KIRKLAND LAKE GOLD

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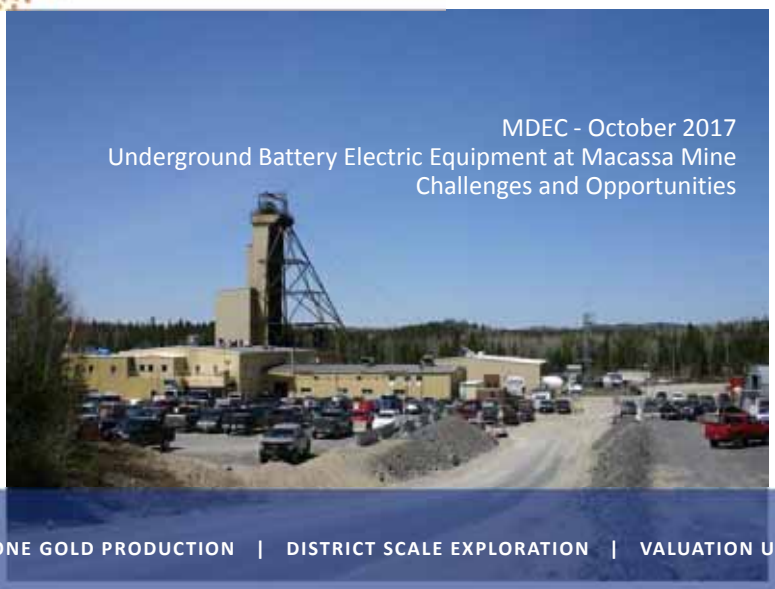

MDEC - October 2017
Underground Battery Electric Equipment at Macassa Mine
Challenges and Opportunities

TIER ONE GOLD PRODUCTION | DISTRICT SCALE EXPLORATION | VALUATION UPSIDE

Macassa – Location

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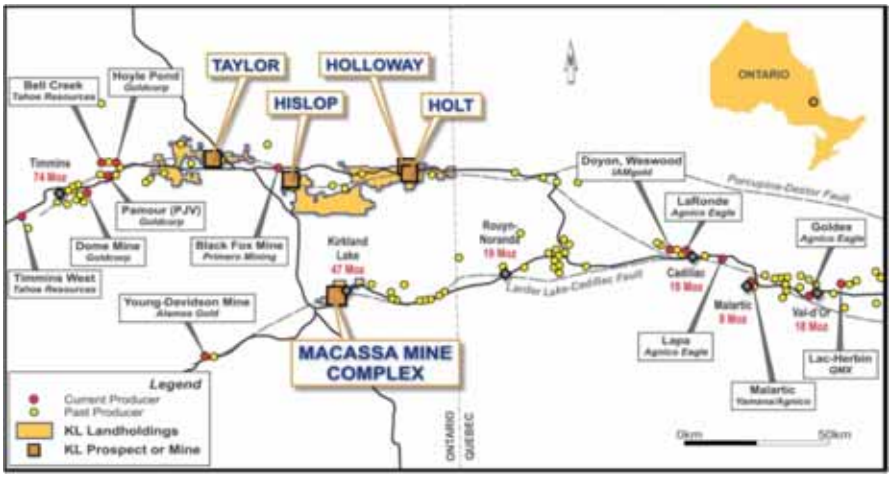

Macassa – Brief History

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Macassa Historic Operation
Kirkland Lake Camp – 25 Moz Produced
Furthest West operation on Main/04 break
Macassa in operation since 1933

Macassa New Zone Discovered
Drill hole hit 26.7 g/t hole over 12 feet 6000 feet south of 04 break in 1999
Distinctly different mineralization

Mining New Zones
Kirkland Lake Gold restarted Macassa in 2002
2003 intersected mineralization 1,600 feet south
2005 New South Zone 78.9 g/t over 27.6 m (not true width)

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Macassa – Ventilation Challenges

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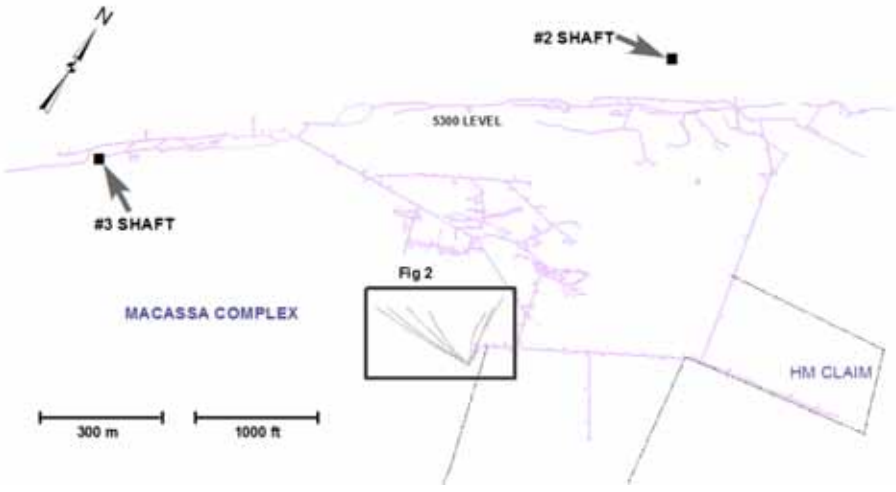

