Implementing a wireless emergency response radio system

inc. enhancing first response systems for the NSW coal industry

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Overview

1. About us
2. Selection of replacement radio system
3. Radio system design and implementation
4. Operating the radio system
5. Brigade training update

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About us

- 24-hour emergency response
- Equipment and technical support during an incident
- Underground brigades training
- Emergency simulations
- Emergency Management System audit and review

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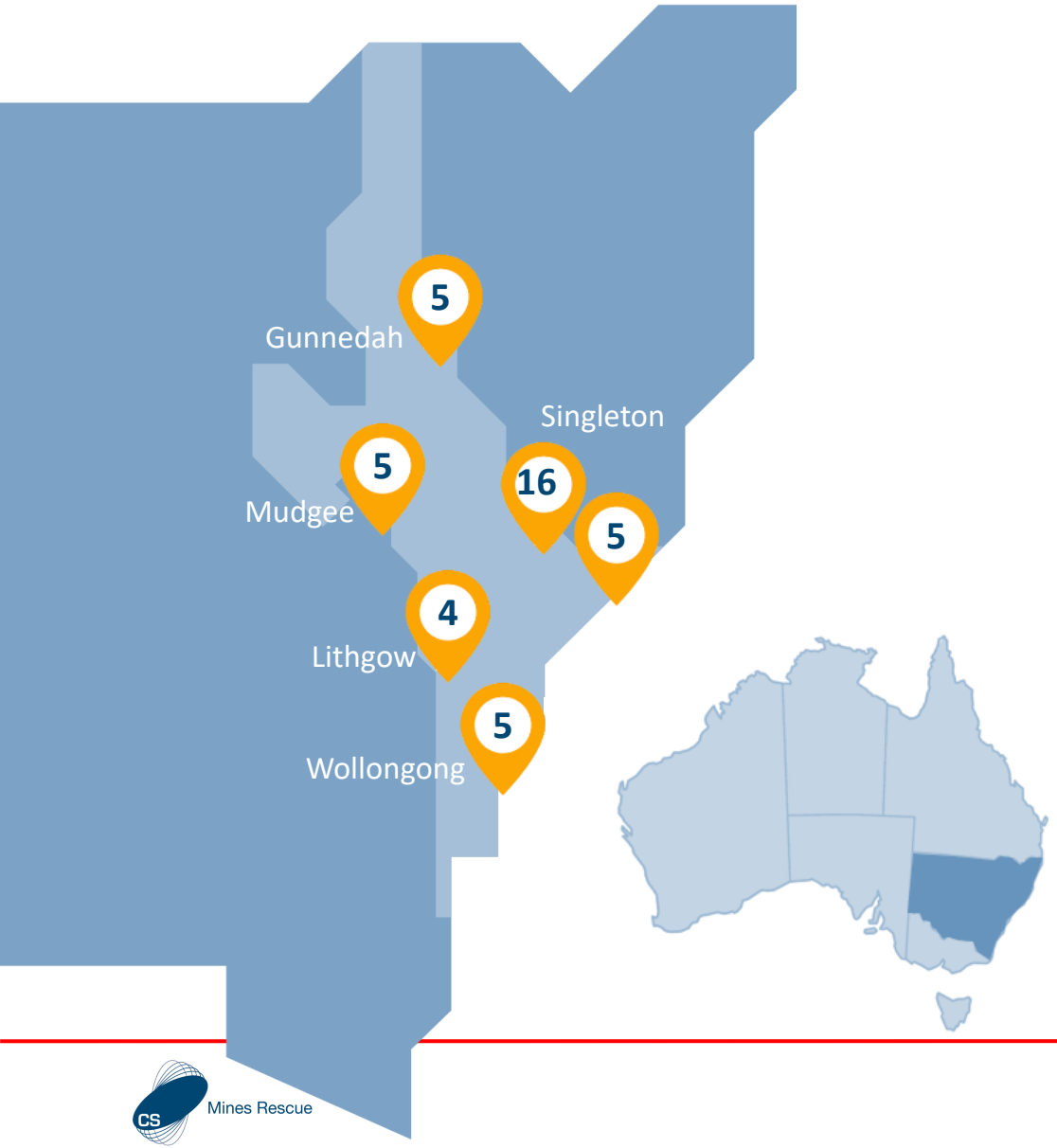
NSW coal industry



Number of mines	40
Production employment	24,984
Exposed to risk*	38,451
Raw coal production	221.2 million tonnes
Exports	139.6 million tonnes

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Financial year data as 30 June 2023
*persons insured by Coal Mines Insurance workers compensation scheme at 30 June 2023

Our history

1923 — Bellbird mining disaster (21 fatalities)

