

## Continental Aluminum Exposure Investigation Report Synopsis

(Please refer to the Exposure Investigation report for full discussion.)

The Exposure Investigation began March 1, 2004 and concluded May 31. Air samples were analyzed for chemicals likely to be emitted by a secondary aluminum smelter. Samples for metals, mercury, and acids were taken at the air-monitoring trailers set up at Dolsen Elementary School. The VOC (volatile organic compound) “grab” samples were taken where verified odor events occurred and at corresponding control sites.

### Metals

• **Ten 24-hour filter samples** were taken about every six days. Two blank (not exposed) filters were analyzed as well. All filters were analyzed for aluminum, barium, beryllium, cadmium, chromium, copper, lead, manganese, selenium, and zinc.

• **Beryllium, cadmium, and selenium** were, for the most part, **not detected**.

**Chromium and lead** were detected but with **some uncertainty**, so their values were estimated by the lab. **Aluminum, barium, copper, manganese, and zinc were detected with certainty in all samples. Aluminum, barium, chromium, copper, lead, manganese, zinc were also detected in blanks** (“clean” filters). (This finding may be due to the filter production process.)

• The April 6 sample had the highest concentrations of almost all metals and had the 2<sup>nd</sup> highest total PM (particulate matter). There was a metallic, hot-wire odor detected at the trailer this day but a “grab” sample was not taken.

• **Most metals were well below their respective health-based Comparison Values.** Aluminum was more than 25,000 times less than its Comparison Value. The metals that were closest to their Comparison Values (lowest Comparison Value compared to highest concentration detected) were **chromium** (nearly equal its Comparison Value) and **manganese** (about 2.5 times less than its Comparison Value). The Comparison Value used for chromium was for the more toxic, hexavalent form. Research at other sites suggests that the majority of airborne chromium is the trivalent, less toxic form. The Comparison Value for trivalent chromium form would be higher. Therefore, the concentrations of chromium detected in the samples likely are of no concern. The concentrations of manganese found are not of concern.

• **No adverse health effects should be expected following exposure to the levels of metals found.**

### Mercury

• **Elemental mercury vapor was continuously monitored** (reporting the average of a 5-minute sample).

• **The average concentration was well below Comparison Values.**

• One day had two 5-minute spikes over 100 ng/m<sup>3</sup> (but only one of the spikes was above the lowest *chronic* Comparison Value; the spike was below the *acute* value).

• Because the recorded average was greater than state background values, this matter has been referred to MDEQ.

• **Inhalation of mercury at these values should not result in adverse health effects.**

### Acid Monitor

- **The acid monitor continuously monitored for the presence of acidic aerosols (real-time reporting).**

- There were **detections on 17** out of the 64 sampling days that were considered valid.

- **No odors were reported during the times that the monitor detected an acid.**

- The acid detected likely was **not hydrogen fluoride (HF)**.

- If the detected acid is assumed to be hydrogen chloride (HCl), the higher concentrations detected exceeded only the EPA Reference Concentration, which addresses 24-hour long-term exposure, not intermittent exposure. Therefore, **no adverse health effects should be expected.**

### VOCs

- Local sampling personnel (mainly the fire department) took **instantaneous (“grab”) samples during odor events.**

- The odor sample was paired with a corresponding “control” sample. There were **10 sample pairs** taken. **Four field blanks (unopened)** were also analyzed.

- **The field blanks had some detections**, which is to be expected with the very low detection levels used for this analytical method.

- **Control concentrations were sometimes higher than odor-event concentrations.**

- All detections were well below Comparison Values. The closest were benzene (close to half its Comparison Value) and 1,3-butadiene (about one-sixth its Comparison Value). Therefore, **no adverse health effects should be expected.**

### Conclusions:

Although chemicals are present, the concentrations are well below the levels at which adverse health effects would be expected. Therefore, the air in Lyon Township around Continental Aluminum poses **no apparent public health hazard**. Because no impact is expected, further environmental sampling is not warranted.

