3

Regional Needs

3.1 Introduction

To plan for future water supplies it is necessary to assess public water supply requirements over our 25-year planning period. This assessment will identify whether there is likely to be a surplus or shortfall of available water; and whether our infrastructure can reliably deliver water supplies and ensure a risk-based approach to continuously meet water quality standards. This defines our current and future water supply needs and forms the first stage of our eight (8) stage process to develop our plan level Preferred Approach (PA) to delivering secure and safe water supplies. The process is referred to as our Options Assessment Methodology. The key stages of the process are illustrated in Figure 3.1 and summarised below.

- Stage 1: Identify the 'Need' based on the Supply Demand Balance (SDB) and Drinking Water Safety Plan (DWSP) Interim Barrier Assessment (Section 3). The SDB calculates the difference between the water we have available in our supplies compared to the Demand for water. The DWSP Interim Barrier Assessment identifies water Quality and Reliability driven Need.
- Stage 2: Scope the Study Areas to determine existing infrastructure deficiencies (Section 4).
- Stage 3 to Stage 6: Option Development, involving the identification of a list of possible Options that are unconstrained by cost, feasibility or specific environmental requirements (Unconstrained Options List); and assessment of these Options through a two (2) stage screening process (Coarse Screening and Fine Screening) to produce a Feasible List of Options (Section 6).
- Stage 7: Approach Development, which tests a range of Options and Option combinations to select the 'best value' solutions to address our Deficits. These are assessed against five (5) criteria (Resilience, Deliverability and Flexibility, Progressibility, Sustainability and Cost) reflecting the objectives of our National Water Resources Plan (NWRP) and associated Strategic Environmental Assessment (SEA). Stage 7 produces our plan level Preferred Approach at a Study Area spatial level (Section 7) and Regional spatial level (Section 8).
- Stage 8: Monitoring and Feedback, where we identify how we will address gaps in data and information to improve the next iteration of our NWRP.

The process is described in further detail in Section 8 of our Framework Plan.

The plan level **Preferred Approach** is the combination of solutions that are assessed as the most effective in meeting the objectives of the National Water Resources Plan (NWRP). Section 6,7 and 8 of the RWRP-SW provide further details.

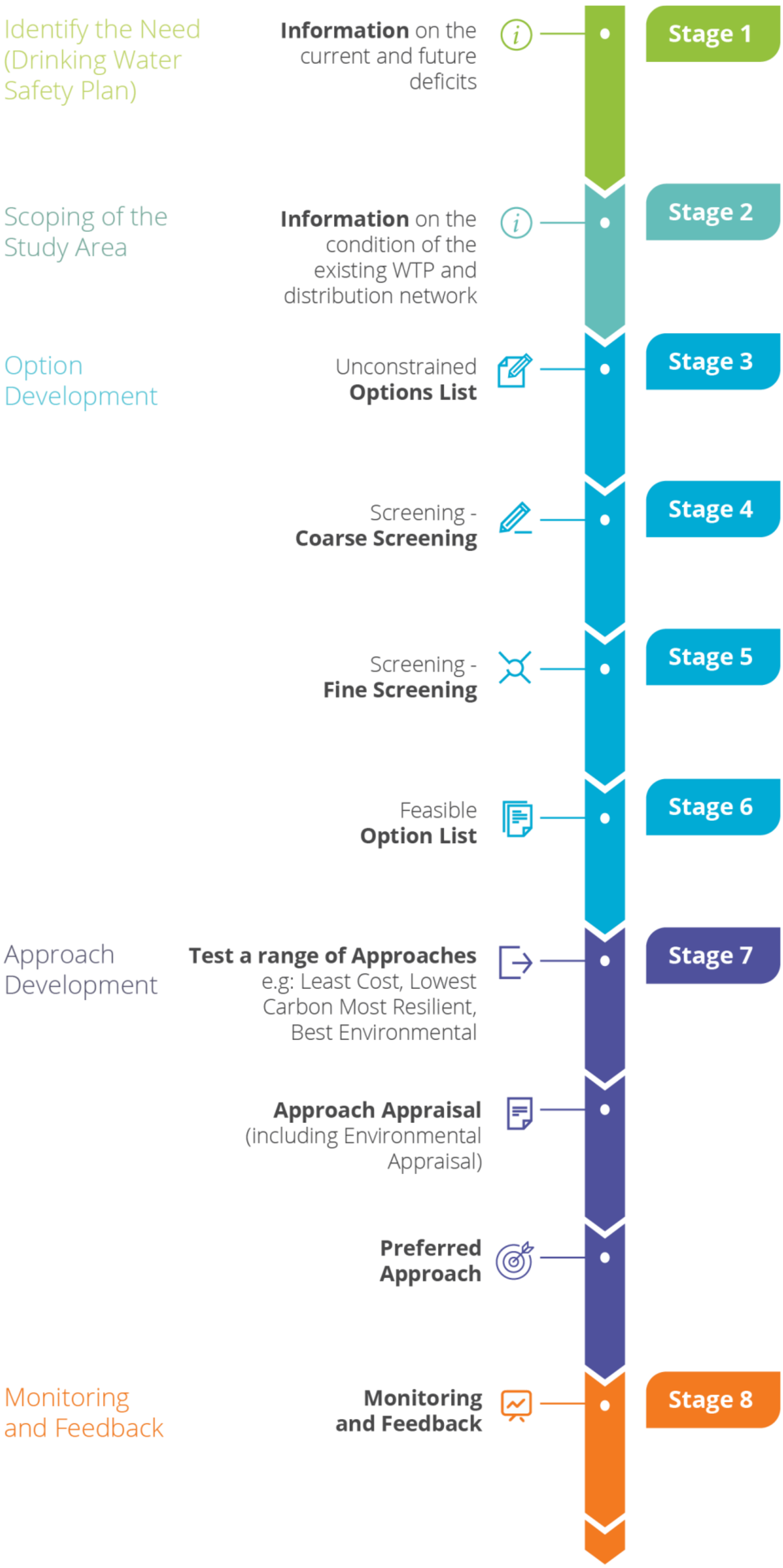

Figure 3.1 Options Assessment Methodology

In this section we present the outcomes of Stage One of our Options Assessment Methodology, describing the future Needs across the South West Region with respect to four (4) themes:

- **Water Quantity**, which is determined as the surplus or shortfall (Deficit) of available water supply over the 25-year planning period;
- **Water Quality**, which is assessed in relation to drinking water standards through the Interim Barrier Assessment which is built off the DWSPs;
- **Reliability** in relation to performance and operational efficiency of Irish Water's Asset Base; and
- **Sustainability** of our water resources to ensure we meet our statutory environmental obligations and secure future supplies under an uncertain climate.

The Needs assessment for the three (3) Study Areas of the Regional Water Resources Plan South West (RWRP-SW) is presented in the Study Area Technical Reports in Appendix 1 - 3. Figure 3.2 provides an overview of our approach to assess Need across our asset base in the context of our Options Assessment Process.

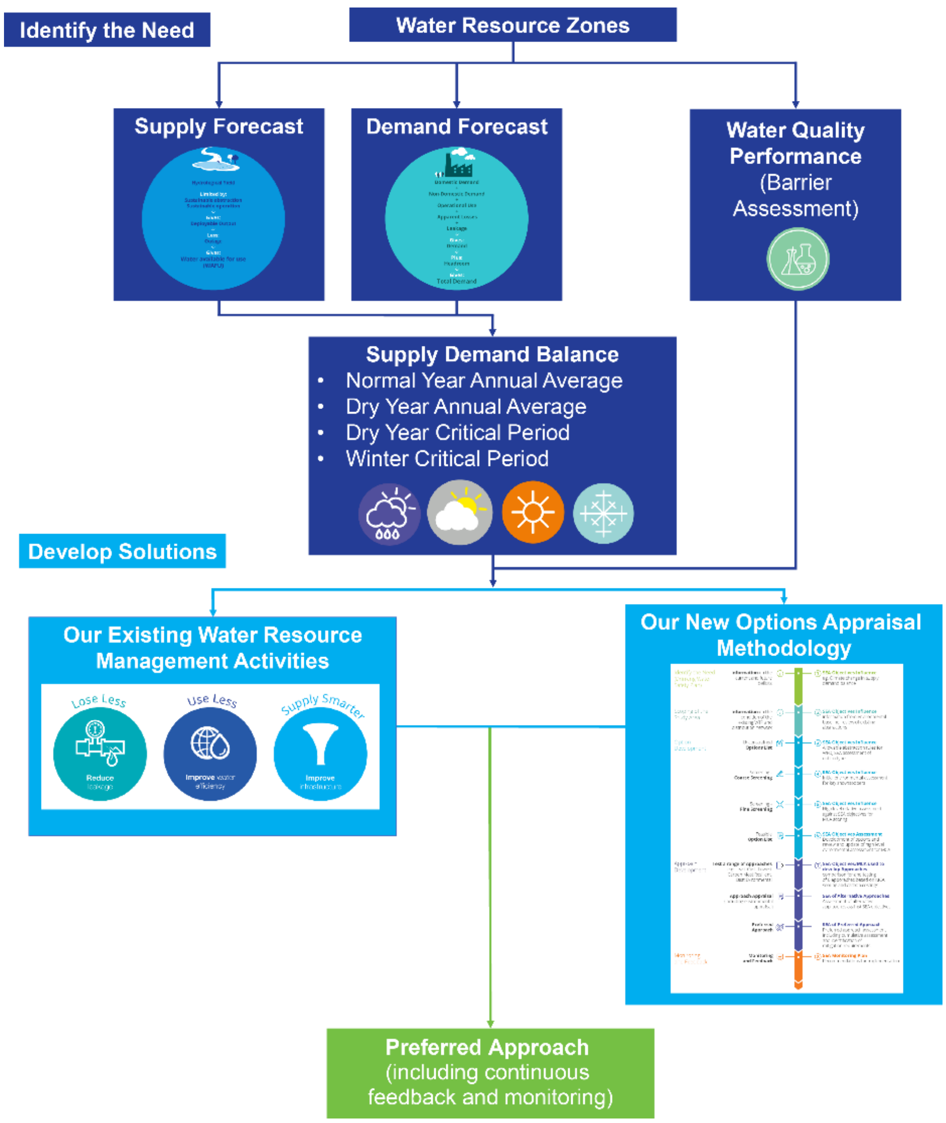

Figure 3.2 NWRP Options Assessment Process

3.2 Water Quantity

3.2.1 Introduction

The Supply Demand Balance (SDB) is the difference between the water we have available in our supplies compared to the demand for water. Figure 3.3 identifies the components of the SDB. In Section 3 and 4 of the Framework Plan, we outline how each of these components is calculated.

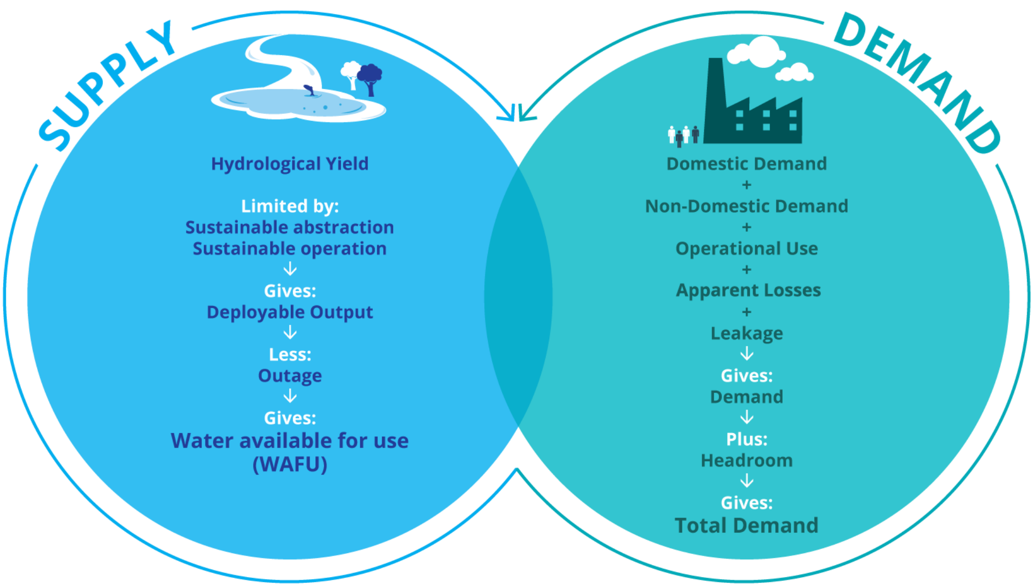

Figure 3.3 Components of the SDB

In terms of supply availability, the SDB considers water availability in the natural environment, current abstractions, water treatment capacity, process losses, trunk main constraints, and required allowances to ensure continuity of supply during planned and unplanned events.

When all of these factors have been considered, we can calculate the Water Available for Use (WAFU) for each Water Resource Zone (WRZ). As part of our supply forecasts, we must consider reducing supply availability due to the impact of climate change and the potential sustainability driven reductions in allowable abstraction from waterbodies.

Water Available for Use (WAFU) is the amount of water that can be supplied from a supply system taking into account infrastructure capacity constraints, treatment losses and planned and unplanned events that can reduce supplies.

We must produce enough water supply at the top of our distribution networks to ensure that customers receive the volume of water they require at the extremities of a complex distribution network. The demand for water must therefore account for network efficiency and losses across the network during distribution.

When we assess demand for water as part of the SDB, we assess the current water balance which includes; domestic demand, non-domestic demand, operational usage (such as flushing water mains and fire hydrants), apparent losses (water used in properties through permanent and temporary connections that are currently unknown) and leakage. As part of demand forecasting, we must consider, leakage reduction, growth in demand, and allow for uncertainties (provision of headroom).

A Deficit in the SDB means that the Demand for water is higher than the available supply. In the event of an identified Deficit, we consider what actions could be taken in response, e.g. reduce future Demand, increase supply or a combination of both.

3.2.1.1 Weather Event Planning Scenarios

The SDB calculations have been developed under four (4) Weather Event Planning Scenarios to ensure that the RWRP-SW supports the development of a resilient water supply system that limits the impacts of extreme events on our customers. The Weather Event Planning Scenarios include:

- Normal Conditions (Normal Year Annual Average – NYAA)
- Dry Years (Dry Year Annual Average – DYAA)
- Drought Periods (Dry Year Critical Period – DYCP)
- Winter Freeze-Thaw Conditions (Winter Critical Period – WCP)

Dry years and drought periods can reduce the available flows in rivers and groundwater recharge, which impacts the WAFU; while storms and cold weather events can disrupt services through asset damage such as water main bursts due to freeze-thaw conditions (periods of cold weather followed by a warming). This increases the water loss in the system, which increases the Total Demand. Consumptive demands may increase with warm weather events as customers increase outdoor water use.

The Framework Plan describes the Weather Event Planning Scenarios in further detail.

3.2.1.2 Level of Service (LoS)

In water resource planning, water supply systems are developed to provide a target Level of Service (LoS). The LoS refers to the Reliability of the supply that our customers can expect to receive. It is the frequency that our customers may experience an interruption to supply because of water availability issues, rather than a water Quality or a network incident.

The Reliability of meeting a LoS for water supply planning purposes is distinct from the day to day, or even hourly, operation of the distribution system. It is also not related to the Reliability associated with regulatory constraints such as required pressure or water Quality levels. Box 3.1 provides an explanation of the LoS as it relates to long-term water supply planning in Ireland.

The LoS we aim to provide our customers will have a significant impact on the level of investment needed. Typically, the greater the target LoS, the higher the amount of investment needed, as more resilient infrastructure is required. However, a lower LoS accepts a greater risk of implementing water restrictions that can have negative social, economic and environmental impacts.

Box 3.1 – Level of Service (LoS)

When planning for future water supply, it is necessary to strike a balance between investing in additional supply capacity now or deferring it for some future time. This will depend on the projected growth and other factors such as climate change, climate variability, environmental flow requirements and aging infrastructure. The uncertainty associated with many of these factors, in particular climate variability, introduces a risk that our customers will experience supply shortfalls during extreme weather conditions. Water supply systems are planned to provide a balance between investment and risk. This is defined as the Level of Service (LoS).

Level of Service (LoS) is expressed as a frequency or return period of supply failure. For example, if the LoS is stated as 1 in 50, as a consumer, you would only ever expect to experience a supply failure due to water availability, on average, once every 50 years. That is, there would be a 2% chance of experiencing a supply failure in any given year.

In Ireland, we define supply failure as the point at which reduced water availability requires the provision of emergency alternative supplies.

The current LoS across the South West Region varies from one location to another, ranging from lower than 1 in 10 to greater than 1 in 50 during normal conditions (NYAA) (Figure 3.4). As summarised in Table 3.1, approximately 84% of the region's population receive our target LoS of >1 in 50 during normal conditions (NYAA). Approximately 16% of the population are therefore at risk of receiving a LoS lower than 1 in 50.

