

***Acid Rock Drainage (ARD) Prediction:
Protecting the environment of mining***

Dr. Anita Parbhakar-Fox

*CRC Optimising Resource Extraction
University of Tasmania*

Exploration



Drilling





Resource Definition

Extraction



Sorting

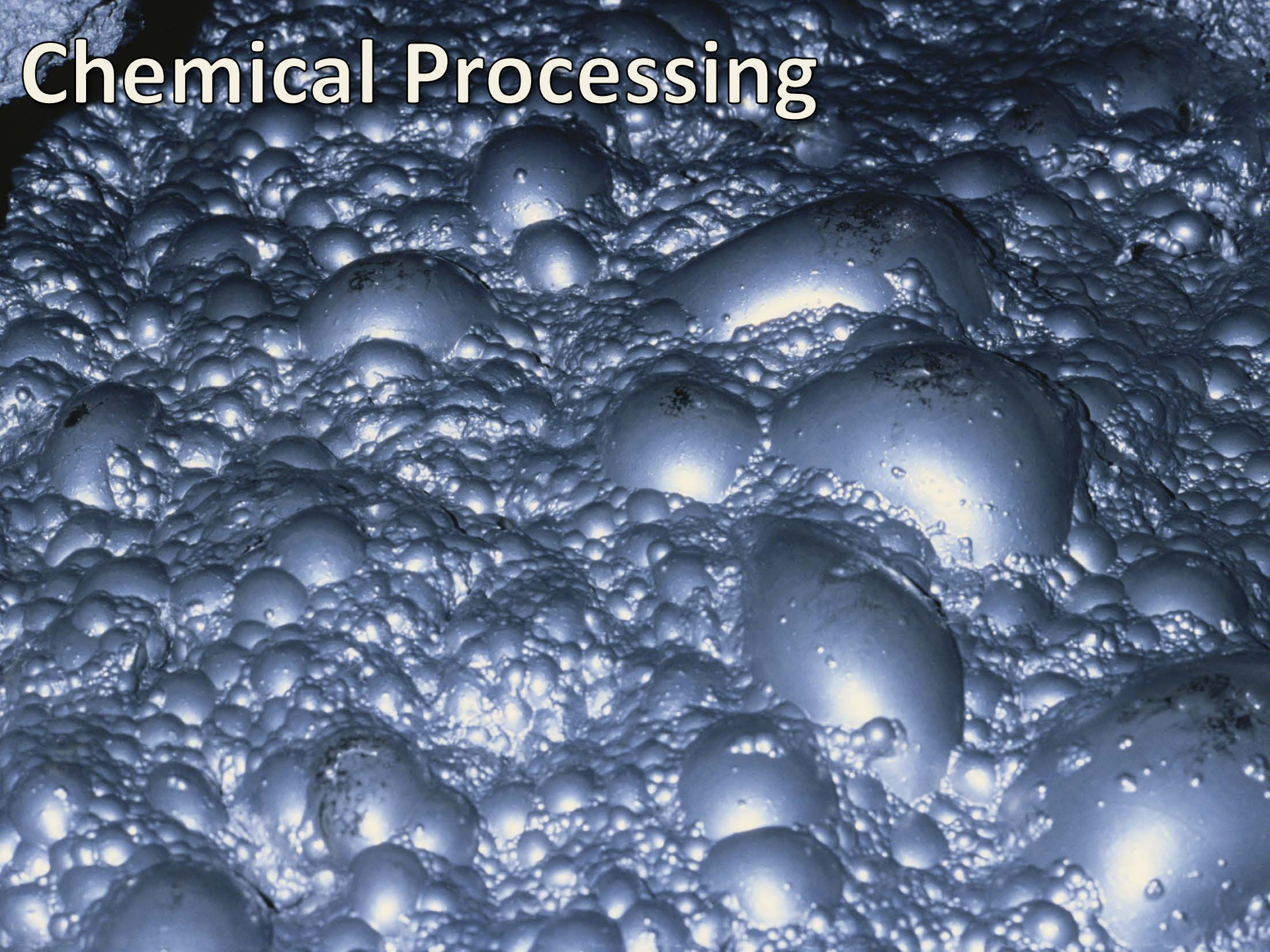


Stockpiling



Physical Processing





Chemical Processing

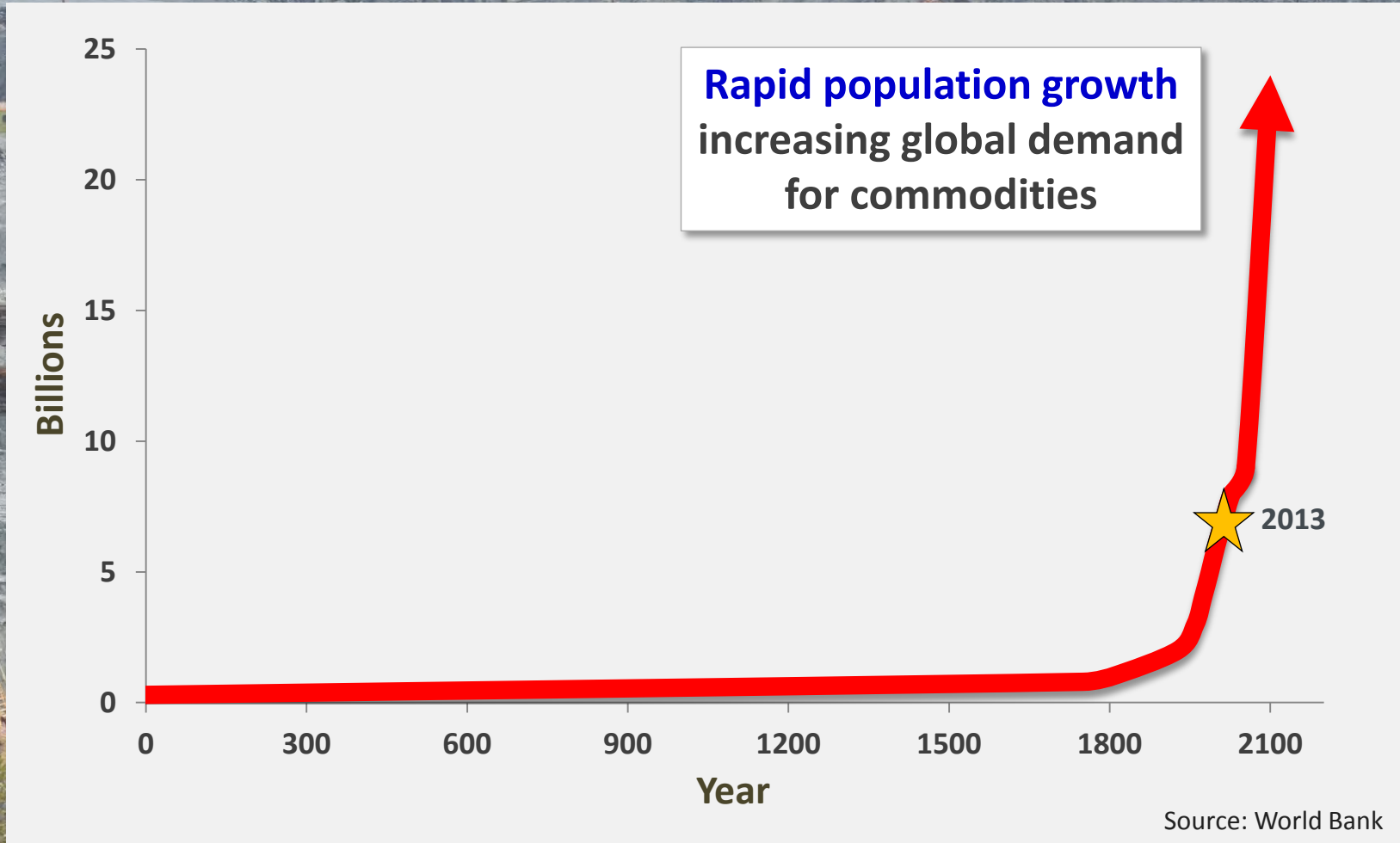
Product



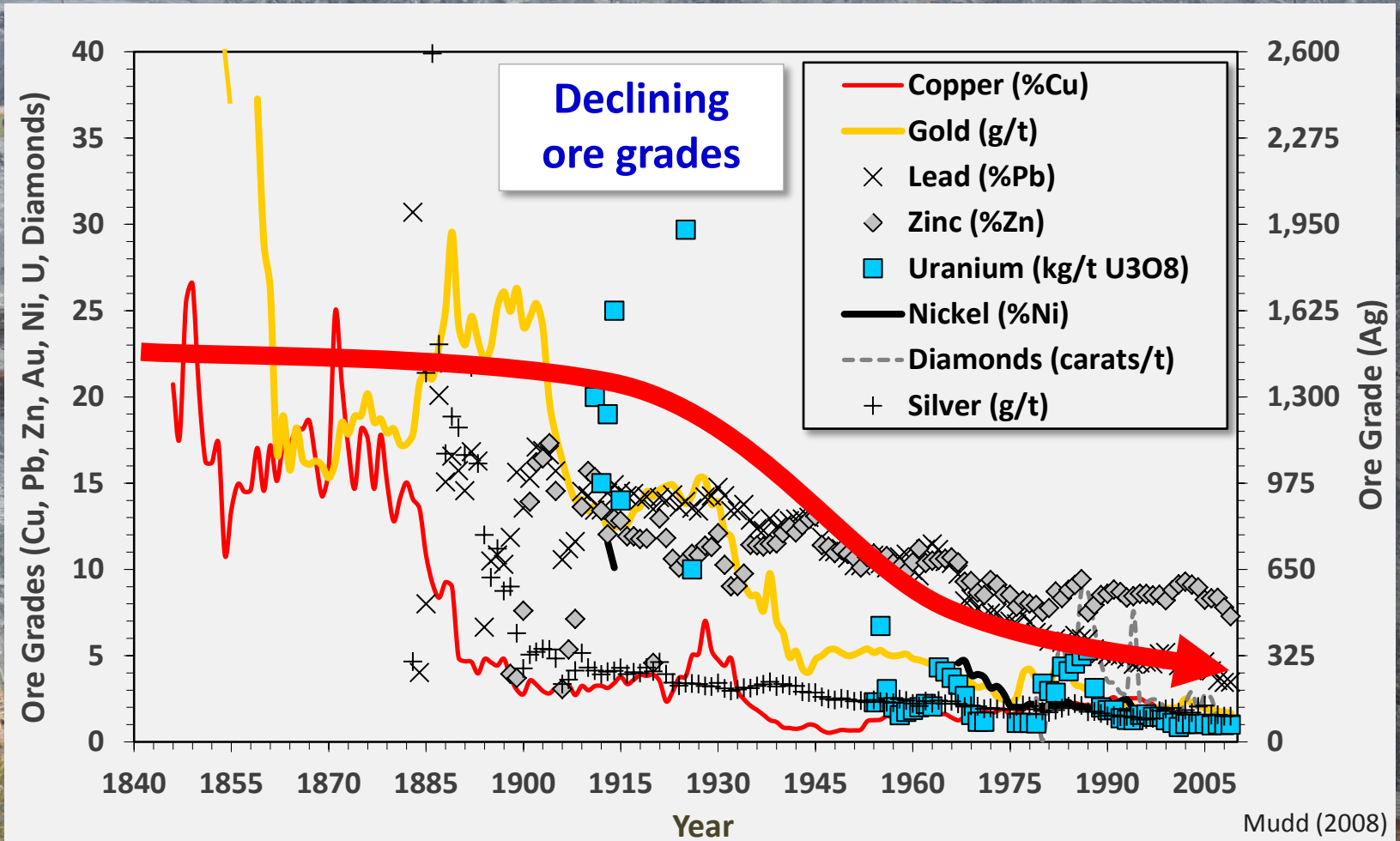
Mining underpins everyday life



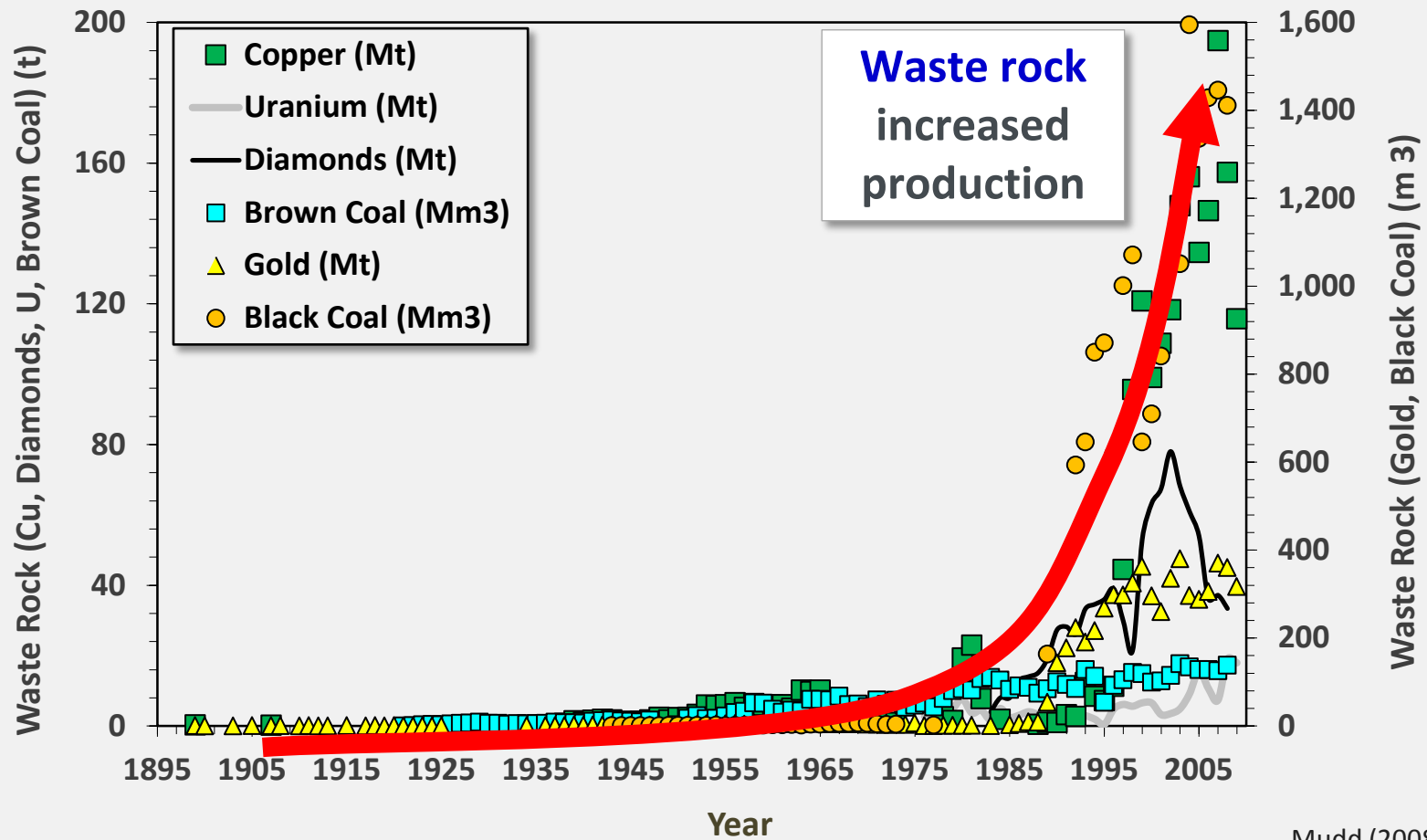
