Autumn 2022

Regional Water Resources Plan–Eastern and Midlands

Strategic Environmental Assessment

Appendix H: Study Area 1 – 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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1 Introduction and Background

1 Introduction and Background

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 1 Environmental Review includes:

- Context for the Study Area Environmental Review;
- 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 1 within the Eastern and Midlands Region for the options and approaches considered and as outlined in the Study Area 1 Technical Report (RWRP-EM Appendix 1). This Environmental Review applies the Strategic Environmental Assessment (SEA) objectives and environmental assessment methodology set out in the NWRP Framework Plan (Framework Plan).

Environmental Reviews are undertaken for each study area and 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 1.2 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 and includes an annual review to identify actions required within the plan cycle.

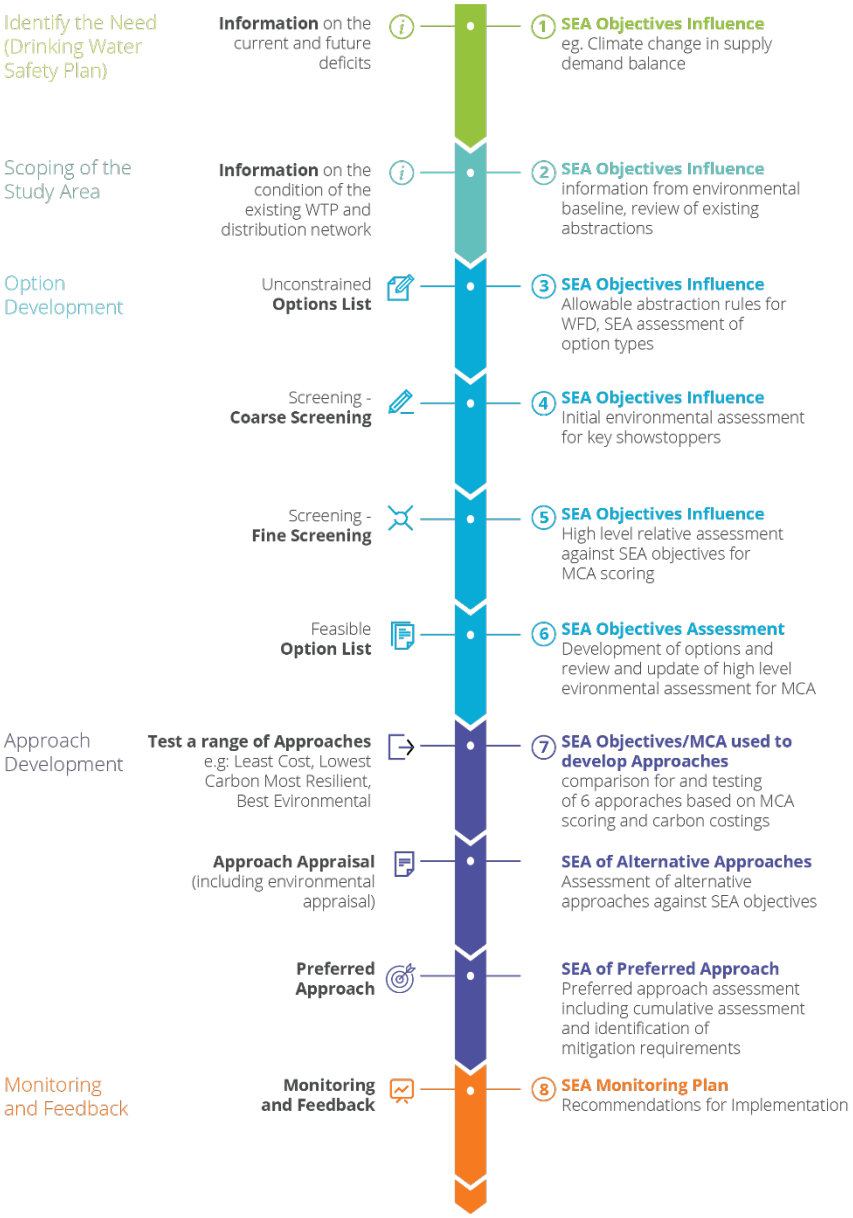

Figure 1.1 Option and Approach Development Process

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 Reviews 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.
	Climate change adaptation

SEA Topic	SEA Objective
	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 development 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 SA1 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 SA1 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 SA1 are provided in chapter 9 of this review.

1.6 Study Area 1

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 SA1, the location of SA1 in relation to the Eastern and Midlands Region is shown in Figure 1.3.

Study Area 1 lies within the counties of Wicklow and Wexford and its total area is approximately 681 km^2. The principal settlement (with a population of over 10,000) within SA1 is Arklow (CSO, 2016a), as shown in Figure 1.4.

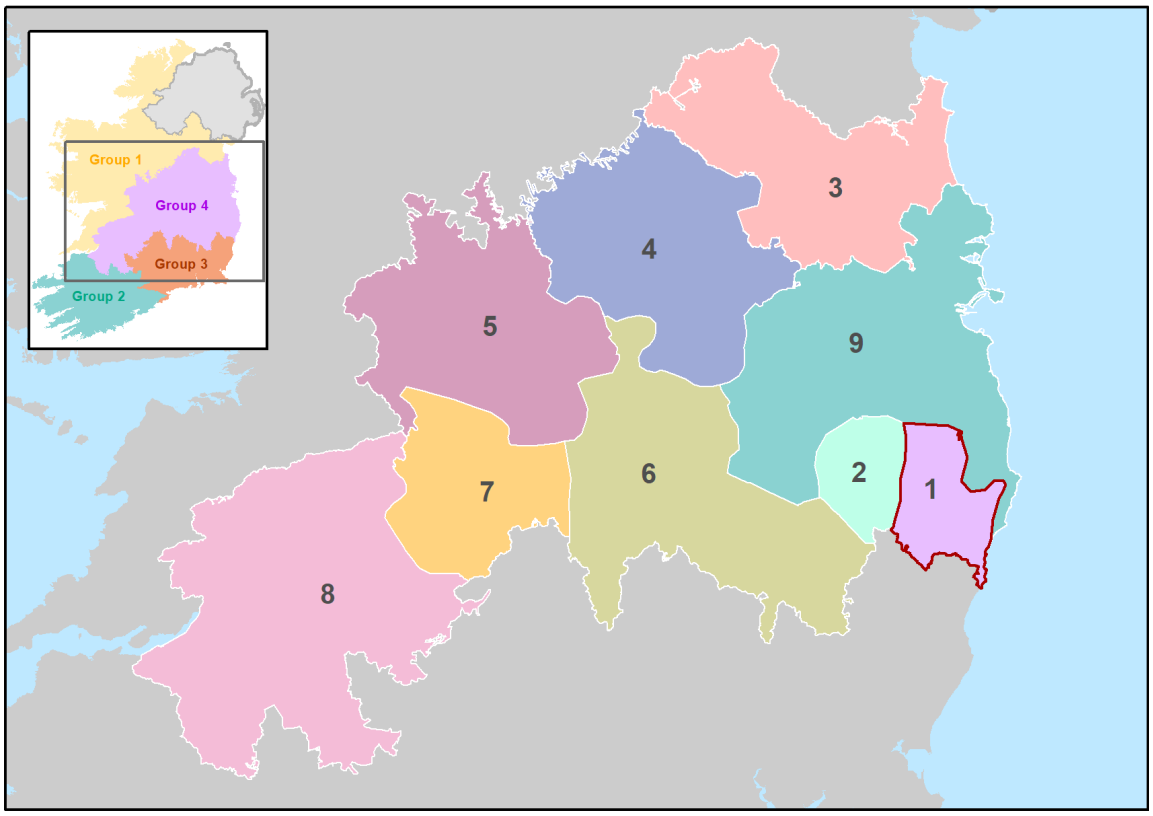

Figure 1.2 Eastern and Midlands Region Study Areas

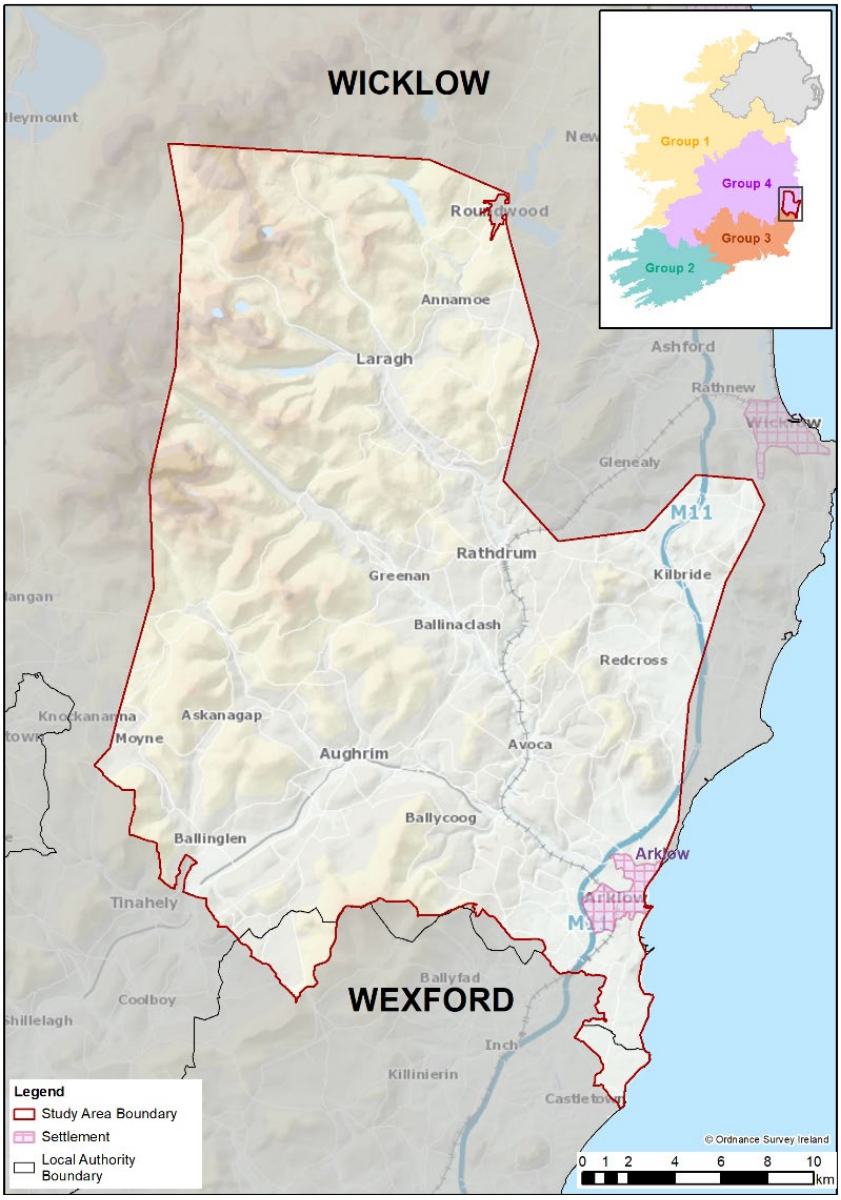

Figure 1.3 Study Area 1

2

Study Area 1 Environmental Baseline Context

2 Study Area 1 Environmental Baseline Context

This chapter provides environmental baseline information for SA1 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 Plan 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 increase in population is expected in the WRZ Arklow Public Supply (3400SC0001). 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 SA1

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
3400SC0001 - Arklow Public Supply	13,688	+25.2%

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
3400SC0006 - Aughrim Annacurra Public Supply	1,624	+15.3%
3400SC0007 - Avoca Ballinaclash Public Supply	1,345	+15.3%
3400SC0012 - Redcross Conary Public Supply	577	+15.3%
3400SC0017 - Barndarrig Public Supply	217	+15.3%
3400SC0018 - Ballycoog Public Supply	52	+15.3%
3400SC0020 - Thomastown Public Supply	179	+15.3%
3400SC0021 - Kirikee Public Supply	88	+15.3%
3400SC0025 - Ballinteskin Public Supply	51	+15.3%
3400SC0027 - Ballinapark Public Supply	10	+15.3%
3400SC0030 - Killavaney Public Supply (Arklow)	8	+15.3%
3400SC0031 - Ballyclogh Public Supply	12	+15.3%
3400SC0032 - Killavaney Public Supply (Tinahely)	6	+15.3%
3400SC0033 - Ballymorris Public Supply	17	+15.3%
3400SC0035 - Kilballyowen (Aughrim) Public Supply	17	+15.3%
3400SC0046 - Rathdrum Public Supply	1,889	+15.3%
3400SC0047 - Laragh Annamoe Public Supply	658	+15.3%
3400SC0002 - Tinahely Regional Supply**	3,608	+15.3%

* 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.

**Tinahely Regional Supply WRZ is outside the study area boundary although it is included here as part of SA1. This is explained in the SA1 Technical report.

2.1.2 Economy and Employment

The majority of SA1 lies within the Mid-East region and a small part lies within the South-East region of Ireland. SA1 had an above average (Mid-East) and below average (South-East) household disposable income per person in 2016 (CSO, 2016b), and an unemployment rate of 7.5% in the Mid-East and 6.4% in the South-East region of the country (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 and 441 for the South-East region (CSO, 2020a).

2.1.3 Tourism and Recreation

Tourism in SA1 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 Wicklow has been described as "*the garden of Ireland*", containing Ireland's largest national park and emphasising outdoor recreation as a key asset for the area (Visit Wicklow, 2020).