1925 — *Mines Rescue Act 1925*

1926 — First mines rescue station established

1996 — Mines Rescue is established as a Registered Training Organisation (RTO)

2002 — Coal Services is created under the *Coal Industry Act 2001* (NSW)

2004 — The first virtual reality simulator officially opens at Newcastle Mines Rescue

2019 — VR headset technology

2020 — Mines Rescue Consulting established

2023 — Completion of Cert III Emergency Response & Rescue

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Mines Rescue

Selection of a new radio system

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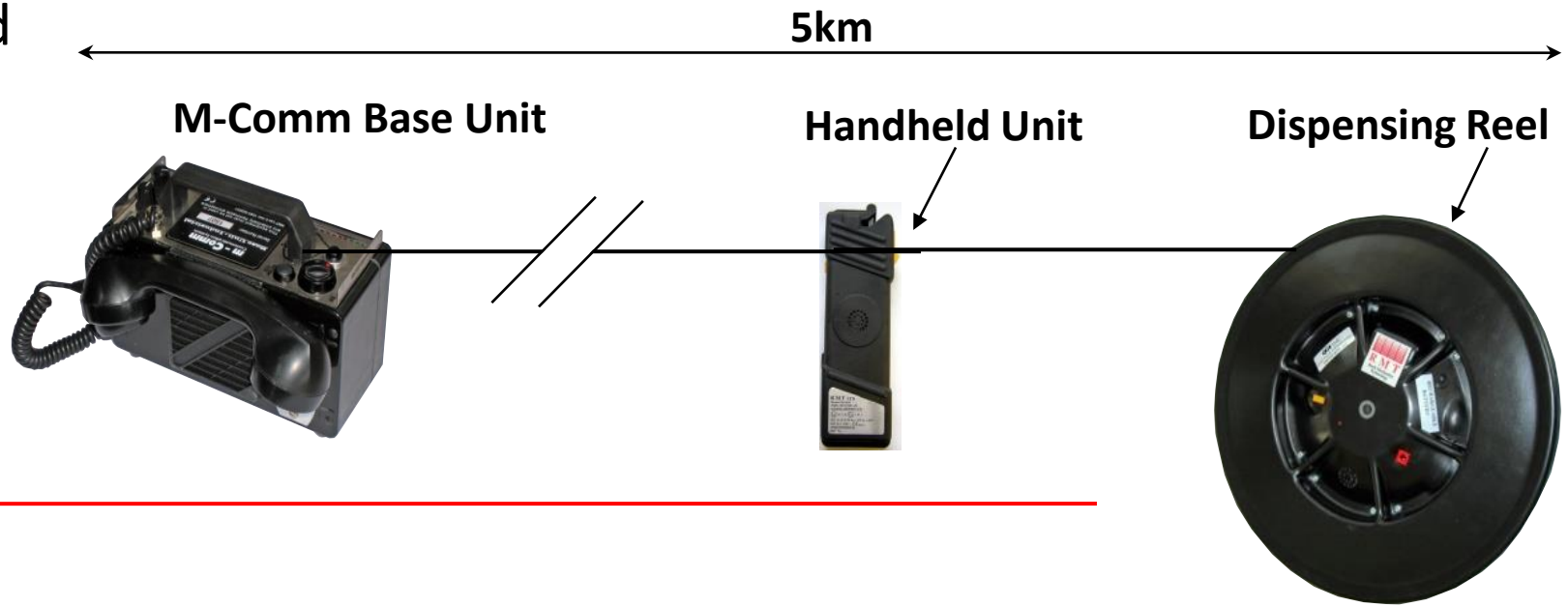
Emergency response radio system – Mcomm system replacement

- The manufacturer of the Mcomm system announced that they would not be supporting the equipment, rendering the system obsolete
- The Mcomm system compromised a hand held unit, a portable base unit and lightweight guide wire on a reel
- The system was reliable and relatively simple to operate



Analysis of radio system replacement options

Functionality and specifications:

Required	Desirable
• Meets Australian Mining Regulations • Reliable system with clear communication • Low weight, ergonomic and easy to transport • Specific Absorption Rate (SAR) below limit required by Australian Regulations • Ease of use over long distances	• Ability to trace the location of the rescue team • Hands free communication

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2rhp ReSys Wireless Communication System

Basic information about ReSys:

- Continuous, two-way (full-duplex) voice transmission among members of a rescue team
- Wireless audio communication
- Fast network building
- Simple to use
- Complies with intrinsic safety requirements

