

**Countywide Recycling & Disposal Facility**  
**Ambient Air Monitoring**  
**Monthly Report #12**  
May 20, 2008

**To Fulfill the Requirements Set Forth in Order 5.A. of the Ohio EPA  
Director's Findings and Orders Dated March 28, 2007**

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**Countywide Recycling & Disposal Facility  
Ambient Air Monitoring  
Monthly Report #12  
May 20, 2008  
Monitoring Events #51 through 55**

**1.0 INTRODUCTION**

Beginning on Monday May 21, 2007 ambient air sampling is being conducted every six days as mandated by Order 5.A. of the Ohio EPA Director's Findings and Orders dated March 28, 2007. This report covers the analytical results from the following Monitoring Events.

- Event #51: Saturday March 22 to Sunday March 23.
- Event #52: Friday March 28 to Saturday March 29.
- Event #53: Thursday April 3 to Friday April 4.
- Event #54: Wednesday April 9 to Thursday April 10.
- Event #55: Tuesday April 15 to Wednesday April 16.

Air samples were collected over a 24-hour period at four locations: Bolivar Elementary School (School); the cell tower on the Countywide facility (Cell Tower); near the top of the hill at the KOA campground to the northeast of the landfill (Campground); and east of the landfill near the floodgates located on Gracemont, off the Tri-County horse trail (Wetland). (Figure 1). The normal specified route for trucks entering the Countywide facility is Dueber Road and Gracemont Road through a wetland, however, due to heavy flooding truck traffic has been routed through Sherman Church Road. The floodgates were opened and the normal traffic pattern was resumed on April 15, 2008 at approximately 1245. Since there are no people working or residing in the wetland, it is being considered a temporary location until such time as the Agency specifies a fourth permanent monitoring location. The campground is frequently in the area of impact predicted by the air model.

As specified by the Ohio EPA in Bryan Zima's March 28, 2007 letter to Jason Perdion of Baker & Hostetler, air samples were analyzed for the following groups of compounds:

- Volatile Organic Compounds (VOCs): EPA Method TO-15 modified with Tentatively Identified Compounds (TICs)
- Sulfur Compounds: EPA Method TO-15 modified
- Aldehydes and Ketones: EPA Method TO-11A
- Hydrogen Fluoride and Hydrogen Chloride: NIOSH Method 7903

All analyses were performed by Integrated Analytical Laboratory (IAL), Randolph, NJ. Certification numbers: ELAP-11402; NJDEP-14751; AIHA-100201.

As a conservative first evaluation, the concentrations of chemicals detected in the air samples were compared to the corresponding USEPA Region 9 Preliminary Remediation Goals (PRGs). The USEPA Region 9 PRG is the concentration of a chemical in the ambient air that is estimated to be without significant risk to a person who would breathe that level of chemical continuously over many decades. The Region 9 PRGs are derived using conservative mathematical formulas and do not represent the level of a chemical in the air (or other environmental media) where health effects are likely to occur. Region 9 PRGs are generally accepted as conservative screening values, such that if the concentration of a chemical in the air is less than the corresponding PRG, most public health officials and regulators are confident that there is no risk to human health. On the other hand, an analytical result that exceeds the corresponding PRG does not mean that there is an unacceptable risk to public health. The chemical that were detected in these Monitoring Events are commonly found at low levels in ambient air. For some compounds such as benzene, the mathematically-derived Region 9 PRG of 0.25 ug/m<sup>3</sup> is lower than the average background concentration of 1.96 ug/m<sup>3</sup> in ambient air in Ohio (Ohio EPA, *Portsmouth Ohio Air Quality Study 2003*). Consequently, finding certain chemicals in ambient air at levels above PRGs that are very close to analytical detection limits is not uncommon and may simply reflect fluctuations in background sources. It should be noted that not all of the compounds found in the air samples have corresponding PRGs.

Ambient environmental/climate conditions are discussed in Section 2.0. Results of the monitoring are discussed in Section 3.0 and summarized in Section 4.0 of this report. Analytical results from the laboratory are provided in the Appendices.

## **2.0 AMBIENT CONDITIONS**

The descriptions of ambient conditions are taken from the Daily Odor Monitoring Summary compiled by Countywide's consultant, Diversified Engineering. For those days when a Daily Odor Monitoring Summary was not available, ambient meteorological conditions were obtained from the "WeatherUnderground" website at <http://www.wunderground.com>.

### Event #51, Saturday/Sunday March 22/23, 2008:

March 22: Average temperature in degrees F: 31, Max. 37, Min. 24.

Winds were 13 mph with max gusts of 26 mph out of the NNE.

Average relative humidity 66% with 0.05 inches of precipitation recorded.

Complaints: There were no odor complaints during this time.

March 23: Average temperature in degrees F: 30, Max. 40, Min. 19

Winds were 5 mph with max gusts of 20 mph out of the NNE.

Average relative humidity 59% with no precipitation recorded.

Complaints: There were no odor complaints during this time.

Event #52, Friday/Saturday March 28/29, 2008:

March 28: Average temperature in degrees F: 36, Max. 43, Min. 28.

Winds were 6 mph with max gusts at 18 mph out of the N.

Average relative humidity 74% with 0.36-inches of precipitation recorded.

Complaints: There were no odor complaints during this time.

March 29: Average temperature in degree F: 34, Max. 46, Min. 23.

Winds were 1 mph out of the E.

Average relative humidity 54% with no precipitation recorded.

Complaints: Complaints occurred at 7:25am from I-77 north of the river bridge. Pump maintenance was a potentially odor-causing activities noted on the Daily Odor Monitoring Summary.

Event #53: Thursday/Friday April 03/04, 2008:

April 03: Average temperature in degrees F: 46, Max. 57, Min. 34.

Winds were 2 mph with max gusts at 17 mph out of the E/SE.

Average relative humidity 57% with 0.05- inches of precipitation recorded.

Complaints: Complaints occurred at 7:45am, 8:02am, 8:35am, and 9:13am from I-77 between mile markers 95-96; 10:18am from Sherman Church Ave., north of Hudson; 2:06pm from Sherman Church Avenue, south of Haut; and 8:08pm from Sherman Church Ave. between Gracemont and Haut. Drilling of PW-346, PW-347, and PW-348; pump maintenance; pipeline maintenance; pipeline construction; temporary cap repair; and intermediate soil cover repair were potentially odor-causing activities noted on the Daily Odor Monitoring Summary.

