



GOSS GILROY INC.

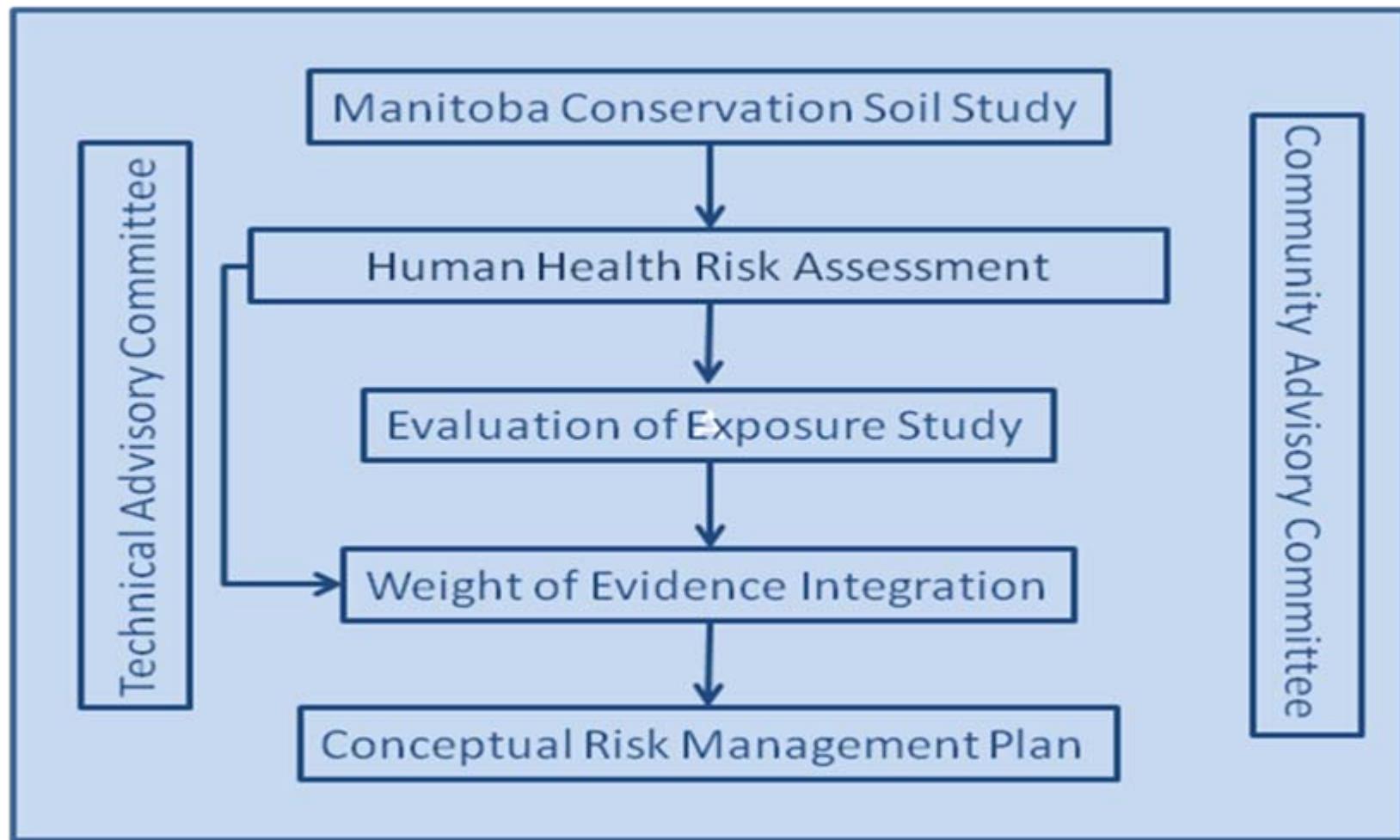


## Flin Flon Soils Study: Follow-up

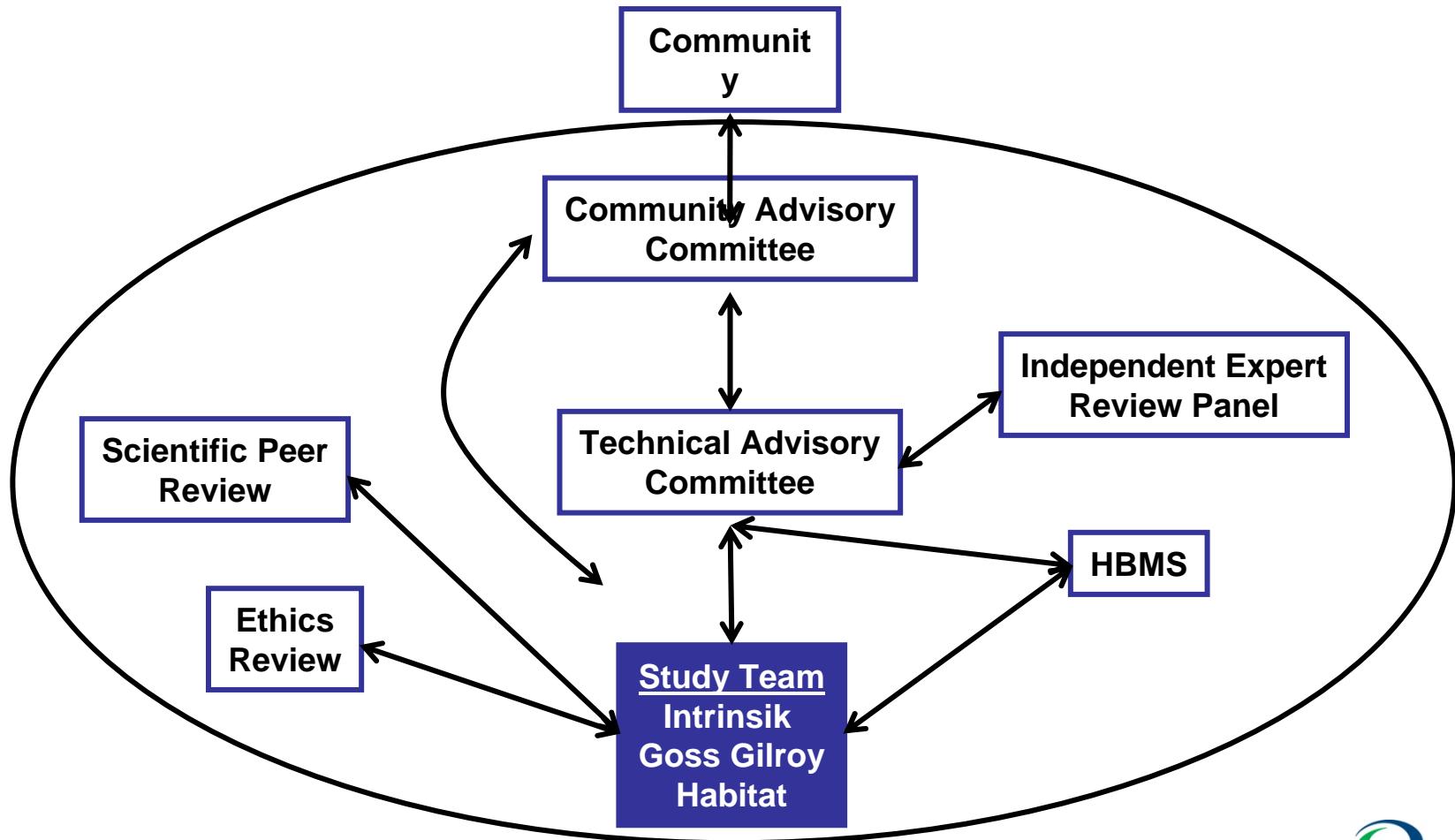
- Brief Recap of the Flin Flon Soils Study
- Risk Management Activities
- Approach to follow-up exposure study
- CAC Input