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

Ireland's natural heritage is recognised as an important tourism asset by the Department of Transport, Tourism and Sport (2019). For SA1, the national parks and nature reserves of note are Wicklow National Park and the Glenealo Valley National Park, and the Glendalough and Vale of Clara Nature Reserves. The rivers and loughs in the area also 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 and South-East regions 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 and South-East Regions within Ireland

Life Expectancy (CSO, 2017b)	Participation in Sports, Fitness or Recreational Physical Activities (% of Persons Aged 15+) (CSO, 2020b)	Air Quality (EPA, 2020a)
Mid-East: Male: 77.2 Female: 81.4	**Mid-East:** 49%	Good
South-East: Male: 76.8 Female: 81.7	**South-East:** 44%	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 SA1.

Table 2.3 Areas Supplied by the WTPs in SA1

WTP	WRZ	Local Authority Supplied
Arklow (Ballyduff) WTP	3400SC0001: Arklow Public Supply	Wicklow
Aughrim / Annacurragh WTP	3400SC0006: Aughrim Annacurra Public Supply	Wicklow

WTP	WRZ	Local Authority Supplied
Avoca Ballinaclash WTP	3400SC0007: Avoca Ballinaclash Public Supply	Wicklow
Redcross WTP	3400SC0012: Redcross Conary Public Supply	Wicklow
Barndarrig WTP	3400SC0017: Barndarrig Public Supply	Wicklow
Ballycoog WTP	3400SC0018: Ballycoog Public Supply	Wicklow
Thomastown WTP	3400SC0020: Thomastown Public Supply	Wicklow
Kirikee WTP	3400SC0021: Kirikee Public Supply	Wicklow
Ballinteskin WTP	3400SC0025: Ballinteskin Public Supply	Wicklow
Ballinapark WTP	3400SC0027: Ballinapark Public Supply	Wicklow
Kilavaney WTP	3400SC0030: Killavaney Public Supply (Arklow)	Wicklow
Ballyclogh WTP	3400SC0031: Ballyclogh Public Supply	Wicklow
Kilavaney Tinahely WTP	3400SC0032: Killavaney Public Supply (Tinahely)	Wicklow
Ballymorris WTP	3400SC0033: Ballymorris Public Supply	Wicklow
Killballyowen Aughrim WTP	3400SC0035: Kilballyowen (Aughrim) Public Supply	Wicklow
Rathdrum WTP	3400SC0046: Rathdrum Public Supply	Wicklow
Glenmacnass WTP and Raheen WTP	3400SC0047: Laragh Annamoe Public Supply	Wicklow
Tinahely Regional WTP*	3400SC0002: Tinahely Regional Supply	Wicklow
Askamore Dunishal WTP*	3400SC0002: Tinahely Regional Supply	Wexford

*Tinahely Regional WTP and Askamore Dunishal WTP are located in the Tinahely WRZ which is outside the study area boundary. While this WRZ is outside of SA1, it is reported in SA1 and SAM (South East Region) as the WRZ is located directly on the boundary of SA1 and SAM

Currently for day-to-day operations, thirteen out of eighteen 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. During the drought in summer 2018, all of the groundwater supplies were monitored due to falling levels in the groundwater bodies, and two of the supplies Barndarrig and Kirikee were severely impacted.

Poor water quality can be linked to risks to health. The Barrier Assessment identified sixteen of the twenty WTPs within the study area as being at high risk of failing to achieve Irish Water's conservative Barrier Assessment standards in relation to maintaining chlorine residual in the network (Barrier 2.1) and the effectiveness of Irish Water's protozoa removal processes (Barrier 3) (see Table 2.1 in the SA1 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. At present there are two WTPs within SA1 on the Environmental Protection Agency (EPA) Remedial Action List (RAL), namely, Aughrim/Annacurragh WTP and Ballymorris WTP. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SA1 in advance of the NWRP. Details of these are included in the SA1 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 SA1.

Table 2.4 provides a summary of the WFD catchments within SA1.

Table 2.4 Catchments within SA1 (EPA, 2020b)

WFD Catchments	Total Catchment Area (km^2)	Catchment Area within SA1 (km^2)
Avoca-Vartry	1,247	662
Liffey and Dublin Bay	1,616	19

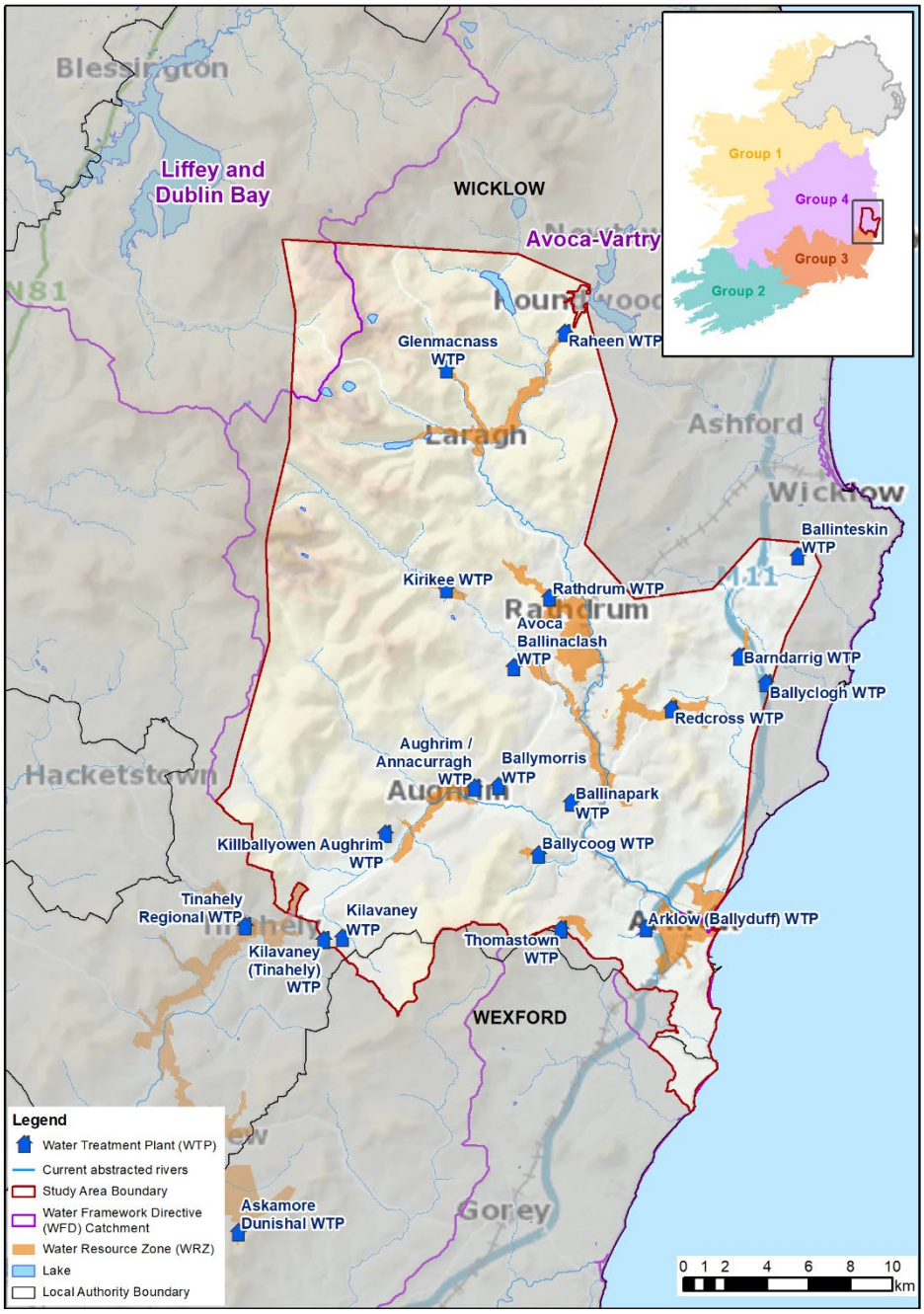

Figure 2.1 Water Environment of SA1

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 SA1 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 SA1 supplies, Irish Water has assessed its surface water abstractions and summarised the potential impact on the Mill Glen Stream (Rathdrum), River Avonbeg tributary (Avoca Ballinaclash), Glenmacnass River (Laragh), River Derry (Tinahely), and Three Wells Stream (Aughrim). Based on this initial assessment, the volumes of water abstracted from the Mill Glen Stream (Rathdrum), River Avonbeg tributary (Avoca Ballinaclash), River Derry (Tinahely), and Three Wells Stream (Aughrim) may not meet sustainability guidelines during dry weather flows.

Irish Water has taken a conservative approach in identifying sustainable abstractions for new options (described in section 3.2) and has applied a sensitivity assessment that 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 two WFD catchments in SA1 and the total number of surface and groundwater waterbodies within SA1 are provided in Table 2.5 below.

Table 2.5 WFD Waterbodies within SA1 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
Rivers	Avoca-Vartry	42	4
	Liffey and Dublin Bay	2	0
Lakes	Avoca-Vartry	6	0
	Liffey and Dublin Bay	0	0
Transitional and Coastal	N/A	2	0
Groundwater	N/A	7	3

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

- Avoca-Vartry: Other (54%) (including historically polluted sites, aquaculture, waste, atmospheric and anthropogenic pressures), Agriculture (31%) and Urban Runoff (23%); and
- Liffey and Dublin Bay: Agriculture (51%), Urban Runoff (32%), Urban Wastewater Treatment Plants (23%) and Domestic Wastewater (23%).

Table 2.6 includes a summary of the 'at risk' waterbodies within SA1.

Table 2.6 Summary of 'At Risk' Waterbodies in SA1 (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	Avoca-Vartry	17	4
	Liffey and Dublin Bay	1	
Lakes	Avoca-Vartry	1	0
	Liffey and Dublin Bay	0	
Transitional and Coastal	N/A	1	0
Groundwater	N/A	3	0
Total		**23**	**4**

* Based on Irish Water assessment of their current abstractions

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 SA1 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 SA1 (catchments.ie, 2021c)

Areas for Action	Key Reasons for Selection
Liffey Upper (pH Wicklow 1)	• An acid water project in the east. • Build on work completed by Wicklow County Council. • Headwaters to reservoir. • Important for recreation - active angling club in the area.
Ow	• High Ecological Status ecological objective waterbody requiring improvement • Building on work that is underway by Coillte • Multi agency collaboration between Coillte, Wicklow County Council and Inland Fisheries Ireland
Potters and Three Mile Water	• Building on improvements in Potters_010 – improved from Poor to Moderate between 2007-2009 and 2010-2015 • Building on existing knowledge in Wicklow County Council regarding farms and quarries in the area • Building on improvements following completion of roadworks that were a pressure • Good community engagement - there are 3 Group Water Schemes • Discharges into Brittas Bay designated bathing waters • A drinking water abstraction in Potters_010

Areas for Action	Key Reasons for Selection
	• Potential for 'quick wins' in both waterbodies
Avonbeg-Avonmore (pH Wicklow 2)	• 2nd pH project to link to the other Wicklow pH project. • Four deteriorated waterbodies • Two High Ecological Status objective water bodies • Headwaters to the Avonbeg and Avonmore rivers

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 SA1.

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 • 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

Summary	
	• 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 SA1

County	Key Risk Areas
Wicklow (Wicklow County Council, 2019)	• Flooding • Extreme rainfall and wind speed/storminess • Rising sea levels
Wexford (Wexford County Council, 2019)	• Storm frequency and intensity • Flooding • Extreme cold events (snow) • Heavy rainfall • Extreme heat/drought conditions • Bog, sand dune, gorse or forest fires • Sea level rise and storm surges

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 SA1, 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 SA1 there are a number of European, national and locally designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), nature reserves, National Parks 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.

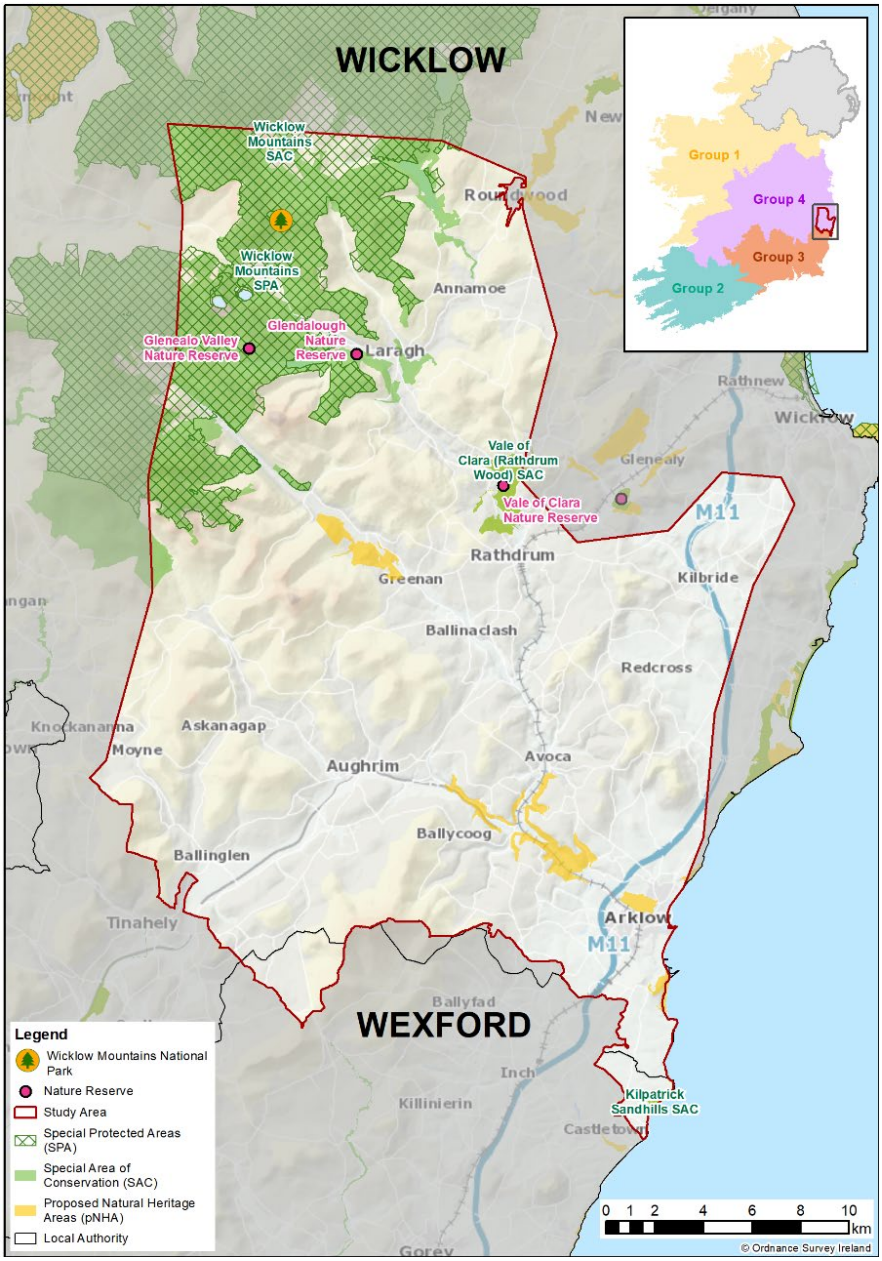

Figure 2.2 Designated Sites in SA1

Table 2.10 Designated Sites within SA1 (NPWS, 2019a)

