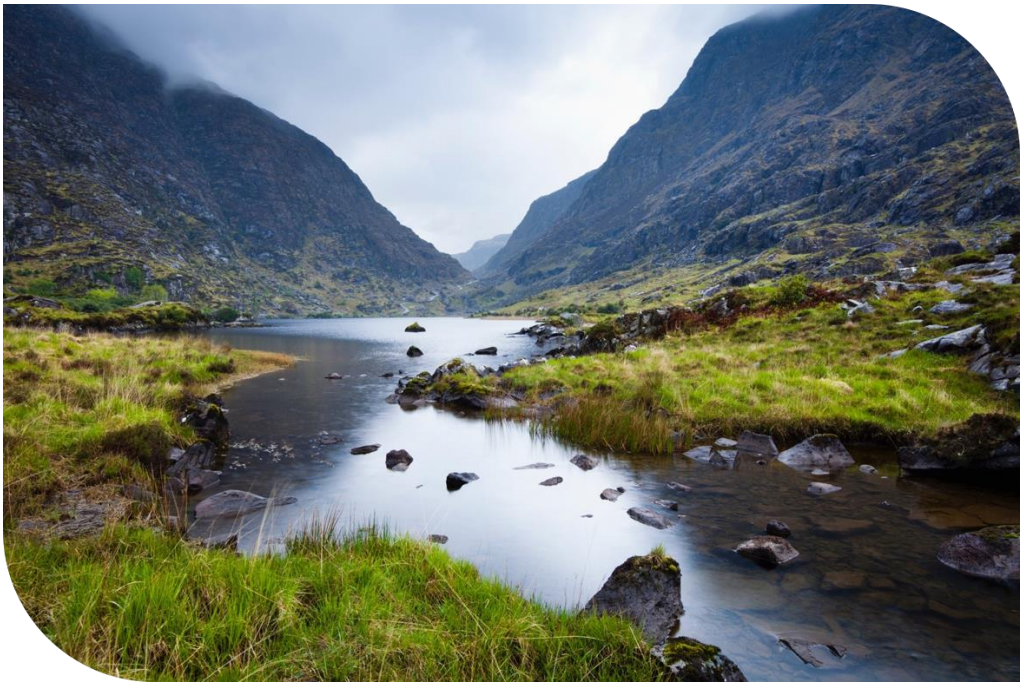
Spring 2023

Regional Water Resources Plan –South West
Appendix 3
Study Area J Technical Report



Tionscadal Éireann
Project Ireland
2040

Data disclaimer: This document uses best available data at time of writing. 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 (NWRP) will also align to relevant updates in applicable policy. In December 2022, the Water Services (Amendment) (No. 2) Act, 2022 was signed into law. This act legislates that from the 31 December 2022, Irish Water will only be known as Uisce Éireann. It also provides that, from that date, all references in any enactment, legal proceedings or other document to Irish Water shall be construed as references to Uisce Éireann only. Therefore, in this Regional Plan, which was developed prior to the name change, all references to Irish Water shall be construed as Uisce Éireann.

Baseline data included in the RWRP-SW has been incorporated from numerous sources including but not limited to; National Planning Framework, Central Statistics Office, Regional Spatial and Economic Strategies, Local Authority data sets, Regional Assembly data sets and Irish Water data sets. Data sources will be detailed in the relevant sections of the RWRP-SW. 2019 was selected as the base year to align with the planning period (2019-2025) of the NWRP.

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1 Introduction and Background

1 Introduction – Study Area J – North Cork/West Waterford

This is the Technical Report for Study Area J 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 –South West (RWRP-SW), which explain key concepts and terminology used throughout the report.

This Study Area includes 62 water resource zones located in County Cork, County Waterford and County Limerick. 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-SW.

1.1 Summary of Our Options Assessment Methodology

In Chapter 8 of the Framework Plan, we described the Option Assessment Methodology that will be used to develop a national programme of proposed solutions for all of our water supplies. The objective of these solutions is to resolve the needs identified through the Supply Demand Balance (SDB), Water Quality, Reliability and Sustainability assessments. These needs will be discussed in further detail in this report. In the Regional Water Resources Plan – South West (RWRP-SW), we apply this methodology to the South West 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.

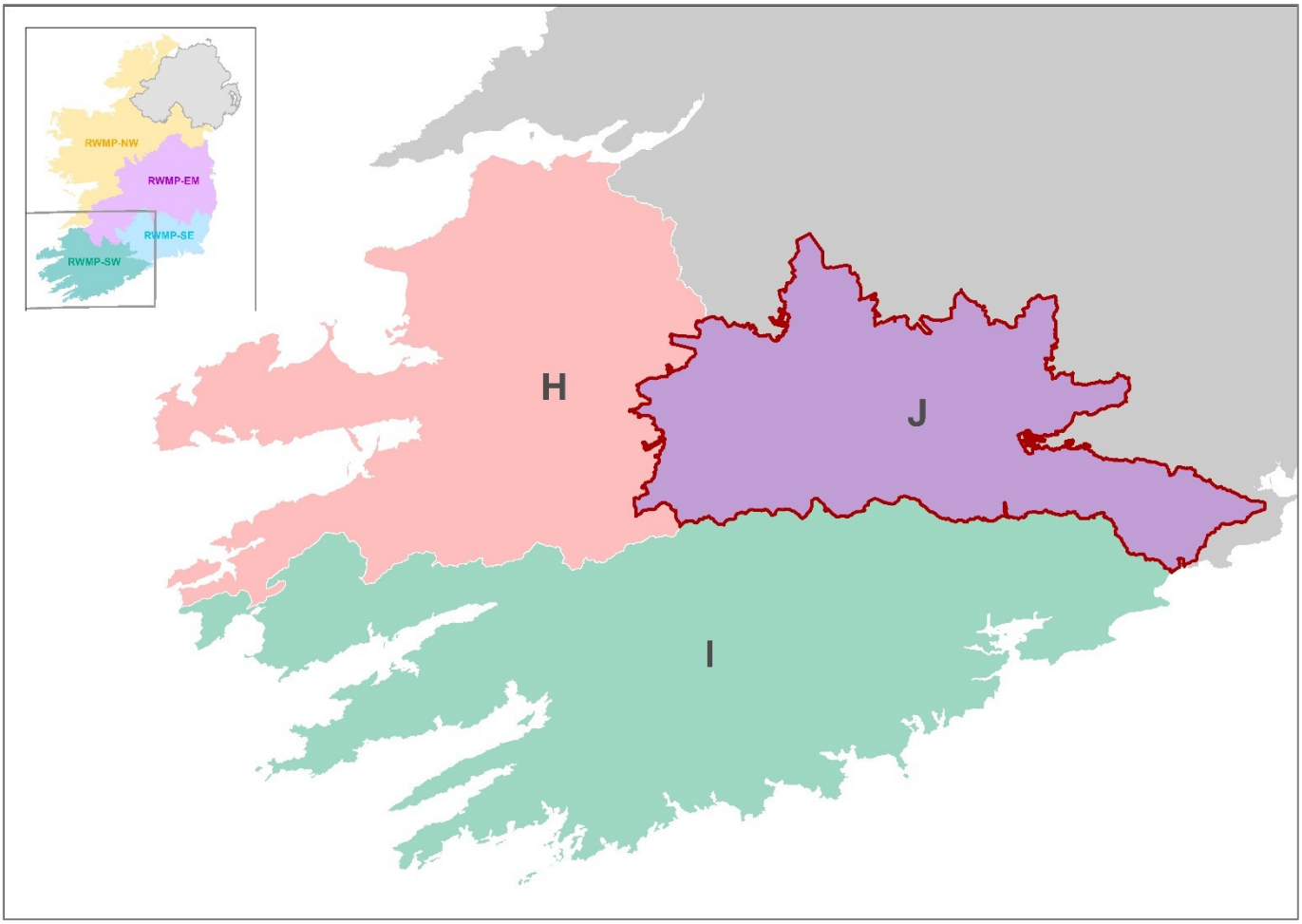


Figure 1.1 Overview of Study Areas within the South West Region .

This Technical Report is for Study Area J (SAJ), which consists of 62 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 TG2 refers the South West Region (Regional Group 2).

It should be noted that assessments and preferred approaches and solutions at this stage are at a plan level. Environmental impacts and costing of projects are further reviewed at Project Level. No statutory consent or funding consent is conferred by inclusion in the national plan. Any projects that are progressed following this plan will require individual environmental assessments, including Environmental Impact Assessment and Appropriate Assessment (as required), in support of planning applications (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions). Any such applications will also be subject to public consultation.

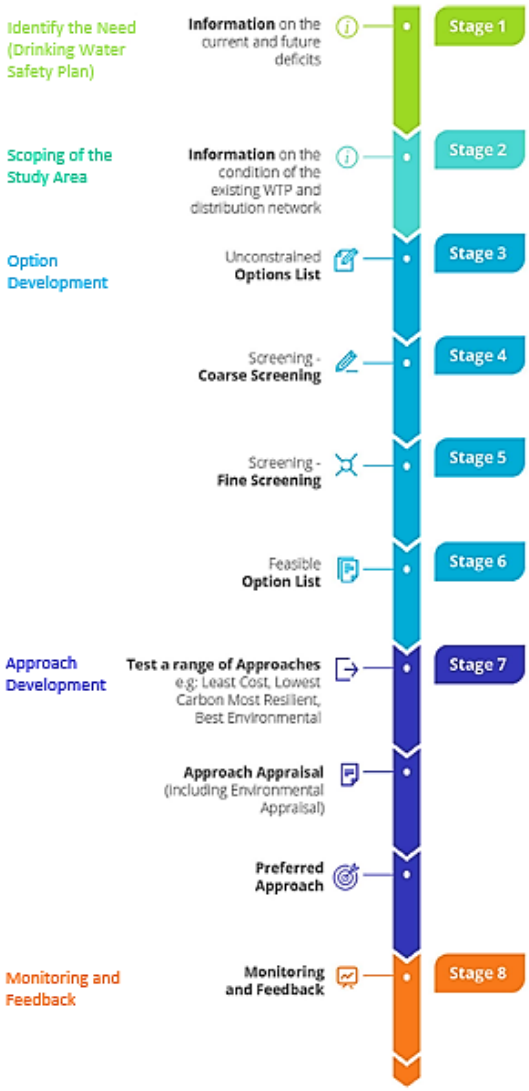


Figure 1.2 Option Assessment Methodology Process

1.2 Introduction to the Study Area

There are approximately 80,000 people served by the public network in Study Area J via 62 water resource zones and 1,668 kilometres of distribution network. The Study Area extends from Grallagh to the north western area of County Cork. The sources of water include 75 groundwater sources and 5 surface water sources. The Study Area is summarised in Figure 1.3. and Table 1.1.

Groundwater supplies are the dominant source of supply for the region. These groundwater sources are replenished by winter rainfall to meet higher demand in the spring and summer. The predominant aquifer type of the area is made up of poorly productive bedrock (74%), followed by karstic (24%) and productive fissured (3%). There have been no major sand and gravel aquifers mapped in SAJ.

Devonian Old Red Sandstone (ORS) consist mainly of coarse and fine sandstones, siltstones, shales, and conglomerates, and along with the Namurian Shales, make up the dominant bedrock geology in SAJ. These rocks are predominantly of a poorly productive bedrock flow regime and assumed to be

generally devoid of intergranular permeability, with groundwater flow occurring predominantly through fractures and faults. Most groundwater flow occurs in the top 15-20 metres of the aquifer, with levels generally mirroring topography, although deeper flows along fault zones or connected fractures are encountered which can provide much higher yields. Significant flows can be found at springs issuing from bedding planes marking a change in lithology.

The karst forms a key regionally important aquifer in some areas, namely around the low-lying valleys between Mallow and Charleville in Cork. The Southern Region is predominantly characterised by a more diffuse network of flow pathways (Rk^d type aquifers), where the distribution of permeability, and hence yield, is more homogenous. The karst system of North Cork appears more complex and is likely comprised of enlarged channels (conduit flow), formed from solution at depth, and other karst features at the surface (represented by springs), and a deeper diffuse type groundwater flowing south. A number of significant abstractions taking place in this region include Castletownroche, Box Cross and Shanballymore.

The Kiltorcan Sandstones make up the productive fissured aquifers in this region and can be found in a narrow band through north east Cork and into Waterford. In general, optimum well yields will be from wells that penetrate to a depth at least 50-100m and near a significant structural feature such as an anticline or fault. It is likely the abstraction at Charleville receives much of the groundwater inflow from this rock unit.

Overall, 75 groundwater sources are managed by Irish Water in the region, with the majority of the smaller abstractions taking place from the sandstones, producing yields averaging 120 – 350m^3/d.

The higher abstraction volumes generally take place in the karst, with a number of large springs issuing from bedding planes marking a change in lithology. These springs can at times provide very large overflows, and under the GSI classification scheme, would be regarded as large springs (>2160 m^3/d).

Furthermore, one groundwater abstraction is from an infiltration gallery located along the Blackwater River. This abstraction has been classified as a groundwater abstraction, however, it is noted that the source of supply is both surfacewater and groundwater.

Regarding surface water availability, SAJ is almost entirely within the Blackwater (Munster) catchment, except for a small part in the far north of the Study Area crossing into the Shannon Estuary South catchment. The River Blackwater is one of the largest rivers in Ireland, with a total catchment area of 3,310 km^2, draining a major part of County Cork and five ranges of mountains. The Blackwater rises in the Mullaghareirk Mountains in County Kerry and flows east through County Cork, draining the Study Area as it passes through the towns of Mallow and Fermoy, then into County Waterford before entering the Celtic Sea at Youghal. The Blackwater basin is primarily composed of Devonian and Carboniferous sedimentary rocks. Broadly speaking the geology consists of east-west trending anticlines (sandstone ridges) and synclines (limestone valleys), which have an overriding control on nature of the drainage systems. The catchment is designated as the Blackwater River (Cork/Waterford) Special Area of Conservation (SAC), with a large portion of this also designated as a Freshwater Pearl Mussel (*Margaritifera margaritifera*) SAC Catchment, therefore requiring to achieve high ecological status WFD objectives.

Approximately a quarter of the water supplies to the Study Area come from 5 surface water sources within the Blackwater catchment. The surface water abstractions are on some of the main tributaries of the Blackwater. Conna Regional WRZ has an abstraction from the River Bride, Allow WRZ is supplied from the River Allow, Mitchelstown WRZ abstracts from the Behanagh River, whilst Mallow WRZ has an intake on the Clyda River and a small impounding reservoir source Fiddane Reservoir.

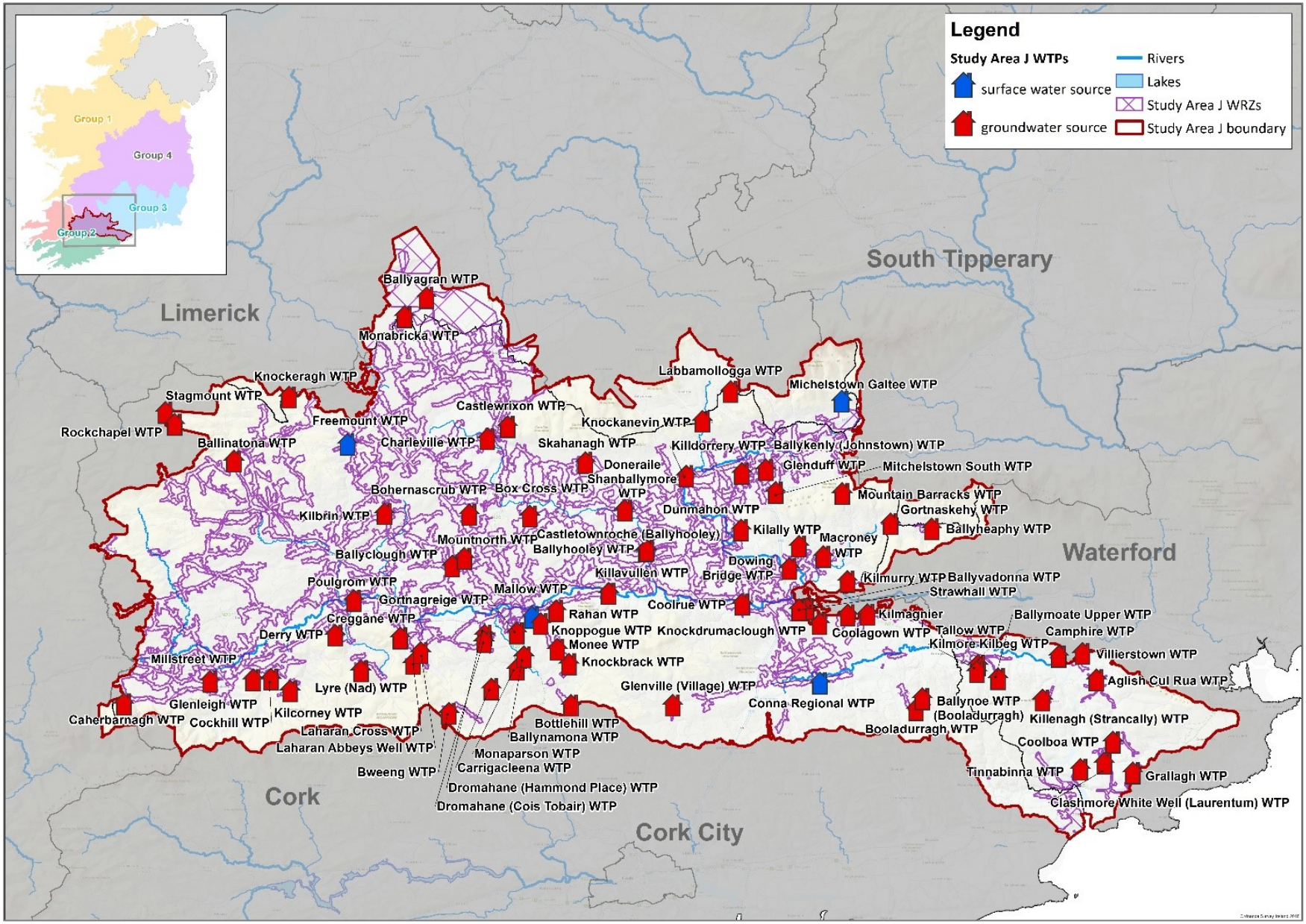


Figure 1.3 SAJ North Cork/ West Waterford Water Supply Study Area

Table 1.1 SAJ Study Area Summary

	Total Population	79,387	**Total Network Length (km)**	1,668	**Number of Water Resource Zones**		62
Counties in Study Area	Cork, Limerick, Waterford						
Principle Settlements	Mallow, Fermoy, Allow Regional, Mitchelstown, Rathluirc (Charleville), Kanturk, Rathcormac, Kilworth, Millstreet, Castlelyons, Newmarket, Bridebridge, Doneraile, Buttevant, Glanworth, Drommahane, Boherbue						
Number of Water Sources	80	**Surface Water Sources**	5		**Groundwater Sources**	75	
Water Treatment Plant	**Source**	**Population**	**WTP Capacity (m^3/day)**	**Quality**	**Quantity**	**Reliability**	**Potential Sustainability**
Ballymoate Upper WTP	Groundwater	98	59	●	●	○	●
Kilmore Kilbeg WTP	Groundwater	23	48	●	○	○	○
Coolboa WTP	Groundwater	338	70	●	●	○	●
Clashmore White Well (Laurentum) WTP	Groundwater	280	92	●	●	○	○
Aglish Cul Rua WTP	Groundwater	239	432	●	○	○	○
Ballyheaphy WTP	Groundwater	40	50	○	○	○	○
Tallow WTP	Groundwater	995	300	●	●	○	○
Camphire WTP	Groundwater	22	170	●	○	○	○
Villierstown WTP	Groundwater	304	322	●	○	○	○

