minecom
The leader in Mine Communications

Thank you for the opportunity of speaking before you today on the subject of -

Wireless Communications and Tracking in a Mining environment

Copyright MineCom 2006

MCA1000 - VHF
MCA2000 - UHF
MCA3000 - 800MHZ
MCA4000 - 2.4GHZ

MINECOM

the leader in mine communications.

the leaky feeder people™

A brief introduction to

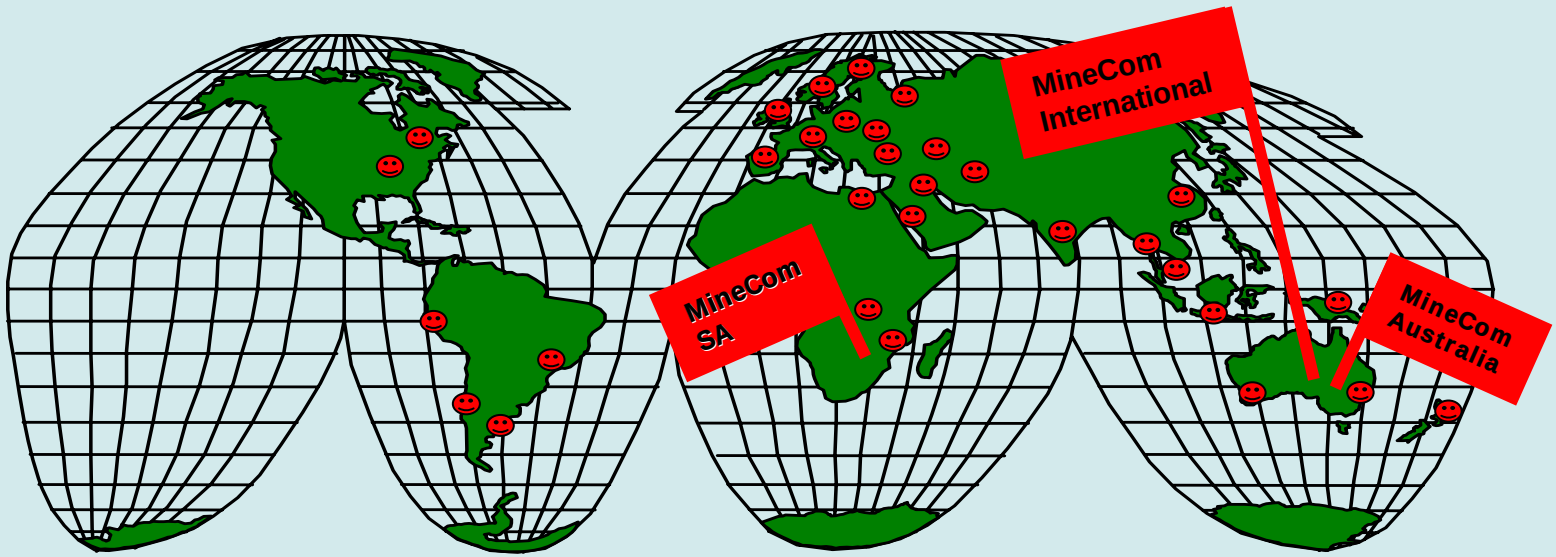
minecom

Copyright MineCom 2006

minecom holds ISO9001-2000 quality assurance certification from SGS

Copyright MineCom 2006

minecom has offices and factories in Australia and South Africa, with distributors located around the world.



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We are represented in the USA by-

Pyott-Boone Electronics

a world renown company in the field of mining electronics equipment

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MineCom has been designing & manufacturing products for the mining industry for the last 19 years

Copyright MineCom 2006

- Leaky Feeder Backbones
- Wireless Automations Systems
- Personnel & Vehicle Tracking Systems
- Block-Light Systems
- Heavy Duty Radios
- Collision Avoidance
- Traffic Management Systems

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"Redundant Communications to protect a mines Assets"

Copyright MineCom 2006

‘ASSET’

One dictionary quotes the following –

An asset is a resource having economic value that a corporation controls with the expectation that it will provide future benefit.

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‘People are Assets’

….therefore they MUST be protected, so that they can continue to provide ‘future benefit’ to the corporation they work for

Copyright MineCom 2006

‘Redundancy’

Dictionary quotes in relation to *Electronics*

+ **Duplication or repetition of elements in electronic equipment to provide alternative functional channels in case of failure**

+ **a system design that duplicates components to provide alternatives in case one component fails**

Copyright MineCom 2006

‘Redundancy’

Dictionary quotes in relation to *Electronics*

+ Repetition of parts, or all of a message, to circumvent transmission errors.

+ Repetition of messages to reduce the probability of errors in transmission

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TENDER

Mine Communications System

Moncks Mining Corporation requires a ‘fully redundant’ communications system for their Moncks No. 1 underground coal mine.

The communications system MUST BE fully redundant

i.e. continue to operate under all conditions, including explosion/rock fall/ cable break

Contact – Ed Jones

Tel:- 804-363-7112

Copyright MineCom 2006

minecom introduced

RINGFeeder®

the first

REDUNDANT

leaky feeder based communications system

5 years ago

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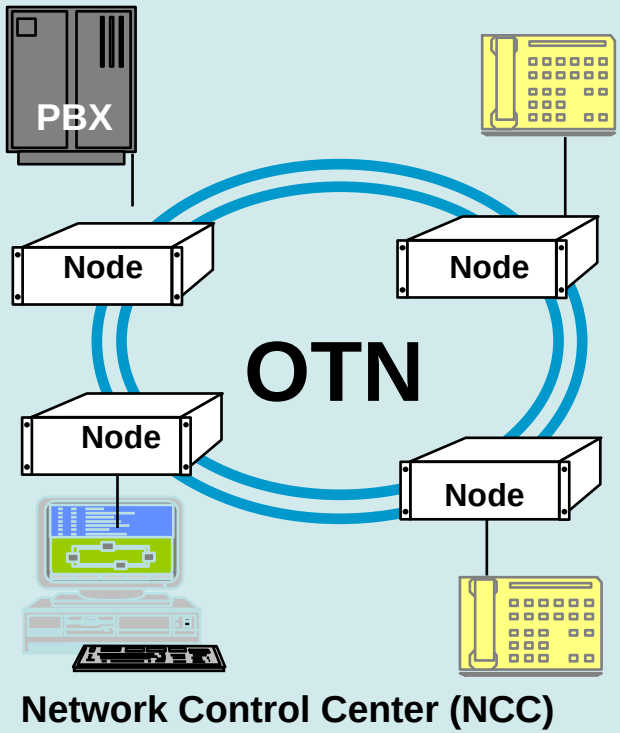
Similar to a Fibre Optic Self Healing Ring Architecture



….if the fibre ring was broken, the traffic would be automatically routed around the cable break.

Copyright MineCom 2006

In 2005 minecom introduced

SMARTReverse

the FIRST

FULLY REDUNDANT

leaky feeder based

communications system

Copyright MineCom 2006

SMARTReverse

was originally developed for main line rail tunnel networks, to provide continuous communications under all conditions

Copyright MineCom 2006

For *SMARTReverse* to be
'fully redundant'
there must be at least
(2) TWO egress points
into the underground tunnel network

Copyright MineCom 2006

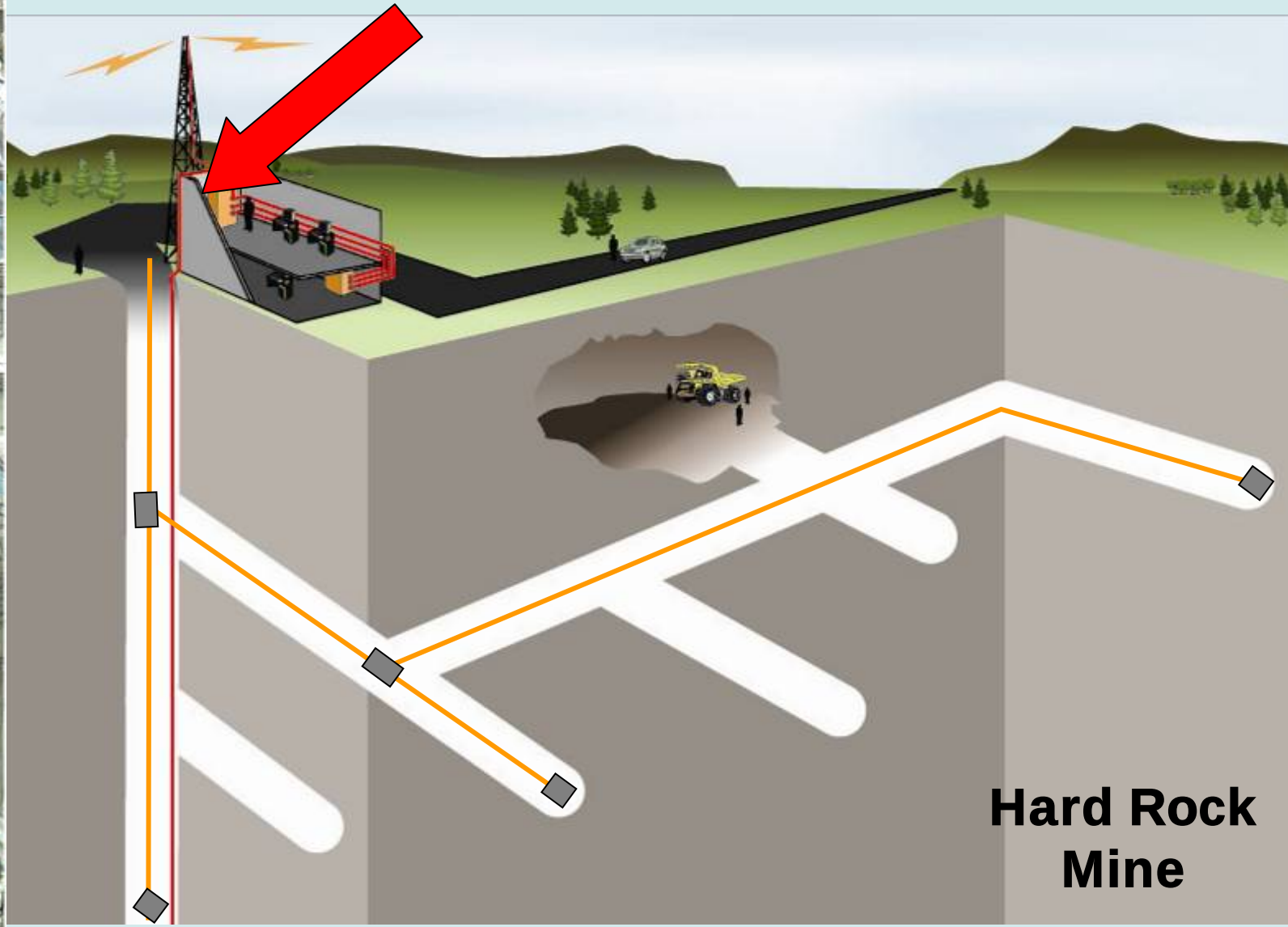
Secondary egress can be via a –

- Return Air Shaft
- Skip or Cage shaft
- Escape way shaft
- Vehicle decline
- Bore Hole

The bore hole can be as small as 4 inches dia, it only needs to carry one or 2 cables

