Surface and groundwater quality – meeting new standards

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Peter McConvey

Geological Survey of Northern Ireland/
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ENVIRONMENT AND HERITAGE SERVICE

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Outline

A Introduction: requirements of the Water Framework Directive (WFD)

B Case studies

1. Assessing surface water bodies
2. Surface water monitoring at Croagh Burn
3. Assessing poorly productive aquifers
4. Saline intrusion: Magilligan
5. Water Resources Management: Identification of dykes in the Lagan Valley

C Future work

D Conclusion

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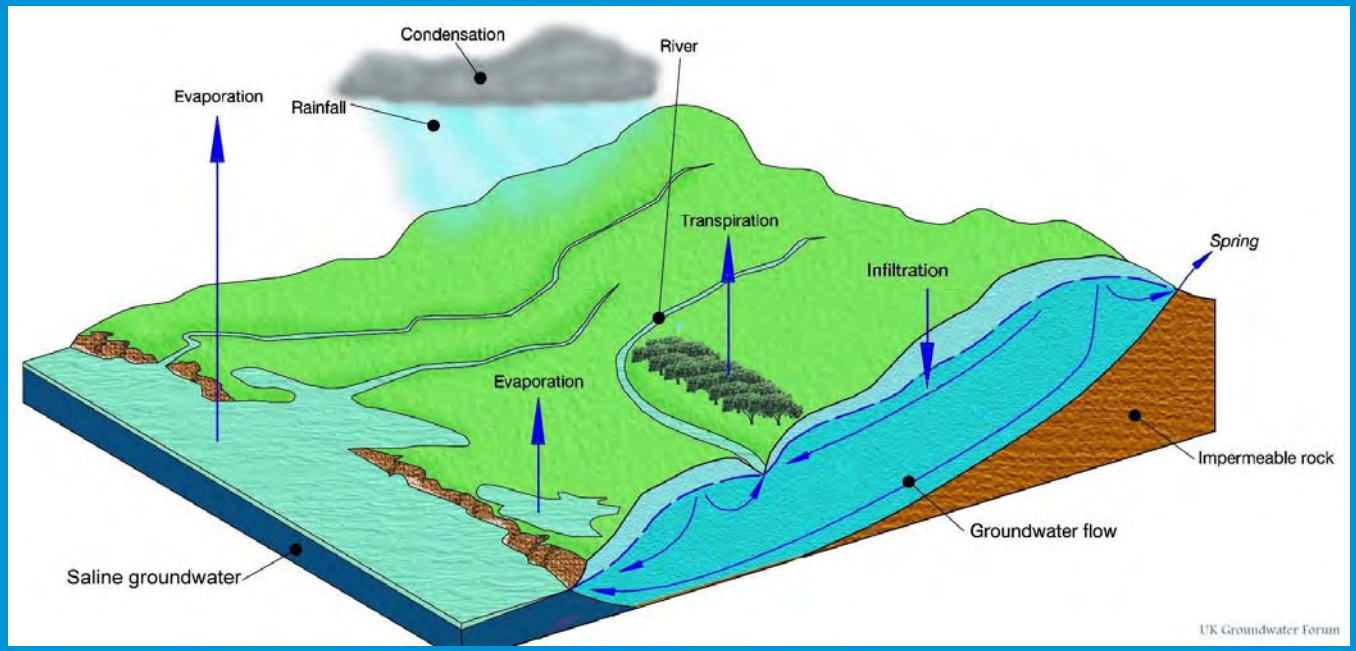
Water Framework Directive (2000/ 60/ EC) and Groundwater Directive (2006/ 118/ EC)



hydrological cycle [UK Groundwater Forum]

holistic approach of description and assessment of water environment:

- groundwater
- surface water
- rainfall
- wetlands
- marine environment

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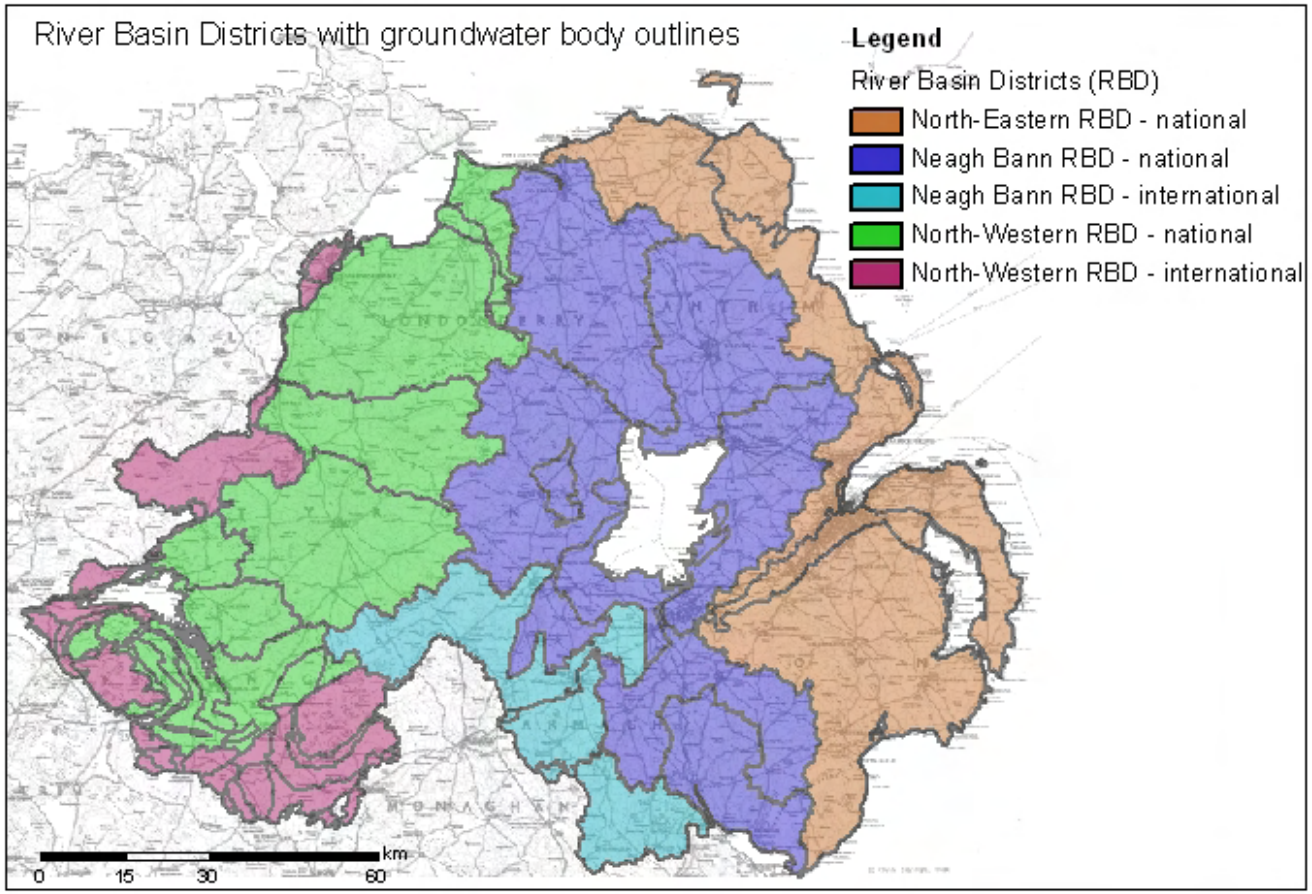
Water Framework Directive (2000/ 60/ EC) and Groundwater Directive (2006/ 118/ EC)



- new management units:
  groundwater bodies
  surface water bodies
- aim for each unit: 'good' status
- assessment against standards
- standards have to be established and need to consider natural background levels

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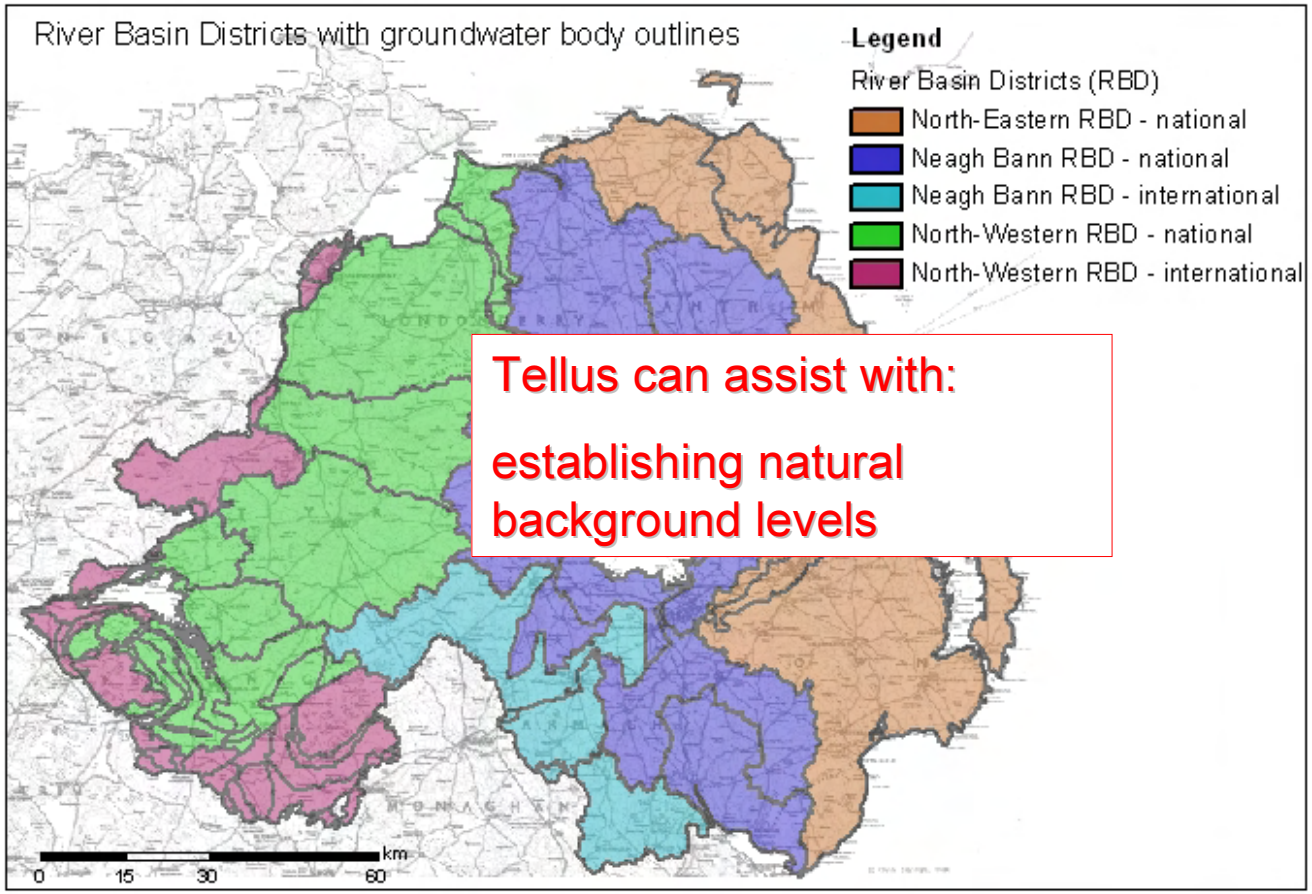
A. Introduction

Water Framework Directive (2000/ 60/ EC) and Groundwater Directive (2006/ 118/ EC)



Tellus can assist with:

establishing natural background levels

- new management units
- aim for each unit: 'good' status
- assessment against standards
- standards have to be established and consider natural background levels

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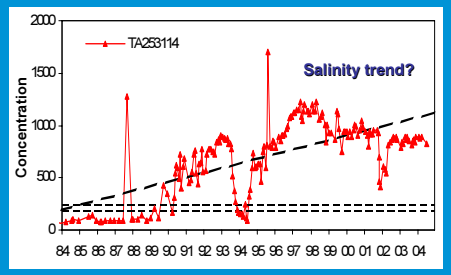
Example of assessment of groundwater body

