Gold Fields South Deep Rebase Plan

Market Presentation
February 2017
Agenda

1. World Class Orebody
2. Operational Strategy & Progress
3. Rebase Plan Strategy & Objectives
4. Geotechnical Considerations and Mine Design
5. Mine Planning and Production Profiles
6. Capital Infrastructure
7. Risks
8. Financials
A World Class Ore Body
**Introduction and Location**

**MAIN CHARACTERISTICS**
- Situated on the NW rim of the Witwatersrand Basin
- Upper Elsburg Formation
- 2900m below surface
- Dips 12 - 14° South West
- Mineral Resource (68.4 Moz) Mineral Reserves (37.3 Moz)
- +70 year mine life

**BRIEF HISTORY**
- 1950: Prospecting commenced in the area
- 1961: Production commenced at Western Areas Gold Mine (WAGM)
- 1999: Placer Dome Western Areas (PDWA) Joint Venture (JV) formed
- 2000: Name changed to South Deep Gold Mine
- 2005: Twin Shaft Complex opened
- 2006: Gold Fields acquired Barrick’s 50% interest
- 2007: Gold Fields acquired 100% interest
- 2008: Stopped all conventional mining
- 2009: Introduced LP mechanised destress stoping
- 2015: Converted from LP to HP destress stoping
- 2016: Cash neutral

**A World Class Ore Body**
A World Class Ore Body

Regional Geology - Depositional Environment

**MAIN FEATURES**

- Upper Elsburg Reef formation constitutes the primary economic target
- Geometry suited to mechanised mining
- **Key Infrastructure**
  - Twin shaft complex: main and ventilation # to 110 level
  - South shaft: main and two sub-vertical shafts to 95 level
  - CIP gold plant
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Local geology

CROSS SECTION VIEW (at intersection line shown in plan view)

Corridors
Mining Span

<table>
<thead>
<tr>
<th></th>
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<th>3</th>
<th>2B</th>
<th>2A</th>
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<tbody>
<tr>
<td></td>
<td>180m</td>
<td>180m</td>
<td>180m</td>
<td>180m</td>
<td>100m</td>
<td>100m</td>
</tr>
</tbody>
</table>

Main target thickness:
- West: 5–40m, 20–40m, 20–30m, 20m
- East: 180m, 180m, 180m, 180m, 100m, 100m

Reserve Tonnes:
- West: 1 319Kt, 50 490Kt, 77 685Kt, 67 898Kt, 21 444Kt
- East:

Reserve Grade:
- West: 8.2g/t, 6.0g/t, 5.4g/t, 4.8g/t, 4.9g/t
- East:

Mining Method:
- VCR: 2m
- Longhole stoping / drifts and benches

Proximal higher grade
- West: 1 319Kt, 50 490Kt, 77 685Kt, 67 898Kt, 21 444Kt

Distal lower grade
- West:

Drifting & Benching

Plan View

Sub-outcrop

Targets – Stope Outlines

120m Vertical

16 Units

EAST
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High Profile Destress & Longhole Stopping

Shaft
Development
Drain Hole
Twin Footwall Cross Cut
Stope Access & Infrastructure
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High Profile Destress & Longhole Stoping

- Shaft
- Development
- Drain Hole
- Twin Footwall Cross Cut
- Intake Ventilation Pass
- Return Ventilation Pass
- Ore Pass
- Cut 1: Destress Starts
- Stope Access & Infrastructure
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High Profile Destress & Longhole Stoping

Shaft
Development
Drain Hole
Twin Footwall Cross Cut
Intake Ventilation Pass
Return Ventilation Pass
Ore Pass

Stope Access & Infrastructure
Cut 1: LHS Starts
Cut 2: Destress Starts
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High Profile Destress & Longhole Stopping

Corridor progression 3 active cuts
40 – 60 kt/month
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High Profile Destress & Longhole Stoping

Destress cuts in 6 corridors

The number of cuts shown are up to the end of North of Wrench
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High Profile Destress and Longhole Stoping (LHS)

1. High profile destressing
2. Longhole Stoping
   - Primary source of reef mining

Mining Direction
- 4,700t/Blast

1. High profile support
   - Mechanical Installation
   - HP destress (5.5m height x 5m wide)
   - Primary & secondary support

