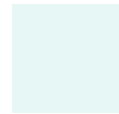


Report: May 2026

Galway Wastewater Strategy

Appendix 5 -
Our Approach to Optioneering &
Feasible Option Development



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Project Ireland
2040



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Our Approach to Optioneering & Feasible Option Development

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This report has been prepared by Ryan Hanley Stantec on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which Ryan Hanley Stantec were appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). Ryan Hanley Stantec accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

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Executive Summary

The purpose of this appendix is to set out the methodology used to identify technically and environmentally viable options for the Galway Wastewater Strategy. This appendix presents the evaluation of different options, which have been considered in the context of current and future investment needs. We set out the decisions made and how these support the objectives of the strategy and our long-term vision.

Over the next 55 years, the region faces three key challenges: accommodating regional growth, maintaining compliance with national and EU legislation with the impacts of climate change, and protecting the environment. Our assessment has allowed us to identify where we will need to intervene to address performance shortfalls and mitigate principal risks at key time horizons (2040, 2055, 2080). Consideration was also given to needs and risks that would emerge prior to 2040. There is inherent uncertainty in long-term planning and circumstances may change. Each strategic option will undergo more detailed assessment ahead of implementation and projects will be prioritised based on the best available information at the time.

The optioneering process followed good practice, starting with a long list of generic interventions, and gradually discounting those which were technically non-viable or otherwise deemed unsuitable to address the need. We used a themed Totex (Total Expenditure) hierarchy to consider options, both strategically and at an agglomeration level.

For the study area, growth and legislative risks emerged as the most significant. Our analysis revealed that current capacity across the region was insufficient to support the anticipated economic and population growth. The expansion of two key existing Wastewater Treatment Plants (WWTP), Mutton Island and Athenry, were not viable, due to site limitations and the environmental impact of increased loadings on local waterbodies. A key conclusion for the strategy was the need to develop **a new WWTP for the region.**

The optioneering process led to the identification of 9 strategic options which underwent Multi-Criteria Decision Analysis (MCDA) to identify the most beneficial options. **Two options have been shortlisted** and taken forward for optimisation with the proposed network improvements. The **Eastern Wastewater Treatment Plant (WWTP)** has been designated as the most suitable location for the new regional WWTP, with the eastern marine outfall option demonstrating the greatest overall benefits according to the assessment. The western marine outfall was ranked second in the MCDA benefit evaluation. While the western outfall provides certain short-term advantages due to its significantly shorter outfall length, facilitating simpler construction and minimising environmental impact, transporting effluent from the eastern WWTP to the western outfall presents significant engineering challenges and has ongoing implications for both carbon emissions and costs that require further detailed appraisal.

Our assessment has confirmed that the agglomerations of Moycullen and Claregalway have sufficient capacity to maintain services up to 2055, based on current, local growth projections. As such, no significant investment needs are anticipated for either agglomeration prior to the 2055 horizon. Beyond 2055, resilience upgrades will be required to accommodate growth. Additional monitoring and assessment will be used to inform the timing and nature of required upgrades.

Stakeholder engagement has been central in our process, to ensure that we have captured the unique needs and priorities of the region. Stakeholder involvement and subject matter experts from within Uisce Éireann and with support from local authorities throughout our MCDA was undertaken to gather broader understanding of the issues which matter most to the local communities. We will further capture key inputs through this second public consultation, which will determine how we progress the Strategy.

1. Introduction

The purpose of this appendix is to set out the process used to identify and evaluate technically and environmentally viable options and eliminate all non-viable options for the Galway Wastewater Strategy (GWS). Our assessment has considered our current and future legislative obligations, risks to our customers and communities, the impacts of climate change on performance, future needs associated with anticipated growth in the region and protection of our environment.

We have incorporated stakeholder input into our optioneering process at several stages to capture broader considerations and priorities. The preferred options identified in this report have been taken forward for public consultation before finalising the strategy. Following strategy finalisation, we will confirm the strategic options to be taken forward for further appraisal and commence investigations related to site selection, environmental assessment, and statutory planning processes. The outputs of this work will inform a cost-benefit analysis and economic appraisal and will support the submission of a Preliminary Business Case as set out in the Infrastructure Guidelines¹.

1.1 Scope of this Report

The development of the GWS follows a structured methodology, to ensure that key risks and challenges to the long-term provision of wastewater services are addressed. The process ensures that decisions are evidence-based, transparent, and aligned with national planning objectives and our long-term vision.

The strategy needs to ensure that we can comply with current and future legislation, support the anticipated population and economic growth of the region, and that our environment, customers and communities are protected. To support the identification of options which will deliver these objectives, performance of our current wastewater system was modelled up to the year 2080, to test the potential impacts of future changes on existing infrastructure.

Lower bound and upper bound estimates of growth were used to assess the impact on current treatment capacity to inform the level of demand on each system (see *Appendix 1*). Modelling and climate change assessments (see *Appendices 2- 4*) were undertaken to understand the performance of assets and compliance with environmental standards now and into the future. Assessments were made relative to the baseline performance of each agglomeration, for which the year 2022 was used.

Where modelling indicated a deterioration in performance, or a greater risk to service or the environment, we undertook root cause analysis to understand the need for the identified investment. Needs were identified at three discrete time horizons – 2040, 2055 and 2080 – however, consideration was also given to needs and risks that would emerge prior to 2040.

¹ [Infrastructure Guidelines](#)

Our analysis allowed us to develop a robust understanding of the spatial and temporal changes in performance and risk relative over the short, medium, and long-term. The identified needs have informed the optioneering and feasible option development set out in this report.

1.2 Overview of the Study Area

The four UÉ wastewater agglomerations included as part of the GWS study area are made up of 35 subcatchments. These four agglomerations are Galway City (Mutton Island), Athenry, Claregalway and Moycullen. The GWS study area contains over 50 UÉ and private Wastewater Pumping Stations (WWPSs) to convey flows for treatment at the relevant WWTPs.

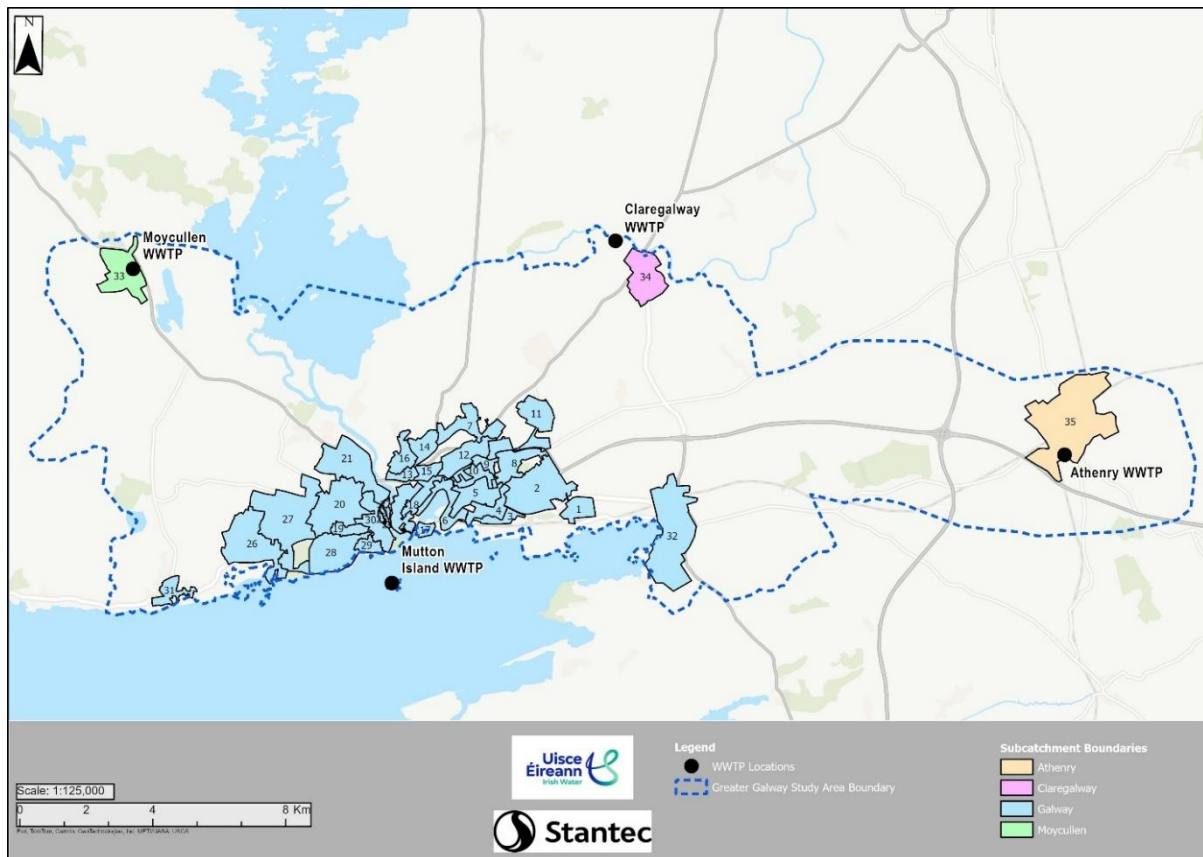


Figure 1-1: Galway Wastewater Strategy Study Area

Throughout the optioneering process we have considered both the strategic needs of the region in addition to the more localised needs of the four agglomerations - both within the networks and at the wastewater treatment plants (WWTPs). This has enabled us to develop a holistic strategy for the region which identifies the best options to ensure resilience and accommodate anticipated growth over the period of the strategy.

1.3 Optioneering Process

This report sets out the process followed, and the results of that process, to arrive at our shortlisted options. The optioneering process follows good practice to support the identification of a strategy that delivers the greatest benefit to the Galway area, whilst delivering resilient wastewater services up to the year 2080.

The high-level optioneering process is set out in Figure 1-2 and forms the basis of the sections throughout the remainder of this report. In each section we set out the process followed and the results of that process. A summary of this process is provided in section 1.3.1.

