Autumn 2022

Regional Water Resources Plan – Eastern and Midlands

Appendix 2 Study Area 2 Technical Report

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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.

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 – Study Area 2

This is the Technical Report for Study Area 2 which applies the Options Assessment Methodology, as set out in the National Water Resources Plan Framework Plan (NWRP-FP), the final version of which was reviewed by the authors of this Technical Report Prior to finalisation of this Technical Report. This document should be reviewed in conjunction with the Framework Plan and the Regional Water Resources Plan – Eastern and Midlands (RWRP-EM), which explain key concepts and terminology used throughout the report.

This Study Area includes 12 water resource zones located in County Wicklow and County Carlow. This 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.

The Preferred Approach for this Study Area feeds into the regional Preferred Approach detailed in the RWRP-EM.

1.1 Summary of Our Options Assessment Methodology

In Chapter 8 of the 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 objective of these solutions is to resolve the needs identified through the Supply Demand Balance (SDB), Water Quality, Reliability and Sustainability assessments. These needs will be discussed in further detail in this report. In the RWRP-EM, we apply this methodology to the Eastern Midlands Region shown in Figure 1.1.

As outlined in Section 1.9.4 of the Framework Plan, the regional boundaries have been delineated for the purpose of delivering the National Water Resources Plan. As a national plan sources outside the delivery region may be considered to meet need within a particular region.

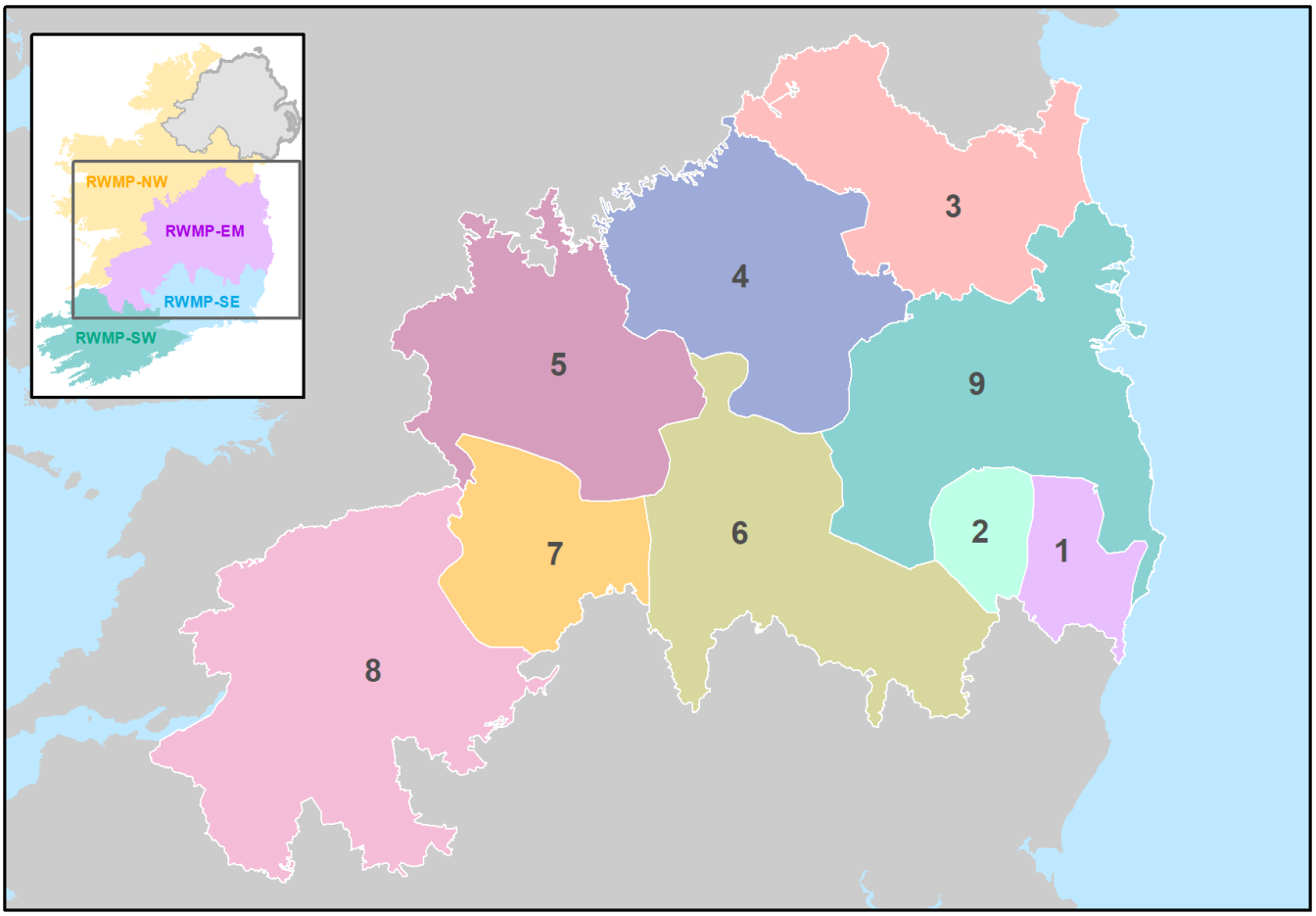

Figure 1.1 Overview of Study Areas within the Eastern and Midlands Region.

This Technical Report is for Study Area 2 (SA2), which consists of 12 individual water resource zones (WRZs). Within this Study Area, the Preferred Approach has been developed following the process shown in Figure 1.2.

In this document, Option codes are labelled using the following naming convention: SAX-00X

- SAX refers to the Study Area within which the option is located.
- 00X refers to the individual option number.
- Any references to TG4 refers the Eastern and Midlands Region (Regional Group 4).

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 (National Water Resource Planning) Framework. Any projects that are progressed following this plan will require individual environmental assessments, including Environmental Impact Assessment and Appropriate Assessment (as required), in support of planning applications (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions). Any such applications will also be subject to public consultation.

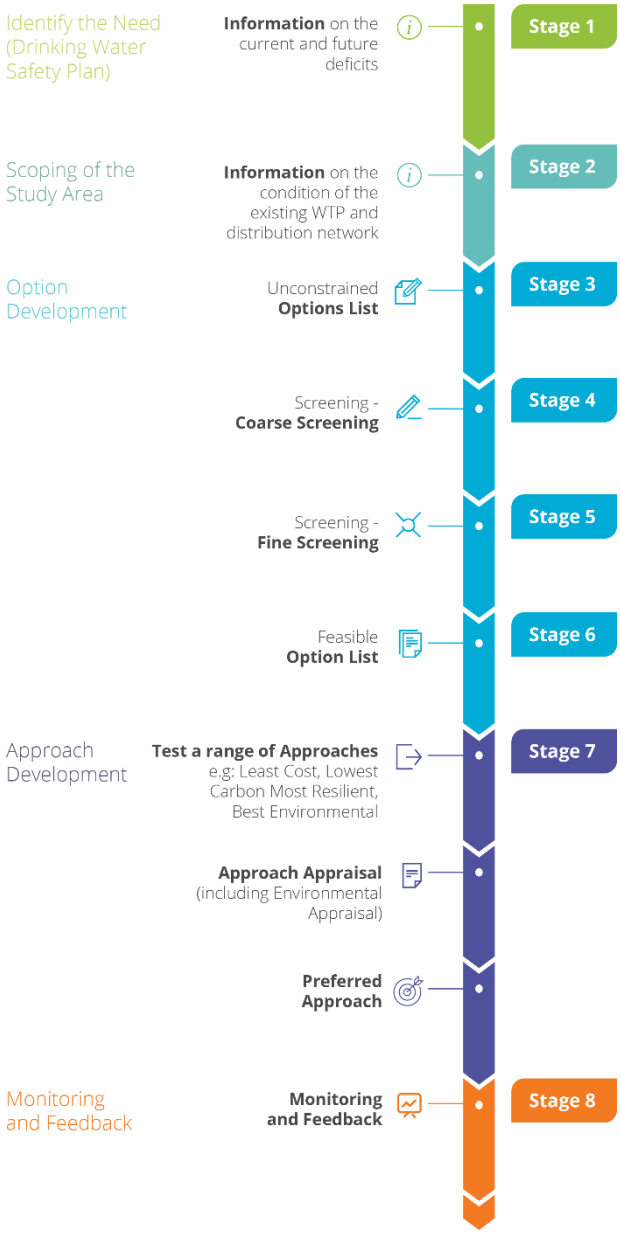

Figure 1.2 Option Assessment Methodology Process

1.2 Introduction to the Study Area

The West Wicklow Area extends south from Ballymore Eustace Town and environs to the north western area of County Carlow. It consists of small settlements, served by local water supplies. The sources of water include 11 groundwater sources and 1 river abstraction. The Study Area is summarised in Figure 1.3 and Table 1.1.

Due to the underlying granitic and schist geologies, the drainage of the Wicklow Mountains in SA2 gives good surface water availability from the rejected recharge of often heavy rainfall. The large River Slaney catchment basin rises in the West Wicklow Mountains and drains south through the study area. The area also contains part of the upper catchment of the River Liffey which includes Poulaphuca Reservoir – the main water supply source for the Greater Dublin Area (SA9).

