

# RockMonitor XR

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- Application Software
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# Fall of Ground Prevention

## Chinese coal mine roof collapse in Shaanxi kills 21

© 13 January 2019

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## Threat of closure best tool to urge roof safety in N.S. coal mine: Minister

'Fines of \$2,000, \$20,000

## Cape Breton coal mine cited for breaking reporting rules in 'massive' cave in

Canadian Press  
Published: Feb 05 at 10:23 a.m.  
Updated: Feb 05 at 1:34 p.m.

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## China coal mine rescue: 18 miners remain trapped after two killed in tunnel collapse

Rescuers free two workers following the rock burst 'explosion' in Shandong province

Peter Stubley | Sunday 21 October 2018 19:21 | 21 shares |

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At least 21 m  
China, officia

## Utah Miner Killed After Roof Collapses at Nevada Gold Mine

A Utah miner died after a roof collapsed at a Nevada gold mine.

Oct. 27, 2018, at 3:58 p.m.

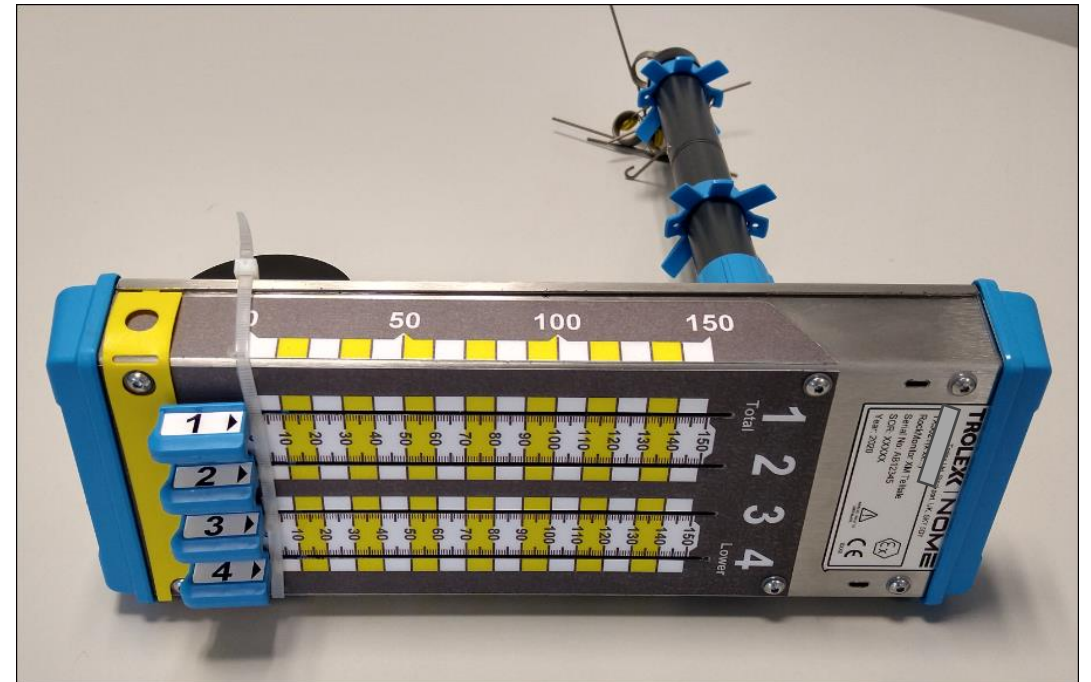
f [twitter] [reddit] [email]

The gates leading to the Donkin mine are shown in this file photo, - Cape Breton Post

# LIMITATIONS OF MANUAL INSPECTION

Whilst mechanical telltales provide a simple low-cost means for visually monitoring strata displacement, manual inspection has a number of limitations:

- Time consuming
- Limited accuracy
- Error prone
- Manual data entry required
- Delayed data analysis
- Difficult to accurately identify trends
- Not possible in restricted and inaccessible areas



# Cost of Failure

- Real time monitoring of critical areas provides early indication of strata movement to prevent a fall of ground event
- Remote reading telltales are the safest way to monitor and manage ground conditions

Type	Cost (USD)
Clean up and bolt up	\$200,000
Spiles and backfill	\$1,000,000
Cost of production loss	\$1,000,000/per day
Loss of equipment	\$5,000,000
Injury / loss of life	Priceless

# BENEFITS OF REMOTE MONITORING



## Enhance Safety

Automated alerts and advanced warnings allow mining operations to take early action, often many hours before the data from manual inspection.

## Improve Efficiency

Increase operational up time by reducing the need to shut down for manual inspections. Minimize the need for manual data collection.

## Optimise Design

Analyse detailed data to gain insights regarding the effectiveness of roof support strategies. Use accurate information to avoid under or over-bolting.

