Uisce Éireann
Irish Water

Strategy: January 2026

Cork Wastewater Strategy

(Cork Metropolitan Area)

Draft Strategy

Tionscadal Éireann
Project Ireland
2040

6 CLEAN WATER AND SANITATION

Safeguarding our water for our future

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GLOSSARY

Glossary	
30 Year Design Storm	A storm that would, on average, be expected to occur once in 30 years, or has a 1 in 30 (3.33%) chance of occurring in any given year
Agglomeration	An area where the population expressed in population equivalent, combined or not with economic activities, is sufficiently concentrated for urban wastewater to be collected and conducted to one or more urban wastewater treatment plants or to one or more final discharge points.
Appropriate Assessment (AA)	An assessment of the potential adverse effects of a plan or project (in combination with other plans or projects) on Special Areas of Conservation (SAC) and Special Protection Areas (SPAs). These sites are protected by National and European Law
Asset	Infrastructure (e.g. buildings, treatment plants) and equipment (e.g. pumps, screens, treatment units, disinfection systems and control panels) controlled and operated by Uisce Éireann to deliver water and wastewater services. We divide these into Below Ground Assets such as pipework and valves and Above Ground Assets such as treatment plants.
Biodiversity	The variety of all living things.
Discharge	Treated effluent from a wastewater treatment plant which is returned to the water environment. This is usually from a pipe and outflow structure into a river or the sea.
Emission Limit Value (ELV)	The maximum allowable concentration or quantity of a pollutant that can be released into the environment from a specific source over a given period.
Network	The interconnection of pipes and pumping stations used for the distribution of treated water and the collection of wastewater.
Population Equivalent (PE)	Wastewater treatment plants are described in terms of their designed treatment capacity, which is generally expressed as population equivalents (PE). This is a measurement of total organic biodegradable load, including industrial, institutional, commercial and domestic organic load, on a wastewater treatment plant, converted to the equivalent number of population equivalents (PE). One person is considered to generate 60g of (Biochemical Oxygen Demand) BOD per day and 1 PE is defined as being equivalent to 60g of BOD per day.
Recast Urban Waste Water Directive (UWWTD)	Directive (EU) 2024/3019. The recast UWWTD is an update on a European Union directive concerning urban wastewater collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors.
Resilience	The ability of a wastewater system to withstand and quickly recover from disruptions and other stresses.
Strategic Environmental Assessment (SEA)	Strategic Environmental Assessment (SEA) is a process for the formal, systematic evaluation of the likely significant environmental effects of implementing a plan or programme, before a decision is made to adopt the plan or programme. SEA aims to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable

Glossary	
	development. Strategic Environmental Assessment (SEA) of plans and programmes is required by European Directive 2001/42/EC ('the SEA Directive')
Storm Water Overflow (SWO)	A controlled discharge point in the wastewater network that releases excess rainwater and untreated sewage to prevent sewer flooding during extreme weather conditions.

LIST OF ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations	
AA	Appropriate Assessment
BOD	Biochemical Oxygen Demand
BW	Bathing Waters
CAP	Climate Action Plan
cfu	Colony Forming Unit
CHSMS	Cork Harbour Strategic Modelling Study
CMA	Cork Metropolitan Area
CMASP	Cork Metropolitan Area Strategic Plan
CRU	Commission for Regulation of Utilities
CWS	Cork Wastewater Strategy
DAP	Drainage Area Plan
DIN	Dissolved Inorganic Nitrogen
DTM	Digital Terrain Model
DWMP	Drainage and Wastewater Management Plan
ECJ	European Court of Justice
ELV	Emission Limit Value
ESD	Environmentally Sustainable Discharge
EPA	Environmental Protection Agency
EU	European Union
EQS	Environmental Quality Standard
FE	Final Effluent
GHG	Greenhouse Gas
KPI	Key Performance Indicator
LSE	Likely Significant Effects
MCA	Multi Criteria Assessment
MRP	Molybdate Reactive Phosphorus
NBAP	National Biodiversity Action Plan
NC	Notionally Clean
NIS	Natura Impact Statement
NMPF	National Marine Planning Framework
NPF	National Planning Framework
NWSMP	National Wastewater Sludge Management Plan
NWRP	National Water Resource Plan
PE	Population Equivalent

Acronyms and Abbreviations	
PS	Pumping Station
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathways
RSES	Regional Spatial and Economic Strategy
rUWWTD	Recast Urban Wastewater Treatment Directive
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SFW	Shellfish Waters
SOP	Standard Operating Procedure
SPA	Special Protection Area
SuDS	Sustainable Drainage Systems
SWO	Storm Water Overflow
TN	Total Nitrogen
TP	Total Phosphorus
TSMM	Technical Standard for Marine Modelling
TSR	Time Series Rainfall
UÉ	Uisce Éireann
UWWTD	Urban Wastewater Treatment Directive
WAC	Wastewater Assimilative Capacity
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WSPS	Water Services Policy Statement
WSSP	Water Services Strategic Plan
WW	Wastewater
WWDL	Wastewater Discharge Licence
WwPS	Wastewater Pumping Station
WwTP	Wastewater Treatment Plant

1. Executive Summary

Overview of Uisce Éireann and Our Vision

Uisce Éireann, formerly known as Irish Water, became Ireland's national public water services provider on January 1, 2014, following the Water Services Act (No. 1) 2013. The organisation is responsible for:

- Providing public water and wastewater services nationwide
- Managing Ireland's water resources
- Ensuring safe drinking water supply and proper wastewater treatment
- Supporting sustainable social and economic growth

Uisce Éireann (UÉ) is regulated by the economic regulator Commission for Regulation of Utilities (CRU) and the environmental regulator Environmental Protection Agency (EPA). Uisce Éireann's vision is to create a sustainable Ireland where water is respected and protected for all life forms and the planet. We address historical underinvestment through capital investment programmes and infrastructure maintenance. Its 25-year Water Services Strategic Plan outlines objectives and implementation strategies, including the development of a Wastewater Strategy Framework. The Cork Wastewater Strategy, part of this framework, focuses on addressing challenges in the Cork Metropolitan Area.

Cork Wastewater Strategy Need and Objective

Uisce Éireann has initiated the Cork Wastewater Strategy (CWS) to address the wastewater infrastructure needs of the Cork Metropolitan Area (CMA), Ireland's second-largest regional metropolitan area. The CMA, covering 820km² with a population of 310,000 (2022 Census), is projected to grow to 476,000 by 2040.

The CWS aims to develop an optimum wastewater treatment solution for the CMA for the strategy horizons of 2030, 2055, and 2080. Currently, UÉ's wastewater system in the CMA comprises 26 treatment plants, 193 pumping stations, 225 storm water overflows, and 1,300 km of pipeline. The strategy's primary objectives include identifying sustainable solutions to address CMA wastewater needs aligned with EU directives and national regulations, supporting economic and population growth, enhancing environmental protection, and improving infrastructure resilience to climate change.

The CWS adopts a strategic approach that incorporates stakeholder needs, supports economic growth, addresses climate change challenges, meets growing population demands, and ensures long-term sustainability and whole life value. Key considerations include infrastructure capacity, expansion, rationalisation of treatment plants and treatment and network enhancements to meet new standards.

By delivering a sustainable wastewater management strategy, the CWS aims to protect public health, safeguard the environment, and facilitate population and economic growth. It provides an understanding of investment needs, proposes enhanced treatment capacity, and strengthens infrastructure resilience to climate change, ultimately supporting the CMA's long-term development and environmental objectives.

The CWS is a forward-looking plan designed to ensure the long-term sustainability and efficiency of wastewater management in the region and is not designed to deliver localised interventions

within the region but instead establishes a strategic framework to guide the long-term development of wastewater conveyance and treatment infrastructure across the CMA. Any options that progress following the CWS will undergo more detailed consideration at the project level and in accordance with the public spending code.

Our Legal Context

Uisce Éireann plans, develops and operates our water service functions in line with the requirements of prevailing relevant national and European legislation. Relevant legislation includes multiple statutes, regulations and European directives. Some of the most pertinent legislation in the context of the operations covered by this plan include the Urban Waste Water Treatment Directive, Water Framework Directive, Wastewater Discharge (Authorisation) Regulations 2007, European Communities Environmental Objectives (Surface Water) Regulations 2009, River Basin Management Plan, and the EU Habitats Directive.

Environmental Assessments

UÉ have developed this draft CWS applying the requirements of the Strategic Environmental Assessment (SEA) Regulations (2004, amended 2011) and the EC Birds and Natural Habitats Regulations (2011). This involves undertaking relevant environmental assessments at each stage of the process. These assessments provide information on the environmental baseline conditions, and key trends, constraints and opportunities within the study area. The SEA scoping and AA Screening were consulted on with the CWS Issues Paper and responses have been fed into the CWS development and environmental assessment approach. Environmental assessments were then undertaken at each stage of the options appraisal process supporting iteration on the options and pipeline routes and informing decision making on the Recommended Approaches. Mitigation and enhancement measures identified through the environmental assessments are incorporated into the CWS implementation approach. These measures aim to address potential impacts and support meeting environmental and sustainability objectives. The proposed SEA monitoring plan forms part of the overall monitoring and feedback and review process applied to inform adaptive management, identify the need for changes and inform future iterations of the strategy.

Our Challenges

The Cork Wastewater Strategy addresses several critical challenges impacting wastewater management in the Cork Metropolitan Area:

Environmental Protection: The CWS aims to enhance environmental protection through improved wastewater treatment processes, reduced pollution, and better management of storm water overflows.

Population Growth and Economic Development: With the CMA's population projected to increase significantly by 2040 and beyond, the strategy focuses on expanding infrastructure capacity to meet growing demands while supporting economic development.

Regulatory Compliance: The strategy adopts a forward-thinking approach to align with current and anticipated policies and regulations. This proactive stance aims to stay ahead of compliance requirements, reducing the risk of non-compliance and associated penalties while safeguarding public health and environmental quality.

Ageing Infrastructure: Many existing wastewater facilities in the CMA are approaching or have exceeded their intended operational lifespans. The CWS addresses this through a capital replacement programme, implementing a proactive strategy to ensure long-term system reliability, reduce maintenance costs, and mitigate potential environmental hazards.

Climate Change Resilience: The CWS incorporates climate adaptation measures to combat rising sea levels, more frequent extreme weather events, and stormwater surges. These include infrastructure enhancements designed to withstand and mitigate environmental changes, ensuring system integrity and efficiency in the face of evolving climate conditions.

By addressing these strategic challenges, the CWS seeks to create a resilient, adaptable, and compliant wastewater management system. This approach aims to ensure the long-term sustainability and effectiveness of wastewater services in the CMA, protecting public health and safeguarding the environment while supporting economic and population growth for generations to come.

Methodology

The Cork Wastewater Strategy employs a structured methodology aligned with established wastewater management frameworks. This approach encompasses current infrastructure assessment, population projections, and design flow estimations for 2030, 2055, and 2080 scenarios. The process includes determining population projections, hydraulic and receiving water quality modelling, environmental assessments, and optioneering to develop recommended solutions.

Key components of the strategy include:

- Evaluating existing infrastructure to identify bottlenecks and capacity issues
- Projecting population growth and its impact on wastewater systems
- Conducting hydraulic and environmental modelling to assess impacts to the surrounding environment
- Assessing environmental impacts and ensuring regulatory compliance of relevant legislation
- Developing and evaluating strategic options for future wastewater management

The methodology also emphasises stakeholder engagement, involving local authorities, industry experts, and the public. The final outcome is a Cork Wastewater Strategy, that provides a sustainable roadmap for wastewater management in the Cork Metropolitan Area through to 2080.

Outcomes

The CWS culminates in the identification of a **Recommended Approach** to address the CMA drainage and wastewater requirements through to 2080. The Recommended Approach consists of a combination of Options ranging from WwTP upgrades, construction of new wastewater transfer pipelines, new pumping stations, wastewater network upgrades, construction of new WwTPs and relocating discharges. The Recommended Approach represents the preferred way forward for developing CMA wastewater infrastructure while protecting and enhancing the environment and supporting social and economic growth.

The Strategy identifies that decommissioning smaller WwTPs and transferring wastewater for treatment at a centralised location improves the overall treatment efficiency whilst simultaneously protecting the environment. As such, the Recommended Approach for the CWS identifies that 16 agglomerations transfer wastewater to larger centralised facilities, such as Carrigrennan or Cork Lower Harbour for treatment by 2080.

This strategic plan outlines the necessary works for implementing the Recommended Approach, segmented into individual implementation projects. These projects are designed to be procured and executed independently, accompanied by a high-level timeline indicating their required implementation periods. Additionally, the Strategy presents alternative Feasible Approaches. While not considered as favourable as the Recommended Approach, these alternatives can meet the Strategy's objectives.

Each recommendation set out in this Strategy will be considered in detail and prioritised based on need, feasibility, environmental requirements and available funding. Its inclusion in the Strategy does not guarantee that it will be progressed or delivered. Rather, it indicates that the recommendation merits further examination as part of Uisce Éireann's future planning and investment cycles, where decisions on implementation will be made in line with organisational priorities and regulatory obligations.

The CWS will be monitored through a set of Key Performance Indicators (KPI) which will focus on critical aspects of wastewater management, allowing for precise measurement of progress and identification of areas requiring attention or improvement. To maintain its relevance and effectiveness, the strategy will undergo reviews every five years, allowing for timely adjustments based on changing conditions and technological advancements. This approach ensures the CWS remains a dynamic and responsive framework for sustainable wastewater management in the region.

Conclusions

The CWS presents a balanced and sustainable approach to address current wastewater infrastructure needs while accommodating future growth and environmental protection in the CMA. The strategy adopts a flexible, adaptive framework that allows for continuous monitoring and adjustment to evolving challenges. Delivery of the CWS Recommended Approach will secure long-term benefits for the CMA, aligning with Uisce Éireann's policies and ensuring sustainable wastewater management for the region's future.

The Draft Cork Wastewater Strategy will undergo a public consultation period, allowing stakeholders and the public to provide feedback. The final strategy, incorporating this feedback, will be published in Summer 2026, aiming to protect public health, safeguard the environment, and facilitate growth through 2080.

2. A Vision for Sustainable Wastewater Management and Strategic Long Term Outcomes

2.1. Who we Are

2.1.1. Our Purpose and vision and Values

On the 1st of January 2014, through the Water Services Act (No. 1) 2013, Uisce Éireann (UÉ) (at the time known as Irish Water) assumed statutory responsibility for the provision of public water services and management of water and wastewater investment. Uisce Éireann's role, as Ireland's national public water services provider, is to provide public water and wastewater services throughout the country. We are the custodian with the responsibility to manage Ireland's precious water resources and, with our Local Authority partners, secure it for future generations. It is our responsibility to ensure that all our customers receive a safe and secure supply of drinking water and have their wastewater collected, appropriately treated and returned to the environment. Uisce Éireann supplies 1.7 billion litres of drinking water to our customers every day and collects and treats more than 1.2 billion litres of wastewater before we safely return it to the environment. We support Ireland's social and economic growth in a sustainable manner through appropriate investment in water services and strive to protect the environment in all our activities. Our vision is of a sustainable Ireland where water is respected and protected, for the planet and all the lives it supports.

2.1.2. Our policy and regulatory framework

Uisce Éireann is regulated by the following:

- The economic regulator, the Commission for Regulation of Utilities (CRU), is charged with protecting the interests of the customer. The CRU also approves appropriate funding to enable Uisce Éireann to deliver the required services to specified standards in an efficient manner.
- The environmental regulator, the Environmental Protection Agency (EPA), sets standards and enforces compliance with EU and National Legislation for drinking water supply and wastewater discharge to water bodies. The EPA liaises with the Health Services Executive on matters of public health.

UÉ has been progressively addressing a legacy of underinvestment through capital investment programmes and maintenance of existing infrastructure. The Water Services Strategic Plan 2050 (WSSP) (Tier 1) sets out UÉ objectives and means by which we will achieve them over the next 25 years. It has identified a requirement for a Wastewater Strategy Framework (Tier 2), which will capture the multifaceted aspects of managing our wastewater assets. The Cork Wastewater Strategy (CWS) is part of this framework, looking at how to address these challenges for the Cork Metropolitan Area (CMA). Figure 2-1 below displays the UÉ framework hierarchy and shows the CWS's place within Tier 2, under the Tier 1 WSSP 2050.

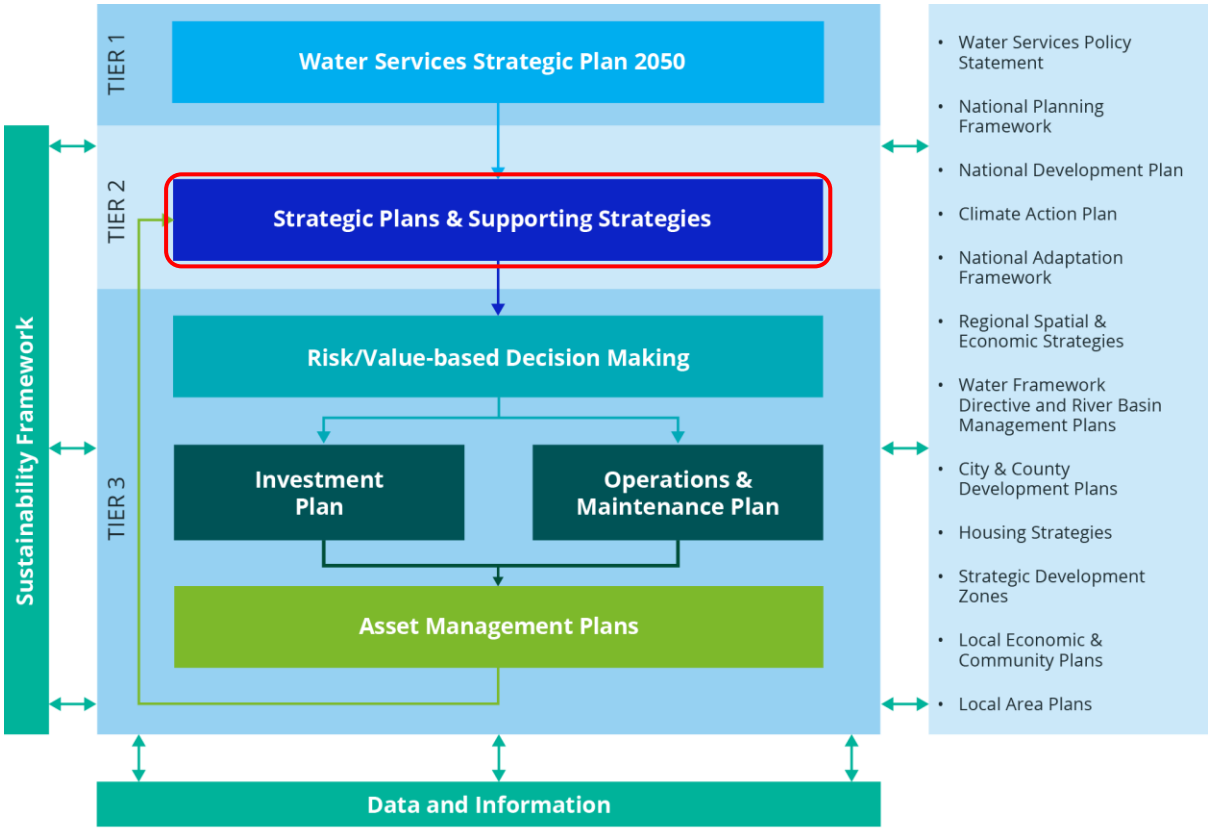

Figure 2-1: Uisce Éireann Framework and where the CWS Lies

2.2. The Need for a Wastewater Strategy for Cork

The Cork Metropolitan Area (CMA) is a major regional metropolitan area, identified as such in the National Planning Framework (NPF) and in the Regional Spatial and Economic Strategy (RSES) 2020-2032 to ensure long term economic, environmental, and social progress. The CMA includes Cork City, its suburbs and the towns and rural areas in the immediate hinterland of the city of Cork as a single integrated entity (see Figure 2-2). For the purpose of this strategy, Grenagh and Watergrasshill have been included as they are nearby UÉ serviced agglomerations which can optimise integration between agglomerations in the CMA. The CMA covers 820km² and has a population of approximately 310,000 as determined from the Census 2022. The NPF 2040 envisages that Cork will become the fastest-growing city region in Ireland with a projected 50% to 60% increase of its population in the period up to 2040. This projected population and associated economic growth will result in a significant increase in water supply and demands on the existing wastewater infrastructure within the area. The existing wastewater infrastructure is already being challenged to keep pace with the increased demand for new serviced land needed for housing, commercial developments and industry.

Figure 2.2: Cork Wastewater Strategy Overview

Table 2-1: WwTPs included within the Strategy and accompanying EPA Registration No.

WwTP Agglomerations				
Blarney WwTP (D0043-01)	Carrignavar WwTP *(D0517-01)*	Carrigrennan WwTP *(D0033-01)*	Killumney WwTP *(A0435-01)*	Saleen WwTP *(A0433-01)*
Courtbrack WwTP (A0437-01)	Grenagh WwTP *(A0524-01)*	Ballygarvan WwTP *(D0540-01)*	Cork Lower Harbour WwTP *(D0057-01)*	Whitegate-Aghada WwTP *(D0423-01)*
Dripsey WwTP (D0426-01)	Whitechurch WwTP	Halfway WwTP *(A0443-01)*	Carrigtwohill WwTP *(D0044-01)*	Ballincurrig WwTP *(A0361-01)*
Inniscarra WwTP (A0441-01)	Knockraha WwTP *(A0352-01)*	Minane Bridge (River Valley) WwTP *(A0356-01)*	North Cobh WwTP (D0140-01)	Lisgoold North WwTP *(A0361-01)*
Kileens WwTP (D0329-01)	Watergrasshill WwTP *(D0201-01)*	Ballincollig WwTP *(D0049-01)*	Cloyne WwTP *(D0298-01)*	Lisgoold South WwTP *(A0361-01)*
Midleton WwTP (D0056-01)				

Recognising the need for a strategic approach to assessing wastewater treatment and network infrastructure for the CMA, UÉ has initiated the Cork Wastewater Strategy. The study area contains over 25 towns and villages in addition to the urban centre of Cork City. The Wastewater Treatment Plants (WwTP) included as part of the study are listed in Table 2-1 above. Areas within the CMA not currently served by an UÉ WwTP are also considered within this strategy.

The need for a holistic drainage assessment and wastewater strategy for the CMA is driven by high growth projections for the area, compliance challenges of some of the WwTPs and sewerage networks in the CMA, and wastewater treatment capacity requirements to accommodate current and future wastewater loads and address associated pressures on the quality of receiving waters.

Jacobs Engineering Ireland Ltd were appointed by UÉ to prepare and deliver a wastewater strategy for the CMA, known as the Cork Wastewater Strategy (CWS). The CWS assesses the existing wastewater treatment and network infrastructure in the CMA to determine the necessary future investments required to support sustainable wastewater projects that address climate change, accommodate economic and population growth, and mitigate environmental impacts.

The scope of the CWS is to produce a strategy that identifies sustainable wastewater investments and projects for the growing CMA over three horizon periods up to 2080.

The CWS identifies and proposes solutions for the sewerage network requirements for the CMA across 3 Strategy Horizons

2030

2055

2080

The CWS considers the capacity of existing wastewater infrastructure and identifies options for upgrading and investing in new wastewater infrastructure covering the three strategy horizon periods up to 2080. The CWS aims to deliver a sustainable wastewater strategy that will protect public health, safeguard our environment and facilitate growth. The Strategy identifies a timeline for initiation of projects by considering the individual catchment needs and any interactions with other agglomerations within the CMA. When a project is designated to be initiated by 2055, for example, it does not necessarily mean the project will commence in that year. Instead, it indicates that the necessary steps to initiate the project will be undertaken in the years between 2030 – 2055. Each recommendation set out in this Strategy will be considered in detail and prioritised based on need, feasibility, environmental requirements and available funding. Its inclusion in the Strategy does not guarantee that it will be progressed or delivered. Rather, it indicates that the recommendation merits further examination as part of Uisce Éireann's future planning and investment cycles, where decisions on implementation will be made in line with organisational priorities and regulatory obligations.

The delivery of a sustainable, integrated wastewater system for the CMA requires a strategic approach to drainage planning incorporating needs of stakeholders, allowing for climate change, adaptive to changing legislation and regulation, while meeting the demand of a growing population and supporting economic growth. A sustainable wastewater solution must be consistent with statutory obligations and regulatory drivers designed to meet both national and international environmental objectives e.g., Water Framework Directive (WFD) and recast Urban Wastewater Treatment Directives (rUWWTD), and those intended to address the impacts of climate change.

This strategic approach incorporates the needs for long-term sustainability and whole life value, maximising value from our wastewater assets, incorporating service resilience, biodiversity enhancement and wider societal benefits.

UÉ aim to ensure good regulation of trade effluent discharging to sewer and that industrial pollutants are more appropriately treated at source, rather than at end-of-pipe in UÉ WwTPs. It will also aim to promote an optimal balance between industry providing their own wastewater treatment and treatment at UÉ WwTPs.

Solutions identified and assessed include the rationalisation of a number of WwTPs, increasing capacity to accommodate a growing population, and enhancing networks to meet new standards that limit storm water overflow (SWO) operations and protect against climate-induced flood risks. To ensure the strategy remains relevant and representative of the changing environment, it will be regularly reviewed and updated every five years.

2.3. Vision, Aims and Objectives

The vision of the CWS is to deliver a sustainable strategy that will protect public health, safeguard our environment and facilitate growth to 2080. Having an overview of wastewater asset investment needs is essential to plan sustainably for the long term. The strategy provides:

- Positive, collaborative engagement with regulators and stakeholders to accelerate achievement of environmental objectives;
- Allowance for future environmental and growth needs with timely and appropriately phased delivery;

- Appropriate risk assessment and management to reduce stress on assets and ensure resilience and good levels of service;
- Measures to meet the requirements of the recast UWWTD and Integrated Urban Wastewater Management Plans;
- Our part in delivering Water Framework Directive objectives by meeting compliance with our Wastewater Discharge Authorisations;
- Adaptive planning that allows scenario testing, considering the whole asset lifecycle and ensures that future needs can be met efficiently, effectively and sustainably through capital or operational activities;
- Proposals for enhanced treatment capacity and efficiency while reducing pollution and improving water quality;
- Strengthening infrastructure resilience to climate change through risk assessments, adaptation strategies, infrastructure design and retrofitting to withstand extreme weather events and sea-level rise.

The CWS delivers a sustainable wastewater management strategy that addresses the needs of wastewater infrastructure, offering achievable strategic and sustainable wastewater options, resulting in better overall performance and providing capacity to meet future demand and support economic growth for the CMA. The key objectives of the CWS are as follows:

- Development of a sustainable wastewater strategy for the CMA consistent with the EU WFD and recast UWWTD Regulations.
- Outline the requirements for wastewater treatment and wastewater network infrastructure capable of meeting the demands of the study area in the context of current Development Plans, the NPF, the Southern Regional Spatial and Economic Strategy (RSES) 2020 and longer-term development potential of the area up to year 2080.
- Identification of alternative solutions for effective management of wastewater to protect and restore the environment, support social and economic growth that are consistent with UÉ WSSP 2050 among other UÉ plans and strategies.
- Evaluation of alternative solutions and identification of preferred wastewater solutions.
- To develop an adaptable strategy where outcomes can be adjusted linked to influences like climate and projected population change.

2.4. Roadmap

The methodology for the CWS follows a structured approach aligned with similar wastewater management frameworks such as Water Resource Management Plans (WRMPs) and Drainage and Wastewater Management Plans (DWMPs). The process is summarised in the roadmap below.

Figure 2-3: CWS Roadmap

2.5. Structure

This strategy is organised to provide a clear and logical flow of information, ensuring an understanding of the CWS. The CWS and supporting material consist of the following documents:

Draft Cork Wastewater Strategy

The Draft CWS (this document) provides an overview of the strategic approach adopted to assessing wastewater treatment and network infrastructure for the CMA and its findings. It consists of fourteen (14) individual sections and seven (7) accompanying Appendices to the strategy.

- **Section 1** concisely presents and summarises the key points, findings, and recommendations of the strategy.
- **Section 2** sets out UÉ's goals and vision while also providing an introduction to the Cork Wastewater Strategy and highlighting the need for the strategy.

- **Section 3** outlines the legislative and regulatory context that shaped the strategy, emphasising the challenges encountered in ensuring compliance.
- **Section 4** details the approach and importance of community and stakeholder collaboration and provides a summary of the feedback from Public Consultation 1.
- **Section 5** provides an overview of the methodology followed in undertaking and preparing the CWS.
- **Section 6** presents an overview of the assessment of current wastewater infrastructure in the CMA.
- **Section 7** examines key risk metrics that pose challenges to the long-term resilience of wastewater infrastructure. It also explores operational, environmental, and social factors that will significantly influence the sustained delivery of wastewater services.
- **Section 8** provides an overview of the methodology of the network modelling undertaken to achieve the results and develop the Recommended Approach.
- **Section 9** provides an overview of the methodology and results of water quality modelling undertaken on freshwater and marine waterbodies within the CMA that may be impacted by future wastewater needs.
- **Section 10** presents our Option Development Process for the CWS.
- **Section 11** summarises the results of the Optioneering process and identifies Feasible Approaches for consideration.
- **Section 12** presents the **Recommended Approach** and Implementation Strategy for the CWS.
- **Section 13** provides an overview of Monitoring and Feedback into the Strategy.
- **Section 14** summarises the overall conclusions of the CWS.

Appendix 1 - Strategic Environmental Assessment Report (SEA)

UÉ has prepared a Strategic Environmental Assessment (SEA) Report to identify and evaluate likely significant effects of the CWS and identify potential mitigation measures, in accordance with the requirements of the EU SEA Directive and associated Irish regulations (outlined in more detail below). It considers alternatives to the approach for the CWS and aims to identify potential interactions with other plans and programmes, including the potential for cumulative effects. The SEA Environmental Report provides the methodology for integrating SEA and Appropriate Assessment (AA) requirements applied throughout the CWS; and provides mitigation and implementation recommendations for the CWS and a draft monitoring plan. The report is provided for consideration as part of the public consultation process required under the SEA regulations and is included in Appendix 1 of this Strategy.

Appendix 2 - NIS and AA Determination Statement

A Natura Impact Statement (NIS) has been prepared to support the Appropriate Assessment (AA) of the CWS. Screening for AA of the CWS assessed whether, on the basis of objective scientific information, the CWS individually or in-combination with other plans or projects, is likely to have

a significant effect on a European site. The relevant information to assist in informing the AA determination by UÉ is documented in this NIS (noting that UÉ's ultimate AA determination will also consider wider factors, including feedback received through consultation). This report is included in Appendix 2 of this Strategy.

Appendix 3 - Wastewater Treatment Plants Flow and Loads Summary Report

A Flow and Loads Summary Report has been prepared to outline the methodology for calculating current and future flow and load projections at the WwTPs and identify any capacity shortfalls and the projected date of shortfall. A current flow and load analysis was completed to understand the immediate needs of the WwTPs and identify any existing capacity issues. This report is included in Appendix 3 of this Strategy.

Appendix 4 - Network Modelling Report

The Network Modelling Report showcases the proposed network interventions required to achieve the objectives of the CWS across the three strategy horizons. This report is included in Appendix 4 of this Strategy.

Appendix 5 - Water Quality Modelling Reports

A study was undertaken to assess the present and projected assimilative capacity of receiving waters within the CMA, to ascertain the impacts of potential options within the CWS may have on the water bodies. Three separate reports have been prepared and are presented in Appendix 5: Freshwater Water Quality Modelling Report, Marine Water Quality Modelling Report, and a Microbiological Assessment Report.

Appendix 6 - Optioneering and Solutions Development Report

An Optioneering and Solutions Development Report has been developed to demonstrate the optioneering methodology employed in identifying potential solutions for implementation within the CWS. This document outlines the systematic approach used to evaluate and select viable options. It also identifies and documents the feasible and preferred strategic drainage and treatment solutions for the CMA, assessing the full range of potential solutions targeting strategy horizons in 2030, 2055, and 2080. This report is included in Appendix 6 of this Strategy.

Appendix 7 - Consultation 1 Responses

A summary of the issues identified from the public consultation are included in Appendix 7 of this Strategy.

2.6. Scope and Limitations of the CWS

2.6.1. What is Included in the Strategy

The CWS is a forward-looking plan designed to ensure the long-term sustainability and efficiency of wastewater management in the region. This strategic initiative encompasses several key focus areas, including infrastructure development, environmental compliance, and climate change resilience. The CWS aims to identify and prioritise critical upgrades and expansions to meet current and future demands while ensuring all operations and developments adhere to stringent environmental standards and regulations. A crucial aspect of the strategy involves incorporating adaptive measures to mitigate the impacts of climate change on wastewater systems.

Recognising the need for large-scale projects to support long-term sustainability, the CWS focuses on developing and implementing policies that support sustainable wastewater management practices over extended periods, creating a robust framework for future decision-making and operations.

Integrating SEA and AA with the development of the CWS has been part of this process and embedded in the decision-making framework. Through consideration of SEA objectives and AA requirements the CWS takes account of key constraints such as the protection of European and National designated sites, supporting achievement of WFD waterbody objectives, identifying opportunities to apply circular economy principled and contributing to net zero carbon targets. Recommendations from the environmental assessments for mitigation and enhancement measures as well as an outline monitoring plan are included in the CWS approach for implementation.

By addressing these crucial aspects, the CWS aims to create a robust, adaptable, and efficient wastewater system that will serve the CMA's needs for generations to come. This strategy represents our commitment to environmental stewardship, public health, and sustainable urban development, ensuring that the CMA's wastewater infrastructure evolves concurrently with the region's growth and changing environmental conditions. Through this approach, we are laying the groundwork for a resilient and sustainable wastewater management system that will benefit the community for years to come.

2.6.2. What is Not Included

The CWS presents a holistic, forward-looking strategy that identifies future drainage and wastewater options for implementation within the CMA. It is important to note that the CWS is not designed to identify localised interventions within the region but instead establishes a strategic framework to guide the long-term development of wastewater conveyance and treatment infrastructure across the CMA.

The CWS Recommended Approach sets the context for subsequent implementation of projects. Approaches and Options are considered at a strategic level, with assessments conducted primarily through desktop-based evaluations. These options have been assessed and evaluated to ensure their feasibility, adherence to the strategy's main goals and objectives, and compatibility with other recommended approaches. It should be emphasised that no concept or detailed design work has been carried out on any of the feasible approaches identified within this strategy. Any options that progress following the CWS will undergo more detailed consideration at the project level and in accordance with the public spending code. At this stage, options will be subject to environmental assessment in line with relevant statutory consenting processes.

Likewise, a high-level financial assessment has been conducted when identifying Feasible Approaches and is presented within the Optioneering and Solutions Development Report in Appendix 6. While a high-level financial assessment has been conducted when identifying feasible approaches, a full economic analysis of the scenarios has not been undertaken. The optimal implementation timeline for the strategy recommendations from a financial perspective is subject to the available funding within given UÉ investment cycles.

3. Strategic Challenges

3.1. Fostering Economic Growth

3.1.1. Population Projections and Design Load Forecasting

The CWS incorporates population growth projections and design loading forecasts, which indicate a significant anticipated increase in wastewater volumes within the CMA. This forward-looking approach is crucial for ensuring that the region's wastewater infrastructure can adequately support sustainable development while preventing capacity constraints.

Our forecast methodology is robust and multifaceted, taking into account a range of factors that influence future wastewater generation. These include demographic trends, planned urban expansion initiatives, and projected economic growth patterns. Our strategy ensures alignment with current policies, plans and regulations regarding population and development growth, as further detailed in Section 3.2, including but not limited to:

- National Planning Framework
- Regional Spatial and Economic Strategy – Southern Region
- Cork Metropolitan Area Strategic Plan
- Cork City Development Plan
- Cork County Development Plan

To account for the inherent uncertainties in long-term forecasting, we have included a headroom allowance (safety margin) in our demand forecast.

This approach to forecasting allows for more flexible and resilient planning. By anticipating a range of possible future demands, we can design infrastructure solutions that are adaptable and scalable. This strategy ensures that the wastewater system can effectively manage increased loads as the population grows and urban areas expand, while also allowing for potential variations in these growth patterns. Growth projections used within the CWS are presented in Table 3-1. Table 3-1 shows the growth of Population Equivalent (PE), which is a measurement of total organic biodegradable load, including industrial, institutional, commercial and domestic organic load, on a WwTP, converted to the equivalent number of population equivalents. The increase in PE detailed in Table 3-1 demonstrates the pressure existing wastewater infrastructure will be placed under and the need for upgrades to the WwTPs and networks to facilitate this growth.

Table 3-1: Population Projections in the CMA

Settlement	Population Type	2022 Census	2030 Projection	2055 Projection	2080 Projection
Cork Metropolitan Area	Residential	310,394	374,564	482,102	534,993
	Commercial PE	49,662	59,932	77,137	85,597

Settlement	Population Type	2022 Census	2030 Projection	2055 Projection	2080 Projection
	Industrial PE	83,834	83,834	83,834	83,834
	Headroom (15%)	0	80,607	103,742	114,874
	Total PE	**443,900**	**598,900**	**746,800**	**819,300**

Note: Total PE rounded to the nearest 100

The alignment of wastewater infrastructure development with these projections is a cornerstone of our strategy. It enables us to proactively address future needs and implement timely infrastructure upgrades. This foresight is essential for maintaining service quality, meeting environmental standards, and supporting the region's economic and social development goals in the face of changing demographics and urban landscapes.

The projected growth rates will be further reviewed and refined at future intervals by UÉ. This will allow UÉ to respond to growth and development needs and prioritise wastewater infrastructure investment with reference to the County/City Development Plans, and Metropolitan Area Strategic Plans (MASP).

3.2. Protecting & Enhancing the Natural Environment

3.2.1. Legislative Framework and Implications

The CWS is a regional UÉ Tier 2 level plan which provides the strategy for wastewater management in the CMA over the period 2025 to 2080. It is influenced by a range of European and Irish legislation, UÉ national level plans and other relevant national and regional level plans as identified in Figure 3-1.