Copyright MineCom 2006

SMARTReverse…NO - only one egress point



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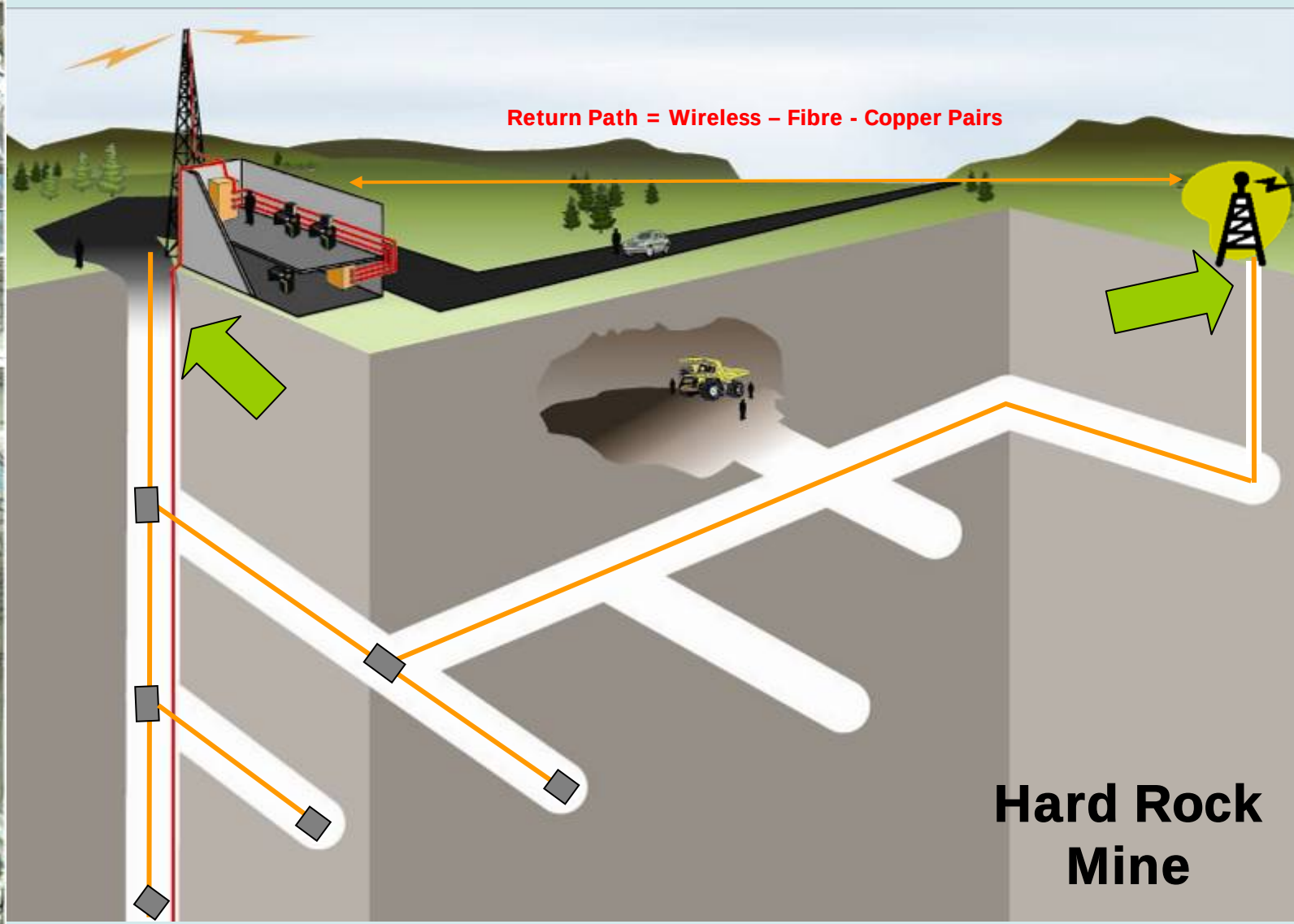
SMARTReverse.....YES - TWO egress points



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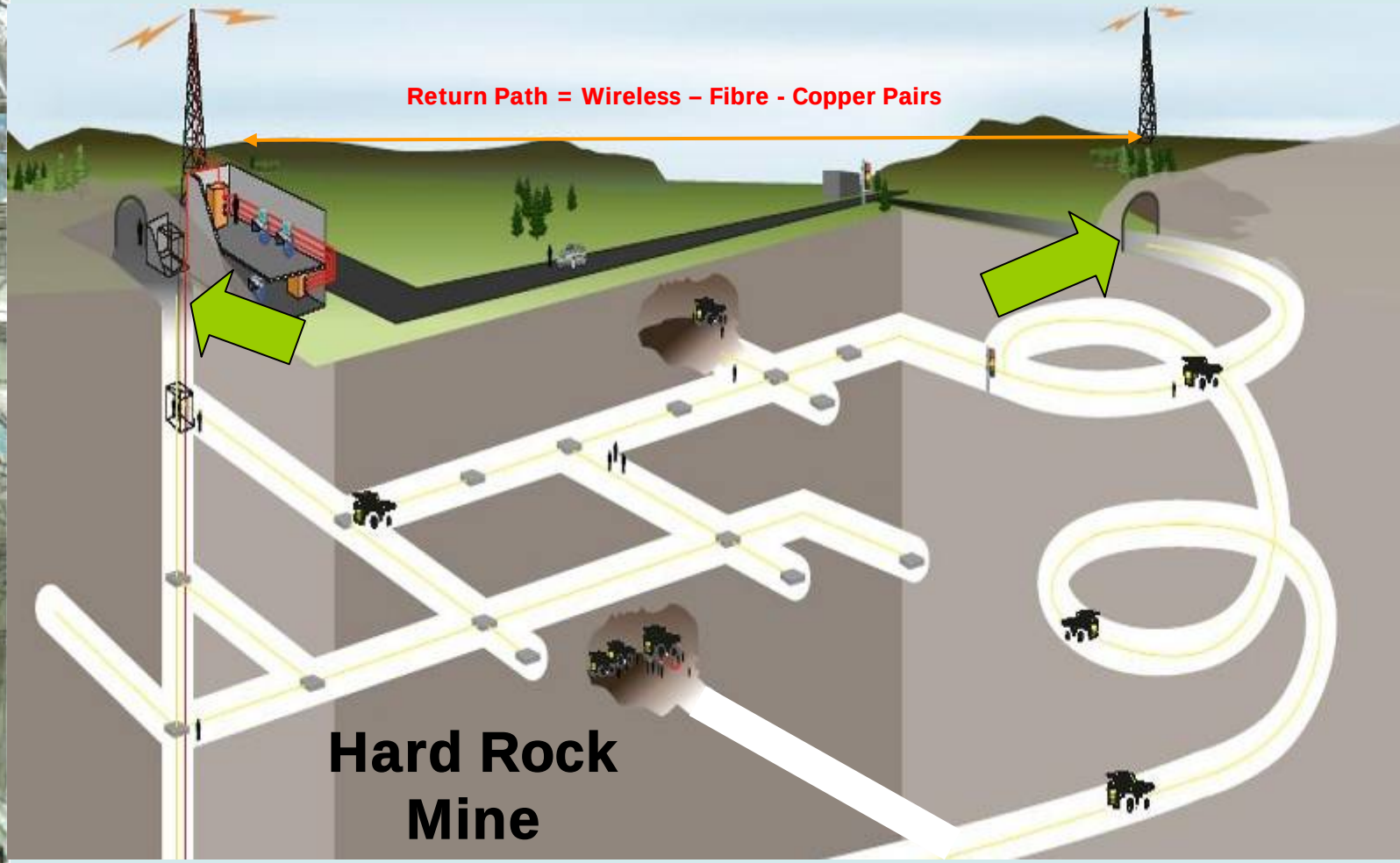
SMARTReverse…….YES - TWO egress points



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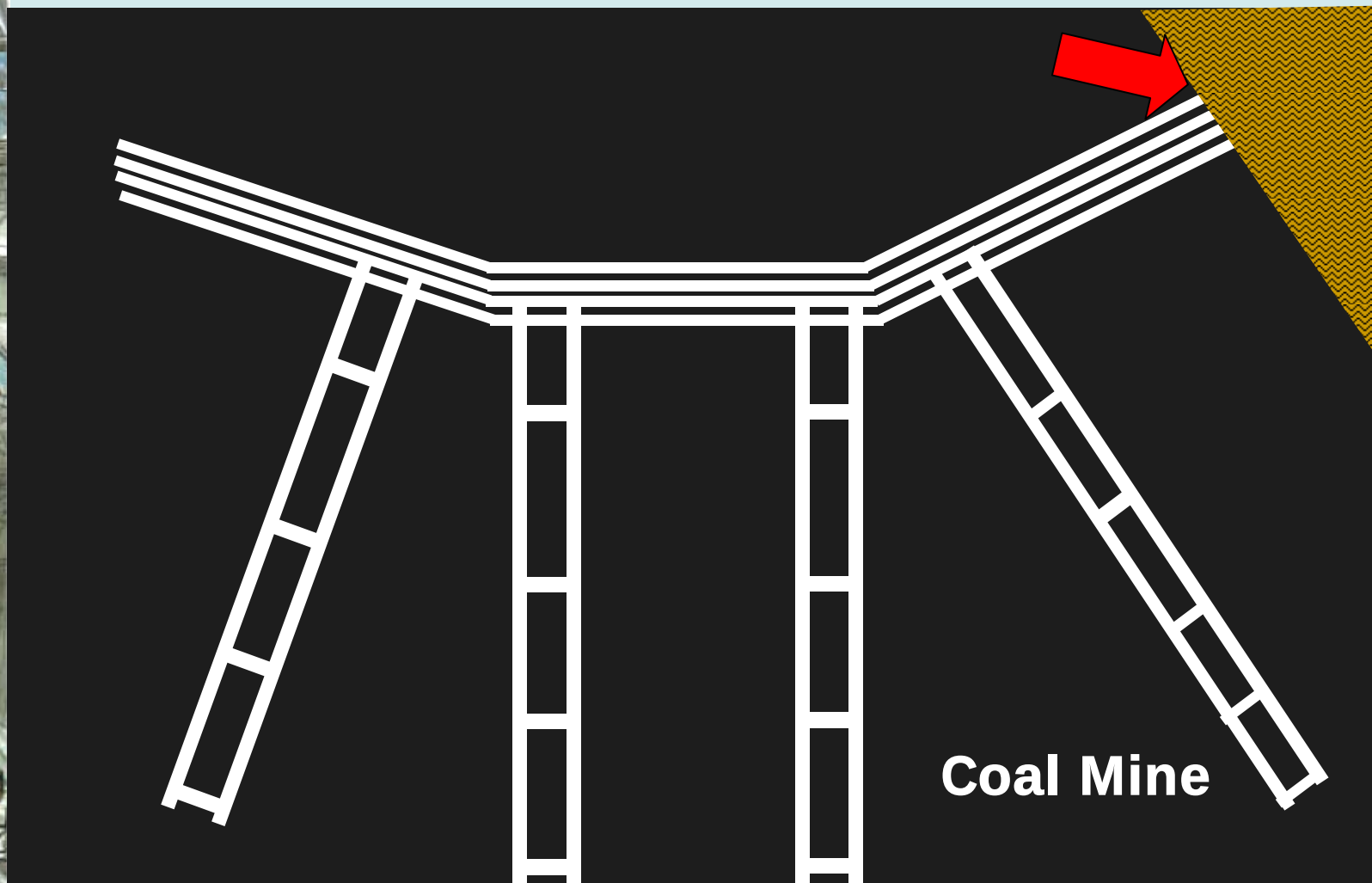
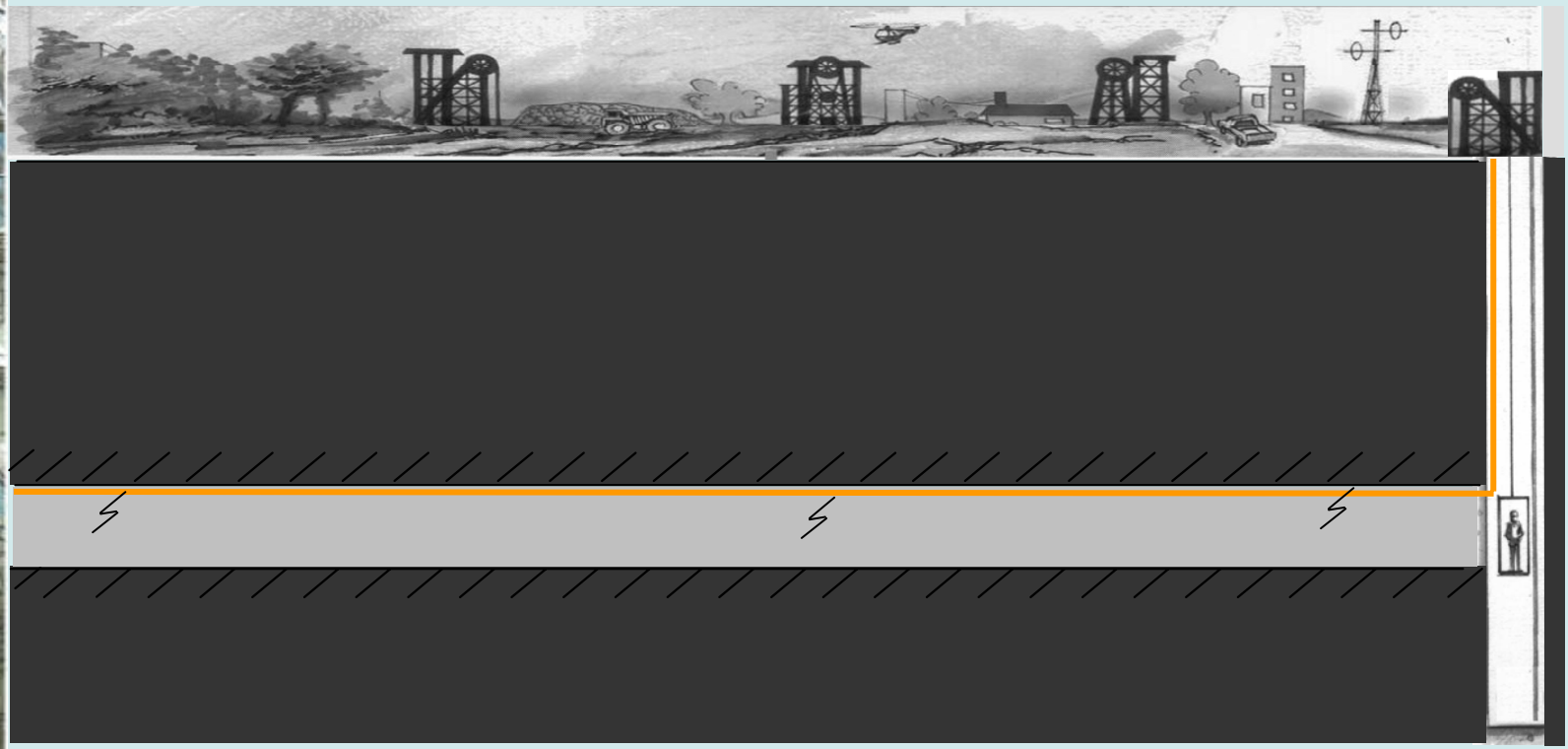
SMARTReverse…NO - one egress point only