Killenagh (Strancally) WTP	Groundwater	38	80	●	○	○	○
Tinnabinna WTP	Groundwater	93	40	○	●	○	○
Grallagh WTP	Groundwater	56	105	●	●	○	○
Ballyagran WTP	Groundwater	1,233	1,000	○	●	○	●
Rahan WTP	Groundwater	270	158	●	○	○	○
Ballyclough WTP	Groundwater	2,041	454	○	○	○	●
Mountnorth WTP	Groundwater	2,041	1,800	●	○	●	○
Gortnagreige WTP	Groundwater	814	220	●	●	○	○
Coolrue WTP	Groundwater	7,522	4,200	●	●	●	○
Dunmahon WTP	Groundwater	1,007	1,000	●	●	○	●
Ballykenley (Johnstown) WTP	Groundwater	1,044	1,500	●	●	○	○
Knoppogue WTP	Groundwater	39	50	●	○	○	○
Strawhall WTP	Groundwater	10	30	●	○	○	○
Kilbrin WTP	Groundwater	101	100	●	○	●	○
Ballinatona WTP	Groundwater	8,587	8,200	●	●	●	●

Derry WTP	Groundwater	32	75	●	●	○	○
Cockhill WTP	Groundwater	7	10	●	●	○	○
Caherbarnagh WTP	Groundwater	296	400	●	●	●	○
Millstreet WTP	Groundwater	3,519	3,000	●	●	○	●
Creggane WTP	Groundwater	230	96	●	●	●	●
Poulgrom WTP	Groundwater	1,407	700	●	●	○	○
Box Cross WTP	Groundwater	4,977	2,500	●	●	●	○
Mallow WTP	Clyda River Fiddane Reservoir	8,261	5,500	●	●	●	●
Laharan Cross WTP	Groundwater	712	240	●	○	○	○
Laharan Abbeys Well WTP	Groundwater	712	240	●	○	●	●
Killavullen WTP	Groundwater	824	700	●	○	○	○
Dromahane (Cois Tobair) WTP	Groundwater	219	300	●	○	○	○
Dromahane (Hammond Place) WTP	Groundwater	855	488	●	○	○	○
Castletownroche WTP	Groundwater	1,106	1,080	●	●	○	○
Ballyvadonna WTP	Groundwater	18	10	●	●	○	○

Macroney WTP	Groundwater	120	90	○	○	●	○
Kilally WTP	Groundwater	418	200	●	●	●	○
Killdorrery WTP	Groundwater	887	822	●	●	○	○
Downing Bridge WTP	Groundwater	1,646	928	●	●	○	○
Castletownroche (Ballyhooly) WTP	Groundwater	1,218	1,200	○	●	●	○
Doneraile Shanballymore WTP	Groundwater	2,359	3,960	●	●	○	○
Charleville WTP	Groundwater	8,212	8,379	○	●	●	○
Freemount WTP	River Allow	3,329	2,600	●	●	●	●
Castlewrixon WTP	Groundwater	24	12	●	○	○	○
Stagmount WTP	Groundwater	5	10	○	○	○	○
Rockchapel WTP	Groundwater	75	150	●	○	○	○
Monabricka WTP	Groundwater	12	30	●	●	○	○
Labbamollogga WTP	Groundwater	46	16	●	○	○	○
Knockeragh WTP	Groundwater	55	20	○	○	○	○
Skahanagh WTP	Groundwater	66	25	○	●	○	○

Knockanevin WTP	Groundwater	12	20	●	●	○	○
Gortnaskehy WTP	Groundwater	45	30	◐	○	○	○
Mountain Barracks WTP	Groundwater	14	65	●	○	○	○
Mitchelstown Galtee WTP	Behanagh River	2,350	1,600	◐	●	○	●
Mitchelstown South WTP	Groundwater	3,146	1,650	●	●	○	○
Glenduff WTP	Groundwater	26	12	●	○	○	○
Boherascrub WTP	Groundwater	18	10	◐	○	○	○
Kilmagnier WTP	Groundwater	308	110	●	●	○	○
Coolagown WTP	Groundwater	195	45	●	◐	○	○
Knockdrumaclough WTP	Groundwater	83	90	●	○	○	○
Glenleigh WTP	Groundwater	13	10	●	○	○	○
Kilcorney WTP	Groundwater	117	82	●	○	○	○
Lyre (Nad) WTP	Groundwater	359	110	●	●	○	○
Ballinamona WTP	Groundwater	17	12	●	○	○	○
Knockabrack WTP	Groundwater	67	35	●	○	○	○

Monee WTP	Groundwater	96	100	●	○	○	○
Monaparson WTP	Groundwater	33	10	●	○	○	○
Carrigcleena WTP	Groundwater	48	18	●	○	○	○
Bweeng WTP	Groundwater	640	300	●	●	○	●
Bottlehill WTP	Groundwater	97	87	●	○	○	○
Booladurragh WTP	Groundwater	309	139	●	○	○	○
Ballynoe Booladurragh WTP	Groundwater	309	139	●	○	○	○
Glenville (Village) WTP	Groundwater	546	240	●	○	○	○
Conna Regional WTP	River Bride	3,373	2800	●	○	○	○
Kilmurray WTP	Groundwater	55	40	●	●	○	○

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

●	
●	High Risk

2 Scoping the Study Area J

2 Scoping the Study Area

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

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

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

2.1 Water Quality

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

The barriers are an internal gauge and the initial desktop assessments of barrier performance for SAJ 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**
Ballymoate Upper WTP	●	○	●	TBC
Kilmore Kilbeg WTP	●	○	●	○
Coolboa WTP	●	○	●	○
Clashmore White Well (Laurentum) WTP	●	○	◐	○
Aglish Cul Rua WTP	○	○	●	○
Ballyheaphy WTP	○	●	○	TBC
Tallow 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**
Camphire WTP				TBC
Villierstown WTP				
Killenagh (Strancally) WTP				
Tinnabinna WTP				
Grallagh WTP				TBC
Ballyagran WTP				
Rahan WTP				TBC
Ballyclough WTP				
Mountnorth WTP				
Gortnagreige WTP				
Coolrue WTP				
Dunmahon WTP				
Ballykenley (Johnstown) WTP				
Knoppogue WTP				
Strawhall WTP				TBC
Kilbrin WTP				
Ballinatona WTP				
Derry WTP				TBC
Cockhill WTP				TBC
Caherbarnagh WTP				
Millstreet WTP				
Creggane 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**
Poulgrom WTP	●	●	●	●
Box Cross WTP	●	●	●	●
Mallow WTP	●	●	●	●
Laharan Cross WTP	●	●	●	●
Laharan Abbeys Well WTP	●	●	●	●
Killavullen WTP	●	●	●	●
Dromahane (Cois Tobair) WTP	●	●	●	●
Dromahane (Hammond Place) WTP	●	●	●	●
Castletownroche WTP	●	●	●	●
Ballyvadonna WTP	●	●	●	TBC
Macroney WTP	●	●	●	TBC
Kilally WTP	●	●	●	●
Killdorrery WTP	●	●	●	●
Downing Bridge WTP	●	●	●	●
Castletownroche (Ballyhooly) WTP	●	●	●	●
Doneraile Shanballymore WTP	●	●	●	●
Charleville WTP	●	●	●	●
Freemount WTP	●	●	●	●
Castlewrixon WTP	●	●	●	TBC
Stagmount WTP	●	●	●	●
Rockchapel WTP	●	●	●	TBC
Monabricka WTP	●	●	●	TBC

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**
Labbamollogga WTP				
Knockeragh WTP				TBC
Skahanagh WTP				TBC
Knockanevin WTP				TBC
Gortnaskehy WTP				TBC
Mountain Barracks WTP				TBC
Mitchelstown Galtee WTP				
Mitchelstown South WTP				
Glenduff WTP				TBC
Boherascrub WTP				TBC
Kilmurray WTP				
Kilmagnier WTP				TBC
Coolagown WTP				TBC
Knockdrumaclough WTP				TBC
Glenleigh WTP				
Kilcorney WTP				TBC
Lyre (Nad) WTP				
Ballinamona WTP				TBC
Knockabrack WTP				
Monee WTP				
Monaparson WTP				TBC
Carrigcleena 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**
Bweeng WTP				
Bottlehill WTP				
Booladurragh WTP				TBC
Ballynoe WTP (Booladurragh)				TBC
Glenville (Village) WTP				
Conna Regional WTP				

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

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

Based on the barrier assessment, 30 of the 79 Water Treatment Plants in the Study Area are considered to be at high risk of failing to achieve the required standards in relation to primary disinfection (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 limited 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 2 water resource zones, within Study Area J, on the EPA Remedial Action List, namely Mitchelstown WRZ (Mitchelstown Galtee WTP) and Killavullen WRZ.

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

Note the Kilclare WTP and Conna Village WTP provided supply to the Conna Regional WRZ. Due to water quality and source reliability issue at the WTPs, Kilclare WTP and Conna Village WTPs were rationalised to Conna Regional WTP. Monanig WTP provided supply for Monanig and Bartlemy WTP provided supply for Bartlemy were rationalised to Cork City WRZ. Ballycurrane WTP provided supply to Ballycurrane and was rationalised to Clashmore/White Well Laurentum (Coolboa WTP). Monabricka provided supply to Monabricka was rationalised to Castletown Ballyagran WRZ. These were completed after the optioneering works for this study area commenced therefore they are reported on separately in this Technical Report.

Table 2.2 Critical Water Quality Requirements SAJ – North Cork/West Waterford

Critical Water Quality Requirements	Progress
1. Mitchelstown Galtee WTP: The WTP is currently on the RAL due to issues with THMs. IRISH WATER is in the process of providing activated carbon treatment at the WTP to improve the WTPs ability to remove organics.	Ongoing
2. Castletownroche (Ballyhooly) WTP: The water treatment process at the plant was inadequate due to insufficient protection against cryptosporidium. The upgrades have provided a more advanced water treatment process, improving the drinking water quality for the area.	Complete
3. Ballydesmond WTP, Kiskeam WTP and Ballinatona WTP: Due to Water Quality and reliability issues associated with the sources for the Ballydesmond WTP and Kiskeam WTP these WTPs were rationalised to the Ballinatona WTP in Newmarket and the Ballydesmond WTP and Kiskeam WTP were taken out of service.	Complete
4. Killavullen RAL The Killavullen WTP is currently on RAL due to high turbidity issues. IRISH WATER is in the process of providing temporary additional storage during periods of turbidity exceedance. The permanent solution is to rationalise Killavullen to Mallow WRZ.	Ongoing
5. Reservoir Cleaning Programme A major reservoir cleaning programme has been undertaken at 43 sites, which has reduced network water quality issues.	Complete
6. Disinfection Programme: In 2016, Irish Water completed a nationwide review of all water treatment plants where disinfection upgrades were required, followed by a programme of works to deliver the required upgrades. To date, the disinfection programme has completed upgrade works at 20 of the 62 WRZs in SAJ, based on assessed priority basis. • Castletownroche (Ballyhooly) WTP • Ballykenley (Johnstown) WTP • Ballinatona WTP • Poulgrom WTP • Coolrue WTP • Mitchelstown Galtee WTP • Ballynoe WTP • Monaparson WTP • Ballinamona WTP • Knockeragh WTP • Dunmahon WTP • Bweeng WTP • Aglish Cul Rua WTP • Ballyheaphy WTP • Camphire WTP • Coolboa WTP • Killenagh (Strancally) WTP • Tallow WTP • Villierstown WTP • Ballyagran WTP Any requirements within the remaining 42 supplies will be identified via Drinking Water Safety Plans with solutions developed as part of the NWRP.	Complete

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

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

2.2 Water Quantity – Supply Demand Balance

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

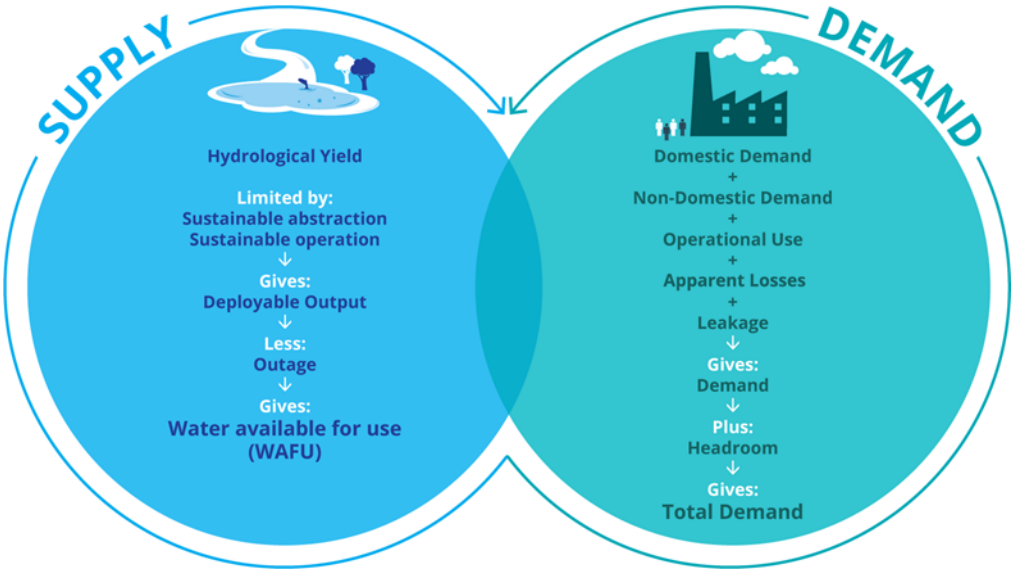


Figure 2.1 Supply Demand Balance

For each of the 62 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 SAJ manifest in the following ways:

1. **Inappropriate standards and levels of risk for a strategic water supply:** As water supply is essential for public health, Irish Water must ensure appropriate standards of supply and be able to cope with drought conditions, peak events, and maintenance of assets. This requires adequate reserve capacity in our supplies to provide a 1 in 50 Level of service. At present, not all supplies within this Study Area meet the required levels of reserve capacity. However, due to the lack of historical monitoring, particularly in relation to groundwater supplies, some of the deficits may be data driven.
   Day to day operations: 31 out of 62 water resource zones in the area suggest a supply demand balance deficit (based on a “do nothing” approach) under present & future scenarios. While

sufficient during normal weather conditions, several would fail in drought. During the drought in summer 2018, all of our groundwater supplies were monitored due to falling levels in the groundwater bodies, and a few of the supplies were severely impacted.

A summary of the SDB deficit across all 62 Water Resource Zones is summarised in Table 2.3. The water resources zones are detailed in Appendix L of the Framework Plan - Supply Demand Balance Summaries.

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

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Ballymoate Upper	3100SC0121	98	-12	-13	-14	-15	-16	-16
Kilmore-Kilbeg	3100SC0106	23	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Clashmore / White Well Laurentum	3100SC0084	681	-104	-108	-113	-117	-121	-124
Aglish Cul Rua	3100SC0082	239	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Ballyheaphy	3100SC0052	40	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Tallow	3100SC0020	1,045	-109	-114	-121	-128	-135	-141
Camphire	3100SC0017	22	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Villierstown	3100SC0016	304	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Strancally	3100SC0010	38	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Tiknock\Tinnabina	3100SC0008	93	-11	-11	-12	-13	-14	-14
Grallagh	3100SC0007	56	-35	-37	-38	-39	-39	-40
Castletown Ballyagran Water Supply	1900SC0018	1,233	-948	-963	-974	-983	-992	-999
Rahan	0500SC0186	270	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Ballyclough & Mount North	0500SC0185	2,041	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Gortnagreige	0500SC0182	814	-34	-40	-48	-56	-64	-70
Fermoy	0500SC0176	7,522	-1,004	-1,059	-1,110	-1,161	-1,211	-1,251
Glanworth /Ballykenley/Johnstown	0500SC0175	2,051	-1,036	-1,072	-1,088	-1,103	-1,118	-1,130
Knoppogue	0500SC0166	39	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Strawhall	0500SC0165	10	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Kilbrin Garran an Darra	0500SC0144	101	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Newmarket	0500SC0143	9,059	-5,139	-5,154	-5,289	-5,383	-5,474	-5,546
Toureen Derry	0500SC0139	32	-93	-95	-95	-96	-96	-96
Millstreet	0500SC0138	3,822	-1,587	-1,483	-1,530	-1,562	-1,593	-1,617
Banteer	0500SC0136	1,637	-369	-380	-391	-402	-413	-421
Mallow	0500SC0131	13,301	-2,205	-2,416	-2,592	-2,769	-2,944	-3,084
Lombardstown Glantane	0500SC0130	712	-12	-20	-27	-34	-40	-46
Killavullen	0500SC0128	824	-52	-60	-66	-71	-76	-81
Dromahane / Kilcolman / Cois Tobair	0500SC0126	1,168	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Castletownroche	0500SC0124	1,106	-437	-452	-462	-471	-479	-487
Ballyvadonna	0500SC0122	18	-3	-3	-3	-4	-4	-4
Macroney	0500SC0121	135	-10	-11	-12	-13	-13	-14
Ballyhooly	0500SC0118	4,170	-1,021	-1,067	-1,096	-1,126	-1,156	-1,179
Charleville / Doneraile	0500SC0114	10,572	-4,076	-4,143	-4,300	-4,411	-4,518	-4,604
Allow Regional	0500SC0113	3,329	-761	-795	-819	-843	-866	-885
Castlewrixon	0500SC0110	24	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Stagmount	0500SC0109	5	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Rockchapel	0500SC0108	75	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Monabricka	0500SC0107	12	-38	-39	-39	-39	-39	-39
Labbamollogga	0500SC0106	46	No Deficit	0	0	-1	-1	-1
Knockeragh	0500SC0105	55	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Skahanagh	0500SC0104	66	-13	-13	-14	-14	-15	-15

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Knockanevin	0500SC0103	12	-3	-3	-3	-4	-4	-4
Gortnaskehy	0500SC0102	45	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Mountain Barracks	0500SC0101	14	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Mitchelstown	0500SC0100	5,496	-- 1,409	-1,506	-1,587	-1,640	-1,691	-1,732
Glenduff	0500SC0099	26	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Boherascrub	0500SC0096	18	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Kilmurry (Mitchelstown)	0500SC0092	55	-10	-10	-10	-11	-11	-11
Kilmagnier	0500SC0090	308	-29	-30	-32	-33	-35	-36
Coolagown	0500SC0089	195	-6	-6	-7	-8	-10	-11
Knockdrumaclough	0500SC0088	83	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Glenleigh	0500SC0076	13	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Kilcorney	0500SC0075	117	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Lyre	0500SC0066	359	-97	-99	-102	-104	-107	-109
Ballinamona	0500SC0065	17	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Monee & Knockabrack	0500SC0064	163	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Monaparson	0500SC0062	33	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Carrigcleena	0500SC0061	48	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Bweeng	0500SC0056	640	-204	-211	-217	-222	-227	-231
Bottlehill	0500SC0006	97	No Deficit	0	-1	-2	-2	-3
Ballynoe	0500SC0004	309	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Conna Regional	0500SC0002	4,451	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit

As outlined in Chapter 4 of the Framework Plan, the estimated population currently living in each WRZ has been based on the 2016 Census data. Forecasts for future populations have been based on draft

growth projections from the National Planning Framework (NPF), and updated information from the Regional Spatial and Economic Strategies (RSES) and Local Authority Planning sections (where available)

The target 1 in 50 level of service in the region were applied in each case, along with the corresponding requirements for reserves, indicating that our supplies are operating with a cumulative SDB deficit of approximately 20,864 m^3/day for the Study Area. As a result, while we can continue to supply water, the water supplies in this area may come under pressure, particularly in drought conditions. In addition, there may be ongoing reliability issues.