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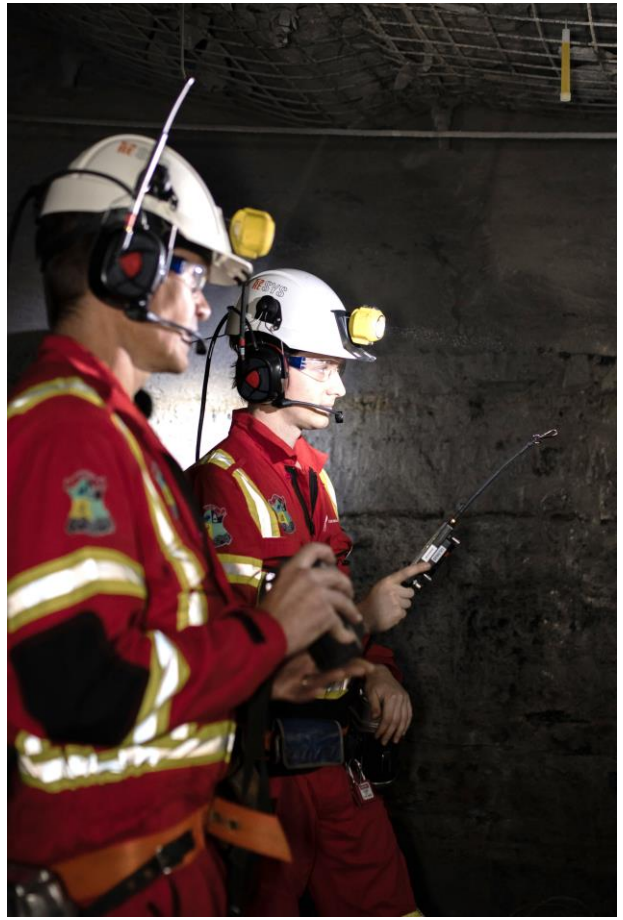
ReSys system overview



ReSys system components:

- Personal communicators
- Repeaters
- Fresh-air base unit
- PC Application
- Fibre optic convertor
- Ethernet gateway
- Battery charger

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ReSys system overview

Unique ReSys functions:

- Handsfree system
- High quality audio and noise cancelling (clear communication with high noise levels)
- Single network shared by all rescue teams
- Batteries can be replaced in explosion hazard zones
- The system operates at 840MHz and 880/882MHz frequency
  - 2rhp et al. research has proven the most effective radio wave propagation is between frequency of 800 and 900 MHz in mines
  - This frequency allows the system to use less power and less devices to build the network

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Challenges with implementation

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Approval to use the ReSys system

- Licensing to operate
- Control of devices at the operational frequency of the ReSys system
- Operating frequency crossed over with Australia's main telco provider

COMMONWEALTH OF AUSTRALIA
AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY

Radiocommunications Act 1992

SPECTRUM LICENCE FOR THE 800 MHz BAND

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Approval to use the ReSys system

- Radio testing to determine effect on mobile phone network
- Tests supported Mines Rescue to enter operate the system under Telstra's Spectrum License
- Limited to use the system underground (800MHz range)

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ReSys Wireless Communication Training System

- 2rhp understood our need to use the system at our training facilities and developed a solution so the radio can be used on the surface

- This involved designing a Radio Training System (RTS) that enables the system to be used at the 2.4GHz frequency at our stations

- The RTS simply adds a component (transceiver) to the repeater so the system operates at 2.4GHz and cannot easily be changed to the underground frequency

