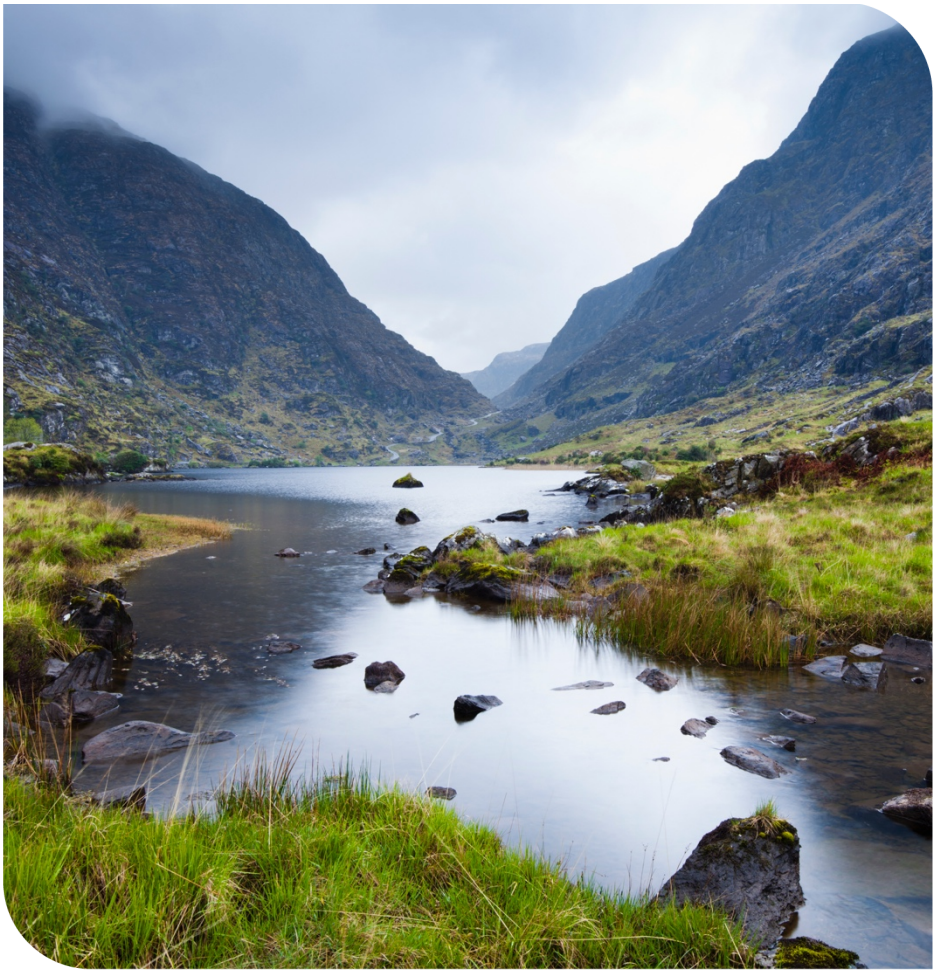
Winter 2020

UISCE ÉIREANN : IRISH WATER

Case Study – Study Area 5 Technical Report



IW/FF/LDB/0115

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 the National Planning Framework.

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SA5.1 Introduction

SA5.1 Introduction – Study Area 5

This is a sample Case Study Technical Report provided with the draft Framework Plan. This demonstrates the process of applying the options assessment methodology, as set out in the draft Framework Plan, to Study Area 5.

The format and presentation of information may change in response to comments on the draft Framework Plan and as part of developing the Regional Plans and supporting information for consultation.

This Study Area includes 10 water resource zones located in the counties Westmeath, Roscommon, Offaly and Galway. This Case Study Technical Report includes:

- **The summary of Identified Need in this Study Area including Quality, Quantity, Reliability and Sustainability;**
- **Options considered within the Study Area;**
- **The range of approaches to resolve Identified Need;**
- **Development of an Outline Preferred Approach for the Study Area; and**
- **The adaptability of our Preferred Approach.**

SA5.1.1 Summary of Our Options Assessment Methodology

In the draft Framework Plan, we described the Option Assessment Methodology that will be used to develop a national programme of proposed solutions for all of our water supplies. The solutions will be used to reduce or eliminate the Supply Demand Balance (SDB), Water Quality, Reliability and Sustainability risks.

In the draft Regional Water Resources Plan - Eastern and Midlands (Regional Plan EM), we apply this methodology to Group Area 4 (GA4) – Eastern and Midlands Study Area 5 shown in Figure SA5.1.1.1. This Case Study Technical Report is for SA5, it summarises a subset of the GA4 Plan for Study Area 5 which consists of 10 individual water resource zones (WRZs).

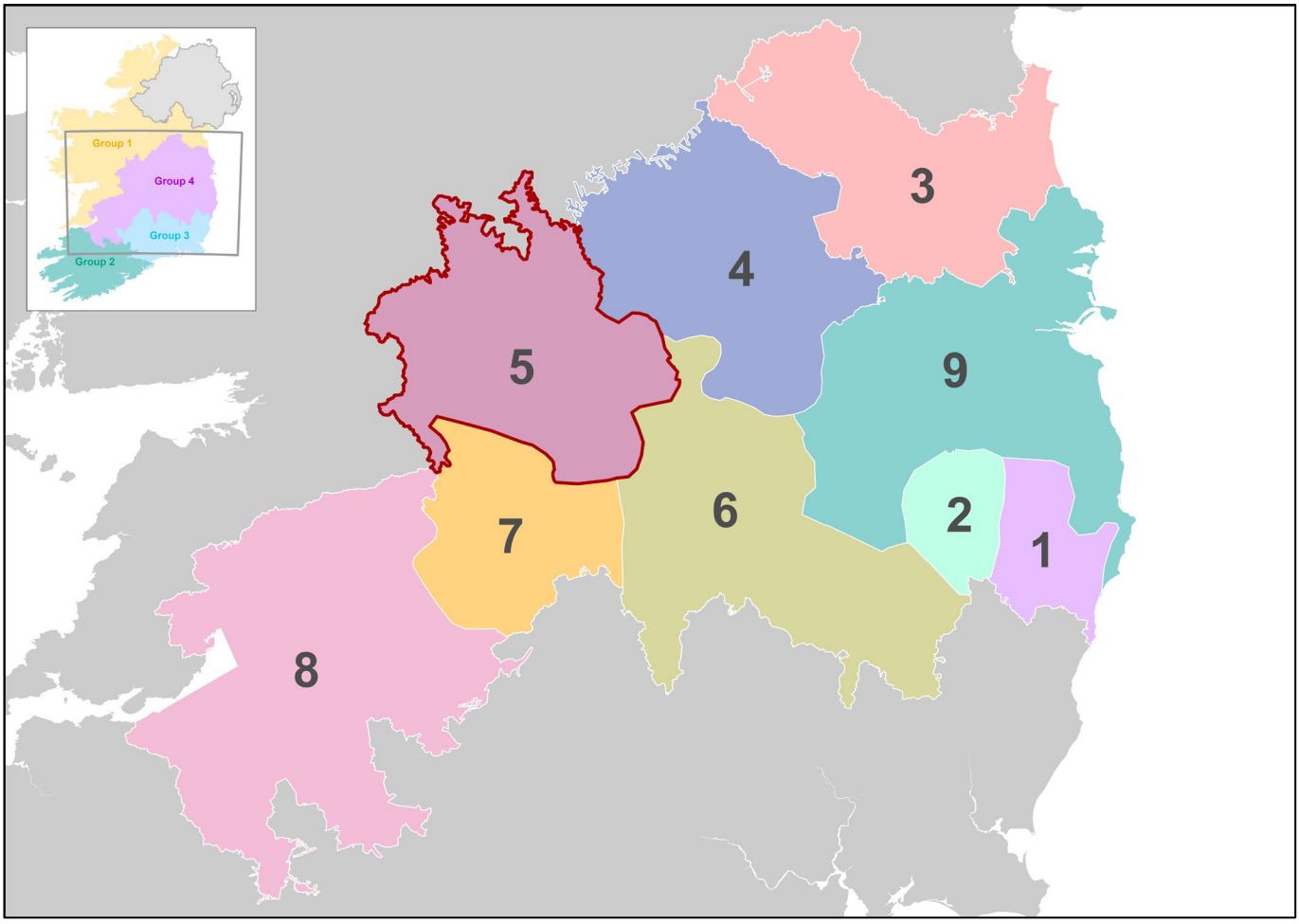


Figure SA5.1.1.1 Study Area 5 within Group Area 4

Within this Study Area, the Preferred Approach had been developed following the process shown in Figure SA5.1.1.2.

It should be noted that assessments and preferred approaches and solutions at this stage are at a plan level. Environmental impacts and costing of projects are further reviewed at project level. No statutory consent or funding consent is conferred by inclusion in the NWRP Framework, and any projects that are progressed following this plan will require individual environmental assessments in support of planning applications (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions).

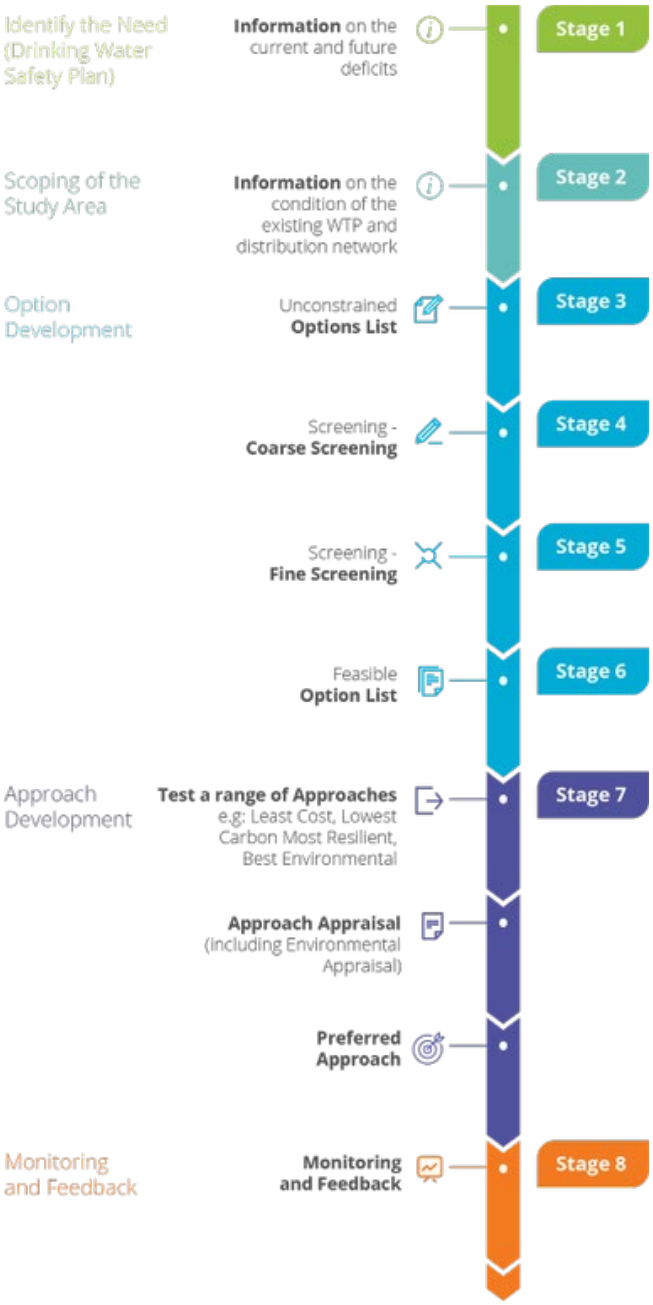


Figure SA5.1.1.2 Option Assessment Methodology Process

SA5.1.2 Introduction to the Study Area

Study Area 5 consists of 10 WRZs supplying a population of approximately 72,000 via approximately 1,100 kilometres of distribution network. The largest town within this Study Area is Athlone. The Study Area is summarised in Figure SA5.1.2.1. South Roscommon Regional Water Supply Scheme, Ballinasloe, Birr, Rahan and Clara/Ferbane are other areas of high demand within the Study Area.

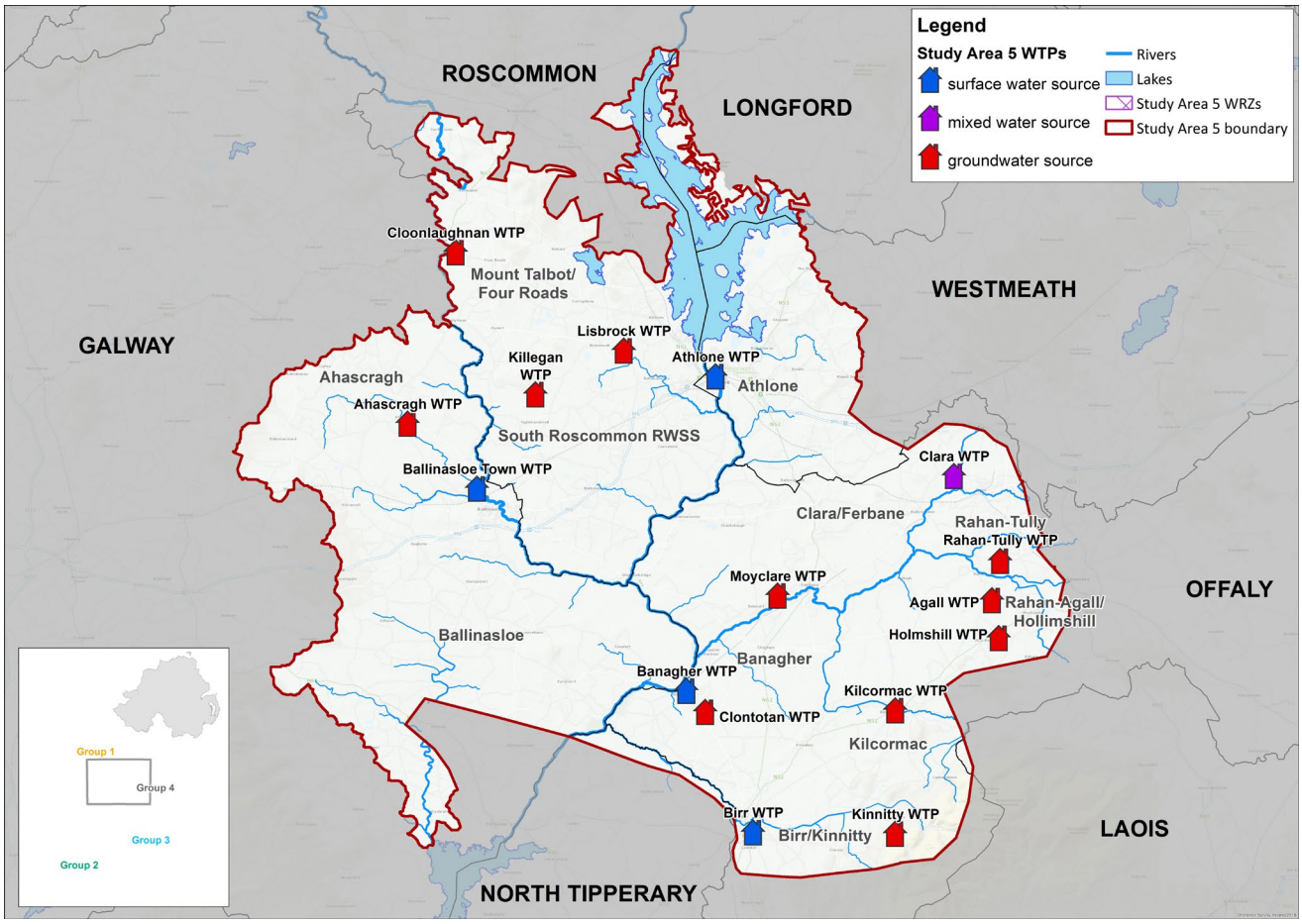


Figure SA5.1.2.1 Study Area 5

The sources of water consist of 7 surface water sources and 13 groundwater abstractions.