This situation will further deteriorate over time due to climate change driven reductions in water resources, together with increased demand due to population growth. If we do nothing, the SDB deficit is estimated to increase to approximately 24,041 m^3/day by 2044.

Our ongoing activities to improve the Supply Demand Balance in SAJ are prioritised as:

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

2.3 Water Supply Reliability

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

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

To date, a significant amount of watermain rehabilitation has been carried out across Study Area J. 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, several raw water sources experienced issues; raw water levels dropped significantly at Charleville WTP boreholes and at the surface water intake to Freemount WTP. In these locations service interventions were required in order to ensure supply to customers could be maintained. Ballinatona WTP, Kilbrin WTP and Mountnorth WTP were also identified at potential drought.

During our needs assessment for SAJ, Irish Water has identified a number of critical requirements for upgrades to the existing asset base, including storage and trunk main requirements. Progress to date on these projects is summarised in Table 2.4.

Table 2.4 SAJ Critical Infrastructure Projects and Need Identification

Critical Requirement	Progress
1. **Fermoy Trunk Main:** 1 no. 300mm asbestos cement trunk main to supply potable water from Coolrue Reservoir, through Fermoy town centre, towards Uplands Reservoir and Clondulane Reservoir. A 2km section of this trunk main has been documented as having regular burst issues averaging 3 breaks/km/year. A failure of this trunk main	**Need Identified**

would ultimately result in disruption to a population in excess of 7,522 in Fermoy town and its environs.	
2. Doneraile Rising Main: 1 no. 300mm asbestos cement trunk main* to supply potable water from Doneraile Shanballymore WTP to Skaghardgannon Reservoir. A 3km section of this trunk main has been documented as having regular burst issues averaging 2 breaks/km/year. A failure of the incomplete section trunk main would ultimately result in disruption to a population in excess of 629 in Doneralie village and its environs. * *It should be noted that work is documented as having started in 2018 on this trunk main but it was not completed. The extent of the works is unknown.*	**Need Identified**
3. Storage: Currently there are 26 supplies within SAJ with no treated water storage. These are generally our smaller supplies and solutions to resolve the storage issues will include connecting these supplies to larger supplies with existing storage or in some cases of the provision of localised storage.	**Assessment Complete**
4. 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 Irish Waters National Leakage Reduction Programme across all Study Areas.

2.4 Water Supply Sustainability

The water supplies within the region were developed over time to address the needs of the local populations and to support growth and development.

As outlined at Section 3.7.2 of the Framework Plan, the Government is currently developing new legislation dealing with water abstractions. While at the end of 2022, the government passed the Water Environment (Abstractions and Associated Impoundments) Act, 2022, this act has not yet commenced and its associated regulations and guidelines which will further detail the types of assessment and national methodology to be used are not yet in place. As this legislation is still being developed, we do not yet have full visibility of the future regulatory regime. We have therefore not progressed through a theoretical licencing process on a site by site basis and cannot reliably include an estimation of sustainable abstraction within the SDB calculations. Instead, we use the hydrological yield, water treatment capacity and bulk transfer limitations in our calculation of DO. This assessment procedure is set out at Appendix C of the Framework Plan, and in line with a precautionary approach.

To understand the potential impact of the pending Abstraction Legislation on the SAJ Supplies, we have assessed the potential impacts on our 5 no. surface water abstractions: River Bride (Conna Regional), Clyde River (Mallow), Fiddane Reservoir (Mallow), Behanagh River (Mitchelstown), and River Allow (Allow Regional).

As noted in Section 1.2 one groundwater abstraction is from an infiltration gallery located along the Blackwater River. While this abstraction has been classified as a groundwater abstraction, it is noted that the source of supply is both surface water and groundwater and the potential impact of this abstraction has also been considered.

Table 2.5 presents the findings of this assessment in order to indicate the potential reductions to abstraction that may be required at our existing surface water supplies. The table presents our current abstraction levels[1], our source hydrological yield[2], and our estimated potential sustainable abstraction[3] amount which the source may be limited to in the future.

Based on this initial assessment, the volumes of water abstracted at River Bride (Conna Regional), Clyde River (Mallow), Fiddane Reservoir (Mallow), Behanagh River (Mitchelstown), and River Allow (Allow Regional) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, sustainable abstraction quantities will be adjudicated by the EPA. We have assumed, given the need to maintain supplies, that a transition to new abstraction quantities would likely take place in the medium term.

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

Description	River Bride (Conna Regional)	Clyde River (Mallow)	Fiddane Reservoir (Mallow)	Behanagh River (Mitchelstown)	River Allow (Allow Regional)	Blackwater River (Fermoy)
Current abstraction (m^3/day)	2,567	5,042	5,042	1,467	2,383	3,850
Hydrological yield (m^3/day)	15,990	10,516	873	1,341	3,023	180,093
Theoretical Future abstraction (m^3/day)	4,958	1,523	238	244	595	25,772

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

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

Description	River Bride (Conna Regional)	Clyde River (Mallow)	Fiddane Reservoir (Mallow)	Behanagh River (Mitchelstown)	River Allow (Allow Regional)	Blackwater River (Fermoy)
Potential change SDB[4] (m^3/day)	None	-3,604	-3,604	-939	-1,897	None

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

[1] Based on WTP 22hr (DYCP) capacity
[2] Our hydrological yield estimate is the 'safe' yield calculated to be available during a 1 in 50 year drought event. We use this figure in the SDB calculations to determine whether a WRZ is projected to be in deficit or surplus
[3] Our sustainable or 'allowable' abstraction estimate is based on limiting abstraction to 5-15% of the Q95 low flow for river sources or 10% of Q50 inflow for lakes. This is based on our best understanding of how the EPA may enforce future abstraction licencing applying UKTAG guidance.
[4] Based on potential changes to the projected 2044 Dry Year Critical Period (DYCP) scenario

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

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

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

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

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

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

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

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

Quality	Upgrades required at all WTPs
Quantity	Nett leakage reduction 369 m3/day in the region over the next 10 years Additional Leakage Targets of 19.2 Ml/d to achieve SELL and reduce leakage levels to 21**%** of demand in WRZs with demand in excess of 1,500m^3/day Interim additional supplies of 20.9 Ml/d within 10 years
	Total of 24 Ml/d additional supplies beyond the 10 year horizon

Reliability (In addition to projects in	Continued network upgrades and improvements in the bulk and distribution networks and storage
Sustainability	Based on our initial desktop assessment, the volumes of water abstracted at Clyde River (Mallow), Fiddane Reservoir (Mallow), Behanagh River (Mitchelstown), and River Allow (Allow Regional), may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA. Over the coming years, Irish Water will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources.

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

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

3 Solution Types Considered in Study Area J

3 Solution Types Considered in Study Area J

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

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

Table 3.1 SELL Targets for WRZ in SAJ

WRZ	Net Leakage Reduction applied to SDB(m^3)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m3/d (m3)	Total Leakage Targets (m3)
Charleville / Doneraile	123	5,464	5,587
Millstreet	123	1,389	1,521
Newmarket	123	3,068	3,191
Ballynoe		15	15
Inch		6	6
Bweeng		46	46
Mitchelstown		1,101	1,101
Knockanevin		3	3
Monabricka		10	10
Stagmount		2	2
Ballyhooly		1,434	1,434
Macroney		20	20
Ballyvadonna		2	2
Castletownroche		67	67
Killavullen		142	142

WRZ	Net Leakage Reduction applied to SDB(m^3)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m3/d (m3)	Total Leakage Targets (m3)
Lombardstown Glantane		3	3
Mallow		3,156	3,156
Glanworth /Ballykenley/Johnstown		1,641	1,641
Fermoy		1,012	1,012
Castletown Ballyagran Water Supply		109	109
Grallagh		33	33
Camphire		5	5

3.2 Water Conservation

At present, Irish Water is conducting pilot studies in relation to water conservation stewardship in businesses and is actively pursuing Conservation Education Awareness Campaigns and partnerships. During drought conditions in 2018 and 2020, a Water Conservation Order was implemented in order to protect our water supplies and reduce pressure on the natural environment during this period. We will continue to promote 'Water Conservation Activities', collecting and monitoring data over a number of years to assess the benefits. As part of the NWRP – Framework Plan, we have not applied reductions to the SDB deficit for unquantifiable water conservation gains, however as stipulated within the Consultation Report prepared in relation to the NWRP- Framework Plan, IRISH WATER 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 SAJ and include:

- Stand-alone groundwater options, across the region
- Stand-alone surface water options, across the region
- Transfers
- Rationalisations
- Conjunctive use
- Water Treatment Plant Upgrades for water quality purposes
- Advanced Leakage Reductions
- Cross Study Area Supply
- Reservoirs
- Other

4 Option Development SAJ

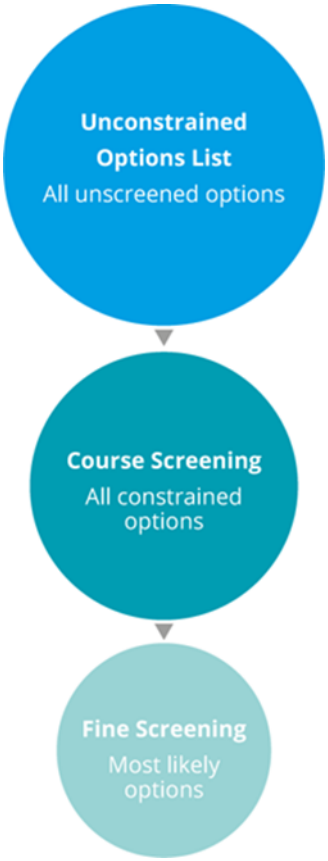
4 Option Development for Study Area J

This chapter describes how our options assessment methodology was applied to produce a Feasible Options list to meet the identified needs.

The purpose of our options assessment process, as outlined in Chapter 8 of the Framework Plan, is to consider the widest practicable range of solutions to resolve identified need within a given area. A suitable screening criterion is then applied to filter out any options that are not feasible, based on sustainability (environmental and social impacts), resilience or deliverability. As sustainability is at the heart of our plan, environmental and social assessment criteria are included at the earliest stages of the screening process. At the outset of the process, some fundamental rules are applied even before screening begins to ensure the protection of the environment. For example, having regard to WFD objectives, Irish Water does not allow for any inter-catchment raw water transfers due to the high risk of transferring invasive non-native species (INNS) between catchments and non-compliance with WFD objectives.

The options assessment screening process involves the following:

- Developing a long list of unconstrained options – Unconstrained Options constitute all of the possible solutions, which either fully or partly resolve a water supply deficit, regardless of any cost, environmental or social constraints. In developing the Unconstrained List, we identify options that are applicable to meet the needs of the study area;
    - Coarse Screening – We filter the unconstrained options using a coarse screening assessment where we remove any options that fail to meet desktop assessment criteria under: Resilience, Deliverability and Flexibility or Sustainability (Environmental and Social Impacts); and,
    - Fine Screening – We filter the remaining options from the coarse screening exercise through a fine screening assessment, which includes 33 detailed questions, related to environmental objectives identified for the SEA (including biodiversity, the water environment and requirements under climate change adaptation) as well as Resilience, Deliverability and Progressibility.



The coarse screening and fine screening questions, and the associated scoring criteria, are included in Chapter 3 and Appendix A of the Study Area Environmental Report.

4.1 Developing a List of Unconstrained Options

At the start of our screening process, we conduct a specialist desktop review of groundwater bodies and surface water catchments. This allows us to understand potential additional availability at existing water abstractions or to identify any potential new water sources within the Study Area; as summarised in Table 4.1.

Table 4.1 Desktop Assessments for Unconstrained Options

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

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

For SAJ, 503 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 SAJ Unconstrained Options

No. of Options	Option Type
201	Groundwater
43	Surface water
1	Conjunctive use
45	Transfer
16	Cross Study Area Supply
143	Rationalisation
21	Advanced Leakage Reductions
31	Upgrade WTP (WQ only)
1	Reservoirs
1	Other

The 503 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues

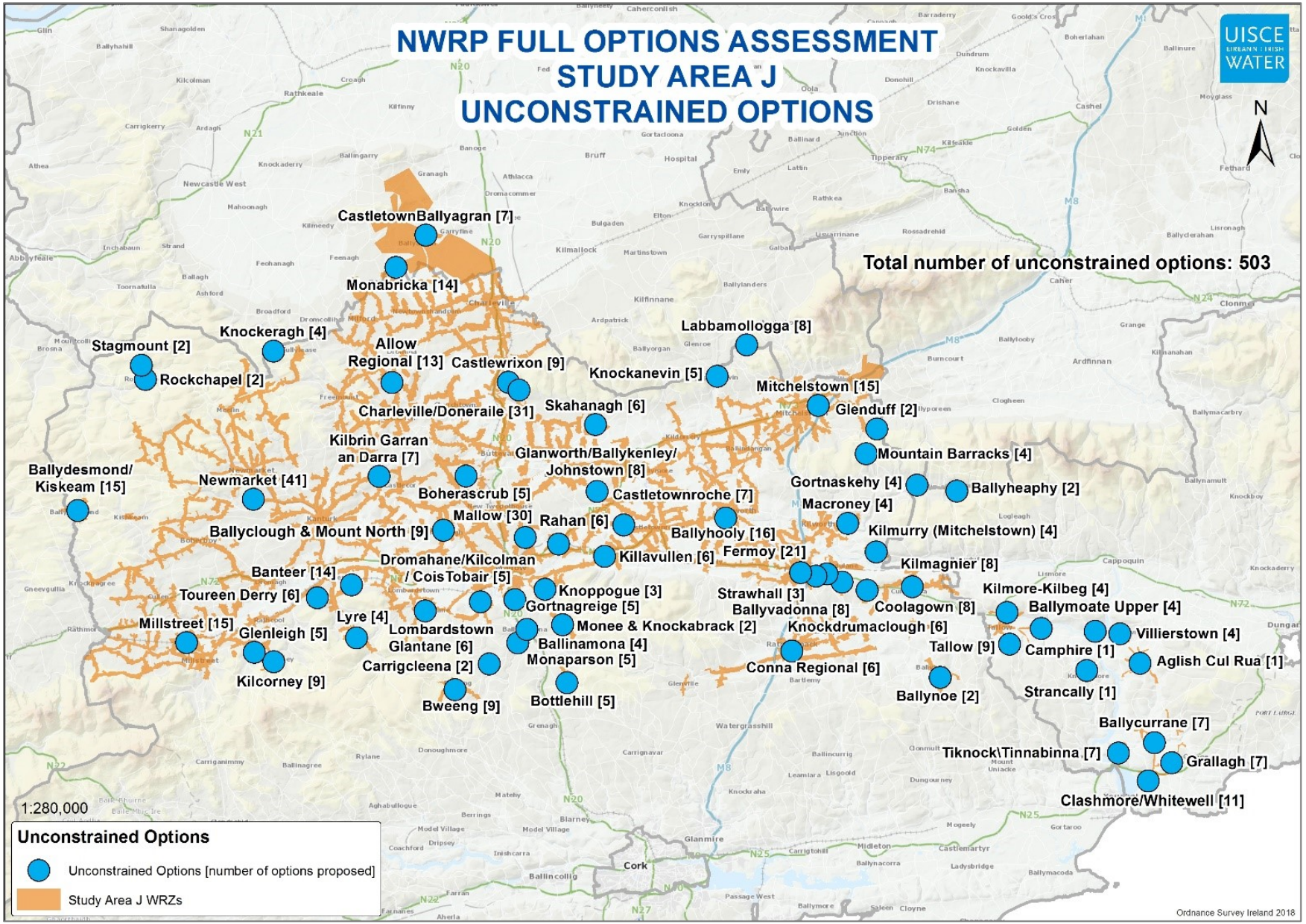


Figure 4.1 SAJ Unconstrained Options

4.2 Coarse Screening

The 503 identified Unconstrained Options were assessed through Coarse Screening against the criteria of:

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

The Course Screening process is summarised in Chapter 8 of the Framework Plan. The Coarse Screening assessments were conducted by a specialist team, including Engineers, Hydrologists, Hydrogeologists, Ecologists and Environmental Scientists.

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

Example Rejected Option

Option SAJ-009

New SW abstraction from the Dalua River and new WTP to partly supply deficit.

Rejection Reason

The River Duala 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.

The remaining 342 options were progressed to further assessment through the Fine Screening process. The rejected options are summarised in Annex A of this Technical Report. Annex A records the criteria against which the rejected options were assessed as having a "red" score for the purposes of the coarse screening exercise (as explained in more detail in Chapter 8 of the Framework Plan), and accordingly were not brought forward at the coarse screening stage. The options remaining after Coarse Screening are summarised by type in Table 4.3.

Table 4.3 SAJ Remaining Options after Course Screening

No. of Options	Option Type
151	Groundwater
19	Surface water
1	Conjunctive use

No. of Options	Option Type
36	Transfer
106	Rationalisation
29	Upgrade WTP (WQ only)

4.3 Fine Screening

The 342 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, a further two options were rejected, with the remaining 340 options considered to be feasible and brought forward to desktop outline design and costing. These are summarised in Table 4.4 and shown spatially in Figure 4.2.