<b>Airborne Metal Particulates (24-hour samples)<sup>A</sup></b>					
<u>Chemical</u>	<u>No. detections / No. samples</u>	<u>Concentration Range (mg/m<sup>3</sup>)</u>	<u>Lowest Comparison Value (mg/m<sup>3</sup>)</u>	<u>Reference for Comparison Value</u>	<u>Lowest Comparison Value / Highest Concentration Found</u>
PM10 (particulate matter less than 10 microns in diameter)	10 / 10	0.0096 - 0.036	0.15	NAAQS <sup>F</sup>	4
Aluminum	10 / 10	0.00031 - 0.00055	15	TEEL-0 <sup>G</sup>	27,000
Barium	10 / 10	0.000070 - 0.00011	0.5	TEEL-0 <sup>G</sup>	4,500
Beryllium	0 / 10	ND <sup>D</sup>	0.002	TEEL-0 <sup>G</sup>	NA <sup>K</sup>
Cadmium	3 / 10 <sup>B</sup>	0.0000002 - 0.0000013	0.005	TEEL-0 <sup>G</sup>	3,800
Chromium	10 / 10 <sup>C</sup>	0.0000019 - 0.0000055	0.000006 <sup>E</sup>	RfC <sup>H</sup>	1.1 <sup>L</sup>
Copper	10 / 10	0.0000082 - 0.000047	100	CaREL <sup>I</sup>	2,000,000
Lead	7 / 10 <sup>C</sup>	0.0000042 - 0.000013	0.05	TEEL-0 <sup>G</sup>	3,800
Manganese	10 / 10	0.0000019 - 0.000016	0.00004	EMEGC <sup>J</sup>	2.5
Selenium	2 / 10	0.000012	0.2	TEEL-0 <sup>G</sup>	16,700
Zinc	10 / 10	0.000016 - 0.000064	10	TEEL-0 <sup>G</sup>	15,600
<b>Notes:</b>					
A. Samples were not adjusted for chemicals found in blanks.					
B. All detections were estimates.					
C. The majority of detections were estimates.					
D. ND = not detected					
E. Comparison value is for hexavalent chromium, the more toxic form. Research at other sites suggests that the majority of airborne chromium is the trivalent (less toxic) form.					
F. NAAQS = National Ambient Air Quality Standard (derived by the US EPA under the Clean Air Act)					
G. TEEL = Temporary Emergency Exposure Limit (derived by the US Department of Energy). TEEL-0 is the threshold concentration below which most people will experience no appreciable risk of health effects. (Addresses acute exposure.)					
H. RfC = Reference Concentration (derived by EPA). A concentration of a chemical in air to which humans may be exposed without experiencing adverse health effects. (Addresses chronic exposure.)					
I. CaREL = California Reference Exposure Level (derived by the California Environmental Protection Agency). Exposure to a specific chemical should not exceed its CaREL more than once every two weeks over the course of a year. (Addresses acute exposure.)					
J. EMEGC = Environmental Media Evaluation Guide for chronic exposure (derived by ATSDR). A concentration of a chemical (in air, in this case) to which humans may be exposed without experiencing adverse health effects. (Addresses chronic exposure.)					
K. NA = not applicable. (Because there were no detections, no comparison can be made.)					
L. The ratio is likely higher, assuming that airborne chromium was a mixture of hexavalent and trivalent forms.					

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<b>Elemental Mercury Vapor (continuous sampling)</b>				
<u>Date of Detection</u> <u>Greater than 10</u> <u>ng/m<sup>3A</sup></u>	<u>Time of</u> <u>Sample</u> <u>(military)</u>	<u>5-Minute Average</u> <u>Concentration</u> <u>(ng/m<sup>3</sup>)</u>	<u>Lowest Chronic</u> <u>Comparison Value<sup>B</sup></u> <u>(ng/m<sup>3</sup>)</u>	<u>Lowest Acute</u> <u>Comparison Value<sup>C</sup></u> <u>(ng/m<sup>3</sup>)</u>
3/30/2004	15:25	511.828	200	1,800
3/30/2004	15:45	120.279	200	1,800
4/17/2004	12:25	12.554	200	1,800
4/17/2004	12:30	12.436	200	1,800
4/17/2004	12:45	10.003	200	1,800
4/21/2004	18:05	14.159	200	1,800
5/6/2004	21:00	10.255	200	1,800
5/14/2004	9:55	25.902	200	1,800
5/14/2004	10:00	34.234	200	1,800
5/31/2004	22:55	13.979	200	1,800
5/31/2004	23:00	14.160	200	1,800
5/31/2004	23:15	10.026	200	1,800
5/31/2004	23:20	12.426	200	1,800
A. Average concentration was 3.6 +/- 1.2 ng/m <sup>3</sup> .				
B. Reference for lowest chronic comparison value is the ATSDR chronic Environmental Media Evaluation Guide for mercury in air.				
C. Reference for lowest acute comparison value is the California Reference Exposure Level (CaREL). Exposure to a specific chemical should not exceed its CaREL more than once every two weeks over the course of a year.				

