



Flin Flon Soils Study

An assessment of Exposure and Human Health Risks in the Flin Flon Area

Community Open House, Thursday June 17th, 2010

OPEN HOUSE PARTICIPANTS AND SCHEDULE

| Speaker | Organization | Topic |
|--|-------------------------|--|
| Sheldon McLeod | Moderator | Introduction |
| Dave Bezak George Bihun | MB and SK Government | Flin Flon Soils Study Background |
| Elliot Sigal | Study Team | Study Background and HHRA Results |
| Dr. Michael Dourson | TERA | IERP process and outcome |
| Elliot Sigal Dr. Celine Pinsent Dr. Murray Lee | Study Team | Exposure Study and Overall Results |
| Dr. Lawrence Elliot Dr. James Irvine | MB and SK Government | Community Health Status and Public Health Perspective |
| Tom Goodman | HBMS | HBMS Perspective and Risk Management |
| Dave Bezak George Bihun | MB and SK Government | Next steps |
| Sheldon McLeod | Moderator | Questions & Answers |

GOVT OPENING REMARKS

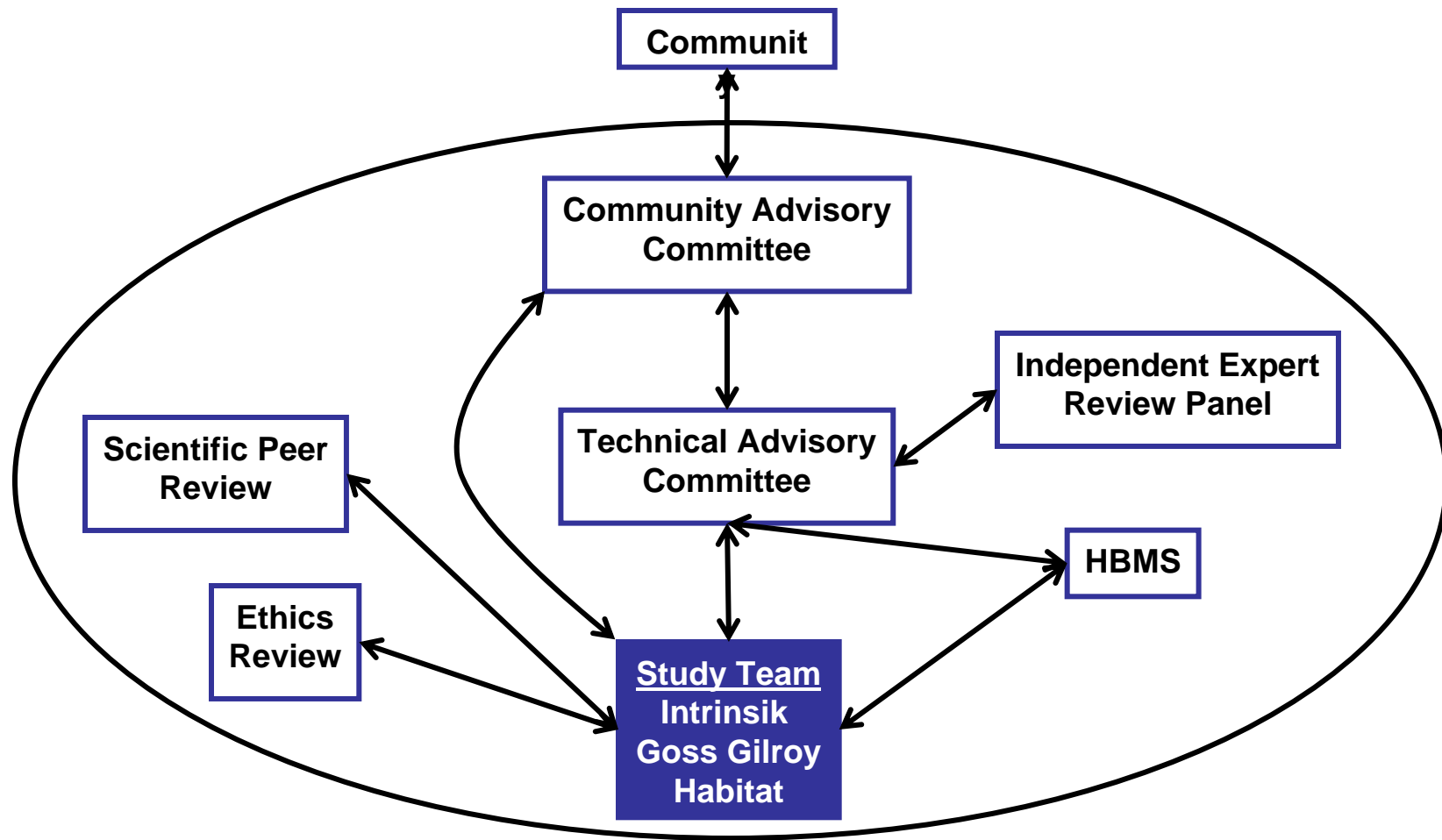
- Welcome
- Significant & important study for the communities
- Expectations from presentations & open house
- Public participation