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

No. of Options	Option Type
151	Groundwater
19	Surface water
1	Conjunctive use
34	Transfers
106	Rationalisation
29	Upgrade WTP (WQ only)

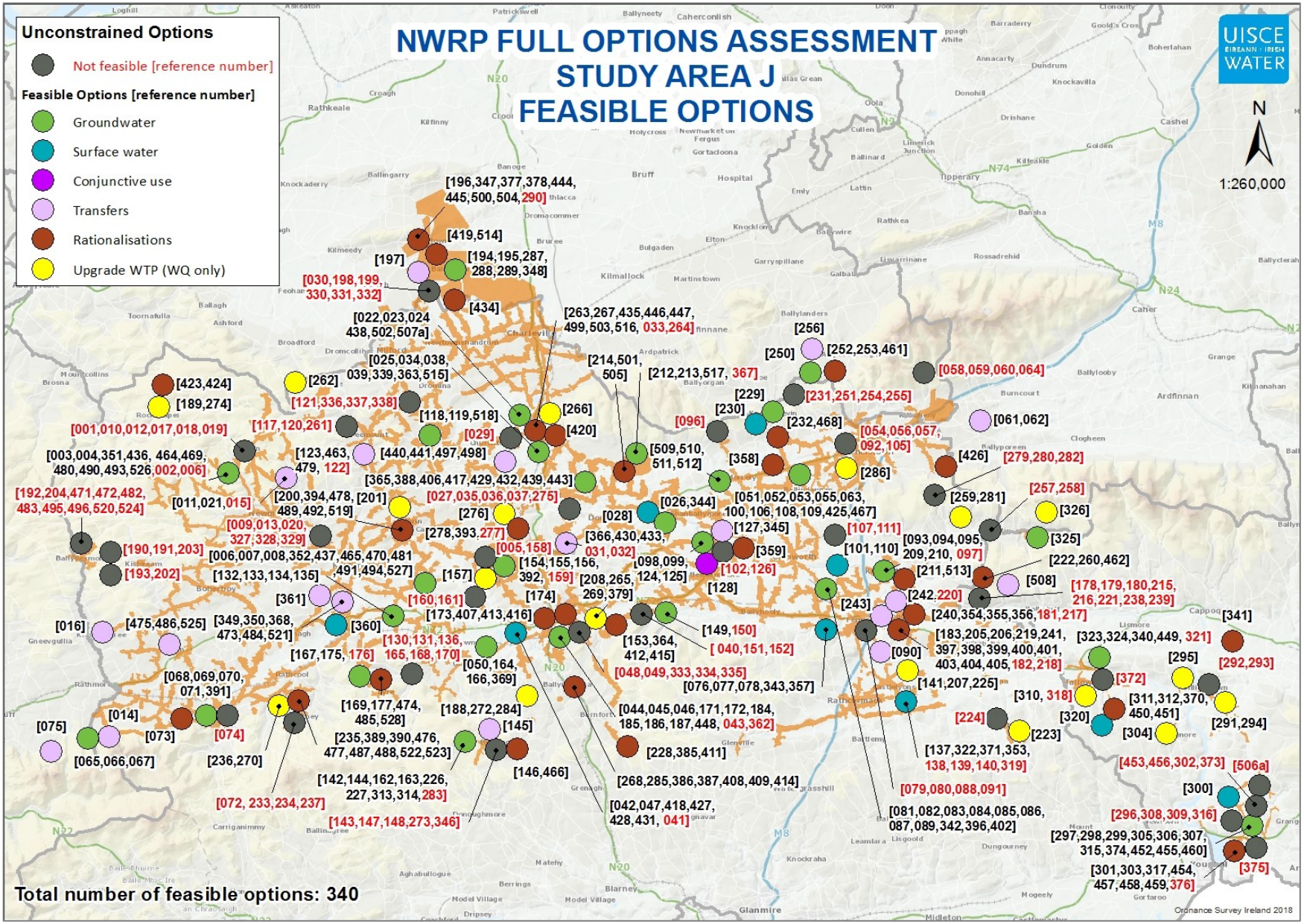


Figure 4.2 SAJ Spatial Overview of Feasible Options

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 estimated SDB deficit in the region ranges between 20,864 m^3/d in 2019 during dry conditions, to a maximum of 24,041 m^3/d in 2044 during dry conditions. During the options assessment stage, a total of 503 unconstrained options were assessed. Of these, 163 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
47	Resilience, Deliverability, Flexibility & Sustainability
39	Deliverability & Flexibility
77	Other

The remaining 340 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 1. From this table it can be noted that there are 104 WRZ Options and 236 options which can be merged to form 90 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 SAJ Feasible Options Summary

Water Resource Zone Name	Option Type	
	WRZ Option	SA Grouped Option
Allow Regional	1	5
Ballymoate Upper	1	3
Kilmore-Kilbeg	1	3
Clashmore / White Well Laurentum	3	3
Aglish Cul Rua	1	0
Ballyheaphy	1	1

Water Resource Zone Name	Option Type	
	WRZ Option	SA Grouped Option
Tallow	2	3
Camphire	1	0
Villierstown	1	1
Strancally	1	0
Tiknock\Tinnabina	3	2
Grallagh	2	2
Castletown Ballyagran	3	3
Rahan	1	3
Ballyclough & Mount North	1	4
Gortnagreige	2	3
Fermoy	3	10
Glanworth /Ballykenley/Johnstown	3	2
Knoppogue	1	2
Strawhall	1	2
Kilbrin Garran an Darra	1	6
Newmarket	1	21
Toureen Derry	1	4
Millstreet	4	8
Banteer	1	9
Mallow	5	15
Lombardstown Glantane	4	1

Water Resource Zone Name	Option Type	
	WRZ Option	SA Grouped Option
Killavullen	1	2
Dromahane / Kilcolman / Cois Tobair	1	4
Castletownroche	3	3
Ballyvadonna	2	6
Macroney	2	2
Ballyhooly	4	8
Charleville / Doneraile	6	15
Castlewrixon	1	8
Stagmount	1	1
Rockchapel	1	1
Monabricka	2	10
Labbamollogga	1	4
Knockeragh	1	1
Skahanagh	2	4
Knockanevin	1	2
Gortnaskehy	1	1
Mountain Barracks	1	0
Mitchelstown	2	6
Glenduff	1	1
Boherascrub	1	2
Kilmurry (Mitchelstown)	1	3

Water Resource Zone Name	Option Type	
	WRZ Option	SA Grouped Option
Kilmagnier	2	3
Coolagown	2	3
Knockdrumaclough	1	5
Glenleigh	1	4
Kilcorney	1	5
Lyre	1	1
Ballinamona	1	3
Monee & Knockabrack	1	1
Monaparson	1	3
Carrigcleena	1	0
Bweeng	2	3
Bottlehill	2	3
Ballynoe	1	0
Conna Regional	1	2

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 J.

5.1 Approach Development

5.1.1 Introduction to Approach Development

The purpose of the NWRP is to examine all potential options that could be used to resolve issues within the water resource zone (unconstrained options) and then to eliminate those that are not feasible or that have identifiable environmental issues at a desktop level (options assessment screening). Of the remaining feasible options Irish Water's next step is to assess a specified number of approaches to resolve need across the Study Area. An approach is a way of configuring an option or options to meet the deficit focused on a particular outcome. For example, a "Least Carbon" approach would be the option or combination of options that would involve the least embodied and operational carbon load over the lifetime of the option. As part of the NWRP, Irish Water considers six approaches, as summarised in Table 5.1.

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

Table 5.1 The Six Approaches

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

Approaches Tested	Description	Policy Driver
Quickest Delivery	Based on an estimate of the time taken to bring an option into operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening This is particularly relevant where an option might be required to address an urgent Public Health issue.	Statutory Obligations under the Water Supply Act and Drinking Water Regulations
Best Environmental	This is the option or combination of options with the highest total score across the 19 No. SEA MCA sub-criteria questions.	SEA Directive and Water Framework Directive
Most Resilient	This is the option or combination of options with the highest total score against the resilience criteria.	National Adaptation Framework and Climate Action Plan
Lowest Carbon	This is the option or combination of options with the lowest embodied and operational carbon cost.	Climate Action Plan

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

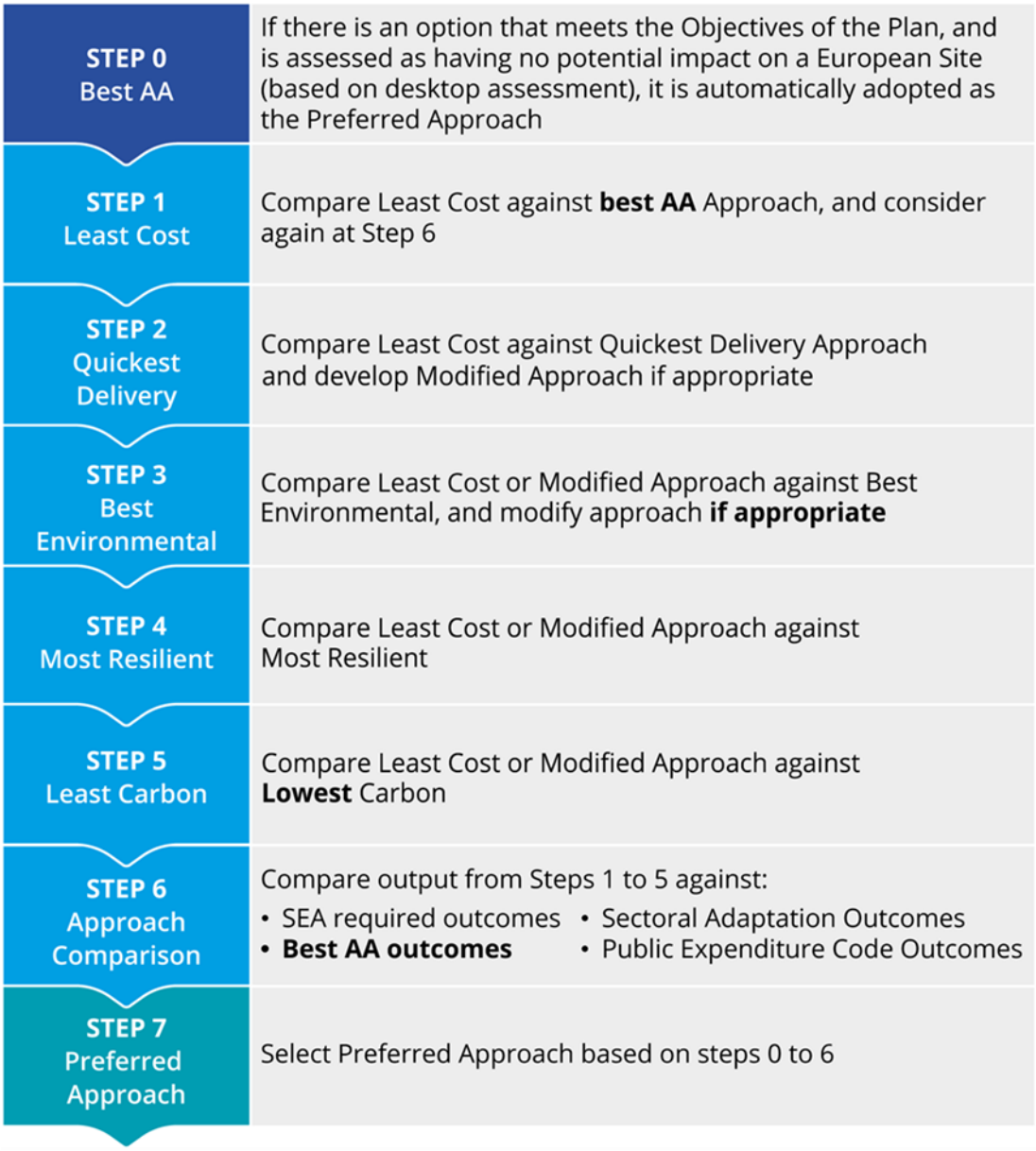


Figure 5.1 Figure of the 7 step assessment process

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

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

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

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

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

5.2 Preferred Approach Development Process for Study Area J

5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this Technical Report there are 340 feasible options. 104 of these options are WRZ Options while 236 options are merged to form 90 Study Area Options. Table 5.2 outlines the 104 WRZ options for SAJ, 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 SAJ Feasible Options

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford	
	Option Code	Option Description
Aglish Cul Rua	SAJ-291	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Allow Regional	SAJ-118	New GW abstraction (karstic) and new WTP to supply full deficit. Decommission Freemount WTP.
Ballinamona	SAJ-269	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Ballyclough & Mount North	SAJ-157	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.
Ballyheaphy	SAJ-326	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Ballyhooly	SAJ-098	Increase GW abstraction from existing Spring and upgrade Castletownroche (Ballyhooly) WTP to supply deficit.
Ballyhooly	SAJ-100	New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit.
Ballyhooly	SAJ-093	Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP to supply deficit.
Ballyhooly	SAJ-101	New SW abstraction from Funshion River and new WTP to supply deficit.
Ballymoate Upper	SAJ-323	Increase GW abstraction from Ballyhamlet BH and upgrade Ballymoate Upper WTP.
Ballynoe	SAJ-223	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Ballyvadonna	SAJ-238	Increase GW abstraction from Ballyvadonna BH and upgrade Ballyvadonna WTP to supply deficit.
Ballyvadonna	SAJ-239	New GW abstraction (poorly productive bedrock) and new WTP to supply deficit.
Banteer	SAJ-132	Increase GW abstraction from Poulgrom springs and upgrade Poulgrom WTP to supply deficit.

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford	
	Option Code	Option Description
Boherascrub	SAJ-276	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Bottlehill	SAJ-226	Increase GW abstraction from Bottlehill BH and upgrade Bottlehill WTP to supply deficit.
Bottlehill	SAJ-227	New GW abstraction and new WTP to supply deficit.
Bweeng	SAJ-142	Increase GW abstraction from existing BH and upgrade Bweeng WTP to supply deficit.
Bweeng	SAJ-144	New GW abstraction and new WTP to supply deficit.
Camphire	SAJ-295	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Carrigcleena	SAJ-272	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Castletown Ballyagran Water Supply	SAJ-287	Increase GW abstraction at Ballyagran BH and upgrade Ballyagran Pump Station WTP to supply deficit.
Castletown Ballyagran Water Supply	SAJ-288	New GW abstraction (karstic) and new WTP to supply deficit.
Castletown Ballyagran Water Supply	SAJ-289	New GW abstraction from Ballingarry groundwater body (productive fissured bedrock) and new WTP
Castletownroche	SAJ-124	Increase GW abstraction from spring and upgrade Castletownroche WTP.
Castletownroche	SAJ-125	New GW abstraction and new WTP to supply deficit.
Castletownroche	SAJ-128	Conjunctive use of existing spring and trial well and upgrade existing Castletownroche WTP.
Castlewrixon	SAJ-266	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Charleville / Doneraile	SAJ-022	Increase GW abstraction from Charleville BHs and upgrade Charleville WTP to partly supply deficit.
Charleville / Doneraile	SAJ-025	Increase GW abstraction from Clogher Spring and upgrade Doneraile Shanballymore WTP.
Charleville / Doneraile	SAJ-028	New SW abstraction from Awbeg River and new WTP to supply deficit.
Charleville / Doneraile	SAJ-427	New SW from River Blackwater, new WTP and new network to supply Charleville/ Doneraile deficit.
Charleville / Doneraile	SAJ-438	New GW abstraction and upgrade existing Charleville WTP to supply deficit.
Charleville / Doneraile	SAJ-507a	New GW and upgrade Charleville WRZ to supply deficit.
Clashmore/Whitewell	SAJ-298	Increase GW abstraction from Laurentum spring and upgrade Clashmore White Well (Laurentum) WTP to supply deficit.
Clashmore/Whitewell	SAJ-299	New GW abstraction in karstic region and new WTP to supply deficit.
Clashmore/Whitewell	SAJ-297	Increase GW abstraction from Ballynamultina BH and upgrade Coolboa WTP to supply deficit.
Conna Regional	SAJ-141	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.
Coolagown	SAJ-215	Increase GW abstraction from existing BH and upgrade Coolagown WTP to supply deficit.
Coolagown	SAJ-216	New GW abstraction and new WTP to supply deficit.
Dromahane / Kilcolman / Cois Tobair	SAJ-188	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford	
	Option Code	Option Description
Fermoy	SAJ-076	New SW abstraction from Blackwater River and new WTP to supply deficit.
Fermoy	SAJ-089	New GW abstraction (karstic) and new WTP to supply deficit.
Fermoy	SAJ-342	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Flood defence required at Project Level.
Glanworth / Ballykenley/Johnstown	SAJ-108	New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit. New Storage at Dunmahon.
Glanworth / Ballykenley/Johnstown	SAJ-110	New SW abstraction from Funshion River and new WTP to supply deficit.
Glanworth / Ballykenley/Johnstown	SAJ-109	New GW abstraction (karstic) and new WTP to supply deficit.
Glenduff	SAJ-286	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Glenleigh	SAJ-270	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Gortnagreige	SAJ-171	Increase GW abstraction from Gortnagraige BH and upgrade Gortnagraige WTP to supply deficit.
Gortnagreige	SAJ-172	New GW abstraction (karstic) and new WTP to supply deficit.
Gortnaskehy	SAJ-259	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Grallagh	SAJ-305	Increase GW abstraction from Grallagh BH and upgrade Grallagh WTP to supply deficit.
Grallagh	SAJ-307	New GW abstraction from karstic region and upgrade WTP
Kilbrin Garran an Darra	SAJ-201	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Kilcorney	SAJ-236	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Killavullen	SAJ-149	Increase GW abstraction and upgrade Killavullen WTP to supply deficit.
Kilmagnier	SAJ-178	Increase GW abstraction from existing no. 2 boreholes and upgrade Kilmagnier WTP to supply deficit.
Kilmagnier	SAJ-179	New GW abstraction in the karstic region north of Kilmagnier and new WTP to supply deficit.
Kilmore-Kilbeg	SAJ-310	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Kilmurry (Mitchelstown)	SAJ-221	Increase GW abstraction from Kilmurry BH and upgrade Kilmurray WTP to supply deficit.
Knockanevin	SAJ-229	Increase GW abstraction from Knockanevin BH and upgrade existing Knockanevin WTP to supply deficit.
Knockdrumaclough	SAJ-207	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Knockeragh	SAJ-262	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Knoppogue	SAJ-208	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Labbamollogga	SAJ-250	Increase GW abstraction from Labbamollogga BH and upgrade Labbamollogga WTP to supply deficit.