***Community Advisory Committee Meeting, Thursday, May 24, 2012***

# The Flin Flon Soils Study



# Who Conducted the Study



# Who Conducted the Study

## Oversight Bodies

**Technical Advisory Committee**

**Community Advisory Committee**

**Ethics Review**

**Scientific Peer Review**

**Independent Expert Review Panel**

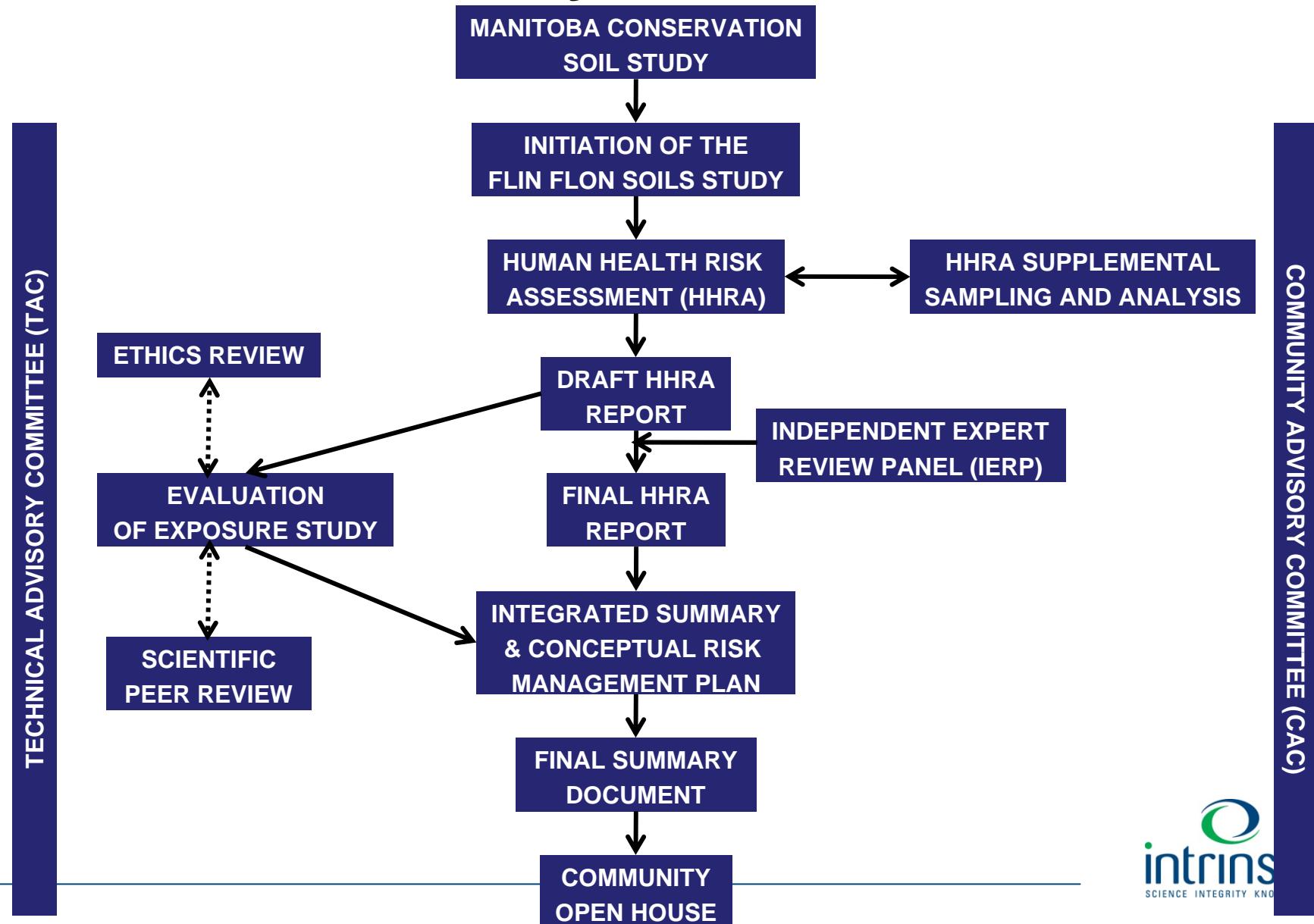
## Study Team

Intrinsik Health Sciences  
Goss Gilroy  
Habitat Health Impact Consulting

## Study Sponsor

**HudBay Minerals**

# How Was the Study Conducted?



# Purpose of the 2009 Exposure Study

- The most direct way to obtain additional information on human health risks is to assess human exposure through biological samples (e.g. blood, urine)
- This additional information was used to supplement the HHRA
- The metals that were measured are **lead, total and inorganic arsenic and inorganic mercury**. The reason for choosing these is that the Human Health Risk Assessment required some additional information for these three metals.

# The exposure study looked at 3 metals

- The study investigated the following questions:
  - *What is the current level of exposure in the bodies of the child population in the Flin Flon Area?*
  - *Do Flin Flon area children have higher arsenic, lead, and/or inorganic mercury levels than residents living in other parts of Canada?*
  - *Are there any potential health risks from these levels of exposure?*
  - *What personal factors are associated with the levels of exposure (e.g., place of residence, parent's place of work, level of COC in soil, age, gender, diet, personal habits, etc.)?*

# **Study focused on children**

- Current and recent exposure would be more apparent among children because:
  - Children are potentially exposed at higher levels because they eat, drink and breathe relatively more than adults when you take into account their body size.
  - Behaviour and habits are also important. Children's normal activities, such as putting hands in their mouths or playing on the ground, create additional opportunities for exposures.
