



7



**Preferred
Approach –
Study Area**



7.1 Introduction

The purpose of this section of the RWRP-SW is to examine all potential Feasible Options that could be used to address the identified Need (both in terms of Quantity and Quality) across the 174 Water Resource Zones (WRZs) in the South West Region. The Approach Development Process, which is set out in Section 8.3.7 of the Framework Plan, seeks to identify the Preferred Approach for addressing Need at three (3) spatial Levels: individual WRZs, Study Area (SA) Level, and Regional Level (Figure 7.1). This process involves comparison of the Feasible Options at each Level using defined criteria.

The Approach Development Process is undertaken sequentially for each WRZ and Study Area, before looking at approaches to address Need at a wider Regional Level. This Section will outline how the process is applied at WRZ and Study Area Level and Section 8 outlines the development of the Preferred Approach at Regional Level.

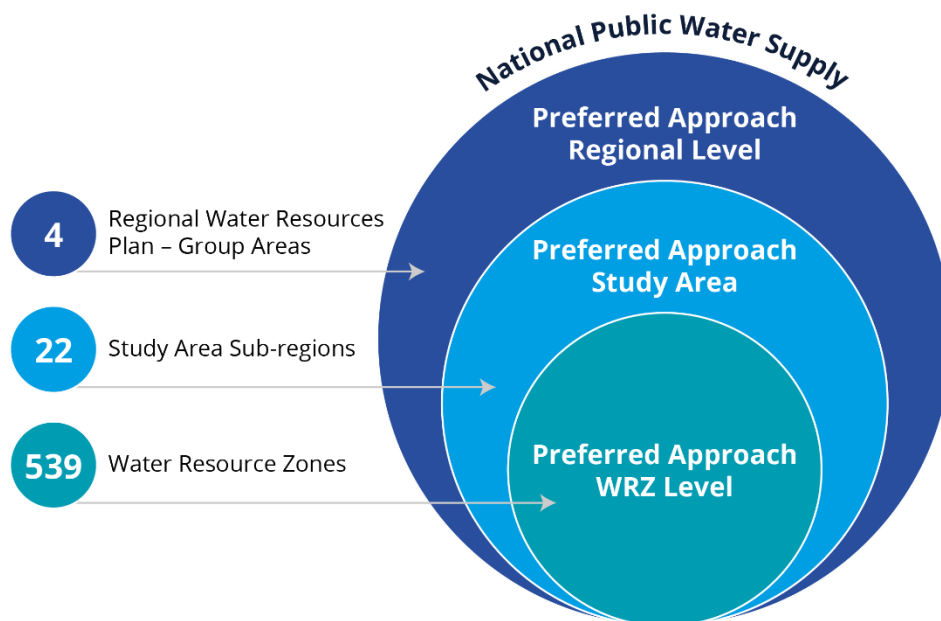


Figure 7.1 Spatial Level Assessment

The process we follow, which is based on a hierarchical view of the South West Region, allows us not only to resolve Need across the individual supplies, but also allows us to understand the potential for the strategic possibilities for collective water supply needs across the South West Region. This complete view means that each WRZ is no longer looked at in isolation (which was historically the case). It also enables the establishment of a wider plan that allows for the integration of WRZs, in circumstances where such integration is identified as the best outcome. This approach aligns with other jurisdictions that have fewer WRZs and will help deliver a more sustainable and cost-effective water supply service.

This section,

- Outlines the Approach Development Process we have implemented to determine the Study Area Preferred Approach (Section 7.2).
- Describes the Study Area Preferred Approach we have developed to address long term Need within the South West Region and compares this with the WRZ Level Approach (Section 7.3 and 7.4).
- Summarises the Preferred Approach for each Study Area (Section 7.5).
- Presents the 'Interim Solutions' we have identified to address the short-term Needs within the South West Region (Section 7.6).

- Details the outcomes of the Sensitivity Analysis of each of the Preferred Approaches to changes in climate change, abstraction limits, leakage targets and growth projections (Section 7.7).

7.2 Approach Development Process

7.2.1 Approach Categories

The Framework Plan establishes an Approach Development Process (Section 8.3.7) to compare various Options to address the Need within each WRZ and Study Area, and across the South West Region as a whole. This process is designed to identify the Option that meets identified Deficits while providing the best overall outcomes when considered against a range of criteria.

Specifically, the Approach Development Process assesses the Feasible Options under six (6) defined "Approach Categories". These categories are Least Cost, Best AA (Best Appropriate Assessment), Best Environmental, Most Resilient, Lowest Carbon and Quickest Delivery. These Approach Categories were selected to align the National Water Resources Plan (NWRP) with relevant Government Policy. The six (6) categories, along with the associated policy drivers, are summarised in Table 7.1 and explained in more detail below.

We use these Approach Categories as a starting point to determine the best performing Option to meet the Deficit, relative to each Approach Category. For example, a "Least Carbon" approach would be the Option that would meet the Deficit and involve the least embodied and operational carbon load over the lifetime of the Option.

Table 7.1 Range of Approaches to Test Feasible Option

Approaches Tested	Description	Policy Driver
Least Cost	Lowest Net Present Value (NPV) cost in terms of Capital, Operational, Environmental and Social and Carbon Costs	Public Spending Code
Best Appropriate Assessment (Best AA)	<p>Lowest score against the European Sites (Biodiversity) sub-criteria question:</p> <p>Score = 0 equates to no Likely Significant Effects (LSEs). If, in our opinion, these 0 scoring Option meet the Deficit/ plan objectives, they are automatically picked as the Preferred Approach.</p> <p>Score = -1 or -2 equates to LSEs that can be addressed with general/standard mitigation measures.</p> <p>Score = -3 equates to LSEs that may be harder to mitigate or require significant Project Level assessment.</p>	Habitats Directive
Quickest Delivery	<p>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</p> <p>This is particularly relevant where an Option might be required to address an urgent Public Health issue.</p>	Statutory Obligations under the Water Supply Act and Drinking Water Regulations

Approaches Tested	Description	Policy Driver
Best SEA Environmental	This is the Option or combination of Options with the highest total score across the 19 No. Strategic Environmental Assessment (SEA) Multi-Criteria Assessment (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 four (4) resilience criteria. These include outages, financial uncertainty, regulatory changes, and climate change.	National Adaptation Plan and Climate Action Plan
Lowest Carbon	This is the Option or combination of Options with the lowest embodied and operational carbon cost	Climate Action Plan

Least Cost Approach

The Least Cost Approach is determined using an Irish Water Net Present Value (NPV) assessment tool which establishes the Option with the lowest comparative NPV cost encompassing: Environmental and Social Costs, Carbon Costs, Capital Costs and Operational Costs. The NPV assessment tool utilises a strict set of requirements and is limited in the flexibility it offers. Therefore, where a number of Options provide similar NPV costs, so as to ensure that no such Options are excluded at this early stage by reference only to "least cost", Irish Water has considered that all Options within a 5% NPV cost margin are in principle eligible to be identified as the "least cost" Option. This approach also recognises the desk-based nature of the NPV assessment, and the fact that these figures will change at Project Stage. To then determine the individual "least cost" Option in each case, Irish Water has applied wider factors, including SEA and Habitats objectives, as part of its exercise of professional judgement (as explained in Section 8.3.7.4 in the Framework Plan). Further details of this approach are provided in Section 7.2.2. below. This approach also ensures that our Plan Level assessments align with the requirements of the Public Spending Code and the National Adaptation Framework¹.

Best Appropriate Assessment (Best AA) Approach

The Best AA approach gives maximum consideration to the Options with no potential for impacts on European Designated sites (no Likely Significant Effects or LSEs) or Options with LSEs that can be addressed with general/standard mitigation measures at the Project Level. This can equally be described as giving maximum consideration to the Option with the Least Impact on European Sites. This prioritises the avoidance of impacts on European Sites in the Option Assessment Process.

Options with a high LSEs, which could lead to adverse effects on a European Site, will have already been removed at Coarse Screening stage.

Quickest Delivery Approach

The Quickest Delivery Approach is based on the estimated time for an Option to be brought into operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening. This approach allows us to potentially optimise the Preferred Approach by minimising the time taken for an Option to become operational. This could be appropriate in a WRZ with a critical water quality issue that might impact on public health, as this approach would identify the Option that could potentially be delivered in the shortest possible timeframe. As the NWRP does not confer funding or statutory consent for any project, and the identified Needs across the South West Region must be considered, we would be unlikely to modify an approach based on Quickest Delivery, unless there is a critical driver.

Best Environmental Approach

The Best SEA Environmental Approach is the Option performing best overall across the 19 SEA objective-based MCA environmental criteria, assessed as part of the Fine Screening assessment (described in Section 8.3.5 of the Framework Plan). Positive and negative scores are summed separately. The purpose of this approach is to ensure that the SEA objectives to minimise potential impacts are considered through the Option Assessment and Approach Selection process. For each Option, we assess the MCA scoring in detail across all SEA assessment criteria, using the sum negative scores to indicate the potential for significant adverse effects and the sum positive to indicate the potential for beneficial effects. We also review the scoring against individual criteria to identify where assessment reflects important differences between Options focusing on potential operational or long-term effects. This ensures that we can review the relative merits of each Option. When the combination with the lowest environmental score also scores any -3 score under the Best AA criteria, we review the other combinations to determine if there are any combinations with a no -3 biodiversity score. The Best Environmental is the Combination with the best performing environmental score with the least number of -3 scores against the best AA criteria.

Table 8.6 of the Framework Plan lists the criteria, sub-criteria and questions that are applied when completing the MCA assessment.

Most Resilient Approach

The Most Resilient Approach is the Option with the highest scores against four (4) resilience MCA screening criteria. These include outages, financial uncertainty, regulatory changes, and climate change. This approach is aligned to the NWRP objective to ensure a safe and secure water supply in the short, medium and long term.

Lowest Carbon Approach

The Lowest Carbon Approach is the Option with the lowest embodied and operational carbon costs. This approach is aligned with Irish Water's carbon reduction policies and the National Adaptation Framework (NAF)¹ in relation to climate change.

7.2.2 Approach Ranking and Appraisal

The EBSD (Economics of Balancing Supply and Demand) method is applied to rank the Options in order of lowest to highest NPV cost and with regard to their applicable MCA scores for the six (6) Approach Categories. The EBSD method determines an optimum combination of Options to address the future Need, balancing across the range of NWRP and SEA objectives outlined above. Further detail on the EBSD method is outlined in Section 8.3.7 of the Framework Plan.

In some instances, Options may achieve similar, although not identical scores within an Approach Category. In these circumstances, to ensure that Options which perform better overall are not excluded from the Approach Development Process, Irish Water (6) takes a wider look at the combination to consider which of these comparable Options to categorise as the “Best” approach within each category. In particular, Irish Water takes into account whether the Option or combination of Options meets the SEA and Habitats objectives outlined in the Framework Plan. This is an example of the exercise of professional judgement from the multi-disciplinary teams identified in Section 8.3.7.4 of the Framework Plan as being necessary.

We then compare the Option identified as the best performing within each of the six (6) Approach Categories (Least Cost, Best AA, Lowest Carbon etc.) against each other to come up with a Preferred Approach that meets the objectives of the Framework Plan and aligns with all relevant Government Policy. This comparison process is outlined in Figure 7.2. In this figure, the ‘Modified Approach’ refers to the Approach that is taken forward at Step 2 to Step 5. For example, at Step 2, if the Quickest Delivery Approach is determined to outperform the Least Cost Approach overall (when comparing the MCA scores of each Approach across the six categories), the Quickest Delivery Approach becomes the ‘Modified Approach’. At Step 3, it is then the Quickest Delivery Approach (as the ‘Modified Approach’) that is compared against the Best Environmental Approach.

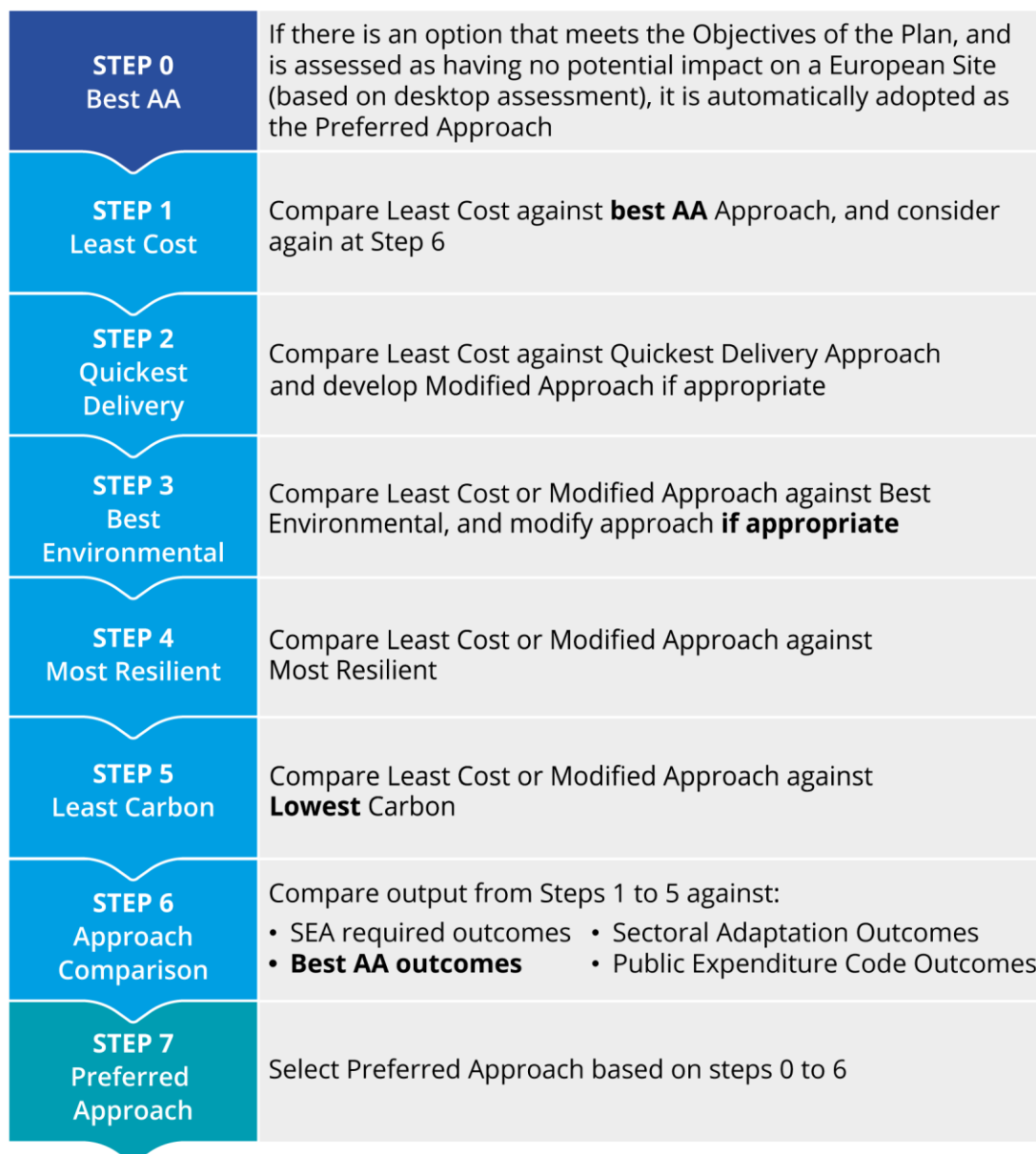


Figure 7.2 Seven (7)-Step Approach Development Process

This Approach Development Process is conducted via a combination of interactive workshops supported by a process of ongoing engagement and dialogue between the technical experts, including Engineers, Hydrologists and Hydrogeologists, Ecologists and Environmental Scientists working directly on the development of the Preferred Approach.

It should be noted that the identification of a Preferred Approach at a Plan Level does not confer any consent to develop a project, nor does it preclude other Options being considered subsequently at the Project Level. Assessments at this stage are desk based and Plan Level assessments. No statutory consent or funding consent is conferred by inclusion of any Option in the NWRP. Any projects that are progressed following identification as a Preferred Approach in the Regional Plans, 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.

As explained in Section 6, the Option to resolve a Deficit can include a transfer of water from outside the WRZ or Study Area. The feasible source area will depend on the size of the demand centre. It is usually not feasible to develop Options that require small volumes of water to be transferred over a distance of five (5) kilometres or more, due to potential water quality issues associated with such transfers.

The Approach Development Process contains three (3) tiers. We first start with WRZ Level and then apply the process sequentially to each Study Area and then the Region as follows:

Stage 1 – We assess the WRZ individually to develop an initial Preferred Approach, the - WRZ Level 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. 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 across the six (6) Approach Categories. This is known as the Preferred Approach at SA Level. We set out the process for identifying the Preferred Approach for WRZ and Study Area Level below, and Section 8 outlines how this is done at Regional Level.

7.2.3 Stage 1 – WRZ Level Approach

7.2.3.1 Test a Range of Approach Types - WRZ Level

The purpose of the NWRP is to examine all potential Options that could be used to resolve the Need within the WRZ (Unconstrained Option) and then to eliminate those that are not feasible or that have identifiable environmental issues at a desktop level (Option assessment screening). This is set out in Section 6.

The remaining Feasible Options are categorised as Options that resolve the Need for one WRZ only (“WRZ Option”), and Options that resolve the Need for more than one WRZ (“Study Area Option”).

To illustrate, Table 7.2 provides an overview of the number of feasible WRZ Options and Study Area Options for the 23 WRZs in Study Area H (SAH) in county Kerry.

Table 7.2 SAH – Option Types

Water Resource Zone	Option Type	
	WRZ Option	Study Area Option
Abbeyfeale Water Supply	2	4
An Baile Mor / An Daingean	4	1
An Clochan	1	2
An Fheothanach / An Mhuirioch/ Baile Breach	6	0
An Mhin Aird	1	3
Annascaul / Ballintermon	2	4
Ardfert North/ Glenderry Ballyheigue WRZ	4	2
Aughacasla	1	2
Baile An Fheirtearaigh / Tir Abhainn Thoir / Cill Maoilcheadair / An Ghraig/Cloichear	2	2
Brosna/Knocknagoshel PWSS 016F	4	0
Cahersiveen	4	4
Castlegregory PWSS 024D	2	2
Ce Bhreannain	1	1
Ceann Tra PWS 074D	1	1
Central Regional - Lough Guitane	10	23
Dun Chaoin PWS 034D	1	3
Emlaghpeasta / Portmagee / Maulin	2	3
Lios Cearnaigh PWS 052D	1	1
Listowel Regional Public Water Supply	0	4
Lyranes 303A	1	0
Mid Kerry	4	7
Mountain Stage PWS 062A	1	2
Rathmore	1	2

Irish Water's next step is to assess the Feasible WRZ Options for each WRZ and identify the best performing Option within each of the six (6) Approach Categories for the relevant WRZ. This is achieved by following the Seven (7)-Step Approach Development Process (Figure 7.2).

There may be WRZs where there are no feasible WRZ Options available to address the Need. This is the case for the Listowel WRZ in Study Area H (SAH) and four (4) WRZs in Study Area I (SAI). In these circumstances the WRZ Level Approach is excluded from the Approach Development Process as it does not meet the Deficit for the region. This is discussed further in Section 7.2.4 and Section 7.2.5.

The Approach Development Process at WRZ Level is illustrated using the Mid-Kerry WRZ in SAH. As can be seen from Table 7.2 above, there are four (4) feasible WRZ Options for Ardfert North / Glenderry Ballyheigue WRZ. We rank the four (4) WRZ Options against the six (6) Approach Categories using the EBSD tool. As set out in Table 7.3, Option SAH-038, provides the best outcome under four (4) Approach Categories, being the Least Cost, Quickest Delivery, Best AA and Most Resilient. In relation to the other Approach Categories, SAH-044 ranks highest for Best SEA (overall environmental score) and SAH-172 ranks highest for Lowest Carbon.

As previously mentioned, in some instances, Options may achieve similar, although not identical, scores within an Approach Category. In the example presented in Table 7.3, there are two (2) Options that achieve similar scores for the Quickest Delivery and the Most Resilient criteria, and four (4) Options that achieve similar scores for the Best AA criteria. As described in Section 7.2.2, where Options or combinations of Options achieve similar, although not exactly identical scores under the six (6) approach types, Irish Water takes a wider look at the comparable combinations/Options to consider which to categorise as the “Best” approach within each category.

Therefore prior to the Seven (7)-Step process we compare the two Options that achieve similar scores for the Quickest Delivery and the Most Resilient criteria to determine which approach should go forward as the Quickest Delivery approach and Most Resilient Approach. The scores for these options across all criteria were comparable, however, SAH-038 had a lower Carbon Cost. Therefore SAH-038 is considered the Quickest Delivery approach and Most Resilient Approach.

