

# Air Dispersion Modelling & Dustfall Monitoring



**FORTUNE**  
MINERALS LIMITED

Fortune Minerals Limited (FML) retained MDH Engineered Solutions Corp. (MDH) to complete an Air Dispersion Model (ADM) and baseline dustfall monitoring as part of the Environmental Impact Assessment (EIA) for the proposed **Saskatchewan Metals Processing Plant (SMPP)**.

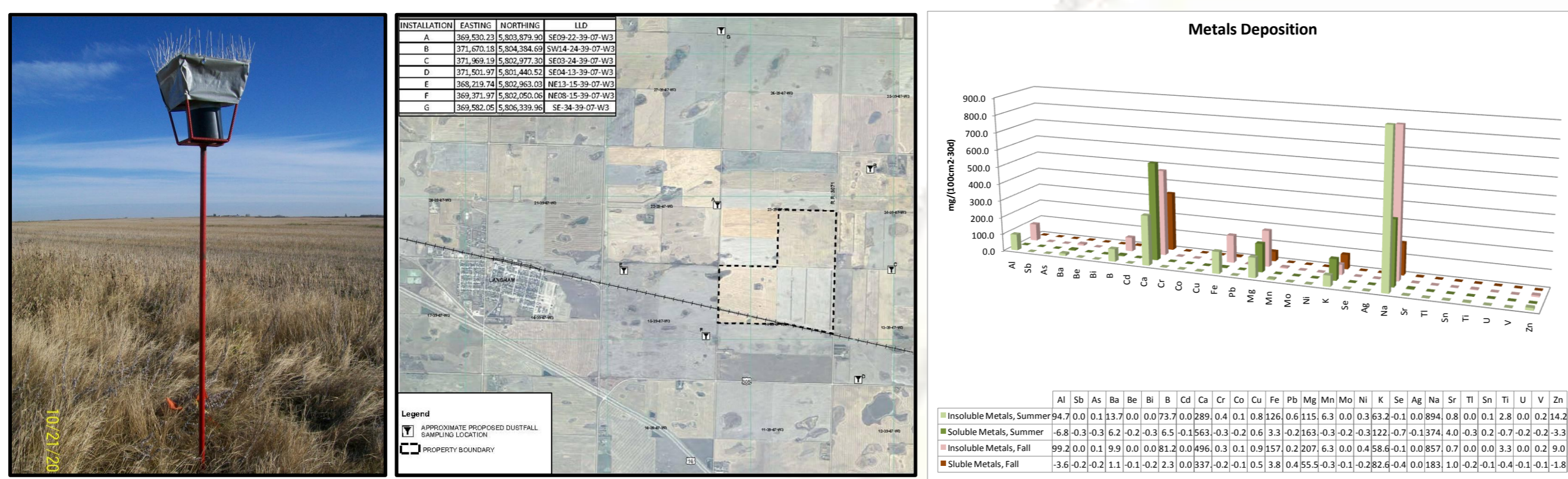
The ADM included estimation of ground level Point of Impingement (POI) concentrations of air emissions and determined if additional mitigative measures are required. The proposed SMPP facility will have emissions from 25 stack sources, vehicles used during construction and operation, and an emergency diesel generator.

The dustfall monitoring included dustfall sample collection over a 30-day period at 7 sites surrounding the proposed SMPP, and sample analysis for soluble and insoluble particulates and metals.

## Dustfall Monitoring

The dustfall monitoring was completed to establish baseline settleable particulate levels in the area of the proposed site. Seven locations were selected based on dominant wind directions, proximity to an adjacent rail-line, and the desire to minimize disruption to agricultural activities. Samples were collected in the spring, summer, and fall of 2010 and sampling will be completed in the winter of 2011 with the collection of snow cores.

Once the SMPP is operational, the main dust generation sources will be from wind erosion and movement of vehicles and large equipment on site. Ongoing monitoring will provide dustfall data for comparison to the baseline levels, in order to determine any necessary mitigation measures.



