

Autumn 2022



Regional Water Resources Plan – Eastern and Midlands

Appendix 7 Study Area 7 Technical Report



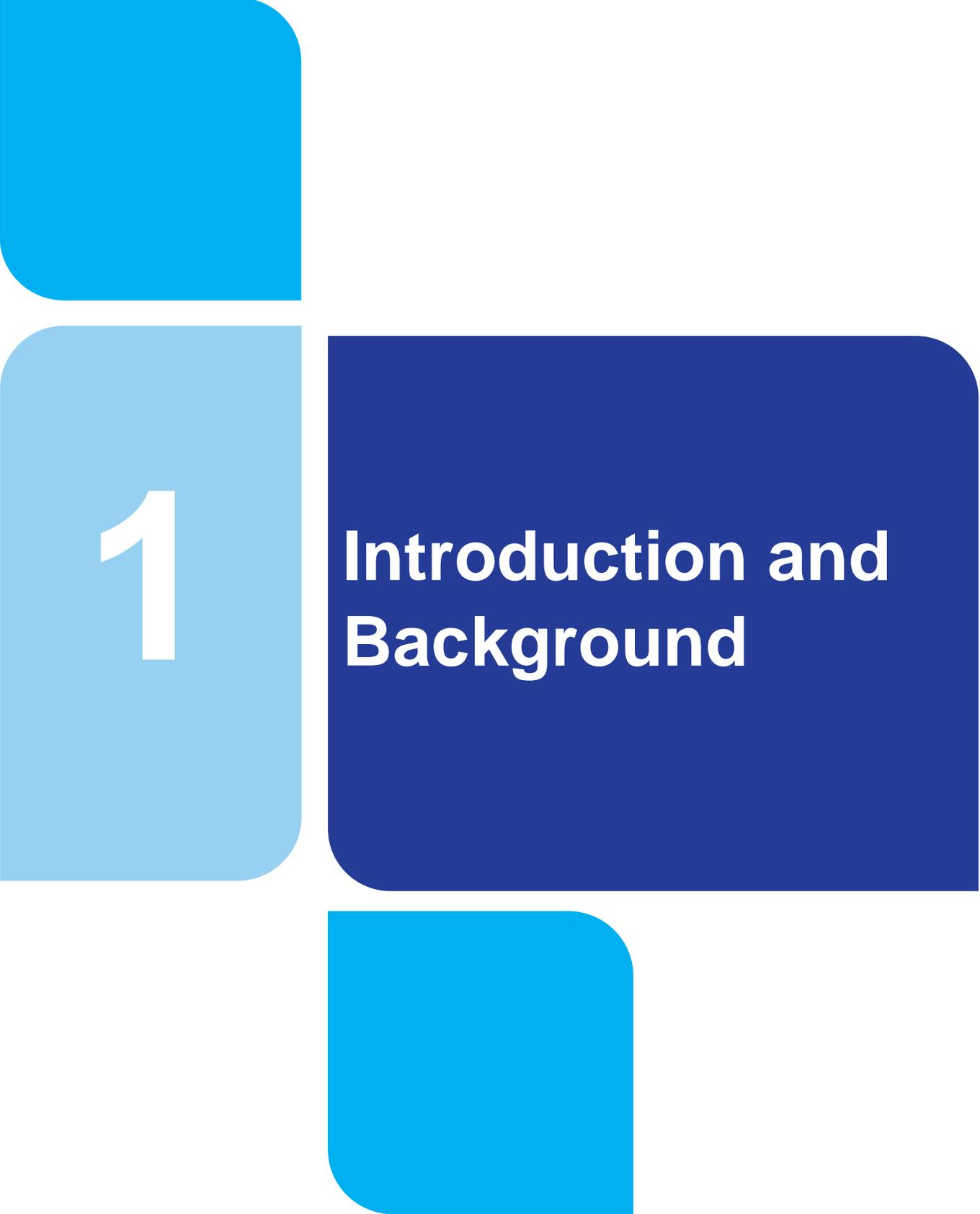
Tionscadal Éireann
Project Ireland
2040

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

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 7

This is the Technical Report for Study Area 7 which applies the Options Assessment Methodology, as set out in the National Water Resources Plan Framework Plan (Framework Plan), 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 10 water resource zones, as outlined in Table 2.3, located counties Galway, Tipperary and Offaly. 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 Regional Water Resources Plan - Eastern Midlands (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.

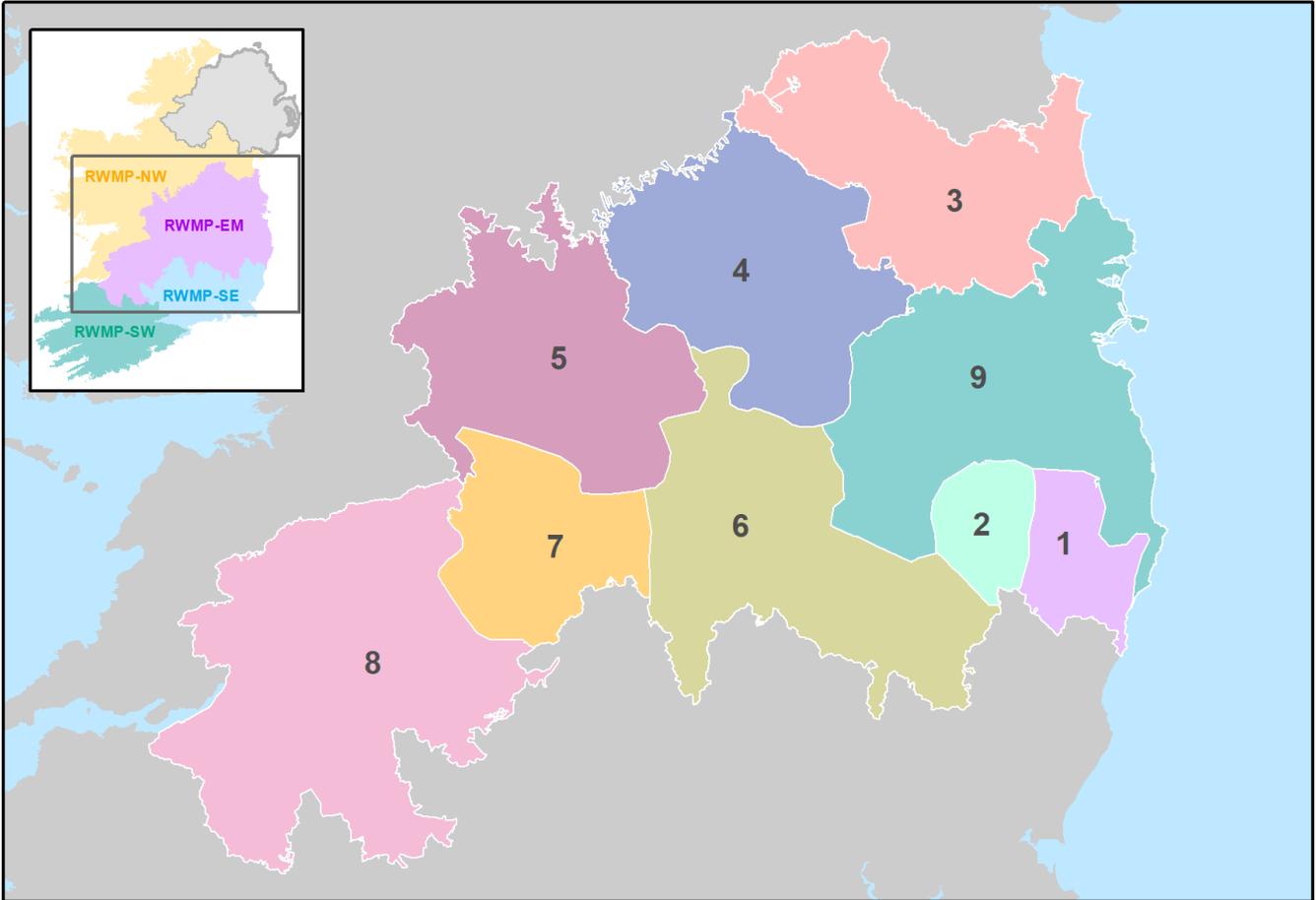


Figure 1.1 Overview of Study Areas within the Eastern and Midlands Region.

This Technical Report is for Study Area 7 (SA7), which consists of a single Water Resource Zone (WRZ). 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 Framework Plan, and any projects that are progressed following this plan will require individual environmental assessments in support of planning applications (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions).

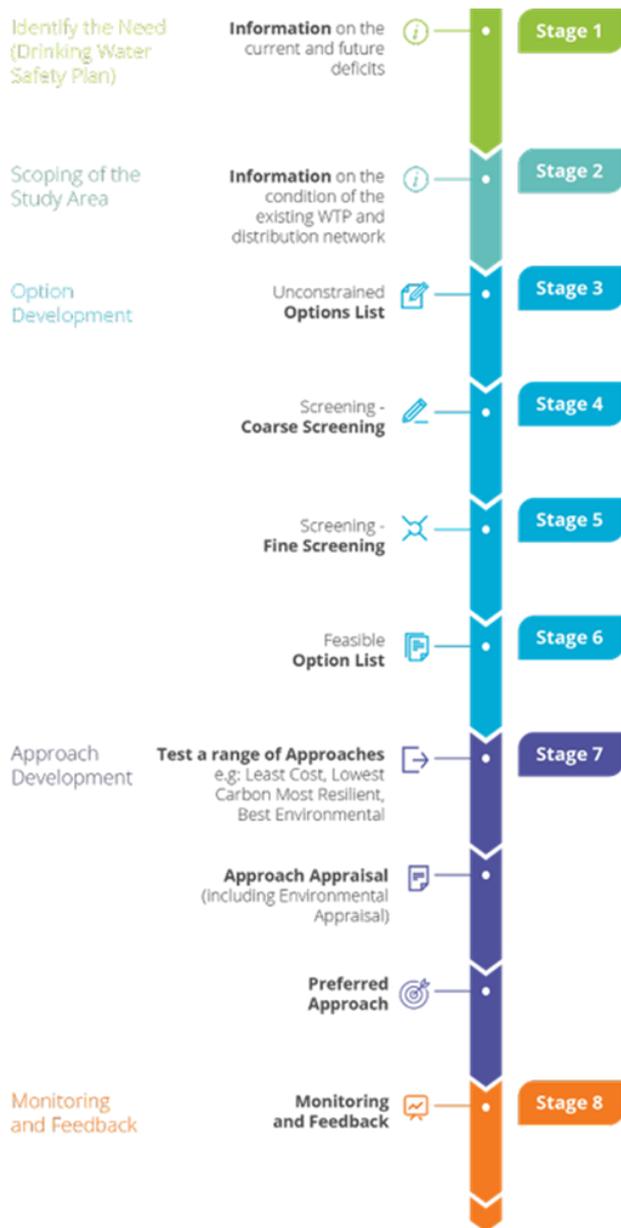


Figure 1.2 Option Assessment Methodology Process

1.2 Introduction to the Study Area

Study Area 7 consists of 10 WRZs supplying a population of 31,237 via approximately 750 kilometres of distribution network. The Study Area is summarised in Figure 1.3 and Table 1.1. The area consists of small towns and villages along with the towns of Nenagh, Roscrea and Portumna. The larger supplies in the area (Nenagh, Portumna and Roscrea) are surface water supplies and abstract water from Lough Derg and the Little Brosna River, whilst the smaller villages utilise groundwater springs and boreholes.