Additionally, all four (4) Options achieve the same scores for the Best AA criteria therefore these Options are compared to determine the Best AA approach. SAH -044 is determined the Best AA approach as it preforms best against the environmental criteria.

Table 7.3 SAH, Ardfert North/Glenderry Ballyheigue WRZ - WRZ Options

Water Resource Zone Name	Feasible Option SA4			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA (Environmental)	Lowest Carbon	Most Resilient
Ardfert North/ Glenderry Ballyheigue WRZ	4	SAH-038	Increase Ballyheigue abstraction. Abandon existing BH at Glenderry Well and rationalise WTP	✓	✓	✓	-	-	✓
		SAH-039	Increase GW abstraction from Slugaire Well (local important aquifer) and upgrade Ballyheigue WTP	-	✓	✓	-	-	✓
		SAH-044	Potential for new GW abstraction at Larig Reservoir, Ballyheigue Reservoir site	-	-	✓	✓	-	-
		SAH-172	New GW abstraction from Ballybunnion GWB	-	-	✓	-	✓	-

7.2.3.2 Approach Appraisal - WRZ Level Approach

Once Irish Water has identified the Option with the best outcomes within each of the Approach Categories, these Options are then brought through to the Approach Development Process. As noted previously, this process allows us to compare the best ranked approaches within each category at WRZ Level relative to each other, to select the Option that provides the best overall solution for that WRZ. This process is demonstrated in Figure 7.3 for the Ardfert North/Glenderry Ballyheigue WRZ in SAH.

STEP 0 Best AA	There are no options assessed as having no potential impact on a European Site (based on a desktop assessment). Proceed to the 7-step process.
STEP 1 Least Cost	We compared the Least Cost Approach against the Best AA Approach. Whilst the Least Cost Approach has a -2 biodiversity score, there are no other Approaches assessed as having no potential impact on the European Site. All other options also had a -2 biodiversity score. The Least Cost Approach was therefore retained at this stage.
STEP 2 Quickest Delivery	We compared the Quickest Delivery Approach against the Least Cost Approach. Two Options were identified as the Quickest Delivery Approach, one of which was the Least Cost Approach. Therefore the Least Cost Approach was retained at this stage.
STEP 3 Best Environmental	We compared the Least Cost against the Best Environmental Approach. The Best Environmental Approach was not significantly better than the Least Cost Approach and was less resilient and had higher carbon and NPV costs. Therefore the Least Cost Approach was retained at this stage.
STEP 4 Most Resilient	We compared the Least Cost Approach against the Most Resilient Approach. Two Options were identified as the Most Resilient, one of which was the Least Cost Approach. The Most Resilient approach is therefore also the Least Cost Approach. The Least Cost Approach was therefore retained at this stage.
STEP 5 Least Carbon	We compared the Least Cost Approach against the Lowest Carbon Approach. The Lowest Carbon Approach had a carbon cost which was only marginally below the Least Cost Approach and was worse in terms of Resilience and NPV Cost. The Least Cost Approach was therefore retained at this stage.
STEP 6 Approach Comparison	A final assessment of the Least Approach was completed against the Least Carbon, Best AA, Best Environmental and Most Resilient Approaches. The Least Cost Approach is also the Most Resilient and Quickest Delivery. It is comparable to other options in relation to the Best AA, Best Environmental and Least Carbon assessment. The Least Cost Approach was therefore retained at this stage.
STEP 7 Preferred Approach	The Least Cost Approach was selected as the Preferred Approach for the Water Resource Zone.

Figure 7.3 WRZ Level Preferred Approach Development - SAH, Ardferf North/Glenderry Ballyheigue WRZ

We follow this same process for the WRZs within each Study Area to establish the Preferred Approach for each WRZ across the three (3) Study Areas of the South West Region. The individual WRZ Preferred Approaches are combined and referred to as the **WRZ Level Approach**. This Stage 1 process is outlined in Figure 7.4.



Figure 7.4 Preferred Approach Development – Stage 1

The outcome of the Stage 1 process for SAH is summarised in Table 7.4. This shows the combination of the WRZ Preferred Approaches in the Study Area and their alignment with the six (6) Approach Categories, as determined by the application of the Seven (7)-Step process. As noted previously, there is no feasible local WRZ Option for the Listowel WRZ. The Unconstrained Options identified for the Listowel WRZ were rejected as they either could not supply the Deficit, or the required increased abstraction would exceed estimated future sustainable thresholds. For this reason, the WRZ Level Approach for SAH (which is the combination of the WRZ Preferred Approaches for each WRZ in the SA) does not address the full Deficit for the Study Area. This highlights the benefit of identifying Options at a broader Study Area Level (Section 7.2.4), where Options that have the potential to meet the Deficit of more than one WRZ can offer an alternative to a potentially unsustainable local WRZ Option. The SA Options are also likely to deliver cost efficiencies by supplying multiple WRZs, as well as providing wider environmental and social benefits through the rationalisation of infrastructure and abstraction points.

Table 7.4 SAH WRZ Level Approach – Assessment Outcome

Water Resource Zone Name	Feasible Options SAH Kerry		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Abbeyfeale Water Supply	TG2-SAH-158	New GW abstraction -abstraction point TBC. Poorly productive aquifer	-	✓	✓	✓	✓	✓	✓	✓
An Baile Mor/An Daingean	TG2-SAH-179	New SW abstraction from Milltown River and WTP	✓	✓	-	✓	-	✓	✓	✓
An Clochan	TG2-SAH-107	Increase GW abstraction at BH. (Currently 5 springs and 2 BHs) Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones	-	✓	✓	✓	✓	✓	✓	✓
An Fheothanach/An Mhuirioch/ Baile Breach	TG2-SAH-122	Amalgamate all sources in WRZ to one WTP and rationalise smaller WTP - Upgrade an Fheothanach WTP.	-	✓	✓	✓	✓	✓	✓	✓
An Mhin Aird	TG2-SAH-099	New GW abstraction in Dingle area to serve the customers currently served by An Mhin Aird Gualainn WTP.	✓	✓	✓	✓	✓	✓	✓	✓
Annascaul/Ballintermon	TG2-SAH-173	WTP Upgrade - No deficit	-	-	✓	✓	✓	-	-	✓
Ardfert North/Glenderry Ballyheigue WRZ	TG2-SAH-038	Increase Ballyheigue abstraction. Abandon existing BH at Glenderry Well and rationalise WTP	-	✓	✓	✓	-	-	✓	✓

Water Resource Zone Name	Feasible Options SAH Kerry		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Aughacasla	TG2-SAH-138	New GW abstraction from Aughacasla BHs and upgrade existing Aughacasla WTP to supply deficit. Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones	-	✓	✓	✓	✓	✓	✓	✓
Baile An Fheirtearaigh /Tir Abhainn Thoir/Cill Maoilheadair /An Ghraig/Cloichear	TG2-SAH-085	Abandon An Ghraig Cloichear WTP, Tir Abhainn Thoir WTP and Leataoibh WTP and feed from Tobar Bhrendain WTP, An Riasc WTP and Cill Maoilheadair WTP	✓	✓	✓	✓	✓	✓	✓	✓
Brosna/Knocknagoshel PWSS 016F	TG2-SAH-225	Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-	✓	-	-	-	✓	-	✓
Cahersiveen	TG2-SAH-062	Supplement Cahersiveen from River Inny	-	✓	✓	✓	✓	✓	✓	✓
Castlegregory PWSS 024D	TG2-SAH-065	New SW abstraction from Lough Gill and upgrade Castlegregory WTP	-	✓	✓	✓	-	-	✓	✓
Ce Bhreannain	TG2-SAH-140	Increase GW abstraction at BH. (1 Spring) Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones	-	✓	✓	✓	✓	✓	✓	✓
Ceann Tra PWS 074D	TG2-SAH-094	Increase GW abstraction from Ceann Trá WTP BHs (Local important aquifer) and upgrade Ceann Tra WTP	✓	✓	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Options SAH Kerry		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	Preferred Approach
Central Regional - Lough Guitane	TG2-SAH-002	New surface water abstraction from the lower Leane catchment, treat at Lough Guitane WTP.	-	-	-	-	-	-	✓	✓
Dun Chaoin PWS 034D	TG2-SAH-123	Increase GW abstraction with 1 new BH. (Currently 1 Spring source)	-	✓	✓	✓	✓	✓	✓	✓
Emlaghpeasta/Portmagee/ Maulin	TG2-SAH-068	Increase GW abstraction from Maulin Well (local important aquifer) and upgrade Málainn WTP	-	✓	✓	✓	✓	✓	✓	✓
Lios Cearnaigh PWS 052D	TG2-SAH-169	No Deficit - WTP Upgrade	✓	✓	✓	✓	✓	✓	✓	✓
Listowel Regional Public Water Supply	No local solution.									
Lyranes 303A	TG2-SAH-148	Increase GW abstraction from source Lyranes BH (local important aquifer) and upgrade Lyranes WTP	-	✓	✓	✓	✓	✓	✓	✓
Mid Kerry	TG2-SAH-021	New SW abstraction from Lough Caragh and new WTP	-	✓	✓	-	✓	-	✓	✓
Mountain Stage PWS 062A	TG2-SAH-170	New abstraction from Coomasaharn Lake, upgrade Mountain Stage WTP to treat	-	✓	✓	✓	✓	✓	✓	✓
Rathmore	TG2-SAH-109	Increase GW abstraction from Awnaskirtaun Spring and upgrade existing Rathmore WTP	-	✓	✓	✓	✓	✓	✓	✓

7.2.4 Stage 2 – Study Area Combinations

As outlined in Section 6, there are three (3) types of Options considered within the NWRP:

- WRZ Option – Options that address Need in one WRZ only
- SA Option – Options that can address needs across multiple WRZs generally within a Study Area
- Regional Option – Options that can address the needs in multiple WRZs across multiple Study Areas.

Accordingly, once the Preferred Approach for each of the individual WRZs has been identified, we determine whether there are alternative SA Options that can address need in more than one WRZ and replace the WRZ Options. Irish Water then develops various combinations of Study Area Options and WRZ Options that can address the Deficit for the entire Study Area. These are called "SA Combinations". This Stage 2 process is summarised in Figure 7.5.

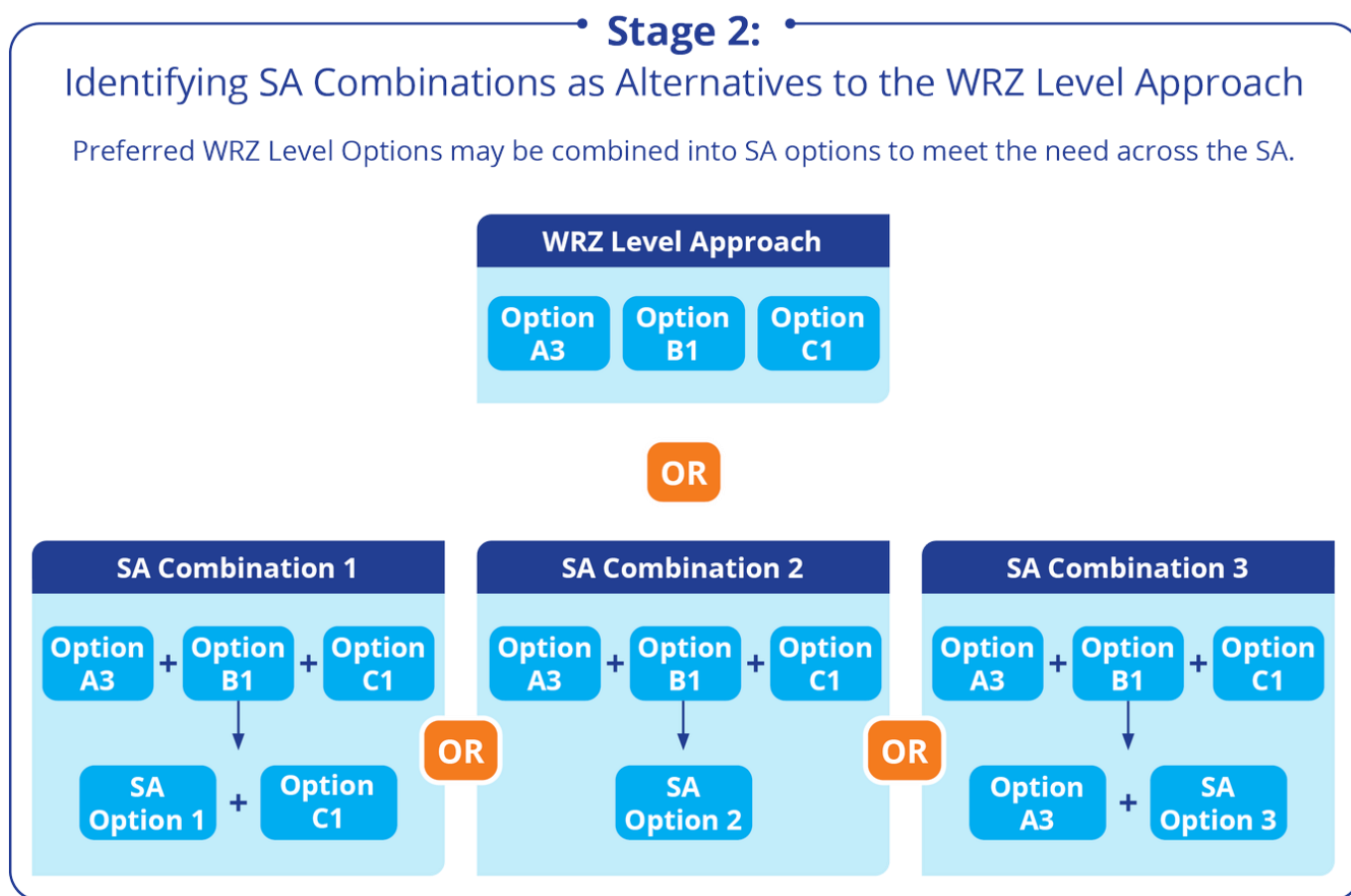


Figure 7.5 Preferred Approach Development – Stage 2

The WRZ Level Approach will form one of these combinations for assessment at the Study Area Level, if it can meet the full Deficit of the Study Area. Where this is not the case, as for SAH and SAI, the WRZ Level Approach is not included in the Seven (7)-Step Option Development Process.

In our example of SAH, eleven (11) SA Combinations were developed and taken through the Seven (7)-Step process to identify the 'Best' performing combination of Options across the six (6) Approach Categories. The combinations for SAH are summarised in Table 7.5.

Table 7.5 SAH WRZ Level Approach - Assessment Outcome

Key	WRZ Level Approach Option	<input type="radio"/>	SA Grouped Option	<input type="checkbox"/>
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WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 24, 30, 31 and 32)	SA Combination 2 (SA Grouped Option 24, 30, 31 and 33)	SA Combination 3 (SA Grouped Option 24, 30 and 31)	SA Combination 4 (SA Grouped Option 24, 30 and 32)	SA Combination 5 (SA Grouped Option 24, 30, 31 and 39)	SA Combination 6 (SA Grouped Option 24, 30, 31, 32 and 39)	SA Combination 7 (SA Grouped Option 24, 30, 31, 33 and 40)	SA Combination 8 (SA Grouped Option 31, 33 and 40)	SA Combination 9 (SA Grouped Option 12, 24, 30, 31, 33 and 40)	SA Combination 10 (SA Grouped Option 36)	SA Combination 11 (SA Grouped Option 24)
Abbeyfeele Water Supply	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An Baile Mor / An Daingean	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>
An Clochan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
An Fheothanach / An Mhuirioch/ Baile Breach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An Mhin Aird	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>
Annascaul / Ballintermon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>
Ardfert North/ Glenderry Ballyheigue WRZ	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aughacasla	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 24, 30, 31 and 32)	SA Combination 2 (SA Grouped Option 24, 30, 31 and 33)	SA Combination 3 (SA Grouped Option 24, 30 and 31)	SA Combination 4 (SA Grouped Option 24, 30 and 32)	SA Combination 5 (SA Grouped Option 24, 30, 31 and 39)	SA Combination 6 (SA Grouped Option 24, 30, 31, 32 and 39)	SA Combination 7 (SA Grouped Option 24, 30, 31, 33 and 40)	SA Combination 8 (SA Grouped Option 31, 33 and 40)	SA Combination 9 (SA Grouped Option 12, 24, 30, 31, 33 and 40)	SA Combination 10 (SA Grouped Option 36)	SA Combination 11 (SA Grouped Option 24)
Baile An Fheirtearaigh / Tir Abhainn Thoir / Cill Maoilcheadair / An Ghraig/Cloichear	○	○	□	○	○	○	○	□	□	□	○	○
Brosna/Knocknagoshel PWSS 016F	○	○	○	○	○	○	○	○	○	○	○	○
Cahersiveen	○	□	□	□	○	□	□	□	□	□	○	○
Castlegregory PWSS 024D	○	○	○	○	○	□	□	○	○	○	○	○
Ce Bhreannain	○	○	○	○	○	○	○	○	○	□	○	○
Ceann Tra PWS 074D	○	□	○	○	□	○	□	○	○	○	○	○
Central Regional - Lough Guitane	○	□	□	□	□	□	□	□	○	□	□	○
Dun Chaoin PWS 034D	○	□	□	○	□	○	□	□	□	□	○	○
Emlaghpeasta / Portmagee / Maulin	○	□	□	□	○	□	□	□	□	□	○	○
Lios Cearnaigh PWS 052D	○	○	○	○	○	○	○	○	○	○	○	○
Listowel Regional Public Water Supply	No local solution	□	□	□	□	□	□	□	□	□	□	□
Lyranes 303A	○	○	○	○	○	○	○	○	○	○	○	○

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 24, 30, 31 and 32)	SA Combination 2 (SA Grouped Option 24, 30, 31 and 33)	SA Combination 3 (SA Grouped Option 24, 30 and 31)	SA Combination 4 (SA Grouped Option 24, 30 and 32)	SA Combination 5 (SA Grouped Option 24, 30, 31 and 39)	SA Combination 6 (SA Grouped Option 24, 30, 31, 32 and 39)	SA Combination 7 (SA Grouped Option 24, 30, 31, 33 and 40)	SA Combination 8 (SA Grouped Option 31, 33 and 40)	SA Combination 9 (SA Grouped Option 12, 24, 30, 31, 33 and 40)	SA Combination 10 (SA Grouped Option 36)	SA Combination 11 (SA Grouped Option 24)
Mid Kerry	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Mountain Stage PWS 062A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>
Rathmore	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="radio"/>

Table 7.5 demonstrates the variety of SA Combinations for SAH. For example, SA Combination 1 contains Group Option 24, 30, 31 and 32. Each Group in this SA Combination resolves the Need for two (2) WRZs: Abbeyfeale Water Supply and Listowel Regional Public Water Supply (Group 24), Central Regional – Lough Guitane and Mid-Kerry (Group 30), Cahersiveen and Emlaghpeasta/ Portmagee/ Maulin (Group 31) and Dun Chaoin PWS 034D and Ceann Tra PWS 074D (Group 32). The Need for the remaining WRZs in SA Combination 1 is resolved by the Preferred Approach at WRZ Level.

Even when we consider all permutations of Study Area Options to create the SA Combinations, there are some water supplies that will always require a WRZ Level Option. For example, in SAH An Fheothanach /An Mhuirioch/Baile Breach, Ardfert North/Glenderry Ballyheigue, Brosn/Knocknagoshel PWSS 016F, Ce Bhreannain, Lios Cearnaigh PWS 052D and Lyranes 303A are always supplied by a WRZ Level Option. These WRZs are typically very small, isolated supplies serving a limited number of people. Due to the age of our water network and water quality issues associated with transferring small volumes of water over long distances, a local supply is a more suitable solution for such WRZs. In these cases, the emphasis of the NWRP is to ensure that the best possible resilient local sources are identified.

In Table 7.6 we show the number of SA Combinations identified for each Study Area.

Table 7.6 Number of SA Combinations for each Study Area

Number of SA Combinations		
SAH	SAI	SAJ
11	6	14

7.2.5 Stage 3 – Study Area Level Preferred Approach

7.2.5.1 Test a Range of Approach Types – Study Area Level

As part of Stage 3, we compare the WRZ Level Approach and the SA Combinations developed in Stage 2. Where the WRZ Level Approach cannot meet the full supply deficit of the Study Area (as is the case for SAH and SAI) it is excluded at this stage of comparison.

The purpose of this exercise is to ensure that the Preferred Approach selected at Study Area Level for each Study Area is the combination of Options that provide the best overall outcome, when considered against the six (6) Approach Categories. To assist us in this exercise, we use the EBSD tool to rank the Study Area Combinations against the six (6) Approach Categories.

Table 7.7 shows an example of the output from the EBSD process for SAH. Scores are not presented for the WRZ Level Approach for SAH as it has been excluded from the assessment at this stage.