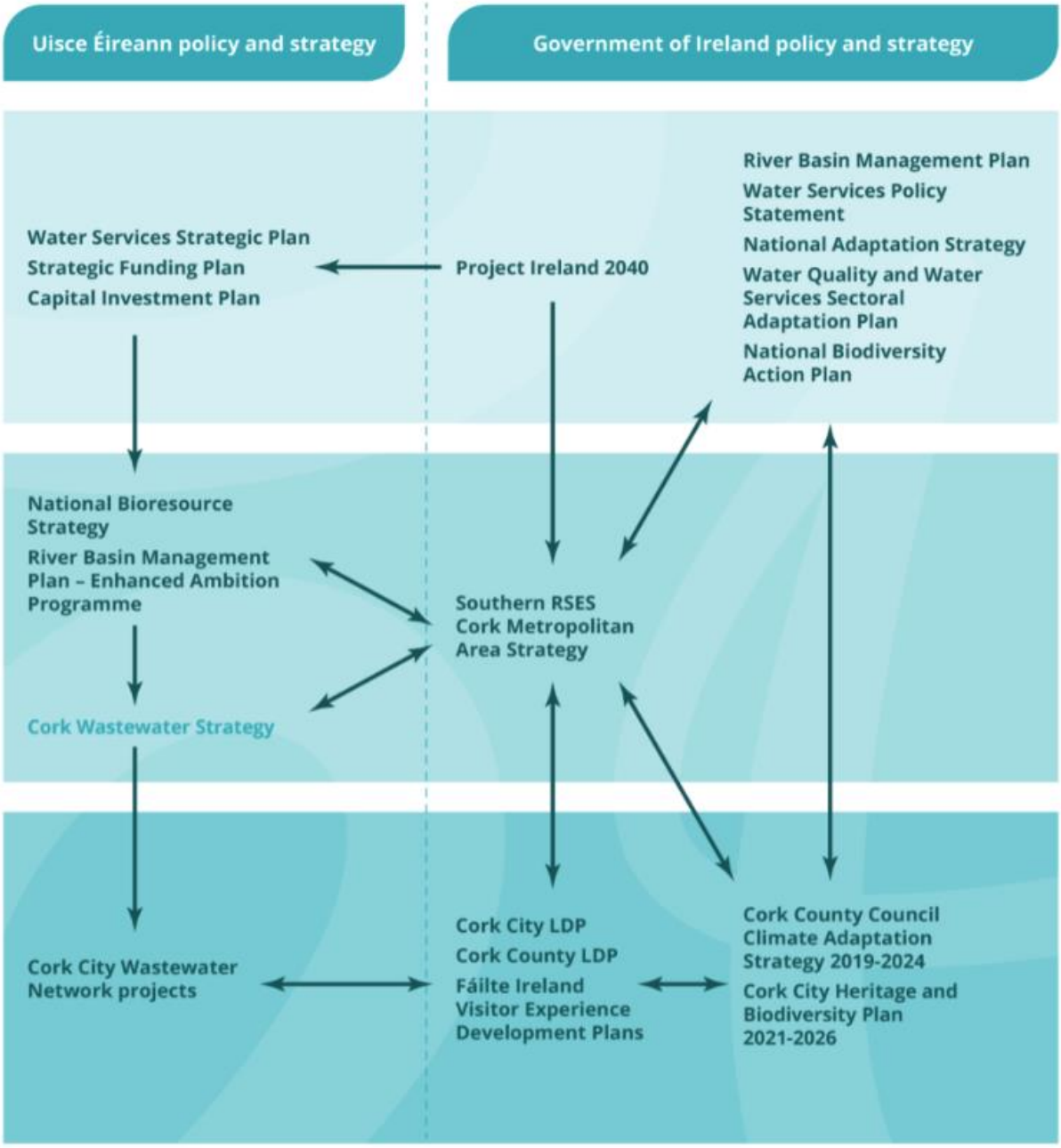

Figure 3-1: Hierarchy and interaction of plans and projects

The non exhaustive list of policies and legislature listed below were considered during the preparation of the strategy decision making process. UÉ are aware that changes in these policies and legislation will have a significant impact on the delivery of wastewater services across the three strategy horizons and the strategy will be reviewed every five years to provide robustness to the measures therein in keeping with changing legislation. Further information on all policies, plans and legislature adhered to is included in the SEA Report accompanying this strategy in Appendix 1.

Water Framework Directive

The Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy) is the overarching Directive relating to water policy in the European Union (EU). It aims to protect and

restore the water environment so that all water bodies are at 'Good Ecological Status' or better. It sets the framework for managing UÉ activities relating to pollution from wastewater discharges. Effectively, this requires that the CWS provides adequate level of wastewater treatment so that all water bodies achieve this status.

River Basin Management Plan

The River Basin Management Plan 2022 – 2027 (RBMP) sets out the measures that are necessary to protect and restore water quality in Ireland. The overall aim of the plan is to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment. The RBMP is updated every six-years as part of the river basin planning cycle; the current RBMP is currently in its third cycle.

The plan identifies multiple causes in the decline of Ireland's water quality. New targeted and effective measures are required to address declines in water quality and to protect those areas where progress has been made. In addition to improving overall water quality, sustainable water management is important to addressing and adapting to the impacts of climate change, with many of the required measures having co-benefits for climate change mitigation and biodiversity.

WwTPs identified in the RBMP as causing water quality impacts in the rivers they discharge to, are included in UÉ River Basin Management Plan Enhanced Ambition Programme funded by the EU under Ireland's National Recovery and Resilience Plan. This will support the objectives of Ireland's River Basin Management Plans and improve water quality in rivers. The programme is aimed at ensuring that UÉ assets are not impacting on the ability of receiving waters to achieve their water quality objectives. The CWS will take account of the objectives and targets of the RBMP for the environment and the specific actions identified for Uisce Éireann.

Wastewater Discharge (Authorisation) Regulations 2020

The Wastewater Discharge (Authorisation) Regulations, 2020 were introduced to control and regulate discharges from Wastewater Treatment Plants.

All discharges to the aquatic environment from wastewater systems owned, managed and operated by Uisce Éireann require a Wastewater Discharge Licence or Certificate of Authorisation from the EPA. Uisce Éireann is required to apply to the EPA for a licence or Certificate of Authorisation.

The process allows the EPA to place stringent conditions on the operation of such discharges to ensure that potential effects on the receiving water bodies are strictly limited and controlled. Wastewater discharges are regulated by the EPA under the EU (Wastewater Discharge) Regulations. The EPA can also issue notices to review Wastewater Discharge Authorisation.

In overall terms, the aim is to achieve good surface water and ground water status in addition to complying with standards and objectives established for associated protected areas in accordance with relevant legislation including the WFD.

Urban Wastewater Treatment Directive

The Urban Wastewater Treatment Directive (UWWTD) (Council Directive 91/271/EEC of 21 May 1991) set the standards to be met in the collection and treatment of wastewater as well as the monitoring requirements for wastewater discharges from urban areas. It sets standards for both

treatment and disposal of wastewater for communities of more than 2,000 PE as well as monitoring requirements for wastewater discharges from urban areas. The directive ensures protection of the environment from the adverse effects of urban wastewater discharges.

A recast UWWTD entered into force on 1 January 2025. The main changes between the Urban Wastewater Treatment Directive (UWWTD) and its recast version (often referred to as the UWWTD recast) primarily involve updates and enhancements aimed at improving water quality and environmental protection standards across the EU. The revision of this directive is one of the key deliverables under the EU's zero pollution action plan and aims to update the current directive by extending its scope and aligning it with the European Green Deal's objectives.

The amendments to this legislation influence the recommendations of the CWS and was closely followed as the Directive text was negotiated and finalised.

Some key differences and updates introduced in the recast include:

Scope and Definitions:

- The recast clarifies and updates definitions related to wastewater collection, treatment and discharge, ensuring consistency and alignment with current environmental standards. The scope of the recast UWWTD has widened to cover smaller settlements and address pollution from stormwater overflows, urban runoff, and poorly performing individual systems while strengthening the polluter pays principle and promoting resource recovery and emphasising the importance of monitoring health parameters in wastewater to support public health actions

Nutrient Removal Requirements:

- The recast strengthens requirements for nutrient removal, particularly for nitrogen and phosphorus, to reduce eutrophication in receiving waters. This includes stricter standards for sensitive areas such as coastal waters and freshwater bodies.

Implementation Deadlines:

- The recast sets revised deadlines for member states to comply with the directive's requirements, reflecting technological advancements and the need for accelerated environmental improvements.
    - All agglomerations of 1,000PE or more to require an urban wastewater collecting system by 2035;
    - Tertiary treatment to be required for treatment of urban wastewater for all agglomerations of 150,000 PE or more by 2039; and by 2045 for those agglomerations greater than 10,000 PE.
    - Quaternary treatment for the removal of a broad spectrum of micropollutants to be mandatory for all WwTPs of over 150,000 PE by 2045 (and by risk assessment over 10,000PE);

Monitoring and Reporting:

- Enhanced provisions for monitoring and reporting on the performance of wastewater treatment plants and the quality of discharged water. This ensures transparency and accountability in achieving environmental objectives.
- Increased Monitoring Requirements including frequency of sampling, range of parameters, sludge destinations and representative SWOs.

- The monitoring of various public health parameters (such as known viruses and emerging pathogens), chemical pollutants, including so-called "forever chemicals" (per- and polyfluoroalkyl substances or PFAS), microplastics and antimicrobial resistance will be strictly monitored.
- Introducing health parameters to monitor pandemics.

Innovation and Best Available Techniques:

- The recast promotes the use of innovative technologies and best available techniques in wastewater treatment processes to improve efficiency and reduce environmental impact.
- Objectives for the reduction of pollution from storm water overflows:
    - an indicative non-binding objective that storm water overflow represents a percentage that cannot be more than 2% of the annual collected urban wastewater load calculated in dry weather conditions. This indicative objective shall be met by 31 December 2039 for all agglomerations of 100,000 PE and above and 31 December 2045 for agglomerations of 10,000 PE and above.

Integration with Other Environmental Legislation:

- The recast ensures better integration with other EU environmental legislation, such as the WFD, to achieve broader environmental objectives cohesively.
- The law introduces extended producer responsibility for medicinal products for human use and cosmetic products, to cover the costs of quaternary treatment (to remove micro-pollutants from urban wastewater). At least 80% of the costs will be covered by producers, complemented by national financing.

Public Participation and Information:

- There is an emphasis on public participation and providing accessible information about wastewater treatment practices and their environmental impacts under the recast.

Energy Audits:

- Energy audits to be completed on WwTPs and collecting systems every 4 years (>100,000 PE by Dec 2025, 10,000PE – 100,000PE by 2030);
- Utilise biogas and reduce methane emissions;
- Total annual energy from renewables, at national level from WwTPs >10,000 PE load, to be equivalent at least to
    - 50% by end 2030;
    - 75% by end 2035;
    - 100% by end 2040.
- Alternative proposals suggest for inclusion of an allowance for up to 30% of energy to be purchased from external sources.

Member States will be required to adopt national legislation transposing the requirements of the UWWTD within 30 months from the entry into force of the Directive (i.e., first quarter of 2027).

European Communities Environmental Objectives (Surface Water) Regulations 2009

These Regulations established legally binding quality objectives for all surface waters and environmental quality standards for pollutants, with the purpose of implementing protection measures. They allow the EPA to set up inventories of priority substances and classify surface water bodies.

The Regulations also require the examination and review of current discharge authorisations to ensure they comply with water quality objectives and standards relating to emission limits. It emphasises that local authorities may work collaboratively with UÉ, other local authorities and the EPA to make pollution reduction plans concerning priority substances and phase out emissions and discharges of priority hazardous substances.

Bathing Water Regulations

The Bathing Water Directive (2006/7/EC) was transposed into Irish law in 2008. It aims to enhance the protection of bather's health and introduced stricter standards for water quality and a new method of assessment. It has established a more proactive approach to the assessment of possible pollution risks, and to the management of bathing waters. It also places significant priority on promoting increased public involvement, and for improved transfer of information on bathing water quality to the general public.

The Directive requires the monitoring and assessment of bathing waters. It ensures timely information is given to the public during the bathing season and requires authorities to disseminate information on bathing water quality actively and promptly. In particular, notices banning or advising against bathing should be rapidly and easily identifiable.

EU Habitats Directive

The European Habitats Directive was adopted in 1992 and requires all Member States to establish a strict protection regime for listed species, both inside and outside Natura 2000 sites. The overall objective is to ensure that these species and habitat types are maintained, or restored, to a favourable conservation status within the EU. In addition to halting the further decline or disappearance of these species and habitats, the Directive aims to allow them to recover and thrive over the long-term. It is built around two pillars: the Natura 2000 Network of protected sites, and the strict system of species protection.

Ireland has a wide diversity of habitats, including 58 Annex I habitats, of which 16 are priority habitats, as designated under the EU Habitats Directive. Furthermore, there are 17 Article 17 habitats within the vicinity of the CMA. Our inland waterways (rivers, streams, lakes, ponds and wetlands) support internationally significant populations of threatened species in Europe, such as the Atlantic salmon, white-clawed crayfish and freshwater pearl mussel. Through the provision of water services in Ireland, we discharge directly to a number of these SACs and SPAs throughout the country, or near these sites with direct hydrological connectivity. As part of our environmental obligations, we are obligated to ensure that our discharges do not impact on these sites and their nature conservation interests.

3.2.2. Strategic Environmental Assessment

The CWS is subject to SEA and AA in accordance with applicable European legislation and associated Irish implementing legislation. The SEA Directive outlines the requirements for environmental assessments for all plans and programmes prepared by relevant authorities and aims to provide for a high level of protection of the environment and to promote sustainable development. It also sets out specific requirements with respect to the Habitats Directive (92/43/EEC) and Birds Directive (2009/42/EC) and needs to take account of the findings of the Appropriate Assessment (see Section 3.2.3 below). The SEA Directive was transposed into Irish law under the European Communities (Environmental Assessment of Certain Plans and

Programmes) Regulations 2004, SI 435/2004, as amended (the SEA Regulations). The SEA process is integral to the development of the CWS and ensures the protection of the environment is considered in our approach. The development of the draft CWS (this document) has been informed at each stage through iterative assessment undertaken as part of the SEA and AA The SEA objectives identified at the scoping stage of the SEA process for the CWS are used for assessing the beneficial and adverse impacts on the environment at all stages of the Options and Solution Development Process. The Options and Solution Development Process enables the selection of our preferred wastewater implementation solutions. The SEA Environmental Report that accompanies the CWS outlines the likely significant environmental effects and potential benefits of implementing the Strategy and mitigation requirements. It is subject to public consultation in accordance with the SEA Directive and SEA Regulations.

The SEA Environmental Report is included in Appendix 1 to this CWS. Recommendations from the SEA, including the SEA monitoring plan and environmental mitigation and enhancement measures will be taken forward as part of the implementation of the CWS as set out in section 12 and section 13.

3.2.3. Appropriate Assessment

A screening for Appropriate Assessment (AA) has been completed in relation to the CWS to assess, in view of best scientific knowledge and in view of the conservation objectives of relevant European sites, if the CWS, individually or in combination with other plans or projects is likely to have a significant effect on any relevant European site(s), i.e. Special Areas of Conservation (SAC) and Special Protection Areas (SPA). A summary of the screening for AA of the CWS concluded that there was potential for Likely Significant Effects (LSEs) therefore AA of the CWS was required. A Natura Impact Statement (NIS) has been prepared to support the AA of the CWS and is included in Appendix 2. NIS mitigation and monitoring requirements are incorporated into the CWS implementation approach as set out in CWS section 12 and section 13.

3.2.4. Consultation

Public consultation is a key element in ensuring members of the public and all interested parties have the chance to be part of the development of the CWS. Key aspects of this process include engagement with environmental authorities throughout the CWS development, recognising their crucial role in shaping and informing the strategy. Pre-consultation workshops for key statutory stakeholders facilitated by Jacobs and supported by relevant Uisce Éireann personnel as appropriate were a key part of the consultation process on the CWS and associated environmental reports. Targeted consultation with specific bodies aimed to gather all relevant data early in the process, while also providing a platform to address concerns and queries in a timely manner. This engagement strategy ensured transparency and inclusivity in the CWS development process, gathered valuable input from a wide range of interested parties, incorporates expert knowledge from environmental authorities, and identified potential issues early in the development stage. By prioritising public consultation and stakeholder engagement, the CWS development process seeks to create a well-informed, and widely accepted strategy that reflects the needs and concerns of all involved parties.

3.3. Alignment with National, Regional and Uisce Éireann Strategies

The CWS aligns itself with a diverse range of national, regional and UÉ strategies and initiatives as well as broader infrastructure plans of the study area. This alignment ensures wastewater management infrastructure is integrated within broader planning efforts to support economic growth and environmental sustainability. This strategic alignment serves multiple purposes. Primarily, it ensures that our wastewater management plans are in harmony with and supportive of broader economic growth objectives. By considering the larger context, we can develop infrastructure that not only meets current needs but also anticipates and facilitates future development. Additionally, this approach reinforces our commitment to environmental sustainability, ensuring that our wastewater management strategies complement and enhance other environmental initiatives. A non-exhaustive list of policies taken into consideration as part of this strategy are detailed below.

National Planning Framework – Project Ireland 2040

The National Planning Framework (NPF) is the overarching policy for Ireland's social, economic, and cultural development. The NPF is a strategic development framework setting out the long-term context for Ireland's physical development and associated progress in economic, social, and environmental terms. It is being followed and underpinned by supporting policies and actions at sectoral, regional and local level. The revised NPF will integrate into the RSES, the Cork City Development Plan and the Cork County Development Plan.

The NPF envisions Cork as an internationally competitive, sustainable urban environment. By 2040, Cork city and suburbs are expected to grow by 40%, requiring significant investment in critical enabling infrastructure such as water and wastewater systems. To support this growth, the framework emphasises the "Sustainable Management of Water, Waste, and other Environmental Resources," mandating new strategic projects to enhance water supply and wastewater treatment capacity.

Regional Spatial and Economic Strategy – Southern Region

The Southern Regional Spatial and Economic Strategy (RSES), published in 2020, provides a strategic framework for regional development in line with the NPF. It mandates alignment between city and county development plans and the RSES to achieve balanced regional growth. The RSES is legally binding, requiring that city and county development align with its objectives. The Strategy highlights the critical importance of wastewater infrastructure in supporting urban expansion, population growth, and economic development for the southern region.

The strategy identified a number of objectives that directly related to the CWS. These mainly relate to supporting Uisce Éireann in:

- Planning for long-term needs
- Implementing our investment plan
- Eliminating untreated discharges
- Investing in strategic wastewater treatment facilities
- Separating foul/surface water networks
- Servicing rural villages
- Supporting rural wastewater treatment programmes

At the time of writing, the RSES identified a number of projects - some of which relate to the CWS. This includes a wastewater pumping station and rising main from Midleton to Carrigtwohill and from Killumney to Ballincollig; the Cork Lower Harbour Main Drainage Project; and Drainage Area Plans for Cork city & suburbs, Ballincollig and some smaller settlements.

Cork Metropolitan Area Strategic Plan

The Cork Metropolitan Area Strategic Plan (CMASP) is an essential component of the RSES for the Southern Region. It provides a framework for accelerated sustainable growth in the CMA and a mechanism to ensure coordination between the local authorities.

The CMASP recognises the critical role of wastewater infrastructure in facilitating urban expansion and maintaining environmental sustainability. In highlights the need for integrated planning, infrastructure upgrades, climate resilience and environmental sustainability. The Plan identifies strategic residential and regeneration areas, four of which relate to the CWS: the Monard Strategic Development Zone, North Environs – Kilbarry – Blackpool, Midleton and Blarney.

Cork City Development Plan

The Cork City Development Plan sets out a vision for the sustainable growth and development of Cork City over the six-year period from 2022 to 2028. It incorporates principles of environmental sustainability, climate resilience, and urban regeneration while supporting population and economic growth in line with national and regional policies, including the NPF and RSES.

The Plan emphasises the importance of efficient water and wastewater services in delivering its vision for a vibrant, sustainable, and climate-resilient city. It outlines policies to enhance water quality, ensure sustainable water resource management, and provide the necessary infrastructure to accommodate the city's growth. The Plan identifies the following objectives that directly impact the CWS:

- Supporting UÉ in identifying and facilitating the timely delivery of water and wastewater projects.
- Supporting UÉ in the promotion of effective management of trade discharges to sewers in order to maximise the capacity of existing sewer networks and minimise detrimental impacts on sewage treatment works.
- Requiring all new proposals for development to provide a separate foul and surface water drainage system and to incorporate Sustainable Urban Drainage Systems in so far as practical.
- Requiring that as part of new proposals for development, evidence of consultation with UÉ should be submitted as part of a planning application, demonstrating that adequate water services are available to service the development and that existing water services will not be negatively impacted.
- Ensure that all new developments connect to the public wastewater infrastructure, where available, and to encourage existing developments that are in close proximity to a public sewer to connect to that sewer, subject to a connection agreement with UÉ.
- To discourage the provision of single house septic tanks and treatment plants to minimise the risk of groundwater pollution. Where such facilities are permitted, full compliance with the prevailing regulations and standards will be required.
- Residential development that requires the provision of private wastewater treatment facilities (i.e. Developer Provided Infrastructure), other than single house systems will generally not be permitted.

- To ensure that private wastewater treatment facilities, where permitted, are operated in compliance with their wastewater discharge license, in order to protect water quality.
- To ensure that developments permitted by the Council which involve discharge of wastewater to surface waters or groundwaters, comply with the requirements of the EU Environmental Objectives (Surface Waters) Regulations and EU Environmental Objectives (Groundwater) Regulations.

The Cork City Development Plan highlights several key projects to support the CWS, including the upgrade of the Carrigrennan WwTP to ensure compliance with its waste license and cater for future population growth; and the preparation of Drainage Area Plans for the Cork City wastewater network, including Glanmire, Glounthaune, Little Island, and Ballincollig, to optimise network performance and plan for future needs.

Cork County Development Plan

The Cork County Development Plan establishes the framework for sustainable growth and development across Cork County for the period 2022–2028. Aligned with national and regional strategies, the Plan emphasises sustainability, climate resilience, and efficient resource management. Its core goal is to foster vibrant, liveable, and environmentally sustainable communities while supporting population and economic growth. Central to achieving these ambitions is the provision of reliable water and wastewater infrastructure, which is recognised as critical to facilitating both urban and rural development.

The Plan highlights several key objectives that directly inform the CWS. It adopts an integrated approach to managing the water cycle, addressing water abstraction, treatment, and wastewater discharge to ensure long-term sustainability. Compliance with the Urban Wastewater Treatment and Wastewater Discharge Regulations, as well as adherence to EPA standards, is a cornerstone of the Plan. Supporting UÉ in the timely delivery of essential infrastructure is also prioritised, as is ensuring sufficient assimilative capacity in water bodies to accommodate growth without unsustainable resource exploitation. The separation of wastewater and surface water networks is promoted to improve efficiency and reduce environmental impacts, while the use of private wastewater treatment systems is discouraged except under specific conditions and in compliance with prevailing standards.

The Plan identifies several critical projects aligned with the CWS. These include upgrades to wastewater treatment facilities to address capacity constraints and improve compliance with EPA discharge limits, as detailed in Uisce Éireann's Wastewater Capacity Register. The preparation of Drainage Area Plans (DAPs) for urban centres is supported to optimise wastewater network performance and meet future growth demands. Strategic infrastructure projects, such as system upgrades in key growth areas, are also prioritised to enable population and economic development.

National Biodiversity Action Plan

The National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature.

The plan is made of 5 objectives and identifies urban wastewater and water/air pollution as one of the pressures driving biodiversity loss.

The NBAP influences the CWS by adopting a whole-of-society approach to biodiversity, by emphasising that all sectors are to integrate biodiversity considerations into their operations. It also calls for immediate actions to conserve and restore biodiversity. The plan requires that the CWS incorporates biodiversity considerations, ensuring that wastewater infrastructure development and management contribute positively to the conservation and enhancement of Ireland's natural heritage.

EPA State of the Environment Report 2024

The EPA State of the Environment Report presents the most recent integrated information on the quality of Ireland's environment. The report outlines the current state of our environment at a strategic level. It also provides an update on the environmental challenges that we face, nationally and globally. The report includes assessment of the nature and the water environment and highlights the current state for these being 'very poor' and 'poor' with continued deteriorating trends especially for protected habitats and birds and mixed trends for water with no net improvements in river or lake water quality in recent years and decline in ecological condition for estuaries. The report highlights that the pace at which UÉ must deliver improvements needs to accelerate and recommends UÉ to prioritise resources to tackle priority areas highlighted by the EPA.

Climate Action Plan 2025

The Climate Action Plan (CAP) outlines Ireland's strategic direction to achieve a 51% reduction in greenhouse gas emissions by 2030 and net-zero emissions by 2050. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by the Government in July 2022.

The Climate Action Plan acknowledges that wastewater treatment is a large consumer of energy, and as such, climate mitigation measures should continue to be implemented to further reduce and mitigate greenhouse emissions. In addition, the CAP notes that sustainable development is key to meeting Ireland's climate targets. This includes the provision of sufficient network and treatment capacity to cater for the increasing population without damaging the environment.

The CWS will set the context for subsequent implementation plans and projects that will detail the programmes of works to be completed in specific areas relevant to climate change adaptation and mitigation and wastewater compliance in accordance with the CAP.

Water Services Strategic Plan 2050

The Water Services Strategic Plan (WSSP 2050) is Uisce Éireann's long-term strategic plan which is required to be prepared under the Water Services No. 2 Act 2013. It sets out our objectives and the means by which we aim to achieve them in the context of the significant challenges we are likely to face over the next 25 years. The plan outlines our strategic direction and the actions we will implement to ensure sustainable public water services for Ireland. The four strategic objectives identified in the WSSP 2050 are:

- Safe and reliable drinking water
- Protect and restore our environment
- Support our customers, communities and the economy
- Sustainable services for the future

Accompanying the 4 strategic objectives are 14 strategic aims that will help us to address our most critical investment needs, respond to emerging policy requirements and capitalise on new opportunities to transform our infrastructure. Strategic Aim 7 as outlined in WSSP 2050 is "Protecting our Water Environment." This aim is supported by a range of actions, including:

- Collaborating with regulators and stakeholders to develop a comprehensive Wastewater Strategy Framework;
- Developing and implementing Integrated Urban Wastewater Management Plans to ensure sustainable and resilient urban water systems;
- Managing water service assets and operations to minimise risks and reduce impacts on water bodies, thereby supporting the achievement of water quality objectives.

National Water Resource Plan

The National Water Resource Plan (NWRP) sets out how we will balance the supply and demand for drinking water over the short, medium and long term. It is a 25-year strategy to ensure we have a safe, sustainable, secure and reliable drinking water supply for everyone.

The NWRP consists of an overarching framework plan and supporting regional plans. The NWRP South West along with this strategy provide a blueprint for the management of water services in the CMA into the future.

National Wastewater Sludge Management Plan (National Bioresource Strategy)

The National Wastewater Sludge Management Plan (NWSMP) sets out a nationwide standardised approach to ensure that treated wastewater sludge is effectively managed, stored, transported, and re-used in a sustainable way, to safeguard public health and the environment.

UÉ adopted the NWSMP in 2016, outlining our strategy for managing wastewater sludge over a 25-year period. Since then, UÉ have commenced the process of reviewing and updating the Plan. The proposed revision will provide a progress update on the recommendations in the original plan and include details on sludge management and how these activities address climate change, sustainability, and circular economy initiatives. The revised plan, to be titled the National Bioresource Strategy, will play a key role in shaping the future management of wastewater sludge and related bioresources and will also address changes in legislation and good practice which have evolved in the period since publication of the current plan in 2016.

3.4. Strengthening Risk and Resilience

The CWS recognises and addresses several critical risks that impact wastewater management in the region. Primarily among these are the challenges posed by climate change, evolving legislative requirements, aging existing infrastructure and the need for regulatory compliance.

By implementing a risk management approach, the CWS aims to create a resilient, adaptable, and compliant wastewater management system. By addressing these key risks head-on, UÉ are working to ensure the long-term sustainability and effectiveness of wastewater services in the CMA, safeguarding public health and environmental quality for generations to come.

Climate change presents a particularly complex set of challenges for wastewater infrastructure in the CMA. Rising sea levels, increasingly frequent extreme weather events, and the potential for

stormwater surges all pose significant threats to the system's integrity and efficiency. In response, our strategy incorporates climate adaptation measures.

Our strategy ensures alignment with the most up-to-date policies and regulations, anticipating future changes where possible. This forward-thinking approach allows us to stay ahead of compliance requirements, reducing the risk of non-compliance and associated penalties.

A significant portion of the existing wastewater infrastructure in the CMA are approaching or have exceeded their intended operational lifespans. This aging infrastructure presents significant risks, including increased likelihood of system failures, reduced efficiency, higher maintenance costs, and potential environmental hazards. The CWS addresses this through a capital replacement programme. By implementing a proactive replacement strategy, UÉ aim to ensure the long-term reliability of the wastewater system.

4. A Collaborative Strategy with Community & Stakeholder Engagement

4.1. Introduction

Public consultation is a key element in ensuring members of the public and all interested parties have the chance to be part of the development of the CWS. Effective stakeholder engagement and consultation play a key role in the success of the strategy (see Figure 4-1). Transparent communication, public consultations, and feedback mechanisms help incorporate diverse perspectives and foster community support for wastewater infrastructure projects.

Figure 4-1: The Purpose of Engagement

The development of the draft CWS involves ongoing engagement with environmental authorities and the public to ensure a transparent, inclusive, and well-informed process. This engagement provides insights and data early in the process, while public consultation helps build understanding and support for wastewater management. The engagement strategy aims to address concerns promptly, promote UÉ's vision, and ensure the CWS reflects the needs of all stakeholders.

4.2. Insights from Public Consultation 1

Public Consultation 1 ran for eight weeks in Summer 2024. Key stakeholders, UÉ regulators and statutory bodies were targeted on the Issues Paper and SEA Scoping Report and Appropriate Assessment Screening. The Issues Paper was drafted to support the development of the draft CWS. The topics identified in the Issues Paper, along with UÉ's vision, are the foundations that helped us define long-term objectives presented in the draft CWS. The aim was to engage with our stakeholders to ensure we identified the issues important to them so that a robust strategy is developed to represent our shared values

Seventeen submissions were received. Submissions revealed several key concerns among stakeholders, primarily focusing on water quality preservation, environmental protection

measures, and climate change impacts on wastewater management. Submissions have been broadly summarised into 10 main themes:

- Study Area
- Uisce Éireann Infrastructure
- Population, growth and demand
- Protection of the water environment
- Timeline and ambition
- Legislative compliance and Plans, Programmes and Policies interactions
- SEA objectives, environmental challenges and opportunities
- Public engagement, communication, consultation
- Strategy and SEA interactions, Monitoring and Mitigation Plans
- Data sources and knowledge gaps

A summary of the feedback and comments arising from Public Consultation 1 are included in Appendix 7 to this strategy. This feedback was duly considered in the development of the draft strategy and the accompanying environmental assessment. Where feedback has had a significant influence, this has been reflected in the relevant sections of the documents.

In response to these concerns, the draft strategy has been developed to incorporate environmental safeguards and network resilience measures. These strategic elements aim to address stakeholder priorities while ensuring the robustness and adaptability of wastewater management systems in the face of future challenges.

4.3. Public Consultation 2 and Future Steps

Public Consultation 2 is scheduled for January 2026 and will run for a minimum of eight weeks. The purpose of the non-statutory consultation is to provide an opportunity to provide feedback on the draft Cork Wastewater Strategy (this document), SEA Environmental Report and NIS.

The purpose of this consultation is to:

- enable key internal and external stakeholders to give feedback on the development of CWS,
- manage expectations of what the CWS will include,
- initiate connection with key, regulatory and statutory stakeholders on the plan,
- identify potential concerns that need to be addressed in the draft CWS and associated environmental reports.

The consultation aims to ensure that the views and concerns of the community are considered in strategy planning, environmental assessments and development.

Statutory stakeholders include;

- Environmental Protection Agency (EPA).
- Department of Agriculture, Food, and the Marine (DAFM).

- Department of Environment, Climate and Communications.
- Department of Housing, Local Government and Heritage.

While the Commission for the Regulation of Utilities (CRU) is not listed as an environmental authority pursuant to the Strategic Environmental Assessment Regulations, as UÉ's regulator, they will also be provided with an opportunity to receive briefings on the SEA Scoping Report and AA Screening.

While not listed as an environmental authority in respect of the SEA Regulations, given their role, An Fóram Uisce (AFU) will be offered briefings in regard to the draft Strategy, the SEA Environmental Report and the NIS.

Following the closing of the Public Consultation 2, we will produce a Post Consultation Report which will outline all engagement that was undertaken with stakeholders.

The final CWS will be published in Q2 2026. After this, Uisce Éireann will undertake periodical reviews of the CWS every 5 years. This will ensure the actions and objectives are fit for purpose in the short, medium and long term and make recommendations for new or updated approaches.

5. Approach Methodology

The methodology for the CWS follows a structured approach aligned with similar water and wastewater services management frameworks such as Water Resource Management Plans and Drainage and Wastewater Management Plans.

Our process encompasses a set of steps designed to ensure analysis and effective planning and to incorporate SEA and AA requirements. By adopting this methodology, UÉ aim to deliver a strategy that is both innovative and practical, tailored specifically to the CMA's needs while adhering to industry standards and regulatory requirements. A primary consideration for the CWS is determining the capacity of the existing WwTPs, what they can potentially be upgraded to and what will the impact be on the receiving waters. This allows us to identify the preferred approach in terms of investment requirements, environmental compliance, contribution to SEA objectives and whole-life cost. Key stages of the process involve:

- Current Infrastructure Assessment – Evaluating existing wastewater networks, pumping stations and treatment plants. This allows us to pinpoint and address weaknesses and deficiencies in the existing network infrastructure and to identify any current or anticipated capacity deficiency or shortfall in the level of treatment at WwTPs.
- Population Projections – It is important that we understand how the changing population will impact on wastewater infrastructure in the study area through the 2030, 2055 and 2080 horizons. This task involves the examination of local and regional development plans and associated studies to project future populations and land usage, development and validation of growth projections within the CMA and determining the extent and nature of the development at each of the three strategy horizons to determine the loading on the wastewater system, wastewater treatment works and receiving waters.
- Design Flow and Loads - Once appropriate growth projections had been determined, we estimated flows and loads for collection at each settlement within the study area for the strategy horizon years of 2030, 2055 and 2080. This task involves establishing the flows and loads currently collected and treated at all the UÉ WwTPs within the study area and estimate the flows and loads for collection and treatment at each settlement for each of the strategy horizon years.
- Hydraulic and Catchment Modelling – Hydraulic modelling identifies the optimised capacity for the strategic wastewater drainage system. This was achieved by developing models to assess current performance and forecast future capacity requirements while identifying any requirements for modifications to the existing systems to address existing and predicted deficiencies. Climate change was considered in network modelling through the use of climate change uplifted design rainfall files (+10% for winter and +20% for summer) and a modified Time Series Rainfall (TSR) dataset within future horizon simulations. The existing Cork Airport (Dungarvan) TSR was manipulated based on Representative Concentration Pathways (RCPs) of 4.5 and 8.5 for each of the time periods, 2021-2050, 2041-2070 and 2071-2100, and applied across the entire study area following suitability testing on catchments for which the Moorepark TSR file was previously recommended.

- Water Quality Modelling - The primary objective of the Water Quality Modelling is to assess the environmental impacts of existing and future UÉ discharges on receiving waters under a range of conditions. This exercise informed the treatment requirements and selection to help identify the Recommended Approach.
- Environmental Assessment – SEA and AA requirements inform the methodology for developing the CWS. This includes taking account of responses to the SEA scoping and AA screening reports published for consultation alongside the CWS Issues paper and this scoping stage provided information on the environmental baseline key trends influencing its evolution over the plan period as well as the policy and plan context for environmental protection and restoration. The SEA objectives and AA requirements are then considered throughout each stage of the optioneering and solutions development process and are embedded in the methodology framework. This includes relevant levels of assessment at the coarse screening, fine screening selection of feasible options and then consideration of combination of options as feasible approaches to select the Recommended Approach. The aim is to assess options and approaches in terms of support for or conflict with the SEA objectives or to identify potential for likely significant adverse effects on European Sites (SAC and SPAs) which would need to be assessed further as part of the AA. This process allows iteration in terms of options to be taken forward or rejected, or amendment such as pipeline route realignment or option discharge outfall location change with the aim of avoiding potential significant effects as a first consideration then identifying mitigation and enhancement measures and monitoring to be taken forward in the CWS implementation.
- Optioneering and Solution Development - Our main aim is to develop favourable wastewater treatment solutions for the CMA to be implemented for the strategy horizons of 2030, 2055, and 2080. This is achieved by identifying and evaluating feasible approaches and determining the preferred strategic drainage and treatment solution(s) for the study area as a whole for strategy horizon years. The Optioneering and Solution Development report also identifies and develops the Recommended Approach for the CMA to provide for the future wastewater needs of the study area and outlines the investments necessary for implementation of the Recommended Approach and strategy for the CMA. It also recommends phasing of the works in accordance with the patterns of potential growth and increase in flow and load within catchments.
- Stakeholder Engagement – Engaging with local authorities, industry experts, statutory stakeholders, regulatory and environmental authorities and representative groups and the public to gather insights, feedback and align strategies.
- Develop Cork Wastewater Strategy - The outcome of the study is the CWS report (this document(draft)).

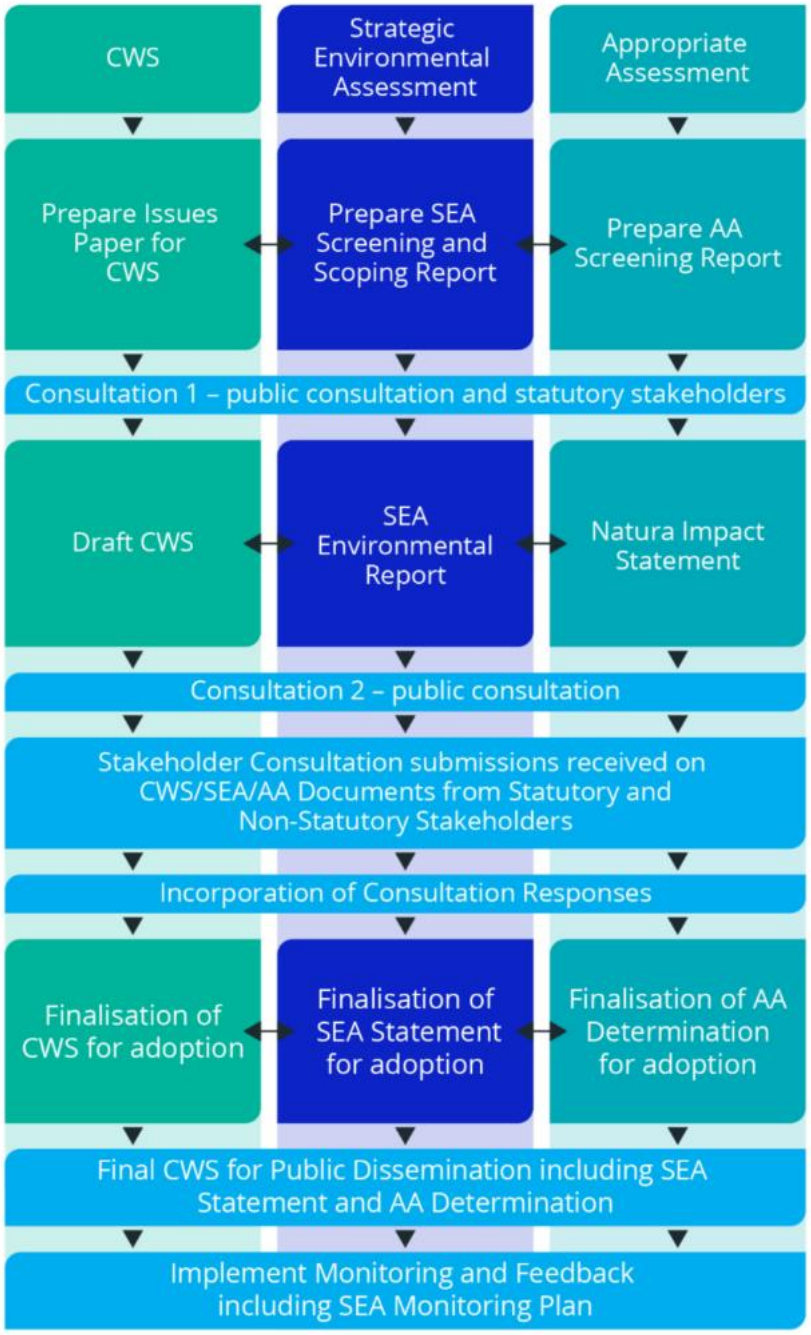

Figure 5-1: Approach Methodology of the Cork Wastewater Strategy

6. Current Infrastructure Performance

6.1. Existing Wastewater Infrastructure

Uisce Éireann are committed to continuous improvement of our wastewater system. This section provides in-sight into the current status of the infrastructure and environment within the CMA, critical infrastructure work that has already been completed and critical infrastructure work that is currently ongoing. The study area contains over 25 towns and villages in addition to the urban core of Cork City. Within the study area wastewater drainage is provided by a mixture of separated foul and stormwater systems and combined sewerage systems with multiple different types of treatment systems and discharges to a range of water bodies. The CMA currently is served by 26 UÉ wastewater treatment plants, 193 pumping stations, 225 storm water overflows, and 1,300 km of pipeline. This section presents an overview of the existing wastewater infrastructure in the study area, informed by the findings from various studies and assessments conducted to date. The studies have evaluated the capacity, condition, and performance of the current wastewater treatment plants, sewerage networks, and associated facilities serving the CMA.