April 04: Average temperature in degrees F: 48, Max. 60, Min. 35.

Winds were 20 mph out of the WSW.

Average relative humidity 74% with 0.02-inches of precipitation recorded.

Complaints: There were no odor complaints during this time.

Event #54: Wednesday/Thursday April 09/10, 2008:

April 09: Average temperature in degrees F: 64, Max. 73, Min. 50

Winds were 5 mph with max gusts at 22 mph out of variable directions.

Average relative humidity was 52% with 0.01-inches of precipitation recorded.

Complaints: Complaints occurred at 7:42am from I-77 at mile marker 97; and at 9:27am from I-77 between mile markers 97-96. Flare 9 startup; Flare 4 shutdown; RW-3, RW-1 pump change outs; pipeline construction; and temporary cap repair were potentially odor-causing activities noted on the Daily Odor Monitoring Summary.

April 10: Average temperature in degrees F: 53, Max. 70, Min. 37.

Winds were calm with max speed of 8 mph out of the E.

Average relative humidity was 49% with no precipitation recorded.

Complaints: Complaints occurred at 6:56am from East Street in Bolivar; at 7:25pm from Sherman Church Ave in Bolivar; and at 9:24 from Sherman Church Ave. Extraction well drilling; flare 4, 5, 9; pipeline construction; RW-3, RW-2 pump maintenance; and pump maintenance were potentially odor-causing activities noted on the Daily Odor Monitoring Summary.

Event #55, Tuesday/Wednesday April 15/16, 2008:

April 15: Average temperature in degrees F: 42, Max. 57, Min. 28  
Winds were calm.

Average relative humidity 52% with no precipitation recorded.

Complaints: There were no odor complaints during this time.

April 16: Average temperature in degrees F: 50, Max. 70, Min. 30.

Winds were calm with max gusts of 16 mph out of the SE.

Average relative humidity was 45% with no precipitation recorded.

Complaints: Complaints occurred at 8:49am from Fohl Rd; and at 9:35am from Sherman Church Ave. Well drilling; RW-1 maintenance; pump maintenance; pipeline construction; and temporary cap maintenance, Cell 7 Haul Rd. were potentially odor-causing activities noted on the Daily Odor Monitoring Summary.

It should be noted that during the monitoring events included in this report, odor complaints were most frequent when the winds were blowing from an easterly direction.

### **3.0 ANALYTICAL RESULTS**

The laboratory analyzed the air samples for a large number of chemicals. Only those results that exceeded Region 9 PRGs will be discussed in the body of the report. Other compounds may have been detected in a sample, but were quantified at concentrations below the respective PRG. All of the analytical results from the laboratory are provided in the Appendices.

#### **3.1 Volatile Organic Compounds**

Compounds detected by Method TO-15 modified are summarized in Tables 1 through 5. Method TO-15 analyzes air samples collected in a summa canister for the presence of an extensive list of volatile organic compounds. In addition to a "standard analyte" list, this method also has the capability to tentatively identify and estimate the concentration of numerous compounds that are not on the "standard" list. These Tentatively Identified Compounds (TICs) include some compounds for which there are other specific analytical methods. Of particular relevance to interpreting the data from this monitoring effort is the fact that Method TO-15 identifies acetaldehyde, a carbonyl compound that is a specific target for Method TO-11A. All results for acetaldehyde will be discussed in Section 3.3. Data reports from the analytical laboratory are provided in the Appendices. Results that exceeded corresponding Region 9 PRGs and any other relevant findings are discussed below. Chemicals that were detected below PRGs will not be discussed unless those particular results help to explain other findings.

Event #51, March 22/23, 2008:

Analytical results for Method TO-15 for Event #51 are summarized in Table 1 and provided in Appendix A. Five compounds were measured at levels above their respective PRG. The prevailing wind direction was from the north-northeast for 3/22 and 3/23.

**Event #51: VOCs Detected Above PRGs  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 3/22 Down : 3/23 Down	<b>Cell Tower</b> 3/22 Down/Cross : 3/23 Down/Cross	<b>Campground</b> 3/22 Up : 3/23 Up	<b>Wetland</b> 3/22 Cross : 3/23 Cross
Benzene	<b>0.25</b>	<b>6.1</b>	<b>118</b>	<b>13</b>	<b>7.2</b>
1,3-Butadiene	<b>0.061</b>	<b>2.3</b>	<b>2.7</b>	<b>2.6</b>	<b>2.3</b>
Methylene Chloride	<b>4.1</b>	<b>4.9</b>	<b>12</b>	3.0	<b>4.4</b>
1,2,4- Trimethylbenzene	<b>6.2</b>	<b>9.7</b>	<b>10</b>	<b>25</b>	<b>11</b>
Acetaldehyde (TIC)	<b>0.87</b>	<b>16</b>	<b>25</b>	ND	<b>17</b>

Event #52, March 28/29, 2008:

Analytical results for Method TO-15 for Event #52 are summarized in Table 2 and provided in Appendix B. Three compounds were measured at levels above their respective PRG. When the monitoring began on 3/28 the prevailing wind direction was from the north. By 3/29 the wind direction was from the east.

**Event #52: VOCs Detected Above PRGs  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 3/28 Down : 3/29 Cross	<b>Cell Tower</b> 3/28 Cross : 3/29 Down	<b>Campground</b> 3/28 Up : 3/29 Cross	<b>Wetland</b> 3/28 Cross : 3/29 Up
Benzene	<b>0.25</b>	<b>5.8</b>	<b>131</b>	<b>7.7</b>	<b>13</b>
1,3-Butadiene	<b>0.0061</b>	<b>2.4</b>	<b>2.7</b>	<b>3.6</b>	<b>2.7</b>
Acetaldehyde (TIC)	<b>0.87</b>	<b>18</b>	<b>29</b>	<b>22</b>	<b>23</b>

Event #53, April 03/04, 2008:

Analytical results for Method TO-15 for Event #53 are summarized in Table 3 and provided in Appendix C. Six compounds were measured at levels above their respective PRG. When the monitoring began on 4/03 the prevailing wind direction was from the east/southeast. By 4/04 the wind direction was from the west-southwest.

