Pilot Airborne Geophysical Surveys carried out in 2006

Eibhlín Doyle and Gerry Stanley

Geological Survey of Ireland

History

- Resource and Environmental Survey of Ireland (RESI) originally conceived and jointly planned by GSI and GSNI in 2002-2003
- Scoping study was completed by CSA Group
- Cost-benefit analysis by UCD
- GSNI secured funding and the Northern part of ‘RESI’. Work commenced in 2004 - TELLUS Programme
- Opportunity for trial surveys in the Republic in June 06 - taking advantage of the completion of the survey in Northern Ireland

Presentation Outline

- Geophysical methods
- Survey parameters
- Area selection
  - Geology
  - Questions to be addressed

Three main systems

1. Magnetics
2. Electromagnetics
3. Radiometrics

Flight parameters

- Flight Line Spacing 100m, 200m
- Flight Line Direction 345°, 360°
- Sensor Height - open areas* 56m
- Sensor Height - developed areas* 240m
- Aircraft speed (normal surveying speed) 210km/hr

* (always subject to pilots' discretion - in the interests of safety)

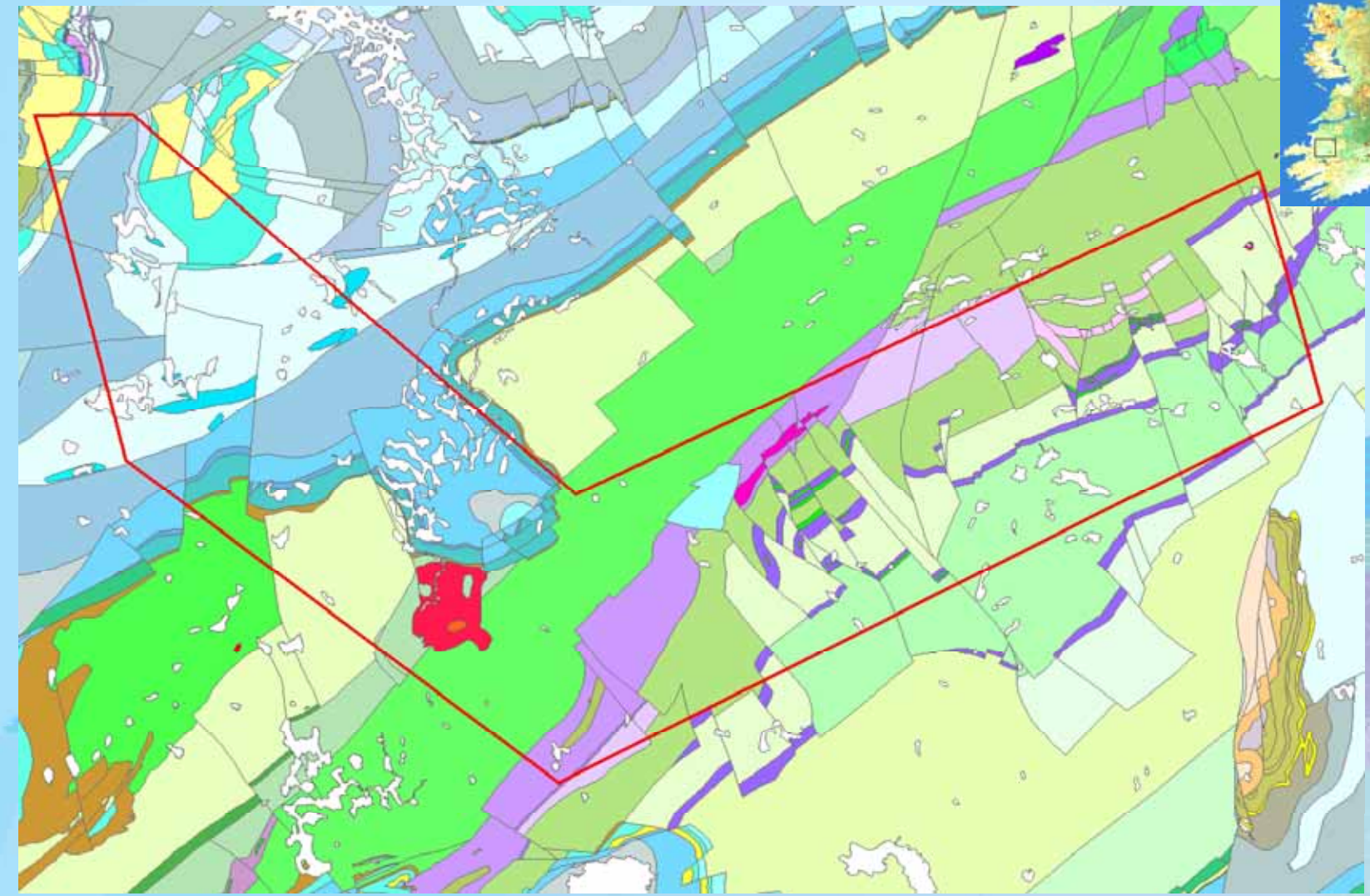
Three Areas

Survey Statistics

	no. of lines	line km	days
Cavan-Leitrim-Monaghan	317	5077	8
Castleisland	164	4583	6
Silvermines	111	722	1

Why Cavan – Leitrim – Monaghan?

1. To demonstrate the feasibility of integrating the survey with the TELLUS survey of Northern Ireland
2. To identify different overburden types (e.g., till, sand and gravel or peat)
3. To assist with mineral exploration
4. To assist with bedrock geological interpretation in support of applied geological studies (e.g., groundwater studies or identification of aggregate resources)



CAVAN – LEITRIM - MONAGHAN

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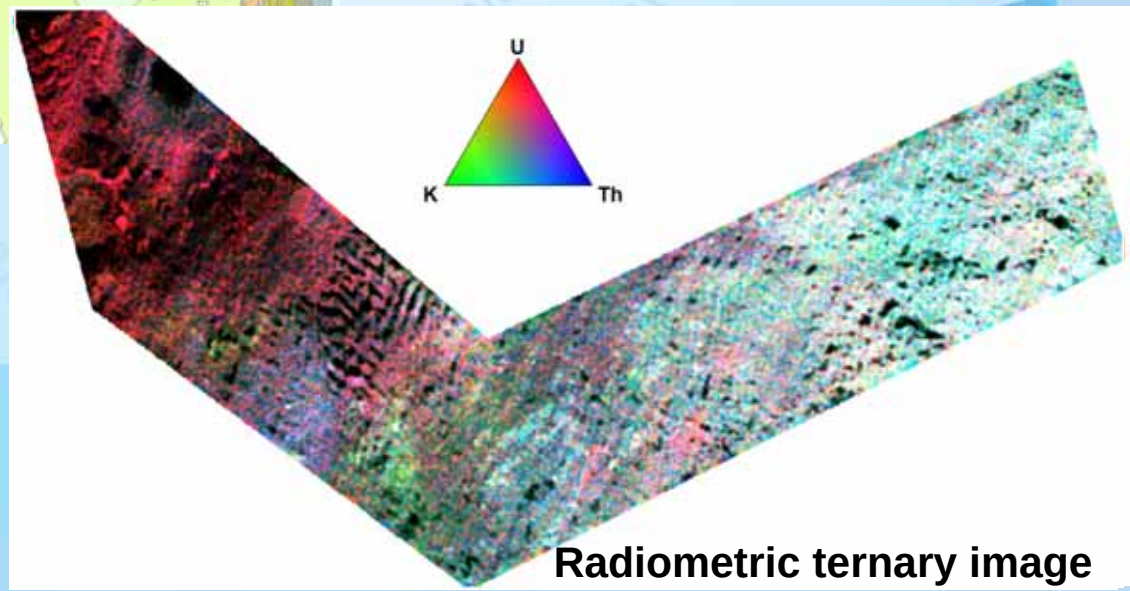
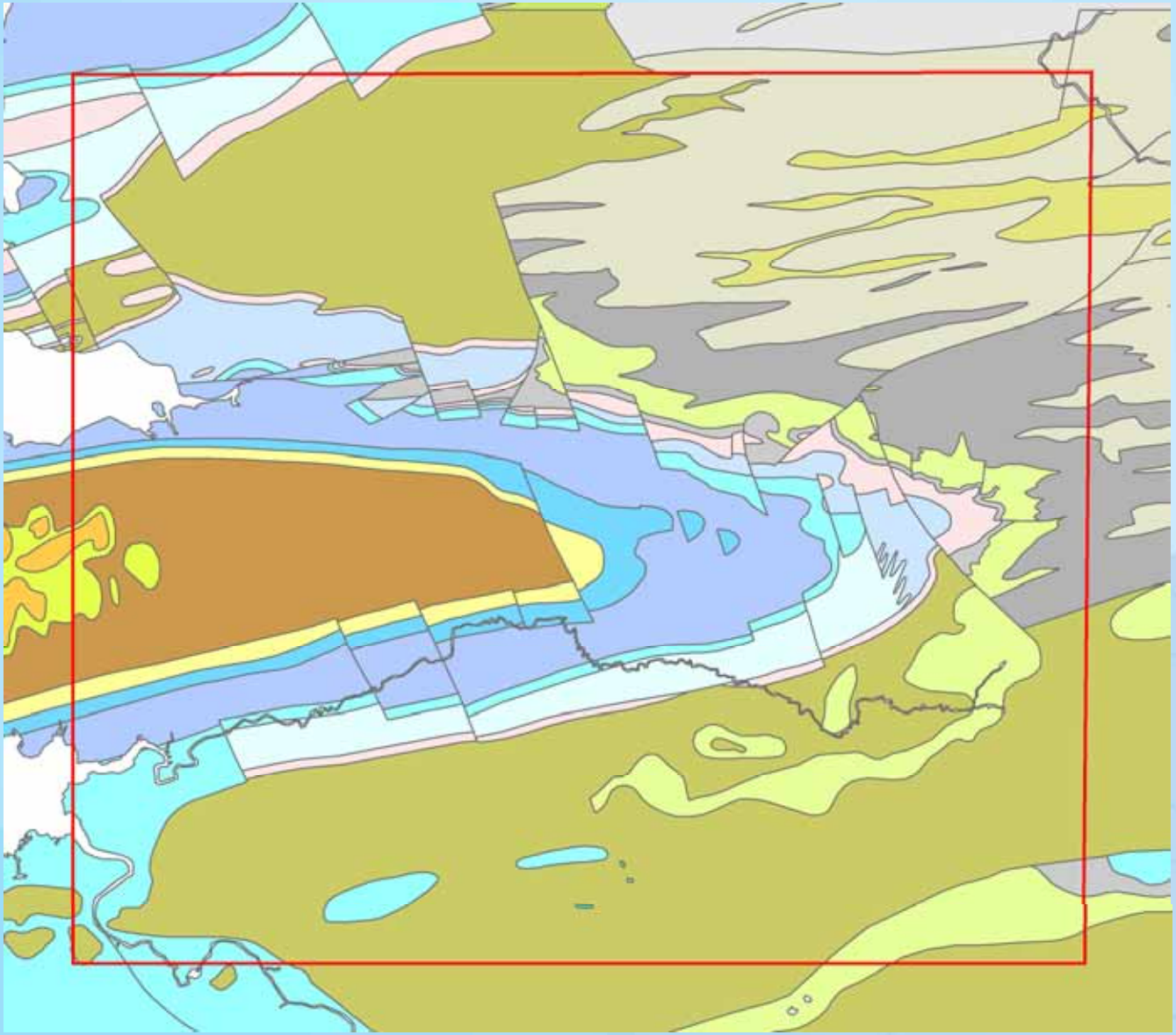


