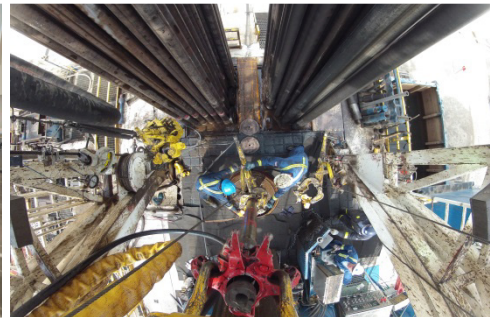




AQUISTORE



August 2015
Kyle Worth, P.Eng., PMP
Senior Project Manager



AQUISTORE: CO₂ STORAGE IN SASKATCHEWAN

- Storing CO₂ underground in deep saline formation.
- Independent research project – SaskPower owner and operator of the wells.
- Aquistore/PTRC manages Measurement, Monitoring and Verification
- Injection commenced April 16, 2015, ribbon cutting ceremony May 20, 2015.
- Testing and comparing proven and novel measurement, monitoring and verification technologies for efficiency and economics



AQUISTORE: MMV

Designed for: (1) project/plume monitoring; (2) public assurance; (3) research objectives

Surface-based:

- Regional 3D seismic survey
 - Geological characterization
 - Baseline & time-lapse
- Permanent seismic array
 - Time-lapse imaging
- Electrical/electromagnetic
- Gravity