## Reduce Densities

Use continuous accurate real-time monitoring to safely reduce the amount of bolting and standing support required. Significantly reduces incidents/injury through a reduction in manual handling and installation.

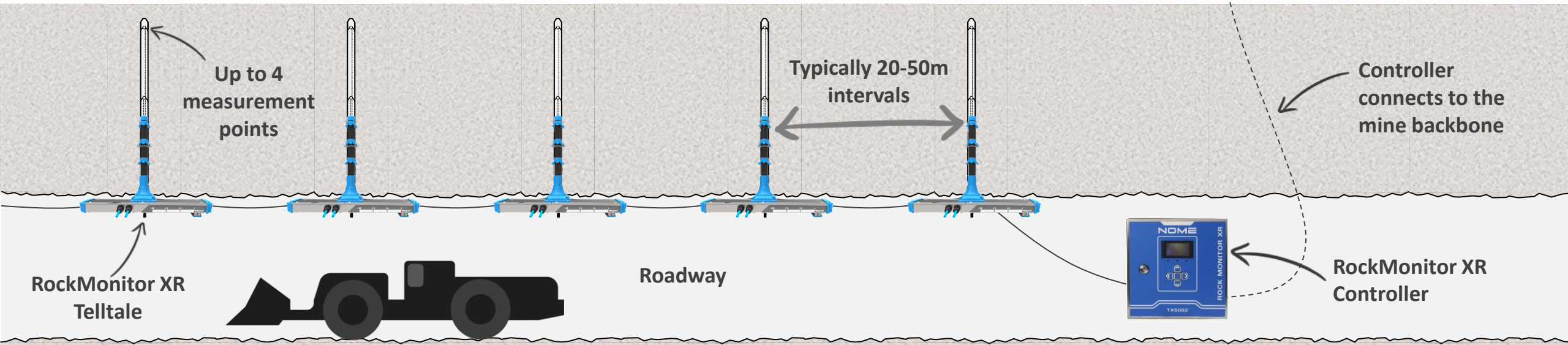
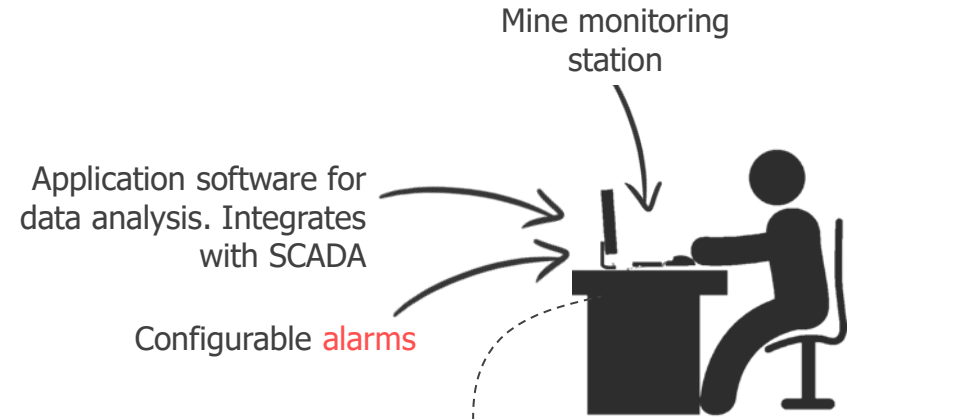


# Continuous Remote Monitoring

RMXR Strata Monitoring

NOME

- Intrinsically safe
- Mine-wide remote strata monitoring
- Data logging and graphical reporting
- Significantly improved operational efficiency and safety
- 150 units up to 10km range
- Plug and Play system - Installed by mine operators



Save Lives, Revolutionise Industries

# ROCKMONITOR XR SYSTEM

NOME



## RockMonitor XR Telltale

Robust, accurate monitoring of strata displacement with up to four measurement points. Positive tension anchor tabs allowing rapid installation and reset

## RockMonitor XR Controller

Collects and stores data from the telltale network and communicates information back to a surface PC or server

## RockMonitor XR Reader

Battery powered installation and maintenance tool for quick and reliable system setup. Data logging capability

## Core Software

Easy to use application software with powerful features for alert configuration, data display and system monitoring

Save Lives, Revolutionise Industries



# CORE SOFTWARE



- Plot telltale positioning on a GIS map for improved safety and monitoring
- Get real-time information on system status and strata movement
- Fully configurable alarms and automated alerts (mine TARPs)





# ALARMS & EMAIL ALERTS



- **Send email alerts** and SCADA alarms at configurable trigger levels
- Multiple **e-mail distribution lists**
- Only relevant people receive required alerts for their department
- CRO can manage alerts via TARP direction

ORANGE TARP TOTAL alarm has been generated for TG808 4.5CT TT0006 located at TG808. Anchor 1 had a read...

