

Autumn 2022



Draft Regional Water Resources Plan- North West

Appendix 6 Study Area F Technical Report



Tionscatal Éireann
Project Ireland
2040

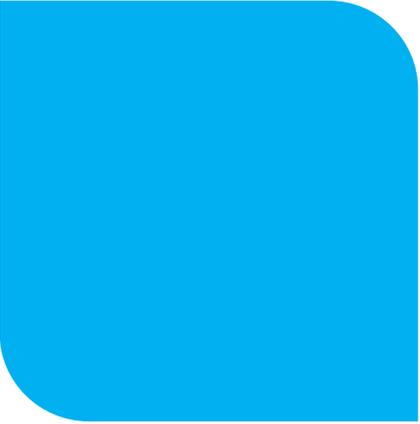
Data Disclaimer:

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

Baseline data included in the draft RWRP-NW 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 draft RWRP-NW. 2019 was selected as the base year to align with the planning period (2019-2025) of the NWRP.

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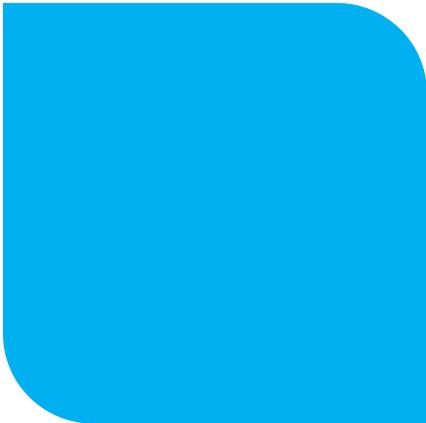
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Introduction and Background



1 Introduction – Study Area F

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

This Study Area includes 15 water resource zones located in County Cavan, County Galway, County Leitrim, County Longford and County Roscommon. 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 draft RWRP-NW.

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 draft RWRP-NW, we apply this methodology to the Northern and Western 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.

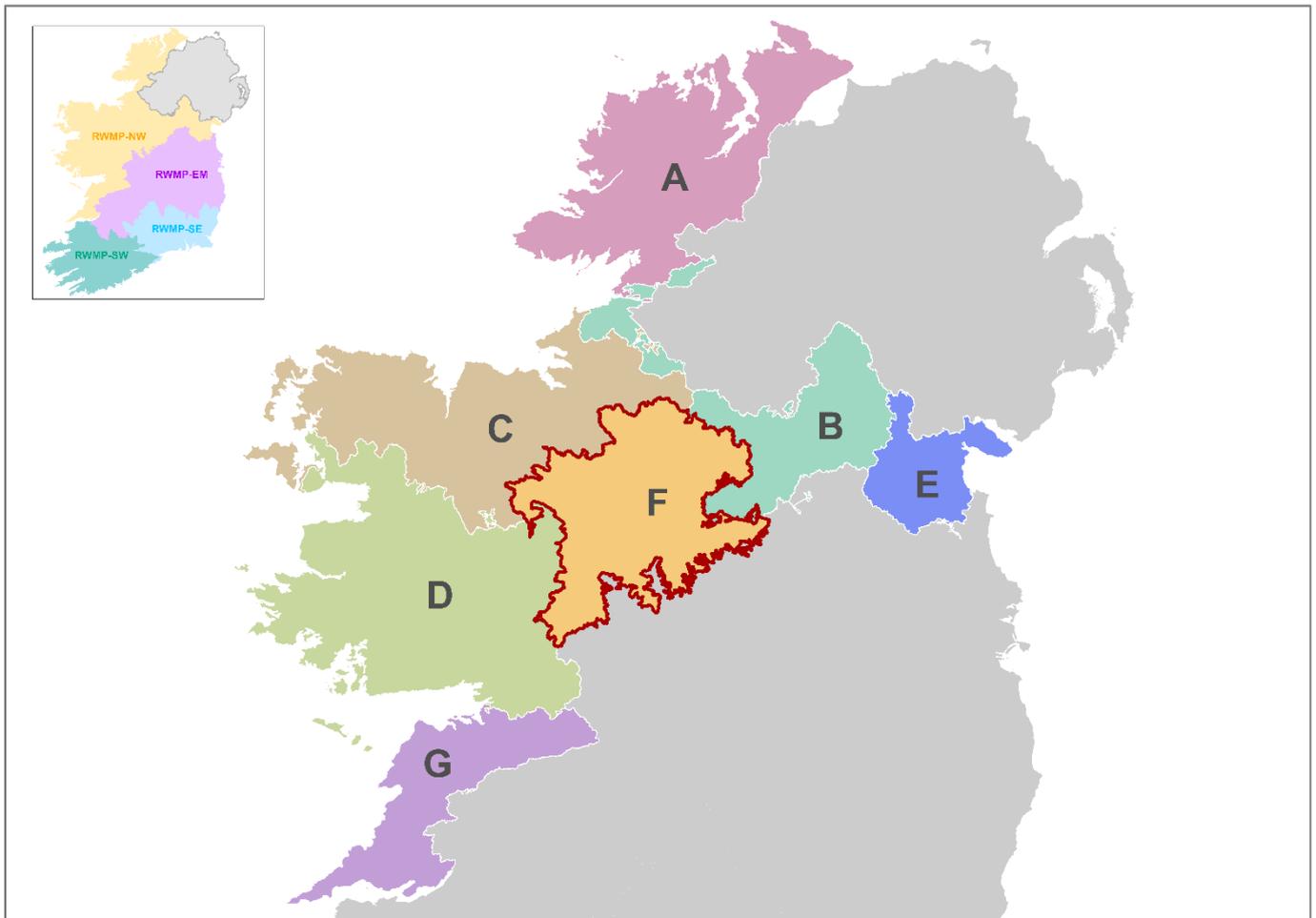


Figure 1.1 Overview of Study Areas within the Northern - Western Region.

This Technical Report is for Study Area F (SAF), which consists of 15 individual water resource zones (WRZs). Within this Study Area, the Preferred Approach has been developed following the process shown in Figure 1.2 and as outlined in Section 8.3 of the Framework Plan.

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 TG1 refers the Northern Western Region (Regional Group 1).

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

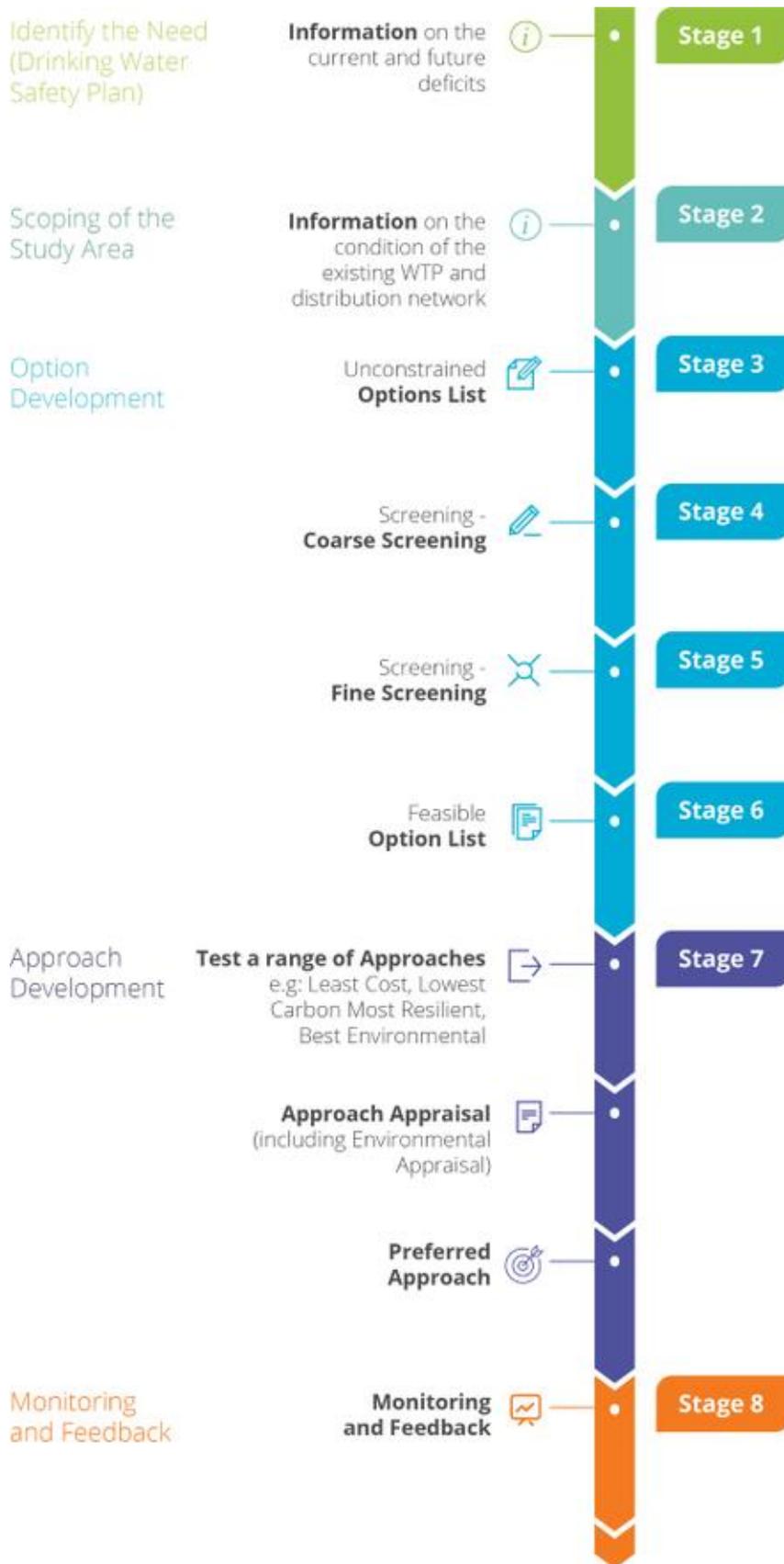


Figure 1.2 Option Assessment Methodology Process

1.2 Introduction to the Study Area

Study Area F consists of 15 WRZs supplying a population of approximately 85,573 people via approximately 3,340 kilometres of distribution network. SAF extends across parts of County Cavan, Galway, Leitrim, Longford, Roscommon and Sligo.

The town of Longford is the largest demand centre, with other notable towns including Roscommon and Carrick-On-Shannon. The sources of water include 13 groundwater sites and 5 surface water sources. The Study Area is summarised in Figure 1.3. and Table 1.1.

Regarding surface water availability in SAF, the Study Area mainly extends across parts of the large Upper Shannon catchment (HA 26), except for a small section in the north east crossing into the Erne catchment (HA 36). The sections of the Upper Shannon catchment within SAF covers the upper reaches around Lough Allen, the adjoining Boyle River sub catchment which includes Lough Gara, and then further downstream sections where the Shannon flows through Lough Forbes before entering the large Lough Ree.

Study Area F has a number of designated area sites including a few small water dependent Special Areas of Conservation (SAC) such as the Lough Forbes Complex SAC and Callow Bog SAC. There are some sections of the Upper Shannon catchment with WFD High Status Objectives (HSOs), but none designated for Margaritifera (Freshwater Pearl Mussel).

Around 60% of the water supply to Study Area F comes from surface water sources, with water being abstracted from 4no. lake sources and 1no. direct river abstraction within the Upper Shannon system. The largest abstraction is from the Lough Gara source, which supplies up to 10,000 m³/day to North Roscommon RWSS WRZ. Closely followed by the direct river abstraction from the River Shannon to supply up to 9,500 m³/day to Carrick on Shannon WRZ. Elsewhere, Grange Lough supplies up to 7,200 m³/day to North East Regional PWS WRZ, Lough Forbes supplies up to 6,900 m³/day to Longford Central WRZ, and Lough Kinale supplies up to 2,000 m³/day to Granard WRZ.

Overall, 13 groundwater sources are managed by Irish Water in the region. The predominant aquifer type of the area is made up of karstic (5 – 7%) bedrock followed by poorly productive (40%), with a relatively minor contribution from productive fissured (3%). There are no sand and gravel bodies mapped in the area. 45 of the 51 public supply sources in Co. Roscommon are supplied by karstified limestones, highlighting their potential for to supply large quantities of water.

The karst forms a key regionally important aquifer in some areas, underlying much of Roscommon, which consists of clean limestone that has been extensively karstified. This band also extends north into Leitrim and east into Longford. All of the area's groundwater abstractions occur in this setting, with the majority appearing as spring overflows, which serve as points of groundwater discharge. Limestone dissolution during karstification causes groundwater flow to concentrate along certain pathways/conduits (Rk^c type aquifers), making it difficult to locate successful wells. Locating high yielding wells in Rk^c aquifers can be difficult due to the uneven distribution of permeability; failed and high yielding wells can occur close together. Both point and diffuse recharge occur. Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. Despite the presence of peat and till, point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines. The largest abstractions in the region take place from springs, most notably at Roscommon Central WSS (c. 6,000 m³/day), Boyle/Ardcarne WSS (c. 5,500 m³/day) and Castlerea WSS (c. 2,500 m³/day). The Dinantian (Lower Carboniferous) Impure Limestones are interleaved in places with the Pure Bedded Limestones. The limestones are often characterised by the occurrence of chert and shale bands and are generally less productive than the Pure Bedded Limestones. These rocks occur primarily in the east of the Study Area in Longford.