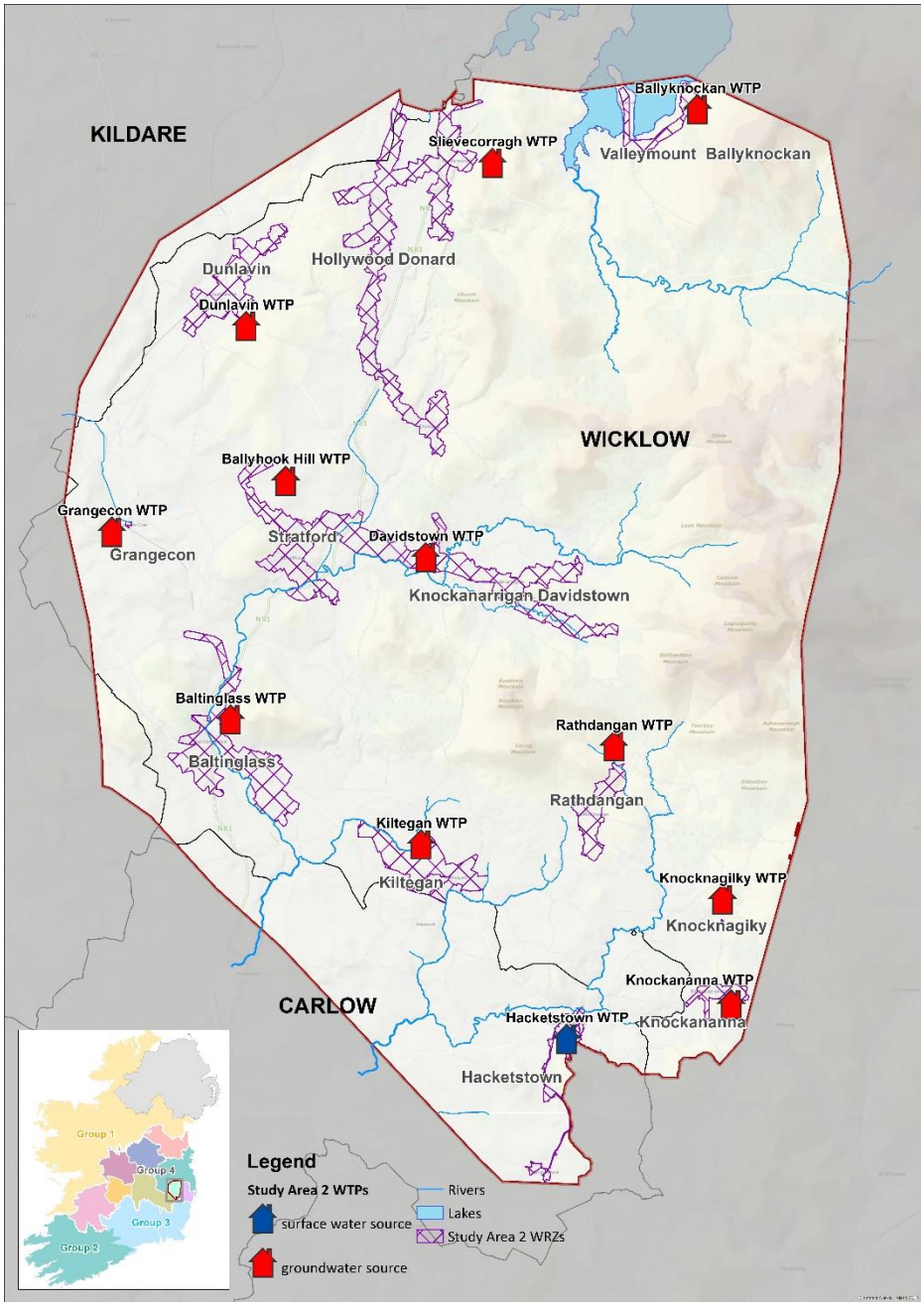

Figure 1.3 SA2 West Wicklow Water Supply Study Area

The one current surface water source in SA2 is a relatively small abstraction from the River Derreen, a main tributary of the Slaney, that serves Hacketstown Public Water Supply. Within the study area almost the entire Slaney watercourse and its main tributaries have been designated as part of the Slaney River Valley SAC and have also been classified as *Margaritifera* (Freshwater Pearl Mussel) Sensitive Area by the National Parks and Wildlife Service (NPWS). The water body is designated as “High Status” within the River Basin Management Plan.

The hills and mountains in west Wicklow reflect the granite underlying geology, and older Ordovician and Silurian metamorphic rocks adjacent to Carlow. The entire region is considered to be of poorly productive aquifer status, and much of the bedrock geology is classed as a Locally Important Aquifer/ or Poor Aquifer.

Overall, the 11 groundwater sources managed by Irish Water abstract relatively small volumes of between 1m^3/d to 680m^3/d. Due to relatively low volumetric requirements within the smaller water resource zones in SA2, these groundwater sources can be sufficient to meet average local needs.

The population within SA2 West Wicklow is approximately 6,840 people, served via 12 water supplies and 135 kilometres of distribution network.

Table 1.1 also provides an overview of the risk of failure against the Quality, Quantity, Reliability, Potential Sustainability criteria. A further breakdown of these scores is provided in Section 2.

Table 1.1 SA2 Study Area Summary

West Wicklow	Total Population	6,840	Total Network Length (km)	135	Number of Water Resource Zones	12
Counties in Study Area	Carlow, Wicklow					
Principal Settlements	Baltinglass,Dunlavin,Donard,Hacketstown,Stratford,Ballyknockan,Knockananna					
Number of Water Sources	12	Surface Water Sources	1	Groundwater Sources	11	

Water Treatment Plant	Source	Population	WTP Capacity (m^3/day)	Quality	Quantity	Reliability	Potential Sustainability
Knocknagilky WTP	Groundwater	1	1	●	●	●	●
Davidstown WTP	Groundwater	225	160	●	●	●	●
Grangecon WTP	Groundwater	51	79	●	●	●	●
Knockananna WTP	Multiple Groundwater	211	144	●	●	●	●
Rathdangan WTP	Groundwater	130	96	●	●	●	●
Kiltegan Pump Station WTP	Groundwater	286	201	●	●	●	●
Ballyhook Hill WTP	Groundwater	582	249	●	●	●	●
Ballyknockan WTP	Groundwater	392	207	●	●	●	●
Slievecorragh WTP	Groundwater	907	456	●	●	●	●

Dunlavin WTP	Spring	975	255	●	●	○	●
Baltinglass WTP	Multiple Groundwater	2,470	680	◉	●	○	●
Hacketstown WTP	Derreen River (Mill Run)	610	500	◉	●	●	○

Score	Irish Water Asset Standard Assessment
○	Low Risk
◉	Medium Risk
◉	
●	High Risk
●	

2

Scoping the Study Area 2

2 Scoping the Study Area

In this chapter we summarise the current and future issues with water supplies in Study Area 2, 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.

2.1 Water Quality

We assess the water quality investment needs of our water supplies by assessing the performance of our assets against the barriers set out in Chapter 5 of the Framework Plan. As set out in Chapter 5 of the Framework Plan, Irish Water is developing scientifically robust datasets to assign risk. Irish Water are utilising the well-established 'Failure Mode Effect Analysis' which provides a step-by-step approach for identifying all possible failure modes that can result in a hazardous event. Once identified, we assess risk against the existing controls (Barriers), which we have in place for source protection within our water treatment plants and networks. This Barrier Assessment process highlights where there is a deficit or potential for future deficit in these controls or treatment process elements.

The barriers are an internal gauge and the initial desktop assessments of barrier performance for SA2 are summarised in Table 2.1.

Table 2.1 Quality: 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**
Knocknagilky WTP	●	●	●	●
Davidstown WTP	●	●	●	●
Grangecon WTP	●	●	●	●
Knockananna WTP	●	●	●	●
Rathdangan 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**
Kiltegan Pump Station WTP	●	●	●	●
Ballyhook Hill WTP	●	●	●	●
Ballyknockan WTP	●	●	●	●
Slievecorragh WTP	●	●	●	●
Dunlavin WTP	●	●	●	●
Baltinglass WTP	●	●	●	●
Hacketstown WTP	●	●	●	●

Score	Irish Water Asset Standard Assessment
●	Low Risk
●	Medium Risk
●	
●	High Risk

The colour coding within the outline assessment indicates the severity of the potential risk of barrier failure . It should be noted that the table is not an indicator of non-compliance with the European Union (Drinking Water) Regulations 2014 as amended (Drinking Water Regulations), but an internal Irish Water assessment of the asset capability standard compared with the asset standard set out in Section 5.7 of the Framework Plan. The assessment provides an indication of the need to invest in areas of our asset base (human and structural) through resource planning, to ensure that we can address potential risks or emerging risks to our supplies.

Based on the barrier assessment, 11 of the 12 WTPs in the Study Area are considered to be at high risk of failing to achieve the required 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). However, in some cases our desktop assessments can over-estimate risk, particularly when there is little available data on the catchment characteristics of our raw water sources. As our "Source to Tap" Drinking Water

Safety Plan (DWSP) assessments, which are a requirement under the Recast Drinking Water Directive (2020), are developed for each water supply, the barrier scores for all of our supplies will be updated and become more reliable.

It should be noted that the “quality need” identified through the Barrier Assessment is not an indicator of compliance with the Drinking Water Regulations. It is an assessment of the need to invest in areas of our asset base (human and structural) through resource planning, to ensure that we can address potential risks or emerging risks to our supplies.

At present, there are no WRZs in SA2 West Wicklow on the EPA RAL. A national programme to improve disinfection standards (Barrier 1) at water treatment facilities across Ireland was initiated by Irish Water in 2017. The Disinfection Programme completed upgrade works in West Wicklow between 2017-2019, as summarised in Table 2.2.

Table 2.2 Critical Water Quality Requirements SA2 – West Wicklow

Critical Water Quality Requirements	Progress
Dunlavin WRZ: There are water quality risks and supply demand balance deficit associated with the WRZ. Consideration was given to developing further groundwater sources in the area and IW drilled a number of trial boreholes, however, the boreholes produced very limited additional water and are now in the process of developing the solution to rationalise the supply to GDA WRZ which is inline with the Preferred Approach.	**In Design**
Disinfection Programme: In 2016, Irish Water completed a nationwide review of all water treatment plants where disinfection upgrades were required, followed by a programme of works to deliver the required upgrades. To date, the disinfection programme has completed upgrade works at 3 of the 12 WRZs in SA2, based on assessed priority basis. • Baltinglass Public Supply • Dunlavin Public Supply • Knocknagilky Public Supply Any requirements within the remaining supplies will be identified via Drinking Water Safety Plans with solutions developed as part of the NWRP	**Ongoing**

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

- Continually update Barrier Performance issues in the WRZ which have the potential to impact on drinking water quality in the region;
- Improve these assessments through the development of DWSPs for all of our supplies;
- Address the priority risks identified on the EPA Remedial Action List (noting that steps have already been taken, and are ongoing, to address these risks); and
- All residual need (grey dots) in relation to water quality, see Table 2.1, will be brought through our options assessment process

2.2 Water Quantity – Supply Demand Balance

Irish Water assess the water quantity investment needs of our supplies by developing SDB calculations for each of our water supplies as summarised in Chapter 3, 4 and 6 of the Framework Plan. The calculations are used to assess the amount of water available in our supplies and compare that to the current and forecast demand for water in accordance with Figure 2.1.

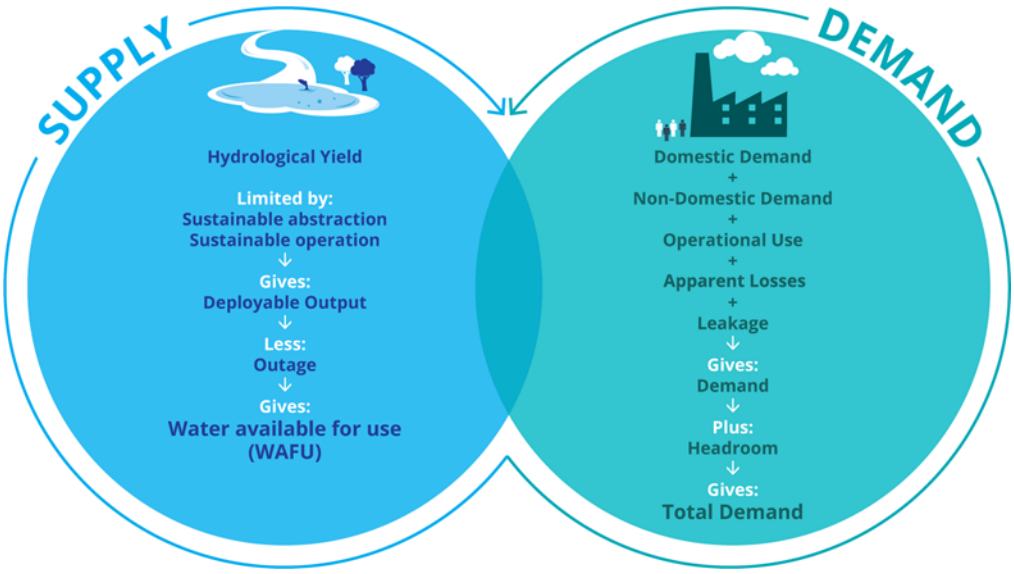

Figure 2.1 Supply Demand Balance

For each of the 12 WRZs in this Study Area, we assessed the baseline SDB and developed 25-year forecasts of supply and demand, in accordance with Figure 2.1.

The SDB assessments were carried out for each of the weather event planning scenarios (Normal Year Annual Average, Dry Year Annual Average, Dry Year Critical Period, Winter Critical Period) which described in Chapter 2 of the Framework Plan. The SDB deficits in SA2 manifest in the following ways:

1. **Inappropriate standards and levels of risk for a strategic water supply:** As water supply is essential for public health, Irish Water must 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 our supplies to provide a 1 in 50 Level of service. 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.