Radiometric ternary image

CAVAN – LEITRIM - MONAGHAN

Why Castleisland, Co. Kerry?

1. To investigate the efficacy of the system in mapping radon hazard.
2. To identify different overburden types (e.g., till, sand and gravel or peat)
3. To assist with bedrock geological interpretation in support of applied geological studies (e.g., groundwater studies or identification of aggregate resources)

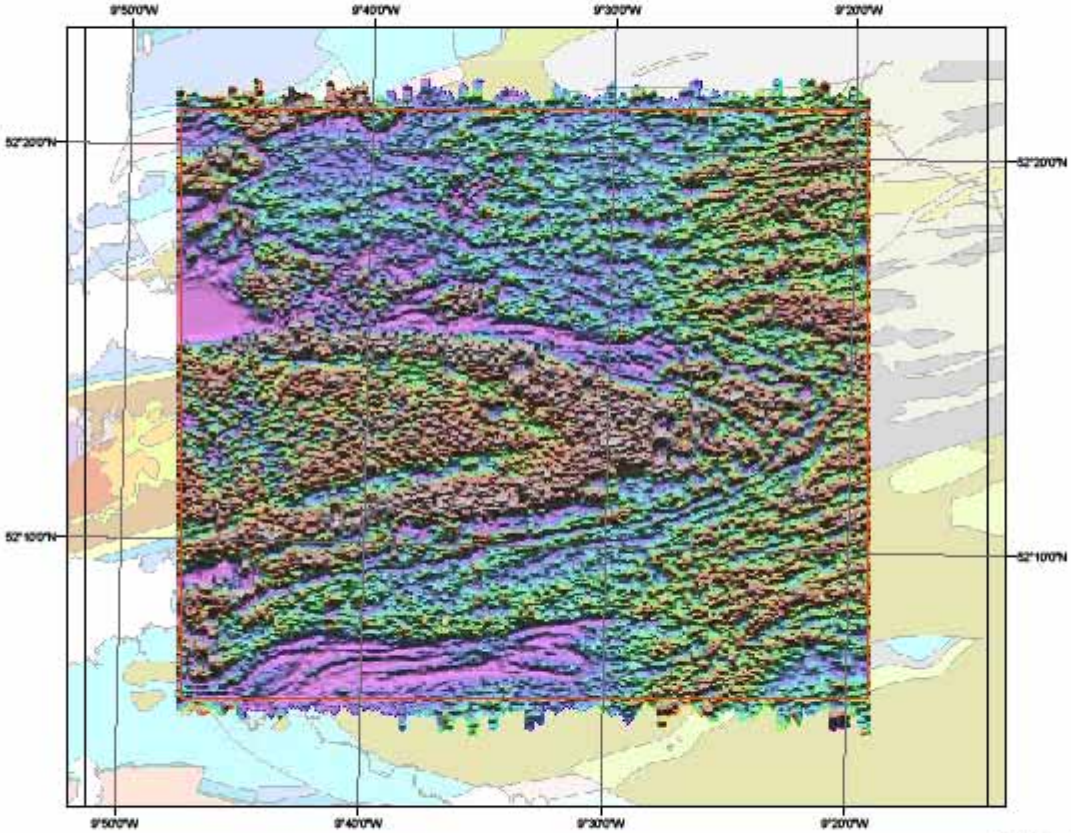


CASTLEISLAND

Castleisland-Tralee

Geological Survey of Ireland

Apparent resistivity at 12 kHz



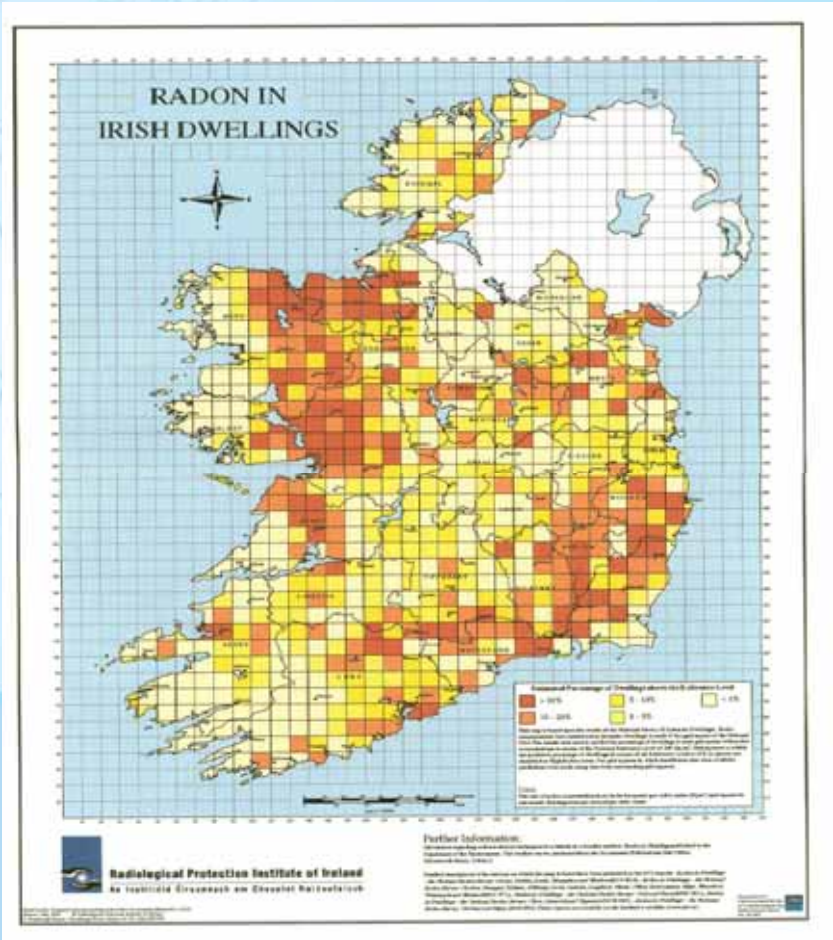
Reid Geophysics Ltd Mar 2007

Plate 20

Extract from 1:100K Mapping

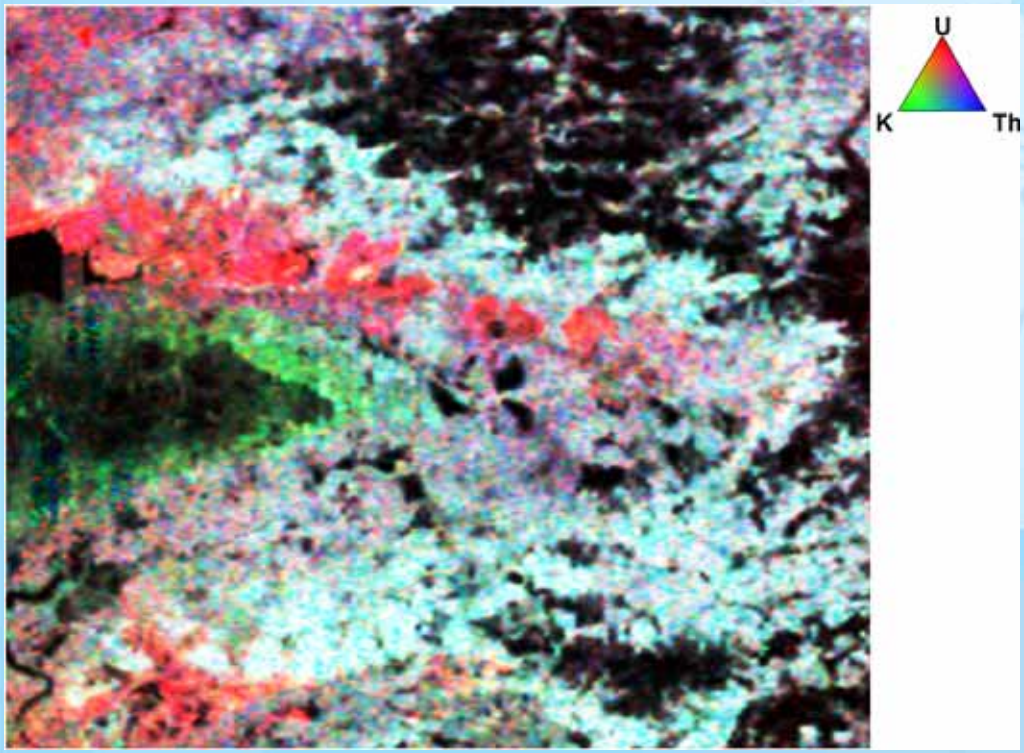
Castleisland

- Recent figures from the National Cancer Registry reports that there are approximately 1,576 new cases of lung cancer diagnosed in Ireland every year. The Registry also estimates that there are approximately 1,499 deaths from lung cancer every year.
- 87% are estimated to be due to smoking and 13% due to other causes.
- Some 150 – 200 people die from lung cancer unrelated to smoking in Ireland each year. Radon contributes to these deaths.

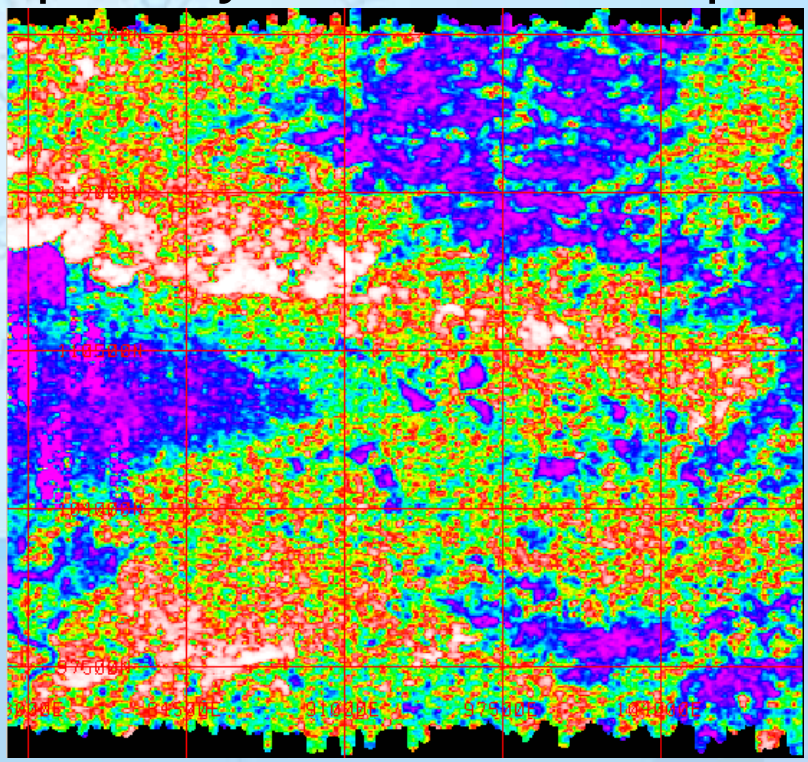


(is actually Bi^{214} and hence $Radon^{222}$)
(this is the primary Radon Risk Map)