The Namurian Sandstones and Shales make up the 'shale uplands' in Leitrim, an area of flat-topped hills. The fractured upper and more permeable layer is unlikely to provide sustainable supplies for larger

wells and will often contain lesser quality water than the deeper permeable horizons. In general, optimum well yields from the Namurian aquifers will be obtained from boreholes drilled into one of the many fault zones and penetrating at least 50-100 m of the aquifer. Groundwater flow in the lesser productive Dinantian Shales and Limestones circulates primarily through fissures as these rocks do not show significant intergranular permeability, and are predominantly interbedded shales and limestones, with little or no sandstone content. Development will usually be possible in local zones (i.e. along faults, fractures and zones of clean limestone).

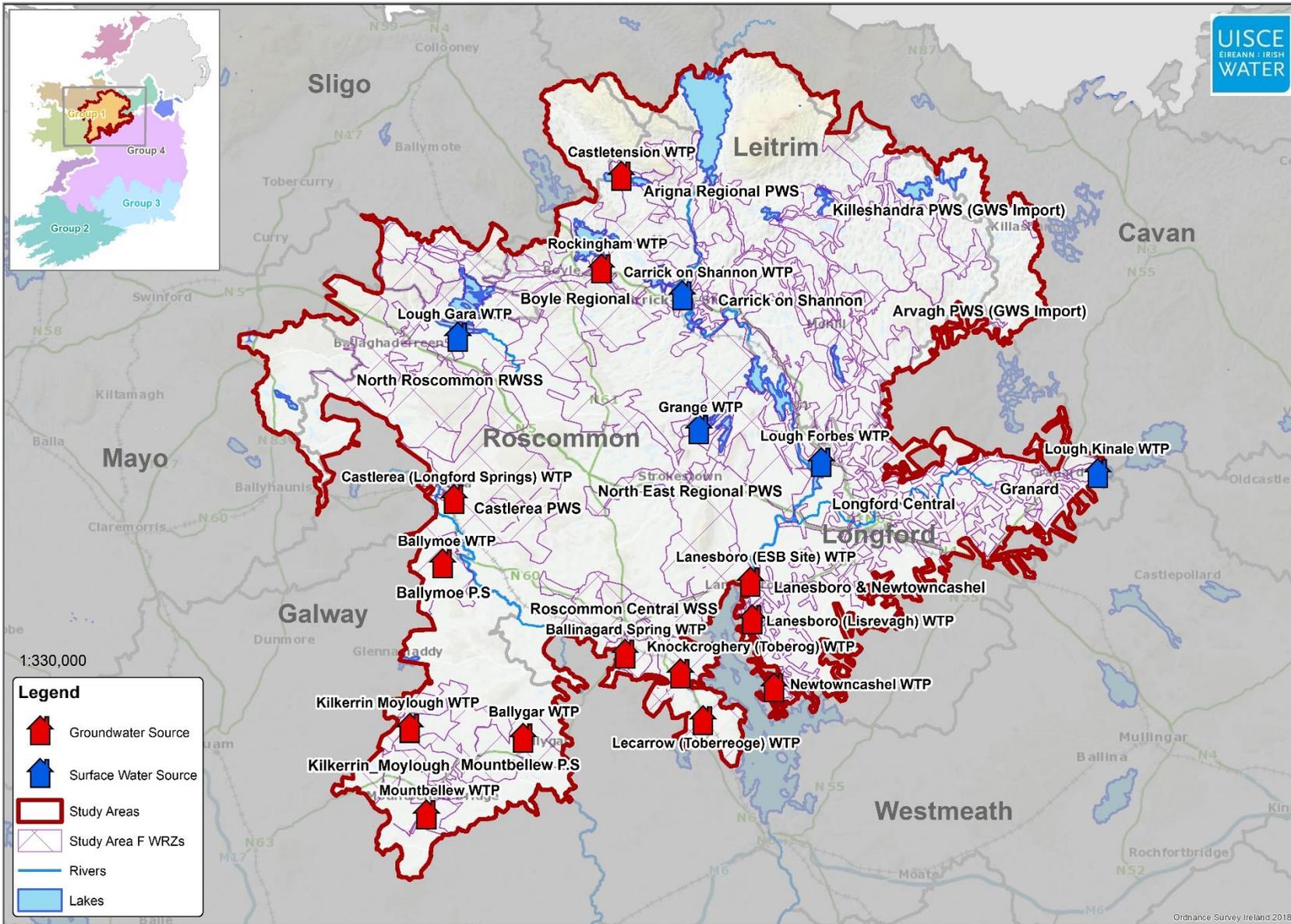


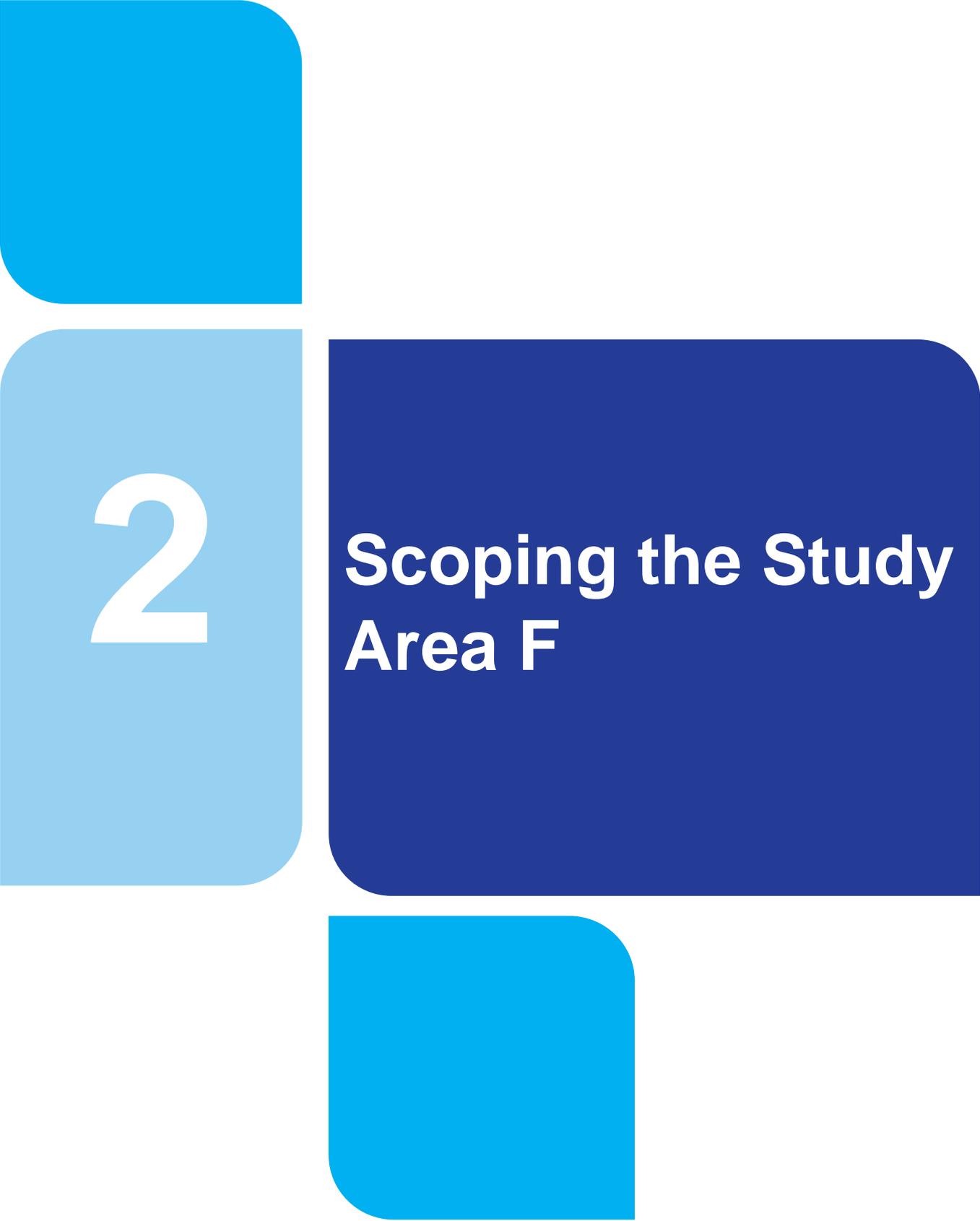
Figure 1.3 SAF Water Supply Study Area

Table 1.1 SAF Study Area Summary

Leitrim, Longford, Roscommon	Total Population	85,573	Total Network Length (km)	3,340	Number of Water Resource Zones	15	
Counties in Study Area	Cavan, Galway, Leitrim, Longford, Roscommon						
Principle Settlements	Longford, Carrick-On-Shannon, Drumlish, Newtownforbes, Boyle, Ballaghaderreen, Lanesborough-Ballyleague, Granard, Drumod, Drumshanbo, Roosky, Strokestown, Mount Bellew, Ballinamore, Mohill, Drumsna, Killashee, Termonbarry, Clontuskert, Ballygar						
Number of Water Sources	18	Surface Water Sources	5		Groundwater Sources	13	
Water Treatment Plant	Source	Population	WTP Capacity (m³/day)	Quality	Quantity	Reliability	Potential Sustainability
Grange WTP	Grange Lough	8,134	7,200	●	●	●	●
Castletenison WTP	Groundwater	816	1,730	●	●	●	●
Castlerea (Longford Springs) WTP	Groundwater	3,969	3,600	●	●	●	●
Rockingham WTP	Groundwater	5,648	5,000	●	●	●	●
Lecarrow (Toberreoge) WTP	Groundwater	1,562	2,200	●	●	●	●
Lough Gara WTP	Lough Gara	8,074	10,000	●	●	●	●
Knockcroghery (Toberog) WTP	Groundwater	848	1,000	●	●	●	●
Ballinagard Spring WTP	Groundwater	7,533	5,000	●	●	●	●
Newtowncashel WTP	Groundwater	400	380	●	●	●	●
Lough Forbes WTP	Lough Forbes	17,147	6,900	●	●	●	●

Lanesboro (Lisrevagh) WTP	Groundwater	4,908	1,600	●	●	●	●
Lanesboro (ESB Site) WTP	Groundwater	4,908	2,000	●	●	●	●
Lough Kinale WTP	Lough Kinale	2,647	2,000	●	●	●	●
Carrick on Shannon WTP	River Shannon	15,791	9,500	●	●	●	●
Mountbellew WTP	Groundwater	2,387	2,340	●	●	●	●
Kilkerrin Moylough WTP	Groundwater	1,575	1,335	●	●	●	●
Ballymoe WTP	Groundwater	707	800	●	●	●	●
Ballygar WTP	Groundwater	1,038	800	●	●	●	●

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



2

Scoping the Study Area F

2 Scoping the Study Area

In this chapter we summarise the current and future issues with water supplies in Study Area F, 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 SAF 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
Grange WTP	●	●	●	●
Castletenison WTP	●	●	●	●
Castlerea (Longford Springs) WTP	●	●	●	●
Rockingham WTP	●	●	●	●
Lecarrow (Toberreoge) WTP	●	●	●	●
Lough Gara WTP	●	●	●	●
Knockcroghery (Toberog) WTP	●	●	●	●
Ballinagard Spring 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
Newtowncashel WTP	●	●	●	●
Lough Forbes WTP	●	●	●	●
Lanesboro (Lisrevagh) WTP	●	●	●	●
Lanesboro (ESB Site) WTP	●	●	●	●
Lough Kinale WTP	●	●	●	●
Carrick on Shannon WTP	●	●	●	●
Mountbellew WTP	●	●	●	●
Kilkerrin Moylough WTP	●	●	●	●
Ballymoe WTP	●	●	●	●
Ballygar 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, 6 of the 18 WTPs in the Study Area are considered to be at high risk of failing to achieve the required standards in relation to barrier and viruses (Barrier 1) chlorine residuals

in our networks (Barrier 2.1) 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 three WRZs within SAF on the EPA Remedial Action List, namely Longford Central North East Regional and Granard. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SAF in advance of the NWRP. Details of these are included in Table 2.2

Table 2.2 Critical Water Quality Requirements SAF – Leitrim, Longford and Roscommon

Critical Water Quality Requirements	Progress
<p>1. Boyle Water Supply Extension: The project involved the extension of Boyle WSS (supplied by Rockingham Water Treatment Plant) to Grangemore, Co Roscommon and the decommissioning of Cavetown Water Treatment Plant which previously served Grangemore. The project has resulted in improved drinking water quality for the area and the removal of Grangemore from the EPA’s Remedial Action List.</p>	Complete
<p>2. Carrick-on-Shannon WTP: Upgrade of Carrick-on-Shannon WTP. The works carried out have enhanced water treatment processes and increased capacity and resilience the water treatment plant, ensuring a safe and secure water supply for residents, agriculture, tourism and industry in the area.</p>	In Progress
<p>3. Longford Central: Upgrade of water treatment plant. Catchment focused engagement regarding pesticides control with the stakeholders required.</p>	In Progress
<p>4. Granard: Amona in raw water in Lough Kinale. Existing WTP requires upgrade and intake requires to be moved to more suitable location as it is currently overgrowing with vegetation. Irish Water to develop the plan to address RAL.</p>	Scoping
<p>5. North East Regional Project involves construction of a new water treatment plant and intake works, site and ancillary works and associated pipelines. Testing is currently underway in order to ensure that it can be removed from the EPA RAL for elevated levels in THMs.</p>	In Progress
<p>6. Reservoir Cleaning Programme: A major reservoir cleaning programme has been undertaken at 48 sites, which has reduced network water quality issues.</p>	Complete
<p>6. Disinfection Programme:</p> <p>In 2016, Irish Water completed a nationwide review of all water treatment plants where disinfection upgrades were required, followed by a programme of works to deliver the required upgrades. To date, the disinfection programme has completed upgrade works at 4 of the 15 WRZs in SAF, based on assessed priority basis.:</p> <ul style="list-style-type: none"> • Carrick-on-Shannon WTP • Lough Kinale WTP • Lanesboro (ESB Site) WTP • Lough Forbes WTP <p>Any requirements within the remaining 11 supplies will be identified via Drinking Water Safety Plans with solutions developed as part of the NWRP.</p>	Complete

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.