Table 7.7 Stage 3 – EBSD Output for SAH (SA Combinations Assessment)

WRZ	WRZ Level Approach (Did not meet need)	SA Combination 1 (SA Grouped Option 24, 30, 31 and 32)	SA Combination 2 (SA Grouped Option 24, 30, 31 and 33)	SA Combination 3 (SA Grouped Option 24, 30 and 31)	SA Combination 4 (SA Grouped Option 24, 30 and 32)	SA Combination 5 (SA Grouped Option 24, 30, 31 and 39)	SA Combination 6 (SA Grouped Option 24, 30, 31, 32 and 39)	SA Combination 7 (SA Grouped Option 24, 30, 31, 33 and 40)	SA Combination 8 (SA Grouped Option 31, 33 and 40)	SA Combination 9 (SA Grouped Option 12, 24, 30, 31, 33 and 40)	SA Combination 10 (SA Grouped Option 36)	SA Combination 11 (SA Grouped Option 24)
Least Cost										Best	Worst	
Quickest Delivery							Best		Worst			
Best AA *no. of -3 scores against biodiversity	4 No. -3 scores	3 No. -3 scores	3 No. -3 scores	3 No. -3 scores	3 No. -3 scores	4 No. -3 scores	4 No. -3 scores	3 No. -3 scores	4 No. -3 scores	2 No. -3 scores	2 No. -3 scores	4 No. -3 scores
Lowest Carbon			Best								Worst	
Most Resilient									Best		Worst	
Best Environmental											Best	
Ranked order (best to worst)		Best										Worst

The SA combinations outlined in Table 7.7 are assessed to determine the ‘Best’ performing combination in each Approach Category. These are summarised in Table 7.8. As can be seen in Table 7.7, when we present the data in this way it allows us to understand the relative benefits of each combination of Options.

Table 7.8 Best SA Combinations for SAH

Approach Categories	Best Performing Combination
Least Cost (LCo)	SA Combination 9 (Group 12,24,30,31,33 and 40)
Best Environmental (BE)	SA Combination 10 (Group 36)
Quickest Delivery (QD)	SA Combination 6 (Group 24, 30, 31, 32 and 39)
Most Resilient (MR)	SA Combination 8 (Group 31, 33 and 40)
Lowest Carbon (LC)	SA Combination 2 (Group 24, 30, 31 and 33)
Best AA (BA)	SA Combination 9 or SA Combination 10 (Group 36)

7.2.5.2 Approach Appraisal – Study Area Level

We then compare the best performing Option or combinations of Options (listed in Table 7.8) within each of the six (6) Approach Categories using the Seven (7)-Step Process to establish the Preferred Approach at Study Area Level. As at WRZ Level, this process allows us to compare the best ranked approaches within each Approach Category at Study Area Level relative to each other, to select the combination of Options that provides the best overall solution for that Study Area. This process is conducted via a workshop, and the decision-making and outcomes are recorded for each supply.

As an illustration, we set out in Figure 7.6 how we applied this process to Study Area H.

STEP 0 Best AA	<p>There is no SA combination in SAH assessed as having no potential impact on a European Site (based on a desktop assessment). Proceed with the 7-step process.</p>
STEP 1 Least Cost	<p>Four (4) SA combinations had a very similar ranking (within 3% of each other) under the Least Cost category. Overall Grouped Option 12, 24, 30, 31, 33 and 40 (Combination 9) performed better against the SEA and Habitats Objective of the Plan and was therefore identified as the Least Cost Approach. The Least Cost Approach is also the Best AA Approach, along with Combination 10. The Least Cost Approach was therefore retained at this Stage.</p>
STEP 2 Quickest Delivery	<p>We compared the Quickest Delivery against the Least Cost Approach. The Quickest Delivery Approach does not deliver significantly better scores against the Quickest Delivery criteria compared to the Least Cost Approach. Furthermore the Quickest Delivery Approach contains 4 Options with a -3 biodiversity score and performs poorly against the Carbon criteria. The Least Cost Approach was therefore retained at this stage.</p>
STEP 3 Best Environmental	<p>We compared the Least Cost against the Best Environmental Approach. The Best Environmental Approach does not have a significantly higher Environmental Score than the Least Cost Approach and performs poorly against the Carbon and Resilience criteria. The Least Cost Approach was therefore retained at this stage.</p>
STEP 4 Most Resilient	<p>We compared the Least Cost against the Most Resilient Approach. The Most Resilient Approach does not have a significantly higher Resilience Score than the Least Cost Approach and performs poorly against the Environment and Carbon criteria when compared to the Least Cost Approach. The Most Resilience Approach contains four (4) Options with a -3 biodiversity score compared to the Least Cost Approach which contains only one (1) Option with a -3 biodiversity score. The Least Cost Approach was therefore retained at this stage.</p>
STEP 5 Least Carbon	<p>We compared the Least Cost Approach against the Lowest Carbon Approach. The Least Carbon Approach has lower carbon costs compared to the Least Cost Approach, however, carbon costs for both approaches are comparable and low when compared against the total NPV costs. The Least Carbon Approach performs poorly against the Environmental and Resilience criteria when compared to the Least Cost Approach and contains three (3) Options with a -3 biodiversity score. The Least Cost Approach was therefore retained at this stage.</p>
STEP 6 Approach Comparison	<p>A final assessment of the Least Cost Approach was completed against the Least Carbon, Best AA, Best Environmental, Quickest Delivery and Most Resilient Approaches. The Least Cost Approach performs well against all criteria compared to other approaches, and there is no significant difference between the scores for the Best AA, Best Environmental, Lowest Carbon, Quickest Delivery and Most Resilient against the relevant criteria compared to the Least Cost Approach. Therefore the Least Cost Approach is considered the Approach that performs best. The Least Cost Approach was therefore retained at this stage.</p>
STEP 7 Preferred Approach	<p>The Least Cost Approach was therefore selected as the Preferred Approach for the Water Resource and Study Area Levels.</p>

Figure 7.6 SA Level Preferred Approach Development - SAH

7.2.5.3 Selection of Preferred Approach – SA Level Approach

Table 7.9 summarises the comparison of the best performing SA combinations for SAH.

When we compare the four (4) best performing approaches against each other (representing the Stage 3 analysis for the selection of the Preferred Approach), their relative performance against categories they were not identified as ‘best’ in, may be different compared to their relative performance within the wider ranking against all the combinations, as presented in Table 7.7. Furthermore, in Table 7.7 the colour scale used to indicate the relative ranking of all combinations requires more gradations of colour to account for the large number of option combinations that can be assessed. Table 7.9 only contains four (4) different combinations and therefore the colours denoting relative performance between the ‘Best Performing SA Combinations’ for a particular Approach Type are different to the colour representing relative performance within the wider ranking. For example, for Combination 9, the Quickest Delivery Score is ranked third against the four (4) other Best Performing SA Combinations (represented by a yellow colour in Table 7.9); whereas it is ranked seventh amongst the eleven (11) combinations in Table 7.7.

Table 7.9 suggests that SA Approach 4 and 5 are the Best AA because they have the same number of -3 biodiversity scores (i.e., they each have two (2) -3 biodiversity scores). However, SA Approach 5 was selected as the Best AA approach after comparing the number of -2 and -1 biodiversity scores.

Table 7.9 Summary of the MCA Scoring for the Best Performing SA Combinations – SAH

Category Criteria	SA Approach 1 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	Preferred Approach SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)
Least Cost Score				Best	Worst
Quickest Delivery Score		Best	Worst		
Best AA Score	Three -3 Biodiversity Scores	Four -3 Biodiversity Scores	Three -3 Biodiversity Scores	Two -3 Biodiversity Scores	Two -3 Biodiversity Scores
Lowest Carbon Score	Best				Worst
Most Resilient Score			Best		Worst
Best Environmental Score			Worst		Best

Key			
Ranked order (best to worst)			
Worst			Best

The outcome when we follow the Seven (7)-Step Process is that SA Approach 4 (SA combination 9) is the Preferred Approach for SAH. As can be seen with reference to Table 7.7, this combination of Feasible Options is well balanced in terms of performance against all criteria and performs significantly better overall than any other combination. In particular, the combination of Options performs well against the environmental criteria.

The general Preferred Approach development process at Study Area Level (Stage 3) is summarised in Figure 7.7.

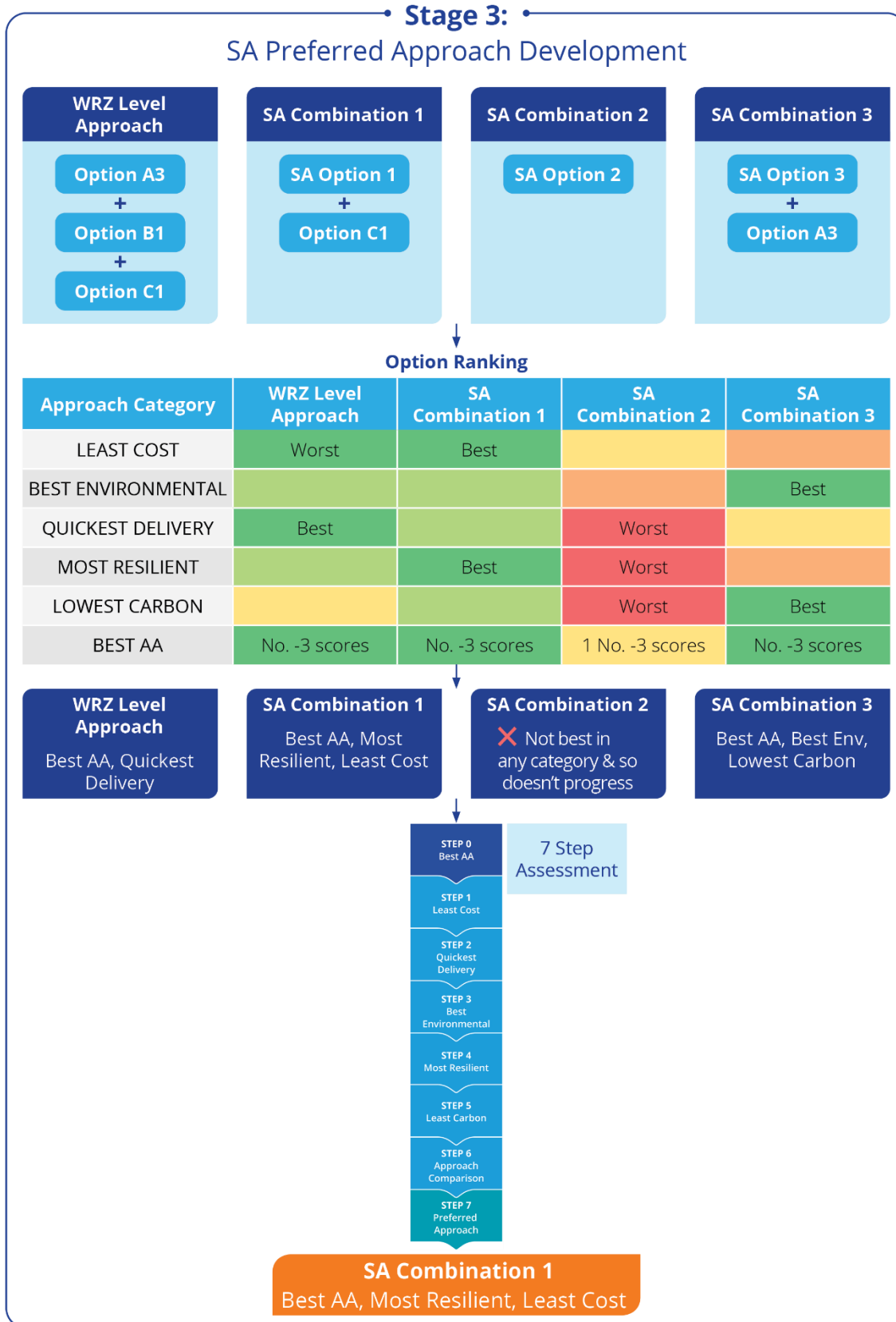


Figure 7.7 SA Preferred Approach Development – Stage 3

7.3 WRZ Level Approach and SA Preferred Approach

In this section, we compare the benefits of developing interconnected systems (under the SA Preferred Approach), with the option of continuing to supply existing WRZs independently (under the WRZ Level Approach).

One of the key benefits of interconnecting supply systems, is to supply WRZs that do not have feasible local Options, as is the case for SAH and SAI. For SAH, four (4) Unconstrained Options were considered to meet the Deficit of the Listowel WRZ, however these were all assessed to be unfeasible. For example, an Option of increasing the existing abstraction was determined to be unfeasible as the abstraction is already greater than the estimated future sustainable thresholds. For SAI, there were no Feasible local solutions for four (4) WRZs (Clonakilty, Bayview, Skibbereen 2 and Caherdaniel/Castecove WRZs) due to their rural, isolated locations.

The lack of a Feasible Option for the five (5) WRZs across SAH and SAI illustrates the benefits of a more holistic approach to water resources planning and the ability to rationalise supplies across WRZs where appropriate. In particular, delivering a local Option for such WRZs could result in potentially adverse environmental impacts, such as unsustainable abstractions (for example). Interconnecting across WRZs allows Irish Water to deliver Options that meet the Deficit while avoiding such impacts.

In the following sections, we compare the combination of the Options that make up the SA Preferred Approach with the WRZ Options that combine to form the WRZ Level Approach. The comparison considers the difference in the infrastructure components and total estimated cost per megalitre (million litres) of additional supply provided by the Option. Additionally, the overall benefit of the SA Preferred Approach is described with reference to the NWRP objectives represented by the six (6) Approach Categories.

7.3.1 Approach Description

The Preferred Approach at Study Area Level comprises 35 SA Grouped Options that collectively supply 112 WRZs across the South West Region (Table 7.10). This creates an interconnected network and allows us to rationalise our infrastructure providing a more resilient supply to our customers. There is also the benefit of eventually moving away from some of our potentially unsustainable abstractions by reducing our abstraction points. Reviewing our supplies at a Study Area Level allows us to understand the regional sustainability of our abstractions.

Table 7.10 SA Preferred Approach

Study Area	Number of WRZs	SA Preferred Approach		Number of WRZs benefitting from a SA Grouped Option
		WRZ Option	SA Grouped Option	
SAH	23	12	6	11
SAI	89	37*	12	53
SAJ	62	14	17	48
Region Total	174	63	35	112

Two (2) WRZ Options are required to meet the supply Deficit in the Whitechurch WRZ in SAI. These include an increase in the existing groundwater source and a new groundwater abstraction.

Table 7.11 and Table 7.12 compare the SA Preferred Approach with the WRZ Level Approach.

The Option summary in Table 7.11 describes whether the supply Deficit will be met through new and/or increased groundwater (GW) and surface water (SW) abstractions, rationalisations (connection of water treatment plants (WTPs) and/or WRZs, usually accompanied by decommissioned abstractions and WTPs) and/or transfers from sources within or outside of the Study Area. The number of Options that only comprise a water quality upgrade to an existing WTP is also presented for those WRZs that are not in Deficit and therefore do not require a new or upgraded supply or transfer from another supply system.

Table 7.12 details the infrastructure components associated with the Options identified for each Study Area. Overall, the SA Preferred Approach across the three (3) Study Areas of the South West Region requires 73 fewer WTP upgrades, and 50 fewer new or increased abstraction sources, when compared to the WRZ Level Preferred Approach. The SA Grouped Options making up the SA Preferred Approach will also eventually result in the decommissioning of 80 more WTPs and the abandonment of 81 more abstractions, presenting the potential to deliver improved environmental outcomes. The higher interconnectivity created by the SA Preferred Approach requires approximately 347 km more pipeline compared with the WRZ Level Approach.

Full details of the SA Preferred Approach development are included in Technical Appendices 1-3.

Table 7.11 Comparison of Option Types

Study Area	WRZ Level Approach	SA Preferred Approach
SAH Kerry	<p>22 WRZ Options:</p> <ul style="list-style-type: none"> - 17 Options with increased/new GW/SW abstractions. - 3 Options involving 'within WRZ supply rationalisations. Decommission 5 WTPs. - 2 Options with WTP upgrades (WQ only) - No feasible WRZ Option was identified for the Listowel WRZ 	<p>12 WRZ Options:</p> <ul style="list-style-type: none"> - 8 Options with increased GW/SW abstractions. - 2 Options involving within WRZ supply rationalisations. Decommission 2 WTPs. - 2 Options with WTP upgrades (WQ only) <p>6 SA Grouped Options:</p> <ul style="list-style-type: none"> - 4 Options, each interconnecting 2 WRZs and including associated increased/new GW/SW abstractions. - 1 Option rationalising Rathmore WRZ to Central Regional – Lough Guitane WRZ. Decommission 1 WTP. - 1 Option transferring water from the Waterville WRZ located in SAI, to 2 WRZs in SAH. The transfer includes an increased abstraction from the Lough Currane source in SAI.
SAI Cork/South Kerry	<p>86 WRZ Options:</p> <ul style="list-style-type: none"> - 57 Options with increased/new GW/SW abstractions. - 4 Options involving 'within WRZ supply rationalisations. Decommission 3 WTPs. - 25 Options with WTP upgrades (WQ only) - No feasible WRZ Option was identified for Clonakilty, Bayview, Skibbereen 2 and Caherdaniel/Castecove WRZs 	<p>37 WRZ Options:</p> <ul style="list-style-type: none"> - 21 Options with increased GW/SW abstractions. - 2 Options involving 'within WRZ supply rationalisations. Decommission 2 WTPs. - 14 Options with WTP upgrades (WQ only) <p>12 SA Grouped Options:</p> <ul style="list-style-type: none"> - 1 Option with increased SW abstraction, interconnecting 2 WRZs. - 1 Option with an increased SW abstraction at Lough Currane to supply the deficit in Waterville WRZ (SAI) and to supply the deficit in Caherdaniel/Castecove WRZ in SAH. Decommission 1 WTP. - 8 Options, collectively rationalising 21 WRZs to 8 WRZs with associated

Study Area	WRZ Level Approach	SA Preferred Approach
		<p>increased abstractions. Decommission 20 WTPs.</p> <ul style="list-style-type: none"> - 1 Option with WTP upgrades (WQ only), transferring spare supply capacity in the Skibbereen 1 to Skibbereen 2 via an interconnection. - 1 Option rationalising 18 WRZs to Cork City WRZ and interconnecting a further 3 WRZs to the Cork City WRZ. This includes an increased abstraction at Inniscarra impoundment. Decommission 20 WTPs.
<p>SAJ</p> <p>North Cork and West Waterford</p>	<p>62 WRZ Options:</p> <ul style="list-style-type: none"> - 32 Options with increased/new GW/SW abstractions. - 1 Option involving a new WTP and GW abstraction and the subsequent decommissioning of the existing WTP. - 29 Options with WTP upgrades (WQ only) 	<p>14 WRZ Options:</p> <ul style="list-style-type: none"> - 4 Options with increased GW/SW abstractions. - 10 Options with WTP upgrades (WQ only). <p>17 SA Grouped Options:</p> <ul style="list-style-type: none"> - 10 Options, collectively rationalising 13 WRZs to 10 WRZs with associated increased/new abstractions. Decommission 16 WTPs. - 1 Option rationalising 3 WRZs and interconnecting a further 2 WRZs, with two new abstractions. Decommission 6 WTPs. - 1 Option rationalising 8 WRZs to Mallow WRZ, with an increased GW abstraction. Decommission 9 WTPs. - 1 Option rationalising 5 WRZs to Fermoy WRZ, with an increased GW abstraction. Decommission 5 WTPs. - 1 Option rationalising to SAI (Bweeng WRZ in SAJ to Donoughmore WRZ in SAI). Decommission 1 WTP. - 3 Options rationalising 3 WRZs to supplies in other Regions: <ul style="list-style-type: none"> o Kilmurray (Mitchelstown) WRZ and Labbamallogga WRZ connecting to 2 independent WRZs in Study Area K (SAK) in

Study Area	WRZ Level Approach	SA Preferred Approach
		<p>the South West Region. Decommission 2 WTPs.</p> <ul style="list-style-type: none"> ○ Monabricka WRZ connecting to Study Area 8 (SA8) in the Eastern and Midlands Region. Decommission 1 WTP.

Table 7.12 Infrastructure Component Summary

SA	Approach Type	Infrastructure Component						
		New Pipeline (km)	New WTPs	Upgrade WTPs *	New/Upgraded Abstracts	Decomm. WTPs	Decomm. Abstracts	No. of Water Storage
SAH	SA Preferred Approach	123	4	39	14	7	8	14
	WRZ Level Approach	112	4	38	20	5	4	15
SAI	SA Preferred Approach	326	9	59	34	43	43	42
	WRZ Level Approach	87	16	93	62	4	5	29
SAJ	SA Preferred Approach	202	4	39	19	40	40	24
	WRZ Level Approach	106	4	78	35	1	1	14
Total	SA Preferred Approach	651	17	137	67	90	91	80
	WRZ Level Approach	304	24	209	117	10	10	58
Difference		+347	-7	-72	-50	+80	+81	+22

* Includes WTP upgrades for both Water Quality only (for those WRZs that are not in Deficit) and WTPs with capacity upgrades.