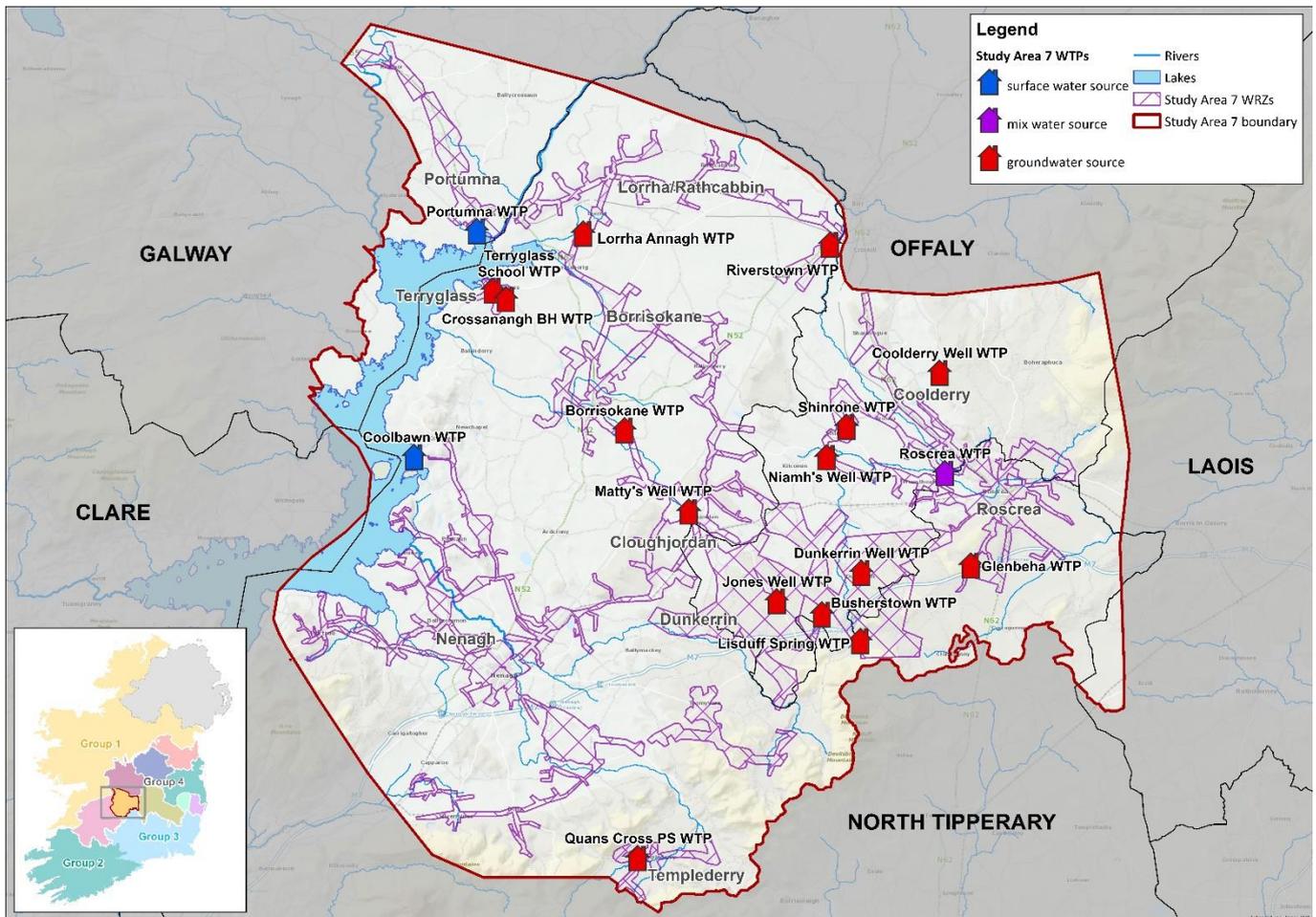


Figure 1.3 SA7 Overview

The majority of the study area is in the Lower River Shannon catchment basin. This includes the Lough Derg waterbody on the main Shannon channel as well as a main tributary, the Little Brosna River, which rises near Dunkerrin and flows north west through the Callows to join the main Shannon channel upstream of Lough Derg. The south east of the study area, near Templemore, crosses into the upper catchment basin of the River Suir which rises on the slopes of the Devil's Bit Mountain. SA7 has several designated areas including the Middle Shannon Callows SPA, River Little Brosna Callows SPA, Lough Derg (Shannon) SPA, River Shannon Callows SAC, and Lough Derg (NE Shore) SAC. Therefore, the combined abstractions in the region need to be reviewed collectively.

There is variable natural geology across the area. Centrally, a regionally important karst aquifer runs South-East and North-East across the study area through Birr, and three regional gravel aquifers lie to the eastern edge of the study area. A larger proportion of the region is considered to be of poorly productive aquifer status. Much of the bedrock geology here is of a local aquifer class due to the poor-quality lime-mudstone. Many of the 16 groundwater sources were historically developed in the mudstones to supply water to the rural populations on the east shores of Lough Derg, and the urban areas of the Moneygall/Roscrea. Nevertheless the scale of the abstractions are small, ranging from 250m³/d to 500m³/d. Recent mapping by the Geological Survey of Ireland show that better availability of groundwater is present in the three gravel aquifers close to Roscrea and Birr towns, and some of the future groundwater options have been positioned here.

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 Study Area 7 North Tipperary

North Tipperary	Total Population	31,240	Total Network Length (km)	757	Number of Water Resource Zones	10	
Counties in Study Area	Galway, Offaly, Tipperary						
Principal Settlements	Nenagh, Roscrea, Portumna, Newtown, Borrisokane, Cloughjordan, Shinrone, Portroe, Moneygall, Silvermines						
Number of Water Sources	19	Surface Water Sources	3	Groundwater Sources	16		
Water Treatment Plant	Source	Population	WTP Capacity (m³/day)	Quality	Quantity	Reliability	Potential Sustainability
Old School Source	Groundwater	139	70	●	●	●	●
Crossanagh WTP	Groundwater		70	●	●	●	●
Coolbawn WTP	Lough Derg	14,866	14,000	●	●	●	●
Matty's Well WTP	Groundwater	1,228	1,200	●	●	●	●
Kylebeg WTP	Spring	1,785	1,150	●	●	●	●

Lorrha Annagh WTP	Groundwater	115	360	●	●	●	●
Riverstown WTP	Spring	1,255	610	●	●	●	●
Quans Cross WTP	Groundwater	286	175	●	●	●	●
Glenbeagh WTP	Spring	6,227	3,600	●	●	●	●
Roscrea WTP	Little Brosna River & BH		5,112	●	●	●	●
Shinrone WTP	Groundwater	1,641	120	●	●	●	●
Niamhs Well WTP	Groundwater		220	●	●	●	●
Coolderry WTP	Groundwater	95	50	●	●	●	●
Busherstown WTP	Spring	345	150	●	●	●	●
Dunkerrin WTP	Spring	1,236	350	●	●	●	●
Jones Well WTP	Spring		400	●	●	●	●
Lisduff Spring WTP	Multiple Groundwater		450	●	●	●	●
Portumna WTP	Lough Derg	2,020	1,500	●	●	●	●

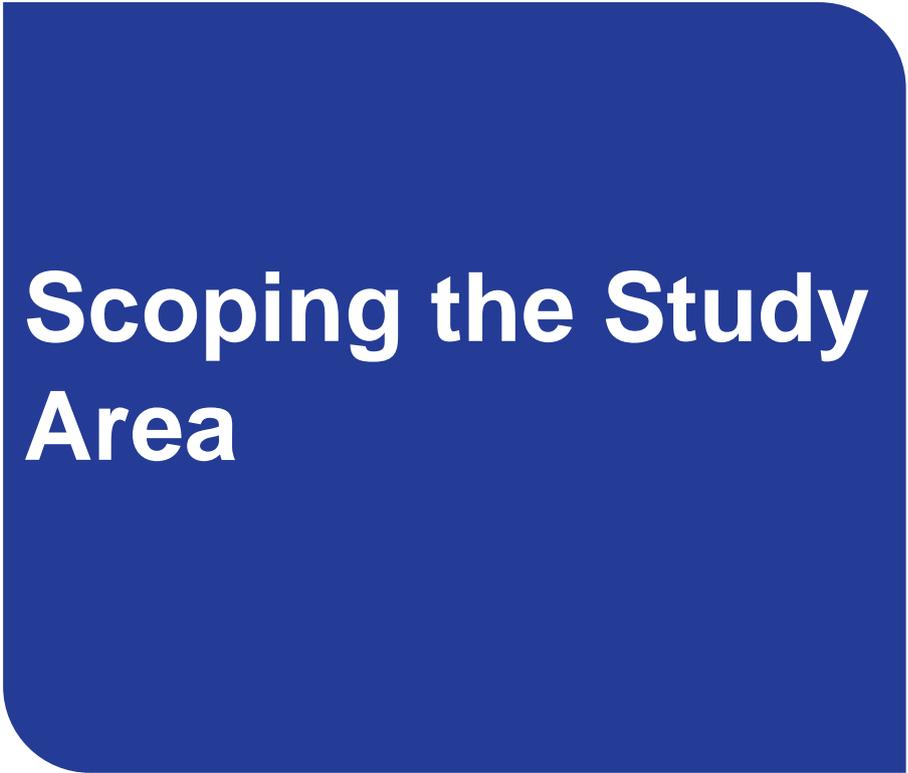
Score

Irish Water Asset
Standard Assessment

●	Low Risk
●	Medium Risk
●	
●	High Risk



2



Scoping the Study Area

2 Scoping the Study Area

In this chapter we summarise the current and future issues with water supplies in Study Area 7, 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 SA7 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
Old School Source	●	●	●	●
Crossanagh WTP	●	●	●	●
Coolbawn WTP	●	●	●	●
Matty's Well WTP	●	●	●	●
Kylebeg WTP	●	●	●	●
Lorrha Annagh 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
Riverstown WTP	●	●	●	●
Quans Cross WTP	●	●	●	●
Glenbehagh WTP	●	●	●	●
Roscrea WTP	●	●	●	●
Shinrone WTP	●	●	●	●
Niamhs Well WTP	●	●	●	●
Coolderry WTP	●	●	●	●
Busherstown WTP	●	●	●	●
Dunkerrin WTP	●	●	●	●
Jones Well WTP	●	●	●	●
Lisduff Spring WTP	●	●	●	●
Portumna 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, 17 of the 18 are considered to be at high risk of failing to achieve the required standards in relation to primary disinfection (Barrier 1) and effectiveness of our 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 two WRZs in SA7 on the RAL, Nenagh and Borrisokane (Greyford source to Crotta). Details of the in progress projects to address critical water quality requirements are included in Table 2.2

