Autumn 2022

Regional Water Resources Plan–Eastern and Midlands

Natura Impact Statement

Tionscadal Éireann
Project Ireland
2040

Data disclaimer: This document uses best available data at time of writing. Some sources may have been updated in the interim period. As data relating to population forecasts and trends are based on information gathered before the Covid 19 Pandemic, monitoring and feedback will be used to capture any updates. The National Water Resources Plan will also align to relevant updates in applicable policy documentation.

Baseline data included in the RWRP-EM has been incorporated from numerous sources including but not limited to; National Planning Framework, Central Statistics Office, Regional Spatial and Economic Strategies, Local Authority data sets, Regional Assembly data sets and Irish Water data sets. Data sources will be detailed in the relevant sections of the RWRP-EM. 2019 was selected as the base year to align with the planning period (2019-2025) of the NWRP.

Glossary

Term	Definition
Adverse Effects on Site Integrity (AESI)	Activities usually resulting from a plan or project that could result in effects on qualifying interest (Annex I habitats or Annex II species) of a European site which could have implications for the conservation objectives of the site leading to AESI.
Annex I Habitat	A habitat listed in Annex I of the Habitats Directive.
Annex II Species	A species listed in Annex II of the Habitats Directive.
Appropriate Assessment (AA)	An assessment carried out under Article 6(3) of the Habitats Directive of the implications of a plan or project, either individually or in-combination with other plans and projects, on a European site in view of the site's conservation objectives.
Best AA	The approach that following a desktop assessment has the Least Impact on European Sites (without consideration of mitigation measures)
BA	Barrier Assessment
Bird Directive	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.
CIRIA	Construction Industry Research and Information Association
Competent authority	Public body provided for in the relevant legislation that makes statutory determinations (for example, in relation to AA).
Conservation Objectives (COs)	In the context of this report, conservation objectives are discussed in relation to European sites. Some European sites have site-specific conservation objectives (SSCOs); other European sites have generic conservation objectives. The National Parks and Wildlife Service are in the process of producing detailed conservation objectives for all European sites and their Qualifying Interests.
CRU	Commission for Regulation of Utilities
Deployable Output (DO)	Deployable Output is the output of a commissioned water supply source, group of sources or bulk supply under a given set of flow sequences as constrained by abstraction licence, environmental constraints, water treatment capacities and asset capacities
DHLGH	Department of Housing, Local Government and Heritage
DMA	District Metered Area
DWSP	Drinking Water Safety Plan
DYCP	Dry Year Critical Period
EBSD	Economics of Balancing Supply and Demand
ECJ	European Court of Justice
Environmental Impact Assessment (EIA)	EIA is the process where potential environmental effects of a proposed project are examined.
EPA	Environmental Protection Agency
European Commission	The Commission of the European Communities.

Term	Definition
EU	European Union
European site	Any Special Area of Conservation (SAC) or Special Protection Area (SPA), also referred to as Natura 2000 sites.
GDA	Greater Dublin Area
Groundwater (GW)	Groundwater is the water held underground in the soil or in pores and crevices in rock.
Groundwater Body (GWB)	A distinct volume of groundwater within an aquifer or system of aquifers, which is hydraulically isolated from nearby groundwater bodies.
GWDTH	Groundwater Dependent Terrestrial Habitat
Habitats Directive	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
IFI	Inland Fisheries Ireland
INNS	Invasive Non-Native Species
IROPI	Imperative Reasons of Over-Riding Public Interest
LDWMP	Lead in Drinking Water Mitigation Plan
LoS	Level of Service
Likely Significant Effects (LSEs)	Term adapted from Article 6(3) of the Habitats Directive (“likely to have a significant effect”), describing the type of effects which, if identified as potentially arising as a result of a project or plan, trigger an AA.
LWB	Lake Waterbody
MCA	Multi-Criteria Analysis
MSA	Midlands Strategic Study Area
National Parks and Wildlife Service (NPWS)	The National Parks and Wildlife Service is fully integrated in the Heritage Division of the Department of Culture, Heritage and the Gaeltacht and has responsibility for the protection and conservation of Ireland's natural heritage and biodiversity at national government level.
NPF	National Planning Framework
NPO	National Planning Objective
NWSMP	National Wastewater Sludge Management Plan
Natura Impact Statement (NIS)	Term for the statutory report produced to inform the AA of a plan by the competent authority.
NPV	Net Present Value
Precautionary Principle	Implicit in the Habitats Directive is the application of the precautionary principle, which requires that the conservation objectives of Natura 2000 should prevail where there is uncertainty. This requires objectively demonstrating, with supporting evidence, that there will be no adverse effects on the integrity of the Natura 2000

Term	Definition
	site. Where this is not the case, adverse effects must be assumed.
Priority habitat	Natural habitat types on Annex I of the Habitats Directive, and indicated by an asterisk (*), which are in danger of disappearance, and for which the European Community has particular responsibility in view of the proportion of their natural range which falls within the European territory of the Member States.
Priority species	Species for the conservation of which the European Community has particular responsibility in view of the proportion of their natural range which falls within the European territory of the Member States, these priority species are indicated by an asterisk (*) in Annex II of the Habitats Directive. At present, Ireland does not have any priority species.
PCT	Project Costing Template
Qualifying Interest (QI)	One of the features (habitat or species) that are the reasons for designation of a Special Area of Conservation, identified in the Conservation Objectives for that site.
Red, Amber or Green (RAG)	A colour code using the traffic light scoring system where a red rating will assume unviability and therefore will be eliminated on this basis and assessed no further; an amber rating would not be ruled out and will be carried forward for further evaluation and a green rating will assume that there are no negative impacts and will therefore be carried forward.
RBMP	River Basin Management Plan
RWRP	Regional Water Resources Plan
Screening for AA	The screening of a plan or project to establish if an AA of the plan or project is required. An AA must be carried out unless the screening assessment can establish that there is no potential for LSEs on a European site.
Special Area of Conservation (SAC)	SACs are sites designated under the Habitats Directive. This requires the conservation of important, rare or threatened habitats and species (not birds, which are protected by Special Protection Areas) across Europe.
Special Conservation Interest (SCI)	The term used to refer specifically to bird species for which Special Protection Areas have been designated. These are also identified in the Conservation Objectives for the site.
Special Protection Area (SPA)	SPAs are sites designated under the Birds Directive to conserve the habitats of certain migratory or rare birds.
Strategic Environmental Assessment (SEA)	A SEA is an environmental assessment of plans and programmes to ensure a high-level consideration of environmental issues in the plan preparation and adoption, and is a requirement provided for under the SEA Directive (2001/42/EC). The SEA and AA are undertaken in tandem with the drafting of a plan.
Study Area (SA)	The Regional Groups are subdivided into Study Areas which are clusters of Water Resource Zones.
Surface Water (SW)	Surface water is any body of water above ground, including streams, rivers, lakes, wetlands and reservoirs.
Supply Demand Balance (SDB)	The SDB is the deficit or surplus between the supply and demand both now and over the 25-year horizon.

Term	Definition
The Framework Plan	A plan on how to provide a safe, secure and reliable water supply for the next 25 years, without causing adverse impacts on the environment.
UKTAG	UK Technical Advisory Group
UKWIR	UK Water Industry Research
WAB	Water Abstraction
WAFU	Water Available for Use
Water Framework Directive (WFD)	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (the WFD) is an EU Directive which commits European Union member states to achieve “Good” qualitative and quantitative status of all water bodies by taking a holistic approach to managing all waters. It applies to rivers, lakes, groundwater, estuaries and coastal waters.
WRMP	Water Resources Management Plan
Water Resource Zone (WRZs)	Water Resource Zones are the units for which the SDB calculations are carried out. WRZs are made up of one or more Water Supply Zones
WHO	World Health Organisation
WSPS	Water Services Policy Statement
WSSP	Water Services Strategic Plan
Water Supply Zones (WSZs)	A Water Supply Zone typically includes one or more abstractions (from a river, lake, Impounding Reservoir or groundwater), a Water Treatment Plant, storage in reservoirs and the distribution pipe network to deliver the water to each household or business.
Water Treatment Plants (WTPs)	A facility that processes and converts wastewater into an effluent (outflowing of water to a receiving body of water) that can be returned to the water cycle with minimal impact on the environment or directly reused.
Zone of Influence (ZoI)	Term used widely in environmental assessments. The ZoI defines the spatial area over which there is potential for LSEs, taking account of the sensitivity and mobility of different QI/Special Conservation Interest, on species or habitats from a project or plan.

1 Introduction and Background

1.1 Introduction

Irish Water assumed statutory responsibility for the provision of public water services and management of water and wastewater investment for Ireland on the 1st January 2014. Its role is to ensure that all its customers and communities receive a safe and secure supply of drinking water and have their wastewater collected, appropriately treated and returned to the environment. Irish Water supports Ireland's social and economic growth in a sustainable manner through appropriate investment in water services and strives to protect the environment in all our activities.

Irish Water is regulated by:

- The economic regulator, the Commission for Regulation of Utilities (CRU), is charged with protecting the interests of the customer. The CRU also approves funding to enable Irish Water to deliver the required services to specified standards in an efficient manner.
- The environmental regulator, the Environmental Protection Agency (EPA), sets standards and enforces compliance with European Union (EU) and national regulations for drinking water supply and wastewater discharge to water bodies. The EPA liaises with the Health Services Executive in matters of public health.

1.2 Regional Water Resources Plans

The Regional Water Resources Plan – Eastern and Midlands (RWRP-EM) is one of four regional plans that, along with the NWRP Framework Plan published in Spring 2021, comprise Ireland's first NWRP. Irish Water's NWRP will be the first such plan for the entire public water supply in Ireland. It will allow Irish Water to integrate government policy, legislation and external factors, including climate change, that have the potential to impact our demand for water and water supplies, into the planning and operation of our existing and future supply asset base and the way we all use water. The objectives of the NWRP are to:

- Enable Irish Water to address needs across water supplies in the most effective way over time, through the regulated investment cycles;
- Ensure that there is a transparent framework to develop the most appropriate projects/programmes to meet statutory obligations in relation to water supply;
- Provide a framework to track outcomes, allowing interventions to be prioritised to bring the water supply up to the required standards in the shortest possible timeframe; and
- Deliver a plan to ensure that all of our customers have access to safe, secure, reliable and sustainable water supplies, wherever they live.

The NWRP also aims to support balanced regional development, as outlined in the National Planning Framework (NPF) and the supporting Regional Spatial and Economic Strategies (RSES), by assessing water supply needs across our growing communities.

The four regional plans will include:

- Regional Water Resources Plan-North West (RWRP-NW) (Group Area 1)
- Regional Water Resources Plan-South West (RWRP-SW) (Group Area 2)
- Regional Water Resources Plan-South East (RWRP-SE) (Group Area 3)
- Regional Water Resources Plan-Eastern and Midlands (RWRP-EM) (Group Area 4)

Each RWRP will identify deficiencies and need across the water supplies within the region and develop regional plan-level solutions to address these issues. The combined regional solutions will be prioritised collectively at a national level through Irish Water's planning and investment cycles and form the basis of the NWRP.

The groupings (as seen in Figure 1.1) reflect Irish Water's operational regions and water supply boundaries, with modifications to account for river catchments, as delineated by the EPA in the River Basin Management Plan (RBMP).

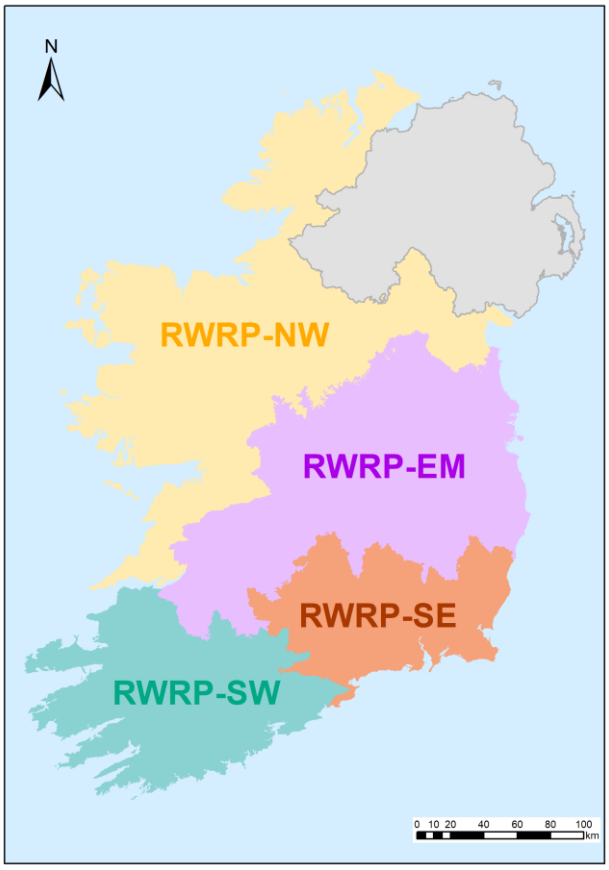

Figure 1.1 – Regional Groupings for Phase 2

The development of four RWRPs is a mechanism for efficient delivery of the NWRP. The outputs of the four RWRPs will be combined for prioritisation and progression through the future cycles of capital investment planning. The Strategic Environmental Assessment (SEA) Environmental Reports and Natura Impact Statement (NIS) for each subsequent Regional Plan will consider the cumulative impacts and in-combination effects with the preceding Regional Plan/Plans and adjustments can be made to address any cumulative impacts identified.

1.3 Structure of the Plan

Phase 1 of the NWRP (the Framework Plan) set out a new Option Assessment Methodology that Irish Water will use to develop a national programme of preferred projects for delivery over the next 25 years to meet the identified need across the public water supply.

The Options Assessment Methodology, as presented in the Framework Plan, will ensure that Irish Water develop appropriate and sustainable interventions, that align with their overarching three pillar approach (see Figure 1.2) to:

- **Lose Less -** reducing water lost through leakage and improving the efficiency of Irish Water's distribution networks.
- **Use Less -** reducing water use through efficiency measures.
- **Supply Smarter -** improving the quality, resilience and security of Irish Water's supply through infrastructure improvements, operational improvements and by developing new sustainable sources of water.

Together these pillars will enable Irish Water to optimise their capital and operational interventions to achieve the best outcomes and react to emerging issues. Further information on the "Three Pillars" is detailed in Chapter 7 of the Framework Plan.

Figure 1.2 – Three Pillar Approach

The Options Assessment Methodology is outlined in Chapter 9 of the Framework Plan. The methodology is based around an option development process which is being rolled out as part of the Regional Plans. The process aligns with the seven standard steps set out in the Department of Public Expenditure and Reform (2019) guidance document "*Public Spending Code: A Guide to Evaluating, Planning and Managing Current Expenditure*". The key stages of the Framework Plan Options Assessment Methodology process is illustrated in Figure 1.3 and summarised below.

1. Identify need - based on SDB and/or Drinking Water Safety Plan Barrier Assessment.
2. Scoping of the Study Area (Water Resource Zones (WRZs)) – understanding the Study Area and the existing conditions of assets, supply and demand issues as well as environmental constraints and opportunities.
3. Unconstrained Options – identifying potential options for consideration relevant to the Study Area.
4. Coarse Screening – assess the unconstrained options and eliminate any that will not be viable.
5. Further option definition, information collection and preliminary costing.

6. Fine Screening – options assessment and scoring against the key criteria with further removal of options identified as unviable and development of feasible options for costing (including environmental and social costs) and scoring assessment update.
7. Approach development – comparison and assessment of combinations of options identified to meet the predicted supply demand deficit at WRZ, Study Area and Regional Group Area level using Multi-Criteria Analysis (MCA) to determine the Preferred Approach. Approaches tested will include:
    - Least Cost
    - Best Appropriate Assessment (Best AA)
    - Quickest Delivery
    - Best Environmental
    - Most Resilient
    - Lowest Carbon
8. Monitoring and feedback into Plan – a feedback mechanism to ensure that the Framework Plan continuously adapts to changes such as evolving scientific data, understanding, and policy change in relation to the natural environment.

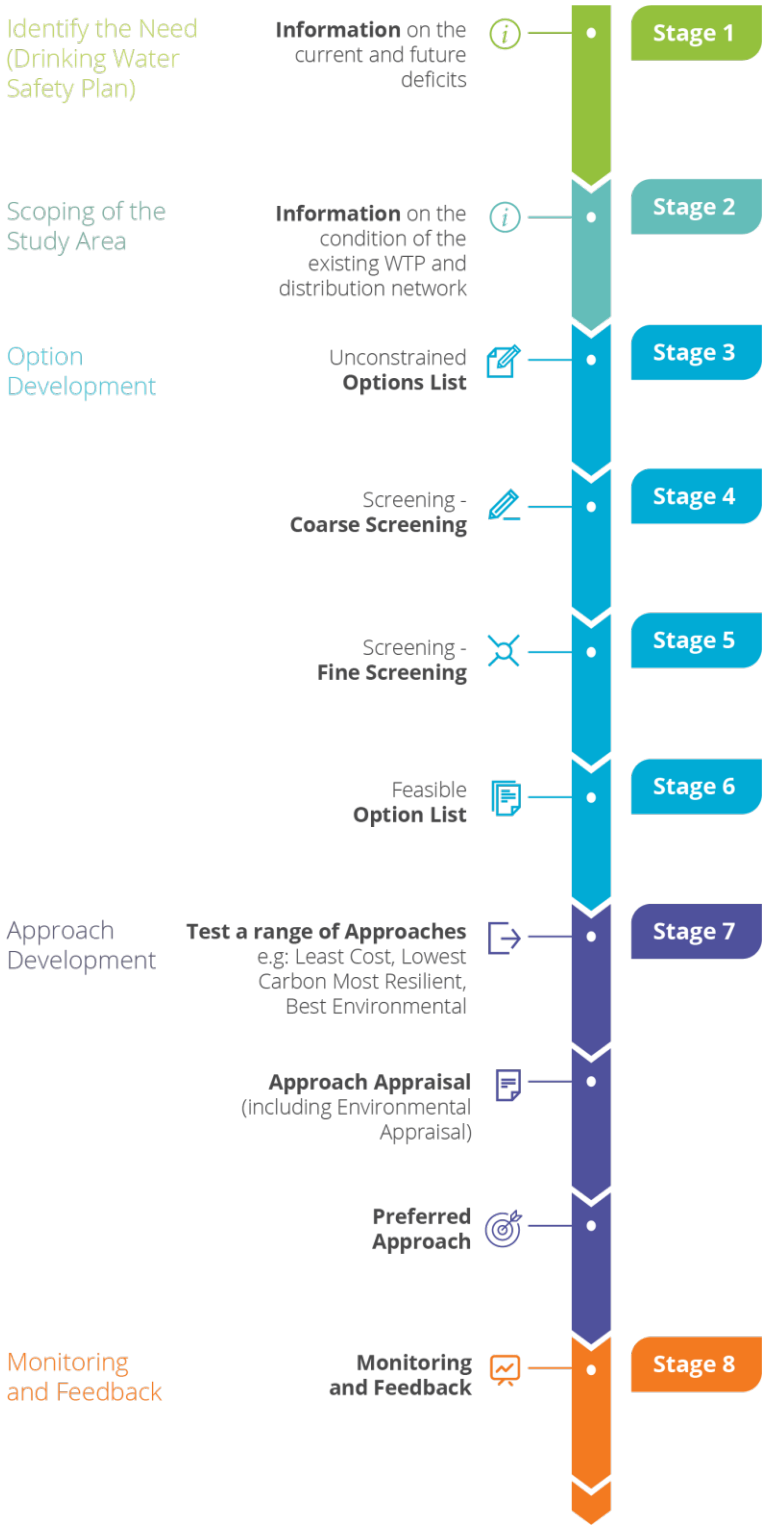

Figure 1.3 – Option Assessment Methodology Process

Table 1.1 - National Water Resources Plan Phases

NWRP Phases	NWRP Reports	Content
Phase 1: NWRP – Framework Plan	NWRP – draft Framework Plan	Need identification including the SDB Calculations NWRP Objectives Generic Option Types Options Assessment Methodology
	Case Study – Study Area	Test of the Options Assessment Methodology against Study Area 5 provided as an example with the draft Framework Plan to demonstrate the methodology. The outcomes are not part of draft Framework Plan consultation.
	NWRP – final Framework Plan	Finalise and adopt NWRP - Framework Plan
Phase 2: RWRPs (Regional Plans)	Draft RWRP (draft Regional Plans)	Application of Options Assessment Methodology and Identification of the Preferred Approach for the following regions: • RWRP-NW (Group Area 1) • RWRP-SW (Group Area 2) • RWRP-SE (Group Area 3) • RWRP-EM (Group Area 4)
	Final RWRPs (final Regional Plans)	Regional Plans for each of the Group Areas (1 to 4) will be published, finaliased and adopted in succession.

The screening for Appropriate Assessment (AA) of the Framework Plan identified that all management option types arising from the NWRP had the potential to give rise to Likely Significant Effects (LSEs) on European sites. Therefore, all Regional Group Areas (1, 2, 3 and 4) and the management option types selected for same, are all subject to Appropriate Assessment with the LSEs identified for the Framework Plan further assessed and their implications for European site integrity identified in the context of potential impact pathways, their implications for the conservation objectives of European site(s), and the identification of any mitigation that might be required to protect site integrity. Given the scale of the NWRP the accompanying NISs to support AA reporting will be presented as part of Phase 1 and Phase 2 (see Table 1.1 above) of the NWRP; Phase 1 of the process having being completed. For Phase 2 of the NWRP the Regional Plans for each of the Group Areas (1 to 4) will be published in succession. The first of the RWRPs to be published was the draft RWRP-EM, followed by the draft RWRP-SW, draft RWRP-NW and draft RWRP-SE. Consultation for each of the draft Regional Plans, and their accompanying NIS, will be undertaken sequentially in 2021, 2022 and 2023. This position was confirmed in the Regional Plan-specific screening for AA that Irish Water carried out in relation to the RWRP-EM, which again concluded that the management option types arising from the RWRP-EM had the potential to give rise to LSEs on European sites, in view of the sites' conservation objectives. Accordingly, Stage 2 AA of the RWRP-EM was considered to be required. The AA Screening Report for the RWRP-EM is provided at Appendix A to this NIS.

1.4 This Report

This is the NIS which has been prepared to support the AA of the RWRP-EM. This NIS has been prepared by Jacobs for Irish Water having regard to the requirements of the EU Habitats Directive (Directive 92/43/EEC) (the Habitats Directive) on the Conservation of Natural Habitats and of Wild Fauna and Flora in particular the provisions of Article 6(3), as transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011). As the national public water authority, the responsibility for carrying out the AA of the RWRP-EM lies with Irish Water. The NIS for the draft RWRP-EM was released for public consultation along with the draft RWRP-EM and other supporting documentation. This NIS will also be published alongside the final RWRP-EM and an AA Determination, which will set out the conclusions of the Appropriate Assessment carried out by Irish Water, as informed by the NIS, public consultation and other prescribed matters as appropriate.

1.5 Legislative Context for Appropriate Assessment

The Habitats Directive provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of community interest through the establishment and conservation of a European Union–wide network of sites known as the "Natura 2000 network" (hereafter referred to as "European sites"[1]). European sites comprise Special Areas of Conservation (SACs[2]) and Special Protection Areas (SPAs).

1.5.1 Public Authorities and Appropriate Assessment

The duties of public authorities in relation to nature conservation are stated in the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended) (the 2011 Regulations). Irish Water is defined as a 'public authority' for the purposes of the 2011 Regulations.

The first step of the AA process is to carry out a screening to establish whether, in relation to a particular plan or project, there is potential for likely significant effects (LSEs) to any European site(s). Specifically, Regulation 42(1) states:

"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site.".

Regulation 42(6) states that:

"The public authority shall determine that an Appropriate Assessment of a plan or project is required where the plan or project is not directly connected with or necessary to the management of the site as a European site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site".

[1] "European site" replaced the term "Natura 2000 site" under the European Union (Environmental Impact Assessment and Habitats) Regulations, 2011 (S.I. No. 473 of 2011).

[2] There are currently no SACs in Ireland. All remain 'candidate' Special Areas of Conservation (cSACs) until the European Commission approves and ratifies the final list of cSACs. cSACs are afforded the same protection as SACs. The process of making cSACs SACs by means of Statutory Instrument has begun. While this process is ongoing, the term SAC will be used, in conformance with nomenclature used in NPWS databases.

In the context of Article 6(3), Irish Water must carry out screening for AA of the RWRP-EM to assess whether, on the basis of objective scientific information the Plan, individually or in-combination with other plans or projects, is likely to have a significant effect on a European site. If this screening determines that it cannot be excluded, on the basis of objective scientific information, that the Plan, individually or in combination with other plans or projects, will have a significant effect on a European site, then Irish Water must determine that an Appropriate Assessment of the plan is required.

To assist Irish Water in carrying out any Appropriate Assessment that may be required following screening, Irish Water must prepare a Natura Impact Statement (NIS), which is a report comprising the scientific examination of a plan or project and the relevant European Site or European Sites, to identify and characterise any possible implications of the plan or project individually or in combination with other plans or projects in view of the conservation objectives of the site or sites, and any further information including, but not limited to, any plans, maps or drawings, scientific information or data required to enable the carrying out of an Appropriate Assessment.

In carrying out the full Appropriate Assessment, the Habitats Regulations 2011 require Irish Water to take into account:

- The NIS;
- Any other plans or projects that may, in combination with the plan or project under consideration, adversely affect the integrity of a European site;
- Any supplemental information furnished in relation to any such report or statement;
- If appropriate, any additional information furnished in relation to the NIS;
- Any information or advice obtained by Irish Water;
- If appropriate, any written submissions or observations made to Irish Water in relation to the application for consent for the Plan; and
- Any other relevant information.

Following the Appropriate Assessment process, Irish Water must then only adopt the RWRP-EM after having determined that the Plan shall not adversely affect the integrity of a European site.

1.6 Overlap with Strategic Environmental Assessment

A Strategic Environmental Assessment (SEA) of the RWRP–EM is being carried out concurrently with the AA process. SEA is required under the EU Council Directive 2002/42/EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment (the SEA Directive) as transposed into Irish Regulations[3]. The purpose of SEA is to enable plan-making authorities to incorporate environmental considerations into decision-making at an early stage and in an integrated way throughout the plan making process and to:

- Identify, evaluate and describe the potential significant environmental effects of implementing the RWRP-EM;
- Ensure that identified significant effects are communicated, mitigated and that the effectiveness of mitigation is monitored;

[3] In Ireland, the SEA Directive has been transposed into national legislation through S.I. No. 435 of 2004 (European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004, as amended by S.I. No. 200 of 2011 (European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011). Also, S.I. No. 436 of 2004 (Planning and Development (Strategic Environmental Assessment) Regulations 2004, as amended by S.I. No. 201 of 2011 (Planning and Development (Strategic Environmental Assessment) (Amendment) Regulations 2011).

- Identify beneficial (and neutral) effects, and to ensure these are communicated; and
- Provide an opportunity for stakeholder and public involvement.

There is a degree of overlap between the requirements of the SEA and AA and in accordance with best practice, an integrated process has been carried out between the development of the RWRP–EM, the SEA and the AA, such as sharing of baseline data where relevant, cohesive assessment of the potential ecological effects of the RWRP–EM on European sites, their qualifying features, and clarification on more technical aspects of the RWRP. These processes together will inform and shape the development of the RWRP–EM. Irish Water has prepared an Environmental Report for the purposes of SEA, which is being published for consultation along with this NIS and the RWRP-EM.

Figure 1.4 below outlines the SEA and AA Stages and how they align with the development of the RWRP–EM.

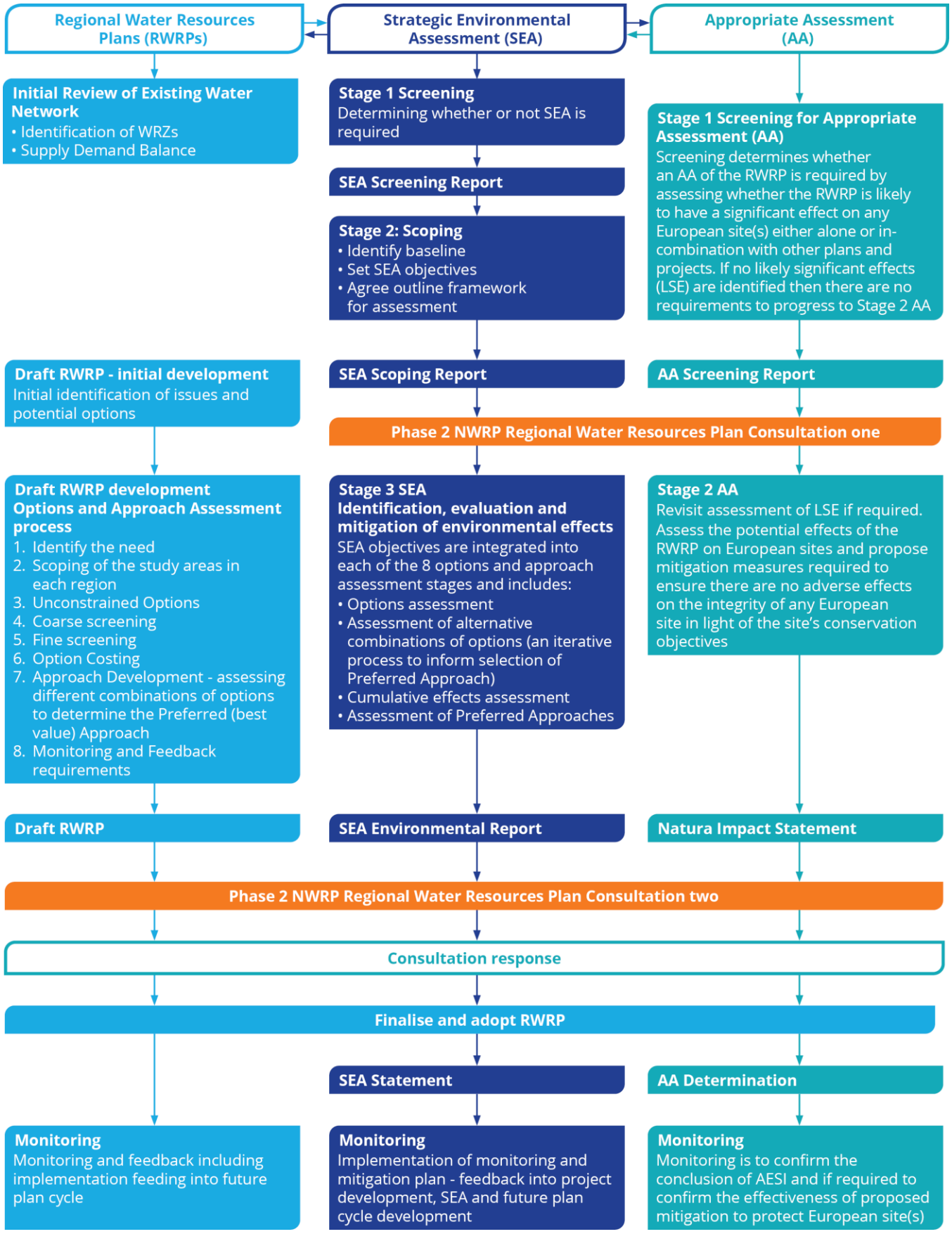

Figure 1.4 - RWRP development with SEA and AA process

1.7 Consultation

Irish Water presented the draft RWRP-EM for consultation alongside the draft NIS and the draft SEA Environmental Report. Irish Water have taken into account submissions and observations relevant to Appropriate Assessment (AA) matters as part of the overall AA process. The AA Determination to be issued alongside this final RWRP-EM records how those submissions have informed the overall AA.

Consultation on the draft RWRP-EM was during the period 14th December through to the 14th March 2022, and was then extended to the 8th April 2022. Submissions in relation to AA made by email or post were accepted until Friday 8th April 2022.

Email: nwrp@water.ie

Post: National Water Resources Plan, Irish Water, PO Box 13216, Glenageary, Co Dublin.

Freephone: 1800 46 36 76

All feedback received has been reviewed by the NWRP team and our responses will be published. Following the consultation, we have published the final version of the RWRP-EM on www.water.ie/nwrp

After the RWRP-EM consultation, Irish Water then commenced the drafting and consultation on the draft RWRPs for the remaining regions of South West, North West and South East. Irish Water will apply the Options Assessment and Preferred Approach Methodology set out in the adopted Framework Plan to each remaining water supply. This will allow Irish Water to develop a nationwide programme of short, medium and long-term options that we will present for consultation within the remaining Regional Plans. The Regional Plans once adopted will be used to inform future regulated capital investment plans and operational plans.

Consultation on the remaining Regional Water Resources Plans including corresponding SEA Environmental Reports and Natura Impact Statements has been or will be undertaken during 2022 and 2023.

2 Assessment Methodology

2.1 Stages of Appropriate Assessment

The methodology for undertaking assessment in relation to AA has evolved fromEuropean Commission guidance "Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC" (November, 2001) and Irish guidance from the former Department of Environment, Heritage and Local Government "Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities" (Revised December 2010)The entire process can be broken down into four stages (Article 42/43 of the Habitats Regulations 2011), as outlined below. If at any stage in the process it is determined that there will be no implications for the European site in view of the site's conservation objectives, the process is effectively completed. The four stages are described below.

Stage 1 - Screening for Appropriate Assessment (AA)/Test of Likely Significance: Screening determines whether an AA is required by determining if the project or plan is likely to have a significant effect(s) on any European site(s) either alone or in-combination with other plans or projects, in light of the site's conservation objectives (see Figure 2.1).

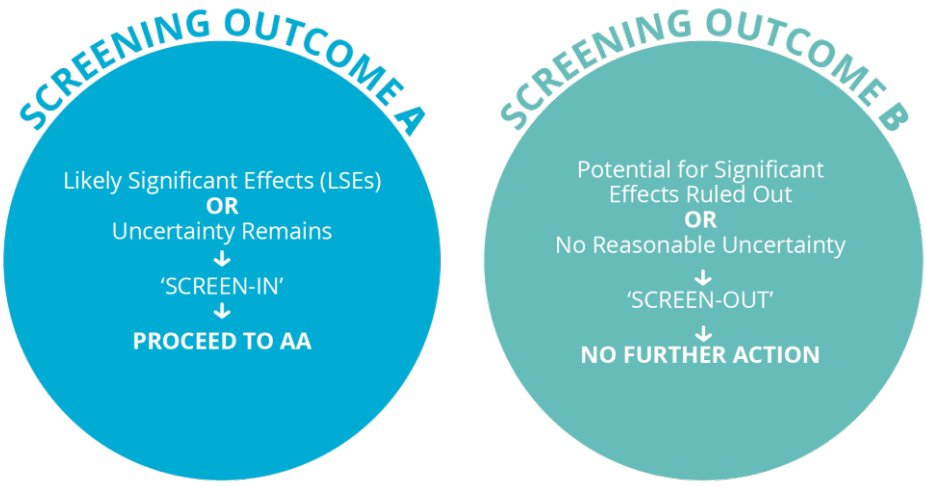

Figure 2.1 - Screening for Appropriate Assessment

Stage 2 - Appropriate Assessment: If the screening has determined that AA is required, the competent authority then considers the effect of the project or plan on the integrity of the European site(s). The AA considers the structure and function of European sites, their conservation objectives and effects from the project/plan both alone and in-combination with other projects or plans. Where Adverse Effects on Site Integrity (AESI) are identified, mitigation measures are proposed as required to avoid compromising the integrity and conservation objectives of the European site(s). The information and data to inform the AA process is documented within an NIS. This is provided to the competent authority to facilitate its AA of the plan or project (along with other factors including submissions and observations received through public consultation, as detailed above).

Stage 3 - Assessment of Alternative Solutions: Following AA, including mitigation proposals, if AESI remain, or uncertainty remains and the project/plan is to be progressed, an Assessment of Alternative Solutions is required under the provisions of Article 6(4) of the Habitats Directive. This process examines the alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the

integrity of the European site. If no alternatives exist, or all alternatives would result in adverse effects on the integrity of a European site, then either the process moves to the next stage or the project is abandoned.

Stage 4 - Imperative Reasons of Over-Riding Public Interest (IROPI): In the unlikely event where an Assessment of Alternative Solutions fails to identify any suitable alternatives, then for a project or plan to be progressed it must meet the requirements of IROPI. In this case the provisions of Article 6(3) cannot be met and therefore, the provisions of Article 6(4) are used. If in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed, thus compensatory measures are implemented to maintain the coherence of the European site network in the face of adverse effects to the integrity of the site(s).

2.2 Approach to AA of Regional Water Resource Plans

RWRPs are required to identify specific water resource options to address predicted SDB deficits in a given WRZ within a defined region. The approach to this AA takes consideration of their strategic nature and uses objective information to determine whether the Plan, in this case the RWRP-EM, have LSEs for European sites in the manner outlined in *Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland* (Court of Justice of the European Union, Case C-6/04, Opinion of Advocate General Kokott)[4] and the Waddenzee case (Court of Justice of the European Union, C-127/02).

2.2.1 Application of the AA process at Plan level

In the context of AA screening, when applying the 'test of significance' the test is of the "likelihood" of effects rather than the "certainty" of effects. In accordance with the Waddenzee Judgement[5], a likely effect is one that cannot be ruled out based on objective information and is underpinned by the precautionary principle and the test of beyond reasonable scientific doubt. This test therefore sets a low bar: a plan should be considered 'likely' to have an effect if the competent authority (in this case Irish Water) is unable (on the basis of objective information) to exclude the possibility that the plan could have significant effects on any European site, either alone or in-combination with other plans or projects. An effect is considered to be 'significant' if it could undermine a European site's conservation objectives.

The methodology for undertaking screening for AA can be applied at both a project and plan level assessment. The suitability of the data and information used and any decisions flowing from its use in the RWRP-EM assessment have to meet the provisions and requirements of the Habitats Directive. The strategic assessments at the plan level will inevitably be undertaken at a higher level than would be the case for projects. However, the RWRP-EM does not provide consent for any future projects arising from it or future iterations of the Plan but, demonstrates that the protection for the European site network is suitably considered and achievable in the context of the remit of the Plan. Also, any future project level AA screenings and/or NIS will have regard for the plan level AA screening as the projects have been identified or specified from the RWRP-EM. To note, all of Irish Water's projects are screened for AA. Therefore, all projects arising from the RWRP-EM will additionally be required to go through individual environmental assessments (including AA screening and if needed AA). These will be obligatory in

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62004CC0006 Accessed August 2020.
[5] [ECJ case C-127/02]

support of planning applications (where a project requires planning permission) or in support of licensing applications (for example, for new or increased surface or groundwater abstractions).

2.2.2 Compliance of the RWRP-EM with the Habitats Directive

The RWRP-EM identifies needs in terms of quantity, quality and reliability, and uses a methodology (Option Assessment Methodology) to develop interventions to address this need. The AA Screening Report for the RWRP-EM is provided in Appendix A, and assessed at a high level the option types that were likely to arise from the RWRP-EM, that is because not all of the Preferred Approaches (PAs) were fixed at the time the AA screening was undertaken. The AA screening for the RWRP-EM concluded that the management option types arising from the RWRP-EM had the potential to give rise to LSEs on European sites, in view of the sites' conservation objectives. Accordingly, Stage 2 AA of the RWRP-EM was considered to be required. All of the PAs once fixed (following MCA analysis) were subsequently considered for their potential for LSE as part of this NIS for the RWRP-EM (see Appendix C).

2.3 Guidance documents in relation to Appropriate Assessment

The requirements of Article 6 of the Habitats Directive for the RWRP-EM have been applied having regard to the following the guidance documents:

- AA of Plans and Projects in Ireland: Guidance for Planning Authorities (Department of Environment, Heritage and Local Government, 2010a);
- Appropriate Assessment Screening for Development Management. OPR Practice Note PN01. (Office of the Planning Regulator, 2021).
- Assessment of Plans and Projects in Relation to Natura 2000 Sites – Methodological Guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission, 2021);
- Communication from the Commission on the Precautionary Principle (European Commission, 2000);
- Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission (European Commission, 2007);
- Marine Natura Impacts Statements in Irish Special Areas of Conservation. A working Document (Department of Arts, Heritage and the Gaeltacht, 2012); and
- Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (European Commission, 2018).

The following circulars have also been used:

- AA under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPW 1/10 and PSSP 2/10 (Department of Environment, Heritage and Local Government, 2010b);
- AA of Land Use Plans. Circular Letter SEA 1/08 & NPWS 1/08 (Department of Environment, Heritage and Local Government, 2008a);
- Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites. Circular Letter PD 2/07 and NPWS 1/07 (Department of Environment, Heritage and Local Government, 2007a);
- Guidance on Compliance with Regulation 23 of the Habitats Directive. Circular Letter NPWS 2/07 (Department of Environment, Heritage and Local Government, 2007b); and

- Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments. Circular L8/08 (Department of Environment, Heritage and Local Government 2008b).

2.4 Guidance Principles and Case Law

A number of cases have been brought to both the national and European courts in relation to the AA process. Irish departmental guidance (Department of Environment, Heritage and Local Government, 2010a)[6] in relation to AA was published over 10 years ago. Therefore, recent case law has, in many cases, superseded this guidance. However, recent guidance from the OPR (2021)[7] in relation to AA screening has now been published and considered in this assessment. European Court of Justice (ECJ) rulings and European Commission (EC) publications have also been considered in the preparation of the NIS for the RWRP-EM.

2.5 Consideration of the protection of European sites

The RWRP-EM including the methodology for option selection has the protection of European sites and environmental considerations at the forefront. Set out below are the measures employed to ensure the protection of European sites.

2.5.1 Sustainable Abstraction

The Government is currently developing new legislation dealing with water abstractions. As this legislation is still being developed, Irish Water does not have full visibility of the future regulatory regime. As the objective of the plan is to achieve safe, secure, reliable and sustainable supplies, any new abstractions proposed to be developed by Irish Water as part of this plan will be based on conservative assessments of sustainable abstraction. This will ensure that water supplies continually improve in terms of environmental sustainability.

Based on initial desk based assessments, Irish Water developed an initial list of unconstrained options for new supplies, increases and upgrades to existing supplies. An Unconstrained Options review workshop was held with Irish Water's Local Authority Water Services Partners to identify any additional unconstrained options that might be available based on local knowledge.

Irish Water has taken a conservative approach in identifying sustainable abstractions for new options and considered the environmental impact of its existing abstractions as well as the potential resources or water quality improvements. Irish Water considered abstraction sustainability in relation to identifying levels of sustainable abstraction. Irish Water understands that the protection of the aquatic environment/ habitat not only requires the protection of water quality but also necessitates the protection and maintenance of physical habitat, hydrological processes and regimes and broader biological diversity which in the context of this NIS support the conservation objectives of European sites. WFD waterbody status has been taken into account through a review of existing abstractions and in the identification of new options, thus ensuring new options can meet sustainable abstraction criteria.

[6] https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf Accessed May 2021
[7] https://www.opr.ie/wp-content/uploads/2021/03/9729-Office-of-the-Planning-Regulator-Appropriate-Assessment-Screening-booklet-15.pdf Accessed May 2021

Using desktop assessments, the sustainable abstraction standard of 10% of Q95 has been applied with the exception of waterbodies requiring "High" status where a higher threshold of 5% of Q95 has been applied[8]. The application of these abstraction standards will help to ensure that any new or increased abstractions from rivers designated as SACs (which require "Good" and/or "High" status water quality) will align with the conservation objectives of these sites. Sustainable abstraction standards for lakes are similarly set at 5% (for lakes requiring "High" status e.g. oligotrophic waterbodies) and 10% of Q50.

New options that are developed by Irish Water must meet those criteria and are not otherwise considered as part of the Plan. As part of the Plan, Irish Water do consider some options that are not new options, but were previously proposed. However, if these do not meet the criteria for sustainable abstraction they are eliminated at Coarse Screening stage unless access to site investigation or other data shows that these proposed abstractions are sustainable and consistent with the protection of European sites. Application of these sustainable abstraction limits at initial option development and during Coarse Screening will protect European sites by eliminating many options with the potential to have adverse effects on the integrity of European sites.

However, these are plan level assessments and will be supplemented by the comprehensive site investigations and surveys, including hydrological surveys, that will be carried out in respect of the Preferred Approaches as delivery of the individual projects from the NWRP progress.. Construction related impacts associated with new or upgraded infrastructure related to surface water abstractions also need to be assessed at project level. For example, for an option that has its abstraction source within a designated European site, it would need to be confirmed whether or not the conservation objectives can be protected within sustainable abstraction limits based on the standard rules.

2.5.2 Coarse Screening

The Coarse Screening applied as part of the Options Assessment Methodology (detailed in the Framework Plan) for identifying the Preferred Approach had environmental considerations at the forefront of the assessment. All options considered to have a significant impact on the environment (e.g. option that may result in waterbody not achieving "High" or "Good" status under WFD) were removed at Coarse Screening stage. Some examples of options removed on environmental grounds, which in turn could not provide protection of European sites include:

- Raw water transfer, which was rejected to avoid the risk of spread of Invasive Non-Native Species (INNS) cross catchment; and
- Options where the yield assessment identified that the proposed abstraction would not be within the sustainable abstraction range as set out above in Section 2.5.1 (e.g. a quantity of water above the sustainable abstraction range was required to resolve the deficit).

All options removed at Coarse Screening are detailed in the individual Study Area Technical Reports, these are provided in Appendix 1-9 of the RWRP-EM. Any options removed due to potential significant impacts on the environment (including European sites) are summarised in Chapter 4 of this report within each Study Area overview (see Sections 4.2.2, 4.3.2, 4.4.2, 4.5.2, 4.6.2, 4.7.2, 4.8.2, 4.9.2 and 4.10.2).

[8] Two sources: (1) UK Environmental Standards and Conditions (Phase 1), (2008). UK Technical Advisory Group on the Water Framework Directive. (2) Quinlan, C. & Quinn, R. (2018). Characterising environmental flows in Ireland and what this means for water resource management in Ireland. Irish National Hydrology Conference 2018.

2.5.3 MCA scoring/Identification of LSEs and integration of AA into optioneering process

Detailed information on the Option Assessment Methodology is included in Chapter 3, Section 3.4 of the Framework Plan NIS. The Multi-Criteria Analysis (MCA) scoring undertaken at Fine Screening stage feeds into the process for identifying Preferred Approaches for each WRZ. Feasible options are assessed individually and in-combination to determine the Preferred Approach. Options are then tested against six approaches which were selected to align the Framework Plan and Regional Plans with all relevant government policy. The six approaches are summarised in Table 2.1 below.

Table 2.1 - Range of Approaches to Test Feasible Options

Approaches Tested	Description	Policy Driver
Least Cost	Lowest Net Present Value (NPV) cost in terms of Capital, Operational, Environmental and Social and Carbon Costs.	Public Spending Code
Best Appropriate Assessment (Best AA)	Lowest score against the European Sites (Biodiversity) sub-criteria question: • **Score = 0** equates to no LSEs. If these 0 scoring options meet the deficit/plan objectives, they are automatically picked as the Preferred Approach. • **Score = -1 or -2** equates to LSEs that can be addressed with general/standard mitigation measures (increased difficulty to mitigate identified by lower negative score). • **Score = -3** equates to LSEs that may be harder to mitigate or require significant project level assessment. Higher scoring options identified where possible.	Habitats Directive
Quickest Delivery	Based on an estimate of the time taken to bring an option into operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening. This is particularly relevant where an option might be required to address an urgent Public Health issue.	Statutory Obligations under the Water Supply Act and Drinking Water Regulations
Best SEA Environmental	This is the option or combination of options with the highest total score across the 19 No. SEA MCA sub-criteria questions	SEA Directive and WFD
Most Resilient	This is the option or combination of options with the highest total score against the resilience criteria.	National Adaptation Plan
Lowest Carbon	This is the option or combination of options with the lowest embodied and operational carbon cost	Sectoral Adaptation Plan

The Fine Screening scoring for the European sites (biodiversity) question identifies at a high-level potential for LSEs from an option. Any option with a score of -1 to -3 has identified LSEs and is taken forward to AA (Stage 2 of the AA process) and assessed within the NIS. The score essentially identifies LSEs with varying implications for European sites (see Table 2.2 for further detail on the scoring criteria applied).

Table 2.2 - MCA Scoring criteria in relation to identification of LSEs

Score	Comment
0	Those options scoring 0 are those where no LSEs on a European site have been identified (based on desktop review). During the optioneering process Irish Water identify if these 0 scoring options meet the the objectives of the RWRP-EM and if they do they are automatically picked as the Preferred Approach.
-1	Identified that the option has potential for LSE (generally construction related impacts). However, it is considered that these LSEs will not result in AESI with standard best practice and in some cases specific mitigation applied. These options are not considered to lead to AESI based on the RWRP-EM level rules/protective measures applied (see sections 2.5.1 and 2.5.2 above) and desktop information available at the time of assessment. *Example of option scoring -1: Option may include works which are hydrologically linked to an SAC some distance downstream.*
-2	Identified that the option has potential for LSE (generally construction related impact). However, it is considered that these LSEs, although harder to mitigate will not result in AESI with standard best practice project and more detailed specific mitigation (for example pollution control compliant with legislation to protect the general environment and not always specifically for European sites or their Qualifying Interest (QI) features). These options are not considered to lead AESI based on the RWRP-EM level rules/protective measures applied (see sections 2.5.1 and 2.5.2 above) and desktop information available at the time of assessment. *Example of option scoring -2: Option may include works which are hydrologically linked to an SAC, a direct crossing of an SAC or disturbance related impacts to an SPA.*
-3	Identified that the option has potential for LSEs that may be more complex to mitigate than -1 or -2 scoring options or where uncertainty around potential impacts remains (uncertainty may remain until site level assessments are carried out) and although deemed feasible through Stage 2, may require a higher burden of site-based proof to succeed if it is ever progressed to project level. *Example of option scoring -3: Option may include construction works within an SAC, surface water abstraction from an SAC or groundwater abstraction outside an SAC but with potential hydrological links to an SAC supporting groundwater dependant habitats (GWDHs) or species.*

NB. Score of -1, -2 or -3 = potential LSEs have been identified at Fine Screening stage in the absence of mitigation (screening for AA cannot take mitigation into consideration). To note all of the Preferred Approaches are reviewed in the NIS to ensure that all potential LSEs have been identified at Fine Screening stage taking account of any further information that may be available when undertaking the assessment to inform AA.

Screening for AA of the Preferred Approaches for the EM region is provided in Appendix C and a list of the European designated sites within the EM region is listed within Appendix B of this report.

