John Coughlan
Kestrel Mine

Holing Underground – An Example of the Swiss-Cheese Model

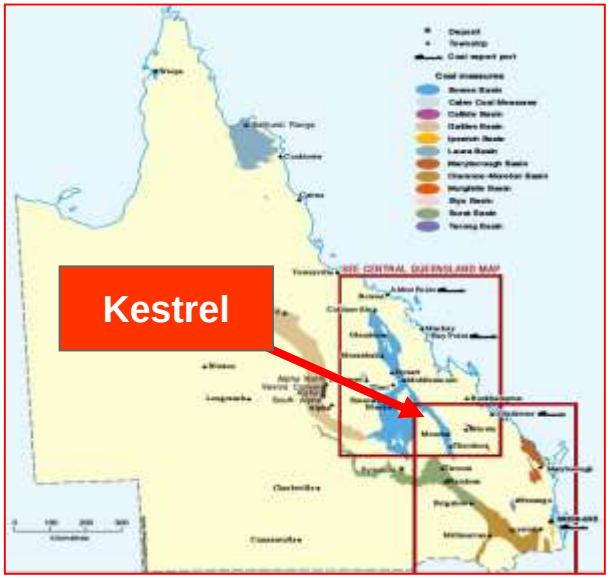
August 2014

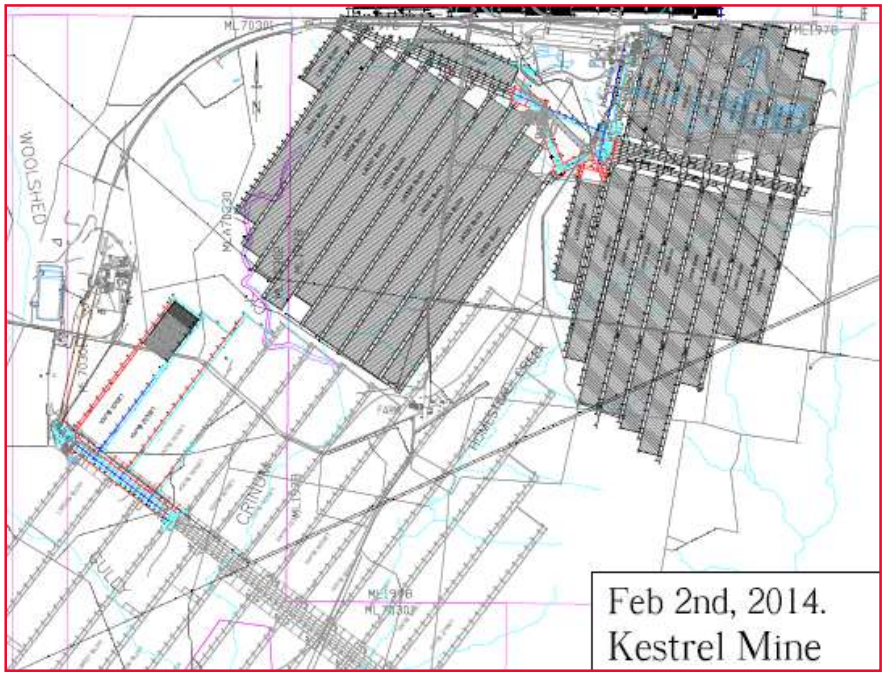
Location

50 km north east of Emerald

Rio Tinto purchased in 1999

Extension opened October 2013





Incident Summary

DATE / TIME: 5th February 2014, 10:30 hrs

LOCATION : MG403 Ventilation Borehole Stub

CONDITIONS: Surface drilling interface with Underground face area

EQUIPMENT: Surface drill rig and Ventilation Borehole 900mm ID cased

CREW: B Crew

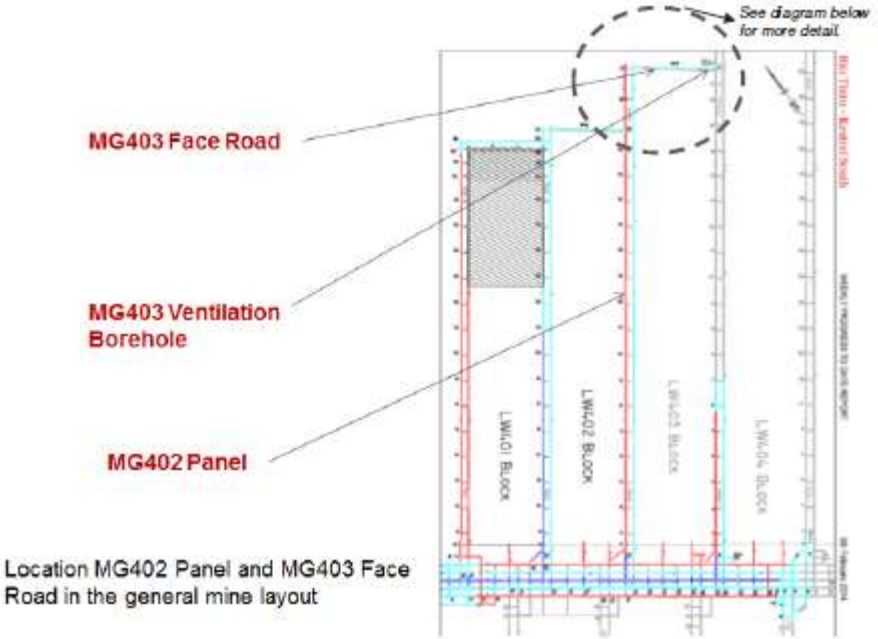
ACTUAL OUTCOME: Medical treatment injuries

MAXIMUM REASONABLE OUTCOME: Critical (Multiple fatality)

Changing time zones

Panel 403 Faceline

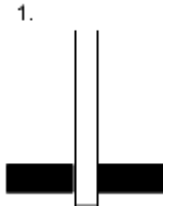
