British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Developing a Programme of Measures to Reduce Groundwater Pollution: A Collaborative Approach in the Eden Valley UK

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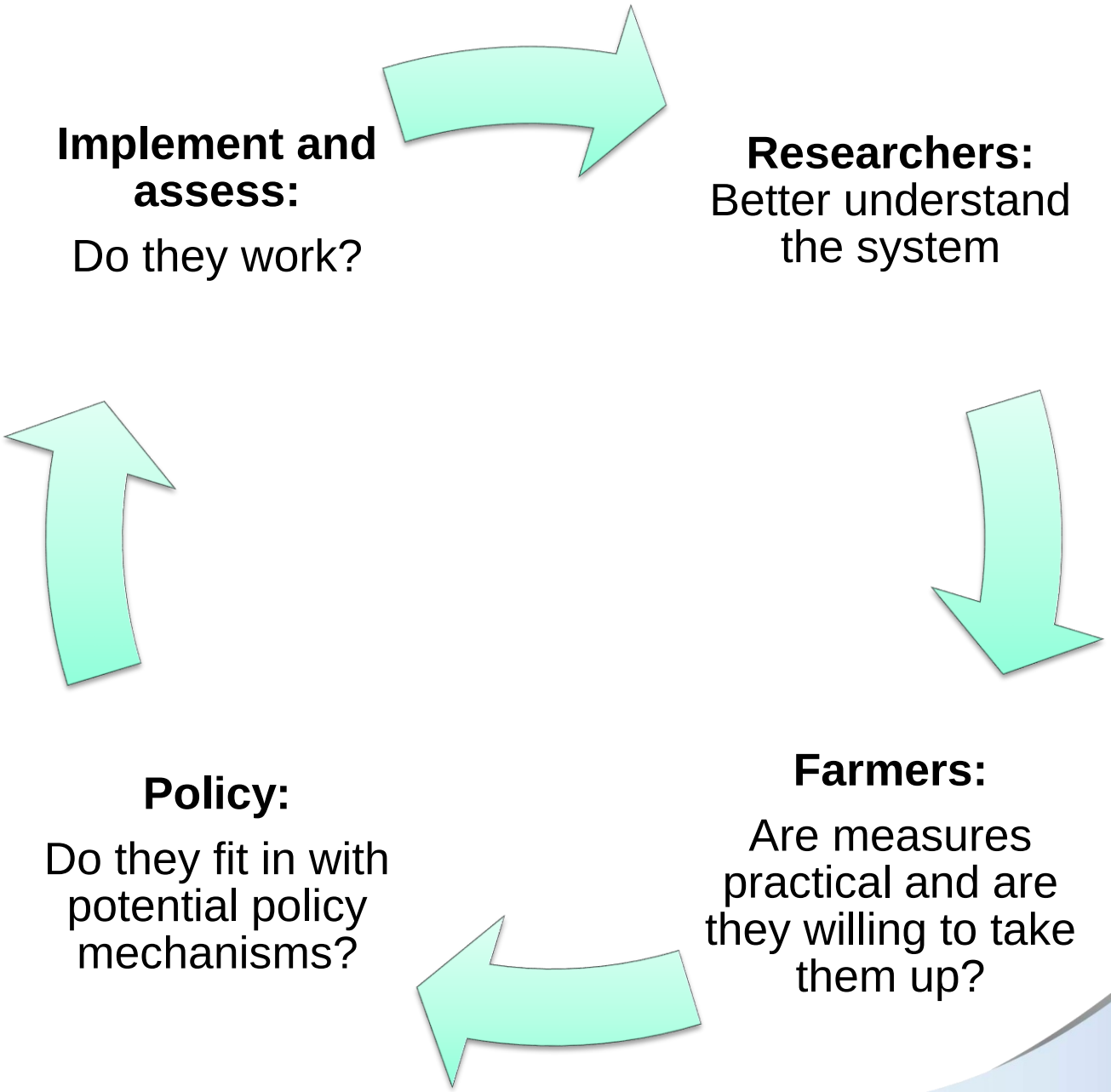
Developing a collaborative approach