7.3.2 Assessment against the Six Approach Categories

Table 7.13 shows the Multi Criteria Assessment (MCA) ranking of the Preferred Approach at Study Area Level and the WRZ Level Approach for SAJ. The ranking (colour coding) presented in Table 7.13 is relative to all SA Combinations identified for the Study Area.

As the WRZ Level Approach did not meet the Deficit for SAH and SAI, it has not been assessed and assigned a score for the purposes of determining the best performing alternative within each Approach Category.

A comparative description for each Study Area is presented in Table 7.14. Further justification for the selection of the SA Preferred Approach is set out in detail in the supporting Study Area Technical Reports (Appendix 1 - 3). The SEA South West Regional Environmental Report details the environmental assessment outcomes.

Table 7.13 Multi Criteria Assessment (MCA) Scores

Study Area	Approach Type	Approach Category					
		Least Cost	Quickest Delivery	Best AA*	Lowest Carbon	Most Resilient	Best Env.
SAH	SA Preferred Approach	Best		2 No. -3 scores			
	WRZ Level Approach			4 No. -3 scores			
SAI	SA Preferred Approach	Best		1. No. -3 Score		Best	Best
	WRZ Level Approach			3 No. -3 Scores			
SAJ	SA Preferred Approach	Best	Worst	2 no. -3 scores			Best
	WRZ Level Approach	Worst		3 No. -3 scores			Worst

* A Best AA score of -3 equates to Likely Significant Effects (LSEs) that may be harder to mitigate or require significant Project Level assessment.

Table 7.14 SA Level Preferred Approach (PA) comparison with the WRZ Level Approach

Study Area	Comparative Assessment
SAH	<p>The PA is the Least Cost Approach.</p> <p>The PA for SAH, includes 12 SA Options and 6 WRZ Options, compared with 22 WRZ Options for the WRZ Level Approach.</p> <p>The PA and WRZ Level Approach require a similar pipeline length. The PA decommissions two (2) additional WTPs and (4) additional abstraction sources. It also has the advantage of requiring six (6) fewer new or increased abstractions and therefore has a lower impact on biodiversity and the water environment.</p> <p>The PA is the Least Cost Approach overall and has an estimated NPV per megalitre of Option volume that is 13% lower than WRZ Level Approach.</p> <p>The PA has two high-risk Options under the Appropriate Assessment that will require further assessment at Project Level: the connection to Central Regional – Lough Guitane and Mid Kerry WRZs involving a new abstraction from the lower Leane catchment; and the new abstraction from Coomasaharn Lake.</p>
SAI	<p>The PA is the Least Cost, Best Environmental, Best AA and Most Resilient Approach.</p> <p>The PA for SAI comprises 12 SA Options and 37 WRZ Options compared with 86 WRZ Options for the WRZ Level Approach. This provides the following advantages: seven (7) less new WTPs, 30 fewer WTP upgrades, 34 fewer new or upgraded abstractions, 39 more decommissioned WTPs and 38 more abandoned abstractions.</p> <p>The PA will result in a reduction of WRZs from 89 to 48. The interconnected Options of the PA will require an estimated 239 km more pipeline than the WRZ Options. Thirteen (13) more water storages will make up the PA, providing additional water security and supply resilience.</p> <p>The PA has been selected as the Least Cost Approach overall, when performance against other Approach Categories is also considered. Although the NPV is higher than WRZ Level Approach, it is within 5% and the PA provides other benefits, described below. The higher cost is mostly due to the additional pipeline required for interconnecting 21 WRZs to the Cork City Supply.</p> <p>The PA has only one high-risk Option that could impact on European sites and will require further assessment at Project Level. This is associated with the rationalisation of three (3) WRZs (Knockadoon, Ballymacoda and Kilcraheen) to Youghal Regional WRZ.</p> <p>The high environmental score for the PA is associated with the lower materials and waste impacts due to the rationalisation of assets. The PA is also likely to have a lower landscape impact as it requires less WTPs. Substantial benefits to the water environment are also achieved through the abandonment of 43 of the 110 abstractions, particularly as six (6) of these abstractions may not meet sustainability guidelines during dry weather flows at Tibbotstown, Castletownbere, Glengarrif, Allihies, Cahermore and Caherdaniel/ Castlecove WRZs. Cessation of abstractions from these surface water sources has potential to improve water quality and benefit water dependent biodiversity including aquatic ecology.</p> <p>The PA has a relatively high carbon impact and will take more time to deliver when compared across all seven (7) SA Combinations; however, the low score in these categories is outweighed by the significant gains in resilience and overall environmental improvement.</p>

Study Area	Comparative Assessment
SAJ	<p>The PA is the Least Cost, and Best Environmental Approach.</p> <p>The PA for SAJ comprises 17 SA Options and 14 WRZ Options compared with 62 WRZ Options for the WRZ Level Approach. This provides the following advantage: 39 fewer WTP upgrades, 16 fewer new or upgraded abstractions, 39 more decommissioned WTPs and 38 more abandoned abstractions. The WRZ Level approach decommissions only 1 WTP and abstraction source.</p> <p>The PA will reduce the number of WRZs from 62 to 30. The interconnected Options of the PA will require 96 km more pipeline than the WRZ Level Approach. Furthermore, 12 more water storages will make up the PA, providing additional water security and supply resilience.</p> <p>The PA is the Least Cost Approach overall and has an estimated NPV that is 14% lower than the WRZ Level Approach. The cost associated with the additional pipeline length and water storage infrastructure is outweighed by the cost savings from reduced operational and maintenance costs resulting from the smaller number of WTPs and abstractions.</p> <p>Both the PA and the WRZ Level Approach have three (3) high-risk Options that could impact on European sites and will require further assessment at Project Level.</p> <p>The PA scores better against the SEA objectives as it is likely to have lower materials and waste impacts due to the rationalisation of assets. It is also likely to have a lower landscape impact as it requires less WTPs. Substantial benefit to the water environment is achieved through the abandonment of 40 of the 80 abstractions. In particular, one (1) of the decommissioned abstractions, the River Allow source, may not meet sustainability guidelines during dry weather flows.</p> <p>The PA has a relatively high carbon impact and will take more time to deliver when compared across all 14 SA Combinations; however, the low score in these categories is outweighed by the significant gains in resilience and overall environmental improvement.</p>

Appropriate Assessment (AA)

SA Combinations for all three (3) Study Areas have -3 scores, indicating there are Options with the potential for Likely Significant Effects (LSEs) on European Sites that cannot be ruled out without further detailed Site Level assessments. These Options have been assessed as -3 either because the mitigation may be complex or there is uncertainty around potential impacts.

The following SA Combinations in the Preferred Approach for SAH have two -3 scores associated with:

- Two Options that connect to Central Regional – Lough Guitane and Mid Kerry WRZs in SAH. Although there are two (2) Options involved, a single -3 score is assigned as the same abstraction from the lower Leane catchment is used to supply both WRZs and is therefore assessed as a single impact. The lower Leane catchment abstraction could directly impact Killarney National Park, Macgillycuddy’s Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA.
- A new abstraction from Coomasaharn Lake to supply the Mountain Stage Public Water Supply. The Lake source is within Killarney National Park SAC.

The Preferred Approach for SAI has one (1) -3 score associated with the rationalisation of three (3) WRZs (Knockadoon, Ballymacoda and Kilcraheen) to Youghal Regional WRZ. This Option involves a new WTP and GW abstraction that may impact the Blackwater Estuary SPA and Blackwater River (SAC

with Groundwater Dependent Terrestrial Ecosystems (GWDTes), and therefore loss of habitat cannot be ruled out without detailed site assessments.

SAJ has three (3) -3 scores associated with:

- Rationalisation of Castlewrixon and Skahanagh to Charleville/Doneraile WRZ, including a new groundwater abstraction. The new abstraction could potentially impact GWDTes.
- Rationalisation of Kilbrin Garran an Darra to Allow Regional WRZ, including a new groundwater abstraction and WTP. The new abstraction could potentially impact GWDTes.
- Rationalisation of Toureen Derry to Banteer and Glenleigh and Kilcorney to Millstreet; and interconnection of Newmarket to both Banteer and Millstreet WRZs. This Option involves two (2) new groundwater abstractions and a new WTP. The new spring sources are supporting habitat to the Awbeg River (Kanturk) and the upper reaches of the Blackwater respectively which form part of Blackwater SAC.

There are Options with -1 and -2 scores across all three (3) Study Areas and as such there is the potential for Likely Significant Effects (LSEs). The potential for LSEs however is generally construction related impacts and it is considered that these LSEs will not result in Adverse Effect on Site Integrity (AESI) if mitigation is in place.

SEA Objectives

The Preferred Approach for both SAI and SAJ are assessed as the Best Environmental Approach. The environmental benefits include improvement to the reliability of supply and reduced long term impact that is achieved through the rationalisation of assets.

While the Preferred Approach for SAH did not score highest against the SEA objectives, it outperformed the Best Environmental Approach on cost, resilience and carbon. The difference in the environmental score between the Preferred Approach and the SA Combination that presented as the Best Environmental Approach is due mainly to the higher number of decommissioned WTPs and abandoned abstractions that would be delivered under the Environmental Approach (which improves the environmental score). Additionally, the two new WTPs and abstractions proposed under the Preferred Approach would result in a lower score for landscape and the water environment for the Preferred Approach. Further detail of this comparison is presented in the SEA Environmental Review for SAH.

The Preferred Approach for all three Study Areas includes the eventual decommissioning of 90 WTPs and 91 abandoned abstractions, of which 13 are surface water sources. Nine (9) of the abandoned surface water sources are abstractions that may not meet sustainability guidelines under dry weather flows (as assessed by Irish Water using the UKTAG guidelines)². Cessation of abstractions from these surface water sources has potential to benefit ecology and support Water Framework Directive (WFD) objectives.

We have also determined that 45 of the surface water abstractions that will be maintained under the Preferred Approach may not meet sustainability guidelines during dry weather flows. The Preferred Approach does improve or avoid further deterioration at 34 of these sources by reducing existing abstractions or developing additional sources to support growth. This has potential to benefit aquatic ecology and contribution to meeting WFD objectives for these sources through reduced abstractions. Alternative supplies, however, may need to be developed to reduce abstraction at a further 11 sites. The SEA and AA set a framework for identifying mitigation and monitoring so that these can be part of the decision-making and inform Option design and development.

Least Carbon

The carbon score of the SA Preferred Approach for SAH was similar to the score of the Lowest Carbon Approach for that Study Area. The difference in scores was primarily due to the embodied carbon for the longer length of pipeline required for the Preferred Approach Options.

The SA Preferred Approaches for SAI and SAJ do not rank high relative to other Option combinations against the Lowest Carbon criteria. This is largely due to the more extensive pipeline network required for these Preferred Approaches despite requiring fewer new WTPs. At detailed Project Level, the carbon performance can be improved significantly through energy efficient design and investigation of low carbon initiatives. Also, further work on future operational modes will allow us to optimise the interconnected supplies, in order to provide resilience and environmental benefit whilst balancing energy and carbon impacts.

7.3.3 Cost Comparison

The cost difference per megalitre of Option volume supplied is compared for the SA Preferred Approach and the WRZ Level Approach for each Study Area. Table 7.15 shows the difference for each Study Area.

SAH and SAJ costs are less for the SA Preferred Approach, while the cost for SAI is 4% higher for the SA Preferred Approach. The higher cost for SAI is due to the cost associated with constructing an estimated 239 additional kilometres of proposed for interconnecting WRZs, in particular, the connection of 21 WRZs to the Cork City supply. The costs for both SAH and SAJ reduce under the SA Preferred Approach mainly due to the decommissioning of additional WTPs and fewer increased or new abstractions. Further details of these Options are provided in Section 7.5.8 and the corresponding Technical Appendices.

Table 7.15 Cost Comparison

Cost per MI/d Difference (%) SA Preferred Approach cf. WRZ Level Approach		
SAH	SAI	SAJ
-13% ↓	↑ 4%	-14% ↓

↓ = Reduced cost

↑ = Increased cost

Figure 7.8 compares the cost per megalitre of the WRZ Level Approaches and the SA Preferred Approaches for the region. There is an overall 8% reduction in the estimated costs across SAH, SAI and SAJ, which is achieved mostly through the reduction in the number of WTPs due to the rationalisation of supplies. This can be seen in the lower operational cost under the SA Preferred Approach which is considerably lower than the WRZ Level Approach.

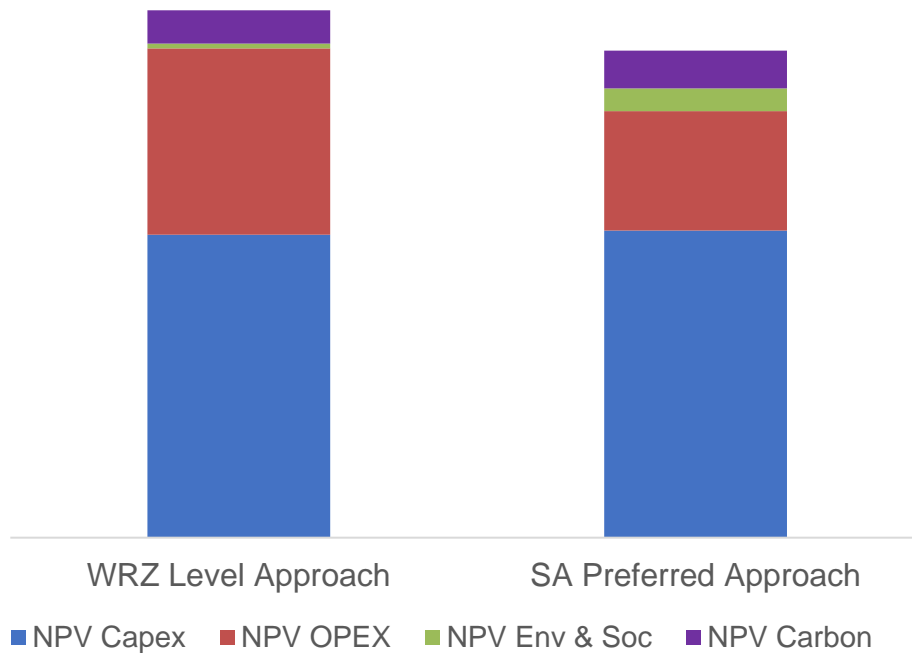


Figure 7.8 NPV Costs for WRZ Level Approach and Study Area Preferred Approach (SAH, SAI and SAJ)

7.4 SA Preferred Approach

7.4.1 Water Supply Sources

The SA Preferred Approach for the three (3) Study Areas address the supply Deficit through:

- Independent local WRZ supplies - small local surface water and groundwater sources;
- Within SA interconnected supplies - interconnected WRZs supplied from a new or upgraded source within the SA; and/or
- Cross SA interconnected supplies – interconnected WRZs supplied from a new or upgraded source outside the SA.

For WRZs that are not in Deficit, the Preferred Approach includes only a WTP Water Quality processing upgrade (WQ upgrade only). Table 7.16 lists the number of WRZs supplied by each source type, and the WRZs where a WTP upgrade (WQ only) is required.

Under the Preferred Approach 26 local groundwater supplies and ten (10) local surface water supplies contribute to meeting an estimated 7% and 3% of the 2044 Deficit across the South West Region in a dry year, respectively. The supplies are mostly expansions of existing sources with some new abstractions.

The interconnection of supply systems reduces the number of WRZs in the region from 174 to 92. Eighty-eight (88%) of the Deficit across the three (3) Study Areas is met by 30 SA Grouped Options that will interconnect WRZs within Study Area boundaries (Within SA Interconnections). The additional demand will be served by increased or new sources within the source WRZ. The Within SA Interconnections will benefit 106 WRZ. Most of these involve the rationalisation of supplies, where WTPs and their associated abstractions are decommissioned. Across the South West Region, the SA Preferred Approach, once delivered, will eventually result in the decommissioning of 86 WTPs and abandon 83

abstractions. The reduction in the number of WTPs achieved through supply rationalisation is likely to have benefits of reduced landscape impact, and over the longer term will reduce operational costs. Resilience and Flexibility are also improved through larger, interconnected supplies. Furthermore, the abandonment of abstractions will deliver environmental benefits to the surface water and groundwater bodies. This is further discussed in Section 7.4.5 below.

Table 7.16 Preferred Approach Source Types

WRZ Source Type	Number of WRZs		
	SAH	SAI	SAJ
Local source (GW)	7	15	4
Local source (SW)	3	7	0
Within SA interconnection	9	53	44
Cross SA interconnection	2	0	4*
WTP upgrade (WQ only)	2	14	10

*Includes two (2) WRZs that connect to supply systems located in the South East Region and one (1) WRZ that connects to Study Area 8 in the Eastern and Midlands Region.

Five (5) cross SA interconnections supply two (2) WRZs in SAH and four (4) WRZs in SAJ and address approximately 2% of the regional Deficit. These include:

- A transfer from Waterville WRZ in SAI to Cahersiveen and Emlaghpeasta/Portmagee/Maulin WRZs in SAH. These WRZs have a combined Deficit of approximately 2,780 m³/day, representing 7% of the total Study Area Deficit forecast for 2044.
- A transfer from Donoughmore WRZ in SAI to Bweeng WRZ in SAJ, addressing approximately 1% of the estimated 2044 Deficit.
- Two (2) transfers from SAK in the South East Region to supply Kilmurray (Mitchelstown) WRZ and Labbamallogga WRZ in SAJ; and
- One (1) transfer from SA8 in the Eastern and Midlands Region to supply Monabricka in SAJ.

The three (3) cross regional transfers are small in volume, representing just 0.2% of the total 2044 Deficit for SAJ.

The Option Development Process at the Study Area Level has not identified any large Regional Options that can connect and supply multiple WRZs across the three (3) Study Areas of the South West Region. This is further discussed in Section 8 of the RWRP-SW, where we consider the Regional Preferred Approach.

The relative contribution of the types of sources that will address the 2044 supply Deficit is represented in Figure 7.9.

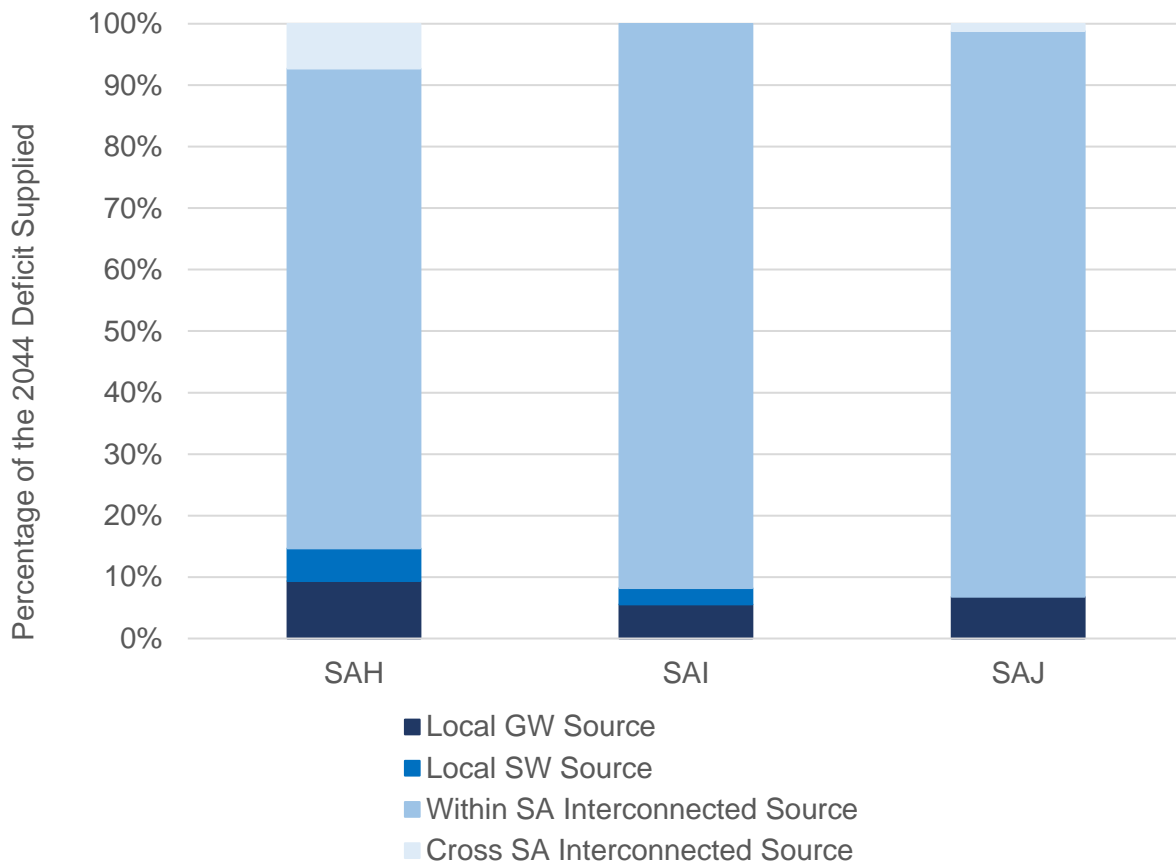


Figure 7.9 Preferred Approach Source Type - Percentage (%) of 2044 Deficit Supplied in a Dry Year

7.4.2 Changes to Existing Infrastructure

Figure 7.10 shows the existing WTPs and key interconnecting pipelines across the region. The two (2) largest WTPs are Inniscarra WTP and Central Regional (Lough Guitane) WTP. Inniscarra supplies Cork City whilst Central Regional (Lough Guitane) supplies Killarnery, Tralee and surrounding areas. Inniscarra WTP has a capacity of 82,500 cubic metres per day (m³/day), almost twice the size of Central Regional (Lough Guitane) (44,000 m³/day), the second largest WTP. Table 7.17 lists the WTPs with capacities exceeding 10,000 m³/day and the WRZs they supply.