YEAR-1: High profile destressing
YEAR-2: 
YEAR-3: Longhole Stoping (19 mth Lead time)
YEAR-4: 
YEAR-5: 
YEAR-6: 
YEAR-7: 

20m
15m
Mining Methods

Drifting and Benching (Selective Mining)

**Drifting**
- Width – 6 m
- Height – 5.5 m
- Length – up to 60m
- 315 tonnes per blast

**Benching**
- Width – 6 m
- Height – 8 - 15 m
- Length – up to 60m
- 670 tonnes per blast
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Mining Areas

RESERVES

- Current Mine: 7Mt, 1.4Moz (6.1g/t)
- North of Wrench: 57Mt, 10.7Moz (5.8g/t)
- South of Wrench East: 50Mt, 8.6Moz (5.3g/t)
- South of Wrench West: 104Mt, 16.6Moz (5.0g/t)
- Total: 218Mt, 37.3Moz (5.3g/t)

LOM

- 88.8km capital development
- End of mine life – 2095

2016 Q4 MONTHLY CONTRIBUTION

- Current Mine: 102kt, 15.4koz (57%)
- North of Wrench: 58kt, 11.5koz (43%)
- Total: 160kt, 26.9koz (100%)
Geological Modelling Inputs - De-risking the Ore Body

**3D Seismic Survey (2004)**
High correlation with drill hole data
Seismic survey conducted for South Deep future working areas with low resolution drilling data.

**Surface drilling (49,536m)**
600m x 600m grid
Used for facies boundaries, structural definition, stratigraphic modelling, assaying and resource estimation.

**LIB Drilling (Long Inclined Boreholes) (~17 km)**
300m x 300m grid
Used for structural definition, stratigraphic modelling, assaying and grade indication.

**Grade Control Drilling**
30m x 30m grid
Used for facies determination, structural definition, stratigraphic modelling, assaying and resource estimation.

10 - 80 Years Ahead of Current Workings.
10 - 80 Years Ahead of Current Workings.
2 – 10 Years Ahead of Current Workings.
0 – 2 Years Ahead of Current Workings.
A World Class Ore Body

Geological Modelling Inputs

CURRENT MINE
1,532 Boreholes

NORTH OF WRENCH
110 Boreholes
6 Boreholes
15 Deflections
21 Reef intersections
Grid of 600m

SOUTH OF WRENCH - EAST
6 Boreholes
15 Deflections
21 Reef intersections
Grid of ±550m

SOUTH OF WRENCH - WEST
10 Boreholes
57 Deflections
67 Reef intersections
Grid of ±550m

SEISMIC SURVEY
Outline of Seismic survey data
- Structure
- Reliable VCR top surface modelling

LIB and Grade Control Drilling - Plan
LIB Drilling - Section
Surface Drilling
Grade control drilling
LIB drilling
Seismic Survey
Operational Strategy & Progress
Secure and Sustain

1. Fix the base
   - Long term plans off the table
   - Focus on short term operational improvements
   - 68 initial BI projects
2. Sustainability
   - Bed down mining methods / geotechnical considerations
   - Mining value chain and interdependencies
   - Mine design and planning
   - Constraint management

Growth

1. Rebase Plan
   - Committed to presenting a new plan in Feb 2017
   - Technical assurance
   - Validated input parameters
   - Capacity analyses
   - Aimed at early profitability

A strong operational platform will ensure sustained operational improvement
## Strategy and Progress

### Fix the Base - Business Improvement

<table>
<thead>
<tr>
<th>Program</th>
<th>Total Projects</th>
<th>Projects Completed</th>
<th>2017</th>
<th>2018</th>
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<td>Financial and Administration</td>
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<tr>
<td>TOTAL</td>
<td>68</td>
<td>29</td>
<td>27</td>
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</table>

### Key Completed Projects:

#### People
- Management Team
- Technical Support
- Mechanised Mining Up-Skilling Program

#### Health and Safety
- Ensure Statutory Compliance
- Safety Incident / Behaviour Management System
- Implement tracking and flagging system (ISOMETRIX)

#### Fleet
- Fleet Renewal
- Underground Workshop Stores
- Fleet Conditions Assessment
- Equip and Commission 93L Workshop

