Summer 2023

Regional Water Resources Plan North West

Appendix 4 Study Area D Technical Report

Tionscadal Éireann Project Ireland 2040

6 CLEAN WATER AND SANITATION

Data Disclaimer:

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

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

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1 Introduction and Background

1 Introduction – Study Area D

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

This Study Area includes 25 water resource zones located in County Mayo and Galway. This Technical Report includes:

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

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

1.1 Summary of Our Options Assessment Methodology

In Chapter 8 of the Framework Plan, we described the Option Assessment Methodology that will be used to develop a national programme of proposed solutions for all of our water supplies. The objective of these solutions is to resolve the needs identified through the Supply Demand Balance (SDB), Water Quality, Reliability and Sustainability assessments. These needs will be discussed in further detail in this report. In the RWRP-NW, we apply this methodology to the Northern and Western Region shown in Figure 1.1.

As outlined in Section 1.9.4 of the Framework Plan, the regional boundaries have been delineated for the purpose of delivering the National Water Resources Plan. As a national plan sources outside the delivery region may be considered to meet need within a particular region.

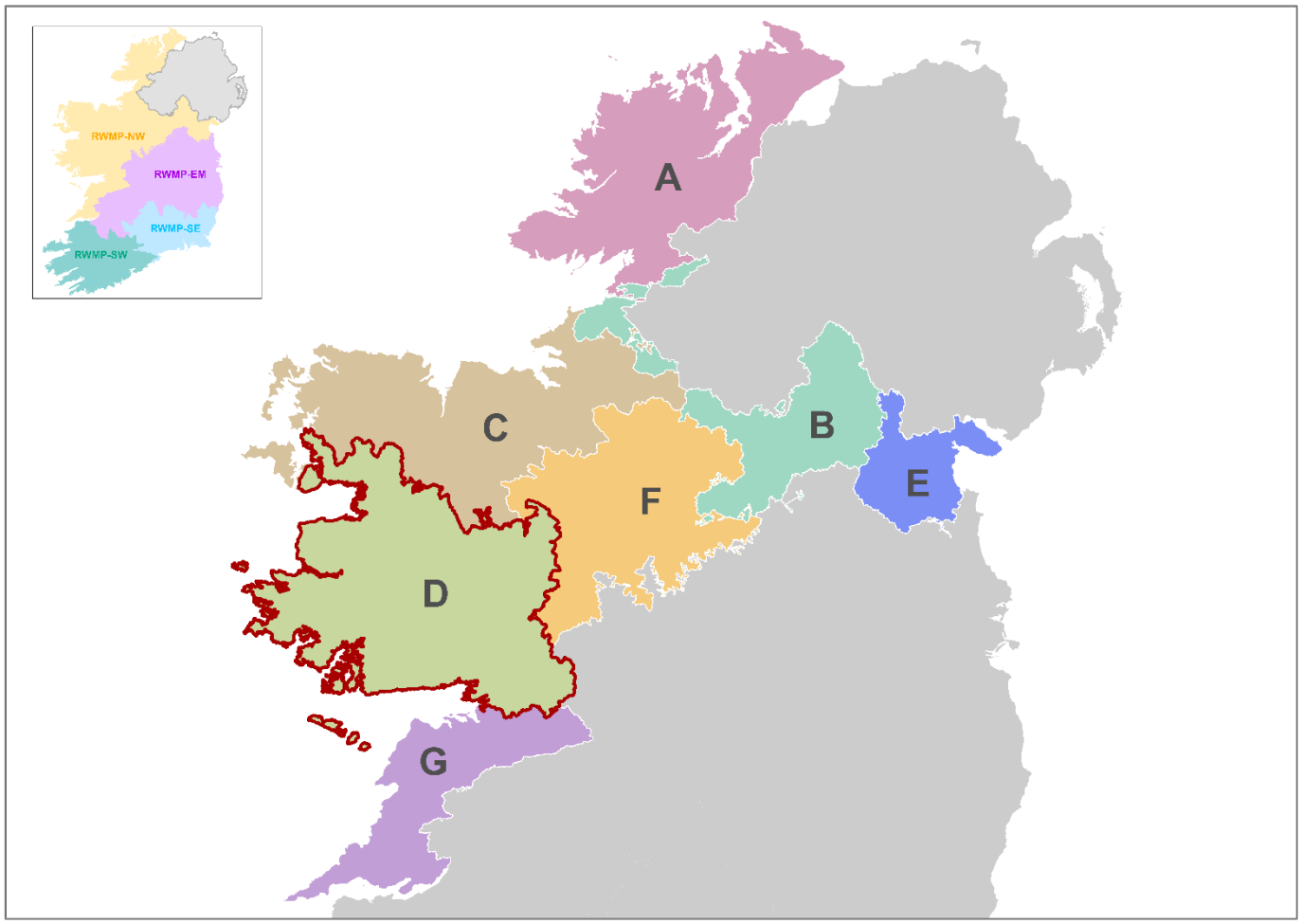

Figure 1.1 Overview of Study Areas within the Northern - Western Region.

This Technical Report is for Study Area D (SAD), which consists of 25 individual water resource zones (WRZs). Within this Study Area, the Preferred Approach has been developed following the process shown in Figure 1.2 and as outlined in Section 8.3 of the Framework Plan.

In this document, Option codes are labelled using the following naming convention: SAX-00X

- SAX refers to the Study Area within which the option is located.
- 00X refers to the individual option number.
- Any references to TG1 refers the Northern Western Region (Regional Group 1).

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

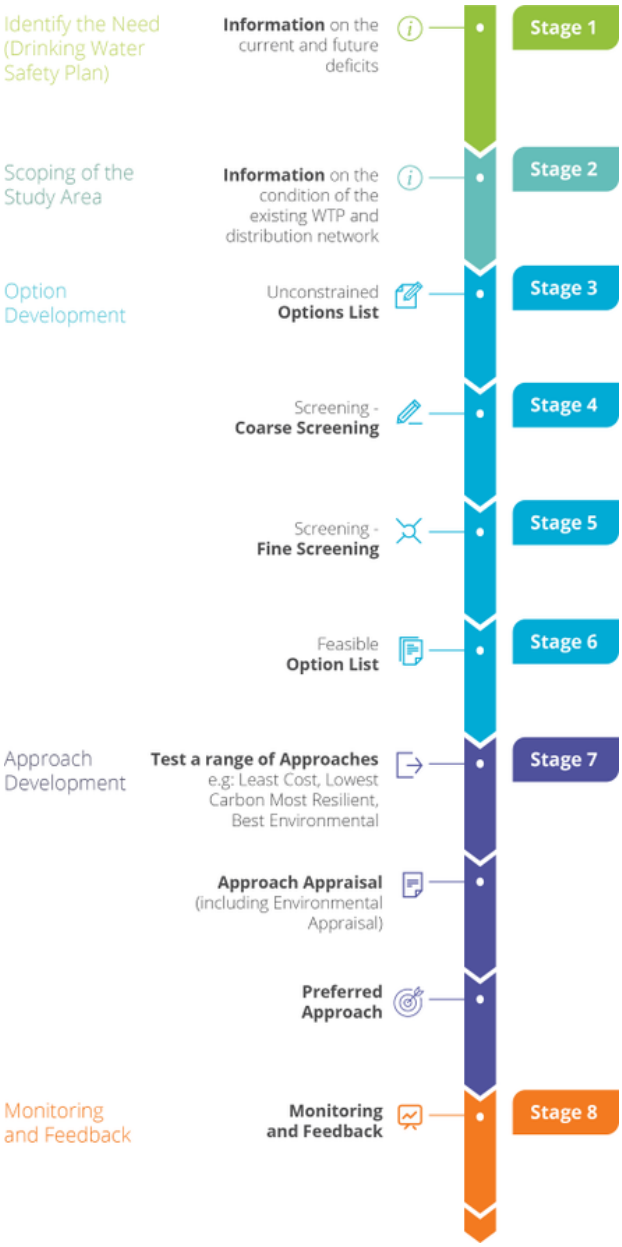

Figure 1.2 Option Assessment Methodology Process

1.2 Introduction to the Study Area

Study Area D consists of 25 WRZs supplying a population of approximately 228,609 people via approximately 3,566 kilometres of distribution network. SAD is the largest Study Area in the country as it extends across most of County Galway and the southern half of County Mayo, including several island off the coast of Ireland such as the Aran Islands (Inishmore, Inishmean, Inishere), Inisboffin, Inishturk and Clare Island.

Galway City is by far the largest demand centre, with other notable towns elsewhere including Castlebar, Tuam and Westport. The sources of water supply consist of 26 surface water abstractions and 8 groundwater abstraction sites. The Study Area's water treatment plants (WTPs) and their associated source type are summarised in Figure 1.3. and Table 1.1.

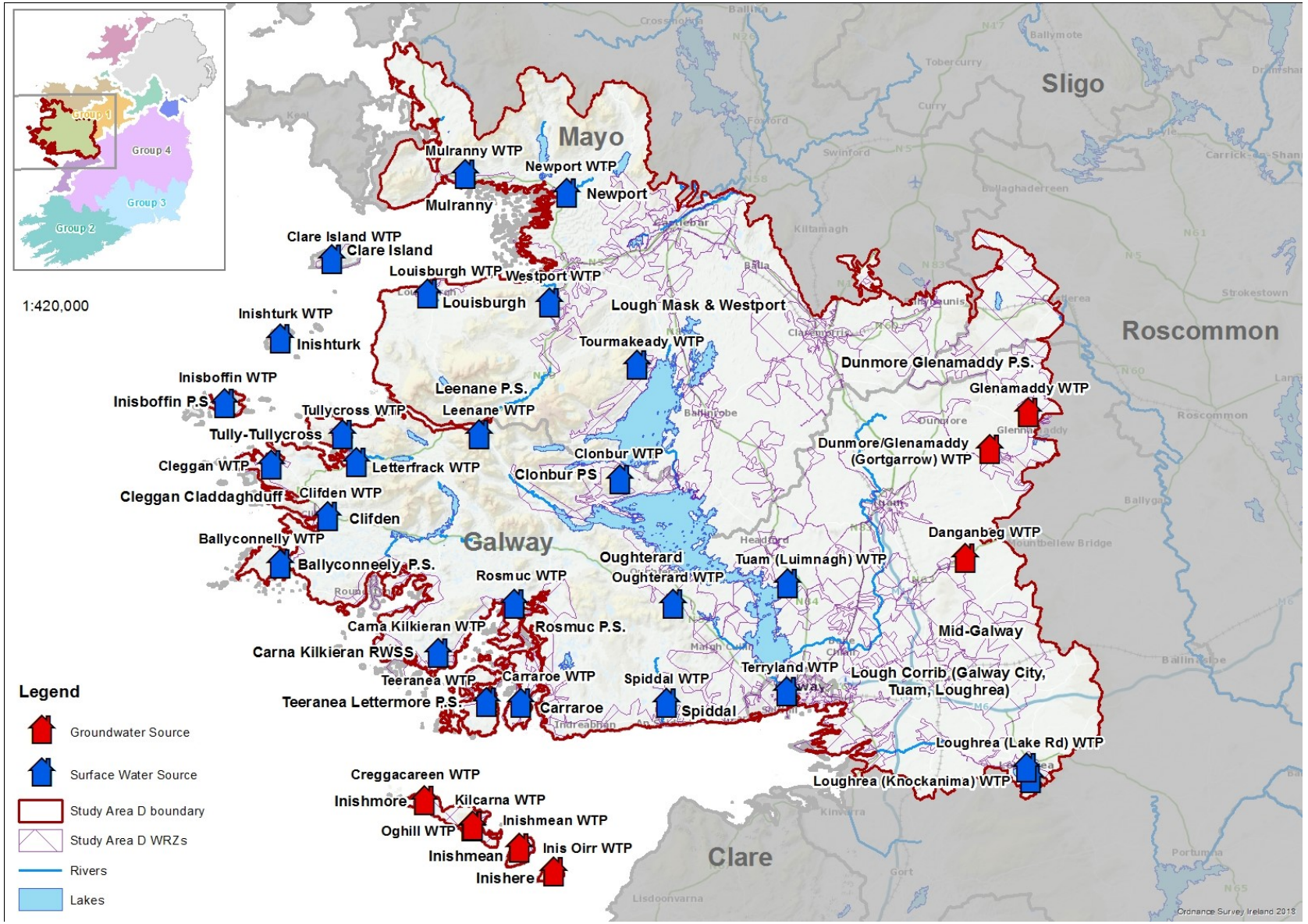

Figure 1.3 SAD Mayo & Galway Water Supply Study Area

Regarding surface water availability in SAD, the Study Area extends across three main catchments: the Corrib (HA 30) in the central and eastern parts, the Galway Bay North (HA 31) in the south west, and the Erriff-Clew Bay (HA 32) in the north west. The Corrib catchment is a large complex system that dominates the Study Area as it comprises of two large lake sources, Lough Corrib and Lough Mask, that receive most of their water from the wide, flat limestone plain in the eastern side of the catchment. This area to the east of the lakes is characterised by karstified limestone where groundwater and surface water are highly interconnected. At the southern tip of Lough Corrib, the River Corrib flows through Galway City before becoming tidal at Galway Bay. The Galway Bay North catchment includes the mountainous Connemara region in the north consisting of some larger lake sources within the Inagh Valley, and the complex bog covered coastline areas of West Galway which comprise of networks of smaller river and lake sources. The Erriff-Clew Bay catchment comprises of several small coastline river and lake systems draining large parts of western County Galway and Mayo. This catchment includes both many mountainous areas and the drumlinised lowland area at Clew Bay.

Study Area D has a number of designated area sites including several large water dependent Special Areas of Conservation (SAC) such as the Lough Corrib SAC, Lough Carra/ Mask Complex SAC and Connemara Bog Complex SAC. It has three SAC catchments designated for Margaritifera (Freshwater Pearl Mussel) - the Owenriff, Dawros, and Bundorragha. The Study Area also has several waterbodies with WFD High Status Objectives (HSOs), including the large Lough Mask source.

Around 90% of the water supply to Study Area D is from surface water sources, with 80% of total supply coming from three large abstractions from the Corrib system. In the upper part of the Corrib catchment, an abstraction on the north end of Lough Mask delivers up to 38,000 m^3/day to Tourmakeady WTP to supply Lough Mask & Westport WRZ. Whilst further downstream at Lough Corrib, there are two abstractions to supply the Lough Corrib (Galway City, Tuam, Loughrea) WRZ. One on the eastern banks of Lough Corrib feeds up to 36,000 m^3/day to Tuam (Luimnagh) WTP, and another downstream on the lake outflow, River Corrib, delivers up to 55,000 m^3/day to Terryland WTP.

Elsewhere in the Study Area, the other notable surface water abstractions are from smaller lake sources. These include the Loughrea source which supplies up to 4,300 m^3/day to Lough Corrib (Galway City, Tuam, Loughrea) WRZ, Moher Lake source supplies up to 2,500 m^3/day to Lough Mask & Westport WRZ, and Loughanwillian supplies up to 2,400 m^3/day to Carraroe WRZ. In the past, several other natural loughs around the Study Area have been raised and impounded to develop reservoir sources to increase the resilience of supply. These impounding reservoir sources include Lough Bouliska supplying up to 4,000 m^3/day to Spiddal WRZ, and Lough Buffy supplying up to 3,000 m^3/day to Oughterard WRZ.

Overall, 8 groundwater sites are managed by Uisce Éireann in the region. The predominant aquifer type of the area is made up of poorly productive bedrock (53%), followed by karstic (44%), with a relatively minor contribution from productive fissured (2%) and sand and gravel (0.3%). Surface water abstractions dominate the total water supply for the region, highlighting the vast areas underlain by aquifer with lower potential, with the majority of higher volume groundwater abstractions taking place from a number of karstic springs.

The majority of the Study Area west of Galway city and Loughs Corrib and Mask, are classified as poorly productive aquifers and will not offer the same kind of groundwater potential as the karstic rocks seen elsewhere (central and eastern areas). This area is characterised by its more mountainous regions of Connemara, which are composed of Precambrian quartzites, with Ordovician igneous and volcanic rocks also present. Silurian Metasediments and Volcanics can be found to the northwest near Louisburgh and Westport, while Granites and other Igneous intrusive rocks make up the bedrock to the south of Connemara, stretching towards the coastline of Galway Bay. The Precambrian rocks and Granites are

characterised by the absence of an intergranular permeability and the presence of low fissure permeability. The marbles may contain some solutionally enhanced permeability zones which could provide a domestic or farm supply or small group scheme. Yields are lowest in the fine-grained schists (pelites) where wells may fail to provide even a domestic yield. Well yields are greater in the coarser grained rocks such as the quartzites, but even in these rocks yields greater than 100 m^3/day would be unusual. Although fractured, the Ordovician and Silurian generally have a low permeability and are mostly regarded as a poor aquifer. Such rocks will often yield enough water to a well to supply a house or small farm (0.2-0.5 l/s and occasionally in major fracture zones may yield a good deal more. However, since the yield often depends on the permeability developed in the uppermost few metres of broken and weathered rock, yields will often decrease markedly in dry spells as the water table falls, and these supplies may therefore be unreliable.

