Ventilation Design for the Big Gossan Open Stope Mine

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Outline

- Background
- General Information about Big Gossan Mine
- Ventilation Design Concept
- Ventilation Modeling
- Infrastructure Requirements
- Trade-off Studies
- Future Design and Conclusions

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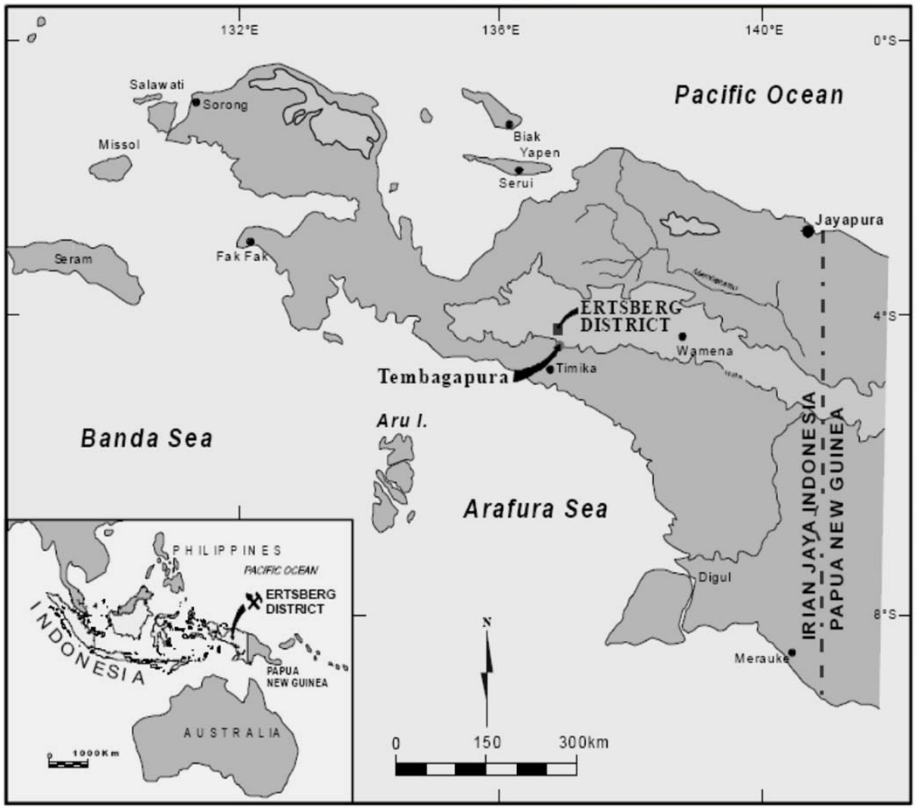
Background

PTFI operations is about 100km north of the southwest coast of Papua between 2,500 m and 4,000 m above sea level.



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PTFI Reserve Status

Deposit	Reserve (Million tons)	Ore Grades		
		Copper (%)	Gold (g/t)	Silver (g/t)
Present				
Grasberg Pit	473	0.88	1.00	2.16
DOZ BC	148	0.84	0.56	4.67
Future				
Grasberg BC	985	1.05	0.86	3.25
KL BC	578	1.20	1.06	5.82
MLZ Cave	108	0.86	0.72	3.75
DMLZ Cave	280	1.08	0.85	5.42
ESZ BC	144	0.50	0.83	1.69
Big Gossan	**53**	**2.31**	**1.10**	**14.75**
DOM BC	22	1.37	0.36	8.82
DOM Pit	24	2.03	0.43	12.13
Total	2,815	1.04	0.90	4.16

