Survivable Leaky Feeder Communication System

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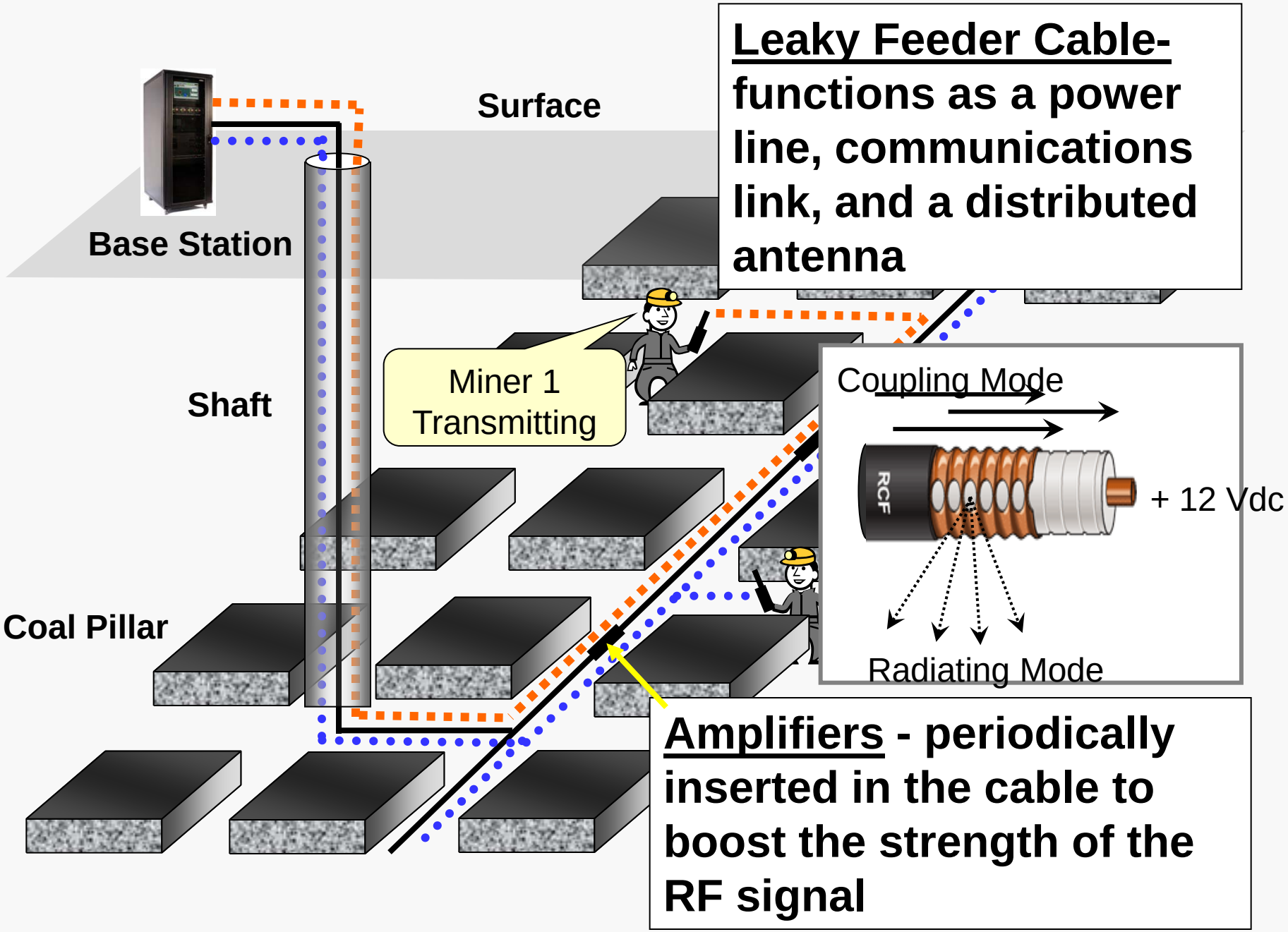
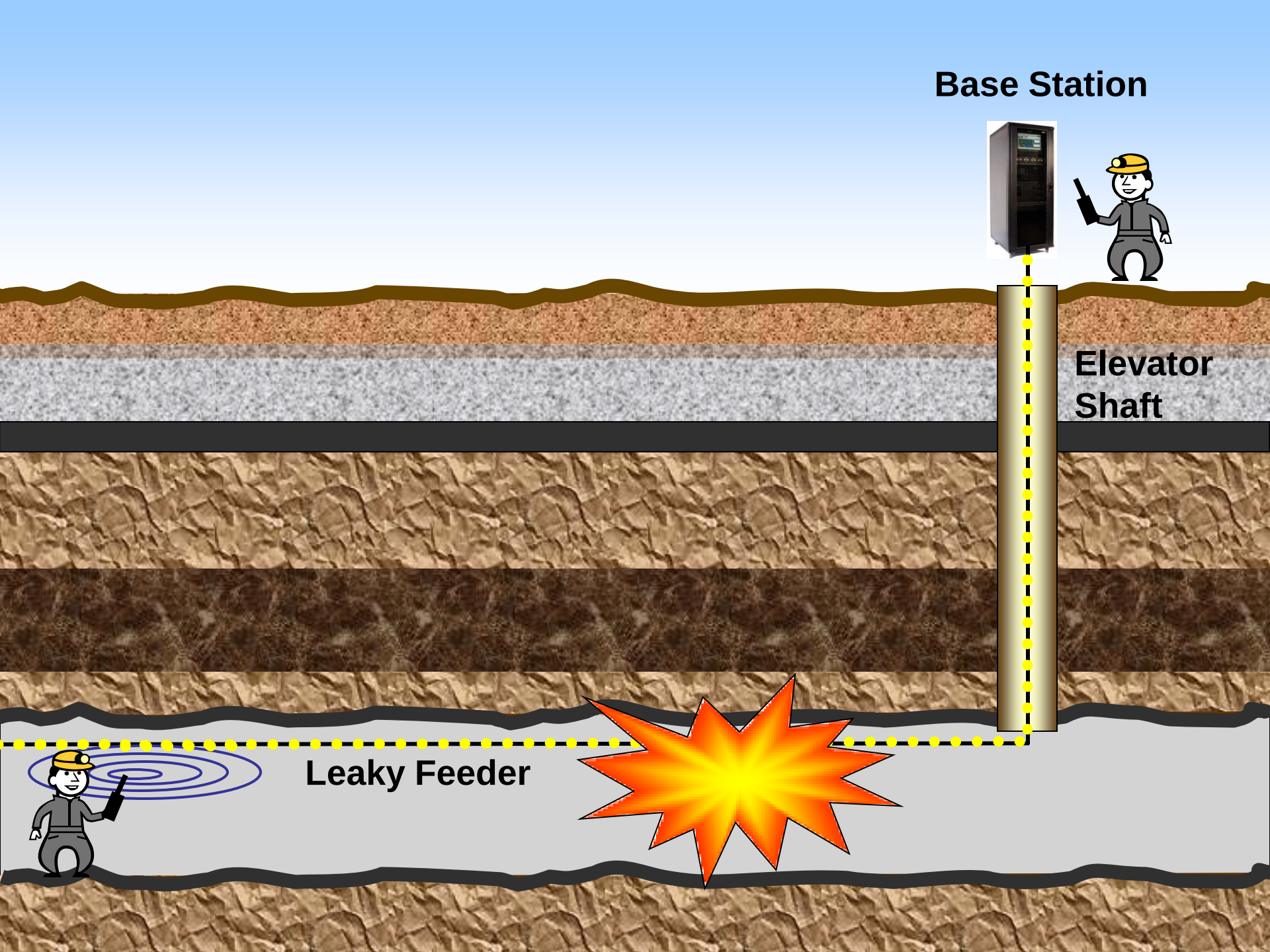
Objective

