



# FFTIS Dust Control Guidelines

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## HUDSON BAY MINING AND SMELTING CO., LIMITED



## FLIN FLON TAILINGS IMPOUNDMENT SYSTEM

### Dust Control Guidelines



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## 1.0 INTRODUCTION

The following report outlines current Hudson Bay Mining and Smelting Co., Limited practices and procedures for dust control within the Flin Flon Tailings Impoundment System (FFTIS). Fugitive dust has been a problem in the Flin Flon and Creighton area for many years. The problem is compounded by the continuous rise of the tailing facility, making it more susceptible to high winds. If dust does migrate off of HBMS property it is considered to be an environmental incident and must be reported to the environmental officer at Saskatchewan Environment.

HBMS Environmental Control staff have established an ongoing program of planning and review and are committed to continual improvement of dust control within the FFTIS.

The dust control procedures are adopted and implemented by:

- HBMS employees responsible for dust control within the FFTIS.
- Contractors implementing the dust control plans and measures.

## 2.0 DEFINITIONS OF TERMINOLOGY

**FFTIS:** Flin Flon Tailings Impoundment System

**HBMS:** Hudson Bay Mining and Smelting Co., Limited

**Active Areas:** Areas that are currently receiving tailing effluent

**Temporarily Inactive Areas:** Areas where tailing deposition has temporarily ceased but will resume in the future.

**Reclamation Regarding Closure:** Areas of inactive tailings that will be progressively reclaimed and revegetated to meet FFTIS closure plans

**Shoulder Season:** The transitional period during spring and fall when low temperatures and lack of snow cover results in freeze/dry conditions on exposed tailings

## 3.0 METHODS OF DUST CONTROL

Extensive work has been completed over the past year by HBMS staff and contractors in an effort to mitigate fugitive tailing dusting. Many of the dust control methods used were implemented on a "trial and error basis" to determine the effectiveness of these methods. The dusting event that occurred during the fall of 2002 was the worst of its kind experienced by environmental staff and the local public. The various types of work involved placement of artificial barriers and chemical dust suppressants. The following



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sections are a brief description of dust control methods used by HBMS environmental staff.

## 3.1 Physical Methods of Dust Control

The materials used currently for dust mitigation include the use of slag and screened gravel. The following is a brief description of these methods.

### Slag

Slag is the waste product produced from the copper smelting process. Slag has been used extensively on the FFTIS for wind and water erosion protection. Historically slag was placed on exposed upstream and downstream slopes of the tailing dams. The slag was ripped from the slag pile and hauled and placed on the slopes of the dams with heavy equipment. Slag is also used as a protective cover on exposed tailing beaches that are abandoned in order to prevent dusting. Slag has also been placed in windrows running in an East-West direction to act as windbreaks. These windbreaks act to reduce the wind velocity at the exposed tailing surface. Windbreaks are easiest to construct late in the shoulder season when the frost penetration depth is great enough to support construction equipment.

### Screened Gravel

Screened gravel is processed at the contractor's crusher site approximately one kilometre South of the FFTIS. The gravel is then hauled to the FFTIS and is used to cover the crest (top running surface) of the constructed tailing dams.

### B Base

B Base is a combination of crushed slag and sand prepared at the contractor's site. Less expensive than screened gravel, B Base has been used to cover exposed tailing surfaces such as the oxide pond.

### Water

During the construction of tailing dams, water is used extensively to maintain haul roads and the crest of the dams in a damp condition thereby preventing dusting.



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## 3.2 Chemical Methods of Dust Control

### Calcium Chloride Sand Cover

Sand mixed with calcium chloride is hauled in from the contractor's crusher site. The sand is applied with a sanding truck that is used on municipal streets in the Flin Flon/Creighton area. "Salted" sand will not freeze at temperatures above minus 10 degrees, and can be spread in a thin layer over exposed frozen tailing surfaces during the shoulder seasons when frost penetration is enough to support the sanding truck. The calcium chloride in the sand acts to melt the frost on the exposed tailing surface and stops the fine particulate dust particles from becoming airborne.

"Salted" sand is typically placed in exposed tailing surfaces that could not be protected from wind erosion by other methods. Areas such as freshly deposited tailing beaches can be protected with this material once frost penetration is sufficient to support the sanding truck.

### Soil Sement

This is a short-term dust control method used in areas where there is a temporary stoppage in tailing deposition. The application can last for periods of one to six months depending on mix ratios and in situ moisture contents of beached tailings, and, whether or not tailings deposition can be delayed in these particular areas. The dust suppressant is spread hydraulically by a spraying application method. The chemical can be used on temporarily inactive exposed tailing slopes that are not easily accessible by heavy equipment and on dam crests where traffic may exist. The chemical is mixed with water and pumped from a water truck through a hose where the operator can place the chemical where it is needed the most. The chemical uses the water as the vehicle and penetrates into the tailings, creating a crust on the surface to prevent tailings dust particles from becoming airborne.

