Summer 2023

# Regional Water Resources Plan North West

## Appendix 3 Study Area C Technical Report

Tionscadal Éireann
Project Ireland
2040

6 CLEAN WATER AND SANITATION

**Data Disclaimer:**

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

Baseline data included in the RWRP-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 Uisce Éireann data sets. Data sources will be detailed in the relevant sections of the RWRP-NW. 2019 was selected as the base year to align with the planning period (2019-2025) of the NWRP.

# Table of Contents

# 1 Introduction and Background

# 1 Introduction – Study Area C

This is the Technical Report for Study Area C 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 Regional Water Resources Plan – North West (RWRP-NW), which explain key concepts and terminology used throughout the report.

This Study Area includes 17 water resource zones located in County Cavan, Leitrim, Mayo and Sligo. This Technical Report includes:

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

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

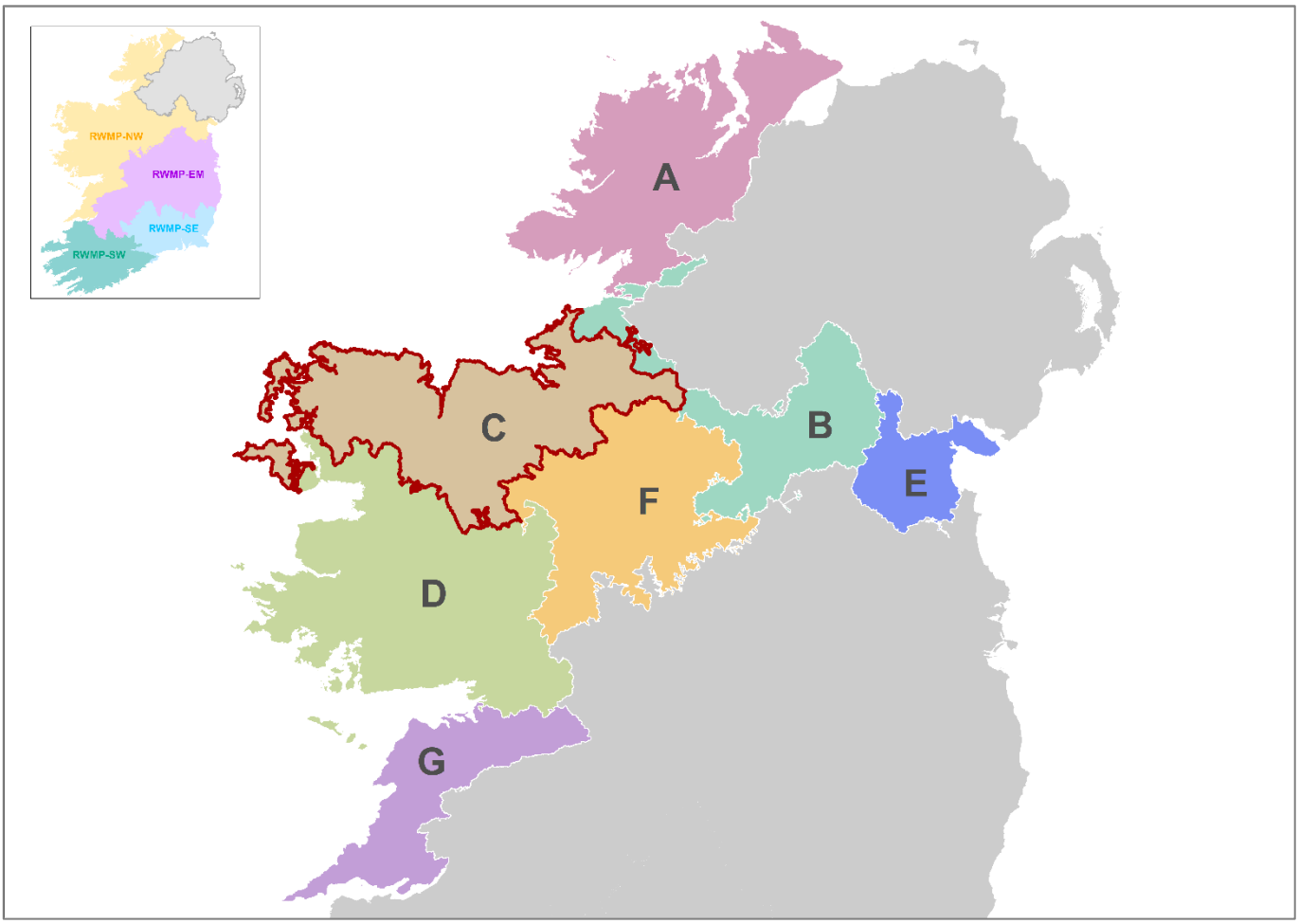


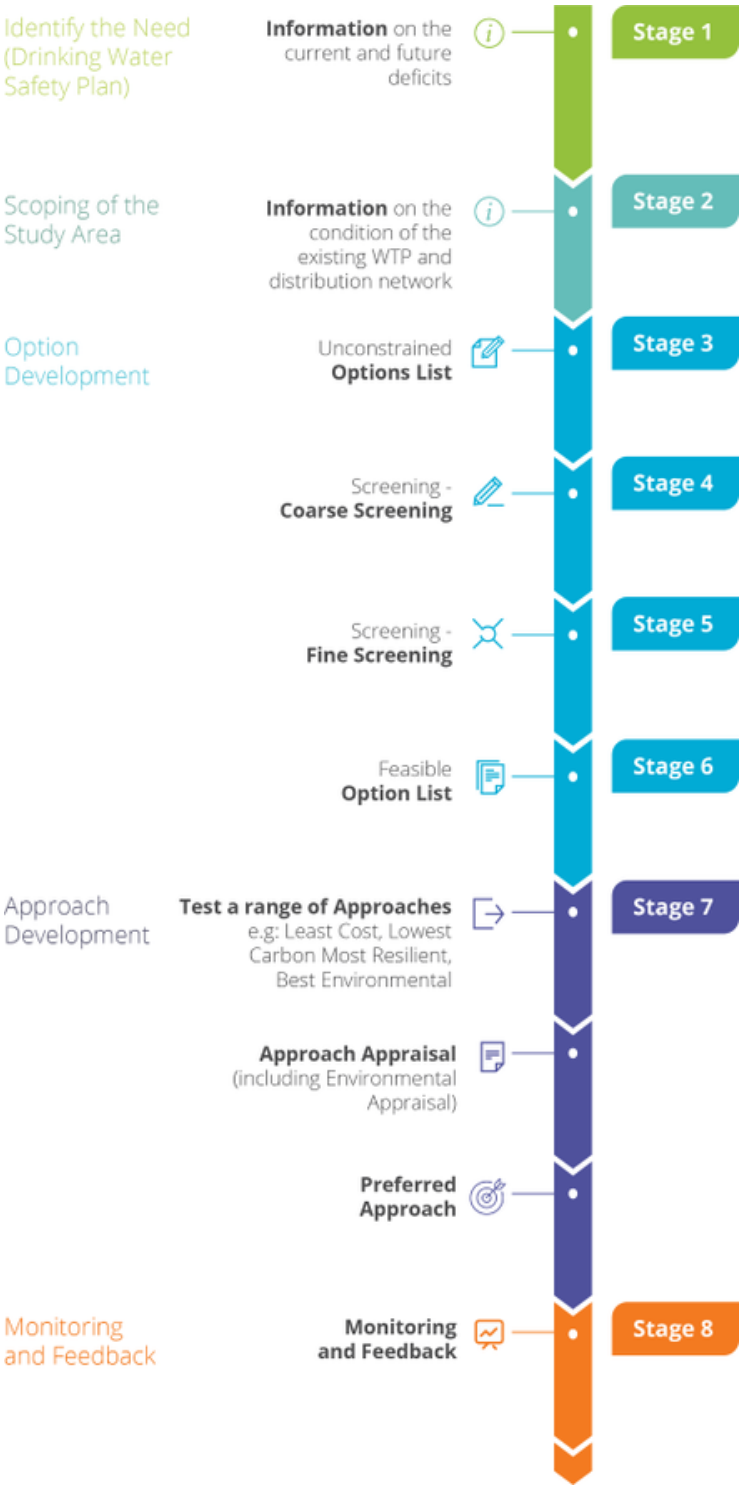

Figure 1.1 Overview of Study Areas within the North West Region

This Technical Report is for Study Area C (SA-C), which consists of 17 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.




## 1.2 Introduction to the Study Area

Figure 1.2 Option Assessment Methodology Process

Study Area C consists of 17 WRZs supplying a population of approximately 96,788 people via approximately 3,119 kilometres of distribution network. SA-C is the third largest study area in the country as it extends across the northern half of County Mayo, including Achill Island and the Belmullet Peninsula, the whole of County Sligo and into part of Cavan and the northern parts of County Leitrim.

The town of Sligo is the largest demand centre, with other towns elsewhere including Ballina and Tobercurry. The sources of water supply consist of 14 surface water abstractions and 7 groundwater abstractions. The Study Area's water treatment plants (WTPs) and their associated source type are summarised in Figure 1.3. and Table 1.1.

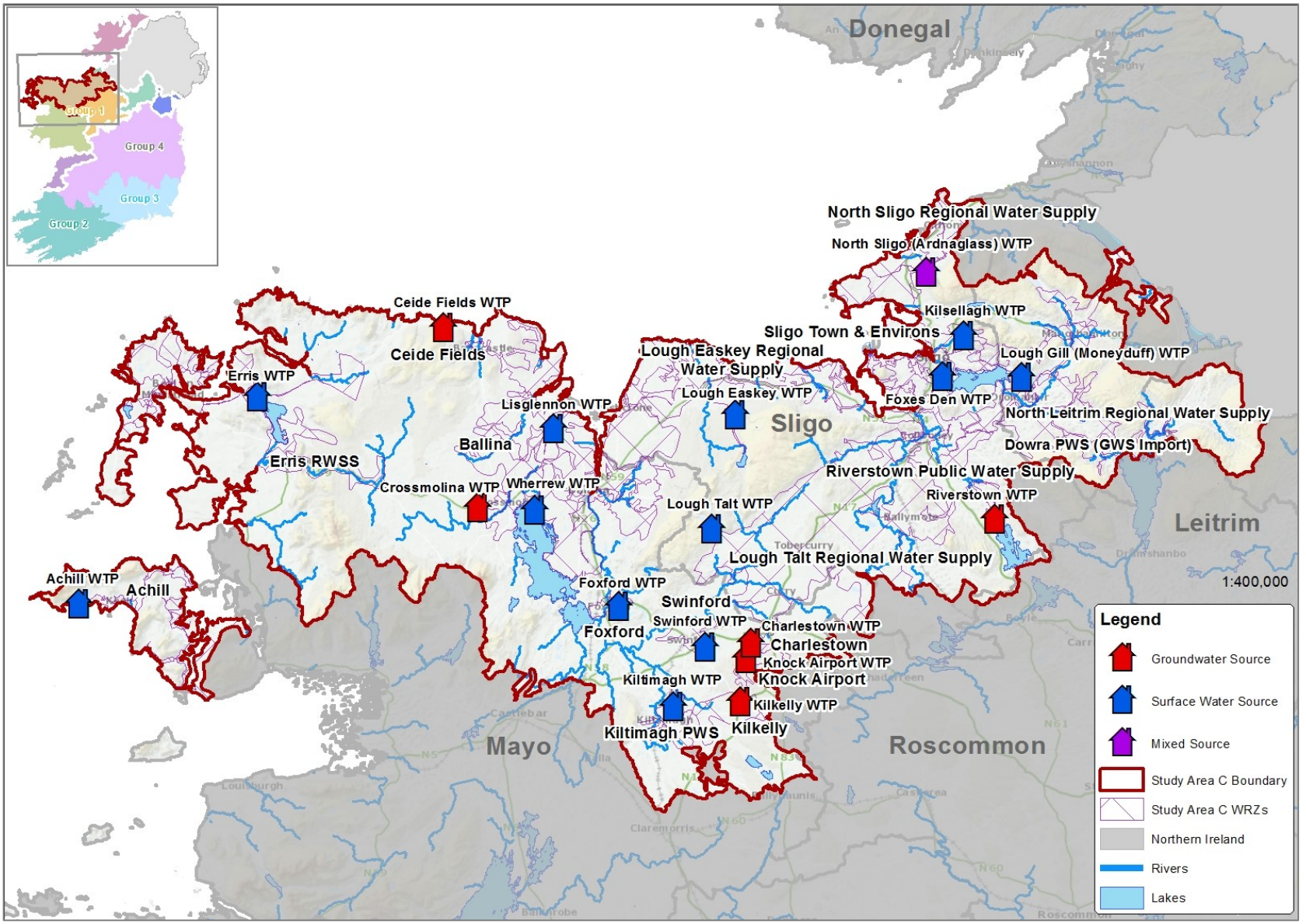



**Figure 1.3 SA-C Water Supply Study Area**

Regarding surface water availability in SA-C, the Study Area extends across three catchments: the Blacksod-Broadhaven (HA 33) in the west, the Moy & Killala Bay (HA 34) in the central areas, and the Sligo Bay & Drowse (HA 35) in the east. The Blacksod-Broadhaven catchment contains several small stream and river sub catchments draining some upland areas across the northern part of the Nephin Beg Mountain range and Achill Island, as well as the flat wide expanses of Atlantic bog landscape that makes up much of western County Mayo. The Moy & Killala Bay catchment consists of the larger River Moy system, which includes the large Lough Conn source in the west of the catchment as well as expanses of drumlin topography across the lowland areas of the catchment. The Sligo Bay & Drowse catchment consists of several smaller sub catchments including the Garavogue River system which flows through the Lough Gill source before Sligo Town and entering the sea at Sligo Harbour.

Study Area C has a number of designated area sites including several water dependent Special Areas of Conservation (SAC) such as the River Moy SAC, Lough Gill SAC and Carrowmore Lake Complex SAC. There are no waterbodies designated for Margaritifera (Freshwater Pearl Mussel) SAC catchments but there are several waterbodies across the study area with WFD High Status Objectives (HSOs).

Around 90% of the water supplies for Study Area C come from surface water sources, with the majority being from a few large lake abstractions. Around half of the total water supply to SA-C comes from two lake sources, which each supplying two separate WTPs. The Lough Gill source has an abstraction on the western bank feeding up to 13,200 $m^3$/day to Foxes Den WTP to supply Sligo Town & Environs WRZ, and another abstraction on the eastern side providing up to 6,600 $m^3$/day to Moneyduff WTP to supply North Leitrim RWS WRZ. The large Lough Conn source supplies Ballina WRZ via a single abstraction point on the northern side which feeds up to 9,100 $m^3$/day to Lisglennon WTP and up to 4,550 $m^3$/day to Wherrew WTP. Other notable surface water abstractions within SA-C involve smaller lake sources including Lough Talt, Lough Easkey, Carramore Lough and the Kilsellagh Impounding Reservoir.