- First pass to be driven as a single entry
- Would then have continuous ventilation provided from a bore-hole to surface
- The borehole would have a drilled diameter of approximately 960mm and is cased with a 900mm internal diameter steel case to 1-2m above the coal seam



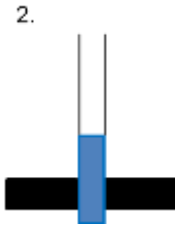
Location MG402 Panel and MG403 Face Road in the general mine layout

Borehole holing methodology

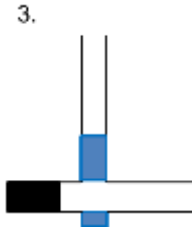
1. Drill the borehole to intersect the seam



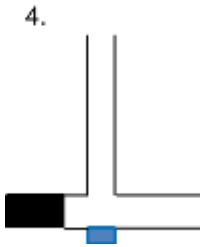
2. Backfill the hole with grout,



3. Intersect the grout-filled hole with the continuous miner,



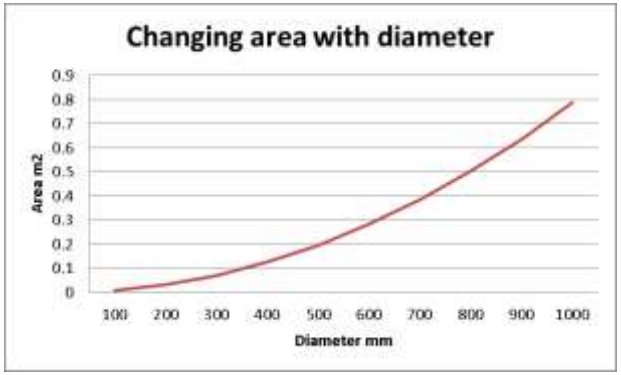
4. Ream out the remaining grout to open the hole to the underground workings.