Radiometric ternary image



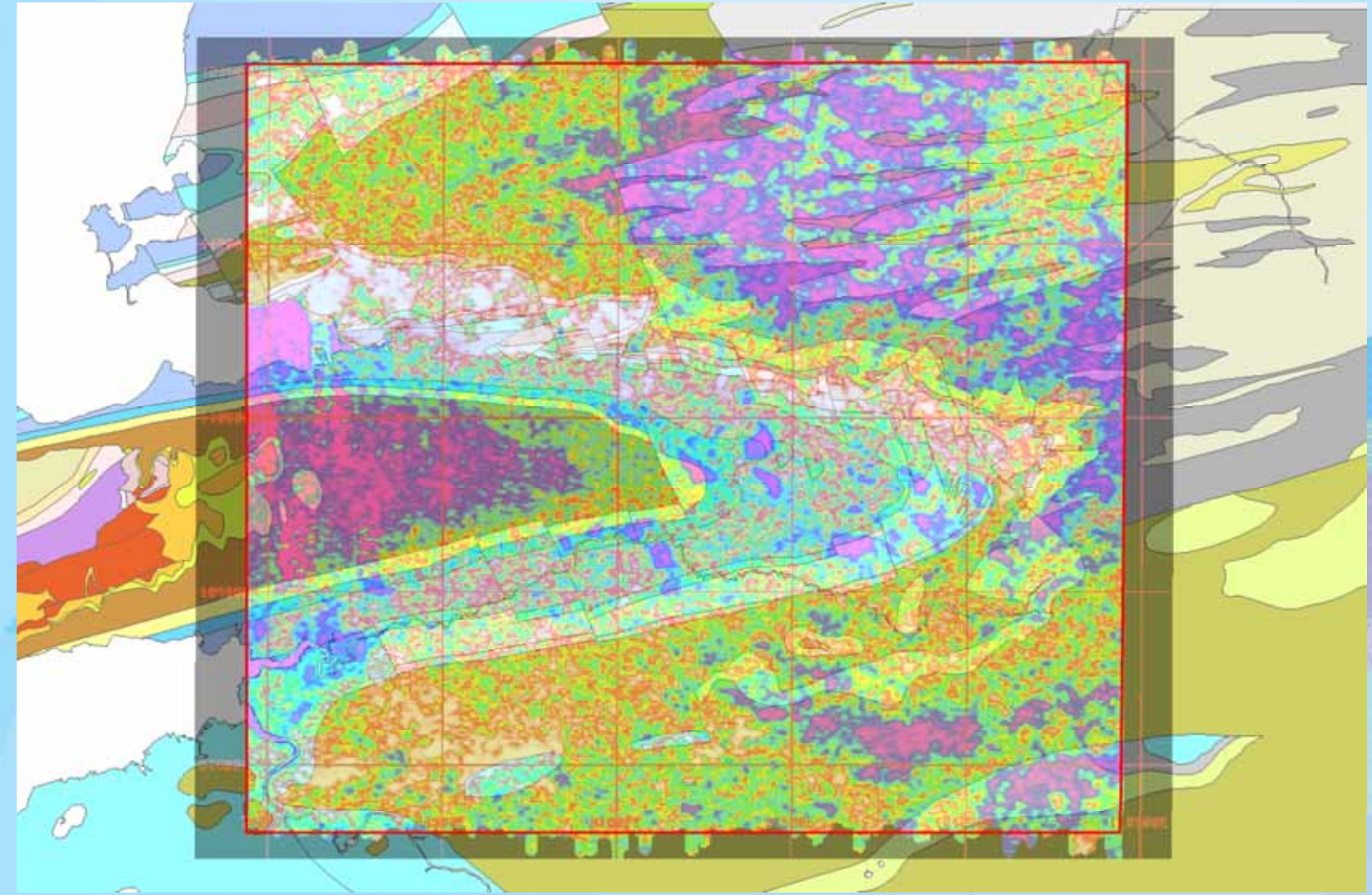
“Uranium” image
primary Radon Risk Map



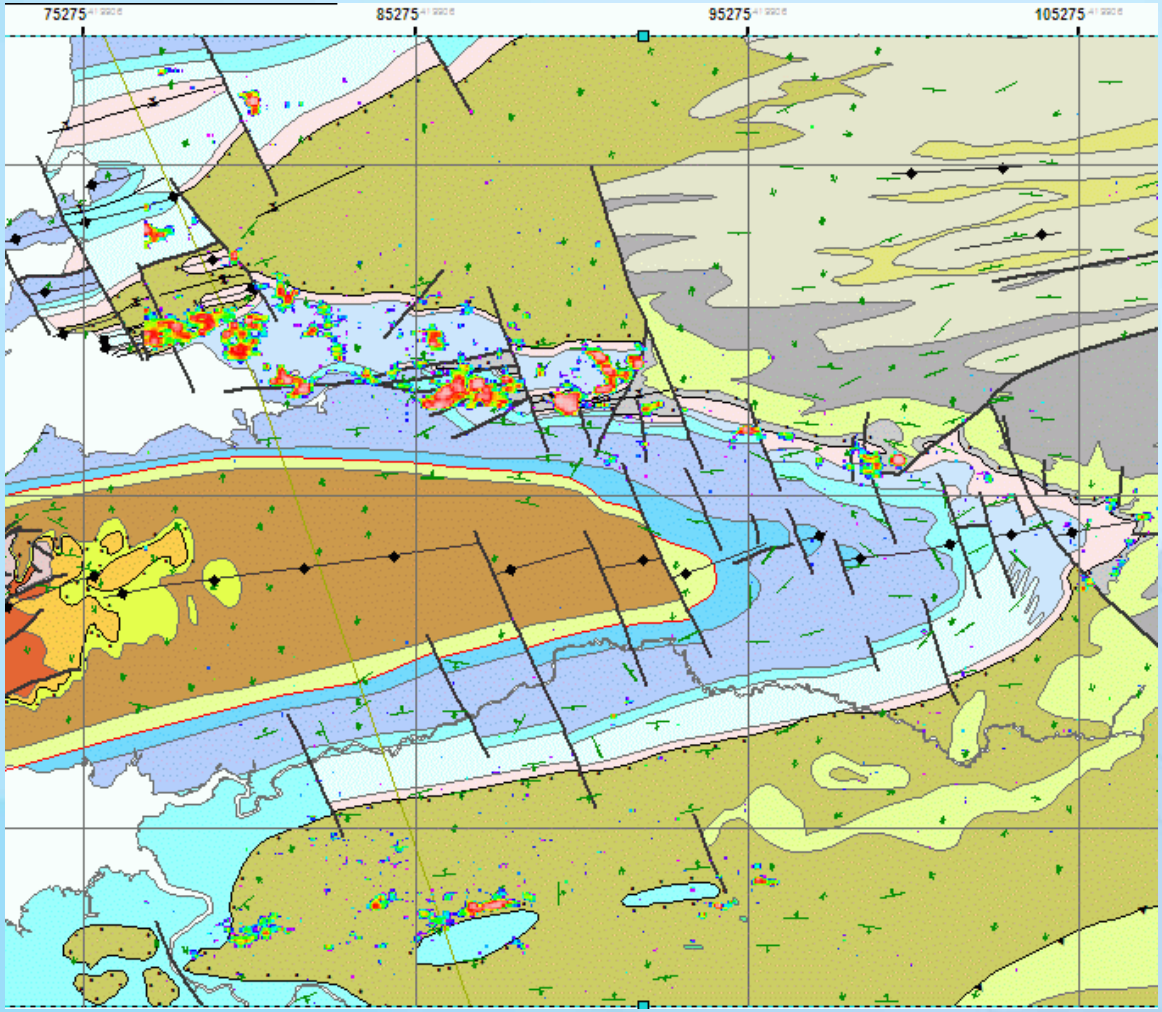
High is red – white.

“eUranium” image (is actually Bi^{214} and hence $Radon^{222}$)

(this is the primary Radon Risk Map)



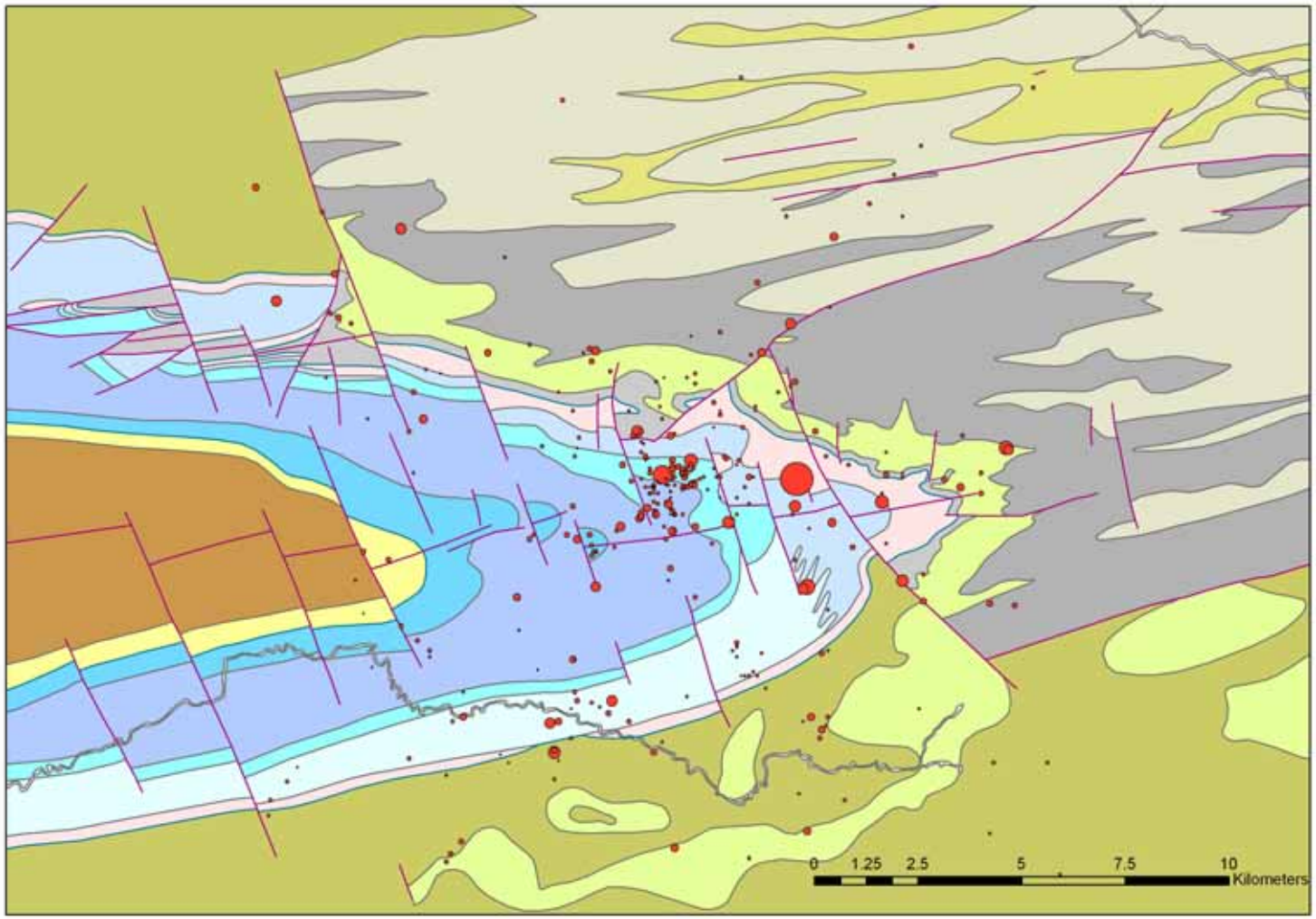
eU greater than 2 standard deviations above mean



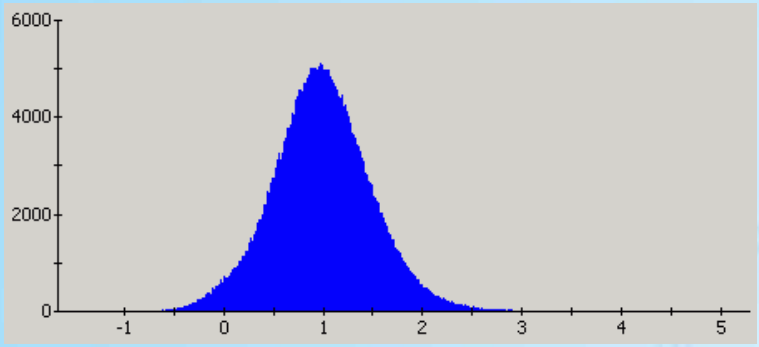
> 2.67 ppm eU

Areas showing red and green are highest risk.

Indoor Radon



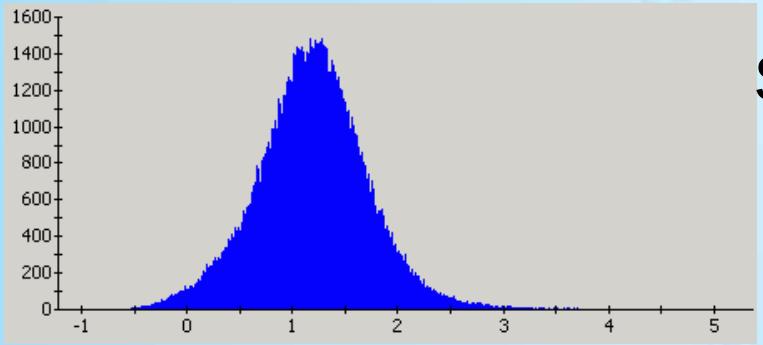
Area histograms of eU signatures (ppm)



Cavan-Monaghan & Silvermines show a single population with a mean at about 1 ppm, a maximum at 5 ppm and very little above 2.5 ppm

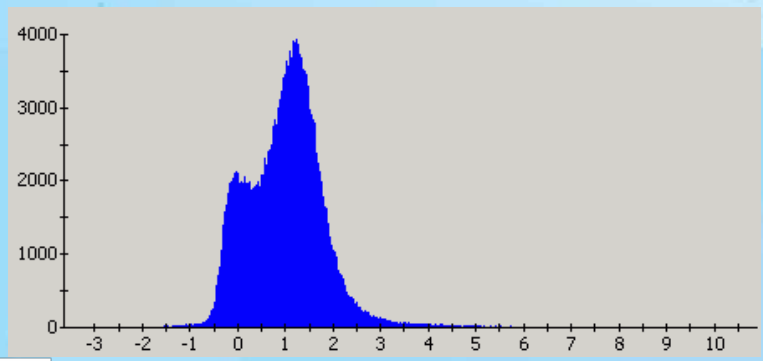
Cavan-Monaghan

Minimum	-1.664045
Maximum	5.285184
Mean	0.995195
Std Dev	0.491938



Silvermines

Minimum	-1.214841
Maximum	5.359684
Mean	1.200299
Std Dev	0.531841



Castleisland-Tralee is bimodal, with a significant tail above 2.5 ppm and a maximum of 10 ppm. It is clearly quite different.