Mining underpins everyday life



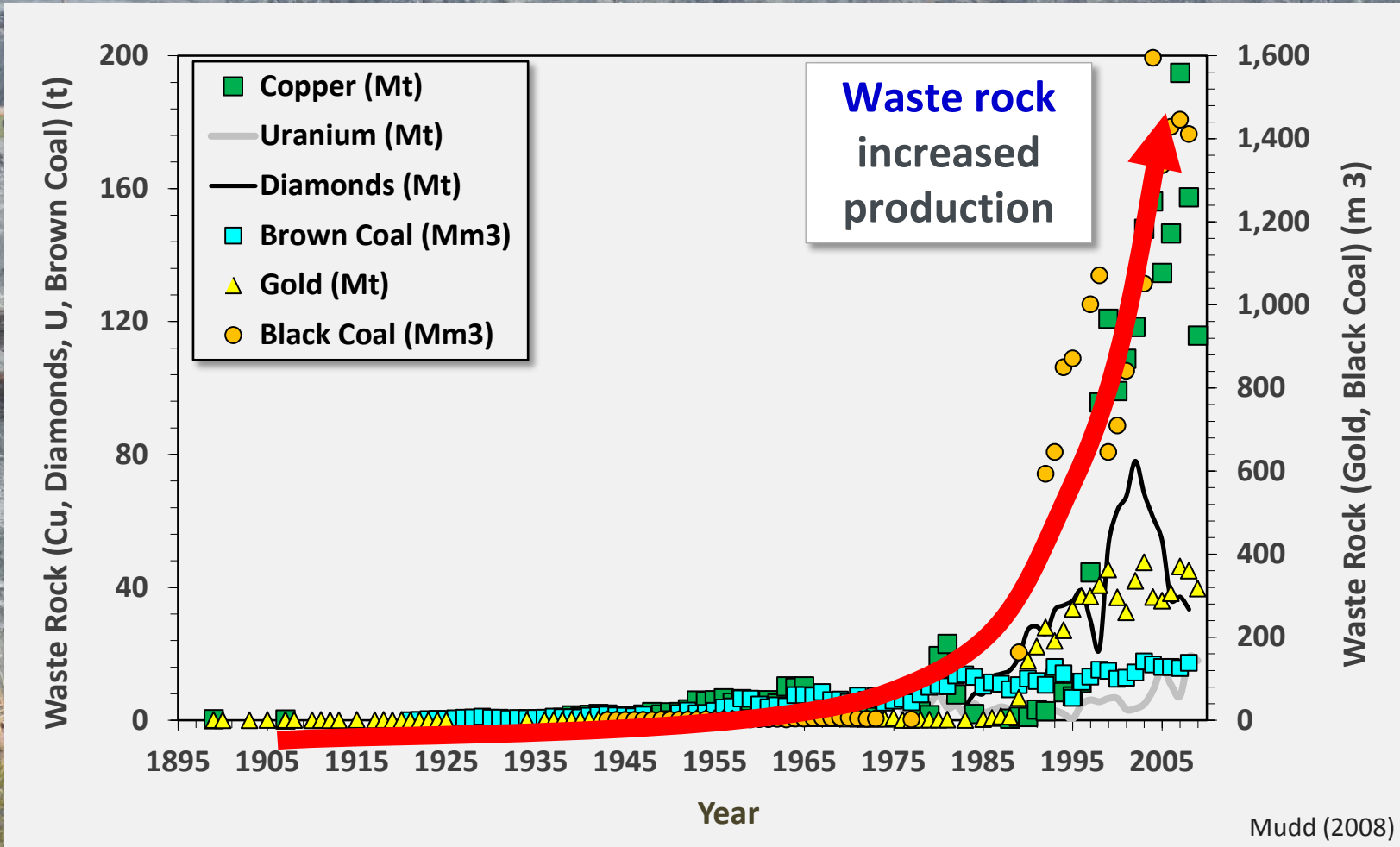
Mining underpins everyday life



Mining underpins everyday life

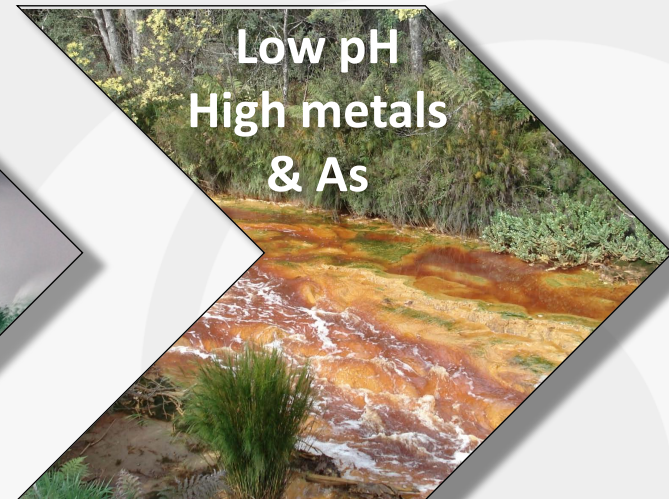


Mining underpins everyday life



But at what environmental cost?

