National Parks & Wildlife Service

Tóchar Midlands Wetland Restoration Scheme

River Boyne and River Blackwater SAC

SAC No. 002299

NFS site No. 104013 and 104014

Fen Restoration Plan

September 2026

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Fen Restoration Plan

The River Boyne and River Blackwater SAC (Westmeath) SAC (002299)

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Executive Summary

The River Boyne and River Blackwater Special Area of Conservation (SAC) (Site Code: 002299) is located approximately 12 km north-east of Mullingar, Co. Westmeath. This Fen Restoration Plan focuses on two National Fen Survey sites within the SAC: Newtown (Site Code: 104014) and Cummerstown (NFS Site Code: 104013), collectively referred to throughout this report as the River Boyne and River Blackwater SAC.

The SAC is designated for Annex I 7230 Alkaline fens, with the two sites supporting a mosaic of fen and associated wetland habitats including Annex I quality 7210 Cladium fens, Annex I quality 7140 Transition mires, Annex I quality 6410 Molinia meadows, Annex I quality 6430 Hydrophilous tall herb fringe communities, Annex I 91E0 Alluvial forests, together with rich fen, swamp, wet grassland, scrub and wet woodland habitats.

The following pressures were identified at site level through the review of historical and current site data:

- Grazing Management;
- Scrub & Non- Native Encroachment;
- Nutrient Enrichment & Water Quality
- Physical Disturbance
- Drainage
- Fragmentation & Isolation

Restoration Plan

The River Boyne and River Blackwater SAC Restoration Plan proposes a targeted programme of hydrological restoration and water quality management to address the key pressures affecting the site and support the recovery and long-term conservation of Annex I fen habitats.

Hydrological restoration measures will focus on reducing the impacts of artificial drainage through the implementation of targeted drain blocking at both sites. At Newtown, restoration will focus on the drainage network located within the southern area of the site where multiple drains converge before discharging into Newtown Lough. Further investigation of an excavated drain located in the north-eastern part of the site will also be undertaken to determine its influence on local hydrology and the potential requirement for remediation measures. At Cummerstown, restoration will focus on drainage features within the southern area of the site, together with drains located along the western and southern boundaries that contribute to water loss from the wetland system and are hydraulically connected to the Deel (Raharney) watercourse.

The effectiveness of hydrological restoration measures will be assessed through the establishment of a groundwater monitoring network comprising piezometers at representative locations across both sites. Surface water monitoring will also be undertaken at selected locations at Newtown and Cummerstown to assess hydrological response and support adaptive management.

Vegetation measures focus on reinstating or maintaining appropriate conservation grazing within accessible areas of fen and associated wet grassland, reviewing grazing pressure where localised poaching has occurred, and undertaking targeted scrub clearance where woody vegetation is encroaching into open fen habitat. At Newtown, management will focus on suitable areas within the eastern, south-eastern and south-western lakeshore sectors, while retaining established wet woodland and excluding areas unsuitable for livestock access. At Cummerstown, grazing management will focus on suitable fen habitat, including areas affected by rank vegetation, with targeted willow clearance around 7140 Transition mire. Vegetation monitoring will be used to assess changes in habitat composition, structure and condition and to inform adaptive management.

The proposed restoration measures are designed to restore natural hydrological functioning, improve habitat connectivity, enhance water quality and support progress towards favourable conservation condition for Annex I habitats within the SAC. Successful implementation will require ongoing collaboration between landowners, the National Parks and Wildlife Service (NPWS) and other relevant stakeholders, supported by long-term hydrological and water quality monitoring.

Habitat and Restoration Map

The habitats recorded during the 2022 NFS and classified according to the Fossitt Habitat Classification system is presented in Figure 1-1 and Figure 1-2.

The Restoration and Monitoring Map including both hydrological and ecological measures is presented in Figure 1-3 and Figure 1-4.

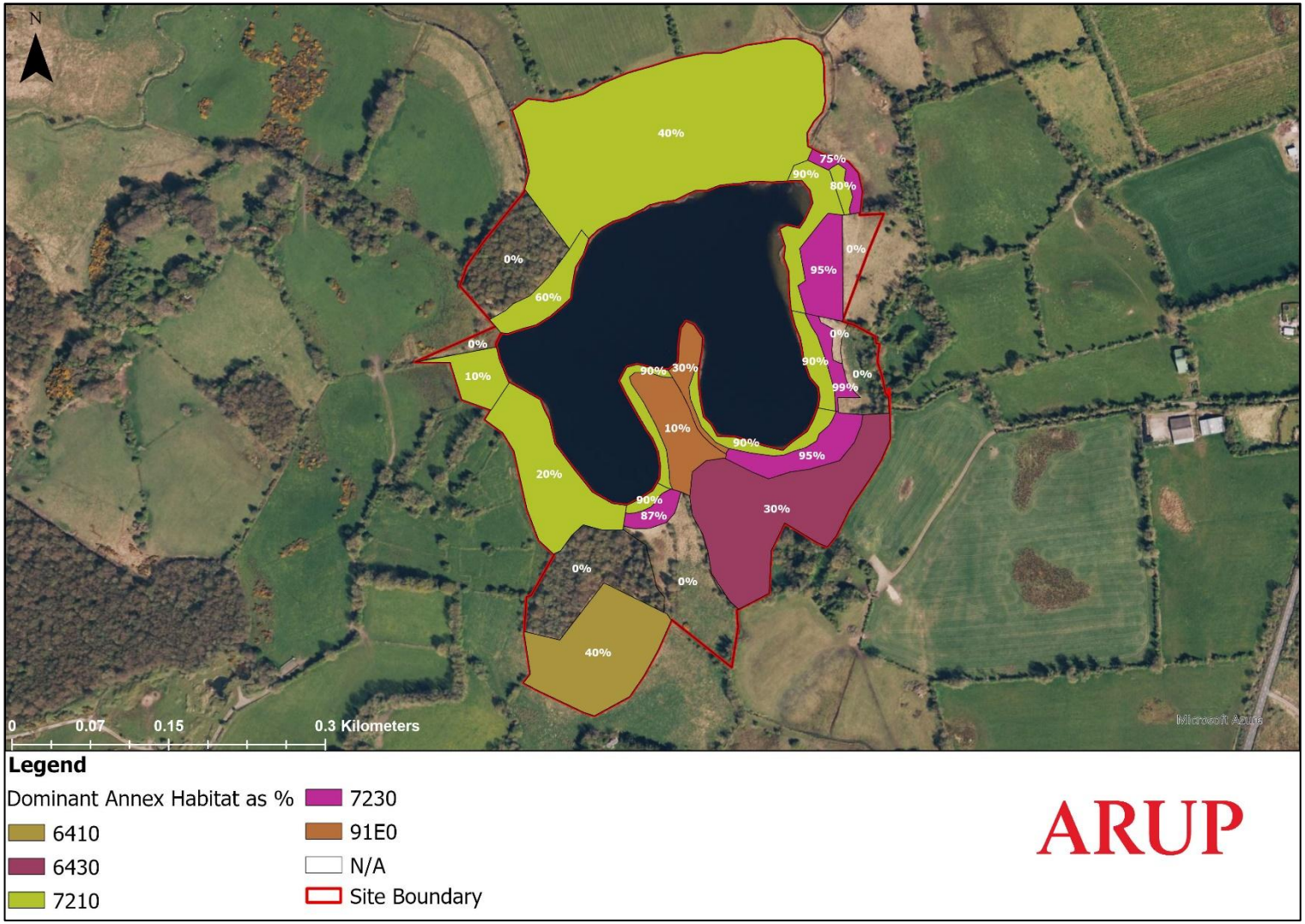


Figure 1-1 Annex I habitats recorded during the 2022 NFS at Newtown. Refer to Table 9 1 for the Annex habitat names and codes. Note the % value indicates the % cover of the Annex I and Annex I quality habitat recorded in the polygon

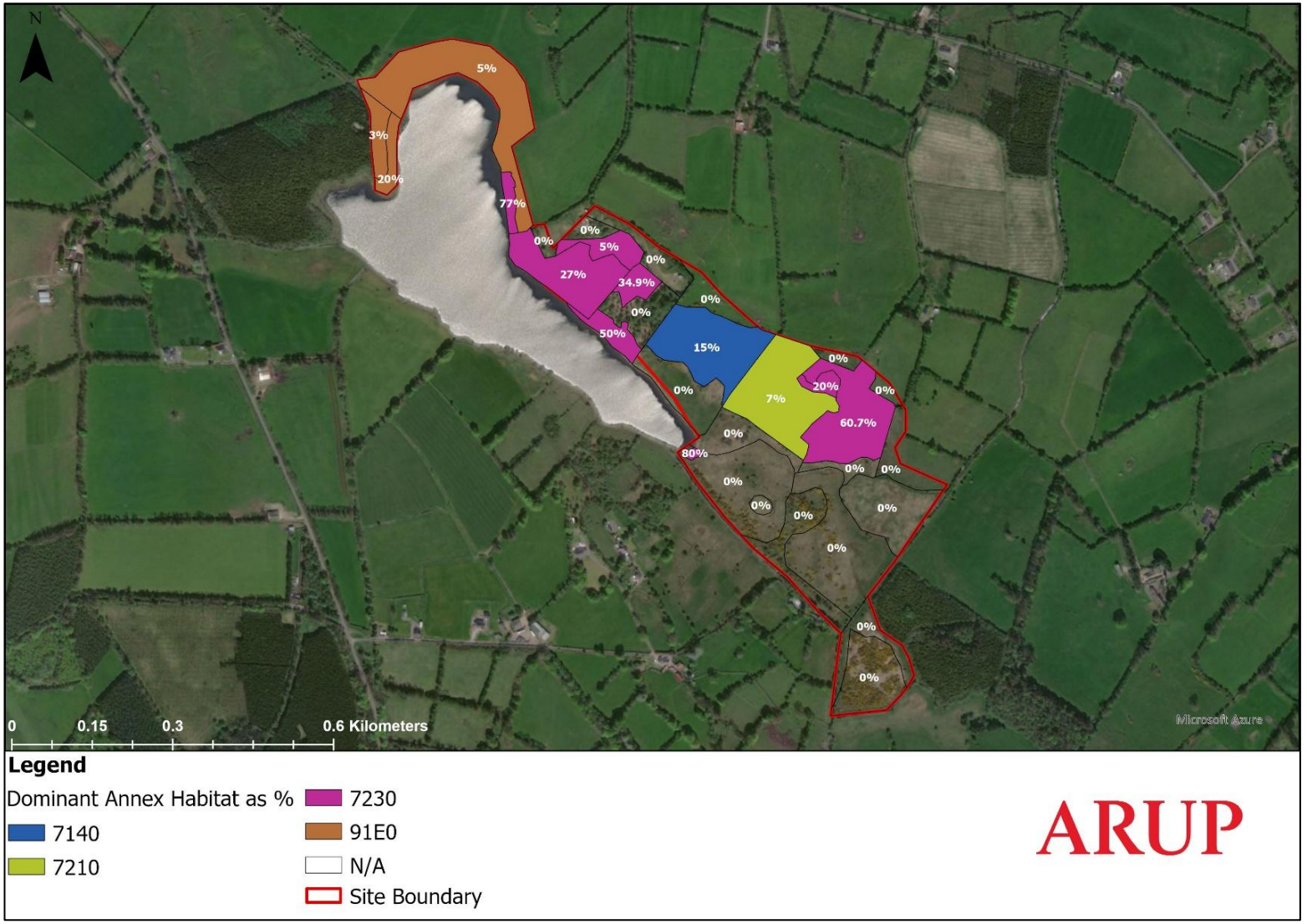


Figure 1-2 Annex I habitats recorded during the 2022 NFS at Cummerstown. Refer to Table 9 1 for the Annex habitat names and codes. Note the % value indicates the % cover of the Annex I and Annex I quality habitat recorded in the polygon

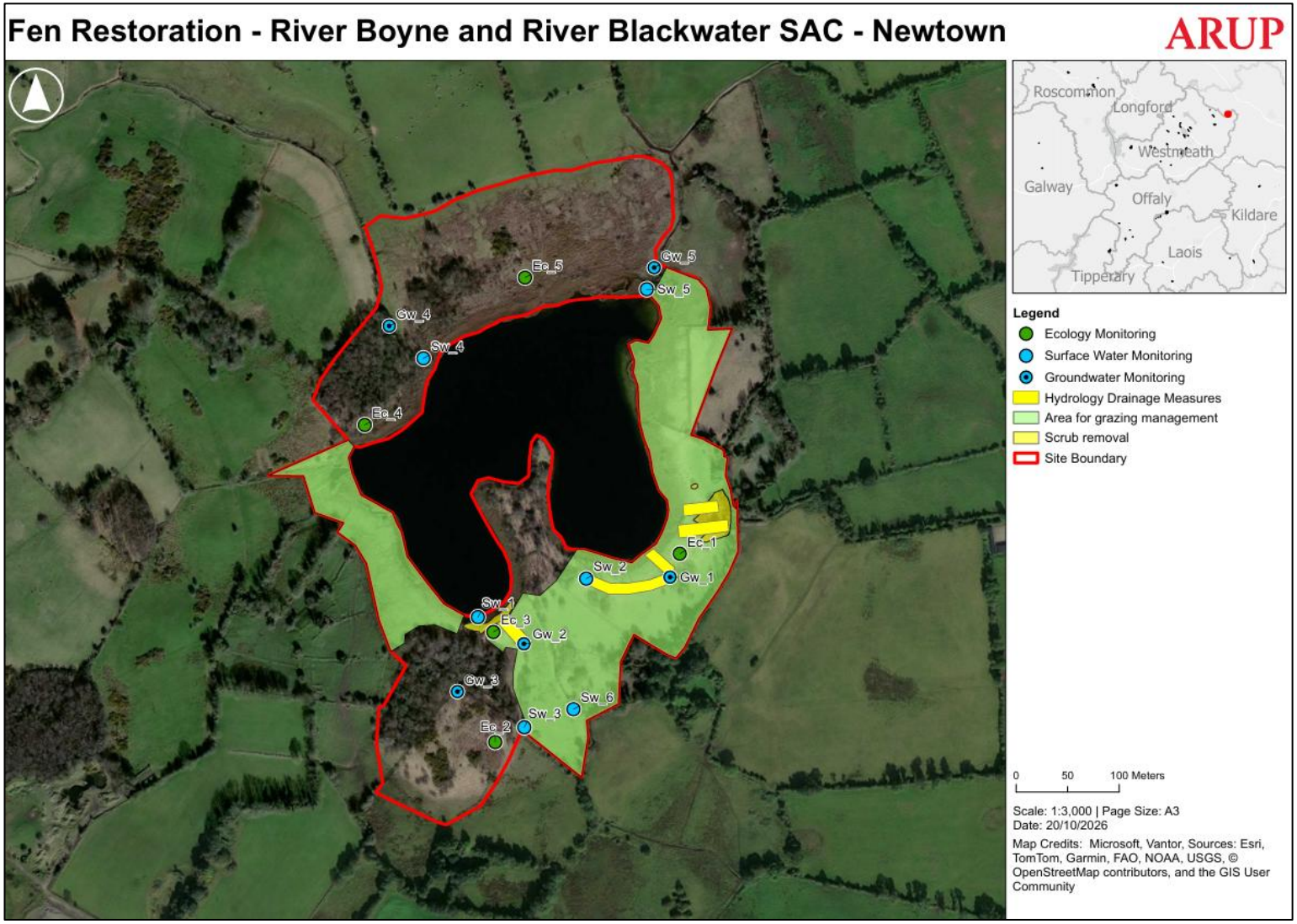


Figure 1-3: Restoration and Monitoring Map including both hydrological and ecological measures for Newtown

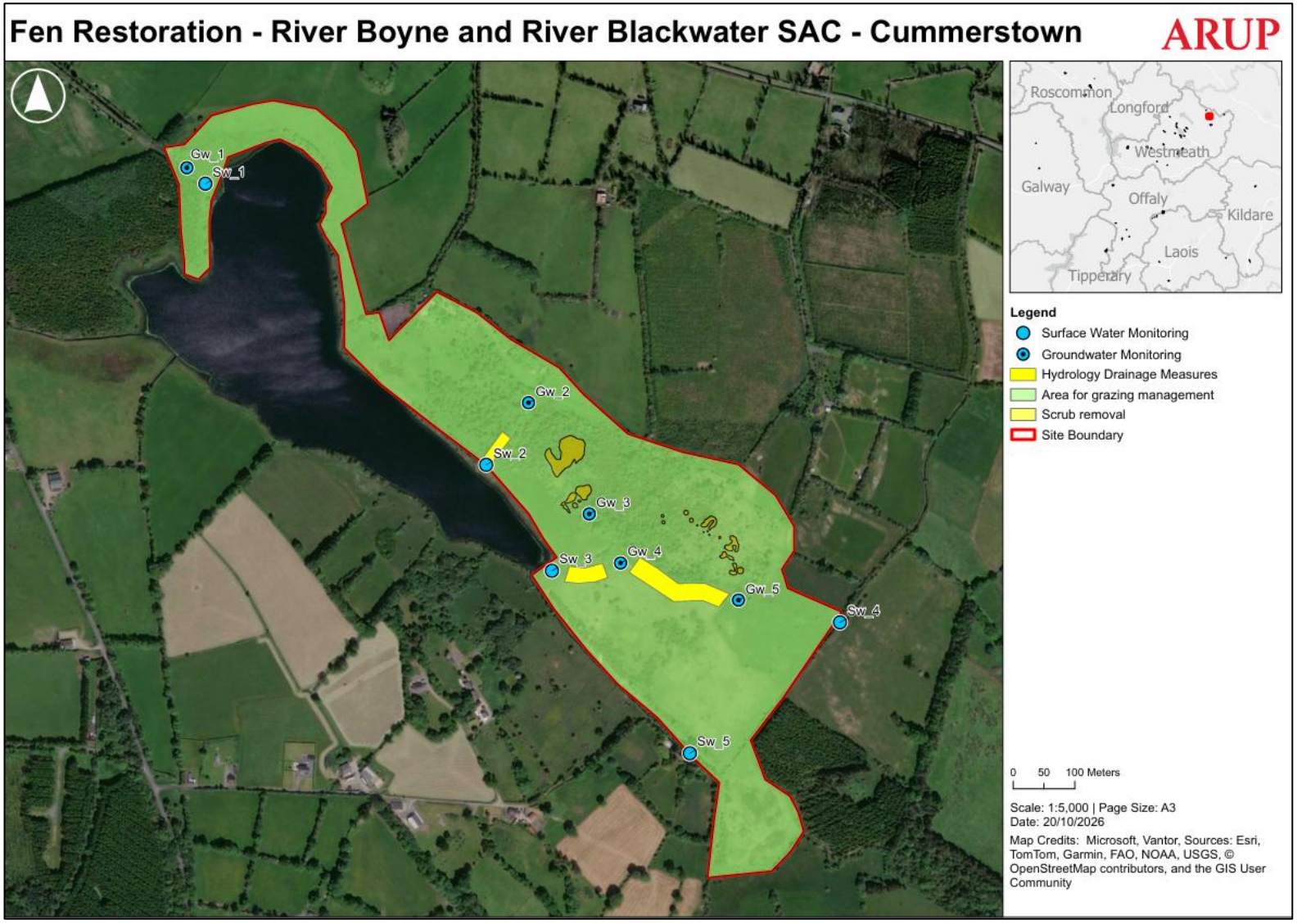


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Acknowledgements

This Fen Restoration Plan was prepared following consultation with a broad range of groups and individuals involved in Peatland restoration, local residents and stakeholders through several workshops.

Thanks to the members of the SAR Directorate, NPWS Regional Staff, Ecological Assessment Unit (EAU), Ecological Guidance and Advisory Unit (EGAU), Wildlife Enforcement and Nature Protection Directorate, Conservations Measures Unit, Conservation Planning Unit, The FENCES Project team and the Tóchar Wetlands Project Team, including Shirley Clerkin (Project Manager), Monica Byrne (Project Administrator), Hazel Daly (Community Engagement Officer), and Emily Nolan (Community Engagement Officer).

Tóchar Wetlands is a wetlands restoration project, co-funded by the Government of Ireland and the European Union through the EU Just Transition Fund Programme. It is managed by the National Parks and Wildlife Service, of the Department of Housing, Local Government and Heritage.

1 Introduction

1.1 Purpose of this Fen Restoration Plan

This Fen Restoration Plan (FRP) has been prepared by Arup on behalf of the National Parks and Wildlife Service (NPWS) to set out proposals for the restoration of Annex I 7230 Alkaline fens and associated Annex I quality habitats[1]: 7140 Transition mires, 7210 Cladium fens, 6430 Hydrophilous tall herb fringe communities (hereafter referred to as 6430 Hydrophilous tall herb fringe communities), 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410 Molinia meadows) and 4010 Northern Atlantic wet heaths with *Erica tetralix* (4010 Northern Atlantic wet heath), with the aim of contributing to the achievement of site-specific conservation objectives (SSCOs) and favourable conservation condition of fen habitat.

The River Boyne and River Blackwater SAC comprise several National Fen Survey (NFS) locations, as documented by NPWS in 2023 (Brophy et al., in prep.). However, this FRP specifically focuses on two NFS sites: Newtown (NFS Site Code: 104014) and Cummerstown (NFS Site Code: 104013)2. These two sites collectively form and lie within the River Boyne and River Blackwater Special Area of Conservation (SAC) (Site Code: 002299). For the purposes of this FRP, "River Boyne and River Blackwater SAC" refers to the combined study area encompassing the Newtown and Cummerstown NFS sites.

The restoration actions proposed as part of this assessment aim to maintain or improve the condition of existing fen habitat and, where feasible, improve hydrological conditions to support the expansion of fen habitat extent, thereby contributing to the achievement of relevant SSCOs and favourable conservation condition. Although the focus of the restoration plan is on fen habitat and associated SSCOs, it is anticipated that restoration actions will also benefit other wetland habitats, including wet woodland, Annex I 91E0 Alluvial forests and Annex I quality 6410 Molinia meadows which were mapped at the River Boyne and River Blackwater SAC during the NFS (Brophy et al., in prep.).

1.2 Wider benefits of fen restoration

Fens are vital habitats due to their rich biodiversity, supporting a wide array of flora and fauna, many of which are rare or endangered. They act as natural water filters, purifying water by trapping pollutants and sediments, thus enhancing water quality downstream. Additionally, fens store significant amounts of carbon in their peat soils, contributing to climate change mitigation by reducing atmospheric carbon dioxide levels. Their ability to absorb and gradually release water helps regulate water flow and minimise flood risks. Beyond their ecological

[1] In this report, “Annex I quality” refers to habitats of Annex I type mapped to Annex-quality standard but is not a qualifying interest of the SAC.

[2] This FRP has been prepared for the Newtown and Cummerstown NFS sites in accordance with the project scope agreed with NPWS and Tóchar.

importance, fens hold cultural, historical, and recreational value, offering opportunities for education, research, and outdoor activities.

Peatland drainage and extraction transform a natural peatland which acts as a modest carbon sink into a carbon source (Waddington & McNeil, 2002; Alm et al. 2007; Wilson et al. 2015). The EPA funded Carbon Restore Project (Wilson et al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function.

Restoration of fen habitat within the River Boyne and River Blackwater SAC may contribute to improvements in water quality and hydrological functioning where restoration measures successfully address identified pressures. Well-functioning fen habitat reduces the risk of dissolved organic carbon passing into a watercourse and has been shown to attenuate the speed at which water moves downstream thereby reducing flood risk.

The River Boyne and the River Blackwater Special Protection Areas (SPA) (site code: 004232) overlaps River Boyne and River Blackwater SAC site and is designated for kingfisher (*Alcedo atthis)*. This species is associated with wetlands, which provide important foraging and nesting habitat. A key target listed in the SSCO document for The River Boyne and River Blackwater SPA for kingfisher is to restore the extent and quality of nesting banks and other suitable nesting features within the SPA in order to ensure nesting and foraging resources for the breeding population (NPWS, 2024). Restoration actions at River Boyne and River Blackwater SAC site have the potential to benefit kingfisher by improving foraging/nesting habitat for both and/or their prey species (in turn resulting in wider ecological benefits).

1.3 Key pressures on fens

The overarching (National) key pressures and threats to Annex I fen habitats have been identified in the latest Status of EU Protected Habitats and Species in Ireland (Article 17 report) (NPWS 2025) in Table 1-1. The overall conservation status is assigned as Alkaline fens 7230 and Transition mires in the Article 17 report.

Table 1-1: National pressures to fen habitats

Habitat	Importance	Pressure
7230 Alkaline fen	High	PA07 Intensive grazing or overgrazing by livestock PA22 Drainage for use as agricultural land J01 Mixed source pollution to surface and ground waters
	Medium	PA05 Abandonment of management/use of grasslands and other agricultural and agroforestry systems (e.g., cessation of grazing, mowing or traditional farming) PA08 Extensive grazing or under grazing by livestock

Habitat	Importance	Pressure
		PB24 Drainage for forestry PL02 Drainage (mixed or unknown drivers) to surface or ground waters
	Low	PI03 Problematic native species PE01 Roads, paths, railroads, and related infrastructure PC05 Peat extraction PA17 Agricultural activities generating pollution to surface or ground waters (including marine) PA20 Livestock farming generating pollution

1.4 Legislative Context

There is a comprehensive system of legislation, both domestic and international, which aims to protect biodiversity at a landscape, habitat and species level in Ireland. This legislation exists within, and independently of, the planning process.

In Ireland, the most important pieces of legislation underpinning biodiversity and conservation are:

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, hereafter referred to as the Habitats Directive;
- Regulation (EU) 2024/1991 of the European Parliament and of the Council of June 2024 on nature restoration and amending Regulation (EU) 2022/869;
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, hereafter referred to as the Birds Directive;
- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011), as amended, hereafter referred to as the Birds and Habitats Regulations;
- Wildlife Acts 1976 to 2017, hereafter referred to as the Wildlife Acts; and
- Flora (Protection) Order, 2015 (S.I. No. 356 of 2015).

According to the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC), Member States are required to establish a Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites includes SACs and SPAs.

The EU Nature Restoration Regulation aims to restore damaged ecosystems and improve biodiversity with particular focus on capturing and storing carbon and reducing the impact of natural disasters. Specific targets include improving and re-establishing biodiverse habitats on

a large scale and bringing back species populations by improving and enlarging their habitats. EU countries are required to submit National Restoration Plans to the European Commission showing how they will deliver on the targets and monitor their progress. Member States are required to implement restoration measures for specific habitats and species, including marine ecosystems, forests, wetlands, and pollinators.

SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and all migratory birds and their habitats. The Annex habitats and species, for which each site is selected, are the qualifying interests (QI) of the SAC and special conservation interest (SCI). Conservation objectives for the site are defined for these qualifying interests.

Ireland is required to manage water resources in an integrated way under the Water Framework Directive (WFD, 2000/60/EC) and the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). Member States are required to submit River Basin Management Plans to the European Commission showing how they will protect and improve the water environment. Restoring surface and groundwater bodies to the equivalent of 'good status' or better and to protect water from any further deterioration requires collaboration at a local and national level. Implementing the WFD supports the achievement of site-specific conservation objectives for fen habitats, contributing to their favourable conservation status.

1.5 Outline of this FRP document

- Section 2 of this FRP report outlines details of River Boyne and River Blackwater SAC and the conservation objectives for 7230 Alkaline fens habitat;
- Section 3 outlines the findings from the land and water desktop and site monitoring surveys that were carried out to inform the development of these FRP;
- Section 4 outlines the findings from the ecological desktop and site monitoring surveys that were carried out to inform the development of these FRP;
- Section 5 provides a summary of the key pressures identified by this FRP report that are impacting on fen;
- Section 6 outlines the key restoration measures proposed by this FRP;
- Section 7 outlines additional considerations to inform the development of the FRP; and
- Section 8 outlines key players in the FRP, summarises restoration actions proposed, habitats that will benefit and further steps required to prepare for implementation.

Restoration actions proposed by this FRP assessment were mapped in GIS format and delivered to NPWS in accordance with NPWS data standards. This includes detailed mapping of the key

pressures addressed by this assessment, detailed mapping of proposed restoration actions, ecological survey results and referenced sensitivity areas. GIS shapefiles which accompany this report include all relevant data on referenced species.

2 Site Overview

2.1 The River Boyne and River Blackwater SAC

For the purposes of this FRP, the River Boyne and River Blackwater SAC study area comprises the Newtown and Cummerstown NFS sites, both located within the River Boyne and River Blackwater SAC. Newtown is located 1.2 km southwest of Clonmellon and Cummerstown is located 4 km east of Collinstown, both in Co. Westmeath.

Figure 2-1 outlines the location and extent of the River Boyne and River Blackwater SAC sites.

The site is designated for the presence of the 7230 Alkaline fens, particularly around lakes such as Shesk Lough, Freehan Lough and Newtown Lough. 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (hereafter referred to as Alluvial Forest) are also a qualifying interest of the SAC as well as species: river lamprey *Lampetra fluviatilis*, Atlantic salmon *Salmo salar* and otter *Lutra lutra*, as listed on Annex I/II of the E.U Habitats Directive.

According to the site synopsis (NPWS, 2014), the River Boyne and River Blackwater SAC encompass the freshwater stretches of the River Boyne, the River Blackwater and several key tributaries across Meath, Westmeath and surrounding counties. The river system flows over a predominantly limestone landscape with localised variations in geology.

Newtown and Cummerstown sites are characterised by gently undulating topography, with local low points associated with Newtown Lough and Lough Adeel, respectively. Ground elevations range from approximately 83 to 90 mOD within the sites, while the surrounding landscape rises to higher elevations, reaching up to 124 mOD north of the Cummerstown site.

The SAC lies within the Boyne Catchment and includes extensive freshwater reaches of the River Boyne, River Blackwater and associated tributaries. These riverine stretches drain a considerable area of counties Meath and Westmeath, as well as smaller areas of counties Cavan and Louth. For the purposes of the Water Framework Directive, the Newtown site is located within the Boyne_SC_070 sub-catchment, while the Cummerstown site is located within the Deel [Raharney]_SC_010 sub-catchment.

The SAC covers a total area of 2,317.87 ha and includes a range of freshwater, wetland, woodland and grassland habitats. Within the Newtown and Cummerstown study area, fen habitats form the principal ecological feature, with several associated wetland habitats also present, as noted in the NFS (Brophy et al., in prep.). Survey visits carried out in 2023 under the NFS estimated the total extent of Annex I 7230 Alkaline fens habitat at SAC to be 4.49ha and Annex I quality 7140 Transition mires to be 0.11ha, while 7210 Cladium fens comprise 2.62ha.

The fen habitats occur within a predominantly agricultural landscape and remain closely linked to surrounding land and water management practices. Parts of the system have been subject to arterial drainage, which historically altered river morphology and continues in some

low-gradient stretches, with associated negative effects on salmonid habitat and small wetland areas.



Figure 2-1: Site Location Map

2.1.1 Fen Condition Assessment

Table 2-1 and Table 2-2 summarise the pressures and threats identified during the NFS site surveys undertaken in 2023 at Newtown and Cummerstown, respectively. These pressures were recorded across the Annex I and Annex I quality fen habitats present within the site and informed the subsequent conservation status assessments.

Table 2-1: Assessment of Impacts of Pressures on Fen Habitats at Newtown

Pressure ode	Pressure [sub-category]	Influence
Annex I 7230 Alkaline fens – SAC qualifying interest feature		
PA05	Abandonment of management/use of grasslands with rank vegetation to the south.	Negative (low)
PA07	Intensive grazing or overgrazing by livestock to the north and west of the site with poaching and trampling evident.	Negative (low)
PA08	Extensive grazing or undergrazing by livestock, as noted above rank vegetation was evident as well as overly grazed on north and west.	Negative (low)

Pressure ode	Pressure [sub-category]	Influence
PA17	Agricultural activities generating pollution to surface or ground waters with green algae detected in drains.	Negative (low)
PA22	Drainage for agricultural land was negatively impacted in the west of the site (7.0329825°W 53.6580374°N) and a depressed margin at (7.0332683°W 53.6575167°N).	Negative (medium)
PI03	Ungrazed areas becoming rank and scrub-dominated	Negative (low)
Annex I quality habitat 7140 Transition mires		
PI03	Ungrazed areas becoming rank and scrub-dominated	Negative (low)
Annex I quality habitat 7210 Cladium fens		
PA07	Intensive grazing or overgrazing by livestock to the north and west of the site with poaching and trampling evident.	Negative (low)
PA17	Agricultural activities generating pollution to surface or ground waters with green algae detected in drains.	Negative (low)
PL02	Multiple drains were recorded across the site.	Negative (medium)

Table 2-2 Assessment of Impacts of Pressures on Fen Habitats at Cummerstown

Pressure Code	Pressure [sub-category]	Influence
Annex I 7230 Alkaline fens – SAC qualifying interest feature		
PA05	Abandonment of management/use of grasslands in 7230, with rank vegetation recorded in the north-west.	Negative (low)
PA08	Extensive grazing or undergrazing by livestock within 7230, with horses grazing heavily in the centre of the site and undergrazed to the north-west shores.	Positive (low)
PA17	Agricultural activities generating pollution to surface or ground waters in with green algae detected in drains to the east of site.	Negative (low)
PA20	Livestock farming generating pollution in the form of manure pile to the north of the site.	Negative (low)
PA22	Drainage for agricultural land negatively impacts on 7230.	Negative (medium)
Annex I quality habitat 7140 Transition mires		
PA05	Abandonment of management/use of grasslands in 7140.	Negative (low)
PA22	Drainage for agricultural land negatively impacts on 7140.	Negative (medium)
PA08	Extensive grazing or undergrazing by livestock within 7140 (centre of the site).	Positive (low)

Pressure Code	Pressure [sub-category]	Influence
Annex I quality habitat 7210 Cladium fens		
PA05	Abandonment of management/use of grasslands in 7210.	Negative (medium)
PA22	Drainage for agricultural land negatively impacts on 7210.	Negative (low)
PA17	Agricultural activities generating pollution to surface or ground waters in with green algae detected in drains to the east of site.	Negative (low)

The results of a field evaluation of the above pressures, carried out in 2026, to inform the restoration planning process, is detailed in Section 5 of this report.

The overall conservation status of 7140 Transition mires in both Newtown and Cummerstown were not assessed during the NFS. While Annex I 7230 Alkaline fens in Newtown was assessed as 'Unfavourable – Bad' and in Cummerstown as 'Unfavourable – Inadequate'. 7210 Cladium fens were assessed as 'Unfavourable-Bad' in both sites. The results of the conservation status assessment of fen habitat carried out as part of the NFS is summarised in Table 2-3.

Table 2-3: Conservation Status Assessment of fen habitats across Newtown and Cummerstown

Annex I habitat/ Annex I quality	Area	Overall Status	Rationale
7230	Favourable	Unfavourable-Bad (Newtown) Unfavourable- Inadequate (Cummerstown)	Insufficient positive indicator species; negative indicator species; drainage; scattered native trees/shrubs
7140	Favourable	Not assessed (Newtown and Cummerstown)	Scattered native trees/shrubs
7210	Favourable	Unfavourable-Bad (Newtown and Cummerstown)	Negative indicator species; drainage; scattered native trees/shrubs

2.1.2 Site-specific conservation objectives

Detailed SSCOs aim to define the conditions necessary to maintain or achieve the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.

The conservation objective for 7230 Alkaline fen is to maintain the favourable conservation condition of Alkaline fens within the River Boyne and River Blackwater SAC. The restoration actions proposed in this Fen Restoration Plan (FRP) aim to contribute towards achieving this

objective. The relevant attributes and targets, together with the anticipated contribution of the proposed restoration measures, are summarised in Table 2-4.

Table 2-4: Attributes and Targets for 7230 Alkaline Fens (NPWS, 2019)

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribution to achieving target?
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Yes	Yes. FRP actions will not result in a decline in area of fen habitat within the SAC. In fact, it will contribute to the increase of 7230 area.
Habitat distribution	Occurrence	No decline, subject to natural processes	Yes	Yes. FRP actions will not result in a decline in distribution of fen habitat within the SAC. In fact, it will contribute to the increase of 7230 distribution.
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Yes	Yes. FRP actions will address nutrient input from surrounding land which will assist in the restoration of more natural nutrient conditions.
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	Yes	Yes. Improvement in the hydrology of fen habitat will improve conditions for peat formation.

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribution to achieving target?
Ecosystem function: hydrology – groundwater levels	Water levels (cm); duration of levels; hydraulic gradients	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Yes	Yes. Drain blocking will increase water retention, reduce the influence of artificial drainage, and help restore the natural groundwater regime required to support the structure and functioning of Alkaline fen, Cladium fens and Transition Mires. Groundwater monitoring through piezometers will be used to assess the effectiveness of restoration measures.
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi- natural drainage conditions	Yes	Yes. Drain blocking is expected to promote surface water movement and retention across the site. This will help restore drainage conditions and improve hydrological connectivity within the wetland system. Surface water monitoring will be used to evaluate the effectiveness of the measures.
Ecosystem function: water quality	Various	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitats	Yes	Yes. FRP actions will include the engagement with landowners for best practice regarding land management to reduce nutrients entering wetland via Glebe River and from surrounding lands. Water quality monitoring will be carried out within the site.
Vegetation composition: Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Yes	The restoration measures seek to have a positive impact on the vegetation structure and composition of Alkaline fens 7130. Subsequently, all attributes should see a favourable shift towards their respective targets.
Vegetation composition: typical brown mosses	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical brown moss species	Yes	

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribution to achieving target?
Vegetation composition: typical vascular plants	Percentage cover at a representative number of monitoring stops	Maintain adequate cover of typical vascular plant species	Yes	
Vegetation composition: native negative indicator species	Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels	Yes	
Vegetation composition: alien species	Percentage cover at a representative number of monitoring stops	Cover of alien species less than 1%	Yes	
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Yes	
Vegetation composition: algal cover	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of algae less than 2%	Yes	

Attribute	Measure	Target	Addressed by FRP	Will restoration actions contribution to achieving target?
Vegetation structure: height	Percentage cover in local vicinity of a representative number of monitoring stops	At least 50% of the live leaves/flowering shoots are more than either 5cm or 15cm above ground surface depending on community type	No	
Physical structure: disturbed bare ground	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of disturbed bare ground not more than 10%	No	
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Indirectly	Areas of tufa are not the target of restoration measures and monitoring. However, measures look to improve the condition of fen habitats which may indirectly positively affect vegetation in areas.
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	Yes	Yes. Improvement in the hydrology of fen habitat is anticipated to support indicators of local distinctiveness.
Transitional areas between fen and adjacent habitats	Hectares; distribution	Maintain adequate transitional areas to support/protect the alkaline fen ecosystem and the services it provides	Yes	Yes, although transitional areas are not the primary target of restoration measures. These measures are likely to improve the condition and function of transitional zones that act as buffers between alkaline fen and adjacent habitats.

3 Land and Water

3.1 Desktop Study

3.1.1 Meteorological Conditions

Understanding long-term meteorological patterns is key for informing effective fen restoration planning, particularly with respect to hydrological dynamics. To support this, historical available precipitation data over the past 19 years from the closest Met Éireann weather station, Collinstown (Lough Bawn), has been reviewed to assess seasonal variability in rainfall at the site and surrounding areas (Met Eireann, 2025).

Two datasets have been visualised: (1) average monthly precipitation (mm), incorporating a 19-year period to show seasonal distribution patterns (Figure 3-1) and (2) total annual precipitation (mm) for each year within the 19-year record (Figure 3-2), to identify longitudinal trends. This information is important to assess water availability and to evaluate the feasibility and sustainability of restoration actions aimed at restoring or maintaining suitable hydrological conditions.

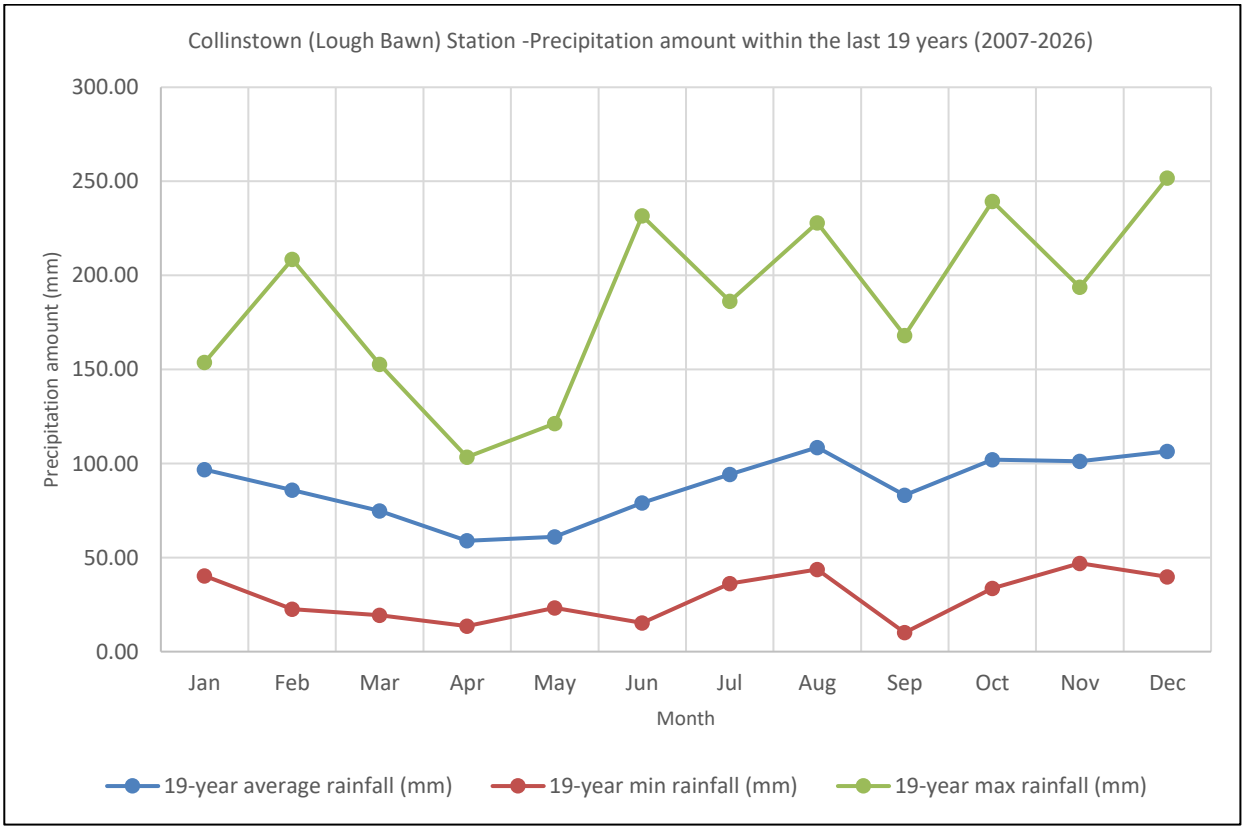


Figure 3-1: Collinstown (Lough Bawn) Station – Precipitation amount (mm) within the last 19 years (2007-2026)

The 19-year monthly rainfall record (Figure 3-1) indicates a seasonal pattern, with rainfall generally highest during late autumn and winter. The highest average monthly rainfall occurs in August (108.6 mm), October (102.1 mm), November (101.1 mm), and December (106.6 mm),

while the lowest average monthly rainfall occurs during spring, particularly in April (58.9 mm) and May (61.1 mm). Rainfall remains relatively high throughout the summer months.