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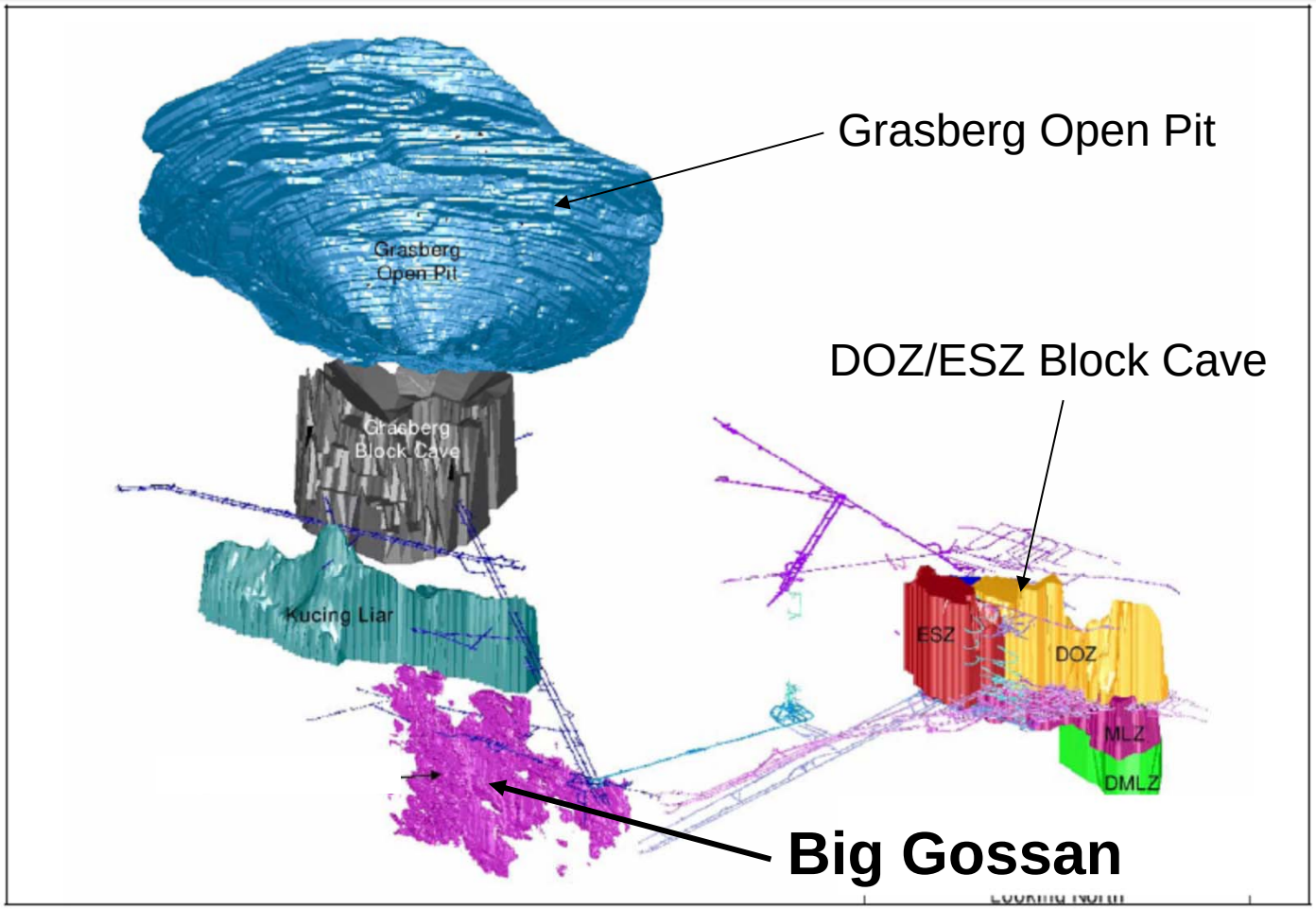
PTFI Mine Complex



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Big Gossan Mine Design

- **Mechanized Open stoping with paste backfill system**
- **7,000 tpd, 18-year mine life**
  - start production 2009
  - full production 2011
- **Stopes: 40m high x 15m wide x 20m deep**
- **Primary-secondary stopes sequencing**
- **Sill pillars @ 2860mL, 2560mL**
- **Underground Paste plant @ 3100mL**
- **Underground Crusher @ 2510L**

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Big Gossan Mine Ore Handling

- 9 Ore Passes connect all Production Level to Truck Haulage 2540mL
- Trucks fed ore to underground crusher at 2510mL
- Sub-vertical muck hoist 2440 to 3060mL
- A 2,500 hp double-drum hoist with two 13-tonne capacity skips hoisting in the 6 m diameter Production Shaft deliver up ore from crusher to conveyor
- A conveyor at 3040/L deliver ore to existing milling facility

