




Australian Government

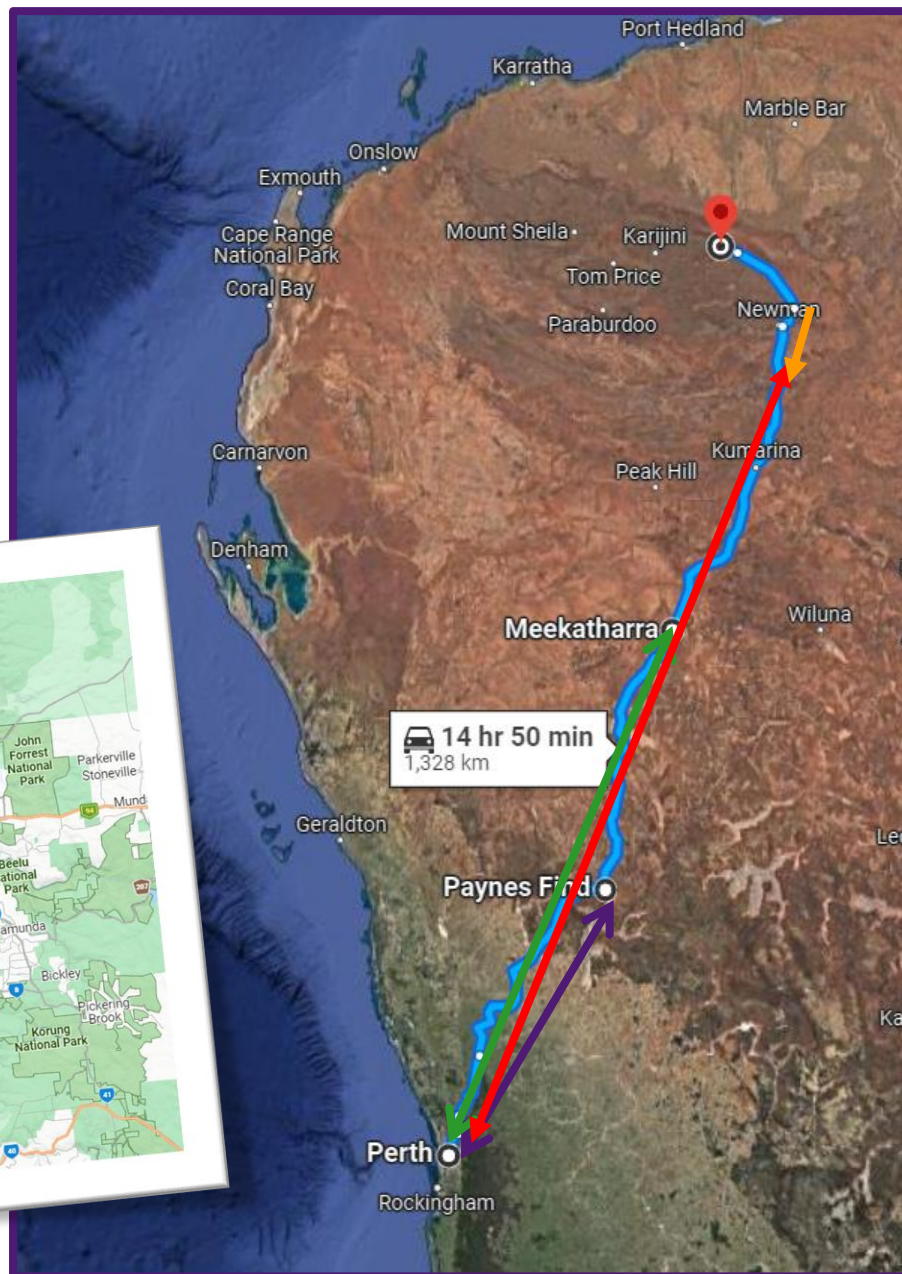
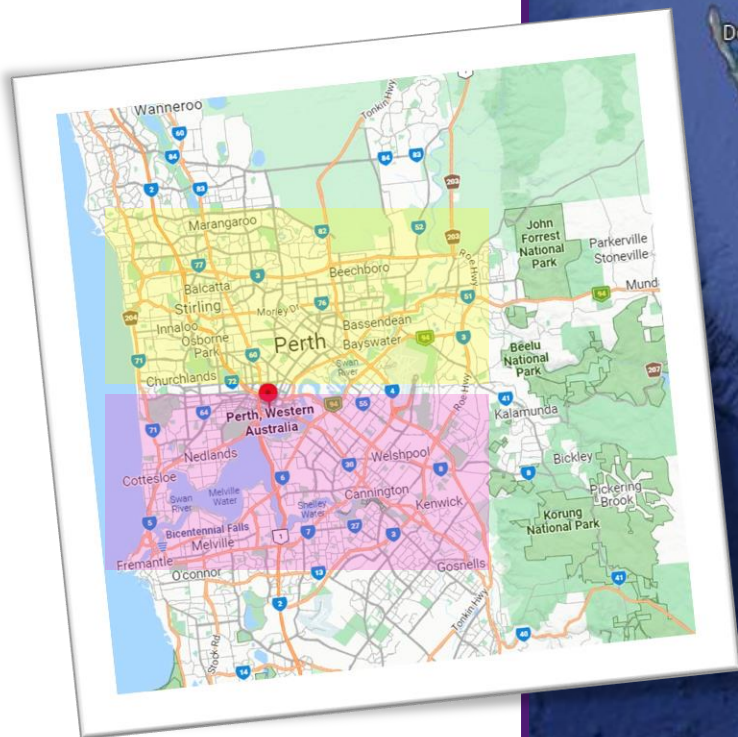
Australian Radiation Protection
and Nuclear Safety Agency