#### Infrastructure
- Rail Bound Equipment Proximity Management System
- Twin Shaft Skip Loading Facility Rehabilitation

#### Mining
- Footwall Ripping to Hanging wall Ripping
- Basic Equipment Appreciation

#### Mineral Resource Management
- High Profile destress Stoping
- South Deep Rebase Project
- Regional Pillar Layout
- VCR Economic Potential

#### Financial and Administration
- Improve Business Analyses and Reporting
Strategy and Progress

Experienced management team appointed

VP and Head of Operations
Adriaan de Beer

Head of Mining
Johan Stoltz

Head of Metallurgy
Stephen Joseph

Head of Projects
Andre Marais

VP Technical Advisor
Ken Matthysen

Head of Mining
Kabelo Sefatsa

Head of SHEQ
Stuart Sepetla

Head of Finance
Blessed Mazibuko

Regional Mining Engineer
MI Botha

Head of Engineering
Johan Kleynhans

Head of Technical
Thabile Makgala

Head of HR
Tumelo Nkisi
People and Skills

**Steady state critical skills in place**

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<th>Description</th>
<th>Act Q4 2016</th>
<th>2017</th>
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People and Skills

Mechanised Mining Skills Development Programs

Mining employees (1,535)

- Management
- Supervision
- Operators
- Assistants
- Mine services

2016 Q1: 13
2016 Q2: 27
2016 Q3: 42
2016 Q4: 58

"Back to Basics" Mining Supervisory Up-Skilling Program Planned 154

Trackless Operator Up-Skilling Program Planned Program 498

TM3 employees planned (716)

- Management
- TM3 Artisan/Fman
- ENG Artisan/Fman
- Lube UV Operators
- Assistants
- ENG services

2016 Q1: 95
2016 Q2: 191
2016 Q3: 288
2016 Q4: 386

Trackless Artisans/Foreman Up-Skilling Planned Program 253

OEM Maintenance Contract

- Outsourced Skills Compliment
  - 2017: 141
  - 2018: 35
  - 2019: 33
  - 2020: 29
  - 2021: 29
  - 2022: 29

- Outsourced Skills Compliment
  - Q1: 22
  - Q2: 45
  - Q3: 69
  - Q4: 94

- Trained population
- Total Remaining

- Q1: 231
- Q2: 208
- Q3: 184
- Q4: 159

- Trained population
- Total Remaining
Physical Conditions

**Before**
- Poor footwall water control
- Poor support quality

**After**
- Correct roadway conditions
- Correct support installation

**Focus on Continuous Condition Improvement**
93 Level workshop commissioned

Effective Infrastructure will Improve Fleet Maintenance and Performance
Positive performance trends achieved

**TRIFR**
- **2014**: 5.00
- **2015**: 4.00
- **2016**: 3.00

**Tonnes Milled – monthly average**
- **2014**: 160,000
- **2015**: 140,000
- **2016**: 120,000

**Gold Recovered Kilograms - monthly average**
- **2014**: 600 kg
- **2015**: 600 kg
- **2016**: 700 kg

**Cash Flow (R'm) - annual**
- **2014**: 200 R'
- **2015**: 400 R'
- **2016**: 600 R'

**Tonnes treated (shafts)**
- **2014**: 100,000 tonnes
- **2015**: 80,000 tonnes
- **2016**: 60,000 tonnes

**Gold recovered**
- **2014**: (1,600) kg
- **2015**: (1,400) kg
- **2016**: (1,200) kg
Positive performance trends achieved

**Operational Performance**

**Development - monthly average**

- **2014**: 400 metres
- **2015**: 350 metres
- **2016**: 500 metres

**Destress - monthly average**

- **2014**: 2,500 m²
- **2015**: 3,000 m²
- **2016**: 3,500 m²

**Longhole Stoping - monthly average**

- **2014**: 30,000 tonnes
- **2015**: 35,000 tonnes
- **2016**: 40,000 tonnes

**Backfill Placed - monthly average**

- **2014**: 20,000 m³
- **2015**: 25,000 m³
- **2016**: 30,000 m³
Rebase Plan Strategy and Objectives
### Strategy and Objectives

