



# River Ehen SAC

## Nutrient Modelling Summary

Date: October 2026

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# Introduction

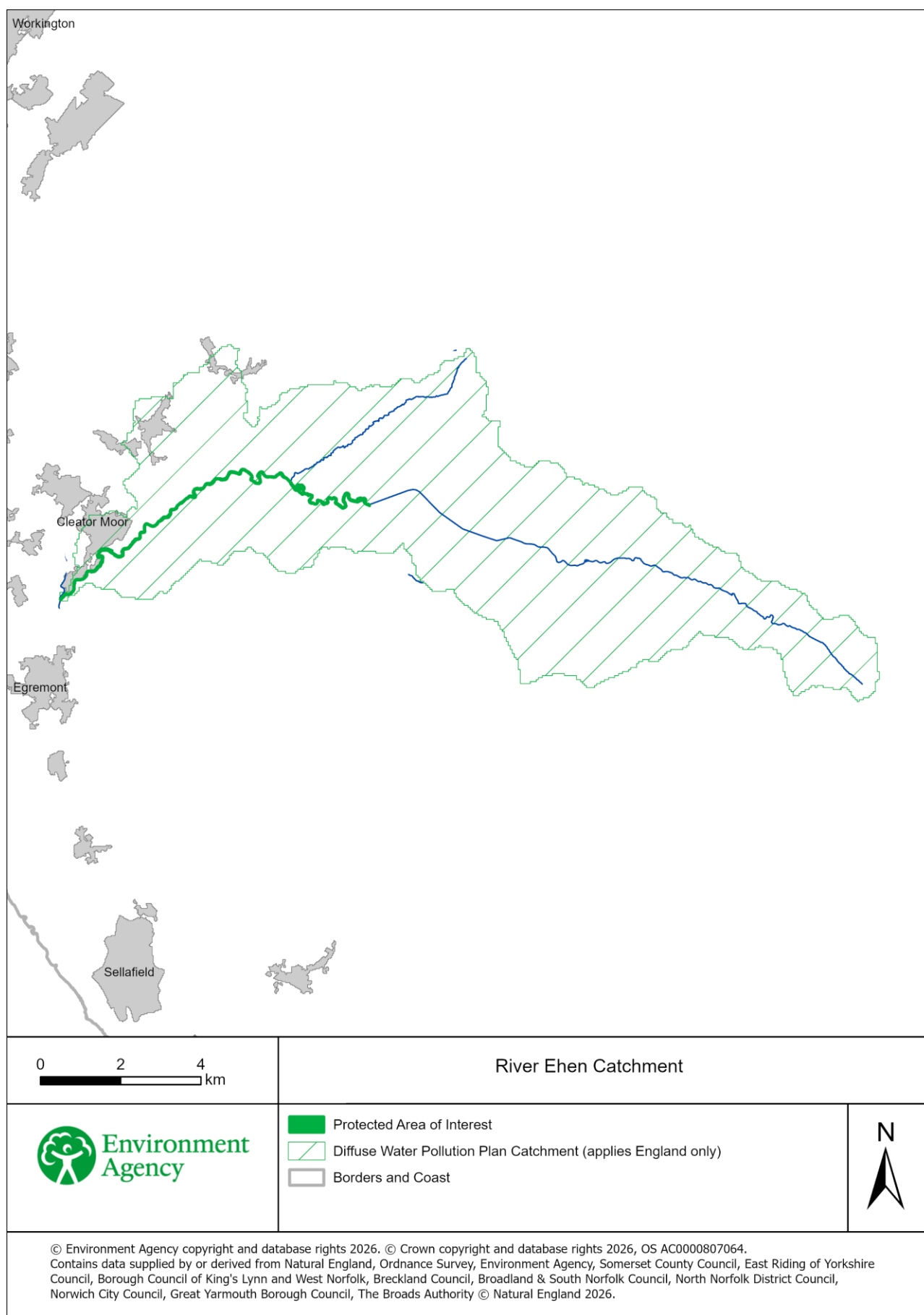
This document provides summary outputs from the Environment Agency's water quality modelling for the River Ehen Special Area of Conservation (SAC) (Map 1). We provide catchment-scale source apportionment information and maps showing the scale of reductions needed to achieve protected area water quality targets. Our outputs will help those working on Diffuse Water Pollution Plans (DWPPs) and working on site restoration. We aim to support a general understanding of the catchment rather than give the level of detail needed to inform specific on-the-ground measures. Our detailed methodology is described in [Catchment statistics for nutrient pollution in protected areas](#).