With only one egress point SMARTReverse cannot operate in this mine



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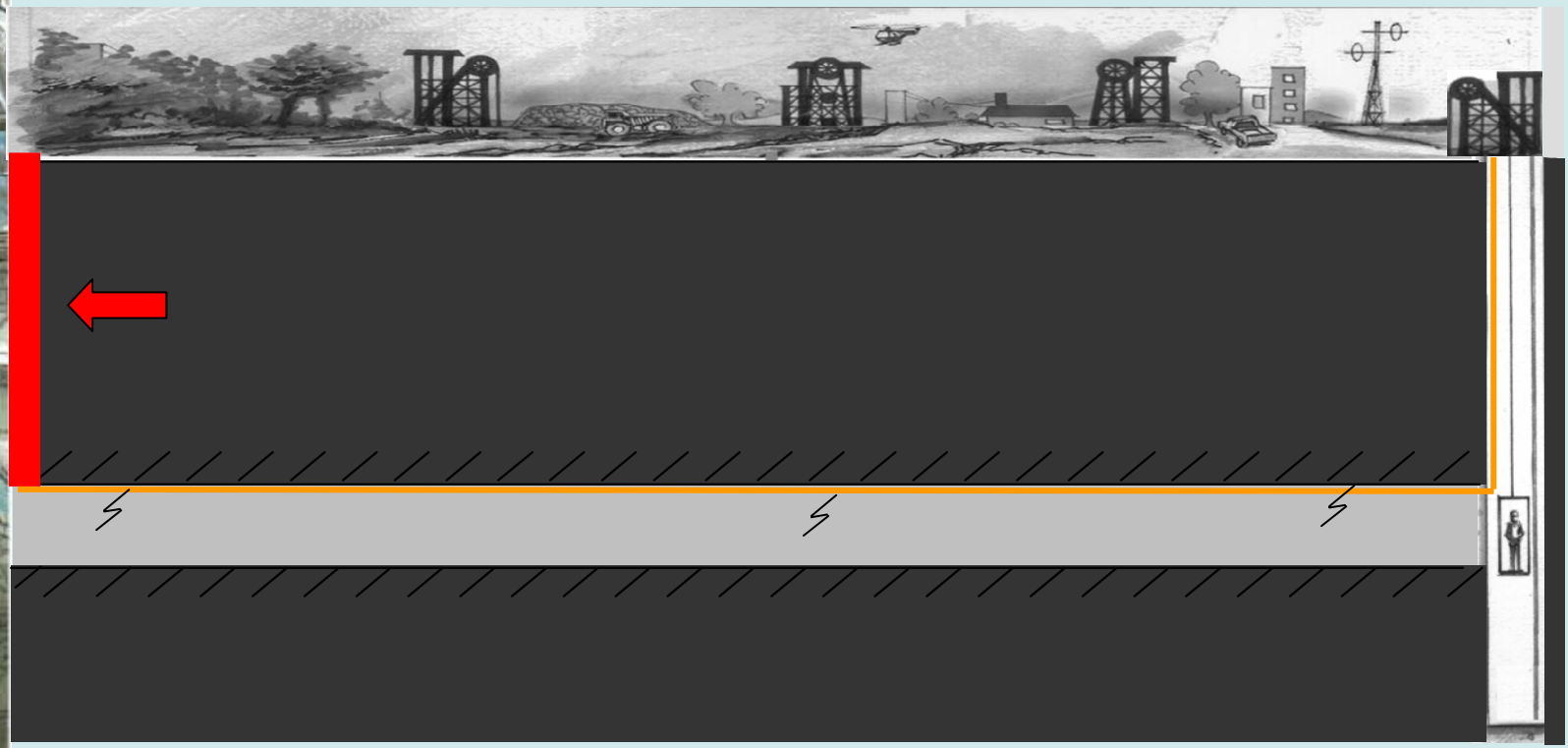
Option 1



Drill a 4 inch bore hole from the surface down to the working level to provide the return path for SMARTReverse

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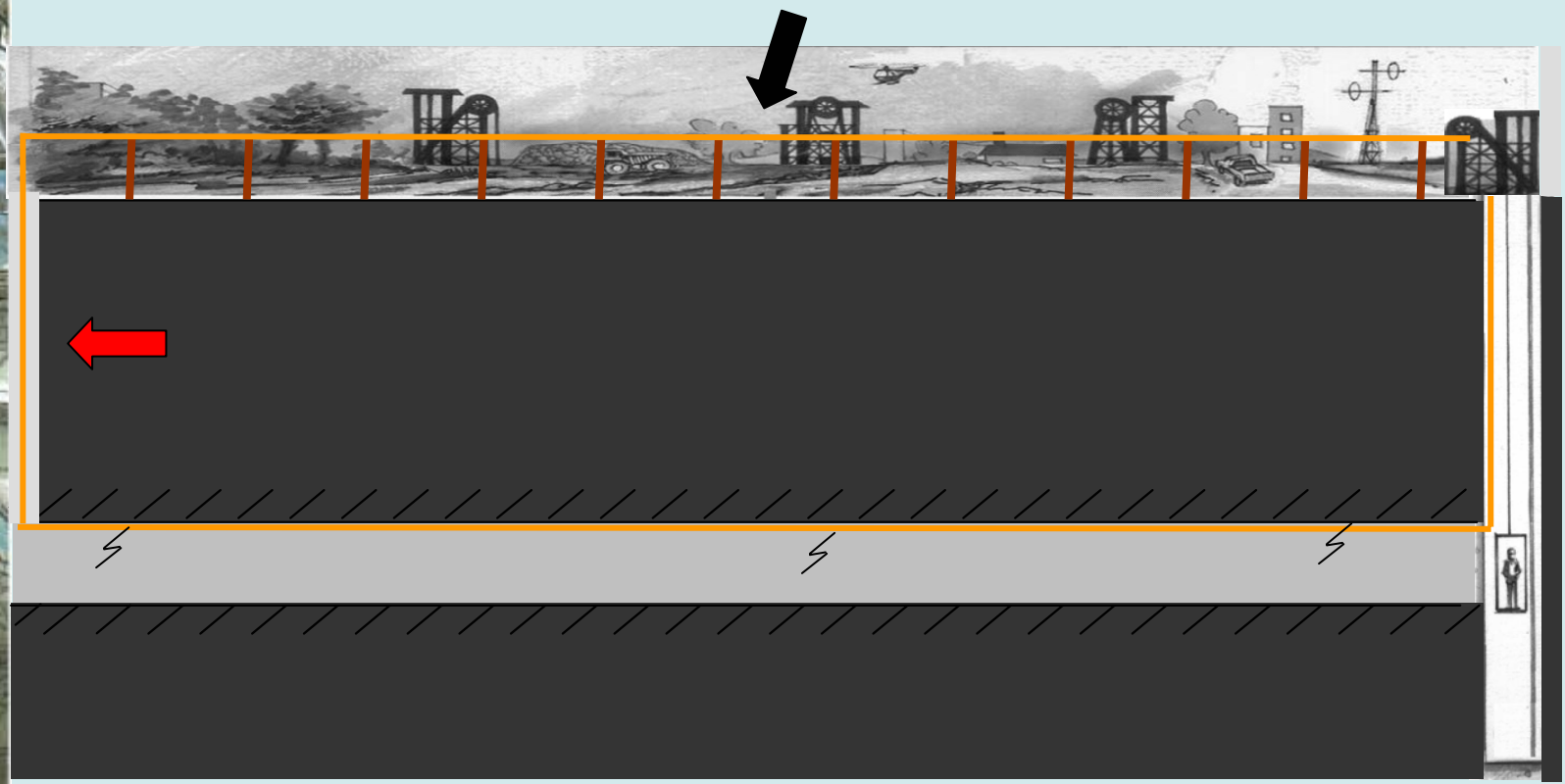
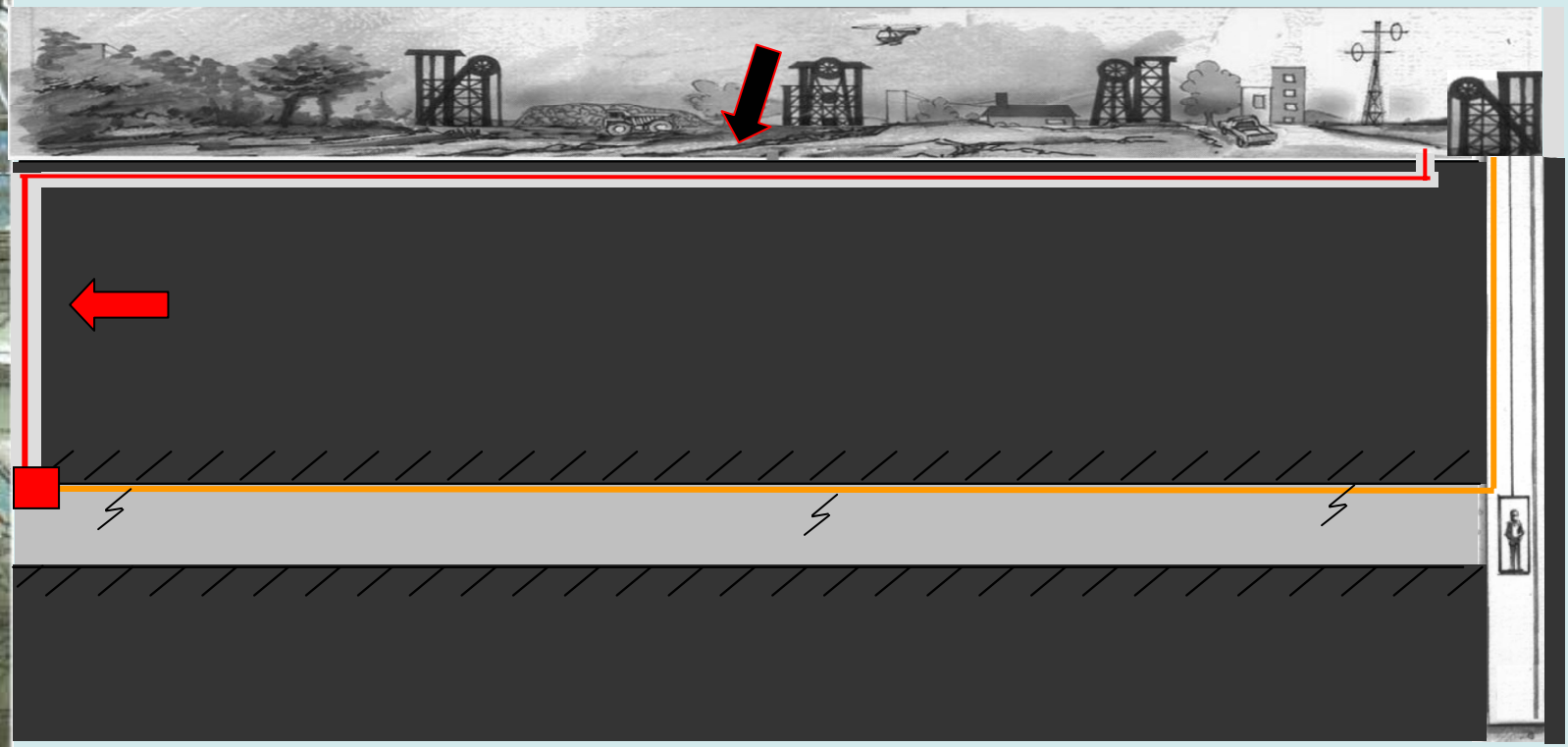
The leaky feeder cable can then be run from the underground to the surface