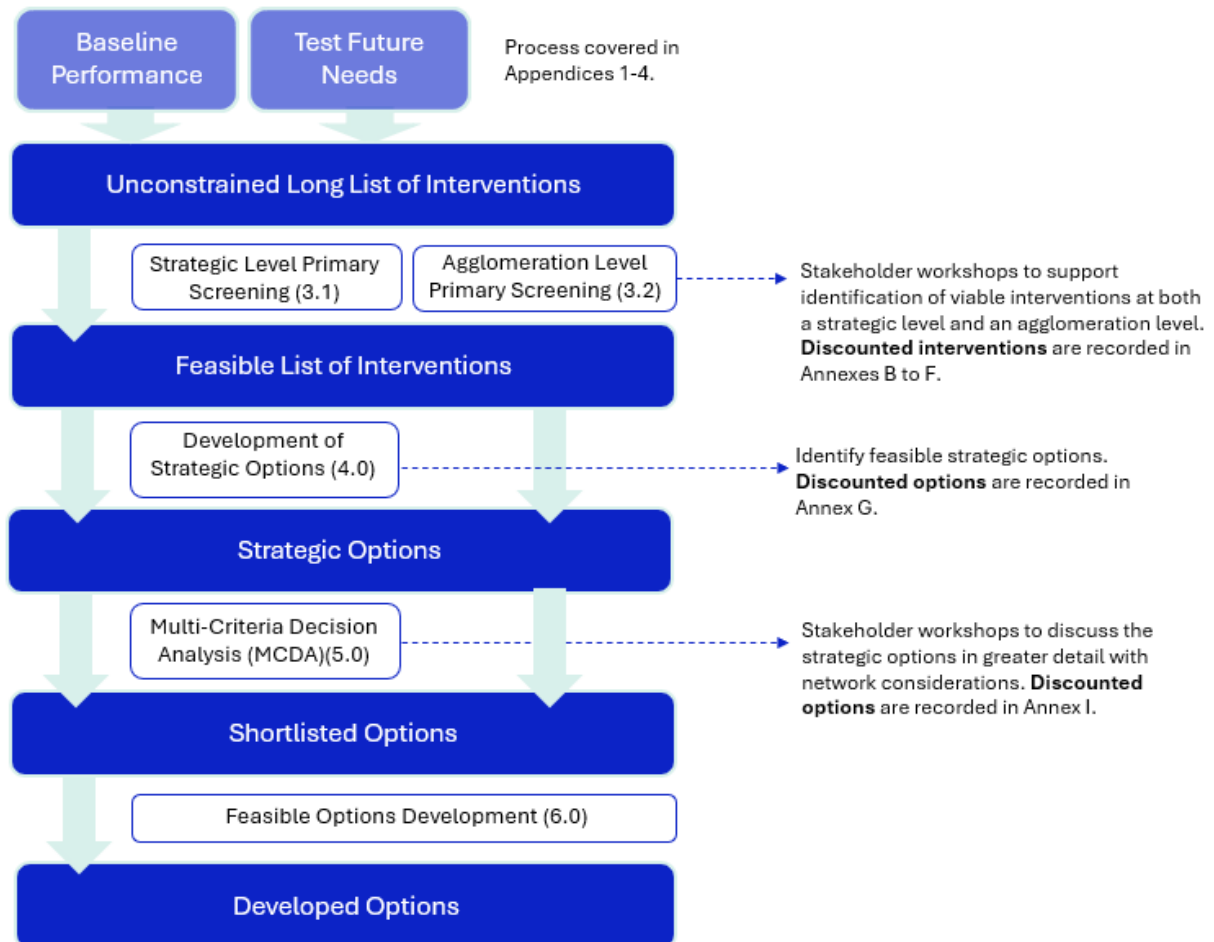


Figure 1-2: The optioneering process adopted. The relevant sections in the report are referenced for each step.

1.3.1. Summary of Optioneering Process

In accordance with good practice, we started the process with an unconstrained long list of interventions developed with internal stakeholders and subject matter experts across a range of disciplines, including strategic planning, infrastructure delivery, regulation, environmental strategy and customer operations. The long list was subsequently assessed against the strategic needs of the Galway region and the needs of each agglomeration to produce a list of feasible interventions. The modelling, system performance indicators and growth assessments were used as part of this process (Appendices 1-4).

The list of feasible interventions was then developed into strategic options to address the GWS study area needs. These strategic options were then further assessed using Multi-Criteria Decision Analysis (MCDA), a tool designed to comparatively assess the benefits of each option. This was carried out with subject matter experts, to facilitate a discussion which considered a wide range

of issues and ensure that the preferred options deliver the greatest benefit to the region. From the MCDA we took forward the highest-ranking options for shortlisting and further consideration and integration with the network solutions.

The interventions and options which have been discounted, or excluded, are provided in annexes B-I of this report, alongside the basis for their exclusion. To help readers understand the progress of interventions through the development of the strategy, we have made a distinction between intervention, option and scenario. Throughout this document we use the following terminology:

- **Interventions** are actions that we could undertake – to intervene - to address the root cause of an issue. Interventions have the potential to provide a performance improvement (e.g. capacity, compliance, resilience, cost efficiency) or mitigate a risk / need in the system.
- **Options** An option may be a single intervention or a combination of interventions, assembled into a plan to solve the particular needs arising from the GWS risk assessment. For example, Option A may have several interventions within it that consider both wastewater treatment and networks performance improvements, whereas Option B may propose a single solution. Different options provide alternative ways of meeting the planning objectives. Options are compared against each other to identify the preferred solution.
- **Scenarios** is a set of external assumptions (such as demographics, climate, regulatory) about the future under which you test your options. These have largely been tested in Appendices 1-4.

This distinction is important because it maintains structured and transparent planning and prevents the conflation of interventions with the way they are grouped as strategic options.

2. Develop an Unconstrained Long List of Interventions

The purpose of this step was to create an unconstrained list of all interventions that could partially or wholly address the identified needs. We developed the long list through engagement with internal subject matter experts and stakeholders. Established interventions were considered, with further examples taken from good practice and comparable wastewater strategies employed in the sector.

Interventions were themed and ranked within a Total Expenditure (TOTEX) hierarchy to provide a basis for comparative assessment (see Figure 2-1). The TOTEX hierarchy directly implements ISO 55001 (Asset Management) and ISO 55002 principles by focusing on the "Total Cost of Ownership." The hierarchy aligns with our Capital Investment Plan methodology, ensuring that every intervention - from policy shifts to new construction - is evaluated for its lifecycle value and long-term financial sustainability.

The application of the TOTEX hierarchy provided a structured framework for discussing and comparing options consistently and transparently. In total, there are 41 interventions and detailed descriptions of these are presented in *Annex A – Themed TOTEX Intervention Hierarchy*. The list includes both generic and more complex, sophisticated options.

Interventions were further categorised by the nature of the need that they would solve, falling into three main categories:

- **Policy and behaviour** - including policy interventions, customer behaviour and partnership working.
- **Networks interventions** - with subcategories to distinguish between sustainable and traditional approaches, and
- **Wastewater treatment interventions** - with subcategories to distinguish between sustainable and traditional approaches.

The categorisation of interventions according to the corresponding need, enabled us to explore hybrid options (i.e. combinations of complementary interventions) as well as to identify opportunities for the integration of multiple complementary interventions that could better address the challenges within the GWS Study Area.

Proposed individual interventions and combinations were discussed at a workshop with subject matter experts to test their viability. Considering interventions in this way helped to focus stakeholder discussions on the full range of possible interventions and different ways that the strategy objectives could be met, rather than focus on isolated interventions.

Discussions led to a final agreed long list of interventions for the GWS area (see Annex A – Themed TOTEX Intervention Hierarchy). Establishing a co-developed long list ensured that the list was comprehensive, reflected a wide range of perspectives, and captured all reasonable approaches before any prioritisation or screening activities commenced.

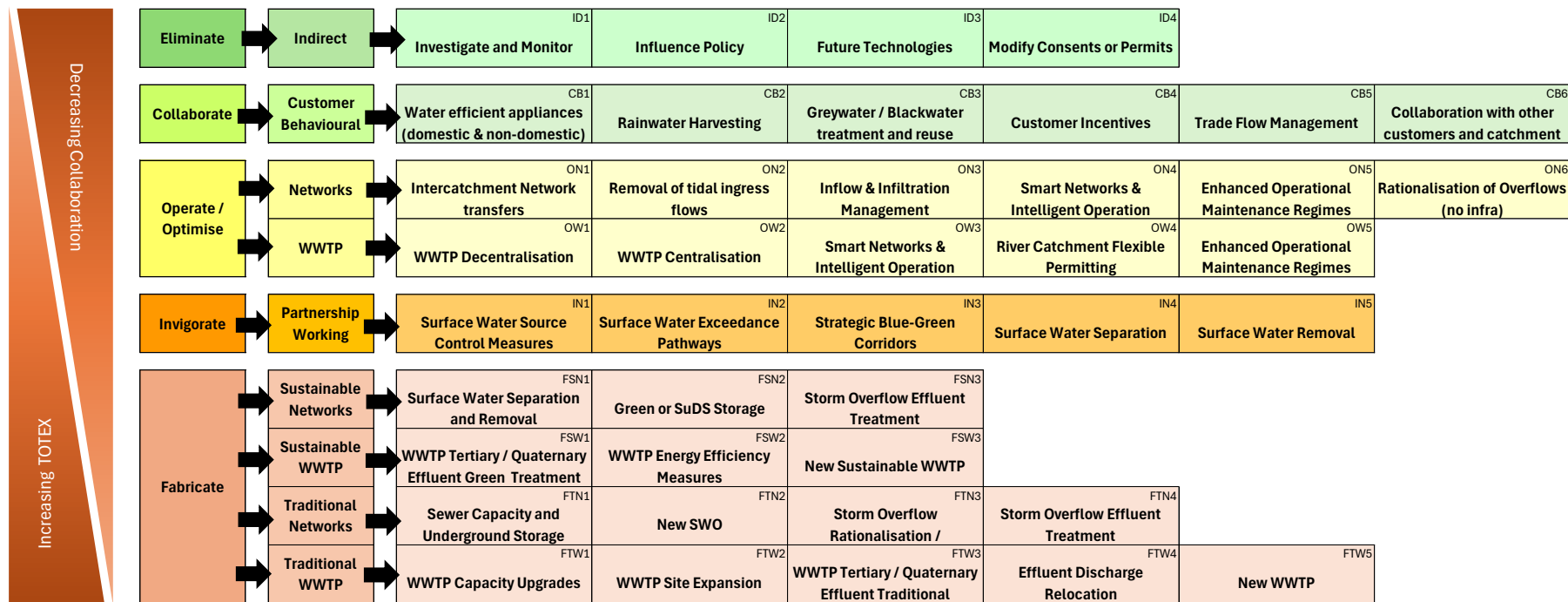


Figure 2-1: Unconstrained TOTES Intervention Hierarchy (Pre-Screening)²

² The Totes hierarchy structures interventions by whole life cost, from lowest cost to greatest. The first layer of interventions represents the likely least cost. For example, **Eliminate** focuses on indirect actions, so that investment is minimal. **Collaborate** involves working with external stakeholders to share responsibility for issues or to potentially co-fund interventions. The interventions under **Operate** focus extracting more value from current infrastructure through better maintenance, monitoring, and process control. Interventions under **Invigorate** targets investment in existing infrastructure to improve its performance and resilience and working in partnership with others to do so. **Fabricate** represents the development of new assets to augment or replace existing systems. Fabricate interventions generally carry the highest costs but offer the most assured delivery of service-related benefits. Within this category a range of types were considered, including blue-green infrastructure and innovative solutions alongside traditional grey infrastructure.