We used the phosphate Common Standards Monitoring Guidance (CSMG) targets applicable to the River Ehen catchment. Natural England and the Environment Agency agree these targets for water dependent protected areas and publish them on the [Catchment Data Explorer](#).

Alongside Simcat SAGIS models, we used the Farmscoper v5 decision support tool and applied the revised polluter pays principle methodology (v0.17) used during PR24 planning to define the sector share for the point and diffuse sectors.

Our outputs highlight the dominant nutrient sources under a range of scenarios, including future estimates based on planned water company investment up to 31 March 2030 (AMP8) and the wider implementation of rural land use measures.

We have not incorporated additional nutrient contributions from any future development and growth including housing. Any additional future nutrient load will be assessed through the planning process led by the Local Planning Authority or through our permitting process.



**Map 1. River Ehen SAC and catchment with protected area highlighted.**

## Models used

We used the PR19 and PR24 [Simcat SAGIS models](#) for this work. Simcat SAGIS (Source Apportionment Geographical Information System) integrates ArcGIS-based digital information management and visualisation with SIMCAT (Simulated Catchment), the Environment Agency's water quality model.

The PR19 Simcat SAGIS model is calibrated to 2010 to 2012 data, following nationally agreed model build and calibration standards across UKWIR (UK Water Industry Research). Outputs from this model are used to establish the sector share under the revised polluter pays principle. Similarly, the PR24 Simcat SAGIS model is calibrated to 2014 to 2020 data, following UKWIR agreed model build and calibration standards.

The calibration process optimises the agreement between measured and simulated values through reasonable and systematic adjustments to model parameters and input data. We adjust the inputs where there is least confidence, those representing diffuse sources of pollution. The associated project overview document details the datasets included in the models. To assess confidence in the models, we compare the measured and simulated values. While Simcat SAGIS provides a robust framework for decision-making in wastewater investment, we have less certainty in the diffuse load estimates. As a result, we have lower confidence when using the models to assess the outcomes of measures that target diffuse sources, including those used here and in the DWPPs.

## Scenarios

The modelling scenarios (Table 1) evaluate the effectiveness of nutrient reductions in point and diffuse sources to meet protected site targets and the diffuse sector share of those targets. As the diffuse sector share is met in the Actual (2014 to 2020) scenario, modelling of reductions in rural land use losses was not necessary. No AMP8 investment is planned for the water company discharges in the Ehen catchment.

**Table 1: Summary description of the point and diffuse measures represented in the Simcat SAGIS Scenarios.**

| Scenario                    | Point Sector Measures                                                                   | Diffuse Sector Measures                                   | Model            |
|-----------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|
| <b>Actual (2014 to 20)*</b> | Observed discharge flow and quality (2014 to 2019). Where not available, defaults used. | Current activities as represented post model calibration. | PR24 Calibration |
| <b>2030 Optimistic</b>      | More recent observed flow and quality reflected where applicable**                      | Current activities as represented post model calibration. | PR24 Calibration |
| <b>2030 At Permit</b>       | All discharges represented at permitted flow and quality values**                       | Current activities as represented post model calibration. | PR24 At Permit   |

\*Previously referred to as the 'recent' scenario.

\*\*Does not include any discharge flow increases that may be required to support growth.

## River Ehen modelled outputs

We estimate the phosphate input load source apportionment for the Ehen to be 25% point source and 75% diffuse source in the Actual (2014 to 2020) scenario. Rural land use (73%) dominates the diffuse sector (Table 2). Under the 2030 At Permit scenario, the point source contribution increases to 34% and the rural land use sector reduces to 65%.