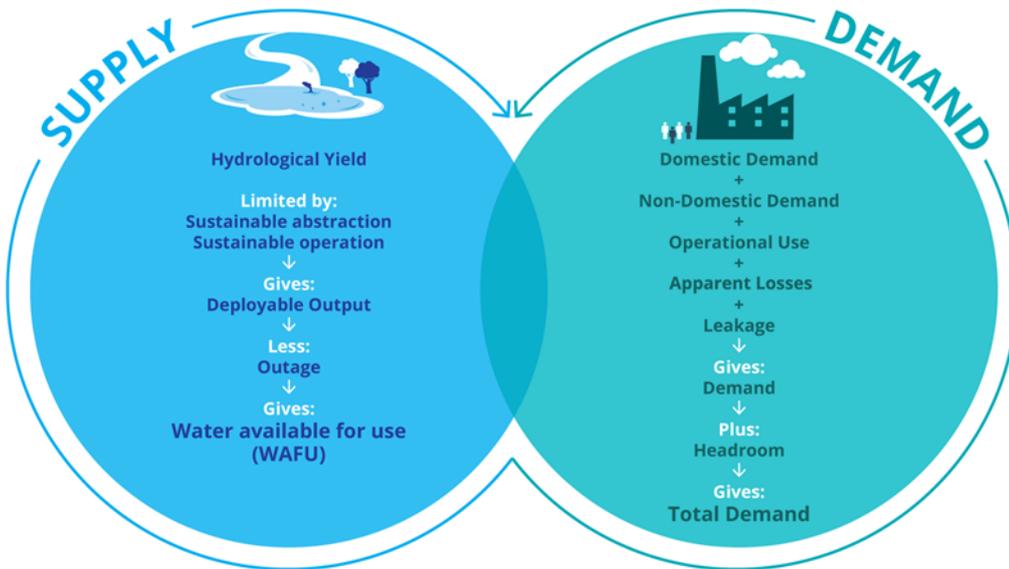


Figure 2.2 Supply Demand Balance

For each of the 15 WRZs in this Study Area, we assessed the baseline SDB and developed 25-year forecasts of supply and demand, in accordance with Figure 2.1.

The SDB assessments were carried out for each of the weather event planning scenarios (Normal Year Annual Average, Dry Year Annual Average, Dry Year Critical Period, Winter Critical Period) which described in Chapter 2 of the Framework Plan. The SDB deficits in SAF 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:** 9 out of 15 water resource zones in the area suggest a supply demand balance deficit (based on a “do nothing” approach) under present & future scenarios. While sufficient on normal weather conditions, several would fail in drought. Longford Springs underwent night-time restrictions in June 2020. Furthermore, the nearby borehole had been used to supplement the spring supply. This ceased on Wednesday 8th July as spring water had replenished sufficiently following the rain over the preceding few weeks.

A summary of the SDB deficit across all 15 Water Resource Zones is summarised in Table 2.3. The water resources zones are detailed in Appendix L of the Framework Plan - Supply Demand Balance Summaries.

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

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m ³ /day					
			2019	2025	2030	2035	2040	2044
North Roscommon Regional Water Supply Scheme	2600SC0009	8,074	-1,406	-1,274	-1,344	-1,414	-1,483	-1,538
Boyle Regional	2600SC0008	7,247	-112	-172	-229	-292	-355	-405
Arigna Regional PWS	2600SC0007	816	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Roscommon Central Water Supply Scheme	2600SC0004	9,942	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Castlerea PWS	2600SC0003	3,969	-2,128	-2,140	-2,153	-2,180	-2,211	-2,235
North East Regional PWS	2600SC0002	8,134	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Longford Central	2000SC0005	17,147	-3,302	-3,486	-3,652	-3,981	-4,350	-4,646
Granard	2000SC0002	2,647	-118	-144	-164	-183	-202	-217
Lanesboro & Newtowncashel	2000SC0001	5,309	-299	-215	-246	-322	-410	-481
Carrick-on-Shannon	1700SC0001	15,791	-4,860	-4,725	-4,874	-5,035	-5,197	-5,327
Ballymoe P.S.	1200SC0001	707	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Mountbellew P.S.	1100SC0001_I	3,425	-221	-250	-273	-296	-318	-336
Kilkerrin_Moylough	1100SC0001_F	1,575	-546	-577	-599	-613	-627	-637
Killeshandra PWS (GWS Import)	0200SC0005	415	0	0	0	0	0	0
Arvagh PWS (GWS Import)	0200SC0001	377	0	0	0	0	0	0

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 12,993 m³/day. 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 supply demand balance deficit will increase to approximately 15,823 m³/day by 2044.

Our ongoing activities to improve the Supply Demand Balance in SAF 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 network and appropriately manage our water production.

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

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

During our needs assessment Irish Water identified a number of these critical requirements and progress to date on these projects is summarised in Table 2.4

Table 2.4 SAF Critical Infrastructure Projects and Need Identification

Critical Requirement	Progress
<p>1. National Leakage Reduction Programme – Lanesboro & Newtowncashel WRZ Ballymakeegan Water Mains Replacement:</p> <p>This project involved the decommissioning of 1,400 metres and replacement of approximately 1,500 metres of problematic water mains with high density polyethylene (plastic) pipes.</p>	Complete
<p>2. Longford Central raising main</p> <p>Single intake pipe and no standby raw water pumping. Rising main prone to burst and can flood nearby properties.</p>	Scoping
<p>3. Mountbellew Ballygar Boreholes</p> <p>Mountbellew Ballygar is supplied from Mountbellew as the current borehole in Ballygar struggles and can't supply water supply zone on its own. Further investigations required.</p>	Scoping
<p>4. Distribution Network Repairs and Upgrades:</p> <p>Rolling programme of active leakage control, pressure management, find and fix and network upgrades.</p>	In Progress

In summary, there are some asset reliability issues across the distribution network within the WRZ. Some critical infrastructural projects, outlined in Table 2.4, to address these issues have been identified and are in progress. In addition to this, a continuous programme of repairs, upgrades and leakage reduction is being progressed as part of Irish Waters National Leakage Reduction Programme across all Study Areas.

2.4 Water Supply Sustainability

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

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

To understand the potential impact of the pending Abstraction Legislation on the SAF Supplies, we have assessed the potential impacts on our 5 no. surface water abstractions: River Shannon (Carrick-on-Shannon), Lough Kinale (Granard), Lough Forbes (Longford Central), Lough Gara (North Roscommon Regional Water Supply Scheme), and Grange Lough (Lisheen) (North East Regional PWS).

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. The table presents our current abstraction levels¹, our source hydrological yield², and our estimated potential sustainable abstraction³ amount which the source may be limited to in the future.

Based on this initial assessment, it is not envisaged that there are sustainability issues with the volumes abstracted at the volumes of water abstracted at our surface water sources. However, under the proposed regulatory regime, this will be adjudicated on by the EPA.

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

Source (WRZ)	Current abstraction (m ³ /day)	Hydrological yield (m ³ /day)	Theoretical future abstraction (m ³ /day)
River Shannon (Carrick-on-Shannon)	8,708	87,000	28,963
Lough Kinale (Granard)	1,833	44,261	23,451
Lough Forbes (Longford Central)	6,325	255,558	338,206
Lough Gara (North Roscommon RWSS)	9,167	179,736	73,305
Grange Lough (North East Regional PWS)	6,600	37,241	34,835

The potential change to the SDB⁴ for each WRZ, as a result of these potential reductions in abstraction during dry weather flows are summarised in Table 2.6.

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

Source (WRZ)	Potential change in WRZ SDB (m ³ /day)
River Shannon (Carrick-on-Shannon)	None
Lough Kinale (Granard)	None
Lough Forbes (Longford Central)	None
Lough Gara (North Roscommon RWSS)	None
Grange Lough (North East Regional PWS)	None

¹ Based on WTP 22hr (DYCP) capacity

² Our hydrological yield estimate is the 'safe' yield calculated to be available during a 1 in 50 year drought event. We use this figure in the SDB calculations to determine whether a WRZ is projected to be in deficit or surplus

³ Our sustainable or 'allowable' abstraction estimate is based on limiting abstraction to 5-15% of the Q95 low flow for river sources or 10% of Q50 inflow for lakes. This is based on our best understanding of how the EPA may enforce future abstraction licencing applying UKTAG guidance.

⁴ Based on the potential changes to the projected WRZ supply demand balance (SDB) figure for the dry year critical period (DYCP) 2044 future scenario.

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 based on available information, included in Appendix G of the Framework Plan. Over the coming years, Irish Water will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources.

On an interim basis Irish Water has developed an initial assessment for existing abstractions based on best available information. For more information, please see Appendix C Supply Assessment and Appendix G Regulatory and Licensing Constraints of the NWRP - Framework Plan. Over the coming years, Irish Water will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources. We are not in a position to estimate changes to the groundwater availability until better data is available.

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

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

When the new Legislation on abstraction of water has been enacted and regulatory assessments completed if an abstraction is confirmed to be affecting a waterbody status the Supply Demand Balance will be updated as outlined in the monitoring and feedback section of the draft 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 F has issues in relation to quality, quantity, reliability and sustainability which must be addressed as part of the Preferred Approach to future water resources planning, summarised in Table 2.7.

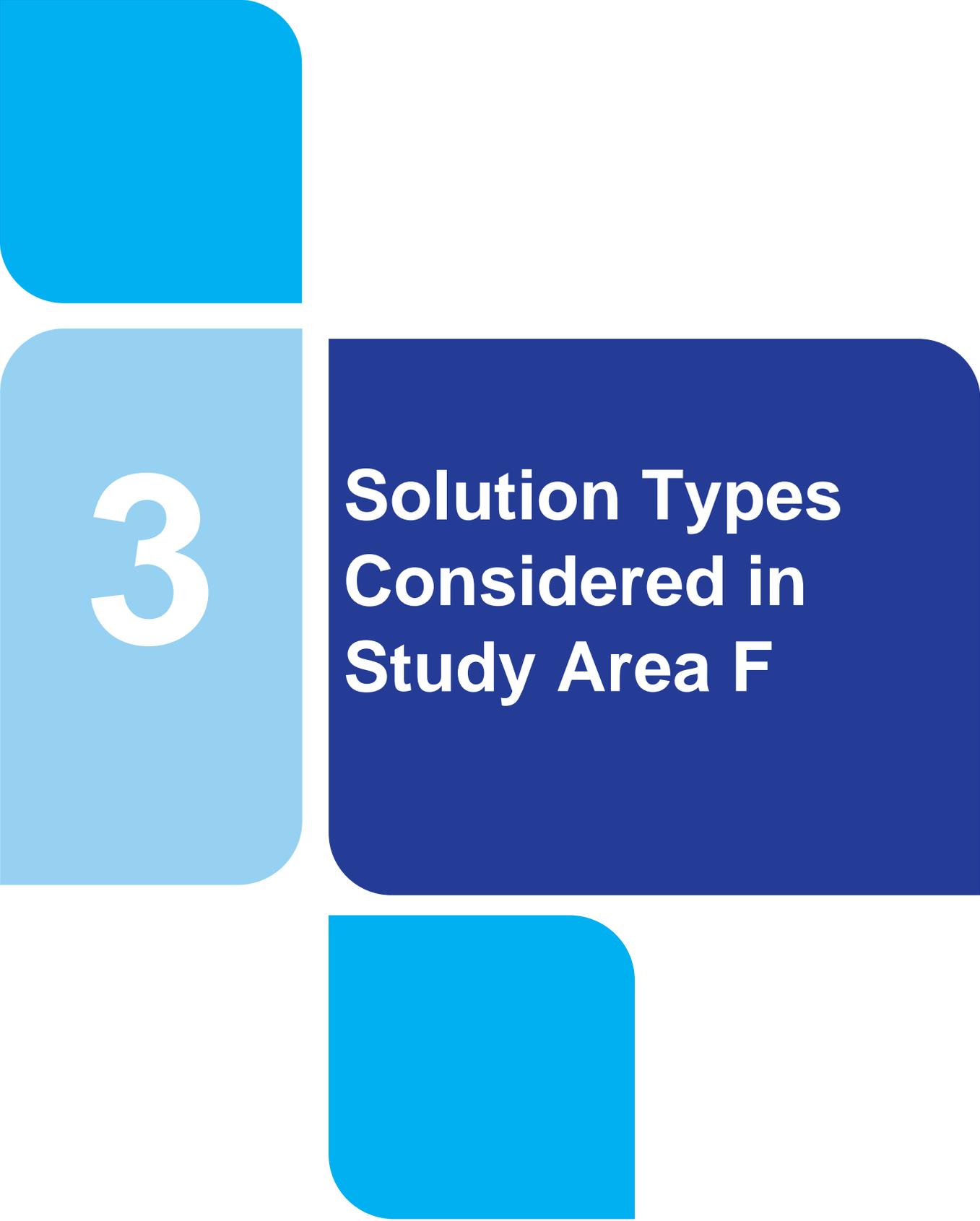
Table 2.7 Summary of Need Quality, Quantity, Reliability and Sustainability

