Flin Flon Soils Study-Integrated Risk Management Plan
Exposure Reduction Strategy and Actions

Prepared for: Hudson Bay Mining and Smelting Co., Limited

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1.0 BACKGROUND

This Integrated Risk Management Plan (*Exposure Reduction Strategy and Actions*) was prepared on behalf of Hudson Bay Mining and Smelting Co., Limited (HBMS) as a follow-up to the Flin Flon Soils Study Human Health Risk Assessment (HHRA) and Exposure Evaluation Study.

The risk assessment and subsequent exposure study were commissioned and fully funded by HBMS. The study was conducted by Intrinsik Environmental Services Inc. (Intrinsik), with the assistance of numerous other technical consulting firms as required.

The study was conducted within a governance structure facilitated by HBMS that included:

- a Technical Advisory Committee (TAC) consisting of appropriate government and scientific representatives;
- a Community Advisory Committee (CAG) consisting of a broad cross-section of local stakeholders; and,
- where appropriate, an independent third party technical expert peer review and ethics review.

The results of both the HHRA and Exposure Evaluation study were compiled into a "Summary Documents and Integration Results" report. All reports are available on-line at www.flinflonsoilsstudy.com. Hard copies can be found in the City of Flin Flon Council Chambers, The Town of Creighton office and the Flin Flon Public Library.

This integration report made three general recommendations where further investigation, continued monitoring efforts and/or risk management actions may be warranted and outlined a two-tiered conceptual risk management plan. The intentions of this document are to provide further details regarding the implementation of these recommendations.

2.0 EXPOSURE REDUCTION STRATEGY AND ACTIONS

2.1 Reduction in Emissions from Industrial Sources

- HBMS finally completed the previously announced closure of its Flin Flon Copper Smelter on June 11th, 2010. It is anticipated that the closure of the smelter will result in a significant improvement in ambient air quality within the Flin Flon and Creighton area.
- It should be noted that the Flin Flon Zinc Plant already utilizes world class technologies that have effectively eliminated atmospheric emissions from this process.
- In addition, HBMS will continue with a program of progressive remediation and revegetation of the area in and around the Flin Flon metallurgical complex. This program should result in a further improvement in ambient air quality. Furthermore, HBMS will continue with operating practices and procedures aimed at minimizing any dust emissions from the Flin Flon Metallurgical Complex in areas such as the metallurgical operations, tailings facility, etc. HBMS will also continue with other environmental improvements within its operations such as the paving of in-plant roads and material handling upgrades that will help improve ambient air quality further.

2.1.1 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.

On-site road dust has been minimized through ongoing paving programs in recent years and planned future pavement expansion projects. **Refer to Attachment A 'Paving Program'.** On these paved areas there is a considerable amount of sand placed due to winter driving conditions. In the summer months the sand applied for winter traction is removed via street sweepers in order to minimize dusting conditions from the dry sand.

On the non-paved roadways HBMS takes proactive measures through the annual application of dust suppressants such as calcium chloride. Continued application of this product in early summer is planned for future years as it is an excellent method of dust suppression. The quantity of 35% calcium chloride applied to the roadways on the metallurgical complex amounts to 9000 litres per annum. In addition to the application of calcium chloride, water is sprayed over sections of the plant roads through the summer months in order to ensure dust conditions are minimized.

Due to the logistics of handling copper and zinc concentrates, stockpiles of this material will be stored outside on the complex. Weather conditions and wind can present the potential of dust being blow off of the stockpiled material. Efforts to mitigate this are through the application of liquid binding agents spayed on the exterior face of the stockpile material. This binding agent prevents dusting issues from arising in warm windy conditions in summer months as well as freeze dry issues in winter.

As part of the operational practices for the tailings placement, efforts are taken to mitigate dusting issues from the tailings impoundment structures. HBMS has developed operating guidelines for the Flin Flon Tailings Impoundment Structure (FFTIS) and is committed to ongoing improvements through Continuous Improvement Initiatives through its management system. **Refer to Attachment B 'LAI-612'.** General traffic on the FFTIS from inspection and monitoring personnel as well as construction equipment required for ongoing dam maintenance activities necessitate continued and ongoing watering of roadways. This is rigorously monitored with daily checks being recorded and remedial actions being taken to ensure dust conditions are minimized.

Each fall a specific plan is developed to mitigate dust conditions on the FFTIS which is matched with the tailings deposition and that summer's construction activity. Retaining more water in the FFTIS prior to freeze-up in conjunction with soil binding agents and salted sand placement, efforts are taken to adjust to conditions present from fall through winter each year. **Refer to Attachment C detailing the dust control plan on the FFTIS for the 2010-2011 winter**. Ongoing field tests continue with the placement of new and improved soil binding agents and products to empirically determine optimum binder characteristics to match with tailings and weather characteristics.