#### Sustainability & Profitability

<table>
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<tr>
<th>Category</th>
<th>Objectives</th>
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<tbody>
<tr>
<td>Safety and Health</td>
<td>• No compromise on safety and health</td>
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<tr>
<td></td>
<td>• Infrastructure maintenance and renewal</td>
</tr>
<tr>
<td></td>
<td>• Safe mining methods (mechanisation &amp; automation, seismic controls, safe design)</td>
</tr>
<tr>
<td></td>
<td>• Secondary support capacity designed to match requirement</td>
</tr>
<tr>
<td>Technical Assurance</td>
<td>• Geology block model updates, Geotechnical, Seismic Hazard Analyses</td>
</tr>
<tr>
<td></td>
<td>• Mining methods validated</td>
</tr>
<tr>
<td></td>
<td>• Mining system capacity analyses</td>
</tr>
<tr>
<td></td>
<td>• Infrastructure capacity</td>
</tr>
<tr>
<td></td>
<td>• Independent reviews (Gold Fields Technical, GRB, Consulting firms)</td>
</tr>
<tr>
<td>Profitability</td>
<td>• Drive towards positive cash flow build up</td>
</tr>
<tr>
<td></td>
<td>• Increase operating margins with volume growth</td>
</tr>
<tr>
<td></td>
<td>• Capital expenditure efficiency</td>
</tr>
<tr>
<td></td>
<td>• Apply technological advancements for increased efficiency</td>
</tr>
<tr>
<td></td>
<td>• Sustainability</td>
</tr>
<tr>
<td>Social Licence</td>
<td>• Full SLP compliance (targets aligned to operational status)</td>
</tr>
<tr>
<td></td>
<td>• Full environmental compliance</td>
</tr>
<tr>
<td></td>
<td>• Continued support for LED and Joint Alliance projects</td>
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<tr>
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<td>• Community relations key priority</td>
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</table>
## Geotechnical Considerations

### Design optimisation

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Improvements/ changes</th>
<th>Reasons for change</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regional Pillars</strong></td>
<td>• 240m horizontal destress span decreased to 180m</td>
<td>• Increase the overall stiffness to reduce deformation, improve safe working conditions and improve longhole extraction</td>
<td>Complete</td>
</tr>
<tr>
<td></td>
<td>• Corridors increased from 4 to 6 at Twin Shaft based primarily on regional pillar changes</td>
<td>• Crush pillar scaling/fretting</td>
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</tr>
<tr>
<td></td>
<td>• Pillar sizes remained at 60m wide</td>
<td>• High levels of rehabilitation and re-support required</td>
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<tr>
<td></td>
<td></td>
<td>• Increased extraction rates - increased excavation stability</td>
<td></td>
</tr>
<tr>
<td><strong>High Profile Destress Stopes</strong></td>
<td>• Converted from low (2.2m) to high profile (5.5m) destress stoping</td>
<td>• Crush pillar fretting/scaling – increased pillar sizes</td>
<td>Complete</td>
</tr>
<tr>
<td></td>
<td>• Converted tunnel profile from square to arched</td>
<td>• One mechanised fleet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Increased yield pillar width from 2.5m (low profile) to 6m (high profile)</td>
<td>• Mechanised support installation enabled</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Rehabilitation cycles reduced</td>
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<tr>
<td></td>
<td></td>
<td>• Higher extraction rates - cuts remain open for shorter periods prior to LHS</td>
<td></td>
</tr>
<tr>
<td><strong>Rib Pillar</strong></td>
<td>• Increased pillars from 10 x 6m to 8 x 20m</td>
<td>• Pillar scaling/fretting at 6m observed</td>
<td>In transition phase</td>
</tr>
<tr>
<td></td>
<td>• Changed primary mining direction from N-S to E-W</td>
<td>• Design based on numerical modelling which showed high convergences in the MAD when mining LHS, indicating a lower LHS recovery</td>
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<td></td>
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<td>• Lower backfill requirements with rib pillar as extraction ratio reduced</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lower rehabilitation backfill required</td>
<td></td>
</tr>
<tr>
<td><strong>Sequential Longhole Stoping</strong></td>
<td>• Primary-Secondary extraction improved to Sequential extraction</td>
<td>• Reduced required life span of Stope Access Drives (SAD’s)</td>
<td>Numerical modelling to verify lower predicted convergences</td>
</tr>
<tr>
<td></td>
<td>• Width changed from 15m to 11m</td>
<td>• Lower stope convergence rates</td>
<td></td>
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<td></td>
<td></td>
<td>• Increased extraction of Secondary Stopes</td>
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<tr>
<td></td>
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<td>• Increased stope availability</td>
<td></td>
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Regional Pillar Design - 240m spans versus 180m spans

