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**UG-2 ore variability**

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# Outline

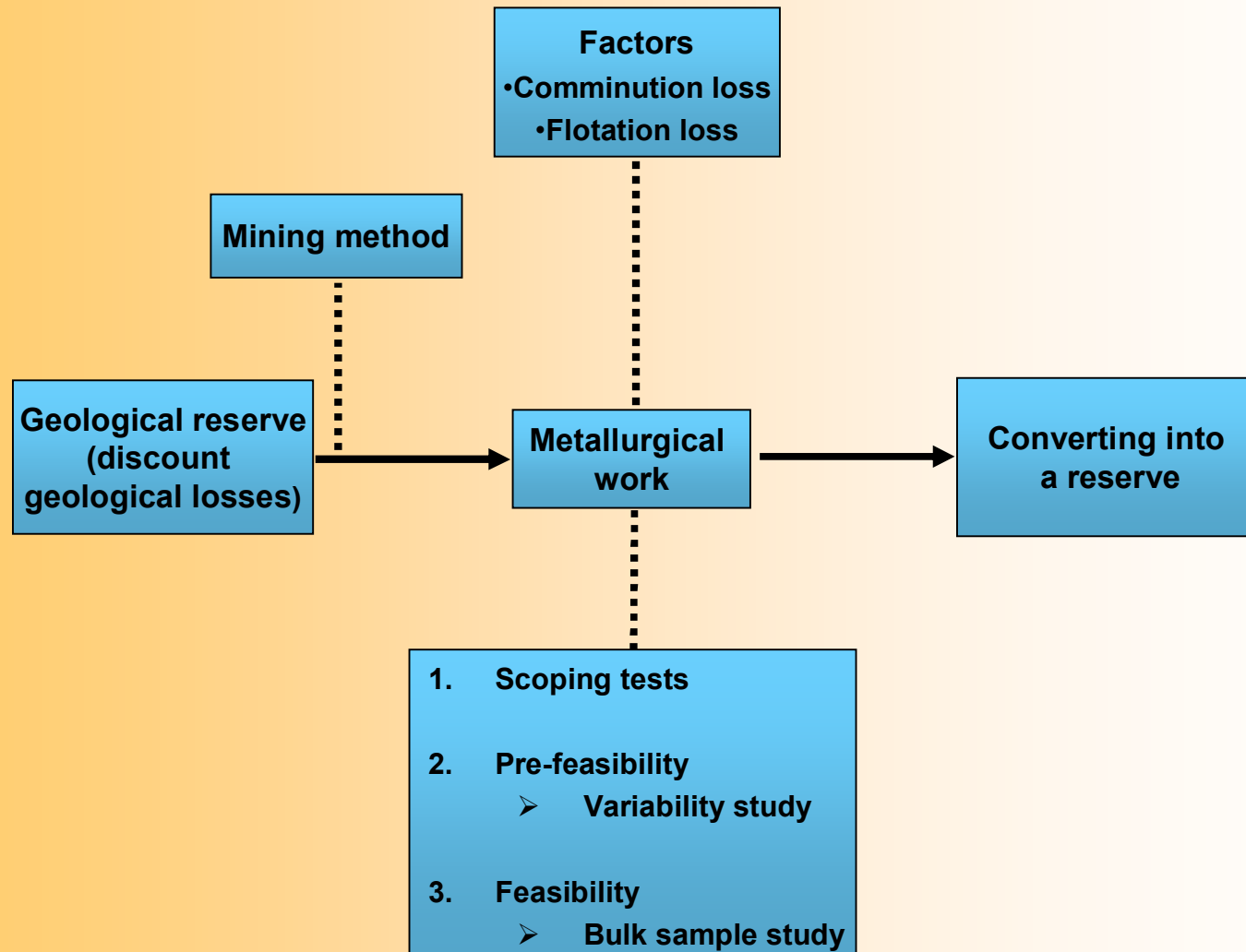
Presentation Outline

1. Variability drivers

2. Database examples  
of UG-2 variability  
with respect to  
flotation & milling

3. Concluding  
remarks

# Project feasibility studies



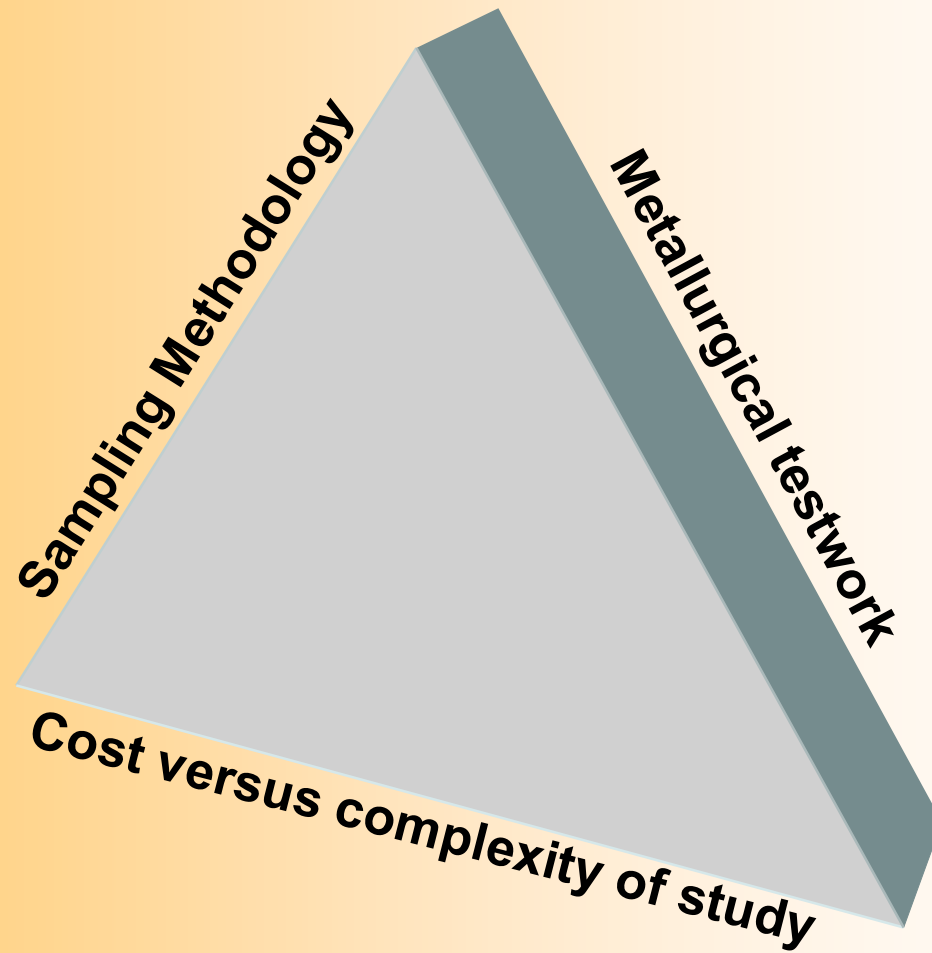
# Drivers of variability in UG-2 ores

1. Head grade
2. Waste dilution
3. Degree of weathering
4. Degree of alteration
5. Blasting and mining methods
6. Proximity to geological features
  - Footwall rock types i.e. IRUP, PEG, PRX, ANS, etc
  - Faults
  - Intrusions
  - Lineaments
7. Geographical location i.e. Western/Eastern Limb

# Consequences of variability

- Important for determining metallurgical parameters like recovery and grade across a deposit
- Important for determining the payback period for a mine
- Milling rates for e.g. waste dilution can reduce throughput by 40 %
- Possible to identify problematic/good areas in a deposit