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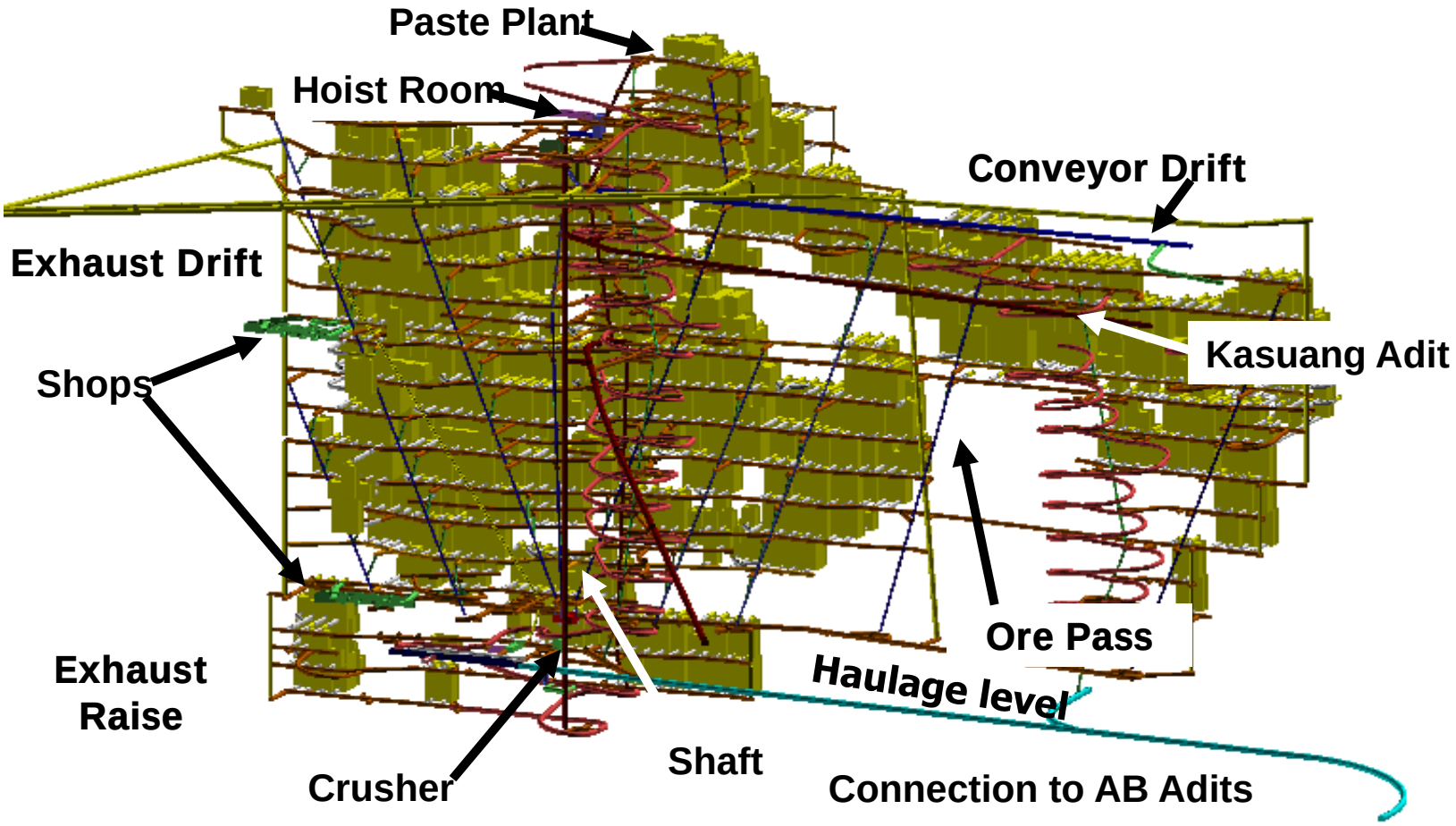
Big Gossan Mine