Rock + Air + Water = **ARD**



Microbes

A
R
D



Human health

Landscape degradation

Global financial liability= **\$100 billion**

Hudson-Edwards et al. (2011)



Human health

Why is ARD still such a major issue?



Global financial liability= \$100 billion

Hudson-Edwards et al. (2011)



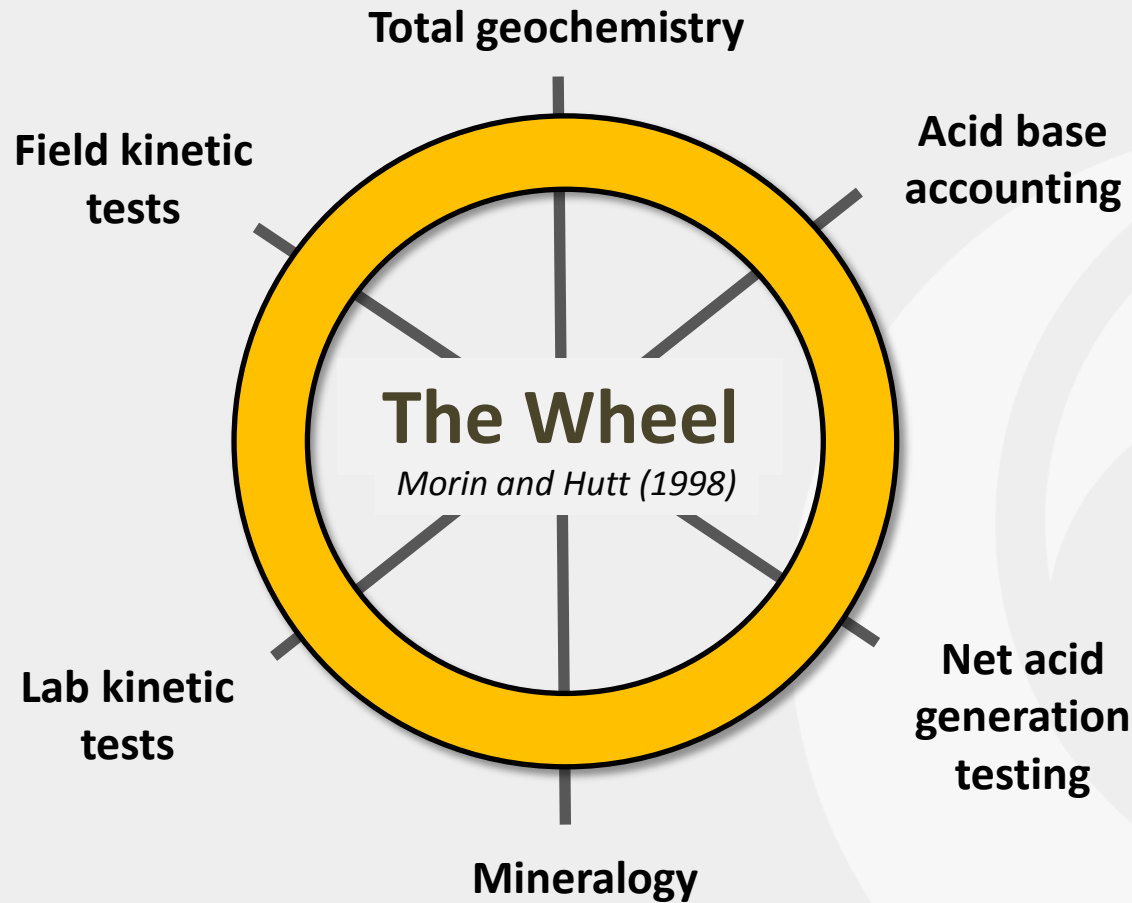
1) Misuse of ARD predictive tests



2) Outdated ARD protocols

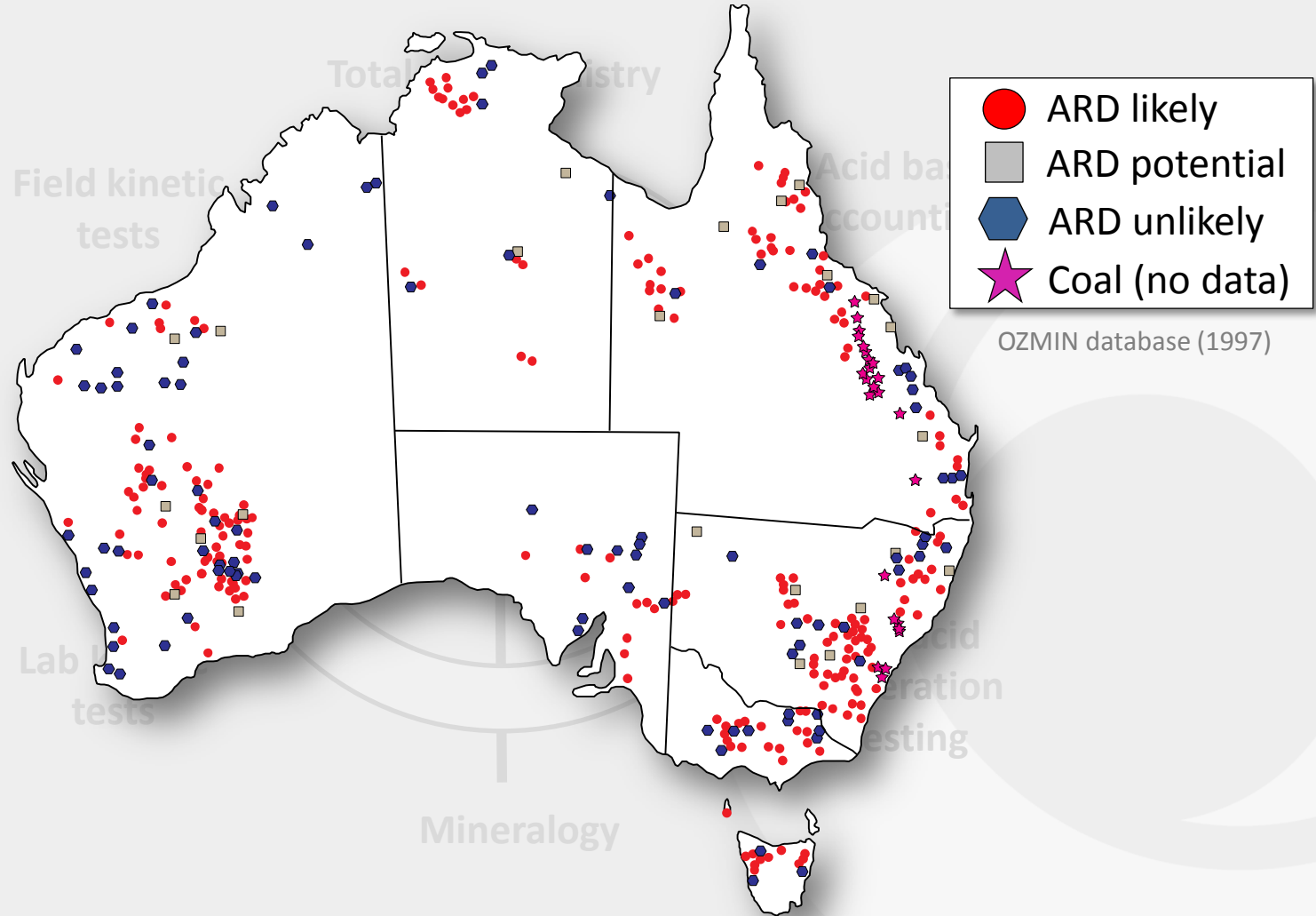


Traditional ARD Prediction Approach