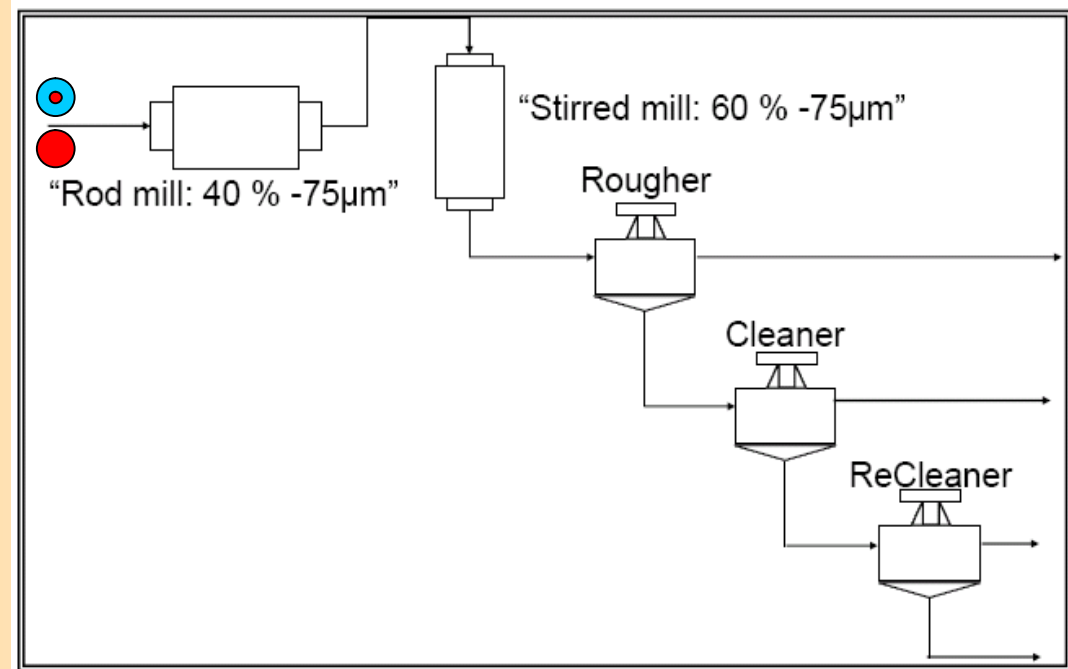
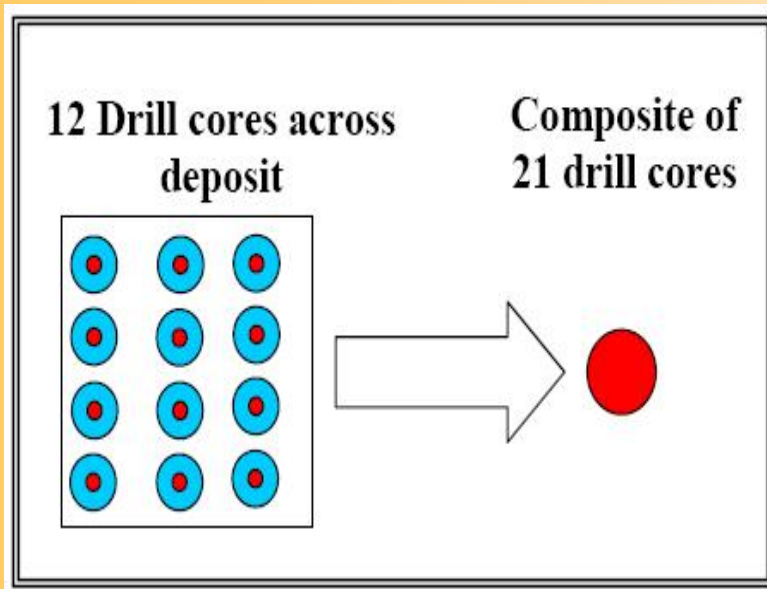
# Variability methodology



# Examples

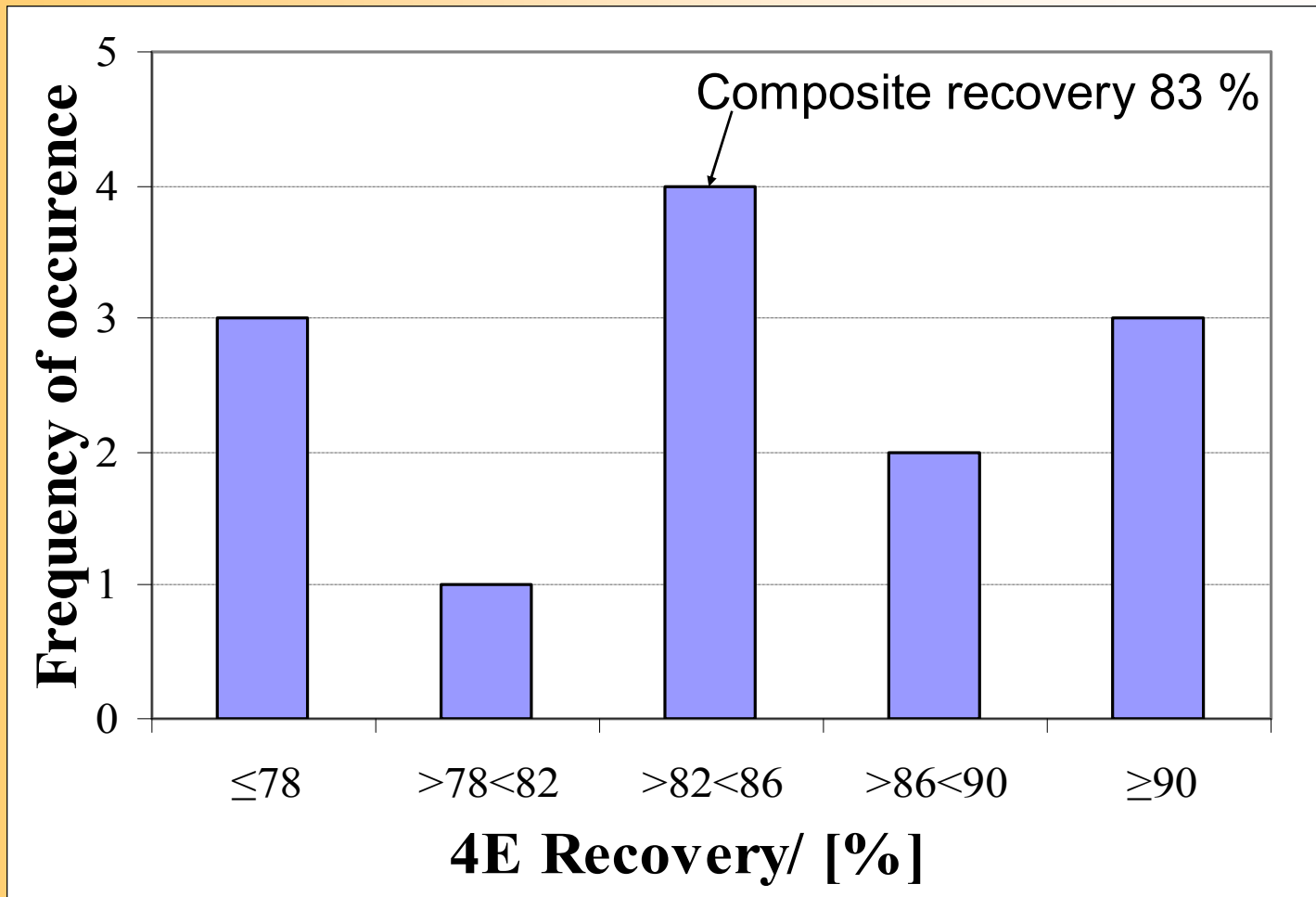
## Examples of three Eastern Limb UG-2 ores