2.5.4 Plan Level Protection of European sites

Plan level protection of European sites has been provided for within the RWRP-EM. As outlined in Section 2.5.2 of this NIS, options with potential for significant impacts on the environment, including options that could result in AESI are removed at coarse screening. Furthermore, as part of the feedback loop from the NIS for the Plan, a better approach to options with LSE i.e. options with -1 to -3 score for biodiversity at Fine Screening are identified where possible (especially in respect to -3 scores due to the potential complexity of implementation at the project stage e.g. an option that meets the RWRP-EM objectives and doesn't score -3). Because it is possible that all of the potential impacts identified for even a -3 scoring option can be entirely ruled out through project level investigation and analysis or avoided through project level mitigation, the -3 scoring option for biodiversity may be progressed as the Preferred Approach. General and option specific mitigation has been provided for within the Plan (see Section 6.3.1-6.3.5 of this NIS).

2.6 Assessment Methodology

2.6.1 "Source-pathway-receptor" model

The "source-pathway-receptor" model was used to assess the Preferred Approach for the EM region (various Preferred Approaches identified at both WRZ and Study Area level). This assessment was undertaken in consideration of all potential impact pathways connecting elements of the RWRP-EM to European sites in view of their conservation objectives.

2.6.2 Transboundary Effects

The RWRP–EM solely covers Irish Water's operational area for the Eastern and Midlands which lies approximately 20km from the boundary between the Republic of Ireland and Northern Ireland (NI). An assessment was undertaken to determine if there was a source-pathway between European sites in NI and the EM region.

2.6.3 Desktop study

The following data sources were consulted for background environmental information in producing this NIS:

- Online data available on European sites as held by the NPWS from www.npws.ie – including site synopsis, conservation objectives and other relevant supporting documentation;
- GIS data for European site boundaries obtained in digital format online from the NPWS;
- Article 17 Overview Report Volume 1 (NPWS, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- National Biodiversity Action Plan 2017-2021 (Department of Culture, Heritage and the Gaeltacht, 2017);
- Environmental Protection Agency (EPA) rivers and water quality data online at https://gis.epa.ie/EPAMaps/;
- The Environmental Sensitivity Mapping (ESM) online at https://enviromap.ie/;
- Northern Ireland Environment Agency (NIEA) Natural Environment Map Viewer online at https://appsd.daera-ni.gov.uk/nedmapviewer/;
- River Basin Management Plan for Ireland 2018 – 2021 (Department of Housing, Planning and Local

Government, 2018); and

- Data from the Geological Survey Ireland (GSI).

2.6.4 Option comprising existing groundwater abstraction

Site specific data is available in some cases, however, location, abstraction rate(s) and site configuration are often the minimum information available. The operational data provides useful information on the yield, and assumptions can be made around the average production from each site. It can be assumed the average abstraction value is an initial estimate of the yield. Most local authorities in the case of development of groundwater sources would likely have drilled and sought the maximum yield possible through 72 hours pumping tests. This provides an initial yield. Additional information on performance in prolonged dry weather periods provides supporting information on yields. Data collected on site is used to improve the yield and impact estimates.

2.6.5 Option comprising new groundwater abstraction

As part of the desk-based assessment specific buffers will be used to identify the Zone of Influence (ZoI) of an option on European sites as outlined below.

Irish departmental guidance on the Zone of Influence (ZoI) considered during the AA process states the following:

"A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects".

However, the actual extent of the ZoI depends on the effect pathway, as well as the specific nature of different habitats/species for which a European site is designated including functional and supporting habitat (OPR, 2021). Therefore, for these reasons the ZoI must be scientifically defined and based upon the "source-pathway-receptor" model.

As part of the desk-based assessment specific buffers will be used to identify the ZoI in relation to groundwater abstraction. As outlined below however, these buffers represent typical groundwater flow distances and only serve as a guide, and where appropriate site-specific information is used instead. To assist with the high-level assessments, the catchment area to the abstraction is also considered. The Zone of Contribution (ZOC) is defined 'as the area needed to support an abstraction from long-term groundwater recharge' (Groundwater Protection Scheme DELG *et al*, 1999). The ZOC is defined and delineated as a means to protect the source, and guide decision making. Long term recharge and abstraction rate dictate the size of the ZOC. As such the ZOC, recharge and abstraction rate enable a water balance. It can be used to assess if a deficit can be potentially met with the existing abstraction or if an alternative solution is required i.e. (i) new well could be drilled nearby (ii) new location needs to be sought, or (iii) alternative solution altogether is required whether it be groundwater or surface water. Typical groundwater flow distances are provided for the various aquifer category types[9]. The domain size associated with these flow systems are considered to be 5km in Karstic aquifers, 3km in Productive

[9] Daly, D., Fitzsimons, V., Hunter Williams, T. & Wright, G. (2005). "ROCK TYPE VERSUS FRACTURES" – CURRENT UNDERSTANDING OF IRISH AQUIFERS. International Association of Hydrogeologists (IAH) Irish group.

Fissured bedrock, 1km in Gravel aquifers and 600m in Poorly Productive aquifers. These are the potential domains that will be used when assessing the potential impacts of groundwater abstractions on European Designated sites and/or surface waters within European sites. As this is a conservative consideration, the buffers act as a guide only. They may flag sites within a 'buffer' for further monitoring etc., but where appropriate are overruled by site specific data. Where available, site specific data (pump test results, borehole construction information, geological constraints etc.) can be used for sites within a 'buffer' to suggest no direct linkage between abstraction and GWDTE. In relation to qualifying interests where specific information was available (e.g. detailed conservation objective mapping etc.), this was used in conjunction with ZOC data from hydrologists to inform the assessment. Where detailed information was lacking, a precautionary approach was taken and potential impacts considered and mitigation provided.

2.6.6 All other options

When assessing likely ZoI for all other options the "source-pathway-receptor" model will be applied. European sites with a hydrological link to any given option/Study Area will be considered to be within the ZoI. As such sites that are outside the boundary of the regional group may also be included in the assessment where there is an effects pathway.

The RWRP-EM covers the Eastern and Midlands region of the Republic of Ireland. Therefore, all European sites within this region (core baseline area – see Section 3.5 of the RWRP-EM SEA Scoping Report) and European sites with potential effects pathways located outside the region were initially considered to be potentially within the ZoI of the RWRP-EM.

3 Overview of European Sites within the EM Region

3.1 Special Areas of Conservation

SACs cover a variety of habitat types recognised in Annex I of the Habitats Directive, with 14 habitats designated as "priority" habitats owing to their ecological vulnerability (NPWS, 2019a) located within the EM region. Habitats for which SACs are designated include lakes, raised bogs, blanket bogs, turloughs, sand dunes, machair, heaths, rivers, woodlands, estuaries and sea inlets. In addition, the Habitats Directive recognises 19 Annex II species. Some of the species for which SACs have been designated include, but are not limited to, Atlantic salmon (*Salmo salar*), otter *(Lutra lutra*), lesser horseshoe bat (*Rhinolophus hipposideros*), freshwater pearl mussel (*Margaritifera margaritifera*) and Killarney fern (*Trichomanes speciosum*). There are 144 SACs within the EM region with some of these SACs supporting various habitats and species that are dependent on surface and/or groundwater sources. A number of significant pressures on these water bodies have been identified (Department of Housing, Planning and Local Government, 2018), including:

- Agriculture;
- Hydromorphological pressures;
- Forestry;
- Urban wastewater;
- Anthropogenic pressures;
- Abstractions; and
- Invasive species.

Of the pressures noted above, water abstraction is of particular relevance to the RWRP-EM. Water abstractions from both ground and surface water have been identified as being a potential threat to some Annex I habitats and Annex II species. As discussed in Chapter 2.5.1 sustainable abstraction limits have been set as part of the RWRP-EM to ensure the protection of these Annexed species and habitats. A full list of water dependent species and habitats in the EM region is provided in Appendix F.

3.2 Special Protection Areas

SPAs are designated for the conservation of Special Conservation Interest (SCI)[10] Annex I birds and other regularly occurring migratory birds and their habitats. The majority of the SPAs located within the EM region are designated for wintering water birds and breeding seabirds/birds of prey with the majority considered to be regularly occurring migratory birds. Several passage migrants also occur at sites along the east coast, namely *Sterna* species. There are 39 SPAs within the EM region. Over 80% of the Annex I listed species that occur in the EM region on a regular basis belong to the breeding seabird and wintering waterbird groups.

The habitats within these SPA sites include bogs, loughs, estuaries, callows, turloughs, rivers and reservoirs. Several of these habitats are dependent on surface and/or groundwater sources. Some of the productive marine intertidal zones of bays and estuaries within the EM region are included within SPAs and these provide vital food resources for several wintering wader species, including knot (*Calidris canutus*), dunlin (*Calidris alpina*) and bar-tailed godwit (*Limosa lapponica*).

[10] The term Special Conservation Interest (SCI) and Qualifying Interest (QI) have been used interchangeably throughout the document when referring to Annex I bird species for which an SPA has been designated.

Finally, a number of inland wetland sites and areas of blanket bog and upland habitats within the EM region have also been designated as SPAs for wintering water birds. These sites provide important breeding and foraging areas for numerous other species including merlin (*Falco columbarius*) and golden plover (*Pluvialis apricaria*). Agricultural land is also represented within the EM region SPA network ranging from the extensive farmland of upland areas where hedgerows, wet grassland and scrub offer feeding and/or breeding opportunities for hen harrier (*Circus cyaneus*) to the intensively farmed coastal polderland where internationally important numbers of swans and geese occur. A list of all water dependent QI bird species in the EM region is provided in Appendix G.

3.3 Conservation Objectives

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of annexed habitats and annexed species of community interest for which an SAC or SPA has been designated. The conservation objectives (COs) for a European site are set out to ensure that the QIs/SCIs of that site are maintained or restored to a favourable conservation condition. Maintenance of favourable conservation condition of habitats and species at a site level in turn contributes to maintaining or restoring favourable conservation status of habitats and species at a national level and ultimately at the European site network level.

Detailed site synopses for each European site are also available from the NPWS website[11]. In Ireland 'generic' COs have been prepared for all European sites, while 'site specific' COs have been prepared for a number of individual sites to take account of the specific QIs/SCIs of that site. Both the generic and the site-specific COs aim to define the requirements for favourable conservation condition for habitats and species at the site level. Generic COs which have been developed by NPWS encompass the spirit of site-specific COs in the context of maintaining and restoring favourable conservation condition as follows;

- For SACs: "*To maintain or restore the favourable conservation condition of the Annex I habitats and/or Annex II species for which the SAC has been selected*".
- For SPAs: "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for the SPA*".

Following on from this, favourable conservation status (or condition, at a site level) of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is "favourable".

The favourable conservation status (or condition, at a site level) of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

[11] https://www.npws.ie/protected-sites (Accessed March 2020)

A full list of the COs and QIs/SCIs that each European site is designated for, as well as the attributes and targets to maintain or restore the QIs/SCIs to a favourable conservation condition are available from the NPWS website[12].

3.4 Overview of European Sites within the Eastern and Midlands region

As discussed in Chapter 2, all European sites within the Eastern and Midlands region were initially considered to be potentially within the ZoI of the RWRP-EM, therefore potential LSEs on the conservation objectives for these sites will be considered. There is a total of 144 SACs and 39 SPAs within the EM region. Two marine SACs, five marine SPAs and one terrestrial SAC are not within the EM region terrestrial boundary but are hydrologically linked to it. These sites are Wicklow Reef SAC, Lambay Island SAC/SPA, Ireland's Eye SPA, Rockabill SPA, Skerries Islands SPA and Dalkey Island's SPA and the Blackwater River (Cork/Waterford) SAC. Table 3.1 below provides a breakdown of European sites within each Study Area within the EM region. A summary of the European sites within the EM region are shown in Figure 3.1 below.

Table 3.1 - Number of European Sites within each Study Area[13] within the EM region

Study Area	No. of SACs	No. of SPAs
1 (Mid Wicklow)	3	1
2 (West Wicklow)	3	2
3 (South Louth East Meath)	8	5
4 (Westmeath)	18	9
5 (Offaly Roscommon)	31	11
6 (Laois)	15	2
7 (Tipperary North)	18	5
8 (Limerick Clare)	42	6
9 (Greater Dublin Area)	27	10

[12] https://www.npws.ie/protected-sites/conservation-management-planning/conservation-objectives (Accessed March/April 2020)
[13] Some SACs or SPAs fall within more than one study area.

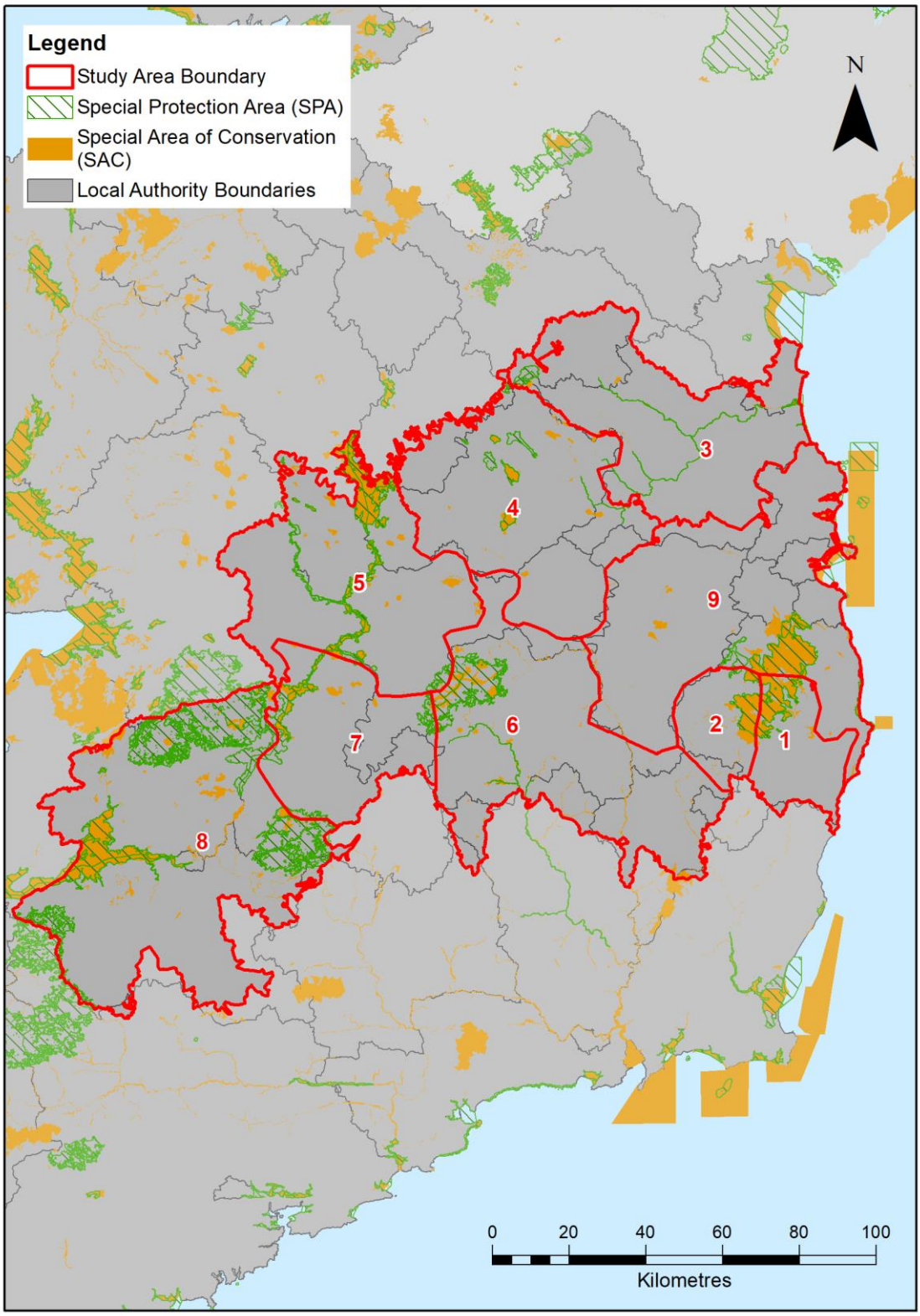

Figure 3.1 - European sites within the Eastern and Midlands region

4 Eastern and Midlands – Preferred Approach

4.1 Overview of Eastern and Midlands

The RWRP-EM has identified the Preferred Approach for the EM region. The Eastern and Midlands Region is subdivided into nine study areas (see Figure 4.1 below) based on factors such as:

- Groundwater body boundaries;
- Surface water sub-catchments;
- Geographical features;
- WRZ boundaries;
- Local authority functional areas; and
- Appropriate size for an efficient reporting structure.

The NIS has assessed the Preferred Approach options for the nine Study Areas and the EM region as a whole.

For ease of assessment each Study Area and the Preferred Approach options for same is discussed in detail in Sections 4.2 to 4.10 below. Detailed information on the Preferred Approach (and how it was reached) for each Study Area is provided in the Study Area reports accompanying the RWRP-EM Plan and summarised in the relevant chapters below.

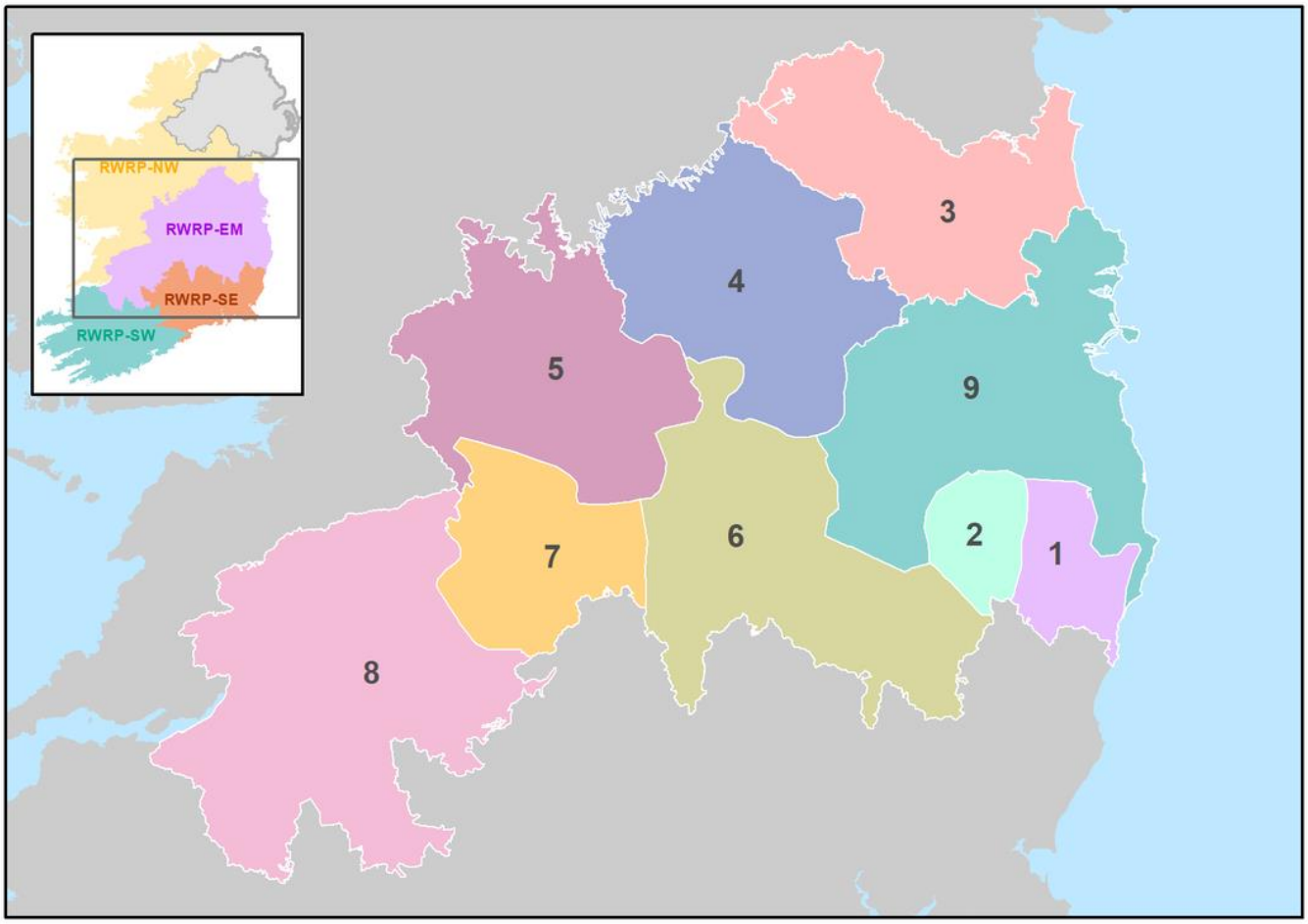

Figure 4.1 - Group Area 4 Study Areas

4.1.1 Solution Types considered across all Study Areas

When identifying the solutions that might be used to address need within a Study Area, Irish Water have compiled the range of available solutions across three pillars; lose less (leakage reduction), use less (water conservation) and supply smarter (rationalisation etc.).

This enables Irish Water to identify the short, medium- and long-term solutions, and the best combination of options. For each Study Area as part of the Unconstrained Options, measures around leakage reduction, water conservation and supplying smarter are looked at and taken into consideration in the SDB deficit although that is not yet possible for water conservation (see section 4.1.2 below). Any specific measures in relation to leakage reduction and supplying smarter is detailed in the various Study Area reports which are accompanying the RWRP-EM.

4.1.2 Water Conservation

At present, Irish Water is conducting pilot studies in relation to water conservation stewardship in businesses and is actively progressing water conservation messaging campaigns. During drought conditions in 2018 a Water Conservation Order was implemented, in order to protect water supplies and reduce pressure on the natural environment during this period.

In order to measure the benefit of Water Conservation Activities Irish Water will need to collect and monitor data over a number of years. Due to these data limitations, as part of this NWRP, Irish Water has not been able to apply reductions in demand due to water conservation to the Supply Demand Balance deficit.

4.1.3 Transboundary Effects

There will be no transboundary effects as there is no source-pathway between the EM region and European sites in NI. There will also be no transboundary effects on the basis that there are no shared groundwater WFD units, no possible marine effects and that the one shared hydrometric area (area 06 Newry, Fane, Glynde and Dee - a small area north of Drogheda) predominantly discharges to Dundalk Bay.

4.2 Overview of Study Area 1 – Mid Wicklow

The location of Study Area 1 (SA1) in relation to the EM region is shown in Figure 4.1 above. SA1 Mid Wicklow includes the area to the south of Wicklow Town and environs, and to the north of county Wexford. SA1's total area is approximately 681km^2 and it lies within the counties of Wicklow and Wexford. The principal settlement (settlements with a population of over 10,000) within SA1 is Arklow (Central Statistics Office, 2016).

There are three SACs and one SPA within SA1 as shown in Table 4.1. European sites within SA1 where there is potential for LSE are discussed further in Section 6.2.1.

Table 4.1 - Number of European Sites within SA1

Study Area	No. of SACs	No. of SPAs
1 (Mid-Wicklow)	3	1

4.2.1 Existing Water Supplies

The population within SA1 is approximately 24,000 people, served via 18 WRZs and 320kms of distribution network. The Study Area is summarised in Figure 4.2 below. The area predominantly consists of small settlements. The sources of water include 15 groundwater supplies and five surface water supplies.

SA1 is mainly located within the River Avoca catchment basin. The Avoca basin has three main rivers – the Avonmore, Avonbeg and Aughrim – which rise in the Wicklow Mountains and drain south easterly through the study area to the Irish Sea at Arklow. The majority of the existing surface water sources supplying the area are small abstractions from minor tributaries within the Avoca basin. There is also a small abstraction from River Derry at Tinahely, which is part of the large River Slaney catchment basin in the south west of the Study Area. The River Derry is a tributary of the Slaney River Valley SAC however it does not form part of the Slaney River Valley SAC designation at the point of the abstraction.

The landscape of Co. Wicklow reflects the varied underlying geology. The mountains in the centre of the country are composed of granite, with older Ordovician and Silurian metamorphic rocks to the east and west. The entire region is considered to be of poorly productive aquifer status, and much of the bedrock geology here is classed as Locally Important Aquifer or Poor Aquifer. Overall, of the 18 groundwater supplies managed by Irish Water in the region, they abstract relatively small volumes between 0.003 Ml/d to 0.35 Ml/d. Due to these relatively low volumetric requirements within the smaller water resource zones in SA1, groundwater sources are both sufficient and sustainable to meet local needs.

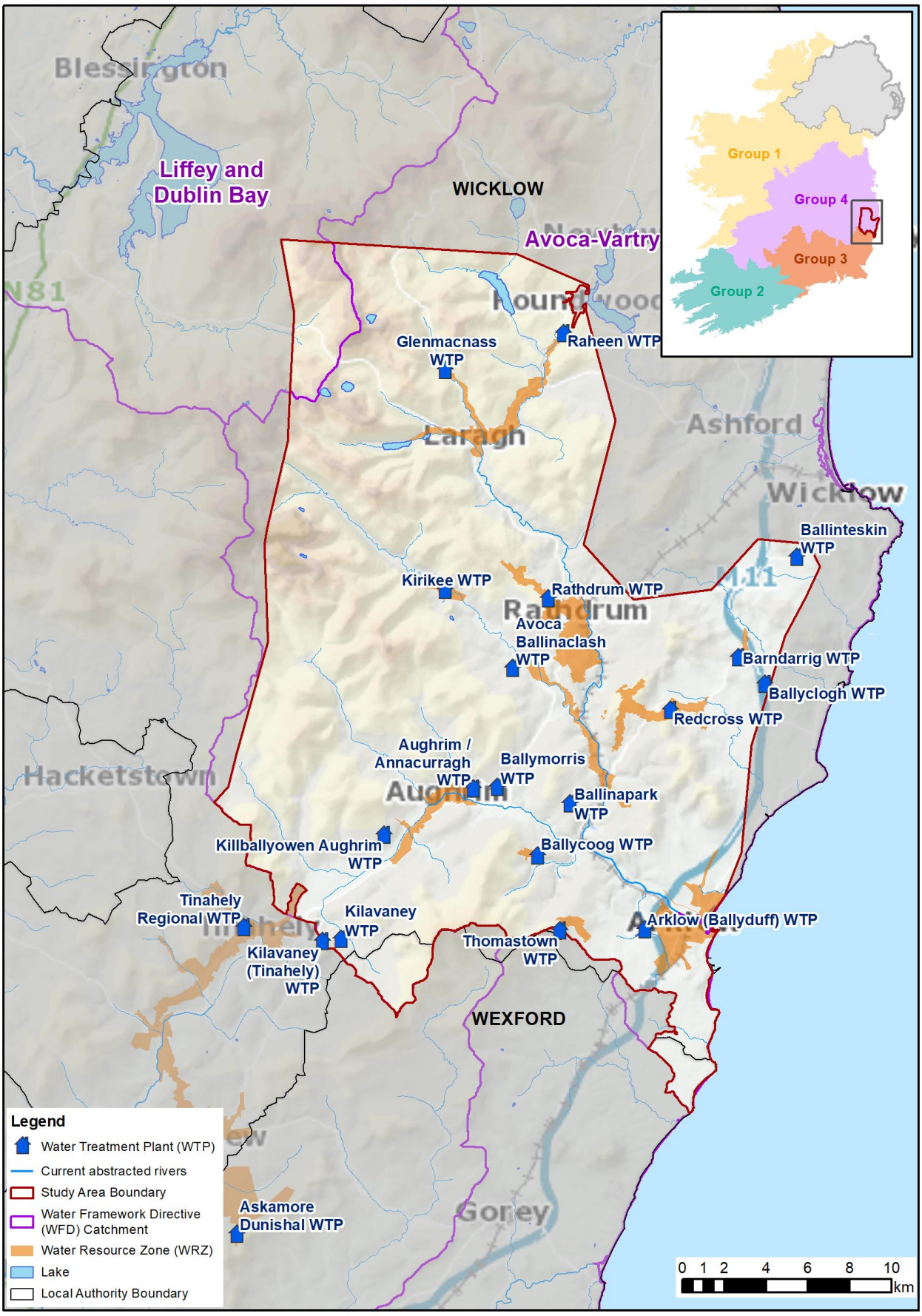

Figure 4.2 - Study Area 1 Mid Wicklow

4.2.2 SA1 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.2 below were removed at Coarse/Fine Screening on environmental grounds.

Table 4.2 - SA1 – Options removed at Coarse/Fine Screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA1-02b	Increase GW abstraction at Aughrim Annacurra and interconnect with Aughrim Annacurra Public Supply	This option included increasing the abstraction at Aughrim Annacurra to supply deficit for Aughrim Annacurra and transfer additional supply to Arklow WRZ. There is a great uncertainty around available yield at this source and as a result, this option is not considered feasible.
SA1-12	Increase GW abstraction at Aughrim Annacurra Public Supply and interconnect with Arklow Public Supply	This option included increasing the abstraction at Aughrim Annacurra to supply deficit for Aughrim Annacurra and transfer additional supply to Arklow WRZ. There is a great uncertainty around available yield at this source and as a result, this option is not considered feasible.
SA1-15	Increase abstraction from the existing Avonbeg River tributary abstraction.	Based on IW desktop assessment the cCurrent abstraction from this source already appears to be over sustainable allowable abstraction limit and therefore is not considered feasible.
SA1-18	New GW source at Avoca Ballinaclash Public Supply.	The proposed abstraction is located in a Locally Important Aquifer. A desktop assessment shows the required abstraction is unlikely to be sustainable at this location and as a result, this option is not considered feasible.

4.2.3 Preferred Approach for SA1

Full details of the Preferred Approach (and how it was reached) are included in the SA1 Technical Report in Appendix 1 of the RWRP-EM. The final Preferred Approach for SA1 is shown in Table 4.3 below. The findings of the Preferred Approach Development for SA1 Mid Wicklow at WRZ level, include the following:

- In terms of Best AA, 15 WRZs options score a zero in relation to potential impact on a European designated site.
- The Best AA and the Best Environmental (overall SEA score) approach is identified for 13 of the 18 WRZs.
- Of the 18 WRZ level Preferred Approaches, none have a -3 score against biodiversity.

All of the options that make up the Preferred Approach and assessed as part of this NIS are listed in Table 4.3 and shown in Figure 4.3. It should be noted that option SA1-71 (Tinahely) is located outside of the EM region boundary. This is because this option was included as part of the pilot study and assessed as part of the EM region. The boundary was amended subsequently which left this option

outside the current EM region boundary. However, as the assessment was already carried out it has been included as part of the RWRP-EM Plan assessment.

Table 4.3 - Final Preferred Approach for SA1 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA1-71 3400SC0002 Tinahely	0	**No Deficit - Do nothing but upgrade Water Treatment Plant (WTP) for Quality need** • WRZ not in deficit, option to upgrade WTP for WQ purposes
SA1-17c **(Part of Grouped Option SA1-503)** 3400SC0007 Avoca Ballinaclash Public Supply	-1	**Rationalisation of Avoca Ballinaclash WTP to Vartry WTP** • Grouped Option 3 - Rationalisation of Avoca Ballinaclash to Varty WTP • WRZ full demand to be met = 0.46 Ml/d Dry Year Critical Period (DYCP) 2044
SA1-57c **(Part of Grouped Option SA1-503)** 3400SC0012 Redcross Conary Public Supply	-1	**Rationalisation of Redcross Intermediate Reservoir to Vartry WTP** • Grouped Option 3 - Rationalisation of Redcross to Vartry WTP • WRZ full demand to be met = 0.49 Ml/d (DYCP 2044) • Decommissioning of existing GW abstraction
SA1-30 3400SC0018 Ballycoog Public Supply	0	**Increase GW abstraction** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Current Water Available For Use (WAFU) DYCP 2044 = 0.01 Ml/d, DYCP 2044 demand = 0.05 Ml/d so additional 0.04 Ml/d WAFU required

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA1-66 3400SC0020 Thomastown Public Supply	0	**Increase GW abstraction** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Current WAFU DYCP 2044 = 0.03 Ml/d, DYCP 2044 demand = 0.04 Ml/d so additional 0.01 Ml/d WAFU required
SA1-23c **(Part of Grouped Option SA1-503)** 3400SC0025 Ballinteskin Public Supply	-1	**Rationalisation of Ballinteskin Pump Station to Vartry WTP, via existing watermain to Cronroe WTP** • Grouped Option 3 - Rationalisation of Ballinteskin to Varty WTP • WRZ full demand to be met = 0.03 Ml/d (DYCP 2044) • Decommissioning of existing GW abstraction
SA1-20 3400SC0027 Ballinapark Public Supply	0	**Rationalisation of Ballinapark Pump Station to Avoca Ballinaclash WTP** • Rationalisation of Ballinapark to Avoca Ballinaslash WTP • Dependent on Avoca rationalisation (Grouped Option 3) to Vartry supply • WRZ full demand to be met = 0.02 Ml/d (DYCP 2044) • Decommissioning of existing GW abstraction
SA1-27 3400SC0031 Ballyclogh Public Supply	0	**WTP upgrade/increase GW abstraction** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ full demand to be met = 0.003 Ml/d (DYCP 2044)
SA1-70 3400SC0032 Killavaney Public Supply (Tinahely)	0	**No Deficit - Do nothing but upgrade WTP for quality need** • WRZ not in deficit, option to upgrade WTP for WQ purposes • WRZ full demand = 0.006 Ml/d (DYCP 2044)
SA1-51c	-1	**Rationalisation of Raheen Well WTP to Vartry WTP for long term OPEX savings (not in deficit)** • Grouped Option 3 - Rationalisation of Laragh Annamoe PS WRZ to Varty WTP (Greater Dublin Area (GDA))

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
(Part of Grouped Option SA1-503) 3400SC0047 Laragh Annamoe Public Supply		• WRZ full demand to be met = 0.603 Ml/d (DYCP 2044) • Decommissioning of existing GW abstraction
SA1-53c **(Part of Grouped Option SA1-503)** 3400SC0046 Rathdrum Public Supply	-1	**Rationalisation of Rathdrum WTP to Vartry WTP, assessed previously as part of Mid Wicklow Scheme** • Grouped Option 3 - Rationalisation of Rathdrum to Varty WTP • WRZ full demand to be met = 0.744 Ml/d (DYCP 2044) • Decommissioning of existing SW abstraction (Avonmore_060 RWB WFD status 2013-2018- good)
SA1-52c **(Part of Grouped Option SA1-503)** 3400SC0047 Laragh Annamoe Public Supply	-1	**Rationalisation of Laragh WTP to Vartry WTP for long term OPEX savings (not in deficit)** • Grouped Option 3 - Rationalisation of Laragh Annamoe PS WRZ to Varty WTP (GDA) • WRZ full demand to be met = 0.603 Ml/d (DYCP 2044) • Decommissioning of existing SW abstraction
SA1-87 **(Part of Grouped Option SA1-503)** 3400SC0017 Barndarrig Public Supply	-1	**Rationalisation of Barndarrig WTP to Vartry WTP** • Decommissioning of existing GW abstraction • WRZ full demand to be met = 0.114 Ml/d (DYCP 2044)
SA1-50 3400SC0021	0	**New GW on site and near existing borehole** • New GW abstraction to meet WRZ deficit DYCP (2044)

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
Kirikee Public Supply		• WRZ full demand to be met = 0.029 Ml/d (DYCP 2044)
SA1-69 3400SC0030 Killavaney Public Supply (Arklow)	0	**No Deficit – do nothing but WTP upgrade for quality need** • WTP upgrade for water quality need • WRZ full demand to be met = 0.008 Ml/d (DYCP 2044)
SA1-42 3400SC0035 Kilballyowen (Aughrim) Public Supply	0	**Increase GW abstraction** • Increase GW abstraction to meet WRZ deficit DYCP (2044) • WRZ full demand to be met = 0.011 Ml/d (DYCP 2044)
SA1-81 **(Part of Grouped Option SA1-514)** 3400SC0001 Arklow Public Supply	0	**Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris; Rationalisation of Aughrim Annacurra WTP and Ballymorris WTP to Arklow WTP** • Grouped Option 14 - Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris • WRZ full demand to be met = 6.218 Ml/d (DYCP 2044)
SA1-82 **(Part of Grouped Option SA1-514)** 3400SC0006 Aughrim Annacurra Public Supply	0	**Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris; Rationalisation of Aughrim Annacurra WTP and Ballymorris WTP to Arklow WTP** • Grouped Option 14 - Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris • WRZ full demand to be met = 0.599 Ml/d (DYCP 2044)
SA1-83 **(Part of Grouped Option SA1-514)**	0	**Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris; Rationalisation of Aughrim Annacurra WTP and Ballymorris WTP to Arklow WTP**

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
3400SC0033 Ballymorris Public Supply		• Grouped Option 14 - Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris • WRZ full demand to be met = 0.007 Ml/d (DYCP 2044)

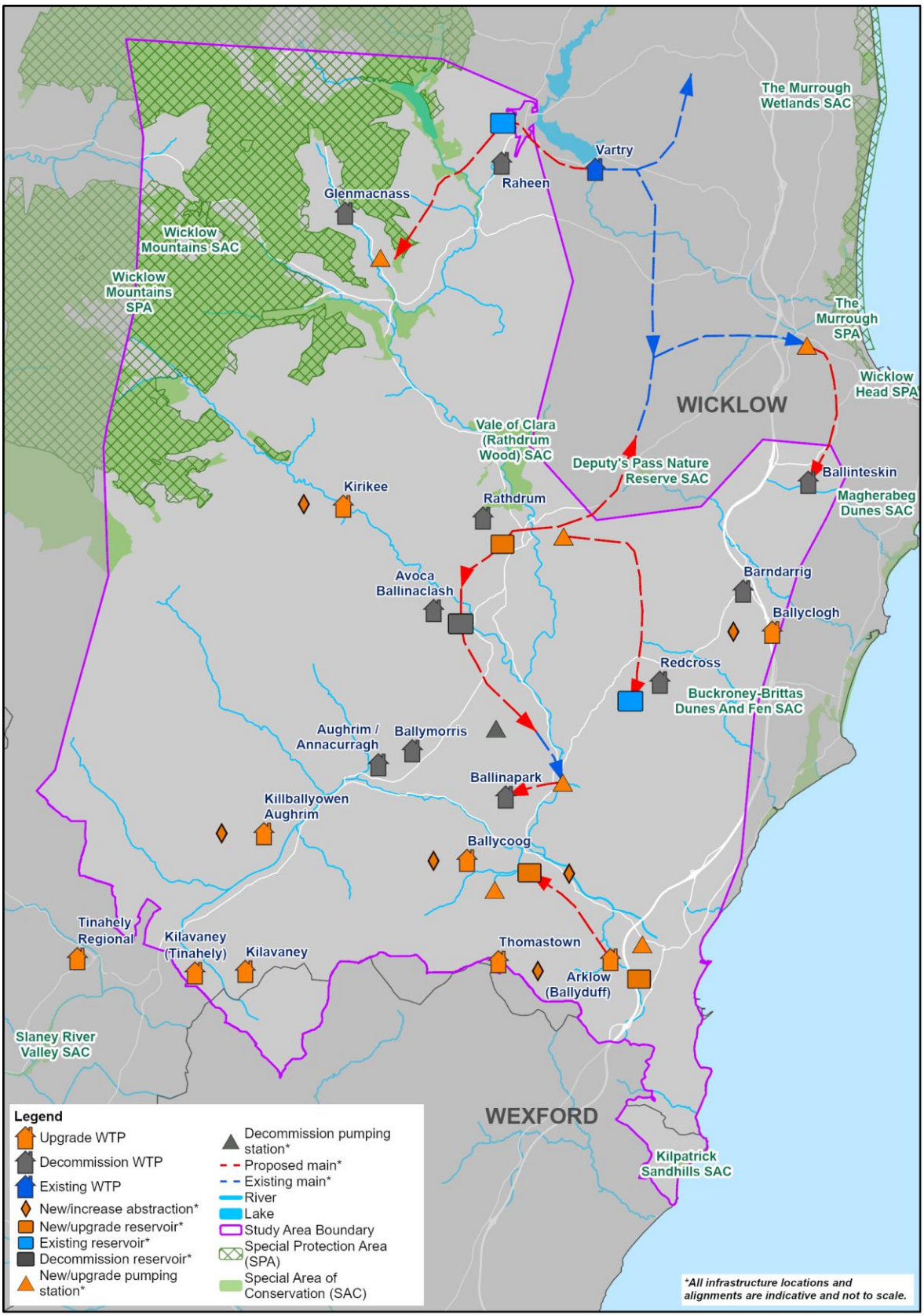

Figure 4.3 - Study Area 1 – Preferred Approach and European sites

4.3 Overview of Study Area 2 – West Wicklow

The location of Study Area 2 (SA2) in relation to the EM region is shown in Figure 4.1 above. The West Wicklow Area extends south from Ballymore Eustace Town and environs to the north-western area of County Carlow. SA2's total area is approximately 545km^2 and lies within the counties of Carlow, Kildare and Wicklow. There are no principal settlements (settlements with a population of over 10,000) within SA2, the largest settlement is Baltinglass with a population of 2,137 (Central Statistics Office, 2016).

There are three SACs and two SPAs within SA2 as shown in Table 4.4. European sites within SA2 where there is potential for LSE are discussed further in Section 6.2.2.

Table 4.4 - Number of European Sites within SA2

Study Area	No. of SACs	No. of SPAs
2 (West Wicklow)	3	2

4.3.1 Existing Water Supplies

SA2 consists of small settlements, served by local water supplies. The population within SA2 is approximately 6,840 people which is served via 12 water supplies and 135kms of distribution network. The sources of water include 11 groundwater abstractions and one river abstraction. The Study Area is summarised in Figure 4.4 below.

Due to the underlying granitic and schist geologies the drainage of the Wicklow Mountains in SA2 gives good surface water availability from the rejected recharge of often heavy rainfall. The large River Slaney catchment basin rises in the West Wicklow Mountains and drains south through the Study Area. The area also contains part of the upper catchment of the River Liffey which includes Poulaphouca Reservoir which is the main water supply source for the Greater Dublin Area (SA9). Within the Study Area almost the entire Slaney watercourse and its main tributaries have been designated as part of the Slaney River Valley SAC which is designated for a number of aquatic QI species including freshwater pearl mussel, lamprey species (river, brook and sea (*Lampetra fluviatilis*, *Lampetra planeri* and *Petromyzon marinus*) respectively), otter and Atlantic salmon. SA2 also overlaps the Slaney Upper *Margaritifera* Sensitive Area. The water body is designated as "High Status" within the RBMP.

The one current surface water source in SA2 is a relatively small abstraction of 0.35-0.5 Ml/d from the River Derreen, a main tributary of the Slaney (both form part of the Slaney River Valley SAC), that serves Hackettstown Public Water Supply. The current abstraction at Hackettstown is considered to be sustainable (the long term required abstraction requirement is <2% of Q95).

The hills and mountains in west Wicklow reflect the granite underlying geology, and older Ordovician and Silurian metamorphic rocks adjacent to Carlow. The entire region is considered to be of poorly productive aquifer status, and much of the bedrock geology is classed as a Locally Important Aquifer/Poor Aquifer. Overall, the 11 groundwater supplies managed by Irish Water abstract relatively small volumes of between 0.001 Ml/d to 0.68 Ml/d. Due to relatively low volumetric requirements within the smaller WRZs in SA2, these groundwater sources can be sufficient to meet average local needs.

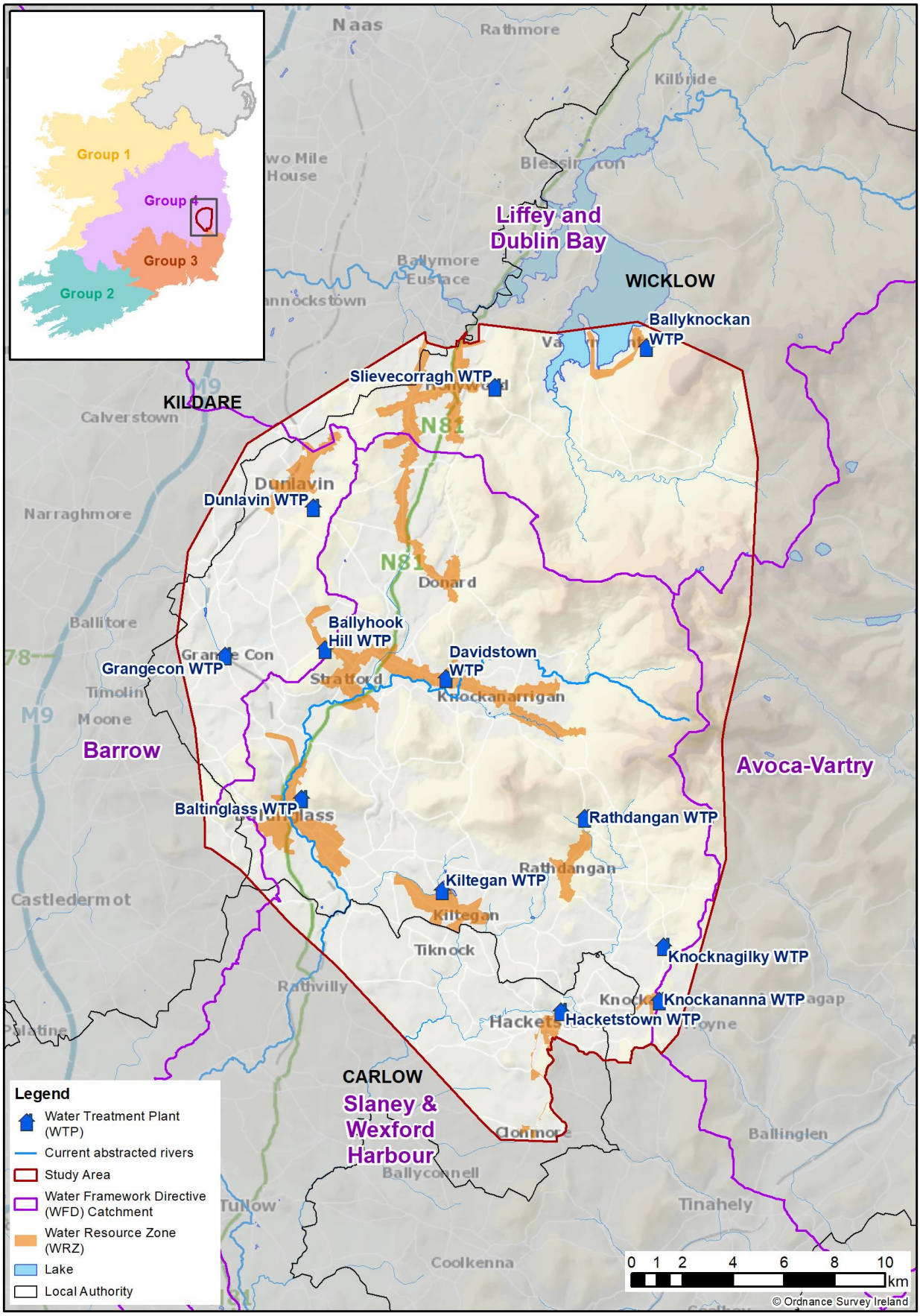

Figure 4.4 - Study Area 2 West Wicklow

4.3.2 SA2 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.5 below were removed at Coarse Screening on environmental grounds.

Table 4.5 - SA2 – Options removed at Coarse/Fine Screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA2-03a	Rationalise Baltinglass Public Supply to Rathvilly via Hacketstown WTP (Upgrade required)	This option was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore could not provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-03b	Rationalise Baltinglass Public Supply to Rathvily via Hacketstown WTP (Upgrade required)	This option was considered as part of a grouped option to rationalise 3 WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-05	New abstraction from River Slaney for Baltinglass	The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site.
SA2-06	Rationalise Baltinglass Public Supply to Rathvilly WTP directly	Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore could not provide the required supply and option required a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-16	New abstraction from River Slaney for Stratford Public Supply	This option was considered as part of a Grouped Option to provide deficit to two WTPs by increasing abstraction from the River Slaney. The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site.

SA2-19a	Rationalise Kiltegan Public Supply to Rathvilly via Hacketstown WTP (in Carlow) for long term OPEX savings (not in deficit)	As per above, this option was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP and therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-19b	Rationalise Kiltegan Public Supply to Rathvilly via Hacketstown WTP (in Carlow) for long term OPEX savings (not in deficit)	As per above, this option was considered as part of a grouped option to rationalise 3 WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP and therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-21	Rationalise Knockananna Public Supply to Rathvilly, via Hacketstown WTP	As per above, this option was considered as part of a grouped option to rationalise four WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP and therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-27	New abstraction from River Slaney for Knockanarrigan Davidstown Public Supply	This option was considered as part of a grouped option to provide deficit to 2 WTPs by increasing abstraction from the River Slaney. The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and may also result in a greater risk of having adverse effects on this European site.
SA2-29	Increased abstraction from River Derreen for Hackettstown	The River Derreen is a tributary of the River Slaney which is designated as the Slaney River Valley SAC. The River Slaney is a “high status” waterbody under WFD. This option was considered not to be feasible based on yield not being available at current abstraction point on Milll Race channel adjacent to the River Derreen main channel. The existing abstraction experienced low flow during the 2018 summer drought due to low flows diverted from the main river into the Mill Race.Thealternative SW option to abstract from main river channel was preferred as yield is available and would be within sustainable abstraction (5% of Q95).
SA2-30	Increased abstraction from River Derreen and Hackettstown WTP expansion	The River Derreen is a tributary of the River Slaney which is designated as the Slaney River Valley SAC. The River Slaney is a WFD “high status” waterbody. This option was considered not to be feasible based on yield not being available at current abstraction point on Milll Race channel adjacent to River Derreen main channel. The existing abstraction experienced low flow during the 2018 summer drought due to low flows diverted from the main river into the Mill Race. The alternative SW option to

		abstract from main river channel preferred as yield is available and would be within sustainable abstraction (5% of Q95).
SA2-30a	Rationalise Hacketstown to Rathvilly	This was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore cannot not provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-30b	Rationalisation Hacketstown to Rathvilly	This was considered as part of a grouped option to rationalise 3 WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore cannot not provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-30c	Rationalise Hacketstown to Rathvilly	Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore cannot not provide the required supply.

4.3.3 Preferred Approach for SA2

Full details of the Preferred Approach (and how it was reached) are included in the SA2 Technical Report in Appendix 2 of the RWRP-EM. The findings of the Preferred Approach Development for SA2 at WRZ level, include the following:

- In terms of Best AA, 6 WRZ options score a 0 in relation to potential impact on a designated European Site;
- The Best AA and the Best Environmental (overall SEA score) approach is identified for 12 of the 12 WRZs;
- Of the 12 WRZ level preferred approaches, none have a -3 score against biodiversity.