The monthly minimum and maximum rainfall values show variability throughout the record. Monthly rainfall totals ranged from as low as 10.1 mm in September to as high as 251.8 mm in December. The greatest variability is evident in the autumn and winter months, which display the widest range between minimum and maximum recorded rainfall totals.

The annual rainfall totals shown in Figure 3-2 also show inter-annual variability over the 19-year period. This variability indicates that the site is subject to a wide range of climatic conditions over time and should be considered when establishing baseline hydrological conditions and the application of the restoration measures under both wetter and drier climatic scenarios.

Rainfall records for 2007, 2022, and 2026 are incomplete and may therefore underestimate annual rainfall totals for those years.

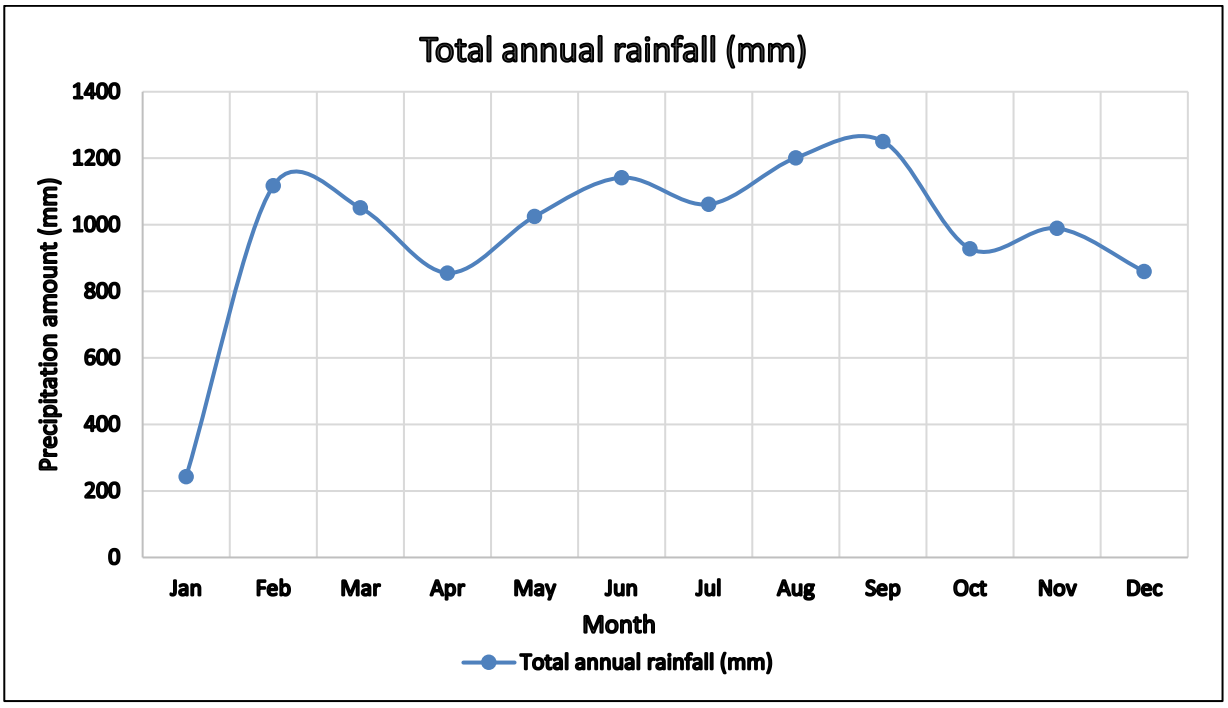


Figure 3-2: Collinstown (Lough Bawn) Station – Total annual rainfall (mm/yr)

3.1.2 Hydrogeological Setting

Both Newtown and Cummerstown sites are underlain by the Lucan Formation, commonly referred to as "Calp", which comprises dark grey to black, fine-grained, argillaceous limestone with subordinate shale horizons, as shown in Figure 3-3 and Figure 3-4, respectively (Bedrock Geology 100K layer (GSI).

Bedrock outcrops are present to the north, west, southwest, south, and southeast of the Cummerstown site, at distances of approximately 1 to 2.5 km, with the nearest outcrop located to the southeast.

Both sites are underlain by a Locally Important (LI) bedrock aquifer that is moderately productive only in local zones, as shown in Figure 3-5 and Figure 3-6. Groundwater flow within this aquifer is concentrated in the upper 15 m, comprising the weathered bedrock layer and the underlying connected fracture network. The sites are located within the Dinantian Upper Impure Limestone (DUIL) hydrostratigraphic rock unit.

A spring is located approximately 1.1 km to the north of Cummerstown (Karst Landforms dataset (GSI).

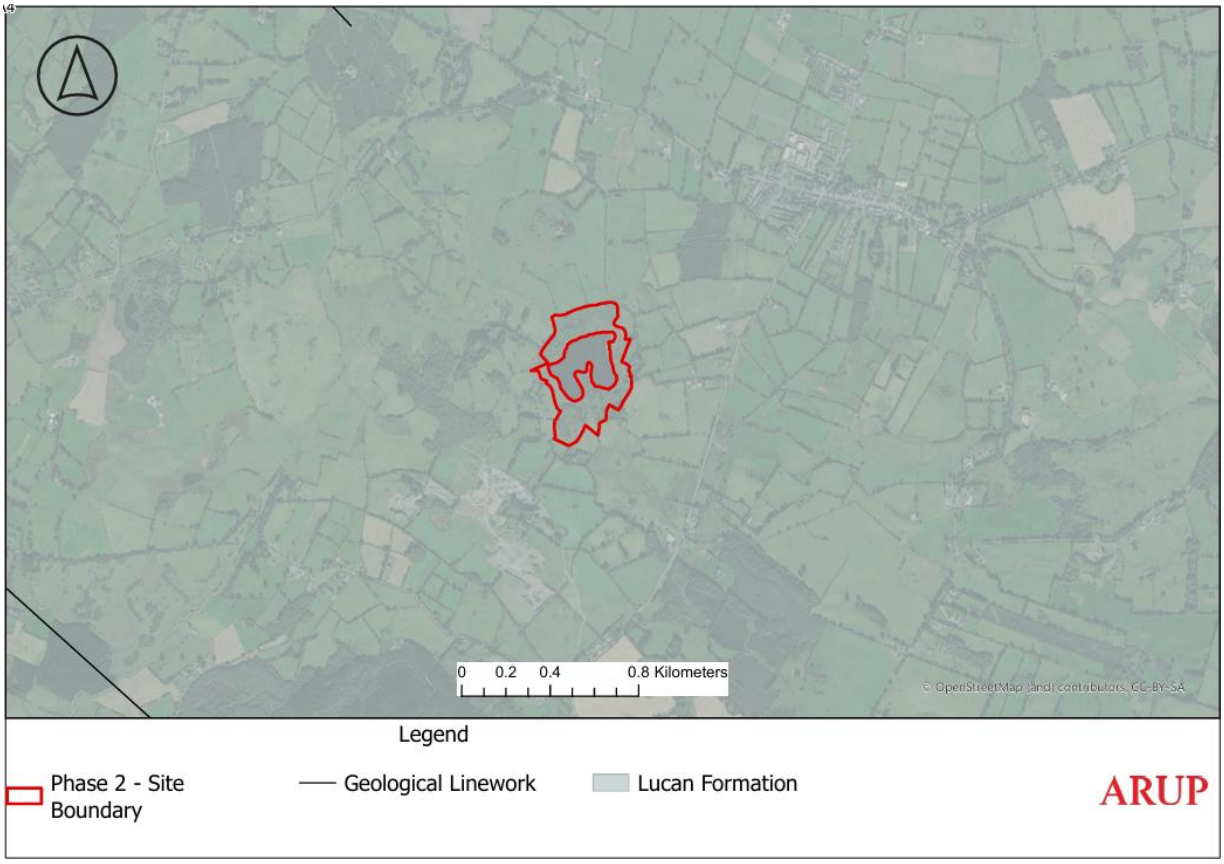


Figure 3-3: Bedrock Geology of Newtown

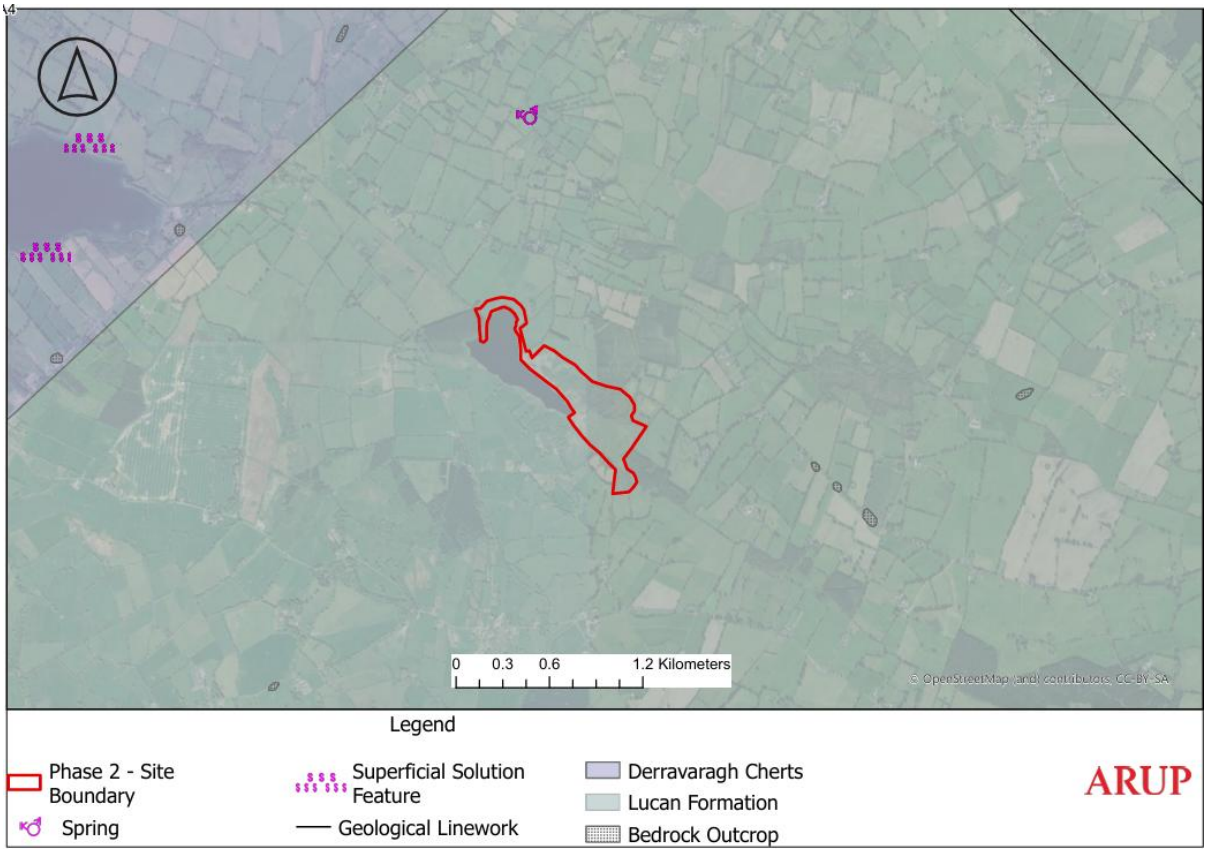


Figure 3-4: Bedrock Geology of Cummerstown

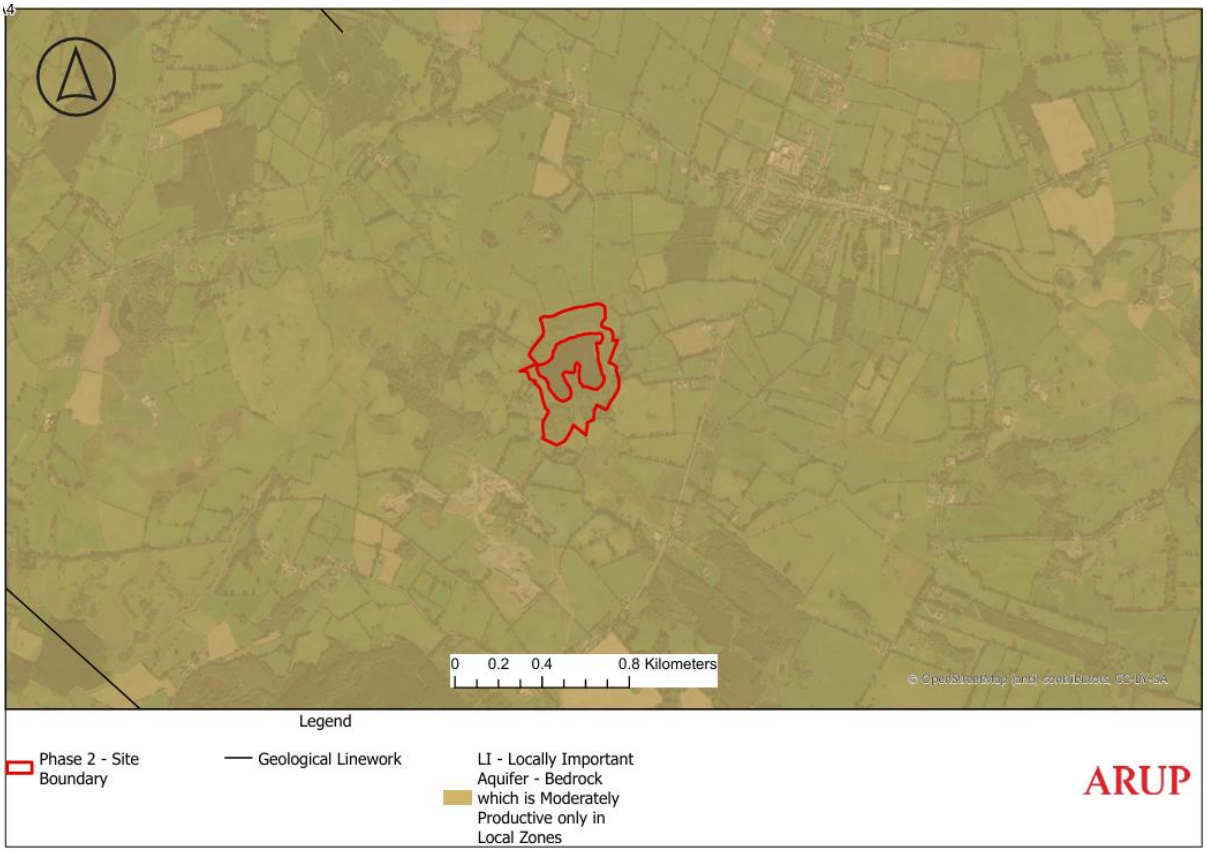


Figure 3-5: Aquifer classification and karst underlying Newtown

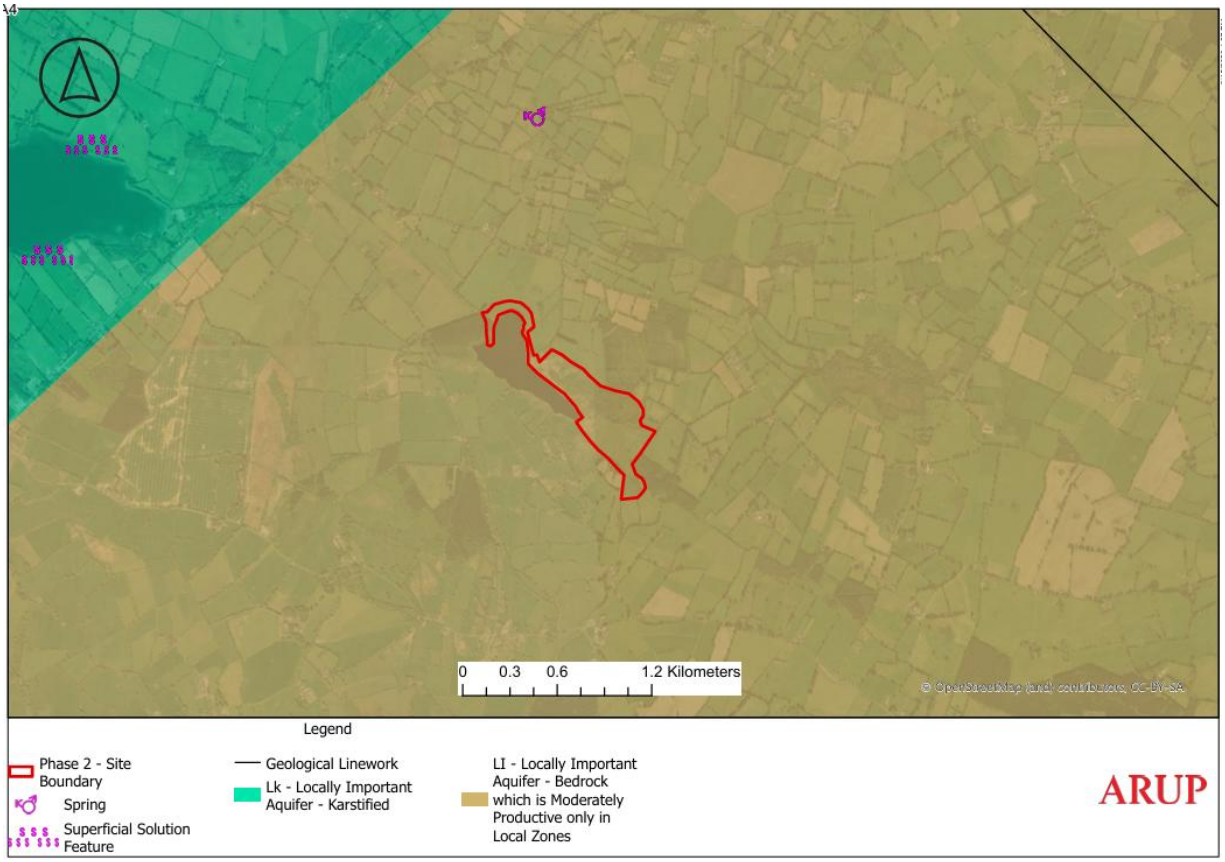


Figure 3-6: Aquifer classification and karst underlaying Cummerstown

Quaternary sediments in Newtown are predominantly composed of fen peat. Till derived from limestone is present in the surrounding areas. Lacustrine sediments occur to the south, east, and northeast of the site. Deposits associated with an esker, comprising gravel of basic reaction, are also present to the south (Figure 3-7).

Similarly, Cummerstown is underlain by fen peat, with till deposits occurring in the surrounding areas. Small deposits associated with an esker are present to the north and northwest of the site. Lacustrine sediments occur to the northwest and south. Gravels derived from limestone are present to the east, south and northwest, while alluvial deposits occur along the eastern boundary and extend both northwards and southwards (Figure 3-8).

Groundwater vulnerability in Newtown (Figure 3-9) is moderate in areas underlain by fen peat, while the surrounding areas exhibit high groundwater vulnerability due to the presence of till, lacustrine sediments, and esker-related gravels.

Groundwater vulnerability in Cummerstown (Figure 3-10) is low in areas underlain by fen peat deposits. The surrounding areas covered by till, located to the north, present moderate groundwater vulnerability, while the gravel deposits located to the southeast present high groundwater vulnerability. There is also an area of extreme vulnerability to the southeast of the site, where rocks are near or at surface.

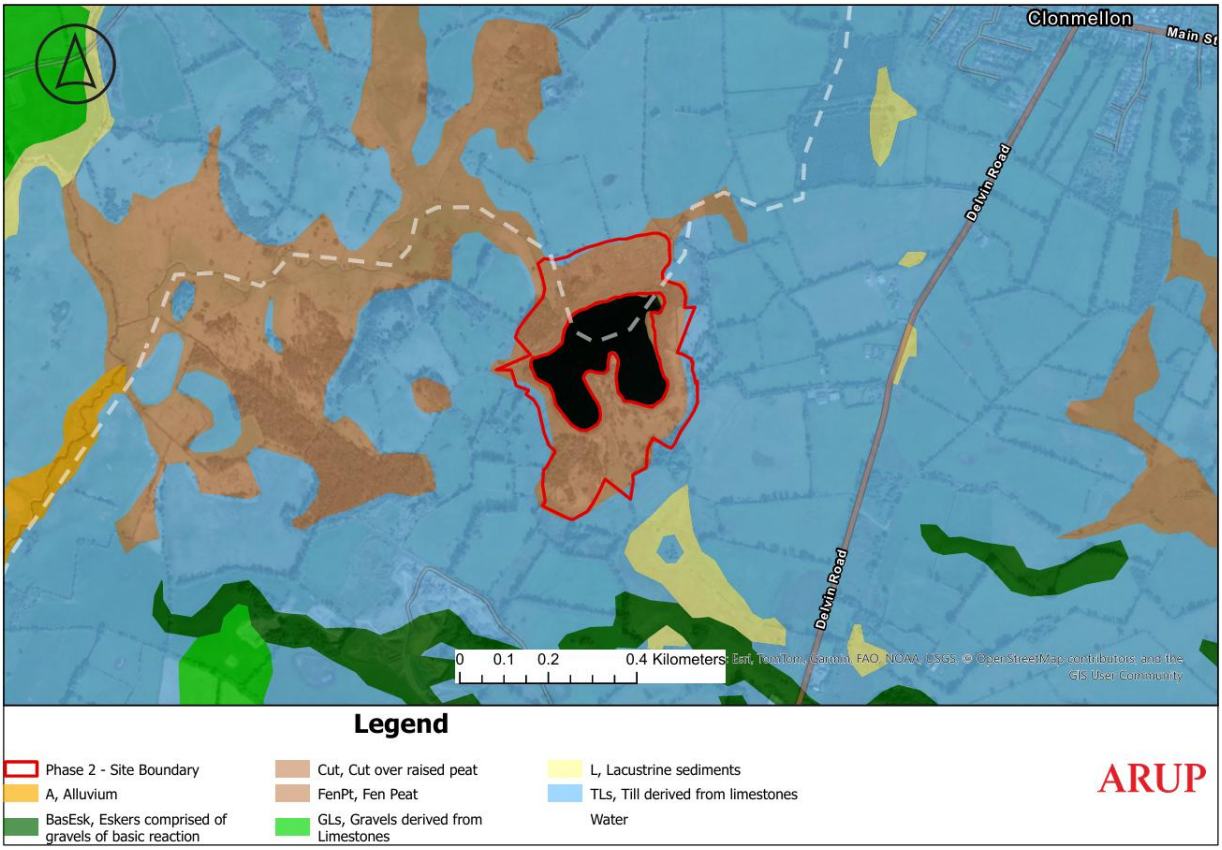


Figure 3-7: Sub-soil type underlying Newtown (Source: GSI Quaternary map)

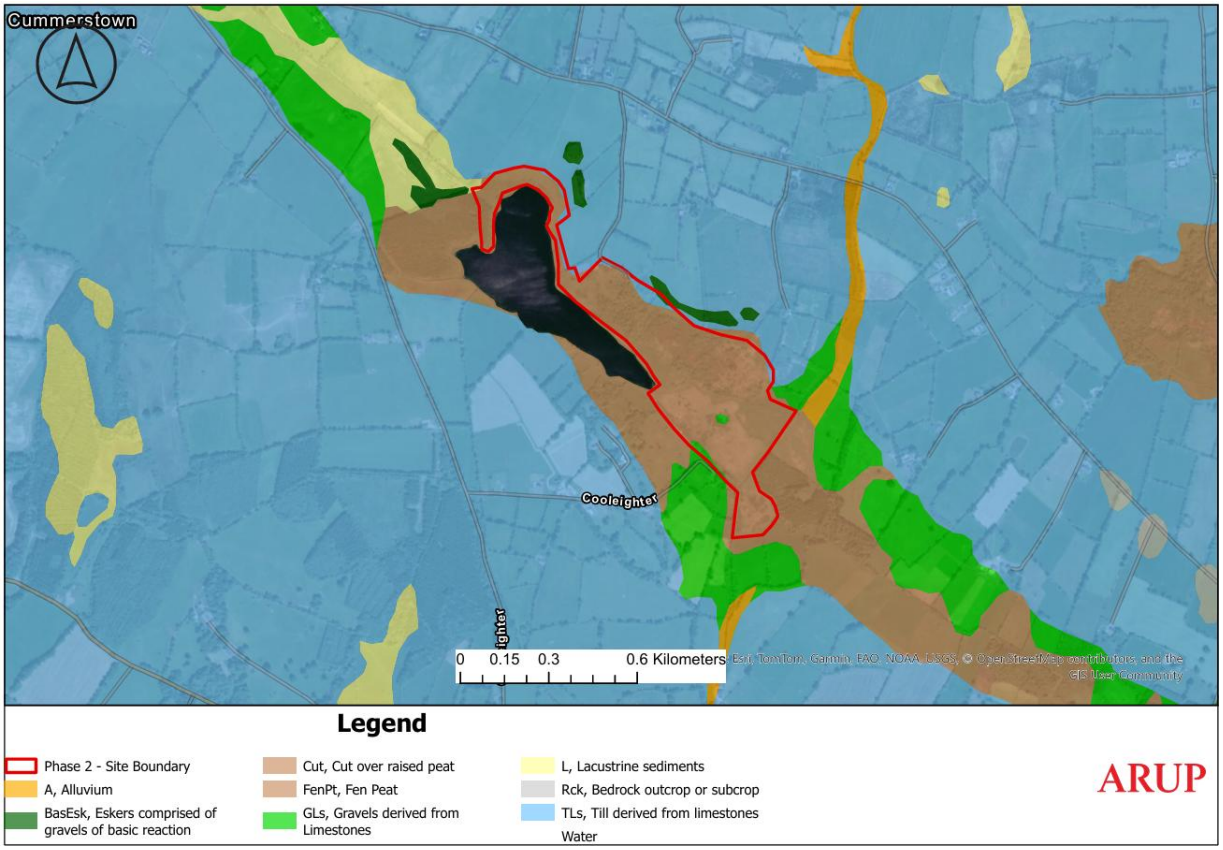


Figure 3-8: Sub-soil type underlying Cummerstown (Source: GSI Quaternary map)

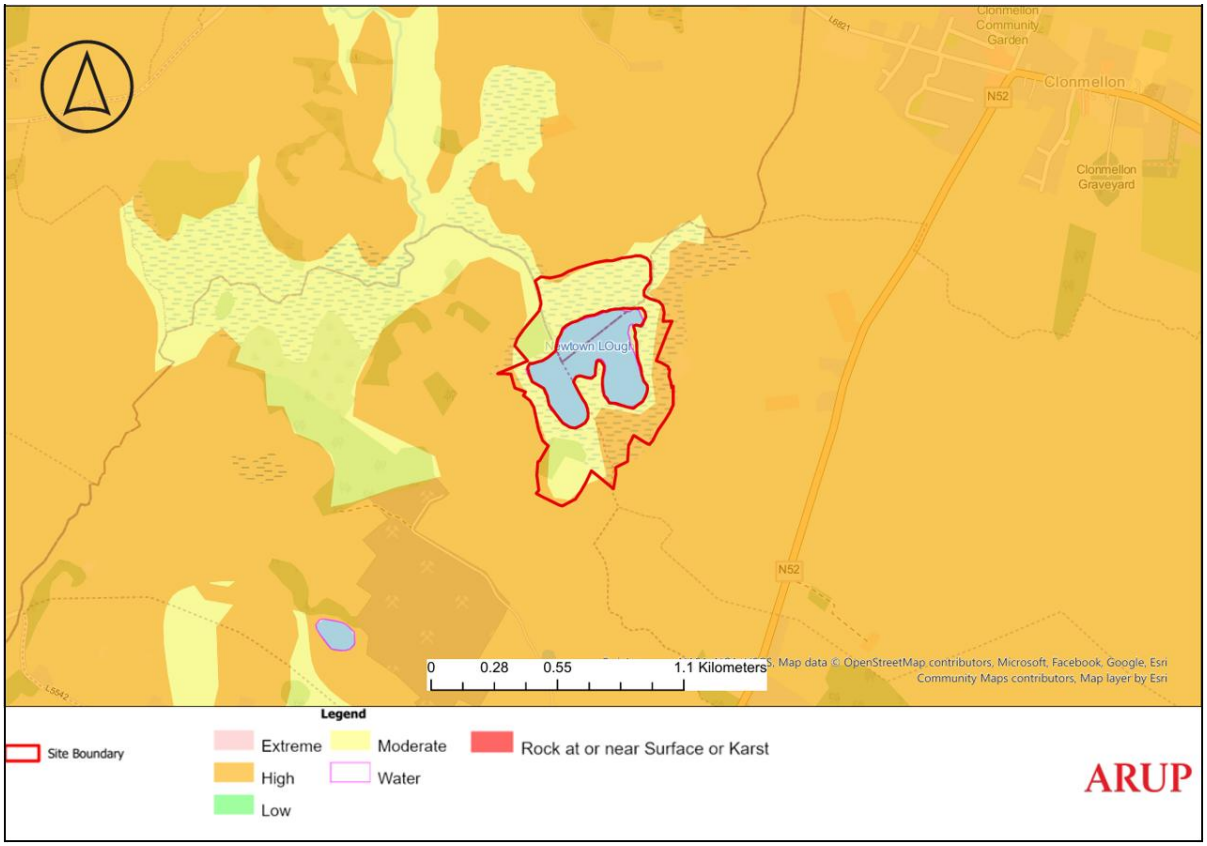


Figure 3-9: Groundwater vulnerability map for Newtown (Source: GSI)

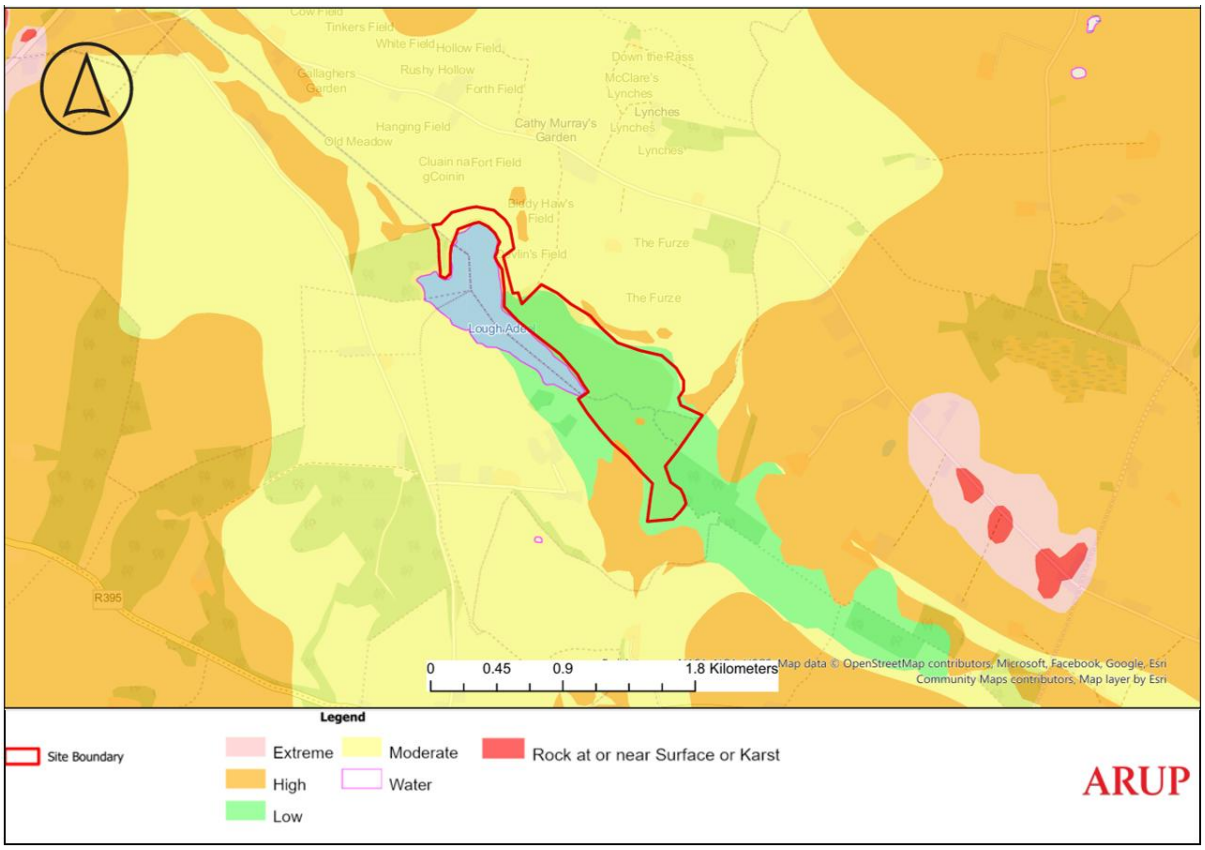


Figure 3-10: Groundwater vulnerability map for Cummerstown (Source: GSI)

3.1.3 Topographic and Surface Water Drainage

Both Newtown and Cummerstown are located within the Boyne WFD Catchment. The Newtown site is situated within the Boyne_SC_070 WFD sub-catchment, while the Cummerstown site is located within the Deel (Raharney)_SC_010 WFD sub-catchment. (Figure 3-11).

At Newtown, the Kilskeer River flows through the lake from northwest to southeast before continuing eastwards and joining the Athboy River, which subsequently flows south to the River Boyne. The National Fen survey 2022 (Brophy et al., In prep) identified drains in the southern and south-eastern areas, while several additional drains traverse the northern part of the site, all discharging into the lake, including the Kilrush Lower stream located to the south of the site. (Figure 3-12).

At Cummerstown site area, the Lough Lene outflow stream and a deep canalised drain (maintain by OPW), both located to the south, join the Deel (Raharney) River, which flows southwest along the southern site boundary before ultimately joining the River Boyne. The National Fen survey 2022 (Brophy et al., In prep) identified two old drains extend across the site from the east-central area into the lake (Figure 3-13).

The ATHBOY_030 river waterbody in Newtown has a Moderate WFD Status and the DEEL (RAHARNEY)_010 WFD river waterbody in Cummerstown has a Good WFD Status. Neither waterbody is considered at risk of failing to achieve its WFD objective.

At Newtown, the topography gently declines from approximately 90 mOD in the northeast to around 86 mOD at Newtown Lough in the southwest. Similarly, along a northwest to southeast transect, elevations decrease from approximately 90 mOD to a low point of 86 mOD at the lake before rising again to approximately 90 mOD towards the southeast.

At Cummerstown, the topography gently declines from approximately 86 mOD in the northwest to approximately 83 mOD at Lough Adeel, in the southeast, where the landscape is relatively flat. Elevation then increases again to approximately 86 mOD. Beyond the site boundary, the terrain becomes notably higher to the north and southeast, with bedrock outcrops rising to approximately 124 mOD in the north and 112 mOD in the southeast.

A review of historical and current hydrological data indicates that, at Newtown, the Kilskeer River flows into the lake from the northwest and discharges from its northeastern end. Historical maps from 1897 to 1913 show a spring located approximately 20 m northeast of the site, adjacent to the Kilskeer River, along with three additional springs, one approximately 450 m to the south and two approximately 800 m southeast of the site. The flow pattern shown on the historic maps is consistent with current observations in the area (Figure 3-14).

Similarly, historic maps of the Cummerstown area (1897 to 1913) reflect current observations, showing water flowing into the lake from the northwest and discharging to the southeast (Figure 3-15).