Table 3.1 NYAA Level of Service by WRZ and Population Served

LoS	Number Of WRZs	Population	% Of Total Regional Population
>1 in 50	112	497,600	83.7%
>1 in 40	0	0	0.0%
>1 in 30	2	2,800	0.5%
>1 in 20	0	0	0.0%
>1 in 10	4	20,400	3.4%
<1 in 10	56	73,500	12.4%

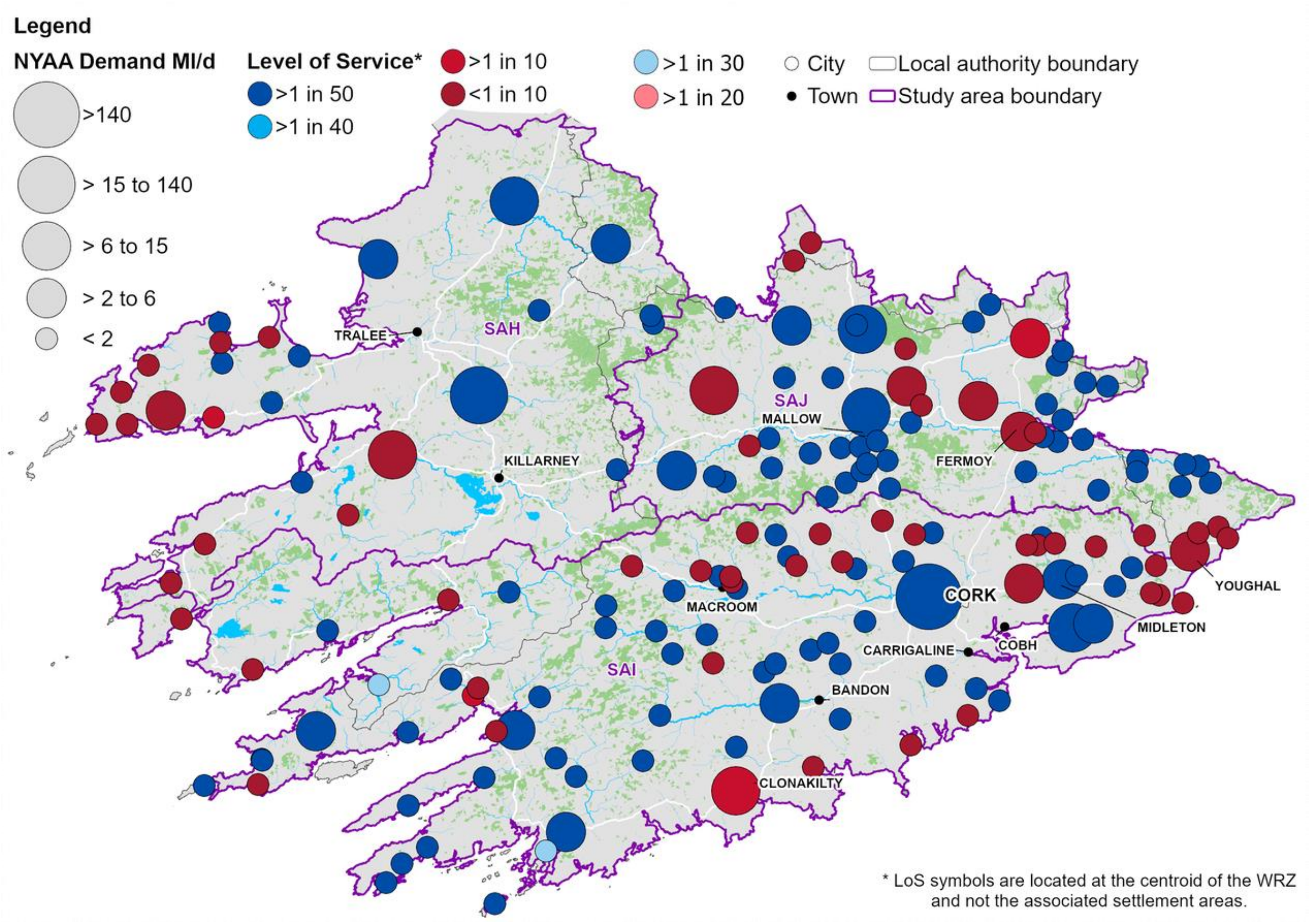

Figure 3.4 LoS for each WRZ for a Normal Year (NYAA)

In dry or severe winter conditions, some customers already experience interruptions to their supply despite considerable efforts and advancements by Irish Water in partnership with Local Authorities. During a dry year critical period (DYCP) 67% of the region's population receive our target >1 in 50 LoS (Table 3.2 and Figure 3.5). Under this scenario approximately 33% of the region's population experience a LoS of <1 in 10.

Table 3.2 DYCP Level of Service by WRZ and Population Served

LoS	NUMBER OF WRZs	POPULATION	% of TOTAL REGIONAL POPULATION
>1 in 50	93	396,000	66.6%
>1 in 40	0	0	0.0%
>1 in 30	1	3,330	0.6%
>1 in 20	1	100	< 0.1%
>1 in 10	1	2800	0.5%
<1 in 10	78	192,200	32.3%

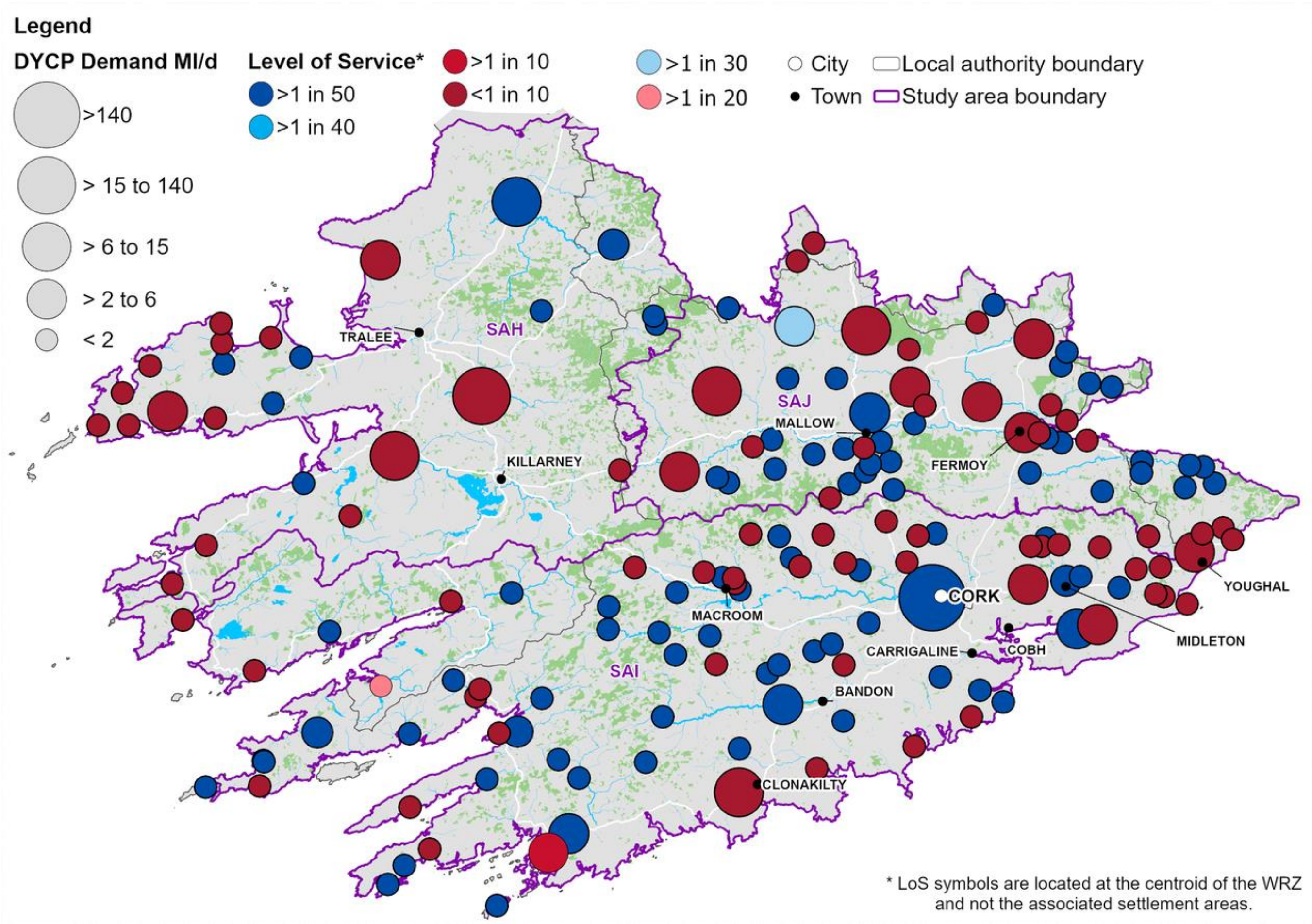

Figure 3.5 LoS for each WRZ for a Dry Year Critical Period (DYCP)

Our current LoS in Ireland is low compared to international norms. In the UK, the current LoS is generally over 1 in 100-year LoS (Appendix D of the Framework Plan). Given the current low LoS for some of our supply systems and the additional uncertainty in the future LoS due to the unknown impact of impending Abstraction Legislation (to be introduced in support of the Water Framework Directive), through this first iteration of the NWRP our aim is to provide a minimum supply Reliability of 1 in 50 to all of our customers. That is, there would be a 2% chance that customers will experience a supply failure in any given year. To achieve a higher LoS will take multiple investment cycles to realise and will not enable a uniform improvement to all our customers.

3.2.2 Current Water Supply

At present, we abstract more water from surface water sources (rivers and lakes) than from groundwater sources (boreholes and springs) for public water supply in the South West Region RWRP-SW. This is illustrated in Figure 3.6 which shows that although we have 75 surface water sources and 172 groundwater sources, our surface water sources provide 81% of our total supply, whilst groundwater sources provide only 19% of the supply.

This is driven by a number of factors, including the historical development of public water supplies, complexity in assessing the availability of groundwater as a water source, and the natural geological conditions in Ireland. Whilst most of Ireland’s bedrock is classified as an aquifer, it is relatively poor at storing and transmitting groundwater. This limits the volumes available for abstraction and in some cases resilience during dry periods.

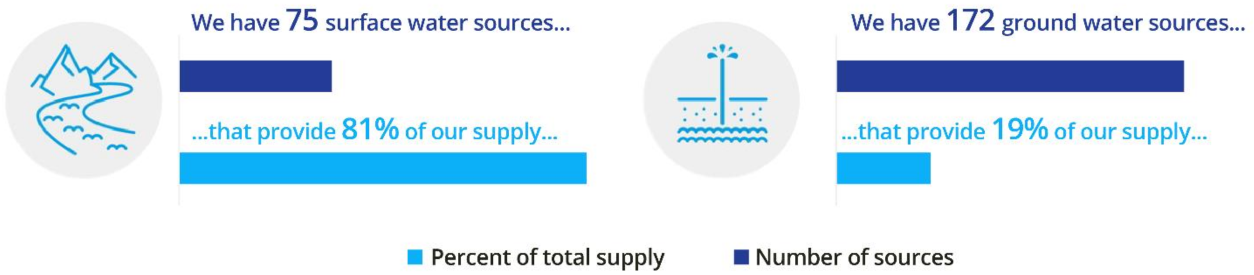

Figure 3.6 Water Supply Sources

The location of the existing surface water and groundwater abstraction points is shown in Figure 3.7. The figure shows that the majority of the groundwater abstractions (well/boreholes) are located to the eastern side of the region in Study Area (SAJ) and Study Area I (SAI). The vast majority of springs are located in SAJ with a secondary cluster located on the Dingle Peninsula in Study Area H (SAH). Through Kerry, West Cork and the Iveragh and Beara Peninsula surface water from river and reservoir intakes is most dominant reflecting the poorly productive bedrocks in these areas. Table 3.3 compares the WAFU from surface water and groundwater sources across the region.

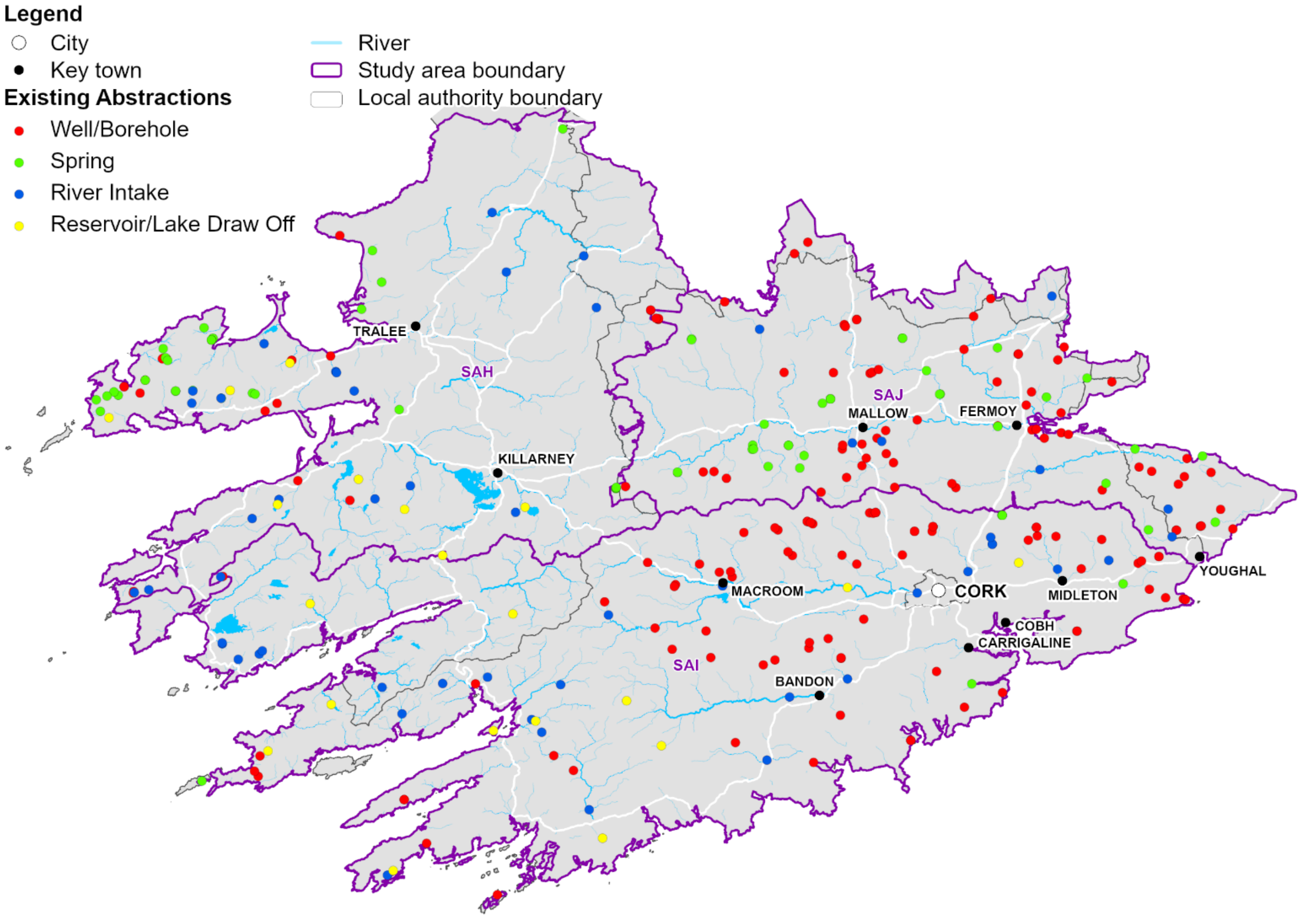

Figure 3.7 Existing Abstraction Locations in the South West Region

A comparison of surface water and groundwater sources within the Study Areas is shown in Figure 3.8. The pie charts show the proportion of each source type as a percentage of the total WAFU (Water Available for Use) for the NYAA (Normal Year Annual Average) planning scenario.

SAH and SAI rely predominantly on surface water. In SAH the regional centre of Killarney is supplied from Lough Guitane whilst Listowel is supplied from the River Feale. In SAI the River Lee and associated impoundment at Inniscarra is the main supply source for Cork City. However, whilst Lough Guitane and the River Feale and River Lee are predominantly fed by surface water runoff, and are hence considered surface water sources, it should be noted that they are all supported by groundwater flows.

In contrast, groundwater is the predominant supply source in SAJ with 78% of the supply being supplied from groundwater sources. Villierstown borehole, Aglish Cul Rua borehole and Tallow Spring are the three (3) largest supplies in SAJ.

Table 3.3 WAFU in 2019 for our Study Areas (NYAA)

SA NO.	SA NAME	NYAA WAFU					
		Groundwater		Surface Water		Total	
		(Ml/d)	(% of Region)	(Ml/d)	(% of Region)	(Ml/d)	(% of Region)
SAH	Kerry	10.5	17.7%	65.1	26.5%	75.6	24.8%
SAI	Cork/South Kerry	11.4	19.3%	170.4	69.4%	181.8	59.6%
SAJ	North Cork and West Waterford	37.3	63.0%	10.2	4.2%	47.5	15.6%
	Total	**59.2**	**100%**	**245.7**	**100%**	**304.9**	**100%**

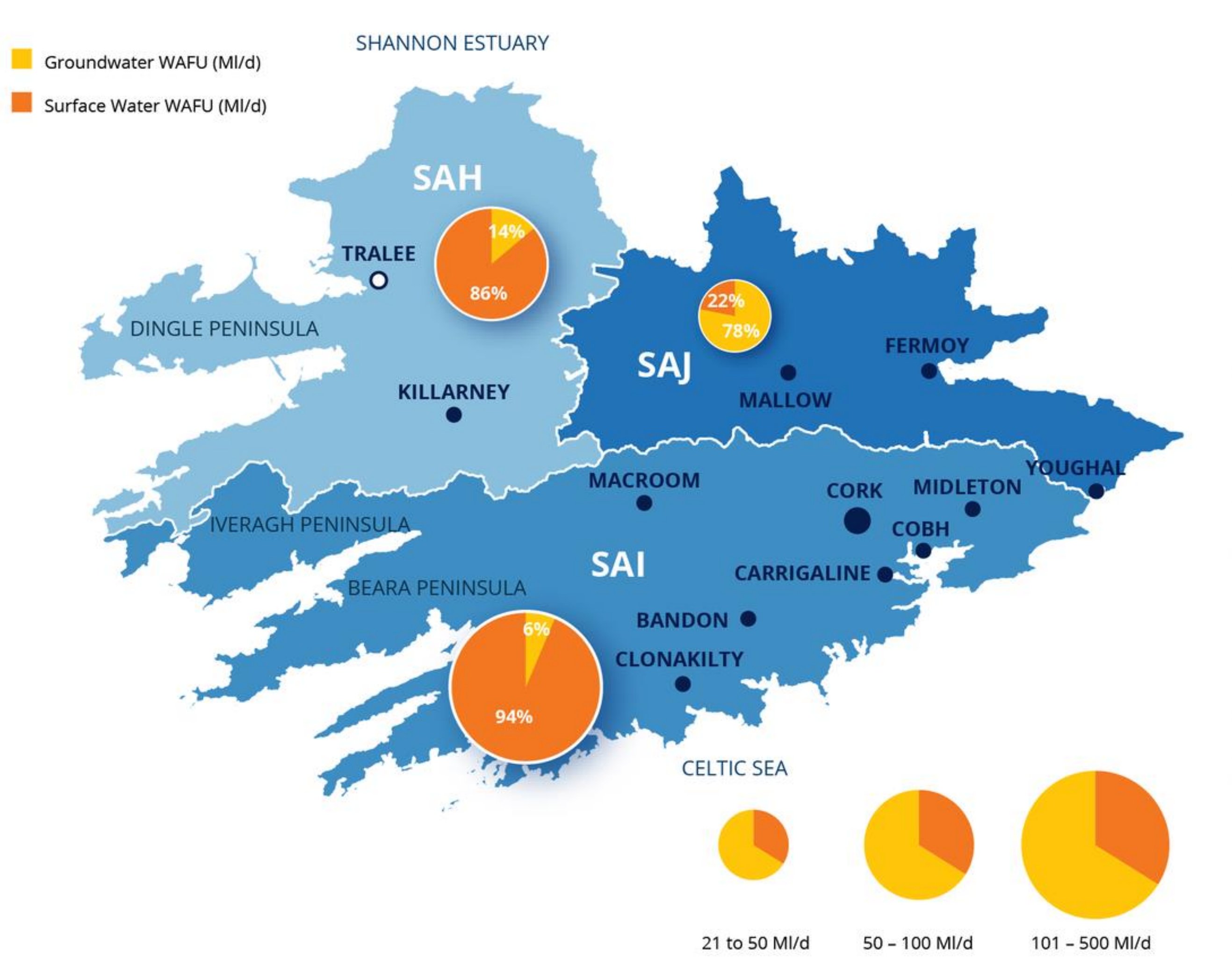

Figure 3.8 Comparison of Groundwater and Surface Water WAFU across the Study Areas for the NYAA

3.2.3 Hydrological Yield

To determine the WAFU we must understand the **Hydrological Yield**, which is the amount of water that is available from a source, be it a river, lake or groundwater body. The Hydrological Yield is dependent on the size, location and hydrological properties of the catchment or groundwater body from which we abstract and the Level of Service we aim to provide.