6.2. Receiving Water Environment

The CWS study area lies within part of the Lee, Cork Harbour and Youghal Bay WFD catchment. This includes Cork's four principal river catchments (Glashaboy, Owenboy, Owencurra, and the River Lee system) and these rivers all ultimately discharge into the Cork harbour system comprising transitional and coastal waterbodies. The WFD status of water bodies in the study area range from High to Poor, with objectives to achieve Good or High Ecological Status by 2027. There are currently 13 WwTPs within the CWS study area discharging to river waterbodies, 4 discharging to ground and 9 with coastal discharges. Four of the CWS WwTPS are discharging to rivers waterbodies that are currently have a WFD high status objective reflecting their location in upper river reaches and their ecological sensitivity. These waters typically support high biodiversity which can include rare and threatened species with particular water quality requirements.

Cork Harbour includes estuarine, coastal and marine habitats of high ecological value and multiple protected area designations important for fisheries, recreation and tourism. Key designations within the CWS study area include the Great Island Channel Special Area of Conservation (SAC) and the Cork Harbour Special Protection Area (SPA) and Ramsar site. The SAC site includes Annex I habitats mudflats and sandflats, and Atlantic salt meadows located within the North Channel Great Island, Lough Mahon and Lough Mahon (Harper's Island) transitional waterbodies. There are four designated shellfish waters in the study area, Cork Great Island North Channel, Rostellan North, Rostellan South, Rostellan West and Ballymacoda Bay, which are protected areas for oysters. Shellfish Waters now come under the protected areas covered under the WFD to avoid microbiological contamination with risk to human health through the consumption of the shellfish. Classified bi-valve mollusc production areas listed for North Channel East and Rostellan are regulated by the Sea-Fisheries Protection Authority (SFPA) which is the competent authority for the regulation of aquaculture and oversees the implementation and compliance with food safety legislation.

Several rivers and estuaries in the Cork area are identified as nutrient-sensitive to phosphorus and nitrogen. There are two transitional waterbodies classified as nutrient sensitive areas within the CWS study area: the Lee Estuary/Lough Mahon and Owencurra Estuary/North Channel. These areas are targeted for nutrient reduction measures under the Urban Waste Water Treatment (UWWT) Directive.

Recreational use of water bodies is significant, especially in Cork Harbour, with activities like sailing, kayaking, and swimming while Fountainstown beach is a designated Bathing Water and Blue Flag beach.

6.3. WWTP Performance

An assessment of the current wastewater treatment plant capacities has been conducted, providing an overview of the existing treatment streams and process units installed at the WwTPs within the CMA. This evaluation includes a high-level performance assessment for each WwTP, focusing on their compliance with current wastewater discharge licences and performance relative to the UWWTD. The assessment serves as a baseline for understanding the current operational status and identifying areas requiring attention or improvement.

Table 6-1, presented below, contains a summary of each site, detailing key information such as design capacity, existing operational issues, existing emission limit values (ELV) issues and any upgrades that are either in progress or proposed for the future. This table provides a reference guide to the current state and future plans for each WwTP in the study area.

Table 6-1: Summary of the Assessment of Existing WwTPs within the CMA

Site	Design Capacity (PE)	Organic Capacity (PE) Remaining**	Hydraulic Capacity Constraints	Organic Treatment Constraints	Outfall Capacity Constraints	ELV Issues	Land Available	On-going Project
Carrigrennan WwTP**	413,200	115,199	No	Yes	No	Yes	Yes	No
Cork Lower Harbour WwTP **	65,000	16,010	No	No	No	No	Yes	No
Ballincollig WwTP**	33,000	7,895	No	No	No	No	Yes	No
Carrigtwohill WwTP**	30,000	20,707	No	No	No	Yes	Yes	No
Midleton WwTP**	15,000	0	Yes	Yes	Yes	No	Yes	Yes
Blarney WwTP**	13,000	2,850	Yes	Yes	No	Yes	Yes	Yes
North Cobh WwTP**	2,000	210	Yes	Yes	No	-	Yes	Yes
Watergrasshill WwTP**	3,000	874	No	Yes	No	Yes	No	No

Site	Design Capacity (PE)	Organic Capacity (PE) Remaining**	Hydraulic Capacity Constraints	Organic Treatment Constraints	Outfall Capacity Constraints	ELV Issues	Land Available	On-going Project
Whitechurch WwTP	3,000	2,137	No	No	No	-	No	No
Cloyne WwTP**	1,400	0	Yes	Yes	No	Yes	Yes	Yes
Ballygarvan WwTP**	634	0	No	Yes	No	Under review	Yes	No
Killeens WwTP**	600	0	No	Yes	Yes	-	Yes, but limited	Yes
Dripsey WWTP**	600	131	Yes	Yes	No	No	Yes	Yes
Grenagh WwTP	1,200	582	No	No	No	Yes	Yes	No
Halfway WwTP	450	192	No	Yes	No	No	No	Yes
Carrignavar WwTP**	300	0	Yes	Yes	No	Under review	Yes	No
Killumney WwTP*	260	165	-	-	-	-	-	Yes
Courtbrack WWTP	250	0	No	No	No	No	Yes	No
Minane Bridge WwTP	250	152	No	No	No	Yes	No	No
Inniscarra WwTP	100	38	No	No	No	No	Yes	Yes
Ballincurrig WwTP*	150	0	Yes	Yes	No	No	No	Yes
Lisgoold North WwTP*	80	18	Yes	Yes	-	-	No	Yes
Lisgoold South WwTP	500	-	-	-	-	-	-	Yes
Knockraha WwTP	350	106	No	No	No	-	Yes	No
Saleen WwTP	40	0	Yes	Yes	-	-	No	Yes
Whitegate-Aghada WwTP	2,500	136	No	No	No	No	Yes	No

***WwTP to be decommissioned as part of ongoing project**

**** According to latest publicly available AER**

Flow and load analyses were conducted to understand the immediate needs of each WwTP and to identify any existing capacity issues. This examination of operational data provides crucial insights into the current performance and limitations of each facility. Recommendations of this report are derived from these results and are based on an evaluation of current capacities, projected demands, and potential future challenges. They aim to ensure that each WwTP is well-positioned to meet both current and future wastewater treatment requirements effectively and efficiently. The outputs of the assessment have been summarised in Appendix 3 Wastewater Treatment Plants Flow and Loads Summary Report.

Based on the findings from the WwTP assessment and the flow and load analysis, coupled with the population projections outlined in Section 3.1, UÉ have developed a timeline for proposed upgrades and investments. This timeline is crucial in preventing WwTPs from exceeding their operational capacities, which could lead to a deterioration in operational efficiency and treatment quality. The strategic timing of these investments is essential to maintain and improve the overall performance of our wastewater treatment infrastructure. Table 6-2 below summarises the findings. A review of the wastewater treatment plants within the Study Area has identified a number of projects that may need to be initiated in the 2030 strategy horizon in order to maintain compliance and capacity at a number of WwTPs. The project details are subject to annual review in terms of both capacity and compliance.

Table 6-2: WwTP Capacity Requirements and Load Projections

WwTP	Design Capacity (PE)	Agglomeration Loading 2030	Agglomeration Loading 2055	Agglomeration Loading 2080	2030	2055	2080
Carrigrennan	413,200	390,857	465,286	500,415	C	E	E
Cork Lower Harbour	65,000	66,955	81,307	92,431	E	E	E
Ballincollig	33,000	37,755	59,486	67,214	E	E	E
Carrigtwohill	30,000	25,500	28,500	30,500	C	C	C
Midleton*	15,000	27,441	33,969	38,867	E	E	E
Blarney	13,000	13,724	23,640	26,939	E	E	E
North Cobh	2,000	1,755	2,144	2,454	C	E	E
Watergrasshill	3,000	2,892	3,450	3,871	C	E	E
Whitechurch	3,000	1,091	1,262	1,418	C	C	C
Cloyne*	1,400	3,199	3,813	4,279	E	E	E
Ballygarvan	634	930	1,079	1,212	E	E	E
Kileens**	600	1,550	2,084	2,285	E	E	E
Dripsey	600	628	726	817	E	E	E
Grenagh	1,200	1,042	1,250	1,411	C	E	E
Halfway	450	363	417	470	C	C	E
Carrignavar	300	907	1,104	1,248	E	E	E
Killumney**	260	3,234	3,936	4,417	E	E	E
Courtbrack	250	660	752	836	E	E	E
Minane Bridge	250	426	511	577	E	E	E
Inniscarra Waterworks	100	334	401	455	E	E	E

WwTP	Design Capacity (PE)	Agglomeration Loading 2030	Agglomeration Loading 2055	Agglomeration Loading 2080	2030	2055	2080
Ballincurrig**	150	567	682	771	E	E	E
Lisgoold North**	80	266	324	366	E	E	E
Lisgoold South	500	266	324	366	C	C	C
Knockraha	350	737	841	935	E	E	E
Saleen	40	891	1,032	1,158	E	E	E
Whitegate and Aghada	2,500	3,361	3,959	4,444	E	E	E

E – Exceeds Capacity

C – Sufficient Capacity

***Denotes there is an ongoing project to increase capacity at WwTP. This table demonstrates existing capacities only and does not account for proposed upgraded capacities.**

****Denotes there is an ongoing project to transfer flows from the agglomeration to a separate WwTP for treatment. This table demonstrates existing capacities only and does not account for proposed upgraded capacities**

6.4. Capital Investment in the Study Area

UÉ has been investing in improving the CMA's wastewater infrastructure through new build projects and upgrades. Local critical infrastructure projects have and continue to be completed across the CMA. Critical projects and programmes to address wastewater infrastructure issues are ongoing and are not impacted or delayed by the delivery of the CWS.

A detailed list of recently completed and ongoing projects is listed and summarised below, which includes network, wastewater/pumping station upgrades, maintenance works and capital works. This progress has allowed for future growth and development, reduction in asset and service risk, and the reduction of flooding and non-compliance. Upon adoption of the CWS, "Ongoing" projects will be examined in the context of the Recommended Approaches which have been identified within the Strategy.

Table 6-3: Recently Completed Projects

Projects	Description of Works
Blarney Strategic Network	Wastewater network upgrades to facilitate the future growth and development.
Blarney - Cloghroe Pumping Station (PS)	Wastewater pumping station (WwPS) upgrade and capital maintenance works to address asset and service risks.

Projects	Description of Works
Ballincollig - Muskerry PS Rising Main Upgrade	Wastewater rising main upgrade and capital maintenance works to address asset and service risks.
Carrigtwohill Wastewater (Ww) Network Upgrade	Wastewater network upgrades to facilitate the future growth and development.
Cobh - Chandlers Rest PS	WwPS upgrade and capital maintenance works to address asset and service risks.
Midleton Ww Network Upgrades	Wastewater network upgrades to provide additional capacity for growth, address repeating sewer flooding and UWTD non-compliance associated with storm water overflows.
Cork City -Barnstead Drive Network Upgrade	Wastewater network upgrades to reduce risk of repeating property flooding.
Cork City - Ardfallen Road WW Network Upgrades	Wastewater network upgrades at Ardfallen Road, Ballinlough in Cork City to alleviate repeating sewer flooding and provide capacity for growth.
WWPS CM Programme - Atlantic Pond & Ballinure Header Chamber CM	Capital maintenance at critical assets to the Cork City network to ensure safe operability.
Ringaskiddy - Crosshaven Car Park PS	WwPS upgrade to address network environmental non-compliance associated with storm water overflow.
Ringaskiddy - Church Road PS Rising Main Upgrade	Wastewater rising main upgrade and capital maintenance works to address asset and service risks.
Whitegate/Aghada WWTP New Build	Construction of WwTP to increase treatment capacity, improve effluent quality, and incorporate modern technologies.

Table 6-4: Ongoing Projects

Projects	Description of Works
Blarney Tower Sewerage Scheme Network (Cloghroe)	Upgrade of network to improve capacity, efficiency and environmental compliance.
Blarney Wastewater Network Upgrade	Upgrade of network to improve capacity, efficiency and environmental compliance.
Carrigrennan Phosphorus Reduction	Implementation of advanced treatment processes at the WwTP to decrease phosphorus levels in treated effluent.

Carrigtwohill Network Upgrade	Upgrade of network to improve capacity, efficiency and environmental compliance.
Cork Lower Cobh Networks	Upgrade of network to improve capacity, efficiency and environmental compliance.
Cork Lower Carrigaline - Ringaskiddy Networks	Upgrade and extension of the wastewater collection networks in Carrigaline, Ringaskiddy, and Crosshaven to connect to the WWTP.
Cork Lower Estuary Crossing	Crossing of Lee Estuary with sewer pipelines.
Cork Lower Passage West - Monkstown Networks	Upgrade and extension of the wastewater collection networks in Passage West-Monkstown to connect to the WWTP.
Cloyne WWTP Upgrade	Enhancement of WwTP to increase treatment capacity, improve effluent quality, and incorporate modern technologies.
Cork City Sewerage Scheme - St Patrick's culvert	Improvement of culvert in Cork City wastewater network.
Cork City Wastewater Network - Silversprings SWO	Storm separation of network to reduce number of spills from SWO.
Cork Mid-West Bundle (Dripsey SS Network and WWTP)	Upgrade of WWTPs, including Drispey WwTP, to cater for present and future population equivalents as well as upgrade to sewerage network.
Little Island Glanmire Wastewater Network Upgrade	Upgrade of network to improve capacity, efficiency and environmental compliance.
Kileens Wastewater Upgrade	Construction of new wastewater pipelines, WW pumping station to convey the current and future raw wastewater flows to the Cork City sewer network.
Midleton North Wastewater PS	The construction of a new wastewater pumping station and pipeline at Millbrook Crescent adjacent to the Mill Road/R626.
Midleton WWTP Phase 1 & 2 upgrades	Construction of new wastewater infrastructure including the construction of 6km of wastewater pipeline from the Midelton to Carrigtwohill and the construction of a new wastewater pumping station to transfer the load.
Saleen Sewerage Scheme Network and WwTP	Enhancement or construction of WwTP to increase treatment capacity, improve effluent quality, and incorporate modern technologies.
Cork Lower Harbour WWTP Odour Control Unit Upgrade	Enhancement of Odour Control Unit to minimise odour emissions and improve air quality.
Wastewater Ballincurrig – Lisgoold - Cork	Enhancement or construction of WwTP to increase treatment capacity, improve effluent quality, and incorporate modern technologies.

Wastewater Network - Ballincollig Wastewater Network	Upgrade of network to improve capacity, efficiency and environmental compliance.
Killumney Cork (STVGP)	Project part of Small Towns and Villages Growth Programme to enhance wastewater infrastructure in smaller urban areas.
Midleton Water Rock Cork County Network Extensions	The construction of a gravity sewer from the Nordic Business Park to the Northern Relief Road roundabout and its continuation to the proposed Midleton North pumping station.
Midleton Wastewater Load Diversion to Carrigtwohill	Building a new pumping station at Midleton North to divert existing and future wastewater loads from the Midleton area to the Carrigtwohill WwTP
Ballyvolane to Carrigrennan Rising Main Cork	New WwPS at Ballyvolane and construction of approximately 2.6km of wastewater rising mains on Ballyhooly Road and North Ring Road to the Old Youghal Road junction

7. Future Performance

7.1. Long Term Resilience of Wastewater Infrastructure

We operate in a rapidly changing global environment. UÉ know that our operating environment over the coming decades will bring challenges for the delivery of water and wastewater services. The CMA wastewater network faces several challenges that will shape future investment and planning decisions, including:

- Increase in Population
- Climate Change and Greenhouse Gas (GHG) Reduction
- Treatment Performance Compliance
- Wastewater Treatment Capacity
- Pressure on Receiving Waters
- Ageing Infrastructure
- Energy Efficiency
- Evolving Legislation, Regulation and Policy
- Economic conditions

Although presented as separate challenges, UÉ recognise that our long-term challenges are complex and interconnected. Addressing these challenges as part of the overall CWS, ensures that future infrastructure development is proportionate to the goals of the CWS and is sustainable, reliable and resilient.

Increase in Population

Population growth and economic success in the CMA are driving increased demand for wastewater services, necessitating greater treatment capacities and enhanced network resilience. This expansion demands new and upgraded infrastructure, as well as an integrated management approach to optimise existing systems.

Urban densification is expected to increase stormwater runoff, challenging wastewater infrastructure and the water environment. Collaboration with planning authorities is crucial to ensure sustainable development of wastewater services that can meet the needs of a growing population while protecting valuable resources.

Climate Change and Greenhouse Gas (GHG) Reduction

The CMA's wastewater infrastructure faces significant challenges due to climate change, particularly from increased precipitation, flooding risks, and sea level rise. Extreme events are becoming more frequent. Projections indicate a potential increase in heavy rainfall days by up to 52% in some areas, posing a serious threat to wastewater systems.

Sea level rise presents another major challenge, with levels in Cork Harbour rising 40 cm since 1942. This threatens coastal infrastructure, reduces the effectiveness of coastal outfalls from a hydraulic stance, and increases the risk of seawater intrusion into drainage and sewer systems.

Temperature increases also pose significant challenges. Recent years have been the warmest on record for Ireland, with projections indicating an overall increase in average temperature of between 1.1 and 1.5°C for County Cork. Higher temperatures can promote algal blooms and bacterial growth in receiving waters, degrading water quality. More frequent heatwaves are expected, potentially occurring almost annually in some parts of the CMA. The multifaceted nature of climate change impacts can also bring potential benefits such as increased water volumes at discharge points, which could enhance dilution of treated effluent.

These climate-related factors collectively threaten the efficiency and resilience of the CMA's wastewater systems, necessitating adaptive strategies to ensure continued effective operation and environmental protection.

Treatment Performance and Compliance

The CMA wastewater infrastructure faces compliance challenges. A number of wastewater treatment plants struggle to meet the existing WWDL effluent quality standards. Sewerage networks, especially in older areas, suffer from infiltration and inflow problems, leading to increased wastewater volumes during heavy rainfall.

Combined sewer systems are notably vulnerable, with SWOs frequently exceeding regulatory limits. More stringent EU wastewater and environmental regulations require continuous upgrades to meet discharge standards and prevent ecological damage.

Wastewater Treatment Capacity

The CMA faces significant challenges in wastewater treatment capacity, both for current needs and future demands. Several WwTPs are operating at or near design capacity, leaving minimal buffer for peak flows or additional load.

This capacity issue is exacerbated by projected population growth and economic development, potentially leading to environmental compliance risks and hindering future development. Seasonal variations and wet weather events further strain the system, causing bypasses or storm water overflows during high rainfall periods. These challenges pose serious environmental and public health concerns, emphasising the urgent need for infrastructure upgrades and capacity expansion to support sustainable growth in the region.

Pressures on Receiving Waters

The CMA's rapid urban growth and industrial development have strained the existing wastewater infrastructure, leading to increased discharge of wastewater into local water bodies, particularly the River Lee and Cork Harbour. This growth also impacts the drainage regime of the area with increased hardstanding and impermeable areas discharging to the wastewater system. This has resulted in exasperating the ongoing issue of nutrients, organic matter, and potentially harmful contaminants in sensitive aquatic ecosystems.

The combined sewer system in parts of Cork city is particularly vulnerable during heavy rainfall, causing SWOs that discharge untreated wastewater diluted with storm water into receiving waters. This impacts water quality, poses public health risks, and affects the aesthetic value of the CMA's waterways. Aging infrastructure and inadequate treatment capacity at some wastewater treatment plants, especially in rapidly growing suburban areas, further exacerbate

the problem, which will lead to suboptimal treatment and more frequent breaches of discharge limits.

Ageing Infrastructure

Our existing wastewater infrastructure in the CMA is ageing, with many of our assets requiring significant maintenance or replacement to ensure the continued delivery of services to an appropriate level. The approach to maintaining and replacing assets in previous decades will not meet future challenges particularly in the context of climate change.

To address these challenges, UÉ must find new ways of delivering wastewater services through new integrated and innovative approaches to delivering solutions in partnership with multiple stakeholders.

Planning for the future requires the implementation of adaptable and resilient solutions that can respond to both immediate needs and long-term challenges. Investing in sustainable infrastructure now will be critical to ensuring the reliability and efficiency of future wastewater services.

Energy Efficiency

UÉ has set ambitious energy and carbon reduction targets, including a 51% reduction in CO_2 equivalent emissions and 50% improvement in energy efficiency by 2030, as well as generating 40% of electrical energy needs from renewables by 2035, with an ultimate goal of Net Zero Carbon by 2040.

These targets require an overhaul of current energy practices in wastewater infrastructure. The challenge lies in implementing energy-efficient designs to reduce consumption in existing energy-intensive WwTPs. This involves optimising all processes, from pumping and aeration to sludge treatment, and considering lifecycle energy consumption in new and upgraded infrastructure.

Additionally, addressing load shifting and time-of-use optimisation through advanced control systems and operational changes is a key tool to reduce energy costs and carbon emissions.

Evolving Legislation, Regulation and Policy

Changes in European and Irish legislation will have a significant impact on the delivery of wastewater services. While UÉ welcome improvements in legislation and regulatory frameworks that support environmental and sustainability objectives, they will require future investment, and these are likely to have wide ranging effects on almost all aspects of wastewater services in Ireland.

The scale of the challenge to adapt will be significant, necessitating a systems-thinking approach to understand the interactions between different objectives and solutions. For example, our commitment to the CAP 2025 target of reducing CO_2 equivalent emissions by 51% by 2030 will require lowering energy consumption at wastewater treatment plants. However, at the same time, the proposed recast UWWTD will introduce stricter wastewater treatment requirements, which will likely increase the level of investment required and associated energy demand at these facilities.

Balancing these competing demands will require innovative solutions, such as catchment-scale measures to reduce reliance on energy intensive treatment processes and the adoption of advanced technologies to improve efficiency. Collaboration across sectors and organisations will also be key to achieving multiple policy and regulatory objectives in a sustainable and integrated manner.

Economic Conditions

Global events like wars and pandemics can significantly impact economic conditions, which in turn affect wastewater services delivery. While service provision continues regardless of economic circumstances, capital infrastructure investment often fluctuates with economic cycles. During periods of growth, increased investment enables strategic long-term planning, fostering innovation and broader benefits for customers, communities, and the environment. Conversely, economic downturns can limit funding for critical infrastructure projects and maintenance, leading to delays in essential upgrades and a focus on immediate operational needs at the expense of long-term challenges.

A stable, forward-thinking investment approach is crucial for ensuring the resilience and sustainability of water services, irrespective of economic conditions.

7.2. Operational Considerations

Effective management of wastewater infrastructure demands a strategy involving several critical components. To ensure optimal performance and longevity of these systems, key operational factors should be prioritised within the strategy. These include the implementation of proactive maintenance programs, the deployment of real-time monitoring systems, and the development of robust emergency response planning. By integrating these elements, UÉ can significantly enhance the efficiency and reliability of our wastewater infrastructure. This approach not only minimises potential disruptions but also promotes sustainable operations and compliance with regulatory standards. Through consideration and implementation of these strategies, UÉ can build resilient systems capable of meeting both current and future challenges. Operational considerations include:

- Optimisation of Pumping Stations – UÉ is committed to optimising its pumping stations to deliver a more reliable and sustainable wastewater service. This initiative encompasses a range of strategic measures designed to improve operational efficiency and reduce environmental impact. These measures can include plans to upgrade infrastructure by installing new energy-efficient equipment, thereby reducing power consumption and operational costs or refining current operating procedures to minimise energy usage and equipment wear and tear, ensuring longevity of assets and improved performance. Additionally, addressing load shifting and time-of-use optimisation can result in reducing energy demand and associated costs.
- Development and adherence to Standard Operating Procedures (SOP) – A goal of the WSSP 2050 is to develop and implement SOPs to carry out maintenance, inspection and operational duties on WwTPs to avoid inconsistencies in treatment plant performance and variations in operational costs due to the different approaches used. Effective wastewater system management depends on the adherence to these SOPs which

include staff training and maintenance regimes across the range and scale of WwTPs and collection networks.

- Reducing Stormwater Overflow Spill Volumes – Ensuring the functionality of SWO's to minimise the frequency and volume of storm water spills to receiving waterbodies is paramount. Regular inspections and maintenance should be carried out on SWO's in accordance with UÉ standards. Optimising flow management during storm events can also lead to decreasing spills. Combined foul and stormwater sewers remain a feature of many existing sewer networks. It is not economically viable to completely remove stormwater from these combined systems therefore SWOs will continue to be required on existing combined networks as they are a necessary feature of any combined wastewater system to prevent out of sewer flooding. However, in this strategy, we have determined an approach to reduce spills to watercourses in line with UÉ policy. The WSSP 2050 also outlines the use of remote asset management and predictive systems supported by real-time monitoring to improve operational control and reduce the occurrence of overflows. Key elements of our approach in developing this Strategy include the below points. This integrated approach ensures that the strategy is resilient, future-proofed, and aligned with both national policy and international best practice.
    - Identifying optimal wastewater treatment plant outfall locations and treatment strategies as a core priority
    - Designing wastewater networks to comply with the recast Urban Wastewater Treatment Directive and other relevant standards
    - Ensuring that all new sewer networks are fully separated
    - Referring to the Controlled Discharge Strategy policy to guide the management of SWOs on existing combined sewer networks
    - Ensuring that all new wastewater pumping stations are designed with emergency storage capacity
    - Enhancing monitoring capabilities across the network to improve visibility of system performance and enable real-time alerts when overflows occur

- Network Monitoring and Automation – Deploying smart and remote monitoring systems to provide continuous, real-time data analysis across a range of critical parameters, including flow rates, wastewater levels, and pressure. Analysis of this information enables UÉ to swiftly identify unusual patterns or deviations from normal operating procedures. By detecting issues early, maintenance teams can address problems before they escalate into major disruptions, reducing system downtime and mitigating the risk of costly repairs, thereby enhancing overall operational efficiency and cost-effectiveness. Automating data collection and analysis substantially reduces the need for manual labour inputs, freeing up valuable human resources for more complex tasks. Implementing these systems improves data driven insights allowing for informed decision making.

7.3. Environmental and Social Considerations

The protection of water bodies and ecosystem is fundamental to the CWS, as untreated wastewater can have severe ecological and health impacts. Key areas of focus include:

- Maintaining Water Quality Standards – Ensuring compliance with the UWWTD and WFD to prevent degradation of rivers, lakes and coastal waters and supporting achieving the relevant WFD objectives.
- Ecosystem Protection – Reducing nutrient loads and pollutants that contribute to algal blooms and oxygen depletion in receiving waters taking into account protected areas including SACs and SPAs.
- Protecting Public Health– Minimising bacterial contamination risks associated with SWO discharges, which can impact bathing water quality and fisheries including shellfish waters.

8. Network Modelling Methodology

8.1. Purpose of this Chapter

To assess both current and future performance of the wastewater network, UÉ developed a strategic drainage model for the CMA. This model served as a planning tool for infrastructure development and inform capital investment in the wastewater infrastructure. This chapter provides an overview of the methodology in undertaking the network modelling which is provided in more detail in Appendix 4 – Network Modelling Report.

8.2. Baseline/Current Modelling

The CMA comprises of 36 No. individual wastewater drainage networks, as seen in Table 8-1. The baseline model for the CMA was developed using a combination of three verified DAP models, one unverified model, and GIS/InfoAsset data for the remaining networks. As this was a strategic-level study based on existing data, no new surveys were conducted. Following the model build phase, a flow balancing exercise was carried out before reviewing network performance. Predicted flows from the model were compared against available average daily flow data from WwTPs to validate network flows. Unverified in the context of available models refers to models built using best available information.

Table 8-1: Baseline Network Model Data Availability

SI No.	Catchment	Verified ICM Model	Network GIS Data	Info Asset Availability
1	Ballygarvan	-	Available	Available
2	Cork Lower Harbour (Ringaskiddy, Passage West, Monkstown, Cobh)	Available (Unverified)	Available	Available
3	North Cobh	Available (Unverified)	Available	Available
4	Cork City	Available (Verified)	Available	Available
5	Midleton	Available (Verified)	Available	Available
6	Carrigtwohill and Environs	Available (Unverified)	Available	Available
7	Ballincollig	Available (Verified)	Available	Available
8	Blarney	-	Available	Available
9	Killeens	-	Available	Available
10	Whitegate-Aghada	-	Available	Available
11	Saleen Village	-	Available	Available
12	Cloyne	-	Available	Available
13	Whitechurch	Available – Cork City	Available	Available

SI No.	Catchment	Verified ICM Model	Network GIS Data	Info Asset Availability
		Model (Verified)		
14	Model Village	-	No	No
15	Killumney/Ovens	-	No	No
16	Crosshaven	Available – CLH Model (Unverified)	Available	Available – CLH
17	Carrigaline	Available – CLH Model (Unverified)	Available	Available – CLH
18	Grenagh	-	Available	Available
19	Ballymore	-	No	No
20	Myrtle Village	-	No	No
21	Minane Bridge	-	Available	Available
22	Halfway	-	Available	Available
23	Carrigrohane	Available – Ballincollig Model (Verified)	Available - Ballincollig	Available - Ballincollig
24	Kerry Pike	-	Available	Available
25	Inniscarra	-	No	No
26	Dripsey	-	No	Available
27	Berrings	-	Available	No
28	Matehy	-	No	No
29	Courtbrack	-	No	No
30	Coole East	-	No	No
31	Monard	-	No	No
32	Knockraha	-	No	No
33	Leamlara	-	No	No
34	Ballincurrig and Lisgoold	-		
35	Carrignavar	-		
36	Watergrasshill	-		

As part of the strategy, future development scenarios for the horizons of 2030, 2055, and 2080 were generated. These strategy horizons reflected residential and commercial growth projections across each catchment. The methodology for developing these future strategy horizons was as follows:

- Creating growth projection scenarios for each catchment for the 2030, 2055, and 2080 strategy horizons.
- Updating the future strategy horizon models with agreed, committed, and proposed network upgrades not included in the baseline model.

- Applying climate change impacts in line with UÉ's Guidance Note on the Application of Rainfall Data for Wastewater Network Modelling. This involved using separate climate-adjusted rainfall events to assess the impact on the network for each strategy horizon.

8.3. Solution Modelling

In advance of developing proposed network solutions, UÉ reviewed the network capacity and assessed the network risk arising from the proposed future strategy horizons. Following the review, the development of strategic solutions process was undertaken, aimed at providing future network capacity and SWO compliance. The focus was to develop a strategic drainage plan for the CWS. This plan aims to create a resilient future network that complies with UÉ's future flooding drivers and environmental regulations as set out in the rUWWTD.

The process adopted for solutions development was as follows:

- Development of an overarching strategy for network upgrades based on capacity risk assessment.
- A preliminary strategic optioneering exercise to evaluate various network scenarios.
- Testing multiple options scenarios for individual catchments in conjunction with the wider Cork Metropolitan Area Strategy.
- Final strategic recommendations for the wastewater drainage system.

Key outcomes of the detailed Strategic Solutions Development,

- Identifying optimal locations for any proposed wastewater treatment plants and any new outfalls.
- Identifying existing pumping station upgrade requirements and potential site locations for new network pumping stations.
- Defining strategic network upgrades and potential route section.
- Proposing strategic SWO upgrades for existing and future compliance, or decommissioning.
- Evaluating the impact of areas not currently served by Uisce Éireann on the overall drainage system.
- Identifying real-time control opportunities for network optimisation of key assets such as pipelines, pumping stations, and treatment plants.

8.4. Model Predicted Future Network Performance

Table 8-2 below provides a comparison of the model projected non-compliant SWOs in the 2030, 2055 and 2080 strategy horizons if no action is taken (Do Nothing Approach) against implementation of the approaches within this strategy. As can be seen in Table 8-2, there are projected to be many non-compliant SWOs across the CMA with that number set to increase through to the 2080 strategy horizon. One of the key drivers of the CWS is the growing pressure from non-compliant storm water overflows (SWOs), which are negatively impacting the River

Basin Management Plans (RBMPs). This pressure is expected to intensify with the implementation of new compliance criteria, which stipulate that storm water overflow volumes must not exceed 4% of the annual urban wastewater load calculated under dry weather conditions. This threshold is equivalent to the requirements set out in the recast Urban Wastewater Treatment Directive (rUWWTD).

Similarly, Table 8-3 presents an overview of out of sewer flood volumes in the projected 2030, 2055 and 2080 strategy horizon where no action is taken against implementation of the approaches within this strategy. The approaches recommended within this strategy are cognisant of the risks stated above resulting in the improved results.

Table 8-2: Model Predicted SWO Non-Compliances in Future Strategy Horizons

Catchment	2030		2055		2080			
	Do Nothing Approach		Do Nothing Approach		Do Nothing Approach		Solution Scenario	
	No. of Compliant SWO	No. of Non - Compliant SWO	No. of Compliant SWO	No. of Non - Compliant SWO	No. of Compliant SWO	No. of Non - Compliant SWO	No. of Compliant SWO	No. of Non - Compliant SWO
Ballincollig	8	0	7	1	7	1	8	0
Cork Lower Harbour**	26	0	26	0	25	1	26	0
Cork City	117	23	114	26	112	28	103*	0
Midleton	10	3	10	3	10	3	11*	0
Carrigtwohill	6	0	6	0	6	0	6	0
Knockraha**	0	0	0	0	0	0	1	0
Carrignavar**	0	0	0	0	0	0	1	0
Inniscarra**	1	0	1	0	1	0	0*	0
Whitechurch	0	0	0	0	0	0	0	0
Blarney**	1	3	1	3	0	4	4	0
Killeens**	1	0	1	0	1	0	1	0
Grenagh**	0	1	0	1	0	1	1	0
Watergrasshill**	0	1	0	1	0	1	1	0
Whitegate-Aghada**	4	0	4	0	3	1	4	0
Saleen*	0	0	0	0	0	0	1*	0
Cloyne*	2	0	3	0	3	0	3	0
Ballymore**	0	0	0	0	0	0	0	0

Catchment	2030		2055		2080			
	Do Nothing Approach		Do Nothing Approach		Do Nothing Approach		Solution Scenario	
	No. of Compliant SWO	No. of Non - Compliant SWO	No. of Compliant SWO	No. of Non - Compliant SWO	No. of Compliant SWO	No. of Non - Compliant SWO	No. of Compliant SWO	No. of Non - Compliant SWO
Myrtleville**	0	0	0	0	0	0	0	0
Minane Bridge**	1	0	1	0	1	0	Decommissioned	
Ballygarvan**	0	1	0	1	0	1	Decommissioned	
Halfway**	1	0	1	0	1	0	1	0
Killumney**	0	0	0	0	0	0	0	0
Dripsey**	2	0	2	0	2	0	2	0
Berrings**	0	0	0	0	0	0	0	0
Matehy**	0	0	0	0	0	0	0	0
Courtbrack**	0	0	0	0	0	0	0	0
Leamlara**	0	0	0	0	0	0	0	0
Ballincurrig	1	0	1	0	1	0	2*	0
Lisgoold North	0	0	0	0	0	0	0	0
Lisgoold South	0	0	0	0	0	0	0	0

****Models built using best available information**

*** There is a variation in the total number of SWOs across the different strategy horizon scenarios and the 2080 Solution Scenario. This is due to some SWOs being proposed for decommissioning or newly introduced in the Solution Scenario, as well as consideration of current capital schemes that are underway to address existing SWO issues.**

Table 8-3: Model Predicted Out of Sewer Flooding in Wastewater Network in Future Strategy Horizons

Catchment	2030		2055		2080			
	Do Nothing Approach		Do Nothing Approach		Do Nothing Approach		Solution Scenario	
	No. of Flood Nodes	Flood Volume (m^3)	No. of Flood Nodes	Flood Volume (m^3)	No. of Flood Nodes	Flood Volume (m^3)	No. of Flood Nodes	Flood Volume (m^3)
Ballincollig	145	5,304	148	5,811	148	5,811	136	4,067
Cork Lower Harbour*	406	31,289	429	39,281	454	41,070	443	23,660
Cork City	4,006	253,200	4,125	284,881	4,200	290,440	2,001	22,166
Midleton	54	3,523	61	3,633	64	3,771	52	3,522
Carrigtwohill	33	704	33	746	33	766	28	498
Knockraha*	2	30	2	105	2	315	2	24
Carrignavar*	1	39	1	63	1	167	5	8
Inniscarra*	4	396	4	521	4	673	1	3
Whitechurch	15	549	15	572	15	589	1	403
Blarney*	124	23,098	149	37,432	150	41,573	124	2,884
Killeens*	4	403	7	77	7	77	7	78
Grenagh*	10	783	10	818	10	887	1	15
Watergrasshill*	29	4,584	32	6,126	32	6,326	4	298
Whitegate-Aghada*	33	4,584	35	4,654	35	4,675	17	70
Saleen*	7	290	7	291	7	293	2	15
Cloyne*	30	1,803	31	2,091	31	2,646	7	61
Ballymore*	3	179	3	180	3	180	2	2
Myrtleville*	4	163	4	166	4	167	-	-

Catchment	2030		2055		2080			
	Do Nothing Approach		Do Nothing Approach		Do Nothing Approach		Solution Scenario	
	No. of Flood Nodes	Flood Volume (m^3)	No. of Flood Nodes	Flood Volume (m^3)	No. of Flood Nodes	Flood Volume (m^3)	No. of Flood Nodes	Flood Volume (m^3)
Minane Bridge*	2	5	2	5	2	5	-	-
Ballygarvan*	11	416	11	428	11	440	3	9
Halfway*	3	44	3	44	3	45	1	8
Killumney*	7	265	11	578	11	1,257	2	2
Dripsey*	2	4	2	4	2	4	1	3
Berrings*	4	15	4	15	4	16	-	-
Matehy*	-	-	-	-	-	-	-	-
Courtbrack*	9	604	9	615	9	626	-	-
Leamlara*	1	23	1	24	1	24	-	-
Ballincurrig*	-	-	-	-	-	-	-	-
Lisgoold North*	3	300	2	34	2	34	-	-
Lisgoold South*	-	-	1	117	1	127	-	-

***Models built using best available information**

For the 2080 solution scenario, residual model predicted flooding remains in some areas of the network. These however are in areas of the model which are currently classed as low-confidence, or model predicted only flooding which are currently unconfirmed on site. Both the low confidence areas and model predicted locations have been modelled using engineering judgment. To improve model confidence in these areas, it is recommended that further investigation and surveys be undertaken. Catchments such as Kileens and Midleton predict a decrease in flood volumes for the 2030 development scenario compared to the 2024 scenario. This reduction is attributed to ongoing network upgrades within these catchments, which have been incorporated into the 2030 development model and thus resolve some of the existing network capacity issues. Similar upgrades have been implemented across all catchments for 2030, 2055, and 2080 strategy horizons as part of the ongoing national investment programme.

9. Water Quality Modelling

9.1. Purpose of this Chapter

The CMA requires strategic enhancements in wastewater infrastructure to accommodate the significant growth anticipated, to handle increased or additional discharges while meeting environmental objectives and meeting Water Framework Directive (WFD) and protected area objectives. Water quality modelling has been implemented to guide the strategy in identifying appropriate discharge locations and volumes to water bodies. This modelling ensures that discharges are environmentally sustainable and aligned with legislative requirements. As part of the CWS, this chapter presents an assessment of the current and future assimilative capacity of freshwater and marine receiving waters within the CMA. In addition, requirements for new outfall infrastructure have been assessed, considering ongoing projects, environmental constraints, and future developments.

Both river and marine water quality models, built by Intertek Metoc as part of the Cork Harbour Strategic Modelling Study (CHMS) for Uisce Éireann, have been used in the assessment.

Two separate modelling reports provide more information, data, and context on the freshwater and marine water quality modelling in Cork Harbour which are included in Appendix 5 – Water Quality Modelling Reports.

9.2. Background and Scope

Cork's four principal river catchments (Glashaboy, Owenboy, Owencurra, and the Lee) discharge into receiving waters around Cork harbour, a marine transitional and coastal waterbody of high ecological value and multiple protected area designations (shellfish waters (SFW), bathing waters (BW), Natura 2000).