Overall, 7 groundwater sources are managed by Uisce Éireann in the region. The predominant aquifer type of the area is made up of poorly productive bedrock (59%), followed by karstic (30%), with a relatively minor contribution from productive fissured (5%) and sand and gravel (2%). The majority of the large abstractions occur as springs which emerge mainly from sand and gravel aquifers.

The karst forms a key regionally important aquifer in some areas. The pure bedded limestones in this area are flat lying and extensive and stretch from North Clare to Mayo. The majority of the larger abstractions occur in this setting and mainly appear as spring overflows, which serve as points of groundwater discharge. This can be seen at Swinford PWS, Killaturly GWS and Charlestown WSS, which abstract on average between 785 – 1,100 $m^3$/d, although the latter two are believed to also be fed from the local sand and gravel aquifer overlying the limestone bedrock. Limestone dissolution during karstification causes groundwater flow to concentrate along certain pathways/conduits ($Rk^c$ type aquifers), making it difficult to locate successful wells. The karstification present in the Northwestern Plateau (counties Sligo, Leitrim and Cavan) is similar to the Burren, but more dissected. 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.

Groundwater flow in the lesser productive Dinantian Shales and Limestones circulates primarily though fissures as these rocks do not show significant intergranular permeability. These rocks occur primarily in counties Sligo and Leitrim, 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). There are also large swathes of Dinantian (Lower Carboniferous) Impure Limestones and are interleaved 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. Ceide Fields WSS abstracts from this type of bedrock which supplies < 50 $m^3$/d. Precambrian rocks consist mainly of gneisses, schists (pelites and psammites), quartzites, and marbles and can be found in northwest Co. Mayo and the Ox Mountains in Co. Sligo. The development potential of the Precambrian rocks is very limited. The marbles may contain some solutionally enhanced permeability zones which could provide a domestic or farm supply or small group scheme. Such rocks will often yield enough water to supply a house or small farm (0.2-0.5 l/s) and occasionally in major fracture zones may yield a good deal more. However, since the yield often depends on the permeability developed in the uppermost few metres of broken and weathered rock, yields will often decrease markedly in dry spells as the water table falls, and these supplies may therefore be unreliable. There are smaller representation of Dinantian Sandstones (Lm), where zones of higher permeability may be found nearer faults and in the upper weathered fractured zone of the top 10-30 m. Yields are dependent on the nature and concentration of faults and fissures.

There are a number of locally important sand and gravel aquifers (Lg) in the region, namely at Crossmolina, Foxford and Swinford-Charlestown. The Moy Sand and Gravel GWB acts as a discharge zone for the Killaturly springs and the Charlestown spring. The gravel body, although classified by the GSI as a ‘Locally Important Sand and Gravel aquifer’ (Lg), is significant, and provides water to several supply schemes in the region. The sand/gravel deposits, when overlying areas of bedrock aquifers, can improve the overall flow and storage to the aquifer and also protect against pollution. Crossmolina PWS supply (c. 900 $m^3$/d) is from a spring which issues local sand and gravel body, with the underlying bedrock not believed to add significant quantities of water to the source. Conversely, groundwater from the bedrock can feed into the gravel under certain conditions. This can be seen at Killaturly GWS, where groundwater in the limestone discharges into the overlying sand and gravel body, under inferred upward hydraulic gradients.

Table 1.1 SA-C Study Area Summary

| Cavan, Leitrim, Mayo, Sligo | Total Population | 96,788 | Total Network Length (km) | 3,119 | Number of Water Resource Zones | 17 |
|---|---|---|---|---|---|---|
| Counties in Study Area | Cavan, Leitrim, Mayo, Sligo | | | | | |
| Principle Settlements | Ballina, Sligo Town, Collooney, Inniscrone, Ballymote, Béal An Mhuirthead, Manorhamilton, Ballincar, Ballisodare, Coolaney, Kiltimagh, Foxford, Crossmolina, Charlestown-Bellahy, Grange, Rosses Point, Cliffoney, Killala, Dromore West, Dromahair | | | | | |
| Number of Water Sources | 21 | Surface Water Sources | 14 | | Groundwater Sources | 7 |

| Water Treatment Plant | Source | Population | WTP Capacity ($m^3$/day) | Quality | Quantity | Reliability | Potential Sustainability |
|---|---|---|---|---|---|---|---|
| Riverstown WTP | Groundwater | 530 | 640 | ● | ● | ● | ● |
| Kilsellagh WTP | Kilsellagh Impounding Reservoir | 7,301 | 8,000 | ● | ● | ● | ● |
| North Sligo (Ardnaglass) WTP | Gortnaleck & Lyle Groundwater | 4,691 | 3,000 | ● | ● | ● | ● |
| Lough Easkey WTP | Lough Easkey | 6,068 | 4,400 | ● | ● | ● | ● |
| Lough Talt WTP | Lough Talt | 13,269 | 10,000 | ● | ● | ● | ● |
| Foxes Den WTP | Foxes Den Intake Site | 23,561 | 13,200 | ● | ● | ● | ● |
| Ceide Fields WTP | Groundwater | 0 | 50 | ● | ● | ● | ● |
| KNOCK AIRPORT WTP | Groundwater | 1 | 80 | ● | ● | ● | ● |
| SWINFORD WTP | Carrowcanada Spring (Stream) | 1,694 | 800 | ● | ● | ● | ● |

| Water Treatment Plant | Source | Population | WTP Capacity (m³/day) | Quality | Quantity | Reliability | Potential Sustainability |
|---|---|---|---|---|---|---|---|
| Kiltimagh WTP | Kilimagh | 1,648 | 800 | ● | ● | ○ | ○ |
| Kilkelly WTP | Groundwater | 1,032 | 546 | ● | ● | ○ | ○ |
| Foxford WTP | Lough Muck Intake | 1,598 | 1,000 | ● | ○ | ○ | ● |
| Crossmolina WTP | Groundwater | 1,567 | 730 | ● | ● | ○ | ● |
| Charlestown WTP | Groundwater | 1,178 | 1,200 | ● | ● | ○ | ○ |
| Erris WTP | Carramore Lough | 3,963 | 4,500 | ● | ○ | ● | ○ |
| Lisglennon WTP | Lough Conn | 5,340 | 9,100 | ● | ● | ● | ○ |
| Wherrew WTP | Lough Conn | 3,019 | 4,550 | ● | ● | ○ | ○ |
| Achill WTP | Accorymore Lake Intake | 2,417 | 1,632 | ● | ● | ○ | ● |
| Lough Gill (Moneyduff) WTP | Moneyduff Lough Gill Intake | 6,145 | 6,600 | ○ | ○ | ○ | ○ |

| Score | Uisce Éireann Asset Standard Assessment |
|---|---|
| ○ | Low Risk |
| ○ | Medium Risk |
| ○ | |
| ● | High Risk |

# 2

# Scoping the Study Area C

# 2 Scoping the Study Area

In this chapter we summarise the current and future issues with water supplies in Study Area C, 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, Uisce Éireann is developing scientifically robust datasets to assign risk. Uisce Éireann 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 SA-C 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** |
| Riverstown WTP | ● | ● | ● | ● |
| Kilsellagh WTP | ● | ● | ● | ● |
| North Sligo (Ardnaglass) WTP | ● | ● | ● | ● |
| Lough Easkey WTP | ● | ● | ● | ● |
| Lough Talt WTP | ● | ● | ● | ● |
| Foxes Den WTP | ● | ● | ● | ● |
| Ceide Fields WTP | ● | ● | ● | ● |
| Knock Airport 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** |
| Swinford WTP | ● | ● | ● | ● |
| Kiltimagh WTP | ● | ● | ● | ● |
| Kilkelly WTP | ● | ● | ● | ● |
| Foxford WTP | ● | ● | ● | ● |
| Crossmolina WTP | ● | ● | ● | ● |
| Charlestown WTP | ● | ● | ● | ● |
| Erris WTP | ● | ● | ● | ● |
| Lisglennon WTP | ● | ● | ● | ● |
| Wherrew WTP | ● | ● | ● | ● |
| Achill WTP | ● | ● | ● | ● |
| Lough Gill (Moneyduff) WTP | ● | ● | ● | ● |

| Score | Uisce Éireann 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 Uisce Éireann assessment of the asset capability standard compared with the asset standard set out in Section 5.7 of the Framework Plan. The assessment provides an indication of the need to invest in areas of our

asset base (human and structural) through resource planning, to ensure that we can address potential risks or emerging risks to our supplies.

Based on the barrier assessment, 17 of the 19 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 no water resource zones, within Study Area C, on the EPA Remedial Action List.

Uisce Éireann is currently progressing immediate corrective action in advance of the NWRP for a number of supplies within SA-C. A national programme to improve disinfection standards (Barrier 1) at water treatment facilities across Ireland was initiated by Uisce Éireann in 2016. Details of the ‘in progress’ projects to address critical water quality requirements are included in Table 2.2.

Table 2.2 Critical Water Quality Requirements SA-C – Cavan, Leitrim, Mayo, Sligo

| Critical Water Quality Requirements | Progress |
|---|---|
| 1. **Dowra PWS (GWS Import) RAL:**<br>Upgrade works at the water treatment plant (operated by a private Group Water Scheme) have been approved. | Complete |
| 2. **Sligo and Environs Water Supply Scheme – Foxes Den/Cairn Hill WTP Upgrade:**<br>Project included the upgrade and refurbishment of the existing Foxes Den Water Treatment Plant and decommissioning the Cairns Hill Water Treatment Plant. The project has improved the drinking water quality for over 11,000 customers in County Sligo and saw associated water supply schemes removed from the EPA Remedial Action List. | Complete |
| 3. **Lough Talt Water Treatment Plant:**<br>The Lough Talt Water Treatment Plant (WTP) was upgraded in order to provide adequate treatment to Tubbercurry, Ballymote and surrounding communities including Annagh, Aclare, Bellaghy, Curry, Lavagh, Ballinacarrow, Carrowneden, Kilmacteige and Coolaney, Cloontia, Doocastle and Quarryfield. The completed upgrade works has allowed for the lifting of boil water notices in the area, benefitting 13,000 customers and has removed Lough Talt Water Regional Supply from the EPA's Remedial Action List (RAL). | Complete |
| 4. **Reservoir Cleaning Programme:**<br>A major reservoir cleaning programme has been undertaken at 56 sites, which has reduced network water quality issues. | Complete |
| 5. **Disinfection Programme:**<br>In 2016, Uisce Éireann 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 13 of the 17 WRZs in SA-C, based on assessed priority basis.<br>• Achill WTP<br>• Kiltimagh WTP<br>• Ballina Wherrew WTP<br>• Foxford WTP<br>• Kilkelly WTP<br>• Ceide Fields<br>• Charlestown WTP<br>• Crossmolina WTP<br>• Swinford WTP<br>• Erris WTP<br>• Knock Airport WTP<br>• Lisglennon WTP<br>• Lough Easkey WTP<br>• Riverstown WTP<br>• North Sligo WTP | Complete |

| Critical Water Quality Requirements | Progress |
|---|---|
| Any requirements within the remaining 4 supplies will be identified via Drinking Water Safety Plans with solutions developed as part of the NWRP. | |

In summary, in relation to water quality, Uisce Éireann 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

Uisce Éireann 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 2.2.

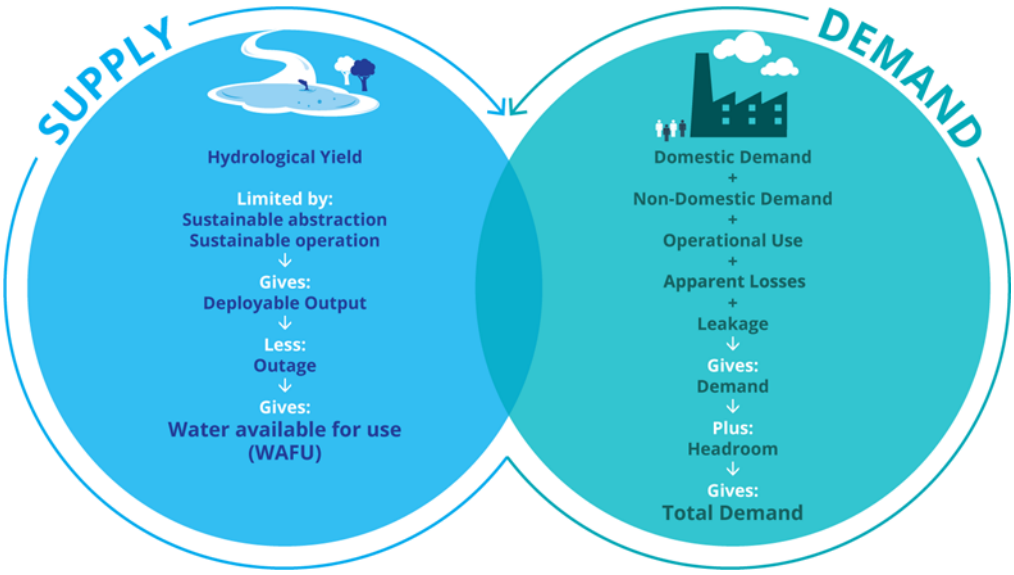



Figure 2.2 Supply Demand Balance

For each of the 17 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 SA-C 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, Uisce Éireann 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:** 14 out of 17 water resource zones in the area show 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. The North Sligo WRZ source has a large SDB Deficit and is subject to significant abstraction issues during summer and dry weather periods, with water levels lowering at higher abstraction rates.

A summary of the SDB deficit across all 17 Water Resource Zones is summarised in Table 2.3. The water resources zones are detailed in Appendix L of the Framework Plan - Supply Demand Balance Summaries.