Surface Water Sources

The quantity of water available from our surface water sources varies throughout the year. Less water is typically available from April to September. For example, the April to September average flow is approximately 30% of the annual average flow on the River Clyda, which supplies Mallow in SAJ. We assess the water available for abstraction from our direct river abstractions (referred to as the hydrological yield) using Flow Duration Curves (FDCs). A FDC describes the percentage of time that flow is likely to be equalled or exceeded. For example, the 95th percentile flow, denoted as Q95, is the flow equalled or exceeded 95% of the time. The Q95 would represent a low flow in the river, whereas the 5th percentile (or Q5 flow) would represent a high flow that is only equalled or exceeded 5% of the time.

As an example, the FDC for the River Clyda is shown on a logarithmic scale in Figure 3.9. This shows a moderate variation in low and high flows with the 95th percentile flow approximately 0.4 cubic metres per second (m^3/s) compared with the 5th percentile flow of 8.5 m^3/s. The slow rising limb in the high flow region suggests a drainage basin with shallow slopes and vegetative cover that provides infiltration capacity, while the drop near the low flow range indicates that baseflows may not sustain flows in dry periods.

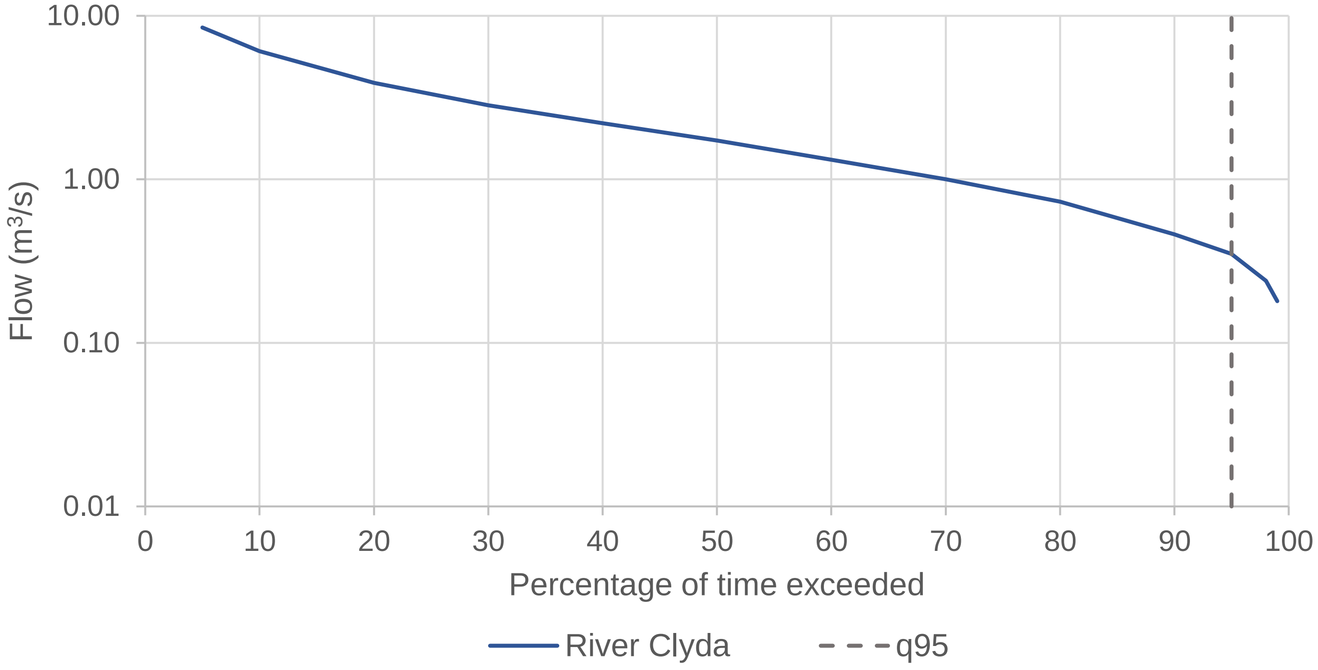

Figure 3.9 Hydrological Characteristics of the River Clyda, near Mallow

A similar approach is used to determine the hydrological yield for lakes and impounding reservoir sources, with the additional consideration of available water storage. The hydrological yield is calculated for a given source based on maintaining a 1 in 50 LoS. The method for calculating the hydrological yield from river and lake sources is summarised in our Framework Plan.

The hydrological yield across our surface water sources varies. Approximately 20% of the region's surface water sources characterised by a yield of less than 100 m^3/day, whilst approximately 10% are characterised by a yield of over 20,000 m^3/day. The highest yielding sources include: Innascarra Reservoir on the River Lee; the direct river abstractions for Cork City from the River Lee and Inishannon; the River Feale supplying Listowel Regional Public Water Supply; and the Bandon River supplying Bandon Regional WRZ.

Groundwater Sources

The yield of our groundwater sources is largely dependent on the inherent hydrogeology. Most of the South West Region's groundwater sources yield less than 1,000 m^3/day (1 Ml/d) as much of the region is underlain by poorly productive aquifers. Approximately 60% of groundwater sources in the South West Region have a yield of less than 100 m^3/day (0.1 Ml/d). These sources serve small rural settlements. The highest yielding source is spring fed and serves Whitegate Regional WRZ in SAI.

Appendix C of the Framework Plan provides further information on the aquifer categories and the expected yields across Ireland.

3.2.4 Current and Future WAFU

The WAFU is generally restricted by the capacity of the water supply assets, rather than the hydrological yield of the source. However, this can alter during dry periods when our river flows and groundwater sources are not replenished by rainfall. In some situations, the WAFU is restricted by the conditions of an abstraction licence. In the normal year (NYAA) planning scenario 47 of our 227 water treatment plants are restricted by the hydrological yield of the source. For the Dry Weather Planning Scenario (DYAA), the number of systems that are limited by the hydrological yield increases to 53. This increases further to 64 for the dry year critical period (DYCP). This is illustrated in Figure 3.10 which shows the number of sources that are limited by hydrological yield compared with sources that are limited by WTP (or distribution capacity) or abstraction licence constraints. During the winter critical period (when flows are high) the WAFU is constrained by the capacity of the water treatment plant. Further detail on the calculation of the baseline WAFU (current available supply) and forecast WAFU (reflecting reduced availability as a result of climate change and proposed changes to existing) can be found in Chapter 3 of our Framework Plan.

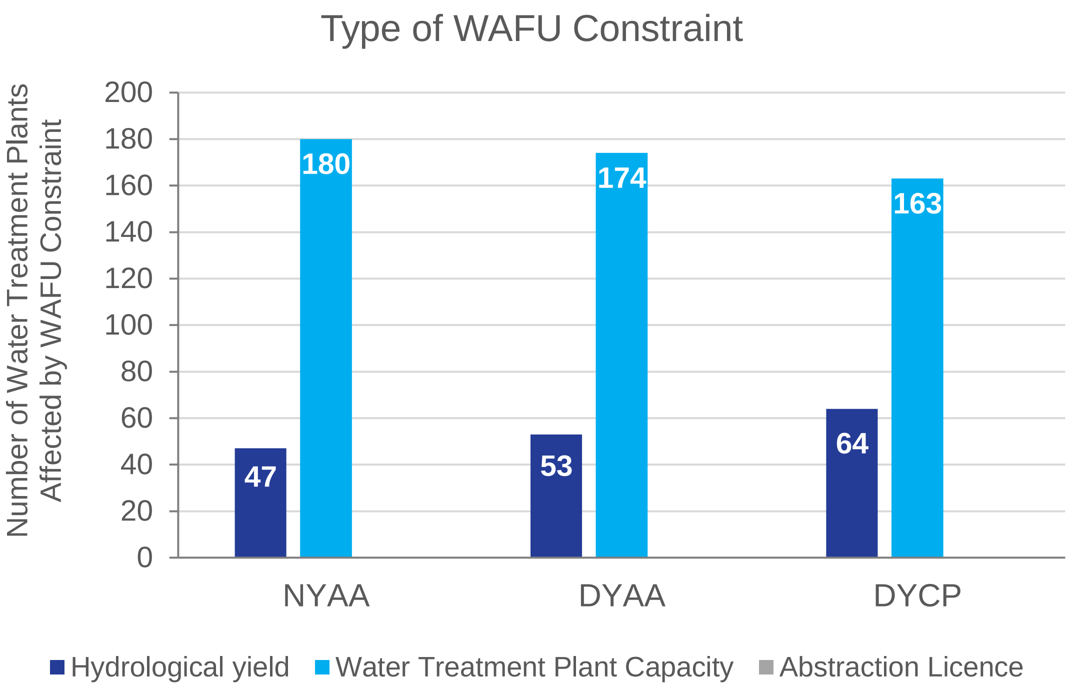

Figure 3.10 Limiting Factor of WAFU at our Water Treatment Plants

The change in estimated WAFU from the base year (2019) to the end of the planning period (2044) is summarised in Table 3.4 and shown in Figure 3.11.

Table 3.4 Change in WAFU, 2019 to 2044

Weather Planning Scenario	Estimated WAFU (Ml/d)		Estimated Change in WAFU (2019 to 2044)	
	2019	2044	Total (Ml/d)	%
NYAA	304.9	301.0	-3.9 ⬇	-1.28 % ⬇
DYAA	293.8	290.4	-3.4 ⬇	- 1.16% ⬇
DYCP	318.1	314.7	-3.4 ⬇	-1.06% ⬇
WCP	396.0	396.0	0.0	0%

⬆ = Increase in WAFU

⬇ = Decrease in WAFU

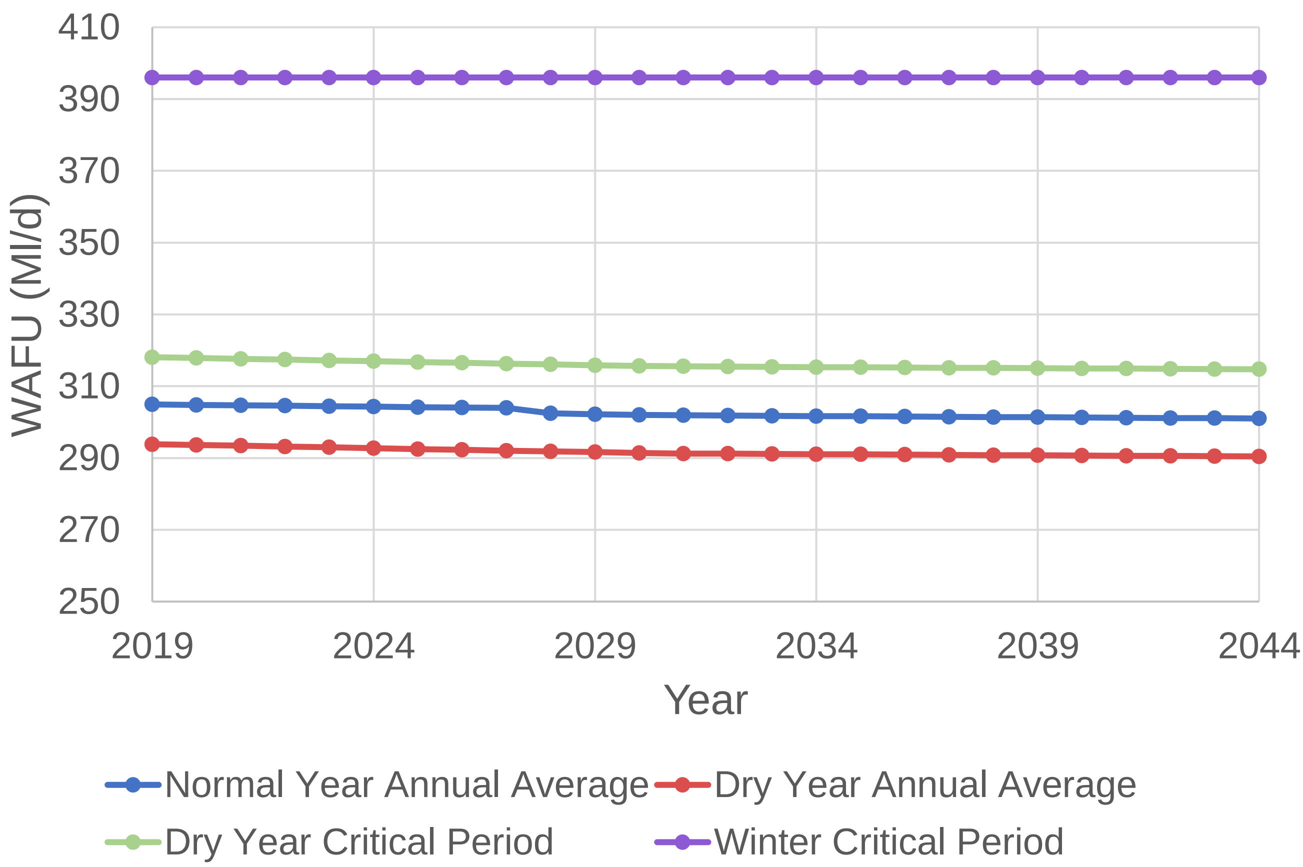

Figure 3.11 Regional Summary of WAFU, 2019 to 2044

Presently, for a normal year (NYAA) the maximum WAFU for the region is approximately **305 Ml/d.** (as shown in Figure 3.11). This will decrease by 2044 to **301 Ml/d** as a result of the impacts of climate change. As such there is a 1.3% decrease in WAFU over the 25-year planning period for the NYAA.

For a dry year (DYAA) the maximum WAFU is estimated to be **294 Ml/d.** This reduces to an estimated **290 Ml/d** in 2044. The WAFU is less in a dry year than in a normal year as dry weather conditions reduce the amount of raw water (Hydrological Yield) that we can abstract from our sources.

For a drought period (DYCP) the estimated maximum WAFU is **318 Ml/d** reducing to an estimated **315 Ml/d** in 2044. Under drought conditions, water treatment plants are operated at a higher capacity to assist in meeting higher water demands due to increased outdoor usage, minimising the reduction in the WAFU.

3.2.4.1 Climate Change Impact

During the planning period for the NWRP, WAFU is forecast to reduce due to climate change. We have allowed a reduction of 12% by 2044 for river hydrological yields in a dry year and 4% for springs and surface water sources with storage, such as abstractions from loughs. For groundwater sources we have assumed a reduction of 1% over the planning period in line with projected changes in average precipitation, which drives groundwater recharge. Geological Survey Ireland (GSI) have embarked on a groundwater monitoring and modelling project that seeks to understand the impact of climate change on the groundwater resources in Ireland[1]. It is envisaged that the findings of this project will inform and assist in iterative sustainable yield assessments and will help in the monitoring and understanding of operational data. The research will help us identify supplies which are potentially susceptible to reductions and enable Irish Water to adapt our resource management.

Additional information on Irish Water's approach to considering the effects of future climate change is provided in Appendix F of our Framework Plan.

When improvements in the Level of Service (Reliability) have been accounted for, the overall regional reduction in WAFU due to climate change is estimated to be **3 Ml/d** under the DYAA and DYCP weather scenario.

3.2.4.2 Sustainable Abstractions

The Government is currently developing new legislation dealing with water abstractions, with the Water Environment (Abstractions and Associated Impoundments) Bill 2022[2]. The new regulatory regime, which is required to meet the requirements of the Water Framework Directive (WFD (2000/60/EC)[3], will inevitably result in modifications to the way that Irish Water currently abstract from its individual water sources. However, as this legislation is still being developed, Irish Water do not have full visibility of the future regulatory regime and therefore we cannot reliably include an estimation of sustainable abstraction within the SDB calculations at this stage. A more detailed site by site assessment will be required when the legislation is published in its final form.

Notwithstanding this, in Section 2 of this Plan, in the absence of legislative requirements, Irish Water has proactively undertaken an independent conservative assessment of abstractions based on UKTAG standards[4] to determine (i) the potential impact on our SDB and (ii) to identify possible alternative solutions to improve the sustainability of our abstractions. This assessment procedure is set out in Appendix C of the Framework Plan and is in line with a precautionary approach. Under the proposed regulatory regime, sustainable abstraction quantities will be adjudicated by the Environment Protection Agency (EPA), and therefore the assessment undertaken by Irish Water is a conservative estimate only, the purpose of which is to help influence future planning.

Sustainable abstraction is dealt with in two (2) ways as part of the NWRP:

- The desktop assessments for all new surface water and groundwater abstractions identified under the Preferred Approach for each Study Area (presented in Section 7) are developed based on conservative assessments to ensure that they are sustainable. These will be further assessed, including site level environmental assessments, should a Preferred Approach advance to project level.
- A Sensitivity Analysis is conducted for each WRZ, to allow us to stress test the sensitivity of the Preferred Approach against potential sustainability driven reductions to existing abstractions (again, taking a conservative and precautionary approach as to the level of reductions that may be required). This will ensure that our decision making is robust and the Preferred Approaches are adaptable and compatible with future potential regulatory regimes, in so far as this can be anticipated at this stage.

The SDB does not include the impacts of the pending abstraction regulations and reform. When implemented, this new legislation will have the potential to increase the Deficits by reducing the amount of water that we can abstract from some sources.

Under the proposed new Abstraction Legislation our available regional water supplies could reduce from an estimated 316 Ml/d to an estimated 235 Ml/d in a normal year, which represents a percentage decrease of 26%.

3.2.5 Current Demand

On average Irish Water currently supply 316 Ml/d of water in a normal year (NYAA) to approximately 594,400 people in the South West Region. This represents the Distribution input which includes domestic and non-domestic consumption, operational use, apparent losses and leakage. In 2019 the public water supply served approximately 238,700 domestic and about 45,000 non-domestic properties in the region. A summary of Irish Water's customers and the volume supplied to meet domestic and non-domestic needs is provided in Table 3.5.