- In short, if the average exposure levels in children are not elevated, it would be unlikely for other age groups to have elevated levels from just living in an exposed community (and not through their occupation).

# How the exposure study was implemented

- **Research team-** led by Dr. Murray Lee (Habitat Health Impact Assessment), in partnership with Intrinsik, Goss Gilroy, and Environmental & Occupational Health Plus (EOHP). Experience in large-scale field studies on human health (medicine and epidemiology) and toxicology.
- **Oversight-** Technical Advisory Committee and Community Advisory Committee.
- **Review-** Local health authorities and independent scientific reviewers familiar with these types of studies who were not part of the study team.
- **Funding-** As with the Flin Flon Soil Study, Hudson Bay Mining and Smelting payed for costs associated with the study. HBMS does not have input into the study design, analysis, or interpretation.

# Re-cap of study activities

- Through September and October 2009 the study team conducted interviews with 251 households.
- Data collected from 447 individuals.
- 379 urine samples, 202 blood sample
- Urine analyzed for arsenic (inorganic, and total) and inorganic mercury.
- Blood was analyzed for lead.
  
- Environmental data was NOT collected concurrently; it was collected during other phases of the Flin Flon Soils Study

# Re-cap of findings

- Exposure to mercury and arsenic was similar to levels found in studies of similar populations.
- Blood lead levels were slightly higher than larger population level studies (e.g. Canada and US). Note difference (e.g. age, community characteristics).
- Lead exposure results for the Flin Flon area children are comparable to communities with lead exposure.
- Again, possible different sources of potential exposure including diet, activities, housing stock, soil levels.