...and could then be run strung from poles back to the main shaft, which would also provide additional surface cover

Copyright MineCom 2006

Alternately the leaky feeder cable could be interfaced to a fibre optic cable (RF to Fibre interface) and run up from underground to the surface



The fibre optic cable could be run in a trench back to the main shaft, however this method would not enhance RF surface coverage

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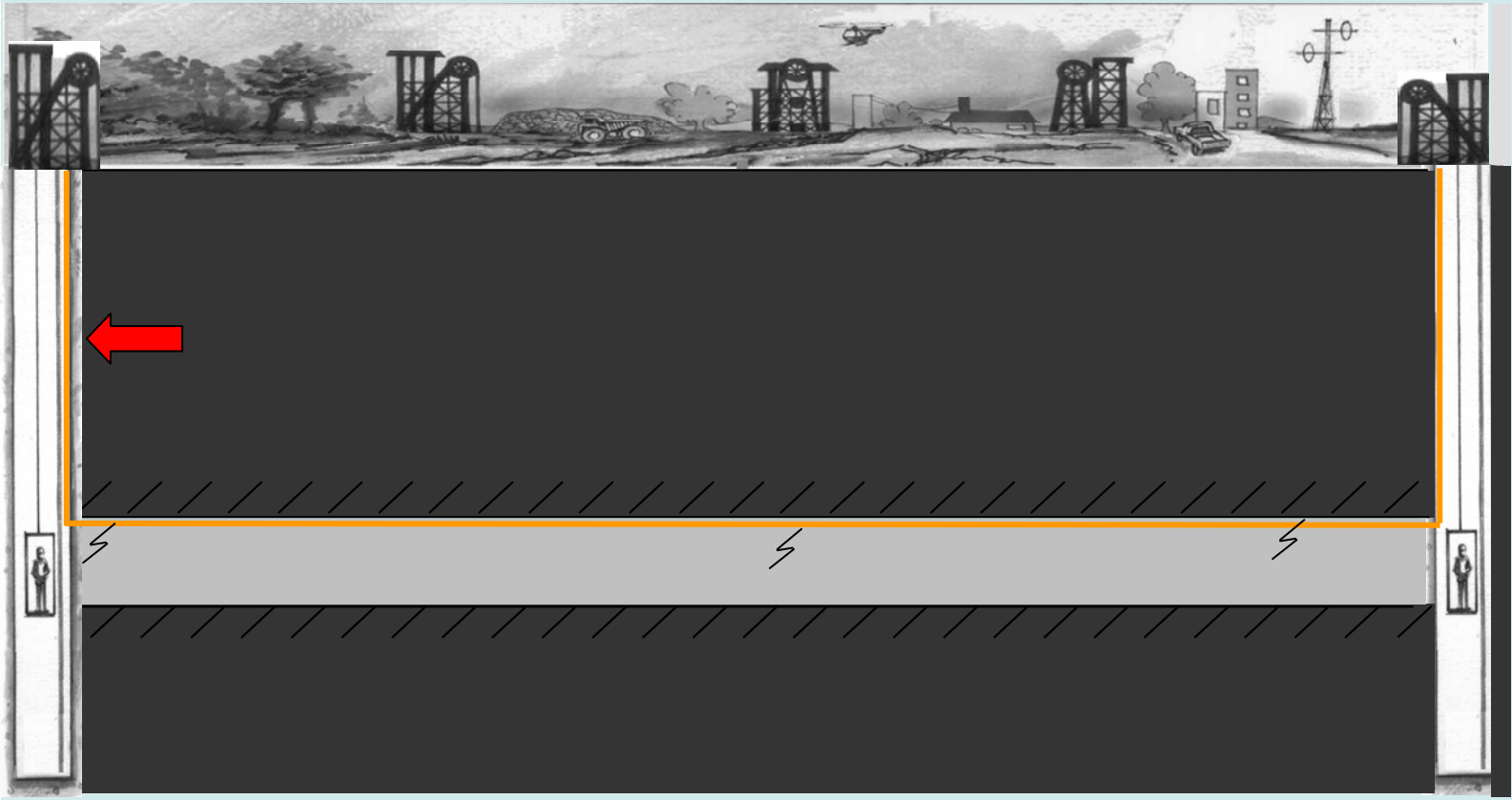
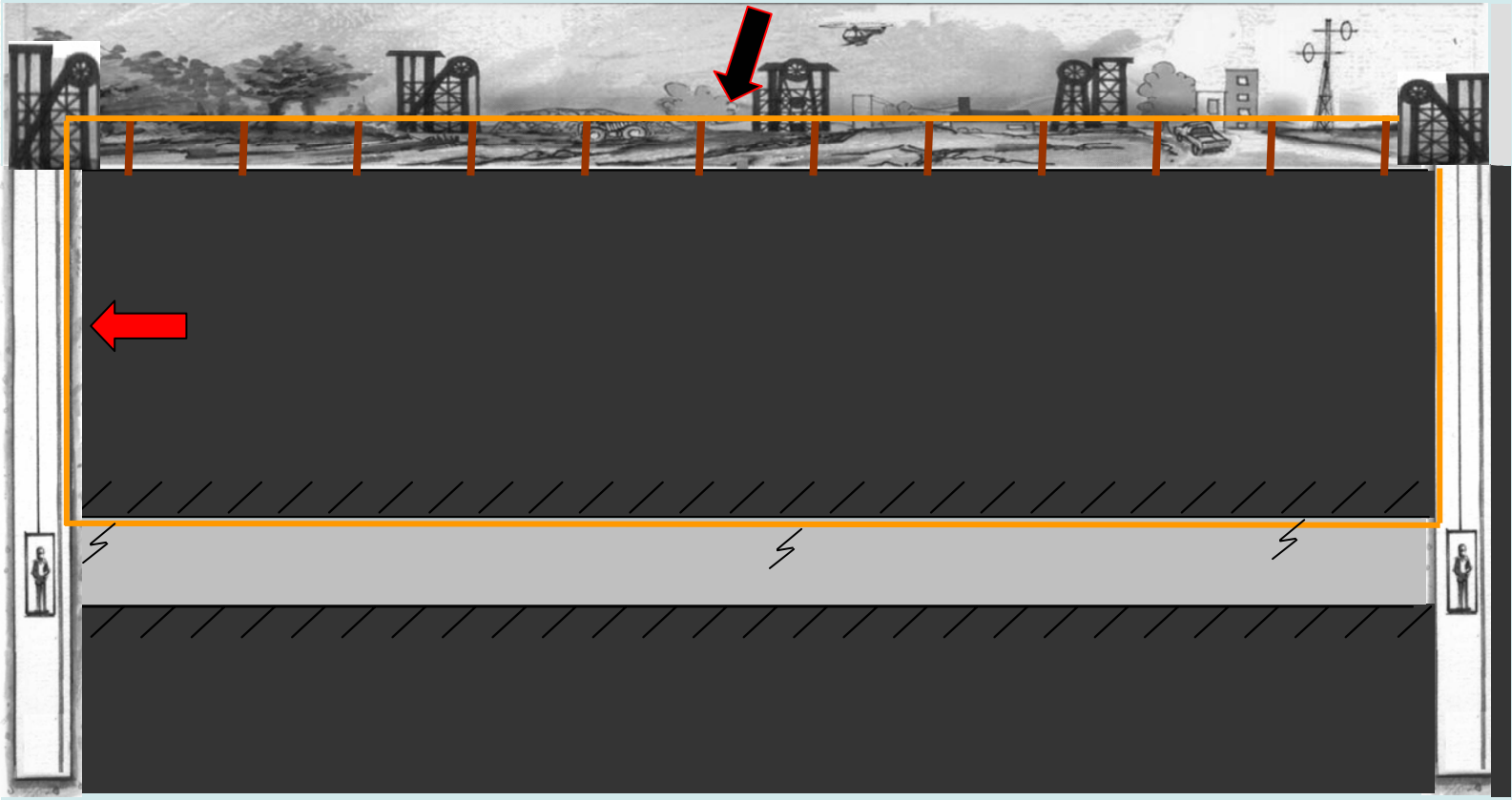
Option 2



Utilise second shaft to provide the return path for *SMARTReverse*

Copyright MineCom 2006

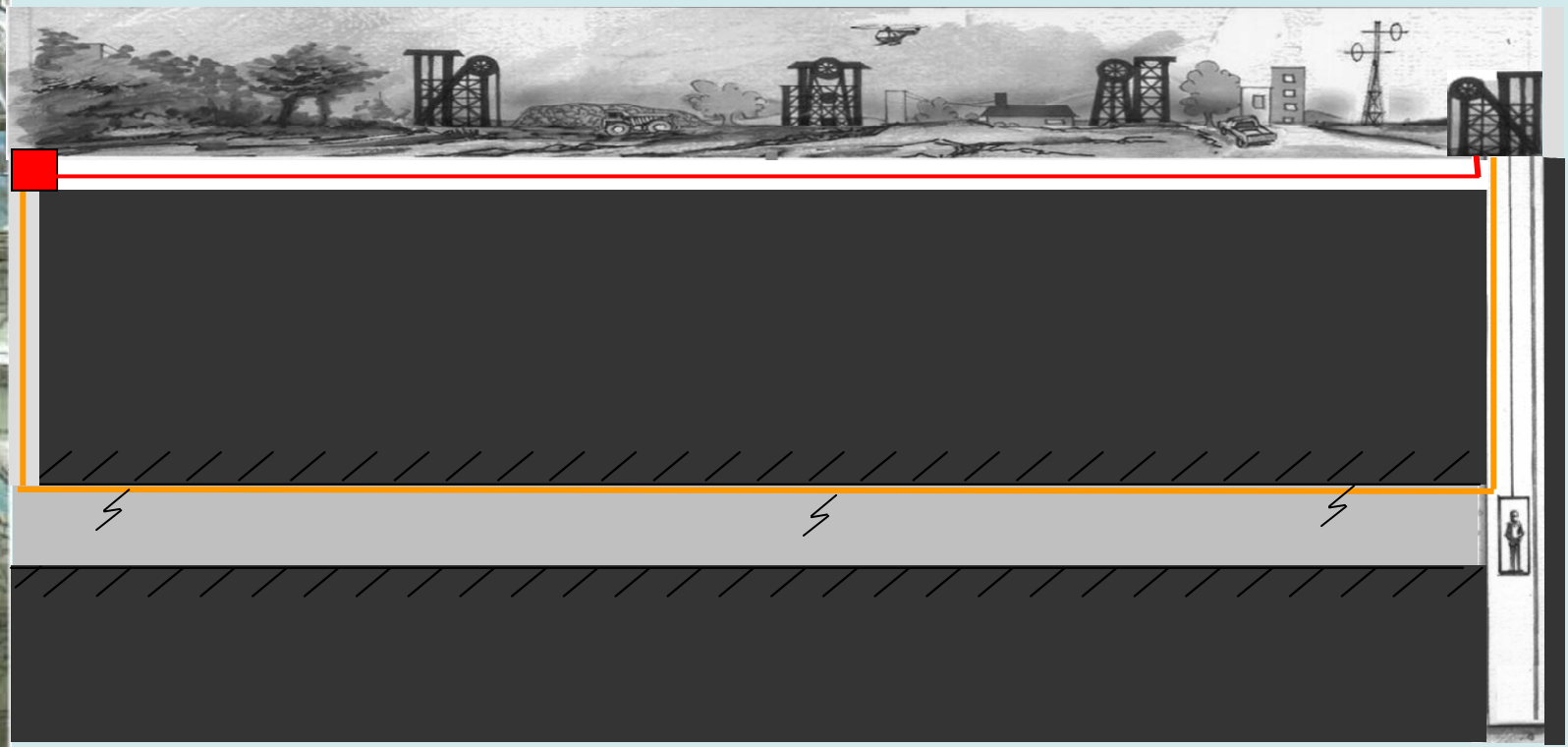
The leaky feeder cable can then be run up the shaft from the underground to the surface



...and could then be run strung from poles back to the main shaft, which would also provide additional surface cover