In summary, the Preferred Approach for SA2 is the Group 2 approach. The Preferred Approach consists of local WRZ supplies for 10 of the 12 WRZs in the Study Area, primarily driven by the small scale of the supplies and difficulties in transporting small volumes of water over long distances.

The Preferred Approach for two WRZs, Dunlavin and Holywood, involve connecting these two supplies to the Greater Dublin Area WRZ, in the neighbouring SA9. The Preferred Approach for Hacketstown involves connection to the Rathvilly WRZ in SA6.

The Preferred Approach for SA2 West Wicklow also includes for demand side (**Lose Less** and **Use Less**) measures, including.

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset Natural Rate of Leakage Rise (NRR)
- Continuation of IW household and business water conservation campaigns, initiatives and education programmes
- The option to implement legally enforceable Water Conservation Orders in drought periods in order to protect the environment and our public water supplies

The Preferred Approach provides benefits for the environment and European sites through decommissioning of the existing abstraction at Hacketstown which currently extracts from the Slaney River Valley SAC.

All of the options that make up the Preferred Approach and assessed as part of the NIS are shown in Table 4.6 and shown in Figure 4.5 below.

Table 4.6 - Final Preferred Approach for SA2 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA2-01 WRZ 3400SC0003 Baltinglass Public Supply	-2	**New GW abstraction – deeper BH in gravel aquifer approx. 3km from Baltinglass.** • WRZ currently supplied by GW (3no. water abstractions (WABs)) but these will be decommissioned and replaced by new deeper boreholes. • New GW abstraction amount to supply full future demand 1.066 Ml/d (DYCP 2044). WRZ dry year critical period (DYCP) 2019 demand = 0.988 Ml/d; DYCP 2044 demand = 1.066 Ml/d
SA2-7b **(Part of Grouped Option SA2-502)** WRZ 3400SC0004 Dunlavin Public Supply	0	**Rationalisation to Ballymore Eustace (BME) WTP** • Grouped Option 2 - Rationalisation of Hollywood-Donnard Public Supply (PS) WRZ and Dunlavin PS WRZ full demands to BME WTP (GDA – SA9). • WRZ DYCP 2019 demand = 0.394 Ml/d; DYCP 2044 demand = 0.421 Ml/d.
SA2-11b **(Part of Grouped Option SA2-502)** WRZ 3400SC0005 Hollywood Donard Public Supply	0	**Rationalisation to BME WTP** • Grouped Option 2 - includes Rationalisation of Hollywood-Donnard PS WRZ and Dunlavin PS WRZ full demands to BME WTP (GDA – SA9). • WRZ DYCP 2019 demand = 0.495 Ml/d; DYCP 2044 demand = 0.529 Ml/d.
SA2-13 WRZ 3400SC0008 Ballyknockan Valleymount Public Supply	-1	**Increase GW abstraction** • Increase GW abstraction to meet WRZ future deficit (DYCP 2044) • Current WRZ DYCP 2044 WAFU= 0.172 Ml/d, DYCP 2044 demand = 0.186 Ml/d so additional 0.014 Ml/d required
SA2-17 WRZ 3400SC0009 Stratford Public Supply	-1	**Increase GW abstraction** • Increase GW abstraction to meet WRZ future deficit (DYCP 2044) • Current WRZ DYCP = 0.214 Ml/d, DYCP 2044 demand = 0.233 Ml/d so additional 0.019 Ml/d required
SA2-28	-2	**Increase GW abstraction** • Increase GW abstraction to meet WRZ future deficit (DYCP 2044)

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
WRZ 3400SC0023 Knockanarrigan Davidstown Public Supply		• Current WRZ DYCP 2044 WAFU = 0.17 Ml/d, DYCP 2044 demand = 0.176 Ml/d so additional 0.006 Ml/d WAFU required
SA2-35 WRZ 3400SC0014 Rathdangan Public Supply	0	**Not in deficit. Treatment upgrade if required** • WRZ not in deficit, option to upgrade WTP for water quality purposes • WRZ DYCP 2019 demand = 0.01 Ml/d; DYCP 2044 demand = 0.011 Ml/d
SA2-24 WRZ 3400SC0019 Grangecon Public Supply	0	**Increase GW abstraction** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Current WRZ DYCP 2019 Demand = 0.017 Ml/d, DYCP 2044 demand = 0.019 Ml/d so additional 0.002 Ml/d WAFU required
SA2-38 WRZ 3400SC0011 Kiltegan Public Supply	-1	**Not in deficit. Treatment upgrade if required** • WRZ not in deficit, option to upgrade WTP for water quality purposes • WRZ DYCP 2019 demand = 0.117 Ml/d; DYCP 2044 demand = 0.128 Ml/d
SA2-20a WRZ 3400SC0015 Knockananna Public Supply	0	**Increase GW abstraction** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Current WRZ DYCP 2019 Demand = 0.052 Ml/d, DYCP 2044 demand = 0.056 Ml/d so additional 0.004 Ml/d WAFU required
SA2-40 WRZ 3400SC0052 Knocknagilky Public Supply	0	**Increase GW abstraction** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Current WRZ DYCP 2019 = 0.001 Ml/d, DYCP 2044 demand = 0.002 Ml/d so additional 0.001 Ml/d required
SA2-30d WRZ 0100SC0005 Hacketstown	-2	**Rationalisation to Rathvilly (Dependent on New Shannon Source)** • Includes rationalisation of WRZ to supply from Srowland WTP (GDA) via connection to Rathvilly WTP (Carlow) • Dependent on New Shannon Source (Lough Derg) supply to GDA to offset Srowland supply to Carlow • Decommissioning of existing surface water abstraction from River Slaney • WRZ full demand to be met = 0.73 Ml/d (DYCP 2044).

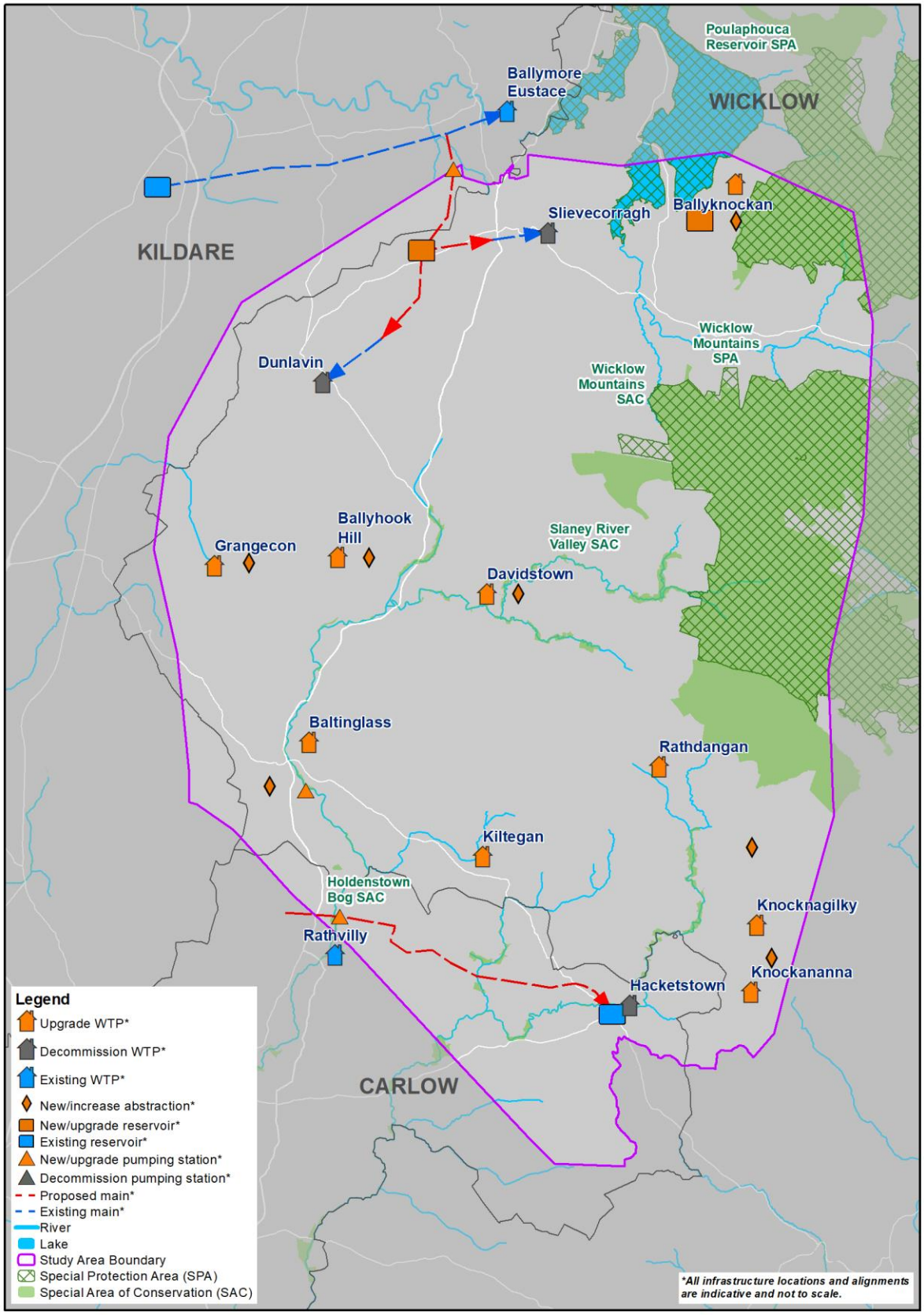

Figure 4.5 - Study Area 2 – Preferred Approach and European sites

4.4 Overview of Study Area 3 – South Louth East Meath

The location of Study Area 3 (SA3) in relation to the EM region is shown in Figure 4.1 above. SA3's total area is approximately 2,404km^2 and lies within the counties of Cavan, Louth, Westmeath and Meath. The principal settlements (settlements with a population of over 10,000) within SA3 are Navan, Drogheda, Laytown-Bettystown-Mornington-Donacarney and Ashbourne (CSO, 2016).

There are eight SACs and five SPAs within SA3 as shown in Table 4.7. European sites within SA3 where there is potential for LSE are discussed further in Section 6.2.3.

Table 4.7 - Number of European Sites within SA3

Study Area	No. of SACs	No. of SPAs
3	8	5

4.4.1 Existing Water Supplies

There are approximately 190,000 people served by the public network in SA3 via 11 WRZs and 1,900kms of distribution network. The Study Area is summarised in Figure 4.6 below. The supplies in the Study Area consist of large regional supplies and small local supplies. The sources of water include 13 groundwater abstractions, and seven surface water abstractions (five river and two lake sources).

The eight surface water abstractions are from the River Boyne catchment. The large River Boyne catchment basin has two main rivers, the River Boyne itself which rises in the south west, and the River Blackwater which rises in the north west. The Blackwater joins the Boyne at Navan before flowing easterly out to the Irish Sea where it enters the tidal waters between the Haven and Mornington Point, Co. Meath. Out of the six existing river abstractions from the Boyne catchment, Liscarton WTP (Blackwater) and Staleen WTP (Boyne) are the most significant. The two existing lake sources, Lough Bane and Skeagh Lough, are located in different areas of the upper Boyne catchment. Lough Bane is a complex groundwater fed lake located in the west of the Study Area on the border of Co. Meath and Co. Westmeath, and flows out to the River Deel (Boyne). Skeagh Lough is located in Co. Cavan in the north west of the Study Area, and flows out to the River Blackwater.The River Boyne and River Blackwater are designated as part of the River Boyne and River Blackwater SAC while Lough Bane is designated as part of Lough Bane and Lough Glass SAC.

The geology of the Study Area can be divided into four main groups: Ordovician and Silurian shales, greywackes and volcanics; Lower Carboniferous limestones and shales; Upper Carboniferous (Calp) sandstones and shales; and Permian/Triassic sandstones. Two aquifer types form the basis for groundwater development in Meath, namely the Calp consisting of dark limestone and shale which is widespread in the region. Secondly, karstified diffuse limestone in north-east Meath has substantial groundwater volumes along the Trim, Slane and Drogheda axis.

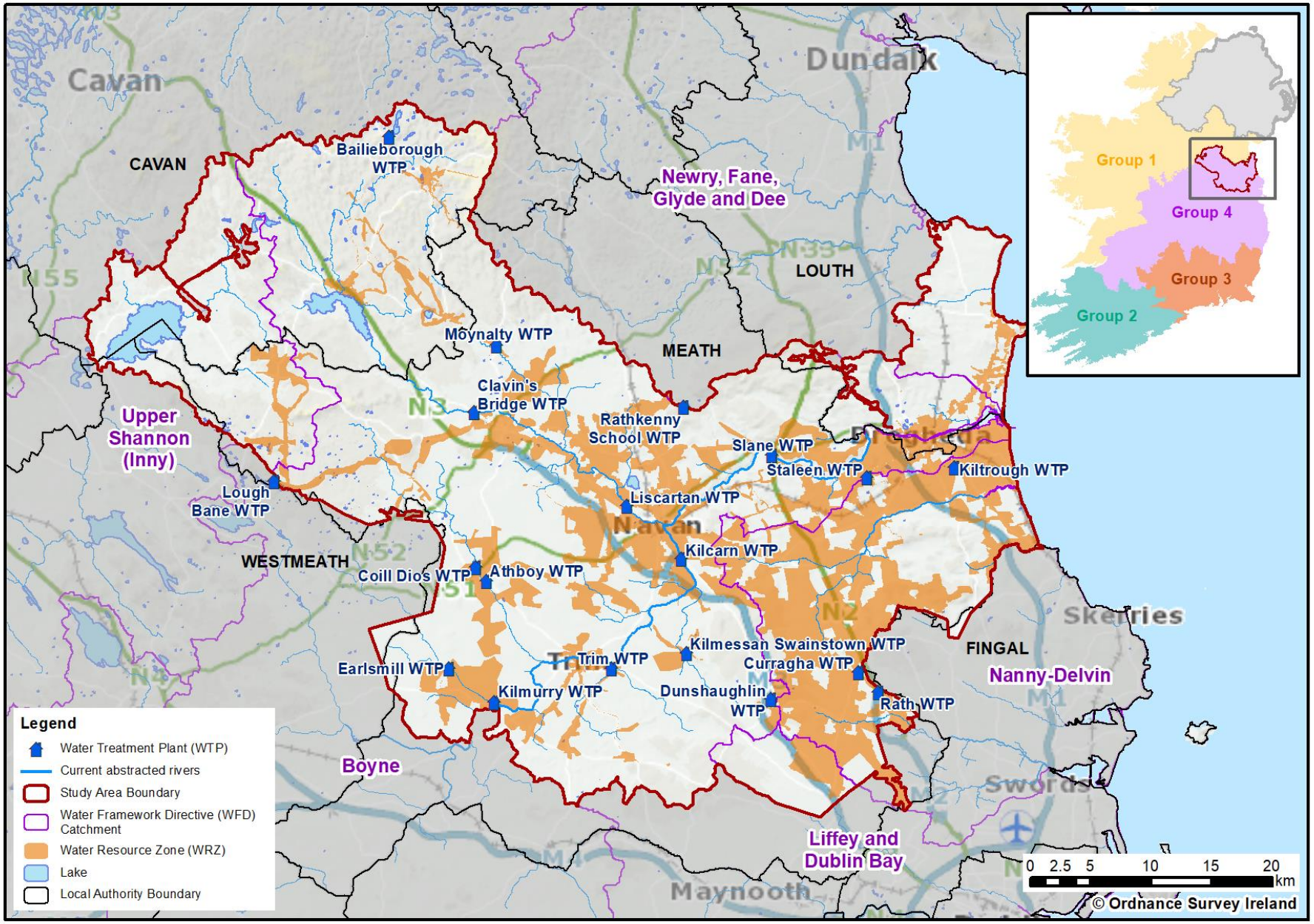

Figure 4.6 - Study Area 3 South Louth East Meath Summary

4.4.2 SA3 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.8 below were removed at Coarse/Fine Screening on environmental grounds.

Table 4.8 - SA3 – Options removed at Coarse/Fine Screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA3-02b	Increase abstraction and WTP capacity at Kiltrough for South Louth East Meath	Based on plan level assessments the overall WFD status of the groundwaterbody at Kiltrough is considered poor therefore it was not considered viable to increase an abstraction from this source.
SA3-06a	Merge South Louth East Meath and Navan Midmeath WRZs. Staleen Expansion. The increased abstraction will be offset by discharge of water from dewatering at Platin downstream of the abstraction. Rath Reservoir WTP, Kilcarn WTP and their abstractions will be decommissioned as part of this option.	The Platin Quarry abstracts sufficient groundwater to maintain the water table below the working quarry flow. This option proposes to divert this abstracted water to the River Boyne downstream of the Staleen abstraction. The overall WFD status of the ground waterbody in this location is classified as poor. Currently the water abstracted is returned to the local environment via the River Nanny which is also classified as poor WFD status. Using discharge from the quarry as a source of supply will result in WTP operations been completely dependent on the quarry operations and would likey impact the ground waterbody and surface waterbody meeting WFD objectives.
SA3-07a	Increase abstraction by 5Ml/d for Staleen WTP (include plant upgrade) and transfer water from dewatering at Platin just downstream from Staleen abstraction on River Boyne.	The Platin Quarry abstracts sufficient groundwater to maintain the water table below the working quarry flow. This option proposes to divert this abstracted water to the River Boyne downstream of the Staleen abstraction. The overall WFD status of the ground waterbody in this location is classified as poor. Currently the water abstracted is returned to the local environment via the River Nanny which is also classified as poor WFD status. Using discharge from the quarry as a source of supply will result in WTP operations been completely dependent on the quarry operations and would likely impact the ground waterbody and surface waterbody meeting WFD objectives.
SA3-07b	Increase abstraction by 5Ml/d for Staleen WTP (include plant upgrade) and transfer water from dewatering at Platin just downstream from Staleen abstraction on River Boyne.	The Platin Quarry abstracts sufficient groundwater to maintain the water table below the working quarry flow. This option proposes to divert this abstracted water to the River Boyne downstream of the Staleen abstraction. The overall WFD status of the ground waterbody in this location is classified as poor. Currently the water abstracted is returned to the local environment via the River Nanny which is also classified as poor WFD status. Using discharge from the quarry as a source of supply will result in WTP operations been completely dependent on the quarry operations and would likely impact the ground waterbody and surface waterbody meeting WFD objectives.

Option Reference	Option Description	Rejection Reasoning
SA3-08	Bring Rosehall WTP back into operation and upgrade WTP for partial supply to South Louth East Meath	Based on plan level assessment itwas determined that the combined sustainable abstraction from Bernatin and Killinear Reservoir is 1 Ml/d, however 4.5 Ml/d is required. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA3-09i	Increase surface water abstraction and treatment capacity at Clavin's Bridge to supply Kells – Oldcastle WRZ. Lough Bane WTP and its abstraction will be decommissioned as part of this option. This option will limit the abstraction downstream and at Staleen WTP therefore a new source will need to be obtained from the GDA for South Louth East Meath.	The River Blackwater is designated as the River Boyne and River Blackwater SAC. The River Blackwater is a Moderate status waterbody under WFD. Based on plan level assessments it was determined that the sustainable allowable abstraction from the River Blackwater at this location is 3.3 Ml/d therefore allowing for an additional 16Ml/d, over and above the current abstraction, to meet the full demand for this WRZ does not make this feasible. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA3-18	Increase surface water abstraction and treatment capacity at Clavin's Bridge to supply Kells-Oldcastle WRZ. Lough Bane WTP and its abstraction will be decommissioned as part of this option. This option will limit the abstraction downstream and at Staleen WTP therefore a new source will need to be obtained from the GDA for South Louth East Meath.	The River Blackwater is designated as the River Boyne and River Blackwater SAC. The River Blackwater is a "moderate status" waterbody under the WFD. Based on plan level assessments, it was determined that the sustainable allowable abstraction from the River Blackwater at this location is 3.3 MLD. Therefore, allowing for an additional 2.3MLD, over and above the current abstraction, to meet the full demand for this WRZ does not make this feasible. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA3-22	Split WRZs - Kells to be supplied from Liscartan WTP (Navan-Mid Meath WRZ) and Oldcastle to be supplied from Lough Bane.	This option was considered as part of a Grouped Option to provide supply to the entire Kells Oldcastle WRZ from Lough Bane. Lough Bane is designated as Lough Bane and Lough Glass SAC. Lough Bane is a Good status waterbody under WFD. On desktop assessment of the yield available at Lough Bane it was determined that the existing abstraction was already greater than the sustainable abstraction. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA3-38e	Supply Navan-Midmeath from GDA (requires new source). New main required across to Navan.	This option was considered as part of a Grouped Option to provide supply to the entire Kells Oldcastle WRZ from Lough Bane. Lough Bane is designated as Lough Bane and Lough Glass SAC. Lough Bane is a Good status waterbody under WFD. On desktop assessment of the yield available at Lough Bane it was determined that existing abstraction was already greater than the sustainable abstraction. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.

Option Reference	Option Description	Rejection Reasoning
SA3-40a	Merge South Louth East Meath and Navan Midmeath WRZs. Staleen Expansion. The increased abstraction will be offset by discharge of water from dewatering at Platin downstream of the abstraction. Rath Reservoir WTP, Kilcarn WTP and their abstractions will be decommissioned as part of this option.	The Platin Quarry abstracts sufficient groundwater to maintain the water table below the working quarry flow. This option proposes to divert this abstracted water to the River Boyne downstream of the Staleen abstraction. The overall WFD status of the ground waterbody in this location is classified as poor. Currently the water abstracted is returned to the local environment via the River Nanny which is also classified as poor WFD status. Using discharge from the quarry as a source of supply will result in WTP operations being completely dependent on the quarry operations and would likely impact the ground waterbody and surface waterbody meeting WFD objectives.
SA3-40b	Supply deficit at Navan-Midmeath from South Louth and East Meath via Staleen WTP (dewatering at Platin to provide increased yield of 5 Ml/d).	The Platin Quarry abstracts sufficient groundwater to maintain the water table below the working quarry flow. This option proposes to divert this abstracted water to the River Boyne downstream of the Staleen abstraction. The overall WFD status of the ground waterbody in this location is classified as poor. Currently the water abstracted is returned to the local environment via the River Nanny which is also classified as poor WFD status. Using discharge from the quarry as a source of supply will result in WTP operations being completely dependent on the quarry operations and would likely impact the ground waterbody and surface waterbody meeting WFD objectives.
SA3-64	Rationalise Moynalty WRZ to Bailieboro RWSS - Lough Skeagh will be the source	Based on plan level assessment of the yield available at Lough Skeagh it was determined that existing abstraction was already greater than the sustainable abstraction. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving Good WFD status.

4.4.3 Preferred Approach for SA3

Full details of the Preferred Approach (and how it was reached) are included in the SA3 Technical Report in Appendix 3 of the RWRP-EM. The final Preferred Approach for SA3 is shown in Table 4.9 below. The findings of the Preferred Approach Development for SA3 South Louth East Meath at WRZ level, include the following:

- Only one option for one WRZ scored a zero at Plan level in relation to potential impact on a designated European Site. This option (SA3-89) was automatically selected as the Preferred Approach.
- The Best AA and Best Environmental (overall SEA score) approach is identified in all 11 WRZs.
- Of the 11 WRZ approach options, none have a -3 score against biodiversity.

The Preferred Approach provides benefits for the environment and European sites through decommissioning existing abstractions at a number of WTPs (for example Lough Bane WTP, Liscarton WTP, Trim WTP etc.) which currently extract from European sites including Lough Bane SAC and the River Boyne and River Blackwater SAC.

All of the options that make up the final Preferred Approach and assessed as part of the NIS are shown in Table 4.9 and shown in Figure 4.7 below.

Table 4.9 - Final Preferred Approach for SA3 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA3-99 **(Part of Grouped Option SA3-523)** WRZ 2300SC0007 Ballivor	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.943 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA • The Grouped Option includes the decommissioning of a number of WTPs but upgrade works will occur at Staleen and Kiltrough.
SA3-101 **(Part of Grouped Option SA3-523)** WRZ 2300SC0011 Kilmessan	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.934 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA • The Grouped Option includes the decommissioning of a number of WTPs but upgrade works will occur at Staleen and Kiltrough.
SA3-88 WRZ 2300SC0023 Moynalty	-1	**Not in deficit – upgrade WTP** • Not in deficit – Upgrade WTP for water quality purposes • WRZ demand = 0.152 Ml/d (DYCP 2044)
SA3-77 WRZ 0200SC0015 Bailieboro RWSS	-1	**New local GW option. Partial deficit only** • New local GW option – to meet partial deficit only • WRZ demand = 3.992 Ml/d (DYCP 2044). WAFU = 2.285 Ml/d; Deficit = 1.707 Ml/d

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA3-96 **(Part of Grouped Option SA3-523)** WRZ 2100SC0001 South Lough & East Meath	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.943 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA
SA3-100 **(Part of Grouped Option SA3-523)** WRZ 2300SC0055 Navan-Midmeath	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.943 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA
SA3-97 **(Part of Grouped Option SA3-523)** WRZ 2300SC005 Kells-Oldcastle	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.943 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA
SA3-98 **(Part of Grouped Option SA3-523)** WRZ 2300SC0006 Athboy	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.943 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA3-47 WRZ 2300SC0009 Slane	-2	**Increase existing GW abstraction and increase capacity at WTP** • Increase existing GW abstraction and increase capacity at WTP • WRZ full demand =2.384 Ml/d (DYCP 2044); WAFU = 1.833 Ml/d; Deficit = 0.551 Ml/d
SA3-102 **(Part of Grouped Option SA3-523)** WRZ 2300SC0014 Trim	-2	**Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option** • Grouped Option 23 • WRZ full demand = 16.943 Ml/d (DYCP 2044) • Grouped Option dependent on New Shannon Source (Lough Derg) supply to GDA
SA3-89 WRZ 2300SC0045 Rathkenny	0	**Increase GW abstraction and increase treatment capacity** • Increase GW abstraction to meet WRZ deficit (2044 DYCP) • Current WRZ WAFU (DYCP 2044) = 0.007 Ml/d, DYCP 2044 demand = 0.012 Ml/d so additional 0.005 Ml/d WAFU required to meet deficit

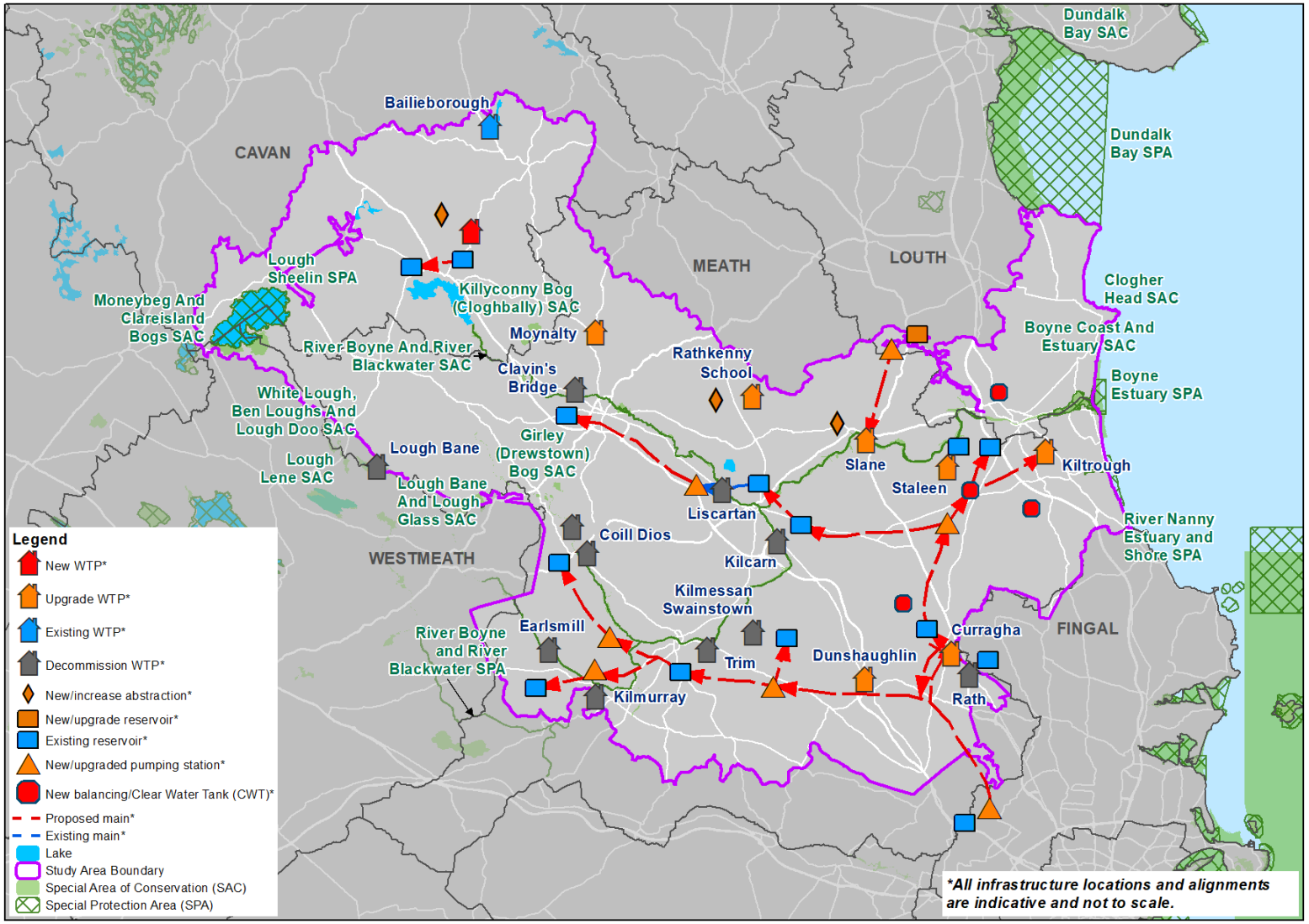

Figure 4.7 - Study Area 3 – Preferred Approach and European sites

4.5 Overview of Study Area 4 – Westmeath

The location of Study Area 4 (SA4) in relation to the EM region is shown in Figure 4.1 above. SA4's total area is approximately 2,637km^2 and lies within the counties of Cavan, Kildare, Longford, Meath, Offaly and Westmeath. The principal settlement within SA4 is Mullingar (Central Statistics Office, 2016).

There are 18 SACs and nine SPAs within SA4 as shown in Table 4.10. European sites within SA4 where there is potential for LSE are discussed further in Section 6.2.4.

Table 4.10 - Number of European Sites within SA4

Study Area	No. of SACs	No. of SPAs
4 (Westmeath)	18	9

4.5.1 Existing Water Supplies

There are approximately 88,000 people served by the public network in SA4 via 13 WRZs and 1,341kms of distribution network. The Study Area is shown in Figure 4.8. The largest town within this Study Area is Mullingar. Ballymahon, Enfield and Edenderry are other growth towns within the Study Area. The remaining WRZs consist of small settlements in the north-east of Offaly, south-west of Meath, and north-west of Kildare. The sources of water consist of three surface water sources (two lakes and one river) and 12 groundwater abstractions.

Mullingar and Ballany WRZs are supplied from Lough Owel and Lough Lene, respectively. Lough Owel is situated at the top of the River Brosna catchment which is part of the River Shannon basin while Lough Lene is located at the top River Deel catchment which is part of the River Boyne basin. Lough Lene is designated as an SAC while Lough Owel is designated as both an SAC and SPA. Both sources are complex groundwater fed lakes where the hydrology is not fully understood. Very low levels were experienced at these lakes during the 2018 drought, highlighting concerns about the long-term sustainability of these sources. Furthermore, as outlined in the abstraction licence for Lough Owel, the abstraction shall be such that the level of the lake does not fall below 98.90m/324.5ft O.D (ordnance datum – Malin) and the operation of the controls at the southern end of the lake on the feeder canal to the Royal Canal must include the provision and operation of works to provide 3 million gallons compensation water per day to the feeder canal and wherever the level of the lake falls to 99.36m/326ft. O.D., to provide for the return to the lake of 1 million gallons per day. This highlights the competing needs of the source, and the risk to water supply for Mullingar, now and in the future.

The one existing river source serving the Study Area is an abstraction from the River Inny, a relatively large river that drains south westerly into Lough Ree where it joins the main River Shannon channel. Based on Irish Water's e-flow assessment, the River Inny abstraction, supplying Ballymahon, is within 10% of the Q95 flow.

Two aquifer types form the basis for groundwater development in the Study Area, namely the Calp consisting of dark shaley limestone which is widespread in the region. Secondly, the regionally important karst aquifers around Kilbeggan, and immediately north of Mullingar and in the area surrounding Castlepollard supply groundwater to the urban hinterlands and also into the Lough Lene and Lough Owel. The towns of Daingean, Longwood, Rhode, Cushina and Geashill are all supplied by groundwater sources sufficient to meet local needs. Overall, of the 12 groundwater supplies managed by Irish Water in the region, each abstract is of relatively small volumes of between 0.015 Ml/d to 4 Ml/d.

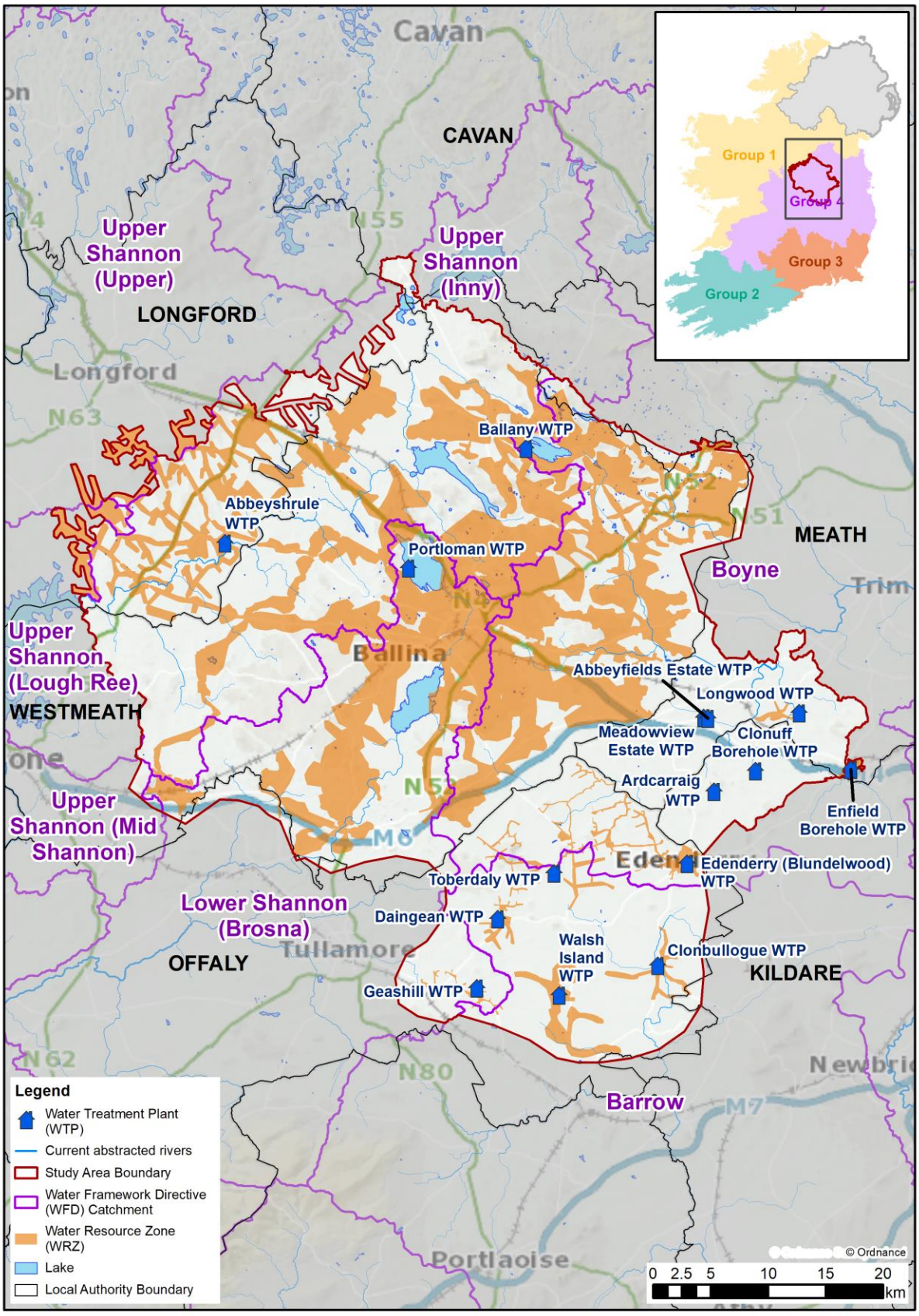

Figure 4.8 - Study Area 4 Westmeath Summary

4.5.2 SA4 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.11 below were removed at Coarse/Fine Screening on environmental grounds.

Table 4.11 - SA4 – Options removed at Coarse/Fine Screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA4-01	New GW abstraction at Ballany	The desktop assessments undertaken indicate that an abstraction at Ballany would lead to a direct pathway to River Blackwater SAC, Lough Bane and Lough Glass SAC, and White Lough, Ben Loughs and Lough Doo SAC, all of which include fen type habitat.
SA4-02	Increase abstraction from Lough Lene (groundwater fed lake) for Ballany.	This option relates to a complex ground water supplied lake. The assessments undertaken in the plan indicate that it is already under pressure and therefore this option was rejected.
SA4-03	New SW abstraction from Lough Derravaragh	The desktop assessments undertaken indicate that a surface water abstraction from Lough Derravaragh may impact Lough Derravaragh SPA. There is also the potential to have a direct impact on the qualifying interests through the lowering of lake level and impacting shallow areas of the lake used as breeding habitat of its QIs. In addition, this is a groundwater fed lake and, (with the lack of available data) there is too much uncertainty in relation to the potential impacts.
SA4-27	Maintain and reduce abstraction from Lough Owel - close connection to canal and pump treated effluent from WWTP to canal to maintain satisfactory levels in the canal.	In accordance with IW current abstraction authorisation, IW must discontinue abstraction at Lough Owel before the end of the decade. Therefore, continued abstraction from Lough Owel is considered unlikely.
SA4-35	New abstraction from L. Killinure and upgrade WTP to supply Athlone and Mullingar WRZs.	This option involves a new abstraction from Lough Killinure. A planning application for new abstraction from this source was withdrawn in 2020 for environmental reasons.
SA4-42	Part supply with Lough Lene - Ballany WRZ to Mullingar.	The desktop assessments undertaken indicate the sustainable abstraction from Lough Lene is less than the existing abstraction. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving Good WFD status.
SA4-43	Part supply from developed GW wellfield north of Ballany	The desktop assessments undertaken in this plan indicate that an abstraction at Ballany would lead to a direct pathway to River Blackwater SAC, Lough Bane and Lough Glass SAC, and White Lough, and Lough Doo SAC, all of which include fen type habitat.
SA4-86	New SW source to supply deficit in Edenderry and	The River Boyne at this location is a tributary of the main channel designated as the River Boyne and River Blackwater SAC. The River Boyne is a

Option Reference	Option Description	Rejection Reasoning
	Rhode WRZ. Nearby River Boyne	Moderate status waterbody under WFD. It was determined that the sustainable abstraction from the River Boyne at this location is 0.75 Ml/d, however additional supply of over 5 Ml/d is required. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.

4.5.3 Preferred Approach for SA4

Full details of the Preferred Approach (and how it was reached) is included in SA4 Technical Report in Appendix 4 of the RWRP-EM. The final Preferred Approach for SA4 is shown in Table 4.12. The findings of the Preferred Approach Development for SA4 Westmeath at WRZ level, include the following:

- No local level options score a zero at Plan level in relation to potential impact on European sites.
- In ten of the 13 WRZs, the Preferred Approach consists of the same Plan level options as the Best AA and Best Environmental Approaches.
- Of the 13 WRZ level Preferred Approaches, none have a -3 score against biodiversity.

The Preferred Approach provides benefits for the environment and European sites through decommissioning existing abstractions (for example Lough Owel, Lough Bane and Lough Lene) which currently extract from European sites including Lough Bane SAC, Lough Owel SAC/SPA and Lough Lene SAC.

All of the options that make up the Preferred Approach and assessed as part of the NIS are shown in Table 4.12 and shown in Figure 4.9 below.

Table 4.12 - Final Preferred Approach for SA4 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA4-10 **(Part of Grouped Option SA4-501)** WRZ 3200SC0003 Ballany	-2	**New connection point from New Shannon Source connecting to Ballany** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 1,822m^3/d, DYCP 2044 demand is 7,126m^3/d so additional 5,304m^3/d required to meet WRZ deficit.
SA4-36a **(Part of Grouped Option SA4-501)** WRZ 3200SC0001 Mullingar Regional	-2	**New connection point from New Shannon Source connecting to Mullingar Region** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 12,440m^3/d, DYCP 2044 demand is 25,837m^3/d so additional 13,397m^3/d required to meet WRZ deficit.
SA4-46 **(Part of Grouped Option SA4-501)** WRZ 2300SC0012 Clonard/Abbeyfields	-2	**New connection point from New Shannon Source connecting to Clonard/Abbeysfields Housing Estate - potential to Rationalise Clonard to Kinnegad (Mullingar Regional WRZ) via 6 km watermain** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 37m^3/d, DYCP 2044 demand is 83m^3/d so additional 46m^3/d required to meet WRZ deficit.
SA4-52 **(Part of Grouped Option SA4-501)** WRZ 2300SC0016 Longwood WS	-2	**New connection point from New Shannon Source connecting to Longwood - potential to connect Longwood to Kinnegad (Mullingar Regional WRZ)** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 550m^3/d, DYCP 2044 demand is 589m^3/d so additional 39m^3/d required to meet WRZ deficit.
SA4-53 **(Part of Grouped Option SA4-501)** WRZ 2300SC0018	-2	**New connection point from New Shannnon Source connecting to Enfield - potential to connect at Kinnegad from Mullingar** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
Enfield WS		• WRZ current WAFU DYCP 2044 is 642m^3/d, DYCP 2044 demand is 1,664m^3/d so additional 1,022m^3/d required to meet WRZ deficit.
SA4-99 WRZ 1400SC0005 Clonuff	-1	**No deficit – WQ upgrade required only** • No deficit - WQ upgrade required only • WRZ full demand = 0.013 Ml/d (DYCP 2044)
SA4-60 **(Part of Grouped Option SA4-501)** WRZ 1400SC0004 Ardcarraig Clogherinkoe	-2	**New connection point from New Shannon Source connecting to Ardcarraig Clogherinko** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 37m^3/d, DYCP 2044 demand is 98m^3/d so additional 62m^3/d required to meet WRZ deficit.
SA4-66 **(Part of Grouped Option SA4-501)** WRZ 2500SC0005 Edenderry & Rhode	-2	**New connection point from New Shannon Source connecting to Edenderry & Rhode** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 1,745m^3/d, DYCP 2044 demand is 6,391m^3/d so additional 4,646m^3/d required to meet WRZ deficit.
SA4-71 **(Part of Grouped Option SA4-501)** WRZ 2500SC0014 Daingean	-2	**New connection point from New Shannon Source connecting to Daingean** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 948m^3/d, DYCP 2044 demand is 839m^3/d so surplus of 109m^3/d to be rationalised to other WRZs' within Group 1 options.
SA4-98 WRZ 2500SC0007 Clonbullogue	-1	**No deficit – WQ upgrade required only** • No increase in abstraction is proposed at existing GW site. Current DYCP WAFU is 0.299 Ml/d and 2044 DYCP demand is 0.383 Ml/d, which can be supplied from the existing abstraction.
SA4-77	-2	**New connection point from New Shannon Source connecting to Walsh Island** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
(Part of Grouped Option SA4-501) WRZ 2500SC0006 Walsh Island PWS		• WRZ current WAFU DYCP 2044 is 917m^3/d, DYCP 2044 demand is 861m^3/d so surplus of 56m^3/d to be rationalised to other WRZs' within Group 1 options.
SA4-20 **(Part of Grouped Option SA4-501)** WRZ 2000SC0003 Ballymahon	-2	**Rationalise Ballymahon To Mullingar WRZ (interconnection points TBC) - new source required (New Shannon Source)** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 4,767m^3/d, DYCP 2044 demand is 5,877m^3/d so additional 1,110m^3/d required to meet WRZ deficit.
SA4-63 **(Part of Grouped Option SA4-501)** WRZ 2500SC0004 Geashill	-2	**New connection point from New Shannon Source connecting to Geashill** • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit. • Shannon abstraction previously assessed as part of GDA study area. • WRZ current WAFU DYCP 2044 is 413m^3/d, DYCP 2044 demand is 536m^3/d so additional 124m^3/d required to meet WRZ deficit.

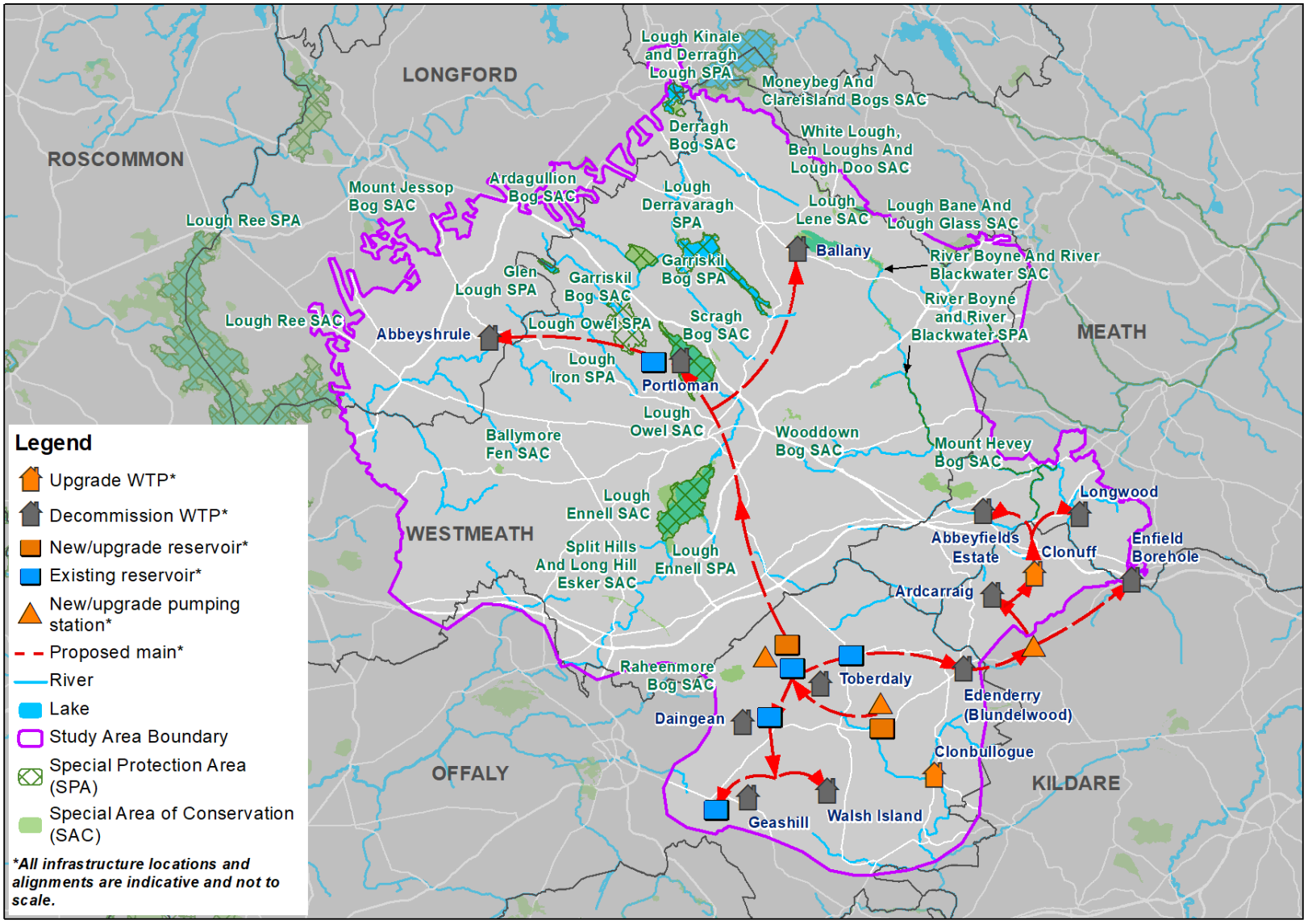

Figure 4.9 - Study Area 4 – Preferred Approach and European sites

4.6 Overview of Study Area 5 – Offaly Roscommon

The location of Study Area 5 (SA5) in relation to the EM region is shown in Figure 4.1. SA5 's total area is approximately 2,589km^2 and lies within the counties of Galway, Roscommon, Longford, Westmeath, Tipperary, Laois and Offaly. The principal settlement (settlement with a population of over 10,000) within SA5 is Athlone (Central Stastistics Office, 2016).

There are 31 SACs and 11 SPAs within SA4 as shown in Table 4.13. European sites within SA5 where there is potential for LSE are discussed further in Section 6.2.5.

Table 4.13 - Number of European Sites within SA5

Study Area	No. of SACs	No. of SPAs
5 (Offaly Roscommon)	31	11

4.6.1 Existing Water Supplies

SA5 consists of 10 WRZs supplying a population of 72,140 via approximately 1,123kms of distribution network. The largest town within this study area is Athlone. South Roscommon Regional Water Supply Scheme, Ballinasloe, Birr, Rahan and Clara/Ferbane are other areas of high demand within the Study Area. The existing supply within SA5 consists of seven surface water and 12 groundwater abstractions. The Study Area is shown in Figure 4.10.

SA5 is entirely within the boundaries of the River Shannon catchment, with WRZs divided between the Upper and Lower Shannon catchment areas. The Lough Ree waterbody is located on the main Shannon channel, to the north of Study Area. The large tributary rivers, namely River Suck, Brosna and Little Brosna, join the main Shannon further downstream. Athlone and Banagher WRZs abstract from the main Shannon channel, at Lough Ree and further downstream, respectively. In the west of the Study Area, Ballinasloe WRZ abstracts from River Suck and Bunowen River (tributary of Suck). In the south, the Birr/ Kinnitty WRZ abstracts from the River Camcor (tributary of Little Brosna) and from the Glenfelly Stream (tributary of Camcor). Whilst in the east, Clara/Ferbane WRZ abstracts from the Gageborough River (tributary of Brosna). This Study Area has a large number of European designated sites and the majority of the existing SA5 surface water sources are located within European sites including the River Shannon Callows SAC, Lough Ree SAC/SPA, River Suck Callows SPA, Middle Shannon Callows SPA and River Little Brosna Callows SPA.