We estimate the baseline (2009) sector share of the protected site target to be 83% diffuse and 17% point. This gives a sector share of 0.004mg/l for the diffuse sector and 0.001mg/l for the point sector (Table 1). The estimated catchment average sector concentrations in the Actual (2014 to 2020) scenario meet both the diffuse and point sector share (Table 3). In the At Permit scenario, the point sector is estimated to need to reduce by 30% to meet the point sector share (Table 3). Given that the diffuse sector share of the target is estimated to be met in the Actual (2014 to 2020) scenario, the additional scenarios simulating the reduction of diffuse input loads are unnecessary.

## Input load source apportionment

Table 2 shows the estimated phosphate input load source apportionment figures for each scenario modelled. We have greatest confidence in the point sector loads where monitoring data is available. Confidence reduces where the contribution from the sector is based on estimates rather than observed data, such as the diffuse sectors. Apportioning the input loads gives an indication of which sector is the dominant nutrient source.

**Table 2: Estimated phosphate input load source apportionment from the catchment endpoint.**

| Scenario                     | Point Sources | Rural Land Use | Urban | Septic Tanks | Other |
|------------------------------|---------------|----------------|-------|--------------|-------|
| <b>Actual (2014 to 2020)</b> | 24.9%         | 73.5%          | 1.0%  | 0.7%         | 0.0%  |
| <b>2030 Optimistic</b>       | 24.9%         | 73.5%          | 1.0%  | 0.7%         | 0.0%  |
| <b>2030 At Permit</b>        | 33.6%         | 64.9%          | 0.9%  | 0.6%         | 0.0%  |

## Catchment average concentrations and reductions

The in-river modelled concentrations arise from the input loads, after the influence of river dilution and natural decay processes in the river have been simulated. Table 3 shows the in-river concentration as a sector catchment average to be consistent with the revised polluter pays principle methodology (v0.17) used in the PR24water company price reviews.

Apportionment by concentration and by load can be different because inputs from different sources tend to occur under different river flow conditions. Inputs from treatment works occur continuously while diffuse source inputs tend to occur under higher river flow conditions where there is greater dilution available in the receiving water. As a result, a