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Volatile Organic Compounds (grab samples)									
Chemical	Blanks		Odors		Controls		Lowest Comparison Value (ppb)	Reference for Comparison Value	
	No. detections / No. samples	Concentration range (ppb)	No. detections / No. samples	Concentration range (ppb)	No. detections / No. samples	Concentration range (ppb)			
1, 1, 1-Trichloroethane	0 / 4	ND <sup>A</sup>	0 / 10	ND	1 / 10	0.02	700	EMEGi <sup>B</sup>	
1, 2, 4-Trimethylbenzene	0 / 4	ND	9 / 10	0.02 - 0.1	8 / 10	0.02 - 0.1	25,000	TEEL-0 <sup>C</sup>	
1, 3, 5-Trimethylbenzene	0 / 4	ND	3 / 10	0.02 - 0.04	3 / 10	0.03 - 0.04	25,000	TEEL-0 <sup>C</sup>	
1, 3-Butadiene	0 / 4	ND	4 / 10	0.06 - 0.14	1 / 10	0.15	0.89	EPA RfC <sup>D</sup>	
Acetonitrile	0 / 4	ND	2 / 10	0.18 - 0.27	0 / 10	ND	36	EPA RfC <sup>D</sup>	
Acetylene	0 / 4	ND	10 / 10	0.11 - 3.35	10 / 10	0.32 - 8.25	2,500,000	TEEL-0 <sup>C</sup>	
Benzene	2 / 4	0.04 - 0.05	10 / 10	0.12 - 1.67	10 / 10	0.12 - 0.52	4	EMEGi <sup>B</sup>	
Carbon tetrachloride	0 / 4	ND	10 / 10	0.02 - 0.11	10 / 10	0.08 - 0.11	50	EMEGi <sup>B</sup>	
Chloromethane	0 / 4	ND	10 / 10	0.47 - 0.62	10 / 10	0.46 - 0.61	44	EPA RfC <sup>D</sup>	
Dichlorodifluoromethane	0 / 4	ND	10 / 10	0.48 - 0.60	10 / 10	0.48 - 0.55	1,000,000	TEEL-0 <sup>C</sup>	
Dichloromethane (Methylene chloride)	0 / 4	ND	9 / 10	0.05 - 0.21	5 / 10	0.03 - 0.13	300	EMEGi,c <sup>BE</sup>	
Ethylbenzene	1 / 4	0.01	9 / 10	0.03 - 0.19	10 / 10	0.02 - 0.09	230	EPA RfC <sup>D</sup>	
m,p-Xylene	1 / 4	0.01	10 / 10	0.4 - 0.49	10 / 10	0.04 - 0.23	100 (total)	EMEGc <sup>E</sup>	
m-Dichlorobenzene (1,3-dichlorobenzene)	0 / 4	ND	0 / 10	ND	1 / 10	0.25	750	TEEL-0 <sup>C</sup>	
Methyl ethyl ketone	2 / 4	0.11 - 0.58	7 / 10	0.34 - 2.77	8 / 10	0.26 - 1.06	340	EPA RfC <sup>D</sup>	
Methyl isobutyl ketone	0 / 4	ND	1 / 10	0.09	1 / 10	0.11	75,000	TEEL-0 <sup>C</sup>	
Methyl methacrylate	2 / 4	0.17	0 / 10	ND	0 / 10	ND	100,000	TEEL-0 <sup>C</sup>	
Methyl tert-butyl ether	0 / 4	ND	1 / 10	0.23	0 / 10	ND	700	EMEGi,c <sup>BE</sup>	
o-Xylene	0 / 4	ND	7 / 10	0.03 - 0.22	10 / 10	0.02 - 0.11	100 (total)	EMEGc <sup>E</sup>	
p-Dichlorobenzene (1,4-dichlorobenzene)	3 / 4	0.05 - 0.19	6 / 10	0.03 - 0.14	6 / 10	0.04 - 0.26	100	EMEGc <sup>E</sup>	
Propylene	1 / 4	0.21	10 / 10	0.07 - 2.82	9 / 10	0.13 - 1.84	24,000,000	TEEL-0 <sup>C</sup>	
Styrene	1 / 4	0.06	7 / 10	0.03 - 0.19	2 / 10	0.03 - 0.05	60	EMEGc <sup>E</sup>	
Toluene	3 / 4	0.05 - 0.07	10 / 10	0.13 - 1.81	10 / 10	0.1 - 0.79	80	EMEGc <sup>E</sup>	
Trichlorofluoromethane	2 / 4	0.07	10 / 10	0.21 - 0.82	10 / 10	0.22 - 0.82	500,000	TEEL-0 <sup>C</sup>	
Trichlorotrifluoroethane	1 / 4	0.03	10 / 10	0.1 - 0.12	10 / 10	0.08 - 0.12	1,000,000	TEEL-0 <sup>C</sup>	
Notes:									
A. ND = not detected									
B. EMEGi = Environmental Media Evaluation Guide for intermediate exposure (derived by ATSDR; "intermediate" means more than 2 weeks and less than 1 year). A concentration of a chemical (in air, in this case) to which humans may be exposed without experiencing adverse health effects. (Addresses intermediate exposure.)									
C. TEEL = Temporary Emergency Exposure Limit (derived by the US Department of Energy). TEEL-0 is the threshold concentration below which most people will experience no appreciable risk of health effects. (Addresses acute exposure.)									
D. RfC = Reference Concentration (promulgated by EPA). A concentration of a chemical in air to which humans may be exposed without experiencing adverse health effects. (Addresses chronic exposure.)									
E. EMEGc = Environmental Media Evaluation Guide for chronic exposure (derived by ATSDR). A concentration of a chemical (in air, in this case) to which humans may be exposed without experiencing adverse health effects. (Addresses chronic exposure.)									