3. Primary Screening of Interventions

The primary screening step aims to develop a more focused longlist, tailored to the Galway study area. We carried out primary screening at both regional and agglomeration level. This has allowed us to consider interventions at different spatial scales to help identify a broad range of feasible interventions to take forward.

We conducted several workshops to facilitate primary screening. The workshops included a range of subject matter experts – from strategic planning, infrastructure delivery, regulation, environmental strategy and customer operations - to support the consideration of a variety of issues across multiple parameters. It is important that we consider all interventions in a consistent way, so that any biases do not influence decisions, and there is a clear audit trail. To facilitate this, we developed a list of questions to guide workshop discussions and ensure that each intervention was subject to the same level of scrutiny.

A binary decision framework - either "yes" (carry forward) or "no" (discount³) - was used to agree which interventions would be carried forward for consideration in the strategy. Table 3-1 presents several principal themes that informed the screening process during the workshops.

Table 3-1: Key themes used to guide discussions with stakeholders and support thorough consideration of interventions.

Theme	Questions Posed
Community Support	Would the intervention have an adverse impact on local communities and what would the public perception be?
Deliverability	What level of confidence is there that the intervention can safely and feasibly be delivered within the agglomeration?
Technical feasibility and confidence	How certain are we that the intervention would deliver, or contribute to the delivery of, the long-term outcome?
Resilience	Is the intervention adaptable and does it increase resilience and reduce vulnerability (no regrets)? For example, a change in circumstances / legislation / or technology within the strategy's horizon? Can it be implemented at different spatial scales?
Environmental	Is it envisaged that the intervention would have a significant environmental impact that cannot be mitigated?

Primary screening was conducted at two levels: at the *study area level*, which considers regional constraints, and at a more detailed, *agglomeration area level*, which considers local constraints. The *study area level* primary screening determined if constraints identified through growth and modelling assessments, warranted excluding certain intervention types. Remaining interventions were subsequently evaluated further to assess their suitability at the *agglomeration level*.

³ An intervention may be discounted on this revision of the Strategy but does not prevent it from future consideration should a specific need or future change occur.

Interventions with clear barriers, or low viability, were discounted and the reasons for exclusion documented in the discount register. Key reasons for discounting options related to:

- the uncertainty or suitability of the intervention to address the underlying issues,
- alignment of the intervention with regulatory objectives and
- location-specific considerations which made the intervention unsuitable for the agglomeration.

Annexes are referenced throughout this section with details on discounted options and the specific rationale. Remaining interventions, after both study area primary screening and agglomeration level primary screening, were taken forward for consideration into strategic options.

3.1 Strategic Level Primary Screening

To respond to the future challenges in the region, the strategy must deliver a number of objectives including compliance with legislation, meeting growth demands and protecting the environment and local communities. Workshops were used to facilitate discussions regarding the viability of the unconstrained long list of interventions in the context of these challenges specific to the study area as set out below.

3.1.1. Meeting Growth Demands

A significant challenge the Galway region faces over the next 50 years is accommodating growth. The locations of projected growth are shown in Figure 3-1. Overall, the total PE to be treated throughout the study area is forecast to increase by more than double to around 383,000 by 2080, with the majority occurring by 2040 (277,700 PE). The collective treatment capacity of the region is insufficient to accommodate this scale of growth. Additional capacity will need to be provided through expansion of existing WWTP(s) or the development of new WWTP(s).

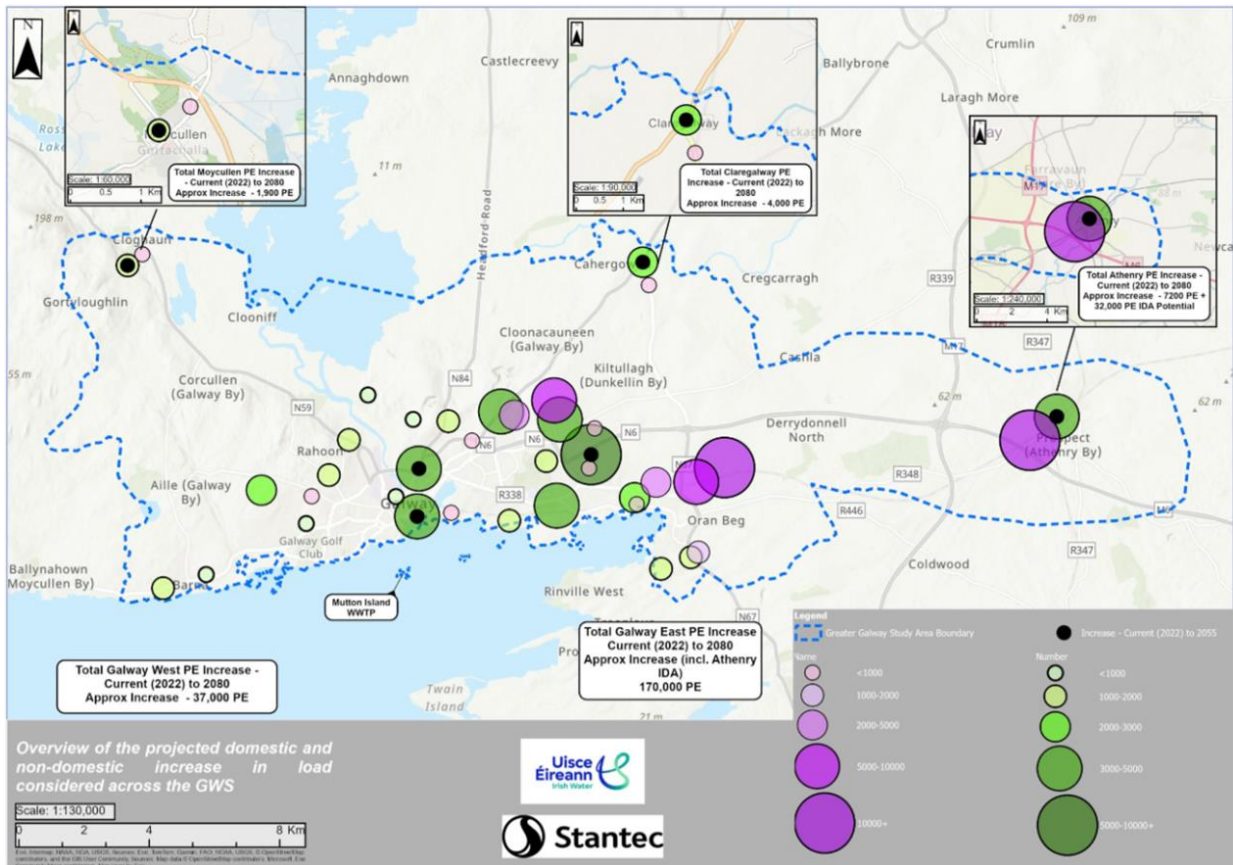


Figure 3-1 Estimated growth projections across the study area⁴

The areas that are serviced by Mutton Island WWTP and Athenry WWTP are both forecast to exceed capacity before 2055. Most of the population and industrial growth will occur to the east of the Galway City (82%), placing the greatest demand on the infrastructure in this area. We considered two principal interventions below – site expansion of existing WWTPs or developing new WWTPs to treat **all** the 2080 load.

Site Expansion

The Totex hierarchy prioritises the expansion of current WWTPs over the development of new WWTPs, as this option has the benefit of maximising the use of existing assets and infrastructure. The feasibility of expansion at each of the four existing WWTPs was assessed at a high level against the strategic treatment needs to 2080 (i.e. to transfer and treat all the additional load generated by growth to an existing WWTP asset).

Each site was evaluated to assess if capacity could be increased to absorb local growth in addition to regional growth. This evaluation included assessing if future compliance with current environmental and regulatory standards could reasonably be achieved with the **anticipated increased loadings**. A summary of the key considerations and findings is set out in Table 3-2.

⁴ The separation between East and West is the River Corrib and Estuary.

Table 3-2 Summary of key considerations in assessing existing WWTPs for expansion to accommodate strategic growth

Site	Expansion considerations	Strategy decision
<p>Mutton Island</p>	<p>Initial assessment has identified that the capacity of the site could be increased using a current Best Available Technology (BAT).</p> <p>However, spatial constraints on site and the resilience of the site when considering asset age, climate change and the requirements outlined within the recast UWWTD alongside possible tightening of future environmental standards, increase the performance and environmental risks associated with this option. There were also concerns associated with phasing of the solution whilst keeping the existing WWTP operational. The construction would also be in a Special Protection Area (SPA) and Special Area of Conservation (SAC).</p> <p>Further details on the strategy for Mutton Island are provided in section 3.2.</p>	<p>Expansion for this site was discounted due to the feasibility of expansion.</p>
<p>Claregalway</p>	<p>The expansion of either site to accommodate all the regional growth would lead to a significant increase in projected loadings. Due to the distance of each WWTP from the anticipated growth areas, extensive conveyancing network and pumping would be required.</p> <p>There is limited assimilative capacity within the Ballycuirke canal and although greater within the River Clare, neither would be able to accommodate the required increase in load.</p>	<p>Expansion for these sites was discounted due to technical and environmental infeasibility.</p>
<p>Moycullen</p>	<p>Both sites currently discharge to Lough Corrib, through tributaries, which is an ecologically important water body and a critical source of drinking water for the local population. The area is also a Special Protection Area (SPA) and Special Area of Conservation (SAC).</p>	
<p>Athenry</p>	<p>Water quality modelling indicates that the local river has limited assimilative capacity which is projected to be further exacerbated by climate change pressures during summer, such as</p>	<p>Expansion for this site was discounted as the long-term resilience was considered low given</p>

Site	Expansion considerations	Strategy decision
	<p>reduced river flows and increased water temperatures.</p> <p>The Clarin river is in a karst catchment and is identified as a sensitive water body. Tightening of water quality standards would pose treatment challenges to ensure no environmental harm, which represents a long-term risk.</p>	<p>the environmental sensitivity of the local receiving water environment.</p>

None of the existing WWTPs were identified as viable options for expansion to treat all the projected growth, which led to us discounting the WWTP expansion from the list of interventions.