Uisce Éireann's growth forecasts for 2030, 2055, and 2080, together with emerging climate-driven changes in rainfall patterns, require a forward-looking assessment of Wastewater Assimilative Capacity (WAC). This is the capacity of a water body to dilute concentrations of contaminants to acceptable levels. This chapter covers water quality assessment of 24 riverine WwTP discharges in total, 7 of which are not included within the CMA boundary however discharge to upstream reaches of river catchments included within the study area. It is a key consideration to consider the effects of these discharges on downstream WwTP discharge requirements to provide a holistic assessment, ascertaining the water quality risks associated with projected growth within the CMA. 9 marine WwTPs are also included within this chapter. A map displaying all riverine and marine WwTPs is shown in Figure 9-1. For each WwTP, environmentally sustainable discharge (ESD) loads are proposed for four planning horizons: Current, 2030, 2055, and 2080 from water quality models.

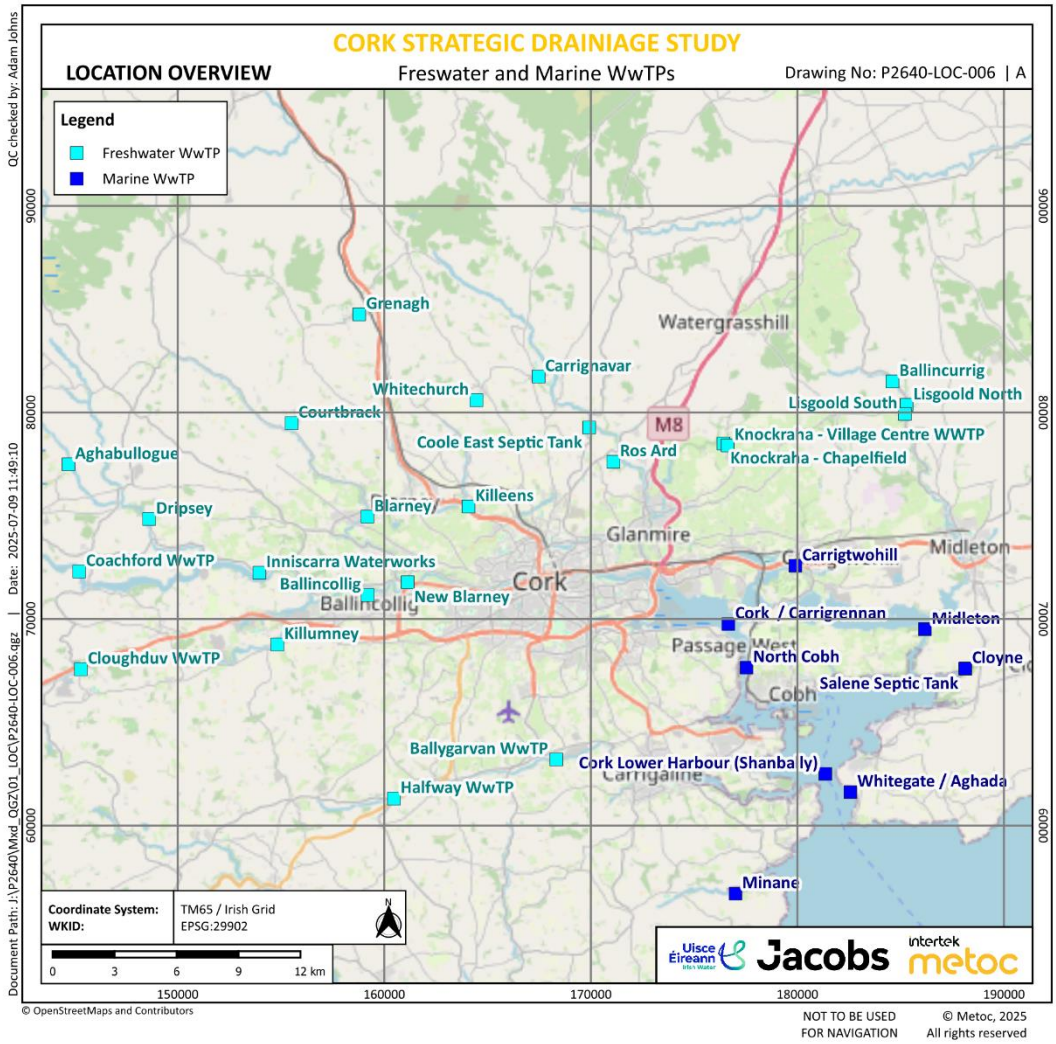

Figure 9-1: Riverine and Marine WwTPs

9.3. Methodology

9.3.1. Receiving Water Characterisation

The EPA has assigned each freshwater catchment was assigned a WFD status objective based on upstream water quality and ecological designation: The target ecological status for a receiving waterbody is set as High if either the waterbody has a formal High-status WFD objective, or the upstream ambient concentration lies in the lower 75 % of the High-status Environmental Quality Standards (EQS) band. The WFD-designated transitional and coastal waterbodies in Cork Harbour have a target ecological status of Good. These are shown in Figure 9-2. WFD Cycle 2 data was used within the WQM exercise. Whilst it is acknowledged Cycle 3 data is now available, the WQM assessment was conducted before this data was available. However, a review of data changes has been undertaken, and it was determined that Cycle 3 data would not significantly impact the results of the CWS WQM assessment which presents a good representation of receiving water body constraints for future horizons to 2080.

Within Cork Harbour, designated shellfish waters are subject to microbiological quality standards to protect shellfish health and support safe harvesting. These standards do not impose nutrient constraints but may influence discharge assessments where microbiological risks are present.

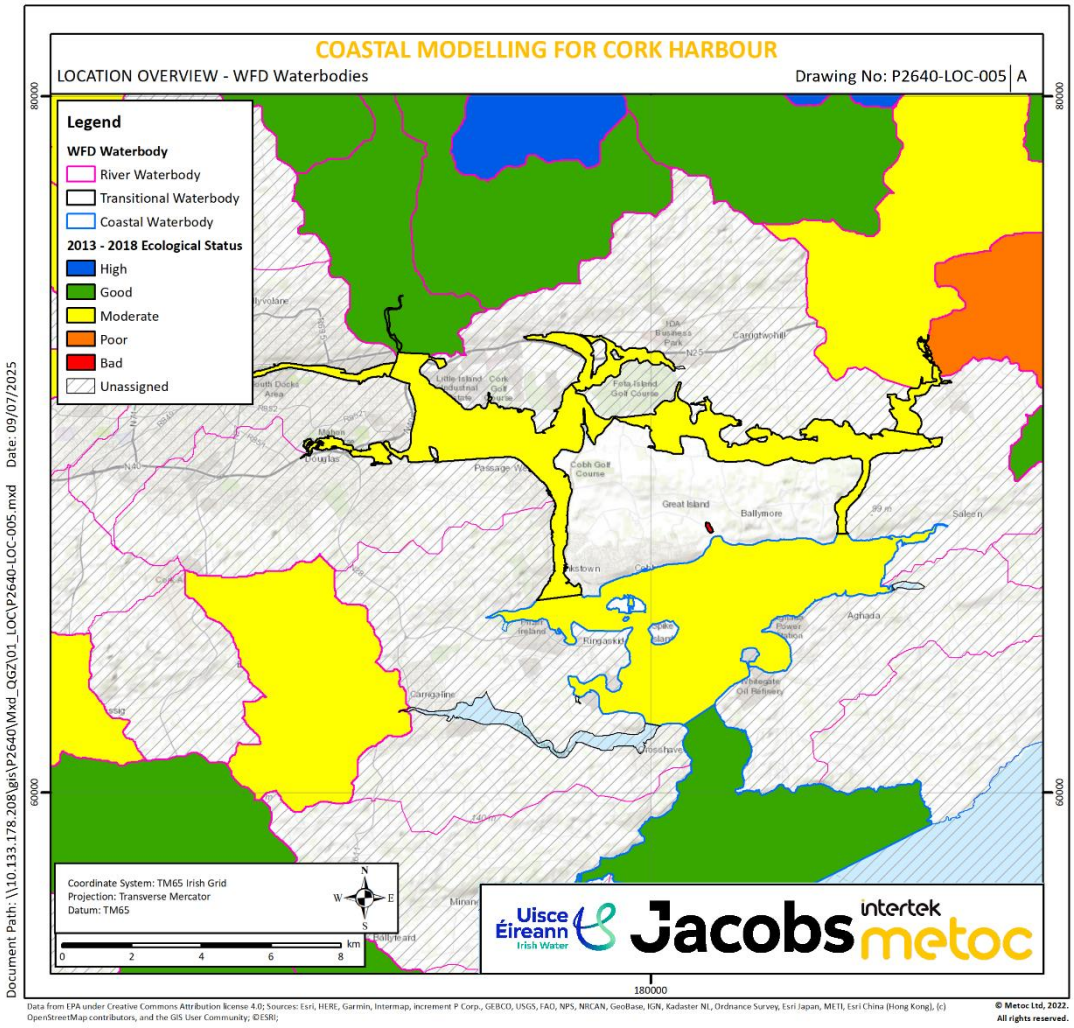

Figure 9-2: WFD Cycle 2 status map

9.3.2. Hydrological and Hydrodynamic Modelling

Hydrological and hydrodynamic modelling was conducted to assess the impact of WwTPs on Cork's water bodies. For freshwater systems, a one-dimensional MIKE11 model was used, simulating water flow along rivers and channels. This model was calibrated using data from EPA gauging stations and performed well in validation tests.

For marine environments, a three-dimensional MIKE3 FM model was employed, capable of simulating complex water movements in coastal waters and estuaries. This model used a flexible-mesh grid with varying resolutions to accurately represent Cork Harbour's estuarine environment.

Both models incorporated climate change scenarios for the strategy horizon years of 2030, 2055, and 2080, considering changes in rainfall patterns and their effects on river flows and water

quality. This approach allows for an assessment of current and future impacts of WwTP discharges on water quality, accounting for both freshwater and marine environments.

Further details are provided in the separate freshwater and marine modelling reports included in Appendix 5.

9.3.3. Microbiological Assessment

A microbiological water quality assessment was conducted to quantify how various pollution sources affect microbiological water quality in designated bathing waters (BW) and shellfish waters (SFW). The study considers multiple pollution sources, including WwTPs, SWOs, rivers, septic tanks, industrial sources, and misconnections.

The project evaluates 4 No. time horizons: current conditions and projections for 2030, 2055, and 2080. These future scenarios incorporate updated population data, wastewater catchment changes, and climate change impacts on river runoff. This approach allows for source apportionment and identification of critical contributors to water quality risks under various environmental conditions.

Further details are provided in the separate microbiological assessment modelling report included in Appendix 5.

9.4. Determining Proposed Treatment

9.4.1. Freshwater Calculations

The calculation of environmentally sustainable discharge loads for each WwTP follows Uisce Éireann's guidance (Interim Technical Guidance for Water Quality Impact Assessment (Freshwaters), 2023). This approach ensures that discharges are compatible with WFD objectives and conservation goals for receiving waters and Protected Areas.

The methodology uses a tiered, risk-based approach to assess wastewater discharge impacts on freshwater environments. It aligns with the WFD's "polluter pays" principle, making dischargers responsible for maintaining the ecological status of receiving waters. The strategy employs a risk-based scoring system to determine allowable use of Wastewater Assimilative Capacity (WAC), promoting fair allocation of environmental burden.

Models were run using the determined environmentally sustainable discharge loads to simulate worst-case scenarios. This process helps assess potential impacts on river water quality and calculate discharge loads that would maintain acceptable WFD water quality status. In cases where required effluent concentrations were lower than current treatment capabilities, alternative discharge locations were evaluated.

The assessment incorporates treated effluent flows from WwTPs for various future scenarios, including some plants outside the Cork Metropolitan Area that affect upstream reaches. For further details on the calculation of environmentally sustainable discharges, please refer to the water quality modelling reports included in Appendix 5.

9.4.2. Marine Calculations

Nitrogen and phosphorus in wastewater discharges exist in various chemical forms, but only certain forms (Dissolved Inorganic Nitrogen (DIN) and Molybdate Reactive Phosphorus (MRP) or orthophosphate) can be utilised by phytoplankton and algae. While WFD standards focus on these bioavailable forms, the Urban Waste Water Treatment Directive sets standards for total nitrogen (TN) and total phosphorus (TP) for discharges to Nutrient Sensitive Areas.

For marine discharges to Cork Harbour, representative discharge loads (as a product of flow and concentration) were determined for each WwTP. Current and 2030 loads are based on existing permits and measured data. From 2045, stricter European rules under the recast Urban Wastewater Directive (rUWWTD) will apply, requiring treatment plants in sensitive areas like Lough Mahon to significantly reduce nitrogen and phosphorus in their discharges. Therefore, for the 2055 and 2080 scenarios, flows were increased to reflect future conditions, and concentrations were reduced, where appropriate.

A detailed numerical model of Cork Harbour was used to assess how these discharges spread and dilute in the water. The model accounts for tides, currents, and the layering of fresh and salt water. To distinguish between the impact of treatment plant discharges and pollution coming from rivers, two scenarios were tested: one using observed river water quality to assess the cumulative impacts of wastewater discharges alongside other environmental pressures, and a second scenario, which considers the impact of the wastewater discharges in isolation. This is referred to as a "Notionally Clean" scenario and is typically used to determine the level of treatment required for a discharge to a waterbody which is already close to or failing its environmental objectives. Both summer and winter conditions were modelled to capture seasonal differences.

9.5. Results Summary

9.5.1. Freshwater WwTPs

Results for WwTPs discharges to freshwater environments around Cork Harbour across the three strategy horizons are presented for typical wastewater nutrient discharges of BOD ammonia and MRP (Table 9-1).

Table 9-1: Freshwater Environmentally Sustainable Discharge result calculations for BOD, Ammonia and MRP

Receiving Watercourse	WwTP	BOD (mg/l)				Ammonia (mg/l)				MRP (mg/l)			
		ELV	2030 CC	2055 CC	2080 CC	ELV	2030 CC	2055 CC	2080 CC	ELV	2030 CC	2055 CC	2080 CC
Butlerstown River	Knockraha - Chapelfield WwTP	125	23.6	20.6	18.6	5	0.98	0.85	0.78	3	0.48	0.42	0.38
	Knockraha - Village Centre WWTP	125	23.6	20.6	18.6	5	0.98	0.85	0.78	3	0.48	0.42	0.38
Glashaboy River	Carrignavar	25	13.7	11.2	10.0	2	0.78	0.64	0.57	1.5	0.41	0.34	0.30
	Coole East	125	86.8	72.5	64.0	20	5.37	4.48	3.96	3	2.46	2.03	1.84
	Ros Ard WwTP	25	25	25	21.2	20	2.10	1.80	1.58	3	0.74	0.64	0.55
Owenboy River	Halfway	5	5	5	5	2	2	2	2	1	1.00	1.00	1.00
	Ballygarvan	25	25	25	25	5	4.10	3.55	3.14	3	3	3	2.74
Owenacurra River	Ballincurrig Septic Tank	125	32.4	26.7	23.9	20	1.39	1.15	1.02	5	0.70	0.58	0.51
	Lisgoold North WwTP	5	5	5	5	5	5	4.62	4.10	0.5	0.5	0.5	0.5
	Lisgoold South WwTP	200	123.2	101.1	90.1	30	3.91	3.20	2.86	3	2.77	2.32	1.98
Dungourney River	Dungourney	145	64.6	55.0	48.7	20	1.63	1.39	1.23	3	0.59	0.50	0.44
Blarney River	Whitechurch WwTP	25	3.3	2.8	2.6	10	0.19	0.16	0.15	5	0.07	0.06	0.06
	Killeens WwTP	25	4.2	2.8	2.6	28.4	0.58	0.39	0.36	1	0.26	0.18	0.16

Receiving Watercourse	WwTP	BOD (mg/l)				Ammonia (mg/l)				MRP (mg/l)			
		ELV	2030 CC	2055 CC	2080 CC	ELV	2030 CC	2055 CC	2080 CC	ELV	2030 CC	2055 CC	2080 CC
Martin River	Grenagh WwTP	25	2.7	2.3	2.0	3	0.60	0.51	0.46	1.7	0.31	0.26	0.23
Shournagh River	Courtbrack WwTP	25	25	25	25	10	3.84	3.18	2.87	2	1.63	1.34	1.21
	Blarney WwTP	20	4.2	2.7	2.4	1.5	0.23	0.15	0.13	0.8	0.08	0.05	0.05
Bride (Lee)	Cloughdov WwTP	10	10	10	10	2	2.00	2.00	2.00	0.8	0.8	0.75	0.65
	Kilumney WwTP	25	25	25	25	10	2.45	2.05	1.76	5	0.73	0.60	0.54
Dripsey River	Rylane WwTP	25	11.1	9.4	8.4	10	0.77	0.66	0.58	2	0.39	0.33	0.29
	Agabullogue WwTP	25	14.0	11.9	10.6	5	3.73	3.17	2.82	1	0.82	0.71	0.61
	Dripsey WwTP	25	24.9	21.5	19.2	10	3.53	3.03	2.74	5	1.60	1.38	1.24
River Lee	Coachford WwTP	21.63	21.63	21.63	21.63	6.8	6.62	5.63	5.01	0.88	0.88	0.88	0.88
	Inniscarra WwTP	25	25	25	25	10	10	10	10	5	5	5	5
	Ballincollig WwTP	25	20.2	13.2	11.6	5	1.13	0.73	0.66	2	0.62	0.40	0.36

Relocation Options

In order to meet the EQS for multiple river reaches, some WwTPs were modelled in a different location which would potentially move the ecological stress to less sensitive receiving waters. The following WwTPs were modelled in new locations or under different flows. The information and results of these are provided in Table 9-2, and Table 9-3.

Table 9-2: Target Status for Relocated WwTPs Discharge Points

WwTP	Previous Discharge Location	Proposed New Location	Proposed Grid Reference	Target Status	Notioanlly Clean?
Knockraha	Butlerstown River nr Knockraha	Glashaboy River, D/S of Butlerstown confluence	W 72998 74921	Good	Yes
Carrignavar	Glashaboy River nr Carrignavar	Glashaboy River nr Upper Glanmire Road	W 71290 78845	Good	Yes
Halfway	Owenboy River nr Halfway	Ballygarvan WwTP (Owenboy River nr Ballygarvan)	-	Good	No
Grenagh	Martin River nr Grenagh	Blarney River nr Blarney	W 61254 75310	Good	Yes
Blarney	Blarney River U/S Shournagh River	River Lee D/S Shournagh River	W 61418 71745	Good	Yes
Ballincollig	River Lee nr Ballincollig	River Lee nr Victoria Cross (Cork)	W 64501 71430	Good	No
Knockraha	River Lee nr Ballincollig	River Lee nr Victoria Cross (Cork), No Upstream WwTPs		Good	No

Table 9-3: Freshwater Environmentally Sustainable Discharge result calculations for relocated WwTPs for BOD, Ammonia, and MRP

Receiving Watercourse	WwTP	BOD (mg/l)				Ammonia (mg/l)				MRP (mg/l)			
		ELV	2030 CC	2055 CC	2080 CC	ELV	2030 CC	2055 CC	2080 CC	ELV	2030 CC	2055 CC	2080 CC
Relocated to Glashaboy River	Knockraha	125	125	125	125	5	5	5	5	3	3	3	3
Relocated to D/S (Glashaboy River)	Carrignavar	25	25	25	25	2	2	2	2	2	1.74	1.46	1.25
Relocated to D/S (Owenboy River), with Halfway	Ballygarvan	25	25	25	25	5	3.05	2.69	2.30	3	0.59	0.51	0.46
Relocated to Blarney River	Grenagh WwTP	25	25	25	25	3	2.97	2.50	2.16	1.65	1.65	1.65	1.65
Relocated to River Lee	Blarney WwTP	20	25	25	25	1.5	2.97	2.50	2.16	0.8	1.65	1.65	1.65
Relocated to D/S (River Lee)	Ballincollig WwTP	25	13.1	12.1	20.5	5	1.82	1.18	1.05	2	0.8	0.8	0.8
Relocated to D/S (River Lee), No Upstream WwTPs	Ballincollig WwTP	25	17.3	15.9	25	5	1.93	1.24	1.13	2	2	2	2

9.5.2. Marine WwTPs

Table 9-4 presents the representative environmentally sustainable discharge loads used in the model for the nine WwTPs discharging to Cork Harbour across four time horizons (current, 2030, 2055, and 2080) for BOD, DIN, and MRP. More details and the results of the water quality modelling (in terms of the size of the area affected by each discharge, or mixing plume) are given in the associated report in Appendix 5.

Several strategic infrastructure changes occur between the 2030 and 2055 horizons that are reflected in the modelling. The Carrigtwohill WwTP discharge will be relocated to a new outfall further south in Lough Mahon. Flows from Cloyne WwTP will discharge via a new extended outfall to Rostellan, with flows from Saleen WwTP transferred to Cloyne WwTP. Flows from both Minane Bridge WwTP and North Cobh WwTP will be transferred to Cork Lower Harbour WwTP.

Table 9-4: Marine Environmentally Sustainable Discharge result calculations for BOD, TN and TP

WwTP	ELV - Current			ELV – 2030			ELV – 2055			ELV - 2080		
	BOD	TN	TP	BOD	TN	TP	BOD	TN	TP	BOD	TN	TP
Carrigrennan *	25	25	2.5	25	25	2.5	25	8	0.5	25	8	0.5
Cork Lower Harbour	245	95 **	2	245	95 **	2	245	95 **	2	245	95 **	2
Carrigtwohill *	25	25	2.5	25	25	2.5	25	10	0.7	25	10	0.7
Midleton *	25	15	2	25	15	2	25	10	0.7	25	10	0.7
North Cobh	25	25	2.5	25	25	2.5	25	25	2.5	25	25	2.5
Whitegate - Aghada	25	54	2.5	25	54	2.5	25	54	2.5	25	54	2.5
Cloyne	25	45	2.5	25	45	2.5	25	45	2.5	25	45	2.5
Saleen	25	30	2.5	25	30	2.5	25	30	2.5	25	30	2.5
Minane Bridge	25	15	2.5	25	15	2.5	25	15	2.5	25	15	2.5

***** rUWWTD limits apply

****** DIN

9.6. Strategic Implications

The findings of the water quality modelling are summarised below:

Freshwater Discharges

- Upstream concentration already exceeding EQS:
    - BOD: Butlerstown, Glashaboy, and Blarney
    - Ammonia: Glashaboy, Blarney, and Bride (Lee)
    - MRP: Butlerstown, Glashaboy, Owenboy, Owenacurra, Blarney, Martin, Shournagh, Bride (Lee), and Dripsey
- Sustainable discharge implications
    - Achieving point-source environmentally sustainable discharge loads without ecological decline also demands catchment-wide reductions in diffuse loads.
    - "Notionally Clean" scenarios assume upstream concentrations at one-fifth of the High/Good EQS boundary (near-reference conditions)
    - Environmentally sustainable discharge loads are calculated under conservative assumptions to ensure compatibility with WFD objectives
- Sites requiring lower environmentally sustainable discharge loads by 2080
    - BOD: Dungourney, Killeens, Grenagh, and Rylane
    - Ammonia: Coole East, Ros Ard, Dungourney, Killeens, Grenagh, Kilumney, and Rylane
    - MRP: Ros Ard, Dungourney, Killeens, Grenagh, Kilumney, and Rylane
- Relocated outfalls
    - Relocation of WwTP discharges to downstream or more favourable locations typically offers a strategic opportunity to reduce environmental impact without reducing pollutant discharge loads through additional treatment.

Marine Discharges

- Most marine discharges can comply with environmental standards through operational improvements and modest upgrades.
- Carrigtwohill WwTP currently generates the largest mixing plume due to its confined location. The planned outfall relocation combined with upgraded treatment from 2055 will substantially reduce this. Similar improvements are expected at Cloyne and Saleen WwTPs following their consolidation and relocation to Rostellan.
- Carrigrennan WwTP, the largest facility, shows moderately sized mixing plume. Midleton, North Cobh, Whitegate Aghada, and Cork Lower Harbour WwTPs all show minimal or no impact due to favourable local dispersion conditions or small discharge volumes.
- Rivers, particularly the River Lee, contribute significantly to nutrient levels in Cork Harbour. At several sites, river inputs have a greater influence on water quality than WwTP discharges, highlighting the need for catchment-wide approaches alongside treatment plant improvements.

Strategic Direction

Uisce Éireann's approach is guided by the "polluter pays" principle under the WFD. This means discharges must be proportionate to the receiving water's capacity to assimilate pollutants, and infrastructure must be designed to avoid deterioration in ecological status.

Where Notionally Clean conditions are applied, the strategy does not speculate on actions required by other sectors. Instead, it ensures that wastewater infrastructure is environmentally responsible and compatible with WFD objectives. Broader pressures on water quality from agriculture, urban runoff, and land use change are addressed through River Basin Management Plans and Water Action Plans.

This modelling provides a clear rationale for prioritising investment in treatment upgrades, outfall relocations, and strategic planning to reduce the impact of discharges on Cork Harbour sensitive receivers and its contributing catchments.

10. Optioneering and Solution Development

10.1. Principles of Optioneering and Solution Development

A breakdown of the Optioneering Methodology is provided in the Optioneering and Solution Development Report, which can be found in Appendix 6. The Optioneering and Solutions Development report offers an in-depth summary of the methodological approach employed in the strategic planning process implemented as part of the CWS.

The overall objective of the Optioneering and Solution Development process for the CMA is to identify and evaluate feasible solutions and determine the preferred strategic drainage and treatment solution(s) for the study area as a whole for strategy horizon years of 2030, 2055 and 2080. Any options for the interim strategy horizon years of 2030 and 2055 should facilitate implementation of the longer term 2080 preferred solution and should not compromise the ability the implement this. This process employs a 5-stage assessment methodology, balancing functionality, environment, sustainability and whole-life cost. An overview of these 5-stages is included in Figure 10-1.

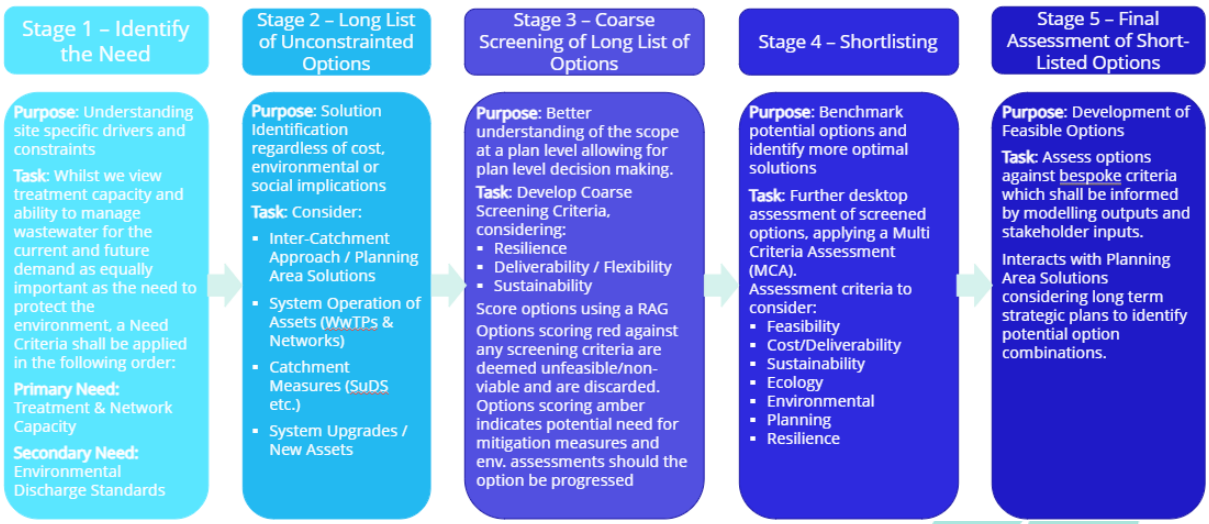

Figure 10-1: Assessment Methodology Overview

Key aspects of the process include:

- **Addressing complex factors such as environmental constraints, treatment plant capacities, and network hydraulics**: The optioneering process aligns with UÉ's commitment to support social and economic growth through optimising treatment and storage capacity, as well as providing network connectivity. This approach caters for planned growth in line with the NPF. The assessment of final effluent compliance under UWWTD and Wastewater Discharge Authorisation Regulations ensures the strategy's adherence to regulatory standards including the WFD and EU Habitats Directive, serving as a measure of process effectiveness and capability. The strategy aligns with broader environmental objectives, such as protecting and enhancing biodiversity, including Natura 2000 sites and nationally designated areas. It aims to prevent deterioration of water body status and contribute to WFD and RBMP objectives

- **Considering regional interdependencies**: The process evaluates synergies between different assets and processes, aligning with UÉ's broader investment portfolio. It considers interoperability and utilisation of existing technologies and systems, promoting a more integrated approach to wastewater management. This consideration of regional interdependencies potentially leads to more cost-effective and environmentally sound solutions across the CMA, ensuring that proposed options contribute to the overall efficiency of the region's wastewater infrastructure.
- **Evaluating solutions based on carbon emissions, energy efficiency and circular economy**: The approach aligns with UÉ's sustainability targets, including a 51% absolute reduction in GHG emissions by 2030 and Net Zero Carbon by 2040. The process assesses embodied, operational, and whole-life carbon impacts of each option. Energy efficiency is a key criterion, with a target of 50% improvement by 2030. The evaluation also considers circular economy principles, promoting material reuse, energy recovery, and nutrient recycling, contributing to carbon neutrality and resource optimisation. This aligns with UÉ's emerging National Wastewater Sludge Strategy.
- **Incorporating risk assessments for transparent, evidence-based decision-making**: The process evaluates delivery risks, considering factors such as construction uncertainties, land stability, contamination risks, and potential disruption to existing operations. It assesses the flexibility and scalability of options to ensure adaptability to future changes. The assessment also considers planning and regulatory risks, examining constraints around land ownership, environmental zoning, and planning policies. This risk assessment provides a robust framework for decision-making, allowing stakeholders to make informed choices based on a clear understanding of potential challenges and mitigation strategies.
- **Ensuring progressive and integrative solutions across different time horizons**: The process evaluates options based on their ability to meet current demands while allowing for phased or incremental delivery to address future changes. Climate resilience is a key consideration, focusing on identifying and mitigating physical climate risks to wastewater services and assets. This approach ensures that selected solutions are effective in the short term and contribute to the long-term sustainability and resilience of the CMA's wastewater infrastructure.

Options which are developed as part of this strategy will be subject to more detailed environmental impact assessments where required and cost analysis if they are subsequently advanced subsequently. Projects advancing from the CWS, where required, will undergo individual full environmental assessments, potentially including Environmental Impact Assessment and Appropriate Assessment. These assessments support planning and licensing applications, where applicable. All such applications will be subject to public consultation, ensuring transparency and stakeholder engagement throughout the project lifecycle.

The optioneering process incorporates a risk assessment for each potential solution. This ensures that the selection is:

- **Evidence-based**: The optioneering process relies on a set of criteria and data to ensure evidence-based decision-making. Each option is evaluated against five key objectives of Addressing the Need, Deliverability, Risk & Resilience, Customer & Stakeholder Support and Environmental & Sustainability. The process also incorporates data on biodiversity impacts, water environment effects, and climate resilience. This rigorous approach ensures that decisions are grounded in factual information and scientific analysis, rather than subjective opinions or assumptions.
- **Transparent**: Transparency is a cornerstone of the optioneering process, with clear and consistent evaluation criteria applied across all potential solutions. The scoring mechanism provides a standardised and easily understandable method for comparing options. Assessments, including environmental impact and waterbody impact analysis are documented and made available for scrutiny. The process clearly outlines the rationale for adopting or rejecting certain approaches and technologies. Furthermore, the commitment to public consultation during planning and licensing applications ensures that the decision-making process remains open and accessible to all stakeholders, fostering trust and accountability.
- **Addresses stakeholder interests**: The optioneering process is designed to address a wide range of stakeholder interests, from local communities to regulatory bodies and environmental groups. It considers the impact on customers, evaluating factors such as odour, noise, and aesthetics. Supporting communities and public health are key criteria, ensuring that selected solutions contribute positively to local wellbeing. The process also addresses the interests of environmental stakeholders by incorporating assessments of biodiversity impact, water quality, and climate resilience. By considering factors such as planning and regulation, delivery timeline, and alignment with broader investment portfolios, the process also addresses the interests of regulatory bodies and UÉ itself. This approach ensures that the selected solutions balance the diverse needs and concerns of all stakeholders involved.

The risk assessment helps explain the rationale behind the adoption or rejection of certain approaches and technologies, fostering stakeholder understanding and buy-in.

10.2. Optioneering Methodology

10.2.1. Stage 1 – Identify the Need

The initial phase of the Optioneering and Strategy Development process focuses on identifying site-specific drivers and constraints. This stage applies a Need Criteria, balancing treatment capacity management with environmental protection. The strategy addresses three key areas:

- Treatment capacity (PE and hydraulic)
- Network capacity (hydraulic)
- Environmental discharge standards

Population projections for the strategy horizons 2030, 2055, and 2080 were developed to estimate growth within the Study Area catchments. These projections have previously been outlined in Section 3.1. These projections informed the estimation of flow and loads for each strategy horizon. This approach allows for the development of solutions that can accommodate long term population changes and associated infrastructure demands. This method ensures the identification of solutions that safeguard the Cork Metropolitan Area's future needs.

Further details on the methodology to identify the need can be found in Figure 10-2.

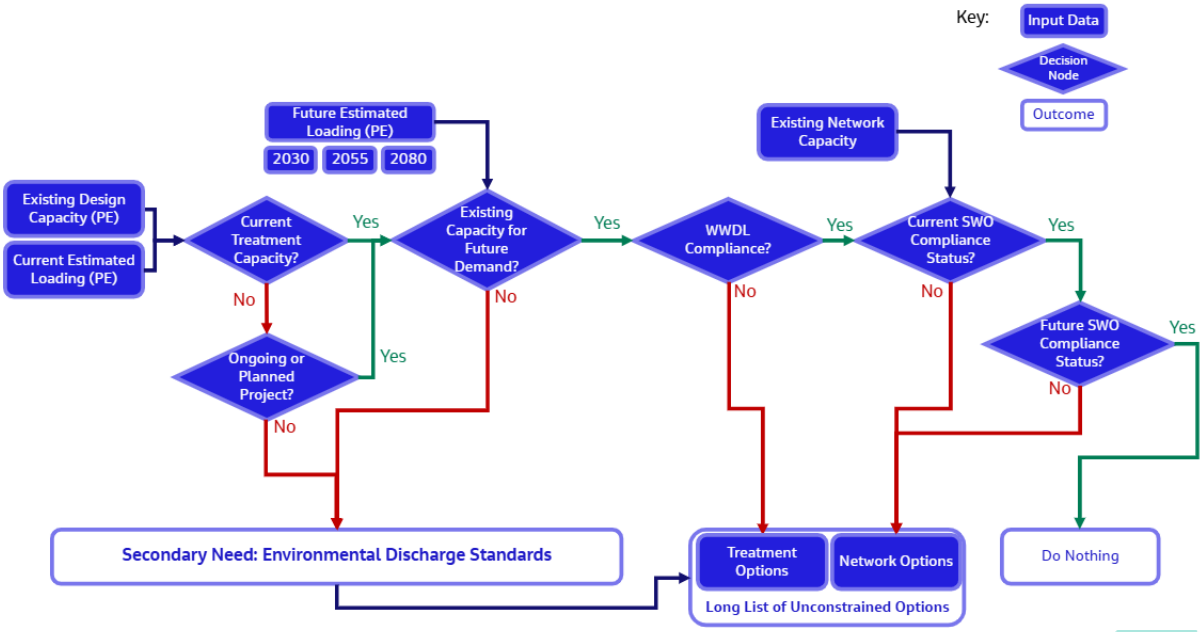

Figure 10-2: Identify the Need – Decision Tree

10.2.2. Stage 2 – Long List of Unconstrained Options

The second stage of the Optioneering and Solution Development process is to identify all potential solutions, regardless of cost, environmental or social implications. This encompasses inter-catchment approaches, planning area solutions, system operation of assets, catchment measures, system upgrades or new assets referred to as a long list of unconstrained options

The purpose of the unconstrainted options is to provide a list of overarching options derived to address future network and wastewater treatment constraints. The unconstrained options list includes a "Do Nothing" scenario as a baseline for comparison. Each agglomeration is assessed against this list to inform the subsequent Coarse Screening process and eliminate options unlikely to address specific constraints. The full lists of WwTP and Network Unconstrained Options is summarised in Figure 10-3 10-3. Note, untreated wastewater load transfer refers to wastewater that is preliminary treated (screened) and transferred to an alternative WwTP.

The detailed environmental constraints are assessed during the Coarse Screening (Stage 3) and Fine Screening (Stage 4) stages of the Option Development Process. Unconstrained options were developed for both Network Assessment and WwTPs and the unconstrained options for each are listed below. A total of 714 Unconstrained Options were identified for the WwTPs in the CMA

across the 3 strategy horizons, demonstrating the breadth of potential solutions considered in this stage.

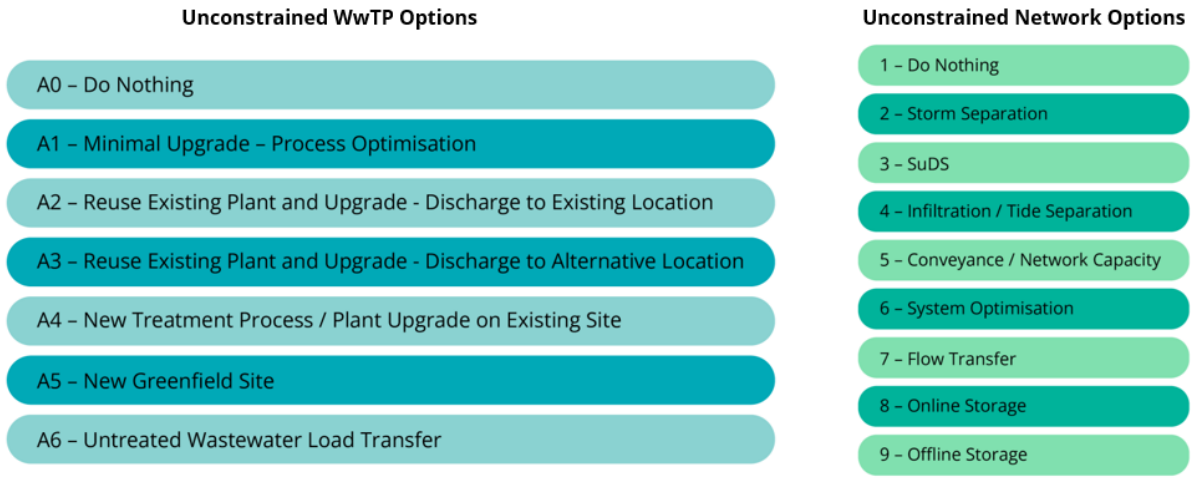

Figure 10-3: Long List of Unconstrained Options

10.2.3. Stage 3 - Coarse Screening of Long List Options

The third stage of the Optioneering and Solution Development process aims to deepen our understanding of required works, enabling strategy level decision making. This stage considers key factors such as resilience, deliverability, flexibility, and sustainability. Each option is assessed individually against the outputs of the Stage 1 – Identify the Need assessment and WwTP specific constraints and consideration across each strategy horizon using a Red-Amber-Green (RAG) matrix, where:

- Red: Unfeasible/non-viable options are eliminated
- Amber: Options requiring potential mitigation measures or environmental assessments
- Green: Viable options

All options undergo screening against technical and environmental criteria. Technical screening criteria for removal (red) of treatment and network upgrade options have been provided in Table 10-1 and 10-2 below. The criteria listed below apply to each of the three strategy horizons. Full details of option specific coarse screening criteria are provided in the Optioneering and Solution Development Report, which can be found in Appendix 6.

Table 10-1: Coarse Screening Process - WwTP Coarse Screening Criteria

Options	Scoring Criteria
A0 – Do Nothing	Red if capacities exceeded or non-compliant; Green if capacities not exceeded and compliant.
A1 – Minimal Upgrade Process Optimisation	Red for significant capacity exceedance or expired asset life; Amber for moderate exceedance or uncertain asset life; Green for minor exceedance and compliant asset life.
A2 – Plant Upgrade Reusing Existing Assets and Existing Discharge Location	Red if capacities not exceeded or insufficient land; Amber if capacities exceeded but land limited; Green if capacities exceeded with sufficient land and manageable discharge limits.

