# Memo

Date: September 4, 2008

To: Alan Hair

From: Elliot Sigal

cc:

Re: Supplemental Dust Study

## Supplemental Dust Study – Preliminary Results

As a follow-up to my memo of August 18th, 2008, we are now in receipt of the re-analysis of the supplemental dust data by Testmark Laboratories in Sudbury ON. The re-analysis results for all chemicals of concern and all sampling locations are summarized in the following table and detailed in the attached lab sheets.

The re-analysis results are significantly different than the original analysis (conducted by Bodycote Laboratories) reported in the August 18th memo. The following table demonstrates the differences for lead and arsenic:

| | Minimum (ug/g) | Mean (ug/g) | Maximum (ug/g) |
|---|---|---|---|
| Lead-Bodycote | 96.7 | 1749 | 34400 |
| **Lead-Testmark** | **74.2** | **183** | **606** |
| Tin-Bodycote | 9 | 1026 | 21000 |
| **Tin-Testmark** | **1.8** | **17** | **83** |
| Arsenic-Bodycote | 36.3 | 60.7 | 1874 |
| **Arsenic-Testmark** | **13.8** | **45** | **138** |

The original results from the supplemental vacuum dust study indicted some potentially elevated levels of lead and other metals in house dust of homes in the Flin Flon area. In addition, a number of QA/QC concerns and data anomalies were noted with the original data. The re-analysis results received from Testmark Laboratory are more consistent with dust studies conducted in other locations and reported in the literature. The Testmark dataset included a more extensive set of Quality Assurance checks than the BodyCote analysis, and the QA/QC outcomes of the Testmark dataset are acceptable. In addition, the dust results correlate better with the co-located yard soil samples, which is a relationship typically seen in these types of studies. Based on the outcomes of the re-analysis, and the outstanding QAQC issues related to the Bodycote dataset, it is our recommendation that the Bodycote analytical results be discounted and that that HHRA study move forward with the Testmark results.

- Soil to dust relationships:

  The primary purpose of the dust study was to understand the relationship between outdoor soil and indoor dust in the Flin Flon area. Previous studies have indicted a causal relationship between soil and dust in smelter communities. This type of relationship was not noted with the original data set. The re-analysis indicates a statistically significant relationship for all chemicals of concern with the exception of lead. Indoor lead levels are often influenced by indoor sources (paint, furniture, toys, blinds) and it is not uncommon for the significance of this relationship to be weak.

- Chemical to chemical interrelationships/concentration trends:

  Also of interest is a comparison of the interrelationships between chemicals in soil versus those in dust. A simplistic method of looking at these trends is to look at the correlation between various elements, to look for common trends. As shown in the following graphs, the trends for the re-analyzed dust data are consistent with those observed in soil.

  Of notably interest, tin levels were elevated in the Bodycote dust analysis and paralleled lead levels. In the Testmark re-analysis, tin levels are quite low and there is no correlation between tin and lead. Both of these factors are consistent with soil results collected in the Flin Flon area.

- Geographical Distribution of Testmark Results for Lead and Arsenic

  As expected, average dust levels in west Flin Flon were elevated (225 ug/g average for lead; 56 ug/g average for arsenic) as compared to Creighton (163 ug/g lead average; 53 ug/g arsenic average) and east Flin Flon (163 ug/g lead average; 32 arsenic average). As such, the geographical distribution of dust concentrations is consistent with the geographical distribution of soil concentrations. That is, dust concentration patterns, primarily for lead and arsenic, are similar to those observed with soil and decrease in relation to the HBMS facility, as would be expected.

- QA/QC Outcomes:

  Examination of the analytical data generated by Testmark and the two measures of laboratory QA/QC, duplicate analysis and comparison to certified reference material analysis, are acceptable and indicative of reliable analytical data.

  A more rigorous analysis of these two factors is on-going and will be provided shortly.

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- Comparison to other locations:

  The lead results for Flin Flon are within the range reported for an urban area without a point source. The following table provides a comparison of the Flin Flon dataset with typically house dust levels characterized by Rasmussen et al. (2001) from the Ottawa area (no point source industry present). Arithmetic mean, 90th%ile and maximum concentration metrics are presented for comparison purposes.

**Comparison of Arithmetic Mean, 90th percentile and Maximum Dust Concentrations in Flin Flon Area to Concentrations reported in Urban House Dust ( Rasmussen et al., 2001)**

| | Arithmetic Mean Dust Concentration (mg/kg) | | | 90th Percentile Dust Concentration (mg/kg) | | | Maximum Dust Concentration (mg/kg) | | |
|---|---|---|---|---|---|---|---|---|---|
| Element | Rasmussen et al. (2001) Dataset (n=48) | Flin Flon Dataset | | Rasmussen et al. (2001) Dataset (n=48) | Flin Flon Dataset | | Rasmussen et al. (2001) Dataset (n=48) | Flin Flon Dataset | |
| | | All Data [Bodycote] (n=38) | All Data [Testmark] (n=38) | | All Data [Bodycote] (n=38) | All Data [Testmark] (n=38) | | All Data [Bodycote] (n=38) | All Data [Testmark] (n=38) |
| Arsenic | 7.3 | 60.71 | 45 | 12.8 | 85.79 | 73.3 | 79.5 | 187 | 138 |
| Cadmium | 6.46 | 19.07 | 16 | 15.30 | 28.26 | 27.5 | 34.94 | 49.8 | 46.5 |
| Copper | 206.08 | 2795.79 | 1561 | 381.76 | 4874 | 2756 | 601.47 | 7520 | 3260 |
| Lead | 405.56 | 1749.07 | 183 | 969.37 | 1872 | 321 | 3225.66 | 34400 | 606 |
| Selenium | 1.2 | 6.64 | 6 | 2.0 | 11.76 | 9.5 | 6.8 | 20 | 18.9 |
| Zinc | 716.9 | 3290.26 | 2188 | 1226.0 | 5011 | 3291 | 1840.0 | 6680 | 4230 |
| Mercury | 3.633 | 8.42 | 2 | 6.565 | 18 | 5.4 | 37.099 | 35 | 11.9 |