Preparation

Risk Assessment

- Previous risk assessments available
- Different context in this case
  - Previously multiple smaller holes
  - Previously drove the heading first



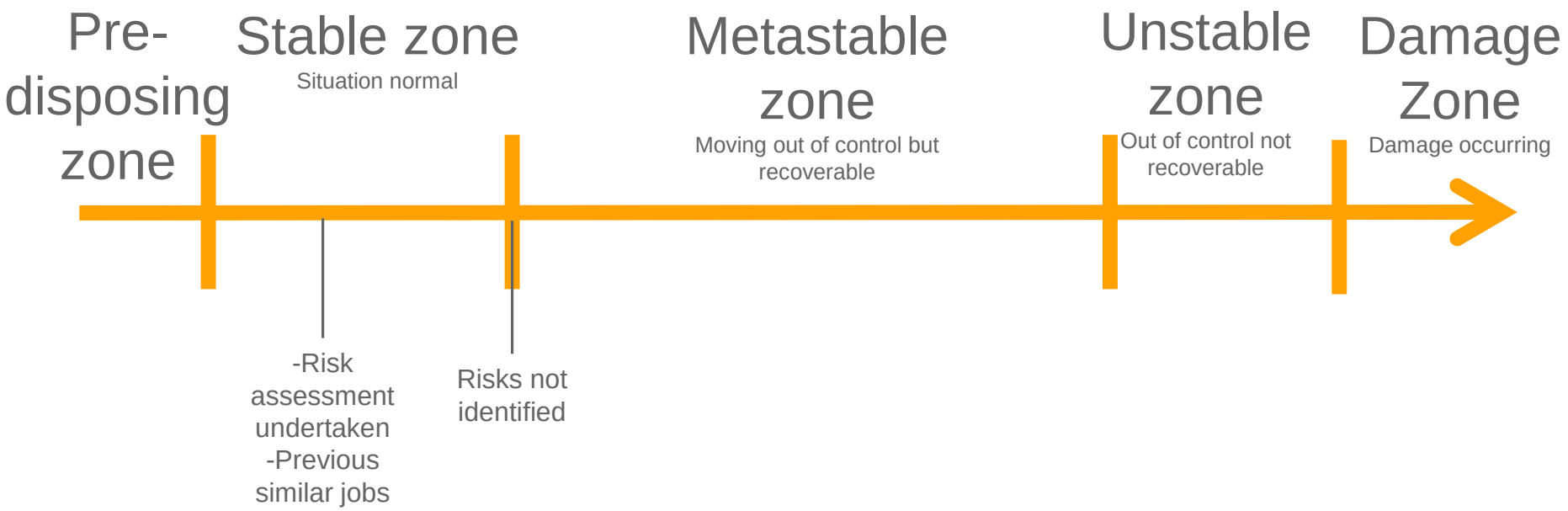
APPENDIX 3 – HOLE-THROUGH PROCEDURE

HOLE-THROUGH PROCEDURE

Drilling out the MG403 Ventilation Shaft Cement Plug
[redacted] Drilling Supervisor
ERZC = ERZ controller Kestrel
CRO = Control Room Operator Kestrel
Assumption: German Creek seam is at 230m DOC. (top of seam)