QUESTIONS THAT WILL BE ANSWERED

- Why was the Flin Flon Soils Study conducted?
- Who conducted the study?
- How was the study conducted?
- What did the study find?
- What happens now?
- How do I get more information?

The overall conclusion of the Flin Flon Soils Study is that the likelihood of health effects among Flin Flon area residents from exposure to the metals evaluated is negligible to low

WHO CONDUCTED THE STUDY



COMMUNITY ADVISORY COMMITTEE

- The CAC consists of interested members of the public, including representatives of local organizations
- The CAC was formed to provide public input to the process, as well as to help make the study an open, transparent process from start to finish

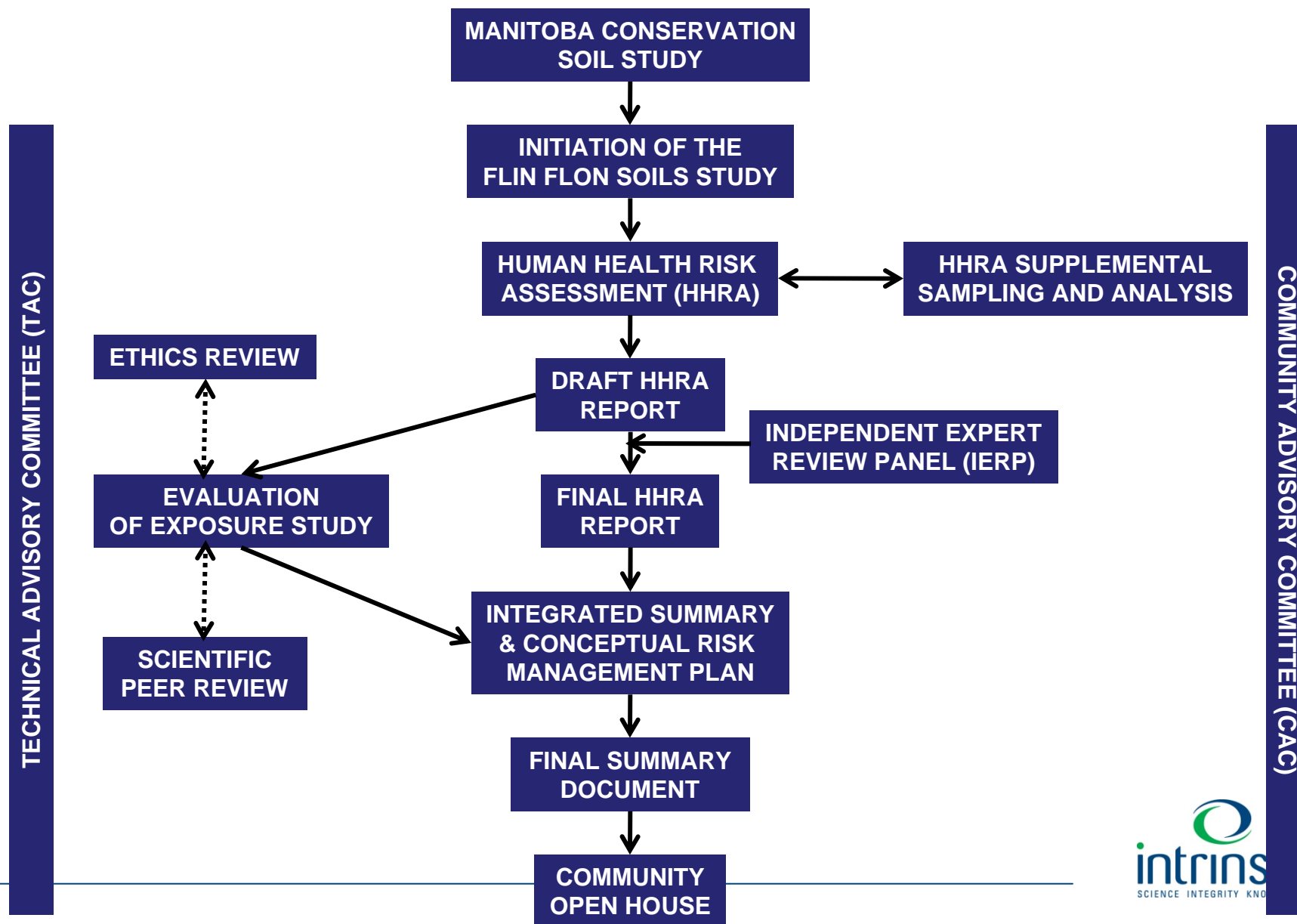
TECHNICAL ADVISORY COMMITTEE

- Manitoba Conservation
- Manitoba Health
- Manitoba Innovation, Energy and Mines (IEM)
- Saskatchewan Ministry of Environment
- Saskatchewan Ministry of Health
- Health Canada
- Representatives from the CAC

WHY WAS THE STUDY CONDUCTED?

- 2007 Manitoba Conservation report;
“Concentrations of Metals and Other Elements in Surface Soils of Flin Flon, Manitoba and Creighton, Saskatchewan, 2006”
- Levels of some metals were elevated in soil but there was no immediate risk to human health