PLUME

- Passive seismic (broadband & short period array)
- InSAR
- GPS
- Tiltmeters

DEFORMATION

- Groundwater & Soil gas monitoring
- Carbon Isotope profile

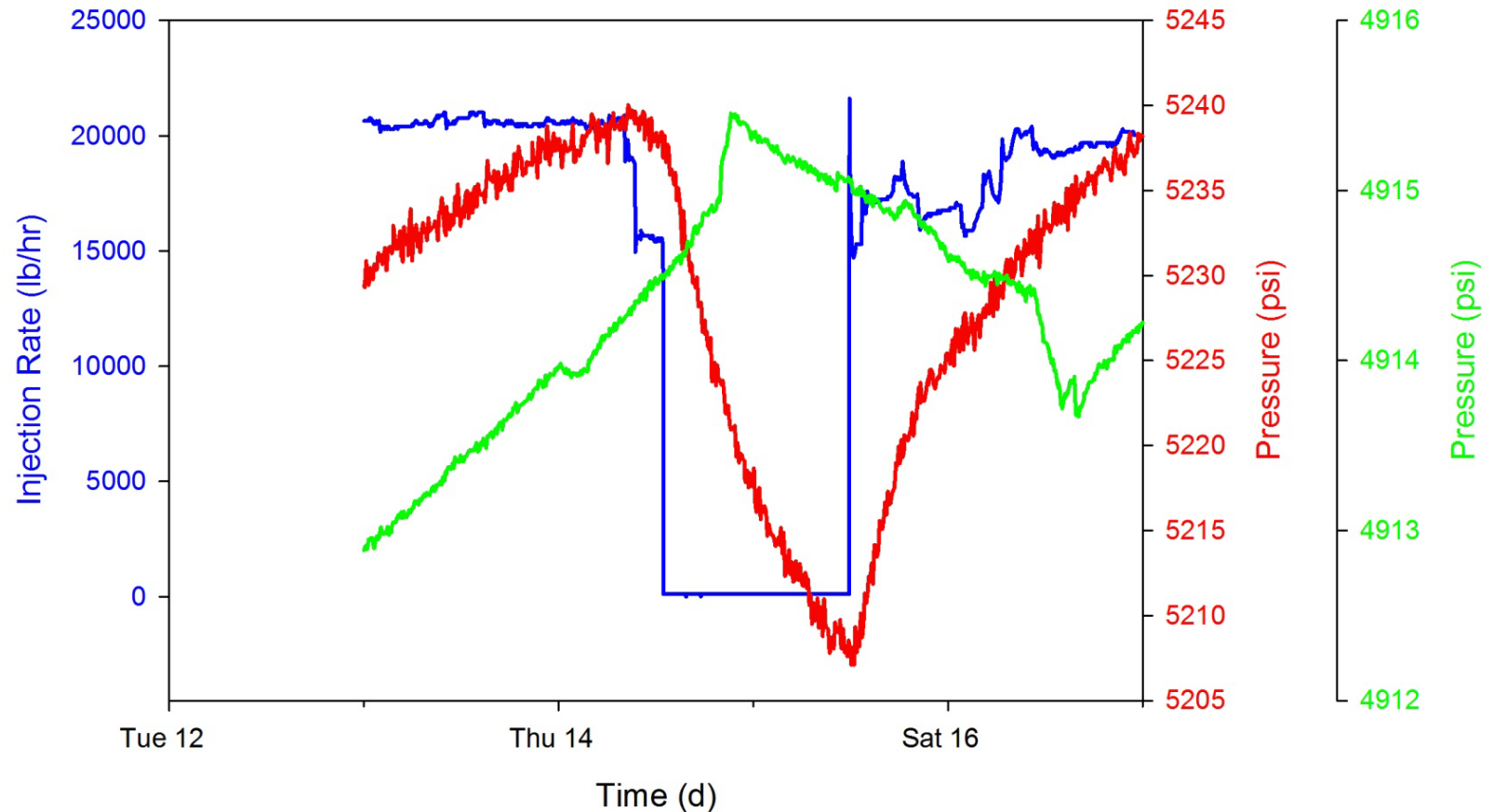
LEAKAGE

Down-hole

- Cross-well seismic & VSP
- Cross-well & surface-to-downhole electrical monitoring
- Real-time P & T
- Passive seismic
- Fluid sampling
- Time-lapse logging
- Distributed Acoustic/Temperature Sensors (DAS/DTS)
- Heater cable
- Gravity

IN SITU

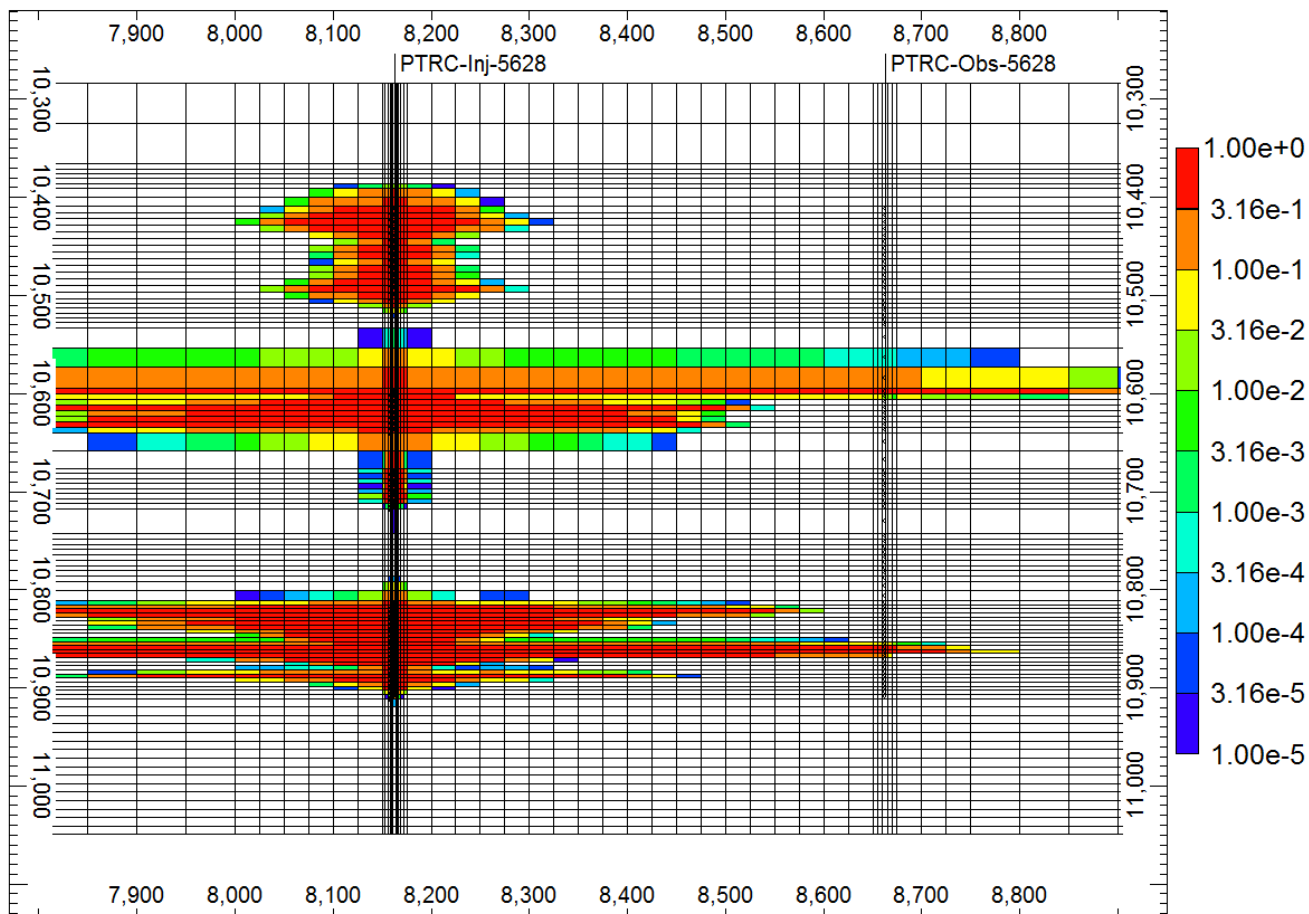
CO₂ INJECTION VS OBSERVATION WELL DOWNHOLE PRESSURE