Castleisland-Tralee

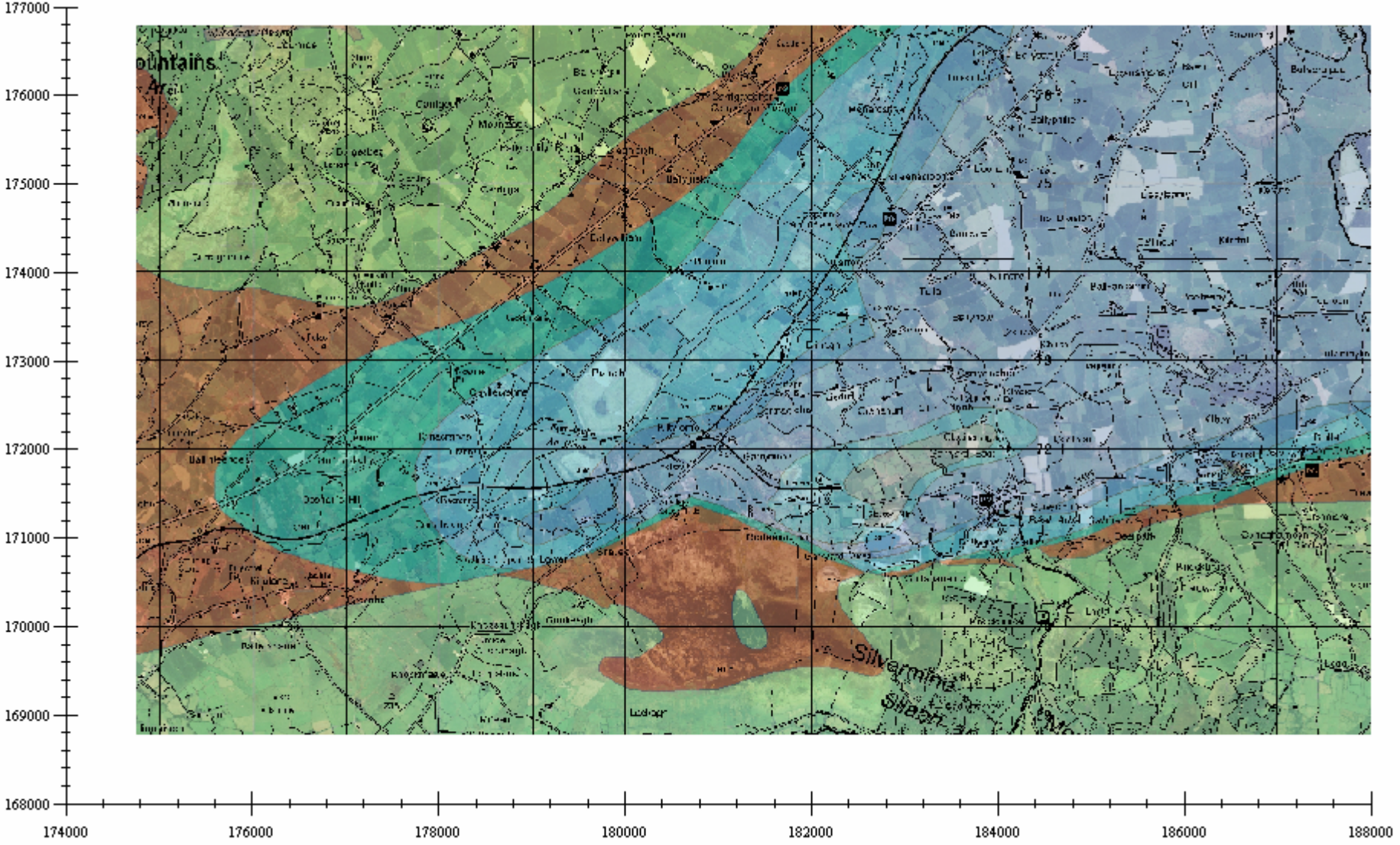
Minimum	-3.630441
Maximum	10.879000
Mean	1.019735
Std Dev	0.824543

Castleisland Tentative Conclusions

- Zones of relatively high radon risk are directly detectable using the gamma ray spectrometer
- High radon is associated with limestones
- The Castleisland area shows significantly greater radon risk (in well-defined small areas) than either Cavan-Monaghan or Silvermines

Why Silvermines?

1. To investigate the efficacy of the system in identifying contamination from past mining activities
2. To identify different overburden types (e.g., till, sand and gravel or peat)
3. To assist with mineral exploration
4. To assist with bedrock geological interpretation in support of applied geological studies (e.g., groundwater studies or identification of aggregate resources)