- The report recommended further study to better understand potential health risks for people living in the Flin Flon area related to the HBMS smelter emissions
- The Flin Flon Soils Study was the result of this recommendation.

HOW WAS THE STUDY CONDUCTED?



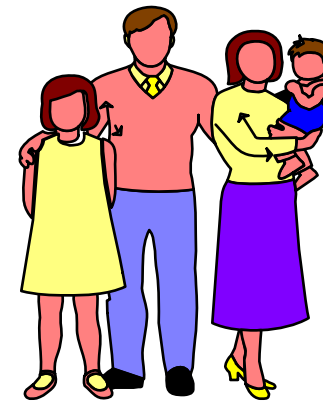
HUMAN HEALTH RISK ASSESSMENT (HHRA)

- Human health risk assessment is a scientific process that is used to estimate the likelihood that a population may experience adverse health effects as a result from exposure to particular chemicals in the environment.
- It considers the following factors:
 - How dangerous a chemical is known to be;
 - How sensitive people are to the chemical;
 - How a person might come into contact with the chemical such as swallowing, breathing, or skin contact as well how often and how long they are exposed; and,
 - How much of the chemical a person is exposed to.



SCOPE OF THE HHRA

- Exposure to six chemicals of concern (arsenic, cadmium, copper, lead, mercury, and selenium);
- Three exposure routes (oral, dermal, inhalation);
- Multiple sources of exposure (soil, dust, air, drinking water, diet);
- Both cancer and non-cancer health effects;
- Five life stages (infant, toddler, child, adolescent, adult) and lifetime;
- Four communities of interest (West Flin Flon, East Flin Flon, Creighton, and Channing).