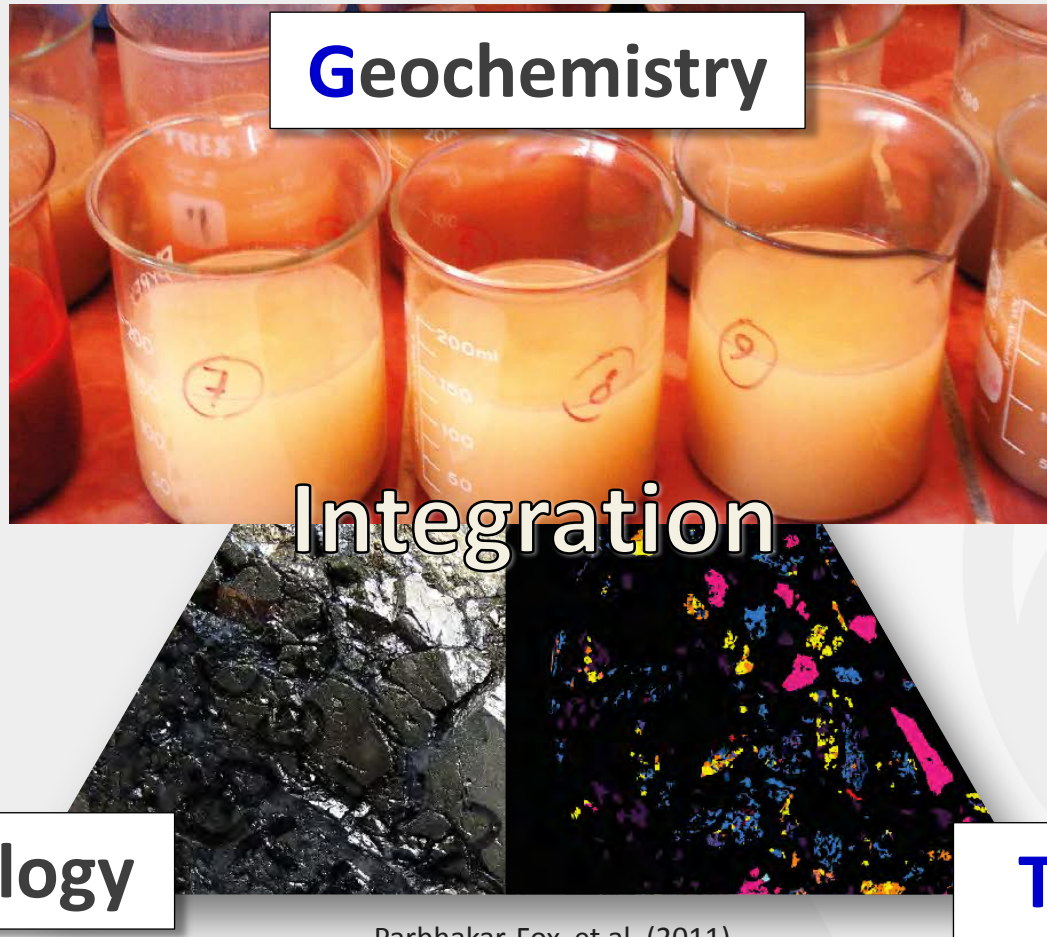
“You can’t reinvent the wheel”

Traditional ARD Prediction Approach



We MUST reinvent the wheel

The GMT Approach



Parbhakar-Fox et al. (2011)

Innovative and Cost Effective

The GMT Approach



Decrease in number of
samples analysed



SAMPLES

GROUPING

STAGE ONE

STAGE TWO

STAGE THREE



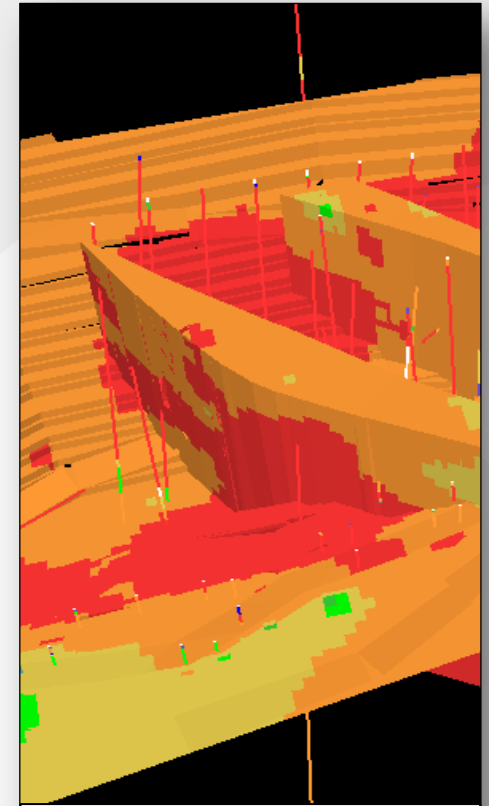
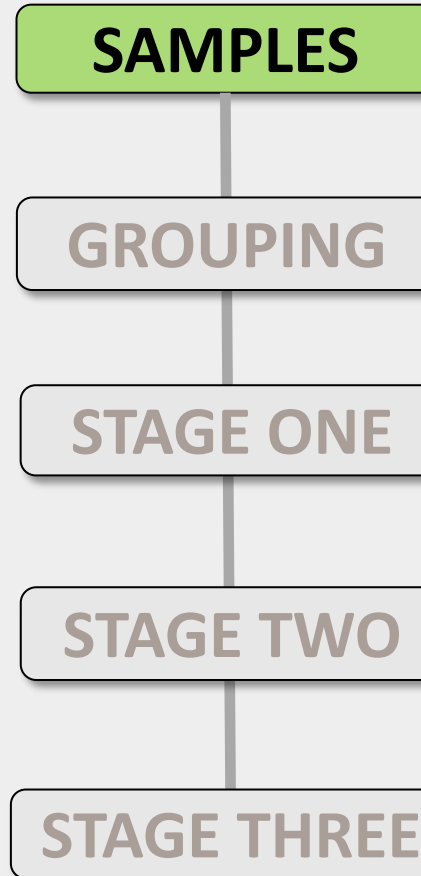
Increase in analytical
sophistication