Understanding the system

Drift Deposits

Sand/gravel lenses in boulder clay

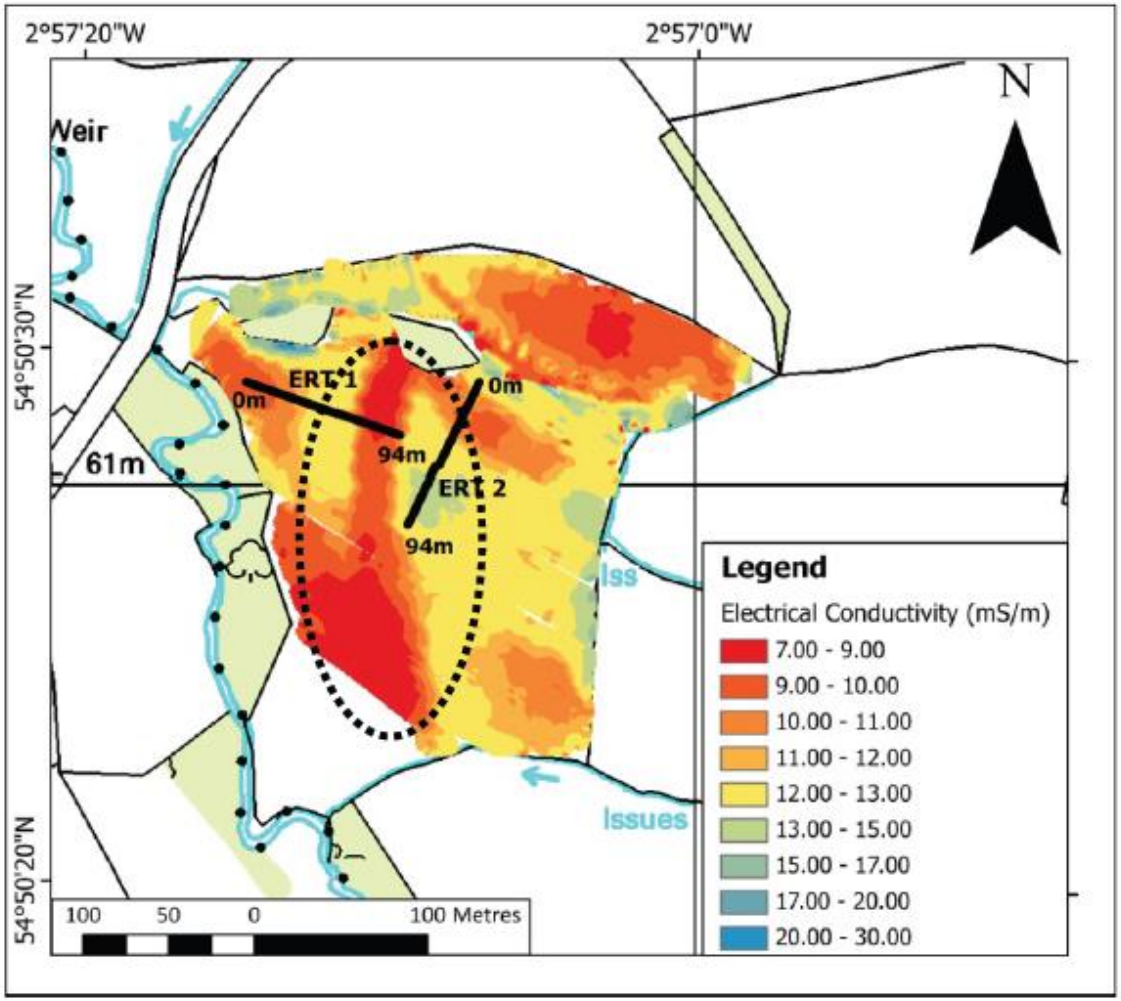
Outcropping →recharge?

Continuity → shallow GW-SW interaction

Sand/gravel lenses at depth → recharge to sandstone

Lateral connectivity within the drift

- Electrical conductivity to 6m depth
- Red = resistive; blue = conductive
- Potential for resistive zones to represent high-permeability zones?