2. **Day to day operations:** At present, 9 out of 12 of the WRZs in SA2 in the area suggest a supply demand balance deficit (based on a “do nothing” approach) under present & future scenarios. 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 being monitored due to falling groundwater levels, and one of the larger supplies at Dunlavin was severely impacted. The surface water supply at Hacketstown in Carlow was also severely impacted.

A summary of the SDB deficit across all 12 Water Resource Zones is summarised in Table 2.3. The water resources zones are detailed in Appendix L of the Framework Plan - Supply Demand Balance Summaries.

Table 2.3 WRZ SDB Dry Year Critical Period Deficits (DYCP)

Water Resource Zone Name	Water Resource Zone code	Population	Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Knocknagilky Public Supply	3400SC0052	1	-1	-1	-1	-1	-1	-1
Knockanarrigan Davidstown Public Supply	3400SC0023	225	-24	-25	-26	-27	-28	-29
Grangecon Public Supply	3400SC0019	51	-2	-3	-3	-4	-4	-4
Knockananna Public Supply	3400SC0015	211	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	-1
Rathdangan Public Supply	3400SC0014	130	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Kiltegan Public Supply	3400SC0011	286	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Stratford Public Supply	3400SC0009	582	-21	-29	-35	-39	-43	-47
Ballyknockan Valleymount Public Supply	3400SC0008	392	-34	-40	-44	-47	-50	-53
Hollywood Donard Public Supply	3400SC0005	907	-145	-159	-169	-177	-185	-191
Dunlavin Public Supply	3400SC0004	975	-160	-167	-172	-177	-183	-187
Baltinglass Public Supply	3400SC0003	2,470	-801	-822	-840	-856	-872	-885
Hacketstown	0100SC0005	610	-90	-97	-101	-105	-109	-112

As outlined in Chapter 4 of the framework plan, the estimated population currently living in each WRZ has been based on the 2016 Census data. Forecasts for future populations have been based on draft growth projections from the National Planning Framework (NPF), and updated information from the Regional Spatial and Economic Strategies (RSES) and Local Authority Planning sections (where available).

The target 1 in 50 level 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 approximately 1,278 m^3/day for the Study Area. As a result, while we can continue to supply water, the 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 approximately 1,510 m^3/day by 2044.

Our ongoing activities to improve the Supply Demand Balance in SA2 West Wicklow are prioritised as:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to meet target levels of Leakage
- Water Conservation measures, including information campaigns and initiatives, and Water Conservation Orders during drought periods

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 and distribution networks.

During the drought in summer 2018, a number of raw water sources experienced issues; raw water levels dropped significantly at Dunlavin WTP and at the surface water intake to Hacketstown WTP. In these locations service interventions were required in order to ensure supply to customers could be maintained.

There are a number of problematic distribution and trunk mains throughout SA2. Irish Water & the Local Authority Water Services sections will continue to monitor the performance of all water mains in the network to ensure that the most problematic mains are replaced as required.

To date, a significant amount of watermain rehabilitation has been carried out across Study Area 2. This provides for a more reliable water supply, reducing instances of bursts and water outages. The works also improve water quality by replacing old cast iron and lead watermains, whilst reducing leakage and improving overall operation and maintenance of our supply system.

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 2.4.

Table 2.4 SA2 Critical Infrastructure Projects and Need Identification

Critical Requirement	Progress
Dunlavin Reservoir Refurbishment works: The treated water storage tank at Dunlavin is at the end of life and needs to be replaced and or significant refurbishment to improve supply reliability to the existing customers.	**Assessment Complete**
Dunlavin WTP: We have experienced Issues with maintaining supply from the existing boreholes during summer month. There were particular issues during the 2018 drought period resulting in low levels of service. Consideration was given to developing further groundwater sources in the area and IW drilled a number of trial boreholes, however, the boreholes produced very limited additional water and are now in the process of developing the solution to rationalise the supply to GDA WRZ.	**In Design**
Distribution Network Repairs and Upgrades: Rolling programme of active leakage control, pressure management, find and fix and network upgrades.	**Delivery**
Baltinglass: A number of issues relating to the quality of raw water in Baltinglass have arisen in 2021. IW are looking at a number of options to resolve these in the short term.	**Assessment Ongoing**

In summary, there are some asset reliability issues across the distribution network within the WRZ. Some critical infrastructural projects, outlined in Table 2.4, 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.

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.

As outlined at Section 3.7.2 of the Framework Plan, the Government is currently developing new legislation dealing with water abstractions. As this legislation is still being developed, we do not have full visibility of the future regulatory regime. We have therefore not progressed through a theoretical licencing process on a site by site basis and cannot reliably include an estimation of sustainable abstraction within the SDB calculations. Instead, we use the hydrological yield, water treatment capacity and bulk transfer limitations in our calculation of DO. This assessment procedure is set out at Appendix C of the Framework Plan, and in line with a precautionary approach.

To understand the potential impact of the pending Abstraction Legislation on the SA2 West Wicklow Supplies, we have assessed our surface water abstraction for Hacketstown WTP (the only surface water abstraction in the Study Area).

Table 2.5 presents the findings of this assessment in order to indicate the potential reductions to abstraction that may be required at our existing surface water sources. The table presents our current

abstraction levels[1], our source hydrological yield[2], and our estimated potential sustainable abstraction[3] amount which the source may be limited to in the future.

Based on this initial assessment, the volume abstracted at Hacketstown would appear to comply with sustainability guidelines (the long term required abstraction requirement is <2% of Q95). However, under the proposed regulatory regime, sustainable abstraction quantities will be adjudicated by the EPA. We have assumed, given the need to maintain supplies, that a transition to new abstraction quantities would likely take place in the medium term.

Table 2.5 Comparison of Current Abstraction, Hydrological Yield and Theoretical Future Abstraction

Description	River Derreen Mill Run (Hacketstown)
Current abstraction (m^3/d)	458
Hydrological yield (m^3/d)	11,512
Theoretical Future abstraction (m^3/day)	1,521

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 2.6.

Table 2.6 Potential Change to the SDB Based on Potential Abstraction Reductions

Description	River Derreen Mill Run (Hacketstown)
Potential change in SDB[4](m^3/d)	none

The net impact of these potential minimum environmental flow requirements has been assessed using the outline assessment methodology described in Appendix C of the 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

As noted in Section 3.2.2 of the framework plan producing robust desktop assessments of water availability from our existing groundwater abstractions is very difficult. Ideally, yield estimates would be based on a three-dimensional assessment of the geology within the vicinity of the supply, supplemented with long term records on pumping and drawdown of water levels over many years. Irish Water does not have this type of information available for most of our groundwater supplies and while we will aim to complete site-specific studies of groundwater availability, this may take many years. On an interim basis,

[1] Based on WTP 22hr (DYCP) capacity
[2] Our hydrological yield estimate is the 'safe' yield calculated to be available during a 1 in 50 year drought event. We use this figure in the SDB calculations to determine whether a WRZ is projected to be in deficit or surplus
[3] Our sustainable or 'allowable' abstraction estimate is based on limiting abstraction to 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.
[4] Based on potential changes to the projected 2044 Dry Year Critical Period (DYCP) scenario

Irish Water has developed an initial assessment based on available information, included in Appendix G of the 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.

On an interim basis Irish Water has developed an initial assessment for existing abstractions based on best available information. For more information, please see Appendix C Supply Assessment and Appendix G Regulatory and Licensing Constraints of the NWRP - 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. We are not in a position to estimate changes to the groundwater availability until better data is available.

In summary, when considering the requirements of the Water Framework Directive (WFD), some of our schemes may be subject to reductions in abstraction, especially during drought periods. While we have developed a potential understanding of the impact of the legislation we cannot reliably include an estimation of sustainable abstraction within the SDB calculations.

However, we do use our sustainable abstraction estimations to assess the sensitivity of the Preferred Approach as set out in Chapter 7 of this Technical Report. This assessment determines whether the Preferred Approach is adaptable to change across a range of potential future scenarios and verifies our ability to adapt and increases our resilience to future changes.

When the new Legislation on abstraction of water has been enacted and regulatory assessments completed if an abstraction is confirmed to be affecting a waterbody status the Supply Demand Balance will be updated as outlined in the monitoring and feedback section of the RWRP, Section 9.2.2. All future abstractions considered through the Framework Plan options assessment are validated for sustainability, including options to increase abstraction at existing sites.

2.5 Water Resource Zone Needs Summary

Study Area 2 has 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 2.7.

Table 2.7 Summary of Need Quality, Quantity, Reliability and Sustainability

Quality	Upgrades required at all WTPs.
Quantity	Additional Leakage Targets of 33 m^3/d to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500 m^3/d Interim additional supplies of 1,278 m^3/d within 10 years and Total of 1,510 m^3/d additional supplies beyond the 10-year horizon
Reliability (In addition to projects in	Continued network upgrades and improvements in the bulk and distribution networks and storage
Sustainability	It is not envisaged that there are sustainability issues with the volumes abstracted from Rivers in this Study Area. However, under the proposed regulatory regime, this will be adjudicated by the EPA. 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.

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/

3 Solution Types Considered in Study Area 2

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In this chapter, we summarise the type of solutions we have considered to address identified need for treated drinking water supply in Study Area 2.

As outlined in Chapter 7 of the Framework Plan, 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 SA2 as part of our unconstrained options, the following options have been reviewed.

3.1 Leakage Reduction

The Leakage reduction measures across the public water supply considered for SA2 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
- Net leakage reductions targets listed in **Error! Reference source not found.** have been applied to 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 WRZs with demand in excess of 1,500m^3/d, see Table 3.1.

Table 3.1 SELL Targets for WRZ in SA2

WRZ	Net Leakage Reduction applied to SDB(m^3)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m3/d (m^3)	Leakage Targets to achieve SELL (m3)
Hacketstown		32	32
Knocknagilky Public Supply		1	1

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 and 2020, 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 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.

3.3 Supply Smarter

The supply options considered as part of the options development are unconstrained by distance from SA2 and include:

- 12 standalone groundwater options across the Study Area;
- 13 standalone surface water options across the Study Area;
- Water Quality upgrades to existing WTPs;
- Interconnection and Rationalisation[5] of WRZs within the Study Area; and
- Network connectivity and transfers from other Study Areas.

[5] Rationalisation of a WRZ includes providing part or full supply to the WRZ from another WRZ. Often some or all of the WTPs in the WRZ obtaining supply are decommissioned as part of this process.

4 Option Development SA2

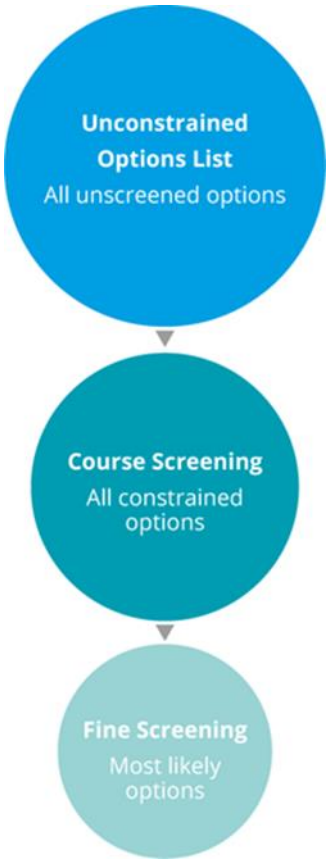
4 Option Development for Study Area 2

This chapter 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, as outlined in Chapter 8 of the Framework Plan, 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, having regard to WFD objectives, Irish Water does 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 WFD objectives.