Geotechnical Considerations

- 240m x Spans & 60m x Pillars
- 4 x Corridors

- 180m x Spans & 60m x Pillars
- 6 x Corridors
Mine Design

Destress Cut 2015 Design

- Cut Access
- Access Ramp
- Ore Pass
- Footwall Infrastructure
- Yield Pillar Design
Mine Design

Destress Design

Previous Normal Destress Stoping Layout
- Single Access
- 6 m x 10 m Yield Pillars
- High Backfill Requirements

New Rib Pillar Destress Stoping Layout
- Twin Access
- 20 m x 8 m Yield Pillars
- Limited Backfill Requirements
Mine Design

Destress Cut Infrastructure Improvements

- Pass Bay
- Access Ramp
- Twin Cut Access
- Intake Pass
- Ore Pass
- Ore Pass No.2
- Ore Pass No.3
- Twin MAD
- Rib Pillar Design
- Footwall Infrastructure
- Pump Relay Station (2-3 per corridor)
- Maintenance Bay
- Waiting Place / Refuge Bay
- Mini-Sub
- Return Pass
- Second Escape
- Pass Bay
- Truck Loading Bay
- Stores
Destress Cut Inclination: Destress cut sloped at 1° downwards to accumulate water at the face to facilitate improved water control.
Mine Design

Longhole Stoping Sequence - Primary / Secondary Sequence (C2017)

Sequential Sequence (C2018)

Legend:
- Stoping
- Backfill

Mine primary stopes and then secondary

Mine primary stopes with back fill support and primary immediately next to it
Geotechnical Considerations

Seismicity

Seismic Properties
- Events related to production volume and in particular to the rate of destress stope advance
- Events located on abutments, pillars and features
- Damage Ratio less than peer mines @ 0.3%

Controls
- Reduce Energy Release Rate
  - Corridor Span & Rib Pillar
- Preconditioning
- Mining Geometry
- Geological Structure Strategy
- Monitor Systems
- Predictive Systems

Forecast
- Energy release per tonne reducing
- Destress output will not increase significantly

Consensus view - seismicity will not intolerably increase
Geotechnical Considerations

Seismicity

Strong correlation with destress stoping volumes

Seismicity (Events) vs Destress Production

Lower energy release rates (potency) due to improved mining methods (increased regional stiffness)

Seismicity (Energy) vs Production
Mine Planning

**Strategy**

**Mining Philosophy**
- Build-up to full production using input assumptions
- Maintain steady state as long as possible from NoW
- Maximise volume from Current Mine while the Corridors build up
- Verify mining method application

**Mine Design**
- Stiffer pillar design (Rib-pillar destress & Regional pillars)
- Per cut infrastructure concept (Engineering, ore and vent passes and dual access)
- Optimised stope designs for improved extraction
- Inclined destress cut ($10^\circ$) for improved footwall water handling
- Converting ore handling from track-bound to trackless
- Removing trucks from the stoping horizons

**Scheduling**
- Production rates derived from actual performance
- Destress advance rates optimised to support the build-up and geotechnical risk
- Primary and secondary stoping for 2017, thereafter sequential mining
- Minimum 2 stopes per stoping drill rig
- Increased volumes with longhole stoping output
- Maintain development resources at improved efficiencies

**Infrastructure Development**
- Footwall development for ore-handling systems and ventilation access
- Conveyor, crusher and silo commissioning
- Services infrastructure
- Defer SoW development
Production ramp up achieved through:

- Increasing contribution from longhole stoping
- Increasing mining footprint (increase in number of available faces/stopes)
- Increasing productivity
## Mine Plan Outputs