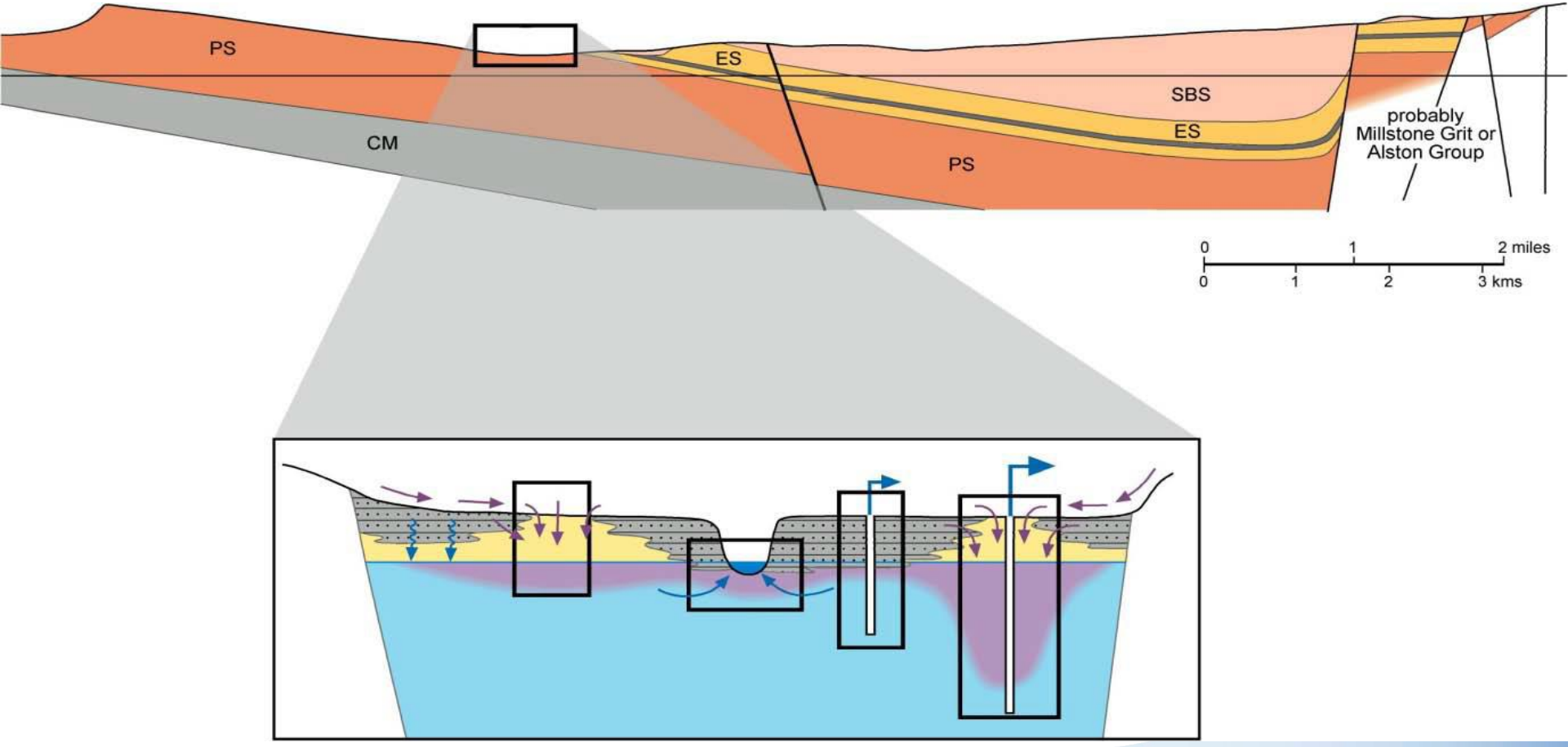


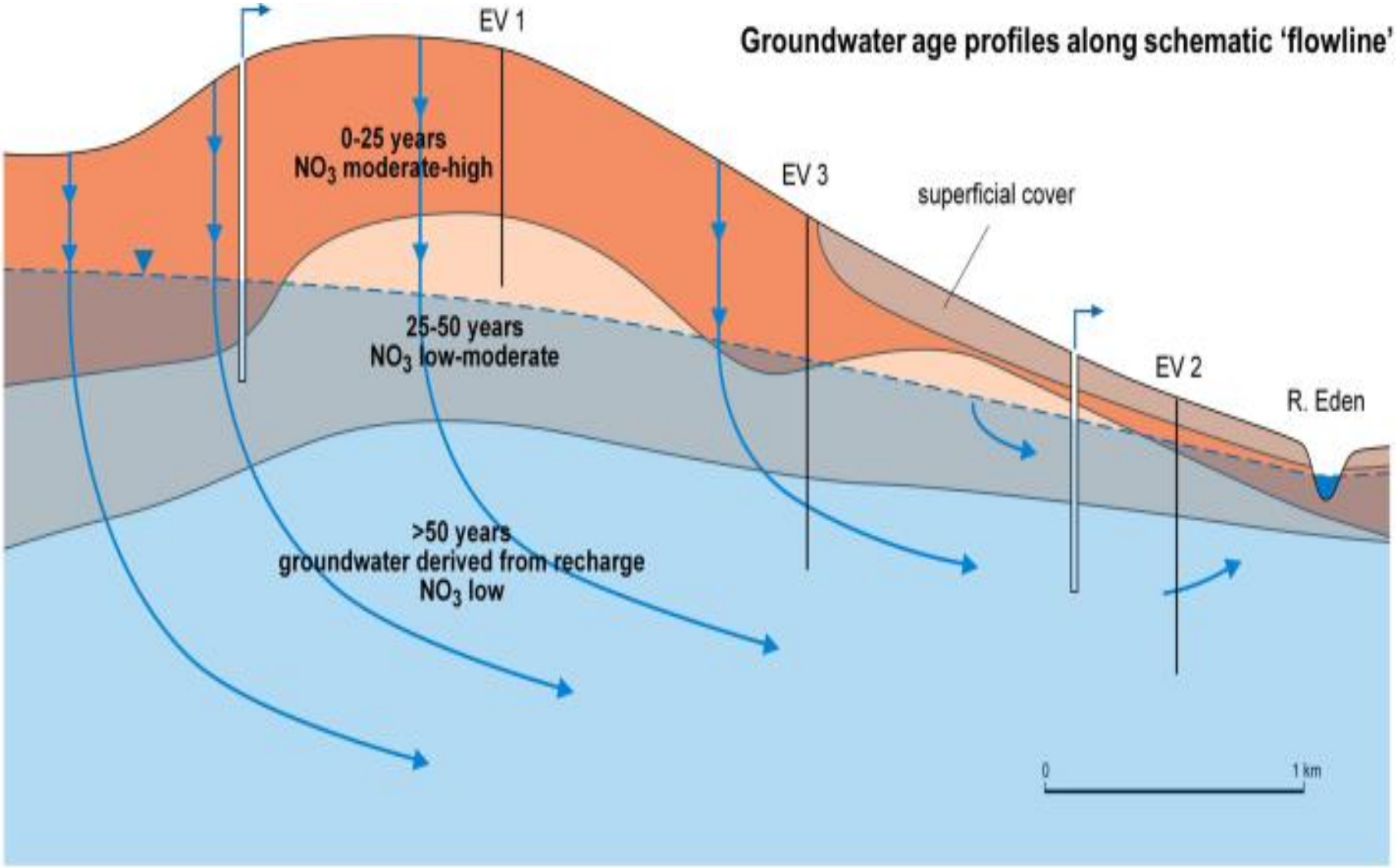
Mejus, L. (2015) Unpublished PhD thesis. Lancaster

EDenDTC
A National Demonstration Test Catchment

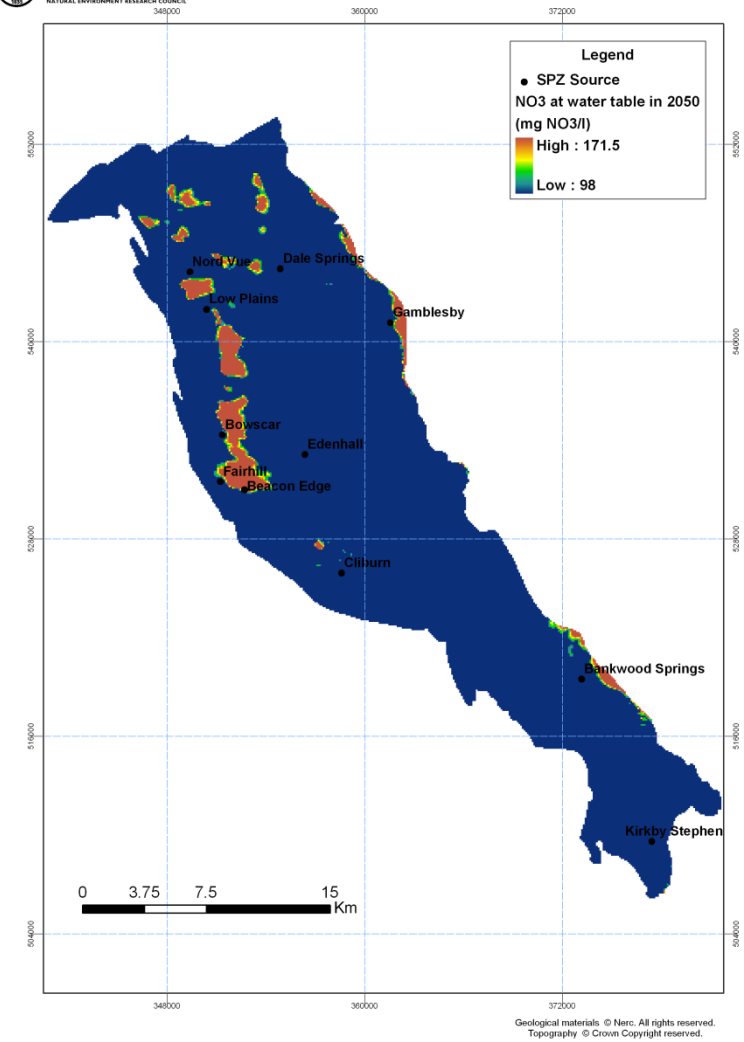
- Infiltration rates to the Penrith and St. Bees Sandstones, at outcrop, as 315 and 350 mm/y