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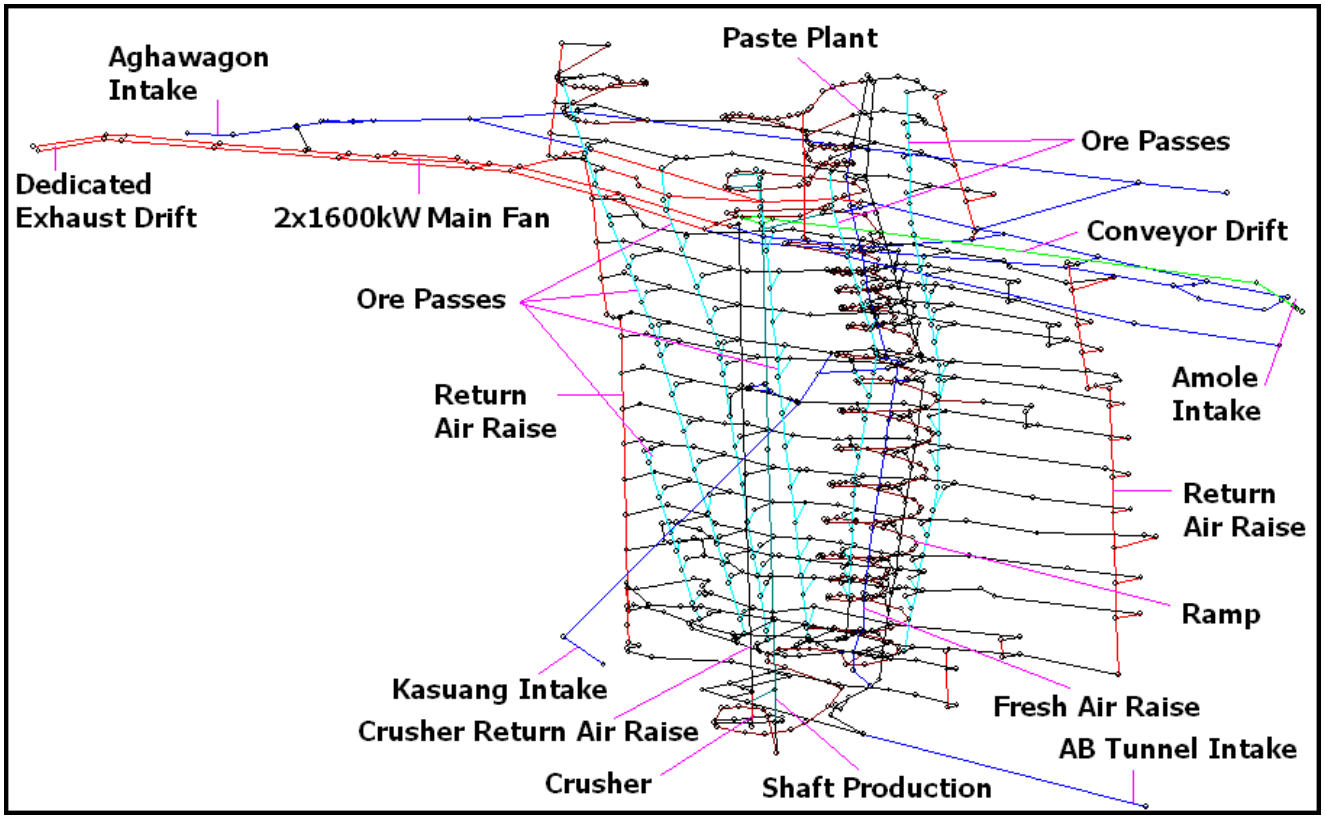
Ventilation Model

Ventilation Model was developed in VnetPC



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Ventilation Design

- All Intake and exhaust drifts connect to the surface
- Fresh air distribute to each level from ramps and Fresh Air Raise
- Dirty air from all production levels are exhausted to three Return Air Raises
- All ramps are down casting
- Production Shaft is not used for ventilation raise
- Fixed facilities exhaust goes to Crusher Return Air Raise or Return Air Raise

Ventilation Design Criteria

- **Based on Indonesian Mining regulations, MSHA and best practice:**
  - **Air velocity criteria (optimized for cost)**
  - **Atkinson friction factors (measured)**
  - **Fixed allowances for vehicles and shops**
  - **Gas, dust and diesel PELs**
  - **Mitigation of smoke/gas spread in the case of a mine fire**

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Airflow Requirement

- **Mobile equipment = 458.0 m^3/s**
- **Fixed Facilities & people = 355.2 m^3/s**
- **Total exclude leakage = 813.5 m^3/s**