The GMT Approach



**Use a robust
1 in every 2m/5m
sampling regime**



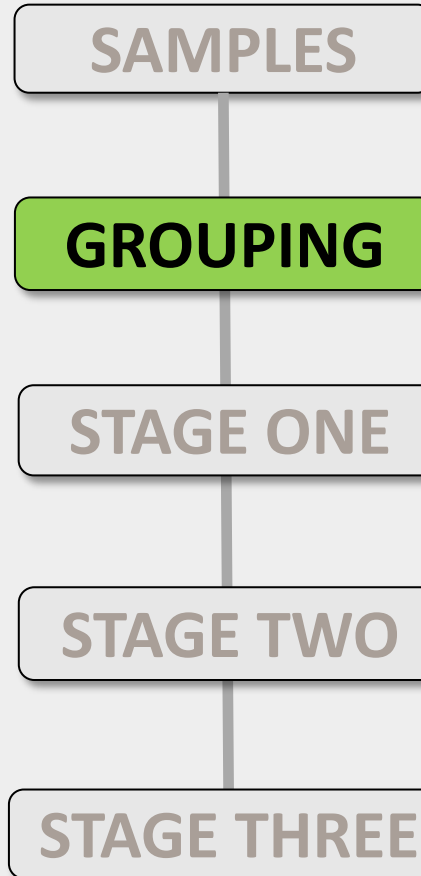
**Accurately map
geological and
ARD variability**