**Event #53: VOCs Detected Above PRGs  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 4/3 Cross : 4/4 Cross	<b>Cell Tower</b> 4/3 : Down : 4/4 Up	<b>Campground</b> 4/3 Cross : 4/4 Cross	<b>Wetland</b> 4/3 Up : 4/4 Cross
Benzene	<b>0.25</b>	<b>16</b>	<b>4.9</b>	<b>2.4</b>	<b>115</b>
1,3-Butadiene	<b>0.061</b>	<b>8.4</b>	<b>2.7</b>	<b>2.7</b>	<b>5.9</b>
Methylene Chloride	<b>4.1</b>	2.0	<b>316</b>	2.0	2.1
1,2,4- Trimethylbenzene	<b>6.2</b>	<b>6.6</b>	5.6	5.3	6.0
Vinyl Chloride	<b>0.11</b>	<b>2.4</b>	ND	ND	<b>1.7</b>
Acetaldehyde (TIC)	<b>0.87</b>	<b>68</b>	ND	<b>22</b>	<b>56</b>
Ethylene Oxide (TIC)	<b>0.019</b>	ND	<b>12</b>	ND	ND

Event #54, April 09/10, 2008:

Analytical results for Method TO-15 for Event #54 are summarized in Table 4 and provided in Appendix D. Seven compounds were measured at levels above their respective PRG. When the monitoring event began on 4/09 the prevailing winds were variable. By 4/10 the winds were coming from the east.

**Event #54: VOCs Detected Above PRGs  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 4/9 Var : 4/10 Cross	<b>Cell Tower</b> 4/9 Var : 4/10 Down	<b>Campground</b> 4/9 Var : 4/10 Cross	<b>Wetland</b> 4/9 Var : 4/10 Up
Benzene	<b>0.25</b>	<b>64</b>	<b>13</b>	<b>180</b>	<b>13</b>
1,3-Butadiene	<b>0.061</b>	<b>13</b>	<b>4.5</b>	<b>13</b>	<b>3.9</b>
Chloroethane	<b>2.3</b>	2.1	ND	<b>3.1</b>	ND
Methylene Chloride	<b>4.1</b>	3.1	<b>161</b>	3.2	4.1
1,2,4- Trimethylbenzene	<b>6.2</b>	<b>20</b>	<b>10</b>	<b>16</b>	<b>7.7</b>
Vinyl Chloride	<b>0.11</b>	<b>3.7</b>	ND	<b>4.5</b>	ND
Acetaldehyde (TIC)	<b>0.87</b>	<b>88</b>	<b>36</b>	ND	<b>31</b>

Event #55, April 15/16, 2008:

Analytical results for Method TO-15 for Event #55 are summarized in Table 5 and provided in Appendix E. Five compounds were measured at levels above their respective PRG. When the monitoring began on 4/15 there was no measurable wind. By 4/16 the wind direction was from the southeast.

**Event #55: VOCs Detected Above PRGs  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 4/15 None : 4/16 Up	<b>Cell Tower</b> 4/15 None : 4/16 Cross/Up	<b>Campground</b> 4/15 None : 4/16 Down	<b>Wetland</b> 4/15 None : 4/16 Cross
Benzene	<b>0.25</b>	<b>7.0</b>	<b>10</b>	<b>2.9</b>	<b>54</b>
1,3-Butadiene	<b>0.061</b>	<b>7.7</b>	<b>7.0</b>	<b>3.3</b>	<b>7.4</b>
1,2,4-Trimethylbenzene	<b>6.2</b>	<b>7.0</b>	<b>9.4</b>	<b>6.3</b>	6.2
Vinyl Chloride	<b>0.11</b>	<b>1.4</b>	ND	ND	<b>1.8</b>
Acetaldehyde (TIC)	<b>0.87</b>	<b>47</b>	<b>54</b>	<b>23</b>	<b>58</b>

**3.2 Sulfur Compounds**

Event #51, March 22/23, 2008:

No sulfur-containing compounds were detected for this event.

Event #52, March 28/29, 2008:

No sulfur-containing compounds were detected for this event.

Event #53, April 03/04, 2008:

No sulfur-containing compounds were detected for this event.

Event #54, April 09/10, 2008:

Carbon disulfide results for Method TO-15 for Event #54 are summarized below and provided in Appendix D.

**Event #54: Sulfur Compounds  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 4/9 Var : 4/10 Cross	<b>Cell Tower</b> 4/9 Var : 4/10 Down	<b>Campground</b> 4/9 Var : 4/10 Cross	<b>Wetland</b> 4/9 Var : 4/10 Up
Carbon disulfide	<b>730</b>	ND	ND	6.9	7.3

Event #55, April 15/16, 2008:

Carbon disulfide results for Method TO-15 for Event #55 are summarized on the following page and provided in Appendix E.

**Event #55: Sulfur Compounds  
Concentrations in ug/m3**

<b>Compound</b>	<b>PRG</b>	<b>School</b> 4/15 None : 4/16 Up	<b>Cell Tower</b> 4/15 None : 4/16 Cross/Up	<b>Campground</b> 4/15 None : 4/16 Down	<b>Wetland</b> 4/15 None : 4/16 Cross
Carbon disulfide	<b>730</b>	ND	ND	2.2	ND

**3.3 Aldehydes and Ketones**

In order to obtain a continuous 24 hours of data, three separate gel collection tubes were sequentially exposed to ambient air for a period of approximately 8-hours each. Consequently there are three separate sample results for each location for each monitoring event.

Event #51, March 22/23, 2008:

Analytical results for aldehydes are summarized below. Formaldehyde was detected in one of the three samples from the Cell Tower, Campground, and Wetland at a level above the Region 9 PRG. Acetaldehyde was estimated at levels above the PRG by Method TO-15 in the samples from the School, Cell Tower, and Wetland, but was only detected in one of the three samples from the Campground and Wetland using Method TO-11A. The levels detected at the Campground and Wetland was at levels below the Region 9 PRG. Analytical results are in Appendix A.