The options assessment screening process involves the following:

- Developing a long list of unconstrained options – Unconstrained Options constitute all of the possible solutions, which either fully or partly resolve a water supply deficit, regardless of any cost, environmental or social constraints. In developing the Unconstrained List, we identify options that are applicable to meet the needs of the study area;
- 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 Chapter 3 and Appendix A of the Study Area Environmental Report.

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. This allows us 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 4.1.

Table 4.1 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, and within a reasonable distance of, 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, and within a reasonable distance of, the study area.
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 SA2, 50 Unconstrained Options were identified to address need. These unconstrained options were not limited by cost, distance from the area or feasibility. These options are summarised in Table 4.2 and shown spatially in Figure 4.1.

Table 4.2 SA2 Unconstrained Options

No. of Options	Option Type
12	Groundwater
13	Surface water
20	Rationalise to another supply
4	Upgrade Water Treatment Plant
1	Small Supplies transfer

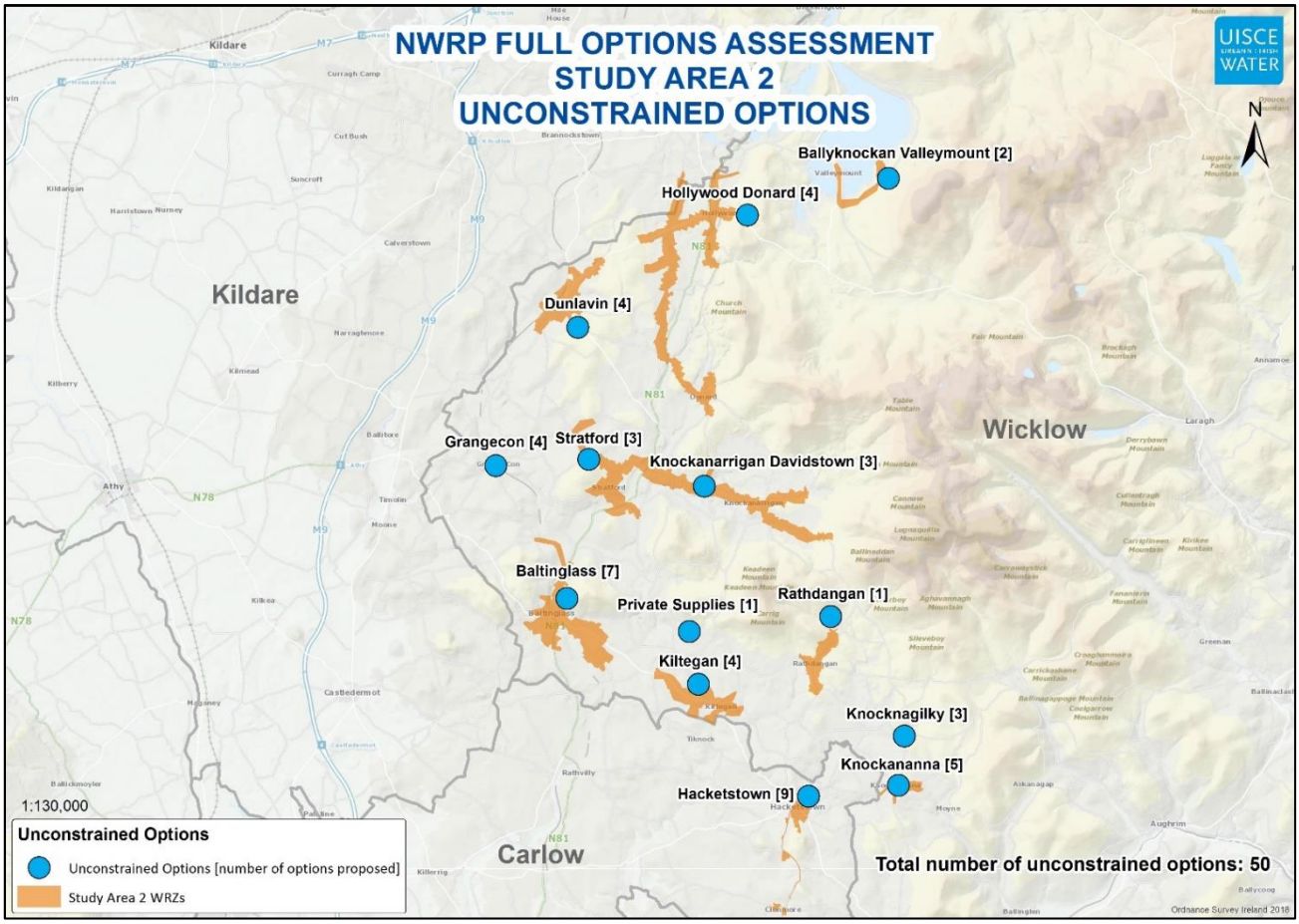


Figure 4.1 SA2 Unconstrained Options

The 50 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues.

4.2 Coarse Screening

The 50 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 Framework Plan. The Coarse Screening assessments were conducted by a specialist team, including Engineers, Hydrologists, Hydrogeologists, Ecologists and Environmental Scientists.

33 Unconstrained Options were rejected at this stage as they were found to be unviable in relation to one or more assessment criteria. Details of these options and the justification for their rejection are outlined in the rejection summary, Annex B of this report. The rejection summary records the criteria against which the rejected options were assessed as having a ‘red’ score for the purposes of the coarse screening exercise (as explained in more detail in Chapter 8 of the framework plan), and accordingly were not brought forward at the coarse screening phase. The box below provides an example of a rejection justification for an option considered for the Baltinglass WRZ.

Example Rejected Option

Option SA2-05

New abstraction from River Slaney

Rejection Reason

The River Slaney is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.

The remaining 17 options were progressed to further assessment through the Fine Screening process. The rejected options are summarised in Annex A of this technical report. Annex A records the criteria against which the rejected options were assessed as having a “red” score for the purposes of the coarse screening exercise (as explained in more detail in Chapter 8 of the Framework Plan), and accordingly were not brought forward at the coarse screening stage. The options remaining after Coarse Screening are summarised by type in Table 4.3.

Table 4.3 SA2 Remaining Options after Course Screening

No. of Options	Option Type
10	Groundwater
3	Surface water
2	Rationalise to another supply
2	Upgrade Water Treatment Plant
0	Small Supplies transfer

4.3 Fine Screening

The 17 remaining options were subject to a more detailed multi-criteria assessment (MCA) at the Fine Screening Stage using desktop assessments of performance against specified questions relating to Sustainability (Environmental and Social Impacts), Resilience, Deliverability and Progressibility. These questions are set out in Appendix N of the Framework Plan 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, no further options were rejected, with the remaining 17 options considered to be feasible and brought forward to desktop outline design and costing. These are summarised in

and shown spatially in Figure 4.2.

Table 4.4 SA2 Remaining Options after Fine Screening (Feasible Options)

No. of Options	Option Type
10	Groundwater
3	Surface water
2	Rationalise to another supply
2	Upgrade Water Treatment Plant
0	Small Supplies transfer

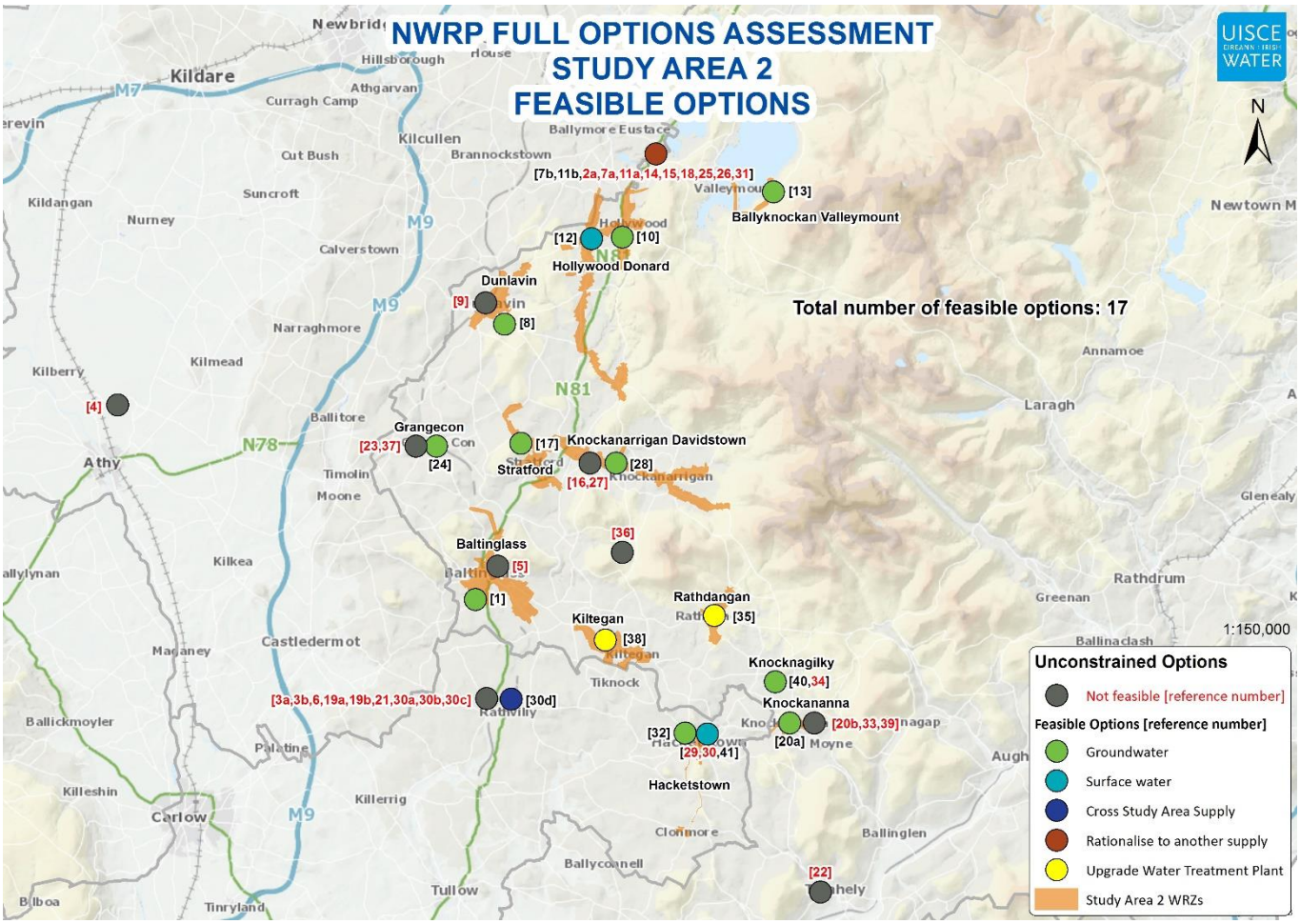


Figure 4.2 SA2 Fine Screening (Feasible Options)

For the purposes of the NWRP, 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 comparative budget costs estimates 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.

4.4 Options Assessment Summary

The SDB deficit in the region ranges between approximately 1,278 m3/d in 2019 during dry conditions, to a maximum of approximately 1,510 m3/d in 2044 during dry conditions. During the options assessment stage, a total of 50 unconstrained options were assessed. Of these, 33 options were screened out for the reasons summarised in Table 4.5 and recorded in Annex B.

