



CALPUFF AIR DISPERSION MODELLING

Giant Mine Remediation Project Environmental Assessment

Technical Report Workshop – June 27-28, 2012

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Giant Mine Remediation Project



Canada

- **Presentation Outline**
 - Background Information
 - Assessment Basis
 - Emission Sources
 - CALPUFF/CALMET
 - Modelling Results



- **Background Information**
 - ISCST3 screening assessment completed in February 2010
 - air quality impacts were assessed for GMRP activities including 3MW of incremental power from the Jackfish Power Plant
 - model results were comparable to baseline monitoring at Giant Mine site
 - no exceedances were predicted at identified sensitive receptor locations



- **Background Information**
 - In response to EC Information Request, subsequent ISCST3 modelling was completed
 - Jackfish Power Plant at maximum capacity (27MW)
 - significant NO₂ exceedances were predicted
 - Advanced CALPUFF modelling assessment was undertaken to refine GMRP activities including maximum Jackfish Power Plant operations



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- **CALPUFF Assessment Scenarios**
 1. GMRP activities plus Jackfish Power Plant operating at 18MW year round
 2. GMRP activities plus Jackfish Power Plant operating at 12MW year round
 3. Jackfish Power Plant operating at 27MW year round **not** including GMRP activities

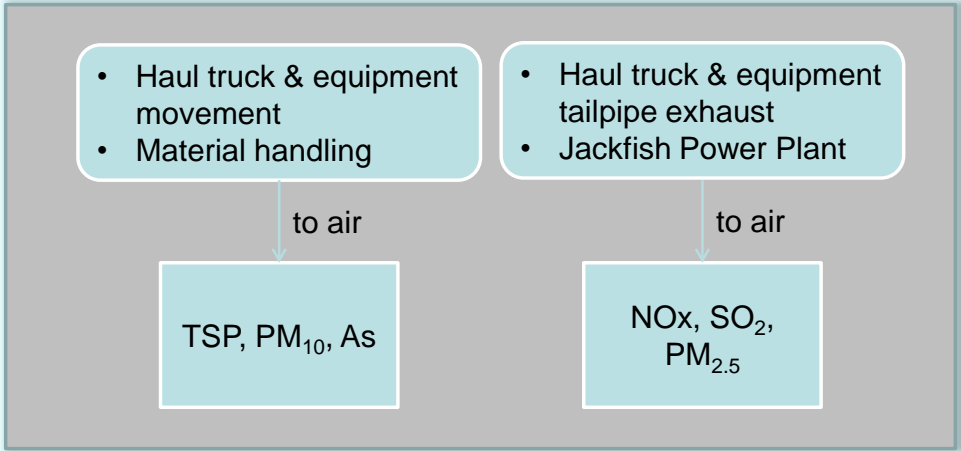


• Emission Sources

Activity	Emission Location	Equipment
Freeze plant and active freezing	Jackfish Power Plant	<ul style="list-style-type: none"> • Diesel generators
Baker Creek rehabilitation	<ul style="list-style-type: none"> • Baker Creek • Borrow Pit A2 	<ul style="list-style-type: none"> • Excavators • Compactors • Haul trucks
Contaminated soils excavation and reclamation	<ul style="list-style-type: none"> • Roaster Building • B1 Pit 	<ul style="list-style-type: none"> • Excavator • Haul trucks • Bulldozer/Compactor
Tailings and sludge pond remediation	<ul style="list-style-type: none"> • South Tailings Pond • Borrow Pit A2 & C1 	<ul style="list-style-type: none"> • Bulldozers/Compactor • Excavator • Haul Trucks
Freeze system install	Underground vaults	<ul style="list-style-type: none"> • Drills
Building and infrastructure demolition and disposal	Roaster Building	<ul style="list-style-type: none"> • Concrete saws • Crane



• **Emission Sources**





- **CALPUFF/CALMET Modelling Package**
 - CALPUFF is an advanced, integrated air dispersion modelling system that considers spatial changes in meteorology, surface conditions, and interacts with terrain
 - Preferred model for areas having complex terrain (e.g., coastal areas)