 Trolex Core <RRTT@angloamerican.com>  
To: br NOME Core <RRTT@angloamerican.com>, nathan@nomeservices.com.au; john.kelly@angloamerican.com; nimesh.ranpatidewage@angloamerican.com; uwe.ieube@angloamerican.com Sun 29/03/2020 9:30 AM

 If there are problems with how this message is displayed, click here to view it in a web browser.

**NOME CORE**

**TG808 4.5CT TT0006 - ORANGE TARP TOTAL Alarm**

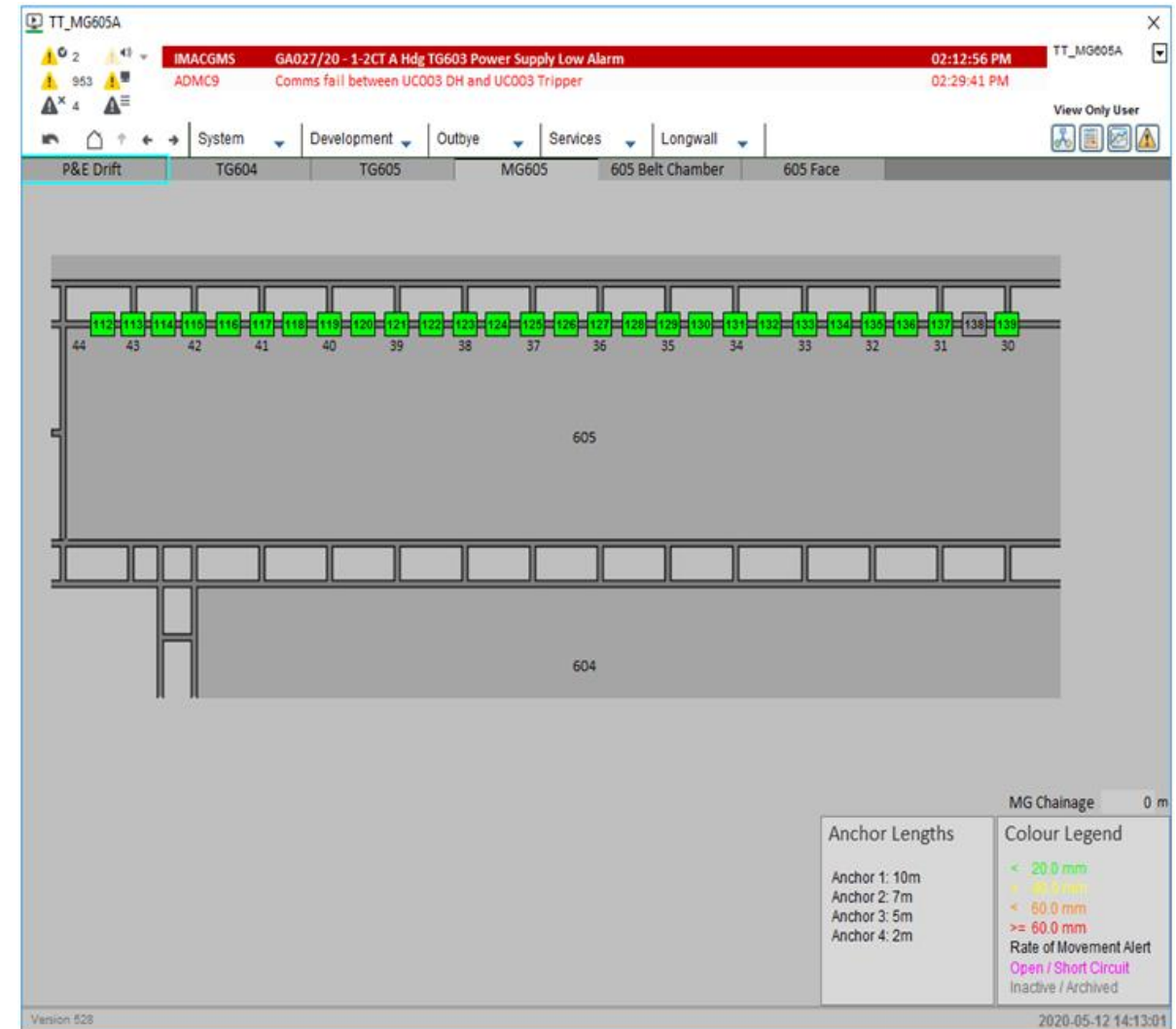
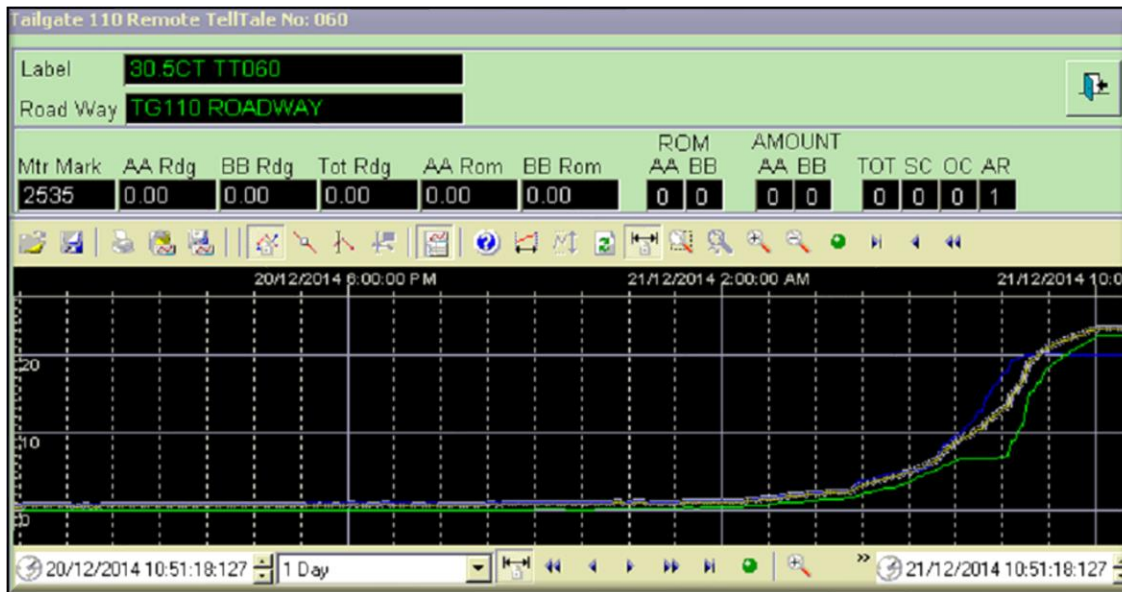
28/03/2020 11:29:40 PM UTC