SILVERMINES

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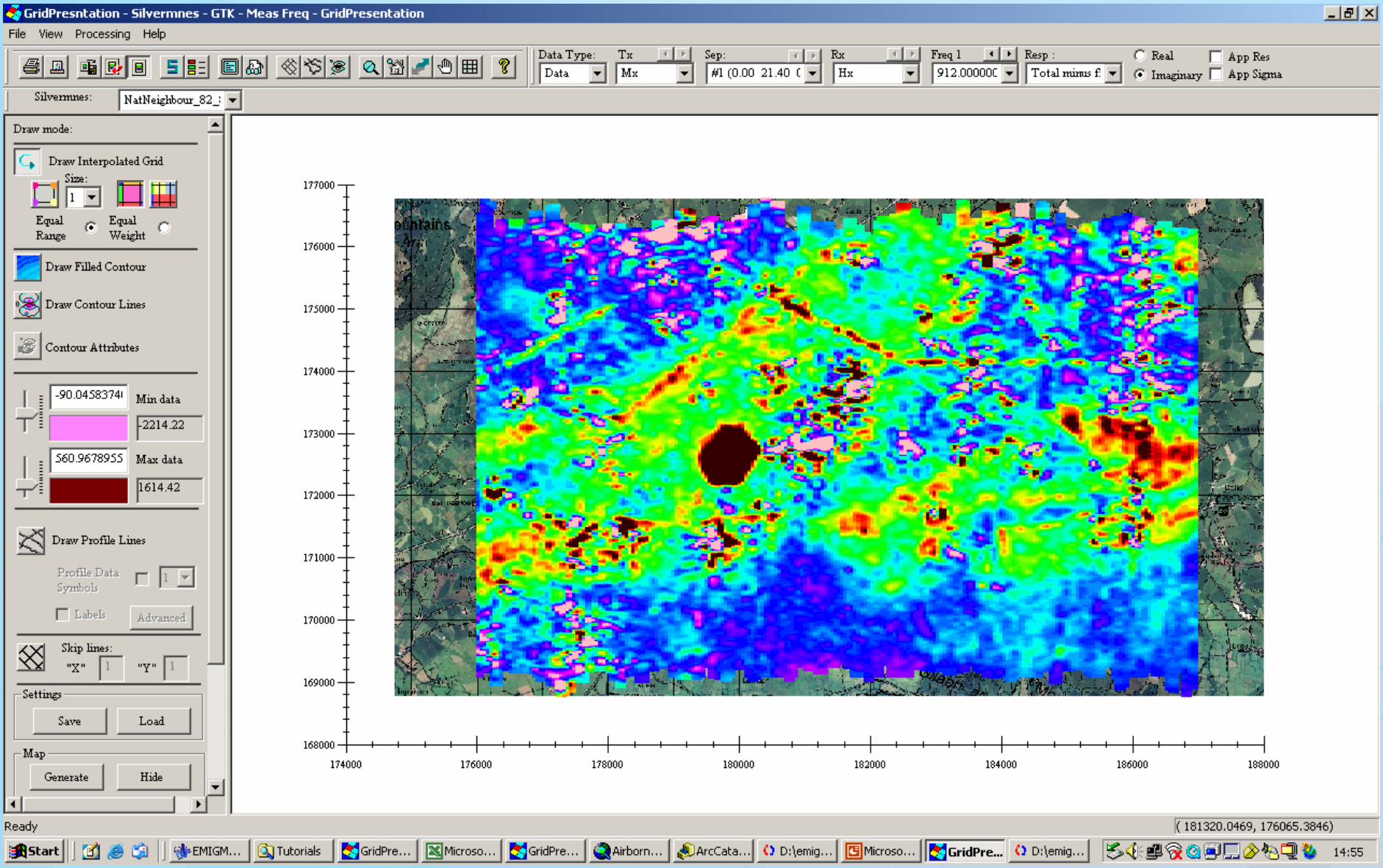
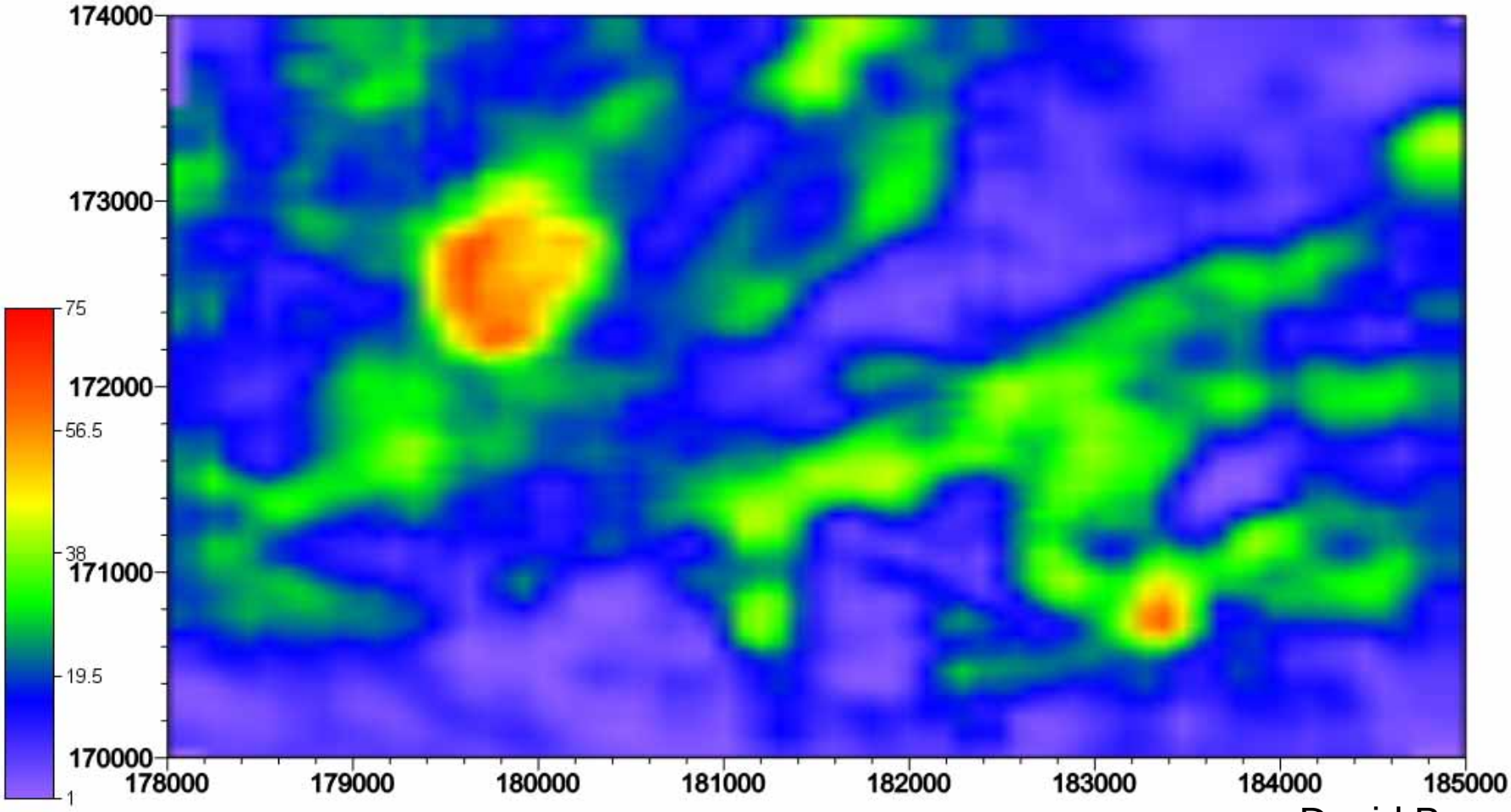
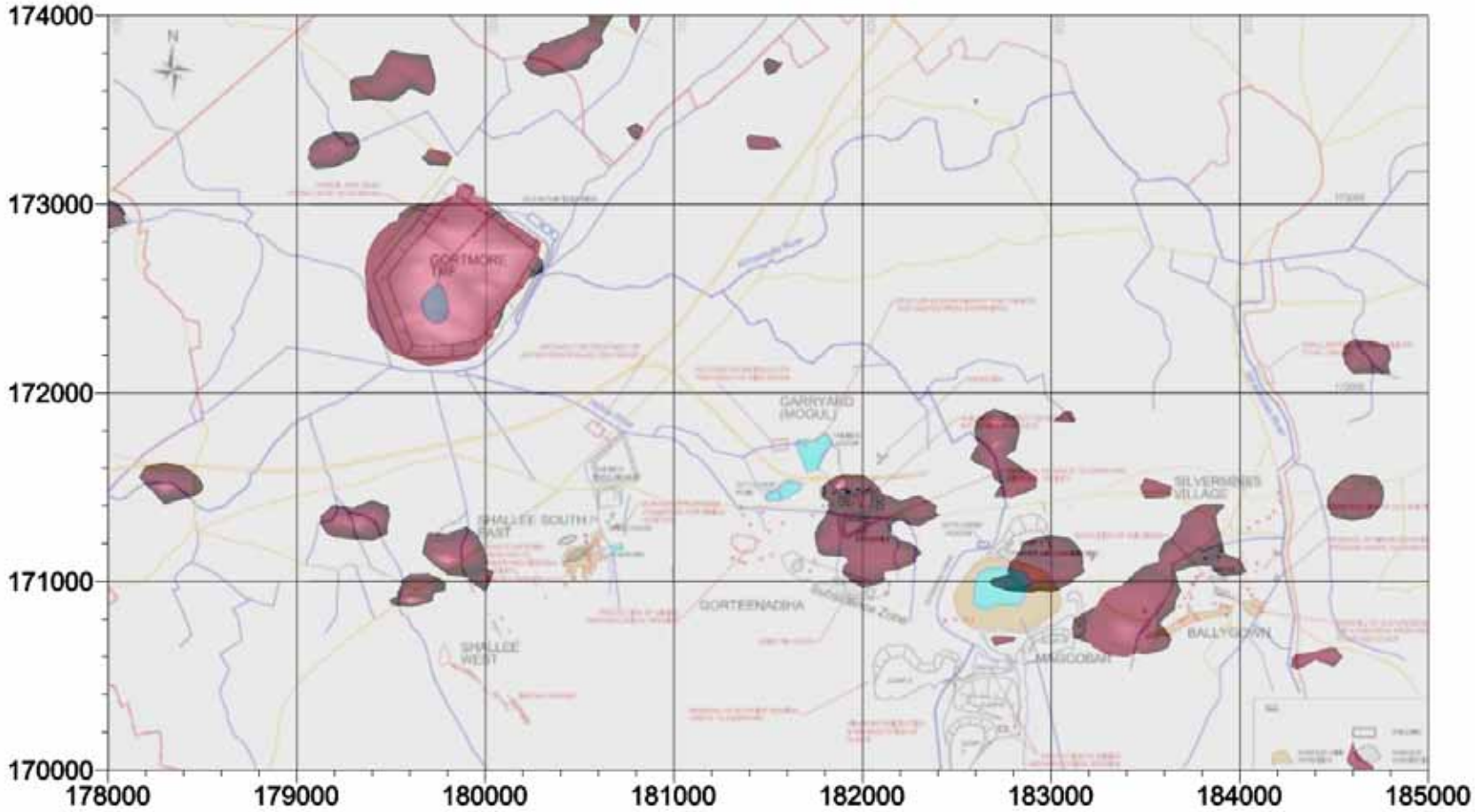