Quality	Upgrades required at all WTPs.
Quantity	<p>Leakage Targets of 513 m³/day to achieve SELL in the region</p> <p>Additional Leakage Targets of 10,431 m³/day to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500 m³/day</p> <p>Interim additional supplies of 12,993 m³/day within 10 years and</p> <p>Total of 15,823 m³/day additional supplies beyond the 10-year horizon</p>
Reliability (In addition to projects in	Continued network upgrades and improvements in the bulk and distribution networks and storage
Sustainability	<p>It is not envisaged that there are sustainability issues with the volumes abstracted at River Shannon (Carrick-on-Shannon), Lough Kinale (Granard), Lough Forbes (Longford Central), Lough Gara* (North Roscommon Regional Water Supply Scheme), Grange Lough (Lisheen) (North East Regional PWS). However, under the proposed regulatory regime, this will be adjudicated by the EPA.</p> <p><i>*Although Lough Gara, at desktop level, does not present sustainability issues, there are issues currently experienced at the abstraction location due to vegetation growth.</i></p> <p>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.</p>

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 F

3 Solution Types Considered in Study Area F

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

As outlined in Chapter 7 of the Framework Plan, we consider measures across the following three pillars: **Lose Less**, **Use Less** and **Supply Smarter** in forming our list of unconstrained options, which are assessed for short, medium and long-term solutions. For SAF as part of our unconstrained options, the following options have been reviewed

3.1 Leakage Reduction



The Leakage reduction measures across the public water supply considered for SAF 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/day, see Table 3.1.

Table 3.1 SELL Targets for WRZ in SAF

WRZ	Net Leakage Reduction applied to SDB (m ³ /day)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m ³ /d (m ³ /day)	Total Leakage Targets (m ³ /day)
Kilkerrin Moylough		288	288
Mountbellew P.S.		456	456
Carrick-on-Shannon	254	2,681	2,935
Lanesboro & Newtowncashel	79	980	1,059
Longford Central		1,115	1,115

WRZ	Net Leakage Reduction applied to SDB (m ³ /day)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m ³ /d (m ³ /day)	Total Leakage Targets (m ³ /day)
North East Regional PWS		304	304
Castlerea PWS		499	499
Roscommon Central Water Supply Scheme		247	247
Boyle Regional		764	764
North Roscommon Regional Water Supply Scheme	180	3,097	3,277

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 NWRP – Framework Plan, we have not applied reductions to the SDB deficit for unquantifiable water conservation gains, however as stipulated within the Consultation Report prepared in relation to the NWRP- Framework Plan, IW will progress pilot studies on water conservation measures. Based on the outcomes of these studies, we may include such factors in future iterations of our NWRP. 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 SAF and include:

- Stand-alone groundwater options, across the region
- Stand-alone surface water options, across the region
- Transfers
- Rationalisations
- Upgrade WTP (WQ only)
- Other



4

Option Development SAF

4 Option Development for Study Area F

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 SAF, 174 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 SAF Unconstrained Options

No. of Options	Option Type
53	Groundwater
40	Surface water
25	Rationalisation
49	Transfers
4	Upgrade WTP (WQ only)
3	Other

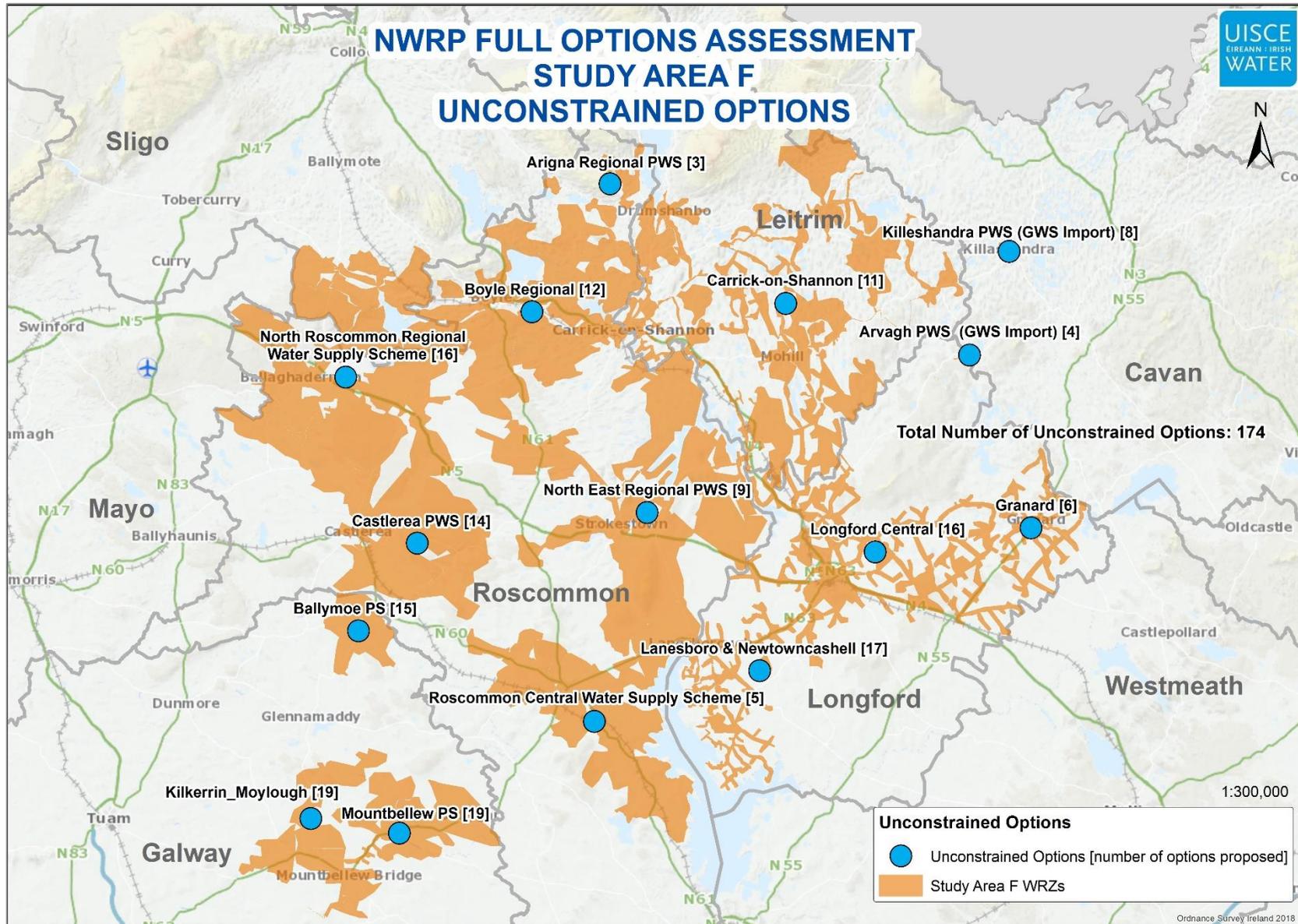


Figure 4.1 SAF Unconstrained Options

The 174 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues. This process is summarised below.

4.2 Coarse Screening

The 174 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 Engineers, Hydrologist, Hydrogeologist, Ecologists and Environmental Scientists.

Example Rejected Option

Option SAF-011

New riverbank filtration adjacent to Lough Forbes (suitable location point TBC) to supply deficit in Longford Central WRZ

Rejection Reason

The overlying sediments here consist of peat with pockets of Till, as such this is not a feasible option.

54 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 Longford Central WRZ.

The remaining 120 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 SAF Remaining Options after Course Screening

No. of Options	Option Type
37	Groundwater
31	Surface water
21	Rationalisation
27	Transfers
4	Upgrade WTP (WQ only)

4.3 Fine Screening

The 120 remaining options were subject to a more detailed multi-criteria assessment (MCA) at the Fine Screening Stage using desktop assessments of performance against specified questions relating to Sustainability (Environmental and Social Impacts), Resilience, Deliverability and Progressibility. These questions are set out in Appendix N of the Framework Plan. The assessment for each option was based on an objective assessment with uniform scoring criteria, based on best publicly available datasets.

At Fine Screening stage, no further options were rejected, and the 120 options considered to be feasible were brought forward to desktop outline design and costing. These are summarised in Table 4.4 and shown spatially in Figure 4.2

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

No. of Options	Option Type
37	Groundwater
31	Surface water
21	Rationalisation
27	Transfers
4	Upgrade WTP (WQ only)

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 supply demand balance deficit in the region ranges between approximately 12,993 m³/day in 2019 during dry conditions, to a maximum of approximately 15,823 m³/day in 2044 during dry conditions. During the options assessment stage, a total of 174 unconstrained options were assessed. Of these 54 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
16	Resilience, Deliverability, Flexibility & Sustainability
19	Deliverability & Flexibility
1	Resilience, Deliverability, Flexibility
18	Other

The remaining 120 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 F. From this table it can be noted that there are 34 WRZ Options and 86 options which can be merged to form 37 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 SAF Feasible Options Summary

Water Resource Zone Name	Option Type	
	WRZ Option	SA Grouped Option
Arigna Regional PWS	1	1
Arvagh PWS (GWS Import)	0	1
Ballymoe P.S.	1	10
Boyle Regional	5	5
Carrick-on-Shannon	3	5
Castlerea PWS	2	6
Granard	4	2
Kilkerrin/Moylough	2	13
Killeshandra PWS (GWS Import)	1	0

Water Resource Zone Name	Option Type	
	WRZ Option	SA Grouped Option
Lanesboro & Newtowncashel	3	8
Longford Central	2	10
Mountbellew P.S.	4	6
North East Regional PWS	1	5
North Roscommon RWSS	4	11
Roscommon Central WSS	1	3



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 F.

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

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

Table 5.1 The Six Approaches

Approaches Tested	Description	Policy Driver
Least Cost	Lowest NPV cost in terms of Capital, Operational, Environmental, Social and Carbon Costs.	Public Spending Code
Best Appropriate Assessment (AA)	Lowest score against the European Sites (Biodiversity) sub-criteria question: Score = 0 equates to no likely significant effects (LSEs). If, in our opinion, these 0 scoring options meet the deficit/ plan objectives, they are automatically picked as the Preferred Approach. Score = -1 or -2 equates to LSEs that can be addressed with general/standard mitigation measures. Score = -3 equates to LSEs that may be harder to mitigate or require significant project level assessment.	Habitats Directive
Quickest Delivery	Based on an estimate of the time taken to bring an option into	Statutory Obligations under the Water Supply

Approaches Tested	Description	Policy Driver
	operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening This is particularly relevant where an option might be required to address an urgent Public Health issue.	Act 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 Framework and Climate Action Plan
Lowest Carbon	This is the option or combination of options with the lowest embodied and operational carbon cost.	Climate Action Plan

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

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 • Sectoral Adaptation Outcomes • Best AA outcomes • Public Expenditure Code Outcomes
STEP 7 Preferred Approach	Select Preferred Approach based on steps 0 to 6

Figure 5.1 Figure of the 7 step assessment process

This methodology which is further detailed in Chapter 7 of the draft RWRP - NW 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-NW and the Environmental Review for this Study Area.

Within the Regional Plan, we will examine the Preferred Approach at a third spatial level across all of the Study Areas in the North West Region and will make any required changes in order to develop a Preferred Approach across the entire Region.

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

5.2 Preferred Approach Development Process for Study Area F

5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this technical report there are 120 feasible options. 34 of these options are WRZ Options while 86 options are merged to form 37 Study Area Options. Table 5.2 outlines the 34 WRZ options for SAF, providing option reference numbers and detailing the WRZs they provide a solution to. These solutions are presented as “Options” for the purposes of this plan; however, will be subject to their own regulatory, timing and budgetary constraints.