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

All other WRZs are groundwater supplies. County Offaly forms part of the Central Lowland of Ireland, an area of low-lying rolling topography with higher ground at the Slieve Bloom Mountains. The higher topographic features have bedrock at or close to the surface. Most of the bedrock in County Offaly is masked by Quaternary sediments and subsoils which form the irregular topographic features in the lowlands such as esker sand, gravel ridges and raised bogs. The landscape of County Roscommon reflects the dominant underlying karstic Carboniferous limestone and shales, much of it exposed as

outcrop. This karst forms a key regionally important aquifer around the towns of Ballinasloe, Athlone and Tullamore.

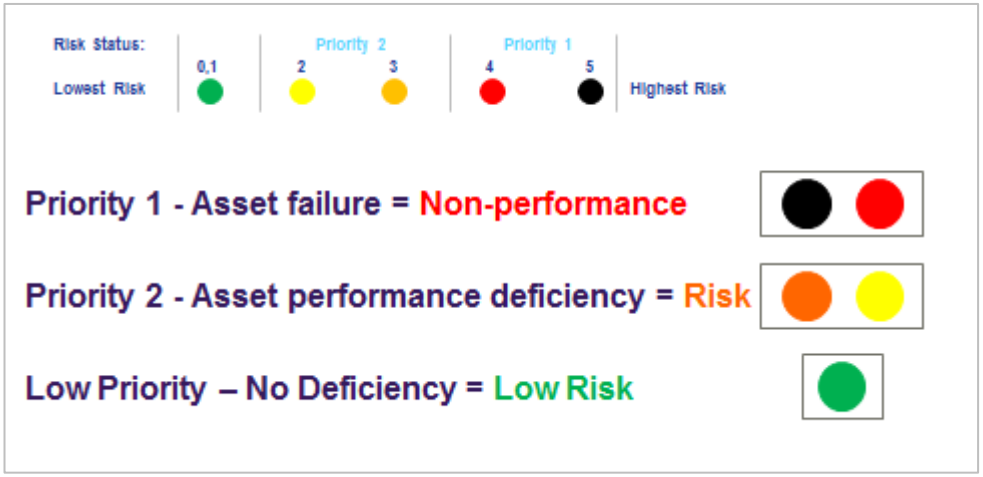
Overall, 13 groundwater supplies are managed by Irish Water in the region, abstracting between 30m^3/d to 5,000m^3/d. The higher volumes reflect the karstified limestones and their high storage and transmissivity.

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

Details of the Study Area are outlined in Table SA5.1.2.1 on the following page.

Table SA5.1.2.1 – SA5 Overview

Study Area 5	Total Population	71,939	Total Network Length (km)	1,123	Number of Water Resource Zones	10		
Counties in Study Area	Galway, Offaly, Roscommon, Westmeath							
Principle Settlements	Athlone, Tullamore, Ballinasloe, Roscommon, Birr, Clara, Ferbane, Mucklagh, Banagher, Cloghan, Athleague, Ahascragh, Kinnitty							
Number of Water Sources	16	Surface Water Sources	5		Groundwater Sources	11		
Water Resource Zone	**Water Treatment Plant**	**Source**	**Population**	**WTP Capacity (m^3/day)**	**Quality**	**Quantity**	**Reliability**	**Potential Sustainability**
Athlone	Athlone WTP	River Shannon	22,477	13,500	🟡	⚫	⚫	🟢
South Roscommon (Lisbrock & Killeglan)	Lisbrock WTP	1 No. Boreholes	7,010	4,000	🟡	⚫	🟢	⚫
	Killeglan Springs WTP	1 No. Boreholes	6,910	5,000	🟡	⚫	🟢	🟢
Mount Talbot/Four Roads	Cloonlaughnan WTP	1 No. Boreholes	3,711	3,200	🟡	⚫	🟢	🟢
Rahan	Rahan - Tully WTP	1 No. Boreholes	856	600	⚫	🟡	⚫	⚫
	Rahan - Holmshill WTP	1 No. Boreholes	2,828	600	⚫	🟡	🟢	🟢
	Agall WTP	1 No. Boreholes		2,200	🔴	🟡	🟢	🟢
Clara/Ferbane/ Moyclare	Moyclare WTP	1 No. Boreholes	1,058	150	🔴	🔴	🟢	🟢
	Clara WTP	Gageborough River & 1 No. Borehole	7,607	5,000	🔴	🔴	🟢	🟢
Birr/Kinnitty	Kinnitty WTP	1 No. Boreholes	5,742	300	🔴	⚫	🟢	🟢
	Birr WTP	Kinnitty, Camcor River		2,500	🟡	⚫	🟢	🟢
Kilcormac PWS	Kilcormac WTP	2 No. Boreholes	1,186	600	🔴	⚫	🟢	⚫
Banagher PWS	Clontotin WTP	2 No. Boreholes	3,492	1,000	🔴	🟢	🟢	🟢
	Banagher WTP	Shannon River		2,500	🔴	🟢	🟢	🟢
Ballinasloe Public Supply	Ballinasloe Town WTP	River Suck, Bunowen River	8,291	4,750	🔴	⚫	⚫	🟢
Ahascragh P.S.	Ahascragh WTP	1 No. Boreholes	770	1,600	🟠	⚫	⚫	⚫


Risk Status:
Lowest Risk
0,1
Priority 2
2
3
Priority 1
4
5
Highest Risk
Priority 1 - Asset failure = Non-performance
Priority 2 - Asset performance deficiency = Risk
Low Priority – No Deficiency = Low Risk

SA5.2 Scoping the Study Area

SA5.2 Scoping the Study Area

In this section we summarise the current and future issues with water supplies in Study Area 5, in terms of water quality, quantity, reliability and sustainability.

To identify the issues and corresponding need with the water supplies in this Study Area, and to inform the nature, scale and scope of the solutions that we need to consider to meet them, we have assessed:

- The **water quality** that we can supply;
- The **water quantity** that we can supply;
- The **reliability** of our existing supplies; and
- Additional information that impacts the long-term **sustainability** of our sources or infrastructure.

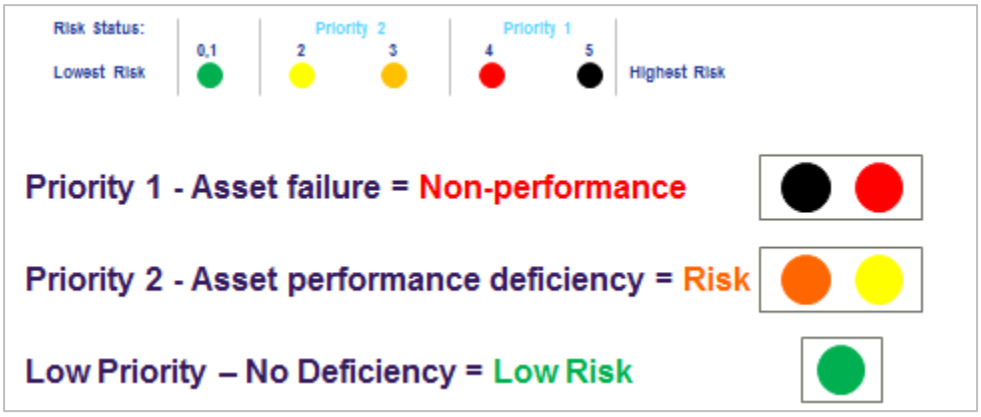
SA5.2.1 Water Quality

We assess the water quality investment needs of our water supplies by measuring the barrier performance to breach of standards of our individual water treatment plants (WTPs) and networks, in line with the assessment criteria set out in Chapter 5 of the draft Framework Plan. The initial desktop assessments of barrier deficits for SA5 Offaly Roscommon are summarised in Table SA5.2.1.1.

Table SA5.2.1.1 – Barrier scores

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Athlone WTP	🟡	🟡	🟢	🟡
Lisbrock WTP	🟡	🟡	🟢	🟢
Killeglan Springs WTP	🟡	🟡	🟢	🟡
Cloonlaughnan WTP	🟡	🟡	🟢	🟢
Rahan - Tully WTP	⚫	🟢	🔴	🟢
Rahan - Holmshill WTP	⚫	🟢	🔴	🟢
Agall WTP	🟡	🟢	🔴	🟢
Moyclare WTP	🔴	🟢	🔴	🟢
Clara WTP	🔴	🟡	🟢	🟡
Kinnitty WTP	🔴	🟢	🟢	🟢
Birr WTP	🟡	🟡	🟢	🟢
Kilcormac WTP	🔴	🟢	🔴	🟢
Clontotin WTP	🔴	🟡	🔴	🟡
Banagher WTP	🔴	🟡	🟡	🟡

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Ballinasloe Town WTP				
Ahascragh WTP				



The colour coding within the outline assessment indicates the severity of the water deficit, and the priority in terms of resolving the identified issues.

Based on the barrier assessment, 9 of the 16 WTPs within the region appear to have significant deficits, identified with a red or black dot. These deficits relate particularly to Bacteria and Virus (Barrier 1) and effectiveness of our Protozoa removal processes (Barrier 3). However, in some cases our desktop assessments can overestimate risk, particularly when there is limited available data on the catchment characteristics of our raw water sources. As our "Source to Tap" Drinking Water Safety Plan (DWSP) assessments are developed for each water supply, the barrier scores for all of our supplies will be updated.

Currently, there is one WRZ within Study Area 5 on the EPA Remedial Action List; namely Clara/Ferbane Regional Water Supply Scheme. There are no supplies within SA5 on an EPA Direction. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SA5 in advance of the NWRP. A national programme to improve disinfection standards (Barrier 1) at water treatment facilities across Ireland was initiated by Irish Water in 2016. Details of the in progress projects to address critical water quality requirements are included in Table SA5.2.1.2.

Table SA5.2.1.2 – Critical Water Quality Requirements SA5

Critical Water Quality Requirements	Progress
1. **Ballinasloe:** WTP Upgrade to provide new and upgrade existing processes to protect against the formation of Trihalomethanes (THMs).	Complete
2. **Clara/Ferbane:** WTP Upgrade to upgrade process to protect against formation of Trihalomethanes (THMs).	Planned 2022
3. **Lead Mitigation Programme:** As part of the programme the top 400 WTP's, nationally, have been assessed for potential Orthophosphate Dosing. 138 of these have been prioritised and works will begin, subject to funding. Lead main replacement has been ongoing across the country:	In Progress

Critical Water Quality Requirements	Progress
Areas in SA5 where significant lead pipe removal has taken place include Athlone & Mullingar WRZs. Areas in SA5 where lead mitigation measures will commence shortly include Ballinasloe.	
4. **Reservoir Cleaning Programme:** A major reservoir cleaning programme has been undertaken nationally, Kinnity Reservoir was included in this programme, this has reduced network water quality issues in the area.	Complete
5. **National Disinfection Programme:** In 2016, Irish Water completed nr review of all WTPs where disinfection upgrades were required. This review was followed by a programme of works to complete any required upgrades. In SA5, the Athlone WTP disinfection system has been upgraded and commissioned as a result of this programme.	Complete

In summary, in relation to water quality, Irish Water will:

- Identify significant barrier performance issues in the WRZs which have the potential to impact on drinking water quality in the region;
- Improve these assessments through the development of Drinking Water Safety Plans for all of our supplies;
- Have plans in place to address the priority risks identified on the EPA Remedial Action List; and
- All residual need (black, red and orange dots) in relation to water quality will be brought through our options assessment process.

Box SA5.1 Ballinasloe Water Treatment Plant Upgrade

Ballinasloe WRZ was on the EPA Remedial Action List because the water treatment process at the plant was inadequate in protecting against the formation of Trihalomethanes (THMs). The upgrades have provided additional treatment and improved the existing water treatment processes, improving the drinking water quality.

The water supply has now been removed from the EPA Remedial Action List (RAL).

<u>Project</u>

The project involved an upgrade of the clarifiers, the provision of two additional pressure filters, an Ultraviolet (UV) disinfection system, pipework and fittings, control and monitoring

instrumentation and a SCADA system, along with new mechanical, electrical, instrumentation, control and automation equipment, and refurbishment of the existing plant.

Benefits

- Enable the removal of the Ballinasloe Regional Water Supply Scheme from the EPA's Remedial Action List (RAL);
- Reduced maintenance costs;
- UV disinfection providing verified protection against Cryptosporidium contamination; and
- Improved water quality and treatment standards.

SA5.2.2 Water Quantity – Supply Demand Balance

Irish Water assess the water quantity investment needs of our supplies by developing supply demand balance (SDB) calculations for each of our water supplies as summarised in Chapter 3, 4 and 6 of the draft Framework Plan. The calculations are used to assess the amount of water available in our supplies and compare that to the current demand for water.

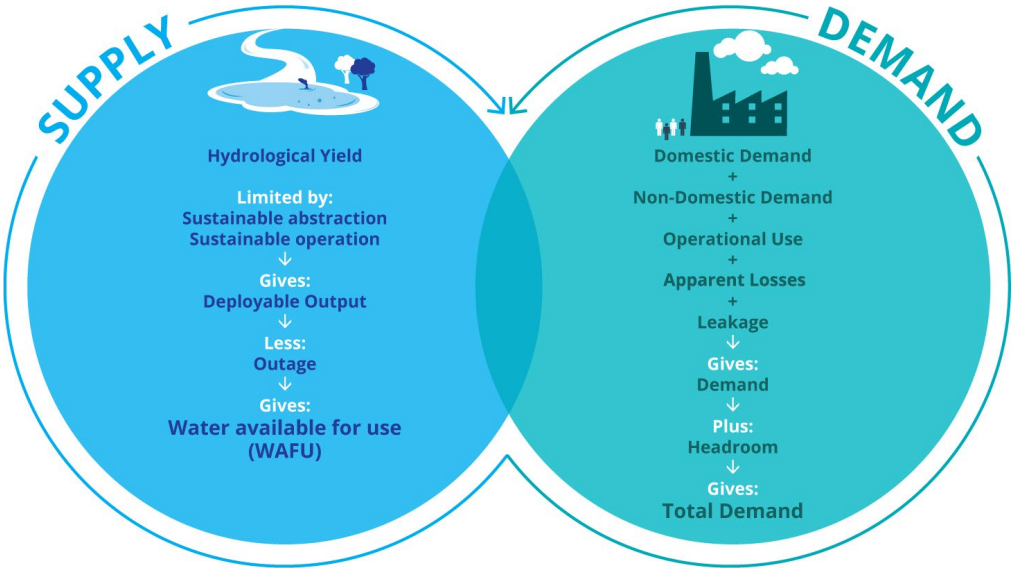


Figure SA5.2.2.1 Supply Demand Balance

For each of the 10 WRZs in this Study Area, we assessed the baseline SDB and developed 25 year forecasts of supply and demand, in accordance with Figure SA5.2.2.1.

The SDB assessments were carried out for each of the weather event planning scenarios described in Chapter 2 of the draft Framework Plan. The SDB deficits in Study Area 5 manifest in the following ways:

Appropriate standards and levels of risk for a strategic water supply: As water supply is essential for public health, regulated water service providers must ensure appropriate standards of water supply which are able to endure drought conditions, peak events, and maintenance of our assets. This requires reserve capacity in our supplies. At present, not all supplies within this Study Area meet the required levels of reserve capacity. However, due to the lack of historical monitoring, particularly in relation to groundwater supplies, some of the deficits may be data driven.