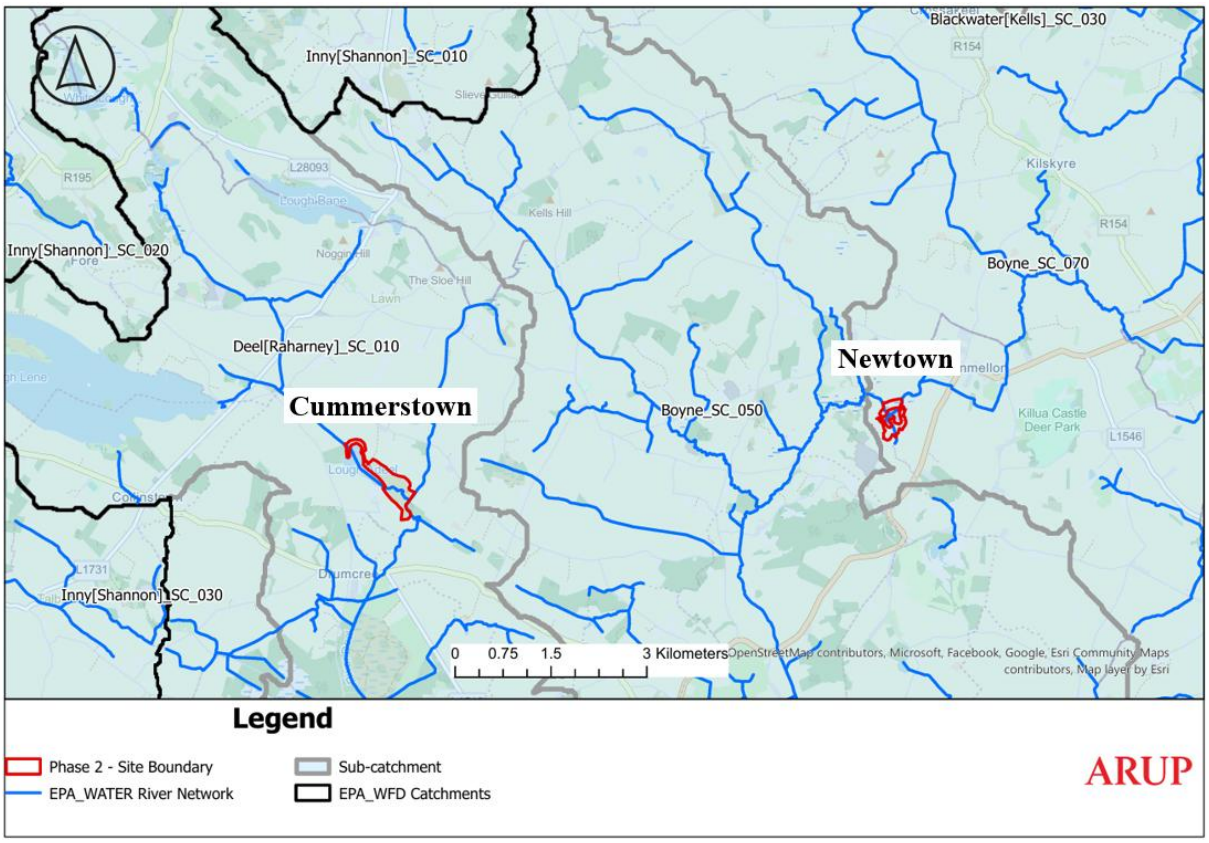


Figure 3-11: WFD Catchment and River sub-basin (EPA, 2025)

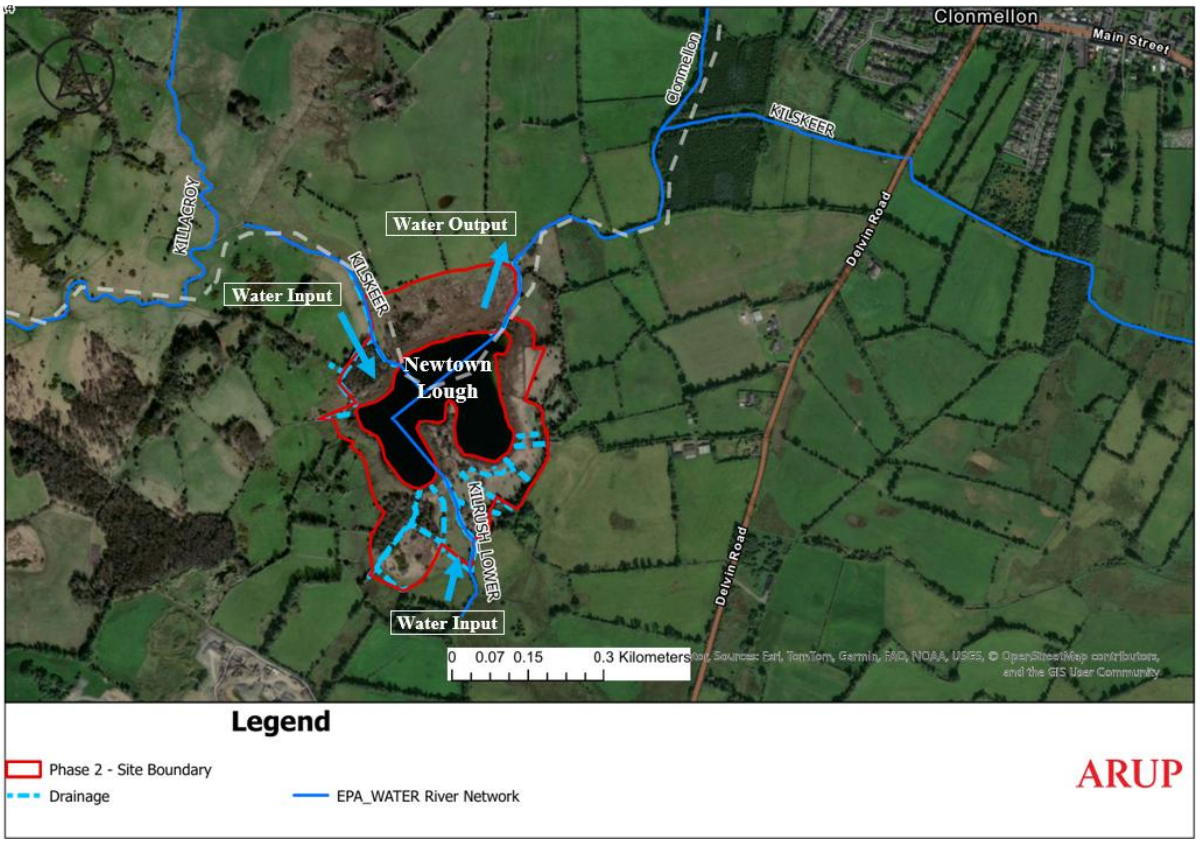


Figure 3-12: Mapped drainage network of Newtown

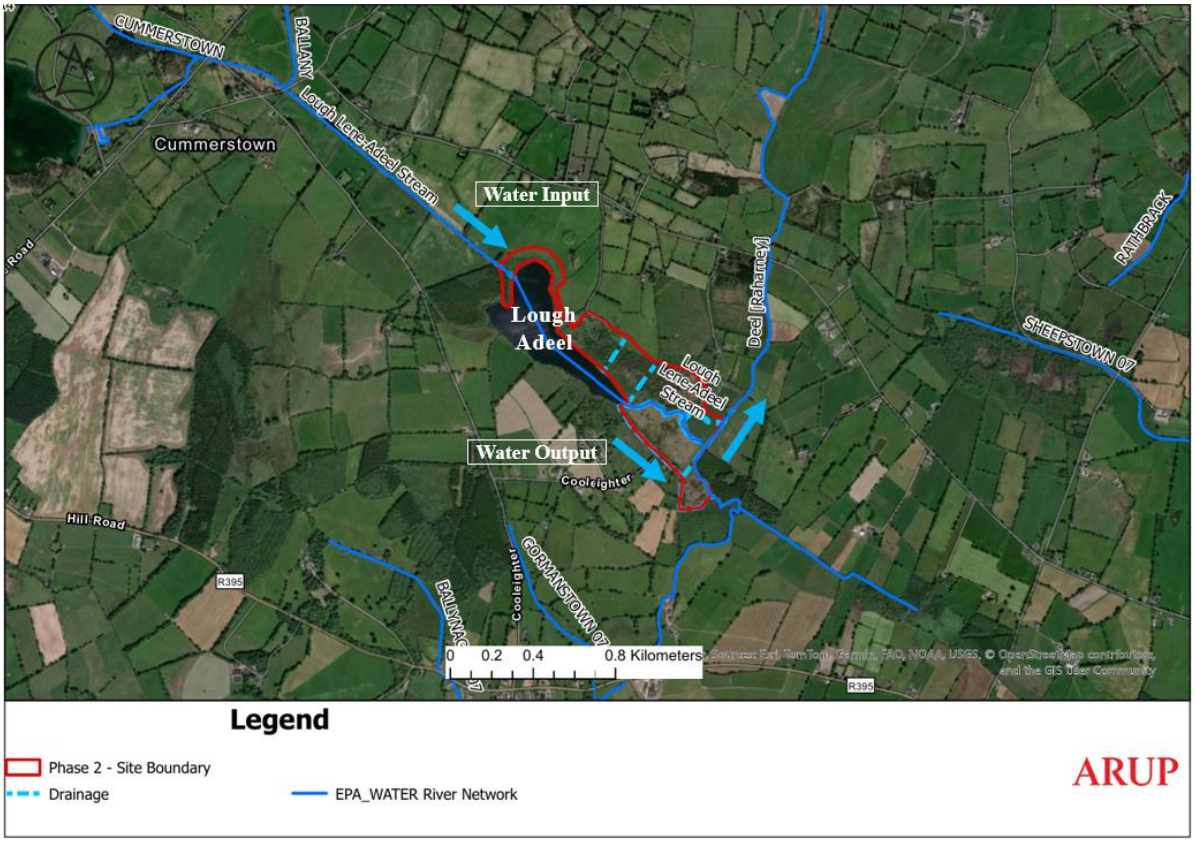


Figure 3-13: Mapped drainage network of Cummerstown

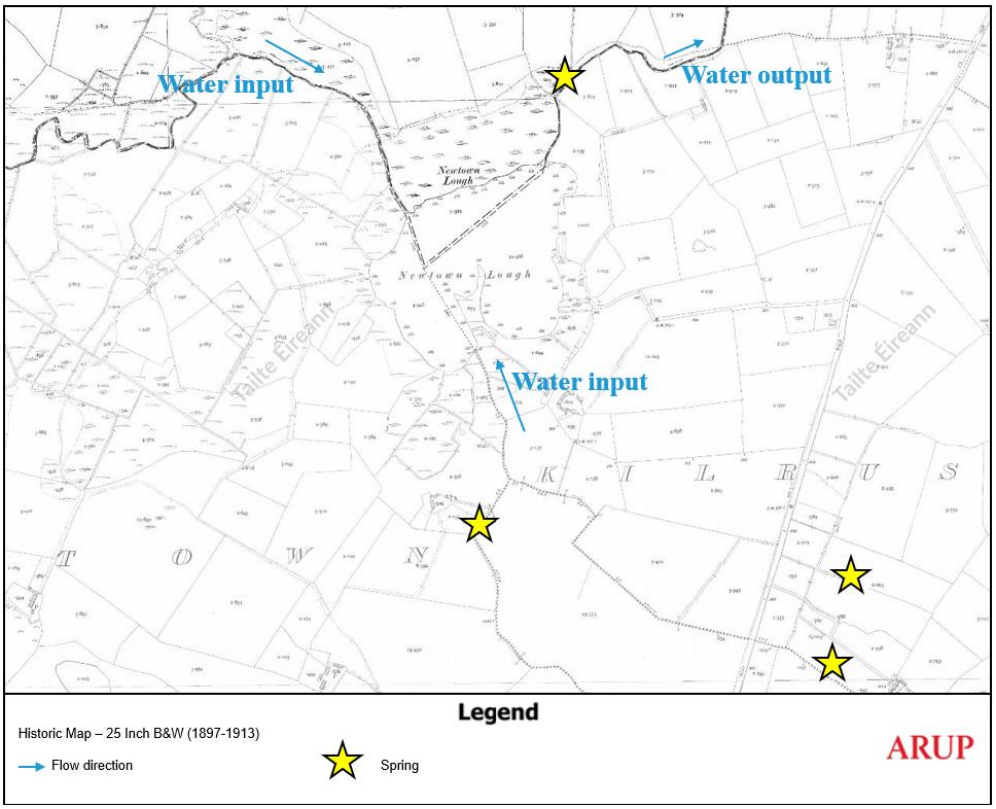


Figure 3-14: Historical water distribution and retention within Newtown (Tailte Éireann Historical mapping)

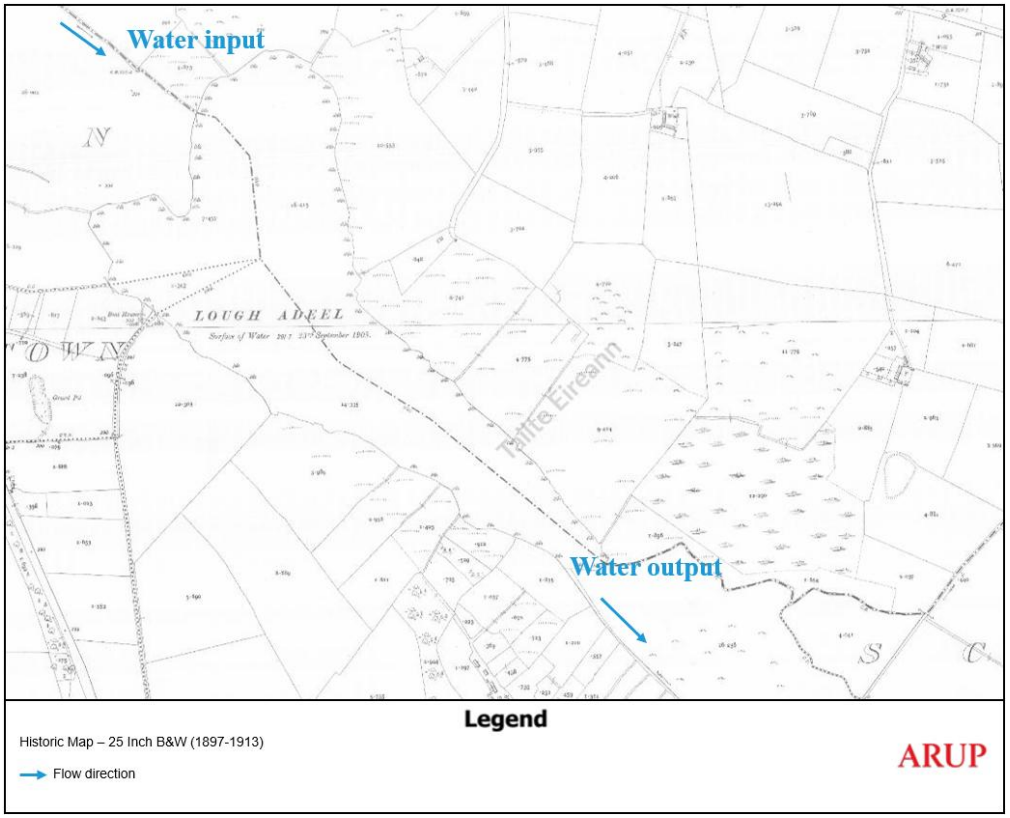


Figure 3-15: Historical water distribution and retention within Cummerstown (Tailte Éireann Historical mapping)

The mapped Wetness Index classifies both sites as temporarily wet (Figure 3-16 and Figure 3-17), indicating periods of saturation and dryness over the period 2012 to 2018. This pattern suggests a mosaic of variable soil moisture conditions, supporting intermittent wetland characteristics across the sites.

Total productivity mapping at Newtown ranges from high in the south and southeast to moderate in the north (Figure 3-18). At Cummerstown it ranges from high in areas surrounding the lake, with moderate productivity occurring in some eastern and southern areas. Minor areas of low productivity are associated with the lake (Figure 3-19).

Higher productivity areas are typically associated with semi-degraded peatland habitats affected by drainage and vegetation encroachment, while lower productivity occurs in areas surrounding the lake, which are characteristic of relatively intact peatlands.

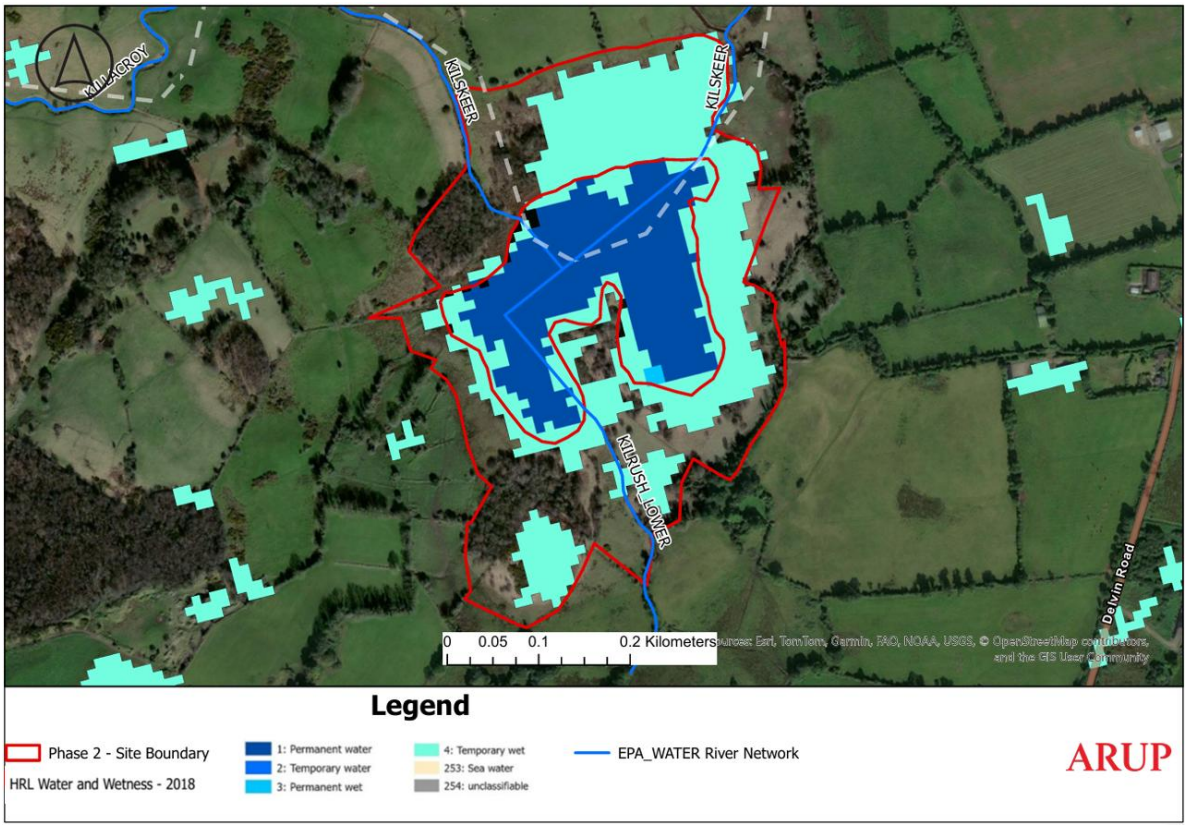


Figure 3-16: HRL Water and Wetness – 2018 of Newtown (Copernicus, 2025)

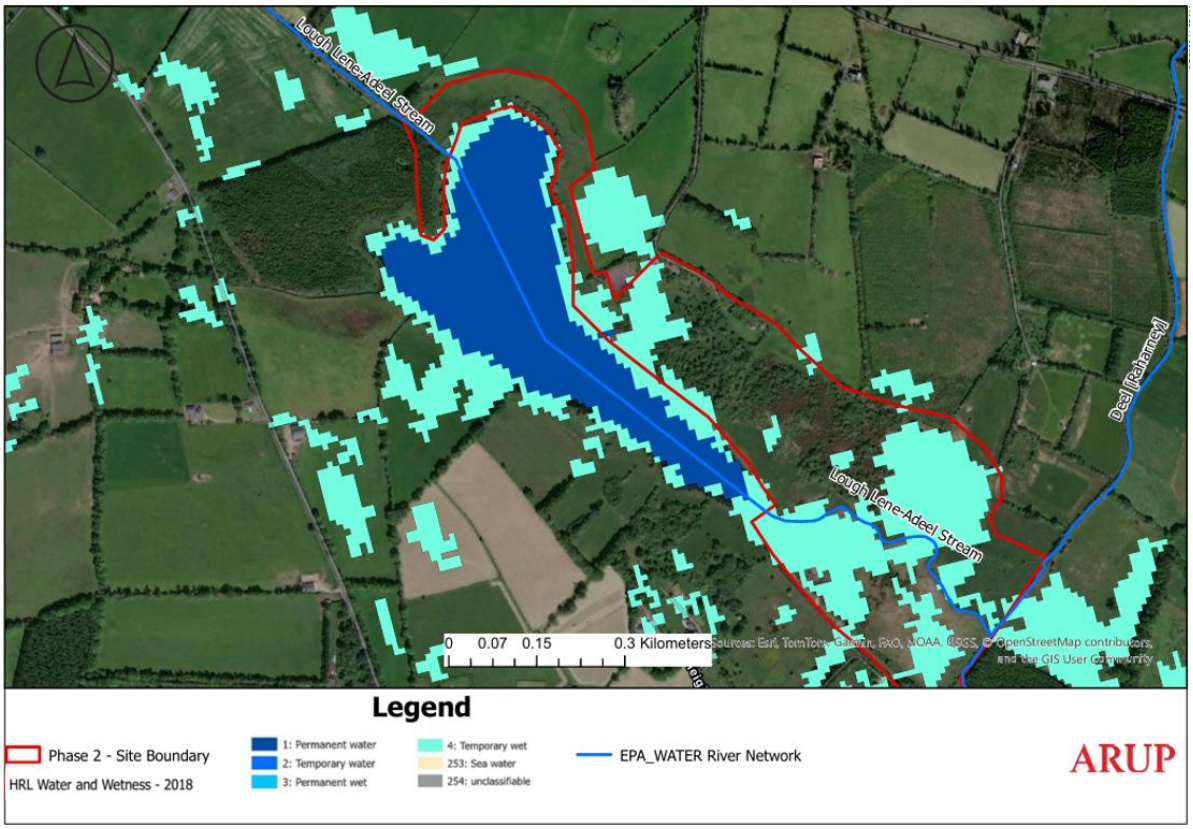


Figure 3-17: HRL Water and Wetness – 2018 of Cummerstown (Copernicus, 2025)

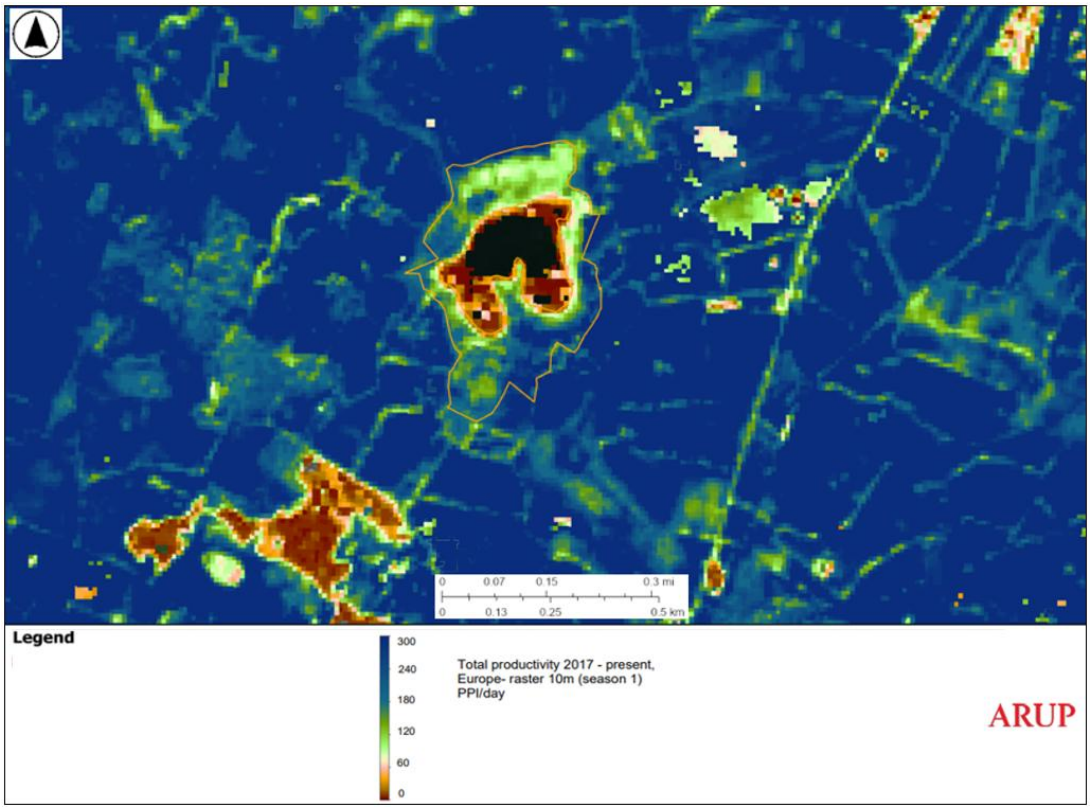


Figure 3-18: Total Productivity 2017 -present, Europe – raster 10m (season 1) of Newtown (Copernicus, 2025)

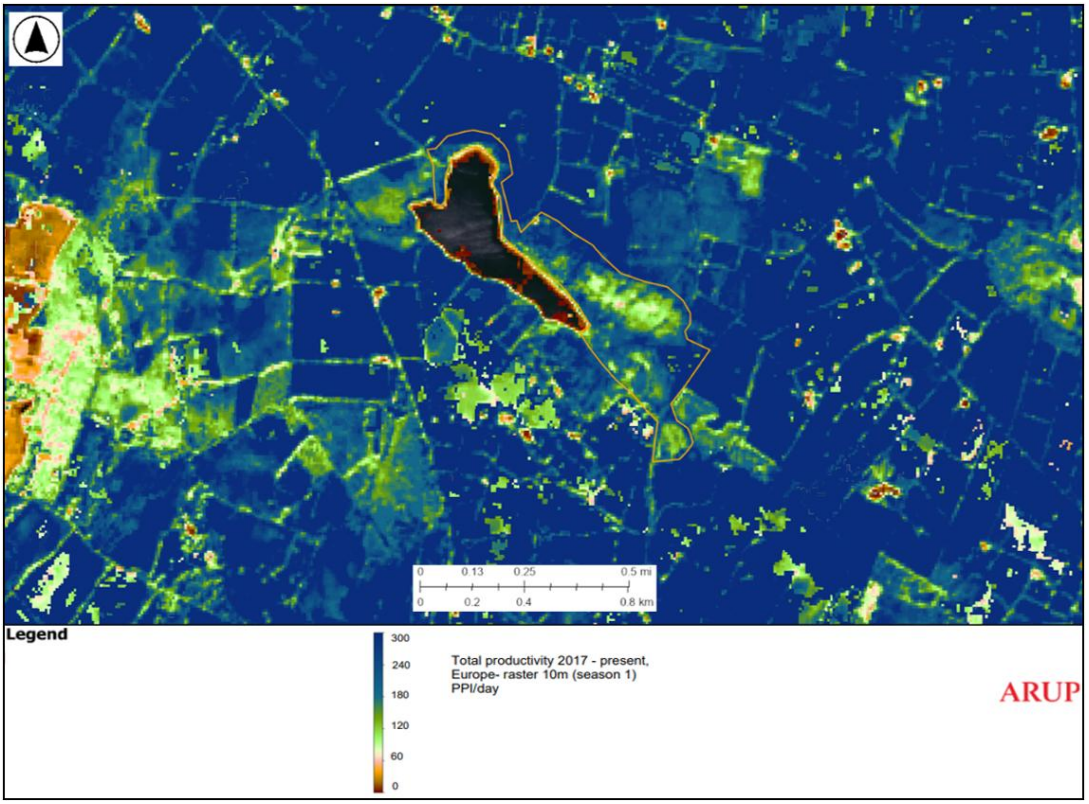


Figure 3-19: Total Productivity 2017 -present, Europe – raster 10m (season 1) of Cummerstown (Copernicus, 2025)

A Digital Terrain Model (DTM) derived from LiDAR data and a site photogrammetry model generated with a camera for Newtown in Figure 3-20 and Figure 3-22 and for Cummerstown in Figure 3-21 and Figure 3-23.

The DTM imagery indicates that, at the Newtown site, the most prominent water feature is located in the northwest and corresponds to the Kilskeer River, which flows into Newtown Lough. This represents the principal water input to the fen in the northwest and the outflow from the lake in the northeast. The channel is most distinct in the northwest and becomes less defined towards the outflow area. Additional drains are visible in the southern part of the site, while peripheral drains are evident along the northwestern and western margins.

At Cummerstown, the most prominent water feature flows through the Lough Adeel in a southerly direction, which is identified as Lough Lene-Adeel Stream and represents the main water input in the northwest and the outflow in the south. The southern section of the channel is less evident within the site but becomes more distinct beyond the southern site boundary. The Deel (Raharney) River, which flows east to west along the southern site boundary, represents an additional surface water input to the site. Two additional drains are visible to the east of the site, consistent with those identified during the National Fen Survey (NFS).

Photogrammetry imagery provides further evidence of the current condition of both sites.

At Newtown, vegetation cover is concentrated primarily in the northwest and southwest. Newtown Lough is visible along the main water features with a small water pond identified within a small area in the northwest of the site.

At Cummerstown, vegetation cover is evident in most of the site. The vegetation appears predominantly green in the northwest, whereas purple-green tones are more evident in the eastern, southeastern, and southern areas. These variations in colour likely reflect differences in vegetation composition, density, growth stage, moisture conditions, or seasonal characteristics at the time of image acquisition. Lough Adeel is associated as the main water feature and lake system that traverses the site.

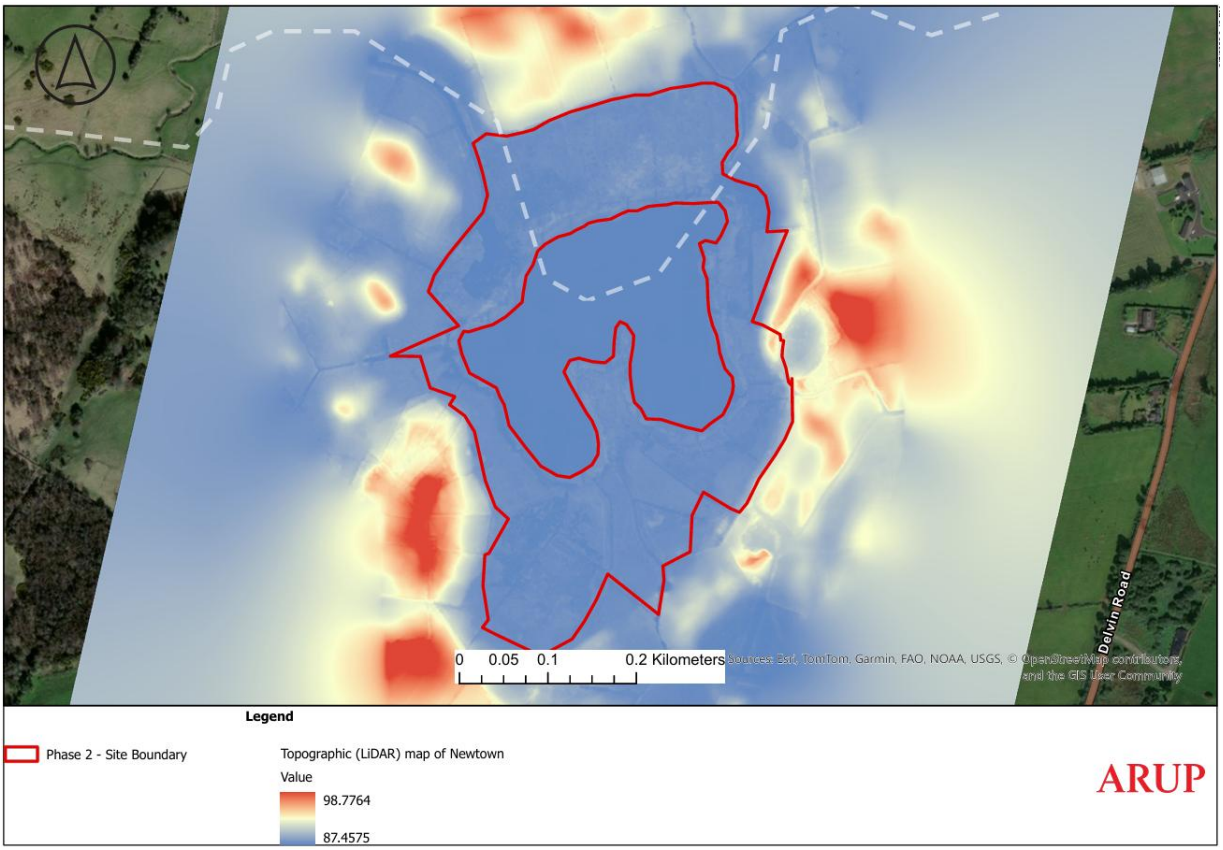


Figure 3-20: DTM Topographic (LiDAR) map of Newtown

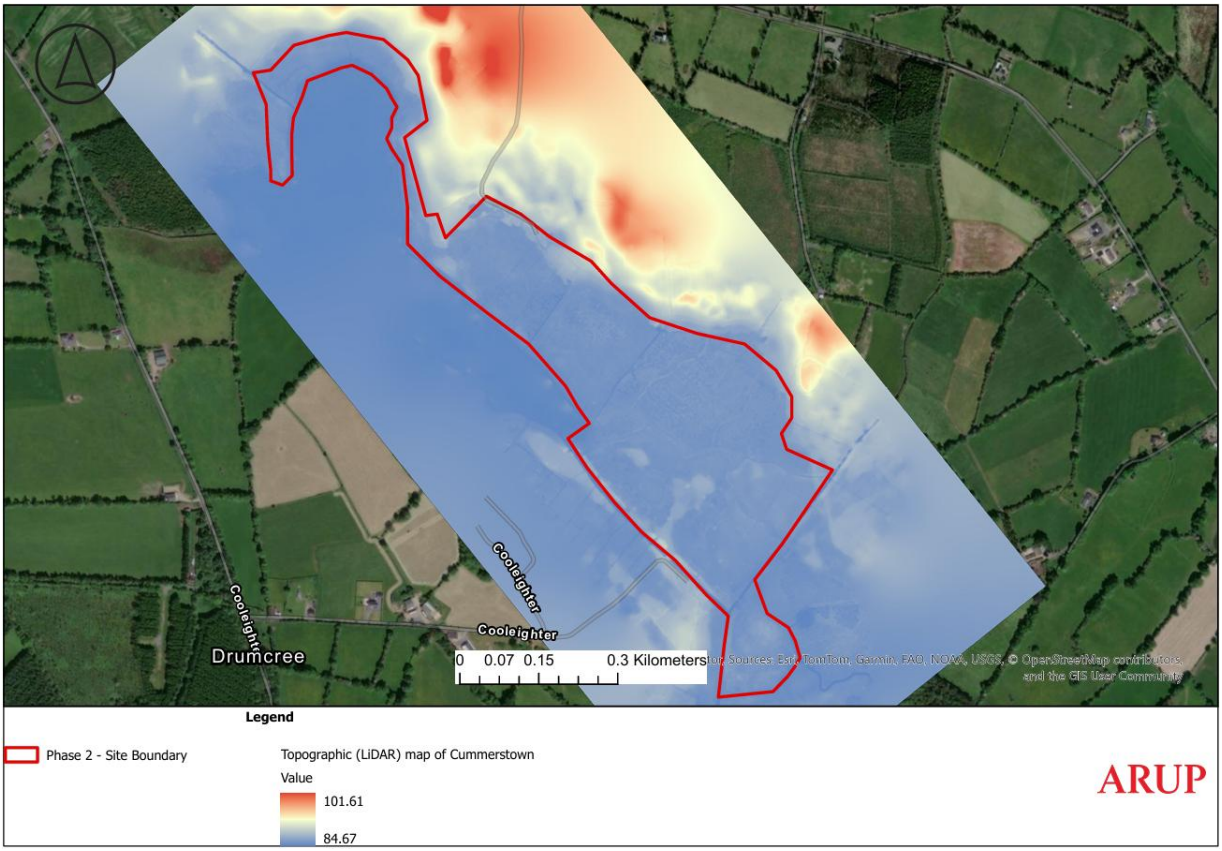


Figure 3-21: DTM Topographic (LiDAR) map of Cummerstown

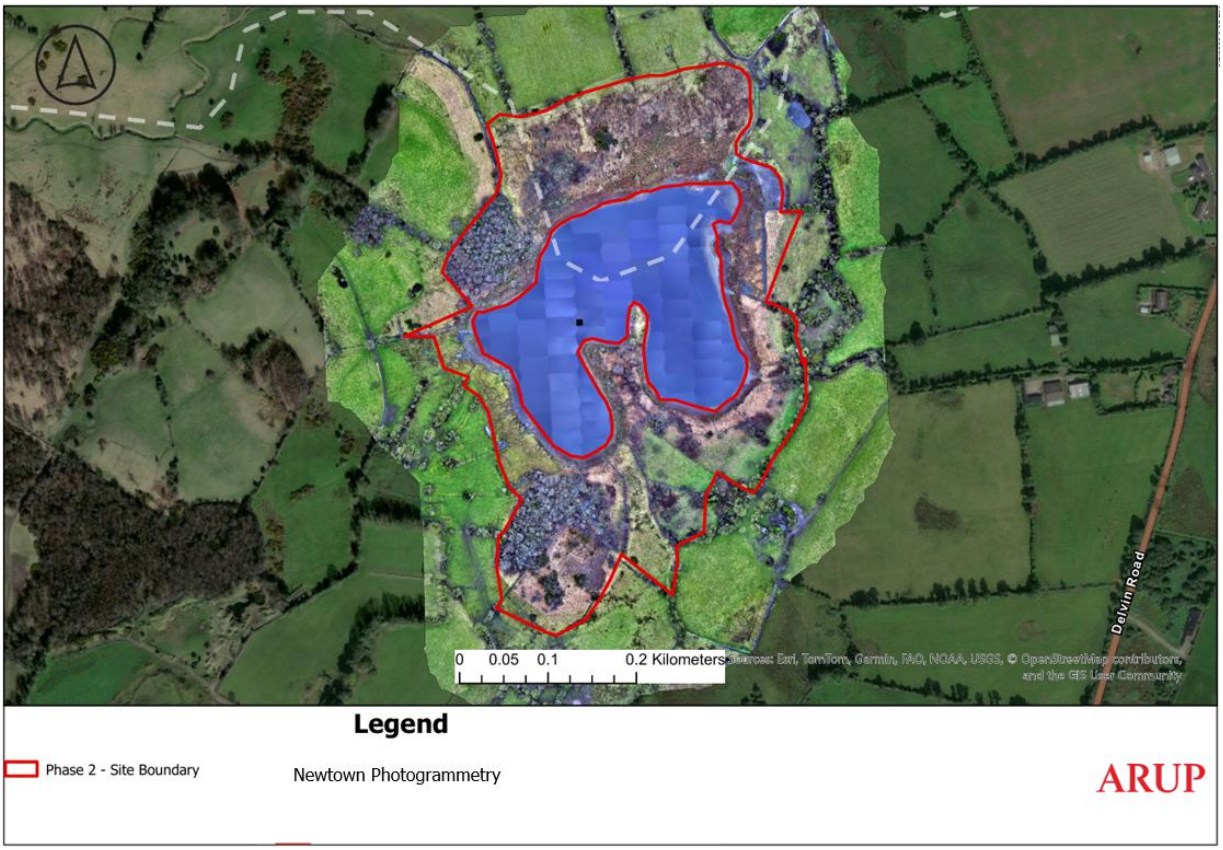


Figure 3-22: Site Photogrammetry map of Newtown

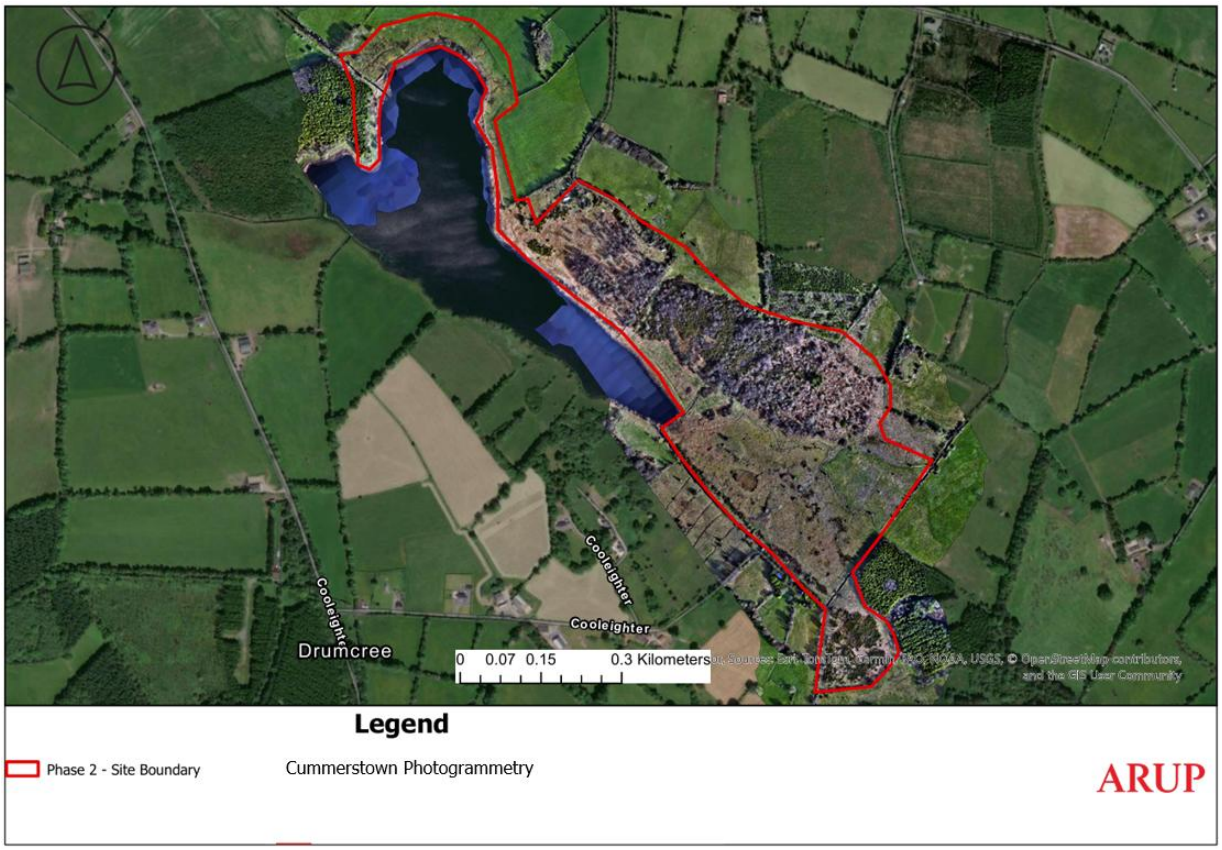


Figure 3-23: Site Photogrammetry map of Cummerstown

3.1.4 Land use Pressures and Water Quality

Pollution Impact Potential (PIP) maps (EPA 2025) show the risk areas on the landscape for losses of nitrate and phosphorus to waterbodies. The PIP estimates annual nutrient losses from the agricultural land using spatial data on farm management, soil and hydrogeology.

High risk areas for phosphorus loss are generally characterised by soils with poor drainage and the presence of predominant overland flow pathways. Such conditions facilitate the movement of phosphorus from the land surface into nearby water bodies.

Phosphorus-delivering flow paths are concentrated in the northern part of the Newtown site (Figure 3-24), with clear variations in risk: Rank 1 areas are mapped to the north, northeast, and west of the site, indicating higher risk, while Rank 6 and 7 areas occur to the east and southwest, indicating lower risk. A Rank 3 area is mapped to the south of the site and corresponds to the Kilrush Lower Stream, which flows through Newtown Lough (Figure 3-26).

At Cummerstown (Figure 3-25), phosphorus-delivering flow paths have been identified in the eastern part of the site, where two historical drains extend from the central eastern area through Lough Adeel. Additional delivering flow paths are present to the northwest of the site. Risk rankings vary across the site: Rank 1 and Rank 3 areas are mapped in the north, while Rank 4 is identified within the central, southern, and southwestern parts of the site, indicating lower risk. The surrounding areas are generally characterised by low risk (Rank 6 and Rank 7) (Figure 3-27).

Freely draining soils and significant groundwater pathways are recognised as high-risk zones for nitrate loss. At Newtown, the risk of nitrate loss is generally considered low. However, areas beyond the site boundary to the northeast, north, northwest, and southwest may represent more vulnerable zones for nitrate loss (Figure 3-28).

Similarly, the overall risk of nitrate loss at Cummerstown and its surrounding area is generally considered low. A small area to the northeast may represent a more vulnerable zone for nitrate loss (Figure 3-29).