Silvermines – Quadrature response (ppm) @ 912Hz



David Beamish



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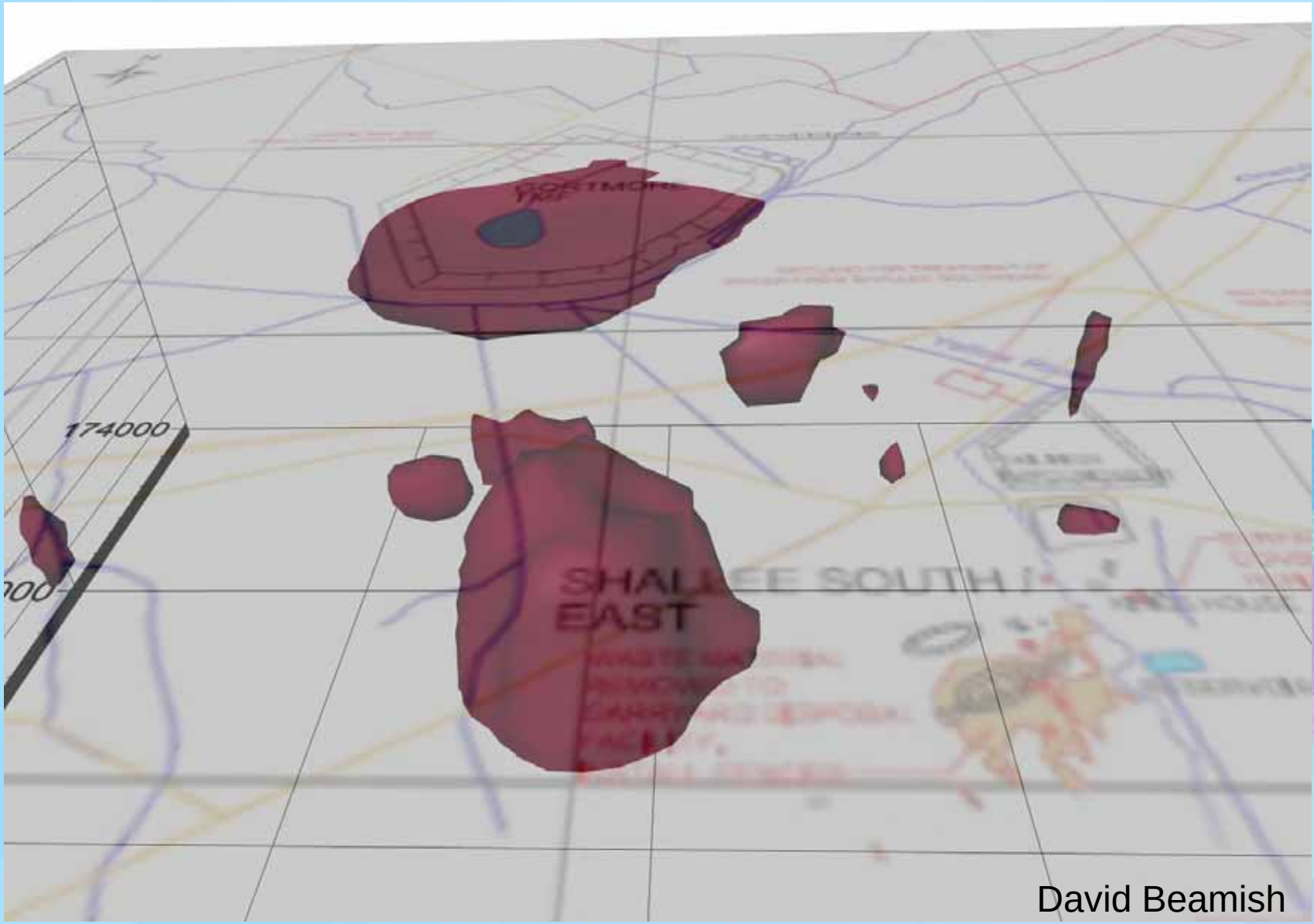