ORANGE TARP TOTAL alarm has been generated for TG808 4.5CT TT0006 located at TG808. Anchor 1 had a reading of 40.1mm

[Nome Services Pty Ltd](#), 52 City Link Drive, Carrara, Australia, 4211  
Email: [service@nomeservices.com.au](mailto:service@nomeservices.com.au)  
Tel: +61 (0) 756 481 315

# SCADA INTEGRATION

- Available on any console running SCADA
- Live alerts and historical trending
- Is easily integrated with existing manual database software
- Ability to tailor reading frequencies and trigger levels to each site/mine area



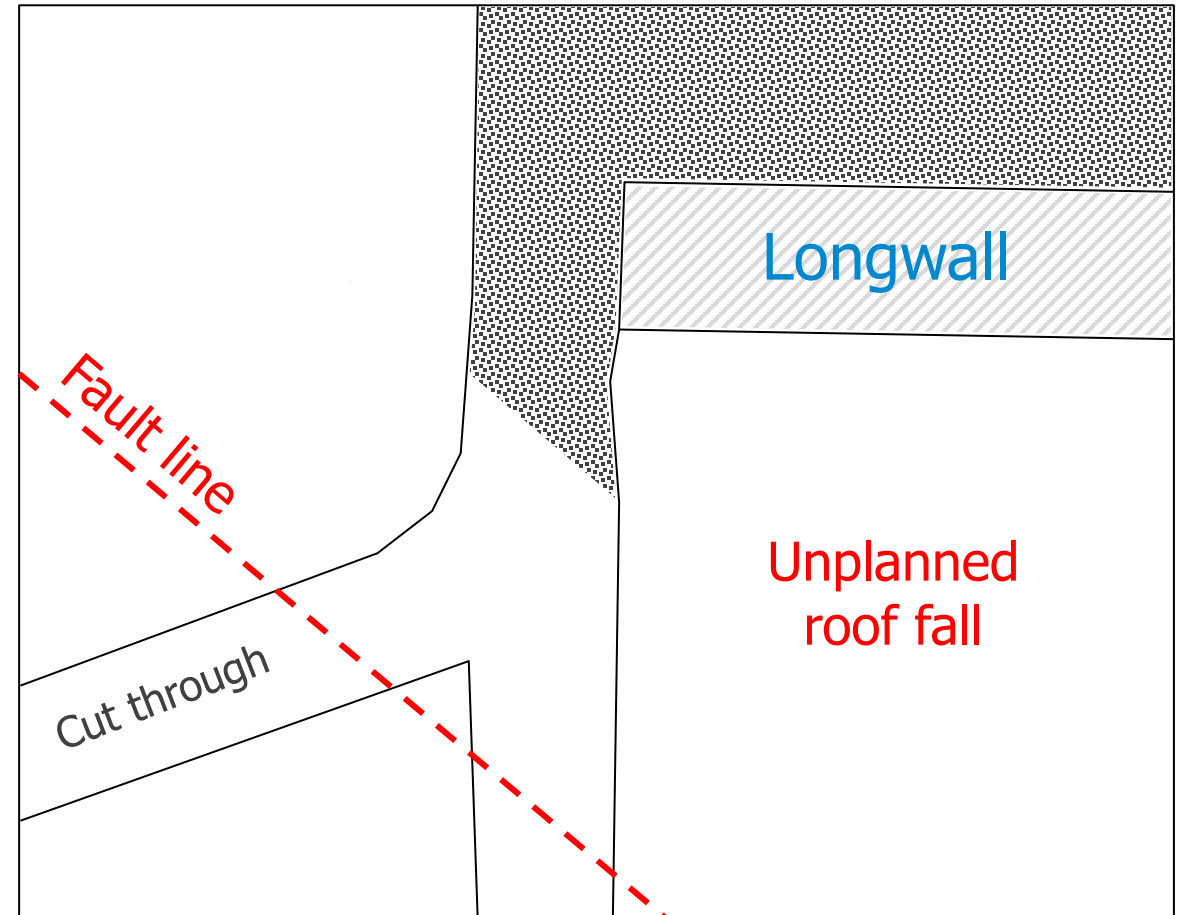
# Applications

- Tunnel Monitoring
- Drift/Decline's
- Backs/Sidewall's
- Gate-roads
- Faceline Monitoring
- Life of Mine Roadways
- Longwall Operations
- Development Operations
- Board and Pillar Operations
- Civil Projects

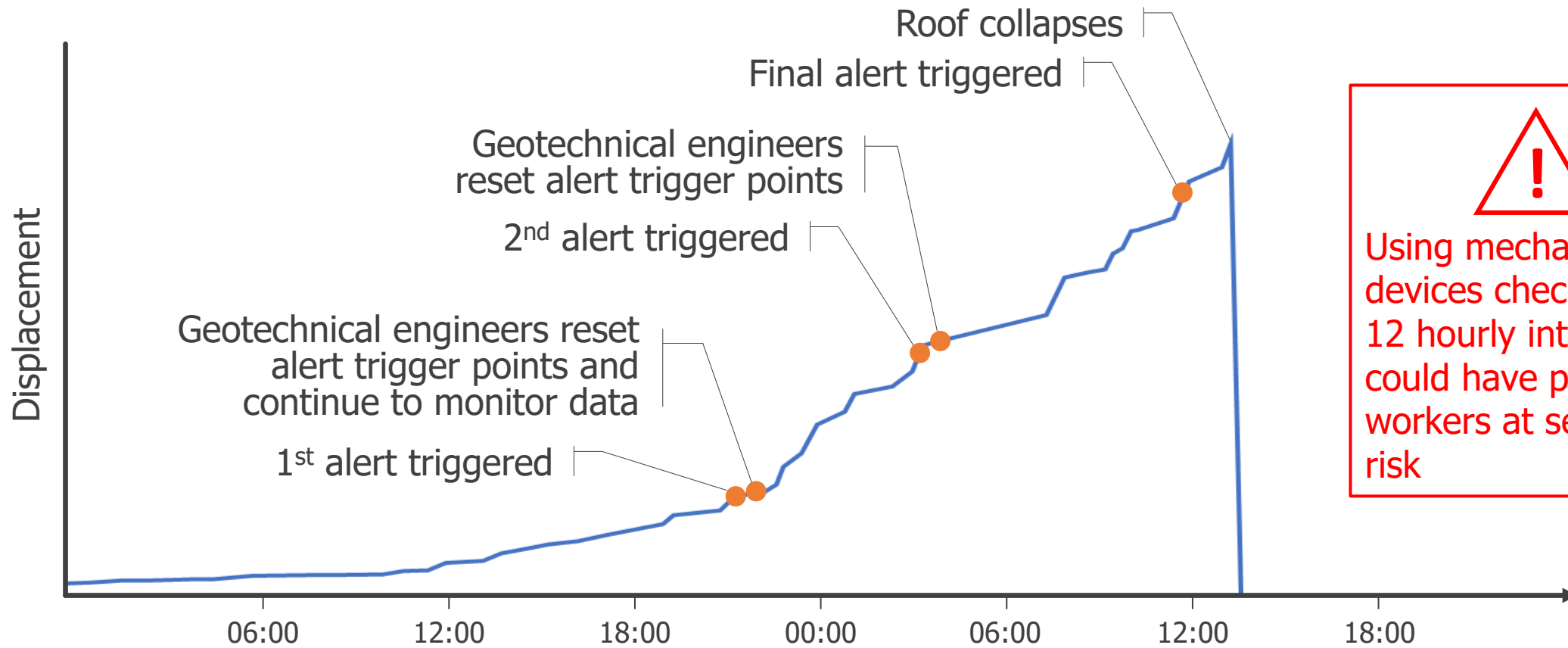
*There are currently thousands of RockMonitor instruments installed in multiple operations across Australia, India, Africa, USA, Canada and Russia.*