Table 3.5 Summary of Irish Water's Demand in the South West Region

Item	Number in 2019
Total population served	594,400
Number of domestic properties served*	238,700
Number of non-domestic properties served*	45,000
Total quantity of water supplied	316 Ml/d (average)
Number of WRZs	174

* Data derived from census data cross-referenced with Irish Water demand and leakage management databases

Table 3.6 highlights how water is used across the varying sizes of WRZs in the South West Region. Out of 174 WRZs, 130 serve a population of less than 1000. In total these 130 WRZs account for just 4% of the population served by Irish Water. In contrast, the largest WRZ, Cork City serves a population of 284,940 accounting for 48% of the population served by Irish Water in the South West Region and 42%

of the total Demand for the South West Region. The second largest WRZ, Central Regional Lough Guitane, serves a population of 73,200 accounting for 12% of the total population in the South West Region and 13% of the total Demand in the South West Region.

Table 3.6 Summary of Irish Water's WRZ in the South West Region

WRZ category	Population served category	Number of WRZs in category	Population in 2019 (million) (% of regional total)	Demand in 2019 (Ml/d) (% of total)
Very Large WRZ: Cork City	Over 100,000	1	284,940 (48%)	132.1 (42%)
Large WRZ: Central Regional Lough Guitane	25,000 to 100,000	1	73,200 (12%)	42.2 (13%)
Medium WRZs	5,000 to 25,000	15	146,540 (25%)	86.5 (28%)
Small WRZs	1,000 to 5,000	27	63,590 (11%)	39.2 (12%)
Very Small WRZs	0 to 1,000	130	26,110 (4%)	16.0 (5%)

The main components of the demand for 2019 for the region are shown in Table 3.7 and Figure 3.12. These values were determined using data from our Leakage Management System (LMS) which draws together a range of live data including numbers of customers, metered customer usage and water put into supply.

Table 3.7 South West Regional Water Demand for 2019

Water balance component	Volume in 2019 (Ml/d)	% of total in 2019
Domestic consumption	88.2	28%
Non-domestic consumption	70.0	22%
Operational use	2.9	1%
Apparent Losses	1.8	1%
Leakage	153.1	48%
Distribution input (i.e., total water supplied)	316.1	**100%**

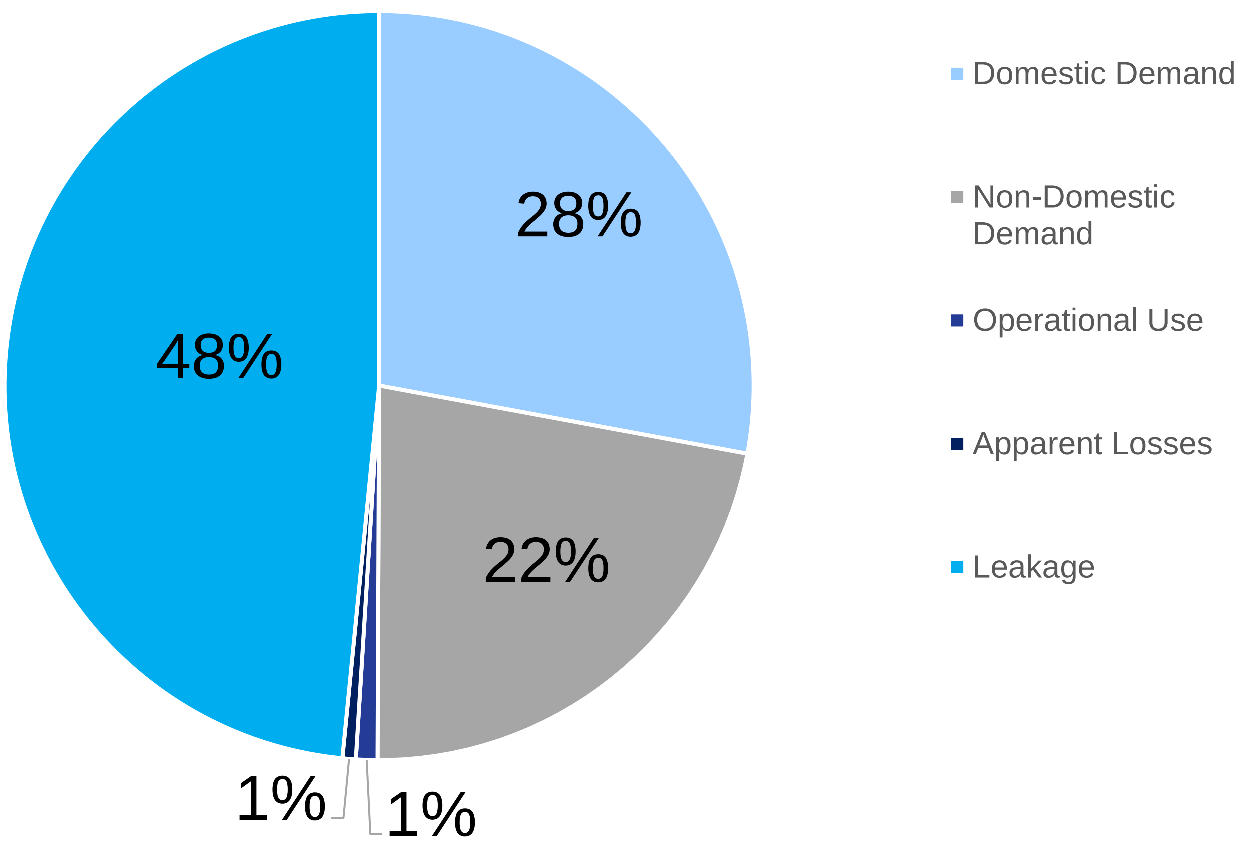

Figure 3.12 South West Region – Components of 2019 Demand

Leakage is currently estimated as the largest component of demand at 153 Ml/d. As explained in Chapter 4 of the Framework Plan, our leakage estimate to our economic regulator, the CRU, is reported as Distribution Network Leakage. However, due to the potential underestimation of Per Capita Consumption in non-metered households, which represent approximately 43% of properties, our Distribution Network Leakage may be overestimated, and in reality, is closer to a Total Leakage assessment.

Our approach to calculating the components of the Base Year Demand is describe in Chapter 4 of our Framework Plan.

Distribution Network Leakage is water losses across the public distribution network (excluding Customer Side Leakage (CSL)).

Total Leakage is the combined water losses across the public distribution networks in addition to leakage in private customer supply pipes and private plumbing systems (based on estimated values for customer side leakage).

3.2.6 Demand Forecast

Over the next 25-years:

- Water use by domestic customers is forecasted to increase due to significant population growth;
- Non-domestic water use is forecasted to increase due to economic growth; and
- Large reductions in leakage are planned.

The approach to calculating these components of the demand forecast is described in Chapter 4 of our Framework Plan and summarised in the following sections.

3.2.6.1 Population Growth

The estimated population currently living in each WRZ is based on the 2016 Census data. The 2016 population was assigned to District Metering Areas (DMAs) by mapping the Central Statistics Office (CSO) data to DMA boundaries. This was then used to determine current population at the WRZ level.

As outlined in Section 4.3 of our Framework Plan, we have projected the 2016 population forward to 2019 to establish our base year populations. The growth projections were based on the draft National Planning Framework (NPF) and updated information from the Regional Spatial and Economic Strategies (RSES) and Local Authority Planning sections (where available). The growth projections from the NPF and RSES have also been used to forecast populations in each WRZ across our 25-year planning horizon. As some WRZs comprise a mix of different settlement types, and can serve both urban and rural areas, we have proportionally allocated different growth rates for these mixed WRZs.

Further details of the population forecasts are provided in Table 3.8. These figures will be reviewed for the next iteration of our National Water Resources Plan (NWRP), when Local Authority Development Plans are adopted.

Table 3.8 Population Growth Rate of Settlements in the South West Region based on the draft NPF*

Settlement/type of settlement	Percentage population growth 2019 to 2044 (%)	Comment
Cork City	54%	Growth from 93,150 in 2019 to 143,220 in 2044
Cork City and surrounding area**	47%	Growth from 284,940 in 2019 to 419,090 in 2044
Towns with population over 10,000 in 2016	On average 26%	Four (4) settlements in the South West Region – Tralee, Killarney, Midleton and Mallow.
Towns with population between 1,500 and 10,000 in 2016	On average 16%	21 settlements in the South West Region (excluding settlements connected to the Cork City WRZ).
Settlements with population <1,500 in 2016	15%	15% growth assumed for all settlements with population <1,500

*The NPF growth rates were provided to 2040. We extended this rate of growth for the remaining 4 years of the Plan. For example, if NPF rates for Cork were 54% by 2040 we added an additional 2.29% every year after that to bring the total growth to 64% by 2044.

**The population figure for Cork City and surrounding area includes Cork City as well as Cork City Harbour, Galshaboy, Innashannon and other smaller connecting settlements.

The NPF envisages a 54% growth in Cork City between now and 2040 with various rates for the remainder of the country based on settlement size. The WRZ that covers Cork City includes Cork City and harbour, Glashaboy, Innashannon and other smaller settlements. The anticipated growth in this WRZ is 47% and represents a weighted combination of Cork City and suburbs and applicable growth rates for the other areas.

3.2.6.2 Domestic Demand Forecast

Domestic demand is calculated by multiplying the population forecast by the Per Capita Consumption (PCC). Factors that drive changes in the PCC can include occupancy rates and technology changes.

It is expected that the occupancy rate of homes in Ireland will decrease in the future meaning the average household will be smaller. This will tend to increase PCC levels as the components of water use which are shared amongst the household will be spread across fewer occupants. However, recent models of appliances such as washing machines and dishwashers use less water per cycle, and so their uptake can off-set increases in consumption from lower occupancy rates.

Due to current data limitations in Ireland, data from the UK was used in our Framework Plan to assess potential changes to PCC for the period of the Framework Plan. We have considered how the improvement in appliance efficiency combined with falling occupancy (based on the NPF) would impact PCC over the next 25-years. This work has indicated that in Ireland, PCC would be expected to increase by 1 l/p/d by 2044, largely driven by reduced household occupancy rates.

On a conservative basis, for the purposes of the Framework Plan, we have taken the view that we should not allow PCC to increase by 1 l/p/d from current levels. This would be achieved under our Use Less pillar (described in Section 5 of this Plan) where we aim to reduce water use through efficiency measures. Therefore, our domestic demand forecasts are based on no change in PCC over the 25-year period of the Plan. Further details of our demand forecast and PCC assumptions are included in Chapter 4.2.2 of the Framework Plan.

The domestic consumption forecast is summarised in Table 3.9 for all areas served by Irish Water in the South West Region. The South West Region contains only two ‘Very Large’ WRZs (Cork City and Central Regional Lough Guitane) which have been presented individually.

Table 3.9 Summary of Domestic Consumption Forecast by WRZ (Ml/d), NYAA

WRZ Category	2019	2024	2034	2044
Very Large WRZ: Cork City	45	45	52	60
Large WRZ: Central Regional Lough Guitane	11	12	13	14
Medium WRZs	22	23	25	27
Small WRZs	10	10	11	11
Very Small WRZs	4	4	4	5
Total (all 174 WRZs)*	88	94	105	117

*Note: Values may not sum exactly due to rounding

Based on forecast population growth, it is estimated that domestic water demand will increase from 88 Ml/d (in 2019) to 117 Ml/d in 2044, for a normal year (NYAA). We are not allowing for any increase in PCC over the period of the Plan.

3.2.6.3 Non-Domestic Growth and Forecast Demand

There are significant differences in water use trends amongst non-domestic customers across our WRZs. This is because water use at non-domestic properties varies enormously from sector to sector, and from property to property. The consumption volumes are primarily related to economic factors, water-use intensity and how this is changing, rather than to numbers of business customers.

Therefore, an allowance for non-domestic growth will be required for towns and cities identified as strong growth areas in Project 2040[5]. For other areas, it is assumed that there will be no significant increase in non-domestic demand, as shown in Table 3.10.

Table 3.10 Summary of Non-Domestic Consumption Forecast*

WRZ Category	2019	2024	2034	2044
Very Large WRZ: Cork City	33	34	35	36
Large WRZ: Central Regional Lough Guitane	10	10	10	10
Medium WRZs	18	18	18	18
Small WRZs	8	8	8	8
Very Small WRZs	2	2	2	2
Total (all 174 WRZs)	70	71	72	73

*Irish Water are committed to the continuous improvement of data sets used within the SBD. These figures are based on the most recently available data.

We have estimated the non-domestic water use for 2019 to be 70 Ml/d across the South West Region. This is projected to increase to 73 Ml/d by 2044.

We have considered the following data to derive an appropriate non-domestic demand forecast for Cork City:

- Intelligence from Local Authorities regarding any specific known expansions
- New Connection Applications
- Growth rates from the NPF

We have taken an informed view that the significant expected increase in population for Cork City of 54% by 2040 will also drive an increase in non-domestic demand. However, non-domestic growth trends are likely to be lower than the growth in domestic demand, as our non-domestic customers are incentivised to use less water through volumetric tariffs. For this reason, an estimated 10% growth in non-domestic demand is assumed for Cork City over the 25-year planning period.

Rest of the South West Region

As in other jurisdictions, we have concluded that there will be no increase in non-domestic demand as the growth in non-domestic demand, outside of Regional Growth Cities, is assumed to be offset by water efficiency. However, Irish Water continually assesses the potential for non-domestic activity through our interface with the Local Authority Planning Sections and the Connection Developer Services Function in Irish Water. Therefore, where data on significant non-domestic growth emerges, we will update the SDB.

While it is noted that farming production is expected to increase significantly over the coming years (Food Wise 2025[6]), the impact this will have on the volume of treated water required is uncertain.

Therefore, we have not allowed for growth for agricultural demand in our forecasts. We will engage with the agricultural sector to understand their water requirements over the coming years. However, existing agricultural demand is accounted for in our 2019 baseline demand. This will be monitored as per the process described in Chapter 8 of the Framework Plan, monitoring and feedback into the NWRP. Further details of our approach to different areas are provided below.

3.2.6.4 Operational Use

Operational use includes water used by Irish Water at our sites, for mains cleaning in operating the distribution network, at hydrants for firefighting, and by Local Authorities for road and gully cleaning. We do not have data which allows us to make a direct estimate of the quantity of operational use in each WRZ. We have therefore assumed that the operational use of water is 1% of distribution input, based on data from the other water utilities in other jurisdictions with similar characteristics.

We estimate that the operational use of water is 1% of distribution input for 2019.

3.2.6.5 Apparent Losses

Apparent Losses include water that is used in properties (both domestic and non-domestic) through permanent and temporary connections that are currently unknown to us. We do not have data which allows us to make a direct estimate of the quantity of apparent losses in each WRZ. Therefore, we have assumed that this amounts to 1% of distribution input in urban areas, based on data from UK water utilities with similar characteristics. We have reduced the allowance to 0.5% in rural areas reflecting the lower density of connections. However, during our Framework Plan consultation period, it was raised by a number of our Local Authority Water Services partners that this figure could be a gross underestimate of apparent losses. As we progress optimisation of our District Metered Area's we will refine data in relation to this.

We estimate that apparent losses amount to 1% of overall demand for 2019 in urban areas and 0.5% in rural areas.

3.2.6.6 Leakage

Irish Water will take a three (3) step process to reduce leakage both nationally and within the South West Region. In summary this includes:

Step 1: Reaching Sustainable Economic Level of Leakage (SELL) by 2034 - The SELL concept is built on the principle that when the total costs of producing water (including environmental and social) are greater than the cost of reducing leakage, there is a natural driver to further reduce leakage to achieve equilibrium. SELL targets are presented and discussed further in Section 5.

Step 2: Go Beyond SELL - Irish Water have set additional leakage targets with the objective of reducing leakage levels to 21% of total demand for larger WRZs (WRZs where demand is greater than 1,500 m^3/day).

Step 3: Appropriate Leakage Level (ALL) (Post 2034) – setting of further leakage reduction targets based on WRZ level and site-specific assessments which will require data which is not yet available to Irish Water.

Further details of the targets and this process can be found in Section 5. Details of the SELL assessment process can be found in Appendix H of the Framework Plan. The SELL targets for the Eastern and Midlands Region have been summarised in Section 5 and presented in the RWRP-EM.

The SELL target for the South West Region is 57 Ml/d. Leakage targets are not automatically applied to the Supply Demand Balance calculations. Leakage outside of the Greater Dublin Area (in the Eastern and Midlands Region) is prioritised on an annual basis as part of the National Leakage Reduction programme. This allows Irish Water's leakage reduction programmes to be flexible and targeted, to meet specific emerging needs. However, as set out in Section 4.3.3 of the Framework Plan leakage targets for 2019 were applied to priority supplies (further information can be found in Section 5.2.2 of this Plan) and therefore 3.7 Ml/d of the 57 Ml/d of planned leakage reduction in the South West Region have been incorporated into the SDB. Leakage reductions are applied to the SDB by reducing the Demand component of the calculation. For this reason, the future estimated Deficit will reduce as a lower Demand is subtracted from the available supply. It is acknowledged that if these leakage targets are not met then the Preferred Approach) will not fully meet the Demand and therefore will not address the Deficit. For this reason, we are working to meet these targets now, in advance of the Preferred Approach reaching project stage.

Where leakage reductions have not been applied to the SDB any leakage reduction that is achieved prior to the delivery of the Preferred Approach, will result in a reduction to the projected Demand. In this scenario the Preferred Approach to address the Deficit within each WRZ, Study Area or the Region may be capable of providing more water than is needed. In this scenario, this will enable us to modify the Preferred Approach to reduce the quantity of water required to be delivered or if it coincides with greater than expected growth it will open up available water for this increased Demand. For this reason, our leakage targets will be reviewed annually and will be subject to further modification at project level where we will review the SDB.

The remaining 53.3 Ml/d of leakage reductions (required to achieve 57 Ml/d of SELL leakage reductions within the South West Region) are not incorporated into the SDB but will be incorporated before 2034 based on annual priorities. At project level, when we proceed to develop the Preferred Approach, we will review the SDB and subtract the target leakage reductions from the Deficit at this stage. This ensures that the Preferred Approaches are not oversized, or that the Needs are over emphasized. Similarly further leakage targets (Go Beyond SELL and ALL) have not yet been applied to the SDB but will be applied appropriately over the coming years.

3.2.6.7 Total Demand

Figure 3.13 and Table 3.11 show the Total Demand for water from our regional supply networks. Presently, in a Normal Year (NYAA), the Total Demand is 352 Ml/d and in an average Dry Year (DYAA) is 359 Ml/d.