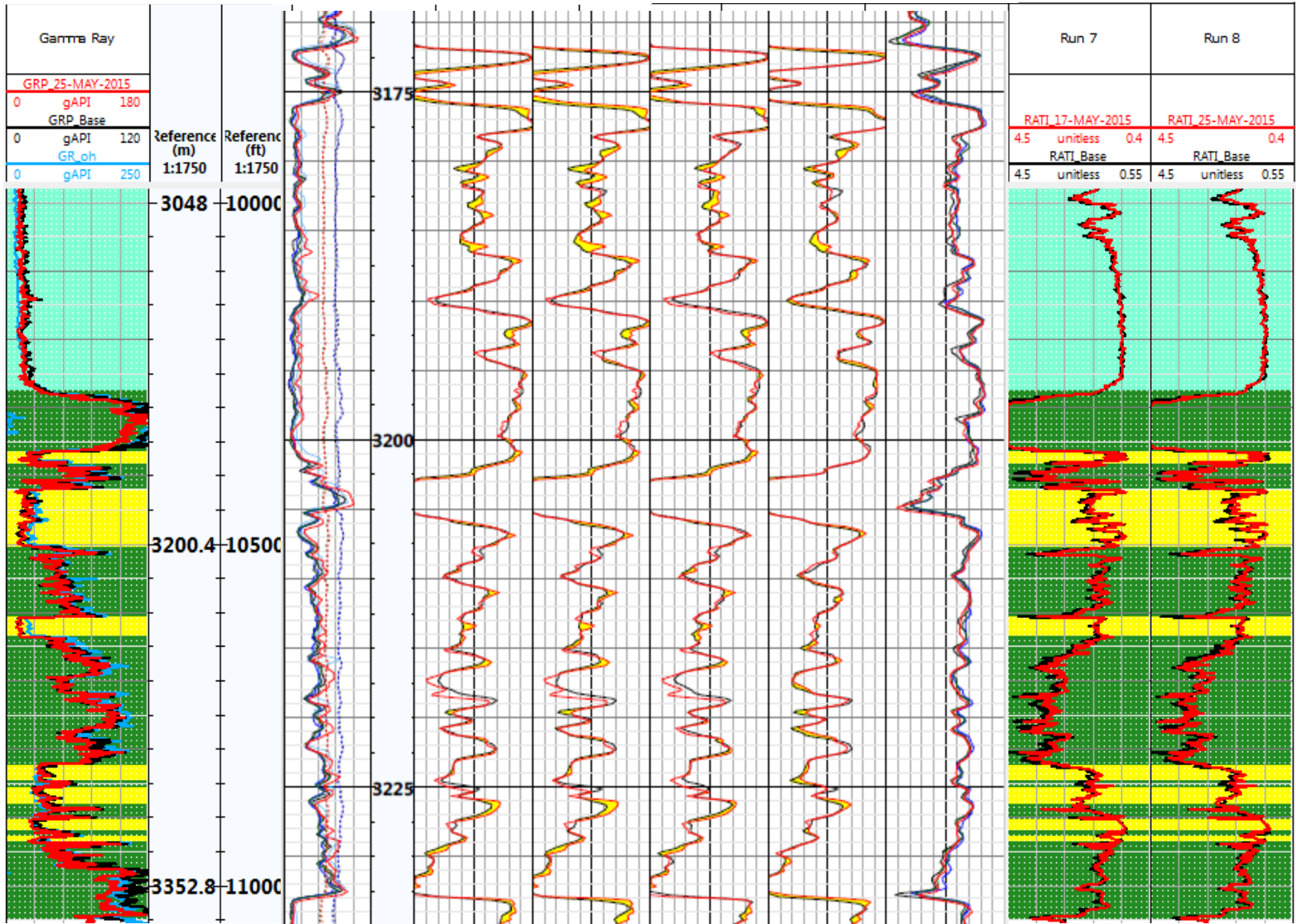
— INJ WELL CO2 FLOW
— OBS WELL 3302M
— OBS WELL 3135M