Copyright MineCom 2006

SMARTReverse



OR.....Interface it to the mines fibre optic network

Copyright MineCom 2006

The *SMARTReverse* return path can be via use of a –

- **Leaky Feeder cable**
- **Fiber Optic Cable**
- **Wireless Link**

Even the old faithful -

- **Copper Cable (pairs)**

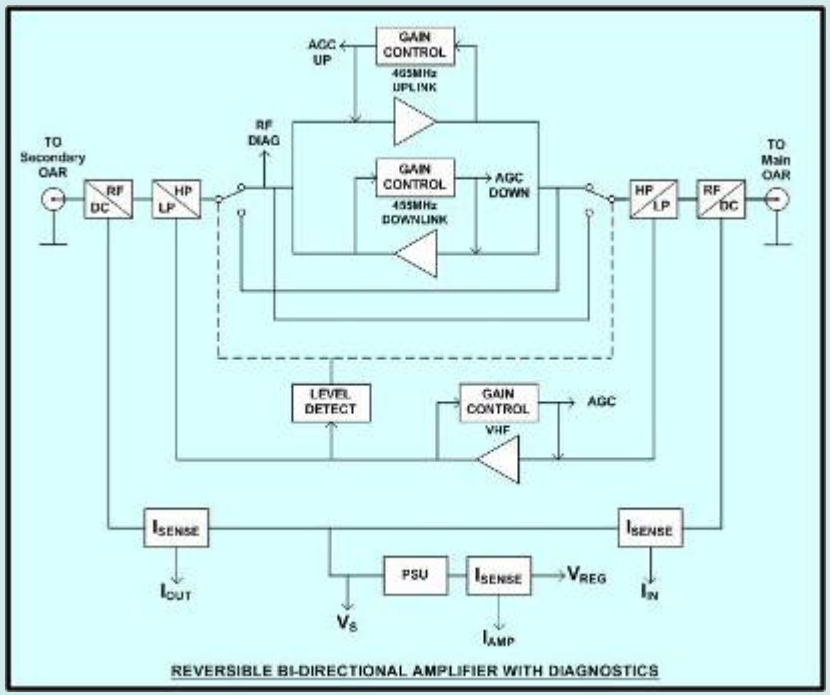
Copyright MineCom 2006

The minecom *SMARTReverse* is a Reversible Bi-Directional Amplifier using custom-built* helical filters to provide selectivity & act as duplexers to provide sufficient isolation between the UPLINK and DOWNLINK paths.

*** in UHF frequency bands only**

Copyright MineCom 2006

Should the cable be damaged, single pole double throw RF switches, with high isolation characteristics 'electrically reverse' the normal uplink and downlink RF paths of the Amplifier.



REVERSIBLE BI-DIRECTIONAL AMPLIFIER WITH DIAGNOSTICS

Copyright MineCom 2006

SMARTReverse **is a fault tolerant leaky feeder system that can operate in the harsh mining environment & provide reliable communications ….on both sides of a damaged cable.**

The direction of the Bi-Directional Amplifier is controlled by the presence, or absence, of a 'control tone', which emanates from the *SMARTReverse* Controller, located in the Head End rack.

The *SMARTReverse* 'control tone' is transmitted downlink (@141.745 MHz standard) & is amplified or boosted, as it passes through each individual amplifier.

Copyright MineCom 2006

SMARTReverse **amplifiers are equipped with *'drive-by'* diagnostics in the form of ultra bright LED's indicating the condition of the amplifier to staff as they pass by.**

An optional, PC based diagnostics package is available to monitor key parameters of the amplifiers and power couplers for remote monitoring of the system from a surface control room.

Windows® based software allows control room staff to monitor the health of the system 24 hours a day.

Copyright MineCom 2006

SMARTReverse **is presently available in FOUR versions…..**

MCA1000SR – VHF band…..150 to 175Mhz

MCA2000WSR – UHF wide band…400 to 500Mhz

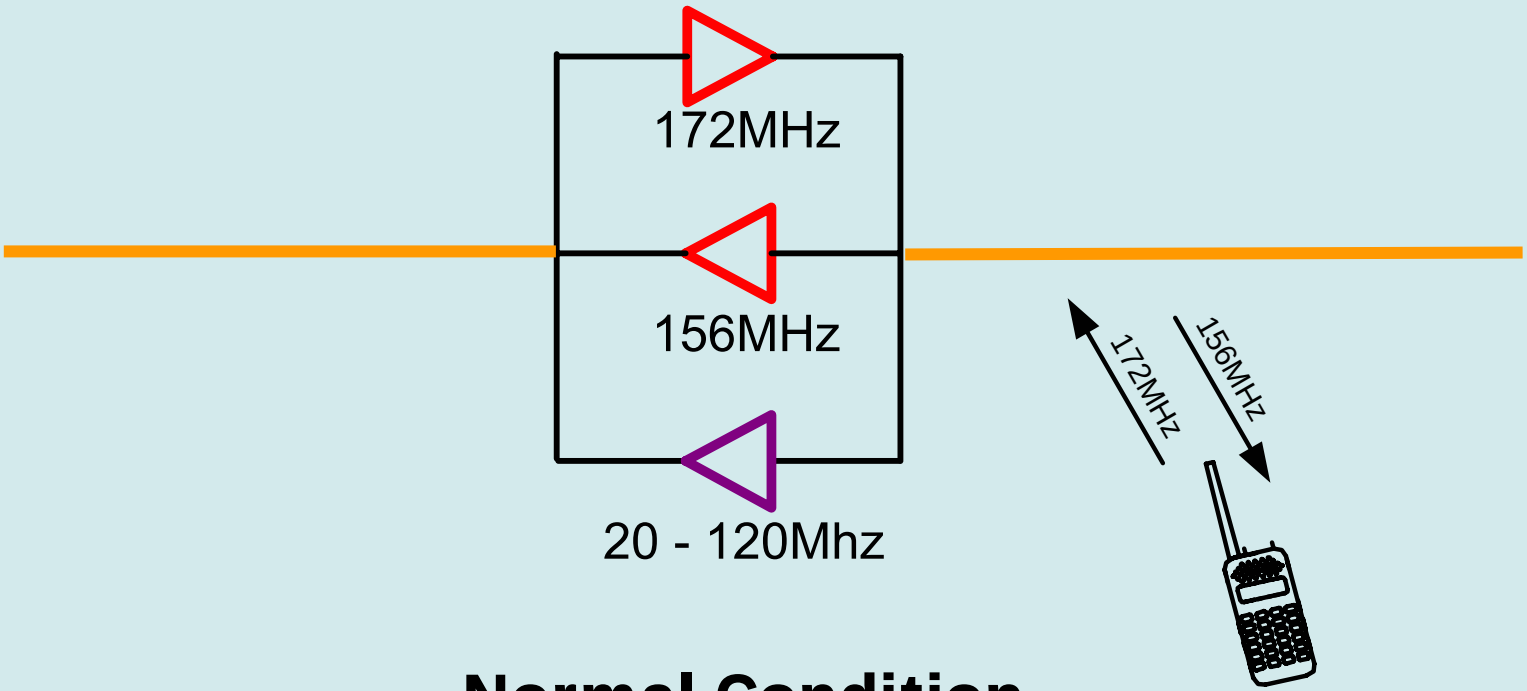
MCA2000NSR – UHF narrow band…400 to 500Mhz

