BACE 2011-05-26 BACE HRA evaluation

Evaluation of the Revised AB2588 Health Risk Assessment for 2005, Average 2008/2009 and 2013 Production Scenarios for the Lehigh Southwest Cement Company facility in Cupertino, California

May 26, 2011

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Submitted by Bay Area
For
Clean Environment

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RE: Evaluation of the Revised AB2588 Health Risk Assessment for 2005, Average 2008/2009 and 2013 Production Scenarios for the Lehigh Southwest Cement Company facility in Cupertino, California.

Dear Dr. Alexeeff, Dr. Marty, Mr. Lutz and Ms. Jordan:

No Toxic Air has evaluated the Revised AB2588 Health Risk Assessment for 2005, Average 2008/2009 and 2013 Production Scenarios for the Lehigh Southwest Cement Company facility in Cupertino, California. We believe that, consistent with its obligations under the Air Toxics "Hot Spots" Information and Assessment Act, the Bay Area Air Quality Management District must return the health risk assessment (HRA) to the Lehigh Southwest Cement Company with instructions to revise the HRA in the following manner:

- Assume the average mercury content of limestone is **0.36 ppm**, not 0.31 ppm. Please see attached spreadsheet: Hg in limestone data.xls.

- Derive maximum 1-hour and 8-hour mercury concentrations at receptors based on maximum production rates and **maximum hourly mercury contents of limestone** (as high as 1.44 ppm, but no less than 0.48 ppm). Please see attached spreadsheet: Hg in limestone data.xls.

- Derive hazard quotients and total hazard indices at receptors by comparing estimated maximum 8-hour concentrations of arsenic, manganese and mercury to the **8-hour Reference Exposure Levels** for these substances.

We would appreciate your careful consideration of the attached evaluation.

Sincerely,

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May 26, 2011

Evaluation of

The Revised AB2588 Health Risk Assessment for 2005, Average 2008/2009 and 2013 Production Scenarios for the Lehigh Southwest Cement Company facility in Cupertino, California.

No Toxic Air reviewed the Revised AB2355 Health Risk Assessment (HRA) for 2005, Average 2008/2009 and 2013 Production Scenarios for the Lehigh Southwest Cement Company facility in Cupertino, California. What follows is a discussion of major flaws contained in the HRA.

1. By excluding its own data, the HRA underestimated the mercury content of limestone used by the Lehigh facility

Pre-blend stone (limestone) is the predominant raw material for the manufacturing of cement. Lehigh consumes more than one million tons of limestone per year, which it mines from a nearby quarry. The mercury content of this limestone is the main variable that determines mercury emissions from Lehigh's facility.

Appendix A of the HRA presents an analysis of the mercury content Lehigh's limestone performed over a 30-day period in March-April 2009. The data is presented in Table 1 of Appendix A.

The data shows substantial variability of the mercury content in Lehigh's limestone that is likely due to the heterogeneity of mercury in limestone. The lowest measured mercury content was 0.2 micrograms per gram (= 0.2 ppm) and the higher measured mercury content was 1.44 ppm. The average mercury content of Lehigh's limestone is 0.36 ppm. See attached spreadsheet: Hg in limestone data.xls.

However, AMEC does not use an average mercury content of 0.36 ppm for determining mercury emissions from Lehigh's facility. Instead, AMEC uses an average mercury content of 0.31 ppm by excluding four measurements (replicate analyses of limestone samples performed on March 26 and March 27, 2009) as 'outliers." However, AMEC does not provide any basis for why these measurements should be excluded as outliers. There is nothing to indicate that the measurements were invalid because of the analytical method: the measurements from 26 and March 27, 2009 have the exact same reproducibility as the other measurements in the dataset.

There is nothing to indicate that the mercury content of the samples analyzed on 26 and March 27, 2009 are beyond the mercury content that can be found in limestone. One cement facility in the U.S. uses limestone with an average mercury content of 1.15 ppm and another facility uses limestone with an average mercury content of 0.63 ppm.[1] The four measurements from 26 and

[1] U.S. EPA (August 9, 2010) "National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants." at page 43.