- The Penrith Sandstone and St Bees Sandstone form the major aquifers



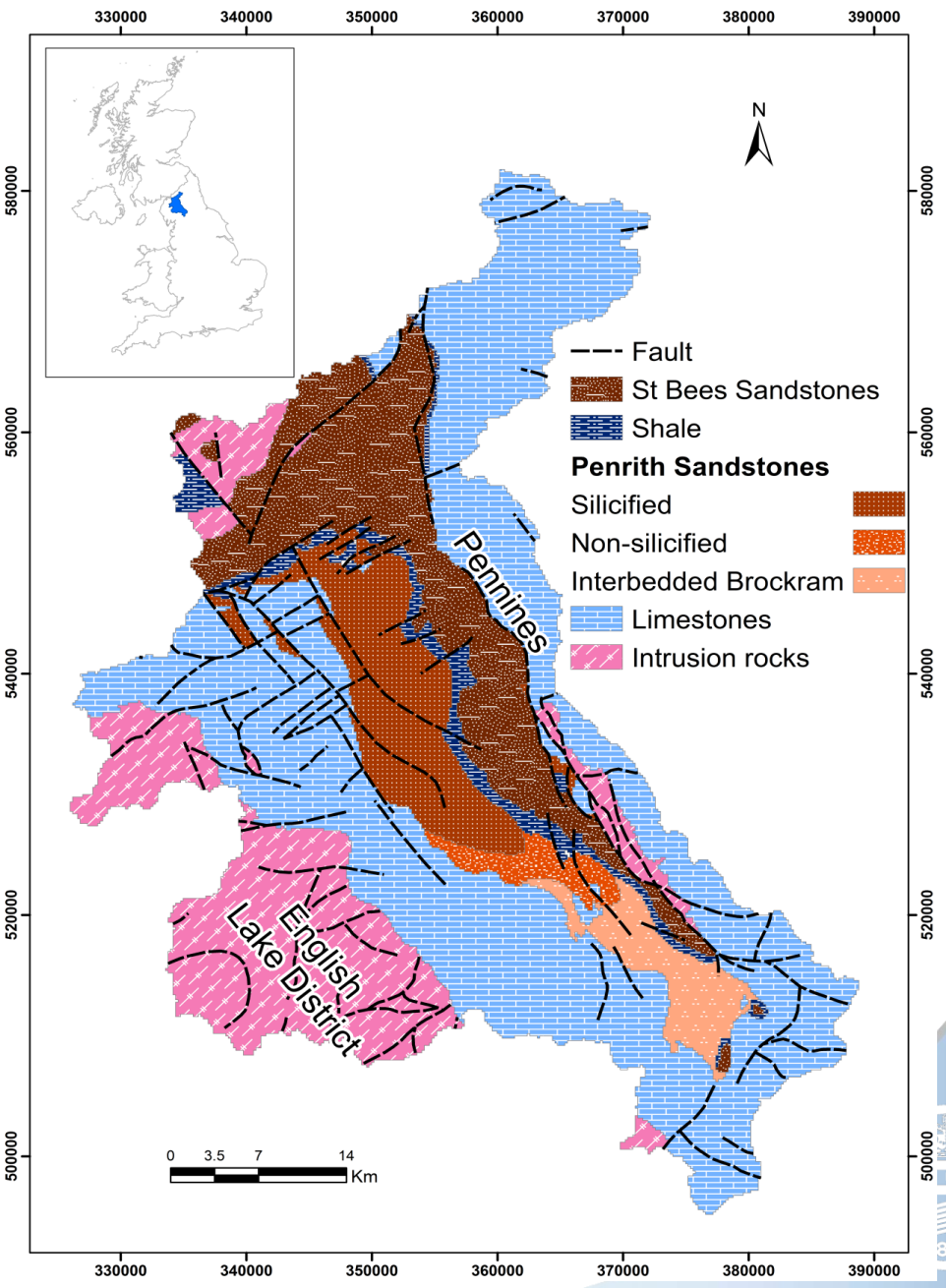


Modelling the unsaturated zone

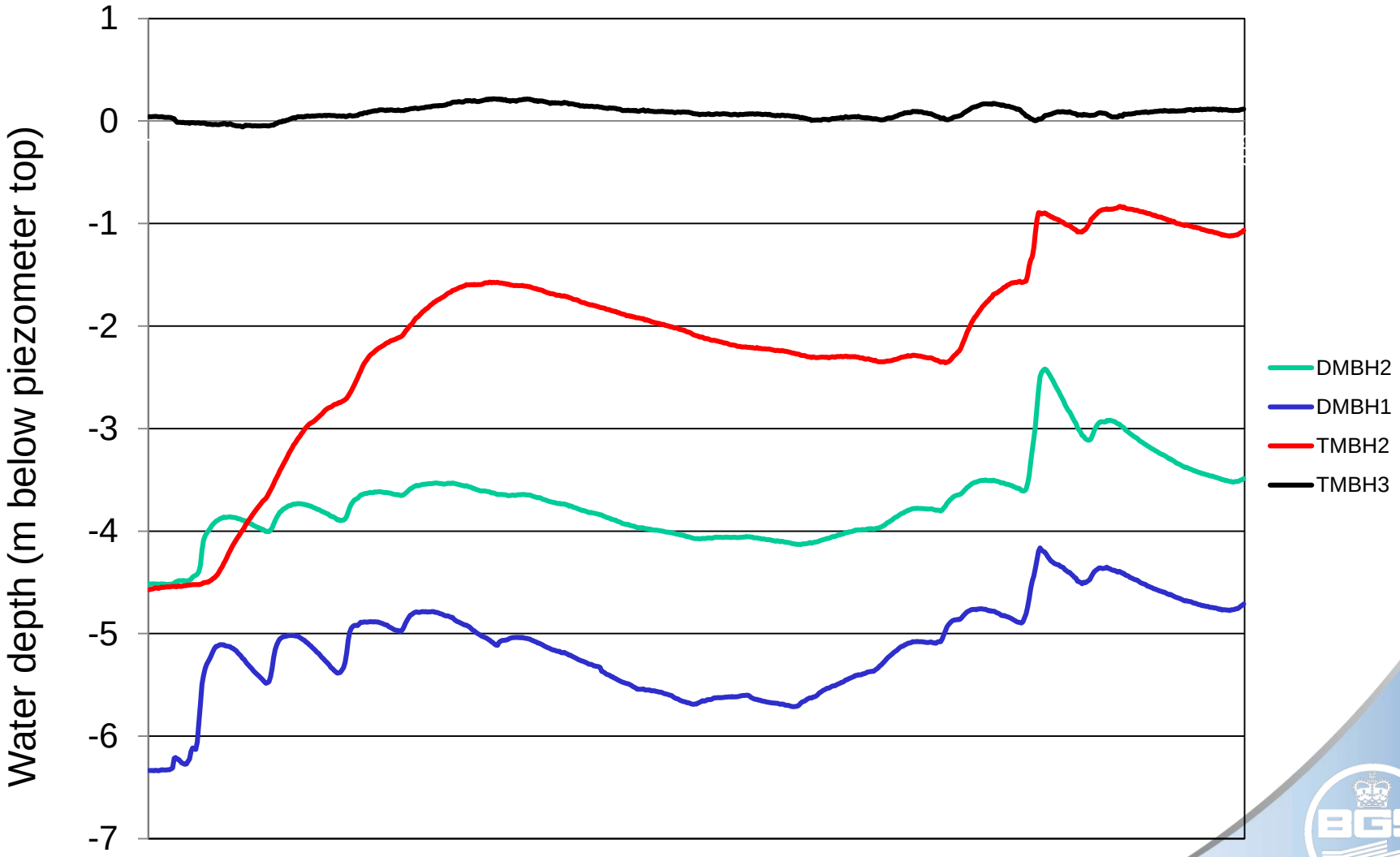


The trend of nitrate concentration at the water table (**before groundwater dilution**) in the next few decades