impacts on the GW body

impacts on dependent receptors

1. Saline or other intrusions



4. Drinking Water Protected Areas

2. SW body chemical & ecological status

5. General Chemical Assessment

3. GW dependent terrestrial ecosystems

GW chemical status

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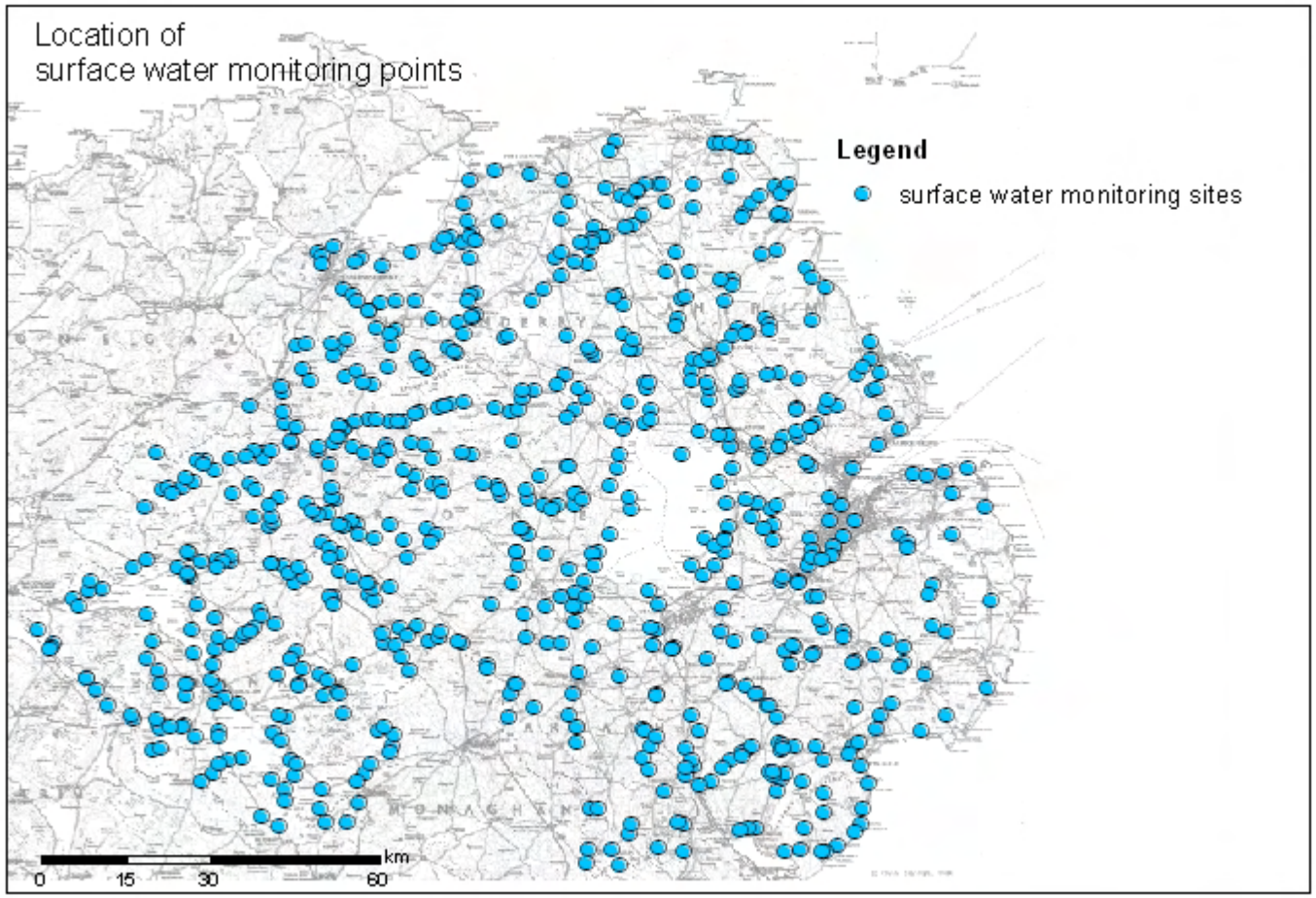
1. Assessing surface water bodies



The current Environment and Heritage Service (EHS) surface water monitoring network …

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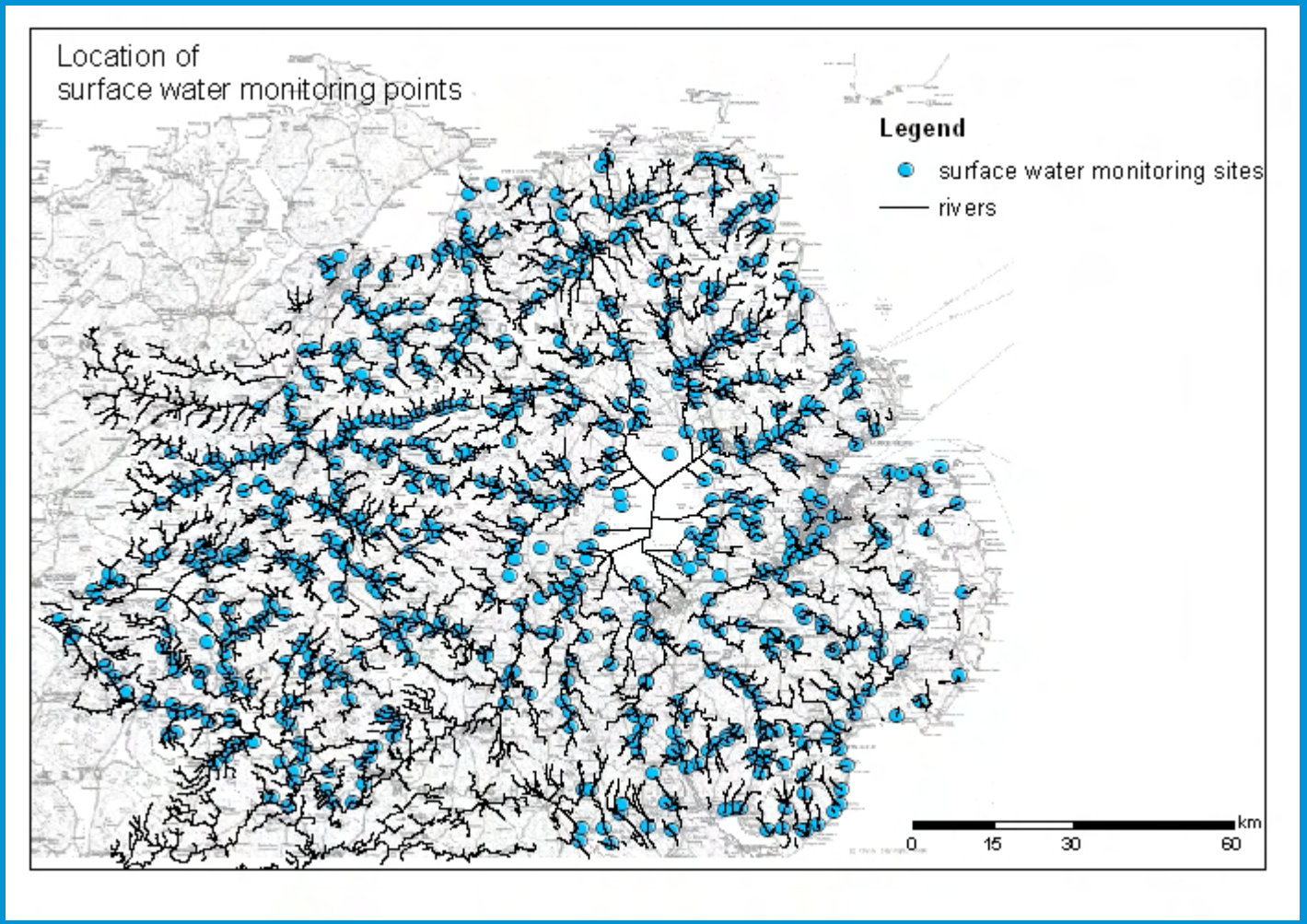
1. Assessing surface water bodies



… is located along major rivers.

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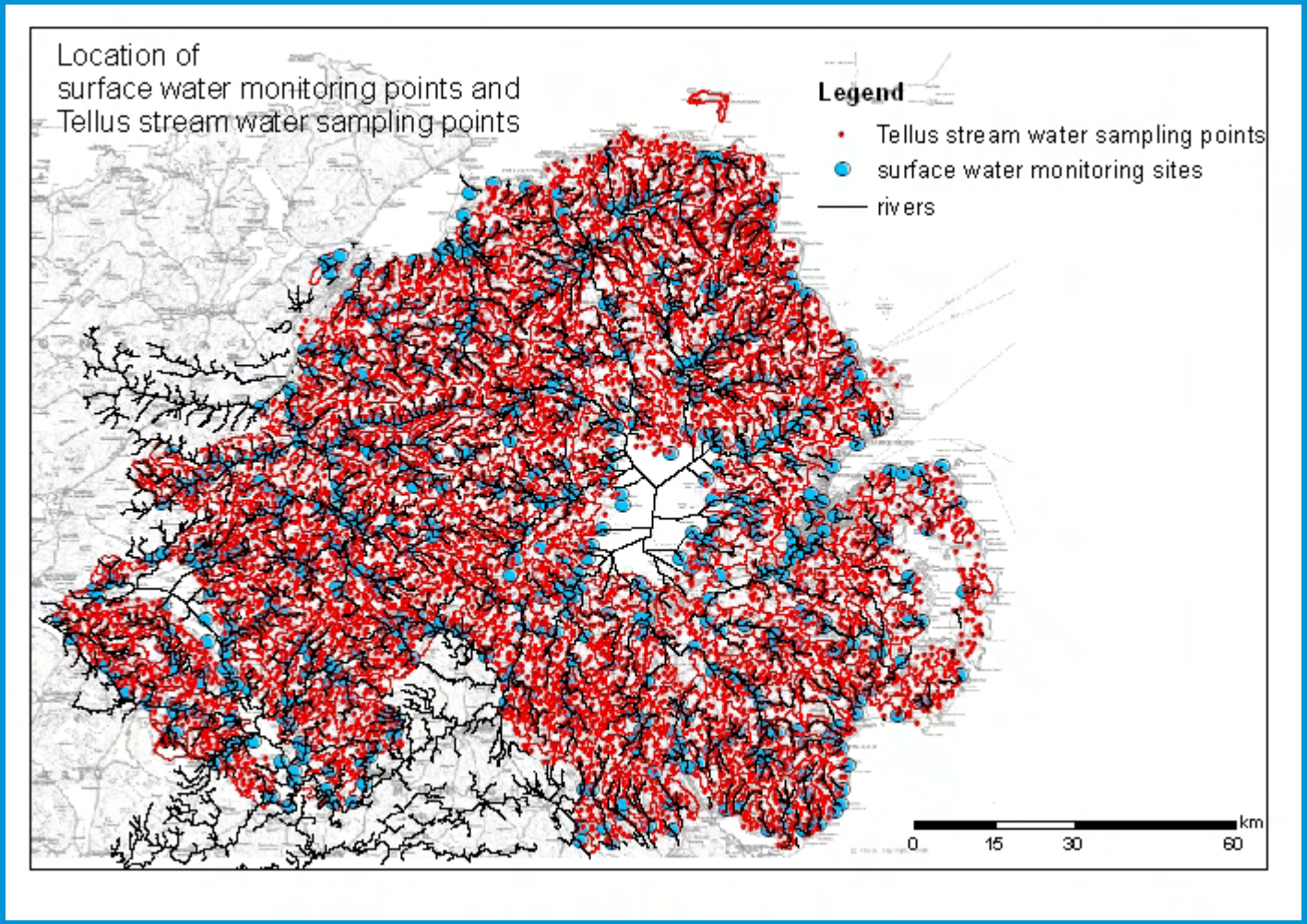
1. Assessing surface water bodies



…, but Tellus sampled stream waters on a much finer scale.

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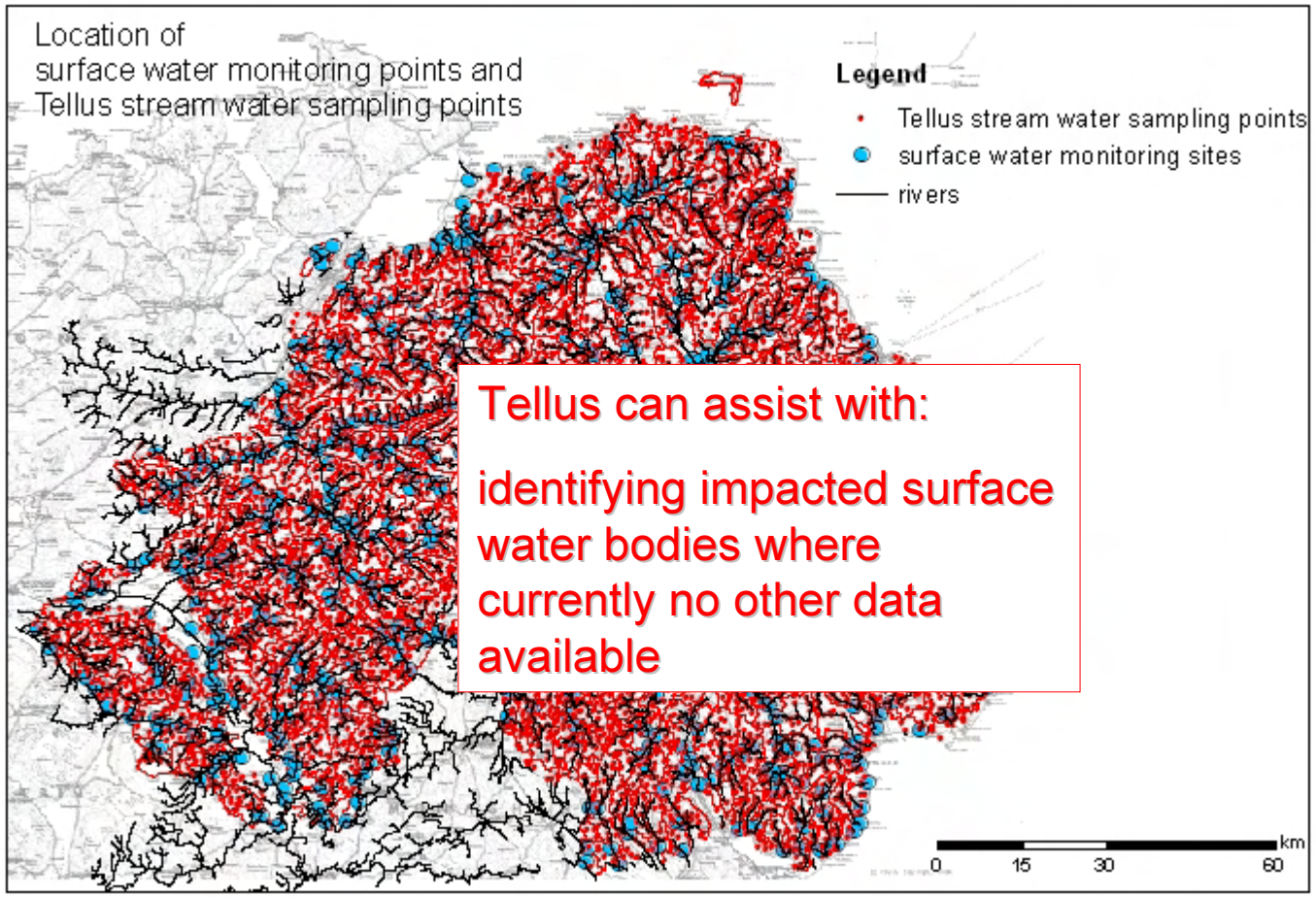
1. Assessing surface water bodies