### Efficiency Assumptions & Plan Outputs

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Production Planning

Trackless Fleet Schedule

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- Fleet size and composition aligned to production requirements
- Minimal change in overall fleet compliment
- Primary production increase based on increase in longhole stoping capacity
- Rebuild fleet replacement and rebuild programme included
- LP fleet phased out
Mining Capacity, Ore Handling and Hoisting Simulation

Mining Activities:
- Development Drilling and Loading Cycles
- Slot Cut Drilling and Loading Cycles
- Longhole Stoping Drilling and Loading Cycles
- Blast Cycles
- Backfill Cycles

Logistics:
- Tramming Cycles (90, 93, 95, 100 L)
- Crushers (2W, 4W, 4W Satellite)
- Conveyors (100, 105 L)
- Silo’s/Transfer Boxes/Passes Levels
- Hoisting Cycles (Main & Vent Shafts)
- RoM Stockpile

Capacity Analysis:
- Cut
- Corridors
- Mining Areas
- Infrastructure

Combined

Infrastructure:
- Hauling Routes
- Surge Capacities
- Crusher Design Specification
- Conveyor Design Specification
- Shaft Design Specification
- RoM Stockpile Design

Mining Activities:
- Drill Designs
- Tramming Routes
- Activity Cycle Elements
- Shift Cycles

Logistics:
- Tramming Cycles (90, 93, 95, 100 L)
- Crushers (2W, 4W, 4W Satellite)
- Conveyors (100, 105 L)
- Silo’s/Transfer Boxes/Passes Levels
- Hoisting Cycles (Main & Vent Shafts)
- RoM Stockpile

Capacity Analysis:
- Cut
- Corridors
- Mining Areas
- Infrastructure

Combined

Performance Analyses

Design Criteria

Variability Modeling

Monte Carlo Simulation

Discreet Event Simulation

Mining Capacity Modeling
Mine Planning

Summary of Results - Mining Capacity, Ore Handling and Hoisting Simulation

Ore Handling and Hoisting

90, 95, 100 Level Tramming
- Capacity
  - 160 ktpm

Crushers Capacity Phase 1
- (2W / 4W Satellite)
  - 180 ktpm

Crushers Capacity Phase 2
- (2W / 4W)
  - 310 ktpm

Total
- 160 ktpm

Mining Capacity 2017

Current Mine
- 90 ktpm

North of Wrench
- 70 ktpm

Total
- 160 ktpm

Mining Capacity 2027 (Steady State achieved by 2022)

Current Mine
- 15 ktpm

North of Wrench
- 230 ktpm

Total
- 245 ktpm

Reef tonnes and internal waste tonnes
Production Profile

Life of Mine - Tonnage Profile – Average Tonnes per Month

- Steady state from Current Mine and North of Wrench: 2022 ≈ 10 years
- South of Wrench (East and West): Destress starts in 2033 ≈ 63 years

Ore Production (kt/mth)
- Current Mine
- NoW
- SoW West: 150 kt/mth
- SoW East: 80kt/mth

Au Production (t)
- Destress starts in 2033 ≈ 63 years
- Steady state from Current Mine and North of Wrench: 2022 ≈ 10 years
Capital Infrastructure

Rock Handling Infrastructure NoW Capacity

- Main Crusher 2 West
- Main Crusher 4 West
- Satellite Crusher 4 West
- 100 Level Rail
- NoW Tonnage

- Main Crusher 2 West Construction 16 Months Aug’18 to Nov’19
- Main Crusher 4 West Construction 14 Months Mar’17 to May’18
- Satellite Crusher 4 West Construction 6 Months June 17 to Dec 17

100 4 West Box 3 June 2017

100 Level Rail
Capital Infrastructure

Backfill - Focus Areas

Backfill Manufacturing
- Refurbish and modernise CCT plant, Control & Instrumentation (Surface and 83 level)
- Hot commission full FPT plant (320m³/hour capacity)
- Integrate FPT & CCT plant operational control

Distribution
- Installation of 2 x additional CCT ranges from surface to 83 level (Redundancy)
- Commissioning 6 x FPT ranges in total (2 already in operation)
- FPT range extension into all corridors

Barricade Construction
- Deployment of interim backfill barricade for LHS (Bags)
- Finalisation of future shotcrete barricade trails
- Development of mechanised shotcrete construction processes