# PREDICTING ROOF COLLAPSE

- The RockMonitor system has been proven to give advance warning prior to roof collapse
- **In ALL instances workers were safely evacuated**
- Automated alarms gave early warning of abnormal movement alerting key staff via e-mail
- Continuous, accurate, remote monitoring allowed intelligent decisions to be made
- Impact of the unplanned falls were minimised



# PREDICTING ROOF COLLAPSE



  
Using mechanical devices checked at 12 hourly intervals could have put workers at serious risk



# INDEPENDENT STUDY –

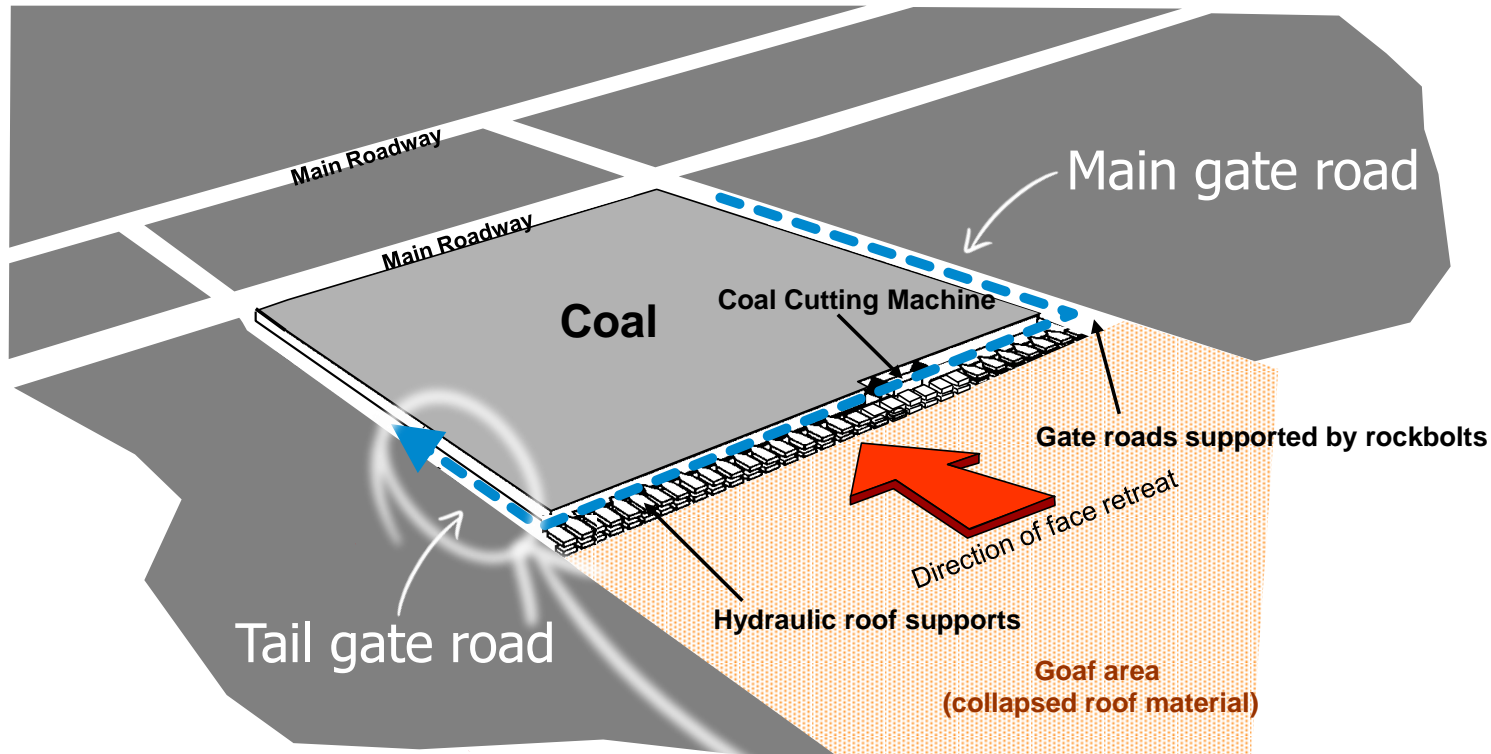


## REDUCING EXPOSURE TO HIGH RISK AREAS

- The installation of remote monitoring in gate-roads has considerably reduced the requirement for inspections in tailgate roadways – thereby eliminating exposure to personnel
- The example below is based on a 3000m longwall block with 3 routine inspections per shift (no maintenance or outbye inspections are included in these numbers)