Wide Area Gamma Radiation Mapping: Is Australia Ready in an Emergency?



*ARPANSA respectfully acknowledges the
Traditional Owners and Custodians of Country
throughout Australia and their continuing
connection to land, waters and community. We
pay our respect to them and their cultures, and to
Elders past and present.*



31 Jan – 1 Feb 2023

Mission execution

Commonwealth agencies start looking

6 Commonwealth Teams join search:

Team ALPHA Defence

Team BRAVO ANSTO

Team CHARLIE ANSTO

Team DELTA ANSTO

Team ECHO ARPANSA

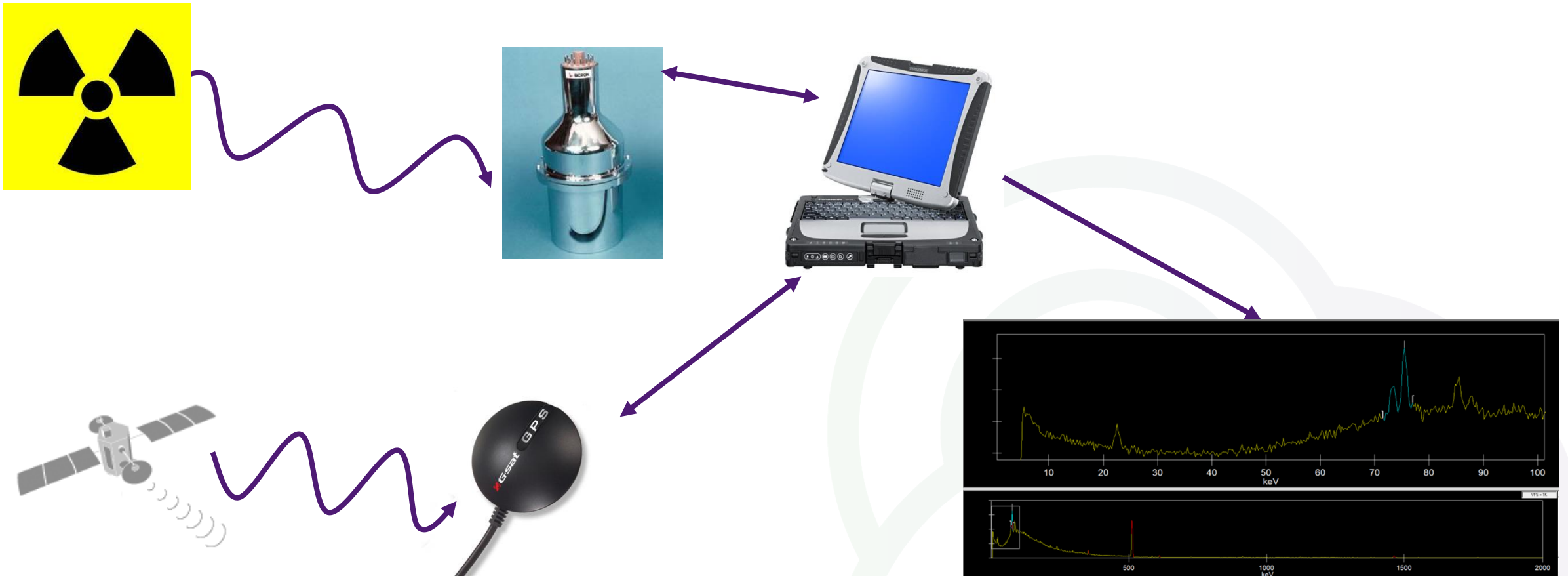
Team FOXTROT ARPANSA

All teams drove between 50 – 70 km/h

AGMS (DARKmap)