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

| Water Resource Zone Name | Water Resource Zone code | Population | Maximum Deficit $m^3$/day | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2019 | 2025 | 2030 | 2035 | 2040 | 2044 |
| Riverstown Public Water Supply | 2700SC0005 | 530 | No Deficit | No Deficit | No Deficit | No Deficit | No Deficit | No Deficit |
| Sligo Town & Environs | 2700SC0004 | 30,862 | -897 | -1,243 | -1,869 | -2,402 | -2,913 | -3,322 |
| North Sligo Regional Water Supply | 2700SC0003 | 4,691 | -1,858 | -1,940 | -2,015 | -2,058 | -2,096 | -2,126 |
| Lough Easkey Regional Water Supply | 2700SC0002 | 6,068 | -266 | -307 | -351 | -394 | -437 | -471 |
| Lough Talt Regional Water Supply | 2700SC0001 | 13,269 | -5,114 | -5,248 | -5,365 | -5,454 | -5,544 | -5,615 |
| Knock Airport | 2200SC0019 | 1 | -15 | -143 | -302 | -461 | -621 | -749 |
| Swinford | 2200SC0018 | 1,694 | -1,032 | -1,050 | -1,071 | -1,089 | -1,105 | -1,119 |
| Kiltimagh PWS | 2200SC0014 | 1,648 | -412 | -418 | -429 | -439 | -450 | -458 |
| Kilkelly | 2200SC0012 | 1,032 | -613 | -620 | -628 | -636 | -644 | -650 |

| Water Resource Zone Name | Water Resource Zone code | Population | Maximum Deficit $m^3$/day | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2019 | 2025 | 2030 | 2035 | 2040 | 2044 |
| Foxford | 2200SC0011 | 1,598 | -20 | -28 | -40 | -53 | -65 | -75 |
| Charlestown | 2200SC0008 | 1,178 | -287 | -315 | -337 | -352 | -366 | -377 |
| Erris RWSS | 2200SC0007 | 3,963 | -124 | -157 | -184 | -212 | -239 | -260 |
| Ceide Fields | 2200SC0006 | 0 | -5 | -6 | -6 | -6 | -6 | -6 |
| Achill | 2200SC0005 | 2,417 | -1,853 | -1,886 | -1,920 | -1,954 | -1,988 | -2,015 |
| Ballina | 2200SC0004 | 21,599 | -3,095 | -2,935 | -3,076 | -3,328 | -3,606 | -3,827 |
| North Leitrim Regional Water Supply | 1700SC0003 | 6,145 | No Deficit | No Deficit | No Deficit | No Deficit | No Deficit | No Deficit |
| Dowra PWS (GWS Import)* | 0200SC0003 | 94 | 0 | 0 | 0 | 0 | 0 | 0 |

*Note: This WRZ is supplied by a private Group Water Supply, therefore, the WAFU has not been verified for use in the Supply Demand Balance.

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 currently operating with a cumulative SDB deficit of approximately 21,338 $m^3$/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 26,817 $m^3$/day by 2044.

Our ongoing activities to improve the Supply Demand Balance in SA-C 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 SA-C. Uisce Éireann & 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 C. This provides for a more reliable water supply, reducing instances of bursts and water outages. The works also improve water quality by replacing old cast iron and lead watermains, whilst reducing leakage and improving overall operation and maintenance of our supply system.

During the drought in summer 2018 a number of water sources experienced issues including the source for Kilkelly and Swinford. The spring source in Kilkelly required sandbagging to contain impoundment and Carrowcanada Spring (stream) which is currently supplying Swinford was also sandbagged during the drought in 2018.

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

Table 2.4 SA-C Critical Infrastructure Projects and Need Identification

| Critical Requirement | Progress |
|---|---|
| **1. National Leakage Reduction Works – Sligo Backyard Service Replacement:** Replacement of ageing back yard water mains and providing new service connections for a number of customers along Pearse Road, Sligo. The works will provide a more reliable water supply, improve water quality and reduce high levels of leakage. The works will involve the decommissioning of 800m of ageing watermains, many running to the rear of properties, the provision of 230m of new water mains in the public road and the provision of a number of new services, some of which will replace current backyard services. | **Ongoing** |
| **2. Lough Gill** During the dry weather conditions the water levels drop down below weir. Assessment required on inflows and outflows from the weir as it may have an impact on the downstream. Fisheries require gates to be opened during the summer for the fish pass. | **Assessment required** |
| **3. Ballina trunkmains:** Rising main to Ballina is currently in poor condition and requires upgrade. The dual raw water rising main from Lough Conn to Lisglennon has a low burst history. It may require condition assessment. | **Assessment required** |
| **4. Erris Carramore Lough:** Carramore Lough is a shallow lake. Water levels drop at the abstraction point and the channel silts up and needs to be re-dredged. The lake source is prone to algal bloom. Raw water pumps are the limiting factor. | **Assessment required** |
| **5. Achill Island:** There are ongoing works to increase the capacity of the Achill WTP and to provide increase storage at the WTP. | **Assessment required** |

| Critical Requirement | Progress |
|---|---|
| **6. North Sligo Regional Water Supply:** The abstraction supplying North Sligo is flashy. There have been supply restrictions in the WRZ. Raw water is impacted by rainwater. | **Assessment required** |
| **7. Distribution Network Repairs and Upgrades:** Rolling programme of active leakage control, pressure management, find and fix and network upgrades. | **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 Uisce Éireanns 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 Deployable Output. 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 SA-C Supplies, we have assessed the potential impacts on our 14 no. surface water abstractions: Moneyduff Lough Gill Intake (North Leitrim Regional Water Supply), Accorymore Lake Intake (Achill), Lough Conn (2no. WTPs, Ballina), Carramore Lough (Erris RWSS), Lough Muck Intake (Foxford), Kilimagh (Kiltimagh PWS), Carrowcanada Spring (Stream) (Swinford), Foxes Den Intake Site (Sligo Town & Environs), Lough Talt (Lough Talt Regional Water Supply), Lough Easkey (Lough Easkey Regional Water Supply), Gortnaleck (North Sligo Regional Water Supply), Lyle (North Sligo Regional Water Supply), Kilsellagh Impounding Reservoir (Sligo Town & Environs).

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

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

Based on this initial assessment, the volumes of water abstracted at, Accorymore Lake Intake (Achill), Lough Muck Intake (Foxford), Carrowcanada Spring (Stream) (Swinford), Lough Talt (Lough Talt Regional Water Supply), Lough Easkey (Lough Easkey Regional Water Supply), Gortnaleck (North Sligo Regional Water Supply), Lyle (North Sligo Regional Water Supply), and Kilsellagh Impounding Reservoir (Sligo Town & Environs) may not meet sustainability guidelines during dry weather flows. 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) |
|---|---|---|---|
| Moneyduff Lough Gill Intake (North Leitrim Regional Water Supply) | 6,050 | 209,028 | 61,729 |
| Foxes Den Intake Site (Sligo Town & Environs) | 12,100 | | |
| Kilsellagh Impounding Reservoir (Sligo Town & Environs) | 7,333 | 1,932 | 1,344 |
| Accorymore Lake Intake (Achill) | 1,496 | 2,849 | 387 |
| Lough Conn (2no. WTPs, Ballina) | 8,342 | 559,023 | 148,706 |
| | 4,171 | | |
| Carramore Lough (Erris RWSS) | 4,125 | 84,599 | 17,393 |
| Lough Muck Intake (Foxford) | 917 | 2,001 | 165 |
| Kilimagh (Kiltimagh PWS) | 733 | 5,172 | 1,196 |
| Carrowcanada Spring (Stream) (Swinford) | 733 | 226 | 59 |
| Lough Talt (Lough Talt Regional Water Supply) | 9,167 | 4,746 | 367 |
| Lough Easkey (Lough Easkey Regional Water Supply) | 4,033 | 9,260 | 938 |

[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.

| Source (WRZ) | Current abstraction ($m^3$/day) | Hydrological yield ($m^3$/day) | Theoretical future abstraction ($m^3$/day) |
|---|---|---|---|
| Gortnaleck (North Sligo Regional Water Supply) | 2,750 | 159 | 61 |
| Lyle (North Sligo Regional Water Supply) | | 114 | 45 |

The potential change to the SDB for each WRZ, as a result of these potential reductions in abstraction during Dry Weather Flow are summarised in Table 2.6.

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

| Source (WRZ) | Potential change in WRZ SDB [4] ($m^3$/day) |
|---|---|
| Moneyduff Lough Gill Intake (North Leitrim Regional Water Supply) | None |
| Foxes Den Intake Site (Sligo Town & Environs) | -521 |
| Kilsellagh Impounding Reservoir (Sligo Town & Environs) | |
| Accorymore Lake Intake (Achill) | -1,153 |
| Lough Conn (2no. WTPs, Ballina) | None |
| Carramore Lough (Erris RWSS) | None |
| Lough Muck Intake (Foxford) | -770 |
| Kilimagh (Kiltimagh PWS) | None |
| Carrowcanada Spring (Stream) (Swinford) | -136 |
| Lough Talt (Lough Talt Regional Water Supply) | -3,945 |
| Lough Easkey (Lough Easkey Regional Water Supply) | -3,202 |
| Gortnaleck (North Sligo Regional Water Supply) | -136 |
| Lyle (North Sligo Regional Water Supply) | |

[4] Based on potential changes to the projected 2044 Dry Year Critical Period (DYCP) 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. Uisce Éireann 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, Uisce Éireann has developed an initial assessment based on available information, included in Appendix G of the Framework Plan. Over the coming years, Uisce Éireann 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 Uisce Éireann 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, Uisce Éireann will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources. We are not in a position to estimate changes to the groundwater availability until better data is available.

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

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

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

## 2.5 Water Resource Zone Needs Summary

Study Area C 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 2.6 Summary of Need Quality, Quantity, Reliability and Sustainability

| | |
|---|---|
| **Quality** | Upgrades required at all WTPs. |
| **Quantity** | Nett leakage reduction 578 $m^3$/day in the region.<br>Additional Leakage Targets of 11,961 $m^3$/day to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500 $m^3$/day.<br>Interim additional supplies of 21,338 $m^3$/day within 10 years.<br>Total of 26,817 $m^3$/day additional supplies beyond the 10-year horizon. |
| **Reliability (In addition to projects in** | Continued network upgrades and improvements in the bulk and distribution networks and storage. |
| **Sustainability** | It is not envisaged that there are sustainability issues with the volumes abstracted Moneyduff Lough Gill Intake (North Leitrim Regional Water Supply), Foxes Den Intake Site (Sligo Town & Environs), Lough Conn (Ballina), Carramore Lough (Erris RWSS), and Kilimagh (Kiltimagh PWS). Based on this initial assessment, the volumes of water abstracted at Accorymore Lake Intake (Achill), Lough Muck Intake (Foxford), Carrowcanada Spring (Stream) (Swinford), Lough Talt (Lough Talt Regional Water Supply), Lough Easkey (Lough Easkey Regional Water Supply), Gortnaleck (North Sligo Regional Water Supply), Lyle (North Sligo Regional Water Supply), and Kilsellagh Impounding Reservoir (Sligo Town & Environs) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA.<br>Over the coming years, Uisce Éireann will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources. |

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

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

# 3 Solution Types Considered in Study Area C

# 3 Solution Types Considered in Study Area C

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

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 SA-C 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 SA-C 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 Table 3.1have been applied to SDB deficit to move towards achieving the national Sustainable Economic Level of Leakage (SELL) target prioritised based on
  - Supply demand deficit;
  - Existing abstractions with sustainability issues; and
  - Drought impacts.
- Additional leakage targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m$^3$/d, see Table 3.1.

Table 3.1 SELL Targets for WRZ in SA-C

| 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$^3$/day (m$^3$/day) | Total Leakage Targets (m$^3$/day) |
|---|---|---|---|
| North Leitrim Regional Water Supply | 48 | 1,953 | 2,001 |
| Ballina | 232 | 2,338 | 2,570 |
| Achill | | 412 | 412 |
| Ceide Fields | | 29 | 29 |
| Charlestown | | 307 | 307 |
| Lough Talt Regional Water Supply | | 2,408 | 2,408 |

| 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 1,500$m^{3/}$day ($m^3$/day) | Total Leakage Targets ($m^3$/day) |
|---|---|---|---|
| Lough Easkey Regional Water Supply | | 432 | 432 |
| North Sligo Regional Water Supply | | 440 | 440 |
| Sligo Town & Environs | 298 | 3,641 | 3,939 |

## 3.2 Water Conservation


At present, Uisce Éireann 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, UÉ 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 SA-C and include:

- Standalone groundwater options across the region
- Standalone surface water options across the region
- Transfers
- Rationalisations
- Conjunctive use
- Water Treatment Plant Upgrades for water quality purposes
- Desalination
- Other
- Network Improvements

# 4 Option Development SA-C

# 4 Option Development for Study Area C

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, Uisce Éireann 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 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, Uisce Éireann 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 SA-C, 214 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 SA-C Unconstrained Options

| No. of Options | Option Type |
|---|---|
| 28 | Groundwater |
| 60 | Surface water |
| 59 | Rationalisation |
| 51 | Transfers |
| 2 | Conjunctive Use |
| 7 | Upgrade WTP (WQ only) |
| 5 | Desalination |
| 1 | Other |
| 1 | Network improvements |

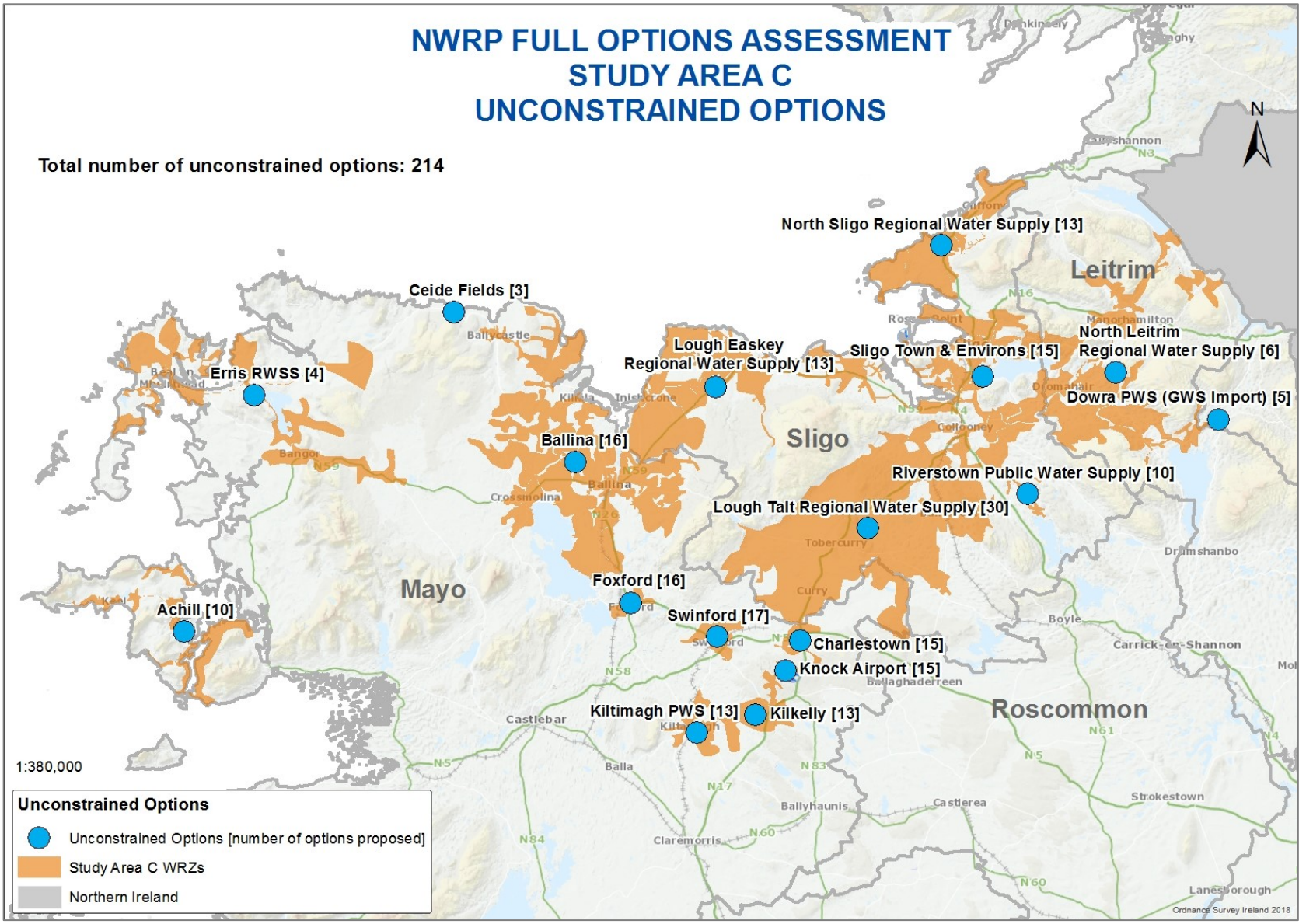



Figure 4.1 SA-C Unconstrained Options

The 214 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 214 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.