# Ore No.1

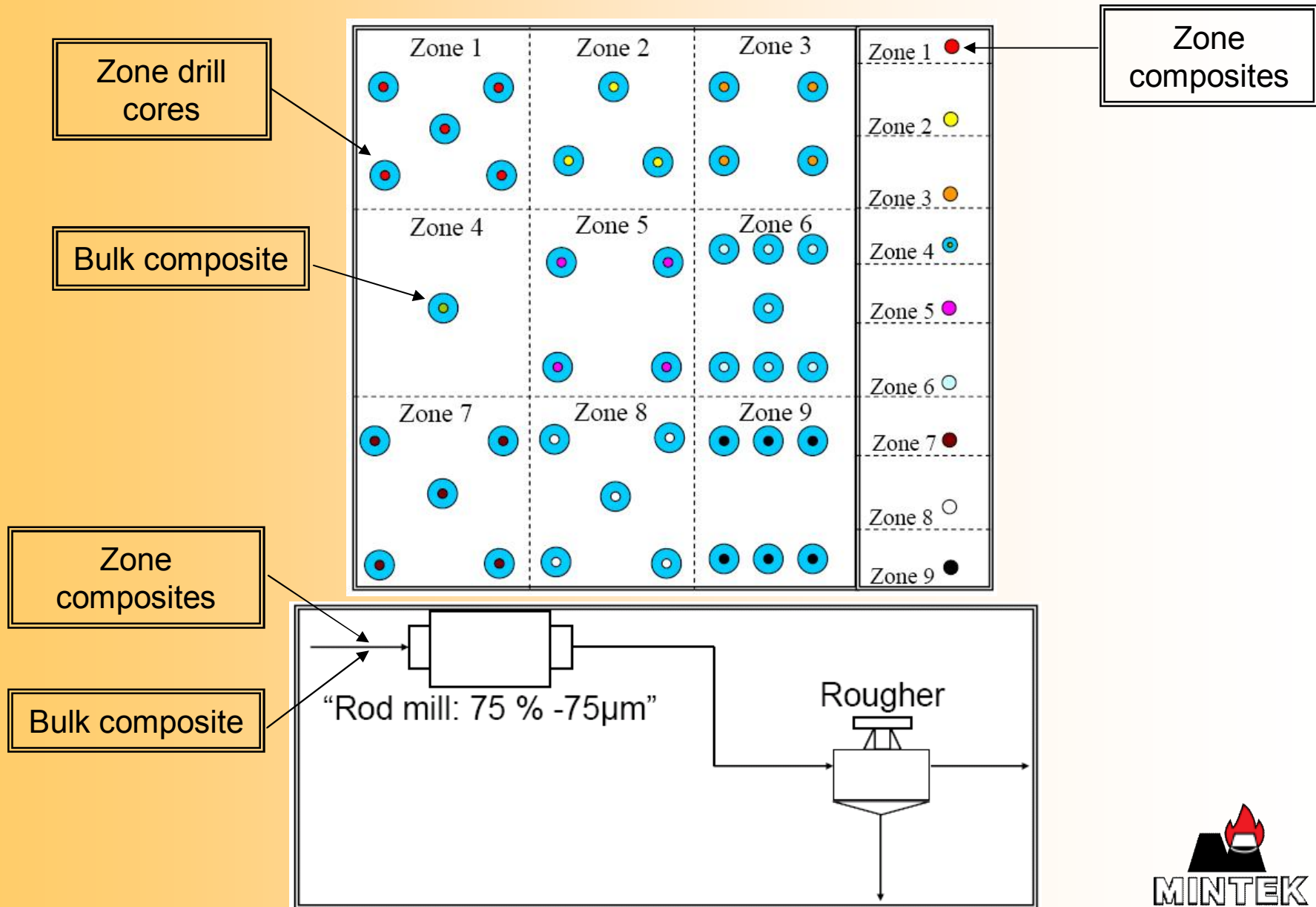




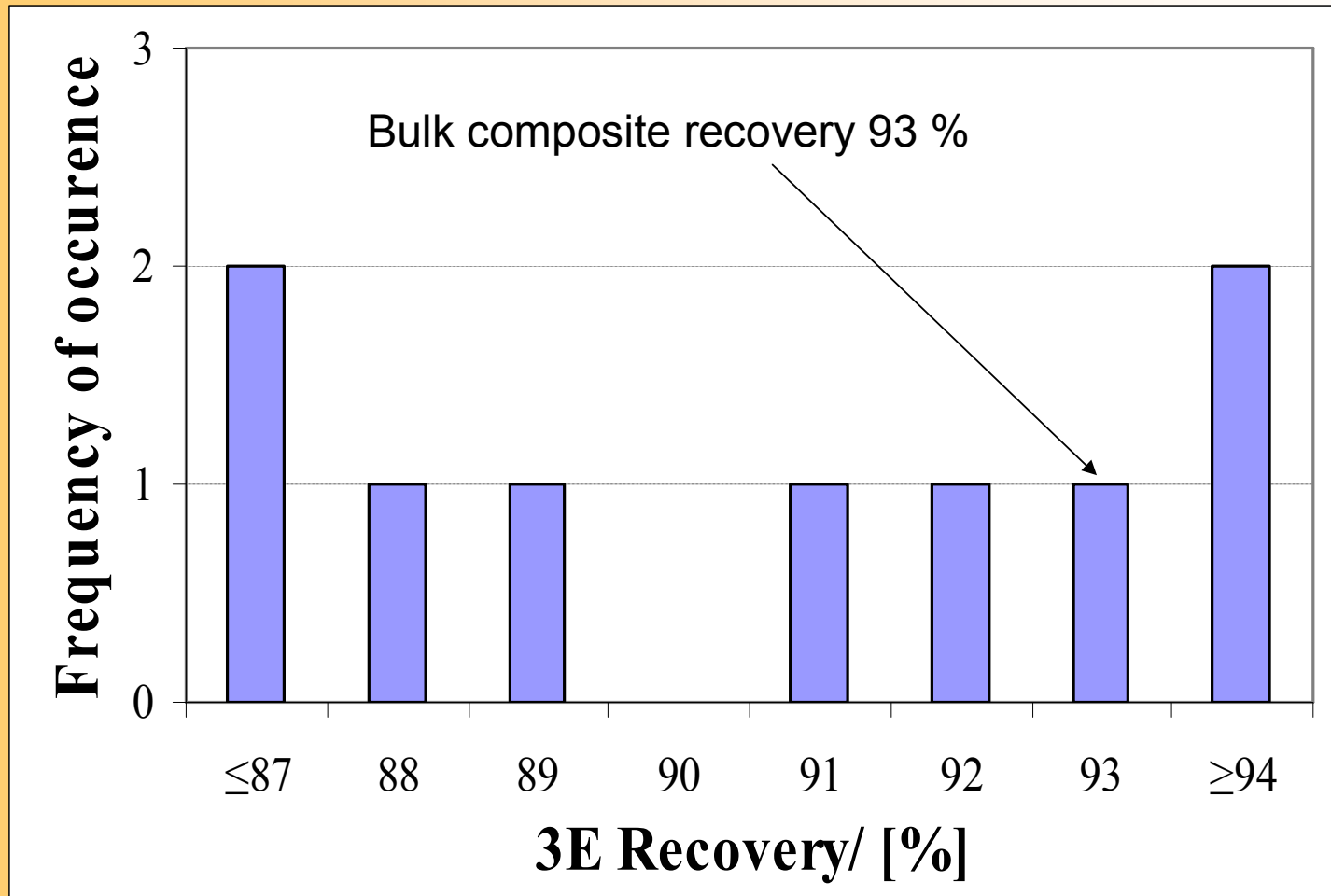
## Ore No.1 cont...



# Ore No.2

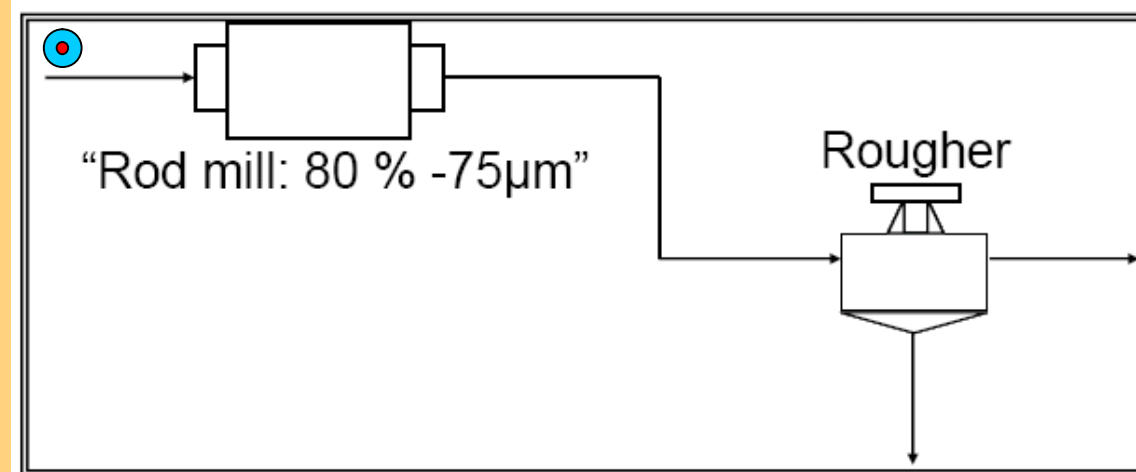
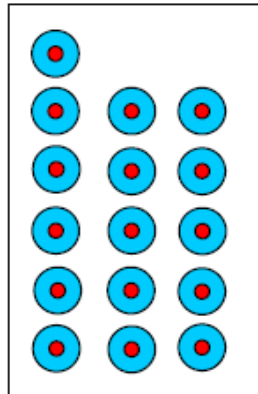