Table 7.17 Water Treatment Plant Capacities >10,000 m³/day

Water Treatment Plant	WRZ Name	Capacity ¹ (m ³ /day)
Inniscarra WTP	Cork City	82,500
Central Regional (Lough Guitane)	Central Regional - Lough Guitane	44,000
Lee Road	Cork City	33,000
Glashaboy	Cork City	20,840
Mid Kerry (Gearha)	Mid Kerry	13,440
Listowel (Dromin)	Listowel Regional Public Water Supply	13,200
Innishannon	Cork City	10,080

¹22 hr WTP Design Capacity

The changes to existing infrastructure associated with the SA Preferred Approaches are shown in Figure 7.11 to Figure 7.13. Options that include independent local WRZ sources are presented in Figure 7.11. Figure 7.12 displays the 20 Grouped SA Options that will serve a combined 2044 population of less than 5,000, while Figure 7.13 presents the remaining 15 SA Grouped Options that merge WRZs to form 13 large supply systems serving populations greater than 5,000.

The largest interconnected supply is Option (SAI-971) which involves rationalising and interconnecting 21 WRZs to the Cork City Supply. This Option will increase abstraction at Inniscarra Impoundment, upgrade Inniscarra WTP and involve approximately 134 km of new trunk main. The merging of WRZs will enable the decommissioning of 20 existing WTPs and 21 abstractions.

In SAH, the Central Regional - Lough Guitane WRZ interconnection with the Mid-Kerry and Rathmore WRZs (SAH-530) will form the second largest system. A new surface water abstraction from the lower Leane catchment and a new WTP are proposed to supply the Deficit and meet future growth. The Option will secure water supply to some of the largest communities in SAH including Killarney and Tralee, which are both identified as Key Towns within the Southern Region Spatial and Economic Strategy³.

There are three (3) Options in SAJ that interconnect six (6) or more WRZs. These include rationalisations to Mallow WRZ (SAJ-597), Fermoy WRZ (SAJ-631) and the interconnection of Millstreet, Banteer and Newmarket WRZs (SAJ-595). The largest of these is the rationalisation of eight (8) WRZs to the Mallow supply system. This system will serve approximately 20,000 customers by 2044 and supply 3% of the regional demand.

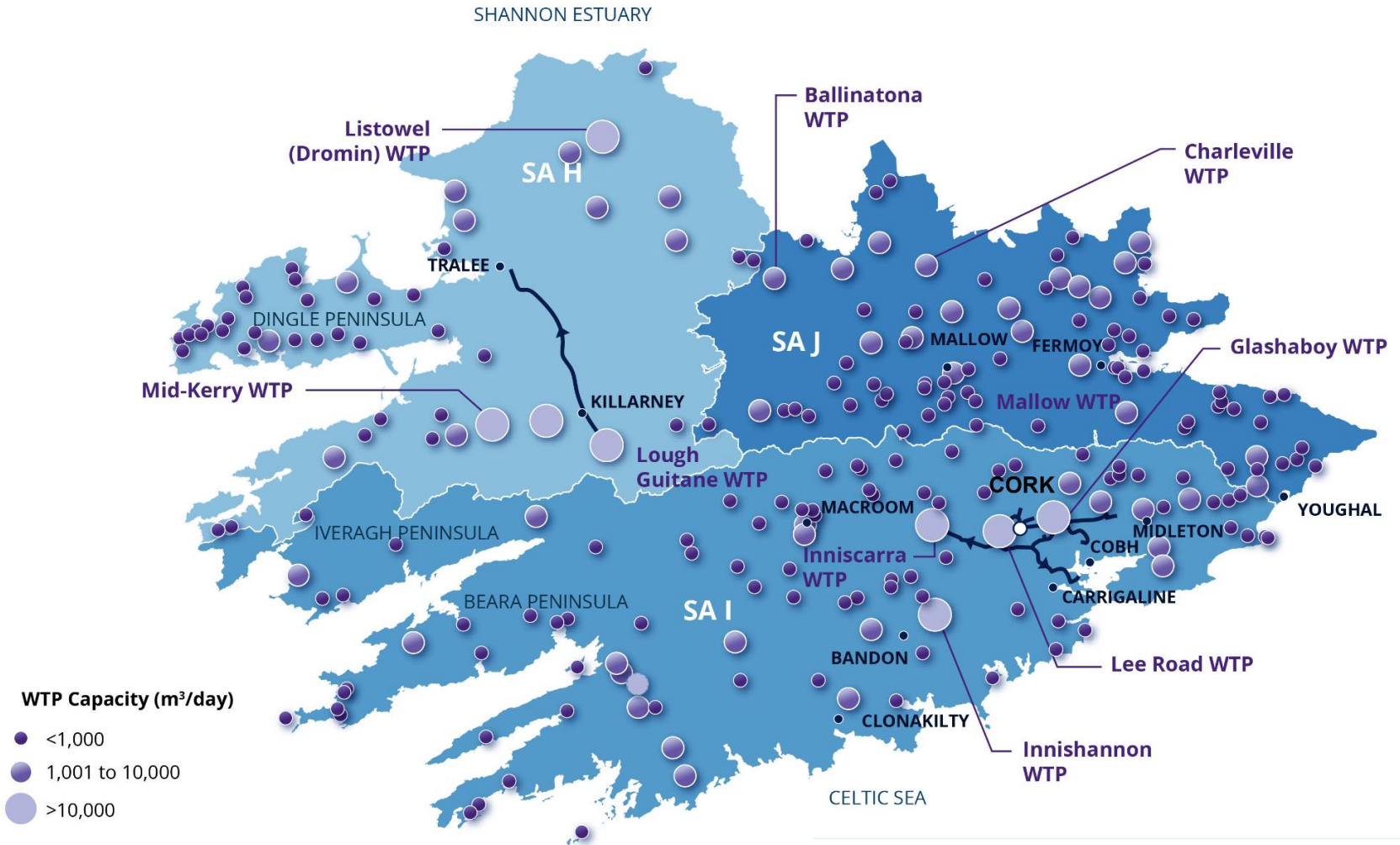
The Cross Study Area Transfer from SAI to SAH (SAH-531) rationalises two (2) WRZs to the Waterville WRZ. The new interconnected system will be supplied by upgrading the existing surface water abstraction at Lough Currane. The Caherdaniel WRZ in SAI will also be connected to the Waterville WRZ (SAH-923) and the existing supply will be supplemented with the upgraded Lough Currane

abstraction. With the Preferred Approach delivered, the total abstraction from Lough Currane will represent less than 1% of the estimated sustainable abstraction amount from the lake.

Table 7.18 includes details of the large interconnected systems, including a list of the benefitting WRZs. Details of the smaller systems are provided in the Technical Appendices 1 – 3.

- City
- Town
- Existing Trunk Mains*

PA – Large SA Options (Population > 5,000)
 PA – Small SA Options (Population < 5,000)
 Local WRZ Options
Existing Infrastructure



*All infrastructure locations and alignments are indicative and not to scale

Figure 7.10 Existing Infrastructure

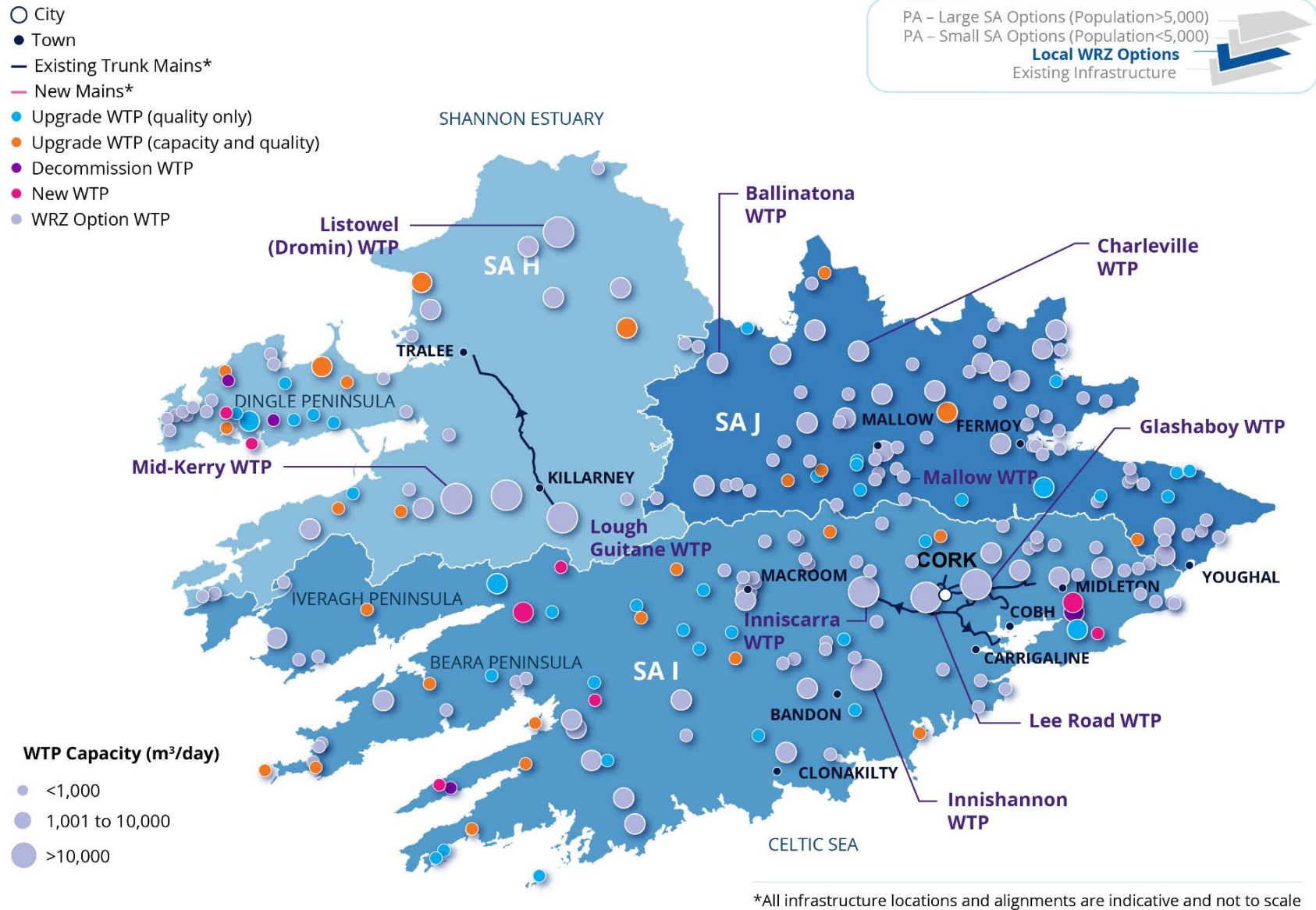
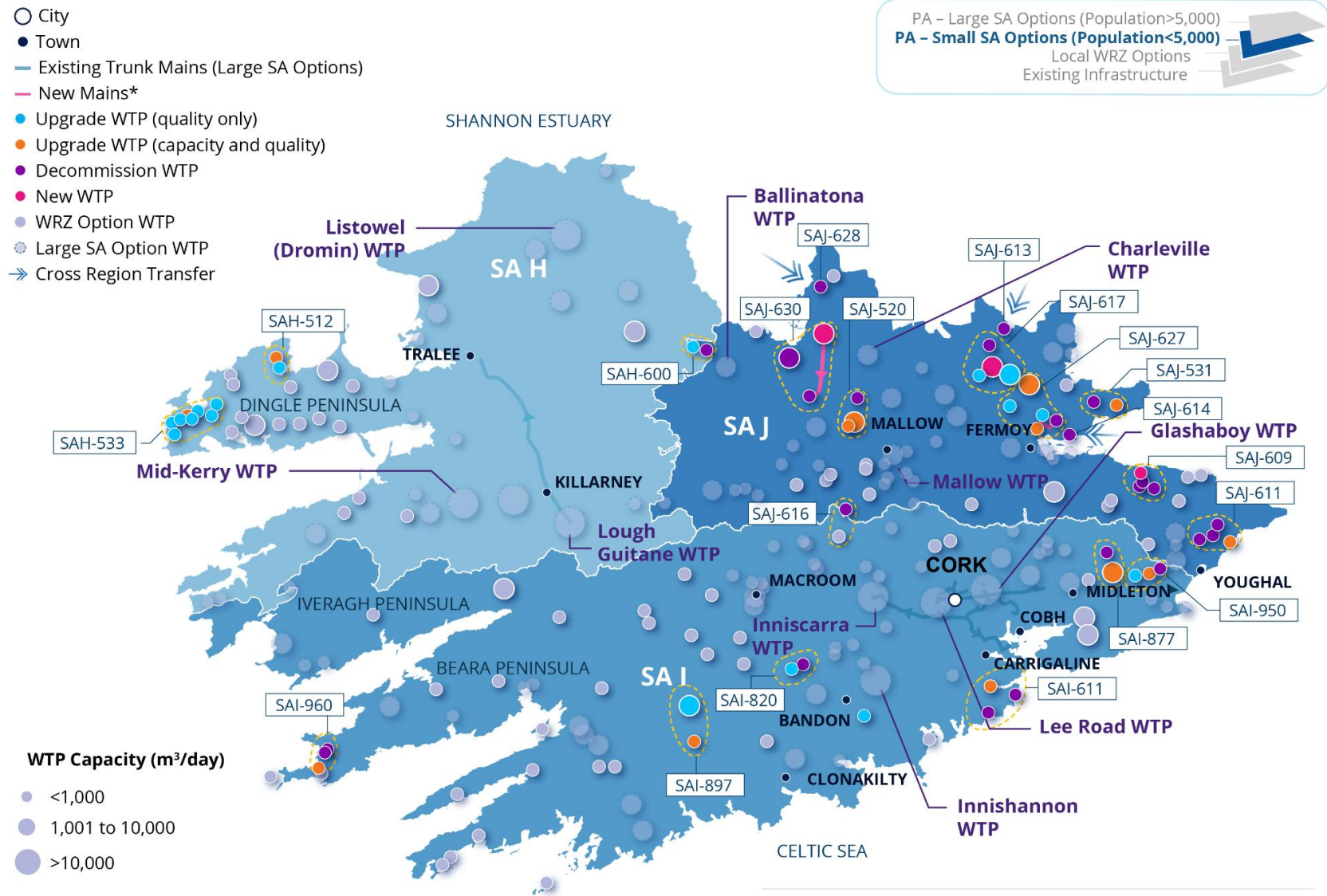


Figure 7.11 Preferred Approach - Local WRZ Sources



*All infrastructure locations and alignments are indicative and not to scale

Figure 7.12 Preferred Approach - Small SA Grouped Options (Population < 5,000)

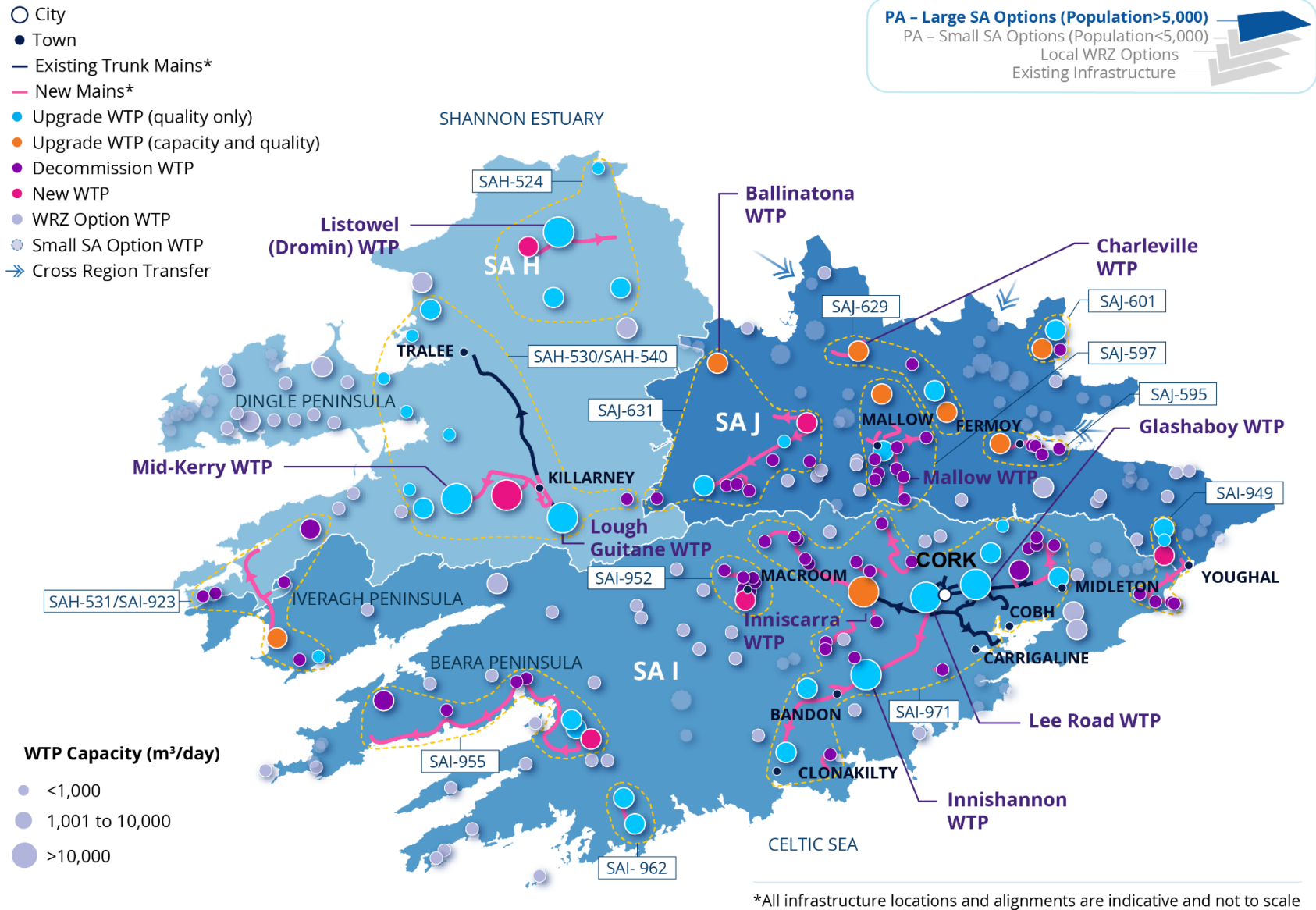


Figure 7.13 Preferred Approach - Large SA Grouped Options (Population > 5,000)

Table 7.18 Study Area Preferred Approach – Large Interconnected Systems

Option number	Source WRZ	Benefitting WRZs	No. of WRZs	Trunk Main (km)	No. of Decomm. WTPs	DYCP		Population (2044)
						Demand 2044 (m3/d)	Deficit 2044 (m3/d)	
SAH-524	New groundwater source	Abbeyfeale, Listowel	2	19	-	19,130	3,310	28,020
SAH-530 & SAH-540	Lower Leane catchment (New surface water source)	Central Regional – Lough Guitane, Mid Kerry, Rathmore	3	43	-	70,010	25,490	104,210
SAH-531 & SAI-923	Waterville	Caherdaniel / Castlecove, Cahersiveen, Emaghpeasta / Portmagee / Maulin, Waterville PWS	4	40	5	2,930	3,660	5,570
SAI-949	Youghal Regional	Ballymacoda, Kilcraheen, Knockadoon, Youghal Regional	4	18	4	4,320	1,630	10,070
SAI-952	Macroom	Ballyverane Clondrohid Coolyhane Kilnagurteen Macroom	5	9	5	2,090	120	5,060
SAI-955	Bantry	Adrigole Bantry Castletownbere Glengarriff Reenmeen West	5	66	4	7,370	2,210	7,910
SAI-962	Skibbereen 1 - Ballyhilty and Drimoleague	Skibbereen 1 – Ballyhilty and Drimoleague Skibbereen 2 – Baltimore and Schull	2	7	0	8,360	810	11,560
SAI-971	Cork City	Aghabullogue Bandon Regional Ballinagree Ballincurrig Lisgoold Ballyshoneen Bayview Clash Leamleara Clashanamid Clonakilty Coolineagh Corbally Cork City Cullen	22	134	20	197,930	65,740	473,150

Option number	Source WRZ	Benefitting WRZs	No. of WRZs	Trunk Main (km)	No. of Decomm. WTPs	DYCP		Population (2044)
						Demand 2044 (m3/d)	Deficit 2044 (m3/d)	
		Grenagh Knockburden Midleton Rylane Stoneview Blarney Templemartin & Garranes Tibbotstown Vicarstown Walshtown						
SAJ-595	Fermoy	Ballyvadonna Coolagown Fermoy Kilmagnier Knockdrumaclough Strawhall	6	21	5	5,080	1,300	9,380
SAJ-597	Mallow	Ballinamona Bottlehill Gortnagreige Killavullen Knoppogue Mallow Monaperson Monee & Knockabrack Rahan	9	43	9	10,760	3,240	19,940
SAJ-601	Mitchelstown	Glenduff Mitchelstown	2	0	1	4,200	1,730	6,370
SAJ-629	Charleville/ Doneraile	Castlewrixon Charleville / Doneraile Skahanagh	3	15	2	13,630	4,620	12,300
SAJ-631	Millstreet Banteer Newmarket	Toureen Derry Banteer Glenleigh Kilcorney Millstreet Newmarket Kiskeam	6	52	6	15,420	7,680	16,930

7.4.3 Addressing Leakage

Leakage reduction measures are a key component of the Preferred Approach to addressing Need across the South West Region. As outlined in Section 5.2, the measures aim to nationally reduce leakage by 400 million litres per day (ML/d) by 2034. This will be achieved through the following contributions:

- 38% within the Eastern and Midlands Region (representing 152ML/d)
- 24% within the South West Region (representing 96 ML/day)

- 26% within the North West Region (representing 104 MI/d)
- 11% within the South East Region (representing 47.5 MI/d)

Leakage outside of the Greater Dublin Area WRZ, which is located in the Eastern and Midlands Region, is prioritised on an annual basis as part of the National Leakage Reduction programme therefore leakage targets are not automatically applied to the Supply Demand Balance (SDB) calculations. This allows Irish Water's leakage reduction programmes to be flexible and targeted, to meet specific emerging needs.