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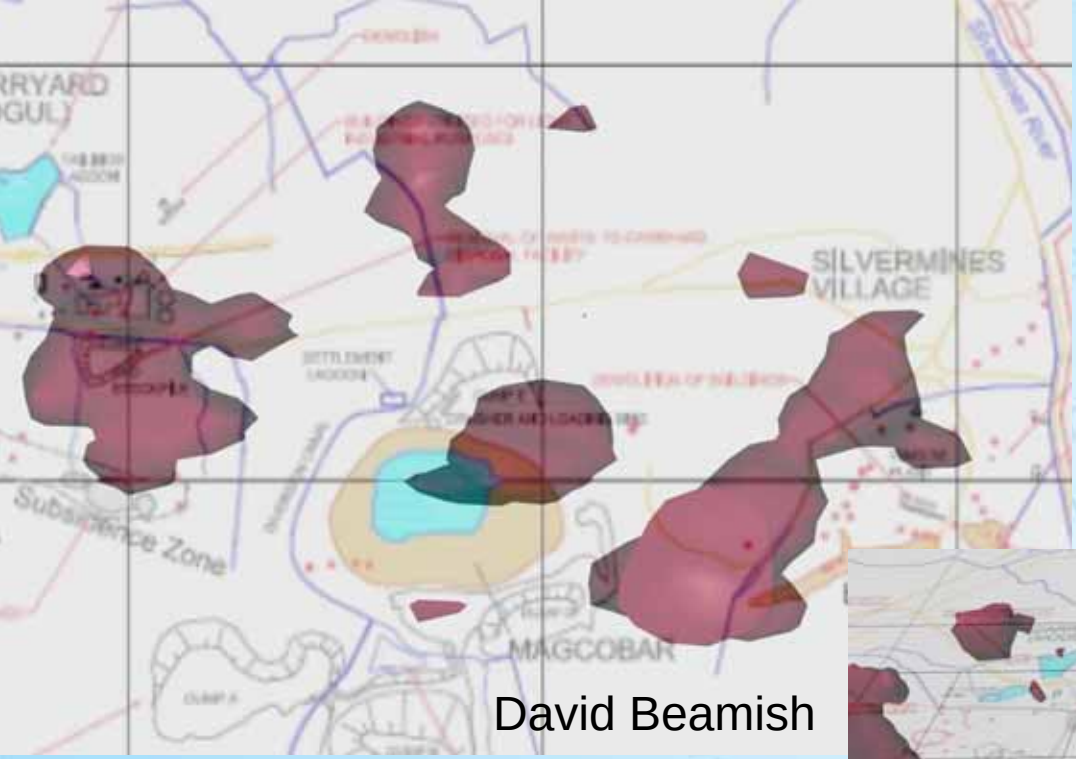

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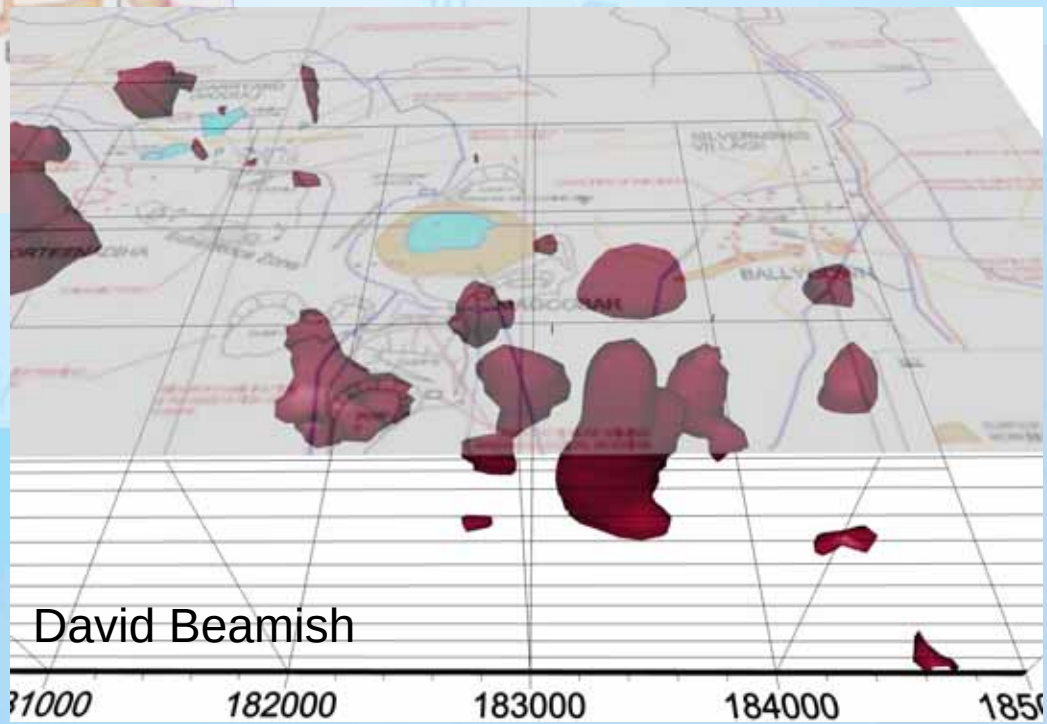

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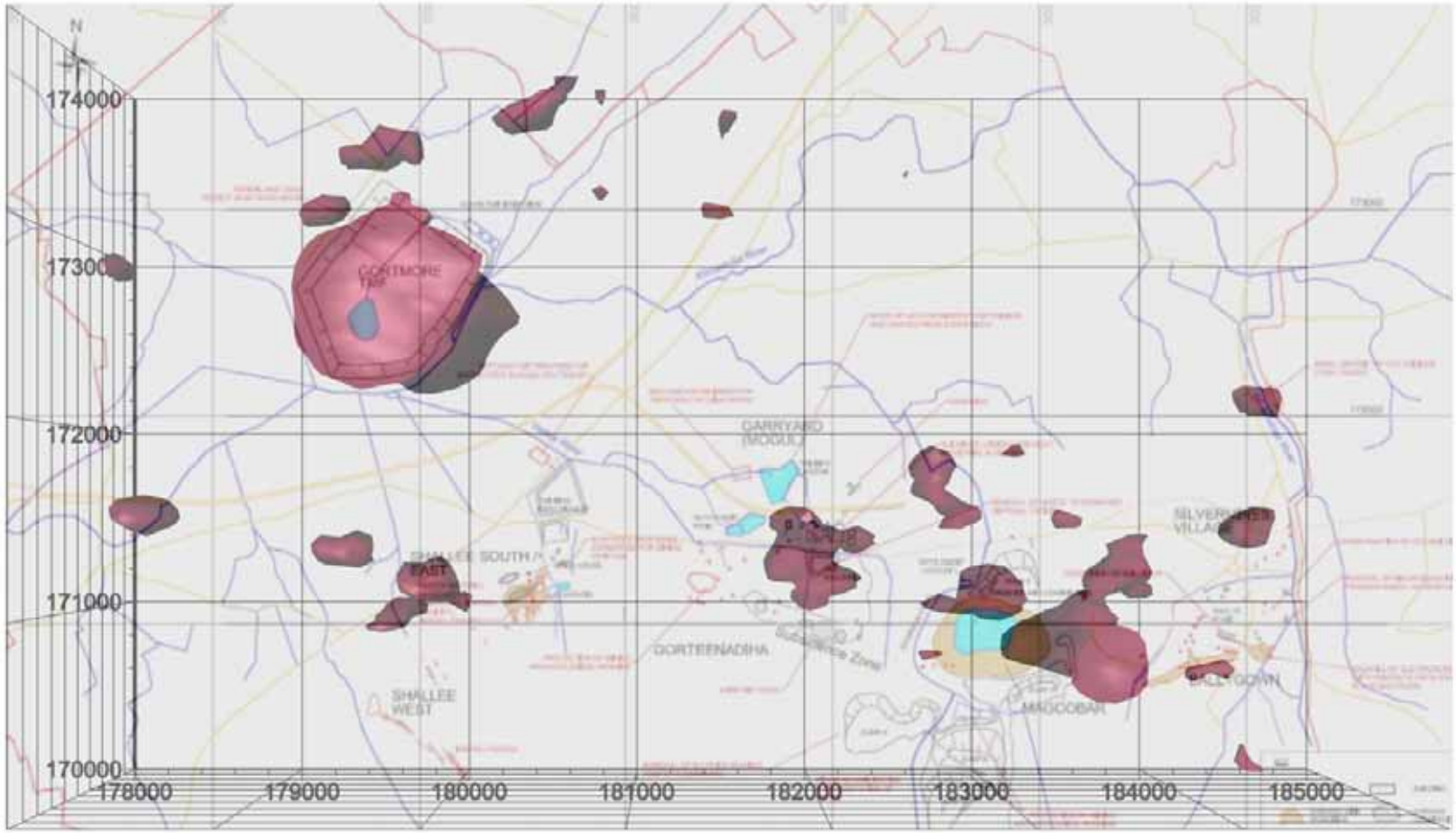