Filling Requirements & Operational Readiness
- Daily Longhole Stoping priority tracking
- Active backlog monitoring
- Flexibility and redundancy improvements
- Improved quality control and training

Backfill Type & QA/QC
- Density, particle size distribution, binder type testing
- Quality test program (UCS, pressure, deflection, rheological)
- Increase FPT contribution from 10% to 90% of total backfill

Evolution from CCT to FPT - Game changer for South Deep backfill operations
Capital Infrastructure

**Backfill - Longhole Stope Barricades**

- **Paddock Barricade**
  - Historical practice at South Deep
  - Labour & Material intensive
  - Multiple lifts constructed on top of one another
  - Wooden uprights covered with wire mesh and shotcrete
  - Construction time required: 9-12 days
  - Fill pour rate: Maximum lift of 0.6m per day vertically

- **Pumpable Bag Stacks (Interim Application)**
  - Pumpable bag stack constructed vertically to create wall
  - Bag size 2.5m W x 5.0m L x 0.4m H, pumped with Cemented Classified Tailings (CCT)
  - Gaps between bags and sidewall sealed with wire mesh and geo-fabric sheets
  - Construction time required: 4-6 days
  - Fill pour rate: Maximum lift of 1.2m per day vertically

- **Shotcrete Barricade Wall (Future)**
  - Large scale deployment of modern curved shotcrete walls (Industry norm)
  - Steel lattice frame covered with wire mesh and shotcrete (450mm thick)
  - Construction time required: 3-4 days
  - Fill pour rate: Continuous pour from start up to 160m³/hour (lift of 3-4m per day for an area of 15m by 30m)

**Longhole Stoping Barricades**
Capital Infrastructure

Backfill Requirements vs Placement Capacity

- 4th FPT range operational
- Increased efficiency due to barricade construction improvements
- Increased efficiency due to an increased void availability
- Increased efficiency due to stope locality and orientation and FPT range distribution

Commissioning of 2 additional FPT ranges

Backfill Required (m³) vs Placement Capacity (m³)

Jan-17 to Nov-21

- Jan-17: Backfill Required (m³)
- Mar-17: Placement Capacity (m³)
- Jul-17: Increased efficiency due to barricade construction improvements
- Sep-17: Increased efficiency due to an increased void availability
- Nov-17: Increased efficiency due to stope locality and orientation and FPT range distribution
- Jan-18: Commissioning of 2 additional FPT ranges
- Mar-18: Increased efficiency due to barricade construction improvements
- Jul-18: Increased efficiency due to an increased void availability
- Sep-18: Increased efficiency due to stope locality and orientation and FPT range distribution
- Nov-18: Commissioning of 2 additional FPT ranges
- Jan-19: Increased efficiency due to barricade construction improvements
- Mar-19: Increased efficiency due to an increased void availability
- Jul-19: Increased efficiency due to stope locality and orientation and FPT range distribution
- Sep-19: Commissioning of 2 additional FPT ranges
- Nov-19: Increased efficiency due to barricade construction improvements
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- Mar-20: Increased efficiency due to stope locality and orientation and FPT range distribution
- Jul-20: Commissioning of 2 additional FPT ranges
- Sep-20: Increased efficiency due to barricade construction improvements
- Nov-20: Increased efficiency due to an increased void availability
- Jan-21: Increased efficiency due to stope locality and orientation and FPT range distribution
- Mar-21: Commissioning of 2 additional FPT ranges
- May-21: Increased efficiency due to barricade construction improvements
- Jul-21: Increased efficiency due to an increased void availability
- Sep-21: Increased efficiency due to stope locality and orientation and FPT range distribution
- Nov-21: Commissioning of 2 additional FPT ranges
Capital Infrastructure

Pumping Strategy

- Separation of the mine service water from cooling water
- Current mine water above 95 Level report to South Shaft
- South Shaft pump station and surface infrastructure to remain for LOM pumping
- Reduction in pumping requirements - Cooling water in closed loop system
- Mine water pumped from stopes to relay pump station
Capital Infrastructure