Table 2.2 Critical Water Quality Requirements SA7

Critical Water Quality Requirements	Progress
1. Kylebeg WTP: The interim measure of installing a temporary duty UV unit at the WTP was completed in May 2021. IW are now progressing with an upgrade of the disinfection system at the plant as part of the Disinfection Programme. This upgrade will include the installation of Duty/Standby UV treatment at the WTP. This is currently at design stage. It is anticipated that works will commence on site in Q4 2021. Expected completion of the works is anticipated by the end of Q1 2022 with submission of verification data to demonstrate the effectiveness of the works by end Q2 2022.	In Progress
2. Borrisokane WTP: This WTP is on the RAL for inadequate treatment for Cryptosporidium. Capital maintenance upgrades at the WTP are proposed for 2022, to include installation of UV disinfection.	Ongoing
3. Coolbawn WTP: This WTP is on the RAL for elevated levels of THMs. Upgrades at the WTP are proposed and will progress to design in 2022.	Ongoing
4. Disinfection Programme: In 2016, Irish Water completed a national review of all water treatment plants where disinfection upgrades were required. This review was followed by a programme of works to complete any required upgrades. In SA7, ten sites in County Tipperary and one site in County Offaly have been assessed and disinfection upgrades are planned for the period 2020-2022.	Ongoing
5. Reservoir Cleaning Programme: A major reservoir cleaning programme is ongoing with cleaning completed at 5 sites in SA7 to date with a further 7 sites to be completed, which will reduce network water quality issues.	In Progress

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 assesses the water quantity investment needs of our supplies by developing SDB calculations for each of our water supplies as outlined 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

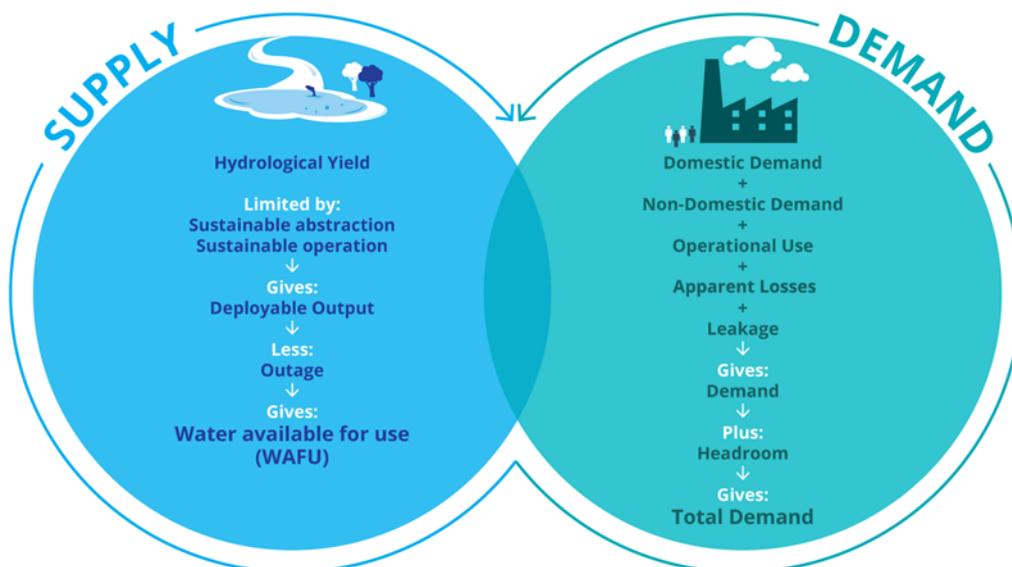


Figure 2.1 Supply Demand Balance

For each of the 10 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 described in Chapter 2 of the Framework Plan. The SDB deficits in SA7 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, 4 out of the 10 water resource zones in Study Area 7 the area suggest a supply demand balance deficit (based on a “do nothing” approach) under present & future scenarios. While sufficient during normal weather conditions, several would fail in drought. During the drought in summer 2018, all of our groundwater supplies were being monitored due to falling levels in the groundwater bodies, and the Lorrha/Rathcabin and Dunkerrin supplies were severely impacted.

A summary of the SDB deficit, for the Dry Year Critical Period, across all 10 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

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m ³ /day					
			2019	2025	2030	2035	2040	2044
Terryglass	2900SC0051	139	No Deficit	No Deficit	-1	-2	-4	-5
Nenagh	2900SC0050	14,866	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Cloughjordan	2900SC0046	1,228	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Greyford source to Crotta	2900SC0045	1,785	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	-2
Lorrha	2900SC0043	1,370	-206	-220	-230	-241	-251	-260
Templederry	2900SC0003	286	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Roscrea	2900SC0002	7,868	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Coolderry PWS	2500SC0012	95	-31	-31	-32	-33	-33	-33
Dunkerrin / Moneygall	2500SC0010	1,581	-337	-357	-368	-380	-391	-400
Portumna PS	1200SC0030	2,020	-199	-220	-237	-254	-271	-284

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 773 m³/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 985 m³/day by 2044.

Our ongoing activities to improve the Supply Demand Balance in SA7 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.

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

To date, a significant amount of watermain rehabilitation has been carried out across Study Area 7. 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 the drought in summer 2018 a number of raw water sources experienced issues. Raw water levels dropped significantly at Lorrha/Rathcabin and Dunkerrin. Therefore, these supplies have reliability as well as supply demand balance issues.

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 SA7 Critical Infrastructure Projects and Need Identification

Critical Water Supply Reliability Requirement	Progress
<p>1. Nenagh RWSS - The raw water at Coolbawn WTP is subject to algae issues resulting in historic taste/odour problems which could affect a population of approximately 14,600. There is also a high risk of THM exceedances at the network extremities and the WRZ is on the RAL for THM exceedances.</p>	<p>Assessment Complete</p>
<p>2. Lorrha/Rathcabin - There are significant network constraints between the Lorrha Annagh Zone 2 network and the Riverstown Zone 3 (Mix) network which significantly limits water transfer between these zones. This is further compounded by the limited treated water storage in the East of the network and both WTP being single sources.</p>	<p>Assessment Complete</p>
<p>3. Borrisokane - This WRZ is supplied by a single spring source at Kylebeg WTP with no standby boreholes. Any issue at this WTP would impact the supply to a population of approximately 1,800.</p> <ul style="list-style-type: none"> The existing 150mm AC main (constructed in the 1980s) between Borrisokane WTP (Kylebeg WTP) and service reservoir is routed through private land with limited access for essential maintenance and repair. 	<p>Assessment Complete</p>
<p>4. Cloughjordan - Cloughjordan is supplied by a single source at Matty's Well WTP with no standby boreholes in the WRZ. Any issue with at this WTP would impact the supply to a population of approximately 1,300.</p> <ul style="list-style-type: none"> The existing 150mm AC main (constructed in the 1980s) between Mattys Well WTP and Cloughjordan service reservoir is routed through private land with limited access for essential maintenance and repair 	<p>Assessment complete</p>
<p>5. Portumna PSW - The intake at Portumna WTP is vulnerable to boat/cruiser traffic. The intake has been damaged a number of times.</p> <ul style="list-style-type: none"> The supply has one large business user which accounts for 50-60% of demand. Their demand can fluctuate considerably which can put a strain on the deliverability of water. The WTP discharges liquid sludge & Washwater to the sewer. The plant lacks a sludge balance tank and overflows onto a nearby carpark can sometimes occur. 	<p>Assessment Complete</p>
<p>6. Dunkerrin/Moneygall - This WRZ has less than the recommended requirement of 24hrs of potable water storage. This issue is exacerbated by the fact that there are on-going water quality and water supply deficits in WRZ.</p> <ul style="list-style-type: none"> Deficits in the WRZ relate to asset design & condition. There is insufficient capacity / resilience within the network to transfer water around the WRZ as required. Works are currently progressing to develop a new production well at Jones Well WTP. 	<p>On Going</p>

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.

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 SA7 Tipperary North Supplies, we have assessed our surface water abstractions and summarised the potential impact on Lough Derg (Portumna and Nenagh) and on the Little River Brosna (Roscrea).

Based on this initial desktop assessment, the volumes of water abstracted at Roscrea from the Little Brosna River, may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA who will have the benefit of detailed project level information . 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 presents the findings of this assessment in order to indicate the potential reductions to abstraction that may be required at our existing surface water supplies. These reductions are based on estimates of the level of reductions that a potential future regulatory regime may require, taking a conservative and precautionary approach. The table presents our current abstraction levels¹, our source hydrological yield², and our estimated sustainable abstraction³ amount which the source may be limited to in the future.

Based on this initial desktop assessment, the volumes of water abstracted at Roscrea from the Little Brosna River, may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA who will have the benefit of detailed project level information . 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 Potential Future Abstraction

Description	Little Brosna River (Roscrea)	Lough Derg (Nenagh)	Lough Derg (Portumna)
Current abstraction (m ³ /day)	4,686	12,833	1,375

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.

Hydrological yield (m ³ /day)	9,104	2,826,219	2,715,324
Potential Future abstraction (m ³ /day)	2,338	1,486,613	1,391,284

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	Little Brosna River (Roscrea)	Lough Derg (Nenagh)	Lough Derg (Portumna)
Potential change in SDB ⁴ (m ³ /d)	-1,035	none	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 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.

⁴ Based on potential changes to the projected 2044 Dry Year Critical Period (DYCP) scenario

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

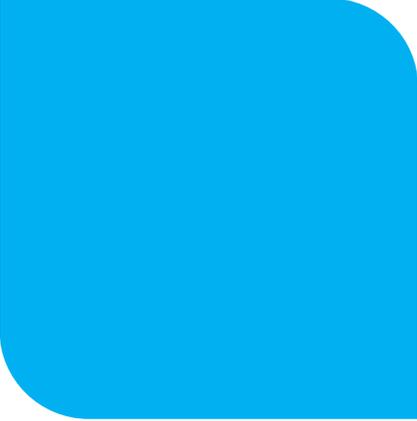
Study Area 7 has issues in relation to quality, quantity, reliability and sustainability which must be addressed as part of the preferred approach to future water resources planning, summarised in Table 2.7.