**Event #51: Aldehydes  
Concentrations in ug/m3**

<b>Aldehyde</b>	<b>PRG</b>	<b>School</b>			<b>Cell Tower</b>			<b>Campground</b>			<b>Wetland</b>		
		3/22 Down : 3/23 Down			3/22 Down/Cross : 3/23 Down/Cross			3/22 Up : 3/23 Up			3/22 Cross : 3/23 Cross		
		1	2	3	1	2	3	1	2	3	1	2	3
Formaldehyde	<b>0.15</b>	ND	ND	ND	ND	ND	<b>0.23</b>	ND	ND	<b>0.54</b>	ND	ND	<b>1.5</b>
Acetaldehyde TO-11A	<b>0.87</b>	ND	ND	ND	ND	ND	ND	ND	ND	0.63	ND	ND	0.79
Acetaldehyde TO-15 (TIC)	<b>0.87</b>	<b>16</b>			<b>25</b>			ND			<b>17</b>		

Event #52, March 28/29, 2008:

No carbonyl compounds were present above detection limits of EPA Method TO-11A in any of the samples collected during this event. Acetaldehyde was reported as a TIC by Method TO-15 at all four locations at levels above the Region 9 PRG. Analytical results are in Appendix B.

Event #53, April 03/04, 2008:

No carbonyl compounds were present above detection limits of EPA Method TO-11A in any of the samples collected during this event. Acetaldehyde was reported as a TIC by Method TO-15 at the School, Campground, and Wetland at levels above the Region 9 PRG. Analytical results are in Appendix C.

Event #54, April 09/10, 2008:

Formaldehyde was detected in one of the three samples from the Cell Tower; two of the three samples from the Campground; and two of the three samples from the Wetland at levels above the Region 9 PRG. As indicated previously, acetaldehyde was reported as a TIC by Method TO-15 at the School, Cell Tower, and Wetland, but was not detected in any of the samples by Method TO-11A. Analytical results are in Appendix D.

**Event #54: Aldehydes  
Concentrations in ug/m3**

Aldehyde	PRG	School 4/9 Var : 4/10 Cross			Cell Tower 4/9 Var : 4/10 Down			Campground 4/9 Var : 4/10 Cross			Wetland 4/9 Var : 4/10 Up		
		1	2	3	1	2	3	1	2	3	1	2	3
Formaldehyde	<b>0.15</b>	ND	ND	ND	ND	<b>0.21</b>	ND	<b>0.23</b>	ND	<b>0.40</b>	<b>0.23</b>	ND	<b>0.54</b>
Acetaldehyde TO-11A	<b>0.87</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetaldehyde TO-15 (TIC)	<b>0.87</b>	<b>88</b>			<b>36</b>			ND			<b>31</b>		

Event #55, April 15/16, 2008:

Formaldehyde was detected in one of the three samples from the Cell Tower; one of three samples from the Campground; and two of the three samples from the Wetland at levels above the Region 9 PRG. As indicated previously, acetaldehyde was reported as a TIC by Method TO-15 at the Campground and Wetland, but was detected in one of the three samples from the Campground by Method TO-11A. The level detected at the Campground was at a level below the PRG. Analytical results are in Appendix E.

**Event #55: Aldehydes  
Concentrations in ug/m3**

Aldehyde	PRG	School 4/15 None : 4/16 Up			Cell Tower 4/15 None : 4/16 Cross/Up			Campground 4/15 None : 4/16 Down			Wetland 4/15 None : 4/16 Cross		
		1	2	3	1	2	3	1	2	3	1	2	3
Formaldehyde	<b>0.15</b>	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.75</b>	<b>0.21</b>	ND	<b>0.50</b>
Acetaldehyde TO-11A	<b>0.87</b>	ND	ND	ND	ND	ND	ND	ND	ND	0.23	ND	ND	ND
Acetaldehyde TO-15 (TIC)	<b>0.87</b>	<b>47</b>			<b>54</b>			<b>23</b>			<b>58</b>		

### 3.4 Hydrogen Chloride and Hydrogen Fluoride

As with the aldehyde and ketone samples, three separate gel collection tubes were sequentially exposed to ambient air for a period of approximately 8-hours each. Consequently there are three separate sample results for each location for each monitoring event. The concentrations of HF and HCl in the air are quantified based on the mass of fluoride and chloride ion captured on the gel inside the tubes and the volume of air that was passed through the tube.

Analytical results for sampling events #51 through #55 are summarized on the following pages. All detected concentrations were very low, and were orders of magnitude below the PRG of  $210 \text{ ug/m}^3$  for HCl.

#### Event #51, March 22/23, 2008:

Hydrogen fluoride was detected at a concentration of  $2.1 \text{ ug/m}^3$  in the third sample tube from the Wetland. Hydrogen chloride was not detected in any of the samples from any of the four locations. Analytical results are in Appendix A.

#### Event #52, March 28/29, 2008:

Hydrogen fluoride was not detected in any of the samples from any of the four locations. Hydrogen chloride not was detected any of the samples from any of the four locations. Analytical results are in Appendix B.

#### Event #53, April 03/04, 2008:

Hydrogen fluoride was not detected in any of the samples from any of the four locations. Hydrogen chloride was detected at a concentration of  $0.92 \text{ ug/m}^3$  in the second sample tube from the Cell Tower;  $0.94 \text{ ug/m}^3$  in the third sample tube from the Cell Tower; and  $18 \text{ ug/m}^3$  in the second sample tube from the Wetland. Hydrogen chloride was also detected in the field blank at a concentration of  $0.40 \text{ ug}$ . The reporting limit for hydrogen chloride is  $0.40 \text{ ug}$ . Analytical results are in Appendix C.

#### Event #54, April 09/10, 2008:

Hydrogen fluoride was not detected in any of the samples from any of the four locations. Hydrogen chloride not was detected any of the samples from any of the four locations. Analytical results are in Appendix D.

#### Event #55, April 15/16, 2008:

Hydrogen fluoride was not detected in any of the samples from any of the four locations. Hydrogen Chloride was detected at a concentration of  $0.88 \text{ ug/m}^3$  in the third sample tube from the Cell Tower. Analytical results are in Appendix E.

## **4.0 SUMMARY**

The results for the monitoring events from the end of March through mid-April were consistent with results from recent months for aldehydes and HF/HCl. However, the VOC results from the monitoring events covered by this report were somewhat different from previous results in that several analytes that were only rarely detected in any previous samples and one analyte (vinyl chloride) that had never been detected previously were reported to be present. Monitoring results are discussed in greater detail below.