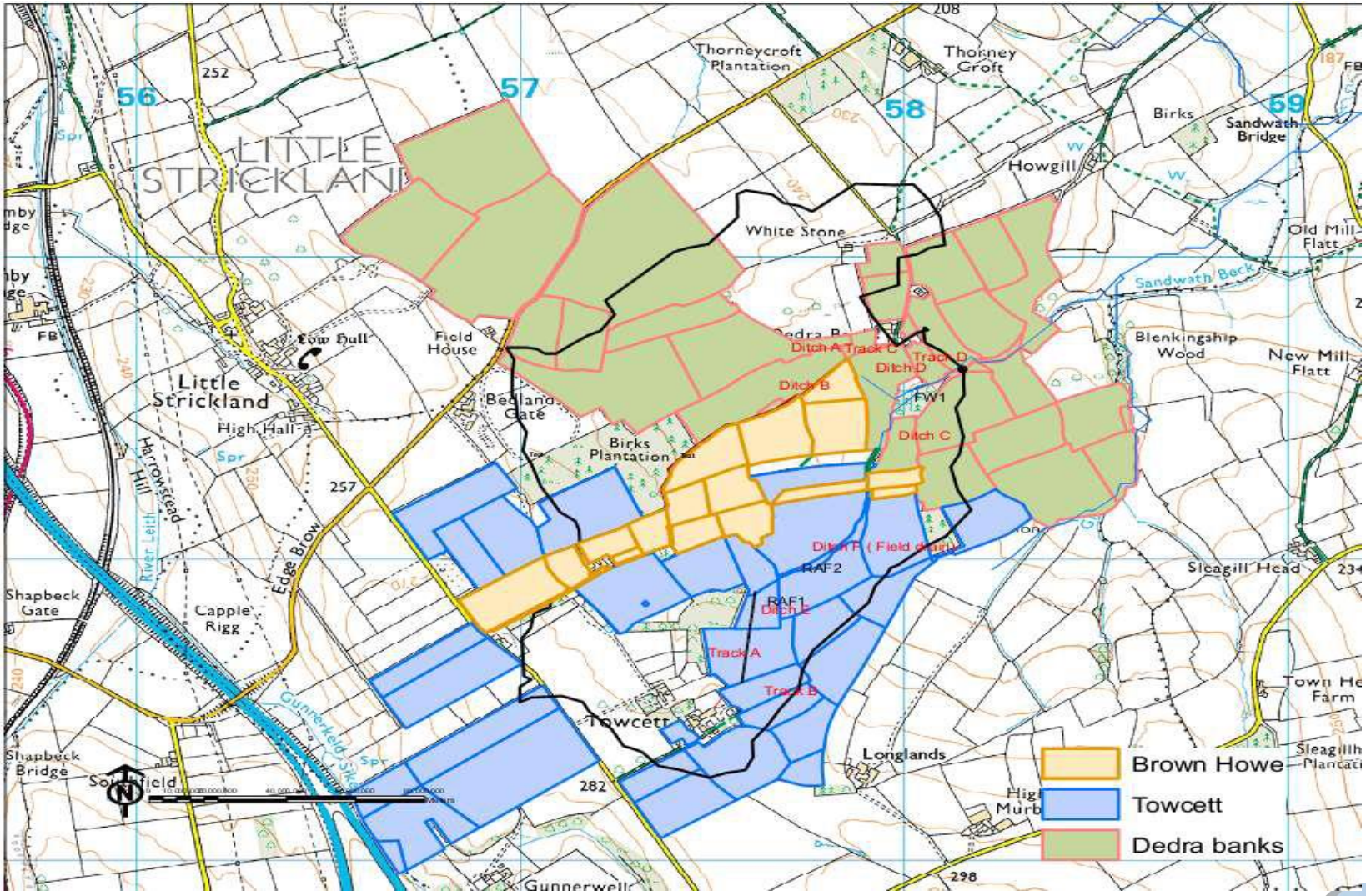
Eden Valley



Boreholes in mitigation area



Implementing measures



What will it take to encourage adoption of specific mitigation measures?

- *What are the motivations? And what are the barriers?*

Which advisors are best placed to deliver advice / influence uptake?