Day to day operations: At present, 6 out of 10 of the WRZs in Study Area 5 have a current deficit and 7 out of 10 have a projected SDB deficit (based on a “do minimum” approach). However, under normal weather and demand conditions, this does not manifest as an interruption to supply for all WRZs. During the drought in summer 2018, all of our groundwater supplies were monitored due to falling levels in the groundwater bodies, and a number of the supplies in SA5 were affected. These include Ahascragh Spring and Rahan Tully boreholes, which abstract from the South Suck and Tullamore groundwater bodies respectively. The sources were noted as having a significant reduction in water availability during this period. The water levels in the River Suck, supplying Ballinasloe, were also severely impacted during the drought and low flow interventions were required to maintain continuity of the public water supply.

A summary of the SDB deficit across all 10 WRZs is summarised in Table SA5.2.2.1. The SDB for each WRZ are detailed in Appendix L of the draft Framework Plan.

Table SA5.2.2.1 – WRZ SDB Dry Year Critical Period Deficits

Water resource zone Name	Water resource zone code	Population	Maximum Deficit m^3/day (Dry Year Critical Period)					
			2019	2025	2030	2035	2040	2044
Athlone	3200SC0002	22,477	-3,068	-3,296	-3,853	-4,123	-4,391	-4,605
South Roscommon (Lisbrock & Killeglan)	2600SC0006	13,920	-884	-1,010	-1,240	-1,367	-1,493	-1,594
Clara/Ferbane / Moyclare	2500SC0016	8,665	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Ballinasloe Public Supply	1200SC0006	8,291	-1,080	-1,202	-1,302	-1,403	-1,503	-1,583
Birr / Kinnitty	2500SC0015	5,742	-220	-89	-132	-175	-218	-252
Mount Talbot/Four Roads	2600SC0001	3,711	No Deficit	No Deficit	-9	-33	-55	-73
Rahan	2500SC0017	3,684	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Banagher PWS	2500SC0001	3,492	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Kilcormac PWS	2500SC0003	1,186	-175	-187	-199	-209	-218	-226
Ahascragh P.S.	1200SC0005	770	-728	-749	-761	-768	-776	-781

The target levels of service in the region were applied in each case, along with the corresponding requirements for reserves, indicating that our supplies are operating with a cumulative SDB deficit of 6,155m^3/day for the Region. As a result, water supplies in this area may come under pressure, particularly in drought conditions. In addition, there may be ongoing reliability issues.

This situation will further deteriorate over time due to climate change driven reductions in water resources, together with increased demand due to population growth. If we do nothing, the SDB deficit is projected to increase to 9,114m^3/day by 2044.

SA5.2.3 Water Supply Reliability

The benefits of having sufficient water supplies in terms of quality and quantity are negated if we cannot distribute the water we produce effectively around our networks. We also need sufficient treated water storage to enable us to respond to planned or unplanned outages on our trunk main network and appropriately manage our water production.

There are a number of problematic distribution and trunk mains across this Study Area. Irish Water, in partnership with each County Council, will continue to monitor the performance of all water mains in the network to ensure the most problematic mains are replaced as required.

The largest WRZ in SA5, Athlone, experiences regular interruptions to supply. During periods of high demand, there are limitations on the throughput of the WTP and night-time restrictions have been introduced intermittently over the past two years to allow the levels in Annagh Reservoir to recover.

During our needs assessment, Irish Water has identified a number of critical requirements for upgrades to the existing asset base, including storage and trunk main requirements. Progress to date on these projects is summarised in Table SA5.2.3.1.

Table SA5.2.3.1 – SA5 Critical Infrastructure Projects and Need Identification

	Critical Requirement	Progress
1.	**Upgrade of Athlone WTP:** The location and restricted site for the abstraction and WTP for Athlone, in the centre of the town, have implications for resilience and security of supply. They are also limiting factors for facilitating growth and development in Athlone. Any interruption to deployable output from the WTP would result in immediate interruptions to water supply for a population of up to 22,000.	In Progress
2.	**Mount Talbot/ Four Roads:** Source improvements to proceed over the period 2020 – 2021, subject to funding.	Planned
3.	**Duplication of the Rising Main to Lackan SR (Mount Talbot WSS):** The existing pipeline from the WTP to Lackan SR is the sole trunk main for the entire water supply of the WRZ. As it operates continuously, it is not possible to take the trunk main out of service to carry out repairs. A significant burst on this trunk main, would impact up to 3,700 people.	Need Identified
4.	**Upgrade of Abstraction for Killeglan WTP (South Roscommon RWSS):** The Killeglan WTP abstracts water from a single BH to supply 55% of the South Roscommon RWSS. Any issue with this single BH would impact the supply a population of 13,700.	Need Identified
5.	**Improved connectivity between Killeglan and Lisbrock supplies (South Roscommon RWSS):** The ability to move water between the areas of the network supplied by Killeglan WTP and Lisbrock WTP is restricted due to the condition of the AC trunk mains between Bellanamullia and Taghmaconnell. This in turn impacts on the ability to distribute water effectively between supplies and respond to major incidents.	Need Identified

Critical Requirement		Progress
6.	**Replacement of Raw Water Main from Kinnitty Abstraction to Birr WTP:** The existing pipeline from the Kinnitty Abstraction to Birr WTP provides over 40% of the entire water supply for the WRZ. The CI main was constructed in the 1910's and is beyond the end of its design life. As it operates continuously, it is not possible to take the raw water main out of service to carry out repairs. A significant burst on this truck main, would impact up to 5,700 people.	Need Identified
7.	**Upgrade of Clara WTP (Clara/Ferbane WSS):** At present, this plant, serving a population of 7,500 is on the EPA's RAL list for THM exceedances.	Outline Design
8.	**Duplication of Raw Water Main from Agall to Holmshill WTP:** The existing raw water main from Agall to Holmshill has a significant burst history. As it is a single main operating continuously, it is not possible to take the raw water main out of service to carry out repairs. A significant burst on this truck main, would impact a population of up to 3,700.	Need Identified
9.	**Duplication of the Rising Main to Garbally SR (Ballinasloe WSS):** The existing AC pipeline from the WTP to Garbally SR is the sole trunk main for the entire water supply of the WRZ. It was constructed in the early 1980's and is approaching the end of its design life. However, as it operates continuously, it is not possible to take the trunk main out of service to carry out repairs. A significant burst on this truck main, would impact up to 8,200 people.	Need Identified
10.	**Athlone Water Mains Rehabilitation – Contract 1:** The project saw €9 million invested to rehabilitate 25 kilometres of aging and defective watermains in Athlone.	Complete
11.	**Ballinasloe Water Conservation Works:** This project involved replacement of 8.3km of watermains in Ballinasloe, Athenry, Oranmore and Headford at locations where existing water mains have been identified as needing rehabilitation.	Complete
12.	**Offaly Water Mains Rehabilitation & Conservation Project:** This project involved replacement of 7km of defective watermains that service Edenderry and Kilcormac.	Complete

In summary, there are some asset reliability issues across the distribution network within the WRZ. Some priority projects to address these issues have been identified and are in progress. In addition to this, a continuous programme of repairs, upgrades and leakage reduction is being progressed as part of Irish Waters National Leakage Reduction Programme across all Study Areas.

SA5.2.4 Water Supply Sustainability

The water supplies within the region were developed over time, to address the needs of the local populations and to support growth and development. Most of these supplies predate most modern environmental legislation and none of our current abstractions in this area were developed through any formalised abstraction process.

To understand the potential impact of the Abstraction Legislation on the SA5 supplies, we have assessed our surface water abstractions and summarised the potential impact on the River Camcor, River Suck, Bunowen River and the Gageborough River. Table SA5.2.4.1 presents these findings to show the potential reductions to our available supplies. The 'baseline model' estimate is our source hydrological yield[1], which we use in the SDB calculations to determine whether a WRZ is projected to be in deficit or surplus. The 'uncertainty scenario' estimate is a test of what the sustainable abstraction[2] amount may be limited to in the future Table SA5.2.4.1.

[1] Our hydrological yield estimate is the 'safe' yield calculated to be available during a 1 in 50 year drought event.
[2] Our sustainable or 'allowable' abstraction estimate is based on limiting abstraction to 7.5-15% of the Q95 low flow for river sources or 10% of Q50 inflow for lakes. This is based on our best understanding of how the EPA may enforce future abstraction licencing applying UKTAG guidance.

Based on this initial assessment, the volumes of water abstracted from the River Gageborough (Clara/Ferbane) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA.

Table SA5.2.4.1 – Comparison Baseline to Potential Sustainable Abstraction

Description	Abstraction (m^3/day)			
	River Camcor (Birr)	River Suck (Ballinasloe)	Bunowen River (Ballinasloe)	River Gageborough (Clara)
Baseline Model	24,700	95,500	9,900	10,900
Uncertainty Scenario	5,750	27,200	2,870	2,000

The potential change to the SDB for each WRZ, as a result of these potential reductions in abstraction during Dry Weather Flow are summarised in Table SA5.2.4.2.

Table SA5.2.4.2 – Potential change to the SDB based on potential reductions for Sustainable Abstraction

Component	Planning Scenario 2044	River Camcor (Birr)	River Suck (Ballinasloe)	River Bunowen (Ballinasloe)	River Gageborough (Clara)
Supply Demand Balance (Ml/d)	Normal Year Annual Average	None	None	None	None
	Dry Year Annual Average	None	None	None	None
	Dry Year Critical Period	None	None	None	-197
	Winter Critical Period	None	None	None	None

The net impact of these potential minimum environmental flow requirements has been assessed using the outline assessment methodology described in Chapter 8 of the draft Framework Plan.

Groundwater abstractions will need to conform to the proposed new abstraction licencing regime. These abstractions will be assessed in two ways:

- Impacts on the groundwater bodies from which they abstract; and
- Impact of the groundwater abstraction on the base flow in surface waterbodies.

At present we have limited knowledge of our groundwater assets. On an interim basis, Irish Water has developed an initial assessment based on available information, included in Appendix G of the draft Framework Plan. Over the coming years, Irish Water will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources.

In summary, when considering the requirements of the Water Framework Directive, some of our existing abstractions are likely to become limited in the medium term, during drought periods. When the new Legislation on abstraction of water has been enacted and regulatory assessments completed, we will update our sustainability analysis and its impact on our baseline SDB calculations. All future abstractions considered through the Framework Plan Options Assessment are validated for sustainability, including options to increase abstraction at existing sites.

In Section SA5.6 of this Case Study Technical Report, an assessment is carried out to determine whether the Preferred Approach developed is adaptable to change, across a range of potential future scenarios. This verifies our ability to adapt for resilience to future changes.

SA5.2.5 Water Resource Zone Needs Summary

Study Area 5 has significant issues in relation to quality, quantity, reliability and sustainability which must be addressed as part of the Preferred Approach to future water resources planning, summarised in Table SA5.2.5.1.

Table SA5.2.5.1 – Summary of Need Quality, Quantity, Reliability, Sustainability

Quality	Upgrades required at all WTPs, aligned with the barrier approach
Quantity	Net leakage reduction 3.79 Ml/d in the region over the next 5 years Total of 13.4 Ml/d additional supplies beyond the 10 year horizon
Reliability (In addition to progressing projects)	Continued network upgrades and improvements in the bulk and distribution networks
Sustainability	Test preferred approach to ensure adaptability to climate change, abstraction licencing and varying demand scenarios

All of these needs will be considered within our options assessment process and in the development of the Preferred Approach.

Further details of planned, live and recently completed projects are available on our website see: https://www.water.ie/projects-plans/our-projects/.

SA5.3

Solution Types Considered in Study Area 5

SA5.3 Solution Types considered in Study Area 5

In this section, we summarise the type of solutions we have considered to address identified need in Study Area 5.

We consider measures across the following three pillars: **Lose Less**, **Use Less** and **Supply Smarter** in forming our list of unconstrained options, which are assessed for short, medium and long-term solutions. For SA5, the following unconstrained options have been reviewed.

SA5.3.1 Leakage Reduction

The Leakage reduction measures across the public water supply considered for SA5 Offaly Roscommon are based on what we 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 (NRR); and
- Further net leakage reductions listed in Table SA5.3.1.1 below have been (applied to SDB deficit) to move towards achieving the national SELL target by 2034.

Table SA5.3.1.1 – SELL Targets for WRZs in Study Area 5

WRZ	Net Leakage Reduction (m^3)
Ahascragh P.S.	450
Ballinasloe Public Supply	90
Rahan	180
Athlone	3,070

SA5.3.2 Water Conservation

At present, Irish Water is conducting pilot studies in relation to water conservation stewardship in businesses and is actively pursuing Conservation Education Awareness Campaigns and partnerships. During drought conditions in 2018, a Water Conservation Order was implemented in order to protect our water supplies and reduce pressure on the natural environment during this period. We will continue to promote 'Water Conservation Activities', collecting and monitoring data over a number of years to assess the benefits. As part of the draft Framework Plan, we have not applied reductions to the SDB deficit for unquantifiable water conservation gains. However, we do assume that any gain will offset consumer usage growth factors.

SA5.3.3 Supply Smarter

The supply options considered as part of the options development are unconstrained by distance from Study Area 5 and include:

- 32 standalone groundwater options across the Study Area;
- 21 standalone surface water options across the Study Area;
- Advanced Leakage Reduction;

- Connection to Group Water Schemes;
- WTP Upgrades;
- Interconnection and Rationalisation of WRZs within the Study Area; and
- Network connectivity and transfers from other Study Areas.

SA5.4

Option Development SA5

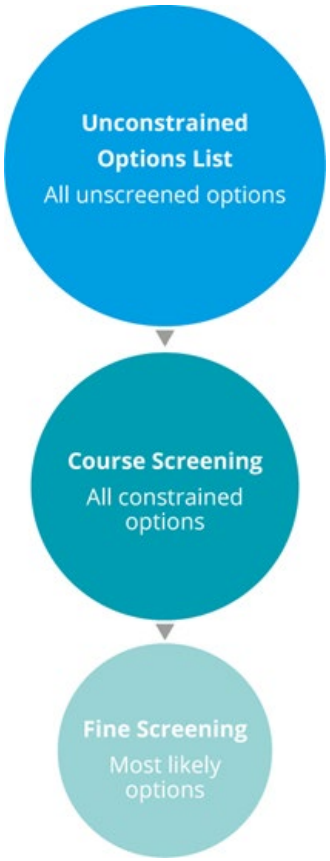
SA5.4 Option Development SA5

This section describes how our Options Assessment Methodology was applied to produce a Feasible Options List to meet the identified needs.

The purpose of our options assessment process is to consider the widest practicable range of solutions to resolve identified need within a given area. A suitable screening criterion is then applied to filter out any options that are not feasible, based on sustainability (environmental and social impacts), resilience or deliverability. As sustainability is at the heart of our plan, 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 even before screening begins to ensure the protection of the environment. For example, Irish Water do not allow for any inter-catchment **raw water transfers** due to the high risk of transferring invasive non-native species (INNS) between catchments and non-compliance with Water Framework Directive objectives.

The options assessment screening process involves the following:

- Developing a long list of unconstrained options – the maximum possible list of unscreened options for water supply, not limited by cost or feasibility;
- Coarse Screening – We filter the unconstrained options using a coarse screening assessment where we remove any options that fail to meet desktop assessment criteria under: Resilience, Deliverability and Flexibility or Sustainability (Environmental and Social Impacts); and
- Fine Screening – We filter the remaining options from the coarse screening exercise through a fine screening assessment, which includes 33 detailed questions, related to environmental objectives identified for the SEA (including biodiversity, the water environment and requirements under climate change adaptation) as well as Resilience, Deliverability and Progressibility.