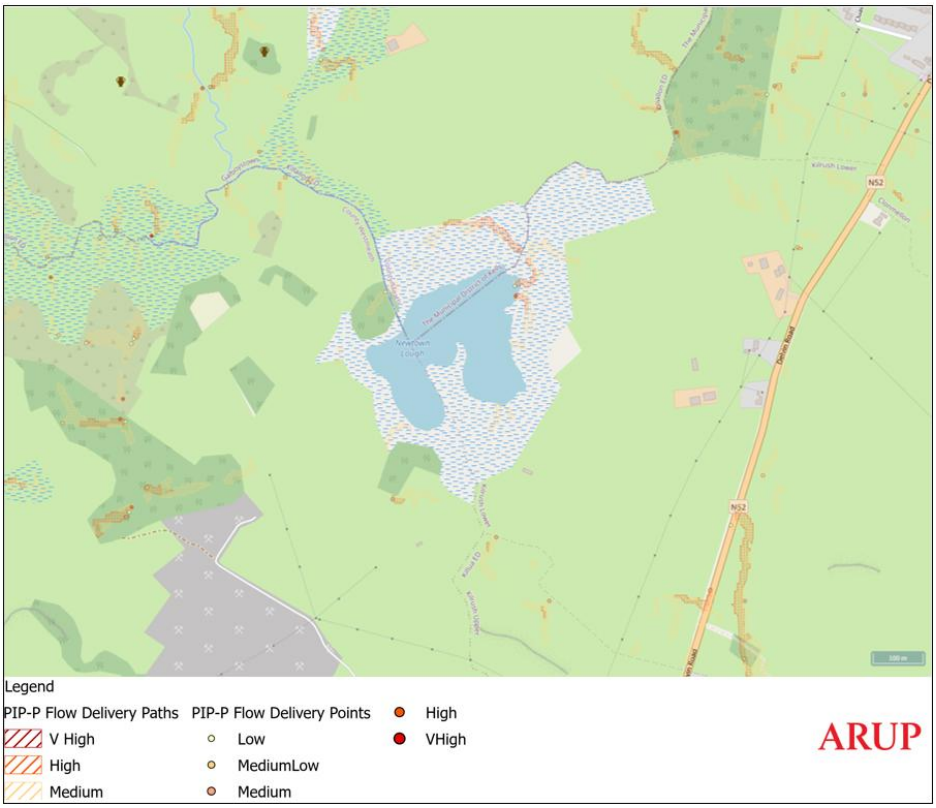


Figure 3-24: PIP- P - Flow delivery paths and points for Phosphorus (EPA, 2021) for Newtown

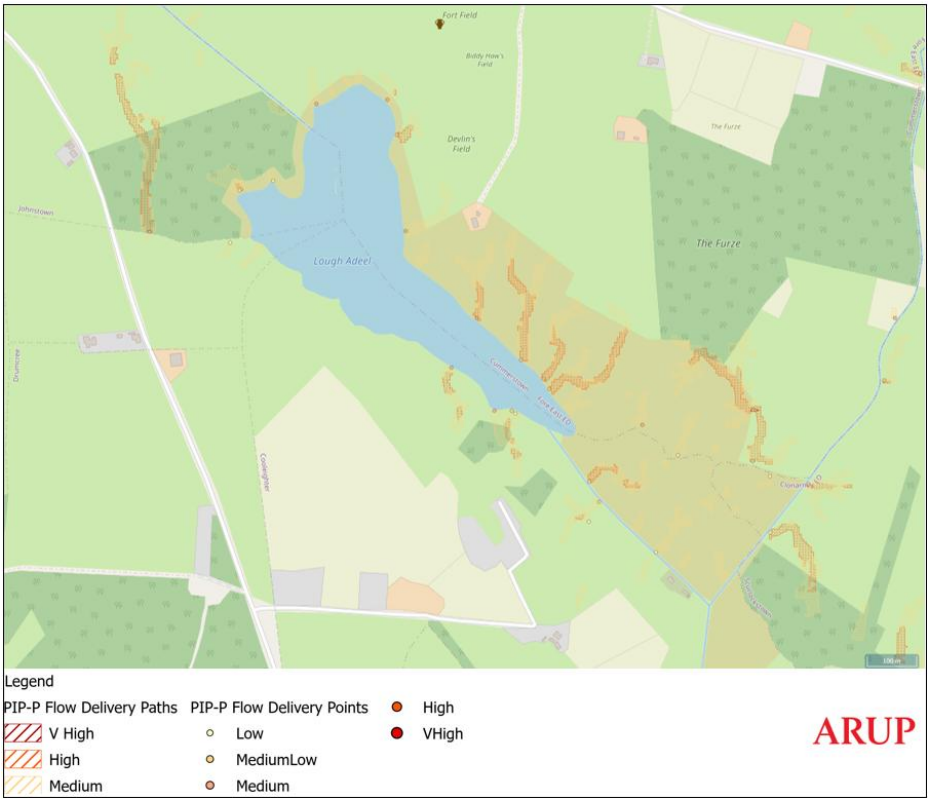


Figure 3-25: PIP- P - Flow delivery paths and points for Phosphorus (EPA, 2021) for Cummerstown

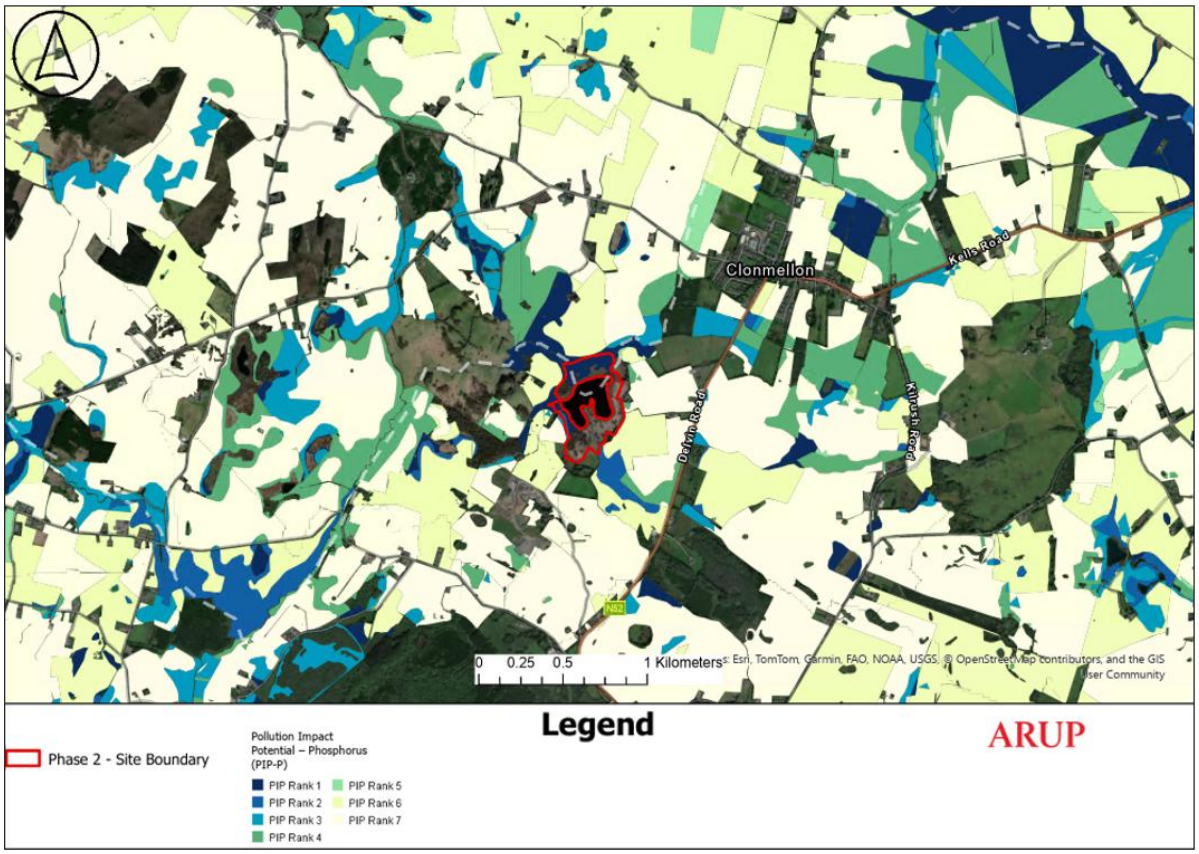


Figure 3-26: PIP maps (Phosphorus) of Newtown

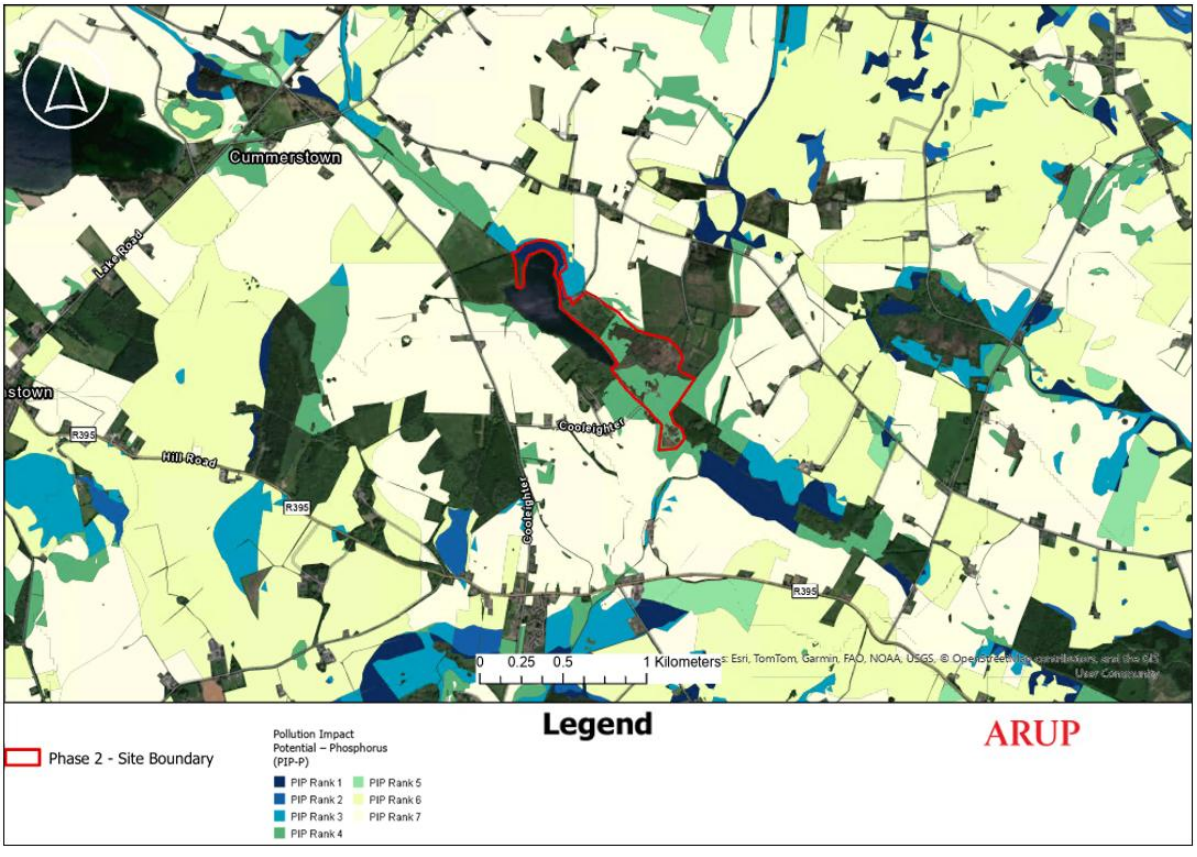


Figure 3-27: PIP maps (Phosphorus) of Cummerstown

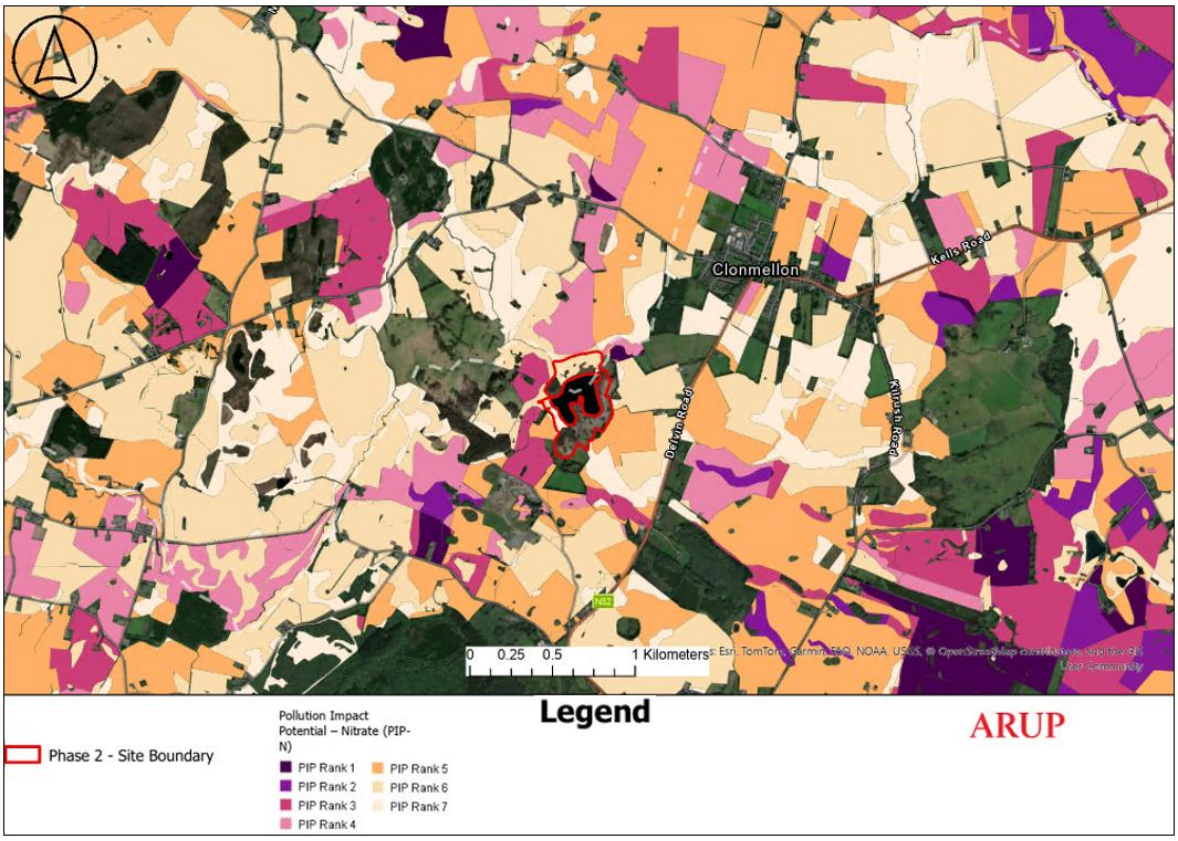


Figure 3-28: PIP maps (Nitrate) of Newtown

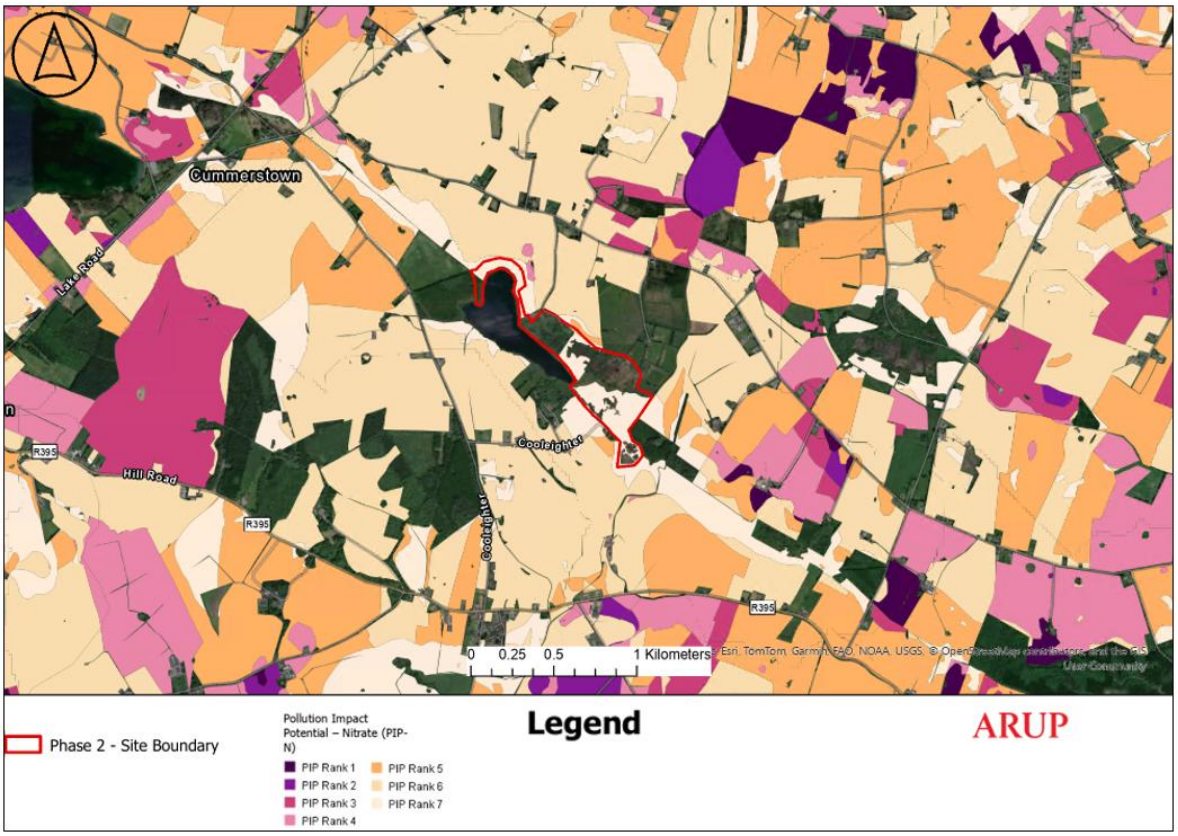


Figure 3-29: PIP maps (Nitrate) of Cummerstown

3.2 Field Survey: Monitoring Activities

Electrical conductivity (EC) and pH were recorded at both Newtown and Cummerstown sites, as part of the National Fen Survey (Brophy et al., in prep.). EC values ranged from 91 to 833 µS/cm at Newtown and from 82 to 862 µS/cm at Cummerstown. pH values ranged from 6.5 to 7.97 at Newtown and from 5.53 to 8.26 at Cummerstown. Peat depth was also measured at both sites, ranging from 0.20m to 2.03m at Newtown and from 0.14m to 3.20m at Cummerstown.

Site monitoring was undertaken in February, March and August 2026, focusing on developing the understanding of the water regime, pressures and implementation of restoration measures within the habitat. The monitoring included peat depth probing, water quality monitoring ((pH, EC, temperature, nitrate, and phosphate), and observations of water flow.

3.2.1 Peat Depth Probing and Ground Investigations

3.2.1.1 Newtown

Peat depth probing was conducted at locations across the northwest, southwest, south, and southeast areas of the site as shown in Figure 3-30. The greatest peat depths, exceeding 3.1 m, were recorded in the northwest and southwest, both situated close the lake. The shallowest peat depth, measuring 0.5 m, was recorded in the southern part of the site near the site boundary.

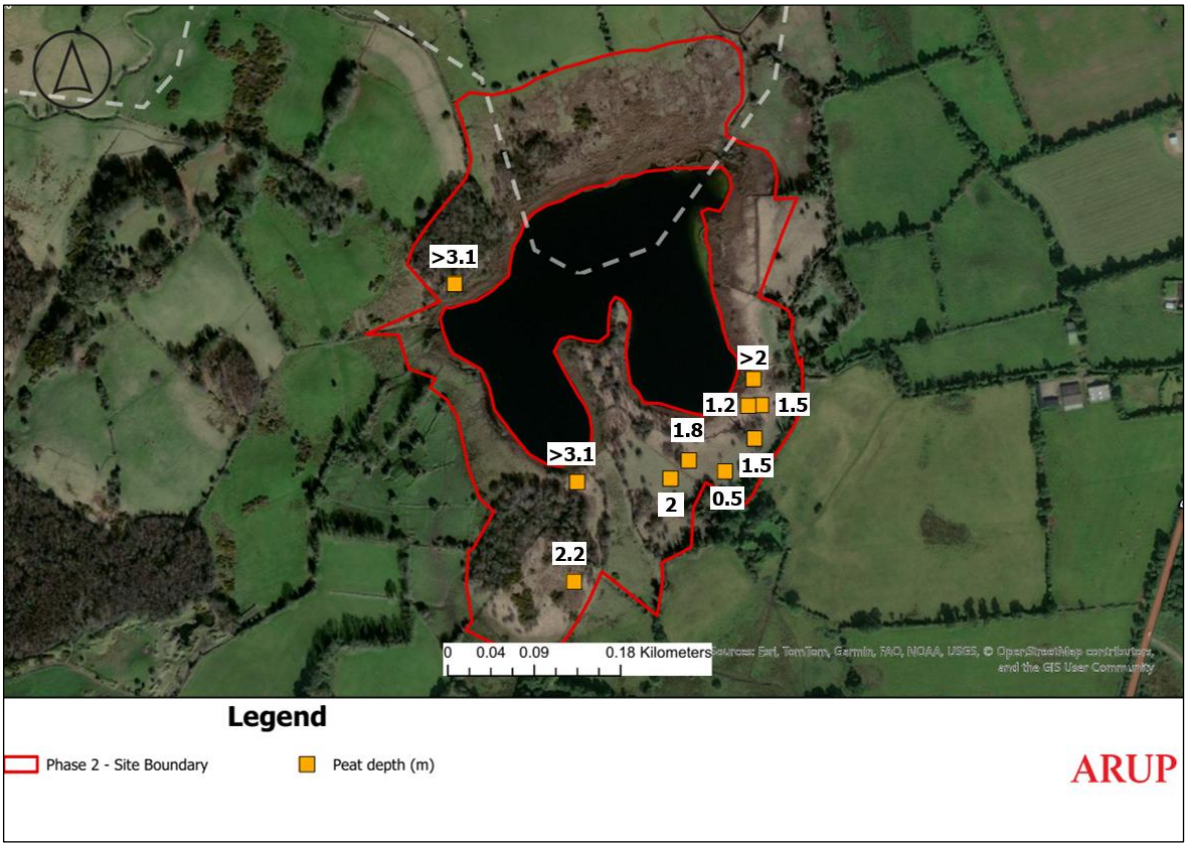


Figure 3-30: Baseline peat monitoring locations of Newtown

3.2.1.2 Cummerstown

Peat depth probing was conducted across the central, southwest, and southeast areas of the site, as shown in Figure 3-31. The greatest peat depths were recorded in the central area, ranging from 3.1 m to 3.5 m and in the southeast, where depths exceeded 3.1 m. The shallowest measurement was recorded in the southwest, at approximately 1 m deep.

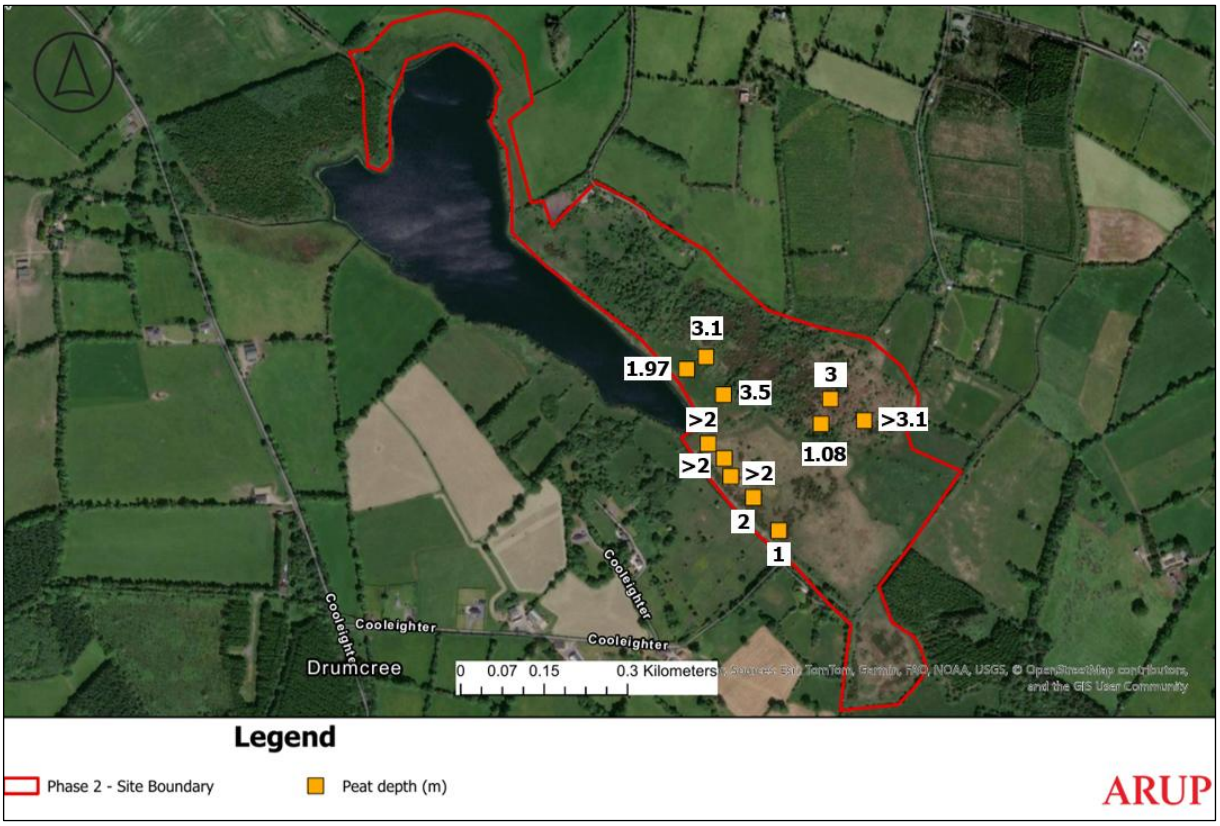


Figure 3-31: Baseline peat monitoring locations of Cummerstown

3.2.2 Surface Water levels

3.2.2.1 Newtown

The NFS carried out in 2023 (Brophy et al., In prep) identified that drains at Newtown criss-cross the south and south-eastern parts of the site and other several transverse the northern part of the site, all draining through Newtown Lough. Historical maps (25 Inch B&W, 1897–1913) identified one spring to the northeast of the site, one to the south of the site, and two to the southeast of the site.

Surface water conditions varied across the site regarding drainage features and flow regimes. The Newtown site is characterised by very wet conditions consistent with fen and mire habitats, with several drains, particularly in the south of the site, although most showed no indication of water flow during the site visits.

The main drain in the southern corresponds to the Kilrush Lower Stream, recorded with a width of approximately 2 m and a depth of less than 1 m. The banks were fully vegetated with

dense grasses, sedges and emergent reed stems. The water was turbid and slow-moving towards the Newtown Lough. The remaining drains in the southern part of the site were recorded with widths ranging from 0.75 m to 1.5 m and depths between 0.3 m and 1 m. Most contained stagnant water and had fully vegetated banks, while some showed exposed disturbed peat adjacent to the banks and scrub encroachment, indicating a potential drawdown effect on surrounding vegetation.

On the western side, numerous drains were visited. Most showed no visible water flow, except for the drain connected to the main watercourse (Kilskeer River). This drain, located in the northwest of the site, represent the principal hydrological input to the site and was recorded with a width of approximately 1 m and a water level of 0.2 m. Kilskeer River flows into the lake and out in the northeastern area of the site, where it is connected to the main receiving watercourse. The outflow watercourse is connected to an OPW Arterial Drainage channel located to the northeast of the site (Reference C1/21/25, Scheme Boyne, Region East).

Water levels were recorded between approximately 0.2 m and 0.4 m across the site. In the northern area, close to Kilskeer River, several seepage zones and springs appear to flow into the woodland on gently sloping ground. Also, a small water pond was observed in the northeast. The drainage network at Newtown is shown in Figure 3-32.

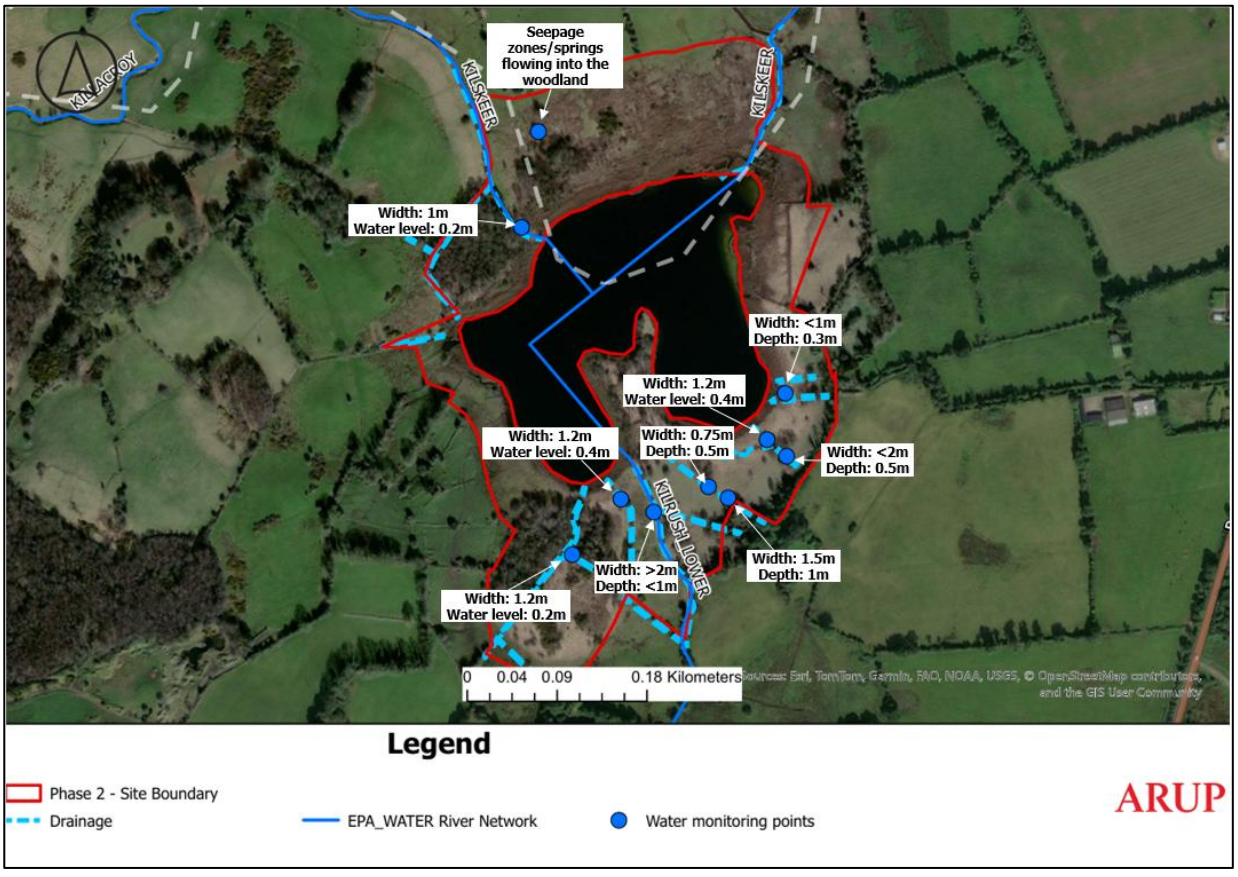


Figure 3-32: Drainage Network of Newtown

3.2.2.2 Cummerstown

The NFS carried out in 2023 (Brophy et al., In prep) identified the lake outflow river, a deep canalised drain in the south of the site and two old drains crossing the site from the centre-east into the lake. Historical maps (25 Inch B&W, 1897–1913) identified water entering the lake from the northwest and flowing out in a south-easterly direction.

The site survey was consistent with these data, with the main water course, identified as Lough Lene-Adeel Stream following from north to south. The measurements taken in the southern area registered a width greater than 2 m, a depth greater than 1 m and fully vegetated banks. Mineral soil was exposed in small patches near the base of the banks but was otherwise well vegetated. The Lough Lene-Adeel Stream forms part of the OPW Arterial Drainage Scheme (Reference C1/37/35/2, Scheme Boyne, Region East). In addition, the Deel (Raharney) River identified within the southern boundary, also forms part of the OPW Arterial Drainage Scheme (Reference C1/37/35, Scheme Boyne, Region East) and is connected to the main watercourse (Lough Lene-Adeel Stream), following at a north-easterly direction.

Across the site, to the south and east of Lough Adeel, numerous drains were identified. Several appeared to be connected directly to the Lough Lene-Adeel Stream, while most secondary drains and channels exhibited no visible flow, suggesting limited internal hydrological circulation. One of the main drains, connected to Lough Lene-Adeel Stream and maintained by the OPW, showed clear water movement toward the southeast. The presence of both flowing and stagnant water areas indicates hydrological variability influenced by both natural and modified drainage features.

The drains were recorded with widths ranging between 1.5 m and 3 m and depths between 0.5 m and 1.75 m, with some poorly defined channels extending through grassland vegetation. Most were dry during the final site visit and were infilled with meadowsweet, common rush, false oat-grass and iris. The drainage network at Cummerstown is shown in Figure 3-33.

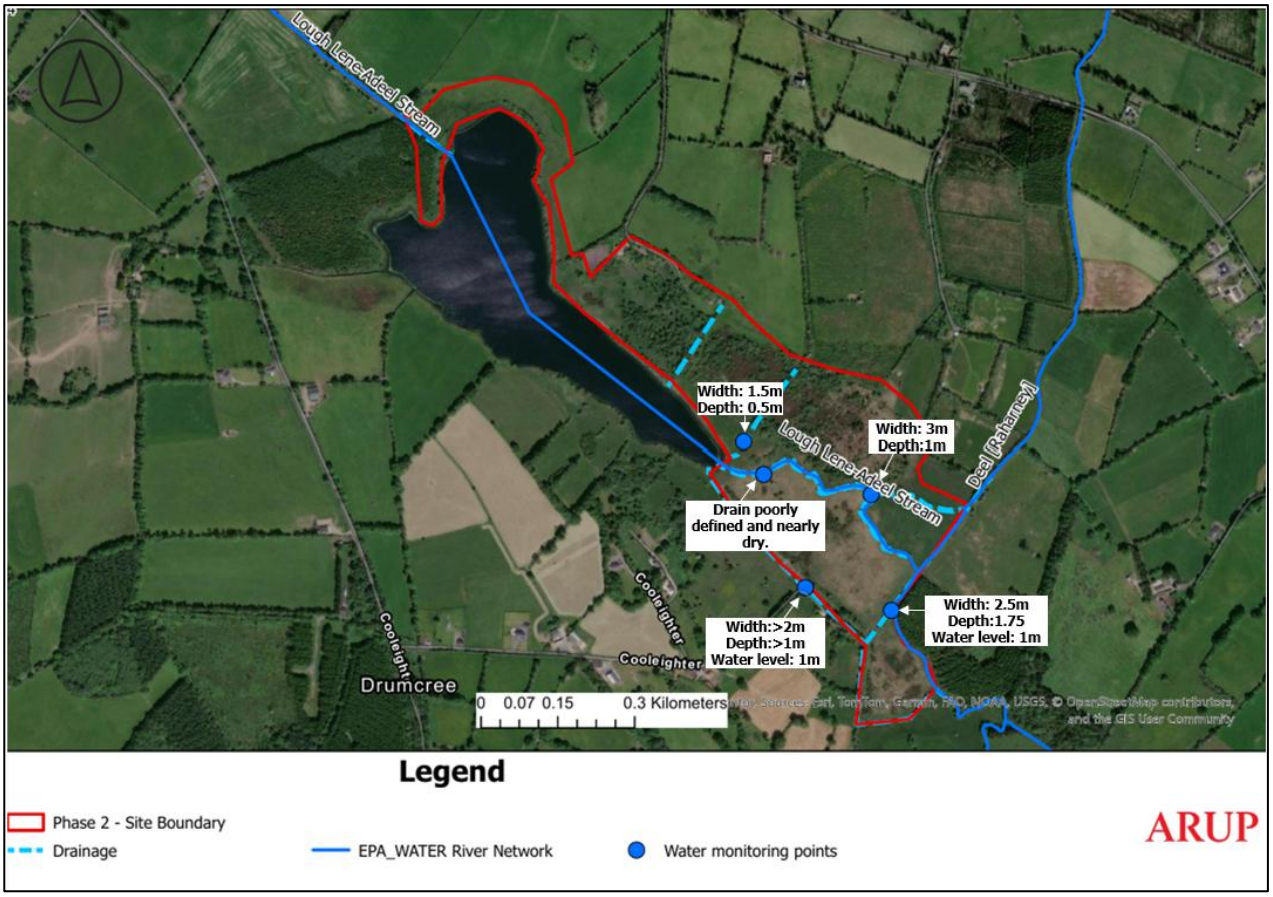


Figure 3-33: Drainage Network of Cummerstown

3.2.3 Water Quality

3.2.3.1 Newtown

Water quality was assessed at three locations within drains situated to the south of the site.

Phosphate (PO_4) concentrations across the site ranged from 0.10 mg/L to 0.27 mg/L (Figure 3-34), with most measurements slightly exceeding the Water Framework Directive (WFD) Good Status Environmental Quality Standard (EQS) of 0.107 mg/L PO_4 (0.035 mg/L PO_4-P). A phosphate concentration of 0.24 mg/L was recorded in the drain connected to the Kilrush Lower Stream, in the south of the site.

Nitrate concentrations were relatively consistent across the southern part of the site (Figure 3-35), ranging from 9.7 mg/L to 10.7 mg/L. All measured concentrations exceeded the ecological threshold of 1.8 mg/L NO_3-N (equivalent to 8 mg/L NO_3^-) (EPA, 2025b), above which adverse effects on ecological water quality may occur. The highest nitrate concentration (10.7 mg/L) was recorded within the drain connected to Kilrush Lower Stream, in the south of the site.

pH values ranged from 6.4 to 6.97, indicating generally slightly acidic conditions across the sampled areas (Figure 3-37). EC ranged from 455 to 552 µS/cm (Figure 3-36), with the lowest value recorded in the drain connected to the main southern watercourse.