## Ore No.2 cont...

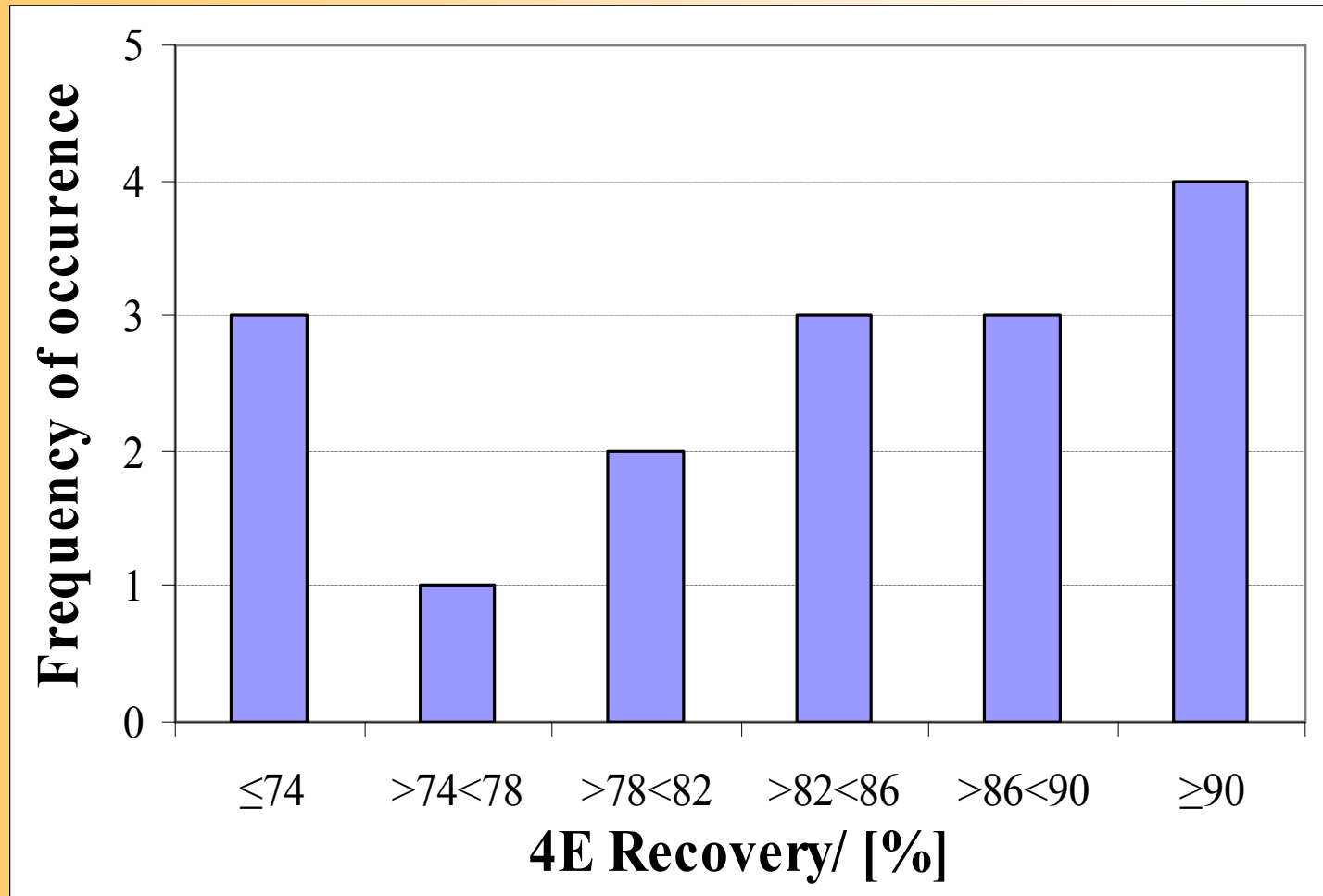


# Ore No.3

16 Drill cores  
across deposit



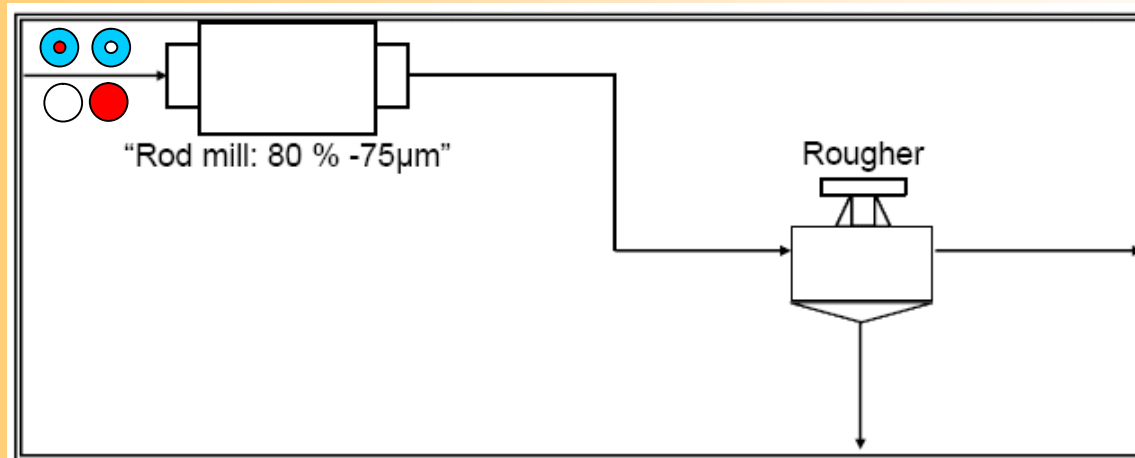
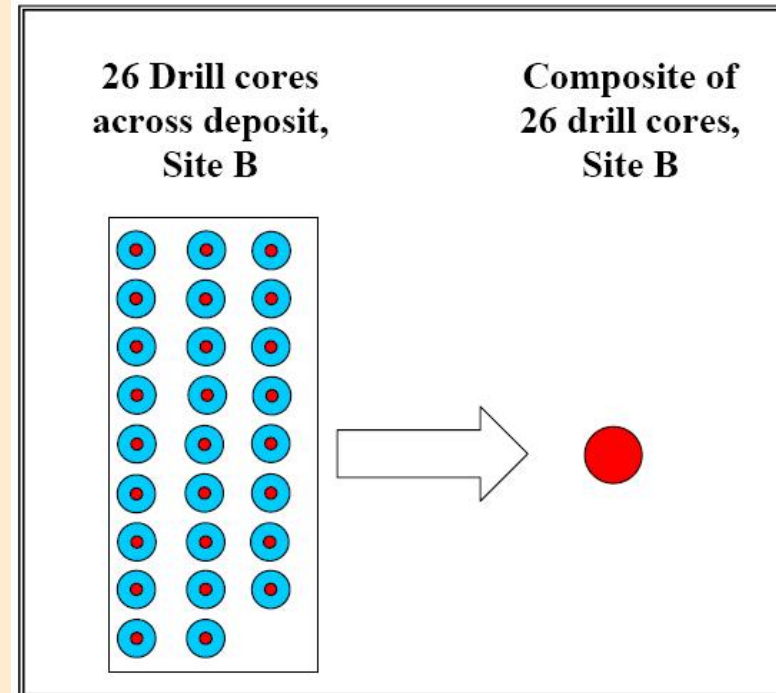
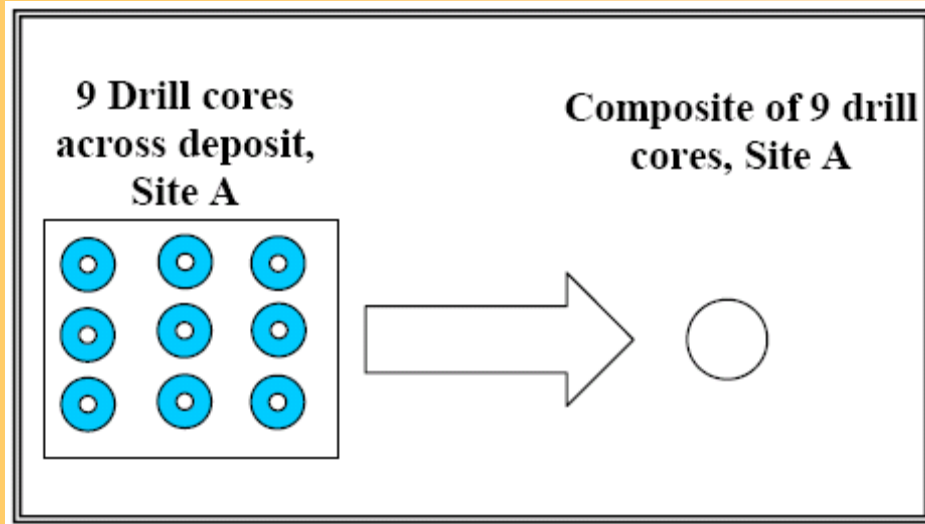
## Ore No. 3 cont...