EXPOSURE PATHWAYS

EXPOSURE PATHWAYS describe the ways that people may be exposed to chemicals in the environment, and may include:



INGESTION



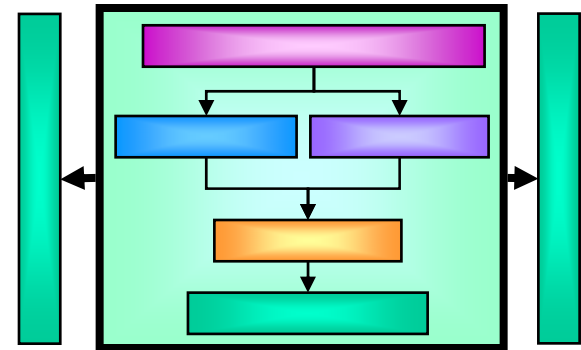
DERMAL CONTACT



INHALATION

EXPOSURE ASSESSMENT

- The HHRA estimated how much exposure people would have for each metal. The HHRA used the following information:
 - Measured levels of metals in the Flin Flon area environment (soil, indoor dust, air, water, fish, local food);
 - Surveys of the community that looked at people's eating habits; and,
 - General assumptions about physical characteristics, lifestyle and activity patterns of people living in the Flin Flon area (time spent outside, length of time living in community, age).



SUMMARY OF HHRA RESULTS

| Summary of HHRA Results for Non-Cancer Endpoints (Toddler) | | | | | |
|--|-----------------------|-----------------------|------------------|-----------------|---------------------------|
| <i>Chemical</i> | <i>East Flin Flon</i> | <i>West Flin Flon</i> | <i>Creighton</i> | <i>Channing</i> | <i>Typical Background</i> |
| Arsenic | ● | ● | ● | ● | ● |
| Cadmium | ○ | ○ | ○ | ○ | ○ |
| Copper | ○ | ○ | ○ | ○ | ○ |
| Lead | ● | ● | ● | ● | ○ |
| Inorganic mercury | ○ | ● | ○ | ○ | ○ |
| Methyl mercury | ● | ● | ● | ● | ○ |
| Selenium | ○ | ○ | ○ | ○ | ○ |

| Summary of HHRA Results for Carcinogenic Endpoints (Lifetime Receptor) | | | | |
|--|-----------------------|-----------------------|------------------|-----------------|
| <i>Chemical</i> | <i>East Flin Flon</i> | <i>West Flin Flon</i> | <i>Creighton</i> | <i>Channing</i> |
| Arsenic | ● | ● | ● | ● |
| Cadmium | ● | ● | ● | ● |

○ Negligible risk – no further investigation required

● Potential risk – risk management or further consideration such as an Exposure Study of residents may be required

Independent Expert Review Panel (IERP)

What is Expert Peer Review?

- Independent* expert scientists review a work product to insure that the results are scientifically-defensible.

Who Organized the Expert Review?

- Toxicology Excellence for Risk Assessment (TERA), an internationally recognized, independent, non-profit corporation.
- Mission of TERA is to support the protection of public health by developing, reviewing, and communicating risk assessment values and analyses, improving risk methods through research, and educating risk assessors and managers and the public on risk assessment issues.
- See www.tera.org for more information.

* Rigorous Conflict of Interest (COI) procedures followed



Protecting *INDEPENDENCE* of the IERP

- TERA communication with Hudson Bay Mining and Smelting (HBMS) was limited to contract information.
- TERA communication with TAC was through a designated contact person (Sheldon McLeod).
- TERA was solely responsible for selecting experts, organizing & conducting the meeting, and preparing meeting report without interference by any party.
- HBMS, TAC, CAC, and Intrinsik, were not permitted to communicate with panel members outside of the IERP meeting.



IERP Members

- Ronald Brecher, Ph.D., C.Chem., QPRA, DABT; GlobalTox and University of Waterloo; Guelph, Ontario
- Michael Dourson, Ph.D., DABT, ATS; Toxicology Excellence for Risk Assessment; Cincinnati, Ohio
- Susan Griffin, Ph.D., DABT; U.S. Environmental Protection Agency; Denver, Colorado
- Sean Hays, M.S.; Summit Toxicology; Denver, Colorado
- Norm Healey, B.Sc., DABT; Azimuth Group; Sidney, British Columbia
- Anthony L. Knafla, M.Sc., DABT, Equilibrium Environmental Inc., Calgary, Alberta
- Rebecca L. Tominack, M.D., FAACT, FACMT; Missouri Regional Poison Center & Saint Louis School of Medicine
- Joyce S. Tsuji, Ph.D., DABT, ATS; Exponent; Bellevue, Washington



Conclusions of the IERP

- The panel members agreed that the...
 - Authors followed commonly accepted risk methods,
 - Input data and assumptions were valid and appropriate, except for those identified during discussion, and
 - HHRA was generally presented clearly & was comprehensive.
- The panel chair & staff of TERA reviewed the revised HHRA & responses & determined that authors...
 - Were responsive to the panel's concerns & recommendations,
 - Had revised the risk assessment accordingly.
- A list of revisions and a description of the review are found in Appendix T of the HHRA.