78 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 Lough Talt WRZ.

**Example Rejected Option**

Option SA-C-08:

New SW abstraction at Lough Arrow and abandon Lough Talt source.

Rejection Reason:

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

The remaining 136 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 SA-C Remaining Options after Course Screening

| No. of Options | Option Type |
|---|---|
| 16 | Groundwater |
| 45 | Surface water |
| 50 | Rationalisation |
| 17 | Transfers |
| 7 | Upgrade WTP (WQ only) |
| 1 | Desalination |

## 4.3 Fine Screening

The 136 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 136 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 SA-C Remaining Options after Fine Screening (Feasible Options)

| No. of Options | Option Type |
|---|---|
| 16 | Groundwater |
| 45 | Surface water |
| 50 | Rationalisation |
| 17 | Transfers |
| 7 | Upgrade WTP (WQ only) |
| 1 | Desalination |

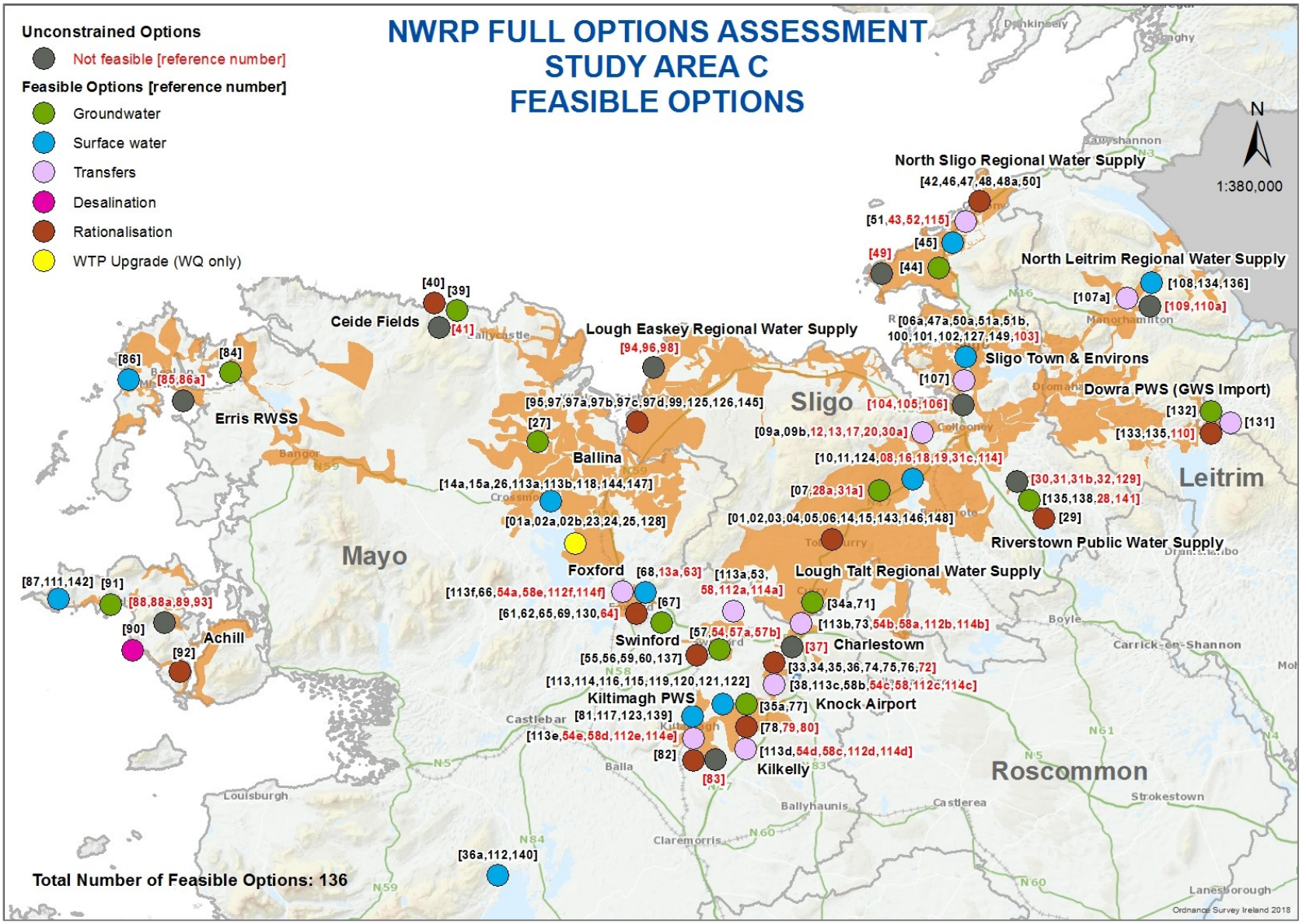



Figure 4.2 Fine Screening (Feasible Options)

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

## 4.4 Options Assessment Summary

The supply demand balance deficit in the region ranges between approximately 21,338 $m^3$/day in 2019 during dry conditions, to a maximum of approximately 26,817 $m^3$/day in 2044 during dry conditions. During the options assessment stage, a total of 214 unconstrained options were assessed. Of these 78 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 |
|---|---|
| 54 | Resilience, Deliverability, Flexibility & Sustainability |
| 14 | Deliverability & Flexibility |
| 10 | Other |

The remaining 136 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 C. From this table it can be noted that there is 40 WRZ Options and 96 options which can be merged to form 28 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 SA-C Feasible Options Summary

| Water Resource Zone Name | Option Type | |
|---|---|---|
| | WRZ Option | SA Grouped Option |
| Achill | 5 | 1 |
| Ballina | 4 | 12 |
| Ceide Fields | 1 | 1 |
| Charlestown | 2 | 7 |
| Dowra PWS (GWS Import) | 2 | 2 |
| Erris RWSS | 2 | 0 |
| Foxford | 3 | 6 |
| Kilkelly | 1 | 5 |
| Kiltimagh PWS | 1 | 6 |

| Water Resource Zone Name | Option Type | |
|---|---|---|
| | WRZ Option | SA Grouped Option |
| Knock Airport | 2 | 8 |
| Lough Easkey Regional Water Supply | 0 | 10 |
| Lough Talt Regional Water Supply | 6 | 11 |
| North Leitrim Regional Water Supply | 1 | 3 |
| North Sligo Regional Water Supply | 2 | 7 |
| Riverstown Public Water Supply | 2 | 1 |
| Sligo Town & Environs | 3 | 8 |
| Swinford | 3 | 8 |

# 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 C.

## 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 Uisce Éireann'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, Uisce Éireann 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 **Error! Reference source not found.** 5.1.

Table 5.1 The Six Approaches

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

| Approaches Tested | Description | Policy Driver |
|---|---|---|
| | durations) as identified at Fine Screening This is particularly relevant where an option might be required to address an urgent Public Health issue. | |
| Best Environmental | This is the option or combination of options with the highest total score across the 19 No. SEA MCA sub-criteria questions | SEA Directive and Water Framework Directive |
| Most Resilient | This is the option or combination of options with the highest total score against the resilience criteria. | National Adaptation Framework and Climate Action Plan |
| Lowest Carbon | This is the option or combination of options with the lowest embodied and operational carbon cost. | Climate Action Plan |

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

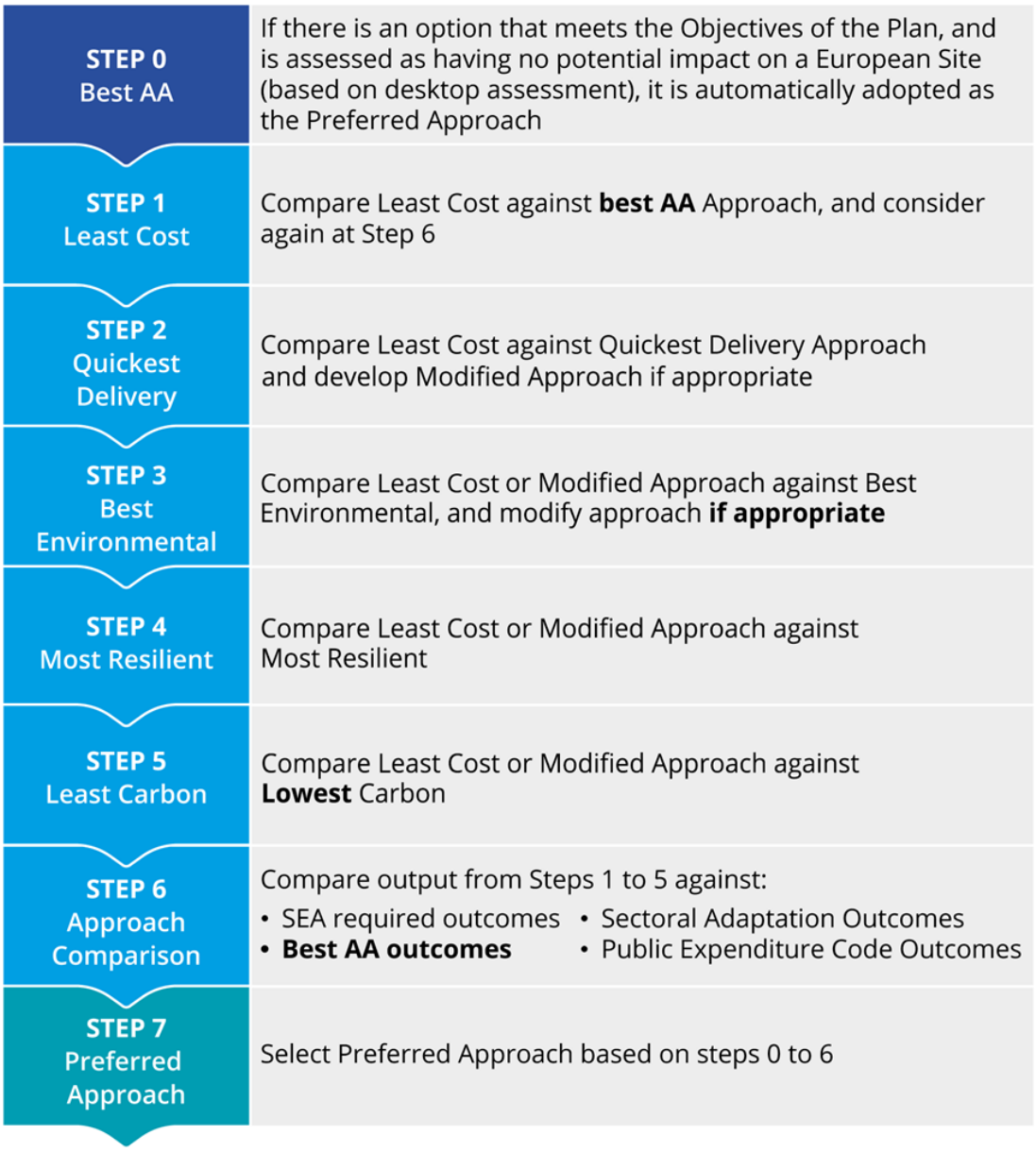



Figure 5.1 Figure of the 7 step assessment process

This methodology which is futured detailed in Chapter 7 of the RWRP – 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 are provided in Chapter 7 of the RWRP -NW. Section 5.2 provides an overview of the application of this process to SA-C.

## 5.2 Preferred Approach Development Process for Study Area C

### 5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this technical report there are 136 feasible options. 40 of these options are WRZ Options while 96 options are merged to form 28 Study Area Options. Table 5.2 outlines the 40 WRZ options for SA-C, 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 SA-C Feasible Options

| Water Resource Zone Name | Feasible Options SA-C | |
|---|---|---|
| | Option Code | Option Description |
| Achill | SAC-87 | Increase SW abstraction from Accorymore Lake. Requires 1m raise of the dam, increased abstraction and WTP upgrade. |
| Achill | SAC-90 | Desalination plant to supply the scheme with possibility to supply Mulranny as well. |
| Achill | SAC-91 | New GW abstraction at Achill Island. |
| Achill | SAC-111 | New SW abstraction from Lough Feeagh and new WTP to supply Achill Island. Abandon existing source. |
| Achill | SAC-142 | New SW abstraction from Keel Lough and new raw water transfer to existing WTP. Includes WTP upgrade. New source to supplement Accorymore Lake during dry periods only. |
| Ballina | SAC-24 | Upgrade of Wherrew WTP to provide additional yield for Ballina only. |
| Ballina | SAC-25 | Upgrade of Lisglennon WTP to provide additional yield for Ballina only. |
| Ballina | SAC-26 | New South Lough Conn WTP to provide additional yield for Ballina only. |
| Ballina | SAC-27 | New GW abstraction in Lisglennon (quarry in the area). |
| Ceide Fields | SAC-39 | Increase GW abstraction to supply deficit. |
| Charlestown | SAC-71 | Increase GW abstraction to supply deficit. |
| Charlestown | SAC-73 | Interconnect Killaturly GWS with Charlestown and supply deficit from GWS. |