A3 – Plant Upgrade Reusing Existing Assets with Alternative Discharge Location	Similar to A2, but considers stricter future discharge limits for Green rating.
A4 – New Plant Upgrade and Existing Discharge Location	Red if capacities are not exceeded or land unavailable; Amber if capacities exceeded but constraints exist; Green if capacities are exceeded with sufficient land and manageable discharge limits.
A5 – New Plant Upgrade with Alternative Discharge Location	Similar to A4, but considers stricter future discharge limits for Amber and Green ratings.
A6 – Wastewater Transfer	Red if population equivalent >5,000 or no nearby network; Amber if <5,000 PE and network within 10km; Green if <5,000 PE and network within 5km.

Table 10-2: Coarse Screening Process - Network Coarse Screening Criteria

Options	Scoring Criteria
A1 - Do Nothing	Assessed based on network capacity. Red if insufficient, Green if sufficient or no issues.
A2 - Storm Separation	Evaluates watercourse proximity, existing storm network capacity, and separation potential. Red for no nearby watercourse or combined system, Amber for limited capacity or partial separation, Green for nearby watercourse and sufficient capacity.
A3 - SuDS	Considers system separation potential, overflow issues, and available space. Red if already separated or no space, Amber for limited opportunities, Green for partial/combined systems with separation potential and available space.
A4 - Infiltration / Tide Separation	Assesses infiltration source identification and tidal ingression. Red if source not identified or no tidal issues, Amber for limited infiltration, Green for significant infiltration potential or tidal ingression issues.
A5 - Conveyance / Network Capacity	Evaluates upgrade length and downstream capacity. Red for extensive upgrades or no capacity, Amber for limited capacity, Green for available capacity and minor upgrades.
A6 - System Optimisation	Considers local capacity and optimization potential. Red for no capacity or opportunity, Amber for limited capacity, Green for sufficient local capacity to meet overflow drivers.
A7 - Flow Transfer	Assesses adjoining network capacity and distance. Red for no capacity or distant networks, Amber for limited capacity within 5-10km, Green for sufficient capacity within 5km.
A8 - Online Storage	Evaluates required storage volume, upgrade length, and urban constructability. Red for large storage needs or difficult construction, Amber for moderate storage needs, Green for manageable storage requirements and feasible construction.
A9 - Offline Storage	Considers storage volume, land availability, and downstream capacity. Red for large storage needs or no land, Amber for moderate needs with some constraints, Green for manageable storage with available land and capacity.

The environmental coarse screening incorporates objectives addressing both SEA and Habitats Directive AA considerations. This approach ensures early identification of potential environmental impacts and regulatory compliance, providing a foundation for more detailed assessments in later stages of the decision-making process.

Following the initial screening process, options receiving Green or Amber scores advance to Stage 4 for further evaluation. This subsequent phase involves a more comprehensive desktop assessment, utilising a Multi Criteria Assessment (MCA) approach to identify shortlisted preferred options. The MCA methodology allows for a systematic and objective evaluation of each option against a range of predetermined criteria.

Conversely, options scored as Red during the screening process are deemed non-viable and are consequently eliminated from further consideration at this stage.

For more detail of the coarse screening methodology employed in this assessment, please consult the Optioneering and Solutions Development Report. This detailed document, which provides in-depth insights into the screening process and its application, can be found in Appendix 6.

A summary of the WwTP options screened in or out at the Coarse Screening Phase for each strategy horizon are illustrated below in Figure 10-4 to Figure 10-7.

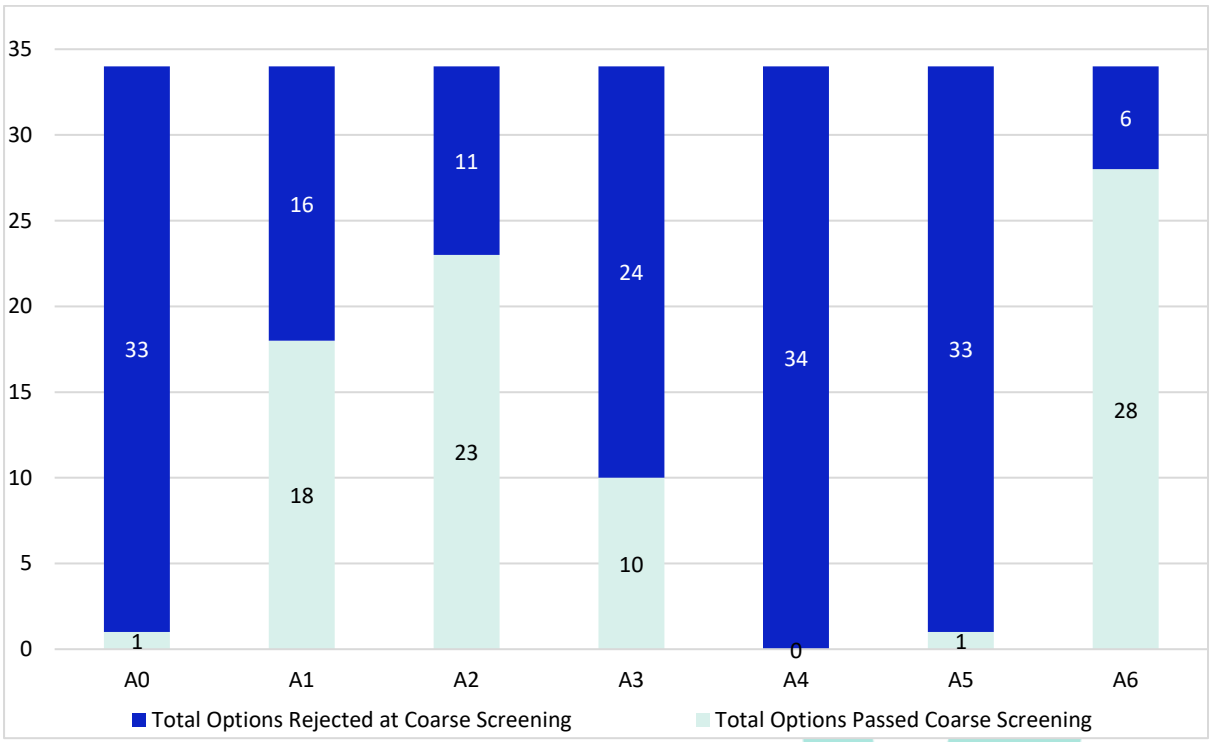

Figure 10-4: Coarse Screening Results for WwTP 2030

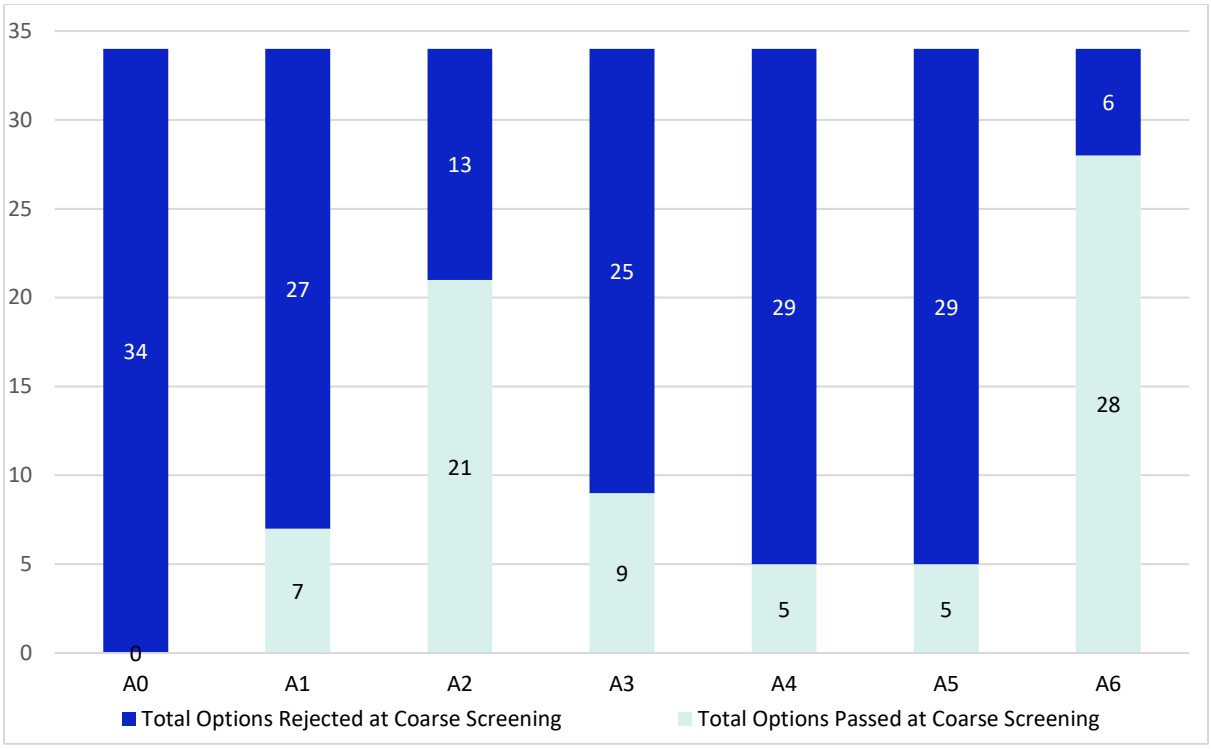

Figure 10-5: Coarse Screening Results for WwTP 2055

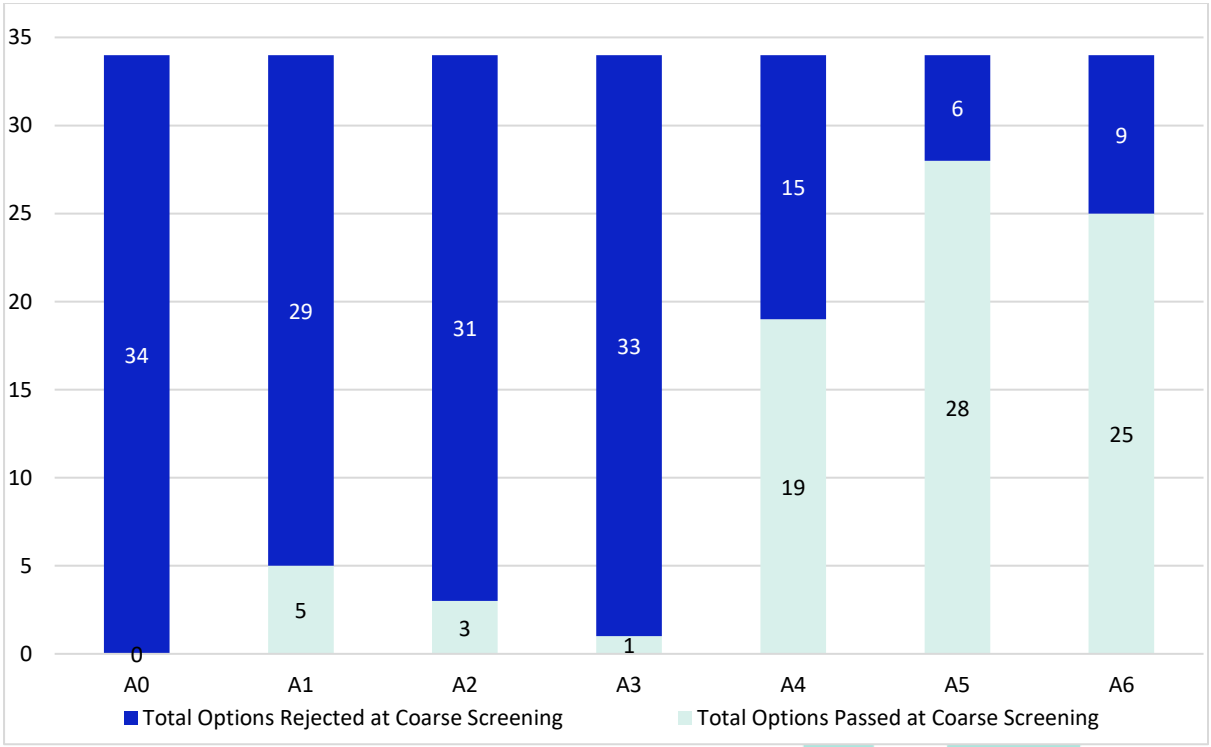

Figure 10-6: Coarse Screening Results for WwTP 2080

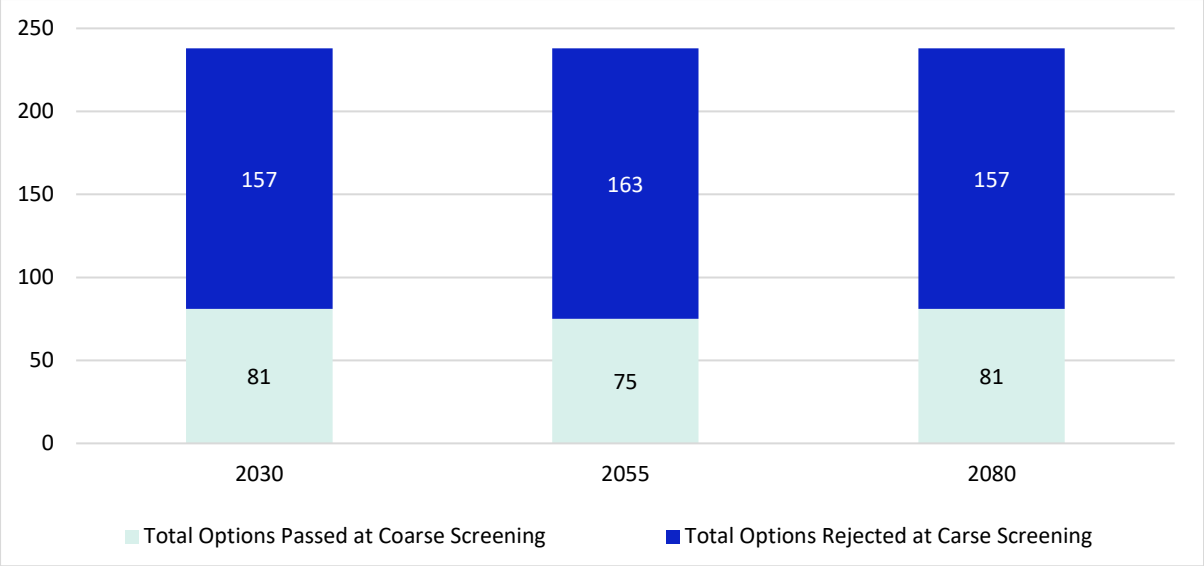

Figure 10-7: Coarse Screening Results for WwTP for all Strategy Horizons

The screening process evaluated 714 distinct options across three strategy horizons for the WwTPs. In total, 237 options successfully passed the coarse screening stage and were progressed to fine screening.

The assessment revealed a notable shift in viable options across different strategy horizons. In the 2030 scenario, short-term solutions, specifically Options A1 - Minimal Upgrade Process Optimisation and A2 - Plant Upgrade Reusing Existing Assets and Existing Discharge Location, passed the screening process. However, these same options proved inadequate when evaluated against the 2080 strategy horizon. This rejection primarily stemmed from concerns regarding the limited design life of existing assets and the necessity for a more sustainable, long-term approach.

Consequently, the 2080 scenario favoured Options A4 – New Treatment Process on Existing Site, A5 – New Greenfield Plant, and A6 – Wastewater Transfer, which demonstrated a higher pass rate in the coarse screening process. This trend underscores the critical importance of considering extended timeframes and the longevity of infrastructure investments in future planning. The analysis highlights the need for adaptive strategies that can meet both immediate needs and long-term sustainability goals in wastewater treatment infrastructure development.

By implementing this Coarse Screening Process, UÉ can more effectively identify and prioritise options that not only meet technical and environmental requirements but also align with broader strategic, economic, and social objectives. This approach significantly enhances the overall quality and robustness of the Optioneering process.

UÉ assessed **714 different Options** for WwTPs during Stage 3 - Coarse Screening. **237 Options** passed through Coarse Screening.

10.2.4. Stage 4 - Fine Screening

Fine Screening is a detailed desktop criteria assessment of options that have passed initial Coarse Screening. It is imperative to note, specific option design details were not established as

part of this optioneering process, therefore engineering judgement and project delivery experience was used to inform criteria that would typically be assessed in further detail during project development stage(s). It employs Multi Criteria Assessment (MCA) to evaluate potential benefits and impacts across key criteria. The MCA process:

- Allows simultaneous consideration of multiple issues
- Enables relative assessment of options
- Indicates comparative cost-effectiveness, environmental acceptability, promotability, resilience, and feasibility.

As discussed above, this approach requires more in-depth analysis of options against established criteria. Based on Uisce Éireann methodology (AMS-AMT-FM-038), the MCA has been tailored to:

- Provide a structured and transparent decision-making framework
- Minimise subjectivity in the evaluation process
- Incorporate both monetary and non-monetary objectives that may influence final decisions

The Fine Screening and MCA process ultimately aids in identifying the most suitable options for further consideration or implementation.

The MCA scoring has been refined to five key objectives that align with UÉ drivers and consideration, as shown below in Table 10-3. A tailored weighting system has been implemented, ensuring each option is evaluated fairly. The key objectives are further broken down into sub-objectives or criteria as shown in Table 10-4. More in depth details of these sub-criteria and how they are assessed can be found in the Optioneering and Solution Development Report in Appendix 6. This approach provides a more robust foundation for decision-making.

Table 10-3: MCA Criteria Scoring Objectives

Objectives	Description
Addressing the Need	How does the option meet the needs of the drivers identified within the strategy? Previously assessed as part of the Coarse Screening using a tiered approach: Stage 1 - Identifying the Need (Primary Need of Treatment & Network Capacity; Secondary Need of Environmental Discharge Standards)
Deliverability	Considering feasibility of proposed option, planning constraints and delivery aspects and alignment with UÉ objectives
Risk & Resilience	Certainty that the option will deliver long term outcome, resilience to future changes (e.g. change in circumstances, legislation or technology). Early identification of delivery risks of the option.
Customer and Stakeholder Support	What is the overall impact on customers (positive or negative) and how does the option support the community and reciprocate support for the option/Uisce Éireann.

Objectives	Description
Environmental & Sustainability	What are the overall environmental and sustainability benefits or disbenefits of the option? Considering a wide range of E&S factors such as water environment, biodiversity, GHG emissions, energy efficiency, climate resilience and circular economy.
Cost	Cost effectiveness of the option for the long term goals of the Strategy. Considers the whole life cost of the option to provide a more effective option appraisal.

Table 10-4: MCA Sub-Criteria

Objectives	Sub-Criteria	Fine Screening Considerations
Addressing the Need	Treatment Capacity	Uisce Éireann supports social and economic growth through the provision of wastewater services and is committed to optimising treatment and storage capacity to cater for planned growth in line with the National Planning Framework and subject to constraints.
	Network Capacity	Uisce Éireann supports social and economic growth through the provision of wastewater services and is committed to providing network capacity to cater for planned growth in line with the National Planning Framework and subject to constraints.
	Final Effluent Compliance	Compliance of the wastewater treatment process under the new requirements under recast UWWTD Regulations and Wastewater Discharge Authorisation Regulations is assessed.
Deliverability	Design Complexity, Ease of Implementation & Feasibility	*Design Complexity*: Does the proposed option require significant future studies (feasibility, site investigation, planning and infrastructure modification)? Is the proposed option a commonly installed/implemented solution? *Ease of Implementation*: Can the proposed option be implemented safely and feasibly without the requirement of complex construction activities and community/environmental interaction? *Feasibility*: Is the proposed option feasible to install - is there sufficient land availability and sites suitable to improve feasibility and implementation of the proposed option?
	Planning & Regulation	A measure of the satisfaction of relevant legislations and legal requirements in order to

		ensure success in the planning phase. Are there constraints around land ownership, type and availability? Consideration of: Zoning, Land Ownership, Land Contamination, Environmental Zoning and Constraints Proximity, Planning Policies and Objectives, Planning Consent Route, Planning History.
	Delivery Timeline & Alignment	Alignment: A measure of the synergy with UÉ's broader investment portfolio; and synergies between different assets and processes that UÉ use. Does the option utilise existing technologies and systems? Are there other synergies with other interventions, undertaken by Uisce Éireann for example sludge treatment and resource recovery initiatives.
Risk & Resilience	Flexibility & Scalability	Prioritise a flexible approach to enable UÉ to adapt its approach to project delivery to evolving needs. Is it possible to adapt/scale the option once delivered to meet any future changes? Does the option allow phased or incremental delivery of the intervention?
	Delivery Risk	There are benefits associated with a simple and safe approach to construction and operation, in order to ensure successful construction and delivery phases of projects. This criterion considers if there are construction uncertainties due to land stability or contamination risk, risk to disruption of other Uisce Éireann operations and the complexity of the solution.
Customer and Stakeholder Support	Impact on Customers	The collection, storage and treatment of wastewater have the potential to have a negative impact on customer well-being and experience. Does the option create any barriers in relation to proximity to populated areas, odour, noise and aesthetics? Are new community benefits provided?
	Community Support, Health and Wellbeing	The impacts of UÉ investments on local communities, as well as the public perception of the investment e.g., broad-based public endorsement, extensive stakeholder collaboration, or added community amenities).

		The health and other impacts of UÉ investments on local people including improving community health, safety, and wellbeing, addressing major risk factors or providing robust enhancements to local living conditions and public facilities including to Shellfish Waters or Bathing Waters.
Environmental & Sustainability	Water Environment	Prevent deterioration of the WFD status of waterbodies regarding quality and quantity due to discharges of wastewater from treatment plants. Contribute towards the "no deterioration" WFD condition target and restore and improve waterbody status to meet WFD and RBMP objectives. Consider if flood risk to property is increased due change to base river flows.
	Waterbody Impact (Existing and New)	
	Waterbody Flood Risk	
	Biodiversity	Consider how option protects and enhances terrestrial and aquatic biodiversity and habitat connectivity, with regard for Natura 2000 sites and nationally designated sites and protected species. Does option support Biodiversity Action Plan (BAP) commitments to achieving Biodiversity Net Gain minimising loss of habitat and optimising benefits.
	AA-Natura 2000 Sites	
	Aquatic Biodiversity	
	Terrestrial Biodiversity (BNG)	
	GHG Emissions	Considering all carbon aspects—construction materials (embodied), ongoing operations (energy, chemicals), and total lifecycle—does this option increase or decrease overall GHG emissions relative to today's baseline? Uisce Éireann's key sustainability targets: 51% absolute reduction in GHG emissions by 2030, Net Zero Carbon by 2040, 40% energy demand met by installed renewables by 2035.
	Embodied Carbon	
	Operational Carbon	
	Whole Life Carbon	
	Energy Efficiency	Uisce Éireann have a 50% energy efficiency improvement target in the delivery of services by 2030. This criterion was used to assess the energy efficiency of proposed option noting that this does not result in a net reduction of energy consumption but an improvement in the use of energy.
	Climate Resilience	Uisce Éireann should ensure a climate-resilient wastewater service by identifying and assessing climate risks and implementing physical and non-physical solutions ('adaptation solutions') that substantially reduce the most important physical climate risks that are material to wastewater services, assets and their surrounding areas.
	Circular Economy	Uisce Éireann has the opportunity to contribute to carbon neutrality and circular

		economy by optimising the re-use of materials. This includes energy recovery and nutrient recovery from wastewater treatment for use. This also includes the re-use of construction materials. Does the option promote circular economy principles (material reuse, energy recovery, nutrient recycling)? Is waste minimised? Does the option contribute to carbon neutrality?
Cost	CAPEX	Capital Expenditure
	OPEX	Operation Expenditure
	Whole Life Cost	Cost based on a 50-year life cycle; repair, maintenance and replacement cost and inflation not included

Each Option is subject to an objective assessment with uniform scoring criteria, based on best publicly available datasets. For each Option, each sub-criterion is scored using a seven-point Likert scale, from -3 to 3 with 3 representing a significant betterment and -3 representing a significant deterioration of the existing system. A final score can then be assigned to each option.

The screening process utilises MCA scores to evaluate options that have passed Coarse Screening, advancing them to the next stage of optioneering. While some constrained options may be eliminated during fine screening if found unsuitable, high-scoring options progress to final assessment and shortlisting.

The process aims to retain options unless they are clearly unfeasible, unsustainable, or unviable. Poor performance in specific sub-criteria may be addressed through design modifications or mitigation measures. Options with uncertain feasibility are carried forward with identified risks, ensuring a wide range of possibilities remains under consideration.

This approach balances thoroughness with efficiency, maintaining a broad spectrum of options while avoiding unnecessary development of unfeasible ones. By addressing uncertainties through design or mitigation where possible, the process ensures the best overall outcome is identified as the Recommended Approach. This methodology promotes evaluation while strategically eliminating clearly unsuitable options, ultimately supporting informed decision-making.

The screening process adheres to a conservative approach in option elimination. Only options that are clearly identified as unfeasible, unsustainable, or unviable are removed from consideration. This cautious methodology ensures that potentially valuable solutions are not prematurely discarded.

It is important to note that while this scoring system provides a valuable quantitative basis for comparison, it should be considered alongside qualitative assessments and expert judgment to ensure a holistic evaluation of each Option.

10.2.5. Stage 5 – Final Assessment of Short List

The fifth and final stage of the Optioneering and Solution Development process focuses on developing and assessing feasible options and approaches, considering long-term strategic plans and identifying potential option combinations within the CMA. Building on the outcomes of the MCA, optimisation of options for each agglomeration were considered to develop feasible approaches. The shortlisted feasible approaches are further evaluated within their broader strategic context, with a particular focus on deliverability, alignment with long-term objectives, and integration with existing infrastructure. This stage aims to produce Feasible Approaches, which may be incorporated into the overall Recommended Approach.

Recognising the significance of interactions and interdependencies among all individual catchments within the CMA, we have segmented the CMA into smaller, interconnected sub-catchments, each comprising of multiple WwTPs. The development of Feasible Approaches for each sub catchment is achieved through a strategic combination of individual options from each WwTP. Figure 10-8 below demonstrates an indicative example of how the Recommended Approach is determined. Note that this is for demonstration purposes only and does not signify the results of the optioneering process.

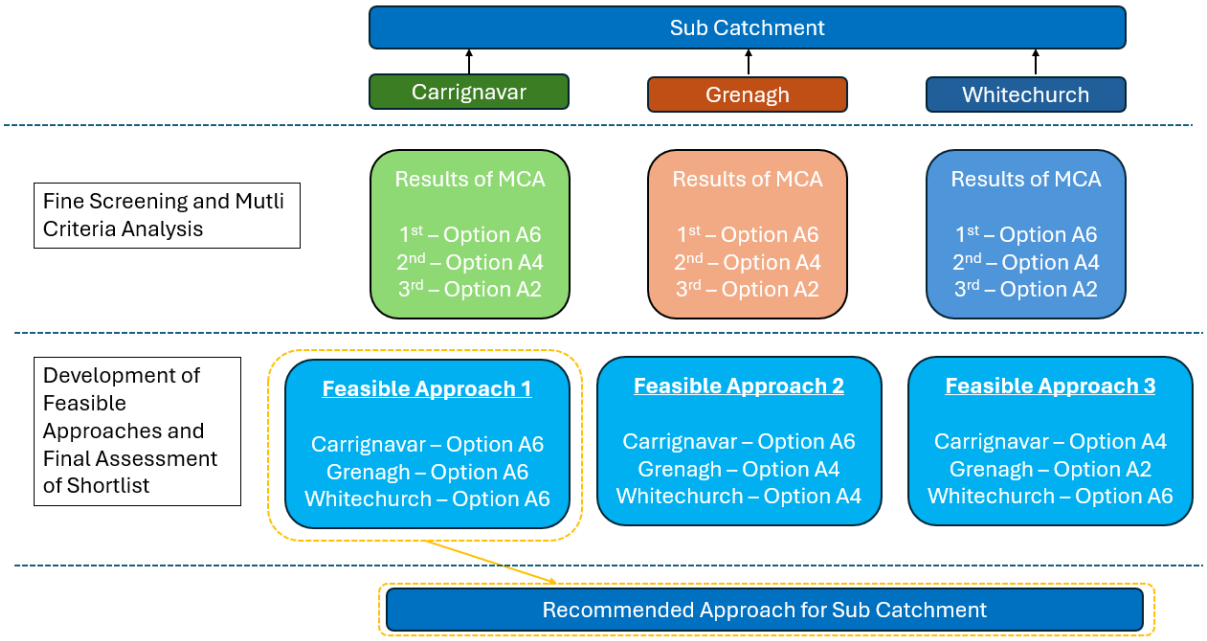

Figure 10-8: Indicative Development of Feasible Approaches and Recommended Approach

A combination of Feasible Approaches for each sub catchment will comprise the Recommended Approach for the CWS. As the process advances to the project level, each aspect undergoes further refinement and development, ensuring a nuanced evaluation of all potential solutions. This evaluation, incorporating construction and operational cost estimates alongside qualitative and quantitative environmental assessments, forms the basis for selecting the Recommended Approach.

The stage culminates in the identification of the **Recommended Approach** for the CWS, considered the most effective and sustainable path forward. The detailed outline of this

Recommended Approach, including its key components and implementation strategy, is presented in Sections 11 and 12 of this strategy.

The Screening process produced **211 Feasible Options** for the WwTPs in the CMA. These Options or a combination of these Options are then appraised to select our Recommended Approach (Solutions)

11. Results of the Optioneering

11.1. Feasible Options/Approaches

The following Section presents a summary of the outcomes derived from the Optioneering process detailed in Section 108. It is important to note that the MCA results for each WwTP are considered independently and in isolation. Recognising the significance of interactions and interdependencies among all individual agglomerations within the CMA, we have segmented the CMA into smaller, interconnected sub-catchments, each comprising of multiple WwTPs as shown in Figure 11-1 and Table 11-1 below. Settlements not currently served by a WwTP but are incorporated into the overall strategy are included here such as Monard, Ballymore and Leamlara. The results for each WwTP are independently evaluated and analysed, with the Feasible Approaches being determined by considering the entire sub-catchment, accounting for the dependencies and interactions among all WwTPs within that area.

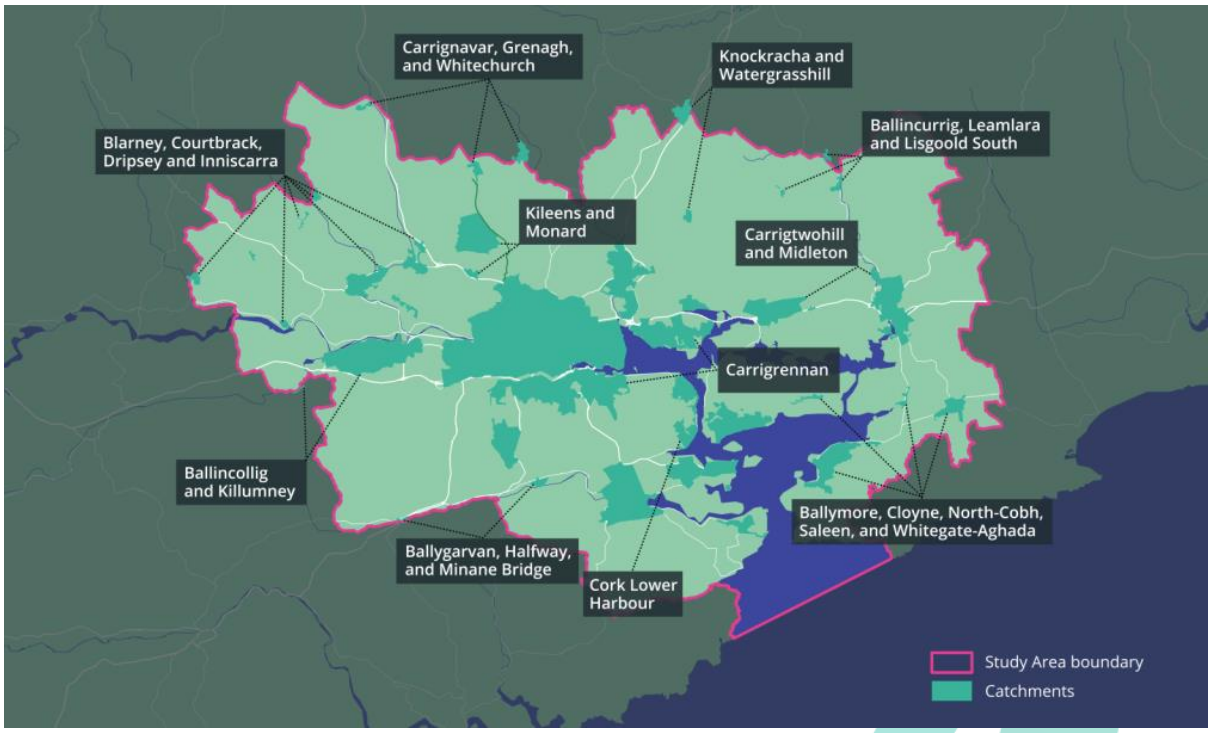

Figure 11-1: Sub Catchments within the CMA

Table 11-1: Sub Catchments within the CMA

Sub Catchment	Agglomerations
Sub Catchment 1 – Blarney, Courtbrack, Dripsey and Inniscarra	Blarney WwTP
	Courtbrack WwTP
	Dripsey WwTP
	Inniscarra WwTP
Sub Catchment 2 – Kileens and Monard	Kileens WwTP
	Monard

Sub Catchment	Agglomerations
Sub Catchment 3 – Carrignavar, Grenagh and Whitechurch	Carrignavar WwTP
	Grenagh WwTP
	Whitechurch WwTP
Sub Catchment 4 – Knockraha and Watergrasshill	Knockraha WwTP
	Watergrasshill WwTP
Sub Catchment 5 - Carrigrennan	Carrigrennan WwTP
Sub Catchment 6 – Ballygarvan, Halfway and Minane Bridge	Ballygarvan WwTP
	Halfway WwTP
	Minane Bridge (River Valley) WwTP
Sub Catchment 7 – Ballincollig and Killumney	Ballincollig WwTP
	Killumney WwTP
Sub Catchment 8 – Cork Lower Harbour	Cork Lower Harbour WwTP
Sub Catchment 9 – Carrigtwohill and Midleton	Carrigtwohill WwTP
	Midleton WwTP
Sub Catchment 10 – Ballymore, Cloyne, North Cobh, Saleen, and Whitegate-Aghada	Ballymore
	Cloyne WwTP
	North Cobh WwTP
	Saleen WwTP
	Whitegate – Aghada WwTP
Sub Catchment 11 – Ballincurrig, Leamlara and Lisgoold	Ballincurrig WwTP
	Leamlara
	Lisgoold South WwTP
	Lisgoold North WwTP

Following the optioneering phase, several Feasible Approaches have been identified for each sub-catchment. These Approaches incorporate combinations of the highest-scoring options derived from the MCA. Each potential Feasible Approach undergoes analysis and consideration, taking into account the broader context of the CWS. This approach ensures that the final Recommended Approach is not only considered favourable for the individual sub-catchment but also aligns with and supports the overarching objectives of the CWS. This approach ensures a holistic assessment of the CMA's wastewater management needs and opportunities.

As shown in Figure 11-2, following the optioneering process, 30 Feasible Approaches were developed to address issues at WwTPs across the 11 sub catchments and are summarised in Table 11-2 to Table 11-12 below.

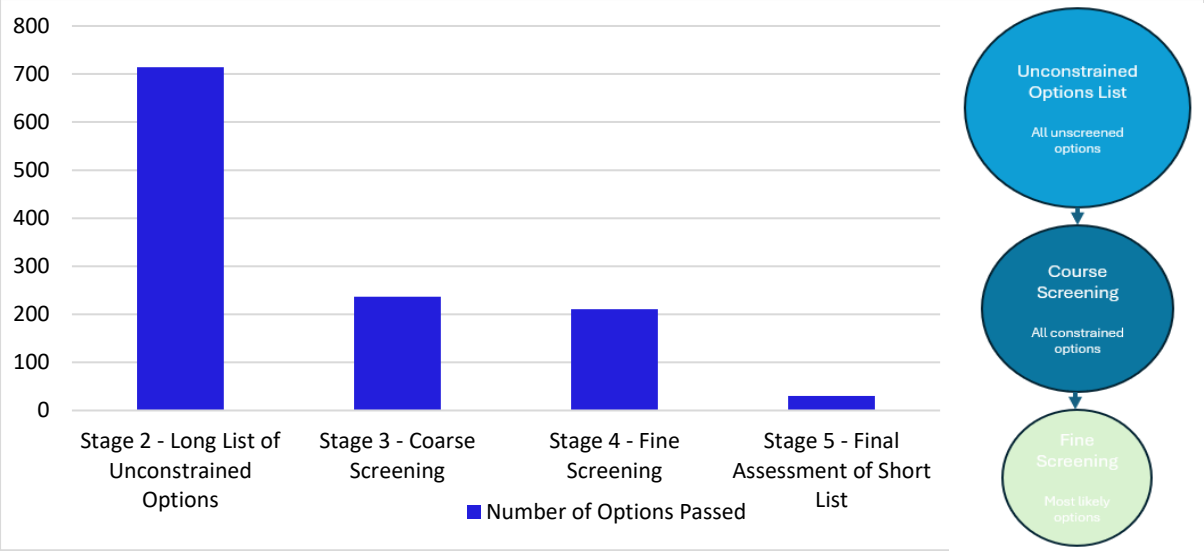

Figure 11-2: Summary of WwTP Optioneering Outputs

The Feasible Approaches developed resulting from the Optioneering Process for each sub catchment within the CMA are summarised in the tables below. For further details, please consult the Optioneering and Solutions Development Report in Appendix 6.

It's important to note that Feasible Approaches are considered at a strategy level, and the assessment of the approaches are desktop-based. Any Approaches progressed following the CWS will be considered in more detail at the project level and in accordance with the public spending code. If project-level assessments confirm the feasibility of the Recommended Approach, the process will move forward with detailed design, planning applications, and procurement processes as appropriate. This may include finalising technical specifications, preparing environmental impact statements, and engaging with contractors, while continuing stakeholder engagement and initiating necessary land acquisition processes.

In the event that project-level assessments determine a Recommended Approach is not feasible, consideration will be given to other feasible approaches outlined in the CWS. Changes to the Recommended Approach that only impact a single wastewater catchment area will not necessitate a variation to the overall strategy; instead, the change will be assessed at a project level. This approach allows for refinements to individual projects or closely related projects within a catchment area to be considered within their own environmental assessments, without systemic impacts on the wider CWS. In instances where a WwTP is proposed to receive wastewater transfers from another WwTP outside of its sub catchment, required upgrades are proposed as part of the Recommended Approach for the receiving WwTP.