The karst forms a key regionally important aquifer in some areas, underlying much of central and east Galway, which consists of clean limestone that has been extensively karstified. The majority of the larger abstractions occur in this setting and mainly appear as spring overflows, which serve as points of groundwater discharge. Limestone dissolution during karstification causes groundwater flow to concentrate along certain pathways/conduits (Rk^c type aquifers), making it difficult to locate successful wells. Locating high yielding wells in Rk^c aquifers can be difficult due to the uneven distribution of permeability; failed and high yielding wells can occur close together. Both point and diffuse recharge occur. Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. Despite the presence of peat and till, point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines.

In the lowlands of East Galway and southeast Mayo, where the elevation rarely exceeds 70 m above sea level, most drainage is underground in solutionally enlarged fissures and conduits, and in several areas groundwater catchments do not match the surface water catchments. Groundwater flow is dominantly westward, to Loughs Mask and Corrib or to Galway Bay. The area is characterised by sinking rivers, with losing rivers during periods of lower groundwater levels and gaining rivers in the winter, as seen with the Robe. In the River Clare–Lough Corrib catchment, no gaining streams are known, so all groundwater discharge is via springs. The Mid-Galway and Dunmore/Glenamaddy are the most notable schemes in this part of the Study Area, which supplies on average 4,000 m^3/day and 3,000 m^3/day respectively. It should be noted the springs discharge in the range of 19,000 – 22,000 m^3/day highlighting the kinds of volumes transported throughout the conduit system. Oftentimes the spring abstraction can be augmented by drilling a borehole, however the nature of the Rk^c flow regime makes well success unpredictable. Both borehole and spring supplies are highly vulnerable to contamination from any pollutants that are allowed to enter the karstic aquifers.

The same karstic bedrock is mirrored in the Aran Islands, with various existing natural groundwater discharge seeps on the islands. Much of the flow takes place in the shallower epikarstic layer with springs often occurring where the shale bands intersect the surface. These spring flows rise and fall quickly in response to rainfall events. Natural discharge is generally less than 400 m^3/d, with the largest source located on Inis Mór. This receives the bulk of the rainfall owing to it's steep cliffs and it is estimated that Inis Oírr, and perhaps Inis Meáin, get 30% less rainfall. The quantity of groundwater available is limited by the surface area of the island, the amount of precipitation, the ability to collect the runoff/recharge and the amount storage available. The groundwater discharge system is fed by rainfall that rapidly discharges at the surface, which can be described as shallow subsurface run off. This is because flow paths are short and the limestone system is shallow, whereby underlying shale beds, above sea level elevation, control groundwater discharge at the surface.

Table 1.1 SAD Study Area Summary

Mayo / Galway	Total Population	228,609	Total Network Length (km)	3,566	Number of Water Resource Zones	25
Counties in Study Area	Galway, Galway City, Mayo					
Principle Settlements	Galway city and suburbs, Castlebar, Athenry, Claremorris, Bearna, Castlerea, Ballinrobe, Ballyhaunis, An Cheathrú Rua, An Spidéal, Ballinlough, Ballinderreen, Craughwell, Kilcolgan, Clifden, Lackaghbeg, Cluain Bú, Corrandulla, Clarinbridge, Conga, Corrofin, Knock, Headford, Balla, Baile Chláir, Glenamaddy					
Number of Water Sources	35	Surface Water Sources	26	Groundwater Sources	8	

Water Treatment Plant	Source	Population	WTP Capacity (m^3/day)	Quality	Quantity	Reliability	Potential Sustainability
Tourmakeady WTP	Lough Mask	42,723	38,000	●	●	●	○
Inishturk WTP	Coolacknick Lake Intake	48	30	●	●	○	●
Clare Island WTP	Knockmore	163	150	●	●	○	●
Westport WTP	Moher lake	3,433	2,500	●	●	●	●
Newport WTP	Newport River	697	408	●	○	○	○
Mulranny WTP	Bunnahowna River	678	640	●	○	●	●
Louisburgh WTP	Bunnahowen River	808	371	●	○	●	○

Water Treatment Plant	Source	Population	WTP Capacity (m^3/day)	Quality	Quantity	Reliability	Potential Sustainability
Terryland WTP	River Corrib	89,660	55,000	●	●	●	●
Loughrea (Knockanima) WTP	Lough Rea	4,393	2,260	●	●	●	●
Loughrea (Lake Rd) WTP	Lough Rea	2,908	2,040	●	●	●	●
Kilcarna WTP	Groundwater	287	650	●	●	●	●
Creggacareen WTP	Groundwater	48	160	●	●	●	●
Tullycross WTP	Tully Lough	392	290	●	●	●	●
Tuam (Luimnagh) WTP	Lough Corrib	42,352	36,000	●	●	●	●
Teeranea WTP	Lough Illauntrasna	928	600	●	●	●	●
Spiddal WTP	Lough Bouliska	8,538	4,000	●	●	●	●
Rosmuc WTP	Lough Aroolagh	450	350	●	●	●	●
Oughterard WTP	Lough Buffy (Stream)	5,668	3,000	●	●	●	●
Danganbeg WTP	Groundwater	8,082	4,482	●	●	●	●
Letterfrack WTP	Diamond Hill Stream	95	170	●	●	●	●
Leenane WTP	Mountain Stream (unnamed)	101	116	●	●	●	●

Water Treatment Plant	Source	Population	WTP Capacity (m^3/day)	Quality	Quantity	Reliability	Potential Sustainability
Inishmean WTP	Groundwater	173	91	●	●	●	●
Oghill WTP	Groundwater	361	550	●	●	●	●
Inis Oirr WTP	Groundwater	281	250	●	●	●	●
Inisboffin WTP	Lough Fawna	158	264	●	●	●	●
Glenamaddy WTP	Groundwater	776	420	●	●	●	●
Dunmore/Glenamaddy (Gortgarrow) WTP	Groundwater	1,796	2,646	●	●	●	●
Clonbur WTP	Coolin Lough	1,380	1,230	●	●	●	●
Clifden WTP	Lough Nambrackeagh	1,524	820	●	●	●	●
Cleggan WTP	Lough Courhoor	517	350	●	●	●	●
Carraroe WTP	Loughaunwillan	3,198	2,400	●	●	●	●
Carna Kilkieran WTP	Lough Lerin, Lough Loughaunore	2,349	2,700	●	●	●	●
Ballyconnelly WTP	Lake Anaserd	157	950	●	●	●	●

Score	Uisce Éireann Asset Standard Assessment
●	Low Risk
●	Medium Risk
●	
●	High Risk

2

Scoping the Study Area D

2 Scoping the Study Area

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

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

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

2.1 Water Quality

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

The barriers are an internal gauge and the initial desktop assessments of barrier performance for SAD are summarised in Table 2.1.

Table 2.1 Quality: Barrier Scores

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Tourmakeady WTP	●	●	●	●
Inishturk WTP	●	●	●	●
Clare Island WTP	●	●	●	●
Westport WTP	●	●	●	●
Newport WTP	●	●	●	●
Mulranny WTP	●	●	●	●
Louisburgh WTP	●	●	●	●
Terryland WTP	●	●	●	●

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Loughrea (Knockanima) WTP				
Loughrea (Lake Rd) WTP				
Kilcarna WTP				
Creggacareen WTP				
Tullycross WTP				
Tuam (Luimnagh) WTP				
Teeranea WTP				
Spiddal WTP				
Rosmuc WTP				
Oughterard WTP				
Danganbeg WTP				
Letterfrack WTP				
Leenane WTP				
Inishmean WTP				
Oghill WTP				
Inis Oirr WTP				
Inisboffin WTP				
Glenamaddy WTP				
Dunmore/Glenamaddy (Gortgarrow) WTP				
Clonbur WTP				
Clifden WTP				

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Cleggan WTP	●	●	●	●
Carraroe WTP	●	●	●	●
Carna Kilkieran WTP	●	●	●	●
Ballyconnelly WTP	●	●	●	●

Score	Uisce Éireann Asset Standard Assessment
●	Low Risk
●	Medium Risk
●	
●	High Risk

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

Based on the barrier assessment, 16 of the 33 WTPs in the Study Area are considered to be at high risk of failing to achieve the required standards in relation to barrier and viruses (Barrier 1) chlorine residuals in our networks (Barrier 2.1) and effectiveness of our Protozoa removal processes (Barrier 3). However, in some cases our desktop assessments can over-estimate risk, particularly when there is little available data on the catchment characteristics of our raw water sources. As our "Source to Tap" Drinking Water Safety Plan (DWSP) assessments, which are a requirement under the Recast Drinking Water Directive (2020), are developed for each water supply, the barrier scores for all of our supplies will be updated and become more reliable.

It should be noted that the "quality need" identified through the Barrier Assessment is not an indicator of compliance with the Drinking Water Regulations. It is an assessment of the need to invest in areas of our asset base (human and structural) through resource planning, to ensure that we can address potential risks or emerging risks to our supplies.

At present, there are three WRZs within Study Area D, on the EPA Remedial Action List, namely Louisburgh, Newport PWS and Inisboffin.

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

Table 2.2 Critical Water Quality Requirements SAD – Mayo and Galway

Critical Water Quality Requirements	Progress
1. **Louisburg EPA RAL:** It is proposed to abandon existing source and rationalise Louisburg to Lough Mask RWSS	**Scoping**
2. **Newport EPA RAL:** Completion of catchment-focused engagement analysis involving Uisce Éireann and relevant stakeholders is required to achieve compliance with the limits for pesticides	**Scoping**
3. **Inisboffin EPA RAL:** Uisce Éireann to develop the plan to address the issue.	**Scoping**
4. **Lough Mask Water Supply Scheme:** Project to increase the capacity of the Tourmakeady Water Treatment Plant (WTP) by circa 10Ml/d is underway. The project will improve the security of water supply and water quality across these areas and ensure compliance with requirements set out in the European Union Drinking Water Directive and National Drinking Water Regulations.	**Ongoing**
5. **Reservoir Cleaning Programme:** A major reservoir cleaning programme has been undertaken at 43 sites, which has reduced network water quality issues.	**Complete**
6. **Disinfection Programme:** In 2016, Uisce Éireann completed a nationwide review of all water treatment plants where disinfection upgrades were required, followed by a programme of works to deliver the required upgrades. To date, the disinfection programme has completed upgrade works at 7 of the 25 WRZs in SAD, based on assessed priority basis. • Inishturk WTP • Clare Island WTP • Louisburgh WTP • Newport WTP • Mulranny WTP • Westport • Oughterard WTP Any requirements within the remaining 18 supplies will be identified via Drinking Water Safety Plans with solutions developed as part of the NWRP.	**Complete**

In summary, in relation to water quality, Uisce Éireann will:

- Continually update Barrier Performance issues in the WRZ which have the potential to impact on drinking water quality in the region;
- Improve these assessments through the development of DWSPs for all of our supplies;
- Address the priority risks identified on the EPA Remedial Action List (noting that steps have already been taken, and are ongoing, to address these risks); and

- All residual need (grey dots) in relation to water quality, see Table 2.1, will be brought through our options assessment process.

2.2 Water Quantity – Supply Demand Balance

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

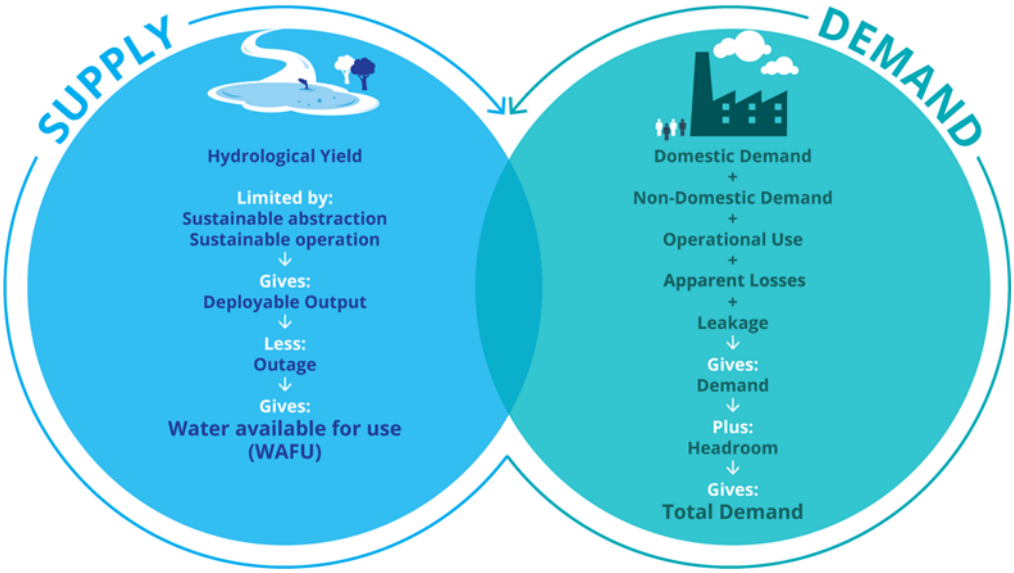

Figure 2.1 Supply Demand Balance

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

The SDB assessments were carried out for each of the weather event planning scenarios (Normal Year Annual Average, Dry Year Annual Average, Dry Year Critical Period, Winter Critical Period) which described in Chapter 2 of the Framework Plan. The SDB deficits in SAD manifest in the following ways:

1. **Inappropriate standards and levels of risk for a strategic water supply:** As water supply is essential for public health, Uisce Éireann must ensure appropriate standards of supply and be able to cope with drought conditions, peak events, and maintenance of assets. This requires adequate reserve capacity in our supplies to provide a 1 in 50 Level of service. At present, not all supplies within this Study Area meet the required levels of reserve capacity. However, due to the lack of historical monitoring, particularly in relation to groundwater supplies, some of the deficits may be data driven.
2. **Day to day operations:** 20 out of 25 water resource zones in the area indicate a supply demand balance deficit in the current scenario, this further deteriorates under the future scenario where 23 out of 25 WRZs indicate a supply demand balance deficit (based on a “do nothing” approach). While sufficient on normal weather conditions, several would fail in drought. During recent dry periods, particularly the summer of 2018 and 2020 when water conservation orders were implemented, a number of the supplies in SAD were impacted. Ahascragh required sandbagging of the Bunowen River to help counteract low levels in the spring, while night time restrictions were imposed on the Aran Islands for a number of months 2020.

A summary of the SDB deficit across all 25 Water Resource Zones is summarised in Table 2.3. The water resources zones are detailed in Appendix L of the Framework Plan - Supply Demand Balance Summaries.

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

Water Resource Zone Name	Water Resource Zone code	Population	Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Newport	2200SC0017	697	-35	-36	-42	-47	-52	-57
Mulranny	2200SC0016	678	No Deficit	No Deficit	No Deficit	-2	-8	-13
Louisburgh	2200SC0015	808	-25	-22	-28	-34	-40	-45
Inishturk	2200SC0003	48	-15	-15	-15	-16	-16	-16
Clare Island	2200SC0002	163	-118	-120	-123	-125	-127	-128
Lough Mask & Westport	2200SC0001	49,642	-15,531	-15,375	-15,731	-16,213	-16,718	-17,121
Spiddal	1200SC0038	8,538	-997	-1,131	-1,232	-1,299	-1,357	-1,404
Carraroe	1200SC0037	3,198	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Tully-Tullycross	1200SC0035	487	-124	-131	-137	-143	-149	-153
Leenane P.S.	1200SC0024	101	-10	-11	-13	-22	-24	-26
Inishmore	1200SC0019	696	-691	-710	-723	-734	-745	-754
Inishere	1200SC0018	281	-150	-151	-154	-156	-158	-160
Inisboffin P.S.	1200SC0017	158	-135	-138	-141	-143	-144	-145
Clonbur PS	1200SC0012	1,380	-156	-177	-193	-209	-225	-237
Clifden	1200SC0011	1,524	-541	-562	-583	-600	-618	-631
Cleggan Claddaghduff	1200SC0010	517	No Deficit	No Deficit	No Deficit	-2	-9	-14
Ballyconneely P.S.	1200SC0007	157	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Inishmean	1200SC0004	173	-14	-16	-17	-19	-21	-22

Water Resource Zone Name	Water Resource Zone code	Population	Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Teeranea Lettermore P.S.	1100SC0001_M	928	-145	-156	-164	-172	-180	-186
Rosmuc P.S.	1100SC0001_K	450	-249	-257	-262	-267	-272	-275
Oughterard	1100SC0001_J	5,668	-309	-361	-404	-447	-489	-524
Mid-Galway	1100SC0001_H	8,082	-926	-989	-1,037	-1,085	-1,132	-1,170
Dunmore Glenamaddy P.S.	1100SC0001_D	2,572	-207	-260	-299	-324	-348	-368
Carna Kilkieran RWSS	1100SC0001_B	2,349	No Deficit	No Deficit	-1	-29	-57	-79
Lough Corrib (Galway City, Tuam, Loughrea)	1100SC0001	139,313	-9,127	-12,246	-15,828	-17,796	-19,351	-20,593

As outlined in Chapter 4 of the framework plan, the estimated population currently living in each WRZ has been based on the 2016 Census data. Forecasts for future populations have been based on draft growth projections from the National Planning Framework (NPF), and updated information from the Regional Spatial and Economic Strategies (RSES) and Local Authority Planning sections (where available).

The target 1 in 50 level of service in the region were applied in each case, along with the corresponding requirements for reserves, indicating that our supplies are operating with a cumulative SDB deficit of approximately 29,504 m^3/day. As a result, while we can continue to supply water, the water supplies in this area may come under pressure, particularly in drought conditions. In addition, there may be ongoing reliability issues.