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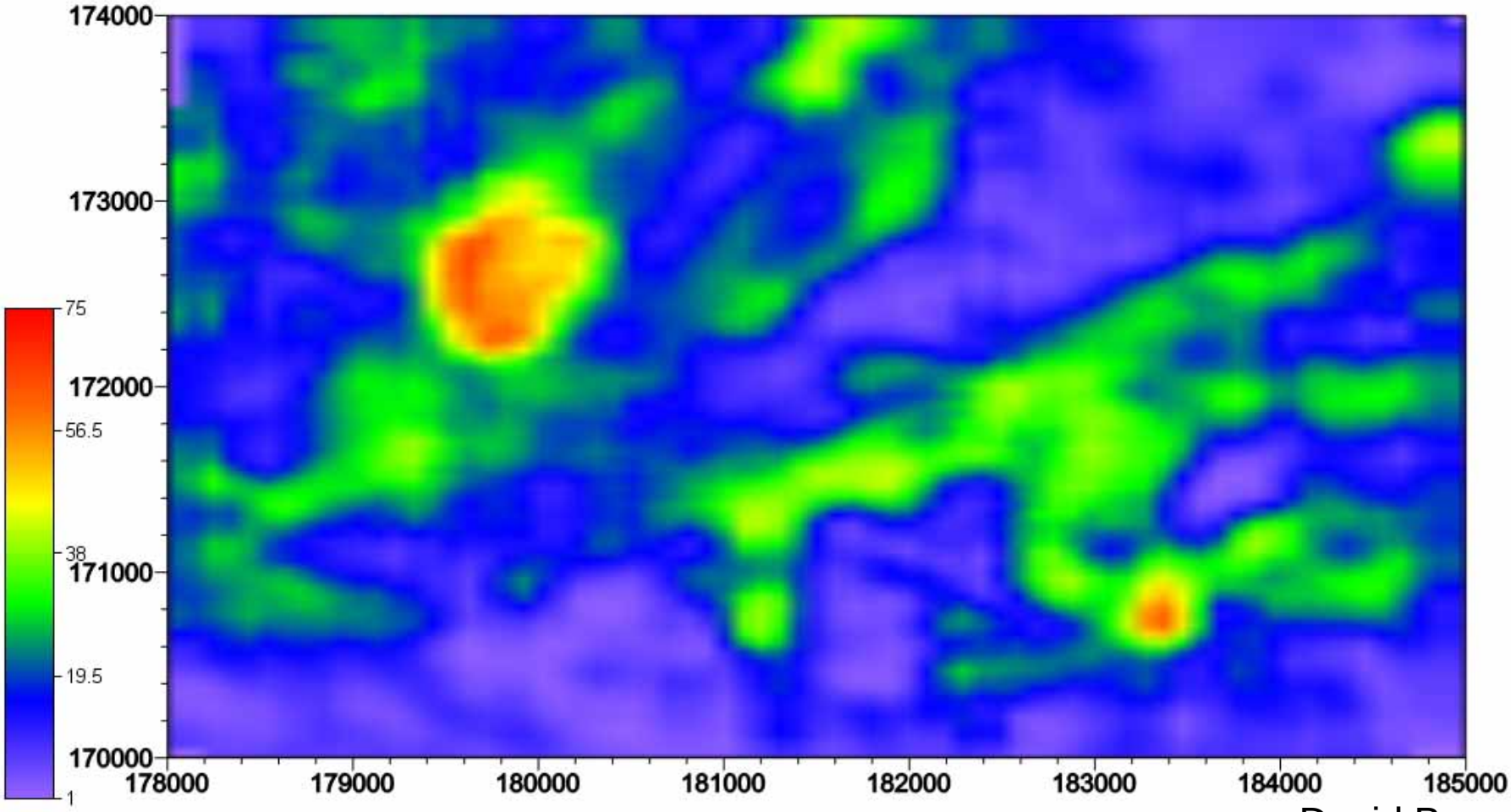

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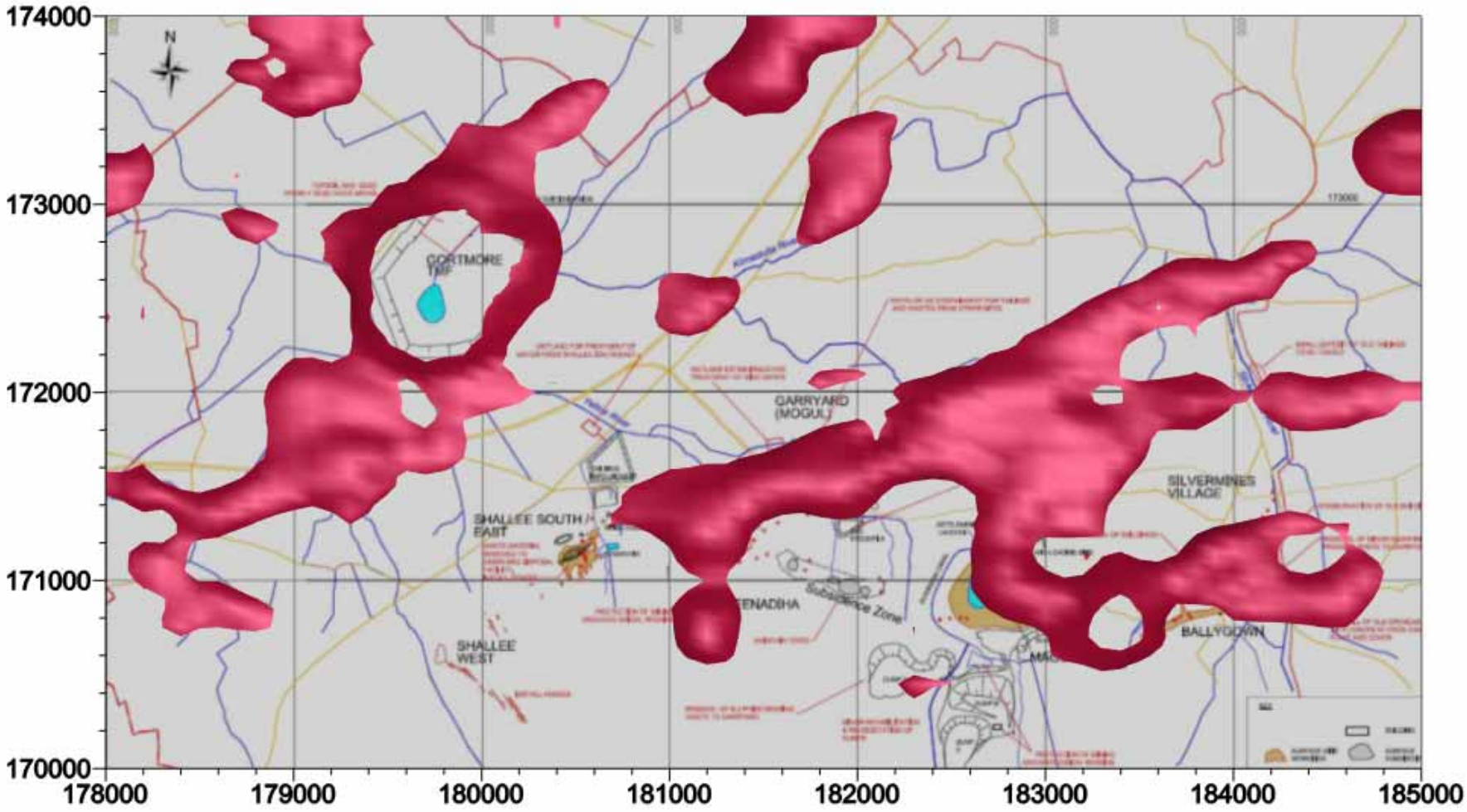

David Beamish

Benefits

- Resource mapping
  - Water
  - Minerals
  - Aggregates
  - Peat
- Hazard mapping
  - Radon
  - Landfill contamination
  - Mine contamination
  - Saltwater intrusion