March 27, 2009 are what they are, and should have been retained in calculations for the average mercury content of the limestone the Lehigh facility uses.

2. By ignoring the heterogeneity of the limestone used at the Lehigh facility, the HRA grossly underestimates maximum 1-hour ambient air concentrations associated with emissions from the facility

Even if we were only to use data not excluded by AMEC, there is substantial variability of the mercury content in Lehigh's limestone. For example, on April 1, 2009, limestone used at the Lehigh facility had a mercury content of 0.48 ppm.[2]

However all of the maximum 1-hour ambient air concentrations contained in the HRA for the Lehigh facility are based on the assumption that at all times the facility is using limestone with the average mercury content of 0.31 ppm.[3] Production rate (capacity) was the only variable that AMEC adjusted in the HRA when predicting maximum 1-hour ambient air concentrations of mercury.

This is an unreasonable assumption. Clearly there are days during when the Lehigh Facility is using limestone with a mercury content 50% (or more) than the average mercury content of such limestone. All of the maximum 1-hour ambient air concentrations contained in the HRA for the Lehigh facility need to be adjusted to correct this unreasonable assumption.

3. By ignoring 8-hour Reference Exposure Levels, the HRA fails to derive accurate hazard quotients and total health indices for exposure to arsenic, manganese and mercury

The Air Toxics "Hot Spots" Information and Assessment Act of 1987 states:

> "Health risk assessments required by this chapter shall be prepared in accordance with guidelines established by the Office of Environmental Health Hazard Assessment."[4]

The OEHHA guidelines for the preparation of health risk assessments states:

> "The output of an air dispersion modeling analysis will be a receptor field of concentrations of the pollutant in ambient air. These concentrations in air need to be coupled with Reference Exposure Levels and cancer potency factors to estimate the hazard indices and potential carcinogenic risks."[5]

Contrary to these guidelines, the HRA for the Lehigh facility failed to compare concentrations of the pollutant in ambient air with Reference Exposure Levels (RELs) that all pertain to the short-term impacts of arsenic, manganese and mercury on the nervous system.[6] These RELs are:

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[2] HRA at Appendix A, Table 1.
[3] HRA at Appendix A, Table 3.
[4] California Health and Safety Code Section 44360(b)(2).
[5] OEHHA (2003) "Air Toxics Hot Spots Program Risk Assessment Guidelines" at page 4-4.
[6] See: http://oehha.ca.gov/air/allrels.html

Inorganic Arsenic 8-Hour REL

Reference Exposure Level	**0.015 µg/ As/m³**
Critical effect(s)	Decreased intellectual function in 10 year old children
Hazard Index target(s)	Development; cardiovascular system; nervous system; lung; skin

Manganese 8-Hour REL

Reference Exposure Level	**0.17 µg/m^3**
Critical effect(s)	Impairment of neurobehavioral function in humans
Hazard index target	Nervous system

Mercury 8-Hour REL

Reference Exposure Level	**0.06 µg Hg/m^3 (0.007 ppb Hg^0)**
Critical effect(s)	Impairment of neurobehavioral functions in humans
Hazard Index target(s)	Nervous system

The HRA for the Lehigh facility used an air dispersion model to predict only very short-term (1 hour) and very long-term (annual) concentrations of arsenic, manganese, and mercury. For example, the HRA contains the following predictions of 1-hour maximum concentrations of arsenic, manganese and mercury at the maximum exposed individual resident (MEIR):

	Arsenic	Manganese	Mercury
HRA, maximum 1-hour concentration at MEIR, 2005 production[7]	0.004	0.003	1.050
HRA, maximum 1-hour concentration at MEIR, 2008-9 production[8]	0.004	0.003	0.966
HRA, maximum 1-hour concentration at MEIR, 2010 production[9]	0.004	0.003	0.677
HRA, maximum 1-hour concentration at MEIR, 2011 production[10]	0.004	0.003	0.336
HRA, maximum 1-hour concentration at MEIR, 2013 production[11]	0.004	NR	0.002

[7] HRA at Table 9A, Receptor 2040
[8] HRA at Table 9B, Receptor 2040
[9] HRA at Table 9C, Receptor 2040
[10] HRA at Table 9C, Receptor 2040
[11] HRA, Appendix J, 2013_Rep_Acu_Rec2041_AllSrc_AllCh_ByRec_ByChem.txt

The HRA for the Lehigh facility only compares these predicted concentrations of arsenic, manganese, and mercury to very short-term (acute, 1-hour) and very long-term (chronic) Reference Exposure Levels adopted by OEHHA in deriving total hazard indices.