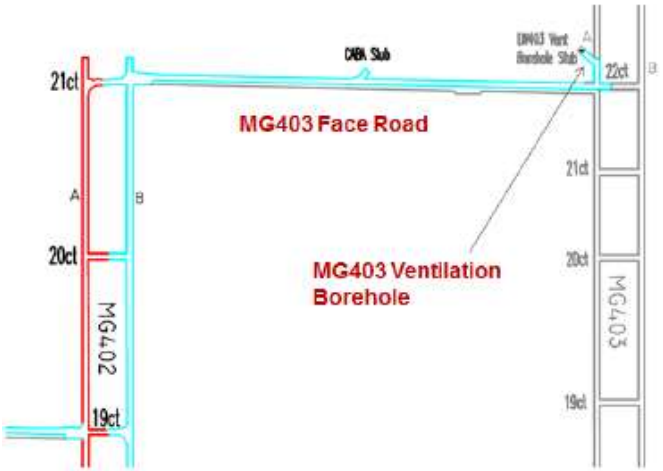
Depth of drilling	Responsible	Action
Drill rig set up to drill at 210m depth	VO / CRO	Note on shift notes, MG402 ERZC to be informed of prospective holing during shift
	Drillers	Inform CRO of operational status
	CRO	CRO to inform VO and MG402 ERZC to ensure all controls are in place underground prior to starting to drill. Instruct MG402 ERZC to go to Hole-Through location.
	MG402 ERZC	Ensure all controls are in place and contact the drillers via CRO with permission to start drilling activities.
Hole workings At 230m depth	Drillers	Inform CRO and cease all activity until positive feedback from CRO on underground situation.
	MG402 ERZC	Confirm Hole-Through with CRO. Confirm location (roof or rib) of holing into workings. Contact Drillers drilling Supervisor directly to give positive contact for removal of drill string from the workings. Ensure barricade is intact after holing and during drill string removal.
	CRO	Contact Panel ERZC's to inform of Hole-Through. Contact VO to inform of situation. Confirm UG situation and follow up actions with Drillers