Table 11-2: Feasible Approaches for Sub Catchment 1 (Blarney, Courtbrack, Dripsey and Inniscarra)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Blarney WwTP	• Optimise WwTP to bring to compliance with current ELVs.	• Upgrade WwTP by 2,000 PE. • Construct FE transfer to Carrigrennan WwTP via Ballyvolane PS	• Upgrade WwTP by 1,100 PE. • Construct FE Transfer to Carrigrennan WwTP via Ballyvolane PS
	Inniscarra WwTP	• Construct WW transfer to Blarney WwTP and associated WwPS. • Decommission WwTP	• Decommission WwTP. • Construct WW transfer to Blarney WwTP and associated WwPS.	• Decommission WwTP. • Construct WW transfer to Dripsey WwTP and associated WwPS.
	Dripsey WwTP	• Optimise WwTP to bring to compliance with current ELVs	• Optimise WwTP to bring to compliance with current ELVs	• Upgrade WwTP by additional 700 PE utilising existing discharge
	Courtbrack WwTP	• Upgrade WwTP by additional 600 PE utilising existing discharge	• Decommission WwTP • Construct WW transfer to Blarney WwTP and associated WwPS.	• Upgrade WwTP by additional 600 PE utilising existing discharge
2055	Blarney WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct new wastewater transfer pipe to Carrigrennan WwTP via new intermediary WwPS and existing Ballyvolane PS • Decommission WwTP.	• Upgrade WwTP by additional 10,500 PE	• Upgrade WwTP by additional 10,000 PE
	Inniscarra WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
	Dripsey WwTP	• Upgrade WwTP by an additional 250 PE utilising existing discharge	• Construct WW transfer to Blarney WwTP via Inniscarra and associated WwPS. • Decommission WwTP.	• Continue to operate WwTP
	Courtbrack WwTP	• Continue to operate WwTP	• Continue to operate WwPS	• Continue to operate WwTP
2080	Blarney WwTP	• Continue to operate WwPS	• Capital replacement of 13,000 PE of WwTP with further upgrade of 4,000 PE	• Capital replacement of 13,000 PE of WwTP with further upgrade of 3,400 PE
	Inniscarra WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS
	Dripsey WwTP	• Continue to operate WwTP • Capital replacement of 600PE of WwTP	• Continue to operate WwPS	• Continue to operate WwTP
	Courtbrack WwTP	• Continue to operate WwTP • Capital replacement of 250 PE of WwTP	• Continue to operate WwPS	• Capital replacement of 250 PE of WwTP

Table 11-3: Feasible Approaches Solutions for Sub Catchment 2 (Kileens and Monard)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Kileens WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct WW transfer to Cork City Network at Northpoint Business Park • Decommission WwTP.	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct WW transfer to proposed Blarney transfer line. • Decommission WwTP.	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct WW transfer to Cork City Network at Northpoint Business Park • Decommission WwTP.

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
	Monard	• Construct a new Wastewater Transfer Pumping Station at Monard (WwPS) • Construct new wastewater transfer (Twin Main) • Construct new intermediate Wastewater Transfer Pumping Station (WwPS) between Blarney and Ballyvolane PS to take inflows from both Monard and Blarney • Construct new Wastewater Transfer (Twin Main)	• Construct a new Wastewater Transfer Pumping Station at Monard (WwPS) • Construct new wastewater transfer (Twin Main) • Construct new intermediate Wastewater Transfer Pumping Station (WwPS) between Blarney and Ballyvolane PS to take inflows from both Monard, Kileens and Blarney • Construct new Wastewater Transfer (Twin Main)	• Construct new WwTP (5,000PE). Construct FE transfer to Ballyvolane PS and associated PS.
2055	Kileens WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS
	Monard	• Continue to operate WwPS	• Upsize wastewater transfer	• Upgrade WwTP by 15,000PE
2080	Kileens WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS
	Monard	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwTP

Table 11-4: Feasible Approaches for Sub Catchment 3 (Carrignavar, Grenagh, and Whitechurch)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Carrignavar WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Constructed new wastewater transfer pipe from Carrignavar to Whitechurch WwTP • Decommission existing WwTP.	• 1,000 PE upgrade of existing WwTP. • Construct FE transfer to new discharge location, downstream on River Glashaboy with associated Pumping Station	• 1,000 PE upgrade of existing WwTP. • Construct FE transfer to new discharge location, downstream on River Glashaboy with associated Pumping Station
	Grenagh WwTP	• Optimise WwTP to bring to compliance with ELVs	• Optimise WwTP to bring to compliance with ELVs	• Optimise WwTP to bring to compliance with ELVs
	Whitechurch WwTP	• Continue to operate WwTP	• Continue to operate WwTP	• Continue to operate WwTP
2055	Carrignavar WwTP	• Continue to operate WwPS	• Continue to operate WwTP	• Continue to operate WwTP
	Grenagh WwTP	• Construct a new Wastewater Pumping Station (WwPS) • Constructed new wastewater transfer pipe from Grenagh to Whitechurch WWTP • Decommission existing WwTP.	• Construct a new Wastewater Pumping Station (WwPS) • Constructed new wastewater transfer pipe from Grenagh to Whitechurch WWTP • Decommission existing WwTP.	• 250 PE upgrade of existing WwTP. • 1,200 PE WwTP capital replacement. • Construct FE transfer to new discharge location, downstream on River Martin with associated Pumping Station
	Whitechurch WwTP	• Decommission / convert WwTP. • Construct terminal WwPS • Utilise existing pipeline to Cork City network.	• Continue to operate WwTP	• Continue to operate WwTP
2080	Carrignavar WwTP	• Continue to operate WwPS	• 1,300 PE WwTP Capital replacement	• Capital replacement of WwTP

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
	Grenagh WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwTP
	Whitechurch WwTP	• Continue to operate WwPS	• Decommission / convert WwTP. • Construct terminal WwPS • Utilise existing pipeline to Cork City network.	• Decommission / convert WwTP. • Construct terminal WwPS • Utilise existing pipeline to Cork City network.

Table 11-5: Feasible Approaches for Sub Catchment 4 (Knockraha and Watergrasshill)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Knockraha WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe to from Knockraha to existing Glanmire Bridge PS • Decommission existing WwTP.	• 500PE upgrade of existing WwTP • Construct FE transfer to Glanmire Bridge PS and associated Pumping Station	• 500PE upgrade of existing WwTP • Construct FE transfer to Butlerstown River and associated Pumping Station via new Watergrasshill FE Pumping Station
	Watergrasshill WwTP	• Optimise WwTP to bring to compliance with current ELVs	• Optimise WwTP to bring to compliance with current ELVs	• Construct Final Effluent Transfer to Butlerstown River and associated Pumping Station
2055	Knockraha WwTP	• Continue to Operate WwPS	• Continue to Operate WwTP	• Continue to Operate WwTP
	Watergrasshill WwTP	• Construct a new Wastewater Pumping Station (WwPS) • Construct a new wastewater transfer pipe from	• Construct New 3,900PE Brownfield WwTP • Construct FE transfer to Glanmire Bridge PS (10km via roads) and associated Pumping Station	• Construct New 3,900PE WwTP

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
		Watergrasshill to existing Glanmire Bridge PS • Decommission existing WwTP		
2080	Knockraha WwTP	• Continue to Operate WwPS	• 100 PE upgrade of existing WwTP. • 350 PE WwTP capital replacement.	• 100 PE upgrade of existing WwTP. • 350 PE WwTP capital replacement.
	Watergrasshill WwTP	• Continue to Operate WwPS	• Continue to Operate WwTP	• Continue to Operate WwTP

Table 11-6: Feasible Approaches for Sub Catchment 5 (Carrigrennan)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Carrigrennan WwTP	• Upgrade existing WwTP to provide tertiary treatment to bring to compliance with current ELVs and to meet Cork City growth demand and wastewater transfers from Sub Catchments 1, 2, 3 and 4	• Upgrade existing WwTP to provide tertiary treatment to bring to compliance with current ELVs and to meet Cork City growth demand and wastewater transfers from Sub Catchments 1, 2, 3 and 4	• Upgrade existing WwTP to provide tertiary treatment to bring to compliance with current ELVs and to meet Cork City growth demand and wastewater transfers from Sub Catchments 1, 2, 3 and 4
2055	Carrigrennan WwTP	• 104,000PE upgrade of existing tertiary WwTP, • Construct new 558,000PE quaternary treatment plant • Upsize existing final effluent discharge outfall	• 91,000PE upgrade of existing tertiary WwTP. • Construct new 532,500PE quaternary treatment plant • Upsize existing final effluent discharge outfall	• Divert south Cork City to Cork Lower Harbour via the Southern Orbital Sewer. • 26,750PE upgrade of existing tertiary WwTP. • Construct new 435,000PE quaternary treatment plant • Upsize existing final effluent discharge outfall

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2080	Carrigrennan WwTP	• Increase treatment capacity by 41,000PE	• Increase treatment capacity by 40,000PE	• Continue to operate WwTP

Table 11-7: Feasible Approaches for Sub Catchment 6 (Ballygarvan, Halfway, and River Valley)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Ballygarvan WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via existing Carrigaline PS • Decommission existing WwTP.	• 500 PE upgrade of existing WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via existing Carrigaline PS • Decommission existing WwTP.
	Halfway WwTP	• Optimise WwTP to bring to compliance with current ELVs	• Optimise WwTP to bring to compliance with current ELVs	• Optimise WwTP to bring to compliance with current ELVs
	Minane Bridge WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via existing Carrigaline PS • Decommission existing WwTP.	• 300PE upgrade of existing WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via existing Carrigaline PS • Decommission existing WwTP.
2055	Ballygarvan WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS
	Halfway WwTP	• Continue to operate WwTP	• Continue to operate WwTP	• Continue to operate WwTP

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
	Minane Bridge WwTP	• Continue to operate WwPS	• Continue to operate WwTP	• Continue to operate WwPS
2080	Ballygarvan WwTP	• Continue to operate WwPS	• 750PE upgrade of existing WwTP. • 634PE WwTP capital replacement	• Continue to operate WwPS
	Halfway WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via Ballygarvan WwPS • Decommission WwTP.	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via Ballygarvan WwPS • Decommission WwTP.	• 500PE upgrade of existing WwTP. • 500PE WwTP capital replacement
	Minane Bridge WwTP	• Continue to operate WwPS	• 300PE WwTP capital replacement	• Continue to operate WwPS

Table 11-8: Feasible Approaches for Sub Catchment 7 (Ballincollig & Killumney)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Ballincollig WwTP	• Construct a New Greenfield WwTP (including tertiary treatment) with design capacity of 64,000 PE north of Lee River. • Construct transfer pipeline from existing Ballincollig site to new site across the Lee River • Construct a new outfall discharge from new WWTP to Lee River	• 10,000PE upgrade of existing WwTP.	• No viable option

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
	Killumney WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Killumney to Ballincollig WwTP • Decommission existing WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Killumney to Ballincollig WwTP • Decommission existing WwTP	
2055	Ballincollig WwTP	• Decommission Existing WwTP when New Plant Constructed. • Upgrade WWTP to increase existing design capacity by 8,000 PE to a new design capacity of 72,000 PE • Construct a new 72,000 PE quaternary treatment plant at the new greenfield WwTP	• 19,000PE upgrade of existing WwTP. • 33,000PE WwTP capital replacement. • Construct FE transfer to Cork Lower Harbour WwTP (for quaternary treatment) and associated WwPS	
	Killumney WwTP	• Continue to operate WwPS	• Continue to operate WwPS	
2080	Ballincollig WwTP	• Continue to operate WwTP	• Continue to operate WwTP	
	Killumney WwTP	• Continue to operate WwPS	• Continue to operate WwPS	

Table 11-9: Feasible Approaches for Sub Catchment 8 (Cork Lower Harbour)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Cork Lower Harbour WwTP	• Upgrade existing WwTP to increase existing design capacity by 5,000 PE and to	• Upgrade existing WwTP to increase existing design capacity by 5,000 PE and to	• Upgrade existing WwTP to increase existing design capacity by 5,000 PE and to

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
		cater for loads from Sub-Catchments 6 and 10. • Upgrade WwTP to provide tertiary treatment to bring plant to compliance with current ELVs for a 70,000 PE design capacity	cater for loads from Sub-Catchments 6 and 10. • Upgrade WwTP to provide tertiary treatment to bring plant to compliance with current ELVs for a 70,000 PE design capacity	cater for loads from Sub-Catchments 6 and 10. • Upgrade WwTP to provide tertiary treatment to bring plant to compliance with current ELVs for a 70,000 PE design capacity
2055	Cork Lower Harbour WwTP	• Upgrade existing WwTP to increase existing design capacity by 15,000 PE and to cater for loads from Sub-Catchments 6 and 10.	• Upgrade existing WwTP to increase existing design capacity by 15,000 PE and to cater for loads from Sub-Catchments 6 and 10. • Construct new marine outfall	• 75,000PE upgrade of existing WwTP • Construct new 235,000PE quaternary WwTP (including Ballincollig WwTP FE treatment [see Table 11-8] • Construct new marine outfall to discharge Cork Lower Harbour WwTP and Ballincollig FE
2080	Cork Lower Harbour WwTP	• Upgrade existing WwTP to increase existing design capacity by 13,000 PE and to cater for loads from Sub-Catchments 6 and 10. • 65,000PE WwTP capital replacement	• Upgrade existing WwTP to increase existing design capacity by 13,000 PE and to cater for loads from Sub-Catchments 6 and 10. • 65,000PE WwTP capital replacement	• Upgrade existing WWTP to increase existing design capacity by 18,000 PE and to cater for loads from Sub-Catchments 6 and 10 and South Cork City WW diversion. • 65,000PE WwTP capital replacement

Table 11-10: Feasible Approaches for Sub Catchment 9 (Carrigtwohill and Midleton)

Strategy Horizon	Catchment	Feasible Approach 1
2030	Carrigtwohill WwTP	• Optimise WwTP to bring to compliance with current ELVs

Strategy Horizon	Catchment	Feasible Approach 1
	Midleton WwTP	• 7,500 PE upgrade of existing WwTP. • Continue to operate WwPS to transfer 5,100 PE to Carrigtwohill WwTP.
2055	Carrigtwohill WwTP	• 15,000 PE upgrade of existing WwTP. • Extend the existing 710mm outfall from current location to further south into Lough Mahon
	Midleton WwTP	• Continue to operate WwTP • Continue to operate WwPS to transfer 11,600 PE to Carrigtwohill WwTP
2080	Carrigtwohill WwTP	• 2,000 PE upgrade of existing WwTP. • Capital replacement of 30,000 PE of WwTP.
	Midleton WwTP	• Capital replacement of 22,500 PE of WwTP • Continue to operate WwPS to transfer 16,500 PE to Carrigtwohill WwTP

Table 11-11: Feasible Approaches for Sub Catchment 10 (Ballymore, Cloyne, Saleen, and Whitegate-Aghada)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Cloyne WwTP	• 3,600PE upgrade of existing WwTP. • Construct new FE transfer and outfall to Rostellan and associated Pumping Station.	• Construct wastewater transfer to Whitegate-Aghada WwTP and associated WwPS • Decommission WwTP	• 3,600PE upgrade of existing WwTP. • Construct new FE transfer and outfall to Rostellan and associated Pumping Station.
	Saleen WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Saleen to Cloyne WWTP • Decommission existing WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe and transfer to Whitegate-Aghada WwTP • Decommission existing WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Saleen to Cloyne WWTP • Decommission existing WwTP

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
	Ballymore	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Ballymore to existing Cobh collection network	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Ballymore to existing Cobh collection network	• Construct new 500 PE WwTP and new FE discharge to Cork Harbour
	Whitegate - Aghada WwTP	• 1,500 PE upgrade of existing WwTP	• 5,000 PE upgrade of existing WwTP	• 1,500 PE upgrade of existing WwTP
	North Cobh WwTP	• Continue to operate WwTP	• Continue to operate WwTP	• Continue to operate WwTP
2055	Cloyne WwTP	• Continue to operate WwTP	• Continue to operate WwPS	• Continue to operate WwTP
	Saleen WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS
	Ballymore	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwTP
	Whitegate - Aghada WwTP	• Continue to operate WwTP	• 2,500 PE upgrade of existing WwTP	• Continue to operate WwTP
	North Cobh WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from North Cobh to existing Cobh collection network which discharges to Cork Lower Harbour WWTP • Decommission WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from North Cobh to existing Cobh collection network which discharges to Cork Lower Harbour WWTP • Decommission WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from North Cobh to existing Cobh collection network which discharges to Cork Lower Harbour WWTP • Decommission WwTP
2080	Cloyne WwTP	• 500 PE upgrade of existing WwTP	• Continue to operate WwPS	• 500 PE upgrade of existing WwTP

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
		• 5,000PE WwTP capital replacement		• 5,000PE WwTP capital replacement
	Saleen WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS
	Ballymore	• Continue to operate WwPS	• Continue to operate WwPS	• 50 PE upgrade of existing WwTP • 500PE WwTP capital replacement
	Whitegate - Aghada WwTP	• 500 PE upgrade of existing WwTP • 4,000PE WwTP capital replacement	• 7,500PE WwTP capital replacement	• 500 PE upgrade of existing WwTP • 4,000PE WwTP capital replacement
	North Cobh WwTP	• Continue to operate WwPS	• Continue to operate WwPS	• Continue to operate WwPS

Table 11-12: Feasible Approaches for Sub Catchment 11 (Ballincurrig, Leamlara and Lisgoold)

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
2030	Ballincurrig WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Ballincurrig to Lisgoold South WWTP • Decommission existing WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Ballincurrig to Lisgoold South WWTP • Decommission existing WwTP	• No viable option
	Leamlara	• Construct a new Wastewater Transfer Pumping Station (WwPS)	• Construct new WwTP (950 PE) at Leamlara. • Construct a final effluent transfer to Owenacurra River	

Strategy Horizon	Catchment	Feasible Approach 1	Feasible Approach 2	Feasible Approach 3
		• Construct a new wastewater transfer pipe from Leamlara to Lisgoold South WWTP	and associated Pumping Station	
	Lisgoold South WwTP	• 1,700PE upgrade of existing WwTP	• Continue to operate WwTP	
	Lisgoold North WwTP	• Construct a new gravity sewer from Lisgoold North WwTP to Lisgoold South WwTP • Decommission existing Lisgoold North WWTP	• Construct a new gravity sewer from Lisgoold North WwTP to Lisgoold South WwTP • Decommission existing Lisgoold North WWTP	
2055	Ballincurrig WwTP	• Continue to operate WwPS	• Continue to operate WwTP	
	Leamlara	• Continue to operate WwPS	• Continue to operate WwTP	
	Lisgoold South WwTP	• Continue to operate WwTP	• Continue to operate WwTP	
2080	Ballincurrig WwTP	• Continue to operate WwPS	• Continue to operate WwPS	
	Leamlara	• Continue to operate WwPS	• Continue to operate WwTP	
	Lisgoold South WwTP	• 200 PE upgrade of existing WwTP • 2,200 PE WwTP capital replacement	• 1,500PE WwTP capital replacement	

In addition to the Feasible Approaches for the WwTPs in each sub-catchment mentioned earlier, the development of Feasible Approaches for the region also considered potential wastewater network interventions across the CMA. These interventions are designed to mitigate the volume and frequency of discharges from SWOs and reduce out-of-sewer flooding within the study area. The evaluation of a network intervention approach has been conducted considering each catchments characteristics, drawing upon previous studies, network modelling results, and the collective expertise of CWS technical specialists and relevant stakeholders. The proposed network intervention for the wastewater network within the CMA is common amongst the Feasible Approaches and is summarised in Table 11-13 overleaf. Further details on the Feasible Approach developed for the wastewater network, including details on specific WwPS and storm tanks referenced are included in Appendix 6 Optioneering and Solutions Development Report and Appendix 4 Network Modelling Report.

Table 11-13: Proposed Interventions for the Wastewater Network

Agglomeration	Network Interventions
Blarney	**Gothic Bridge WwPS**: Proposed storage upgrade be initiated in 2030 strategy horizon. **Kerry Pike WwPS**: Proposed storage upgrade be initiated in 2030 strategy horizon. **Cloghroe WwPS**: Proposed storage upgrade be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment**: Proposed upsizing of approx. 6km of existing sewer system to provide additional network capacity be initiated in 2030 strategy horizon. **Network Infiltration Reduction**: Proposed 70% reduction of ground infiltration within the upstream network to provide additional capacity be initiated in 2030 strategy horizon. **Blarney WwTP**: Proposed storage and FFT upgrade be initiated in 2030 strategy horizon. **Blarney Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP be initiated in 2055 strategy horizon via Ballyvolane WwPS. This would require the construction of a new WwPS and rising main (approx. 26 km) with an upgraded PFF and storage facility. This would also include a further storage facility upgrade be initiated in 2080 strategy horizon as well as the decommission of the existing Blarney WwTP.
Courtbrack	**Courtbrack WwTP:** Proposed new storm storage with a return pump to be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 200m of existing sewer system and proposed approx. 1 km of new sewer lines be initiated in 2030 strategy horizon to increase network capacity. **Online Storage Across Catchment:** Proposed online storage be initiated in 2030 strategy horizon. **CK-RD Development WwPS:** Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Dripsey	**Dripsey WWTP:** Proposed storm storage upgrades be initiated in 2030 strategy horizon and a further storage upgrade and inlet screening upgrade be initiated in 2055 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 200 m of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity.
Inniscarra	**Inniscarra Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP be initiated in 2030 strategy horizon via Blarney and thereafter Ballyvolane WwPS. This would require the construction of a new WwPS and rising main (approx. 6 km). This would also include a proposed storage facility upgrade and the decommission of the existing Inniscarra Waterworks WwTP.

Agglomeration	Network Interventions
	Environment Building WwPS: Proposed storage upgrade and overflow decommission be initiated in 2030 strategy horizon. **Online Storage Across Catchment:** Proposed online storage be initiated in 2030 strategy horizon.
Killeens	**Killeens WwPS:** No further proposed interventions beyond ongoing project which includes the decommission of the existing WwTP and construction of new storage facility and rising main (approx. 10 km) pumped flow transfer to Cork City be initiated in 2030 strategy horizon. **Rathpeacon WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Carrig Rua WwPS:** Proposed WwPS decommission be initiated in 2030 strategy horizon.
Monard	**Monard Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP to be initiated in the 2030 horizon via Ballyvolane WwPS. This would require the construction of a new WwPS and rising main (approx. 3 km). This would also include a new proposed storage facility and two further PFF upgrades by 2055 and 2080.
Carrignavar	**Carrignavar Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP be initiated in 2030 strategy horizon via Whitechurch. This would require the construction of a new WwPS and rising main (approx. 4 km). This would also include a new proposed storage facility and the decommission of the existing Carrignavar WwTP. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 1 km of the existing sewer system be initiated in 2030 strategy horizon.
Grenagh	**Grenagh WwTP:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Grenagh Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP be initiated in 2055 strategy horizon via Whitechurch. This would require the construction of a new WwPS and rising main (approx. 9 km). This would also include the decommission of the existing Grenagh WwTP. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 3 km of the existing sewer system and proposed approx. 1 km of new sewer lines be initiated in 2030 strategy horizon to increase the network's capacity. **Grenagh_X-01 Development WwPS:** Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Knockraha	**Knockraha Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP be initiated in 2030 strategy horizon via Cork City network. This would require the construction of a new WwPS and rising main (approx. 7 km). This would also include a new proposed storage facility and the decommission of the existing Knockraha WwTP.

Agglomeration	Network Interventions
	Glenmore WwPS: Proposed storage and PFF upgrades be initiated in 2030 strategy horizon.
Watergrasshill	**Watergrasshill WwTP:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Watergrasshill Flow Transfer:** Proposed flow transfer to Carrigrennan WwTP via Cork City network be initiated in 2055 strategy horizon. This would require the construction of a new WwPS and rising main (approx. 10 km). This would also include the decommission of the existing Watergrasshill WwTP. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 300 m of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity. **The Orchard WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Church View WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Storm area separation:** Proposed reduction of road and hard standing area within foul/combined network be initiated in 2030 strategy horizon to provide additional capacity.
Cork City	**Ballyvolane WwPS:** Proposed storage upgrade and FFT upgrade to meet 3DWF be initiated in 2030 strategy horizon, with further PFF and storage upgrades be initiated in 2055 strategy horizon and another PFF upgrade be initiated in 2080 strategy horizon. **Atlantic Pond WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Grand Parade WwPS:** Proposed storage upgrade and reduction in tidal infiltration be initiated in 2030 strategy horizon, with a further PFF increase be initiated in 2055 strategy horizon. **Silversprings SWO:** Proposed hydro brake upgrade be initiated in 2030 strategy horizon. **Coal Quay WwPS:** Proposed storm diversion and reduction in tidal infiltration be initiated in 2030 strategy horizon. **Storm Separation Across Catchment:** Proposed storm separation of roof, road, hard standing and permeable area be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 7 km of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity. **Whitechurch:** Proposed WwTP decommission and existing rising main diversion to Ballyvolane WwPS be initiated in 2055 strategy horizon.

Agglomeration	Network Interventions
	Note: This list is not exhaustive. The upgrades mentioned are proposed as part of the Cork Wastewater Strategy study, in addition to the SWO and flooding interventions produced in the Cork Wastewater Infrastructure Solution report, which was part of the Drainage Area Plan stage 4 conducted between 2022 and 2023.
Ballygarvan	**Ballygarvan Flow Transfer:** Proposed flow transfer to Cork Lower Harbour WwTP be initiated in 2030 strategy horizon via Carrigaline. This would require the construction of a new WwPS and rising main (approx. 5 km). This would also include a proposed storage facility upgrade and the decommission of the existing Ballygarvan WwTP. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 3 km of the existing sewer system along with the addition of approx. 1 km of new sewer lines be initiated in 2030 strategy horizon to increase the network's capacity.
Halfway	**Halfway WwTP Storage Upgrade & Flow Transfer:** Proposed storage upgrade be initiated in 2055 and 2080 strategy horizons, proposed flow transfer to Cork Lower Harbour WwTP be initiated in 2080 strategy horizon via Ballygarvan and thereafter Carrigaline. This would require the construction of a new WwPS and rising main (approx. 8 km). This would also include the decommission of the existing Halfway WwTP. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 400 m of the existing sewer system be initiated in 2080 strategy horizon to increase the network's capacity.
Minane Bridge (River Valley)	**Minane Bridge Flow Transfer:** Proposed flow transfer to Cork Lower Harbour WwTP to be initiated in 2030 strategy horizon via Carrigaline. This would require the construction of a new WwPS and rising main (approx. 9 km). This would also include a proposed storage facility upgrade and the decommission of the existing Minane Bridge WwTP. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 36 m of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity. **T-01 Development WwPS:** Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network. **ME-RD Development WwPS:** Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Ballincollig	**R09 Development WwPS:** Proposed flow diversion downstream to the gravity network avoiding Maglin WwPS be initiated in 2030 strategy horizon to alleviate pressure. **Maglin WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon.

Agglomeration	Network Interventions
	Network upgrade to mitigate flooding: Proposed upgrade of approx. 1 km of existing sewer system be initiated in 2030 strategy horizon to provide additional network capacity. **Network Infiltration Reduction:** Proposed 50% reduction in network infiltration within the upstream network be initiated in 2030 strategy horizon to provide additional capacity. **Harrington Street:** Proposed new storage facility to mitigate flooding caused by existing hydraulic constraints and proposed new developments in the public car park near Harrington Street be initiated in 2030 strategy horizon. **Ballincollig WwTP**: Proposed storm tank storage upgrade.
Killumney	**Killumney Flow Transfer:** No further proposed interventions beyond ongoing project which includes the decommission of the existing WwTP and construction of new storage facility and rising main (approx. 5 km) pumped flow transfer to Ballincollig be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 4 km of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity.
Cork Lower Harbour	**Church Road WwPS:** Proposed PFF upgrade be initiated in 2030 strategy horizon. **Cork Road WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Town Parks (Attenuation Tank) WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **North Cobh WwTP:** Proposed WwTP decommission, flow diversion and proposed new WwPS with an approx. 2 km rising main to Cobh Village and a new storage arrangement be initiated in 2055 strategy horizon. **Network Infiltration Reduction:** Proposed new Flap Valves at Dock Cottages WwPS and Old Town Hall WwPS overflows be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of a total of approx. 4 km of existing sewer system be initiated in 2055 strategy horizon and in 2080 strategy horizon to provide additional network capacity. **Crosshaven 1 WwPS:** Proposed PFF upgrade be initiated in 2055 strategy horizon. **Crosshaven 2 WwPS (Car Park):** Proposed PFF upgrade be initiated in 2055 strategy horizon.
Carrigtwohill	**Network Upsize Main Route:** Proposed upgrade of approximately 300m of existing sewer system be initiated in 2030 strategy horizon to provide additional network capacity to resolve flooding issues caused by flows from new developments. **Old Cobh Road WwPS:** Proposed PFF and storage upgrade be initiated in 2030 strategy horizon.

Agglomeration	Network Interventions
	Carrigtwohill WwTP: Proposed FFT upgrade to be initiated in 2030 strategy horizon and propose a new extended outfall discharge of approx. 4 km from the plant be initiated in 2055 strategy horizon.
Midleton	**Ballick No.1 WwPS:** Proposed PFF reduction, proposed new bypass system to redirect flows to Waterrock PS via Middleton South PS, and proposed storage upgrade be initiated in 2030 strategy horizon. **Ballick No.2 WwPS:** Proposed PFF upgrade and storage upgrade be initiated in 2030 strategy horizon. **Abbeywood WwPS:** Proposed PFF upgrade be initiated in 2030 strategy horizon. **Drurys Avenue SWO:** Proposed decommission of spill pipe from the storm line to the foul line, and proposed upgrade of approx. 500m of foul network be initiated in 2030 strategy horizon to address flooding issues. **Riversfield SWO:** Proposed decommission of spill pipe from the storm line to the foul line, and proposed upgrade of approx. 100 m of foul network be initiated in 2030 strategy horizon to address flooding issues. **Dwyers Road WwPS:** Proposed PFF upgrade and storage upgrade. Proposed upgrade of approximately 500 m of existing network be initiated in 2055 strategy horizon to mitigate flooding issues. **Network Upgrades Across Catchment:** Proposed upgrade of approximately 2 km of existing network be initiated in 2080 strategy horizon to mitigate flooding issues.
Ballymore	**Ballymore Flow Transfer:** Proposed flow transfer to North Cobh be initiated in 2030 strategy horizon. This would require the construction of a new WwPS and rising main (approx. 5 km). This would also include a new proposed storage facility. **Network Upgrade Across Catchment:** Proposed upgrade of approximately 2 km of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity. **BM-RD Development WwPS:** Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Cloyne	**Cloyne WwTP:** Proposed storage upgrade with return pump. Additionally, proposed new extended outfall for the treatment works be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 2 km of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity. **Cois na Cruma WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon.

Agglomeration	Network Interventions
	CY-RAP-01 Development WwPS: Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Saleen	**Saleen Flow Transfer:** Proposed flow transfer to Cloyne WwTP be initiated in 2030 strategy horizon. This would require the construction of a new WwPS and rising main (approx. 5 km). This would also include a proposed storage facility upgrade and the decommission of the existing Saleen Septic Tank and a further storage upgrade be initiated in 2055 strategy horizon and two PFF upgrades by 2055 and 2080 respectively. **Network Upgrade Across Catchment:** An upgrade of approx. 3 km of the existing sewer system be initiated in 2030 strategy horizon is proposed to increase the network's capacity. **SN-RD Development WwPS:** Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Whitegate – Aghada	**Whitegate WwTP:** Proposed outfall flap valve upgrade be initiated in 2030 strategy horizon. **Lower Aghada WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Rostellan WwPS:** Proposed storage upgrade be initiated in 2030 strategy horizon. **Whitegate WwPS:** Proposed storage upgrade and outfall flap valve upgrade be initiated in 2030 strategy horizon with further storage upgrades required to be initiated by 2055 and 2080. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 7 km of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity.
Ballincurrig	**Ballincurrig WwPS:** No further proposed interventions be initiated in 2030 strategy horizon beyond ongoing planned project which includes the decommission of the existing septic tank and construction of new storage facility with overflow and rising main (approx. 1 km) pumped flow transfer to proposed new Lisgoold North network, discharging directly to Lisgoold South WwTP. By 2055, proposed PFF upgrade to meet 3DWF.
Leamlara	**Leamlara Flow Transfer:** Proposed flow transfer to Lisgoold South WwTP be initiated in 2030 strategy horizon. This would require the construction of a new WwPS and rising main (approx. 7 km). This would also include a proposed storage facility upgrade and two further PFF upgrades to be initiated within 2055 and 2080 strategy horizons. **Network Upgrade Across Catchment:** Proposed upgrade of approx. 200 m of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity.

Agglomeration	Network Interventions
	New storage at LL-RD Development WwPS: Proposed new storage and rising main at the location of the new development be initiated in 2030 strategy horizon to reduce the strain on existing network.
Lisgoold (North and South)	**Lisgoold South WwTP:** Proposed storm tank storage upgrade be initiated in 2030 strategy horizon. **Network Upgrade Across Catchment:** Proposed upgrade of approximately 800 m of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity.
Berrings	**Network Upgrade Across Catchment:** Proposed upgrade of approximately 1 km of the existing sewer system be initiated in 2030 strategy horizon to increase the network's capacity.
Coole East	**Coole East Septic Tank:** Proposed storage upgrade be initiated in 2080 strategy horizon.

11.2. Sustainability Considerations and Environmental Assessment

Environmental protection and restoration along with sustainability initiatives are of significant importance to UÉ and have been integrated into the development of Feasible Approaches throughout the optioneering process and the MCA.

As outlined in section 3.2.2, the development of the draft CWS has been informed at each stage through iterative assessment undertaken as part of the SEA and AA. This has included the steps outlined below.

SEA Scoping and AA screening were published for Consultation 1 alongside the CWS Issues Paper and responses from this consultation have informed the approach developed for CWS and the environmental assessment. All consultation comments and UÉ's actions and responses to them are included in Appendix 7. SEA objectives were finalised following Consultation 1 and incorporate UÉ and national sustainability aims.

UÉ recognise the goals of the CAP 2025 which aims to achieve a 51% reduction in greenhouse gas emissions by 2030 and net-zero emissions by 2050. Additionally, UÉ recognise the objectives of the recast UWWTD, which directs for treatment plants to become energy neutral and reduce their greenhouse gas emissions by 2045. As a key player in Ireland's efforts to meet these targets, UÉ understand that the outcomes of the CWS will significantly impact our performance in energy efficiency and sustainability. Uisce Éireann has set an ambitious target to achieve Net Zero greenhouse gas emissions in our Sustainability Framework. Consequently, sustainability considerations have been a focus throughout the process of determining a Recommended Approach for the CWS. All projects will be subject to Uisce Éireann Energy Efficient Design Standard.

As detailed in Section 10, the coarse screening assessment of the unconstrained options included a technical feasibility screening followed by an initial environmental assessment to identify options to avoid or requiring amendment to address potential significant environmental effects that might be difficult to mitigate. This stage also provided a basis for understanding options and focusing information collection for the next stage assessment.

The MCA conducted during the fine screening of options included an assessment and evaluation based on the SEA objectives covering environmental and sustainability criteria as well as criteria on community, health and wellbeing, land use and planning. Development of the relevant environmental and sustainability criteria included mapping the MCA criteria against the higher level tier1 WSSP objectives and strategic aims as well as the SEA objectives. Specific criteria were included to identify risk related to effects on European Sites SAC and SPAs (Natura 2000 sites). The environmental and sustainability criteria were applied in the MCA under the following headings:

- Water Environment
- Biodiversity
- Greenhouse Gas Emissions
- Energy Efficiency

- Climate Resilience
- Circular Economy

The MCA stage also included iteration and amendment to options, pipeline routes and discharge locations to address environmental and technical issues.

SEA and AA assessment was undertaken on all feasible options and option scoring undertaken for the MCA options including comparison with the counterfactual option (continuation of current situation). This assessment influenced the ranking of options and the decision to take forward for further overall and environmental assessment and consideration as option combinations for the Feasible Approaches. In addition, as part of the comparison of the Feasible Approaches, performance against the environmental and sustainability criteria were considered. This assessment influenced the decision to select Recommended Approaches.

As part of the SEA and AA Recommended Approaches were then subject to further assessment including consideration of in combination and cumulative effects both between CWS approaches and with other plans and programmes. Mitigation and enhancement measures were identified to address potential significant effects and to support meeting SEA Objectives and well as CWS objectives.

The assessments are set out in the SEA Environmental Report Appendix 1 and the NIS Appendix 2.

The assessments reflect the long-term operation benefit from network improvements including bringing SWOs into compliance combined with the improvements to the WwTPs. These improvements include the decommissioning of 9 WwTPs with freshwater river discharges with transfers to larger plants with coastal water body discharges. The discharges to the marine environment will all be treated to meet the requirements of the rUWWTD and include quaternary treatment at Carrigrennan. The marine environment will also benefit from the combination of river WwTP and the network improvements addressing SWOs and out of sewer flood risks. The assessments are based on water quality and network modelling taking account of climate change. There are also long-term benefits for communities adjacent to decommissioned WwTPs or upgraded WwTPs with potential to remove or address odour issues.

Overall, for the CWS as a whole, the SEA Environmental Report identified significant long-term benefits to the SEA Objectives for Water Environment, Biodiversity and Population Economy, Tourism and Recreation and Health and Wellbeing, and for environmental Climate Change Resilience. These results reflect the CWS proposals bringing all the relevant WwTP discharges into compliance to support receiving waters meeting their relevant WFD status objectives, where these are influenced by wastewater discharge and urban drainage. This has associated benefits for aquatic ecology and for community, recreational and economic uses of the water environment.

The effects in terms of SEA Objectives are mixed for some objectives. Possible adverse effects largely reflect potential for short term temporary impacts related to construction activity. These include greenhouse gas emissions, material assets and soils impacts and pollution risk for the water environment. Construction activities and traffic can also cause disruption and disturbance

for biodiversity, landscape, cultural heritage and communities, given the extent of transfer pipelines and network improvements required. These construction related impacts are, however, expected to be mitigated through application of the mitigation hierarchy which firstly aims to avoid effects, such as through siting and routing, before mitigation and compensatory measures are needed. The application of appropriate planning, consultation, good construction environmental management and biodiversity net gain approaches are expected to address these types of effects.

In relation to greenhouse gas emissions, energy use, material use and circular economy principles, consideration has been given to the implementation of sustainability initiatives such as the installation and use of renewable energy sources. This approach aligns with the requirements of the recast UWWTD, which aims to increase the proportion of energy reliance on renewable sources at WwTPs. The options under consideration encompass energy generation, resource recovery, and operational efficiency improvements, all of which are tailored to local conditions and infrastructure capabilities. It is important to note that these innovations have only been preliminarily considered at the strategy level. This approach will ensure an evaluation and optimal implementation of these sustainability measures. Possible initiatives are outlined below:

- Wind & Solar Energy
- Use of low energy intensity treatment solutions
- Process optimisation and smart monitoring
- Energy efficiency process equipment (e.g. VSD pumps, blowers etc)
- Chemical usage reduction and rationalization
- Biosolids resource recovery and use of biogas within CHP Systems

The SEA Environment Report and the NIS set out the general mitigation approaches required and specific mitigation or enhancement measures for the plan as a whole or for individual approaches.

The NIS concluded that, based on a plan-level assessment of the draft CWS, and with implementation of appropriate mitigation for protecting European sites, there will be no adverse effects on the integrity of any European site(s), either alone or in-combination with other plans or projects as a result of progressing Recommended Approaches within the draft CWS.

Detailed environmental assessments will be undertaken as required for each individual project as it progresses to implementation. This ensures that each specific project will be thoroughly evaluated for its environmental impact and feasibility before proceeding. All project proposals are screened for AA as part of Uisce Éireann's standard procedures.

12. Implementation of the Strategy

12.1. Recommended Approach

As discussed previously in this strategy, there are a total of 26 WwTP's across the CMA considered as part of this strategy. In Section 10 and Section 11 of this strategy, each individual agglomeration was assessed independently with consideration given to the interactions between the existing wastewater infrastructure/assets in the CMA. This was necessary and appropriate to make the Option development and assessment tasks manageable for both UÉ and the public/stakeholders during the consultation phase. One of the key benefits of developing the CWS is that it allows us to consider options to address the needs of each individual agglomeration, and then to further assess whether the outcomes can be improved by reviewing the options that can be applied across the study area.

Following our individual assessments of each WwTP, we identified Feasible Approaches for sub-catchments in which the individual WwTPs would interact and integrate with each other. This interaction necessitated the consideration of the sub-catchment as a whole, rather than treating each agglomeration in isolation. This holistic approach allows for a more comprehensive understanding of the interconnected nature of the wastewater systems within each sub-catchment and enables the development of more effective and efficient strategies for managing wastewater treatment across the broader area.

