Autumn 2022

Regional Water Resources Plan–Eastern and Midlands

Strategic Environmental Assessment

Appendix H: Study Area 3 – Environmental Review

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.

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Table of Contents

1 Introduction and Background

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This Study Area Environmental Review forms part of the SEA Environmental Report for the Regional Water Resources Plan (RWRP) for the Eastern and Midlands Region (referred to as the Regional Plan). The Regional Plan includes nine individual study area reviews (SA1-9) as appendices.

This Study Area 3 Environmental Review includes:

- Context for the Study Area Environmental Report;
- Environmental baseline context;
- Environmental assessment for the options screening process and feasible options;
- Assessment of the alternatives considered and the Preferred Approach;
- Cumulative effects assessment; and
- Recommendations for implementation, including mitigation and monitoring.

This Environmental Review summarises the environmental assessment undertaken for Study Area 3 within the Eastern and Midlands Region for the options and approaches considered and as outlined in the Study Area 3 Technical report (RWRP-EM Appendix 3). This Environmental Review applies the Strategic Environmental Assessment (SEA) objectives and environmental assessment methodology set out in the NWRP Framework Plan (Framework Plan).

Environmental Reports will be undertaken for each study area and will form Appendices to the SEA Environmental Reports for the Regional Plans which form Phase 2 of the National Water Resources Plan (NWRP). Phase 1 in the development of the NWRP was the preparation of the Framework Plan, which was adopted in Spring 2021 following SEA, Appropriate Assessment (AA) and extensive public consultation. The Framework Plan and supporting documentation are available at https://www.water.ie/projects/strategic-plans/national-water-resources/.

1.1 Options Assessment Methodology

The Options Assessment Methodology implemented as part of the RWRP-EM provides a framework to identify potential solutions to address identified need. The key stages of the process are illustrated in Figure 1.1 and summarised below:

1) Identifying need – based on SDB and/or Drinking Water Safety Plan Barrier Assessment;
2) Scoping of the study area (WRZs) – understanding the study area and the existing conditions of assets, supply and demand issues; as well as environmental constraints and opportunities;
3) Identifying potential options for consideration relevant to the study area;
4) Coarse screening – assessing 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 and scoring assessment update;
7) Approach appraisal – comparison and assessment of combinations of options identified to meet the predicted supply demand deficit to determine the Preferred Approach; and

8) Monitoring and Feedback – a process for monitoring the implementation of the plan and responding to changes to policy and guidelines and to information changes which will feed into the 5 year plan cycle.

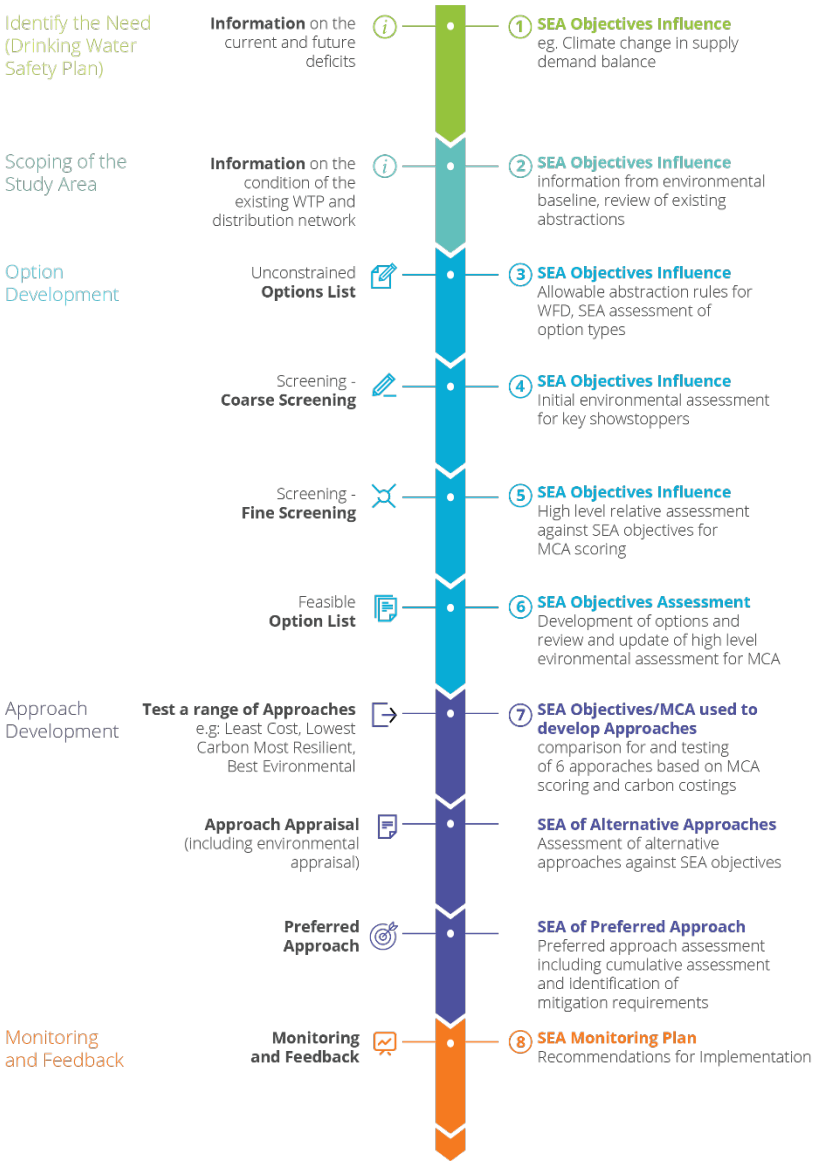

Figure 1.1 Option and Approach Development Process

1.2 Regional Plan Strategic Environmental Assessment

The four RWRPs, implementing Phase 2 of the NWRP, are each subject to a separate SEA process. The study area assessments will follow the outline methodology established by the Framework Plan. The SEA Environmental Reports are being published for consultation alongside the draft Regional Plans for each of the four regions.

Each of the Study Area Environmental Reports are presented as appendices to the SEA Environmental Reports and include:

- Introduction for SEA, Water Framework Directive (2000/60/EC) (WFD) and AA applied at the study area level;
- Environmental baseline context;
- Environmental assessment for the options screening process and feasible options;
- Assessment of the alternatives considered and the Preferred Approach;

- Cumulative effects assessment between options within each study area and with other proposed developments in the study area; and
- Recommendations for implementation, including mitigation and monitoring.

1.3 Study Area: Strategic Environmental Assessment

The set of SEA objectives developed at the Phase 1 scoping stage have been refined and finalised following consultation (see Table 1.1). These objectives have been influenced by the plans, policies and programmes review, the baseline trends and pressures identified, and the scope of the assessment as defined in the Regional Plan SEA scoping report.

Table 1.1 SEA Objectives

SEA Topic	SEA Objective
Population, economy, tourism and recreation, and human health	Protect and, where possible, contribute to enhancement of human health and wellbeing and to prevent restrictions to recreation and amenity facilities in providing water services.
Water environment	Water quality and resources Prevent deterioration of the WFD status of waterbodies with regard to both water quality and quantity due to Irish Water's activities. Contribute towards the "no deterioration" WFD condition and, where possible, to the improvement of waterbody status for rivers, lakes, transitional and coastal waters, and groundwater to at least 'Good' status.
	Flood risk Protect and, where possible, reduce risk from ground water and surface water flooding as a result of Irish Water's activities.
Biodiversity	Protect and, where possible, enhance terrestrial, aquatic and soil biodiversity; particularly regarding European sites and protected species in providing water services.
Material assets	Minimise resource use and waste generation from, new or upgraded, existing water services infrastructure and management of residuals from drinking water treatment - to protect human health and the ecological status of waterbodies. Minimise impacts on other material assets and existing water abstractions.
Landscape and visual amenity	Protect and, where possible, enhance designated landscapes in providing water services.
Climate change	Climate change mitigation Minimise contributions to climate change emissions to air (including greenhouse gas emissions) as a result of Irish Water's activities.

SEA Topic	SEA Objective
	Climate change adaptation Promote the resilience of the environment, water supply and treatment infrastructure to the effects of climate change.
Cultural heritage	Protect and, where possible, enhance cultural heritage resources in providing water services.
Geology and soils	Protect soils and geological heritage sites and, where possible, contribute towards the appropriate management of soil quality and quantity.

The SEA informs the developments of the approaches and is undertaken on the various alternative approaches considered and the Preferred Approaches identified, along with cumulative impact assessment and identification of 'in-combination' effects.

The Regional Plan SEA Environmental Report was completed only after all study area reports for the Eastern-Midlands region were available. At that point, Irish Water conducted an exercise as part of the development of the overall relevant Regional Plan to assess the cumulative and in-combination impacts of the Preferred Approaches identified for each study area within the Eastern Midlands region. The conclusions of that cumulative assessment are presented in the SEA Environmental Report for the Eastern Midlands region.

If appropriate, the Preferred Approach identified for SA3 will have been modified prior to finalisation of the Regional Plan Technical Report and Environmental Review to take into account the conclusions of that cumulative assessment and identification of in-combination effects. The SEA for each of the Regional Plans in turn includes a cumulative assessment of the Preferred Approaches identified in the Regional Plan, in combination with the effects of the Preferred Approaches for each other region (to the extent that data was available and recognising that each Regional Plan is at a different stage of development).

1.4 Study Area: Water Framework Directive

Requirements under the WFD to avoid deterioration in waterbody status or objectives has been incorporated into the allowable abstraction constraints for new option abstractions. WFD requirements are also included in the SEA objectives for the assessment (see Table 1.1). Baseline data in relation to the WFD is presented in section 2.2.1 and a summary of the assessment for SA3 is provided in chapter 8 of this review.

1.5 Study Area: Appropriate Assessment

An AA was required for the Framework Plan to comply with the EU Habitats Directive (92/43/EEC) and is relevant to development of the Regional Plans, including the component study areas.

AA issues will be addressed in a separate Natura Impact Statement (NIS) for the Regional Plan, which will support the overall AA process that Irish Water is required to carry out. Habitats Directive requirements have been integrated into the options development process and conclusions from the NIS for SA3 are provided in chapter 9 of this review.

1.6 Study Area 3

The Eastern and Midlands Region is subdivided into nine study areas 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.

This Appendix reports on SA3, the location of SA3 in relation to the Eastern and Midlands Region is shown in Figure 1.2.

Study Area 3 lies within the counties of Cavan, Louth, Fingal, Westmeath and Meath and its total area is approximately 2,402 km^2. The principal settlements (with a population of over 10,000) within SA3 are Navan, Drogheda, Laytown-Bettystown-Mornington and Ashbourne (CSO, 2016a), as shown in Figure 1.3.

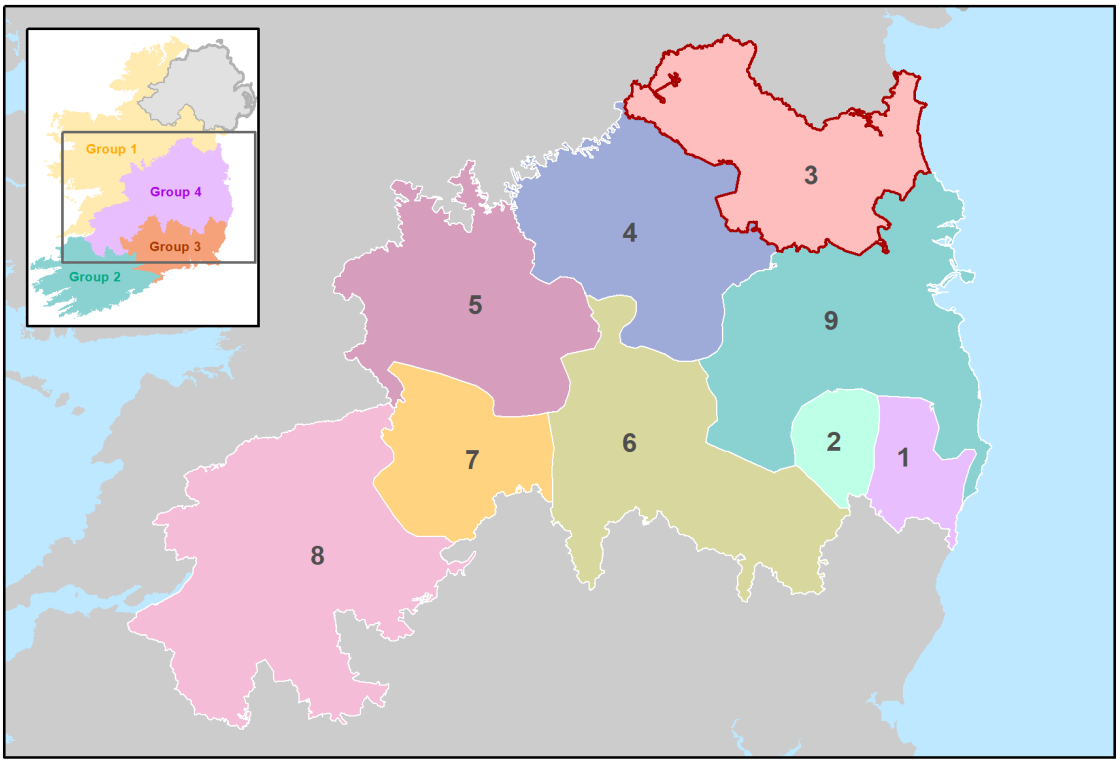

Figure 1.2 Eastern and Midlands Region Study Areas

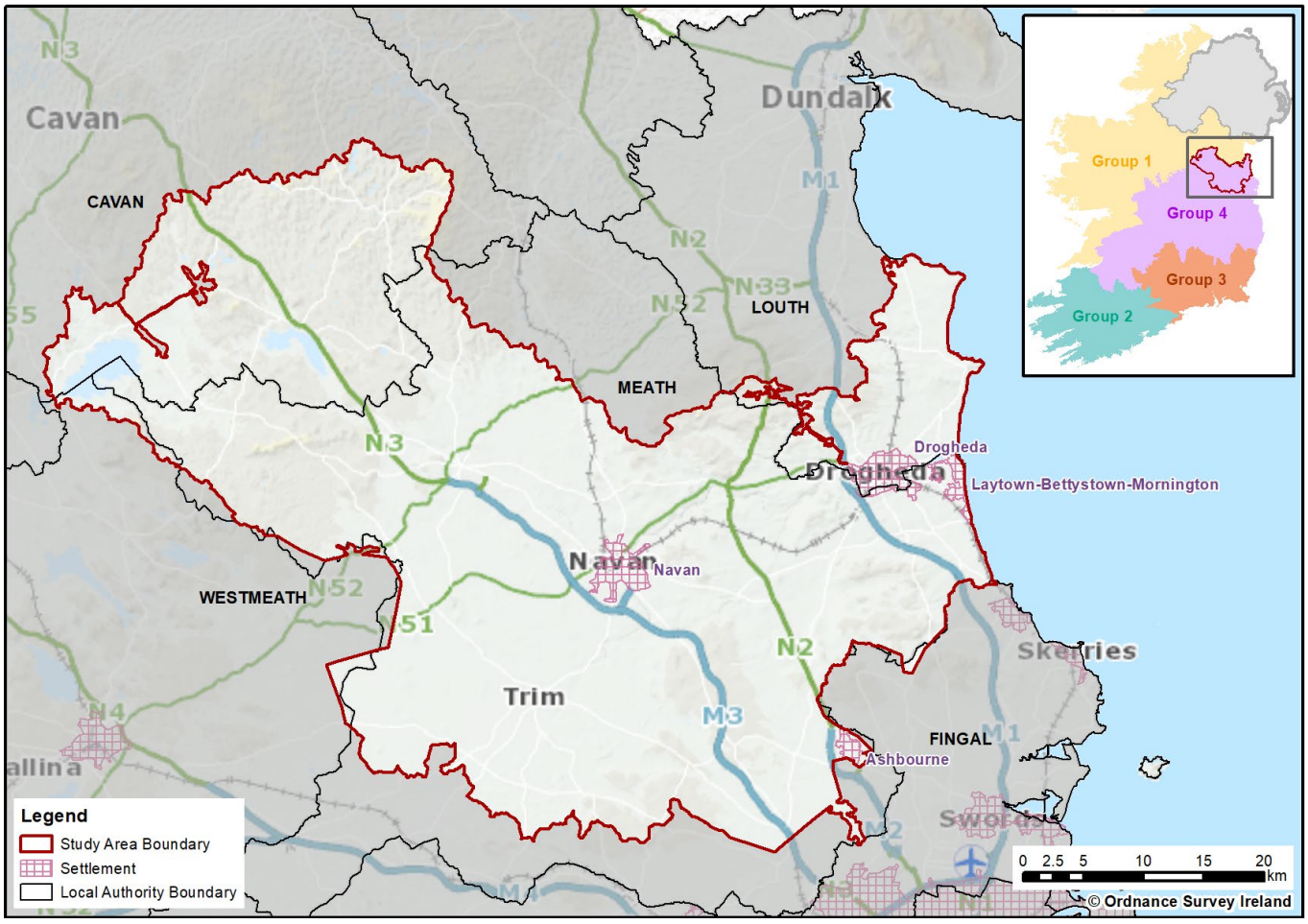

Figure 1.3 Study Area 3

2

Study Area 3 Environmental Baseline Context

2 Study Area 3 Environmental Baseline Context

This chapter provides environmental baseline information for SA3 regarding the following key environmental topics in the SEA:

- Population, Economy, Tourism and Recreation, and Human Health;
- Water Environment;
- Biodiversity, Flora and Fauna;
- Material Assets;
- Landscape and Visual Amenity;
- Air Quality and Noise;
- Climate Change;
- Cultural Heritage;
- Geology and Soils; and
- Summary of Key Issues and Trends over the Plan Period within the study area.

The baseline environment considers key indicators characterising the current situation in the study area and how these aspects are likely to develop over the Framework Plan's planning period. This includes issues relating to pressures on the environment or the sensitivity of the environment to change. This chapter is intended to support and add to the baseline environmental information for the Regional Plans SEA Environmental Report, as context for the option appraisal and programme selection.

The baseline assessment also addresses the environmental aspects of Stages 1 and 2 of the options assessment methodology:

- Stage 1 Identifying need – based on SDB and/or Drinking Water Safety Plan Barrier Assessment; and
- Stage 2 Scoping of the study area (WRZs) – understanding WRZ's within the study area and the existing conditions of assets, supply and demand issues as well as environmental constraints and opportunities.

2.1 Population, Economy, Tourism and Recreation, and Human Health

2.1.1 Population

Table 2.1 provides a general overview of the WRZ's population and the projected percentage change in population between 2019 and 2044. The largest projected increases in population are expected in the WRZs South Louth & East Meath (2100SC0001) and Navan Mid-Meath (2300SC0055). The estimated population currently living in each WRZ has been based on the 2016 Census data. The 2016 population was assigned to District Metering Areas (DMAs) by mapping the Central Statistics Office (CSO) data to DMA boundaries. Irish Water have projected the 2016 population forward to 2019 using the growth projections in the National Planning Framework, updated information from the Regional Spatial and Economic Strategies, and Local Authority Planning sections (where available).

Table 2.1 Overview of the Population within the WRZs of SA3

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
0200SC0015 - Bailieboro RWSS	7,931	+15.3%

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
2100SC0001 - South Louth & East Meath	107,827	+23.0%
2300SC0011 – Kilmessan	1,138	+15.3%
2300SC0005 - Kells-Oldcastle	11,117	+15.3%
2300SC0006 - Athboy	4,669	+15.3%
2300SC0007 – Ballivor	2,540	+15.3%
2300SC0009 – Slane	3,066	+15.3%
2300SC0014 – Trim	11,399	+15.3%
2300SC0027 – Moynalty	188	+15.3%
2300SC0045 - St Louis, National School, Rathkenny	5	+15.3%
2300SC0055 - Navan-Mid Meath	40,101	+23.2%

*The estimated population has been based on the 2016 Census data. Irish Water have projected the 2016 population forward to 2019 using the growth projections in the National Planning Framework, Regional Spatial and Economic Strategies, and Local Authority Planning sections

2.1.2 Economy and Employment

SA3 lies within the Mid-East region which had an above average household disposable income per person in 2016 (CSO, 2016b), and an unemployment rate of 7.5% (CSO, 2017a).

Population increase and expected economic growth has meant that housing and sustainable urban development have been made a priority for the National Development Programme; therefore, to supply the demand there is an aim to increase housing stock. The number of new dwellings completed in Q3 2020 was 1,303 for the Mid-East region (CSO, 2020a).

2.1.3 Tourism and Recreation

Tourism in SA3 has an important role, particularly in rural areas, with the National Planning Framework (NPF) stating that tourism is a key aspect of rural job creation now and in the future (Government of Ireland, 2018). The county of Meath includes the Boyne Valley, which has been described as "*Ireland's ancient capital*", containing Ireland's UNESCO World Heritage Site at Brú na Bóinne (Newgrange and Knowth) as well as Ireland's largest Anglo-Norman castle at Trim (Meath County Council, 2020).

Additionally, the study area is located within Ireland's Ancient East, which is part of a tourism development strategy that covers the South, East and part of the Midlands, places emphasis on the importance of historic sites in the area (National Tourism Development Authority, 2016).

Ireland's natural heritage is also recognised as an important tourism asset by the Department of Transport, Tourism and Sport (2019). For SA3, the two main rivers in Meath, the Boyne and the Blackwater, join at Navan and is the most historic waterway in Ireland, rich in aquatic life, and the salmon and trout are recognised as among the finest in Ireland. Rivers, loughs and coastal areas all make an important contribution to tourism and recreational opportunities and support important fisheries.

2.1.4 Human Health

Table 2.2 provides well-being indicators for the Mid-East region within Ireland. Improvements in air quality, access to good quality drinking water and participation in recreational activities can all have a positive influence on human health and well-being.