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<b>Acid Monitor (continuous sampling)<sup>A</sup></b>						
<u>Start Date of Detection</u>	<u>Time Started (military)</u>	<u>Elapsed Time (hr:min)</u>	<u>Concentration Range (ppb<sup>C</sup>)</u>	<u>Lowest Chronic Comparison Value for HCl<sup>D</sup> (ppb<sup>C</sup>)</u>	<u>Lowest Acute Comparison Value for HCl<sup>E</sup> (ppb<sup>C</sup>)</u>	<u>Odor Reported during Elapsed Time?</u>
3/24/2004	23:49	1:54	0-27	13	500	no
3/25/2004	18:08	33:47	0-32	13	500	no
4/5/2004	16:07	0:09	3-37	13	500	no
4/17/2004	9:46	0:08	6-27	13	500	no
4/17/2004	11:49	4:09	0-46	13	500	no
4/18/2004	10:18	2:24	0-27	13	500	no
4/21/2004	4:37	2:28	0-27	13	500	no
4/21/2004	9:37	0:12	0-27	13	500	no
4/25/2004	12:01	5:00	0-32	13	500	no
5/1/2004	0:57	4:56	0-27	13	500	no
5/6/2004	19:35	2:24	0-27	13	500	no
5/9/2004	10 <sup>B</sup>	1 <sup>B</sup>	2	13	500	no
5/9/2004	17 <sup>B</sup>	1 <sup>B</sup>	20	13	500	no
5/9/2004	19 <sup>B</sup>	18 <sup>B</sup>	11-33	13	500	no
5/10/2004	18 <sup>B</sup>	12 <sup>B</sup>	16-33	13	500	no
5/11/2004	20 <sup>B</sup>	22 <sup>B</sup>	2-33	13	500	no
5/12/2004	19 <sup>B</sup>	52 <sup>B</sup>	12-37	13	500	no
5/17/2004	7 <sup>B</sup>	3 <sup>B</sup>	1-11	13	500	no
Notes:						
A. Acid detected is assumed to be hydrochloric acid (HCl).						
B. Following a power outage in the area, only hourly data were available starting 5/9/2004.						
C. ppb = parts per billion						
D. Reference for lowest chronic comparison value for HCl is the EPA Reference Concentration, a concentration of a chemical in air to which humans may be exposed long-term without experiencing						
E. Reference for lowest acute comparison value for HCl is TEEL-0 (Temporary Emergency Exposure Limit, derived by the US Department of Energy), the threshold concentration below which most people will experience no appreciable risk of health effects.						