- The AGMS is used to quickly measure and assess the intensity of gamma emitting radioisotopes over a wide area.
- The system can be either vehicle mounted or carried on foot.
- Outputs 8 filetypes at the end of a survey – high redundancy
- Calculates Air Kerma dose rate – energy weighted

How the mapping system works



SPECIFICATIONS

Scintillators

- NaI
 - 6" x 4"
 - 3" x 3"
 - 2" x 2"
 - 16" x 4" x 4"
- LaBr
 - 1" x 4"

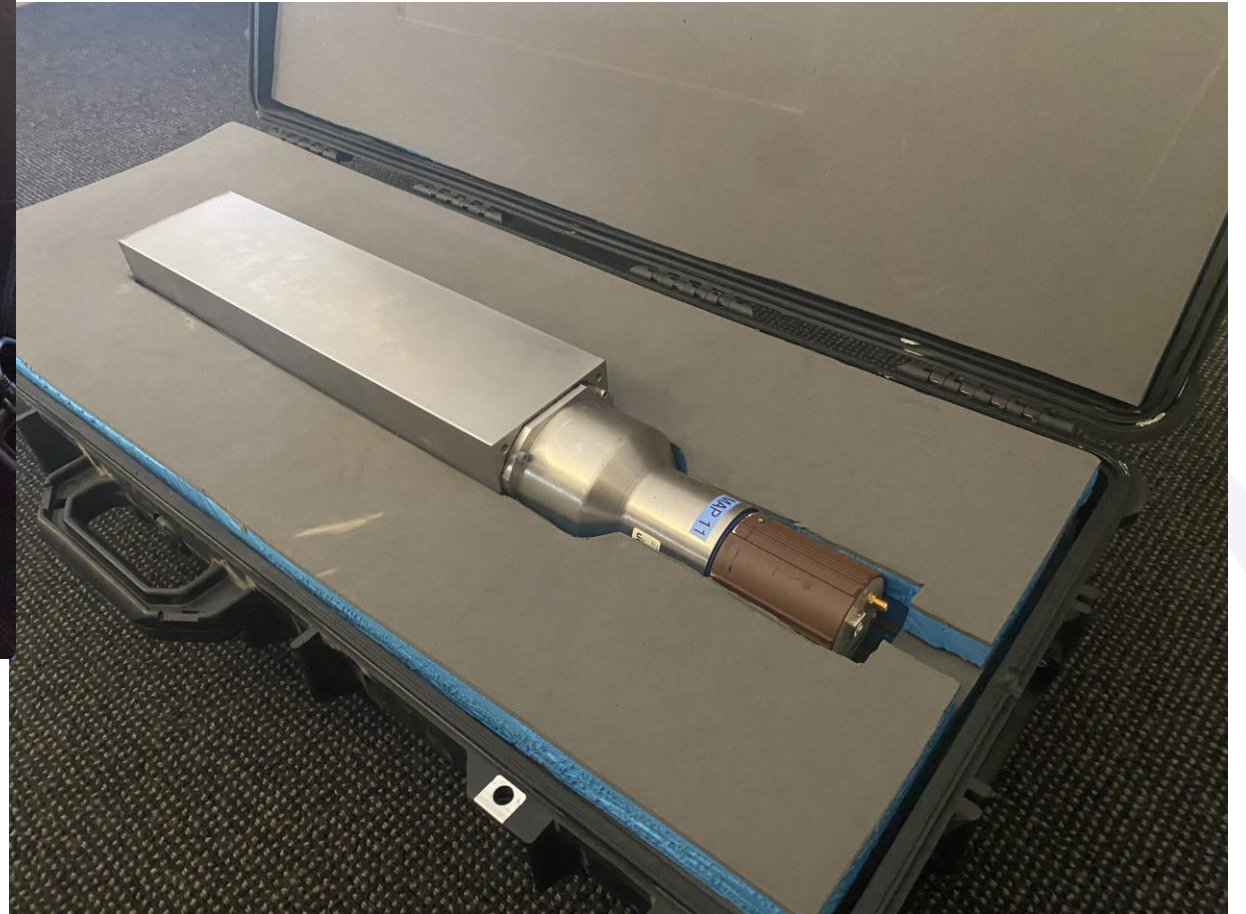
MCA

- Ortec DigiBase
 - 1024 channel
 - ~6 keV per channel

Software

- Custom development by ARPANSA
- GUI
 - Initialisation
 - Map
 - Spectrum and ROI
 - History
 - logging

Big ol block of NaI

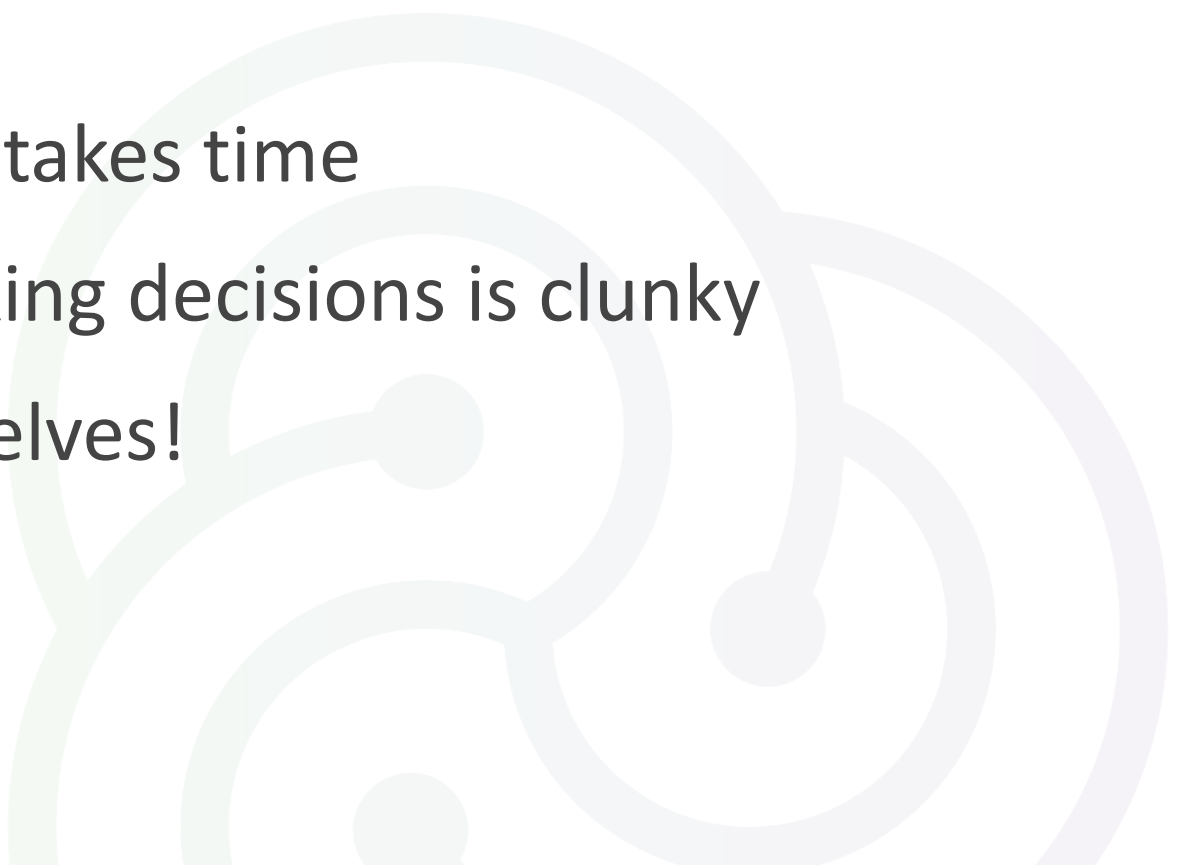


How much and what sensitivity do we need?