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

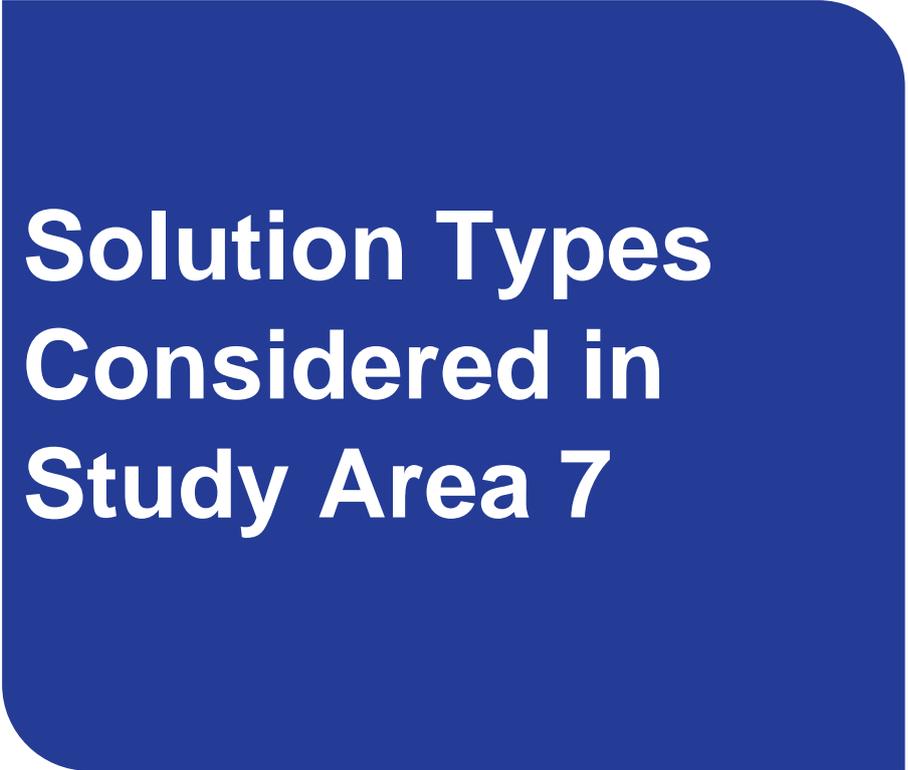
Quality	Upgrades required at all WTPs, aligned with the barrier approach
Quantity	Leakage Targets of 2,078 m ³ /d to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500 m ³ /d The SDB deficit in the region ranges between 773 m ³ /d in 2019 during dry conditions, to a maximum of 985 m ³ /d in 2044 during dry conditions..
Reliability (In addition to progressing projects)	Continued network upgrades and improvements in the bulk and distribution networks
Sustainability	Based on this initial desktop assessment, the volumes of water abstracted at Roscrea from the Little Brosna River, may not meet sustainability guidelines during dry weather flows. 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.

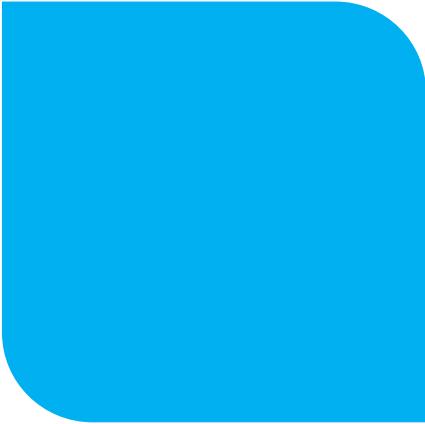
Further details of planned, live and recently completed projects are available on our website see: <https://www.water.ie/projects-plans/our-projects/>



3



**Solution Types
Considered in
Study Area 7**



3 Solution Types Considered in Study Area 7

In this chapter, we summarise the type of solutions we have considered to address identified need in Study Area 7.

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 SA7, the following unconstrained options have been reviewed.

3.1 Leakage Reduction



The Leakage reduction measures across the public water supply considered for SA7 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 1,500m³/d, see Table 3.1.

Table 3.1 SELL Targets for WRZ in SA7

WRZ	Net Leakage Reduction applied to SDB (m ³)	Leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m ³ /d (m ³)	Total Leakage Targets (m ³)
Dunkerrin/ Moneygall		221	221
Coolderry PWS		27	27
Roscrea		828	828
Lorrha		56	56
Nenagh		945	945

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.

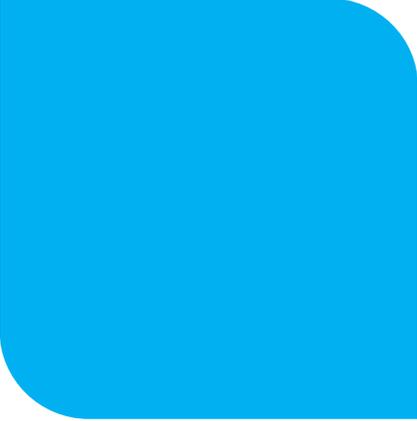
3.3 Supply Smarter



The supply options considered as part of the options development are unconstrained by distance from SA7 and include:

- 22 stand-alone groundwater options, across the region
- 10 stand-alone surface water options, across the region
- 10 Interconnections and transfers from WRZs and Group Water Schemes
- 16 Transfers from other WRZs in other study areas
- 7 Rationalisation⁵ Options
- 1 Conjunctive Use Option

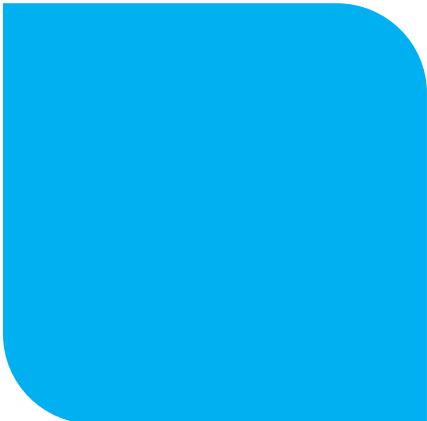
⁵ Rationalisation of a WRZ includes providing part or full supply to the WRZ from another WRZ. Often some or all of the WTPs in the WRZ obtaining supply are decommissioned as part of this process.



4



**Option
Development SA7**



4 Option Development for Study Area 7

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 SA7, 82 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 SA7 Unconstrained Options

No. of Options	Option Type
22	Groundwater
10	Surface water
3	Transfer from scheme in surplus
2	Transfer from Group Water Scheme
1	Interconnection GW
4	Interconnection SW
16	Cross Study Area Supply
17	Rationalise to another supply
1	Conjunctive Use
2	Tankering during dry weather
4	Upgrade Water Treatment Plant

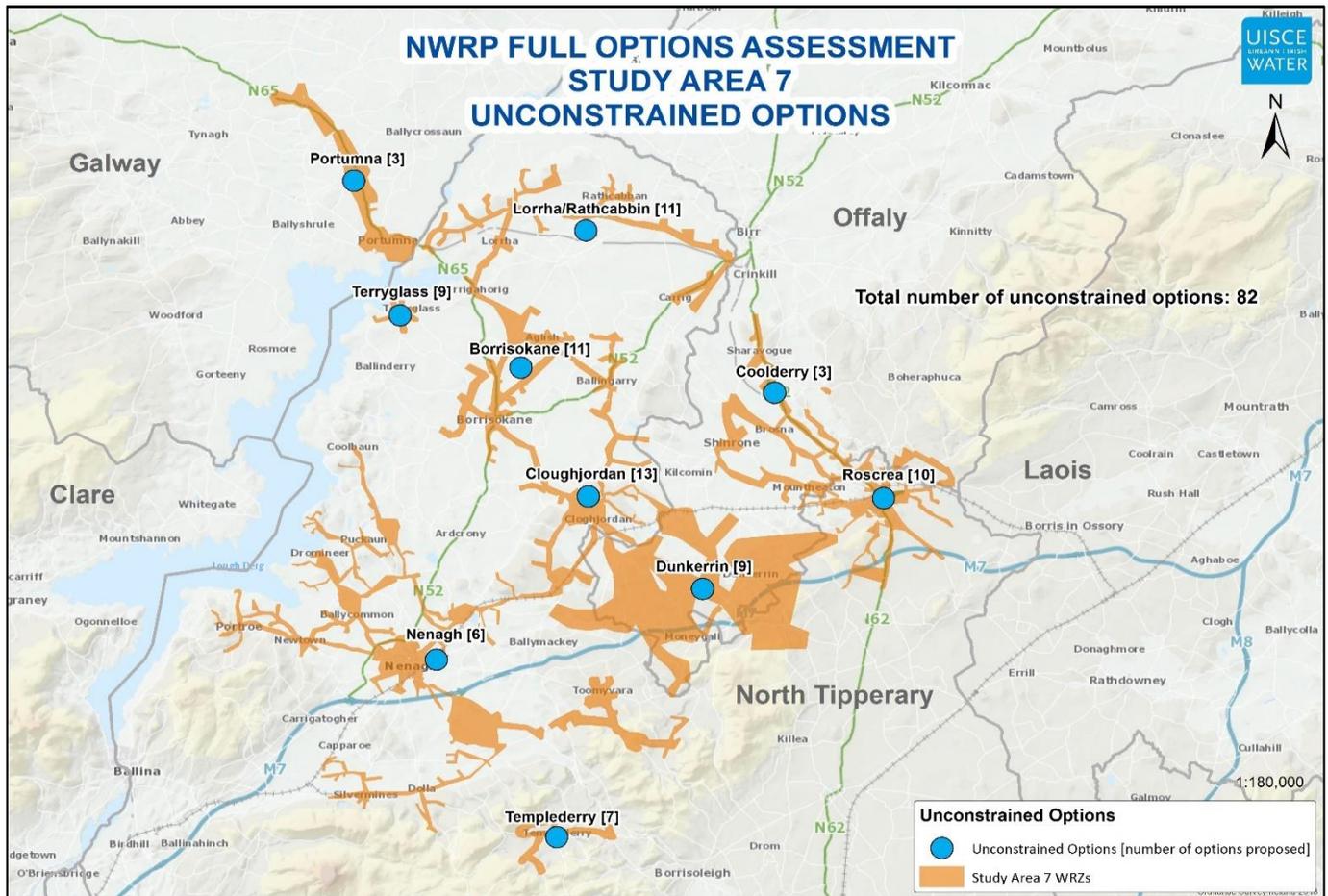


Figure 4.1 SA7 Unconstrained Options

The 82 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues.

4.2 Coarse Screening

The 82 identified Unconstrained Options were assessed through Coarse Screening against the criteria of:

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

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

48 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 Templederry WRZ.

Example Rejected Option

Option SA7-06

Rationalise Templeberry to Nenagh WRZ via Killeen GWS (approx. distance 6km, new watermains and network upgrades required) and new WTP

Rejection Reason

The option requires a significant length of new pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water and sedimentation of mains. Therefore, as there were other viable options for these WRZs this option was not considered feasible at coarse screening stage.

The remaining 34 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 remaining options are summarised in Table 4.3

Table 4.3 SA7 Remaining Options after Coarse Screening

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

4.3 Fine Screening

The 34 remaining options were subject to a more detailed multi-criteria assessment (MCA) at the Fine Screening Stage using desktop assessments of performance against 33 specified questions relating to Sustainability (Environmental and Social Impacts), Resilience, Deliverability and Progressibility. 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, two further options were rejected, with the remaining 32 options considered to be feasible and brought forward to desktop outline design and costing.

These are summarised in Table 4.4 and shown spatially in Figure 4.2.