| Water Resource Zone Name | Feasible Options SA-C | |
|---|---|---|
| | Option Code | Option Description |
| Dowra PWS (GWS Import) | SAC-131 | Keep supplying Dowra WRZ from Doobally GWS. |
| Dowra PWS (GWS Import) | SAC-132 | New GW abstraction to supply Dowra WRZ. |
| Erris RWSS | SAC-84 | New GW abstraction at Erris. |
| Erris RWSS | SAC-86 | Increase SW abstraction from Carrowmore Lake. |
| Foxford | SAC-66 | Interconnect Foxford with Callow GWS to supply deficit from GWS. |
| Foxford | SAC-67 | New GW abstraction to supply deficit in Foxford. |
| Foxford | SAC-68 | New abstraction from the River Moy. |
| Kilkelly | SAC-77 | Increase GW abstraction to supply deficit. |
| Kiltimagh PWS | SAC-81 | Increase SW abstraction from River Glore. |
| Knock Airport | SAC-38 | Interconnect Killaturly GWS with Knock Airport and supply deficit from GWS. |
| Knock Airport | SAC-58b | New GW wellfield and supply deficit to Knock Airport WRZ |
| Lough Talt Regional Water Supply | SAC-07 | New GW abstraction in regionally karstified aquifer in Tobercurry to partly supply deficit in Lough Talt WRZ. |
| Lough Talt Regional Water Supply | SAC-09a | Supply deficit from Culfadda GWS. |
| Lough Talt Regional Water Supply | SAC-09b | Interconnect Killaturly GWS with Lough Talt and supply deficit from GWS. |
| Lough Talt Regional Water Supply | SAC-10 | Supply Lough Talt WRZ from Lough Gara and abandon Lough Talt source. |
| Lough Talt Regional Water Supply | SAC-11 | Recommission Cairns Hill WTP and abandon Lough Talt source. |
| Lough Talt Regional Water Supply | SAC-124 | New SW abstraction from Ballysadare River and new water treatment plant. Network requirements to distribution network. |
| North Leitrim Regional Water Supply | SAC-108 | Upgrade Moneyduff WTP - no deficit |
| North Sligo Regional Water Supply | SAC-42 | Rationalise to Ballyshannon WRZ. |

| Water Resource Zone Name | Feasible Options SA-C | |
|---|---|---|
| | Option Code | Option Description |
| North Sligo Regional Water Supply | SAC-44 | New GW abstraction to supply deficit. |
| North Sligo Regional Water Supply | SAC-45 | New SW abstraction from Glencar Lough. |
| Riverstown Public Water Supply | SAC-135 | No Deficit - Upgrade existing WTP. |
| Riverstown Public Water Supply | SAC-138 | Refurb existing spring and upgrade WTP for water quality improvements |
| Sligo Town & Environs | SAC-100 | Foxes Den Public Water Supply - Increase SW abstraction from Lough Gill and expand Foxes Den WTP to supply deficit. |
| Sligo Town & Environs | SAC-101 | Foxes Den Public Water Supply - Rationalise Kilsellagh impoundment if deemed unreliable source and increase abstraction from Lough Gill and expand of Foxes Den WTP to cover Kilsellagh supply and supply deficit. |
| Sligo Town & Environs | SAC-102 | Foxes Den Public Water Supply - New SW abstraction from Glencar Lough including new WTP to partly supply deficit. |
| Swinford | SAC-53 | Interconnect Killaturly GWS with Swinford and supply deficit from GWS. |
| Swinford | SAC-57 | Increase SW abstraction from Carrowcanada Spring to supply deficit. |
| Swinford | SAC-137 | Rationalise Swinford to Killaturly GWS |

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 SA-C Alignment of WRZ Option/s with Approach Categories

| Water Resource Zone Name | Feasible Options SA-C | | Approach | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No. WRZ Options | Option Description | Least Cost | Quickest Delivery | Best AA | Best SEA | Lowest Carbon | Most Resilient |
| Achill | 5 | Increase SW abstraction from Accorymore Lake. Requires 1m raise of the dam, increased abstraction and WTP upgrade. | ✓ | - | - | - | ✓ | - |
| | | Desalination plant to supply the scheme with possibility to supply Mulranny as well. | - | - | ✓ | - | - | ✓ |
| | | New GW abstraction at Achill Island. | - | - | - | - | - | - |
| | | New SW abstraction from Lough Feeagh and new WTP to supply Achill Island. Abandon existing source. | - | - | - | - | - | - |
| | | New SW abstraction from Keel Lough and new raw water transfer to existing WTP. Includes WTP upgrade. New source to supplement Accorymore Lake during dry periods only. | - | ✓ | - | ✓ | - | - |
| Ballina | 4 | Upgrade of Wherrew WTP to provide additional yield for Ballina only. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Upgrade of Lisglennon WTP to provide additional yield for Ballina only. | - | ✓ | ✓ | ✓ | - | ✓ |
| | | New WTP to provide additional yield for Ballina only. | - | - | ✓ | - | - | - |
| | | New GW abstraction in Lisglennon (quarry in the area). | - | - | - | - | - | - |
| Ceide Fields | 1 | Increase GW abstraction to supply deficit. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| Water Resource Zone Name | Feasible Options SA-C | | Approach | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No. WRZ Options | Option Description | Least Cost | Quickest Delivery | Best AA | Best SEA | Lowest Carbon | Most Resilient |
| Charlestown | 2 | Increase GW abstraction to supply deficit. | - | ✓ | ✓ | ✓ | - | ✓ |
| | | -Interconnect Killaturly GWS with Charlestown and supply deficit from GWS. | ✓ | - | ✓ | - | ✓ | - |
| Dowra PWS (GWS Import) | 2 | Keep supplying Dowra WRZ from Doobally GWS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | New GW abstraction to supply Dowra WRZ. | - | - | ✓ | - | - | - |
| Erris RWSS | 2 | New GW abstraction at Erris. | - | - | ✓ | - | - | - |
| | | Increase SW abstraction from Carrowmore Lake. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Foxford | 3 | New GW abstraction to supply deficit in Foxford. | ✓ | - | ✓ | ✓ | - | - |
| | | New abstraction from the River Moy. | - | ✓ | - | - | - | ✓ |
| | | Interconnect Foxford with Callow GWS to supply deficit from GWS. | ✓ | - | - | - | ✓ | - |
| Kilkelly | 1 | Increase GW abstraction to supply deficit. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Kiltimagh PWS | 1 | Increase SW abstraction from River Glore. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Knock Airport | 2 | Interconnect Killaturly GWS with Knock Airport and supply deficit from GWS. | - | - | ✓ | - | - | ✓ |
| | | New GW wellfield and supply deficit to Knock Airport WRZ | ✓ | ✓ | ✓ | ✓ | ✓ | - |
| Lough Talt Regional Water Supply | 6 | New GW abstraction in regionally karstified aquifer in Tobercurry to partly supply deficit in Lough Talt WRZ. | - | - | ✓ | - | - | - |

| Water Resource Zone Name | Feasible Options SA-C | | Approach | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No. WRZ Options | Option Description | Least Cost | Quickest Delivery | Best AA | Best SEA | Lowest Carbon | Most Resilient |
| | | Supply deficit from Culfadda GWS. | - | - | ✓ | - | - | - |
| | | Interconnect Killaturly GWS with Lough Talt and supply deficit from GWS. | - | - | ✓ | - | - | - |
| | | Supply Lough Talt WRZ from Lough Gara and abandon Lough Talt source. | ✓ | ✓ | ✓ | - | - | ✓ |
| | | Recommission Cairns Hill WTP and abandon Lough Talt source. | - | - | ✓ | ✓ | ✓ | - |
| | | New SW abstraction from Ballysadare River and new water treatment plant. Network requirements to distribution network. | - | - | - | - | - | - |
| North Leitrim Regional Water Supply | 1 | Increase SW abstraction from Lough Gill. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| North Sligo Regional Water Supply | 3 | Rationalise to Ballyshannon WRZ - 2.73Ml/d | - | ✓ | ✓ | ✓ | - | ✓ |
| | | New GW abstraction to supply deficit. | ✓ | - | ✓ | - | - | - |
| | | New SW abstraction from Glencar Lough. | - | ✓ | ✓ | - | ✓ | - |
| Riverstown Public Water Supply | 2 | No Deficit - Upgrade existing WTP | ✓ | - | ✓ | - | ✓ | ✓ |
| | | Refurb existing spring and upgrade WTP for water quality improvements | - | ✓ | ✓ | ✓ | - | - |

| Water Resource Zone Name | Feasible Options SA-C | | Approach | | | | | |
|---|---|---|---|---|---|---|---|---|
| | No. WRZ Options | Option Description | Least Cost | Quickest Delivery | Best AA | Best SEA | Lowest Carbon | Most Resilient |
| Sligo Town & Environs | 3 | Increase SW abstraction from Lough Gill and expand Foxes Den WTP to supply deficit. | - | ✓ | ✓ | ✓ | - | ✓ |
| | | Rationalise Kilsellagh impoundment if deemed unreliable source and increase abstraction from Lough Gill and expand of Foxes Den WTP to cover Kilsellagh supply and supply deficit. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | New SW abstraction from Glencar Lough including new WTP to partly supply deficit. | - | - | - | - | - | - |
| Swinford | 3 | Interconnect Killaturly GWS with Swinford and supply deficit from GWS. | - | - | ✓ | - | - | - |
| | | Increase SW abstraction from Carrowcanada Spring to supply deficit. | - | - | ✓ | ✓ | - | ✓ |
| | | Rationalise Swinford to Killaturly GWS | ✓ | ✓ | ✓ | - | ✓ | - |

The 7 Step Process outlined in Figure 5.3 was then applied to each WRZ in SA-C, 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-C at WRZ level, include the following:

- In terms of Best AA, 1 WRZ option scores a 0 in relation to potential impact on a designated European Site;
- The Best AA and the Best Environmental (overall SEA score) approach is identified as the Preferred Approach for 15 and 13 of the 17 WRZs respectively;
- Of the 16 WRZ level preferred approaches, no WRZs have a -3 score against biodiversity;
    - No WRZ level approach has been identified for Lough Easkey because there is no feasible option that can meet the full deficit for this WRZ.

The WRZ level approaches for each WRZ in SA-C are outlined in Table 5.4

Table 5.4 SA-C WRZ Approach Options

| Water Resource Zone Name | Feasible Options SA-C | | Approach | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Option Code | Option Description | Zero AA | Least Cost | Quickest Delivery | Best AA | Best SEA | Lowest Carbon | Most Resilient | Preferred Approach |
| Achill | SAC-142 | New SW abstraction from Keel Lough and new raw water transfer to existing WTP. Includes WTP upgrade. New source to supplement Accorymore Lake during dry periods only. | - | - | ✓ | - | ✓ | - | - | ✓ |
| Ballina | SAC-24 | Upgrade of Wherrew WTP to provide additional yield for Ballina only. | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ceide Fields | SAC-39 | Increase GW abstraction to supply deficit. | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Charlestown | SAC-73 | Interconnect Killaturly GWS with Charlestown and supply deficit from GWS. | - | ✓ | - | ✓ | - | ✓ | - | ✓ |
| Dowra PWS (GWS Import) | SAC-131 | Keep supplying Dowra WRZ from Doobally GWS. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Erris RWSS | SAC-86 | Increase SW abstraction from Carrowmore Lake. | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Foxford | SAC-67 | New GW abstraction to supply deficit in Foxford. | - | ✓ | - | ✓ | ✓ | - | - | ✓ |
| Kilkelly | SAC-77 | Increase GW abstraction to supply deficit. | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Kiltimagh PWS | SAC-81 | Increase SW abstraction from River Glore. | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Knock Airport | SAC-58b | New GW wellfield and supply deficit to Knock Airport WRZ | - | ✓ | ✓ | ✓ | ✓ | ✓ | - | ✓ |

| Water Resource Zone Name | Feasible Options SA-C | | Approach | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Option Code | Option Description | Zero AA | Least Cost | Quickest Delivery | Best AA | Best SEA | Lowest Carbon | Most Resilient | Preferred Approach |
| Lough Easkey Regional Water Supply | **No local solution** | | | | | | | | | |
| Lough Talt Regional Water Supply | SAC-11 | Recommission Cairns Hill WTP and abandon Lough Talt source. | - | - | - | ✓ | ✓ | ✓ | - | ✓ |
| North Leitrim Regional Water Supply | SAC-108 | Upgrade Moneyduff WTP - no deficit | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| North Sligo Regional Water Supply | SAC-44 | New GW abstraction to supply deficit. | - | ✓ | - | ✓ | - | - | - | ✓ |
| Riverstown Public Water Supply | SAC-138 | Refurb existing spring and upgrade WTP for water quality improvements | - | - | ✓ | ✓ | ✓ | - | - | ✓ |
| Sligo Town & Environs | SAC-101 | Rationalise Kilsellagh impoundment if deemed unreliable source and increase abstraction from Lough Gill and expand of Foxes Den WTP to cover Kilsellagh supply and supply deficit. | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Swinford | SAC-137 | Rationalise Swinford to Killaturly GWS | - | ✓ | ✓ | ✓ | - | ✓ | - | ✓ |

### 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 28 Study Area options.

Table 5.5 SA-C Grouped Options

| Water Resource Zone | Feasible Options SA-C | | |
|---|---|---|---|
| | Option Code | Option Description | SA Grouped Option |
| Lough Talt Regional Water Supply<br>Ballina<br>Lough Easkey Regional Water Supply | SAC-501 | Rationalise Lough Talt to Lough Conn. Upgrade of Wherrew WTP to provide additional output and new watermains through Ballina and Bonniconlon to Lough Talt required. Rationalise Lough Easkey to Lough Conn. | Group 1 |
| Lough Talt Regional Water Supply<br>Ballina | SAC-502 | Rationalise Lough Talt to Lough Conn. Upgrade of existing Wherrew WTP to provide additional output and new watermains through Ballina and Bonniconlon to Lough Talt required. Upgrade Wherrew WTP to provide additional yield. | Group 2 |
| Lough Talt Regional Water Supply<br>Ballina<br>Swinford<br>Foxford<br>Charlestown<br>Lough Easkey Regional Water Supply | SAC-503 | Upgrade existing Wherrew WTP and rationalise Lough Talt, Swinford, Foxford, Charlestown and Lough Easkey WRZs. | Group 3 |
| Lough Talt Regional Water Supply<br>Ballina<br>Ceide Fields<br>Swinford<br>Foxford<br>Charlestown<br>Lough Easkey Regional Water Supply | SAC-504 | Rationalise Lough Talt, Ceide Fields, Swinford, Foxford, Charlestown and Lough Easkey WRZs to Lough Conn. Upgrade of existing Lisglennon WTP to provide additional output and new watermains through Ballina and Bonniconlon to Lough Talt required. | Group 4 |

