



South Downs Way Ahead Nature Improvement Area – Collaborative Nitrate Modelling Project

Background

Rising nitrate in Southern Chalk aquifer over the past 60 years has increased the need for treatment of groundwater and river water used for drinking and, more recently, to the deterioration of protected inter-tidal habitats along the south coast by increased algal growth fed by nitrate in transitional and coastal waters. The South Downs Collaborative Nitrate Modelling Project sought to identify the risk of nitrate pollution of groundwater and how to mitigate these risks in the South Downs National Park Nature Improvement Area and Chalk aquifer beyond.

The project was initiated under the banner of the South Downs Way Ahead Nature Improvement Area (NIA), one of twelve schemes set up to deliver the UK Natural Environment White Paper of "bigger, better, more joined up protected landscapes".

Project

The main project objective was to provide compelling evidence to persuade stakeholders that sustainable land management practices to reduce nitrate leaching from soils are enough to reverse groundwater and surface water quality deterioration.

To plan to how to deal with the risk from nitrate pollution now and in the future, the project partners needed to know how long improvements in water quality would take and the wider benefits of following a catchment-based approach. The evidence base produced needed to cover all potential sources of nitrate to the water environment to avoid perceived bias towards the agricultural sector and to also counter the perception that the very slow response of groundwater to changes in land management is a reason to take no action.

Project Steering Group:

South Downs National Park Authority, Downs and Harbours Clean Water Partnership (CSF), Environment Agency (SSD), Portsmouth Water, Southern Water

Location:

The project area covered the Southern Chalk aquifer beneath the catchments of the Rivers Itchen, Test, Adur, Ouse, Lavant, Cuckmere and Pevensey Levels, and the Isle of Wight. These Chalk fed rivers and streams drain towards the Solent and the south coast of England.

Although current land management practices have improved compared to past times, there may still need to be improvements to reduce nitrate to within acceptable levels.

A series of desk studies into the sources of nitrate in groundwater were carried out to identify:

- the connections between groundwater and surface water via solution features and as baseflow in rivers;
- the behaviour of nitrate in the aquifer based on calculations of how much nitrate leaches from soils; and how the nitrate ends up at public water supplies and in coastal waters.

The project worked through phases of risk mapping and scenario development, identifying both problems and solutions. Cost benefit modelling of solutions including land use change, livestock management, fertiliser management, manure management and organic farming were used to guide recommended mitigations. An 'advice programme' to instigate wider behavioural change was also implemented. Feedback and discussion of project results from a stakeholder workshop included how to communicate the work to a non-technical audience and the wider environmental benefits of future work.

Outcomes

The project provided partners with an evidence base covering point and diffuse sources of nitrate from national and water company datasets, local expertise and farm visits to produce a representative output that could confidently be discussed with stakeholders.

A nitrate budget for groundwater in each catchment was calculated, and the sectors contributing to the highest concentrations identified.

Predictions of if, when and for how long nitrate will exceed the drinking water standard were made, using an approach that can be explained to non-experts, to help future supply management by water companies.

Zones of faster-flow paths were identified to help focus action to control spikes in nitrate concentration at a shorter timescale than usually identified for groundwater, giving short to medium term solution for the water companies.



Catchment management was identified as more cost-effective compared to chemical treatment in most groundwater drinking water catchments over a 40-50 year period.

Lessons learnt

Completed in 2013/14, project results have guided subsequent NEP work by Portsmouth Water and Southern Water, and the proposal of innovative catchment measures for Ofwat's Price Review 19 (2020-2025).

The project provided evidence for the Brighton ChaMP project highlighting that on average the current nitrate loading across the Brighton Chalk exceeds the WFD threshold of 37.5 mg/l NO₃.

The wider benefits of measures to address nitrate concentrations in groundwater have been assessed by Portsmouth Water, including a better understanding of the costs and benefits of woodland planting.

Both Portsmouth and Southern Water have looked at ways of identifying the location of surface karstic features in the Chalk aquifer which could provide rapid pathways to groundwater abstractions and have worked in areas prone to rapid flow paths to raise awareness of risks to drinking water.

In the spirit of sharing learning to a wider group, the outputs from the project were shared with the BGS for use as a case study in the report "Modelling the nitrate legacy" Groundwater Science Directorate Open Report OR/15/00. 2015.

In rolling out the findings of the work on the ground the following were identified:

- For voluntary measures to be effective they need to be attractive and effective to convince farmers and land managers.
- In developing measures with farmers to address nitrate, keeping things simple by addressing nitrate loss across the whole farm allows farmers and their agronomists the freedom to work out a system to comply with limits.



Next steps

- Further cost benefit analysis for nitrate measures effectiveness at Portsmouth Water's groundwater abstractions has supported the focus of farmer engagement and discussion of which measures are feasible.
- Refining the input to the nitrate budget from historic dilute and disperse landfill with Environment Agency and Local Authority monitoring records, as some of these historic sites may still contribute nitrate to groundwater.
- Further work on mapping karst and understanding how the risk of pollution through potential rapid pathways (can be 10s of kms per day) can be managed.



Websites:

www.southdowns.gov.uk/care-for/water/brighton-champ-for-water/
www.cleanwaterpartnership.co.uk/

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