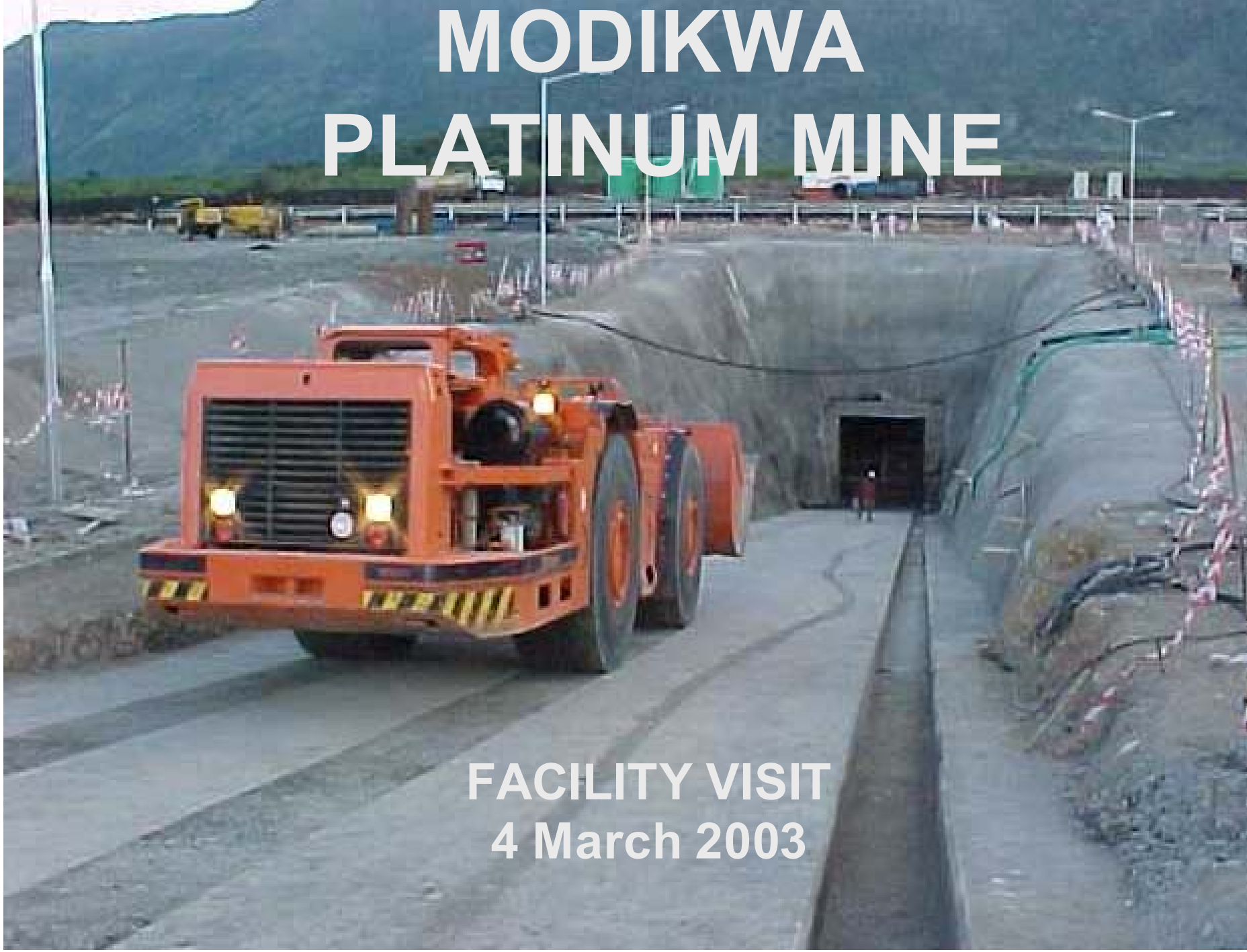


MODIKWA PLATINUM MINE

FACILITY VISIT
4 March 2003

MODIKWA
PLATINUM MINE

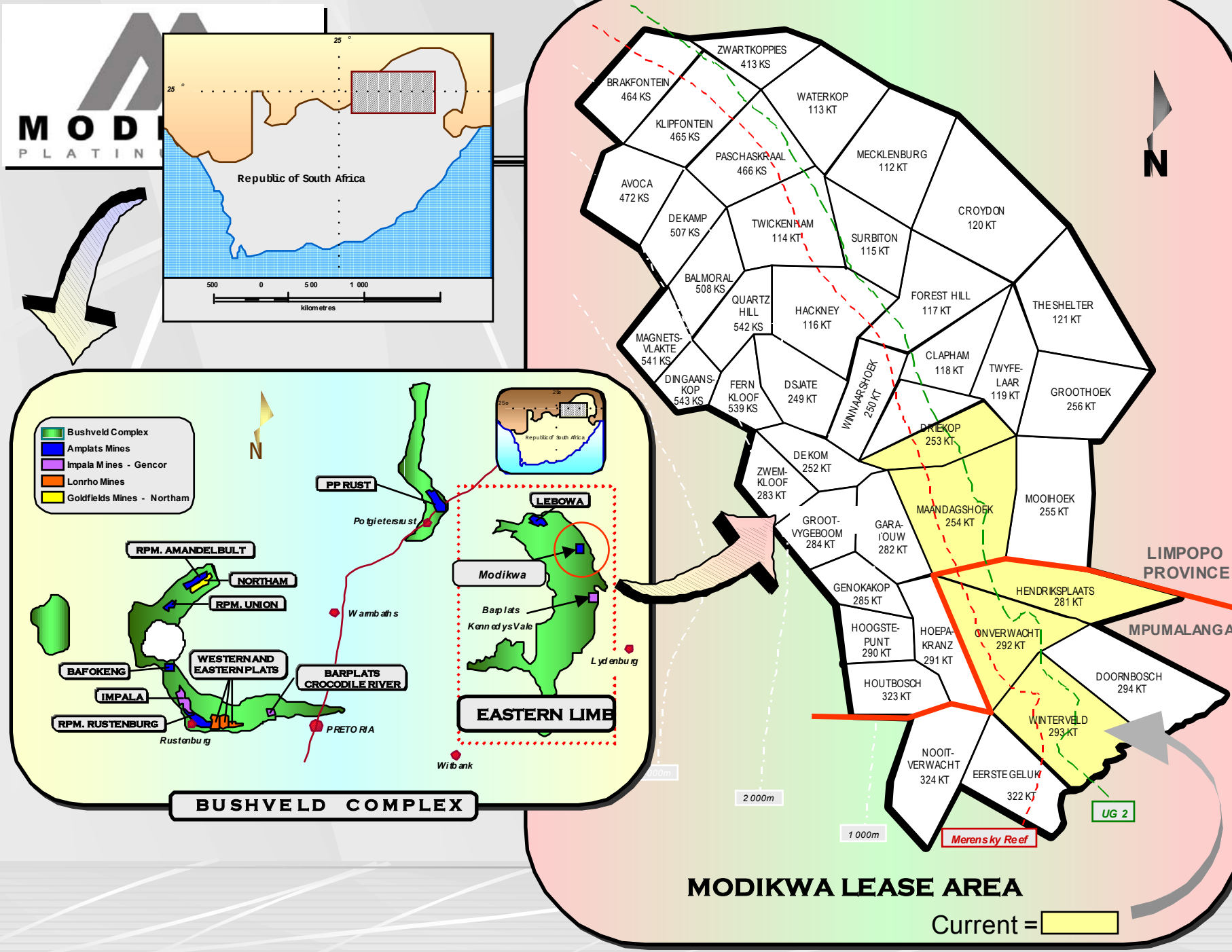
Agenda

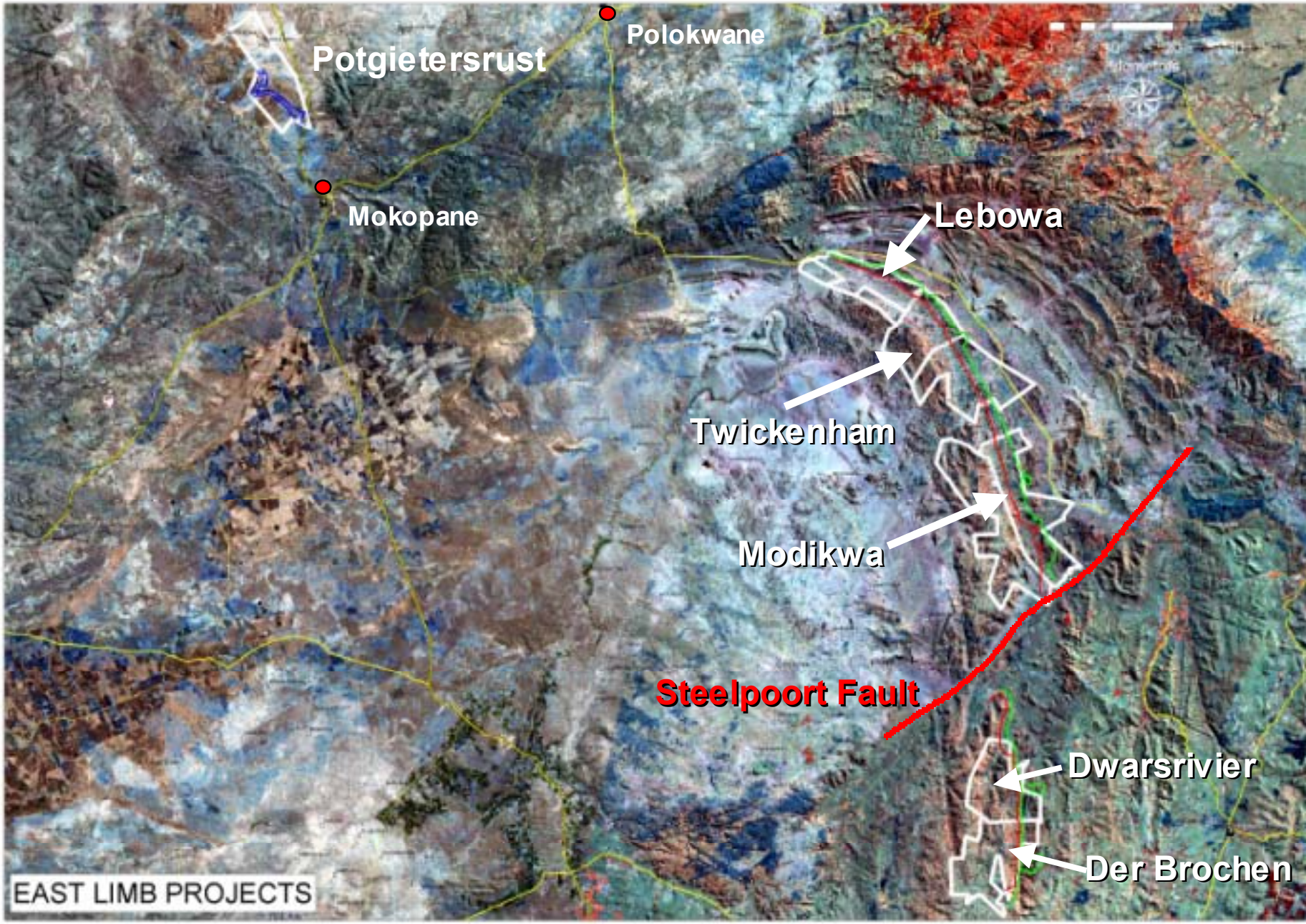
Mike Jooste : Business Leader

- Location and setting
- Project parameters
- JV structure and management
- Mine layout and mining method
- Geology and exploration
- Training and development
- Socio- economic development