Receptor	Name	Total Number
Special Protected Area (SPA)	Wicklow Mountains SPA	1
Special Area of Conservation (SAC)	Wicklow Mountains SAC	3
	Kilpatrick Sandhills SAC	
	Vale of Clara (Rathdrum Wood) SAC	
Ramsar sites	N/A	0
Nature reserves	Glenealo Valley Nature Reserve	3
	Glendalough Nature Reserve	
	Vale of Clara Nature Reserve	
National Parks	Wicklow Mountains National Park	1
Natural Heritage Areas (NHAs)	N/A	0
Proposed Natural Heritage Areas (pNHAs)	Vale Of Clara (Rathdrum Wood)	9
	Kilpatrick Sandhills	
	Arklow Rock-Askintinny	
	Arklow Sand Dunes	
	Avoca River Valley	
	Ballinacor Wood	
	Vartry Reservoir	
	Arklow Town Marsh	
	Avondale	

2.4.2 Habitats

Table 2.11 lists the percentage of the study area, and the number of hectares, covered by each habitat within SA1; as reported in the Corine land use dataset[1].

Table 2.11 Habitat Areas for SA1 (EPA, 2018)

Habitat	Ha	% of Study Area
Agricultural Land		
Pastures	27,810	40.77%
Land principally occupied by agriculture, with significant areas of natural vegetation	3,349	4.91%

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

Habitat	Ha	% of Study Area
Non-irrigated arable land	3,272	4.80%
Complex cultivation patterns	377	0.55%
Natural Habitats		
Moors and heathland	7,371	10.81%
Peat bogs	3,797	5.57%
Natural grasslands	1,798	2.64%
Water bodies	141	0.21%
Inland marshes	140	0.20%
Sparsely vegetated areas	130	0.19%
Sea and ocean	60	0.09%
Forest		
Coniferous forest	10,602	15.54%
Transitional woodland-shrub	3,328	4.88%
Mixed forest	2,690	3.94%
Broad-leaved forest	1,807	2.65%

Particularly relevant habitats that depend on the water quality and/or quantity in SA1 are:

- Oligotrophic lake habitats;
- Bog habitats – *Rhynchosporion* depressions, transition mires and quaking bog habitats;
- Alkaline fens; and
- Groundwater dependant terrestrial habitats, such as petrifying springs with tufa formation and blanket bogs.

2.4.3 Species

The key species and habitats (Nelson et al, 2019) of concern within SA1 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 and European eel);
- 'Qualifying interest' bird species e.g. peregrine falcon (*Falco peregrinus*), merlin (*Falco columbarius*); and
- Fresh-water pearl mussel.

The key invasive species to consider (European Communities (Birds and Natural Habitats) Regulations, 2011) for developing options within SA1 include:

- Himalayan balsam (*Impatiens glandulifera*);
- Himalayan knotweed (*Persicaria wallichii*);
- Japanese knotweed (*Fallopia japonica*); and
- *Elodea spp.*

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 SA1 are listed in Table 2.12, such as agricultural land and natural habitats. County Wicklow is also the most forested county in Ireland, making it a key asset for SA1.

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 twenty WTPs in SA1, meeting the demand of 8.3 Ml/d in 2019.

There are no canals, ports or airports of national or regional significance in SA1. Other significant transport infrastructure includes the main road (particularly the M11) and rail network (Dublin Connolly - Rosslare, and the DART and Dublin Commuter).

Any new infrastructure considered for SA1 will need to take, existing as well as planned land zoning and local development into consideration.

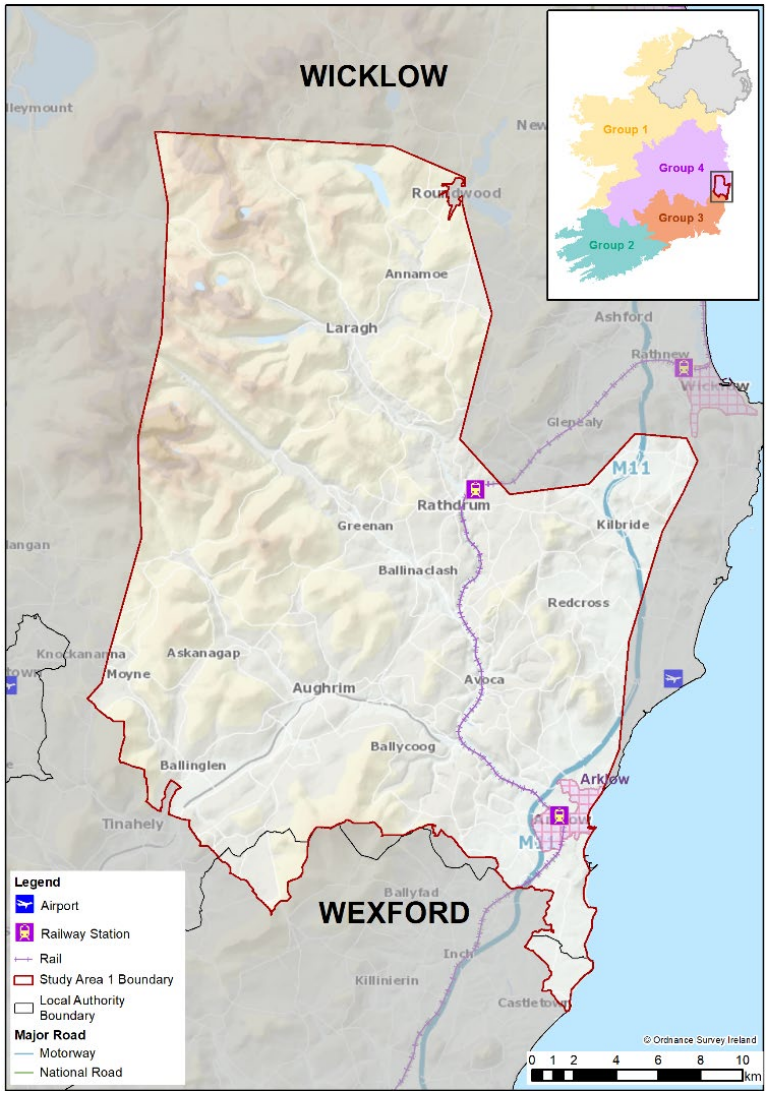

Figure 2.3 Transport Infrastructure in SA1

Table 2.12 Land Use within SA1 (EPA, 2018)[2]

Land use	Ha	% of Study Area	Comparison to Overall Eastern and Midland Region %
Agriculture	34,807	51.03%	75.52%
Forest	18,427	27.02%	9.42%
Natural habitats	13,437	19.70%	10.61%
Urban	1,200	1.76%	3.69%
Industry	256	0.37%	0.70%
Other	83	0.12%	0.06%

Proposals for other strategic developments within SA1 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 SA1[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	
Arklow Flood Relief Scheme	Arklow Historic Town Core
Arklow Sewerage Scheme Wastewater Treatment Plant	

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 county of Wexford[4].

The value of the landscape in SA1 is reflected in baseline data sections 2.1.3 (Tourism and Recreation), 2.4 (Biodiversity, Flora and Fauna) and 2.8 (Cultural Heritage).

[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 SA1 being the 15//01/21.
[4] As with all the baseline information, the LCA information will be updated as part of regular reviews.

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 SA1 (Ordnance Survey Ireland. n.d.)

Landscape Character Area	Sensitivity
County: Wexford	
No LCA information available	
County: Wicklow (Wicklow County Council, 2016)	
Western Corridor	Medium
Blessington LAP	Low
Poulaphouca Reservoir	High
Mountain Uplands	High
Glencree / Glencullen	High
Northern Mt. Lowlands	High
Bray Environs Masterplan	Low
Coastal Area	High
Greystones / Delgany LAP	Low
Eastern Corridor	Medium
Newtown Mount Kennedy LAP	Low
Ashford LAP	Low
Wicklow Town Environs	Low
Rural Area	Medium
Southern Hills	High
Rural Area	Medium
Southern Mt. Lowlands	High
Baltinglass Hills	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 SA1 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 M11.

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 SA1, 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.

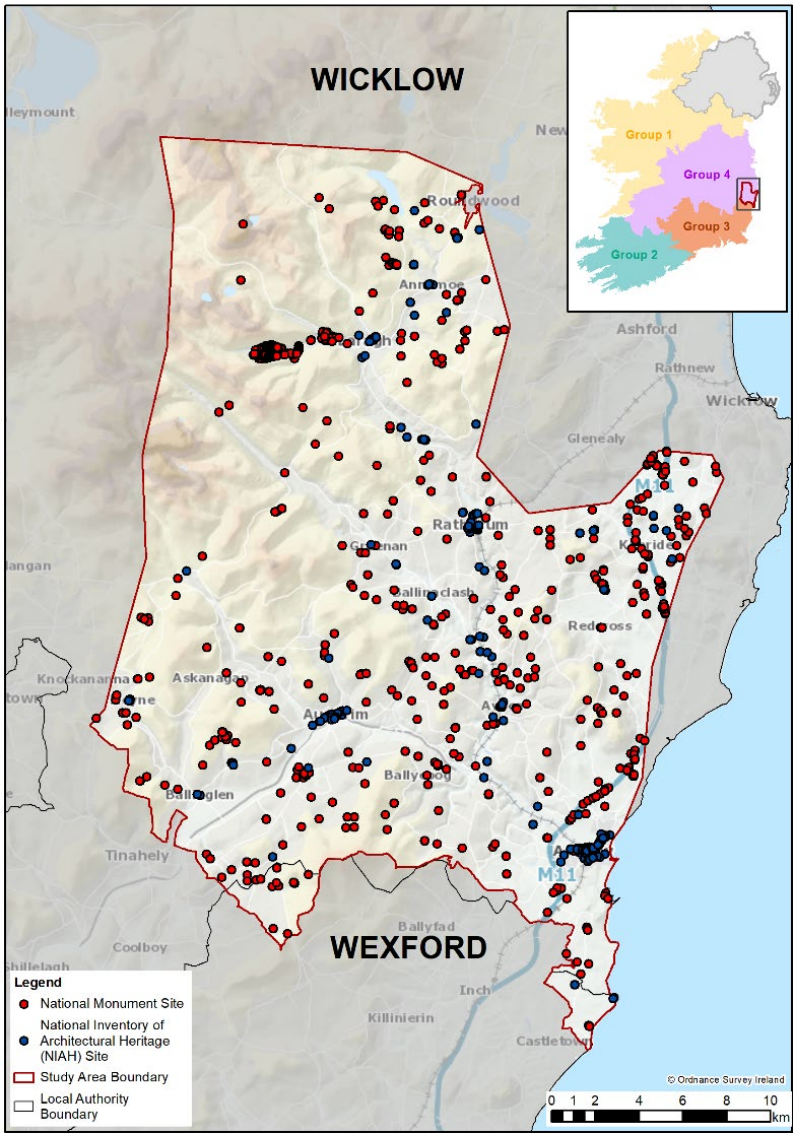

Figure 2.4 SA1 Cultural Heritage Assets

Table 2.15 Cultural Heritage Assets within SA1

Assets	Total Number
National Monuments Service sites	879
National Inventory of Architectural Heritage sites	259
Sites and Monuments Record Zones	372

2.9 Geology and Soils

Table 2.12 lists the land uses within SA1. SA1 predominantly has a fine loamy soil type with areas of peaty soil to the east and a peat soil type to the west of the study area (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 SA1 are shown in Figure 2.5.

The landscape of county Wicklow reflects the varied underlying geology. The mountains in the centre of the country are composed of Granite, with older Ordovician and Silurian metamorphic rocks to the east and west. The entire region is considered to be of poorly productive aquifer status, and much of the bedrock geology here is classed as Locally Important Aquifer/Poor Aquifer.

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, 29 of which have the potential to constrain water resource options in SA1.