Local contractors provide the services for spraying the chemical dust suppressants within the FFTIS areas. The Section Leader of Engineering and Special Projects or his designate co-ordinates with the contractors on a daily basis, and targets the specific areas that need to be attacked. The chemical agents are supplied from external suppliers.

## 3.3 Natural Methods of Dust Control

The most economical method of dust control on the FFTIS is precipitation. Rainfall during warm weather keeps exposed surfaces damp. Snow during cold weather creates a snow cover that protects exposed surfaces. The Flin Flon/Creighton area is part of the Northern Boreal region that receives an average 559-mm of precipitation annually, 333 mm as rainfall and 126 mm as snowfall.



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## Snow Cover

Under normal winter conditions, snow that falls directly on the tailing surface during late fall is wet and once frozen will remain in-place all winter protecting the tailing surface from dusting. Should this early snow cover melt, subsequent snowfall will be powdery and subject to drifting, leaving the tailing surface unprotected during and following periods of elevated wind. To avoid this potential problem the following action is taken.

When enough snowfall is received on the FFTIS, the Section Leader of Engineering and Special Projects or his designate will direct the contractor to mechanically compact the snow with track type equipment in areas that are safe to travel on. The compacted snow will stay in place longer and will melt at a much slower rate.

In addition to the natural snowfall, snow removal within the HBMS plant site by the surface department is hauled up to the tailings pond for disposal. The snow is then spread and compacted, as directed by the Section Leader of Engineering and Special Projects or his designate, in areas where exposed tailings require a cover.

## Ice Cover

Ice cover on exposed tailing surfaces can be achieved by various methods, including ponding water during freezing weather and mechanical placement. Water can be held back in specified locations and retained there during the shoulder seasons when freezing weather will create an ice cap. The ice will develop in thickness and is a very effective method of dust control. Once the ice cap is achieved the open water beneath the ice can be drained off. The Section Leader of Engineering and Special Projects or his designate will perform routine monitoring of water levels and seepage rates within the containment areas that are retaining water. The most common method of retaining water is to temporarily block or restrict its flow through discharge culverts. The release of water after the ice is created must also be closely monitored and performed at a very slow rate in order to maintain water quality standards, and to minimise impact on the tailing dams.

Ice cover can be mechanically placed during extremely cold weather by loading water directly from the wastewater streams on the tailing pond into rock trucks and hauling and dumping it directly on the exposed tailing surface.

## 4.0 DUST CONTROL PROCEDURES FOR THE FFTIS

The key elements of HBMS dust control procedure are as follows:

- Define the potential causes of dusting events.
- Identify areas that are sensitive to dusting.



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- Develop a dust control plan well in advance.
- Budget sufficient funds and manpower to implement the plan.
- Implement the plan by co-ordinating with the appropriate people.

The following sub-sections outline these steps in greater detail.

## 4.1 Dust Control Strategies

Each year, the Section Leader of Engineering and Special Projects or his designate will develop a dust control strategy for the upcoming year. The first step in developing this strategy is to develop a tailing deposition plan outlining which areas will be active or temporarily inactive for the upcoming year. The following procedures will be adopted for these two types of areas.

## 4.2 Temporarily Inactive Areas

The goal of the annual dust control plan will be to ensure that all temporarily inactive areas (i.e., areas that are not receiving tailings at that time) are covered with water, if possible, by adjusting pond water elevations, over the course of the construction season (summer/fall).

Due to the vast areas requiring coverage, time constraints, and geotechnical constraints it may not be possible to cover some exposed tailing beaches with water in time to control seasonal dust problems. In such situations, temporary dust control measures such as chemical dust suppressants will be performed. The dust control strategy with respect to water control will prioritise coverage areas so that more critical areas are covered first, followed by the less critical areas. Areas that are not expected to receive fresh tailings for extended periods should be covered with a thin layer of sand or slag.

## 4.3 Active Areas

During warm weather operation, active areas of the FFTIS are not a significant dusting problem as the tailing slurry water maintains the surface tailing in a damp condition, which effectively prevents dusting.

During cold weather operation, preventing dusting in active areas of the FFTIS is considerable more problematic. A good understanding of the tailings deposition plans and dust control methods for the various areas is required as well as constant monitoring of the wind direction and drops in overnight temperatures. Dust control in these active areas is very difficult to address due to inaccessibility to these areas. Changing tailings discharge locations and allowing the freshly deposited tailings to freeze and generate sufficient frost depth to support equipment will allow access to these areas. Once access is possible, dust control is achieved by applying calcium chloride sand and/or compaction of snow, if it is readily available.



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## 4.4 Sensitive Areas

Sensitive areas within the FFTIS during the freeze dry shoulder seasons must be identified. Due to the close proximity of the Town of Creighton and City of Flin Flon, dust control in the following areas within the FFTIS is regarded as paramount. All dusting in these areas requires a quick response:

- Southern end of the FFTIS is in close proximity of the Town of Creighton when there is a northwest wind.
- Eastern side of the FFTIS is in close proximity to the City of Flin Flon when there is a west wind.
- Areas that are located farthest away from the tailings discharge locations (west side and northern end), as they are mainly comprised of finest tailing grain size particles, which are more subject to wind erosion and becoming airborne.