Best Practice sampling achieved

The GMT Approach



**Examination of
mineralogy and
texture**



**Short wave Infrared
techniques (SW-IR)**



**Field portable X-Ray
Fluorescence (FP-XRF)**

Define 'mesotextural' groups

The GMT Approach



Paste pH testing



Sulphur analysis

SAMPLES

GROUPING

STAGE ONE

STAGE TWO

STAGE THREE



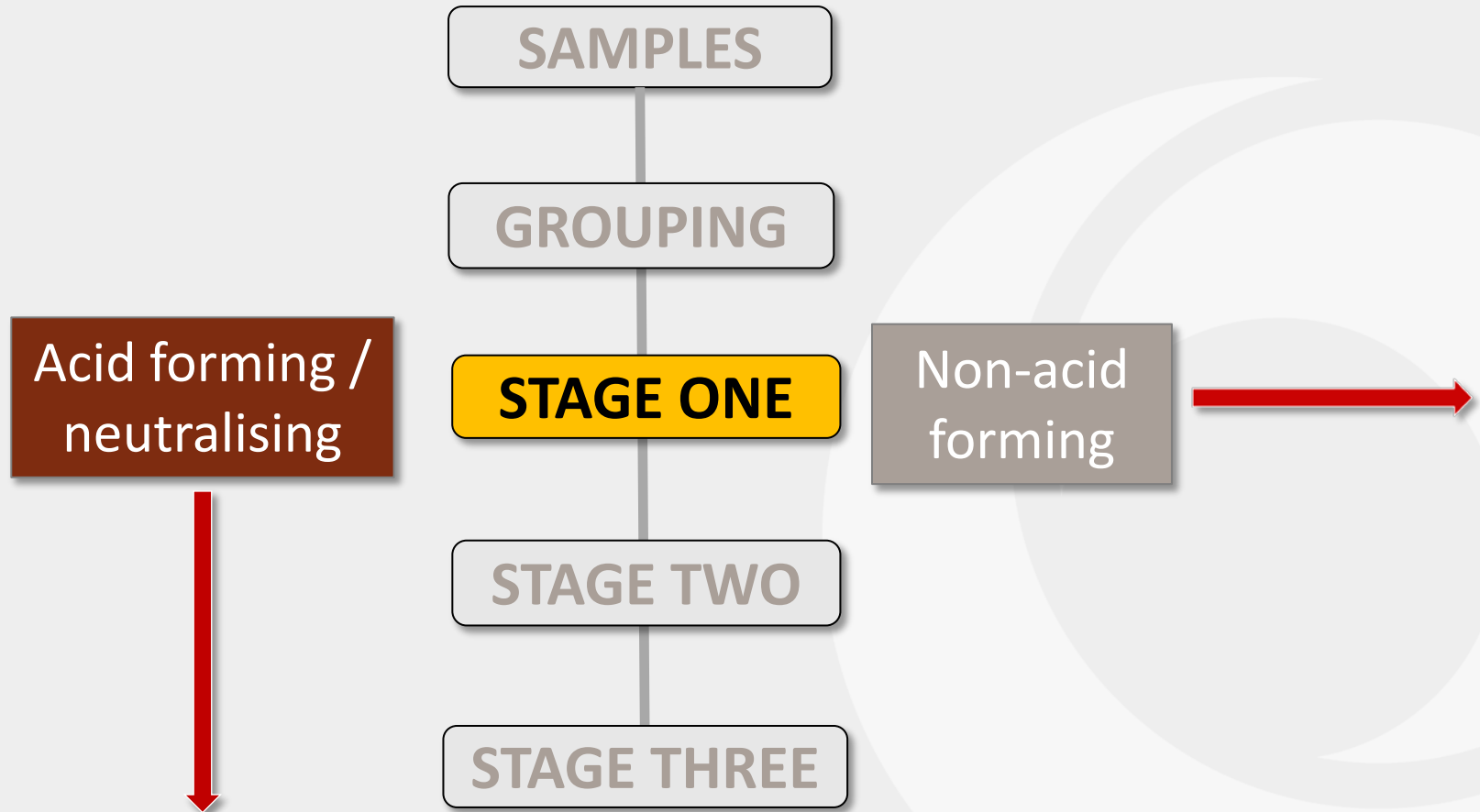
X-Ray Diffraction



ARD Index

New pre-screening stage

The GMT Approach

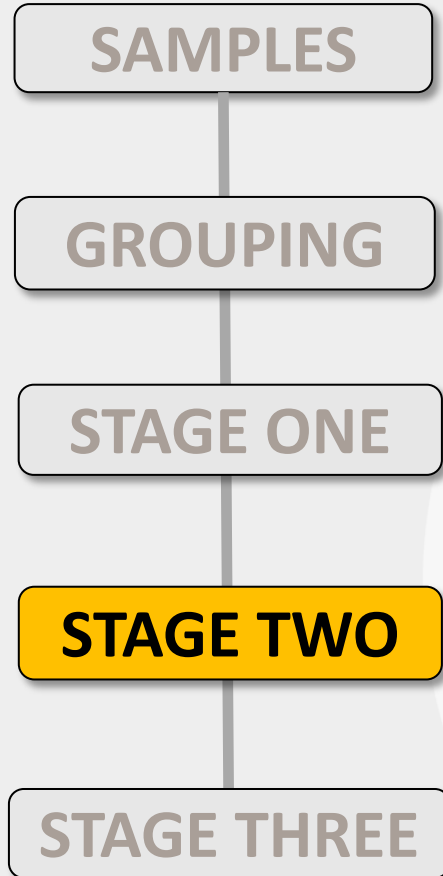


No further testing for inert samples

The GMT Approach



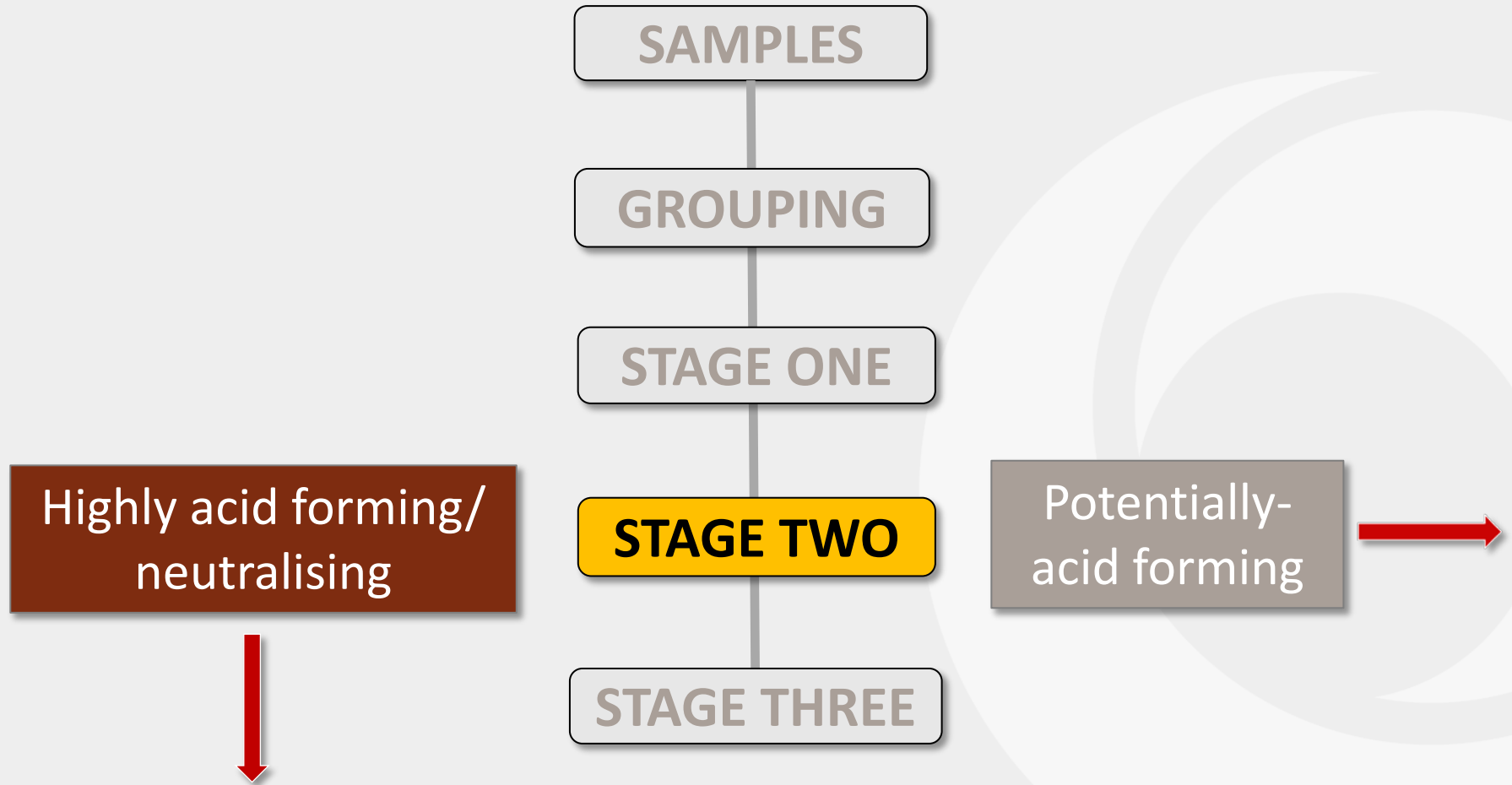
**Net Acid
Generation tests**



**Net Acid Producing
Potential tests**

Screening tests performed

The GMT Approach

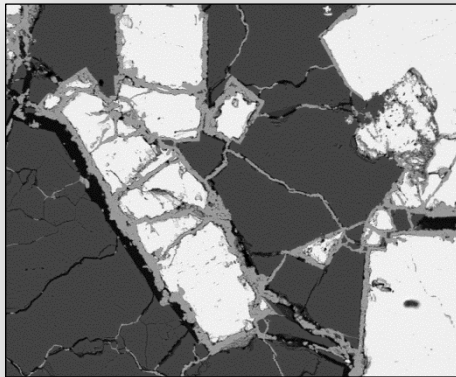


Only 'extreme' samples progressed

The GMT Approach



**Advanced
Geochemical tests**



**Electron Microprobe
Analysis**

SAMPLES

GROUPING

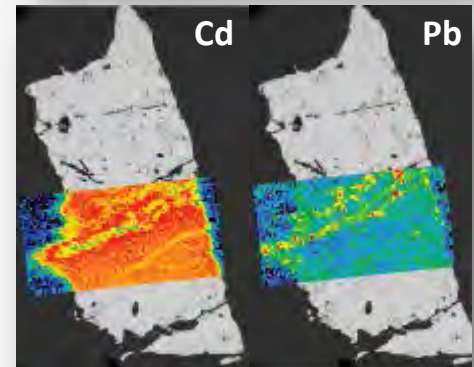