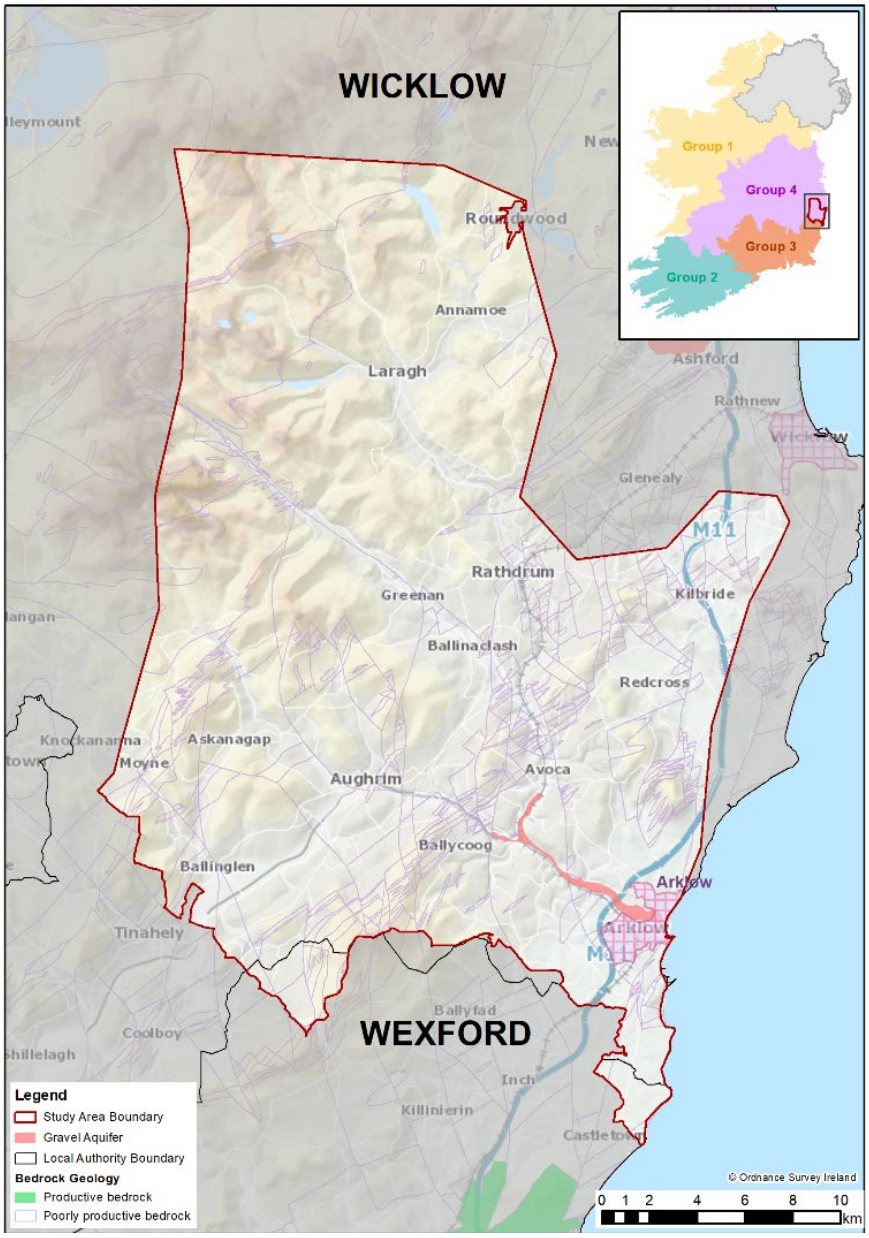

Figure 2.5 SA1 Hydrogeology

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 SA1 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 put in place measures to address risks as part of the NWRP. Irish Water has ongoing activities to improve the Supply Demand Balance in SA1, 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 along with valuing water as part of access to environment for recreation.	Climate change, biodiversity, water environment, material assets and landscape and visual amenity
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 SA1, 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 SA1 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 assessment for the new legislation is undertaken. **Opportunities:** to take account of identified pressure on the water environment in the selection of solutions for SA1.	Biodiversity and climate change
Biodiversity, Flora and Fauna	Issues: 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

SEA Topic	Issues and Opportunities	Interrelated Topics
Landscape and Visual Amenity	**Issues:** potential for climate change to affect land use and influencing landscape character, quality and amenity.	Biodiversity and geology and soils, climate change, health and well being
Air Quality and Noise	No specific issues identified for the baseline for SA1	Health and well being
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 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.	Biodiversity and water environment
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 and 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 not 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 SA1 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 review. The key stages considered in this chapter for SA1 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 109 unconstrained options were identified for SA1 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 109 unconstrained options, 55 were rejected after being analysed against the coarse screening criteria of resilience, deliverability and environment.

Sustainability reasons for rejecting options were identified for four 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 SA1. The full rejection register for both the coarse and fine screening (where applicable) is provided in Appendix C of the SA1 Technical Report.

Table 3.2 Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
SA1-02b	Increase GW abstraction at Aughrim Annacurra and interconnect with Aughrim Annacurra Public Supply	This option included increasing the abstraction at Aughrim Annacurra to supply deficit for Aughrim Annacurra and transfer additional supply to Arklow WRZ. As there is a great uncertainty around available yield at this source, this option is not considered feasible and was not taken forward to the fine screening stage.
SA1-012	Increase GW abstraction at Aughrim Annacurra Public Supply and interconnect with Arklow Public Supply	
SA1-015	Increase abstraction from the existing Avonbeg River tributary abstraction	Based on Irish Water desktop assessment the current abstraction from this source already appears to be over sustainable

Option Reference	Option Description	Rejection Reasoning
		abstraction limits and therefore, it was rejected at coarse screening stage.
SA1-018	New GW source at Avoca Ballinaclash Public Supply	The proposed abstraction is located in a Locally Important Aquifer. A desktop assessment shows the required abstraction is unlikely to be sustainable at this location. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria of the RWRP-EM and was not taken forward to fine screening stage.

3.4 Stage 5: Fine Screening

A total of 54 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 in SA1.

3.5 Stage 6: Feasible Options List

A total of 54 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 SA1 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 as a whole. 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.

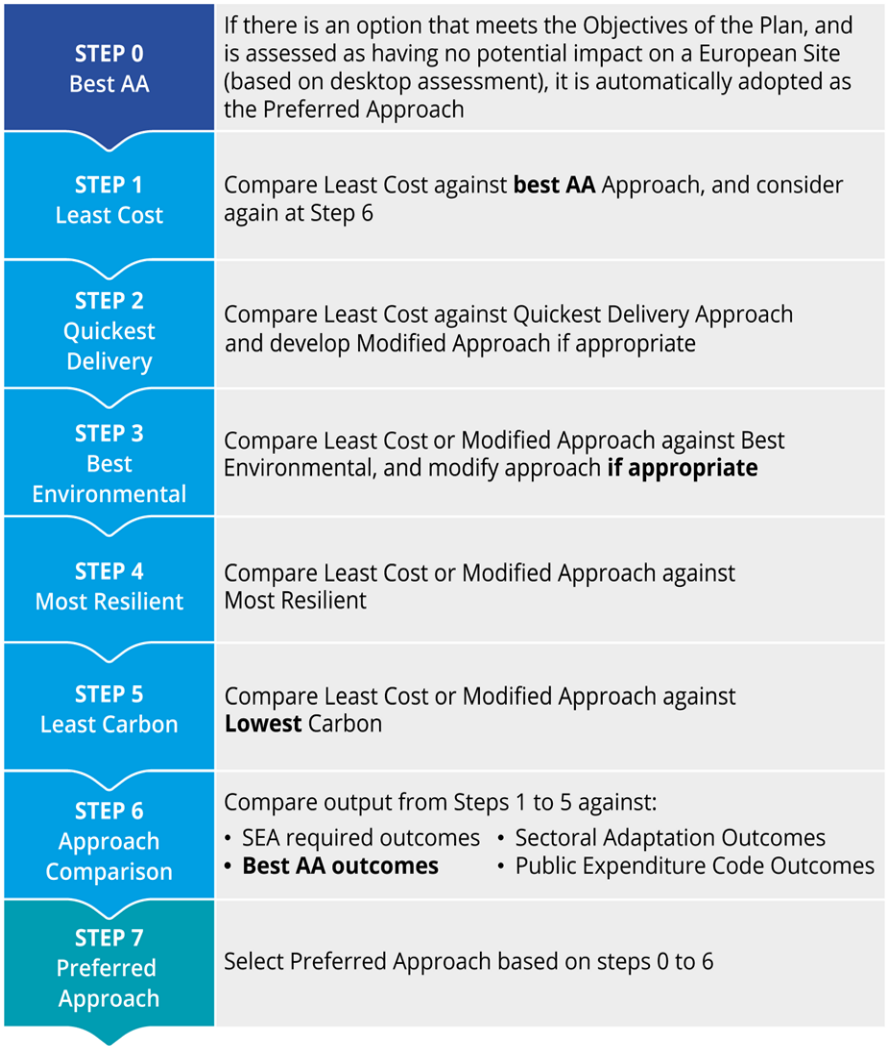

Figure 4.1 The 7 Step Process

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 (tCO_2e) 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 (tCO_2e) 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.

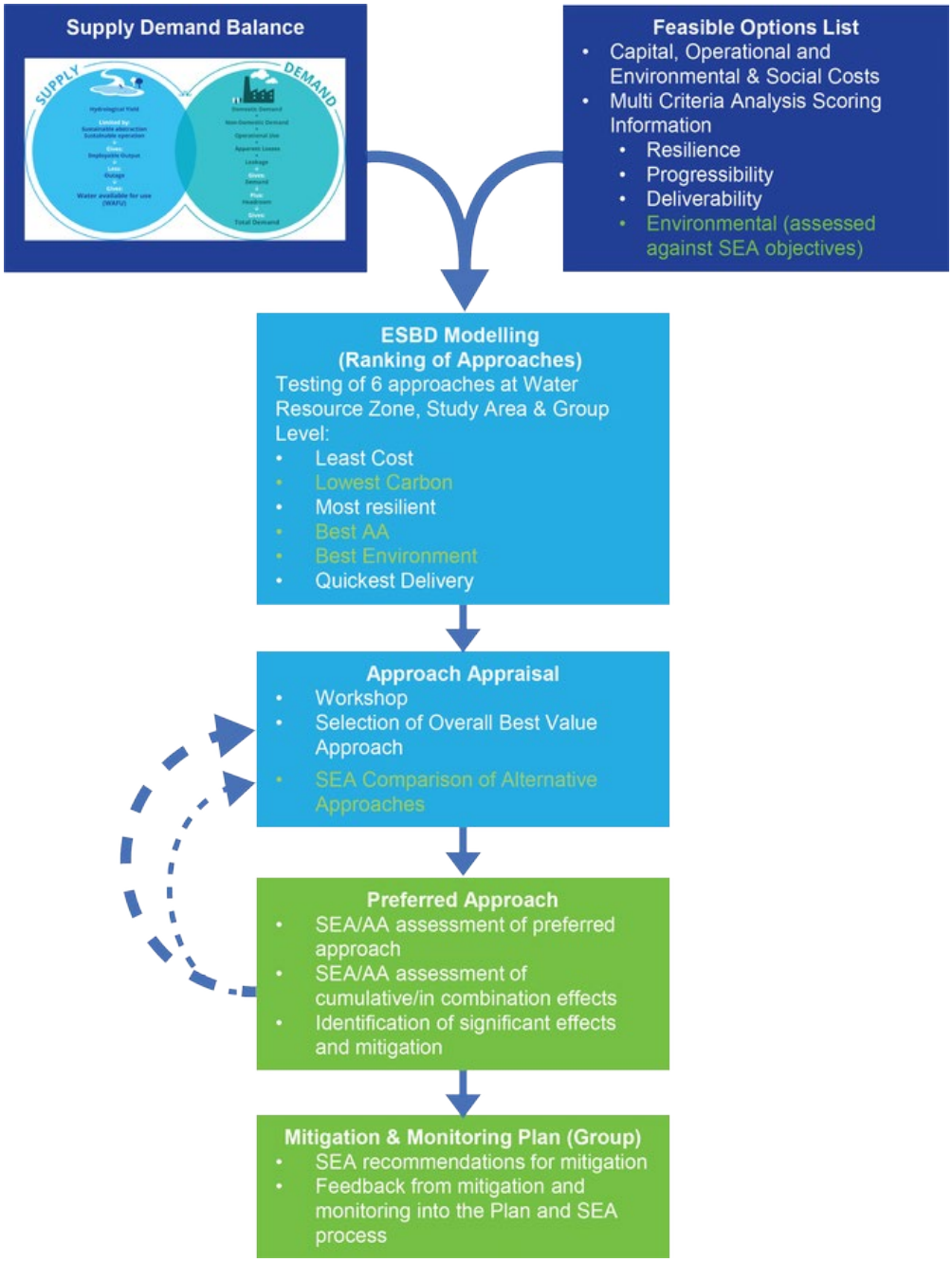

Figure 4.2 Approach Development Process

4.3 SA1 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 and combinations at WRZ and study area levels applying the three stages:

Stage 1 - comparing WRZ options and identify the preferred WRZ level approach. For SA1 there are 26 WRZ options and these are listed in Table 5.2 in the SA1 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 (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 SA1, a total of 20 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 SA1 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 5)	SA combination 4 (SA option 6)	SA combination 5 (SA option 8)	SA combination 6 (SA option 11)	SA combination 7 (SA option 12)	SA combination 8 (SA option 13)	SA combination 9 (SA option 14)	SA combination 10 (SA option 3 & 6)	SA combination 11 (SA option 3 & 12)	SA combination 12 (SA option 3 & 13)	SA combination 13 (SA option 3 & 14)	SA combination 14 (SA option 5 & 6)	SA combination 15 (SA option 8 & 11)	SA combination 16 (SA option 4, 5 & 6)	SA combination 17 (SA option 4, 6 & 11)	SA combination 18 (SA option A)	SA combination 19 (SA option B)
Least Cost														Best*				Worst		
Quickest Delivery																		Best		Worst
Number of -3 Biodiversity Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores	No -3 Scores
Lowest Carbon	Best																Worst			
Most Resilient	Best												Worst **	Worst **						
Best Environmental	Worst		Worst											Best						

Key															
Ranked order (best to worst)	Best														Worst

* SA combination 12 has the lowest cost, however, this is within 1%. Therefore, because SA combination 13 has a much lower carbon cost and is the best environmental it has been selected as least cost

** SA combination 12 and SA combination 13 have the same score against the Most Resilient Criteria

Through comparing all the potential SA combinations, the best SA approach for each of the six approach categories was identified. For SA1, these aligned as three approaches (see Table 4.3).