Our requirements for water in a drought or severe winter period can increase the Total Demand by up to 16%. For the DYCP (drought), the current Total Demand is 424 Ml/d. The Total Demand is higher still for the WCP at 461 Ml/d, due to the increase in pipe bursts resulting from freeze-thaw conditions.

Total Demand is forecast to increase by about 8% for all Weather Planning Scenarios despite the estimated overall regional population increase of 33%.

This comparatively small increase in Total Demand is attributed to the ambitious leakage reduction targets we have set ourselves.

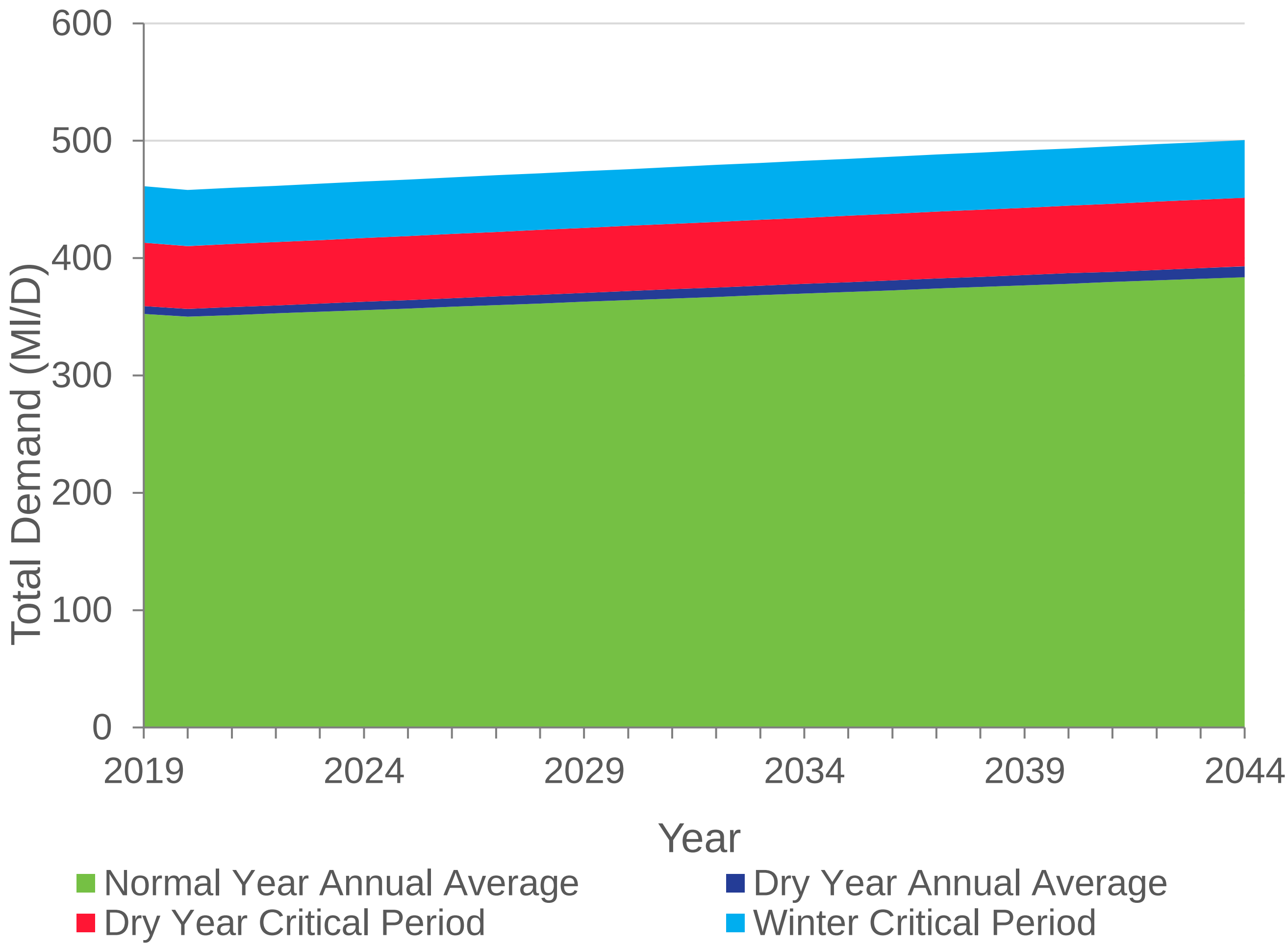

Figure 3.13 Regional Summary of Total Demand, 2019 to 2044

Table 3.11 Regional Summary of Total Demand

Weather Planning Scenario	Total Demand (Ml/d)		Change	
	2019	2044	Total (Ml/d)	(%)
NYAA	352	384	31 ↑	8.2% ↑
DYAA	359	393	34 ↑	8.6% ↑
DYCP	424	464	40 ↑	8.7% ↑
WCP	461	500	39 ↑	7.8% ↑

↓ = Reduced Demand

↑ = Increased Demand

3.2.7 Supply and Demand Balance

We combine our forecast calculations for supply and demand over the next 25 years, to understand the Deficits (Need) in the SDB that we will need to address.

Supply Demand Balance (SDB) calculations have been developed for the 174 WRZs in the South West Region. The calculations cover the 25-year planning period from 2019 to 2044. The SDB calculations for each WRZ in the South West Region are included in Appendix L of the Framework Plan.

As explained in Section 3.2.3, potential reductions in our allowable abstractions may be required to meet environmental standards outlined in the Water Framework Directive. These reductions are not currently included in the calculation of the SDB; however, we have assessed the potential impact of the impending Abstraction Legislation in a Sensitivity Analysis of our Preferred Approaches. This is explained in more detail in Section 3.5 below.

For the purposes of the regional summary, we have presented this information as:

- The regional net Surplus or Deficit across the 174 WRZs for each Weather Planning Scenario; and
- The number of WRZs that would be in Deficit (i.e., where there would be a risk of supply disruption to our customers) compared with the number of WRZs in Surplus.

Net Surplus & Deficit

Figure 3.14 and Table 3.12 show the regional summary of the forecast net Surplus or Deficit across our Weather Planning Scenarios for 2019 and 2044. This volume is calculated by subtracting the Total Deficit from the Total Surplus volume across the WRZs.

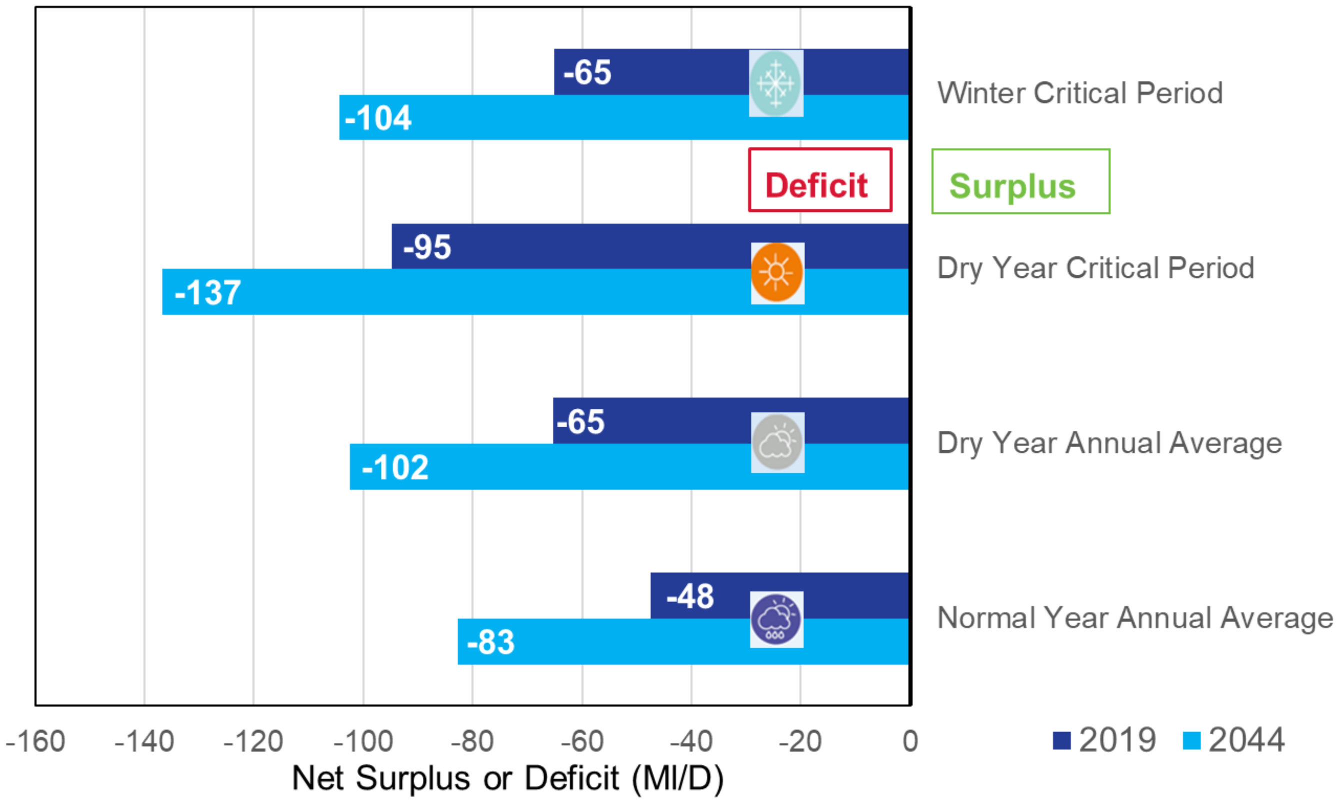

Figure 3.14 Regional Summary of the SDB for 2019 to 2044

At present, there are Deficits (i.e., Total Demand exceeds the WAFU) for all Weather Event Planning Scenarios, including during a normal year. At present these Deficits do not regularly translate to outages to our customers due to our responses, including emergency pressure reduction and management of supplies.

The largest current net Deficit in the SDB (2019) is for the DYCP, with a net Deficit across the South West Region estimated to be 95 Ml/d. The largest Deficit occurs under the DYCP scenario because raw water sources are impacted during the extreme warm periods such as drought which typically coincides with increases in Demand.

Table 3.12 Regional SDB Estimated Net Deficit Change from 2019 to 2044*

Weather Planning Scenario	Estimated Net SDB Deficit (Ml/d)		Estimated Change	
	2019	2044	Total (Ml/d)	(%)
NYAA	-48	-83	35 ⇑	74% ⇑
DYAA	-65	-102	37 ⇑	57% ⇑
DYCP	-95	-137	42 ⇑	44% ⇑
WCP	-65	-104	39 ⇑	60% ⇑

⇑ = Increased Deficit

* The regional Deficit is not equal to the total WAFU – Demand as this would assume all WRZs are interconnected. The regional Deficit is the sum of all the individual Deficits for each WRZ.

The net Deficit regionally for the WCP is estimated to be 65 Ml/d. There are normally no restrictions to the amount of water we can abstract during the WCP. This Deficit is predominantly driven by the ability of our water treatment plants and distribution networks to cater for the increased Demand driven by water main bursts and increased leakage resulting from the impact of freeze-thaw conditions on the water supply infrastructure.

By 2044, our SDB Deficit will increase across all Weather Planning Scenarios. This is primarily due to a growth in Demand, combined with a forecast reduction in water availability due to climate change.

Figure 3.15 shows the Total Deficit and Surplus across the South West Region for each of the planning scenarios. In a normal year (NYAA) there are 91 WRZs in deficit, with an estimated Total Deficit of 56 Ml/d. The 85 remaining WRZs are in surplus, with an estimated Total Surplus of 8 Ml/d. Between 2019 and 2044, in all planning scenarios the Deficit increases and the Surplus decreases.

In developing the Preferred Approach there may be an opportunity to interconnect WRZs in Deficit to WRZs which have Surplus water available. The Preferred Approach considers the applicability of these connections whilst also considering alternative solutions such as upgrading existing abstractions and or the development of new abstractions.

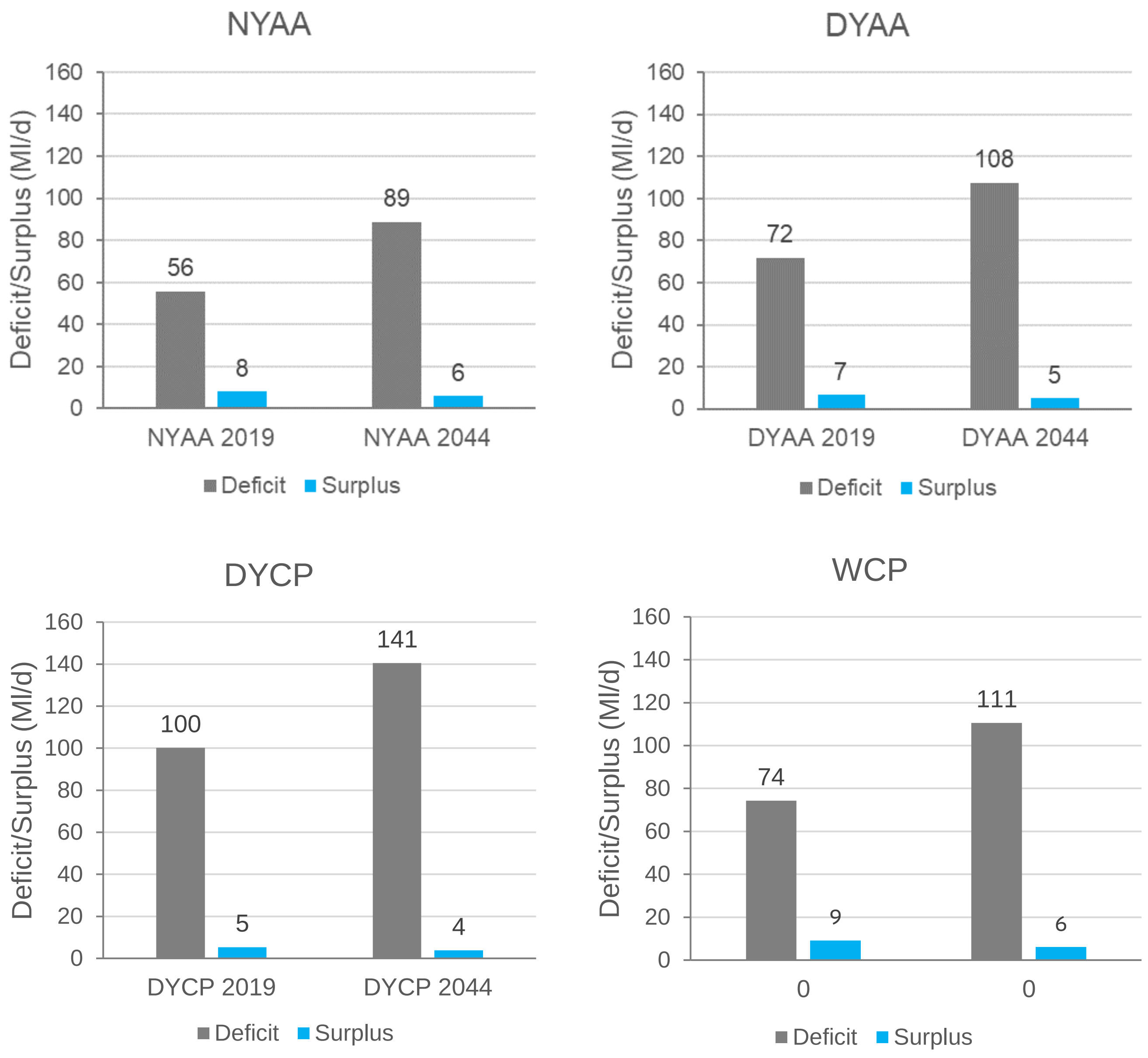

Figure 3.15 Total Estimated Deficit and Surplus across the South West Region

WRZ Impacts

Figures 3.16 to 3.19 show the number of Water Resources Zones which are currently in Surplus or Deficit across our four (4) Weather Event Planning Scenarios. These figures show

- During the Normal Year Annual Average Planning Scenario, 91 (52%) of our WRZs, supplying approximately 528,600 customers, are in Deficit whilst 83 (48%) are in Surplus;
- During the Dry Year Annual Average Planning Scenario, 95 (55%) of our WRZs, supplying approximately 549,520 customers, are in Deficit whilst 79 (45%) are in Surplus;
- During the Dry Year Critical Period Planning Scenario, 104 (60%) of our WRZs, supplying approximately 555,730 customers, are in Deficit whilst 70 (40%) are in Surplus; and
- During the Winter Critical Period Planning Scenario, 110 (63%) of our WRZs, supplying approximately 520,280 customers, are in Deficit whilst 64 (37%) are in Surplus.

When a WRZ is in Deficit customers may receive a lower LoS due to a less resilient supply. For example, during a period of Deficit customers may experience lower water pressure.