This situation will further deteriorate over time due to climate change driven reductions in water resources, together with increased demand due to population growth. If we do nothing, the supply demand balance deficit will increase to approximately 44,123 m^3/day by 2044.

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

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

2.3 Water Supply Reliability

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

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

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

During the drought in summer of 2018, several raw water sources experienced issues; instream pumping, and sandbagging were required at Clifden WTP, Louisburg WTP, Mulranny WTP and Westport WTP in order to ensure supply to customers could be maintained. During the drought in 2020, Tankering took place to Inis Oirr WTP, and night time restrictions were in place for both Inis Oirr WTP and Inishmean WTP. Restrictions take place on these islands almost every year. Tankering takes place to Inis Oirr almost every year.

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

Table 2.4 SAD Critical Infrastructure Projects and Need Identification

Critical Requirement	Progress
1. Drinking Water Storage - Galway: Projects are to be advanced to construct new reservoirs in Gort, Kilkerrin/Moylough, Letterfrack and Tír an Fhia in order to increase the security of the water supply to these areas. The new reservoirs will increase treated water storage capacity up to 24 hour storage and will ensure there is adequate treated water storage in order to safely and securely supply for over 6,700 people across Galway.	**Ongoing**
2. Galway County Water Conservation Works Stage 3 – Phase 2: Rehabilitation and replacement of approx.19km of water mains and service connections which has benefitted approximately 16,000 customers in the towns of Carraroe, Spiddal, Loughrea and the Island of Inis Mór in Co.Galway. The project has ensured a reinforced network, resulting in an improvement in the water supply for these areas by reducing service disruptions and improving the water quality and pressure.	**Complete**
3. Distribution Network Repairs and Upgrades: Rolling programme of active leakage control, pressure management, find and fix and network upgrades.	**In Progress**

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

2.4 Water Supply Sustainability

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

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

To understand the potential impact of the pending Abstraction Legislation on the SAD Supplies, we have assessed our surface water abstractions on our 26 no. surface water abstractions: Lake Anaserd (Ballyconneely P.S.), Lough Lerin (Carna Kilkieran RWSS), Loughaunore Intake (Carna Kilkieran RWSS), Loughaunwillian (Carraroe), Knockmore River (Clare Island), Lough Courhoor (Cleggan Claddaghduff), Lough Nambrackeagh (Clifden), Coolin Lough (Clonbur PS), Lough Fawna (Inisboffin P.S.), Coolacknick Lake (Inishturk), Mountain Stream (unnamed) (Leenane P.S.), Lough Corrib (Lough Corrib (Galway City, Tuam, Loughrea), River Corrib (Lough Corrib (Galway City, Tuam, Loughrea), Lough Rea (2no. abstractions) (Lough Corrib (Galway City, Tuam, Loughrea), Lough Mask (Lough Mask & Westport), Moher lake (Lough Mask & Westport), Bunnahowen River (Louisburgh), Bunnahowna River (Mulranny), Newport River (Newport), Lough Buffy (Stream) (Oughterard), Lough Aroolagh (Rosmuc P.S.), Lough Bouliska (Spiddal), Lough Illauntrasna (Teeranea Lettermore P.S.), Diamond Hill Stream (Tully-Tullycross), and Tully Lough (Tully-Tullycross).

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

Based on this initial assessment, the volumes of water abstracted at Lake Anaserd (Ballyconneely P.S.), Lough Lerin (Carna Kilkieran RWSS), Loughaunore Intake (Carna Kilkieran RWSS), Loughaunwillian (Carraroe), Knockmore River (Clare Island), Lough Courhoor (Cleggan Claddaghduff), Lough Nambrackeagh (Clifden), Coolin Lough (Clonbur PS), Lough Fawna (Inisboffin P.S.), Coolacknick Lake (Inishturk), Mountain Stream (unnamed) (Leenane P.S.), Lough Rea (2no. abstractions) (Lough Corrib (Galway City, Tuam, Loughrea), Moher lake (Lough Mask & Westport), Bunnahowna River (Mulranny), Lough Aroolagh (Rosmuc P.S.), Lough Illauntrasna (Teeranea Lettermore P.S.), and Diamond Hill Stream (Tully-Tullycross) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, sustainable abstraction quantities will be adjudicated by the EPA.

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

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

Source (WRZ)	Current abstraction (m^3/day)	Hydrological yield (m^3/day)	Theoretical future abstraction (m^3/day)
Lake Anaserd (Ballyconneely P.S.)	871	2,110	114
Lough Lerin (Carna Kilkieran RWSS)	2,475	2,145	293
Loughaunore Intake (Carna Kilkieran RWSS)		635	116
Loughaunwillian (Carraroe)	2,200	2,800	589
Knockmore River (Clare Island)	138	35	11
Lough Courhoor (Cleggan Claddaghduff)	321	967	197
Lough Nambrackeagh (Clifden)	752	543	57
Coolin Lough (Clonbur PS)	1,128	1,972	164
Lough Fawna (Inisboffin P.S.)	242	112	15
Coolacknick Lake (Inishturk)	28	133	20
Mountain Stream (unnamed) (Leenane P.S.)	106	118	40
Lough Corrib (Lough Corrib (Galway City, Tuam, Loughrea)	33,000	1,120,103	489,203
River Corrib (Lough Corrib (Galway City, Tuam, Loughrea)	50,417	229,233	81,273
Lough Rea (2no. abstractions) (Lough Corrib (Galway City, Tuam, Loughrea)	3,942	12,298	1,657
Lough Mask (Lough Mask & Westport)	34,833	743,215	89,814
Moher lake (Lough Mask & Westport)	2,292	4,699	1,366
Bunnahowen River (Louisburgh)	340	4,989	1,843
Bunnahowna River (Mulranny)	587	861	292
Newport River (Newport)	374	19,820	3,452
Lough Buffy (Stream) (Oughterard)	2,750	9,704	3,092
Lough Aroolagh (Rosmuc P.S.)	321	898	128

Source (WRZ)	Current abstraction (m^3/day)	Hydrological yield (m^3/day)	Theoretical future abstraction (m^3/day)
Lough Bouliska (Spiddal)	3,667	22,033	13,920
Lough Illauntrasna (Teeranea Lettermore P.S.)	550	712	82
Diamond Hill Stream (Tully-Tullycross)	266	8	3
Tully Lough (Tully-Tullycross)	266	2,397	406

The potential change to the SDB[4] for each WRZ, as a result of these potential reductions in abstraction during dry weather flows are summarised in Table 2.6.

Table 2.1 Potential Change to the SDB Based on Potential Abstraction Reductions

Source (WRZ)	Potential change in WRZ SDB (m^3/day)
Lake Anaserd (Ballyconneely P.S.)	-641
Lough Lerin (Carna Kilkieran RWSS)	-2,113
Loughaunore Intake (Carna Kilkieran RWSS)	
Loughaunwillian (Carraroe)	-1,438
Lough Courhoor (Cleggan Claddaghduff)	-146
Knockmore River (Clare Island)	-21
Lough Nambrackeagh (Clifden)	-431
Coolin Lough (Clonbur PS)	-982
Lough Fawna (Inisboffin P.S.)	-86
Coolacknick Lake (Inishturk)	-9
Mountain Stream (unnamed) (Leenane P.S.)	-64

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

Source (WRZ)	Potential change in WRZ SDB (m^3/day)
Lough Corrib (Lough Corrib (Galway City, Tuam, Loughrea)	-2,402
River Corrib (Lough Corrib (Galway City, Tuam, Loughrea)	
Lough Rea (2no. abstractions) (Lough Corrib (Galway City, Tuam, Loughrea)	
Lough Mask (Lough Mask & Westport)	-1,082
Moher lake (Lough Mask & Westport)	
Bunnahowen River (Louisburgh)	None
Bunnahowna River (Mulranny)	-348
Newport River (Newport)	None
Lough Buffy (Stream) (Oughterard)	None
Lough Aroolagh (Rosmuc P.S.)	-207
Lough Bouliska (Spiddal)	None
Lough Illauntrasna (Teeranea Lettermore P.S.)	-478
Tully Lough (Tully-Tullycross)	-4
Diamond Hill Stream (Tully-Tullycross)	

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

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

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

As noted in Section 3.2.2 of the framework plan producing robust desktop assessments of water availability from our existing groundwater abstractions is very difficult. Ideally, yield estimates would be based on a three-dimensional assessment of the geology within the vicinity of the supply, supplemented with long term records on pumping and drawdown of water levels over many years. Uisce Éireann does not have this type of information available for most of our groundwater supplies and while we will aim to complete site-specific studies of groundwater availability, this may take many years. On an interim basis, Uisce Éireann has developed an initial assessment based on available information, included in Appendix G of the Framework Plan. Over the coming years, Uisce Éireann will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources.

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

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

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

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

2.5 Water Resource Zone Needs Summary

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

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

Quality	Upgrades required at all WTPs.
Quantity	Nett leakage reduction 1,448 m^3/day in the region Additional Leakage Targets of 40,107 m^3/day to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500 m^3/day
	Interim additional supplies of 29,504 m^3/day within 10 years
	Total of 44,123 m^3/day additional supplies beyond the 10-year horizon
Reliability (In addition to projects in	Continued network upgrades and improvements in the bulk and distribution networks and storage
Sustainability	It is not envisaged that there are sustainability issues with the volumes abstracted at Lough Corrib (Lough Corrib (Galway City, Tuam, Loughrea), River Corrib (Lough Corrib (Galway City, Tuam, Loughrea), Lough Mask (Lough Mask & Westport), Bunnahowen River (Louisburgh), Newport River (Newport), Lough Buffy (Stream) (Oughterard), Lough Bouliska (Spiddal), and Tully Lough (Tully-Tullycross). Based on this initial assessment, the volumes of water abstracted at Lake Anaserd (Ballyconneely P.S.), Lough Lerin (Carna Kilkieran RWSS), Loughaunore Intake (Carna Kilkieran RWSS), Loughaunwillian (Carraroe), Knockmore River (Clare Island), Lough Courhoor (Cleggan Claddaghduff), Lough Nambrackeagh (Clifden), Coolin Lough (Clonbur PS), Lough Fawna (Inisboffin P.S.), Coolacknick Lake (Inishturk), Mountain Stream (unnamed) (Leenane P.S.), Lough Rea (2no. abstractions) (Lough Corrib (Galway City, Tuam, Loughrea), Moher lake (Lough Mask & Westport), Bunnahowna River (Mulranny), Lough Aroolagh (Rosmuc P.S.), Lough Illauntrasna (Teeranea Lettermore P.S.), and Diamond Hill Stream (Tully-Tullycross) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA. Over the coming years, Uisce Éireann will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources.

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

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

3 Solution Types Considered in Study Area D

3 Solution Types Considered in Study Area D

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

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

3.1 Leakage Reduction

The Leakage reduction measures across the public water supply considered for SAD are based on what we assess to be both achievable and sustainable and include:

- Ongoing leakage management, including active leakage control, pressure management and Find and Fix activities, to offset Natural Rate of Leakage Rise (NRR);
- Net leakage reductions targets listed in Table 3.1 have been applied to SDB deficit to move towards achieving the national Sustainable Economic Level of Leakage (SELL) target prioritised based on
  - Supply demand deficit;
  - Existing abstractions with sustainability issues; and
  - Drought impacts.
- Additional leakage targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m^3/d, see Table 3.1.

Table 3.1 SELL Targets for WRZ in SAD

WRZ	Net Leakage Reduction applied to SDB (m^3/day)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m3/day (m^3/day)	Total Leakage Targets (m^3/day)
Lough Corrib (Galway City, Tuam, Loughrea)	951	21,748	22,699
Carna Kilkieran RWSS		571	571
Dunmore Glenamaddy P.S.		726	726
Mid-Galway		855	855
Oughterard		566	566
Rosmuc P.S.		57	57

WRZ	Net Leakage Reduction applied to SDB (m^3/day)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m3/day (m^3/day)	Total Leakage Targets (m^3/day)
Teeranea Lettermore P.S.		27	27
Ballyconneely P.S.		379	379
Inisboffin P.S.		32	32
Inishmore		186	186
Spiddal		953	953
Lough Mask & Westport	497	14,006	14,503

3.2 Water Conservation

At present, Uisce Éireann is conducting pilot studies in relation to water conservation stewardship in businesses and is actively pursuing Conservation Education Awareness Campaigns and partnerships. During drought conditions in 2018 and 2020, a Water Conservation Order was implemented in order to protect our water supplies and reduce pressure on the natural environment during this period. We will continue to promote 'Water Conservation Activities', collecting and monitoring data over a number of years to assess the benefits. As part of the NWRP – Framework Plan, we have not applied reductions to the SDB deficit for unquantifiable water conservation gains, however as stipulated within the Consultation Report prepared in relation to the NWRP- Framework Plan, UÉ will progress pilot studies on water conservation measures. Based on the outcomes of these studies, we may include such factors in future iterations of our NWRP. However, we do assume that any gain will offset consumer usage growth factors.

3.3 Supply Smarter

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

- Standalone groundwater options across the region
- Standalone surface water options across the region
- Transfers
- Desalination
- Rationalisations
- Reservoirs

4 Option Development SAD

4 Option Development for Study Area D

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

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

The options assessment screening process involves the following:

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

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

4.1 Developing a List of Unconstrained Options

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

Table 4.1 Desktop Assessments for Unconstrained Options

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

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

For SAD, 281 Unconstrained Options were identified to address need. These unconstrained options were not limited by cost, distance from the area or feasibility. These options are summarised in Table 4.2 and shown spatially in Figure 4.1.

Table 4.2 SAD Unconstrained Options

No. of Options	Option Type
38	Groundwater
127	Surface Water
37	Transfers
15	Desalination
58	Rationalisation
6	Reservoirs

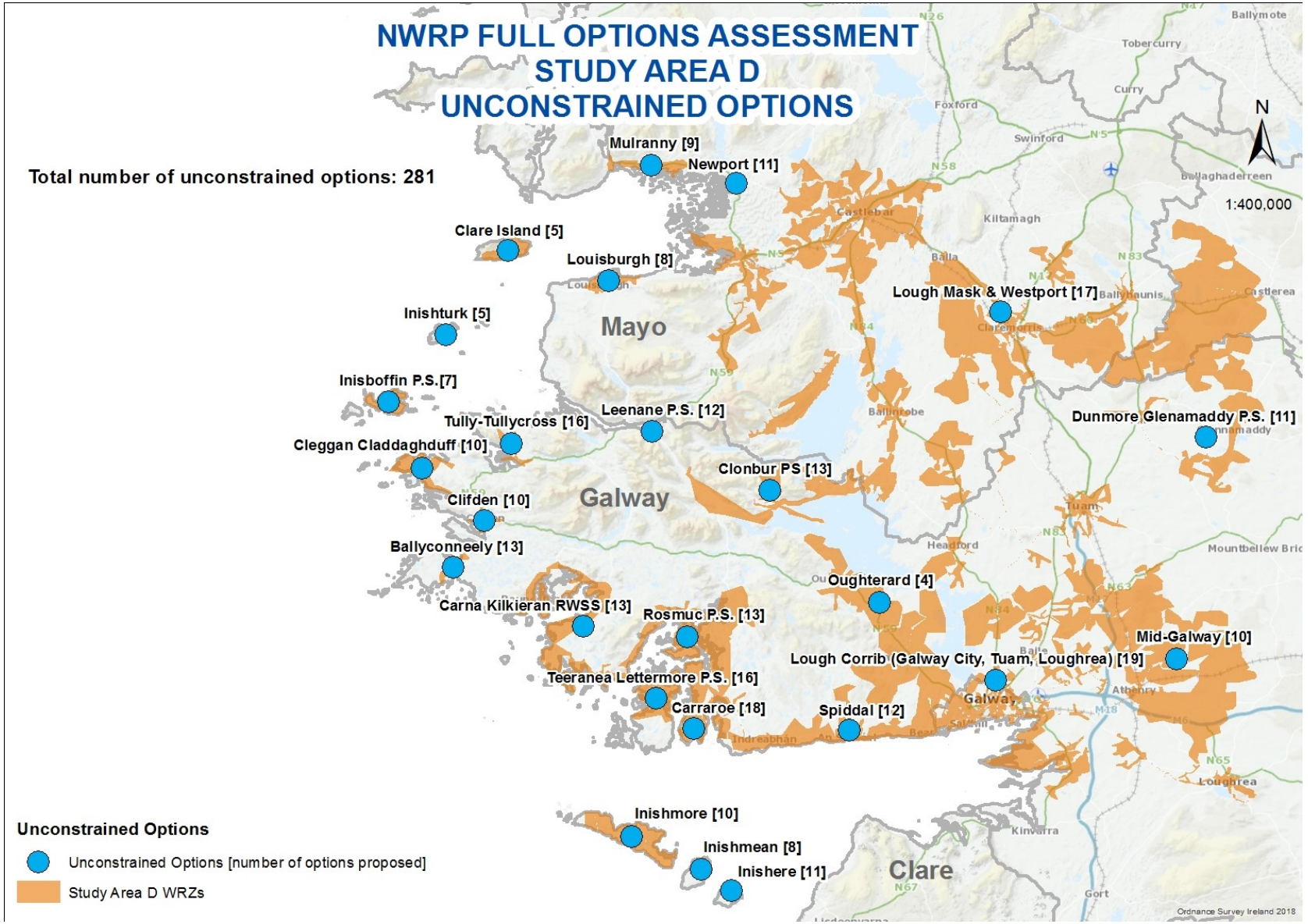

Figure 4.1 SAD Unconstrained Options

The 281 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues. This process is summarised below.