Table 4.3 Study Area Approach Categories

Category	SA Approach 1 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (LCo, BE, BA)	SA Approach 3 (SA Combination 17) (QD)
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 13)	Best Appropriate Assessment Approach (SA Combination 13)	Quickest Delivery Approach (SA Combination 17)	Best Environmental Approach (SA Combination 13)	Most Resilient Approach (WRZ Approach)	Lowest Carbon Approach (WRZ Approach)
SA options (Group options)	No options	**SA option 3:** 17c, 23c, 51c, 52c, 53c, 57c, 87 **SA option 14:** 081, 082, 083	**SA option 3:** 17c, 23c, 51c, 52c, 53c, 57c, 87 **SA option 14:** 081, 082, 083	**SA option 4:** 23d, 51d, 52d **SA option 6:** 02a, 009 **SA option 11:** 35b, 60b	**SA option 3:** 17c, 23c 51c, 52c 53c, 57c, 87 **SA option 14:** 081, 082, 083	N/A	N/A
WRZ options	No options	020 027 030 042	020 027 030 042	16a 020 027 030 042	020 027 030 042	013 16a 020 024	013 16a 020 024

Options included	Do Minimum	Least Cost Approach (SA Combination 13)	Best Appropriate Assessment Approach (SA Combination 13)	Quickest Delivery Approach (SA Combination 17)	Best Environmental Approach (SA Combination 13)	Most Resilient Approach (WRZ Approach)	Lowest Carbon Approach (WRZ Approach)
		050	050	031	050	027	027
		066	066	042	066	030	030
		069	069	050	069	031	031
		070	070	056	070	037	037
		071	071	066	071	042	042
				069		050	050
				070		056	056
				071		60a	60a
						066	066
						069	069
						070	070
						071	071
						085	085
						086	086

* For the option references - all options are part of SA1 e.g. SA1-020 is shown as 020 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 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 SA1 Technical Report.

Within SA1, this resulted in three approaches being selected from the 20 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 three 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 for the SA approaches suggests that all three SA approaches are the best AA because they have the same number of -3 biodiversity scores (i.e. none of these approaches had -3 scores). However, 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 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (LCo, BE, BA)	SA Approach 3 (SA Combination 17) (QD)
Least Cost Score		Best	Worst
Quickest Delivery Score		Worst	Best
Best AA Score	No -3 Biodiversity Scores	No -3 Biodiversity Scores	No -3 Biodiversity Scores
Lowest Carbon Score	Best		Worst
Most Resilient Score	Best	Worst	
Best Environmental Score	Worst	Best	

Key		
Ranked order (best to worst) within the 3 selected approaches		
Worst		Best

4.4 Comparison of SA1 Approaches

An overall summary of the infrastructure components and abstractions for each of the SA approaches identified for SA1 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 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (BE, BA)	SA Approach 3 (SA Combination 17) (QD)
New pipeline network (km)	0	14	62	42
New WTPs	0	2	0	2
Upgrade WTPs	0	20	10	16

Infrastructure Summary	Do Minimum	SA Approach 1 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (BE, BA)	SA Approach 3 (SA Combination 17) (QD)
New/upgraded abstractions	0	15	6	10
WTPs decommissioned	0	2	10	7
Abstractions abandoned	0	0	10	0
Raw water storage	0	0	0	0
Treated water storage	0	3	5	5

A comparative assessment of the three 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 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (BE, BA)	SA Approach 3 (SA Combination 17) (QD)	Range (Difference between Lowest and Highest Score)
Population, health, economy and recreation	-3 scores	No Difference			0
	MCA score	Worst	Best		10
Water Environment: quality and resources	-3 scores	Worst	Best	Worst	1
	MCA score	Worst	Best		9
Biodiversity, Flora and Fauna	-3 scores	No Difference			0
	MCA score	Worst	Best		27

Topic	Total No. of	SA Approach 1 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (BE, BA)	SA Approach 3 (SA Combination 17) (QD)	Range (Difference between Lowest and Highest Score)
Material Assets	-3 scores	Best	Worst	Best	1
	MCA score	Worst	Best		8
Landscape and Visual	-3 scores	No Difference			0
	MCA score		Best	Worst	5
Climate Change	-3 scores	No Difference			0
	MCA Score	Worst	Best		6
Culture, Heritage and Archaeology	-3 scores	No Difference			0
	MCA Score	No Difference			0
Geology and Soils	-3 scores	No Difference			0
	MCA Score	Worst	Best	Worst	1

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 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 (WRZ Approach) (MR, LC)

SA approach 1, key comparison points:

- Identified as the best in the Most Resilient and Lowest Carbon categories;

- Option types included:
  - WRZ options: 9 groundwater abstraction options, 4 surface water abstraction options, 2 rationalisation options and 3 WTP upgrade options;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 1 results in the lowest pipeline length, the lowest number of decommissioned WTPs, and the lowest number of treated water storages in comparison to the other approaches. However, it results in the highest number of WTP upgrades and the highest number of new/upgraded abstractions.

4.4.2 SA Approach 2 (SA Combination 13) (LCo, BE, BA)

SA approach 2, key comparison points:

- Identified as the best in the following categories: Least Cost, Best Environmental and Best Appropriate Assessment;
- Option types included:
  - SA options (group options): 1 groundwater abstraction option and 1 rationalisation option;
  - WRZ options: 5 groundwater abstraction options, 1 rationalisation option and 3 WTP upgrade options;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 2 has the longest pipeline length at approximately four and a half times that of SA approach 1. It also has the highest number of decommissioned WTPs, no new WTPs and the lowest number of upgraded WTPs and new/upgraded abstractions.

4.4.3 SA Approach 3 (SA Combination 17) (QD)

SA approach 3, key comparison points:

- Scored the best in the Quickest Delivery category;
- Option types included:
  - SA options (group options): 2 groundwater abstraction options and 1 rationalisation option;
  - WRZ options: 5 groundwater abstraction options, 2 surface water abstraction options, 2 rationalisation options and 3 WTP upgrade options;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 3's new infrastructure requirement lies between what is required for SA approach 2 and SA approach 1. However, SA approach 3 does share the highest number of new WTPs with SA approach 1 and the highest number of treated water storages with SA approach 2.

4.5 SA1 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 -1,039 m^3/d in 2019, to a projected maximum of -1,287 m^3/d 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 SA1.

Table 4.8 Supply Demand Balance for SA1

WRZ Name	WRZ Code	Population	Estimated Maximum Deficit m^3/day*	
			2019	2044
Arklow Public Supply	3400SC0001	13,688	No Deficit	No Deficit
Aughrim Annacurra Public Supply	3400SC0006	1,624	-252	-297
Avoca Ballinaclash Public Supply	3400SC0007	1,345	-71	-111
Redcross Conary Public Supply	3400SC0012	577	-144	-165
Barndarrig Public Supply	3400SC0017	217	-55	-66
Ballycoog Public Supply	3400SC0018	52	-32	-36
Thomastown Public Supply	3400SC0020	179	-6	-12
Kirikee Public Supply	3400SC0021	88	-16	-20
Ballinteskin Public Supply	3400SC0025	51	-19	-21
Ballinapark Public Supply	3400SC0027	10	-19	-20
Killavaney Public Supply (Arklow)	3400SC0030	8	No Deficit	No Deficit
Ballyclogh Public Supply	3400SC0031	12	No Deficit	No Deficit
Killavaney Public Supply (Tinahely)	3400SC0032	6	No Deficit	No Deficit
Ballymorris Public Supply	3400SC0033	17	-3	-3
Kilballyowen (Aughrim) Public Supply	3400SC0035	17	-4	-4
Rathdrum Public Supply	3400SC0046	1,889	-356	-442
Laragh Annamoe Public Supply	3400SC0047	658	-62	-90
Tinahely Regional Supply	3400SC0002	3,608	No Deficit	No Deficit

*Based on the Dry Year Critical Period (DYCP) weather event 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 (WRZ Approach) (MR, LC)	SA Approach 2 (SA Combination 13) (BE, BA)	SA Approach 3 (SA Combination 17) (QD)
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	-
5. Reduce greenhouse gas emissions	C	0	0	0	0
	O	-	-	-	-
6. Contribute to environmental climate change resilience	C	0	-	-	-
	O	--	+	+	0
7. Protect and improve surface water and groundwater status	C	0	0	0	0
	O	--	--	-	--
8. Avoid flood risk	C	0	0	0	-
	O	0	0	0	0
9. Protect and where appropriate, enhance cultural heritage assets	C	0	-	-	-
	O	0	0	0	0
10. Protect quality and function of soils	C	0	--	-	-
	O	0	0	0	0

Key			
Major beneficial	+++	Minor adverse	-

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

The overall assessment of the approaches against the SEA objectives indicates that SA approach 2 is likely to be more beneficial for public wellbeing and landscape due to the decommissioning and rationalisation of existing infrastructure and improvement of water quality issues within the study area. SA approach 2 also has the lowest number of increased groundwater abstractions; hence there are lower potential impacts to biodiversity. SA approach 1 and SA approach 2 are considered to be more resilient as there are fewer new abstractions and/or these abstractions are taken from sources with a good quantitative status.

Mitigation for the Preferred Approach is identified in chapter 5 based on individual options assessments and in chapter 6 in terms of 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 2 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 SA1 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 4.10. 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 SA1 Preferred Approach.

Table 4.10 Alternative Options for SA1 WRZs Dependent on the SA9 Preferred Approach

WRZ	SA1 Preferred Approach Options	SA1 Alternative Options
Ballinapark Public Supply	SA1-020 Rationalisation of Ballinapark Pump Station to Avoca Ballinaclash WTP	SA1-022 Maintain and upgrade existing WTP and Increase GW abstraction
Avoca Ballinaclash Public Supply	SA Option 3 Rationalise Avoca Ballinaclash, Ballinteskin, Barndarrig, Laragh	SA1-16a Maintain and upgrade existing WTP and abstraction and provide additional supply

WRZ	SA1 Preferred Approach Options	SA1 Alternative Options
	Annamoe, Rathdrum, Redcross Conary WRZs to Vartry WTP	from new SW abstraction from the River Avoca
Ballinteskin Public Supply		SA1-024 Maintain and upgrade existing WTP and Increase GW abstraction
Barndarrig Public Supply		SA1-037 Maintain and upgrade existing WTP and Increase GW abstraction
Laragh Annamoe Public Supply		SA1-085 Maintain and upgrade existing WTPs and increase SW abstraction from the River Glenmacnass
Rathdrum Public Supply		SA1-056 Maintain and upgrade existing WTP and New SW abstraction and New WTP from the River Avonmore
Redcross Conary Public Supply		SA1-60a Maintain and upgrade existing WTP and Increase existing GW abstraction

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)	49	10
New WTPs	0	2
Upgrade WTPs	0	8
New/upgraded abstractions	0	7
WTPs decommissioned	8	0
Abstractions abandoned	8	0
Raw water storage	0	0
Treated water storage	3	3

Table 4.12 provides an overall comparative assessment between the SA1 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 have nearly five 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 options decommission failing WTPs whereas the Alt options upgrade these failing WTPs to provide benefits during operation.
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	-	--	Both the Alt and PA options have potential to impact bat roosts. However, the Alt options also have potential to impact local biodiversity e.g. woodlands, riparian habitats and several areas which could impact Annex listed species, such as salmon, lamprey and otter.
	O	0	-	The PA options have no direct links to European sites or risks associated with operation. The Alt options have potential impacts on river ecosystems and potential hydrological links to European sites.
3. To protect landscapes, townscapes and visual amenity	C	-	-	The PA options have approximately five times 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 eight WTPs, whereas the Alt options require two new WTPs to be built which have the potential to cause moderate long term visual impacts.
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	--	--	The PA options require approximately 49km of new pipeline, however, the Alt approach requires two new WTPs to make use of existing assets.
	O	0	-	The PA options require approximately 49km of pipeline, however, land will be reinstated after construction and no long term impacts are predicted. The Alt options will result in the loss of agricultural land to allow for the new WTPs.

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
5. Reduce greenhouse gas emissions	C	--	--	There is a moderate 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 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 do not include any new or increased abstractions whereas the Alt options include two new surface water abstractions and five increased groundwater abstractions. The Alt option SA1-60a also has potential concerns around its long term sustainability.
8. Avoid flood risk	C	0	0	No impediment to surface water flow paths or increase to flood risk anticipated.
	O	0	0	
9. Protect and where appropriate, enhance cultural heritage assets	C	-	-	The Alt and 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 Alt and PA 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 six 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

SA1 Preferred Approach: Strategic Environmental Assessment

5 SA1 Preferred Approach Strategic Environmental Assessment

5.1 SA1 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 nine 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. The SA Preferred Approach includes two SA options (group options), these being SA option 3 for six WRZs, namely Avoca Ballinaclash, Redcross Conary, Ballinteskin, Barndarrig, Rathdrum and Laragh Annamoe, and SA option 14 for three WRZs, namely Arklow, Aughrim Annacurra and Ballymorris.

SA option 3 involves improving the interconnection between the six WRZs. SA option 14 involves an increased groundwater abstraction, a WTP upgrade and improved interconnection between the three WRZs. The SA Preferred Approach for the remaining WRZs involves WTP upgrades, new and increased groundwater abstractions, and improved interconnection.

Table 5.1 gives a breakdown of the options in SA1 and the associated abstractions/demand.