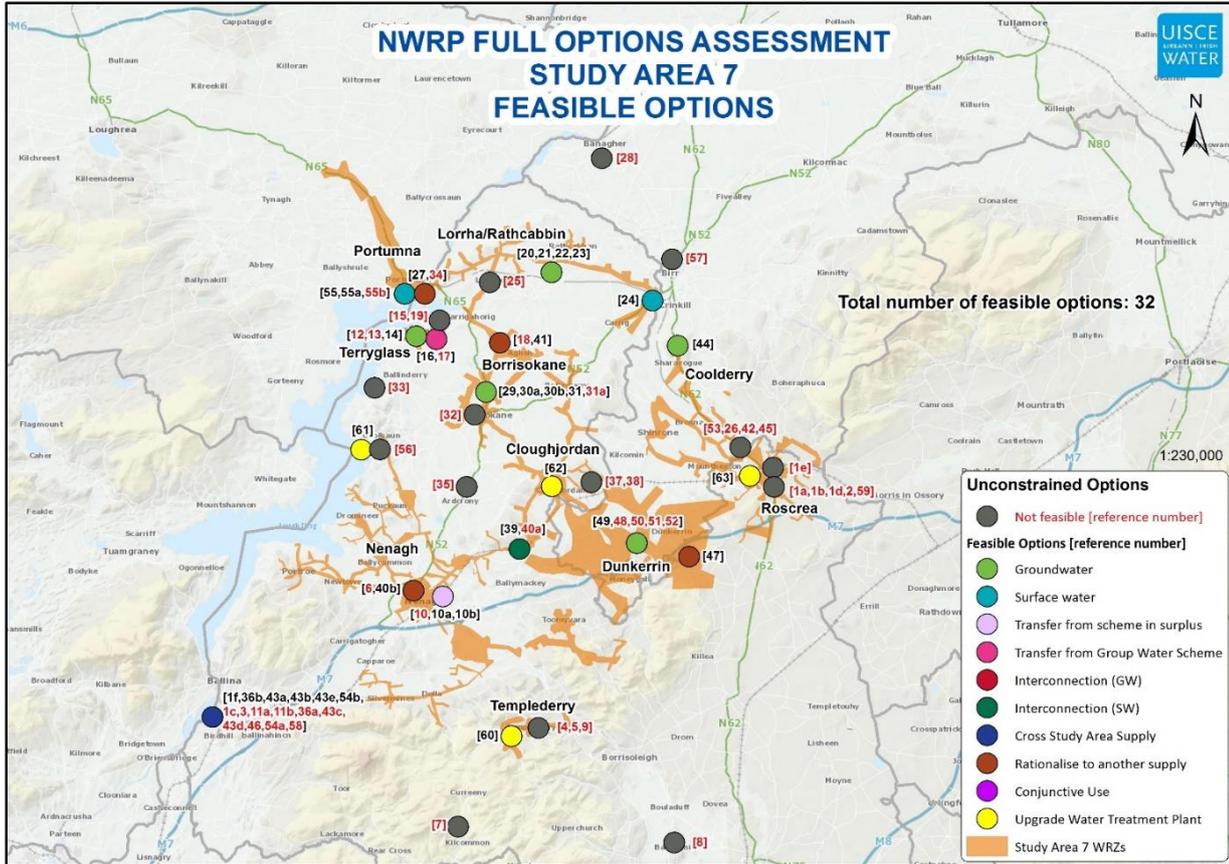


Figure 4.2 Fine Screening (Feasible Options)

Table 4.4 SA7 Remaining Options after Fine Screening (Feasible Options)

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

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 773 m³/d in 2019 during dry conditions, to a maximum of approximately 985 m³/d in 2044 during dry conditions. During the options assessment stage, a total of 82 unconstrained options were assessed. Of these, 50 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
39	Deliverability & Flexibility
11	Other reasons such as repeat options or operational options which did not provide additional supply

The remaining 32 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 8. From this table it can be noted that there are 19 WRZ Options and 13 options which can be merged to form 6 Study Area Options.

A summary of the number of options and whether they are WRZ or SA options is contained in Table 4.6.

Table 4.6 SA7 Feasible Options Summary

Water Resource Zone Name	Option Type	
	WRZ Option	Study Area Option
Greyford to Crotta	3	2
Cloughjordan	2	5
Coolderry PWS	1	0
Dunkerrin / Moneygall	2	1
Lorrha/Rathcabbin	5	1
Nenagh RWSS	1	2
Portumna	1	1
Roscrea RWSS	1	1
Templederry	1	0
Terryglass	2	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 7.

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

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 (Best 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	Statutory

Approaches Tested	Description	Policy Driver
	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.	Obligations under the Water Supply Act 2007 and Drinking Water Regulations
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 Plan 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.

STEP 0 Best AA	If there is an option that meets the Objectives of the Plan, and is assessed as having no potential impact on a European Site (based on desktop assessment), it is automatically adopted as the Preferred Approach
STEP 1 Least Cost	Compare Least Cost against best AA Approach, and consider again at Step 6
STEP 2 Quickest Delivery	Compare Least Cost against Quickest Delivery Approach and develop Modified Approach if appropriate
STEP 3 Best Environmental	Compare Least Cost or Modified Approach against Best Environmental, and modify approach if appropriate
STEP 4 Most Resilient	Compare Least Cost or Modified Approach against Most Resilient
STEP 5 Least Carbon	Compare Least Cost or Modified Approach against Lowest Carbon
STEP 6 Approach Comparison	Compare output from Steps 1 to 5 against: <ul style="list-style-type: none"> • SEA required outcomes • Best AA outcomes • Sectoral Adaptation Outcomes • Public Expenditure Code Outcomes
STEP 7 Preferred Approach	Select Preferred Approach based on steps 0 to 6

Figure 5.2 Figure of the 7 step assessment process

This methodology which is further 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.

- 1) 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 SA 7.
- 2)

5.2 Preferred Approach Development

5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this technical report there are 32 feasible options. 19 of these options are WRZ Options while 13 options are merged to form 13 Study Area Options. Table 5.2 outlines the 13 WRZ options for SA7, 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 5.3 SA7 Feasible Options

Water Resource Zone Name	Feasible Options SA7 North Tipperary	
	Option Code	Option Description
Terryglass	SA7-014	Terryglass - New GW abstraction (poorly productive aquifer) to supply full demand and abandon existing sources
Terryglass	SA7-016	Terryglass - Supply deficit from nearby Carrigahorig GWS
Lorrha/Rathcabbin	SA7-020	Lorrha/Rathcabbin - Increase GW abstraction at Riverstown sources (poorly productive aquifer) and upgrade Riverstown WTP
Lorrha/Rathcabbin	SA7-021	Lorrha/Rathcabbin - Increase GW abstraction at Lorrha source (poorly productive aquifer) and upgrade Lorrha Annagh PS WTP
Lorrha/Rathcabbin	SA7-022	Lorrha/Rathcabbin - New GW abstraction from Birr gravels groundwater body and new WTP to supply deficit
Lorrha/Rathcabbin	SA7-023	Lorrha/Rathcabbin - New GW abstraction from Birr groundwater body (karstic bedrock) and new WTP to supply deficit
Lorrha/Rathcabbin	SA7-024	Lorrha/Rathcabbin - New SW abstraction from River Little Brosna
Greyford to Crotta	SA7-029	Greyford to Crotta - Increase GW abstraction at Greyford Source (poorly productive aquifer) and upgrade existing Borrisokane WTP
Greyford to Crotta	SA7-030a	Greyford to Crotta - New GW abstraction from Greyford to Crotta groundwater body (karstic bedrock)

Water Resource Zone Name	Feasible Options SA7 North Tipperary	
	Option Code	Option Description
Greyford to Crotta	SA7-031	Greyford to Crotta - New GW abstraction from Lismaline groundwater body (productive fissured bedrock)
Cloughjordan	SA7-043b	Cloughjordan - New connection point from connecting to Cloughjordan
Coolderry PWS	SA7-044	Coolderry PWS - Increase abstraction from Coolderry Well and upgrade Coolderry WTP (Roscrea Gravels groundwater body)
Dunkerrin / Moneygall	SA7-047	Dunkerrin / Moneygall - Develop Jones Well into a production wells (No. 2 G2 BHs with filtration, UV and 6 hrs storage). Rationalise Dunkerrin and Lisduff via upgraded 5.2km watermains and existing network. Rationalise Moneygall via 1.5km of watermains.
Dunkerrin / Moneygall	SA7-049	Dunkerrin / Moneygall - Increase abstraction at Jones Well (poorly productive aquifer) and upgrade Jones Well WTP to partly supply deficit
Portumna	SA7-055	Portumna - Increase abstraction and Upgrade WTP
Templederry	SA7-060	Templederry WTP Upgrade
Nenagh RWSS	SA7-061	Nenagh WTP Upgrade
Cloughjordan	SA7-062	Cloughjordan WTP Upgrade
Roscrea RWSS	SA7-063	WTP upgrade

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 5.4 SA7 Alignment of WRZ Option/s with Approach Categories

Water Resource Zone Name	Feasible Options SA7 Tipperary North			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
Terryglass	2	SA7-014	Terryglass - New GW abstraction (poorly productive aquifer) to supply full demand and abandon existing sources	✓	-	✓	✓	-	-
		SA7-016	Terryglass - Supply deficit from nearby Carrigahorig GWS	-	✓	-	-	✓	✓
Lorrha/Rathcabbin	5	SA7-020	Lorrha/Rathcabbin - Increase GW abstraction at Riverstown sources (poorly productive aquifer) and upgrade Riverstown WTP	-	-	-	-	-	✓
		SA7-021	Lorrha/Rathcabbin - Increase GW abstraction at Lorrha source (poorly productive aquifer) and upgrade Lorrha Annagh PS WTP	-	-	-	-	-	-
		SA7-022	Lorrha/Rathcabbin - New GW abstraction from Birr gravels groundwater body and new WTP to supply deficit	-	-	-	-	-	-
		SA7-023	Lorrha/Rathcabbin - New GW abstraction from Birr groundwater body (karstic bedrock) and new WTP to supply deficit	-	-	✓	✓	✓	-
		SA7-024	Lorrha/Rathcabbin - New SW abstraction from River Little Brosna	✓	✓	-	-	-	-
Greyford to Crotta	3	SA7-029	Greyford to Crotta - Increase GW abstraction at Greyford Source (poorly productive aquifer) and upgrade existing Borrisokane WTP	✓	✓	✓	✓	✓	-
		SA7-030a	Greyford to Crotta - New GW abstraction from Greyford to Crotta groundwater body (karstic bedrock)	-	-	-	-	-	✓
		SA7-031	Greyford to Crotta - New GW abstraction from Lismaline groundwater body (productive fissured bedrock)	-	-	-	-	-	-
Cloughjordan	1	SA7-043b	Cloughjordan - New connection point from NSS connecting to Cloughjordan	✓	-	-	-	✓	✓
Coolderry PWS	1	SA7-044	Coolderry PWS - Increase abstraction from Coolderry Well and upgrade Coolderry WTP (Roscrea Gravels groundwater body)	✓	✓	✓	✓	✓	✓
Dunkerrin / Moneygall	1	SA7-047	Dunkerrin / Moneygall - Develop Jones Well into a production wells (No. 2 G2 BHs with filtration, UV and 6 hrs storage). Rationalise Dunkerrin and Lisduff via upgraded	✓	✓	✓	✓	-	-

Water Resource Zone Name	Feasible Options SA7 Tipperary North			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
			5.2km watermains and existing network. Rationalise Moneygall via 1.5km of watermains.						
Portumna	1	SA7-055	Portumna - Increase abstraction and Upgrade WTP	✓	✓	✓	✓	✓	✓
Templederry	1	SA7-060	Templederry WTP Upgrade	✓	✓	✓	✓	✓	✓
Nenagh RWSS	1	SA7-061	Nenagh WTP Upgrade	✓	✓	✓	✓	✓	✓
Cloughjordan	1	SA7-062	Cloughjordan WTP Upgrade	-	✓	✓	✓	-	-
Roscrea RWSS	1	SA7-063	WTP upgrade	✓	✓	✓	✓	✓	✓

The 7 Step Process outlined in Figure 5.2 was then applied to each WRZ in SA7, 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, no 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 9 of the 10 WRZs;
- Of the 10 WRZ level preferred approaches, none have a -3 score against biodiversity

Preferred Approaches at WRZ level are outlined in Table 5.4.