- *Why farmers listen to certain organisations for advice on specific measures?*

Farmers Attitudes to Advisors

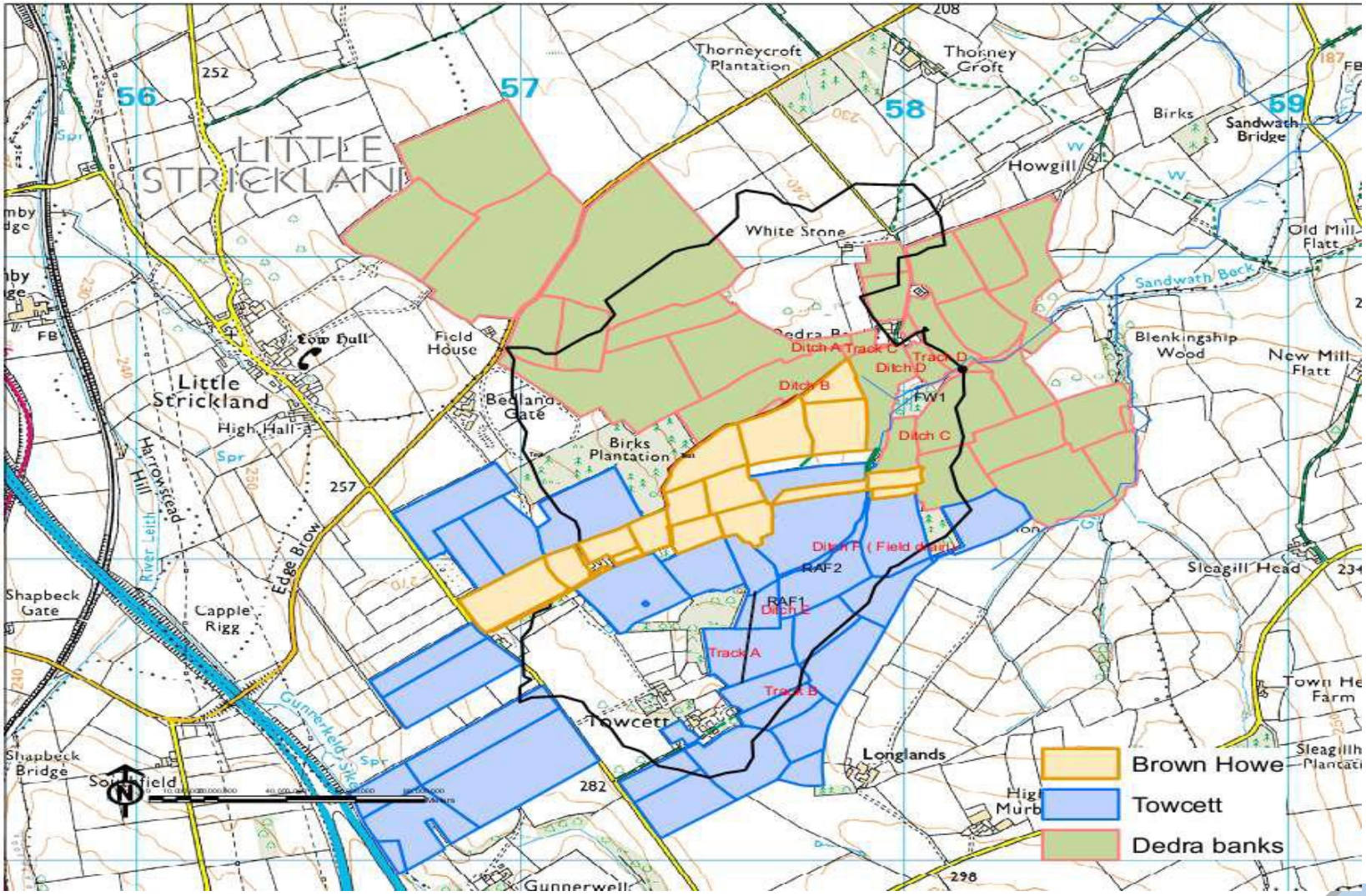
Independent advisor

Salesperson

Large agri company

Water company

Implementing measures



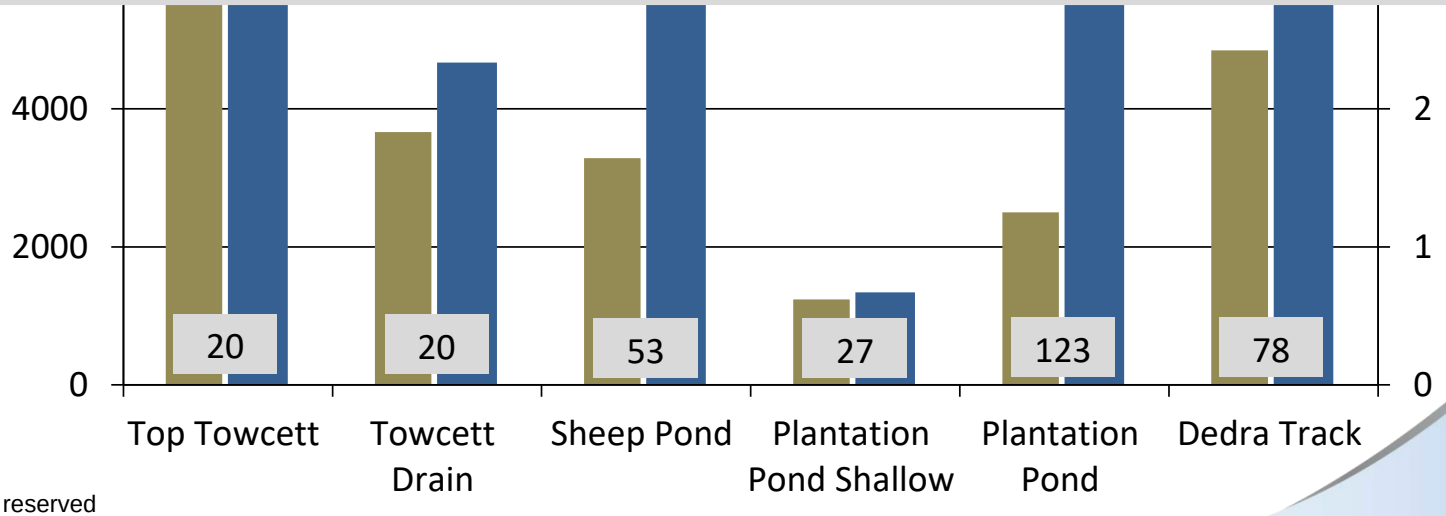
Identifying Potential Measures

- Tackling sources
  - Farm infrastructure
  - Nutrient management
- Reducing mobilisation in fields