STAGE ONE

STAGE TWO

STAGE THREE



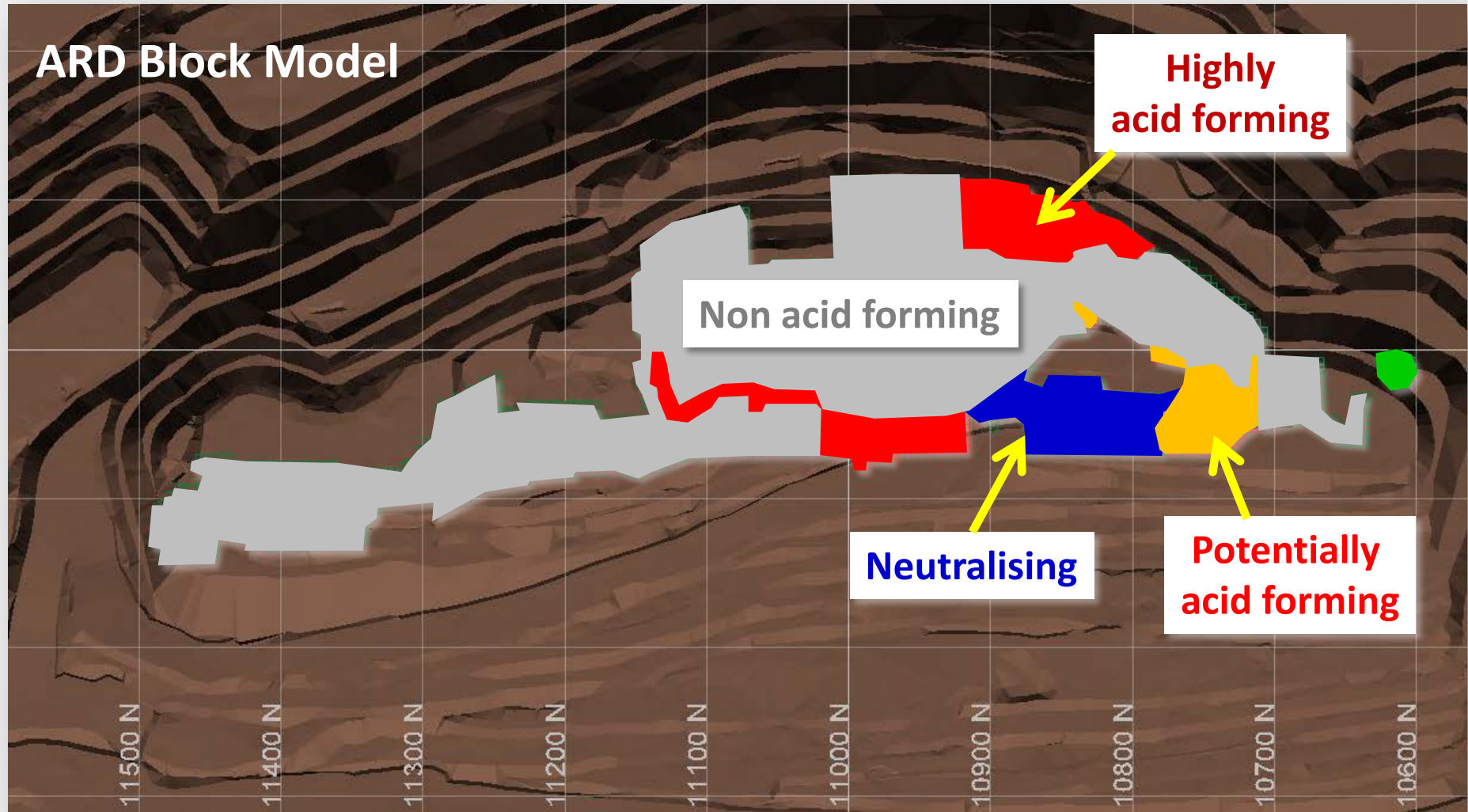
**Mineral Liberation
Analysis**



**Laser Ablation
ICPMS**

ARD controls characterised

The GMT Approach



Result: Improved ARD risk assessment

The GMT Approach



Croydon, QLD: Abandoned Mines

Parbhakar-Fox et al. (2013a); Parbhakar-Fox et al. (2013b)

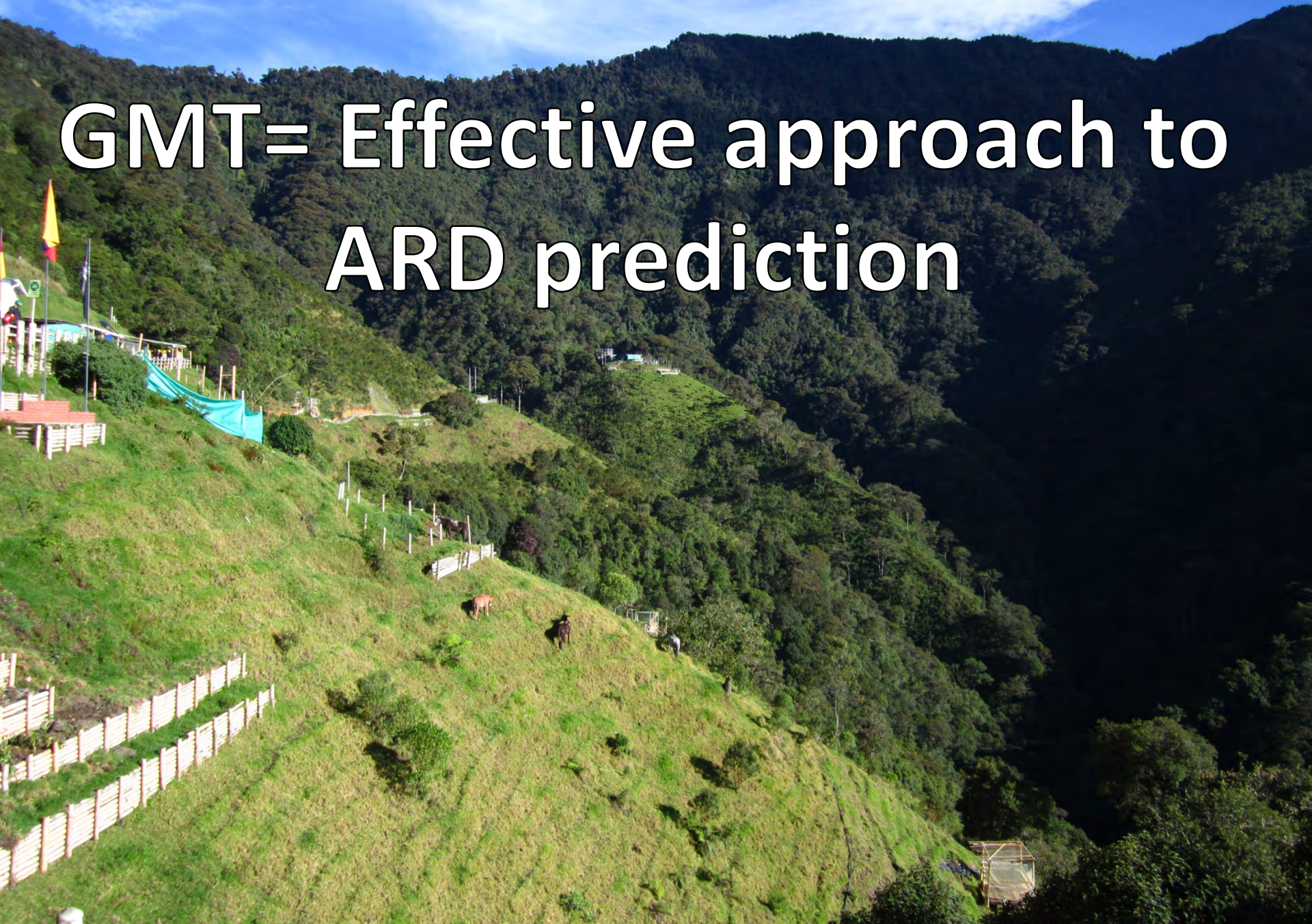


Ernest Henry, QLD: Operational Mine

Parbhakar-Fox et al. (2013c)

Positive outcomes → new study sites

GMT= Effective approach to
ARD prediction





Support Acknowledgement

Transforming resource extraction and its evaluation



Dr Steve Walters (CRC ORE, Australia)

Professor Bernd Lottermoser (University of Exeter, UK)

Professor Dee Bradshaw (University of Queensland, Australia)

Dr Karsten Goemann (University of Tasmania, Australia)

Dr Nathan Fox (University of Tasmania, Australia)

Tim Howard (CRC ORE, Australia)