### **4.1 Aldehydes (Carbonyl Compounds)**

Aldehydes (primarily formaldehyde and acetaldehyde) were only rarely detected by Method TO-11A and at very low concentrations (less than 1 ug/m<sup>3</sup>). The most significant source of formaldehyde (and other related aldehydes) in ambient air is from motor vehicle exhaust. Although the levels of formaldehyde found in samples from the ambient monitoring stations exceeded the very conservative Region PRG of 0.15 ug/m<sup>3</sup>, the levels are well within the range reported from areas (including locations in Ohio) where there is motor vehicle traffic. As summarized on pages 299-300 of the ATSDR Toxicological Profile for Formaldehyde (July 1999), a number of studies have been conducted documenting that formaldehyde is a common constituent of ambient air in the US. The concentrations of formaldehyde found in the Countywide Ambient Air Monitoring Program are consistent with the range of concentrations reported in these studies.

After almost twelve months of monitoring, it is apparent that motor vehicle emissions is the most likely source of the formaldehyde (and other aldehydes) found in the ambient air and not the landfill. Furthermore the risk posed by levels of aldehydes in ambient air around Countywide landfill is similar to that in other areas of the US. A Data Reduction Request is being prepared that will present justification for terminating further sampling for aldehydes by Method TO-11A.

### **4.2 Hydrogen Fluoride and Hydrogen Chloride**

Consistent with the results of previous rounds of sampling, hydrogen fluoride and hydrogen chloride were rarely detected in any of the samples and at very low concentrations below any health-based guidelines when they were present. It is clear that the levels of HF and HCl occasionally found in the ambient air around Countywide landfill do not pose a risk to public health and continued sampling for these compounds will not yield information that is relevant managing the situation at the landfill. A Data Reduction Request is being prepared that will present justification for terminating further sampling for HF and HCl.

### 4.3 Volatile Organic Compounds

Spuriously high concentrations of methylene chloride and benzene have been sporadically reported throughout the monitoring program and do not appear related to any specific ambient source. This continues to be the case for the monitoring events included in this report. Most of the VOCs detected above Region 9 PRGs, including benzene, 1, 3-butadiene, 1, 2, 4-trimethylbenzene and acetaldehyde have significant vehicle emission sources. Methylene chloride is a typical laboratory contaminant that is also present in many commercial products including aerosol paints, automotive and machinery refinishing paints, automotive body polish and cleaners, household cleaners, household insecticides, etc.

As discussed in previous reports, the origin of the benzene concentrations is not known and no clear pattern has emerged. The frequent changes in wind direction and complex topography make it difficult to clearly distinguish the upwind and downwind relationship of the monitoring stations relative to the landfill during many of the sampling events. Any given monitor may be influenced by numerous potential sources of VOCs during a 24-hour period.

However, it should be noted that high concentrations of benzene (similar to those sporadically reported from our monitoring) have been documented in areas with heavy motor vehicle traffic, including USEPA monitoring along highways in the New Orleans, LA area following Hurricane Katrina and a recent study in Mumbai, India (USEPA TAGA Results; Srivastava et al., 2006). While there is no plausible mechanism for the high concentrations of benzene occasionally detected at the monitoring stations to have originated from the landfill, they may be attributable to high-level short-term emissions from motor vehicles. The potential sources of the apparent benzene anomalies continue to be under investigation.

Although 1, 3-butadiene has been detected on rare occasion in the past, this compound has been present in almost every sample from every monitoring location starting with Event #49 on March 10/11. Regardless of location or meteorological conditions (wind direction) during the sampling time, the concentrations of 1, 3-butadiene that have been detected are consistently within a narrow range (1.5 to 13 ug/m<sup>3</sup>). The most common source of 1, 3-butadiene in ambient air is motor vehicle emissions, with oil refineries, and rubber and plastics manufacturing being lesser contributors. In high traffic areas, 1, 3-butadiene is released almost continuously. The levels of 1, 3-butadiene detected at the monitoring stations around Countywide are within the range of values reported from studies conducted in the US (ATSDR Toxicological Profile for 1, 3-Butadiene; California Environmental Protection Agency-Air resources Board; Scorecard.org; USEPA TTN Air Toxics Website). The fact that the concentrations are similar amongst all four monitoring locations strongly suggests that this compound is primarily coming from motor vehicle traffic and reflects regional air quality and is not specifically related to the landfill.

1, 2, 4-Trimethylbenzene, which is also a component of motor vehicle emissions was found in all samples from all locations during all sampling events except for Event # 52

on March 28/29. 1, 2, 4-Trimethylbenzene concentrations ranged from 5.3 to 25 ug/m<sup>3</sup>. There was no obvious correlation between levels of 1, 2, 4-trimethylbenzene and location with regard to wind direction. This strongly suggests that this compound reflects regional air quality and is not specifically related to the landfill.

Vinyl chloride had not been detected in any of the ambient air samples under this monitoring program until Events #53, 54 and 55 beginning in April. Very low levels of vinyl chloride (1.4, 1.8, 3.7 ug/m<sup>3</sup>) were reported in the samples from the school. The school was not in the downwind direction with respect to the landfill during any of those three monitoring events. During Events #53 and 55, vinyl chloride was found in the samples from the wetland at 1.7 and 1.8 ug/m<sup>3</sup>. The wetland was either upwind or crosswind with respect to the landfill on both of those occasions. During Event #54, vinyl chloride was found in the sample from the campground at 4.5 ug/m<sup>3</sup>. Winds were variable during that time period.

Vinyl chloride has rarely been detected in samples of ambient air (ATSDR Toxicological Profile for Vinyl Chloride). Vinyl chloride is a typical constituent of non-hazardous waste landfill gases, so there is nothing unusual about the fact that it is a constituent of the landfill gas at Countywide. The fact that the vinyl chloride concentrations were similar amongst all locations and the fact that none of the locations was downwind of the landfill during the monitoring events when this compound was found argues strongly against the landfill being the source.

#### **4.4 Laboratory Issues**

The February 7, 2008 DFFO mandated that a second set of summa canisters be co-located with the summa canisters collected during two of the regularly scheduled monitoring events and submitted to the Ohio EPA laboratory for Method TO-15 modified analysis to help determine if the benzene is an artifact of the sampling and analysis process. Three co-located sampling events specified by the DFFO were completed during Events #45 - #47. As of April 15, the Ohio EPA laboratory was in the process of comparing their analytical results to those from Integrated Analytical Laboratories. Ohio EPA (Phil Downey) has shared their results with us. We are in the process of comparing the results from the Ohio EPA laboratory to those from Integrated Analytical Laboratories.