All other WRZs are groundwater supplies. County Offaly forms part of the central lowland of Ireland, an area of low-lying rolling topography with higher ground at the Slieve Bloom Mountains. The higher topographic features have bedrock at or close to the surface. Most of the bedrock in Co. Offaly is masked by Quaternary sediments and subsoils which form the irregular topographic features in the lowlands such as esker sand, gravel ridges and raised bogs. The landscape of Co. Roscommon reflects the dominant underlying karstic Carboniferous limestone and shales, much of it exposed as outcrop. This karst forms a key regionally important aquifer around the towns of Ballinasloe, Athlone and Tullamore.

Overall, 12 groundwater supplies are managed by Irish Water in the region, abstracting between 0.03 Ml/d to 5 Ml/d. The higher volumes reflect the karstified limestones and their high storage and transmissivity.

For the larger WRZ deficits in the Study Area, there is potential for further development of the existing abstractions from the large River Shannon source whilst maintaining sustainable abstraction limits.

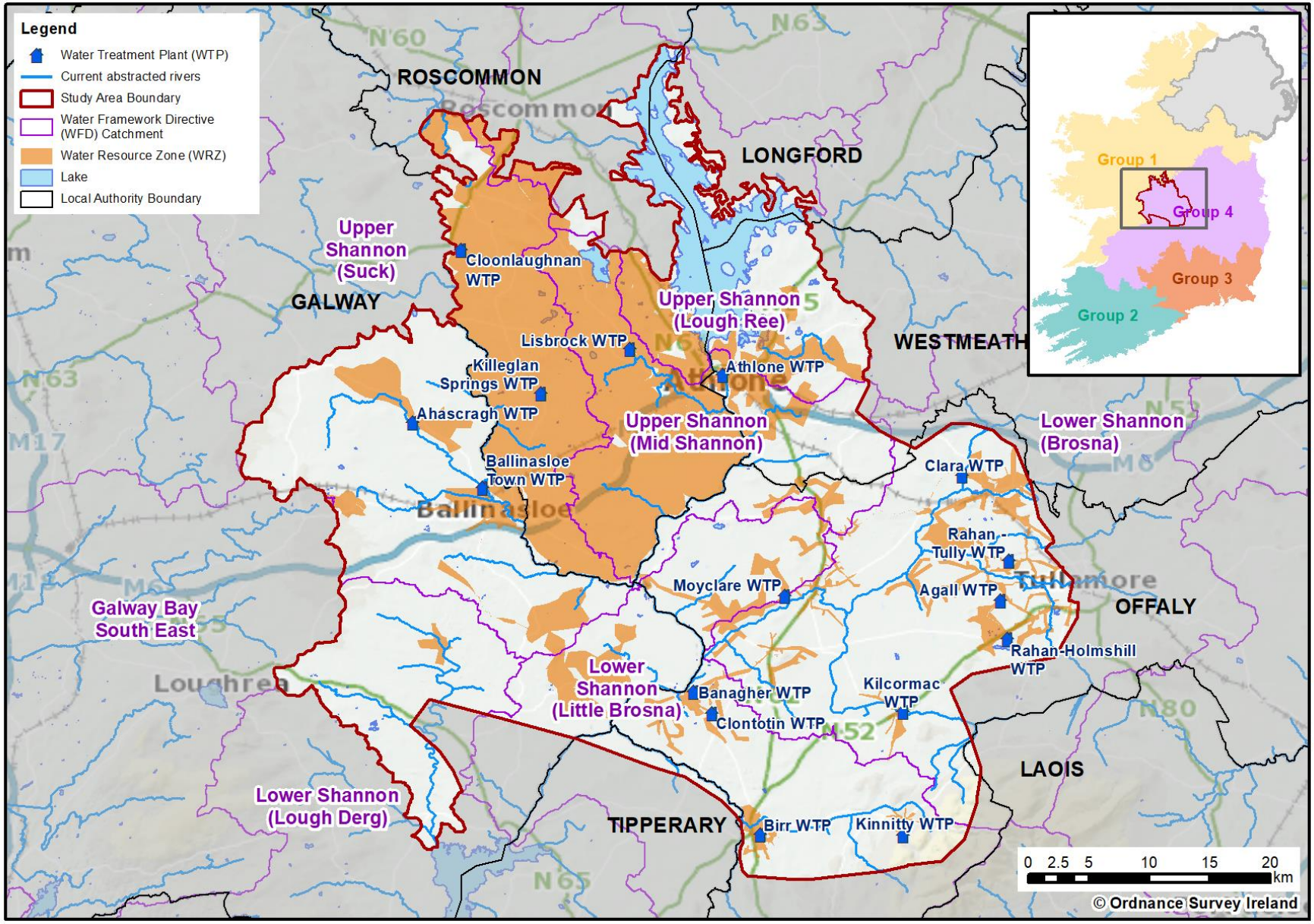

Figure 4.10 - Study Area 5 Offaly Roscommon Summary

4.6.2 SA5 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.14 below were removed at Coarse/Fine Screening on environmental grounds.

Table 4.14 - SA5 – Options removed at Coarse/Fine Screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA5-10a	New WTP at Killinure Lake for Athlone.	A planning application for a new abstraction from this source was withdrawn in 2020 for environmental reasons.
SA5-10b	New WTP at Killinure Lake to supply deficit in Athlone, and South Roscommon	A planning application for a new abstraction from this source was withdrawn in 2020 for environmental reasons.
SA5-52	New WTP at Killinure Lake to supply deficit in Athlone and South Roscommon	A planning application for a new abstraction from Killinure was withdrawn in 2020 for environmental reasons.
SA5-73	Increase abstraction at Hollimshill BHs and upgrade Rahan - Holmshill WTP (Tullamore groundwater body - karstic bedrock)	Great uncertainty around groundwater availability for the full demand requirement. Option unlikely to address the full deficit.
SA5-74	Increase abstraction at Agall Spring and upgrade Agall WTP (Tullamore groundwater body - karstic bedrock)	Great uncertainty around groundwater availability for the full demand requirement. Option unlikely to address the full deficit.
SA5-75	Increase abstraction at Tully BHs and upgrade Rahan - Tully WTP (Tullamore groundwater body - karstic bedrock)	Great uncertainty around groundwater availability for the full demand requirement. Option unlikely to address the full deficit.
SA5-76	New GW abstraction/wellfield at Holimshill-Killeigh Gavels groundwater body for Rahan	Great uncertainty around groundwater availability for the full demand requirement. Option unlikely to address the full deficit.
SA5-78	Rationalise Rahan WRZ to Tullamore (neighbouring scheme) and supply deficit from Tullamore WRZ (network upgrades required)	Great uncertainty around groundwater availability for the full demand requirement. Option unlikely to address the full deficit.

4.6.3 Preferred Approach for SA5

Full details of the Preferred Approach (and how it was reached) are included in SA5 Technical Report in Appendix 5 of the RWRP-EM. The final Preferred Approach for SA5 is shown in Table 4.15 below. The findings of the Preferred Approach Development for SA5 Offaly Roscommon at WRZ level, include the following:

- Two local options score a zero at Plan level in relation to potential impact on European sites.
- In seven of the ten WRZ, the Preferred Approach coincides with the Best AA score and the Best Environmental (overall SEA score).
- None of the Preferred Approaches at WRZ have a -3 score against biodiversity.

All of the options that make up the Preferred Approach and assessed as part of the NIS are shown in Table 4.15 and shown in Figure 4.11 below.

Table 4.15 - Final Preferred Approach for SA5 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA5-02 WRZ 1200SC0005 Ahascragh	-1	**New GW abstraction for Ahascragh WRZ to supply deficit** • New GW abstraction to meet WRZ future deficit (DYCP 2044) • WRZ WAFU = 0.538 Ml/d; WRZ full demand = 1.32 Ml/d (DYCP 2044); Deficit is 0.782 Ml/d
SA5-09a WRZ 3200SC0002 Athlone	-2	**Increase SW abstraction at River Shannon and upgrade Athlone WTP** • Upgrade Athlone WTP DYCP (2044) • WRZ WAFU = 11.756 Ml/d, WRZ full demand = 16.362 Ml/d (DYCP 2044); Deficit is 4.606 Ml/d
SA5-17a WRZ 1200SC0006 Ballinasloe	-2	**Increase abstraction from River Suck (New Intake Required)** • Increase abstraction from River Suck (New Intake required) DYCP (2044) • WRZ WAFU = 4.354 Ml/d; WRZ full demand = 5.937 Ml/d (DYCP 2044); Deficit is 1.583 Ml/d
SA5-517 **(Group 17 – comprising of option SA5-25)** WRZ 2500SC0015 Birr/Kinnitty	-1	**Increase abstraction from the River Camcor and upgrade WTP to supply Birr and Kinnity** • Increase SW abstraction to meet WRZ deficit (DYCP 2044) • Current WAFU (DYCP 2044) = 2.567 Ml/d, DYCP 2044 demand = 2.819 Ml/d so additional 0.252 Ml/d WAFU required
SA5-33 WRZ 2500SC0003 Kilcormac	0	**Increase GW abstraction to supply deficit in Kilcormac and upgrade WTP (Tullamore groundwater body – karstic bedrock)** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Current WAFU (DYCP 2044) = 0.332 Ml/d, DYCP 2044 demand = 0.558 Ml/d so additional 0.226 Ml/d WAFU required
SA5-37b WRZ 2600SC0001 Mount Talbot/Four Roads	-2	**Increase GW abstraction at Mount Talbot Spring to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044)

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
		Current WAFU (DYCP 2044) = 2.933 Ml/d, DYCP 2044 demand = 3.007 Ml/d so additional 0.074 Ml/d required
SA5-518 **(Grouped Option 18 – comprising of option SA5-82 and option SA5-83)** WRZ 2600SC0006 SRRWSS	-2	**Increase GW abstraction at Killeglan and Lisbrock. Upgrade WTPs (Grouped Option 18 – 2 WTPs)** • Increase GW abstraction at Killeglan and Lisbrock and Upgrade WTPs (Grouped Option 18 - 2 WTPs) • WRZ WAFU = 6.178 Ml/d; WRZ full demand = 7.772 Ml/d (DYCP 2044); Deficit is 1.594 Ml/d
SA5-84 WRZ 2500SC0016 Clara/Ferbane	-1	**No deficit. WTP upgrade only** • No Deficit. WTP Upgrade Only • WRZ full demand = 4.333 Ml/d (DYCP 2044)
SA5-86 WRZ 2500SC0017 Rahan	0	**New GW abstraction to meet partial deficit for Rahan and Upgrade WTP** • New GW abstraction and upgrade WTP • WRZ WAFU = 0.834Ml/d; WRZ full demand 2044 = 2.412Ml/d; Deficit is 1.578Ml/d
SA5-80 WRZ 2500SC0001 Banagher	-1	**No deficit. Upgrade Banagher WTP to address WQ issue** • WRZ not in deficit, option to upgrade Banagher WTP for WQ issues • WTP supplied by SW abstraction from River Shannon
SA5-81 WRZ 2500SC0001 Banagher	-1	**No deficit. Upgrade Clontotin WTP to address WQ issue** • WRZ not in deficit, option to upgrade Clontotin WTP for WQ issues • WTP supplied by GW abstraction (2no. BHs)

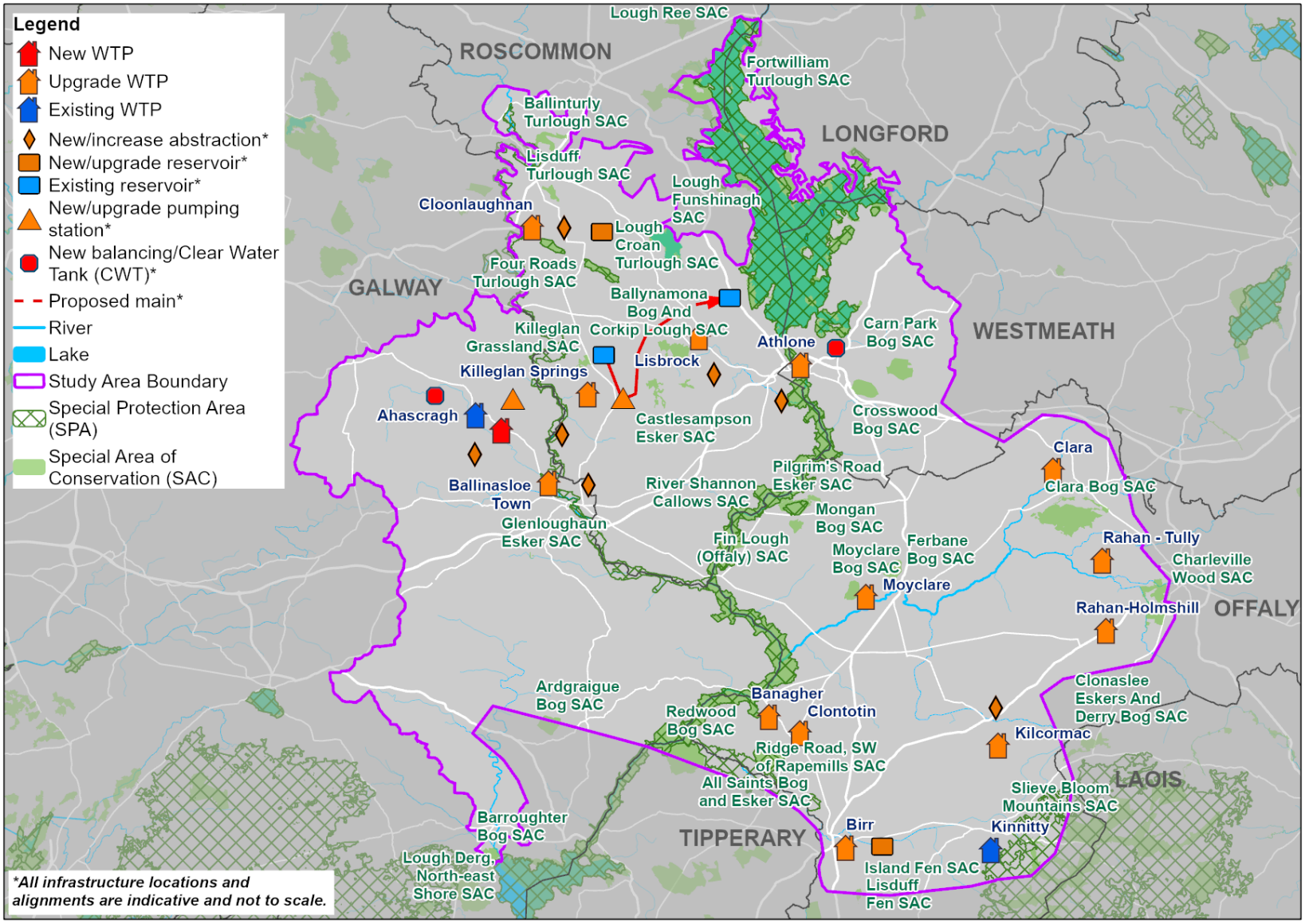

Figure 4.11 - Study Area 5 – Preferred Approach and European sites

4.7 Overview of Study Area 6 - Laois

The location of Study Area 6 (SA6) in relation to the EM region is shown in Figure 4.1. SA6's total area is approximately 3,027 km^2 and lies within the counties of Carlow, Kildare, Kilkenny, Laois, Tipperary, Westmeath, Wexford, Wicklow and Offaly. The principal settlements (settlements with a population of over 10,000) within SA6 are Carlow, Portlaoise and Tullamore (Central Statistics Office, 2016).

There are 15 SACs and two SPAs within SA6 as shown in Table 4.16. European sites within SA6 where there is potential for LSE are discussed further in Section 6.2.6.

Table 4.16 - Number of European Sites within SA6

Study Area	No. of SACs	No. of SPAs
6 (Laois)	15	2

4.7.1 Existing Water Supplies

The population within Study Area 6 (SA6) is approximately 126,665 people, served across 28 WRZs via approximately 1,700 kms of distribution network. The Study Area is shown in Figure 4.12. The largest demand centres in the Study Area include Carlow Town, Portlaoise, Tullamore, Portarlington and Mountmellick. The sources of water for SA6 consist of six surface water and 38 groundwater abstractions.

The majority of the Study Area is located within the River Nore and River Barrow catchment basins, which rise in the Slieve Bloom Mountains and drain south. The south east of the Study Area, near Tullow, crosses into the River Slaney catchment.

Together the Nore, Barrow and Slaney drain a large portion of the south eastern part of the country. The majority of the existing SW abstractions are in the south east of the Study Area, near Carlow Town. There are two abstractions each from River Slaney and River Burren (tributary of the Barrow), with the Slaney abstraction at Rathvilly WTP being the most significant in the region. Additionally, in the south, an abstraction from River Dinin (tributary of the Nore) serves Clogh Castlecomer WRZ, and in the north, a small abstraction from River Clodiagh (tributary of the Brosna/Shannon) supplies Tullamore WRZ. During the drought of 2018, significant reductions in the levels of the River Slaney were experienced and low flow interventions were required on the River Burren and Clodiagh Rivers, highlighting the sustainability risk of these sources, now and in the future. There are a number of European sites within SA6 including the Slaney River Valley SAC and the River Barrow and River Nore SAC.

All WRZs in Laois are groundwater supplies. The geology of the Study Area is dominated by widespread limestones lying as lowland topography covered in substantial thicknesses of overlying gravelly soils, with two topographic high points at the Slieve Bloom (Silurian) uplands to the northwest, and the Castlecomer Plateau (Leinster Coalfields) to the southeast at Carlow town.

The limestone rock units in the lowlands form a key regionally important aquifer close to the towns of Tullamore, Portlaoise and Durrow, which feeds each town with significant volumes of groundwater.

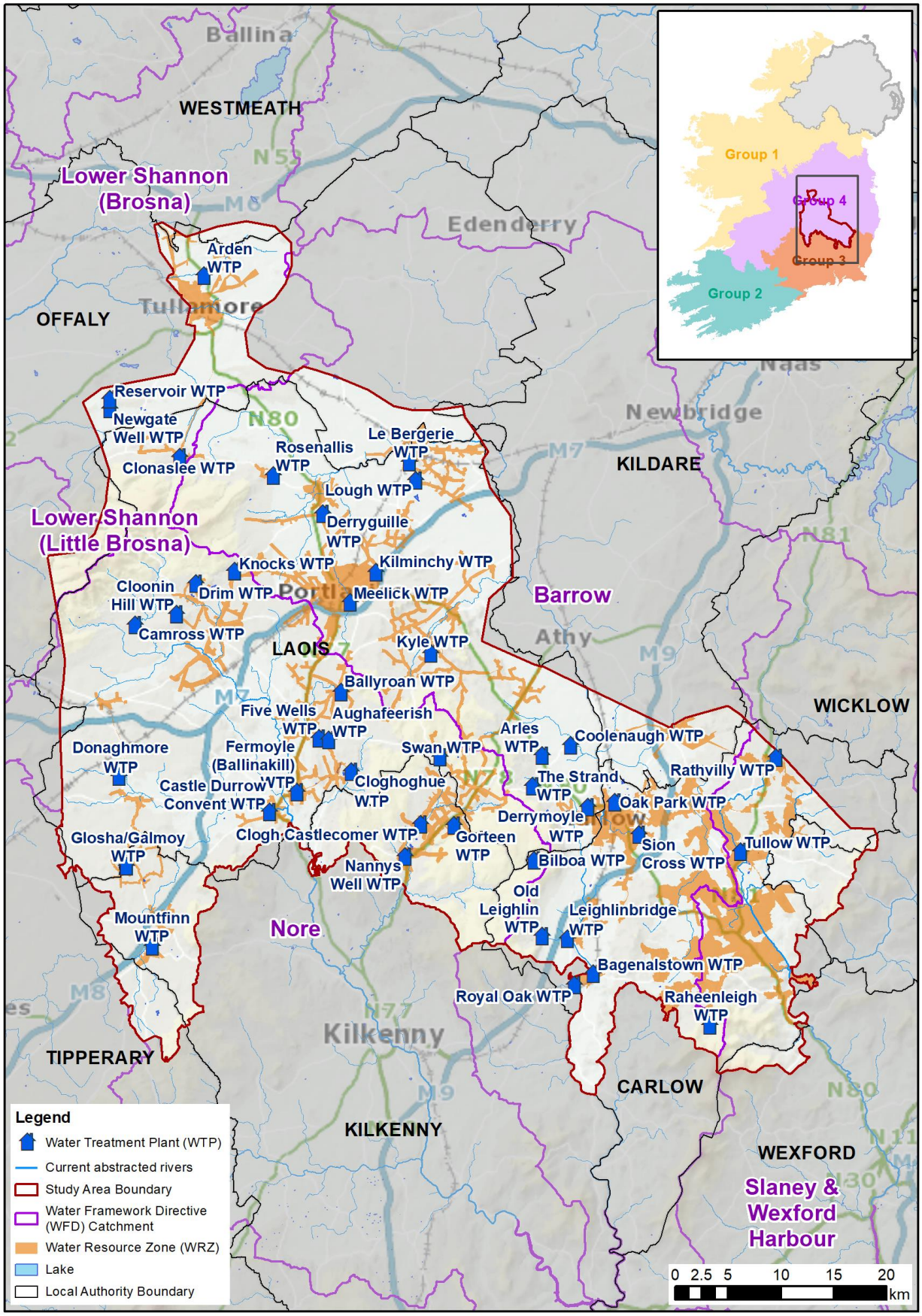

Figure 4.12 - Study Area 6 Laois Summary

4.7.2 SA6 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.17 below were removed at Coarse/Fine screening on environmental grounds.

Table 4.17 - SA6 – Options removed at Coarse/Fine screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA6-01	Increase surface water abstraction from River Burren to supply deficit to Carlow Town.	The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02a	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02b	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02c	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02d	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02e	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02f	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-02g	Increase surface water abstraction from River Slaney - Carlow North Regional abstraction to	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.

Option Reference	Option Description	Rejection Reasoning
	supply deficit to Carlow Town.	
SA6-03a	Increase surface water abstraction from River Slaney - Tullow abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-03b	Increase surface water abstraction from River Slaney - Tullow abstraction to supply deficit to Carlow Town.	The River Slaney is designated as the Slaney River Valley SAC. The River Slaney is a WFD high status waterbody. The plan has identified that this option does not have available yield to meet the DYCP demand. The option is therefore unviable.
SA6-10	Supply deficit at Carlow Town from neighboring GWS - Ballinabranna	This option requires pump tests to determine yield due to the need for a significant amount of supply. It also involves transferring water via a significant length of pipeline over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of the water.
SA6-12	Upgrade Sion Cross WTP	The plan identified the calculated sustainable abstraction at this source is not sufficient to meet the demand.
SA6-16a	Rationalise Leighlinbridge to Carlow Town	The plan identified that this option does not have available yield to meet the DYCP demand.
SA6-16b	Rationalise Leighlinbridge to Carlow Town	The plan identified that this option does not have available yield to meet the DYCP demand.
SA6-22	Rationalise Old Leighlin to Carlow Town via Leighlinbridge	The plan identified that this option does not have available yield to meet the DYCP demand.
SA6-25	Rationalise Bilboa to Carlow Town WRZ	The plan identified that this option does not have available yield to meet the DYCP demand.
SA6-35a	Rationalise Carlow Central Regional to Carlow Town	The plan identified that this option does not have available yield to meet the DYCP demand.
SA6-47	Riverbank filtration from River Dinin	This option involves an abstraction close to the River Dinin which has potential to undermine the conservation objectives of River Barrow and River Nore SAC. Making this a feasible option is considered likely to result in a greater risk of having adverse effects on this European site.
SA6-48	New SW abstraction from River Dinin to supply deficit for Clogh-Castlecomer.	Proposal is above the sustainable abstraction limit. Abstracting close to River Dinin has potential to undermine the conservation objectives of River Barrow and River Nore SAC. Making this a feasible option is considered likely to result in a greater risk of having adverse effects on this European site.
SA6-58	New SW abstraction from River Triogue for Portlaoise.	The plan has identified that the sustainable abstraction from the source in this option would only meet less than 20% of the deficit in the WRZ.

Option Reference	Option Description	Rejection Reasoning
SA6-76	New river abstraction from the Owenass River (CFRAM study – flood alleviation scheme underway) for Mountmellick.	This option is a high-cost option requiring a new WTP that would not meet the WRZ deficit.
SA6-89	Rationalise Arles to Carlow Town WRZ	The plan has identified that this option does not have available yield at Rathvilly to meet DYCP.
SA6-92	Rationalise The Strand to Carlow Town WRZ	The plan has identified that this option does not have available yield at Rathvilly to meet DYCP.
SA6-108	New SW abstraction from River Strandbally	The plan has identified that this option is likely to be above the sustainable abstraction limits.
SA6-146	Supply deficit from neighboring GWS - Cullahill GWS	The source is not productive, and unlikely that it can provide the required supply to resolve the full deficit. The option was therefore deemed unviable.
SA6-171	Increase SW abstraction from Gorragh River to partly supply deficit in Tullamore.	The desktop assessments undertaken in this plan identify that the sustainable abstraction for this source can only supply approximately less than 1% of the deficit. The option was therefore deemed unviable.
SA6-172	Increase SW abstraction from Clodiagh River to partly supply deficit in Tullamore.	The desktop assessments undertaken in this plan identify that the sustainable abstraction for this source can only supply approximately less than 1% of the deficit. The option was therefore deemed unviable.
SA6-173	New SW abstraction from Tullamore U.D.C. to partly supply deficit in Tullamore.	The desktop assessments undertaken in this plan identify that the sustainable abstraction for this source can only supply a small proportion of the deficit. The option was therefore deemed unviable.
SA6-181	Increase GW abstraction at Newgate Well and upgrade Newgate Well WTP (poorly productive bedrock).	The existing source is not productive, and unlikely that it can provide the required supply to resolve the full deficit, particularly during critical periods. The option is therefore deemed unviable.
SA6-182	Increase GW abstraction at Village Well and upgrade Mountbolus WTP (poorly productive aquifer).	The existing source is not productive, and unlikely that it can provide the required supply to resolve the full deficit, particularly during critical periods. The option is therefore deemed unviable.
SA6-192	New SW abstraction from River Burren to meet deficit. Requiring new abstraction intake works and new WTP for 1Ml/d supply, plus approximately 3.5km of new pipe to Ballon SR.	Option above sustainable limit. The option was therefore deemed unviable.

4.7.3 Preferred Approach for SA6

Full details of the Preferred Approach (and how it was reached) are included in the SA6 Technical Report in Appendix 6 of the RWRP-EM. The final Preferred Approach for SA6 is shown in Table 4.18 below. The findings of the Preferred Approach Development for SA6 Laois at WRZ level, include the following:

- Three local options score a zero at Plan level in relation to potential impact on European sites.
- In 19 of the 28 No. WRZs, the Preferred Approach option coincides with both the Best AA and Best Environmental score.
- The Preferred Approache at WRZ level for Ballinakill has a -3 score against biodiversity. However, Group 53 was ultimately brought forward as the Preferred Approach (increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill) which scored a -2 against biodiversity.

All of the options that make up the Preferred Approach and assessed as part of the NIS are listed in Table 4.18 and shown in Figure 4.13 below.

Table 4.18 - Final Preferred Approach for SA6 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA6-193 WRZ 0100SC0001 Carlow Town	-2	**Connect to New Shannon Source via Srowland** • Option to rationalise and connect WRZ to Srowland WTP (Preferred Approach for SA9) • Includes decommissioning of current sources/WTPs supplying WRZ • WRZ deficit to be met = 10.594 Ml/d (DYCP 2044) • Dependent on New Shannon Source (Lough Derg) supply to GDA. Existing Barrow abstraction to be maintained.
SA6-197 WRZ 0100SC0002 Leighlinbridge	-1	**WTP upgrade only** • WTP upgrade only (DYCP 2044) • WRZ current full demand = 0.608 Ml/d
SA6-19 WRZ 0100SC0003 Old Leighlin	-1	**Increase GW abstraction to supply deficit - yield assessments required** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.018 Ml/d, DYCP 2044 demand = 0.028 Ml/d so additional 0.01 Ml/d WAFU required to meet WRZ deficit
SA6-24 WRZ 0100SC0004 Bilboa	-1	**New GW abstraction to supply full demand** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.011 Ml/d, DYCP 2044 demand = 0.016 Ml/d so additional 0.005 Ml/d WAFU required to meet WRZ deficit
SA6-191 WRZ 0100SC0008 Bagenalstown	-1	**WTP upgrade** • WRZ not in deficit, option to upgrade WTP for WQ purposes • WRZ full demand = 1.612 Ml/d (DYCP 2044)
SA6-33 WRZ 0100SC0011 Carlow Central Regional	-2	**New GW to supply deficit to the Barrow gravels just south of Carlow Town** • New GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.958 Ml/d, DYCP 2044 demand = 1.693 Ml/d so additional 0.735 Ml/d WAFU required from new GW to meet WRZ deficit • Existing SW abstraction from River Burren to be maintained

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA6-38 WRZ 1500SC0006 Urlingford-Johnstown WS	-2	**New GW to supply deficit and improve water quality** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.456 Ml/d, DYCP 2044 demand = 0.726 Ml/d so additional 0.270 Ml/d WAFU required to meet WRZ deficit
SA6-45a WRZ 1500SC0009 Clogh-Castlecomer WS	-2	**New GW abstraction/wellfield to supply deficit** • New GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.98 Ml/d, DYCP 2044 demand = 1.895 Ml/d so additional 0.915 Ml/d WAFU required from new GW to meet WRZ deficit • Current sources/WTPs to be maintained
SA6-53a WRZ 1500SC0018 Galmoy-Rathdowney PWS	-2	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.736 Ml/d, DYCP 2044 demand = 1.875 Ml/d so additional 1.139 Ml/d WAFU required to meet WRZ deficit
SA6-57a WRZ 1600SC0001 Portlaoise PWS	-2	**New GW abstraction/wellfield development** • New GW abstraction/wellfield development DYCP (2044) • WRZ current WAFU DYCP 2044 = 8.708 Ml/d, DYCP 2044 demand = 12.888 Ml/d so additional 4.180 Ml/d WAFU required to meet WRZ deficit
SA6-64 WRZ 1600SC0003 Rosenallis PWS	0	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.041 Ml/d, DYCP 2044 demand = 0.043 Ml/d so additional 0.002 Ml/d WAFU required to meet WRZ deficit • Small scale abstraction increase at existing source
SA6-69a WRZ 1600SC0004 Mountmellick 1 PWS	-1	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 1.742 Ml/d, DYCP 2044 demand = 2.470 Ml/d so additional 0.728 Ml/d WAFU required to meet WRZ deficit • Existing small-scale abstraction increase. • No new infrastructure required.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA6-77 WRZ 1600SC0005 Portarlington 1 PWS	-2	**Increase GW abstraction to supply deficit** • Develop groundwater close to existing abstraction to meet WRZ deficit (DYCP 2044) • Option involves 5 no. new boreholes. • WRZ current WAFU DYCP 2044 = 2.246 Ml/d, DYCP 2044 demand = 4.819 Ml/d so additional 2.573 Ml/d
SA6-86a WRZ 1600SC0006 Arles 2 PWS	0	**Increase GW abstraction to supply deficit - yield assessments required** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.017 Ml/d, DYCP 2044 demand = 0.027 Ml/d so additional 0.01 Ml/d WAFU required to meet WRZ deficit.
SA6-90 WRZ 1600SC0007 The Strand PWS	0	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.005 Ml/d, DYCP 2044 demand = 0.008 Ml/d so additional 0.003 Ml/d WAFU required to meet WRZ deficit.
SA6-94 WRZ 1600SC0008 Coolanagh PWS	-1	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.006 Ml/d, DYCP 2044 demand = 0.012 Ml/d so additional 0.006 Ml/d WAFU required to meet WRZ deficit.
SA6-99 WRZ 1600SC0010 Borris in Ossory PWS	-1	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.312 Ml/d, DYCP 2044 demand = 0.573 Ml/d so additional 0.261 Ml/d WAFU required to meet WRZ deficit.
SA6-104 WRZ 1600SC0011 Camross PWS	-2	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.005 Ml/d, DYCP 2044 demand = 0.012 Ml/d so additional 0.007 Ml/d WAFU required to meet WRZ deficit.
SA6-105 WRZ 1600SC0014 South East Regional PWS	-2	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044)

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
		• WRZ current WAFU DYCP 2044 = 1.422 Ml/d, DYCP 2044 demand = 4.024 Ml/d so additional 2.602 Ml/d WAFU required to meet WRZ deficit.
SA6-113a WRZ 1600SC0015 Swan PWS	-2	**Increase GW abstraction to supply deficit** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.556 Ml/d, DYCP 2044 demand = 0.822 Ml/d so additional 0.266 Ml/d WAFU required to meet WRZ deficit.
SA6-122 WRZ 1600SC0016 Mountrath	-2	**Rationalise Cloonin Hill, Drim and Knocks into 1 WTP to add resilience. Require source protection** • Option involves decommissioning/rationalisation of Drim WTP and Cloonin Hill WTP and increased GW (4no. new BHs) at Knocks WTP to meet WRZ demand (DYCP 2044) • Based on decommissioning of Drim and Cloonin Hill WTPs. Knocks WTP current WAFU (DYCP 2044) = 0.525 Ml/d, DYCP 2044 demand = 2.492 Ml/d so additional 1.967 Ml/d WAFU required from increased GW to meet WRZ demand.
SA6-126 WRZ 1600SC0017 Abbeyliex South	-2	**Increase GW abstraction to supply deficit** • Increase GW abstraction to supply deficit DYCP (2044). • WRZ current WAFU DYCP 2044 = 0.370 Ml/d, DYCP 2044 demand = 0.629 Ml/d so additional 0.259 Ml/d WAFU required to meet WRZ deficit.
SA6-553 **(Group 53 comprising of option 139)** WRZ 1600SC0018 Ballinakill	-2	**Increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill** • Increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill DYCP (2044) • WRZ current WAFU DYCP 2044 = 0.408 Ml/d, DYCP 2044 demand = 1.752 Ml/d so additional 1.344 Ml/d WAFU required to meet WRZ deficit.
SA6-553 **(Group 53 comprising of option 144e)** WRZ 1600SC0019 Durrow	-2	**Increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill** • Increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill DYCP (2044) • WRZ current WAFU DYCP 2044 = 0.408 Ml/d, DYCP 2044 demand = 1.752 Ml/d so additional 1.344 Ml/d WAFU required to meet WRZ deficit.
SA6-149	-2	**Increase GW abstraction to supply deficit**

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
WRZ 1600SC0020 Abbeyleix North		• Increase GW abstraction to supply deficit DYCP (2044) • WRZ current WAFU DYCP 2044 = 0.787 Ml/d, DYCP 2044 demand = 1.315 Ml/d so additional 0.528 Ml/d WAFU required to meet WRZ deficit.
SA6-156 WRZ 1600SC0021 Ballyroan	-2	**Increase GW abstraction to supply deficit – Ballyroan Spring** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.611 Ml/d, DYCP 2044 demand = 1.004 Ml/d so additional 0.393 Ml/d WAFU required to meet WRZ deficit.
SA6-552 **(Group 52 comprising of option 180c)** WRZ 2500SC0002 Tullamore	-1	**Supply Tullamore from New Shannon Source** • WRZ current WAFU DYCP 2044 = 2.196 Ml/d, DYCP 2044 demand = 8.859 Ml/d so additional 6.663 Ml/d required to meet WRZ deficit. • Dependent on New Shannon Source supply to GDA.
SA6-552 **(Group 52 comprising of option 184)** WRZ 2500SC0013 Mountbolus PWS	-1	**New connection point from New Shannon Source connecting to Mountbolus** • WRZ current WAFU DYCP 2044 = 0.083 Ml/d, DYCP 2044 demand = 0.062 Ml/d so additional 0.021 Ml/d required to meet WRZ deficit. • Dependent on New Shannon Source supply to GDA.

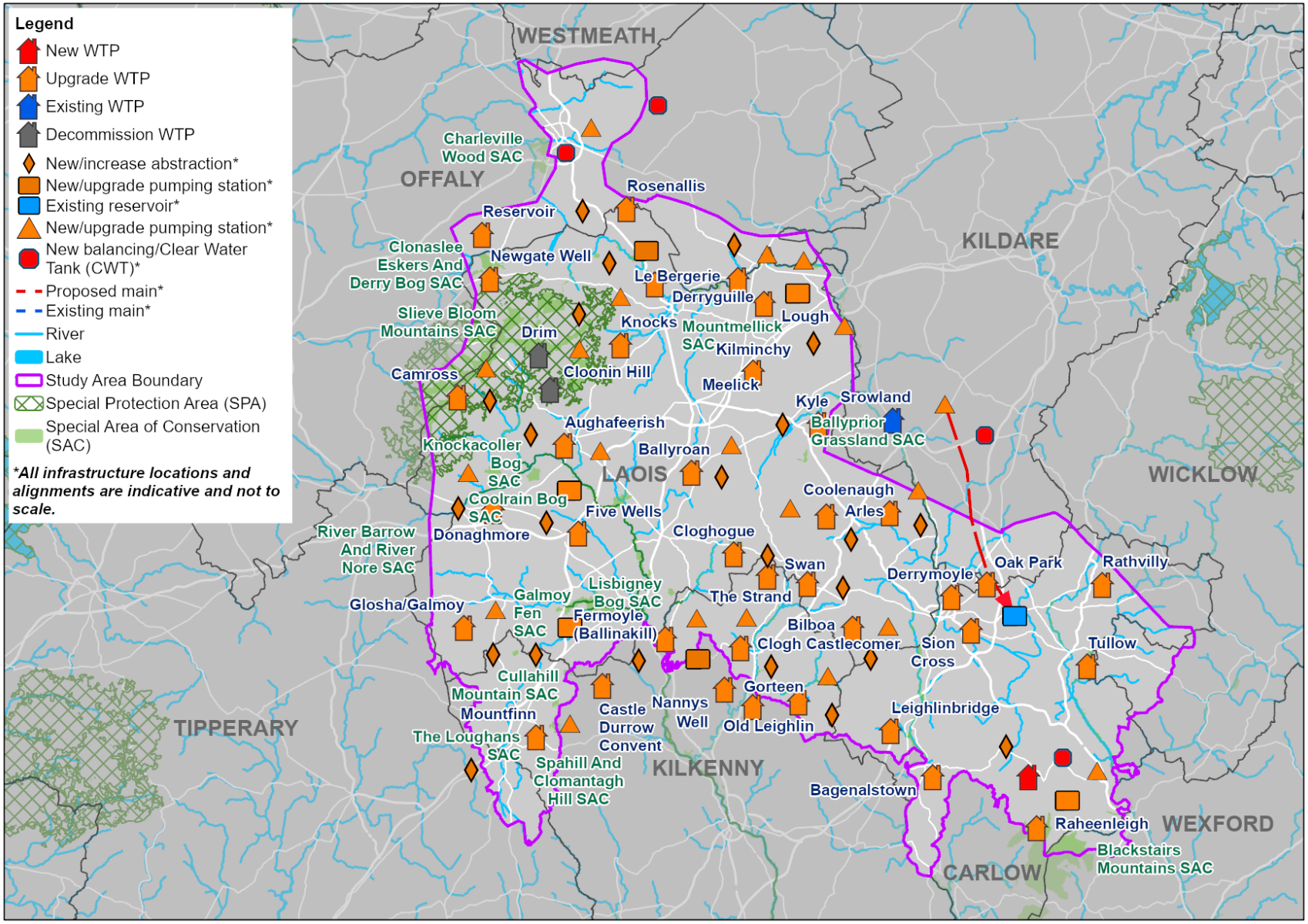

Figure 4.13- Study Area 6 – Preferred Approach and European sites

4.8 Overview of Study Area 7 – Tipperary North

The location of Study Area 7 (SA7) in relation to the EM region is shown in Figure 4.1. SA7's total area is approximately 1,455km^2 and lies within the counties of Clare, Galway, Laois, North Tipperary, and Offaly. There are no principal settlements (settlements with a population of over 10,000) within SA7, however, the main settlements (settlements with a population of over 5,000) are Nenagh and Roscrea (Central Statistics Office, 2016).

There are 18 SACs and five SPAs within SA7 as shown in Table 4.19. European sites within SA7 where there is potential for LSE are discussed further in Chapter 6.2.7.

Table 4.19 - Number of European Sites within SA7

Study Area	No. of SACs	No. of SPAs
7 (Tipperary North)	18	5

4.8.1 Existing Water Supplies

SA7 Tipperary North covers the area to the south and east of Lough Derg and consists of 10 WRZs supplying a population of 31,237 via approximately 750kms of distribution network. The Study Area is shown in Figure 4.14. The area consists of small towns and villages along with the towns of Nenagh, Roscrea and Portumna. The larger supplies in the area (Nenagh, Portumna and Roscrea) are surface water supplies and abstract water from Lough Derg and the Little Brosna River, whilst the smaller villages utilise groundwater springs and boreholes.

The majority of the Study Area is in the Lower River Shannon catchment basin. This includes the Lough Derg waterbody on the main Shannon channel as well as a main tributary, the Little Brosna River, which rises near Dunkerrin and flows north-west through the Callows to join the main Shannon channel upstream of Lough Derg. The south-east of the Study Area, near Templemore, crosses into the upper catchment basin of the River Suir which rises on the slopes of the Devil's Bit Mountain. There are a number of European sites within SA7 including but not limited to the River Shannon Callows SAC, Lough Derg North-East Shore SAC, Middle Shannon Callows SPA, River Little Brosna Callows SPA and Lough Derg (Shannon) SPA.

There is variable natural geology across the area. Centrally, a regionally important karst aquifer runs south-east and north-east across the study area through Birr, and three regional gravel aquifers lie to the eastern edge of the Study Area. A larger proportion of the region is considered to be of poorly productive aquifer status. Much of the bedrock geology here is of a local aquifer class due to the poor-quality lime-mudstone. Many of the 16 groundwater abstractions were historically developed in the mudstones to supply water to the rural populations on the east shores of Lough Derg, and the urban areas of the Moneygall/Roscrea. Nevertheless, the scale of the abstractions is small, ranging from 0.25 Ml/d to 0.5 Ml/d. Recent mapping by the Geological Survey of Ireland show that better availability of groundwater is present in the three gravel aquifers close to Roscrea and Birr towns, and some of the future groundwater options have been positioned here.

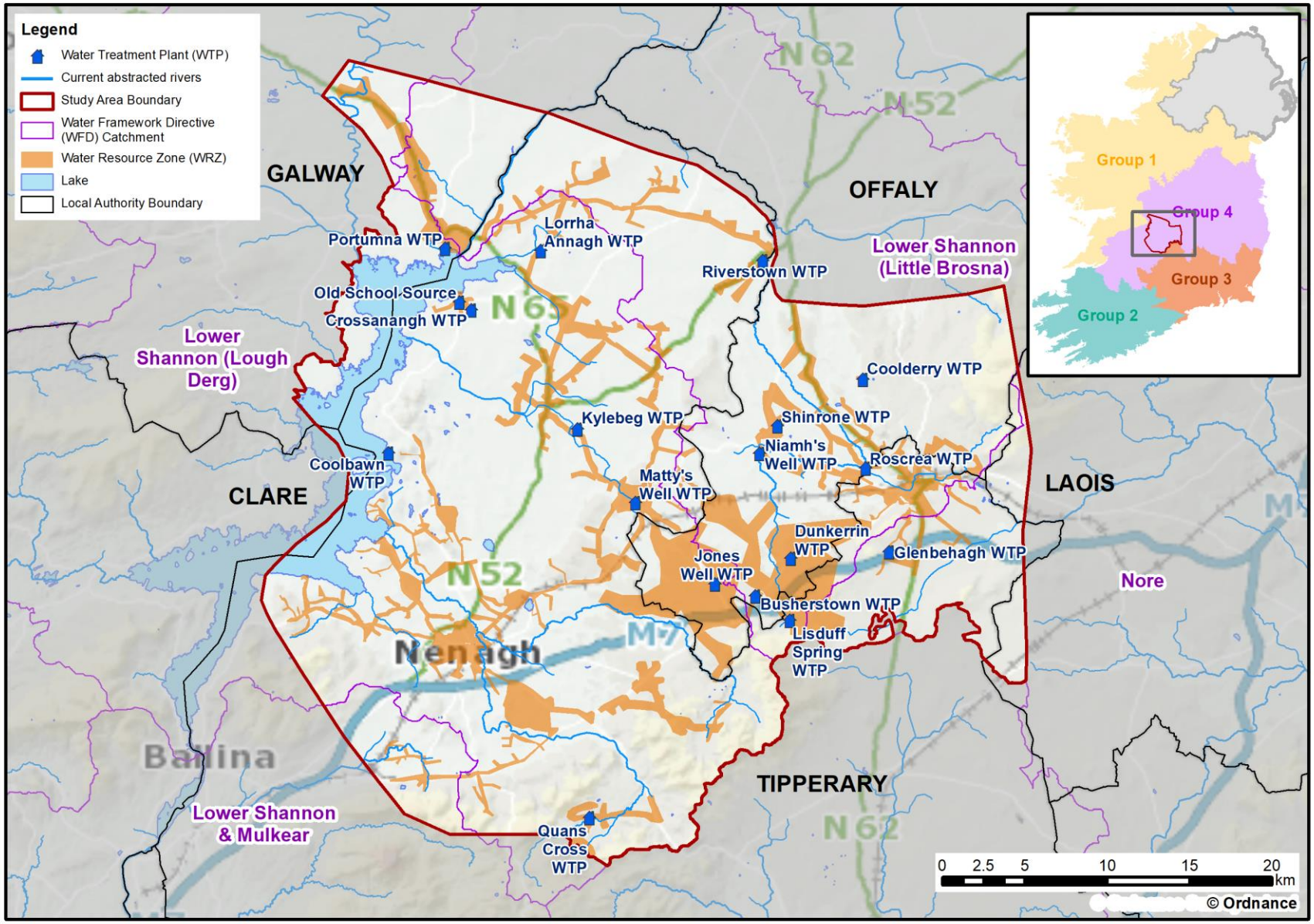

Figure 4.14 - Study Area 7 North Tipperary Summary

4.8.2 SA7 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.20 below were removed at Coarse/Fine screening on environmental grounds.

Table 4.20 - SA7 – Options removed at Coarse/Fine screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA7-01e	Transfer spare capacity from Roscrea to Dunkerrin/ Moneygall	This is a Regional option. Following more detailed analysis at Fine Screening, it was determined that the estimated sustainable abstraction at this location is 2.34 Ml/d, not accounting for the existing abstraction. The deficit in the WRZ is approximately 0.54 Ml/d and could be greater, based on the calculated sustainable limits. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA7-53	Rationalise Dunkerrin/Moneygall WRZ to Roscrea WRZ (approx. distance is 800m; new watermains and network upgrades required)	This is a Regional option. Following more detailed analysis at Fine Screening, it was determined that the estimated sustainable abstraction at this location is 2.34 Ml/d, not accounting for the existing abstraction. The deficit in the WRZ is approximately 0.54 Ml/d and could be greater, based on the calculated sustainable limits. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.

4.8.3 Preferred Approach for SA7

Full details of the Preferred Approach (and how it was reached) are included in the SA7 Technical Report in Appendix 7 of the RWRP-EM. The final Preferred Approach for SA7 is shown in Table 4.21 below. The findings of the Preferred Approach Development for SA7 Tipperary North at WRZ level, include the following:

- No local level options score a zero at Plan level in relation to potential impact on European sites.
- In 9 of the 10 WRZs, the Preferred Approach coincides with the Best AA and the Best Environmental score.
- Of the 10 WRZ level preferred approaches, none have a -3 score against biodiversity

All of the options that make up the Preferred Approach and assessed as part of the NIS are listed in Table 4.21 and shown in Figure 4.13 below.

Table 4.21 - Final Preferred Approach for SA7 – Options

WRZ Name and Option Reference	Fine Screening score (European Sites question only)	Option Description
SA7-55 WRZ 1200SC0030 Portumna	-2	**Increase abstraction and upgrade WTP** • Increase SW abstraction to meet WRZ deficit • WRZ current WAFU DYCP 2044 = 1.375 Ml/d, DYCP 2044 demand = 1.659 Ml/d so additional 0.284 Ml/d required to meet WRZ deficit.
SA7-504 **(Comprised of option SA7-54b)** WRZ 2500SC0010 Dunkerrin/Moneygall	-1	**New connection point from New Shannon Source connecting to Dunkerrin/Moneygall** • Existing abstraction from Lisduff spring WTP and Dunkerrin WTP is proposed to be decommissioned • A new storage of 1.009 Ml/d will be required at Jones Well WTP • Proposed transfer is from New Shannon Source, meeting the total demand requirement in Dunkerrin/Moneygall of 1.884 Ml/d.
SA7-44 WRZ 2500SC0012 Coolderry PWS	-1	**Increase abstraction from Coolderry Well and upgrade Coolderry WTP (Roscrea Gravels groundwater body)** • Existing GW source at Coolderry PWS. Current DYCP WAFU is 0.046 Ml/d. DYCP 2044 demand is 0.079 Ml/d therefore new GW will require increased abstraction of 0.056 Ml/d.
SA7-63 WRZ 2900SC0002 Roscrea RWSS	-1	**No deficit – upgrade WTP** • WRZ not in deficit, option to upgrade WTP • WRZ full demand = 4.813 Ml/d (DYCP 2044) • Works would be of a temporary nature.
SA7-60 WRZ 2900SC0003 Templederry	-1	**WTP upgrade - no deficit** • WRZ not in deficit, option to upgrade Templederry WTP for WQ purposes • WRZ full demand = 0.119 Ml/d (DYCP 2044)
SA7-23 WRZ 2900SC0043 Lorrha/Rathcabbin	-1	**New GW abstraction from Birr groundwater body (karstic bedrock) and upgrade WTP to supply deficit** • New GW abstraction from Birr groundwater body (karstic bedrock) and upgrade WTP to supply deficit • Current DYCP WAFU is 0.889 Ml/d. DYCP 2044 demand is 1.149 Ml/d therefore new GW will require increased abstraction of 0.260 Ml/d.