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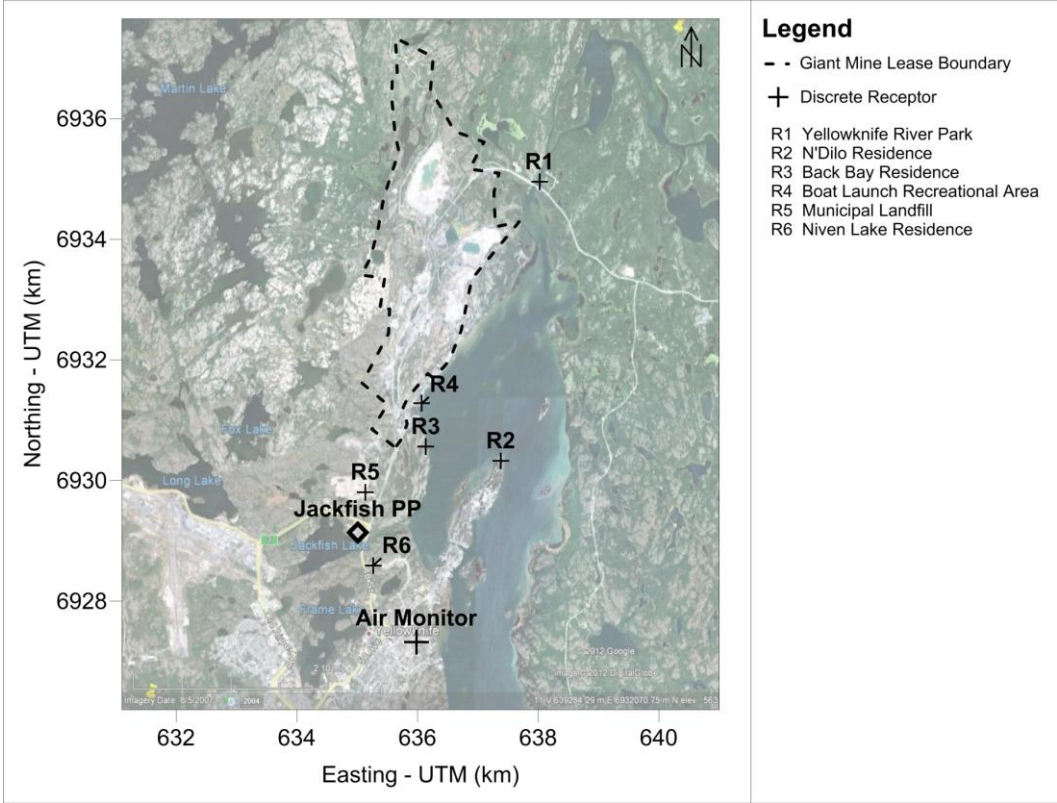
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- **CALPUFF/CALMET Modelling Package**
 - CALMET is a diagnostic, 3-D meteorological model used as an input to CALPUFF
 - Prepared using Yellowknife Airport surface observations and upper wind fields from a U.S. nonhydrostatic mesoscale model (NMM)



- **CALPUFF Model Receptor Grid**
 - Full model grid:
 - 100 m by 100 m spacing for a distance of approximately 2 km from GMRP site
 - 1 km by 1 km spacing further out from GMRP site
 - Discrete receptors:
 - 6 identified sensitive receptor locations
 - air monitoring station

Sensitive Receptor Locations





- **NO_x to NO₂ Conversion**
 - **ISCST3 screening level assessment**
 - **NO₂/NO_x ratio from monitoring data was applied**
 - **CALPUFF modelling assessment**
 - **Ozone limiting method was applied**