- Removing pollutant pathways
  - Edge of field
  - Tracks
- Buffering receptors

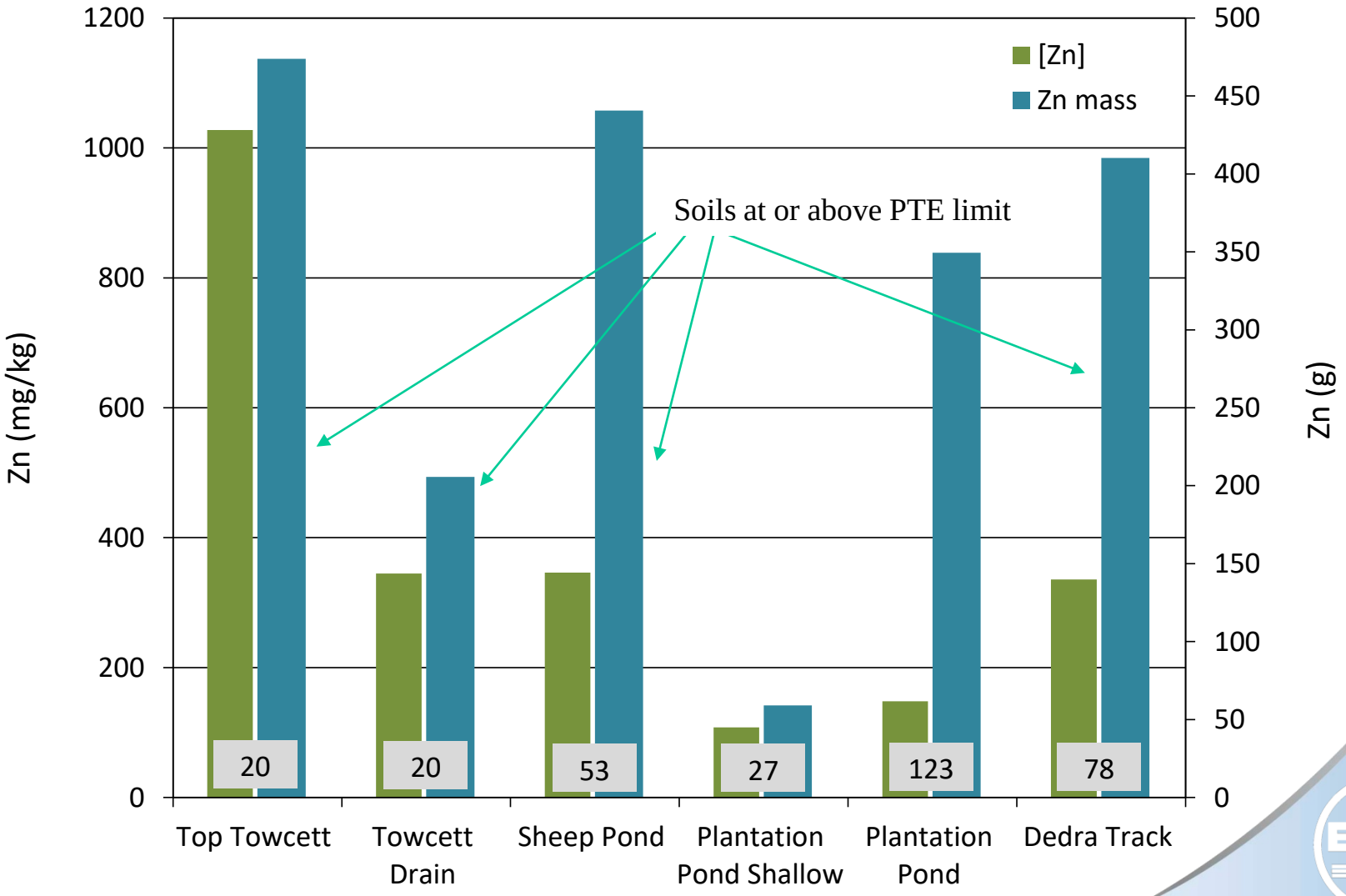
Runoff detention features (RDFs):

RDFs: Total nitrogen

- 24.2 kg N stored in 2014/2015.
- Equates to specific yield reduction of 0.16 kg N/ha at Dedra outlet.
- However, this from features covering c.0.02% of the catchment area to Dedra outlet (1.55 km^2) and c.0.003% of the catchment area to Newby outlet (12.5 km^2).