WRZ Name and Option Reference	Fine Screening score (European Sites question only)	Option Description
SA7-504 **(Comprised of option 36b)** WRZ 2900SC0045 Borrisokane	-1	**New connection point from New Shannon Source connecting to Borrisokane** • Existing abstraction from Kylebeg WTP is proposed to be decommissioned • Proposed transfer is from the New Shannon Source, meeting the total demand requirement in Borrisokane of 1.057 Ml/d.
SA7-504 **(Comprised of option 43a)** WRZ 2900SC0046 Cloughjordan	-1	**New connection point from New Shannon Source connecting to Cloughjordan** • Existing abstraction from Matty's Well WTP is proposed to be decommissioned • Proposed transfer is from New Shannon Source, meeting the total demand requirement in Cloughjordan of 0.853 Ml/d.
SA7-61 WRZ 2900SC0045 Nenagh	-1	**WTP upgrade - no deficit** • WRZ not in deficit, option to upgrade WTP for WQ purposes
SA7-14 WRZ 2900SC0051 Terryglass	-1	**New GW abstraction to supply full demand and abandon existing sources** • New GW abstraction to supply full demand and abandon existing sources • Current DYCP WAFU is 0.128 Ml/d. DYCP 2044 demand is 0.134 Ml/d therefore new GW will require increased abstraction of 0.006 Ml/d

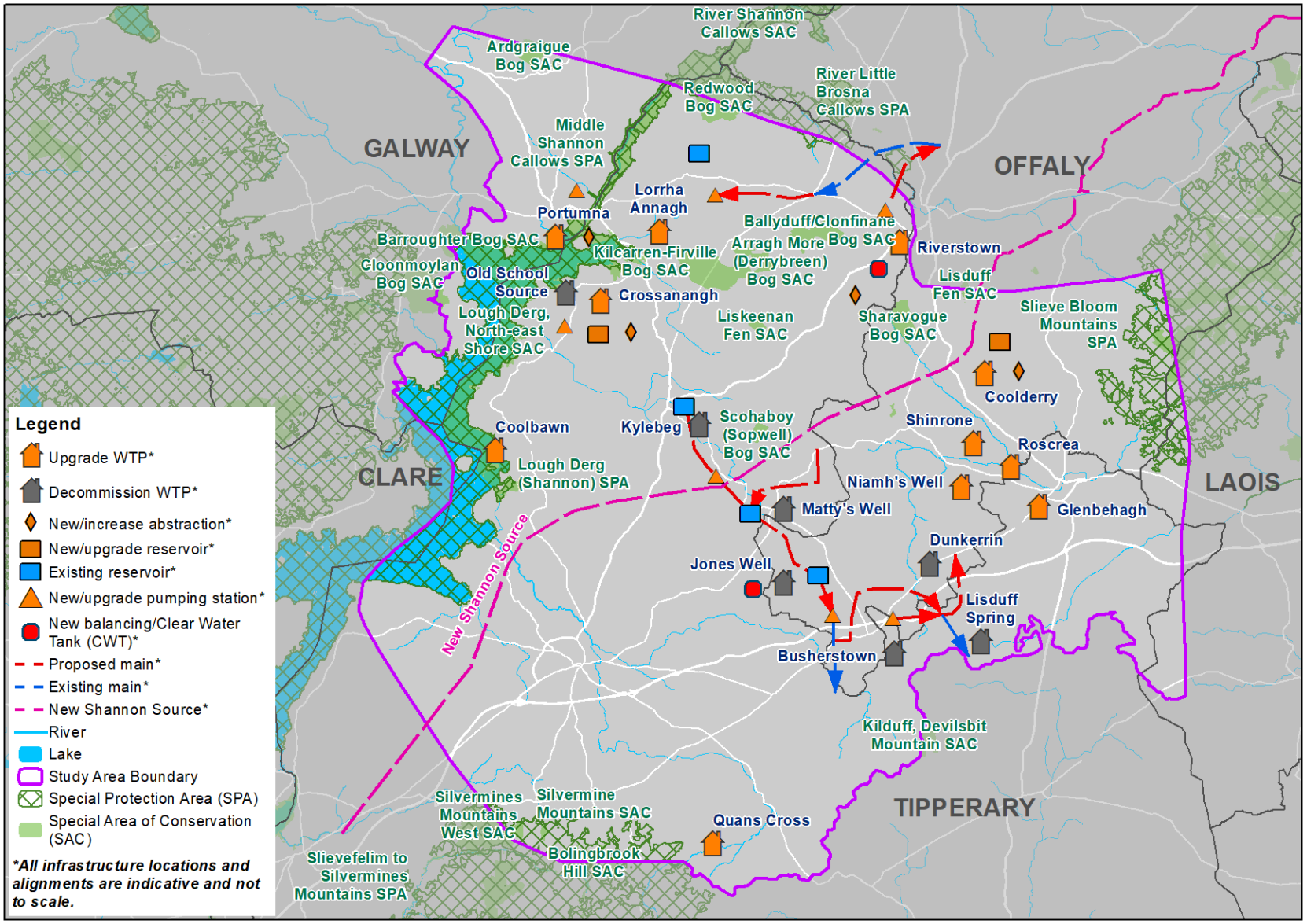

Figure 4.15 - Study Area 7 – Preferred Approach and European sites

4.9 Overview of Study Area 8 - Limerick Clare

The location of Study Area 8 (SA8) in relation to the EM region is shown in Figure 4.1. SA8's total area is approximately 4,176km^2 and lies within the counties of Clare, Cork, Galway, Limerick, Limerick City, North Tipperary and South Tipperary. The principal settlements (settlements with a population of over 10,000) within SA8 are Limerick City and Suburbs, and Ennis (Central Statistics Office, 2016).

There are 42 SACs and six SPAs within SA8 as shown in Table 4.27. European sites within SA8 where there is potential for LSE are discussed further in Section 6.2.8.

Table 4.27 - Number of European Sites within SA8

Study Area	No. of SACs	No. of SPAs
8 (Limerick Clare)	42	6

4.9.1 Existing Water Supplies

SA8 consists of 31 WRZs, located to the north and south and of Shannon Estuary, including areas as far east as Ardnacrusha dam on the River Shannon. The population of the area is approximately 239,750 people, supplied via approximately 3,200kms of distribution network. The Study Area is shown in Figure 4.16.

SA8 consists of three large settlements, namely Limerick City, Ennis and Shannon, and 61 smaller towns and villages. The larger supplies in the area are surface water supplies from the River Shannon, River Deel and Castle Lake. The remaining towns and villages utilise a mix of smaller surface water abstractions or localised groundwater sources including springs and boreholes.

SA8 is spread across the Lower River Shannon, Shannon Estuary North and Shannon Estuary South catchment basins, which form the lower reaches of the River Shannon catchment, the largest catchment on the island of Ireland. The River Shannon is regulated by the ESB, which controls releases at Parteen Basin and maintains water levels in Lough Derg in accordance within an operational band. This enables the ESB to divert flows to the Hydro Station at Ardnacrusha for power generation, to maintain the safety and integrity of the dam structures, to fulfil its obligations under the Floods Directive (2007/60/EC), and to maintain statutory compensations flows down the Lower reaches of the River Shannon. The largest existing water supply in the region abstracts water from both the headrace canal for Ardnacrusha and the main channel of the River Shannon. The water is treated at Clareville WTP for onward supply into Limerick City and environs.

There are a number of European sites within SA8 including but not limited to the Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, and Ratty River Cave SAC.

There is variable natural geology across the study area, centrally a regionally important karst aquifer sits as a large basin south of Limerick city and a less productive aquifer lies to the north east towards Nenagh. Within this Study Area, 41 groundwater abstractions have been developed for public water supply, centred on the clean regional karstic limestone bedrock areas in the Limerick basin, in the Adare/Croom/Rathkeale/Charleville vicinity. There are large abstractions in the area ranging between 0.1 Ml/d to 3.5 Ml/d, with an average daily production of 0.625 Ml/d.

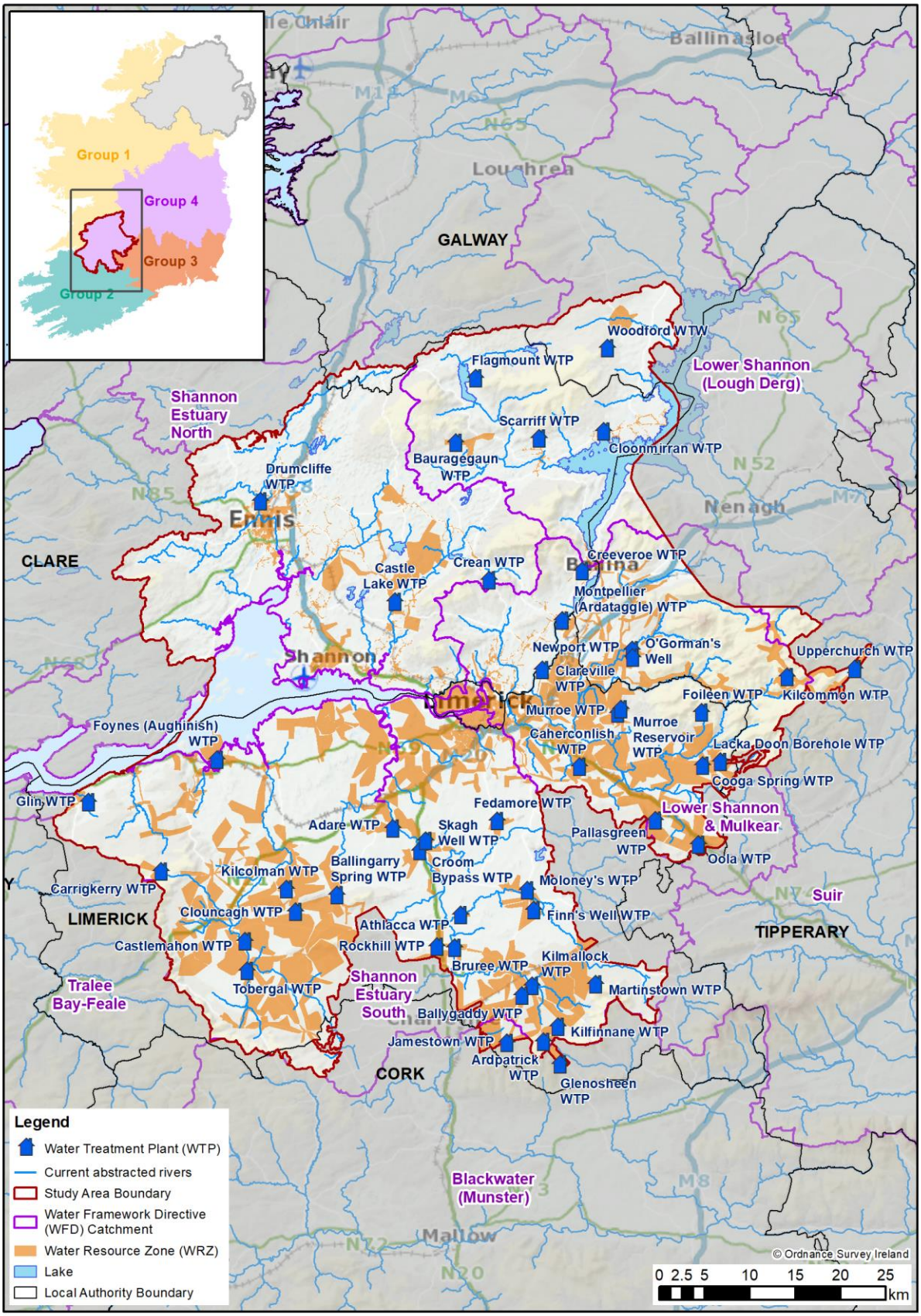

Figure 4.16 - Study Area 8 Limerick Clare Summary

4.9.2 SA8 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.28 below were removed at Coarse/Fine screening on environmental grounds.

Table 4.28 - SA8 – Options removed at Coarse/Fine Screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA8-03	New SW abstraction from Lough Inchicronan and new WTP to partly supply deficit	This option requires a new SW source and a new WTP. This option will meet only approximately 70% of the deficit while abstracting the full limit of calculated sustainable abstraction. Additionally, 6km of new watermain would be required for a relatively small volume. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was not considered feasible.
SA8-04	Supply part of the deficit from neighboring Kilmaley/Inagh GWS (network upgrades required)	This option takes supply from a very small catchment (<1km^2), which would not have additional yield available to supply both current GWS supply and new Ennis WRZ supply of approximately 4MLD deficit. This option would also require significant additional mains of approximately 12km.
SA8-10	New GW abstraction from Broadford Gravels groundwater body and new WTP to partly supply deficit	It is unlikely that yield would be available with this option to meet the full demand. Broadford gravels are approximately 8km to the network and would require new watermain for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water.
SA8-12	New surface waterabstraction from Rosroe Lake and new WTP to partly supply deficit	The desktop assessments undertaken identified a sustainable abstraction at this location of approximately 4.35 Ml/d. The deficit in the WRZ is approximately 4.6 Ml/d. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA8-13	New SW abstraction from Lough Cullaunyheeda and new WTP to partly supply deficit	This option requires a new SW source and a new WTP. This option is calculated to meet less than 50% of the deficit while abstracting the estimated sustainable abstraction limit. Additionally, 10km of new watermain would be required for a relatively small volume. Transferring small quantities of water over long distances can affect the quality of water.
SA8-75	Increase SW abstraction from River Deel and upgrade existing Castlemahon WTP to partly supply deficit	The desktop assessments undertaken identified that the estimated sustainable abstraction at this location is approximately 5.472 Ml/d, not accounting for the existing abstraction. Currently abstracting above the calculated sustainable limits. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.

Option Reference	Option Description	Rejection Reasoning
SA8-101	Increase SW abstraction from River Deel and upgrade existing Foynes Shannon Estuary WTP (Aughinish WTP) to partly supply deficit	The desktop assessments undertaken indicate that there is no scope to increase the abstraction from the River Deel, as current abstraction is already above sustainable abstraction limit.
SA8-111	Increase abstraction at Ardpatrick Spring (poorly productive aquifer) and upgrade Ardpatrick WTP to supply deficit	Based on the desktop assessment undertaken the yield availability from this source is deemed to be high risk and unlikely. Other groundwater options were deemed to be viable for this WRZ and progressed through to Fine Screening.
SA8-115	Increase SW abstraction from River Allow	The desktop assessments undertaken determined that the sustainable abstraction at this location is approximately 1.2 Ml/d, not accounting for the existing abstraction. Irish Water is currently abstracting at the sustainable limits. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status.
SA8-116	New GW abstraction in karstic developable resource	Based on the desktop assessments undertaken, the yield availability from this source is deemed to be unlikely. Therefore, this option was rejected at coarse screening stage.
SA8-158	Increase SW abstraction from Newport River and upgrade WTP, rationalise O Gormans Well	The desktop assessments undertaken determined that the sustainable abstraction at this location is approximately 2.2 Ml/d, which Irish Water is currently abstracting above. Abstracting an increased volume of water at this location would likely to result in the waterbody not achieving good WFD status.

4.9.3 Preferred Approach for SA8

Full details of the Preferred Approach (and how it was reached) are included in the SA8 Technical Report in Appendix 8 of the RWRP-EM. The final Preferred Approach for SA8 is shown in Table 4.29 below. The findings of the Preferred Approach Development for SA8 at WRZ level, include the following:

- No local level options score a zero at Plan level in relation to potential impact on European sites.
- In 24 of the 31 WRZs, the Preferred Approach coincides with the Best AA score.
- There is one -3 score associated with the Preferred Approach as discussed below.

There is just one -3 score associated with the Preferred Approach SA8-510 (comprised of options SA8-17f, SA8-84, SA8-105 and SA8-192), SA8-504 (SA8-31a), SA8-508 (SA8-199, SA8-40, SA8-138 and SA8-49) and SA8-177 which relates to the connection to Limerick City WRZ, the abstraction for which is direct from the Lower River Shannon SAC. The reason for the single -3 score is that this is the same abstraction across multiple preferred approaches, and as such is assessed as a single impact. Although demand increase can be facilitated within the existing Clareville WTP capacity, demand is projected to grow from approximately 58Ml/d to 70Ml/d under DYCP conditions. Therefore, an increase in abstraction of a minimum 12Ml/d is estimated over the next 25 years for Limerick City.

All of the options that make up the Preferred Approach and assessed as part of the NIS are listed in Table 4.29 and shown in Figure 4.17 below.

Table 4.29 - Final Preferred Approach for SA8 – Options

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-09 WRZ 0300SC0006 Shannon/Sixmilebridge	-2	**Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit** • Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit. • WRZ current WAFU DYCP 2044 =13.796 Ml/d, DYCP 2044 demand = 17.972 Ml/d so additional 4.176 Ml/d WAFU required to meet WRZ deficit.
SA8-20a WRZ 0300SC0014 Flagmount	-2	**Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP** • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • WRZ current WAFU DYCP 2044 = 0.055 Ml/d, DYCP 2044 demand = 0.085 Ml/d so additional 0.030 Ml/d WAFU required to meet WRZ deficit.
SA8-21 WRZ 0300SC0015 Feakle	-2	**Increase GW abstraction from Feakle public supply new BH (poorly productive aquifer) and upgrade existing Bauragegaun Pump Station WTP** • Increase GW abstraction from Feakle public supply new BH (poorly productive aquifer) and upgrade existing Bauragegaun Pump Station WTP. • WRZ current WAFU DYCP 2044 = 0.238 Ml/d, DYCP 2044 demand = 0.330 Ml/d so additional 92 Ml/d WAFU required to meet WRZ deficit.
SA8-22 WRZ 0300SC0016 Scariff	-1	**Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade Scarriff WTP** • Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade Scarriff WTP. • WRZ current WAFU DYCP 2044 = 0.693 Ml/d, DYCP 2044 demand = 1.001 Ml/d so additional 0.308 Ml/d WAFU required to meet WRZ deficit.
SA8-24 WRZ 0300SC0017 Mountshannon	-2	**Increase GW abstraction from existing Mountshannon BH (poorly productive aquifer) and upgrade Cloonmirran Pumphouse WTP** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.458 Ml/d, DYCP 2044 demand = 0.819 Ml/d so additional 0.361 Ml/d WAFU required to meet WRZ deficit.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-504 **(Comprised of option SA8-31a)** WRZ 0300SC0019 O'Briensbridge	-3	**Rationalise O'Briensbridge WRZ to Limerick City WRZ (approx. distance 2.5km, new watermains and network upgrades required)** • Rationalise WRZ to Limerick City WRZ to meet full future demand • WRZ DYCP 2044 demand to be met = 1.877 Ml/d • Includes decommissioning of current sources/WTPs – Montpellier WTP • No new surface water abstractions as option would be using spare capacity already available within the WRZ.
SA8-01 WRZ 0300SC0020 Ennis	-2	**Increase GW abstraction at Drumcliffe Springs (Ennis groundwater body - karstic bedrock) and upgrade Drumcliffe WTP to partly supply deficit** • Increase GW abstraction at Drumcliffe Springs (Ennis groundwater body - karstic bedrock) and upgrade Drumcliffe WTP to partly supply deficit. • WRZ current WAFU DYCP 2044 =13.933 Ml/d, DYCP 2044 demand = 16.985 Ml/d so additional 3.052 Ml/d WAFU required to meet WRZ deficit.
SA8-172 WRZ 0300SC0020 Ennis	-1	**Advanced leakage reduction. This leakage option needs to be implemented in conjunction with local GW option SA8-01 in order to meet full deficit.** • Advanced leakage reduction. This leakage option needs to be implemented in conjunction with local GW option SA8-01 in order to meet full deficit. • WRZ current WAFU DYCP 2044 =13.933 Ml/d, DYCP 2044 demand = 16.985 Ml/d so additional 3.052 Ml/d WAFU required to meet WRZ deficit.
SA8-512 **(Comprised of option SA8-27)** WRZ 0300SC0024 Killaloe PWS	-2	**Rationalise Killaloe WRZ to Newport WRZ via Killaloe bridge** • Supply Newport RWSS from New Shannon Source (rationalise). • WRZ full demand 2044 = 3.064Ml/d so additional 1.457Ml/d required to meet WRZ deficit. • Dependent on New Shannon Source to GDA.
SA8-120 WRZ 1200SC0036 Woodford	-2	**Increase existing GW** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.141 Ml/d, DYCP 2044 demand = 0.152 Ml/d so additional 0.011 Ml/d WAFU required to meet WRZ deficit.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-510 **(Comprised of option SA8-17f)** WRZ 1900SC0001 Limerick City Environs	-3	**Not in deficit - supply spare capacity to neighbouring WRZs and upgrade** • WRZ in projected surplus, not deficit. • Part of Grouped Option (510) to use current WRZ spare capacity and increase SW abstraction at Clareville WTP (Shannon) transfer supply to Newcastle West WRZ and Foynes/Shannon Estuary WRZ to meet future deficits • Combined future deficits of Newcastle West WRZ + Foynes/Shannon Estuary WRZ = ~15 Ml/d (DYCP 2044) • Limerick WRZ surplus = ~4 Ml/d (DYCP 2044) • Hence increase SW abstraction/WTP capacity by additional ~11Ml/d required to meet deficits of neighbouring WRZs. • Existing SW abstraction WAFU (DYCP 2044) = ~80 Ml/d, so plus additional ~11 Ml/d means total ~91 Ml/d which is ~10% of compensation flow release (ESB agreement). • Existing SW abstraction licence up to 115 Ml/d
SA8-508 **(Comprised of option SA8-199)** WRZ 1900SC0037 Murroe	-3	**Supply from Limerick** • Supply from Limerick • WRZ current WAFU DYCP 2044 = 0.55 Ml/d, DYCP 2044 demand = 1.202 Ml/d so additional 0.652 Ml/d WAFU required to meet WRZ deficit.
SA8-508 **(Comprised of option SA8-40)** WRZ 1900SC0003 Cappamore Foileen WS	-3	**Supply from Limerick** • Supply from Limerick • WRZ current WAFU DYCP 2044 =1.110 Ml/d, DYCP 2044 demand = 1.658 Ml/d so additional 0.548 Ml/d WAFU required to meet WRZ deficit.
SA8-508 **(Comprised of option SA8-138)** WRZ 1900SC0004 Doon Water Supply	-3	**Supply from Limerick** • Supply from Limerick • WRZ current WAFU DYCP 2044 = 0.367 Ml/d, DYCP 2044 demand = 0.570 Ml/d so additional 0.203 Ml/d WAFU required to meet WRZ deficit.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-508 **(Comprised of option SA8-49)** WRZ 1900SC0005 Pallasgreen Water Supply	-3	**Supply from Limerick** • Supply from Limerick • WRZ current WAFU DYCP 2044 =1.031 Ml/d, DYCP 2044 demand = 1.549 Ml/d so additional 0.518 Ml/d WAFU required to meet WRZ deficit.
SA8-51 WRZ 1900SC0007 Fedamore Water Supply	-1	**New GW abstraction from Fedamore groundwater body (karstic) and upgrade Fedamore WTP/new WTP** • New GW abstraction to meet WRZ future deficit. • WRZ current WAFU DYCP 2044 = 0.151 Ml/d, DYCP 2044 demand = 0.288 Ml/d so additional 0.137 Ml/d WAFU required to meet WRZ deficit.
SA8-52 WRZ 1900SC0009 Bruff Water Supply	-1	**Increase GW abstraction at Finn's Well (poorly productive aquifer) and upgrade Finn's Well WTP** • Increase GW abstraction at Finn's Well (poorly productive aquifer) and upgrade Finn's Well WTP • WRZ current WAFU DYCP 2044 = 1.031 Ml/d, DYCP 2044 demand = 1.549 Ml/d so additional 0.518 Ml/d WAFU required to meet WRZ deficit.
SA8-59 WRZ 1900SC0014 Martinstown Water Supply	-1	**Increase GW abstraction at Martinstown BH (poorly productive aquifer) and upgrade Martinstown WTP** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.733 Ml/d, DYCP 2044 demand = 0.770 Ml/d so additional 0.037 Ml/d WAFU required to meet WRZ deficit.
SA8-516 **(Comprised of option SA8-65)** WRZ 1900SC0015 Glenosheen/ Jamestown/ Kilmallock	-2	**Not in deficit – supply and rationalize Kilfinane Ardpatrick** • Not in deficit – supply and rationalize Kilfinane Ardpatrick • WRZ full demand = 1.981 Ml/d

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-68 WRZ 1900SC0016 Bruree Water Supply	-1	**Increase GW abstraction at Bruree BH (Bruree groundwater body - productive fissured bedrock) and upgrade Bruree PS WTP** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.522 Ml/d, DYCP 2044 demand = 0.752 Ml/d so additional 0.230 Ml/d WAFU required to meet WRZ deficit.
SA8-179 WRZ 1900SC0017 Athlacca Water Supply	-1	**Not in deficit – upgrade WTP only** • Not in deficit – upgrade WTP only. • WRZ full demand = 1.981 Ml/d
SA8-510 **(comprised of option SA8-84)** WRZ 1900SC0019 South West Regional	-3	**Connect South West Regional to Limerick City WRZ** • Connect WRZ to Limerick City WRZ supply to meet future deficit • Part of Grouped Option (510) to use current WRZ spare capacity and increase SW abstraction at Clareville WTP (Shannon) transfer supply to Newcastle West WRZ and Foynes/Shannon Estuary WRZ to meet future deficits. • Combined future deficits of Newcastle West WRZ + Foynes/Shannon Estuary WRZ = ~15 Ml/d (DYCP 2044) • Limerick WRZ surplus = ~4 Ml/d (DYCP 2044). • Hence increase SW abstraction/WTP capacity by additional ~11 Ml/d required to meet deficits of neighbouring WRZs. • Existing SW abstraction WAFU (DYCP 2044) = ~80 Ml/d, so plus additional ~11 Ml/d means total ~91 Ml/d which is ~10% of compensation flow release (ESB agreement). • Existing SW abstraction licence up to 115 Ml/d
SA8-98 WRZ 1900SC0020 Carrigkerry Water Supply	-2	**Increase GW abstraction from Carrigkerry Spring (poorly productive aquifer) and upgrade Carrigkerry WTP** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.083 Ml/d, DYCP 2044 demand = 0.14 Ml/d so additional 0.057 Ml/d WAFU required to meet WRZ deficit.
SA8-100 WRZ 1900SC0022 Glin Water Supply	-1	**Increase GW abstraction from Glin BH (poorly productive aquifer) and upgrade existing Glin WTP** • Increase GW abstraction from Glin BH (poorly productive bedrock) and upgrade existing Glin WTP. • WRZ current WAFU DYCP 2044 = 0.275 Ml/d, DYCP 2044 demand = 0.442 Ml/d so additional 0.167 Ml/d WAFU required to meet WRZ deficit.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-510 **(Comprised of option SA8-105)** WRZ 1900SC0024 Foynes Shannon Estuary PWS	-3	**Connect Foynes/Shannon Estuary to Limerick City WRZ** • Connect WRZ to Limerick City WRZ supply to meet future deficit • Part of Grouped Option (510) to use current WRZ spare capacity and increase SW abstraction at Clareville WTP (Shannon) transfer supply to Newcastle West WRZ and Foynes/Shannon Estuary WRZ to meet future deficits. • Combined future deficits of Newcastle West WRZ + Foynes/Shannon Estuary WRZ = ~15 Ml/d (DYCP 2044). • Limerick WRZ surplus = ~4 Ml/d (DYCP 2044). • Hence Increase SW abstraction/WTP capacity by additional ~11 Ml/d required to meet deficits of neighbouring WRZs. • Existing SW abstraction WAFU (DYCP 2044) = ~80 Ml/d, so plus additional ~11 Ml/d means total ~91 Ml/d which is ~10% of compensation flow release (ESB agreement). • Existing SW abstraction licence up to 115 Ml/d.
SA8-510 **(Comprised of option SA8-192)** WRZ 1900SC0029 Adare	-3	**Rationalise to Limerick** • Rationalise to Limerick • Connect WRZ to Limerick City WRZ supply to meet future deficit. • Part of Grouped Option (510) to use current WRZ spare capacity and increase SW abstraction at Clareville WTP (Shannon) transfer supply to Newcastle West WRZ and Foynes/Shannon Estuary WRZ to meet future deficits. • Combined future deficits of Newcastle West WRZ + Foynes/Shannon Estuary WRZ = ~15 Ml/d (DYCP 2044). • Limerick WRZ surplus = ~4 Ml/d (DYCP 2044). • Hence increase SW abstraction/WTP capacity by additional ~11 Ml/d required to meet deficits of neighbouring WRZs. • Existing SW abstraction WAFU (DYCP 2044) = ~80 Ml/d, so plus additional ~11 Ml/d means total ~91 Ml/d which is ~10% of compensation flow release (ESB agreement). Existing SW abstraction licence up to 115 Ml/d.
SA8-516 **(Comprised of option SA8-114)** WRZ 1900SC0034 Kilfinnane Ardpatrick Water Supply	-2	**Rationalise to Jamestown WTP** • WRZ full demand = 1.191 Ml/d

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-149 WRZ 1900SC0035 Ballingarry	-1	**Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade existing Ballingarry Spring WTP to partly supply deficit** • Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade exisitng Ballingarry Spring WTP to partly supply deficit • WRZ current WAFU DYCP 2044 = 0.367 Ml/d, DYCP 2044 demand = 0.790 Ml/d so additional 0.423 Ml/d WAFU required to meet WRZ deficit.
SA8-145 WRZ 1900SC0036 Rathkeale	-1	**Increase GW abstraction at Kilcolman Spring (Knockaderry groundwater body - productive fissured bedrock) and upgrade existing Kilcolman WTP to partly supply deficit.** • Increase GW to meet WRZ future deficit. • WRZ current WAFU DYCP 2044 = 1.742 Ml/d, DYCP 2044 demand = 3.789 Ml/d so additional 2.047 Ml/d WAFU required to meet WRZ deficit.
SA8-523 **(Comprised of option SA8-163)** WTZ 2900SC0005 Kilcommon	-2	**Increase GW abstraction at Kilcommon (poorly productive aquifer) and upgrade WTP.** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.596 Ml/d, DYCP 2044 demand = 1.048 Ml/d so additional 0.452 Ml/d WAFU required to meet WRZ deficit.
SA8-512 **(Comprised of option SA8-118)** WTZ 2900SC0066 Newport RWSS	-2	**Rationalise Newport to New Shannon Source** • Supply Newport from New Shannon Source (rationalise). • WRZ full demand = 4.262 Ml/d so additional 0.412 Ml/d required to meet WRZ deficit. • Dependent on New Shannon Source to GDA.
SA8-523 **(Comprised of option SA8-166)** WRZ 2900SC0068 Upperchurch	-2	**Rationalise Upperchurch to Kilcommon WRZ (distance 1km, new watermains and network upgrades required).** • Increase GW to meet WRZ future deficit • WRZ current WAFU DYCP 2044 = 0.055 Ml/d, DYCP 2044 demand = 0.057 Ml/d so additional 0.002 Ml/d WAFU required to meet WRZ deficit.

WRZ Name and Option Reference	Fine Screening score (European sites question only)	Option Description
SA8-177 WRZ 1900SC0028 Croom PWS	-3	**Rationalise Croom WRZ to Limerick City WRZ (approx. distance 16km, new watermains and network upgrades required)** • Rationalise WRZ to Limerick City WRZ to meet full future demand • WRZ DYCP 2044 demand to be met = 1.100 Ml/d • Includes decommissioning of current sources/WTPs – Croom WTP • No new surface water abstractions as option would be using spare capacity already available within the WRZ.

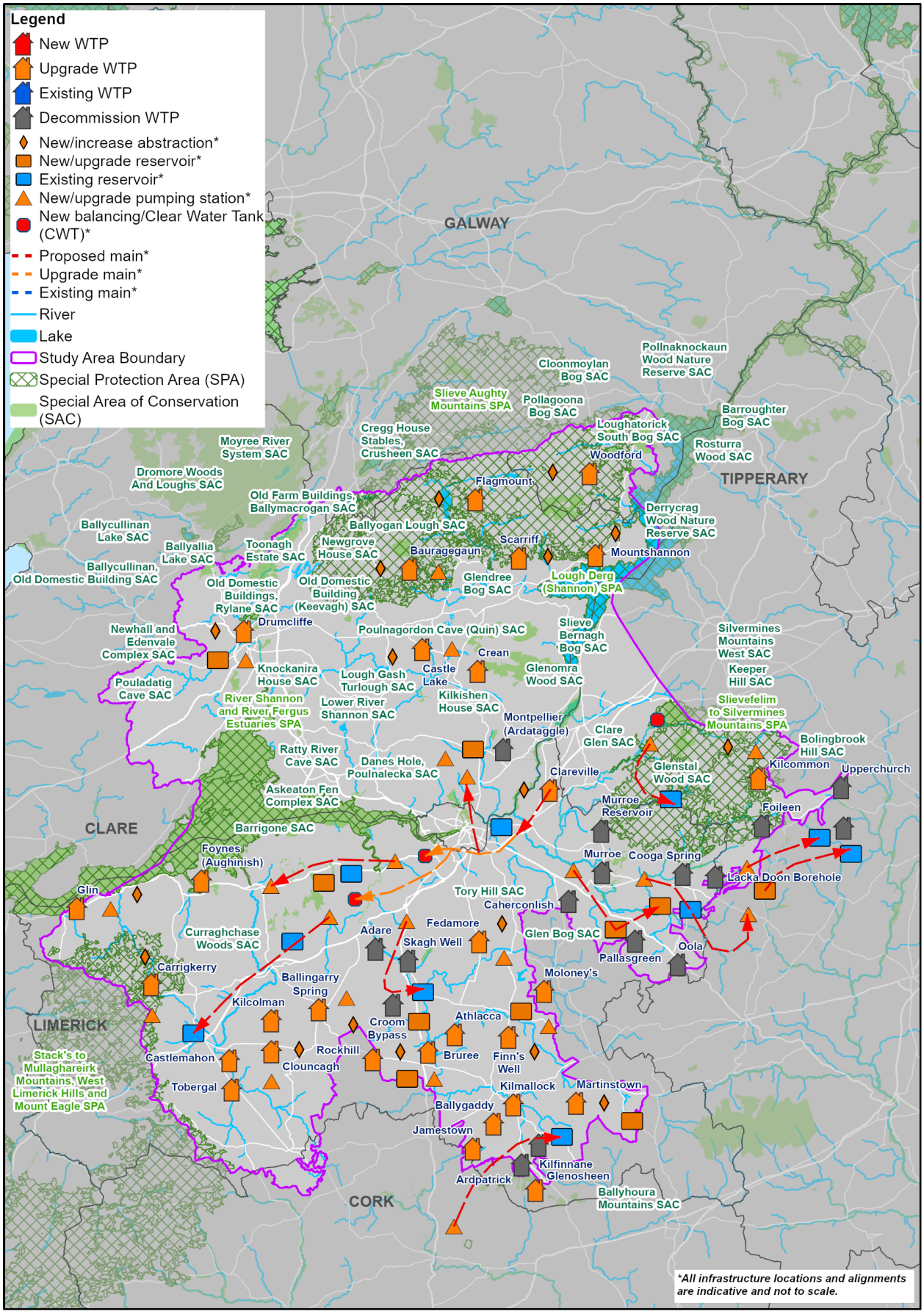

Figure 4.17 - Study Area 8 – Preferred Approach and European sites

4.10 Overview of Study Area 9 – Greater Dublin Area

The location of Study Area 9 (SA9) in relation to the EM region is shown in Figure 4.1. SA9's total area is approximately 3,313km^2 and lies within the counties of Dublin City, Dun Laoghaire-Rathdown, Fingal, Kildare, Meath, South Dublin, Wicklow, Laois and Offaly. The principal settlements (settlements with a population of over 10,000) within SA9 are Balbriggan, Bray, Celbridge, Droichead Nua (Newbridge), Dublin City and suburbs, Greystones-Delgany, Leixlip, Malahide, Maynooth, Naas, Skerries, Swords and Wicklow (Central Stastics Office, 2016).

There are 27 SACs and 10 SPAs within SA9 as shown in Table 4.30. The European sites within SA9 where there is potential for LSE are discussed further in Section 6.2.9.

Table 4.30 - Number of European Sites within SA9

Study Area	No. of SACs	No. of SPAs
9 (Greater Dublin Area)	27	10

4.10.1 Existing Water Supplies

SA9 consists of a single Water Resource Zone covering County Dublin and parts of Counties Meath, Wicklow and Kildare, supplying a population of approximately 1.7 million via approximately 8,500kms of distribution network. The Study Area's WTPs and their associated source type are summarised in Figure 4.18.

SA9 is predominantly urban in nature, and the existing supplies are generally located in the less developed areas. Some of these sources were developed in the late 19th century, and urban development has occurred around them in the intervening years.

Of the 12 WTPs in the region, seven are surface water sources, with the remaining five groundwater supplies. The largest WTPs in the area abstract surface water from the River Liffey, Vartry, Dodder and Barrow catchments. The rivers Liffey, Vartry and Dodder rise in the Wicklow Mountains, and there are reservoirs fed by the rivers from which the supply is stored or taken. The River Barrow rises in the Slieve Bloom mountains and is dependent on baseflow from groundwater recharge in the Kildare Gravels during winter and spring to sustain supplies over the summer and autumn periods. The two abstractions from the River Liffey at Poulaphouca and Leixlip contribute 85% of the water to this WRZ.

Dublin City and the area towards Wicklow are underlain by the dark Calp limestones and granites which are moderately to poorly productive and have limited aquifer potential. Kildare has varied underlying geology, and is prominent for its large gravel aquifer in the Curragh overlying the limestone bedrock. Kildare provides groundwater supply to two of the WTPs.

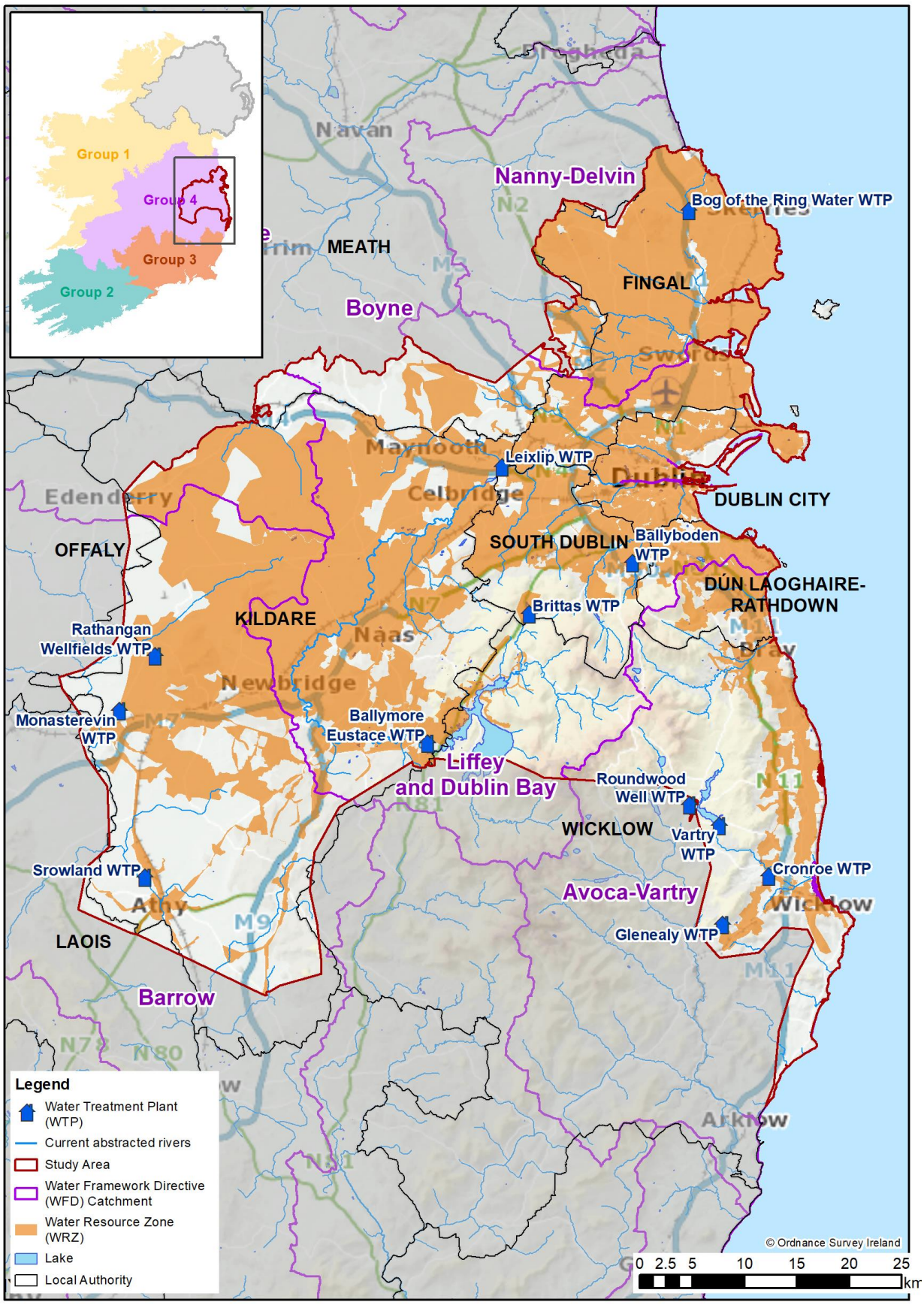

Figure 4.18 - Study Area 9 - GDA

4.10.2 SA9 Options Removed at Coarse/Fine Screening

The options detailed in Table 4.32 below were removed at Coarse/Fine screening on environmental grounds.

Table 4.31 - SA9 – Options removed at Coarse/Fine screening on environmental grounds

Option Reference	Option Description	Rejection Reasoning
SA9-01	Water Transfer from the River Shannon. Water to be abstracted and treated on the eastern shore of Lough Ree before it is transferred to the GDA. Option proposed to provide Full Need of 330 Ml/d.	Option A from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report[14]. On the review of the water available for abstraction it was noted that the ESB minimum normal operation levels for the Shannon at Lough Ree were not maintained during the 1995 drought without an abstraction, therefore any abstraction at this location would not be resilient as the yield is not available and would likely have a negative environmental impact.
SA9-04	Water Transfer from the River Shannon. Water to be abstracted and treated on the eastern shore of both Lough Derg and Lough Ree before it is transferred to the GDA. Option proposed to provide Full Need of 330 Ml/d.	Option D from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report. On the review of the water available for abstraction it was noted that the ESB minimum normal operation levels for the Shannon at Lough Ree were not maintained during the 1995 drought without an abstraction, therefore any abstraction at this location would not be resilient as the yield is not available and would likely have a negative environmental impact.
SA9-05	Water Transfer from the River Shannon. Water to be abstracted and treated on the eastern shore of Lough Ree before it is transferred to the GDA. Full Need of 330 Ml/d.	Option E from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report. On the review of the water available for abstraction it was noted that the ESB minimum normal operation levels for the Shannon at Lough Ree were not maintained during the 1995 drought without an abstraction, therefore any abstraction at this location would not be resilient as the yield is not available and would likely have a negative environmental impact.
SA9-06a	Water Transfer from the River Shannon. Water to be abstracted from Lough Derg with raw water storage provided in a bog at Rochfortbridge. Option proposed to provide Full Need of 330 Ml/d.	Option F1 from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report Raw water transfer across catchments is not feasible due to the risk of transfer of invasive species. Therefore, this option was not considered environmentally viable.

[14] * Water Supply Project Eastern and Midlands Region, Water Supply Options Working Paper, June 2015 - http://www.watersupplyproject.ie/wp-content/uploads/2015/05/150525WSP1_Options-Working-Paper_A011.pdf

Option Reference	Option Description	Rejection Reasoning
SA9-06b	Water Transfer from the River Shannon. Water to be abstracted from Lough Derg with raw water storage provided in a bog at Garryhinch. Option proposed to provide Full Need of 330 Ml/d.	Option F2 from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report. Raw water transfer across catchments is not feasible due to the risk of transfer of invasive species. Therefore, this option was not considered environmentally viable.
SA9-07	Water Transfer from the River Shannon. Raw water to be transferred and stored in an impoundment in the Wicklow Mountains where it will be treated before it is transferred to the GDA. Option proposed to provide Full Need of 330 Ml/d.	Option G from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report. On the review of the water available for abstraction it was noted that the ESB minimum normal operation levels for the Shannon at Lough Ree were not maintained during the 1995 drought without an abstraction, therefore any abstraction at this location would not be resilient as the yield is not available and would likely have a negative environmental impact.
SA9-09	Groundwater abstraction. Various groundwater abstractions within 80km radius of Dublin. Option proposed to provide Full Need of 330 Ml/d.	Option I from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report. Groundwater supply for the full 330 Ml/d is not achievable as the full yield is not available. Options considering smaller groundwater sources to meet NWRP required demand, are considered.
SA9-10	Increased abstraction at the River Barrow. Increase of existing abstraction when more water is available in the Winter/ Spring and combine and transfer for treatment at Ballymore Eustace to increase output. Option proposed to provide Full Need of 330 Ml/d.	Option J from the Water Supply Options Working Paper which was required to meet full need of 330 Ml/d considered in this report. Option does not provide full 330 Ml/d as the full additional yield is not available. Options considering smaller groundwater sources, to meet NWRP required demand, are considered.
SA9-16	New Surface Water abstraction from the River Dan. Abstract and treat water from the River Dan in Wicklow before transferring to the GDA. Option proposed to provide 5 Ml/d in WCP	Option required the construction of a dam at Lough Dan for the provision on an additional supply of 5 Ml/d. The proposed operational regime required the pumping of flow from the lake to maintain Q95 flow in the channel downstream. The option is considered likely to result in the waterbody not achieving good WFD status.
SA9-75	Increase Surface Water abstraction from the River Boyne and increase treatment at Staleen WTP. Option proposed to provide 10 Ml/d.	Option considered not feasible as full abstraction required for south Louth east Meath supply. Increase a further 10 Ml/d is considered likely to result in the waterbody not achieving good WFD status.

Option Reference	Option Description	Rejection Reasoning
SA9-79	New groundwater abstraction at Roberstown, Kildare. Option includes abstraction and associated WTP and connection to the GDA network. Option proposed to provide additional 4 Ml/d	Option considered not feasible as the abstraction was likely to have an impact on the SAC and the option is considered likely to result in the ground waterbody not achieving good WFD status.
SA9-15a	New Surface Water abstraction from the River Ow. Abstract and treat water from the River Ow before transferring to the GDA. Dam is required at the River Ow to facilitate abstraction. Option proposed to provide 7 Ml/d	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives.
SA9-15b	New Surface Water abstraction from the River Ow and the River Aughrim. Abstract and treat water from the River Ow before transferring to the GDA. Dam is required at the River Ow to facilitate abstraction. Raw water transfer from the River Aughrim to the dam to increase volume of water available. Option proposed to provide 11 Ml/d	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives.
SA9-18b	New abstraction from Lower Bohernabreena Reservoir. De-silting & Ballyboden WTP upgrade Option proposed to provide 25 Ml/d.	On further review of the option at fine screening stage it was noted that the proposal would require raising the lower reservoir dam height by 25m and the purchase and demolition of houses, land purchase, including area of forestry and site prep to allow for flooding of valley.
SA9-53	New Surface Water abstraction from the River Slaney. Abstract and treat water at the River Slaney at Glen of Imaal. To obtain abstraction of 12 Ml/d an impoundment is also required. Option proposed to provide 12 Ml/d.	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives.
SA9-81	GW in North Meath - Combined volume of 20M/ld required between Platin and Kiltrough. Existing abstraction 2.7 Ml/d. Option proposed to provide 17.5 Ml/d to the GDA	The overall WFD status of the groundwater body at Kiltrough is considered poor therefore it was not considered viable to increase an abstraction from this source.

4.10.3 Preferred Approach for SA9

Full details of the Preferred Approach (and how it was reached) are included in the SA9 Technical Report in Appendix 9 of the RWRP-EM. Unlike the other study areas SA9 comprises just one large WRZ. The GDA is the largest WRZ in the country with the largest deficit and as such requires a significant new source either alone or in combination with multiple smaller sources to alleviate this large deficit.

The findings of the Preferred Approach Development for SA9 include the following:

- No options that could supply the required deficit score a zero at Plan level in relation to potential impacts on European sites.

The final Preferred Approach for SA9 is shown in Table 4.34. On the basis of this assessment at Plan level, combination 12 comprising options SA9-84, Network Upgrade 1 and SA9-87 (common to all requirements) form the Preferred Approach for SA9. There is a -3 score associated with this Preferred Approach which relates to the abstraction from New Shannon Source which forms part of the Lower River Shannon SAC. It is important to note that SA9-87 looks at the GDA individually and includes all interventions required to resolve issues in SA9. As SA1 and other study areas look to connect to the GDA, network will be required to connect them, hence, the network routes of the required connections will logically take the route of some of the network proposed for the GDA and appear to duplicate infrastructure. For example, SA1 Preferred Approach SA1-503 proposes new network to connect to a WTP outside of SA1. This network has been assessed as part of SA1, therefore, to avoid duplication it has not been assessed as part of SA9-87. The components that have been assessed as part of other study areas have been greyed out in Figure 4.21 to indicate this.

A need for a main allowing connectivity from the strategic reservoirs to the city centre has been identified. The main (Network Upgrade 1) is required to provide approximately 30 – 40Ml/d to the city. A proposed route for this main has been included in the considered combinations to allow for a full comparison of the different feasible combinations, as the source of new supply is one factor which may influence the route of the supply. For the purposes of the assessment, Network Upgrade 1 is included in Option SA9-87 and assessed as part of same.

The GDA WRZ is experiencing acute problems with meeting supply demand balance at present (particularly in summer periods, e.g., summer 2018). These problems are immediate, and at present demand can be higher than the volume of water that Irish Water can produce on a day-to-day basis. This supply demand balance issue will continue until a major new water source is developed for the region. Based on the scale of project associated with the Preferred Approach, the timeframe for the adoption of the new abstraction legislation and the requirements of the consenting process, it is estimated that the Preferred Approach may not be delivered before 2029. Therefore, it has been identified that interim options are required for this WRZ until the Preferred Approach solution is in place to alleviate the deficit. The interim options have been assessed within this NIS and comprises optimisation of Poulaphouca Reservoir, upgrade of Leixlip WTP and an increase in surface water abstraction from the River Liffey (options SA9-28 and SA9-46). The Preferred Approach for SA9 including the interim options are listed in Table 4.34 and shown in Figures 4.19, 4.20 and 4.21.