LONGWALL BLOCK DAYS OF RETREAT	NO RRTT INSTALLATIONS		WITH RRTT INSTALLATIONS		EXPOSURE
	ROUTINE INSPECTIONS PER DAY	TOTAL NO. OF INSPECTIONS	ROUTINE INSPECTIONS	TOTAL NO. OF INSPECTIONS	TOTAL REDUCTION (%)
<b>210</b>	<b>3</b>	<b>630</b>	<b>1</b>	<b>210</b>	<b>60%</b>

# INDEPENDENT STUDY – REDUCED STANDING SUPPORT



Longwall tailgate application

Part of continual drive for 'zero harm'

100m 'outbye' area in tailgate inaccessible ~90% of time

Aim to dramatically reduce the need for standing support



Leading cause of injury and incident was having to erect support (cribs) to prevent strata control problems

# INDEPENDENT STUDY – REDUCED STANDING SUPPORT

NOME



\*Link 'n' Lock wooden cribs

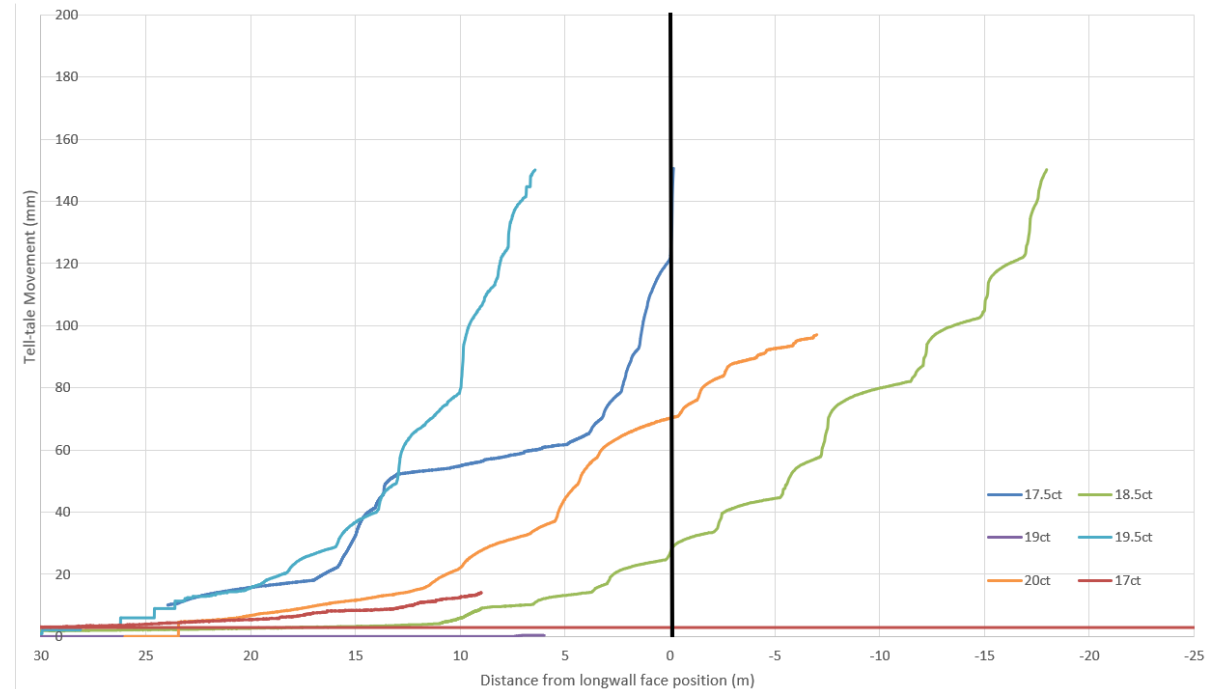
- 49%** reduction in standing supports through greater spacing (data collection and analysis)
- 25%** Increase in up-time each maintenance shift
- 4%** Increase in production rates per week.
- 65%** Reduction in injury/incident reports

# INDEPENDENT STUDY – OPTIMISE TARP TRIGGERS

Real time data provides geotechnical engineers valuable insight into:

- Roof stability
- Effects of changed stress orientation
- Movement by horizon
- Acceleration rates

Using this information in combination with total movement in relation to the face position, can be used to establish baseline roof movement behaviour and help develop appropriate TARP triggers.