The coarse screening and fine screening questions, and the associated scoring criteria, are included in Section 3 and Appendix A of the Case Study Environmental Review.

SA5.4.1 Developing a List of Unconstrained Options

At the start of our screening process, we conduct a specialist desktop review of groundwater bodies and surface water catchments in order to understand potential additional availability at existing water abstractions or to identify any potential new water sources within the Study Area; as summarised in Table SA5.4.1.1.

Table SA5.4.1.1 – Desktop Assessments for Unconstrained Options

Existing and New Ground Water sources	A Hydrogeologist conducts a desktop groundwater availability assessment of all potential aquifers and aquitards within the Study Area
Existing and New Surface Water sources and Conjunctive Use Options	A Hydrologist carries out a desktop surface water availability assessment of all potential catchments and waterbodies, within the given Study Area and outside of the Study Area. This review includes existing abstraction sites
Water Treatment upgrades, Desalination, Rationalisation and Effluent Reuse Options	An Engineer reviews any potential increases in capacity at existing water treatment sites and any potential conjunctive use or effluent reuse options

Based on these desktop assessments, Irish Water developed an initial list of unconstrained options for new supplies and increases and upgrades to existing supplies and assets. An unconstrained options review workshop was then held with our Local Authority Partners to identify any additional unconstrained options that may be available based on local knowledge. A total list of unconstrained options was then compiled.

For Study Area 5, 97 Unconstrained Options were identified to address need. These unconstrained options were not limited by cost, distance from the area or feasibility and are summarised in Table SA5.4.1.2 and shown spatially in Figure SA5.4.1.1.

Table SA5.4.1.2 – SA5 Unconstrained Options

No of Options	Option Type
33	Groundwater
21	Surface water
1	Transfer from scheme in surplus
2	Transfer from Group Water Scheme
6	Interconnection (GW)
14	Interconnection (SW)
7	Cross Study Area Supply
8	Rationalise to another supply
2	Upgrade Water Treatment Plant
3	Advanced Leakage Reduction

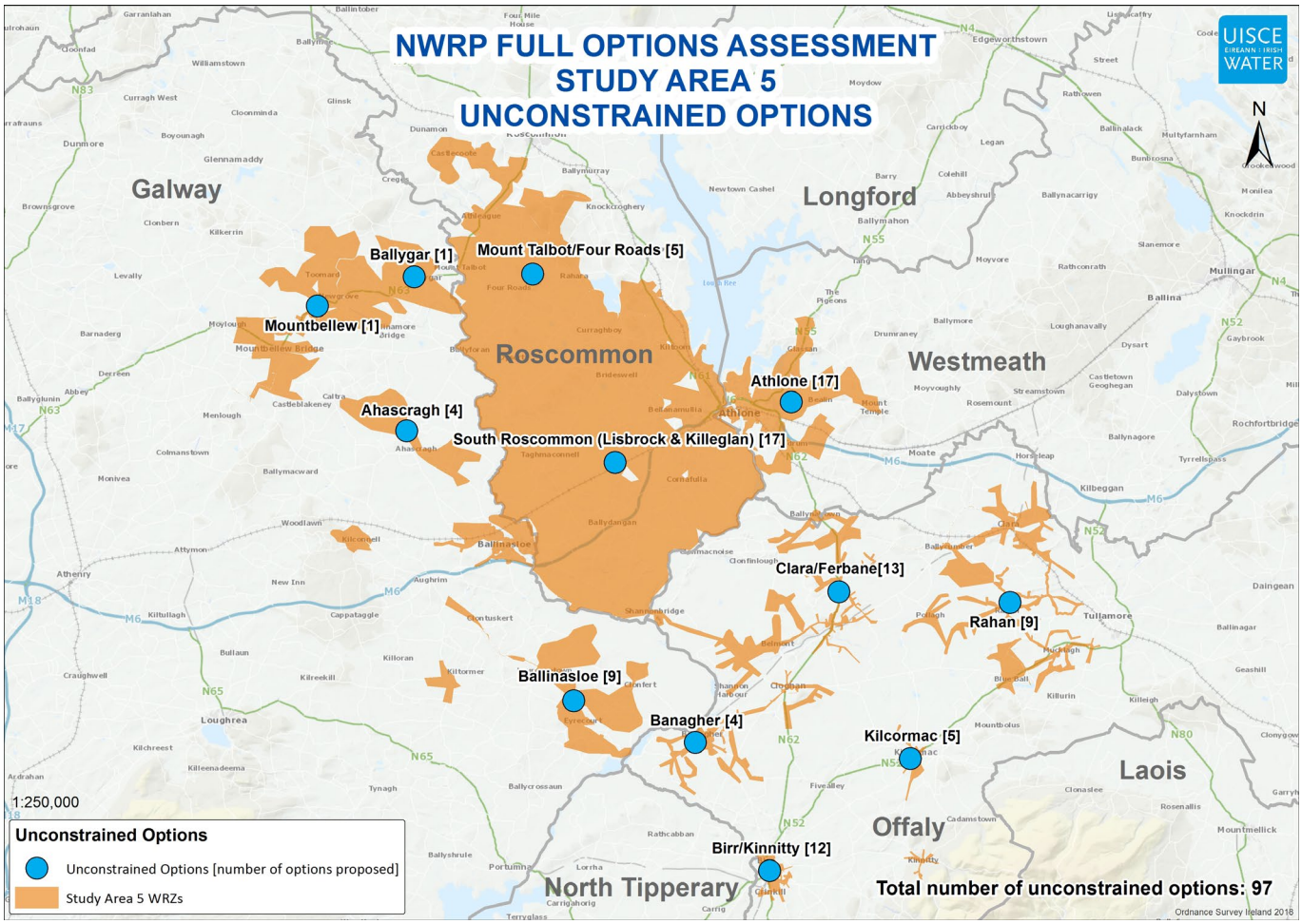


Figure SA5.4.1.1 SA5 Unconstrained Options

The 97 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues. The process is summarised below.

SA5.4.2 Coarse Screening

The 97 identified Unconstrained Options were assessed through Coarse Screening against the criteria of:

- Resilience;
- Deliverability and Flexibility; and
- Sustainability (Environmental and Social Impacts).

The Course Screening process is summarised in Chapter 8 of the draft Framework Plan. The coarse screening assessments were conducted by a specialist team, including a Hydrologist, Hydrogeologist, Ecologist, Environmental Engineer and Civil Engineer.

37 Unconstrained Options were rejected at this stage as they were found to be unviable in relation to one or more assessment criteria. Box SA5.2 provides an example of rejection justification for an Option considered for the Birr/Kinnitty WRZ.

Box SA5.2 – Example Rejected Option

TG4-SA5-56- Increase abstraction from River Kinnitty and upgrade Birr WTP to supply deficit

It was determined that the sustainable allowable abstraction at this location is 0.27M/ld, not accounting for the existing abstraction. The deficit in the WRZ is approximately 1.3M/ld. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the sustainability objectives of the plan.

The remaining 60 options were progressed to further assessment through the Fine Screening process. The remaining options are summarised in Table SA5.4.2.1.

Table SA5.4.2.1 – SA5 Remaining options after Course Screening

No of Options	Option Type
22	Groundwater
11	Surface water
1	Transfer from scheme in surplus
1	Transfer from Group Water Scheme
8	Interconnection (SW)
6	Cross Study Area Supply
4	Rationalise to another supply
4	Upgrade Water Treatment Plant
3	Advanced Leakage Reduction

SA5.4.3 Fine Screening

The 60 remaining options were subject to a more detailed multi-criteria assessment (MCA) at the Fine Screening Stage using desktop assessments of performance against 33 specified questions relating to Sustainability (Environmental and Social Impacts), Resilience, Deliverability and Progressibility. The assessment for each option was based on an objective assessment with uniform scoring criteria, based on best publicly available datasets.

At Fine Screening stage, 5 further options were rejected, with the remaining 55 options considered to be feasible and brought forward to desktop outline design and costing. These are summarised in Table SA5.4.3.1 and shown spatially in Figure SA5.4.3.1

Table SA5.4.3.1 – SA5 Remaining options after Fine Screening (Feasible Options)

No of Options	Option Type
22	Groundwater
11	Surface water
1	Transfer from scheme in surplus
1	Transfer from Group Water Scheme
7	Interconnection (SW)
6	Cross Study Area Supply
3	Rationalise to another supply
4	Upgrade Water Treatment Plant

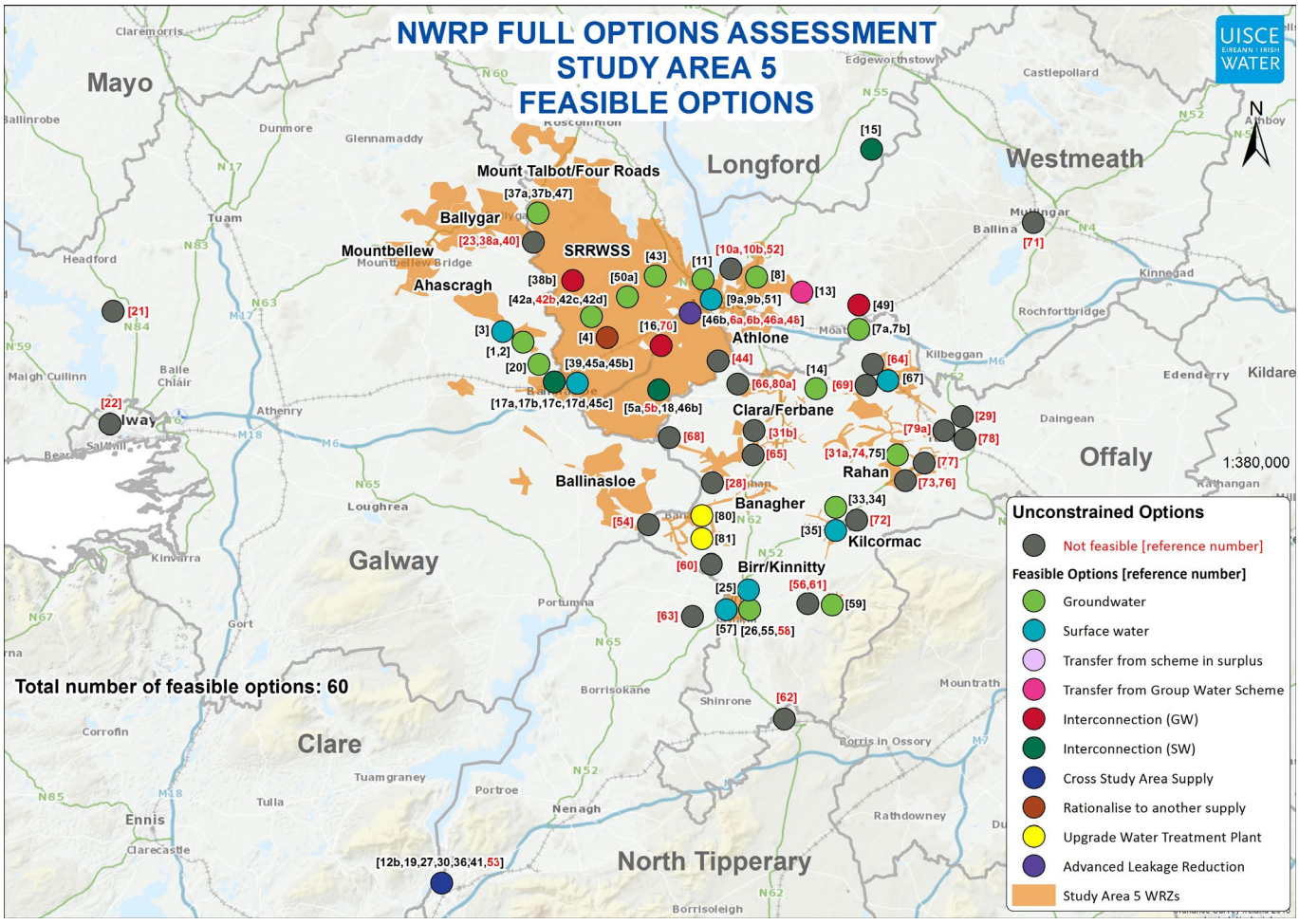


Figure SA5.4.3.1 SA5 Spatial Overview of the feasible options

SA5.4.4 Options Assessment Summary

The SDB deficit in the region ranges between 6,155 m^3/d in 2019 during normal conditions, to a maximum of 9,114 m^3/d in 2044 during dry conditions. During the options assessment stage, a total of 98 unconstrained options were assessed. Of these 42 options were screened out for the reasons summarised in Table SA5.4.4.1.

Table SA5.4.4.1 – SA5 Summary of Rejected Options

No of Options	Reason for Rejection
3	Environmental Impact
1	Does not address supply-demand problem
17	Options did not meet Feasibility criteria
21	Other

(Note: A more detailed summary of the rejected options will be provided as an Appendix to the Study Area report)

Of the 55 feasible options, 27 of these are referred to as **WRZ Options**, where the options are only sufficient to resolve need in a single WRZ in the vicinity of the source. The remaining options are referred to as **Study Area (SA) options**. These options are larger and can address need in more than one WRZ in terms of addressing a deficit in a supply or replacing the existing supply entirely.

In SA5, there are 11 SA options (addressing 28 WRZ supplies). A summary of the number of options and whether they are WRZ or SA options is contained in Table SA5.4.4.2.

Table SA5.4.4.2 – SA5 Offaly Roscommon Feasible Options Summary

Water Resource Zone Name	Water Resource Zone Code	Option Type	
		WRZ Option	SA Option
Ahascragh	1200SC0005	2	2
Athlone	3200SC0002	7	5
Ballinasloe	1200SC0006	2	5
Banagher	2500SC0001	2	0
Birr/Kinnitty	2500SC0015	5	1
Clara/Ferbane	2500SC0016	1	1
Kilcormac	2500SC0003	3	1
Mount Talbot/Four Roads	2600SC0001	1	3
Rahan	2500SC0017	1	1
South Roscommon (Lisbrock & Killeglan)	2600SC0006	3	9

For the purposes of the Framework Plan, outline designs have been prepared at a desktop level for each feasible option (for use as part of comparative assessments between options). The outline designs include a high level inventory of option requirements, including capacities of plants, pipelines, pumps and treatment requirements. They include budget costs for required site level studies (including site level environmental assessments), Capital (CAPEX), Operational (OPEX), Environmental and Social (E&S) costs, and Carbon Costs for use in the next stage of the assessment process.

SA5.5 Approach Development

SA5.5 Approach Development

This section describes how we tested different combinations of the Feasible Options to develop a Preferred Approach to meet the needs we identified for the water resource zones in Study Area 5.

SA5.5.1 Approach Development

SA5.5.1.1 Introduction to Approach Development

The purpose of the Framework Plan is to examine all potential options that could be used to resolve issues within the water supply (unconstrained options) and then to eliminate those that are not feasible or that have identifiable environmental issues at a desktop level (options assessment screening). Of the remaining feasible options Irish Water's next step is to assess a specified number of approaches to resolve need within each WRZ and across the Study Area. An approach is a way of configuring an option or options, to achieve an outcome. For example, a Least Carbon approach to solving need in a particular WRZ would be the option or combination of options that would involve the least embodied and operational carbon load over the whole lifetime of the option. As part of the NWRP, Irish Water considers six approaches, as summarised in Table SA5.5.1.1.1.

These six approaches will be consulted on in our Phase 2 SEA Scoping consultation conducted between and have been specifically chosen to ensure that the NWRP aligns with all relevant Government Policies outlined in Table SA5.5.1.1.1. These six approaches are not finalised and are here to help illustrate how the methodology is going to be applied. These approaches will be assessed within the Regional Water Resources Plan for the Eastern and Midlands Area and will go through a separate consultation process when it is published in 2021.