- **Start with a robust and demonstrated technology – Leaky Feeder**
  - used in mines since the 1980s
  - several vendors selling systems to mining industry
- **Investigate approaches to make Leaky Feeder more survivable**
- **Develop hardware and demonstrate technology in-mine**

Pillar proposed using the Becker UHF leaky feeder system as the base system

– Consol Energy Loveridge Mine


Leaky Feeder Cable- functions as a power line, communications link, and a distributed antenna
Surface
Base Station
Shaft
Miner 1 Transmitting
Coupling Mode
RCF
+ 12 Vdc
Radiating Mode
Coal Pillar
Amplifiers - periodically inserted in the cable to boost the strength of the RF signal


Base Station
Elevator
Shaft
Leaky Feeder

Approaches for Survivability

- **Hardening**
  - Measures to improve the ability of communication system parts or components to survive mine incidents.
- **Redundancy**
  - Changes to the communication system design or implementation that allow it to continue functioning after a mine incident has caused part of the system to fail.

Hardening

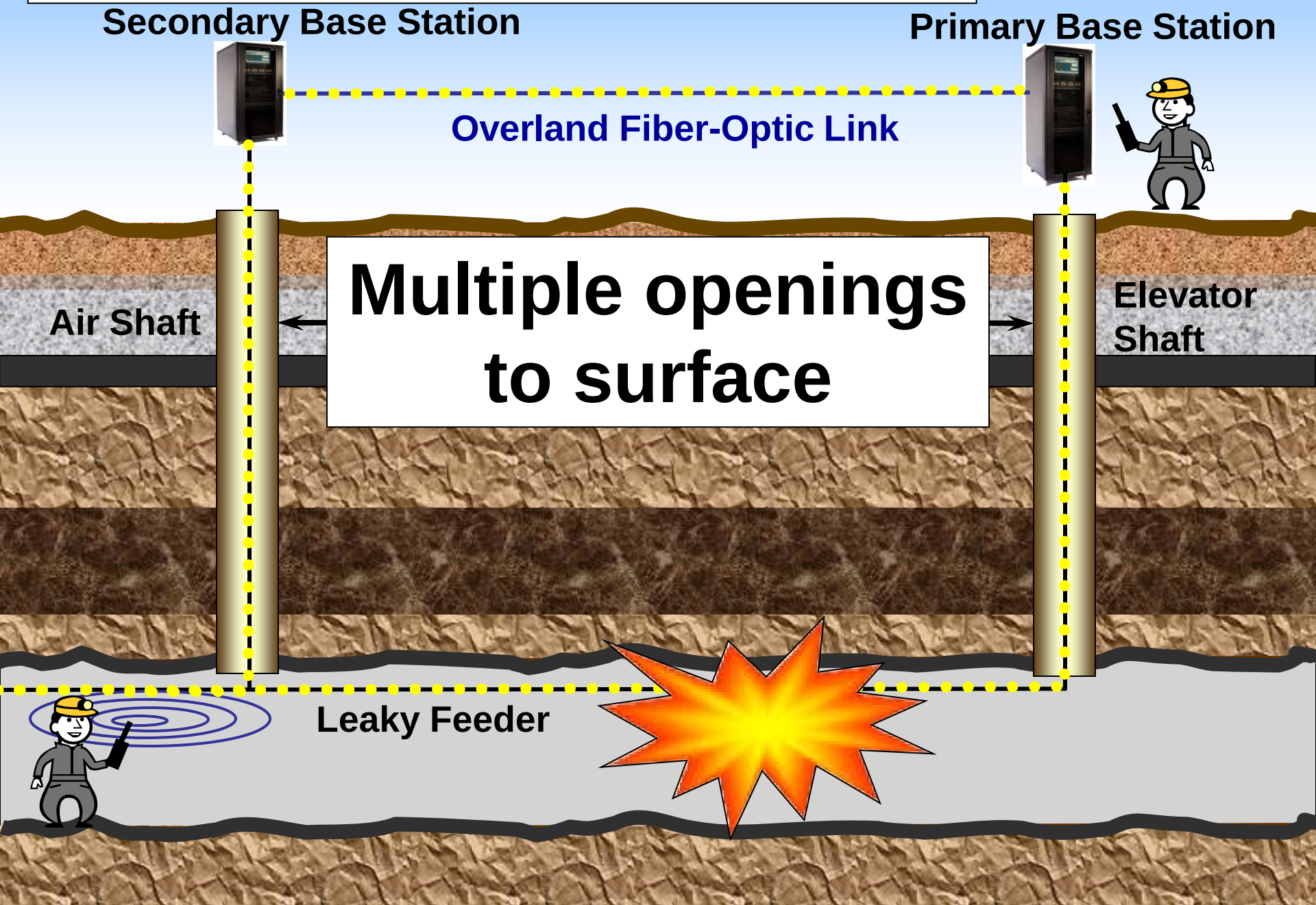
- Cable Installation Methods
  - j-hooks, latch-back hooks, cable ties with PVC spacers, and rope hangers
- Stress Relief
- Leaky Feeder Cable Covered/Buried
  - Covered with gunite
  - Buried in floor
- Component Fire Protection
- Cable in Conduit, Integrated Messenger with Cable
- Explosion tests

