Technology Integration Enhancing Safety & Productivity

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In particular, the forward looking statements in this document include among others those relating to the Damang Exploration Target Statement; the Far Southeast Exploration Target Statement; commodity prices; demand for gold and other metals and minerals; interest rate expectations; exploration and production costs; levels of expected production; Gold Fields’ growth pipeline; levels and expected benefits of current and planned capital expenditures; future reserve, resource and other mineralisation levels; and the extent of cost efficiencies and savings to be achieved. Such forward looking statements involve known and unknown risks, uncertainties and other important factors that could cause the actual results, performance or achievements of the company to be materially different from the future results, performance or achievements expressed or implied by such forward looking statements. Such risks, uncertainties and other important factors include among others: economic, business and political conditions in South Africa, Ghana, Australia, Peru and elsewhere; the ability to achieve anticipated efficiencies and other cost savings in connection with past and future acquisitions, exploration and development activities; decreases in the market price of gold and/or copper; hazards associated with underground and surface gold mining; labour disruptions; availability terms and deployment of capital or credit; changes in government regulations, particularly taxation and environmental regulations; and new legislation affecting mining and mineral rights; changes in exchange rates; currency devaluations; the availability and cost of raw and finished materials; the cost of energy and water; inflation and other macro-economic factors, industrial action, temporary stoppages of mines for safety and unplanned maintenance reasons; and the impact of the AIDS and other occupational health risks experienced by Gold Fields’ employees.

These forward looking statements speak only as of the date of this document. Gold Fields undertakes no obligation to update publicly or release any revisions to these forward looking statements to reflect events or circumstances after the date of this document or to reflect the occurrence of unanticipated events.
1. Granny Smith gold mine overview
2. Mining challenges drive innovation and technology
3. Technology roadmap
4. Technology integration framework – safety and productivity
5. Case studies - Digital communication underground (data highway)
6. Case studies - Enhancing health & safety through the use of technology
7. Case studies - Enhancing productivity through the use of technology
8. Conclusion
Granny Smith Gold Mine Overview

Large scale underground mine
Mining Challenges Drive Innovation & Technology

WHY do we need to Innovate and Integrate Technology?

Add Value

HOW do we add Value?

- Society
- Economics
- Environment

PEOPLE Intensity
MINING Intensity
CAPITAL Intensity
CASH Profitability
ENERGY Intensity
WHAT ARE WE DOING TO ADD VALUE?

The three key focus pillars are: Technology, Culture & Lean

Current focus

H1 & H2

The goal is consistency – You can’t automate something that varies a lot.
Automation is a destination, don’t skip the journey
# Technology Integration Framework

<table>
<thead>
<tr>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021-Beyond</th>
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## Remote Bogging
- RCT Surface Capability; RCT Guidance
- 2nd Surface Chair; Point to Point Kits
- RCT P2P Live
- RCT P2P Operational
- Scope ‘Haul Truck Operator Assist’ (HTOA) guidance system
- HTOA & Remote Trucking Trial
- Auto Dig
- Electric Drive loader

## Explosives Emulsion
- Production
- Development
- 2nd Rig arrives
- Increase Storage Capability
- 3rd Rig arrives

## Ties into Live Activity Information: Next Slide
- Underground Fibre backbone upgrade
- High Hazard Job Remote Monitoring
- Paste Fill Barricades Monitoring
- Newtrax Cap Lamp & MineEvac System
- Newtrax MineHop Network Expansion
- Newtrax VEMTR Vehicle & Personnel Tracking
- Newtrax “Man down”
- Newtrax Proximity Detection 1
- Newtrax Proximity Detection 2

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**Legend**

- COMPLETE
- IN PROGRESS / PLANNED
## Technology Integration Framework

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<td>Seismic Sensor Expansion</td>
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### Live Activity Information
- Underground live feed – tablet trial
- LTE 4G Underground Trial
- LTE 4G Underground Conversion
- UG Wireless Access points
- Maestro Primary Fan Monitoring
- UG Power Monitoring
- Paste Fill

### Planning/Schedule
- RCT Surface Capability; RCT Guidance
- RCT P2P Live
- RCT Digital Upgrade Multi-Machine Control
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### Technology Integration Enhancing Safety & Productivity | Michael Place | 25th October 2018
Digital Communication Underground (Data Highway)
Granny Smith Case Studies
Digital Communication Underground

Enhance Safety & Productivity, Sustain & Grow Cash Margin

Digital Backbone
1. Fibre Network Upgrade
2. Breakout Port’s Upgrade

Digital Network
1. Digital remote loader capability
2. Wireless Access Points in operating levels

LTE Network
1. LTE and VHF voice communications
Digital Communication Underground