Even though the air dispersion model used in the HRA for the Lehigh facility only predicted 1-hour (and annual) concentrations of arsenic, manganese, and mercury, there is a means of predicting 8-hour concentrations based on such data. The Office of Environmental Health Hazard Assessment (OEHHA) guidelines for the preparation of health risk assessments contain a recommended procedure for "Estimating Concentrations of Longer Averaging Periods from the Maximum One-Hour Concentration for Screening Purposes."[12]

This recommended procedure involves the application of conversion factors according to the following table found on page H-2 of the OEHHA guidelines for the preparation of health risk assessments.

Table H.1 Recommended Factors to Convert Maximum 1-hour Avg. Concentrations to Other Averaging Periods (U.S. EPA, 1992; ARB, 1994).

Averaging Time	Range	Typical Recommended
3 hours	0.8 - 1.0	0.9
8 hours	0.5 - 0.9	0.7
24 hours	0.2 - 0.6	0.4
30 days	0.2 - 0.3	0.3
Annual	0.06 - 0.1	0.08

Application of these conversion factors to the predicted 1-hour maximum concentrations contained in the HRA allow an estimation of the following maximum 8-hour concentrations of arsenic, manganese and mercury at the MEIR.

	Arsenic	Manganese	Mercury
8-hour concentration at MEIR, 2005 production	0.003	0.002	0.735
8-hour concentration at MEIR, 2008-9 production	0.003	0.002	0.676
8-hour concentration at MEIR, 2010 production	0.003	0.002	0.474
8-hour concentration at MEIR, 2011 production	0.003	0.002	0.235
8-hour concentration at MEIR, 2013 production	0.003	NR	0.001

If, as required by the OEHHA guidelines, one compares these maximum 8-hour concentrations of arsenic, manganese and mercury at the MEIR to the 8-hour Reference Exposure Levels for arsenic, manganese and mercury, then one obtains the following hazard quotients and total hazard indices:

[12] OEHHA (2003) "Air Toxics Hot Spots Program Risk Assessment Guidelines" at Appendix H.

	Arsenic	Manganese	Mercury	Total HI
Hazard quotients at MEIR, 2005 Production	0.19	0.01	12.25	12.45
Hazard quotients at MEIR, 2008-9 Production	0.19	0.01	11.27	11.47
Hazard quotients at MEIR, 2010 Production	0.19	0.01	7.90	8.10
Hazard quotients at MEIR, 2011 Production	0.19	0.01	3.92	4.12
Hazard quotients at MEIR, 2013 Production	0.17	NR	0.02	0.18

The total hazard indices for 2005 and 2008-9 production scenarios are not only above the public notification threshold (hazard index =1), but are above the threshold the BAAQMD uses as a criteria for requiring a facility to reduce emissions.

These hazard quotients and total hazard indices do not reflect the fact that the HRA for the Lehigh facility underestimates the average mercury content of the limestone it uses and ignore the heterogeneity of mercury content in this material. Had the HRA for the Lehigh facility correctly inputted data about the mercury content of the limestone it uses and compared maximum 8-hour concentrations of arsenic, manganese and mercury at the MEIR to the 8-hour Reference Exposure Levels for arsenic, manganese and mercury, then even higher total hazard indices would have been derived.

4. Derived 1-hour maximum concentrations of mercury under the 2013 production scenario are inconsistent with emission factors provided in the HRA.