Tellus can assist with:

identifying impacted surface water bodies where currently no other data available

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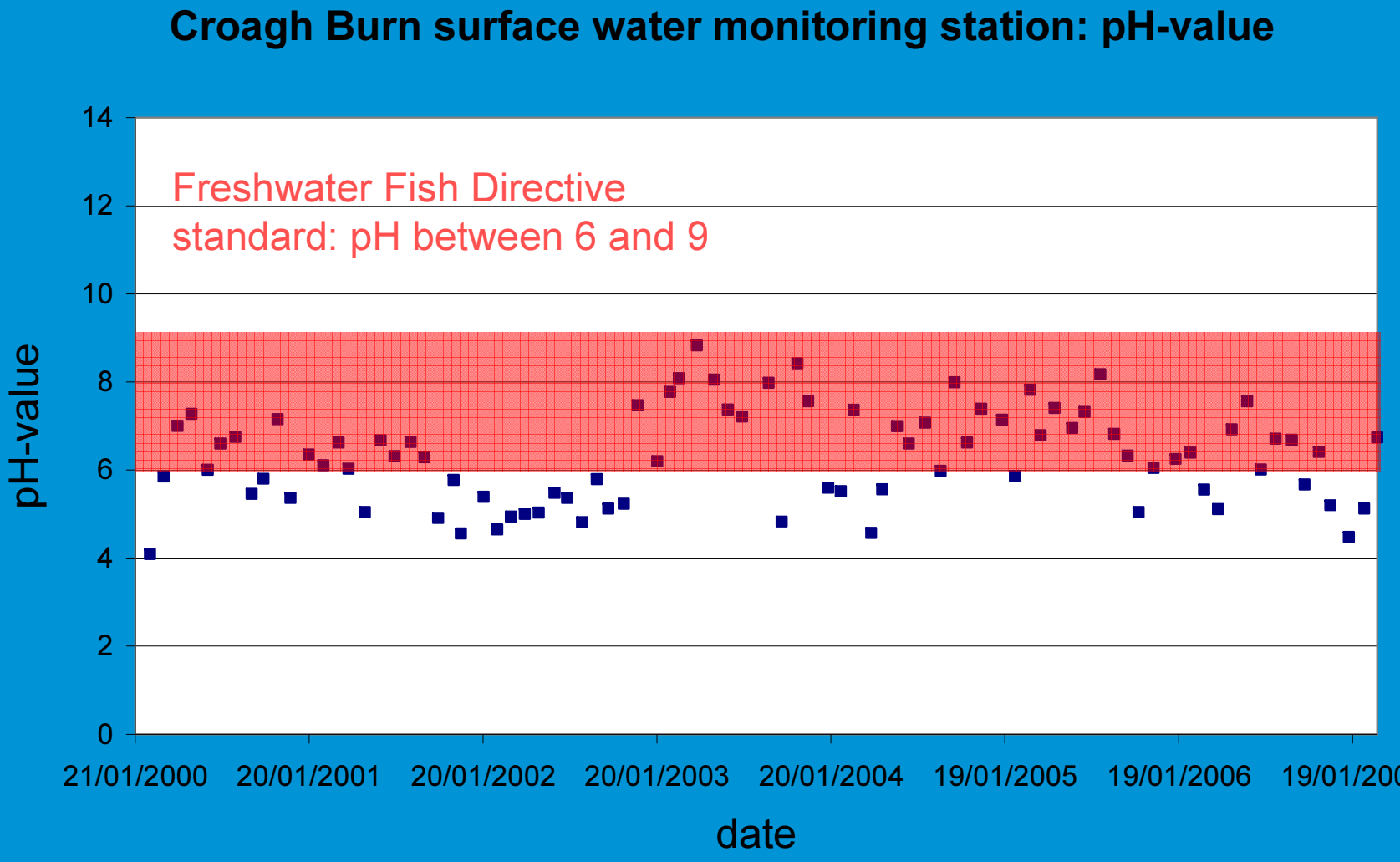
2. Surface water monitoring at Croagh Burn



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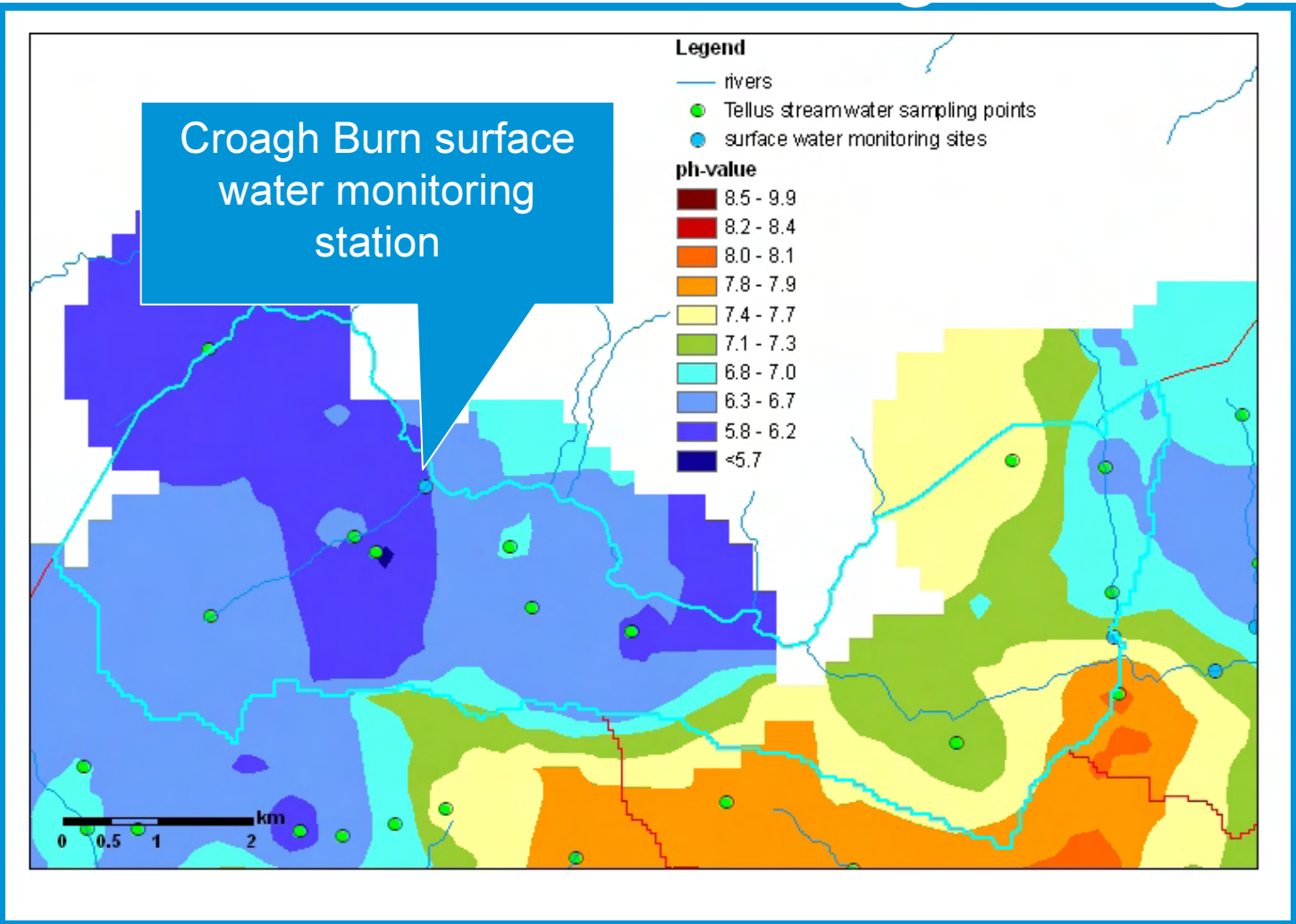
2. Surface water monitoring at Croagh Burn



- pH-values measured during the G-Base survey from the mid-90's
- pH ranges between 5.8 and 6.3

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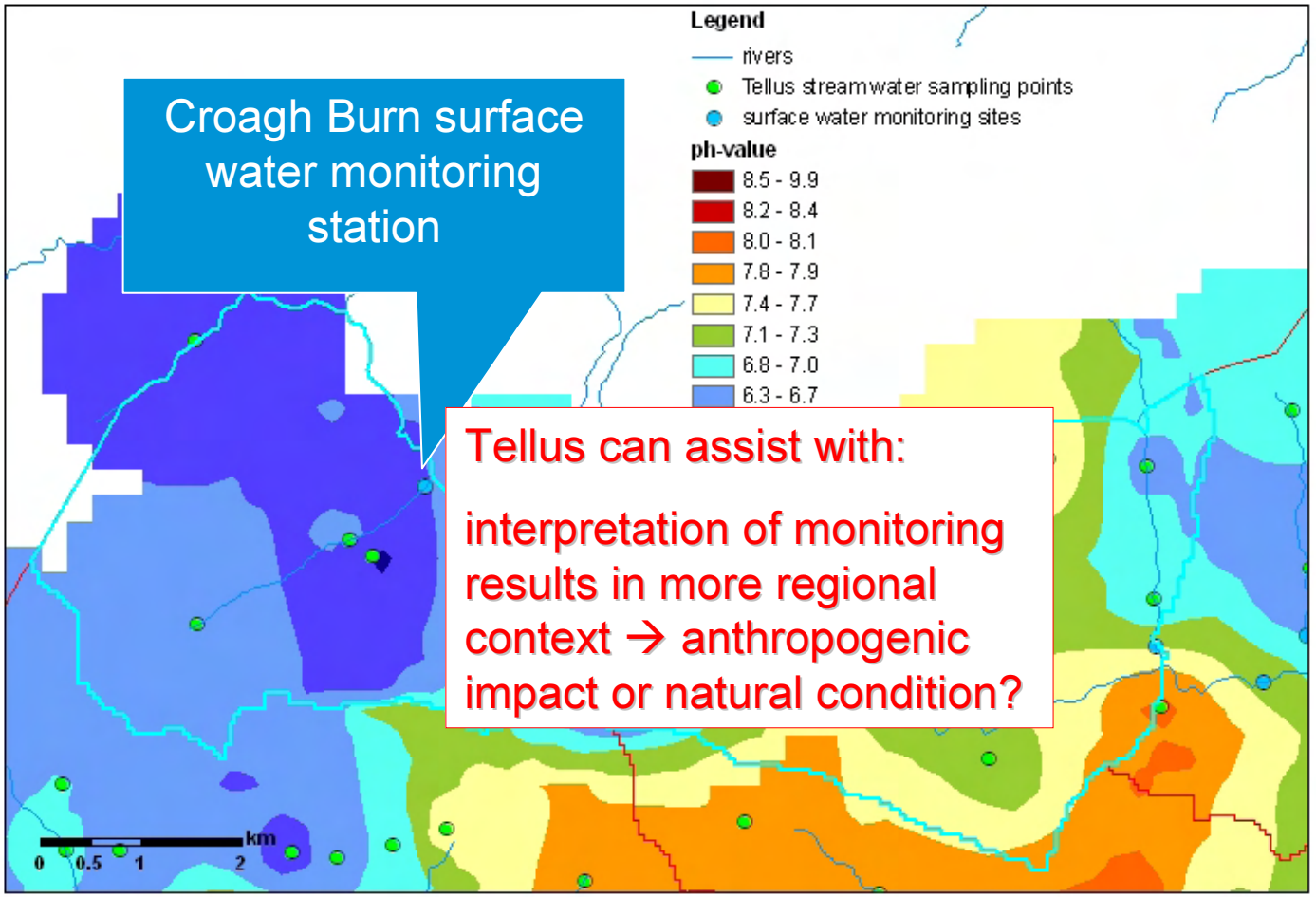
2. Surface water monitoring at Croagh Burn