Table 4.34 - Final Preferred Approach for SA9 – Options (Preferred Approach options and Interim options)

Option Reference	Fine Screening score (European sites question only)	Option Description
SA9-84 (Preferred Approach option) GDA	-3	**New Shannon Source surface water abstraction of 210 Ml/d** This option proposed to increase supply to the WRZ by a new Surface Water abstraction of 210 Ml/d from The Parteen Basin. The option also includes a new WTP at Birdhill with an output capacity of 200 Ml/d. Twin rising mains from abstraction to WTP (2km), A new break pressure tank, two clear water tanks, new pumping station & booster pumping station, new termination point reservoir in Peamount. The supply will be transferred approximately 41km from the WTP to the break pressure tank via a new 1600mm pumped pipeline, From the break pressure tank the supply will flow by gravity for the first 170 Ml/d and pumped when demand goes above 170Ml/d. The pipeline from the Break pressure tank to the termination point reservoir will be 1600mm diameter with an approximate length of 130km.
SA9-87	-2	Common to all Requirements. This is a group of interventions required to improve resilience and quality, regardless of the Preferred Approach selected to address the SDB deficit.
Network Upgrade 1 (included in the assessment and figure for SA9-87)	N/A	Main from Strategic Reservoir to the City Centre. This main is required to deliver 30-40 Ml/d of supply from our strategic reservoirs to the city centre. The exact route and location of this main and required strategic reservoir connectivity will be determined at project assessment stage.
SA9-28 and SA9-46 (Interim options) GDA	0 for option SA9-28 -1 for option SA9-46	Increase abstraction at Ballymore Eustace by optimising storage at Poulaphouca Reservoir and provision of 24km main from Ballymore Eustace to the Saggart Area (the 24km main is also included in the Option SA9-87 but has been included in SA9-46 as a key element and is assessed as part of this option only). Leixlip WTP Upgrade - +50 Ml/d – Winter Critical Period and Normal Year Annual Average only Option SA9-46 requires an increase in supply to the WRZ by an increase of 50 Ml/d in the existing surface water abstraction (235 Ml/d-285 Ml/d) from the River Liffey at Leixlip. This option includes an upgrade to Leixlip WTP, new/upgraded pumps and approximately 5.5km of new/upgraded network to allow for the additional supply.

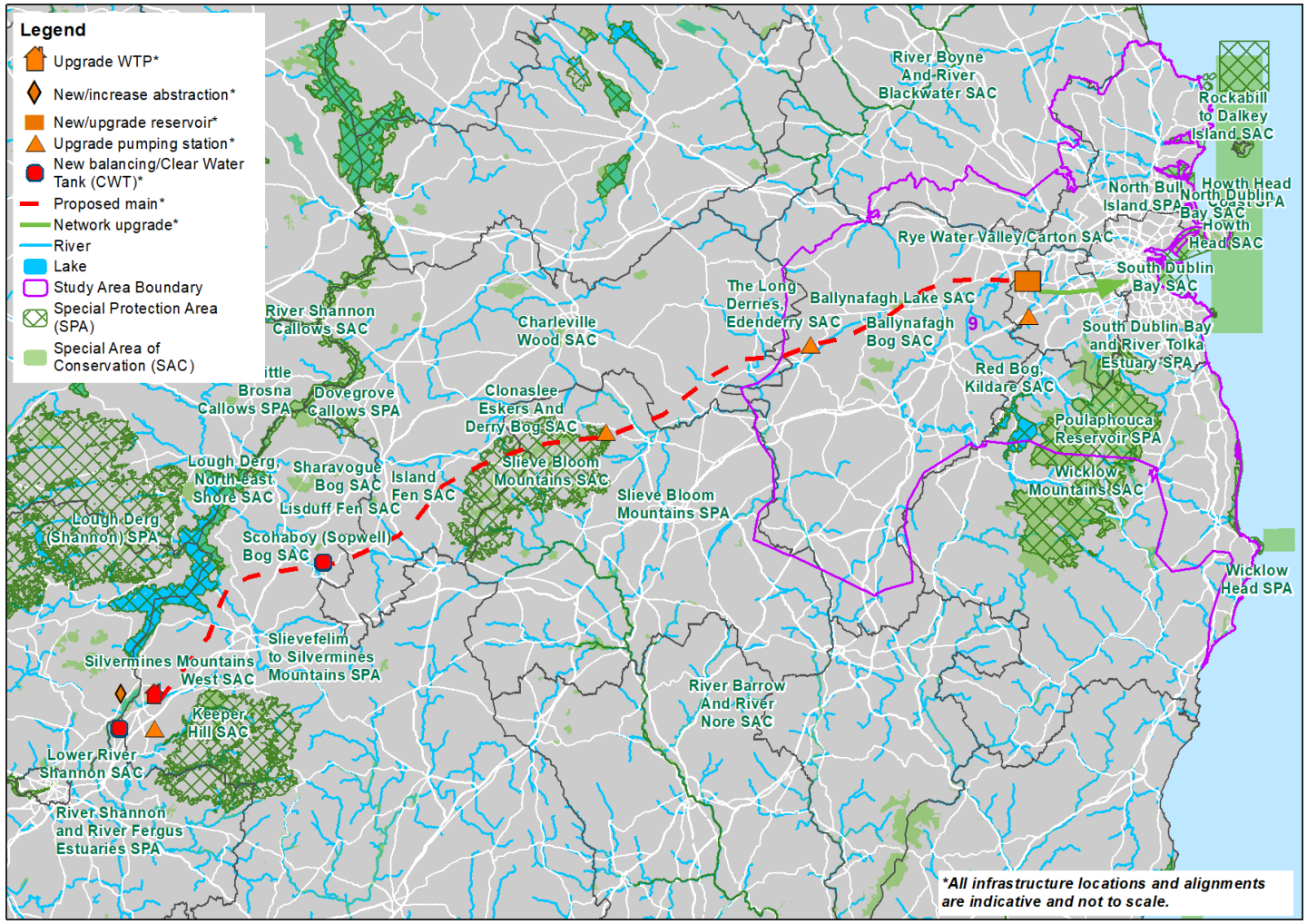

Figure 4.19 - Study Area 9 – Preferred Approach (SA9-84) and European sites

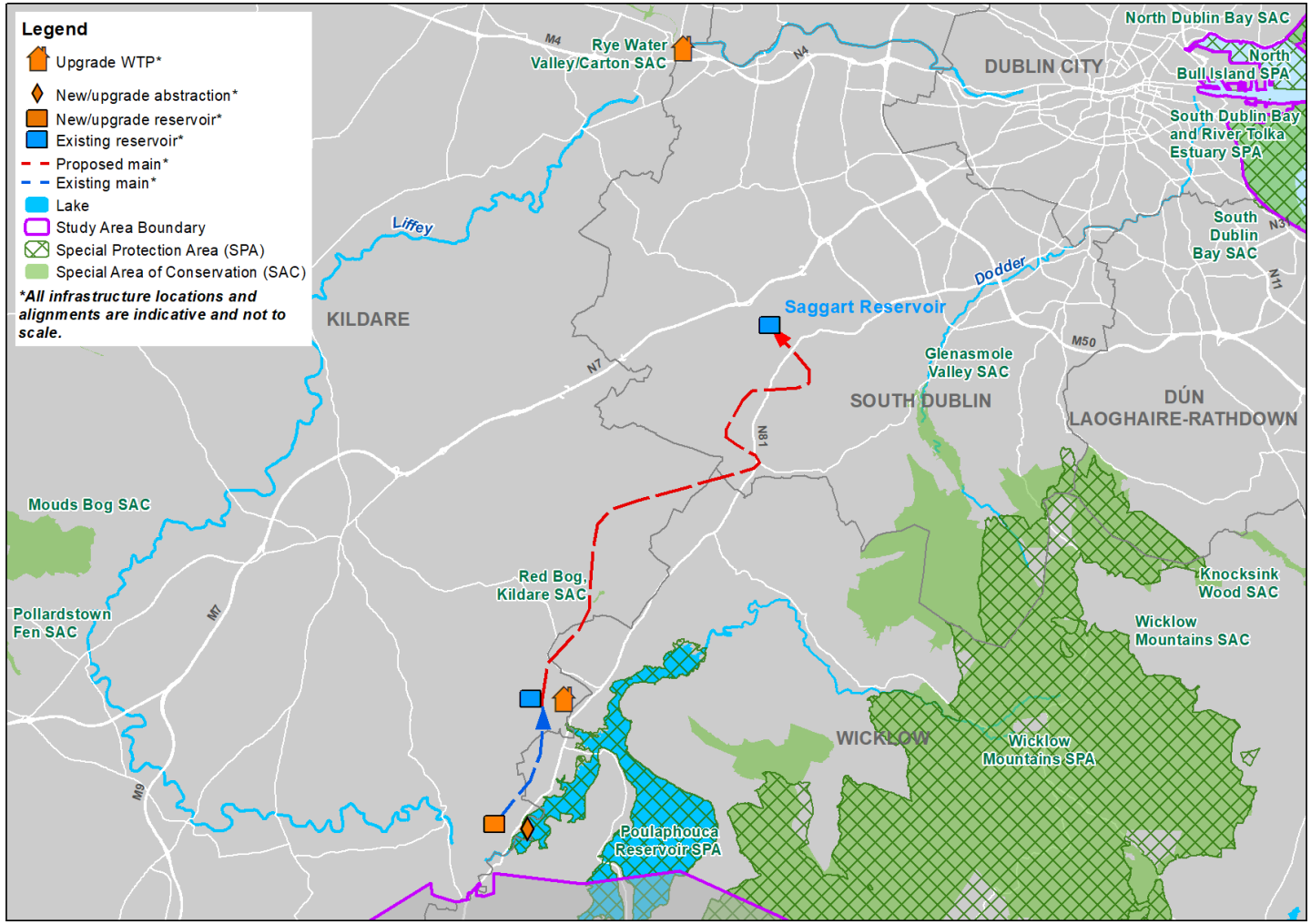

Figure 4.20 - Study Area 9 – GDA Interim options (SA9-28 and SA9-46) and European sites

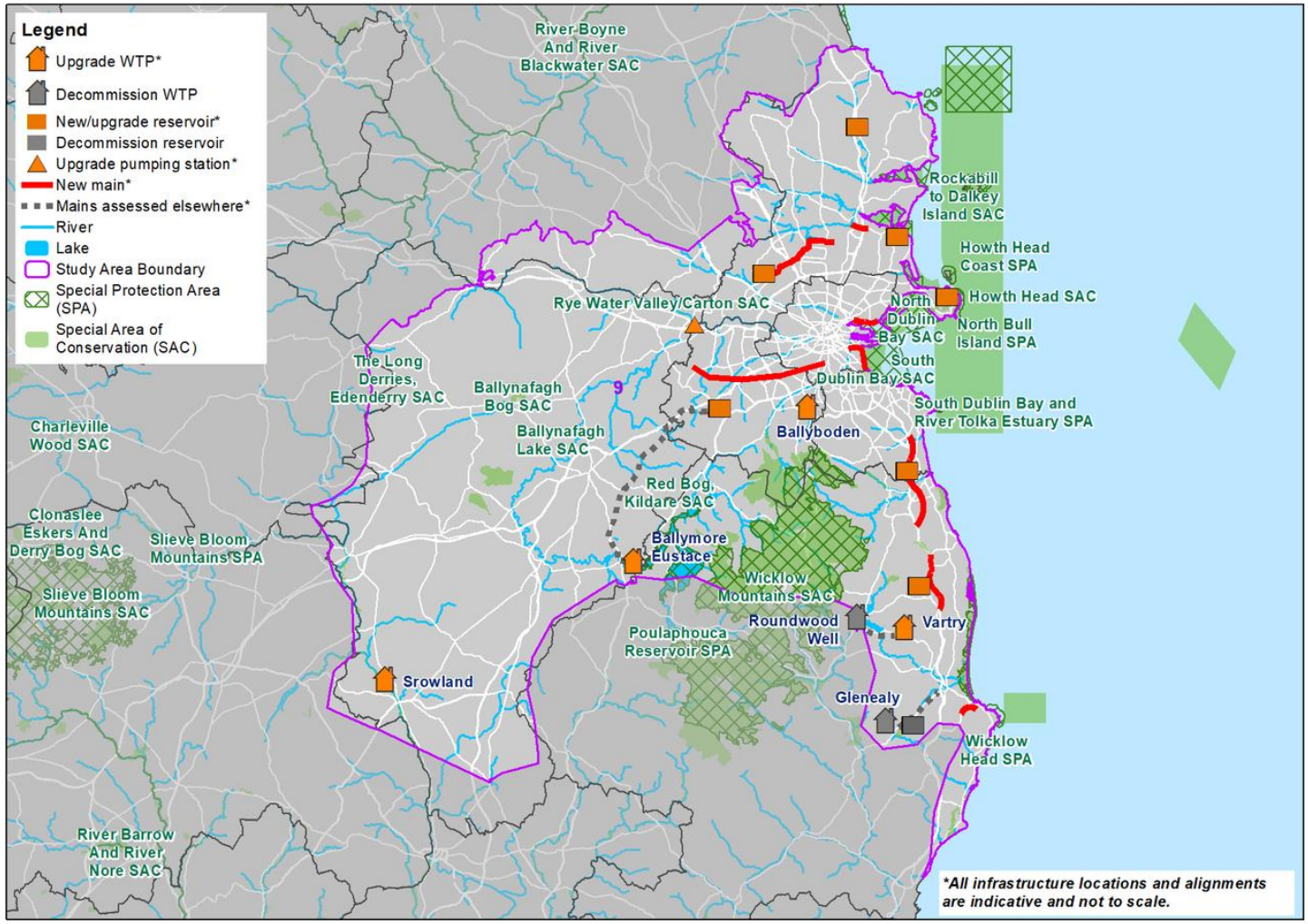

Figure 4.21 - Study Area 9 – Common to all Requirements (SA9-87) and European sites

5 Summary of Screening for Appropriate Assessment

5.1 Identification of potential impacts and pathways for effect

Table 5.1 outlines broad categories of potential impacts that could occur as a result of construction and or operation of the Preferred Approach for each Study Area, and the likely significant effects on European sites and their qualifying interest.

Table 5.1 - Potential effect pathways of Preferred Approaches arising from the RWRP-EM

Broad categories of potential impacts on European sites	Potential effect pathways *(distance assumptions shown in italics)*
Physical loss of habitats/supporting habitat *(Construction-related)*	Development of built infrastructure associated with the various options, for example pipelines, WTPs, temporary weirs and access routes, could result in direct loss of QI habitat (terrestrial or aquatic) in a European site (for example, smothering of gravel beds). *Physical loss of habitat is only likely to be significant if it is within the boundary of a European site, or within an area of supporting habitat outside of the European site (for example, off-site area of known foraging, roosting, breeding habitat for a QI for which a European site is designated).*
Mortality *(Construction-related)*	• Mortality of some species could occur through an increase in wildlife casualty incidents, for example entrapment/entrainment of fish on/in screens (during the abstraction process). • Mortality may also occur as a result of pollution events to habitats that support QI animal or plant species during construction, in particular aquatic QI species.
Habitat degradation – changes in water quality (pollution) *(Construction-related)*	• Water quality can be affected by oil, chemicals, heavy metals and other material, or through chronic runoff of such materials. • Water quality can also be affected by sedimentation through runoff from construction sites. Construction of new infrastructure as a result of options taken forward could result in both acute and chronic runoff of sediments. • Changes in water quality could directly affect QI species or habitats or affect them indirectly through loss of aquatic prey species, or through changes in their habitat. • *Pollution effects can occur outside of a European site and at a distance from works (for example, via a hydrological link).*
Disturbance (including biological disturbance) *(Construction-related)*	• Development associated with any potential option taken forward could result in disturbance of QI species. This disturbance may include, but not be limited to, noise, vibration, movement (of people and/or vehicles) and lighting. • Disturbance may lead to the abandonment of habitats or resting sites by QI species, which could include designated or supporting habitats outside of a European site[15] • Creation of new pathways for non-native invasive species.
Habitat degradation – hydrological/ hydrogeological changes *(Operation-related)*	• Operational effects from the construction phase related to tunnelling and deep excavations affecting groundwater quality and/or quantity and thereby the existing hydrological regime. • Operational effects due to ground and/or surface water abstraction. • Changes in hydrology can alter geomorphological processes which can affect the deposition of shingle or other material potentially impacting on QI fish species

[15] The need to consider use of habitat areas outside of an SPA by SCI bird species is set out in the Conservation Objectives Supporting Documents for a number of SPAs. For example, the North Bull Island and South Dublin Bay and River Tolka Estuary SPA Conservation Objectives Supporting Documents Version 1 (NPWS, 2014) states: "*Ex-situ factors: several of the listed waterbird species may at times use habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it. The reliance on these habitats will vary from species to species and from site to site*." Where SPAs do not have site specific conservation objectives, this is the approach taken. Furthermore, this document notes that brent geese from this and surrounding SPAs in the Dublin area feed at inland (terrestrial grassland) sites but roost within the SPA.

Broad categories of potential impacts on European sites	Potential effect pathways *(distance assumptions shown in italics)*
	amongst others. • Changes in these processes can impact aquatic/riparian/terrestrial habitats and species either directly or indirectly.
Water table/availability *(Operation-related)*	• Changes to water levels and flows due to water abstraction from ground or surfaces waters. *These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site.*

5.2 Assessment of Likely Significant Effects

The AA screening report for the RWRP-EM is provided in Appendix A. The RWRP-EM has applied the methodology developed in the Framework Plan to identify suitable water resource management options for the various WRZs throughout the region. The focus of the RWRP-EM is on the Eastern and Midlands region (core baseline area – see Section 3.5 of the SEA Scoping Report).

All of the Preferred Approaches as outlined in Chapters 4.2 to 4.10 identified in the RWRP-EM have been considered for their potential for LSE as part of this NIS for the RWRP-EM (as presented in Appendix C). The Preferred Approaches with identified potential LSEs that could lead to adverse effects on site integrity (AESI) are assessed for the purposes of AA in Chapter 6 of this report. Where Preferred Approaches were determined not to give rise to potential LSEs, no further assessment for the purposes of AA was carried out.

6 Assessment of Adverse Effects on Site Integrity

6.1 Preferred Approach taken forward to Appropriate Assessment

This section assesses the LSEs that may occur from the identified impact pathways as a result of progressing activities associated with the various Preferred Approaches for Eastern and Midlands region (Study Areas 1-9), the implications they may have for European site(s) and their conservation objectives, and mitigation measures required to ensure there are no AESI.

As outlined above, all of the Preferred Approaches identified in the RWRP-EM were considered for their potential to give rise to LSEs as part of this NIS. The Preferred Approaches outlined in Chapter 6 below were assessed as having potential for LSEs (see Appendix C) and therefore taken forward to full AA. As noted in Section 5.2, a number of other Preferred Approaches were assessed as not having the potential for LSEs (see Appendix C), and therefore no further assessment was carried out of those options for the purposes of AA.

6.1.1 Study Area 1

The Preferred Approaches for SA1 with potential for LSEs on European sites are shown in Table 6.1.1.

Table 6.1.1 – SA1 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA1-71 3400SC0002 Tinahely	No Deficit - Do nothing but upgrade WTP for Quality need
SA1-17c **(Group 3)** 3400SC0007 Avoca Ballinaclash Public Supply	Rationalisation of Avoca Ballinaclash WTP to Vartry WTP
SA1-57c **(Group 3)** 3400SC0012 Redcross Conary Public Supply	Rationalisation of Redcross Intermediate Reservoir to Vartry WTP
SA1-23c **(Group 3)** 3400SC0025 Ballinteskin Public Supply	Rationalisation of Ballinteskin Pump Station to Vartry WTP, via existing watermain to Cronroe WTP
SA1-52c (**Group 3**) 3400SC0047 Laragh Annamoe Public Supply	Rationalisation of Laragh WTP to Vartry WTP for long term OPEX savings (not in deficit)
SA1-87 **(Group 3)** 3400SC0017 Barndarrig Public Supply	Rationalisation of Barndarrig WTP to Vartry WTP

WRZ Name and Option Reference	Option Description
SA1-50 3400SC0021 Kirikee Public Supply	New GW on site and near existing borehole
SA1-69 3400SC0030 Killavaney Public Supply (Arklow)	No Deficit – do nothing but WTP upgrade for quality need
SA1-42 3400SC0035 Kilballyowen (Aughrim) Public Supply	Increase GW abstraction

6.1.2 Study Area 2

The Preferred Approaches for SA2 with potential for LSEs on European sites are shown in Table 6.1.2.

Table 6.1.2- SA2 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA2-01 WRZ 3400SC0003 Baltinglass Public Supply	New GW abstraction – deeper BH in gravel aquifer approx. 3 km from Baltinglass.
SA2-13 WRZ 3400SC0008 Ballyknockan Valleymount Public Supply	Increase GW abstraction
SA2-28 WRZ 3400SC0023 Knockanarrigan Davidstown Public Supply	Increase GW abstraction
SA2-35 WRZ 3400SC0014 Rathdangan Public Supply	Not in deficit. Treatment upgrade if required.
SA2-24 WRZ 3400SC0019 Grangecon Public Supply	Increase GW abstraction
SA2-38 WRZ 3400SC0011 Kiltegan Public Supply	Not in deficit. Treatment upgrade if required.
SA2-40 WRZ 3400SC0052 Knocknagilky Public Supply	Increase GW abstraction

WRZ Name and Option Reference	Option Description
SA2-30d WRZ 0100SC0005 Hacketstown	Rationalisation to Rathvilly (Dependent on New Shannon Source)

6.1.3 Study Area 3

The Preferred Approaches for SA3 with potential for LSEs on European sites are shown in Table 6.1.3.

Table 6.1.3 - SA3 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA3-99 **(Group 23)** WRZ 2300SC0007 Ballivor	Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.
SA3-101 **(Group 23)** WRZ 2300SC0011 Kilmessan	Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.
SA3-88 WRZ 2300SC0023 Moynalty	Not in deficit – upgrade WTP
SA3-77 WRZ 0200SC0015 Bailieboro RWSS	New local GW option – Partial deficit only.
SA3-96 **(Group 23)** WRZ 2100SC0001 South Lough & East Meath	Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.
SA3-100 **(Group 23)** WRZ 2300SC0055 Navan-Midmeath	Transfer from the GDA Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.

WRZ Name and Option Reference	Option Description
SA3-97 **(Group 23)** WRZ 2300SC005 Kells-Oldcastle	Transfer from the GDA Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.
SA3-98 **(Group 23)** WRZ 2300SC0006 Athboy	Transfer from the GDA Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.
SA3-47 WRZ 2300SC0009 Slane	Increase existing groundwater abstraction and increase capacity at WTP.
SA3-102 **(Group 23)** WRZ 2300SC0014 Trim	Transfer from the GDA Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come from new source for the GDA. Rath Reservoir WTP, Clavins Bridge WTP, Lough Bane WTP, Coill Dios WTP, Athboy WTP, Earlsmill WTP, Kilmurray WTP, Liscarton WTP, Kilcarn Interim WTP, Kilmessan Swainestown WTP, Trim WTP and their abstractions will be decommissioned as part of this option.

6.1.4 Study Area 4

The Preferred Approaches for SA4 with potential for LSEs on European sites are shown in Table 6.1.4.

Table 6.1.4 - SA4 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA4-10 **(Group 1)** 3200SC0003 Ballany	New connection point from New Shannon Source connecting to Ballany.
SA4-36a **(Group 1)** 3200SC0001 Mullingar Regional	New connection point from New Shannon Source connecting to Mullingar Regional.
SA4-46 **(Group 1)** 2300SC0012	New connection point from New Shannon Source connecting to Clonard/Abbeysfields Housing Estate - potential to Rationalise Clonard to Kinnegad (Mullingar Regional WRZ) via 6 km watermain.

WRZ Name and Option Reference	Option Description
Clonard/Abbeyfields	
SA4-52 **(Group 1)** 2300SC0016 Longwood WS	New connection point from New Shannon Source connecting to Longwood - potential to connect Longwood to Kinnegad (Mullingar Regional WRZ).
SA4-53 **(Group 1)** 2300SC0018 Enfield WS	New connection point from New Shannon Source connecting to Enfield - potential to connect at Kinnegad from Mullingar.
SA4-99 1400SC0005 Clonuff	No deficit – WQ upgrade required only.
SA4-60 **(Group 1)** 1400SC0004 Ardcarraig Clogherinkoe	New connection point from New Shannon Source connecting to Ardcarraig Clogherinkoe.
SA4-66 **(Group 1)** 2500SC0005 Edenderry & Rhode	New connection point from New Shannon Source connecting to Edenderry & Rhode.
SA4-71 **(Group 1)** 2500SC0014 Daingean	New connection point from New Shannon Source connecting to Daingean.
SA4-98 2500SC0007 Clonbullogue	No deficit – WQ upgrade required only.
SA4-77 **(Group 1)** 2500SC0006 Walsh Island PWS	New connection point from New Shannon Source connecting to Walsh Island.
SA4-20 **(Group 1)** 2000SC0003 Ballymahon	Rationalise Ballymahon To Mullinagr WRZ (interconnection points TBC) - new source required (New Shannon Source).

WRZ Name and Option Reference	Option Description
SA4-63 **(Group 1)** 2500SC0004 Geashill	New connection point from New Shannon Source connecting to Geashill.

6.1.5 Study Area 5

The Preferred Approaches for SA5 with potential for LSEs on European sites are shown in Table 6.1.5.

Table 6.1.5 - SA5 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA5-02 WRZ 1200SC0005 Ahascragh	New GW abstraction for Ahascragh WRZ to supply deficit
SA5-09a WRZ 3200SC0002 Athlone	Upgrade Athlone WTP
SA5-17a WRZ 1200SC0006 Ballinasloe	Increase abstraction from River Suck (New Intake required)
SA5-517 **(Group 17 – comprising of option SA5-25)** WRZ 2500SC0015 Birr/Kinnitty	Increase abstraction from the River Camcor and upgrade WTP to supply Birr and Kinnity
SA5-37b WRZ 2600SC0001 Mount Talbot/ Four Roads	Increase GW abstraction at Mount Talbot Spring to supply deficit
SA5-518 **(Group 18 – consisting of option SA5-82 and option SA5-83)** WRZ 2600SC0006 SRRWSS.	Increase GW abstraction at Killeglan and Lisbrock and Upgarde WTPs (Group 18 - 2 WTPs).
SA5-84 WRZ 2500SC0016 Clara/Ferbane	No Deficit. WTP Upgrade Only.
SA5-80 WRZ 2500SC0001 Banagher	No deficit. Upgrade Banagher WTP to address WQ issue

WRZ Name and Option Reference	Option Description
SA5-81 WRZ 2500SC0001 Banagher	No deficit. Upgrade Clontotin WTP to address WQ issue

6.1.6 Study Area 6

The Preferred Approaches for SA6 with potential for LSEs on European sites are shown in Table 6.1.6.

Table 6.1.6 - SA6 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA6-193 WRZ 0100SC0001 Carlow Town	Connect to New Shannon Source via Srowland.
SA6-197 WRZ 0100SC0002 Leighlinbridge	WTP upgrade only.
SA6-19 WRZ 0100SC0003 Old Leighlin	Increase GW abstraction to supply deficit - yield assessments required.
SA6-24 WRZ 0100SC0004 Bilboa	New GW abstraction to supply full demand.
SA6-191 WRZ 0100SC0008 Bagenalstown	WTP upgrade
SA6-33 WRZ 0100SC0011 Carlow Central Regional	New GW abstraction to supply deficit to the Barrow gravels just south of Carlow Town.
SA6-38 WRZ 1500SC0006 Urlingford-Johnstown WS	New GW abstraction to supply deficit and improve water quality.
SA6-45a WRZ 1500SC0009 Clogh-Castlecomer WS	New GW abstraction/wellfield to supply deficit.
SA6-53a WRZ 1500SC0018 Galmoy-Rathdowney PWS	Increase GW abstraction to supply deficit.

WRZ Name and Option Reference	Option Description
SA6-57a WRZ 1600SC0001 Portlaoise PWS	New GW abstraction/wellfield development.
SA6-64 WRZ 1600SC0003 Rosenallis PWS	Increase GW abstraction to supply deficit.
SA6-69a WRZ 1600SC0004 Mountmellick 1 PWS	Increase GW abstraction to supply deficit.
SA6-77 WRZ 1600SC0005 Portarlington 1 PWS	Increase GW abstraction to supply deficit.
SA6-86a WRZ 1600SC0006 Arles 2 PWS	Increase GW abstraction to supply deficit - yield assessments required.
SA6-90 WRZ 1600SC0007 The Strand PWS	Increase GW abstraction to supply deficit.
SA6-94 WRZ 1600SC0008 Coolanagh PWS	Increase GW abstraction to supply deficit.
SA6-99 WRZ 1600SC0010 Borris in Ossory PWS	Increase GW abstraction to supply deficit.
SA6-104 WRZ 1600SC0011 Camross PWS	Increase GW abstraction to supply deficit.
SA6-105 WRZ 1600SC0014 South East Regional PWS	Increase GW abstraction to supply deficit.
SA6-113a WRZ 1600SC0015 Swan PWS	Increase GW abstraction to supply deficit.
SA6-122 WRZ 1600SC0016 Mountrath	Rationalise Cloonin Hill, Drim and Knocks into 1 WTP to add resilience. Require source protection.

WRZ Name and Option Reference	Option Description
SA6-126 WRZ 1600SC0017 Abbeyliex South	Increase GW abstraction to supply deficit.
SA6-553 **(Group 53 consisting of option SA6-139)** WRZ 1600SC0018 Ballinakill	Increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill.
SA6-553 **(Group 53 consisting of option SA6-144e)** WRZ 1600SC0019 Durrow	Increase GW abstraction at Fermoyle WTP to supply deficit and interconnect with Ballinakill.
SA6-149 WRZ 1600SC0020. Abbeyleix North	Increase GW abstraction to supply deficit.
SA6-156 WRZ 1600SC0021 Ballyroan	Increase GW abstraction to supply deficit – Ballyroan Spring.
SA6-552 **(Group 52 consisting of option SA6-180c)** WRZ 2500SC0002 Tullamore	Supply Tullamore from New Shannon Source.
SA6-552 **(Group 52 consisting of option SA6-184)** WRZ 2500SC0013 Mountbolus PWS	New connection point from New Shannon Source connecting to Mountbolus

6.1.7 Study Area 7

The Preferred Approaches for SA7 with potential for LSEs on European sites are shown in Table 6.1.7.

Table 6.1.7 - SA7 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA7-55 WRZ 1200SC0030 Portumna	Increase abstraction and Upgrade WTP.
SA7-504 **(Comprised of option SA7-54b)** WRZ 2500SC0010 Dunkerrin/Moneygall	New connection point from New Shannon Source connecting to Dunkerrin/Moneygall.

WRZ Name and Option Reference	Option Description
SA7-63 WRZ 2900SC0002 Roscrea RWSS.	No deficit – upgrade WTP.
SA7-23 WRZ 2900SC0043 Lorrha/Rathcabbin	New GW abstraction from Birr groundwater body (karstic bedrock) and new WTP to supply deficit.
SA7-504 **(Comprised of option SA7-36b)** WRZ 2900SC0045 Borrisokane	New connection point from New Shannon Source connecting to Borrisokane.
SA7-504 **(Comprised of option SA7-43a)** WRZ 2900SC0046 Cloughjordan	New connection point from New Shannon Source connecting to Cloughjordan.
SA7-61 WRZ 2900SC0045 Nenagh	WTP Upgrade - no deficit
SA7-14 WRZ 2900SC0051 Terryglass	New GW abstraction to supply full demand and abandon existing sources.

6.1.8 Study Area 8

The Preferred Approaches for SA8 with potential for LSEs on European sites are shown in Table 6.1.8.

Table 6.1.8 - SA8 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA8-09 WRZ 0300SC0006 Shannon/Sixmilebridge	Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit.
SA8-20a WRZ 0300SC0014 Flagmount	Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP.
SA8-21 WRZ 0300SC0015 Feakle	Increase GW abstraction from Feakle public supply new BH (poorly productive aquifer) and upgrade existing Bauragegaun Pump Station WTP.
SA8-22 WRZ 0300SC0016 Scariff	Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade Scarriff WTP.

WRZ Name and Option Reference	Option Description
SA8-24 WRZ 0300SC0017 Mountshannon	Increase GW abstraction from existing Mountshannon BH (poorly productive aquifer) and upgrade Cloonmirran Pumphouse WTP.
SA8-504 **(Comprised of option SA8-31a)** WRZ 0300SC0019 O'Briensbridge	Rationalise O'Briensbridge WRZ to Limerick City WRZ (approx. distance 2.5km, new watermains and network upgrades required).
SA8-01 (in conjunction within option SA8-172) WRZ 0300SC0020 Ennis	Advanced leakage reduction. This leakage option needs implemented in conjunction with local GW option SA8-172 in order to meet full deficit.
SA8-512 **(Comprised of option SA8-27)** WRZ 0300SC0024 Killaloe PWS	Rationalise Killaloe WRZ to Newport WRZ via Killaloe bridge.
SA8-120 WRZ 1200SC0036 Woodford	Increase existing GW.
SA8-510 **(Comprised of option 17f)** WRZ 1900SC0001 Limerick City Environs	Not in deficit - supply spare capacity to neighbouring WRZs and upgrade.
SA8-508 **(Comprised of option SA8-199)** WRZ 1900SC0037 Murroe	Supply from Limerick.
SA8-508 **(Comprised of option SA8-40)** WRZ 1900SC0003 Cappamore Foileen WS	Supply from Limerick.
SA8-508 **(Comprised of option SA8-138)** WRZ 1900SC0004 Doon Water Supply	Supply from Limerick.
SA8-508 **(Comprised of option SA8-49)** WRZ 1900SC0005 Pallasgreen Water Supply	Supply from Limerick.

WRZ Name and Option Reference	Option Description
SA8-51 WRZ 1900SC0007 Fedamore Water Supply	New GW abstraction from Fedamore groundwater body (karstic) and upgrade Fedamore WTP/new WTP.
SA8-52 WRZ 1900SC0009 Bruff Water Supply	Increase GW abstraction at Finn's Well (poorly productive aquifer) and upgrade Finn's Well WTP.
SA8-59 WRZ 1900SC0014 Martinstown Water Supply	Increase GW abstraction at Martinstown BH (poorly productive aquifer) and upgrade Martinstown WTP.
SA8-516 **(Comprised of option SA8-65)** WRZ 1900SC0015 Glenosheen/Jamestown/Kilmallock	Not in deficit - supply and rationalise Kilfinane Ardpatrick.
SA8-68 WRZ 1900SC0016 Bruree Water Supply	Increase GW abstraction at Bruree BH (Bruree groundwater body - productive fissured bedrock) and upgrade Bruree PS WTP.
SA8-179 WRZ 1900SC0017 Athlacca Water Supply	Not in deficit - Upgrade WTP only.
SA8-510 **(Comprised of option SA8-84)** WRZ 1900SC0019 Newcastle West Water Supply	Connect Newcastle West to Limerick City WRZ.
SA8-98 WRZ 1900SC0020 Carrigkerry Water Supply	Increase GW abstraction from Carrigkerry Spring (poorly productive aquifer) and upgrade Carrigkerry WTP.
SA8-100 WRZ 1900SC0022 Glin Water Supply	Increase GW abstraction from Glin BH (poorly productive bedrock) and upgrade existing WTP.
SA8-510 **(Comprised of option SA8-105)** WRZ 1900SC0024 Foynes Shannon Estuary PWS	Connect Foynes/Shannon Estuary to Limerick City WRZ.
SA8-510 **(Comprised of option SA8-192)** WRZ 1900SC0029 Adare	Rationalise to Limerick.

WRZ Name and Option Reference	Option Description
SA8-516 **(Comprised of option SA8-114)** WRZ 1900SC0034 Kilfinnane Ardpatrick Water Supply	Rationalise to Jamestown WTP.
SA8-149 WRZ 1900SC0035 Ballingarry	Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade exisitng Ballingarry Spring WTP to partly supply deficit.
SA8-145 WRZ 1900SC0036 Rathkeale	Increase GW abstraction at Kilcolman Spring (Knockaderry groundwater body - productive fissured bedrock) and upgrade existing Kilcolman WTP to partly supply deficit.
SA8-523 **(Comprised of option SA8-163)** WRZ 2900SC0005 Kilcommon	Increase GW abstraction at Kilcommon (poorly productive aquifer) and upgrade WTP.
SA8-512 **(Comprised of option SA8-118)** WRZ 2900SC0066 Newport RWSS	Rationalise Newport to New Shannon Source.
SA8-523 **(Comprised of option SA8-166)** WRZ 2900SC0068 Upperchurch	Rationalise Upperchurch to Kilcommon WRZ (distance 1km, new watermains and network upgrades required).
SA8-177 WRZ 1900SC0028 Croom PWS	Rationalise Croom WRZ to Limerick City WRZ (approx. distance 16km, new watermains and network upgrades required).

6.1.9 Study Area 9

The Preferred Approaches for SA9 with potential for LSEs on European sites are shown in Table 6.1.9.

Table 6.1.9 - SA9 Preferred Approaches subject to AA

WRZ Name and Option Reference	Option Description
SA9-84 and **SA9-87** (Preferred Approach options)	New Shannon Source surface water abstraction of 210Ml/d Group of interventions required to improve resilience and quality.
SA9-28 and **SA8-46** (Interim options)	Purchase of Poulaphouca Reservoir from ESB and Upgrade of Leixlip WTP. Leixlip WTP Upgrade and increased of 50MLD from existing surface water abstraction from River Liffey.

6.2 Appraisal of LSE leading to potential AESI

An overview of the potential impact types/pathways leading to LSEs identified as part of this NIS, and that could arise as a result of progressing the various Preferred Approaches for the EM region, and which could potentially lead to AESI in the absence of mitigation are outlined below. The European sites and their qualifying interest (QI) species or habitats potentially affected are detailed further in Appendix D (Tables D1 [SA1] – D9 [SA9]) and summarised below.

6.2.1 Study Area 1

European sites identified as at risk of LSEs as a result of progressing the Preferred Approaches for SA1 are shown in Table 6.2.1 while potential impact types identified for SA1 are discussed below and outlined in Tables 6.2.2 – 6.2.5.

Table 6.2.1 - European sites within the ZoI of Study Area 1 (Mid -Wicklow) with LSE identified and the potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
Wicklow Mountains SAC (002122)	The Murrough SPA (004186)
Deputy's Pass Nature Reserve SAC (000717)	
Buckroney-Brittas Dunes and Fen SAC (000729)	
Slaney River Valley SAC (000781)	
The Murrough Wetlands SAC (002249)	
Magherabeg Dunes SAC (001766)	

In summary, no operational impacts were identified as a result of progressing options associated with the Preferred Approach for SA1.

The main construction related LSEs identified were disturbance to QI, in particular otter (QI of Wicklow Mountains SAC) and greylag goose (*Anser anser*) which is a QI of The Murrough SPA. Potential impacts were also identified in relation to habitat degradation with the potential for the spread of invasive species related to works adjacent to Deputy's Pass Nature Reserve SAC (associated with options 17c, 57c, 23c, 53c, 51c, 52c, 87– Group 3) which supports the Annex I habitat old sessile oak woods. Potential impacts from changes in water quality during construction works where European sites are hydrologically linked to or adjacent to potential works area were also identified for The Murrough Wetlands SAC, Magherabeg Dunes SAC, Buckroney-Brittas Dunes and Fen SAC (Group 3 options only) and Slaney River Valley SAC (option SA1-71 only) which supports a number of sensitive aquatic QI species. Changes in water quality from a pollution event could impact on aquatic QI species including lamprey species, salmon, freshwater pearl mussel and otter.

Table 6.2.2 - Summary of potential LSEs from option SA1-Group 3 (17c, 57c, 23c, 53c, 51c, 52c, 87) on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Wicklow Mountains SAC (002122)					✓
Deputy's Pass Nature Reserve SAC (000717)					✓
The Murrough Wetlands SAC (002249)		✓			
Magherabeg Dunes SAC (001766)		✓			
Buckroney-Brittas Dunes and Fen SAC (000729)		✓			

Table 6.2.3 - Summary of potential LSEs from option SA1-71 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)		✓			

Table 6.2.4 - Summary of potential LSEs from option SA1-Group 3 (17c, 57c, 23c, 53c, 51c, 52c, 87) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
The Murrough SPA (004186)					✓

6.2.2 Study Area 2

European sites identified as at risk of LSE as a result of progressing the Preferred Approaches for SA2 are shown in Table 6.2.5 while potential impact types identified for SA2 are discussed below and outlined in Tables 6.2.6 – 6.2.14.

Table 6.2.5 - European sites within the ZoI of Study Area 2 (West Wicklow) with LSEs identified and the potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
Slaney River Valley SAC (000781) Wicklow Mountains SAC (002122) River Barrow and River Nore SAC (002162)	Poulaphouca Reservoir SPA (004063)

In summary, no operational LSEs were identified as a result of progressing options associated with the Preferred Approach for SA2. The main construction related LSEs identified were disturbance to QI, in particular otter and greylag goose and changes in water quality during construction where European sites are hydrologically linked to potential works area (e.g. Slaney River Valley SAC, Wicklow Mountains SAC and River Barrow and River Nore SAC). Changes in water quality from a pollution event could have an effect on aquatic QI species including lamprey species, salmon, freshwater pearl mussel and otter.

In addition to disturbance to QI species and changes in water quality from a pollution event other potential LSEs were associated with potential pipeline crossing of the Slaney River Valley SAC (options SA2-30d and SA2-01) which depending on the crossing location or method used could result in physical loss of habitat within the SAC boundary or mortality of QI species.

Table 6.2.6 - Summary of potential LSEs from option SA2-13 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Wicklow Mountains SAC (002122)					✓

Table 6.2.7 - Summary of potential LSEs from option SA2-35 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)		✓			✓
Wicklow Mountains SAC (002122)					✓

Table 6.2.8 - Summary of potential LSEs from option SA2-38 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)		✓			✓

Table 6.2.9 - Summary of potential LSEs from option SA2-24 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓			

Table 6.2.10 - Summary of potential LSEs from option SA2-40 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)		✓			

Table 6.2.11 - Summary of potential LSEs from option SA2-30d on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)	✓	✓		✓	✓

Table 6.2.12 - Summary of potential LSEs from option SA2-01 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)	✓	✓		✓	✓

Table 6.2.13 - Summary of potential LSEs from option SA2-28 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slaney River Valley SAC (000781)		✓			

Table 6.2.14 - Summary of potential LSEs from option SA2-13 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Poulaphouca Reservoir SPA (004063)					✓

6.2.3 Study Area 3

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA3 are shown in Table 6.2.15 while potential impact pathways identified for SA3 and discussed below and outlined in Tables 6.2.16 – 6.2.23.

Table 6.2.15 - European sites within the ZoI of Study Area 3 (Meath South Louth) with LSE identified and the potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
River Boyne and River Blackwater SAC (002299) Lough Bane and Lough Glass SAC (002120)	River Boyne and River Blackwater SPA (004232)

Potential operational LSEs were identified as a result of progressing two options associated with the Preferred Approach for SA3. These were a new groundwater abstraction (SA3-77) and an increase to an existing groundwater abstraction (SA3-47) which could potentially impact on aquatic QI species associated with the River Boyne and River Blackwater SAC through changes to water levels, flows (water table/availability) and water quality (hydrological changes). For option SA3-77 the abstraction is located outside the SAC boundary (linked to tributaries of this SAC) and for option SA3-47 the abstraction is located within the SAC boundary therefore reduced flows could impact on mobile QI species associated with the SAC and utilising its tributaries.

The construction related LSEs (associated with Group 23 [options SA3-96, SA3-100, SA3-97, SA3-98, SA3-102, SA3-99, SA3-101], option SA3-77, option SA3-88 and option SA3-47) identified were disturbance, mortality, habitat degradation and/or physical loss of habitat associated with works within or adjacent to or crossing an SAC (e.g. works adjacent to the River Boyne and River Blackwater SAC and Lough Bane and Lough Glass SAC) potentially impacting on QI species such as otter and QI habitats associated with these SACs (e.g. alluvial woodland, alkaline fens and hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.). Potential LSEs were also identified in relation to habitat degradation and the potential for the spread of invasive species and changes in water quality during construction where European sites are hydrologically linked to or adjacent to potential works area (e.g. River Boyne and River Blackwater SAC and Lough Bane and Lough Glass SAC). Changes in water quality from a pollution event could impact on a number of aquatic QI species including but not limited to white-clawed crayfish (*Austropotamobius pallipes*), otter, salmon and river lamprey.

In addition, works adjacent to or in close proximity to River Boyne and River Blackwater SPA (associated with Group 23) could result in mortality and/or disturbance related impacts to kingfisher where works are within close proximity of potential nesting sites/territories. While changes in water quality (option SA3-88) could have an indirect impact on kingfisher through changes in water quality impacting on their prey species.

Table 6.2.16 - Summary of potential LSEs from option SA3-523 (96, 100, 97, 98, 102, 99, 101) on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SAC (002299)	✓	✓		✓	✓
Lough Bane and Lough Glass SAC (002120)	✓	✓		✓	✓

Table 6.2.17 - Summary of potential LSEs from option SA3-77 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SAC (002299)		✓	✓		✓

Table 6.2.18 - Summary of potential LSEs from option SA3-88 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SAC (002299)		✓			✓

Table 6.2.19 - Summary of potential LSEs from option SA3-47 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SAC (002299)	✓	✓	✓	✓	✓

Table 6.2.20 - Summary of potential LSEs from option SA3-523 (96, 100, 97, 98, 102, 99, 101) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SPA (004232)		✓		✓	✓

Table 6.2.21 - Summary of potential LSEs from option SA3-77 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SPA (004232)		✓			

Table 6.2.22 - Summary of potential LSEs from option SA3-88 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SPA (004232)		✓			

Table 6.2.23 - Summary of potential LSEs from option SA3-47 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SPA (004232)		✓		✓	✓

6.2.4 Study Area 4

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA4 are shown in Table 6.2.24 while potential impact types identified for SA4 discussed below and outlined in Tables 6.2.25 – 6.2.28.

Table 6.2.24 - European sites within the ZoI of Study Area 4 (Mullingar) with LSE identified and the potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
River Boyne and River Blackwater SAC (002299) River Barrow and River Nore SAC (002162) Lough Ennell SAC (000685) Lough Lene SAC (002121) Lough Owel SAC (000688) Garriskil Bog SAC (000679) Charleville Wood SAC (000571) Slieve Bloom Mountains SAC (000412)	Lough Iron SPA (004046) River Boyne and River Blackwater SPA (004232) Lough Ennell SPA (004044) Lough Derravarragh SPA (004043) Lough Owel SPA (004047) Garriskil Bog SPA (004102) Lough Ree SPA (004064)

SACs	SPAs
Lough Ree SAC (000440)	

In summary, no operational impacts were identified as a result of progressing options associated with the Preferred Approach for SA4.

The main construction related LSEs identified were disturbance and/or physical loss of habitat associated with works adjacent to an SAC (e.g. works adjacent to Lough Ennell SAC and River Boyne and River Blackwater SAC [Group 1]) potentially impacting on QI species such as otter and QI habitats associated with these SACs (e.g. alluvial woodland and alkaline fens). Potential LSEs were also identified in relation to the spread of invasive species and changes in water quality during construction where European sites are hydrologically linked to or adjacent to potential works area (e.g. River Boyne and River Blackwater SAC, River Barrow and River Nore SAC, Lough Ennell SAC, Lough Lene SAC, Lough Owel SAC, Garriskil Bog SAC, Charleville Wood SAC, Slieve Bloom Mountains SAC, and Lough Ree SAC). Changes in water quality from a pollution event could impact on a number of aquatic QI species including but not limited to river and brook lamprey, salmon, white-clawed crayfish and otter.

In addition, works adjacent to or in close proximity to Lough Iron SPA (associated with Group 1) could result in disturbance, mortality and/or physical loss of habitat related impacts to whooper swan (*Cygnus cygnus*) utilising habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland), as well as other QI bird species the SPA has been designated for. Other potential LSEs were identified in relation to disturbance of QI birds and changes in water quality during construction where European sites are hydrologically linked to or adjacent to potential works area (e.g. Lough Iron SPA, River Boyne and River Blackwater SPA, Lough Ennell SPA, Lough Derravarragh SPA, Lough Owel SPA, Garriskil Bog SPA, and Lough Ree SPA).

Table 6.2.25 - Summary of potential LSEs from option SA4-99 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Boyne and River Blackwater SAC (002299)		✓			✓

Table 6.2.26 - Summary of potential LSEs from option SA4-98 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓			

Table 6.2.27 - Summary of potential LSEs from option SA4-501 (10, 36a, 46, 52, 53, 60, 66, 71, 77, 20, 63) on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Ennell SAC (000685)	✓	✓			✓
Lough Lene SAC (002121)		✓			✓
River Boyne and River Blackwater SAC (002299)		✓			✓
Lough Owel SAC (000688)		✓			✓
River Barrow and River Nore SAC (002162)		✓			
Garriskil Bog SAC (000679)		✓			
Charleville Wood SAC (000571)		✓			
Slieve Bloom Mountains SAC (000412)		✓			

Lough Ree SAC (000440)		✓			

Table 6.2.28 - Summary of potential LSEs from option SA4-501 (10, 36a, 46, 52, 53, 60, 66, 71, 77, 20, 63) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Iron SPA (004046)	✓	✓		✓	✓
River Boyne and River Blackwater SPA (004232)		✓			✓
Lough Ennell SPA (004044)		✓			✓
Lough Derravarragh SPA (004043)		✓			✓
Lough Owel SPA (004047)		✓			✓
Garriskil Bog SPA (004102)		✓			
Lough Ree SPA (004064)		✓			

6.2.5 Study Area 5

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA5 are shown in Table 6.2.29 while potential impact types identified for SA5 and discussed below and outlined in Tables 6.2.30 – 6.2.43.

Table 6.2.29 - European sites within the ZoI of Study Area 5 (Athlone SRRWSS Sub-Area) with LSE identified and the potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
River Shannon Callows SAC (000216)	River Suck Callows SPA (004097)
Lough Ree SAC (000440)	Lough Ree SPA (004064)
Four Roads Turlough SAC (001637)	Middle Shannon Callows SPA (004096)
Lisduff Turlough SAC (000609)	All Saints Bog SPA (004103)
Lough Croan Turlough SAC (000610)	River Little Brosna Callows SPA (004086)

SACs	SPAs
Ballynamona Bog and Corkin Lough SAC (002339)	Dovegrove Callows SPA (004137)
Castlesampson Esker SAC (001625)	Four Roads Turlough SPA (004140)

The Preferred Approach for SA5 includes a number of new or increased surface and groundwater abstractions many of which are within karstic aquifers with a potential link to surrounding European designated sites. Potential operational LSEs were identified as a result of progressing six Preferred Approaches associated with SA5. These include three groundwater (SA5-02, SA5-37b and SA5-518) and three surface water (SA5-09a, SA5-17a and SA5-517) abstractions which could potentially impact on wetland bird species utilising wetland habitats within Lough Ree SPA, Dovegrove Callows SPA, Four Roads Turlough SPA and River Suck Callows SPA, aquatic QI species (otter) associated with the River Shannon Callows SAC and Lough Ree SAC and a number of SACs designated for turloughs (Four Roads Turlough SAC, Lisduff Turlough SAC, Ballynamona Bog and Corkip Lough SAC, Castlesampson Esker SAC and Lough Croan Turlough SAC) through a reduction or changes in water levels/flows (water table/availability) and or changes in water quality (habitat degradation/hydrological changes).