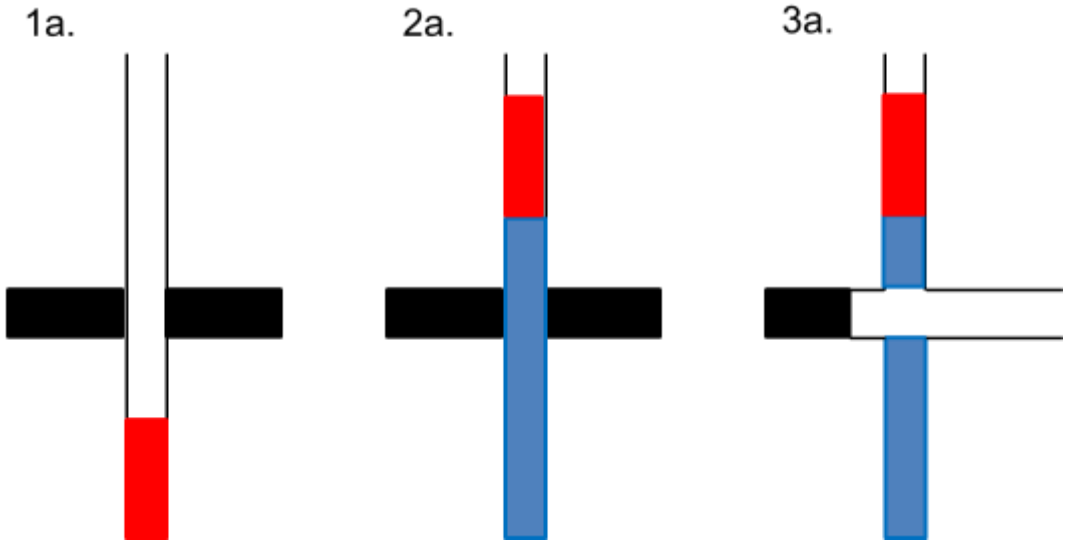
Changing time zones



Implementation

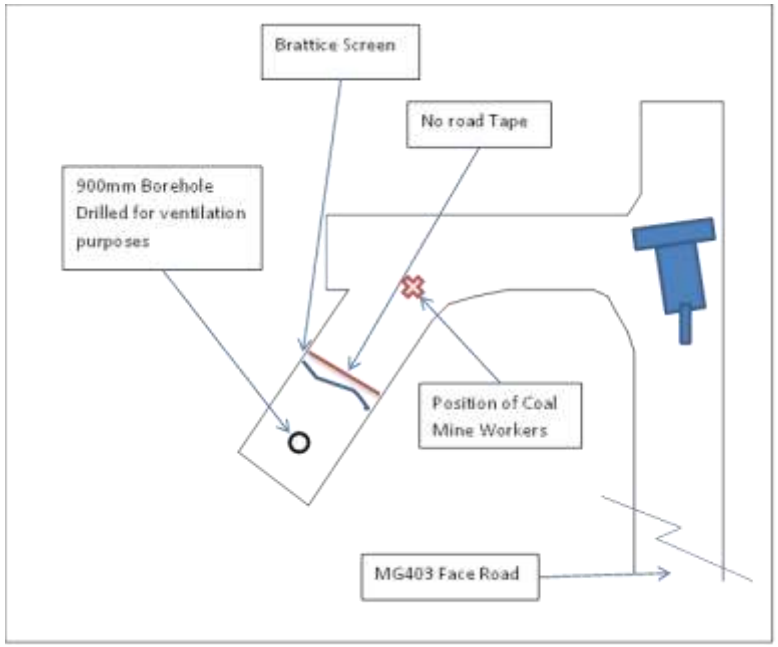
- Drilled without incident
- Target depth missed and hole depth becomes 259m
- Three attempts to grout to 20m above roof of coal
- Increased potential there for material in the hole
- Stub driven and hole intercepted by underground crew



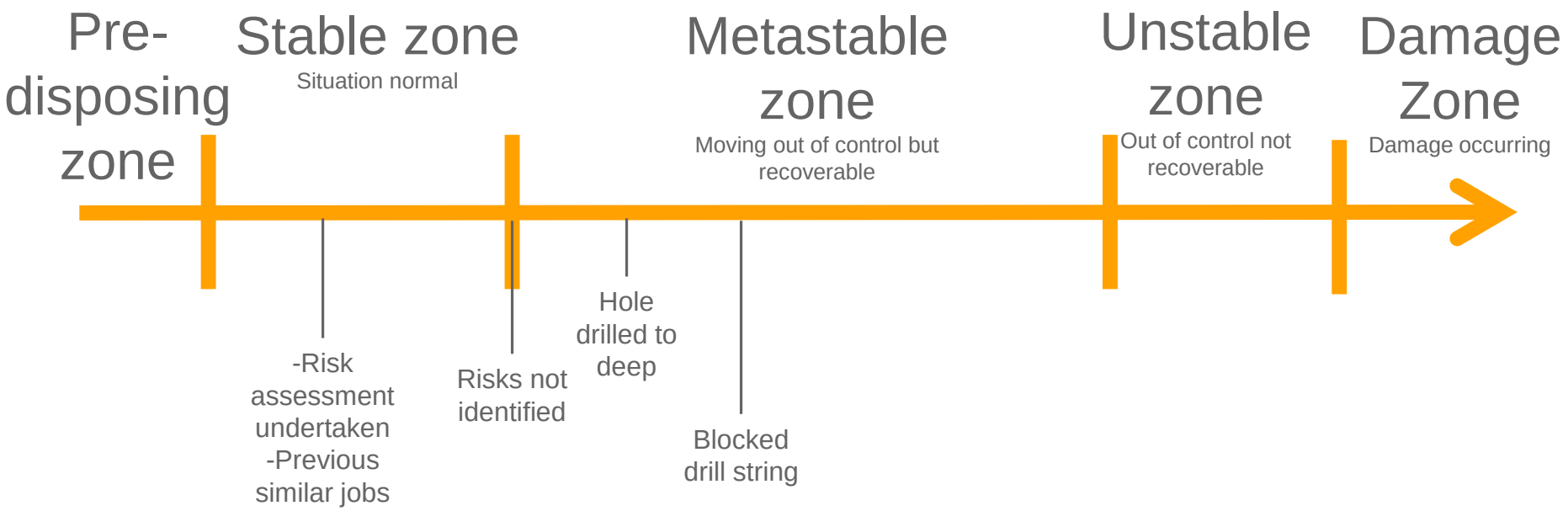


Implementation

- Time to coordinate the hole-through
- Procedure initiated
- Brattice and barricade established
- Drill string blocked – reaming interrupted then postponed