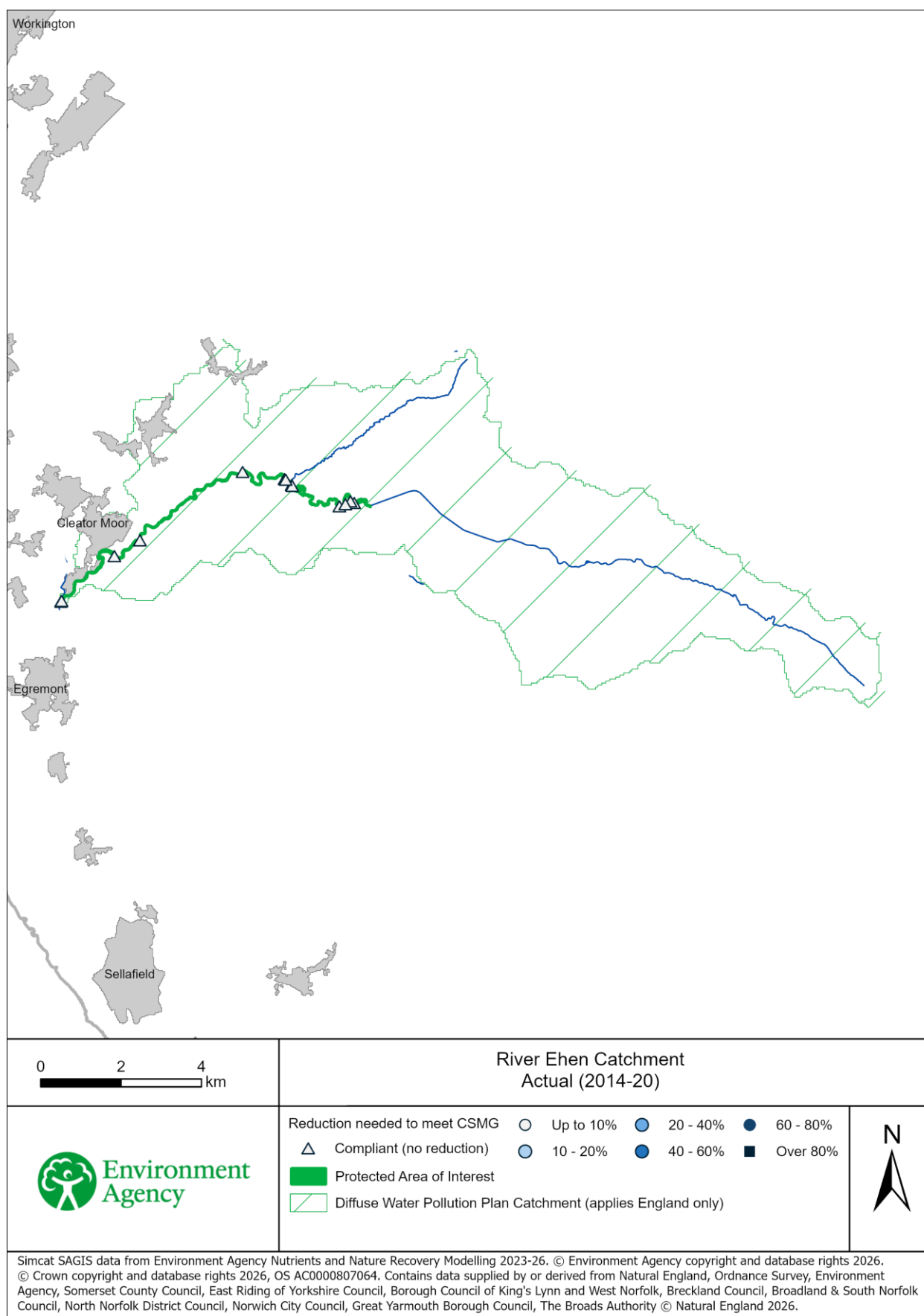
kilogram of phosphorus discharged from a treatment works will have a relatively greater impact on in-river concentrations than the equivalent input from diffuse sources.

**Table 3: Catchment average phosphate sector share alongside modelled catchment average concentrations (mg/l) and estimated percentage reductions across all scenarios.**