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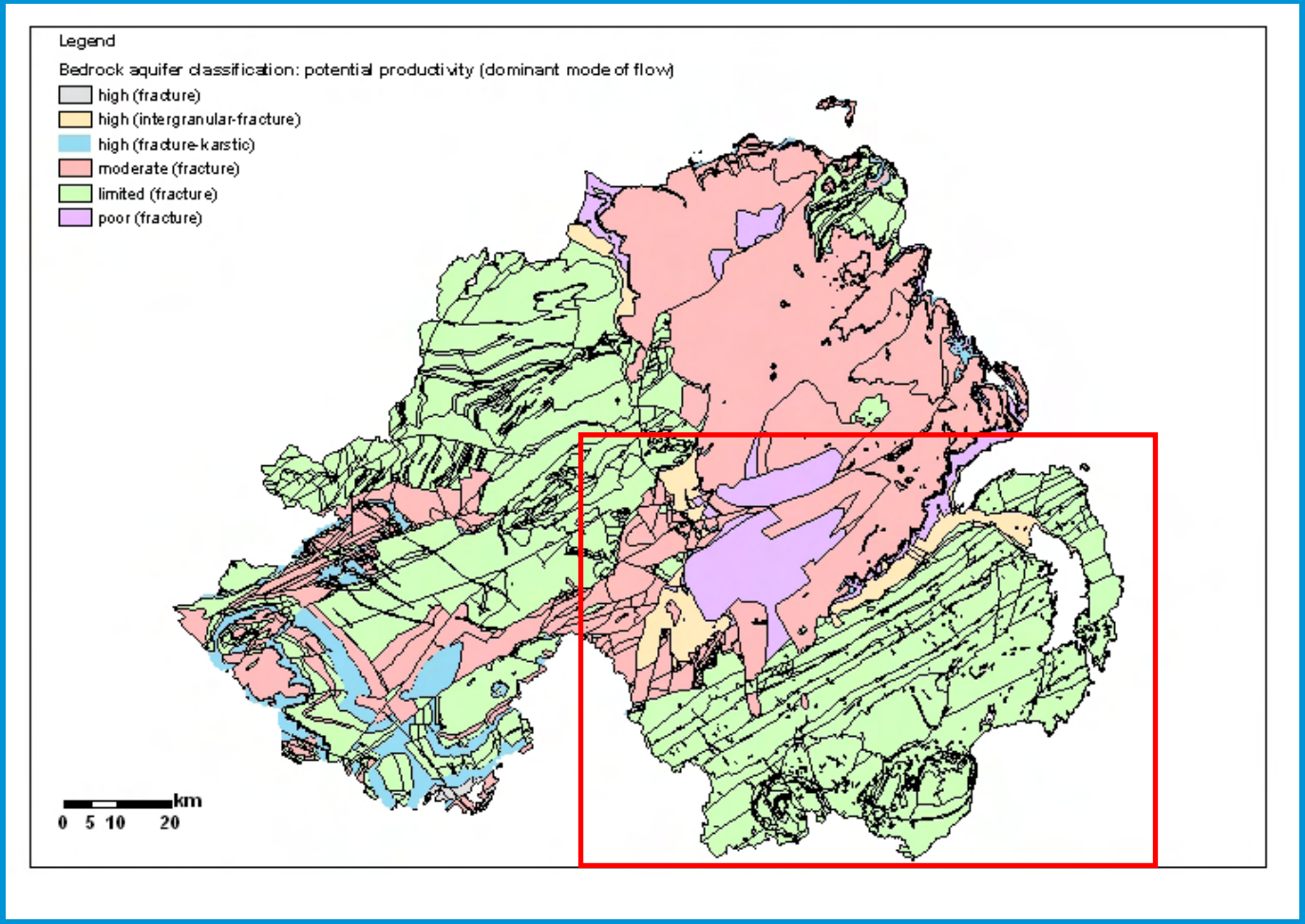
3. Assessing poorly productive aquifers



approximately 50 % of bedrock aquifers are of limited potential productivity

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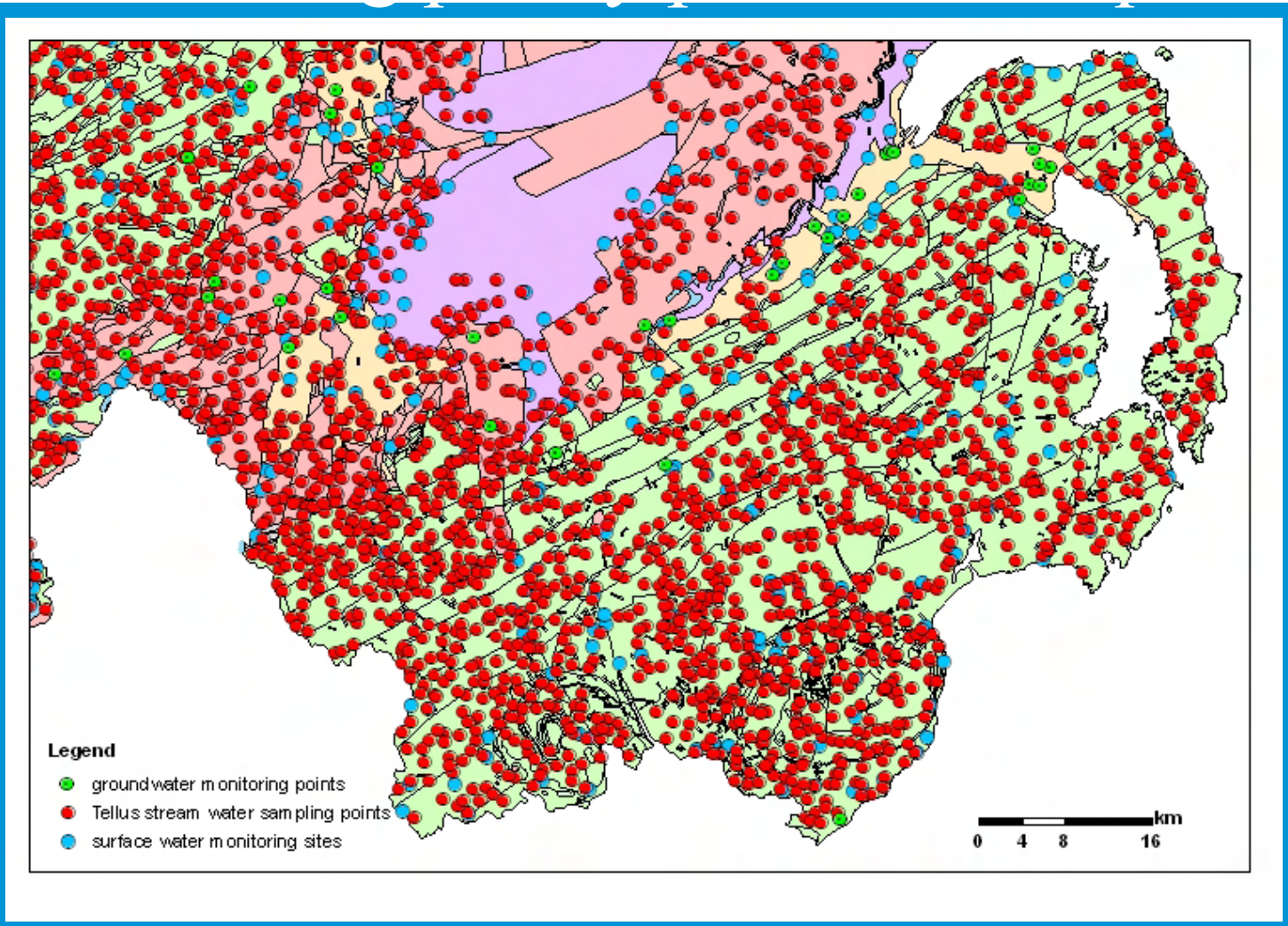
3. Assessing poorly productive aquifers



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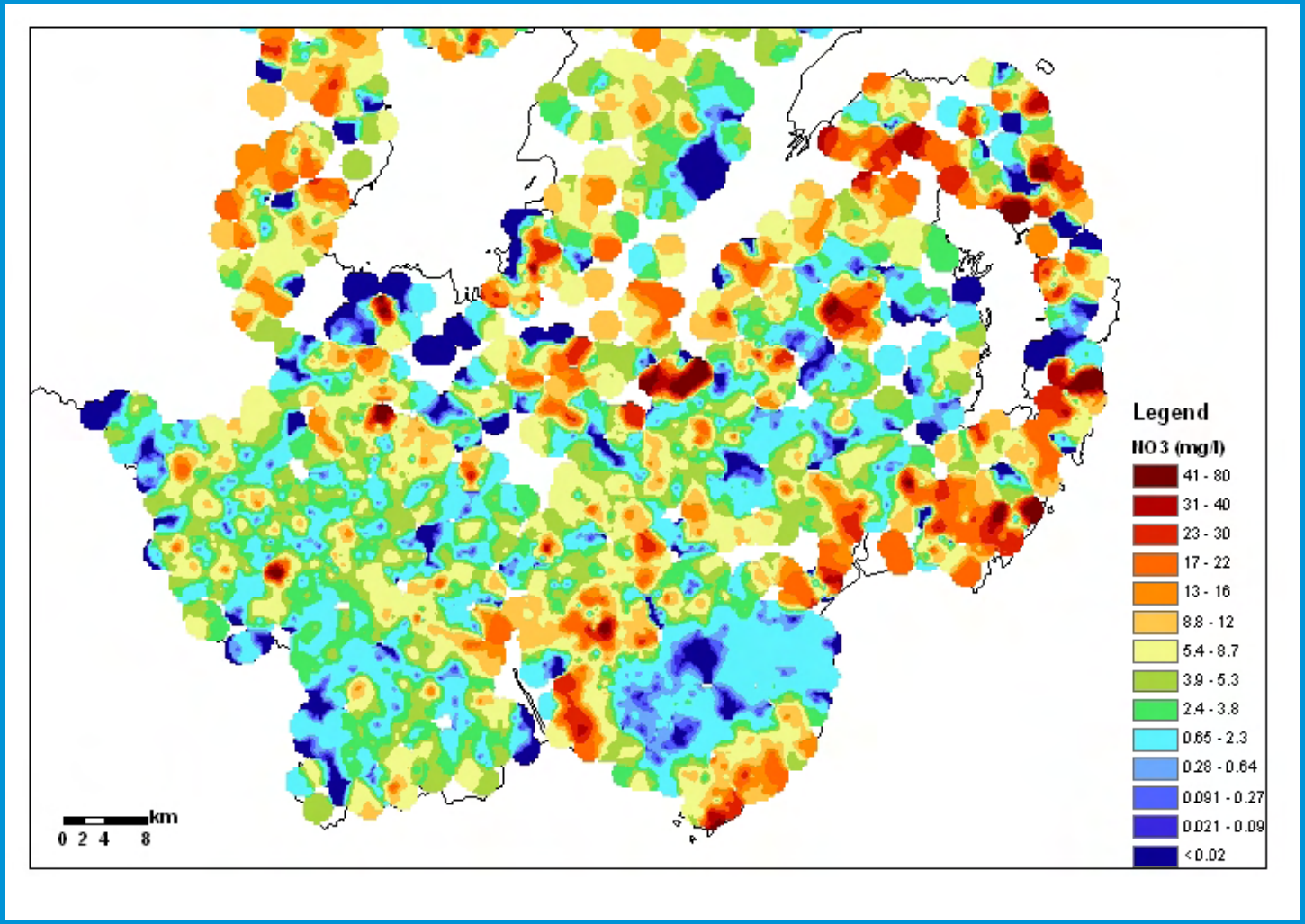

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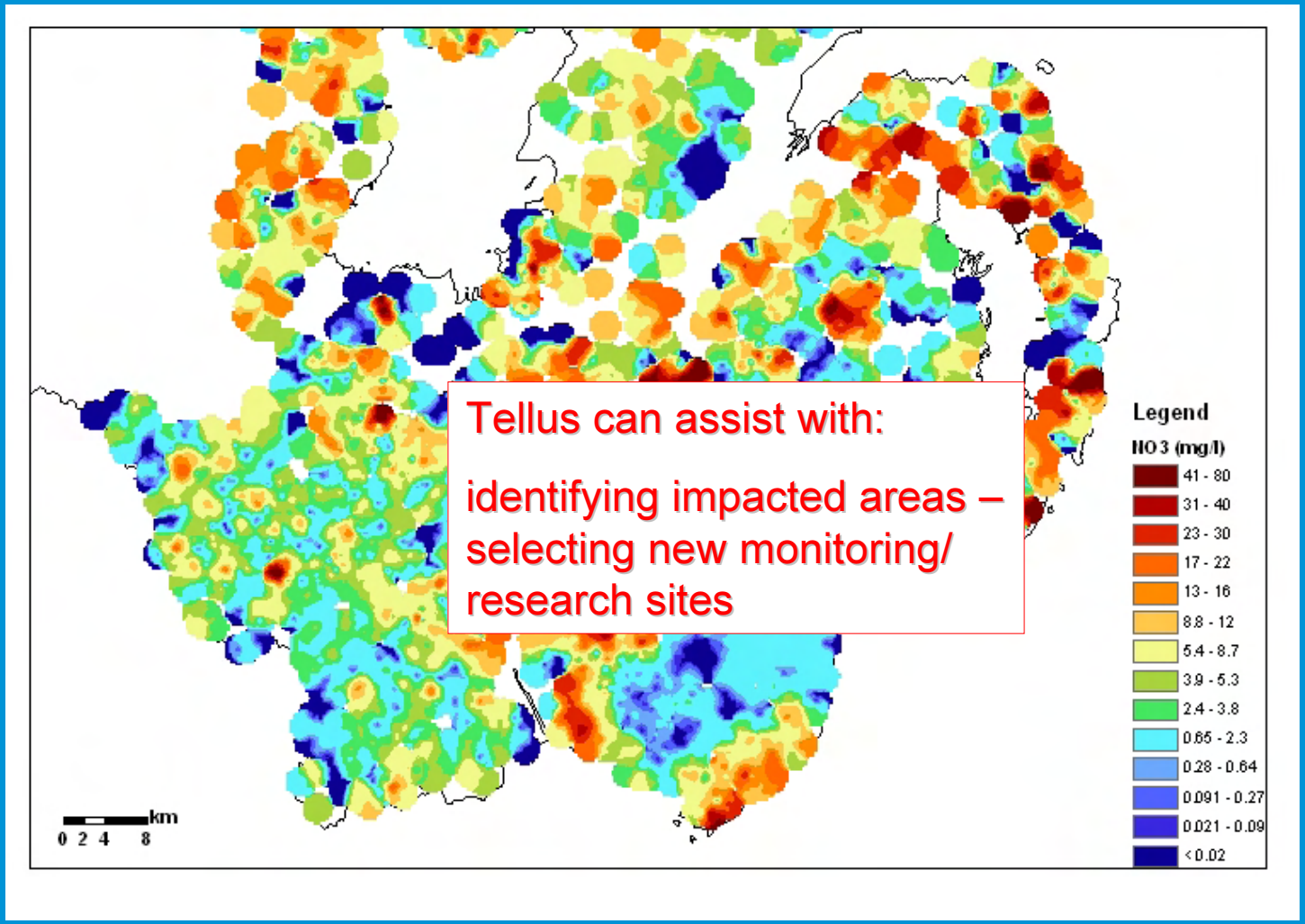

