

# RAPID GROWTH OF A MID-TIER MINER: Lessons for Future Exploration

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## OUTLINE

- Background Perspective
  - Growth of a Mid-Tier Mining Company
- Exploration Geoscience Database
  - More Than 'Finding a Mine' Catalyst for Growth & Value
  - The Rock Foundation
- Building the Mineral Resource
- The Integrated Mine System
- <u>People are the Key</u>

## BACKGROUND – GROWTH OF A MID-TIER Perspective In Context



- 2001 Inco agreement
- 2003 McCreedy West Mine re-opens
- 2004 Podolsky Mine shaft collared
- 2005 Morrison Deposit Discovery
- 2008 Initial Technical Success @ Victoria



- 2004 BHP agreement & Robinson re-opened
- 2005 Carlota acquired
- 2006 Sierra Gorda sulphide discovery
- 2007 Malmbjerg acquired
- 2009 Franke acquired

2010 - Victoria Zone 4 Discovery

POLSKA MIEDZ

2010 – Victoria Zone 4 Dist
2011 – Sierra Gorda JV





# **EXPLORATION – GEOSCIENCE DATABASE**



### **EXPLORATION UPDATE!**

- Current Status
  - Easiest of near-surface deposits found/exploited
    - Does not mean everything has been found!
      - Geology-driven discoveries in the future
  - Future deposits will be challenging on many fronts
    - Technical challenges deep, vague geophysical responses, metallurgical complexities, environmental, etc.,
    - Social challenges new standards to achieve a social license to operate
- So What?
  - Explorationists/Geoscientists play a key role in getting the 'Rock Foundation' right
    - Need to be invaluable part of the process-project-mine
  - Majors about to enter into another phase of divestiture driven by cost pressures

#### **EXPLORATION – The Catalyst For Organic Growth**

- Honour the Database
  - Historical & New
- The 'Datacube' Concept
  - The importance of getting the details of the geology documented in 2D in 3D space
    - 2D captures detail must be captured
  - Use the same/compatible digital platforms across all disciplines, where possible: environmental, engineering/planning & metallurgy/processing...
- 'Learn & Adjust'
  - Every drillhole should influence planning for the next



## **GEOSCIENCE – HONOUR THE DATABASE** The Importance Of The Exploration Team

- Typically the first corporate data managers & data 'owners' to kick off renewed exploration or project efforts
  - Establish excellent data & file management practices at the start
- Operational experience in varied mine environments invaluable to being an effective explorationist
- New Data Acquisition
  - Core logging is the most under-rated task
- With success Project & Engineering specialists will base all on the initial exploration/geoscience database
  - Geoscience/Exploration Engineering Planning should attempt to use the same digital platforms
  - Errors will be magnified in \$

#### EXPLORATION – HONOUR THE DATABASE What About The 'FLAT' Files?



Loader

#### DATACUBE – THE POWER OF DETAIL

#### Roxgold's 55 Zone, Yaramoko Project, Burkino Faso



Alkali Intrusive Granodiorite Intermediate Volcanic Rocks Volcanic Sedimentary Rocks **Mafic Volcanic Rocks** Granite **Diabase Dyke Tarkwian Sedimentary Rocks** Felsic Dyke Gabbro Diorite **Felsic Intrusive Quartz Veins** Faults/Shears



## DATACUBE – THE POWER OF DETAIL

#### Roxgold's 55 Zone, Yaramoko Project, Burkino Faso



# EXPLORATION SUCCESS– The Power Of Geological Modeling

#### Victoria Discovery

- Blind to all standard remote exploration techniques
- *'Learn and Adjust'* drilling process whereby the information from each hole determines the strategy for the next hole
- Required multiple years of geological reconstruction to get to discovery.