# Potential Health Risks (Lead)

- None of the blood lead levels measured in the Flin Flon area are associated with symptomatic clinical effects.
- Considering the available literature, the blood lead levels measured in the Flin Flon area and specifically in West Flin Flon may be associated with asymptomatic, population effects.
  - Studies indicate childhood blood lead levels above 10 µg/dL may be linked to decreased intelligence and impaired neurobehavioral development.
- Health Canada's policy is to reduce exposure to lead wherever practical. The US CDC state that there is no known minimum threshold of harm for lead exposure.
- Participants with levels at or above 5 µg/dL were asked to follow up individually with physician – cautionary level

# Risk Management

- As a result of the findings of the original study, several risk management activities have occurred since 2010
  - HBMS facility/site/operations related
  - Community related
- These activities also included a recommendation to complete a follow-up study to assess the status of blood Lead levels in the community.

# Reduction in Emissions from Industrial Sources

- Closure of its Flin Flon Copper Smelter on June 11th, 2010
- Flin Flon Zinc Plant utilizes world class technologies that effectively eliminate atmospheric emissions
- HBMS will continue with a program of progressive remediation and revegetation of the area in and around the Flin Flon metallurgical complex
- HBMS will continue with operating practices and procedures aimed at minimizing any dust emissions
- HBMS will also continue with other environmental improvements

# Dust Control

- The control of dust from the metallurgical facility is managed primarily on two forums. The first is dealing with dust originating from the metallurgical complex and the second is dust prevention activities on the tailings impoundment structures.
  - Road dust has been minimized through ongoing paving programs in recent years and planned future pavement expansion projects
  - On the non-paved roadways HBMS takes proactive measures through the annual application of dust suppressants such as calcium chloride
  - Efforts to mitigate dust being blow off of the stockpiled material are through the application of liquid binding agents spayed on the exterior face of the stockpile material
  - HBMS has taken efforts to mitigate dusting issues from the Flin Flon Tailings Impoundment Structure (FFTIS)
  - Each fall a specific plan is developed to mitigate dust conditions on the FFTIS
  - Details of dust control activities are documented and compiled and a year end report is produced

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# Remediation (*studies/projects*)

- The Green Project
  - HBMS intends on continued funding of the Flin Flon area community based remediation project
- University of Saskatchewan
  - HBMS has entered into a multi-year agreement with the University of Saskatchewan to conduct research in the Flin Flon area
  - Research will continue to be carried out to better understand the soil characteristics with a view of further development of soil amendments

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# Remediation (*operational work*)