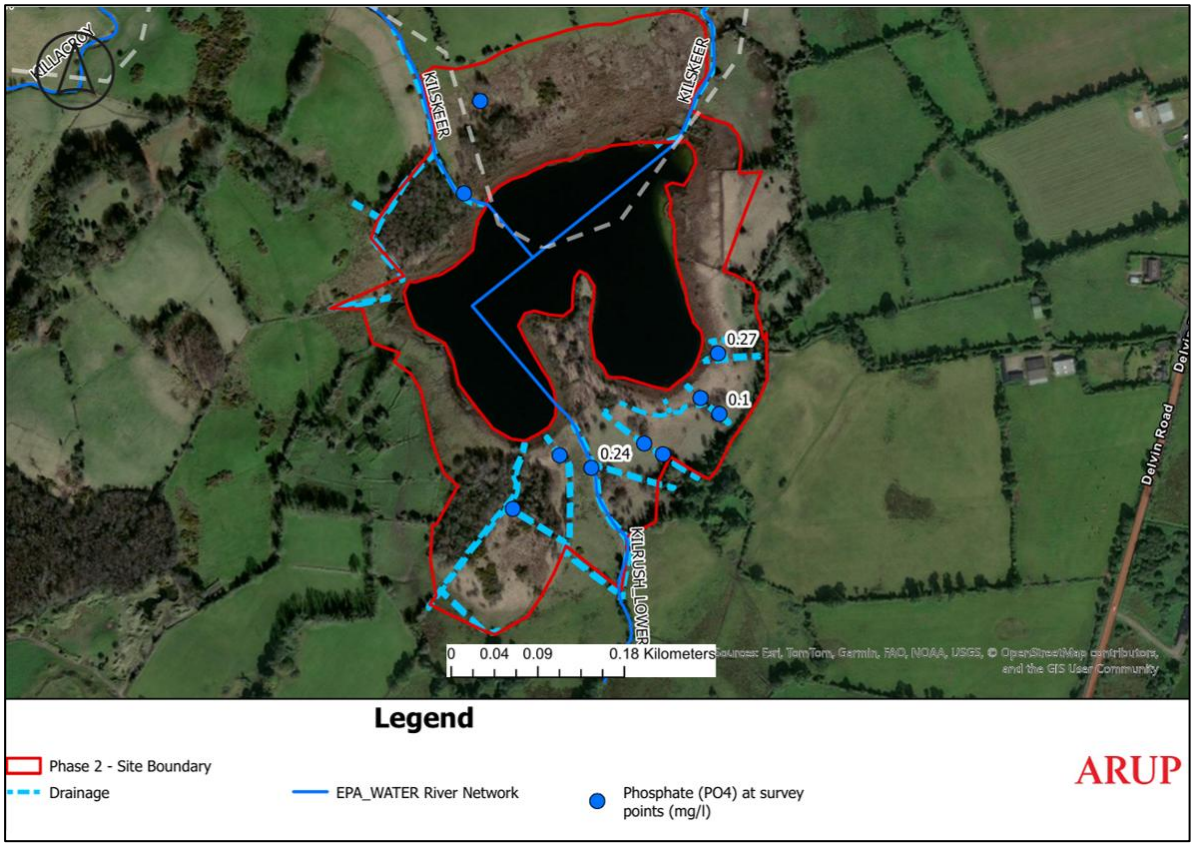


Figure 3-34: Phosphate (mg/L PO_4) at survey points in Newtown

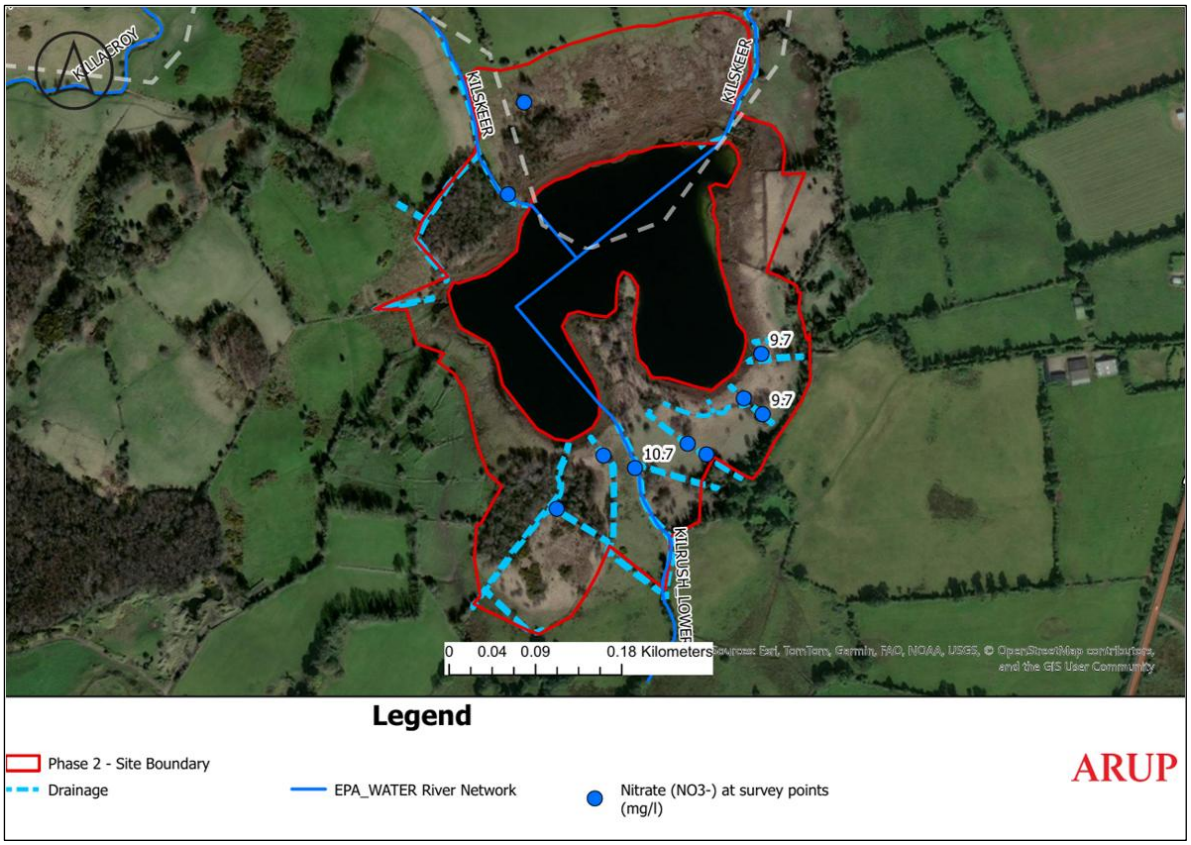


Figure 3-35: Nitrate (mg/L NO_3) at survey points in Newtown

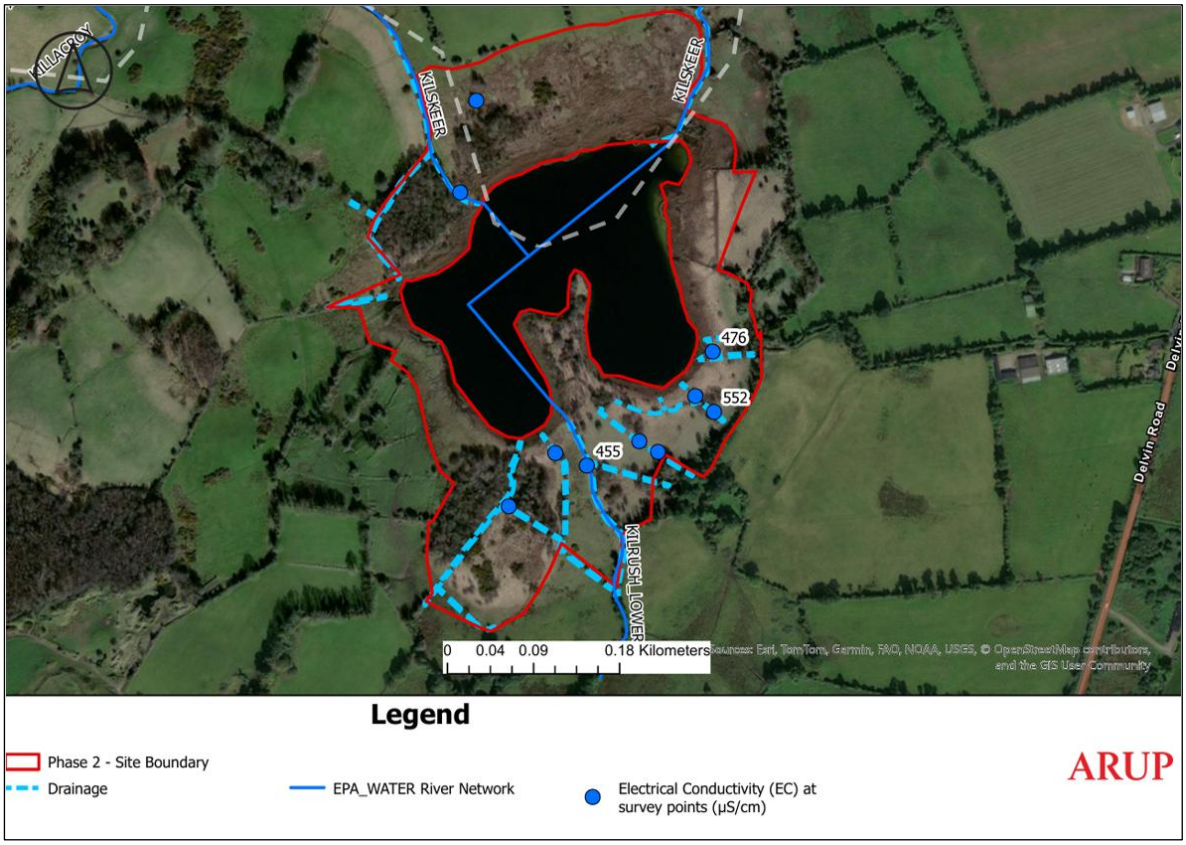


Figure 3-36: Electrical Conductivity (EC) (µS/cm) at survey points in Newtown

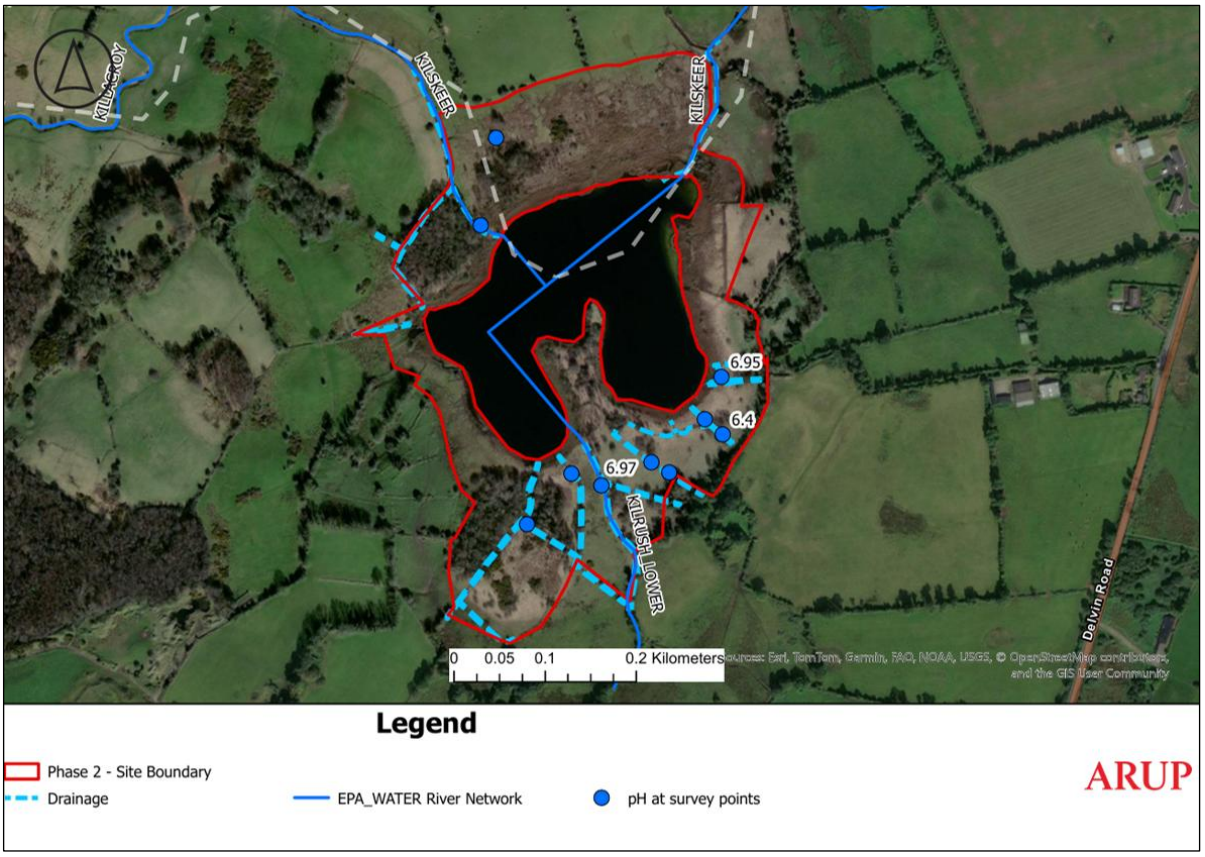


Figure 3-37: pH at survey points in Newtown

3.2.3.2 Cummerstown

Water quality was assessed at three locations within the drainage network located to the south of the site, including measurements taken within the OPW Arterial Drainage connected to Lough Lene-Adeel Stream and within the Deel (Raharney) River.

Phosphate (PO_4) concentrations ranged from 0.05 mg/L to 0.19 mg/L (Figure 3-38). Two of the three monitoring locations recorded concentrations that slightly exceeded the WFD Good Status Environmental Quality Standard of 0.107 mg/L PO_4 (0.035 mg/L PO_4-P). The lowest phosphate concentration, which was below the EQS threshold, was recorded in the Deel (Raharney) River.

Nitrate concentrations showed higher spatial variation than those observed at Newtown, ranging from 2.6 mg/L in the southern boundary (Deel (Raharney) River) to 12.1 mg/L in the western boundary (OPW Arterial Drainage connected to Lough Lene-Adeel Stream) (Figure 3-39). All measured concentrations exceeded the indicative ecological threshold of 1.8 mg/L NO_3-N (8 mg/L NO_3^-) (EPA, 2025b), suggesting the potential for nutrient enrichment and associated impacts on ecological water quality.

pH values ranged from 7.6 to 7.9 (Figure 3-41), indicating slightly alkaline conditions. EC ranged from 300 to 656 µS/cm (Figure 3-40), with the lowest value recorded in the outflow OPW Arterial Drainage connected to the Lough Lene-Adeel Stream along the southern

boundary and the highest value recorded in the southern boundary (Deel (Raharney) River). The variation in EC values suggests different hydrological influences across the site. Elevated EC values may indicate groundwater contributions to some drainage features; however, the observed range likely reflects a combination of groundwater and surface water inputs.

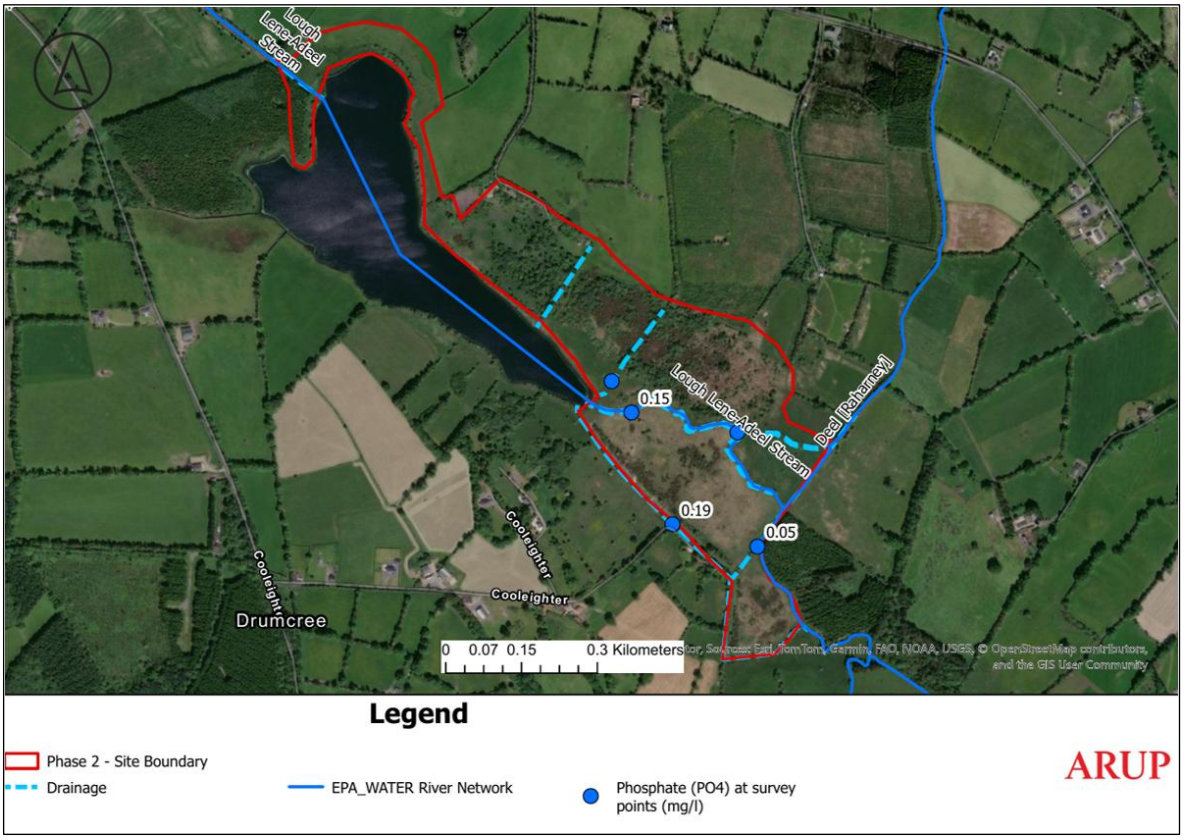


Figure 3-38: Phosphate (mg/L PO_4) at survey points in Cummerstown

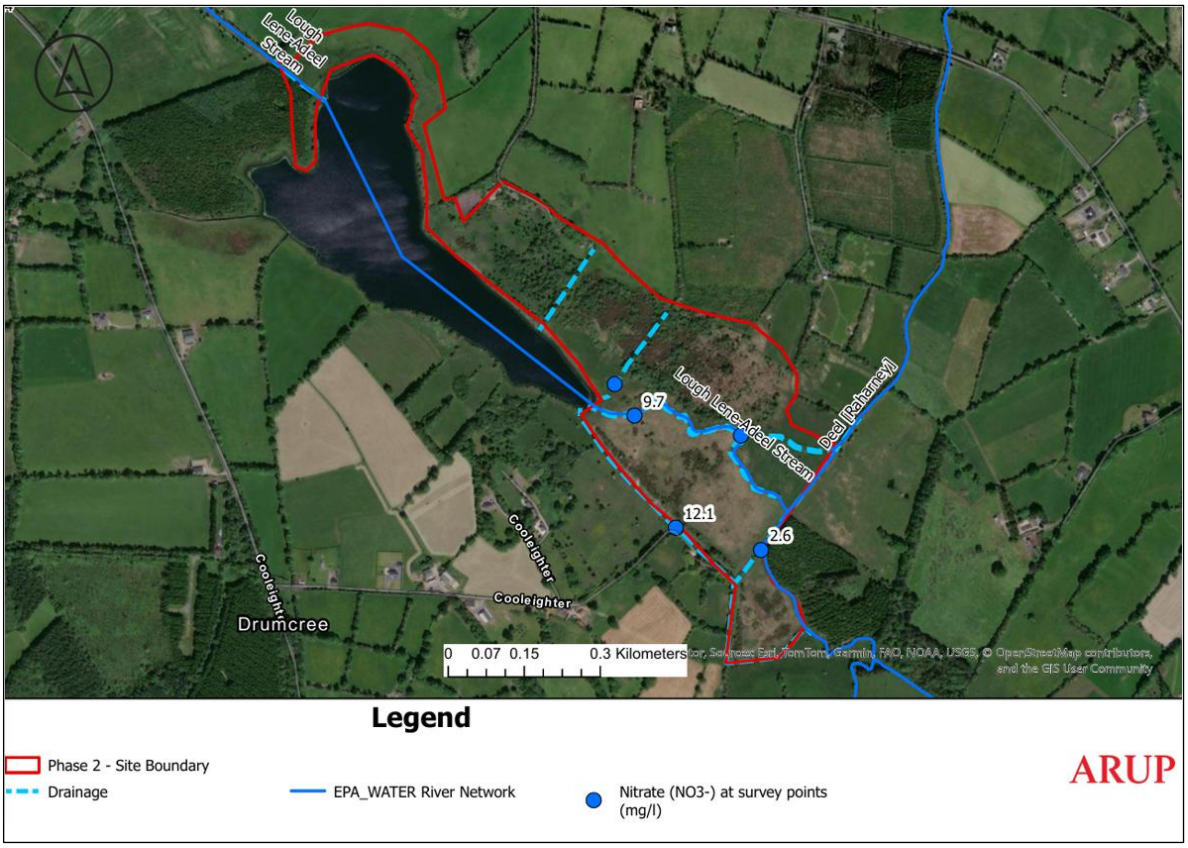


Figure 3-39: Nitrate (mg/L NO3) at survey points in Cummerstown

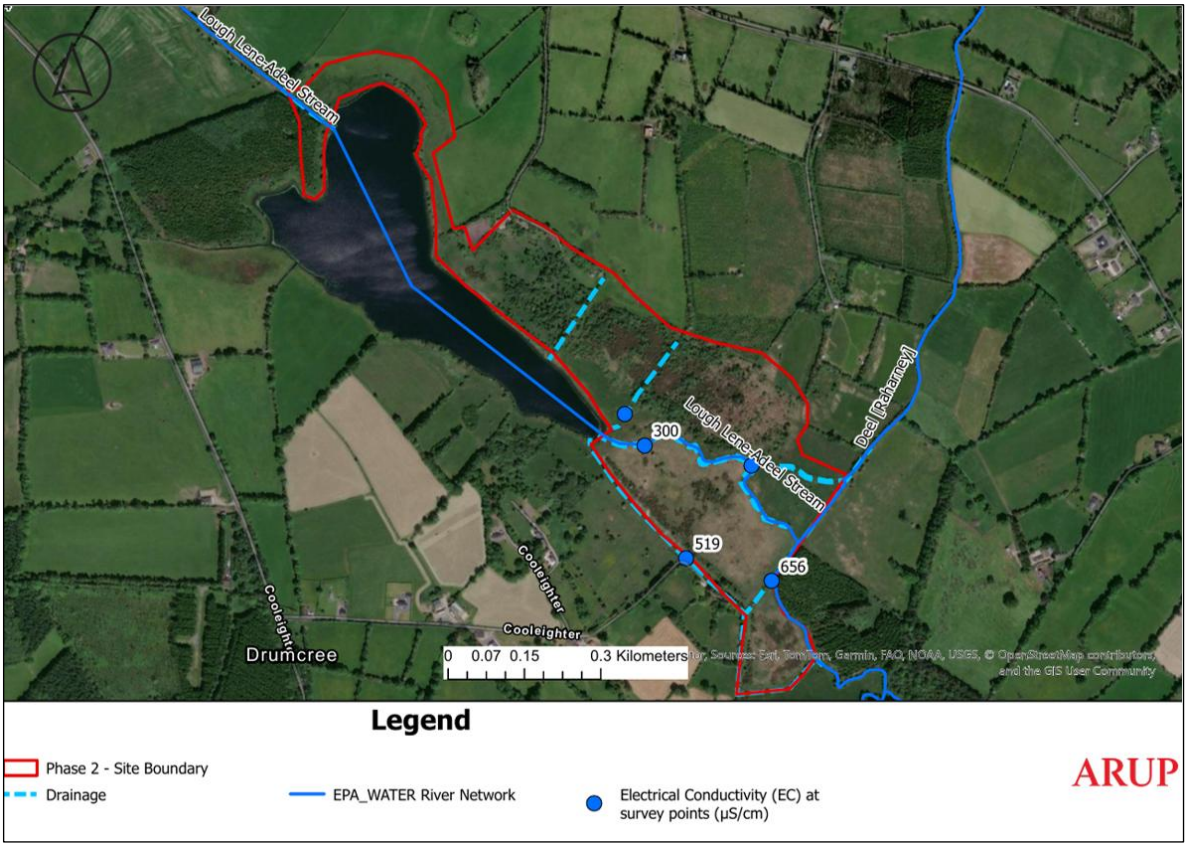


Figure 3-40: Electrical Conductivity (EC) (µS/cm) at survey points in Cummerstown

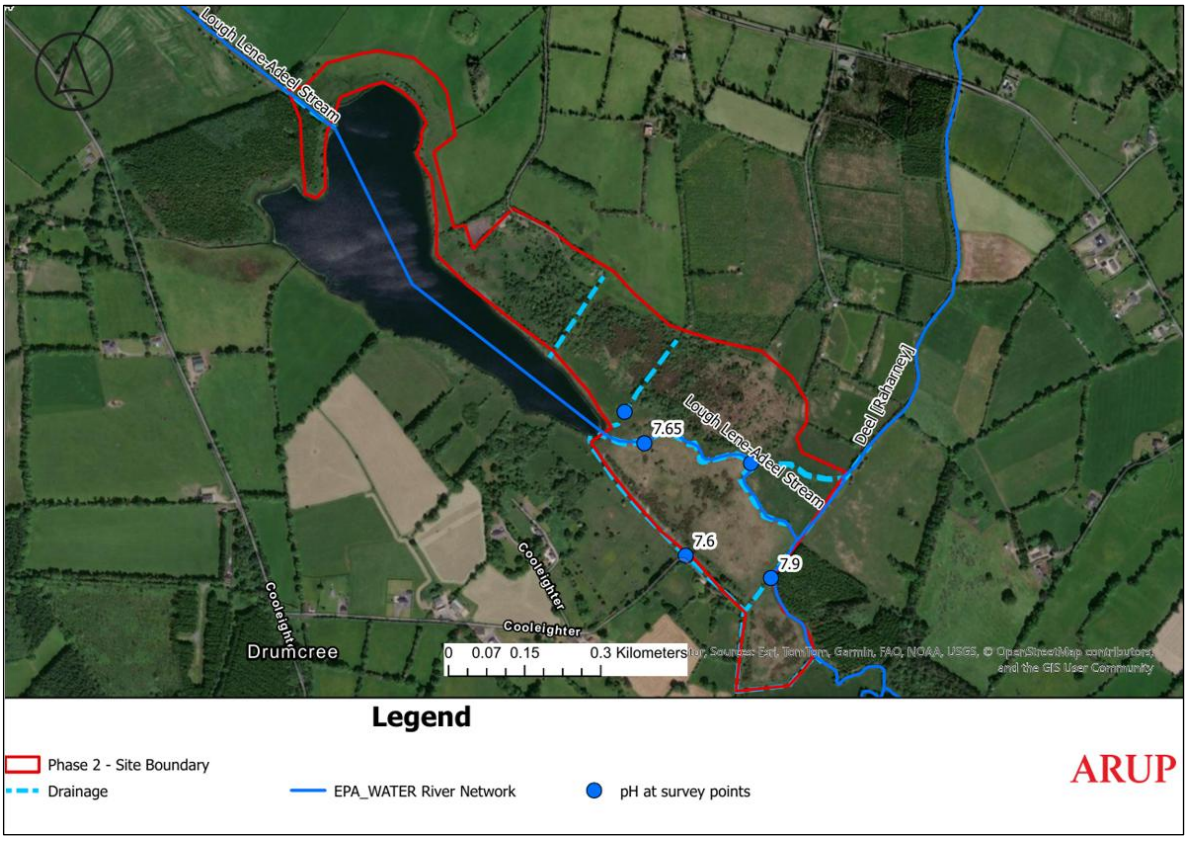


Figure 3-41: pH at survey points in Cummerstown

3.3 Conceptual Site Model

3.3.1.1 Newtown

Newtown is classified as a groundwater-fed valley-bottom fen (WETMEC 9), characterised by a low-lying basin centred on Newtown Lough, where groundwater discharge from the surrounding catchment, together with local surface water inflows, maintains the minerotrophic wetland conditions. Water moves through the site via the Kilskeer River and associated drainage network before discharging downstream within the River Boyne catchment. The site shows characteristics of both WETMEC 9a (wet groundwater bottom) and WETMEC 9b (part-drained groundwater bottom), reflecting the influence of historical drainage and hydrological modification on an otherwise groundwater-dependent fen system.

The classification is supported by the following information:

- Newtown is located at a low-lying topographic basin, with elevations decreasing from approximately 90 mOD in the northeast towards Newtown Lough at approximately 86 mOD.
- The site is underlain by the Lucan Formation ("Calp"), comprising argillaceous limestone and subordinate shale. The bedrock provides a source of base-rich groundwater and supports groundwater discharge to the wetland system.

- The site is underlain by a Locally Important Aquifer (LI), which is moderately productive only in local zones. Groundwater discharge from the surrounding catchment is considered an important component of the site's water balance.
- The Kilskeer River is the main surface water input, flowing from the northwest through Newtown Lough before continuing north-eastwards.
- Historical mapping (1897-1913) records one spring northeast of the site near the Kilskeer River and at approximately 20 m and three additional springs to the south and southeast, at approximately 450 m and 800 m, respectively. This indicates groundwater discharge within the local landscape.
- Field surveys identified seepage zones and potential springs in the northern part of the site, while evidence of paludal tufa deposition indicates continued influence of calcium-rich groundwater.
- Electrical conductivity values range from 455 to 552 µS/cm and pH values from 6.4 to 6.97, indicating relatively mineral-rich water and supporting the evidence of groundwater influence within the wetland system.
- Habitat distribution is strongly controlled by hydrological gradients associated with Newtown Lough, supporting a mosaic of alkaline fen, transition mire, swamp, wet grassland and wet woodland communities.
- Phosphate concentrations ranged from 0.10 to 0.27 mg/L and nitrate concentrations from 9.7 to 10.7 mg/L, suggesting that nutrient enrichment is occurring within site-associated surface waters, likely reflecting influences from surrounding land use.
- The National Fen Survey and subsequent site investigations identified hydrological modification and nutrient enrichment as the principal pressures affecting site condition. Drainage has altered natural water levels and contributed to habitat fragmentation across the wetland.
- The occurrence of Annex I alkaline fen habitat within a low-lying, groundwater-influenced setting, together with mineral-rich waters and evidence of sustained groundwater contribution, is consistent with the ecological expression of a groundwater-fed valley-bottom fen (WETMEC 9). Areas affected by drainage and hydrological modification are likely to correspond more closely to WETMEC 9b conditions.

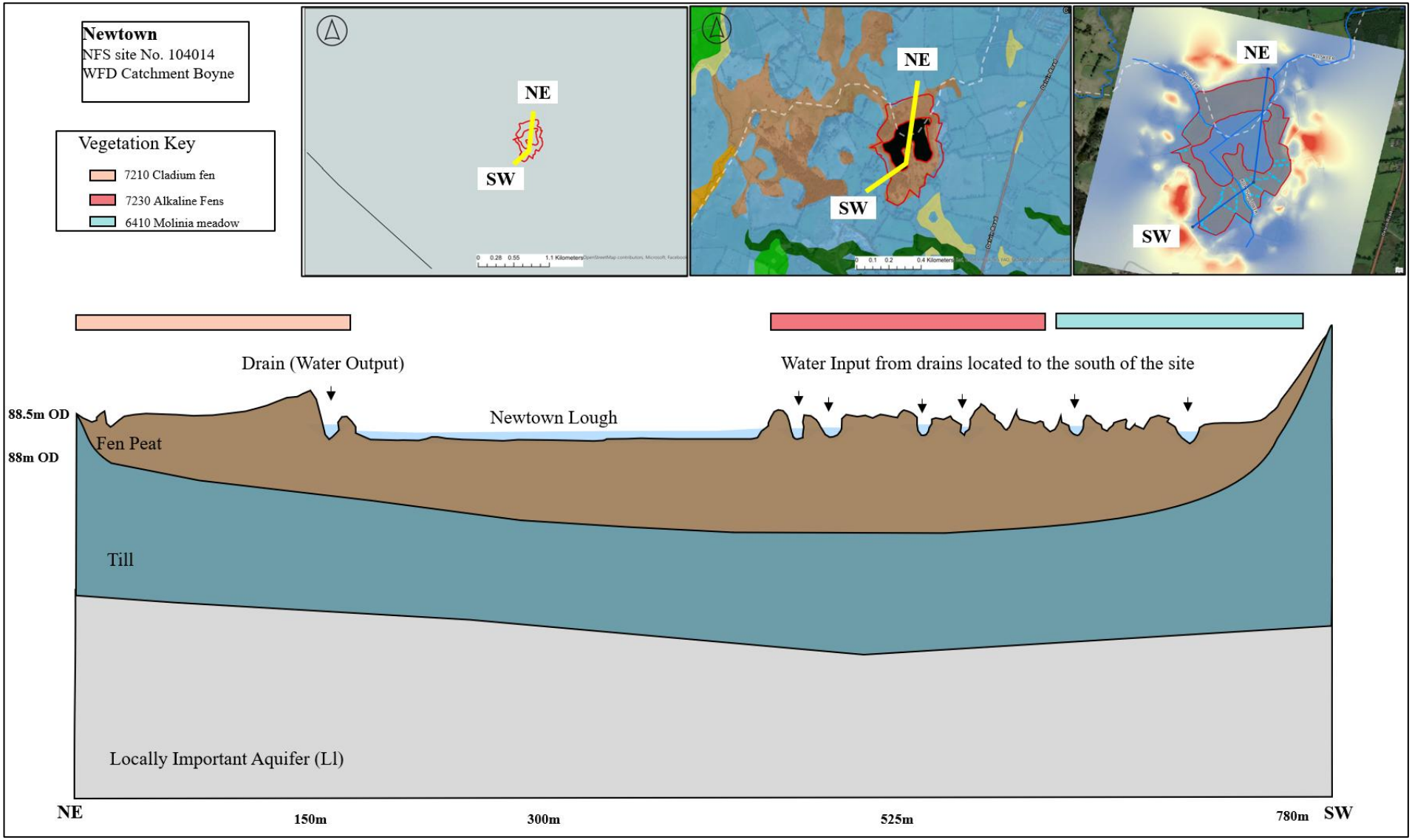


Figure 3-42: Conceptual Site Model for Newtown

3.3.1.2 Cummerstown

Cummerstown is classified as a groundwater-fed valley-bottom fen (WETMEC 9), characterised by a basin-like depression associated with Lough Adeel where groundwater discharge from the surrounding catchment (Lough Lene-Adeel Stream) represents the principal water source sustaining fen conditions. The site receives mineral-rich groundwater from adjacent higher ground, which accumulates within the low-lying wetland before flowing through the site via local surface water pathways and flowing out at the Deel (Raharney) River. Based on the available hydrological and hydrochemical evidence, the site most closely corresponds to WETMEC 9a (wet groundwater bottom), although localised areas may exhibit WETMEC 9b characteristics where hydrological functioning has been modified.

The classification is supported by the following information:

- The site is located within a low-lying basin associated with Lough Adeel, with elevations decreasing from approximately 86 mOD to 83 mOD at the lake. Higher ground surrounding the site provides potential for groundwater movement towards the wetland.
- The site is underlain by the Lucan Formation ("Calp") and a Locally Important aquifer (LI), which is moderately productive only in local zones.
- Surface water flows into Lough Adeel from the northwest via the Lough Lene-Adeel Stream (identified as an OPW Arterial Drainage) and flows out towards the southern area, at the Deel (Raharney) River. Hydrological pattern within the site is consistent to historical mapping and current observations and influence wetland the water levels.
- Water quality indicates groundwater influence, with electrical conductivity values ranging from 300 to 656 µS/cm.
- Phosphate concentrations ranged from 0.05 to 0.19 mg/L and nitrate concentrations from 2.6 to 12.1 mg/L, indicating that nutrient inputs are present within the site's surface water system and may be influenced by surrounding land uses.
- The site supports a diverse mosaic of alkaline fen, *Cladium mariscus* fen, transition mire, reed swamp, wet grassland, woodland and open-water habitats associated with Lough Adeel. Brown moss-rich vegetation, extensive *Cladium mariscus* stands and species-rich alkaline fen communities demonstrate the continued operation of fen-forming processes and the influence of base-rich conditions.
- The presence of species-rich alkaline fen and Cladium fen vegetation, together with evidence of groundwater influence from topography, geology and water chemistry, represents the expected ecological expression of a functioning groundwater-fed valley-bottom fen (WETMEC 9), with some modified areas more closely resembling WETMEC 9b conditions.

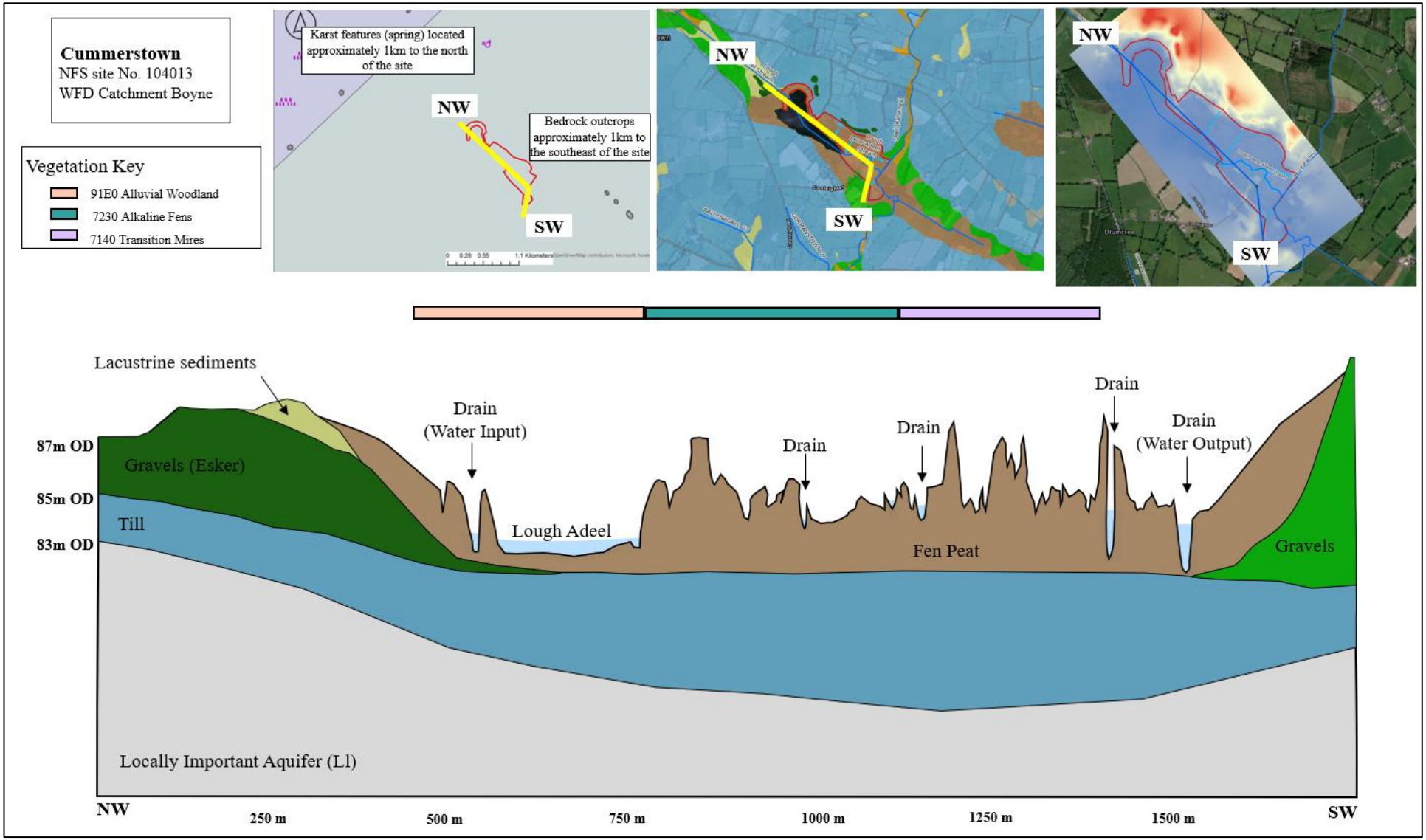


Figure 3-43: Conceptual Site Model for Cummerstown

4 Ecology

4.1 Desk Study

A review of available desktop information was undertaken to establish the ecological baseline for the Newtown and Cummerstown study area within the River Boyne and River Blackwater SAC. The review included the following information sources:

- NPWS Protected Sites – Special Areas of Conservation – The River Boyne and River Blackwater SAC;
- NPWS Article 17 habitats distribution datasets;
- NFS (Brophy et al., in prep);
- Biodiversity Maps - National Biodiversity Data Centre (NBDC); and
- Plant Atlas 2020 website - Botanical Society of Britain & Ireland (BSBI).

The NFS was commissioned to address knowledge gaps relating to the distribution, extent and condition of fen habitats. As noted in Section 1.1, Newtown and Cummerstown were surveyed in June and July 2023. The survey methodology included:

- Detailed vegetation assessments using quadrats to record species composition and structure;
- Hydrological observations including water levels and flow; and
- Documentation of disturbance indicators, including drainage, grazing, and invasive species.

GPS mapping and photographic records were also used to support habitat boundary delineation and condition assessment. While the primary emphasis was on habitat quality, vascular plants and bryophytes were recorded as part of the vegetation surveys, contributing to an understanding of species diversity and habitat integrity at the site.

The River Boyne and River Blackwater SAC overlap with The River Boyne and River Blackwater SPA, and Lough Shesk proposed Natural Heritage Area (pNHA) encompasses part of the Newtown site.

4.1.1 Habitats

The NFS identified that Newtown supports a mosaic of wet woodland, fen, grassland and open water habitats. Drains intersect the southern and south-eastern parts of Newtown, while several additional drains occur in the north, with drainage generally directed towards Newtown Lough. Lands to the east, south and west of Newtown Lough form part of Lough Shesk pNHAs. Fen habitats account for approximately 40% of the Newtown site, of which approximately 14% was identified as Annex I 7230 Alkaline fens.

The NFS at Cummerstown identified that the site consists of a complex mosaic of fens, gorse scrub, wet woodland, calcareous grassland, grassland verges, acid grassland, wet grassland, swamp and open water habitats around the northern shores of Lough Adeel. Approximately 10% of the Cummerstown site comprised fen habitat, including two areas of Annex I 7230 Alkaline fens.

Habitat maps for Newtown and Cummerstown are provided in Appendix B.

4.1.1.1 Annex Habitats

The Annex habitats that are QIs to the River Boyne and River Blackwater SAC. Both Annex habitats have been grouped by habitat and site below:

- **7230 Alkaline fens (Newtown):** A total of 1.92 ha of 7230 Alkaline fens was recorded. The majority comprised a black bog-rush *Schoenus nigricans* and purple moor-grass *Molinia caerulea* community, with associated species including bottle sedge *Carex rostrata*, long-stalked yellow-sedge *Carex lepidocarpa*, marsh pennywort *Hydrocotyle vulgaris*, creeping spear-moss *Scorpidium scorpioides* and marsh arrowgrass *Triglochin palustris* within a channel in the eastern part of Newtown. In several locations, this habitat degrades into non-Annex fen. Areas of the habitat show evidence of drainage and support scattered native trees and shrubs. The overall conservation status was assessed as 'Unfavourable-Bad';
- **7230 Alkaline fens (Cummerstown):** A total of 2.57 ha of 7230 Alkaline fens was recorded. Two principal areas of 7230 Alkaline fens were identified. In the north-east, rank black bog-rush and purple moor-grass fen forms a mosaic with 7210 Cladium fens dominated by great fen-sedge *Cladium mariscus*. The second area is located to the west, where a short-sedge alkaline fen community forms a mosaic with species-rich calcareous grassland that is currently grazed by horses. This transitions northwards, beyond fencing, into an ungrazed area of rank, black bog-rush, alkaline fen. The short-sedge community is particularly species-rich, supporting carnation sedge *Carex panicea*, glaucous sedge *Carex flacca*, marsh helleborine *Epipactis palustris*, fragrant orchid *Gymnadenia conopsea*, common spotted-orchid *Dactylorhiza fuchsii*, grass-of-Parnassus *Parnassia palustris*, marsh arrowgrass and golden star moss *Campylium stellatum*. This block also includes non-Annex I rich fen and flush (PF1) along parts of the lakeshore flood zone. A further small area of 7230 Alkaline fens occurs at the southern tip of Lough Adeel, where it forms a mosaic with rank and unmanaged 7210 Cladium fens. The overall conservation status of the habitat was assessed as 'Unfavourable–Inadequate';
- **91E0 Alluvial forest (Newtown):** 91E0 Alluvial forests occur mainly to the south-west, north-west and south of Newtown Lough. A condition score was not provided in the NFS, as the assessment focused on fen habitats.; and

- **91E0 Alluvial forest (Cummerstown):** 91E0 Alluvial forests occur to the north of Lough Adeel and extend along the northern boundary, with an additional area present on the eastern lakeshore.

Annex I quality habitats[1] were identified as follows:

- **7210 Cladium fens:** In Newtown, 2.62 ha occurs as a band around Newtown Lough, interspersed locally with common reed *Phragmites australis* and common club-rush *Schoenoplectus lacustris*. In Cummerstown, a smaller area of 0.84 ha forms a mosaic with 7230 Alkaline fens in the south-east and is generally rank;
- **7140 Transition mires:** In Newtown, 0.11 ha occurs around parts of Newtown Lough, including a small quaking mire at the southern end. In Cummerstown, 0.35 ha is present across three small patches: lakeshore fen at the reed-swamp edge dominated by bottle sedge *Carex rostrata*; a central clearing with poor fen and flush (PF2) and scrub; and an infilled lake basin in the south, formerly supporting transition mire, which is grazed by horses;
- **6430 Hydrophilous tall herb fringe communities**: This habitat was recorded only within Newtown, where it occurs in the centre of the site. Characteristic species include meadowsweet *Filipendula ulmaria*, purple loosestrife *Lythrum salicaria*, hedge bindweed *Calystegia sepium*, tufted vetch *Vicia cracca*, cleavers *Galium aparine*, false oat-grass *Arrhenatherum elatius* and common reed;
- **6410 Molinia meadows:** In Newtown, 0.42 ha occurs in the south, forming a mosaic with 7140 Transition mires and supporting high-quality indicators such as common spotted-orchid Dactylorhiza fuchsii. In Cummerstown, a small pocket forms a mosaic with non-Annex grassland in the north.; and
- **4010 Northern Atlantic wet heaths**– Recorded in Newtown only.

4.1.1.2 Non-Annex/Fossitt habitats

Non-Annex I fen and other habitats were also recorded within the Newtown and Cummerstown study area, with mapping based on the Fossitt (2000) classification. Table 4-1 presents the Fossitt habitats recorded, together with notes on their distribution across Newtown and Cummerstown.