Ron McGregor : Business Area Leader : Process

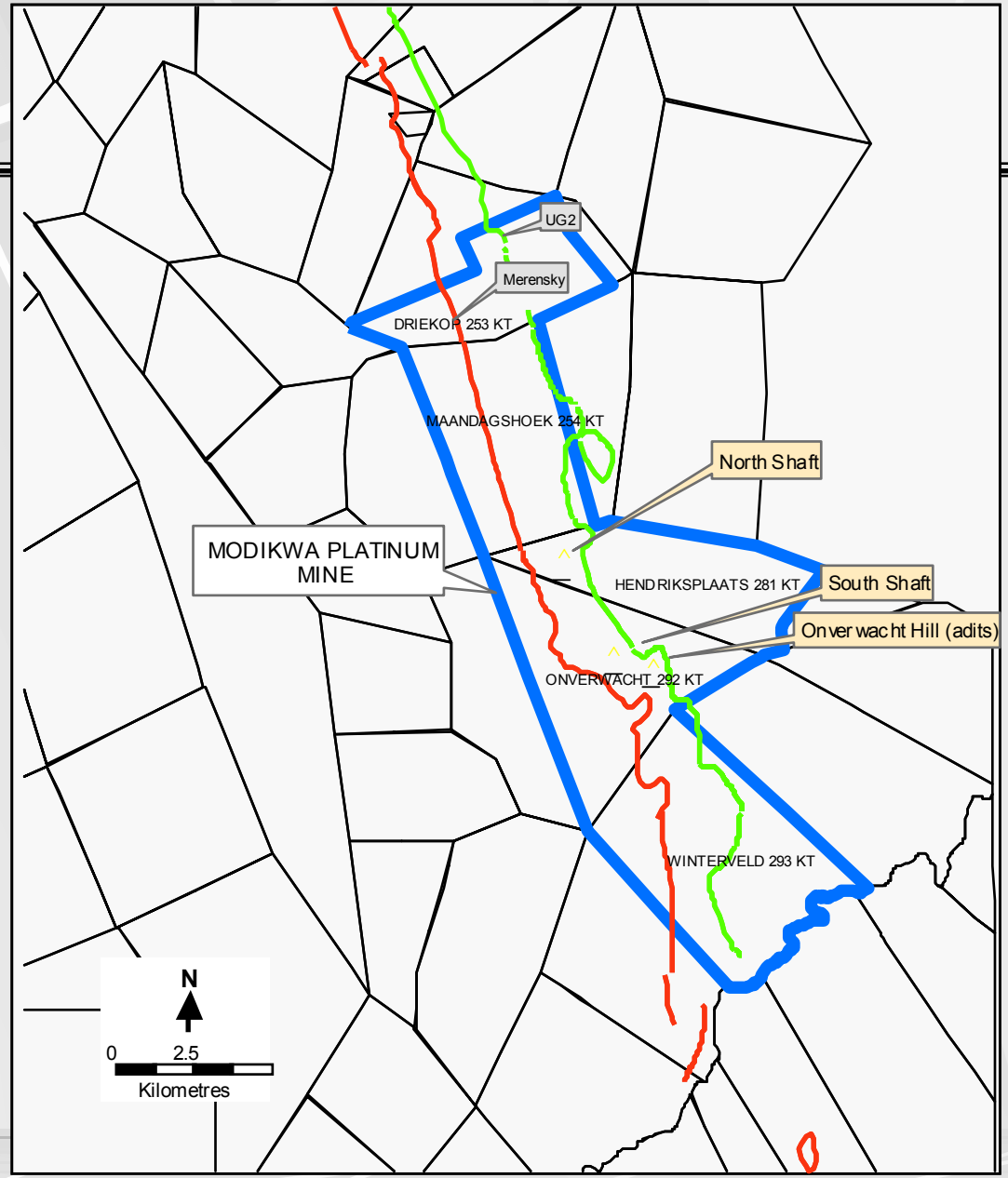
- Concentrator and metallurgy


Republic of South Africa
500 0 500 1 000
kilometres
Bushveld Complex
Amplats Mines
Impala Mines - Gencor
Lonrho Mines
Goldfields Mines - Northam
N
PP RUST
Potgietersrust
LEBOWA
RPM. AMANDELBULT
NORTHAM
RPM. UNION
Warmbaths
Modikwa
Barplats
Kennedysvale
Lydenburg
WESTERN AND EASTERN PLATS
BAFOKENG
IMPALA
RPM. RUSTENBURG
BARPLATS CROCODILE RIVER
Rustenburg
PRETORIA
Witbank
EASTERN LIMB
BUSHVELD COMPLEX
ZWARTKOPPIES 413 KS
BRAKFONTEIN 464 KS
KLIPFONTEIN 465 KS
WATERKOP 113 KT
PASCHASKRAAL 466 KS
MECKLENBURG 112 KT
AVOCA 472 KS
DE KAMP 507 KS
TWICKENHAM 114 KT
SURBITON 115 KT
CROYDON 120 KT
BALMORAL 508 KS
QUARTZ HILL 542 KS
HACKNEY 116 KT
FOREST HILL 117 KT
THE SHELTER 121 KT
MAGNETS-VLAKTE 541 KS
DINGAANS-KOP 543 KS
FERN KLOOF 539 KS
DSJATE 249 KT
WINNIAARSHOEK 250 KT
CLAPHAM 118 KT
TWYFE-LAAR 119 KT
GROOTHOEK 256 KT
DRIEKOP 253 KT
DEKOM 252 KT
ZWEM-KLOOF 283 KT
MOOIHOEK 255 KT
GROOT-VYGEBOOM 284 KT
GARA-IOUW 282 KT
MAANDAGSHOEK 254 KT
LIMPOPO PROVINCE
GENOKAKOP 285 KT
HENDRIKSPLAATS 281 KT
MPUMALANGA
HOOGSTE-PUNT 290 KT
HOEPA-KRANZ 291 KT
ONVERWACHT 292 KT
HOUTBOSCH 323 KT
DOORNBOSCH 294 KT
WINTERVELD 293 KT
NOOIT-VERWACHT 324 KT
EERSTE GELUK 322 KT
UG 2
Merensky Reef
2 000m
1 000m
N
MODIKWA LEASE AREA
Current =


Potgietersrust
Polokwane
Mokopane
Lebowa
Twickenham
Modikwa
Steelpoort Fault
Dwarsrivier
Der Brochen
EAST LIMB PROJECTS

MODIKWA
PLATINUM MINE

Modikwa Platinum Mine



MODIKWA
PLATINUM MINE

Key Parameters

- Mining authorisation covers the farms Driekop, Maandagshoek, Hendriksplaats, Onverwacht & Winterveld
- First phase comprises 2 decline shaft systems on Onverwacht and Hendriksplaats + adit system on Onverwacht Hill
- Production on steady state – 200 ktm, 162 koz Pt/annum
- 2 100 employees
- Budget – R1,8 billion (real 2003 terms)
- Plant commissioned – August 2002
- Full production – 2004

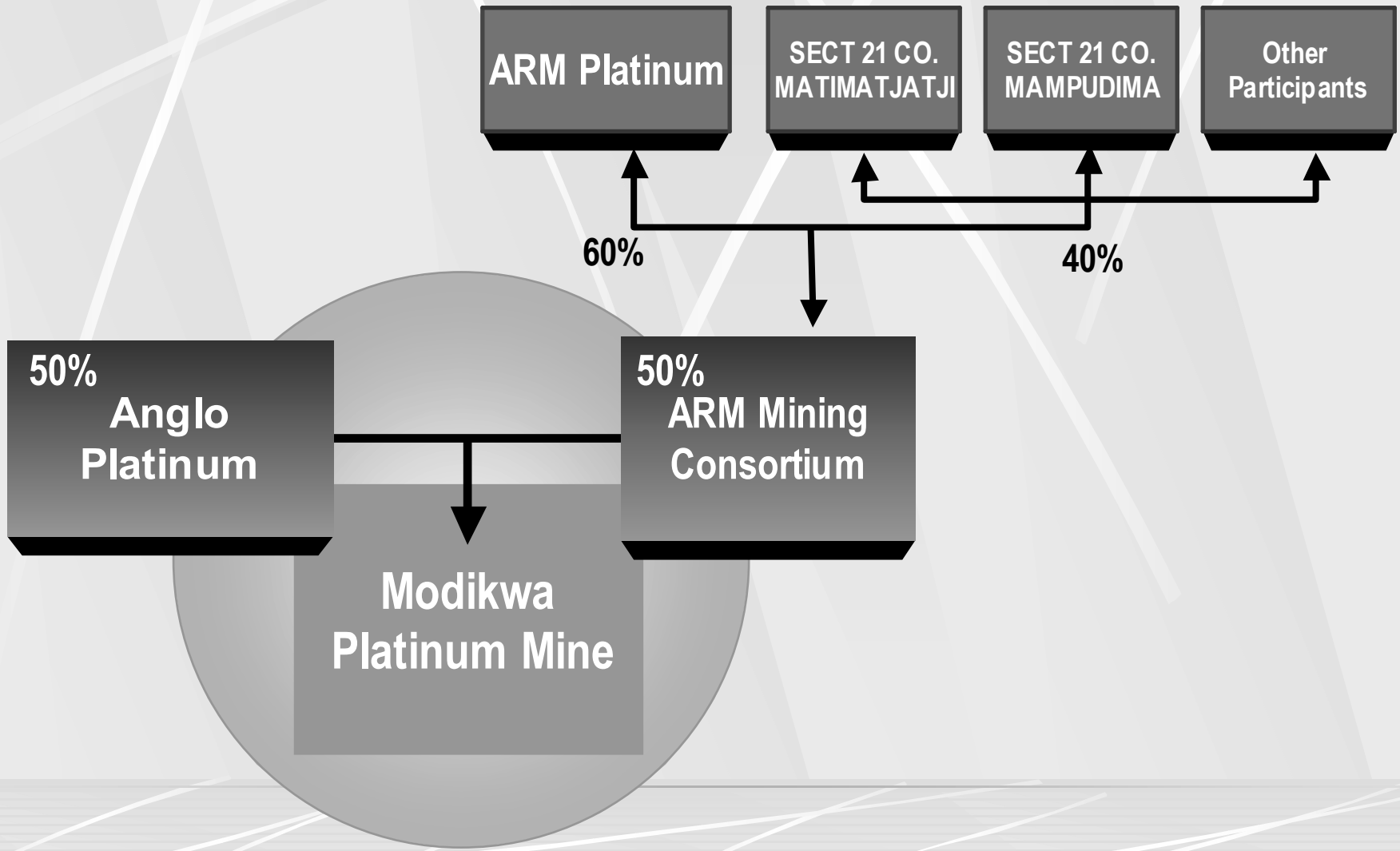
MODIKWA
PLATINUM MINE

Modikwa (Jan 2002)