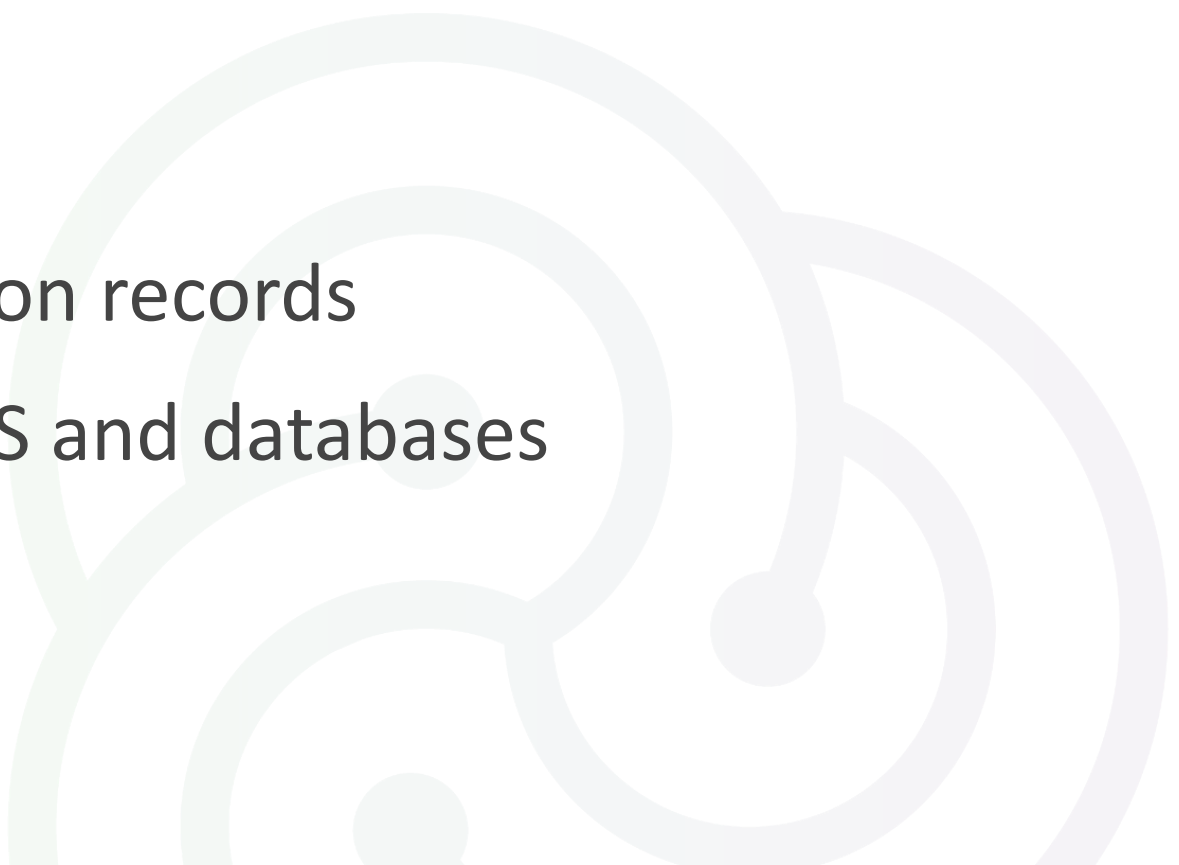
- WA background – 0.15 $\mu\text{Sv/h}$
- Detection limit on infinite plane $\approx 200\text{m}$
- Geometry helps us!
- Anomaly detection pushes even further
- Intervening materials create problems

Speed	Detector measurement ($\mu\text{Sv h}^{-1}$)		
	Source 15m from road, 1s integration	Source 15m from road, 3s integration	Source 15m from road, $\sim 30\text{cm}$ concrete attenuation
$\sim 35\text{km h}^{-1}$	6.3	4	1
$\sim 70\text{km h}^{-1}$	5	2.4	0.8
$\sim 110\text{km h}^{-1}$	4	1.7	0.6
	Source 50 m from road, 1s integration	Source 50m from road, 3s integration	Source 50m from road, $\sim 30\text{cm}$ concrete attenuation
$\sim 35\text{km h}^{-1}$	0.65	0.59	0.1
$\sim 70\text{km h}^{-1}$	0.63	0.48	0.1
$\sim 110\text{km h}^{-1}$	0.59	0.39	0.09

Spectral Analysis

- Post processing at the end of the day/start of next day
 - Real time anomaly detection
 - Fine analysis of multiple points takes time
 - Reporting results back and making decisions is clunky
 - Field team can't do it all themselves!
- 
- A decorative background graphic consisting of several concentric circles and dots in light green and light purple colors, located in the bottom right quadrant of the slide.