4.2 Coarse Screening

The 281 identified Unconstrained Options were assessed through Coarse Screening against the criteria of:

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

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

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

Example Rejected Option

Option SAD-505

Rationalise Ballyconneely Public Supply, Carna Kilkieran RWSS, Clifden Public Supply, Clonbur Public Supply, Dunmore/Glenamaddy (Glenamaddy) Public Supply, Leenane Public Supply, Mid-Galway Public Supply, Rosmuc Public Supply and Tully-Tullycross Public Supply to Galway City Public Water Supply.

Rejection Reason

This was considered part of a grouped option to rationalise 9 water resource zones to Galway City WRZ. The option requires over 100km of pipeline to meet demand. It is not a viable option due to the significant length of pipeline required for a relatively small deficit. Therefore, it was considered not feasible at coarse screening and would not be taken forward to fine screening stage. Rationalisation of the WRZs individually or in smaller groups were considered in other options.

The remaining 173 options were progressed to further assessment through the Fine Screening process. The rejected options are summarised in Annex A of this technical report. Annex A records the criteria against which the rejected options were assessed as having a "red" score for the purposes of the coarse screening exercise (as explained in more detail in Chapter 8 of the Framework Plan), and accordingly were not brought forward at the coarse screening stage. The remaining options are summarised in Table 4.3.

Table 4.3 SAD Remaining Options after Coarse Screening

No. of Options	Option Type
33	Groundwater
83	Surface Water
20	Transfers
10	Desalination
27	Rationalisation

4.3 Fine Screening

The 173 remaining options were subject to a more detailed multi-criteria assessment (MCA) at the Fine Screening Stage using desktop assessments of performance against specified questions relating to Sustainability (Environmental and Social Impacts), Resilience, Deliverability and Progressibility. These questions are set out in Appendix N of the Framework Plan. The assessment for each option was based on an objective assessment with uniform scoring criteria, based on best publicly available datasets.

At Fine Screening stage, no further options were rejected, and the 173 options considered to be feasible were brought forward to desktop outline design and costing. These are summarised in Table 4.4 and shown spatially in Figure 4.2.

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

No. of Options	Option Type
33	Groundwater
83	Surface Water
20	Transfers
10	Desalination
27	Rationalisation

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

4.4 Options Assessment Summary

The supply demand balance deficit in the region ranges between approximately 29,504 m^3/day in 2019 during dry conditions, to a maximum of approximately 44,123 m^3/day in 2044 during dry conditions. During

the options assessment stage, a total of 281 unconstrained options were assessed. Of these 108 options were screened out for the reasons summarised in Table 4.5 and recorded in Annex B.

Table 4.5 Rejected Options Summary

No. of Options	Reason for Rejection
33	Resilience, Deliverability & Flexibility, Sustainability
5	Resilience, Deliverability & Flexibility
61	Deliverability & Flexibility
9	Other

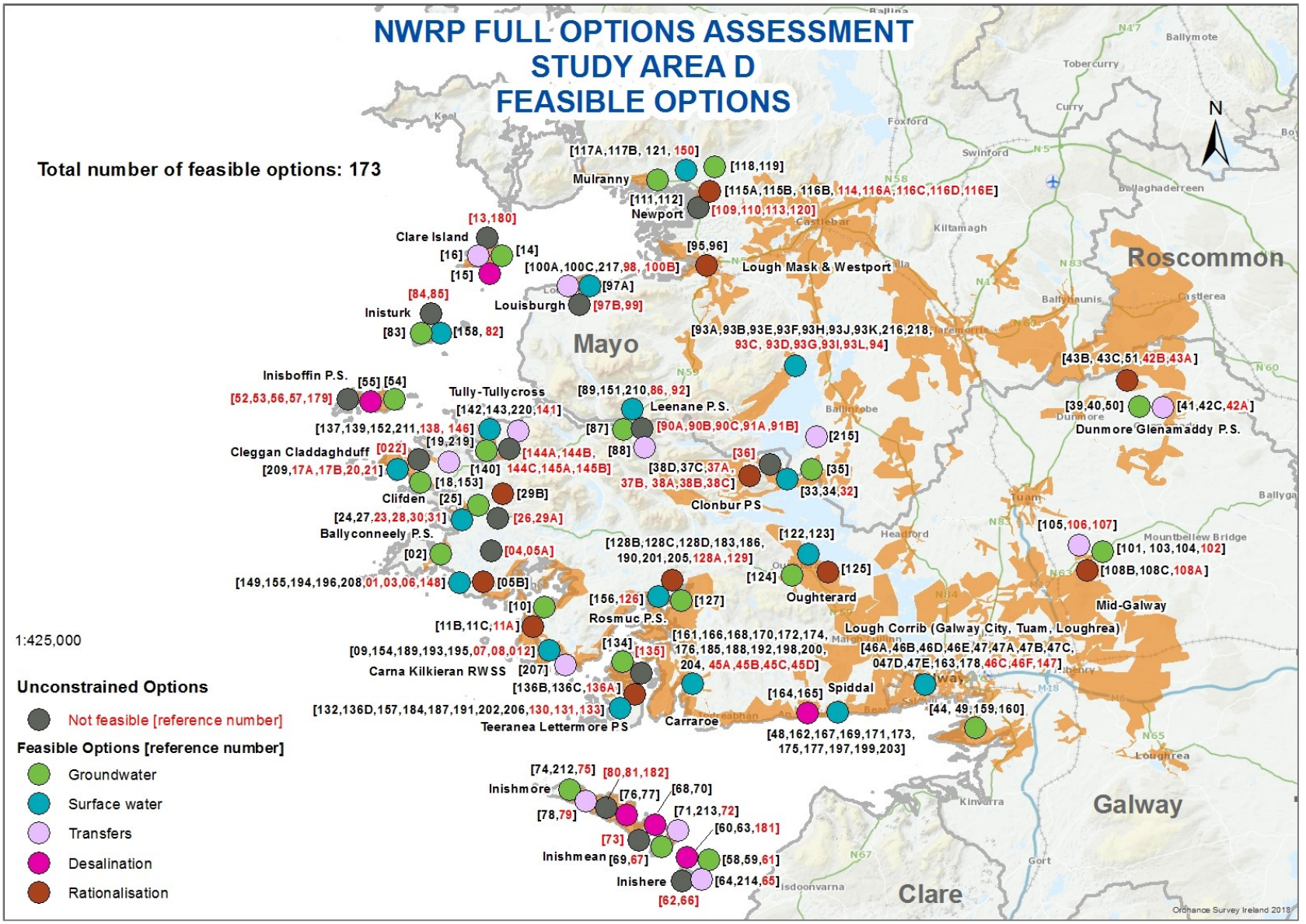

Figure 4.2 Fine Screening (Feasible Options)

The remaining 173 feasible options are categorised into options that resolve the need for one WRZ only "WRZ options" and options that resolved the need for more than one WRZ "Study Area options". Table 4.6 provides an overview of the number of WRZ options and Study Area options for the WRZs in Study Area 1. From this table it can be noted that there are 59 WRZ Options and 114 options which can be merged to form 35 Study Area Options.

A summary of the number of options and whether they are WRZ or SA options is contained in **Error! R eference source not found.**.

Table 4.6 SAD Feasible Options Summary

Water Resource Zone Name	Option Type	
	WRZ Option	Study Area Option
Ballyconnelly P.S.	2	5
Carna Kilkieran RWSS	2	7
Carraroe	0	14
Clare Island	2	1
Cleggan Claddaghduff	2	3
Clifden	3	1
Clonbur PS	3	3
Dunmore/Glenamaddy (Glenamaddy) PS	4	4
Lough Corrib (Galway City, Tuam, Loughrea)	7	9
Inisboffin PS	2	0
Inishere	3	3
Inishmean	2	3
Inishmore	2	3
Inishturk	2	0
Leenane PS	2	3
Lough Mask & Westport Public Supply	1	10
Louisburgh	1	3
Mid-Galway	3	3
Mulranny	2	2
Newport	3	3
Oughterard	3	1
Rosmuc PS	1	9
Spiddal	1	11
Teeranea Lettermore	2	9
Tully-Tullycross	4	4

5 Approach Development

5 Approach Development

This chapter describes how we tested different combinations of the Feasible Options to develop a Preferred Approach to meet the needs we identified for the WRZ in Study Area D.

5.1 Approach Development

5.1.1 Introduction to Approach Development

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

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

Table 5.1 The Six Approaches

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

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

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

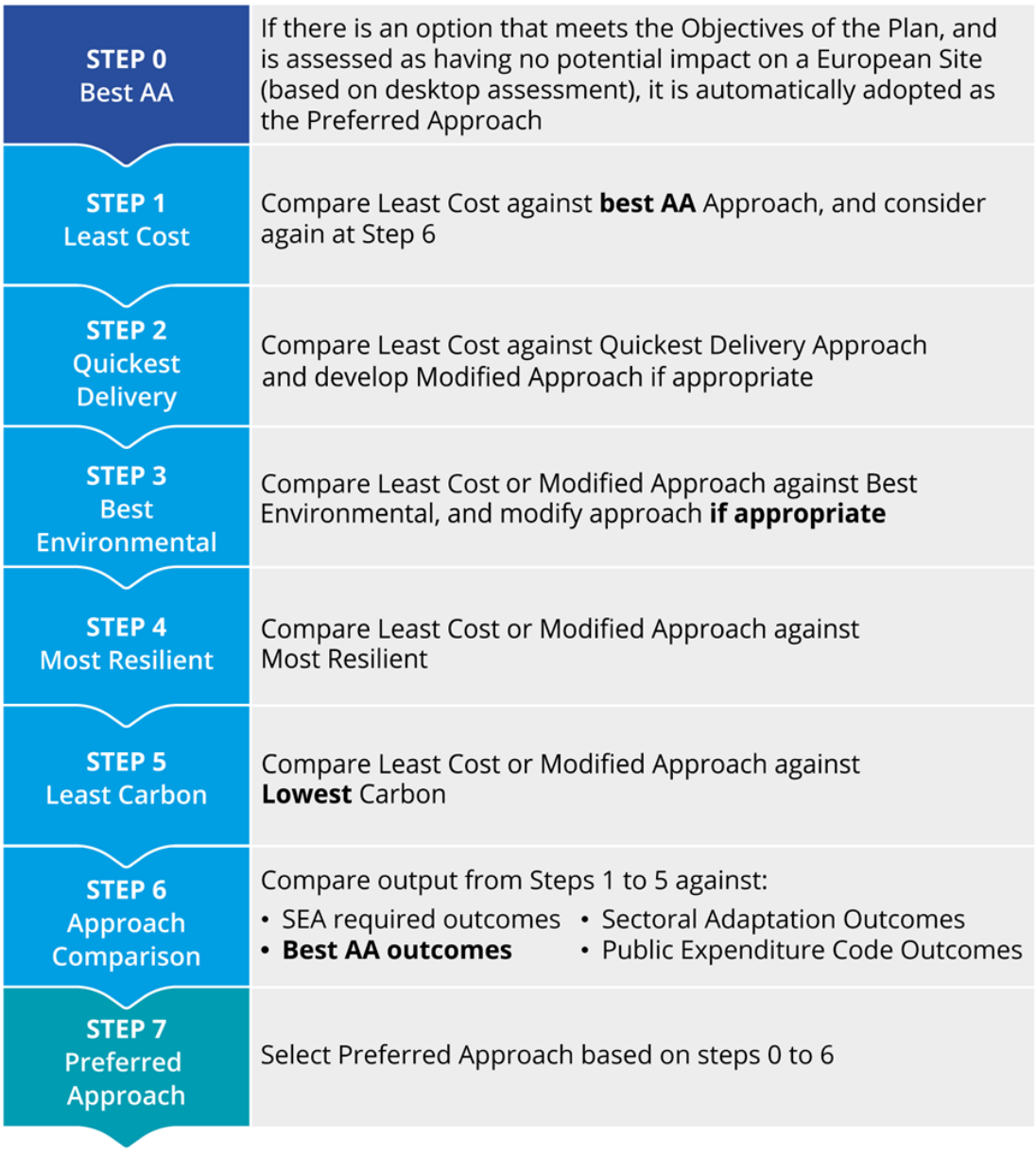

Figure 5.1 Figure of the 7 step assessment process

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

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

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

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

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

5.2 Preferred Approach Development Process for Study Area D

5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this technical report there are 173 feasible options. 59 of these options are WRZ Options while 114 options are merged to form 35 Study Area Options. Table 5.2 outlines the 60 WRZ options for SAD, providing option reference numbers and detailing the WRZs they provide a solution to. These solutions are presented as "Options" for the purposes of this plan; however, will be subject to their own regulatory, timing and budgetary constraints.

Table 5.2 SAD Feasible Options

Water Resource Zone Name	Feasible Options SAD	
	Option Code	Option Description
Ballyconneely	SAD-002	New GW abstraction (close to poorly productive bedrock - Clifden Castlebar groundwater body).
Ballyconneely	SAD-149	New SW abstraction from Maumeen Lough.
Carna Kilkieran RWSS	SAD-009	New SW abstraction and upgrade existing WTP.
Carna Kilkieran RWSS	SAD-010	New GW abstraction (poorly productive bedrock - Spiddal groundwater body).
Clare Island	SAD-014	New GW abstraction (poorly productive bedrock - Clare Island groundwater body).
Clare Island	SAD-015	Desalination plant to supply full deficit. No blending, chemical remineralization only.
Cleggan Claddaghduff	SAD-018	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).
Cleggan Claddaghduff	SAD-019	Supply deficit from neighbouring Ballinakill Moyard GWS.
Clifden	SAD-024	New SW abstraction from River Owenglin and new WTP.
Clifden	SAD-025	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).
Clifden	SAD-027	New SW abstraction from Lough Auna.
Clonbur	SAD-033	New SW abstraction from Lough Corrib and new WTP.
Clonbur	SAD-034	New SW abstraction from Lough Mask and new WTP.
Clonbur	SAD-035	New GW abstraction (karstic bedrock - Cong-Robe groundwater body).
Dunmore Glenamaddy P.S.	SAD-039	Increase GW abstraction at Glenamaddy WRZ to supply deficit.

Water Resource Zone Name	Feasible Options SAD	
	Option Code	Option Description
Dunmore Glenamaddy P.S.	SAD-040	New GW abstraction from Gortgarogh GWB (Sean, Robbie spring) spring.
Dunmore Glenamaddy P.S.	SAD-041	Supply deficit from Keelogues GWS (WRZ also influenced by Clare Corrib).
Dunmore Glenamaddy P.S.	SAD-050	New GW source (2 'good' karstic GW options -Clare Corrib, Suck South).
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-044	New wellfield supplying part of the deficit (karstic bedrock - Northern Area.
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-046a	Increase existing SW abstraction at Terryland from River Corrib.
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-047	Increase abstraction from Luimneagh for water transfer to Galway city - increase resilience and many new developments planned around area (GW Clare Corrib).
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-047c	Increase existing SW abstraction at Luimneagh from Lough Corrib.
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-049	Abstract water from spring source on site of Luimneagh WTP (karstic bedrock - Clare-Corrib groundwater body).
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-159	New wellfield supplying part of the deficit (karstic bedrock - Kilcornan Spring.
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-160	New wellfield supplying part of the deficit (karstic bedrock - Near Craughwell GWS.
Inisboffin	SAD-054	New GW abstraction (poorly productive bedrock - Inisboffin groundwater body).
Inisboffin	SAD-055	Desalination plant to supply full deficit. No blending, chemical remineralization only.
Inishere	SAD-058	Increase GW abstraction from existing springs.
Inishere	SAD-059	New GW abstraction - to target the shallow epikarst layer (no expected saline intrusion). Back up to SAD-058.
Inishere	SAD-060	Desalination plant to supply full deficit. No blending, chemical remineralization only.
Inishmean	SAD-068	Desalination plant to supply full deficit. Based on 2:1 blending during desal remineralization for taste using existing RW storage.
Inishmean	SAD-069	Increase GW abstraction from current springs.
Inishmore	SAD-074	Increase GW abstraction from existing boreholes (karstic bedrock - Inishmore groundwater body).