AQUISTORE: RESERVOIR SIMULATIONS

Gas Saturation 2015-08-31 | layer: 45



AQUISTORE: REPEAT PULSED NEUTRON LOGGING



AQUISTORE: MICROSEISMIC MONITORING

Geophones

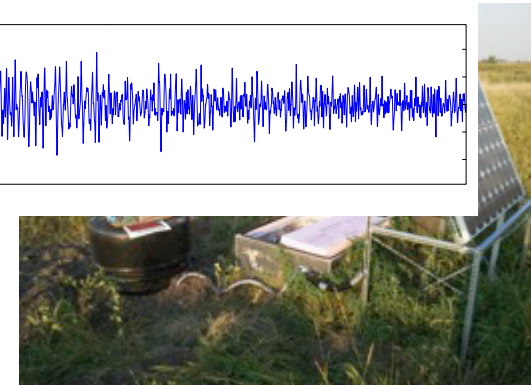
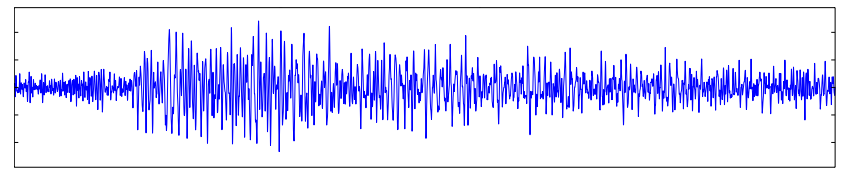
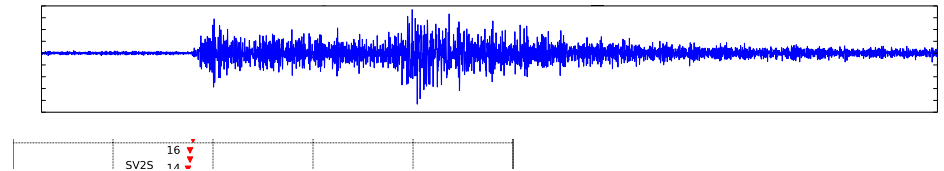
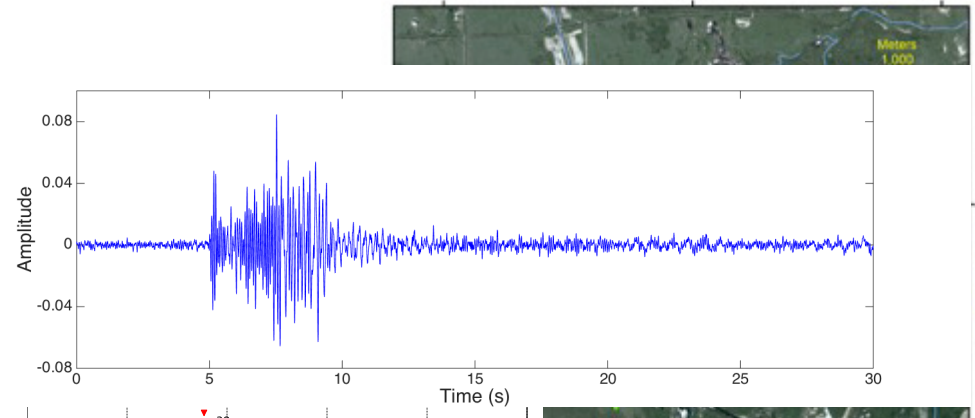
- 51 vertical component
 - 20m deep
 - Since July 2012
- 25 3-component
 - 6m deep
 - Recording since Nov 2014