In Section 11 and the Optioneering and Solutions Development Report in Appendix 6, we conducted a review of the Feasible Approaches for each sub catchment. This process involved assessing all approaches to determine their compatibility with other sub catchments within the CMA. This Approach development process was conducted via a combination of workshops supported by a process of ongoing engagement and dialogue between the technical experts, including Engineers, Hydrologists and Hydrogeologists, Ecologists and Environmental Scientists working directly on the development of the Recommended Approach. The outcome of this was the identification of the **Recommended Approach** for the CWS. In this section 12 we will detail the Recommended Approach for the entire CMA and the proposals for implementing this strategy. The Recommended Approach identifies a timeline for initiation of projects by considering the individual catchment needs and any interactions with other agglomerations within the CMA. When a project is designated to be initiated by 2055, for example, it does not necessarily mean the project will commence in that year. Instead, it indicates that the necessary steps to initiate the project will be undertaken in the years between 2030 – 2055. Each recommendation set out in this Strategy will be considered in detail and prioritised based on need, feasibility, environmental requirements and available funding. Its inclusion in the Strategy does not guarantee that it will be progressed or delivered. Rather, it indicates that the recommendation merits further examination as part of Uisce Éireann's future planning and investment cycles, where decisions on implementation will be made in line with organisational priorities and regulatory obligations. The Recommended Approach for the CMA is presented in Table 12-1 and displayed in Figure 12-1 to Figure 12-11 overleaf and summarises the projects to be initiated within each strategy horizon for each agglomeration.

Table 12-1: Cork Wastewater Strategy Recommended Approach

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
Sub Catchment 1 – Blarney, Courtbrack, Dripsey and Inniscarra			
Blarney WwTP	• Optimise WwTP to bring to compliance with current ELVs • Utilise existing discharge	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct new wastewater transfer pipe to Carrigrennan WwTP via existing Ballyvolane PS • Decommission existing WwTP.	• Continue to operate WwPS
Inniscarra WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Constructed new wastewater transfer pipe to Blarney WwTP • Decommission existing WwTP	• Continue to operate WwPS	• Continue to operate WwPS
Dripsey WwTP	• Optimise WwTP to bring to compliance with current ELVs • Utilise existing discharge	• Upgrade WWTP to increase existing design capacity by 250 PE to a new design capacity of 850 PE	• Continue to operate WwTP • Capital replacement of 600PE of existing original capacity of WwTP
Courtbrack WwTP	• Upgrade WwTP to Increase existing design capacity by 600 PE to a new design capacity of 850 PE • Utilise existing discharge	• Continue to operate WwTP	• Continue to operate WwTP • Capital replacement of 250PE of existing original capacity of WwTP
Sub Catchment 2 – Kileens and Monard			
Kileens WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct new wastewater transfer pipe to Cork City Network at Northpoint Business Park • Decommission existing WwTP.	• Continue to operate WwPS	• Continue to operate WwPS

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
Monard	• Construct a new Wastewater Transfer Pumping Station at Monard (WwPS) • Construct new wastewater transfer (Twin Main) • Construct new intermediate Wastewater Transfer Pumping Station (WwPS) between Blarney and Ballyvolane PS to take inflows from both Monard and Blarney • Construct new Wastewater Transfer (Twin Main) to Carrigrennan WwTP via existing Ballyvolane PS	• Continue to operate WwPSs	• Continue to operate WwPSs
Sub Catchment 3 – Carrignavar, Grenagh and Whitechurch			
Carrignavar WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Constructed new wastewater transfer pipe from Carrignavar to Whitechurch WwTP • Decommission existing WwTP.	• Continue to operate WwPS	• Continue to operate WwPS
Grenagh WwTP	• Optimise WwTP to bring to compliance with current ELVs • Utilise existing discharge	• Construct a new Wastewater Pumping Station (WwPS) – sized to meet future demand • Construct a new wastewater transfer pipe from Grenagh to Whitechurch WwTP • Decommission existing WwTP.	• Continue to operate WwPS

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
Whitechurch WwTP	• Continue to operate existing WwTP and treated effluent main to Cork City Network	• Construct a terminal Wastewater Pumping Station (WwPS) – sized to meet demand from Grenagh, Carrignavar and Whitechurch • Utilitise existing treated effluent main to Cork City Network • Decommission / convert existing WwTP.	• Continue to operate WwPS
Sub Catchment 4 – Knockraha and Watergrasshill			
Knockraha WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe to from Knockraha to existing Glanmire Bridge PS • Decommission existing WwTP.	• Continue to Operate WwPS	• Continue to Operate WwPS
Watergrasshill WwTP	• Optimise WwTP to bring to compliance with current ELVs • Utilise existing discharge	• Construct a new Wastewater Pumping Station (WwPS) • Construct a new wastewater transfer pipe to from Watergrasshill to existing Glanmire Bridge PS • Decommission existing WwTP	• Continue to Operate WwPS
Sub Catchment 5 - Carrigrennan			
Carrigrennan WwTP	• Upgrade existing WwTP to provide tertiary treatment to bring to compliance with current ELVs and to meet Cork City growth demand and wastewater transfers from Sub Catchments 1, 2, 3 and 4 • Utilise existing discharge	• Continue to operate WwTP • Provide an 104,000 PE upgrade of the existing tertiary treatment works at WwTP, • Construct a new 558,000 PE quaternary treatment plant at the existing WwTP.	• Continue to operate WwTP • Upgrade WwTP to increase design capacity by 41,000 PE • Utilise existing discharge

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
		• Upsize existing final effluent discharge outfall	
Sub Catchment 6 – Ballygarvan, Halfway and Minane Bridge			
Ballygarvan WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via existing Carrigaline PS • Decommission existing WwTP.	• Continue to operate WwPS	• Continue to operate WwPS
Halfway WwTP	• Optimise WwTP to bring to compliance with current ELVs • Utilise existing discharge	• Continue to operate WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via Ballygarvan WwPS • Decommission WwTP.
Minane Bridge WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct wastewater transfer pipe to Cork Lower Harbour WwTP via existing Carrigaline PS • Decommission existing WwTP.	• Continue to operate WwPS	• Continue to operate WwPS
Sub Catchment 7 – Ballincollig and Killumney			
Ballincollig WwTP	• Construct a New Greenfield WwTP (including tertiary treatment) with design capacity of 64,000 PE north of Lee River.	• Decommission Existing WwTP when New Plant Constructed. • Upgrade WWTP to increase existing design capacity by 8,000 PE to a new design capacity of 72,000 PE	• Continue to operate WwTP

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
	• Construct transfer pipeline from existing Ballincollig site to new site across the Lee River • Construct a new outfall discharge from new WwTP to Lee River	• Construct a new 72,000 PE quaternary treatment plant at the new greenfield WwTP	
Killumney WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Killumney to Ballincollig WwTP • Decommission existing WwTP	• Continue to operate WwPS	• Continue to operate WwPS
Sub Catchment 8 – Cork Lower Harbour (Carrigaline, Cobh, Passage West)			
Cork Lower Harbour WwTP	• Upgrade existing WwTP to Increase existing design capacity by 5,000 PE to a new design capacity of 70,000 PE and to cater for loads from Sub-Catchments 6 and 10 • Upgrade WwTP to provide tertiary treatment to bring plant to compliance with current ELVs for a 70,000 PE design capacity • Utilise existing discharge	• Upgrade WwTP to Increase existing design capacity by 15,000 PE to a new design capacity of 85,000 PE and to cater for loads from Sub-Catchments 6 and 10 • Utilise existing discharge	• Upgrade WwTP to increase existing design capacity by 13,000 PE to a new design capacity of 98,000 PE and to cater for loads from Sub-Catchments 6 and 10 • Provide a 65,000 PE capital replacement of the original WwTP • Utilise existing discharge
Sub Catchment 9 – Carrigtwohill and Midleton			
Carrigtwohill WwTP	• Optimise existing WwTP to bring to compliance with current ELVs • Retain existing load transfer (5,100 PE) from Midleton • Utilise existing discharge	• Upgrade WwTP to increase existing design capacity by 15,000 PE to a new design capacity of 45,000 PE • Extend the existing outfall from current location to further south into Lough Mahon	• Upgrade WwTP to increase existing design capacity by 2,000 PE to a new design capacity of 47,000 PE • Provide a 30,000 PE capital replacement of the original WWTP

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
Midleton WwTP	• Upgrade existing WwTP to increase existing design capacity by 7,500 PE to a new design capacity of 22,500 PE • Utilise existing discharge • Continue to operate existing WwPS to transfer 5,100 PE from Midleton to Carrigtwohill WwTP.	• Continue to operate WwTP • Continue to operate existing WwPS to transfer 11,600 PE from Midleton to Carrigtwohill WwTP.	• Provide a 22,500 PE capital replacement of the original WWTP • Continue to operate existing WwPS to transfer 16,500 PE from Midleton to Carrigtwohill WwTP.
Sub Catchment 10 – Ballymore, Cloyne, North Cobh, Saleen, and Whitegate-Aghada			
Cloyne WwTP	• Upgrade existing WwTP to increase existing design capacity by 3,600 PE to a new design capacity of 5,000 PE • Construct a new treated wastewater pipe, pumping station and outfall from Cloyne WwTP to Rostellan.	• Continue to operate WwTP	• Upgrade existing WwTP to increase existing design capacity by 500 PE to a new design capacity of 5,500 PE • Provide a 5,000 PE capital replacement of the original WwTP
Saleen WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Saleen to Cloyne WwTP • Decommission existing WwTP	• Continue to operate WwPS	• Continue to operate WwPS
Ballymore	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Ballymore to existing Cobh collection network	• Continue to operate WwPS	• Continue to operate WwPS

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
Whitegate - Aghada WwTP	• Upgrade existing WwTP to increase existing design capacity by 1,500 PE to a new design capacity of 4,000 PE	• Continue to operate WwTP	• Upgrade existing WwTP to Increase existing design capacity by 500 PE to a new design capacity of 4,500 PE • Provide a 4,000 PE capital replacement of the original WWTP
North Cobh WwTP	• Continue to operate WwTP • Utilise existing discharge	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from North Cobh to existing Cobh collection network which discharges to Cork Lower Harbour WwTP • Decommission WwTP	• Continue to operate WwPS
Sub Catchment 11 – Ballincurrig, Leamlara and Lisgoold			
Ballincurrig WwTP	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Ballincurrig to Lisgoold South WwTP • Decommission existing WwTP	• Continue to operate WwPS	• Continue to operate WwPS
Leamlara	• Construct a new Wastewater Transfer Pumping Station (WwPS) • Construct a new wastewater transfer pipe from Leamlara to Lisgoold South WWTP	• Continue to operate WwPS	• Continue to operate WwPS
Lisgoold South WwTP	• Construct a new gravity sewer from Lisgoold North WwTP to Lisgoold South WwTP	• Continue to operate WwTP	• Upgrade existing WwTP to increase existing design capacity by 200 PE to a new design capacity of 2,400 PE

Catchment	2030 Recommended Approach	2055 Recommended Approach	2080 Recommended Approach
	• Decommission existing Lisgoold North WwTP • Upgrade existing Lisgoold South WwTP to Increase existing design capacity by 1,700 PE to a new design capacity of 2,200 PE		• 2,200 capacity WwTP capital replacement

Figure 12-1: Recommended Approach for Sub Catchment 1 (Blarney, Courtbrack, Dripsey and Inniscarra)

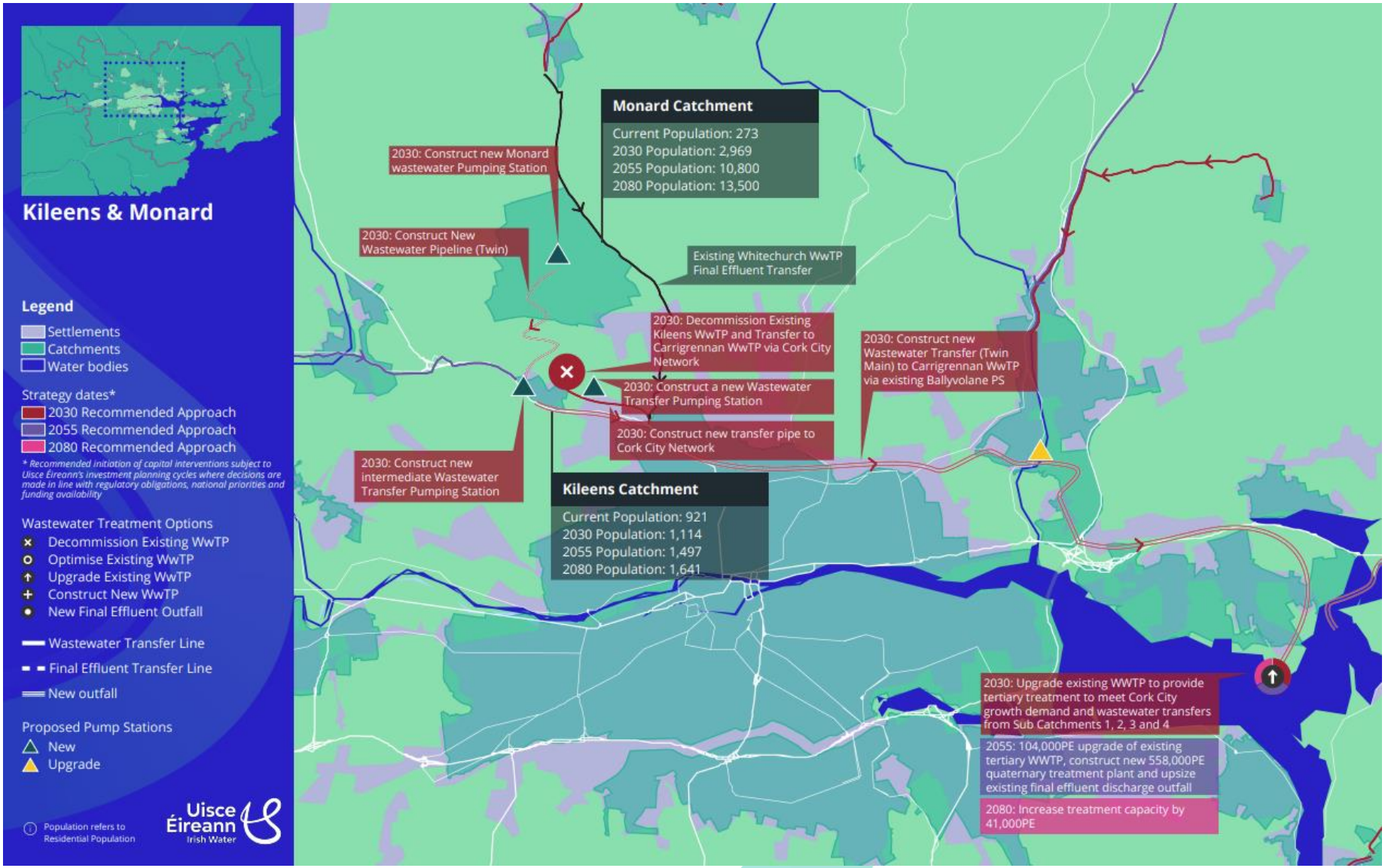

Figure 12-2: Recommended Approach for Sub Catchment 2 (Kileens and Monard)

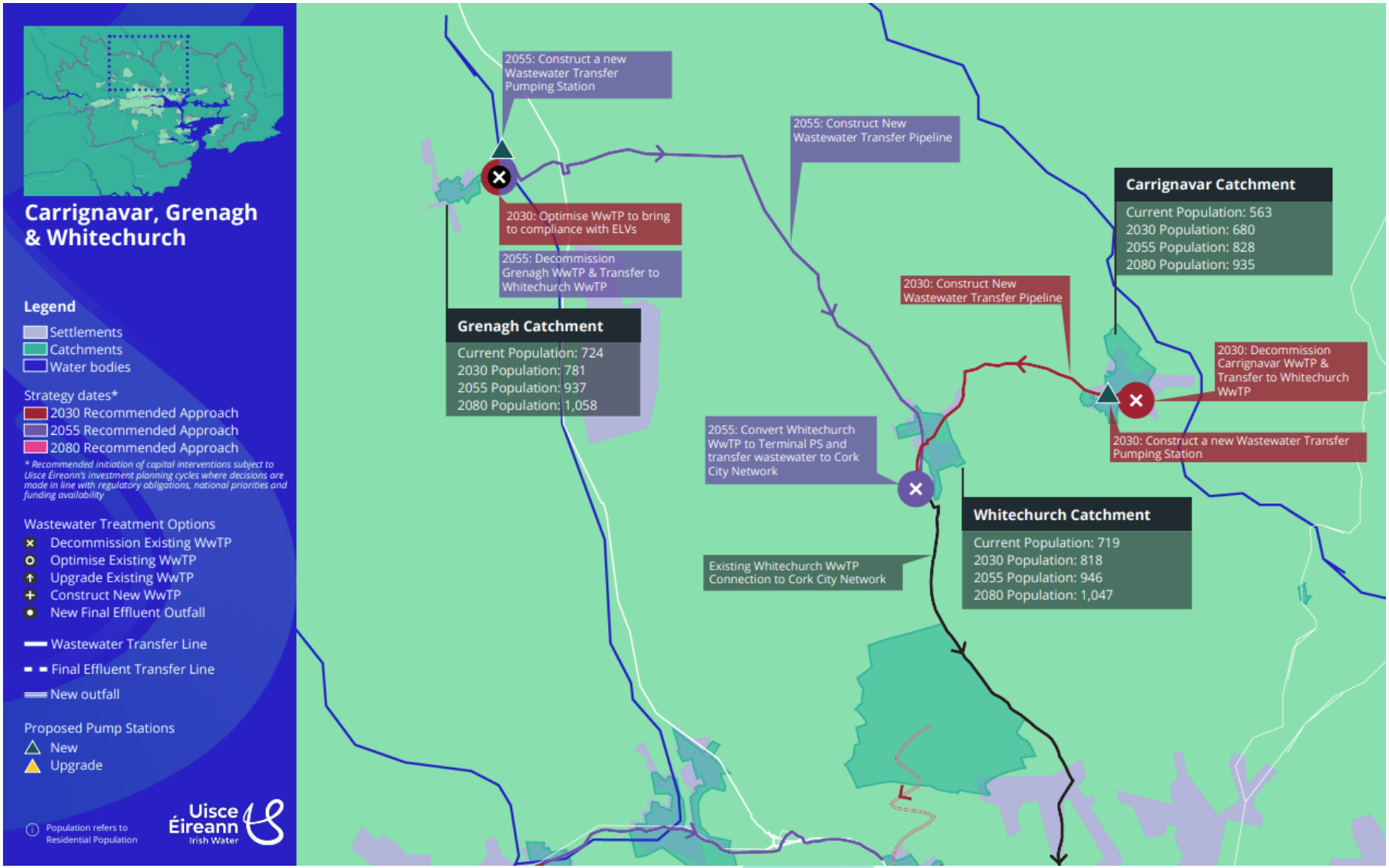

Figure 12-3: Recommended Approach for Sub Catchment 3 (Carrignavar, Grenagh and Whitechurch)

Figure 12-4: Recommended Approach for Sub Catchment 4 (Knockraha and Watergrasshill)

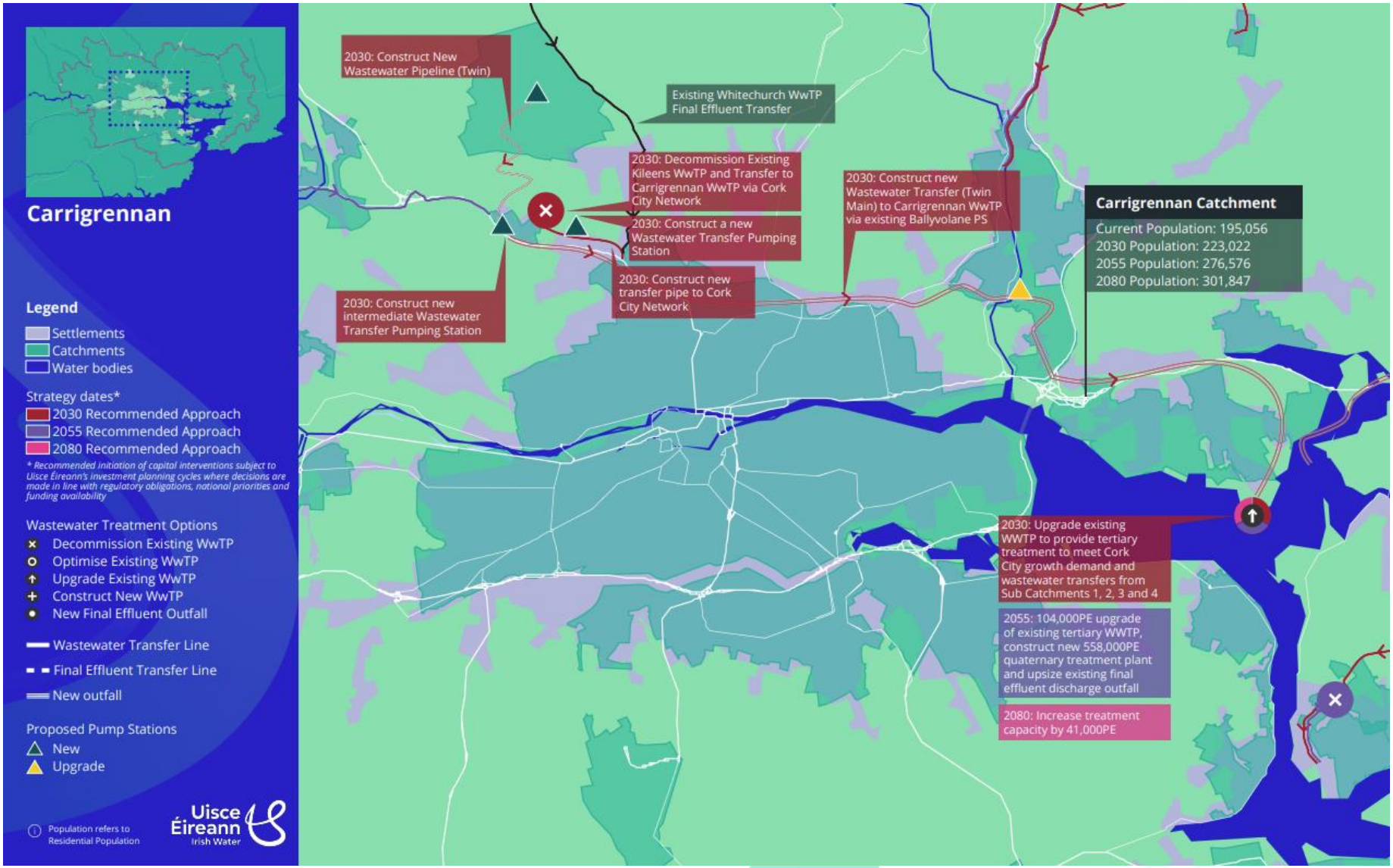

Figure 12-5: Recommended Approach for Sub Catchment 5 (Carrigrennan)

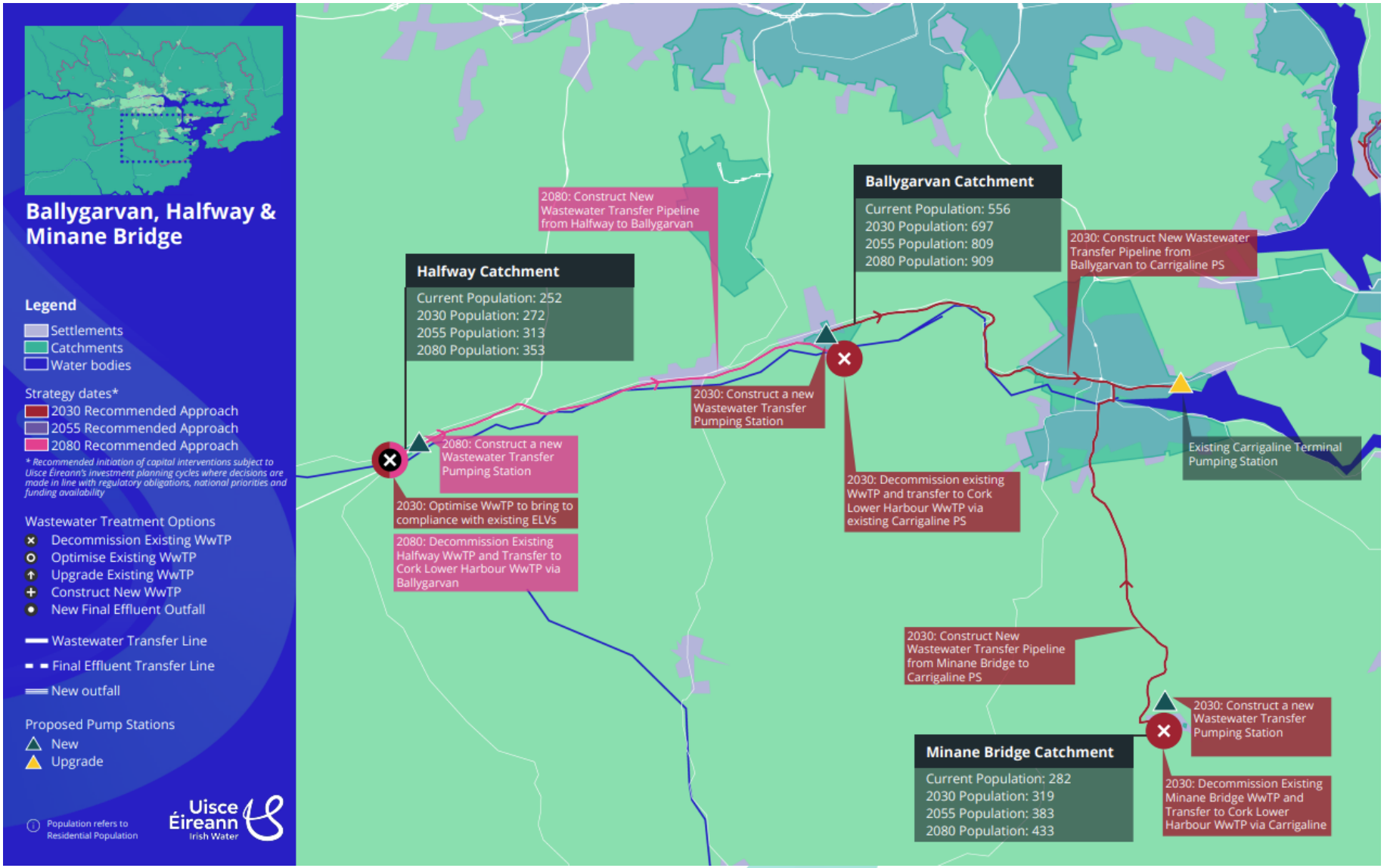

Figure 12-6: Recommended Approach for Sub Catchment 6 (Ballygarvan, Halfway and Minane Bridge (River Valley))

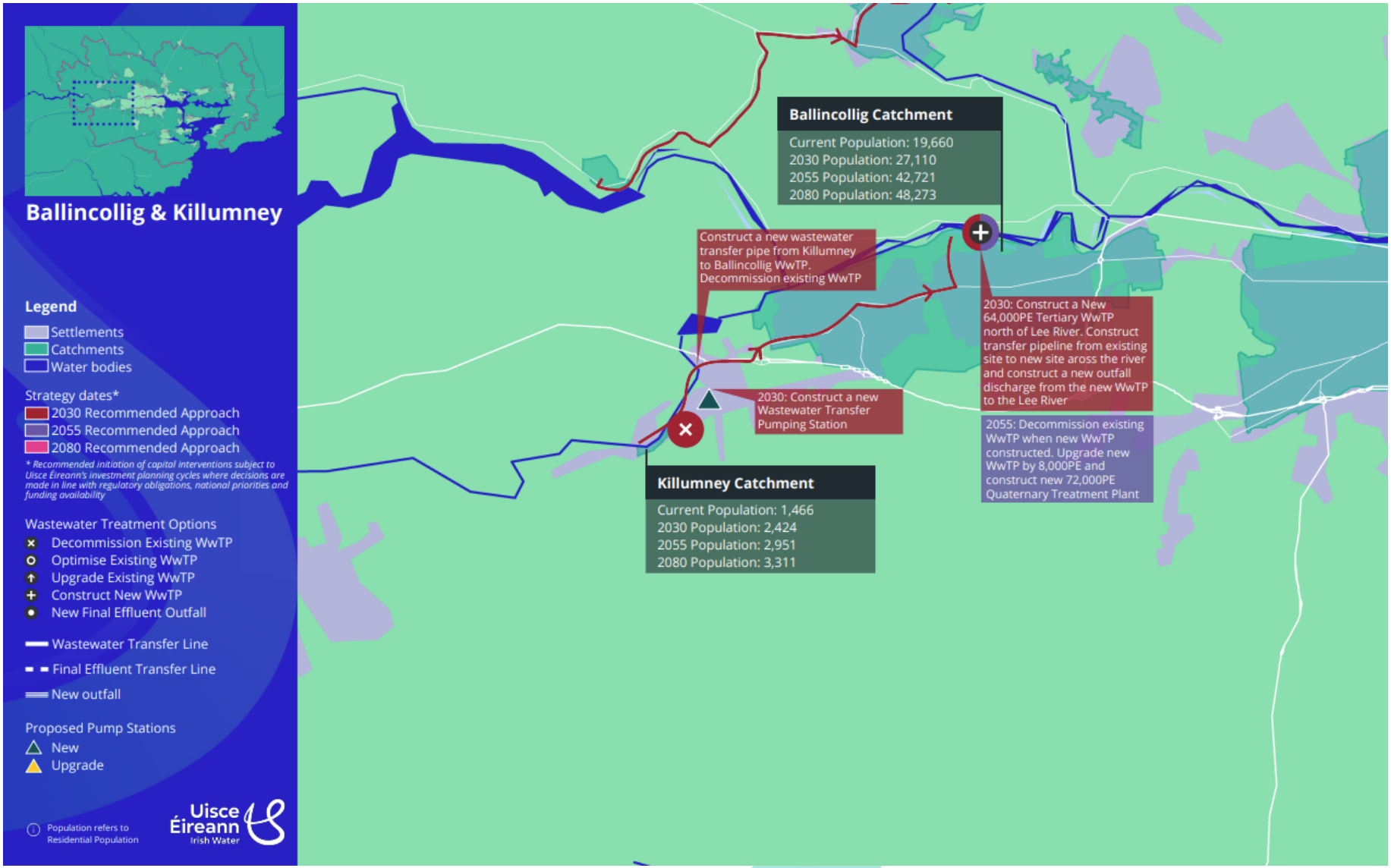

Figure 12-7: Recommended Approach Sub Catchment 7 (Ballincollig and Killumney)

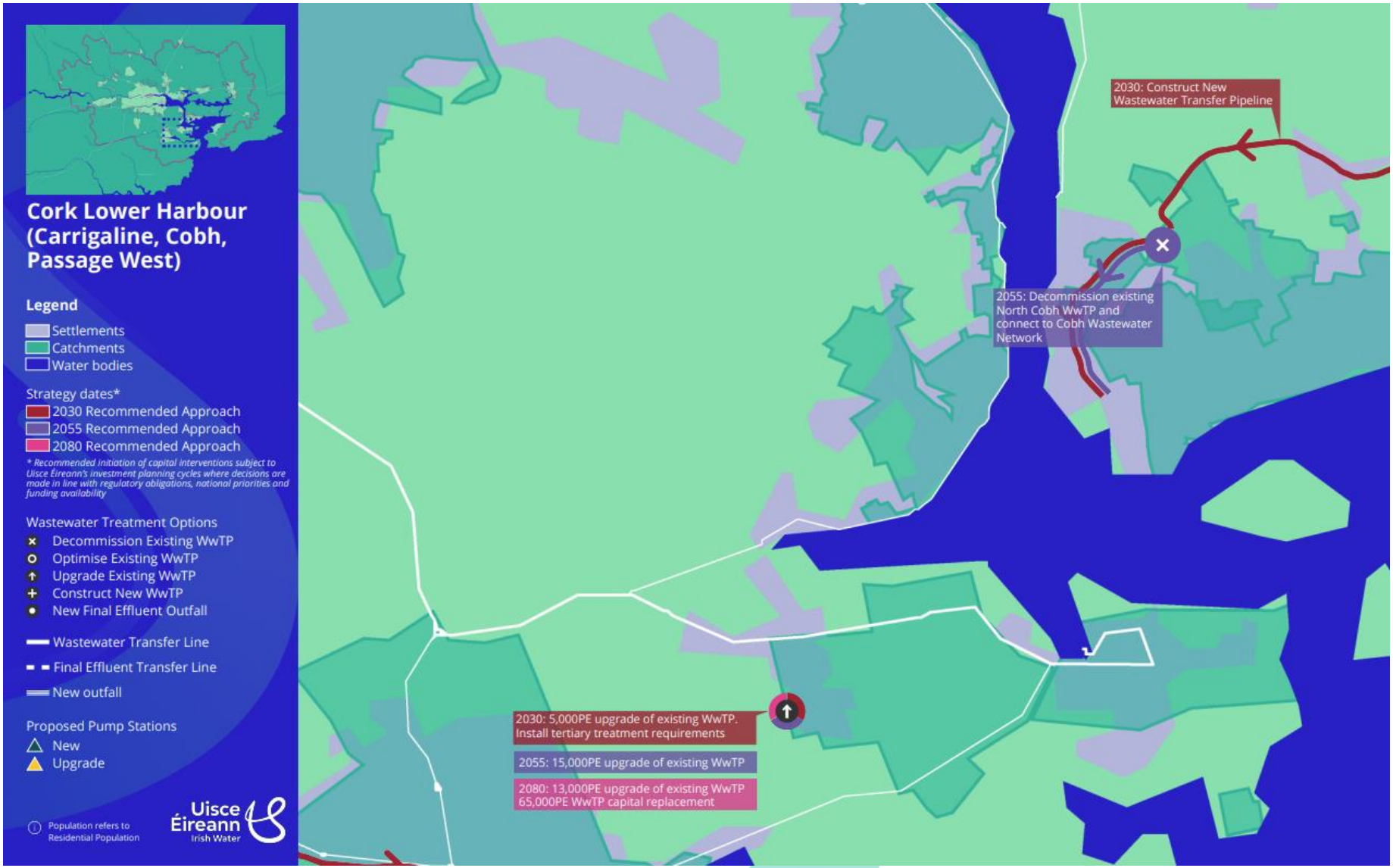

Figure 12-8: Recommended Approach Sub Catchment 8 (Cork Lower Harbour)

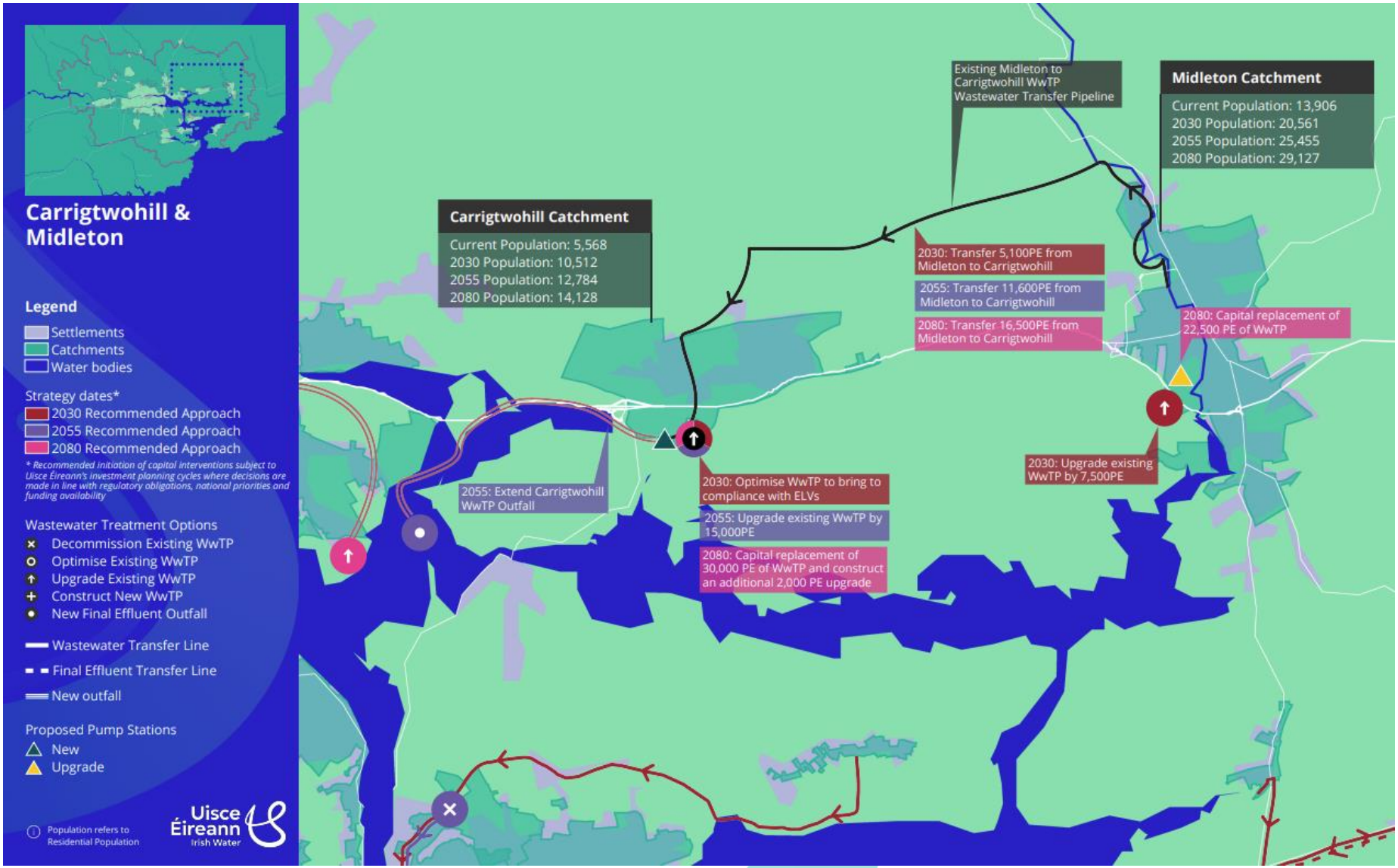

Figure 12-9: Recommended Approach Sub Catchment 9 (Carrigtwohill and Midleton)

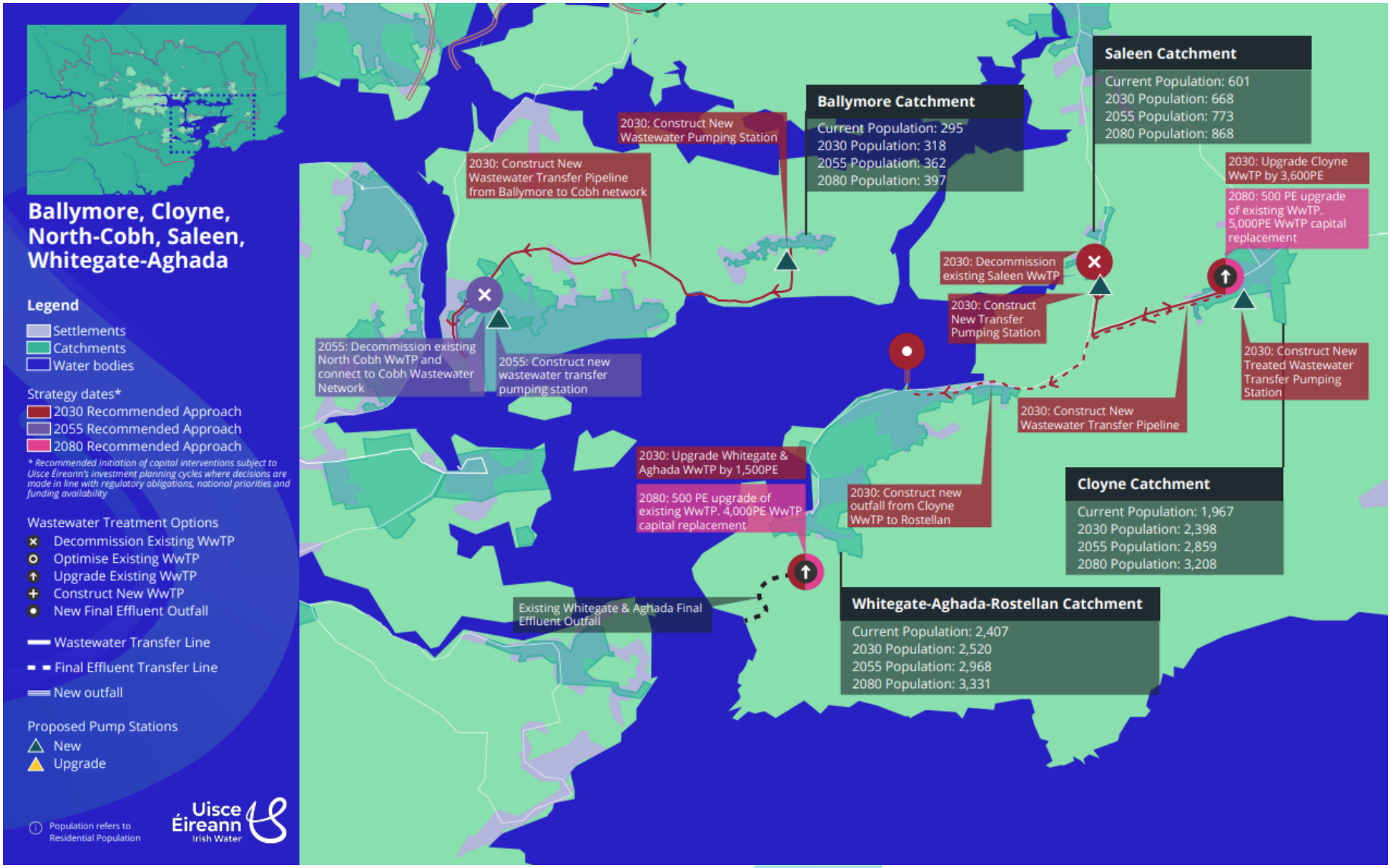

Figure 12-10: Recommended Approach Sub Catchment 10 (Ballymore, Cloyne, Saleen, North Cobh and Whitegate-Aghada)

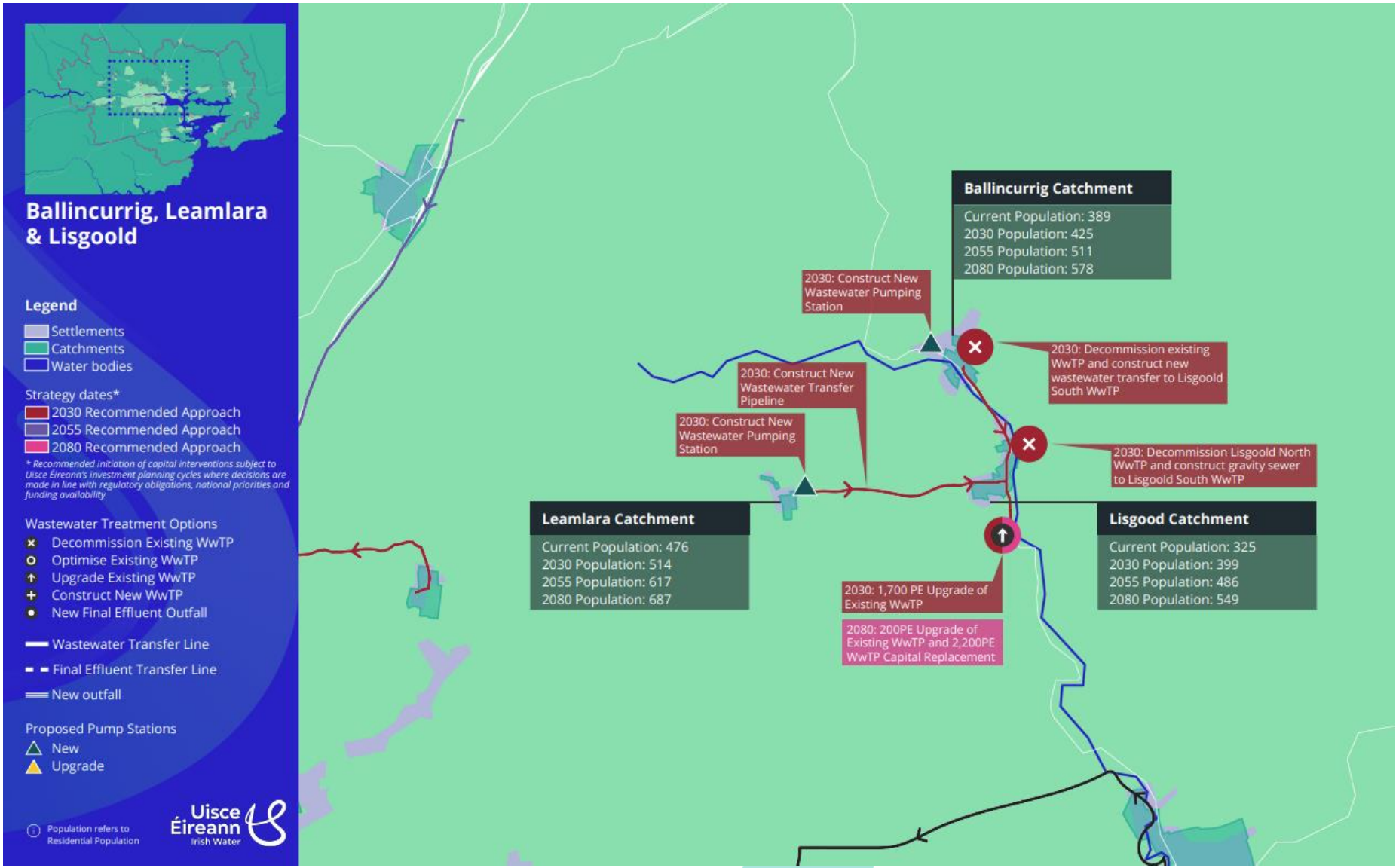

Figure 12-11: Recommended Approach Sub Catchment 11 (Ballincurrig, Leamlara and Lisgoold)

The Strategy identifies that decommissioning smaller WwTPs and transferring wastewater for treatment at a centralised location improves the overall treatment efficiency whilst simultaneously protecting the environment and ecological boundaries. As such, the Recommended Approach for the CWS identified that 16 agglomerations transfer wastewater to larger centralised facilities, such as Carrigrennan or Cork Lower Harbour for treatment by 2080.