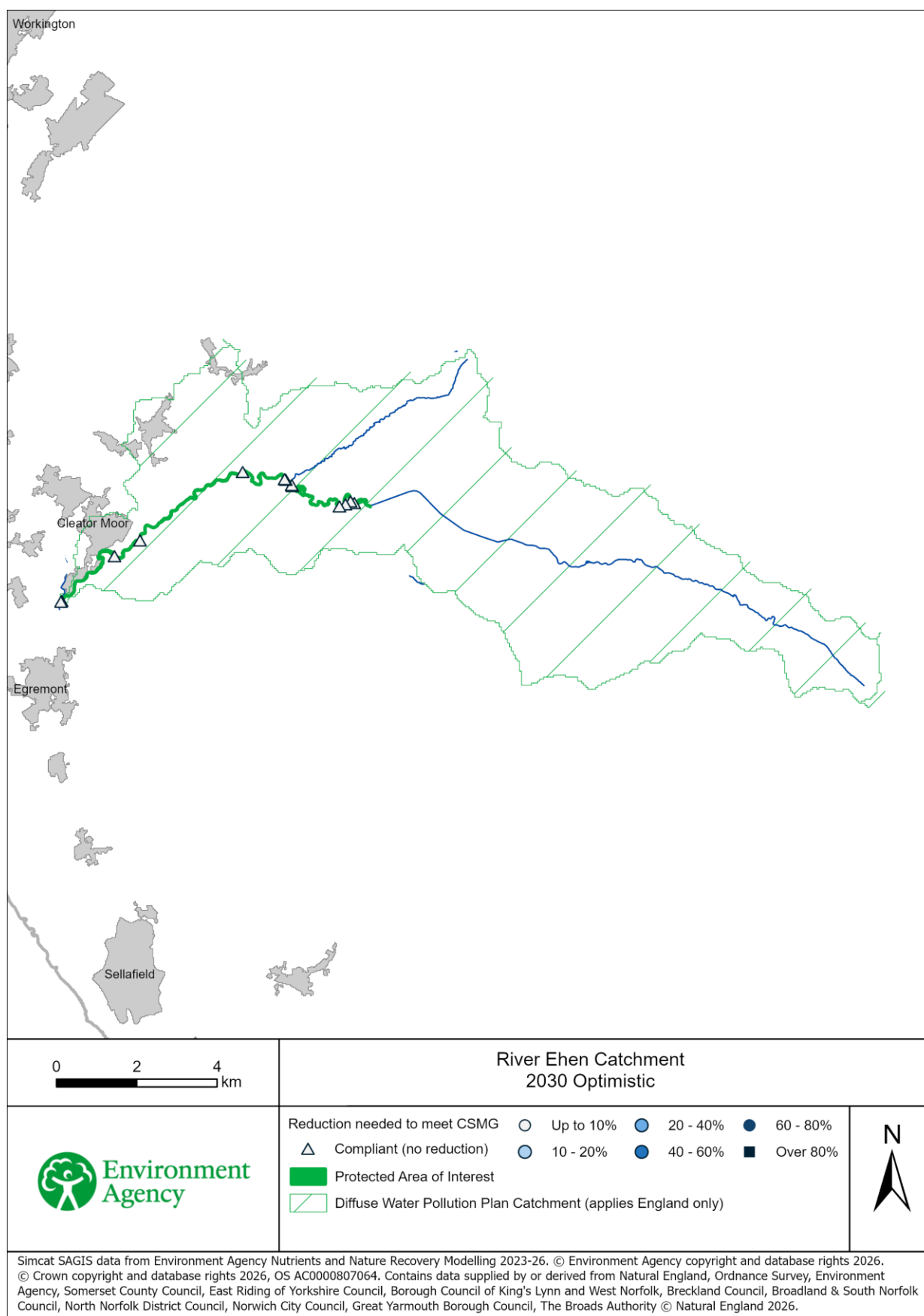
| Scenario and Assessment Metric                                      | Diffuse | Point  | Total |
|---------------------------------------------------------------------|---------|--------|-------|
| <b>Baseline (2009) Sector Share of the target</b>                   | 83%     | 17%    |       |
| <b>Catchment average sector share of the target (mg/l)</b>          | 0.004   | 0.001  | 0.005 |
| <b>Actual (2014 to 2020) - modelled sector concentration (mg/l)</b> | 0.003   | 0.0005 | 0.004 |
| <b>Actual (2014 to 2020) - reduction to meet sector share</b>       | 0%      | 0%     | 0%    |
| <b>2030 Optimistic – modelled sector concentration (mg/l)</b>       | 0.003   | 0.0005 | 0.004 |
| <b>2030 Optimistic – reduction to meet sector share</b>             | 0%      | 0%     | 0%    |
| <b>2030 At Permit – modelled sector concentration (mg/l)</b>        | 0.003   | 0.0012 | 0.004 |
| <b>2030 At Permit – reduction to meet sector share</b>              | 0%      | 30%    | 0%    |