Table 5.5 SA7 WRZ Level Approach

Water Resource Zone Name	Feasible Options SA7 Tipperary North		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Greyford to Crotta	SA7-29	Increase GW abstraction at Crotta Source (poorly productive aquifer) and upgrade existing Borrisokane WTP	-	✓	✓	✓	✓	✓	-	✓
Cloughjordan	SA7-43b	New connection point from NSS connecting to Cloughjordan	-	✓	-	-	-	✓	✓	✓
Coolderry PWS	SA7-44	Increase abstraction from Coolderry Well and upgrade Coolderry WTP (Roscrea Gravels groundwater body)	-	✓	✓	✓	✓	✓	✓	✓
Dunkerrin / Moneygall	SA7-47	Develop Jones Well into a production wells (No. 2 G2 BHs with filtration, UV and 6 hrs storage). Rationalise Dunkerrin and Lisduff via upgraded 5.2km watermains and existing network. Rationalise Moneygall via 1.5km of watermains.	-	✓	✓	✓	✓	-	-	✓
Lorrha/Rathcabbin	SA7-23	New GW abstraction from Birr groundwater body (karstic bedrock) and upgrade Riverstown WTP to supply deficit	-	-	-	✓	✓	✓	-	✓
Nenagh RWSS	SA7-61	WTP Upgrade - no deficit	-	✓	✓	✓	✓	✓	✓	✓
Portumna	SA7-55	Increase abstraction and Upgrade WTP	-	✓	✓	✓	✓	✓	✓	✓
Roscrea RWSS	SA7-63	WTP Upgrade - no deficit	-	✓	✓	✓	✓	✓	✓	✓
Templederry	SA7-060	Templederry WTP Upgrade	-	✓	✓	✓	✓	✓	✓	✓
Terryglass	SA7-14	New GW abstraction (poorly productive aquifer) to supply full demand and abandon existing sources	-	✓		✓	✓	-	-	✓

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. Looking at a wider, more 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 6 Study Area options.

Table 5.6 SA7 Grouped options

Water Resource Zone Name	Water Resource Zone code	Feasible Options SA7 North Tipperary		
		Option Code	Option Description	SA Grouped Option
Greyford to Crotta Cloughjordan Dunkerrin / Moneygall	2900SC0045 2900SC0046 2500SC0010	SA7-504	New connection point from NSS connecting to Greyford to Crotta, Cloughjordan and Dunkerrin	Group 4
Greyford to Crotta Cloughjordan	2900SC0045 2900SC0046	SA7-505	New GW abstraction from Greyford to Crotta groundwater body and rationalise Cloughjordan to Greyford to Crotta WRZ (network upgrades required)	Group 5
Portumna Lorrha/Rathcabbin	1200SC0030 2900SC0043	SA7-510	Increase abstraction and upgrade Portumna WTP. Rationalise Lorrha/Rathcabbin to Portumna WRZ.	Group 10
Cloughjordan Nenagh RWSS	2900SC0046 2900SC0050	SA7-512	Transfer spare capacity from Nenagh to neighbouring schemes in deficit. Improve connectivity of Cloughjordan and Nenagh WRZs (network upgrades required)	Group 12
Cloughjordan Nenagh RWSS	2900SC0046 2900SC0050	SA7-514	Transfer spare capacity from Nenagh to neighbouring schemes in deficit. Rationalise Cloughjordan to Nenagh WRZ.	Group 14
Roscrea RWSS Cloughjordan	2900SC0002 2900SC0046	SA7-515	New connection point from NSS connecting to Roscrea and Cloughjordan WRZs.	Group 15

SA Combinations with Group 12 and Group 15 options did not meet the full deficit therefore were not considered any further.

The 4 Study Area options result in 5 SA Combinations including the WRZ level Approach. The 5 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.7 SA7 Combinations Options Summary

Key	WRZ Approach Option	○	SA Grouped Option	□
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WRZ	WRZ approach options	SA combination 2 (Group4)	SA combination 3 (Group 5)	SA combination 4 (Group 10)	SA combination 5 (Group 15)
Portumna	○	○	○	□	○
Dunkerrin / Moneygall	○	□	○	○	○
Coolderry PWS	○	○	○	○	○
Roscrea RWSS	○	○	○	○	□
Templederry	○	○	○	○	○
Lorrha/Rathcabbin	○	○	○	□	○
Borrisokane	○	□	□	○	□
Cloughjordan	○	□	□	○	○
Nenagh RWSS	○	○	○	○	○
Terryglass	○	○	○	○	○

5.2.1 Stage 3 – Preferred Approach at Study Area Level

As part of stage three, we compare the WRZ Level Approach and the SA Combinations 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 7.1, to establish the Preferred Approach at Study Area level. The results of this process are provided in Table 5.7.

The SA combinations including the WRZ approach outlined in Table 5.7 are assessed to determine the approach categories as summarised in Table 5.7

Table 5.8 Best Combinations

Approach Categories	Best Performing Combination
Least Cost (LCo)	Group 10
Best Environmental (BE)	Group 4
Quickest Delivery (QD)	Group 5
Most Resilient (MR)	Group 4
Lowest Carbon (LC)	Group 10
Best AA (BA)	Group 4

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 Group 10 has the lowest NPV Cost, as shown in Figure 5.2, with the lowest total costs (CAPEX and OPEX) over the solutions lifetime.

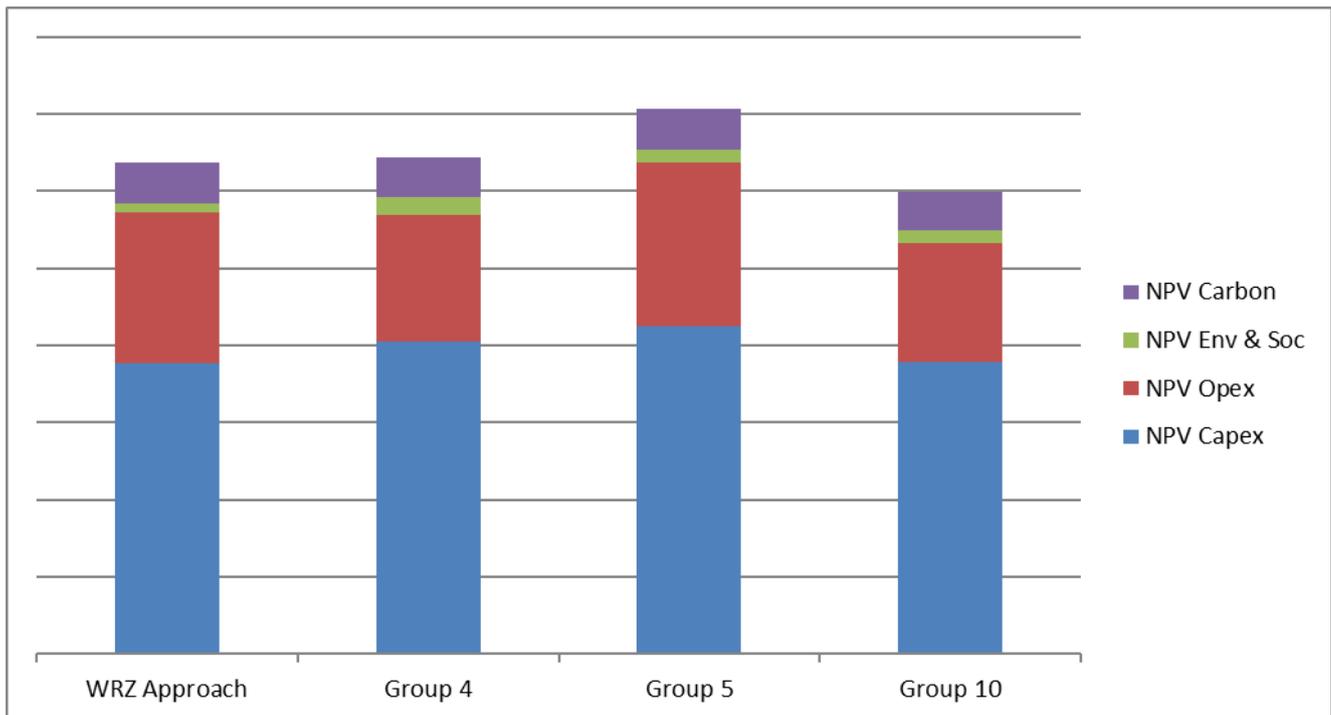


Figure 5.2 SA7 NPV Costs for WRZ and SA approaches

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 is the SA Preferred Approach. 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 contained no options with a -3 biodiversity score and is comparable to 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 carbon and resilience criteria compared to the Least Cost and performs poorly against the environmental criteria. The Least Cost approach was therefore retained at this stage.
- Step 3 - We compared the Least Cost against the Best Environmental Approach. The Best Environmental Approach is also the Most Resilient and Best AA Approach. As it is not significantly more expensive than the Least Cost Approach and Carbon costs are comparable to the Least Cost Approach, the Best Environmental approach was taken forward for consideration.
- Step 4 – We compared the Best Environmental Approach against the Most Resilient Approach. As these are the same approaches the Best Environmental Approach therefore retained at this stage.
- Step 5 - We compared the Best Environmental Approach against the Least Carbon Approach. The Carbon costs between the Best Environmental Approach and the Least Carbon Approach are within 4% therefore the Best Environment Approach does not have significantly greater Carbon costs and the Best Environmental Approach was retained at this stage.
- Step 6 – A final assessment of the Best Environmental Approach was completed against the Least Carbon, Best AA, Best Environmental and Most Resilient Approaches. The Best

Environmental Approach is also the Most Resilient and Best AA Approach and is not significantly more expensive or have significantly higher Carbon costs than the Least Carbon or Least Cost Approaches. The Best Environmental Approach performs poorly against the Quickest Delivery criteria, however, scores comparability against this criteria to the Least Cost Approach. The Best Environmental Approach was therefore retained at this stage.

- Step 7 – The Best Environmental 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 4 represents the Preferred Approach for Study Area 7. The Preferred Approach (Group 4) comprised the options listed in listed in Table 5.9.