Table 4.5 Rejected Options Summary

No. of Options	Reason for Rejection
15	Deliverability & Flexibility
2	Resilience
14	Deliverability & Flexibility, Resilience, and Sustainability
2	Other reasons such as repeat options or Operational Options which did not provide additional supply.

The remaining 17 feasible options are categorised into options that resolve the need for one WRZ only "WRZ options" and options that resolved the need for more than one WRZ " Study Area options". Table 4.6 provides an overview of the number of WRZ options and Study Area options for the WRZs in Study Area 2. From this table it can be noted that there are 15 WRZ Options and 2 options which can be merged to form 1 Study Area Options. The lack of Study Area Options for SA2 is a result of the fact that WRZs within SA2 are typically small isolated WRZs and the SDB deficits are on average 150m3/day, due to issues with transferring small quantities of water over long distances local WRZ options are typically suitable solutions for these WRZs.

A summary of the number of options and whether they are WRZ or SA options is contained in Table 4.66

Table 4.6 SA2 Feasible Options Summary

WRZ Name	WRZ Code	Option Type	
		WRZ Option	SA Grouped Option
Ballyknockan Valleymount Public Supply	3400SC0008	1	0
Baltinglass Public Supply	3400SC0003	1	0
Dunlavin Public Supply	3400SC0004	1	1
Grangecon Public Supply	3400SC0019	1	0
Hacketstown	0100SC0005	3	0
Hollywood Donard Public Supply	3400SC0005	2	1
Kiltegan Public Supply	3400SC0011	1	0

WRZ Name	WRZ Code	Option Type	
		WRZ Option	SA Grouped Option
Knockananna Public Supply	3400SC0015	1	0
Knockanarrigan Davidstown Public Supply	3400SC0023	1	0
Knocknagilky Public Supply	3400SC0052	1	0
Rathdangan	3400SC0014	1	0
Stratford Public Supply	3400SC0009	1	0

5 Approach Development

5 Approach Development

This Chapter describes how we tested different combinations of the Feasible Options to develop a Preferred Approach to meet the needs we identified for the WRZ in Study Area 2.

5.1 Approach Development

5.1.1 Introduction to Approach Development

The purpose of the NWRP is to examine all potential options that could be used to resolve issues within the water resource zone (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 number of approaches to resolve need across the Study Area. An approach is a way of configuring an option or options to meet the deficit focused on a particular outcome. For example, a "Least Carbon" approach would be the option or combination of options that would involve the least embodied and operational carbon load over the lifetime of the option. As part of the NWRP, Irish Water considers six approaches, as summarised in Table 5.1.

These six approaches have been outlined at Section 8.3.7 of the Framework Plan, and were consulted on as part of the SEA Scoping consultation conducted between 9th November 2017 and 22nd December 2017. These approaches have been specifically chosen to ensure that the NWRP aligns with all the relevant Government Policies outlined in Table 5.1.

Table 5.1 The Six Approaches

Approaches Tested	Description	Policy Driver
Least Cost	Lowest Net Present Value (NPV) cost in terms of Capital, Operational, Environmental and Social and Carbon Costs.	Public Spending Code
Best Appropriate Assessment (AA)	Lowest score against the European Sites (Biodiversity) sub-criteria question: Score = 0 equates to no likely significant effects (LSEs). If, in our opinion, these 0 scoring options meet the deficit/ plan objectives, they are automatically picked as the Preferred Approach. Score = -1 or -2 equates to LSEs that can be addressed with general/standard mitigation measures. Score = -3 equates to LSEs that may be harder to mitigate or require significant project level assessment.	Habitats Directive
Quickest Delivery	Based on an estimate of the time taken to bring an option into operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening This is particularly relevant where an option might be required to address an urgent Public Health issue.	Statutory Obligations under the Water Supply Act and Drinking Water Regulations

Approaches Tested	Description	Policy Driver
Best Environmental	This is the option or combination of options with the highest total score across the 19 No. SEA MCA sub-criteria questions	SEA Directive and Water Framework Directive
Most Resilient	This is the option or combination of options with the highest total score against the resilience criteria.	National Adaptation Framework and Climate Action Plan
Lowest Carbon	This is the option or combination of options with the lowest embodied and operational carbon cost.	Climate Action Plan

We then compare the options identified as the best performing within each of the six approach criteria (Least Cost, Best AA, Lowest Carbon etc.) against each other as outlined in Figure 5.1 to come up with a Preferred Approach that meets the objectives of the Framework Plan and aligns with all relevant Government Policy.

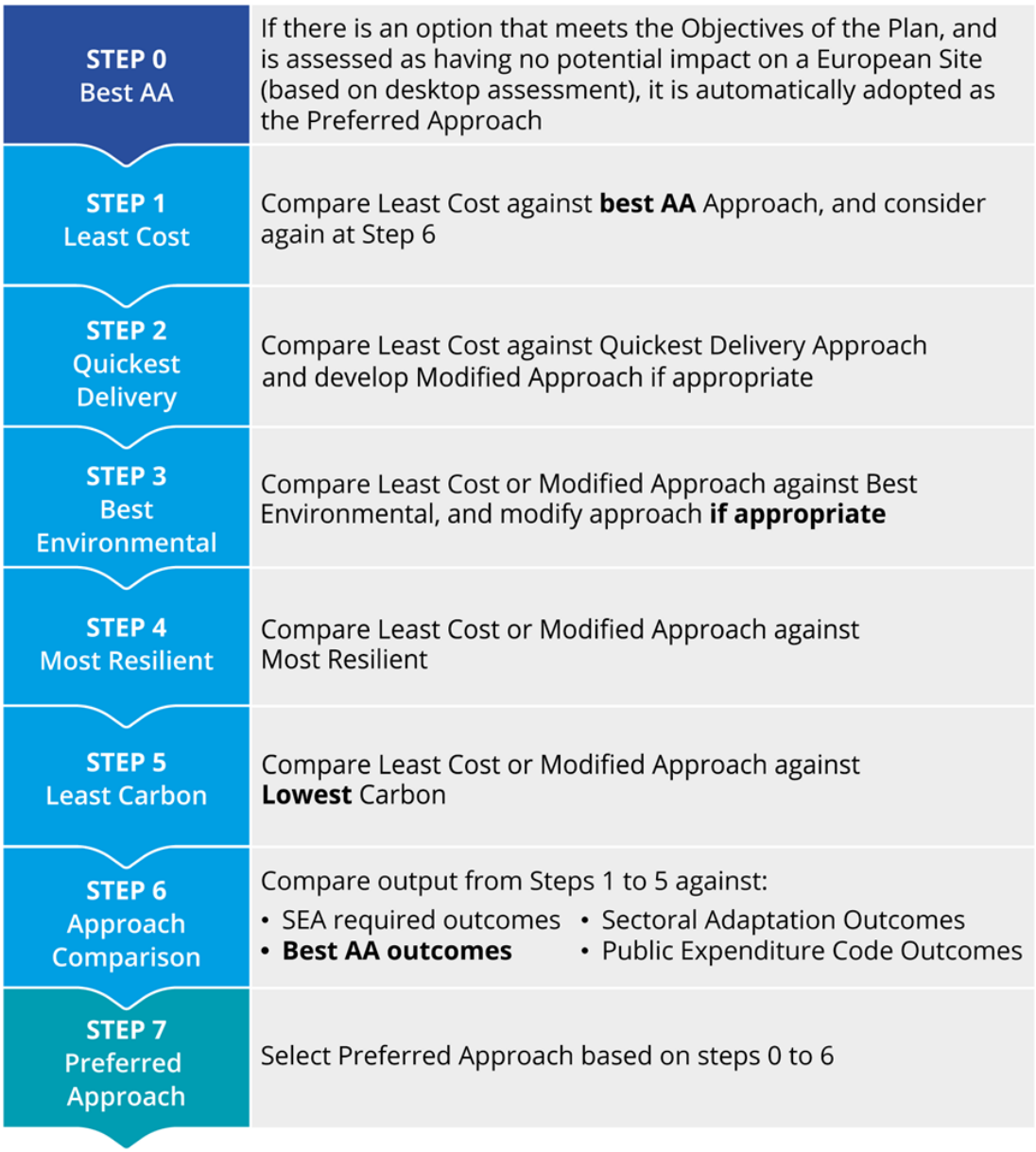


Figure 5.1 Figure of the 7 step assessment process

This methodology which is futured detailed in Chapter 7 of the RWRP -EM follows a process to develop the Preferred Approach for a Study Area across three stages;

- **Stage 1** – We assess the water resource zones individually to develop an initial Preferred Approach, the **WRZ Preferred Approach** for all of the supplies in the Study Area
- **Stage 2** – We assess whether there are any larger options that might resolve deficits across multiple WRZs within a Study Area. We then develop combinations of these options (SA Combinations).
- **Stage 3** – We assess the SA Combinations and the WRZ Level approach in order to determine the best performing combination. This is known as the Preferred Approach at SA Level.

At each stage of assessment as detailed above, we carry out an assessment of the cumulative and in-combination effects of the Preferred Approach as detailed in the SEA Environmental Report for the RWRP-EM and the Environmental Review for this Study Area.

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

Further details on these three stages is provided in Chapter 7 of the RWRP -EM. Section 5.2 provides an overview of the application of this process to SA2.

5.2 Preferred Approach Development Process for Study Area 1

5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this technical report there are 17 feasible options. 15 of these options are WRZ Options while 2 options are merged to form 1 Study Area Option. Table 5.2 outlines the 15 WRZ options for SA2, providing option reference numbers and detailing the WRZs they provide a solution to. These solutions are presented as “Options” for the purposes of this plan; however, will be subject to their own regulatory, timing and budgetary constraints.

Table 5.2 SA2 Feasible Options

Water Resource Zone Name	Feasible Options SA2 West Wicklow	
	Option Code	Option Description
Baltinglass Public Supply	SA2-001	New GW - deeper BH in gravel aquifer approx. 3 km from Baltinglass
Dunlavin Public Supply	SA2-008	Increase GW abstraction
Hollywood Donard Public Supply	SA2-010	Increase GW abstraction
Hollywood Donard Public Supply	SA2-012	New SW abstraction at Lemonstown
Ballyknockan Valleymount Public Supply	SA2-013	Increase GW abstraction
Stratford Public Supply	SA2-017	Increase GW abstraction
Knockanarrigan Davidstown Public Supply	SA2-028	Increase GW abstraction
Hacketstown	SA2-030d	Rationalisation to Rathvilly (Dependant on NSS)
Hacketstown	SA2-032	new GW source

Water Resource Zone Name	Feasible Options SA2 West Wicklow	
	Option Code	Option Description
Rathdangan	SA2-035	WTP Upgrade
Kiltegan Public Supply	SA2-038	Not in deficit. Treatment upgrade if required.
Knocknagilky Public Supply	SA2-040	Increase GW abstraction
Hacketstown	SA2-041	New SW abstraction from the main channel. Dependant on new source supplying Rathvilly, therefore ceasing abstraction from the River Slaney at Rathvilly.
Knockananna Public Supply	SA2-020a	Increase GW abstraction
Grangecon Public Supply	SA2-024	Increase GW abstraction

The WRZ options are then assessed against the six approach types, outlined in Table 5.1 and the result of this process is provided in Table 5.3.