## Maps - modelled reductions needed

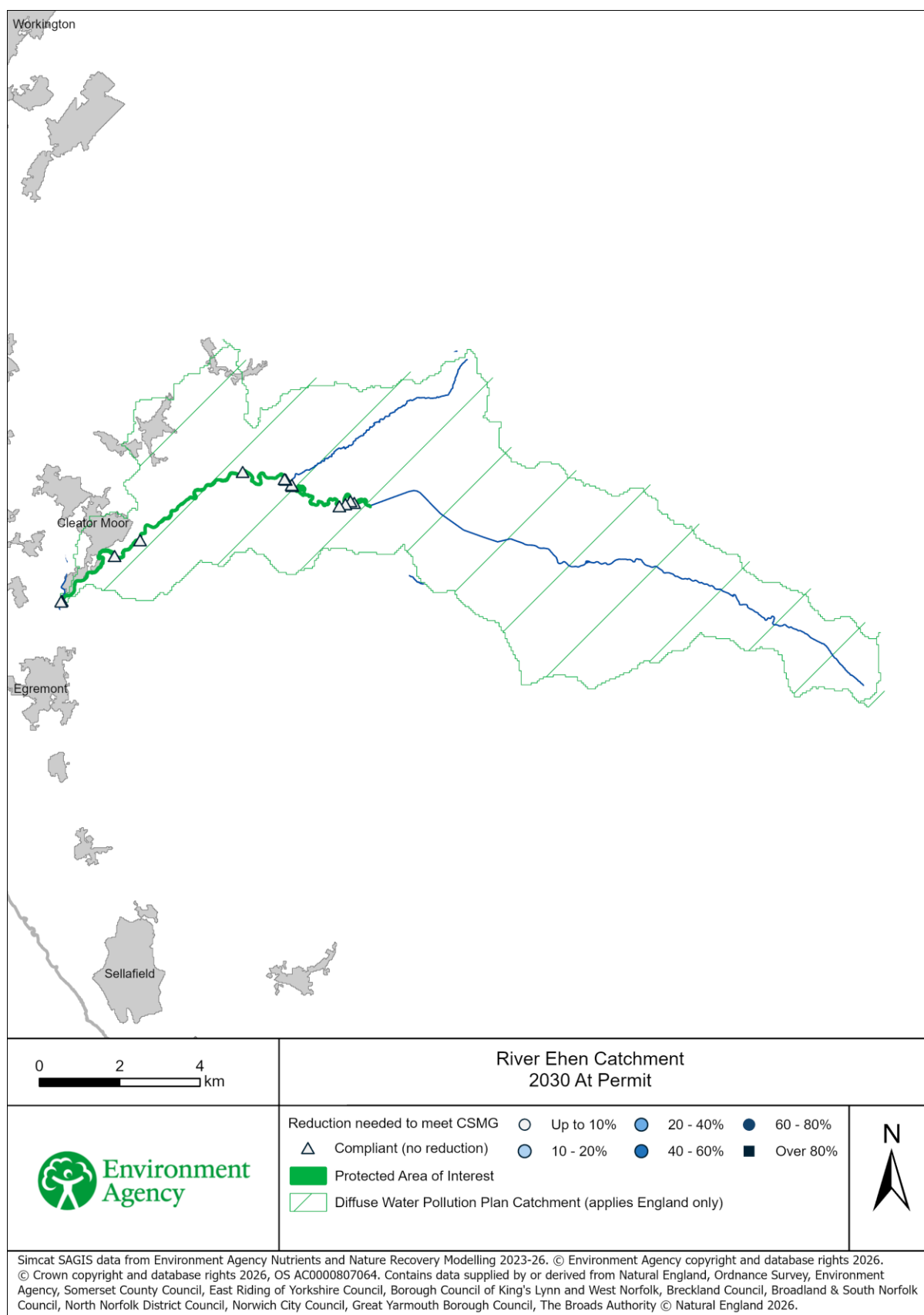
The catchment average information above provides an overview of the sector concentrations and reductions at the catchment scale. The detailed catchment maps reinforce that all modelled locations in the designated reaches of the Ehen catchment are estimated to be compliant with the overall target in both the Actual (2014 to 2020) scenario and the 2030 At Permit scenario (Maps 2 to 4). Similarly, Map 5 confirms that the diffuse sector share of the target is met in all locations in the designated reaches. Data is plotted for each modelled plotting point where there is a real-world feature for example monitoring point or discharge location.