| Water Resource Zone | Feasible Options SA-C | | |
|---|---|---|---|
| | Option Code | Option Description | SA Grouped Option |
| Lough Talt Regional Water Supply<br>Sligo Town & Environs<br>Riverstown Public Water Supply<br>North Sligo Regional Water Supply<br>Lough Easkey Regional Water Supply | SAC-505 | Increase SW abstraction at Lough Gill and upgrade of Foxes Den WTP. Rationalise Lough Talt, Riverstown, North Sligo Regional and Lough Easkey WRZs to Foxes Den WTP. New watermains to Castleoye SR required. | Group 5 |
| Lough Talt Regional Water Supply<br>Ballina<br>Lough Easkey Regional Water Supply | SAC-510 | Rationalise Lough Talt and Lough Easkey to Wherrew WTP. Increase SW abstraction from Lough Conn. Upgrade Wherrew WTP and abandon Lisglennon WTP. | Group 10 |
| Lough Talt Regional Water Supply<br>Ballina<br>Lough Easkey Regional Water Supply | SAC-511 | Rationalise Lough Talt and Lough Easkey to Lisglennon WTP. Increase SW abstraction from Lough Conn. Replace Lisglennon WTP and abandon Wherrew WTP. | Group 11 |
| Knock Airport<br>Charlestown | SAC-514 | Rationalise Knock Airport to Charlestown WRZ. Increase GW abstraction to partly supply deficit at Charlestown WRZ, upgrade Charlestown WTP. | Group 14 |
| Knock Airport<br>Kilkelly | SAC-515 | Rationalise Knock Airport to Kilkelly WRZ. Increase GW abstraction at Kilkelly WRZ, upgrade Kilkelly WTP. | Group 15 |
| Knock Airport<br>Lough Mask<br>Swinford<br>Foxford<br>Kilkelly<br>Kiltimagh PWS<br>Achill | SAC-516 | Rationalise Knock Airport, Swinford, Foxford, Kilkelly, Kiltimagh and Achill Island WRZ to Lough Mask WRZ. Increase SW abstraction at Lough Mask and upgrade Tourmakeady WTP. | Group 16 |
| North Sligo Regional Water Supply<br>Sligo Town & Environs | SAC-519 | Rationalise North Sligo Regional Water Supply to Kinsellagh WTP. Supply Sligo Town from upgraded Foxes Den WTP and offset Kinsellagh for North Sligo RWSS. Increase SW abstraction from Lough Gill and expand Foxes Den WTP to supply deficit. | Group 19 |

| Water Resource Zone | Feasible Options SA-C | | |
|---|---|---|---|
| | Option Code | Option Description | SA Grouped Option |
| North Sligo Regional Water Supply Kinlough/Tullaghan | SAC-520 | Rationalise North Sligo Regional Water Supply to Kinlough Tullaghan. Increase GW abstraction (Glencar GWB (karstic)) to supply deficit at Kinlough/Tullaghan, upgrade Gleaned WTP. | Group 20 |
| North Sligo Regional Water Supply Sligo Town & Environs | SAC-521 | Supply North Sligo from Kinsellagh. New trunk main from Kinsellagh WTP to Rosses Point required. Supply Sligo Town from upgraded Foxes Den WTP and offset Kinsellagh for North Sligo RWSS. | Group 21 |
| Sligo Town & Environs North Sligo Regional Water Supply | SAC-522 | Increase SW abstraction from Lough Gill and expand Foxes Den WTP to supply deficit. Maintain existing abstraction at Kilsellagh impoundment. Supply deficit to North Sligo from Sligo Town (Kilsellagh WTP). | Group 22 |
| Ballina<br>Swinford<br>Charlestown<br>Knock Airport<br>Kilkelly<br>Kiltimagh PWS<br>Foxford | SAC-526 | Increase SW abstraction from Lough Conn to supply deficit at Ballina WRZ, upgrade Lisglennon WTP. Interconnect Swinford WRZ, Charlestown WRZ, Knock Airport WRZ, Kilkelly WRZ, Kiltimagh WRZ, Foxford WRZ with Lough Conn. | Group 26 |
| Sligo Town & Environs North Leitrim Regional Water Supply | SAC-529 | Increase SW abstraction from Lough Gill. Interconnect North Leitrim RWSS and Sligo Environs for increased resilience. | Group 29 |
| Lough Talt Regional Water Supply<br>Knock Airport<br>Swinford<br>Foxford<br>Charlestown | SAC-530 | New South Lough Conn WTP - abstraction point at the southern end of Lough Conn to serve the Lough Talt catchment. New mains through Foxford and Aclare to Lough Talt required. Rationalise Knock Airport, Swinford, Foxford and Charlestown to South Lough Conn WTP. | Group 30 |
| Ballina Lough Easkey Regional Water Supply | SAC-521 | Increase SW abstraction from Lough Conn. Upgrade Wherrew WTP to provide additional yield. Rationalise Lough Easkey to Lough Conn. | Group 35 |

| Water Resource Zone | Feasible Options SA-C | | |
|---|---|---|---|
| | Option Code | Option Description | SA Grouped Option |
| Lough Mask<br>Swinford<br>Charlestown<br>Knock Airport<br>Kilkelly<br>Kiltimagh PWS | SAC-537 | Increase SW abstraction from Lough Mask and upgrade Tourmakeady WTP. Interconnect Swinford WRZ, Charlestown WRZ, Knock Airport WRZ, Kilkelly WRZ and Kiltimagh WRZ with Lough Mask. | Group 37 |
| Ballina<br>Swinford<br>Charlestown<br>Knock Airport<br>Kilkelly<br>Kiltimagh PWS<br>Foxford | SAC-538 | Increase SW abstraction from Lough Conn and upgrade Wherrew WTP. Rationalise Swinford WRZ, Charlestown WRZ, Knock Airport WRZ, Kilkelly WRZ, Kiltimagh WRZ and Foxford WRZ to Lough Conn. | Group 38 |
| Lough Easkey Regional Water Supply<br>Sligo Town & Environs<br>Ballina | SAC-539 | Transfer of part of Lough Easkey from Ballina RWSS and other part from Foxes Den PWS. Increase SW abstraction from Lough Gill and expand Foxes Den WTP to supply deficit. Upgrade of Lisglennon WTP to provide additional yield. | Group 39 |
| Dowra PWS (GWS Import)<br>North Leitrim Regional Water Supply | SAC-540 | Rationalise Dowra to North Leitrim RWSS. | Group 40 |
| Dowra PWS (GWS Import)<br>North Leitrim Regional Water Supply | SAC-541 | Rationalise Dowra to North Leitrim via Ballinagleragh GWS. | Group 41 |
| Kiltimagh PWS<br>Lough Mask | SAC-542 | Rationalise Kiltimagh to Lough Mask WRZ. Increase SW abstraction at Lough Mask and upgrade Tourmakeady WTP. | Group 42 |
| Lough Talt Regional Water Supply<br>Ballina<br>Lough Easkey Regional Water Supply | SAC-543 | Rationalise Lough Talt and Lough Easkey to Lisglennon WTP. Increase SW abstraction from Lough Conn. Upgrade Lisglennon WTP for increased capacity and maintain Wherrew WTP at current capacity. | Group 43 |
| Lough Talt Regional Water Supply<br>Ballina | SAC-544 | Rationalise Lough Talt to Lisglennon WTP. Increase SW abstraction from Lough Conn. Upgrade Lisglennon WTP for increased capacity and maintain Wherrew WTP at current capacity. | Group 44 |

| Water Resource Zone | Feasible Options SA-C | | |
|---|---|---|---|
| | Option Code | Option Description | SA Grouped Option |
| Lough Talt Regional Water Supply Sligo Town & Environs | SAC-545 | Rationalise Lough Talt to Foxes Den WTP. Increase SW abstraction from Lough Gill and expand Foxes Den WTP to supply deficit. | Group 45 |
| North Sligo Regional Water Supply Ballyshannon | SAC-546 | Rationalise North Sligo to Ballyshannon WRZ (Lough Melvin). | Group 46 |

The 28 Study Area options result in 13 SA Combinations including the WRZ level Approach. The 13 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.6 SA-C Combinations Options Summary

| Key | WRZ Approach Option | ○ | SA Grouped Option | □ |
|---|---|---|---|---|

| WRZ | WRZ Approach Options | SA Combination 1 (SA Grouped Option 1 and 15) | SA Combination 2 (SA Grouped Option 1) | SA Combination 3 (SA Grouped Option 10 and 15) | SA Combination 4 (SA Grouped Option 11 and 15) | SA Combination 5 (SA Grouped Option 15, 42 and 43) | SA Combination 6 (SA Grouped Option 3) | SA Combination 7 (SA Grouped Option 4) | SA Combination 8 (SA Grouped Option 5) | SA Combination 9 (SA Grouped Option 10) | SA Combination 10 (SA Grouped Option 11) | SA Combination 11 (SA Grouped Option 39) | SA Combination 12 (SA Grouped Option 43) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Achill | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Ballina | ○ | □ | □ | □ | □ | □ | □ | □ | ○ | □ | □ | □ | □ |
| Ceide Fields | ○ | ○ | ○ | ○ | ○ | ○ | ○ | □ | ○ | ○ | ○ | ○ | ○ |
| Charlestown | ○ | ○ | ○ | ○ | ○ | ○ | □ | □ | ○ | ○ | ○ | ○ | ○ |
| Dowra PWS (GWS Import) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Erris RWSS | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Foxford | ○ | ○ | ○ | ○ | ○ | ○ | □ | □ | ○ | ○ | ○ | ○ | ○ |
| Kilkelly | ○ | □ | ○ | □ | □ | □ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Kiltimagh PWS | ○ | ○ | ○ | ○ | ○ | □ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Knock Airport | ○ | ○ | ○ | □ | □ | □ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| WRZ | WRZ Approach Options | SA Combination 1 (SA Grouped Option 1 and 15) | SA Combination 2 (SA Grouped Option 1) | SA Combination 3 (SA Grouped Option 10 and 15) | SA Combination 4 (SA Grouped Option 11 and 15) | SA Combination 5 (SA Grouped Option 15, 42 and 43) | SA Combination 6 (SA Grouped Option 3) | SA Combination 7 (SA Grouped Option 4) | SA Combination 8 (SA Grouped Option 5) | SA Combination 9 (SA Grouped Option 10) | SA Combination 10 (SA Grouped Option 11) | SA Combination 11 (SA Grouped Option 39) | SA Combination 12 (SA Grouped Option 43) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lough Easkey Regional Water Supply | No local solution | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ |
| Lough Talt Regional Water Supply | ○ | □ | □ | □ | □ | □ | □ | □ | □ | □ | □ | ○ | □ |
| North Leitrim Regional Water Supply | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| North Sligo Regional Water Supply | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | □ | ○ | ○ | ○ | ○ |
| Riverstown Public Water Supply | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | □ | ○ | ○ | ○ | ○ |
| Sligo Town & Environs | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | □ | ○ | ○ | □ | ○ |
| Swinford | ○ | ○ | ○ | ○ | ○ | ○ | □ | □ | ○ | ○ | ○ | ○ | ○ |

### 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 RWRP-NW, where options or combinations of options achieve similar, although not exactly identical scores under the six approach types, UÉ takes a wider look at the comparable combinations /options to consider which to categorise as the “Best” approach within each category. In particular, UÉ 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 SA-C, five SA combinations had a very similar ranking under the Least Cost category, within 5% of each other.

- Grouped Option 1 and 15 (Combination 1)
- Grouped Option 1 (Combination 2)
- Grouped Option 10 and 15 (Combination 3)
- Grouped Option 15, 42 and 43 (Combination 5)
- Grouped Option 43 (Combination 12)

The Least Cost Approach is determined using an Uisce Éireann 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 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, Uisce Éireann 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 five combinations against each other to identify which should go forward as the Least Cost approach, all 5 combinations scored similarly against the Best AA criterion, while combinations 1, 3 and 5 scored significantly better against the Best Environmental criterion than combinations 2 and 12.

Of Combinations 1, 3 and 5, Combination 5 scored best against the Lowest Carbon criterion and better than Combinations 1 and 3 against the resilience criterion. While Combinations 1 and 3 scored better against the Quickest Delivery Criterion, the difference was not significant. Therefore, as Combination 5 scored best against the Lowest Carbon category and better than Combinations 1 and 3 against the resilience criterion, it was taken forward as the Least Cost Approach in the Approach Development Stage.

SA Combinations 1, 3 and 4 scored the same against the quickest delivery criteria, however, Combination 1 scored better against the least cost, lowest carbon and best environmental criteria. Therefore, Combination 1 was taken forward as the Quickest Delivery Approach in the Approach Development Stage.

Table 5.7 SA-C Summary of SA Combination of Performance against Approach Type

| Ranked order (best to worst) | Best | | | | | | | | | | | | Worst |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| WRZ | WRZ Approach Option (Did not meet need) | SA Combination 1 (SA Grouped Option 1 and 15) | SA Combination 2 (SA Grouped Option 1) | SA Combination 3 (SA Grouped Option 10 and 15) | SA Combination 4 (SA Grouped Option 11 and 15) | SA Combination 5 (SA Grouped Option 15, 42 and 43) | SA Combination 6 (SA Grouped Option 3) | SA Combination 7 (SA Grouped Option 4) | SA Combination 8 (SA Grouped Option 5) | SA Combination 9 (SA Grouped Option 10) | SA Combination 10 (SA Grouped Option 11) | SA Combination 11 (SA Grouped Option 39) | SA Combination 12 (SA Grouped Option 43) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Least Cost | | | | | | Best | | | | | | Worst | |
| Quickest Delivery | | Best | | | | | | | Worst | | | | |
| Best AA biodiversity | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 1 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores | 2 No -3 Scores |
| Lowest Carbon | | | | | | Best | Worst | | | | | | |
| Most Resilient | | | | | | | Worst | Best | | | | | |
| Best Environmental | | | | | | | | Best | | Worst | Worst | Worst | |

The SA combinations outlined in Table 5.6 and Table 5.7**Error! Reference source not found.** are a ssessed 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 5 |
| Best Environmental (BE) | SA Combination 7 |
| Quickest Delivery (QD) | SA Combination 1 |
| Most Resilient (MR) | SA Combination 7 |
| Lowest Carbon (LC) | SA Combination 5 |
| Best AA (BA) | SA Combination 7 |