Current Digital Backbone Underground

WHY?
Lift the lid from underground mining enhancing Safety & Productivity

HOW?
Integration of technology communications from UG to Surface

WHAT?
24 Core Fibre Backbone & Fibre Switches

Technology Integration Enhancing Safety & Productivity | Michael Place | 31st October 2018
Digital Communication Underground

LTE Network Underground
Proof of Concept planned for late 2018

Seamlessly integrate people & vehicles from above to below ground without losing connection
Enhancing Health & Safety through the use of Technology
Granny Smith Case Studies
Phase 1 of the Newtrax system at Granny Smith is the Safety System

Lone Worker Safety
1. Emergency Assistance Request
2. “Man Down” Function

Evacuation & Rescue
1. Mine-Wide Evacuation Notification
2. Tracking of Personnel
3. Post-Incident Data

Proximity Warning System
1. Personnel – Vehicle
2. Vehicle – Vehicle
Lone Worker Safety – Newtrax Enabled Cap Lamps
Deployed at Granny Smith in 2018

**MAIN FEATURES**

- Electronic Display
- Emergency Warning
- ID Pairing

**Electronic Tag Board**
Know who is in the mine and their location via their Cap Lamp.
Evacuation & Rescue – Mine Evacuation (MineEvac) Over Leaky Feeder
Deployed at Granny Smith in 2018

Granny Smith has over 80km of tunnels UG & more than 100 people UG at any one time
Proximity Warning System
Deployed in 2018 – Main Heavy Equipment - Phase 1
Planned for 2019 - Remainder Heavy Equipment & Light Vehicles - Phase 2

MAIN FEATURES

- Proximity Awareness
- Emergency Stop
- Fixed Hazards
Surface Operating Room (SOR)
1. Removing Personnel from the face
2. Increased Safety & Efficiency

Guidance
1. Dependent Guidance
2. Independent Guidance (Point to Point)

Multi-Machine Control
1. Digital Network
2. Real time information (G-Dash)
Surface Tele-remote Bogging

Independent Guidance (Point to Point) Tele-remote Bogging (Semi-autonomous loader)
Combined with Multi-Machine Control through a digital network

MAIN FEATURES

Surface Operating Room (SOR)
Independent Guidance (Point to Point)
Multi-Machine Control
G-Dash – Real Time Information
Enhancing Productivity through the use of Technology
Granny Smith Case Studies
Phase 2 – Enhance Productivity, Sustain & Grow Cash Margin

Vehicle Monitoring Tracking Reports (VMTR)
1. Live Vehicle Tracking
2. Location Reporting
3. Cycle Data

Mobile Equipment Telemetry (MET) System (ISAAC)
1. Live OEM Agnostic & Data Capture

Ventilation On Demand (VOD) & Atmospheric Monitoring System (AMS)
1. Automatic Secondary Fan Control
2. Real time air quality monitoring
Vehicle Monitoring Tracking Reports (VMTR) & Mobile Equipment Telemetry (MET) System (ISAAC)

Trial Deployed in 2018 – Currently being undertaken
Planned for 2019 – Remainder Main Heavy Equipment

Primary Goal – Maintenance Management Standard for UG heavy machinery using ISAAC data
Reducing maintenance costs through real-time vehicle health monitoring & tracking
Ventilation can account for 35-50% of an underground mine’s energy consumption.
Granny Smith spends in excess of $10M/year on power to run secondary ventilation fans.
Potential savings could translate up to more than $3.2M/year through VOD.
Downhole Survey
1. QAQC of production blast hole accuracy

Production Optimiser
1. The Opti-Box
2. Smart Collar
3. Online Reporting Engine

Reduce Deviation, Reduce Dilution, Increase Recovery
1. Enhance Productivity, Sustain & Grow Cash Margin

In 2 years Gold Fields Australia spent ~$2.5M on in-hole survey
Reduce blast hole deviation,
Reduce over-break/under-break and secondary drill and blasts

MAIN FEATURES

OPTi™ Box
SMART™ Collar
Minnovare™ Core
DIGI Plan™
DIGI PLOD™

These systems combined create the Production Optimiser™
Performance Comparison
Proven to deliver more reliable set up and improved drilling effectiveness

QAQC Data Captured from OEM RCS
- Average collar deviation 4.4%
- Average toe deviation 4.9%

QAQC Data Captured from Production Optimiser
- Average collar deviation 1.5%
- Average toe deviation 2.5%

Overall Result - 68% decrease in collar deviation and 51% decrease in toe deviation
Key Learning: It seems we are often in the R&D space, and this takes an enormous amount of resources and time. Research what's promised by suppliers prior to implementation.
Thank you

QUESTIONS AND ANSWERS