Table 5.3 SA2 Alignment of WRZ Options with Approach Categories

Water Resource Zone Name	Feasible Options SA2		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
Baltinglass Public Supply	1	New GW - deeper BH in gravel aquifer approx. 3 km from Baltinglass	✓	✓	✓	✓	✓	✓
Dunlavin Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓
Hollywood Donard Public Supply	2	Increase GW abstraction	✓	✓	✓	✓	✓	-
		New SW abstraction at Lemonstown	-	-	-	-	-	✓
Ballyknockan Valleymount Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓
Stratford Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓
Knockanarrigan Davidstown Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓
Hacketstown	3	Rationalisation to Rathvilly (Dependant on NSS)	✓	-	✓	✓	✓	✓
		New SW abstraction from the main channel. Dependant on new source supplying Rathvilly, therefore ceasing abstraction from the River Slaney at Rathvilly.	-	✓	-	-	-	-
		New GW source	-	-	-	-	-	-
Rathdangan	1	WTP Upgrade	✓	✓	✓	✓	✓	✓
Kiltegan Public Supply	1	Not in deficit. Treatment upgrade if required.	✓	✓	✓	✓	✓	✓
Knocknagilky Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓
Knockananna Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓
Grangecon Public Supply	1	Increase GW abstraction	✓	✓	✓	✓	✓	✓

The 7 Step Process outlined in Figure 5.2 was then applied to each WRZ in SA2, 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 5.4.

The findings of the Preferred Approach development for SA at WRZ level include the following:

- In terms of Best AA, 6 WRZ options score a 0 in relation to potential impact on a designated European Site;

- The Best AA and the Best Environmental (overall SEA score) approach is identified for 12 of the 12 WRZs;
- Of the 12 WRZ level preferred approaches, none have a -3 score against biodiversity. A -3 Score against biodiversity indicates a potential high risk (without mitigation measures) under the biodiversity criterion for a European Site.

The WRZ level approaches for each WRZ in SA2 are outlined in Table 5.4.

Table 5.4 SA2 WRZ Level Approach

Water Resource Zone Name	Feasible Options SA2 West Wicklow		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Baltinglass Public Supply	SA2-001	New GW - deeper BH in gravel aquifer approx. 3 km from Baltinglass	-	✓	✓	✓	✓	✓	✓	✓
Dunlavin Public Supply	SA2-008	Increase GW abstraction	✓	✓	✓	✓	✓	✓	-	✓
Hollywood Donard Public Supply	SA2-010	Increase GW abstraction	✓	✓	✓	✓	✓	✓	-	✓
Gallinacean Valleymount Public Supply	SA2-013	Increase GW abstraction	-	✓	✓	✓	✓	✓	✓	✓
Stratford Public Supply	SA2-017	Increase GW abstraction	-	✓	✓	✓	✓	✓	✓	✓
Knockanarrigan Davidstown Public Supply	SA2-028	Increase GW abstraction	-	✓	✓	✓	✓	✓	✓	✓
Hacketstown	SA2-030d	Rationalisation to Rathvilly (Dependant on NSS)	-	✓	✓	✓	✓	✓	✓	✓
Rathdangan	SA2-035	WTP Upgrade	✓	✓	✓	✓	✓	✓	✓	✓
Kiltegan Public Supply	SA2-038	Not in deficit. Treatment upgrade if required.		✓	✓	✓	✓	✓	✓	✓
Knocknagilky Public Supply	SA2-040	Increase GW abstraction	✓	✓	✓	✓	✓	✓	✓	✓
Knockananna Public Supply	SA2-020a	Increase GW abstraction	✓	✓	✓	✓	✓	✓	✓	✓
Grangecon Public Supply	SA2-024	Increase GW abstraction	✓	✓	✓	✓	✓	✓	✓	✓

5.2.2 Stage 2 - Creation of the Study Area Combinations

The Second Stage of our Approach Development Process involves identifying the Study Area options that can address Need in more than one WRZ within the Study Area, and then develop various combinations which contain elements of the different options. These are called SA Combinations SA Combinations will consist of a number of different projects or options; however, looking at a wider, nore holistic, spatial scale benefits the plan level assessment in considering what options might work across multiple WRZ's.

For each Study Area, one of the SA Combinations will always be the WRZ Level Approach. The WRZ Level Approach is the combination of all of the individual the Preferred Approach at WRZ level for the entire Study Area. Table 5.5 below provides a summary of the 1 Study Area option in Study Area 2. The lack of Study Area Options for SA2 is a result of the fact that WRZs within SA2 are typically small isolated WRZs and the SDB deficits are on average 150m3/day, due to issues with transferring small quantities of water over long distances local WRZ options are typically suitable solutions for these WRZs.

Table 5.5 SA2 Grouped option

WRZ	Option Description -
Dunlavin Public Supply Hollywood Donard Public Supply	Rationalise Dunlavin and Hollywood Donard WRZs to the Greater Dublin Area WRZ

The 1 Study Area option1 result in 2 SA Combinations including the WRZ level Approach. The 2 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.6 SA2 Combinations

Key	WRZ Approach Option	○	SA Grouped Option	□

WRZ	WRZ approach options	SA combination 1 (SA grouped option 2)
Hacketstown	○	○
Baltinglass Public Supply	○	○
Dunlavin Public Supply	○	□
Hollywood Donard Public Supply	○	□
Ballyknockan Valleymount Public Supply	○	○
Stratford Public Supply	○	○
Kiltegan Public Supply	○	○
Rathdangan	○	○
Knockananna Public Supply	○	○
Grangecon Public Supply	○	○
Knockanarrigan Davidstown Public Supply	○	○
Knocknagilky Public Supply	○	○

5.2.3 Stage 3 – Preferred Approach at Study Area Level

As part of stage three, we compare the WRZ Level Approach and the SA Combination to determine the Preferred Approach that provides the best outcome for the Study Area.

We use the EBSD tool to rank the combinations against the assessment criteria and we then compare the best performing SA Combinations under each of the six approach types, using the 7 step process set out in Fig 5.1, to establish the Preferred Approach at Study Area level. The results of this process are provided in Table 5.7.

Table 5.7 SA1 Summary of SA Combination of Performance against Approach Type

Ranked order (best to worst)	Best													Worst

WRZ	WRZ approach options	SA combination 1 (SA grouped option 2) - Preferred Approach
Least Cost	Worst	Best
Quickest Delivery	Best	Worst
Best AA *no. of -3 biodiversity scores	0 No. -3 scores	0 No. -3 scores
Lowest Carbon	Best	Worst
Most Resilient	Worst	Best
Best Environmental	Worst	Best

The SA Combinations in The 1 Study Area option1 result in 2 SA Combinations including the WRZ level Approach. The 2 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.6 are assessed to determine the approach categories as summarised in Table 5.8.

Table 5.8 Best Combinations

Approach Categories	Best Performing Combination
Least Cost (LCo)	Group 2
Best Environmental (BE)	Group 2
Quickest Delivery (QD)	WRZ Approach
Most Resilient (MR)	Group 2
Lowest Carbon (LC)	WRZ Approach
Best AA (BA)	Group 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 Spending Code.

In terms of NPV Cost, the SA Group 2 Approach has the lowest NPV Cost, as shown in Figure 5.2, with the lowest total costs (CAPEX and OPEX) over the solutions lifetime.

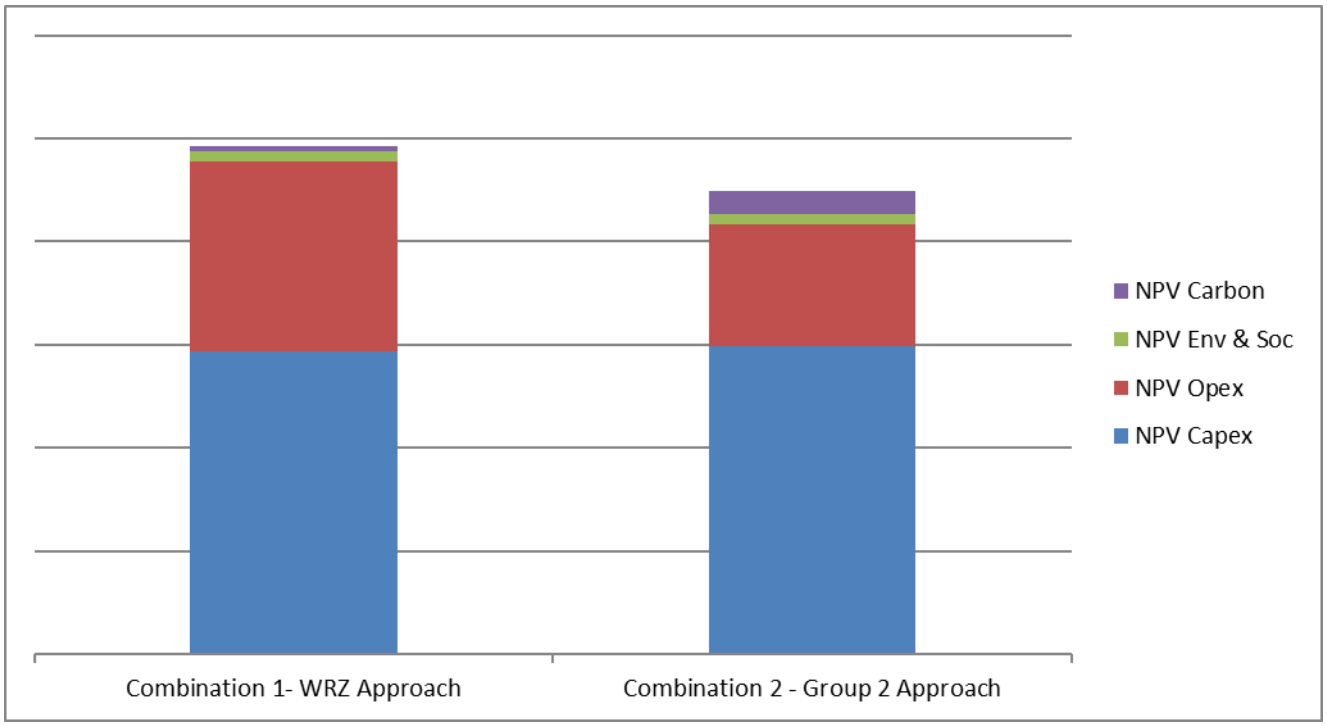


Figure 5.2 SA2 NPV Costs for WRZ and Group 2

In accordance with the Options Methodology, These approaches are then compared against each other using the 7-Step process in Figure 5.1 to generate the best value combination of options at the Study Area level. The best value combination of options at the Study Area level results in the SA Preferred Approach. The outputs from the assessment were as follows:

The outputs from the assessment were as follows:

- Step 1 – We compared the Least Cost Approach against the Best AA approach. The least cost approach is the Best AA approach therefore the least Cost Approach was retained at this stage.
- Step 2 – We compared the Quickest Delivery Approach against the Least Cost Approach. The Quickest Delivery approach does not deliver significantly better scores against the quickest delivery criteria compared to the Least Cost and the Least Costs Approach is the Best AA, Best Environmental and Most Resilient Approach. The Least Cost approach was therefore retained at this stage.
- Step 3 - We compared the Least Cost against the Best Environmental Approach. The Least Cost approach is the Best Environmental approach therefore the least Cost Approach was retained at this stage.
- Step 4 – We compared the Least Cost against the Most Resilient Approach. The Least Cost approach is the Most Resilient approach therefore the least Cost Approach was retained at this stage.
- Step 5 - We compared the Least Cost Approach against the Least Carbon Approach. The Least Carbon Approach has significantly lower carbon costs compared to the Least Cost Approach, however, carbon costs for both approaches are low when compared the total NPV costs. However, the Least Cost Approach is the Best AA, Best Environmental and Most Resilient Approach. The Least Cost approach was therefore retained at this stage.
- Step 6 – A final assessment of the Least Cost was completed against the Least Carbon, Best AA, Best Environmental, Quickest Delivery and Most Resilient Approaches. The Least Costs Approach is the Best AA, Best Environmental and Most Resilient Approach. While the Least Cost Approach has significantly higher carbon costs compared to the Least Carbon Approach carbon costs are low when compared the total NPV costs. While the WRZ Level Approach performs better on Quickest Delivery the scores are not significantly better than the Least Cost. Therefore, the Least Cost approach was retained at this stage.
- Step 7 – The Least Cost Approach was therefore selected as the Preferred Approach for the Water Resource and Study Area Levels.