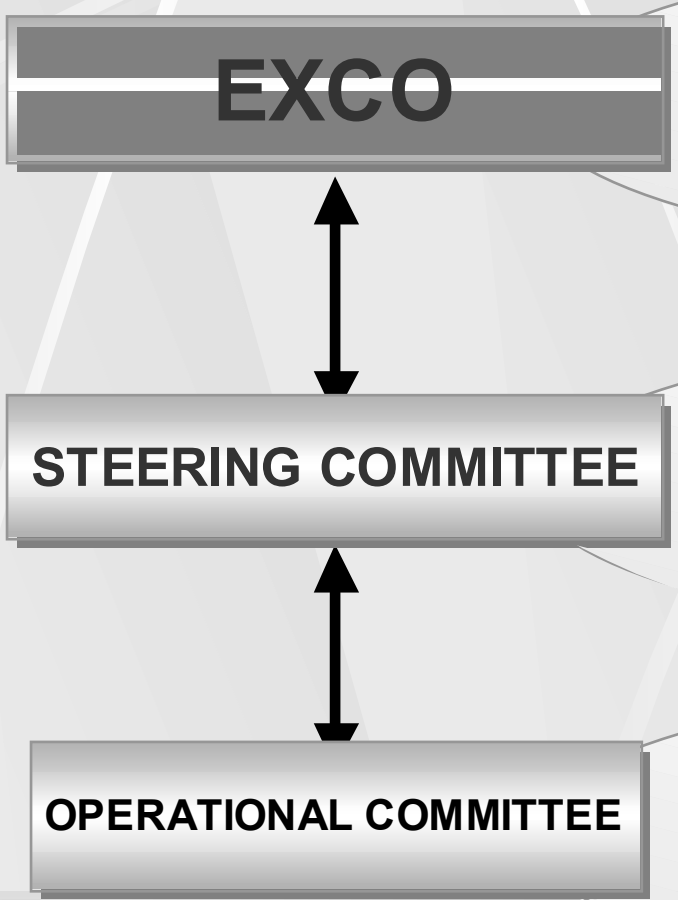
MODIKWA
PLATINUM MINE

Modikwa (Jan 2003)

Joint Venture



JV Management Structure



Policy decisions

Equal number of members appointed from ARM and Anglo Platinum
Chairperson - P Motsepe

Technical decisions

Members with requisite skills appointed by the EXCO's of ARM and Anglo Platinum

Operational decisions

On mine operational team

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PLATINUM MINE

Management Team

- Business Leader – M Jooste
- Area Leader North – M da Costa
- Area Leader South – G Strong
- Area Leader Process – R McGregor
- Area Leader Info & Financial – E Cilliers
- SHE Leader – F Veltman
- Area Leader Logistics – A Olivier
- Area Leader ERM – B van Rhyn
- Other : HR, Training, IR, Community

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PLATINUM MINE

Basic Layout of Decline Shafts

- Trackless material decline (5m x 5m)
- Conveyor decline (4,5m x 4m)
- Chairlift decline (4m x 4m)
- Four production levels and a RAW
- Levels accessed by means of ramps from the material decline
- Main drives developed on reef

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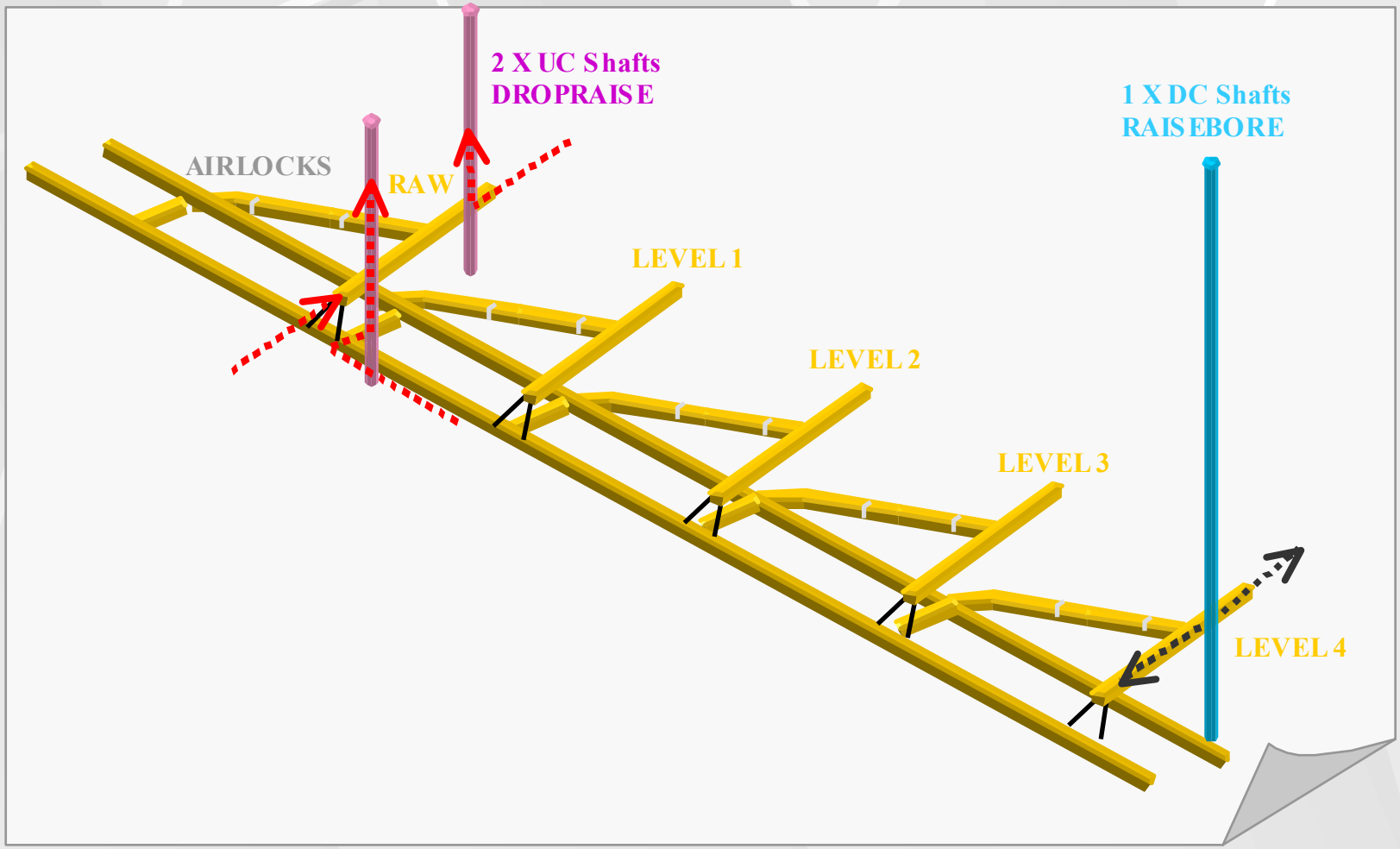
PLATINUM MINE

Decline Shaft Layout



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PLATINUM MINE

Declines and Drives

- Developed using mechanised equipment
- Equipment:
  - Axera D06 Drill Rigs
  - Axera D06 Roofbolters
  - Toro 1250 LHD's
  - Toro D50 Dump Trucks
  - Fermel Utility Vehicles

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Twin Boom Drill Rig

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Roof Bolter

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12.5 ton Load Haul Dumper

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PLATINUM MINE

50 ton Dump Truck

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Equipment Maintenance

- Tamrock contract in place
- Workshops on site
- SAP Planned Maintenance system

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Winzes

- Mechanised development using low profile machines
- Equipment:
  - Axera LP Drill Rigs
  - EJC 115 Lhd's
- Where reef dips exceed 15° winzing is done conventionally