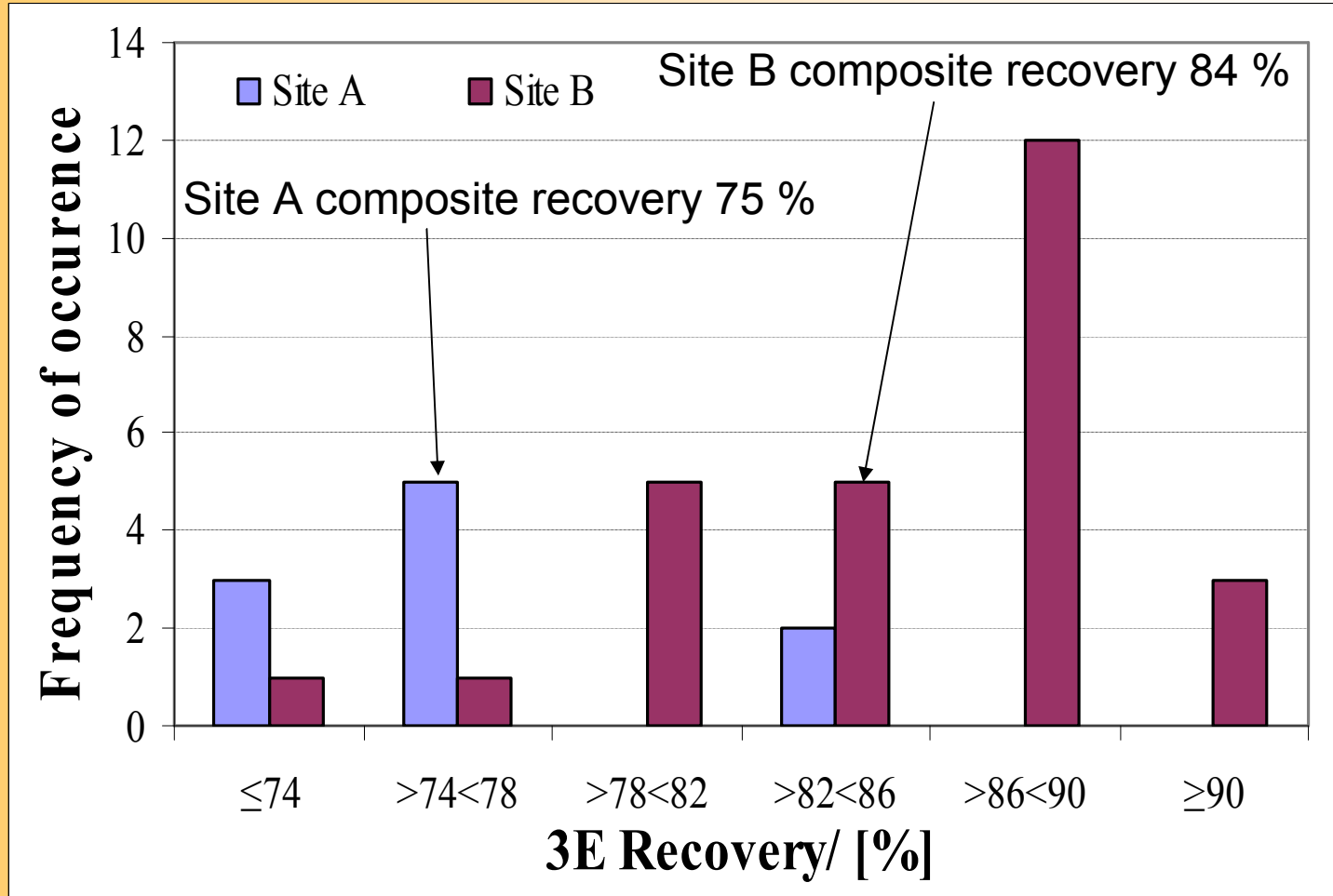
# Examples

## Examples of two Western Limb UG-2 ores

# Ore No.4



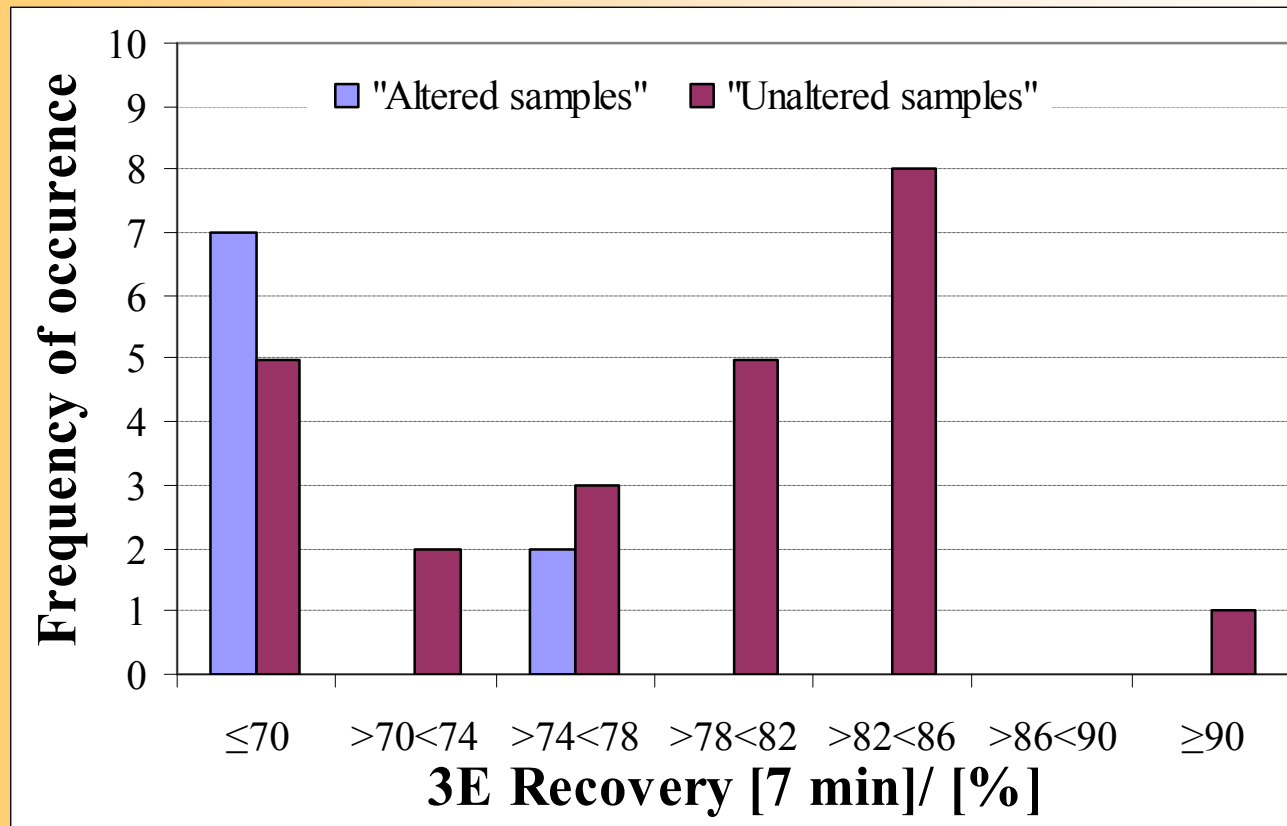
# Ore No.4 cont...



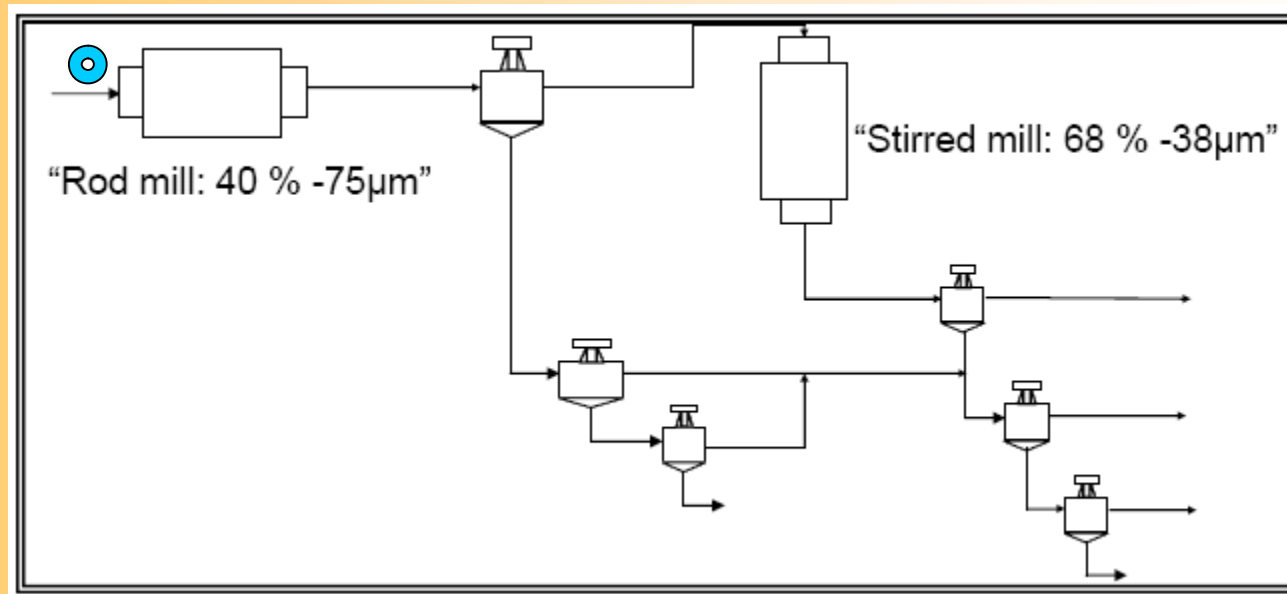
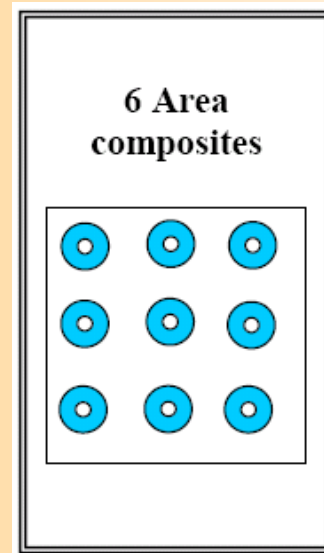


## Ore No.4 cont...

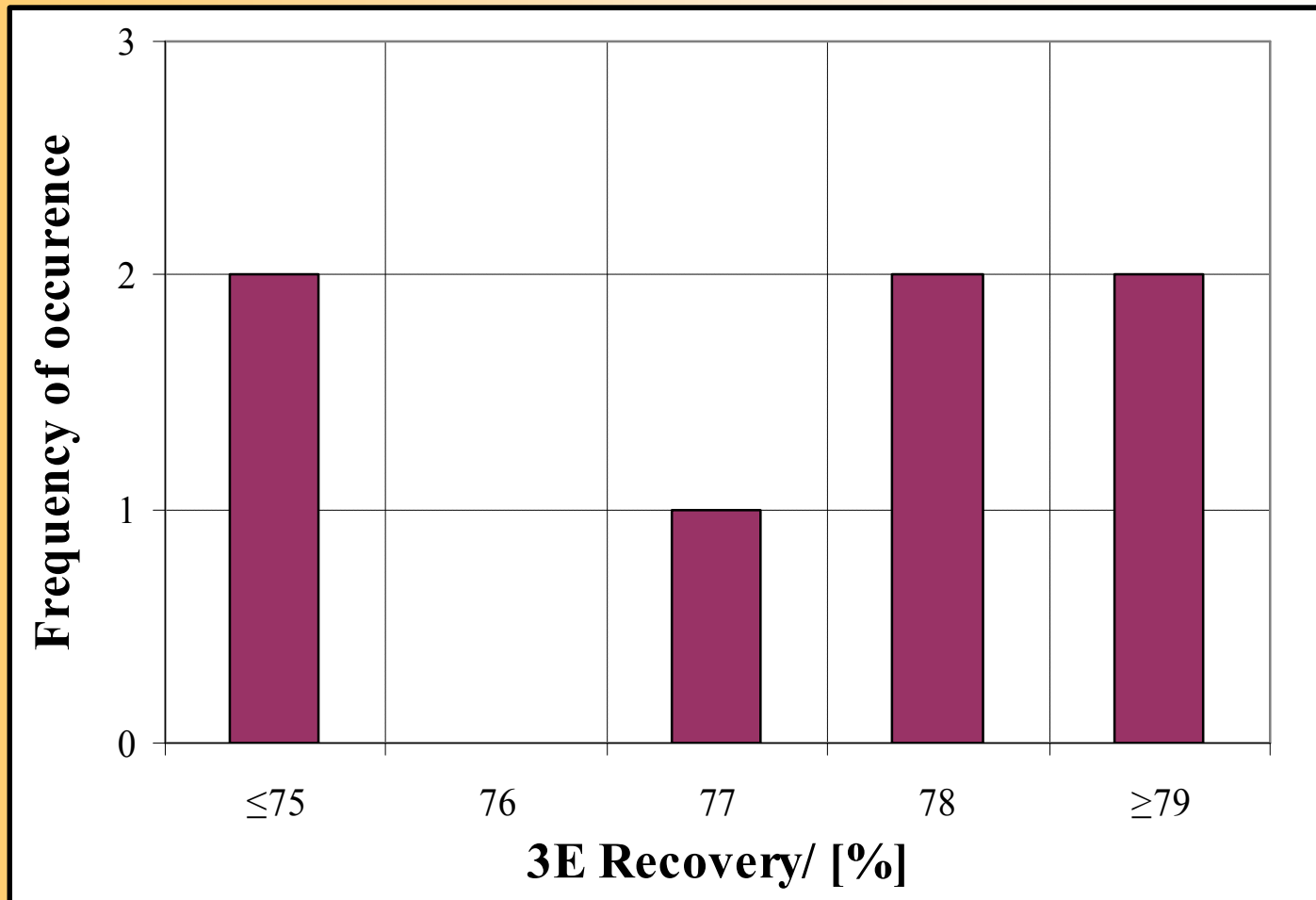
- Site A and Site B were characterised into altered and unaltered samples
- The presence of large amounts of talc, chlorite, serpentine, amphibole and mica indicate some degree of alteration