Table SA5.5.1.1.1 – Six Approaches Considered as part of the NWRP

Approaches Tested	Description	Policy Driver
Least Cost	Lowest NPV cost in terms of Capital, Operational, Environmental, Social and Carbon Costs.	Public Expenditure Code
Best Appropriate Assessment (Best AA)	Lowest score against the European Sites (Biodiversity) question. Zero ('0') score equates to no likely significant effects (LSEs); LSEs.of -1 and -2 are impacts that can be addressed with general/standard mitigation measures; -3 scores are LSEs that may be harder to mitigate.	Habitats Directive
Quickest Delivery	Based on an estimate of project lead-in time (including typical feasibility, consent and construction durations) as identified at Fine Screening. May be required for urgent Public Health issues.	Statutory Obligations under the Water Supply Act and Drinking Water Regulations
Best Environmental	Best sum of negative scores across all 19 environmental criteria.	SEA Directive and Water Framework Directive
Most Resilient	Best resilience score against resilience criteria.	National Adaptation Plan
Lowest Carbon	Lowest embodied and operational carbon cost.	Climate Change Strategy

Within each Study Area, we follow a process to develop the Preferred Approach at two spatial levels, each increasing in size.

1. Assess the Preferred Approach for each WRZ. This usually results in small local WRZ option/s that can only resolve need in the immediate vicinity, or
2. Assess whether there are any SA options that can be applied to more than one WRZ and whether these can improve the Preferred Approach at Study Area Level.

Within the draft Regional Plan - Eastern and Midlands, we will examine the Preferred Approach at a third spatial level for the entire GA4 Midlands Strategic Study Area and will make any required changes in order to develop a Preferred Approach across the entire Region.

For this first stage of statutory consultation on our draft Framework Plan, we assessed the 10 WRZs within SA5 as a sample case study. We will formally consult on the preferred option/s for all 539 water resource zones, SA Preferred Approaches for 22 Study Areas and Regional/Group Level Preferred Approaches for 4 Group Areas, taking account of first phase feedback. When completed, we will include a 4th level of assessment and develop a preferred approach at each regional level. The assessment process is summarised in Figure SA5.5.1.1.1. The terminology used to describe options/approaches at each of the 4 levels is shown in Figure SA5.5.1.1.2.

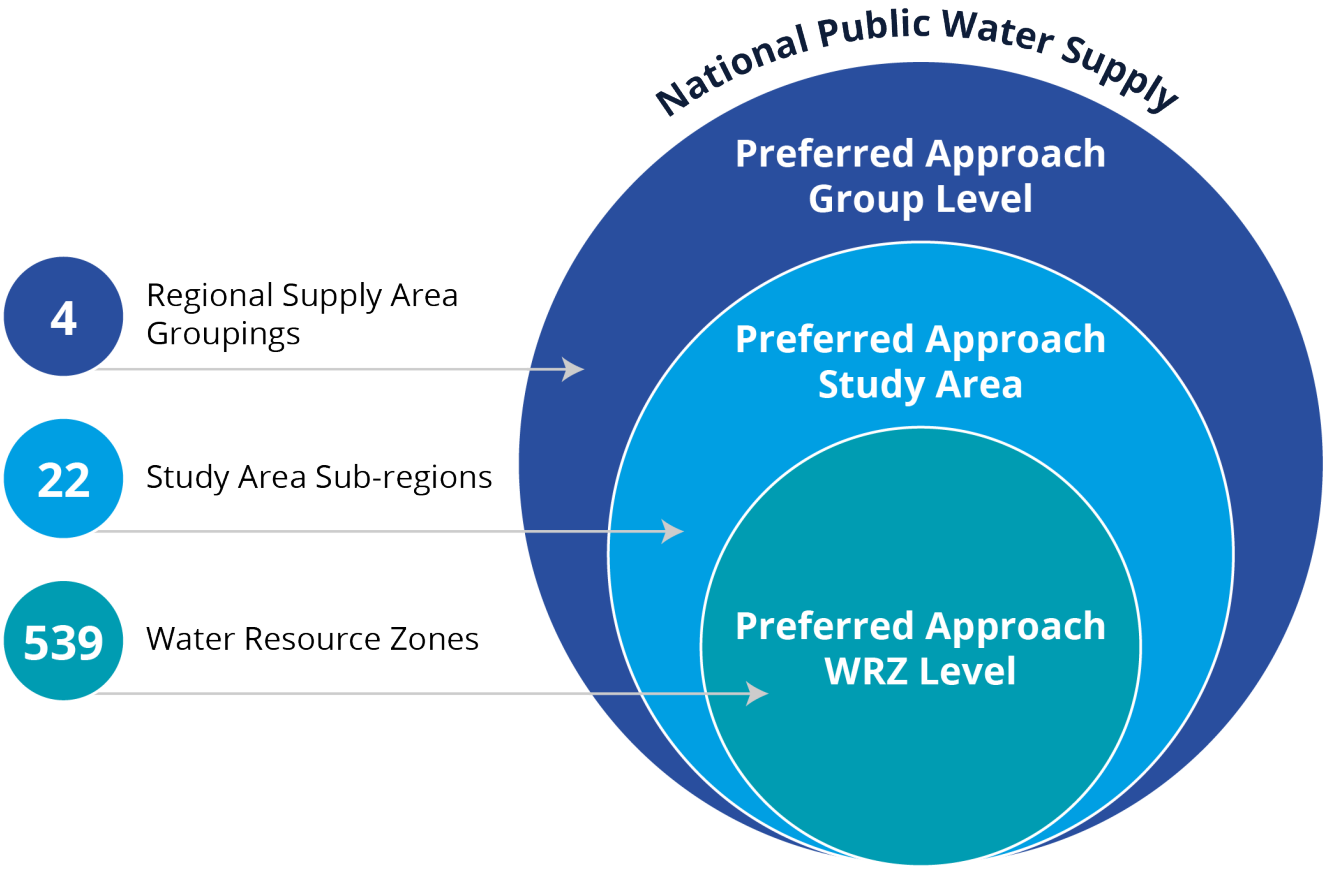


Figure SA5.5.1.1.1 Six Approaches Considered as part of the NWRP

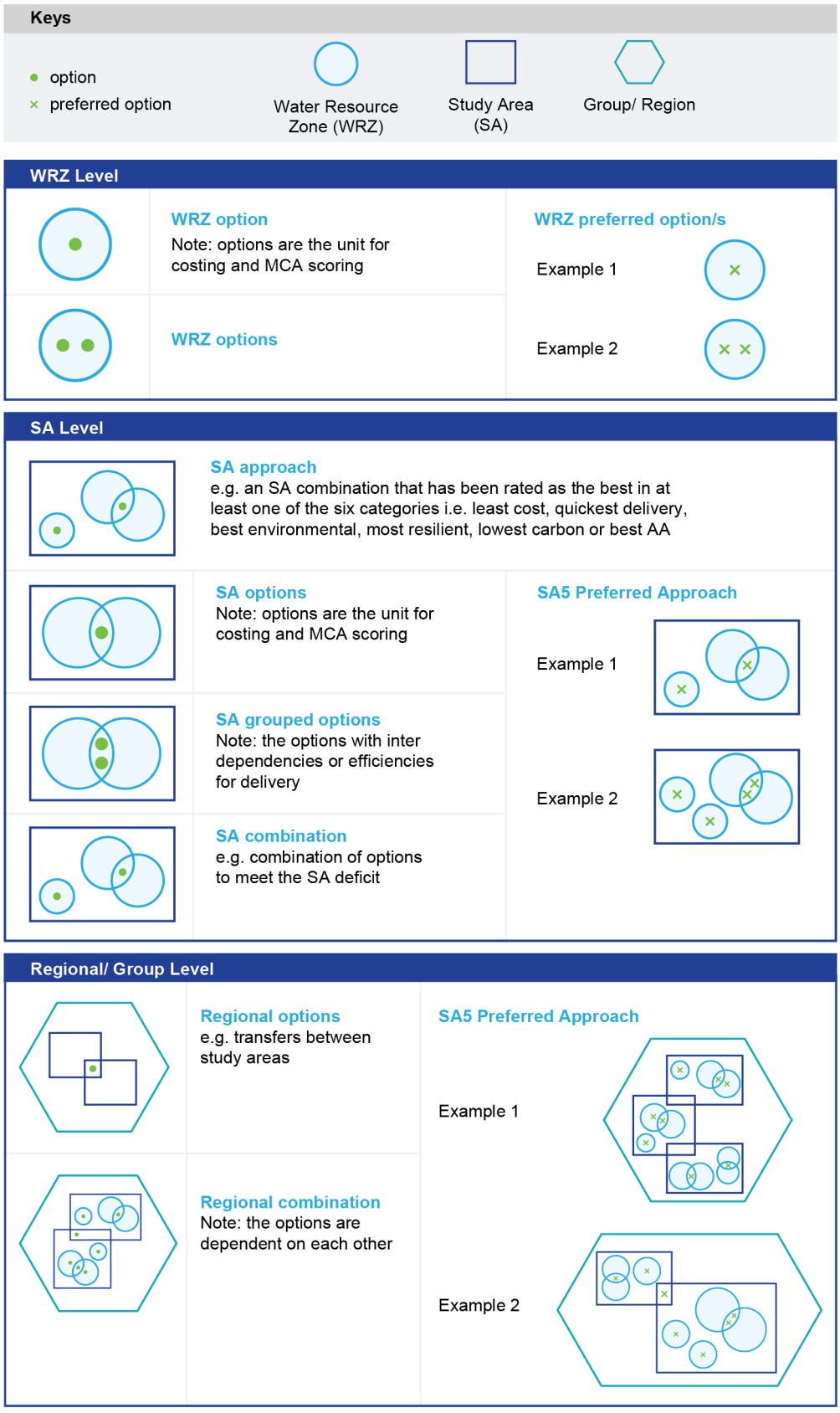


Figure SA5.5.1.1.2 Preferred Approach Development Process terminology

Table SA5.5.1.1.2 on the following page outlines the feasible options for Study Area 5, detailing WRZ option references and descriptions, along with SA options and their reference. The SA options are detailed further in Stage 3 of Section SA5.5.3

Table SA5.5.1.1.2 – SA5 Feasible Options

Water Resource Zone Name	Feasible Options SA5			
	No. WRZ Options	Option Code	Option Description	No. SA Options
Ahascragh	2	TG4-SA5-01	Increase GW abstraction for Ahascragh WRZ to supply deficit	2
		TG4-SA5-02	New GW abstraction for Ahascragh WRZ to supply deficit	
Ballinasloe	2	TG4-SA5-17a	Increase abstraction from River Suck	5
		TG4-SA5-20	New wellfield in Ballinasloe to supply the scheme	
Banagher	2	TG4-SA5-80	No deficit. Upgrade Banagher WTP to address WQ issue	N/A
		TG4-SA5-81	No deficit. Upgrade Clontotin BH to address WQ issue	
Kilcormac	3	TG4-SA5-33	Increase GW abstraction to supply deficit in Kilcormac and upgrade WTP	1
		TG4-SA5-34	New GW abstraction to supply deficit in Kilcormac	
		TG4-SA5-35	New SW abstraction to supply deficit in Kilcormac	
Birr/ Kinnitty	5	TG4-SA5-25	Increase abstraction from the R. Camcor and upgrade WTP to supply Birr and Kinnitty	1
		TG4-SA5-26	New GW abstraction to supply Birr and Kinnitty	
		TG4-SA5-55	New riverbank filtration from River Camcor to supply deficit	
		TG4-SA5-57	New SW abstraction from River Little Brosna to supply deficit	
		TG4-SA5-59	Increase GW abstraction at Ballyshane Bridge Borehole, Kinnitty to partly supply deficit	
Clara/ Ferbane	1	TG4-SA5-67	No deficit. Upgrade WTP to address WQ issues.	1
Rahan	5	TG4-SA5-75	No deficit. Upgrade WTP to address WQ issues.	1
Mount Talbot/ Four Roads	1	TG4-SA5-37b	Increase GW abstraction at Mount Talbot Spring to supply deficit	3
South Roscommon (Lisbrock & Killeglan)	3	TG4-SA5-42a	New GW at Killeglan and upgrade of WTP	9
		TG4-SA5-43	New GW at Lisbrock and upgrade of WTP	
		TG4-SA5-45b	Increase SW abstraction from River Suck	
Athlone	7	TG4-SA5-07a	Develop Moate groundwater (3 No. borehole) and transfer water from new WTP at Moate through new pumped watermain to SR in Athlone	5
		TG4-SA5-08	New GW at Athlone Gravels to supply the deficit	

Water Resource Zone Name	Feasible Options SA5			
	No. WRZ Options	Option Code	Option Description	No. SA Options
		TG4-SA5-09a	Upgrade Athlone WTP to 18Ml/d	
		TG4-SA5-11	New riverbank filtration adjacent to River Shannon at Athlone to supply deficit in Athlone WRZ	
		TG4-SA5-13	Large reserve at Mount Temple GWS to supply/partly supply deficit	
		TG4-SA5-14	Gravels at Ballycumber to supply deficit	
		TG4-SA5-15	Upgrade Ballymahon (Abbeyshrule WTP) and interconnect	

SA5.5.2 Preferred Approach Development Process for SA5

The **First Stage** in our Preferred Approach Development Process for SA5 is to compile the feasible options at the WRZ level that best conform with each of the six approach descriptions. For example, the WRZ option/s with the lowest carbon cost would be classified as the Lowest Carbon Approach, based on our comparative outline design. This will generate the WRZ level approach.

The **Second Stage** in our Preferred Approach Development at Study Area level is to assess whether there are any SA options/grouped options/combination that could replace WRZ level approach option/s, to improve the Preferred Approach at Study Area level.

The **Third Stage** in our Preferred Approach Development Process we assess the SA approaches against each other using the 7 Step assessment shown in Figure SA5.5.2.1 through a workshop. Details of the 7 Step assessment are included in Section 8.3.7 of the draft Framework Plan.