## 5.0 OTHER CONSIDERATIONS

### 5.1 Seasonal Effects

The tailing pond operators will be familiar with the seasonal nature of the dust hazards and its control constraints. HBMS experience indicates that the spring and fall seasons present the most critical time with respect to dust control on the FFTIS.

The freezing weather during spring and fall dries the tailing surface which, when exposed to wind, can readily become airborne. The tailing slurry is deposited at the south end of the facility and results in a tailing beach that slopes at 0.5% from south to north. This slope is even more subject to dusting since the prevailing winds in the area are out of the northwest.

The wet spring and fall climatic conditions make access to sensitive areas difficult for applying covering material.

### 5.2 Exposed Tailing Beaches

Long exposed tailing beaches pose a significant problem with respect to dusting. These beaches can be very difficult to apply a protective cover to, as almost all are difficult to access due to soft ground conditions. The potential for dusting from the majority of beaches can be controlled by fluctuating pond water levels. If weather permits, some of the sandier beaches can be watered down with a water cannon mounted on a water truck.





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## 5.3 Planning in Advance

The "Dust Control Plan" can only be developed and successfully implemented once the "Tailing Deposition Plan" for FFTIS covering the upcoming year is in place. Methods of tailing deposition need to be well thought out and visual inspections to verify the areas of concern are required on a daily basis.

The "Dust Control" and "Tailing Deposition" Plans are reviewed in late winter to ensure that the tailings pond conditions and the dust control measures that are in place are applicable for that moment in time.

Application of soil sement and calcium chloride sand over much of the exposed beaches will need to be part of the plan. These materials will remain in place until the following year and must take care of both shoulder seasons in those areas. Similar approaches can be taken on other critical areas as required. Seasonal effects (i.e. wind direction, freeze-thaw cycles, climatic conditions) should also be taken into account while planning and scheduling for dust control activities.

## 5.4 Implementing the Dust Control Plan

HBMS Environmental Control Department's Section Leader of Engineering and Special Projects or his designate are ultimately responsible for implementing the plan. They are responsible for work site review and for co-ordinating the contractor's work as well as ordering the necessary materials and equipment and implementing the dust control measures in the field.

## 6.0 UPDATING

This procedure should be updated if and when any of the dust control methods described in this document are revised or new methods are adopted.

## 7.0 RESPONSIBILITIES

The Section Leader of Engineering and Special Projects or his designate are responsible for planning and co-ordinating the dust control measures for all areas within the FFTIS boundaries. The general contractor on site is responsible for performing the actual work. The following summarizes the responsibilities of the key persons involved in planning and implementing the dust control measures.

### Section Leader of Engineering and Special Projects or his Designate

- Identify areas requiring dust control measures.
- Select the dust control methods to be used on site-specific areas.
- Co-ordinate tailing deposition with Mill personnel.
- Develop the "Dust Control Plan" for the upcoming year.
- Order materials and equipment for dust control applications.



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- Monitor the general contractor's progress and control expenditures.
- Report to the Superintendent, Environment as required.
- Review and ensure that dust control measures in place at winter's end are applicable to tailings pond conditions.
- Adjust the "Dust Control Plan" as necessary to take into account unexpected events.

## HBMS Environment Department Employees and General Contractors

- HBMS Environment Department daily water sampler will take note of any dusting events or areas that may be prone to dusting and report the wind direction and location of the event to the Section Leader of Engineering and Special Projects or his designate as soon as possible.
- HBMS Environment Department air monitoring staff to step up sampling at site-specific locations to quantify the effects of tailing dust storm particles in the event of a dusting "spill".
- General contractor on site performing construction of annual dam raises to be visually aware of any dusting events or areas that may be ready to dust and report it to the Section Leader of Engineering and Special Projects or his designate as soon as possible.
- While on their evening security inspection, HBMS security guards to report any dusting events or areas that may be prone to dusting to the Section Leader of Engineering and Special Projects or his designate as soon as possible.

## 8.0 RECORDS AND DOCUMENTATION

The following records should be maintained as appropriate:

- Photographs of areas treated and brief reports summarizing the methodology used with associated costs incurred.
- Records showing times and locations where dust control measures were required and implemented; specifically LAO-500 "Daily Monitoring & Inspection Form 2003", LAO-501 "Weekly Monitoring & Inspection Form 2003", LAO-502 "**Monthly** Flin Flon Dam Inspection Forms", **LAO-544 Weekly Dam Inspection Form**, and LAO-503 "Project Report Master Form". These documents contain sections that can illustrate areas of concern on an overall map, and climatic conditions, which is forwarded to the Section Leader of Engineering and Special Projects or his designate.