MCA3000NSR – UHF wide band…800 to 900Mhz

Copyright MineCom 2006

Example

VHF *SMARTReverse* Amplifier

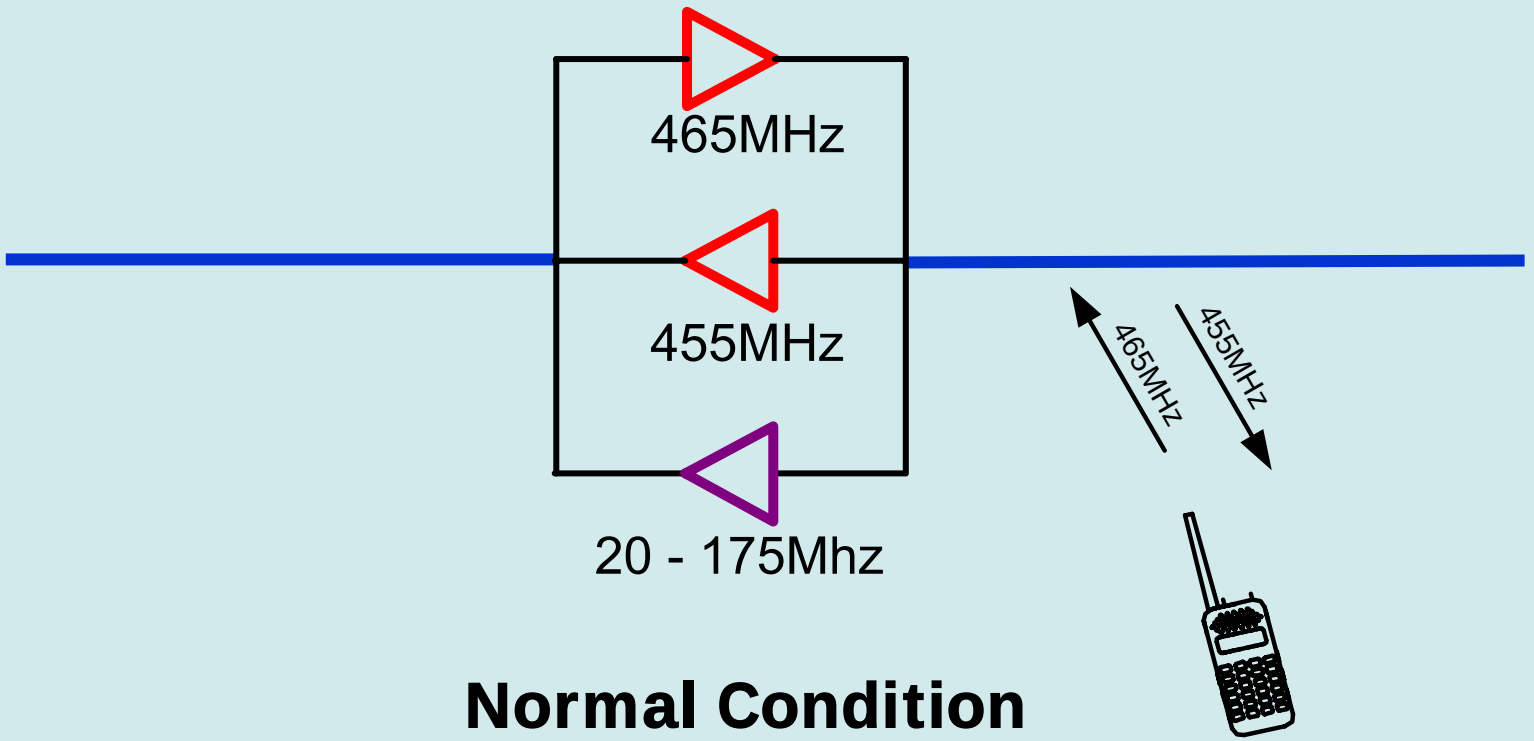


Normal Condition

Copyright MineCom 2006

Example

UHF *SMARTReverse* Amplifier

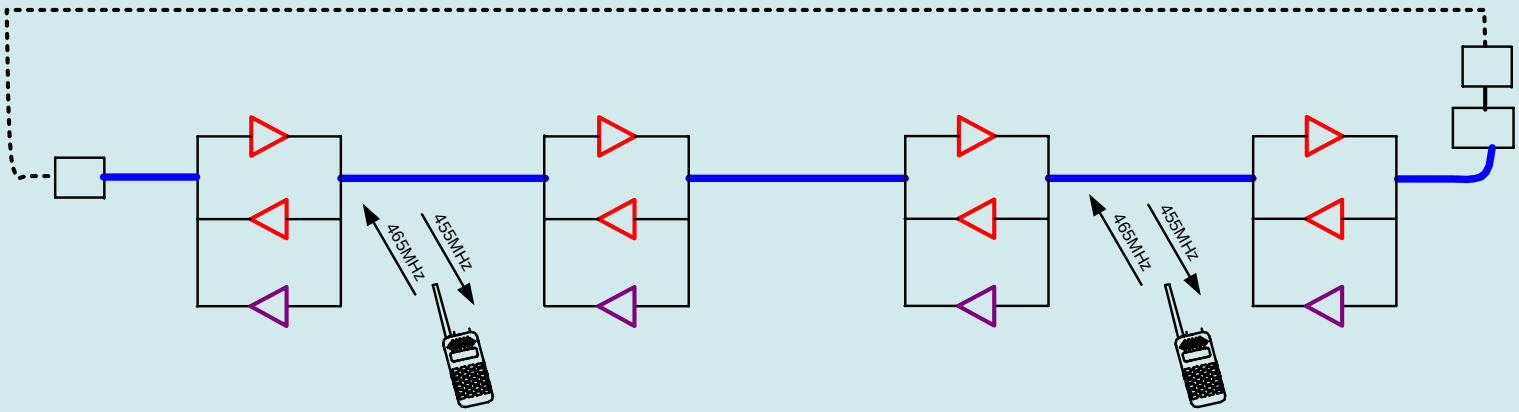


Normal Condition

Copyright MineCom 2006

Example

UHF *SMARTReverse* System

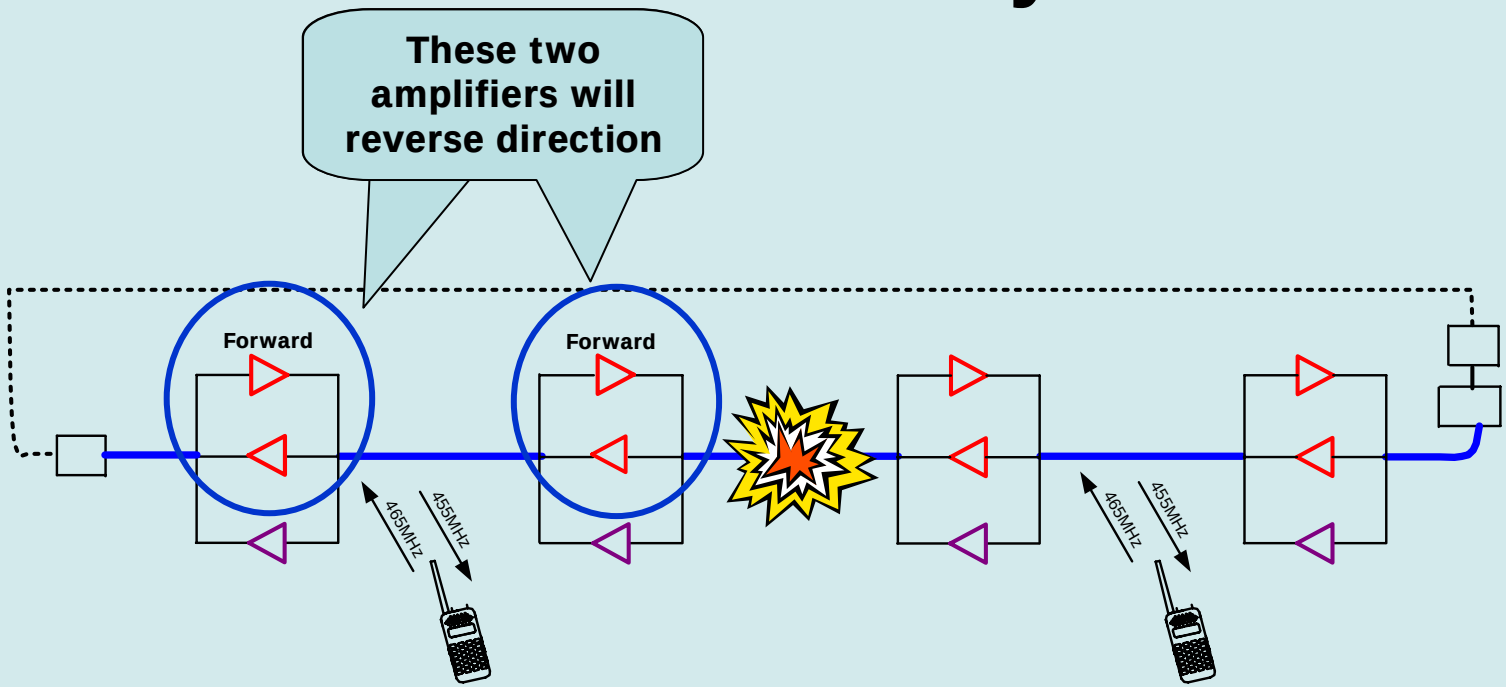


Normal Condition

Copyright MineCom 2006

Example

UHF *SMARTReverse* System

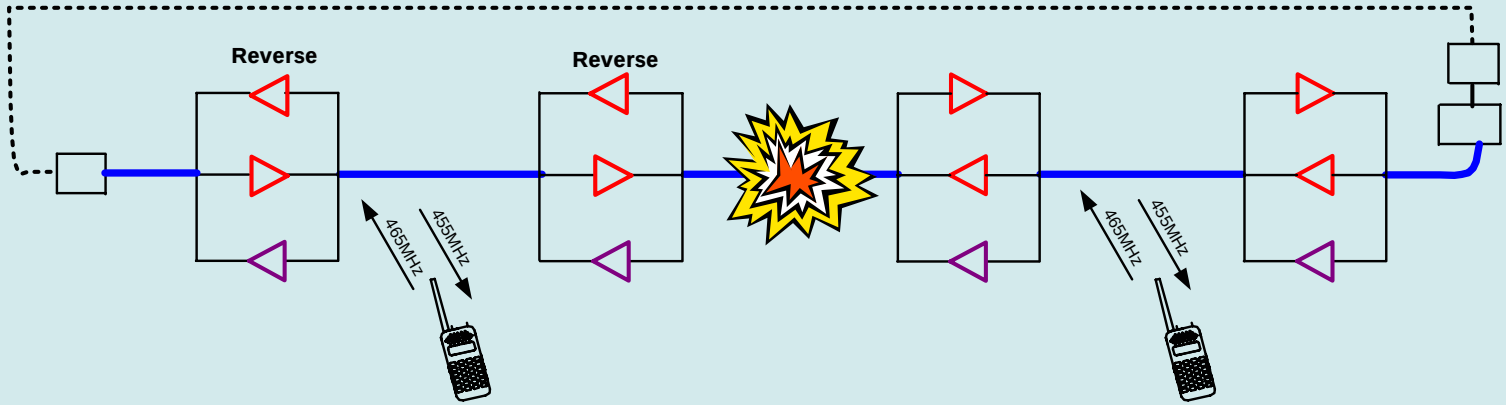


No Cable Break

Copyright MineCom 2006

Example

UHF *SMARTReverse* System

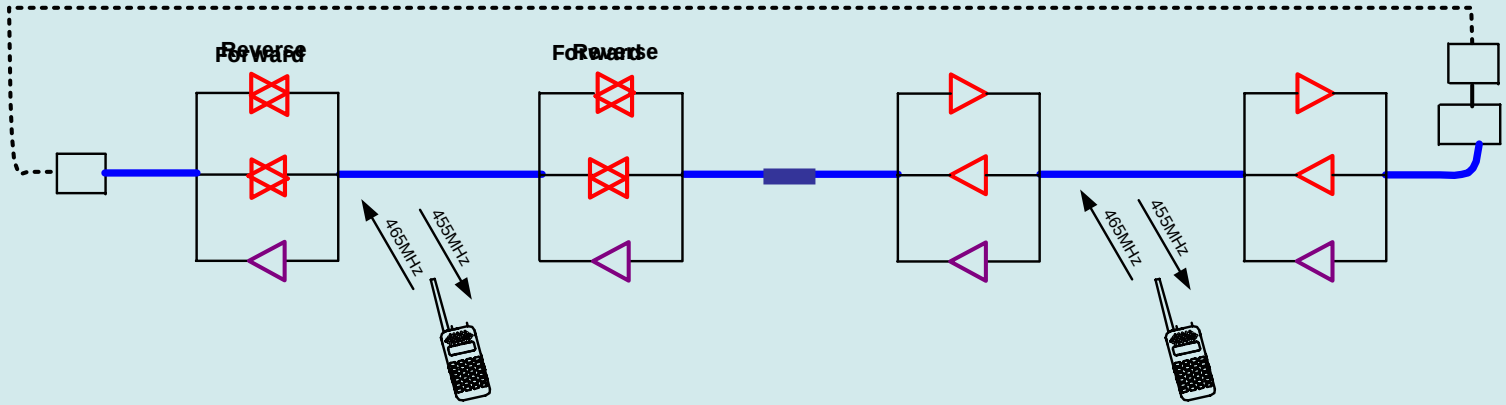


Cable Break

Copyright MineCom 2006

Example

UHF *SMARTReverse* System



Cable Repaired – system returns to normal operation

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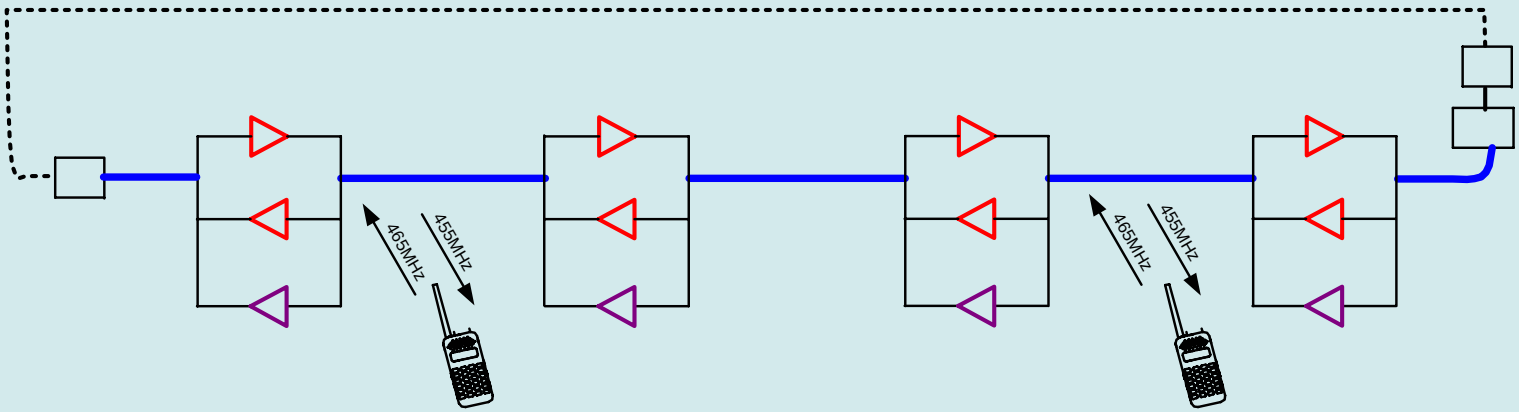
Example

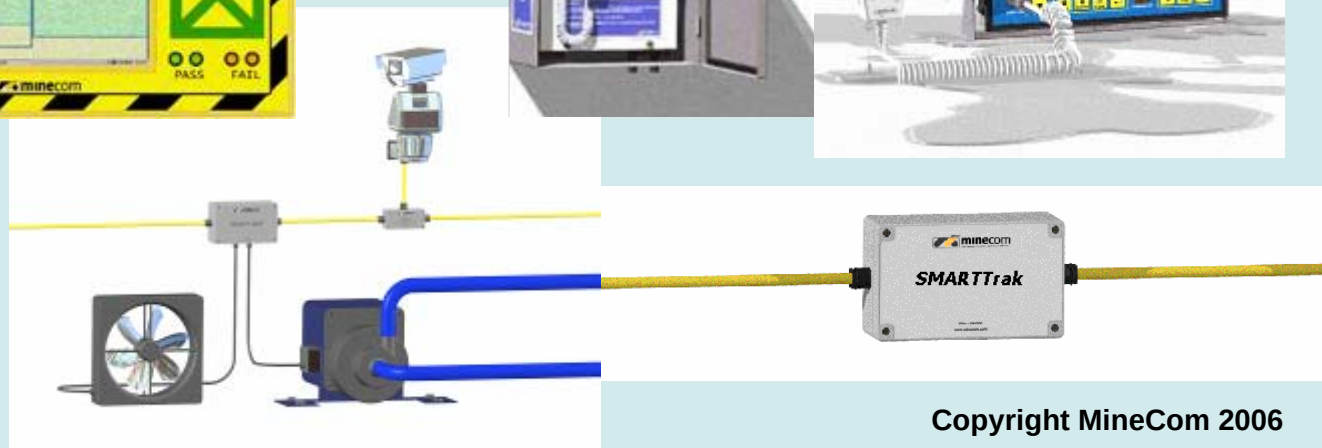
UHF *SMARTReverse* System



Normal Condition

Copyright MineCom 2006

minecom SMART Products



Copyright MineCom 2006

Many mines only used their leaky feeder communications backbone for voice communications, not realising its full capability and true potential

Copyright MineCom 2006

Since minecom **introduced it's range of *'SMART'* products into the market 5 years ago, mines have been adding additional functionality and services to their leaky feeder backones....**