However as set out in Section 4.3.3 of the Framework Plan and Section 5.2.2 of the RWRP-SW, leakage targets for 2019 were applied to priority supplies based on:

- supply demand deficit,
- existing abstractions with sustainability issues,
- and drought impacts.

For supplies within the South West region, leakage targets of 3.7 MI/d were included in the SDB for 2019 and it was noted that leakage targets for further years would be allocated to supplies to meet specific emerging needs.

Planned leakage reductions across WRZs in the South West Region (built into the SDB) include the following reductions:

- SAH – 1.07 MI/d through net leakage reduction in Listowel Regional Public Water Supply, Central Regional – Lough Guitane and Mid-Kerry.
 - SAI – 2.29 MI/d through net leakage reduction in Cork City and Clonakilty.
 - SAJ – 0.37 MI/d through net leakage reduction in Charlesville/Doneraile, Millstreet and Newmarket.
- (Note: 1,000 m³ per day is equivalent to 1 MI/d).

This does not mean that only 3.7 MI/d will be applied for the region between 2019 and 2034 but rather we committed to a figure for 2019 in the SDB and provided flexibility in where leakage reduction would occur after that. Our current leakage targets are to reduce leakage in supplies with demand greater than 1,500 m³/day to 21% of total demand by 2034. For the South West Region this equates to a total leakage reduction of 96 MI/d, which will reduce leakage to 23% of demand on average across the region.

Our leakage targets will be reviewed annually and will be subject to further modification. At Project Level, when we proceed to develop the Preferred Approach, we will review the SDB and subtract the target leakage reductions from the Deficit at this stage. This ensures that the Preferred Approaches are not oversized, or that the needs are over emphasized.

The achievement of these additional leakage targets may mean that the supply volume delivered by the Preferred Approach would not be required in full. This will provide the opportunity to adapt the Preferred Approach, for example through changes in the delivery timeframe or modular designs. In the circumstance that higher than projected growth occurs, the additional leakage reductions would go towards balancing the additional demand generated through higher growth.

In order to ensure that the Preferred Approach which we develop remain appropriate in the scenario of reduced leakage and static demand we have carried out a Sensitivity Analysis of our Preferred Approach. This has allowed us to understand the impact of leakage reductions on the proposed Preferred Approach and whether it would still be valid under a reduced leakage scenario. This process allows us to balance the delivery of the Preferred Approach between the Lose Less pillar (Section 5.2) and Supply Smarter pillar (Section 5.4).

7.4.4 Addressing Water Quality

Irish Water's Interim Barrier Assessment (described in our Framework Plan and summarised in Section 3.3.2 of this Plan) identifies Water Quality driven Need to inform the Preferred Approach development. The assessment determined that 158 of the 227 WTPs in the Region have a high risk of not meeting one (1) or more of four (4) Water Quality Barriers. However, these are internal Irish Water assessments and in some cases our desktop assessments can over-estimate risk, particularly when there is little available data on the catchment characteristics of our raw water sources. As our "Source to Tap" Drinking Water Safety Plan (DWSP) assessments (which are a requirement under the Recast Drinking Water Directive (DWD)⁴) are developed for each water supply, the barrier scores for all our supplies will be updated and become more reliable.

A '**Barrier**' consists of any actions, processes, procedures, standards or assets (WTPs, water mains, pumping stations etc) put in place across the entire system from catchment to tap to achieve water of sufficient quality and quantity. The four Barriers include: 1) Protection against bacteria and virus; 2) Maintain chlorine residuals in the network; 3) Protozoa removal processes; 4) Prevention of the formation of trihalomethanes (THMS).

It should be noted that the assessment is not an indicator of non-compliance with the European Union (Drinking Water) Regulations 2014, as amended (Drinking Water Regulations)⁵, but an assessment of the asset capability standard compared with the asset standard as 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.

The Preferred Approach for all Study Areas includes upgrades to Water Quality treatment efficiency for all WTPs that are not associated with an in-flight project (a project that is in progress). In-flight projects for the South West Region are described in Section 4. The WTP upgrades are designed to address the risks identified in Section 3.3.2 through improvements in filtration, coagulation and ultraviolet (UV) treatment. They do not include improvement measures that are related to actions required on WTPs that are subject to an Environmental Protection Agency (EPA) direction or are listed on the EPA Remedial Action List (as outlined in Table 3.15 of this Plan).

7.4.5 Environmental Sustainability

At the end of 2022, the government passed the Water Environment (Abstractions and Impoundments) Act, 2022 (Abstractions Act)⁶, which will align abstraction licensing with the requirements of the Water Framework Directive (WFD) (2000/60/EC), both for the specific abstraction and in combination with other activities. The Environmental Protection Agency (EPA) will determine the licences.

As outlined in the Abstractions Act, abstractions greater than 25 m³/day will be reviewed to examine any potential risk to WFD objectives; and all abstractions greater than 2,000 m³/day will automatically require a licence. The new regulatory regime will inevitably result in modifications to the way that Irish Water currently abstract from its individual water sources. While the Abstractions Act has been passed, it has not yet commenced and the 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 have full visibility of the future regulatory regime and therefore cannot reliably include an estimation of sustainable abstraction within the SDB calculations. A more detailed site by site assessment will be required when the regulations and guidelines are published.

Notwithstanding this, as discussed in Section 2, in the absence of full visibility of the future regulatory regime, Irish Water has proactively undertaken an independent conservative assessment of surface water abstractions based on UKTAG standards to determine (i) the potential impact on our SDB and (ii) to identify possible alternative solutions to improve the sustainability of our abstractions. This assessment procedure is set out in Appendix C of the Framework Plan and is in line with a precautionary approach. Under the pending legislation, sustainable abstraction quantities will be adjudicated by the EPA, and therefore the assessment undertaken by Irish Water is a conservative estimate only, the purpose of which is to help influence future planning.

A Sensitivity Analysis (presented in Section 7.7) is conducted for each WRZ, to allow us to stress test the sensitivity of the Preferred Approach against potential sustainability driven reductions to existing abstractions (again, taking a conservative and precautionary approach as to the level of reductions that may be required). This will ensure that our decision making is robust, and the Preferred Approaches are adaptable and compatible with future regulatory regimes, in so far as this can be anticipated at this stage.

7.4.5.1 Surface Water Abstractions

Our assessment has identified 54 existing surface water sites where potential abstraction reductions may be required in the future under forthcoming abstraction legislation (which will ensure Ireland can meet its obligations under the WFD). Our assessment is based on conservative estimates of what a future regime may require. The 54 sites are shown in Figure 7.14 by symbols outlined in red. The WFD ecological status of the surface water waterbody is represented by the colour coded site identifier. The site names are listed in Table 7.19 against the corresponding site number that is displayed in Figure 7.14.

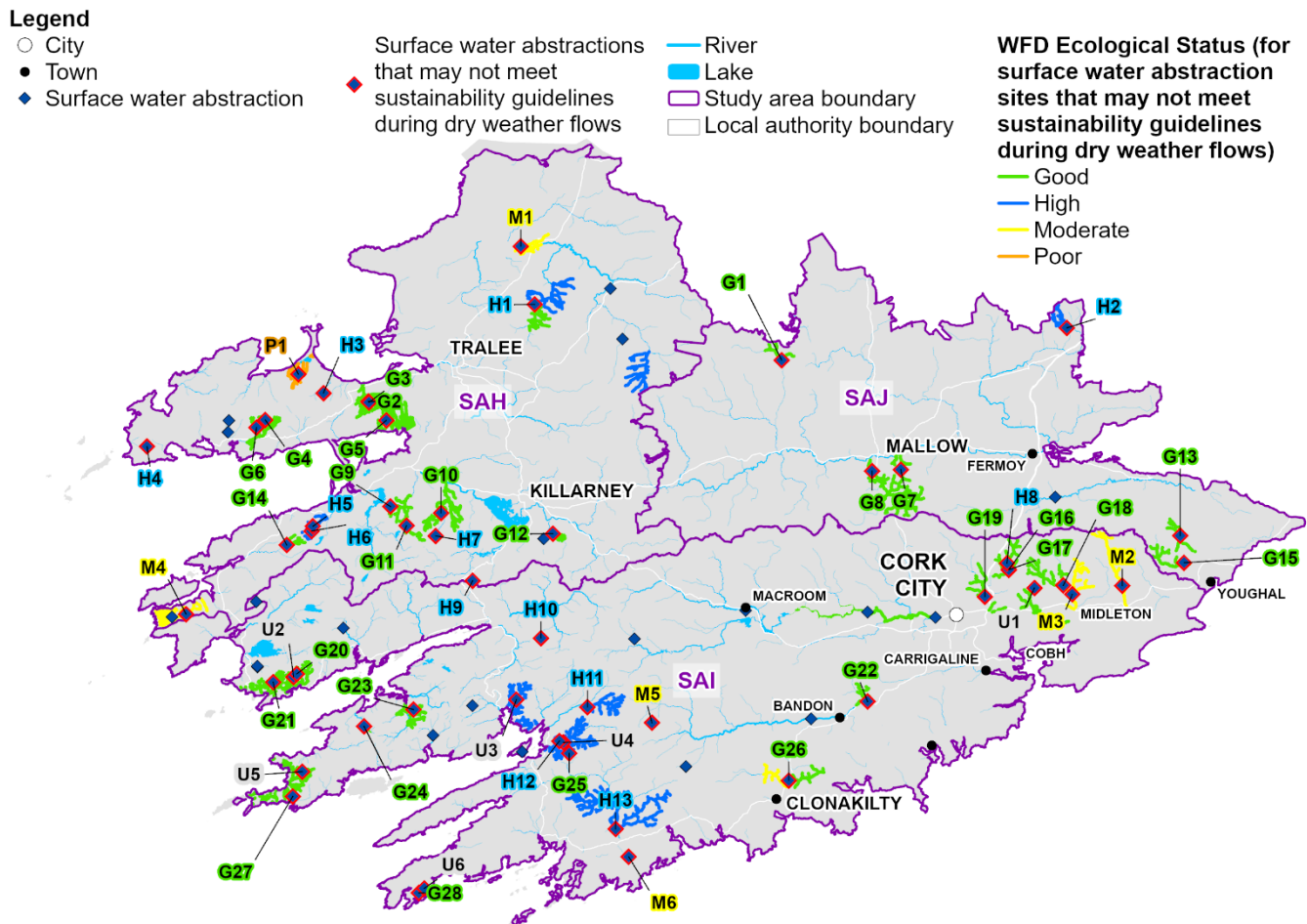


Figure 7.14 Existing Surface Water Abstractions

When developing our Preferred Approach, we considered solutions to improve the sustainability at the sites that were assessed to be potentially impacted by the new legislation.

Nine (9) of the 54 surface water abstractions, which have been identified as potentially exceeding sustainable abstraction thresholds, are intended to be decommissioned as part of the Preferred Approach. These sites are shown in Figure 7.15 which presents the changes to surface water abstractions under the Preferred Approach development, including new abstractions and existing abstractions which will be maintained, upgraded or abandoned. The decommissioning of potentially unsustainable abstractions has the potential to improve the environmental outcomes at these sites and reduce the uncertainty posed by the future legislation. For the remaining 45 surface water abstractions, the Preferred Approach will facilitate the reduction of supplies from 18 of these abstractions and reduce pressure on a further 16 by supplying projected increases in demand with alternative sources. Eleven (11) abstractions may require alternative supply solutions.

The actual reductions that may be needed in future will depend on the specific requirements of the future legislation. Irish Water will update the NWRP as appropriate to account for these requirements, once known, using the monitoring and feedback process set out in Section 9 of this Plan.

Table 7.19 Preferred Approach – Abstractions Potentially Exceeding Sustainable Abstraction Thresholds

Preferred Approach Outcome	Abstraction Sites		
	SAH	SAI	SAJ
Decommission	<p>G14 - Coulagh River Intake (Cahersiveen)</p> <p>M4- Gurrane Stream (Emlaghpeasta/ Portmagee/Maulin)</p>	<p>G7 - Gowlane Stream (Caherdaniel / Castlecove)</p> <p>G24 - Glenbeg (Castletownbere)</p> <p>G27- Cahermore River (Cahermore)</p> <p>U9 - Tibbotstown Reservoir (Tibbotstown)</p> <p>U15 - Barony River (Glengarriff)</p> <p>U17 - Allihies Impoundment (Allihies)</p>	<p>G1 - River Allow (Allow Regional)</p>
Maintain	<p>H1- Smearlagh River (Listowel Regional Public Water Supply)</p> <p>H3- Lough Acummeen (Aughacasla)</p> <p>H4- Mount Eagle Lake S50 (Ceann Tra PWS 074D)</p> <p>H5- Maithegarbh River (Mountain Stage PWS 062A)</p> <p>H6- Coomaglaslaw Lake S67 (Mountain Stage PWS 062A)</p> <p>H7- Lough Callee S76 (Mid Kerry)</p> <p>G2- Curracullenagh River (Central Regional - Lough Guitane)</p> <p>G3- Curracullenagh Stream (Central Regional - Lough Guitane)</p> <p>G4- Puckisland (An MhinAird)</p> <p>G5- Ballyarkane River (Central Regional - Lough Guitane)</p> <p>G6- Gowlane Stream (An Mhin Aird)</p>	<p>H8- Coolguerisk (Cork City)</p> <p>H9- Lough Eirk (stream) (Kenmare / Kilgarvan)</p> <p>H10- Coomclogherane Lake S64 (Kilgarvan)</p> <p>H11- Owengar River (Kealkill)</p> <p>H12- Inchilough (Bantry)</p> <p>H13- River Ilen (Skibbereen)</p> <p>G13- Glendine River (Youghal Regional)</p> <p>G15- Tourig River Source (Youghal Regional)</p> <p>G16 - Butlerstown River Tributary, Kilquana Bridge (Cork City)</p> <p>G17- Butlerstown River Tributary (Cork City)</p> <p>G18- Owenacurra River (Over Pump) (Midleton WRZ)</p> <p>G19- Glashaboy River (Cork City)</p> <p>G20- Gowla River (Behaghane) (Caherdaniel / Castlecove)</p> <p>G21- Coonmahorna West River (Caherdaniel / Castlecove)</p>	<p>H2- Behanagh River (Mitchelstown)</p> <p>G7- Fiddane Reservoir (Mallow)</p> <p>G8- Clyda River (Mallow)</p>

Preferred Approach Outcome	Abstraction Sites		
	SAH	SAI	SAJ
	<p>G9- Lough Cummernamuck (Mid Kerry)</p> <p>G10- Gaddagh River (Mid Kerry)</p> <p>G11- Cottoners River (Breanlee Stream from Lough Eighter) (Mid Kerry)</p> <p>G12- L Guitane (Central Regional - Lough Guitane)</p> <p>M1- Feale (Listowel Regional Public Water Supply)</p> <p>P1- Stradbally Intake (Castelgregory)</p>	<p>G22- Inishannon (Cork City)</p> <p>G23- Ahadav stream (Lauragh PWS 051A)</p> <p>G25- Lough Bofinna Intake (Bantry)</p> <p>G26- Arideen River, Jones Bridge (Clonakilty)</p> <p>G28 - Crookhaven Impoundment (Arduslough, Crookhaven)</p> <p>M2- Kiltha River (Mogeely)</p> <p>M3- Owenacurra River (Midleton)</p> <p>M5- Coolkellure lake (Dunmanway)</p> <p>M6- Lough Abisdealy (Skibbereen)</p> <p>U4- Drombrow Lake Intake (Bantry)</p> <p>U6- Goleen Intake (Goleen)</p>	

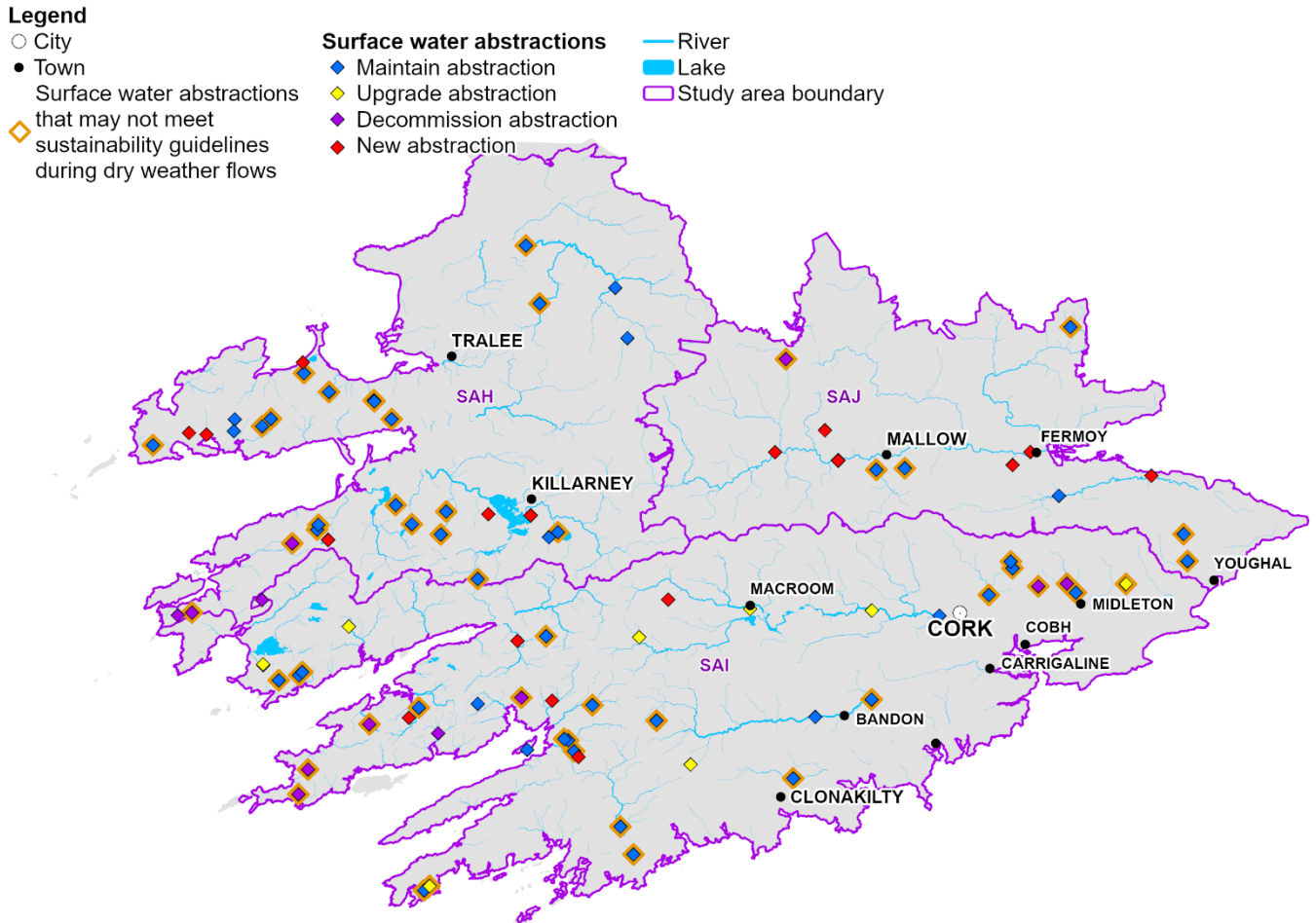


Figure 7.15 Preferred Approach - Surface Water Abstractions

7.4.5.2 Groundwater Abstractions

As explained in Section 3.2.2 of the Framework Plan, groundwater abstractions will need to conform to the proposed new abstraction licencing regime as well. Due to the limited long-term records on pumping and drawdown of water levels for many of our groundwater supplies, it is difficult to present robust desktop assessments of water availability for our existing groundwater abstractions. Until site-specific studies of groundwater availability are completed, Irish Water have developed an initial assessment for existing abstractions based on best available information. Appendix C and Appendix G of the Framework Plan includes describes our approach to groundwater supply assessments and the regulatory and licencing constraints, respectively. Over the coming years, Irish Water will work with the environmental regulator (the 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.