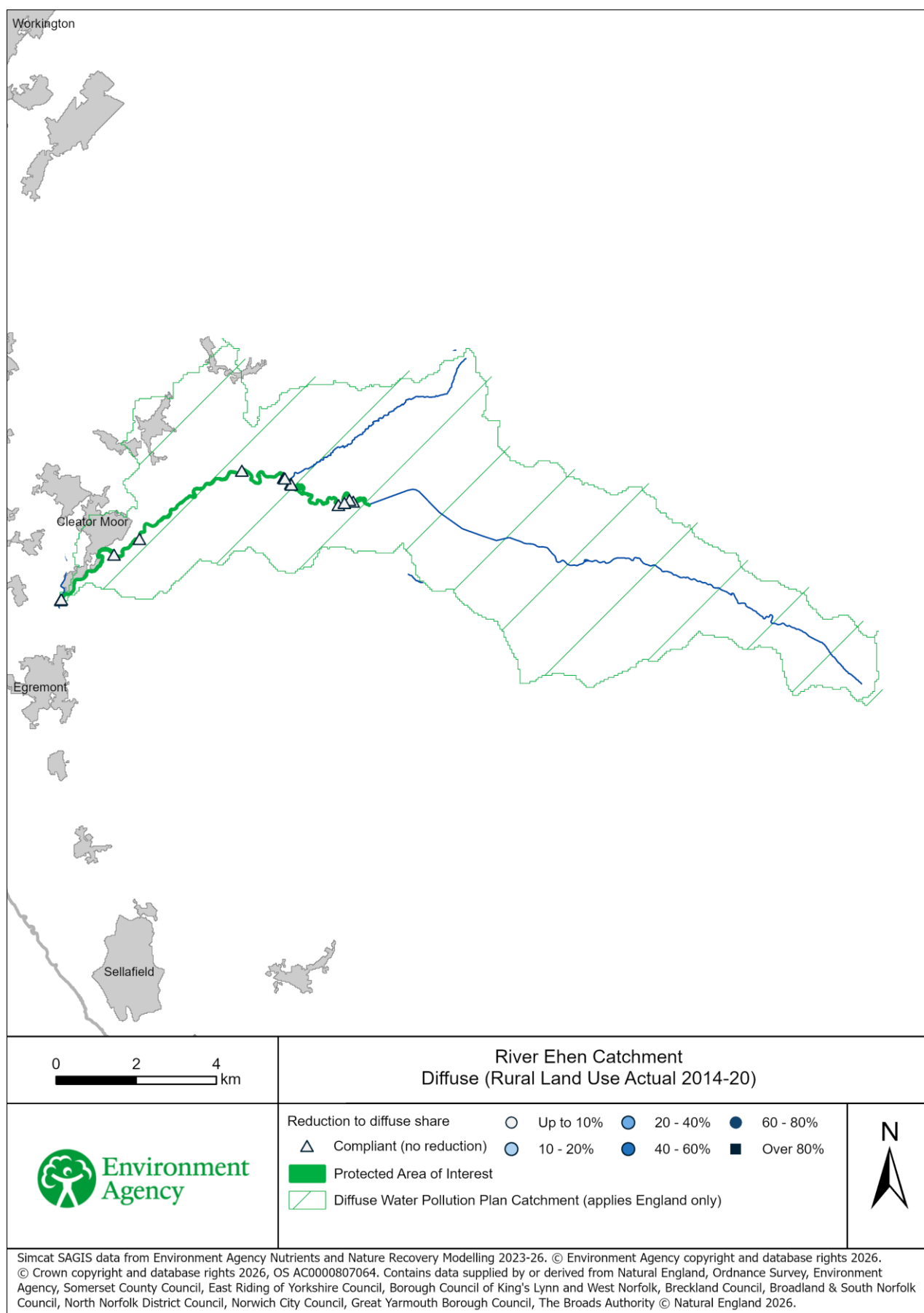
**Map 2. Estimated reductions needed in phosphate total concentrations to meet the CSMG target in the Actual (2014 to 2020) Scenario. All modelled locations in the designated reaches are compliant.**