The main construction related LSEs are disturbance to QI species (otter), habitat degradation and the potential for the spread of invasive species, and pollution impacts (resulting in changes to water quality) where European sites are hydrologically linked to potential works area (e.g. works associated with SA5-09a potentially impacting on the River Shannon Callows SAC and Lough Ree SAC).

In addition, works adjacent to or in close proximity to Four Roads Turlough SPA, River Suck Callows SPA, Dovegrove Callows SPA, Middle Shannon Callows SPA, All Saints Bog SPA, River Little Brosna Callows SPA and Lough Ree SPA (associated with options SA5-02, SA5-09b, SA5-17a, SA5-80, SA5-517, SA5-37b and SA5-81) could result in disturbance related impacts to QI bird species in particular whooper swan (*Cygnus cygnus*) and Greenland white-fronted goose (*Anser albifrons flavirostris*) that may be utilising habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).

Table 6.2.30 - Summary of potential LSEs from option SA5-09a on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Shannon Callows SAC (000216)	✓	✓	✓		✓
Lough Ree SAC (000440)		✓	✓		✓

Table 6.2.31 - Summary of potential LSEs from option SA5-80 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Shannon Callows SAC (000216)	✓	✓			✓

Table 6.2.32 - Summary of potential LSEs from option SA5-81 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Shannon Callows SAC (000216)		✓			✓

Table 6.2.33 - Summary of potential LSEs from option SA5-84 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Shannon Callows SAC (000216)		✓			

Table 6.2.34 - Summary of potential LSEs from option SA5-37b on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Four Roads Turlough SAC (001637)		✓	✓		
Lisduff Turlough SAC (000609)		✓	✓		
Lough Croan Turlough SAC (000610)		✓	✓		

Table 6.2.35 - Summary of potential LSEs from option SA5-518 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Ballynamona Bog and Corkip Lough SAC (002339)		✓	✓		
Castlesampson Esker SAC (001625)		✓	✓		
Lough Ree SAC (000440)		✓	✓		✓
River Shannon Callows SAC (000216)		✓			

Table 6.2.36 - Summary of potential LSEs from option SA5-02 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Suck Callows SPA (004097)		✓	✓		✓

Table 6.2.37 - Summary of potential LSEs from option SA5-09a on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Ree SPA (004064)					✓
Middle Shannon Callows SPA (004096)					✓

Table 6.2.38 - Summary of potential LSEs from option SA5-17a on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Suck Callows SPA (004097)		✓	✓		✓

Table 6.2.39 - Summary of potential LSEs from option SA5-80 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Middle Shannon Callows SPA (004096)					✓
All Saints Bog SPA (004103)					✓

Table 6.2.40 - Summary of potential LSEs from option SA5-81 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Middle Shannon Callows SPA (004096)					✓
All Saints Bog SPA (004103)					✓
River Little Brosna Callows SPA (004086)					✓

Table 6.2.41 - Summary of potential LSEs from option SA5-517 (SA5-25) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Dovegrove Callows SPA (004137)		✓	✓		✓

Table 6.2.42 - Summary of potential LSEs from option SA5-37b on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Suck Callows SPA (004097)		✓	✓		✓
Four Roads Turlough SPA (004140)		✓	✓		✓

Table 6.2.43 - Summary of potential LSEs from option SA5-518 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Ree SPA (004064)		✓	✓		✓
River Suck Callows SPA (004097)		✓	✓		✓

6.2.6 Study Area 6

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA6 are shown in Table 6.2.44 while potential impact types identified for SA6 and discussed below and outlined in Tables 6.2.45 – 6.2.58.

Table 6.2.44 - European sites within the ZoI of Study Area 6 (Laois) with LSE identified and potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
River Barrow and River Nore SAC (002162)	River Nore SPA (004233)
Slaney River Valley SAC (000781)	Slieve Bloom Mountains SPA (004160)
Slieve Bloom Mountains SAC (000412)	
Lisbigney Bog SAC (000869)	
The Loughans SAC (000407)	
Galmoy Fen SAC (001858)	

SACs	SPAs
Charleville Wood SAC (00571) Clonaslee Eskers and Derry Bog SAC (000859)	

No new or increased surface water abstractions are proposed for SA6. The geology of the Study Area is dominated by widespread limestones and as such provides good groundwater sources. The Preferred Approach for SA6 includes a number of new or increased groundwater abstractions, many of which are within karstic aquifers with a potential link to surrounding European designated sites. Potential operational impacts were identified for the River Barrow and River Nore SAC, The Loughans SAC, Slieve Bloom Mountains SAC, Lisbigney Bog SAC and Galmoy Fen SAC from changes to water levels, flows (water table/availability) and water quality (hydrological changes). Although the groundwater abstractions are located outside the SAC boundaries many are within karst aquifers or have potential links to surface water bodies hydrologically linked to these SACs as such reduced flows could impact on mobile QI species and/ or groundwater dependant habitats (GWDHs) associated with these SACs. For example, the groundwater abstraction for option SA6-19 is located within a karst aquifer and located less than 100m from the River Barrow and River Nore SAC which supports GWDHs and species including petrifying springs and Desmoulin's Whorl Snail (*Vertigo moulinsiana*). Further groundwater assessments would be required to fully understand potential impacts of abstraction in this location.

The main construction related LSEs identified were disturbance, mortality and/or physical loss of habitat associated with crossing of, or works adjacent to an SAC (e.g. crossing of the River Barrow and River Nore SAC (SA6-193), works adjacent to the River Barrow and River Nore SAC (SA6-19)) potentially impacting on QI species and QI habitats associated with this SACs (e.g. alluvial woodland, petrifying springs and hydrophilous tall herb communities, otter, salmon and freshwater pearl mussel etc.)

Potential LSEs were also identified in relation to habitat degradation and the potential for the spread of invasive species and changes in water quality during construction where European sites are hydrologically linked to or adjacent to potential works area (e.g. River Barrow and River Nore SAC and Slaney River Valley SAC). Changes in water quality from a pollution event could impact on a number of aquatic QI species including but not limited to river and brook lamprey, salmon, white-clawed crayfish and otter.

Table 6.2.45 - Summary of potential LSEs from option SA6-193 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)	✓	✓		✓	✓
Slaney River Valley SAC (000781)		✓			✓

Table 6.2.46 - Summary of potential LSEs options SA6-197, SA6-191, SA6-99 and SA6-24 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓			✓

Table 6.2.47 - Summary of potential LSEs from options SA6-19, SA6-45a and SA6-104 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability (option SA6-155 only)	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)	✓	✓	✓	✓	✓

Table 6.2.48 - Summary of potential LSEs from option SA6-53a on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓			✓
Galmoy Fen SAC (001858)		✓	✓		

Table 6.2.49 - Summary of potential LSEs from option SA6-33 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓	✓		✓
Slaney River Valley SAC (000781)		✓			✓

Table 6.2.50 - Summary of potential LSEs from option SA6-38 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓			✓
The Loughans SAC (000407)		✓	✓		

Table 6.2.51 - Summary of potential LSEs from option SA6-57a, SA6-105, SA6-113a, SA6-156, SA6-90 and SA6-94 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓	✓		✓

Table 6.2.52 - Summary of potential LSEs from options SA6-90, SA6-77 and SA6-69a on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓	✓		

Table 6.2.53 - Summary of potential LSEs from options SA6-64 and SA6-86a on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓			

Table 6.2.54 - Summary of potential LSEs from option SA6-122 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slieve Bloom Mountains SAC (000412)		✓	✓		
River Barrow and River Nore SAC (002162)		✓			

Table 6.2.55 - Summary of potential LSEs from options SA6-126, SA6-149 and SA6-553 (option SA6-139 and option SA6-144e combined) on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Barrow and River Nore SAC (002162)		✓	✓		✓
Lisbigney Bog SAC (000869)		✓	✓		

Table 6.2.56 - Summary of potential impact pathways from option SA6-552 (option SA6-180c and option SA6-184 combined) on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Clonaslee Eskers and Derry Bog SAC (000859)		✓			✓
Charleville Wood SAC (000571)		✓			✓

Table 6.2.57 - Summary of potential LSEs from options SA6-104 and SA6-553 (option SA6-139 and option SA6-144e combined) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.) (option SA6-104 only)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species) (option SA6-553 only)
River Nore SPA (004233)		✓			✓

Table 6.2.58 - Summary of potential LSEs from options SA6-122 and SA6-552 (option SA6-180c and option SA6-184 combined) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slieve Bloom Mountains SPA (004160)					✓

6.2.7 Study Area 7

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA7 are shown in Table 6.2.59 while potential impact types identified for SA7 and discussed below and outlined in Tables 6.2.60 – 6.2.67.

Table 6.2.59 - European sites within the ZoI of Study Area 7 (North Tipperary) with LSE identified and with potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
Lough Derg, North-east Shore SAC (002241) River Shannon Callows SAC (000216) Sharavogue Bog SAC (000585)	Lough Derg (Shannon) SPA (004058) Dovegrove Callows SPA (004137) River Little Brosna Callows SPA (004086) Middle Shannon Callows SPA (004096)

Three of the Preferred Approach options for SA7 include groundwater abstractions; two of which are a new groundwater abstraction. Potential operational impacts have been identified for one of these groundwater abstractions on European sites. Potential operational impacts were identified for the Lough Derg, North-east Shore SAC (option SA7-14) from changes to water levels, flows (water table/availability) and water quality (habitat degradation) which could have impacts on groundwater dependant habitats such as alkaline fen (associated within Lough Derg North-east Shore SAC). Option SA7-14 is located within the same karst aquifer and is ca. 600m from Lough Derg North-east Shore SAC. Further groundwater assessments would be required to fully understand potential impacts of abstraction in this location.

The main construction related LSEs identified were disturbance, physical loss of habitat associated with works adjacent to a SAC (e.g. Lough Derg North-east Shore SAC (SA7-55)), habitat degradation with the potential for the spread of invasive species and pollution which would impact on water quality, where a European site is hydrologically linked to potential works area. Changes in water quality from a pollution event could impact on QI species such as otter (e.g. River Shannon Callows SAC (SA7-55)).

In addition works adjacent to or in close proximity to Lough Derg (Shannon) SPA (associated with SA7-55) could result in disturbance related impacts to QI bird species within the SPA or to Greenland white-

fronted goose associated with Dovegrove Callows SPA if geese were utilising habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).

Table 6.2.60 - Summary of potential LSEs from option SA7-55 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Derg, North-east Shore SAC (002241)	✓	✓	✓		✓
River Shannon Callows SAC (000216)		✓	✓		✓

Table 6.2.61 - Summary of potential LSEs from option SA7-23 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Derg, North-east Shore SAC (002241)		✓			✓
River Shannon Callows SAC (000216)		✓			✓

Table 6.2.62 - Summary of potential LSEs from option SA7-61 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Derg, North-east Shore SAC	✓	✓			✓

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
(002241)					

Table 6.2.63 - Summary of potential LSEs from option SA7-14 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Derg, North-east Shore SAC (002241)		✓	✓		✓

Table 6.2.64 - Summary of potential LSEs from option SA7-504 (36b, 43a, 54b) on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Derg, North-east Shore SAC (002241)		✓			

Table 6.2.65 - Summary of potential LSEs from option SA7-63 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Sharavogue Bog SAC (000585)		✓			

Table 6.2.66 - Summary of potential LSEs from options SA7-55, SA7-61 and SA7-14 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.) (Option SA7-55 only)	Water table/ availability (Option SA7-55 only)	Mortality	Disturbance (incl. spread of non-native invasive species)
Lough Derg (Shannon) SPA (004058)		✓	✓		✓

Table 6.2.67 - Summary of potential LSEs from options SA7-23 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Middle Shannon Callows SPA (004096					✓
River Little Brosna Callows SPA (004086)					✓
Dovegrove Callows SPA (004137)					✓

6.2.8 Study Area 8

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA8 are shown in Table 6.2.68 while potential impact types identified for SA8 and discussed below and outlined in Tables 6.2.69 – 6.2.85.

Table 6.2.68 - European sites within the ZoI of Study Area 8 (Limerick) with LSE identified and potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
Lower River Shannon SAC (002165) Ratty River Cave SAC (002316) Blackwater River (Cork/Waterford) SAC (002170) Tory Hill SAC (000439) Lower River Suir SAC (002137)	River Shannon and River Fergus Estuaries SPA (004077) Slieve Aughty Mountains SPA (004168) Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) Slievefelim to Silvermines Mountains SPA (004165) Lough Derg (Shannon) SPA (004058)

Potential operational LSEs were identified for group options SA8-504, SA8-508 and SA8-510 with a connection to Limerick City WRZ as these options includes an increase in surface water abstraction from the Lower River Shannon SAC. Potential LSEs associated with increased abstraction from the Lower River Shannon SAC could result in changes to water levels, flows (water table/availability) and water quality (habitat degradation) which could impact on aquatic QI species for which this site is designated (lamprey species, salmon, otter and freshwater pearl mussel etc.). Potential operational LSEs were also identified for groundwater and surface water abstractions on the Lower River Shannon SAC (from options SA8-01 (in conjunction with option SA8-172) and SA8-177) and Tory Hill SAC (from option SA8-51). Both options with groundwater abstractions are within the same karst aquifer as these SACs. There is potential for impacts to groundwater dependant habitats (alkaline fens) associated with Tory Hill SACs if the groundwater abstraction was to reduce flows to this habitat. While impacts on the Lower River Shannon SAC are related to the likely link between groundwater and surface water bodies within the SAC as the groundwater abstraction is located adjacent to the main river and SAC. If a link exists between these waterbodies the abstraction could lead to reduced flows (water table/availability) and water quality (habitat degradation) impacts on aquatic QI species as noted above. The surface water abstraction associated with option SA8-177 could lead to potential LSEs including changes to water levels and flows (water table/availability) which could impact on the designated aquatic QI species listed above.

The main construction related LSEs identified were disturbance, habitat degradation with the potential for the spread of invasive species, mortality and/or physical loss of habitat associated with works adjacent to or crossing a SAC. For example, works associated with group options SA8-504 and SA8-508 require pipeline crossings of the Lower River Shannon SAC. Potential LSEs were also identified in relation to changes in water quality during construction (pollution event) where European sites are hydrologically linked to or adjacent to potential works area (e.g. Blackwater River (Cork/Waterford) SAC (SA8-516) and Lower River Shannon SAC (various options).

SA8 is the only Study Area where potential impacts to lesser horseshoe (*Rhinolophus hipposideros*) bat have been identified from a Preferred Approach option. For example, works associated with SA8-09 are within the core foraging range of a lesser horseshoe (LHS) SAC, the Ratty River Cave SAC. The works associated with this option is within the 2.5km core foraging range from this SAC (just 120m from Ratty River Cave SAC). As such vegetation, hedgerow or tree clearance associated with the works or lighting impacts from the works could sever important commuting routes for LHS bats commuting between their roost site in the SAC and foraging areas outside the confines of the SAC. This would require further assessment to ensure impacts are avoided.

Finally works associated with a number of options require the installation of pipelines within or adjacent to SPAs which could result in disturbance related impacts to QI bird species associated with River Shannon and River Fergus Estuaries SPA from group option SA8-510 including whooper swan and light-bellied brent goose (*Branta bernicla*) and Slieve Aughty Mountains SPA (SA8-24, SA8-20a, SA8-22, SA8-120 and SA8-21) designated for merlin and hen harrier (*Circus cyaneus*). There is also the potential for loss of habitat/supporting habitat and disturbance to hen harrier within Slievefelim to Silvermines Mountains SPA from works associated with group options SA8-508 and SA8-523.

Table 6.2.69 - Summary of potential LSEs from option SA8-09 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)		✓			✓
Ratty River Cave SAC (002316)	✓				

Table 6.2.70 - Summary of potential LSEs from option SA8-512 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)	✓	✓		✓	✓

Table 6.2.71 - Summary of potential LSEs from options SA8-504 and SA8-508 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)	✓	✓	✓	✓	✓

Table 6.2.72 - Summary of potential LSEs from options SA8-22, SA8-24, SA8-179 and SA8-100 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)		✓			✓

Table 6.2.73 - Summary of potential LSEs from option SA8-510 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)	✓	✓	✓	✓	✓

Table 6.2.74 - Summary of potential LSEs from option SA8-51 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Tory Hill SAC (000439)		✓	✓		

Table 6.2.75 - Summary of potential LSEs from option SA8-516 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Blackwater River (Cork/Waterford) SAC (002170)		✓			

Table 6.2.76 - Summary of potential LSEs from options SA8-21, SA8-52, SA8-59, SA8-68, SA8-149 and SA8-145 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)		✓			

Table 6.2.77 - Summary of potential LSEs from option SA8-523 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)		✓			
Lower River Suir SAC (002137)		✓			✓

Table 6.2.78- Summary of potential LSEs from option SA8-01 (in conjunction with option SA8-172) and SA8-177 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC (002165)		✓	✓		✓

Table 6.2.79 - Summary of potential LSEs from options SA8-510, SA8-504, SA8-09 and SA8-01 (in conjunction with SA8-172) on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Shannon and River Fergus Estuaries SPA (004077)		✓			✓

Table 6.2.80 - Summary of potential LSEs from options SA8-20a, SA8-22, SA8-21 and SA8-24 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slieve Aughty Mountains SPA (004168)					✓

Table 6.2.81 - Summary of potential LSEs from option SA8-98 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)					✓

Table 6.2.82 - Summary of potential LSEs from option SA8-100 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
River Shannon and River Fergus Estuaries SPA (004077)					✓

Table 6.2.83 - Summary of potential LSEs from options SA8-523 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slievefelim to Silvermines Mountains SPA (004165)	✓				✓

Table 6.2.84 - Summary of potential LSEs from option SA8-120 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slieve Aughty Mountains SPA (004168)					✓
Lough Derg (Shannon) SPA (004058)		✓			

Table 6.2.85 - Summary of potential LSEs from option SA8-508 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Slievefelim to Silvermines Mountains SPA (004165)	✓				✓

6.2.9 Study Area 9

European sites identified with potential for LSEs as a result of progressing the Preferred Approaches for SA9 are shown in Table 6.2.86 while potential impact types identified for SA9 and discussed below and outlined in Tables 6.2.87 – 6.2.91.

Table 6.2.86 - European sites within the ZoI of Study Area 9 (GDA) with LSE identified and with potential for AESI (in the absence of more detail/mitigation)

SACs	SPAs
Lower River Shannon SAC (002165)	Poulaphouca Reservoir SPA (004063)
Lough Derg North-East Shore SAC (002241)	North Bull Island SPA (004006)
Lisduff Fen SAC (002147)	South Dublin Bay and River Tolka Esturary SPA (004024)
Sharavogue Bog SAC (000585)	Baldoyle Bay SPA (004016)
River Barrow and River Nore SAC (002162)	Malahide Esturary SPA (004025)
Charleville Wood SAC (000571)	Rogerstown Esturary SPA (004015)
Rye Water Valley/Carton SAC (001398)	The Murrough SPA (004186)
River Shannon Callows SAC (000216)	
River Boyne and River Blackwater SAC (002299)	
Baldoyle Bay SAC (000199)	
Malahide Estuary SAC (000205)	
The Murrough Wetlands SAC (002249)	

Preferred Approach

Potential operational and construction related LSEs were identified from the Preferred Approach options SA9-84 and SA9-87. Operational LSEs were identified associated with the proposed abstraction from the Lower River Shannon SAC (New Shannon Source). Potential LSEs associated with abstraction from the Lower River Shannon SAC could result in changes to water levels, flows (hydrological) and water quality (habitat degradation) which could impact on aquatic QI species for which this site is designated (lamprey species, salmon, otter etc.)

Construction related impacts were also identified associated with new infrastructure required for the abstraction. Construction works within the Lower River Shannon SAC could lead to physical loss of habitat/supporting habitats, disturbance to QI species (e.g. otter), habitat degradation (changes in water quality from a pollution event) as well as the potential for the spread of invasive species.

Potential LSEs were also identified in relation to construction of the pipeline from Parteen to the GDA (SA9-84). The pipeline route crosses multiple river channels as such there is potential for the spread of invasive species and changes in water quality during construction (pollution event) where European sites are hydrologically linked to the works area (e.g. Lower River Shannon SAC, Lough Derg North-East Shore SAC, Sharavogue Bog, River Barrow and River Nore SAC and Rye Water Valley/Carton SAC). A pollution event could impact on QI species for which these SACs are designated. Works associated with the pipeline are also within 500m of Lisduff Fen SAC which is designated for groundwater dependant habitats; petrifying springs and alkaline fens. The works area is hydrologically linked to this SAC and as such could lead to habitat degradation impacts on these QI habitats.

Works associated with the Preferred Approach option SA9-87 require the installation of pipelines adjacent to SPAs which could result in disturbance related impacts to QI bird species associated with

North Bull Island SPA, South Dublin Bay and River Tolka Esturary SPA, Baldoyle Bay SPA, Malahide Esturary SPA, Rogerstown Esturary SPA and, The Murrough SPA.

Table 6.2.87 - Summary of potential LSEs from options SA9-84 on SACs with the potential to give rise to AESI.

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Lower River Shannon SAC	✓	✓	✓	✓	✓
Lough Derg North-East Shore SAC		✓			✓
Lisduff Fen SAC	✓	✓			✓
River Barrow and River Nore SAC		✓			✓
Charleville Wood SAC		✓			✓
Sharavogue Bog SAC		✓			✓
River Shannon Callows SAC		✓			✓
River Boyne and River Blackwater SAC		✓			✓

Table 6.2.88 - Summary of potential LSEs from option SA9-87 on SACs with the potential to give rise to AESI.

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Baldoyle Bay SAC (000199)		✓			✓

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Malahide Estuary SAC (000205)		✓			✓
The Murrough Wetlands SAC (002249)		✓			

Table 6.2.89 - Summary of potential LSEs from option SA9-87 on SPAs with the potential to give rise to AESI.

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
North Bull Island SPA (004006)					✓
South Dublin Bay and River Tolka Esturary SPA (004024)					✓
Baldoyle Bay SPA (004016)					✓
Malahide Esturary SPA (004025)					✓
Rogerstown Esturary SPA (004015)					✓
The Murrough SPA (004186)					✓

Interim options

Operational LSEs on European sites were identified from the interim options (SA9-28 and SA9-46) in relation to reduced flows (water table/availability) potentially affecting petrifying springs associated with the Rye Water Valley/Carton SAC. Potential LSEs associated with new watermains could result in habitat degradation and disturbance to a number of SACs, in addition to habitat loss and mortality risk which are also predicted for the Rye Water Valley/Carton SAC.Construction works are within 500m of the Rye Water Valley/Carton SAC which is hydrologically linked. Habitat degradation resulting in changes in water quality (pollution event) during construction works could impact on petrifying springs QI habitat for which the site is designated.

Works associated with the interim options are ca.1.3km from Poulaphouca Reservoir SPA which could result in disturbance related impacts to greylag goose utilising habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it (e.g. grassland, arable farmland).

Table 6.2.90 - Summary of potential LSEs from interim options SA9-28 and SA9-46 on SACs with the potential to give rise to AESI

SAC	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Rye Water Valley/Carton SAC		✓	✓		

Table 6.2.91 - Summary of potential impact pathways from interim options SA9-28 and SA9-46 on SPAs with the potential to give rise to AESI

SPA	Habitat Loss (including supporting habitat outside designated sites)	Habitat degradation (impacts to water quality and hydrological/ hydrogeological changes etc.)	Water table/ availability	Mortality	Disturbance (incl. spread of non-native invasive species)
Poulaphouca Reservoir SPA					✓

6.3 Mitigation

6.3.1 Protection of European Sites in Plan Development

Set out in Chapter 2.5 of this report are a number of measures employed to ensure the protection of European sites in the Plan development process, while mitigation measures specific to the option types arising from the Preferred Approach for the EM region as detailed below.

6.3.2 Avoidance

The setting of sustainable abstraction limits (as outlined in Chapter 2.5.1) for any new or increased abstractions arising as a result of the RWRP-EM have been established to ensure impacts on aquatic QI species and habitats requiring high status water quality are avoided.

The Option Assessment Methodology has aimed to identify options that avoid or minimise impacts on European sites (as outlined in Chapter 2.5.3). The Best AA approach gives maximum consideration to those options with no potential for impacts on European Sites or options with LSEs that can be addressed with general/standard mitigation measures at the project level (based on desktop study). It puts avoidance of impacts on European sites at the forefront of the assessment taking account for the fact that options with a high likelihood of having adverse effects on a European site have already been removed at Coarse Screening stage. Taking this approach any Feasible Option that meets the objectives of the Plan and scores neutral or zero against the European Sites (Biodiversity) question is automatically picked as the Preferred Approach (this is in line with the provisions of Article 6(3) of the Habitats Directive to ensure the protection of European Sites).

As outlined in Section 2.5.4. no option arising from the Plan with the potential for AESI identified at project level will be progressed as the Plan will have identified other options that could be progressed at the project level if required. Such protective measures have been built into the plan to ensure AESI are avoided as a result of adopting the RWRP-EM.

6.3.3 General Mitigation Measures and Principles

6.3.3.1 Overview

The various measures that may be applied to options include:

- **General Measures** (established construction best-practice, etc.) which will be applied to all options;
- **Option-specific Measures** (established and reliable measures identified to avoid specific potential effects on European sites, in particular for highly sensitive species incl. freshwater pearl mussel)
- **Further assessments and data**

These measures will be applied unless project-level AAs or project-specific environmental assessments demonstrate that they are not required (i.e. the predicted effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate.

Note that these measures are not exhaustive or exclusive and must be reviewed at the project stage, taking into consideration any changes in best-practice as well as project-specific survey information or studies.

6.3.3.2 General Mitigation Measures

Scheme Design and Planning

All options will be subject to project-level environmental assessment as and when they are brought forward, which will include assessments of their potential to affect European sites during their construction or operation. These assessments will consider or identify (*inter alia*):

- potential for avoiding effects on European sites through design (e.g. alternative pipeline routes; micro siting; etc);
- best practice construction measures that need to be incorporated into scheme design and/or planning to avoid or mitigate potential effects, for example, ensuring that sufficient working area is available for pollution prevention measures to be installed, such as sediment traps; and
- operational regimes required to ensure no adverse effects occur (e.g. compensation flow releases or reduced abstraction rates [seasonal restrictions]. **Note:** these measures could only be identified through detailed site assessments and agreed through the abstraction licensing process when in place).

Irish Water will implement the objectives of their Biodiversity Action Plan (Irish Water, 2021). Where appropriate this would include measures to ensure "no net loss" of biodiversity across Irish Water sites when carrying out activities, delivering plans for example, or promote the use of nature-based solutions for water protection and wastewater treatment or manage invasive alien species on Irish Water sites to increase biodiversity on their sites.

Pollution Prevention

Best practice construction methods will be applicable to all of the proposed options and can be relied on (at this level) to prevent significant or adverse effects on a European site occurring as a result of construction related impacts (e.g. pollutants). Pollution control measures will be detailed in project specific construction and environmental management plans. The following guidance documents detail the current industry best-practices in construction that are likely to be relevant to all options:

- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters; and
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes[16]

Construction Industry Research and Information Association (CIRIA) guidance:

- CIRIA C532: Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors
- CIRIA C692: Environmental Good Practice on Site;
- CIRIA C648: Control of Water Pollution from Linear Construction Projects: Technical Guidance; and
- CIRIA C649: Control of water pollution from linear construction projects: Site guide.

The best-practice procedures and measures detailed in these documents will be followed for all construction works arising from the RWRP-EM as a minimum standard, unless project-specific investigations identify additional measures and/or more appropriate non-standard approaches for dealing with potential site-derived pollutants.

[16] https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Crossing-of-Watercourses-during-the-Construction-of-National-Road-Schemes.pdf

General measures for species and habitats

Most species-specific avoidance or mitigation measures can only be determined at the project level, following detailed project-specific surveys. Detailed species-specific mitigation measures will vary according to a range of factors that cannot be determined at the strategic RWRP-EM level. In addition, some general 'best-practice' measures may not be appropriate to the QI of the European sites concerned (for example, clearing vegetation in winter is usually proposed to avoid impacts on nesting birds; however, this is unlikely to be necessary to avoid effects on some SPA species (such as overwintering estuarine birds) and the removal of vegetation in winter might actually have a negative effect on these species through disturbance). However, the following general measures will be followed to minimise the potential for impacts on QI species unless project level environmental assessments or project level AA indicate that they are not required or not appropriate, or that alternative or additional measures are more appropriate/necessary:

Works programme: The works programme and requirements for each option will be determined at the earliest opportunity to allow surveys and mitigation to be appropriately scheduled and to provide sufficient time for consultations with bodies such as the National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA) and Inland Fisheries Ireland (IFI).

Scheme design: Will aim to minimise the environmental effects by 'designing to avoid' potential impacts.

Use less: Will aim to minimise environmental effects through water efficiency measures, for example, reducing water wastage.

Habitat Loss and Supporting Habitats Loss: Pipelines are usually (where practical) constructed within existing public roads, therefore limiting or avoiding the potential for habitat loss within European sites. Where possible all new infrastructure such as WTPs will be sited outside of European sites. Where preferred approach options are within or hydrologically/hydrogeologically linked to European sites, detailed surveys of habitats within the affected area will be undertaken to locate and avoid sensitive habitats to ensure there is no loss of QI Annex I habitats or Annex II species. Similarly, any upgrade of existing infrastructure within or adjacent to European sites will aim to avoid impacts on these species or habitats through appropriate scheme design.

Habitat features that may be used by QI species (supporting habitat) when outside the European site boundary will be avoided through project specific studies and appropriate scheme design. Surveys focusing on mobile QI species will ensure any significant areas of supporting habitat (for example, foraging areas for QI birds very near but outside of an SPA, otter holts outside an SAC boundary) will be identified and avoided or appropriate mitigation measures put in place to protect them.

Invasive Species: There is the potential for both terrestrial and aquatic non-native invasive species to be present across the country. If present, these could potentially be spread to habitats within SACs/SPAs during construction works/operation (for example, maintenance works to WTPs and pipelines). The introduction of invasive species into a European site can affect the conservation objectives for QI habitats or species, potentially adversely affecting the integrity of the European site (for example, affecting vegetation composition of an Annex I QI habitat, affecting species distribution and abundance and/or out-competing native species). Invasive species surveys (for species listed on Schedule 3 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) will be undertaken for any future projects that may arise from the RWRP-EM. If invasive species are found to be present, an Invasive Species Management Plan will be prepared to outline the control and or removal measures. These measures will ensure such species are not spread during construction

or operation of any future projects that may arise from option types outlined within the RWRP-EM. All works relating to invasive species will be implemented in line with relevant national guidelines as well as those relevant guidelines produced by Irish Water including:

- Biosecurity protocols in relation to water quality and biological sampling.
- Invasive Species Management Guidelines for Japanese knotweed (*Reynoutria japonica*), Himalayan balsam (*Impatiens glandulifera*) and giant hogweed (*Heracleum mantegazzianum*).

Pre-construction Surveys/Seasonal Restrictions/Ecological Clerk of Works: To ensure appropriate protection of QI habitats and species, pre-construction surveys will be undertaken for all future projects (where required). Additionally, the implementation of seasonal working restrictions may be required. Furthermore, works in sensitive areas will be supervised by an experienced ecologist/Ecological Clerk of Works with appropriate qualifications to manage the risks associated with the specific conservation interests of the affected European Site.

6.3.4 Option Specific Measures

The plan-level assessment has identified option specific mitigation measures have been identified for a small number of options with highly sensitive QI species (e.g. freshwater pearl mussel) as outlined in Table 6.3.1 below.

Table 6.3.1 - Option specific mitigation measures

Study Area/Option	European Site	QI Features	Mitigation Measure (in addition to General Mitigation Measures.
SA1	-	-	No option specific mitigation measures required for SA1.
SA2 (option SA2-30d and option SA2-01)	Slaney River Valley SAC	Salmon/Freshwater pearl mussel (FWPM)	Option pipeline crosses this European site. For SAC river crossings it is assumed that the least impactful solution will always be employed, for example, directional drilling beneath the river rather than open cut. Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.*

Study Area/Option	European Site	QI Features	Mitigation Measure (in addition to General Mitigation Measures.
SA3 (option SA3-523)	River Boyne and River Blackwater SAC	Salmon	Option pipeline crosses this European site. For SAC river crossings it is assumed that the least impactful solution will always be employed, for example, directional drilling beneath the river rather than open cut. Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI).
SA4	-	-	No option specific mitigation measures required for SA4.
SA5	-	-	No option specific mitigation measures required for SA5.
SA6 (option SA6-193)	River Barrow and River Nore SAC	Salmon/Freshwater pearl mussel (FWPM)	Option pipeline crosses this European site. For SAC river crossings it is assumed that the least impactful solution will always be employed, for example, directional drilling beneath the river rather than open cut. Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.*

Study Area/Option	European Site	QI Features	Mitigation Measure (in addition to General Mitigation Measures.
SA7	-	-	No option specific mitigation measures required for SA7.
SA8 (options SA8-504, SA8-510, SA8-508 and SA8-512)	Lower River Shannon SAC	Salmon/Freshwater pearl mussel (FWPM)	These option pipelines cross this European site. For SAC river crossings it is assumed that the least impactful solution will always be employed, for example, directional drilling beneath the river rather than open cut. Construction works (pipeline crossing of SAC) will avoid the main migration and spawning periods for salmon (this period is also critical to the lifecycle of the freshwater pearl mussel) to minimise the risk of displacement or barrier effects due to noise, vibration or site-derived pollutants, unless project-specific environmental assessments identify that any effects associated with construction works will be 'not significant' or will have no adverse effect on the integrity of the SAC. To note there are significant variations in the timing and duration of salmonid spawning activity throughout the Republic of Ireland (IFI,2016). Instream works should be carried out during the period July-September (except in exceptional circumstances and with agreement with IFI). *Note it is not anticipated that there would be any direct impacts on FWPM indirect effects only by impacting on their host species.*
SA9	-	-	No option specific mitigation measures required for SA9.

6.3.5 Further assessments and data to inform potential impacts

As discussed in Chapter 2.5 the management option types could have an effect on European sites and their water dependent QI species or habitats. Applying sustainable abstraction limits of 10% and 5% of Q95 will provide protection for European sites. However, as with all management option types arising from the Plan further assessments will be required at the project level to ensure the most robust data is used to inform any environmental assessment in support of planning applications/abstraction licences etc.

Further detailed site-specific hydrological assessments will be required for a number of the options relating to new or increased ground or surface water abstractions. These will be required to fully understand the potential impacts (if any) on European sites. These further assessments are particularly important for new groundwater abstractions where there is very limited information or knowledge on sustainable abstraction limits or potential zones of contribution (the area over which effects may occur). Outlined below are some of the assessments that may be required at the project level.

Potential effects include, but are not limited to, changes in water quality and/or water levels, habitat loss and disturbance. Prior to progressing any new management option, the following assessments will be required:

- **Measure 6.3.5a: Yield assessment:** This assessment will identify the amount of water that can be sustainably abstracted from a given waterbody, taking account of, for example, low flows and climate change. This data will be interpreted alongside field data on the QI(s) in question.
- **Measure 6.3.5b: Hydrological modelling:** This will indicate what change in water levels would result from a given abstraction. This data would need to be interpreted alongside field data on the QI(s) in question (for example fish habitat assessment undertaken at low flows). Modelling may also include potential changes in salinity associated with desalination plants.
- **Measure 6.3.5c: Hydrogeological modelling:** This will indicate the distribution and movement of groundwater sources. This data will need to be interpreted alongside field data on the QI(s) in question (for example. how the groundwater abstraction may interact with groundwater dependent QI habitats or species).
- **Measure 6.3.5d: Examining lake/groundwater catchment (for abstractions):** To determine if the lake is a hydraulic sink or part of groundwater flow-through systems or linked to surrounding GWDTHs.

Note that this list of assessment is non-exhaustive and must be reviewed at the project stage, taking into account project-specific survey information or studies.

6.4 Conclusion to AESI

Appendix D (see Tables D1 [SA1] – D9 [SA9]) summarises the potential impacts to European sites and the corresponding mitigation measures to ensure any potential adverse effects on site integrity are avoided as a result of progressing the Preferred Approach for the EM region. Mitigation measures are referenced in Appendix D but detailed in Section 6.3 above.

7 In-combination Effects

7.1 Assessment of In-combination Effects

Under Article 6(3) of the Habitats Directive, an assessment of 'in-combination' effects with other plans and projects is required. The assessment used the best available information at the time of writing.

The assessment of in combination effects focused on potential effects between options and effects between options and other major projects or plans. Table 7.1 presents the in-combination assessment for RWRP-EM with other plans. The assessment is undertaken at the regional level. The in-combination assessment for projects and between SAs is detailed in Appendix E (see Tables E1 [SA1] – E9 [SA9] and E10 [EM region]) and summarised in Table 7.2 below.

In summary potential in-combination effects with other plans, projects and between options were identified. However, with the implementation of mitigation there will be no adverse effects on the integrity of any European site, either alone or in-combination with other plans or projects as a result of implementing the RWRP-EM.

As noted Previously at the project level further detailed assessment of potential in-combination effects in relation to surface or groundwater abstractions will be required and appropriate measures to avoid in-combination effects be identified at that stage.

Table 7.1 - Summary of in-combination assessment with other plans

Plan/Project	Potential impacts types common to RWMP-EM and other plans	In-combination Likely Significant Effects? (Y/N)	Potential for in-combination effects and mitigation	In-combination adverse effects on site integrity? (Y/N)
Irish Water Plans				
Water Services Strategic Plan (WSSP)[17] The WSSP is the highest tier Irish Water asset management plan. It sets the overarching framework for detailed Implementation Plans including the Framework Plan and specific water services projects over the next 25 years.	• Habitat loss and disturbance from new/upgraded infrastructure • Species disturbance/ mortality • Changes to water quality or quantity	Y	A screening for AA[18] was undertaken for the WSSP which concluded that there was potential for significant effects on European sites from the implementation of the plan. The WSSP is the highest tier (Tier 1) Irish Water asset management plan. The WSSP is a high level plan with no location-specific information. The AA screening for both the WSSP and the RWRP-EM identify potential LSEs from impacts of a similar nature, and therefore a potential for in-combination effects was identified. The NIS for the WSSP highlighted the need for additional plan/project environmental assessments to be carried out at the Tier 2 and Tier 3 level. Page xii of the WSSP sets out a summary of the strategic objectives and aims of the plan. In particular, Chapter 6 presents overarching strategies (EN1 to EN3) that aim to protect and enhance the environment. Strategy EN2 is of particular relevance: *"Operate our water services infrastructure in a manner that supports the achievement of water body objectives under the Water Framework Directive and our obligations under the Birds and Habitats Directives"…"projects are designed and developed in accordance with statutory planning processes and environmental regulations from the outset. We will comply with the statutory processes relevant to our programmes and projects, including Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) under the Habitats Directive, ensuring the avoidance of potential significant adverse effects on biodiversity (including protected sites), human health, water, air quality, cultural heritage (including archaeology), soil and landscape and visual amenity as a result of the upgrade to/construction of new infrastructure, including potential transboundary effects".*	N

[17] https://www.water.ie/docs/WSSP_Final.pdf (Accessed, June 2018)
[18] https://www.water.ie/docs/WSSP-AA-Natura-Impact-Statement-(Web).pdf (Accessed, June 2018)

			The NIS for the RWRP-EM has highlighted the need for additional project level environmental assessments, while high-level mitigation measures have been outlined in Chapter 8 of this NIS. Mitigation required will be developed and delivered as options are advanced which will protect European sites within the EM region from in-combination effects that could lead to AESI. Given the overarching strategies and objectives within the WSSP to protect the environment, and with the implementation of mitigation measures, including project level AA, no AESI in light of European sites' conservation objectives are predicted as a result of in-combination effects.	
National Wastewater Sludge Management Plan (NWSMP) 2016-2021[19] The NWSMP is a Tier 2 plan which sets out the long-term strategy for the management of wastewater sludge produced at Waste WTPs under the control of Irish Water.	• Habitat loss and disturbance from new/upgraded infrastructure • Changes in water quality (increased phosphorous in receiving waters) • Loss of or disturbance to habitats or species or their supporting features, for example water quality through inappropriate siting of new infrastructure.	Y	The AA screening for the NWSMP concluded that the NWSMP could lead to significant effects on European sites. This is a high level (Tier 2) plan with no location-specific information. However, the AA screenings for both the NWSMP and the RWRP-EM identify potential LSEs from impacts of a similar nature, and therefore a potential for in-combination effects has been identified. For example, siting of new wastewater sludge infrastructure has the potential to impact the same receptors as new infrastructure under the RWRP-EM. A number of mitigation measures have been outlined in Table 6-1 of the NIS for the NWSMP which includes a number of policies, actions and research initiatives which all aim to protect the environment, including European sites. One such action states: *"Irish Water will also ensure that in carrying out its activities associated with management of wastewater sludge, that we are in compliance with our obligations under the Birds and Natural Habitats Regulations 2011-2015".* Research actions included: "Irish Water will record how the existing standards for monitoring of wastewater sludge and soil samples comply with EU and international practice. This will provide a benchmark which can be used to determine what changes need to be made going forward". Given the mitigation measures set out in the NIS for the NWSMP and the mitigation measures in Chapter 8 of this NIS, and with the requirement for project level assessments for any project arising from the plans, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects. Given the mitigation measures outlined in both the NWSMP and this NIS, no AESI in light of a European site's conservation objectives are predicted as a	N

[19] https://www.water.ie/projects-plans/our-plans/wastewater-sludge-management/Final-NWSMP.pdf (Accessed, June 2018)

			result of in-combination effects.	
Lead in Drinking Water Mitigation Plan (LDWMP)[20] In 2015, the Government published the National Strategy with the aim to ensure the protection of human health and achieve a solution to the issue of lead in drinking water. As the national public water utility, Irish Water developed the Lead in Drinking Water Mitigation Plan in order to address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework serving properties connected to the public water network. The plan identified that Orthophosphate treatment would be required at the Water Supply Zone where lead replacement is not feasible.	• Changes to water quality • Increased phosphorous in receiving waters leading to nutrient enrichment and proliferation of plant growth (eutrophication)	Y	The AA screening[21] for the LDWMP concluded that the LDWMP could lead to significant effects on European sites. This is a high level (Tier 2) plan with no location-specific information. Both the LDWMP and the RWRP-EM identify potential LSEs from impacts of a similar nature, and therefore a potential for in-combination effects has been identified. As part of the LDWMP, Irish Water developed a model to facilitate specific environmental risk assessment of any proposed orthophosphate treatment and provide a methodology to determine the risk to the receiving environment of this corrective water treatment. Mitigation measures have been outlined in Chapter 7 of the NIS for the LDWMP and states that, "*Where the EAM (Environmental Assessment Methodology) and NIS (if required) indicate an adverse effect on European site integrity in view of the site's conservation objectives, orthophosphate treatment will not be applied*". Given the mitigation measures set out in Chapter 7 of the NIS for the NWSMP and the mitigation measures in Chapter 8 of this NIS, and with the requirement for project level assessments for any project arising from the plans, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Other relevant Plans				
National Planning Framework (NPF)[22]	• Loss of habitat • Changes to	Y	The NPF, including a Strategic Flood Risk Assessment, was subject to screening for AA. The screening was undertaken at an early stage of plan development,	N

[20] https://www.water.ie/docs/Lead-in-Drinking-Water-Mitigation-Plan.pdf (Accessed, June 2018)
[21] https://www.water.ie/projects-plans/national-projects/lead-mitigation-plan/public-consultation/Lead-in-Drinking-Water-Mitigation-Plan-Natura-Impact-Statement.pdf (Accessed, June 2018)
[22] http://npf.ie/wp-content/uploads/Project-Ireland-2040-NPF.pdf (Accessed May, 2018)

The purpose of the long-term strategy is to provide a framework for the growth of Ireland's cities and towns over the next 20 years in an environmentally sustainable way. It is envisaged that the NPF will be detailed in Regional Spatial and Economic Strategies to ensure proper planning and sustainable development in the long term, at local, regional and national levels.	hydrology/ water quality • Disturbance/ disruption resulting in a reduction of key specie/species density during construction and operation • Invasive species introduction		which promotes sustainable development, and considers European sites. For example, National Planning Objective (NPO) 59 centres on the enhancement and conservation of European sites. Potential LSEs were identified from land use change from development and an increase in jobs and associated work force. The NPF identified that a key priority is *"Ensuring that water supply and waste-water needs are met by new national projects".* The conclusion of the screening for AA was that, given the uncertainty as to what the policy objectives may include, the potential for LSEs could not be ruled out and a Stage 2 AA was undertaken[23]. Therefore, there is potential for in-combination effects from the NPF and the RWRP-EM. The NPF is a strategic plan which sets the framework for, and relies to a significant degree on, other policy, strategy and plan initiatives to achieve its objectives. These other plans have been or will be subject to AA and will have identified mitigation measures to ensure no AESI. The measures committed to in these other plans will be essential to ensuring that the objectives of the NPF are met and that the NPF does not have adverse effects on any European site. Given the mitigation measures set out in Chapter 7, Table 7-1 of the NPF NIS and Chapter 8 of this NIS, and with the requirement for project level assessments for any project arising from the plans, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	
Regional Spatial and Economic Strategies The Regional Spatial and Economic Strategies is a policy document which seeks to focus future growth patterns through a strategic planning framework as required under the NPF. Each of the Regional Assemblies has a role to play in identifying regional policies and coordinating initiatives that support the delivery and implementation of national planning policy. The	• Loss of habitat • Provision of new/upgraded infrastructure • Changes to hydrology • Changes in water quality • Disturbance to species • Species mortality	Y	All Regional Spatial and Economic Guidelines are subject to screening for AA. By their very nature, such plans will promote sustainable development which also feeds into the NPF, including the provision of sustainable and clean water sources. However, there is potential for in-combination effects with the RWRP-EM. As with all projects arising from the RWRP-EM, all projects arising from Regional Spatial and Economic Strategies will be subject to project level assessments. Given the mitigation measures set out in Chapter 8 of this NIS, and with the requirement for project level assessments for any project arising from the plans, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[23] http://npf.ie/wp-content/uploads/2017/09/Natura-Impact-Statement-%E2%80%93-Ireland-2040.pdf (Accessed May, 2018)

regions are as follows: • Northern and Western Region; • Eastern and Midland Region; and • Southern Region.				
River Basin Management Plan (RBMP) (2018 -2021)[24] This plan by the Department of Housing, Planning and Local Government sets out an integrated approach to the protection, improvement and sustainable management of the water environment in Ireland.	• Provision of new/upgraded infrastructure • Land use changes • Changes to water quality or quantity improvement	Y	The AA[25] screening for the RBMP concluded that the RBMP could lead to significant effects on European sites. Although this is a strategic plan with an overarching aim of improving the water environment across the country, a potential for LSEs was identified from the provision of new/upgraded infrastructure required to improve water (for example, upgrade or construction of WTPs). Therefore, there is potential for in-combination effects with the RWRP-EM. The RBMP sets out a number of measures and objectives to address pressures on the aquatic environment from, for example, agriculture, forestry and invasive species with an overall aim of improving the water environment. Overall, this will have a positive impact on European sites and associated aquatic habitats and species. As with the Framework Plan, any projects arising as a result of the RBMP will be subject to project level AA assessments. Given the mitigation measures set out in Chapter 8, Table 8-1 of the RBMP and Chapter 8 of this NIS, including the requirement for project level assessments, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Forestry Programme 2014 – 2020: IRELAND[26] The objective of the programme is to develop a 100% State funded sustainable and competitive forest sector to provide a full range of	• Changes to water quality • Loss/ fragmentation of habitats and species • Increase in pollution from sediment and	Y	All activities funded under the programme must adhere to the principles of Sustainable Forest Management, that is foresters and forest owners must adhere to the 'Code of Best Forest Practice – Ireland'[27] and the suite of environmental guidelines (currently under review). Forestry is not listed as a key threat to protected habitats or annex species but is identified as a pressure on both. This programme was subject to screening for AA[28] which concluded that there was potential for significant effects on European sites from the implementation of the programme. Both the Forestry Programme and the RWRP-EM identify potential LSEs from impacts of a similar nature, and therefore a potential for in-	N