Table 2.2 Well-Being Indicators for the Mid-East Region within Ireland

Life Expectancy (CSO, 2017b)	Participation in Sports, Fitness or Recreational Physical Activities (% of Persons Aged 15+) (CSO, 2020b)	Air Quality (EPA, 2020a)
Male: 77.2 Female: 81.4	49%	Good

A key issue for public health is reliable access to good quality drinking water. Regulated water service providers have to ensure appropriate standards of supply and be able to cope with drought conditions, peak events, and maintenance of assets. This requires adequate reserve capacity in Irish Water's supplies to provide a 1 in 50 Level of Service. At present, not all supplies within this study area provide the required levels of reserve capacity. Due to the limited historical monitoring of these supplies, particularly in relation to groundwater, this will need to be studied further. Table 2.3 lists the areas supplied by the Water Treatment Plants (WTPs) in SA3.

Table 2.3 Areas Supplied by the WTPs in SA3

WTP	WRZ	Local Authority Supplied
Bailieborough WTP	0200SC0015 - Bailieboro RWSS	Cavan
Dunshaughlin WTP, Kiltrough WTP, Curragha WTP, Staleen WTP and Rath WTP	2100SC0001 - South Louth & East Meath	Louth
Lough Bane WTP and Clavin's Bridge WTP	2300SC0005 - Kells-Oldcastle	Meath
Athboy WTP and Coill Dios WTP	2300SC0006 - Athboy	Meath
Kilmurry WTP and Earlsmill WTP	2300SC0007 - Ballivor	Meath
Slane WTP	2300SC0009 - Slane	Meath
Trim WTP	2300SC0014 - Trim	Meath
Moynalty WTP	2300SC0027 - Moynalty	Meath
Kilmessan Swainstown WTP	2300SC0011 - Kilmessan	Meath
Liscartan WTP and Kilcarn WTP	2300SC0055 - Navan-Mid Meath	Meath
Rathkenny School WTP	2300SC0045 - St Louis, National School, Rathkenny	Meath

Currently for day-to-day operations, ten out of eleven of the WRZs in the area have a current and projected SDB deficit (based on a 'Do Minimum' approach – see section 4.5 for further clarification). However, under normal weather and demand conditions, the current deficit does not manifest as an interruption to supply for all WRZs.

Poor water quality can be linked to risks to health. The Barrier Assessment identified eighteen of the nineteen WTPs within the study area as being at high risk of failing to achieve Irish Water's conservative Barrier Assessment standards in relation to bacteria and viruses (Barrier 1) and the effectiveness of Irish Water's protozoa removal processes (Barrier 3) (see Table 2.1 in the SA3 Technical Report). The "quality need" identified through the Barrier Assessment is not an indicator of compliance with the Drinking Water Regulations. It is an internal Irish Water assessment of the need to invest in areas of the Irish Water asset base through resource planning, to ensure that potential risks or emerging risks to supplies are addressed. Currently, there are three WTPs on the EPA Remedial Action List within SA3, namely Trim WTP within the Trim WRZ, Kilcarn WTP within the Navan Mid Meath WRZ and Bailieborough WTP within the Bailieboro WRZ. There are three supplies within SA3 on an EPA Direction: Slane WTP, Earlsmill WTP and the Kilmurray WTP. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SA3 in advance of the NWRP. Details of these are included in the SA3 Technical Report.

2.2 Water Environment

This topic covers geomorphology, WFD, flood risk, surface water quality and groundwater receptors. Figure 2.1 shows the water environment, including the WRZs, the WFD water catchment boundaries, the WTPs and the waterbodies in SA3.

Table 2.4 provides a summary of the WFD catchments within SA3.

Table 2.4 Catchments within SA3 (EPA, 2020b)

WFD Catchments	Total Catchment Area (km^2)	Catchment Area within SA3 (km^2)
Boyne	2,694	1,646
Liffey and Dublin Bay	1,616	52
Nanny-Delvin	711	355
Newry, Fane, Glyde and Dee	2,125 (1,390 of which is located within the Republic of Ireland)	96
Upper Shannon (Inny)	1,229	250

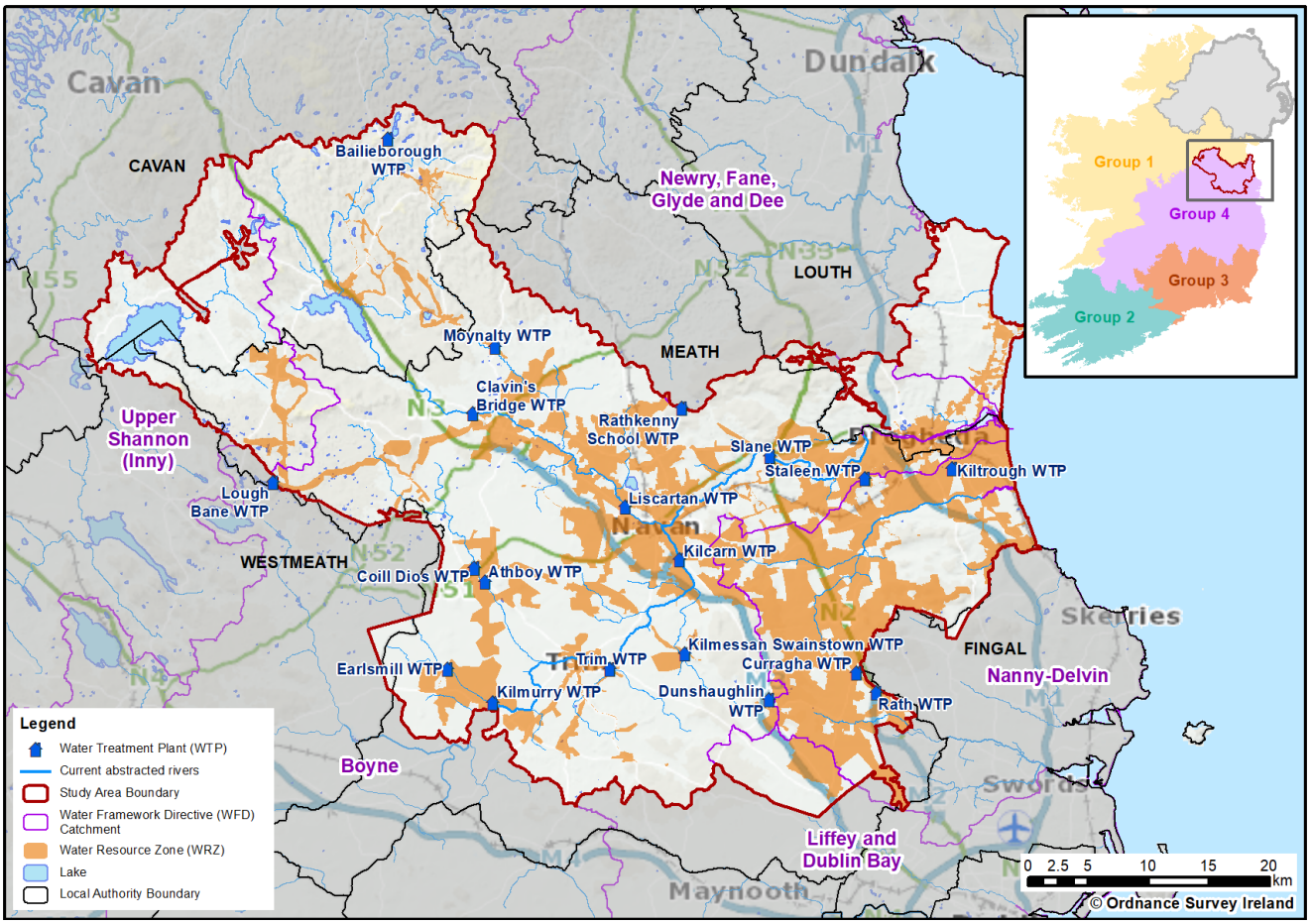

Figure 2.1 Water Environment of SA3

2.2.1 Water Framework Directive

Under the WFD, Ireland must ensure that all waterbodies achieve 'Good' status by 2027. In addition, under the legislation, any modification to a WFD waterbody should not lead to deterioration in either the overall status or any of the WFD water quality parameters.

The General Scheme of the Water Environment (Abstractions) Bill 2018 (The Bill), to introduce abstraction licensing aligned to the WFD, was published in summer 2018. This legislation will set the amount Irish Water can take from the water supplies that it abstracts water from.

As there are very few long duration flow records for Irish Water's abstractions and for waterbodies within Ireland, Irish Water lacks comprehensive data to fully understand the impact of the new legislation on these sources. Information is not currently stored centrally as it was historically collected and collated by Local Authorities. Irish Water is building a telemetry system which will aid bringing all this data together, but this will take time. Therefore, improved monitoring and gathering better data is a priority.

On an interim basis, Irish Water has developed an initial desktop assessment based on available information (see SA3 Technical Report). Over the coming years, Irish Water will work with the environmental regulator, the EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of its groundwater sources.

To understand the potential impact of the Abstraction Legislation on the SA3 supplies, Irish Water has assessed its surface water abstractions and summarised the potential impact on their surface water abstractions – five river abstractions from the River Blackwater (Liscarton), and two lake abstractions from Lough Bane and Skeagh Lough. Based on this initial assessment, the volumes of water abstracted

from the River Blackwater at Liscarton, Lough Bane and Skeagh Lough may not meet sustainability guidelines during dry weather flows.

Irish Water have taken a conservative approach in identifying sustainable abstractions for new options (described in section 3.2) and sensitivity assessment considers proposals against potential for future sustainability related reductions in volume (section 5.4).

The Department of Housing, Planning and Local Government's (2019a) public consultation document, regarding the significant water management issues, has been considered by Irish Water. Therefore, the pressures, and the relevant priority 'Areas for Action' are provided below and in Table 2.7.

There are five WFD catchments in SA3 and the total number of surface and groundwater waterbodies within SA3 are provided in Table 2.5 below.

Table 2.5 WFD Waterbodies within SA3 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
Rivers	Boyne	76	21
	Liffey and Dublin Bay	4	2
	Nanny-Delvin	24	12
	Newry, Fane, Glyde and Dee	4	2
	Upper Shannon (Inny)	12	7
Lakes	Boyne	7	4
	Liffey and Dublin Bay	0	0
	Nanny-Delvin	0	0
	Newry, Fane, Glyde and Dee	0	0
	Upper Shannon (Inny)	1	0
Transitional and Coastal	N/A	6	0
Groundwater	N/A	32	2

The predominant pressures, and the percentage of 'at risk' waterbodies impacted by them, in the latest catchment summaries (catchments.ie, 2021a, 2021b, 2021c, 2021d, 2021e) are:

- Boyne: Agriculture (68%) and Hydromorphology (41%);
- Liffey and Dublin Bay: Agriculture (51%), Urban Runoff (32%), Urban Wastewater Treatment Plants (23%) and Domestic Wastewater (23%).
- Nanny-Delvin: Agriculture (79%), Hydromorphology (56%), Urban Wastewater (32%) and Domestic Wastewater (32%);
- Newry, Fane, Glyde and Dee: Agriculture (65%), Hydromorphology (33%) and Urban Wastewater (23%); and
- Upper Shannon (Inny): Agriculture (81%).

The Boyne catchment summary (catchments.ie, 2021a) also notes that Acurry Lake (Clifferna Private Water Supply) and Bane Noggin Hill Lake (Kells/Oldcastle Public Water Supply) are under significant pressure due to abstraction for water supply. Table 2.6 includes a summary of the 'at risk' waterbodies within SA3.

Table 2.6 Summary of 'At Risk' Waterbodies in SA3 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
Rivers	Boyne	44	1
	Liffey and Dublin Bay	4	
	Nanny-Delvin	17	
	Newry, Fane, Glyde and Dee	2	
	Upper Shannon (Inny)	8	
Lakes	Boyne	5	2
	Liffey and Dublin Bay	0	
	Nanny-Delvin	0	
	Newry, Fane, Glyde and Dee	0	
	Upper Shannon (Inny)	1	
Transitional and Coastal	N/A	1	0
Groundwater	N/A	6	2
Total		**88**	**5**

To meet WFD objectives, it has been recognised that there is a need to prioritise and focus efforts to address issues through identifying 'Areas for Action'. The reasons for selection of the 'Areas for Action' within the sub-catchments of SA3 are listed in Table 2.7. Note that the 'Areas for Action' included in Table 2.7 are from the WFD cycle 2 River Basin Management Plan (RBMP), as the WFD cycle 3 RBMP was undergoing consultation at the time of writing.

Table 2.7 'Areas for Action' within SA3 (catchments.ie, 2018f)

Areas for Action	Key Reasons for Selection
Ashbourne	• Pilot project to address urban diffuse pressures with focus on 500m stretch of Broadmeadow_020. • Building on work carried out by Meath and Irish Water to rehabilitate leaky sewers. • Small and manageable area with single pressure (urban diffuse)
Athboy	• Headwater tributaries to the Boyne main channel • Long term challenge - five of the six waterbodies are At Risk

Areas for Action	Key Reasons for Selection
	• Building on work completed by Meath County Council to reduce nutrient concentrations in the river water body • One deteriorated waterbody
Blackwater (Longwood)	• Building on work completed by Kildare County Council • Opportunity to address spikes in ammonia from peat • Headwaters of Blackwater (Longwood) • Opportunity to work with Bord naMona and Office of Public Works (OPW)
Boycetown	• Build on work completed by Meath County Council – stream walks completed on the lower portion: ~80 cattle access points were identified • Two deteriorated waterbodies
Lough Lene	• Headwaters to Lough Lene which has heritage values and is a popular designated bathing location • Deteriorated water body • Lough Lene failed to meet protected area objective for drinking water
Lower Nanny	• Pilot project to examine impact of tillage on poorly draining soils • The Nanny Meath river discharges into coastal waters which have both designated bathing and shellfish areas • Building on existing improvements by Irish Water at Duleek wastewater treatment plant • One deteriorated waterbody
Moynalty	• Salmonid river • Potential for ‘quick wins’ • Possible high nitrate areas which would help with TraC water nitrate reduction requirement • Four deteriorated waterbodies
Nadreegeel	• Cavan/Monaghan lakes scenario project • Headwaters to Nadreegeel Lough • Potential ‘quick win’ • Building on existing work completed by Cavan County Council • Will provide insight into question regarding river monitoring stations downstream of failing lakes • A group water scheme here abstracts immediately upstream • Public water abstraction • One deteriorated waterbody
Sheelin (with Inny)	• Sub catchment project • Headwaters of the River Inny • One potential ‘quick win’

Areas for Action	Key Reasons for Selection
	• Building on improvements completed at Oldcastle WWTP • Building on improvement works completed by Meath County Council - nutrient concentrations have declined in the last few years • Building on Inland Fisheries Ireland (IFI) Lough Sheelin project. The lake is one of 13 wild brown trout fisheries in Europe and IFI • The River Inny and Lough Sheelin are important for tourism & heritage • Two deteriorated waterbodies
Upper Tolka	• One 'Bad' status water body where the pressure is known • Headwaters of the River Tolka • Potential to apply the results of the Santry Project here • Building on decline in phosphate concentrations • Important fishery, huge amenity for youth engagement with the Tolka anglers • Four deteriorated waterbodies

2.2.2 Flood Risk

Flood risk is considered as part of the options appraisal; however, many options are at a conceptual stage and there is insufficient information to differentiate between options on the basis of flood risk when design details, siting and routing are still to be determined. Both surface water and ground water flood risk will need to be considered further as part of the development of option design and for assessment at project level.

The OPW has been implementing the European Communities (Assessment and Management of Flood Risks) Regulations 2010 mainly through the Catchment Flood Risk Assessment and Management (CFRAM) Programme, through which draft Flood Risk Management Plans have been developed. Approximately 300 Areas for Further Assessment have been established along with a range of measures to reduce or manage the flood risk within each catchment. CRFAMS mapping for all Areas for Further Assessment is available to view on the CFRAMS website (OPW, 2018). Figure 5.4 in the SEA Environmental Report (Appendix A) provides a summary of surface water and groundwater flood risk from the OPW CFRAMS data for the region including SA3.

For existing water infrastructure assets such as WTPs, flood risk vulnerability is considered in decisions on need to rationalise and decommission assets.

Any options which are progressed and require planning permission will require a Flood Risk Assessment to be completed in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009).

2.3 Climate Change

Ireland's climate is heavily influenced by the Atlantic Ocean. Consequently, Ireland has a milder climate that has less extreme temperature variation compared with other countries at a similar latitude. The hills and mountains, many of which are near the coasts, provide shelter from strong winds and from the direct oceanic influence. Winters tend to be cool and windy, while summers are generally mild and less windy (Met Éireann, 2019).

In June 2019, the government agreed to support the adoption of a net zero target by 2050 at EU level, and to pursue a trajectory of emissions reduction nationally which is in line with reaching net zero in Ireland by 2050.

Section 15 of the Climate Action and Low Carbon Development Act 2015 (as amended in 2021) sets a new "national climate objective" for Ireland, which provides that:

"*The State shall, so as to reduce the extent of further global warming, pursue and achieve, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy.*"

The amended Act requires public authorities, including IW, to take account of, so far as practicable, perform their functions in a manner consistent with the furtherance of the national climate objective and the relevant national and sectoral plans and strategies to mitigate greenhouse gas emissions and adapt to the effects of climate change.

The Department of the Environment, Climate and Communications' Climate Action Plan (CAP) published November 2021, replacing CAP 2019, commits to achieving a 51% reduction in overall greenhouse gas emissions by 2030 and reaching net zero carbon emissions by 2050. The aim is for more sustainable growth and to create a resilient, vibrant and sustainable country. The CAP defines a roadmap to this goal and initiates a set of policy actions to achieve this. A detailed sectoral roadmap has also been set out, which is designed to deliver a cumulative reduction in emissions, over the period 2021 to 2030. CAP 2021 updates existing targets with renewable energy to provide 80% of electricity by 2030 and sets targets for sectors including for agriculture and forestry such as woodland planting and improving land management to support carbon sequestration (Department of the Environment, Climate and Communications, 2021).

In addition, Ireland has a sectoral climate adaptation plan for the ‘Water Quality and Water Services Infrastructure’ sector. A summary of the report’s findings is included in Table 2.8.

Table 2.8 Summary of Key Points from the 'Water Quality and Water Services Infrastructure' Sectoral Climate Change Plan (Department of Housing, Planning and Local Government, 2019b)

Summary	
Key Points	• Protecting and improving water quality and improving water services infrastructure are major challenges in Ireland • Climate change-induced threats will increase the scale of these challenges • Risks to water quality and water infrastructure arise from changing rainfall patterns and different annual temperature profiles. The frequency and intensity of storms and sea level rise are also considered
The challenges: Water services infrastructure	• Increased surface and sewer flooding leading to pollution, water and wastewater service interruptions • Reduced availability of water resources • Hot weather increasing the demand for water

Summary	
	• Increased drawdown from reservoirs in the autumn/winter for flood capacity, leading to resource issues • Business continuity impacts or interruptions for water services providers
Primary adaptive measures	• Fully adopt the 'integrated catchment management' approach • Improve treatment capacity and network functions for water services infrastructure • Water resource planning and conservation – on both supply and demand sides • Include climate measures in monitoring programmes and research • Many of these proposed adaptation actions are already underway through existing and scheduled water sector plans and programmes

There are four aims that local authorities are required to include in their climate adaptation strategies (Department of Communications, Climate Action and Environment, 2018):

- Mainstream Adaptation: That climate change adaptation is a core consideration and is mainstreamed in all functions and activities across the local authority. In addition, ensure that local authority is well placed to benefit from economic development opportunities that may emerge due to a commitment to proactive climate change adaptation and community resilience;
- Informed decision making: That effective and informed decision making is based on a reliable and robust evidence base of the key impacts, risks and vulnerabilities of the area. This will support long term financial planning, effective management of risks and help to prioritise actions;
- Building Resilience: That the needs of vulnerable communities are prioritised and addressed, encourage awareness to reduce and adapt to anticipated impacts of climate change, and promote a sustainable and robust action response; and
- Capitalising on Opportunities: Projected changes in climate may result in additional benefits and opportunities for the local area and these should be explored and capitalised upon to maximise the use of resources and influence positive behavioural changes.

In addition to these high-level aims, each local authority is required to identify the key risks to their area; these are provided in Table 2.9.

Table 2.9 Climate Change Risks Identified by Local Authorities in SA3

County	Key Risk Areas
Cavan (Cavan County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures

County	Key Risk Areas
Kildare (Kildare Country Council, 2019)	• Extreme rainfall events • Windstorms • Extreme heat/drought events • Freezing/snow events
Longford (Longford County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Meath (Meath County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Offaly (Offaly County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Westmeath (Westmeath County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures

Climate change is expected to influence weather conditions, such as frequency of droughts and extreme events such as storms, and is likely to affect habitats and species, water availability for supply and water demand and water quality. For SA3, not all supplies within the study area meet the required levels of reserve capacity. As evidenced in the 2018 drought, there is the potential for this deficit to affect access to water in the future. This situation will further deteriorate over time due to climate change driven reductions in water resources.

A key aspect of Irish Water's strategy is to 'Supply Smarter', by improving the quality, resilience and security of their supply through infrastructural improvements. One of the high-level goals taken from the national level is building resilience, with water services being a key factor.

Supporting environmental resilience to climate change will also be an important consideration for the future with additional benefits for supply resilience.

2.4 Biodiversity, Flora and Fauna

2.4.1 Designated Sites

Within SA3 there are a number of European, national and locally designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), Natural Heritage Areas, and proposed Natural Heritage Areas (see Table 2.10 and Figure 2.2). The European sites (SPAs and SACs), and the potential impacts on them, are discussed in more detail in the NIS.