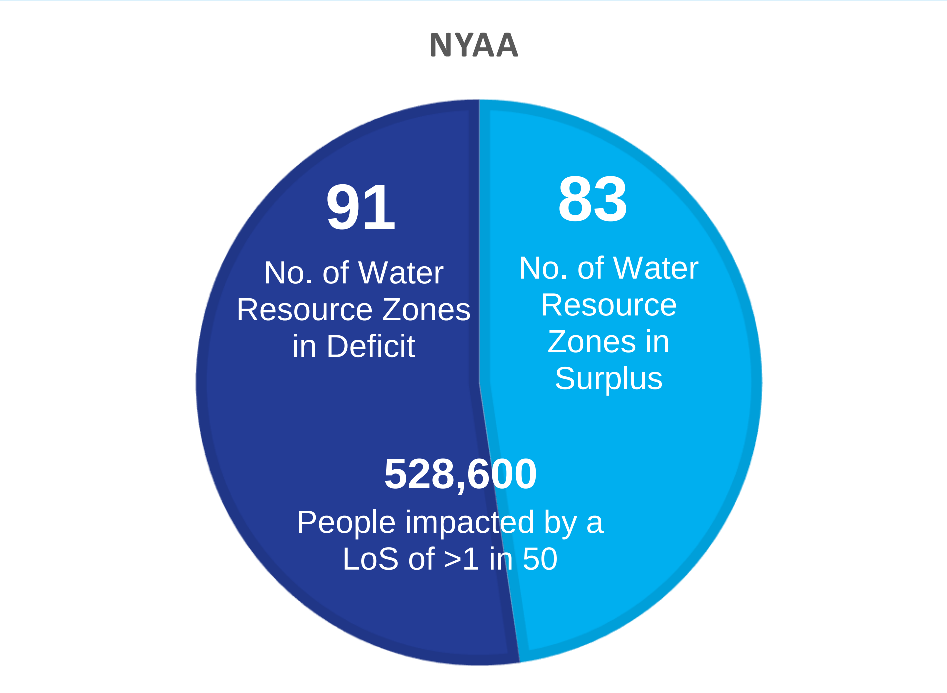

Figure 3.16 Number of WRZs in Surplus or Deficit in 2019 for the NYAA Planning Scenario

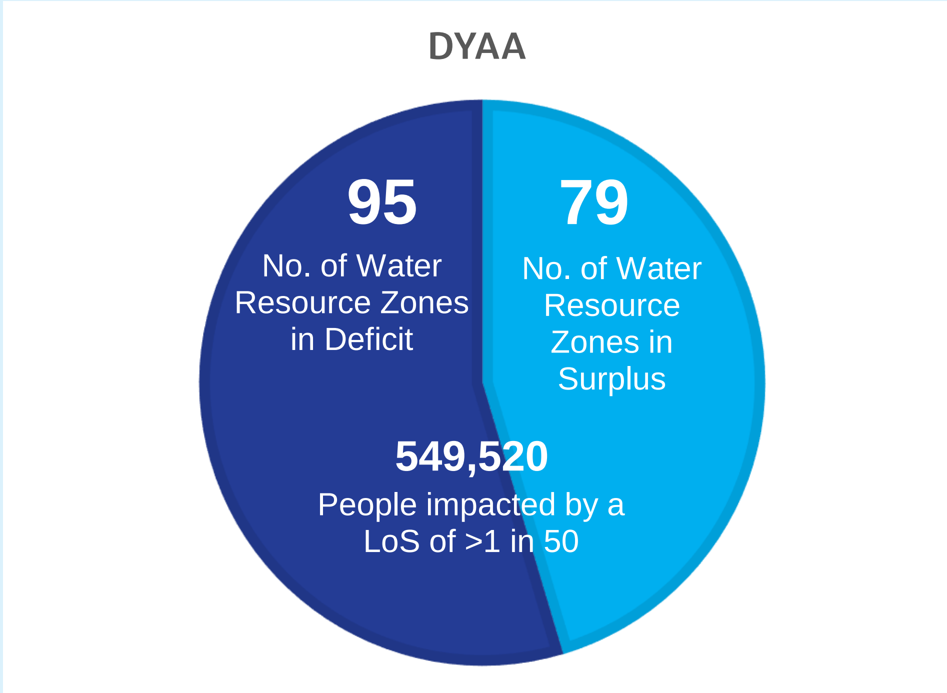

Figure 3.17 Number of WRZs in Surplus or Deficit in 2019 for the DYAA Planning Scenario

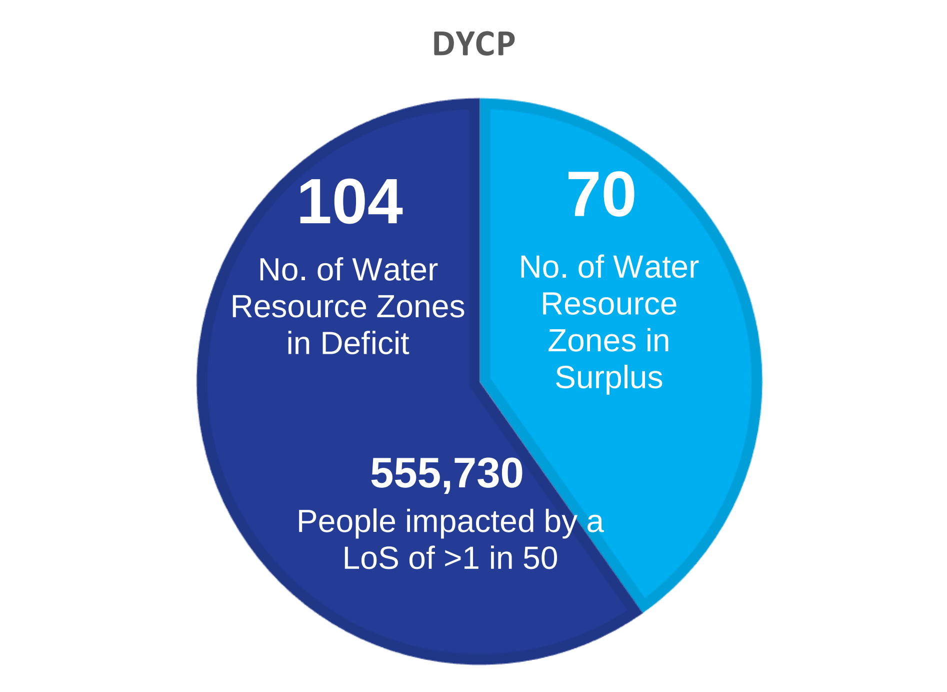

Figure 3.18 Number of WRZs in Surplus or Deficit in 2019 for the DYCP Planning Scenario

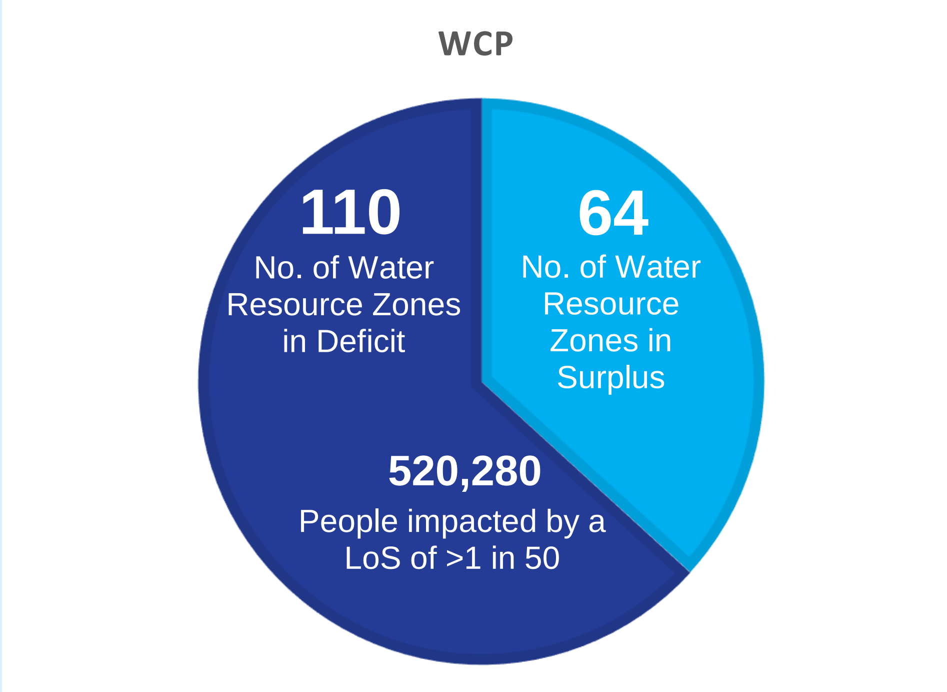

Figure 3.19 Number of WRZs in Surplus or Deficit in 2019 for the WCP Planning Scenario

Based on this analysis, it is clear that our baseline position is challenging, and that many of our supplies currently experience significant SDB Deficits, particularly during dry periods. The current position reflects the condition and performance of our existing asset base particularly in relation to WAFU constraints.

Figure 3.20 and Table 3.13 show that between 2019 and 2044 there will be an increase in the number of WRZs in Deficit.

However, despite the projected 33% increase in growth and the climate change impact, the number of WRZs in Deficit across the South West Region is only forecast to increase by 6 under the NYAA weather scenario and 12 in the DYAA weather scenario by 2044, representing an increase of 7% and 12% respectively. Our existing leakage reduction program taking place over the next five years is helping to address current Deficits, buffering against population growth and climate change.

The Deficits at a WRZ Level are presented in the Study Area Technical Reports (Appendix 1 - 3).

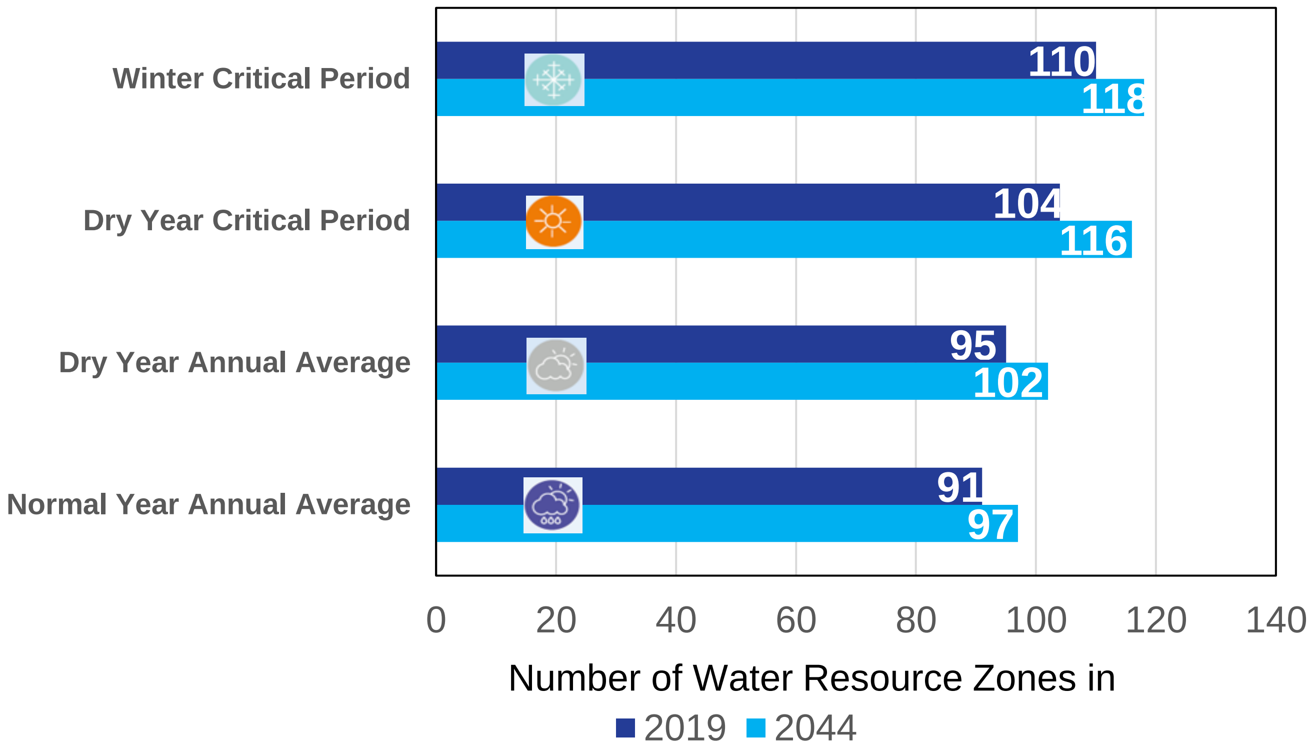

Figure 3.20 Number of WRZs in Deficit, 2019 to 2044

Table 3.13 Number of WRZs in Deficit and Change from 2019 to 2044

Weather Planning Scenario	Number of WRZs in Deficit		Change from 2019 to 2044	
	2019	2044	Count	(%)
NYAA	91	97	6	6.6%
DYAA	95	102	7	7.4%
DYCP	104	116	12	11.5%
WCP	110	118	8	7.3%

Study Area Water Quantity Needs

The Deficits in 2019 and 2044 across the Study Areas for the DYCP are shown spatially in Figures 3.21 and Figure 3.22, respectively. This shows significant existing Deficits in Cork City WRZ (SAI) as well as Central Regional -Lough Guitane (SAH). By 2044, the source Deficit for Cork City (SAI) increases by 27 Ml/d. Notable increases in the Deficit are also seen in Central Regional Lough Guitane (SAH), Mid Kerry (SAH), Clonakilty (SAI), Tibbotstown (SAI), Whitegate Regional (SAI), Charlesville/Doneraile (SAJ) and Mallow (SAJ).

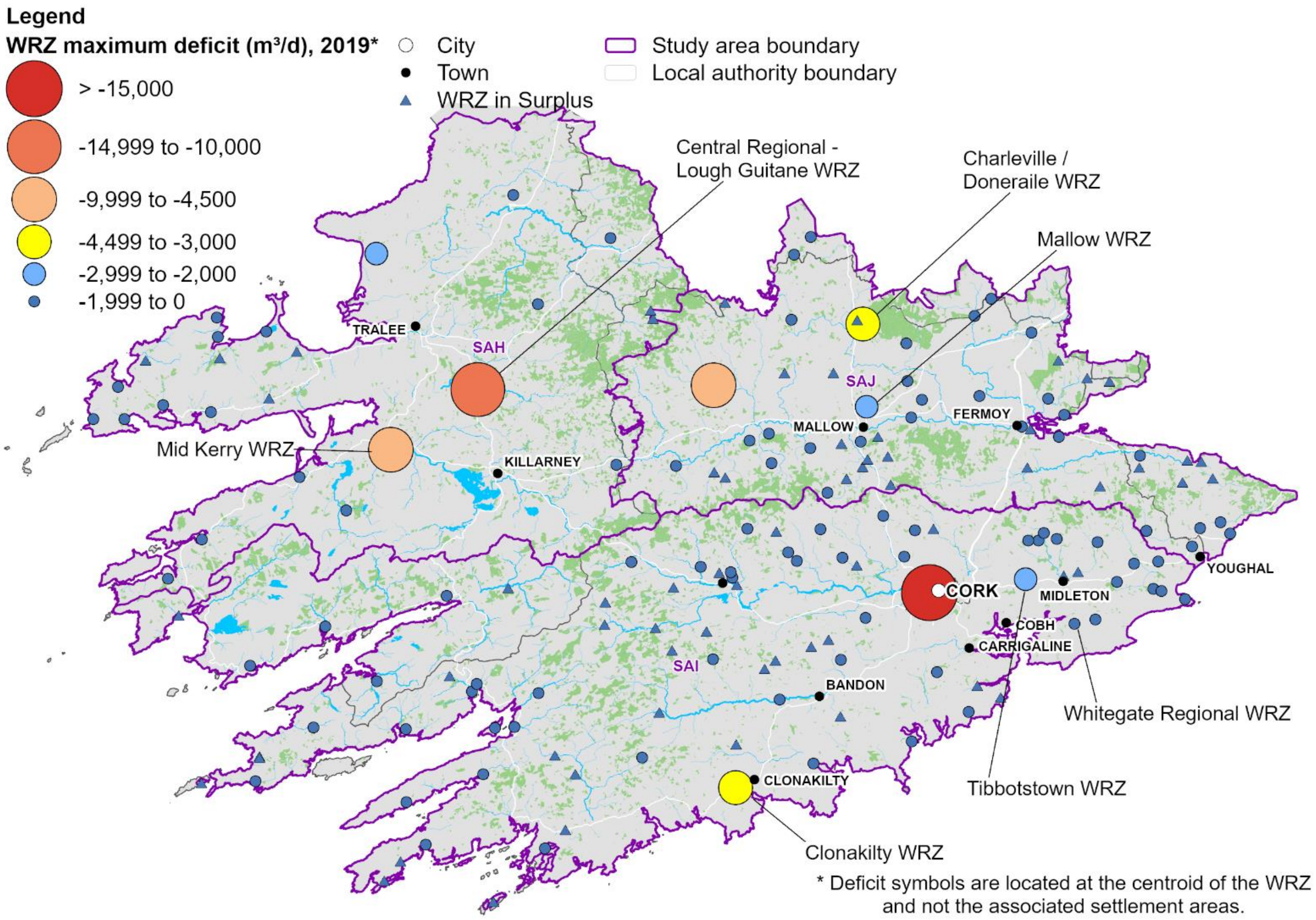

Figure 3.21 Deficit in 2019 across the South West Region (DYCP)

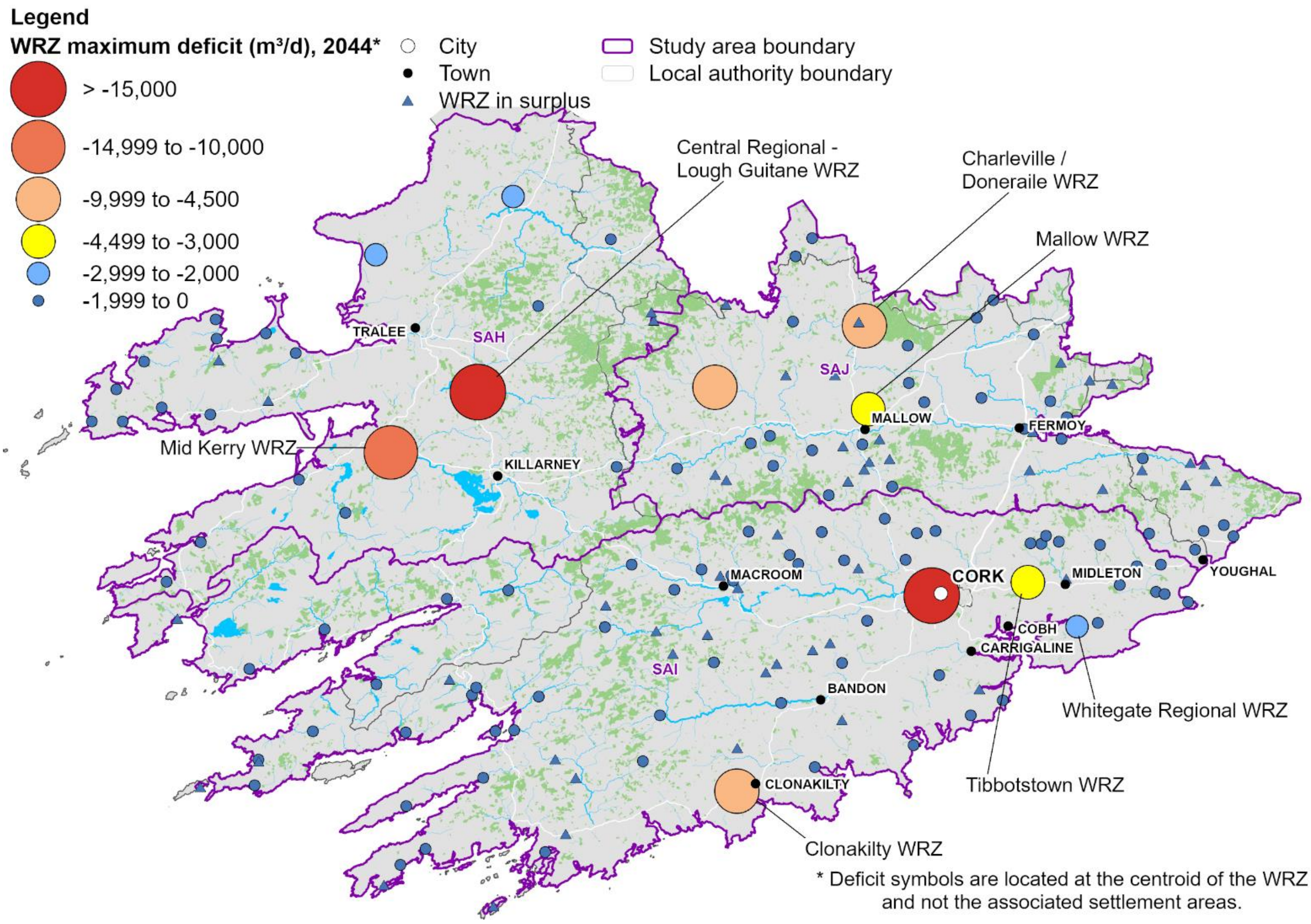

Figure 3.22 Deficit in 2044 across the South West Region (DYCP)

Capacity Register

As set out in Section 2 of this Plan and Section 4 of the Framework Plan, Irish Water has developed a 10-year capacity register based on the SDB to provide Local Authorities with an indication of settlements with potential capacity constraint. The capacity register will be made available for use in Development Plans.