Table 5.2 SAF Feasible Options

Water Resource Zone Name	Feasible Options SAF	
	Option Code	Option Description
Arigna Regional PWS	SAF-068	Arigna Regional PWS not in deficit - Castletenison WTP Upgrade.
Ballymoe P.S.	SAF-072	Ballymoe WTP upgrade - no deficit.
Boyle Regional	SAF-059	Increase GW abstraction at Boyle WRZ to supply deficit.
Boyle Regional	SAF-060	New GW abstraction at Boyle WRZ to supply deficit.
Boyle Regional	SAF-061	New SW abstraction from Lough Key to supply deficit at Boyle Regional, new WTP.
Boyle Regional	SAF-062	New SW abstraction from Lough Allen to supply deficit at Boyle Regional, new WTP.
Boyle Regional	SAF-063	New SW abstraction from Lough Arrow to supply deficit at Boyle Regional, new WTP.
Castlerea PWS	SAF-039	Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP.
Castlerea PWS	SAF-046	Connect neighbouring Group Water Schemes (Carane/Ballintubber, Ballymacurley/Kiltultoge, Shadlough, Grage Lower, Grange/Four-Mile-House, Ogulla/Tulsk, Rathcroghan, Clooneyquinn, Peake Mantua, Creglahan/Cloonchambers , Clooneygrasson, Rathcarren and Donamon) with Castlerea and create a new Mid-Roscommon Water Supply Scheme.
Granard	SAF-030	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP.
Granard	SAF-031	New SW abstraction from Lough Sheelin to supply deficit at Granard WRZ, upgrade Lough Kinale WTP.

Water Resource Zone Name	Feasible Options SAF	
	Option Code	Option Description
Granard	SAF-033	New GW to supply deficit in Granard WRZ, upgrade Lough Kinale WTP.
Granard	SAF-034	Supply Granard from neighbouring Group Water Scheme.
Kilkerrin/Moylough	SAF-076	Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit.
Kilkerrin/Moylough	SAF-077	New GW abstraction for Kilkerrin Moylough WRZ to supply deficit.
Killeshandra PWS (GWS Import)	SAF-156	New SW abstraction from Lake Town and new WTP.
Lanesboro & Newtowncashel	SAF-018	Abandon existing ESB BHs location site with capacity of 1.9MI/d (not IW owned). Develop a new wellfield in the vicinity of current BHs.
Lanesboro & Newtowncashel	SAF-020	Increase abstraction at Ballagha Spring (Newtowncashel) and upgrade WTP.
Lanesboro & Newtowncashel	SAF-021	New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisrevagh WTP.
Longford Central	SAF-009	Increase SW abstraction from Lough Forbes and upgrade WTP.
Longford Central	SAF-010	New GW abstraction (Newtown Forbes GWB) to supply full/part of the deficit in WRZ.
Mountbellew P.S.	SAF-085	Increase GW abstraction from Ballygar spring WRZ to supply deficit.
Mountbellew P.S.	SAF-084	Increase GW abstraction for Mountbellew WRZ to supply deficit.
Mountbellew P.S.	SAF-086	New GW abstraction for Mountbellew WRZ to supply deficit.
Mountbellew P.S.	SAF-087	New SW abstraction from Castlegar River, connection to existing Mountbellew WTP and WTP upgrade to supply deficit.
North East Regional PWS	SAF-161	Not in deficit - Grange WTP upgrade.
North Roscommon RWSS	SAF-052	Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.
North Roscommon RWSS	SAF-053	New GW abstraction - Creevy groundwater source.

Water Resource Zone Name	Feasible Options SAF	
	Option Code	Option Description
North Roscommon RWSS	SAF-054	New GW abstraction (Swinford Gravels GWB, Gweestion-Moy Gravels Group 1 GWB, Carrick-on-Shannon GWB, Ballymote GWB).
North Roscommon RWSS	SAF-057	New SW abstraction from Lough Arrow to supply deficit at North Roscommon RWSS, new WTP.
Roscommon Central WSS	SAF-038	WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs.
Carrick-on-Shannon	SAF-001	Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP.
Carrick-on-Shannon	SAF-002	New SW abstraction from Lough Allen.
Carrick-on-Shannon	SAF-006	New GW abstraction (Carrick-on-Shannon GWB, Newtown-Ballyconnell GWB, Annaghmore GWB, Scramoge North GWB) to supply full/part of the deficit in WRZ.

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

Table 5.3 SAF Alignment of WRZ Options with Approach Categories

Water Resource Zone Name	Feasible Options SAF		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest	Best AA	Best SEA	Lowest Carbon	Most Resilient
Arigna Regional PWS	1	Arigna Regional PWS not in deficit - Castletenison WTP Upgrade.	✓	✓	✓	✓	✓	✓
Ballymoe P.S.	1	Ballymoe WTP upgrade - no deficit.	✓	✓	✓	✓	✓	✓
Boyle Regional	5	Increase GW abstraction at Boyle WRZ to supply deficit.	✓	-	✓	✓	✓	-
		New GW abstraction at Boyle WRZ to supply deficit.	-	-	✓	-	-	-
		New SW abstraction from Lough Key to supply deficit at Boyle Regional, new WTP.	-	✓	✓	-	-	-

Water Resource Zone Name	Feasible Options SAF		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest	Best AA	Best SEA	Lowest Carbon	Most Resilient
		New SW abstraction from Lough Allen to supply deficit at Boyle Regional, new WTP.	-	-	✓	-	-	✓
		New SW abstraction from Lough Arrow to supply deficit at Boyle Regional, new WTP.	-	-	-	-	-	-
Castlereah PWS	2	Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP.	✓	✓	✓	✓	✓	✓
		Connect neighbouring Group Water Schemes (Carane/Ballintubber, Ballymacurley/Kiltultoge, Shadlough, Grage Lower, Grange/Four-Mile-House, Ogulla/Tulsk, Rathcroghan, Clooneyquinn, Peake Mantua, Creglahan/Cloonchambers, Clooneygrasson, Rathcarren and Donamon) with Castlereah and create a new Mid-Roscommon Water Supply Scheme.	-	-	✓	-	-	-
Granard	4	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP.	✓	✓	-	✓	✓	✓
		New SW abstraction from Lough Sheelin to supply deficit at Granard WRZ, upgrade Lough Kinale WTP.	-	-	-	-	-	✓
		New GW to supply deficit in Granard WRZ, upgrade Lough Kinale WTP.	-	-	✓	-	-	-
		Supply Granard from neighbouring Group Water Scheme.	-	-	-	✓	-	-
Kilkerrin/Moylough	2	Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit.	-	✓	✓	✓	-	✓
		New GW abstraction for Kilkerrin Moylough WRZ to supply deficit.	✓	-	✓	-	✓	-
Killeshandra PWS (GWS Import)	1	New SW abstraction from Lake Town and new WTP.	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Options SAF		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest	Best AA	Best SEA	Lowest Carbon	Most Resilient
Lanesboro & Newtowncashel	3	Abandon existing ESB BHs location site with capacity of 1.9MI/d (not IW owned). Develop a new wellfield in the vicinity of current BHs.	✓	-	✓	-	-	-
		Increase abstraction at Ballagha Spring (Newtowncashel) and upgrade WTP.	-	✓	✓	-	-	-
		New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisrevagh WTP.	-	-	✓	✓	✓	✓
Longford Central	2	Increase SW abstraction from Lough Forbes and upgrade WTP.	✓	✓	-	-	✓	✓
		New GW abstraction (Newtown Forbes GWB) to supply full/part of the deficit in WRZ.	-	-	✓	✓	-	-
Mountbellew P.S.	4	Increase GW abstraction from Ballygar spring WRZ to supply deficit.	-	-	-	-	-	-
		Increase GW abstraction for Mountbellew WRZ to supply deficit.	✓	✓	-	✓	✓	✓
		New GW abstraction for Mountbellew WRZ to supply deficit.	-	-	-	-	-	✓
		New SW abstraction from Castlegar River, connection to existing Mountbellew WTP and WTP upgrade to supply deficit.	-	-	✓	-	-	✓
North East Regional PWS	1	Not in deficit - Grange WTP upgrade.	✓	✓	✓	✓	✓	✓
North Roscommon RWSS	4	Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	✓	-	-	✓	✓	-
		New GW abstraction - Creevy groundwater source.	-	✓	✓	-	-	-
		New GW abstraction (Swinford Gravels GWB, Gweestion-Moy Gravels Group 1	-	✓	✓	-	-	-

Water Resource Zone Name	Feasible Options SAF		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest	Best AA	Best SEA	Lowest Carbon	Most Resilient
		GWB, Carrick-on-Shannon GWB, Ballymote GWB).						
		New SW abstraction from Lough Arrow to supply deficit at North Roscommon RWSS, new WTP.	-	-	✓	-	-	✓
Roscommon Central WSS	1	WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs.	✓	✓	✓	✓	✓	✓
South Leitrim Regional Carrick-on-Shannon	3	Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP.	-	-	✓	-	✓	-
		New SW abstraction from Lough Allen.	-	✓	✓	-	-	✓
		New GW abstraction (Carrick-on-Shannon GWB, Newtown-Ballyconnell GWB, Annaghmore GWB, Scramoge North GWB) to supply full/part of the deficit in WRZ.	✓	-	✓	✓	-	-

The 7 Step Process outlined in Figure 5.1 was then applied to each WRZ in SAF, 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, 5 WRZs scores a 0 in relation to potential impact on a designated European Site;
- In 9 of the 15 Water Resource Zones, the Preferred Approach consists of the same Plan Level options as the Best AA and Best Environmental Approaches.
- Two WRZ options have a -3 AA score against the European Site (Biodiversity) question. A -3 Score against biodiversity indicates a potential high risk (without mitigation measures) under the biodiversity criterion for a European Site and for this reason a potential alternative approach must be identified.
- No WRZ level approach was identified for Arvagh PWS (GWS Import) as there is no feasible option that can meet the full deficit for this WRZ.

Preferred Approaches at WRZ level are outlined in Table 5.4.

Table 5.4 SAF WRZ Approach Options

Water Resource Zone Name	Feasible Options SAF		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Arigna Regional PWS	SAF-068	Arigna Regional PWS not in deficit - Castletenison WTP Upgrade.	✓	✓	✓	✓	✓	✓	✓	✓
Arvagh PWS (GWS Import)	No local solution									
Ballymoe P.S.	SAF-072	Ballymoe WTP upgrade - no deficit.	-	✓	✓	✓	✓	✓	✓	✓
Boyle Regional	SAF-059	Increase GW abstraction at Boyle WRZ to supply deficit.	✓	✓	-	✓	✓	✓	-	✓
Castlerea PWS	SAF-039	Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP.	-	✓	✓	✓	✓	✓	✓	✓
Granard	SAF-030	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP.	-	✓	✓	-	✓	✓	✓	✓
Kilkerrin/Moylough	SAF-076	Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit.	-	-	✓	✓	✓	-	✓	✓
Killeshandra PWS (GWS Import)	SAF-156	New SW abstraction from Lake Town and new WTP.	-	✓	✓	✓	✓	✓	✓	✓
Lanesboro & Newtowncashel	SAF-021	New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisrevagh WTP.	-	-	-	✓	✓	✓	✓	✓
Longford Central	SAF-009	Increase SW abstraction from Lough Forbes and upgrade WTP.	-	✓	✓	-	-	✓	✓	✓
Mountbellew P.S.	SAF-084	Increase GW abstraction for Mountbellew WRZ to supply deficit.	-	✓	✓	-	✓	✓	✓	✓
North East Regional PWS	SAF-161	Not in deficit - Grange WTP upgrade.	✓	✓	✓	✓	✓	✓	✓	✓
North Roscommon RWSS	SAF-052	Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	-	✓	-	-	✓	✓	-	✓
Roscommon Central WSS	SAF-038	WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs.	-	✓	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Options SAF		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Carrick-on-Shannon	SAF-001	Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP.	✓	-	-	✓	-	✓	-	✓

5.2.2 Stage 2 - Creation of the Study Area Combinations

The Second Stage of our Approach Development Process involves identifying the Study Area options that can address Need in more than one WRZ within the Study Area, and then develop various combinations which contain elements of the different options. These are called SA Combinations. SA Combinations will consist of a number of different projects or options; however, looking at a wider, 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 Approaches identified at WRZ level for the entire Study Area. Table 5.5 below provides a summary of the 37 Study Area options.