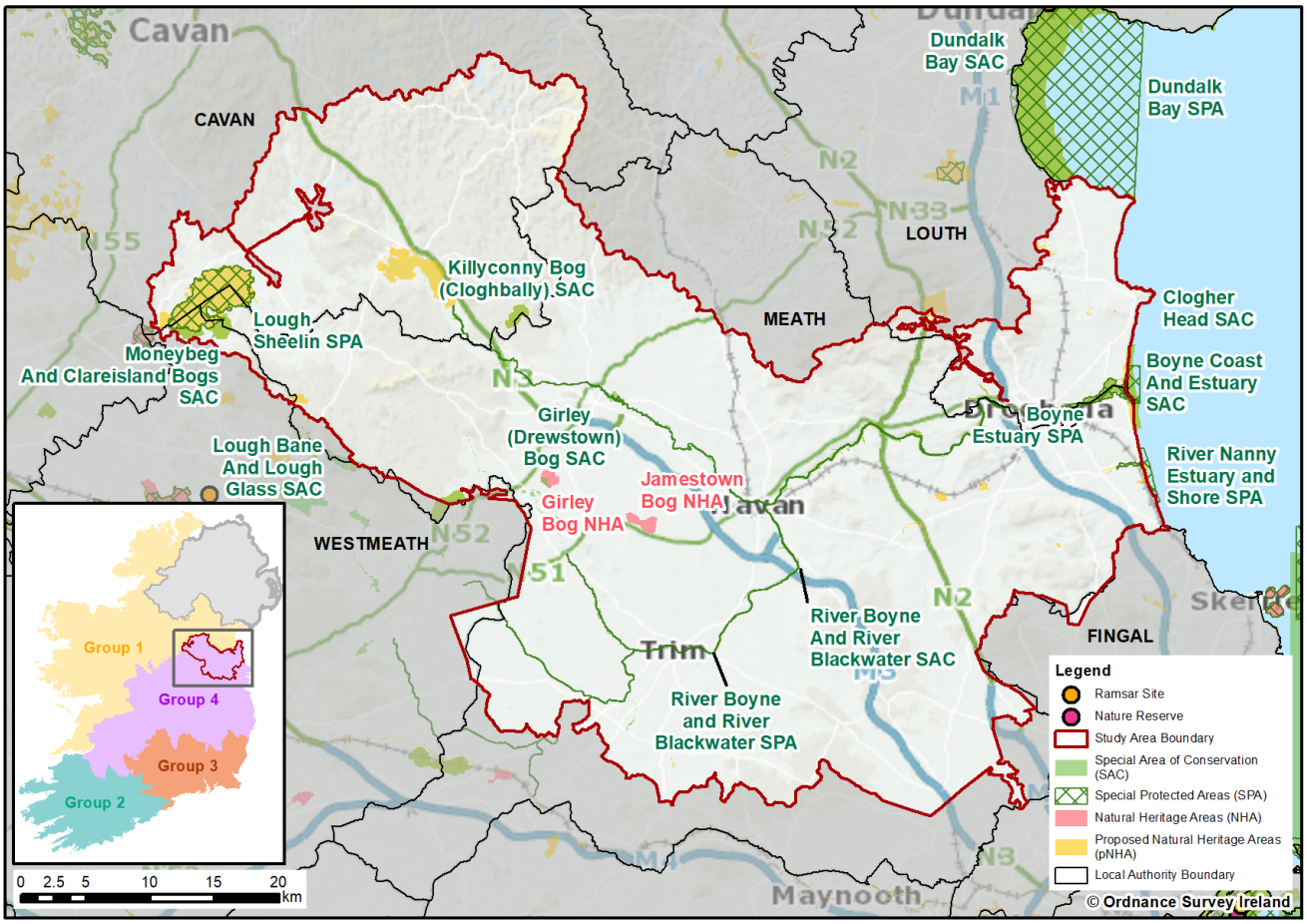

Figure 2.2 Designated Sites in SA3

Table 2.10 Designated Sites within SA3 (NPWS, 2019a)

Receptor	Name	Total Number
Special Protected Area (SPA)	Boyne Estuary SPA	5
	Dundalk Bay SPA	
	Lough Sheelin SPA	
	River Boyne and River Blackwater SPA	
	River Nanny Estuary and Shore SPA	
Special Area of Conservation (SAC)	Boyne Coast and Estuary SAC	8
	Clogher Head SAC	
	Dundalk Bay SAC	
	Girley (Drewstown) Bog SAC	

Receptor	Name	Total Number
	Killyconny Bog (Cloghbally) SAC	
	Lough Bane and Lough Glass SAC	
	Moneybeg And Clareisland Bogs SAC	
	River Boyne And River Blackwater SAC	
Ramsar sites	N/A	0
Nature reserves	N/A	0
Natural Heritage Areas (NHAs)	Girley Bog NHA	2
	Jamestown Bog NHA	
Proposed Natural Heritage Areas (pNHAs)	Shown in Figure 2.2	27

2.4.2 Habitats

Table 2.11 lists the percentage of the study area, and the number of hectares, covered by each habitat within SA3; as reported in the Corine land use dataset[1].

Table 2.11 Habitat Areas for SA3 (EPA, 2018)

Habitat	Ha	% of Study Area
Agricultural Land		
Pastures	172,295	71.68%
Non-irrigated arable land	38,916	16.19%
Land principally occupied by agriculture, with significant areas of natural vegetation	6,640	2.76%
Complex cultivation patterns	2,236	0.93%
Fruit trees and berry plantations	37	0.02%
Urban		
Green urban areas	30	0.01%
Natural Habitats		
Water bodies	2,754	1.15%
Peat bogs	2,285	0.95%
Intertidal flats	234	0.10%
Water courses	149	0.06%
Inland marshes	77	0.03%
Salt marshes	66	0.03%

[1] The EPA land use dataset will be used once this is available

Habitat	Ha	% of Study Area
Beaches, dunes, sands	54	0.02%
Sea and ocean	2	0.00%
Forest		
Mixed forest	2,045	0.85%
Broad-leaved forest	1,738	0.72%
Transitional woodland-shrub	1,634	0.68%
Coniferous forest	742	0.31%

Particularly relevant habitats that depend on the water quality and/or quantity in SA3 are:

- Turlough ecosystems;
- Oligotrophic, hard oligo-mesotrophic and natural eutrophic lakes;
- Bog habitats – Active raised bogs, degraded raised bogs still capable of natural regeneration, *Rhynchosporion* depressions, transition mires and quaking bogs;
- Alkaline fens; and
- Groundwater dependant terrestrial habitats, such as petrifying springs with tufa formation and calcareous fens.

2.4.3 Species

The key species and habitats (Nelson et al, 2019) of concern within SA3 include:

- Otter;
- Bat species - Daubenton's bat along the waterways. The most common species in the study area are Common and Soprano pipistrelles and Leisler's bat;
- Fish species (Lamprey, Atlantic salmon and European eel);
- Waterbirds of 'qualifying interest' e.g. Brent goose and winter migratory waders;
- Other 'qualifying interest' bird species e.g. kingfisher;
- Protected whorl snails e.g. *Vertigo moulinsiana*); and
- Freshwater white-clawed crayfish.

The key invasive species to consider (European Communities (Birds and Natural Habitats) Regulations, 2011) for developing options within SA3 include:

- Japanese knotweed;
- Himalayan balsam;
- Giant hogweed;
- *Elodea spp.*; and
- Parrot's feather (*Myriophyllum aquaticum*).

2.5 Material Assets

Material assets are considered to be the natural and built assets (non-cultural assets) required to enable a society to function as a place to live and work, in giving them material value.

Some of the natural assets within SA3 are listed in Table 2.12, such as agricultural land and forest areas.

Built assets include transport and communications infrastructure, and other developed areas, including existing water supply infrastructure (see Figure 2.1 and Figure 2.3). These assets all need to be taken into account in new water resource developments.

In addition, water resources and water quality are influenced by urban, agricultural and forestry activity within river and groundwater catchments. This can affect the availability and quality of water for supply.

Irish Water has nineteen WTPs in SA3, meeting the demand of 67.5 Ml/d in 2019.

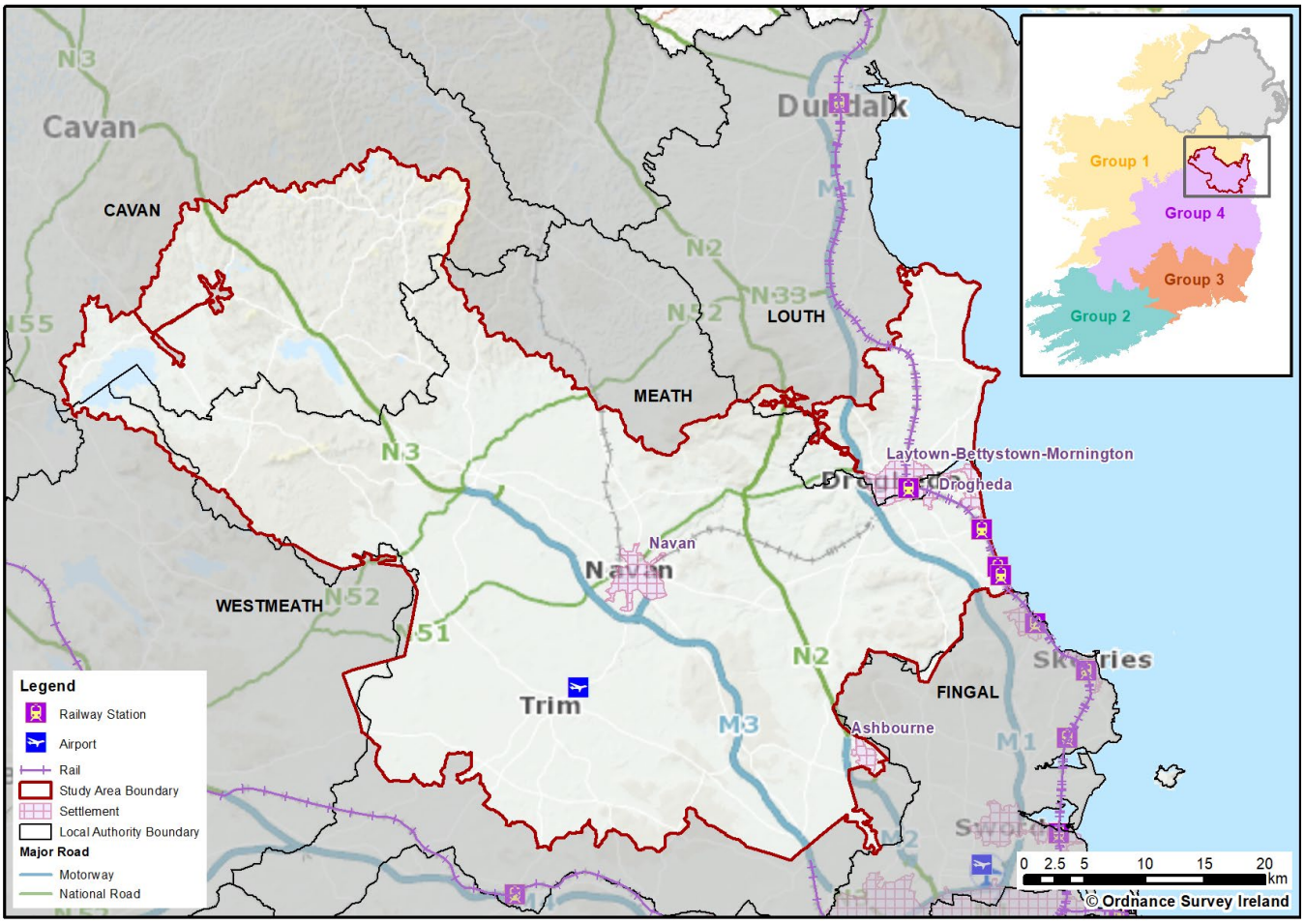

Figure 2.3 Transport Infrastructure in SA3

There are no ports or airports of national or regional significance in SA3. Although there is a local airport, namely Trim Aerodrome.

Other significant transport infrastructure includes the main road (particularly the M1, N2, M3, N3 and N51) and the rail network (Dublin - Dundalk commuter, Dublin Connolly - Belfast Central, and the DART and Dublin Commuter). Other significant transport infrastructure includes the main road network (particularly the M6, M4, N5 and the N55) and rail network (Dublin Connolly - Sligo, and Dublin - Maynooth, Longford and M3 Parkway).

Any new infrastructure considered for SA3 will need to take, existing as well as planned land zoning and local development into consideration.

Table 2.12 Land Use within SA3 (EPA, 2018)[2]

Land use	Ha	% of Study Area	Comparison to Overall Eastern and Midlands Region %
Agriculture	220,124	91.57%	75.52%
Urban	6,822	2.84%	3.69%
Forest	6,159	2.56%	9.42%
Natural habitats	5,620	2.34%	10.61%
Industry	1,278	0.53%	0.70%
Other	379	0.16%	0.06%

Proposals for other strategic developments within SA3 are considered for the assessment. These are primarily identified from the National Planning Framework and from myProjectIreland, where any relevant projects for the study area are included (other local developments may also be included that are not listed in myProjectIreland if they are considered to be of an appropriate scale). Small scale housing and business development are not considered for this plan level assessment.

Table 2.13 gives an overview of the project developments which are available from myProjectIreland (2021) for SA3[3]. The myProjectIreland map focuses mainly on major projects with costs over €20 million. The map also includes all projects supported to date under the Government's Urban and Rural Regeneration Funds and reflects the full portfolio of projects in the pipeline at present.

Table 2.13 Proposed New Developments

Development		
Ashbourne Road and Public Realm	Flowerhill Regeneration Project	Navan Active Land Management Project
Boyne Navigation and Greenway	Greater Dublin Area Groundwater Augmentation	Navan Mid Meath Programme
Department of Education site, Castle Street, Ashbourne	Kells Creative Placemaking (Phase 1) - Kells Courthouse Cultural Hub and Kells Printworks and Topography Centre	Railway Street Regeneration and County Archive
Drogheda and Dundalk Water Supply Schemes	Kells Heritage Development	St Paul's National School
Drogheda Courthouse - PPP: Ongoing Unitary Charge Payments	Laytown to Bettystown Link Road	Trim Library and Cultural Centre
Drogheda Flood Relief Scheme	Libraries Capital Programme - Virginia Library	Virginia Civic Centre

[2] The EPA land use dataset will be used once it has been made available
[3] Note that the myProjectIreland dataset was taken at a fixed point in time to allow for assessment of cumulative effects. The date for SA3 being the 15//01/21.

Development		
Farganstown	N2 Slane Bypass	Westgate Vision Drogheda

2.6 Landscape and Visual Amenity

The National Landscape Strategy 2015 - 2025 is in the process of being implemented and will be Ireland's vehicle for complying with the EU Landscape Convention. Landscape assessment guidance is also available from the local authorities. This will be taken into account when identifying landscape character areas and protected areas at the project level in the future. Table 2.14 shows the value and sensitivity of the Landscape Character Areas (LCAs) within each of the counties listed within the study area. No data is available for the values and sensitivities of the LCAs within the Cavan or Westmeath counties. No data is available for the values of the LCAs within the county of Louth[4].

The value of the landscape in SA3 is reflected in baseline data sections 2.1.3 (Tourism and Recreation), 2.4 (Biodiversity, Flora and Fauna) and 2.8 (Cultural Heritage).

Water supply infrastructure will need to take account of sensitive landscapes and views. This will need to include culturally important areas, townscapes, natural areas and areas and views of importance for tourism and recreation.

Table 2.14 Value and Sensitivity of Landscape Character Areas in the Counties of SA3 (Ordnance Survey Ireland. n.d.)

Landscape Character Area	Value	Sensitivity
County: Cavan (Cavan County Council, 2014)		
No LCA values or sensitivities available		
County: Louth (Louth County Council, 2002)		
Cooley Lowlands & Coastal Area	-	Low
Carlingford Lough & Mountains including West Feede uplands	-	High
Lower Faughart, Castletown & Flurry River Basins	-	Low
Louth Drumlin & Lake Areas	-	Medium
Muirhevna Plain	-	Medium
Dundalk Bay Coast	-	Medium
Dunany, Boyne Estuary Close	-	Medium
Uplands of Collon, Monasterboice	-	Medium
Boyne & Mattock Valley	-	High
County: Fingal (Fingal County Council, 2017)		
Rolling Hills Type	Modest	Medium

[4] As with all the baseline information, the LCA information will be updated as part of regular reviews

Landscape Character Area	Value	Sensitivity
High Lying Type	High	High
Low Lying Type	Modest	Low
Estuary Type	Exceptional	High
Coastal Type	Exceptional	High
River Valley and Canal Type	High	High
County: Westmeath (Westmeath County Council, 2021)		
No LCA values or sensitivities available		
County: Meath (Meath County Council, 2016)		
Teervurcher Uplands	High	Medium
North Meath Lakelands	Moderate	Low
North Navan Lowlands	Moderate	Medium
Rathkenny Hills	Very High	High
Boyne Valley	Exceptional	High
Central Lowlands	High	Medium
Coastal Plain	Moderate	High
Nanny Valley	Very High	High
Bellewstown Hills	Very High	Medium
The Ward Lowlands	Low	High
South East Lowlands	Very High	Medium
Tara Skryne Hills	Exceptional	High
Rathmoylan Lowlands	High	High
Royal Canal	High	Medium
South West Lowlands	High	Medium
West Navan Lowlands	Moderate	Medium
South West Kells Lowlands	Moderate	Medium
Lough Sheelin Uplands	High	High
Loughcrew and Slieve na Calliagh Hills	Exceptional	High
Blackwater Valley	Very High	High

2.7 Air Quality and Noise

2.7.1 Air Quality

Air quality is monitored and managed using Air Quality Zones and air monitoring sites, the air quality index rating of the area within SA3 is rated as ‘good’.

In general, the water industry is not a major contributor to air quality issues, although there is potential for local pollution through Irish Water vehicles, generator plants and drinking water residuals treatment facilities. There is a requirement to comply with air pollution regulations and also identify potential opportunities for reducing emissions. Air quality will be a consideration at the project level, for example, through scheme construction management and scheme design and operation.

2.7.2 Noise

The main areas that experience noise pollution are likely to be areas along the main roads, particularly around the M1, M3 and N51.

Water infrastructure development is not expected to add significantly to noise pollution. Construction noise will be considered through scheme construction management and design for local receptors and for sensitive receptors in close proximity. Noise pollution will also be managed through the planning process with conditions included in planning permissions.

2.8 Cultural Heritage

Within SA3, there are numerous designated and non-designated cultural heritage assets inventoried in the Record of Monuments and Places, the Sites and Monuments Record, the Record of Protected Structures, and the National Inventory of Architectural Heritage (NIAH) (see Table 2.15).

Figure 2.4 shows the location of the individual cultural heritage records from the National Monuments Service and the NIAH. Given the number of small sites, these can be better viewed on the Department of Culture, Heritage and the Gaeltacht's (2020) 'Historic Environment Viewer' website.

There are also potentially unknown, undesignated archaeological and architectural remains throughout Ireland. Water supply can affect cultural heritage through, direct loss or construction of infrastructure involving disturbance of soils, above ground structures close to existing heritage sites affecting setting or changes due abstraction changing drainage and affecting interests within wetland sites.

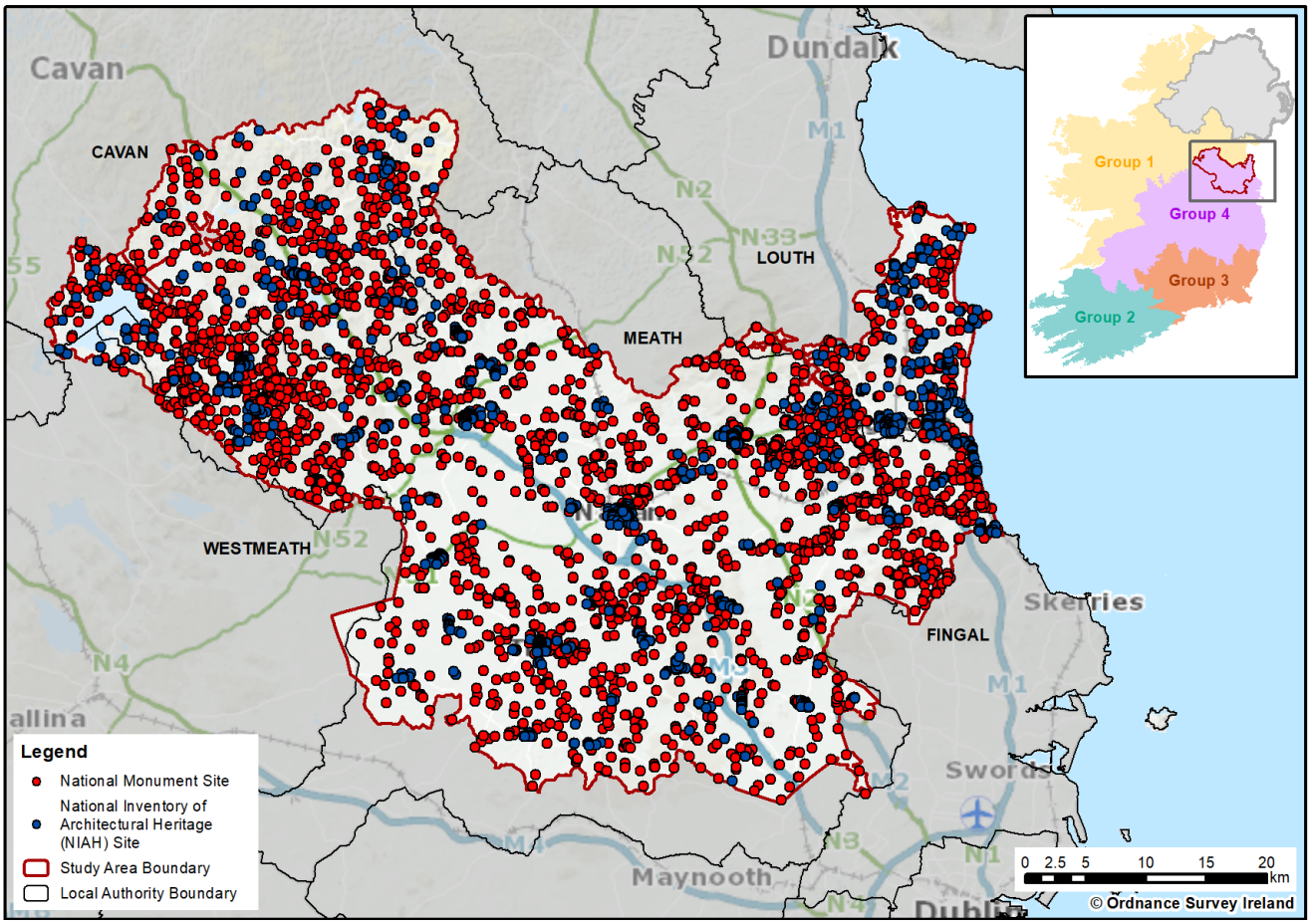

Figure 2.4 SA3 Cultural Heritage Assets

Table 2.15 Cultural Heritage Assets within SA3

Assets	Total Number
National Monuments Service sites	4,334
National Inventory of Architectural Heritage sites	1,925
Sites and Monuments Record Zones	2,090

2.9 Geology and Soils

Table 2.12 lists the land uses within SA3. SA3 has a predominantly fine loamy soil type (EPA, 2019a).