#### **4.5 Conclusion**

After almost a year of monitoring, no clear pattern has emerged that implicates the landfill as either the sole source, or even a major source of the various compounds present in the ambient air around Countywide. The majority of the constituents found in ambient air are primarily associated with motor vehicle emissions. A few of the chemicals are almost certainly laboratory contaminants (i.e. methylene chloride) or originated from ephemeral sources in very close proximity to the monitors. It is very likely that the air monitoring program has been characterizing regional ambient air

quality related to multiple sources rather than characterizing potential exposures directly related to Countywide RDF.

## 5.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Formaldehyde*. U.S. Public Health Service, July 1999. (pg. 299-300).

Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for 1, 3-Butadiene*. U.S. Public Health Service, July 1992. (pg. 62-63).

Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Vinyl Chloride*. U.S. Public Health Service, September 1977. (pg. 163-164).

California Environmental Protection Agency-Air Resources Board. *Initial Statement of Reasons for Rulemaking: Proposed Identification of 1, 3-Butadiene as a Toxic Air Contaminant; Staff Report/Executive Summary*. May 1992.

1, 3-Butadiene ([www.scorecard.org/chemical-profiles/html/13butadiene.html](http://www.scorecard.org/chemical-profiles/html/13butadiene.html))

A. Srivastava, S.N. Nair, A.E. Joseph. *Ambient concentration of benzene in air due to vehicular movement in Mumbai*. *Current Science*, 91(10):1315-1318.

USEPA. 1, 3-Butadiene. *Technology Transfer Network, Air Toxics Website*, ([www.epa.gov/ttn/atw/hlthef/butadien.html](http://www.epa.gov/ttn/atw/hlthef/butadien.html))

USEPA. *TAGA Results; Hurricane Katrina Response-Response to 2005 Hurricanes*. ([www.epa.gov/katrina/testresults/air/taga.html](http://www.epa.gov/katrina/testresults/air/taga.html))

**Countywide Recycling & Disposal Facility  
Ambient Air Monitoring  
Monthly Report #12**

May 20, 2008

**EPA Method TO-15 SUMMARY TABLES**

<b>Countywide Recycling &amp; Disposal Facility</b>					
<b>EPA Method TO-15 Modified: Volatile Organic Compounds</b>					
<b>Table 1: Event #51 March 22/23, 2008</b>					
Analyte	PRG	Monitoring Location			
		School	Cell Tower	Campground	Wetland
		3/22 Down : 3/23 Down	3/22 Down/Cross : 3/23 Down/Cross	3/22 Up : 3/23 Up	3/22 Cross : 3/23 Cross
All results in ug/m3					
<b>Method TO-15 Modified</b>					
Acetone	3300	103	91	ND	93
Benzene	0.25	6.1	118	13	7.2
1,3-Butadiene	0.061	2.3	2.7	2.6	2.3
tert-Butyl alcohol	NA	88	85	105	117
Chloromethane	95	4.2	6.5	5.1	3.9
Cyclohexane	6200	ND	ND	3.8	ND
Dichlorodifluoromethane	210	7.2	9.8	45	6.4
Ethylbenzene	1100	8.5	7.5	10	10
4-Ethyltoluene	NA	ND	ND	4.9	2.5
Heptane	NA	21	23	17	22
Hexane	210	4.9	5.7	23	4.8
Methyl ethyl ketone	5100	39	39	24	38
Methyl isobutyl ketone	3100	6.0	5.1	8.4	5.7
Methylene chloride	4.1	4.9	12	3.0	4.4
Toluene	400	20	19	38	24
1,1,1-Trichloroethane	2300	ND	ND	3.9	ND
Trichlorofluoromethane	730	ND	3.3	3.5	ND
1,2,4-Trimethylbenzene	6.2	9.7	10	25	11
1,3,5-Trimethylbenzene	6.2	ND	2.8	5.4	ND
2,2,4-Trimethylpentane	NA	ND	ND	3.3	ND
m/p-Xylene	110	28	26	37	32
o-Xylene	110	8.2	9.6	14	9.3
<b>Tentatively Identified Compounds</b>					
Acetaldehyde	0.87	16	25	ND	17
Acetonitrile	62	ND	6.7	ND	ND
Allene	NA	ND	ND	ND	299
Butanal	NA	13	18	ND	15
Butane, 2-methyl-	NA	ND	ND	32	ND
Decane, 3-cyclohexyl	NA	ND	ND	38	ND
Heptane, 3-methylene	NA	55	22	ND	60
1-Heptene	NA	33	14	ND	36
1-Hexene	NA	16	11	ND	19
Isobutane	NA	ND	ND	31	ND
1R- .alpha. -Pinene	NA	22	25	ND	26
Pentane	NA	ND	ND	15	ND
Pentane, 2-methyl	NA	ND	ND	14	ND
2-Pentanone	NA	13	ND	ND	15
1-Pentene	NA	11	9.2	ND	12

Analyte	PRG	Monitoring Location			
		School	Cell Tower	Campground	Wetland
		3/22 Down : 3/23 Down	3/22 Down/Cross : 3/23 Down/Cross	3/22 Up : 3/23 Up	3/22 Cross : 3/23 Cross
All results in ug/m3					
Propane	NA	ND	ND	15	ND
Propene	NA	ND	7.6	ND	ND
1-Propene-2-methyl	NA	36	38	28	31
Propyne	NA	317	ND	ND	ND
Tetradecane	NA	ND	ND	58	ND
Tridecane, 7-methyl	NA	ND	ND	41	ND
Undecane, 2,6-dimethyl-	NA	ND	ND	29	ND
ND = Not Detected					
NA = Not Available					
Shading indicates result exceeds PRG					