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PLATINUM MINE

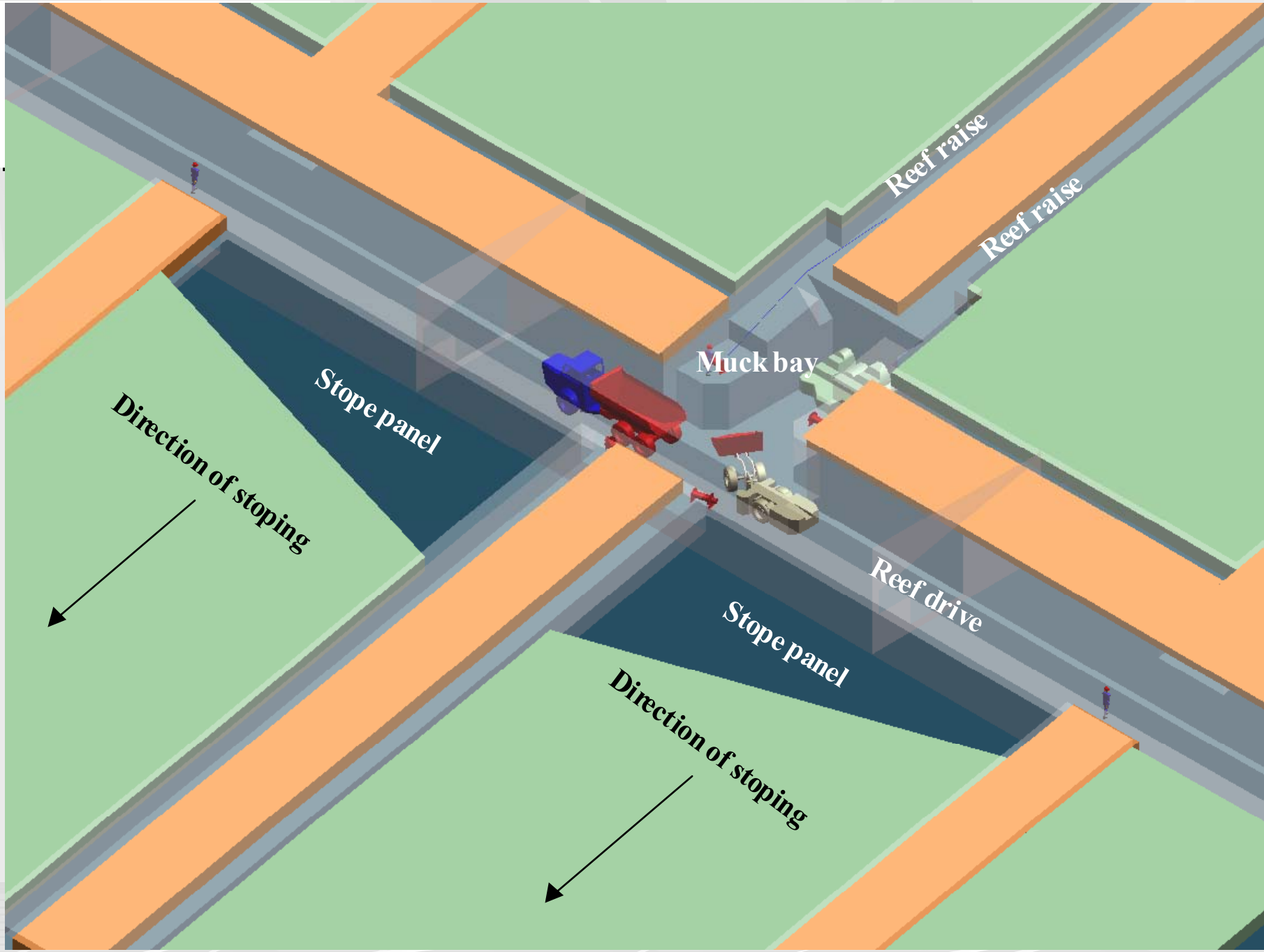
Raising and Stoping

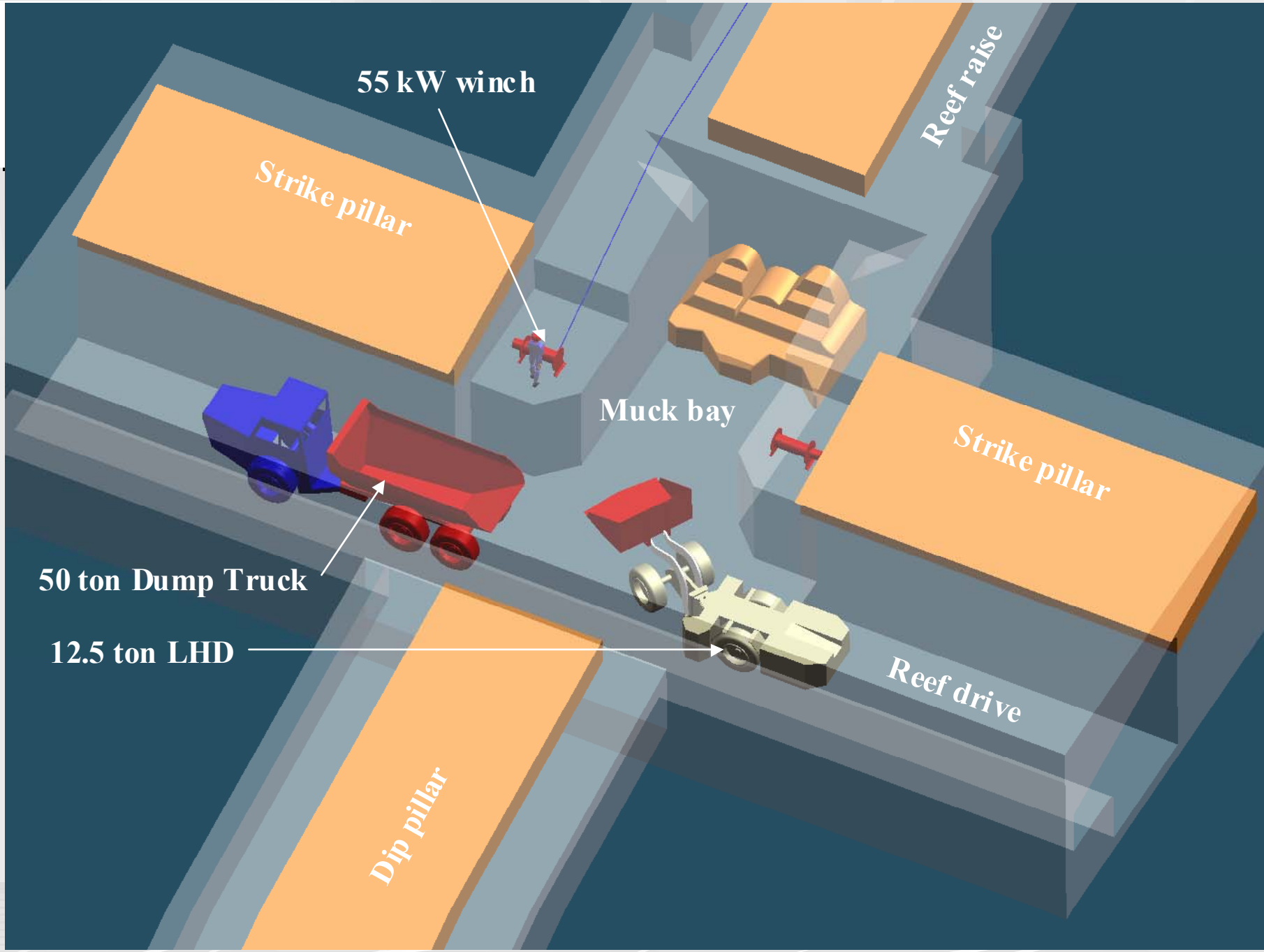
Raising :

- **Conventional raising with handheld machines**

Stoping :

- **Down-dip panels ± 28m face length**
- **Conventional stoping**
  - **Handheld machines**
  - **Scraper cleaning**
  - **Blasting with Anfex and shocktube**


Reef raise
Reef raise
Muck bay
Stope panel
Direction of stoping
Reef drive
Stope panel
Direction of stoping


55 kW winch
Strike pillar
Reef raise
Muck bay
Strike pillar
50 ton Dump Truck
12.5 ton LHD
Reef drive
Dip pillar

MODIKWA
PLATINUM MINE

Some Design Criteria

- Two shaft systems – approx. 3,2km's apart
  - One material and one conveyor shaft
  - Chairlift decline added later
  - Hillside adit mining
- 200 000 ton per month concentrator
  - Natural fines circuit
  - Autogenous / ROM ball milling
  - Chrome silica circuit
- Central infrastructure
  - Offices and training facility

MODIKWA
PLATINUM MINE

Some Design Criteria

- Conventional stoping
  - Raises
  - Down dip stoping
  - Handheld drills
- High productivity mine:
  - Continuous operations
  - Two panel cycle
  - No night shift on the reef plane
  - Concentrator has high level of process control

MODIKWA
PLATINUM MINE

GEOLOGY
and
EXPLORATION

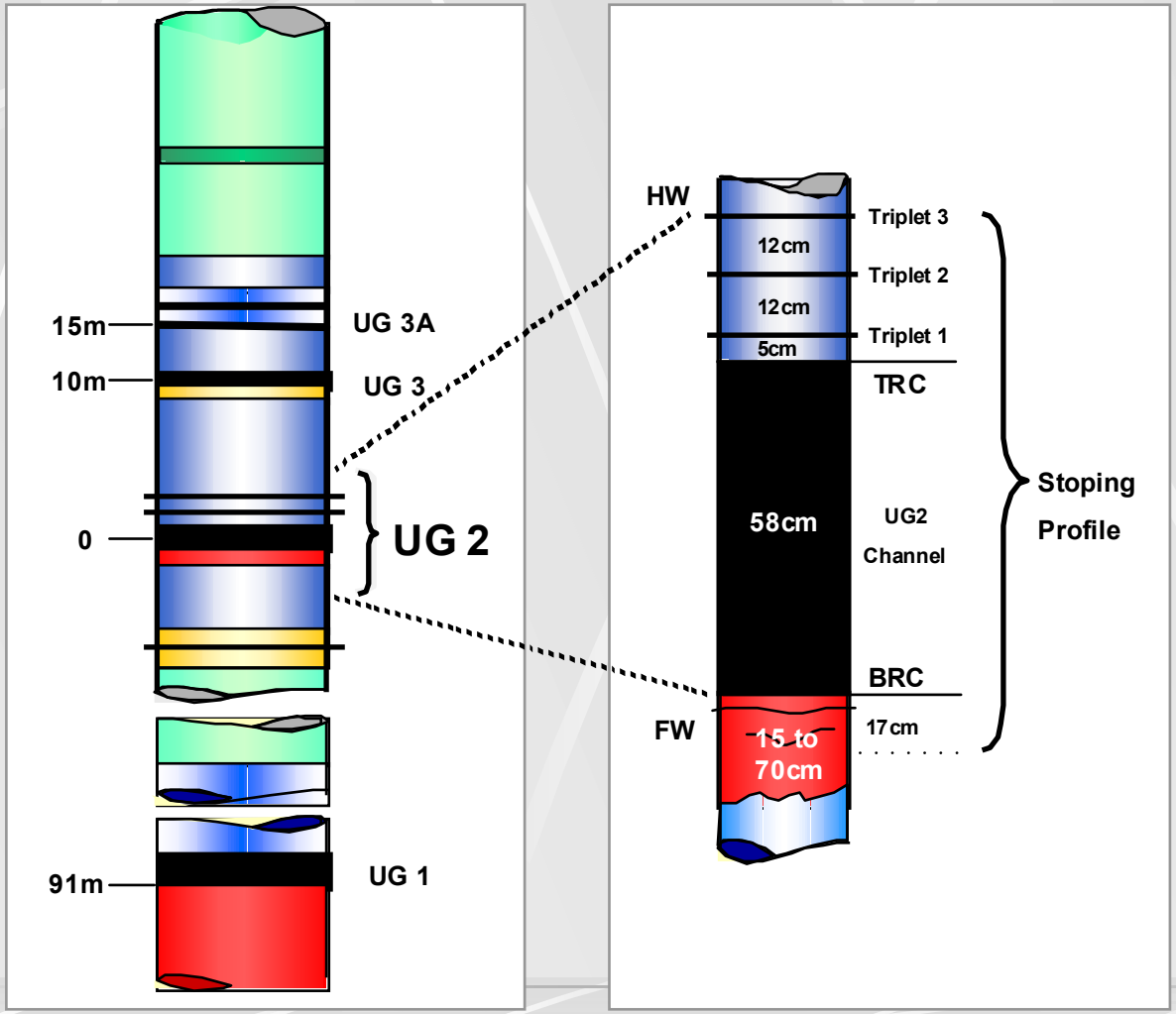
MODIKWA
PLATINUM MINE

Geology

- Lithological setting and optimal stope cut
- Geological model and mine design optimisation
- Exploration drilling programme