**Map 3. Estimated reductions needed in phosphate total concentrations to meet the CSMG target in the 2030 Optimistic Scenario. All modelled locations in the designated reaches are compliant.**



**Map 4. Estimated reductions needed in phosphate total concentrations to meet the CSMG target in the 2030 At Permit Scenario. All modelled locations in the designated reaches are compliant.**



**Map 5. Estimated reductions needed in diffuse phosphate concentrations to meet the diffuse share of the target in the Actual (2014 to 2020) Scenario. All modelled locations in the designated reaches meet the diffuse sector share.**

## Input load figures used to calculate source apportionment

Table 4: Estimated phosphate input loads (kg/d) and input load source apportionment after calibration, before in-river processes.

| Scenario                     | STW<br>(kg/d) | Intermittents<br>(kg/d) | Industrial<br>(kg/d) | Rural<br>Land<br>Use<br>(kg/d) | Urban<br>(kg/d) | Septic<br>Tanks<br>(kg/d) | Highways<br>(kg/d) | Point<br>(%) | Rural<br>Land<br>Use<br>(%) | Urban<br>(%) | Septic<br>Tanks<br>(%) | Other<br>(%) |
|------------------------------|---------------|-------------------------|----------------------|--------------------------------|-----------------|---------------------------|--------------------|--------------|-----------------------------|--------------|------------------------|--------------|
| <b>Actual (2014 to 2020)</b> | 0.22          | 0.40                    | 0.02                 | 1.92                           | 0.03            | 0.02                      |                    | 24.9%        | 73.5%                       | 1.0%         | 0.7%                   | 0.0%         |
| <b>2030 Optimistic</b>       | 0.22          | 0.40                    | 0.02                 | 1.92                           | 0.03            | 0.02                      |                    | 24.9%        | 73.5%                       | 1.0%         | 0.7%                   | 0.0%         |
| <b>2030 At Permit</b>        | 0.51          | 0.42                    | 0.02                 | 1.84                           | 0.03            | 0.02                      |                    | 33.6%        | 64.9%                       | 0.9%         | 0.6%                   | 0.0%         |

## References

Defra (2019a). A national scale assessment of current and future actions to reduce diffuse pollution of water by agriculture. [Report by ADAS for Defra project WT1594](#): 1-47.

Environment Agency (2022). Water quality: what 3 future environmental land management schemes can achieve by 2027. [Water quality: what 3 future environmental land management schemes can achieve by 2027](#).

Gooday, R. D., Anthony, S.G., Chadwick, D.R., Newell-Price, P., Harris, D., Duethmann, D., Fish, R., and A. L. a. W. Collins, M. (2014). Modelling the cost-effectiveness of mitigation methods for multiple pollutants at farm scale. [Science of the Total Environment](#) (468-469): 1198-1209.

## List of abbreviations

ADAS – UK-based independent agricultural and environmental consultancy, previously National Agricultural Advisory Service (NAAS).

AMP8 WINEP – Asset Management Plan 8 (2025 – 2030) Water Industry National Environment Programme - [Water industry national environment programme \(WINEP\) methodology - GOV.UK](#)

CSMG – Common Standards Monitoring Guidance – includes guidance on the appropriate standards and targets for designated sites [Common Standards Monitoring Guidance for Freshwater Habitats | JNCC Resource Hub](#)

DWPP – Diffuse Water Pollution Plan

NEAP-N – ADAS model providing annual 1 km grid loadings of nitrate.

PR – [Price Review https://www.ofwat.gov.uk/regulated-companies/price-review/](https://www.ofwat.gov.uk/regulated-companies/price-review/)

PSYCHIC – ADAS model providing annual 1 km grid loadings of Phosphate.

SAC – Special Area of Conservation

SAGIS – Source Apportionment Geographical Information System

SPA – Special Protection Area

SSSI – Site of Special Scientific Interest

UKWIR – United Kingdom Water Industry Research

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