Table 4-1: Fossitt Habitats recorded during the NFS at Newtown and Cummerstown

Fossitt Habitat	NFS site	Distribution and Notes
BL3 – Buildings and artificial surfaces	Cummerstown	Bare land at Cummerstown is present at the parcel located beside the access track.
FL3 – Acid oligotrophic lakes	Newtown & Cummerstown	Open water habitats associated with Newtown Lough and Lough Adeel.
FS1 – Reed and large sedge swamps	Newtown & Cummerstown	Surrounds much of Newtown Lough, with a large area to the north forming a mosaic with rich fen and flush (PF1). This habitat totals 2.96 ha across Newtown. Occurs along the north-western shore of Lough Adeel, totalling 1.27 ha across Cummerstown.
FS2 – Tall-herb swamps	Newtown	Forms a mosaic with GS4 south-east of Newtown Lough.
FW4 – Drainage ditches	Newtown & Cummerstown	Drains crisscross much of Newtown, particularly in the south-east and north-west. Outflow river of the lake and a deep canalized drain in the south of Cummerstown. Two old drains cut across the site from the centre east into the lake.
GA1 – Improved agricultural grassland	Cummerstown	A land parcel which forms part of the northern boundary at Cummerstown.
GS1 – Dry calcareous and neutral grassland	Cummerstown	Across various land parcels in Cummerstown to the north, centre as well as mosaic with WS1 in the south.
GS2 – Dry meadows and grassy verges	Newtown & Cummerstown	Forms a mosaic with GS4 to the west of Newtown. Parcel along the east boundary at Cummerstown as well as a larger portion in the centre.
GS3 - Dry-humid acid grassland	Cummerstown	Predominantly in the southern land parcels in Cummerstown.
GS4 – Wet grassland	Newtown & Cummerstown	Approximately 5.91 ha occurs across Cummerstown, forming mosaics with other habitats and dominating parts of the southern lakeshore and south-eastern boundary.
PB4 - Cutover bog	Cummerstown	Small land parcel within the centre of Cummerstown.
PF1 – Rich fen and flush	Newtown & Cummerstown	Distributed across Cummerstown, covering approximately 2.75 ha.
PF2 – Poor fen and flush	Cummerstown	Parcel to the south of Cummerstown, surrounded by GS3, approximately 0.23ha of habitat.
PF3 – Transition mires and quaking bogs	Newtown & Cummerstown	Forms a mosaic at Cummerstown within an area to the south of Lough Adeel, covering approximately 0.35 ha.
WD1 - (Mixed) broadleaved woodland	Cummerstown	Woodland present within scrub at access track at Cummerstown.
WD4 – Conifer plantation	Cummerstown	Recorded along north-west shores of the Cummerstown Lough
WL2 – Treeline	Newtown & Cummerstown	Treeline present in land parcels to the west of Newtown
WN6 – Wet willow-alder-ash woodland	Newtown & Cummerstown	Mosaic with PF1 on land extending into Newtown Lough.

Fossitt Habitat	NFS site	Distribution and Notes
WS1 – Scrub	Newtown & Cummerstown	Mosaic with PF1 on land extending into Newtown Lough in addition to scattered along north-east shores of the Lough.

4.1.2 Species

The following subsections outline species recorded within the Newtown and Cummerstown study area, and within the wider zone of influence (ZoI). This includes protected species listed under relevant legislation and conservation frameworks such as the EU Habitats and Birds Directives (Annex I, II, IV, and V), the Irish Red Lists, and the Wildlife Acts (including species protected under the Flora Protection Order. Where available, maps of recorded sightings will be provided to support spatial understanding of species distribution. Records are limited to those from the past ten years, reflecting the most plausible timeframe for continued presence and ecological relevance to the site - excepting where invasive species have been historically recorded and there has been no indication since of their elimination.

4.2 Species Within the Site

A review of species records held by the NBDC identified no protected or sensitive species records from within the Newtown site boundary. The only protected or notable species identified within the Cummerstown site were whooper swan *Cygnus cygnus*, an Annex I species protected under the Birds Directive and the Wildlife Acts, and snipe *Gallinago gallinago*, which was recorded during the 2026 walkover survey[3].

4.2.1.1 Species within the Zone of Influence

The 2 km grid square in which the Newtown site is located contains NBDC records of buzzard *Buteo buteo* and otter *Lutra lutra*. Buzzard is protected under the Wildlife Acts, while otter is protected under the Wildlife Acts and is listed under Annex II and Annex IV of the Habitats Directive. These records are not identified as originating from within the Newtown site boundary. Therefore, desk-study records alone do not confirm the presence of protected or sensitive species within Newtown.

NBDC records indicate the presence of several species with legislative protection within the 2km grid square around the Cummerstown site (Table 4-2). Based on the desk-study review,

[3] Although NBDC records indicate few or no protected species recorded directly within the site boundaries, this should not be interpreted as confirmation of absence. NBDC data are opportunistic and reliant submissions and therefore do not provide comprehensive coverage of all taxa present. As such, the limited number of records likely reflects a lack of biological recording rather than a lack of ecological value. Consequently, the potential for protected or otherwise sensitive species to occur cannot be ruled out based on desk-study data alone, and field survey results remain essential to establish the true species assemblage present within both sub-sites.

these species may occur within or adjacent to the site where suitable habitat is present; however, the records do not confirm presence within the site boundary unless stated.

Table 4-2: Species records withing the Zone of Influence of Cummerstown

Legislative Protection	Common Name	Latin Name	Date of Most Recent Record
Birds Directive & Wildlife Acts	Kingfisher	*Alcedo atthis*	21/09/2021
Birds Directive & Wildlife Acts	Short-eared owl	Asio flammeus	06/03/2021
Birds Directive & Wildlife Acts	Whooper swan	Cygnus cygnus	11/10/2021
Birds Directive & Wildlife Acts	Mute swan	Cygnus olor	09/04/2021
Birds Directive & Wildlife Acts	Goldcrest	Regulus regulus	15/09/2021
Birds Directive & Wildlife Acts	Great crested grebe	Podiceps cristatus	20/05/2010
Birds Directive & Wildlife Acts	House martin	Delichon urbicum	24/05/2021
Birds Directive & Wildlife Acts	Swallow	Hirundo rustica	01/10/2021
EU Habitats Directive Annex V Wildlife Acts	Pine marten	Martes martes	08/05/2021
Wildlife Acts	Badger	Meles meles	31/12/2012
Wildlife Acts	Hedgehog	Erinaceus europaeus	01/05/2021

4.3 Field Survey

Following review of available desktop data, targeted ecological surveys were undertaken at Newtown and Cummerstown in May and July 2026 to collect site-specific baseline data to inform the FRP.

The field surveys concentrated on key areas highlighted during the desk-based assessment, specifically those with potential for restoration activities. These locations were investigated in detail to verify and further assess ecological conditions and parameters, ensuring that any recommended restoration measures would be both appropriate and effective in the identified zones.

Two survey forms were created to collect data relevant to:

- Monitoring data; and
- Pressures and threats.

4.3.1 Monitoring Points

The targeted walkover survey was designed to gather site-specific ecological data at pre-identified monitoring points. The walkover was designed to assess ecological condition at pre-identified monitoring points. Monitoring points 1-5 are located at Newtown, while monitoring points 6-9 are located at Cummerstown. All monitoring points were selected based on the presence of hydrological features, habitat potential and restoration feasibility. The locations were determined through expert discussion and review of baseline data and are intended to

provide fixed monitoring stations for future assessment. Monitoring locations are shown in Appendix B.

These monitoring points now serve a dual purpose:

- Baseline characterisation of current site conditions; and
- Long-term monitoring stations to assess ecological change following restoration.

The surveys focused on two key components:

- Target Notes: Qualitative observations at each monitoring point, capturing site condition, vegetation structure, hydrological features, and legacy management; and
- Pressures and Threats Identification: Systematic recording of anthropogenic and natural pressures affecting each location.

The surveys confirmed the presence of Annex I 7230 Alkaline fens, Annex I quality 7140 Transition mires and Annex I quality 7210 Cladium fens within the study area. Annex I 7230 Alkaline fens were recorded at monitoring points 1, 3, 4, 5 and 6; 7140 Transition mires were recorded at monitoring points 2 and 8; and 7210 Cladium fens were recorded at monitoring point 7.

4.3.2 Pressure & Threats

This section outlines the historical and current pressures and threats affecting fen habitats within Newtown and Cummerstown. Information was collated from the 2026 ecological walkover and monitoring surveys and supplemented by site observations recorded during restoration planning surveys[4]. The assessment identifies distinguishes between pressures recorded during the NFS and pressures observed during the 2026 field surveys.

4.3.2.1 Historical Pressures & Threats

The NFS identified a number of historical pressures affecting Annex I fen habitats at Newtown and Cummerstown. The principal pressures identified were drainage, nutrient enrichment, abandonment of pastoral systems / undergrazing, scrub encroachment and overgrazing.

- **Drainage**: Drainage was identified as a high impact, affecting fen habitats within both Newtown and Cummerstown. Drainage for agricultural land use was recorded as having a medium to high impact on 7210 Cladium fens and 7230 Alkaline fens at Newtown, and a low to medium impact on 7140 Transition mires, 7210 Cladium

[4] Pressure and threat information for Cummerstown was collected using monitoring point-based pressure and threat forms. Equivalent forms were not completed for Newtown; therefore, pressure information for Newtown was derived from ecological walkover observations and restoration planning notes.

fens and 7230 Alkaline fens at Cummerstown. Drainage has altered hydrological conditions and contributed to the degradation of fen habitat;

- **Nutrient enrichment**: Nutrient enrichment associated with agricultural activities was recorded as a low impact pressure at both Newtown and Cummerstown. Elevated nutrient inputs have the potential to alter vegetation composition and reduce habitat quality;
- **Abandonment of pastoral systems / undergrazing**: Abandonment of management and undergrazing were recorded as low impact pressures affecting fen habitats at both Newtown and Cummerstown. Reduced grazing pressure can result in the development of rank vegetation and a decline in habitat quality;
- **Scrub encroachment**: Scrub encroachment was identified as a low impact pressure affecting fen habitats within both sub-sites. The expansion of scrub vegetation can reduce the extent of open fen habitat and contribute to changes in vegetation structure and composition. These were noted as invasive non-natives species such as conifer saplings;
- **Overgrazing**: Overgrazing was identified as a low impact pressure affecting 7210 Cladium fens and 7230 Alkaline fens within Newtown. Localised grazing pressure resulted in trampling and poaching of fen habitats where stocking pressures are excessive at both sites.

4.3.2.2 Current Pressures

Drainage

- Drainage was identified as a pressure affecting parts of Newtown, particularly along the south-eastern and eastern margins of Newtown Lough. Several drains were recorded running perpendicular to the lakeshore through areas supporting 7230 Alkaline fens and adjacent wet grassland. Additional drainage features were noted within the south-western sector, where 7140 Transition mires occur within a mosaic of poor fen and flush, wet woodland and cutover bog (PB4). Drainage effects were most evident within the eastern part of the site, where modified hydrological conditions coincided with fenced areas of fen habitat; and
- Drainage was recorded as affecting the Cummerstown site at monitoring points 6 and 9. Historical lake level lowering, drainage activity and associated hydrological modification were evident across parts of the site. At monitoring point 6, supporting 7230 Alkaline fen, remnant fen vegetation occurred within an area affected by historical drainage and former peat cutting activity, with water levels recorded approximately 50–70 cm below the fen surface. Monitoring point 9 was similarly identified as former fen habitat affected by lake-level lowering and adjacent drains;

Abandonment of pastoral systems / undergrazing

- Undergrazing was identified across parts of Newtown, particularly within the south-eastern, eastern and south-western sections where fen habitats have been fenced off from livestock grazing. Areas supporting 7230 Alkaline fen, 7140 Transition mires and associated wet grassland were recorded as receiving little or no active grazing management. Field observations indicated low grazing pressure and an absence of regular management in these areas; and
- At Cummerstown, grazing was recorded as absent at monitoring points 6, 8 and 9, while abandonment of pastoral systems was identified at monitoring points 6 and 9. Field observations indicated that active management was currently absent across these areas, despite historical evidence indicating that parts of the site had previously been managed through grazing;

Scrub encroachment:

- Scrub encroachment was identified within the south-eastern and eastern parts of Newtown, particularly in areas where fen habitats have been excluded from grazing. Scrub development was associated with drainage features and ungrazed sections of lakeshore fen supporting 7230 Alkaline fens and 7210 Cladium fens. Localised scrub was also recorded within wetland habitat mosaics surrounding Newtown lough; and
- Scrub encroachment was identified as a localised pressure at Cummerstown's monitoring point 8, which supported 7140 Transition mires. The monitoring location was surrounded by established willow Salix spp. scrub. No significant active scrub expansion was recorded during the survey.

Overgrazing:

Overgrazing was identified on the western side of the Newtown site, where a narrow band of lakeshore fen and adjoining wet grassland showed evidence of poaching and intensive livestock use. This pressure was primarily associated with areas supporting 7210 Cladium fens and adjacent wetland habitats, where grazing intensity appeared greater than elsewhere across the site.

4.3.3 Additional Observations

4.3.3.1 Newtown

The monitoring points indicate that habitat distribution at Newtown is strongly influenced by local hydrological gradients associated with Newtown Lough. Small changes in topography and water availability support a mosaic of alkaline fen, transition mire, swamp, wet grassland and wet woodland habitats, creating a diverse sequence of transitional communities between open water and terrestrial habitats. The close spatial association of these habitats highlights the ecological connectivity that exists across the wetland complex.

Evidence of paludal tufa deposition within wetter areas suggests the continued influence of base-rich groundwater and reinforces the importance of groundwater-fed processes in maintaining habitat diversity. The repeated occurrence of alkaline fen around the lake margins indicates that these groundwater influences remain a key driver of habitat distribution within the site.

The site displays a high degree of structural diversity, with open-water habitats grading through swamp and fen communities into scrub, woodland and grassland habitats. This habitat heterogeneity contributes significantly to the ecological value of Newtown and supports a wide range of wetland conditions within a relatively small area.

4.3.3.2 Cummerstown

The monitoring points indicate that Cummerstown supports a diverse wetland mosaic characterised by strong transitions between fen, wet grassland, reed swamp, woodland and open-water habitats associated with Lough Adeel. Variation in water levels across the site contributes to fine-scale habitat diversity and supports a range of wetland communities within the wider landscape.

The presence of species-rich alkaline fen, Cladium fen and transition mire communities demonstrate that key fen-forming processes remain active within parts of the site. Brown moss-rich vegetation, extensive stands of Cladium mariscus and the occurrence of characteristic fen species indicate the continued influence of base-rich conditions across sections of the wetland complex.

Habitat connectivity is a notable feature of the site, with extensive transitional zones occurring between open water, reed swamp, fen and wet grassland communities. These transitions increase ecological heterogeneity and contribute to the overall biodiversity value of the wetland system.

4.3.4 Site Conservation Priority Matrix for the River Boyne and River Blackwater SAC Site

The Site Conservation Priority Matrix (Table 4-3) summarises the key ecological receptors identified within the River Boyne and River Blackwater SAC, the principal pressures and threats affecting them, and the restoration measures proposed in response. The matrix provides a high-level overview of the relationship between identified pressures and the restoration actions presented later in this FRP.

Table 4-3: Site Priority Conservation Matrix for the River Boyne and River Blackwater SAC

Level	Feature Type	Feature Name	Extent/ Population	Pressure/Threat affecting it	Restoration Measure On-Site	Restoration Measure Off- Site
1	SAC Habitat (Annex 1 habitat)	7230 Alkaline fens	4.49 ha	Drainage Abandonment of pastoral systems / undergrazing Scrub encroachment	Drain blocking Hydrology monitoring Conservation grazing Targeted scrub clearance along drains and encroaching scrub edges	Engagement with landowners
	Annex I quality habitat (Non-QI)	6410 Molinia meadows	0.42 ha	N/A	N/A	N/A
		7210 Cladium fens	0.46 ha	Drainage Abandonment of pastoral systems / undergrazing Localised overgrazing and poaching Scrub encroachment	Drain blocking Hydrology monitoring Grazing management Targeted scrub clearance along drains and encroaching scrub edges	N/A
		7140 Transition mires	3.46 ha	Drainage Abandonment of pastoral systems / undergrazing Scrub encroachment	Drain blocking Hydrology monitoring Conservation grazing Targeted scrub clearance along drains and encroaching scrub edges	Engagement with landowners
		91E0 Alluvial forest	N/A	Drainage	Drain blocking Hydrology monitoring	N/A

Level	Feature Type	Feature Name	Extent/ Population	Pressure/Threat affecting it	Restoration Measure On-Site	Restoration Measure Off- Site
		6430 Hydrophilous tall herb fringe	N/A	N/A	N/A	N/A
2	pNHA Habitat	Lough Shesk	N/A	Drainage Abandonment of pastoral systems / undergrazing Scrub encroachment	Drain blocking Hydrology monitoring Conservation grazing Targeted scrub clearance along drains and encroaching scrub edges	Landowner engagement
3	European Priority Species	Otter	Record of species within 2km	Deterioration of wetland habitat quality through drainage	Drain blocking Hydrology monitoring	
		Whooper swan		Drainage Abandonment of pastoral systems / undergrazing Scrub encroachment	Drain blocking Hydrology monitoring Conservation grazing Targeted scrub clearance along drains and encroaching scrub edges	
4	Nationally important species	See Table 4-1 and Table 4-2 **Table 4-2**	See Table 4-1 and Table 4-2**Table 4-2**			
5	Habitats and species of local interest	See Table 4-1 and Table 4-2**Table 4-2**	See Table 4-1 and Table 4-2**Table 4-2**			

Note: Conservation grazing measures refer only to areas considered suitable for livestock access. See Section 4.3.3.1 for site specific details on Newtown where areas have been identified as unsuitable for grazing.

4.4 Impact Assessment Notes

The restoration measures proposed for the River Boyne and River Blackwater SAC focuses on hydrological restoration, including drain blocking and hydrological monitoring, alongside vegetation management measures such as conservation grazing and targeted scrub management. These measures are intended to address the principal pressures identified at the site, namely drainage, abandonment of pastoral systems/undergrazing, scrub encroachment and nutrient enrichment.

Hydrological restoration measures have the potential to alter local water levels and flow pathways within the fen system. In the short term, localised changes in surface water distribution may occur in proximity to restoration works. However, these changes are necessary to restore the hydrological conditions required to support 7230 Alkaline fens, 7210 Cladium fens and 7140 Transition mires. Over the medium to long term, restoration of more natural hydrological conditions is expected to improve habitat function and support recovery of fen vegetation.

Vegetation management measures, including conservation grazing and targeted scrub removal, may result in temporary disturbance during implementation. However, these measures are intended to address the impacts of undergrazing and vegetation succession currently affecting parts of the site. Improved vegetation structure and reduced scrub encroachment are expected to support the maintenance and recovery of characteristic fen communities.

There is potential for short-term impacts on water quality during implementation, particularly where the potential for disturbance of sediments or mobilisation of nutrients could occur within the drainage network. This is of particular relevance given the nutrient enrichment pressures identified within parts of the site. Appropriate pollution prevention measures, together with hydrological and water quality monitoring, should therefore be incorporated into implementation planning.

Restoration works also have the potential to result in temporary disturbance to protected and notable species, including otter and wintering bird species. Consideration should therefore be given to appropriate timing of works and pre-construction ecological checks where required.

Consideration should be given to potential indirect effects on the qualifying interests of the River Boyne and River Blackwater SAC through hydrological and water quality pathways. These pathways should be assessed as part of any future Appropriate Assessment screening undertaken prior to implementation of restoration measures.

Overall, the potential impacts associated with implementation of the restoration measures are considered short-term and manageable. Subject to appropriate design, implementation and monitoring, the proposed measures are expected to result in long-term ecological benefits through restoration of hydrological function, improved vegetation structure and recovery of fen habitat condition.

4.5 Good Practice Recommendations

Several good practice measures are recommended based on the requirement for compliance with legislation but also the occurrence of sensitive receptors and possible pathways for negative effects during preparation for or implementation of restoration actions. These are summarised in Table 4-4 and should be taken as generally applicable in the planning of FRP.

Consultation with relevant NPWS staff should be undertaken prior to implementation to obtain more recent or up to date information on the locations of sensitive receptors, and buffers revised accordingly. Any further requirements outlined by NPWS at pre implementation stage should also be adhered to.

Table 4-4: Good Practice Recommendations

Receptor	Measure
Ground nesting birds	No vegetation clearance or activity which might contravene Section 40 of the wildlife act (consolidated) should be undertaken.
Invasive Alien Species	All vehicles should undergo stream cleaning before site entry. Identified buffers on IAS should be avoided during site preparation and restoration implementation.
Protection of European Sites	Any required mitigation measures to avoid potentially adverse effects on European Sites should be incorporated into an Environmental Management Plan or Checklist of Environmental Commitments. Implementation should be overseen by a suitably qualified ecologist.
Protection of Sensitive Habitats	High sensitivity habitats should be protected from long term damage by the use of low-pressure vehicles. Extensive repeated tracking over fen habitat or any other identified priority habitat should be avoided. The storage locations of any materials should avoid high & medium sensitivity habitats.

5 Key Pressures – Field Validation and Evaluation

The FRP considers pressures on River Boyne and River Blackwater SAC through an initial desktop assessment of existing information on the site (including previous NPWS commissioned surveys), assessment of land, water and topographic data and aerial imagery, followed by field surveys to characterise and confirm key pressures mapped through desktop assessment. Consultation with NPWS Regional Staff was also undertaken, including a visit with the Conservation Ranger for the area to inform identification of pressures.

The NFS undertook a site evaluation and ranking which determined the conservation value of the site. This evaluation considered 15 criteria as outlined which included naturalness, non-recreatability, potential value, typicality, educational value, size, diversity, fen value, rarity of species, rarity of habitats, viability, recorded history, management needs, intrinsic appeal and expert opinion. These criteria then informed the overall conservation status assessment was applied based.

The conservation status assessment results for River Boyne and River Blackwater SAC are summarised in Table 5-1 for Newtown and Table 5-2 for Cummerstown.

Table 5-1: Conservation Status Assessment as per NFS 2023 Newtown (Brophy et al, In prep)

OVERALL CONSERVATION STATUS ASSESSMENT				
Annex I habitat	**Area**	**Structure & functions**	**Future prospects**	**Overall Conservation Status**
7140	Favourable	Unfavourable-Bad	Not assessed	Not assessed
7210	Favourable	Unfavourable-Bad	Unfavourable-Bad	Unfavourable-Bad
7230	Favourable	Unfavourable-Bad	Unfavourable-Bad	Unfavourable-Bad

Table 5-2: Conservation Status Assessment as per NFS 2023 Cummerstown (Brophy et al, In prep)

OVERALL CONSERVATION STATUS ASSESSMENT				
Annex I habitat	**Area**	**Structure & functions**	**Future prospects**	**Overall Conservation Status**
7140	Favourable	Favourable	Not assessed	Not assessed
7210	Favourable	Unfavourable-Bad	Unfavourable-Bad	Unfavourable-Bad
7230	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate

5.1 Field surveys of key pressures

Following completion of desktop mapping of key pressure, field surveys were carried out by personnel to verify the findings of the desktop assessment and characterise conditions of the pressures to inform selection of appropriate restoration actions required. The site surveys are discussed in Sections 3.2 and Section 4.2. These surveys aimed to capture information on the land and water environment such as drainage features, peat depth and water quality and the ecology.

As part of the ecology monitoring surveys, pressures and threats associated with the monitoring point were recorded. A summary is provided within Section 5.2.

5.2 Key Pressures

An overview of the key pressures identified on site, following desktop review and site visits are summarised below.

The NFS and subsequent walkover observations identify hydrological modification and nutrient enrichment as the principal pressures affecting the condition and restoration potential of fen, swamp and associated wetland habitats at Newtown and Cummerstown. Drainage associated with historical land management has altered natural hydrological regimes across both sites, resulting in water loss, reduced groundwater levels and fragmentation of wetland habitats. Nutrient inputs from surrounding agricultural land, forestry operations and local point sources also present a risk to water quality and ecological condition.

An overview of the key pressures identified across the two sites, following desktop review, LiDAR analysis and in-situ walkovers, is summarised below.

All identified pressures and threats, both historical and currently observed, have been comprehensively considered within the FRP to inform appropriate remediation measures. The proposed suite of restoration actions combines hydrological restoration with vegetation-based interventions. These actions are designed to support the long-term conservation of Annex I habitats within the SAC, while providing co-benefits to associated non-Annex habitats and protected species.

The prioritisation of pressures was informed by a review of NFS data and observations recorded during field surveys. The implementation of these measures, supported by ongoing hydrological, water quality and vegetation monitoring, will contribute to restoring ecosystem function, improving habitat condition and resilience, and supporting the long-term achievement of the site-specific conservation objectives for the SAC.

5.2.1 Flora and Fauna Pressures

The principal flora and fauna pressures affecting the River Boyne and River Blackwater SAC relate to grazing management and vegetation succession. These pressures influence vegetation structure, habitat composition and the long-term viability of fen communities across the site.

- **Abandonment of pastoral systems / undergrazing**: Appropriate grazing is an important ecological process in fen systems, helping to maintain open vegetation structure and limit the dominance of competitive species. Where grazing levels are insufficient, vegetation can become increasingly rank, resulting in the accumulation of biomass, reduced structural diversity and increasingly favourable conditions for scrub establishment. Over time, this can lead to a decline in habitat quality and a reduction in the extent of vegetation characteristic of Annex I 7230 Alkaline fens, Annex I quality 7210 Cladium fens and Annex I quality 7140 Transition mires habitats;
- **Overgrazing and poaching**: While undergrazing represents the dominant grazing-related pressure across the site, localised overgrazing pressure was identified within the west side of Newtown where livestock have access to sensitive lakeshore habitats. Excessive grazing pressure can result in trampling, poaching and damage to wetland vegetation, particularly in areas of soft or waterlogged ground. While grazing remains an important management tool for fen restoration, inappropriate grazing intensity can adversely affect habitat structure and reduce the ecological quality of fen communities. Achieving an appropriate grazing regime is therefore important to support habitat recovery whilst avoiding localised degradation; and
- **Scrub encroachment and vegetation succession**: Scrub development is a common response to changes in management and hydrological conditions within fen systems. The establishment and expansion of woody species can increase shading, alter vegetation composition and contribute to the gradual loss of open fen habitat. Scrub encroachment may also influence local hydrological conditions through increased evapotranspiration. If unmanaged, vegetation succession has the potential to reduce the extent and ecological function of fen habitats across the site.



Figure 5-1: Flora & Fauna Pressures mapped within The River Boyne and River Blackwater SAC (Cummerstown)



Figure 5-2: Flora & Fauna Pressures mapped within The River Boyne and River Blackwater SAC (Newtown)

5.2.2 Fen Hydrology Pressures

Drainage represents the principal pressure affecting fen habitats within the River Boyne and River Blackwater SAC. The ecological function of fen and associated wetland habitats is dependent upon the maintenance of stable groundwater, influenced hydrological conditions and prolonged periods of soil saturation. Alterations to natural hydrological processes can disrupt the interaction between groundwater, surface water and vegetation communities, resulting in changes to habitat structure, species composition and ecological function.

The SAC supports a mosaic of Annex I habitats, including 7230 Alkaline fens, 7210 Cladium fens and 7140 Transition mires and quaking bogs, all of which depend on appropriate water levels and hydrochemical conditions.

At Newtown, within the southern and south-eastern areas of the site, the multiple drainage channels that converge before discharging into the lake, are considered particularly significant. Additional drains traverse the northern part of the site and may contribute to reduced water retention and localised lowering of water levels. A drain located in the north-eastern area which was recently excavated may also be contributing to localised drying and requires further investigation.

At Cummerstown, drainage has modified the natural hydrology of fen and swamp habitats through a series of drains located particularly within the southern area of the site and along the western and southern boundaries. The southern drainage network is connected to the Lough Lene outflow stream and the Deel (Raharney) watercourse and facilitates water loss from the wetland system, contributing to altered hydrological conditions across adjoining habitats.

Hydrological modification is also likely to have contributed to habitat fragmentation and the degradation of former wetland areas within both sites, reducing the extent and connectivity of habitats capable of supporting characteristic fen communities.

5.2.3 Fen Nutrient Pressures

Nutrient enrichment was identified during the NFS 2023 (Brophy et al, In prep) and remains a potential pressure affecting the ecological condition of wetland habitats within the River Boyne and River Blackwater SAC. Elevated nutrient inputs can alter hydrochemical conditions, promote the growth of competitive vegetation and algae, and reduce the abundance and diversity of characteristic fen species.

At Newtown, diffuse nutrient inputs from adjacent agricultural land and forestry operations represent potential sources of nutrient enrichment. Nutrients may enter the site via connected surface water features and the drainage network, which provides hydrological connectivity between the wider catchment and wetland habitats.

At Cummerstown, nutrient pressures are associated primarily with surrounding agricultural land uses. A manure pile recorded during the NFS 2023 (Brophy et al, In prep) represents a potential point source of nutrient input, while runoff from adjacent agricultural land may contribute diffuse nutrient loading to the wetland system through connected drains and watercourses.

While potential nutrient pathways are present at both sites, ecological surveys undertaken to inform this FRP did not identify widespread evidence of nutrient-related habitat degradation. Consequently, nutrient enrichment is considered a secondary pressure, with hydrological modification remaining the principal factor affecting habitat condition and restoration potential.

6 Restoration Measures

6.1 Introduction

The restoration actions proposed by the FRP will help to maintain or improve the quality of existing areas of fens and improve the conditions that will allow an expansion of the area of fen. In some areas it must be recognised that restoration to fen habitat will not be possible, and the objective may simply be to improve the habitat condition.

Selection of the most appropriate restoration action depends on a range of factors including peat depth, hydrological conditions (flow rates, existing and expected flow paths after restoration), substrate type, existing ecological conditions, potential ecological constraints and practicality of access for machinery.

Each of the factors was considered based on a combination of desktop analysis combined with site-specific field surveys to select the most appropriate restoration technique to address each pressure considered by the FRP. The restoration measures proposed are outlined in Section 6.2 to Section 6.4, with detailed mapping of proposed measures illustrated in the maps provided in Appendix B.

The River Boyne and River Blackwater SAC comprise multiple landownership and management units. Differences in grazing practices, drainage management and historical land use have contributed to variation in habitat condition across the site. Successful implementation of restoration measures will therefore require engagement with multiple landowners and stakeholders to facilitate a coordinated approach to hydrological restoration, grazing management and long-term habitat management.

6.2 Hydrology Measures

6.2.1 On-site Fen Hydrology Measures

6.2.1.1 Drainage Measures

Drain blocking is proposed as the primary hydrological restoration measure for the River Boyne and River Blackwater SAC. The objective is to increase water retention within the system, reduce the influence of artificial drainage, and restore the hydrological conditions required to support habitats development within 7230 Alkaline fens, 7210 Cladium fens, and 7140 Transition mires. Drainage has been identified as the principal pressure affecting habitats at both Newtown and Cummerstown.

- Cummerstown

At Cummerstown, drain-blocking measures are proposed at three locations to restore hydrological conditions in areas affected by historical drainage and hydrological modification, particularly within the eastern and southern parts of the site, linked to the Lough Lene-Adeel Stream. By increasing water retention and reducing drainage-related drawdown, these

measures are expected to promote the development and maintenance of favourable wetland conditions for Annex I habitats, including 7230 Alkaline fens, 7210 Cladium fens and 7140 Transition mires, supporting the recovery of characteristic fen vegetation and ecological function

Drain blocking at the central-eastern area is targeted within an old internal drain. A short section close to the Newtown Lough should be blocked to increase wetness within nearby habitats. The south-eastern drain has not been considered since there are no habitats requiring hydrological improvement at this area.

Drain blocking is also proposed at two locations along the Lough Lene-Adeel Stream, in the southern area. The first location is within the upper section of the stream, close to the Lough Adeel, where a small area of high-quality fen habitat would benefit from improved hydrological conditions. The second location is within the central section of the stream and is intended to improve and maintain wet conditions within the Annex I 7230 Alkaline fen habitats located immediately north of the watercourse. These proposed restorations aim to improve hydrological connectivity between fen and wet woodland habitats while reducing water losses from the wetland system where feasible.

The Lough Lene-Adeel Stream is part of the OPW ADS watercourse and should therefore be considered separately from internal drainage drain measures. Any future proposals affecting this channel would require detailed hydrological assessment, consultation with relevant stakeholders, and completion of any necessary statutory approvals. Consequently, measures affecting this watercourse should be considered long-term restoration measures due their greater complexity, whereas measures affecting the internal drains should be considered short-term restoration measures.

- Newtown

At Newtown, drain-blocking measures are proposed at four locations to restore hydrological conditions in areas affected by historical drainage and hydrological modification, particularly within the south-eastern and south-western part of the site.

At south-eastern, drains intersect areas of 7230 Alkaline fen, 7210 Cladium fen, and adjacent wet grassland. These drainage features are likely to contribute to water loss from the fen system and should therefore be prioritised for hydrological restoration. At south-western there is a wetland complex, where drainage features occur within a mosaic of poor fen, woodland, former cutover peatland, and pockets of 7140 Transition mires.

Many of these drainage features displayed limited or no visible flow during field surveys and are considered suitable for restoration through measures, since they are contributing to habitat fragmentation.

At the southeast drain, blocking should begin at points closest to Newtown Lough and progress outwards. Three other locations, including an east-west drain are being proposed for drain blocking, which are located at the south-central, and south-western areas.

These proposed drain measures are related to internal drains; therefore, they should be considered short-term restoration measures. The implementation of drain-blocking measures will be fully dependent on landowner agreement and site access.

Monitoring progress

Regular groundwater and surface water monitoring will be undertaken through a proposed network of piezometers and surface water monitoring points to establish baseline conditions, assess the need for restoration interventions, and evaluate the effectiveness of restoration measures. Monitoring will focus on changes in groundwater levels, surface water levels, and hydrological connectivity resulting from the proposed drain-blocking measures.

- Cummerstown

A hydrological monitoring network is proposed to assess site conditions, which will include five piezometers and five surface water monitoring locations.

The piezometers are proposed in the following locations: one in the northwest area, within the main water input at the Lough Lene-Adeel Stream, two at the central-eastern area, within two old internal drains and two in the southern area, within the Lough Lene-Adeel Stream, before it flows through the Deel (Raharney) River, which represents the water outflow of the site. Surface water monitoring will be undertaken at the main water input in the northwest of the site and at an additional location close to the lake to monitor lake water levels.

Surface water monitoring is proposed at five at the main water input, at northwest within the Lough Lene-Adeel Stream, one in the central-eastern area, close to Lough Adeel, and three in the southern, within the canalised Lough Lene-Adeel Stream and within the Lough Lene-Adeel Stream, before joining the Deel (Raharney) River.

- Newtown

A hydrological monitoring network is proposed to assess site conditions, which will include five piezometers and six surface water monitoring locations.

The piezometers are proposed in the following locations: one in the northwest area, within the main water input at the Kilskeer River, one in the northeast area, also at the Kilskeer River and three in the southern area along the multiple drains located within this part of the site.

Surface water monitoring is proposed at six locations: in the northwest and northeast, within the Kilskeer River, representing the main water input and output, respectively. And other four in the southern area, one within the Kilrush Lower Stream, and the three others along the multiple drains located within this part of the site.

6.3 Nutrient Measures

6.3.1 On-site Nutrient Measures

Potential nutrient pathways are present at both Newtown and Cummerstown. PIP mapping identified areas with potential phosphorus and nitrate delivery pathways associated with existing hydrological connections within and surrounding the sites. However, surveys undertaken to inform this FRP did not identified nutrient enrichment as a key pressure affecting habitat condition. Therefore, no specific on-site nutrient measures are proposed at this stage, apart from an area at Cummerstown, where management measures will also include the removal or relocation of the manure pile identified during site surveys, which represents a direct source of nutrient enrichment. Continued water quality, including both groundwater and surface water monitoring, is considered sufficient to detect any future changes in nutrient status.

6.3.2 Off-site Nutrient Measures

PIP mapping indicates that nutrient delivery pathways may extend beyond the site boundaries and are linked to the wider catchment through surface water and groundwater connections. Potential nutrient sources within the catchment include agricultural activities, forestry operations and, at Cummerstown, a manure pile recorded during the NFS 2023. As nutrient enrichment was not identified as a key pressure during the 2026 surveys, no targeted off-site nutrient measures are currently proposed. Any future nutrient management actions should be considered within the wider catchment context if monitoring identifies evidence of increasing nutrient inputs.

6.3.3 Water Quality Monitoring

Proposed water quality monitoring includes measuring nutrients (nitrate and phosphate), electrical conductivity, pH and temperature. Water samples will be taken from the piezometers and surface water monitoring points proposed at selected locations at Newtown and Cummerstown.

6.4 Vegetation Measures

6.4.1 On-site Vegetation Measures

Conservation Grazing and Grazing Management

Conservation grazing is proposed within suitable areas of 7230 Alkaline fens, 7210 Cladium fens, 7140 Transition mires and associated wet grassland to maintain open vegetation structure and support characteristic fen communities. Appropriate grazing levels will help reduce the accumulation of rank vegetation, limit scrub establishment and maintain habitat diversity.

At Newtown, conservation grazing should be introduced or reinstated within suitable fen habitats in the eastern, south-eastern and south-west (lake shore) sectors of the site. Grazing

management should also be reviewed within areas currently subject to higher grazing pressure to ensure stocking levels are appropriate and do not result in localised damage to sensitive wetland habitats. Figure 1-3 and Figure 1-4 displays the area of land considered unsuitable for grazing.

At Cummerstown, grazing management should be used to maintain and restore favourable vegetation structure within suitable fen habitats. Management should seek to reduce the development of rank vegetation, maintain open fen communities and support habitat diversity through the application of appropriate grazing levels.

Grazing prescriptions should be agreed on a site- and compartment-specific basis following assessment of ground conditions, habitat sensitivity and existing grazing pressure. Livestock type, timing, duration and intensity should be adjusted through adaptive management. Grazing should not be introduced within areas identified as unsafe or ecologically unsuitable.

Targeted Scrub Clearance Along Drains and Encroaching Scrub Edges

Targeted scrub clearance is proposed to maintain and restore open fen habitat. Clearance should focus on scrub associated with drainage features and areas where scrub is actively encroaching into 7230 Alkaline fens, 7210 Cladium fens and 7140 Transition mires habitats.

At Newtown, scrub clearance should be targeted within the eastern and south-eastern sectors of the site, with target species including birch, willow and conifer sapling. At Cummerstown, management should focus on scrub surrounding the 7140 Transition mires habitat in the vicinity of Monitoring Point 8, this was noted to be consisting of willow. Scrub management will reduce shading, maintain open fen habitat and support the recovery and long-term maintenance of characteristic fen vegetation communities.

Vegetation Monitoring

Vegetation monitoring will be required at the ecology monitoring points to provide a repeatable baseline for assessing changes in fen condition and the effectiveness of restoration measures over time. Monitoring should record vegetation composition, structure and condition indicators relevant to fen habitats, including the presence and abundance of characteristic fen species, cover of rank grasses, scrub or invasive species, evidence of grazing or poaching, bare ground and any indicators of hydrological stress or nutrient enrichment. Results should be compared between monitoring years to identify trends and inform any adaptive management required to support the recovery and maintenance of favourable fen condition.

6.4.2 Off-site Vegetation Measures

6.4.2.1 Landowner Engagement

Landowner engagement is proposed to support the coordinated implementation of conservation grazing and vegetation management measures across the site. As outlined in

Section 6.1, a coordinated approach will be required to deliver restoration measures consistently across the fen system.

Engagement should focus on promoting appropriate grazing management, supporting the long-term maintenance of restored habitats and facilitating the implementation of targeted vegetation management measures where required. A coordinated approach to vegetation management will help maintain open fen habitat, reduce the risk of further scrub encroachment and support the long-term recovery of characteristic fen communities.

7 Additional Considerations

7.1 Drainage Management Plan

Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The purpose of the schemes was to improve land for agriculture, to ensure that the 3 – year flood was retained in bank; this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes.

The Newtown site is connected to the Kilskeer River, which flows though Newtown Lough and discharge in the northeastern area of the site, also at Kilskeer River. The outflow watercourse is connected to an OPW Arterial Drainage Area (ADS)[5] (Reference C1/21/25, Scheme Boyne, Region East).

The Cummerstown site is connected to the OPW ADS through the Lough Lene-Adeel Stream (Reference C1/37/35/2, Scheme Boyne, Region East). In addition, the Deel (Raharney) River, which is located along the southern boundary of the site, and it is flowing in a north-easterly direction, also forms part of the OPW ADS (Reference C1/37/35, Scheme Boyne, Region East).

Consultation with OPW is required regarding the maintenance and function of the channel and the impact of future drainage plans on the fen and the impact of the proposed restoration measures on the objectives of the drainage district.

The preliminary drainage management plan for both sites is presented in Appendix C.

7.2 Peat Stability Assessment

Restoration activities have the potential to introduce additional risk of peat stability issues. The combination of additional loading (e.g. when excavators are used) and a higher water table has the potential to increase risk. At present, no specific guidance is available in Ireland detailing how peat stability risks should be managed in restoration projects.

7.2.1 GSI Landslide Susceptibility Mapping

Undertaking detailed geotechnical assessments is beyond the scope of the FRP. However, preliminary peat stability analysis was undertaken to inform the level of assessment required prior to the implementation of restoration actions. This includes a review of the landslide susceptibility map and historic landslide events produced by the Geological Survey of Ireland

[5] https://www.floodinfo.ie/map/drainage_map/

(GSI). The GSI landslide susceptibility map provides a preliminary indication of the susceptibility of a landslide based on several contributing factors, including where previous landslides have occurred and what caused them (slope, soil type and the impact of the flow of water in an area).

The proposed approach to peat stability is a tiered approach that aims to filter out low risk sites that can proceed with limited ground investigation, followed by more complex sites that require a more detailed quantitative assessment. Where risks cannot be excluded following these steps it may be necessary to progress to more detailed geotechnical studies.

According to the GSI mapping, landslide susceptibility is assessed as low at both sites. The GSI landslide susceptibility map for Newtown and Cummerstown is presented in Figure 7-1 and Figure 7-2, respectively.