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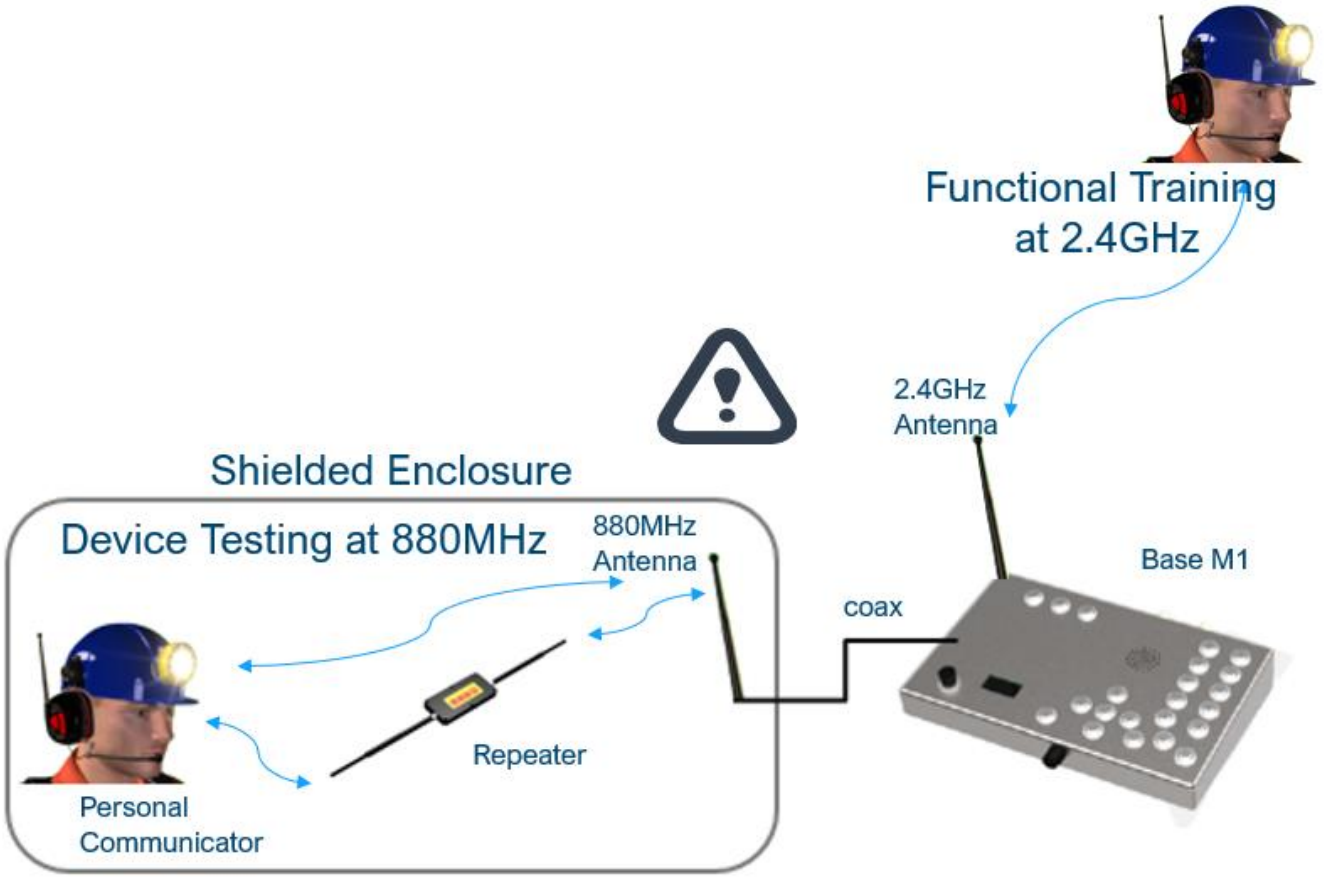
System design for use in Australia

- Mines Rescue uses the system in two modes (underground and surface training)
- Engineering controls designed and implemented to minimise the risk of operating at incorrect frequency
- Changing modes is simple for trained operators but requires consecutive actions



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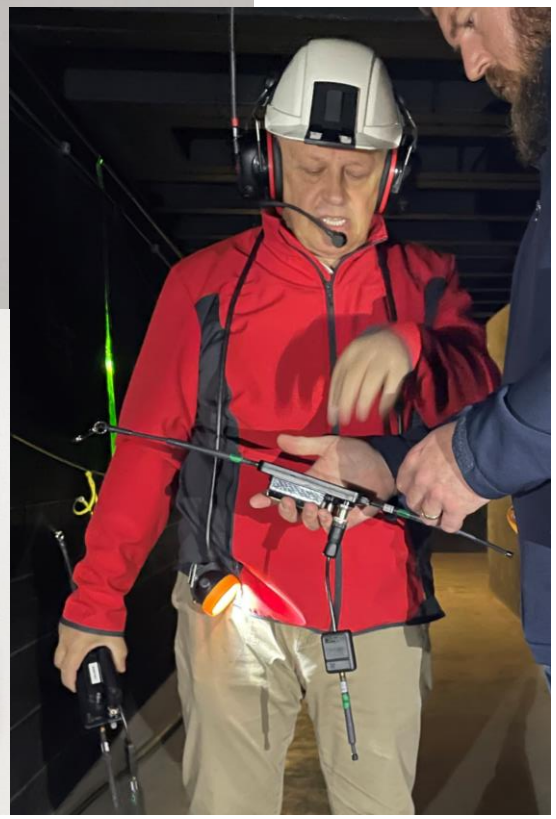
Using the system in training mode



- The transceiver (pictured top left) is simply screwed into the repeater and Base Station
- The RTS (pictured lower left) is set up to provide background frequency to initiate training mode
- Once transceiver attached, system components will recognise that the system is in training mode (2.4GHz)
- Personal Communicators always turn on in training mode
- Personal Communicators also have voice notification that inform the wearer of what mode the Personal Communicator is in