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Drift & Raise Sizes

- Dedicated Exhaust Drift, 6.5 m x 5.5 m
- Foot Wall Drift, 5.0 m x 5.0 m
- Fresh Air Raise, 4.8 m diameter slashed
- Return Air Raise, 6.8 m diameter slashed
- Shaft Production, 6.0 m diameter lined
- Orepasses, 3.1 m diameter bored
- Waste Pass, 3.1 m diameter bored
- Crusher Return Air Raise, 3.1 m diameter bored
- Ramp, 5.0 m x 5.0 m
- Conveyor Drifts, 5.0 m x 5.0 m

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Main Fan Requirements

- **One of 2x1600 kW Main Fan already installed and commissioned in December 2007 to support development activities**

- **Predicted both Main Fans duties are:**

  Main Fan # 1: 460 m^3/s 1810 Pa 1,250 kW

  Main Fan # 2: 460 m^3/s 1810 Pa 1,250 kW

  (anticipated commissioning – 3rd Qtr 2010)

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Big Gossan Mine Main Fan # 1

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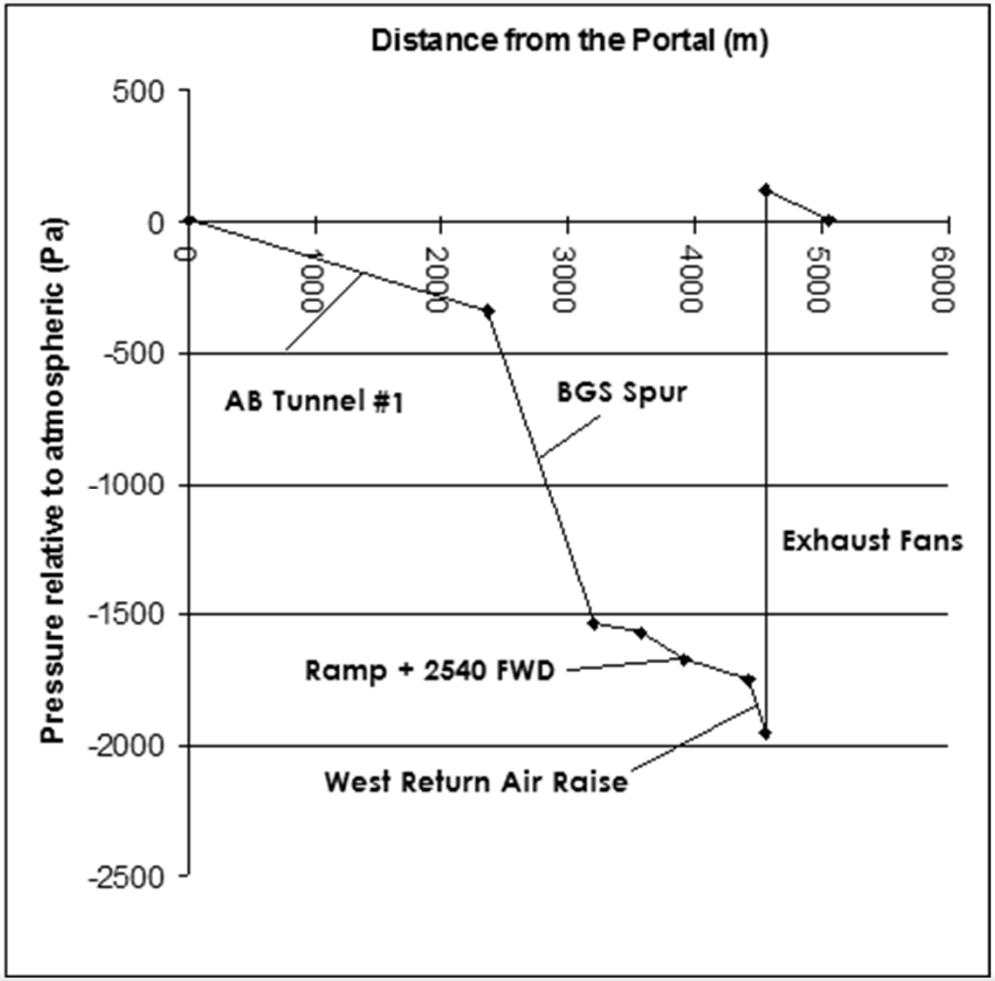
Representative Pressure Profile