It is envisaged that the majority of growth and development Needs within the next ten (10) years will be facilitated through leakage reduction, which will initially be targeted at settlements towards the upper end of regional and county settlement hierarchies. However, this will be an interim measure as leakage reduction alone will be insufficient to address the forecast Deficit and will not address existing LoS issues within the current supplies.

Therefore, while the capacity register will be used as a tool to inform the next review of Regional Planning Strategies, the preparation of Local Authority Development Plans and the requirement of interim options, it does not consider LoS. For this reason, it is not used to inform the Deficit required to be resolved when considering solutions in this Plan.

3.2.8 Summary

Key findings from our SDB calculations are as follows:

- 52% of our WRZs are in Deficit at present and do not provide adequate Reliability to our customers in normal conditions based on the 1 in 50 Level of Service that we have adopted for our NWRP.
- Across all weather scenarios, the WAFU from our existing supplies is not sufficient to balance the current Demand for water. The highest estimated net Deficit occurs for the Dry Year Critical Period at 95 Ml/d. The Deficit for remaining weather scenarios is estimated to be 65 Ml/d for the Winter Critical Period and Dry Year Annual Average and 56 Ml/d for the Normal Year Annual Average respectively.
- Total Demand is forecast to increase by only 8% for all Weather Planning Scenarios despite the estimated overall regional population increase of 33%. This comparatively small increase in Total Demand is attributed to the ambitious leakage reduction targets we have set ourselves and incorporated in our SDB assessment; and
- By 2044, the net Deficit across the South West Region is forecast to increase by 74% in a normal year, 57% in a dry year, 44% for the Dry Year Critical Period and 60% for the Winter Critical Period. The largest Deficit occurs for the Dry Year Critical Period at 137 Ml/d.
- The increase in Deficit is driven by population growth, and climate change.
- We have assessed the potential impact of impending Abstraction Legislation, which may reduce our allowable abstractions to meet environmental standards outlined in the WFD. The legislative changes could increase the SDB Deficit by an estimated 84 Ml/d under a Dry Year Critical Period scenario. We have completed a Sensitivity Analysis of our Preferred Approaches against the potential abstraction reductions to ensure they are robust and adaptable.

The key components of Deficit are represented in Figure 3.23 for the Dry Year Critical Period, the scenario with the largest Deficit due to the impact of extreme warm periods such as drought on our raw water sources.

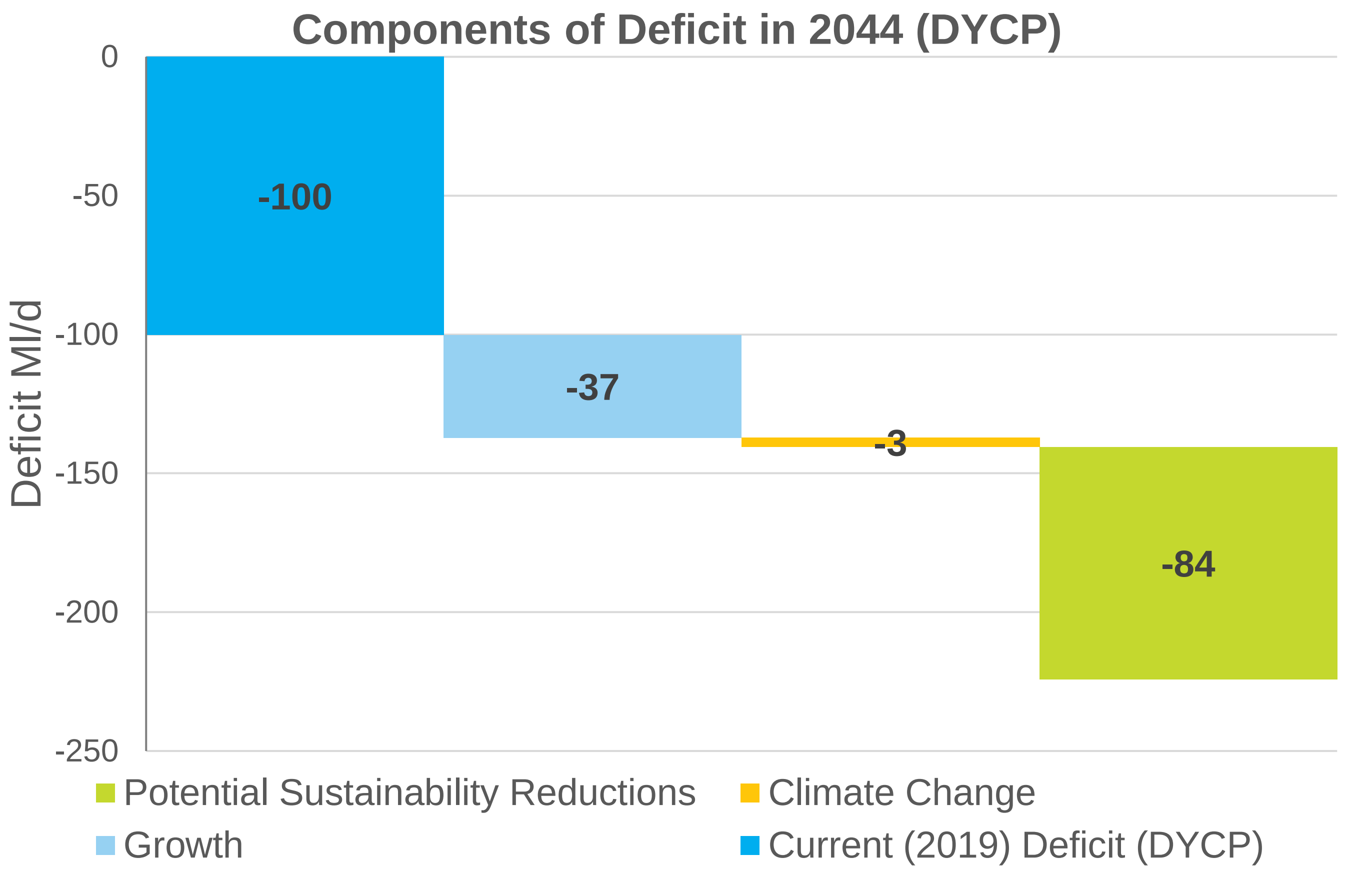

Figure 3.23 Pressures on Our Water Supply (DYCP)

3.3 Water Quality

This section summarises the current water Quality status of our supplies with respect to the Interim Barrier Assessment and risk-based Drinking Water Safety Plan (DWSP) approach.

Our Drinking Water Safety Plan (DWSP), described in Chapter 5 of our Framework Plan, will assess the risk that hazardous events could occur in our drinking water supply from source (catchment) to tap (consumer). This assessment informs the 'Need' for operational, maintenance or capital interventions to ensure a safe and reliable supply.

The methodologies for the DWSP approach are being developed following guidance of:

- World Health Organisation's Guidelines for Drinking Water Quality (2004)
- Water Safety Plan Manual (2009)
- EPA's Drinking Water Advice Note No 8
- Department of the Environment and Local Government, EPA and GSI (1999)

Furthermore, the measures and contaminants identified in the Recast Drinking Water Directive (DWD)[7] are being integrated into the development of DWSP methodologies. The overarching objective of the Recast DWD is to ensure a high level of protection of the environment and of human health from the adverse effects of contaminated drinking water. Under the recast DWD, quality standards for water intended for human consumption have been updated, and minimum hygiene requirements for materials in contact with drinking water (e.g., pipes, taps) have been introduced.

The 174 water resource zones in the South West Region are supplied with water from 227 water treatment plants, as shown in Figure 3.24.

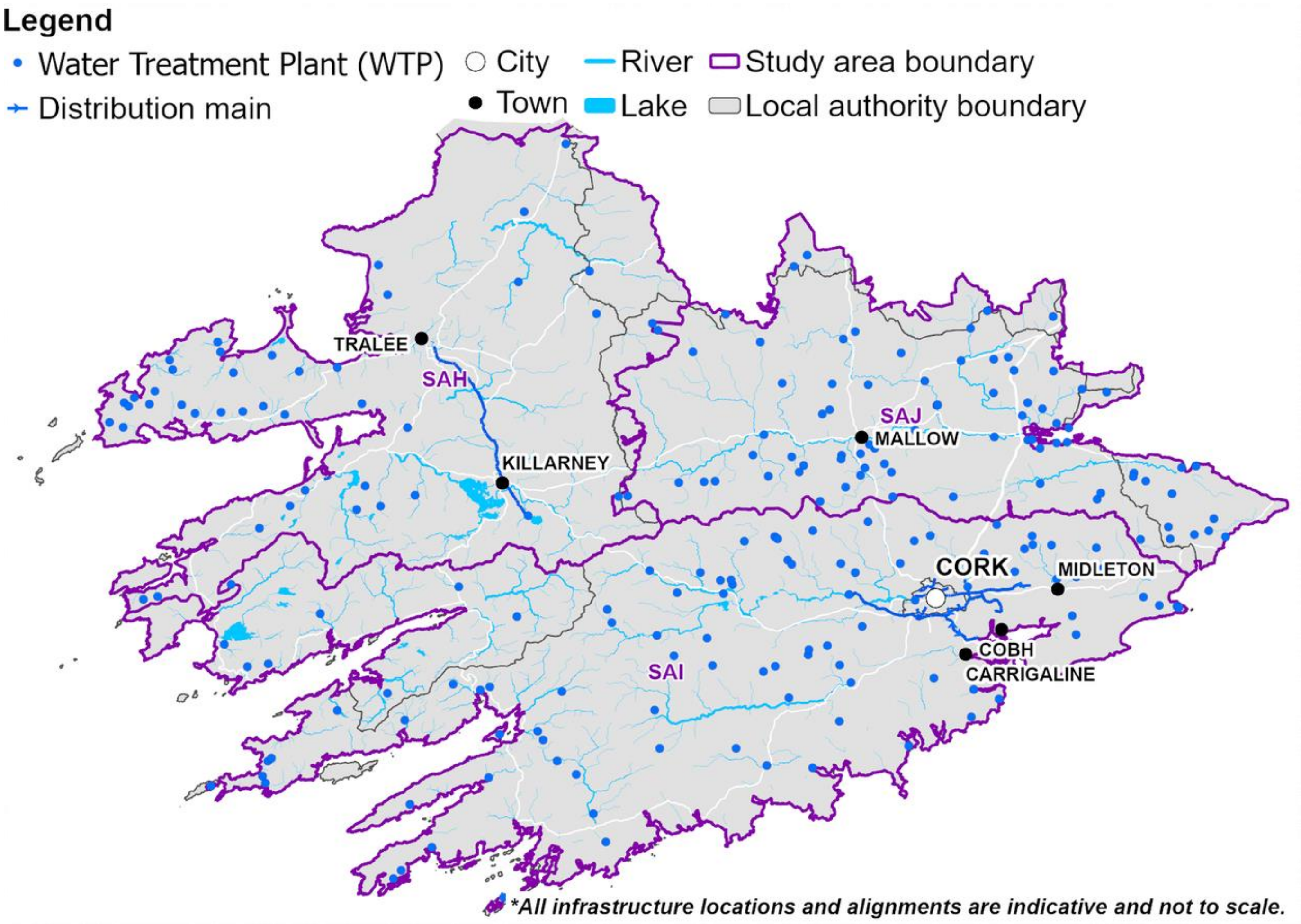

Figure 3.24 WTPs in the South West Region

The water treatment plants vary in size from 5 to 82,500 m^3/day (22-hour capacity), and by type of treatment process. The number of water treatment plants of each process type is outlined in Table 3.14.

Table 3.14 Types of Water Treatment Processes

Water Treatment Process	Number
Simple Disinfection	150
Filtration	43
CFC	34

3.3.1 Compliance with EPA Regulations

Irish Water monitors all public water supplies in accordance with the requirements of the European Union (Drinking Water) Regulations 2014, as amended (Drinking Water Regulations (DWR)[8]) and the Drinking Water Directive and the results of these tests are reported to the EPA. The EPA is the drinking water quality regulator, responsible for enforcing the Drinking Water Regulations. Irish Water publishes the results from the regulatory monitoring programme on its website at www.water.ie/waterquality. If a drinking water sample shows a result above a specified water quality standard, Irish Water reports it immediately (where applicable) to the EPA.

The EPA, as the regulator, supervises the investigation Irish Water undertakes following notification of water quality failures, including the effectiveness and timeliness of corrective and preventative actions. The EPA has a hierarchy of further enforcement actions available to them, including undertaking an Audit, placing the supply on the Remedial Action List (RAL), or imposing a Direction.

The **RAL** is a register of public water supplies that are in need of corrective action, usually at a water treatment plant. The EPA requires Irish Water to complete an action programme for each supply on the list. The EPA updates and publishes their RAL every three months which can be viewed at **www.epa.ie/water/dw/ral**.

Box 3.2 includes an excerpt from the EPA's latest published Drinking Water Quality in Public Supplies 2019 Report, setting out the current status of our supplies with respect to compliance with Microbiological, Chemical and Indicator parameters in the Drinking Water Regulations.

Box 3.2 Water Quality in 2019

Water Quality across each of the three parameter categories has shown good compliance since Irish Water became responsible for public water supplies in 2014.

Overall percentage compliance of samples taken for public water supplies

Parameter Categories	2014	2015	2016	2017	2018	2019	2020
Microbiological (%)	99.9	99.9	99.9	99.9	99.9	99.9	100.0
Chemical (%)	99.4	99.4	99.5	99.6	99.6	99.6	99.7
Indicator (%)	99.3	99.1	99.8	98.9	98.8	99.1	99.0

As can be seen in Box 3.2, in general our supplies show good compliance with the Regulations, and most compliance trends have improved over time.

Despite improvements which have already been made, Table 3.15 shows that all of the Study Areas have WTPs which are on the EPA RAL. The majority of WTPs on the EPA RAL present water quality issues related to the inadequate filtration and disinfection systems. Irish Water are currently providing proposed action programs to the EPA or are actively progressing corrective action for the WTPs listed on the RAL list.

Table 3.15 Number of WTPs on the EPA Remedial Action List (RAL) or subject to EPA Direction

Study Area	STUDY AREA NAME	Number of WTPs on Remedial Action List (RAL)
SAH	Kerry	5
SAI	Cork and South Kerry	6
SAJ	North Cork and West Waterford	2

3.3.2 Barrier Assessment – DWSP Approach

An Interim Barrier Assessment was undertaken as part of the development of our Framework Plan to identify "Water Quality and Reliability" need for the RWRPs. The assessment evaluates the risk against our existing controls (Barriers) which we have in place for either source protection or within our water treatment plants and networks. The interim approach is required while we progress in the development of DWSPs for all of our supplies. This is expected to take place over several years given the approach involves 227 individual assessments.

A **'Barrier'** consists of any actions, processes, procedures, standards or assets (treatment plants, water mains, pumping stations etc) put in place across the entire system from catchment to tap to achieve water of sufficient Quality and Quantity.

The Interim Barrier Assessment allows us to identify water Quality driven Need for the purposes of the RWRP-SW and has in turn been used to inform the Preferred Approaches (capital interventions and associated level of investment) required within the RWRP-SW.

The Framework Plan describes eight (8) key barriers:

- **Barrier 1**: Inactivation of bacteria and virusus
- **Barrier 2**: Maintenance of a microbiological barrier in the distribution network
- **Barrier 3**: Inactivation of prozoa (i.e., Cryptosporidium and Giardia) by UV radiation
- **Barrier 4**: Removal of protozoa by coagulation, flocculation and clarification (CFC) and filtration, slow sand filtration or membrane filtration
- **Barrier 5**: Prevention of supply interruptions
- **Barrier 6**: Prevention of the formation of trihalomethanes (THMs)
- **Barrier 7**: Prevention of pollution of the environment
- **Barrier 8**: Minimising the level of other physical/chemical parameters such as lead, pesticides, nitrates, aluminium, iron, manganese, and taste and odour.

These barriers should sufficiently address the potential hazards identified in the DWSPs (Appendix J of the Framework Plan). The interim approach evaluates all 227 WTPs within the South West Region based on four (4) of eight (8) critical barriers identified by Irish Water: Barrier 1, Barrier 2, Barrier 3 and Barrier 6.

The barriers selected for assessment have been chosen based on existing data availability. Hazard assessments against the remaining critical barriers will be completed as our data and information systems improve and the site specific DWSPs are completed. For example, as the DWSPs are completed for each of the individual supplies, the Interim Barrier Assessments will be updated to include any additional information available, as per the monitoring and feedback process described in Chapter 8 of our Framework Plan.

It should be noted that the "Quality Need" identified through the Barrier Assessment is **not** an indicator of compliance with the European Union (Drinking Water) Regulations 2014, as amended (Drinking Water Regulations) but the ability to be able to provide our planned LoS of 1 in 50 years. It is therefore an assessment or an indicator of the need to invest in areas of our asset base (human and structural) through resource planning, to ensure that we can address potential risks or emerging risks to our supplies.

The source risk assessments currently in development align with the Recast DWD[7] and will offer a leading or potential indicator of risk of contamination rather than a 'lagging' assessment at the customers tap. A 'lagging' assessment identifies an existing water quality risk at the customer's tap and hence does not allow the opportunity for preventative action; whereas a leading assessment identifies a potential risk of contamination at source, enabling Irish Water to take preventative action to mitigate the risk.