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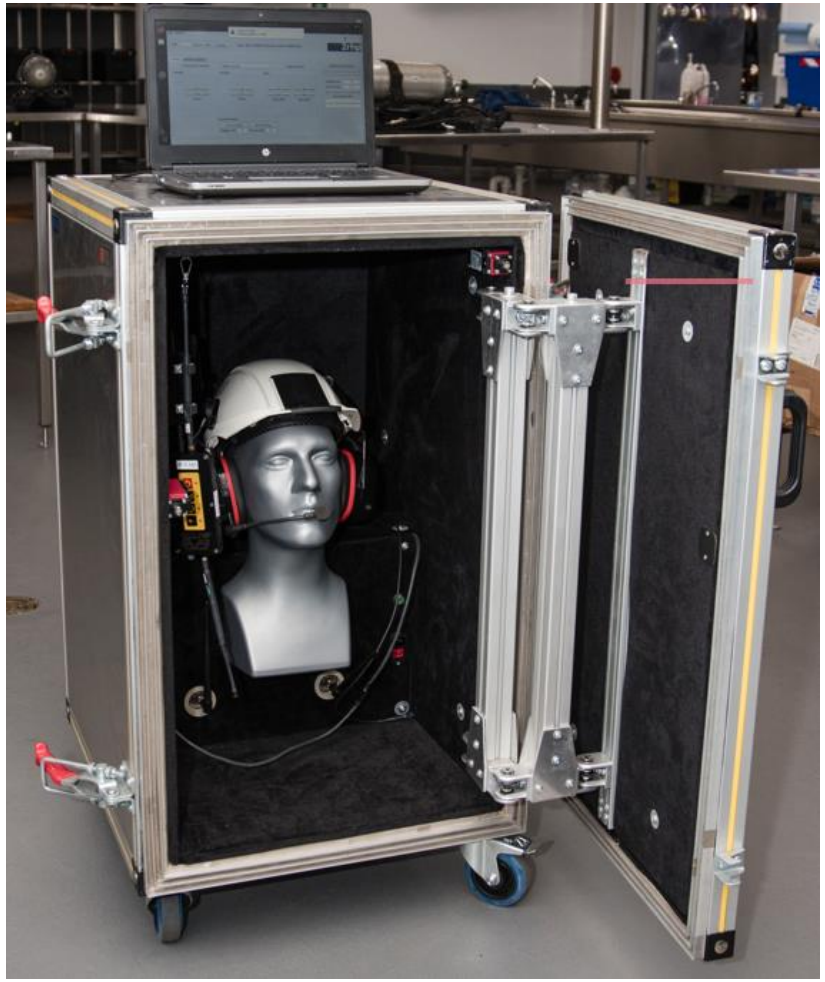
Testing the system for underground use



- 2rhp designed a “Test Box” (pictured) to allow testing of the system at the 800MHz frequency range
- The Test Box prevents radio frequency emissions when the door is closed
- Telstra tested and approved the use of the Test Box
- The Test Box connects to a PC with ReSys software installed that controls functional testing, fault finding and allows remote login (e.g 2rhp in Poland)

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Original Equipment Manufacturer (OEM) Training

- 2rhp provided two experts to deliver training to our staff in Australia
- Training covered using the RTS and underground modes, maintenance and trouble shooting

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Preparing the system for use