Copyright MineCom 2006

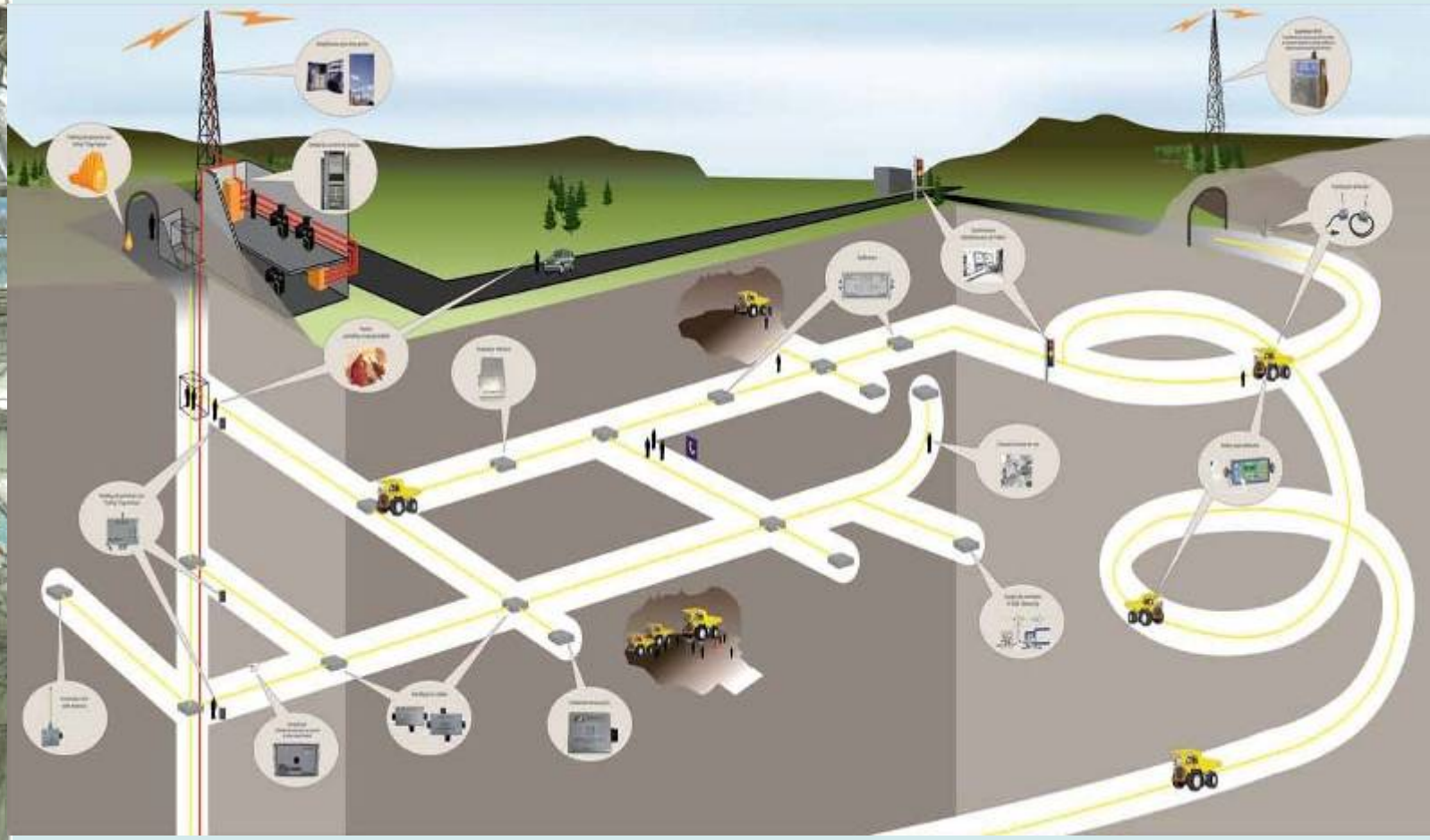
ONE cable carries ALL

VOICE DATA VIDEO

TRACKING TELEMETRY

WIRELESS AUTOMATION

Copyright MineCom 2006



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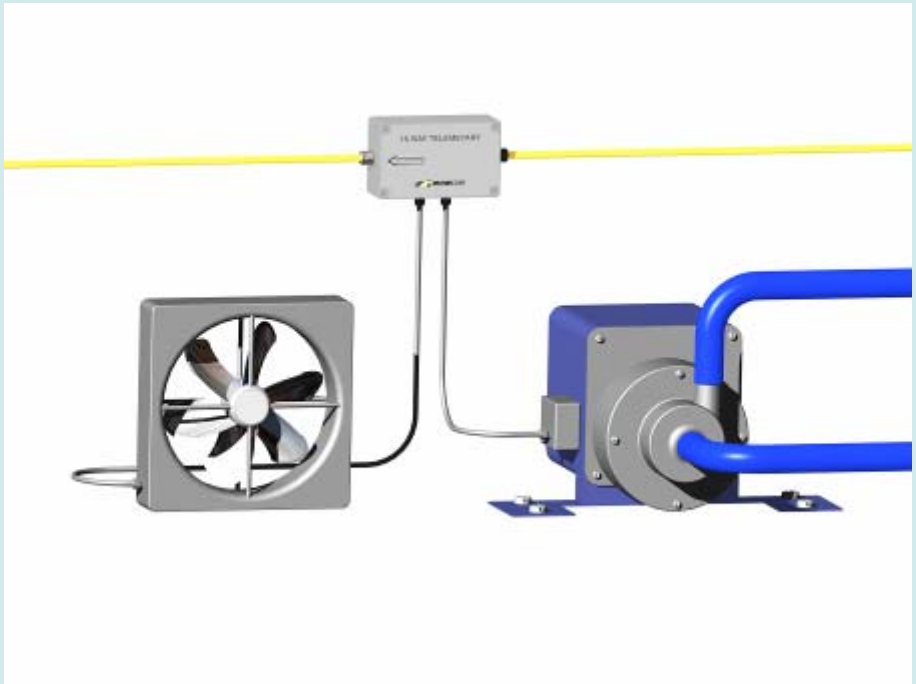
SMARTAmp Telemetry



Control / Monitor

Pumps

Fans

Environmental Sensors

Sub Stations

Remote Alarms

Simply cut the cable and install a *SMARTAmp* Telemetry unit offering -

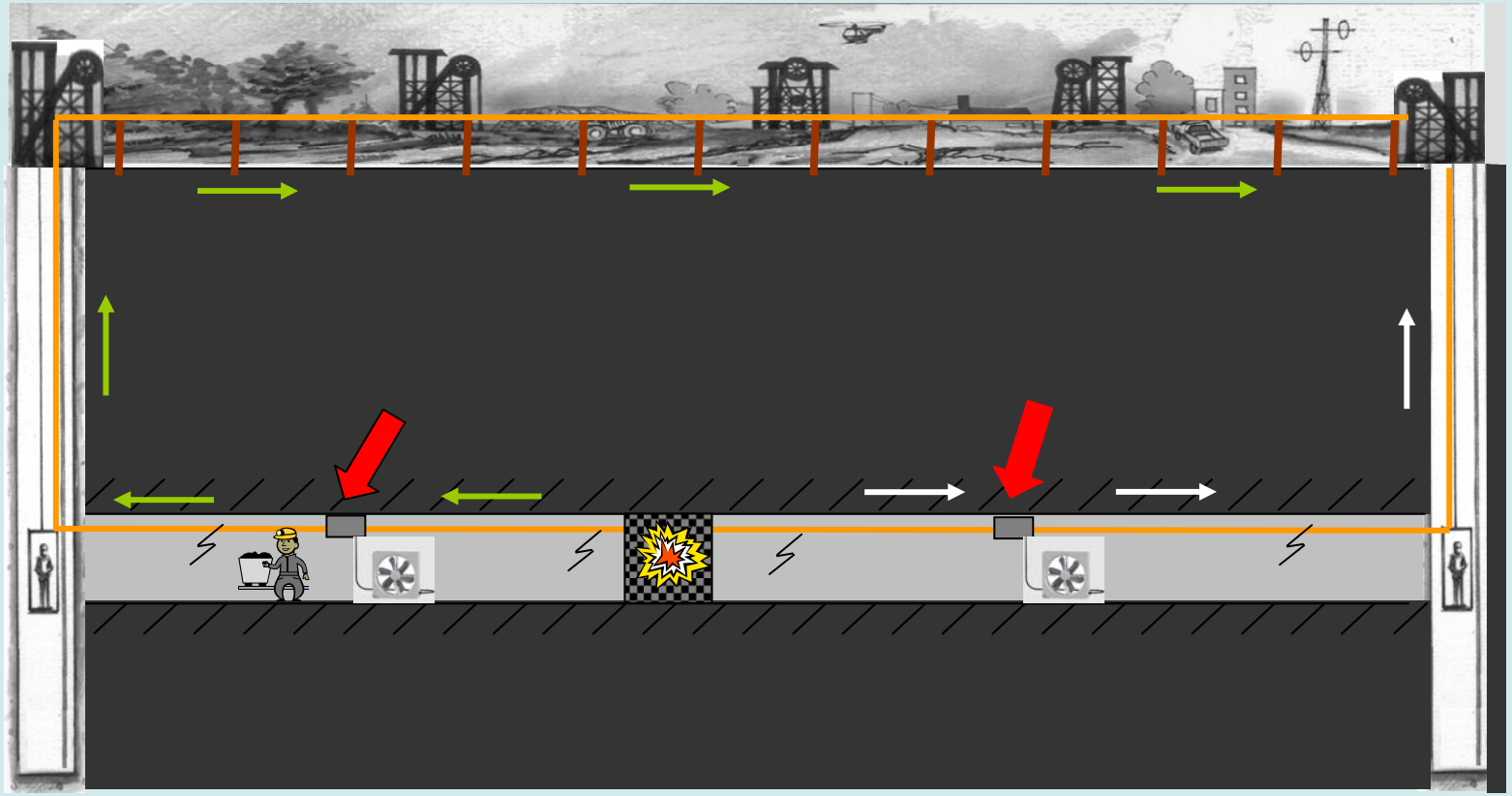
8 x Analogue INPUTS

8 x Digital INPUTS

8 x Digital OUTPUTS

Copyright MineCom 2006

Telemetry SMARTAmp



...SMARTAmp's will continue to operate on BOTH sides of a blast or cave in.

Copyright MineCom 2006

SMARTCam Video

MONITOR – VIEW...

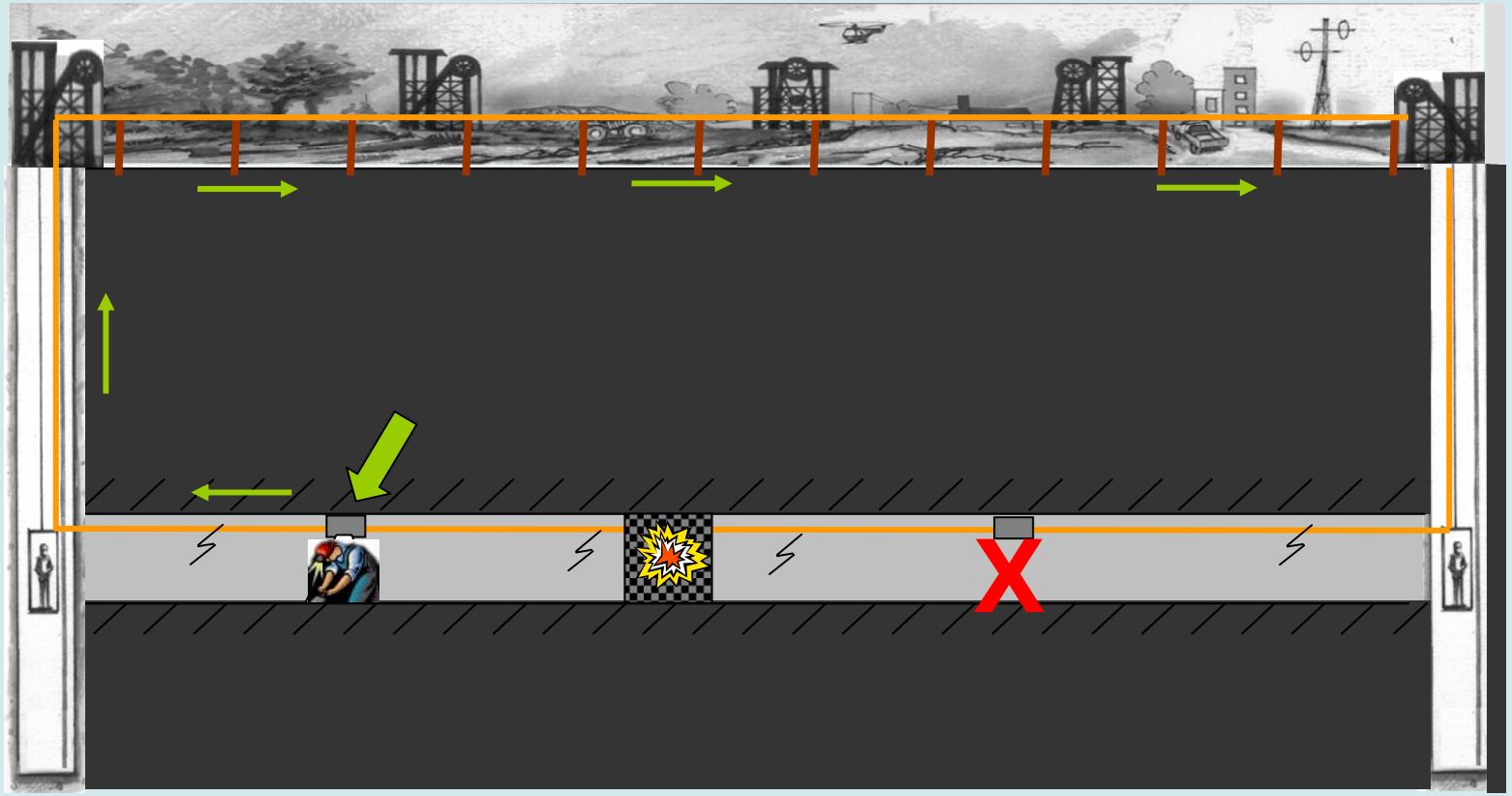
- **Assembly Points**
- **Rescue Chambers**
- **Conveyor belts**
- **Sub Stations**
- **Remote Locations**