Capital Development - 2016 - 2022

- 2W Main Crusher: Feeds rock to 100 level and 105 level conveyers
- 4W Main Crusher: Feeds 105 level conveyor
- 100 level conveyor
- 105 level conveyor
- 93 level access to 1W (2018)
  - Return air ways
  - Access to 93 level workshop
- Corridor 2A Cross Cut Development
- Corridor 2B Cross Cut Development
- Corridor 3 Cross Cut Development
- Corridor 4 Cross Cut Development
- 100-1A and 1B Cross Cut Development
- Twin Shaft
- South Shaft
- 93 level
- 95 level
- 100 level workshop
- 100 level workshop
- 93 Level access to 1W (2018)
## Capital Infrastructure

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<td>253</td>
<td>2 173</td>
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</table>

- The R2.17b includes R1,36b not spent from the 2009 Feasibility Study and an additional R809m for scope and schedule variances.
- The additional R809m includes increases in infrastructure development (R300m), electricity (R104m), backfill (R98m), workshops (R95m), vertical development (R88m), crushers (R77m), fleet (R66m), underground drilling (R58m), conveyor belting (R56m), relay pump stations (R34m), tip construction (R24m), others (R108m) and contingency (R90m). It furthermore includes reductions in pumping infrastructure (R344m), metallurgical (R31m) and refrigeration (R14m).
Risks
# Top Operational Risks

<table>
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<tr>
<th>No</th>
<th>Risk</th>
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<td>• Pillar behaviour monitoring</td>
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<td>• Preconditioning</td>
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<td>2</td>
<td>Loss of secondary longhole stopes</td>
<td>• Change to sequential mining beyond 2017</td>
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<tr>
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<td>• Secondary stope monitoring</td>
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<td>• Production engineering department establishment</td>
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<td>• Planned stope availability buffer</td>
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<td>Seismicity</td>
<td>• Daily seismic hazard warning informed by real time underground instrumentation</td>
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<td>• Independent review of seismic risk IMS / SRK / GRB</td>
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<td>• Seismic task team</td>
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<td>• Mine design and face shape management</td>
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<td>Achieve mine planning input parameters</td>
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<td>• Additional ore passes</td>
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<td></td>
<td></td>
<td>• Growth infrastructure projects</td>
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<td>5</td>
<td>Key growth infrastructure delays</td>
<td>• Best practice project management services and skills for project execution</td>
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<td>• Outsourcing</td>
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<td>• Performance Management</td>
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<td>Supervisory skills and TM3 skills</td>
<td>• Training programs</td>
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<td>• On the job training and coaching</td>
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<td>• New recruits with experience</td>
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<td>7</td>
<td>Quality backfill supply and placement</td>
<td>• Utilize FPT plant for longhole stoping</td>
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<td>• Upgrade of the backfill infrastructure</td>
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<td>• Designed backfill barricade</td>
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<td>• Backfill binder control</td>
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<td>8</td>
<td>Availability of Mineable LHS</td>
<td>• Destress mining progress to increase redundancy</td>
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<td>• Additional 20% stopes planned at all time</td>
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<td>• Continuation of LHS operating model</td>
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<td>9</td>
<td>Face time utilization</td>
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<td>• Horizontal transportation optimization</td>
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<td>• Zoning and Shaft Schedule</td>
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<td>10</td>
<td>Labour relations (Shift cycles, Equity)</td>
<td>• Continuous engagements</td>
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<td>• Strategic intervention regarding shift cycles</td>
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## Executive Summary 2017 Money Terms

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<th>Description</th>
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</tbody>
</table>

### Long Term Guide

1. Gold remains at circa 500k oz per annum from 2023 to 2031 and thereafter reduces to circa 480 k oz per annum due to a reduction in grade.

2. Operating costs remains at circa R4.5m per annum after 2022.

3. Sustaining capex reduces from R1b in 2022 to circa R800m per annum from 2026 onwards.

4. Growth capex increase steadily from R250m in 2022 to R880m in 2027 to account for South of Wrench expenditure and thereafter reduces to R200m per annum in 2040.

5. South of Wrench capex commences in 2024 and escalates to a peak of R600m in 2031 before initiation of the drop off.

6. All in Cost remains below 900 US$/oz after 2022 and reduces to 800 US$/oz from 2044.