Details of dust control activities are documented and compiled and a year end report is produced. The activity log is included in the annual FFTIS report. **Refer to Attachment D for excerpts of the 2009 FFTIS Annual Report.**

2.1.2 Remediation (studies/projects)

The Green Project
HBMS intends on continued funding of the Flin Flon area community based remediation project known as The Green Project. Over the past several years naturally occurring re-vegetation has been documented due to simple soil amendments of crushed limestone addition to alter the soil pH such that natural re-vegetation will occur. **Attachments E, F and G contains further information regarding the Green Project** detailing activities in recent years and outlining areas of remediation and soil amendment application planned for the summer of 2011. It is believed that increased support from HBMS will be required in upcoming years as the access to the remaining untreated territory in the Flin Flon area has become more and more difficult. The limited number of roadways and trails over the undulating rocky ground will limit the amount of ground to be amended with limestone addition as delivery of the material for spreading will become difficult without the use of expensive equipment and/ or the construction of access roads to remote areas.

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. These amendments will promote and assist future re-vegetation in the Flin Flon area where both naturally occurring events and anthropogenic activity have affected present vegetation levels.

It is envisaged that research and development in the area of soil characteristics, amendment alternatives, and re-vegetation strategies will continue in future years pending budgetary approvals.

2.1.3 Remediation (operational work)

Mouse Pond
North of the 777 Mine site on the West side of the highway is a historically impacted area referred to as Mouse Pond. Remedial activities have been planned to re-vegetate the area and control surface water runoff as well as eliminate the potential for dusting conditions regardless of extreme weather conditions.

In 2010 material was hauled and stockpiled near Mouse Pond such that a clay cover could be placed over top of the contaminated material. This material will be covered with a layer of organic soil in order to promote re-vegetation in the area. The organic soil cover was stockpiled for future use at this site in 2009. This overall project schedule is subject to budgetary approvals in upcoming years.

South Main Headframe area
Final demolition activities at the South Main Headframe area were essentially complete in the fall of 2010. Final cleanup and safety precautions such as the installation of engineered bulkheads are scheduled for completion in 2011. Material has been hauled to stockpile at the South Main site with the intention of placement of a clay cover over top of the contoured rock placed during the original construction of the mine site several decades ago.

The clay cover will act as a protective barrier for the backfill material which may be comprised of Potentially Acid Generating (PAG) material. An organic soil layer will be placed on top of the clay layer to promote and sustain plant growth and natural re-vegetation. This plan will allow for

the protection of potential contaminants as well as a general improvement in the visual aesthetic of the area which is located close to the walking path between the communities of Flin Flon and Creighton.

Continued reclamation work at this site as well as the previously detailed remediation efforts are part of the submitted capital budget and are tentatively scheduled for completion in 2011.

Acid Lake area
The Acid Lake area was drained and the contaminated material was excavated and removed in the summer of 2010. Clay material was placed in the excavation area and contoured to promote positive drainage towards the Lake Bottom sump on the East side of the FFTIS.

Scheduled in 2011 is another excavation project that will facilitate the placement of more clay material in the Acid Lake area. It is anticipated that this additional volume of cover material will complete the requirements of clay backfill and allow for improved drainage of the area.

Subject to budgetary approval, in 2012 the placement of organic soil layers and seeding will be completed. The vegetation that germinates will be fertilized and monitored in future years to ensure successful re-vegetation and plant growth is promoted.

Hanson Lake Highway drainage
In order to allow for future reclamation and remedial activities, it is necessary to complete all work in the area of the FFTIS that is required after operations cease and HBMS initiates its closure plan. The re-vegetation on the slopes of the FFTIS cannot proceed until the drainage channel improvements required post closure are completed. A drainage ditch along the Hanson Lake Highway was designed to accommodate future seepage water from the FFTIS as well as extreme flood conditions. The construction of this drainage channel was initiated in the fall of 2010 and is tentatively scheduled for completion prior to January 2011. Once complete, this drainage channel will be operationed in perpetuity. Its completion will facilitate further remedial work on the FFTIS slopes (detailed in section below).

FFTIS Slope vegetation
Due to research and development activities from internal operations, private consultants, and academic institutions, re-vegetation of the FFTIS has proven viable on some areas of the structures while in operation. Portions of the FFTIS are inactive and will not be altered due to downstream construction techniques associated with dam raises in future years. These sections of the dam can be successfully re-vegetated, which not only eliminates dusting potential and protects the dam from erosion control, it greatly improves the overall visual aesthetics of the FFTIS.

Sections of the dam slopes along the Hanson Lake highway have been successfully revegetated in recent years utilizing a specific design of cover materials and seeded with naturally occurring plant species. Scheduled in the 2011 growing season is the further monitoring and fertilizing of the vegetated slopes.
In addition to the ongoing monitoring of the re-vegetated slopes will be the stockpile of appropriate material for continued remedial work on untreated slopes. These stockpiling activities are part of the submitted 2011 operational budget. Further work in the slope area near to the Hanson Lake Highway is tentatively planned subject to budgetary approvals in 2012. The overall project will include re-vegetation of the FFTIS slopes adjacent to the highway on the North side of the town of Creighton.