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

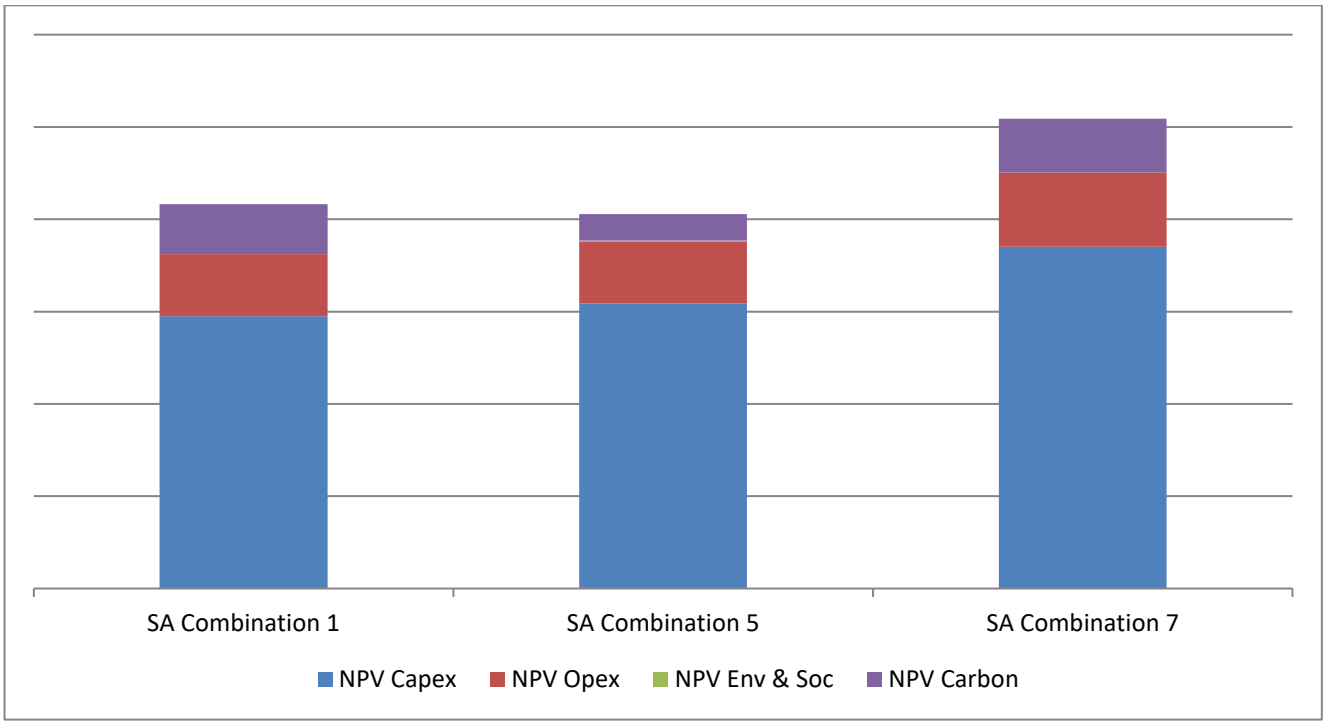



**Figure 5.2 SA-C NPV Costs for WRZ and SA approaches**

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. There is a significant cost difference between the Best AA Approach and the Least Cost Approach, and the Carbon Costs of the Best AA Approach are double those of the Least Cost Approach. While the Least Cost Approach comprises one more option with a -3 score against the AA criteria compared to the Best AA approach, which means likely significant effects of the 3 additional 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. The Least Cost approach was therefore retained at this stage.
- Step 2 – We compared the Quickest Delivery Approach against the Least Cost Approach. There were no significant benefits to progress the Quickest Delivery Approach over the Least Cost Approach as the Least Cost Approach scored closely to the Quickest Delivery Approach under this category. The Least Cost Approach was therefore retained at this stage.
- Step 3 - We compared the Least Cost against the Best Environmental Approach. There is a significant cost difference between the Best Environmental Approach and the Least Cost Approach and the Carbon Costs of the Best Environmental Approach are double those of the Least Cost Approach. When this is considered in context of the fact that the Best Environmental Approach did not score significantly better than the Least Cost Approach against the environmental criteria it was decided to retain the Least Cost approach at this stage.
- Step 4 – We compared the Least Cost Approach against the Most Resilient Approach. The Least Cost Approach scored similarly to the Most Resilient Approach against the resilience category and the carbon costs for the Most Resilient Approach were significantly greater than the carbon costs for the Least Cost Approach. The Least Cost Approach was therefore retained at this stage.

- Step 5 - We compared the Least Cost Approach against the Lowest Carbon Approach. The Least Cost Approach is the Lowest Carbon Approach and was therefore retained at this stage.
- Step 6 – A final assessment of the Least Cost and Carbon Approach was completed against the Quickest Delivery, Best Environmental and Most Resilient Approaches. The Least Cost and Lowest Carbon Approach scores well in terms of delivery and resilience and no significant environmental impacts have been identified at plan level. 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.
- Step 7 – The Least Cost Approach was therefore selected as the Preferred Approach.

While the Least Cost Approach comprises three more options with a -3 score against the AA criteria compared to the Best AA approach, which means likely significant effects of the 3 additional 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. The Least Cost approach was therefore retained at this stage.

## 5.3 Study Area Preferred Approach Summary

On the basis of this initial assessment at Plan level, SA Combination 5 represents the Preferred Approach for Study Area C, which consists of the options listed in Table 5.9.

Table 5.9 Preferred Approach for SA-C

| WRZ Name | Preferred Approach Option Description<br>SA Combination – Combination 5 (Group 15, 42 & 43) |
|---|---|
| Achill | SAC-142<br>New SW abstraction from Keel Lough and new raw water transfer to existing WTP. Includes WTP upgrade. New source to supplement Accorymore Lake during dry periods only. |
| Ballina<br>Lough Easkey Regional Water Supply<br>Lough Talt Regional Water Supply | Group 43<br>Rationalise Lough Talt and Lough Easkey to Lisglennon WTP. Increase SW abstraction from Lough Conn. Upgrade Lisglennon WTP for increased capacity and maintain Wherrew WTP at current capacity. |
| Ceide Fields | SAC-39<br>Increase GW abstraction to supply deficit. |
| Charlestown | SAC-73<br>Interconnect Killaturly GWS with Charlestown and supply deficit from GWS. |
| Dowra PWS (GWS Import) | SAC-131<br>Keep supplying Dowra WRZ from Doobally GWS. |
| Erris RWSS | SAC-86<br>Increase SW abstraction from Carrowmore Lake. |

| WRZ Name | Preferred Approach Option Description<br>SA Combination – Combination 5 (Group 15, 42 & 43) |
|---|---|
| Foxford | SAC-67<br>New GW abstraction to supply deficit in Foxford. |
| Kilkelly<br>Knock Airport | Group 15<br>Rationalise Knock Airport to Kilkelly WRZ. Increase GW abstraction at Kilkelly WRZ, upgrade Kilkelly WTP. |
| Kiltimagh PWS | Group 42<br>Rationalise Kiltimagh to Lough Mask WRZ. Increase SW abstraction at Lough Mask and upgrade Tourmakeady WTP. |
| North Leitrim Regional Water Supply | SAC-108<br>Upgrade Moneyduff WTP - no deficit |
| North Sligo Regional Water Supply | SAC-44<br>New GW abstraction to supply deficit. |
| Riverstown Public Water Supply | SAC-138<br>Refurb existing spring and upgrade WTP for water quality improvements |
| Sligo Town & Environs | SAC-101<br>Foxes Den Public Water Supply - Rationalise Kilsellagh impoundment if deemed unreliable source and increase abstraction from Lough Gill and expand of Foxes Den WTP to cover Kilsellagh supply and supply deficit. |
| Swinford | SAC-137<br>Rationalise Swinford to Killaturly GWS. |

The Preferred Approach (SA Combination 5) is shown schematically in Figure 5.3.

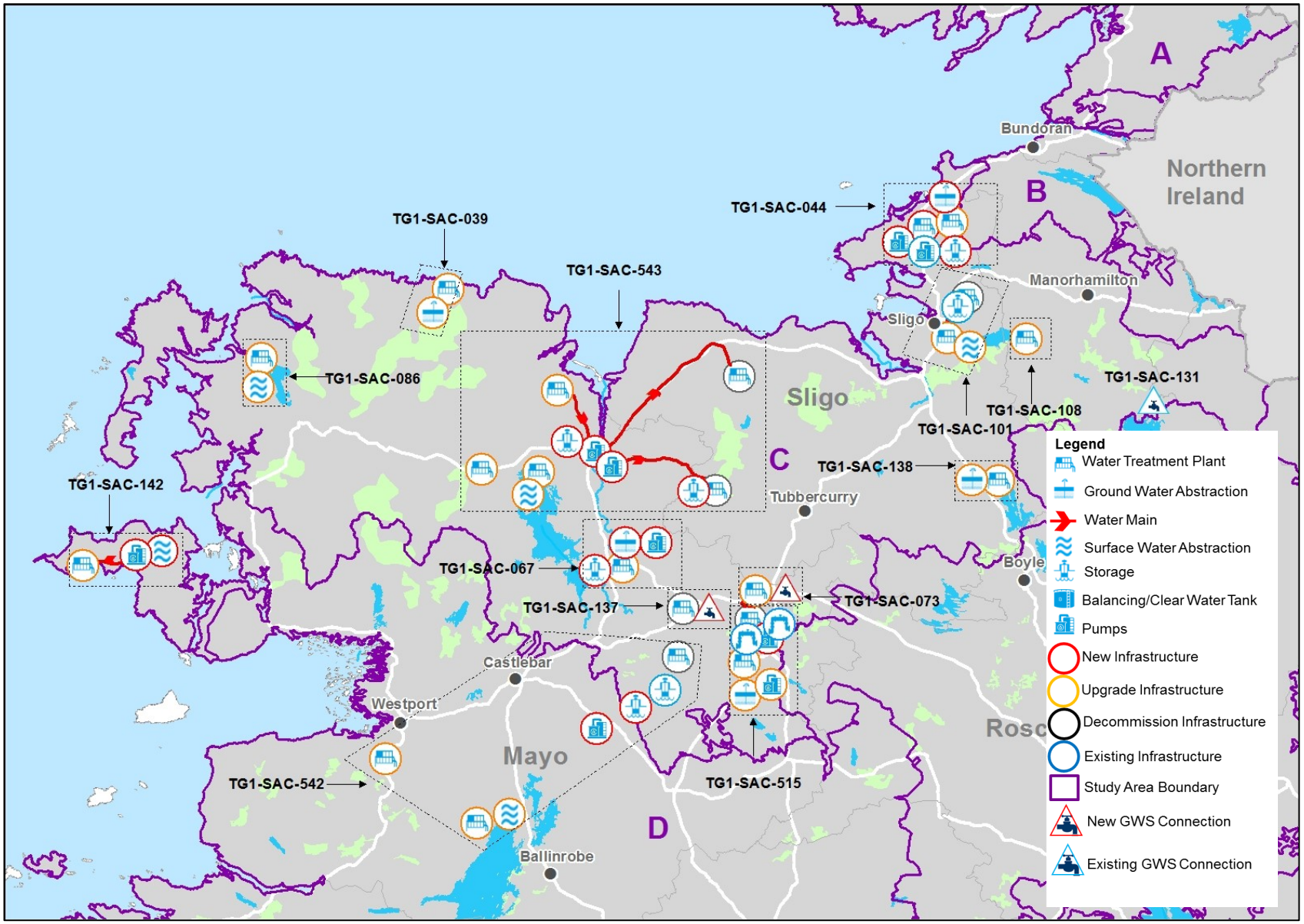



**Figure 5.3 SA-C Preferred Approach**

The Preferred Approach for SA-C, 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 UÉ 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 SA-C, 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, Uisce Éireann 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 UÉ 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 SA-C Interim Options

| WTP Name | Interim Option |
|---|---|
| Lough Gill (Moneyduff) WTP | Upgrade WTP to UÉ Standards |
| Achill WTP | Upgrade WTP to UÉ Standards |
| Wherrew WTP | Upgrade WTP to UÉ Standards |
| Lisglennon WTP | Upgrade WTP to UÉ Standards |
| Erris WTP | Upgrade WTP to UÉ Standards |
| Charlestown WTP | Refurb existing Spring, and upgrade WTP to UÉ Standards |
| Crossmolina WTP | Refurb existing Spring, and upgrade WTP to UÉ Standards |
| Foxford WTP | Upgrade WTP to UÉ Standards |
| Kilkelly WTP | Refurb existing Spring, and upgrade WTP to UÉ Standards |
| Kiltimagh WTP | Upgrade WTP to UÉ Standards – Potential site for a containerised solution |
| Swinford WTP | Upgrade WTP to UÉ Standards – Potential site for a containerised solution |
| Knock Airport WTP | Refurb existing Spring, and upgrade WTP to UÉ Standards – Potential site for a containerised solution |
| Ceide Fields WTP | Refurb existing Spring, and upgrade WTP to UÉ Standards |
| Foxes Den WTP | Upgrade WTP to UÉ Standards |
| Lough Talt WTP | Upgrade WTP to UÉ Standards – Potential site for a containerised solution |
| Lough Easkey WTP | Upgrade WTP to UÉ Standards – Potential site for a containerised solution |
| North Sligo (Ardnaglass) WTP | Refurb existing Borehole, and upgrade WTP to UÉ Standards |
| Kilsellagh WTP | Upgrade WTP to UÉ Standards – Potential site for a containerised solution |
| Riverstown WTP | Refurb existing Borehole, and upgrade WTP to UÉ Standards |

Small Towns and Villages Growth Programme Uisce Éireann's Investment Plan 2020-2024 includes a number of programmes and projects targeted at providing for growth. One such programme is the Small Towns and Villages Growth Programme (STVGP) which will provide funding for Water and Wastewater

Treatment Plant growth capacity in smaller settlements which are not otherwise provided for in the Capital Investment Plan 2020 to 2024. The STVGP is focused on supporting growth in areas already served by UÉ infrastructure but where current or future capacity deficits have been identified.

Uisce Éireann have engaged with Local Authorities across the country to ensure that the investment is made appropriately in accordance with the relevant county development plan. Under this programme interim options works will be considered in the North Sligo Water Resource Zone, to address issues within the Cliffoney and Mullaghmore settlements.

# 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 SA-C is shown in Table 7.1.

Table 7.1 Sensitivity Analysis for SA-C

| 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) | +10,000 $m^3$/day | **The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the supply demand balance deficit**. There are some surface water sources in SA-C that would be impacted from sustainability reductions. However, our preferred approach is designed to rationalise or supplement these sources by supplying from larger, more resilient surface water and groundwater sources. This includes a regional solution to decommission the Lough Talt and Lough Easkey sources and supply these schemes from Lough Conn which has potential to be developed. Groundwater sustainability is more difficult to assess at desktop level, however, as the abstractions in SA-C are small in scale they do not appear to be problematic.<br><br>Based on this scenario, the Preferred Approach remains the optimal solution. |

| Uncertainty | Likelihood | Increase/Decrease in Deficit | Impact on Preferred Approach |
|---|---|---|---|
| **Climate Change** | High (international climate change targets have not been met) | +600 $m^3$/day | **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.<br>Based on this scenario, the Preferred Approach remains the optimal solution. |
| **Demand Growth** | Low/Moderate (growth has been based on policy) | -26,817 $m^3$/day | **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 17 individual water resource zones and is driven by quality as well as quantity issues. In this rural area, growth is relatively low.<br>Based on this scenario, the Preferred Approach remains the optimal solution. |
| **Leakage Targets** | Low (Uisce Éireann is focused on sustainability and aggressive leakage reduction) | 578 $m^3$/day | **The impact of lower than expected leakage savings would increase the supply demand balance deficit and the overall need requirement.** As Uisce Éireann 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.<br>Based on this scenario, the Preferred Approach remains the optimal solution. |

| Uncertainty | Likelihood | Increase/Decrease in Deficit | Impact on Preferred Approach |
|---|---|---|---|
| | Moderate/High (Uisce Éireann is focused on sustainability and aggressive leakage reduction) | 11,961 $m^3$/day | **Increased leakage savings beyond SELL would reduce the supply demand balance deficit and the overall need requirement.** The need drivers in SA-C are across all 17 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.<br>Based on this scenario, the Preferred Approach remains as the optimal solution. |

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

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

- Interim Approach – As the purpose of the Interim Approach is to allow for priority Quality and Quantity issues, the solutions will have a limited design life (usually less than 10 years). They allow time to assess the Preferred Approach and improve adaptability within our Plan
- Preferred Approach – The supplies in SA-C vary in size with a large number of small WRZs <1Ml/d as well as large growth areas such as Sligo Town. 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 C

# 8 Summary of Study Area C

The Preferred Approach for SA-C (summarised in Table 5.8 and Figure 5.3) consists of local WRZ solutions for Ceide Fields, North Sligo Regional Water Supply, Swinford, Foxford, Charlestown, Erris RWSS, Achill, Sligo Town & Environs, North Leitrim Regional Water Supply, Riverstown Public Water Supply and Dowra PWS (GWS Import) WRZs. The Preferred Approach for Ballina, Lough Talt Regional Water Supply, Knock Airport, Kilkelly, Kiltimagh PWS and Lough Easkey Regional Water Supply WRZs involve transfers from a number of existing surface water and groundwater abstractions in the study area.