New Wastewater Treatment Plant

From the regional distribution of projected growth scenarios, we identified three feasible strategic areas for the development of a new WWTP; a western regional WWTP, a northern regional WWTP or an eastern regional WWTP. Determining the precise location of a proposed WWTP is not required at this stage; a detailed site selection process will be undertaken following the completion of the Strategy. Instead, indicative locations were considered sufficient to support strategic scenario testing. These WWTP options (Figure 3-2) are taken forward for further consideration (see Section 4).

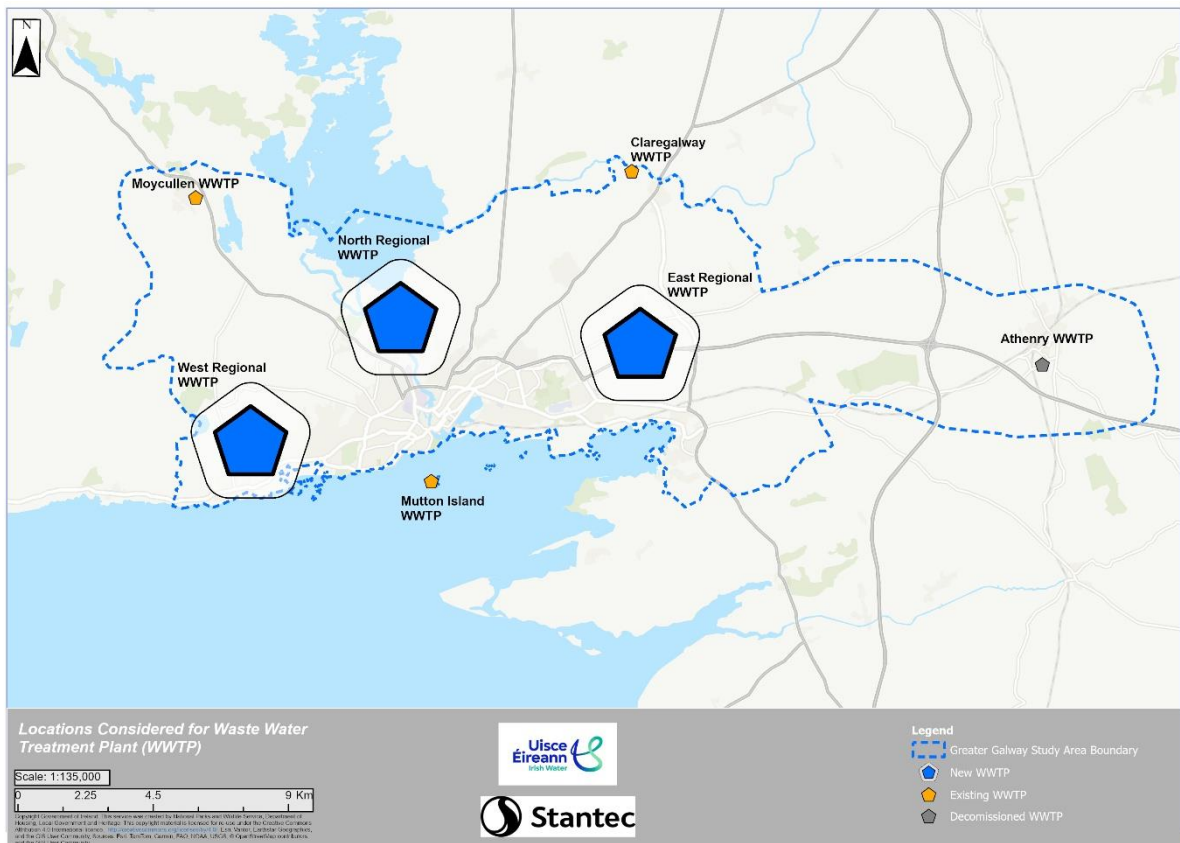


Figure 3-2 Three locations considered for future Wastewater Treatment Plant (WWTP)

3.1.2. Compliance with legislation

A key objective of the Strategy is that it delivers compliance with the key legislative and regulatory drivers now and into the future. Key legislation considered is the Water Framework Directive (WFD), the Urban Wastewater Treatment (UWWTD) Regulations, with due consideration to changes implemented in the recast UWWTD (rUWWTD), and the wastewater discharge regulations. The objective of these regulations is to protect human health and the environment from the adverse effects of insufficiently treated wastewater and meet national and European water quality standards.

At a strategic level we have discounted the intervention of **reviewing our discharge license** (modify consents and permits in Hierarchy) and the **consideration of flexible permitting / licensing**. These options do not resolve the underlying issues and therefore do not support the delivery of a strategy which protects our environment.

In addition to tighter discharge allowances, Article 7 of the rUWWTD introduces new national treatment standards with phased targets up to 2045. By 2039 tertiary treatment will be mandatory for agglomerations over 150,000 PE ~~2039~~ and over 10,000 PE, discharging to sensitive areas by 2045. Quaternary treatment, targeting micropollutants, will be required for agglomerations over 150,000 PE (and conditionally over 10,000 PE by risk assessment) by 2045. We discounted the intervention of **sustainable treatment streams to deal with emerging legislative targets** as it was considered unlikely to deliver the outcomes needed at the scale required.

3.1.3. Protecting the Environment

We must further consider the environmental impacts arising from growth and climate change and take steps to ensure that our water bodies are not negatively affected. Additional legal requirements stemming from the recast EU Urban Wastewater Treatment Directive (rUWWTD) will support this objective. Such requirements may include upgrading treatment standards in some cases, as determined by the facilities capacity and location relative to sensitive receiving water bodies.

Growth and climate change will place additional demands on the wastewater system and increase the risk of flooding and the use of stormwater overflows. We considered the creation of **new SWO's**, identified as a potential network intervention, however these were not carried as they would not address the strategic needs identified within the agglomerations. As such, we did not carry this intervention forward.

The rUWWTD requires that storm water overflows (SWOs) are controlled and minimized to prevent environmental damage during heavy rainfall events. An indicative non-binding objective has been introduced, which sets out that storm water overflow represents less than 2 % of the annual collected urban wastewater load calculated in dry weather conditions.

Climate change is likely to result in higher frequency storm events with increased intensity of rainfall. We considered **Surface Water Source Control Measures** and **Surface Water Exceedance Pathways**. The former includes opportunities for large-scale source control, such as retrofitting in highways and around buildings. This option was discounted due to difficulty in implementing it at the scale required to realise the benefits and other interventions may be more

effective. **Surface Water Exceedance Pathways** provide safe escape for floodwater during extreme rainfall events. This option is particularly limited within built-up areas due to the space required to carry it out. As the vast majority of surface water risk is within the Galway area, there is very limited scope for the implementation of this intervention across the study area. As these specific interventions are not carried, other measures to manage surface water flows entering the wastewater system, that will require partnership working are carried for consideration (IN3 – IN5). Some of these at a local scale may include elements of discounted surface water interventions that should be assessed at a local level for viability.

3.1.4. Summary

Within the Totex hierarchy, we identified several interventions that are integral in supporting the sustainable development of the Galway Wastewater Strategy. The interventions which drive policy or customer behavioural change, captured against the ‘eliminate’ and ‘collaborate’ categories (Figure 3-4), were all carried forward as ubiquitous strategy objectives. These are not specific to catchments but will be applied across the region to support the delivery of sustainable wastewater solutions in the long-term. The intervention to “Investigate and Monitor” remains as a feasible option as the strategy moves from a strategic level to a planning level.

Initial screening of the TOTEX Hierarchy identified several interventions which would not be carried forward for further assessment. These are summarised in Figure 3-4 and the reason for discounting logged within the discount register in Annex B.

In summary, ten interventions were discounted, while an additional six were carried forward but not included in agglomeration-level screening. Consequently, 25 intervention types remained for agglomeration-level screening (shown illustratively in Figure 3-5). Figure 3-5 shows the consolidated Totex Hierarchy used for the agglomeration level screening.