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford	
	Option Code	Option Description
Lombardstown Glantane	SAJ-162	Increase GW abstraction from Kilgobnet (Spring) and upgrade Laharan Abbeys Well WTP to supply deficit.
Lombardstown Glantane	SAJ-163	Increase GW abstraction from Laharan Cross Spring and upgrade Laharan Cross WTP to supply deficit.
Lombardstown Glantane	SAJ-164	New GW abstraction in karstic region and new WTP to supply deficit.
Lombardstown Glantane	SAJ-166	New GW abstraction and new WTP to supply deficit.
Lyre	SAJ-167	Increase GW abstraction from Lyre spring and upgrade Lyre WTP to supply deficit.
Macroney	SAJ-209	Increase GW abstraction from Macroney spring and upgrade Macroney WTP to supply deficit.
Macroney	SAJ-210	New GW abstraction (karstic) and new WTP to supply deficit.
Mallow	SAJ-046	Recommission old GW sources (2 BHs) for Mallow at Oliver's Cross (disused due to hydrocarbon contamination, but potential to reuse if contamination issue can be resolved) and supply deficit.
Mallow	SAJ-047	New SW abstraction from Blackwater River and new WTP to supply deficit.
Mallow	SAJ-050	GW abstraction from BH near Glantane School and new WTP to supply deficit.
Mallow	SAJ-034	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit.
Mallow	SAJ-045	New GW abstraction (karstic) and new WTP to partly supply deficit.
Millstreet	SAJ-065	Increase GW abstraction at Caherbarnagh and upgrade Caherbarnagh WTP.
Millstreet	SAJ-068	Increase GW abstraction from Tubrid Spring and Millstreet BH and upgrade existing Millstreet WTP.
Millstreet	SAJ-071	New GW abstraction at Millstreet BH (karstic Region) and upgrade Millstreet WTP.
Millstreet	SAJ-073	Rationalise Caherbarnagh WTP and Cockhill WTP to Millstreet WTP. Rationalisation within WRZ.
Mitchelstown	SAJ-051	Increase existing GW abstraction from Ballybeg BHs and upgrade Mitchelstown South WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs.
Mitchelstown	SAJ-063	New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs.
Monabricka	SAJ-194	Increase GW abstraction from existing BH and upgrade Monabricka WTP to supply deficit.
Monabricka	SAJ-195	New GW abstraction (karstic) and new WTP to supply deficit.
Monaparson	SAJ-284	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Monee & Knockabrack	SAJ-265	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Mountain Barracks	SAJ-281	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Newmarket	SAJ-605	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit.

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford	
	Option Code	Option Description
		New GW abstraction from Ketragh Springs and new WTP to supply deficit (karstic region).
Rahan	SAJ-379	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Rockchapel	SAJ-189	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Skahanagh	SAJ-212	Increase GW abstraction from springs and upgrade Skahanagh WTP to supply deficit.
Skahanagh	SAJ-213	New GW abstraction (karstic) and new WTP to supply deficit.
Stagmount	SAJ-274	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Strancally	SAJ-304	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Strawhall	SAJ-225	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Tallow	SAJ-320	Bring back Kilbeg stream (currently not in use) to production and upgrade Tallow WTP to supply deficit.
Tallow	SAJ-340	New GW abstraction in karstic region and new WTP to supply deficit.
Tiknock\Tinnabinna	SAJ-313	Increase GW abstraction from Tinnabinna BHs and upgrade Tinnabinna WTP to supply deficit.
Tiknock\Tinnabinna	SAJ-314	Bring back Tiknock BH to production, upgrade Tiknock WTP and supply deficit.
Tiknock\Tinnabinna	SAJ-315	New GW abstraction in karstic region and new WTP
Toureen Derry	SAJ-175	Increase GW abstraction from springs (no. 3 springs) and upgrade Derry WTP to supply deficit.
Villierstown	SAJ-294	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.

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 SAJ Alignment of WRZ Option/s with Approach Categories

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Aglish Cul Rua	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Allow Regional	1	New GW abstraction (karstic) and new WTP to supply full deficit. Decommission Freemount WTP.	□	□	□	□	□	□
Ballinamona	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Ballyclough & Mount North	1	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Ballyheaphy	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Ballyhooly	4	Increase GW abstraction from existing Spring and upgrade Castletownroche (Ballyhooly) WTP to supply deficit.	□	□	-	□	-	-
		New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit.	-	-	□	-	-	-
		Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP to supply deficit.	-	-	-	-	□	-
		New SW abstraction from Funshion River and new WTP to supply deficit.	-	-	-	-	-	□
Ballymoate Upper	1	Increase GW abstraction from Ballyhamlet BH and upgrade Ballymoate Upper WTP.	□	□	□	□	□	□
Ballynoe	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Ballyvadonna	2	Increase GW abstraction from Ballyvadonna BH and upgrade Ballyvadonna WTP to supply deficit.	□	-	□	□	□	□
		New GW abstraction (poorly productive bedrock) and new WTP to supply deficit.	-	□	□	-	-	-

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Banteer	1	Increase GW abstraction from Poulgrom springs and upgrade Poulgrom WTP to supply deficit.	□	□	□	□	□	□
Boherascrub	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Bottlehill	2	Increase GW abstraction from Bottlehill BH and upgrade Bottlehill WTP to supply deficit.	□	-	□	□	□	□
		New GW abstraction and new WTP to supply deficit.	-	□	□	-	-	□
Bweeng	2	Increase GW abstraction from existing BH and upgrade Bweeng WTP to supply deficit.	□	□	□	□	-	-
		New GW abstraction and new WTP to supply deficit.	-	-	□	-	□	□
Camphire	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Carrigcleena	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Castletown Ballyagran Water Supply	3	Increase GW abstraction at Ballyagran BH and upgrade Ballyagran Pump Station WTP to supply deficit.	□	-	□	□	□	-
		New GW abstraction (karstic) and new WTP to supply deficit.	-	□	-	-	-	□
		New GW abstraction from Ballingarry groundwater body (productive fissured bedrock) and new WTP	-	-	-	□	-	-
Castletownroche	3	Increase GW abstraction from Spring and upgrade Castletownroche WTP.	-	□	□	□	-	-
		New GW abstraction and new WTP to supply deficit.	-	□	□	-	-	□
		Conjunctive use of existing spring and trial well and upgrade existing Castletownroche WTP.	□	-	□	-	□	-
Castlewrixon	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Charleville / Doneraile	6	Increase GW abstraction from Charleville BHs and upgrade Charleville WTP to supply deficit.	-	-	□	-	-	-

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		Increase GW abstraction from Clogher Spring and upgrade Doneraile Shanballymore WTP.	-	-	□	□	-	-
		New SW abstraction from Awbeg River and new WTP to supply deficit.	-	-	□	-	-	□
		New SW from River Blackwater, new WTP and new network to supply Charleville/ Doneraile deficit.	-	-	□	-	-	-
		New GW abstraction (no. 8 BHs) and no.2 new WTPs and upgrade existing Charleville WTP to supply deficit.	-	□	□	-	-	-
		New GW and upgrade Charleville WRZ to supply deficit.	□	-	□	-	□	-
Clashmore/ Whitewell	3	Increase GW abstraction from Laurentum spring and upgrade Clashmore White Well (Laurentum) WTP to supply deficit.	-	□	-	-	-	□
		New GW abstraction in karstic region and new WTP to supply deficit.	-	□	-	-	-	-
		Increase GW abstraction from Ballynamultina BH and upgrade Coolboa WTP to supply deficit.	□	□	□	□	□	-
Conna Regional	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Coolagown	2	Increase GW abstraction from existing BH and upgrade Coolagown WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction and new WTP to supply deficit.	-	□	□	-	-	-
Dromahane / Kilcolman / Cois Tobair	1	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Fermoy	3	New SW abstraction from Blackwater River and new WTP to supply deficit.	-	-	-	-	-	□
		New GW abstraction (karstic) and new WTP to supply deficit.	-	-	□	-	-	-
		Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Flood defence required at Project Level.	□	□	□	□	□	-

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Glanworth / Ballykenley/ Johnstown	3	New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit. New Storage at Dunmahon.	□	□	□	□	-	-
		New SW abstraction from Funshion River and new WTP to supply deficit.	-	-	-	□	□	□
		New GW abstraction (karstic) and new WTP to supply deficit.	-	-	□	-	-	-
Glenduff	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Glenleigh	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Gortnagreige	2	Increase GW abstraction from Gortnagraige BH and upgrade Gortnagraige WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction (karstic) and new WTP to supply deficit.	-	-	-	-	-	-
Gortnaskehy	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Grallagh	2	Increase GW abstraction from Grallagh BH and upgrade Grallagh WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction from karstic region and upgrade WTP	-	□	-	-	-	□
Kilbrin Garran an Darra	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Kilcorney	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Killavullen	1	Increase GW abstraction and upgrade Killavullen WTP to supply deficit.	□	□	□	□	□	□
Kilmagnier	2	Increase GW abstraction from existing no. 2 boreholes and upgrade Kilmagnier WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction in the karstic region north of Kilmagnier and new WTP to supply deficit.	-	□	-	-	-	-
Kilmore-Kilbeg	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Kilmurry (Mitchelstown)	1	Increase GW abstraction from Kilmurry BH and upgrade Kilmurray WTP to supply deficit.	□	□	□	□	□	□
Knockanevin	1	Increase GW abstraction from Knockanevin BH and upgrade existing Knockanevin WTP to supply deficit.	□	□	□	□	□	□
Knockdrumaclough	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Knockeragh	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Knoppogue	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Labbamollogga	1	Increase GW abstraction from Labbamollogga BH and upgrade Labbamollogga WTP to supply deficit.	□	□	□	□	□	□
Lombardstown Glantane	4	Increase GW abstraction from Kilgobnet (Spring) and upgrade Laharan Abbeys Well WTP to supply deficit.	□	□	□	-	□	-
		Increase GW abstraction from Laharan Cross Spring and upgrade Laharan Cross WTP to supply deficit.	-	□	□	□	-	-
		New GW abstraction in karstic region and new WTP to supply deficit.	-	-	-	-	-	-
		New GW abstraction (wells) and new WTP to supply deficit.	-	-	-	-	-	□
Lyre	1	Increase GW abstraction from Lyre spring and upgrade Lyre WTP to supply deficit.	□	□	□	□	□	□
Macroney	2	Increase GW abstraction from Macroney spring and upgrade Macroney WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction (karstic) and new WTP to supply deficit.	-	-	-	-	-	-
Mallow	5	Recommission old GW sources (2 BHs) for Mallow at Oliver's Cross (disused due to hydrocarbon contamination, but potential to reuse if contamination issue can be resolved) and supply deficit.	-	□	□	-	-	-
		New SW abstraction from Blackwater River and new WTP to supply deficit.	-	-	-	-	-	□
		GW abstraction from BH near Glantane School and new WTP to supply deficit.	-	-	-	-	-	-

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit.	□	□	□	□	-	-
		New GW abstraction (karstic) and new WTP to partly supply deficit.	-	-	-	□	□	-
Millstreet	4	Increase GW abstraction at Caherbarnagh and upgrade Caherbarnagh WTP.	-	-	-	-	-	-
		Increase GW abstraction from Tubrid Spring and Millstreet BH and upgrade existing Millstreet WTP.	□	□	□	□	□	-
		New GW abstraction at Millstreet BH (karstic Region) and upgrade Millstreet WTP.	-	□	□	-	-	□
		Rationalise Caherbarnagh WTP and Cockhill WTP to Millstreet WTP. Rationalisation within WRZ.	-	-	□	-	-	-
Mitchelstown	2	Increase existing GW abstraction from Ballybeg BHs and upgrade Mitchelstown South WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs.	-	□	□	□	□	-
		New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs.	□	-	□	-	-	□
Monabricka	2	Increase GW abstraction from existing BH and upgrade Monabricka WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction (karstic) and new WTP to supply deficit.	-	□	-	-	-	-
Monaparson	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Monee & Knockabrack	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Mountain Barracks	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Newmarket	1	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit.	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		New GW abstraction from Ketragh Springs and new WTP to supply deficit (karstic region).						
Rahan	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Rockchapel	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Skahanagh	2	Increase GW abstraction from springs and upgrade Skahanagh WTP to supply deficit.	□	□	□	□	□	□
		New GW abstraction (karstic) and new WTP to supply deficit.	-	□	□	-	-	-
Stagmount	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Strancally	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Strawhall	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□
Tallow	2	Bring back Kilbeg stream (currently not in use) to production and upgrade Tallow WTP to supply deficit.	-	□	-	-	□	-
		New GW abstraction in karstic region and new WTP to supply deficit.	□	-	□	□	-	□
Tiknock\Tinnabinna	3	Increase GW abstraction from Tinnabinna BHs and upgrade Tinnabinna WTP to supply deficit.	□	□	□	□	□	□
		Bring back Tiknock BH to production, upgrade Tinnabinna WTP and supply deficit.	-	-	□	-	-	□
		New GW abstraction in karstic region and new WTP	-	-	-	-	-	-
Toureen Derry	1	Increase GW abstraction from springs (no. 3 springs) and upgrade Derry WTP to supply deficit.	□	□	□	□	□	□
Villierstown	1	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□

The 7 Step Process outlined in Figure 5.3 was then applied to each WRZ in SAJ, in order to develop a WRZ level approach. A summary of the outcome of this assessment at WRZ level (i.e. WRZ options only) is shown in Table 5.4.

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

- In terms of Best AA, 7 WRZ options 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 for 57 of the 62 WRZs;
- Of the 62 WRZ level preferred approaches, 3 WRZs have a -3 score against biodiversity.

The WRZ level approaches for each WRZ in SAJ are outlined in Table 5.4

Table 5.4 SAJ WRZ Approach Options

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Aglish Cul Rua	SAJ-291	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Allow Regional	SAJ-118	New GW abstraction (karstic) and new WTP to supply full deficit. Decommission Freemount WTP.	-	□	□	□	□	□	□	□
Ballinamona	SAJ-269	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Ballyclough & Mount North	SAJ-157	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Ballyheaphy	SAJ-326	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Ballyhooly	SAJ-093	Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP to supply deficit.	-	-	-	-	-	□	-	□
Ballymoate Upper	SAJ-323	Increase GW abstraction from Ballyhamlet BH and upgrade Ballymoate Upper WTP.	-	□	□	□	□	□	□	□
Ballynoe	SAJ-223	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Ballyvadonna	SAJ-238	Increase GW abstraction from Ballyvadonna BH and upgrade Ballyvadonna WTP to supply deficit.	-	□	-	□	□	□	□	□
Banteer	SAJ-132	Increase GW abstraction from Poulgrom springs and upgrade Poulgrom WTP to supply deficit.	-	□	□	□	□	□	□	□
Boherascrub	SAJ-276	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□	□	□
Bottlehill	SAJ-226	Increase GW abstraction from Bottlehill BH and upgrade Bottlehill WTP to supply deficit.	-	□	-	□	□	□	□	□
Bweeng	SAJ-142	Increase GW abstraction from existing BH and upgrade Bweeng WTP to supply deficit.	-	□	□	□	□	-	-	□
Camphire	SAJ-295	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□	□	□
Carrigcleena	SAJ-272	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Castletown Ballyagran Water Supply	SAJ-287	Increase GW abstraction at Ballyagran BH and upgrade Ballyagran Pump Station WTP to supply deficit.	□	□	-	□	□	□	-	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Castletownroche	SAJ-128	Conjunctive use of existing spring and trial well and upgrade existing Castletownroche WTP.	-	□	-	□	-	□	-	□
Castlewrixon	SAJ-266	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Charleville / Doneraile	SAJ-507a	New GW and upgrade Charleville WRZ to supply deficit.	-	□	-	□	-	□	-	□
Clashmore/Whitewell	SAJ-297	Increase GW abstraction from Ballynamultina BH and upgrade Coolboa WTP to supply deficit.	-	□	□	□	□	□	-	□
Conna Regional	SAJ-141	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□	□	□
Coolagown	SAJ-215	Increase GW abstraction from existing BH and upgrade Coolagown WTP to supply deficit.	-	□	□	□	□	□	□	□
Dromahane / Kilcolman / Cois Tobair	SAJ-188	Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Fermoy	SAJ-342	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Flood defence required at Project Level.	-	□	□	□	□	□	-	□
Glanworth / Ballykenley/Johnstown	SAJ-110	New SW abstraction from Funshion River and new WTP to supply deficit.	-	-	-	-	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Glenduff	SAJ-286	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Glenleigh	SAJ-270	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Gortnagreige	SAJ-171	Increase GW abstraction from Gortnagraige BH and upgrade Gortnagraige WTP to supply deficit.	-	□	□	□	□	□	□	□
Gortnaskehy	SAJ-259	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Grallagh	SAJ-305	Increase GW abstraction from Grallagh BH and upgrade Grallagh WTP to supply deficit.	-	□	□	□	□	□	□	□
Kilbrin Garran an Darra	SAJ-201	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Kilcorney	SAJ-236	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Killavullen	SAJ-149	Increase GW abstraction and upgrade Killavullen WTP to supply deficit.	-	□	□	□	□	□	□	□
Kilmagnier	SAJ-178	Increase GW abstraction from existing no. 2 boreholes and	-	□	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
		upgrade Kilmagnier WTP to supply deficit.								
Kilmore-Kilbeg	SAJ-310	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Kilmurry (Mitchelstown)	SAJ-221	Increase GW abstraction from Kilmurry BH and upgrade Kilmurray WTP to supply deficit.	-	□	□	□	□	□	□	□
Knockanevin	SAJ-229	Increase GW abstraction from Knockanevin BH and upgrade existing Knockanevin WTP to supply deficit.	-	□	□	□	□	□	□	□
Knockdrumaclough	SAJ-207	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Knockeragh	SAJ-262	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Knoppogue	SAJ-208	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Labbamollogga	SAJ-250	Increase GW abstraction from Labbamollogga BH and upgrade Labbamollogga WTP to supply deficit.	-	□	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Lombardstown Glantane	SAJ-162	Increase GW abstraction from Kilgobnet (Spring) and upgrade Laharan Abbeys Well WTP to supply deficit.	-	□	□	□	-	□	-	□
Lyre	SAJ-167	Increase GW abstraction from Lyre spring and upgrade Lyre WTP to supply deficit.	-	□	□	□	□	□	□	□
Macroney	SAJ-209	Increase GW abstraction from Macroney spring and upgrade Macroney WTP to supply deficit.	-	□	□	□	□	□	□	□
Mallow	SAJ-034	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit.	-	□	□	□	□	-	-	□
Millstreet	SAJ-068	Increase GW abstraction from Tubrid Spring and Millstreet BH and upgrade existing Millstreet WTP.	-	□	□	□	□	□	-	□
Mitchelstown	SAJ-051	Increase existing GW abstraction from Ballybeg BHs and upgrade Mitchelstown South WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs.	-	-	□	□	□	□	-	□
Monabricka	SAJ-194	Increase GW abstraction from existing BH and upgrade Monabricka WTP to supply deficit.	□	□	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Monaparson	SAJ-284	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Monee & Knockabrack	SAJ-265	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Mountain Barracks	SAJ-281	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Newmarket	SAJ-605	New GW abstraction from Ballinatona Springs, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit (karstic region).	-	□	□	□	□	□	□	□
Rahan	SAJ-379	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Rockchapel	SAJ-189	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Skahanagh	SAJ-212	Increase GW abstraction from springs and upgrade Skahanagh WTP to supply deficit.	-	□	□	□	□	□	□	□
Stagmount	SAJ-274	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Strancally	SAJ-304	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□	□	□
Strawhall	SAJ-225	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	-	□	□	□	□	□	□	□
Tallow	SAJ-340	New GW abstraction in karstic region and new WTP to supply deficit.	-	□	-	□	□	-	□	□
Tiknock\Tinnabinna	SAJ-313	Increase GW abstraction from Tinnabinna BHs and upgrade Tinnabinna WTP to supply deficit.	-	□	□	□	□	□	□	□
Toureen Derry	SAJ-175	Increase GW abstraction from springs (no. 3 springs) and upgrade Derry WTP to supply deficit.	-	□	□	□	□	□	□	□
Villierstown	SAJ-294	Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.	□	□	□	□	□	□	□	□

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 Approach at WRZ level for the entire Study Area. Table 5.5 below provides a summary of the 97 Study Area options.