Table 5.5 SAF Study Area Options

Water Resource Zone Name	Feasible Options SAF		
	Option code	Option Description	SA Grouped Option
Carrick-on-Shannon Boyle Regional	SAF-501	Increase SW abstraction from River Shannon and interconnect Boyle and Carrick-on-Shannon WRZs for increased resilience.	Group 1
Carrick-on-Shannon Longford Central	SAF-502	Increase SW abstraction from Lough Forbes and supplement Carrick-on-Shannon WRZ, upgrade Lough Forbes WTP. Supply part of Carrick-on-Shannon from Lough Forbes WTP for increased resilience.	Group 2
Carrick-on-Shannon North East Regional PWS	SAF-503	Develop new wellfield in conjunction with GWS augmentation (Polecat Springs) and supply part of the deficit from North East Regional WRZ (Co. Roscommon).	Group 3
Longford Central Ballymahon	SAF-505	Supplement part of Longford Central deficit from Abbeyshrule WTP - River Inny (Ballymahon WRZ).	Group 5
Longford Central North East Regional PWS	SAF-506	Develop new wellfield in conjunction with GWS augmentation (Polecat Springs) and supply part of the deficit from North East Regional WRZ (Co. Roscommon).	Group 6
Longford Central Granard	SAF-507	Increase SW from Lough Kinale and interconnect Longford Central and Granard to supply deficit and increase resilience.	Group 7
Lanesboro & Newtowncashel North East Regional PWS	SAF-509	Supply part of the deficit at Lanesboro & Newtowncashel from North East Regional WSS.	Group 9
Lanesboro & Newtowncashel Roscommon Central WSS	SAF-510	Increase GW Ballinagard spring abstraction to supply Lanesboro & Newcashel WRZ, upgrade WTP. Rationalise Lanesboro to Roscommon Central (Ballinagard WTP).	Group 10

Feasible Options SAF			
Water Resource Zone Name	Option code	Option Description	SA Grouped Option
Lanesboro & Newtowncashel Roscommon Central WSS	SAF-511	Increase GW abstraction at Ballinagard WTP and supply Lanesboro & Newtowncashel.	Group 11
Lanesboro & Newtowncashel Ballymahon	SAF-513	Increase SW abstraction from River Inny to cover deficit for Ballymahon and supply full demand of Lanesboro & Newtowncashel (upgrade Abbeyshrule WTP).	Group 13
Lanesboro & Newtowncashel Longford Central	SAF-514	Increase SW abstraction from Lough Forbes to cover deficit in Longford Central and Lanesboro & Newtowncashel WRZ (upgrade Lough Forbes WTP).	Group 14
Lanesboro & Newtowncashel Longford Central	SAF-515	Increase SW abstraction from Lough Forbes to cover deficit in Longford Central and supply full demand for Lanesboro & Newtowncashel WRZ, upgrade (Lough Forbes WTP).	Group 15
Granard Longford Central	SAF-516	Increase SW abstraction from Lough Forbes to cover deficit in Longford Central and Granard WRZ (upgrade Lough Forbes WTP).	Group 16
North East Regional PWS Longford Central	SAF-517	Increase SW abstraction from Lough Forbes to cover deficit in Longford Central and supply full demand for North East Regional PWS (upgrade Lough Forbes WTP).	Group 17
Castlerea PWS Lough Mask & Westport Ballymoe P.S.	SAF-521	Increase SW abstraction from Lough Mask and rationalise Castlerea PWS and Ballymoe P.S..	Group 21
Castlerea PWS Roscommon Central WSS	SAF-522	Increase GW abstraction at Ballinagard WTP to fully cover Castlerea PWS demand.	Group 22
Castlerea PWS North Roscommon RWSS	SAF-523	Increase GW abstraction and interconnect Castlerea PWS WRZ with North Roscommon WRZ.	Group 23
Castlerea PWS Ballymoe P.S.	SAF-524	Interconnect Castlerea PWS WRZ with Ballymoe WRZ and supply deficit	Group 24
North Roscommon RWSS Charlestown	SAF-525	Increase GW abstraction from unnamed spring between Killaturly and Charlestown interconnect North Roscommon WRZ and Charlestown WRZ.	Group 25
North Roscommon RWSS Lough Mask & Westport	SAF-526	Increase SW abstraction from Lough Mask to supply deficit at Lough Mask & Westport WRZ	Group 26

Feasible Options SAF			
Water Resource Zone Name	Option code	Option Description	SA Grouped Option
		(upgrade WTP). Rationalise North Roscommon RWSS to Lough Mask RWSS.	
Boyle Regional North East Regional PWS	SAF-527	Supply deficit in Boyle from North East Regional PWS.	Group 27
Boyle Regional Carrick-on-Shannon	SAF-528	Rationalise Boyle Regional to South Leitrim WRZ (increase abstraction from Shannon and upgrade WTP).	Group 28
Boyle Regional Carrick-on-Shannon	SAF-529	Interconnect Boyle Regional with South Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP).	Group 29
Arigna Regional PWS Boyle Regional	SAF-530	Interconnect Arigna Regional PWS with Boyle Regional to supplement supply.	Group 30
Ballymoe P.S. Lough Mask & Westport	SAF-531	Increase SW abstraction from Lough Mask to supply deficit at Lough Mask & Westport WRZ (upgrade WTP). Rationalise Ballymoe to Lough Mask.	Group 31
Kilkerrin/Moylough Mid-Galway	SAF-532	Increase GW abstraction at Danganbeg WTP and supply Kilkerrin/Moylough WRZ.	Group 32
Kilkerrin/Moylough Galway City (Terryland & Luimnagh) [Tuam RWSS]	SAF-533	Rationalise Kilkerrin/Moylough to Tuam RWSS (Luimnagh).	Group 33
Kilkerrin/Moylough Dunmore /Glenamaddy P.S.	SAF-534	Increase GW abstraction at Gortgarrow Spring, upgrade WTP. Rationalise Kilkerrin/Moylough to Dunmore Glenamaddy.	Group 34
Kilkerrin/Moylough Lough Mask & Westport	SAF-535	Increase SW abstraction from Lough Mask and supply Kilkerrin/Moylough WRZ, upgrade WTP.	Group 35
Mountbellew P.S. Mount Talbot/Four Roads	SAF-537	Increase GW (spring) abstraction at Cloonlaughnan WTP, rationalise Ballygar WTP and connect Mountbellew to Mount Talbot/Four Roads.	Group 37
Dunmore /Glenamaddy P.S. Kilkerrin/Moylough Mountbellew P.S. Ballymoe P.S.	SAF-541	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, and Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask.	Group 41

Feasible Options SAF			
Water Resource Zone Name	Option code	Option Description	SA Grouped Option
Lough Mask & Westport			
Arvagh PWS (GWS Import) Gowna	SAF-542	Increase SW abstraction from Lough Gowna and supply Arvagh PWS.	Group 42
Mountbellew P.S. Mount Talbot/Four Roads	SAF-544	Increase GW spring abstraction and supply Mountbellew and Ballygar.	Group 44
Longford Central Lanesboro & Newtowncashel	SAF-545	Increase GW abstraction and supplement Longford Central from Lanesboro BHs.	Group 45
Dunmore /Glenamaddy P.S. Kilkerrin/Moylough Mountbellew Ballymoe P.S.	SAF-546	Interconnect Dunmore Glenamaddy, Kilkerrin/Moylough, Mountbellew, Ballygar and Ballymoe and supply from Tuam.	Group 46
Dunmore /Glenamaddy P.S. Ballymoe P.S Mountbellew Kilkerrin/Moylough	SAF-547	Augment current sources at Dunmore Glenamaddy and/or Kilkerrin/Moylough and supply Dunmore Glenamaddy, Kilkerrin/Moylough, Mountbellew, Ballygar and Ballymoe.	Group 47
North Roscommon RWSS	SAF-548	Further develop existing Trial Wells at L Gara WTP to partly supply full demand (Abandon existing L Gara source). Further develop existing TW's at Creevy to partly supply full demand (Abandon existing L Gara source). New GW development in vicinity of Creevy to partly supply full demand (Abandon existing L Gara source). New GW development in vicinity of Lissian to partly supply full demand (Abandon existing L Gara source). Increase GW abstraction and interconnect Castlerea Regional WRZ with North Roscommon WRZ (Abandon existing L Gara source).	Group 48

The 37 Study Area options result in 13 SA Combinations that could meet the need across all WRZs. WRZ Level Approach is excluded at this stage of comparison as 1 WRZ does not have a WRZ Level Approach (and accordingly the WRZ level approach does not meet the need across all WRZs). The 13 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Roscommon Central WSS	○	○	○	○	□	○	○	○	○	○	○	○	○	○
Carrick-on-Shannon	○	□	□	○	○	○	○	○	□	○	○	○	○	○

5.2.3 Stage 3 – Preferred Approach at Study Area Level

As part of stage three, we compare the WRZ Level Approach and the SA Combinations to determine the Preferred Approach that provides the best outcome for the Study Area. As the WRZ Level Preferred Approach did not meet the deficit for the Study Area as a whole, it has not been assessed and assigned a score for the purposes of determining the best performing alternative within each approach category.

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

In accordance with Section 7.2.2 of the draft RWRP NW, where options or combinations of options achieve similar, although not exactly identical scores under the six approach types, IW takes a wider look at the comparable combinations /options to consider which to categorise as the “Best” approach within each category. In particular, IW takes into account whether the option or combination of options meets the SEA and Habitats objectives outlined in the Framework Plan. This is an example of the professional judgement from the multi-disciplinary teams, identified in section 8.3.7.4 of the Framework Plan.

For SAF, six SA combinations had a very similar ranking under the Least Cost category, within 5% of each other.

- Combination 1
- Combination 7
- Combination 8
- Combination 9
- Combination 11
- Combination 13

The Least Cost Approach is determined using an Irish Water Net Present Value assessment tool. The NPV tool uses a strict set of requirements and is limited in what flexibility it offers. Therefore, as set out in further detail in Section 7.2.1 of the draft RWRP NW, where an Option or Combination of Options provide similar NPV costs, and in some circumstances so as to ensure that no option is discounted at this early stage by reference only to “Least Cost” only, Irish Water has considered that all options within a 5% NPV cost margin are in principle eligible to be identified as the “Least Cost” option. This approach recognises the desktop nature of the NPV assessment and the fact that the figures will almost certainly change at project stage.

When we compare these six combinations against each other to identify which should go forward as the Least Cost approach.

Combinations 7, 8, 9, 11 and 13 all propose a local WRZ Preferred Approach for Kilkerrin Moylough WRZ which involves developing groundwater in the area. Recent trial well data and data from the existing source have indicated a higher degree of vulnerability at the source than was previously understood as it is shallow rock and has been found to be high in manganese. Combination 1 involves a rationalisation of the Kilkerrin Moylough WRZ to Dunmore Glenamaddy which would offer better overall resilience and security of supply, therefore this is selected as the Least Cost Approach. This assessment is an example of the exercise of professional judgement by Irish Water, with the benefit of input from local authority stakeholders, as provided for in section 8.3.7.4 of the Framework Plan.

The SA combinations outlined in Table 5.6 are assessed to determine the approach categories as summarised in Table 5.8

Table 5.8 Best Combinations

Approach Categories	Best Performing Combination
Least Cost (LCo)	SA Combination 1
Best Environmental (BE)	SA Combination 6
Quickest Delivery (QD)	SA Combination 1
Most Resilient (MR)	SA Combination 12
Lowest Carbon (LC)	SA Combination 2
Best AA (BA)	SA Combination 6

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, SA Combination 1 has the lowest NPV Cost, as shown in Figure 5.2 with the lowest total costs (CAPEX and OPEX) over the solutions lifetime.