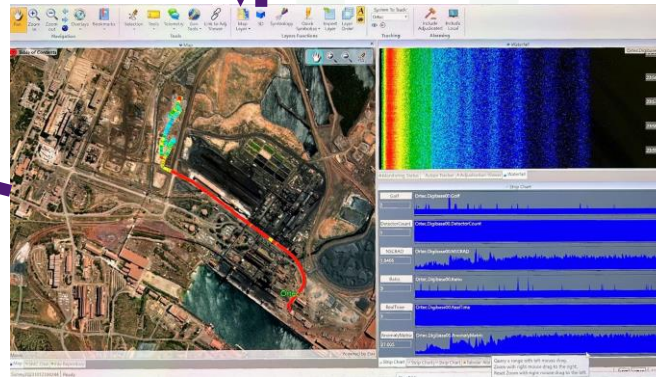
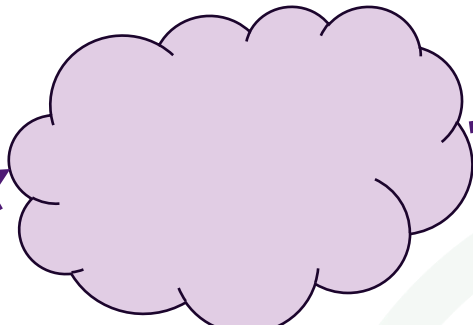
Gaps in the AGMS

- Data aggregation
 - Real time remote monitoring
 - Analysis
 - Decision making and adjudication records
 - Modernise Detectors, MCA, GPS and databases
- 
- A decorative background graphic consisting of several overlapping, concentric, and semi-circular lines in shades of light green and light purple, creating a stylized, organic shape on the right side of the slide.

Solution: iAVID

- Real time measurement, visualisation and analysis
- Aerial and mobile systems
- Joint project between Remote Sensing Laboratory (RSL) and Pacific Northwest National Laboratory (PNNL)
- Provided by agreement between federal governments
NNSA=>ARPANSA