Redundancy :

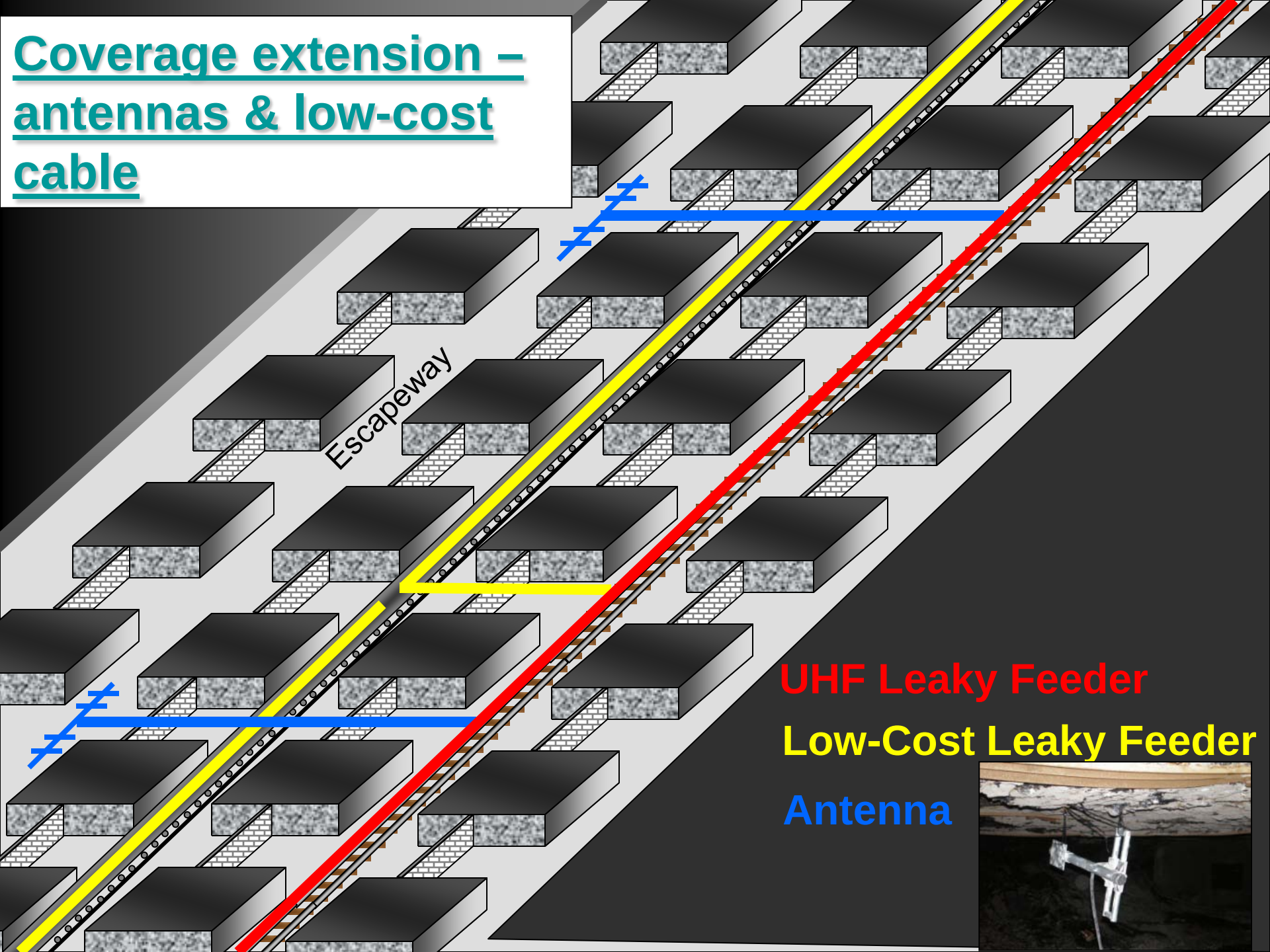
- Dual-base station loop linkage

- Independent cables run in parallel entries
  - Coverage extension using antennas and low-cost cable