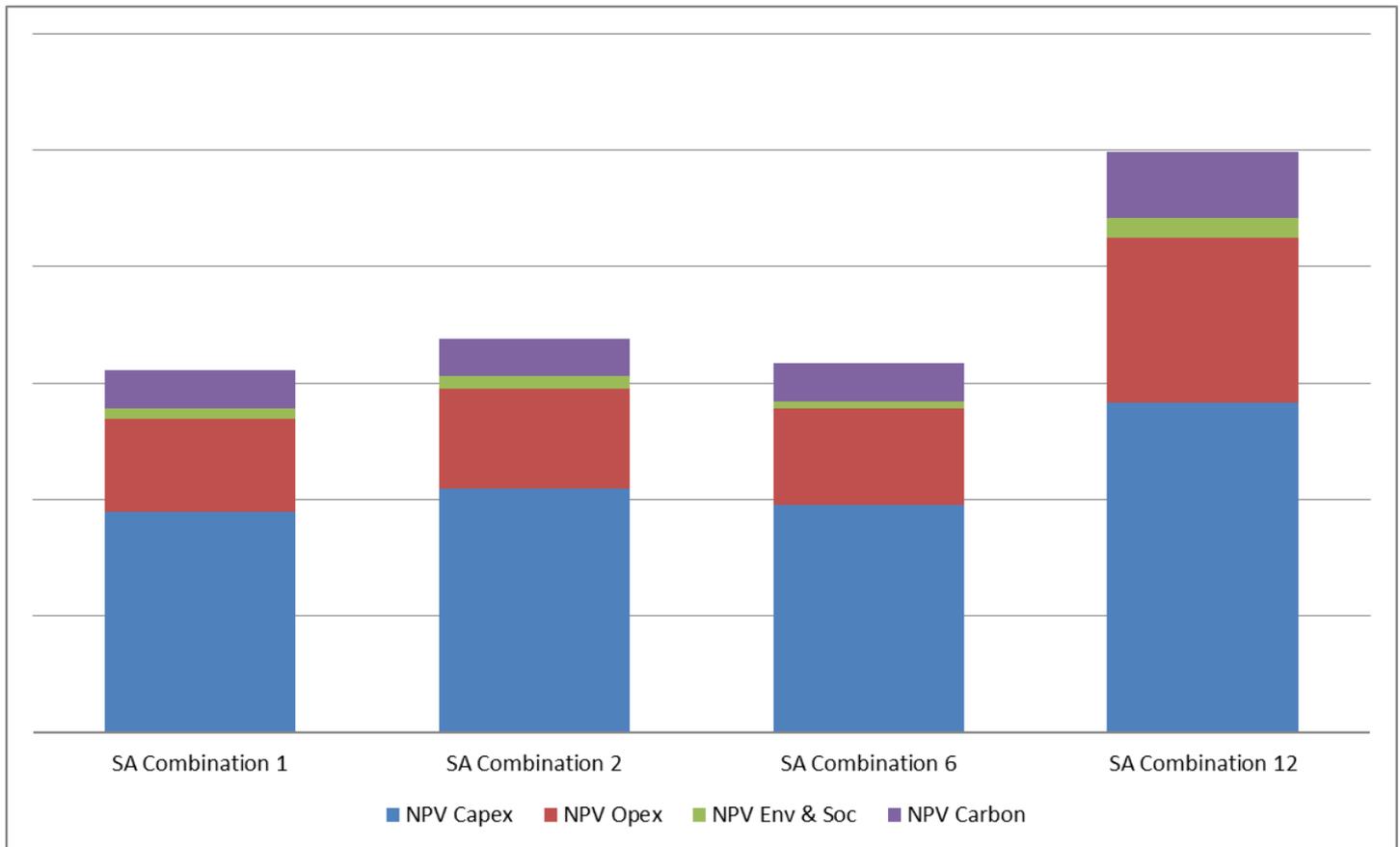


Figure 5.2 SAF NPV Costs for WRZ and SA approaches

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 results in 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. While the Least Cost Approach comprises two options with a -3 score against the AA criteria, which means likely significant effects of the options may be harder to mitigate, it is understood at plan level that mitigation would be achievable, however further project level assessments are required to confirm this. One of the options with a -3 score against the AA criteria as part of the Least Cost Approach is the preferred approach for the Kilkerrin Moylough WRZ which considers a rationalisation of the supply to the Dunmore Glenamaddy WRZ. The alternative option in the Best AA Approach is to develop a local GW source. Recent trial well data and data from the existing groundwater source and have indicated a higher degree of vulnerability at the source than was previously understood as it is shallow rock and has been found to be high in manganese. As it is understood at plan level that mitigation in respect of AA impacts would be achievable and the Least Cost Approach provides more resilience, the Least Cost Approach is retained at this stage.
- Step 2 – We compared the Quickest Delivery Approach to the Least Cost Approach. The Quickest Delivery Approach is the same as the Least Cost Approach. The Least Cost and Quickest Delivery Approach was therefore progressed as the Preferred Approach.
- Step 3 – We compared the Least Cost and Quickest Delivery Approach against the Best Environmental Approach. The Best Environmental Approach is also the Best AA Approach and was compared above. There are no significant environmental benefits to progressing the Best

Environmental Approach over the Least Cost and Quickest Delivery Approach. The Least Cost and Quickest Delivery Approach was therefore retained at this stage.

- Step 4 – We compared the Least Cost and Quickest Delivery Approach against the Most Resilient Approach. The Least Cost and Quickest Delivery Approach scored similarly to the Most Resilient Approach against the resilience criteria while the Most Resilient Approach performed worst against the Least Cost and Lowest Carbon criteria. There are no significant benefits to progressing the Most Resilient Approach over the Least Cost and Quickest Delivery Approach. The Least Cost and Quickest Delivery Approach was therefore retained at this stage.
- Step 5 - We compared the Least Cost and Quickest Delivery Approach against the Lowest Carbon Approach. There were no significant benefits to progressing the Lowest Carbon Approach over the Least Cost and Quickest Delivery Approach, as there was no significant difference in carbon costs and the Lowest Carbon Approach had higher NPV costs and a lower resilience score than the Least Cost and Quickest Delivery Approach. The Least Cost and Quickest Delivery Approach was therefore retained at this stage.
- Step 6 – A final assessment of the Least Cost and Quickest Delivery Approach was completed against the Best AA, Best Environmental, Most Resilient and Lowest Carbon Approaches. There is no significant difference between the approaches across the NPV costs, carbon, quickest delivery, or environmental criteria. The Least Cost and Quickest Delivery Approach provides significantly more resilience than the Lowest Carbon and Best Environmental Approach and while the Least Cost and Quickest Delivery Approach comprise two options with a -3 score against the AA criteria, which means likely significant effects of the options may be harder to mitigate, it is understood at plan level that mitigation would be achievable, however further project level assessments are required to confirm this.
- At plan level, the Least Cost and Quickest Delivery Approach offers good results in overall cost, carbon delivery, resilience and overall environmental score, so is retained at this stage as the Preferred Approach.
- Step 7 – The Least Cost and Quickest Delivery Approach was therefore selected as the Preferred Approach.

5.3 Study Area Preferred Approach Summary

On the basis of this initial assessment at Plan level, SA Combination 1 represents the Preferred Approach for Study Area F, which consists of the options listed in Table 5.9.

Table 5.9 Preferred Approach for SAF

WRZ Name	Option Description
Longford Central	SAF-009: Increase SW abstraction from Lough Forbes and upgrade WTP.
Lanesboro & Newtowncashel	SAF-021: New GW abstraction at Lisrevagh WTP.
Granard	SAF-030: Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP
Roscommon Central WSS	SAF-038: WTP Upgrade - Not in deficit, pump tests to prove high yield spring and BHs.

WRZ Name	Option Description
Castlerea PWS	SAF-039: Increase GW abstraction at existing Longford Springs and boreholes to supply deficit and upgrade WTP;
North Roscommon RWSS	SAF-052: Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.
Arigna Regional PWS	SAF-068: Not in deficit - WTP Upgrade.
Ballymoe P.S	SAF-072: WTP upgrade - no deficit.
Mountbellew	SAF-084: Increase GW abstraction for Mountbellew WRZ to supply deficit.
Killeshandra PWS (GWS Import)	SAF-156: New SW abstraction from Lake Town and new WTP.
North East Regional PWS	SAF-161: Not in deficit - WTP Upgrade.
Boyle Regional Carrick-on-Shannon	Group 29: Interconnect Boyle with Carrick-on-Shannon WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP).
Kilkerrin/Moylough Dunmore/Glenamaddy	Group 34: Increase abstraction at Gortgarrow Spring WTP. Rationalise Kilkerrin/ Moylough to Dunmore/ Glenamaddy.
Arvagh PWS (GWS Import) Gowna	Group 42: Rationalise Arvagh to Gowna WRZ.

The Preferred Approach (SA approach Combination 1) is shown schematically in Figure 5.3

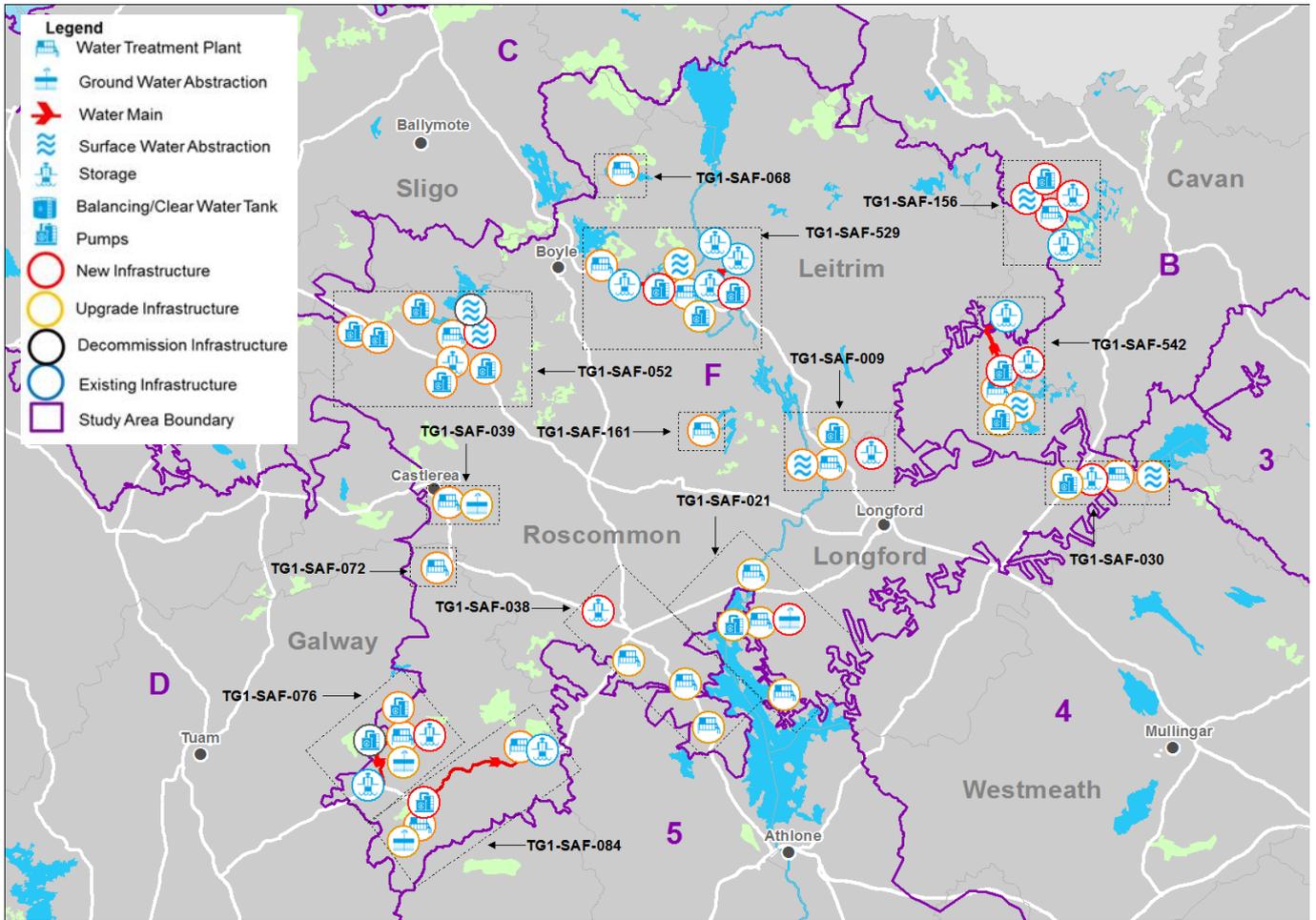


Figure 5.3 SAF Preferred Approach

The Preferred Approach for SAF, 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 SAF, 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; and
- **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).



6

**Preferred Plan
Constraints –
Interim Solutions**

6 Preferred Plan Constraints – 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 SAF Interim Options

WTP Name	Interim Option
Ballygar WTP	Refurb existing Spring, and upgrade WTP to IW Standards – Potential site for a containerised solution
Ballymoe WTP	Refurb existing Spring, and upgrade WTP to IW Standards
Kilkerrin Moylough WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Mountbellew WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Carrick on Shannon WTP	Upgrade WTP to IW Standards
Lough Kinale WTP	Upgrade WTP to IW Standards
Lanesboro (ESB Site) WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Lanesboro (Lisrevagh) WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Lough Forbes WTP	Upgrade WTP to IW Standards
Newtowncashel WTP	Refurb existing Spring, and upgrade WTP to IW Standards
Ballinagard Spring WTP	Refurb existing Spring, and upgrade WTP to IW Standards
Knockcroghery (Toberog) WTP	Refurb existing Spring, and upgrade WTP to IW Standards
Lough Gara WTP	Upgrade WTP to IW Standards
Lecarrow (Toberreoge) WTP	Refurb existing Spring, and upgrade WTP to IW Standards
Rockingham WTP	Refurb existing Borehole and Spring, and upgrade WTP to IW Standards
Castlerea (Longford Springs) WTP	Refurb existing Spring, and upgrade WTP to IW Standards
Castletenison WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Grange WTP	Upgrade WTP to IW Standards



7



**Preferred
Approach –
Sensitivity
Analysis**

7 Preferred Approach – Sensitivity Analysis

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

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

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

Table 7.1 Sensitivity Analysis for SAF

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Sustainability	Moderate/High (as our current abstractions are large compared to the water bodies from which they abstract)	+0 m ³ /day	<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. Based on our initial assessment, it is not envisaged that there are sustainability issues with the volumes abstracted at our surface water sources as these 5no. abstractions are from large resilient sources in the Upper Shannon system. Groundwater sustainability is more difficult to assess at desktop level, however, as the abstractions in SAF are small in scale they do not appear to be problematic.</p> <p>Based on this scenario, the Preferred Approach remains the optimal solution.</p>

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Climate Change	High (international climate change targets have not been met)	+0 m ³ /day	<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. Regarding the existing groundwater abstractions, there is more difficulty and uncertainty in assessing increased climate change impacts, however it is understood that generally groundwater will be more resilient than surface water sources.</p> <p>Based on this scenario, the Preferred Approach remains the optimal solution.</p>
Demand Growth	Low/Moderate (growth has been based on policy)	-15,823 m ³ /day	<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 15 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	Low (Irish Water is focused on sustainability and aggressive leakage reduction)	513 m ³ /day	<p>The impact of lower than expected leakage savings would increase the supply demand balance deficit and the overall need requirement.</p> <p>As Irish Water is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage targets as opposed to accepting lower targets.</p> <p>Based on this scenario, the Preferred Approach remains the optimal solution.</p>