Source: NI 43-101 Technical Report on the Victoria Deposit, May 31,2012. (SEDAR)





# **BUILDING THE MINERAL RESOURCE**



## BUILDING THE RESOURCE – No Solitudes/Silos "...But We've Always Done It This Way..."

• Inter-disciplinary teamwork = key to success



## FRANKE MINE/CHINA PIT, CHILE: Historical Workings Influence Resource & Mine Plan

- Historical/artesnal workings not integrated or difficult to integrate into digital database
  - No analogue files
  - High grade portions mined
  - Ground stability/geotechnical challenges



## BUILDING THE RESOURCE: Disconnects & When To Ask Questions





# THE INTEGRATED MINE SYSTEM



#### MINE 'SYSTEM' ARCHITECTURE – THE ROCK FOUNDATION 'No Silos'

 Exploration & mining success rests on understanding of rocks



#### BUILDING THE MINE & OPERATIONAL EXCELLENCE Rock Foundation To Integrated, Design-Based Planning





- Access to & utilization of high-quality, near real time, secure datasets for all stakeholders
- Need for integration of platforms/enterprise solutions
- Communication stakeholder alignment on production plans & forecasts
- Facilitates power & flexibility in corporate strategic planning

### **OPERATIONAL IMPROVEMENT** Franke Mine, Chile

- World's highest consumer of acid for Cu leach operation
  - Key performance improvements facilitated by:
    - Primary crusher improvements
    - Detailed remodeling of geology block model mine plan
    - Identification of complete degradation of rock-forming minerals
      - not limited to soluble Cu-bearing & carbonate minerals
        - Product an impermeable mass that resulted in Cu loss to ripios waste
        - PLS turbidity

	Q2-12	Q2-11	H1-12	H1-11
Cu Cathode Production (M lbs)	8.8	8.3	18.2	15.5

-Acid consumption also reduced by ~30%

Source: KGHM Q2-12 MD&A

### **OPERATIONAL IMPROVEMENT** Franke Mine, Chile

Solutions:

- Improved dry plant throughput
- Reduce pad heights from 3 m to 2 m
- Reduce PLS turbidity
  - Complete remodeling of acquired geoscience database
    - New block model & mine plan
    - Comprehensive blending strategies

Success through teamwork (Geology-Operations-Engineering-Processing)

New

Pad Heights





# INTEGRATED MINE SYSTEM Key To Long Range/Strategic Solutions

Environment

CSR

Commercial

Processing

**Operations** 

Reserves

Safety

**Resource Modeling** 

Safety

Geotechnical

Mine Planning

Sectore 1910

Exploration





# **PEOPLE ARE THE KEY**



#### ONE MINE'S APPROACH: Integrated Mine System Keeping the Team Together



SOCIAL LICENSE TO OPERATE – People Are The Key

- The rules have changed
  - Respect what has come previously
  - It is your home too
  - Improve on what is there
    - Community capacity building
    - Education/training
    - Long-term solutions
  - Communities as part of the process



### PEOPLE ARE THE KEY

- Not everyone can be a superstar, but everyone can overachieve
  - Great team can make a marginal project work, but...
- Visible, Felt Leadership
- Empowerment engagement
- No silos/solitudes promote success through teamwork





#### SO YOU THINK YOU CAN BE A GEOLOGIST People + Rock Foundation = Success

- Get the Rock Foundation right
  - Honour all data
  - Problems are magnified through mining cycle
- No Silos or Solitudes
  - Integrated Mine System
    - Technical + Team/Discipline Integration
- People/Team is the key
  - Can turn difficult projects into some level of success
  - Bad team approach is bad for good rocks

## ....OF COURSE YOU CAN.... We Did!...with help...

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- our many friends & colleagues in the FNX Quadra FNX – KGHM International adventure
  - Sudbury Kelly Lake Road, McCreedy West, Levack, Podolsky, Victoria Project
  - Robinson Mine, Nevada
  - Carlota Mine, Arizona
  - Chile MEK, Sierra Gorda JV, Franke Mine