Table 5.1 Preferred Approach Breakdown

WRZ Name and Option Reference *	Option Description	Abstraction / Demand
SA1-17c (SA option 3) 3400SC0007 Avoca Ballinaclash Public Supply	Rationalisation of Avoca Ballinaclash WTP to Vartry WTP • SA option 3 includes rationalisation of Avoca Ballinaclash to Vartry WTP and decommissioning of Avoca Ballinaclash WTP and WSR, and existing SW abstraction (Avonber_040 – river waterbody WFD status 2013-2018 – Good) • Vartry Lower source lake waterbody WFD status 2013-2018 – Good	460 m^3/d
SA1-57c (SA option 3) 3400SC0012 Redcross Conary Public Supply	Rationalisation of Redcross WTP to Vartry WTP • SA option 3 includes rationalisation of Redcross to Vartry WTP and decommissioning of existing GW abstraction • Vartry Lower source lake waterbody WFD status 2013-2018 – Good	486 m^3/d
SA1-030 3400SC0018 Ballycoog Public Supply	Increase GW abstraction and upgrade Ballycoog WTP • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Wicklow groundwater body WFD status 2013-2018 – Good	50 m^3/d
SA1-066	Increase GW abstraction and upgrade Thomastown WTP	41 m^3/d

WRZ Name and Option Reference *	Option Description	Abstraction / Demand
3400SC0020 Thomastown Public Supply	• Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Inch groundwater body WFD status 2013-2018 – Good	
SA1-23c (SA option 3) 3400SC0025 Ballinteskin Public Supply	Rationalisation of Ballinteskin Pump Station to Vartry WTP • SA option 3 includes rationalisation of Ballinteskin to Vartry WTP and decommissioning of existing GW abstraction • Vartry Lower source lake waterbody WFD status 2013-2018 – Good	32 m^3/d
SA1-020 3400SC0027 Ballinapark Public Supply	Rationalisation of Ballinapark to Avoca Ballinaclash WTP • Rationalisation of Ballinapark to Avoca Ballinaclash WTP and decommissioning of existing GW abstraction • Dependent on Avoca rationalisation (SA option 3) to Vartry supply • Vartry Lower source lake waterbody WFD status 2013-2018 – Good	24 m^3/d
SA1-027 3400SC0031 Ballyclogh Public Supply	New GW abstraction and Upgrade Ballyclogh WTP • New GW abstraction to meet WRZ deficit (DYCP 2044) • Wicklow groundwater body WFD status 2013-2018 – Good	3 m^3/d
SA1-070 3400SC0032 Killavaney Public Supply (Tinahely)	No Deficit - Do nothing but upgrade WTP for quality need • WRZ not in deficit, option to upgrade WTP for water quality purposes • Ballyglass groundwater body WFD status 2013-2018 – Good.	N/A
SA1-53c (SA option 3) 3400SC0046 Rathdrum Public Supply	Rationalisation of Rathdrum WTP to Vartry WTP • SA option 3 includes rationalisation of Rathdrum to Varty WTP and decommissioning of existing SW abstraction (Avonmore_060 river waterbody WFD status 2013-2018 - Good) • Vartry Lower source lake waterbody WFD status 2013-2018 – Good	744 m^3/d
SA1-51c and SA1-52c (SA option 3) 3400SC0047 Laragh Annamoe Public Supply	SA1-51c and SA1-52c: Rationalisation of Raheen Well WTP to Vartry WTP for long term OPEX savings (not in deficit) • SA option 3 includes rationalisation of Laragh Annamoe PS WRZ to Varty WTP (GDA) and decommissioning of existing GW and SW abstraction (Glenmacnass river waterbody WFD status 2013-2018 – Good)	603 m^3/d

WRZ Name and Option Reference *	Option Description	Abstraction / Demand
	• Vartry Lower source lake waterbody WFD status 2013-2018 – Good	
SA1-087 (SA option 3) 3400SC0017 Barndarrig Public Supply	Rationalisation of Barndarrig WTP to Vartry WTP • SA option 3 includes rationalisation of Barndarrig to Varty WTP (GDA) and decommissioning of existing GW abstraction • Vartry Lower source lake waterbody WFD status 2013-2018 – Good	114 m^3/d
SA1-050 3400SC0021 Kirikee Public Supply	New GW on site and upgrade Kirikee WTP • New GW abstraction to meet WRZ deficit DYCP (2044) • Wicklow groundwater body WFD 2013-2018 – Good	29 m^3/d
SA1-069 3400SC0030 Killavaney Public Supply (Arklow)	No Deficit – Do nothing but WTP upgrade for quality need • Killavaney (Arklow) WTP upgrade for water quality need • Ballyglass groundwater body WFD status 2013-2018 – Good	N/A
SA1-042 3400SC0035 Kilballyowen (Aughrim) Public Supply	Increase GW abstraction and upgrade Kilballyowen WTP • Increase GW abstraction to meet WRZ deficit DYCP (2044) • Wicklow groundwater body WFD status 2013-2018 – Good	11 m^3/d
SA1-081 (SA option 14) 3400SC0001 Arklow Public Supply	Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris • SA option 14 - Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris; Rationalisation of Aughrim Annacurra WTP and Ballymorris WTP to Arklow WTP • Wicklow groundwater body WFD status 2013-2018 – Good	6,218 m^3/d
SA1-082 (SA option 14) 3400SC0006 Aughrim Annacurra Public Supply		599 m^3/d
SA1-083 (SA option 14) 3400SC0033 Ballymorris Public Supply		7 m^3/d
SA1-071 3400SC0002 Tinahely	No Deficit - Do nothing but upgrade WTPs for quality need • WRZ not in deficit, option to upgrade WTPs for water quality purposes	N/A

WRZ Name and Option Reference *	Option Description	Abstraction / Demand
	• Ballyglass groundwater body WFD status 2013-2018 – Good.	

* 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 3 and SA option 14 are labelled as SA1-503 and SA1-514 respectively.

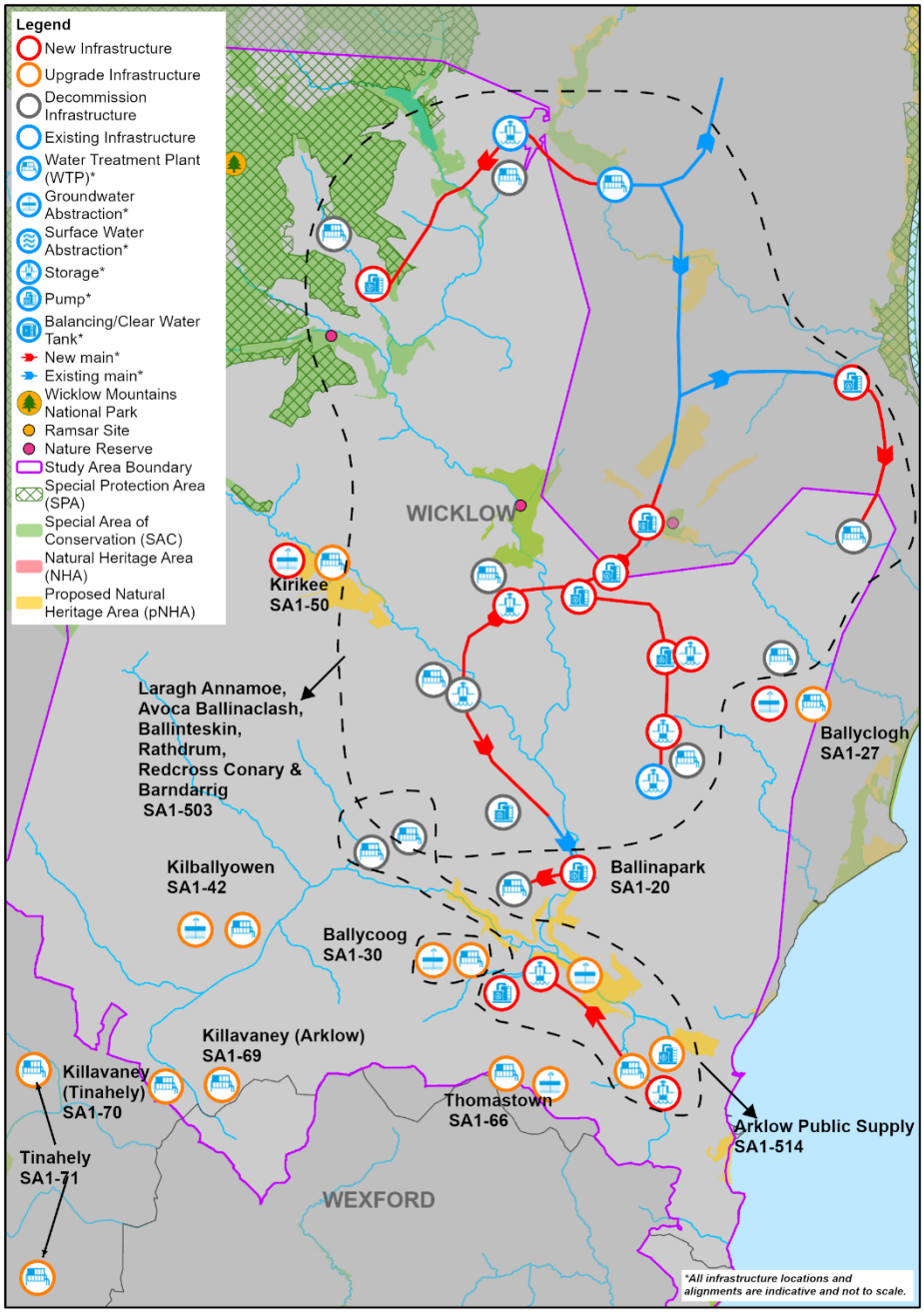

Figure 5.1 SA Preferred Approach and Key Environmental Designations

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
SA1-020	✓	-	-	-	✓	✓	-	-
SA1-027	-	-	-	✓	-	-	-	-
SA1-030	-	-	-	✓	-	-	-	-
SA1-042	-	-	-	✓	-	-	-	-
SA1-050	-	-	-	✓	-	-	-	-
SA1-066	-	-	-	✓	-	-	-	-
SA1-069	-	-	✓	-	-	-	-	-
SA1-070	-	-	✓	-	-	-	-	-
SA1-071	-	-	✓	-	-	-	-	-
SA option 3 (SA1-17c, SA1-23c, SA1-51c, SA1-52c, SA1-53c, SA1-57c and SA1-087)	✓	-	-	-	✓	✓	-	✓
SA option 14 (SA1-081, SA1-082 and SA1-083)	✓	-	✓	✓	✓	✓	-	✓

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)
SA1-030	Increase GW abstraction	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	0	0	0	0	0	-	-	0	0	0
SA1-066	Increase GW abstraction	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	0	0	0	0	0	-	-	0	0	0
SA1-050	New GW on site and near existing BH	Construction	-	-	-	0	0	-	0	0	0	-
		Operation	0	0	0	0	0	-	-	0	0	0
SA1-020	Rationalisation of Ballinapark Pump Station to Avoca Ballinaclash WTP	Construction	-	-	-	-	0	0	0	0	-	-
		Operation	+	0	+	0	0	++	0	0	0	0
SA1-069		Construction	-	-	0	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)
	No Deficit - Do nothing but upgrade WTP for quality need	Operation	+	0	0	0	0	0	0	0	0	0
SA1-027	New GW abstraction and Upgrade Ballyclogh WTP	Construction	-	-	-	0	-	--	0	0	0	0
		Operation	0	0	0	0	-	--	-	0	0	0
SA1-070	No Deficit - Do nothing but upgrade WTP for quality need	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	+	0	0	0	0	0	0	0	0	0
SA1-042	Increase GW abstraction	Construction	-	-	0	0	-	-	0	0	0	0
		Operation	0	0	0	0	-	-	-	0	0	0
SA1-17c (SA option 3)	Rationalisation of Avoca Ballinaclash WTP to Vartry WTP	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	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)
SA1-23c (SA option 3)	Rationalisation of Ballinteskin Pump Station to Vartry WTP, via existing watermain to Cronroe WTP	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	0	++	0	--	++	0	0	0	0
SA1-51c (SA option 3)	Rationalisation of Raheen WTP to Vartry WTP for long term OPEX savings (not in deficit)	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	0	++	0	--	++	0	0	0	0
SA1-52c (SA option 3)	Rationalisation of Laragh WTP to Vartry WTP for long	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	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)
	term OPEX savings (not in deficit)											
SA1-53c (SA option 3)	Rationalisation of Rathdrum WTP to Vartry WTP, assessed previously as part of Mid Wicklow Scheme	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	0	++	0	--	++	0	0	0	0
SA1-57c (SA option 3)	Rationalisation of Redcross Intermediate Reservoir to Vartry WTP	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	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)
SA1-087 (SA option 3)	Rationalisation of Barndarrig WTP to Vartry WTP	Construction	--	-	--	--	--	0	0	0	-	-
		Operation	++	0	++	0	--	++	0	0	0	0
SA1-081 (SA option 14)	Increase GW abstraction at Woodenbridge, treat at Arklow WTP and interconnect with Aughrim Annacurra Public Supply and Ballymorris	Construction	-	-	-	-	--	-	0	0	-	-
		Operation	++	-	+	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)
SA1-082 (SA option 14)	Rationalisation of Aughrim Annacurra WTP to Arklow WTP - new well at Woodenbridge Wellfied and upgrade Arklow WTP	Construction	-	-	-	-	--	-	0	0	-	-
		Operation	++	-	+	0	--	-	-	0	0	0
SA1-083 (SA option 14)	Rationalisation of Ballymorris WTP to Arklow WTP - new well at Woodenbridge Wellfield and	Construction	-	-	-	-	--	-	0	0	-	-
		Operation	++	-	+	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)
	upgrade Arklow WTP											
SA1-071	No Deficit - Do nothing but upgrade WTPs for quality need	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	++	0	0	0	0	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 SA1 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: Arklow Public Supply, Redcross, Ballycoog, Ballinteskin, Ballinapark, Killavaney, Ballymorris, Killballyowen and Laragh Annamoe.