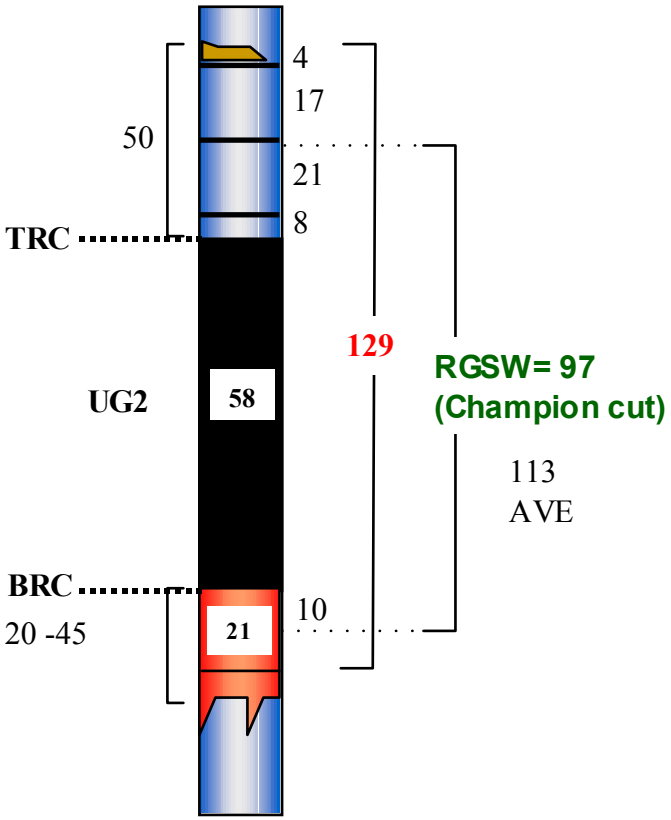
MODIKWA
PLATINUM MINE

Eastern Bushveld :
Stratigraphic column in proximity of UG2 at Modikwe

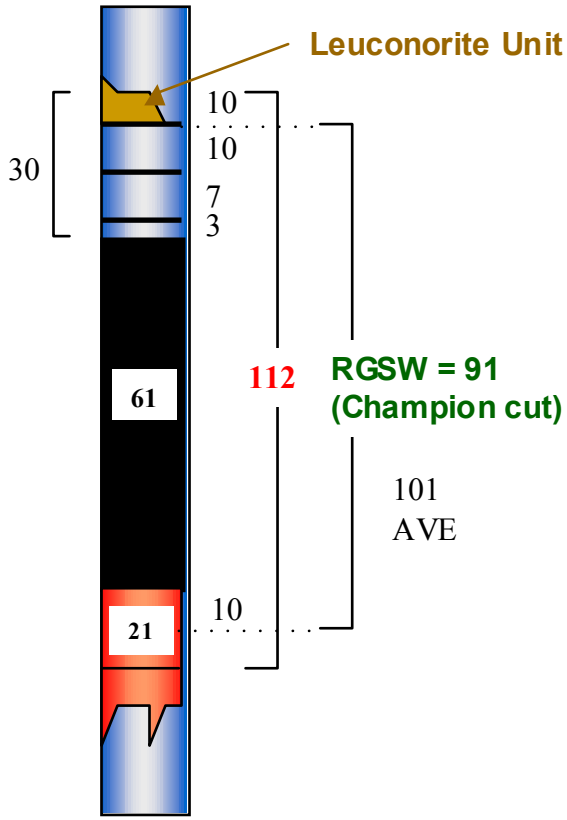


MODIKWA PLATINUM MINE

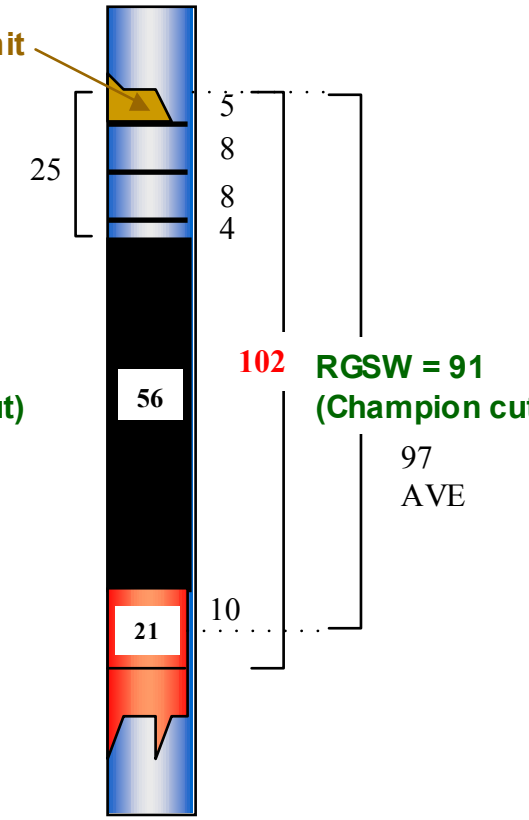
Optimal Stoping Cut
(per shaft area)



NORTH MINE



SOUTH MINE

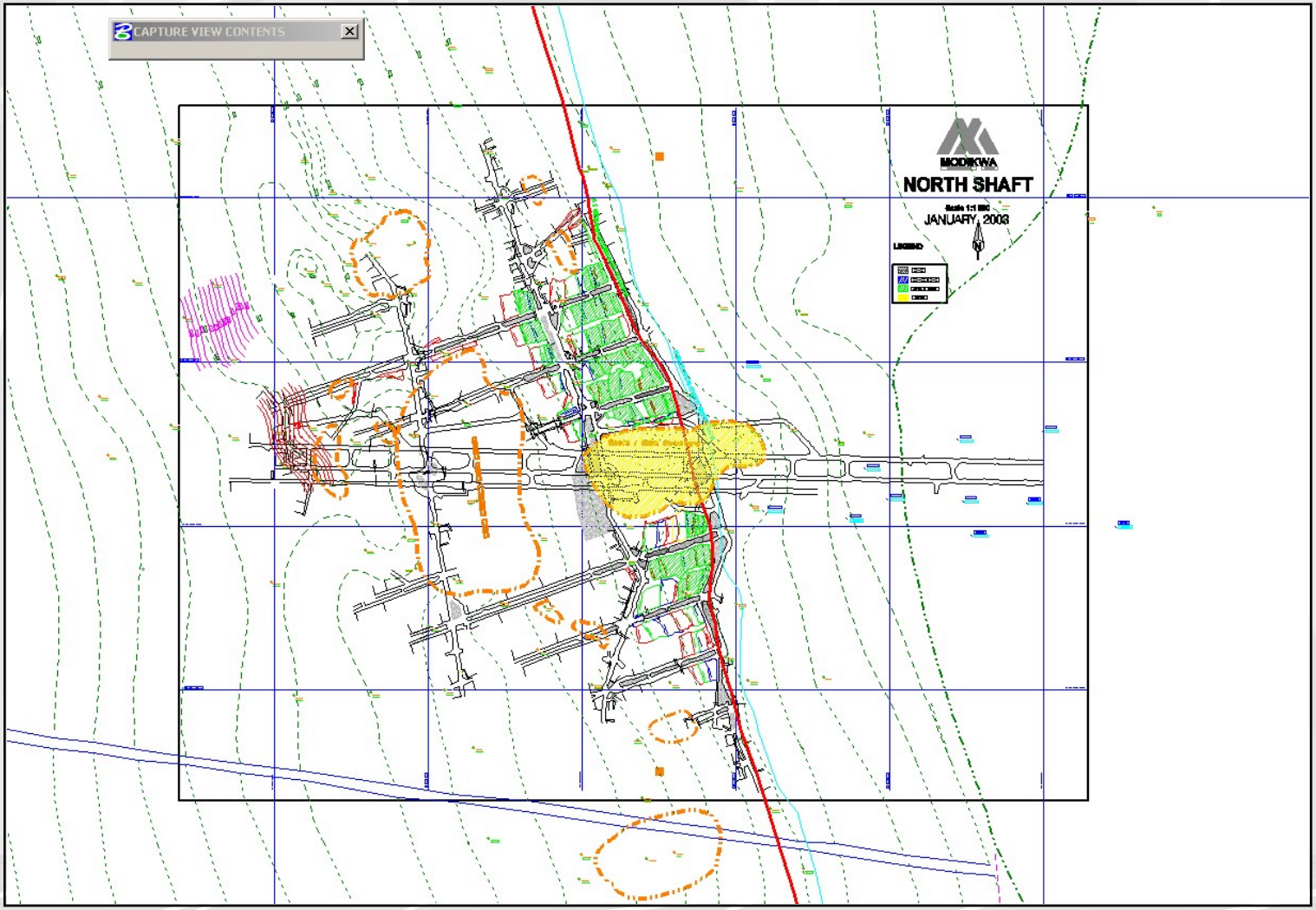


HILL MINE

* RGSW= Recommended Geological Stoping Width

MODIKWA
PLATINUM MINE

Geological Model – North Mine



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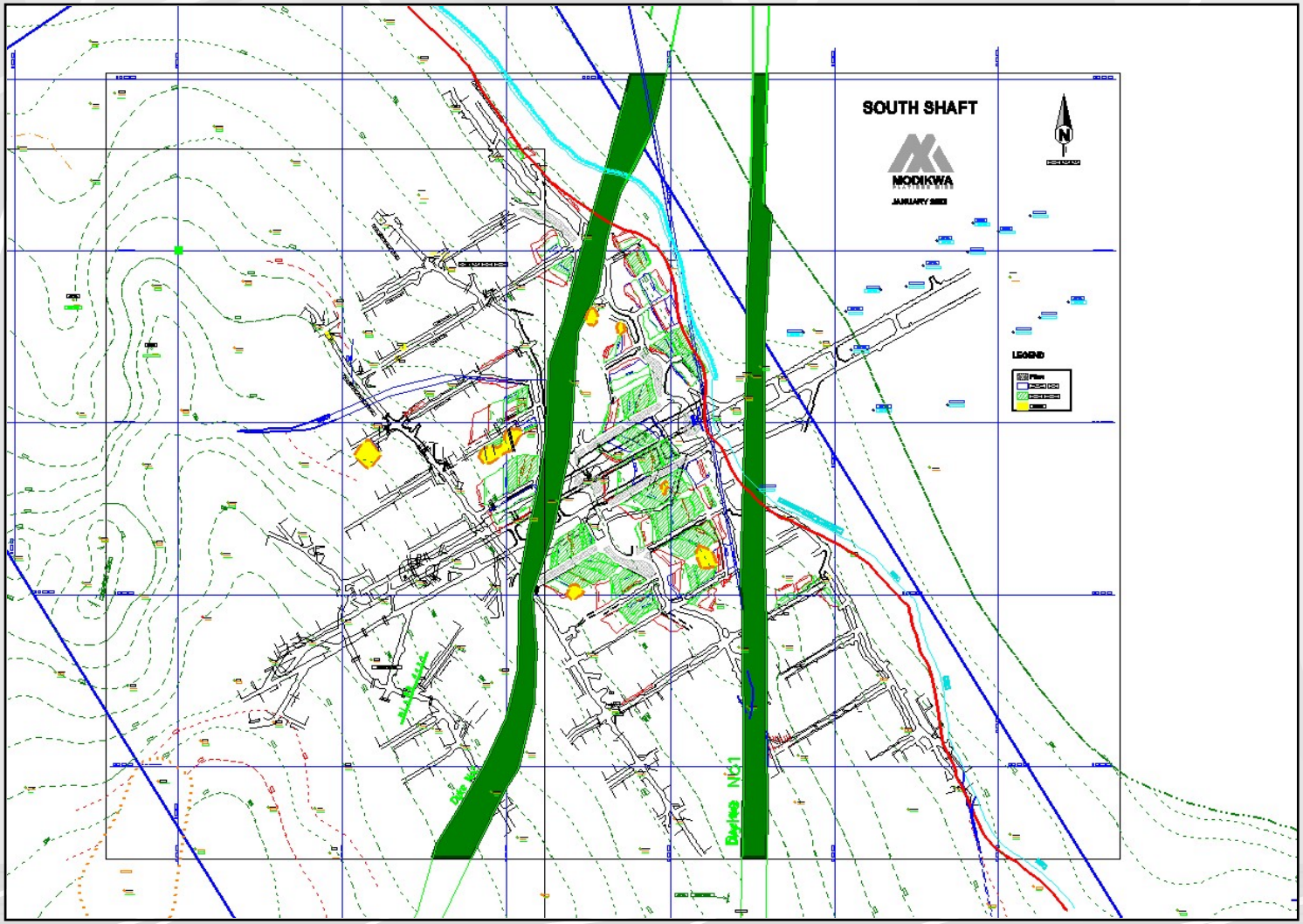
PLATINUM MINE