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Macassa – Ventilation Challenges

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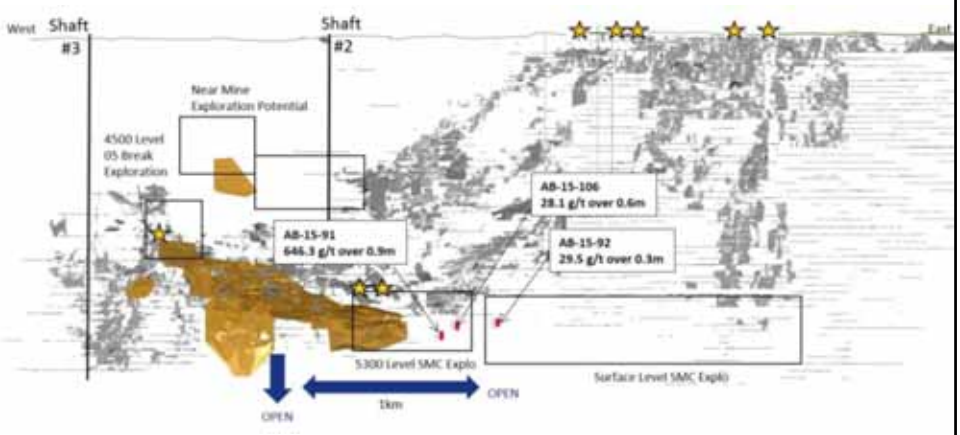

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Macassa – Battery Electric Mobile Fleet

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	Current Fleet	Fleet Additions
Loaders	12 x RDH 300 2 x Artisan 153 2 x Atlas Copco ST7 4 x Atlas Copco ST2G	2 x Artisan 153
Trucks	3 x RDH 800 3 x Atlas Copco 2010	1 x Artisan Z40 3 x Atlas Copco 2010

First order in 2011
Currently about 80% of production done with battery equipment

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Value of Battery Electric Machines

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Air Quality
The machines have no emissions. We have focused on loaders and trucks as offset the most emissions per kW resulting in cleaner air.

Reduced Heat
During mucking cycle temperature increase of under 2 degC versus 8 degC

Improved Ergonomics
Less heat, vibration and noise, operators are less tired at the end of the shift.

Reduced Dust
No exhaust to blow dust into the air.

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Challenges of Battery Electric Machines

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Capital Cost
Machines are much more expensive to purchase (2 to 3 times cost).

Limited Product Range
Currently machines only available in smaller size class from a limited number of manufacturers.

Operating Cost
Battery cells require replacement, components are relatively expensive and have less design history to ensure reliability.

Tire Wear
Some machines are speed control versus torque control limiting the operators ability to limit tire spin. This can result in high tire wear rates.

Low Power Limit
Battery thermal performance currently limits machine power. Largest truck approx. 250 kW rating reducing travel speed while loaded up ramp.

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Challenges of Battery Electric Machines

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Limited Technical Knowledge
Technology is new and limited support network (vendors, technicians, etc.)

Limited Standardization of Products
Battery equipment has limited interchangeability across OEMs.

Rapidly Developing Technology
Improvements and developments drive new opportunity, but result in limited compatibility and interchangeability of spares.

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Opportunities in Battery Electric Machines

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Increase in Power
Machines are limited by thermal performance of battery. Active cooling will increase power density of batteries.

Reliability Improvements
Maturing products have increased reliability considerably, this trend will continue.

Reductions in Operating Costs
Improvements in cell chemistry and temperature control will reduce cell costs. Improvements in hardware reliability will increase MTBF.

Improved Packaging
As machines are designed for battery power rather than modified, final products are lighter, more reliable, more productive. We have observed a steady improvement in packaging and integration.

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Practical Considerations of Battery Electric

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What performance do you need?
- Speed, payload, runtime.
- Do you need to change batteries, or will you wait for recharging?
- Where will you charge/change batteries (travel time vs cost)?

Who will you service the equipment?
- What skill set do they require?
- Where will they work on the equipment?

How does the equipment impact the mine design?
- Can the mine design be modified to take advantage of battery power?
- Can the sequence use trucks hauling down ramp?
- Can the ventilation system design be changed to reuse the air?

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Questions

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