The source risk assessments will be approached using the source-pathway-receptor concept considering sources of contaminants in the catchment. These risk assessments will span existing contaminants in the short term, e.g., pesticides, *Cryptosporidium*, *E. coli* and natural organic matter, with a view to expanding to contaminants of emerging concern (microplastics, 'forever chemicals' and pathogenic and antimicrobial resistant bacteria).

3.3.3 Barrier Assessment – Summary

In this section we present a summary of the Interim Barrier Assessment for the WRZs in the South West Region. The detailed assessments are presented in the Study Area Technical Reports (Appendix 1 - 3).

We have used colour coding to indicate the severity of the potential barrier deficit and the risk of the asset failing to achieve the required water quality standard. However, 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 assessment of the asset capability standard compared with the asset standard as set out in Section 5.7 of the Framework Plan.

This assessment provides an indication of the level of investment (or intervention) we need to plan for to meet our stringent asset capability standards. The asset standard assessment is defined in Table 3.16. The colour coding indicates the severity of the potential risk of barrier failure.

Table 3.16 Asset Capability Score

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

The Pie Charts in Figure 3.25 represents our 227 WTPs and the portion of these that fall into the 1 to 4 scale categories for each Barrier. A score of 1 indicates a low risk which represents a low priority for intervention. A score of 2 or 3 indicates a medium risk (medium-low or medium-high), whilst a score of 4 indicates a high risk and represents a high priority asset. Such assets are at a high risk of not meeting Irish Water's asset standard assessment rather than a risk of non-compliance with Drinking Water Regulations. This simple representation does not indicate the size of the supplies, which vary considerably across the Region. In summary,

Barrier 1: 30% of WTPs in the South West Region are considered to be at high risk of failing to achieve the required disinfection standard, while 67% are considered to be at medium risk of failing to achieve the required disinfection standard.

Barrier 2.1: More than three quarters of the water supply systems have a low risk of issues associated with maintaining residual chlorine through the network; however, 19% are at high risk of failing to maintain the required residual.

Barrier 3: 41% of WTPs are considered to be at high risk of failing to effectively remove protozoa, while 34% are considered to be at a medium risk of failure.

Barrier 6: 86% of the WTPs in the South West Region have a low risk of issues associated with removing THMs. THMs can form when natural organic matter (NOM) is not sufficiently removed by Barrier 6, therefore, reacting with chlorine over time. There are a small number (5%) of WTPs that are at high risk of failing to maintain the required levels of THMs.

The barrier assessment results for each WTP are included in the Study Area Technical Reports in Appendix 1 - 3.

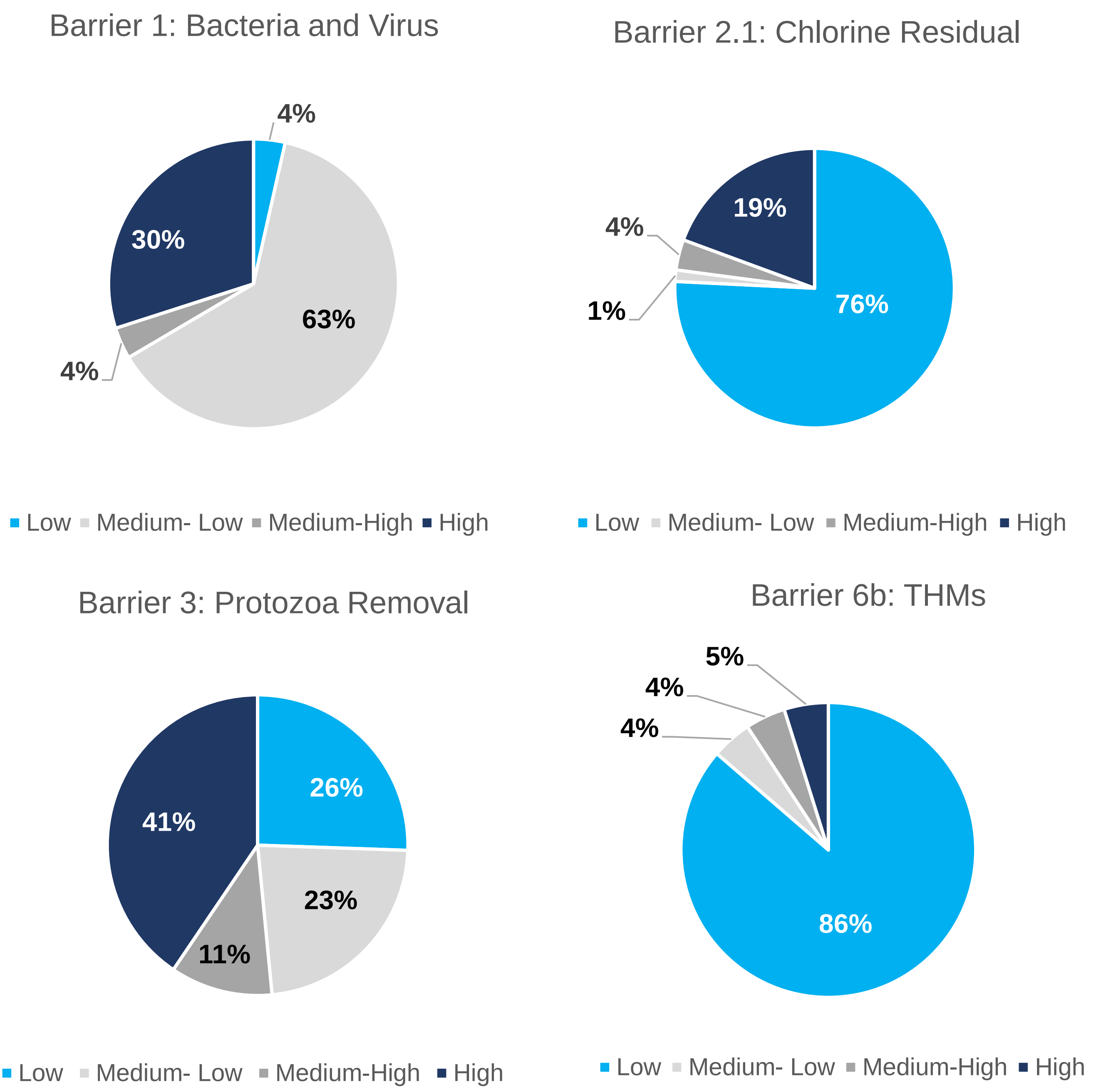

Figure 3.25 Proportion of WTPs in each Asset Capability category

Table 3.17 provides a breakdown of the number of WTPs in each SA that are assessed as high risk for each of the Barrier Types. A total of 158 out of the 227 treatment plants are considered high risk for one or more of the Barriers.

Across the South West Region effective removal of protozoa (Barrier 3) is the largest risk (in terms of the number of WTPs impacted) impacting 41% of WTPs, whilst 30% of WTPs are 'at risk' from bacteria and viruses. Maintenance of chlorine residuals in the network (Barrier 2.1) impacts 19% of the WTPs in the region. The formation of THMs (Barrier 6b) is a risk for 11 WTPs across SAH and SAI. No WTPs in SAJ are at risk from THM formation.

Table 3.17 Number of WTPs in Study Areas assessed as 'High Risk' for each Barrier Type

Study Area	Study Area Name	Total Number of WTPs	Total No. of WTPs with a High Priority Barrier Score	Number of 'High Risk' WTPs			
				Barrier 1	Barrier 2.1	Barrier 3	Barrier 6
SAH	Kerry	46	34	20	18	7	4
SAI	Cork and South Kerry	102	65	33	19	30	7
SAJ	North Cork and West Waterford	79	59	15	7	55	0
	TOTAL	227	158	68	44	92	11

3.4 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 adequate treated water storage to enable us to respond to planned or unplanned outages on our trunk main and distribution networks.

In our Needs assessment we have identified a number of upgrades critical to ensuring that we are able to deliver a reliable supply. Critical assets are the single point of failure that have the potential to significantly impact on our ability to provide water to our customers. They include abstraction points, large water treatment plants, and our bulk transfer or trunk mains (including any pumping stations associated with these). As a failure of one of these assets would result in a large-scale interruption to supply, they need to be maintained at a higher condition and performance grade.

The critical infrastructure projects that have been identified across the South West Region are summarised in Section 4 and the technical reports for each Study Area that are included as Appendices 1-3 of our Regional Plan.

3.5 Water Supply Sustainability

A key objective of the NWRP is to improve the sustainability of the national water supply from its current baseline. This will include consideration of sustainable abstraction limits. The Water Framework Directive, and the associated River Basin Management Plan, is guiding the implementation of sustainable abstractions through the development of environmental standards. These standards will be defined under pending Abstraction legislation[2] and associated regulations and guidelines. To meet the sustainability objectives to be set out under the Abstraction legislation, some of our surface water and groundwater abstractions may need to be modified.

Whilst the regulations and guidances for the new abstraction regime are being developed, we cannot reliably include an estimation of sustainable abstraction within the SDB calculations, so our forecast deficits do not account for reductions in allowed abstractions that may result from legislative changes. However, as part of our Options Assessment Methodology (see Section 7 of this Plan) we include a Sensitivity Assessment to ensure we understand how the abstraction legislation could impact our Preferred Approaches and programmes for each WRZ. This assessment applies a conservative approach in evaluating the potential impacts of the legislative changes on our surface water abstractions and ensuring selected Options would still be appropriate in the event that allowable abstraction quantities change to the extent that the future regime can be anticipated at this stage.

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 applying the UKTAG guidance as modified for the Irish context as outlined in Section 2.3.7. This approach is described in Appendix C and G of our Framework Plan.

The potential change to the Deficit for each WRZ, as a result of these potential reductions in abstraction is described in the Sensitivity Assessment of the individual Study Area reports (Appendix 1-3) and is summarised in Table 3.18. The legislative changes could increase the SDB Deficit by an estimated 84 Ml/d under a Dry Year Critical Period scenario. This change is for illustrative purposes only, and again is based on a conservative estimate of what the regulatory regime may require. The actual reductions that may be needed in future will depend on the specific requirements of that legislation. Irish Water will update the NWRP as appropriate to account for these requirements, once known, using the monitoring and feedback process set out in Section 9 of the RWRP-SW.

Groundwater abstractions will also need to conform to the proposed new abstraction licensing regime. At present the SDB does not account for changes to the abstraction licensing regime.

It is expected that as part of the proposed new abstraction licensing regime groundwater 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 our Framework Plan, Irish Water does not currently have information to produce robust assessments of water availability from our existing groundwater. Over the coming years, Irish Water will work with the EPA and the GSI, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources. In the interim, we have developed an initial assessment based on available information, included in Appendix C of the Framework Plan.

The multi-annual government funded GW3D project currently in progress[9] will provide more robust and refined scientific understanding and information on geodatabases. Specifically, the ’Groundwater resources assessment’ component of this project will yield hydrogeological conceptual models at the catchment scale. These outputs will allow Irish Water to work towards catchment-scale cumulative assessments in future iterations of the NWRP.

Table 3.18 Potential Change to the Deficit* based on the Potential Reductions to Abstractions (DYCP)

Study Area	Study Area Name	Number of SW Abstraction Sites		SW Abstraction Site Name (WRZ)	Potential Change to the Deficit (m^3/day)
		Assessed	Impacted		
SAH	Kerry	23	19	Puckisland (An MhinAird) Gowlane Stream (An Mhin Aird) Lough Acummeen (Aughacasla) Coulagh River Intake (Cahersiveen) Stradbally Intake (Castelgregory) Mount Eagle Lake S50 (Ceann Tra PWS 074D) L Guitane (Central Regional Lough Guitane) Curracullenagh Stream (Central Regional Lough Guitane) Curracullenagh River (Central Regional Lough Guitane) Ballyarkane River (Central Regional Lough Guitane) Gurrane Stream (Emlaghpeasta/Portmagee/Maulin) Smearlaugh River (Listowel Regional Public Water Supply) Feale (Listowel Regional Public Water Supply)) Lough Cummernamuck (Mid Kerry) Gaddagh River (Mid Kerry) Lough Callee S76 (Mid Kerry) Cottoners River (Breanlee Stream from Lough Eighter) (Mid Kerry) Coomaglaslaw Lake S67 (Mountain Stage PWS 062A) Maithgarbh River (Mountain Stage PWS 062A))	-47,200
SAI	Cork and South Kerry	44	31	Allihies Impoundment (Allihies) Drombrow Lake Intake (Bantry) Inchilough (Bantry) Lough Bofinna Intake (Bantry) Coonmahorna West River (Caherdaniel / Castlecove) Gowla River (Behaghane) (Caherdaniel / Castlecove) Gowlane Stream (Caherdaniel / Castlecove)	-30,180

Study Area	Study Area Name	Number of SW Abstraction Sites		SW Abstraction Site Name (WRZ)	Potential Change to the Deficit (m^3/day)
		Assessed	Impacted		
				Cahermore River (Cahermore) Glenbeg (Castletownbere) Arideen River, Jones Bridge (Clonakilty) Butlerstown River Tributary (Cork City) Butlerstown River Tributary (Cork City) Coolguerisk (Cork City) Glashaboy River (Cork City) Inishannon (Cork City) Crookhaven Impoundment (Arduslough) (Crookhaven) Coolkellure lake (Dunmanway) Barony River (Glengarriff) Goleen Intake (Goleen) Owengar River (Kealkill) Lough Eirk (stream) (Kenmare / Kilgarvan) Coomclogherane Lake S64 (Kilgarvan) Ahadav stream (Lauragh PWS 051A) Owenacurra River (Midleton) Kiltha River (Mogeely) Lough Abisdealy (Skibbereen) River Ilen (Skibbereen) Tibbotstown Reservoir (Tibbotstown) Owenacurra River (Over Pump) (Tibbotstown) Tourig River Source (Youghal Regional) Glendine River (Youghal Regional)	
SAJ	North Cork and West Waterford	6	4	Clyde River (Mallow) Fiddane Reservoir (Mallow) Behanagh River (Mitchelstown) River Allow (Allow Regional)	-6,440
TOTAL REGION		**73**	**54**	**-**	**-83,820**

***** Based on potential changes to the projected 2044 Dry Year Critical Period (DYCP) scenario.

3.6 Summary

In this section we have described the water supply 'Needs' of the NWRP South West Region. We have determined the:

- Shortfalls in our supply to deliver **secure** supplies at a 1 in 50 Level of Service for our customers over the 25-year planning period;
- Water Quality deficiencies of our WTPs in delivering **safe** drinking water;
- Critical infrastructure improvements required to ensure **reliable** supplies; and
- Reductions in abstraction volumes to improve the **sustainability** of our water supply systems.

Water Quantity and Sustainability

Our Supply Demand Balance is under significant pressure:

- 52% of our WRZs are in Deficit at present and do not provide adequate reliability to our customers in normal conditions based on the 1 in 50 Level of Service that we have adopted for our NWRP.
- The WAFU from our existing supplies is not sufficient to balance the current demand for water across all weather planning scenarios. The highest net Deficit occurs for the Dry Year Critical Period at 95 ML/d.
- Total Demand is forecast to increase by only 8% for all weather planning scenarios despite the estimated overall regional population increase of 33%. This comparatively small increase in Total Demand is mostly attributed to the ambitious leakage reduction targets we have set ourselves
- By 2044, the net Deficit across the South West Region will increase by 74% in a normal year, 57% in a dry year (DYAA), 44% for the Dry Year Critical Period and 60% for the Winter Critical Period.
- The increasing Deficit is driven by a number of pressures. In a DYAA these include growth and climate change. The resulting increase in the SDB net Deficit is 42 Ml/d.
- Changes to legislation and the regulatory process around abstractions has the potential to increase the Deficit by a further 84 Ml/d under the DYCP.

Water Quality and Reliability

The risk to our drinking water Quality of inadequate protection against key drinking water parameters (including bacteria and virus, protozoa and triahalomethanes) is high, with 158 out of the 227 water treatment plants assessed as high risk of not meeting one or more of the water Quality Barriers representing Irish Water's internal asset standards. As mentioned above, these standards are not an assessment of compliance with Drinking Water Quality Regulations but rather an internal conservative gauge to indicate where works are required.

Barrier 1: 30% of WTPs in the South West Region are classified as "high risk" of failing to achieve the required disinfection standard, while 67% are considered to be at "medium risk" of failing to achieve the required disinfection standard.

Barrier 2.1: More than three quarters of the water supply system have a "low risk" of issues associated with maintaining residual chlorine through the network; however, 19% are at "high risk" of failing to maintain the required residual.

Barrier 3: 41% of WTPs are classified as "high risk" of failing to effectively remove protozoa, while 34% are considered to be at a "medium risk" of failure.

Barrier 6: 86% of the WTPs in the South West Region have a “low risk” of issues associated with removing THMs. There are a small number (5%) that are at “high risk” of failing to maintain the required levels of THMs.

The Reliability of our water supply system is impacted by deficiencies in our WTPs and critical infrastructure. We have identified critical infrastructure projects which reflect the Reliability Needs across the South West Region as summarised in Section 4 and presented in the technical reports for each Study Area (Appendices 1-3). These will be incorporated into our Preferred Approach (solutions) to secure our supplies over the 25-year planning period.

Addressing the Need

The progress we have made so far to address our immediate needs is described in Section 4. This includes programmes to tackle water Quality deficiencies, along with programmes such as the reservoir cleaning programmes, the network cleaning and repairing works and the national leakage reduction programme.

Our Options to address our future Needs are presented in Section 6, while our Preferred Approaches at a Study Area Level are discussed in Section 7. Section 8 presents our Regional Preferred Approach.

3.7 References

1. Geological Survey Ireland (GSI). 2021. GWClimate. [Online]. Available from: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/gwclimate/Pages/default.aspx.
2. Water Environment (Abstractions and Associated Impoundments) Bill 2022 (as initiated).[Online]. Available from: https://www.oireachtas.ie/en/bills/bill/2022/87/.
3. European Commission. 2000. *WFD Directive 2000/60/EC on establishing a framework for community action in the field of water policy*.
4. UK Technical Advisory Group (UKTAG). 2008.UK Environmental Standards and Condition (PHASE 1). Water Framework Directive.
5. Department of Public Expenditure and Reform. 2022. Project Ireland 2040. [Online]. Available from: https://www.gov.ie/en/campaigns/09022006-project-ireland-2040/
6. Department of Agriculture, Food and the Marine. 2021. Food Wise 2025. [Online]. Available from: https://www.gov.ie/en/publication/a6b0d-food-wise-2025/.
7. Drinking Water Directive (98/83/EC), Provisional Agreement of Recast Directive 18th December 2019.
8. European Union (Drinking Water) Regulations 2014. (S.I. No. 122/2014).
9. Geological Survey Ireland. 2021. *GW3D*. Available from: https://www.gsi.ie/.