OVERVIEW OF THE EXPOSURE STUDY

- Preliminary info from the HHRA for the Flin Flon area indicated that further information would assist to fully understand exposure to potential human health risks associated with some metals in the community through biological samples (e.g. blood, urine)
- The metals that were measured are **lead, total and inorganic arsenic** and **inorganic mercury**.
- The study investigated the following questions:
 - *What is the current level of lead, arsenic, and inorganic mercury in the blood and urine of children in the Flin Flon area?*
 - *Do Flin Flon area children have higher lead, arsenic, and/or inorganic mercury levels than residents living in other parts of Canada?*
 - *Based upon the current scientific literature, what are the health risks from the levels of lead in blood, and arsenic and inorganic mercury in urine that were found in children in the Flin Flon area?*
 - *What personal factors are associated with the level of chemicals in the children of Flin Flon, such as place of residence, parents place of work, age, gender, diet, personal habits and playing habits such as children putting soil in their mouths?*

WHAT WE LEARNED FROM THE STUDY (1)...

Inorganic Mercury:

- The Evaluation of Exposure found no elevated levels of inorganic mercury in children's urine.
- Half of the samples were below the detection limit.
- The Flin Flon Area levels of inorganic mercury were below levels found in other recent studies, including similarly aged populations in other studies.

Arsenic:

- Children's levels of total and inorganic arsenic in urine were not elevated.
- The community levels were very similar to the levels found in other Canadian communities where soil levels were not elevated.
 - including both communities with potential soil exposure (e.g., Falconbridge, Wawa, Deloro) and
 - comparison communities with no soil contamination (e.g., Hanmer, Havelock).

WHAT WE LEARNED FROM THE STUDY (2)...

Lead:

- Measured blood lead levels in children from the Flin Flon area do not indicate immediate health concerns.
- Very few children (about 2%) had measured blood lead levels above Health Canada's current intervention level. As a precaution, a more sensitive reference point was used for the study; as a result, about 13% of the children tested were referred to a physician for follow-up.
- Many factors were associated with the measured blood lead levels in Flin Flon area children including:
 - gender
 - area of residence
 - year that their house was constructed (age of house may indicate other exposures)