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 SA1 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 SA1 Preferred Approach is provided in the SA1 Technical report. A high-level assessment of what this could mean for the SEA is shown in Table 5.4.

Table 5.4 SA1 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/High (as Irish Water's current abstractions are large compared to the water bodies from which they abstract)	+2,108 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 have found that the Derry River (Tinahely), River Avonbeg tributary (Avoca Ballinaclash), Three Wells Stream (Aughrim), and Mill Glen Stream (Rathdrum) sources may be at risk However, the Avoca Ballinaclash and Rathdrum abstractions are to be decommissioned as part of the Preferred Approach. The preferred approach for Tinahely WRZ is a WTP upgrade as there is currently no deficit. If there is a requirement to reduce the Derry River abstraction, further to site based assessments, Irish Water will review the feasible options for Tinahely.
			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)	+100 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 SA1, several existing small river abstractions would be vulnerable to increased climate change impacts scenarios. However, these sources are decommissioned as part of the Preferred Approach, except for Three Wells Stream (Aughrim) which would have a minor increase to the deficit. Regarding the existing groundwater abstractions to be maintained, there is more difficulty and uncertainty in assessing increased climate change impacts, however, it is understood that generally groundwater will be more resilient than surface water sources.

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
			Potential for additional abstraction pressure unless optimisation can address.
Demand Growth	Low/Moderate (growth has been based on policy)	-200 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 thirteen of the eighteen WRZs in SA1 and is driven by quality and quantity issues. In this rural area, growth is relatively low.
			This could allow lower than expected energy and carbon and reduce expected abstraction requirements
Leakage Targets	Low/ Moderate (the distribution network in the region is extensive at approximately 320 kilometres)	-625 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

6 SEA Cumulative Effects for SA1 Preferred Approach

6 SEA Cumulative Effects for SA1 Preferred Approach

Secondary, cumulative and the synergistic nature of the effects of the SA1 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 SA1

The potential 'within plan' cumulative effects for SA1 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 SA1

Preferred Approach option references	SA1-071	SA1-030	SA1-066	SA1-050	SA1-020	SA1-069	SA1-027	SA1-070	SA1-042	SA option 3 (Group option 3)
SA option 14 (Group option 14)		AA AV			AA AV				AA	AA
SA option 3 (Group option 3)		AA			AA				AA	
SA1-042		AA			AA					
SA1-070										
SA1-027										
SA1-069										
SA1-020		AA AV								
SA1-050										
SA1-066										
SA1-030										

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
Buckroney-Brittas Dunes and Fen SAC	BDF

Key	
Avoca Valley pNHA	AV
R747 (Aughrim to Arklow)	AA

There could be cumulative effects associated with construction, in terms of traffic, noise and dust, for the options located along the R747 route from Aughrim to Arklow (indicated by AA in Table 6.1). These could be mitigated by standard mitigation measures such as planning of construction traffic routes and movements and engaging with local residents about the disruption. With these standard good practice measures in place, there are unlikely to be significant cumulative effects.

There could be cumulative effects from disturbance and pollution to Avoca Valley pNHA if construction of options SA1-030, 020 and components of SA option 18 are concurrent. With standard good practice mitigations, such as having buffer strips and having an emergency plan in place, there are unlikely to be significant cumulative effects to the SAC and pNHA. The impacts on the European designation are provided in the NIS and also summarised in chapter 9 of this review.

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 SA1 Preferred Approach to the Avoca Valley pNHA (see Table 6.1). Options SA1-030 and SA option 18 both include increases in groundwater abstractions that could have potential cumulative effects to the pNHA from habitat degradation impacts. With the implementation of appropriate mitigation, adverse cumulative effects are not anticipated to be significant. See Figure 6.1 for the Preferred Approach abstractions in SA1 (Note that SA option 14 is labelled as SA1-514).

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 two of the WFD groundwater bodies (Inch and Wicklow) affected by abstractions have a good quantitative status, therefore, the likelihood of affecting their WFD objectives is low, and no interaction was identified with 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 SA1 this averages as 2.09 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.

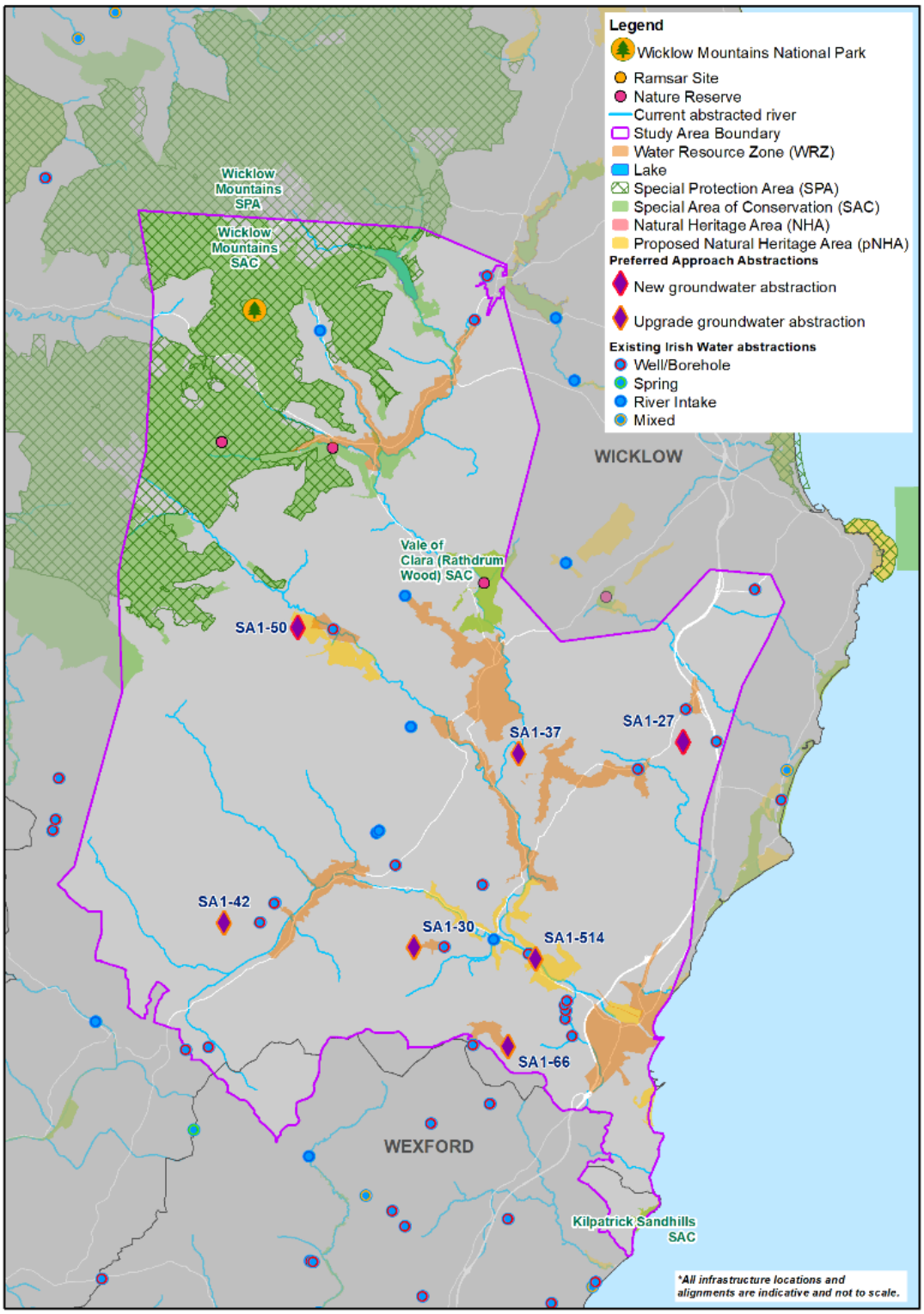

Figure 6.1 SA Preferred Approach Abstractions in SA1

6.2 Cumulative Effects with Other Developments

The SA1 Preferred Approach has been assessed alongside other developments that could occur within the plan area. Table 6.2 shows that within SA1 there are three developments which are all within Arklow.

6.2.1 Cumulative Effects during Construction

The plan level assessment indicates that there could be potential for cumulative effects from construction disturbance between the three projects in Arklow and the SA Preferred Approach (Table 6.2). Potential effects could include increased traffic, noise and dust. 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.

Table 6.2 Potential Cumulative Effects between Preferred Options and Other Developments in SA1

	Preferred Approach Options										
Project Developments	**SA1-071**	**SA1-030**	**SA1-066**	**SA1-050**	**SA1-020**	**SA1-069**	**SA1-027**	**SA1-070**	**SA1-042**	**SA option 3 (Group option 3)**	**SA option 14 (Group option 14)**
Arklow Sewerage Scheme WwTP											
Arklow Flood Relief Scheme											
Arklow Historic Town Core											

Key	
Construction Phase	
Operation Phase	
Construction and Operation	

6.2.2 Cumulative Effects during Operation

The plan level assessment indicates that there could be cumulative effects during the operation phase between the SA Preferred Approach (SA option 14) and the Arklow Sewage Scheme (Wastewater Treatment Plan). The Arklow Sewerage Scheme project includes the development of a new Wastewater Treatment Plant and associated network to stop the discharge of untreated wastewater to the Avoca River. This would have potential benefits to water quality and quantity to the Avoca River which could combine with the SA Preferred Plan to bring cumulative benefits to water quality and quantity.

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 SA1 preferred approach apply, 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 SA1 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 effects on rural and urban areas near Avoca, Ballinteskin, Rathdrum and Roundwood from visual impacts and increase in traffic, noise and dust during construction of SA option 3. The option includes rationalisation of water between six WRZs, construction of approximately 48km of new network, service reservoirs, storages and pumps, and decommissioning of numerous existing assets;
- Moderate adverse effects to material assets with SA option 3 due to the significant construction of new infrastructure required; and
- Moderate adverse effects to environmental climate change resilience with options SA1-050 and 028 due to the requirement of new groundwater abstractions.

Cumulative effects assessment identified potential significant effects in relation to carbon emissions, although the individual options are assessed only as neutral to moderate 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 SA1 but does not provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as increased 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 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 increasing the sourcing of 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 2) 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 Neutral 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 contribute to	C Minor Adverse O Neutral to Minor Adverse Impacts from construction works for pipelines and service reservoirs on biodiversity. These can be	Routing/siting to avoid impacts. Standard good construction practice and specific measures as identified in the NIS of the Framework Plan.	• Temporary and permanent habitats lost vs habitats created/enhanced	• Monitor construction activities to ensure compliance

SEA Objectives	SA Preferred Approach (PA) (SA Approach 2) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
resilient ecosystems	minimised through careful routing and siting. Operational impacts on habitats of the River Avoca. Potential for construction and operational impacts on National designated sites, most notably the Avoca River Valley pNHA.	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	
3. To protect landscapes, townscapes and visual amenity	C Neutral to Moderate Adverse O Neutral to Moderate Beneficial Construction landscape impacts as a result of extensive new network and beneficial long term impacts due to the decommissioning of existing 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 restored to meet requirements	• Duration of construction works • Number of complaints received regarding visual impact of construction works
4. Protect and where appropriate	C Neutral to Moderate Adverse O Neutral	Materials management to be integrated into design to optimise use of existing resources and	• Loss of greenfield land, including agricultural, forestry or other land uses	• Construction wastes sent to landfill

SEA Objectives	SA Preferred Approach (PA) (SA Approach 2) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
enhance, built and natural assets and reduce waste	New resources required for construction works, including extensive lengths of pipeline, service reservoirs and new/upgraded WTPs. Ongoing maintenance requirements.	minimise waste from construction and operation.	• Disruptions to strategic infrastructure/services • Use of waste management plans • Volume of drinking water treatment residuals sent to landfill	
5. Reduce greenhouse gas emissions	C Neutral to Moderate Adverse O Neutral to Moderate 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 quality, carbon sequestration and linking with other objectives.	• 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
6. Contribute to environmental climate	C Moderate Adverse to Neutral O Moderate Adverse to Moderate Beneficial	Consider how operation can further reduce climate change pressure on at risk sources and associated designations,	• WFD waterbody status objectives at risk and designated site condition status	• None identified

SEA Objectives	SA Preferred Approach (PA) (SA Approach 2) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
	change resilience	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 SA1-030, SA1-066, SA1-027 and SA1-042 and SA option 14 require further assessment to understand their sustainability in the longer term.	particularly for WRZ options SA1-050 and SA1-027. Sustainability review of sources taking account of groundwater and surface water interconnections for WRZ options SA1-030, SA1-066, SA1-027 and SA1-042 and SA option 14.	• Frequency of drought orders requiring change to normal abstractions/ compensation releases	
7.	Protect and improve surface water and groundwater status	C Neutral to Minor Adverse O Neutral Generally, new/increased abstractions are limited to allowable limits and have a low risk of adverse effect on WFD waterbody status objectives, with the potential exception of the Three Wells Stream (Aughrim).	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 the Three Wells Stream (Aughrim)

SEA Objectives	SA Preferred Approach (PA) (SA Approach 2) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
8. Avoid flood risk	C Neutral O Neutral	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/ interpretation of interest features	• Number of archaeological finds recorded during construction
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 SA1 are 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 SA1 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 SA1, 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.