The HRA for the Lehigh facility provides information about mercury emissions under the various production scenarios (2005, 2008-2009, 2010 and 2013) it inputted into the air dispersion models for predicting 1-hour maximum concentrations of mercury.[13] These emission factors are as follows:

2005 Production Scenario: 0.2 pounds per hour
2008-2009 Production Scenario: 0.18 pounds per hour (90% of 2005 level)
2010 Production Scenario: 0.14 pounds per hour (70% of 2005 level)
2013 Production Scenario: 0.011 pounds per hour (5.5% of 2005 level)

For the 2005, 2008-2009 and 2010, the HRA for the Lehigh facility discloses the predicted 1-hour maximum concentrations of mercury at the MEIR that are consistent with the decline in mercury emissions for these years. They are as follows:

2005 1-hour maximum [mercury]: 1.06 $\mu g/m^3$
2008-2009 1-hour maximum [mercury]: 0.966 $\mu g/m^3$ (91% of 2005 level)
2010 1-hour maximum [mercury]: 0.677 $\mu g/m^3$ (63% of 2005 level)

The body of the HRA for the Lehigh facility does not disclose the predicted 1-hour maximum concentration of mercury at the MEIR under the 2013 production scenario. However, consistent with the claim that mercury emissions under the 2013 production scenario would be approximately 5-6% of mercury emissions under the 2005 production scenario, one would

[13] HRA at Appendix A, Table 3

expect that the predicted 1-hour maximum concentration of mercury at the MEIR under the 2013 production scenario would be approximately 0.058 $\mu g/m^3$.

Although the body of the HRA for the Lehigh facility does not disclose the predicted 1-hour maximum concentration of mercury at the MEIR under the 2013 production scenario, Appendix J of the HRA for the Lehigh facility - HARP Modeling Input and Output files, 2013 Production Scenario.

One of the files (2013_Rep_Acu_Rec2041_AllSrc_AllCh_ByRec_ByChem.txt) in Appendix J allows one to calculate the predicted 1-hour maximum concentration of mercury at the MEIR under the 2013 production scenario that the HRA does not reveal in its body. This file calculates an acute hazard quotient for mercury of 0.00252 in comparison to the acute Reference Exposure Level for mercury of 0.6 $\mu g/m^3$. This allows one to calculate that the HRA for the Lehigh facility assumes that under the 2013 production scenario, the predicted 1-hour maximum concentration of mercury at the MEIR would be 0.0015 $\mu g/m^3$.

This predicted 1-hour maximum concentration of mercury at the MEIR under the 2013 production scenario is only 0.15% of the predicted 1-hour maximum concentration of mercury at the MEIR under the 2005 production scenario and, therefore, is glaringly inconsistent with the claim that mercury emissions under the 2013 production scenario would still be roughly 5-6% of mercury emissions under the 2005 production scenario. Therefore, the HRA for the Lehigh facility needs to explain why predicted 1-hour maximum concentration of mercury at the MEIR under the 2013 production scenario are a 99.85% reduction of predicted 1-hour maximum concentration of mercury at the MEIR under the 2005 production scenario.

Hg in limestone data.xls.

25-Mar-09	0.394
	0.396
26-Mar-09	0.774
	0.780
27-Mar-09	1.440
	1.420
28-Mar-09	0.401
	0.397
29-Mar-09	0.302
	0.306
30-Mar-09	0.298
	0.295
31-Mar-09	0.328
	0.328
1-Apr-09	0.483
	0.480
2-Apr-09	0.272
	0.271
3-Apr-09	0.346
	0.342
4-Apr-09	0.384
	0.384
5-Apr-09	0.263
	0.264
6-Apr-09	0.279
	0.283
7-Apr-09	0.340
	0.341
8-Apr-09	0.382
	0.384
10-Apr-09	0.243
	0.243
11-Apr-09	0.253
	0.255
12-Apr-09	0.446
	0.446
13-Apr-09	0.261
	0.261
14-Apr-09	0.263
	0.262
15-Apr-09	0.247
	0.249

16-Apr-09	0.351
	0.352
17-Apr-09	0.238
	0.238
18-Apr-09	0.267
	0.267
19-Apr-09	0.200
	0.200
20-Apr-09	0.232
	0.232
21-Apr-09	0.216
	0.217
22-Apr-09	0.274
	0.273
23-Apr-09	0.326
	0.325
24-Apr-09	0.295
	0.296
Average	**0.360**