- **Scenario 2 - 12MW Model Results**

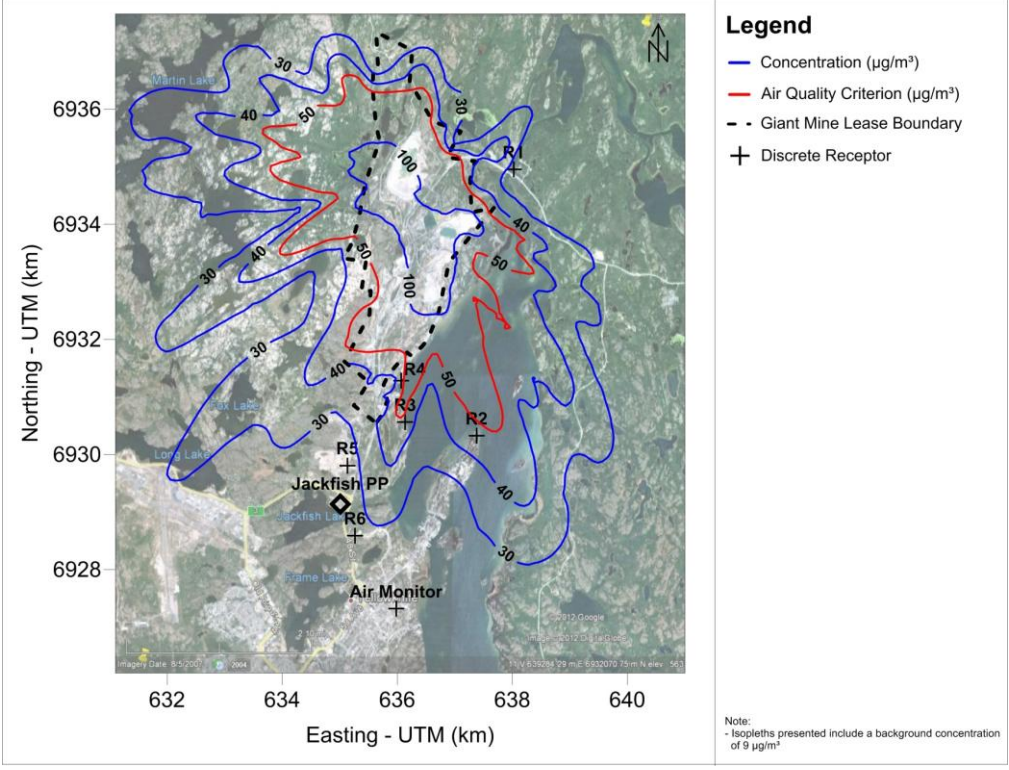
Receptor	Model Predicted 1-hour NO ₂ Concentration (µg/m ³)
R1	61
R2	71
R3	80
R4	71
R5	207
R6	295
Background (µg/m ³)	6
AAQC (µg/m ³)	400