Geological Model – South Mine



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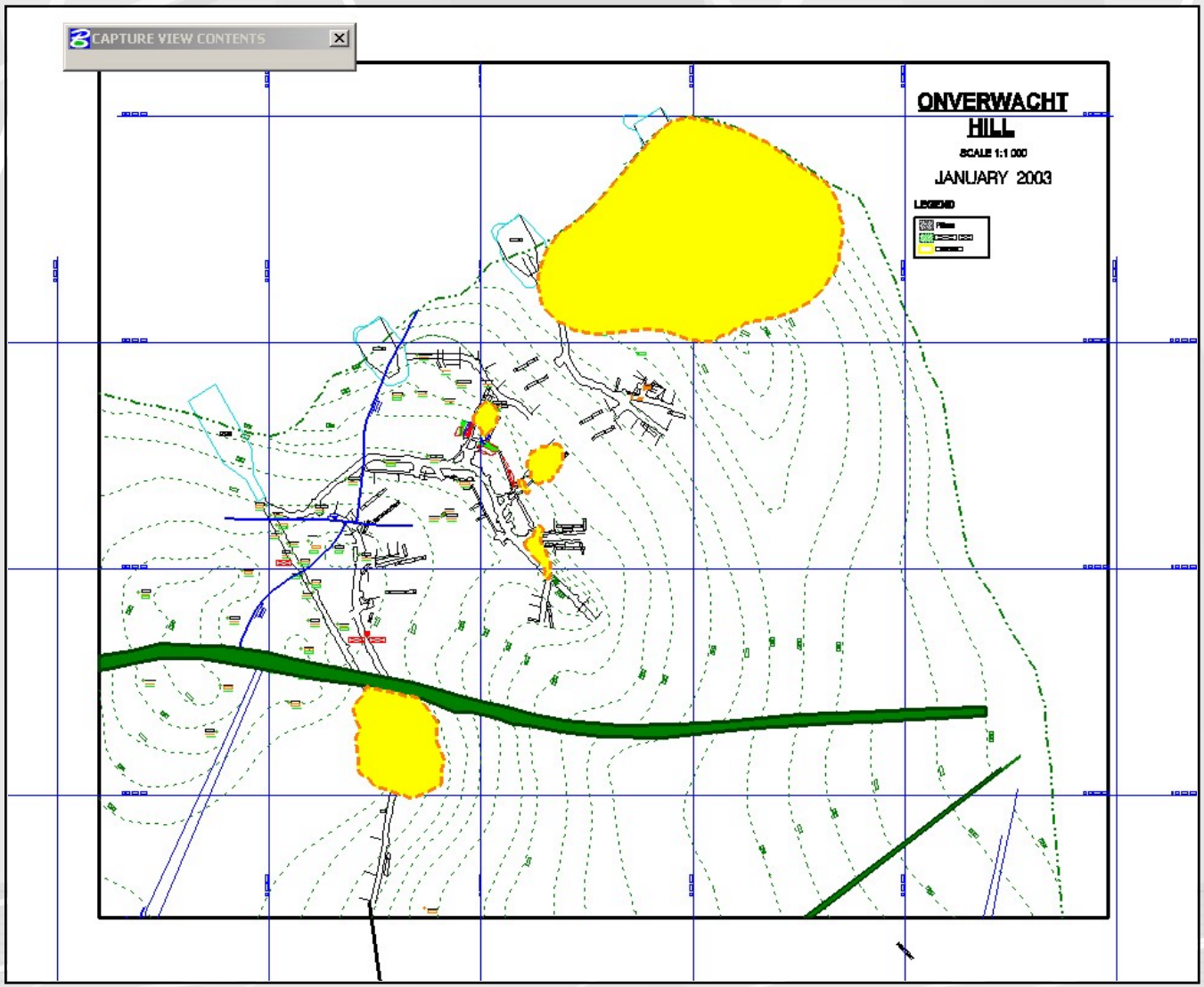
Geological Model – Hill Operations



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PLATINUM MINE

Mine Design Optimisation

- Structural features including slumps, potholes, shear zones/faults, undulating reef, and pegmatite replacement bodies although challenging are being successfully addressed
- An increased drilling density is enabling optimal positioning of drives and access ramps.
- Dip drives are in place to fit optimal raise backs
- The base of the regolith / UG2 interference line is determined ahead of mining

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PLATINUM MINE

Mine Design Optimisation

- Groundwater modeling and management is in place. Surface appears dry – small secondary aquifers do exist - dewatering programme in place
- Geological logging and modelling is in place and assists in optimal cut selection

MODIKWA PLATINUM MINE

Exploration Drilling Programme

Planned drilling for 2003 :

• Surface drilling	24 600 m
• Underground drilling	14 600 m
• Total	39 200 m

- **Density matched to achieve optimal mine design**

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PLATINUM MINE

Training and Development

"Create One Mine
One Culture"

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PLATINUM MINE

Behavioural Department

Goal: To develop every employee to his / her full potential. This will ensure world-class performance with world-class safety record

Areas of Focus:

- **Self Mastery** (Focus on Personal Qualities)
- **Team Mastery** (Focus on Team Qualities)
- **Business Mastery** (Focus on Business Principles)
- **Behavioural Safety** (Focus on Critical Safe Behaviour)

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Behavioural Process – Methods

- **Behavioural and leadership training**
- **Theatre and video's** (A visual training program)
- **Experiential training business program** (Comprehensive business training program)
- **Assessment program** (Alignment with MQA and introduction of Modikwa assessment training program)
- **Behavioural safety interventions and programs**
- **Analysis and continuous involvement**

MODIKWA PLATINUM MINE

Socio-Economic Development

- Employment equity status
- SME and HDSA implementation and progress
- Socio- Economic Development (SED) and local community involvement

MODIKWA PLATINUM MINE

Employment Equity

AO 1 AND ABOVE

LEVEL	Male	Female		Male	Female		Male	Female		Male	Female			
E3										1		1	1	0.0
SE1	1		1							6		6	7	14.3
MP2	2		2							10		10	12	17.0
MP1	6		6		1	1				23	2	25	32	28.0
SS2	11	1	12				1		1	79	3	82	95	17.0
SS1	6	1	7							6	5	11	18	67.0
AO2	21	2	23	2		2				55	3	58	83	48.0
AO1	67	5	72	1		1				29	1	30	103	72.0
	114	9	123	3	1	4	1		1	209	14	223	351	41.0

MODIKWA PLATINUM MINE

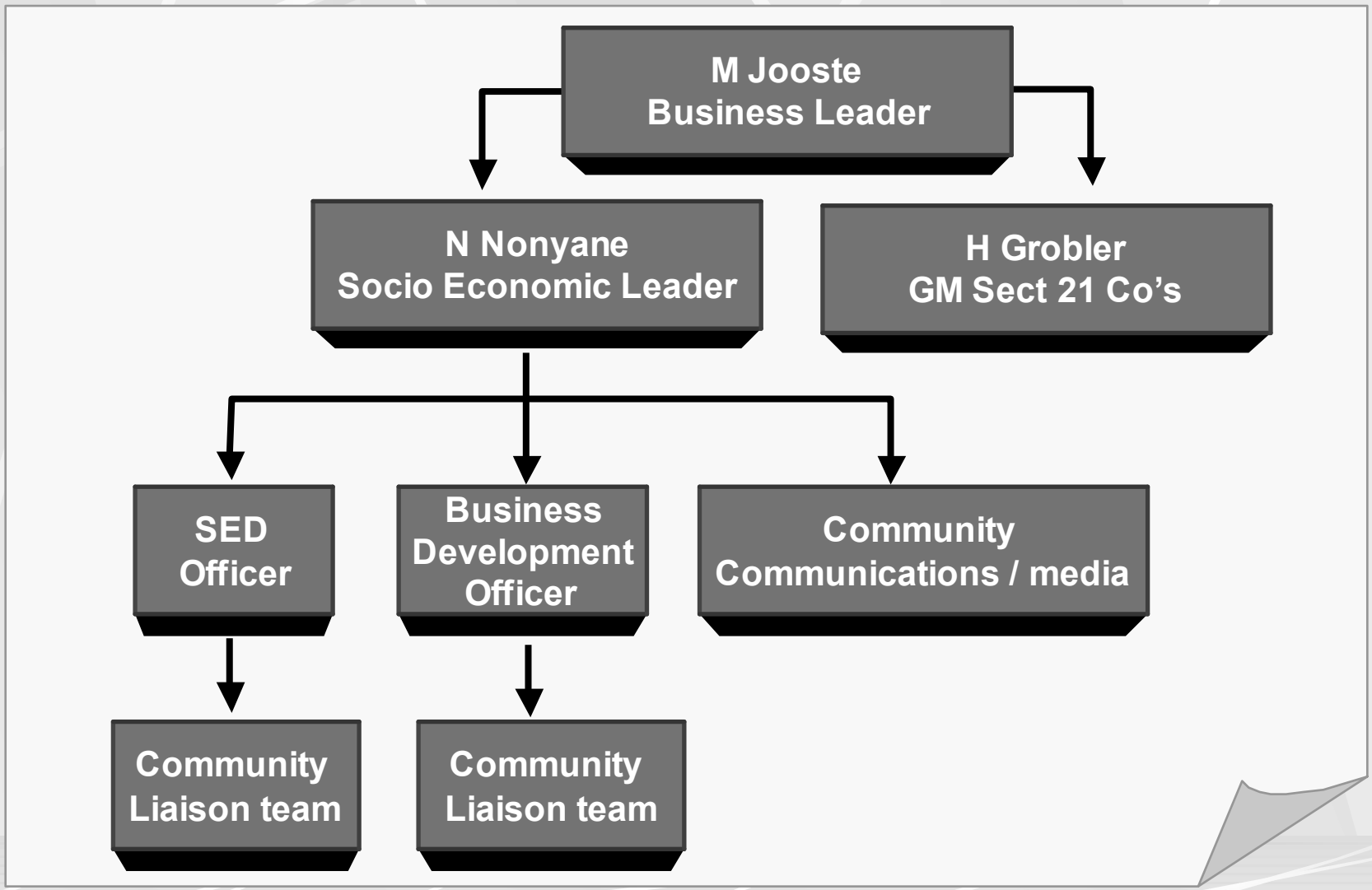
SME and HDSA Implementation

% of contract awarded to HDSA's :

- **Transporting of concentrate : 75%**
- **Transporting of ore : 40%**
- **Hostel administration and catering : 100%**
- **Construction of concrete slabs for mobile offices : 100%**
- **Building of 3 vendor training houses : 100%**
- **Construction of security access gates : 100%**

MODIKWA PLATINUM MINE

Socio-Economic Development



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ACHIEVEMENTS

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PLATINUM MINE

Modikwe Safety Summary

Date	*Achievement*	*Section*
27-Oct-01	**1 000 000 LTI Free Hours**	**Modikwa**
19-Jan-02	1 000 000 LTI Free Hours	Central Logistics
10-Feb-02	**1000 Fatality Free Production Shifts**	**Modikwa**
10-Feb-02	1000 Fatality Free Production Shifts	Central Log
23-Mar-02	1000 Fatality Free Production Shifts	North Shaft
23-Mar-02	1000 Fatality Free Production Shifts	South Shaft
30-Mar-02	1000 Fatality Free Production Shifts	Concentrator
26-Apr-02	1 000 000 LTI Free Hours	Concentrator
30-Apr-02	1000 Fatality Free Production Shifts	Onverwacht Hill
26-Jun-02	1 000 000 LTI Free Hours	Central Logistics
9-Jul-02	2 000 000 LTI Free Hours	Concentrator
26-Jul-02	**1 000 000 LTI Free Hours**	**Modikwa**
23-Sep-02	2 000 000 LTI Free Hours	Central Logistics
20-Oct-02	**1 000 000 LTI Free Hours**	**Modikwa**
23-Nov-02	3 000 000 LTI Free Hours	Concentrator
30-Dec-02	1 000 000 LTI Free Hours	North Shaft