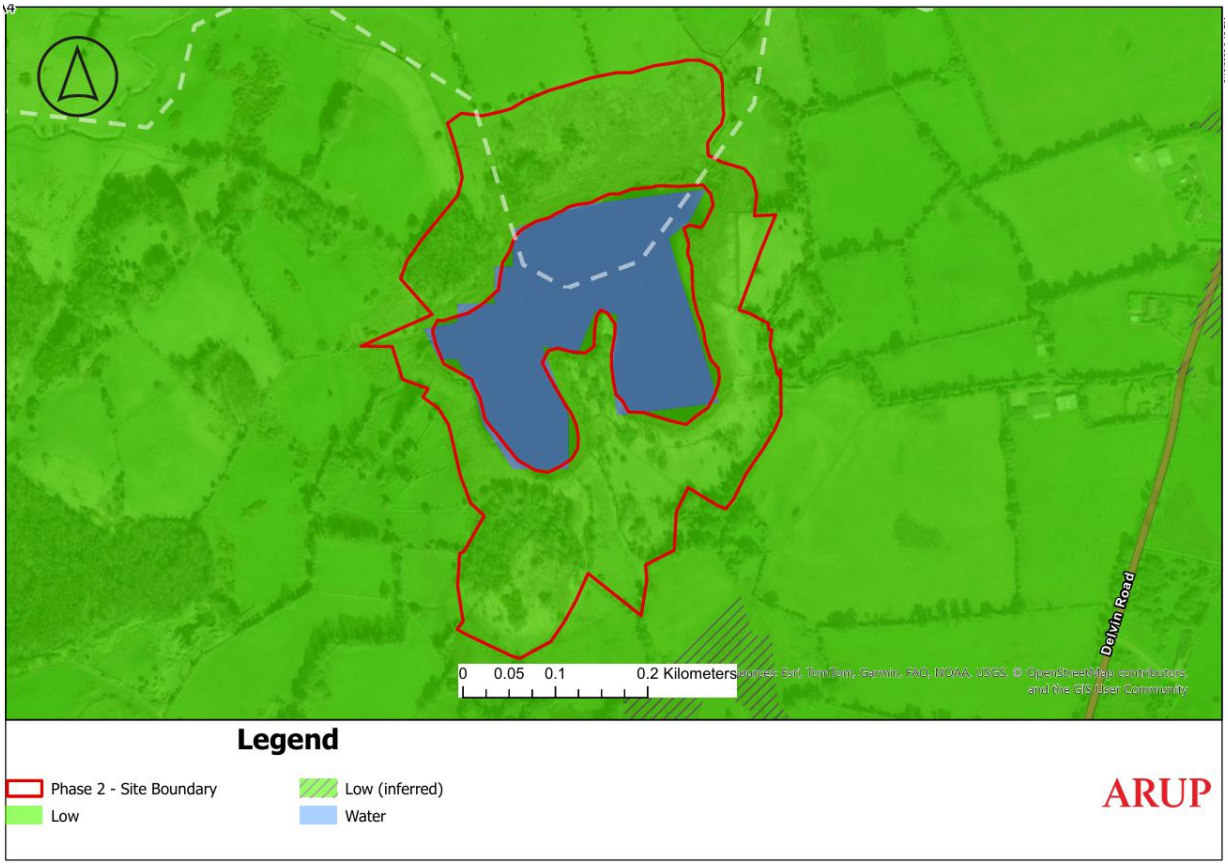


Figure 7-1: Geological Survey of Ireland Landslide Susceptibility mapping for Newtown



Figure 7-2: Geological Survey of Ireland Landslide Susceptibility mapping for Cummerstown

7.3 Archaeology

A desktop constraint assessment was conducted using the National Monuments Service (NMS) Historic Environment Viewer to evaluate the site boundary and immediate surrounding buffer zones against the statutory Record of Monuments and Places (RMP) and the Sites and Monuments Record (SMR).

The available records indicate that there is one recorded archaeological monument within Cummerstown and and one within the Newtown site. A number of recorded monuments are located within the surrounding areas, as detailed below.

Four recorded ringforts are located in the vicinity of the Cummerstown site. These monuments are situated approximately 60 m to the east (WM008-062), 90 m to the northeast (WM008-037), 190 m to the northwest (WM008-118), and 600 m and 750 m to the west (WM008-059; WM008-058) of the site, as shown in Figure 7-3. An earthwork is located approximately 120 m to the north (WM008-120), while an unclassified castle (WM008-063) and a bawn (WM008-063001) are situated approximately 570 m and 600 m to the southeast, respectively. Additionally, an enclosure is situated within the Cummerstown site, approximately 100m southeast of the southern shoreline of Lough Adeel.

There are no proposed intrusive on-site or off-site works in the vicinity of the archaeological site. The temporary construction compound and associated access route will follow the existing

field boundary and are anticipated to have a very low impact. Consult with the Westmeath County Council archaeologist or National Monuments Service (NMS) to ensure the archaeological site is protected and not compromised.

Four recorded monuments are situated in the vicinity of Newtown. The Crannóg (WM009-005) lies within Newtown Lough, while an unclassified castle (WM009-004) is located approximately 150 m west of the site. A ringfort (ME022-029) and a moated site (ME023-011) are located approximately 600 m and 450 m northwest of the site, respectively, as illustrated in Figure 7-4. However, these features are not expected to be affected within the scope of the restoration measures.

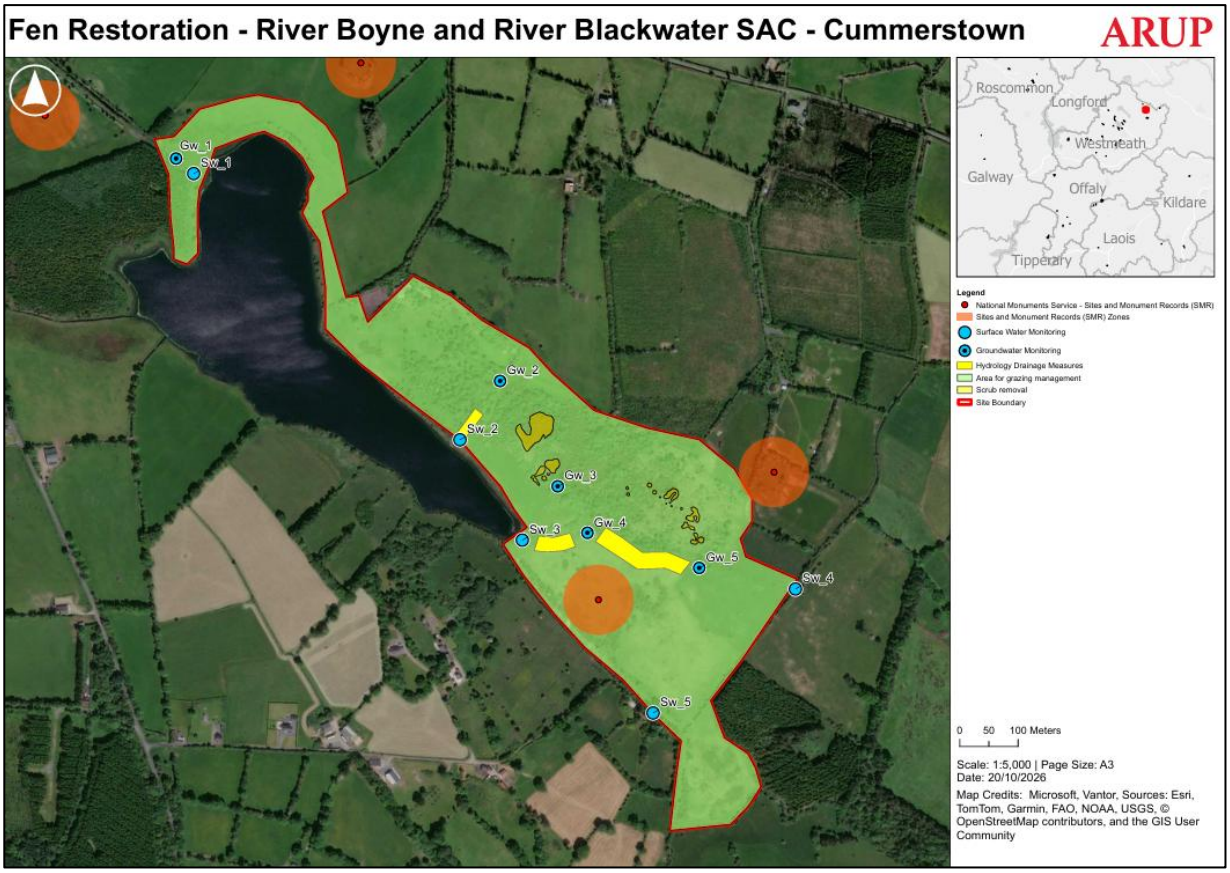


Figure 7-3: Archaeological Sites for Cummerstown (NMS, 2025)

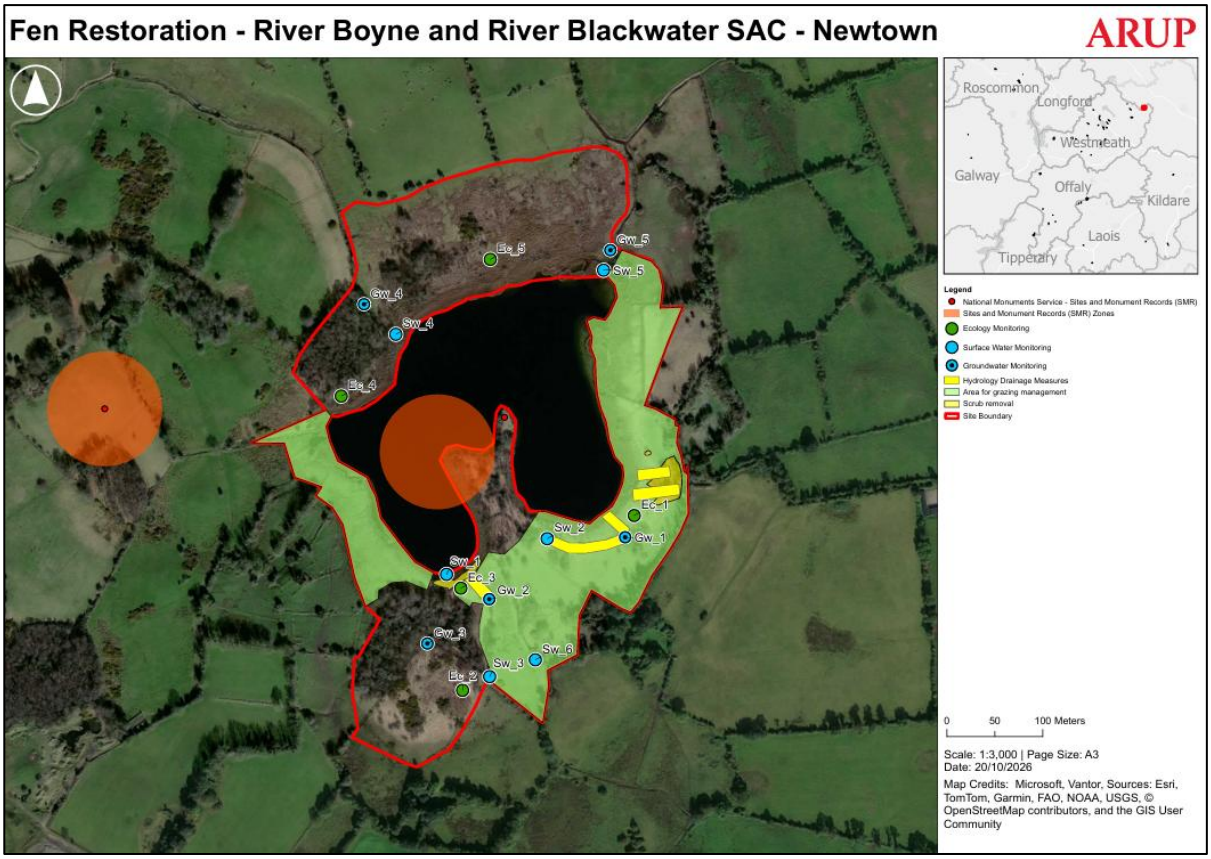


Figure 7-4: Archaeological Sites for Newtown (NMS, 2025)

8 Summary of Fen Restoration Plan Actions

Prior to proceeding with the implementation of the restoration measures outlined in the FRP, consultation with landowners and key stakeholders with an interest in the site is essential (Table 8-1). While this FRP identifies the key pressures and actions to be implemented, consultation with landowners and stakeholders may identify the need to amend or alter restoration actions. There may also be opportunities to provide additional benefits to the wider community. Consultation with local NPWS staff will be crucial to informing implementation planning.

Table 8-1: Role players in FRP

Measures	Stakeholder	Description
On-site	Landowners	Both subsites of River Boyne and Blackwater are under private ownership E
Off-site	Landowners & farmers	Engagement for uptake of catchment measures.
Capacity building	NPWS	NPWS engaging in community education and events

This section provides the summary of the FRP Actions for River Boyne and River Blackwater SAC (Table 8-2).

Table 8-2: Implementation plan for River Boyne and River Blackwater SAC Fen Restoration

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
1	Required preliminary actions							
1.1	Screening for Appropriate Assessment report.							
	This report must outline all restoration measures that shall be undertaken as part of the project at River Boyne and River Blackwater SAC. The Screening for AA must conclude whether a likely significant effect is anticipated to arise from the implementation of the project.	Sitewide	Screening report	Pre-restoration	NPWS			NPWS
1.2	Drainage management plan							
	Consultation with Westmeath Co. Co on the drainage management plan is required to ensure compliance with legislation and local authority objectives.	Sitewide	Drainage management plan	Pre-restoration	NPWS	Westmeath Co. Co	Arup	Within Tóchar project scope
1.3	Archaeological assessment							
	Consultation with NMS on the archaeology is required to ensure compliance with legislation and local authority objectives.	Sitewide	Archaeological assessment report	Pre-restoration	NPWS	Westmeath Co. Co	Arup	Within Tóchar project scope
2	Enabling Works							
2.1	Pre-restoration Works Surveys							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Pre-site walkover with Ecologist/Ecological Clerk of Works (ECoW) to ensure proposed measures are appropriate and whether alterations are required.	Sitewide	ECoW report	Pre-restoration			Arup	Within Tóchar project scope
2.2	**Implementation of Mitigation Measures**							
	Ecological Impact Assessment Considerations – identification of necessary mitigation measures. Such measures may include, but are not limited to, the utilisation of hand machinery to avoid impact on sensitive habitats	Sitewide	ECoW report	Pre-restoration			Arup	Within Tóchar project scope
2.3	**Breeding Bird Considerations**							
	Prior to restoration works, where any restoration measures are identified to have the potential to interfere with breeding birds e.g. scrub removal, these works shall occur outside the breeding bird season (1 March – 31 August inclusive).	Sitewide	ECoW report	Pre-restoration			Arup	Within Tóchar project scope
2.4	**Good Practice Recommendations and CEMP**							
	Good Practice Recommendations – Includes, but not limited to, avoidance of sensitive ecological receptors, pollution prevention procedures, biosecurity measures etc. The preparation and provision of a Construction Environmental Management Plan (CEMP).	Sitewide	ECoW report	Pre-restoration			Arup / Contractor	Within Tóchar project scope
3	**On-Site Restoration measures**							
3.1	**Hydrology measures**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Drain blocking is proposed as the primary hydrological restoration measure for the River Boyne and River Blackwater SAC. For the Cummerstown site, both long-term and short-term drainage measures are proposed: one at an old internal drain located in the central-eastern area and two in the southern area within the Lough Lene-Adeel Stream. The Lough Lene-Adeel Stream forms part of the OPW ADS watercourse and should therefore be considered separately from measures relating to the internal drainage network. For Newtown, only short-term drainage measures are proposed, as these relate solely to the internal drainage network, which of the four drains are located in the southern area.	Cummerstown: Drain blocking at three locations in the central-eastern and southern areas. Newtown: Drain blocking at four locations in the southeast and southwest areas.	Water management balance	Restoration in 2027	NPWS to facilitate Engagement with OPW	Westmeath Co.CO	Arup/ Contractor	Within Tóchar project scope
3.2	**Vegetation measures**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Proposed measures to address vegetation condition, rank vegetation, scrub encroachment and undergrazing include: 1. Implementation of conservation grazing across fen habitats, with stocking type, timing and intensity agreed with landowners. 2. Targeted scrub management, including removal where monitoring indicates encroachment is contributing to habitat degradation; and 3. Ongoing vegetation monitoring at established monitoring points to assess species composition, vegetation structure and response to management.	Sitewide (Section 4.3.3.1 notes areas unsuitable for grazing)	Site records habitat surveys monitoring point assessments	Restoration phase (2026–2027), with long-term adaptive management	NPWS to facilitate access and implement ation		Tóchar / Contractor	Within Tóchar project scope (implementation phase); future NPWS or agri-environment schemes for long-term grazing
5	**Monitoring progress**							
5.1	**Hydrology monitoring**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Hydrological monitoring, including groundwater monitoring (piezometers) and surface water monitoring, is also proposed to assess the effectiveness of the restoration measures.	Cummerstown: monitoring at the northwest, central-east, and southern areas along the Lough Lene-Adeel Stream. Newtown: monitoring at the northwest, northeast, and southern areas along the Kilskeer River, Kilrush Lower Stream, and associated drains.	Surface and Groundwater levels	Long -term	NPWS to facilitate site access			Within Tóchar project scope
5.2	**Nutrient monitoring**							
	Water quality monitoring includes measuring nutrients (nitrate and phosphate), electrical conductivity, pH and temperature at the defined groundwater and surface water monitoring locations	Allocated locations at Newtown and Cummerstown.	Nitrate, Phosphorus, EC, Temperature and pH	Long term	NPWS to facilitate site access			NPWS
5.3	**Vegetation monitoring**							

	Activity	Location	Monitoring/ implementation indicator	Timeframe	Key role player			Possible funding source
					National	Regional/ Local	Other	
	Vegetation monitoring will be undertaken using detailed relevés to document habitat composition, cover, and structural characteristics within representative plots. The surveys will also record any pressures or threats, including scrub encroachment, invasive species, or changes to hydrological conditions. These surveys will guide any restoration actions if changes are detected.	Sitewide	Site records/habitat surveys	Long term	NPWS to facilitate site access	Co. Westmeath		NPWS
6	**Capacity building and training**							
	Public meeting: To engage stakeholders on developments and results from the restoration measures.			Long-term	NPWS			NPWS
	Farmer training: Training such as that provided by the Farming for Water EIP will provide farmers with knowledge of alternative and habitat sensitive measures			Long-term	NPWS/ Farming for Water EIP / LAWPRO / Teagasc			Farming for Water EIP / other similar

8.1 Habitats Benefiting from Implementation of Restoration Actions

The restoration measures proposed within this FRP are primarily intended to benefit Annex I 7230 Alkaline fens, which is the qualifying interest of the River Boyne and River Blackwater SAC. Restoration of hydrological processes, together with appropriate vegetation management, is expected to improve habitat condition, support the recovery of characteristic fen communities and contribute towards the achievement of the site-specific conservation objectives for the habitat.

The proposed measures are also expected to benefit Annex I quality 7210 Cladium fens and 7140 Transition mires habitat recorded within Newtown and Cummerstown. Improvements in hydrological functioning, vegetation structure and habitat connectivity are expected to support the maintenance and recovery of these associated fen habitats, particularly where they occur in close association with 7230 Alkaline fens.

Additional benefits may occur for associated wetland habitats, including 6410 Molinia meadows, 6430 Hydrophilous tall herb fringe communities and non-Annex rich fen and wet grassland habitats that form part of the wider wetland mosaic. Restoration of more natural hydrological conditions and the maintenance of open vegetation structure are expected to improve ecological functioning across the site and support habitat diversity.

Localised benefits may also occur within wet woodland and 91E0 Alluvial forest habitats through improvements in wider wetland hydrological function. However, these habitats are not the primary target of restoration measures and should continue to be managed in accordance with their own ecological requirements.

8.2 Species Benefiting from Implementation of Restoration Actions

The restoration measures proposed within this FRP are expected to benefit species associated with fen, wetland and lakeshore habitats through the maintenance and improvement of habitat condition. The greatest benefits are anticipated for species dependent on open fen and wetland habitats, particularly where restoration measures contribute to the maintenance and recovery of 7230 Alkaline fens and associated wetland communities.

Protected and notable species recorded within, or in proximity to, the site is expected to benefit indirectly from the restoration of fen habitats and associated wetland mosaics. In particular, improvements in habitat condition are expected to support the continued use of the site by otter and whooper swan, together with other wetland-associated bird (including snipe) and mammal species recorded within the wider zone of influence. Restoration of wetter hydrological conditions and the maintenance of habitat diversity are expected to improve the availability of foraging, sheltering and resting habitats across the site.

Additional benefits are expected for species of local conservation interest associated with wet grassland, rich fen and lakeshore habitats through the maintenance of habitat diversity, the retention of habitat mosaics and the long-term protection of ecological function across the site.

Improvements in fen condition may also support invertebrate communities and other species reliant on structurally diverse wetland habitats, contributing to wider biodiversity benefits within the site.

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Appendix A – Non-Technical Summary

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary			
Site Name	River Boyne and River Blackwater SAC -Newtown	**NFS site no.**	104014
County	Westmeath	**Designations**	*PNHA 000556, SAC 002299*
Fen habitats present (area)	7230 Alkaline fens (1.92 ha) 7210 Cladium fens (2.62 ha) 7140 Transition mires and quaking bogs (0.11 ha) 6410 Molinia meadows (0.42 ha)	**Species of note**	No protected or sensitive species records from within the site boundary

Site Description

Newtown is located approximately 1.2 km southwest of Clonmellon, Co. Westmeath, within the River Boyne and River Blackwater SAC. The site supports a mosaic of wet woodland, fen, grassland and open water habitats. Drains intersect the southern and south-eastern parts of Newtown, while several additional drains occur in the north, with drainage generally directed towards Newtown Lough. Lands to the east, south and west of Newtown Lough form part of Lough Shesk pNHAs. Fen habitats account for approximately 40% of the Newtown site, of which approximately 14% was identified as Annex I 7230 Alkaline fens.

Conceptual Site Model (CSM)

Newtown is a groundwater-fed valley-bottom fen (WETMEC 9) centred on Newtown Lough, where groundwater discharge from the surrounding catchment, together with surface water inflows, maintains minerotrophic wetland conditions. Water flows through the site via the Kilskeer River and associated drainage network before discharging to the wider River Boyne catchment. The site shows characteristics of both WETMEC 9a (wet groundwater bottom) and WETMEC 9b (part-drained groundwater bottom) due to historical drainage and hydrological modification.

The site is underlain by the Lucan Formation (Calp), and a Locally Important Aquifer (LI). Historical records and field surveys identified springs, seepage zones, and evidence of paludal tufa deposition, indicating ongoing influence of calcium-rich groundwater. Water chemistry, including elevated electrical conductivity and near-neutral pH values, further indicates groundwater influence.

Hydrological gradients associated with Newtown Lough support a mosaic of alkaline fen, transition mire, swamp, wet grassland, and wet woodland habitats. Nutrient concentrations indicate some nutrient enrichment within site waters, likely linked to surrounding land uses.

The presence of Annex I alkaline fen habitat, mineral-rich waters, and sustained groundwater inputs is consistent with the ecological expression of a groundwater-fed valley-bottom fen (WETMEC 9). Areas affected by drainage and hydrological modification are considered more representative of WETMEC 9b conditions.

Key Pressures

Hydrology Pressures	Multiple drainage channels within the southern and south-eastern areas of the site are considered particularly significant. Additional drains traverse the northern part of the site and may contribute to reduced water retention and localised lowering of water levels. A recently excavated drain in the north-eastern area may also be contributing to localised drying. Hydrological modification has contributed to habitat fragmentation and degradation of former wetland areas.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Nutrient Pressures	Diffuse nutrient inputs from adjacent agricultural land and forestry operations represent potential sources of nutrient enrichment. Nutrients may enter the site via connected surface water features and the drainage network. Nutrient enrichment is considered a secondary pressure when compared to hydrological modification.
Ecology Pressures	The principal ecological pressures affecting Newtown are inappropriate grazing management and scrub encroachment. Large areas of lakeshore fen in the eastern, south-eastern and south-western parts of the site are currently ungrazed, resulting in the accumulation of rank vegetation and facilitating encroachment by willow, birch and other woody species. In contrast, parts of the western lakeshore are subject to higher grazing pressure and localised poaching. Scrub encroachment associated with drainage features and ungrazed fen areas is contributing to a decline in open fen habitat quality. Historical drainage and associated drying have also facilitated changes in vegetation structure and habitat fragmentation.
Objective of Restoration Plan	
The objective of the Newtown Restoration Plan is to maintain and improve the quality of existing fen habitats and improve the conditions that will allow an expansion of fen habitats where feasible. Restoration efforts focus on increasing water retention within the system, reducing the influence of artificial drainage and restoring the hydrological conditions required to support fen habitats.	
Restoration Measures	
Hydrology Measures	**On-Site Measures:** Drain blocking at four locations within the south-eastern, south-central and south-western areas of the site to restore hydrological conditions and reduce water loss from the fen system.
Nutrient Measures	**On-Site Measures:** Surface water and groundwater monitoring, including nitrate, phosphate, electrical conductivity, pH and temperature. **Off-Site Measures:** No targeted off-site nutrient measures are currently proposed. Any future nutrient management actions should be considered within the wider catchment context if monitoring identifies increasing nutrient inputs.
Ecology Measures	**On-Site Measures:** Conservation grazing is proposed within suitable fen and wet grassland habitats to maintain and restore favourable vegetation structure and species composition. Grazing management will also be reviewed in areas where higher grazing pressure and poaching have been recorded. Targeted scrub clearance is proposed within the eastern and south-eastern parts of the site where willow, birch and other woody species are encroaching into 7230 Alkaline fen and 7210 Cladium fen habitats. Established wet woodland habitats will be retained where appropriate.
Monitoring Progress	
Hydrology Monitoring	Groundwater and surface water monitoring through a network of five piezometers and six surface water monitoring locations.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Nutrient Monitoring	Ongoing monitoring of groundwater and surface water quality parameters including nitrate, phosphate, electrical conductivity, pH and temperature.
Ecology Monitoring	Vegetation monitoring will be undertaken at representative locations across the site to assess habitat condition, vegetation structure, grazing effectiveness and the response of fen habitats to restoration measures. Monitoring will focus on changes in the extent and condition of 7230 Alkaline fen, 7210 Cladium fen and 7140 Transition mire habitats, together with the effectiveness of scrub management and grazing measures.
More information	
Fen Restoration Plan Report Tóchar website: https://www.tocharwetlands.ie/fen-restoration/	

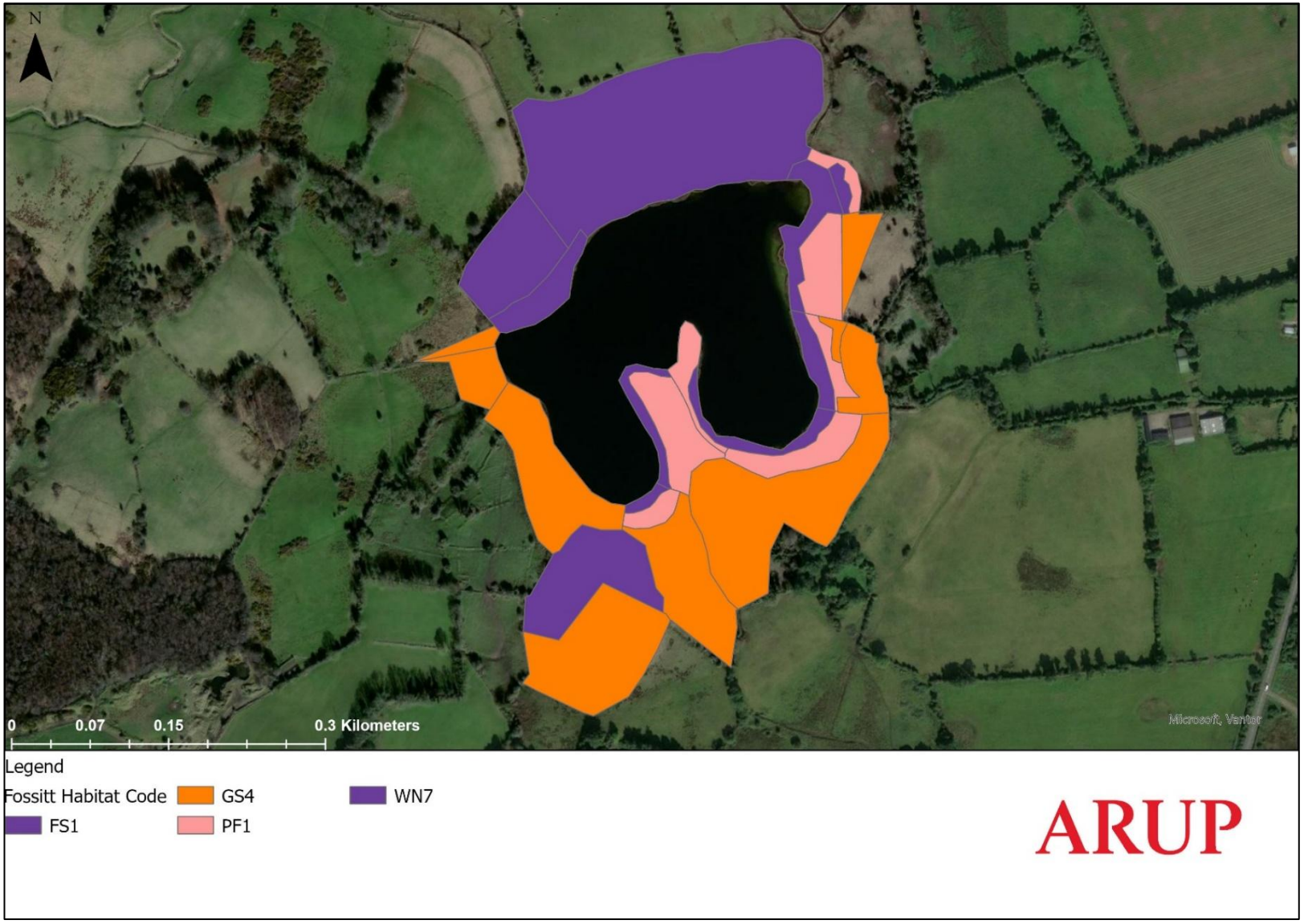


Figure 1: Site Habitat Map

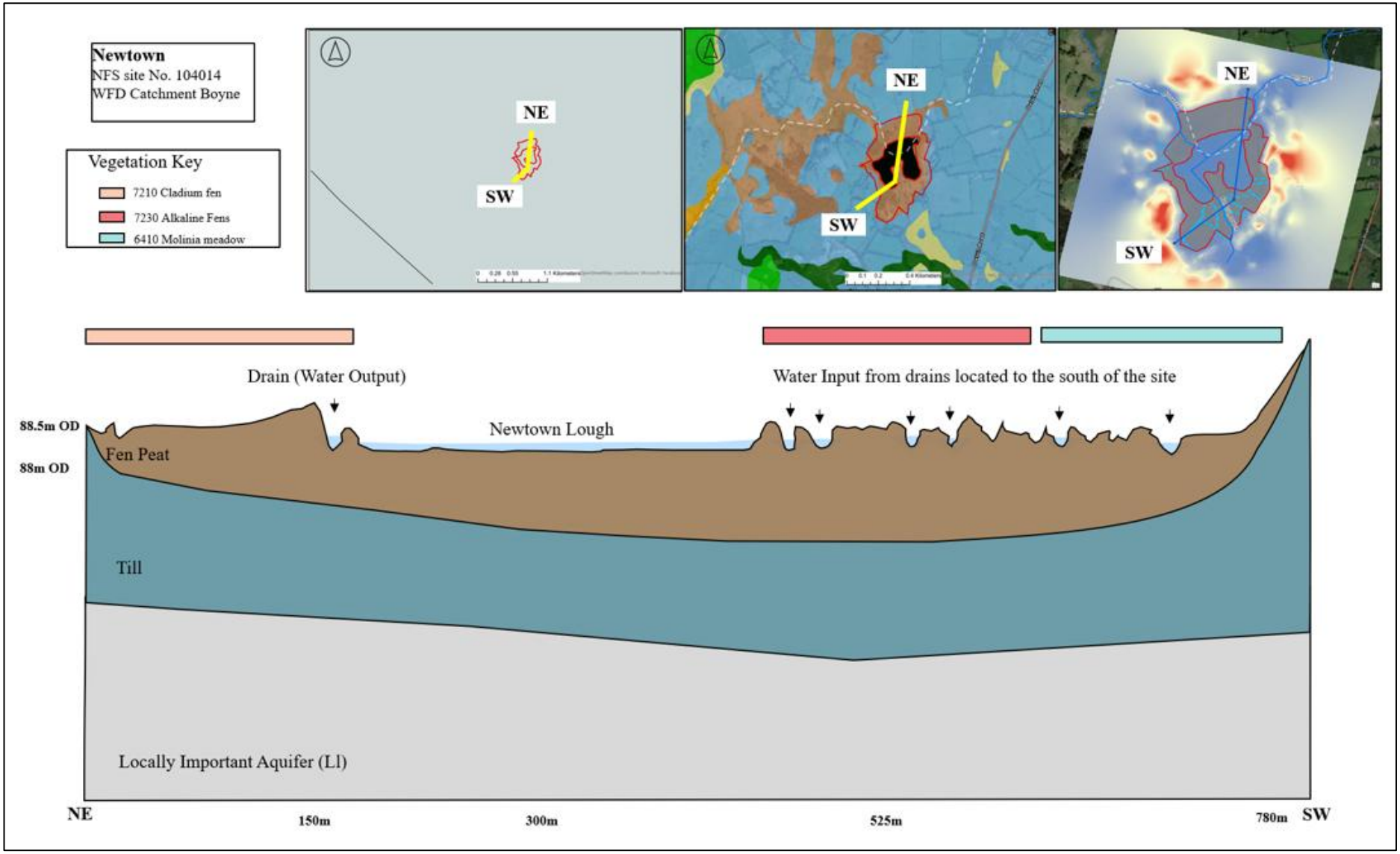


Figure 2: Conceptual Site Model

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary			
Site Name	River Boyne and River Blackwater SAC - Cummerstown	**NFS site no.**	*104013*
County	Westmeath	**Designations**	*SAC (002299)*
Fen habitats present (area)	7230 Alkaline fens (2.57 ha) 7210 Cladium fens (0.84 ha) 7140 Transition mires and quaking bogs (0.35 ha)	**Species of note**	Whooper Swan *(Cygnus cygnus)* Snipe *Gallinago gallinago*

Site Description

Cummerstown is located approximately 4 km east of Collinstown, Co. Westmeath, within the River Boyne and River Blackwater SAC. The site consists of a complex mosaic of fens, gorse scrub, wet woodland, calcareous grassland, grassland verges, acid grassland, wet grassland, swamp and open water habitats around the northern shores of Lough Adeel. Approximately 10% of the Cummerstown site comprised fen habitat, including two areas of Annex I 7230 Alkaline fens.

Conceptual Site Model (CSM)

Under the WETMEC framework, Cummerstown is a groundwater-fed valley-bottom fen (WETMEC 9), associated with Lough Adeel, where groundwater discharge from the surrounding catchment represents the principal water source sustaining fen conditions. Based on the available hydrological and hydrochemical evidence, the site most closely corresponds to WETMEC 9a (wet groundwater bottom), although localised areas may exhibit WETMEC 9b characteristics.

Cummerstown is located within a low-lying basin, with elevations decreasing towards Lough Adeel and higher ground surrounding the site providing potential for groundwater movement towards the wetland. The site is underlain by the Lucan Formation (Calp) and a Locally Important aquifer. Surface water flows into Lough Adeel via the Lough Lene–Adeel Stream and exits through the Deel (Raharney) River. Water quality indicates groundwater influence, while the site supports a diverse mosaic of alkaline fen, Cladium mariscus fen, transition mire, reed swamp, wet grassland, woodland and open-water habitats. The presence of species-rich alkaline fen and extensive Cladium mariscus stands is consistent with the expected ecological expression of a functioning groundwater-fed valley-bottom fen system.

Key Pressures

Hydrology Pressures	Drainage has modified the natural hydrology of fen and swamp habitats through a series of drains located particularly within the southern area of the site and along the western and southern boundaries. The drainage network facilitates water loss from the wetland system and contributes to altered hydrological conditions across adjoining habitats. Hydrological modification has also contributed to habitat fragmentation and degradation of former wetland areas.
Nutrient Pressures	Nutrient pressures are associated primarily with surrounding agricultural land uses. A manure pile recorded during the National Fen Survey represents a potential point source of nutrient input, while runoff from adjacent agricultural land may contribute diffuse nutrient loading through connected drains and watercourses. Nutrient enrichment is considered a secondary pressure within the site.

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan Non-Technical Summary	
Ecology Pressures	The principal ecological pressures affecting Cummerstown are the absence of appropriate grazing management and localised scrub encroachment. Areas of fen habitat are currently subject to limited or no grazing, resulting in the development of rank vegetation and reducing the structural diversity of the habitat. Localised scrub encroachment, particularly around areas of transition mire habitat, is contributing to the loss of open fen conditions and may restrict the development and persistence of characteristic fen vegetation. Historical drainage has also influenced vegetation composition by promoting drier conditions in some parts of the site and reducing the extent of suitable habitat for fen-associated plant communities.
Objective of Restoration Plan	
The objective of the Cummerstown Restoration Plan is to maintain and improve the quality of existing fen habitats and improve the conditions that will allow an expansion of fen habitats where feasible. Restoration efforts focus on restoring hydrological conditions, improving hydrological connectivity and maintaining the ecological function of alkaline fen and associated wetland habitats.	
Restoration Measures	
Hydrology Measures	**On-Site Measures:** Drain blocking within an internal old drain in the central-eastern area and at two locations along the Lough Lene-Adeel Stream in the southern area to restore hydrological conditions and reduce water loss from the fen system.
Nutrient Measures	**On-Site Measures**: Surface water and groundwater monitoring, including monitoring of nitrate, phosphate, electrical conductivity, pH and temperature. **Off-Site Measures**: No targeted off-site nutrient measures are currently proposed. Any future nutrient management actions should be considered within the wider catchment context if monitoring identifies increasing nutrient inputs.
Ecology Measures	**On-Site Measure**: Conservation grazing is proposed within suitable fen habitats to maintain and restore favourable vegetation structure and species composition. Focus will be placed on areas where grazing is currently absent and where rank vegetation has developed. Targeted scrub clearance is proposed around areas of 7140 Transition mire and adjacent fen habitat where woody vegetation is encroaching into open wetland communities. Vegetation management measures will aim to maintain open fen conditions, support characteristic fen species and improve habitat resilience.
Monitoring Progress	
Hydrology Monitoring	Groundwater and surface water monitoring through a network of five piezometers and five surface water monitoring locations.
Nutrient Monitoring	Ongoing monitoring of groundwater and surface water quality parameters including nitrate, phosphate, electrical conductivity, pH and temperature.
Ecology Monitoring	Vegetation monitoring will be undertaken at representative locations throughout the site to assess habitat condition, vegetation structure and the effectiveness of grazing and scrub management measures. Monitoring will focus on changes in the condition

	and extent of 7230 Alkaline fen, 7210 Cladium fen and 7140 Transition mire habitats, together with evidence of scrub encroachment, grazing impacts and recovery of characteristic fen vegetation.
More information	
Fen Restoration Plan Report Tóchar website: https://www.tocharwetlands.ie/fen-restoration/	