Table 5.5 SAJ Grouped options

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
Newmarket Allow Regional	SAJ-501	New GW abstraction (karstic) and new WTP to supply full deficit. Decommission Freemount WTP. Interconnect Newmarket with Allow Regional and supply deficit from Allow Regional.	Group 1
Newmarket Millstreet	SAJ-502	Increase GW abstraction from Tubrid Spring and Millstreet BH and upgrade existing Millstreet WTP. Increase GW abstraction at Caherbarnagh and upgrade Caherbarnagh WTP. Interconnect Newmarket and Millstreet WRZs and partly supply deficit from Millstreet.	Group 2
Newmarket Rathmore (SA H)	SAJ-505	Increase existing GW abstraction from Ballinatona Springs, upgrade existing Ballinatona WTP and supply deficit. Interconnect Newmarket with Rathmore WRZ (Kerry) and supply deficit from Rathmore.	Group 5
Newmarket Allow Regional	SAJ-508	New GW abstraction from Ketragh Springs and new WTP to supply deficit (karstic region). Interconnect Allow Regional with Newmarket and supply deficit from Newmarket.	Group 8
Fermoy Conna Regional	SAJ-511	Increase SW abstraction from River Bride and upgrade Conna Regional WTP. Supply spare capacity to neighboring WRZ in deficit. Interconnect Fermoy and Conna Regional and supply deficit from Conna Regional.	Group 11
Fermoy Ballyvadonna	SAJ-513	New SW abstraction from Blackwater River and new WTP to supply deficit. Interconnect Ballyvadonna and Fermoy and supply deficit from new SW abstraction from River Blackwater at Fermoy.	Group 13
Fermoy Ballyvadonna	SAJ-514	New SW abstraction from Blackwater River and new WTP to supply deficit. Rationalise Ballyvadonna to Fermoy WRZ.	Group 14
Fermoy Ballyvadonna	SAJ-515	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Rationalise Ballyvadonna to Fermoy WRZ.	Group 15

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
Fermoy Ballyvadonna	SAJ-516	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Interconnect Ballyvadonna and Fermoy and supply deficit.	Group 16
Ballyclough & Mount North Boherascrub	SAJ-520	Increase GW abstraction from Mount North (spring) and upgrade Mountnorth WTP. Increase GW abstraction from Mount North & Ballyclough (spring) and upgrade Ballyclough WTP. Supply spare capacity to neighboring WRZ. Rationalise Boherascrub to Ballyclough & Mount North WRZ.	Group 20
Mallow Bottlehill	SAJ-521	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Bottlehill to Mallow WRZ.	Group 21
Bweeng Dromahane / Kilcolman / Cois Tobair	SAJ-522	Increase GW abstraction from Dromahane BH and upgrade Hammond Place WTP. Increase GW abstraction from Cois Tobair BH and upgrade Cois Tobair WTP. Supply spare capacity to neighboring scheme in deficit. Interconnect Bweeng and Dromahane/Kilcolman/Cois Tobair WRZs.	Group 22
Bweeng Dromahane / Kilcolman / Cois Tobair	SAJ-523	Increase GW abstraction from Dromahane BH and upgrade Hammond Place WTP. Increase GW abstraction from Cois Tobair BH and upgrade Cois Tobair WTP. Supply spare capacity to neighboring scheme in deficit. Rationalise Bweeng to Dromahane/Kilcolman/Cois Tobair WRZ.	Group 23
Ballyhooly Castletownroche	SAJ-525	Increase GW abstraction from existing Spring and upgrade Castletownroche (Ballyhooly) WTP to supply deficit. Interconnect Castletownroche with Ballyhooly WRZ and supply deficit.	Group 25
Charleville / Doneraile Castlewrixon	SAJ-526	Increase GW abstraction from Charleville BHs and upgrade Charleville WTP to supply deficit. Rationalise Castlewrixon to Charleville WRZ.	Group 26
Mallow Gortnagreige	SAJ-530	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Increase existing SW abstraction from Clyda River (Mallow WTP). Rationalise Gortnagreige to Mallow WRZ.	Group 30
Gortnaskehy Ballyheaphy	SAJ-531	Increase GW abstraction from Ballyheaphy BH and upgrade Ballyheaphy WTP to supply spare capacity to neighboring scheme. Rationalise Gortnaskehy to Ballyheaphy WRZ.	Group 31
Millstreet Kilcorney	SAJ-532	Increase GW abstraction at Caherbarnagh and upgrade Caherbarnagh WTP. Increase GW abstraction from Tubrid Spring and Millstreet BH and upgrade existing Millstreet WTP. Rationalise Kilcorney to Millstreet WRZ.	Group 32
Rahan Killavullen	SAJ-533	Increase existing GW abstraction from Lavally BH and upgrade existing Rahan WTP. Rationalise Killavullen to Rahan WRZ.	Group 33

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
Ballyhooly Kilmurry (Mitchelstown)	SAJ-534	Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP to supply deficit. Rationalise Kilmurry (Mitchelstown) to Ballyhooly WRZ.	Group 34
Newmarket Knockeragh	SAJ-535	Increase existing GW abstraction from Ballinatona Springs, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit (karstic region). Rationalise Knockeragh to Newmarket WRZ.	Group 35
Mitchelstown Labbamollogga	SAJ-537	Increase existing GW abstraction from Ballybeg BHs and upgrade Mitchelstown South WTP to supply deficit. Rationalise Labbamollogga to Mitchelstown WRZ.	Group 37
Mitchelstown Labbamollogga	SAJ-538	New GW abstraction (karstic location) and new WTP to supply deficit. Rationalise Labbamollogga to Mitchelstown WRZ.	Group 38
Labbamollogga Ballylanders (SA K)	SAJ-541	Interconnect Labbamollogga and Ballylanders WRZs and supply deficit from Ballylanders (Study Area K).	Group 41
Banteer Lyre	SAJ-543	Increase GW abstraction from Poulgrom springs and upgrade Poulgrom WTP to supply deficit. Rationalise Lyre to Banteer WRZ.	Group 43
Ballyhooly Macroney	SAJ-544	Increase GW abstraction from Downing Bridge BH and upgrade existing Downing Bridge WTP to supply deficit. Rationalise Macroney to Ballyhooly WRZ.	Group 44
Charleville / Doneraile Monabricka	SAJ-545	Increase GW abstraction from Charleville BHs and upgrade Charleville WTP to supply deficit. Rationalise Monabricka to Charleville/Doneraile WRZ.	Group 45
Charleville / Doneraile Skahanagh	SAJ-546	Increase GW abstraction from Clogher Spring and upgrade Doneraile Shanballymore WTP. Rationalise Skahanagh to Charleville/Doneraile WRZ.	Group 46
Banteer Toureen Derry	SAJ-547	Increase GW abstraction from Poulgrom springs and upgrade Poulgrom WTP to supply deficit. Rationalise Toureen Derry to Banteer WRZ.	Group 47
Clashmore/Whitewell Grallagh	SAJ-548	Increase GW abstraction from Grallagh BH and upgrade Grallagh WTP to supply deficit. Rationalise Clashmore White Well (Laurentum) WTP to Grallagh WRZ.	Group 48
Kilmore-Kilbeg Tallow	SAJ-552	Increase GW abstraction from Tallow Hill spring and upgrade Tallow Hill WTP. Rationalise Kilmore-Kilbeg to Tallow WRZ.	Group 52
Kilmore-Kilbeg Ballymoate Upper	SAJ-553	Increase GW abstraction from Ballyhamlet BH and upgrade Ballymoate Upper WTP. Rationalise Kilmore-Kilbeg to Ballymoate Upper WRZ.	Group 53
Glanworth / Ballykenley/Johnstown Knockanevin	SAJ-556	Increase GW abstraction from Johnstown (BH) and upgrade Ballykenley (Johnstown) WTP to supply deficit.	Group 56

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
		Rationalise Knockanevin to Glanworth/Ballykenley/Johnstown WRZ.	
Mitchelstown	SAJ-562	Increase existing GW abstraction from Ballybeg BHs and upgrade Mitchelstown South WTP to supply deficit. Improve interconnectivity of Mitchelstown North (Mitchelstown Galtee WTP) and Mitchelstown South (Mitchelstown South WTP) and supply deficit from Mitchelstown South WTP.	Group 62
Monabricka South West Regional (SA 8)	SAJ-563	Interconnect Monabricka with South West Regional Scheme WRZ and supply deficit (Tobergal WTP).	Group 63
Fermoy Knockdrumaclough	SAJ-565	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Rationalise Knockdrumaclough to Fermoy WRZ.	Group 65
Ballyclough & Mount North Kilbrin Garran an Darra	SAJ-566	Increase GW abstraction and upgrade Ballyclough WTP to supply spare capacity to neighboring WRZ. Rationalise Kilbrin Garran an Darra to Ballyclough & Mount North WRZ.	Group 66
Mallow Gortnagreige Ballinamona Monaparson	SAJ-567	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Gortnagreige, Ballinamona and Monaparson to Mallow WRZ.	Group 67
Fermoy Kilmagnier Knockdrumaclough Coolagown	SAJ-568	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Rationalise Kilmagnier, Knockdrumaclough and Coolagown to Fermoy WRZ.	Group 68
Mitchelstown Burncourt Ballylooby (SA K)	SAJ-571	Interconnect Mitchelstown and Burncourt Ballylooby WRZs and supply deficit from Ballylooby Springs WTP.	Group 71
Villierstown	SAJ-573	Rationalise Villierstown to LCB Cappoquin WTP (Study Area K).	Group 73
Charleville / Doneraile Castletownroche	SAJ-574	Increase GW abstraction from Clogher Spring and upgrade Doneraile Shanballymore WTP. Interconnect Castletownroche and Charleville/Doneraile WRZs and supply deficit.	Group 74
Monabricka Castletown Ballyagran Water Supply	SAJ-576	Increase GW abstraction and upgrade Ballyagran Pump Station WTP to supply deficit. Rationalise Monabricka to Castletown Ballyagran WRZ.	Group 76
Banteer Newmarket	SAJ-577	Increase existing GW abstraction from Ballinatona Springs, upgrade existing Ballinatona WTP and supply deficit. Interconnect Banteer and Newmarket WRZs and supply deficit.	Group 77
Banteer Newmarket	SAJ-578	New GW abstraction and from Ketragh Springs and new WTP to supply deficit. Interconnect Banteer and Newmarket WRZs and supply deficit.	Group 78
Conna Regional Coolagown Knockdrumaclough Kilmagnier	SAJ-579	Increase SW abstraction from River Bride and upgrade Conna Regional WTP. Supply spare capacity to neighboring WRZ in deficit.	Group 79

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
		Rationalise Coolagown, Knockdrumaclough and Kilmagnier to Conna Regional WRZ.	
Fermoy Ballyhooly Castletownroche	SAJ-580	New SW abstraction from Blackwater River and new WTP to supply deficit in Fermoy. Interconnect Ballyhooly and Castletownroche WRZs with Fermoy and supply deficit.	Group 80
Banteer Newmarket	SAJ-581	New SW abstraction from River Blackwater and new WTP to supply deficit in Banteer WRZ. Interconnect Banteer and Newmarket WRZs and supply deficit.	Group 81
Mallow Rahan	SAJ-582	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Rahan to Box's Cross WTP.	Group 82
Mallow Charleville / Doneraile	SAJ-583	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Interconnect Charleville/Doneraile and Mallow and supply deficit from Box Cross WTP.	Group 83
Banteer Lombardstown Glantane	SAJ-585	New GW abstraction and new WTP to supply deficit in Lombardstown Glantane WRZ. Interconnect Banteer and Lombardstown Glantane WRZs and supply deficit.	Group 85
Ballymoate Upper Tallow	SAJ-586	Increase GW abstraction from Tallow Hill spring and upgrade Tallow Hill WTP. Rationalise Ballymoate Upper to Tallow WRZ.	Group 86
Castletown Ballyagran Water Supply Rathkeale (SA 8)	SAJ-589	Rationalise Castletown Ballyagran to Rathkeale WRZ (Study Area 8).	Group 89
Castletown Ballyagran Water Supply Bruree (SA 8)	SAJ-590	Rationalise Castletown Ballyagran to Bruree WRZ (Study Area 8).	Group 90
Bottlehill Monaparson Ballinamona Mallow	SAJ-592	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Bottlehill, Monaparson and Ballinamona to Mallow WRZ.	Group 92
Kilcorney Glenleigh Millstreet	SAJ-593	New GW abstraction at Millstreet BH and upgrade Millstreet WTP. Rationalise Kilcorney and Glenleigh to Millstreet WRZ.	Group 93
Ballyclough & Mount North Boherascrub Kilbrin Garran an Darra	SAJ-594	Increase GW abstraction and upgrade Mountnorth WTP to supply spare capacity to neighboring WRZ. Rationalise Boherascrub and Kilbrin Garran an Darra to Ballyclough & Mount North WRZ.	Group 94
Fermoy Ballyvadonna Strawhall Knockdrumaclough Coolagown Kilmagnier	SAJ-595	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Additional treatment is provided when the infiltration gallery floods. Rationalise Ballyvadonna, Strawhall, Knockdrumalough, Coolagown and Kilmagnier to Fermoy WRZ.	Group 95
Fermoy Ballyvadonna Strawhall Knockdrumaclough	SAJ-596	Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Additional treatment is provided when the infiltration gallery floods.	Group 96

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
		Rationalise Ballyvadonna, Strawhall and Knockdrumalough to Fermoy WRZ.	
Mallow Gortnagreige Ballinamona Monaparson Bottlehill Killavullen Knoppogue Monee & Knockabrack Rahan	SAJ-597	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Gortnagreige, Ballinamona, Monaparson, Bottlehill, Killavullen, Knoppogue, Monee & Knockabrack and Rahan to Mallow WRZ.	Group 97
Mallow Knoppogue	SAJ-598	Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Knoppogue to Mallow WRZ.	Group 98
Stagmount Rockchapel	SAJ-600	Rationalise Stagmount to Rockchapel WRZ.	Group 100
Mitchelstown Glenduff	SAJ-601	Increase existing GW abstraction from Ballybeg BHs and new GW from no. TWs upgrade Mitchelstown South WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs. Rationalise Glenduff to Mitchelstown WRZ.	Group 101
Mallow Charleville / Doneraile	SAJ-602	New SW abstraction from River Blackwater u/s of Mallow Town and treat at existing Mallow WTP (upgrade) to supply Mallow full demand. Abandoning existing SW sources Fiddane Reservoir and Clyda River. Therefore allowing to offset Box Cross WTP (increased GW) to supply Charleville/Doneraile WRZ. Increase GW abstraction at Box Cross, upgrade WTP and interconnect with Charleville/Doneraile WRZ to supply deficit.	Group 102
Charleville / Doneraile Monabricka Castlewrixon	SAJ-603	New SW from River Blackwater, new WTP and new network to supply deficit in Charleville/Doneraile WRZ. Rationalise Monabricka and Castlewrixon to Charleville/Doneraile WRZ.	Group 103
Mallow Charleville / Doneraile Monabricka Castlewrixon	SAJ-604	New SW abstraction from River Blackwater u/s of Mallow Town and treat at existing Mallow WTP (upgrade) to supply Mallow full demand. Abandoning existing SW sources Fiddane Reservoir and Clyda River. Therefore allowing to offset Box Cross WTP (increased GW) to supply Charleville/Doneraile WRZ. Increase GW abstraction at Box Cross, upgrade WTP and interconnect with Charleville/Doneraile WRZ to supply deficit. Rationalise Monabricka and Castlewrixon to Charleville/Doneraile WRZ.	Group 104
Charleville / Doneraile Monabricka Castlewrixon	SAJ-606	New GW abstraction new WTP and upgrade existing Charleville WTP to supply deficit.	Group 106

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
		Rationalise Monabricka and Castlewrixon to Charleville/Doneraile WRZ.	
Mallow Charleville / Doneraile Monabricka Castlewrixon	SAJ-607	New GW abstraction new WTP and upgrade existing Charleville WTP. Increase GW abstraction at Box Cross, upgrade WTP and interconnect to Charleville/ Doneraile to supply deficit. Rationalise Monabricka and Castlewrixon to Charleville/Doneraile WRZ.	Group 107
Mallow Charleville / Doneraile	SAJ-608	New GW abstraction and upgrade existing Charleville WTP. Increase GW abstraction at Box Cross, upgrade WTP and interconnect to Charleville/ Doneraile to supply deficit.	Group 108
Tallow Kilmore-Kilbeg Ballymoate Upper	SAJ-609	New GW abstraction and new WTP to supply full demand in Tallow. Rationalise Kilmore-Kilbeg and Ballymoate Upper to Tallow WRZ.	Group 109
Grallagh Clashmore/Whitewell Tiknock/Tinnabinna	SAJ-611	Increase GW abstraction and upgrade Grallagh WTP to supply deficit. Rationalise Tiknock/Tinnabina, and Clashmore/Whitewell to Grallagh WRZ.	Group 111
Clashmore/Whitewell Tiknock/Tinnabinna	SAJ-612	Increase GW abstraction and upgrade Clashmore White Well (Laurentum) WTP to supply deficit. Rationalise Tiknock/Tinnabina to Clashmore/Whitewell WRZ.	Group 112
Labbamollogga Ballylanders (SA K)	SAJ-613	Rationalise Labbamollogga to Ballylanders WRZ (Study Area K).	Group 113
Kilmurry (Mitchelstown) Inchinleamy (SA K)	SAJ-614	Rationalise Kilmurry (Mitchelstown) to Inchinleamy WRZ (Study Area K).	Group 114
Newmarket Allow Regional	SAJ-615	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit. Interconnect Allow Regional with Newmarket and supply deficit.	Group 115
Bweeng Donoughmore (SA I)	SAJ-616	Rationalise Bweeng to Donoughmore WRZ (Study Area I).	Group 116
Glanworth / Ballykenley/Johnstown Knockanevin	SAJ-617	New GW abstraction at Ballynacagheragh (no. 2 BHs - projected yield 2.2 MLD) and new WTP to supply deficit. New Storage at Dunmahon. Rationalise Knockanevin to Glanworth/Ballykenley/Johnstown WRZ.	Group 117
Newmarket Banteer Toureen Derry Millstreet Glenleigh Kilcorney Kilbrin Garran an Darra Allow Regional	SAJ-618	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit. Rationalise Kilbrin Garran an Darra to Newmarket WRZ. Interconnect Newmarket with Banteer and rationalise Toureen Derry to Banteer.	Group 118