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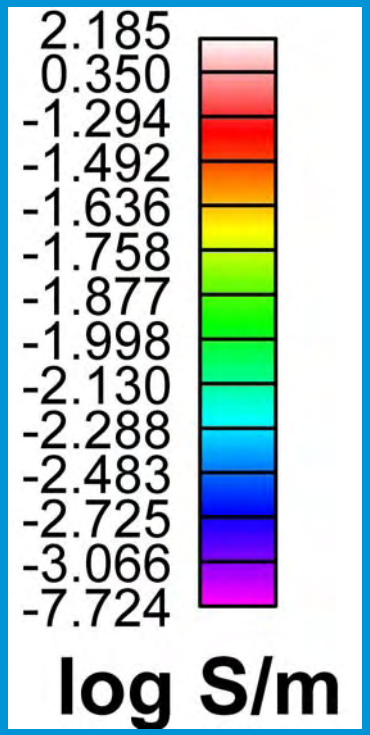
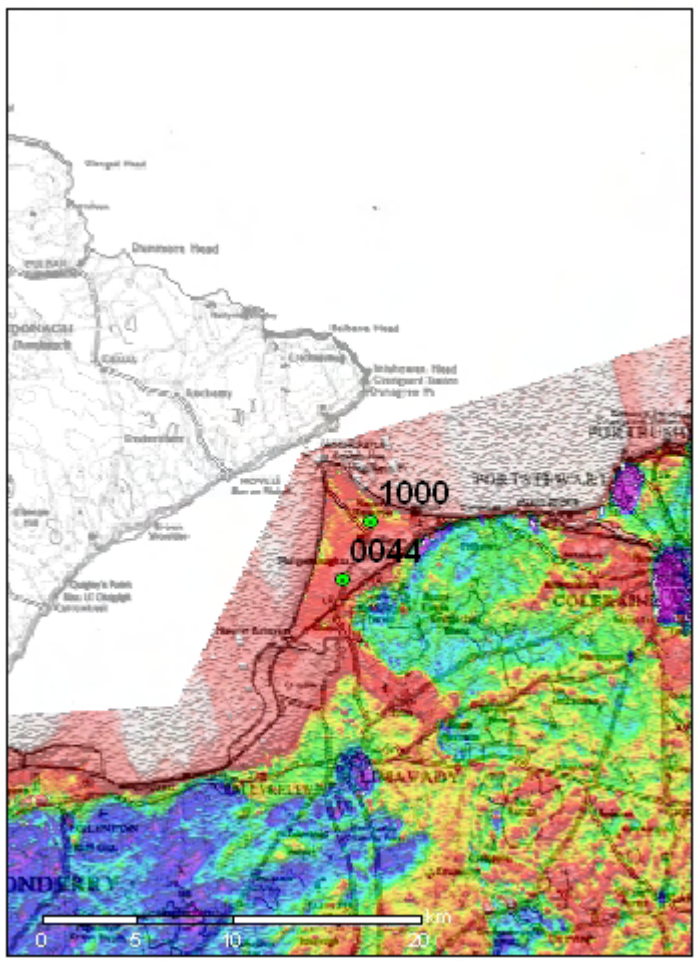
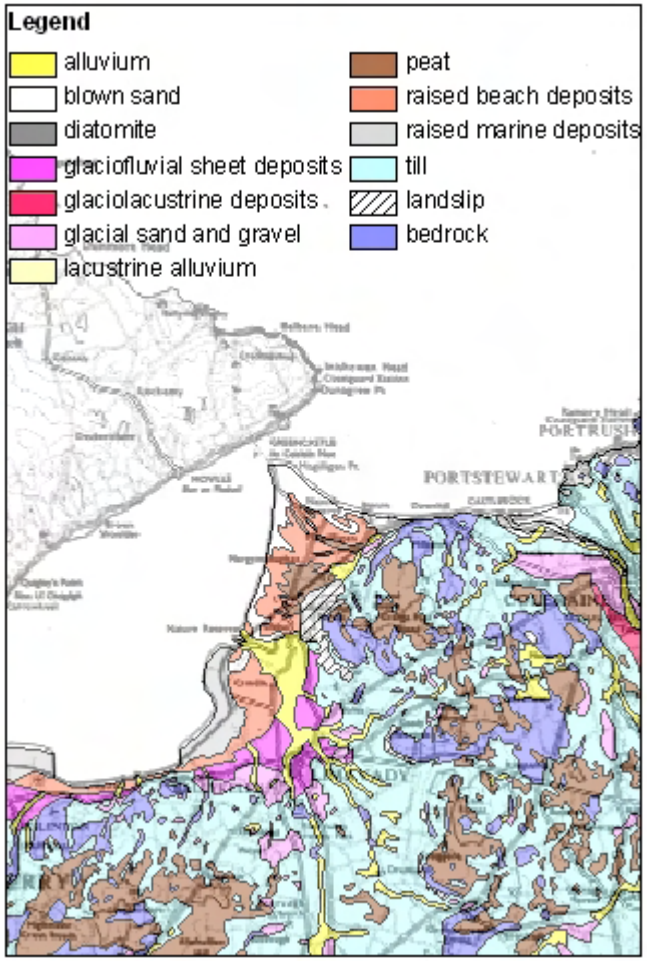
4. Saline intrusion: Magilligan



Tellus airborne electromagnetics





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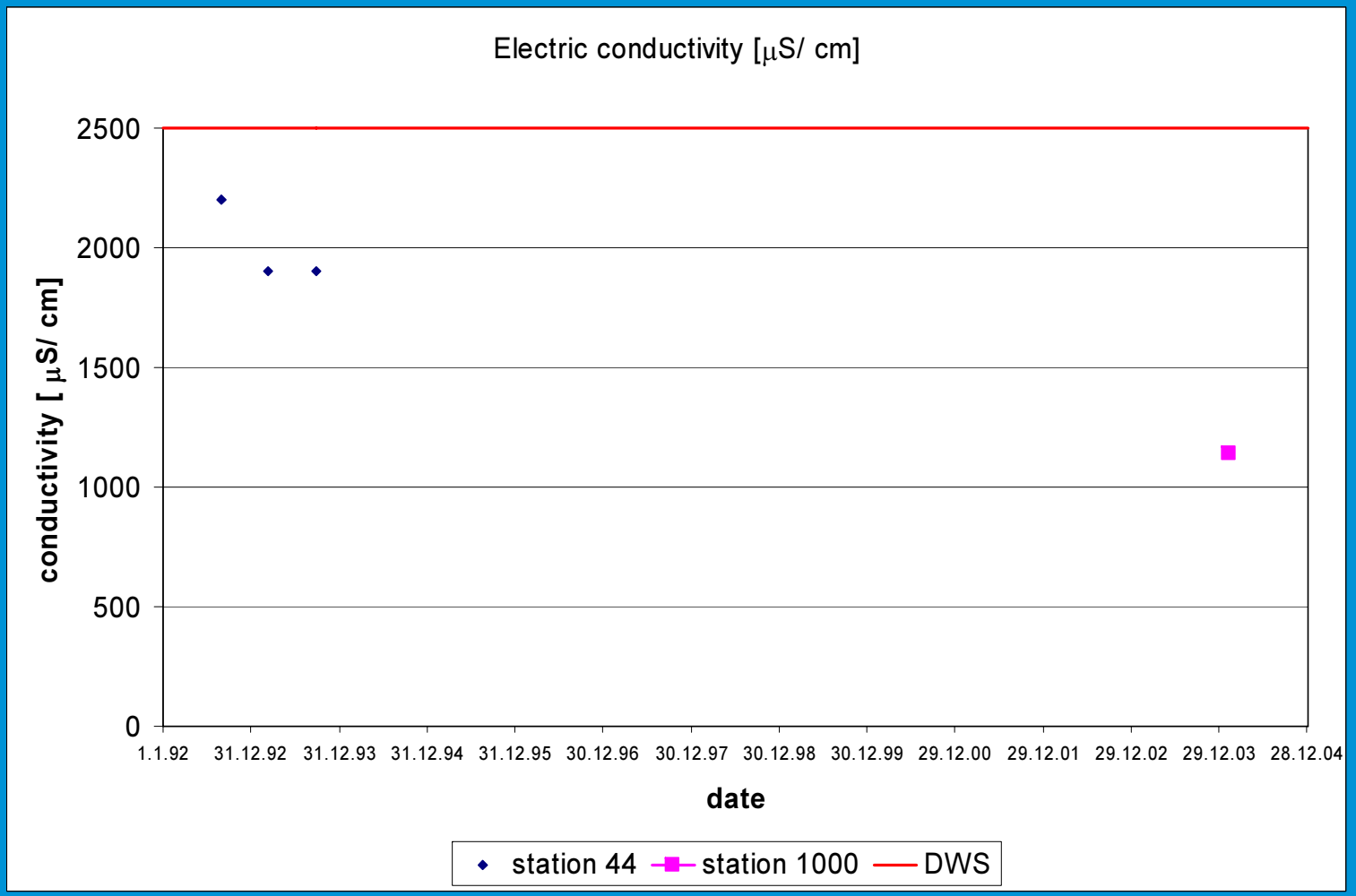
4. Saline intrusion: Magilligan



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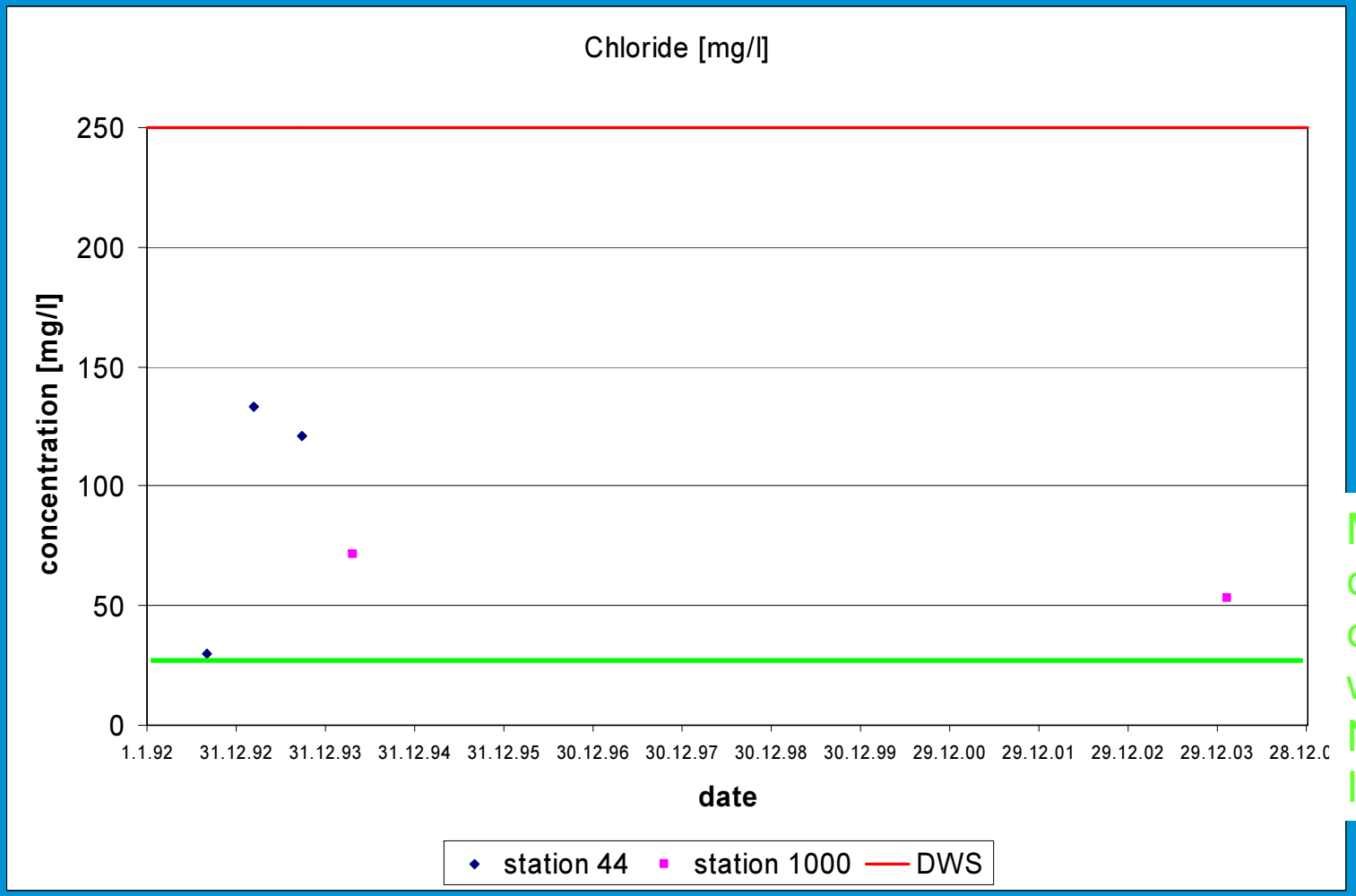