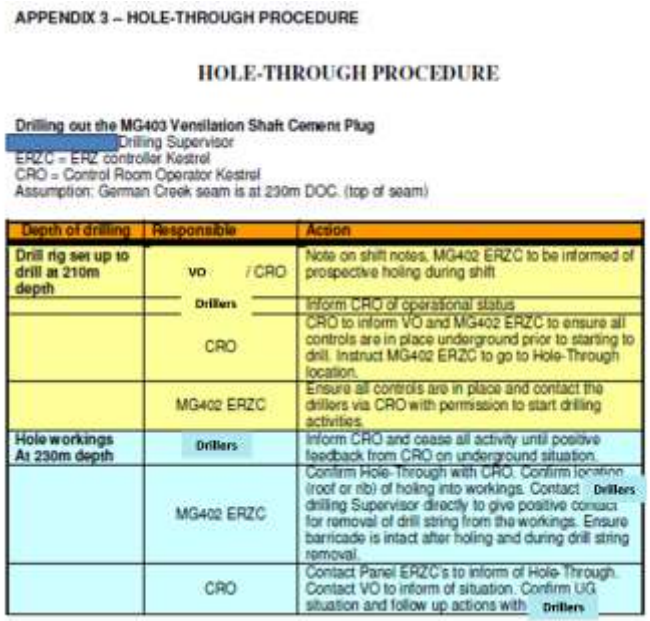


Changing time zones Metastable



Implementation

- New crew due to roster change
- Distracting start to the shift
- CRO required for random drug test
- Request to proceed from the drillers
- Request granted