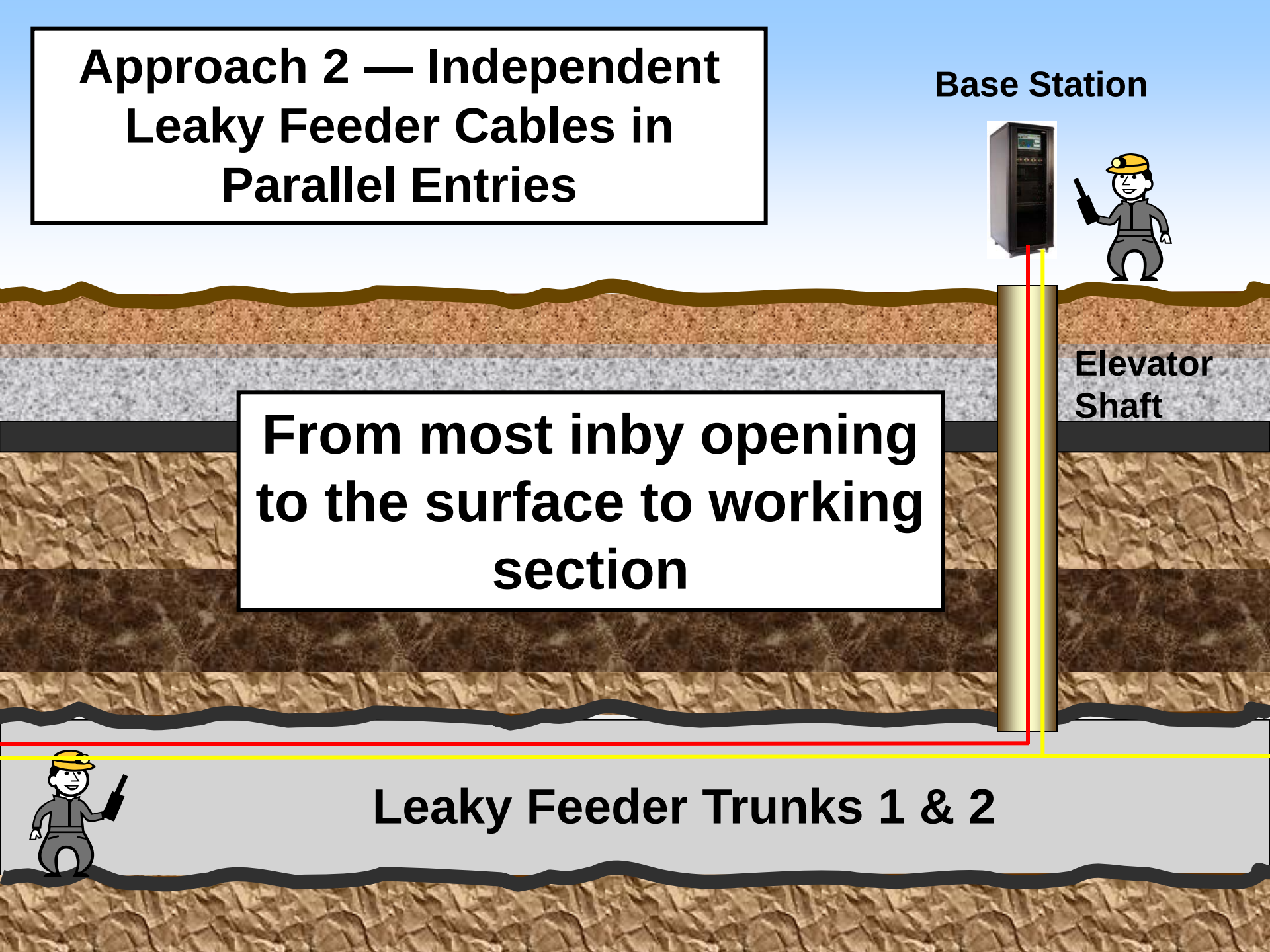
Approach 1 - Redundant loop



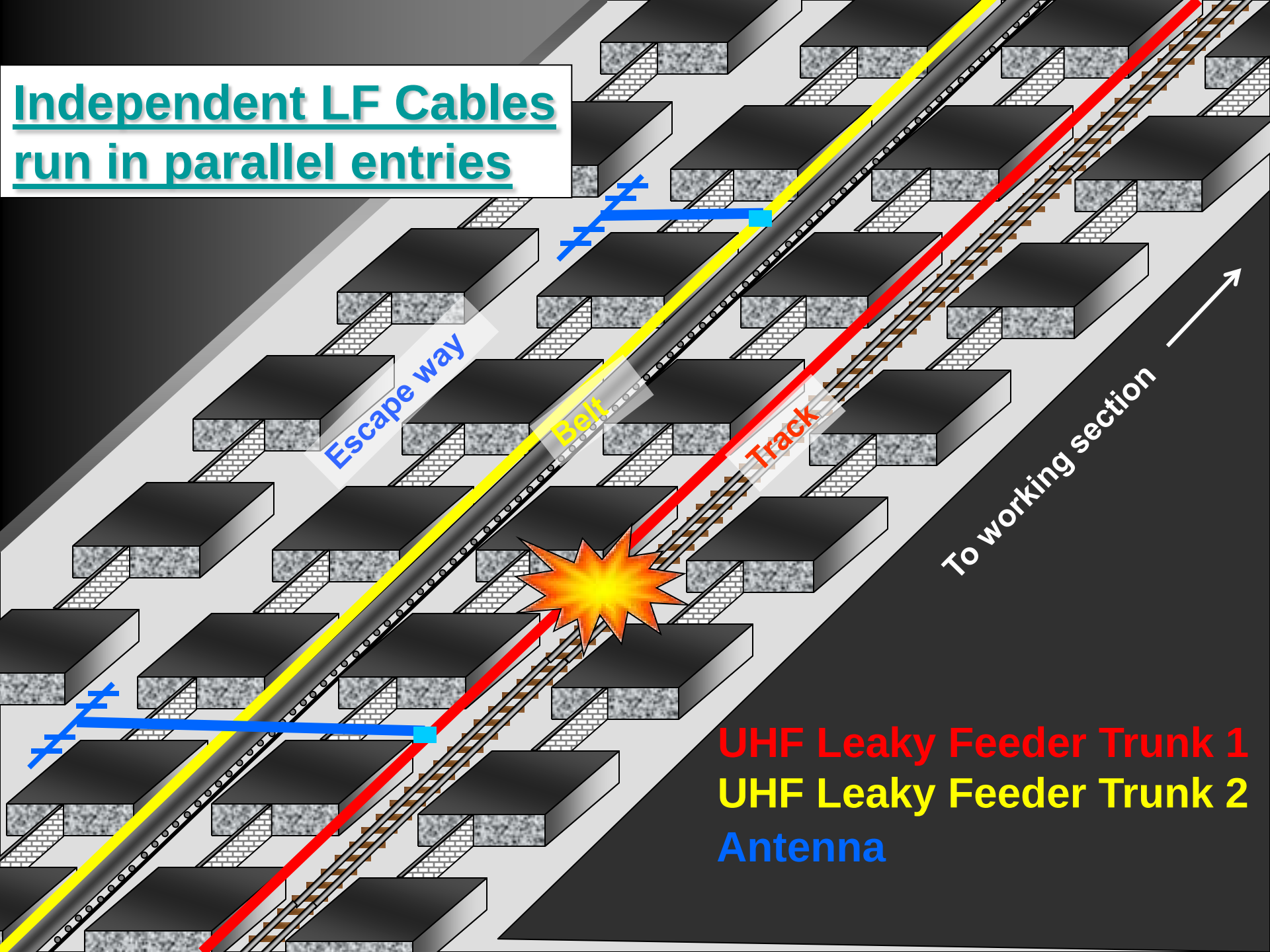
Coverage extension – antennas & low-cost cable



Approach 2 — Independent Leaky Feeder Cables in Parallel Entries



Independent LF Cables run in parallel entries



Questions?