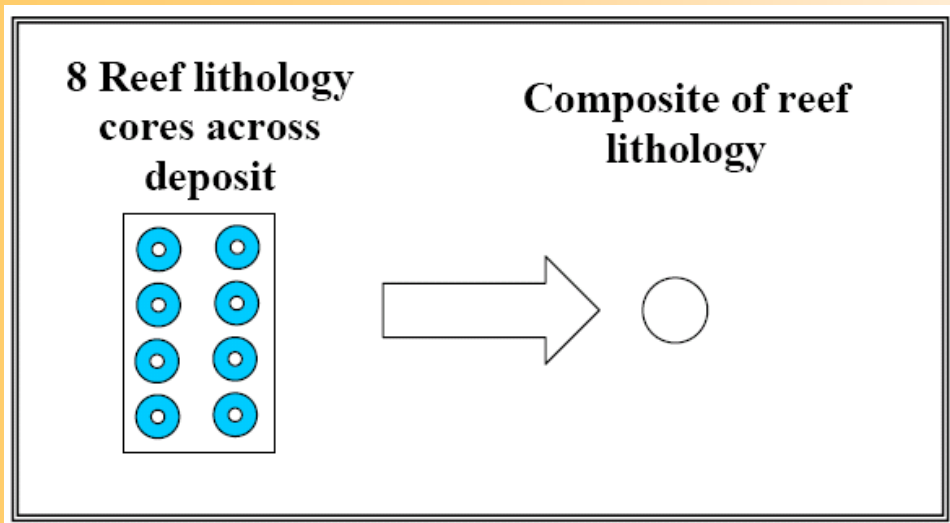
# Ore No. 5 – Area composite



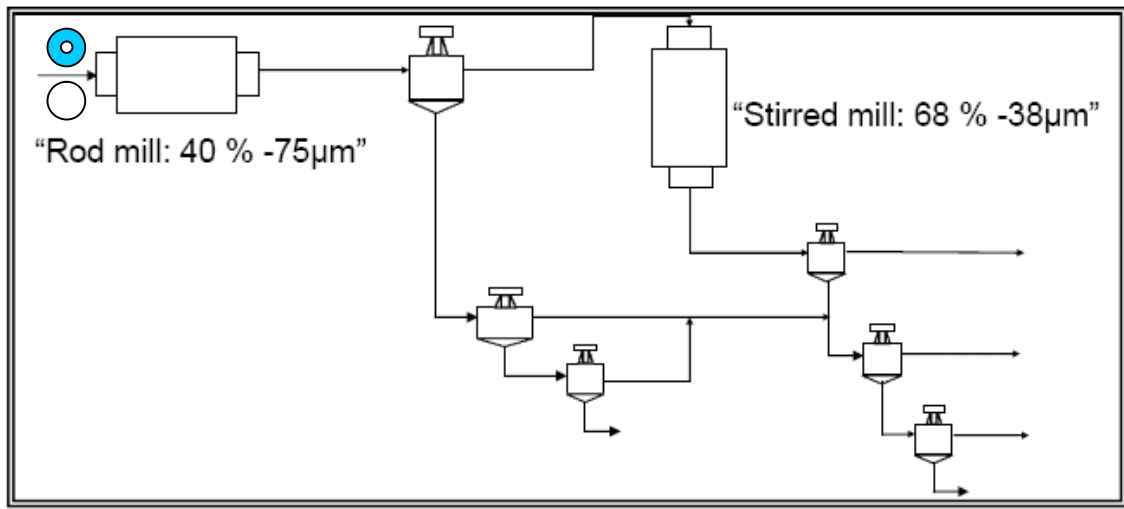
## Ore No. 5 – Area composite cont...



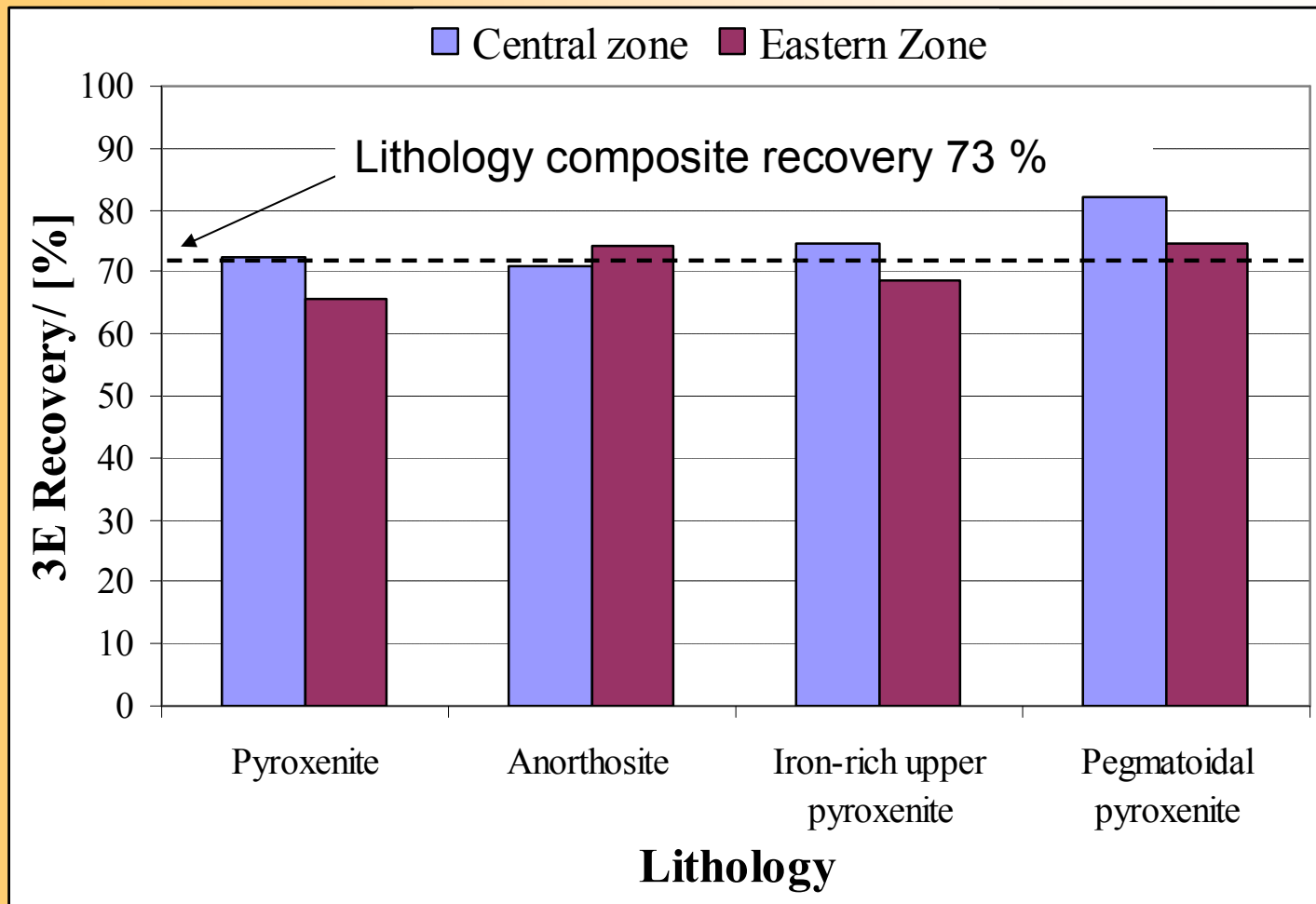
# Ore No. 5 - Lithologies



- 4 Central zone reef samples differentiated into Pyroxenite, Anorthosite, Iron-rich upper pyroxenite & Pegmatoidal pyroxenite
- 4 Eastern zone reef samples differentiated into Pyroxenite, Anorthosite, Iron-rich upper pyroxenite & Pegmatoidal pyroxenite