Simply cut the cable and install a *SMARTCam* Video camera unit offering -

Real-Time video B & W, colour or thermal images from underground back to the surface

Copyright MineCom 2006

Video *SMARTCam*



…*SMARTCam's* will continue to operate on the DOWN side of a blast or cave in.

Copyright MineCom 2006

SMARTTrak Tracking

Personnel Tracking

Vehicle Tracking

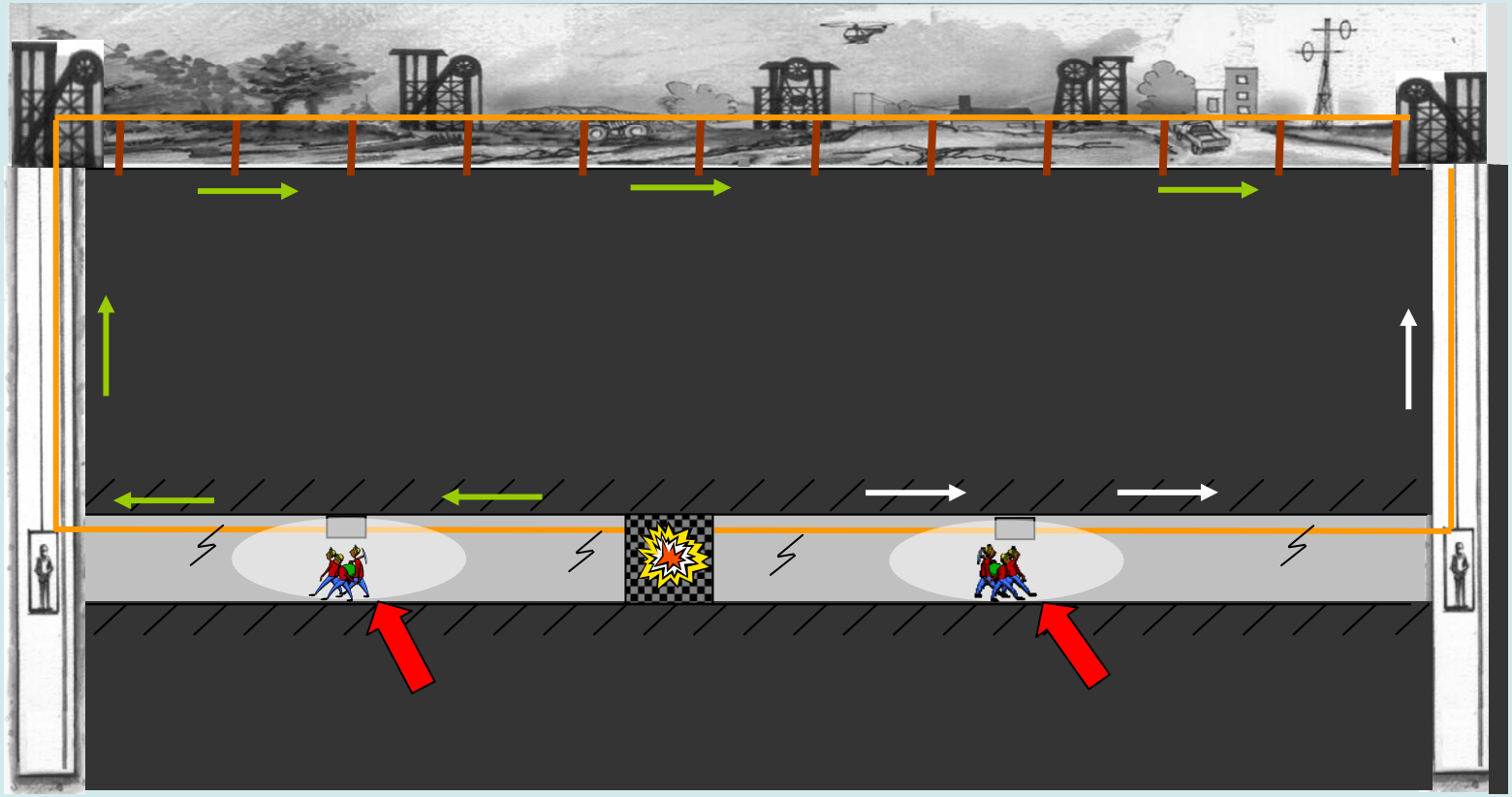
Track Mobile Plant & Equipment

Simply cut the cable & install a *SMARTTrak* Tracking unit offering -

Real-Time tracking / location / direction of personnel & vehicles underground & on the surface

Copyright MineCom 2006

Tracking & Location *SMARTTrak*



…*SMARTTrak* readers will continue to operate on BOTH sides of the blast / cave in, cable break.

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SMARTCage Automation

Two Way Voice Communications

Emergency Stop

Monitoring functions

Control functions

Knocker Bell

Shaft Maintenance

SMARTCage – provides real time Automation or Semi Automation over a Cage and/or Skip

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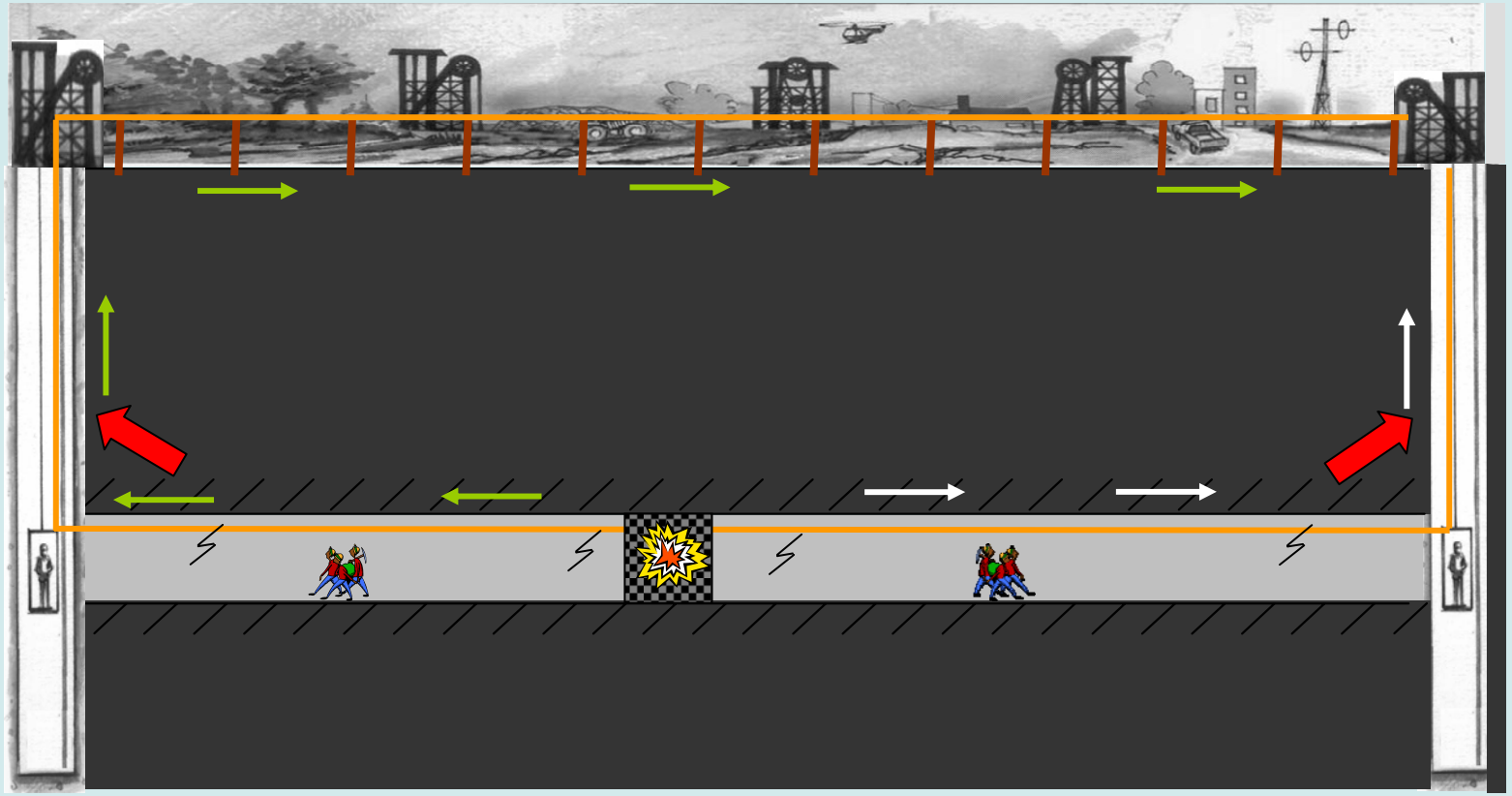
Automation SMARTCage



...SMARTCage will continue to operate on BOTH sides of a blast/cave in.

Copyright MineCom 2006

minecom offers a range of Passive and Active Tagging Sytems

Copyright MineCom 2006

ePROX

Personnel Tracking

***ePROX** electronic Tag Boards used to track the movement of personnel around the mine utilise small electronic tags that do NOT require a battery to power them. A range of models are offered with or without LCD displays.*

Copyright MineCom 2006

ePROX II

Personnel Tracking

Second generation *ePROX II* Tag Readers with *expanded* range, reads multiple Tags up to 12 meters away simultaneously. *ePROX II* Tags can be read at speed & DO NOT require a battery to power them. A range of Tag Readers and Tags are offered.

Up to 12m read range with this antenna

Copyright MineCom 2006

TelTAG

Personnel & Vehicle Tracking

TelTAG **electronic personnel and vehicle tracking system utilise small electronic transmitters (tags) that are powered from a miners caplamp, or small lithium battery to power them. A range of models are offered which can be used for tracking people, vehicles**

Copyright MineCom 2006

LAMPS

Personnel Tracking

LAMPS **IS approved electronic personnel tracking system utilises small self contained electronic transmitters (tags) that are powered from a small internal lithium battery. Tag readers can be linked by Fibre or Wireless.**

Copyright MineCom 2006

Termite II

A rugged vehicle radio designed for open cab mine vehicles –
Waterproof – IP66
Heavy duty, shock proof
12 or 24VDC powered
Emergency Evacuation alarm
Back lite LCD display and keypad

Copyright MineCom 2006

TermiteFAB

A rugged wall mounted radio designed for wall mounted installation in underground mine tunnels

- ***Waterproof – IP66***
- ***Heavy duty, shock proof***
- ***110/240VAC powered.....OR***

Leaky feeder cable powered version

- ***Emergency Evacuation alarm***
- ***Back lite LCD display and keypad***

Copyright MineCom 2006

minecom GUARANTEE

minecom provides a written guarantee that wherever you install a minecom leaky feeder system to an approved design criteria, good quality Voice, Data and Video communications are guaranteed

Copyright MineCom 2006