Table 5.9 Preferred Approach for SA7

WRZ Name	Preferred Approach Option Description SA Combination – Group 4
Portumna	SA7-055: Portumna - Increase abstraction and Upgrade WTP
Coolderry PWS	SA7-044: Coolderry PWS - Increase abstraction from Coolderry Well and upgrade Coolderry WTP (Roscrea Gravels groundwater body)
Roscrea RWSS	SA7-063: WTP Upgrade
Templederry	SA7-060: Templederry WTP Upgrade
Lorrha/Rathcabbin	SA7-023 New GW abstraction from Birr groundwater body (karstic bedrock) and new WTP to supply deficit
Dunkerrin / Moneygall	Group 4 Option.
Greyford to Crotta	
Cloughjordan	SA7-504: New connection point from NSS connecting to Greyford to Crotta, Cloughjordan and Dunkerrin / Moneygall WRZs.
Nenagh RWSS	SA7-061: Nenagh WTP Upgrade
Terryglass	SA7-014: Terryglass - New GW abstraction (poorly productive aquifer) to supply full demand and abandon existing sources

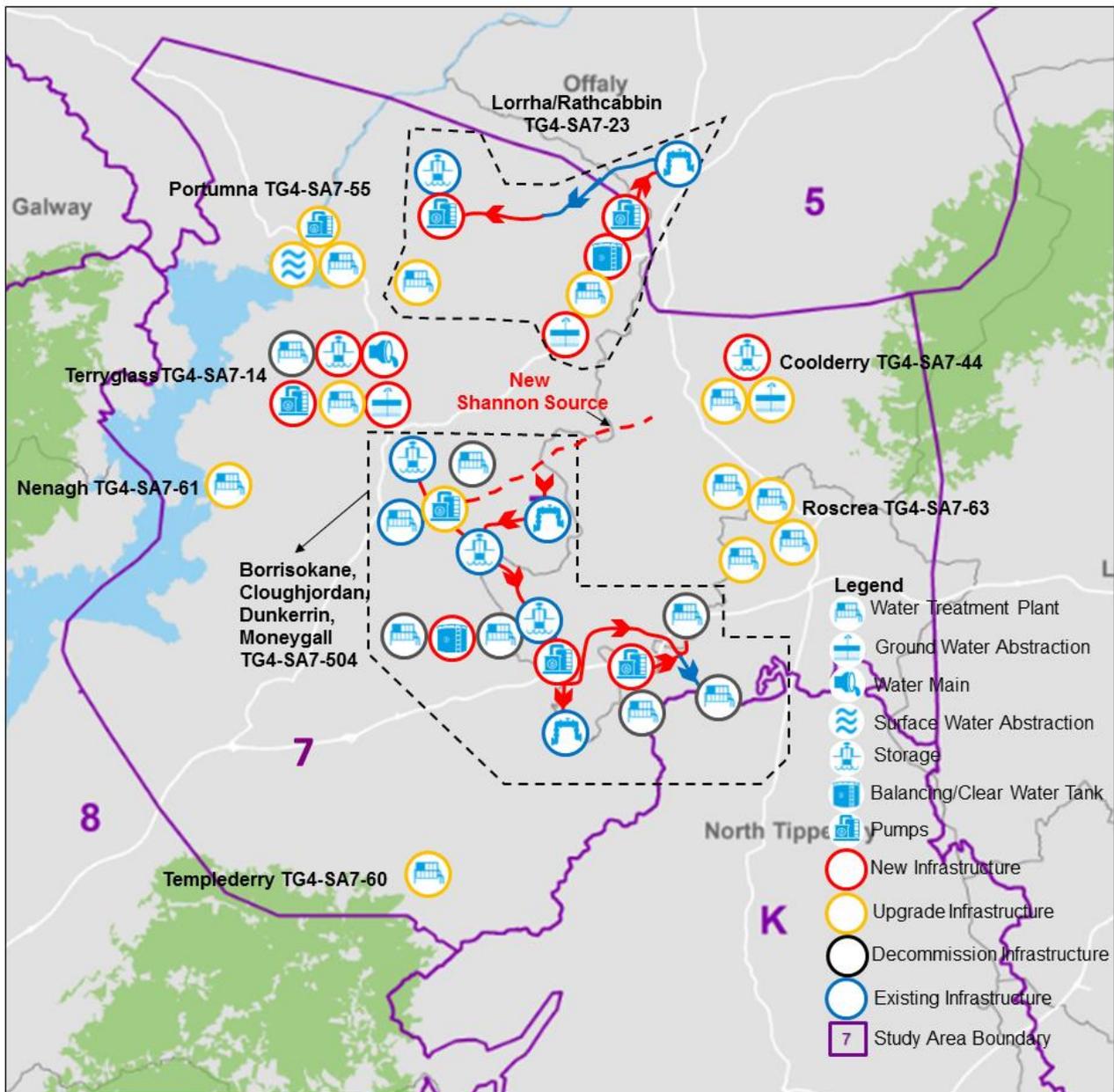


Figure 5.5 SA7 Preferred Approach

The Preferred Approach (SA approach Group 4) is shown schematically in Figure 5.5.

The Preferred Approach for SA7 Tipperary North also includes for demand side (**Lose Less** and **Use Less**) measures, including.

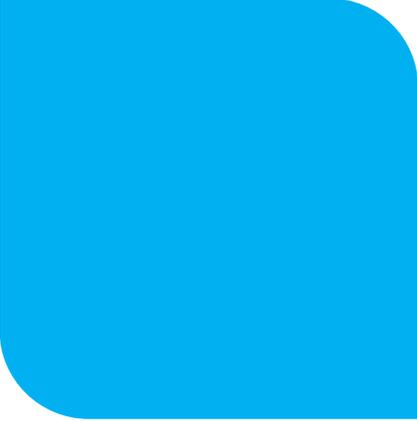
- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset Natural Rate of Leakage Rise (NRR)
- Continuation of IW household and business water conservation campaigns, initiatives and education programmes
- The option to implement legally 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 SA7, 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 Dunkerrin / Moneygall, Borrisokane, and Cloughjordan WRZ is to obtain supply from the proposed New Shannon Source which forms part of the Preferred Approach for 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 alternative options considered are outlined in Table 5.10 below.

Table 5.10 Alternative Options for WRZs dependent on another SA option

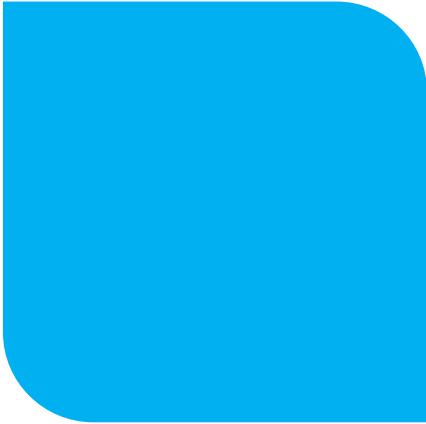
WRZ Name	Alternate Option
Dunkerrin / Moneygall	SA7-047 Decommission 3 of the existing 4 WTPs (4) and increase GW abstractions at Jones Well WTP. (+400m3/day)
Borrisokane	SA7-029 Maintain and increase output at existing WTP by increasing GW abstraction. (+2 m3/day)
Cloughjordan	SA7-062 Upgrade to existing WTP no increase in output required.



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 SA7 Interim Options

WTP Name	Interim Option
Portumna WTP	Upgrade WTP to IW Standards
Lisduff Spring WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Jones Well WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Dunkerrin WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Busherstown WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Coolderry WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Niamhs Well WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Shinrone WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Kylebeg WTP	Upgrade WTP to IW Standards – Potential site for a containerised solution
Matty's Well WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Crossanagh WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Old School Source	Refurb existing Borehole, and upgrade WTP to IW Standards
Coolbawn WTP	Upgrade WTP to IW Standards
Roscrea WTP	Upgrade WTP to IW Standards
Glenbehagh WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Quans Cross WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Riverstown WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Lorrha Annagh WTP	Refurb existing Borehole, and 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 achieve SELL and 21% leakage targets in our larger WRZs within the timeframe of the plan resulting in lower Needs

A summary of the adaptability criteria and analysis we have undertaken for SA7 is shown in Table 7.1.

Table 7.1 Sensitivity Analysis for SA7

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)	+ 1035 m ³ /d	<p>The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the supply demand balance deficit.</p> <p>Our outline sustainability assessments would mean a potential increase in deficit for SA7 based on reductions in the sustainable abstraction amounts from the Little Brosna River supplying Roscrea WRZ. As this WRZ currently shows no projected deficit, feasible options would have to be considered if a sustainability issue is confirmed for the Little Brosna River.</p> <p>Based on this scenario, a Preferred Approach would have to be determined for the Roscrea WRZ.</p>

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Climate Change	High (international climate change targets have not been met)	+ 100 m ³ /d	<p>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.</p> <p>Based on this scenario, the Preferred Approach remains the optimal solution.</p>
Demand Growth	Low/Moderate (growth has been based on policy)	-200 m ³ /d	<p>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 10 individual water resource zones and is driven by quality as well as quantity issues. In this rural area, growth is relatively low.</p> <p>Based on this scenario, the Preferred Approach remains the optimal solution.</p>
Leakage Targets	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	2,078 m ³ /d	<p>The impact of achieving SELL and 21% leakage targets in our larger WRZs would reduce the supply demand balance deficit and the overall need requirement. The need across the water resource zones is driven by quality as well as quantity issues. SA7 includes several regional towns where steady growth is predicted. A significant element of leakage is allocated to Nenagh a WRZ not in deficit. Achieving leakage targets in this WRZ will allow us to reduce the volume of water abstracted.</p> <p>Based on this scenario, the Preferred Approach remains the optimal solution.</p>

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 SA7 Tipperary North 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 7

8 Summary of Study Area 7

The Preferred Approach for SA7 (summarised in Table 5.9 and Figure 5.5) consists of local WRZ supplies for 7 of the 10 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 three WRZs, Cloughjordan, Greyford to Crotta and Dunkerrin/Moneygall involve connecting these supplies to a new treatment plant, at Birdhill, in the neighbouring SA8. The Preferred Approach for the remaining WRZs are local WRZ options.

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 SA7 Tipperary North 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 SA7, as summarised in Table 6.1 in Section 6. The measures will only be progressed in the event of critical need and/or public health impact and to allow time for delivery of the required Preferred Approach solutions in the Study Area.