The geology and soils in the environment are fundamental for the quality and quantity of water in the area through differences in drainage, chemical composition, filtration and soil type, topography and resultant land use. Land use has significant impact on water quantity and quality. Groundwater supply depends on the type of aquifers in the area, as they determine the system's ability to store and transmit groundwater. The regionally and locally important aquifers with resource potential for SA3 are shown in Figure 2.5.

The geology of SA3 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 (Rkd) in north-east Meath has substantial groundwater volumes along the Trim, Slane and Drogheda axis.

Important geological and geomorphological sites could be identified for protection as NHAs, however, until designation is confirmed, these sites are classified as Irish Geological Heritage Sites (IGHS). There are over 900 IGHS identified around Ireland, 34 of which have the potential to constrain water resource options in SA3.

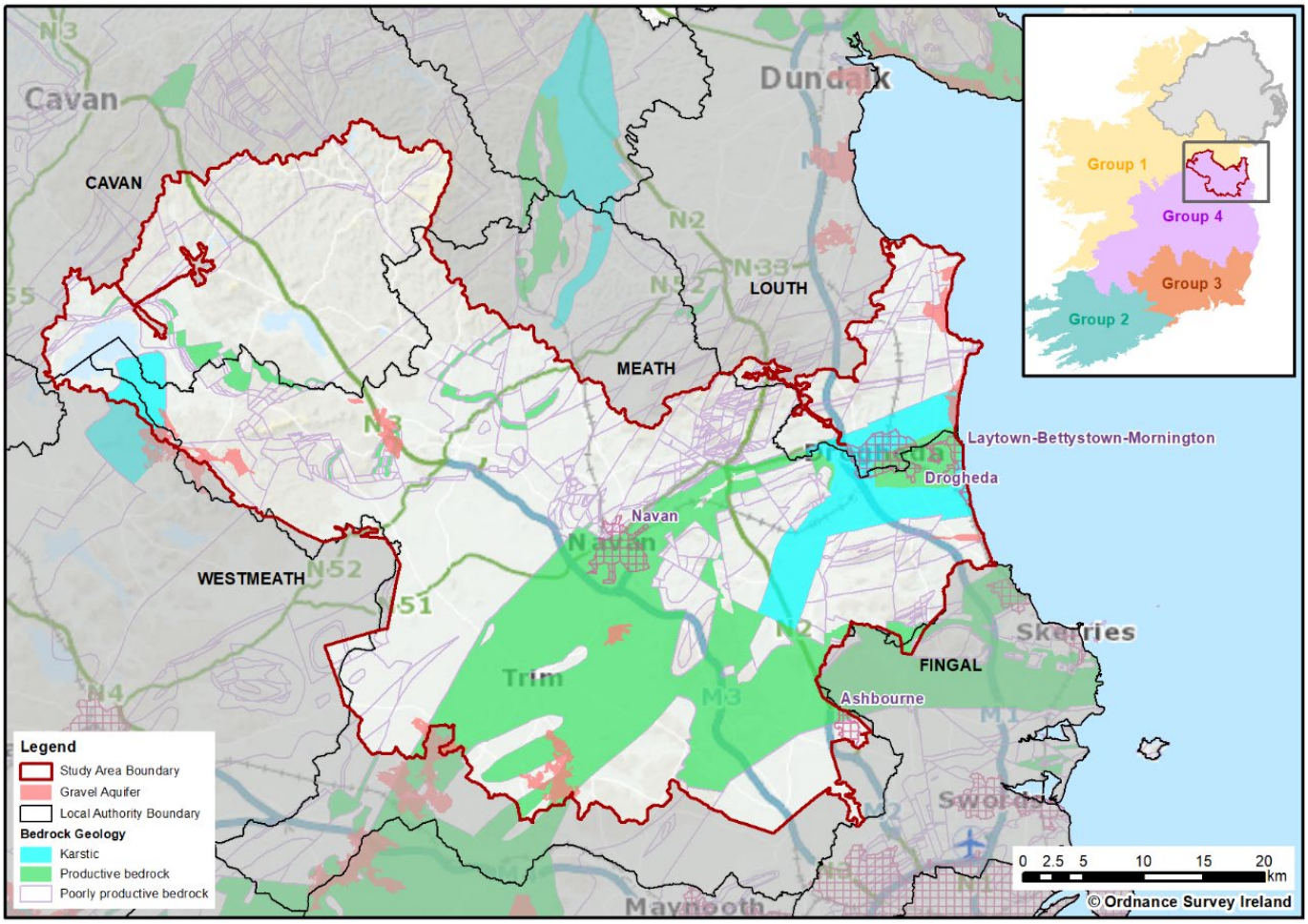

Figure 2.5 SA3 Hydrogeology

2.10 Summary of Key Issues and Trends over the Plan Period

All aspects of the environment will need to be considered as individual schemes are taken forward for further design and implementation. However, the key issues relevant for strategic water planning identified within SA3 are listed in Table 2.16.

Table 2.16 Summary of Key Issues and Trends Over the Plan Period

SEA Topic	Issues and Opportunities	Interrelated Topics
Population, Economy, Tourism and Recreation, and Human Health	**Issues:** Increasing population and the increased stress of climate change on water quality and water resources could affect health and well-being. **Opportunities**: Irish Water will put in place plans to assess water quality and measures to address risks as part of the Framework Plan.	Climate Change, water environment, biodiversity, material assets and landscape and visual amenity

SEA Topic	Issues and Opportunities	Interrelated Topics
	Irish Water has ongoing activities to improve the SDB in SA3, including, leakage management and water conservation measures. Raising awareness of the importance of water conservation and efficiency measures, and the value of the environment for health and wellbeing, can play an important part in water planning. Valuing access to environment for recreation.	
Water Environment	**Issues**: The proposed abstraction licensing, aligned to WFD requirements, will require many current abstractions to be licensed and may limit future abstraction or involve significant conditions being imposed at associated sites. For SA3, some of the existing abstractions may not meet sustainability guidelines in the medium term; specifically, during drought periods. On an interim basis, Irish Water has developed an initial conservative assessment based on available information (see SA3 Technical Report). This has been used to inform options identification and appraisal. Irish Water will update its sustainability analysis and impact on their baseline SDB calculations when regulatory assessments for the new legislation is undertaken. **Opportunities:** To take account of identified pressure on the water environment in the selection of solutions for SA3.	Biodiversity and climate change
Biodiversity, Flora and Fauna	**Issues:** For SA3, it is considered especially important to avoid the loss of irreplaceable or rare habitats and increasing pressure on vulnerable species; potentially through direct land take or indirect such as through increased abstraction pressure	Water resources, water quality and climate change
Material Assets	**Issues:** WTP assets and network infrastructure requiring improvement or replacement. **Opportunities**: Improvements to support reliability of access to good quality water.	Health and wellbeing
Landscape and Visual Amenity	**Issues:** Potential for climate change to affect land use and habitats and influencing landscape quality and amenity.	Biodiversity and geology and soils, climate change, health and wellbeing
Air Quality and Noise	No specific issues identified for the baseline for SA3.	Health and wellbeing
Climate Change	**Issues**: Climate change issues regarding sea level rise, flooding, extreme weather events and changes in seasonal weather patterns. Climate change has been taken into account in supply forecasts and additional	Biodiversity and water environment

SEA Topic	Issues and Opportunities	Interrelated Topics
	risks to infrastructure and operations will need to be taken into account in planning for drought and freeze/thaw events; and in detailed scheme design and network operation. **Opportunities:** Additional management to minimise impact on supply and the environment, vulnerability to climate change, and drought is required.	
Cultural Heritage	**Issues:** Known cultural heritage and archaeological assets and potential unknown archaeological assets.	Health and wellbeing
Geology and Soils	No specific issues, although general need for good soil conservation and retention of nutrients and carbon in soil resources.	Biodiversity, landscape and climate change
Additional interrelated aspects	**Issues**: Poor water quality requiring additional water treatment and affecting biodiversity. **Opportunities:** Potential for catchment management initiatives leading to habitat, water retention, water quality enhancement and soil quality have the potential to provide wider benefits for environmental resilience and water supply; although this has not been specifically studied in this study area.	

3 Environmental Assessment – Options Appraisal

3 Environmental Assessment – Options Appraisal

This chapter provides a summary of the environmental assessment of options considered in the study area, including the option identification and screening process, and assessment of options used in approach development.

3.1 Overview

Irish Water applied its Options Assessment Methodology from the Framework Plan to identify potential solutions to meet the needs identified in the SA3 WRZs.

The general methodology, and how environmental assessment is included, is outlined in the SEA Environmental Report prepared in relation to the Framework Plan. That report identifies SEA objectives and assessment criteria and provides a framework for integrating the environmental assessment of options and combinations of options into a phased appraisal process which also takes account of other criteria such as feasibility, deliverability, resilience and cost.

The Framework Plan Options Assessment Methodology covers eight stages. Stages 1 and 2 are covered through the needs and baseline assessments addressed in chapter 2 of this report. The key stages considered in this chapter for SA3 are Stage 3-6:

- Stage 3 Unconstrained options – to identify all the potential options to be considered to resolve water quality or quantity requirements;
- Stage 4 Coarse screening – to assess the unconstrained options and eliminate any that will not be viable and collect information to inform the next stage;
- Stage 5 Fine screening – options assessment and scoring against the key criteria to verify option feasibility and understand key risks and constraints; and
- Stage 6 Feasible option list – further option development encompassing costing and SEA assessment of options.

3.2 Stage 3: Unconstrained Options

Environmental and social assessment criteria are included at the earliest stages of the screening process. At the outset of the process, some fundamental rules are applied as part of option identification. For example, inter-catchment raw water transfers are excluded due to the high risk of transferring invasive non-native species (INNS) between catchments and potential conflict with WFD objectives.

WFD objectives have also been a key consideration at this stage through an internal sustainable abstraction risk review. This was a specialist review of groundwater bodies and surface water catchments that was undertaken as part of the option identification stage. UK Technical Advisory Group on the Water Framework Directive (UKtag) guidance (UKtag, 2013) on baseflows have been used for the purposes of this plan until Ireland specific standards come into place.

The application of these conservative abstraction standards to new options ensures that any new or increased abstractions from rivers are likely to support conservation objectives for the most sensitive environmental sites. For surface waterbodies, the allowable 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. Allowable abstraction standards for lakes are set at 5 or 10% of Q50 in line with this guidance (the NIS prepared in relation to the Framework Plan, sets out the approach in relation to Appropriate Assessment).

As mentioned previously, these are estimates applied for the purpose of strategic planning and are based on a conservative approach to what new legislative regime might require. The EPA will be the authority adjudicating the sustainability or otherwise of abstractions, once the legislation is enacted and will have the benefit of more detailed site specific information.

For groundwater sources, the assessment includes a high level assessment taking account of a range of information available for existing site and in many cases limited information for new abstraction options This desktop assessment undertaken aimed to identify potential yield and the impact of the yield, including the steps described below.

3.2.1 Existing Groundwater Abstractions

Site specific data is taken into account where possible in assessing potential sustainable yield for increasing abstraction at existing sources. 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.

3.2.2 New Groundwater Abstractions

The Zone of Contribution (ZOC), the land area that contributes water to the well or spring, is defined and used to calculate a preliminary water balance for the source using the average abstraction rate and the annual average recharge rate as estimated from the Geological Survey Ireland (GSI) recharge maps. The water balance estimates the area needed to supply the yield and is then compared to the delineated ZOC. A WFD >30% recharge is applied as a guide for assessment in the fine screening assessment but is recognised to apply more to catchment scale abstraction impact assessments so at a very local abstraction scale it can overestimate the impacts for some sources.

Additional assessment is undertaken on potential preferred groundwater options to inform the SEA taking into account site specific information and consideration of likely impacts on WFD and cumulative effects with existing groundwater abstractions.

Further work will need to be undertaken for groundwater options taken forward as part of abstraction licensing and the development of Drinking Water Safety Plans. This will include establishing detailed geoscientifically robust zones of contribution in line with GSI's Groundwater Protection Schemes (Department of Environment, Community and Local Government, GSI and EPA, 1999) and the EPA Advice Note Number 7, Source Protection and Catchment Management (EPA, 2013). This work will provide in-depth hydrogeological information on the source that will establish reliable and sustainable yields.

3.2.3 Sustainable Abstraction in Options Assessment

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 outlined above, 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.

3.3 Stage 4: Coarse Screening

A total of 101 unconstrained options were identified for SA3 and subjected to coarse screening. The coarse screening process assessed the options against the criteria outlined in Table 3.1. This process is summarised in chapter 9 of the SEA Environmental Report for the Framework Plan. The process allows the assessment of the unconstrained options to eliminate any that will not be viable. The focus at this stage is on options that would be difficult to mitigate, those with likely significant effects on European or nationally important sites, or options likely to lead to deterioration of waterbody WFD status.

Table 3.1 Coarse Screening Assessment Criteria

Criteria	Unconstrained Option Assessment Questions	
Resilience	Q1	Does the option address the supply-demand problem?
Deliverability and Flexibility	Q2	Is the option technically feasible?
	Q3	Can the risks and uncertainties associated with the option be mitigated to avoid failure of the option?
Sustainability (Environmental and Social Impacts)	Q4	Can significant impacts on known high level environmental constraints for example European/ international or nationally designated biodiversity, landscape, cultural heritage sites, WFD objectives or community assets, be avoided or minimised? If not, is mitigation likely to be possible?

Of the 101 unconstrained options, 24 were rejected after being analysed against the coarse screening criteria of resilience, deliverability and environment.

Sustainability reasons for rejecting options were identified for thirteen options. Table 3.2 provides the options that were rejected on an environmental basis and not considered suitable to address the deficit for the WRZs located in SA3. The full rejection register for both the coarse and fine screening (where applicable) is provided in Appendix C of the SA3 Technical Report.

Table 3.2 Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
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
SA3-40a		

Option Reference	Option Description	Rejection Reasoning
SA3-40b	Supply deficit from South Louth and East Meath via Staleen WTP (dewatering at Platin to provide increased yield of 5 Ml/d)	operations being completely dependent on the quarry operations and would likely impact the ground waterbody and surface waterbody meeting WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
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.	
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.	
SA3-008	Bring Rosehall WTP back into operation and upgrade WTP for partial supply to South Louth East Meath	Based on plan level assessments, it was determined that the sustainable allowable abstraction at this location is 1Ml/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. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
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 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 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. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SA3-018		
SA3-022	Split Kells-Oldcastle WRZs - Kells to be supplied from Liscartan WTP (Navan-Mid Meath WRZ) and	This option was considered as part of a grouped option to provide supply to the entire Kells Oldcastle WRZ from Lough Bane. On desktop assessment of

Option Reference	Option Description	Rejection Reasoning
	Oldcastle to be supplied from Lough Bane	the yield available at Lough Bane it was determined that the existing abstraction was already greater than the sustainable allowable 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. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SA3-38e	Supply Navan-Midmeath from GDA (requires new source). New main required across to Navan.	
SA3-41b	Supply deficit from South Louth and East Meath via new GW at Kiltough during the summer, and increase abstraction from the Boyne (treated at Staleen) during the winter - interim	Based on plan level assessment 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 and not taken forward to the fine screening stage.
SA3-02b	Increase abstraction and WTP capacity at Kiltrough for South Louth East Meath	
SA3-064	Rationalise Moynalty WRZ to Bailieboro RWSS - Lough Skeagh will be the source	On plan level assessment of the yield available at Lough Skeagh it was determined that the existing abstraction was already greater than the sustainable allowable 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. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.

3.4 Stage 5: Fine Screening

A total of 77 options passed the coarse screening stage; these options were subjected to further consideration as part of a multi-criteria assessment (MCA) at the fine screening stage.

The objective of the MCA and the fine screening process is to determine the potential benefits and impacts of the options across a range of key criteria. The MCA process allows a combination of issues to be considered together. This process can help indicate if one option will be overall more cost effective, environmentally sustainable, progressible, resilient or feasible when compared with other options. This process requires a desk-based analysis of the options and their potential benefits and impacts against the key criteria.

The environmental criteria are based on the SEA objectives in the form of screening questions. These questions have been developed to allow the performance of each option to be assessed against the SEA objectives. The list of questions developed to assess the environmental and social effects of the options and guidance on the MCA scoring for the fine screening is provided in the SEA Environmental Report: Appendix B.

Summaries of the environmental assessment for options that passed the fine screening stage are grouped by option type and are included in Appendix A. These summaries combine the assessments against individual criteria to give an overall environmental topic score; this overall score is based on the worst score across each of the topic's criteria.

This is a high-level risk based assessment intended to support a comparison of options. Likely beneficial effects are represented by positive scores and likely adverse effects are represented by negative scores based on a seven-point scale.

No further options were rejected at fine screening stage.

3.5 Stage 6: Feasible Options List

A total of 77 options were included as feasible options and were taken forward for Approach Development. The next step was to use the information collected for the fine screening assessment to inform the development of approaches to resolve the SDB deficit within each WRZ and across the study area.

Details of the feasible options identified for this study area, and the Preferred Approach selected, are provided in the SA3 Technical Report.

4

Environmental Assessment – Approach Development

4 Environmental Assessment – Approach Development

This chapter describes how the SEA was integrated into the development of potential approaches/combinations for meeting the SDB deficit at the WRZ level, then at the study area level, and how alternative approaches were considered and assessed.

4.1 Introduction to Approach Development

After the feasible options for the study area were identified the next step was to assess a range of possible SA combinations to resolve the supply deficit within each WRZ and across the study area. This chapter addresses Stage 7 in the assessment methodology.

A SA combination is a way of configuring an option, or options, to meet either an SDB deficit or water quality requirements. As set out in the Framework Plan, Irish Water considers six SA approaches, which are the combinations rated as the best within the six categories summarised in Table 4.1. This process contributes to assessment of alternatives to meet plan objectives. Consideration of reasonable alternatives is an important part of meeting SEA regulatory requirements.

Table 4.1 The Six SA Approaches

SA Approaches Tested	Description	Policy Driver
Least Cost (LCo)	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) (BA)	Lowest score against the European Sites (Biodiversity) sub criteria question based on assessing the option as having either no LSEs, LSEs that can be addressed with general/standard mitigation measures or LSEs that may be more difficult to mitigate. For options scoring -3, potential alternative higher scoring options are sought where possible.	Habitats Directive
Quickest Delivery (QD)	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 (potential benefit for SEA Objective on population and public health).	Statutory Obligations under the Water Supply Act and Drinking Water Regulations
Best Environmental (BE)	This is the option or combination of options with the highest total score across the SEA objective criteria MCA questions. In addition, high risk -3 issues are considered against individual criteria focusing on long term operational effects.	SEA Directive and WFD
Most Resilient (MR)	This is the option or combination of options with the highest total score against the resilience criteria. (Link	National Adaptation Plan

SA Approaches Tested	Description	Policy Driver
	to SEA Objective for climate change adaptation for environment)	
Lowest Carbon (LC)	This is the option or combination of options with the lowest embodied and operational carbon cost	Climate Change Strategy

These six SA approaches focus on different plan or environmental objectives. Three of the six SA approaches address environmental objectives;

- Best AA;
- Best Environmental; and
- Lowest Carbon approaches.

These are all focused on environmental criteria and are based on the environmental information and scoring undertaken for the MCA.

4.2 Stage 7: Approach Development Process

There are three stages in the Approach Development Process, these are summarised below and provided in more detail in section 7 of the RWRP-EM:

The **First Stage** is the Approach Appraisal at WRZ level. This stage assesses the feasible options for each WRZ and identifies the best performing option within each of the six Approach Types for the relevant WRZ. For example, the option or combination of options that would be classified as the Lowest Carbon Approach, would be that with the lowest carbon cost, based on comparative outline design. The best performing options within each Approach Category are then compared against one another using the 7-step process outlined in Figure 4.1. This process develops an initial Preferred Approach at WRZ level, for all of the individual WRZs in the study area (the "WRZ Level Preferred Approach").

For the Best AA Approach, the scoring on the European Sites (Biodiversity) sub-criteria question refers to the possibility for Likely Significant Effects (LSEs). A Score of 0 equates to no LSEs. If an option is identified that meets the “Objectives of the Plan” and is assessed as having no potential impact on a European Site (zero or neutral score based on desktop assessment), it is automatically adopted as the Preferred Approach at WRZ level. Furthermore, because it is possible that all of the potential impacts identified at Plan level can be entirely ruled out through project level investigation and analysis or avoided through project level mitigation, options with potential for LSEs (score of -1 to -3 for biodiversity) may be progressed as the Preferred Approach. If potential impacts cannot be ruled out or avoided, then mitigation in the form of avoidance is provided for within the NWRP to protect European site(s). Should potential adverse effects on European sites be identified at the project level from a given option/Preferred Approach the NWRP will have identified other options[5] that could be progressed at the project level if required. Therefore, no project arising from the NWRP, with Adverse Effects on Site Integrity (AESI) identified at the project stage would be implemented. Scores of -1 to -3 equates to LSEs being identified. Scores of -1 to -2 are LSEs that will not result in AESI with standard best practice

[5] These options may not have progressed as the Preferred Approach initially as they may have scored significantly worse against other environmental, resilience or feasibility criteria (e.g. the best AA approach may identify an option that results in four times more carbon being produced or is twice as expensive).

project specific mitigation applied as these can be addressed with general/standard mitigation measures. Scores of -3 equates to LSEs that may be difficult to mitigate or where uncertainty remains.