5.3 Study Area Preferred Approach Summary

On the basis of this initial assessment at Plan level, Group 2 approach represents the Preferred Approach for Study Area 2, which consists of the options listed in Table 5.9.

Table 5.9 Preferred Approach for SA2

WRZ Name	Preferred Approach Option Description SA Combination – Group 2
Hacketstown	SA2-30d: Rationalisation to Rathvilly WTP (River Slaney) within SA6
Baltinglass Public Supply	SA2-01: New GW - deeper BH in gravel aquifer approx. 3 km from Baltinglass
Dunlavin Public Supply	Group 2 Rationalisation to the Greater Dublin Area WRZ
Hollywood Donard Public Supply	

WRZ Name	Preferred Approach Option Description SA Combination – Group 2
Ballyknockan Valleymount Public Supply	SA2-13: Increase GW abstraction
Stratford Public Supply	SA2-17: Increase GW abstraction
Kiltegan Public Supply	SA2-38: Not in deficit. Treatment upgrade if required.
Rathdangan	SA2-35: Increase GW abstraction
Knockananna Public Supply	SA2-020a: Increase GW abstraction
Grangecon Public Supply	SA2-24: Increase GW abstraction
Knockanarrigan Davidstown Public Supply	SA2-28: Increase GW abstraction
Knocknagilky Public Supply	SA2-40: Increase GW abstraction

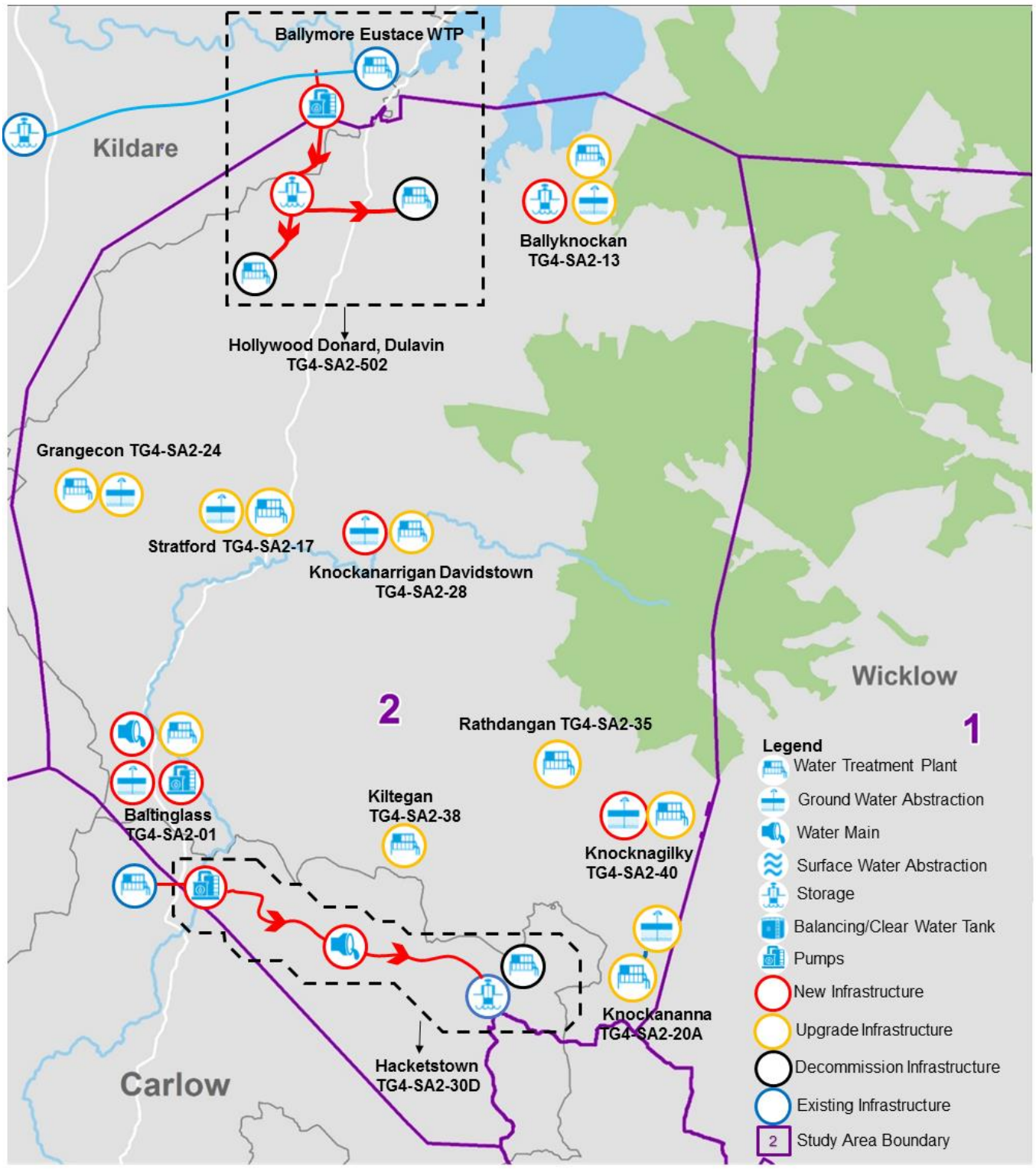


Figure 5.3 SA2 Preferred Approach

The Preferred Approach (SA approach Combination 2 Group 2) is shown schematically in Figure 5.3.

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

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

Before we adopt this approach at Plan level for SA2, we must give consideration to the following:

- **Interim Solutions**: Based on scale of investment required across the entire country 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 future scenarios (for example, what if population growth rates are lower than expected 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 dependent on another SA option:** The Preferred Approach for the Dunlavin Public Supply and Hollywood Donard Public Supply is to obtain supply from the GDA WRZ. This option is dependent on the development of the Preferred Approach for the GDA WRZ SA9, therefore an alternative option is required for consideration as an alternative at Regional level and in the event the Preferred Approach for SA9 cannot advance. The Preferred Approach for Hacketstown involves connection to the Rathvilly WRZ in SA6. Similarly this option is dependent on the development of the Preferred Approach for SA6 and an alternative is required. The alternative options considered are outlined in Table 5.10 below.

Table 5.10 Alternative Options for WRZs dependent on another SA option

WRZ Name	Alternate Option
Dunlavin Public Supply	SA2-008 Maintain and upgrade existing WTP and new GW abstraction local to the existing WTP (+187m3/day)
Hollywood Donard Public Supply	SA2-010 Maintain and upgrade existing WTP and new GW abstraction local to the existing WTP (+191m3/day)
Hacketstown	SA2-032 Maintain and upgrade existing WTP and abstractions and new GW abstraction local to the existing WTP (+112m3/day)

6

Preferred Plan Constraints – Interim Solutions

6 Interim Solutions

As outlined in more detail in Section 8.3.7.6 of the Framework Plan, the NWRP provides for an “interim solution” approach, which allows shorter term interventions to be identified and prioritised, when needed. The Preferred Approach for each WRZ, Study Area and Region will be delivered on a phased basis subject to budget and regulatory constraints. It will take many investment cycles to deliver the Preferred Approach across all WRZs, therefore, Irish Water must have a means to continue delivering safe, secure and reliable water supplies (on a short to medium term basis) while we deliver our Preferred Approach.

On this basis, interim, short term capital maintenance solutions have been identified for all WTPs and will be utilised when needed. These solutions will allow IW time to deliver the Preferred Approach, while at the same time, maintaining a sustainable water supply. These interim solutions are generally smaller in scale and rely on making best use of already existing infrastructure.

Examples of general interim measures for different water sources include the following:

- For groundwater sites, where the Preferred Approach requires that the existing WTP is to be maintained, the interim solution would typically provide for refurbishment of the existing or development of new boreholes and borehole pumps, and an upgrade of the treatment process in line with proposed growth predictions. This may require a staged upgrade of the WTP. For example, the interim solution would typically include an upgrade of the WTP to provide supply to existing customers with consideration given to a further required expansion of the WTP at a later date.
- For surface water sites, where the Preferred Approach requires that the existing WTP is to be maintained, the interim option would typically involve the upgrade of the existing WTP in line with proposed growth predictions. As for groundwater sites this may require a staged upgrade of the WTP where the interim solution would typically include an upgrade of the WTP to provide supply to existing customers with consideration given to a further required expansion of the WTP at a later date.
- For groundwater and surface water sites where the Preferred Approach involves the decommissioning of the WTP by providing supply to the customers from another WTP within the WRZ or from another WRZ/Study Area/Region, the interim solution would involve the advancement of the rationalisation of the WTP, by provision of part supply or full supply if possible. If rationalisation is not feasible at that point in time due to dependencies on Study Area or Regional options, containerised WTP upgrade solutions would be considered for the WTP. This involves the provision of a package WTP within a containerised unit. These package plants can be modified for use on other sites in the future therefore are considered “no regrets” infrastructure investment

A decision to progress any interim solution will be based on priority need to address water quality risk or supply reliability e.g. RAL, drought issues or critical need for example. The Regional Plan does not confer funding availability for any project and any interim measures will be subject to budget availability, relevant environmental assessment and other required consents in the normal way.

These solutions, in most cases, will only be used to allow time to deliver the longer-term solution. The interim solutions are determined in line with the Preferred Approach and as such, they are considered “no regrets” infrastructure investment.

Table 6.1 SA2 Interim Options

WTP Name	Interim Option
Slievecorragh New Reservoir (BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Dunlavin WTP	Trial well to develop new borehole failed to provide the required yield there it is proposed to progress with the Preferred Approach to rationalise to the GDA WRZ.
Ballyknockan WTP (AKA Valleymount)(BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards
Ballyhook Hill WTP (BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards
Kiltegan Pump Station (Barraderry North) (BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards
Rathdangan WTP (BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards
Knockananna WTP (BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards
Grangecon WTP (BH - South Leinster DBO Bundle)	Refurb existing Borehole, and upgrade WTP to IW Standards
Davidstown WTP (Davidstown well (Pierce)	Refurb existing Borehole, and upgrade WTP to IW Standards
Baltinglass WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Hacketstown WTP	Upgrade WTP to IW Standards – Potential site for a containerised solution

7

Preferred Approach – Sensitivity Analysis

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 have been considered in Chapter 8 of the 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?

A summary of the adaptability criteria and analysis we have undertaken for SA2 is shown in Table 7.1.