Figure 3-3: Strategic Primary Screening Summary

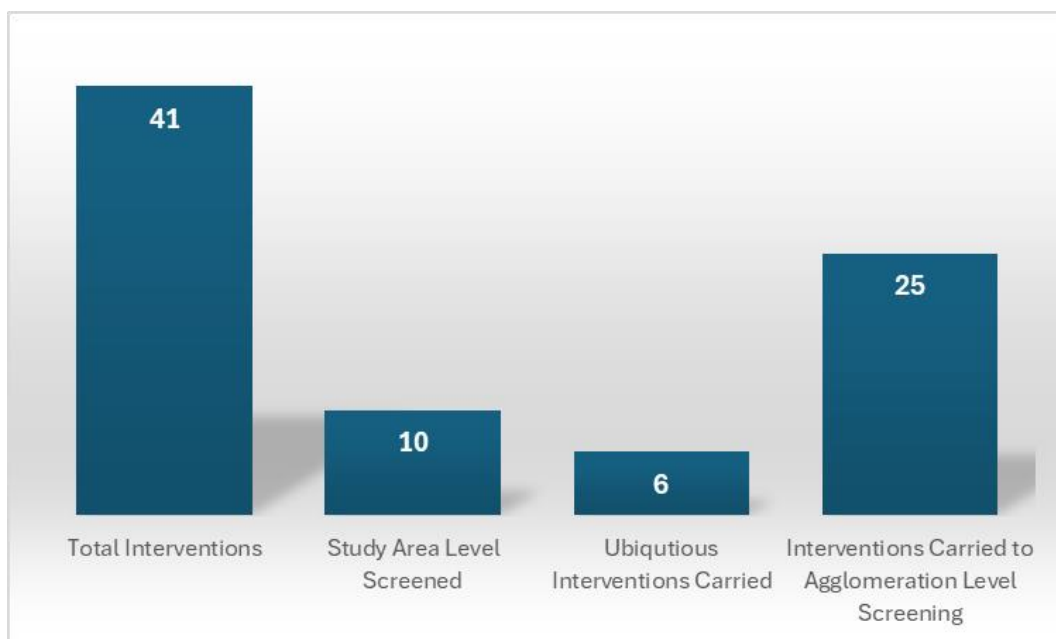


Figure 3-4: TOTEX Intervention Hierarchy: Study Area Level Screened

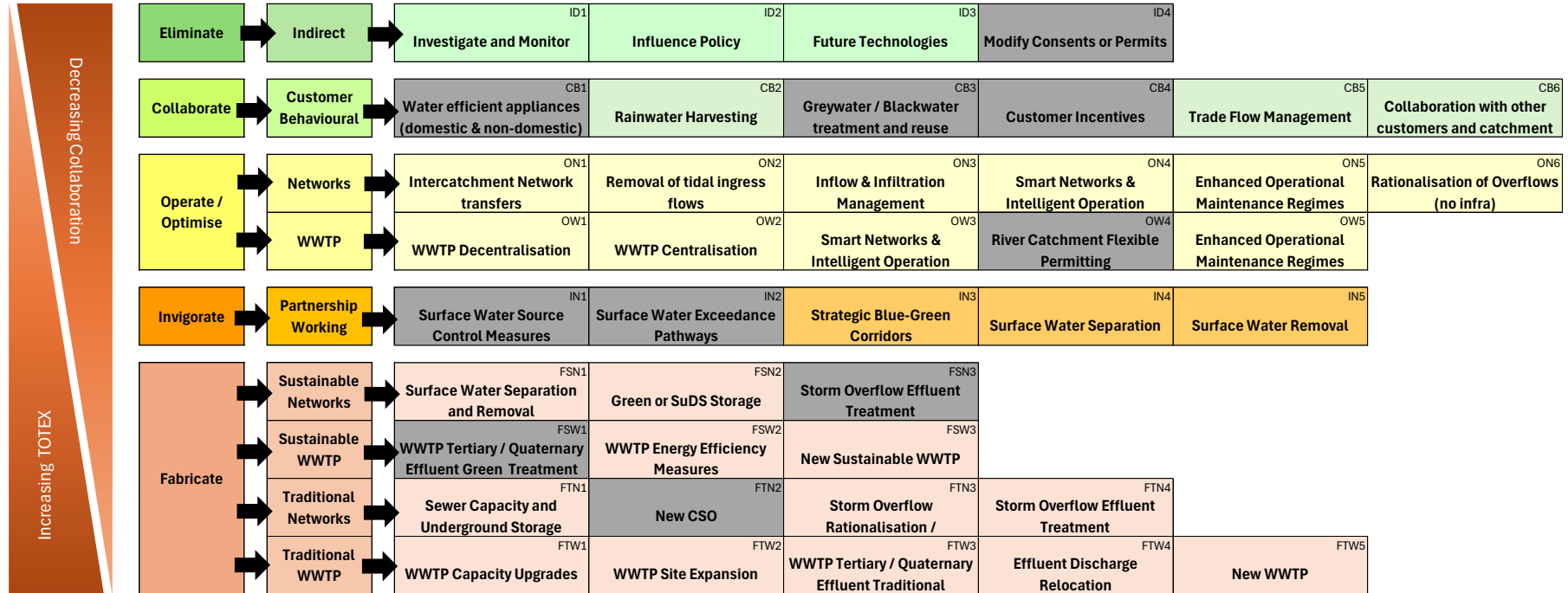
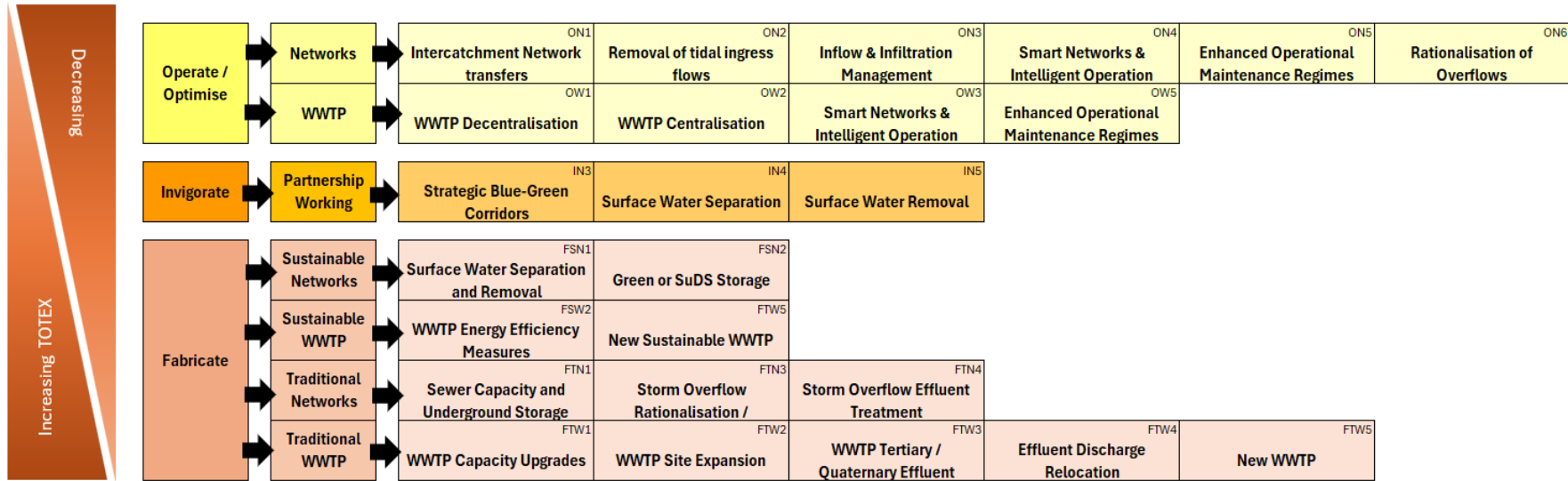


Figure 3-5: Consolidated TOTEX Intervention Hierarchy: Company Level Screened



3.2 Agglomeration Level Primary Screening

Primary screening was further carried out at an agglomeration level, which considered the specific risks and issues identified in each of the four agglomerations. The purpose of primary screening at the agglomeration level was to identify local constraints and dependencies. We have considered the results of the performance analysis, including modelling, which examined the likely impact of growth and climate change on performance. Appendices 3 and 4 were critical inputs into the screening of interventions.

For each intervention we re-considered the key themes in Table 3-1. For each area we have provided a brief introduction and outlined the performance risks before presenting the key constraints relating to possible interventions for each WWTP and for the network.

Network sensitivity testing

To support the identification of successful network interventions we undertook sensitivity modelling to evaluate the likely efficacy of different network intervention strategies identified within the TOTEX Hierarchy. The study area comprises a strategic wastewater network model and the networks within it range from older combined systems in urban centres like Galway City and Athenry to fully separate systems in newer settlements, such as Claregalway. Combined and partially separate sewerage networks, along with their associated storm water overflow (SWO) outlets, exhibit performance variability primarily determined by the proportion of impermeable surfaces within their catchment areas, prevailing rainfall patterns, and system ingress impacts. They can also have an impact on flooding risk within the areas.

The modelling specifically assessed the sensitivity of the network to traditional combined sewer separation, urban runoff misconnections to the wastewater system, and both tidal and groundwater infiltration. The sensitivity of the results enabled us to identify which interventions would have the greatest impact on the SWO's in the relevant agglomeration to assist the screening process.

3.2.1. Galway City (Mutton Island) WWTP

Mutton Island WWTP serves Galway City and suburbs, including Oranmore and Bearna. The catchment is separated into an east section and a west section, separated by the River Corrib. It is Ireland's third largest wastewater treatment plant. The size of the WWTP and catchment make this the most significant agglomeration within the study area.

The WWTP collects and treats domestic and commercial sewage as well as surface water from both combined and partially separated sewer systems. The majority of SWO's in the study area (26 of 29) are in the Galway City agglomeration. **As such, a high proportion of the identified study area risks are confined to this critical agglomeration.** Some SWOs are in close proximity to bathing waters, waters used for recreational purposes, and protected habitats (e.g. SACs and SPAs), where untreated storm water overflow load must be strictly controlled under new requirements outlined within the recast Urban Wastewater Treatment Directive (rUWWTD).

The WWTP comprises preliminary, primary, and secondary treatment processes, with a design PE of 170,000⁵. The facility currently discharges via a 400m sea outfall into the Corrib Estuary.

Performance Indicators Summary

The assessment of risk is included in *Appendix 3 – Status and Performance of the Wastewater System*. Performance indicators have been assessed across the current baseline scenario and across future horizons (2040, 2055, 2080) to evaluate the impact of growth and climate change on the existing system. This has enabled us to identify where interventions are required and to establish which interventions will be effective. Figure 3-6 shows the changes in performance indicators risk up to the year 2080.

Galway City	Network					Wastewater Treatment Plant	
	Flood risk ¹ (# of sub-catchments)			Storm Overflow		Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
	Red	Amber	Green	PCRSWO ²	rUWWTD ³		
Baseline	3	3	27	Red	Grey	Yellow	Yellow
2040	7	4	22	Red	Yellow	Red	Red
2055	11	4	18	Red	Red	Red	Red
2080	11	4	18	Red	Red	Red	Red

1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.

2. This is an assessment against current SWO performance criteria (PCRSWOs)

3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 3-6: Mutton Island Performance Indicators Summary

⁵ [Annual Environmental Report 2024](#), Uisce Éireann, 2025

Mutton Island WWTP Constraints

Capacity – Based on upper bound growth projections for this agglomeration, there will be an increase in wastewater load of over 200,000 PE from 2022 to 2080. The WWTP is projected to reach its operational limit by 2040. If housing development accelerates over the next 15 years at the rate specified in the RSES, the facility's capacity may be exceeded before 2040.

The flow entering the WWTP is hydraulically limited, which means that monitoring may not have captured the full diurnal flow pattern experienced in wastewater agglomerations. We have assessed the treatment efficacy based on current loadings and the WWTP is compliant with its discharge licence, however, further assessment of the wastewater treatment plant and a resilience upgrade is recommended to ensure compliance with the discharge licence to accommodate short term growth.