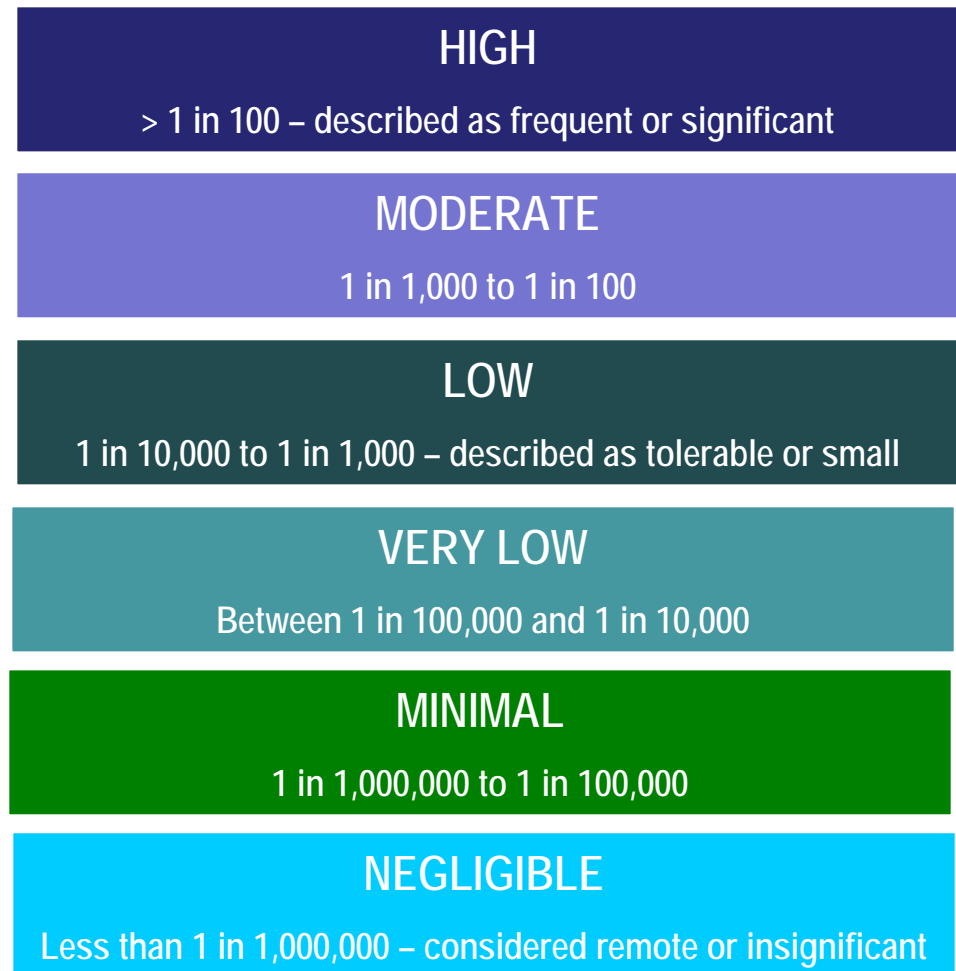
WHAT WE LEARNED FROM THE STUDY (3)...

Lead (continued):

- The blood lead levels measured in Flin Flon area children were compared with numerous other studies.
- There were challenges in making each comparison as there is not a “perfect” comparison for Flin Flon area children. (e.g. age, community characteristics, etc.)
- With these cautions in mind, comparisons that have been made provide a context in which the study results can be looked at.
- The blood lead results for Flin Flon area children were comparable with or even slightly lower than other Canadian smelter communities, and were slightly higher than the average levels reported for a large US national study of the general population.
- Overall, studies are showing that over time blood lead levels have been declining everywhere. The adults in the room likely had much higher blood lead levels when they were children than the blood lead levels currently found in Flin Flon children.

OVERALL RESULTS: WHAT DID THE FLIN FLON SOILS STUDY FIND?

- The overall conclusion of the Flin Flon Soils Study is that the likelihood of health effects among Flin Flon area residents from exposure to the metals evaluated is negligible to low***



RESULTS: SHORT-TERM RISKS

- Short-term risks associated with infrequent exposure scenarios were evaluated for air, soil and snow
- The results of this evaluation indicated that on rare occasions some people may experience short-term and reversible minor health effects from exposure to metals in soil and air, such as irritation of the eyes, nose, or throat; or aggravation of symptoms of those with asthma

RESULTS: LONG-TERM RISKS

- Long-term risks are associated with regular and repeated exposure scenarios that may occur throughout a lifetime.
- *Copper:*
 - The study indicated that no elevated risks from exposure to copper were predicted
- *Selenium:*
 - The study indicated that no elevated risks from exposure to selenium were predicted
- *Cadmium:*
 - Air concentrations of cadmium could pose a low long-term health risk
 - Increased cases of lung cancer in the Flin Flon area are not expected given the small population size and estimated low risk level
 - The smelter shut down is expected to decrease air levels substantially

RESULTS: LONG-TERM RISKS (continued)

- *Methyl Mercury:*
 - Some fish in Flin Flon area lakes had elevated concentrations of mercury.
 - The elevated concentrations of methyl mercury in fish generally appeared to increase with distance from the HBMS facility
- *Inorganic Mercury:*
 - The Evaluation of Exposure found no elevated levels of inorganic mercury in children's urine.
- *Arsenic:*
 - Air concentrations of arsenic could pose a low long-term health risk.
 - Increased cases of lung cancer in the Flin Flon area are not expected given the small population size and estimated low risk level and the smelter shut down is expected to decrease air levels substantially
 - The Evaluation of Exposure found that children's levels of inorganic arsenic in urine were not elevated. The community levels were very similar to the levels found in other Canadian communities where soil levels were not elevated