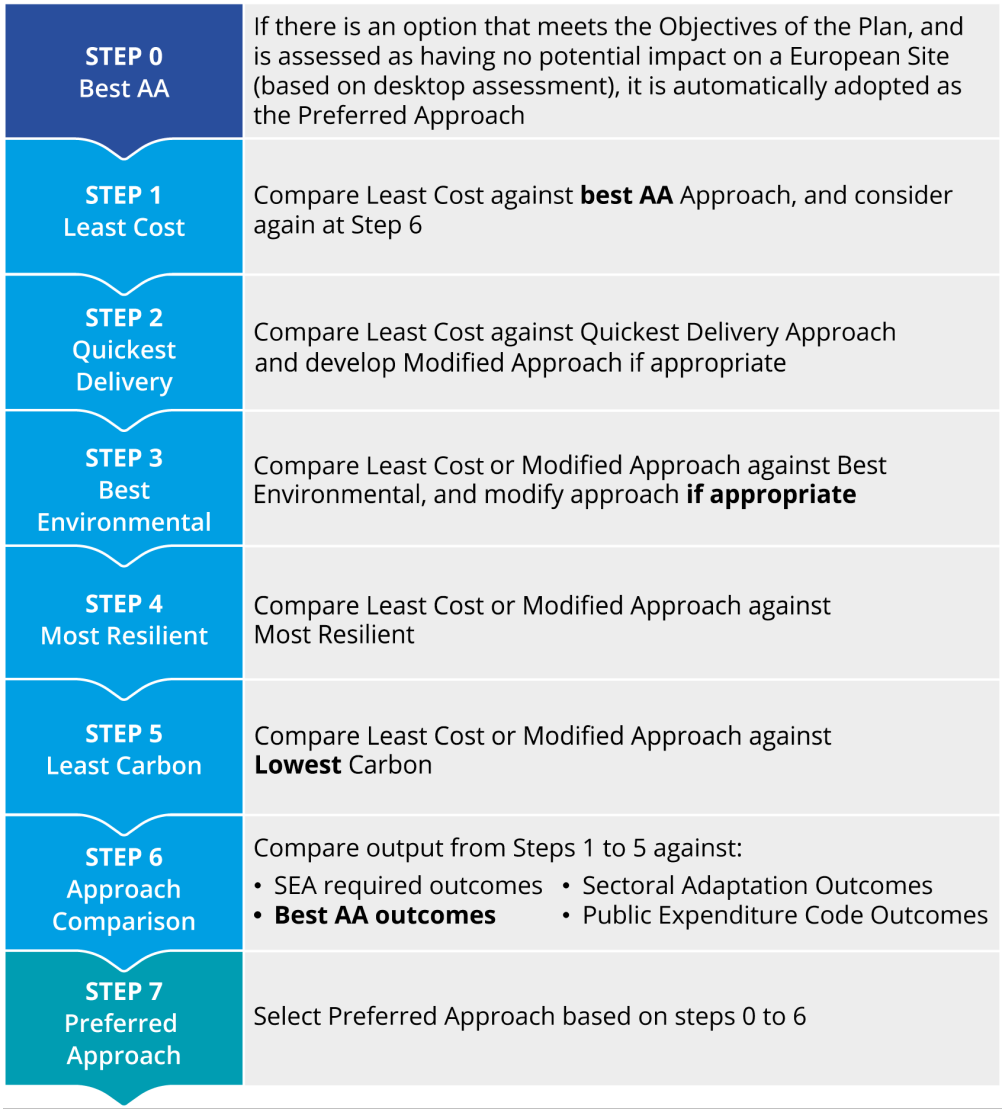


Figure SA5.5.2.1 Preferred Approach Development Process

The overarching rules in terms of Preferred Approach Development are as follows:

- The Preferred Approach must meet the Objectives of the Plan (address the identified need);
- 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 into the WRZ approach at the WRZ level;
- Although the Preferred Approach development process starts with the Least Cost approach, it must consider Environmental Legislation and Government Policy on climate change adaptation and public expenditure; and
  The Preferred Approach at Plan level does not confer any consent to develop a project, nor does it preclude other options being considered at the Project Level.

Approach Development Workshop

In line with the Framework Plan, the Approach Development process uses the professional judgement from the teams involved, which has been recorded as a narrative at each stage, in order to reflect the considerations of the intricacies of the approaches. This has been conducted via workshops involving technical experts including Engineers, Ecologists and Environmental Scientists. The decision-making

process and outcomes have been documented for each Water Resource Zone. These outcomes are incorporated into the Study Area Approach Development workshops to identify a preferred approach for each Study Area. The Preferred Approach outcomes are assessed further (incorporating Regional Options and considering cumulative and in combination effects) for each of the four Regional Water Resources Plans.

SA5.5.3 Preferred Approach Development at Water Resource Zone Level

Stage 1 – Develop Range of Approaches based on WRZ preferred option/s

Table SA5.5.3.1 summarises how the WRZ approach option/s for SA5 align with the Approach Categories for each WRZ. There are a total of 28 feasible options for the 10 WRZs within SA5. The option, or options, that meet the WRZ deficit are compared and those option/s that perform the best under the Least Cost, Quickest Delivery, Best Environmental, Lowest Carbon and/or Most Resilient approach categories are identified.

Table SA5.5.3.1 – SA5 Offaly Roscommon Alignment of WRZ option/s with Approach Categories

Water Resource Zone Name	WRZ option/s SA5 Offaly Roscommon		Approach Categories					
	Option Code	Option Description	Least Cost	Quickest Delivery	Best NIS	Best Environmental	Lowest Carbon	Most Resilient
Ahascragh	TG4-SA5-01	Increase GW abstraction for Ahascragh WRZ to supply deficit	✓	✓	✓	✓	✓	✓
	TG4-SA5-02	New GW abstraction for Ahascragh WRZ to supply deficit	-	-	✓	✓	-	✓
Athlone	TG4-SA5-11	New riverbank filtration adjacent to River Shannon at Athlone to supply deficit in Athlone WRZ	-	-	-	-	-	-
	TG4-SA5-08	New GW at Athlone WRZ - Athlone Gravels to supply the deficit	✓	-	-	-	-	-
	TG4-SA5-07a	Develop Moate groundwater (3 No. borehole) and transfer water from new WTP at Moate through new pumped watermain (17.5km) to SR in Athlone.	-	-	✓	-	✓	-
	TG4-SA5-14	Gravels at Ballycumber to supply deficit	-	-	✓	-	-	-
	TG4-SA5-13	Large reserve at Mount Temple GWS- supply/part supply deficit	-	-	-	✓	-	-
	TG4-SA5-09a	Upgrade Athlone WTP to 18Ml/d	-	-	-	-	-	✓
	TG4-SA5-15	Upgrade Ballymahon (Abbeyshrule WTP) and interconnect	-	✓	-	-	-	-
Ballinasloe	TG4-SA5-20	New wellfield in Ballinasloe to supply the scheme (better quality water anticipated - lower opex costs)	✓	-	✓	-	✓	-
	TG4-SA5-17a	Increase abstraction from River Suck	-	✓	✓	✓	-	✓
Banagher	TG4-SA5-81	No deficit. Upgrade Clontotin BH to address WQ issue	✓	✓	✓	✓	✓	✓
	TG4-SA5-80	No deficit. Upgrade Banagher WTP to address WQ issue	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	WRZ option/s SA5 Offaly Roscommon		Approach Categories					
	Option Code	Option Description	Least Cost	Quickest Delivery	Best NIS	Best Environmental	Lowest Carbon	Most Resilient
Birr/Kinnitty	TG4-SA5-26	New GW abstraction to supply Birr and Kinnity	-	-	✓	-	✓	✓
	TG4-SA5-25	Increase abstraction from the R. Camcor and upgrade WTP to supply Birr and Kinnity	✓	✓	✓	-	-	-
	TG4-SA5-59	Increase GW abstraction at Ballyshane Bridge Borehole, Kinnity (Bredagh groundwater body - productive fissured bedrock) to partly supply deficit	-	-	✓	✓	-	-
	TG4-SA5-55	New riverbank filtration from R. Camcor to supply deficit	-	-	✓	-	-	-
	TG4-SA5-57	New SW abstraction from River Little Brosna to supply deficit	-	-	✓	-	-	✓
Clara/Ferbane	TG4-SA5-67	No deficit. Upgrade WTP to address WQ issues.	✓	✓	✓	✓	✓	✓
Kilcormac	TG4-SA5-35	New SW abstraction to supply deficit in Kilcormac (R. Silver 10% 95 = 1.6M/ld)	✓	✓	✓	-	✓	-
	TG4-SA5-33	Increase GW abstraction to supply deficit in Kilcormac and upgrade WTP.	-	-	✓	✓	-	✓
	TG4-SA5-34	New GW abstraction to supply deficit in Kilcormac	-	-	✓	-	-	✓
Mount Talbot/Four Roads	TG4-SA5-37b	Increase GW abstraction at Mount Talbot Spring to supply deficit	✓	✓	✓	✓	✓	✓
Rahan	TG4-SA5-75	No deficit. Upgrade WTP to address WQ issues.	✓	✓	✓	✓	✓	✓
South Roscommon (Lisbrock & Killeglan)	TG4-SA5-43	New GW at Lisbrock and upgrade of WTP	✓	-	-	✓	✓	✓
	TG4-SA5-45b	Increase SW abstraction from River Suck	-	✓	✓	-	-	-
	TG4-SA5-42a	New GW at Killeglan and upgrade of WTP	-	-	-	-	-	✓

The 7 Step Process outlined in Figure SA5.5.2.1 was applied to each WRZ in SA5, in order to develop a WRZ level approach. A summary of the outcome of this assessment at WRZ level (i.e. WRZ options only) is shown in Table SA5.5.3.2.

The findings of the Preferred Approach Development for SA5 at WRZ level include the following:

- In terms of Best AA, no WRZ options score a 0 (zero) in relation to potential impact on a designated European Site;
- The Best AA approach is identified for 8 of the 10 WRZs and the Best Environmental approach (overall SEA score) is identified in 7 of the 10 WRZs.
    - For Athlone WRZ, the Best Environmental approach is selected as the WRZ approach option/s, over the Best AA. The Best Environmental approach scores significantly better in

terms of the overall SEA criteria and did not score a -3 against biodiversity. The WRZ approach option/s scores significantly better in terms of carbon costs and resilience;

  - The WRZ approach option/s for Ballinasloe and, Birr/Kinnity are the best in terms of AA; however, they do not score the best in terms of overall environmental score. The Best Environmental approach for Ballinasloe scores significantly worse in terms of carbon cost, so the Best AA approach score progressed as the WRZ approach. The Best Environmental approach for Birr/Kinnity did not have significantly more benefits compared with the Best AA approach and was double the cost so the Best AA approach progressed as the WRZ approach option/s;

- Of the 11 WRZ approach options, 2 of these have a -3 score against biodiversity. A -3 Score against biodiversity indicates a potential high risk (without mitigation measures) under the biodiversity criterion for a European Site and for this reason a potential alternative approach must be identified;
  - The WRZ approach option/s for South Roscommon Regional WSS has a -3 score against biodiversity. TG4-SA5-45b has been identified as an alternative at WRZ level, and will be assessed again in Stage 3 at Study Area level; and
  - Mount Talbot Four Roads has a -3 score against biodiversity and has no alternative at WRZ level. An alternative is sought at Study Area or Group level.

The WRZ level approach option/s are outlined in Table SA5.5.3.2 and the options with a -3 score against biodiversity are outlined in red.

Table SA5.5.3.2 – SA5 WRZ Approach Options

Water Resource Zone Name	WRZ Approach Option/s SA5 Offaly Roscommon	Approach Categories					
	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
Ahascragh	Increase GW abstraction for Ahascragh WRZ to supply deficit	✓	✓	✓	✓	✓	✓
Athlone	Large reserve at Mount Temple GWS-supply/part supply deficit	-	-	-	✓	-	-
Ballinasloe	New wellfield in Ballinasloe to supply the scheme (better quality water anticipated - lower OPEX costs)	✓	-	✓	-	✓	-
Banagher	No deficit. Upgrade Clontotin BH to address WQ issue	✓	✓	✓	✓	✓	✓
Banagher	No deficit. Upgrade Banagher WTP to address WQ issue	✓	✓	✓	✓	✓	✓
Birr/Kinnitty	Increase abstraction from the R. Camcor and upgrade WTP to supply Birr and Kinnity	✓	✓	✓	-	-	-
Clara/Ferbane	No deficit. Upgrade WTP to address WQ issues.	✓	✓	✓	✓	✓	✓
Kilcormac	Increase GW abstraction to supply deficit in Kilcormac and upgrade WTP.	-	-	✓	✓	-	✓
Mount Talbot/Four Roads	Increase GW abstraction at Mount Talbot Spring to supply deficit	✓	✓	✓	✓	✓	✓
Rahan	No deficit. Upgrade WTP to address WQ issues.	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	WRZ Approach Option/s SA5 Offaly Roscommon	Approach Categories					
	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
South Roscommon (Lisbrock & Killeglan)	New GW at Lisbrock and upgrade of WTP	✓	-	-	✓	✓	✓

Stage 2 - Preferred Approach Development at the Study Area Level

The Second Stage of our Approach Development Process involves identifying whether improvements can be made to the WRZ level approach option/s (Stage 1) based on consideration of any SA options/grouped options/combination. In SA5, 11 SA grouped options were identified as listed in Table SA5.5.3.3 below.

Table SA5.5.3.3 – SA5 Grouped options

SA5 Offaly Roscommon - SA grouped options	
Water Resource Zone	**Option Description**
Athlone Ballinasloe South Roscommon (Lisbrock & Killeglan)	Interconnect South Roscommon (Lisbrock & Killeglan), Athlone and Ballinasloe to supply deficits and increase resilience of WRZs (SA Grouped Option 1)
Ballinasloe Mount Talbot/Four Roads South Roscommon (Lisbrock & Killeglan)	Supply deficit from Ballinasloe (River Suck) and interconnect South Roscommon (Lisbrock & Killeglan) (existing links) Increase SW abstraction from River Suck, upgrade WTP at Ballinasloe and supply deficit at Mount Talbot (SA Grouped Option 2)
Athlone South Roscommon (Lisbrock & Killeglan)	Develop Moate groundwater (3 No. borehole) and transfer water from new WTP at Moate through new pumped watermain to SR in Athlone. (SA Grouped Option 3)
Mount Talbot/Four Roads South Roscommon (Lisbrock & Killeglan)	Interconnect Mount Talbot/Four Roads with South Roscommon (Lisbrock & Killeglan) and supply deficit from new GW at South Roscommon (Lisbrock & Killeglan) (SA Grouped Option 5)
Ballinasloe South Roscommon (Lisbrock & Killeglan)	Supply deficit from Ballinasloe (River Suck) and interconnect South Roscommon (Lisbrock & Killeglan) (SA Grouped Option 8)
Athlone South Roscommon (Lisbrock & Killeglan)	Upgrade Athlone WTP to 18M/ld and supply deficit to the east of South Roscommon via new watermain, connecting into existing 400mm (SA Grouped Option 9)
Athlone South Roscommon (Lisbrock & Killeglan)	New GW at South Roscommon (Lisbrock & Killeglan) WRZ to supply deficit in Athlone & South Roscommon (Lisbrock & Killeglan) (SA Grouped Option 10)
Mount Talbot/Four Roads South Roscommon (Lisbrock & Killeglan)	Increase GW abstraction at Mount Talbot Spring to supply deficit (SA Grouped Option 12)
Ahascragh Ballinasloe	Increase SW abstraction on River Suck to supply deficit and interconnect existing links (SA Grouped Option 14)

SA5 Offaly Roscommon - SA grouped options	
Water Resource Zone	**Option Description**
Ahascragh	New GW at Killeglan and upgrade of WTP. Rationalise Ahascragh to South Roscommon (Lisbrock & Killeglan) (SA Grouped Option 15)
South Roscommon (Lisbrock & Killeglan)	
Athlone	Interconnection of Athlone, Ballinasloe, Kilcormac, Birr/Kinnitty, Clara/Ferbane and Rahan (SA Grouped Option 16)
Ballinasloe	
Kilcormac	
Birr/Kinnitty	
Clara/Ferbane	
Rahan	

The 11 SA grouped options result in 13 SA combinations that are compared against the WRZ level approach, identified at Stage 1.

The WRZ approach and the 13 SA combinations are summarised in Table SA5.5.3.4 in terms of the types of options within each combination and then how the combinations are ranked based on the MCA scores against each Approach category.