The implementation of the CWS Recommended Approach will be executed in phases, aligning with UÉ's capital investment planning framework and adhering to standard regulatory approval processes overseen by both the Commission for Regulation of Utilities (CRU) and the EPA. Given the scale and complexity of the required interventions, the Strategy's delivery is expected to span multiple investment cycles.

While the Recommended Approach presents a proposal for advancing wastewater infrastructure across the CMA, certain individual projects within this framework will require its own specific project plan. These plans will be influenced by various factors and will necessitate unique inputs, including site selection processes, concept and detailed design, feasibility studies, business case development, planning applications, marine area consent licences and Wastewater Discharge License (WWDL) applications. The necessity for each individual requirement will be determined at project level.

Projects will undergo assessment in accordance with national investment governance procedures as required to ensure value for money, environmental compliance, and alignment with long-term sustainability goals and this strategy. The CWS outlines a broad strategy horizon for implementing the Recommended Approach, recognising the full lifecycle of individual project delivery, encompassing appraisal, planning, procurement, construction, and operation phases.

In accordance with UÉ's procedures all projects, regardless of scale, will be subject to Appropriate Assessment screening to determine the need for further assessment. EIA screening will be undertaken to determine if EIA is required to support the relevant consenting process. Table 12-2 below indicates where EIA is most likely to be required. Projects will be subject to UÉ's governance process to assess environment risks and incorporate sustainability requirements throughout design and delivery.

It is crucial that projects delivered across all strategy horizons are integrated to achieve the strategy's objectives. For instance, the transfer of wastewater from Saleen to Cloyne WwTP must be coordinated with necessary upgrades to Cloyne WwTP to accommodate projected future loads. These considerations have been incorporated into the implementation timelines for each sub-catchment, as demonstrated in the Optioneering and Solutions Development Report in Appendix 6.

This foresight in programming and scheduling ensures that no redesign, alterations, or changes are necessary at the strategy level, preventing financial losses and delays in implementation. Projects requiring new greenfield sites will necessitate site selection reports to identify preferred locations for new infrastructure, initiating land acquisition procedures and the planning process. Additionally, projects involving changes to permitted discharge ELVs and WwTP capacity increases will require new WWDL applications to the EPA. This approach demonstrates how the various strategy horizons are integrated into a cohesive delivery strategy, ensuring efficient and

effective implementation of the CWS. Table 12-2 below indicates what additional permits, licenses and procedures are likely for each project. The full requirements for each project will be determined at project level.

Table 12-2: Anticipated Requirements for Implementation of Projects

WwTP / Catchment	Land Acquisition	Marine Area Consent Licence	WWDL	AA Screening	EIA	Planning	Reason
Blarney	-	-	-	✓	-	✓	New Pumping Station
Courtbrack	-	-	✓	✓	-	-	Higher treatment standard required
Dripsey	-	-	✓	✓	-	-	Higher treatment standard required
Inniscarra	-	-	-	✓	-	✓	New Pumping Station
Kileens	-	-	-	✓	-	✓	New Pumping Station
Monard	-	-	-	✓	-	-	New Pumping Station
Carrignavar	-	-	-	✓	-	✓	New Pumping Station
Grenagh	-	-	-	✓	-	✓	New Pumping Station
Whitechurch	-	-	-	✓	-	✓	New Pumping Station
Knockraha	-	-	-	✓	-	✓	New Pumping Station
Watergrasshill	-	-	-	✓	-	✓	New Pumping Station
Carrigrennan	-	✓	✓	✓	✓	✓	Upgrade to WwTP and Higher treatment standard required
Ballygarvan	-	-	-	✓	-	✓	New Pumping Station
Halfway	-	-	-	✓	-	✓	New Pumping Station
Minane Bridge	-	-	-	✓	-	✓	New Pumping Station
Ballincollig	✓	-	✓	✓	✓	✓	New Greenfield WwTP
Killumney	-	-	-	-	-	-	Ongoing Project
Cork Lower Harbour	-	-	✓	✓	✓	✓	Upgrade to WwTP and Higher

WwTP / Catchment	Land Acquisition	Marine Area Consent Licence	WWDL	AA Screening	EIA	Planning	Reason
							treatment standard required
Carrigtwohill	-	✓	✓	✓	✓	✓	New Outfall
Midleton	-	-	-	-	-	-	Ongoing Project
Ballymore	-	-	-	✓	-	✓	New Pumping Station
Cloyne	-	✓	✓	✓	✓	✓	Higher treatment standard required and New WwPS
Saleen	-	-	-	✓	-	✓	New Pumping Station
Whitegate-Aghada	-	-	✓	✓	✓	✓	Higher treatment standard required
Ballincurrig & Lisgoold	-	-	-	-	-	-	Ongoing Project
Leamlara	-	-	-	✓	-	✓	New Pumping Station

12.2. Key Risks and Mitigation Strategies

Each strategic option presents risks that must be managed through proactive mitigation strategies. Options which rely on upgrading existing WwTPs carry the risk of potential capacity constraints in high growth zones, necessitating phased upgrades and robust hydraulic modelling to avoid service disruptions. Financially, operational costs could increase due to reliance on aging infrastructure, making it necessary to secure funding through partnerships and phased investment models. Environmentally, the ability to meet future effluent quality standards may be constrained by site limitations, requiring improvements over time.

In instances which rely on integrating new WwTPs into the existing network infrastructure, the complexity of planning and executing new facility construction increases project risk, requiring site selection and phased rollouts to align with urban expansion. Financially, the high upfront capital investment poses a challenge, necessitating innovative funding mechanisms such as public-private partnerships. Land availability and environmental considerations, including compliance with ecological protection laws, may restrict site selection, requiring environmental impact assessments, appropriate assessment and adaptive mitigation strategies.

Environmental mitigation and enhancement recommendations for the implementation of the CWS are set out in the SEA Environmental Report and Appendix 1 and the NIS Appendix 2 and key specific Sub Catchment WwTP mitigation measures are included in the summary in Table 12.2 below.

Plan level mitigation and enhancement recommendation from the SEA Environmental Report include:

- **Proactive community engagement** - supporting awareness campaigns on challenges for WwTPs and wastewater pollution to encourage appropriate behaviours, and to support understand the improvement works proposed and long-term benefits compared to temporary disruption.
- **Partnership and collaboration for catchment management** - water quality modelling identified the influence of other sources of pollution affecting water quality and aquatic biodiversity including in relation to BOD, ammonia and phosphates. These are identified where water quality modelling used 'notionally clean' concepts to identify treatment and discharge requirements. These are identified as potential areas to prioritise support for catchment management measures aimed at reducing other sources of pollution. These can provide wider environmental benefits in addition to water quality improvements such as environmental enhancement for biodiversity and flood management. The types of measures involved can improve water retention in soils, reducing nutrient run off and soil erosion. These measures can only be delivered through collaboration with other parties such as the EPA, IFI, LawPro and landowner/ tenant involvement.
- **Partnership and collaboration for network improvements -** with the local authorities in relation to new developments and urban regeneration can support the network improvements and integration of Nature based Solutions/Sustainable Urban Drainage systems with potential to provide wider environmental and community benefits.
- **Partnership and collaboration on marine environment and fisheries –** with the Maritime Area Regulatory Authority and Sea-fisheries Protection Authority on monitoring and initiatives for protecting and enhancing resilience and quality of the transitional and coastal waters.
- **Nature based Solutions (NbS**) - WwTP and network upgrades should be considered as part of detailed design the potential to include NbS as part of delivering requirements and also to including provide additional water quality and biodiversity benefits where this is identified as feasible.
- **Circular economy**/waste and sludge management**,** energy efficiency and renewable energy generation, contribution to carbon net gain targets and use of carbon calculator tools should be integrated should be integrated into project development and design and operation improvements.

Table 12-3: Summary of Key Risks and Mitigation Measures

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
Sub Catchment 1 – Blarney, Courtbrack,	Blarney WwTP	• Construction of 26km of pipeline for transfer with potential for habitat	• Standard good construction / decommissioning management including

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
Dripsey and Inniscarra		loss and disruption/ disturbance. • Receiving water bodies influenced by pollution from other sources and hence use of notionally clean basis for water quality modelling.	circular economy principles and traffic management for pipeline and network construction. • Detailed transfer route alignment and assessment for example to minimise habitat loss. Surveys and assessments depending on routing such as ecology, contaminated land, cultural heritage/ archaeological interest. • Application of biodiversity net gain to address any pipeline habitat losses – consider final use of decommissioned site. • Consider opportunities to support Upper Lee catchment management measures to reduce nutrient pollution to the Shournagh river for period before transfer.
	Courtbrack WwTP	• Land acquisition may be required for future upgrade. • Land take requirement likely to include some habitat loss and potentially within flood plain. • Flood risk assessment (FRA) may be required for future site expansion	• Early engagement with landowner(s) and Planning Authority • Environmental surveys and assessments including ecology, planning, cultural heritage / archaeology, and flood risk assessment. • Application of Biodiversity net gain to address losses – consider potential to include enhancement on site. • Consider scope for NbS as part of design. Opportunities for NbS measures include: Sludge Drying Reed Beds
	Dripsey WwTP	• Land take requirement for upgrade - likely to	• Mitigation as for Courtbrack - based on engagement, surveys,

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
		include some habitat loss and potentially within flood plain. • Flood risk assessment (FRA) may be required for future site expansion	assessments and mitigation measures. • Consider scope for NbS as part of design. Opportunities for NbS measures include Wetland, Reedbed/Sludge Drying Reed Beds/SWO Storm Management Lagoon. • Consider opportunities to support Upper Lee catchment management measures to reduce nutrient pollution to the Dripsey river. • Undertake FRA at early project stage to ascertain flood mitigation requirements
	Inniscarra WwTP	• Receiving water bodies influenced by pollution from other sources and hence use of notionally clean basis for water quality modelling.	• Standard good construction / decommissioning management including circular economy principles.
Sub Catchment 2 – Kileens and Monard	Kileens WwTP	• Decommissioning works, transfer pipeline construction	• Standard good construction / decommissioning management, pipeline route alignment and Biodiversity net gain as for Blarney WwTP
	Monard	• Transfer pipeline and pumping station construction	• As above for pumping station transfer pipeline construction
Sub Catchment 3 – Carrignavar, Grenagh and Whitechurch	Carrignavar WwTP	• Decommission WwTP construction works for a 3.8km wastewater transfer pipeline to Whitechurch WwTP.	• Standard good construction / decommissioning management, pipeline route alignment and Biodiversity net gain as for Blarney WwTP
	Grenagh WwTP	• Initial optimisation then pipeline	• Consider support for catchment management

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
		transfer. Worsened ambient receiving water (river) quality may impact Recommended Approach selection	measures / initiatives to improve receiving river water quality. Standard good construction / decommissioning management, pipeline route alignment and Biodiversity net gain as for Blarney WwTP
	Whitechurch WwTP	• Additional load to Cork City Network and potential network capacity constraints	• Recommended Approach has been included within network modelling assessment and outcomes • Standard good construction, management, pipeline route alignment and Biodiversity net gain as for Blarney WwTP
Sub Catchment 4 – Knockraha and Watergrasshill	Knockraha WwTP	• Recommended Approach relies on integration with existing wastewater pumping stations, networks and Carrigrennan WwTP capacity upgrade.	• Recommended Approach has been included within network modelling assessment and outcomes. • Standard good construction, management, pipeline route alignment and Biodiversity net gain as for Blarney WwTP
	Watergrasshill WwTP	• Worsened ambient receiving water (river) quality may impact Recommended Approach selection • Recommended Approach relies on integration with existing wastewater pumping stations, networks and Carrigrennan WwTP capacity upgrade	• Consider support for catchment management measures/initiatives to improve receiving river water quality • Recommended Approach has been included within network modelling assessment and outcomes. • Standard good construction / decommissioning management, pipeline route alignment and Biodiversity net gain as for Blarney WwTP
Sub Catchment 5 - Carrigrennan	Carrigrennan WwTP	• Site construction for WwTP upgrade and the upsize of the	• Site has capacity for expansion without need to

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
		treated effluent discharge outfall. • Site boundary adjacent to SAC/SPA/pNHA. Tree planting within site area. • Discharge outfall outside designated areas.	extend into designated areas. • Further project level environmental assessment will need to identify any additional measures to avoid impacts on adjacent designated sites and from upsizing discharge outfall. Potential for loss of trees planted within site and other habitats - where possible loss should be avoided/minimised. Within site habitat losses will need to be assessed using the Biodiversity net gain approach and may require off site enhancements. • Consider scope for including NbS as some part of design. • Consider potential for cumulative construction effects with works on Sub Catchment 9 for the outfall extension from Carrigtwohill if these are undertaken at the same time,
Sub Catchment 6 – Ballygarvan, Halfway and Minane Bridge	Ballygarvan WwTP	• Recommended Approach relies on integration with existing wastewater pumping stations, networks and Cork Lower Harbour WwTP capacity upgrade potential proximity of pipeline to European Site.	• Recommended Approach has been included within network modelling assessment and outcomes • Project-level route alignment /design to maximise distance between pipeline and European site
	Halfway WwTP	• Worsened ambient receiving water (river) quality may impact Recommended Approach selection	• Consider support for catchment management measures/initiatives to improve receiving river water quality. Review of existing and best available

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
			treatment technologies to ensure future compliance
	Minane Bridge (River Valley) WwTP	• Recommended Approach relies on integration with existing wastewater pumping stations, networks and Cork Lower Harbour WwTP capacity upgrade	• Recommended Approach has been included within network modelling assessment and outcomes
Sub Catchment 7 – Ballincollig and Killumney	Ballincollig WwTP	• Upstream of public surface water abstraction. Site specific risk assessment under the rUWWTD will be required for quaternary treatment requirements	• Include quaternary treatment considerations within project stage optioneering and design • Detailed site selection assessments and optioneering to confirm Recommended Approach compared to alternative options. Site selection to aim to minimise valuable habitat / amenity / loss, landscape/visual impacts for local community, odour and archaeological risk and WFD and aquatic ecology impacts from new outfall location. Flood risk assessment may be required to consider changes to baseflow. • Standard construction / decommissioning good practice measures and for pipeline routing and river crossing. • Application of biodiversity net gain to address habitat losses. Consider final use of decommissioned site – community and biodiversity benefits.
	Killumney WwTP	• Decommissioning and transfer pipeline construction – with	• Standard construction / decommissioning

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
		potential for habitat loss and proximity to a European Site.	measures and routing assessment as above • Project-level design to maximise distance between pipeline and European site. Application of biodiversity net gain to address any losses
Sub Catchment 8 – Cork Lower Harbour	Cork Lower Harbour WwTP	• Site upgrade for tertiary treatment	• Standard construction measures as above.
Sub Catchment 9 – Carrigtwohill and Midleton	Carrigtwohill WwTP	• Carrigtwohill existing site partially within SAC/SPA/pNHA designation will require upgrade works.	• New discharge location outside SAC and AA/NIS to assess new pipeline route/ discharge location and identify construction mitigation, • Detailed site assessment of project area to determine ecological importance to SPA/SAC habitats and species • Project-level design to microsite new infrastructure to locations out with the SPA/SAC/pNHA site boundary
		• Current discharge located within SAC with risks to Atlantic Salt Marsh. New discharge pipeline may have construction impacts on habitats within the SAC.	• Detailed site assessment of project area to determine ecological importance to SPA/SAC habitats and species including potential areas of Atlantic saltmarsh habitat and identify areas of invasive alien species. • Update baseline mapping of sensitive habitats to inform pipeline routing and construction approach and to support future monitoring. • Project-level design to microsite new infrastructure to locations out with any newly

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
			identified areas of saltmarsh and ensure no surface structures which would cause physical obstruction to normal sediment/tidal flows. • Undertake construction works out with the overwintering period for qualifying interests. • Biosecurity management plan to control risk of common cord-grass colonisation. Outfall assessments to consider also cultural heritage/archaeological interest and pollution risks
	Midleton WwTP	• Recommended Approach relies on integration with existing wastewater pumping stations, networks and Carrigtwohill WwTP capacity upgrade	• Standard assessment, good construction and route alignment measures as for Blarney WwTP
Sub Catchment 10 – Ballymore, Cloyne, North Cobh, Saleen, and Whitegate-Aghada	Ballymore	• Approach relies on integration with existing wastewater pumping stations, networks and Cork Lower Harbour WwTP capacity upgrade	• Standard assessment, good construction and route alignment measures as for Blarney WwTP
	Cloyne WwTP	• Land acquisition will be required for future upgrade • Flood risk assessment (FRA) may be required for future site expansion	• Early engagement with landowner(s) and Planning Authority and undertake relevant environmental surveys and assessments including FRA at early project stage to ascertain flood mitigation and other mitigation requirements. • Consider potential for NbS as part of design considerations.

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
			• Application of biodiversity net gain to address habitat losses
	Saleen WwTP	• Decommissioning of septic tanks and transfer	• Standard route selection process and good construction management measures.
	Whitegate – Aghada WwTP	• Upgrade to WwTP construction and pipeline with proximity to European Site,	• Project-level design to maximise distance between pipeline and European site. • Detailed site assessment of project area to determine ecological importance to SPA species. • Undertake construction works out with the overwintering period for qualifying interests.
Sub Catchment 11 – Ballincurrig, Leamlara and Lisgoold	Ballincurrig WwTP	• No construction works	• N/A
	Leamlara	• Transfer pipeline	• Standard route selection process and good construction management measures.
	Lisgoold South WwTP	• Site construction for works upgrades. • Ambient water quality in receiving waterbody from other sources. • Upstream of drinking water abstractions	• Standard good construction, planning and design measures as for Blarney WwTP • Consider support for catchment management measures to improve water quality. • Confirm treatment requirements in relation to downstream water abstraction and treatment. • Application of biodiversity net gain to address any losses – consider potential to include enhancement on site. • Opportunities for NbS measures include: Wetland, Reedbed/ Sludge Drying

Sub Catchment	Agglomeration	Key Risks	Mitigation Measures
			Reed Beds/ SWO Storm Management Lagoon

12.3. Strategic Opportunities – Collaborative Partnerships

Uisce Éireann recognise that partnerships, collaboration and stakeholder engagement will be central to achieving our goals. Uisce Éireann are committed to active participation in collaboration with public agencies and stakeholders seeking opportunities to enhance the success of the CWS and to achieve our shared objectives. Strategic partnerships with industries, educational and recreational organisations, research institutions and government agencies provide opportunities for knowledge sharing, funding access and technological advancements which has the ability to optimise the efficiency and sustainability of the strategy. We will seek opportunities to explore how we can collaborate with local stakeholders to develop amenity value in suitable Uisce Éireann assets, where this can be done safely and without compromising our core function of delivering wastewater services for the CMA. Uisce Éireann will liaise closely with other public infrastructure providers to develop a shared perspective on growth projections within the region and to ensure alignment across sectors to create shared projection models to identify where and when investment is required.

13. Monitoring and Evaluation

13.1. How will the Strategy be Monitored?

Uisce Éireann understand the importance and significance of the continuous monitoring of both performance and effectiveness of wastewater developments implemented through the CWS. This ensures that the infrastructure and systems put in place remain aligned with our strategic objectives and operational standards. By maintaining a constant focus on the outcomes of our wastewater initiatives, UÉ can promptly identify areas of success, pinpoint opportunities for improvement, and adapt our strategies in response to changing environmental conditions or technological advancements. The CWS will be monitored through selected Key Performance Indicators (KPI) which will focus on critical aspects of wastewater management, allowing for measurement of progress and identification of areas requiring attention or improvement. The KPIs will be focus on:

- Treated Effluent Quality and Compliance: Our monitoring strategy includes continuous assessment of WwTP performance and treated effluent standards against the required ELVs as specified in the WWDL and in compliance with the recast UWWTD. The ELV for individual agglomerations will serve as the primary KPIs for assessing WwTP performance. This rigorous monitoring process involves regular sampling of the receiving waters and evaluation of annual environmental reports published by the EPA. Through this we can identify areas requiring remedial action and accurately track the success of improvements implemented at our WWTPs. This approach ensures that our treatment processes remain effective, compliant with regulatory standards, and responsive to environmental needs, thereby supporting our commitment to sustainable wastewater management. This assessment allows us to project the plant's ability to accommodate future growth and increased loadings, aligning with the projections outlined in the strategy.
- WwTP Capacity: Our continuous monitoring strategy involves assessing the operational capacity of the WwTP involving an evaluation of both hydraulic and organic loadings currently being processed at the plant. By closely monitoring these parameters, we can accurately gauge the existing capacity availability and determine whether it is adequate to handle current treatment demands. This assessment allows us to project the plant's ability to accommodate future growth and increased loadings, aligning with the projections outlined in the CWS.
- SWO Performance: The CWS objective is for all SWOs to meet Department of Housing, Local Government and Heritage criteria and limit annual SWO spills from each agglomeration to (i) be no more than 4% of the annual collected urban wastewater load calculated in dry weather conditions, and (ii) an average of ≤10 significant (>50m^3) spill events per annum from each SWO. These objectives will serve as the primary KPIs for assessing SWO performance. The frequency and volume of SWO spills will be continuously monitored against these KPIs which allows for real-time evaluation of our stormwater management systems, enabling us to quickly identify trends, assess the

effectiveness of implemented measures, and make data-driven decisions for system improvements.

- Network Performance: The objective of the CWS is to ensure SWO compliance and minimise network flooding. As part of our monitoring strategy, UÉ will closely track SWO Performance and the number of recorded instances of network flooding. This data serves as a crucial indicator of the overall performance of our wastewater network and allows us to effectively assess the network's capacity and resilience under various conditions.
- Energy Performance: UÉ will monitor and evaluate energy consumption across all wastewater infrastructure assets. This approach is designed to optimise our operational processes, with the primary goal of minimising energy usage throughout our wastewater management systems. By closely tracking and analysing energy consumption patterns, UÉ can identify opportunities for efficiency improvements and implement targeted interventions.
- Operational Reliability: To effectively gauge the reliability and resilience of our wastewater infrastructure UÉ will monitor unplanned downtime and maintenance requirements across all wastewater assets, giving us insights into the operational performance and overall resilience of our network. By closely monitoring these metrics, UÉ can identify potential vulnerabilities, anticipate maintenance needs, and evaluate the long-term effectiveness of our infrastructure investments.
- Environmental and sustainability: As part of the SEA UÉ have developed a draft monitoring plan which will be finalised following the consultation process and integrated with the implementation monitoring outlined and will provide a basis for providing feedback on meeting environmental and sustainability objectives and the need for corrective action and inform adaptive planning, The draft monitoring plan is included in the draft SEA in Appendix 1.

Our data collection process use automated monitoring systems, flow meters, event loggers, and regulatory audits to gather information on our wastewater systems. This data is compiled into regular reports, which are then reviewed by UÉ and relevant regulatory bodies. This approach ensures accurate monitoring, regulatory compliance, and timely identification of any issues in our wastewater management practices.

13.2. Tracking Progress

The CWS is designed as a 50-year strategy to address long-term wastewater management needs of the CMA. To maintain its relevance and effectiveness the CWS will undergo review every five years, aligning with UÉ planning processes. This periodic review cycle ensures the ongoing effectiveness of the strategy, allowing for adjustments based on changing environmental conditions, technological advancements, financial considerations and evolving community needs. By implementing regular reviews, the CWS remains a dynamic and responsive framework for sustainable water management.

The review cycle will incorporate the information gathered from our KPI's to evaluate the strategy's effectiveness. This process involves an assessment of the collected data, enabling us to gain an understanding of how well the strategy is performing. By analysing these metrics, UÉ can identify trends, successes, and areas requiring improvement, thereby ensuring the continued relevance and efficiency of our wastewater management approach.

UÉ are committed to maintaining an open dialogue with stakeholders throughout the implementation of the CWS. By actively seeking and incorporating stakeholder feedback, alongside our analysis of KPIs, UÉ ensure an approach to strategy evaluation. Feedback can come from a number of stakeholders such as Cork County Council and Cork City Council, environmental agencies, and local communities. This collaborative process allows us to refine our strategic objectives, taking into account both quantitative performance metrics and qualitative insights from our stakeholders.

A critical component of our review cycle is ensuring adequate funding to implement the strategy's recommendations. This requires long-term planning to deliver the Recommended Approach effectively. A significant aspect of this planning involves securing appropriate funding allocations within regulatory frameworks to sustain our wastewater infrastructure. Our approach combines the findings from our performance monitoring with an assessment of available financial resources. Based on this analysis, UÉ shall develop a prioritisation strategy that identifies and ranks key areas for improvement within our overall wastewater management plan. This method allows us to allocate resources efficiently, focusing on the most critical needs while maintaining a long-term perspective on infrastructure development and maintenance. By aligning our financial planning with our strategic objectives, UÉ aim to ensure the sustainable and effective implementation of our wastewater management strategy.

13.3. Adaptive Planning

The CWS may be influenced by a number of internal and external factors. Uisce Éireann is committed to a programme of continuous monitoring to ensure both internal and external factors that may influence and impact the implementation of the CWS are identified including:

- Changing Legislation - Uisce Éireann is committed to maintain the relevance and compliance of the CWS by conducting reviews in response to the publication of any new legislation, regulations, or policies that may impact the strategy. This proactive approach ensures that the CWS remains aligned with the most current regulatory framework and industry best practices. The policy instruments and publications that will be subject to ongoing monitoring are outlined in Section 3.3 of the Strategy.
- Climate Change – The development of this strategy has considered the potential impacts of climate change. However, it is crucial to maintain ongoing monitoring of these effects throughout the strategy's implementation period. In the event that climate change consequences prove more severe than current projections, the strategy incorporates provisions for implementing mitigation measures. These measures are designed to address any unforeseen impacts and their potential effects on the CMA's wastewater infrastructure. This proactive approach ensures that the strategy remains adaptable and resilient in the face of evolving environmental challenges.

- New Technology Developments – UÉ will continuously monitor and evaluate emerging technologies that have the potential to enhance our wastewater network's efficiency and effectiveness. This approach will allow us to identify and implement cutting edge solutions that align with and support the core objectives of our strategy. By integrating these technological advancements into our wastewater infrastructure, UÉ aim to improve operational performance, increase sustainability, and deliver better outcomes for our stakeholders. This ongoing process of technological assessment and implementation will ensure that our wastewater management practices remain innovative, efficient, and capable of meeting both current and future challenges in the field.
- Budget / Funding Availability – The implementation of the CWS is intrinsically linked to the availability of funding within the prescribed UÉ investment cycles, necessitating a flexible and phased approach to project execution. Given the scale and complexity of the required interventions, the Strategy's delivery is expected to span multiple investment cycles.
- Economic Environment - Continuous monitoring of global and local economic factors, including events such as wars and pandemics, will inform the strategy's implementation and evolution. While the provision of wastewater services remains a constant necessity, the approach to capital infrastructure investment may be adjusted to align with economic cycles. During periods of economic growth, the strategy will capitalise on increased investment opportunities to advance long-term planning initiatives, foster innovation, and pursue projects that offer broader benefits to customers, communities, and the environment. Conversely, in times of economic downturn, the strategy will prioritise critical infrastructure maintenance and essential upgrades, ensuring the continuity of core services while potentially deferring less urgent long-term projects.

If any such changes affect the Recommended Approach for a sub-catchment or the CMA as a whole, the CWS will be reviewed. This evaluation will determine whether significant revisions to the Recommended Approach are necessary and identify any potential knock-on effects resulting from these changes. Following this assessment, the CWS will be updated accordingly to maintain its alignment with current regulations, policies, and best practices in water management.

When changes are deemed to be material and a variation to the CWS is required, UÉ will screen the change for SEA and AA in accordance with its legal obligations and where required it will carry out an SEA and/or AA before adopting the variation (including public and/or statutory consultation, as appropriate). If there is no change to the Recommended Approach, then there is no variation to the CWS.

14. Conclusion

14.1. Strategy Outcomes

The Recommended Approach and Implementation Strategy presented in this strategy are integral to UÉ's approach to delivering the CWS. The strategy outlines a balanced and sustainable delivery plan to address current wastewater infrastructure issues within the CMA, while simultaneously allowing for future population and economic growth and environmental protection by minimising any detrimental effects on receiving watercourses.

Developed with a holistic perspective of the CMA, the strategy is cognisant of future risks, allowing for adaptations to be implemented through continuous monitoring and evaluation of the strategy implementation. This flexible approach enables the review and revision of challenges and opportunities as necessary to align with the ever-evolving surroundings. The strategy ensures that Uisce Éireann can make informed decisions about infrastructure development and resource allocation, while maintaining the agility to adjust to changing circumstances, technological advancements, and regulatory requirements. By balancing immediate needs with long-term sustainability goals, the CWS aims to create a resilient and efficient wastewater management system that will support CMA growth and environmental protection for the foreseeable future.

The Strategy identifies that decommissioning smaller WwTPs and transferring wastewater for treatment at a centralised location improves the overall treatment efficiency whilst simultaneously protecting the environment. As such, the Recommended Approach for the CWS identified that 16 agglomerations transfer wastewater to larger centralised facilities, such as Carrigrennan or Cork Lower Harbour for treatment by 2080. This strategy ensures long-term sustainability by leveraging existing treatment facilities at larger WwTPs, capitalising on their size and more achievable treatment requirements. This approach mitigates risks such as limited land availability for expansion, increasing asset life and more stringent ELVs to be enforced at receiving waterbodies. These risks will still apply at the larger WwTPs but become more manageable as the wastewater treatment has been consolidated to one central area.

14.2. Strategy Benefits

The development of the CWS allows UÉ to review wastewater needs collectively across the CMA and considering a full range of risks including Quality, Quantity, Reliability and Sustainability. Delivery of the CWS Recommended Approach will address the current and future needs of the CMA wastewater infrastructure, facilitating population and economic growth and advancement within the region. The Recommended Approach is designed to be reliable, sustainable, and resilient in the face of climate change. Adoption of the CWS will ensure a robust and forward-thinking wastewater management system that can adapt to evolving challenges while supporting the region's development. This strategic approach not only addresses immediate infrastructure concerns but also lays the groundwork for long-term environmental protection and sustainable growth, positioning the CMA to meet its wastewater management needs efficiently and effectively for years to come. Adoption of the CWS will ensure:

- Development of a sustainable drainage strategy for the Cork Metropolitan Area consistent with the EU Water Framework Directive and Urban Wastewater Treatment Regulations.
- Evaluation of alternative approaches and identification of the Recommended Approach concerning wastewater drainage solutions having regard to whole-life cost and environmental performance.
- Establish a positive connection with the public and inspire confidence in UÉ as trustworthy guardians of water and wastewater services.
- Outline the requirements for wastewater drainage and treatment capacity capable of meeting the demands of the study area in the context of current Development Plans, the National Planning Framework, the RSES 2020 and longer-term development potential of the area up to year 2080.
- Identification of solutions for implementing the recommendations of the Wastewater Strategy, together with the prioritisation of such implementation projects.
- Identification of alternative solutions for effective management of wastewater to protect and restore the environment, support social and economic growth aligning with UÉ Water Services Strategic Plan and the Government of Ireland Water Services Policy Statement (WSPS).
- Development of an adaptable strategy where outcomes are expected to be linked to volatile influences like climate and population change and confirming that strategy will achieve performance indicators and outcomes at least cost.
- Seamless integration and alignment with Uisce Éireann's existing plans and policies.
- A roadmap for enhancing wastewater treatment across the CMA, upholding the highest treatment standards.
- Significant improvements in treatment capacity and efficiency, coupled with pollution reduction and water quality enhancement.
- An approach to identify priority projects, developing cost estimates, and outlining the capital expenditure (CAPEX) requirements necessary to deliver sustainable wastewater infrastructure across the region. These outputs will directly inform Uisce Éireann’s Strategic Funding Plan, ensuring that investment decisions are aligned with both regional needs and national policy objectives.
- Strengthened protection and enrichment of the natural environment, including Natura 2000 sites.
- Development of a robust and environmentally sustainable wastewater network.
- Optimised wastewater network performance, particularly in mitigating leakage and flooding risks.

- Advancement towards Uisce Éireann's sustainability goals, in line with the Climate Action Plan and recast UWWTD.
- Capacity to support and facilitate the region's future population growth and economic development.
- Optimisation of resource recovery and circular economy by consolidating treatment at a centralised location and improve overall treatment efficiency whilst simultaneously protecting the environment and ecological boundaries.

14.3. Next Steps

With the publication of this Draft Cork Wastewater Strategy, there will be a period of public consultation which will allow internal and external stakeholders and the public the opportunity to review and analyse the draft CWS and provide feedback and identify concerns of stakeholders to be addressed on the development of the final CWS. The public consultation ensures that views and concerns are considered in the development of the final Cork Wastewater Strategy. Following the closure of the public consultation, UÉ will produce a Post Consultation Report which will outline all engagement that was undertaken with stakeholders.

Following on the feedback and comments from the public consultation, UÉ will develop and finalise the final Cork Wastewater Strategy. The final CWS will be published in Q2 2026 and will deliver a sustainable drainage strategy that will protect public health, safeguard our environment and facilitate growth to 2080. Uisce Éireann will undertake periodical reviews of the CWS every five years. This will ensure the actions and objectives are fir for purpose in the short, medium and long term and make recommendations for new or updated approaches.

The Recommended Approaches and Implementation Strategy outlined in the strategy will be undertaken as individual projects and be subject to standard UÉ project lifecycles. Each project will undergo assessment in accordance with national investment governance procedures to ensure value for money, environmental compliance, and alignment with long-term sustainability goals and the final strategy as required. The full lifecycle of individual project delivery encompasses appraisal, planning, procurement, construction, and operation phases and will typically commence by undergoing the Uisce Éireann i20 workshop process to assess the viability of the works.

Appendices

Appendix 1 – SEA Report

Appendix 2 – NIS

Appendix 3 – Wastewater Treatment Plants Flow and Loads Summary Report

Appendix 4 – Network Modelling Report

Summarises technical reports relating to network and water quality modelling undertaken in the course of the strategy in a public facing less technical format

Appendix 5 – Water Quality Modelling Reports

Appendix 6 – Optioneering and Solutions Development Report

Summarises approach arriving at feasible strategies as a result of various workshops

Appendix 7 – Consultation 1 Responses