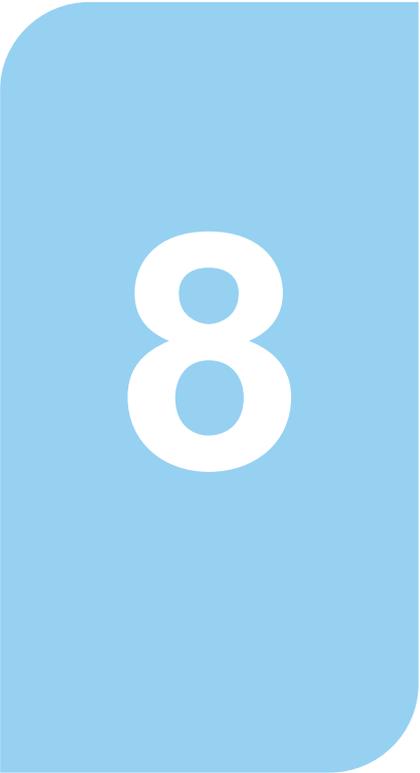
Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	10,431 m ³ /d	<p>Increased leakage savings beyond SELL would reduce the supply demand balance deficit and the overall need requirement. The need drivers in SAF are across all 15 water resource zones and are driven by quality as well as availability issues. Therefore, the Preferred Approach is required, even accounting for increased leakage savings.</p> <p>Based on this scenario, the Preferred Approach remains as 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 – The supplies in SAF vary in size with a large number of small WRZs <1MI/d as well as large growth areas such as Carrick-on-Shannon. The majority of preferred options look to expand existing surface water and groundwater supplies which will require further investigation at project level.

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 F

8 Summary of Study Area F

The Preferred Approach for SAF (summarised in Table 5.9 and Figure 5.3) consists of local WRZ for Arigna Regional PWS, Ballymoe P.S, Castlerea PWS, Granard, Killeshandra PWS (GWS Import), Lanesboro & Newtowncashel, Longford Central, Mountbellew, North East Regional PWS, North Roscommon RWSS, Roscommon Central WSS WRZs in the Study Area. As part of Grouped Preferred Approach, it is proposed to rationalise Arvagh PWS (GWS Import) to Gowna WRZ, rationalise Kilkerrin/Moylough to Dunmore/ Glenamaddy and interconnect Boyle with Carrick-on-Shannon WRZ and supply deficit from Carrick-on-Shannon. It is also proposed to increase abstraction from River Shannon and upgrade Carrick-on-Shannon WTP).

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 SAF also includes for demand side (**Lose Less** and **Use Less**) measures, including:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset NRR;
- Nett leakage reduction in Carrick-on-Shannon, Lanesboro & Newtowncashel and North Roscommon Regional Water Supply Scheme Water Resource Zones, amounting to 513 m³ per day (applied to SDB Deficit) to move towards achieving the National SELL Target by 2034
- Continuation of IW household and business water conservation campaigns, initiatives and education programmes; and
- The option to implement legally enforceable Water Conservation Orders in drought periods in order to protect the environment and our public water supplies.

As part of our Preferred Approach we have also identified a range of interim solutions for SAF, 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 F Water Treatment Plants

WTP Asset Name	Local Plant Names
Lough Kinale WTP	Lough Kinale WTP
Lanesboro (Lisrevagh) WTP	Lanesboro (Lisrevagh) WTP
Lanesboro (ESB Site) WTP	Lanesboro (ESB Site) WTP
Lough Forbes WTP	Lough Forbes WTP
Newtowncashel WTP	Newtowncashel WTP
Ballinagard Spring WTP	Ballinagard Spring WTP
Knockcroghery (Toberog) WTP	Knockcroghery (Toberog) WTP
Lough Gara WTP	Lough Gara WTP
Lecarrow (Toberreoge) WTP	Lecarrow (Toberreoge) WTP
Rockingham WTP	Rockingham WTP
Castlerea (Longford Springs) WTP	Castlerea (Longford Springs) WTP
Castletenison WTP	Castletenison WTP
Grange WTP	Grange WTP

Annex B – Study Area F Rejection Register Summary

Annex B Study Area F Rejection Register Summary

Study Area F - CS Rejection

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-003	New riverbank filtration adjacent to River Shannon at Carrick-on-Shannon to supply deficit in South Leitrim RWSS WRZ	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-008	Partly supply deficit from Arigna (Co. Roscommon) to Drumshambo	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-099	Partly supply deficit from Arigna (Co. Roscommon) to Drumshambo	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria and was rejected at fine screening stage.	●	●	●
TG1-SAF-011	New riverbank filtration adjacent to Lough Forbes (suitable location point TBC) to supply deficit in Longford Central WRZ	The overlying sediments here consist of peat with pockets of Till, as such this is not a feasible option. Therefore, this option did not meet the requirements of the Resilience or Deliverability criteria.	●	●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-016	Increase SW abstraction from Lough Forbes, upgrade WTP and interconnect Longford Central and Gowna to supply deficit and increase resilience	Gowna assessed as part of Study Area B. Therefore, this option was not progressed to the fine screening stage.	Gowna assessed as part of Study Area B		
TG1-SAF-017	Increase GW abstraction from ESB well and extend supply from Lanesboro into Newtowncashel and upgrade WTP	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-019	New riverbank filtration adjacent to River Shannon at Lanesborough to supply deficit in Lanesboro & Newtowncashel WRZ	Difficult to constrain whether there are gravels beneath the alluvium and no information available on the alluvium itself. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-025	Raw water impoundment in cutaway bog area to capture flood water in Lanesboro & Newtowncashel WRZ	A bog is located on a regionally important aquifer (Karstified) presenting a water quality issue. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-026	Supply deficit from upgraded Abbeyshrule WTP (Ballymahon WRZ)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAF-037	Develop new wellfield in North East Regional PWS and supply deficit to neighbouring WRZs	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-103	Interconnect Longford Central and Gowna to supply deficit and increase resilience	Gowna assessed as part of Study Area B. Therefore, this option was not progressed to the fine screening stage.	Gowna assessed as part of Study Area B		
TG1-SAF-107	Increase SW abstraction from River Inny to cover deficit for Ballymahon and Lanesboro WRZ, upgrade Abbeyshrule WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAF-113	Develop new wellfield in North East Regional and supply neighbouring WRZs	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-114	Develop new wellfield in North East Regional and supply neighbouring WRZs	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-115	Develop new wellfield in North East Regional and supply neighbouring WRZs	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-116	Develop new wellfield in North East Regional and supply neighbouring WRZs	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAF-117	Develop new wellfield in North East Regional and supply neighbouring WRZs	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-040	Bring back Silver Island spring source	No information on the source with historic quality issues noted and there are better alternatives available. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-041	Longford Springs WTP upgrade only	When unconstrained options list was originally drawn up this WRZ was not in deficit; however, due to an updated SDB, the WRZ is now in deficit and requires additional supply.	WRZ is now in deficit and a new supply option is required.		
TG1-SAF-042	New GW abstraction (Suck South GWB, Carrick-on-Shannon GWB, Suck North GWB) to supply deficit	New GW is not required, as it is likely that an increase at the existing spring will meet the demand requirement. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-043	New SW source to supply Castlera WRZ	Surface water option have been assessed as part of group option 21, so this option was not progressed.	Assessed as part of a different feasible option		
TG1-SAF-044	Supply part of the deficit from Roscommon Central WRZ	There is not enough surplus available at Roscommon Central to supply deficit in Castlerea. Increase in supply is assessed as part of TG1-SAF-039 option.	Assessed as part of a different feasible option		
TG1-SAF-118	Surplus to supply Castlerea. Small increase required at Ballingard for full deficit,	There is not enough surplus available at Roscommon Central to supply deficit in Castlerea. Increase in supply is assessed as part of TG1-SAF-039 option.	Assessed as part of a different feasible option		
TG1-SAF-045	Supply part of the deficit from North East Regional WRZ (Co. Roscommon)	When unconstrained options list was originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	WRZ is no longer in deficit		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-119	Develop New GW Wellfield and supply Castlerea	When unconstrained options list was originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	WRZ is no longer in deficit		
TG1-SAF-051	Increase SW abstraction at Lough Gara and refurbish WTP intake	Problem at intake regarding overgrown vegetation and water quality treatability issues at lower lake. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-056	New SW abstraction from Lough Allen, upgrade Lough Gara WTP	The plan required a significant length of the pipeline for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-067	Supply Boyle/Ardcarne from neighbouring Group Water Scheme (Drumherriff Co. Roscommon; Geevagh/Highwood, Castlebaldwin Co. Sligo) - options available locally	The plan required a significant length of the pipeline for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-070	Maintain GWS import in Arvagh PWS	This is assessed as part of option SAF-147 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed as part of a different feasible option		
TG1-SAF-071	Maintain GWS import in Killeshandra PWS	This is assessed as part of option SAF-150 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed as part of a different feasible option		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-073	New GW abstraction for Ballymoe WRZ to supply deficit	When unconstrained options list was originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	WRZ is no longer in deficit		
TG1-SAF-075	Critical Infrastructure Upgrades	This option will be considered by IW as a critical infrastructure option, and will be included as part of the design for feasible options	Considered as a critical infrastructure option and will be included in option design		
TG1-SAF-078	New SW abstraction for Kilkerrin Moylough WRZ to supply deficit	This option has a lack of suitable SW river sources in local vicinity that can meet the deficit. This is not a sustainable long-term abstraction to supply deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	•	•	•
TG1-SAF-083	Critical Infrastructure Upgrades	This option will be considered by IW as a critical infrastructure option, and will be included as part of the design for feasible options	Considered as a critical infrastructure option and will be included in option design		
TG1-SAF-088	Rationalise to Tuam regional	The option requires a significant length of pipeline for a relatively very small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-092	Increase GW abstraction at Ballymoe and interconnect and supply deficit to Dunmore/Glenamaddy, Kilkerrin Moylough and Mountbellew to create regional scheme for increased resilience	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-093	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe and Four Roads	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-095	Critical Infrastructure Upgrades	This option will be considered by IW as a critical infrastructure option, and will be included as part of the design for feasible options	Considered as a critical infrastructure option and will be included in option design		
TG1-SAF-135	Increase SW abstraction from Lough Corrib and supply Mountbellew	The option requires a significant length of pipeline for a relatively very small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-137	Increase GW abstraction at Ballymoe and interconnect and supply deficit to Dunmore/Glenamaddy, Kilkerrin Moylough and Mountbellew to create regional scheme for increased resilience	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-138	Increase GW abstraction at Ballymoe and interconnect and supply deficit to Dunmore/Glenamaddy, Kilkerrin Moylough and Mountbellew to create regional scheme for increased resilience	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-139	Increase GW abstraction at Ballymoe and interconnect and supply deficit to Dunmore/Glenamaddy, Kilkerrin Moylough and Mountbellew to create regional scheme for increased resilience	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-140	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe and Four Roads	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-141	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe and Four Roads	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-142	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe and Four Roads	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	
TG1-SAF-143	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe and Four Roads	The option requires a significant length of pipeline for a relatively small deficit. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-147	Maintain supply to Arvagh WRZ from Erne Valley GWS.	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria and was rejected at fine screening stage.	●	●	●
TG1-SAF-150	Keep supplying Killeshandra WRZ from Erne Valley GWS.	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria and was rejected at fine screening stage.	●	●	●
TG1-SAF-151	Recommission Portaliffe WTP (Mill Lough) and supply Killeshandra.	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria and was rejected at fine screening stage.	●	●	●
TG1-SAF-152	Increase GW abstraction from existing boreholes at Ballyconnell to supply deficit and supply full demand to Killeshandra, and rationalise Bawnboy and Swanlibar	The plan required a significant length of the pipeline for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability
TG1-SAF-153	Increase GW abstraction from existing boreholes at Ballyconnell to supply deficit and supply full demand to killeshandra, and rationalise Bawnboy and Swanlibar	This option covers 3 WRZs in Study Area B and is already assessed as part of this study area. As a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed in a different option		
TG1-SAF-154	Increase GW abstraction from existing boreholes at Ballyconnell to supply deficit and supply full demand to killeshandra, and rationalise Bawnboy and Swanlibar	This option covers 3 WRZs in Study Area B and is already assessed as part of this study area. As a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed in a different option		
TG1-SAF-155	Increase GW abstraction from existing boreholes at Ballyconnell to supply deficit and supply full demand to killeshandra, and rationalise Bawnboy and Swanlibar	This option covers 3 WRZs in Study Area B and is already assessed as part of this study area. As a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed in a different option		
TG1-SAF-159	Develop new wellfield in North East Regional PWS. Supply deficit to neighbouring WRZs.	When unconstrained options list was originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	WRZ is no longer in deficit		