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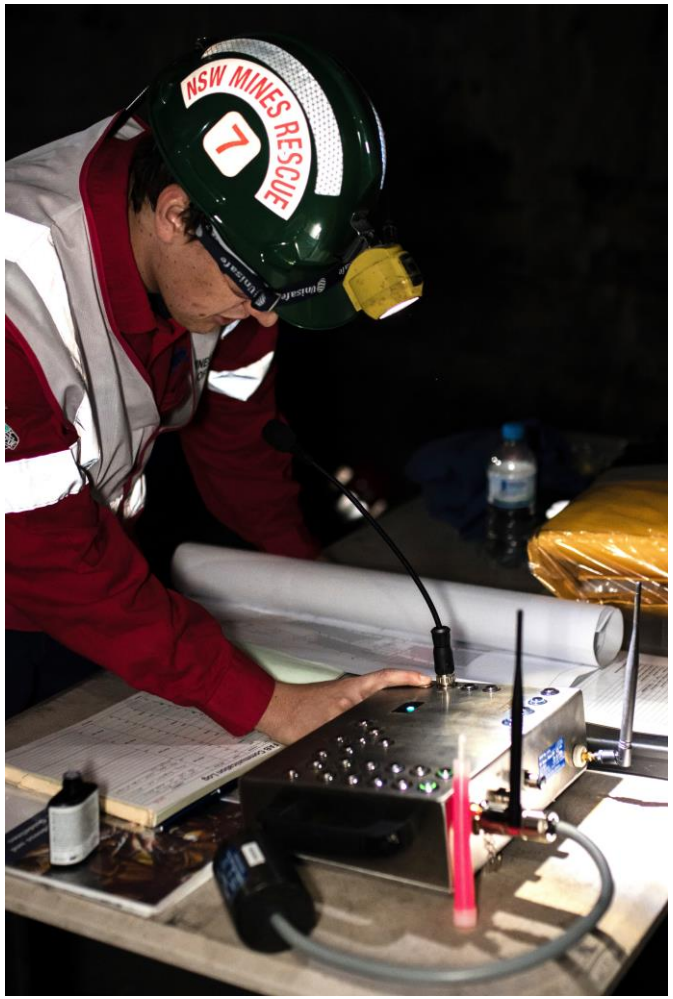
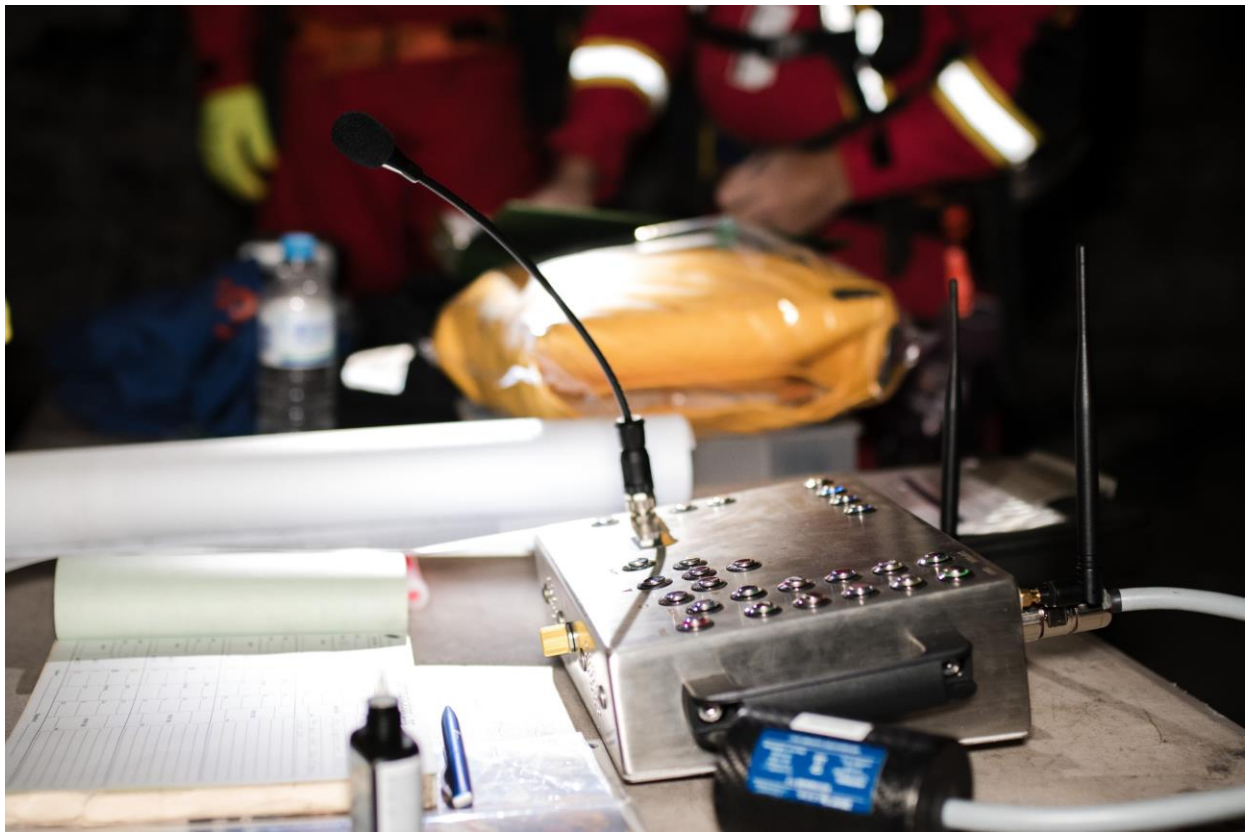
Base station at fresh air base