Surface

- 3 broadband seismometers
 - Recording since Nov 2013

Downhole

- 5-level 3C geophones above reservoir
- 20 day test of DAS passive recording

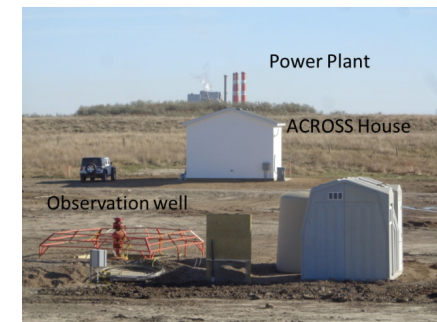
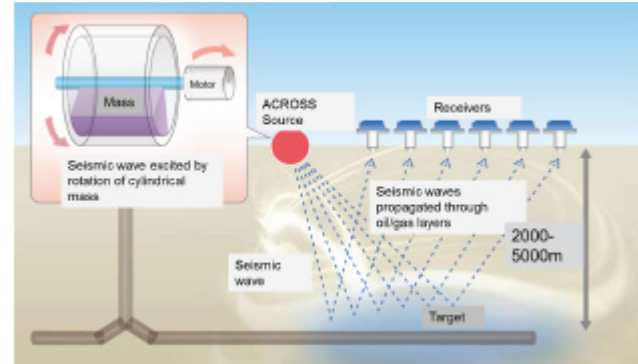


AQUISTORE: ACROSS SOURCE

- ACROSS (Accurately Controlled and Routinely Operated Signal System)

- Fixed in cement at surface, can produce repeatable, extremely precise two-component seismic signal

- Used in collaboration with Aquistore's 620 buried geophones.



CUTTING EDGE TECHNOLOGY: FIBRE OPTICS

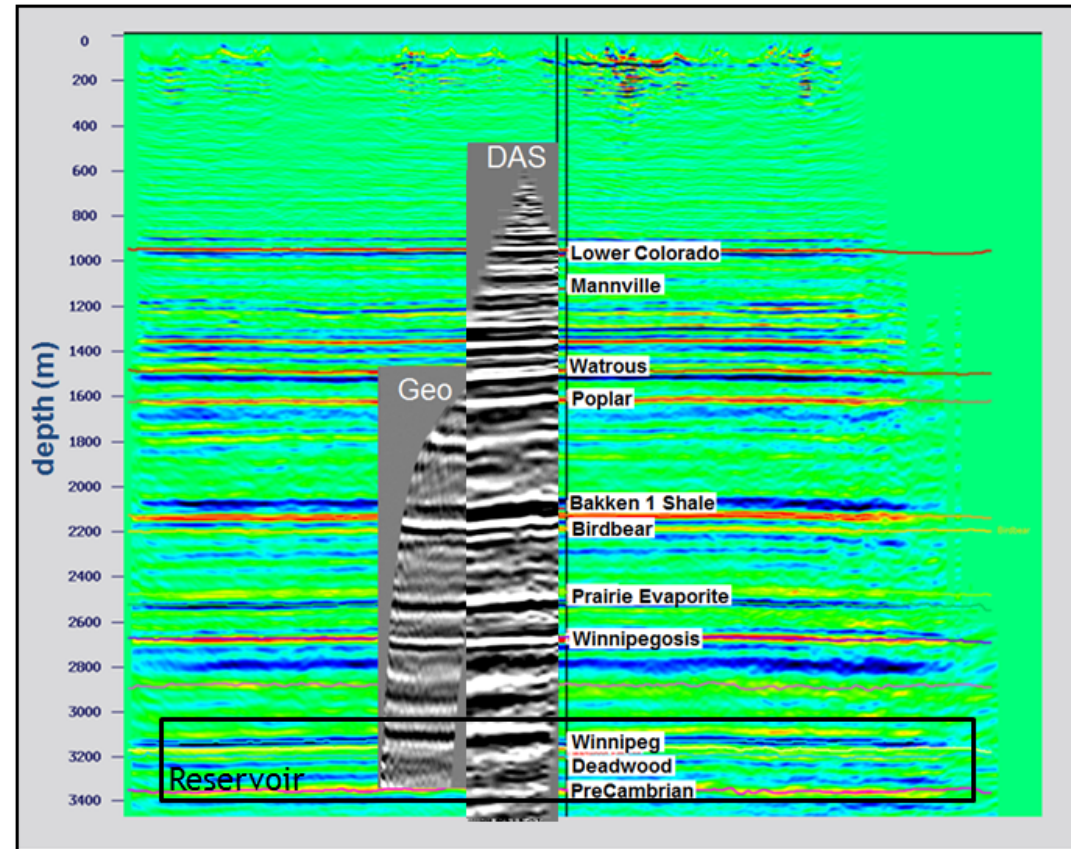
- Compare multi-source, multi-receiver and multi-company tools for efficacy and economics.

Sources

- 670 x 1kg dynamite charges
- Depth of 15m
- Arranged in 72 x 144m grid

Receivers

- 57 geophone Sercel tool
- Single mode optical fibre
-



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