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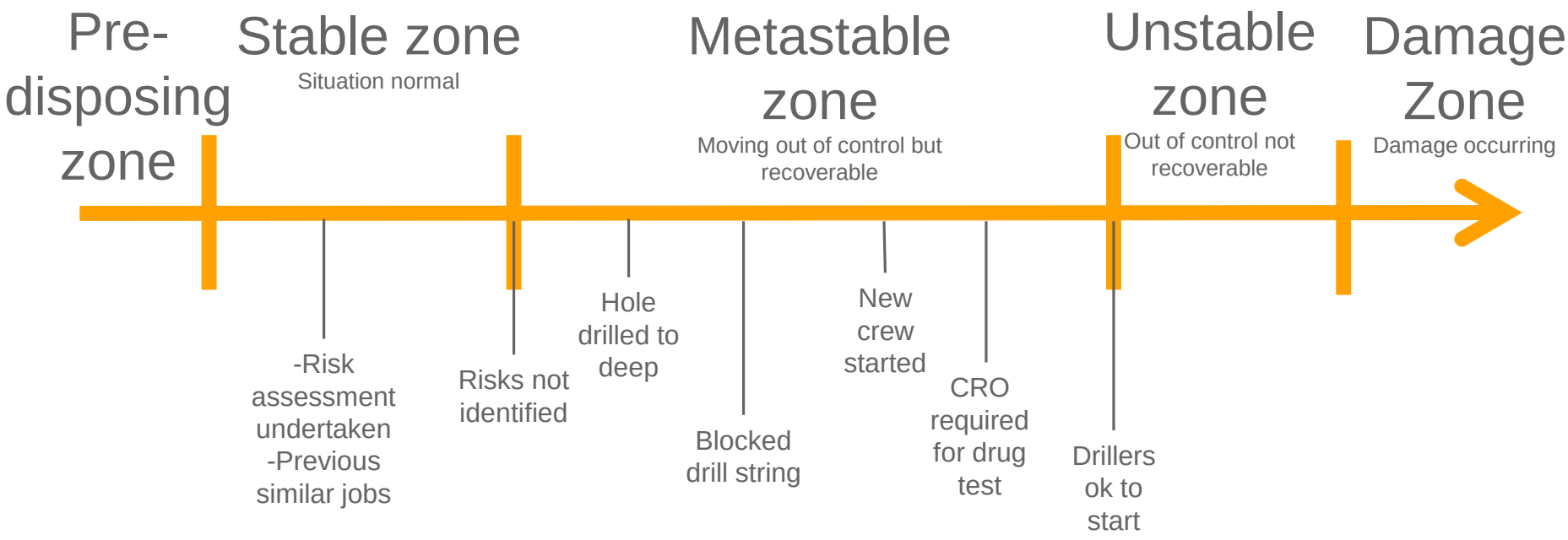
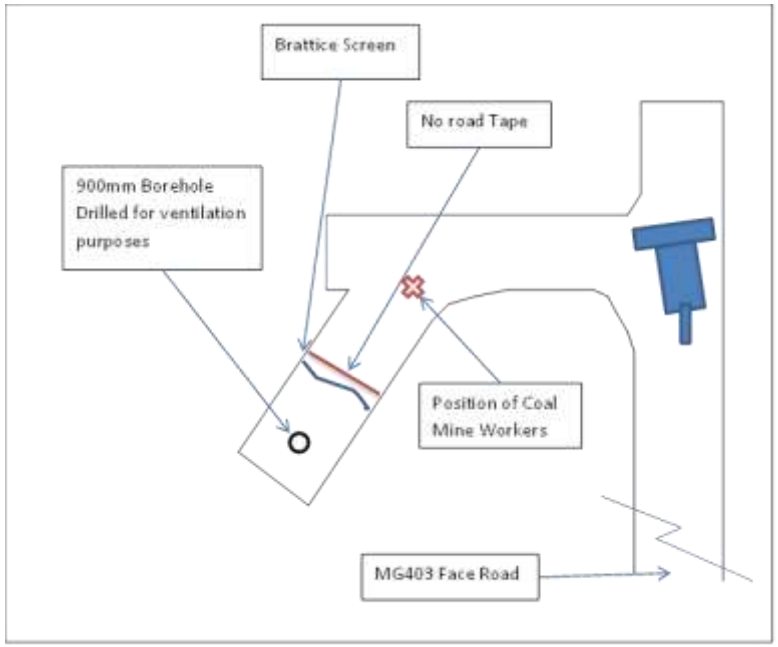
Changing time zones
Metastable to Unstable