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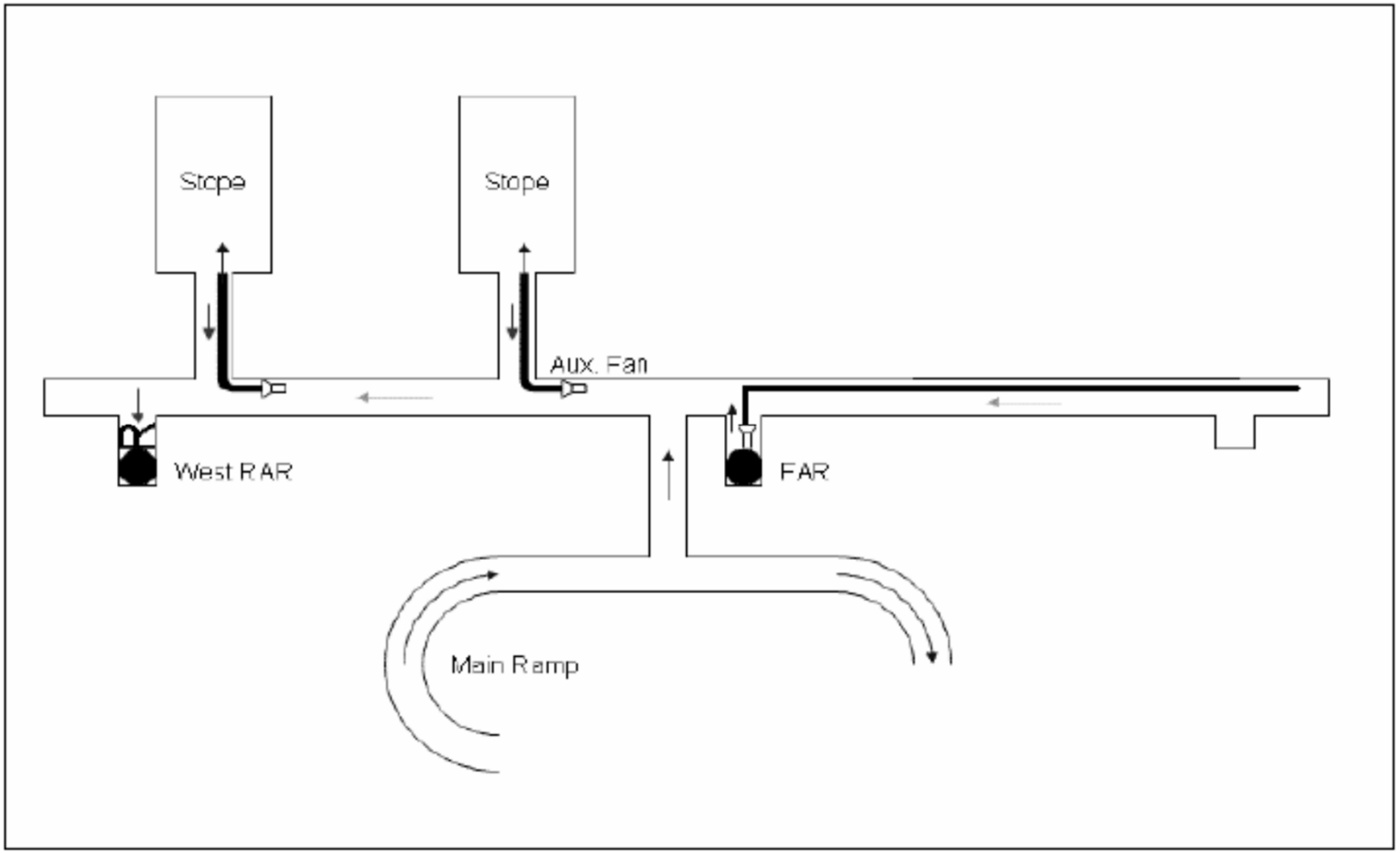
Auxiliary Ventilation System in each actives Level