[24] http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf (Accessed June, 2018)
[25] http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_natura_impact_statement_0.pdf (Accessed June, 2018)
[26] https://www.agriculture.gov.ie/media/migration/forestry/forestryprogramme2014-2020/IRELANDForestryProgramme20142020230215.pdf (Accessed May, 2018)
[27] https://www.agriculture.gov.ie/media/migration/forestry/publications/codeofbestforestpractice/Code%20of%20Best%20Forest%20Prac%20Part%201.pdf (Accessed June, 2018)
[28] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturaImpactStatement290914.pdf (Accessed May, 2018)

benefits to society, environmental, economic and social, which aligns with the Forest Europe definition of forest management in a sustainable manner.	nutrients entering watercourses • Acidification		combination effects was identified. A number of mitigation measures are proposed as part of the Forestry Programme as set out in Chapter 6.1 of the NIS. A key measure as set out in Chapter 7.1.1 is that all proposed forestry projects should be subject to an assessment of their impacts, and the proximity of European sites and their associated habitats and species should be taken into account when proposals are generated. Given the mitigation measures set out in Chapter 8 of this NIS and Chapter 6 and 7 of the Forestry Programme NIS, including the requirement for project level assessments, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	
Water Resource and Supply Resilience Plan – Habitats Regulation Assessment[29] The Plan by Northern Ireland Water (NI Water) aims to have a secure, resilient water supply network that will provide protection against drought and emergency situations.	• Physical loss – destruction (including offsite effects, e.g. foraging habitat) and smothering • Physical damage – sedimentation/ silting etc. • Non-physical disturbance – noise, visual presence, human presence, light pollution • Water table/availability – drying. Flooding/storm water, changes to surface water levels and flows, changes in groundwater levels and	Y	Three water resource options and five resilience options comprising the WR & SR Plan and 13 potentially impacted internationally/European important nature conservation sites within the study area were subject to Stage 1 HRA screening. For four of the resilience options, LSEs could be confidently discounted, as no, or only very weak source-receptor-pathways were identified. For the remaining resilience option and all three water resource options, it was determined that standard mitigation (such as noise and vibration management plans, best practice pollution prevention control guidelines and timing restrictions) would be needed to discount LSE. These options could not be screened out from further assessment and these options were therefore identified as requiring Stage 2 AA. Both the Water Resource and Supply Resilience Plan and the RWRP-EM identify potential LSEs from impacts of a similar nature, and therefore potential for in-combination effects was identified. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods, and sensitive siting of the works based on baseline survey information as detailed in the Water Resource and Supply Resilience Plan, it anticipated that the potential for adverse effects on nature conservation sites of international or European importance would be avoided/eliminated. No AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[29] https://www.niwater.com/sitefiles/resources/pdf/2020/wrm/wrsrplanhabitatregulationsassessment.pdf Accessed August 2020

	flows, changes to coastal water movement • Toxic contamination – water pollution, soil , air pollution • Non-toxic contamination – nutrient enrichment etc.			
National Marine Planning Framework (NMPF)[30] The Plan by the Department of Housing, Planning and Local Government aims to provide a common framework for the marine area where environmental, social and economic factors will be considered in the decision-making process for a range of projects, plans and policy.	• Habitat loss or destruction • Loss of key supporting habitats and ecosystem complexes • Habitat fragmentation or degradation • Disturbance to habitats/species • Species mortality • Alterations to water quality and/or water movement • Alterations to air quality • Alterations due to climate change • Introduction or spread of invasive	Y	TheNMPF is a strategic plan subject to a high-level AA and SEA. The AA concluded that there was potential for significant effects on European sites from the implementation of the programme given the nature of the policy objectives that it presents. The NMPF is at a national strategic level, therefore it focuses on the potential for indirect impacts arising from the developments arising from the various national policy objectives. Both the NMPF and RWRP-EM identify potential LSEs from impacts of a similar nature, and therefore the potential for in-combination effects was identified. A number of mitigation measures are proposed as part of the NMPF in Chapter 8 of the accompanying NIS for the NMPF. The mitigation chapter was revised post consutation to reflect the final and adopted NMPF. As the NMPF is a strategic plan it relies on other policy, strategy and plan initiatives to achieve its objectives to ensure that the objectives are met and that there are no adverse effects on any European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[30] gov.ie - National Marine Planning Framework (www.gov.ie) Accessed October 2021

	species			
Limerick County Development Plan 2010-2016[31] The Plan sets a framework for the proper planning and sustainable development of Limerick County from the period of 2010-2016 (as extended).	• Land take • Changes in water quality • Loss of priority habitat • Disturbance • Changes in groundwater levels • Reduction of foraging habitat for whooper swans	Y	Limerick County Development Plan 2010-2016 was subject to a SEA, Stage 1 and Stage 2 AA. The AA screening undertaken identified potential LSEs on four Natura 2000 sites; the Lower River Shannon SAC, Curraghchase Woods SAC, Askeaton Fen SAC and the River Shannon and River Fergus Estuaries SPA. There is the potential for in-combination effects with the Plan and the RWRP-EM. However, a number of mitigation measures are proposed as part of the Development Plan in Chapter 6 of the accompanying NIS for Limerick County Development Plan. The Plan states that with these mitigation measures in place there will be no adverse effects on the integrity of any Natura 2000 site as a result of the adoption of the Proposed Variation, either individually or in combination with other plans and projects, and that no reasonable scientific doubt remains in this regard. Therefore, given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Clare County Development Plan 2017-2023[32] The Plan sets out an overall strategy for the proper planning and sustainable development of the functional area of Clare County Council over a six year period.	• Changes in water quality • Disturbance to lesser horseshoe bats • Changes to the hydrology of groundwater-dependent QI habitats • Invasive non-native species • Disturbance to	Y	Clare County Development Plan 2017-2023 was subject to a SEA, Stage 1 and Stage 2 AA and LSEs were identified for the Plan. There is the potential for in-combination effects with the Plan and the RWRP-EM. However, the NIS for Clare County Development Plan determined that with the application of the mitigation measures provided in Table C2 of the NIS, there would be no adverse effects on the integrity of European Sites in isolation or in combination with other Plans and Projects acting in the same area. Therefore, given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[31] https://www.limerick.ie/council/services/planning-and-property/development-plans/county-development-plan
[32] https://www.clarecoco.ie/services/planning/ccdp2017-2023/

	QI birds			
Cork County Development Plan 2014[33] The Plan is a six year development plan which sets out the overall planning and sustainable development strategy for the county which must be consistent with the National Spatial Strategy 2002-2020 and the South West Regional Planning Guidelines 2010-2022.	• Changes in water quality • Habitat loss • Habitat degradation • Mortality	Y	Cork County Development Plan 2014 was subject to a SEA, Stage 1 and Stage 2 AA. The Plan identified Natura 2000 sites and QIs that could be affected by the Plan and what the potential LSEs were. There is the potential for in-combination effects with the Plan and the RWRP-EM. However, with the recommendations set out in Table 6 of the NIR, there is no potential for adverse effects on European sites. Therefore, given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Galway County Development Plan 2015-2021[34] The Galway County Development Plan 2015-2021 sets out an overall strategy for the proper planning and sustainable development of the functional area of Galway County Council.	• Habitat loss • Habitat degradation • Disturbance • Changes in key indicators of conservation value such as decrease in water quality/quantity	Y	Galway County Development Plan 2015-2021 was subject to a SEA, Stage 1 and Stage 2 AA. The Plan identified potential LSEs that could occur through its implementation. There is the potential for in-combination effects with the Plan and the RWRP-EM. However, with the recommendations set out in Chapter 4 of the NIR, there is no potential for adverse effects on European sites. Therefore, given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Regional Spatial and Economic Strategies The Regional Spatial and Economic Strategies is a policy document which seeks to focus future growth patterns through a	• Loss of habitat • Provision of new/upgraded infrastructure • Changes to hydrology • Changes in water quality	Y	All Regional Spatial and Economic Guidelines are subject to screening for AA. By their very nature, such plans will promote sustainable development which also feeds into the NPF, including the provision of sustainable and clean water sources. However, there is potential for in-combination effects with the RWRP-EM. As with all projects arising from the RWRP-EM, all projects arising from Regional Spatial and Economic Strategies will be subject to project level assessments. Given the mitigation measures set out in Chapter 8 of this NIS, and with the	N

[33] http://corkcocodevplan.com/
[34] http://www.galway.ie/en/services/planning/planspolicy/gcdp2021/

strategic planning framework as required under the NPF. Each of the Regional Assemblies has a role to play in identifying regional policies and coordinating initiatives that support the delivery and implementation of national planning policy. The regions are as follows: • Northern and Western Region; • Eastern and Midland Region; and • Southern Region.	• Disturbance to species • Species mortality		requirement for project level assessments for any project arising from the plans, no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	
Roscommon County Development Plan 2014-2020[35] The plan sets out the strategy for the planning and sustainable development of area and includes Local Area Plans.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality • Alterations due to climate change	Y	The Roscommon County Development Plan 2014 – 2020 was subject to AA. The inclusion of mitigation measures in the Plan will prioritise the avoidance of impacts and mitigate impacts where these cannot be avoided, thus resulting in this Plan excluding significant adverse effects on the integrity of Natura 2000 sites. There is potential for in-combination effects with the Plan and the RWRP-EM. However, given the mitigation measures proposed as part of the Roscommon County Development Plan, there is no potential for adverse effects on European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[35] http://www.roscommoncoco.ie/en/Services/Planning/Roscommon-County-Council-Planning-Publications/Roscommon-County-Council-Planning-Publications/County_Development_Plan_2014_-_2020/County-Development-Plan-2014-2020/

Draft Wexford County Development Plan 2021-2027[36] The Wexford County Development Plan 2021-2027 sets out the overall strategy for the proper planning and sustainable development of County Wexford for the plan period and beyond.	• Habitat loss and fragmentation • Alterations to water quality/water movement • Threats to species and/or habitats as a result of the introduction and/or spread of non-native invasive species • Disturbance, displacement or mortality impacts to species • Decrease in air quality • Changes in the natural functioning of coastal systems	Y	The Draft Wexford County Development Plan 2021 -2027 was subject to AA and SEA. The Natura Impact Report concluded that the draft plan will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Draft Wexford County Development Plan in Section 8 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Carlow County Development Plan 2015 – 2021[37] The Plan establishes the strategic priorities for the County to guide development throughout County Carlow for the proper planning and sustainable development	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water	Y	The Carlow County Development Plan 2015 – 2021 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan will not have a significant adverse effect on the integrity of the Natura 2000 network. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Carlow County Development Plan in Section 4 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are	N

[36] https://consult.wexfordcoco.ie/en/consultation/draft-wexford-county-development-plan-2021-2027
[37] http://www.carlow.ie/wp-content/documents/uploads/carlow-county-dev-plan-2015-2021.pdf

of County Carlow.	movement		known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	
Kildare County Development Plan 2017 – 2023[38] The aim of this plan is to facilitate sustainable development, through the provision of high-quality employment opportunities and residential developments supported by quality urban and rural environments with physical and social infrastructure to support communities throughout the county.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement	Y	The Kildare County Development Plan 2017 - 2023 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan is not foreseen to give rise to any significant effects the ecological integrity of any European sites, alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Kildare County Development Plan in Section 4 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Kilkenny City and County Draft Development Plan[39] This Development Plan sets out Kilkenny County Council's policies and objectives for the proper planning and sustainable development of the City and County from 2021 to 2027.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality • Alterations due	Y	The Kilkenny City and County Draft Development Plan 2021 – 2027 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan is not foreseen to give rise to any significant effects on designated European sites, alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Kilkenny City and County Draft Development Plan in Section 5 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Draft Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[38] https://kildare.ie/countycouncil/YourCouncil/Publications/Planning/developmentplans/KildareCountyDevelopmentPlan2017-2023/
[39] https://consult.kilkenny.ie/en/consultation/kilkenny-city-and-county-draft-development-plan-2021-2027

	to climate change			
Laois County Development Plan 2017 – 2023[40] The Plan sets out a framework for the sustainable spatial and physical development of the County Laois while considering the conservation and protection of the built and natural environment.	• Loss of biodiversity • Damage to the hydrogeological and ecological function of soil • Adverse impacts to the status and quality of water bodies	Y	The Laois County Development Plan 2017 – 2023 was subject to AA and SEA. The AA conclusion statement stated that having incorporated mitigation commitment; it is considered that the Laois County Development Plan 2017-2023 is not foreseen to have any likely significant effects on the ecological integrity of any European Site. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation proposed as part of the Laois County Development Plan in the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, any lower-level plans and projects arising through the implementation of the Plan will themselves be subject to relevant stages of Appropriate Assessment when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Draft Offaly County Development Plan 2021 – 2027[41] This Plan is a land use plan and overall strategy for the proper planning and sustainable development of the functional area of County Offaly over the period 2021- 2027.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality • Alterations due to climate change	Y	The Draft Offaly County Development Plan 2021 – 2027 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan is not foreseen to give rise to any significant effects on designated European sites, alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Draft Offaly County Development Plan in Section 5 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Draft Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[40] https://laois.ie/departments/planning/development-plans/draft-laois-county-development-plan-2017-2023/
[41] https://www.offaly.ie/eng/Services/Planning/County-Development-Plan-2021-2027/Stage-2-Draft/Draft-Offaly-County-Development-Plan-2021-2027.html

Draft Longford County Development Plan 2021-2027[42] The Plan sets out policies and strategies to strengthen and develop the economic, social and cultural life of the county.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality	Y	The Draft Longford County Development Plan 2021 - 2027 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan will not have a significant adverse effect on the integrity of the Natura 2000 network. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Draft Longford County Development Plan in Section 4 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Draft Westmeath County Development Plan 2021-2027[43] The Plan is designed to set out the key policy context for the development of the county and is set within a hierarchy of national and regional spatial plans and guidelines and provides a detailed strategic landuse framework for each local authority.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality • Alterations due to climate change	Y	The Draft Westmeath County Development Plan 2021 – 2027 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan is not foreseen to give rise to any significant effects on designated European sites, alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Draft Westmeath County Development Plan in Section 5 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Draft Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[42] https://www.longfordcoco.ie/services/planning/preparation-of-longford-cdp-2021-2027/previous-stages-of-development-plan-2021-2027-preparation/stage-3-draft-plan-public-consultation.html
[43] https://consult.westmeathcoco.ie/en/consultation/draft-westmeath-county-development-plan-2021-2027

Draft Meath County Development Plan 2021-2027[44] The Meath County Development Plan 2020-2026 sets out the policies and objectives and the overall strategy for the development of the County over the plan period 2020-2026.	• Impacts on water quality • Impact on hydrogeology • Habitat loss/degradation • Disturbance impacts on sensitive species • Reduction in ecological connectivity	Y	The Draft Meath County Development Plan 2021 – 2027 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan is not foreseen to give rise to any significant effects on designated European sites, alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, assuming the successful implementation of the policies/objectives in the Written Statement of the Draft Meath County Development Plan, compliance with the Settlement Written Statement and Maps and application of the mitigation measures provided in Table C1 and C2 (Appendix C) of the Draft Plan, there will be no adverse effects on integrity of European Sites in isolation, or in combination, with other Plans and Projects acting in the same area. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Draft Louth County Development Plan 2021-2027[45] The Draft Louth County Development Plan 2021-2027 sets out the Council's overall strategy for the proper planning and sustainable development of County Louth	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality • Alterations due to climate change	Y	The Draft Louth County Development Plan 2021 – 2027 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan is not foreseen to give rise to any significant effects on designated European sites, alone or in combination with other plans or projects. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Draft Louth County Development Plan in Section 5 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Draft Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[44] https://consult.meath.ie/en/consultation/meath-draft-county-development-plan
[45] https://www.louthcoco.ie/en/publications/development-plans/draft-louth-county-development-plan-2021-2027/draft-louth-county-development-plan-2021-2027.html

Cavan County Development Plan 2014 – 2020[46] The Plan sets out the strategic land use objectives and policies for the overall development of the County up to 2020.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement	Y	The Cavan County Development Plan 2014 – 2020 was subject to Stage 1 Screening for AA. The AA Screening report concluded that there are likely to be no significant effects on the Natura 2000 sites and that appropriate protection and mitigation, where necessary, in respect of Natura 2000 Network has been formulated within the Amended Draft Cavan County Development Plan. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Cavan County Development Plan there is no potential for adverse effects on European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Wicklow County Development Plan 2016 – 2022[47] The Wicklow County Development Plan 2016-2022 sets out the overall strategy for the proper planning and sustainable development of County Wicklow for the plan period and beyond.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement	Y	The Wicklow County Development Plan 2016 -2022 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan will not have a significant adverse effect on the integrity of the Natura 2000 network. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Wicklow County Development Plan in Section 4 of the accompanying NIS for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
South Dublin County Council Development Plan 2016 – 2022[48] The plan sets out the framework to guide further growth and development in the	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density	Y	The South Dublin County Development Plan 2016 - 2022 was subject to Stage 1 Screening for AA. This screening concluded that a Stage Two Appropriate Assessment (AA) of the Draft South Dublin County Development Plan 2016-2022 is not required, given that there are no likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on any Natura 2000 site. Given the mitigation measures set out in Chapter 8 of this NIS and with the	N

[46] http://www.cavancoco.ie/cavan-county-development-plan.htm
[47] https://www.wicklow.ie/Living/Services/Planning/Development-Plans-Strategies/National-Regional-County-Plans/Wicklow-County-Development-Plan/Wicklow-County-Development-Plan-2016-2022
[48] https://www.southdublindevplan.ie/stage-2

county.	• Alterations to water quality/water movement		standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	
Dún Laoghaire-Rathdown County Council Draft County Development Plan, 2022-2028[49] The Plan sets out the policy objectives and the overall strategy for the proper planning and sustainable development of the County over the plan period from 2022 to 2028.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement • Alterations to air quality • Alterations due to climate change	Y	The Dún Laoghaire-Rathdown County Council Draft County Development Plan, 2022-2028 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan will not have a significant adverse effect on the integrity of the Natura 2000 network. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Dún Laoghaire-Rathdown County Council Draft County Development Plan in Section 5 of the accompanying NIR for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Fingal Development Plan 2017-2023[50] The Plan sets out the Council's proposed policies and objectives for the development of the County over the Plan period.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement	Y	The Fingal Development Plan 2017 -2023 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan will not have a significant adverse effect on the integrity of the Natura 2000 network. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Fingal Development Plan in Section 4.9 of the accompanying NIR for the Plan, there is no potential for adverse effects on European sites. In addition, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[49] https://www.dlrcoco.ie/en/county-development-plan/draft-county-development-plan-2022-2028
[50] https://www.fingal.ie/fingal-development-plan-2017-2023

Dublin City Development Plan 2016-2022[51] The Plan provides an integrated coherent spatial framework for the development of Dublin City.	• Habitat loss and fragmentation impacts • Water quality impacts • Disturbance to wildlife • In-combination impacts	Y	The Dublin City Development Plan 2016 - 2022 was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the Plan will not have a significant adverse effect on the integrity of the Natura 2000 network. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the Dublin City Development Plan in Chapter 5 of the accompanying NIR for the Plan, there is no potential for adverse effects on European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Food Vision 2030[52] This is a ten-year agri-food strategy that aims to establish how the agri-food sector is to develop up to 2030 for the benefit of the Irish economy, society and environment.	• Agricultural intensification • Atmospheric factors • Diffuse pollution of surface water and groundwater • Drainage • Reduced breeding success or increased predation, possibly resulting in reduced population viability • Impacts to inshore and offshore fisheries	Y	The Food Vision 2030 strategy was subject to AA and SEA. The AA concluded that after the consideration of the positive sustainable measures in place and with safeguards and best practice measures there would be no adverse impacts on the integrity of European sites. There is potential for in-combination effects with the strategy and the RWRP-EM. However, with the mitigation measures proposed as part of Food Vision 2030 in Chapter 5 of the accompanying NIS for the Strategy, there is no potential for adverse effects on European sites. Given the mitigation measures set out in Chapter 6 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[51] https://www.dublincity.ie/dublin-city-development-plan-2016-2022
[52] https://www.gov.ie/en/publication/c73a3-food-vision-2030-a-world-leader-in-sustainable-food-systems/

EU Biodiversity Strategy for 2030[53] This is a long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030 and contains specific actions and commitments.	• Establishing a larger network of protected areas • Launching a nature restoration plan • Improved implementation of biodiversity strategies	N	The 2030 Biodiversity Strategy builds upon and goes beyond the existing EU Birds and Habitats Directives and the EU Natura 2000 Network of protected areas. The strategy aims to build our societies' resilience to future threats such as the impacts of climate change, forest fires, food insecurity and disease outbreaks - including by protecting wildlife and fighting illegal wildlife trade. Given the nature of this plan there is potential for beneficial impacts to biodiversity and the conservation objectives of European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
National Biodiversity Action Plan[54] The Plan sets out actions through which a range of government, civil and private sectors will undertake to achieve Ireland's 'Vision for Biodiversity', and follows on from the work of the first and second National Biodiversity Action Plans.	• Strengthened legislation to tackle biodiversity loss • Increased awareness of biodiversity and ecosystem services • Conservation of biodiversity and ecosystem services • Improved management of protected areas and species	N	This plan provides a framework to track and assess progress towards Ireland's Vision for Biodiversity over a five-year timeframe from 2017 to 2021. Ireland's Vision for Biodiversity is: "That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally." Given the nature of this plan there is potential for beneficial impacts to biodiversity and the conservation objectives of European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
All Ireland Pollinator Plan 2021 – 2025[55] This plan aims to help restore pollinator populations to healthy	• Making land more pollinator friendly • Conserving rare pollinator	N	At its core, the Pollinator Plan is about providing food and shelter across all types of land so that pollinators can survive and thrive. It creates a framework to bring together pollinator initiatives across the island. Given the nature of this plan there is potential for beneficial impacts to biodiversity and the conservation objectives of European sites.	N

[53] https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en
[54] https://www.npws.ie/legislation/national-biodiversity-plan
[55] https://pollinators.ie/new-ambitious-plan-to-save-our-bees-creates-a-buzz/

levels. Over the next five years, this plan will work to bring about landscape where pollinators can flourish.	species • Support for beekeepers		Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	
National Waste Action Plan for a Circular Economy 2020 – 2025[56] This plan is Ireland's new roadmap for waste planning and management. It shifts focus away from waste disposal and looks instead to how we can preserve resources by creating a circular economy.	• Transition to a circular economy • Supporting reuse and recycling of materials	N	The plan identifies opportunities for the application of circular economy principles across a range of areas such as food. The plan also recognises the importance of eco- and smart design in waste prevention through the delivery of products that are more amenable to recycling or reuse of constituent components. Given the nature of this plan there is limited potential for negative impacts to biodiversity and some potential for beneficial impacts to biodiversity through a reduction in waste and pollution. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
National Climate Action Plan 2019[57] This plan sets out a course of action over the coming years to address climate breakdown. Note: at the time of writing the Climate Action Plan 2021 was still in development and not published.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement	Y	The plan sets out proposals to reduce Ireland's greenhouse gas emissions in line with other important policy objectives, such as promoting sustainable economic development pathways, improving energy security, and addressing air pollution impacts on human health. However, there is also potential for in-combination effects with the Plan and the RWRP-EM. Given the nature of this plan there is potential for beneficial impacts to biodiversity and the conservation objectives of European sites. There is also potential for negative impacts to European sites, however, all lower level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N

[56] https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/#:~:text=The%20Waste%20Action%20Plan%20for%20a%20Circular%20Economy%20sets%20out,and%20Citizen%20Engagement%2C%20Plastics%20and

[57] https://assets.gov.ie/25419/c97cdecddf8c49ab976e773d4e11e515.pdf

Offshore Renewable Energy Development Plan[58] This plan provides a framework for the sustainable development of Ireland's offshore renewable energy resource.	• Loss or damage to habitats • Damage to non-mobile species • Impacts to water quality and water movement • Species disturbance • Collision risk • Changes to food availability	Y	The Offshore Renewable Energy Development Plan (OREDP) was subject to AA and SEA. The AA concluded that, with the implementation of mitigation measures, the OREDP will not have a likely significant effect on a Natura site or cetacean species listed under Annex IV of the Habitats Directive. There is potential for in-combination effects with the Plan and the RWRP-EM. However, with the mitigation measures proposed as part of the OREDP in Chapter 11 of the accompanying NIS, there is no potential for adverse effects on European sites. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
National Adaptation Framework (NAF)[59] This plan specifies the national strategy for the application of adaptation measures in different sectors and by local authorities to reduce the vulnerability of the State to the negative effects of climate change and to avail of any positive effects that may occur.	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in species density • Alterations to water quality/water movement	Y	The National Adaptation Framework was subject to Screening for AA. This screening concluded that an AA of the framework was not required, given that the administrative provisions of Articles 9(1) and 9(3) of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations, as amended have been not been fulfilled. Adaptation approaches and identification of locations or sites will be detailed via lower-level adaptation plans and strategies which may undergo appropriate assessment, as appropriate. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	N
Tourism Development and Innovation 2016 – 2022[60] This strategy sets out the framework and mechanisms for delivery of investment to cities,	• Loss/reduction of habitat area • Habitat fragmentation • Disturbance to key species • Reduction in	Y	The strategy will be outcome based and will identify the types of projects to invest in that will support innovation in the tourism sector, rather than specific projects or locations for investment. There is potential for in-combination effects with the Plan and the RWRP-EM. However, all lower-level plans and projects arising through the implementation of the Plan will themselves be subject to AA/screening for AA when further details of	N

[58] https://www.gov.ie/en/publication/e13f49-offshore-renewable-energy-development-plan/
[59] https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/
[60] https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/6_Funding/1-FI-Tourism-Investment-Strategy-Final-07-06-16.pdf

towns, villages, communities and businesses across the country	species density • Alterations to water quality/water movement		design and location are known. Given the mitigation measures set out in Chapter 8 of this NIS and with the standard good practice construction methods no AESI in light of a European site's conservation objectives are predicted as a result of in-combination effects.	

Table 7.2 - Summary of In-combination Assessment between SAs and Projects and between SAs within the EM region

Study Area	Appendix E	Potential for in-combination effect	Conclusion
SA1	See Table E1	**In-combination with other projects** No in-combination effects with other plans and projects were identified for SA1. **In-combination between Preferred Approach options** No in-combination effects from the Preferred Approach options within SA1 were identified.	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E1)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.
SA2	See Table E2	**In-combination with other projects** Potential in-combination effects with other projects and options were identified on the **Slaney River Valley SAC** predominantly associated with pollution impacts during construction if the construction phase for **options SA2-38, SA2-40, SA2-35, SA2-30d, SA2-01** and **SA2-28** is concurrent with Making Baltinglass the Hub for South West Wicklow works and Arklow to Shillelagh Recreational Trail works. Other potential impacts included habitat loss, habitat degradation, mortality of QI species, spread of invasive non-native species and disturbance impacts (see Appendix E, Table E2 for details on specific options). **In-combination between Preferred Approach options** There is potential for construction related in-combination effects from the projects within SA2 to the **Slaney River Valley SAC** including habitat loss, habitat degradation, mortality of QI species, spread of invasive non-native species and disturbance impacts if Preferred Approach **options SA2-35, SA2-38, SA2-40, SA2-30d, SA2-01** and **SA2-28** were constructed at the same time (see Appendix E, Table E2 for details on specific options).	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E2)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.
SA3	See Table E3	**In-combination with other projects** Potential in-combination effects with other projects and options were identified on the **River Boyne and River Blackwater SAC** predominantly associated with pollution impacts during construction if the construction phase for **options SA3-523 (options 96, 100, 97, 98, 102, 99, 101), SA3-77, SA3-88** and **SA3-47** is concurrent with 13 projects in the SA3 area (see Appendix E, Table E3 for details on specific options). Other potential impacts included habitat loss, habitat degradation, mortality of QI species, spread of invasive non-native species and disturbance impacts, with potential for habitat degradation impacts during operation with various projects. **In-combination between Preferred Approach options** There is potential for construction related in-combination effects from the projects within SA3 to the **River**	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E3)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
		Boyne and River Blackwater SAC & **SPA** including habitat loss, habitat degradation, mortality of QI species, spread of invasive non-native species and disturbance impacts if Preferred Approach **options SA3-523 (options 96, 100, 97, 98, 102, 99, 101), SA3-77, SA3-88** and **SA3-47** were constructed at the same time (see Appendix E, Table E3 for details on specific options).	
SA4	See Table E4	**In-combination with other projects** There are potential in-combination effects with other projects and options for **Lough Ennell SAC** and **SPA** and **Lough Owel SAC** and **SPA** from habitat degradation and loss, disturbance and from spread of invasive species if the construction phase for **option SA4-501 (options 10, 36a, 46, 52, 53, 60, 66, 71, 77, 20, 63)** is concurrent with Mullingar Courthouse - PPP: Ongoing Unitary Charge Payments, Railway Terrace, Mullingar, Mullingar Radiation Department, Ardmore Road, Mullingar, Blackhall, Mullingar, Mullingar Theatres, Saplings Mullingar & Gaelscoil an Choillin, Canal Avenue & Environs Regeneration Project, Kinnegad Regeneration works, Mullingar Greenway Recreational Hub and proposed Mullingar Town Bus Service. Potential for in-combination construction related impacts in relation to pollution on **Lough Ree SAC** and **SPA** if The Yard, Abbeyshrule – Community and Economic Hub works are progressed at the same time as. There is also potential for in-combination construction related impacts in relation to pollution and disturbance on **Lough Derravarragh SPA** if construction phase for **option SA4-501 (options 10, 36a, 46, 52, 53, 60, 66, 71, 77, 20, 63)** is concurrent with Historic Granard Motte Project works. **In-combination between Preferred Approach options** There is potential for construction related in-combination effects from the Preferred Approach options within SA4 on the **River Barrow and River Nore SAC** (potential impacts from pollution during construction) and the **River Boyne and River Blackwater SAC** (from spread of invasive species, pollution and disturbance to otter during construction) if the Preferred Approach options are constructed at the same time (see Appendix E, Table E4 for details on specific options).	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E4)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.
SA5	See Table E5	**In-combination with other projects** Potential in-combination effects with other projects and options were identified for **River Suck Callows SPA** and **Lough Ree SPA** from disturbance to QI bird species and/or habitat degradation during construction if options **SA5-02, SA5-518, SA5-17a** and **SA-37b** are progressed at the same time as Portiuncula University Hospital 50 bed ward block works, and also with potential for habitat degradation impacts during operation. There is also potential for in-combination construction related impacts in relation to disturbance to otter and pollution on **Lough Ree SAC** if the construction phase of options **SA5-518** and **SA5-09a** is concurrent with various projects in the SA5 area (see table E5 Appendix E for details on specific options) and during operation of some of these various projects from habitat degradation.	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E5)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
		Potential in-combination impacts from disturbance, spread of invasive species and/or habitat degradation on **River Shannon Callows SAC, River Suck Callows SPA**, **Lough Ree SAC** and **SPA** (disturbance only), **Middle Shannon Callows SPA** (disturbance only) if the construction phase for **SA5-09a, SA5-37b**, **SA5-17a**, **SA5-80**, **SA5-84** and **SA5-81** is concurrent with various projects in the SA5 area and during operation of some of these various projects from habitat degradation (see Appendix E, Table E5 for details on specific options) . **In-combination between Preferred Approach options** There is potential for construction and operational related in-combination effects from the Preferred Approach options within SA5 on the **River Suck Callows SPA** from habitat degradation and disturbance impacts if construction of options is concurrent and during operation from habitat degradation. Potential for habitat loss, disturbance, spread of invasive species and habitat degradation impacts on **River Shannon Callow SAC** if construction of options is concurrent and during operation through habitat degradation. Potential for disturbance impacts on **Middle Shannon Callows SPA** if construction of options is concurrent. Potential for disturbance impacts on **All Saints Bog SPA** if construction of options is concurrent. Potential for disturbance impacts on **Lough Ree SAC** and **SPA** if construction of options is concurrent and from habitat degradation and water table/availability impacts on **Lough Ree SAC** during operation (see Appendix E, Table E5 for details on specific options).	
SA6	See Table E6	**In-combination with other projects** Potential in-combination effects with other projects and options were identified for **River Barrow and River Nore SAC** from disturbance, habitat degradation, spread of invasive species and/or habitat loss if options **SA6-193, SA6-197, SA6-19, SA6-24, SA6-191, SA6-33, SA6-38, SA6-45a, SA6-53a, SA6-57a, SA6-64, SA6-69a, SA6-77, SA6-86a, SA6-90, SA6-94, SA6-99, SA6-104, SA6-105, SA6-113a, SA6-122, SA6-553, SA6-126, SA6-149** and **SA6-156** progress concurrently with Corrig Glen, Station Road, Portarlington, Co. Laois works, Monasterevin Town Centre Regeneration works, Colaiste Mhuire Carlow, Knockbeg works, Carlow Town works, Carlow Wastewater Treatment Plant, Carrigbrook, Tullow Road works, Emo Court works, Libraries Capital Programme - Portlaoise Library, Portlaoise - A Low Carbon Town, Presentation Convent & Lands, Portlaoise, Portlaoise - A Cultural Quarter, Portlaoise Southern Distributor Road, and Portlaoise 40 bed Residential Mental Health Unit works, and Altamont House and Gardens works. There is also the potential for impacts during operation of some of these various projects from habitat degradation (see Appendix E, Table E6 for details on specific options). Potential in-combination impacts from disturbance, spread of invasive species and habitat degradation on **Slaney River Valley SAC** if **option SA6-193** and **SA6-33** works are concurrent with Altamont House and Gardens works.	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E6)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
		Potential in-combination impacts from spread of invasive species and habitat degradation on **Charleville Wood SAC** if **option SA6-552** works concurrent with Tullamore Urban Area & Kearney's Field works and the Residential Development at Clonminch Road, Tullamore works. **In-combination between Preferred Approach options** There is potential for construction and operational related in-combination effects from the Preferred Approach options within SA6 on the **River Barrow and River Nore SAC** from habitat degradation, water table/availability, disturbance impacts, mortality and spread of invasive species if construction of options is concurrent and/or during operation (see Appendix E, Table E6 for details). There is potential for for disturbance impacts on **Slieve Bloom Mountains SPA** if construction of options is concurrent. There is potential for habitat degradation and water table/availability impacts on **Lisbigney Bog SAC** during operation. There is potential for disturbance, spread of invasive non-native species and habitat degradation impacts on **Slaney River Valley SAC** if construction of options is concurrent.	
SA7	See Table E7	**In-combination with other projects** Potential in-combination effects with other projects and options were identified for **Lough Derg, North-east Shore SAC** from habitat degradation, disturbance and spread of invasive non-native species impacts during construction if options **SA7-55, SA7-504** (habitat degradation impact only)**, SA7-23, SA7-61** and **SA7-14** works are progressed at the same time as the improvements to the boat mooring facilities works at Lough Derg Yacht Club. Potential in-combination effects with other projects, plans and between options were identified for **Lough Derg (Shannon) SPA** from disturbance impacts during construction if options **SA7-55, SA7-61** and **SA7-14** works are progressed at the same time as the improvements to the boat mooring facilities works at Lough Derg Yacht Club. Potential in-combination effects with other projects, plans and between options were identified for **Sharavogue Bog SAC** from pollution impacts during construction and from habitat degradation impacts during operation if option **SA7-63** is concurrent with Roscrea Enterprise, Digital and Social Impact Hub. **In-combination between Preferred Approach options** There is potential for construction related in-combination effects from the Preferred Approach options within SA7 on **Lough Derg, North-east Shore SAC** from habitat loss, spread of invasive species and habitat degradation impacts, on **Lough Derg, (Shannon) SPA** from disturbance and on **River Shannon Callows SAC** from spread of invasive species and habitat degradation if construction of options within SA7 are concurrent (see Appendix E, Table E7 for details).	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E7)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
SA8	See Table E8	**In-combination with other projects** Potential in-combination effects with other projects, plans and between options were identified for **Lower River Shannon SAC** from habitat degradation, habitat loss (options **SA8-09**, **SA8-504**, **SA8-508** and **SA8-512** only), mortality (options **SA8-504**, **SA8-508** and **SA8-512** only), disturbance and spread of invasive non-native species if the construction phase of options **SA8-09, SA8-177, SA8-512** (habitat degradation, disturbance and spread of invasive non-native species impacts only), **SA8-01** (in conjunction with **SA8-172**), **SA8-504, SA8-22, SA8-24, SA8-179** (habitat degradation and spread of invasive non-native species impacts only)**, SA8-21** (habitat degradation impacts only), **SA8-510, SA8-508, SA8-52** (habitat degradation impacts only), **SA8-59** (habitat degradation impacts only), **SA8-68** (habitat degradation impacts only), **SA8-100, SA8-149** (habitat degradation impacts only), **SA8-145** (habitat degradation impacts only), and **SA8-523** (habitat degradation impacts only) is concurrent with Coonagh to Knockalisheen Road works, Shannon Crossing/Killaloe, Bypass/R494 Upgrade works, N21/N69 Limerick to Adare to Foynes Road & Limerick Regeneration Programme works, N21 Newcastle West Road Scheme/N21 Abbeyfeale Road Scheme works and Bunratty Folk Park works. There is also the potential for habitat degradation impacts during operation of some of these various projects from options **SA8-01** (in conjunction with **SA8-172**) **SA8-177, SA8-504, SA8-508** and **SA8-510** (see Appendix E, Table E8 for details on specific options). Potential in-combination effects with other projects and options were identified for **River Shannon and River Fergus Estuaries SPA** if the construction phase of options associated with **SA8-09**, **SA8-01**, **SA8-504**, **SA8-510** and **SA8-100** (disturbance impact only) is concurrent with Coonagh to Knockalisheen Road works, N21 Newcastle West Road Scheme/N21 Abbeyfeale Road Scheme works, Bunratty Folk Park works and N21/N69 Limerick to Adare to Foynes Road & Limerick Regeneration Programme works. Potential in-combination effects with other projects and options were identified for **Lough Derg (Shannon) SPA** from pollution if the construction phase of option **SA8-120** is concurrent with Shannon Crossing/Killaloe, Bypass/R494 Upgrade works. Potential in-combination effects with other projects, plans and between options were identified for **Blackwater River (Cork/Waterford) SAC** from habitat degradation if construction phase of option **SA8-516** is concurrent with the N20 Cork to Limerick works and Celtic Interconnector Project works. Potential in-combination effects with other projects, plans and between options were identified for **Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA** from disturbance if construction phase of options associated with **SA8-98** concurrent with N21/N69 Limerick to Adare to Foynes Road & Limerick Regeneration Programme works and the N21 Newcastle West Road Scheme/N21 Abbeyfeale Road Scheme works. **In-combination between Preferred Approach options**	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E8)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
		There is potential for in-combination effects from the Preferred Approach options within SA8 on **Lower River Shannon SAC** from habitat loss, mortality, disturbance, spread of invasive non-native species and habitat degradation, hydrological changes and water table impacts if construction of options is concurrent and/or during operation, impacts on **River Shannon and River Fergus Estuaries** SPA from disturbance and habitat degradation, on **Slieve Aughty Mountains SPA** from disturbance impacts and **Slievefelim to Silvermines Mountains SPA** from habitat loss and disturbance if the construction phase of options were concurrent (see Appendix E, Table E8 for further details).	
SA9	See Table E9	**In-combination with other projects** Potential in-combination effects with other projects and option **SA9-87** only were identified for **Baldoyle Bay SAC** and **Malahide Estuary SAC** from habitat degradation and disturbance (spread of invasives) and disturbance for **Malahide Estuary SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Baldoyle Bay SPA** and **Rogertown Estuary SPA** only if construction phase concurrent with MetroLink Dublin, Luas Green Line Capacity Enhancement, National Train Control Centre works, North Runway Project at Dublin Airport, New Visual Control Centre at Dublin Airport, M50 Enhancing Motorway Operation Services. Potential in-combination effects with other projects and option **SA9-87** only were identified for **Baldoyle Bay SAC** and **Malahide Estuary SAC** from habitat degradation and disturbance (spread of invasives) and disturbance for **Malahide Estuary SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Baldoyle Bay SPA and Rogertown Estuary SPA** only if construction phase concurrent with GDD. Potential in-combination effects with other projects and option **SA9-87** only were identified for **North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA** from disturbance only if construction phase concurrent with Ringsend WTP Upgrade. Potential in-combination effects with other projects and option **SA9-87** only were identified for **The Murragh Wetlands SAC** from habitat degradation, and disturbance for **North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA** and **The Murragh Wetlands SPA** if construction phase concurrent with M11 Capacity Enhancement (Phase 1 & Phase 2). Potential in-combination effects with other projects and option **SA9-87** only were identified for **North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Baldoyle Bay SPA** and **Malahide Estuary SPA** from disturbance only if construction phase concurrent with Blanchardstown Sewerage Scheme. **In-combination between Preferred Approach options** No in-combination effects from the Preferred Approach options within SA9 were identified.	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E9)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
EM region	See Table E10	**In-combination between Study Areas within the EM region** There are potential in-combination effects between options across Study Areas but only if construction/operation of options progressed concurrently as follows: • On **Slaney River Valley SAC** from options within **SA1, SA2** and **SA6**. There is potential for in-combination impacts from from habitat degradation (all SAs), disturbance (SA2 and SA6 only) and the spread of invasive non-native species (SA2 and SA6 only) if construction of options within these SAs is concurrent. • On **Wicklow Mountains SAC** from options within **SA1** and **SA2**. There is potential for in-combination impacts from disturbance if construction of options within SA1 and SA2 is concurrent. • On **The Murrough Wetlands SAC** from options within **SA1** and **SA9**. There is potential for in-combination impacts from habitat degradation if construction of options within these SAs is concurrent. • On **The Murrough SPA** from from options within **SA1** and **SA9**. There is potential for in-combination impacts from disturbance if construction of options within these SAs is concurrent. • On **Poulaphouca Reservoir SPA** from options within **SA2** and **SA9**. There is potential for in-combination impacts from disturbance if construction of options within these SAs is concurrent. • On **River Barrow and River Nore SAC** from options within **SA2, SA4, SA6** and **SA9**. There is potential for in-combination impacts from habitat degradation (all SAs) and the spread of invasive non-native species (SA6 and SA9 only) if construction of options within these SAs is concurrent. • On **River Boyne and River Blackwater SAC** from options within **SA3, SA4** and **SA9**. There is potential for in-combination impacts from disturbance (SA3 and SA4 only), habitat degradation (all SAs) and the spread of invasive non-native species (all SAs) if construction of options within these SAs is concurrent. • On **River Boyne and River Blackwater SPA** from options within **SA3** and **SA4**. There is potential for in-combination impacts from disturbance and habitat degradation if construction of options within these SAs is concurrent. • On **Lough Ree SAC** from options within **SA4** and **SA5.** There is potential for in-combination impacts from habitat degradation) if construction of options within these SAs is concurrent. • On **Lough Ree SPA** from options within **SA4** and **SA5**. There is potential for in-combination impacts from habitat degradation if construction of options within these SAs is concurrent. • On **River Shannon Callows SAC** from options within **SA5, SA7** and **SA9**. There is potential for in-combination impacts from habitat degradation and spread of invasive non-native species if construction of	With the implementation of mitigation as detailed in **Chapter 6.3** and **Appendix E (Table E10)** there will be no adverse effects on the integrity of this European site, either alone or in-combination with other plans or projects.

Study Area	Appendix E	Potential for in-combination effect	Conclusion
		these SAs is concurrent, and during operation from water table/availability and habitat degradation impacts (SA5 and SA7 only). • On **Middle Shannon Callows SPA** from options within **SA5** and **SA7**. There is potential for in-combination impacts from disturbance if construction of options within these SAs is concurrent. • On **River Little Brosna Callows SPA** from options within **SA5** and **SA7**. There is potential for in-combination impacts from disturbance if construction of options within these SAs is concurrent. • On **Dovegrove Callows SPA** from options within **SA5** and **SA7**. There is potential for in-combination impacts from disturbance if construction of options within these SAs is concurrent. • On **Lough Derg, North-east Shore SAC** from options within **SA7** and **SA9**. There is potential for in-combination impacts from habitat degradation and spread of invasive non-native species if construction of options within these SAs is concurrent. • On **Charleville Wood SAC** from options within **SA4, SA6** and **SA9**. There is potential for in-combination impacts from habitat degradation (all SAs) and spread of invasive non-native species (SA6 and SA9 only) if construction of options within these SAs is concurrent. • On **Lough Derg (Shannon) SPA** from options within **SA7** and **SA8**. There is potential for in-combination impacts from disturbance if construction of options within these SAs is concurrent. • On **Lower River Shannon SAC** from options within **SA8** and **SA9**. There is potential for in-combination impacts from habitat loss, mortality risk, disturbance, habitat degradation and spread of invasive non-native species if construction of options within these SAs is concurrent, and during operation from water table/availability and habitat degradation impacts.	

8

Eastern and Midlands Summary and Conclusion

8.1 Eastern and Midlands Region Summary

8.1.1 Transfers from the Greater Dublin Area (GDA)

Within the EM region, water transfers will occur across Study Areas, predominantly associated with transfers from the Greater Dublin Area (GDA). The abstraction will be sourced from New Shannon Source (options SA9-84) and be transferred to the benefiting corridor, which includes a number of Study Areas. A summary of the Study Areas (and WRZs) benefiting from these transfers are listed in Table 8.1 below.

Potential impacts associated with New Shannon Source abstraction were assessed as part of the SA9 assessment, while connecting infrastructure (for example pipelines and pumping stations) to enable transfers from SA9 to other Study Areas were assessed within the relevant Study Area assessments and in-combination assessment.

Table 8.1 - Summary of Study Area/WRZs that will benefit from transfers from the GDA (SA9)

WRZ Name	Study Area	Preferred Approach
Avoca Ballinaclash	1	SA1-17c (Regional Group 3) Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Avoca Ballinaclash WTP to Vartry WTP
Redcross Conary	1	SA1-57c (Regional Group 3) Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Redcross Intermediate Reservoir to Vartry WTP
Ballinteskin	1	SA1-23c (Regional Group 3) Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Ballinteskin Pump Station to Vartry WTP, via existing watermain to Cronroe WTP
Ballinapark	1	SA1-20 Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Ballinapark Pump Station to Avoca Ballinaclash WTP
Barndarrig Public Supply	1	SA1-87 (Regional Group 3) Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Barndarrig WTP to Vartry WTP
Rathdrum	1	SA1-53c (Regional Group 3) Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Rathdrum WTP to Vartry WTP, assessed previously as part of Mid Wicklow Scheme

WRZ Name	Study Area	Preferred Approach
Laragh Annamoe	1	SA1-51c (Regional Group 3) Transfer from the Greater Dublin Area (Study Area 9) and rationalisation of Raheen Well WTP to Vartry WTP for long term OPEX savings (not in deficit)
Hacketstown	2	SA2-30d Transfer from the Greater Dublin Area (Study Area 9) via Srowland and rationalisation to Ratvilly WTP
Hollywood Donard Public Supply	2	SA2-11b Transfer from the Greater Dublin Area (Study Area 9)
Dunlavin Public Supply	2	SA2-07b Transfer from the Greater Dublin Area (Study Area 9)
Kilmessan	3	SA3-48 Transfer from the Greater Dublin Area (Study Area 9)
Navan-Midmeath	3	SA3-82 (Regional Group 22) Transfer from the Greater Dublin Area (Study Area 9) and rationalise and supply deficit from Liscarton WTP
South Louth & East Meath	3	SA3-81 (Regional Group 22) Transfer from the Greater Dublin Area (Study Area 9) and rationalise and supply deficit from Liscarton WTP
Kells-Oldcastle	3	SA3-83 (Regional Group 22) Transfer from the Greater Dublin Area (Study Area 9) and rationalise and supply deficit from Liscarton WTP
Trim	3	SA3-86 (Regional Group 22) Transfer from the Greater Dublin Area (Study Area 9) and rationalise and supply deficit from Liscarton WTP
Athboy	3	SA3-84 (Regional Group 22) Transfer from the Greater Dublin Area (Study Area 9) and rationalise and supply deficit from Liscarton WTP
Ballivor	3	SA3-35 Transfer from the Greater Dublin Area (Study Area 9) and rationalise Ballivor to Mullingar - Westmeath (new source required at Mullingar)

WRZ Name	Study Area	Preferred Approach
Carlow North	6	SA6-193 Transfer from the Greater Dublin Area (Study Area 9) via Srowland

8.1.2 In-combination Assessment (EM region Summary)

The in-combination assessment is detailed in Chapter 7 and Appendix E of this report including the assessment of potential in-combination effects at the EM regional level. In summary, potential in-combination effects were identified within the EM region between Preferred Approaches, between Preferred Approaches and other (non-Irish Water) projects, and between Study Areas (Preferred Approaches only) as shown in Table 8.2 below. However, potential in-combination effects (construction and/or operational) would only occur where options within each Study Area are progressed concurrently with one another or with other external projects, and in the absence of mitigation. With the implementation of mitigation as outlined in Chapter 6.3 and Appendix E there will be no adverse effects on the integrity of any European site(s), either alone or in-combination with other plans or projects as a result of progressing the Preferred Approach options associated with the RWRP-EM.

Table 8.2 – European sites with potential in-combination effects within the EM region

In-combination effects between Preferred Approaches and other projects within a Study Area	In-combination effects between Preferred Approaches only within a Study Area	In-combination effects between Study Areas (Preferred Approaches only)
All Saints Bog SPA	Dovegrove Callows SPA	Charleville Wood SAC
Baldoyle Bay SAC	Lisbigney Bog SAC	Dovegrove Callows SPA
Baldoyle Bay SPA	Lower River Shannon SAC	Lough Derg (Shannon) SPA
Blackwater River (Cork/Waterford) SAC	Poulaphouca Reservoir SPA	Lough Derg, North-east Shore SAC
Charleville Wood SAC	River Barrow and River Nore SAC	Lough Ree SAC
Lough Derg (Shannon) SPA	River Boyne and River Blackwater SPA	Lough Ree SPA
Lough Derg, North-east Shore SAC	River Little Brosna Callows SPA	Lower River Shannon SAC
Lough Derravarragh SPA	River Shannon and River Fergus Estuaries SPA	Middle Shannon Callows SPA
Lough Ennell SAC	Slaney River Valley SAC	Poulaphouca Reservoir SPA
Lough Ennell SPA	Slieve Aughty Mountains SPA	River Barrow and River Nore SAC
Lough Owel SAC	Slieve Bloom Mountains SPA	River Boyne and River Blackwater SAC
Lough Owel SPA	Slievefelim to Silvermines Mountains SPA	River Boyne and River Blackwater SPA
Lough Ree SAC	Wicklow Mountains SAC	River Little Brosna Callows SPA
Lough Ree SPA		River Shannon Callows SAC
Lower River Shannon SAC		Slaney River Valley SAC
Malahide Estuary SAC		The Murrough SPA
Malahide Estuary SPA		The Murrough Wetlands SAC
Middle Shannon Callows SPA		Wicklow Mountains SAC
North Bull Island SPA		

In-combination effects between Preferred Approaches and other projects within a Study Area	In-combination effects between Preferred Approaches only within a Study Area	In-combination effects between Study Areas (Preferred Approaches only)
River Barrow and River Nore SAC		
River Barrow and River Nore SPA		
River Boyne and River Blackwater SAC		
River Shannon and River Fergus Estuaries SPA		
River Shannon Callows SAC		
River Suck Callows SPA		
Rogertown Estuary SPA		
Sharavogue Bog SAC		
Slaney River Valley SAC		
Slieve Bloom Mountains SPA		
South Dublin Bay and River Tolka Estuary SPA		
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA		
The Murrough SPA		
The Murrough Wetlands SAC		

Groundwater Abstraction

The potential for in-combination effects on groundwater bodies have been considered in the hydrogeological assessment of the groundwater abstractions (AWN, 2020). The assessment considered the likely cumulative effects of groundwater abstractions on meeting WFD objectives.

In-combination effects from groundwater and surface water abstractions on European sites is considered in the in-combination assessment undertaken in this NIS.

8.2 Conclusion

The conclusion of the NIS for the RWRP-EM is that, based on a plan-level assessment, and with implementation of appropriate mitigation for protecting European sites, there will be no adverse effects on the integrity of any European site(s), either alone or in-combination with other plans or projects as a result of progressing Preferred Approach options within the RWRP-EM.

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