Mean chloride concentrations of monitored wells in Northern Ireland in 2006

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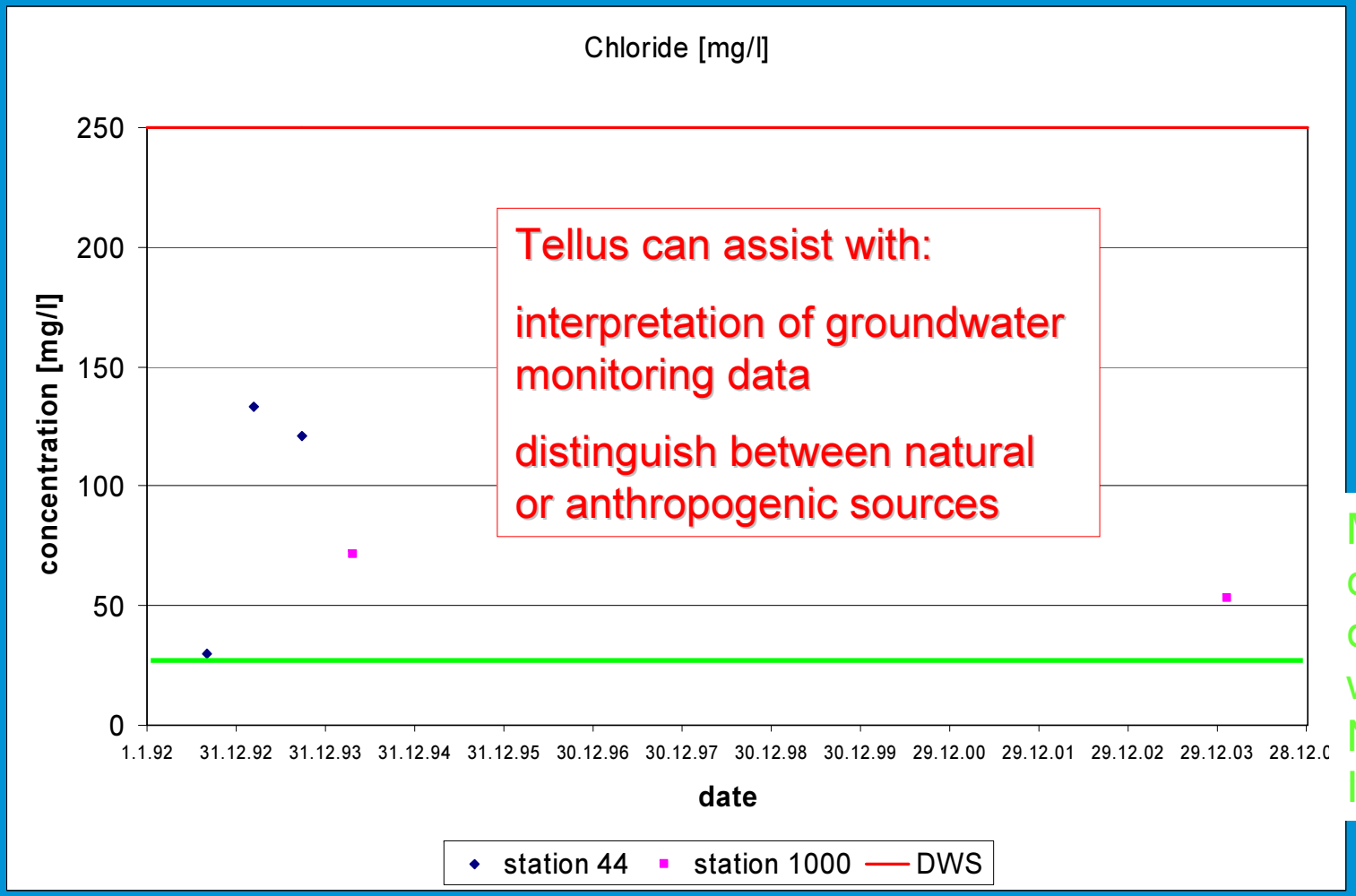

Tellus can assist with:

interpretation of groundwater monitoring data

distinguish between natural or anthropogenic sources

Mean chloride concentrations of monitored wells in Northern Ireland in 2006

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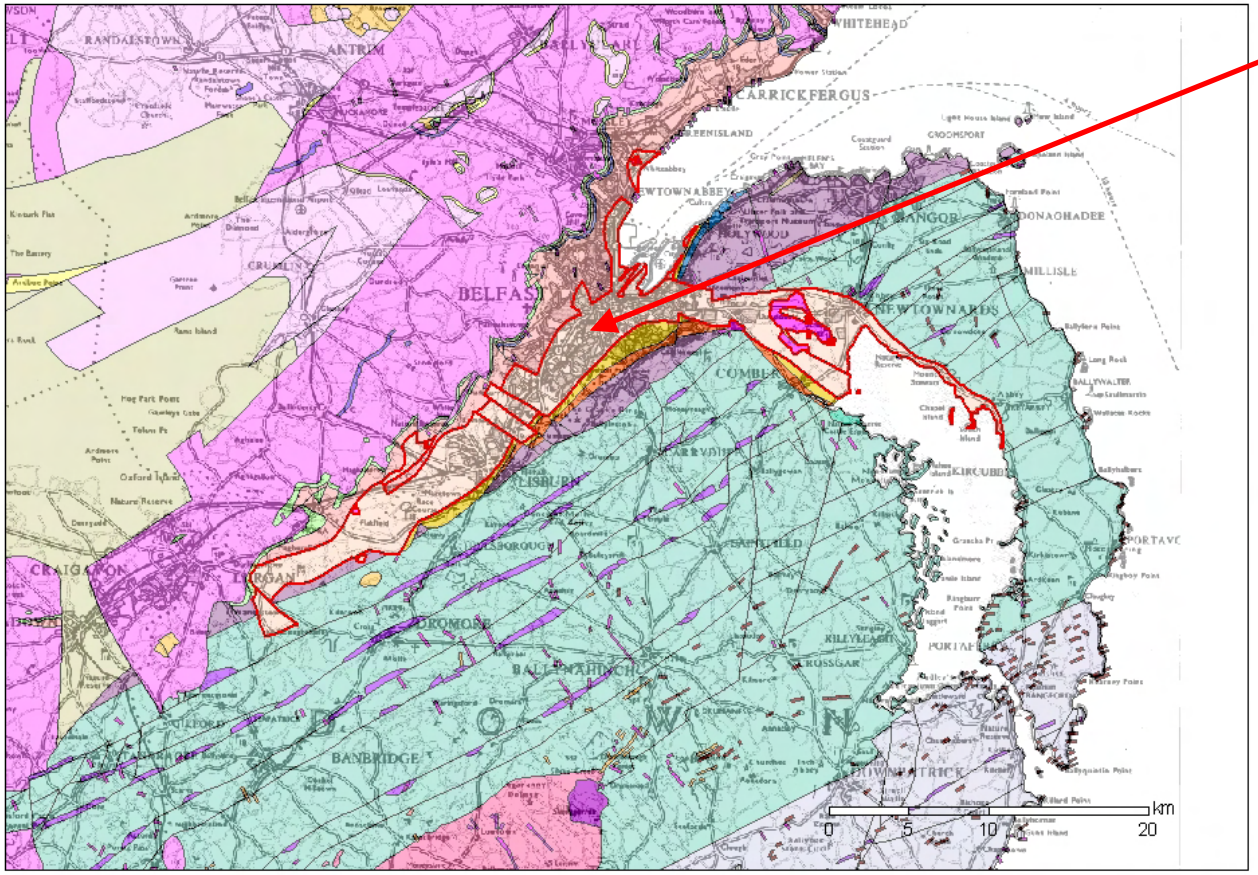
B. Case studies

5. Water Resources Management: identification of dykes in the Lagan Valley



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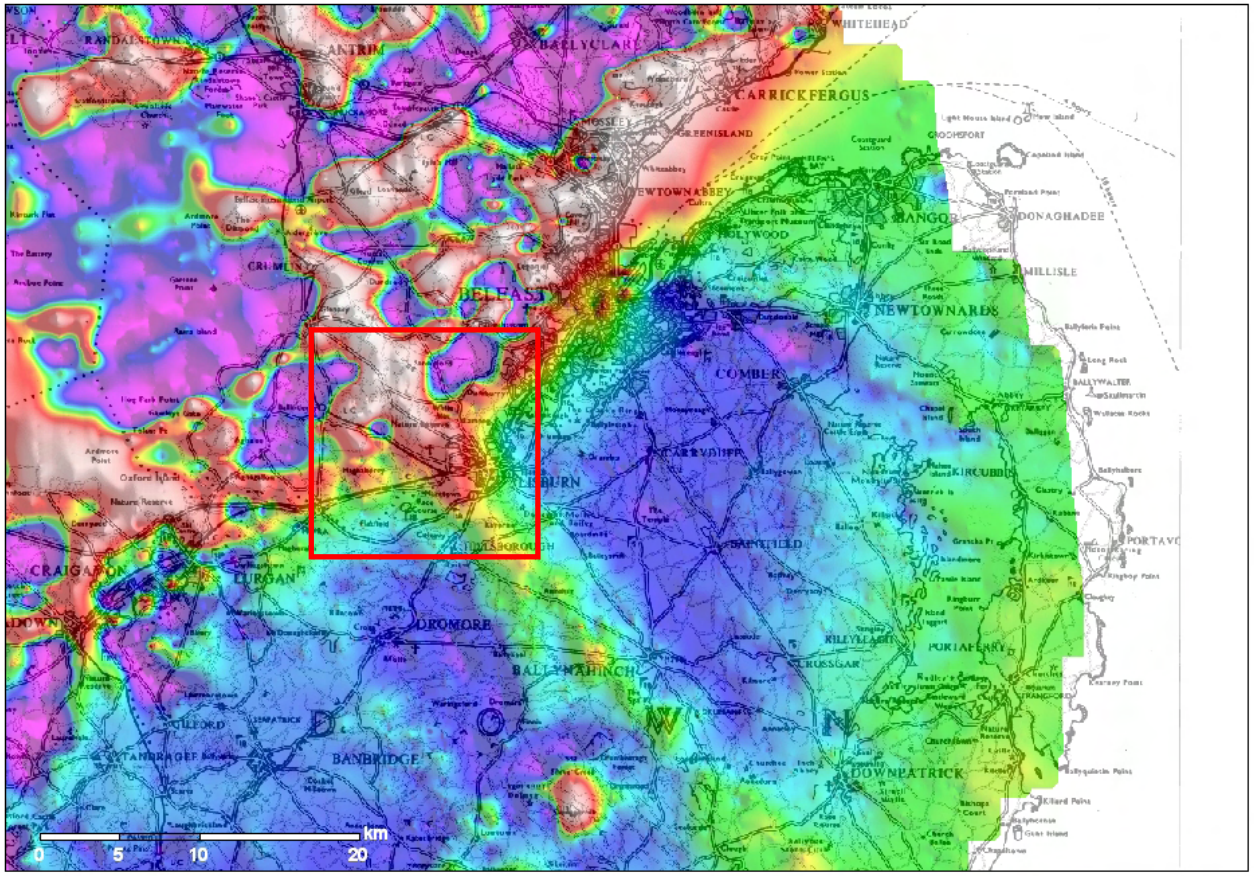
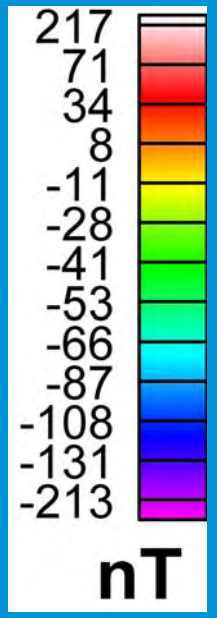


magnetic anomaly near Lisburn

'old' airborne survey from 1970's



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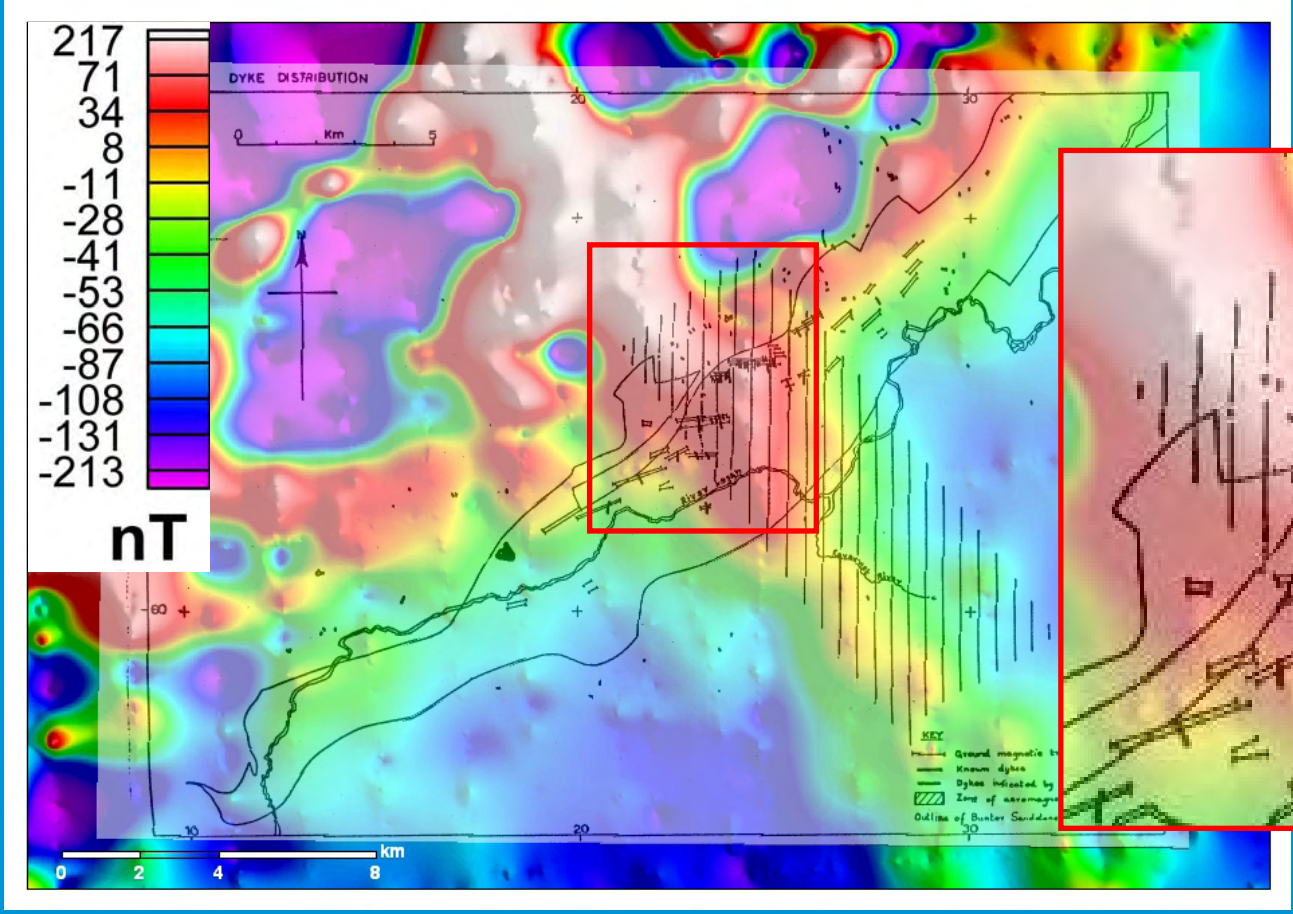
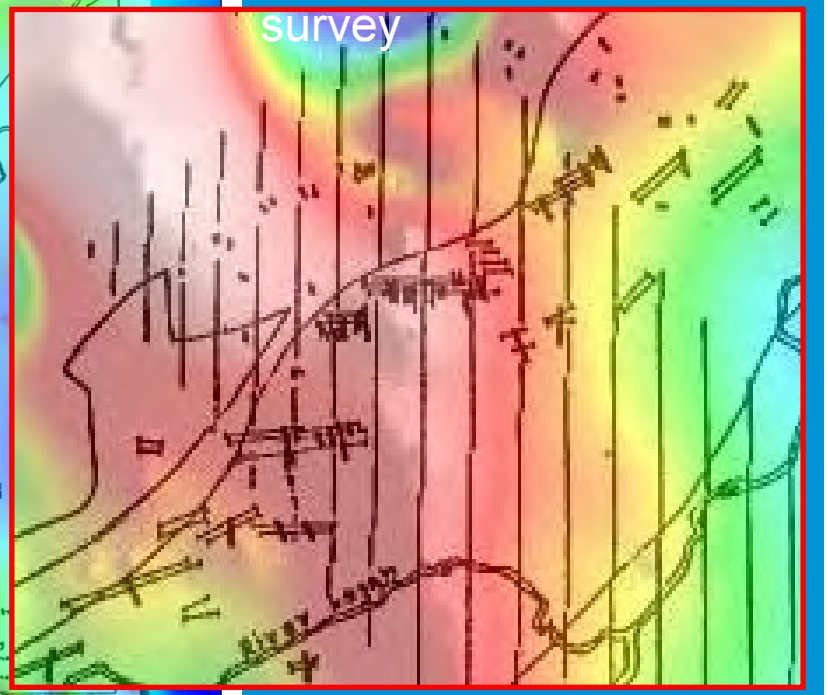