RDFs: Heavy metals



Timing of slurry applications

Helping remove the need to spread slurry at times when:

- Land is waterlogged and at risk of rutting and compaction
- Likelihood of surface runoff is high
- Heavy rainfall predicted
- Nutrient requirement by the crop is low

Fencing

Before

After

Machinery for rejuvenating soil

Aeration – shallow livestock compaction

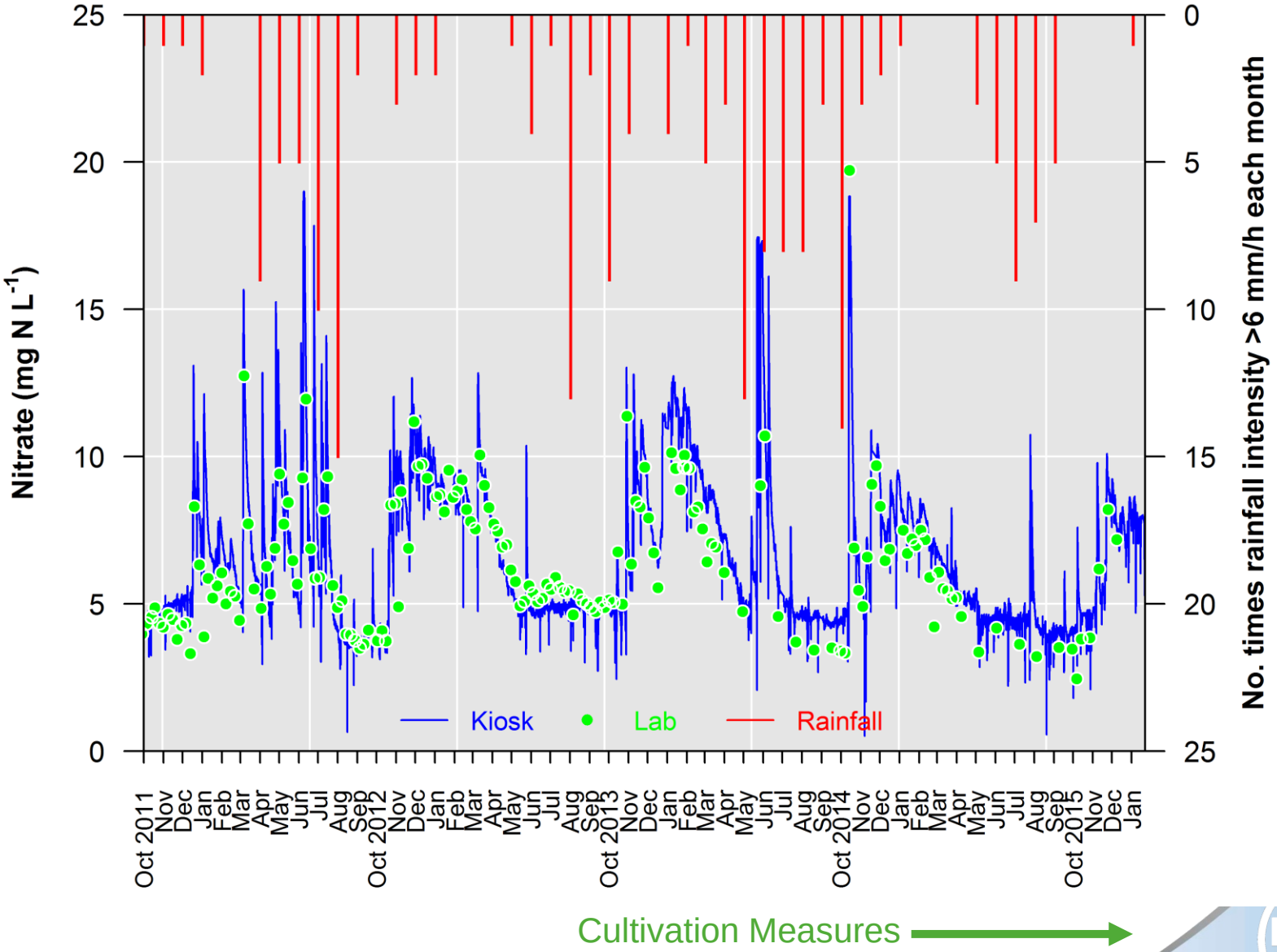
Subsoiling – deeper machinery compaction

6 October 2013

Oilseed radish:
Seed rate: 18 kg/ha (total 1836 kg)
Cost £4,957

Starter fertiliser N:
Application rate: 30 kg/ha
Cost £2,093

Trends in Nitrate Concentrations at Site E and Rainfall Intensity 2011-16



Cultivation Measures →

Summary

Determine the hydrogeological regime including time lags

Engage with farmers when designing policy, to understand their needs.

Gain knowledge of the motivations and barriers to uptake for **specific measures.**

Discover the **role of advisors** and who farmers most listen to help influence uptake.

It is not only important to decide **what** to encourage but also **how** and **who** should do the encouraging!

Thank You

with acknowledgements to unknown artist in NeWater FP6 project