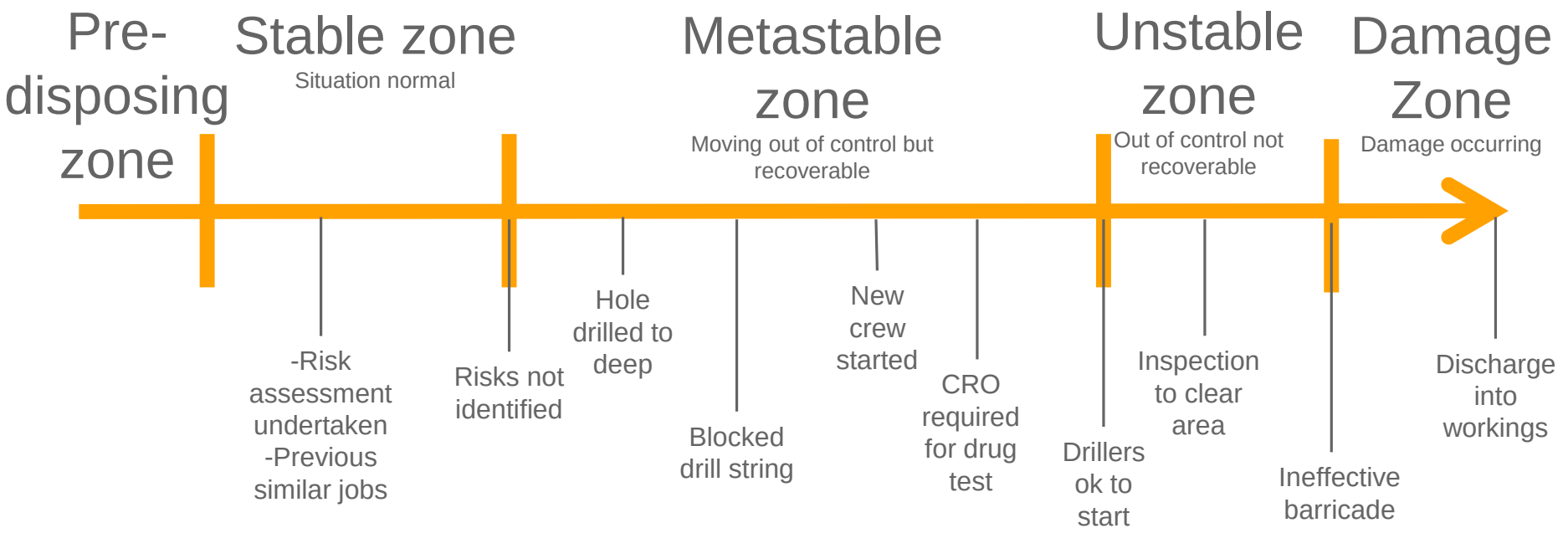


Incident moment

- Drilling is underway
- Panel ERZC undertook inspection in the faceroad
- Development Coordinator accompanied the ERZC
- Proceeded to the barricade in the stub
- No sound or vibration indicating the drilling was underway

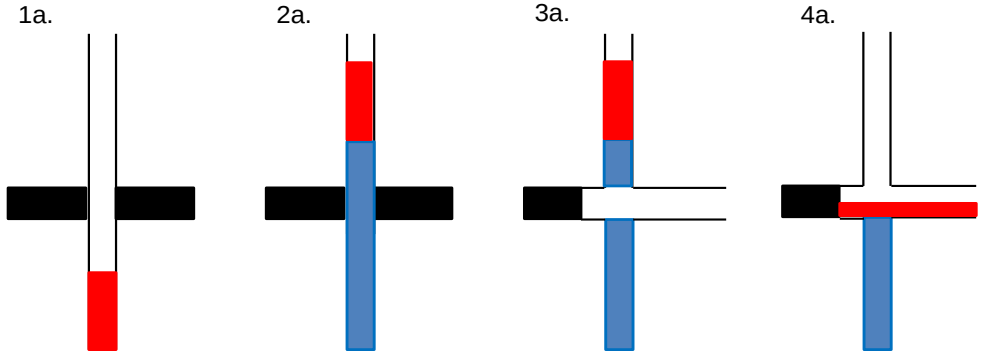


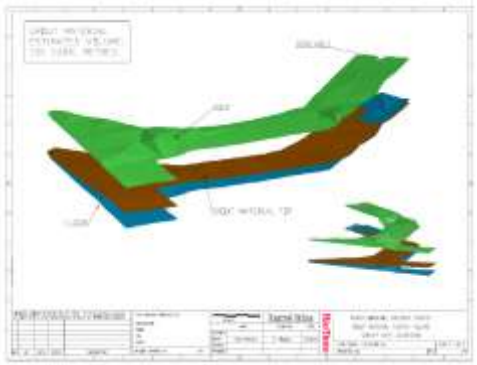
Changing time zones
Unstable to Damage



Incident moment

- Drill cuttings, drill mud, water and compressed air entered the workings
- The two men were thrown to their knees by an air blast, struck by fine grout material and drilling fluid





Learnings

- A formal Management of Change process has been established for one-off or new jobs, which involve concurrent activities (surface/UG, Cat 2, 3 Contractor groups). This process is applied, reviewed and signed-off, to ensure that the hazards and risks are understood and managed.

- A permit process has been established for activities involving interaction between a surface drilling operation and the underground workings. This requires formal sign-off by, as a minimum, the driller, CRO, Deputy responsible for the shift and a Dept. Leader.

Questions?