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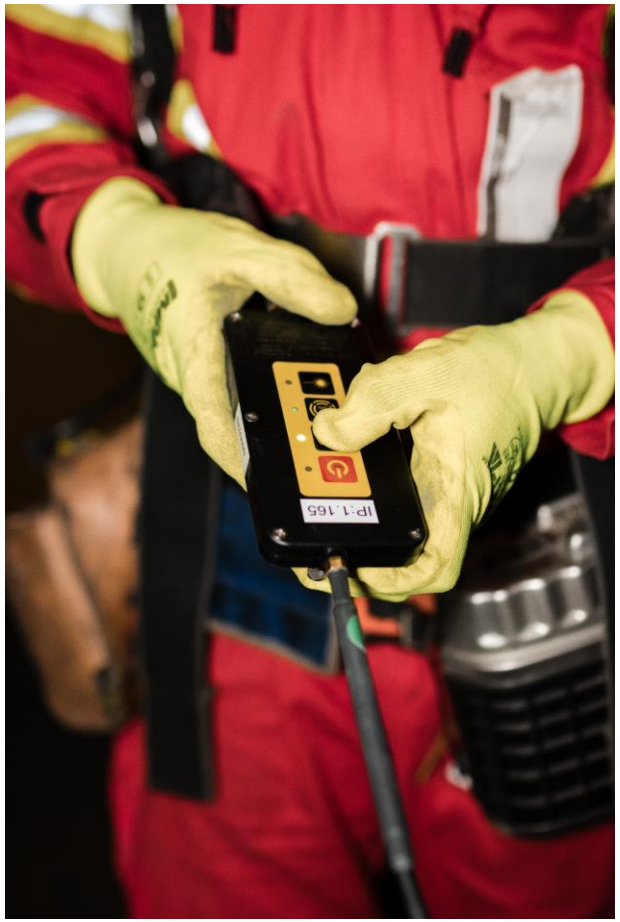
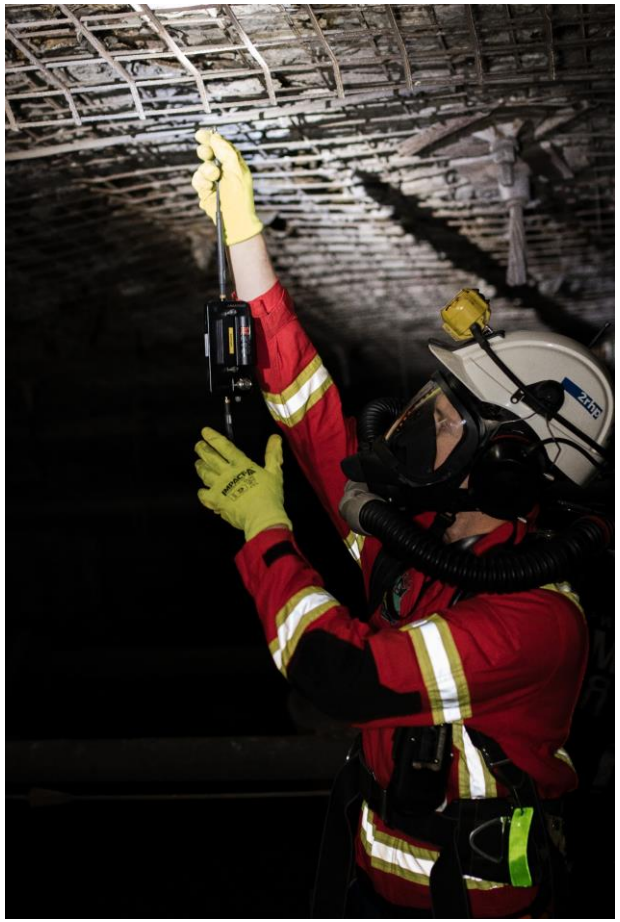
Building the network





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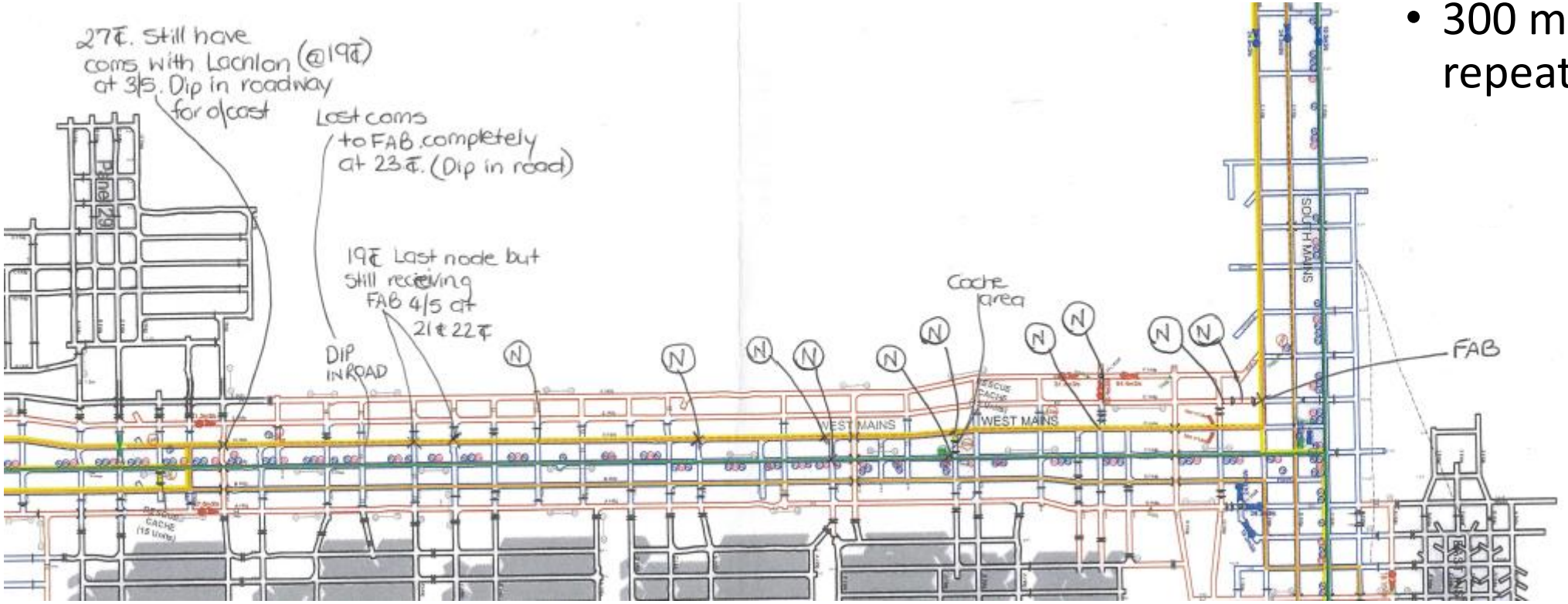
Underground training