Water Resource Zone Name	Feasible Options SAD	
	Option Code	Option Description
Inishmore	SAD-076	Desalination plant to supply full deficit. No blending, chemical remineralization only.
Inishturk	SAD-083	New GW abstraction (poorly productive bedrock - Inisboffin groundwater body).
Inishturk	SAD-158	Raise existing dam height and new impoundment on the other side of the lake. Increase SW abstraction from existing Lake Coolacknick impoundment and WTP upgrade.
Leenane	SAD-087	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).
Leenane	SAD-089	New SW abstraction from tributary of Leenane River.
Lough Mask & Westport	SAD-093a	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.
Louisburgh	SAD-097a	Increase SW abstraction from existing River Bunnahowen. Option to include relocating abstraction intake to deeper part of river.
Mid-Galway	SAD-101	Increase existing GW abstraction from existing spring (karstic bedrock - Clare-Corrib groundwater body).
Mid-Galway	SAD-103	New GW abstraction (karstic bedrock - Clare-Corrib groundwater body).
Mid-Galway	SAD-104	New GW abstraction (karstic bedrock -Clarinbridge groundwater body).
Mulranny	SAD-111	New GW abstraction (karstic bedrock - Newport groundwater body).
Mulranny	SAD-112	New GW abstraction (productive fissured bedrock- Beltra Lough South groundwater body).
Newport	SAD-117a	Increase SW abstraction from existing River Newport.
Newport	SAD-118	New GW abstraction (karstic bedrock - Newport groundwater body).
Newport	SAD-119	New GW abstraction (productive fissured bedrock - Beltra Lough South groundwater body).
Oughterard	SAD-122	Increase SW abstraction from existing Lough Buffy.
Oughterard	SAD-123	New SW abstraction from Lough Corrib and new WTP.
Oughterard	SAD-124	New GW abstraction (karstic bedrock - Ross Lake groundwater body).

Water Resource Zone Name	Feasible Options SAD	
	Option Code	Option Description
Rosmuc	SAD-127	New GW abstraction (poorly productive bedrock - Spiddal groundwater body).
Spiddal	SAD-048	Increase existing SW abstraction from Lough Bouliska.
Teeranea Lettermore	SAD-132	New SW abstraction and new WTP from lake - Lough Awillia.
Teeranea Lettermore	SAD-134	New GW abstraction (poorly productive bedrock - Spiddal groundwater body).
Tully-Tullycross	SAD-137	Increase existing SW abstraction from Lough Tully.
Tully-Tullycross	SAD-139	New SW abstraction from River Dawros and new WTP.
Tully-Tullycross	SAD-140	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).

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

Table 5.3 SAD Alignment of WRZ Option/s with Approach Categories

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Ballyconneely	2	New GW abstraction (close to poorly productive bedrock - Clifden Castlebar groundwater body).	✓	-	✓	✓	-	-
		New SW abstraction from Maumeen Lough.	-	✓	-	-	✓	✓
Carna Kilkieran RWSS	2	New SW abstraction and upgrade existing WTP.	✓	✓	✓	-	✓	✓
		New GW abstraction (poorly productive bedrock - Spiddal groundwater body).	-	-	✓	✓	-	-
Clare Island	2	New GW abstraction (poorly productive bedrock - Clare Island groundwater body).	✓	✓	✓	✓	✓	-

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		Desalination plant to supply full deficit. No blending, chemical remineralization only.	-	-	-	-	-	✓
Cleggan Claddaghduff	2	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).	-	-	✓	✓	✓	-
		Supply deficit from neighbouring Ballinakill Moyard GWS.	✓	✓	✓	-	-	✓
Clifden	3	New SW abstraction from River Owenglin and new WTP.	✓	-	-	-	✓	-
		New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).	-	-	✓	✓	-	-
		New SW abstraction from Lough Auna.	-	✓	✓	✓	-	✓
Clonbur	3	New SW abstraction from Lough Corrib and new WTP.	-	✓	-	-	✓	✓
		New SW abstraction from Lough Mask and new WTP.	-	-	✓	✓	-	-
		New GW abstraction (karstic bedrock - Cong-Robe groundwater body).	✓	-	-	-	-	-
Dunmore Glenamaddy P.S.	4	Increase GW abstraction at Glenamaddy WRZ to supply deficit.	-	✓	✓	✓	-	-
		New GW abstraction from Gortgarogh GWB (Sean, Robbie spring) spring.	✓	-	✓	-	-	✓

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		Supply deficit from Keelogues GWS (WRZ also influenced by Clare Corrib).	-	-	✓	-	✓	-
		New GW source (2 'good' karstic GW options -Clare Corrib, Suck South).	-	-	✓	-	-	-
Lough Corrib (Galway City, Tuam, Loughrea)	7	New wellfield supplying part of the deficit (karstic bedrock - Northern Area.	-	-	-	-	-	-
		Increase existing SW abstraction at Terryland from River Corrib.	✓	-	✓	-	✓	-
		Increase abstraction from Lumineagh for water transfer to Galway city - increase resilience and many new developments planned around area (GW Clare Corrib).	-	-	✓	-	-	✓
		Increase existing SW abstraction at Lumineagh from Lough Corrib.	-	✓	✓	✓	-	✓
		Abstract water from spring source on site of Lumineagh WTP (karstic bedrock - Clare-Corrib groundwater body).	-	-	-	-	-	-
		New wellfield supplying part of the deficit (karstic bedrock - Kilcornan Spring.	-	-	-	-	-	-
		New wellfield supplying part of the deficit (karstic bedrock - Near Craughwell GWS.	-	-	✓	-	-	-

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Inisboffin	2	New GW abstraction (poorly productive bedrock - Inisboffin groundwater body).	✓	✓	✓	✓	✓	-
		Desalination plant to supply full deficit. No blending, chemical remineralization only.	-	-	✓	-	-	✓
Inishere	3	Increase GW abstraction from existing springs.	-	✓	✓	✓	✓	-
		New GW abstraction - to target the shallow epikarst layer (no expected saline intrusion). Back up to SAD-058.	-	-	-	-	-	-
		Desalination plant to supply full deficit. No blending, chemical remineralization only.	✓	-	-	-	-	✓
Inishmea	2	Desalination plant to supply full deficit. Based on 2:1 blending during desal remineralization for taste using existing RW storage.	-	-	-	-	-	✓
		Increase GW abstraction from current springs.	✓	✓	✓	✓	✓	-
Inishmore	2	Increase GW abstraction from existing boreholes (karstic bedrock - Inishmore groundwater body)	✓	✓	✓	✓	✓	-
		Desalination plant to supply full deficit. No blending, chemical remineralization only.	-	-	-	-	-	✓
Inishturk	2	New GW abstraction (poorly productive bedrock - Inisboffin groundwater body).	-	✓	✓	✓	-	✓

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		Raise existing dam height and new impoundment on the other side of the lake. Increase SW abstraction from existing Lake Coolacknick impoundment and WTP upgrade.	✓	-	✓	-	✓	✓
Leenane	2	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).	-	-	✓	✓	-	-
		New SW abstraction from tributary of Leenane River.	✓	✓	✓	-	✓	✓
Lough Mask & Westport	1	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	✓	✓	✓	✓	✓	✓
Louisburgh	1	Increase SW abstraction from existing River Bunnahowen. Option to include relocating abstraction intake to deeper part of river.	✓	✓	✓	✓	✓	✓
Mid-Galway	3	Increase existing GW abstraction from existing spring (karstic bedrock - Clare-Corrib groundwater body).	-	✓	✓	✓	-	✓
		New GW abstraction (karstic bedrock - Clare-Corrib groundwater body).	✓	-	-	-	✓	-
		New GW abstraction (karstic bedrock - Clarinbridge groundwater body).	-	-	-	-	-	-
Mulranny	2	New GW abstraction (karstic bedrock - Newport groundwater body).	-	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
		New GW abstraction (productive fissured bedrock - Beltra Lough South groundwater body).	✓	✓	✓	✓	-	-
Newport	3	Increase SW abstraction from existing River Newport.	✓	✓	-	✓	✓	✓
		New GW abstraction (karstic bedrock - Newport groundwater body).	-	-	✓	-	-	-
		New GW abstraction (productive fissured bedrock - Beltra Lough South groundwater body).	-	-	✓	-	-	-
Oughterard	3	Increase SW abstraction from existing Lough Buffy.	-	✓	✓	✓	✓	-
		New SW abstraction from Lough Corrib and new WTP.	-	-	✓	-	-	✓
		New GW abstraction (karstic bedrock - Ross Lake groundwater body).	✓	-	-	-	-	-
Rosmuc	1	New GW abstraction (poorly productive bedrock - Spiddal groundwater body).	✓	✓	✓	✓	✓	✓
Spiddal	1	Increase existing SW abstraction from Lough Bouliska.	✓	✓	✓	✓	✓	✓
Teeranea Lettermore	2	New SW abstraction and new WTP from lake - Lough Awillia.	✓	✓	✓	-	✓	✓
		New GW abstraction (poorly productive bedrock - Spiddal groundwater body).	-	✓	-	✓	-	-

Water Resource Zone Name	Feasible Options SAD		Approach					
	No. of WRZ Options	Option Description	Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient
Tully-Tullycross	4	Increase existing SW abstraction from Lough Tully.	✓	✓	-	-	✓	-
		Tully-Tullycross - New SW abstraction from River Dawros and new WTP.	-	-	-	-	-	✓
		New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).	-	-	✓	✓	-	-
		Interconnect Ballinakill GWS with Tully-Tullycrosss PWS (GW Clifden Castlebar)	-	-	-	-	-	-

The 7 Step Process outlined in Figure 5.1 was then applied to each WRZ in SAD, in order to develop a WRZ level approach. A summary of the outcome of this assessment at WRZ level (i.e. WRZ options only) is shown in Table 5.4

The findings of the Preferred Approach Development for SAD at WRZ level, include the following:

- In terms of Best AA, 1 WRZ option scores a 0 in relation to potential impact on a designated European Site;

The Best AA and the Best Environmental (overall SEA score) approach is identified as the Preferred Approach for 13 of the 25 WRZs.

- Of the 25 WRZ level preferred approaches, 3 WRZs have a -3 score against biodiversity.
- No WRZ level approach determined for Carraroe as there is no feasible option that can meet the full deficit for this WRZ.

Preferred Approaches at WRZ level are outlined in Table 5.4.

Table 5.4 SAD WRZ Approach Options

Water Resource Zone Name	Feasible Options SAD		Zero AA	Approach						Preferred Approach
	Option Code	Option Description		Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	
Ballyconneely	SAD-002	New GW abstraction (close to poorly productive bedrock - Clifden Castlebar groundwater body).	-	✓	-	✓	✓	-	-	✓
Carna Kilkieran RWSS	SAD-009	New SW abstraction and upgrade existing WTP.	-	✓	✓	✓	-	✓	✓	✓
Carraroe	**No local option**									
Clare Island	SAD-014	New GW abstraction (poorly productive bedrock - Clare Island groundwater body).	-	✓	✓	✓	✓	✓	-	✓
Cleggan Claddaghduff	SAD-019	Supply deficit from neighbouring Ballinakill Moyard GWS.	-	✓	✓	✓	-	-	✓	✓
Clifden	SAD-027	New SW abstraction from Lough Auna.	-	-	✓	✓	✓	-	✓	✓
Clonbur	SAD-033	New SW abstraction from Lough Corrib and new WTP.	-	-	✓	-	-	✓	✓	✓
Dunmore Glenamaddy P.S.	SAD-040	New GW abstraction from Gortgarogh GWB (Sean, Robbie spring) spring.	-	✓	-	✓	-	-	✓	✓
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-046a	Increase existing SW abstraction at Terryland from River Corrib.	-	✓	-	✓	-	✓	-	✓

Water Resource Zone Name	Feasible Options SAD		Zero AA	Approach						Preferred Approach
	Option Code	Option Description		Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	
Inisboffin	SAD-055	Desalination plant to supply full deficit. No blending, chemical remineralization only.	-	-	-	✓	-	-	✓	✓
Inishere	SAD-058	Increase GW abstraction from existing springs.	-	-	✓	✓	✓	✓	-	✓
Inishmean	SAD-069	Increase GW abstraction from current springs.	-	✓	✓	✓	✓	✓	-	✓
Inishmore	SAD-074	Increase GW abstraction from existing boreholes (karstic bedrock - Inishmore groundwater body).	-	✓	✓	✓	✓	✓	-	✓
Inishturk	SAD-158	Raise existing dam height and new impoundment on the other side of the lake. Increase SW abstraction from existing Lake Coolacknick impoundment and WTP upgrade.	✓	✓	-	✓	-	✓	✓	✓
Leenane	SAD-089	New SW abstraction from tributary of Leenane River.	-	✓	✓	✓	-	✓	✓	✓
Lough Mask & Westport	SAD-093a	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	-	✓	✓	✓	✓	✓	✓	✓
Louisburgh	SAD-097a	Increase SW abstraction from existing River Bunnahowen. Option to include relocating abstraction intake to deeper part of river.	-	✓	✓	✓	✓	✓	✓	✓
Mid-Galway	SAD-101	Increase existing GW abstraction from existing spring (karstic bedrock - Clare-Corrib groundwater body).	-	-	✓	✓	✓	-	✓	✓

Water Resource Zone Name	Feasible Options SAD		Zero AA	Approach						Preferred Approach
	Option Code	Option Description		Least Cost	Quickest Delivery	Best AA	Best SEA	Lowest Carbon	Most Resilient	
Mulranny	SAD-111	New GW abstraction (karstic bedrock - Newport groundwater body).	-	-	✓	✓	✓	✓	✓	✓
Newport	SAD-117a	Increase SW abstraction from existing River Newport.	-	✓	✓	-	✓	✓	✓	✓
Oughterard	SAD-122	Increase SW abstraction from existing Lough Buffy.	-	-	✓	✓	✓	✓	-	✓
Rosmuc	SAD-127	New GW abstraction (poorly productive bedrock - Spiddal groundwater body).	-	✓	✓	✓	✓	✓	✓	✓
Spiddal	SAD-048	Increase existing SW abstraction from Lough Bouliska.	-	✓	✓	✓	✓	✓	✓	✓
Teeranea Lettermore	SAD-132	New SW abstraction and new WTP from lake - Lough Awillia.	-	✓	✓	✓	-	✓	✓	✓
Tully-Tullycross	SAD-140	New GW abstraction (poorly productive bedrock - Clifden Castlebar groundwater body).	-	-	-	-	-	-	-	✓

5.2.2 Stage 2 - Creation of the Study Area Combinations

The Second Stage of our Approach Development Process involves identifying the Study Area options that can address Need in more than one WRZ within the Study Area, and then develop various combinations which contain elements of the different options. These are called SA Combinations SA Combinations will consist of a number of different projects or options; however, looking at a wider, more holistic, spatial scale benefits the plan level assessment in considering what options might work across multiple WRZ's.

For each Study Area, one of the SA Combinations will always be the WRZ Level Approach. The WRZ Level Approach is the combination of all the individual the Preferred Approaches identified at WRZ level for the entire Study Area. Table 5.5 below provides a summary of the 35 Study Area options.

Table 5.4 SAD Study Area Options

Water Resource Zone Name	Feasible Options SAD		
	Option Code	Option Description	Option Code
Ballyconneely Carna Kilkieran RWSS Clifden Clonbur Lough Corrib (Galway City, Tuam, Loughrea) Rosmuc Teeranea Lettermore Carraroe Spiddal	SAD-501	Increase existing SW abstraction at Lumineagh from Lough Corrib. Rationalise Ballyconneely, Carna Kilkieran, Clifden, Clonbur, Rosmuc, Teeranea Lettermore, Carraroe and Spiddal to Lough Corrib (Galway City, Tuam, Loughrea)	Group 1
Dunmore Glenamaddy P.S. Lough Corrib (Galway City, Tuam, Loughrea) Mid-Galway Rosmuc Carraroe Spiddal	SAD-502	Increase existing SW abstraction at Lumineagh from Lough Corrib. Rationalise Mid-Galway, Rosmuc, Carraroe and Spiddal to Lough Corrib (Galway City, Tuam, Loughrea). Interconnect Dunmore Glenamaddy with Tuam RWSS via Dublin Road.	Group 2
Lough Corrib (Galway City, Tuam, Loughrea) Mid-Galway	SAD-503	Rationalise Mid-Galway WRZ to Lough Corrib (Galway City, Tuam, Loughrea) via link to Tuam RWSS. Increase existing SW abstraction at Lumineagh from Lough Corrib.	Group 3
Carna Kilkieran RWSS Lough Corrib (Galway City, Tuam, Loughrea) Rosmuc Teeranea Lettermore Carraroe Spiddal	SAD-504	Rationalise Rosmuc, Carna Kilkieran, Teeranea Lettermore, Carraroe and Spiddal to Lough Corrib (Galway City, Tuam, Loughrea). Increase existing SW abstraction at Terryland from River Corrib.	Group 4

Water Resource Zone Name	Feasible Options SAD		
	Option Code	Option Description	Option Code
Lough Corrib (Galway City, Tuam, Loughrea) Oughterard Teeranea Lettermore Carraroe Spiddal	SAD-507	Rationalise Oughterard, Teeranea Lettermore, Carraroe and Spiddal to Lough Corrib (Galway City, Tuam, Loughrea). Increase existing SW abstraction at Terryland from River Corrib.	Group 7
Lough Corrib (Galway City, Tuam, Loughrea) Inishere Inishmean Inishmore	SAD-508	Increase existing SW abstraction at Terryland from River Corrib. Connect all three islands to the mainland (via Carraroe PWS).	Group 8
Lough Corrib (Galway City, Tuam, Loughrea) Mid-Galway	SAD-510	Increase existing SW abstraction at Lumineagh from Lough Corrib. Split Mid Galway WRZ into 3 three part and connect each part to the following schemes: Tuam RWSS - connection point at Athenry; Tuam RWSS - connection to Loughrea pipeline, connection at Tuam.	Group 10
Clonbur Dunmore Glenamaddy P.S. Lough Mask & Westport	SAD-514	Rationalise Clonbur and Dunmore Glenamaddy to Lough Mask & Westport WRZ. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 14
Dunmore Glenamaddy P.S. Lough Mask & Westport	SAD-515	Rationalise Dunmore Glenamaddy P.S. to Lough Mask & Westport WRZ. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 15
Lough Mask & Westport Newport	SAD-516	Rationalise Westport water supply and Newport (approx. distance - 12km) to Lough Mask. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 16
Clare Island Lough Mask & Westport Louisburgh	SAD-517	Connect Clare Island to mainland (Louisburgh). Interconnect with new Community/GWS being developed to take water from Westport to Murrisk. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 17
Lough Mask & Westport Louisburgh	SAD-519	Interconnect with new Community/GWS being developed to take water from Westport to Murrisk. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 19
Lough Mask & Westport	SAD-520	Rationalise Westport water supply to Lough Mask. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 20
Mulranny Newport	SAD-522	Rationalise Mulranny to Newport via Burrishoole GWS. Increase SW abstraction from existing River Newport.	Group 22