Table SA5.5.3.4 – SA5 Combinations Options Summary

Key	
○	WRZ Approach Option
□	SA Grouped Option

Ranked order (best to worst)	Best													Worst

WRZ	WRZ approach options	SA combination 0 (SA grouped option 1) - Deficit not Met	SA combination 1 (SA grouped option 2)	SA combination 2 (SA grouped option 3)	SA combination 3 (SA grouped option 5)	SA combination 4 (SA grouped option 8)	SA combination 5 (SA grouped option 9)	SA combination 6 (SA grouped option 10)	SA combination 7 (SA grouped option 12)	SA combination 8 (SA grouped option 14)	SA combination 9 (SA grouped option 15)	SA combination 10 (SA grouped option 16)	SA combination 11 (SA grouped option 12 & 14)	SA combination 12 (SA grouped option 15 & 16)
Ahascragh	○	○	○	○	○	○	○	○	○	□	□	○	□	□
Athlone	○	□	□	□	○	○	□	□	○	○	○	□	○	□
Ballinasloe	○	□	□	○	○	□	○	○	○	□	○	□	□	□
Banagher	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Birr/Kinnitty	○	○	○	○	○	○	○	○	○	○	○	□	○	□
Clara/Ferbane	○	○	○	○	○	○	○	○	○	○	○	□	○	□
Kilcormac	○	○	○	○	○	○	○	○	○	○	○	□	○	□
Mount Talbot/Four Roads	○	○	□	○	□	○	○	○	□	○	○	○	□	○
Rahan	○	○	○	○	○	○	○	○	○	○	○	□	○	□
South Roscommon (Lisbrock & Killeglan)	○	□	□	□	□	□	□	□	□	○	□	○	□	□

WRZ	WRZ approach options	SA combination 0 (SA grouped option 1) - Deficit not Met	SA combination 1 (SA grouped option 2)	SA combination 2 (SA grouped option 3)	SA combination 3 (SA grouped option 5)	SA combination 4 (SA grouped option 8)	SA combination 5 (SA grouped option 9)	SA combination 6 (SA grouped option 10)	SA combination 7 (SA grouped option 12)	SA combination 8 (SA grouped option 14)	SA combination 9 (SA grouped option 15)	SA combination 10 (SA grouped option 16)	SA combination 11 (SA grouped option 12 & 14)	SA combination 12 (SA grouped option 15 & 16)
Approaches														
Least Cost		Best					Next Best							Worst
Quickest Delivery	Worst													Best
Best AA *no. of -3 scores against biodiversity	2 No. -3 scores	2 No. -3 scores	0 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	2 No. -3 scores	2 No. -3 scores	1 No. -3 scores	2 No. -3 scores	2 No. -3 scores	2 No. -3 scores	1 No. -3 scores	2 No. -3 scores
Lowest Carbon		Best						Next Best						Worst
Most Resilient				Worst										Best
Best Environmental			Best											Worst

Stage 3 – Comparison of Study Area Approaches

The 14 SA combinations in Table SA5.5.3.4 are assessed against each other to identify if any improvements can be made to the WRZ approach option/s.

As summarised in Table SA5.5.3.5, SA combinations 1, 4, 5, 6 and 12 are the best SA combinations, when aligned with the Plan approaches. We therefore assess these in detail against the WRZ level approach option/s. SA combination 0, including SA grouped option 1 is the Least Cost approach in Table SA5.5.2.2.4, however, this is a resilience option only and requires another option to meet the deficit. For this reason, SA combination 5, including SA grouped option 9, is the Least Cost approach that can meet the full deficit across the Study Area.

Table SA5.5.3.5 – SA5 Best Combinations aligned with Plan Approaches

Approach Categories	Best Performing Combination	Stage 3 Approach
Least Cost (LCo)	SA combination 5 (includes SA grouped option 9)	SA Approach 1
Best Environmental (BE)	SA combination 1 (includes SA grouped option 2)	SA Approach 2
Quickest Delivery (QD)	SA combination 12 (includes SA grouped option 15 & 16)	SA Approach 3
Most Resilient (MR)	SA combination 12 (includes SA grouped option 15 & 16)	SA Approach 3
Lowest Carbon (LC)	SA combination 6 (includes SA grouped option 10)	SA Approach 4
Best AA (BA)	SA combination 1 (includes SA grouped option 2)	SA Approach 2

The MCA assessment included the following assessment criteria:

- Resilience;
- Deliverability and Flexibility;
- Progressibility; and
  Sustainability (Environmental and Social Impacts).

The NPV Costs are based on four criteria:

- Capital Costs – the cost to construct the option, including all overheads, consent and land acquisition costs;
- Operational Costs – the whole life cost to operate the option, including operators, chemical requirements and energy requirements including pumping;
- Carbon Costs – the whole life embodied and operational Carbon costs of the option; and
- Environmental and Social – the whole life Environmental and Social cost of the option covering climate regulation, traffic disruption and food production (carbon emissions are covered separately in the bullet point above).

The wider range of costs used in the estimation of the NPV aligns our Plan with any future Project Level Cost Benefit Analysis, in accordance with the Public Expenditure Code.

In terms of NPV Cost, SA Approach 1 (LCo) has the lowest NPV Cost, as shown in Figure SA5.5.3.2, with the lowest capital costs (CAPEX) over the solution's lifetime. While SA Approach 3 (QD, MR) has the lowest operational costs, this is not significantly better than SA Approach 1 and overall capital costs are 3 times greater. SA Approach 4 (LC) has the lowest carbon cost; however, SA Approach 1 is within 2% of this.

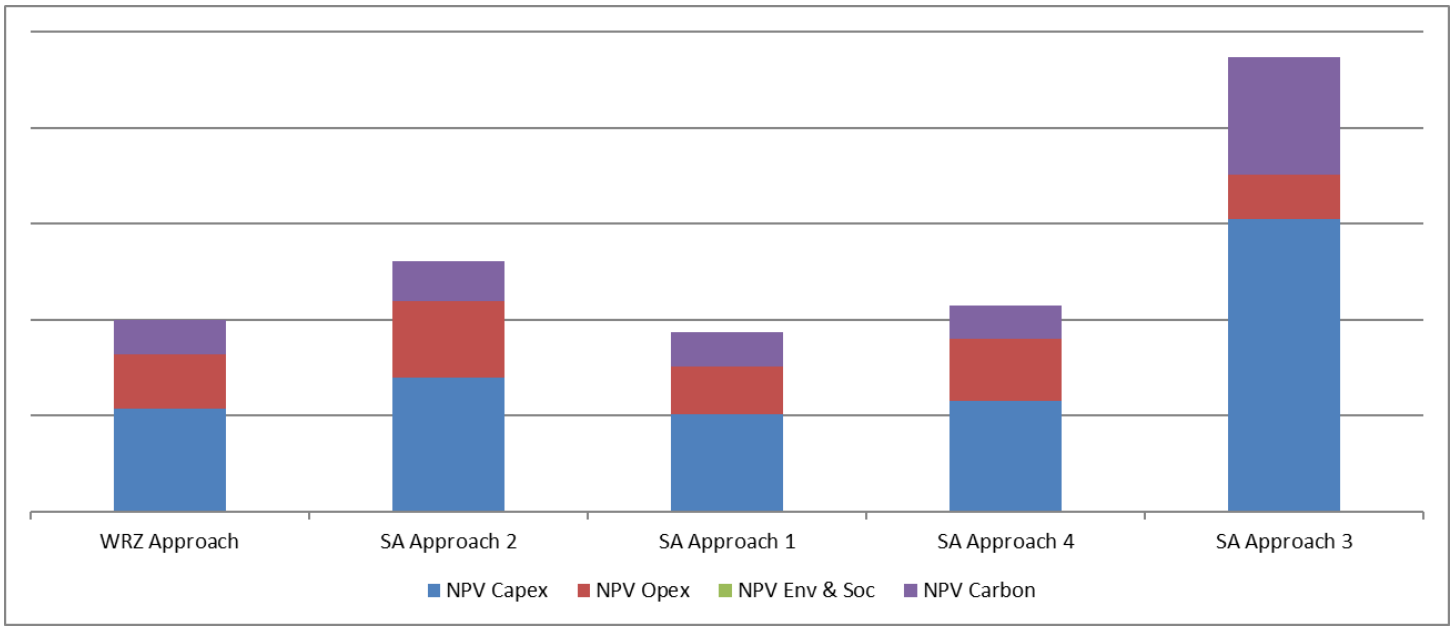


Figure SA5.5.3.1 SA5 NPV Costs for WRZ Approach and SA approaches

SA5.5.4 Study Area Preferred Approach Summary

Figure SA5.5.4.1 shows a Radar Plot of the combined comparative NPV Cost scores and MCA scores for the WRZ level approach options and the four SA approaches. This is used to illustrate the approaches considered following the analysis and comparison. In the radar plot a higher score is more favourable, and the option that takes up the largest area on the plot is the best option in terms of all criteria.

As can be seen in Figure SA5.5.4.1, at a SA level, SA Approach 1 has the best score in terms of cost, with little difference in MCA scores, on average, across most approaches.

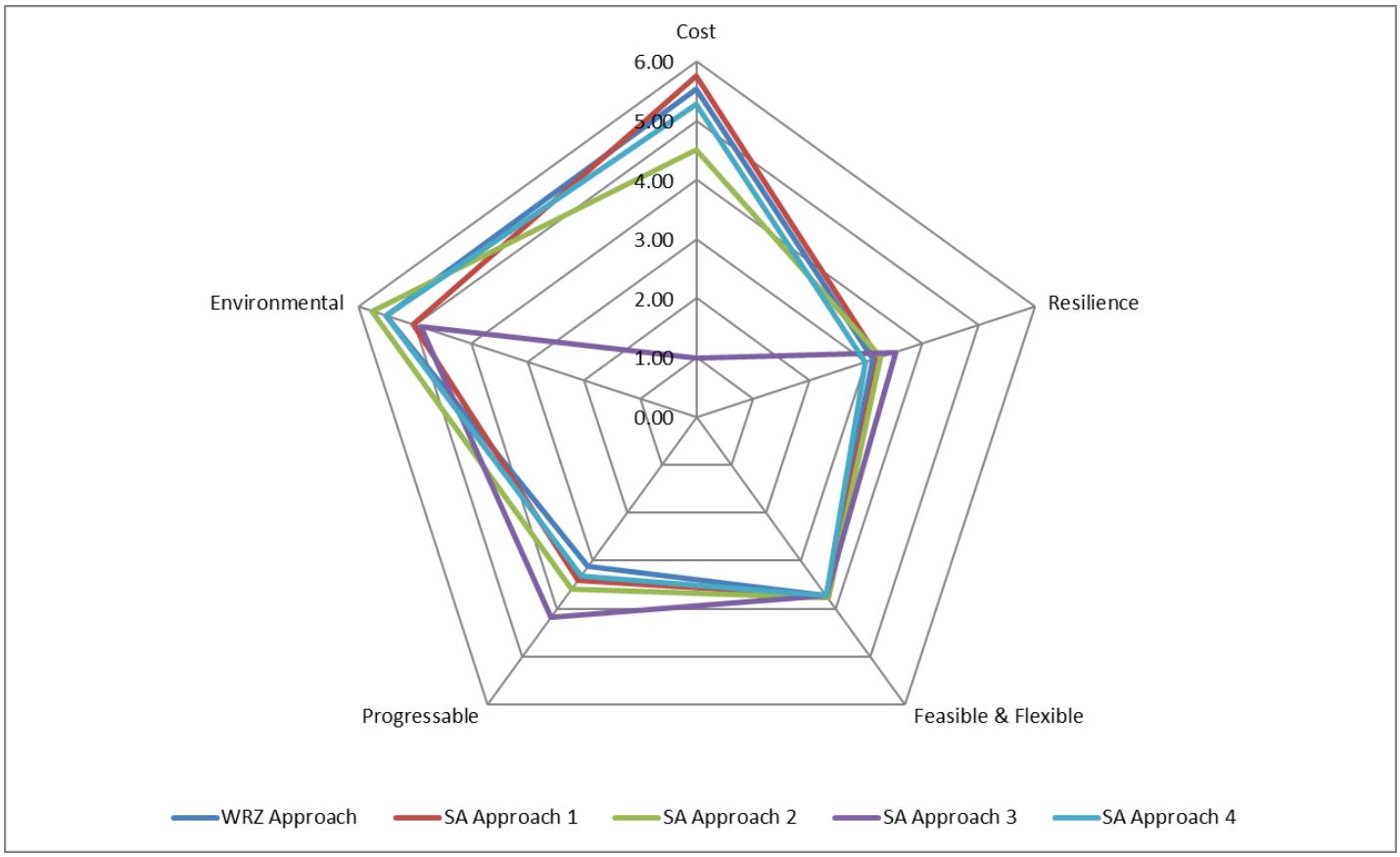


Figure SA5.5.4.1 SA5 Radar Plot for WRZ Approach and SA Approaches 1, 2, 3 and 4

SA Approach 1 (LCo) selected as the Preferred Approach for Study Area 5 and is quite similar in area to the Best Environmental approach (SA Approach 2 (BE, BA) although significantly lower cost, and also similar to the Most Resilient approach (SA Approach 4 MR) and WRZ approach. SA Approach 4 (LC) is performs overall much worse on cost and other environmental criteria.

The Preferred Approach (SA Approach 1) comprised the options listed in Table SA5.5.4.1.

Table SA5.5.4.1 – Preferred Approach for Study Area 5

WRZ ID	WRZ Name	Option Description
1200SC0005	Ahascragh	Increase GW abstraction for Ahascragh WRZ to supply deficit
3200SC0002	Athlone	SA grouped option 9 - Increase abstraction and upgrade Athlone WTP
1200SC0006	Ballinasloe	New wellfield in Ballinasloe to supply the scheme (better quality water anticipated - lower opex costs)
2500SC0001	Banagher	1) No deficit. Upgrade Banagher WTP to address WQ issue. 2) No deficit. Upgrade Clontotin BH to address WQ issue
2500SC0015	Birr/Kinnitty	Increase abstraction from the R. Camcor and upgrade WTP to supply Birr and Kinnity
2500SC0016	Clara/Ferbane	No deficit. Upgrade WTP to address WQ issues

WRZ ID	WRZ Name	Option Description
2500SC0003	Kilcormac	Increase GW abstraction to supply deficit in Kilcormac and upgrade WTP.
2600SC0001	Mount Talbot/Four Roads	Increase GW abstraction at Mount Talbot Spring to supply deficit
2500SC0017	Rahan	No deficit. Upgrade WTP to address WQ issues
2600SC0006	South Roscommon (Lisbrock & Killeglan)	SA grouped option 9 - Upgrade Athlone WTP and supply deficit to the east of South Roscommon

The Preferred Approach (SA Approach 1) is shown schematically in Figure SA5.5.4.2.