Countywide Recycling & Disposal Facility					
EPA Method TO-15 Modified: Volatile Organic Compounds					
Table 2: Event #52 March 28/29, 2008					
Analyte	PRG	Monitoring Location			
		School	Cell Tower	Campground	Wetland
		3/28 Down : 3/29 Cross	3/28 Cross : 3/29 Down	3/28 Up : 3/29 Cross	3/28 Cross : 3/29 Up
All results in ug/m3					
<b>Method TO-15 Modified</b>					
Acetone	3300	177	119	166	268
Benzene	0.25	5.8	131	7.7	13
1,3-Butadiene	0.061	2.4	2.7	3.6	2.7
tert-Butyl alcohol	NA	35	111	136D	369D
Chloromethane	95	7.1	7.8	5.1	4.5
Dichlorodifluoromethane	210	8.8	8.2	7.5	6.8
Ethylbenzene	1100	5.1	11	8.5	11
4-Ethyltoluene	NA	ND	2.6	ND	ND
Heptane	NA	22	32	30	45
Hexane	210	9.2	6.2	6.7	6.6
Methyl ethyl ketone	5100	34	53	51	67
Methyl isobutyl ketone	3100	4.8	8.5	9.7	8.4
Methylene chloride	4.1	2.0	6.1	2.4	2.3
Toluene	400	28	29	24	26
Trichlorofluoromethane	730	3.5	3.2	3.0	3.0
1,2,4-Trimethylbenzene	6.2	12	10	9.7	9.2
1,3,5-Trimethylbenzene	6.2	ND	2.5	ND	ND
2,2,4-Trimethylpentane	NA	2.5	ND	2.8	3.3
m/p-Xylene	110	18	34	28	35
o-Xylene	110	5.9	9.6	8.5	9.8
<b>Tentatively Identified Compounds</b>					
Acetaldehyde	0.87	18	29	22	23
Acetonitrile	62	ND	14	74	14
Butanal	NA	ND	25	17	35
Butane	NA	ND	ND	ND	ND
1-Butene	NA	ND	ND	ND	ND
3-Butanoic acid	NA	ND	ND	ND	ND
Cyclopropanecarboxamide	NA	ND	ND	ND	ND
Ethanol	NA	ND	ND	ND	ND
Ethanimidic acid, ethyl ester	NA	ND	ND	ND	ND
Heptane, 3-methylene-	NA	22	44	73	115
Heptafluorobutyric anhydride	NA	184	ND	ND	ND
1-Heptene	NA	20	20	81	44
Hexanal	NA	14	23	19	18
1-Hexene	NA	15	ND	21	19
Isobutane	NA	ND	ND	ND	ND
Pentane	NA	ND	ND	ND	ND
2-Pentanone	NA	ND	ND	37	ND
1,4-Pentadiene	NA	ND	ND	ND	ND
Pentafluoropropionic anhydride	NA	203	ND	ND	ND
1-Pentene	NA	ND	12	15	ND

2-Pentene	NA	10	ND	ND	ND
1R .alpha. -Piene	NA	ND	30	ND	89
.beta.Piene	NA	ND	ND	ND	ND
Propane	NA	ND	ND	ND	ND
Propene	NA	ND	7.2	ND	ND
1-Propene-2-methyl	NA	40	40	50	52
Propanal, 2,2-dimethyl	NA	14	ND	ND	16
ND = Not Detected					
NA = Not Available					
Shading indicates result exceeds PRG					

<b>Countywide Recycling &amp; Disposal Facility</b>					
<b>EPA Method TO-15 Modified: Volatile Organic Compounds</b>					
<b>Table 3: Event #53 April 03/04, 2008</b>					
Analyte	PRG	Monitoring Location			
		School 4/3 Cross : 4/4 Cross	Cell Tower 4/3 : Down : 4/4 Up	Campground 4/3 Cross : 4/4 Cross	Wetland 4/3 Up : 4/4 Cross
All results in ug/m3					
<b>Method TO-15 Modified</b>					
Acetone	3300	297	292	61	155
Benzene	<b>0.25</b>	<b>16</b>	<b>4.9</b>	<b>2.4</b>	<b>115</b>
1,3-Butadiene	<b>0.061</b>	<b>8.4</b>	<b>2.7</b>	<b>2.7</b>	<b>5.9</b>
tert-Butyl alcohol	NA	95	116	55	102
Chloroethane	2.3	1.4	ND	ND	ND
Chloromethane	95	6.5	2.6	3.2	4.4
Cyclohexane	6200	ND	7.4	ND	ND
Dichlorodifluoromethane	210	7.0	34	6.4	6.0
1,2-Dichloroethane	0.074	ND	2.2	ND	ND
Ethylbenzene	1100	11	6.5	5.6	10
4-Ethyltoluene	NA	2.8	ND	2.6	2.8
Heptane	NA	30	15	6.7	29
Hexane	210	14	6.3	3.5	5.5
Methyl ethyl ketone	5100	59	29	11	47
Methyl isobutyl ketone	3100	7.8	3.6	ND	6.6
Methylene chloride	<b>4.1</b>	2.0	<b>316</b>	2.0	2.1
Toluene	400	17	61	6.4	14
Trichlorofluoromethane	730	ND	5.7	2.8	2.9
1,2,4-Trimethylbenzene	<b>6.2</b>	<b>6.6</b>	5.6	5.3	6.0
2,2,4-Trimethylpentane	NA	3.2	ND	ND	ND
Vinyl Chloride	<b>0.11</b>	<b>2.4</b>	ND	ND	<b>1.7</b>
m/p-Xylene	110	38	17	20	36
o-Xylene	110	11	6.7	5.3	10
<b>Tentatively Identified Compounds</b>					
Acetaldehyde	<b>0.87</b>	<b>68</b>	ND	<b>22</b>	<b>56</b>
Acetonitrile	62	16	57	4.9	20
Butanal	NA	19	ND	5.6	32
Ethanol	NA	ND	15	ND	ND
Ethylene Oxide	<b>0.019</b>	ND	<b>12</b>	ND	ND
Heptane, 3-methylene	NA	60	22	15	55
1-Heptene	NA	52	16	24	28
Hexanal	NA	34	ND	ND	ND
1-Hexene	NA	30	ND	11	ND
Isobutane	NA	ND	16	ND	ND
Pentanal	NA	23	ND	ND	ND
Pentane	NA	ND	38	7.1	ND
1-Pentene	NA	ND	ND	13	21
2-Pentene, (Z)-	NA	34	12	ND	ND
1-Pentene, 2-methyl	NA	ND	ND	ND	20
1R .alpha. -Piene	NA	ND	ND	ND	28

Propane	NA	ND	13	ND	ND
Propene	NA	22	ND	7.0	16
1-Propene, 2-methyl-	NA	ND	26	62	78
ND = Not Detected					
NA = Not Available					
Shading indicates result exceeds PRG					