Water Resource Zone Name	Feasible Options SAD		
	Option Code	Option Description	Option Code
Mulranny Newport	SAD-523	Rationalise Mulranny to Newport via Burrishoole GWS. New supply to solve Mulranny and Newport - Lough Feeagh.	Group 23
Inishere Inishmean Inishmore	SAD-524	Desalination plant to supply full deficit located on 1 of the Aran Island and distribute the supply to other 2 islands.	Group 24
Leenane Tully-Tullycross Cleggan Claddaghduff	SAD-531	New Connemara RWSS: New Connemara	Group 31
Carna Kilkieran RWSS Ballyconneely Rosmuc Teeranea Lettermore	SAD-532	New SW abstraction from Glenicmurrin Lough and upgrade existing Carna Kilkieran WTP. New SW abstraction from Glenicmurrin Lough and upgrade existing Ballyconneely WTP. New SW abstraction from Glenicmurrin Lough and upgrade existing Rosmuc WTP. New SW abstraction from Glenicmurrin Lough and upgrade existing Tiernee WTP.	Group 32
Leenane Tully-Tullycross	SAD-533	New West Connemara RWSS with source from Kylemore Lough.	Group 33
Carraroe Spiddal Lough Corrib (Galway City, Tuam, Loughrea)	SAD-534	Rationalise Carraroe and Spiddal from Terryland WTP. Increase SW abstraction at Terryland and upgrade WTP, Upgrade network to supply out to Spiddal and Carraroe.	Group 34
Carraroe Spiddal	SAD-535	Desalination plant to supply Carraroe and Spiddal.	Group 35
Carraroe Spiddal	SAD-536	New SW abstraction from Glenicmurrin Lough and new WTP to supply Carraroe and Spiddal.	Group 36
Carraroe Spiddal Lough Corrib (Galway City, Tuam, Loughrea)	SAD-537	Interconnect Carraroe and Terryland WTP. Interconnect Spiddal and Terryland WTP. Increase SW abstraction at Terryland and upgrade WTP, Upgrade network to supply out to Spiddal and Carraroe.	Group 37
Rosmuc Teeranea Lettermore Carraroe	SAD-538	Rationalise Rosmuc to new Glenicmurrin Lough Scheme. New SW abstraction from Glenicmurrin Lough and upgrade existing Tiernee WTP. New abstraction from Glenicmurrin Lough and new WTP.	Group 38

Water Resource Zone Name	Feasible Options SAD		
	Option Code	Option Description	Option Code
Rosmuc Teeranea Lettermore Carraroe Carna Kilkieran RWSS	SAD-539	Rationalise Rosmuc to new Glenicmurrin Lough Scheme. New SW abstraction from Glenicmurrin Lough and upgrade existing Tiernee WTP. New abstraction from Glenicmurrin Lough and new WTP. New SW abstraction from Glenicmurrin Lough and upgrade existing Carna Kilkieran WTP.	Group 39
Rosmuc Teeranea Lettermore Carraroe Carna Kilkieran RWSS Ballyconneely	SAD-540	Rationalise Rosmuc to new Glenicmurrin Lough Scheme. New SW abstraction from Glenicmurrin Lough and upgrade existing Tiernee WTP. New abstraction from Glenicmurrin Lough and new WTP. New SW abstraction from Glenicmurrin Lough and upgrade existing Carna Kilkieran WTP. New SW abstraction from Glenicmurrin Lough and upgrade existing Ballyconneely WTP.	Group 40
Carna Kilkieran RWSS Ballyconneely	SAD-541	Rationalise Ballyconneely to Carna Kilkieran. New SW abstraction from Lough Skannive and upgrade existing WTP and upgrade existing Carna Kilkieran WTP.	Group 41
Spiddal Carraroe	SAD-542	Rationalise Carraroe to Spiddal (Lough Bouliska). Increase existing SW abstraction from Lough Bouliska and connect with neighbouring WRZs.	Group 42
Spiddal Carraroe Rosmuc Teeranea Lettermore	SAD-543	Rationalise Carraroe, Rosmuc and Teeranea Lettermore to Spiddal (Lough Bouliska). Increase existing SW abstraction from Lough Bouliska and connect with neighbouring WRZs.	Group 43
Spiddal Carraroe Rosmuc Teeranea Lettermore Carna Kilkieran RWSS Ballyconneely	SAD-544	Rationalise Ballyconneely, Carraroe, Rosmuc and Teeranea Lettermore to Spiddal (Lough Bouliska. Interconnect Carna Kilkieran RWSS with Spiddal (Lough Bouliska). Increase existing SW abstraction from Lough Bouliska and connect with neighbouring WRZs.	Group 44
Cleggan Claddaghduff Leenane Tully-Tullycross	SAD-545	New Connemara RWSS (Kylemore Lough).	Group 45
Inishmore Inishmean Inishere	SAD-546	Interconnect Inishmean and Inishere with Inishmore. Increase GW abstraction from existing boreholes and new raw water storage to maximise GW availability in winter months.	Group 46
Clonbur Lough Mask & Westport	SAD-547	Interconnect Clonbur with Lough Mask. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 47

Water Resource Zone Name	Feasible Options SAD		
	Option Code	Option Description	Option Code
Louisburgh Lough Mask & Westport	SAD-548	Rationalise Louisburgh via new Community/GWS being developed to take water from Westport to Murrisk. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.	Group 48
Cleggan Claddaghduff	SAD-549	Interconnect Cleggan Claddaghduff WRZ and Tully-Tullycross WRZ with Ballinakill GWS to supply deficits from Lough Ballinakill source.	Group 49

The 114 Study Area options result in 22 SA Combinations that could meet the need across all WRZs. WRZ Level Approach is excluded at this stage of comparison as 1 WRZ does not have a WRZ Level Approach (and accordingly the WRZ Level Approach does not meet the need across all WRZs). The 22 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.6 SAD Combinations Summary

Key	WRZ Approach Option	○	SA Grouped Option	□

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 3 and 35)	SA Combination 2 (SA Grouped Option 8 and 35)	SA Combination 3 (SA Grouped Option 10 and 35)	SA Combination 4 (SA Grouped Option 14 and 35)	SA Combination 5 (SA Grouped Option 15 and 35)	SA Combination 6 (SA Grouped Option 16 and 35)	SA Combination 7 (SA Grouped Option 17 and 35)	SA Combination 8 (SA Grouped Option 19 and 35)	SA Combination 9 (SA Grouped Option 20 and 35)	SA Combination 10 (SA Grouped Option 22 and 35)	SA Combination 11 (SA Grouped Option 23 and 35)	SA Combination 12 (SA Grouped Option 24 and 35)	SA Combination 13 (SA Grouped Option 31 and 35)	SA Combination 14 (SA Grouped Option 32 and 35)	SA Combination 15 (SA Grouped Option 33 and 35)	SA Combination 16 (SA Grouped Option 17, 23, 32	SA Combination 17 (SA Grouped Option 1 and 33)	SA Combination 18 (SA Grouped Option 32 and 37)	SA Combination 19 (SA Grouped Option 23, 24, 32	SA Combination 20 (SA Grouped Option 1, 17, 22	SA Combination 21 (SA Grouped Option 41, 43, 45	SA Combination 22 (SA Grouped Option 35)
Ballyconnely	○	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	□	□	□	□	□	□	○
Carna Kilkieran RWSS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	□	□	□	□	□	□	○
Carraroe	No local option	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Clare Island	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	□	○	○	○	□	○	○
Cleggan Claddaghduff	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	○	□	□	○
Clifden	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	○	□	○	○
Clonbur	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○	○	○	□	○	○	□	○	○
Dunmore /Glenamaddy (Glenamaddy)	○	○	○	○	□	□	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 3 and 35)	SA Combination 2 (SA Grouped Option 8 and 35)	SA Combination 3 (SA Grouped Option 10 and 35)	SA Combination 4 (SA Grouped Option 14 and 35)	SA Combination 5 (SA Grouped Option 15 and 35)	SA Combination 6 (SA Grouped Option 16 and 35)	SA Combination 7 (SA Grouped Option 17 and 35)	SA Combination 8 (SA Grouped Option 19 and 35)	SA Combination 9 (SA Grouped Option 20 and 35)	SA Combination 10 (SA Grouped Option 22 and 35)	SA Combination 11 (SA Grouped Option 23 and 35)	SA Combination 12 (SA Grouped Option 24 and 35)	SA Combination 13 (SA Grouped Option 31 and 35)	SA Combination 14 (SA Grouped Option 32 and 35)	SA Combination 15 (SA Grouped Option 33 and 35)	SA Combination 16 (SA Grouped Option 17, 23, 32	SA Combination 17 (SA Grouped Option 1 and 33)	SA Combination 18 (SA Grouped Option 32 and 37)	SA Combination 19 (SA Grouped Option 23, 24, 32	SA Combination 20 (SA Grouped Option 1, 17, 22	SA Combination 21 (SA Grouped Option 41, 43, 45	SA Combination 22 (SA Grouped Option 35)
Galway City (Terryland & Lumineagh)	○	□	□	□	○	○	○	○	○	○	○	○	○	○	○	○	□	□	○	□	○	○
Inisboffin	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Inishere	○	○	○	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	□	○	○	○
Inishmean	○	○	□	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	□	○	○	○
Inishmore	○	○	□	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	□	○	○	○
Inishturk	○	○	□	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Leenane	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	□	□	□	○	○	□	○
Lough Mask & Westport	○	○	○	○	□	□	□	□	□	□	○	○	○	○	○	○	□	○	○	○	□	○
Louisburgh	○	○	○	○	○	○	○	□	□	○	○	○	○	○	○	○	□	○	○	○	□	○
Mid-Galway	○	□	○	□	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Mulranny	○	○	○	○	○	○	○	○	○	○	□	□	○	○	○	○	□	○	○	□	□	○
Newport	○	○	○	○	○	○	□	○	○	○	□	□	○	○	○	○	□	○	○	□	□	○
Oughterard	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Rosmuc	○	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	□	□	□	□	□	○
Spiddal	○	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Teeranea Lettermore	○	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	□	□	□	□	□	○
Tully-Tullycross	○	○	○	○	○	○	○	○	○	○	○	○	○	□	○	□	□	□	○	○	□	○

5.2.3 Stage 3 – Preferred Approach at Study Area Level

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

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

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

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

- Combination 4
- Combination 5
- Combination 6
- Combination 8
- Combination 9
- Combination 10
- Combination 11
- Combination 13
- Combination 14
- Combination 15
- Combination 18
- Combination 21
- Combination 22

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

When the thirteen Combinations are compared against each other, Combination 21 also has the best carbon cost and the overall environmental score is also the best. For this reason Combination 21 is progressed as the Least Cost.

Table 5.5 SAD Summary of SA Combination of Performance against Approach Type

Ranked order (best to worst)	Best																					Worst

WRZ	WRZ Approach Options	SA Combination 1 (SA Grouped Option 3 and 35)	SA Combination 2 (SA Grouped Option 8 and 35)	SA Combination 3 (SA Grouped Option 10 and 35)	SA Combination 4 (SA Grouped Option 14 and 35)	SA Combination 5 (SA Grouped Option 15 and 35)	SA Combination 6 (SA Grouped Option 16 and 35)	SA Combination 7 (SA Grouped Option 17 and 35)	SA Combination 8 (SA Grouped Option 19 and 35)	SA Combination 9 (SA Grouped Option 20 and 35)	SA Combination 10 (SA Grouped Option 22 and 35)	SA Combination 11 (SA Grouped Option 23 and 35)	SA Combination 12 (SA Grouped Option 24 and 35)	SA Combination 13 (SA Grouped Option 31 and 35)	SA Combination 14 (SA Grouped Option 32 and 35)	SA Combination 15 (SA Grouped Option 33 and 35)	SA Combination 16 (SA Grouped Option 17, 23, 32 33 and 35)	SA Combination 17 (SA Grouped Option 1 and 33)	SA Combination 18 (SA Grouped Option 32 and 37)	SA Combination 19 (SA Grouped Option 23, 24, 32 and 35)	SA Combination 20 (SA Grouped Option 1, 17, 22 and 31)	SA Combination 21 (SA Grouped Option 41, 43, 45 and 48)	SA Combination 22 (SA Grouped Option 35)
Least Cost																				Worst		Best	
Quickest Delivery							Worst										Best						
Best AA biodiversity	3 No. -3 Scores	4 No. -3 Scores	4 No. -3 Scores	4 No. -3 Scores	2 No. -3 Scores	3 No. -3 Scores	4 No. -3 Scores	4 No. -3 Scores	4 No. -3 Scores	4 No. -3 Scores	4 No. -3 Scores	5 No. -3 Scores	5 No. -3 Scores	5 No. -3 Scores	5 No. -3 Scores	5 No. -3 Scores	7 No. -3 Scores	3 No. -3 Scores	4 No. -3 Scores	7 No. -3 Scores	3 No. -3 Scores	5 No. -3 Scores	4 No. -3 Scores
Lowest Carbon																					Worst	Best	
Most Resilient					Worst															Best			
Best Environmental										Worst											Best		

The SA combinations including the WRZ approach outlined in **Error! Reference source not found.** are a ssessed to determine the approach categories as summarised in Table 5.8

Table 5.8 Best Combinations

Approach Categories	Best Performing Combination
Least Cost (LCo)	SA Combination 21
Best Environmental (BE)	SA Combination 20
Quickest Delivery (QD)	SA Combination 16
Most Resilient (MR)	SA Combination 19
Lowest Carbon (LC)	SA Combination 21
Best AA (BA)	SA Combination 4

The MCA assessment included the following assessment criteria:

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

The NPV Costs are based on four criteria:

- Capital Costs – the cost to construct the option, including all overheads, consent and land acquisition costs;
- Operational Costs – the whole life cost to operate the option, including operators, chemical requirements and energy requirements including pumping;
- Carbon Costs – the whole life embodied and operational Carbon costs of the option; and
- Environmental and Social – the whole life Environmental and Social cost of the option covering climate regulation, traffic disruption and food production (carbon emissions are covered separately in the bullet point above).

The wider range of costs used in the estimation of the NPV aligns our Plan with any future Project Level Cost Benefit Analysis, in accordance with the Public Spending Code.

In terms of NPV Cost, SA Combination 21 has the lowest NPV Cost, as shown in Figure 5.2 with the lowest total costs (CAPEX and OPEX) over the solutions lifetime.