The NIS provides more detail in the LSE and the AESI Tables: Appendices C-D. Any option with a score of -1 to -3 is taken forward to AA (Stage 2 of the AA process) and assessed within the NIS for the Regional Plan.

The **Second Stage** assesses whether there are any larger options (SA options, also referred to as 'group options') that might resolve deficits across multiple WRZs within a study area. Combinations are then developed using these SA options and WRZ Preferred options to create "SA Combinations".

The **Third Stage** compiles the SA Combinations that rank highest for each of the Six Approach Types to generate SA Approaches. The WRZ Level Approach and SA Approaches are then compared against each other using the 7-Step process in Figure 4.1 to generate the SA Preferred Approach.

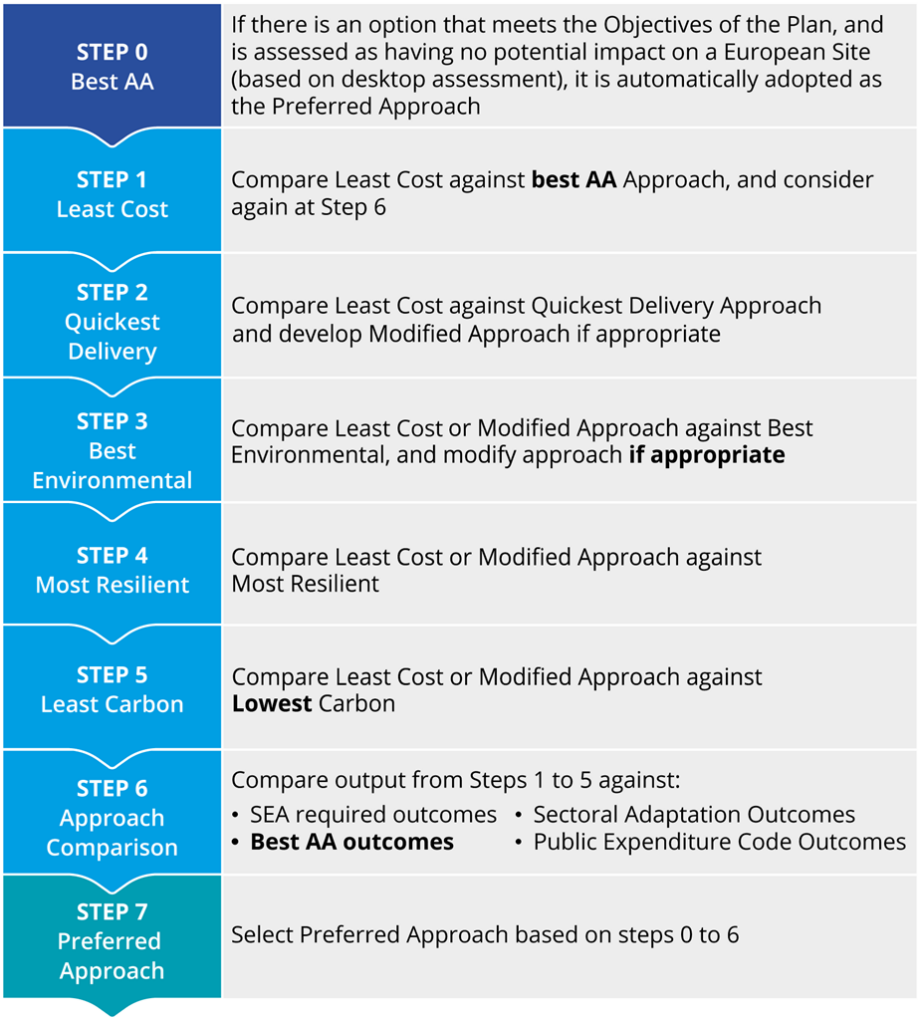

Figure 4.1 The 7 Step Process

4.2.1 Environmental Assessment in the Approach Development process

Combinations of feasible options are identified to balance the water demand and predicted baseline supply and address the remaining deficit over the plan period. The Approach Development process allows Irish Water to compare and optimise the options against different elements to create a range of approaches capable of meeting the deficit.

There are two strands of environmental information and assessment used in the Approach Development process. These are:

Environmental and social costs: these were based on a natural capital/ecosystems services framework and scoped to be relevant and achievable with the information available and to add to, rather than duplicate, the qualitative environmental assessment of the options. This included:

i. Climate regulation – woodland;
ii. Traffic impacts – opportunity cost of time due to road congestion from roadworks;
iii. Food – crops and livestock; and
iv. Carbon equivalent emissions tonnes (note total greenhouse gas emissions are expressed in terms of carbon equivalent emissions) including embodied and operational carbon were also calculated and costed.

The approach for calculating the elements i, ii, iii and iv are explained in the SEA Environmental Report Appendix E.

Carbon emissions (tCO2e) and carbon costs are calculated alongside construction and operational costs. As part of the environmental assessment carbon efficiency has also been calculated to identify carbon emissions per ML of water supply.

Environmental assessment: this is qualitative assessment against the SEA objective for each option as part of the MCA scoring for the fine screening. These scores are based on assessing options in terms of potential adverse or beneficial effects and a seven-point scale is used from Major, Moderate or Minor Adverse, Neutral, to Minor, Moderate or Major Beneficial. These are reflected in numeric scores -3 to 0 to +3 and are used to assess option performance against the MCA scores. The scoring applied at fine screening is reviewed and updated based on the developed option descriptions and additional environmental analysis.

Carbon emissions (tCO2e) were initially assessed through qualitative assessment for fine screening as this preceded option costing, however in the approach development process the carbon emissions as total Net Present Value (NPV) costs have been used to inform the Approach Development Process Total life- time carbon emissions and carbon efficiency per ML have been used to inform the SEA assessment.

The general process is illustrated in Figure 4.2 below.

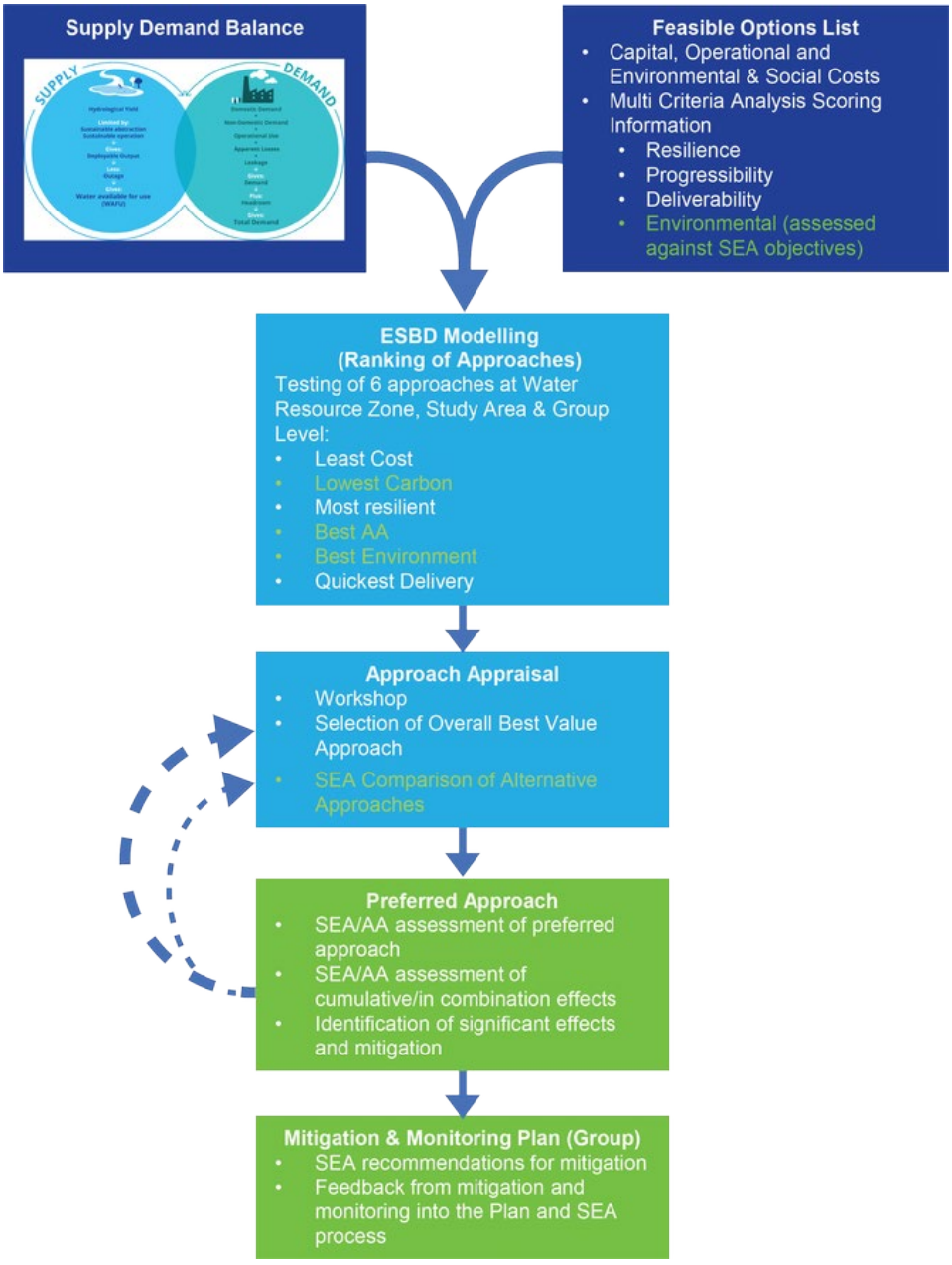

Figure 4.2 Approach Development Process

4.3 SA3 Approach Development Process

The approach appraisal process was undertaken through structured workshops and reviews involving relevant environmental expertise (including ecologists, hydrogeologists, hydrologists and environmental scientists) and included Local Authority involvement and feedback. This process was supported by information on the feasible options, including the environmental assessment against SEA criteria in the MCA and the option costings.

The options were then taken through the sequential testing (the 7 step process detailed in section 4.2, Figure 4.1 above) against the six SA categories (lowest carbon, best environmental, best AA, least cost, quickest delivery and most resilient) to identify the best overall options at each of the three spatial levels, the WRZ and study area levels applying the three stages:

Stage 1 - comparing WRZ options and identify the preferred WRZ level approach. For SA3 there are 27 WRZ options and these are listed in Table 5.2 in the SA3 Technical Report, providing option reference

numbers and the relevant WRZ. These options were taken through the 7 step process to identify the preferred WRZ approach.

Stage 2 - creating combinations of WRZ options and SA options (group options) for comparison. These are the possible SA combinations and are presented and ranked against the approach categories in (see Table 4.2).

Stage 3 - selecting the Preferred Approach at study area level – this stage compares the WRZ level preferred approach and the SA combinations to determine the Preferred Approach that provides the best outcome for the study area. The best performing SA combinations under each of the six approach categories are identified and then compared using the 7 step process applied in the workshop to establish the Preferred Approach at study area level.

Performance ranking against the assessment criteria was based on the MCA scoring, including the fine screening environmental assessments, and costings. Further environmental assessment has also been undertaken to compare the alternative approaches in line with SEA requirements and this assessment is presented in Table 4.7 and Table 4.9 below.

For SA3, a total of 14 combinations were compared including the WRZ Level Approach; these are presented in Table 4.2. Note that the Preferred Approach selected at the end of the process has been outlined in red throughout this section.

Table 4.2 SA3 Summary of SA Combination of Performance against Approach Category

Category	WRZ level approach	SA combination 1 (SA option 3)	SA combination 2 (SA option 4)	SA combination 3 (SA option 7)	SA combination 4 (SA option 8)	SA combination 5 (SA option 9)	SA combination 6 (SA option 10)	SA combination 7 (SA option 16)	SA combination 8 (SA option 17)	SA combination 9 (SA option 20)	SA combination 10 (SA option 22)	SA combination 11 (SA option 22b)	SA combination 12 (SA option 23)	SA combination 13 (SA option 8 & 16)
Least Cost							Worst						Best	
Quickest Delivery							Best							Worst
Number of -3 Biodiversity Scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	One -3 score	No -3 scores	One -3 score	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	One -3 score
Lowest Carbon								Best				Worst		
Most Resilient						Worst		Best						
Best Environmental			Best				Worst							

Key														
Ranked order (best to worst)	Best													Worst

Through comparing the potential SA combinations, the best SA approach for each of the six approach categories was identified (also see section 5 of the Study Area Technical Report); these aligned as four approaches (see Table 4.3). Costs for four of the SA combinations are within 5% of each other and are therefore all considered as possible least cost combinations. However, after further comparison (see section 5 of the SA3 Technical Report), combination 12 was identified as the best least cost combination.

Table 4.3 Study Area Approach Categories

Category	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)
Least cost (LCo)	✓	-	-	-
Quickest Delivery (QD)	-	-	✓	-
Best Environmental (BE)	-	✓	-	-
Most Resilient (MR)	-	-	-	✓
Lowest Carbon (LC)	-	-	-	✓
Best AA (BA)	-	✓	-	-

The WRZ options and SA options (group options) that make up each SA approach are listed in Table 4.4. More detailed descriptions of the options are provided in Appendix A and a full list of options for each approach is given in Appendix B of this report.

Table 4.4 Study Area Approaches

Options included	Do Minimum	Least Cost Approach (SA Combination 12)	Best Appropriate Assessment Approach (SA Combination 2)	Quickest Delivery Approach (SA Combination 6)	Best Environmental Approach (SA Combination 2)	Most Resilient Approach (SA Combination 7)	Lowest Carbon Approach (SA Combination 7)
SA options (Group options)	No options	**SA option 23:** 096, 097, 098, 099, 100, 101, 102	**SA option 4:** 09c, 017, 026, 030, 38b, 045, 048, 053	**SA option 10:** 04a, 42a	**SA option 4:** 09c, 017, 026, 030, 38b, 045, 048, 053	**SA option 16:** 065, 76b	**SA option 16:** 065, 76b
WRZ options	No options	047 077	077 088	028 035	077 088	09a 028	09a 028

Options included	Do Minimum	Least Cost Approach (SA Combination 12)	Best Appropriate Assessment Approach (SA Combination 2)	Quickest Delivery Approach (SA Combination 6)	Best Environmental Approach (SA Combination 2)	Most Resilient Approach (SA Combination 7)	Lowest Carbon Approach (SA Combination 7)
		088	089	047	089	035	035
		089		049		047	047
				077		049	049
				088		089	089
				089		090	090
				091		091	091
				106		106	106

* all options are part of SA3 e.g. SA3-096 is shown as 096 above

For the purposes of the Approach Development Process as set out in the SA Technical Report and for the purpose of the SEA comparison as set out in this Environmental Review, Irish Water has only considered the options that were identified as the "best" performing options for each approach category. The identification of the approaches and 7 step process are outlined in detail in section 5 of the SA3 Technical Report.

Within SA3, this resulted in four approaches being selected from the 14 SA combinations identified in Table 4.2, as they were identified as the best performing against the six approach categories - Least Cost, Best Environmental, Quickest Delivery, Most Resilient, Best AA and Lowest Carbon. This means that when comparing the four identified approaches against each other (representing the Stage 3 analysis for the selection of the Preferred Approach used in the workshop - see Table 4.5), their relative performance against categories they were not identified as “best” in in Table 4.2 may be different. This because Table 4.2 compares all of the combinations to give a wider ranking, whereas Table 4.5 only compares the best performing combinations that have been selected as approaches. For example, an option identified as the "worst" performer against a particular approach category in Table 4.5 may not be the overall worst performing option when considered alongside all of the combinations in Table 4.2.

Table 4.5 includes a summary of the MCA scoring and cost comparison used in the approach development for the each of the SA approaches identified as performing best against at least one of the approach categories.

The three stages identified above were applied through a final workshop with all of the background MCA and option costing information available for each option and the ranking from the Economic Balance of Supply and Demand (EBSD) tool. Table 4.5 shows both SA approach 1 and SA approach 2 as the best AA because they have the same number of -3 biodiversity scores (i.e. Neither approach had any -3 biodiversity scores). SA approach 2 was selected as the best AA approach in Table 4.3 after comparing the number of -2 and -1 biodiversity scores.

Table 4.5 Summary of the MCA Scoring Costing for the SA Approaches

Category Criteria	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)
Least Cost Score	Best*		Worst	
Quickest Delivery Score		Worst	Best	
Best AA Score	No -3 Biodiversity Scores	No -3 Biodiversity Scores	One -3 Biodiversity Score	No -3 Biodiversity Scores
Lowest Carbon Score			Worst	Best
Most Resilient Score		Worst		Best
Best Environmental Score		Best	Worst	

Key			
Ranked order (best to worst) within the 4 selected approaches			
Worst			Best

*As set out above and in more detail in section 5 of SA3 Technical Report, combination 12 was brought forward as the best least cost approach.

4.4 Comparison of SA3 Approaches

An overall summary of the infrastructure components and abstractions for each of the SA approaches identified for SA3 is provided below in Table 4.6 and has been used to inform the environmental assessment.

Table 4.6 Study Area Approach Components Summary

Infrastructure Summary	Do Minimum	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)
New pipeline network (km)	0	160	172	100	110
New WTPs	0	1	1	3	3
Upgrade WTPs	0	8	14	11	10
New/upgraded abstractions	0	3	2	8	8

Infrastructure Summary	Do Minimum	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)
WTPs decommissioned	0	11	5	6	6
Abstractions abandoned	0	12	0	0	0
Raw water storage	0	0	0	0	0
Treated water storage	0	7	6	7	7

A comparative assessment of the four SA approaches based on the environmental option scores is summarised in Table 4.7 below. This covers:

- Scores across the options summed for all the sub-criteria against each SEA objective topic heading;
- Total numbers of -3 scores representing higher risk of effect, or likely greater requirement for mitigation, against each SEA objective topic heading; and
- Indication of the extent of difference in performance across the options to help identify if the differences between the SA approaches are small or large.

Table 4.7 Study Area Approach Comparison Summary

Topic	Total No. of	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)	Range (Difference between Lowest and Highest Score)
Population, health, economy and recreation	-3 scores	No difference				0
	MCA score		Best		Worst	16
Water Environment: quality and resources	-3 scores		Best	Worst	Worst	2
	MCA score		Best	Worst		12
Biodiversity, Flora and Fauna	-3 scores	Best	Best	Worst	Best	1
	MCA score		Best	Worst		35

Topic	Total No. of	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)	Range (Difference between Lowest and Highest Score)
Material Assets	-3 scores	Worst	Worst	Worst	Best	1
	MCA score	Best	Best	Worst		7
Landscape and Visual	-3 scores	No difference				0
	MCA score	Best	Best	Worst	Worst	3
Climate Change	-3 scores	Worst	Worst	Worst	Best	1
	MCA Score		Best		Worst	8
Culture, Heritage and Archaeology	-3 scores	No difference				0
	MCA Score	Best		Worst	Worst	3
Geology and Soils	-3 scores	No difference				0
	MCA Score	Worst	Best	Worst	Worst	2

Key
MCA/No. of -3 scores against each criterion
Worst | | | Best

* approaches are showing similar level of risk on climate change adaptation and therefore represented as no difference. However, carbon mitigation is covered separately based on estimated emissions and carbon cost (NPV). See lowest carbon approach.

** approaches are showing similar level of risk on geology culture, heritage and archaeology. Routing and siting is only indicative at this stage. Most options involving new constructions include a level of risk to buried unknown archaeology, this would need to be investigated further at the project level.

4.4.1 SA Approach 1 (SA Combination 12) (LCo)

SA approach 1, key comparison points:

- Identified as the best against the Least Cost category;

- Option types included:
    - SA option: 1 rationalisation option;
    - WRZ options: 3 groundwater abstraction options and 1 WTP upgrade option;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 1 is similar to SA approach 2 in terms of infrastructure development, with the main differences being that it also includes an option which increases the existing groundwater abstraction at, and upgrades, Slane WTP. The SA options included in SA approach 1 require fewer WTP upgrades andmore WTPs to be decommissioned.

4.4.2 SA Approach 2 (SA Combination 2) (BE, BA)

SA approach 2, key comparison points:

- Identified as the best in the Best Environmental and the Best AA categories;
- Option types included:
    - SA option: 1 rationalisation option;
    - WRZ options: 2 groundwater abstraction options and 1 WTP upgrade option;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 2 is similar to SA approach 1 as described above, with the key differences being that SA approach 2 involves the longest length of pipeline and most WTP upgrades, as well as less than half as many WTPs to be decommissioned.

4.4.3 SA Approach 3 (SA Combination 6) (QD)

SA approach 3, key comparison points:

- Identified as the best in the Quickest Delivery category;
- Option types included:
    - SA option: 1 rationalisation option;
    - WRZ options: 5 groundwater abstraction options, 1 rationalisation option, 2 surface water abstraction options and 1 WTP upgrade option;
- One -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 3 is similar to SA approach 4 and involves a greater number of new WTPs and new or upgraded abstractions than SA approaches 1 or 2 and that the SA options involve increased abstraction at Staleen WTP in Lough offset by discharge of treated effluent from Drogheda WwTP.