LEFT: Dustfall collection apparatus; Dustfall collection sites; Soluble and insoluble metals in dustfall (summer and fall samples)

## Air Dispersion Modelling

### Methodology

FML supplied an Emission Inventory (EI) with a list of emission sources, emission rates, and stack attributes. MDH completed the ADM using Alberta guidelines (AENV, 2009a) as Saskatchewan has no detailed ADM guidelines in practice for industrial developments. Saskatchewan recommends using air dispersion models approved for use by the United States Environmental Protection Agency (EPA) such as SCREEN 3 and AERMOD. Guidelines based on Ontario regulations (Ontario Ministry of Environment, 2005) were also used in situations where Alberta guidelines had no specific information. The assessment was completed in two phases:

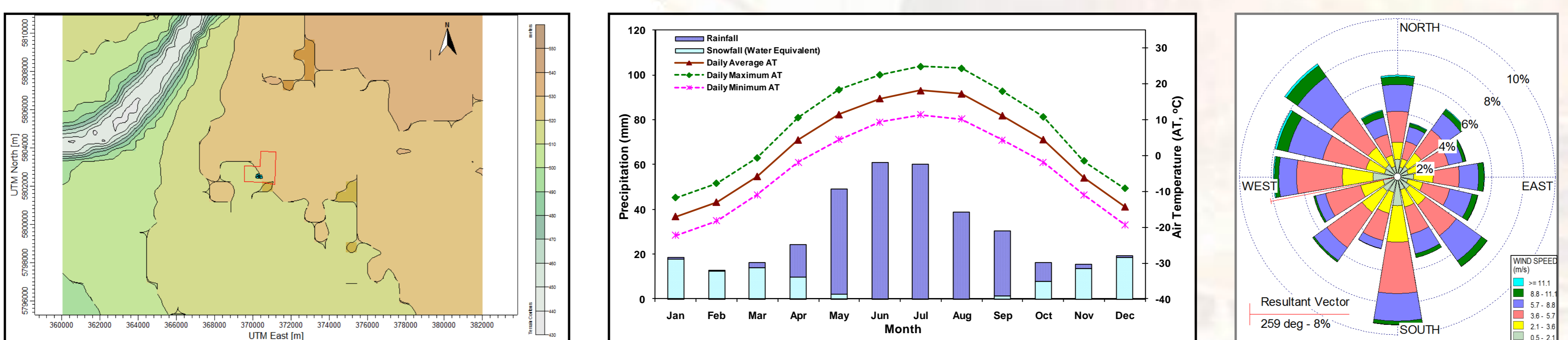
- Screen Modelling; and
- Refined and Advanced Modelling.

No monitored background data was available for the proposed SMPP location. Therefore, background air quality data from nearby air monitoring stations was acquired from the National Air Pollution Surveillance Program (NAPS, 2010) and Western Interprovincial Scientific Studies Association (WISSA, 2006).

Regulatory objectives were acquired from ambient air objectives of the Canadian Council of Ministers of the Environment (CCME), and regulatory agencies from Saskatchewan, Alberta, Ontario, and Texas.

### Modelling

The AERMOD and SCREEN 3 models were developed by integrating topographical, landuse, and surface and upper meteorological data of the study area. Examples of the data used in the modelling are shown in the figures below.



LEFT: Topography within and around the proposed SMPP site used in AERMOD model; CENTER: Climatic normals of Saskatoon meteorological station; RIGHT: rose diagrams of the surface meteorological data used in the air dispersion modelling (Environment Canada, 2010)