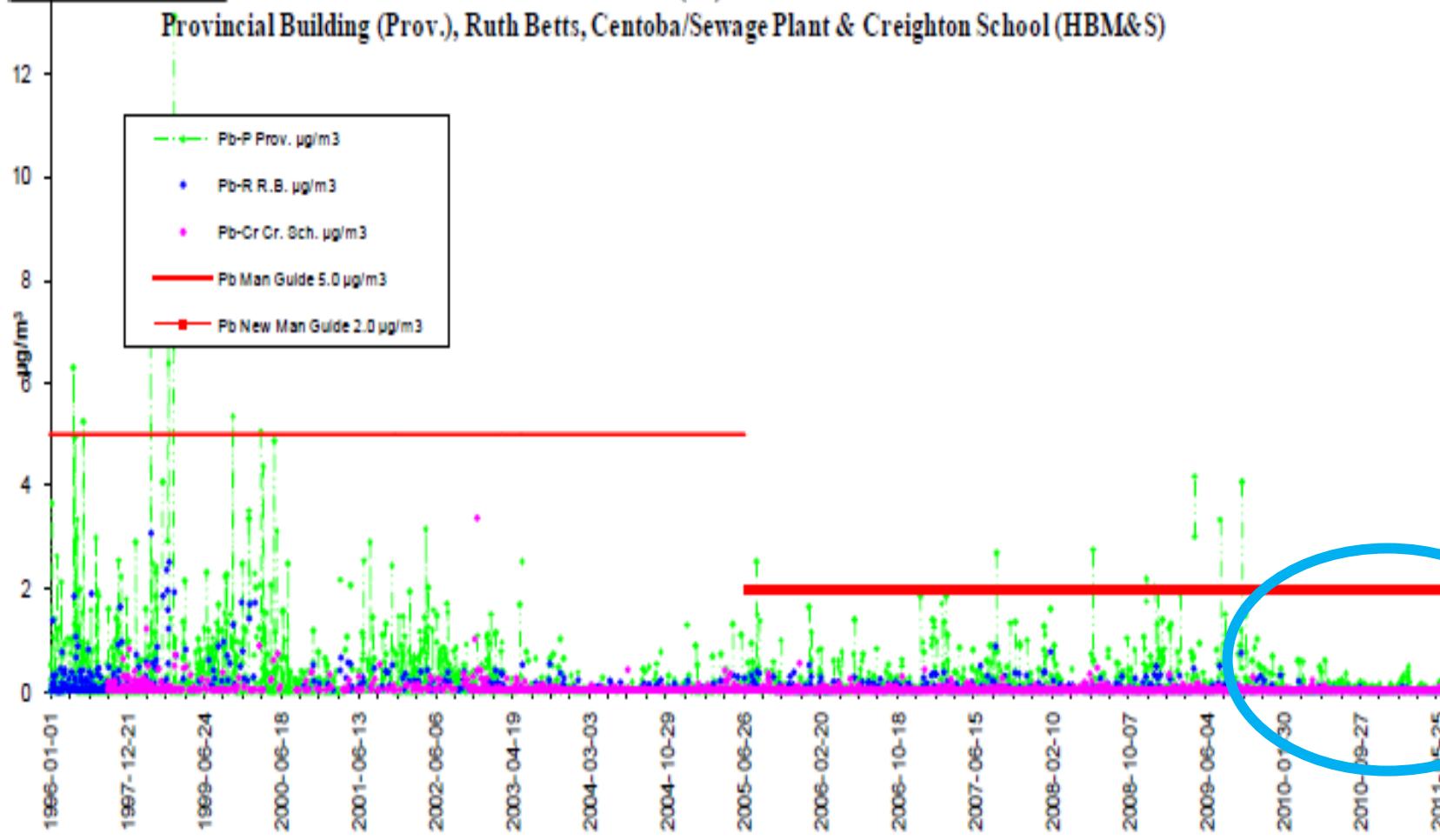
- Mouse Pond
- South Main Headframe area
- Acid Lake area
- Hanson Lake Highway drainage
- FFTIS Slope vegetation

# Continued Environmental Monitoring Activities

- Continuation of the ambient air quality monitoring program to confirm that the anticipated ambient air quality improvements have been achieved
- Snow surveys have been undertaken in recent years and provide a correlation between operating and non-operating conditions and the effect on snow contaminant levels
  - Due to the lack of snow, the study could not be repeated in 2012; another attempt will be made during the winter of 2013