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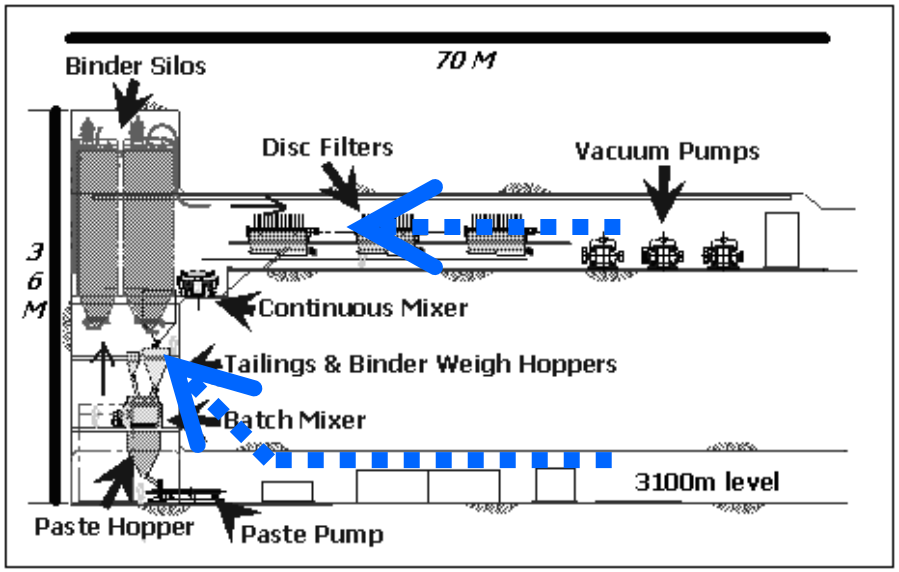
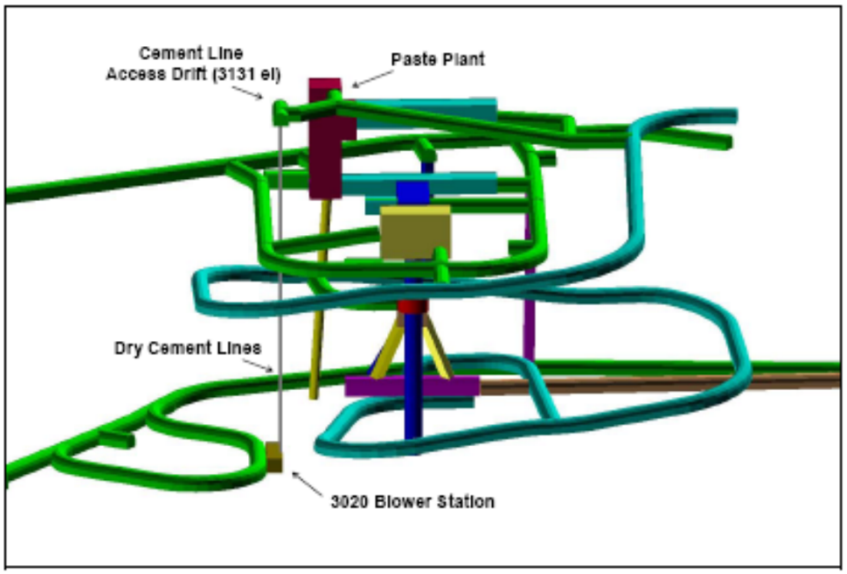
Paste Plant Auxiliary Ventilation System





Future Ventilation Design Efforts

- **A real time Airflow Monitoring & Control System**
- **Leakage prevention:**
  - Finger raises on the ore passes
  - Interconnection between two levels in a production stope
  - Before backfill process
- **Dust & Diesel Particulates**
- **Mixed-flow mine fans**

Conclusions

- The Big Gossan Mine is a modern, large open stoping operation requiring a relatively complex ventilation system
- The primary ventilation will be supplied using durable primary mixed-flow exhaust fans
- Ventilation doors at the orepass grizzlies will be required to maintain dust control requirements and to manage the airflow system
- Ventilation management systems and infrastructure, including real time monitoring and controlling systems, should be designed to fit the mine operations philosophy
- Continued comprehensive engineering and strategic planning are still required for managing the respirable dust and diesel particulate matter issues
- Future, eastward, mine expansion is another challenge to maintain optimized ventilation infrastructure utilization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