4.4.4 SA Approach 4 (SA Combination 7) (LC, MR)

SA approach 4, key comparison points:

- Identified as the best in the Lowest Carbon and Most Resilient categories;
- Option types included:
    - SA option: 1 rationalisation option;
    - WRZ options: 4 groundwater abstraction options, 2 rationalisation options and 3 surface water abstraction options;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 4 is similar to SA approach 3, with the key differences being that the SA options involve a new WTP and abstraction from Lough Ramor rather than increased abstraction at

Staleen WTP. Similar to SA approaches 1 and 2, this approach relies on transfer from the Greater Dublin Area.

4.5 SA3 Approach Assessment Comparison

The 'Do Minimum' approach is the 'without plan' approach, meaning that this is the approach that would occur without the NWRP. As a result, the 'Do Minimum' approach would only include reactive, unplanned interim measures to address failures in infrastructure.

The SDB shows a current deficit, applying the level of service in the area with the corresponding requirements for reserves, indicating operation of supplies with an SDB ranging from 18,155 m^3/day in 2019, to a projected maximum of 26,013 m^3/day in 2044 during dry conditions under a 'Do Minimum' scenario. As a result, public water supplies in this area are vulnerable, particularly under drought conditions. In addition, there may be ongoing reliability issues with the supplies and the situation is expected to further deteriorate due to climate change driven reductions in water resources and increased demand growth within the area. Table 4.8 shows the SDB for the WRZs in SA3.

Table 4.8 Supply Demand Balance for SA3

WRZ Name	WRZ Code	Population	Maximum Deficit m^3/day*	
			2019	2044
Bailieboro RWSS	0200SC0015	7,931	-1,446	-1,707
South Louth & East Meath	2100SC0001	73,436	-10,318	-15,596
Kells-Oldcastle	2300SC0005	11,117	-3,396	-3,776
Athboy	2300SC0006	4,669	-387	-497
Ballivor	2300SC0007	2,540	-53	-131
Slane	2300SC0009	3,066	-430	-551
Kilmessan	2300SC0011	1,138	-98	-141
Trim	2300SC0014	11,399	-442	-692
Moynalty	2300SC0027	188	No Deficit	No Deficit
St Louis, National School, Rathkenny	2300SC0045	5	-4	-4
Navan-Mid Meath	2300SC0055	40,101	-1,581	-2,918

*Based on the Dry Year Critical Period (DYCP) weather vent planning scenario

An overall assessment and comparison of the SA approaches considered along with the 'Do Minimum' approach (a continuation of the current situation) is provided in Table 4.9 below.

Table 4.9 Assessment of the SA Approaches and the 'Do Minimum' Approach

SEA Objectives	Phase (Construction (C) / Operation (O))	Do Minimum	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)
1. Protect public health and promote wellbeing	C	0	-	-	--	--
	O	---	++	++	++	++
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	0	-	--	--	--
	O	--	--	-	---	--
3. To protect landscapes, townscapes and visual amenity	C	0	-	--	--	--
	O	0	++	+	+	+
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	0	--	---	---	---
	O	-	0	0	0	0
5. Reduce greenhouse gas emissions	C	0	--	---	---	-
	O	-	--	---	---	-
6. Contribute to environmental climate change resilience	C	0	-	-	-	-
	O	--	-	0	-	+
7. Protect and improve surface water and groundwater status	C	0	-	-	-	-
	O	--	--	-	---	---
8. Avoid flood risk	C	0	0	0	0	0
	O	0	0	0	0	0
9. Protect and where appropriate, enhance cultural heritage assets	C	0	-	-	-	-
	O	0	0	0	0	0
	C	0	-	0	-	-

SEA Objectives	Phase (Construction (C) / Operation (O))	Do Minimum	SA Approach 1 (SA Combination 12) (LCo)	SA Approach 2 (SA Combination 2) (BE, BA)	SA Approach 3 (SA Combination 6) (QD)	SA Approach 4 (SA Combination 7) (LC, MR)
10. Protect quality and function of soils	O	0	0	0	0	0

Key			
Major beneficial	+++	Minor adverse	-
Moderate beneficial	++	Moderate adverse	--
Minor beneficial	+	Major adverse	---
Neutral	0		

The overall assessment of the approaches against the SEA objectives indicates that SA approach 1 (identified as the Preferred Approach) and SA approach 2 are likely to have lower impacts on public health and wellbeing due to the number of existing WTPs being decommissioned and the number of upgrades to WTPs to improve water quality. SA approach 1 is also indicated to improve the landscape as a result of the higher number of existing WTPs being decommissioned and less construction associated; this also resulted in SA approach 1 being indicated to have a lower impact for materials.

Mitigation for the Preferred Approach is identified in chapter 5 through the individual options assessment and the chapter 6 cumulative assessment. All the approaches address the identified water supply quantity and quality requirements to secure a level of service important for public health and wellbeing compared with the 'Do Minimum'.

4.5.1 Selection of the SA Preferred Approach

SA approach 1 has been selected through the 7-step process as the best performing approach overall across the different categories.

The SA Preferred Approach does not include any -3 Biodiversity score options. Therefore, no higher risk options for effects on European Sites are included in the Preferred Approach. For options identified as having some level of risk for LSEs, mitigation measures to address these are set out in the NIS and no AESI are identified.

4.6 Without Regional Transfer Alternative

The approach development process at study area level identifies a number of locations where a supply from outside the study area is likely to represent a better solution than relying on local supply solutions only. The SA3 Preferred Approach includes options that are dependent on the development of the SA9 Preferred Approach. Alternatives for these options need to be considered in the event that the Preferred Approach for SA9 cannot advance, the alternative options are outlined in Table 4.9. Note that the options for the other WRZs that are not specified in Table 4.10 will remain the same as those in the current SA3 Preferred Approach.

Table 4.10 Alternative Options for WRZs Dependent on the SA9 Preferred Approach

WRZ	SA3 Preferred Approach Option	SA3 Alternative Option
Navan Mid Meath	SA Option 23 Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come for new source for the GDA. Rath Reservoir, Clavin's Bridge, Coill Dios, Trim, Earlsmill, Liscarton, Kilmurray, Athboy, Lough Bane, Kilmessan Swainstown and Kilcarn interim WTPs and their abstractions will be decommissioned as part of this option.	SA3-090 Maintain and upgrade existing WTP and increase existing surface water abstraction from the River Boyne for the Kilcarn WTP
South Louth & East Meath		SA3-04b Maintain existing WTPs and abstractions. Increase existing abstraction from the River Boyne and WTP capacity at Staleen WTP. Pump treated effluent from Drogheda WwTW downstream of Staleen abstraction as compensate flow to mitigate impact of increasing abstraction.
Kells-Oldcastle		SA3-091 Decommission existing WTPs and surface water abstractions from the Lough Bane and the River Blackwater. New surface water abstraction and WTP at Lough Ramor and provision of network to provide supply to the WRZ.
Trim		SA3-106 Increase surface water abstraction from River Boyne and upgrade Trim WTP
Athboy		SA3-028 Maintain existing WTPs and abstractions. New groundwater abstraction and associated WTP
Ballivor		SA3-033 Maintain existing WTPs and abstraction at Kilmurray WTP. Increase surface water abstraction from Stoneyford River and treatment capacity at Earlsmill WTP.
Kilmessan		SA3-049 Increase existing abstraction and treatment plant capacity at Kilmessan WTP

An overall infrastructure summary of the Preferred Approach options and the alternative options listed in Table 4.10 are provided in Table 4.11, covering the main components of the options.

Table 4.11 Alternative and Preferred Approach Options Infrastructure Summary

Infrastructure Summary	Preferred Approach Options	Alternative Approach Options
New pipeline network (km)	153.7	60.0
New WTPs	0	2
Upgrade WTPs	4	8
New/upgraded abstractions	0	7
WTPs decommissioned	11	4
Abstractions abandoned	11	0
Raw water storage	0	0
Treated water storage	6	6

Table 4.12 provides an overall comparative assessment between the SA3 Preferred Approach options and the alternative options listed in Table 4.10 against the SEA objectives.

Table 4.12 Assessment of the Preferred Approach Options and the Alternatives

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
1. Protect public health and promote wellbeing	C	--	--	The PA options require over twice times the length of pipeline; however, the Alt options require two new WTPs. Both have the potential to cause disruption to urban and rural areas.
	O	++	+	The PA option decommissions seven more WTPs than the Alt options, removing failing WTPs and reducing traffic in the local area. The Alt options build two new WTPs which could result in higher traffic and noise levels in the local area during operation.
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	--	-	The Alt options pipeline and new WTP construction may impact commuting pathway for bird and bat species. The PA options could cause potential pollution impacts as the pipeline network crosses waterbodies which have both direct and in-direct pathways to European designated sites.
	O	-	---	The PA option pipeline has multiple river crossings and has both direct and indirect links to multiple European sites. The Alt options has the potential to

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
				lead to significant impacts through abstraction pressures causing reduced flow rate on qualifying interests, including Atlantic salmon and River Lamprey. There is also potential for impacts to European sites such as the River Boyne and Backwater SAC/SPA both directly and indirectly through potential pollution via treated effluent pumped at Staleen.
3. To protect landscapes, townscapes and visual amenity	C	-	-	The PA option has over twice the length of pipeline, however, the Alt options require two new WTPs. Both have the potential to cause visual impacts to urban and rural areas during construction.
	O	+	-	The PA options include the decommissioning of eleven WTPs. Although the Alt options decommission four WTPs they also require two new WTPs to be built. This has the potential to cause minor long term visual impacts.
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	--	--	The PA options require approximately 153km of new pipeline, however, the Alt approach requires 60km of pipeline and also two new WTPs to make use of existing assets. Both options will result in the temporary loss of access to agricultural land, although the Alt option SA3-091 would result in the temporary loss of land used for recreational amenity in Proudstown.
	O	0	0	Both the Alt and the PA options have no predicted operational impacts as access and land will be reinstated.
5. Reduce greenhouse gas emissions	C	---	---	There is a major level of carbon emissions associated with both the PA and Alt options in relation to the Deployable Output created.
	O	---	---	
6. Contribute to environmental climate change resilience	C	0	0	No construction impacts are predicted.
	O	+	--	The PA options use a large resilient supply whereas the Alt options utilise several smaller supplies that are more vulnerable to climate change impacts. The

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
				PA options would also help to reduce pressure on existing environmental sources within these WRZs through rationalising the supply.
7. Protect and improve surface water and groundwater status	C	0	0	No construction impacts are predicted.
	O	0	--	The PA options does not include any new or increased abstractions whereas the Alt options include one new surface water abstraction, four increased surface water abstractions and two increased groundwater abstractions. The Alt option SA3-028 also has potential concerns around its long term sustainability.
8. Avoid flood risk	C	0	-	The PA option is not predicted to cause any impediment to surface water flow paths or increase to flood risk anticipated. The Alt options SA9-028 and SA9-091 could result in minor impediment to flood risk management or result in loss of a small area of flood plain.
	O	0	-	
9. Protect and where appropriate, enhance cultural heritage assets	C	-	--	Some of the Alt options are located in areas where there are a number of cultural heritage assets listed under the Record of Monuments/Record of Protected Structures and/or National Inventory of Architectural Heritage records. The PA options are not located where there are any records of cultural heritage assets or unknown archaeology listed under the Record of Monuments/Record of Protected Structures and/or National Inventory of Architectural Heritage records. However, due to new network required, risk of unknown archaeology is assessed as minor.
	O	0	0	No operational impacts are predicted.
10. Protect quality and function of soils	C	-	-	The PA and Alt options are located where there are a number of sites listed under IGHS, NHAs, or pNHAs of geological significance present. There is also potential risk of minor damage to valuable soils with construction of the network.

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
	O	0	0	Soils will be reinstated after construction and no operation impacts are predicted.

Key			
Major beneficial	+++	Minor adverse	-
Moderate beneficial	++	Moderate adverse	--
Minor beneficial	+	Major adverse	---
Neutral	0		

The Preferred Approach options are assessed in Table 4.12 as performing better against seven of the ten SEA objectives, a summary of the key reasoning behind this is also provided.

In the event that the SA9 Preferred Approach cannot progress, the alternatives above will be required to replace those options that are reliant on it. These alternatives will be subject to their own planning and regulatory processes and it will take a number of investment cycles to progress these projects; hence, they may change in later iterations of the plan.

5

SA3 Preferred Approach: Strategic Environmental Assessment

5 SA3 Preferred Approach Strategic Environmental Assessment

5.1 SA3 Preferred Approach Options

This chapter provides an environmental assessment of the proposed SA Preferred Approach as required by the SEA Directive and implementing Irish regulations. The environmental effects are considered for each option individually. Additional measures proposed to be taken forward along with these options are also considered. Cumulative effects for both the 'within plan' SA Preferred Approach and the cumulative effects with other proposed developments outside the Framework Plan are addressed in chapter 6.

The SA Preferred Approach consists of WRZ options for four of the WRZs in the study area. This reflects the small scale of the supplies and difficulties in transporting small volumes of water over long distances. For seven of the WRZs, namely Athboy, Ballivor, Kells-Oldcastle, Kilmessan, Navan-Mid Meath, South Louth & East Meath, and Trim, SA option 23 was selected. SA option 23 involves improved interconnection between WRZs, decommissioning of existing WTPs and supply from a New Shannon Source. The SA Preferred Approach for the remaining WRZs involves new and increased groundwater abstractions, along with WTP upgrades.

Table 5.1 gives a breakdown of the options in SA3 and the associated abstractions/demand.

Table 5.1 Preferred Approach Breakdown

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
SA3-089 2300SC0045 St Louis, National School, Rathkenny	Increase GW abstraction and increase treatment capacity • Increase GW abstraction to meet WRZ deficit (2044 DYCP) • Current GW source (Wilkinstown groundwater body) WFD status 2013-2018 – Good	12 m^3/d
SA3-088 2300SC0027 Moynalty	Not in Deficit – Upgrade WTP • Not in deficit – Upgrade WTP for water quality purposes • Current river waterbody status 2013-2018 – Poor	N/A
SA3-077 0200SC0015 Bailieboro RWSS	New local GW option • New local GW option - to meet deficit only • Bailieborough bedrock aquifer WFD status 2013-2018 – Good	1,707 m^3/d
SA3-047 2300SC0009 Slane	Increase existing GW abstraction and increase capacity at WTP • Increase existing GW abstraction and increase capacity at WTP • Current GW source (Trim groundwater body) WFD status 2013-2018 – Good	2,384 m^3/d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
SA3-100 (SA option 23) 2300SC0055 Navan-Mid Meath	GDA Transfer, Interconnection and Rationalisation • SA option 23. Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs. Additional supply will come for new source for the GDA. Rath Reservoir, Clavin's Bridge, Coill Dios, Trim, Earlsmill, Liscarton, Kilmurray, Athboy, Lough Bane, Kilmessan Swainstown and Kilcarn interim WTPs and their abstractions will be decommissioned as part of this option. SA option 23 is dependent on the New Shannon Source (Lough Derg) supply • Lough Derg highly modified waterbody - WFD status 2013-2018 – Good	16,943 m^3/d
SA3-101 (SA option 23) 2300SC0011 Kilmessan		
SA3-102 (SA option 23) 2300SC0014 Trim		
SA3-096 (SA option 23) 2100SC0001 South Louth & East Meath		
SA3-097 (SA option 23) 2300SC0005 Kells-Oldcastle		
SA3-098 (SA option 23) 2300SC0006 Athboy		
SA3-099 (SA option 23) 2300SC0007 Ballivor		

* Note: SA Options are the same as Group Options

The SA Preferred Approach options are shown in Figure 5.1, in relation to key environmental designations. Note that SA option 23 is labelled as SA3-523.

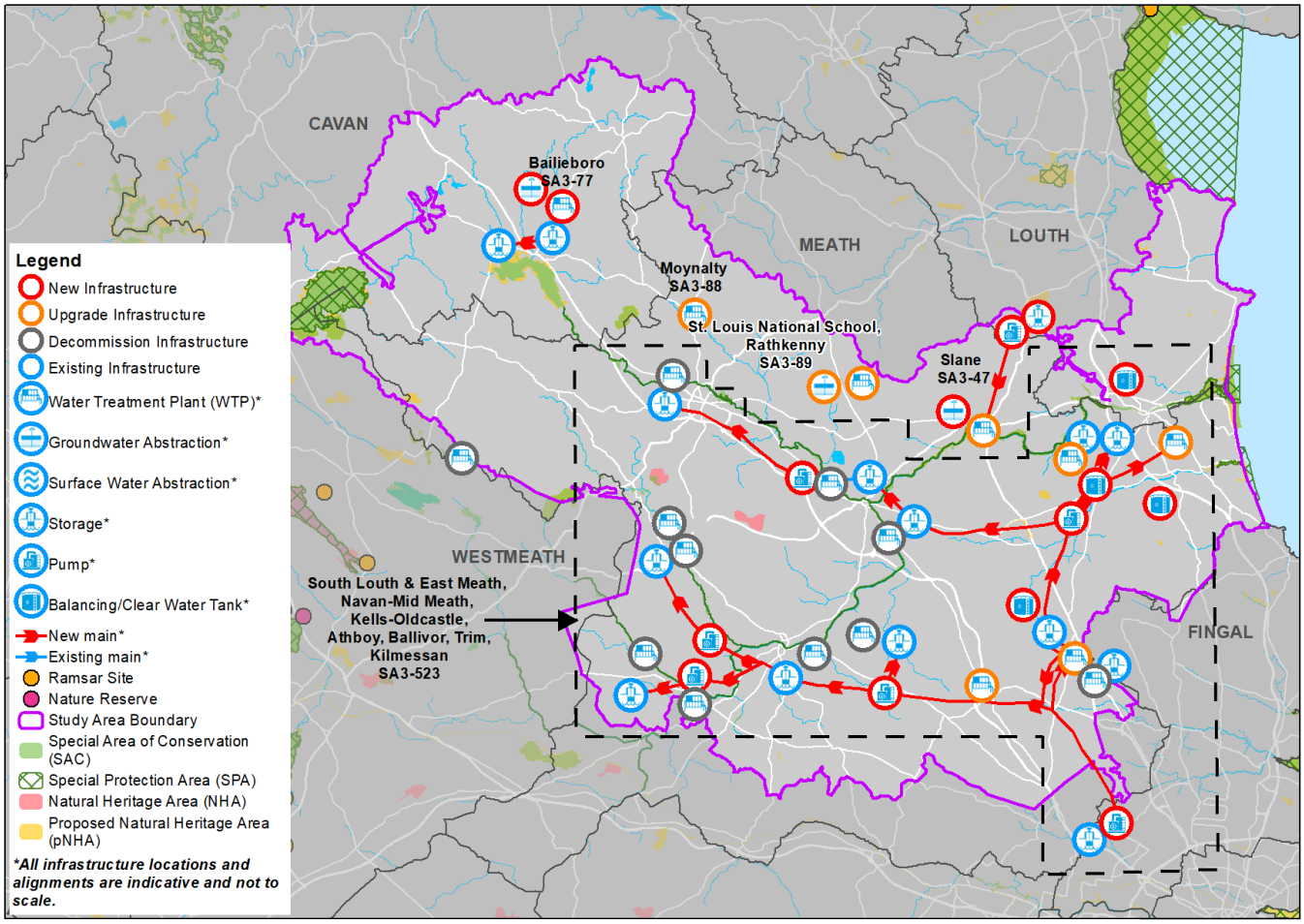

Figure 5.1 SA Preferred Approach and Key Environmental Designations

The SA Preferred Approach options have each been assessed against the SEA objectives, taking account of construction and operational phases, long term and short term, permanent and temporary, and indirect and direct impacts. Mitigation requirements to avoid or reduce effects have also been taken into consideration.Table 5.2 provides a breakdown of the infrastructural components and Table 5.3 provides an assessment summary of the options included in the SA Preferred Approach. Individual options assessments are available on request. The overall Preferred Approach assessment, including all the options combined, is summarised in Table 7.1.

Table 5.2 Component Table

Option Reference	New / Refurbished Pipeline	New WTP	Upgrade WTPs	New / Upgraded Abstractions	WTPs Decommissioned	Abstractions Abandoned	Raw Water Storage	Treated Water Storage
SA3-047	-	-	✓	✓	-	-	-	✓
SA3-077	✓	✓	✓	✓	-	-	-	-
SA3-088	-	-	✓	-	-	-	-	-
SA3-089	-	-	✓	✓	-	-	-	-
SA option 23 (SA3-100, SA3-101, SA3-102, SA3-096, SA3-097, SA3-098 and SA3-099)	✓	-	✓	-	✓	✓	-	✓

Table 5.3 Options Assessment Summary

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
SA3-077	New local GW option	Construction	-	-	-	-	-	--	0	0	-	-
		Operation	-	-	-	0	-	--	-	0	0	0
SA3-047	Increase existing GW abstraction and increase capacity at WTP	Construction	-	-	-	-	---	---	0	-	-	-
		Operation	++	--	0	0	---	---	---	-	0	0
SA3-088	Not in deficit - Upgrade WTP	Construction	-	-	0	0	0	0	0	0	-	0
		Operation	+	0	0	0	0	0	0	0	0	0
SA3-089	Increase GW abstraction and increase treatment capacity	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	+	0	0	0	0	-	-	0	0	0

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
SA option 23 (SA3-100, SA3-101, SA3-102, SA3-096, SA3-097, SA3-098 and SA3-099)	Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Kilmessan, Trim and the GDA WRZs.	Construction	--	--	--	--	---	0	0	0	-	-
		Operation	++	-	++	0	---	++	0	0	0	0

* Note SA Option is the same as Group Option

** Total lifetime tCO_2e categories: minor beneficial = -ve negligible/neutral = <1000 minor = 1000 to <10,000, Moderate = 10,000 to <50,000, Major = 50,000+

5.2 Additional Measures

In addition to the SA Preferred Approach supply options, Irish Water is already implementing measures across the three pillars of Lose Less, Use Less and Supply Smarter to improve the level of service to their customers in this study area. These are described in the SA3 Technical Report and include leakage reduction and water conservation.