There were no potential in-combination effects with other projects and plans identified for the preferred options on European sites or potential in-combination effects between preferred options identified. 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 Raw Water Connection Options in SA1

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
SA1-010	New GW Abstraction and Upgrade Aughrim WTP									1	0	-13

Table A.2 Fine Screening Summary of GW Options in SA1

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
SA1-02a	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-16
SA1-014	New GW Abstraction and Upgrade Aughrim WTP									0	0	-15
SA1-022	Increase GW Abstraction and Upgrade Ballinapark WTP									0	0	-5
SA1-024	Increase GW Abstraction and Upgrade Ballinteskin WTP									0	0	-5
SA1-027	New GW Abstraction and Upgrade Ballyclogh WTP									0	0	-2
SA1-030	Increase GW Abstraction and Upgrade Ballycoog WTP									0	0	-3

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
SA1-034	Increase GW Abstraction and Upgrade Ballymorris WTP									0	0	-3
SA1-037	Increase GW Abstraction and Upgrade Barndarrig WTP									0	0	-4
SA1-042	New GW Abstraction and Upgrade Kilballyowen WTP									0	0	-2
SA1-050	New GW Abstraction and Upgrade Kirikee WTP									0	0	-6
SA1-055	New GW Abstraction and Upgrade Rathdrum WTP									0	0	-8
SA1-60a	Increase GW Abstraction at Redcross Wellfield and Upgrade Redcross WTP									1	0	-10
SA1-60b	Abandon Barndarrig WTP and feed from Redcross Conary Public Supply									1	0	-11

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
SA1-066	Increase GW Abstraction at Thomastown									0	0	-4
SA1-076	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-12
SA1-078	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-16
SA1-081	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-12
SA1-084	Increase GW at Raheen Borehole									1	0	-10

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
SA1-086	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-11

Table A.3 Fine Screening Summary of Rationalisation Options in SA1

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
SA1-008	Abandon Aughrim WTP, New SW Abstraction from River Avoca, New WTP									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
	Onsite, Feed to Aughrim and Avoca											
SA1-009	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-16
SA1-17c	Rationalise WTPs and Feed from Vartry									1	0	-14
SA1-020	Abandon Ballinapark WTP and feed from Avoca									0	0	-7
SA1-23c	Rationalise WTPs and Feed from Vartry									1	0	-14
SA1-23d	Rationalise WTPs and Feed from Vartry via Roundwood WSR									0	0	-10
SA1-031	Rationalise Ballymorris WTP and Refurbish Aughrim WTP									0	0	-6

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
SA1-35b	Abandon Barndarrig WTP and feed from Redcross Conary Public Supply									1	1	-10
SA1-039	Abandon Kilballyowen Aughrim WTP and feed from Aughrim Public Supply									0	2	-8
SA1-51c	Rationalise WTPs and Feed from Vartry									1	0	-14
SA1-51d	Rationalise WTPs and Feed from Vartry via Roundwood WSR									0	0	-10
SA1-52c	Rationalise WTPs and Feed from Vartry									1	0	-14
SA1-52d	Rationalise WTPs and Feed from Vartry via Roundwood WSR									0	0	-10
SA1-53c	Rationalise WTPs and Feed from Vartry									1	0	-14

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
SA1-054	Abandon Rathdrum WTP and feed from Avoca									0	0	-9
SA1-57c	Rationalise WTPs and Feed from Vartry									1	0	-14
SA1-058	Abandon Redcross WTP and New Abstraction from River Avoca									0	0	-16
SA1-077	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-13
SA1-079	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-16
SA1-080	Abandon Aughrim WTP, New GW Source and									1	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
	Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow											
SA1-082	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-12
SA1-083	Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow									1	0	-12

Table A.4 Fine Screening Summary of SW Options in SA1

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
SA1-004	Aughrim Annacura, Avoca Ballinaclash and Rathdrum (Proposed Regional Water Supply Scheme) (Deficit 0.85Ml/d)									0	0	-18
SA1-005	Aughrim Annacura, Avoca Ballinaclash and Rathdrum (Proposed Regional Water Supply Scheme) (Deficit 1.85Ml/d									0	0	-17
SA1-013	New SW Abstraction and Upgrade Aughrim WTP									0	0	-16
SA1-16a	New SW Abstraction and new WTP onsite									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
SA1-16b	Abandon Redcross WTP and New Abstraction from River Avoca									0	0	-16
SA1-16c	Abandon Aughrim WTP, New SW Abstraction from River Avoca, New WTP Onsite, Feed to Aughrim and Avoca									0	0	-16
SA1-056	New SW Abstraction and New WTP Onsite									0	0	-16
SA1-085	Increase SW abstraction at Glenmacnass									0	0	-5

Table A.5 Fine Screening Summary of WTP Options in SA1

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
SA1-069	Upgrade Killavaney WTP for Water Quality Purposes - No Deficit									0	0	-4
SA1-070	Upgrade Killavaney WTP for Water Quality Purposes - No Deficit									0	0	-4
SA1-071	No Deficit - Do nothing but upgrade WTPs for Quality need									0	0	-4

Appendix B SA Approaches for SA1

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

WRZ	Preferred Approach - SA Approach 2		Least Cost - SA Approach 2		Quickest Delivery - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0001: Arklow Public Supply	SA1-081 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-081 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-02a Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	6
3400SC0006: Aughrim Annacurra Public Supply	SA1-082 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-082 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-009 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	6
3400SC0007: Avoca Ballinaclash Public Supply	SA1-17c Rationalise WTPs and Feed from Vartry	3	SA1-17c Rationalise WTPs and Feed from Vartry	3	SA1-16a New SW Abstraction and new WTP onsite	-
3400SC0012: Redcross Conary Public Supply	SA1-57c Rationalise WTPs and Feed from Vartry	3	SA1-57c Rationalise WTPs and Feed from Vartry	3	SA1-60b Abandon Barndarrig WTP and feed from Redcross Conary Public Supply	11
3400SC0017: Barndarrig Public Supply	SA1-087 Rationalisation of Barndarrig WTP to Vartry WTP	3	SA1-087 Rationalisation of Barndarrig WTP to Vartry WTP	3	SA1-35b	11

WRZ	Preferred Approach - SA Approach 2		Least Cost - SA Approach 2		Quickest Delivery - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
					Abandon Barndarrig WTP and feed from Redcross Conary Public Supply	
3400SC0018: Ballycoog Public Supply	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-
3400SC0020: Thomastown Public Supply	SA1-066 Increase GW Abstraction at Thomastown	-	SA1-066 Increase GW Abstraction at Thomastown	-	SA1-066 Increase GW Abstraction at Thomastown	-
3400SC0021: Kirikee Public Supply	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	-	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	-	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	-
3400SC0025: Ballinteskin Public Supply	SA1-23c Rationalise WTPs and Feed from Vartry	3	SA1-23c Rationalise WTPs and Feed from Vartry	3	SA1-23d Rationalise WTPs and Feed from Vartry via Roundwood WSR	4
3400SC0027: Ballinapark Public Supply	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-
3400SC0030: Killavaney Public Supply (Arklow)	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-

WRZ	Preferred Approach - SA Approach 2		Least Cost - SA Approach 2		Quickest Delivery - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0031: Ballyclogh Public Supply	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-
3400SC0032: Killavaney Public Supply (Tinahely)	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-
3400SC0033: Ballymorris Public Supply	SA1-083 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-083 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-031 Rationalise Ballymorris WTP and Refurbish Aughrim WTP	-
3400SC0035: Kilballyowen (Aughrim) Public Supply	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-
3400SC0046: Rathdrum Public Supply	SA1-53c Rationalise WTPs and Feed from Vartry	3	SA1-53c Rationalise WTPs and Feed from Vartry	3	SA1-056 New SW Abstraction and New WTP Onsite	-
3400SC0047: Laragh Annamoe Public Supply	SA1-51c & SA1-52c Rationalise WTPs and Feed from Vartry	3	SA1-51c & SA1-52c Rationalise WTPs and Feed from Vartry	3	SA1-51d & SA1-52d Rationalise WTPs and Feed from Vartry via Roundwood WSR	4

WRZ	Preferred Approach - SA Approach 2		Least Cost - SA Approach 2		Quickest Delivery - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0002: Tinahely Regional Supply	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-

WRZ	Best Environmental - SA Approach 2		Most Resilient - SA Approach 1		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0001: Arklow Public Supply	SA1-081 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-086 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	-	SA1-086 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	-
3400SC0006: Aughrim Annacurra Public Supply	SA1-082 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-013 New SW Abstraction and Upgrade Aughrim WTP	-	SA1-013 New SW Abstraction and Upgrade Aughrim WTP	-
3400SC0007: Avoca Ballinaclash Public Supply	SA1-17c Rationalise WTPs and Feed from Vartry	3	SA1-16a New SW Abstraction and new WTP onsite	-	SA1-16a New SW Abstraction and new WTP onsite	-

WRZ	Best Environmental - SA Approach 2		Most Resilient - SA Approach 1		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0012: Redcross Conary Public Supply	SA1-57c Rationalise WTPs and Feed from Vartry	3	SA1-60a Increase GW Abstraction at Redcross Wellfield and Upgrade Redcross WTP	-	SA1-60a Increase GW Abstraction at Redcross Wellfield and Upgrade Redcross WTP	-
3400SC0017: Barndarrig Public Supply	SA1-087 Rationalisation of Barndarrig WTP to Vartry WTP	3	SA1-087 Rationalisation of Barndarrig WTP to Vartry WTP	3	SA1-087 Rationalisation of Barndarrig WTP to Vartry WTP	3
3400SC0018: Ballycoog Public Supply	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-
3400SC0020: Thomastown Public Supply	SA1-066 Increase GW Abstraction at Thomastown	-	SA1-066 Increase GW Abstraction at Thomastown	-	SA1-066 Increase GW Abstraction at Thomastown	-
3400SC0021: Kirikee Public Supply	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	-	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	-	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	--
3400SC0025: Ballinteskin Public Supply	SA1-23c Rationalise WTPs and Feed from Vartry	3	SA1-024 Increase GW Abstraction and Upgrade Ballinteskin WTP	-	SA1-024 Increase GW Abstraction and Upgrade Ballinteskin WTP	-
3400SC0027: Ballinapark Public Supply	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-

WRZ	Best Environmental - SA Approach 2		Most Resilient - SA Approach 1		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0030: Killavaney Public Supply (Arklow)	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-
3400SC0031: Ballyclogh Public Supply	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-
3400SC0032: Killavaney Public Supply (Tinahely)	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-
3400SC0033: Ballymorris Public Supply	SA1-083 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14	SA1-031 Rationalise Ballymorris WTP and Refurbish Aughrim WTP	-	SA1-031 Rationalise Ballymorris WTP and Refurbish Aughrim WTP	-
3400SC0035: Kilballyowen (Aughrim) Public Supply	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-
3400SC0046: Rathdrum Public Supply	SA1-53c	3	SA1-056	-	SA1-056	-

WRZ	Best Environmental - SA Approach 2		Most Resilient - SA Approach 1		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
	Rationalise WTPs and Feed from Vartry		New SW Abstraction and New WTP Onsite		New SW Abstraction and New WTP Onsite	
3400SC0047: Laragh Annamoe Public Supply	SA1-51c & SA1-52c Rationalise WTPs and Feed from Vartry	3	SA1-085 Increase SW abstraction at Glenmacnass	-	SA1-085 Increase SW abstraction at Glenmacnass	-
3400SC0002: Tinahely Regional Supply	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-

WRZ	Best Appropriate Assessment - SA Approach 2	
	Option Description	SA Option
3400SC0001: Arklow Public Supply	SA1-081 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14
3400SC0006: Aughrim Annacurra Public Supply	SA1-082 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14

WRZ	Best Appropriate Assessment - SA Approach 2	
	Option Description	SA Option
3400SC0007: Avoca Ballinaclash Public Supply	SA1-17c Rationalise WTPs and Feed from Vartry	3
3400SC0012: Redcross Conary Public Supply	SA1-57c Rationalise WTPs and Feed from Vartry	3
3400SC0017: Barndarrig Public Supply	SA1-087 Rationalisation of Barndarrig WTP to Vartry WTP	3
3400SC0018: Ballycoog Public Supply	SA1-030 Increase GW Abstraction and Upgrade Ballycoog WTP	-
3400SC0020: Thomastown Public Supply	SA1-066 Increase GW Abstraction at Thomastown	-
3400SC0021: Kirikee Public Supply	SA1-050 New GW Abstraction and Upgrade Kirikee WTP	-
3400SC0025: Ballinteskin Public Supply	SA1-23c Rationalise WTPs and Feed from Vartry	3

WRZ	Best Appropriate Assessment - SA Approach 2	
	Option Description	SA Option
3400SC0027: Ballinapark Public Supply	SA1-020 Abandon Ballinapark WTP and feed from Avoca	-
3400SC0030: Killavaney Public Supply (Arklow)	SA1-069 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-
3400SC0031: Ballyclogh Public Supply	SA1-027 New GW Abstraction and Upgrade Ballyclogh WTP	-
3400SC0032: Killavaney Public Supply (Tinahely)	SA1-070 Upgrade Killavaney WTP for Water Quality Purposes - No Deficit	-
3400SC0033: Ballymorris Public Supply	SA1-083 Abandon Aughrim WTP, New GW Source and Upgrade Arklow Ballyduff WTP to Feed Aughrim and Arklow	14
3400SC0035: Kilballyowen (Aughrim) Public Supply	SA1-042 New GW Abstraction and Upgrade Kilballyowen WTP	-
3400SC0046: Rathdrum Public Supply	SA1-53c Rationalise WTPs and Feed from Vartry	3

WRZ	Best Appropriate Assessment - SA Approach 2	
	Option Description	SA Option
3400SC0047: Laragh Annamoe Public Supply	SA1-51c & SA1-52c Rationalise WTPs and Feed from Vartry	3
3400SC0002: Tinahely Regional Supply	SA1-071 Upgrade WTPs for water quality Purposes - No Deficit	-