INJURY RATES PROJECT TO DATE

LTIFR – 0.44 RIFR – 0.25

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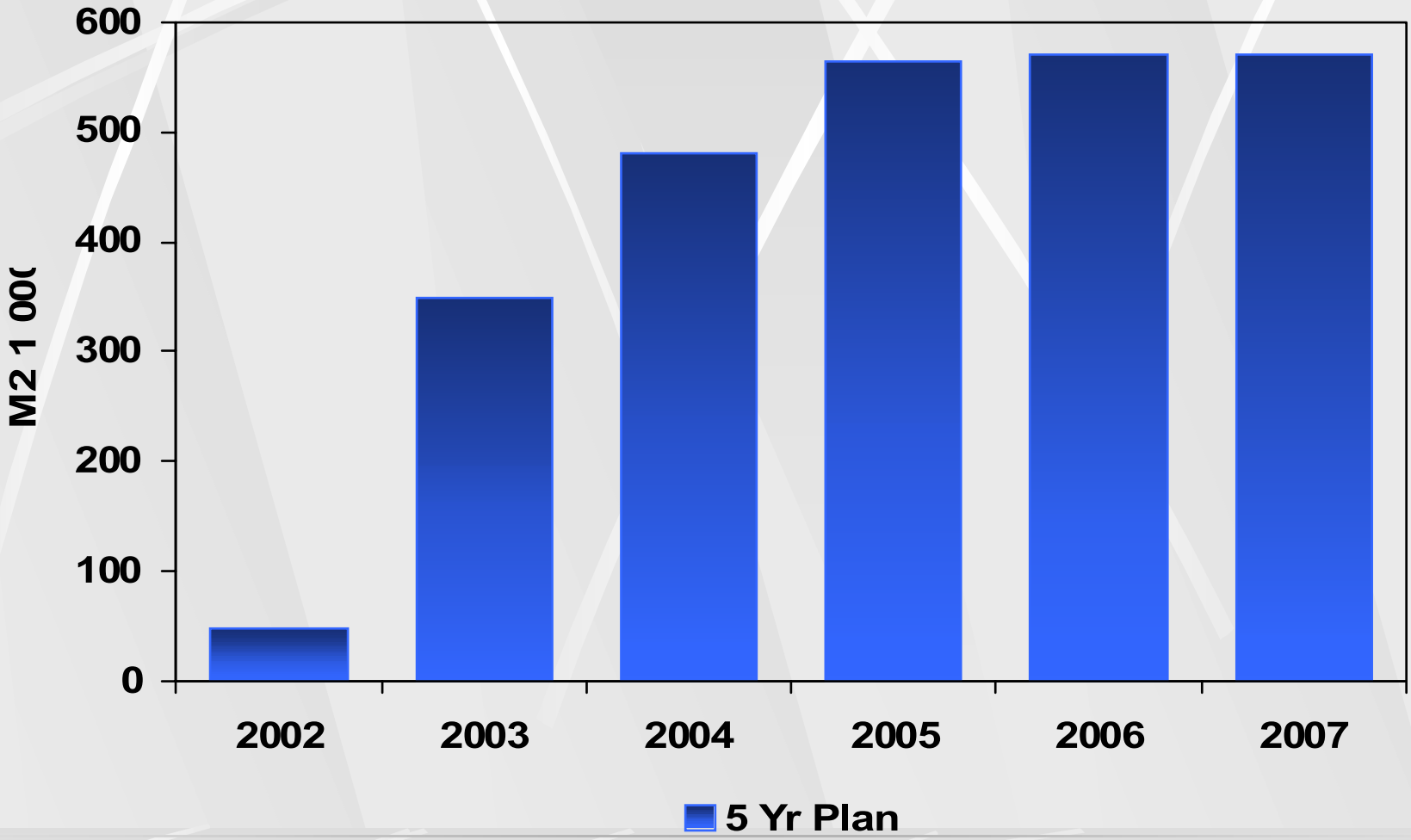
Production Stoping Plan



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PLATINUM MINE

Achievements

- Safety at RIFR 0.25 for project to date
- Mining of portals initiated March 01
  - 1st stoping March 02
  - Plant commissioned Aug 02
  - 100 000 tons first month
  - 59 622m^2 mined to date
  - 31 006m developed to date
- Achieved 29m face advance (74m^2/ise)
- 1400 local novices recruited and trained
- Will achieve full production in by end of 2004

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PLATINUM MINE

CONCENTRATOR and METALLURGY

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PLATINUM MINE

Safety Statistics

Project :

- **2 LTI's (one reportable)**
- **2.81 million manhours without a LTI**

Operations (Staff and plant contractors)

- **0 LTI's**
- **409 days without a LTI (486 010 hours)**

PROJECT AND OPERATIONS TOTAL :

3 297 070

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PLATINUM MINE

Project Key Dates

- Earthworks commenced : 8 February 2001
- Civil works commenced : 21 May 2001
- Steel erection commenced : 12 Dec 2001
- E&I erection commenced : 02 Jan 2001
- Hot commissioning started : 05 August 2002

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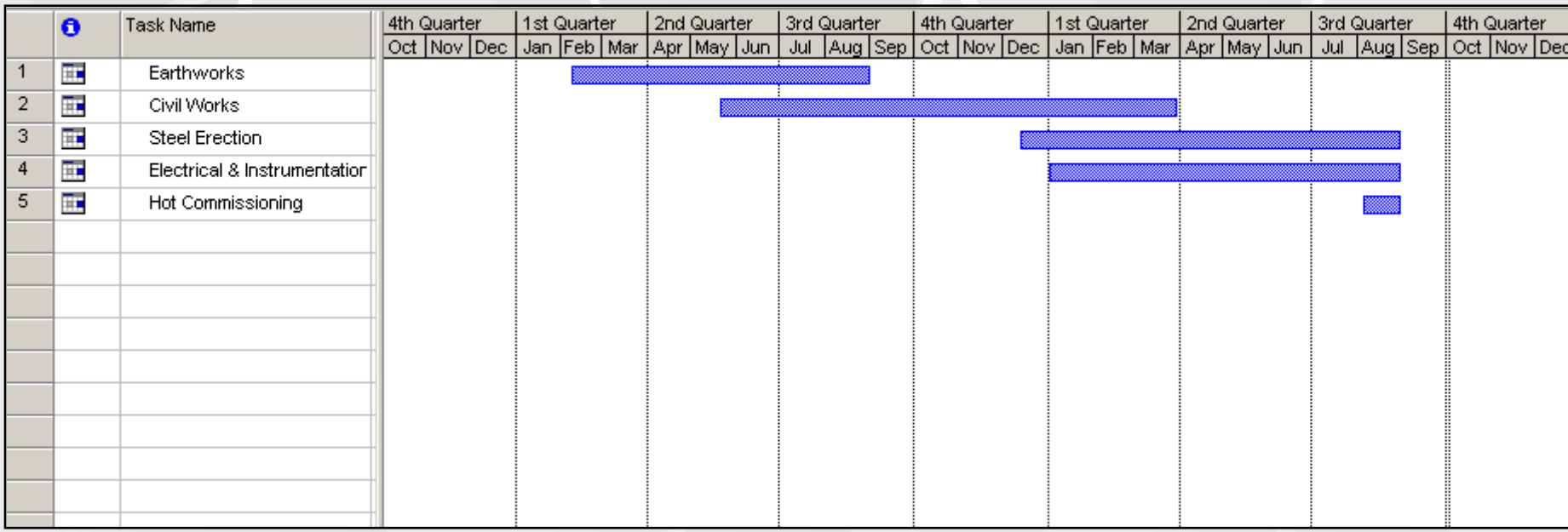
PLATINUM MINE



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PLATINUM MINE

25 July 2001

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Milling Circuit

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Flotation Cells

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Plant Project Statistics

Pipelines	57km
Structural Steel	2 900 T
Platework	1 500 T
Motors	500
Pumps	257
Resources	1 960 people (Peak)

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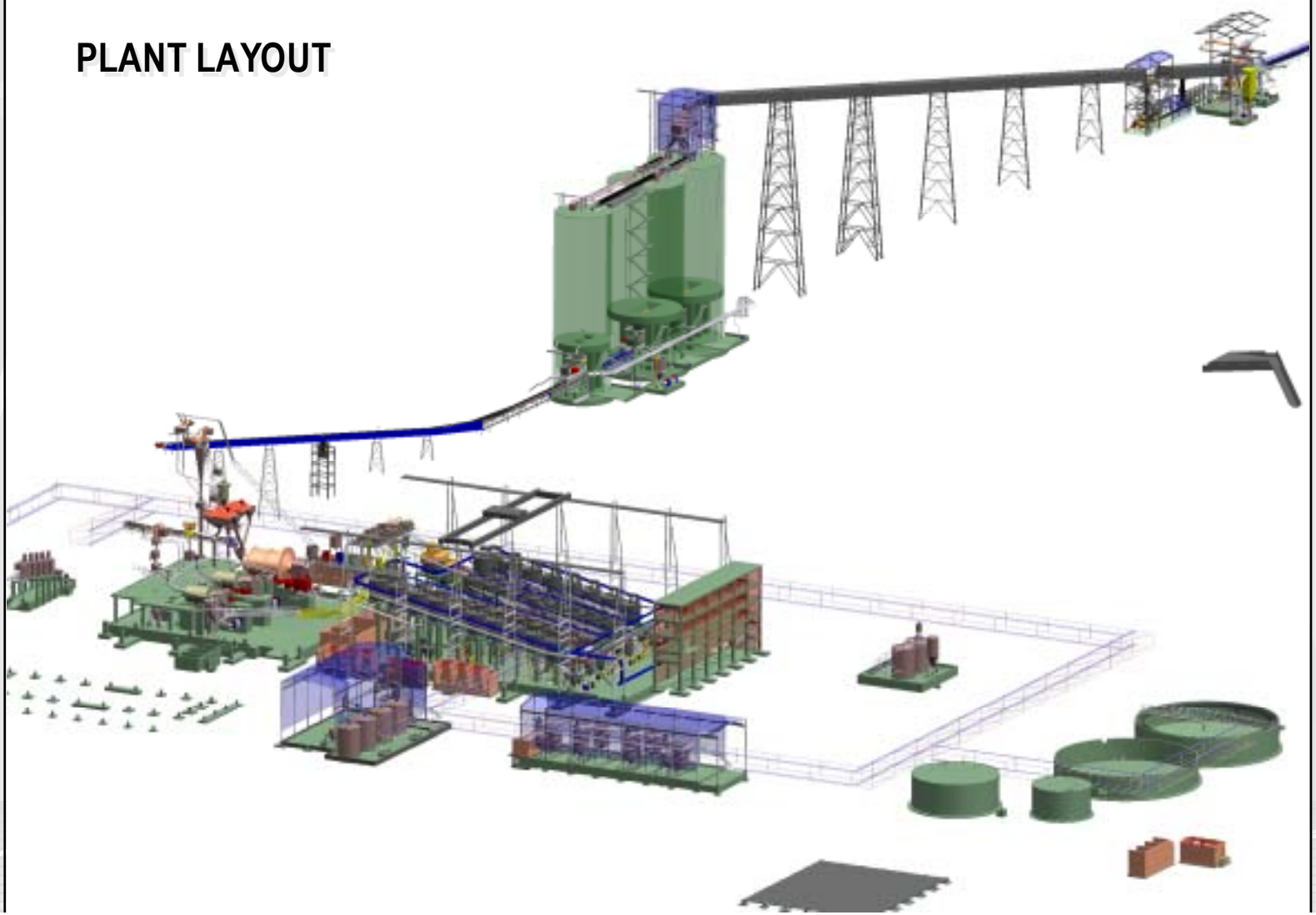
PLATINUM MINE