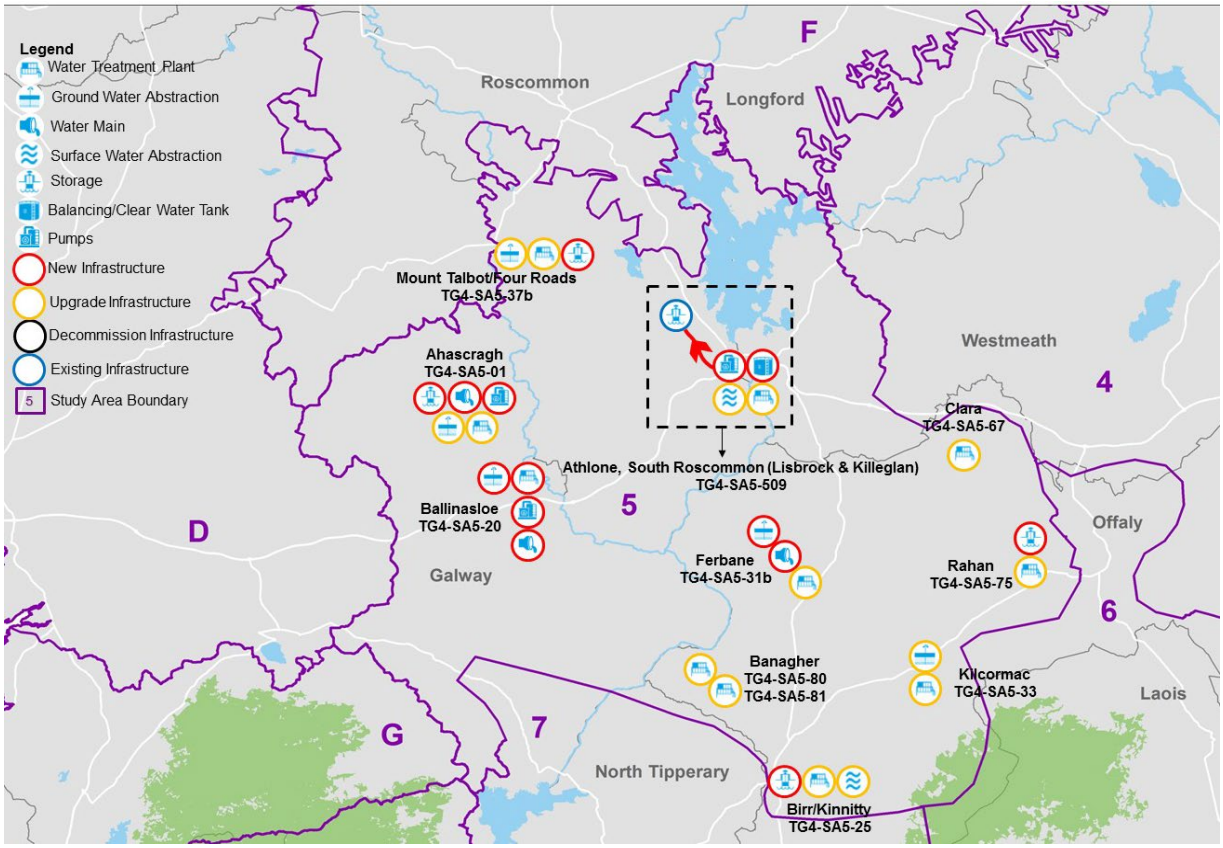


Figure SA5.5.4.2 SA5 Preferred Approach

Before we adopt this approach at Plan level for Study Area 5, we must give consideration to the following:

- **Interim Solutions:** Based on the scale of need identified across all 539 WRZs, it is likely that it may take 5-10 investment cycles before we address all issues with the existing water supplies. Therefore, small localised options may be required on an interim basis to secure priority need in existing supplies until the SA Preferred Approach can be delivered;
- **Sensitivity Analysis:** When planning for water supplies over a medium to long term horizon, we must give consideration to adaptability of our plan to change across a range of futures (for example, what if changes to technology allow us to reduce leakage beyond SELL, even in small

WRZs or what if we are unable to secure a licence in the medium term to abstract the quantity water currently allowed for at a given location); and

- **Alternative options for WRZs with a -3 Score against biodiversity:** As part of the SA Preferred Approach, a SA grouped option and a WRZ option which score -3 against biodiversity have been identified for Athlone and Mount Talbot/Four Roads. The Best Environmental and Best AA approach has been identified as an alternative for Athlone and Mount Talbot/ Four Roads which will be considered at project level if required.

SA5.6

Preferred Plan Constraints – Interim Solutions

SA5.6 Preferred Plan Constraints – Interim Solutions

As many of our smaller WTPs were not designed or developed in a way that can guarantee continuous compliance with Drinking Water Regulations, these supplies can have intermittent water quality risk. As it will take many investment cycles to deliver the Preferred Approach across all WRZs, Irish Water must have a means to effectively react to emergency or unplanned issues across our supplies, on a short to medium term basis, while we deliver our Preferred Approaches.

On this basis, interim short term capital maintenance solutions have been identified for the small WRZs with a capacity of less than 2,000 m^3/d. These small containerised solutions are only utilised in the event of a potential public health issue or severe drought.

- For groundwater sites, the interim solution would provide for refurbishment of existing or development of new boreholes and borehole pumps, and the addition of containerised pressure filtration and UV disinfection at the site (if required); and
- For surface water sites, the interim option would provide for the addition of pressure filtration and UV disinfection to the site.

For comparative purposes across all of the Study Areas, an NPV cost has been calculated for the interim solutions, assuming a uniform commencement year and operational period. Carbon costing is included, but site specific E&S costs have not been determined. E&S costs are likely to be minimal as the interim options are modest upgrades to existing smaller WTPs. The potential interim solutions for the SA5 Offaly Roscommon supplies are summarised in Figure SA5.6.1 and Table SA5.6.1.

Any interim solutions will only be progressed on the basis of urgent or priority need (such as inclusion on the EPA Remedial Action List) to address water quality risk and supply reliability. The Regional Plan does not confer funding availability and any interim measures will be subject to budget availability and Appropriate Assessment Screening and relevant consents in the normal way. These solutions, in most cases, will only be used for emergency response to allow time to deliver the longer term solution. As such, they are considered “no regrets” infrastructure investment.

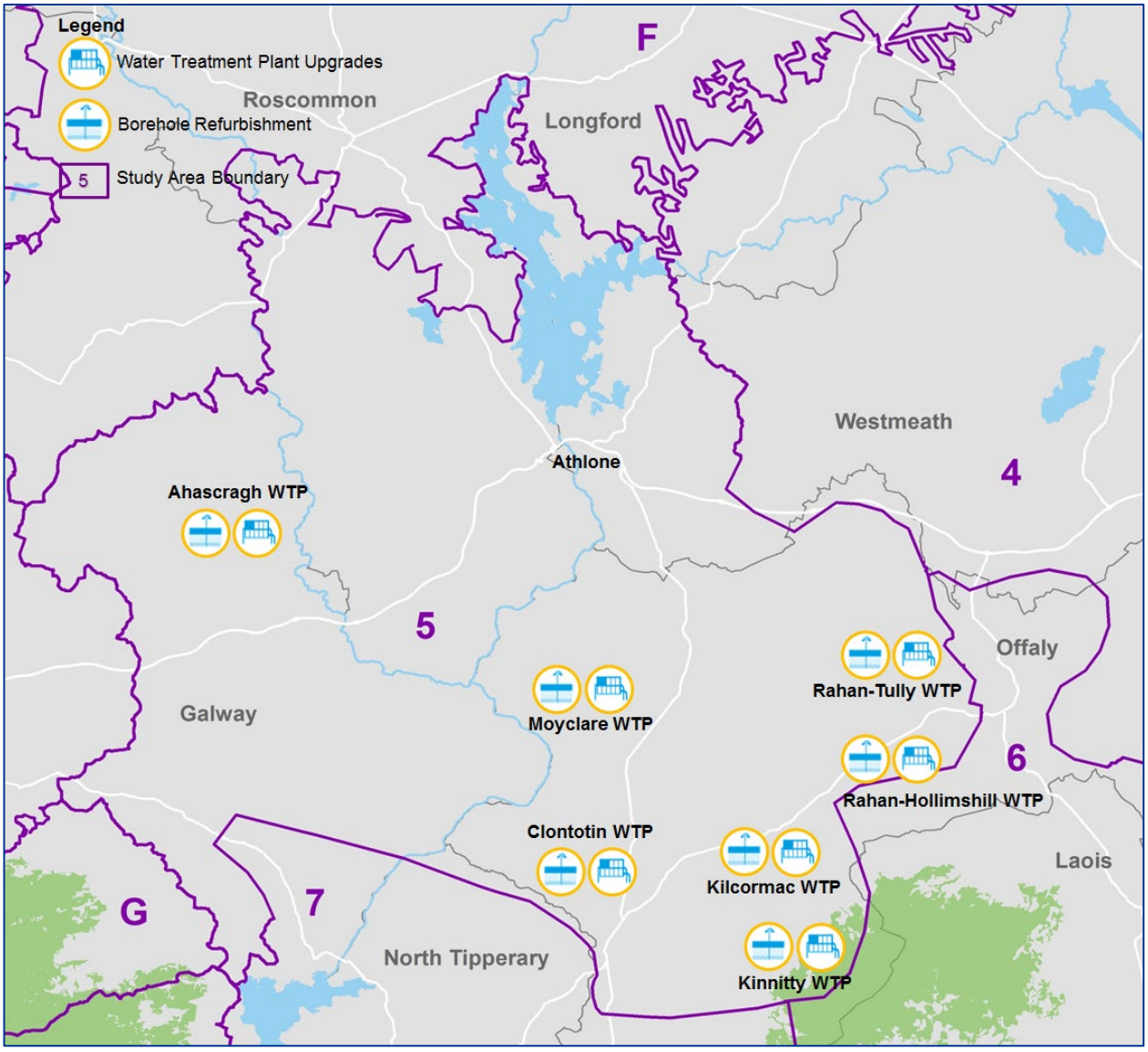


Figure SA5.6.1 SA5 Interim Options

Table SA5.6.1 – SA5 Interim Options

WTP Name	Interim Option	Implementation Year	WTP Capacity (m^3/d)
Ahascragh WTP	Refurb borehole, new pressure filter and UV, up to 2,000m^3/d.	2024	1600
Clontotin BH	Refurb borehole, new pressure filter and UV, up to 2,000m^3/d.	2024	1000
Moyclare WTP	Refurb borehole, new pressure filter and UV, up to 200m^3/d.	2024	150
Kilcormac WTP	Refurb borehole, new pressure filter and UV, up to 1,000m^3/d.	2024	600
Kinnitty WTP	Refurb borehole, new pressure filter and UV, up to 500m^3/d.	2024	300
Rahan - Holmshill WTP (BH)	Refurb borehole, new pressure filter and UV, up to 1,000m^3/d.	2024	600
Rahan - Tully WTP (Tully Boreholes x 2)	Refurb borehole, new pressure filter and UV, up to 1,000m^3/d.	2024	600

SA5.7

Preferred Approach – Sensitivity Analysis

SA5.7 Preferred Approach – Sensitivity Analysis

Our supply demand forecast and water quality barrier deficit assessments have been developed using the application of best practice methods within the data available. We have identified areas where we will focus improvements in data to improve the certainty of our forecasts. However, all long-term forecasts are subject to uncertainty. We have explored the sensitivity of our supply and demand forecasts to some of the key factors which influence them through a range of scenarios. This enables us to test the sensitivity of the Preferred Approach to changes in need, in order to ensure that our decision making is robust and that the approach is adaptable. We describe the factors which we have considered in Chapter 8 of the draft Framework Plan. In summary we test our Preferred Approach against the following questions:

1. What if the deployable output across our supplies is reduced based on sustainability limits within the new legislation on abstraction resulting in a larger supply demand balance deficit?
2. What if climate change impacts on our existing supplies are greater than anticipated?
3. What if our forecasts are too great and expected demand growth does not materialise resulting in a smaller supply demand balance deficit?
4. What if we are able to reduce leakage below SELL within the timeframe of the plan resulting in lower Needs?
5. What if we fail to achieve our leakage targets?

A summary of the adaptability criteria and analysis we have undertaken for SA5 is shown in Table SA5.7.1.

Table SA5.7.1 – Sensitivity Analysis for SA5

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Impact on SA Preferred Approach
Sustainability	Moderate	+197 m^3/d	**The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the SDB deficit**. Our outline sustainability assessments would mean a potential increase in deficit for SA5 based on reductions in the sustainable abstraction amounts from the Gageborough River (197 m^3/day), affecting the Clara Ferbane WRZ. As this WRZ currently shows no deficit feasible options would have to be considered, if a sustainability issue is confirmed for the Gageborough River. Based on this scenario, a Preferred Approach would have to be determined for the Clara Ferbane WRZ.
Climate Change	High (international climate change targets have not been met)	+1 Ml/d	**Higher climate change scenarios would impact our 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 against by optimizing our operations on a more environmentally sustainable basis across the range of supplies. Based on this scenario, the SA Preferred Approach remains the optimal solution.

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Impact on SA Preferred Approach
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 10 individual water resource zones and is driven by quality as well as quantity issues. In this rural area, growth is relatively low. However, there are large growth centres such as Carlow Town and Portlaoise.
			Based on this scenario, the SA Preferred Approach remains the optimal solution.
Leakage Targets	Moderate (the distribution network in the region is extensive at approximately 1,100 kilometres)	+3,790 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 our networks, we 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 of approximately 3.8Ml/d across SA5 WRZs, as opposed to accepting lower targets.
			Based on this scenario, the SA Preferred Approach remains the optimal solution.
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-200 m^3/d	**Increased leakage savings beyond SELL would reduce the SDB deficit and the overall need requirement.** The need drivers in SA5 Offaly Roscommon are across all 10 water resource zones and are driven by quality as well as availability issues. Therefore, the SA Preferred Approach is required, even accounting for increased leakage savings.
			Based on this scenario, the SA Preferred Approach remains as the optimal solution.

In reality, a combination of these scenarios may occur together. For example, growth in demand might be lower if we achieve greater leakage reductions. However, if this coincided with a reduction in permitted abstraction volume under the abstraction licensing regime, the reduction in demand may offset some or all of the loss in supply availability due to abstraction sustainability reductions.

Based on the sensitivity assessment, the Interim and Preferred Approaches perform as follows:

- Interim Approach – As the purpose of the Interim Approach is to allow for emergency works for priority Quality and Quantity issues, the solutions will have a limited design life (usually less than 10 years). They allow time to assess the Preferred Approach and improve adaptability within our Plan; and
- Preferred Approach – The supplies in SA5 vary in size with a large number of small WRZs <1M/ld as well as large growth areas such as Athlone. The majority of preferred options look to expand existing surface water and groundwater supplies which will require further investigation at project level. However, the Preferred Approach grouped option for Athlone and South Roscommon RWSS propose increased abstraction at Lough Ree and improved interconnection between the 2 WRZs. This grouped option could provide scope for future connections to other WRZs. Our Preferred Approach is therefore adaptable.

In summary, our sensitivity assessment of the Interim and Preferred Approaches demonstrates that they are both highly adaptable to a range of futures, and therefore represent 'no regrets' infrastructure.

The Preferred Approaches for Athlone and Mount Talbot score -3 against biodiversity, which indicates a high risk under the biodiversity criterion for a European Site. This risk will be further investigated at

Project level. If at the project level it is determined that the risk cannot be mitigated, alternative feasible options for these WRZs will need to be considered.

SA5.8

Summary SA5

SA5.8 Summary SA5

The Preferred Approach for SA5 (summarised in Table SA5.5.4.1and Figure SA5.5.4.2 of Section SA5.5) consists of Local WRZ supplies for all of the WRZs in the Study Area, primarily driven by the small scale of the supplies and difficulties in transporting small volumes of water over long distances.

The Preferred Approach for two of the larger demand areas, Athlone and South Roscommon RWSS, involves increasing the existing abstraction on the River Shannon at Lough Ree and improving the interconnection between these two neighbouring WRZs. The Preferred Approach for the remaining WRZs involves new and increased groundwater abstractions, along with increased surface water abstractions.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience. The Preferred Approach for SA5 also includes for demand side (**Lose Less** and **Use Less**) measures, including:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset NRR;
- Net leakage reduction in Ahascragh, Ballinasloe, Rahan and Athlone WRZ, amounting to 3,790 m^3/day (applied to SDB Deficit) to move towards achieving the National SELL Target by 2034;
- Ongoing Water Conservation Messaging; and
- The option to implement legally enforceable Water Conservation Orders in drought periods in order to protect the environment and our public water supplies.

As part of our Preferred Approach we have also identified a range of interim emergency solutions for SA5, as summarised in Figure SA5.6.1 and Table SA5.6.1 in Section SA5.6. The measures will only be progressed in the event of critical need and/or public health impact and to allow time for delivery of the required Preferred Approach solutions in the Study Area.