Compliance – In the medium-term, several upcoming legislative changes will impact Mutton Island WWTP. Under the rUWWTD, the plant will need to implement tertiary treatment by 2039, and quaternary treatment by 2045. The plant's design as a carbonaceous treatment facility presents a considerable challenge for meeting these additional requirements. **WWTP Capacity upgrades and Tertiary/ Quaternary Effluent Traditional Treatment** were discounted due to technical feasibility concerns and the environmental and operational risks of expanding the site beyond the current boundary (please see Appendix 3 for further details). Considering regulatory risk and resilience, and the physical expansion constraints of the current WWTP, it is not considered feasible for the plant to accommodate the forecasted growth of this Strategy in the medium to long term. **Effluent Discharge Relocation** was considered, to relocate discharge to a larger waterbody with greater dilution. This option was discounted due as it was not in line with the strategy's objectives or addresses the study area needs and was limited by on-site expansion capability.

Environment - The expansion of site capacity is principally restricted by its island location. Conventional Activated Sludge Processes (ASP) cannot be built in the available space. Expanding beyond the site boundary is not considered feasible due to the environmental sensitivity of the area, flooding risks associated with sea level rise and prohibitive costs associated with land reclamation and construction. This led to the discounting of **WWTP Site Expansion**.

Under the rUWWTD, the site will need to achieve energy neutrality targets by 2045 due to its size. This requirement should also be considered alongside the need to take advantage of renewable energy usage and recovering valuable resources, such as phosphorus from sludge.

WWTP Primary Screening Considerations

Three interventions were identified as viable options for Mutton Island WWTP:

- **WWTP Decentralisation**
 - **Resilience Upgrade,**
 - **WWTP Efficiency Measures.**
-
- **WWTP Decentralisation:** There is a clear risk of maintaining compliance with regulatory discharge standards by 2040 given the projected increase in loadings and the tightening of

regulatory standards. The site limitations in terms of capacity indicate that **WWTP decentralisation** is a viable option to protect the existing infrastructure from overloading and help to minimise the impact to the environment.

- **Resilience Upgrade:** A limitation of WWTP decentralisation is that there is no available location to treat the wastewater load in the short term. As such, it is recommended that a resilience upgrade process be implemented in the short term, to ensure the plant meets its current discharge license requirements and extends the design life of the wastewater treatment plant (WWTP) to support anticipated growth up to 2040. This will allow time for capacity to be created elsewhere.

Engineering evaluation indicates that downsizing the WWTP to approximately 100,000 PE, while maintaining appropriate headroom, would effectively manage potential future regulatory risks on a constrained site in the long-term (beyond 2040). This approach will require a phased transfer of load away from Mutton Island to an alternative site, when one is identified.

- **WWTP Efficiency Measures:** The rUWWTD requires that WWTP's treating above 10,000 PE must achieve energy neutrality by 2045. **WWTP Energy Efficiency Measures** will be taken forward as an important intervention to support meeting this objective. The scope of the site to implement energy efficiency measures, is beyond the scope of this strategy.

Primary screening and performance indicator analysis in Appendix 3 has established the necessity for an interim resilience upgrade to Mutton Island to accommodate anticipated growth up to 2040. The upgrade will ensure that the site can maintain compliance with our discharge license and seek to maximise the use of existing assets. Beyond 2040 a staged transfer of load to the new WWTP will be undertaken to ensure the long-term viability of Mutton Island. Opportunities to implement energy efficiency measures will be explored at each opportunity to progress the site towards energy neutrality by 2045 and make better use of recycled resources.

Galway City Network Constraints

Capacity – The Galway city network has the highest concentration of SWOs in the region and a high proportion of impermeable surfaces draining into the combined sewer and partially separate networks. This causes large peak flows in the network during wet weather, which can increase the risk of wastewater loss via SWOs.

The rUWWTD includes an indicative non-binding objective that the percentage of SWO load that is untreated - in relation to the percentage of annual collected urban wastewater load in dry weather conditions - cannot be greater than 2%. Assessment of the baseline performance indicates that the Galway City agglomeration loses between 2 to 5% of load. As the growth in Galway City is due to increase, this risk has been increased beyond the 2040 horizon.

Modelling various interventions against SWO performance was carried out to identify which options had the greatest impact. Results indicate that the SWO's located in Galway City are most sensitive to solutions targeting **tidal ingress** and the **removal of stormwater to wastewater cross connections**. **Combined sewer separation** is also shown to be an effective solution for select SWOs, although this is more difficult and costly to carry out. **Groundwater and tidal**

infiltration reduction is an effective intervention in more coastal areas of the catchment, specifically in Salthill, Grattan Road and Oranmore sub-catchments. **SWO Environmental Performance** – We have reviewed constraints against the requirements related to the management of SWO's set out in the rUWWTD and in the Performance and Criteria in relation to SWOs (PCRSWO). Assessment of the Galway network performance identified 4 SWOs in the agglomeration which currently cause visual or aesthetic impacts and are subject to complaints (refer to Appendix 3 – Status and Performance of the Wastewater System).

There are four SWO's in the agglomeration which discharge in proximity to bathing waters. All SWOs in proximity of these bathing waters are meeting the less than 3 spills per bathing season on average requirement. Therefore, the risk associated with this performance indicator is low. One SWO has been identified as operating in dry weather and is currently undergoing further investigation. For precautionary purposes, this SWO is designated as elevated risk for strategy development.

Flooding Performance - A baseline risk to internal and external sewer flooding was identified - at the sub-catchment level - in areas to the west of Galway City and the centre of Galway City. This flood risk increases over time as a result of growth and the impacts of climate change. The network system is predominantly combined in these areas, which suggests that increased **separation of surface water** could help mitigate this risk.

Network Primary Screening Considerations

The primary screening has identified several interventions which should be carried forward from this stage. SWO's which do not currently meet requirements will be prioritised.

- ✓ **Combined sewer separation**
- ✓ **Removal of Storm Water to Wastewater cross connections**
- ✓ **Tidal Ingress Reduction**
- ✓ **Groundwater/Tidal Infiltration Reduction**
- ✓ **Smart Networks and Intelligent Operation**
- ✓ **Surface Water Separation**
- ✓ **Strategic Blue-Green Corridors and Green or SuDS Storage**
- **Combined sewer separation, Removal of Storm Water cross connections, Tidal Ingress Reduction, Groundwater/Tidal Infiltration Reduction:** Modelling analysis of the network has identified that each of the four interventions assessed will be relevant for different areas of the network in Galway City and Oranmore. As such, **combined sewer separation, removal of storm water cross connections, tidal ingress reduction** and **groundwater/tidal infiltration reduction** are all taken forward as viable interventions.
- **Smart Networks and Intelligent Operation** cover a broad range of approaches but fundamentally will allow the system to be operated proactively. In the case of phasing flows from the Mutton Island to a new regional WWTP, the transition to smart networks will be highly

beneficial. This will support service continuity before the existing facility reaches its capacity limit. Active sewer control should be investigated as part of this intervention to create capacity further downstream and limit the load lost.

- **Surface Water Separation and removal** are both retained as an intervention for use in areas where combined / partially separate systems result in a higher flood or environmental risk.
- **Strategic Blue-Green Corridors, Green or SuDS Storage:** To address medium and long-term needs there may be the opportunity to introduce green or nature-based solutions to mitigate future issues. As such, **Strategic Blue-Green Corridors** and **Green or SuDS Storage** are taken forward as viable interventions to create additional capacity in the network in partnership with local authorities (see Figure 3-7).

Primary Screening Outcome

After a comprehensive evaluation of the catchment’s performance, risks, and resilience, the following residual interventions were advanced to the subsequent stage for further integration within the Strategy (see Figure 3-7). The discount register has been duly recorded in Annex C – Primary Screening Discount Register: Agglomeration Level – Mutton Island.

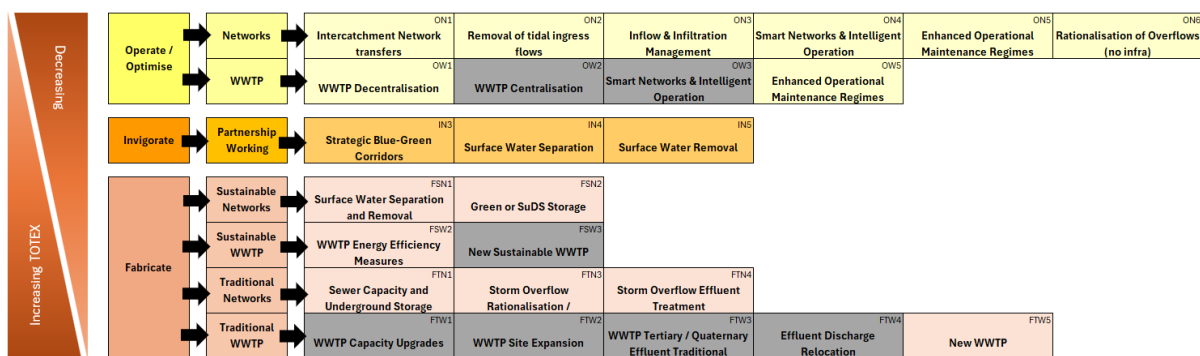


Figure 3-7 Residual effective interventions for Mutton Island

3.2.2. Athenry

Athenry WWTP serves Athenry agglomeration, which is located approximately 22km east of Galway City and situated on the River Clarin. The Athenry WWTP is located to the south-west of the town within the townland of Prospect, on a site approximately 1 hectare in area. Wastewater is conveyed by gravity and small pump stations to an activated-sludge plant. The treated effluent is discharged to the River Clarin via gravity. The River Clarin flows south-westwards until it meets the sea at Dunbaulkin Bay which forms part of the Galway Bay Complex SAC and Inner Galway Bay SPA.

Performance Indicators Summary

The assessment of risk is included in *Appendix 3 – Status and Performance of the Wastewater System*. Performance indicators have been assessed across the current baseline scenario and across future horizons (2040, 2055, 2080) to evaluate the impact of growth and climate change on the existing system. This has enabled us to identify where interventions are required and to establish which interventions will be effective. Figure 3-8 shows the changes in performance indicators up to the year 2080.