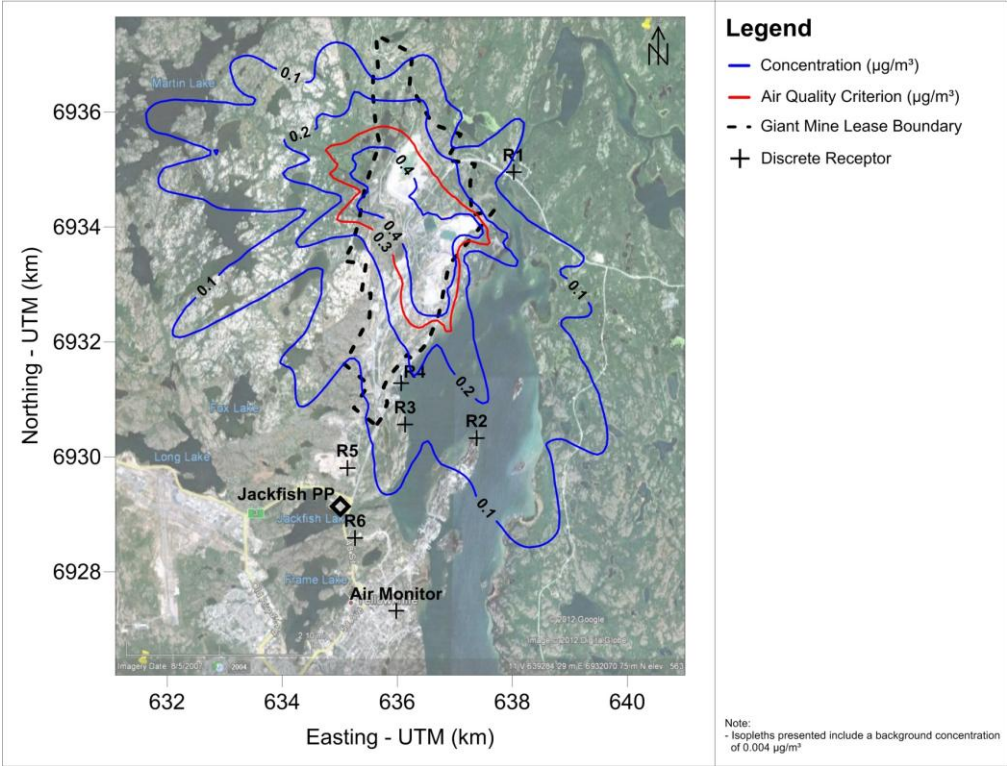
- **Scenario 1 - 18MW Model Results**

Receptor	Maximum Predicted Concentration ($\mu\text{g}/\text{m}^3$)			
	PM ₁₀ 24-hr	As 24-hr	NO ₂	
			1-hr	24-hr
R1	27	0.08	65	19
R2	46	0.15	81	55
R3	48	0.16	94	59
R4	47	0.16	80	38
R5	28	0.08	285	113
R6	25	0.07	410	174
Background ($\mu\text{g}/\text{m}^3$)	9	0.004	6	6
AAQC ($\mu\text{g}/\text{m}^3$)	50	0.3	400	200

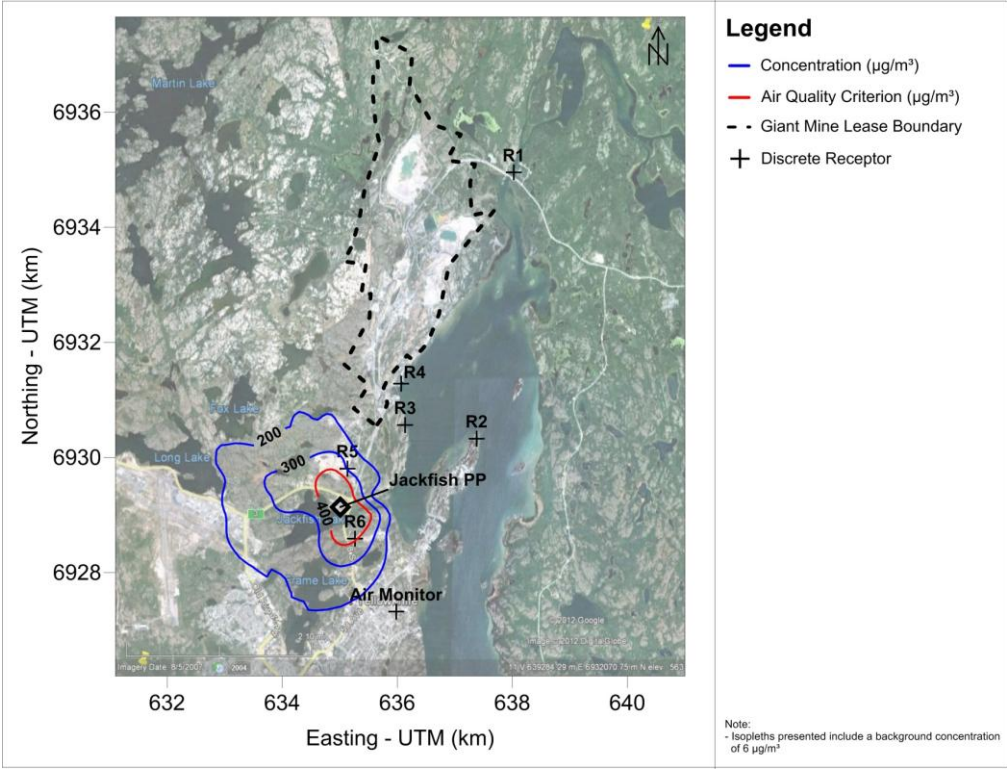
Model Predicted 24-hr PM₁₀ Concentration (µg/m³) Scenario 1 – 18MW