anomaly in 'old' magnetic survey near Lisburn and ground magnetic survey



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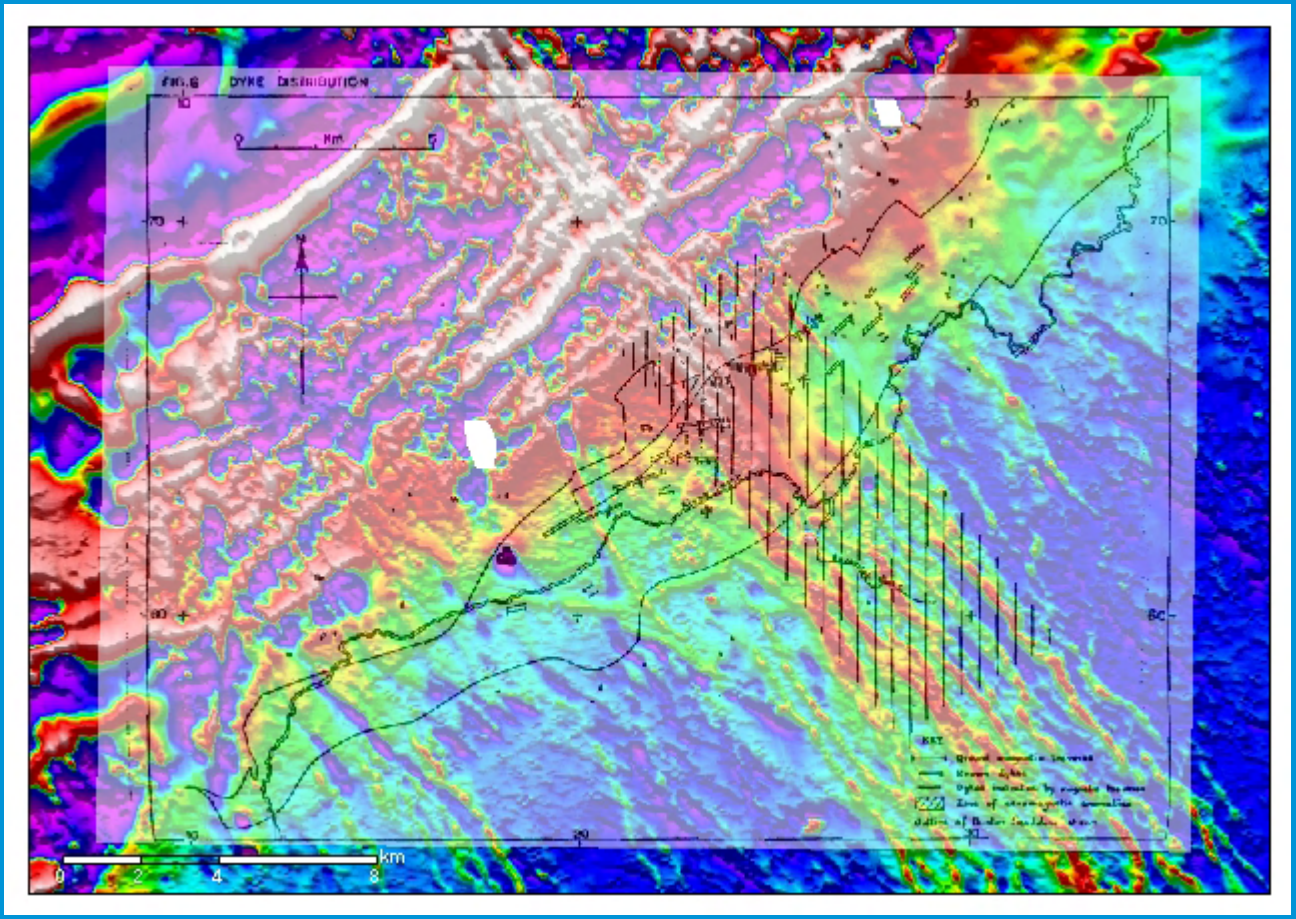
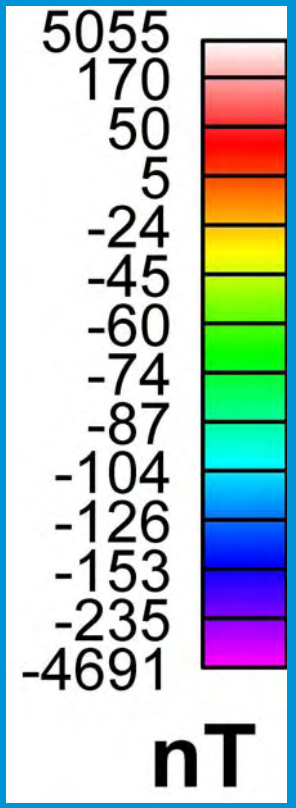
5. Water Resources Management: identification of dykes in the Lagan Valley





'new' Tellus magentic airborne survey

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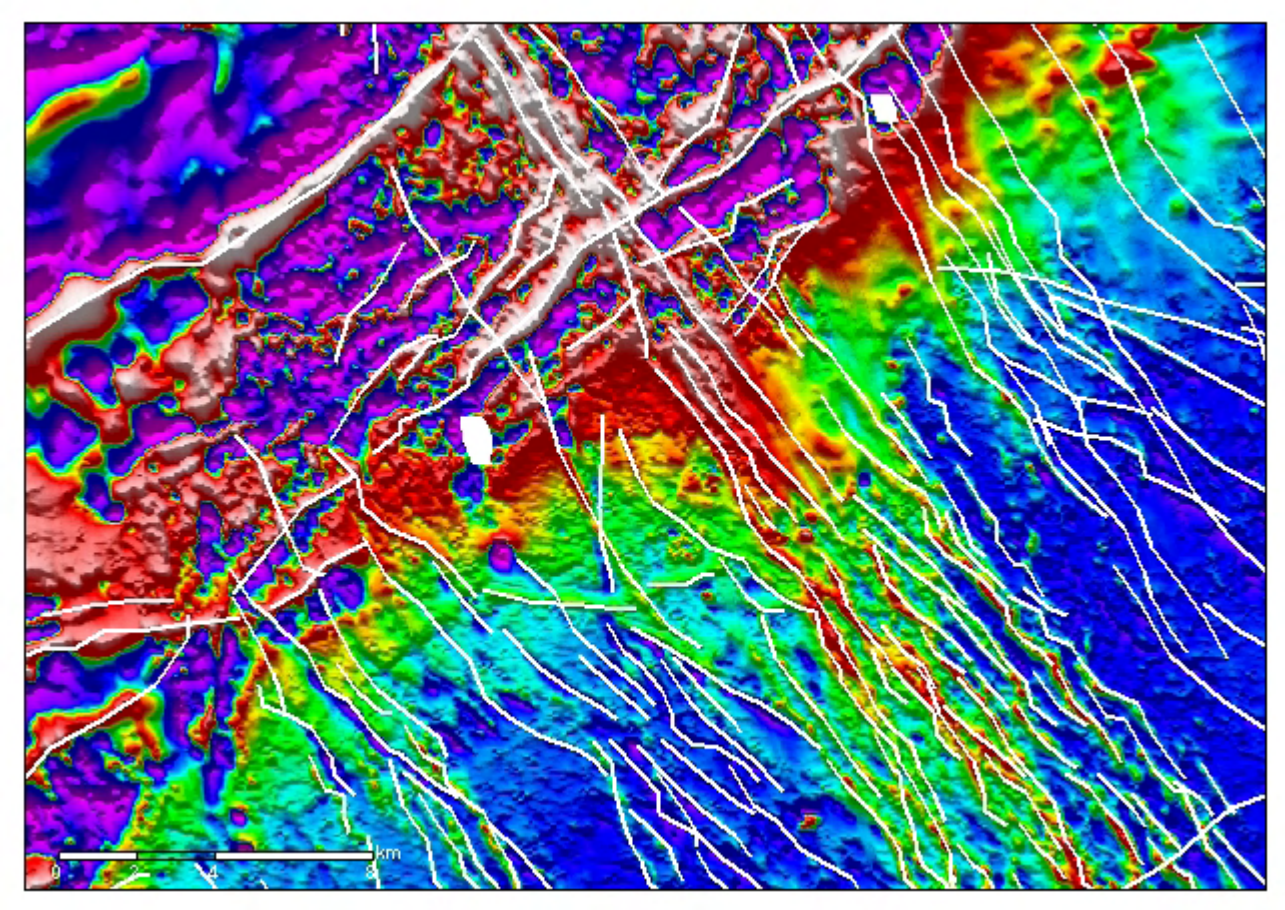
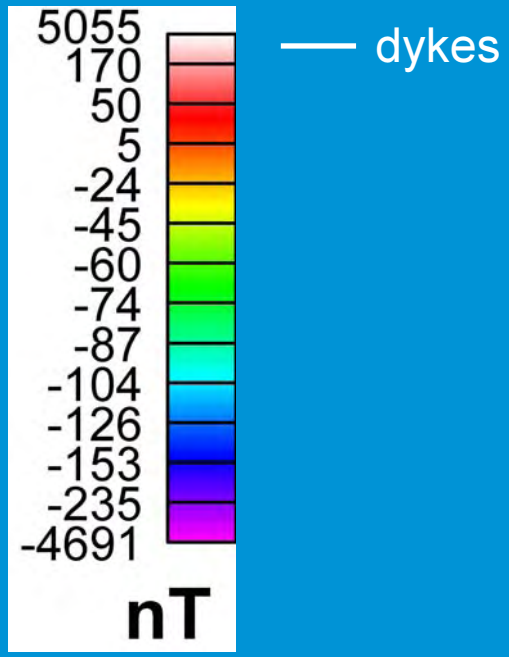
5. Water Resources Management: identification of dykes in the Lagan Valley





interpretation of dykes derived from 'new' Tellus airborne survey (magnetics)