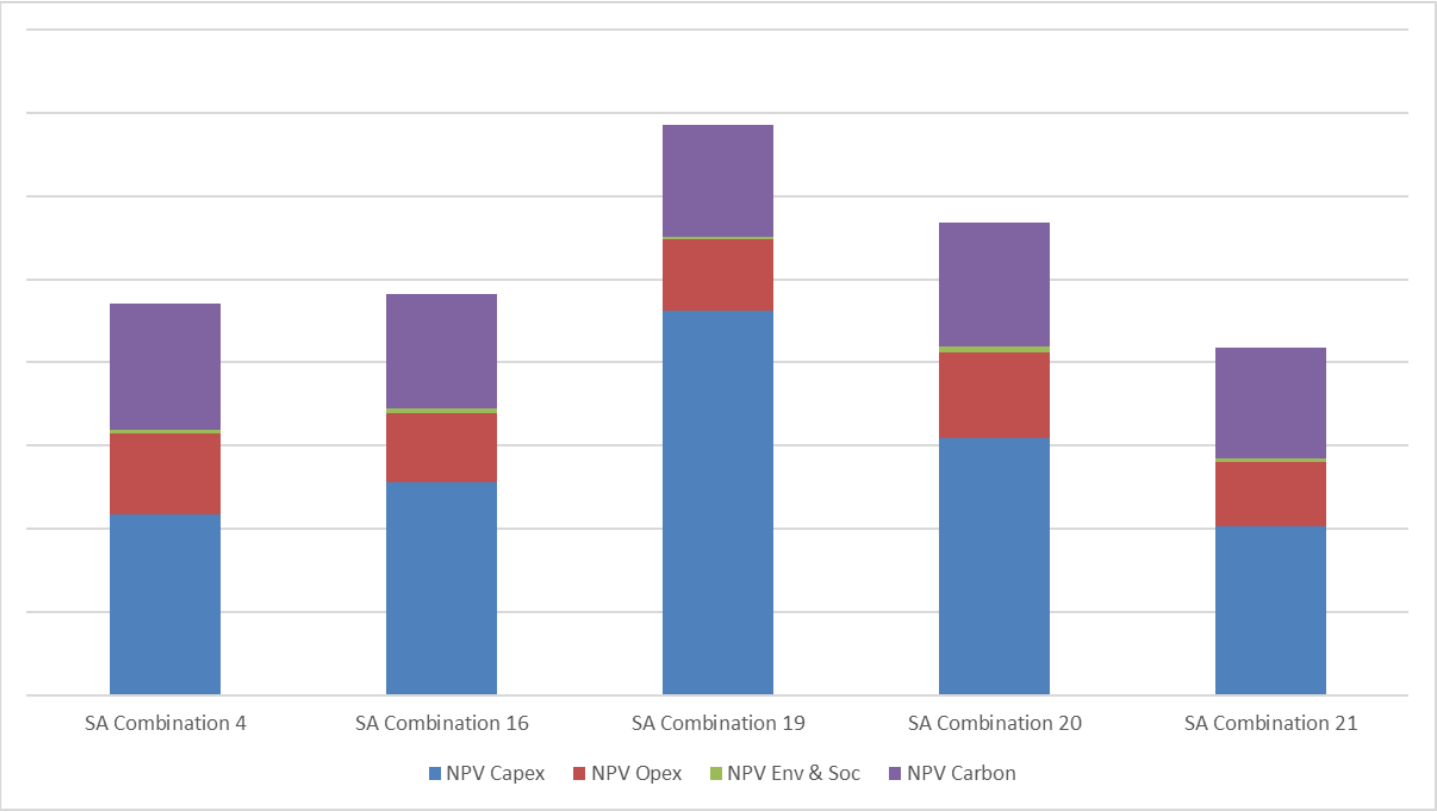

Figure 5.3 SAD NPV Costs for WRZ and SA approaches

In accordance with the Options Methodology, these approaches are then compared against each other using the 7-Step process in Figure 5.1 to generate the best value combination of options at the Study Area level. The best value combination of options at the Study Area level results in the SA Preferred Approach. The outputs from the assessment were as follows:

- Step 1 – We compared the Least Cost Approach against the Best AA approach. The Best AA Approach scores worse overall in terms of carbon, and much worse against the resilience, quickest delivery and environmental criteria. The Best AA approach involves developing a much higher number of local solutions that don't offer the same resilience as larger sustainable source interconnections that are proposed as part of the Least Cost. While the Least Cost Approach comprises three more options with a -3 score against the AA criteria compared to the Best AA approach, which means likely significant effects of the 3 additional options may be harder to mitigate, it is understood at plan level that mitigation would be achievable, however further project level assessments are required to confirm this. The Least Cost approach was therefore retained at this stage.
- Step 2 – We compared the Quickest Delivery Approach against the Least Cost Approach. The Quickest Delivery approach is significantly more expensive than the Least Cost Approach and performs worse against the AA criterion with a further 2 options which score a "-3" against the AA criteria at plan level. The Least Cost approach was therefore retained at this stage.
- Step 3 - We compared the Least Cost Approach against the Best Environmental Approach. The Least Cost Approach scored similarly to the Best Environmental Approach against the environmental category, and the carbon costs and NPV costs for the Best Environmental Approach were significantly greater than the carbon costs for the Least Cost Approach. The Least Cost Approach was therefore retained at this stage.

- Step 4 – We compared the Least Cost Approach against the Most Resilient Approach. The Most Resilient Approach has a significantly higher NPV costs and comprises 2 additional options which score a "-3" against the AA criteria compared to the Least Cost Approach. The Least Cost Approach was therefore retained at this stage.
- Step 5 - We compared the Least Cost Approach to the Lowest Carbon Approach. The Least Cost Approach is the Lowest Carbon Approach and is therefore brought forward as the Preferred Approach.
- Step 6 – A final assessment of the Least Cost and Lowest Carbon Approach was completed against the Quickest Delivery, Best AA, Best Environmental and Most Resilient Approaches. The Least Cost Approach scores best in terms of Cost and Carbon and provides resilient solutions for all WRZs. It also has a good overall Environmental Score. While the Least Cost and Lowest Carbon Approach comprises five options with a -3 score against the AA criteria, which means likely significant effects of the options may be harder to mitigate, it is understood at plan level that mitigation would be achievable, however further project level assessments are required to confirm this.
- The Least Cost and Lowest Carbon Approach was therefore retained at this stage.
- Step 7 – The Least Cost and Carbon Approach was therefore selected as the Preferred Approach.

5.3 Study Area Preferred Approach Summary

On the basis of this initial assessment at Plan level, SA Combination 21 represents the Preferred Approach for Study Area D, which consists of the options listed in Table 5.9.

Table 5.9 Preferred Approach for SAD

WRZ Name	Preferred Approach Option Description SA Combination 21
Ballyconneely Carna Kilkieran RWSS	Group 41 Rationalise Ballyconneely to Carna Kilkieran. New SW abstraction from Lough Skannive and upgrade existing WTP and upgrade existing Carna Kilkieran WTP.
Clare Island	SAD-014 New GW abstraction (poorly productive bedrock - Clare Island groundwater body).
Cleggan Claddaghduff Leenane Tully-Tullycross	Group 45 New Connemara RWSS (Kylemore Lough).
Clifden	SAD-027 New SW abstraction from Lough Auna.
Clonbur	SAD-033 New SW abstraction from Lough Corrib and new WTP.
Dunmore Glenamaddy P.S.	SAD-040 New GW abstraction from Gortgarogh GWB (Sean, Robbie spring) spring.
Lough Corrib (Galway City, Tuam, Loughrea)	SAD-046a Increase existing SW abstraction at Terryland from River Corrib.
Inisboffin	SAD-055 Desalination plant to supply full deficit. No blending, chemical remineralization only.
Inishere	SAD-058 Increase GW abstraction from existing springs.
Inishmean	SAD-069 Increase GW abstraction from current springs.
Inishmore	SAD-074 Increase GW abstraction from existing boreholes (karstic bedrock - Inishmore groundwater body).
Inishturk	SAD-158 Raise existing dam height and new impoundment on the other side of the lake. Increase SW abstraction from existing Lake Coolacknick impoundment and WTP upgrade.

WRZ Name	Preferred Approach Option Description SA Combination 21
Lough Mask & Westport Louisburgh	Group 48 Rationalise Louisburgh via new Community/GWS being developed to take water from Westport to Murrisk. Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP.
Mid-Galway	SAD-101 Increase existing GW abstraction from existing spring (karstic bedrock - Clare-Corrib groundwater body).
Mulranny	SAD-111 New GW abstraction (karstic bedrock - Newport groundwater body).
Newport	SAD-117a Increase SW abstraction from existing River Newport.
Oughterard	SAD-122 Increase SW abstraction from existing Lough Buffy.
Rosmuc Spiddal Teeranea Lettermore Carraroe	SAD-543 Rationalise Carraroe, Rosmuc and Teeranea Lettermore to Spiddal (Lough Bouliska). Increase existing SW abstraction from Lough Bouliska and connect with neighbouring WRZs.

The Preferred Approach (SA approach Combination 21) is shown schematically in Figure 5.3

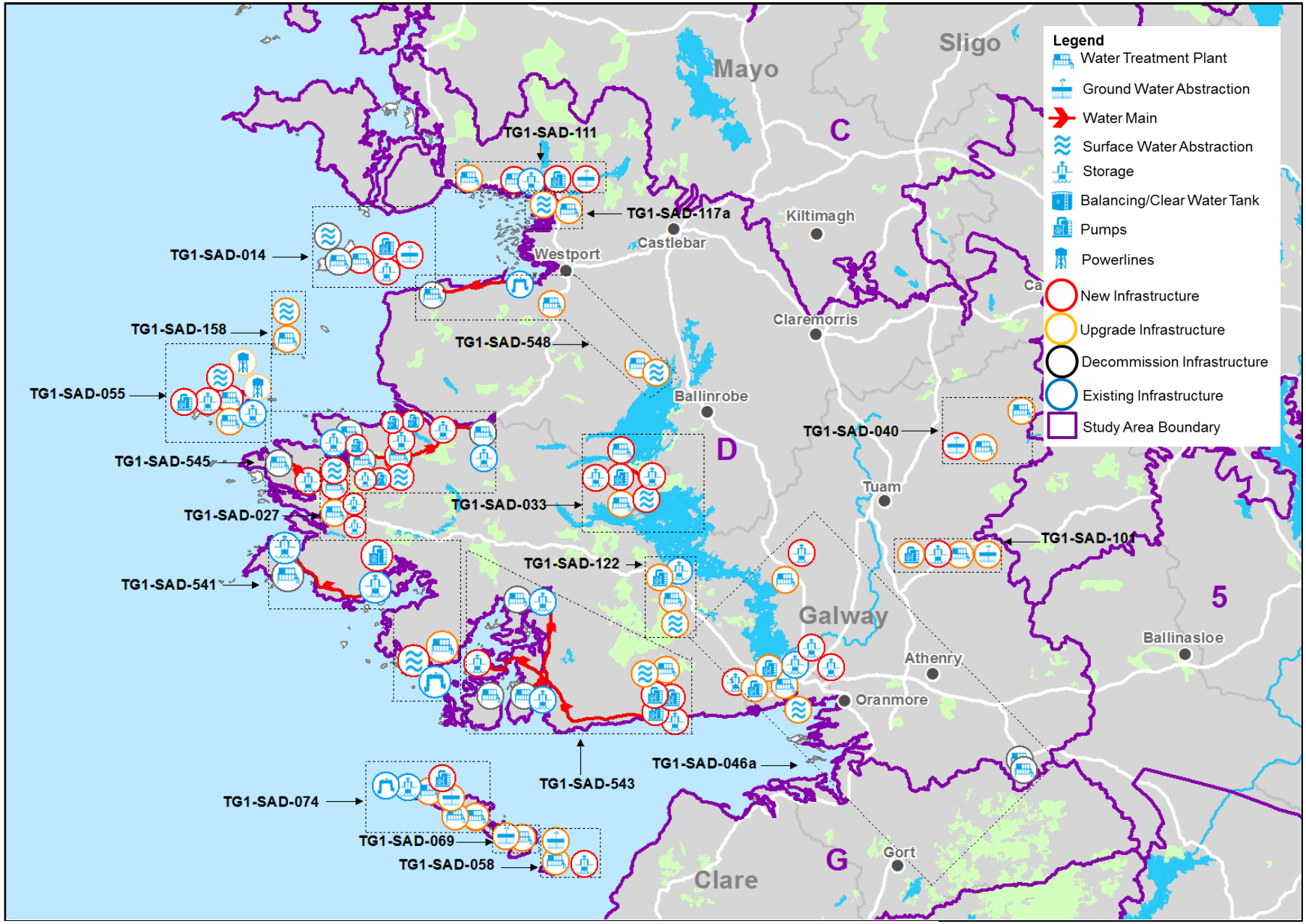

Figure 5.3 SAD Preferred Approach

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

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

As part of our Preferred Approach, we have also identified a range of interim solutions for SAD, as summarised in Figure 5.3 and Table 5.8. The measures will only be progressed in the event of critical need and/or public health impact and to allow time for delivery of the required Preferred Approach solutions in the Study Area.

Before we adopt this approach at Plan level for SAD, we must give consideration to the following:

- **Interim Solutions**: Based on scale of investment required across the entire country it is likely that it may take 5-10 investment cycles before we address all issues with the existing water supplies. Therefore, small localised options may be required on an interim basis to secure priority need in existing supplies until the SA Preferred Approach can be delivered; and
- **Sensitivity Analysis**: When planning for water supplies over a medium to long term horizon, we must give consideration to adaptability of our plan to change across a range of future scenarios (for example, what if population growth rates are lower than expected or what if we are unable to secure a licence in the medium term to abstract the quantity water currently allowed for at a given location).

6 Preferred Plan Constraints – Interim Solutions

6 Preferred Plan Constraints – Interim Solutions

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

On this basis, interim, short term capital maintenance solutions have been identified for all WTPs and will be utilised when needed. These solutions will allow UÉ time to deliver the Preferred Approach, while at the same time, maintaining a sustainable water supply. These interim solutions are generally smaller in scale and rely on making best use of already existing infrastructure.

Examples of general interim measures for different water sources include the following:

- For groundwater sites, where the Preferred Approach requires that the existing WTP is to be maintained, the interim solution would typically provide for refurbishment of the existing or development of new boreholes and borehole pumps, and an upgrade of the treatment process in line with proposed growth predictions. This may require a staged upgrade of the WTP. For example, the interim solution would typically include an upgrade of the WTP to provide supply to existing customers with consideration given to a further required expansion of the WTP at a later date.
- For surface water sites, where the Preferred Approach requires that the existing WTP is to be maintained, the interim option would typically involve the upgrade of the existing WTP in line with proposed growth predictions. As for groundwater sites this may require a staged upgrade of the WTP where the interim solution would typically include an upgrade of the WTP to provide supply to existing customers with consideration given to a further required expansion of the WTP at a later date.
- For groundwater and surface water sites where the Preferred Approach involves the decommissioning of the WTP by providing supply to the customers from another WTP within the WRZ or from another WRZ/Study Area/Region, the interim solution would involve the advancement of the rationalisation of the WTP, by provision of part supply or full supply if possible. If rationalisation is not feasible at that point in time due to dependencies on Study Area or Regional options, containerised WTP upgrade solutions would be considered for the WTP. This involves the provision of a package WTP within a containerised unit. These package plants can be modified for use on other sites in the future therefore are considered "no regrets" infrastructure investment

A decision to progress any interim solution will be based on priority need to address water quality risk or supply reliability e.g. RAL, drought issues or critical need for example. The Regional Plan does not confer funding availability for any project and any interim measures will be subject to budget availability, relevant environmental assessment and other required consents in the normal way.

These solutions, in most cases, will only be used to allow time to deliver the longer-term solution. The interim solutions are determined in line with the Preferred Approach and as such, they are considered "no regrets" infrastructure investment.

Table 6.1 SAD Interim Options

WTP Name	Interim Option
Ballyconnelly WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Carna Kilkieran WTP	Upgrade WTP to UÉ Standards
Carraroe WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Cleggan WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Clifden WTP	Upgrade WTP to UÉ Standards
Clonbur WTP	Upgrade WTP to UÉ Standards
Dunmore/Glenamaddy (Gortgarrow) WTP	Refurb existing Spring, and upgrade WTP to UÉ Standards
Glenamaddy WTP	Refurb existing Borehole, and upgrade WTP to UÉ Standards
Inisboffin WTP	Upgrade WTP to UÉ Standards
Inis Oirr WTP	Refurb existing Springs, and upgrade WTP to UÉ Standards
Oghill WTP	Refurb existing Borehole, and upgrade WTP to UÉ Standards
Inishmean WTP	Refurb existing Spring, and upgrade WTP to UÉ Standards
Leenane WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Letterfrack WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Danganbeg WTP	Refurb existing Spring, and upgrade WTP to UÉ Standards
Oughterard WTP	Upgrade WTP to UÉ Standards
Rosmuc WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Spiddal WTP	Upgrade WTP to UÉ Standards
Teeranea WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Tuam (Luimnagh) WTP	Upgrade WTP to UÉ Standards

WTP Name	Interim Option
Tullycross WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Creggacareen WTP	Refurb existing Borehole, and upgrade WTP to UÉ Standards
Kilcarna WTP	Refurb existing Borehole, and upgrade WTP to UÉ Standards
Loughrea (Lake Rd) WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Loughrea (Knockanima) WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Terryland WTP	Upgrade WTP to UÉ Standards
Louisburgh WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Mulranny WTP	Upgrade WTP to UÉ Standards
Newport WTP	Upgrade WTP to UÉ Standards
Westport WTP	Upgrade WTP to UÉ Standards
Clare Island WTP	Upgrade WTP to UÉ Standards – Potential site for a containerised solution
Inishturk WTP	Upgrade WTP to UÉ Standards
Tourmakeady WTP	Upgrade WTP to UÉ Standards

7

Preferred Approach – Sensitivity Analysis

7 Preferred Approach – Sensitivity Analysis

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

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

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

Table 7.1 Sensitivity Analysis for SAD

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Sustainability	Moderate/High (as our current abstractions are large compared to the water bodies from which they abstract)	+10,000 m^3/day	**The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the supply demand balance deficit**. There are some surface water sources in SAD that would be impacted from sustainability reductions. However, our preferred approach is designed to rationalise or supplement these sources by supplying from larger, more resilient surface water and groundwater sources. Groundwater sustainability is more difficult to assess at desktop level, however, as the abstractions in SAD are small in scale they do not appear to be problematic. Based on this scenario, the Preferred Approach remains the optimal solution.