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
		Interconnect Newmarket with Millstreet and rationalise Glenleigh and Kilcorney to Millstreet. Interconnect Allow Regional with Newmarket and supply deficit.	
Newmarket Banteer Toureen Derry Millstreet Glenleigh Kilcorney Kilbrin Garran an Darra	SAJ-619	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit. Rationalise Kilbrin Garran an Darra to Newmarket WRZ. Interconnect Newmarket with Banteer and rationalise Toureen Derry to Banteer. Interconnect Newmarket with Millstreet and rationalise Glenleigh and Kilcorney to Millstreet.	Group 119
Newmarket Kilbrin Garran an Darra	SAJ-620	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit. Rationalise Kilbrin Garran an Darra to Newmarket WRZ.	Group 120
Charleville / Doneraile Glenosheen/Jamestown/Kilmallock (SA 8)	SAJ-622	New GW abstraction and upgrade Charleville WTP to partly supply deficit. Interconnect with Mount Russel BH - Glenosheen/Jamestown/Kilmallock WRZ (Study Area 8) and supply the rest of the deficit.	Group 122
Charleville / Doneraile Castlewrixon Monabricka Skahanagh Glenosheen/Jamestown/Kilmallock (SA 8)	SAJ-623	New GW abstraction and upgrade Charleville WTP to partly supply deficit. Interconnect with Mount Russel BH - Glenosheen/Jamestown/Kilmallock WRZ (Study Area 8) and supply the rest of the deficit. Rationalise Castlewrixon, Monabricka and Skahanagh to Charleville/Doneraile WRZ.	Group 123
Charleville / Doneraile Castlewrixon Monabricka Skahanagh	SAJ-624	New GW and upgrade Charleville WRZ to supply deficit. Rationalise Castlewrixon, Monabricka and Skahanagh to Charleville/Doneraile WRZ.	Group 124
Kilmurry (Mitchelstown) Inchinleamy (SA K)	SAJ-625	Interconnect Kilmurry (Mitchelstown) and Inchinleamy (Study Area K) WRZs and supply deficit.	Group 125
Ballyhooly	SAJ-626	Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP. Increase GW abstraction from existing Spring and upgrade Castletownroche WTP.	Group 126
Ballyhooly Macroney	SAJ-627	Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP. Increase GW abstraction from existing Spring and upgrade Castletownroche Rationalise Macroney to Ballyhooly WRZ.	Group 127
Monabricka South West Regional (SA 8)	SAJ-628	Rationalise Monabricka to South West Regional Scheme WRZ.	Group 128
Charleville / Doneraile Castlewrixon Skahanagh	SAJ-629	New GW and upgrade Charleville WRZ to supply deficit.	Group 129

Water Resource Zone Name	Feasible Options SAJ North Cork/West Waterford		
	Option Code	Option Description	SA Grouped Option
		Rationalise Castlewrixon and Skahanagh to Charleville/Doneraile WRZ.	
Allow Regional Kilbrin Garran an Darra	TG2-SAJ-630	New GW abstraction (karstic) and new WTP to supply full deficit. Decommission Freemount WTP. Rationalise Kilbrin Garran an Darra to Allow regional WRZ.	Group 130
Newmarket Banteer Toureen Derry Millstreet Glenleigh Kilcorney	TG2-SAJ-631	New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit. Interconnect Newmarket with Banteer and rationalise Toureen Derry to Banteer. Interconnect Newmarket with Millstreet and rationalise Glenleigh and Kilcorney to Millstreet.	Group 131

The 90 Study Area options result in 14 SA Combinations including the WRZ level Approach. The 14 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.6 SAJ Combinations Options Summary

Key	WRZ Approach Option	□	SA Grouped Option	□

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 1, 15, 20, 25, 26, 33, 38, 47)	SA Combination 2 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78)	SA Combination 3 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 76)	SA Combination 4 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 85)	SA Combination 5 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 85)	SA Combination 6 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 79a, 85)	SA Combination 7 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47 85)	SA Combination 8 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 85)	SA Combination 9 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56)	SA Combination 10 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78, 79a)	SA Combination 11 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56, 79a)	SA Combination 12 (SA Grouped Option 20, 31, 95, 97, 100, 101, 109, 111, 113, 114, 116, 117, 127, 128, 129, 130, 131)	SA Combination 13 Group 552
Aglish Cul Rua	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Allow Regional	○	□	○	○	○	○	○	○	○	○	○	○	□	○
Ballinamona	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Ballyclough & Mount North	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Ballyheaphy	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Ballyhooly	○	□	□	○	○	○	○	○	○	○	□	○	□	○
Ballymoate Upper	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Ballynoe	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Ballyvadonna	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Banteer	○	□	□	○	○	□	□	□	□	□	□	□	□	○
Boherascrub	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Bottlehill	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Bweeng	○	○	○	□	□	□	□	□	□	□	○	□	□	○
Camphire	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Carrigcleena	○	○	○	○	○	○	○	○	○	○	○	○	○	○

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 1, 15, 20, 25, 26, 33, 38, 47)	SA Combination 2 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78)	SA Combination 3 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 76)	SA Combination 4 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 85)	SA Combination 5 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 85)	SA Combination 6 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 79a, 85)	SA Combination 7 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47 85)	SA Combination 8 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 85)	SA Combination 9 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56)	SA Combination 10 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78, 79a)	SA Combination 11 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56, 79a)	SA Combination 12 (SA Grouped Option 20, 31, 95, 97, 100, 101, 109, 111, 113, 114, 116, 117, 127, 128, 129, 130, 131)	SA Combination 13 Group 552
Castletown Ballyagran Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Castletownroche	○	□	□	□	□	□	○	□	□	○	□	○	○	○
Castlewrixon	○	□	□	□	□	○	○	○	○	○	□	○	□	○
Charleville / Doneraile	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Clashmore/Whitewell	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Conna Regional	○	○	○	○	○	○	□	○	○	○	□	□	○	○
Coolagown	○	○	○	○	○	○	□	○	○	○	□	□	□	○
Dromahane / Kilcolman / Cois Tobair	○	○	○	□	□	□	□	□	□	□	○	□	○	○
Fermoy	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Glanworth / Ballykenley/Johnstown	○	○	○	○	○	○	○	○	○	□	○	□	□	○
Glenduff	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Glenleigh	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Gortnagreige	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Gortnaskehy	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Grallagh	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Kilbrin Garran an Darra	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Kilcorney	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Killavullen	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Kilmagnier	○	○	○	○	○	○	□	○	○	○	□	□	□	○
Kilmore-Kilbeg	○	○	○	○	○	○	○	○	○	○	○	○	□	□

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 1, 15, 20, 25, 26, 33, 38, 47)	SA Combination 2 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78)	SA Combination 3 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 76)	SA Combination 4 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 85)	SA Combination 5 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 85)	SA Combination 6 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 79a, 85)	SA Combination 7 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47 85)	SA Combination 8 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 85)	SA Combination 9 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56)	SA Combination 10 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78, 79a)	SA Combination 11 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56, 79a)	SA Combination 12 (SA Grouped Option 20, 31, 95, 97, 100, 101, 109, 111, 113, 114, 116, 117, 127, 128, 129, 130, 131)	SA Combination 13 Group 552
Kilmurry (Mitchelstown)	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Knockanevin	○	○	○	○	○	○	○	○	○	□	○	□	□	○
Knockdrumaclough	○	○	○	○	○	○	□	○	○	○	□	□	□	○
Knockeragh	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Knoppogue	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Labbamollogga	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Lombardstown Glantane	○	○	○	○	□	□	□	□	□	○	○	○	○	○
Lyre	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Macroney	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Mallow	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Millstreet	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Mitchelstown	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Monabricka	○	○	○	□	○	□	□	□	□	□	○	□	□	○
Monaparson	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Monee & Knockabrack	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Mountain Barracks	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Newmarket	○	□	□	□	□	□	□	□	□	□	□	□	□	○
Rahan	○	○	○	○	○	○	□	○	○	○	○	□	□	○
Rockchapel	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Skahanagh	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Stagmount	○	○	○	○	○	○	○	○	○	○	○	○	□	○

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 1, 15, 20, 25, 26, 33, 38, 47)	SA Combination 2 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78)	SA Combination 3 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 76)	SA Combination 4 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 85)	SA Combination 5 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 85)	SA Combination 6 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 79a, 85)	SA Combination 7 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47 85)	SA Combination 8 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 85)	SA Combination 9 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56)	SA Combination 10 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78, 79a)	SA Combination 11 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56, 79a)	SA Combination 12 (SA Grouped Option 20, 31, 95, 97, 100, 101, 109, 111, 113, 114, 116, 117, 127, 128, 129, 130, 131)	SA Combination 13 Group 552
Strancally	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Strawhall	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Tallow	○	○	○	○	○	○	○	○	○	○	○	○	□	□
Tiknock\Tinnabinna	○	○	○	○	○	○	○	○	○	○	○	○	□	○
Toureen Derry	○	□	○	○	○	□	○	□	□	□	○	□	□	○
Villierstown	○	○	○	○	○	○	○	○	○	○	○	○	○	○

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.

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.

5.7 SAJ Summary of SA Combination of Performance against Approach Type

Ranked order (best to worst)	Best													Worst

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 1, 15, 20, 25, 26, 33, 38, 47)	SA Combination 2 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78)	SA Combination 3 (SA Grouped Option 7, 15, 20, 23, 26, 33, 38, 76)	SA Combination 4 (SA Grouped Option 7, 15 20, 23, 26, 33, 38, 85)	SA Combination 5 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 85)	SA Combination 6 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47, 79a, 85)	SA Combination 7 (SA Grouped Option 7, 15, 20, 23, 33, 38, 45, 47 85)	SA Combination 8 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 85)	SA Combination 9 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56)	SA Combination 10 (SA Grouped Option 15, 20, 25, 26, 33, 38, 78, 79a)	SA Combination 11 (SA Grouped Option 7, 16, 20, 23, 33, 38, 45, 47, 56, 79a)	SA Combination 12 (SA Grouped Option 20, 31, 95, 97, 100, 101, 109, 111,113, 114, 116, 117, 127, 128, 129, 130, 131)	SA Combination 13 (Group 552)
Least Cost	Worst												Best	
Quickest Delivery													Worst	Best
Best AA *no. of -3 scores against biodiversity	3 No. -3 Scores	1 No. -3 Scores	2 No. -3 Scores	2 No. -3 Scores	2 No. -3 Scores	2 No. -3 Scores	3 No. -3 Scores	2 No. -3 Scores	2 No. -3 Scores	2 No. -3 Scores	3 No. -3 Scores	3 No. -3 Scores	2 No. -3 Scores	3 No. -3 Scores
Lowest Carbon		Best	Worst											
Most Resilient											Best			Worst
Best Environmental	Worst												Best	

The SA combination in Table 5.6 is assessed to determine the approach categories as summarised in Table 5.7.

Table 5.7 Best Combinations

Approach Categories	Best Performing Combination
Least Cost (LCo)	SA Combination 12
Best Environmental (BE)	SA Combination 12
Quickest Delivery (QD)	SA Combination 13
Most Resilient (MR)	SA Combination 10
Lowest Carbon (LC)	SA Combination 1
Best AA (BA)	SA Combination 1

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, Combination 12 has the lowest NPV Cost, as shown in Figure 5.2 with the lowest total costs (CAPEX and OPEX) over the solutions lifetime.

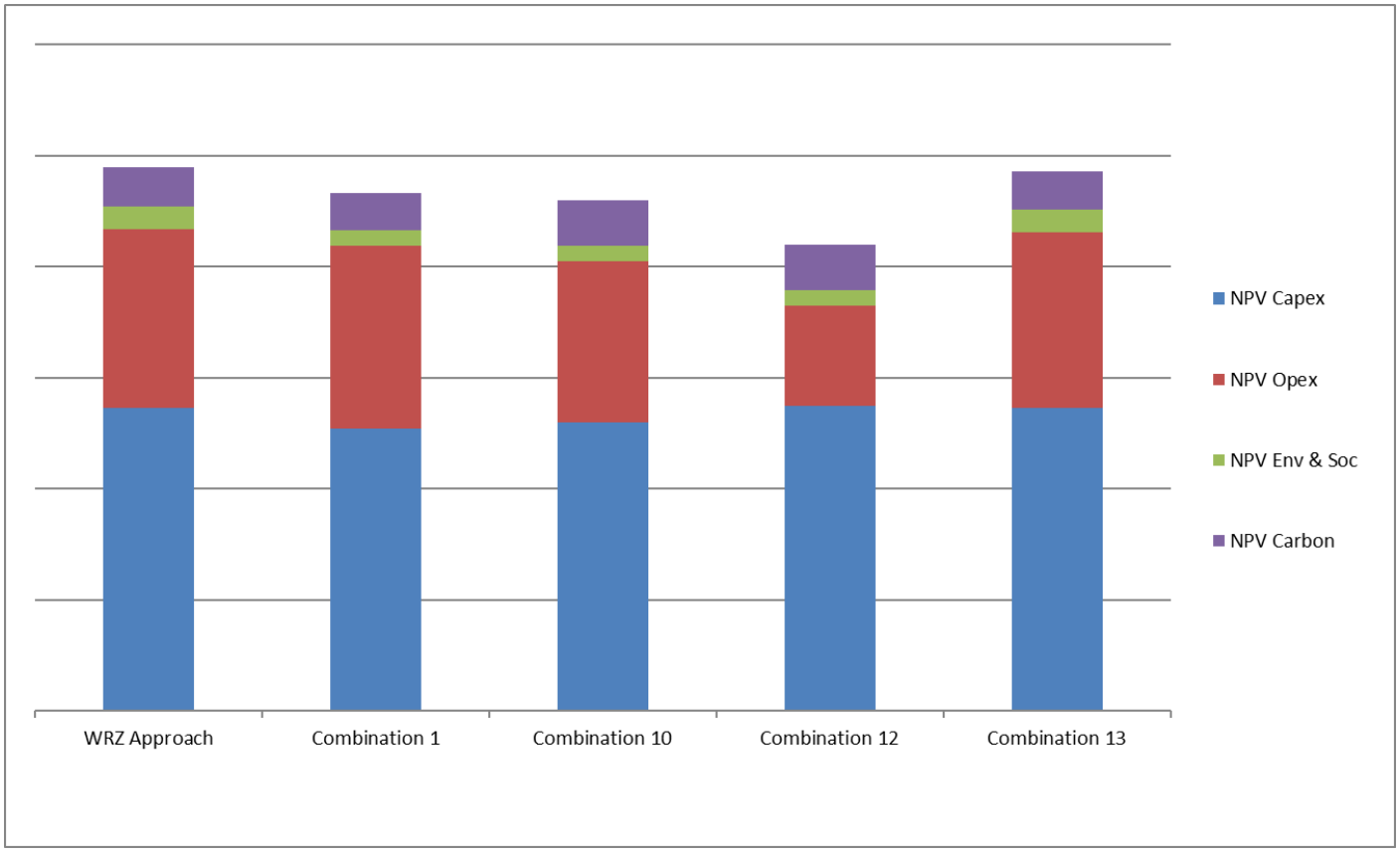


Figure 5.2 SAJ NPV Costs for WRZ and SA approaches

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. The Best AA Approach has a higher Totex by 11% but overall scores worse in terms of environmental score and scores worse in terms of resilience. The Least Cost approach was therefore retained at this stage.
- Step 2 – We compared the Quickest Delivery Approach against the Least Cost Approach. The Quickest Delivery approach is significantly more expensive that the Least Cost Approach and preforms poorly against the environment resilience criteria compared to all other approach. The Least Cost approach was therefore retained at this stage.
- Step 3 - We compared the Least Cost against the Best Environmental Approach. The Least Cost approach and the Best Environmental Approach are the same Approach. The Least Cost approach was therefore retained at this stage.
- Step 4 – We compared the Least Cost against the Most Resilient Approach. There is only a minimal difference between the resilience score for the Most Resilience Approach and the Least Cost Approach and the Least Cost Approach preforms significantly better against the environmental criteria. The Least Cost approach was therefore retained at this stage.
- Step 5 - We compared the Least Cost Approach against the Least Carbon Approach. The Least Carbon Approach has lower carbon costs compared to the Least Cost Approach, however, carbon costs for both approaches are low when compared to the total NPV costs. The Least Cost approach was therefore retained at this stage.

- Step 6 – A final assessment of the Least Cost was completed against the Least Carbon, Best AA, Best Environmental, Quickest Delivery and Most Resilient Approaches. The Least Costs Approach is the Best Environmental Approach overall, although not the Best AA it scores significantly better under all other criteria. While the Least Cost Approach has higher carbon costs compared to the Least Carbon Approach carbon costs are low when compared the total NPV costs. While the Least Cost approach did not perform well against the resilience criteria there is not a significant difference in the resilience score between the Least Cost and the Most Resilience Approach. The Least Cost approach was therefore retained at this stage.
- Step 7 – The Least Cost Approach was therefore selected as the Preferred Approach for the Water Resource and Study Area Levels.

5.3 Study Area Preferred Approach Summary

On the basis of this initial assessment at Plan level, Combination 12 represents the Preferred Approach for Study Area J North Cork / West Waterford, which consists of the options listed in Table 5.9.

Table 5.9 Preferred Approach for SAJ

WRZ Name	Preferred Approach Option Description SA Combination – Combination 12
Aglish Cul Rua	SAJ-291: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Ballynoe	SAJ-223: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Camphire	SAJ-295: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Carrigcleena	SAJ-272: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Castletown Ballyagran Water Supply	SAJ-287: Increase GW abstraction at Ballyagran BH and upgrade Ballyagran Pump Station WTP to supply deficit.
Castletownroche	SAJ-128: Conjunctive use of existing spring and trial well and upgrade existing Castletownroche WTP.
Conna Regional	SAJ-141: Upgrade existing WTPs for water quality improvements. The WRZ is not in deficit.
Dromahane / Kilcolman / Cois Tobair	SAJ-188: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Knockeragh	SAJ-262: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Lombardstown Glantane	SAJ-162: Increase GW abstraction from Kilgobnet (Spring) and upgrade Laharan Abbeys Well WTP to supply deficit.
Lyre	SAJ-167: Increase GW abstraction from Lyre spring and upgrade Lyre WTP to supply deficit.
Mountain Barracks	SAJ-281: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Strancally	SAJ-304: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.