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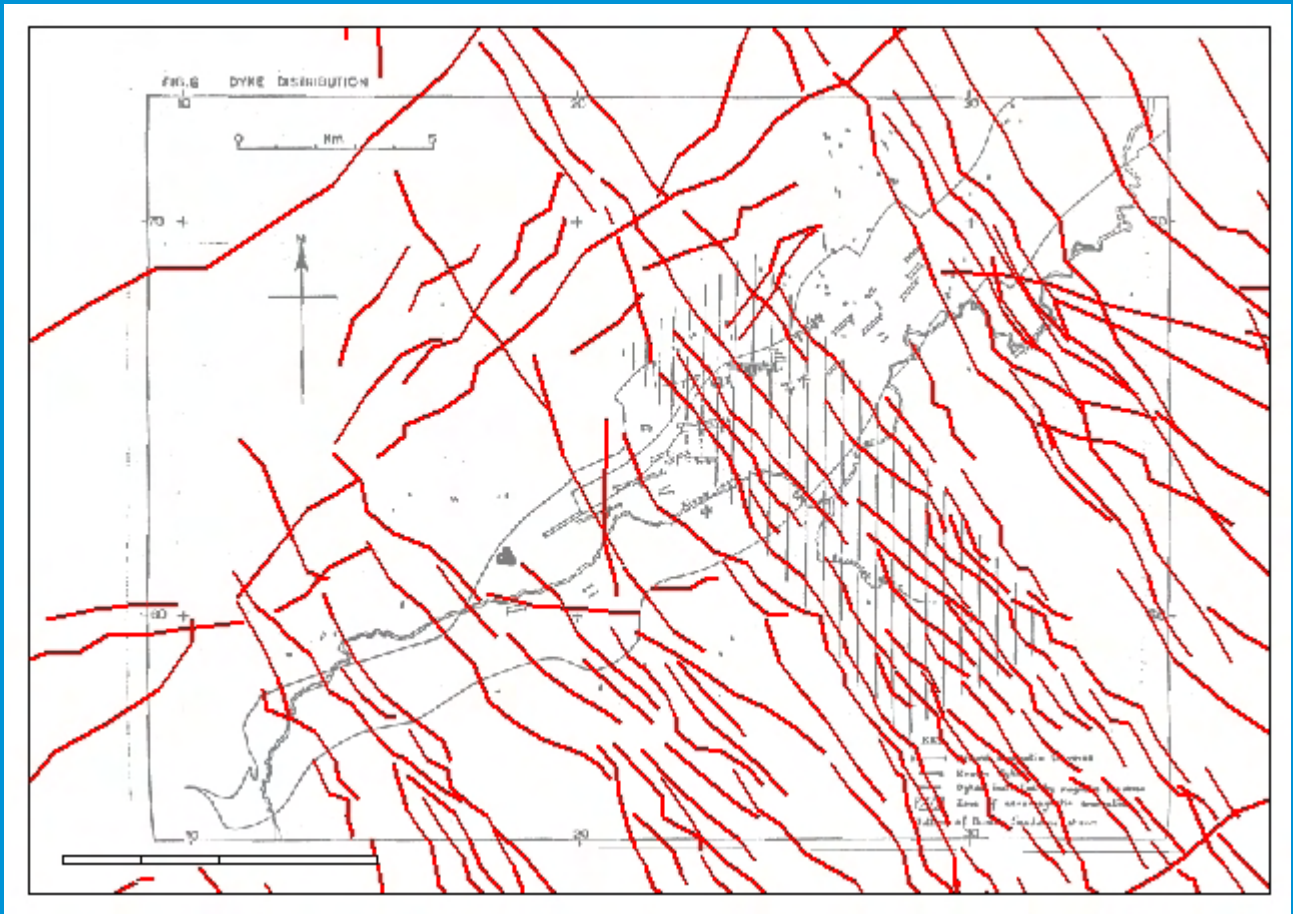
5. Water Resources Management: identification of dykes in the Lagan Valley



— dykes from 'new' Tellus airborne magnetic survey (overlying results from ground magnetic survey)

better and more regional information of dykes

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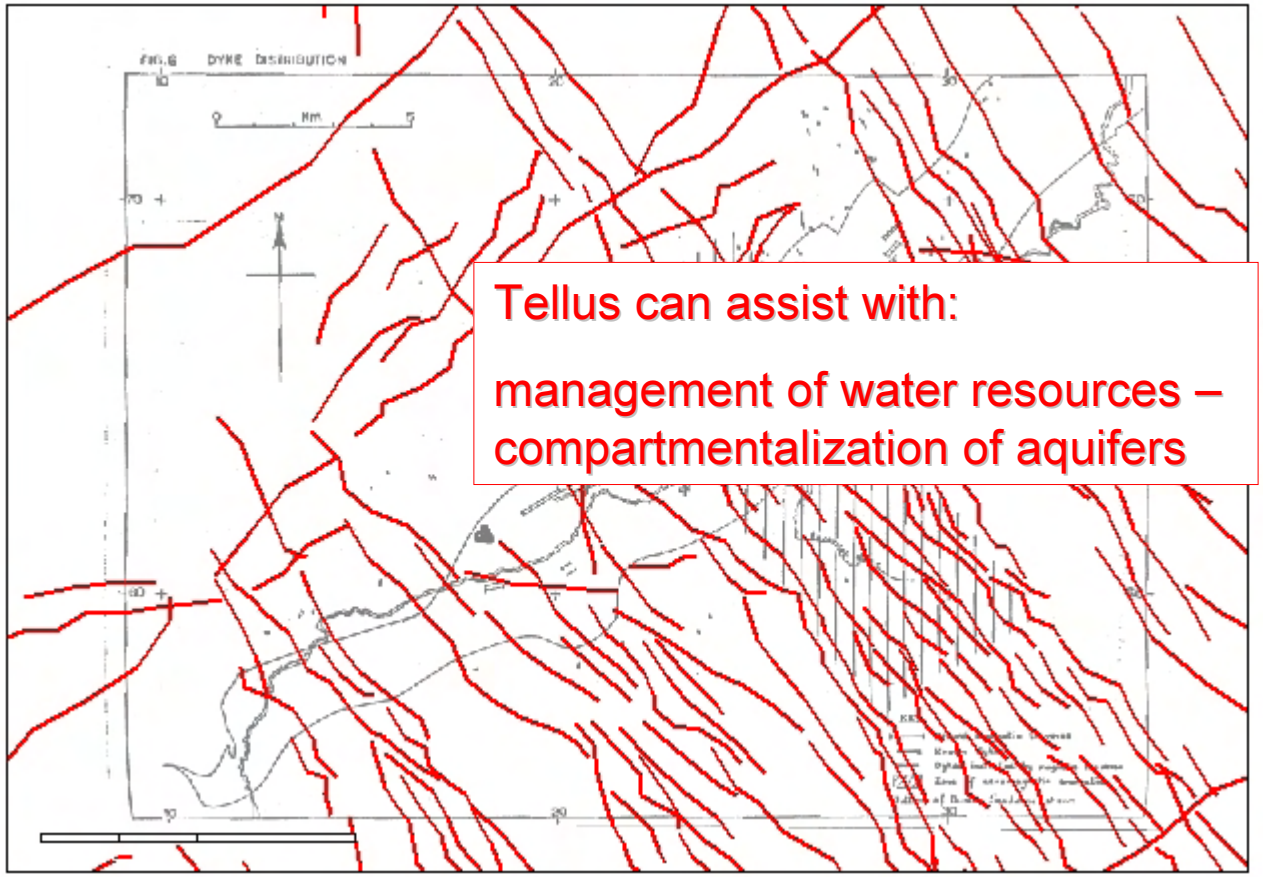
5. Water Resources Management: identification of dykes in the Lagan Valley



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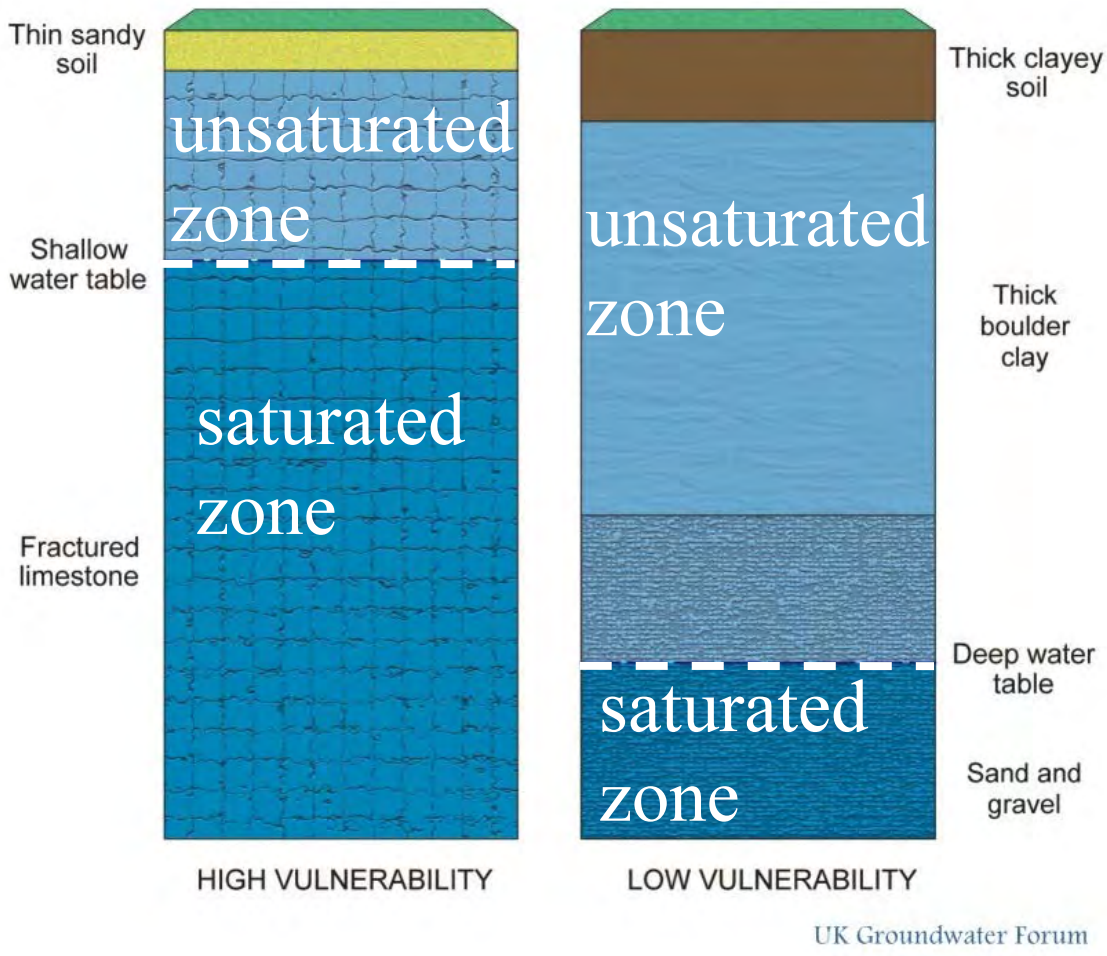
Future work: depth-to-bedrock model



2 frequencies from electro-magnetics →
start model for inversion:
2 layer model

superficial deposits σ_1 ; z_1
bedrock σ_2 ; $z_2 = \infty$

see also posters by
David Beamish
on using Tellus EM data

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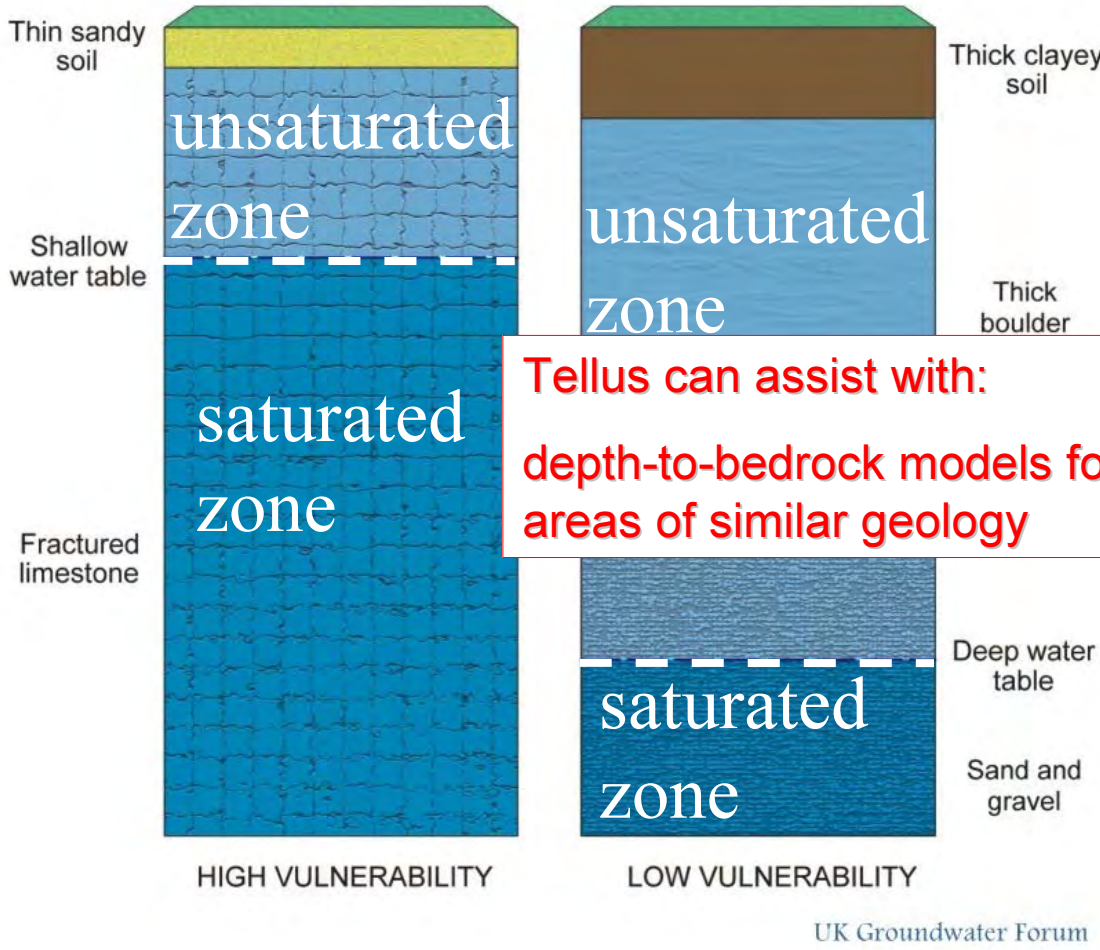
Future work: depth-to-bedrock model



Tellus can assist with:

depth-to-bedrock models for areas of similar geology

2 frequencies from electro-magnetics →
start model for inversion:
2 layer model

superficial deposits σ_1 ; z_1
bedrock σ_2 ; $z_2 = \infty$

see also posters by David Beamish on using Tellus EM data

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Conclusion

- New legislation is requiring a much more comprehensive understanding of all water systems including the relationships between them.
- There is a need to identify significance of anthropogenic impacts on ‘status’ of each water body. To understand impacts, we need to have a handle on natural baseline and geological influences.
- The objective of the Directives requires new management of activities such as abstraction.
- Tellus datasets should assist with developing improved conceptual models of all water systems and assist with both monitoring and management of these systems, whilst acknowledging limitations.

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Acknowledgements

Dawn Lynch - Freshwater Resources, Environment and Heritage Service (EHS)

Gabriel Nelson - Water Resources, Environment and Heritage Service (EHS)

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