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Climate Change	High (international climate change targets have not been met)	+400 m^3/day	**Higher climate change scenarios would impact our existing supplies and result in decreased water availability at certain times of year.** Although the likelihood of this scenario is high based on climate change adaptation to date, potential impacts may be mitigated against by optimizing our operations on a more environmentally sustainable basis across the range of supplies. Based on this scenario, the Preferred Approach remains the optimal solution.
Demand Growth	Low/Moderate (growth has been based on policy)	-29,504 m^3/day	**The impact of lower than expected growth would reduce the supply demand balance deficit and the overall need requirement.** The supply demand balance deficit is spread across 25 individual water resource zones and is driven by quality as well as quantity issues. In this rural area, growth is relatively low. Based on this scenario, the Preferred Approach remains the optimal solution.
Leakage Targets	Low (Uisce Éireann is focused on sustainability and aggressive leakage reduction)	1,448 m^3/day	**The impact of lower than expected leakage savings would increase the supply demand balance deficit and the overall need requirement.** As Uisce Éireann is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage targets as opposed to accepting lower targets. Based on this scenario, the Preferred Approach remains the optimal solution.
	Moderate/High (Uisce Éireann is focused on sustainability and aggressive leakage reduction)	40,107 m^3/day	**Increased leakage savings beyond SELL would reduce the supply demand balance deficit and the overall need requirement.** The need drivers in SAD are across all 25 water resource zones and are driven by quality as well as availability issues. Therefore, the Preferred Approach is required, even accounting for increased leakage savings. Based on this scenario, the Preferred Approach remains as the optimal solution.

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

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

- Interim Approach – As the purpose of the Interim Approach is to allow for emergency works for priority Quality and Quantity issues, the solutions will have a limited design life (usually less than 10 years). They allow time to assess the Preferred Approach and improve adaptability within our Plan
- Preferred Approach – As the Supplies in SAD Galway/Mayo are relatively small, and as conservative limits have been applied to the supply availability assessments, the Preferred Approach is adaptable to a range of future outlooks in relation to sustainability and climate change. The demand growth in the area is small, and the Supply Demand Deficits are primarily driven by reliability. As Water Treatment Plants are modular, capacity will be delivered on a phased basis, allowing for adaptation across a range of futures. Our Preferred Approach is therefore Adaptable.

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

8 Summary of Study Area D

8 Summary of Study Area D

The Preferred Approach for SAD (summarised in Table 5.8 and Figure 5.3) consists of local WRZ supplies for Clare Island, Clifden, Clonbur, Dunmore Glenamaddy P.S., Lough Corrib (Galway City, Tuam, Loughrea), Inisboffin, Inishere, Inishmean, Inishmore, Inishturk, Mid-Galway, Mulranny, Newport and Oughterard in the Study Area. The Preferred Approach for Ballyconneely, CARNA Kilkieran, Cleggan Claddaghduff, Carraroe, Spiddal, Leenane, Lough Mask & Westport, Louisburgh, Rosmuc, Teeranea Lettermore, and Tully-Tullycross WRZs involve transfers from a number of existing and new surface water abstractions in the study area.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience. The Preferred Approach for SAD also includes for demand side (**Lose Less** and **Use Less**) measures, including:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset NRR;
- Nett leakage reduction in Lough Corrib (Galway City, Tuam, Loughrea) and Lough Mask & Westport Water Resource Zones, amounting to 1,448 m³ per day (applied to SDB Deficit) to move towards achieving the National SELL Target by 2034
- Continuation of UÉ household and business water conservation campaigns, initiatives and education programmes; and
- The option to implement legally enforceable Water Conservation Orders in drought periods in order to protect the environment and our public water supplies.

As part of our Preferred Approach we have also identified a range of interim solutions for SAD, as summarised in Table 6.1 in Section 6. The measures will only be progressed in the event of critical need and/or public health impact and to allow time for delivery of the required Preferred Approach solutions in the Study Area.

Annex A - Study Area D Water Treatment Plants

WTP Asset Name	Local Plant Names
Tourmakeady WTP	Tourmakeady WTP
Inishturk WTP	Inishturk WTP
Clare Island WTP	Clare Island WTP
Westport WTP	Knappagh WTP
Newport WTP	Newport WTP
Mulranny WTP	Mulranny WTP
Louisburgh WTP	Louisburgh WTP
Terryland WTP	Terryland WTP
Loughrea (Knockanima) WTP	Loughrea (Knockanima) WTP
Loughrea (Lake Rd) WTP	Loughrea (Lake Rd) WTP
Kilcarna WTP	Kilcarna WTP
Creggacareen WTP	Creggacareen WTP
Tullycross WTP	Tullycross WTP
Tuam (Luimnagh) WTP	Tuam (Luimnagh) WTP
Teeranea WTP	Teeranea WTP
Spiddal WTP	Spiddal WTP
Rosmuc WTP	Rosmuc WTP
Oughterard WTP	Oughterard WTP
Danganbeg WTP	Danganbeg WTP
Letterfrack WTP	Letterfrack WTP
Leenane WTP	Leenane WTP
Inishmean WTP	Inishmean WTP
Oghill WTP	Oghill WTP
Inis Oirr WTP	Inis Oirr WTP
Inisboffin WTP	Inisboffin WTP
Glenamaddy WTP	Glenamaddy WTP
Dunmore/Glenamaddy (Gortgarrow) WTP	Dunmore/Glenamaddy (Gortgarrow) WTP
Clonbur WTP	Clonbur WTP
Clifden WTP	Clifden WTP
Cleggan WTP	Cleggan WTP
Carraroe WTP	Carraroe WTP

WTP Asset Name	Local Plant Names
Carna Kilkieran WTP	Carna Kilkieran WTP
Ballyconnelly WTP	Ballyconnelly WTP

Annex B - Study Area D Rejection Register Summary

Annex B Study Area D Rejection Register Summary

Study Area D - CS Rejection

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-001	Increase existing SW abstraction from Lake Anaserd to supply deficit at Ballyconneely WRZ, upgrade WTP	Sustainability issues associated with this option. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-003	Supplement deficit in Ballyconneely from surrounding lake	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-004	Supply deficit from neighbouring GWSs - Foreglass/Dolan GWS; Mannin GWS; Aillebrack GWS	This option is already in place; therefore, this option will not progress to fine screening.	Option already delivered		
TG1-SAD-005A	Rationalise Ballyconneely WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-006	New Connemara RWSS	The option requires significant works for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-007	Increase existing SW abstraction from Lough Lerin to supply deficit at Carna Kilkieran, upgrade Carna Kilkieran WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-008	Increase existing SW abstraction from Lough Loughaunore to supply deficit at Carna Kilkieran, upgrade Carna Kilkieran WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-011A	Rationalise Carna Kilkieran RWSS scheme to Galway City WRZ via Rosmuc WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-012	New Connemara RWSS	The option requires significant works for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-013	Increase SW abstraction from existing River Knockmore to supply deficit at Clare Island WRZ, upgrade WTP	Sustainability issues associated with this option. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-017A	Increase existing SW abstraction from Lough Courhoor to supply deficit at Cleggan Claddaghduff WRZ, upgrade Cleggan WTP	Sustainability issues associated with this option. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-017B	Increase existing SW abstraction from Lough Courhoor to supply deficit at Cleggan Claddaghduff WRZ, upgrade Cleggan WTP	Sustainability issues associated with this option. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria .	●	●	●
TG1-SAD-020	New SW abstraction from Lough Auna	The option requires a 6km pipeline for a relatively small demand. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-021	New West Connemara RWSS with source from Kylemore Lough	The option requires significant works for a relatively small deficit. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-022	Rationalise Cleggan Claddaghduff WRZ to Lough Mask WRZ	The option requires significant works for a relatively small supply. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-023	Increase existing SW abstraction from Lough Nambrackeagh to supply deficit at Clifden WRZ, upgrade WTP	Sustainability issues associated with this option. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-026	Supply deficit from neighbouring Ballinakill Moyard GWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-028	New SW abstraction from Derrylea Lough to supply deficit at Clifden WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-029A	Rationalise Clifden WRZ to Galway City PWS via Ballyconneely	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-030	New West Connemara RWSS with source from Kylemore Lough	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-031	New Connemara RWSS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-032	Increase existing SW abstraction from Lough Coolin to supply deficit at Colnbur WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-036	Supply deficit from neighbouring GWSs - Lough Mask Creevagh GWS/ Funchona/Cross GWS (Lough Mask/Lough Corrib)	There is a lack of data available for private group water schemes required to assess scheme, therefore, this option is not taken forward to the fine screening stage.	No data available to assess option		
TG1-SAD-037A	Rationalise Clonbur WRZ to Galway City WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-037B	Rationalise Clonbur WRZ to Galway City WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-038A	Rationalise Clonbur WRZ to Lough Mask WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-038B	Rationalise Clonbur WRZ to Lough Mask WRZ	The option requires a significant length pipeline for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-038C	Rationalise Clonbur WRZ to Lough Mask WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-042A	Interconnect with Tuam RWSS via Dublin Road	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-042B	Rationalise Dunmore/Glenamaddy to Tuam RWSS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-043A	Rationalise Dunmore/Glenamaddy to Lough Mask WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-045A	Increase existing SW abstraction from Lough Haunwillan (Carraroe source) to supply deficit at Carraroe ERZ, upgrade WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-045B	Increase existing SW abstraction from Lough Haunwillan (Carraroe source) to supply deficit at Carraroe ERZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-045C	Increase existing SW abstraction from Lough Haunwillan (Carraroe source) to supply deficit at Carraroe ERZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-045D	Increase existing SW abstraction from Lough Haunwillan (Carraroe source) to supply deficit at Carraroe ERZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-046C	Increase existing SW abstraction at Terryland from River Corrib, ugrade Terryland WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-046F	Increase existing SW abstraction at Terryland from River Corrib, upgrade Terryland WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-052	Increase existing SW abstraction from Lough Fawna to supply deficit at Inisboffin WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-053	New SW abstraction from Lough Bofin to supply deficit at Inisboffin WRZ, upgrade WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-056	Connect Inisbofin to mainland (Cleggan-Claddaduff)	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-057	Rainwater harvesting - particularly for Inisboffin WRZ hotels	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. The Rainwater Harvesting (RWH) scheme based on commercial hotels only would not provide enough supply to meet deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	
TG1-SAD-061	Connect Lacrannagh Spring with new pipe to increase capture when available, upgrade existing WTP	This option is already part of option SAD-058 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed as part of a different feasible option		
TG1-SAD-062	Increase RW storage on Inishere island to maximise winter rainfall capture	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. The Rainwater Harvesting (RWH) scheme based on commercial hotels only would not provide enough supply to meet deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	
TG1-SAD-065	Connect Inish Oirr to mainland (Carraroe - Lough Corrib WRZ)	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-066	Rainwater harvesting - particularly for Inishere hotels	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. The Rainwater Harvesting (RWH) scheme based on commercial hotels only would not provide enough supply to meet deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	
TG1-SAD-067	New GW abstraction (karstic bedrock - Inishmann Machairs groundwater body) to supply deficit at Inishmean WRZ, upgrade WTP	This option is already part of option SAD-069 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed as part of a different feasible option		
TG1-SAD-072	Connect Inishmean to mainland (Carraroe)	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-073	Rainwater harvesting - particularly for Inishmean hotels	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. The Rainwater Harvesting (RWH) scheme based on commercial hotels only would not provide enough supply to meet deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	
TG1-SAD-075	New GW abstraction (karstic bedrock - Inishmore groundwater body) to supply deficit at Inishmore WRZ, upgrade WTP	This option is already part of option SAD-074 and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	Assessed as part of a different feasible option		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-079	Connect Inishmore to mainland	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-080	Increase RW storage on Inishmore island to maximise winter rainfall capture	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. The Rainwater Harvesting (RWH) scheme based on commercial hotels only would not provide enough supply to meet deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	
TG1-SAD-081	Rainwater harvesting - particularly for Inishmore hotels	This option is duplicate option and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option.	Assessed as part of a different option		
TG1-SAD-084	Desalination plant to supply full deficit. No blending, chemical remineralization only.	This option is not suitable as high energy intensive option for a small demand, when there are better alternatives available. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-085	Connect Inishturk to mainland	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-086	Increase SW existing abstraction from River to supply deficit at Leenane WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-090A	Rationalise Leenane WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-090B	Rationalise Leenane WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-090C	Rationalise Leenane WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-091A	Rationalise Leenane WRZ to Lough Mask via Clonbur	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-091B	Rationalise Leenane WRZ to Lough Mask via Westport	The option requires a significant length pipeline for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-092	New Connemara RWSS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-093C	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-093D	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-093G	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-093i	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-093l	Increase SW abstraction from existing Lough Mask and upgrade Tourmakeady WTP	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-094	Increase SW abstraction from existing Lake Moher (Westport WSS source) to supply deficit at Lough Mask & Westport WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-097B	New GW abstraction (Poorly productive clifden castlebar GWB) to supply deficit at Louisburgh WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-098	Supply deficit from neighbouring GWS - Laughta GWS; Killeen GWS (GW Clifden Castlebar)	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-099	Rationalise Louisburgh to Lough Mask & Westport WRZ for increased resilience (approx. distance - 15km)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-100B	Interconnect with new Community/GWS being developed to take water from Westport to Murrisk	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-102	Bring back unused GW source (Karstic - Clarinbridge, Clare Corrib	This option was not progressed to fine screening due to a lack of local information.	No data available to assess option		
TG1-SAD-106	Take off section of Farmablake from Mid-Galway and connect to Loughrea	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-107	Supply deficit from GWS (DBO schemes) Kilkieran GWS	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-108A	Rationalise Mid-Galway WRZ to Galway City WRZ via link to Tuam RWSS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-109	Increase SW abstraction from existing River Bunnahowna to supply deficit at Mulranny WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-110	Supply deficit from neighbouring GWS - Burrishoole GWS; Tierhaur/Roskeen GWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-113	New SW abstraction from Lough Feeagh	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-114	Rationalise to Lough Mask RWSS (via Newport PWS)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-116A	Rationalise to Lough Mask RWSS (via Newport PWS)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-116C	Rationalise Newport to Lough Mask & Westport WRZ for increased resilience (approx. distance - 12km)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-116D	Rationalise Newport to Lough Mask & Westport WRZ (approx. distance - 12km)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-116E	Rationalise Newport to Lough Mask & Westport WRZ (approx. distance - 12km)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-120	Supply deficit from neighbouring GWS - Kilmeena GWS	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-126	Increase SW abstraction from existing Lough Aroolagh to supply deficit at Rosmuc WRZ, upgrade Rosmuc WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-128A	Rationalise Rosmuc WRZ to Galway City WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-129	Rationalise Rosmuc WRZ to to a new Connemara RWSS (possibly Lough Innagh)	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-130	Increase SW abstraction from existing Lough Illauntrasna to supply deficit at Teeranea Lettermore WRZ, upgrade Tiernee WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-131	New SW abstraction and new WTP from lake - Lough Hibbert	Downstream is a better alternative as more water availability. Therefore, this option was screened out for Deliverability		●	
TG1-SAD-133	New SW abstraction and new WTP from lake - Lough Ballynakill	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-135	Supply deficit from neigbouring GWSs - Lettermullen GWS; Lettermullen GWS No.2	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-136A	Rationalise Tir an Fhia WRZ to Galway City WRZ	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-138	Increase existing SW abstraction from Diamond Hill River to supply deficit at Tully-Tullycross WRZ, upgrade WTP	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-141	Supply deficit from neighbouring GWSs - Cloonluane GWS (SW)	This option is a duplicate and is assessed as part of a different feasible option. As a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option.	Assessed as part of a different option		
TG1-SAD-144A	Rationalise Tully-Tullycross WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-144B	Rationalise Tully-Tullycross WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-144C	Rationalise Tully-Tullycross WRZ to Galway City PWS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-145A	Rationalise Tully-Tullycross WRZ to Lough Mask-Clonbur	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-145B	Rationalise Tully-Tullycross WRZ to Lough Mask-Clonbur	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-146	New Connemara RWSS	The option requires a significant length pipeline for a relatively small deficit. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-147	Increase SW abstraction at Lough Corrib, WTP upgrade and network upgrade	This option is a repeat of option 047C and as a result, is not taken forward to the fine screening stage as it is assessed as part of a different feasible option	This option is assessed as part of a different option		
TG1-SAD-148	New SW abstraction from Lough Scannive to supply deficit at Ballyconneely WRZ, upgrade WTP	The costs associated with this option are too high for such a small demand for this to be considered feasible. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-150	Connect to Cuilmore GWS (increase abstraction from Skerdagh River)	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●
TG1-SAD-179	New small scale desalination plant and new raw water storage to maximise SW availability in winter months on Inishboffin Island. Based on 2:1 blending during desal remineralization for taste.	This option was not considered feasible as it is not possible to store enough source water for 2:1 blending with desalination water during a drought. There are better alternatives available. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Environmental
TG1-SAD-180	New small scale desalination plant and new raw water storage to maximise SW availability in winter months on Clare Island. Based on 2:1 blending during desal remineralization for taste.	This option was not considered feasible as it is not possible to store enough source water for 2:1 blending with desalination water during a drought. There are better alternatives available. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-181	New small scale desalination plant and new raw water storage to maximise GW availability in winter months. Based on 2:1 blending during desal remineralization for taste.	This option was not considered feasible as it is not possible to store enough source water for 2:1 blending with desalination water during a drought. There are better alternatives available. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-182	New desalination plant and new raw water storage to maximise GW availability in winter months on Inishmore Island. Based on 2:1 blending during desal remineralization for taste.	This option was not considered feasible as it is not possible to store enough source water for 2:1 blending with desalination water during a drought. There are better alternatives available. Therefore, this option did not meet the Deliverability and Flexibility Criteria.		●	
TG1-SAD-082	Increase SW abstraction from existing Lake Coolacknick impoundment	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.	●	●	●