Telemetry and sharing data



De

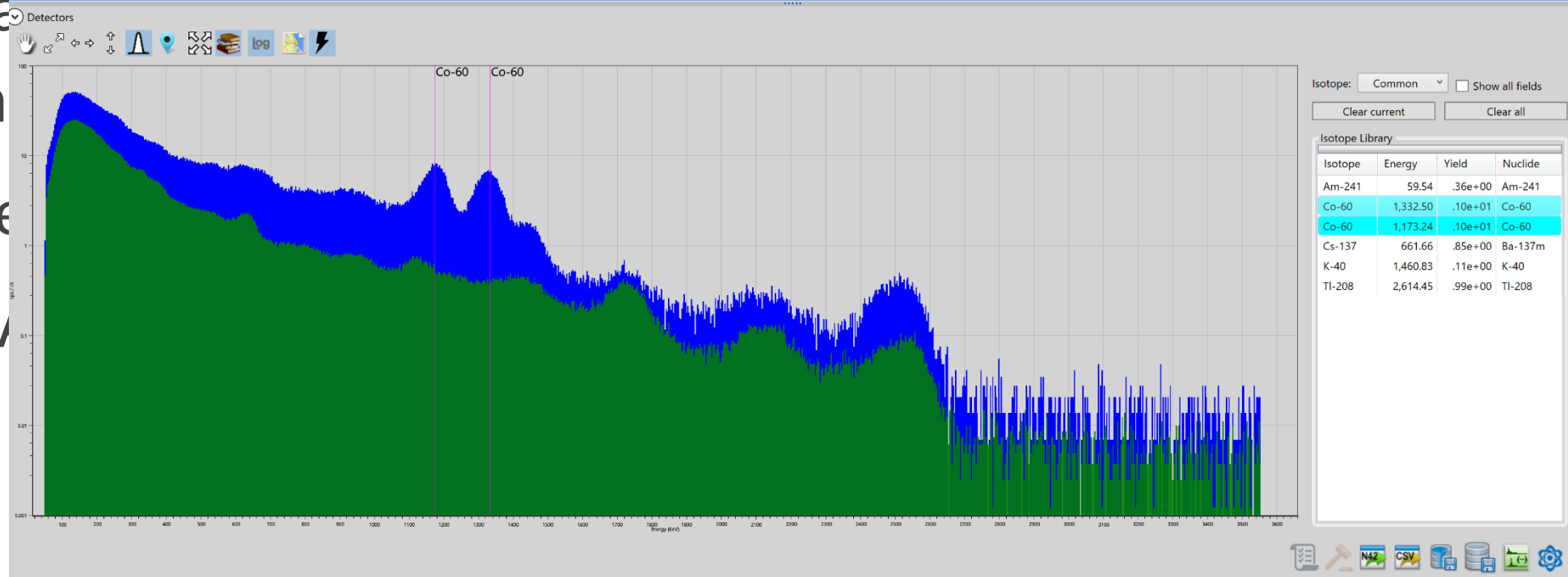
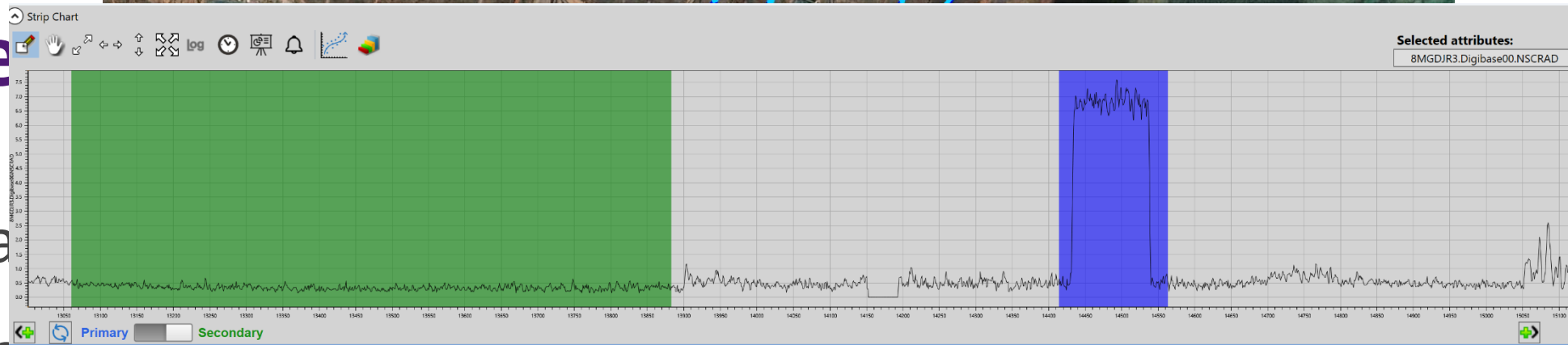
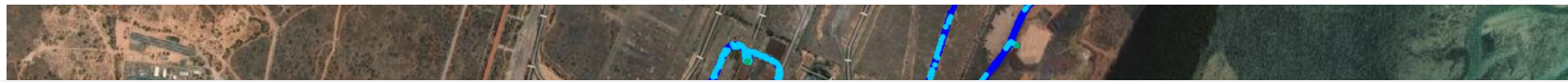
• Sa

• Ca

m

• Ae

• G



Real time remote monitoring

- Deployed iAVID to Whyalla, SA
- Much smaller source ≈ 30 MBq
- More complex environment
- Smooth integration
- What happens if we didn't find the WA source?

Radioactive material 'missing'

EXCLUSIVE

SARAH ISON

A radioactive piece of equipment used in steel manufacturing has been lost in South Australia, with the state's Environmental Protection Authority and the national nuclear safety agency still searching for the missing radioactive source.

It follows an incident in Western Australia earlier this year, where a highly radioactive capsule was lost in the outback as it was being transported between mine sites.

The Australian can reveal Whyalla company Liberty OneSteel – which has recently changed its name to Infrabuild – reported the missing piece of equipment, known as an industrial bin level gauge, which is used to measure stored materials in industrial silos and bins.

The SA EPA confirmed the gauge contained a radiation source and had been missing for about three weeks.

"After being notified, the EPA mobilised its emergency response team to the site, including EPA radiation safety specialists," a spokeswoman said.

"The EPA initiated incident management arrangements, which included the South Australian Police and SA Metropolitan Fire Service. The EPA also contacted the Australian Radiation Protection and Nuclear Safety Agency."

She said an extensive radiological search had been conducted but "to date, the gauge has not been located".