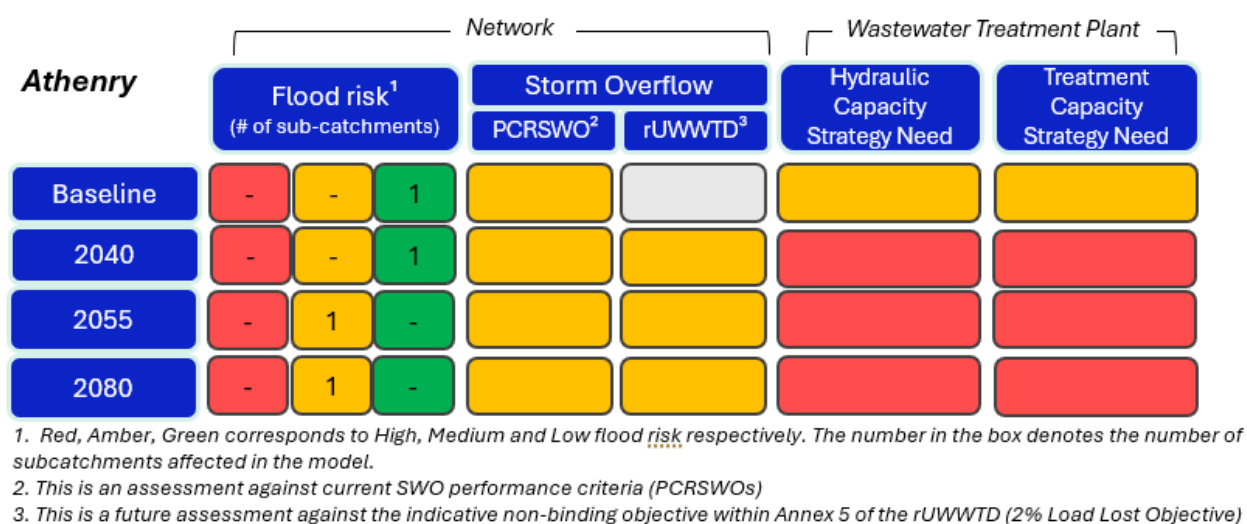


Figure 3-8: Athenry Performance Indicators Summary

Athenry WWTP Constraints

Capacity - The site has a capacity of 9,500 PE⁶ with a current estimated load of ~6,000 PE. Projected loads of 13,800 PE by 2080 will far exceed the site’s current capacity. There is a risk that if housing development accelerates over the next 15 years at the rate specified in the RSES, the facility’s capacity may be exceeded by 2030, without intervention.

Athenry WWTP has a capacity of 9,500 PE but in 2024 the peak load collected was 6,206 PE⁴. As the plant operates below peak capacity, one treatment streams is currently offline (stream 2) which can be brought into service to accommodate catchment growth. Additional treatment capacity up

⁶ [Annual Environmental Report 2024](#), Uisce Éireann, 2025

to 10,000 PE can proceed, before additional plannings and approvals may be required. However, there is insufficient headroom to accommodate all future growth.

Compliance - Investigation into WWTP performance highlighted that there is a need for an immediate resilience upgrade focused on enhanced nutrient removal to ensure that the WWTP remains compliance with its discharge license to accommodate short term growth. The ammonium and orthophosphate limits at this WWTP are particularly challenging and are representative of the sensitive nature of the receiving waterbody. Anticipated growth increases will drive the need to meet tighter environmental standards under the rUWWTD. There is a risk that the site will be unable to meet future discharge license requirements with available treatment technology.

Environment - The River Clarin is a sensitive karst environment and flow estimation in the river remains uncertain due to the complex geology and a lack of local data. The river discharges into the ecologically critical Galway Bay Complex SAC/SPA. The dilution available in the River Clarin is low and modelling indicates that the river flow may lessen in summer with climate change, resulting in further reductions in assimilative capacity. Water quality modelling indicates that treatment standards for the WWTP in future would not be viable using existing known technologies, resulting in continued discharge to this receiving watercourse unviable in the medium to long term.

WWTP Primary Screening Considerations

Based on the constraints discussed above, several interventions were carried forward as feasible options.

- Resilience upgrade
 - WWTP decentralisation
 - Effluent Discharge Relocation
- **Resilience Upgrade:** There is significant growth anticipated in the area from now to 2040. A **resilience upgrade** – developing existing assets on the site – offers a viable intervention to accommodate this growth in the short term. Beyond 2040 the WWTP may no longer be a viable option due to treatment constraints and the limited assimilative capacity of the receiving water body. (A new WWTP discharging to the same location will also not be viable and was screened out – see Section 3.1).

In the medium term:

- **WWTP decentralisation** is identified as a feasible intervention beyond 2040, when an available WWTP is available, to manage the environmental risks from increased loadings at the site. Transferring the load from Athenry to an alternative regional facility is recommended to ensure long-term growth for the area.

The balance of loads between Athenry WWTP and an alternative regional WWTP will be determined based on the conveyance constraints and location of Athenry from this new facility. The Athenry WWTP should be transitioned to a pumping station, to allow for the decommissioning of legacy treatment components like aerators and clarifiers in favour of repurposing settlement tanks into wet wells or attenuation storage. By transferring load to a

new regional facility with higher treatment standards, the environmental risk of discharging effluent into the river Clarin should be avoided in the medium to long term. **Effluent discharge relocation** should be considered as a viable intervention in combination with the transitioning from a WWTP to a WWPS for strategy option development.

Athenry Network Constraints

There are two SWO's in Athenry, both terminal SWO's at the WWTP (i.e. positioned at the end of the network within the WWTP). Assessment of the Procedures and Criteria in relation to SWOs shows that neither are currently subject to visual or aesthetic impact and neither operate in dry weather. There is an increasing risk from intermittent discharges to water quality in line with agglomeration growth. Modelling demonstrated that intermittent discharges are not at risk of causing ecological harm to the River Clarin, based on Fundamental Intermittent Standards (FIS), however, the UPM High Polluting Standards (which aren't legal targets in Ireland) suggest that the intermittent discharges may potentially have an ecological impact on the receiving watercourse. For this reason, the network is given medium risk status in relation to intermittent discharges. In relation to non-conformance with the non-binding objective outlined in Annex V of the rUWWTd the agglomeration is a risk. Several interventions were discounted on the basis that they would not be effective – **intercatchment network transfers, rationalisation of overflows or abandonment**, and **surface water separation** were discounted. There is no evidence of tidal ingress in this area, as expected, so this intervention was discounted.

Network Primary Screening Considerations

The primary screening identified several interventions which should be carried forward from primary screening:

- ✓ **Removal of storm water to wastewater cross connections**
- ✓ **Nature-based interventions**
- ✓ **Sewer capacity and underground storage upgrades**
- ✓ **Smart networks technologies**
- **Removal of storm water cross connections:** Modelling sensitivity analysis identifies surface water management as a high-priority intervention to improve SWO performance and mitigate flood risk in the short-medium term. This approach targets direct stormwater ingress points within the area, as this approach has proven effective in reducing both the volume and duration of storm water overflow discharges. This may be used in conjunction with **nature-based interventions** to reduce the load lost.
- **Nature-based interventions:** Athenry has a high proportion of impermeable surfaces leading to greater run-off. Future development in the area will further contribute to the loss of more permeable surface. Several nature-based interventions have the potential to mitigate this impact and are thus carried forward - **Strategic Blue-Green Corridors**, and **Green or SuDS Storage**.

- Sewer Capacity and Underground Storage Options:** In the medium to long term, growth and climate change will place additional demand on the existing assets. **Sewer capacity and underground storage upgrades** can work to reduce storm water overflows discharges and can be used in conjunction with **smart networks technologies** to maximise existing capacity within the networks.

In considering the conversion of the WWTP into a pumping station, the network will need to manage multiple future inflows while maintaining the functionality of the existing on-site Storm Water Overflow (SWO). To ensure network resilience and prevent downstream surcharging, the converted pumping station will need sufficient attenuation capacity and upscaled pumping infrastructure to handle peak flows while mitigating the risk of premature SWO activation during heavy rainfall events.

Primary Screening Outcome

After a comprehensive evaluation of the catchment’s performance, risks, and resilience, the following (Figure 3-9) residual interventions were advanced to the subsequent stage for further integration within the Strategy. The discount register has been duly recorded in Annex D – Primary Screening Discount Register: Agglomeration Level – Athenry

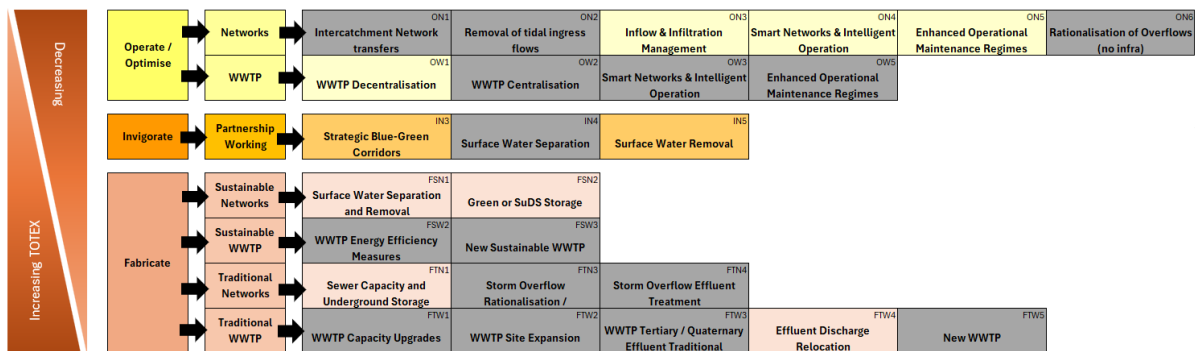


Figure 3-9: Residual effective interventions for Athenry

3.2.3. Claregalway

Claregalway WWTP serves Claregalway agglomeration, approximately 10km northeast of Galway City. The Claregalway WWTP is situated west of the village and operates alongside Claregalway WWPS, which transfers wastewater to the WWTP. The agglomeration has a separate, foul-only network serving approximately 2,408 PE⁷.

Final effluent from Claregalway WWTP discharges into River Clare. The WFD assessment of the waterbody⁸ is ‘Good’ upstream of the discharge location and achieves “High” status for BOD and ammonia, and “Good” status for orthophosphate. The River Clare downstream⁹ was classified WFD Poor in the 2019-2024 assessment on grounds of Invertebrate Status or Potential. There are no storm overflows within the Claregalway agglomeration contributing to this status.

Performance Indicators Summary

The assessment of risk is included in *Appendix 3 – Status and Performance of the Wastewater System*. Performance indicators have been assessed across the current baseline scenario and across future horizons (2040, 2055, 2080) to evaluate the impact of growth and climate change on the existing system. Figure 3-10 shows the changes in performance indicators up to the year 2080.