Model Predicted 24-hr Arsenic Concentration ($\mu\text{g}/\text{m}^3$) Scenario 1 – 18MW



Model Predicted 1-hr NO₂ Concentration (µg/m³) Scenario 1 – 18MW

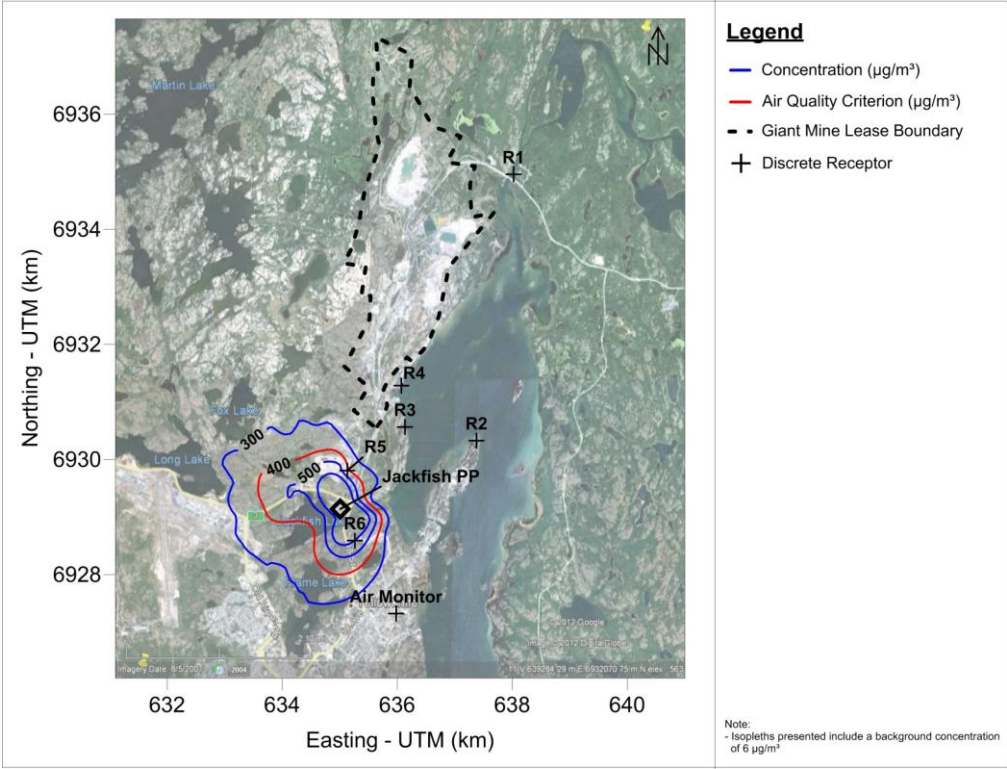




- **Scenario 3 - 27MW Model Results**

Receptor	Model Predicted 1-hour NO ₂ Concentration (µg/m ³)
R1	71
R2	94
R3	115
R4	64
R5	425
R6	598
Background (µg/m ³)	6
AAQC (µg/m ³)	400

Model Predicted 1-hr NO₂ Concentration (µg/m³) Scenario 3 – 27MW





- **Conclusions**

- CALPUFF results for particulate and arsenic consistent with the screening assessment
- 1-hour NO₂ criterion exceeded at sensitive receptor locations if Jackfish Power Plant operates continuously at 27MW or 18MW
 - Typical operating capacity is only 12MW
 - Mitigation measures are available for peak power use periods
 - Monitoring is planned at nearby residences to validate model predictions