Table 7.1 Sensitivity Analysis for SA2

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Sustainability	Moderate/High (as our current abstractions are large compared to the water bodies from which they abstract)	+0 m^3/d	**The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the supply demand balance deficit.** The likelihood of this scenario appears to be low for the Surface Water abstraction at Hacketstown WTP based on outline sustainability assessments. Groundwater Sustainability is more difficult to assess at desktop level, however, as the abstractions in SA2 are small in scale they do not appear to be problematic. Based on this scenario, the Preferred Approach remains the optimal solution.
Climate Change	High (international climate change targets have not been met)	+100 m^3/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. Within SA 2, the single river abstraction at Hacketstown would be vulnerable to

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
			increased climate change impacts scenarios. However, this source is to be decommissioned as part of the Preferred Approach. Regarding the existing and proposed new groundwater abstractions, 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.
			Based on this scenario, the Preferred Approach remains the optimal solution.
Demand Growth	Low/Moderate (growth has been based on policy)	-283 m^3/d	**The impact of lower than expected growth would reduce the supply demand balance deficit and the overall need requirement**. The supply demand balance deficit is spread across 12 individual water resource zones and is driven by quality as well as quantity issues. In this rural area, growth is relatively low.
			Based on this scenario, the Preferred Approach remains the optimal solution.
Leakage Targets	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	33 m^3/d	**The impact of achieving SELL would reduce the supply demand balance deficit and the overall need requirement.** The need drivers in SA2 West Wicklow are across all 12 water resource zones and are driven by quality as well as availability issues. Therefore, the Preferred Approach is required, even accounting for increased leakage savings. Based on this scenario, the 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 adaptability assessment, the Interim and Preferred Approaches perform as follows:

- Interim Approach – As the purpose of the Interim Approach is to allow 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
- Preferred Approach – As the Supplies in SA2 West Wicklow are relatively small, and as conservative limits have been applied to the supply availability assessments, the Preferred Approach is adaptable to a range of future outlooks in relation to sustainability and climate

change. The demand growth in the area is small, and the Supply Demand Deficits are primarily driven by reliability. As Water Treatment Plants are modular, capacity will be delivered on a phased basis, allowing for adaptation across a range of futures. 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 broad range of futures, and therefore represent ‘no regrets’ infrastructure.

8

Summary of Study Area 2

8 Summary of Study Area 2

The Preferred Approach for SA2 (summarised in Table 5.8 and Figure 5.3 of Section 5.3.3) consists of local WRZ supplies for 10 of the 12 WRZs in the Study Area, primarily driven by the small scale of the supplies and difficulties in transporting small volumes of water over long distances.

The Preferred Approach for two WRZs, Dunlavin and Holywood, involve connecting these two supplies to the Greater Dublin Area WRZ, in the neighbouring SA 9. The Preferred Approach for Hacketstown involves connection to the Rathvilly WRZ in SA6.

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

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

As part of our Preferred Approach we have also identified a range of interim solutions for SA2, as summarised in Table 6.1.The measures will only be progressed in the event of critical need to allow time for delivery of the required Preferred Approach solutions in the Study Area.

Annex A Study Area 2 Water Treatment Plants

WTP Asset Name	Local Plant Names
Hacketstown WTP	Hacketstown WTP
Baltinglass WTP	Baltinglass WTP
Slievecorragh WTP	Hollywood WTP
Dunlavin WTP	Dunlavin WTP
Ballyhook Hill WTP	Ballyhook Hill WTP
Ballyknockan WTP	Ballyknockan WTP
Kiltegan Pump Station WTP	Kiltegan WTP
Davidstown WTP	Davidstown WTP
Knockananna WTP	Knockananna WTP
Rathdangan WTP	Rathdangan WTP
Grangecon WTP	Grangecon WTP
Knocknagilky WTP	Knocklnagilky WTP

Annex B Study Area 2 Rejection Register Summary

Study Area 2 – Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA2-02a	Rationalise Baltinglass Public Supply to BME WTP	This option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-07a	Rationalise Dunlavin Public Supply to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-11a	Rationalise Hollywood Donard Public Supply to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in		●	

		other options.			
TG4-SA2-14	Rationalise Ballyknockan Valleymount Public Supply to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-15	Rationalise Stratford Public Supply to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-18	Rationalise Kiltegan Public Supply to BME WTP for long term OPEX savings (not in deficit)	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	

TG4-SA2-25	Rationalise Grangecon Public Supply to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-31	Rationalise Hacketstown to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-26	Rationalise to Knockanarrigan Davidstown Public Supply to BME WTP	As per above, this option was considered as part of a grouped option to rationalise 9 WTPs in SA2 to BME. The grouped option required a significant length of the pipeline over 74km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		●	
TG4-SA2-03a	Rationalise Baltinglass Public	This option was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit	●	●	●

	Supply to Rathvily via Hacketstown WTP (Upgrade required)	in the DYCP therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.			
TG4-SA2-19a	Rationalise Kiltegan Public Supply to Rathvilly via Hacketstown WTP (in Carlow) for long term OPEX savings (not in deficit)	As per above, this option was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and sedimentation, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.	•	•	•
TG4-SA2-21	Rationalise Knockananna Public Supply to Rathvilly, via Hacketstown WTP	As per above, this option was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and sedimentation, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.	•	•	•
TG4-SA2-30a	Rationalise Hacketstown to	As per above, this option was considered as part of a grouped option to rationalise 4 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as	•	•	•

	Rathvilly	having a deficit in the DYCP therefore cannot provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore, the grouped option was considered not feasible at coarse screening stage, due to age of water and sedimentation, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.			
TG4-SA2-03b	Rationalise Baltinglass Public Supply to Rathvily via Hacketstown WTP (Upgrade required)	This option was considered as part of a grouped option to rationalise 3 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore could not provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore, the grouped option was considered not feasible, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.	•	•	•
TG4-SA2-19b	Rationalise Kiltegan Public Supply to Rathvilly via Hacketstown WTP (in Carlow) for long term OPEX savings (not in deficit)	This option was considered as part of a grouped option to rationalise 3 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore could not provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore, the grouped option was considered not feasible, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.	•	•	•
TG4-SA2-30b	Rationalisation Hacketstown to Rathvilly	This option was considered as part of a grouped option to rationalise 3 WTPs in SA2 to Ratvilly WTP. Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP therefore could not provide the required supply and the option requires a significant length of the pipeline over 27km for a relatively small supply. Therefore,	•	•	•

		the grouped option was considered not feasible, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.			
TG4-SA2-16	New abstraction from River Slaney for Stratford Public Supply	This option was considered as part of a grouped option to provide deficit to 2 WTPs by increasing abstraction from the River Slaney. The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	•	•	•
TG4-SA2-27	New abstraction from River Slaney for Knockanarrigan Davidstown Public Supply	This option was considered as part of a grouped option to provide deficit to 2 WTPs by increasing abstraction from the River Slaney. The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	•	•	•
TG4-SA2-04	Rationalise Baltinglass Public Supply to Srowland WTP	This option required a significant length of the pipeline over 26km for a relatively small supply. Therefore, it was considered not feasible due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in		•	

		other options.			
TG4-SA2-05	New abstraction from River Slaney for Baltinglass	The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	•	•	•
TG4-SA2-06	Rationalise Baltinglass Public Supply to Rathvilly WTP directly	Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP, therefore, could not provide the required supply and option required a significant length of the pipeline over 27km for a relatively small supply. Therefore, it was considered not feasibledue to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.	•	•	•
TG4-SA2-09	New SW abstraction at Greese River for Dunlavin	This option required a new abstraction and a length of the pipeline over 3km for a relatively small supply. As there were other viable alternative options at WRZ level this option was not taken forward to fine screening.		•	
TG4-SA2-20b	Increase GW abstraction at Kockananna Public Supply and connect to knockaglivky	This option is part of a grouped option to rationalise Knocknagilky Public Supply to Knockanna Public Supply and increase GW abstraction at Knockanna. While the volume of water required at Knockanna is available for the rationalisation of the Knocknagilky WRZ,as the deficit at the Knocknagilky WRZ is 1m3 and the overall demand in the WRZ in the DYCP is 2 m3, the rationalisation works for such a very small supply were considered not feasible . Therefore, it was considered not feasible, due to age of water and possible sedimentation issues and not taken		•	

		forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.			
TG4-SA2-22	Rationalise Knockananna Public Supply to Tinahely WTP	This option required significant works for a relatively small supply. There were other viable alternative options at WRZ level. It was considered not feasible at coarse screening stage, due to age of water and sedimentation, and not taken forward to fine screening.		•	
TG4-SA2-23	New abstraction from Grangecon Stream for Grangecon Public Supply	This option required significant works for a relatively small supply. There were other viable alternative options at WRZ level.It was considered not feasible at coarse screening stage, due to age of water and sedimentation, and not taken forward to fine screening.		•	
TG4-SA2-29	Increased abstraction from River Derreen for Hacketstown	The River Dereen is a tributary of the River Slaney which is designated as the Slaney River SAC. The River Slaney is a “high status” waterbody under WFD. This option was not considered feasible based on yield not being available at the current abstraction point on Mill Race channel adjacent to the River Dereen main channel. The existing abstraction experienced low flow interventions during the summer 2018 drought due to low flows diverted from the main channel into the Mill Race. The alternative SW option to abstract from the Main River channel was preferable as there is yield available and would be sustainable abstraction (5% Q95).	•	•	•
TG4-SA2-30	Increased abstraction from River Derreen	The River Dereen is a tributary of the River Slaney which is designated as the Slaney River SAC. The River Slaney is a “high status” waterbody under WFD. This option	•	•	•

	and Hacketstown WTP expansion	was not considered feasible based on yield not being available at the current abstraction point on Mill Race channel adjacent to the River Dereen main channel. The existing abstraction experienced low flow interventions during the summer 2018 drought due to low flows diverted from the main channel into the Mill Race. The alternative SW option to abstract from the Main River channel was preferable as there is yield available and would be within sustainable abstraction (5% Q95).			
TG4-SA2-30c	Rationalse Hacketstown to Rathvilly	Rathvilly WTP is identified in the RWRP EM as having a deficit in the DYCP, therefore, cannot provide the required supply. Therefore, the option was considered unviable at coarse screening stage at not taken forward to fine screening.	•	•	•
TG4-SA2-33	Rationalisation Kocknagilky Public Supply to Knockananna	This option is part of a grouped option to rationalise Knocknagilky Public Supply to Knockanna Public Supply and increase GW abstraction at Knockanna. While the volume of water required at Knockanna is available for the rationalisation of the Knocknagilky WRZ,as the deficit at the Knocknagilky WRZ is 1m3 and the overall demand in the WRZ in the DYCP is 2 m3, the rationalisation works for such a very small supply were considered not feasible . Therefore, it was considered not feasible, due to age of water and possible sedimentation issues and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.		•	
TG4-SA2-34	Increase GW abstraction at Knockagilky Public	This option is a repeat of TG4-SA2-40. As a result, it would not be considered at coarse screening stage and would not be taken forward to fine screening stage. TG4-SA2-40 is advanced to fine screening.	**This option is a repeat and is assessed as part of a different feasible option'**		

	Supply				
TG4-SA2-36	Proposal to connect small private supplies to IW supplies	Private schemes are currently outside of consideration for current NWRP	**Outside scope of current NWRP - no data available for private supplies**		
TG4-SA2-37	Grangecon Public Supply not in deficit. Treatment upgrade if required.	Due to an SDB update this WRZ is now projected to be in deficit in 2044 and, as such a new supply option is required to address this need. Therefore, this option which solely relates to upgrade of the WTP for Quality Need is no longer suitable and was rejected at coarse screening stage	•		
TG4-SA2-39	Knockananna Public Supply not in deficit. Treatment upgrade if required.	Due to an SDB update this WRZ is now projected to be in deficit in 2044 and, as such a new supply option is required to address this need. Therefore, this option which solely relates to upgrade of the WTP for Quality Need is no longer suitable and was rejected at coarse screening stage	•		