	4	0
<i>A location representative of the total flow rate to the cooling tower</i>	34	28	6
<i>If subject to the HRVOC rules, a location representative of the flow of cooling water from only the HRVOC-containing process units</i>	14	10	4
<i>Other</i>	10	8	2
<i>Cooling tower inlet + Downstream of the cooling tower inlet</i>	2	2	0
<i>Cooling tower inlet + Other</i>	1	1	0
<i>A location representative of the total flow rate to the cooling tower + Other</i>	2	2	0

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<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Location</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Cooling tower inlet</i>	17	13	4
<i>Downstream of the cooling tower inlet</i>	12	4	8
<i>A location representative of the total flow rate to the cooling tower</i>	15	1	14
<i>If subject to the HRVOC rules, a location representative of the flow of cooling water from only the HRVOC-containing process units</i>	0	0	0
<i>Other</i>	16	5	11
<i>No Response</i>	7	5	2

*\*In addition to the responses included in the table above, two participants that responded No to question #5 responded Other to question #5C.*

**6. Is the cooling tower heat exchange system subject to Chapter 115, Subchapter H, Division 2, HRVOC monitoring and testing requirements?**

- Yes
- No—Exempt under §115.767(1): Cooling water side pressure is greater than 5.0 psig higher than the process side pressure for exchangers with greater than 100 ppmw HRVOC.
- No—Exempt under §115.767(2): All heat exchangers contain less than or equal to 100 ppmw HRVOC in the process side fluid.
- No—Exempt under §115.767(4): System permanently out of service by April 1, 2006.
- No—Exempt under §115.767(5): System with an intervening cooling fluid containing less than 100 ppmw HRVOC between the process and the cooling water.

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Response</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Yes</i>	196	131	65

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Response</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Yes</i>	0	0	0
<i>No—Exempt under §115.767(1)</i>	7	7	0
<i>No—Exempt under §115.767(2)</i>	107	59	48
<i>No—Exempt under §115.767(5)</i>	9	5	4
<i>No—Exempt under §115.767(1) + §115.767(2)</i>	1	1	0
<i>No—Exempt under §115.767(1) + §115.767(5)</i>	2	1	1
<i>No—Exempt under §115.767(2) + §115.767(5)</i>	1	0	1
<i>No—Exempt under §115.767(1) + §115.767(2) + §115.767(5)</i>	1	1	0
<i>No Response</i>	37	10	27

## COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY FOR THE HGB AREA

**(A) If yes, please select the compliance method used to determine the VOC and/or HRVOC concentration.**

**Choose one:**

- §115.764(a)(2)-(5): Design capacity to circulate greater than 8,000 gallons per minute and continuous on-line VOC monitoring and periodic HRVOC sampling.
- §115.764(a)(6): Design capacity to circulate greater than 8,000 gallons per minute and continuous on-line monitoring of speciated HRVOC.
- §115.764(b)(2)-(5): Design capacity to circulate less than 8,000 gallons per minute and periodic VOC and HRVOC sampling.
- §115.764(b)(6): Design capacity to circulate less than 8,000 gallons per minute and continuous on-line monitoring of speciated HRVOC.
- §115.764(d): Monthly sampling option for systems containing less than 5.0 percent by weight HRVOC in the process side fluid.
- §115.764(h): Finite volume systems with design capacity to circulate greater than 8,000 gallons per minute.

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Compliance Method</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
§115.764(a)(2)-(5)	12	10	2
§115.764(a)(6)	146	96	50
§115.764(b)(2)-(5)	16	15	1
§115.764(b)(6)	3	1	2
§115.764(d)	19	9	10
§115.764(h)	1	1	0

*\* Five participants (all in perimeter counties) who responded they are not measuring flow in question #5 answered they are complying with the HRVOC rules using §115.764(d).*

**(B) If yes, please list any constituents monitored other than HRVOC. The list may include individual constituents (e.g., methane) or groups of compounds (e.g., C5+) if the compounds are monitored as a group.**

*Note: Many additional compounds were listed in the survey results. The tables show the proportion of responses that included compounds originally considered as part the HRVOC rules plus some additional compounds of interest.*

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Compound</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Ethylene</i>	166	116	50
<i>Propylene</i>	166	116	50
<i>1,3-Butadiene</i>	143	116	27
<i>Butenes</i>	143	116	27
<i>Xylene</i>	1	1	0
<i>Toluene</i>	1	1	0
<i>Butane</i>	77	54	23
<i>Pentane</i>	12	8	4

## COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY FOR THE HGB AREA

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Compound</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Trimethyl Benzenes</i>	0	0	0
<i>Ethyl Toluenes</i>	0	0	0
<i>Formaldehyde</i>	0	0	0
<i>Pentenes</i>	3	0	3
<i>Isoprene</i>	1	1	0
<i>C3+ Aldehydes</i>	0	0	0
<i>Acetaldehyde</i>	0	0	0
<i>Styrene</i>	5	5	0

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Compound</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Ethylene</i>	1	1	0
<i>Propylene</i>	1	1	0
<i>1,3-Butadiene</i>	1	1	0
<i>Butenes</i>	1	1	0
<i>Pentane</i>	1	1	0
<i>Xylene</i>	0	0	0
<i>Toluene</i>	0	0	0
<i>Butane</i>	0	0	0
<i>Trimethyl Benzenes</i>	0	0	0
<i>Ethyl Toluenes</i>	0	0	0
<i>Formaldehyde</i>	0	0	0
<i>Pentenes</i>	0	0	0
<i>Isoprene</i>	0	0	0
<i>C3+ Aldehydes</i>	0	0	0
<i>Acetaldehyde</i>	0	0	0
<i>Styrene</i>	0	0	0

**7. If the cooling tower heat exchange system is not subject to the Chapter 115, Subchapter H, HRVOC rules, is the VOC concentration in the cooling water monitored?**

**Choose one:**

Yes

No

To be monitored in the future—please provide the date:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Response</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Yes</i>	6	1	5
<i>No</i>	1	1	0
<i>Future</i>	2	2	0

**COOLING TOWER HEAT EXCHANGE SYSTEM SURVEY FOR THE HGB AREA**

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Response</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Yes</i>	98	42	56
<i>No</i>	63	41	22
<i>Future</i>	0		
<i>No Response</i>	4	1	3

**(A) If yes, why is the VOC concentration in the cooling water monitored?**

- Permit requirement
- Federal regulation
- Non-regulatory/process monitoring
- Other—please specify:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Reason</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Permit requirement</i>	6	2	4
<i>Federal regulation</i>	0		
<i>Non-regulatory/process monitoring</i>	2	1	1
<i>Other</i>	0		

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Reason</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Permit requirement</i>	62	29	33
<i>Federal regulation</i>	16	9	7
<i>Non-regulatory/process monitoring</i>	12	3	9
<i>Other</i>	1	0	1
<i>Permit requirement + Federal regulation + Non-regulatory/process monitoring</i>	2	0	2
<i>Permit requirement + Federal regulation</i>	5	1	4

**(B) If yes, how is the concentration monitored?**

- Air-stripping method in Appendix P or Air Permits El Paso Method RG108
- Water sampling method
- Continuous on-line monitor
- Other—please specify:

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Method</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Air-stripping method in Appendix P or Air Permits El Paso Method RG108</i>	4	2	2
<i>Water sampling method</i>	3	0	3
<i>Continuous on-line monitor</i>	0		
<i>Other</i>	0		

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<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Method</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Air-stripping method in Appendix P or Air Permits El Paso Method RG108 + Other</i>	1	1	0

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Method</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Air-stripping method in Appendix P or Air Permits El Paso Method RG108</i>	56	19	37
<i>Water sampling method</i>	33	17	16
<i>Continuous on-line monitor</i>	0		
<i>Other</i>	3	3	0
<i>Air-stripping method in Appendix P or Air Permits El Paso Method RG108 + Water sampling method</i>	2	0	2
<i>Water sampling method + Continuous on-line monitor</i>	3	2	1

\* One participant (in Harris County) that responded No to question #7 answered water sampling to this question.

**(C) If yes, is the VOC concentration monitored as total VOC or speciated VOC?**

- Total VOC
- Speciated VOC—Please list any constituents monitored. The list may include individual constituents (e.g., methane) or groups of compounds (e.g., C5+) if the compounds are monitored as a group.

<i>Cooling Towers Subject to the HRVOC Rules</i>			
<i>Compounds Monitored</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Total VOC</i>	3	2	1
<i>Speciated VOC</i>	4	1	3
<i>Total VOC + Speciated VOC</i>	1	0	1

<i>Cooling Towers NOT Subject to the HRVOC Rules</i>			
<i>Compounds Monitored</i>	<i>Total</i>	<i>Harris</i>	<i>Perimeter</i>
<i>Total VOC</i>	62	26	36
<i>Speciated VOC</i>	29	12	17
<i>Total VOC + Speciated VOC</i>	2	0	2