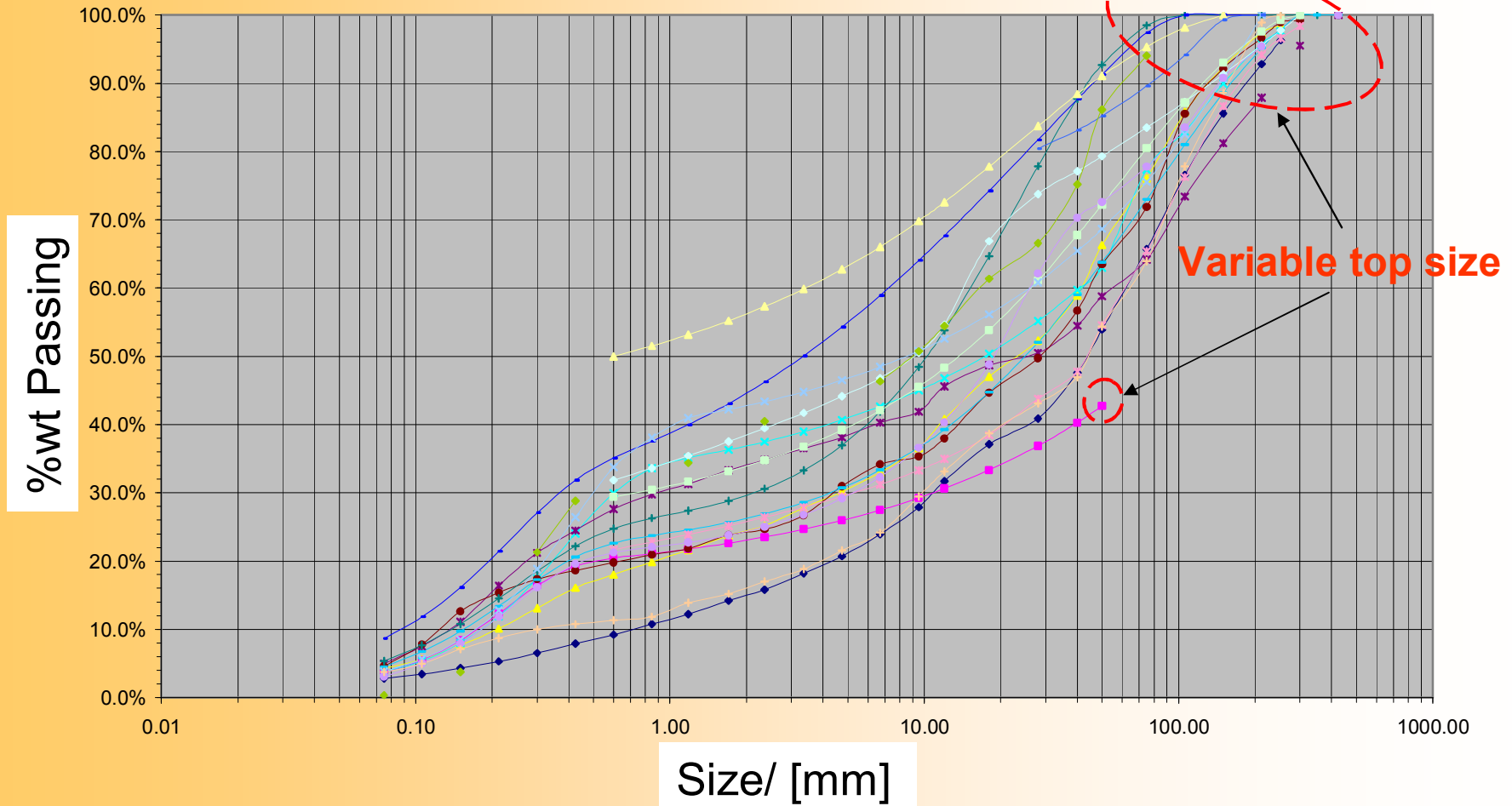
# Ore No. 5 - Lithologies cont...



# Milling variability

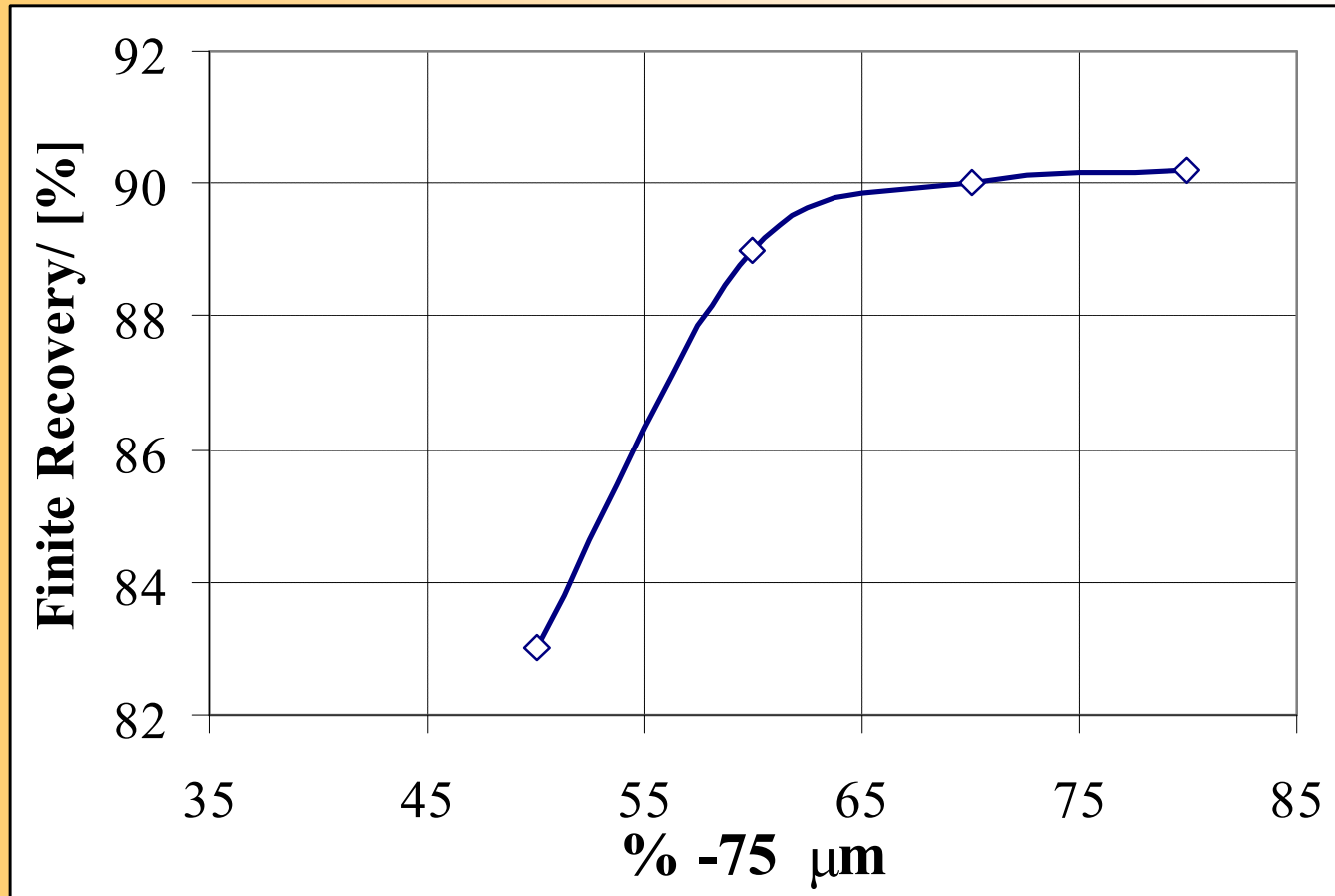
# Milling Variability cont...

## UG-2 ROM Size Distribution



# Western Limb

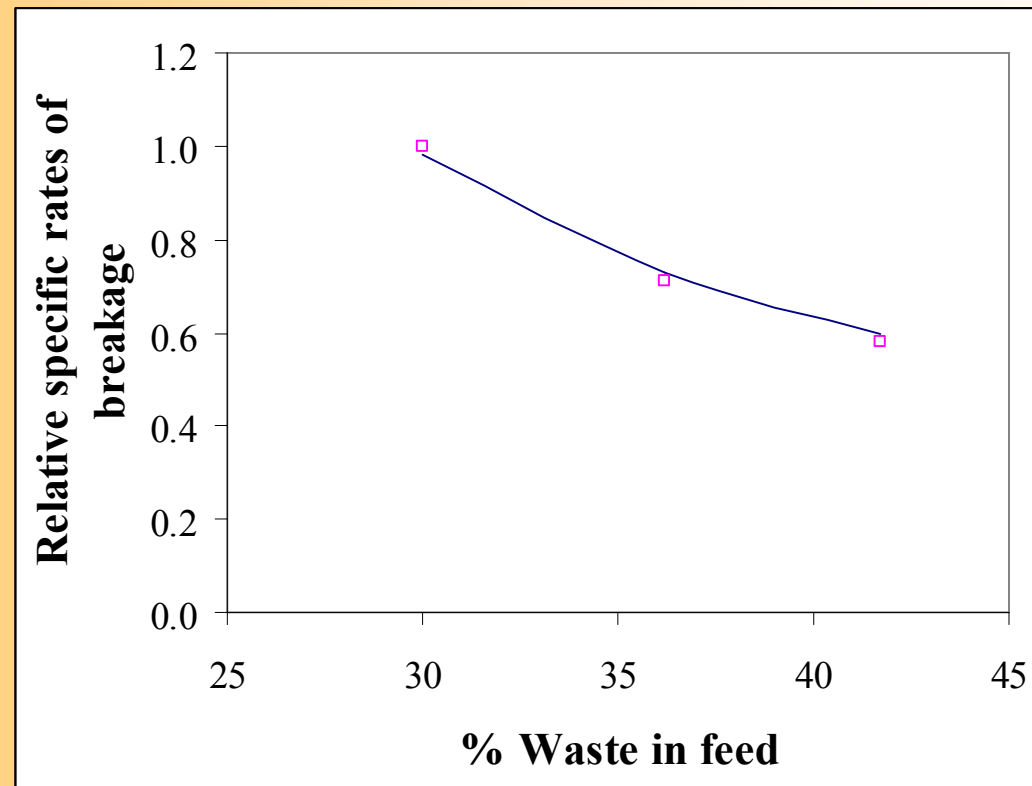
- Ore body Variability affects grind and therefore recovery
- Example- Typical finite recovery-grind curve