5.2.1 Leakage Reduction

The leakage reduction measures across the public water supply are based on what Irish Water assess to be both achievable and sustainable and include:

- Ongoing leakage management, including active leakage control, pressure management, and find and fix activities to offset Natural Rate of Leakage Rise;
- Net leakage reductions targets have been applied to the SDB deficit to move towards achieving the national Sustainable Economic Level of Leakage (SELL) target prioritised based on:
    - Supply demand deficit;
    - Existing abstractions with sustainability issues; and
    - Drought impacts.
- Additional leakage targets to achieve SELL and reduce leakage levels to 21% of demand in the WRZs: South Louth & East Meath, Slane, Trim, Moynalty, Athboy, Bailieboro, Navan Mid Meath, Kells-Oldcastle, and St Louis, National School, Rathkenny.

5.2.2 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 their water supplies and reduce pressure on the natural environment during this period. Irish Water will continue to promote 'Water Conservation Activities', collecting and monitoring data over a number of years to assess the benefits. As part of the Framework Plan, Irish Water have not applied reductions to the SDB for unquantifiable water conservation gains. However, they do assume that any gain will offset consumer usage growth factors.

5.3 Interim Solutions

The SA3 Technical Report identifies potential interim solutions that allow shorter term interventions to be identified and prioritised, when needed. These are expected to be small scale, within site works and are not likely to give rise to significant environmental effects. However, they would need to be subject to relevant assessments, including AA screening as and when they are required.

5.4 Approach Uncertainty and Adaptability

A summary of the adaptability criteria and sensitivity analysis Irish Water have undertaken for the SA3 Preferred Approach is provided in the SA3 Technical report. A high-level assessment of what this could mean for the SEA is shown in Table 5.4.

Table 5.4 SA3 Sensitivity Analysis and Environmental Impacts

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
Sustainability	Moderate	+5,800 m^3/d	The impact of sustainability reductions would reduce the volumes that can be abstracted from Irish Water's existing sources; therefore, increasing the SDB deficit. Irish Water's outline sustainability assessments would mean a potential increase in deficit for SA3 based on reductions in the sustainable abstraction amounts from the River Boyne (Liscarton WTP), Lough Bane and Lough Skeagh, affecting the Navan Midmeath, Kells-Oldcastle and Bailieboro WRZs. The Preferred Approach decommissions abstractions from the River Boyne (Liscarton WTP) and Lough Bane, therefore, restrictions in abstractions will not impact the Preferred Approach. The current abstraction at Lough Skeagh is included in the Preferred Approach, therefore, alterative options would need to be considered to reduce abstraction from this source if required.
			The SA Preferred Approach addresses reduction, although additional sustainability reductions could add pressure for additional supply from outside the study area.
Climate Change	High (international climate change targets have not been met)	+ 400 m^3/d	Higher climate change scenarios would impact Irish Water's existing supplies and result in decreased water availability at certain times of year. Although the likelihood of this scenario is high based on climate change adaptation to date, potential impacts may be mitigated by optimising Irish Water's operations on a more environmentally sustainable basis across the range of supplies. Within SA3, several existing river abstractions would be vulnerable to increased climate change impacts scenarios. However, the Preferred Approach aims to decommission several of these abstractions.
			Potential for additional abstraction pressure unless optimisation can address.
Demand Growth	Moderate (growth has been based on policy)	-7,700 m^3/d	The impact of lower than expected growth would reduce the SDB deficit and the overall need requirement. The SDB deficit is spread across eleven of the twelve WRZs and is driven by quality as well as quantity issues.

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
			SA3 includes several towns where steady growth is predicted.
			This could decrease expected energy and carbon and decrease expected abstraction requirements
Leakage Targets	Low (Irish Water is focused on sustainability and aggressive leakage reduction)	+356 m^3/d	The impact of lower than expected leakage savings would increase the SDB deficit and the overall need requirement. Due to the length and condition of Irish Water's networks, Irish Water could potentially fail to achieve target leakage reductions within the timeframes set out. However, as Irish Water is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage targets as opposed to accepting lower targets.
			This could increase carbon and the effects of abstraction pressure on the environment
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-12,669 m^3/d	Increased leakage savings beyond SELL would reduce the SDB deficit and the overall need requirement. The scale of the Preferred Approach can be reduced if additional leakage targets are met.
			This could allow lower than expected energy and carbon and reduce expected abstraction requirements

6 SEA Cumulative Effects for SA3 Preferred Approach

6 SEA Cumulative Effects for SA3 Preferred Approach

Secondary, cumulative and the synergistic nature of the effects of the SA3 Preferred Approach proposals are required to be considered as part of SEA. These include:

- 'Within plan' or 'in-combination' effects; and
- Interaction with other plans and programmes.

Cumulative effects are also considered for the proposals across the nine study areas within the Eastern and Midlands Region and reported in the SEA Environmental Report of the Regional Plan. Further consideration of any inter regional cumulative effects will be addressed in each Regional Plan SEA sequentially.

6.1 Cumulative Effects 'Within Plan' for SA3

The potential 'within plan' cumulative effects for SA3 are considered at the following different levels:

- Option level: Identification of mutually exclusive or dependent options – this was considered through the options screening and approach development process;
- SA approaches: Cumulative effects are taken into account in the selection of approaches for key aspects such as abstraction from the same waterbody through the sustainability rules applied for Irish Water abstractions (see section 3.2);
- SA Preferred Approach: The combined effect of options within the SA Preferred Approach – these are addressed in this chapter; and
- Eastern and Midlands Region level: Considering combined effects from proposals in the nine study areas (see the SEA Environmental Report of the Regional Plan).

For cumulative effects to occur, there needs to be an overlap of temporal periods in some way for the impact and/or the effect. For example, two schemes being constructed at the same time could result in cumulative traffic movements, while two schemes being operated together could result in additional drawdown of groundwater levels. A precautionary approach has been taken for the cumulative effects assessment, which assumes that all options could be constructed at the same time and then all options would be operated at the same time (Table 6.1). However, this is very unlikely to be the case for construction impacts due to budget resources and regulatory constraints.

The assessment has considered the cumulative effects across all environmental topics to identify those interactions that are likely to generate significant effects. These are likely to be around:

- Biodiversity – for example, a cumulative loss of habitats or changes to a habitat's quality through changes in water quality or groundwater levels;
- Water environment (surface water and groundwater WFD status) – for example, changes to water flow due to combined abstraction pressure;
- People and health – for example, disruption due to multiple construction works taking place at the same time;
- Landscape and visual – for example, if there are a number of options located close together that could alter the landscape character or views;
- Cultural heritage – for example if the same cultural heritage features are affected by above ground infrastructure in close proximity or the combined effect of loss to undesignated archaeological assets or from combined impacts resulting in additional changes to water levels affecting archaeological resources; and

- Climate change – combined carbon emissions for the approach as a whole have been considered through the approach selection process and are also reported here to identify potential requirements for mitigation. Combined effects on climate change adaptation are also considered.

6.1.1 Cumulative Effects during Construction

In general, the SA Preferred Approach options are geographically spaced out and most are small scale in construction works. Therefore, there are unlikely to be many cumulative effect interactions during construction.

Table 6.1 Potential In-Combination Effects Between Preferred Options in SA3

Preferred Approach option references	SA3-077	SA3-047	SA3-088	SA3-089
SA option 23 (Group option 23)	B&BW	B&BW	B&BW	
SA3-089				
SA3-088	B&BW	B&BW		
SA3-047	B&BW			

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
River Boyne and River Blackwater SAC & SPA	B&BW

There could be cumulative effects from habitat loss, disturbance and spread of invasive species on River Boyne and River Blackwater SAC and SPA if construction of options SA3-077, 047, 088 and SA option 23 (see Table 6.1) are concurrent. The River Boyne and River Blackwater SAC and SPA are designated for their alkaline fens and alluvial forests habitats and Annex I/II species such as River Lamprey, Atlantic Salmon and Otter. Cumulative construction works within the river valley could affect water quality through increasing surface water run off or increasing the risk of pollution during works. However, these can be managed by standard good practice mitigation, such as having buffers along the edge of the river and having an emergency plan in place during construction. With these standard good practice measures in place, there are unlikely to be significant cumulative effects. The impacts on the European designations are provided in the NIS and also summarised in chapter 9 of this report.

6.1.2 Cumulative Effects during Operation

The SEA has not identified, at a plan level, any potential for cumulative effects during operation of the SA3 Preferred Approach to the River Boyne and River Blackwater SAC & SPA. Options SA3-047 and 077 include new and increase groundwater abstractions that could have potential cumulative effects to the designated sites from habitat degradation impacts. See Figure 6.1 for the Preferred Approach abstractions in SA3. New and increase groundwater abstractions could cause hydrological changes and

water table/availability impacts to the sites. However, with the implementation of mitigations as outlined in the NIS, there will be no adverse cumulative effects on the integrity of the SPA or the SAC.

The potential for cumulative effects on groundwater bodies have been considered in a hydrogeological assessment of the groundwater abstractions commissioned by Irish Water (Irish Water, 2022). This hydrogeological assessment considers the abstraction quantities and proximities and concludes that all three of the WFD groundwater bodies (Baillieborough, Trim and Wilkinstown) affected by abstractions have a good quantitative status but are currently 'at risk' of failing the WFD objectives. However, with the relatively small increase of demand in SA3, the likelihood of affecting the WFD objectives is considered low. No interaction was identified between the new and existing Irish Water abstractions.

There could also be cumulative effects in terms of carbon across the SA Preferred Approach. The whole life carbon estimate (including construction and operation) for the SA Preferred Approach indicates increased contribution to carbon emissions related to carbon embodied in materials used for construction and through operational energy use and water treatment. Generally, in terms of carbon emissions, increase in carbon emissions can be considered a significant effect, as these add cumulatively across all developments and contribute to the national target for carbon. However, consideration also needs to be given to the additional water supply provided from the options and therefore the overall carbon efficiency in terms of carbon emissions per ML of supply is an appropriate metric and for SA3 this averages as 2.65 tCO_2e/ML (lifetime sum). Mitigation for carbon emissions could include increased sourcing of energy from renewable sources and improving energy efficiency. This could be undertaken alongside leakage reduction and campaigns to raise awareness of measures to reduce water consumption (which in turn would reduce energy consumption). This could include the promotion of water efficient devices and working with planning authorities and developers to encourage new development to be water efficient.

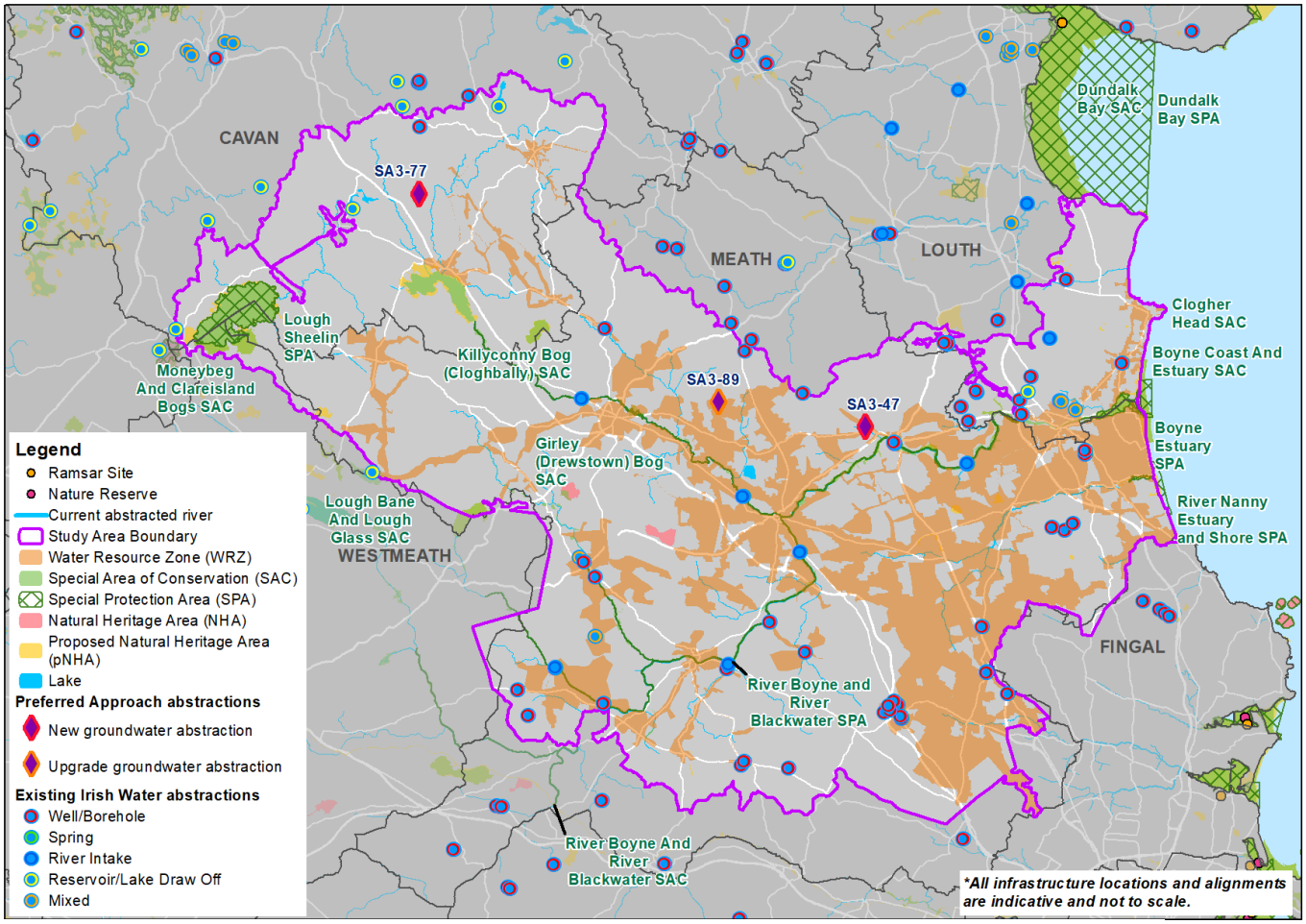

Figure 6.1 SA Preferred Approach Abstractions in SA3

6.2 Cumulative Effects with Other Developments

The SA3 Preferred Approach has been assessed alongside other developments that could occur within the plan area. Potential effects could include increased traffic and noise. These could be mitigated by standard mitigation measures, such as planning of construction traffic routes and informing local residents about the works. With these standard good practice measures in place, there are unlikely to be significant cumulative effects.

Table 6.2 shows that within SA3 there are a number of regeneration and construction projects clustered around Navan, Kells and Drogheda. There are also projects located at Virginia, Trim, Slane, and Ashbourne. Other developments that were not considered further due to the size and the distance of the developments from the SA Preferred Approach are the Archdeaconry Glebe Housing Development, the N51 Park and Ride Facility, the Castle Street, Ashbourne Housing scheme, the Lagore Road, Dunshaughlin Housing scheme, the N52 Grange to Clontail Scheme, the Rathoath Pedestrian and Cycling Scheme, and the Nobber Fire Station Development.

6.2.1 Cumulative Effects during Construction

The regeneration projects in Navan and Kells and N2 Bypass project in Slane could result in cumulative effects with the SA Preferred Approach if they were to be constructed at the same time (Table 6.2). Potential cumulative effects include construction disturbance between the developments and the SA Preferred Approach for example increased noise and traffic levels. These could be mitigated by standard mitigation measures, such as planning of construction traffic routes and informing local residents about the works. With these standard good practice measures in place, there are unlikely to be significant

cumulative effects. The plan level assessment indicates that there is potential for cumulative effects on cultural heritage assets including archaeological resources related to the total extent of the ground works required, this will need to be considered further as detailed route alignments and site locations are determined along with approaches for more detailed desk studies, investigation and mitigation.

The plan level assessment indicates that there is potential for cumulative effects from disturbance, spread of invasive species and habitat degradation impacts on the River Boyne and River Blackwater SAC and SPA if construction phase of all of the regeneration projects in Navan, Virginia and Trim, some projects in Drogheda (Drogheda and Dundalk Water Supply Schemes; Drogheda Courthouse – PPP; and Drogheda Flood Relief Scheme), and N2 Bypass project in Slane are concurrent with the SA Preferred Approach (SA3-77, 47, 88 and SA option 23). The River Boyne and River Blackwater SAC and SPA are less than 1km from projects in Navan, Trim and Slane, and less than 5km from projects in Virginia. With the implementation of mitigations as outlined in section 6.3.3 of the NIS, there will be no adverse cumulative effects on the integrity of the SAC and SPA.

Table 6.2 Potential Cumulative Effects between Preferred Options and Other Developments in SA3

	Preferred Approach Options					
Project Developments	**SA3-077**	**SA3-047**	**SA3-088**	**SA3-089**	**SA option 23 (Group option 23)**	
Navan - Railway Street Regeneration and County Archive	B&BW	B&BW	B&BW		B&BW	N
Navan Active Land Management Project	B&BW	B&BW	B&BW		B&BW	N
Navan Mid Meath Programme	B&BW	B&BW	B&BW		B&BW	N
Navan - Farganstown	B&BW	B&BW	B&BW		B&BW	N
Navan - Flowerhill Regeneration Project	B&BW	B&BW	B&BW		B&BW	N
Navan - St Paul's National School	B&BW	B&BW	B&BW		B&BW	N
Kells Creative Placemaking (Phase 1)					K	
Kells Heritage Development					K	
Libraries Capital Programme - Virginia Library	B&BW	B&BW	B&BW		B&BW	
Virginia Civic Centre	B&BW	B&BW	B&BW		B&BW	
Drogheda - Westgate Vision						
Drogheda and Dundalk Water Supply Schemes	B&BW	B&BW	B&BW		B&BW	
Drogheda Courthouse - PPP	B&BW	B&BW	B&BW		B&BW	

	Preferred Approach Options				
Project Developments	**SA3-077**	**SA3-047**	**SA3-088**	**SA3-089**	**SA option 23 (Group option 23)**
Drogheda Flood Relief Scheme	B&BW	B&BW	B&BW		B&BW
Near Drogheda - Boyne Navigation and Greenway					
Near Drogheda - Laytown to Bettystown Link Road					
Near Drogheda - Greater Dublin Area Groundwater Augmentation					
N2 Slane Bypass	B&BW	S B&BW	B&BW		B&BW
Trim Library and Cultural Centre	B&BW	B&BW	B&BW		B&BW
Department of Education site, Castle Street, Ashbourne					
Ashbourne Road and Public Realm					

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
Boyne and Blackwater SPA	B&BW
Navan	N
Kells	K
Slane	S

6.2.2 Cumulative Effects during Operation

The plan level assessment indicates that there could be cumulative effects to the River Boyne and River Blackwater SAC and SPA from habitat degradation impacts during the operation phase of the SA Preferred Approach (SA3-077 and 047), regeneration projects in Navan (excluding St Paul's National School), Drogheda Flood Relief Scheme and the N2 Slane Bypass. However, with the implementation of standard good practice measures there will be no adverse effects on the integrity of this European site.

There could be cumulative effects in terms of carbon emissions, as all developments will generate carbon emissions from operation whether this is from routine maintenance activities to water treatment and the energy required for moving water. As outlined in section 6.1.2, any increase in carbon can be considered a significant effect, as these add cumulatively across all developments and contribute to the national target for carbon. The same mitigation measures suggested for the SA3 Preferred Approach,

including increased sourcing of energy from renewable sources and raising awareness of measures to reduce water consumption (which in turn would reduce energy consumption). Working with third parties, including planning authorities and other developers, to identify water efficient measures and joint promotion of water issues would also further mitigate this effect.

7 Strategic Environmental Assessment Summary

7 Strategic Environmental Assessment Summary

SEA objectives have been taken into account at each stage of the approach development process for SA3 and a range of options and SA Approaches have been considered and assessed, including a 'Do Minimum' approach.

Key beneficial impacts assessed include, up to, moderate beneficial impacts for all options associated with increasing resilience and the quality of water supply for local communities; and the subsequent benefits of this for public health.

Key potential adverse impacts identified at plan level include:

- Moderate adverse impacts on the River Boyne and River Blackwater SAC and SPA as the new abstraction of option SA3-047 is directly adjacent and hydrologically linked to the site. New abstraction could lead to hydrological changes (reduced flows – impacting on water quality) that could impact on QI species or habitats. Therefore, there is potential for impacts on aquatic QI species utilising this European site through a reduction in flows/water levels. The NIS identifies mitigation measures to avoid AESI for these sites;
- Moderate adverse impacts on the River Boyne and River Blackwater SAC and SPA, and Lough Bane and Lough Glass SAC associated with the extensive construction of new infrastructures required for SA option 23. There is potential for some loss of/damage to QI/Annex 1 habitats during construction works given that the works are immediately within or adjacent to the designated sites boundary. Pollution of water courses during demolition and construction (associated with sediment runoff, or accidental spillage) could impact fish and restrict access to spawning habitat. Potential changes in water quality from pollution during construction could also affect hydrologically connected habitats. The NIS identifies mitigation measures to avoid AESI for these sites;
- Moderate adverse effects on rural and urban areas near Navan, Kells, Trim, Ratoath and Drogheda from visual impacts and increase in traffic, noise and dust during construction of SA option 23. Option include rationalisation of water from the GDA to six WRZs, construction of 154km of new network, service reservoirs, pumps and pumping station, upgrade of WTPs and decommissioning of numerous existing infrastructures;
- Moderate adverse impacts to the resilience of Trim and Bailieborough groundwater bodies to climate change as new abstractions are required with options SA3-077 and 047. Both of the groundwater bodies currently have a good quantitative status, but Trim groundwater is currently at risk of failing the WFD objectives. However, with the relatively small increase of demand the likelihood that the new abstractions will impact the WFD objectives is low; and
- Moderate adverse effects to built and natural assets with SA option 23 due to the significant construction of new infrastructures required.