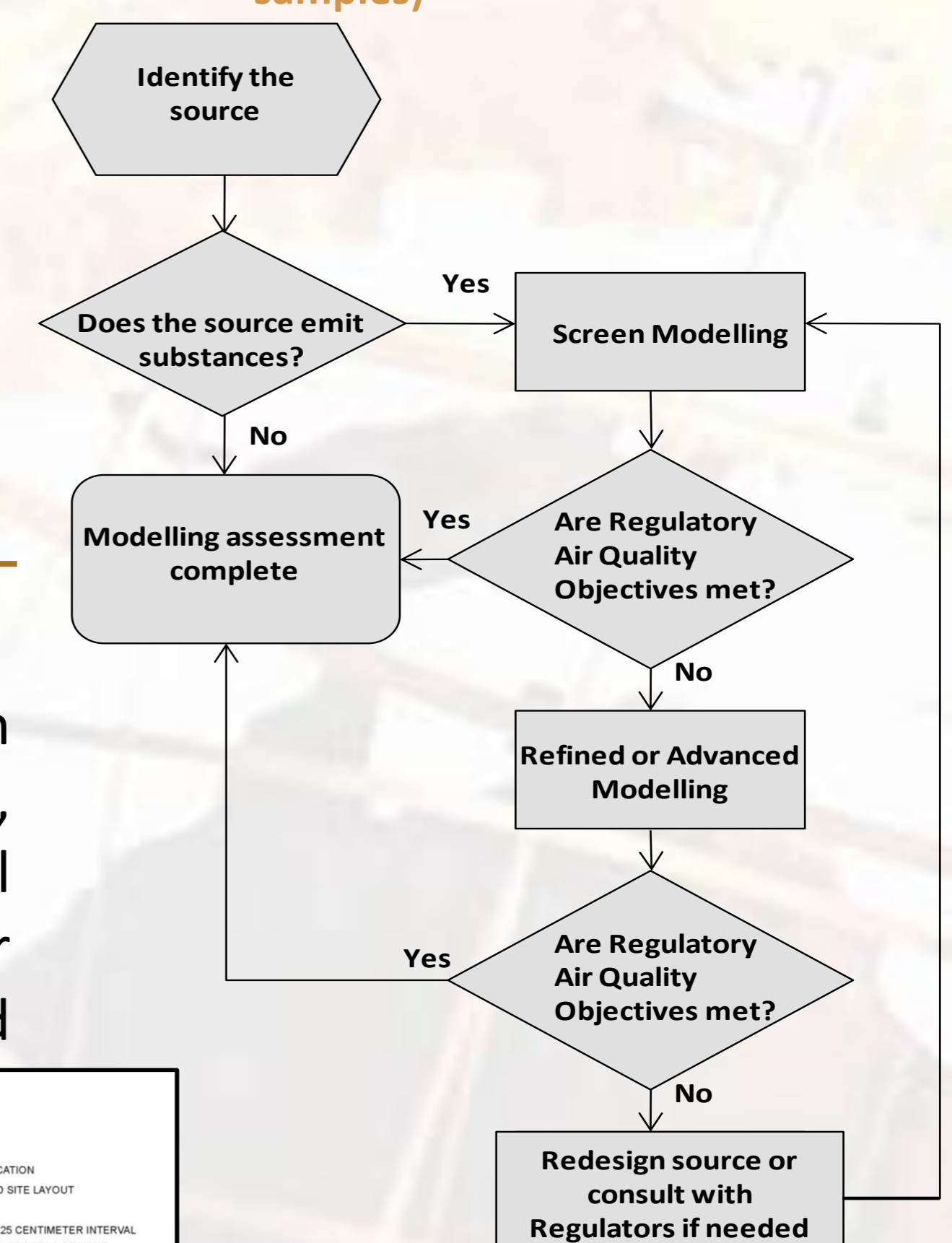
### Summary

- Based on the results, the estimated concentrations of PM<sub>2.5</sub> and Co and their corresponding background data beyond the property boundary are lower than the regulatory ambient air objectives;
- Dominant Green House Gases (GHG) from the proposed facility include CO<sub>2</sub>, water vapour, and NO<sub>x</sub>. The GHG emission rates and the corresponding concentrations from the facility are not expected to have a significant impact on regional and global scales;
- The proposed mitigative measures include bag houses, demisters, and scrubbers with single and double stages; and
- Cumulative effects are negligible since no major industrial developments that emit significant air emissions are situated within a 10 km radius from the proposed facility.

### Mitigation & Monitoring

The air dispersion modelling completed for the proposed SMPP facility shows that the estimated air emission concentrations beyond the property boundary are in compliance with the regulatory ambient air objectives. However, mitigation strategies and monitoring programs being evaluated include:

- Minimize dust emissions during construction and operation of the proposed development by:
  - Wetting waste piles, exposed surfaces, and rubbish, and utilizing cover or dust suppressants;
  - Managing traffic to reduce driver exposure time; and
  - Reducing construction time of unpaved ground.
- Develop a long-term monitoring program to measure air emissions from the stack sources and ambient air quality parameters;
- Any expansion and modification to the SMPP facility that may change the plant emissions are required to be evaluated using a detailed air dispersion model; and
- Develop an Emergency Preparedness Plan (EPP) with mitigative measures for potential leaks that occur accidentally and cause significant impact to environment and human health conditions.



ABOVE: Flow chart of the modelling phases involved in the study  
LEFT: SMPP buildings and stack locations