The 172 existing groundwater sources are shown in Figure 7.16 while Figure 7.17 presents our groundwater sources with the SA Preferred Approach in place. If the SA Preferred Approach is delivered as proposed, abstractions from 77 groundwater sources will be decommissioned, there will be increased abstractions from 29 sources and 21 new groundwater sources will be developed.

Legend

- ◆ Groundwater abstraction
- City
- Town
- Lake
- River
- ▭ Study area boundary

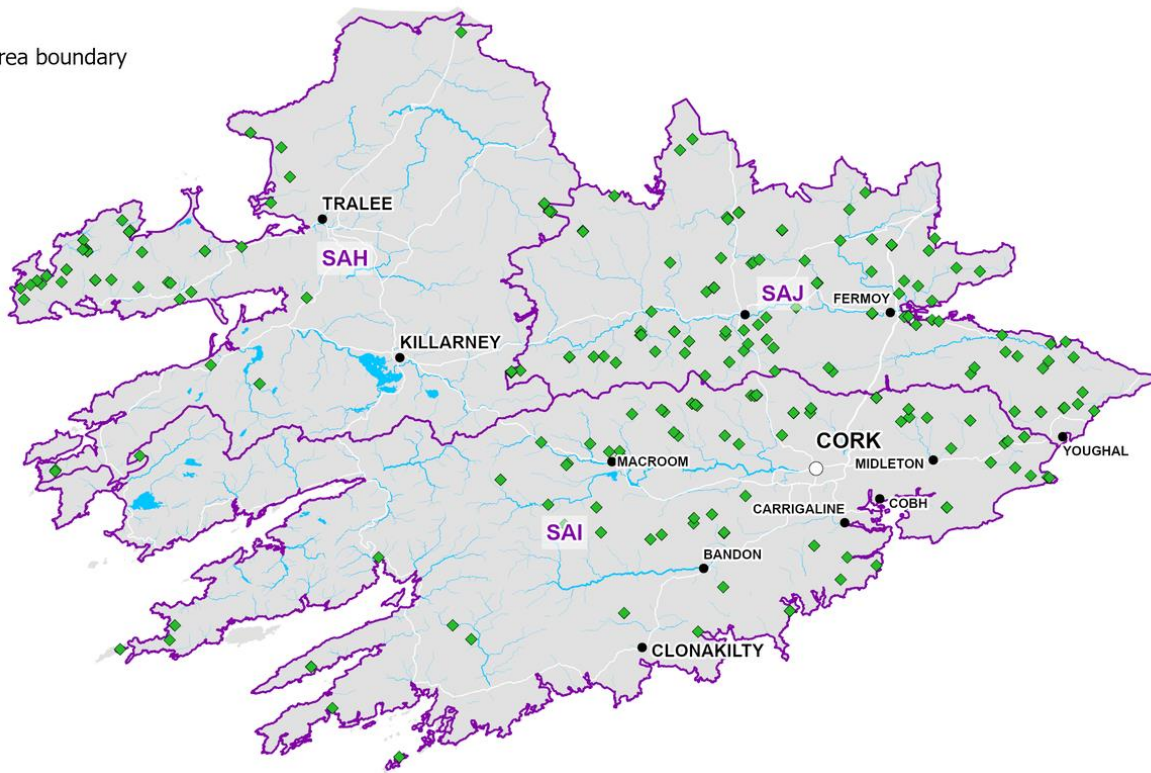


Figure 7.16 Existing Groundwater Abstractions

Legend

- City
- Town
- Groundwater abstractions**
- ◆ Maintain abstraction
- ◆ Upgrade abstraction
- ◆ Decommission abstraction
- ◆ New abstraction
- River
- Lake
- ▭ Study area boundary

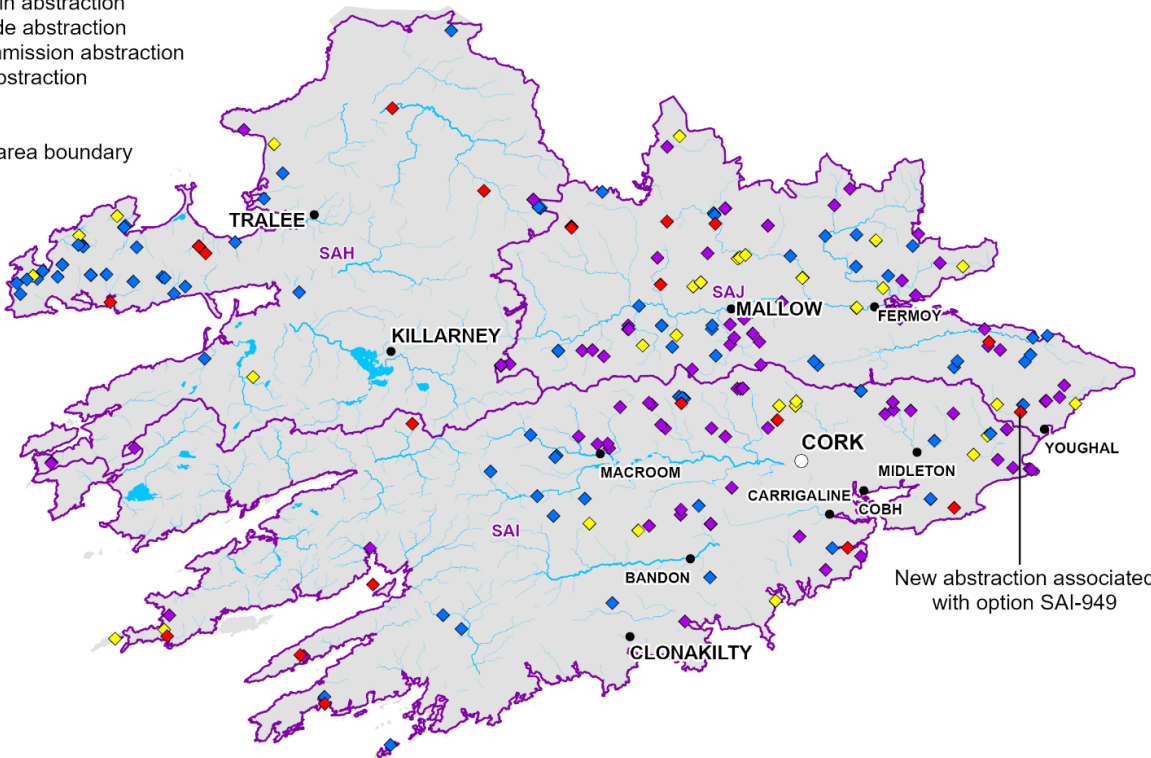


Figure 7.17 Preferred Approach - Groundwater Abstractions

7.5 SA Preferred Approach Summaries

The following sections provide a summary of the Preferred Approaches for each Study Area. Further details are contained in the Study Area Technical Reports in Appendices 1-3.

7.5.1 Study Area H – Kerry

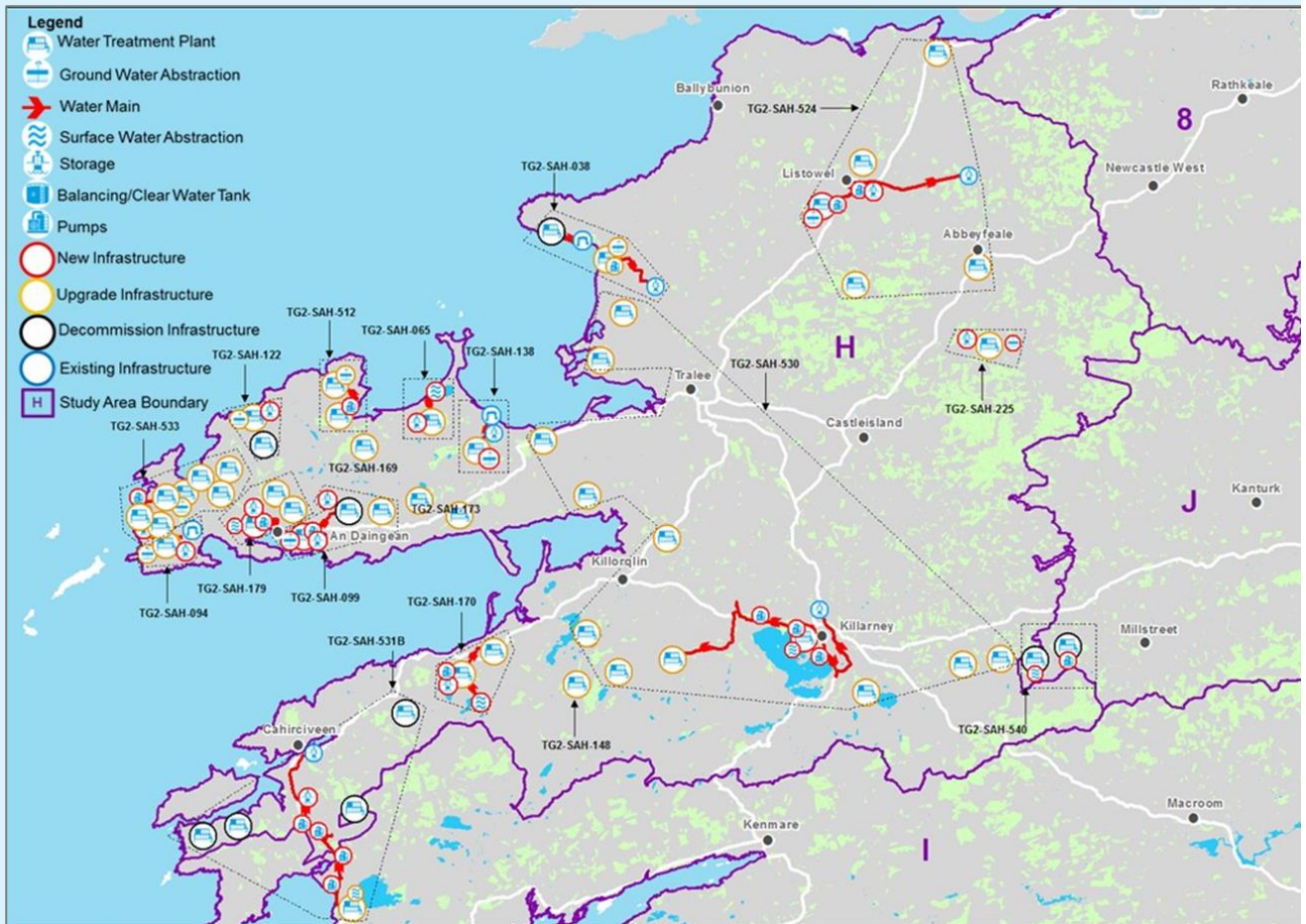
Study Area H					
No. of WRZs	SAH lies within the county of Kerry, covering an area of approximately 4,060 km ² . The population of the Study Area is approximately 125,200.				
23	The Principal Settlements (with a population of over 10,000) are Tralee and Killarney.				
Current Supply System					
WTPs	No.	Water Source Type	No.	Supply Deficit	m ³ /day
Existing WTP	46	Groundwater	31	DYCP 2019	19,820
High Risk WTP	35	Surface Water	26	DYCP 2044	23,780
Preferred Approach Summary					
Number of WTPs	No.	GW Abstractions	No.	SW Abstractions	No.
Upgrade (WQ only)	29	Increase	5	Increase	0
Upgrade (Capacity & WQ)	10	Maintain	22	Maintain	22
Decommission	7	Decommission	4	Decommission	4
New	4	New	5	New	4
<p>The Preferred Approach (PA) for SAH consists of local WRZ Options for 12 of the 23 WRZs in the Study Area. The 11 other WRZs are supplied by six (6) SA Grouped Options that involve interconnections between one or more supplies, reducing the total number of WRZs from 23 to 17. The SA Grouped Options include:</p> <ul style="list-style-type: none"> • Four (4) interconnections with associated increased or new abstractions to support within SA transfers: <ul style="list-style-type: none"> ○ Listowel and Abbeyfeale, with a new groundwater developed in the gravels between the two WRZs (SAH-524). ○ An Clochan and Ce Brennan WRZs, and increased groundwater abstraction at An Clochan (SAH-512). ○ Dun Chaoin and Baile an Fheirtearaigh WRZs, and increased groundwater abstraction from Tobar Bhreaddáin WTP boreholes and supplying Dun Chaoin (SAH-533). ○ Central Region and Mid Kerry, and a new surface water abstraction from the lower Leane catchment (SAH-530). • Two (2) options, rationalising supply systems: <ul style="list-style-type: none"> ○ Rathmore rationalised to the Central Regional – Lough Guitane WRZ, decommissioning Rathmore WTP (SAH-540). ○ Two (2) WRZs (Cahersiveen and Emlagheaster) rationalised to Waterville (SAI), with an increased abstraction from Lough Currane, decommissioning 4 (four) WTPs: Emlaghpeasta, Portmagee, Malainn and Cahersiveen WTPs. (SAH-531) <p>The Preferred Approach provides environmental benefits by decommissioning two (2) existing abstractions that may not meet sustainability guidelines - the Coulagh River Intake (Cahersiveen) and Gurrane Stream</p>					

Study Area H

(Emlaghpeasta/Portmagee/Malinn) - and reducing a further five (5) abstractions to theoretical sustainable thresholds.

Ongoing leakage management through our National Leakage Reduction Programme, also contributes by reducing the volume of water lost in distributing water to demand centres. In SAH, planned leakage reduction programmes will reduce leakage by 1,070 m³/day in Listowel, Central Regional – Lough Guitane and Mid-Kerry WRZs. We have also committed to additional Leakage Targets of 32.4 MI/d that will reduce leakage to 21% of demand in WRZs where the demand exceeds 1,500 m³/day.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience.



TG4-SAX-00X are the Option Codes assigned to each option. A description of each Option can be found in Table 5.9 of the Technical Appendices 1-3.

7.5.2 Study Area I – Cork/South Kerry

Study Area I					
No. of WRZs	SAI lies within the counties of Cork, Kerry and Cork City, covering an area of approximately 5,920 km ² . The population of the Study Area is about 389,800.				
	89	The Principal Settlements (with a population of over 10,000) are Cork City and suburbs, Carrigalline, Cobh and Midleton.			
Current Supply System					
WTPs	No.	Water Source Type	No.	Supply Deficit	m ³ /day
Existing WTP	102	Groundwater	86	DYCP 2019	46,600
High Risk WTP	65	Surface Water	44	DYCP 2044	78,370
Preferred Approach Summary					
Number of WTPs	No.	GW Abstractions	No.	SW Abstractions	No.
Upgrade (WQ only)	37	Increase	11	Increase	8
Upgrade (Capacity & WQ)	22	Maintain	21	Maintain	28
Decommission	43	Decommission	35	Decommission	8
New	9	New	10	New	5
<p>The Preferred Approach (PA) for SAI consists of local WRZ Options for 36 of the 89 WRZs in the Study Area. This includes two (2) Options for the Whitechurch WRZ – increasing the existing groundwater abstraction and developing a new groundwater abstraction. The 53 other WRZs are supplied by 12 SA Grouped Options that involve interconnections between one or more supplies, reducing the total number of WRZs from 89 to 49. The SA Grouped Options include:</p> <ul style="list-style-type: none"> • Ten (10) supply rationalisations: <ul style="list-style-type: none"> ○ Rationalising 18 WRZs to Cork City and interconnecting a further three (3) WRZs to the scheme. This requires an increased surface water abstraction at Inniscarra impoundment to supply the deficit across the 22 WRZs (including Cork City). Twenty (20) WTPs will be decommissioned. (SAI-971) ○ Rationalising four (4) WRZs (Kilnagurten, Coolyhane, Ballyverane and Clondrohid) to Macroom WRZ. This requires an increased surface water abstraction from Sullan River and a new WTP. Five (5) WTPs will be decommissioned. (SAI-952) ○ Rationalising four (4) WRZs (Castletownbere, Glengarrif, Adrigole and Reenmeen West) to Bantry WRZ. This requires an increased surface water abstraction and new WTP. Four (4) WTPs will be decommissioned. (SAI-955) ○ Rationalising three (3) WRZs (Kknockadoon, Ballymacoda and Kilchraheen) to Youghal Regional WRZ. This Option involves a new WTP and GW abstraction and decommissions four (4) WTPs. (SAI-949) ○ Five (5) Options rationalising six (6) WRZs. These options each require increased GW abstractions and will collectively decommission seven (7) WTPs 					

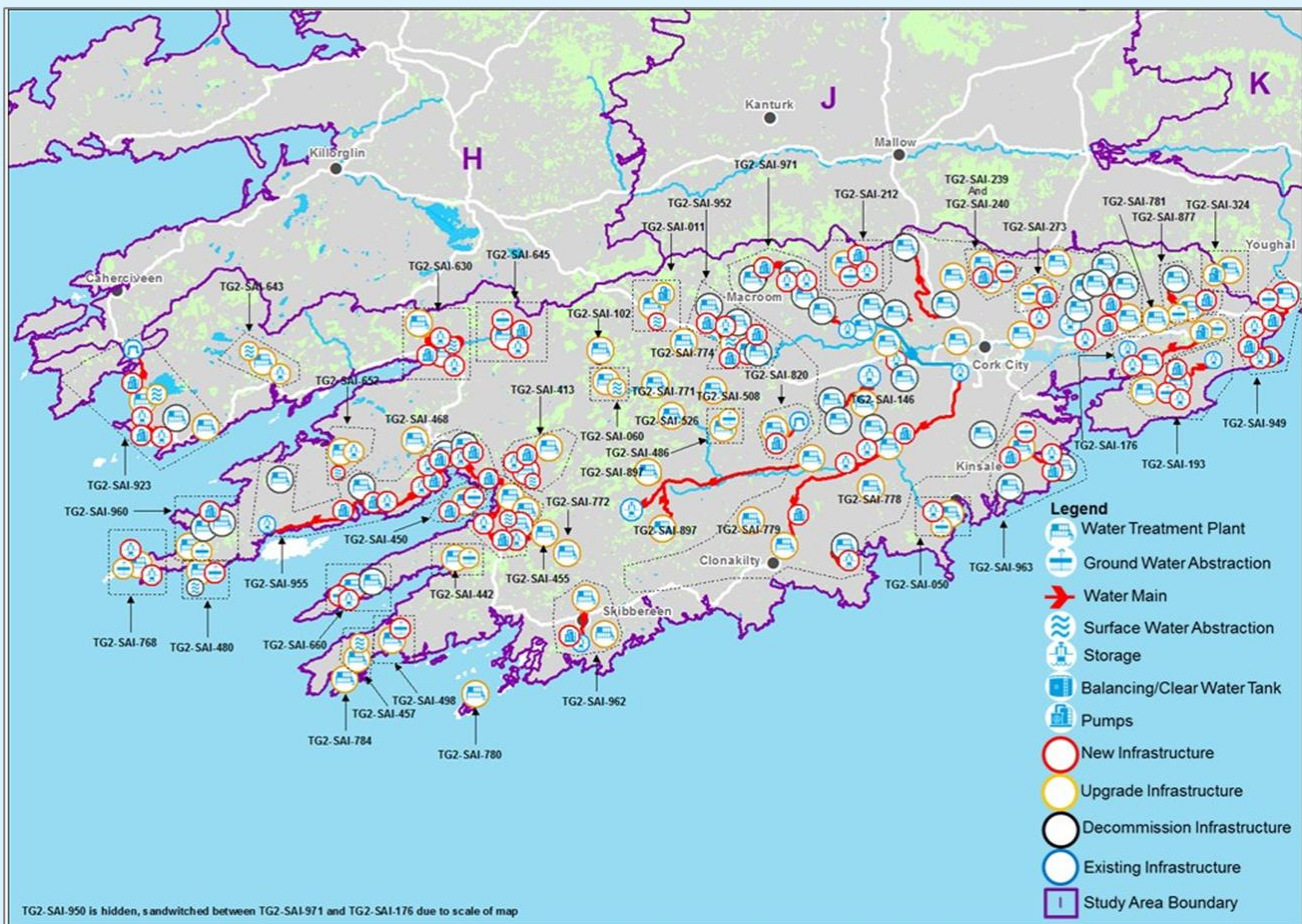
Study Area I

- Rationalising Caherdaniel/Castlecove to Waterville WRZ. This requires an increased abstraction from Lough Currane and decommissioning one (1) WTP. (SAI-923)
- Interconnecting Dunmanway and Drinagh and increasing the surface water abstraction from Curraghlicky Lake (SAI-897).
- Transferring spare capacity within Skibbereen 1 to Skibbereen 2, via an interconnection (SAI-962).