# Eastern Limb

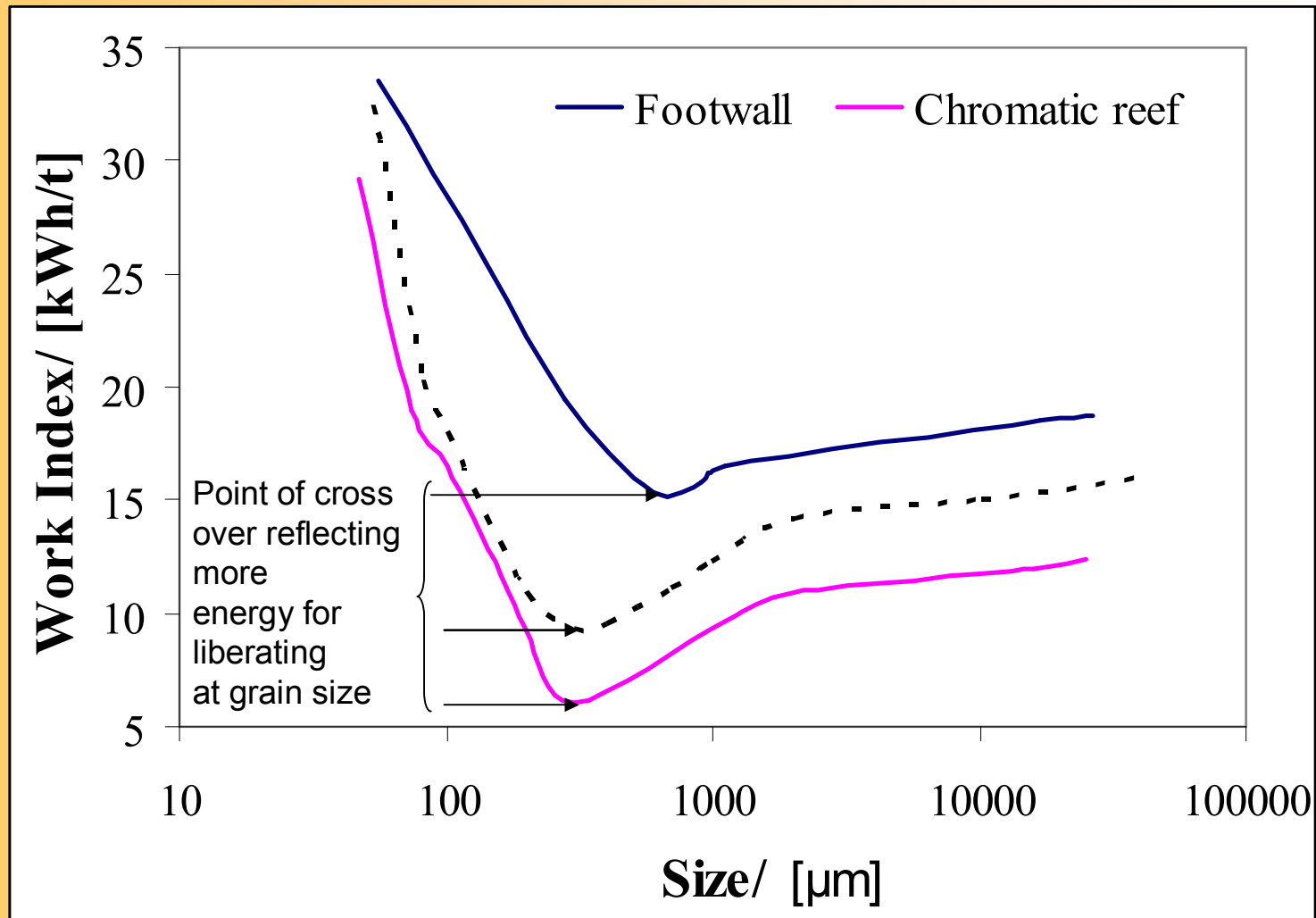
- Waste rock generally harder than on Western Limb; and higher variability encountered
- Example- Eastern Limb 'waste fraction' effect on ROMB grinding efficiency



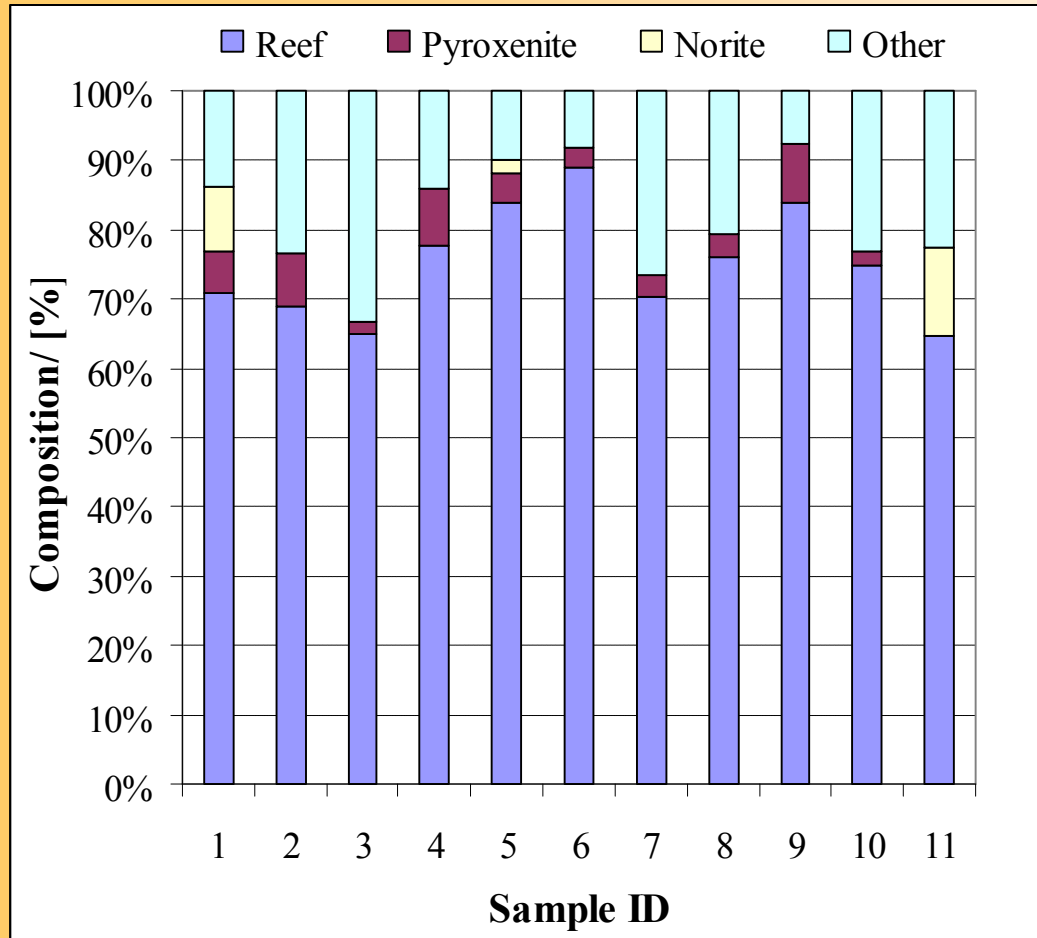
- Indicates 40 % slowdown in breakage at high waste levels!

# UG2 Grinding cont...

- Bi-modal nature of ore is significantly affected by variations in 'waste' dilution



# Grind Variation- Typical Western Limb UG2



Sample No	Relative Grind $\kappa_n/\kappa_{\text{control\_avg}}$	Actual % -75 $\mu\text{m}$
10 (Control)	1.019	75.3
	0.981	73.5
1	1.081	71.8
2	1.283	77.2
3	1.030	69.4
4	1.078	71.4
5	1.070	70.7
6	0.957	67.4
7	1.088	77.0
8	1.053	76.3
9	1.145	78.6
11	0.912	71.9
Composite	1.026	73.9

# Concluding remarks

- Allocate more resources to understand the inherent variability in a deposit
- Formulate a standard metallurgical variability methodology
- Use the methodology to understand what factors control variability within a deposit



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**Thank you**