<b>Countywide Recycling &amp; Disposal Facility</b>					
<b>EPA Method TO-15 Modified: Volatile Organic Compounds</b>					
<b>Table 4: Event #54 April 09/10, 2008</b>					
Analyte	PRG	Monitoring Location			
		School 4/9 Var : 4/10 Cross	Cell Tower 4/9 Var : 4/10 Down	Campground 4/9 Var : 4/10 Cross	Wetland 4/9 Var : 4/10 Up
All results in ug/m3					
<b>Method TO-15 Modified</b>					
Acetone	3300	547	ND	357	161
Benzene	<b>0.25</b>	<b>64</b>	<b>13</b>	<b>180</b>	<b>13</b>
1,3-Butadiene	<b>0.061</b>	<b>13</b>	<b>4.5</b>	<b>13</b>	<b>3.9</b>
tert-Butyl alcohol	NA	170	297	145	141
Carbon disulfide	730	ND	ND	6.9	7.3
Chloroethane	<b>2.3</b>	2.1	ND	<b>3.1</b>	ND
Chloromethane	95	5.7	7.1	7.1	3.1
Cyclohexane	6200	2.0	7.5	ND	ND
Dichlorodifluoromethane	210	4.9	6.3	4.8	5.7
Ethylbenzene	1100	19	11	18	14
4-Ethyltoluene	NA	6.4	3.3	5.7	2.9
Heptane	NA	63	38	56	29
Hexane	210	32	13	19	11
Methyl ethyl ketone	5100	110	76	103	62
Methyl isobutyl ketone	3100	16	8.2	13	13
Methylene chloride	<b>4.1</b>	3.1	<b>161</b>	3.2	4.1
Styrene	1100	ND	2.5	ND	ND
Toluene	400	63	68	61	89
Trichlorofluoromethane	730	ND	7.3	ND	ND
1,2,4-Trimethylbenzene	<b>6.2</b>	<b>20</b>	<b>10</b>	<b>16</b>	<b>7.7</b>
1,3,5-Trimethylbenzene	6.2	5.7	2.9	4.9	ND
2,2,4-Trimethylpentane	NA	7.5	3.8	3.6	4.1
Vinyl Chloride	<b>0.11</b>	<b>3.7</b>	ND	<b>4.5</b>	ND
m/p-Xylene	110	67	33	59	45
o-Xylene	110	22	11	19	14
<b>Tentatively Identified Compounds</b>					
Acetaldehyde	<b>0.87</b>	<b>88</b>	<b>36</b>	ND	<b>31</b>
Acetonitrile	62	ND	ND	ND	55
Butanal	NA	32	35	50	26
Butane, 2-methyl-	NA	ND	118	ND	ND
Cyclotrisiloxane, hexamethyl-	NA	58	ND	ND	51
Heptane, 3-methylene	NA	128	179	147	151
1-Heptene	NA	52	60	68	52
1-Hexene	NA	38	24	41	ND
Hexanal	NA	78	ND	65	ND
Methacrolein	NA	27	ND	ND	ND
Pentanal	NA	ND	25	ND	ND
2-Pentanone	NA	ND	ND	ND	28
1-Pentene	NA	46	24	49	22
1R .alpha. -Piene	NA	ND	ND	178	ND

1S-.alpha.-Pinene	NA	ND	ND	ND	40
.beta.-Pinene	NA	ND	ND	78	ND
2-Propenal	NA	ND	ND	30	ND
Propene	NA	17	ND	26	ND
1-Propene, 2-methyl-	NA	ND	69	ND	57
ND = Not Detected					
NA = Not Available					
Shading indicates result exceeds PRG					

<b>Countywide Recycling &amp; Disposal Facility</b>					
<b>EPA Method TO-15 Modified: Volatile Organic Compounds</b>					
<b>Table 5: Event #55 April 15/16, 2008</b>					
Analyte	PRG	Monitoring Location			
		School	Cell Tower	Campground	Wetland
		4/15 None : 4/16 Up	4/15 None : 4/16 Cross/Up	4/15 None : 4/16 Down	4/15 None : 4/16 Cross
All results in ug/m3					
<b>Method TO-15 Modified</b>					
Acetone	3300	114	192	ND	153
Benzene	0.25	7.0	10	2.9	54
1,3-Butadiene	0.061	7.7	7.0	3.3	7.4
tert-Butyl alcohol	NA	41	234	59	86
Carbon disulfide	730	ND	ND	2.2	ND
Chloromethane	95	4.8	3.1	3.7	5.0
Dichlorodifluoromethane	210	8.5	6.5	7.5	6.9
Ethylbenzene	1100	3.7	7.4	3.1	4.6
4-Ethyltoluene	NA	ND	2.9	ND	ND
Heptane	NA	10	40	5.9	21
Hexane	210	7.8	6.5	3.8	7.2
Methyl ethyl ketone	5100	18	76	9.5	45
Methyl isobutyl ketone	3100	2.1	11	ND	5.7
Methylene chloride	4.1	3.3	ND	2.0	ND
Toluene	400	11	35	10	22
Trichlorofluoromethane	730	3.2	2.9	3.2	3.1
1,2,4-Trimethylbenzene	6.2	7.0	9.4	6.3	6.2
Vinyl Chloride	0.11	1.4	ND	ND	1.8
m/p-Xylene	110	15	26	13	17
o-Xylene	110	6.8	8.6	5.3	5.5
<b>Tentatively Identified Compounds</b>					
Acetaldehyde	0.87	47	54	23	58
Acetonitrile	62	ND	14	5.4	13
Butanal	NA	5.9	38	ND	22
Cyclobutane, methyl-	NA	ND	ND	ND	25
Heptane, 3-methylene	NA	13	188	ND	50
1-Heptene	NA	15	60	8.4	22
Hexane, 2-methyl-4-methylene-	NA	ND	ND	37	ND
1-Hexene	NA	13	31	8.6	ND
Pentane	NA	21	ND	8.5	18
Pentanal	NA	ND	20	ND	ND
1-Pentene	NA	25	28	13	ND
1R- .alpha. -Pinene	NA	ND	ND	ND	37
Propanal, 2,2-dimethyl-	NA	9.5	ND	ND	ND
Propene	NA	31	13	14	24
1-Propene, 2-methyl-	NA	90	109	55	85
ND = Not Detected					

NA = Not Available

Shading indicates result exceeds PRG