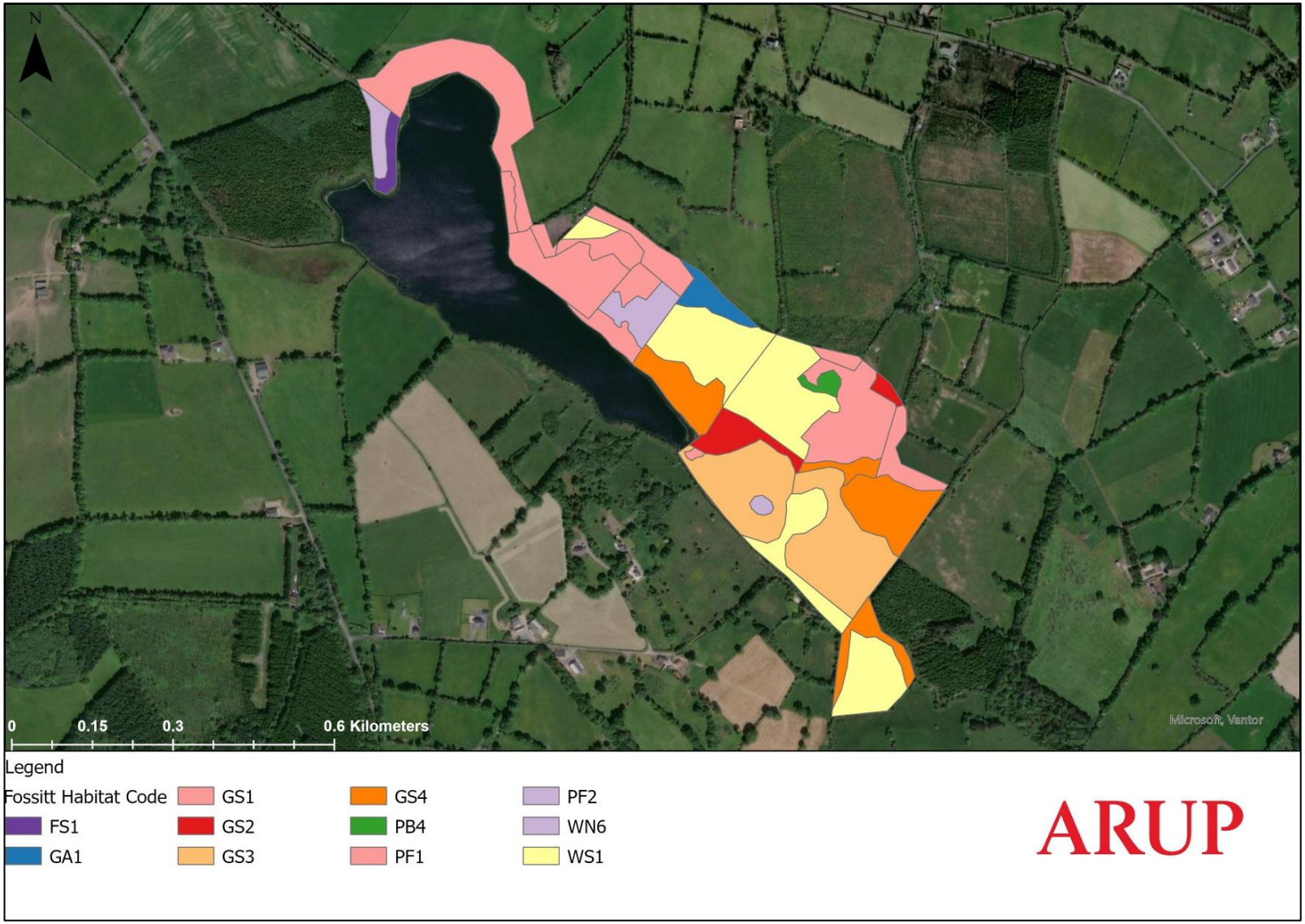


Figure 1: Site Habitat Map

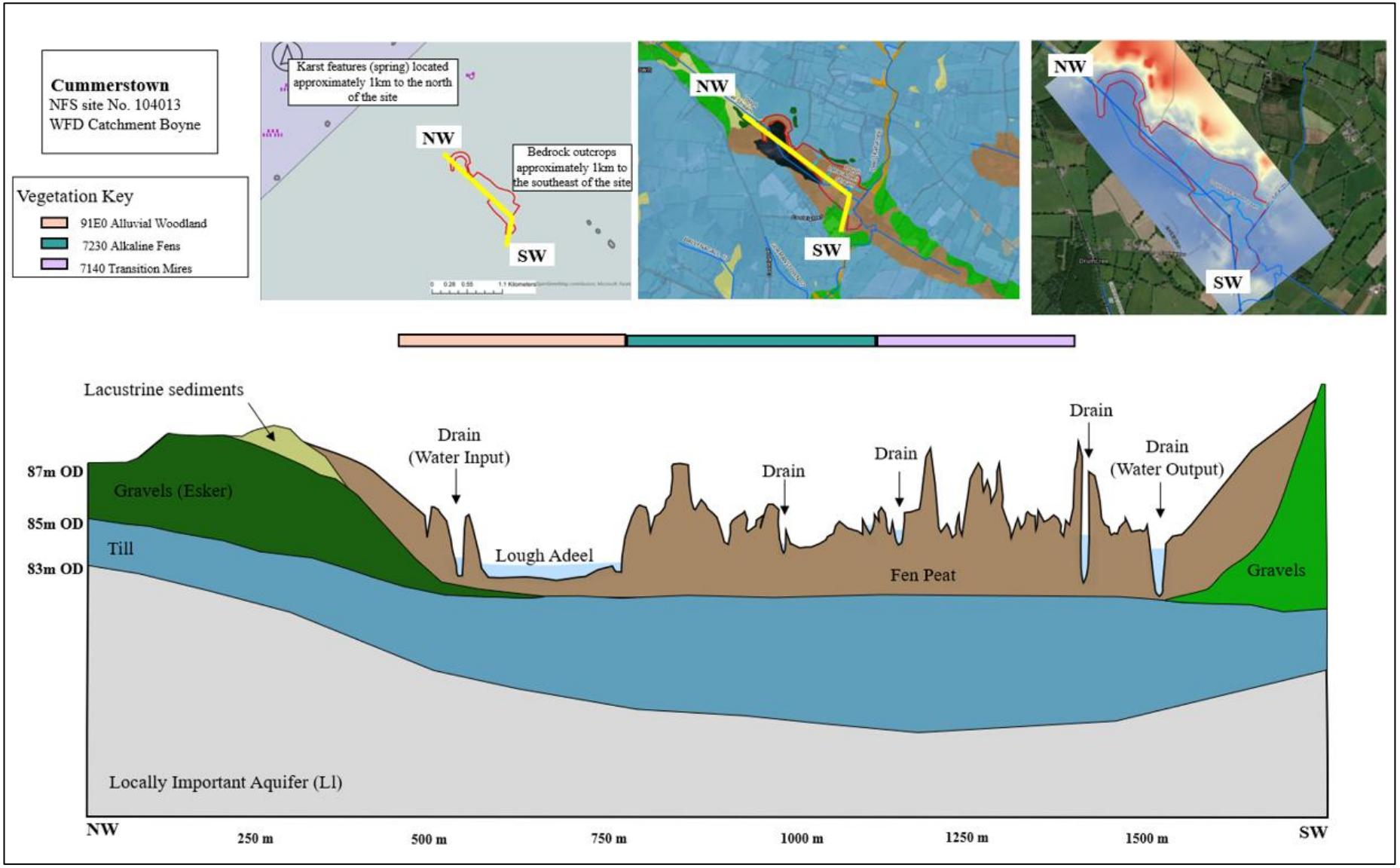


Figure 2: Conceptual Site Model

Appendix B – Ecological Survey Maps

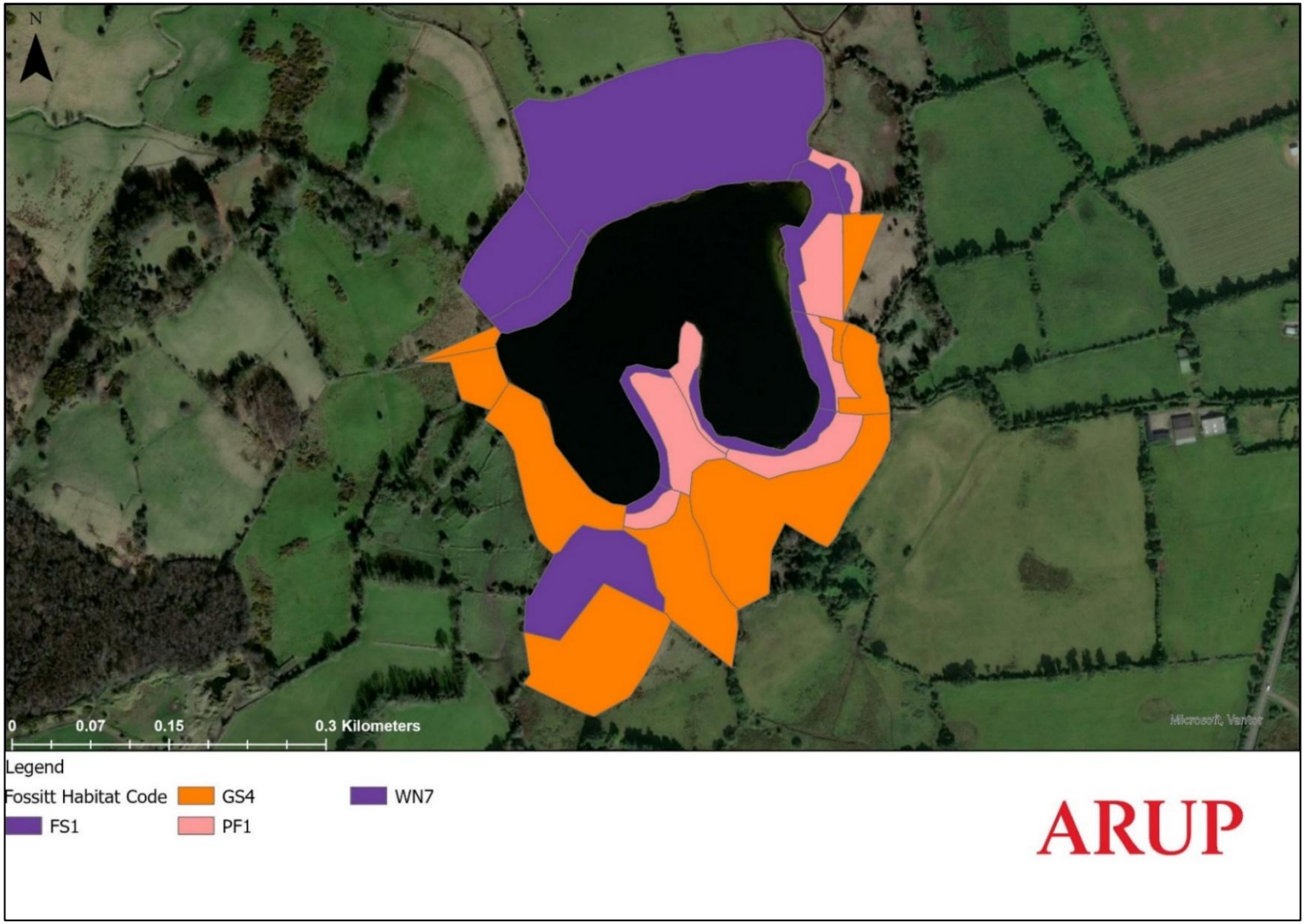


Figure 9-1 Newtown Fossitt habitats mapped as part of the NFS surveys in 2022. Refer to Table 9-1 for the full list of habitat names

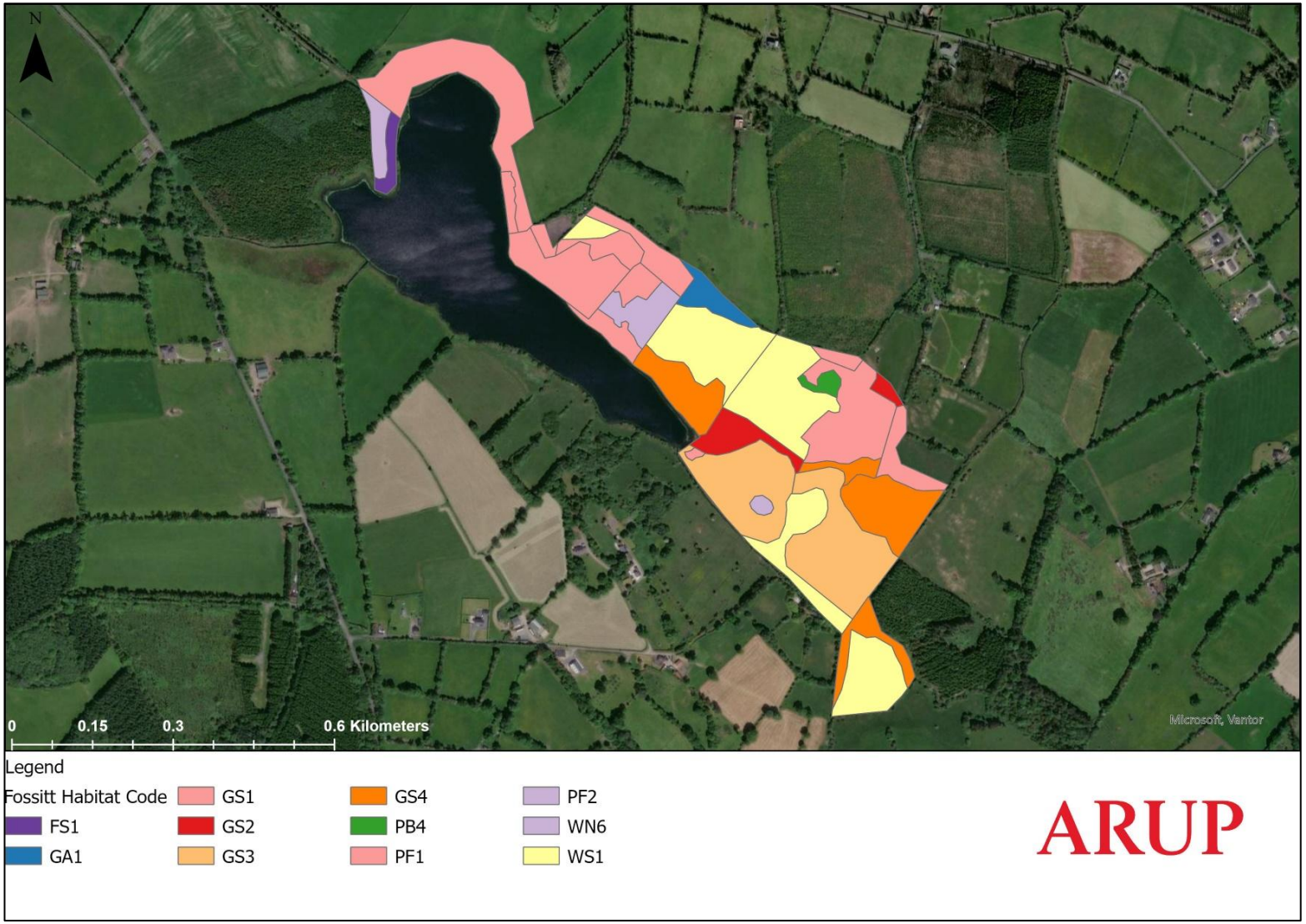


Figure 9-2 Cummerstown Fossitt habitats mapped as part of the NFS surveys in 2022. Refer to Table 9-1 for the full list of habitat names

Table 9-1 Annex I habitat and Fossitt habitat code directory

Annex I habitat code	Annex I habitat name	Fossitt Habitat Code	Fossitt Habitat Name
3110	Oligotrophic Isoetid lake habitat	FL1	Dystrophic lakes
3130	Slender Naiad-type lakes	FL2	Acid oligotrophic lakes
3140	Hard-water lakes	FL3	Limestone/marl lakes
3150	Rich pondweed lake habitat	FL4	Mesotrophic lakes
3160	Acid oligotrophic lakes	FL5	Eutrophic lakes
3180	Turloughs	FL6	Turloughs
3260	Vegetation of flowing waters	FL7	Reservoirs
3270	Chenopodion rubri	FL8	Other artificial lakes and ponds
4010	Wet heaths	FW1	Eroding/upland rivers
4030	Dry heaths	FW2	Depositing/lowland rivers
4060	Alpine and subalpine heath	FW3	Canals
5130	Juniper scrub	FW4	Drainage ditches
6130	Calaminarian grasslands	FP1	Calcareous springs
6210	Orchid-rich calcareous grassland	FP2	Non-calcareous springs
6230	Species-rich Nardus grassland	FS1	Reed and large sedge swamps
6410	Molinia meadows	FS2	Tall-herb swamps
6430	Hydrophilous tall-herb swamp	GA1	Improved agricultural grassland
6510	Hay meadows	GA2	Amenity grassland (improved)
7110	Raised bog (active)	GS1	Dry calcareous and neutral grassland
7120	Degraded raised bogs	GS2	Dry meadows and grassy verges
7130	Blanket bog (active)	GS3	Dry-humid acid grassland
7140	Transition mires	GS4	Wet grassland
7150	Rhynchosporion depressions	GM1	Marsh
7210	Cladium fens	HH1	Dry siliceous heath
7220	Petrifying springs	HH2	Dry calcareous heath
7230	Alkaline fens	HH3	Wet heath
8110	Siliceous scree	HH4	Montane heath
8120	Calcareous scree	HD1	Dense bracken
8210	Calcareous rocky slopes	PB1	Raised bog
8220	Siliceous rocky slopes	PB2	Upland blanket bog
8240	Limestone pavement	PB3	Lowland blanket bog
8310	Caves	PB4	Cutover bog
8330	Sea caves	PB5	Eroding blanket bog
91A0	Old oak woodland	PF1	Rich fen and flush
91D0	Bog woodland	PF2	Poor fen and flush
91E0	Alluvial woodland	PF3	Transition mire and quaking bog
91J0	Yew woodland	WN1	Oak-birch-holly woodland
		WN2	Oak-ash-hazel woodland
		WN3	Yew woodland

Annex I habitat code	Annex I habitat name	Fossitt Habitat Code	Fossitt Habitat Name
		WN4	Wet pedunculate oak-ash woodland
		WN5	Riparian woodland
		WN6	Wet willow-alder-ash woodland
		WN7	Bog woodland
		WD1	(Mixed) broadleaved woodland
		WD2	Mixed broadleaved/conifer woodland
		WD3	(Mixed) conifer woodland
		WD4	Conifer plantation
		WD5	Scattered trees and parkland
		WS1	Scrub
		WS2	Immature woodland
		WS3	Ornamental/non-native shrub
		WS4	Short rotation coppice
		WS5	Recently felled woodland
		WL1	Hedgerows
		WL2	Treelines
		ER1	Exposed siliceous rock
		ER2	Exposed calcareous rock
		ER3	Siliceous scree and loose rock
		ER4	Calcareous scree and loose rock
		EU1	Non-marine caves
		EU2	Artificial underground habitats
		ED1	Exposed sand, gravel or till
		ED2	Spoil and bare ground
		ED3	Recolonising bare ground
		ED4	Active quarries and mines
		ED5	Refuse and other waste
		BC1	Arable crops
		BC2	Horticultural land
		BC3	Tilled land
		BC4	Flower beds and borders
		BL1	Stone walls and other stonework
		BL2	Earth banks
		BL3	Buildings and artificial surfaces

Appendix C – Restoration measures and monitoring

Table C-1: Long-term monitoring points for fen restoration at River Boyne and River Blackwater SAC (Newtown)

Point	Measure	Objective	Timeframe	Frequency of monitoring
Gw_1	Hydrological	Groundwater levels and quality monitoring	Long-term	Quarterly for year 1 Annual for year 2-5
Gw_2				
Gw_3				
Gw_4				
Gw_5				
Sw_1		Monitoring of surface water levels and quality	Long-term	Quarterly for year 1 Annual for year 2-5
Sw_2				
Sw_3				
Sw_4				
Sw_5				
Sw_6				
Ec_1	Ecological	Monitoring within areas of 7230 Alkaline fens	Long-term	Seasonal for year 1 Every 3 years for year 2-5
Ec_2				
Ec_3				
Ec_4				

Table C-1: Long-term monitoring points for fen restoration at River Boyne and River Blackwater SAC (Cummerstown)

Point	Measure	Objective	Timeframe	Frequency of monitoring
Gw_1	Hydrological	Groundwater levels and quality monitoring	Long-term	Quarterly for year 1 Annual for year 2-5
Gw_2				
Gw_3				
Gw_4				
Gw_5				
Sw_1		Monitoring of surface water levels and quality	Long-term	Quarterly for year 1 Annual for year 2-5
Sw_2				
Sw_3				
Sw_4				
Sw_5				
Ec_1	Ecological	Monitoring within areas of 7230 Alkaline fens	Long-term	Seasonal for year 1 Every 3 years for year 2-5
Ec_2				
Ec_3				
Ec_4				

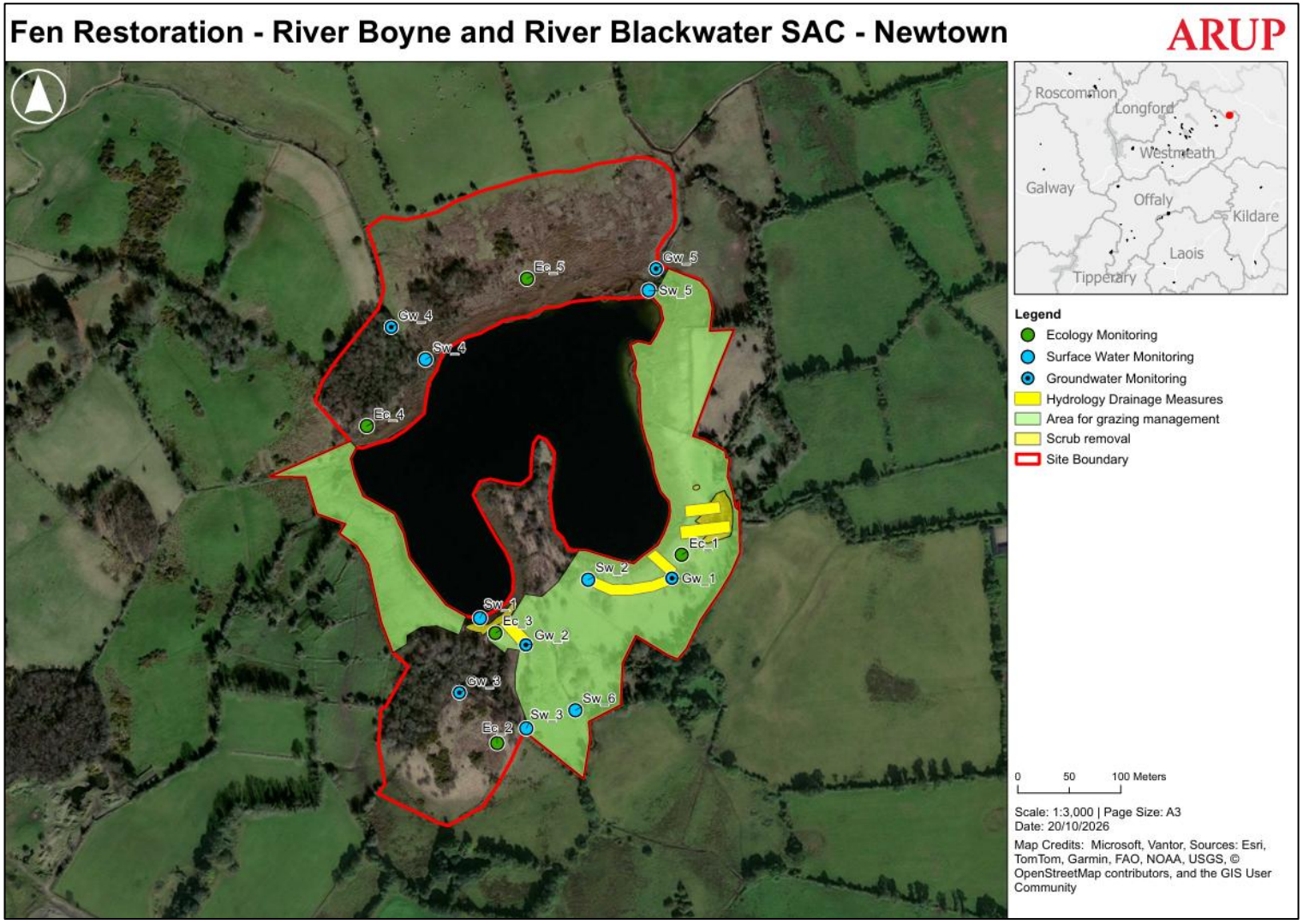


Figure 9-3: Proposed restoration measures and monitoring for Newtown

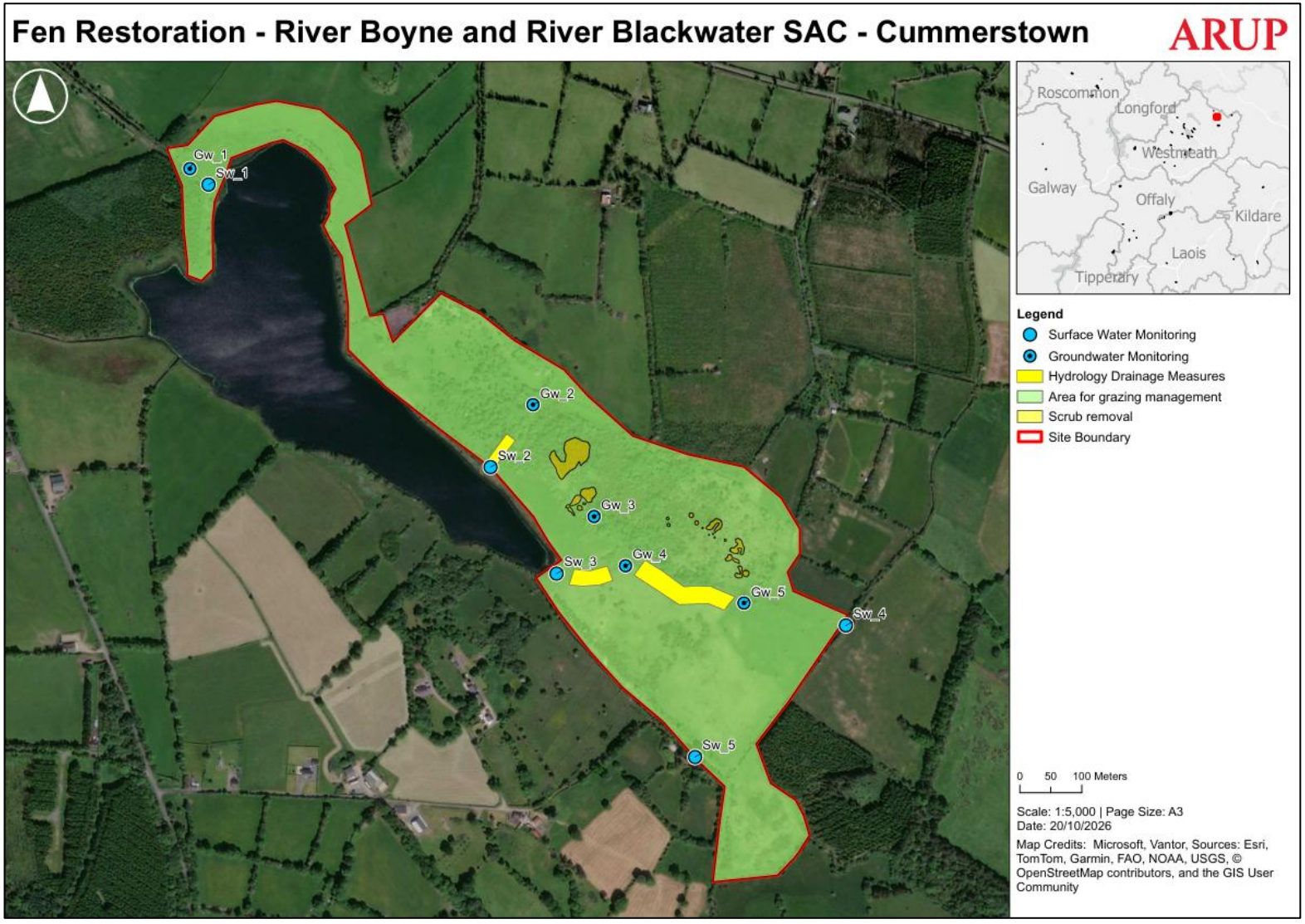


Figure 9-4: Proposed restoration measures and monitoring for Cummerstown

Appendix D – Drainage Management Plan

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan			
Site name	Newtown (The River Boyne and River Blackwater SAC)		
County	Westmeath	NFS site No.	104014
Catchment overview:			
Newtown is located within the Boyne WFD Catchment and the Boyne_SC_070 WFD sub-catchment. The Kilskeer River flows through Newtown Lough from northwest to southeast before continuing eastwards to join the Athboy River, which subsequently flows south to the River Boyne. The ATHBOY_030 river waterbody, within which the site is located, has been assigned a Moderate WFD Status and is not considered at risk of failing to achieve its WFD objectives. The site topography slopes gently from approximately 90 mOD to 86 mOD at Newtown Lough, before rising back to around 90 mOD towards the southeast.			
WFD catchment	Boyne	WFD Sub-catchment	Boyne_SC_070
Drainage Area	Scheme Boyne, Region East (Reference C1/21/25)	Drainage District	None
Responsible authority	Westmeath County Council (WCC)	Maintenance date	TBD
Surrounding landowners	Landowners		
Wetland drainage			
A review of historical and current hydrological data indicates that the Kilskeer River enters Newtown Lough from the northwest and discharges from its northeastern end. Historical mapping dating from 1897 to 1913 identifies a spring approximately 20 m northeast of the site, adjacent to the Kilskeer River, as well as three additional springs located approximately 450 m to the south and 800 m to the southeast. The drainage pattern showed on the historical maps is consistent with present-day hydrological observations. Several drains were mapped in the southern and southeastern areas, while additional drains traverse the northern part of the site. These drainage features, including the Kilrush Lower stream located south of the site, discharge into Newtown Lough.			
Surface water inflow	The northwestern area (Kilskeer River) and the southwestern area (Kilrush Lower)	Surface water outflow	Northeastern area
Groundwater inflow	Groundwater discharge from the surrounding catchment. Springs located to the northeast, to the south and southeast of the site		
Internal drains	Several drains are present in the southern and northern areas	Perimeter drains	A drain is located along the northwestern boundary, while several additional drains are present along the southern boundary
On site hydrology measures			
On-site measure 1	Drain blocking	Role player	NPWS/Surrounding landowners
On-site measure 2	Hydrological monitoring	Role player	NPWS/Surrounding landowners

Nutrient measures

As nutrient enrichment was not identified as a key pressure affecting habitat condition, no target nutrient measures (on-site and off-site) are currently proposed.

Proposed Water Monitoring:

Hydrological monitoring will assess site water conditions and the influence of the drainage network on water levels and fen habitat development. The proposed network comprises five piezometers and six surface water monitoring locations.

Five piezometers are proposed: one at the Kilskeer River inflow (NW), one adjacent to the Kilskeer River (NE), and three along the southern drainage network.

Six surface water monitoring locations are proposed: two on the Kilskeer River representing the main inflow (NW) and outflow (NE), and four in the south, including one on the Kilrush Lower Stream and three on site drains.

Indicator	Water level/ Water quality	Location	Various locations across site	Role players	NPWS/ Surrounding landowners

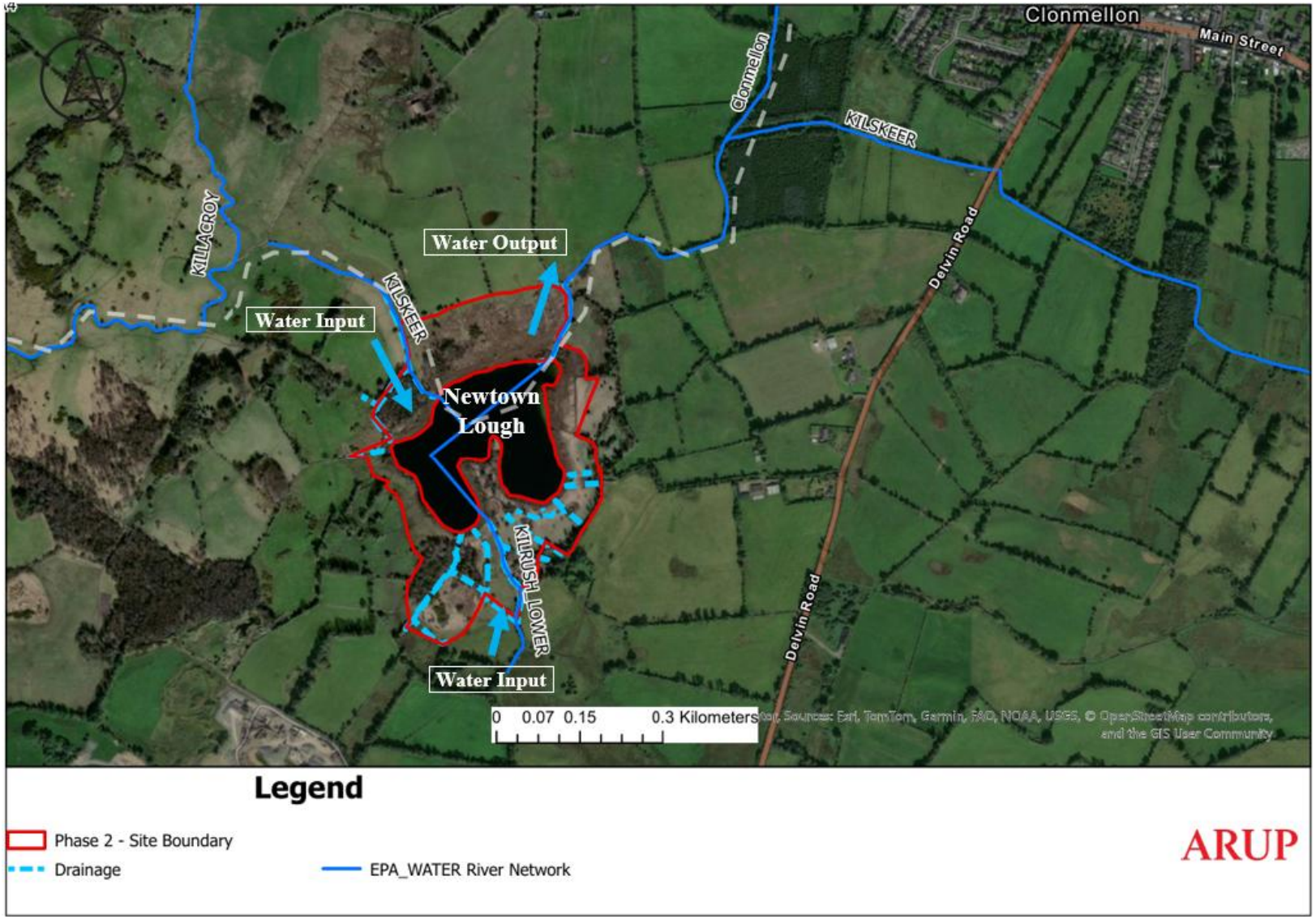


Figure 1: Mapped drainage network at Newtown

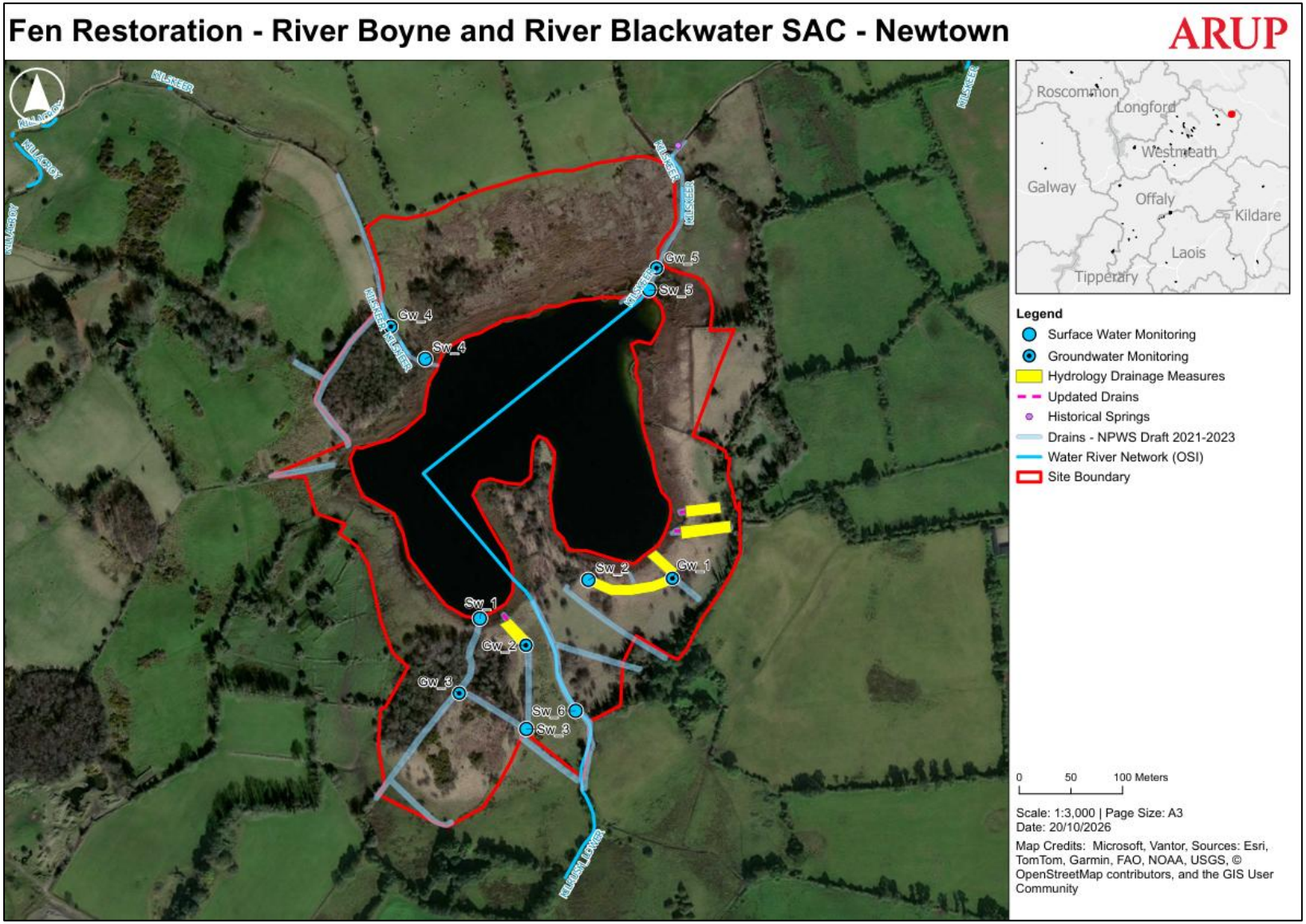


Figure 2: On-site hydrology measures at Newtown

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan			
Site name	Cummerstown (The River Boyne and River Blackwater SAC)		
County	Westmeath	NFS site No.	104013
Catchment overview:			
Cummerstown is located within the Boyne WFD Catchment and the Deel (Raharney)_SC_010 WFD sub-catchment. The Lough Lene-Adeel outflow stream and a deep canalised drain maintained by the OPW, both situated south of the site, discharge to the Deel (Raharney) River. The river flows southwest along the southern site boundary before joining the River Boyne. The DEEL (RAHARNEY)_010 WFD river waterbody is classified as having Good WFD Status and is not considered at risk of failing to meet its WFD objectives. The topography gently slopes from approximately 86 mOD in the northwest to 83 mOD at Lough Adeel in the southeast, before rising again to around 86 mOD. Beyond the site boundary, elevations increase more sharply, reaching approximately 124 mOD to the north and 112 mOD to the southeast.			
WFD catchment	Boyne	WFD Sub-catchment	Deel (Raharney)_SC_010
Drainage Area	Scheme Boyne, Region East (References: C1/37/35/20 and C1/37/35)	Drainage District	None
Responsible authority	Westmeath County Council (WCC)/ OPW	Maintenance date	TBD
Surrounding landowners	Landowners		
Wetland drainage			
Historic maps of the Cummerstown area (1897–1913) are consistent with current observations, showing inflow to the lake from the northwest and outflow to the southeast. Additionally, two old drains extend from the east-central part of the site into the lake.			
Surface water inflow	Northwest (Lough Lene-Adeel stream)	Surface water outflow	Southeast (Lough Lene-Adeel stream and a deep canalised drain)
Groundwater inflow	Groundwater discharge from the surrounding catchment		
Internal drains	Two old drains located in the east-central area	Perimeter drains	A deep, canalised drain extends along the southwestern site boundary and the Deel Raharney River flows along the southern boundary
On site hydrology measures			
On-site measure 1	Drain blocking	Role player	NPWS/Surrounding landowners
On-site measure 2	Hydrological monitoring	Role player	NPWS/Surrounding landowners
Nutrient measures			
As nutrient enrichment was not identified as a key pressure affecting habitat condition, no target nutrient measures (on-site and off-site) are currently proposed.			
Proposed Water Monitoring:			

NPWS Tóchar Midlands Wetland Restoration Scheme Fen Restoration Plan: Drainage Management Plan					
A hydrological monitoring network is proposed to assess site water conditions and the influence of the drainage network on water levels and fen habitat development. The network will comprise five piezometers and five surface water monitoring locations positioned to monitor the main water inflows, internal drainage features, lake water levels, and site outflows. Piezometers will be installed in the northwest at the main inflow, within internal drains in the central-eastern area, and along the southern outflow channel. Surface water monitoring will be undertaken at the main inflow, near Lough Adeel, and at locations along the southern drainage network before discharge to the Deel (Raharney) River.					
Indicator	Water level/ Water quality	Location	Various locations across site	Role players	NPWS/ Surrounding landowners



Figure 1: Mapped drainage network at Cummerstown

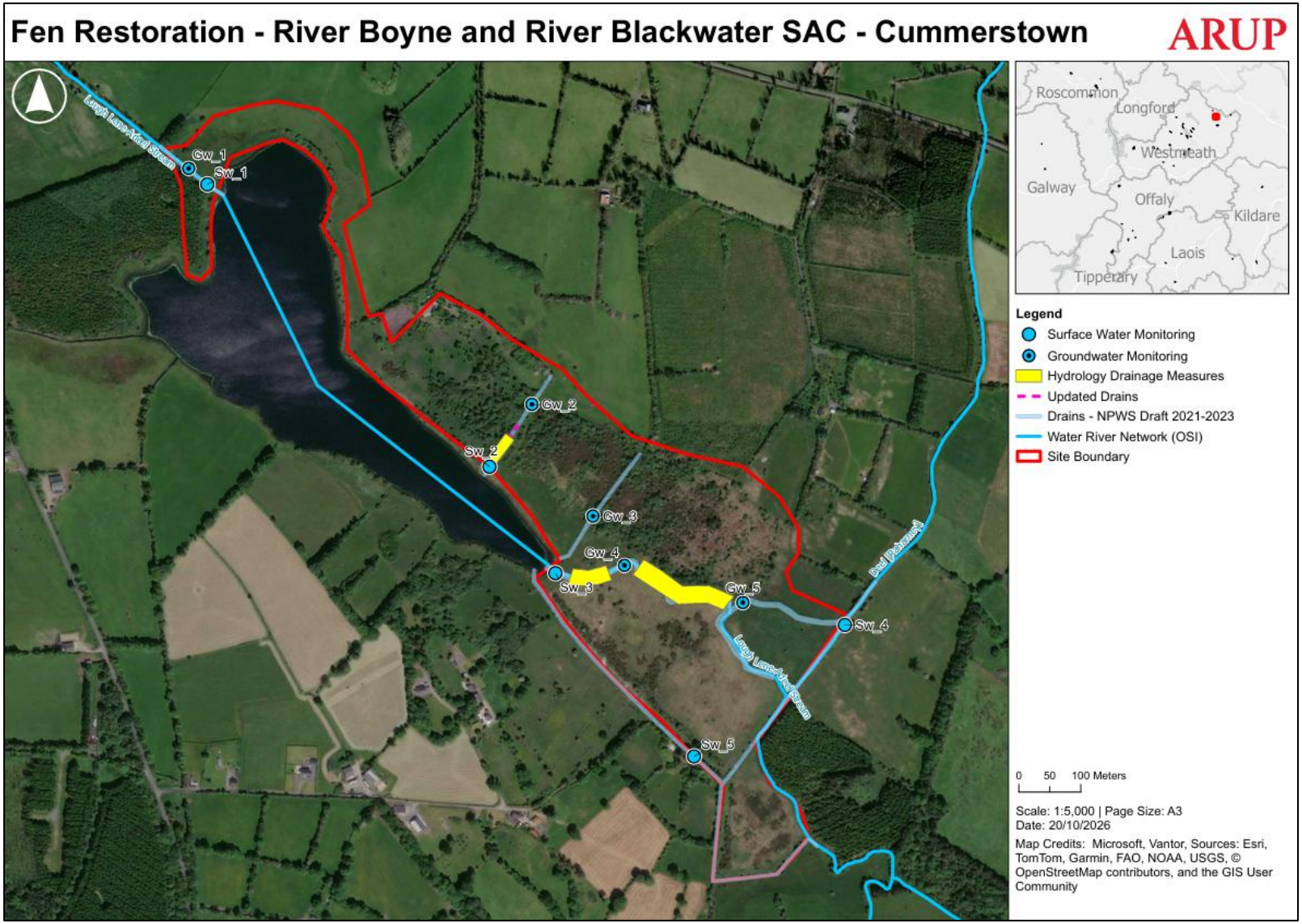


Figure 2: On-site hydrology measures at Cummerstown