2.2 Continued Environmental Monitoring Activities

- HBMS is committed to the continuation of its ambient air quality monitoring program to confirm that the anticipated ambient air quality improvements have been achieved. **Air monitoring details are provided in Attachment H.** HBMS, in conjunction with the Manitoba Government, will also ensure that such information continues to be both publicly available and that the annual Air Quality Update presentation will continue to be made at the Healthy Flin Flon meetings for as long as is required.
- Snow surveys have been undertaken in recent years while the Copper Smelter was operational. Planned for the 2011 winter season is another snow survey which will be used to compare to previous reports. The results of this season's findings will provide a correlation between operating and non-operating conditions and the effect on snow contaminant levels. Dependent upon results from the 2011 snow survey and subject to future budgetary approvals, it is anticipated that the snow survey will be continued in 2012**. Refer to Attachments I and J for details regarding previous Snow Surveys.**

2.3 Public Outreach and Education

Lead exposure is a general community concern throughout the country, even in non-mining areas. Sources in older communities also include the historical use of lead paint, leaded gasoline and lead components in plumbing systems.

In line with its other community outreach initiatives, HBMS will work with the appropriate stakeholders to facilitate the development of educational programs and related strategies to assist in reducing child exposure to lead hazards arising from all potential sources of lead.

Attachment K details the Educational Outreach Program that has been designed for the Flin Flon area. The program consists of the following three components:

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

The ultimate program goal is to lower blood lead levels in Flin Flon area children. In addition, the program has been developed to enhance the capacities of community partners that will continue to serve this function in the future, thus contributing to overall community well-being.

2.4 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 re-evaluate the average blood lead levels of children in the community, 3 years after the original exposure evaluation, and after the implementation of the proposed risk management activities.

- To meet the sampling window of September/October 2012, the optimum timing to start the process (e.g., develop protocols, ethics submissions, start lining up school boards, day care centres, etc) would be in the January/February 2012 time period.
- The follow-up study will involve ethics and peer review through the IRB (Independent Review Board) combined with the Health Authorities
- For comparison purposes, the follow-up study will attempt to look at a similar number of children in the same age range (1 to 6 years old) as the original study

- Recruitment may be more difficult for the follow-up study since there will not be an HHRA process ongoing
- Recruitment will try to utilize a similar approach as was done for the original study, that is following a somewhat random sampling approach for comparative purposes. We may attempt to recruit by phone rather than by visiting. Also, we can use the public health clinics, day care centres and schools to assist with recruiting. We may want to consider setting up clinics in schools or daycares to boost response rates, and add to legitimacy to the process.

2.5 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 in 2010 and beyond.
- HBMS will continue to maintain the Flin Flon Soils Study website (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.
- It is expected that 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.

2.6 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.

3.0 REGULATORY ACKNOWLEDGMENT

As indicated in the following e-mail correspondence, the Governments of Manitoba and Saskatchewan have acknowledged receipt of this document and have recommended full implementation of the plan (recognizing that many activities are already underway). Several suggestions have been provided that will be adopted in the future, including:

- Annual reports to both governments by March 31 of the following year, starting in March 31, 2012, including the following information: summary of activities undertaken to date under the plan, associated results or findings, any suggested changes or modifications to the plan from these findings, and an updated plan for the following year; and
- Continued operation of the committee structures (TAC and the Community Advisory Committee) to ensure the continuing exchange of information and receipt of advice, as may be necessary, to assist with delivery of elements of the plan.

Elliot Sigal

From: Bezak, Dave (CON) <Dave.Bezak@gov.mb.ca>
Sent: September-13-11 4:20 PM
To: 'Alan Hair'
Cc: Elliot Sigal; 'george.bihun@gov.sk.ca'
Subject: Final Risk Management Plan (Flin Flon Metals in Soils)

RE: Flin Flon Soils Study – Integrated Risk Management Plan; Exposure Reduction Strategy and Actions; July 2011

This email will acknowledge receipt of the above risk management plan that was developed in response to the evaluation of potential risks from exposure to metals in soils in the Flin Flon area. On behalf of the Technical Advisory Committee (TAC) and our two governments, we have appreciated the opportunity to participate in the process that has led to the development of your plan.

We have reviewed the final copy of the plan and are encouraged that comments provided by members of the TAC on the draft report have been addressed. We would now recommend that you proceed to fully implement the plan, recognizing that many of the activities are already underway. Additionally, we recommend that the plan, along with the appendices, be placed on your public web site (Flin Flon Soils Study).

Since the plan will take a number of years to be delivered and will be subject to additional review as you have noted in your plan, especially after the findings from biological testing of child blood for lead in the fall of 2012 are available, we would additionally suggest:

- Annual reports to both governments by March 31 of the following year, starting in March 31, 2012, including the following information: summary of activities undertaken to date under the plan, associated results or findings, any suggested changes or modifications to the plan from these findings, and an updated plan for the following year; and
- Continued operation of the committee structures (TAC and the Community Advisory Committee) to ensure the continuing exchange of information and receipt of advice, as may be necessary, to assist with delivery of elements of the plan.

Signed by:

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