RESULTS: LONG-TERM RISKS (LEAD)

- Measured blood lead levels in children from the Flin Flon area do not indicate immediate health concerns.
- The blood lead results for Flin Flon area children were comparable with or even slightly lower than other Canadian smelter communities, and slightly higher than the average levels reported for a large US national study
- Blood lead levels in Canada have declined significantly over time. However, some of the latest studies on lead indicate that there may be slight developmental and cardiovascular effects even at low levels. The findings from the studies show lead exposure in Flin Flon is slightly higher than available population data but well below the current action levels for medical intervention.
- Few children (about 2%) had measured blood lead levels above Health Canada's current intervention level. As a precaution, about 13% of the children tested were referred to a physician for follow-up.
- Many factors were associated with the measured blood lead levels in Flin Flon area children including gender, area of residence, and the year that their house was constructed (age of house may indicate other exposures such as from lead in paint or pipes).

NEXT STEPS: WHAT HAPPENS NOW?

- ***Overall, the findings from these studies are reassuring, but some low level risks were identified from some metals. Reducing air emissions, continued monitoring and some additional precautionary measures are recommended.***
- The HBMS smelter is scheduled to cease operations by mid-June 2010.
 - It is recommended that air monitoring programs continue to confirm that concentrations of metals in the air decrease
- It is recommended that the Provinces evaluate the need for recreational fish advisories on the lakes with increased fish mercury concentrations identified in this study

NEXT STEPS (continued)

- Based on the outcome of the HHRA and exposure studies, recommendations have been made to address lead in the environment
- The recommendations includes exposure reduction strategies including general education and best cleaning practices
- A follow-up blood lead analysis is recommended in the fall of 2011 to assess the effectiveness of these exposure reduction strategies
- ***Based on the results of the Flin Flon Soils Study, the removal or management of soils in the community are not justified at this time.***

COMMUNITY HEALTH STATUS ASSESSMENT

for Flin Flon / Creighton area: 1996-2005

- Completed by public health officials from Saskatchewan and Manitoba.
- Provides information on the overall general health of the population in the Flin Flon / Creighton area over the past decade
- Made comparisons to Manitoba, Saskatchewan, and the NOR-MAN and Mamawetan Churchill River Health Regions
- The purpose was to determine if there were particular areas of concern that could require further health status studies.

Generally, the overall health status of the Flin Flon-Creighton population is as good, if not better, than the provincial averages for most of the indicators studied.



**Saskatchewan
Ministry of
Health**



Medical Officer of Health Perspective

- We support the scientific methods and independent peer-reviewed process used for the Study
- We feel that together, the Study results and the Community Health Status Assessment are reassuring that adverse health effects are unlikely
- We agree with the cautious approach recommended to ensure that health is protected, with short term and long term measures and ongoing monitoring and surveillance



**Saskatchewan
Ministry of
Health**



HBMS

Reduction Strategy and Actions

- Reduction in Emissions from Industrial Sources
- Community Ambient Air Quality Monitoring
- Public Outreach and Education
- Further Exposure Evaluation for Lead
- Public Consultation and Communication
- Future Performance Review and Re-evaluation

PROCESS GOING FORWARD

- Review & comment on the study
- Review & comment on the HBM&S next steps
- Finalization of reports
- Decision on the plan

HOW TO SUBMIT YOUR COMMENTS/QUESTIONS

- **By MAIL:**
 - Flin Flon Soils Study – Public Comments
 - c/o Intrinsic Environmental Science Inc.
 - 500-6605 Hurontario Street
 - Mississauga, ON L5T 0A3
- **By EMAIL:**
 - comments@flinflonsoilsstudy.com
- **By INTERNET:**
 - www.flinflonsoilsstudy.com (online comment form)
- **By PHONE:**
 - 204-271-3792