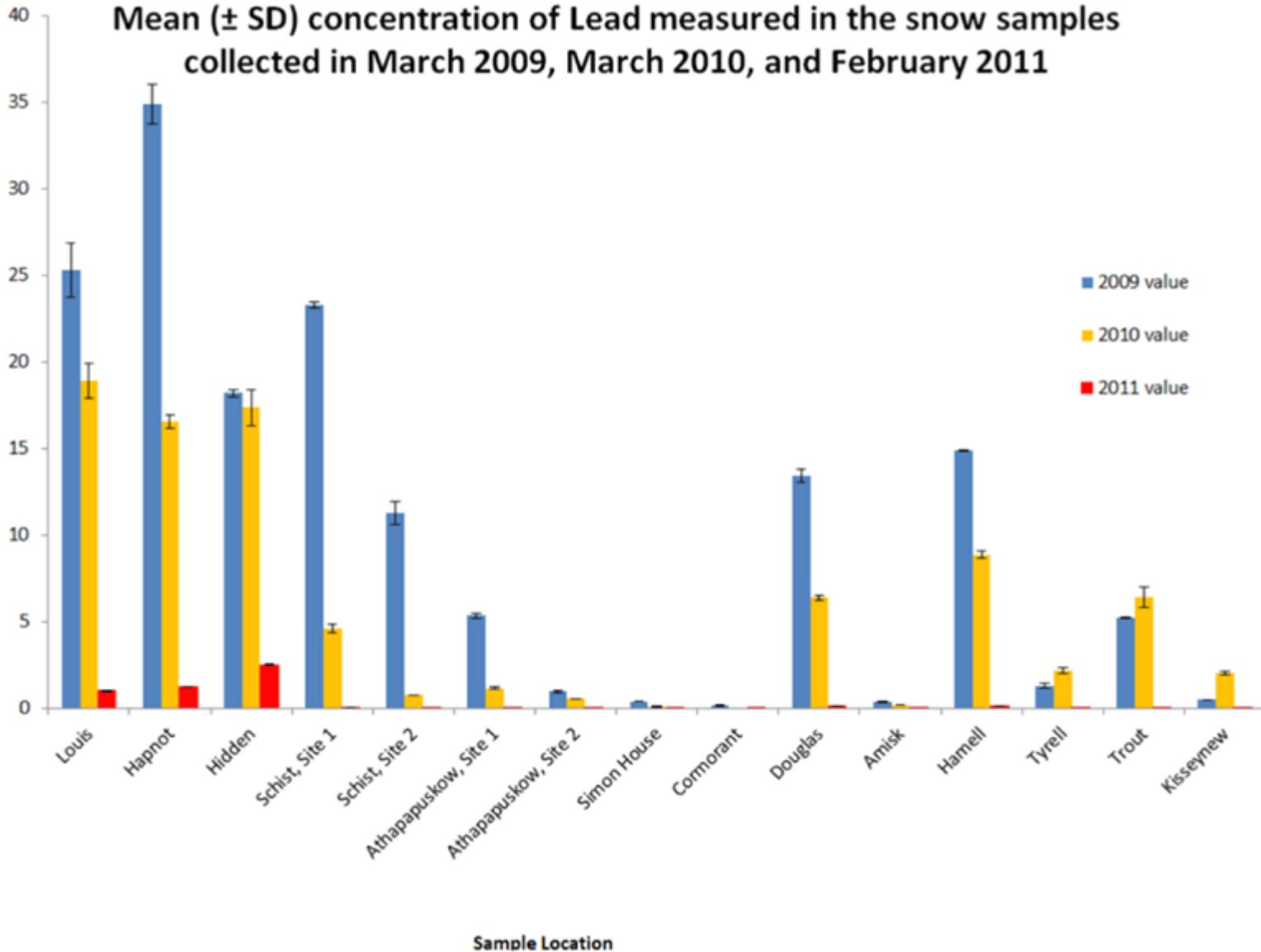
## Flin Flon - TSP - Lead (Pb) in Ambient Air

Provincial Building (Prov.), Ruth Betts, Centoba/Sewage Plant &amp; Creighton School (HBM&amp;S)



## Mean ( $\pm$ SD) concentration of Lead measured in the snow samples collected in March 2009, March 2010, and February 2011

Lead Deposition (mg/m<sup>2</sup>)



# Public Outreach and Education

- General awareness campaign
- Hand washing campaign
- Home renovations campaign



# Public Consultation & Communication

- HBMS will continue to facilitate the continuation of the study governance structure through a period of appropriate public consultation and follow-up
- HBMS will continue to maintain the Flin Flon Soils Study website ([www.flinflonsoilsstudv.com](http://www.flinflonsoilsstudv.com)) and telephone helpline (204-687-2020) to ensure that the study results, and potential future developments, remain fully accessible to the public and that queries can be addressed, for as long as is required.
- The TAC and CAC will continue to operate, with periodic meetings taking place on an as needed and when needed basis. It is anticipated that CAC meetings will occur semi-annually, with additional meetings occurring during the design and implementation of the follow-up blood lead study.