- Travelled 1,000 metres with 10 repeaters
- 300 metres from last repeater in straight line



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Monitoring team location

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Next steps

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Next steps

- Training on the system to be provided to all Mines Rescue Brigades Members (+450)
- Implementing software to monitor team location
- Establish remaining equipment in each mining region
- Post implementation review – iterate our Procedures and Training (if required)

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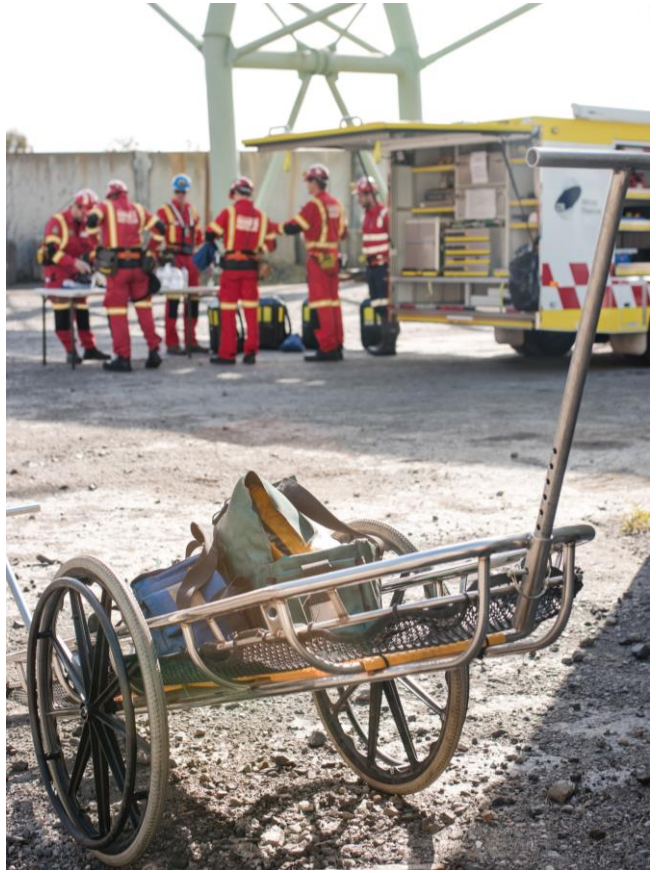
Benefits of the system

- Ability to maintain constant communication with rescue team/s
- Ability to monitor approximate positions of rescue team/s in the mine
- Improved response times through ease of network establishment
- Travel distance for rescue teams is not limited by communication
- Safe to use in explosive atmospheres
- Improved communication between team members
- Strong support from the OEM



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Enhancing first response systems for the NSW coal industry

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Brigade Training Program Post Cert III

Brigade training program currently transitioning to a highly practical program covering:

- Scene assessment and management
- Communication
- Long duration search and rescue
- Trauma management
- Fire fighting
- Extrication
- First response underground

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Mines Rescue would like to thank

Yancoal and 2rhp

for their assistance in the review, trial and implementation of the ReSys Wireless Radio System

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MINES RESCUE SERVICES South Africa
INTERNATIONAL MINES RESCUE BODY CONFERENCE 2023

Mines Rescue

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