The Preferred Approach provides environmental benefits by decommissioning six (6) existing abstractions that may not meet sustainability guidelines – Allihies impoundment, Gowlane Stream, Cahermore River, Glenberg, Barony River, Tibbotstwon Reservoir - and reducing a further 11 abstractions to theoretical sustainable thresholds.

Ongoing leakage management through our National Leakage Reduction Programme, also contributes by reducing the volume of water lost in distributing water to demand centres. In SAI, planned leakage reduction programmes will reduce leakage by 2,294 m³/day in Cork City and Clonakilty. We have also committed to additional Leakage Targets of 39.4 MI/d that will reduce leakage to 21% of demand in WRZs where the demand exceeds 1,500 m³/day.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience.



*TG4-SAX-00X are the Option Codes assigned to each option. A description of each option can be found in Table 5.9 of the Technical Appendices 1-3.

7.5.3 Study Area J – North Cork and West Waterford

Study Area J	
No. of WRZs	SAJ lies within the counties of Cork, Waterford, Limerick, Tipperary and Kerry, covering an area of approximately 3,000 km ² . The population of the Study Area is about 79,400.
62	The Principal Settlement (with a population of over 10,000) is Mallow.

Current Supply System

WTPs	No.	Water Source Type	No.	Supply Deficit	m ³ /day
Existing WTP	79	Groundwater	100	DYCP 2019	10,590
High Risk WTP	59	Surface Water	5	DYCP 2044	12,130

Preferred Approach Summary

Number of WTPs	No.	GW Abstractions	No.	SW Abstractions	No.
Upgrade (WQ only)	24	Increase	13	Increase	0
Upgrade (Capacity & WQ)	15	Maintain	23	Maintain	4
Decommission	40	Decommission	39	Decommission	1
New	4	New	6	New	0

The Preferred Approach (PA) for SAJ consists of local WRZ Options for 14 of the 62 WRZs in the Study Area. This includes two (2) Options for the Whitechurch WRZ – increasing the existing groundwater abstraction and developing a new groundwater abstraction. The 48 other WRZs are supplied by 17 SA Grouped Options that involve interconnections between one or more supplies, reducing the total number of WRZs from 62 to 26. The SA Grouped Options all involve supply rationalisations:

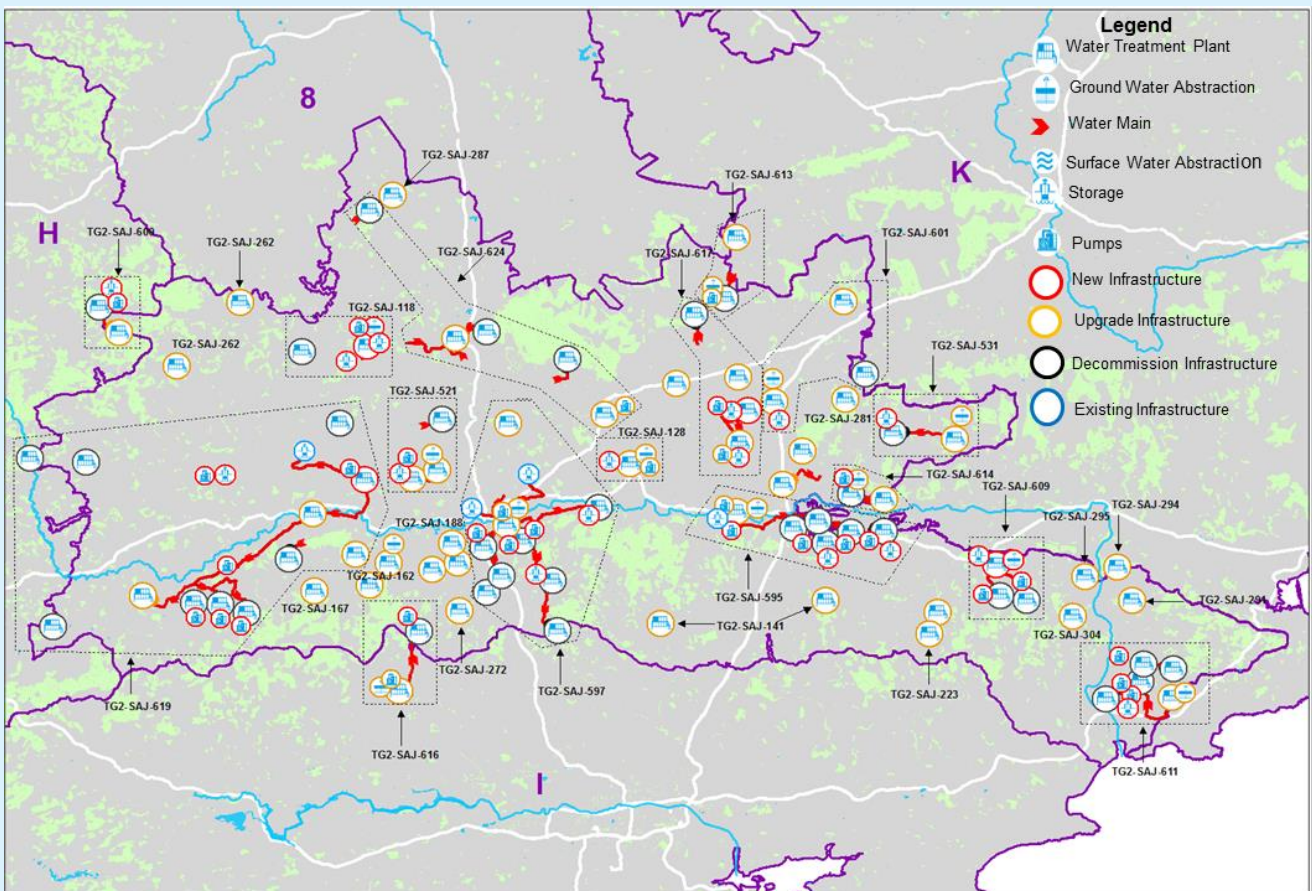
- Three Options rationalise supplies to WRZs located in other Regions:
 - Labbamollogga WRZ rationalised to Ballylanders WRZ in SAK in the South East Region, decommissioning one (1) WTP (SAJ-613).
 - Kilmurray (Mitchelstown) WRZ rationalised to Inchinleamy WRZ in SAK in the South East Region, decommissioning one (1) WTP (SAJ-614).
 - Monabricka WRZ rationalised to South West Regional WRZ in SA8 in the Eastern and Midlands Region, decommissioning one (1) WTP (SAJ-628).
- One Option rationalising Bweeng WRZ in SAJ to Donoughmore WRZ in SAI, decommissioning one (1) WTP (SAJ-616).
- Rationalising eight (8) WRZs to Mallow, requiring an increased groundwater abstraction. Nine (9) WTPs will be decommissioned. (SAI-597)
- Rationalising five (5) WRZs to Fermoy, requiring an increased groundwater abstraction. Five (5) WTPs will be decommissioned. (SAI-595)
- One Option rationalising three (3) WRZs (Toureen Derry to Banteer and Glenleigh and Kilcorney to Millstreet) and two (2) interconnections (Newmarket to Banteer and Millstreet), with two (2) new abstractions. The rationalisations decommission six (6) WTPs.

- Ten (10) Options collectively rationalising 23 WRZs to ten (10) WRZs with associated increased/new abstractions. Sixteen (16) WTPs will be decommissioned.

The Preferred Approach provides environmental benefits by decommissioning the River Allow abstraction which may not meet sustainability guidelines and reducing a further two (2) abstractions to theoretical sustainable thresholds.

Ongoing leakage management through our National Leakage Reduction Programme, also contributes by reducing the volume of water lost in distributing water to demand centres. In SAJ, planned leakage reduction programmes will reduce leakage by 369 m³/day in Charleville/Doneraile, Millstreet and Newmarket WRZs. We have also committed to additional Leakage Targets of 18.7 Ml/d that will reduce leakage to 21% of demand in WRZs where the demand exceeds 1,500 m³/day.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience



*TG4-SAX-00X are the Option Codes assigned to each option. A description of each option can be found in Table 5.9 of the Technical Appendices 1-3.

7.6 Review of Preferred Approaches arising from Consultation

As set out in Section 9 of the RWRP-SW the RWRP will be formally updated every five years at which point there will be further opportunities for public participation. Baseline forecasts and data feeding into the NWRP will be reviewed annually. Our data is continuously improving, and it is important that we review our Preferred Approach further to the receipt of updated data. During the consultation period for the RWRP-SW we received updated data for a number of WRZs through consultation workshops and subsequent further assessment, which resulted in a review of the Preferred Approach for those WRZs.

Following the review, Irish Water considered that no change to the Preferred Approach is required at this stage but there is potential for amendment as the process of review and feedback is applied.

A summary of the updated data received and updates to the RWRP-SW are provided below.

7.6.1 Whiddy Island (Study Area I)

In the SAI Technical Report the WRZ preferred approach for Whiddy Island is to develop a new groundwater abstraction on the island to supply the required deficit. Three sites on the Island are considered potentially good locations for ground water supply and a trial well was developed at one of these sites. Results from the trial well test indicate that arsenic is evident in the groundwater and it would not be a suitable source of raw water for public water supply purposes. Trial tests will be carried out at the other two sites and if it is determined, further to these site investigations, that the groundwater supply is not suitable for public water supply other feasible alternatives will have to be reconsidered.

In the draft RWRP-SW, the only alternative feasible option for the Whiddy Island WRZ is to develop a desalination plant. Due to the planning and licensing application processes required for the desalination plant it would take several years to progress this project. However, there is a critical need on Whiddy Island and there have been significant issues associated with the deterioration of raw water quality which has led to the a 'do not consume' notice being applied to the supply for a significant period of time. An option to rationalise Whiddy Island to Bantry was considered as part of a Study Area group option in the draft RWRP-SW and it is considered that this option could be delivered quicker than a desalination plant solution. Therefore, in this final RWRP-SW Irish Water have included the option to rationalise Whiddy Island to Bantry as a feasible alternative at WRZ level.

The Study Area I Technical Report has been updated to note the uncertainty associated with the WRZ Preferred Approach for Whiddy Island and the feasible alternative to rationalise Whiddy Island to Bantry, which was previously considered as a group option, has been considered as a feasible WRZ alternative option.

7.6.2 Kenmare (Study Area I)

The Kenmare supply is dependent on an import from a local group water scheme in dry weather when water levels at the existing lake source are low and there is an increase in demand associated with tourism in the area. During the consultation period it was noted that the group water scheme would not be able to continue providing supply to Irish Water.

The Preferred Approach for Kenmare, to develop a new SW abstraction from Kenmare River, will take several years to develop and obtain planning for the works, therefore in the interim there is a requirement to develop an emergency source to maintain supply during the summer period. Irish Water are currently workshopping potential interim emergency supplies.

The Study Area I Technical Report has been updated to note that the interim solution for Kenmare is to Upgrade WTP to Irish Water Standards and develop an emergency source.

7.7 Interim Solutions

As outlined 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 boreholes 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 solution would typically involve the upgrade of the existing WTP in line with proposed growth predictions. Similar to 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 Option, 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, drought issues or critical need. The RWRP-SW 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.

The interim solutions are for the purpose of maintaining continuity of supply and facilitating growth while we deliver the objective of the NWRP. However, it should be noted that the interim solutions will not improve the Level of Service. 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.

The potential interim solutions for Study Areas H, I and J are summarised in Table 7.20 and described in the Technical Appendices 1 -3.

Table 7.20 SAH, I and J Interim Solutions

Interim Solutions	Number of Interim Solutions by Type		
	SAH	SAI	SAJ
Upgrade WTP to Irish Water standards	13	36	4
Upgrade WTP to Irish Water standards- Potential site for containerised solution	4	44	37
Refurb existing borehole and upgrade WTP to Irish Water standards	25	18	31
Refurb existing borehole and upgrade WTP to Irish Water standards- potential for a containerised solution	4	0	0
Refurb existing springs and upgrade the WTP to Irish Water Standards	0	4	6
Refurb existing abstraction from infiltration gallery and upgrade WTP to Irish Water standards	0	0	1
Total no. of solutions	46	102	79

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. The interim solution for the Glanworth/Ballykenley/Johnstown WRZ (SAJ) will be considered under this programme.

7.8 Sensitivity Analysis

Our supply demand forecast has been developed using the best available information and application of best practice methods where we have data to do so. The uncertainty associated with our data is captured within our estimate of Headroom. The Headroom component is added to the Demand component of the SDB. We have identified areas where we will focus improvements in data to improve the certainty of our forecasts. These are outlined in Section 9 of this Plan.

Future events that could alter the SDB and impact on Need, such as climate change and new abstraction legislation, introduce uncertainty to our long-term forecasts. For this reason, we undertake a Sensitivity Analysis that allows us to stress test our Preferred Approaches against a range of possible futures. This ensures that our decision making is robust and that the Preferred Approaches are adaptable.

We test our Preferred Approaches against future scenarios defined by five (5) uncertainty factors:

- **Sustainability:** New abstraction legislation introducing sustainability limits on quantities to be abstracted, increasing the SDB Deficit.
- **Climate change:** Climate change reduction in water availability at certain times of the year is greater than anticipated, increasing the SDB Deficit.
- **Growth forecast:** Growth in demand is lower than forecast, reducing the SDB Deficit.
- **Leakage targets exceeded:** We achieve better than expected levels of effectiveness and efficiency in reducing leakage, reducing the SDB Deficit.
- **Leakage targets not met:** Leakage does not reduce to target levels within the planning period, increasing the SDB Deficit.

We have not assessed against a scenario where growth is higher than forecast, as we consider the projections that we have used in our SDB calculation reflect an optimistic growth forecast. Furthermore, the scenario of higher than forecast growth would have the same impact as a scenario where Leakage targets are not met.






The uncertainty factors are tested independently. A combination of these scenarios may occur together. For example, we may find growth in demand is lower than forecast, and/or we achieve greater leakage reduction at the same time as the abstraction licensing regime limits our water availability. In this case, reductions in demand would offset some of the increasing deficit arising due to abstraction sustainability reductions.

As data and models improve over time Irish Water will incorporate a more extensive approach to sensitivity analysis in the form of Adaptive Planning. This will provide the flexibility to respond to uncertainty when it occurs.

Overall, our sensitivity assessment of the Interim Solutions and Preferred Approach indicates they are highly adaptable to a broad range of futures, and therefore represent 'no regrets' infrastructure

We describe the scenarios we have assessed in further detail Chapter 8 of the Framework Plan. A summary of the outcomes of the analysis we have undertaken is given in Table 7.21. Further details can be found in the Study Area Technical Reports (Appendices 1-3).

Table 7.21 Sensitivity Analysis of the Preferred Approach

Sensitivity Criteria	Impact on the SA Preferred Approach		
	SAH	SAI	SAJ
Sustainability Impact*			
Status of abstraction potentially impacted by new legislations with PA in place	Decommission 2 Maintain 17	Decommission 6 Maintain 25	Decommission 1 Maintain 3
Likelihood	Moderate/High	Moderate/High	Moderate/High
Change in Deficit (m ³ /day) 	+47,200	+30,200	+6,400
Climate Change Impact			
Likelihood	High	High	High
Change in Deficit (m ³ /day) 	+1,000	+3,000	+1,900
Demand Growth Impact			
Likelihood	Low/Moderate	Low/Moderate	Low/Moderate
Change in Deficit (m ³ /day) 	- 33,870	-50,370	-21,560
Leakage Targets not met			
Likelihood	Moderate	Low	Low
Change in Deficit (m ³ /day) 	+1,070	+2,300	+370
Leakage Targets exceeded			
Likelihood	Moderate/High	Moderate/High	Moderate/High
Change in Deficit (m ³ /day) 	-33,360	-40,990	-19,200

 = Reduced SDB Deficit

 = Increased SDB Deficit

* Number of abstractions potentially impacted by new legislation that are proposed to be decommissioned in the Preferred Approach. Abstractions which will be potentially impacted by the new legislation are set out in Table 3.18 in Section 3. These impacts are based on conservative estimates of what a future regulatory regime may require. The actual reductions that may be needed in future will depend on the specific requirements of that legislation.

7.9 Summary

Our SA Preferred Approaches consist of a combination WRZ Options and SA Options that perform best against our criteria of Resilience, Deliverability and Flexibility and Sustainability. These solutions have been developed with input from technical and local experts through workshops involving the assessment of 999 Feasible Options.

Our SA Preferred Approaches:

- Consist of 98 Options comprising 63 WRZ Options and 35 Study Area (SA) Grouped Options. The SA Grouped Options supply more than one WRZ and generally rationalise supplies, with associated environmental benefits.
- Comprise 26 increased or new local groundwater supplies, and ten (10) increased or new local surface water supplies that contribute to meeting an estimated 7% and 3% of the Deficit across the South West Region.
- Supply 88% of the regional Deficit through 30 Within SA Interconnections (which are combined with upgraded or new groundwater or surface water sources). The Within SA Interconnections benefit 106 WRZs.
- Supply 2% of the regional Deficit through five (5) Cross Study Area Interconnections benefitting six (6) WRZs. Three (3) of the interconnections are supplied from WRZs located outside of the South West Region. This includes two transfers from SAK in the South East Region and one transfer from SA8 in the Eastern and Midlands Region.
- Upgrade WTPs to reduce Water Quality risks identified through our Barrier Assessments (including 26 WRZs where the Preferred Approach only involves a WTP upgrade to improve water quality).
- Reduce investment costs by approximately 8% across the region when compared with alternative independent and smaller scale WRZ Options.
- Increase resilience by delivering solutions through interconnections and rationalisation and providing 80 more water storages.
- Improve sustainability outcomes by decommissioning 90 WTPs and abandoning 91 associated abstractions. This includes nine (9) surface water abstraction sites that have been assessed to be potentially impacted by future abstraction legislation. The assessment was based on a conservative estimate of what a future regulatory regime may require.
- Include 227 Interim Solutions to ensure shorter term Deficits are addressed to account for lead times in delivery of Options that will ultimately meet the Deficit across the 25-year planning period.
- Are adaptable to change across a range of future scenarios including climate change, growth projections, sustainability outcomes and changes in leakage targets.

The development of our SA Preferred Approaches at the Regional Level is presented in Section 8.

7.10 References

1. Department of Communications, Climate Action and Environment. 2018. *National Adaptation Framework. Planning for a Climate Resilient Ireland*. [Online]. Available from: <https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/>
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3. Southern Regional Assembly, 2021. Southern Region Spatial and Economic Strategy. [Online]. Available from <https://www.southernassembly.ie/regional-planning/regional-spatial-and-economic-strategy>
4. Drinking Water Directive (98/83/EC), Provisional Agreement of Recast Directive 18th December 2019.
5. European Union (Drinking Water) Regulations 2014. (S.I. No. 122/2014)
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