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 SA-C 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 North Leitrim Regional Water Supply, Ballina, and Sligo Town & Environs Water Resource Zones, amounting to 578 m³ per day (applied to SDB Deficit) to move towards achieving the National SELL Target by 2034
- Continuation of UÉ 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 SA-C, 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 C Water Treatment Plants

| WTP Asset Name | Local Plant Names |
|---|---|
| Lough Gill (Moneyduff) WTP | Lough Gill (Moneyduff) WTP |
| Achill WTP | Achill WTP |
| Wherrew WTP | Wherrew WTP |
| Lisglennon WTP | Lisglennon WTP |
| Erris WTP | Erris WTP |
| Charlestown WTP | Charlestown WTP |
| Crossmolina WTP | Crossmolina WTP |
| Foxford WTP | Foxford WTP |
| Kilkelly WTP | Kilkelly WTP |
| Kiltimagh WTP | Kiltimagh WTP |
| SWINFORD WTP | SWINFORD WTP |
| KNOCK AIRPORT WTP | KNOCK AIRPORT WTP |
| Ceide Fields WTP | Ceide Fields WTP |
| Foxes Den WTP | Foxes Den WTP |
| Lough Talt WTP | Lough Talt WTP |
| Lough Easkey WTP | Lough Easkey WTP |
| North Sligo (Ardnaglass) WTP | North Sligo (Ardnaglass) WTP |
| Kilsellagh WTP | Kilsellagh WTP |
| Riverstown WTP | Riverstown WTP |

# Annex B – Study Area C Rejection Register Summary

## Annex B Study Area C Rejection Register Summary

Study Area C - CS Rejection

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-08 | New SW abstraction at Lough Arrow and abandon Lough Talt source. | Lough Arrow is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-12 | Part supply deficit from Lough Easkey. | Lough Easkey is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-13 | Interconnect Foxford and Lough Talt WRZs. Supply deficit from Foxford WRZ. | Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-13a | Increase existing SW abstraction from Lough Muck to supply deficit at Foxford, upgrade WTP | Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-16 | Maintain allowable abstraction at Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-114x | Maintain allowable abstraction at Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-17 | WSZ near Lough Talt- extend Boyle & Boyle/Ardcarne supply into Lough Talt. New GW source required for Boyle & Boyle/Ardcarne scheme. | 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-SAC-18 | New SW abstraction from the River Moy to supply deficit at Lough Talt WRZ, upgrade WTP | Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-19 | Recomission Bellanascarrow Lake source (old Ballymote supply). | Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-20 | Regional scheme for Swinford, Foxford, Charlestown, Knock Airport, Kilkelly, Kiltimagh, from Lough Talt WRZ. | This option is a duplicate of regional option 30 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-SAC-28 | Increase GW abstraction at Riverstown and supply spare capacity to Lough Talt 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-SAC-28a | Increase GW abstraction at Riverstown and supply spare capacity to Lough Talt 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-SAC-30 | Interconnect Geevagh/Highwood & Castlebaldwin GWSs with Riverstown WRZ and supply deficit from GWSs. | 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 | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-30a | Interconnect Geevagh/Highwood & Castlebaldwin GWSs with Lough Talt WRZ and supply deficit from GWSs. | 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-SAC-31 | Rationalise Riverstown to Lough Talt for long term OPEX savings and improved resilience. | 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-SAC-31b | Rationalise Riverstown to Lough Talt (Lough Arrow source) for long term OPEX savings and improved resilience. | Lough Arrow is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. Option to part supply Lough Talt only will be assessed. | ● | ● | ● |
| TG1-SAC-31c | New SW abstraction from Lough Arrow and abandon Lough Talt WTP. | Lough Arrow is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-31a | New GW abstraction in regionally karstified aquifer in Tobercurry to partly supply deficit in Lough Talt 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-SAC-32 | New SW abstraction at Lough Arrow and abandon Riverstown source. | When unconstrained options list was originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, the WRZ is no longer in deficit. Therefore, no new supply option is required. | **WRZ is no longer in deficit** | | |
| TG1-SAC-112x | Increase SW abstraction from Lough Mask, upgrade Tourmakeady WTP | The plan required a significant length of the pipeline for a relatively small supply. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. Rationalisation of the WRZs individually or in smaller groups was considered in other options. | | • | |
| TG1-SAC-37 | Yield test to be carried out to confirm yield and to cater for potential growth of Strategic Development Zone. | Existing source assessed as part of TG1-SAC-58b. Uncertainty around available yield so therefore only assessed to meet the outlined deficit. | This option is a repeat and is assessed as part of a different feasible option | | |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-41 | Interconnect Balldaragh Bellderrig GWS with Ceide Fields and supply deficit from GWS. | 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-SAC-43 | Supply deficit from neighbouring GWS. | 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-SAC-115x | New SW abstraction from Glenade lake, upgrade Glenade WTP | Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-49 | Desalination plant to supply the scheme | This option has very high costs and is energy intensive for small demand, with better feasible alternatives available. Therefore, this option did not meet the requirements of the Deliverability criterion. | | ● | |
| TG1-SAC-52 | New SW abstraction from Glenade Lake and supply deficit to North Sligo RWSS WRZ. | Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-54 | Increase GW abstraction at Swinford 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-SAC-54a | Increase SW abstraction at Swinford and upgrade WTP. Rationalise Foxford, Chalestown, Knock Airport, Kilkelly and Kiltimagh to Swinford - new Regional Water Supply Scheme. | 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-SAC-54b | Increase SW abstraction at Swinford and upgrade WTP. Rationalise Foxford, Chalestown, Knock Airport, Kilkelly and Kiltimagh to Swinford - new Regional Water Supply Scheme. | 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-SAC-54c | Increase SW abstraction at Swinford and upgrade WTP. Rationalise Foxford, Chalestown, Knock Airport, Kilkelly and Kiltimagh to Swinford - new Regional Water Supply Scheme. | 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-SAC-54d | Increase SW abstraction at Swinford and upgrade WTP. Rationalise Foxford, Chalestown, Knock Airport, Kilkelly and Kiltimagh to Swinford - new Regional Water Supply Scheme. | 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 | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-54e | Increase SW abstraction at Swinford and upgrade WTP. Rationalise Foxford, Chalestown, Knock Airport, Kilkelly and Kiltimagh to Swinford - new Regional Water Supply Scheme. | 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-SAC-57a | Increase SW abstraction from Carrowcanada Spring to supply deficit at Swinford WRZ, 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-SAC-57b | Increase SW abstraction from Carrowcanada Spring to supply deficit at Swinford WRZ, wpgrade 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-SAC-112a | Interconnect Swinford WRZ with Lough Mask. | The overall plan required a significant length of the pipeline for relatively small supplies. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. | | ● | |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-114a | Interconnect Swinford WRZ with Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-63 | Increase SW abstraction from Lough Muck to supply deficit at Foxford, upgrade WTP t. | 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-SAC-64 | Rationalise Foxford to Swinford 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-SAC-112b | Interconnect Charlestown WRZ with Lough Mask. | The overall plan required a significant length of the pipeline for relatively small supply. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. | | ● | |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-114b | Interconnect Charlestown WRZ with Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-58 | New GW wellfield and supply deficit to Swinford WRZ (new regional WSS). | The overall plan required a significant length of the pipeline for relatively small supply. 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-SAC-58 | New GW wellfield and supply deficit to Swinford WRZ (new regional WSS). | The overall plan required a significant length of the pipeline for relatively small supply. 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-SAC-112c | Interconnect Knock Airport WRZ with Lough Mask. | The overall plan required a significant length of the pipeline for relatively small supplies. It was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. Rationalisation of the WRZs individually or in smaller groups was considered in other options. | | ● | |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-114c | Interconnect Knock Airport WRZ with Lough Talt. | Abstracting the volume of water required is considered unfeasible. The overall plan required a significant length of the pipeline for relatively small supply. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-58x | New GW wellfield and supply deficit to Knock Airport WRZ (new regional WSS). | Abstracting the volume of water required is considered unfeasible. The overall plan required a significant length of the pipeline for relatively small supply. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-112d | Interconnect Kilkelly WRZ with Lough Mask. | The overall plan required a significant length of the pipeline for relatively small supply. It was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. | | ● | |
| TG1-SAC-114d | Interconnect Kilkelly WRZ with Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving high WFD status and to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-58c | New GW wellfield and supply deficit to Kilkelly WRZ(new regional WSS). | The overall plan required a significant length of the pipeline for relatively small supply. 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 | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-112e | Interconnect Kiltimagh WRZ with Lough Mask. | The overall plan required a significant length of the pipeline for relatively small supplies. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. | | ● | |
| TG1-SAC-114e | Interconnect Kiltimagh WRZ with Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving high WFD status and to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-58d | New GW wellfield and supply deficit to Kiltimagh WRZ (new regional WSS). | The overall plan required a significant length of the pipeline for relatively small supply. 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-SAC-114f | Interconnect Foxford WRZ with Lough Talt. | Lough Talt is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving high WFD status and to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-58e | New GW wellfield and supply deficit to Foxford WRZ (new regional WSS). | The overall plan required a significant length of the pipeline for relatively small supply. 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 | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-112f | Interconnect Foxford WRZ with Lough Mask. | The plan required a significant length of the pipeline for relatively small supply. It was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | | ● | |
| TG1-SAC-72 | Rationalise Charlestown to Lough Talt 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-SAC-79 | Rationalise Kilkelly to Lough Talt 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-SAC-80 | Rationalise Kilkelly to Swinford 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-SAC-83 | Refurbish old spring source. | This option included increasing the abstraction at Kilkelly Charlestown GWB to supply deficit at Kiltimagh WRZ. There is a great uncertainty around available yield, to meet the full demand requirement. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-85 | Desalination plant to supply the scheme. | This option has very high costs and is energy intensive for small demand, with better feasible alternatives available. Therefore, this option did not meet the requirements of the Deliverability criterion. | | ● | |
| TG1-SAC-86a | Increase SW abstraction from Carrowmore Lake to supply deficit at Erris WRZ, upgrade Erris WTP | The overall plan required a significant length for a relatively small supply. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. As a result, it was not taken forward to fine screening. | | ● | |
| TG1-SAC-88a | Increase SW abstraction from Bunnahowna River to supply deficit at Mulranny WRZ, upgrade WTP | Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-88 | Rationalise Achill Island to Mulranny WRZ. | Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-89 | Rationalise Achill Island to Erris WRZ. | The overall plan required a significant length of for a relatively small supply. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. Therefore, this option did not meet the requirements of the Deliverability and Flexibility criteria. Rationalisation of the WRZs individually or in smaller groups was considered in other options. | | ● | |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-93 | Tankering water when required. | Tankering is not a robust, resilient, long-term solution for any WRZ within the region and for this reason, is not taken forward to fine screening | **Tankering is not a robust, resilient, long-term solution for any WRZ** | | |
| TG1-SAC-94 | Desalination plant to supply the scheme. | This option has very high costs and is energy intensive for small demand, with better feasible alternatives available. Therefore, this option did not meet the requirements of the Deliverability criterion. | | ● | |
| TG1-SAC-96 | Increase SW abstraction from Lough Easkey to supply deficit at Lough Easkey WRZ, upgrade WTP | Lough Easkey is a WFD high status waterbody. Abstracting the volume of water required to make this a feasible option is likely to result in the waterbody not achieving high WFD status and to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-98 | New GW abstraction at Lough Easkey to supply deficit at Lough Easkey WRZ, 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-SAC-103 | New SW abstraction from Ballysadare River and raw water pumped to Foxes Den WTP which would need expansion of plant capacity to treat new additional supply. | Does not meet WFD objectives as there is risk of transfer of invasive species across catchment with raw water transfers. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-104 | New SW abstraction from Ballysadare River and expansion of Lough Gill abstraction and Foxes Den WTP capacity to treat from either river or lough. Based on conjunctive use approach of using new river/lough in combination to meet deficit i.e. utilise high river flows when available in winter months. | Does not meet WFD objectives as there is risk of transfer of invasive species across catchment with raw water transfers. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-105 | New SW abstraction from Ballysadare River and expansion of Lough Gill abstraction and Cairns Hill WTP capacity to treat from either river or lough. Based on conjunctive use approach of using new river/lough in combination to meet deficit i.e. utilise high river flows when available in winter months. | Does not meet WFD objectives as there is risk of transfer of invasive species across catchment with raw water transfers. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria. | ● | ● | ● |
| TG1-SAC-106 | Desalination plant to supply the scheme. | This option has very high costs and is energy intensive for small demand, with better feasible alternatives available. Therefore, this option did not meet the requirements of the Deliverability criterion. | | ● | |

| Option Reference | Option Description | Rejection Reasoning | Resilience | Deliverability & Flexibility | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-109 | New GW abstraction at North Leitrim, Upgrade Moneyduff WTP | 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-SAC-110 | Rationalise Dowra to North Leitrim via Ballinagleragh GWS. | 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. | **WRZ is no longer in deficit** | | |
| TG1-SAC-110a | New GW abstraction at North Leitrim, Upgrade Moneyduff WTP | 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. | **WRZ is no longer in deficit** | | |
| TG1-SAC-58a | New GW wellfield and supply deficit to Charlestown WRZ (new regional WSS). | The overall plan required a significant length of the pipeline for relatively small supplies. Therefore, it was considered not feasible at coarse screening stage, due to age of water and sedimentation. 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 | Environmental |
|---|---|---|---|---|---|
| TG1-SAC-129 | Interconnect Geevagh/Highwood & Castlebaldwin GWSs with Riverstown WRZ and supply from GWSs. | Lack of data for design of connection to private scheme and as a result, it was not taken forward to fine screening. | **Lack of information available for private GWS** | | |
| TG1-SAC-58a | New GW wellfield and supply deficit to Charlestown WRZ (new regional WSS). | This option is a repeat of SAC-71 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option. | **This option is a repeat and is assessed as part of a different feasible option** | | |
| TG1-SAC-141 | New boreholes at Heapstown Spring | This option is a repeat of SAC-138 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option. | **This option is a repeat and is assessed as part of a different feasible option** | | |