# Current and Evolving Science & Regulatory Policy

- It is recognized that accepted standards or guidelines for human health exposure can continue to develop and change over time. These standards and guidelines will be continually monitored and this Risk Management Plan will be modified as necessary to reflect the latest science and regulatory policy.
- The exposure reduction strategy should be re-evaluated following the exposure evaluation study that is tentatively scheduled for the fall of 2012 and with the availability of post-smelter closure ambient air quality data. This re-evaluation will then determine if the strategy is delivering the anticipated reductions or whether further actions will be required.

# **Further Exposure Evaluation for Lead in Children**

- HBMS is committed to performing an additional lead exposure evaluation study, scheduled for the Fall of 2012, to establish whether the various actions taken as a result of this Risk Management Plan have brought about a reduction in the average lead in blood levels of children within the community.

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# 2012 Follow-up Exposure Study

- Similar to the 2009 study, except only blood Lead (mercury and arsenic not recommended for further study)
  - CAC and TAC oversight
  - 7 years old and under; less than 84 months.
  - September 2012 (same time of year)
- Blood clinics will likely be held in more locations
- Shorter household interviews will occur
- Environmental Sampling to occur concurrently
  - Soil, dust and water sample collection will occur at the same time as household interviews; a paint scan will also be conducted
- Results will be shared with home owners

# Reporting of Environmental Results

Media Sampled	Your Results	Overall 2012 Study Results [average (max)]	Community 2012 Study Results [average (max)]	Overall Flin Flon Soils Study Results [average (max)]	Community Flin Flon Soils Study Results [average (max)]	Guideline Level
Soil (ug/g)				225 (820)	332 (820)W 141 (333)E 164 (456)C 112 (266)Ch	140 ug/g (CCME)
Dust (ug/cm <sup>2</sup> )				0.015 (0.26)	0.02 (0.2)W 0.009 (0.06)E 0.01 (0.06)C 0.01 (0.06)Ch	0.05 ug/cm <sup>2</sup> (EPA/HUD)
Drinking Water (ug/L)				4.6	1.5 (27) FF 0.8 (2.5) Cr	10 ug/L (CCME)
Paint (ppm)				ND	ND	90 ppm (HC)

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# Approach to the Follow-up Study (2)

- Study Questions:
  1. *What is the current level of internal exposure to lead in the child population residing in the Flin Flon Area?*
  2. *Compared to the lead exposure levels measured in 2009, have levels in Flin Flon Area children increased, decreased, or remained the same in 2012?*
  3. *Are the personal factors associated with children's lead exposure measured in 2009 (e.g., place of residence, age, gender) similar in 2012?*

# Approach to the Follow-up Study (3)

- Sample: stratified random sample approach based on municipal tax roll
  - Stratified by community East/West Flin Flon, Creighton, Channing
  - Also allow interested eligible households to participate. Treat separate from original sample initially to determine if differences in characteristics exist.
- Awareness raising: Combination of mail, news, open-house, word-of-mouth
- Recruiting: door-to-door and phone
- Awareness raising and recruiting will benefit from CAC direction and assistance
  - Types of communications
  - Timing of communications

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# Reporting

- Individual Results - Individual results to the participants' parents/guardians. If follow-up is needed, these will be provided by mail, along with general information on lead exposure and interpretation of results. If additional follow-up is needed, the team physician will call to go through the results and recommended follow-up procedures.
- Technical Reporting - The study team will prepare a scientific technical report for the study for peer review.
- Community Reporting - A community report that translates the scientific technical report for a general population audience. This report will focus primarily on the findings from the study. The study team will present to community groups and further describe the findings.

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# Questions about the follow-up study?

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# Work plan

- Study plan drafted (March)
- TAC Review (April/May)
- Integrate CAC input to study plan (early June)
- Ethics Review (mid-June)
- Start communications activities (July)
- Recruiting (late August)
- Start field work (September)
- Report individual results (November)
- Community Results (January)