Cumulative effects assessment identifies potential significant effects in relation to carbon emissions, individual options are assessed between neutral to major adverse in relation to this SEA. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SA3 but does not provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure or treatment technology or potential for mitigation such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

SEA mitigation identified to address the key adverse impacts identified above includes further hydrological or hydrogeological modelling (as appropriate) to further inform understanding of potential impacts on the River Boyne and River Blackwater SAC and SPA and other European and national designated sites identified as potentially affected by new and increased abstractions from groundwater sources (see the NIS of the Framework Plan for further information). Other mitigation identified also includes development of construction environmental management plans, public consultation with local residents on disruption during construction and consideration of the waste hierarchy in design. Measures to address the cumulative impact for carbon emissions include sourcing the energy supply from renewable sources. All developments will aim to achieve as far as possible requirements for no net loss in biodiversity or enhancement, as set out in the Biodiversity Action Plan (Irish Water, 2021). There may be potential to also provide opportunities for carbon sequestration with biodiversity enhancement. In addition, there are opportunities to reduce water demand (which in turn would reduce energy and carbon) by raising awareness of water issues, promoting water efficient devices and through leakage reduction.

In general, these are standard mitigation measures with some specific measures and additional requirements for further assessment or monitoring (see the SEA Appendix and the NIS Appendix for AA and SEA standard mitigation measures respectively).

An overall summary assessment, including potential for cumulative and in-combination effects and other measures, identified to be progressed alongside the supply side options is provided in Table 7.1. Key mitigation and proposed monitoring measures are also shown.

Table 7.1 SEA Summary

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
SA Preferred Approach with interim measures as required and a programme of leakage reduction and water conservation measures, taking an adaptive approach to address uncertainty				
1. Protect public health and promote wellbeing	C Minor Adverse to Moderate Adverse O Minor Adverse to Moderate Beneficial The PA is expected to improve overall drinking water quality reliability and sustainability through the decommissioning of failing WTPs and the replacement of abstractions vulnerable to drought conditions. The PA is expected to reduce risks to access of good quality water supply across different conditions and over the plan period.	Standard good construction practice and consultation Further assessment of risks to water quality and consideration of catchment management initiatives to improve water quality and reduce treatment cost. For example, working with landowners and managers on practices to reduce levels of sediment and pollution from entering water courses through run off.	• Level of service, and the frequency and duration of drought orders • Number of days/hours when water supply to people is disrupted due to drought, freeze-thaw or other service/infrastructure issues • Number of public rights of way closures/diversions and length of paths created compared to loss	• Duration of construction works, and number of complaints received regarding construction works • Duration of temporary closures of footpaths and other recreational assets
2. Protect and enhance biodiversity and	C Minor Adverse to Moderate Adverse O Neutral to Moderate Adverse	Routing/siting to avoid impacts. Standard good construction practice and specific measures as	• Temporary and permanent habitats lost vs habitats created/enhanced	• Monitor construction activities to ensure compliance

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
contribute to resilient ecosystems	Impacts from construction works for pipelines and service reservoirs on biodiversity. These can be minimised through careful routing and siting. Operational impacts on habitats of the River Kells. Potential for construction and operational impacts on European and National designated sites, most notably the River Boyne and River Blackwater SAC and SPA, Slane Riverbank pNHA and Boyne Woods, River Boyne SAC/SPA, Malahide Estuary SAC/SPA, River Nanny Estuary SPA and Boyne Valley pNHA.	identified in the NIS of the Framework Plan. Design to meet no net loss biodiversity or achieve enhancement, where possible, on or off site and in line with the Biodiversity Action Plan objectives. Further hydrological/hydrogeological assessments to determine impacts on designated sites. Operating rules to limit impacts on European and National sites.	• Site condition and population data for QI of European and National designated sites, including River Boyne and River Blackwater SAC and SPA, Slane Riverbank pNHA and Boyne Woods, River Boyne SAC/SPA, Malahide Estuary SAC/SPA, River Nanny Estuary SPA and Boyne Valley pNHA.	
3. To protect landscapes, townscapes and visual amenity	C Neutral to Moderate Adverse O Minor Adverse to Moderate Beneficial Construction landscape impacts and long term impacts from above ground structures, such as new WTPs.	Routing and siting to reduce tree loss and appropriate location and design of above ground structures with landscape planting. Reinstatement of land use and vegetation.	• Total working area of pipelines non-designated landscapes • Land use/landscape features re-established for schemes over appropriate period – areas/km successfully	• Duration of construction works • Number of complaints received regarding visual impact of construction works

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
			restored to meet requirements	
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C Minor Adverse to Moderate Adverse O Neutral New resources required for construction works, including extensive lengths of pipeline, service reservoirs and new/upgraded WTPs. Ongoing maintenance requirements.	Materials management to be integrated into design to optimise use of existing resources and minimise waste from construction and operation.	• Loss of greenfield land, including agricultural, forestry or other land uses • Disruptions to strategic infrastructure/services • Use of waste management plans • Volume of drinking water treatment residuals sent to landfill	• Construction wastes sent to landfill
5. Reduce greenhouse gas emissions	C Neutral to Major Adverse O Neutral to Major Adverse Embodied and operational carbon contribute to national level carbon emission targets. Leakage and water efficiency can contribute to reducing carbon.	Design to minimise embodied carbon emissions and optimise operational efficiency. Seek renewable energy supply sources and optimise use of leakage and water efficiency measures to reduce carbon. Consider offsetting approaches with multiple benefits for water	• Percentage of energy supply from renewable sources or reduced energy use • Carbon footprint (total tonnes) per year, predicted over plan period, lifetime of schemes and carbon intensity of water resource options (tonnes/Ml/d)	• Carbon footprint (total tonnes) during construction • Operational Carbon Intensity kgsCO2equic/ML

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
		quality, carbon sequestration and linking with other objectives.		
6. Contribute to environmental climate change resilience	C Neutral to Major Adverse O Moderate Beneficial to Major Adverse Abstractions generally reduce environmental resilience but overall improved flexibility for operation using regional schemes has the potential to reduce pressure on at risk local resources. WRZ options SA3-047, SA3-077 and SA3-089 require further assessment to understand their sustainability in the longer term.	Consider how operation can further reduce climate change pressure on at risk sources and associated designations, particularly for SA3-047 and SA3-077. Sustainability review of sources taking account of groundwater and surface water interconnections for WRZ options SA3-047, SA3-077 and SA3-089.	• WFD waterbody status objectives at risk and designated site condition status • Frequency of drought orders requiring change to normal abstractions/ compensation releases	• None identified
7. Protect and improve surface water and groundwater status	C Neutral O Neutral to Major Adverse Generally, new/increased abstractions are limited to allowable limits and have a low risk of adverse effect on WFD	Further investigation to consider effects on groundwater abstraction on the surface water environment.	• WFD waterbody status objectives at risk	• Pollution incidents during construction • Additional monitoring of Lough Skeagh if needed

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
	waterbody status objectives, with the potential exception of Lough Skeagh.			
8. Avoid flood risk	C Neutral to Minor Adverse O Neutral to Minor Adverse Potential for minor impediment to flood risk management or could result in the loss of a small area of flood plain for SA3-047. Also, flood risk impacts on operations with effect on meeting supply.	Siting and design of schemes to take account of flood risk and design for flood risk resilience.	• Number of options at risk of flooding at each AEP level	• Lost time to flooding • Lost time to power supply interruptions
9. Protect and where appropriate, enhance cultural heritage assets	C Neutral to Minor Adverse O Neutral Potential construction impacts on unknown archaeological interest. Impacts on known interests are expected to be avoided.	Standard good practice approaches to minimise potential impacts.	• Number of archaeological assets adversely affected by water resource options • Number of options that are rerouted to avoid cultural heritage impacts • Number of schemes including improvements to access recording of archaeological assets or communication/	• Number of archaeological finds recorded during construction

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
			interpretation of interest features	
10. Protect quality and function of soils	C Neutral to Minor Adverse O Neutral Potential for loss and damage to valuable soils during construction but impacts to geological assets are expected to be avoided.	Standard good practice to conserve and reinstate soils.	• Soil Management Plans implemented • Volume of contaminated land restored, or soils removed	• Total volume of soil removed or reused on site

8

Water Framework Directive Summary

8 Water Framework Directive Summary

Through the options identification and assessment process new options considered have been restricted to those expected to meet estimated sustainability requirements and all options have been assessed based on conservative allowable abstraction constraints. The options identified in SA3 are also expected to be sustainable, based on additional plan-level desk-based assessment, in terms of avoiding deterioration of WFD status or avoiding conflict with meeting WFD objectives.

All groundwater bodies used for the SA3 abstractions have good quantitative status (Irish Water, 2022). The abstractions are not located in close proximity and the risk of combined effects on groundwater body WFD objectives, or on existing abstractions, are considered low. However, impacts, including cumulative effects with non Irish Water abstractions, will need to be considered in further detail as part of project level consenting to demonstrate both sustainability for any connected surface waterbodies and groundwater dependent habitats and protected areas.

9 Appropriate Assessment Summary

9 Appropriate Assessment Summary

The NIS of the Regional Plan's conclusions for SA3, regarding 'In-combination effects with other plans and projects' and 'In-combination effects between Preferred Options', as set out below, and are included in more detail in Appendix E of the NIS for the Regional Plan.

Potential in-combination effects with other projects and plans were identified for the preferred options on the River Boyne and River Blackwater SAC & SPA. The potential effects included disturbance, habitat degradation, habitat loss, mortality of Qualifying Interest (QI) species and spread of invasive non-native species. However, the assessment concluded that with the mitigation identified there will be no adverse effects on the integrity of the European site in-combination with other plans or projects.

Potential in-combination effects between preferred options were identified for River Boyne and River Blackwater SAC & SPA if construction of options is concurrent. The potential impacts include habitat loss, habitat degradation, spread of invasive non-native species, water table/availability and disturbance. With the implementation of mitigation as detailed in Appendix E of the NIS, there will be no adverse effects on the integrity of European sites.

10 Recommendations for Implementation

10 Recommendations for Implementation

Environmental actions for the implementation plan and the draft monitoring plan are identified in:

- SEA Environmental Report of the Framework Plan – this includes general proposals and standard mitigation requirements (also see SEA Environmental Report Appendix); and
- SEA Environmental Report of the Regional Plan - this includes specific mitigation and monitoring requirements for Eastern and Midlands Region options and cumulative effects.

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Appendix A Fine Screening Summaries

Key			
0 Neutral	-1 Minor adverse	-2 Moderate Adverse	-3 Major adverse
	1 Minor beneficial	2 Moderate Beneficial	3 Major Beneficial

Table A.1 Fine Screening Summary of Conjunctive Use Options in SA3

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-105	Recommission Rosehall WTP for conjunctive SW and GW Usage									1	0	-15
SA3-093	New Groundwater Abstraction at Donore/Old Bridge									1	0	-21

Table A.2 Fine Screening Summary of Rationalisation Options in SA3

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-04a	Increased Surface Water Abstraction offset by Treated Effluent									3	0	-26
SA3-09a	Transfer from New Shannon Source									0	0	-12
SA3-09b	New Shannon Source Transfer to SLEM and Interconnect Navan Mid Meath									2	0	-19
SA3-09c	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-09f	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-09h	New Shannon Source Transfer, New WTP for									2	0	-27

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	Navan Mid Meath & Rationalisation											
SA3-09k	New Shannon Source Transfer, Interconnection and Rationalisation									1	0	-17
SA3-100	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18
SA3-101	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18
SA3-102	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18
SA3-103	New Shannon Source Transfer, Interconnection and Rationalisation									1	0	-20

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-104	New Shannon Source Transfer, Interconnection and Rationalisation									1	0	-22
SA3-017	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-019	New Surface Water Abstraction at Lough Ramor									0	0	-22
SA3-21a	New WTP for Navan Mid Meath, Rationalisation of Kells-Oldcastle & Athboy WRZs & Increased Surface Water Abstraction for Slane & Trim WRZs									1	0	-26
SA3-21b	New Shannon Source Transfer, New WTP for Navan Mid Meath & Rationalisation									2	0	-27

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-025	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-026	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-027	New Shannon Source Transfer, Interconnection and Rationalisation									1	0	-17
SA3-29a	New WTP for Navan Mid Meath, Rationalisation of Kells-Oldcastle & Athboy WRZs & Increased Surface Water Abstraction for Slane & Trim WRZs									1	0	-26
SA3-29b	New Shannon Source Transfer, New WTP for Navan Mid Meath & Rationalisation									2	0	-27

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-030	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-31a	New Shannon Source Transfer, New WTP for Navan Mid Meath & Rationalisation									2	0	-27
SA3-032	Groundwater Enhancement at Kilmurry WTP									2	0	-17
SA3-035	Rationalise Ballivor to Mullingar									0	0	-10
SA3-036	New Surface Water Abstraction at Lough Ramor									0	0	-20
SA3-38a	New Shannon Source Transfer to SLEM and Interconnect Navan Mid Meath									2	0	-19

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-38b	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-38c	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-38d	New Shannon Source Transfer, Interconnection and Rationalisation									1	0	-17
SA3-42a	Increased Surface Water Abstraction offset by Treated Effluent									3	0	-25
SA3-43a	New WTP for Navan Mid Meath, Rationalisation of Kells-Oldcastle & Athboy WRZs & Increased Surface Water Abstraction for Slane & Trim WRZs									1	0	-26

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-43b	New Shannon Source Transfer, New WTP for Navan Mid Meath & Rationalisation									2	0	-27
SA3-045	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-046	New WTP for Navan Mid Meath, Rationalisation of Kells-Oldcastle & Athboy WRZs & Increased Surface Water Abstraction for Slane & Trim WRZs									1	0	-26
SA3-048	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-50b	New Shannon Source Transfer, New WTP for Navan Mid Meath & Rationalisation									2	0	-27

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-051	New Shannon Source Transfer and Interconnection of WRZs									2	0	-19
SA3-052	New WTP for Navan Mid Meath, Rationalisation of Kells-Oldcastle & Athboy WRZs & Increased Surface Water Abstraction for Slane & Trim WRZs									1	0	-26
SA3-053	Merge South Louth East Meath, Navan Midmeath, Kells Oldcastle, Athboy, Ballivor, Slane Kilmessan, Trim and the GDA WRZs.									2	0	-19
SA3-55a	New Shannon Source Transfer, New WTP for Navan Mid Meath & Rationalisation									2	0	-27
SA3-065	New Surface Water Abstraction and									0	0	-16

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	Rationalisation at Moynalty WRZ											
SA3-76b	New Surface Water Abstraction and Rationalisation at Moynalty WRZ									0	0	-15
SA3-081	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-19
SA3-082	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-19
SA3-083	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-19
SA3-084	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-19

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-085	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-19
SA3-086	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-19
SA3-096	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18
SA3-097	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18
SA3-098	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18
SA3-099	New Shannon Source Transfer, Interconnection and Rationalisation									2	0	-18

Table A.3 Fine Screening Summary of Groundwater Options in SA3

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-10a	New Groundwater Abstraction at Curragha									1	0	-12
SA3-10b	New Groundwater Abstraction at Dunshaughlin									1	0	-15
SA3-012	New Groundwater Abstraction at Ballinreask									1	0	-18
SA3-013	New Groundwater Abstraction at Donore/Old Bridge									1	0	-21
SA3-028	New Groundwater Abstraction at Athboy									1	0	-14
SA3-034	Groundwater Enhancement at Kilmurry WTP									2	0	-16
SA3-047	Groundwater Enhancement at Slane									1	0	-17

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-049	New Groundwater Abstraction and Rationalisation									0	0	-10
SA3-054	Groundwater Abstraction at Trim									1	0	-14
SA3-077	New Groundwater Abstraction at Crossreagh									0	0	-12
SA3-089	Upgrade Moynalty WTP for Water Quality Purposes									0	0	-3

Table A.4 Fine Screening Summary of Surface Water Options in SA3

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-04b	Surface Water Enhancement at River Boyne & Expansion of WTP at Stalleen									1	0	-23
SA3-06b	Re-use dewatering and WTP expansion at Stalleen									1	0	-22
SA3-024	New Surface Water Abstraction at Athboy									0	0	-16
SA3-76a	New Surface Water Abstraction at Lough Ramor									0	0	-15
SA3-090	Increase SW Abstraction from the River Boyne and Upgrade Kilcarn WTP									0	0	-13
SA3-091	New SW Abstraction at Lough Ramor									0	0	-17

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-094	Develop new WTP at Dowdstown and decommission Kilcarn WTP. New abstraction intake from Boyne.									0	0	-22
SA3-095	Develop new WTP at Dowdstown and decommission Liscarton and Kilcarn WTP. New abstraction intake from Boyne.									1	0	-25
SA3-033	Increase SW abstraction from Stoneyford River									0	0	-11
SA3-106	Trim - Increase SW abstraction from River Boyne & upgrade WTP									0	0	-11

Table A.5 Fine Screening Summary of WTP Options in SA3

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA3-088	Upgrade Moynalty WTP for Water Quality Purposes									0	0	-9

Appendix B SA Approaches for SA3

Note: SA Options are also referred to as 'Group' options

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Best Environmental - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2300SC0006: Athboy	SA3-098 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-098 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-026 New Shannon Source Transfer and Interconnection of WRZs	4
0200SC0015: Bailieboro RWSS	SA3-077 New Groundwater Abstraction at Crossreagh	-	SA3-077 New Groundwater Abstraction at Crossreagh	-	SA3-077 New Groundwater Abstraction at Crossreagh	-
2300SC0007: Ballivor	SA3-099 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-099 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-030 New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0005: Kells-Oldcastle	SA3-097 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-097 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-017 New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0011: Kilmessan	SA3-101 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-101 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-048 New Shannon Source Transfer and Interconnection of WRZs	4

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Best Environmental - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2300SC0027: Moynalty	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-
2300SC0055: Navan-Midmeath	SA3-100 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-100 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-38b New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0009: Slane	SA3-047 Groundwater Enhancement at Slane	-	SA3-047 Groundwater Enhancement at Slane	-	SA3-045 New Shannon Source Transfer and Interconnection of WRZs	4
2100SC0001: South Louth & East Meath	SA3-096 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-096 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-09c New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0045: St Louis, National School, Rathkenny	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-
2300SC0014: Trim	SA3-102 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-102 New Shannon Source Transfer, Interconnection and Rationalisation	23	SA3-053 New Shannon Source Transfer and Interconnection of WRZs	4

WRZ	Quickest Delivery - SA Approach 3		Most Resilient - SA Approach 4		Lowest Carbon - SA Approach 4	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2300SC0006: Athboy	SA3-028 New Groundwater Abstraction at Athboy	-	SA3-028 New Groundwater Abstraction at Athboy	-	SA3-028 New Groundwater Abstraction at Athboy	-
0200SC0015: Bailieboro RWSS	SA3-077 New Groundwater Abstraction at Crossreagh	-	SA3-077 New Groundwater Abstraction at Crossreagh	-	SA3-077 New Groundwater Abstraction at Crossreagh	-
2300SC0007: Ballivor	SA3-035 Rationalise Ballivor to Mullingar	-	SA3-035 Rationalise Ballivor to Mullingar	-	SA3-035 Rationalise Ballivor to Mullingar	-
2300SC0005: Kells-Oldcastle	SA3-091 New SW Abstraction at Lough Ramor	-	SA3-091 New SW Abstraction at Lough Ramor	-	SA3-091 New SW Abstraction at Lough Ramor	-
2300SC0011: Kilmessan	SA3-049 New Groundwater Abstraction and Rationalisation	-	SA3-049 New Groundwater Abstraction and Rationalisation	-	SA3-049 New Groundwater Abstraction and Rationalisation	-
2300SC0027: Moynalty	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-
2300SC0055: Navan-Midmeath	SA3-42a Increased Surface Water Abstraction offset by Treated Effluent	10	SA3-42a Increased Surface Water Abstraction offset by Treated Effluent	10	SA3-42a Increased Surface Water Abstraction offset by Treated Effluent	10

WRZ	Quickest Delivery - SA Approach 3		Most Resilient - SA Approach 4		Lowest Carbon - SA Approach 4	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2300SC0009: Slane	SA3-047 Groundwater Enhancement at Slane	-	SA3-047 Groundwater Enhancement at Slane	-	SA3-047 Groundwater Enhancement at Slane	-
2100SC0001: South Louth & East Meath	SA3-04a Increased Surface Water Abstraction offset by Treated Effluent	10	SA3-04a Increased Surface Water Abstraction offset by Treated Effluent	10	SA3-04a Increased Surface Water Abstraction offset by Treated Effluent	10
2300SC0045: St Louis, National School, Rathkenny	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-
2300SC0014: Trim	SA3-106 Trim - Increase SW abstraction from River Boyne & upgrade WTP	-	SA3-106 Trim - Increase SW abstraction from River Boyne & upgrade WTP	-	SA3-106 Trim - Increase SW abstraction from River Boyne & upgrade WTP	-

WRZ	Best Appropriate Assessment - SA Approach 2	
	Option Description	SA Option
2300SC0006: Athboy	SA3-026 New Shannon Source Transfer and Interconnection of WRZs	4
0200SC0015:	SA3-077	-

WRZ	Best Appropriate Assessment - SA Approach 2	
	Option Description	SA Option
Bailieboro RWSS	New Groundwater Abstraction at Crossreagh	
2300SC0007: Ballivor	SA3-030 New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0005: Kells-Oldcastle	SA3-017 New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0011: Kilmessan	SA3-048 New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0027: Moynalty	SA3-088 Upgrade Moynalty WTP for Water Quality Purposes	-
2300SC0055: Navan-Midmeath	SA3-38b New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0009: Slane	SA3-045 New Shannon Source Transfer and Interconnection of WRZs	4
2100SC0001: South Louth & East Meath	SA3-09c New Shannon Source Transfer and Interconnection of WRZs	4
2300SC0045: St Louis, National School, Rathkenny	SA3-089 Upgrade Moynalty WTP for Water Quality Purposes	-
2300SC0014: Trim	SA3-053 New Shannon Source Transfer and Interconnection of WRZs	4