Annex A Study Area 7 Water Treatment Plants

WTP Asset Name	Local Plant Names
Portumna WTP	Portumna WTP
Lisduff Spring WTP	Lisduff Spring WTP
Jones Well WTP	Jones Well WTP
Dunkerrin WTP	Dunkerrin Well WTP
Niamhs Well WTP	Niamh's Well WTP
Busherstown WTP	Busherstown WTP
Shinrone WTP	Shinrone WTP
Coolderry WTP	Coolderry Well WTP
Coolbawn WTP	Coolbawn WTP
Roscrea WTP	Roscrea WTP
Glenbehagh WTP	Glenbeha WTP
Matty's Well WTP	Matty's Well WTP
Kylebeg WTP	Borrisokane WTP
Riverstown WTP	Riverstown WTP
Lorrha Annagh WTP	Lorrha Annagh WTP
Quans Cross WTP	Quans Cross WTP
Crossanagh WTP	Crossanagh WTP
Old School Source	Terryglass School WTP

Annex B Study Area 7 Rejection Register Summary

Study Area 7 - CS Rejection

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-01a	Transfer spare capacity at Roscrea to neighbouring schemes in deficit	This is a Regional Option. The option requires a significant length of new pipeline of over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-01b	Transfer spare capacity at Roscrea to neighbouring schemes in deficit	This is a Regional Option. The option requires a significant length of new pipeline of over 3km for a relatively small supply (~100m ³ /day). Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-01c	New connection point from New Shannon Source connecting to Roscrea	This is a Regional Option. The option requires a significant length of new pipeline of over 20km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-01d	Transfer spare capacity from Roscrea to neighbouring schemes in deficit	This is a Regional Option. The option requires a significant length of new pipeline of over 12km for a relatively small supply from Roscrea to Rivertown. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-02	Conjunctive use of Little Brosna River in winter and groundwaters sources (Fanure BH and Glenbeha springs) in summer for Roscrea	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	Roscrea WRZ is no longer in deficit		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-03	New connection point from New Shannon Source connecting to Roscrea	This is a Regional Option. The option requires a significant length of new pipeline of over 30km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-04	Increase GW abstraction from Quans Cross source (poorly productive aquifer) and upgrade existing Quans Cross PS WTP to supply deficit	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	Templederry WRZ is no longer in deficit		
TG4-SA7-05	New SW abstraction from River Nenagh. New WTP/upgrade existing WTP for Templederry	This option proposed a new surface water abstraction from the River Nenagh. The existing abstraction is groundwater and increase the existing groundwater is a viable option therefore this new surface water abstraction was considered not necessary for a small additional supply (<10m ³ /day) and not taken through to the fine screening stage		•	
TG4-SA7-06	Rationalise Templederry to Nenagh WRZ via Killeen GWS (approx. distance 6km, new watermains and network upgrades required) and new WTP	The option requires a significant length of new pipeline of over 6km for a relatively small supply (~10m ³ /day). Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-07	Rationalise Templederry to Kilcommon WTP (approx. distance 6km, new watermains and network upgrades required)	The option requires a significant length of new pipeline of over 6km for a relatively small supply (~10m ³ /day). Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-08	Rationalise Templederry to Thurles WRZ (approx. distance 5km, new watermains and network upgrades required)	The option requires a significant length of new pipeline of over 5km for a relatively small supply (~10m ³ /day). Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-09	Tanker water when required for Templederry	<u>Tankering is not a robust, resilient, long term solution for any WRZ within the region and for this reason, is not taken forward to fine screening</u>	This option is a tactical option and is unlikely to meet the full deficit. This will likely be implemented along with a new supply option		
TG4-SA7-10	Transfer spare capacity at Nenagh to neighbouring schemes in deficit	This option involves the transfer of spare capacity at Nenagh to neighbouring schemes. However, as there is almost no deficit in the neighbouring schemes and there is a high cost in delivering this option, for resilience benefits alone, it was rejected at coarse screening stage.		•	
TG4-SA7-11a	New connection point from New Shannon Source connecting to Nenagh	This is a Regional Option. The option requires a significant length of new pipeline of over 30km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-11b	New connection point from New Shannon Source connecting to Nenagh	This is a Regional Option. The option requires a significant length of new pipeline of over 20km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-12	Increase GW abstraction at Crossanagh BH (poorly productive aquifer) and upgrade Crossanagh Borehole WTP, decommission Old School Source WTP.	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	Terryglass WRZ is no longer in deficit		
TG4-SA7-13	Increase GW abstraction at Terryglass School Borehole (currently used seasonally) (poorly productive aquifer) and upgrade Old School Source WTP	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	Terryglass WRZ is no longer in deficit		
TG4-SA7-15	New SW abstraction from Lough Derg and new WTP to supply deficit at Terryglass	This option proposed a new surface water abstraction from the Lough Derg. The existing abstraction is groundwater and increase the existing groundwater is a viable option therefore this surface water abstraction was not considered necessary for a small additional supply (<200m ³ /day) and therefore it was not progressed to the fine screening stage		•	
TG4-SA7-17	Supply deficit at Terryglass from nearby Ballinderry GWS	The option requires a significant length of upgraded pipeline of in excess of 5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-18	Rationalise Terryglass to Borrisokane WRZ via Carrigahorig GWS (approx. distance 5km, new watermains and network upgrades required)	The option requires a significant length of upgraded pipeline of in excess of 5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-19	Tanker water when required for Terryglass	<u>Tankering is not a robust, resilient, long term solution for any WRZ within the region and for this reason, is not taken forward to fine screening</u>			
	This option is a tactical option and is unlikely to meet the full deficit. This will likely be implemented along with a new supply option				
TG4-SA7-25	Improve interconnection of Lorrha/Rathcabbin and Borrisokane WRZs for increased resilience and supply deficit (5km main required)	This is a Regional Option. The option requires a significant length of upgraded pipeline of in excess of 11km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-26	Rationalise Lorrha/Rathcabbin to Roscrea WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 12km, from Roscrea to Rivertown, for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-28	Rationalise Lorrha/Rathcabbin to Banagher WRZ (approx. distance 6.5km, new watermains and network upgrades required)	The option requires a significant length of new and upgraded pipeline in excess of 12km, between service reservoirs, for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage		•	
TG4-SA7-31a	New GW abstraction from Lismaline groundwater body (productive fissured bedrock) for Borrisokane	This is a Regional Option. The option requires a significant length of upgraded pipeline of in excess of 11km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-32	New SW abstraction from River Ballyfinboy for Borrisokane. New WTP/upgrade existing WTP	There is a small deficit of 2m ³ /day at 2044 for this WRZ and there it was not considered viable to develop a new surface water source to meet such a small demand, as there are better viable options. For that reason, it was screened out at coarse screening.		•	
TG4-SA7-33	New SW abstraction from Lough Derg for Borrisokane and new WTP	This option proposed a new surface water abstraction from the Lough Derg. The existing abstraction is groundwater and increase the existing groundwater is a viable option therefore this new surface water abstraction was not considered necessary for a small additional supply (<300m ³ /day).		•	
TG4-SA7-34	Rationalise Borrisokane to Portumna WRZ	This is a Regional Option. The option requires a significant length of upgraded pipeline of in excess of 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-35	Connect Borrisokane to Nenagh WRZ via Kilbarron GWS (approx. distance 7km, new watermains and network upgrades required)	This option involves the connection of the Borrisokane WRZ to Nenagh WRZ via Kilbarron GWS. This is an extensive piece of network to supply a very small deficit. It is also a high cost option to improve resilience alone. Therefore it was rejected at coarse screening and not brought through to fine screening.		•	
TG4-SA7-36a	New connection point from New Shannon Source connecting to Borrisokane	This is a Regional Option. The option requires a significant length of new pipeline of over 30km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-37	Increase GW abstraction at Matty's Well (poorly productive aquifer)	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	Cloughjordan WRZ is no longer in deficit		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
	and upgrade existing Matty's Well WTP				
TG4-SA7-38	New GW abstraction from Lismaline groundwater body (productive fissured bedrock) for Cloughjordan	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	Cloughjordan WRZ is no longer in deficit		
TG4-SA7-40a	Connect Cloughjordan to neighbouring Nenagh WRZ (network upgrades required)	This is an extensive piece of network to supply a very small deficit. It is also a high cost option to improve resilience alone. Therefore it was rejected at coarse screening and not brought through to fine screening		•	
TG4-SA7-42	Rationalise Cloughjordan to Roscrea WRZ (approx. distance 6km, new watermains and network upgrades required)	This is a Regional Option. The option requires a significant length of new pipeline of over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-43c	New connection point from New Shannon Source connecting to Cloughjordan	This is a Regional Option. The option requires a significant length of new pipeline of over 30km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-43d	New connection point from New Shannon Source connecting to Cloughjordan	This is a Regional Option. The option requires a significant length of new pipeline of over 20km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-45	Rationalise Coolderry WRZ to Roscrea WRZ (approx. distance 3km; new watermains and network upgrades required)	This is a Regional Option. The option requires a significant length of new pipeline of over 3km for a relatively small supply (~100m ³ /day). Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-46	New connection point from New Shannon Source connecting to Coolderry	This is a Regional Option. The option requires a significant length of new pipeline of over 30km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage		•	
TG4-SA7-48	Increase abstraction at Dunkerrin Well (Cloughjordan-Moneygall gravels) and upgrade Dunkerrin Well WTP to partly supply deficit	The source is not productive, and unlikely that it can provide the required supply to resolve the full deficit. The option is therefore deemed unviable and as a result is not feasible at coarse screening stage and would not be taken forward to fine screening stage.		•	
TG4-SA7-50	Increase abstraction at Lisduff Spring (poorly productive aquifer) and upgrade Lisduff Spring WTP to partly supply deficit	The source is not productive, and unlikely that it can provide the required supply to resolve the full deficit. The option is therefore deemed unviable and as a result is not feasible at coarse screening stage and would not be taken forward to fine screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-51	Increase abstraction at Busherstown Springs (Cloughjordan-Moneygall gravels) and upgrade Busherstown WTP to partly supply deficit	The source is not productive, and unlikely that it can provide the required supply to resolve the full deficit. The option is therefore deemed unviable and as a result is not feasible at coarse screening stage and would not be taken forward to fine screening stage.		•	
TG4-SA7-52	New GW abstraction from Cloughjordan-Moneygall gravels (location TBC); decommission all existing sources and WTPs	The source is not productive, and unlikely that it can provide the required supply to resolve the full deficit. The option is therefore deemed unviable and as a result is not feasible at coarse screening stage and would not be taken forward to fine screening stage.		•	
TG4-SA7-54a	New connection point from New Shannon Source connecting to Dunkerrin / Moneygall	This is a Regional Option. The option requires a significant length of new pipeline of over 30km for a relatively small supply, where some WRZs are not in deficit and the option is for resilience only. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-55b	Increase abstraction at Lough Derg and Upgrade Portumna WTP	This is a Regional Option. The option requires a significant length of upgraded pipeline of in excess of 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-56	Rationalise Terryglass to Nenagh WRZ - Coolbawn WTP (approx. distance 10km, new watermains and network upgrades required)	The option requires a significant length of new and upgraded pipeline in excess of 10km, for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA7-57	Rationalise Lorrha/Rathcabbin to Birr WRZ (approx. distance 2km, new watermains and network upgrades required)	The option requires a significant length of new pipeline in excess of 2km, for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-58	New connection point from New Shannon Source connecting to Lorrha/Rathcabbin	The option requires a significant length of new pipeline in excess of 15km, for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA7-59	New abstraction in the Roscrea Gravels	On review of the SDB, it was found that the WRZ was no longer in deficit and hence the screening out of the option.	Roscrea WRZ is no longer in deficit		

Study Area 7 - FS Rejection

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG4-SA7-01e	Transfer spare capacity from Roscrea to Dunkerrin/ Moneygall	This is a Regional option. Following more detailed analysis at Fine Screening, it was determined that the estimated sustainable allowable abstraction at this location is 2.34MLD, not accounting for the existing abstraction. The deficit in the WRZ is approximately 0.54MLD and could be greater, based on the calculated sustainable limits. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG4-SA7-53	Rationalise Dunkerrin/Moneygall WRZ to Roscrea WRZ (approx. distance is 800m; new watermains and network upgrades required)	This is a Regional option. Following more detailed analysis at Fine Screening, it was determined that the estimated sustainable allowable abstraction at this location is 2.34MLD, not accounting for the existing abstraction. The deficit in the WRZ is approximately 0.54MLD and could be greater, based on the calculated sustainable limits. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●