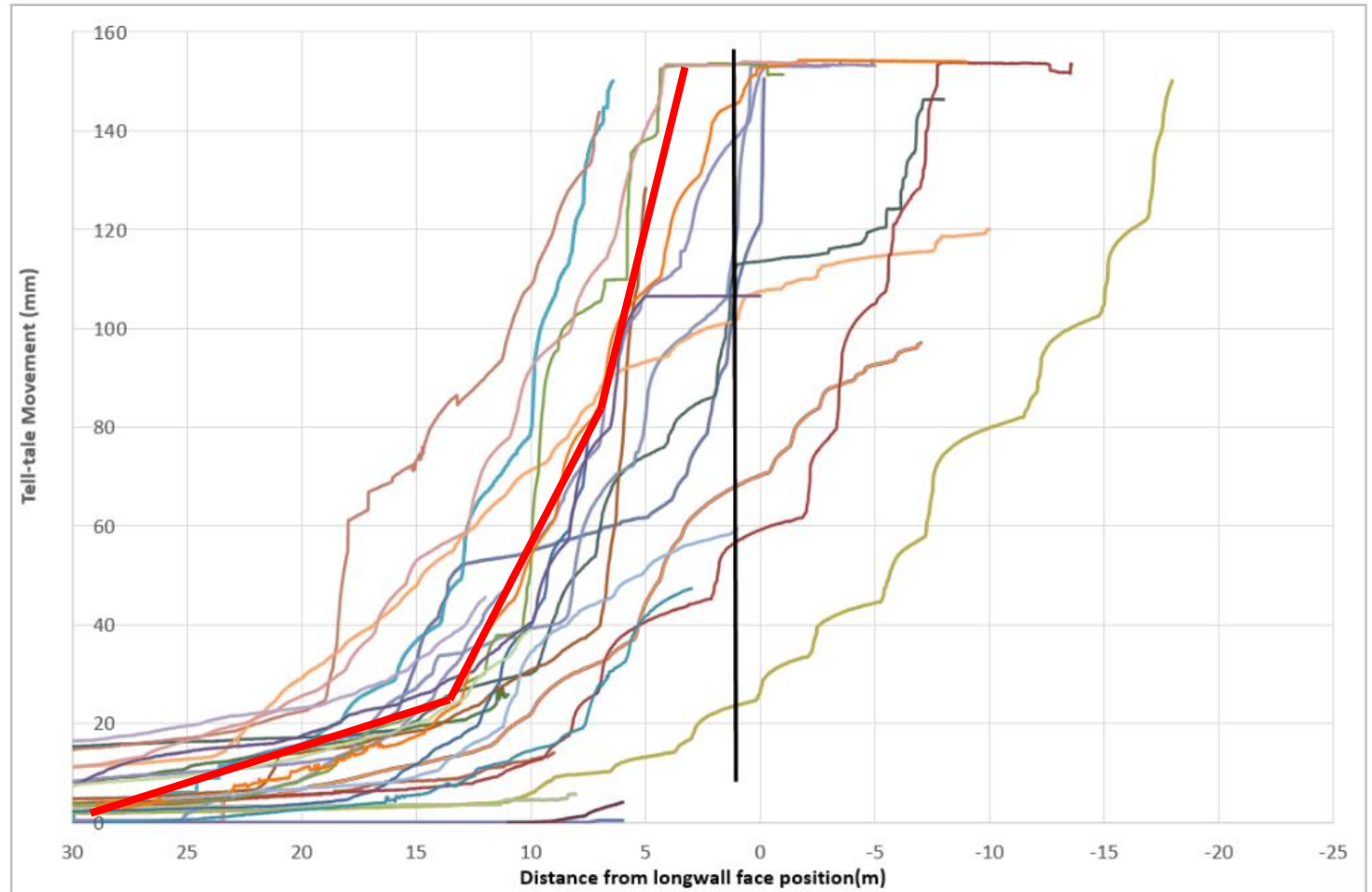
RRTT device (ct)	Total Movement (mm)	Movement by Horizon (mm)			
		0 - 1.5m	1.5 - 3.5m	3.5 - 5.5m	5.5 - 8.0m
20ct	97	49	20	22	0
19.5	150	44	52	43	10
19	-	-	-	-	-
18.5	150	48	76	26	0
18	-	-	-	-	-
17.5	150	101	33	16	0
17	14	9	4	0	0

# INDEPENDENT STUDY – ESTABLISHING BASELINE BEHAVIOUR

The case study shown in this slide indicates that there is a change in acceleration rate at approximately 30mm and 80mm.

This continuous feedback loop has been proven to allow sites to optimise their TARP triggers.

When we know what “normal” looks like we can respond effectively and make educated design recommendations for support requirements in the future.



- Remote monitoring provides **significant benefits** vs. manual, including a dramatic increase in safety.
- RockMonitor have been **proven** in some of the world's largest mines.
- Instruments now able to be installed directly from continuous miner **by operators**, as part of standard mining processes.
- Efficiency improvements gained through **increased production** and reduced manual checking can provide significant savings.



## Continue the Automation Journey!

- SMART junction box being designed and certified to allow for automated disconnection and in conjunction with remote operating centres.
- University collaboration to incorporate machine learning.
- Predictive TARPS for proactive not reactive planning.
- Proximity detection included for exclusion of personal from areas when trigger points reached.

**THANK YOU**  
Questions?