Process

PLANT LAYOUT



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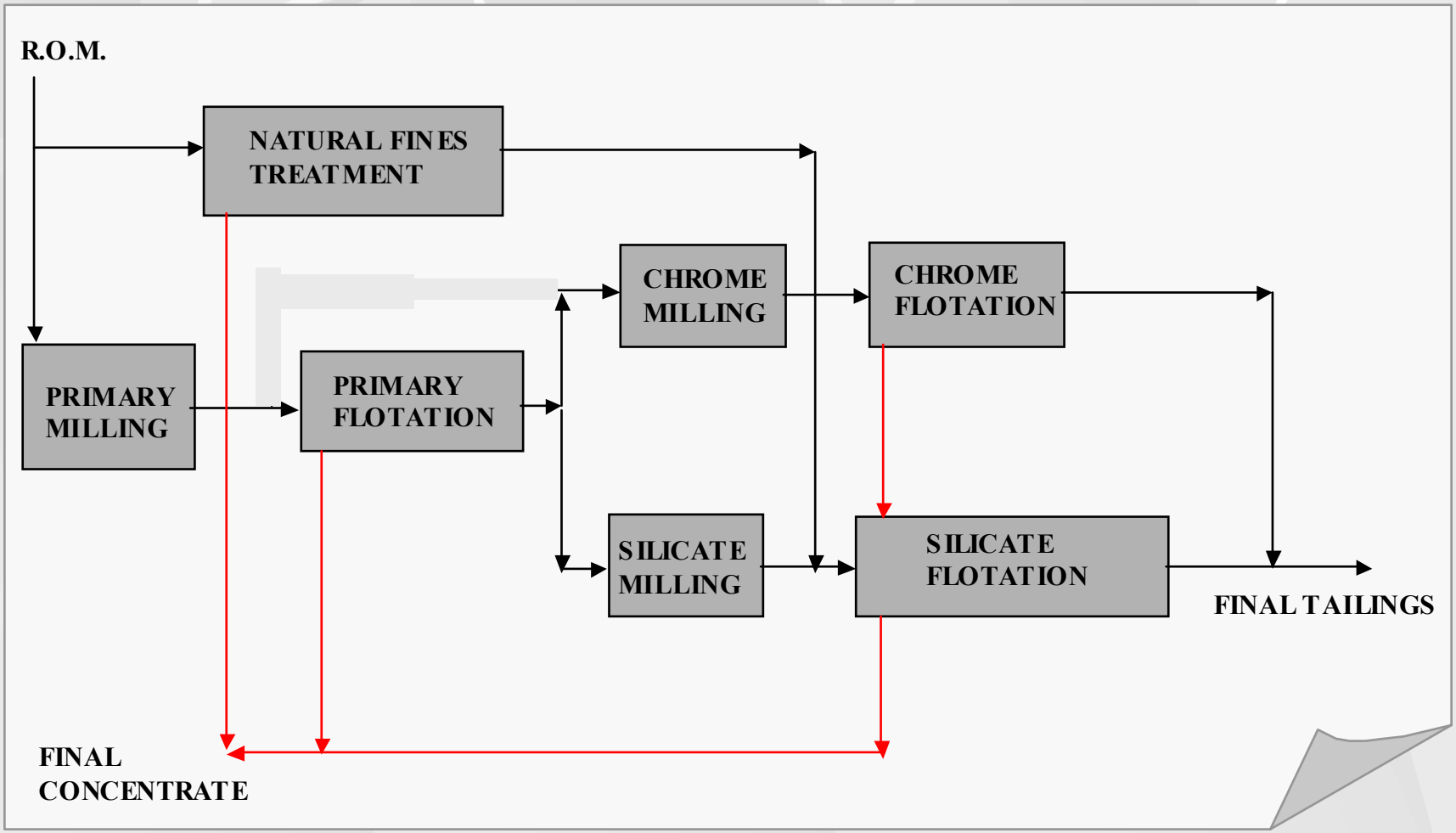
PLATINUM MINE

Process – Salient Features

- 200 000 tons per month UG2 nominal rating
- Original design was based on FAG Milling
- Modified to accommodate build-up by ROM ball milling
- Separate treatment of chromitite and silicate fractions
- Separate treatment of naturally occurring fine size fraction
- Automated Process Control Laboratory

Modikwa Concentrator – Simplified Flow Schematic



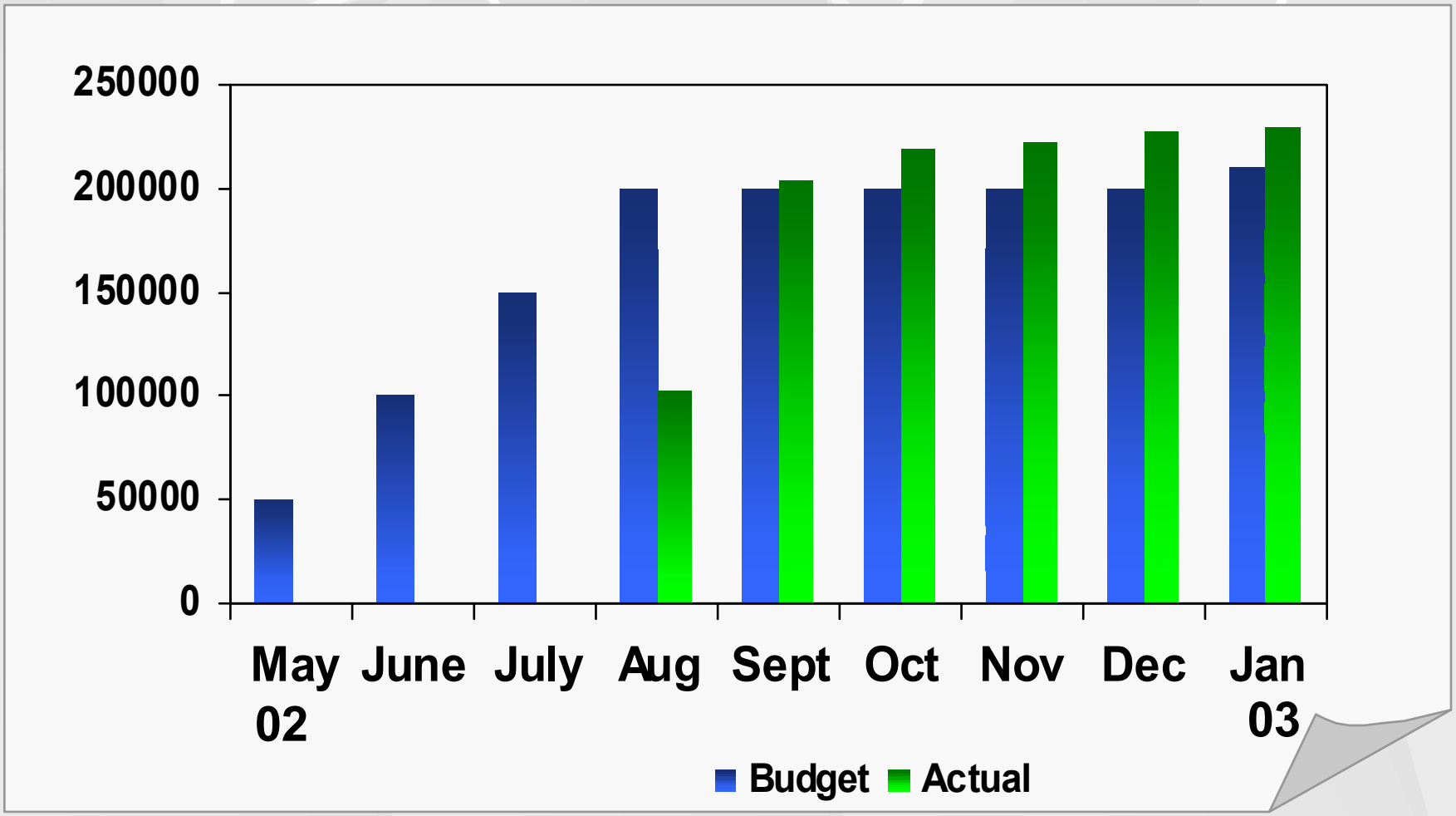
MODIKWA
PLATINUM MINE

Process – Commissioning Progress

- Commissioned Primary Mill on 5th Aug 2002 in MF2 configuration
- Treated 102 000 tons development reef during August
- Chrome circuit commissioned 6th September 2002
- Achieved 205 000 tons in September through to 230 000 tons in January 2003
- Optimisation program underway on existing circuit
- Fines specific treatment commissioned at end of 2002
- Process Control Laboratory operational by April 2003

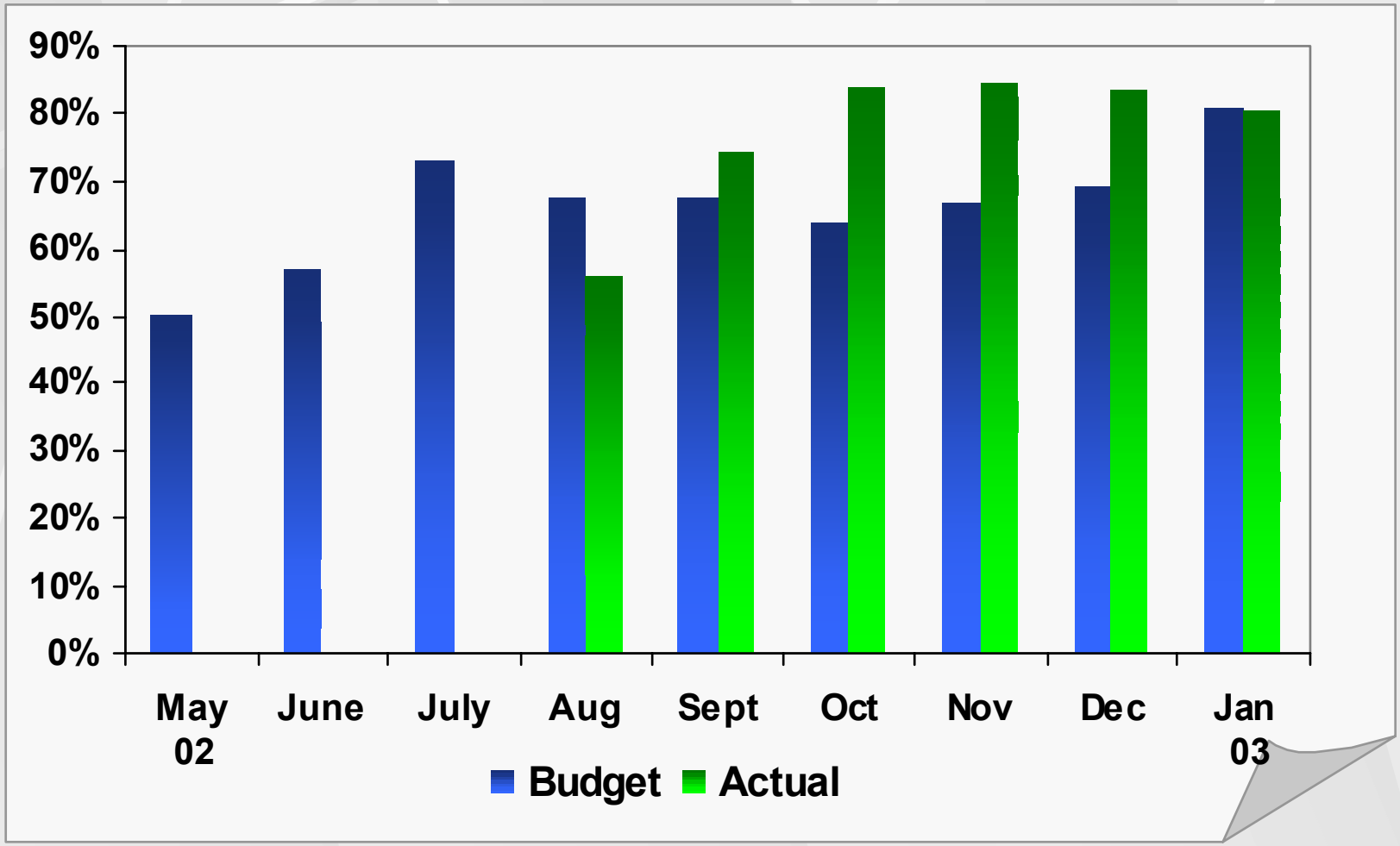
MODIKWA
PLATINUM MINE

Tons Milled



MODIKWA
PLATINUM MINE

Recovery 4E




Questions