WRZ Name	Preferred Approach Option Description SA Combination – Combination 12
Villierstown	SAJ-294: Upgrade existing WTP for water quality improvements. The WRZ is not in deficit.
Ballyclough & Mount North Boherascrub	Group 20 Increase GW abstraction from Mount North (spring) and upgrade Mountnorth WTP to supply spare capacity to neighboring WRZ. Increase GW abstraction from Mount North & Ballyclough (spring) and upgrade Ballyclough WTP to supply spare capacity to neighboring WRZ. Rationalise Boherascrub to Ballyclough & Mount North WRZ.
Ballyheaphy Gortnaskehy	Group 31 Rationalise Gortnaskehy to Ballyheaphy WRZ. Increase GW abstraction from Ballyheaphy BH and upgrade Ballyheaphy WTP to supply spare capacity to neighboring scheme.
Ballyvadonna Coolagown Fermoy Kilmagnier Knockdrumaclough Strawhall	Group 95 Increase existing GW abstraction from infiltration gallery alongside Blackwater River and upgrade Coolrue WTP. Additional treatment is provided when the infiltration gallery floods. Rationalise Ballyvadonna, Strawhall, Knockdrumalough, Coolagown and Kilmagnier to Fermoy WRZ.
Ballinamona Bottlehill Gortnagreige Killavullen Knoppogue Mallow Monaparson Monee & Knockabrack Rahan	Group 97 Increase GW abstraction at Box Cross and upgrade Box Cross WTP to supply deficit. Rationalise Gortnagreige, Ballinamona, Monaparson, Bottlehill, Killavullen, Knoppogue, Monee & Knockabrack and Rahan to Mallow WRZ.
Rockchapel Stagmount	Group 100 Rationalise Stagmount to Rockchapel WRZ.
Glenduff Mitchelstown	Group 101 Increase existing GW abstraction from Ballybeg BHs and new GW from no. TWs upgrade Mitchelstown South WTP to supply deficit. Improve interconnectivity between Mitchelstown North and Mitchelstown South WSZs. Rationalise Glenduff to Mitchelstown.
Ballymoate Upper Kilmore-Kilbeg Tallow	Group 109 New GW abstraction in karstic region and new WTP to supply full demand. Rationalise Kilmore-Kilbeg and Upper to Tallow WRZ.
Tiknock\Tinnabinna Clashmore/Whitewell Grallagh	Group 111 Increase GW at Grallagh and rationalise Tiknock/Tinnabina, Ballycurrane and Clashmore/Whitewell WRZs.
Labbamollogga	Group 113 Rationalise Labbamollogga to Ballylanders WRZ (Study Area K).
Kilmurry (Mitchelstown)	Group 114 Rationalise Kilmurry (Mitchelstown) to Inchinleamy (SA K Waterford) WRZ. This WRZ is not in deficit and spare capacity can cover the demand in Kilmurry (Mitchelstown).
Bweeng	Group 116 Rationalise Bweeng to Donoughmore WRZ (SA I) (SAI-212).
Glanworth / Ballykenley/Johnstown Knockanevin	Group 117 New GW and new WTP for Glanworth / Ballykenley/Johnstown and rationalise Knockanevin WRZ.

WRZ Name	Preferred Approach Option Description SA Combination – Combination 12
Ballyhooly Macroney	Group 127 Increase GW abstraction at Downing Bridge BH and upgrade existing Downing Bridge WTP. Increase GW abstraction from existing Spring and upgrade Castletownroche WTP Rationalise Macroney to Ballyhooly WRZ (Downing Bridge WTP).
Monabricka	Group 128 Rationalise Monabricka to South West Regional Scheme WRZ.
Castlewrixon Charleville / Doneraile Skahanagh	Group 129 New GW and upgrade Charleville WRZ to supply deficit. Rationalise Castlewrixon and Skahanagh WRZs to Charleville/Doneraile WRZ.
Allow Regional Kilbrin Garran an Darra	Group 130 New GW abstraction (karstic) and new WTP to supply full deficit. Decommission Freemount WTP. Rationalise Kilbrin Garran an Darra to Allow regional WRZ.
Toureen Derry Banteer Glenleigh Kilcorney Millstreet Newmarket	Group 131 New GW abstraction in the vicinity of Ballinatona WTP, upgrade existing Ballinatona WTP and supply deficit. New GW abstraction from Ketragh Springs and new WTP to supply deficit. Interconnect Newmarket with Banteer and rationalise Toureen Derry to Banteer. Interconnect Newmarket with Millstreet and rationalise Glenleigh and Kilcorney to Millstreet.

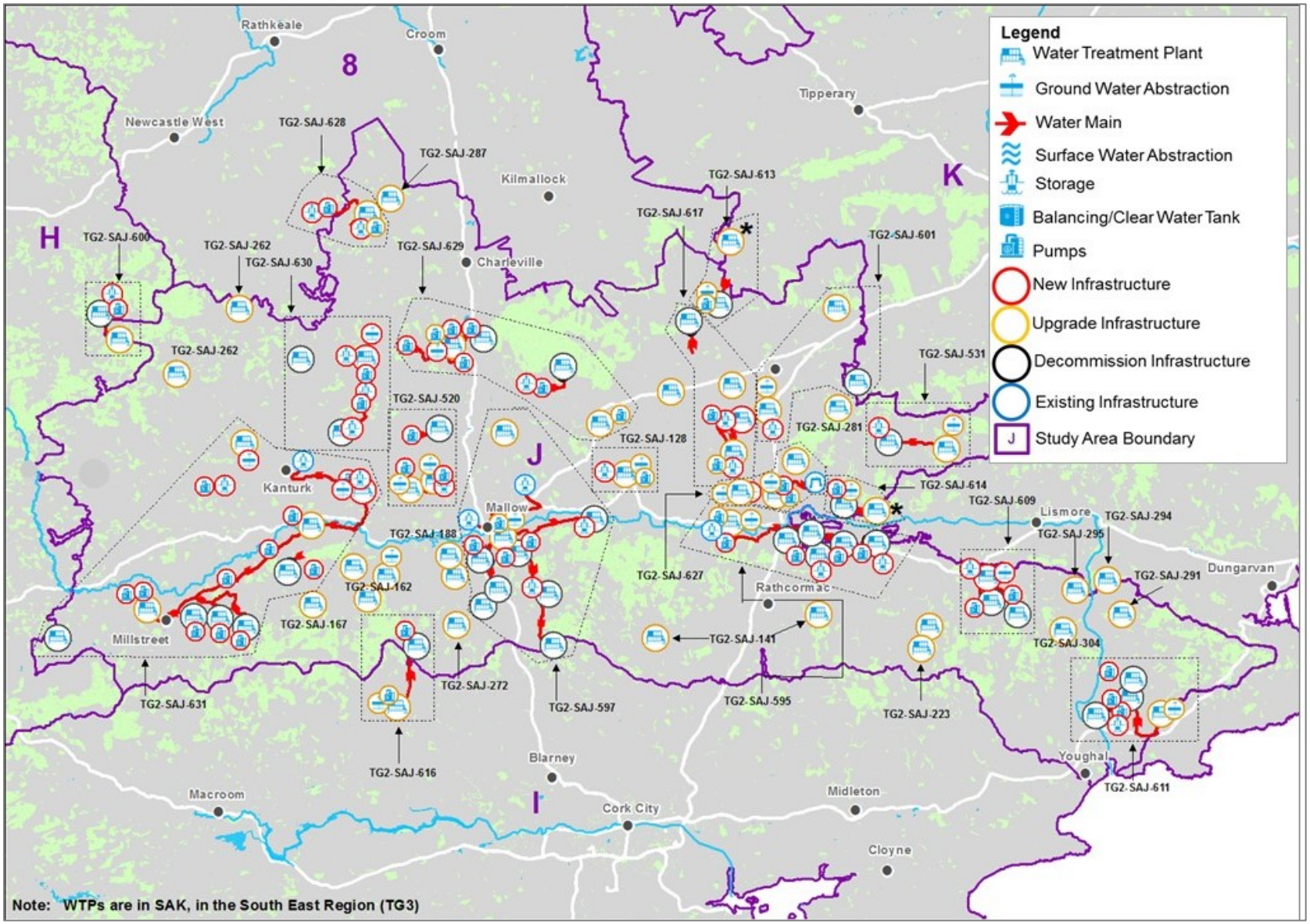


Figure 5.3 SAJ Preferred Approach

The Preferred Approach (SA Combination 12) is shown schematically in Figure 5.3.

The Preferred Approach for SAJ North Cork/West Waterford 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 IRISH WATER 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 SAJ, we must give consideration to the following:

- **Interim Solutions**: Based on the 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 Interim Solutions

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

On this basis, interim, short term capital maintenance solutions have been identified for all WTPs and will be utilised when needed. These solutions will allow IRISH WATER 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 urgent or priority need to address water quality risk or supply reliability e.g. RAL or 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 SAJ Interim Options

WTP Name	Interim Option
Freemount WTP	Upgrade WTP to IRISH WATER Standards
Castlewrixon WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Charleville WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Doneraile Shanballymore WTP	Spring Source - upgrade WTP to IRISH WATER Standards
Monabricka WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Skahanagh WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Ballynoe WTP (Booladurragh)	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Booladurragh WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Castletownroche (Ballyhooly) WTP	Spring Source - upgrade WTP to IRISH WATER Standards
Conna Regional WTP	Upgrade WTP to IRISH WATER Standards
Downing Bridge WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Coolrue WTP	Refurb existing abstraction from infiltration gallery, and upgrade WTP to IRISH WATER Standards
Kilally WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Kilmagnier WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Knockdrumaclough WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Strawhall WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Kilmurray WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Gortnaskehy WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Macroney WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Coolagown WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Ballyvadonna WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution

WTP Name	Interim Option
Bottlehill WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Bweeng WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Ballinamona WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Castletownroche WTP	Spring Source - upgrade WTP to IRISH WATER Standards
Creggane WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Dromahane (Hammond Place) WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Gortnagreige WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Killavullen WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Laharan Abbeys Well WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Laharan Cross WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Mallow WTP	Upgrade WTP to IRISH WATER Standards
Monaparson WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Monee WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Mountnorth WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Ballyclough WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Rahan WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Carrigcleena WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Box Cross WTP	Refurb existing Boreholes, and upgrade WTP to IRISH WATER Standards
Knoppogue WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Boherascrub WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Knockabrack WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Dromahane (Cois Tobair) WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards

WTP Name	Interim Option
Poulgrom WTP	Spring Source - upgrade WTP to IRISH WATER Standards
Caherbarnagh WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Cockhill WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Glenleigh WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Kilcorney WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Lyre (Nad) WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Millstreet WTP	Spring Source - upgrade WTP to IRISH WATER Standards
Derry WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Ballykenley (Johnstown) WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Glenduff WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Killdorrery WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Knockanevin WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Labbamollogga WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Mitchelstown Galtee WTP	Upgrade WTP to IRISH WATER Standards
Mitchelstown South WTP	Refurb existing Boreholes, and upgrade WTP to IRISH WATER Standards
Mountain Barracks WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Dunmahon WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Ballinatona WTP	Spring Source - upgrade WTP to IRISH WATER Standards
Rockchapel WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Knockeragh WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Stagmount WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Kilbrin WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution

WTP Name	Interim Option
Glenville (Village) WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Ballyagran WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Ballyheaphy WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Ballymoate Upper WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Camphire WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Coolboa WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Grallagh WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Kilmore Kilbeg WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Killenagh (Strancally) WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Tallow WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Tinnabinna WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Villierstown WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards
Clashmore White Well (Laurentum) WTP	Upgrade WTP to IRISH WATER Standards – Potential site for a containerised solution
Aglish Cul Rua WTP	Refurb existing Borehole, and upgrade WTP to IRISH WATER Standards

Small Towns and Villages Growth Programme Irish Water'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 IRISH WATER infrastructure but where current or future capacity deficits have been identified.

Irish Water 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 Glanworth / Ballykenley/Johnstown Water Resource Zone.

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 SAJ is shown in Table 7.1.

Table 7.1 Sensitivity Analysis for SAJ

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)	+6,400 m^3/d	**The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the supply demand balance deficit**. There are some surface water sources in SAJ that would be impacted from sustainability reductions. However, our preferred approach is designed to relieve pressure on these sources by supplementing from new more resilient groundwater sources at these sites.
			Based on this scenario, the Preferred Approach remains the optimal solution.
Climate Change	High (international climate change targets have not been met)	+1,900 m^3/d	**Higher climate change scenarios would impact our existing supplies and result in decreased water availability at certain times of year.** Although the likelihood of this scenario is high based on climate change adaptation to date, potential impacts may be mitigated against by optimizing our operations on a more environmentally sustainable basis across the range of supplies.
			Based on this scenario, the Preferred Approach remains the optimal solution.

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Demand Growth	Low/Moderate (growth has been based on policy)	-21,558 m^3/d	**The impact of lower than expected growth would reduce the supply demand balance deficit and the overall need requirement.** The supply demand balance deficit is spread across 62 individual water resource zones and is driven by quality as well as quantity issues. In this rural area, growth is relatively low.
			Based on this scenario, the Preferred Approach remains the optimal solution.
Leakage Targets	Low (Irish Water is focused on sustainability and aggressive leakage reduction)	+369 m^3/d	**The impact of lower than expected leakage savings would increase the supply demand balance deficit and the overall need requirement.** As Irish Water is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage targets as opposed to accepting lower targets.
			Based on this scenario, the Preferred Approach remains the optimal solution.
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-19,197 m^3/d	**The impact of achieving SELL and 21% leakage targets in our larger WRZs would reduce the supply demand balance deficit and the overall need requirement.** The need drivers in SAJ are across all 62 water resource zones and are driven by quality as well as availability issues. Therefore, the Preferred Approach is required, even accounting for increased leakage savings.
			Based on this scenario, the Preferred Approach remains as the optimal solution.

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

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

- Interim Approach – As the purpose of the Interim Approach is to allow for emergency works for priority Quality and Quantity issues, the solutions will have a limited design life (usually less than 10 years). They allow time to assess the Preferred Approach and improve adaptability within our Plan

- Preferred Approach – As the Supplies in SAJ North Cork/West Waterford are relatively small, and as conservative limits have been applied to the supply availability assessments, the Preferred Approach is adaptable to a range of future outlooks in relation to sustainability and climate change. The demand growth in the area is small, and the Supply Demand Deficits are primarily driven by reliability. As Water Treatment Plants are modular, capacity will be delivered on a phased basis, allowing for adaptation across a range of futures. Our Preferred Approach is therefore Adaptable.

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

8 Summary of Study Area J

8 Summary of Study Area J

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 SAJ (summarised in Table 5.8 and Figure 5.3) consists of local WRZ option for 14 of the 62 Water Resource Zones in the Study Area, primarily driven by the small scale of the supplies and difficulties in transporting small volumes of water over long distances.

The Preferred Approach will result in a reduction of WRZs from 62 to 30. 39 of the existing 80 abstractions in SAJ are proposed to be decommissioned, providing significant environmental benefit, particularly as 1 of these is identified in Section 2.4 as abstraction which may not meet sustainability guidelines during dry weather flows, for Allow Regional WRZ.

The preferred approach provides environmental benefits by; allowing IRISH WATER to decommission existing groundwater source at Kilbrin WTP which was identified at potential drought and to decommission the River Allow source which may not meet the sustainability guideline during dry weather flows.

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 SAJ North Cork/West Wicklow also includes for demand side (**Lose Less** and **Use Less**) measures, including.

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

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

Annex A

Study Area J Water Treatment Plants

WTP Asset Name	Local Plant Names
Mallow WTP	Ballyalies WTP
Freemount WTP	Freemount WTP
Castlewrixon WTP	Castlewrixon WTP
Charleville WTP	Charleville WTP
Doneraile Shanballymore WTP	Doneraile Shanballymore WTP
Monabricka WTP	Monabricka WTP
Skahanagh WTP	Skahanagh WTP
Ballynoe WTP (Booladurragh)	Ballynoe WTP (Booladurragh)
Booladurragh WTP	Booladurragh WTP
Castletownroche (Ballyhooly) WTP	Castletownroche (Ballyhooly) WTP
Conna Regional WTP	Conna Regional WTP
Downing Bridge WTP	Downing Bridge WTP
Coolrue WTP	Coolrue WTP
Kilally WTP	Kilally WTP
Kilmagnier WTP	Kilmagnier WTP
Knockdrumaclough WTP	Knockdrumaclough WTP
Strawhall WTP	Strawhall WTP
Kilmurray WTP	Kilmurray WTP
Gortnaskehy WTP	Gortnaskehy WTP
Macroney WTP	Macroney WTP
Coolagown WTP	Coolagown WTP
Ballyvadonna WTP	Ballyvadonna WTP
Bottlehill WTP	Bottlehill WTP
Bweeng WTP	Bweeng WTP
Ballinamona WTP	Ballinamona WTP
Castletownroche WTP	Castletownroche WTP
Creggane WTP	Creggane WTP

WTP Asset Name	Local Plant Names
Dromahane (Hammond Place) WTP	Dromahane (Hammond Place) WTP
Gortnagreige WTP	Gortnagreige WTP
Killavullen WTP	Killavullen WTP
Laharan Abbeys Well WTP	Laharan Abbeys Well WTP
Laharan Cross WTP	Laharan Cross WTP
Monaparson WTP	Monaparson WTP
Monee WTP	Monee WTP
Ballyclough WTP	Ballyclough WTP
Mountnorth WTP	Mountnorth WTP
Rahan WTP	Rahan WTP
Carrigcleena WTP	Carrigcleena WTP
Box Cross WTP	Box Cross WTP
Knoppogue WTP	Knoppogue WTP
Boherascrub WTP	Boherascrub WTP
Knockabrack WTP	Knockabrack WTP
Dromahane (Cois Tobair) WTP	Dromahane (Cois Tobair) WTP
Poulgrom WTP	Poulgrom WTP
Caherbarnagh WTP	Caherbarnagh WTP
Cockhill WTP	Cockhill WTP
Glenleigh WTP	Glenleigh WTP
Kilcorney WTP	Kilcorney WTP
Lyre (Nad) WTP	Lyre (Nad) WTP
Millstreet WTP	Millstreet WTP
Derry WTP	Derry WTP
Ballykenley (Johnstown) WTP	Ballykenley (Johnstown) WTP
Glenduff WTP	Glenduff WTP
Killdorrery WTP	Killdorrery WTP
Knockanevin WTP	Knockanevin WTP
Labbamollogga WTP	Labbamollogga WTP
Mitchelstown Galtee WTP	Mitchelstown Galtee WTP
Mitchelstown South WTP	Mitchelstown South WTP

WTP Asset Name	Local Plant Names
Mountain Barracks WTP	Mountain Barracks WTP
Dunmahon WTP	Dunmahon WTP
Ballinatona WTP	Ballinatona WTP
Rockchapel WTP	Rockchapel WTP
Knockeragh WTP	Knockeragh WTP
Stagmount WTP	Stagmount WTP
Kilbrin WTP	Kilbrin WTP
Glenville (Village) WTP	Glenville (Village) WTP
Ballyagran WTP	Ballyagran WTP
Ballyheaphy WTP	Ballyheaphy WTP
Ballymoate Upper WTP	Ballymoate Upper WTP
Camphire WTP	Camphire WTP
Coolboa WTP	Coolboa WTP
Grallagh WTP	Grallagh WTP
Kilmore Kilbeg WTP	Kilmore Kilbeg WTP
Killenagh (Strancally) WTP	Killenagh (Strancally) WTP
Tallow WTP	Tallow WTP
Tinnabinna WTP	Tinnabinna WTP
Villierstown WTP	Villierstown WTP
Clashmore White Well (Laurentum) WTP	Clashmore White Well (Laurentum) WTP
Aglish Cul Rua WTP	Aglish Cul Rua WTP

Annex B

Study Area J Rejection Register Summary