A spokesman for ARPANSA confirmed the national peak body had deployed a team of experts with specialised detection equipment to conduct "extensive radiological searches for the missing item".

He said "any repercussions for the company would be determined by the regulator, the EPA".

An investigation into the lost capsule in WA – which measured just 8mm by 6mm – wrapped up earlier this month but did not lead to any charges being laid against Rio Tinto.

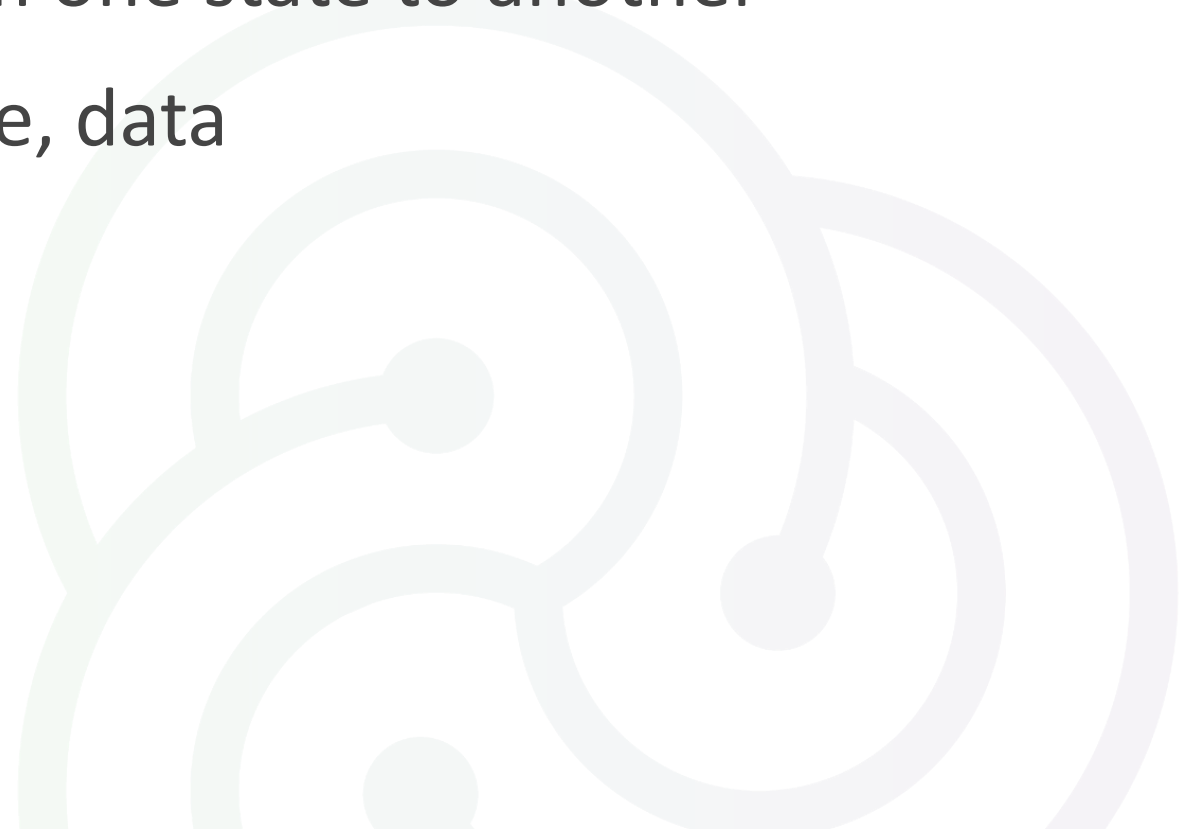
A spokesman for the GFG Alliance – the umbrella company for Liberty OneSteel – said the device, which contained a low level of radioactivity, "was moved during maintenance works".

"There is no evidence that the device has left the Whyalla Steelworks site. A radiation expert has been engaged. The device is not considered to present a risk," the spokesman said.

The EPA spokeswoman confirmed Infrabuild's lost gauge was purchased 35 years ago, meaning its radioactivity had now decreased to 30 megabecquerel, or 100 times less than when the unit was new.

National Framework?

- Better understanding between agencies of capabilities
- Ability to deploy resources from one state to another
- Sharing of expertise, experience, data
- Practice more!



Questions?



Thank you

callum.watson@arpansa.gov.au

Phone: 03 9433 2339



ARPANSAGovernment



ARPANSA



ARPANSANews



ARPANSA