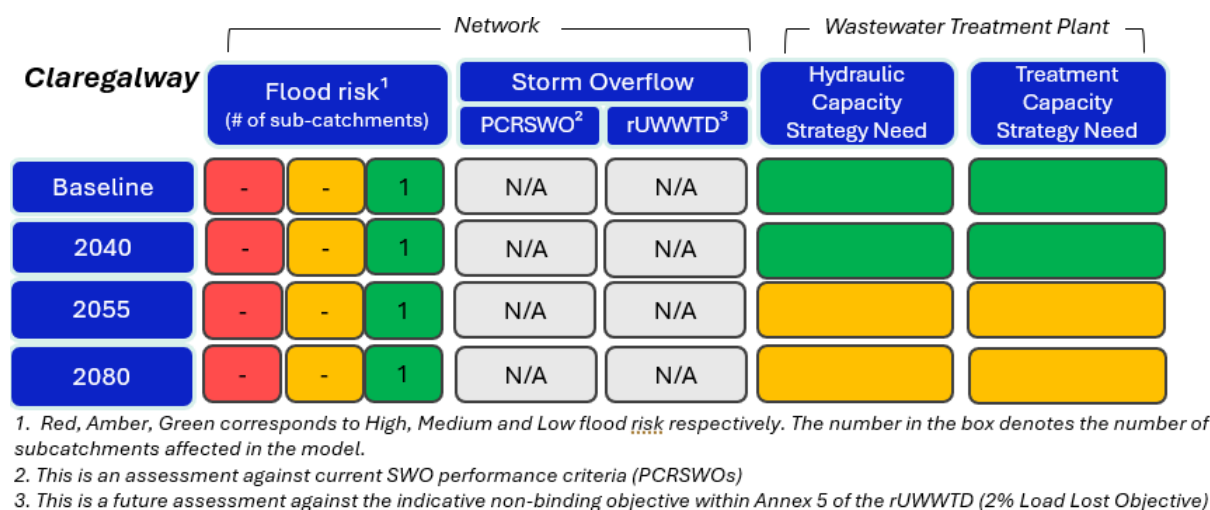


Figure 3-10: Claregalway Performance Indicators Summary

Claregalway WWTP Constraints

Capacity - The WWTP has a capacity of 6,000 PE⁶ and treats wastewater using preliminary and secondary treatment processes. Growth projections show that there is a risk that the site will run out of capacity between 2040 and 2055 under the worst-case scenario, however the lower bound estimate could be accommodated by the existing capacity of the site. We have discounted the

⁷ Annual Environmental Report 2024, D0543-01, Uisce Éireann, 2025.

⁸ Waterbody name: CLARE (GALWAY)_90

⁹ Waterbody name: CLARE (GALWAY)_!00

need for **Decentralisation** or **Centralisation**, as the site will be able to accommodate local growth up to 2055 and other agglomerations are not in close proximity to make this a practical option.

Compliance – Data from the past 5 years shows that the WWTP rarely exceeds its ELV for ammonia and orthophosphate and demonstrates full compliance with BOD and COD requirements. The WWTP is compliant, and modelling indicates that it will remain compliant up to 2055. The risk is raised to amber in 2055 through to 2080, as the increase in load will require capacity upgrades to maintain quality standards.

Environment – Water Quality modelling demonstrates that treatment and discharge to the existing location will remain feasible through 2080 using presently available technologies. The River Clare has a high flow and provides high dilution to the WWTP effluent. Based on current water quality standards we have discounted the need to **relocate effluent discharge**.

There are no anticipated regulatory obligations linked to the rUWWTD at this site, due to the projected population remaining below 10,000. As such, we have discounted the need for **Tertiary/Quaternary Treatment**.

Catchment Flood Risk Assessment and Management (CFRAM) indicates that the site falls partially within a 1-in-10 year and a 1-in-100-year fluvial plains, which may merit additional flood mitigation measures.

WWTP Primary Screening Considerations

Analysis of current and future performance at the WWTP does not identify any immediate risks or need for investment. Beyond 2055 we have carried forward the following interventions:

- ✓ **WWTP Site Expansion**
 - ✓ **WWTP Capacity Upgrades**
 - ✓ **WWTP Energy Efficiency Measures**
- **WWTP Site Expansion and WWTP Capacity Upgrades:** Beyond 2055 we have carried forward two interventions to help support the increase in load – **WWTP Site Expansion** and **WWTP Capacity Upgrades**, if required.
 - **WWTP Energy Efficiency measures:** The rUWWTD sets out new energy neutrality requirements for all plants treating a load of 10,000 PE or above. The future capacity may not exceed this load towards the end of the 55 years, however, to support Irish Government's emissions targets and protect our environment, we are taking forward **WWTP Energy Efficiency measures**.

Claregalway Network Constraints

The collection system which conveys load to the WWTP was constructed in 2014 and was designed as a separate system. Minimal storm water enters the network upstream of the WWTP and as such there is no storm discharge or storage at Claregalway WWTP. There are no SWO's in the network.

Network Primary Screening Considerations

There is an identified risk of infiltration ingress in the catchment, which should be investigated to determine if investment is required. No further investment needs were identified for the network over the period of the strategy (to 2080).

Primary Screening Outcome

After a comprehensive evaluation of the catchment’s performance, risks, and resilience, the following residual interventions were advanced to the subsequent stage for further integration within the Strategy. The discount register has been duly recorded in Annex F – Primary Screening Discount Register: Agglomeration Level – Claregalway.

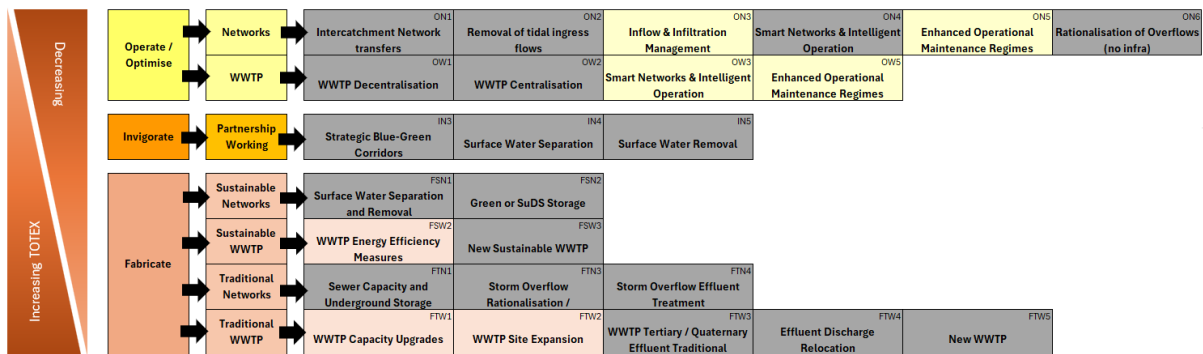


Figure 3-11: Residual effective interventions for Claregalway

3.2.4. Moycullen

Moycullen village is in County Galway approximately 10km northwest of Galway city. The Moycullen WWTP is located to the east of Moycullen village and is designed to treat 4,000 PE¹⁰. The Moycullen network is a small, separately drained network. There are no stormwater overflows in the network, and only one at the WWTP at the storm tank. The tank is equipped with pumps to return stormwater to the system once the storm has passed.

The WWTP discharges treated effluent to the Ballycuirke Canal which in turn discharges to Ballycuirke Lough approximately 500 meters south of the discharge point. The canal has a “Moderate” WFD ecological status upstream and downstream of the discharge point. The lake drains to Lough Corrib via Ballycuirke Stream, both of which form part of the Lough Corrib Special Area of Conservation (SAC).

Performance Indicators Summary

The assessment of risk is included in *Appendix 3 – Status and Performance of the Wastewater System*. Performance indicators have been assessed across the current baseline scenario and across future horizons (2040, 2055, 2080) to evaluate the impact of growth and climate change on the existing system. Figure 3-12 shows the changes in performance indicators up to the year 2080.

Moycullen	Network					Wastewater Treatment Plant	
	Flood risk ¹ (# of sub-catchments)			Storm Overflow		Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
				PCRSWO ²	rUWWTD ³		
Baseline	-	-	1		N/A		
2040	-	-	1		N/A		
2055	-	-	1		N/A		
2080	-	-	1		N/A		

1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 3-12: Moycullen Performance Indicators Summary

Moycullen WWTP Constraints

The WWTP consists of two land parcels: the main treatment site with (including preliminary treatment, secondary treatment, chemical phosphorus removal and sludge treatment processes; 0.86 ha) and a reed bed tertiary treatment system (2.4 ha). A wetland/lagoon system is also in place to treat surface water from Moycullen village prior to discharge to the Ballycuirke canal. In

¹⁰ [Annual Environmental Report 2024](#), Uisce Éireann, 2025.

storm conditions, excess wastewater from high inflows is stored in a stormwater tank with a capacity of 381m³.

Capacity - Growth projections indicate that the site can expect an increase of approximately 2,000 PE by 2080, which exceeds the current sites capacity. The growth gradient for this agglomeration is relatively gentle; the upper bound estimate indicates that there is a risk that the WWTP will run out of capacity between 2040 and 2050 and the lower bound estimate indicates that capacity would be exceeded between 2060 and 2070.

Decentralisation and **centralisation** were discounted as other sites and load centres are not in close proximity to the site. Moycullen WWTP is a relatively modern asset and has sufficient headroom to 2055.

Compliance - The plant is designed to treat wastewater to an emission limit value (ELV) of 10, 35, and 1 mg/l for biological oxygen demand, suspended solids and ammonia, respectively. The site has an Orthophosphate standard of 0.5 mg/l. Although the assessment for Moycullen shows no immediate strategic needs identified for the WWTP, there are exceedances for ammonia that should be investigated at an appraisal level. To compliment this appraisal, a better understanding of treatment flows is required to accurately determine if there are any immediate needs and should be subject to further modelling. For purposes of the Strategy, any needs that could arise from this detailed assessment are likely to require base maintenance upgrades and are not detrimental to Strategy outcomes and recommendations.

The catchment's growth should be closely monitored with appropriate flow measurement systems implemented to assess WWTP performance throughout the Strategy's duration. Pending completion of further investigatory work as part of Strategy implementation, the risk profile remains green but will escalate to amber by the 2055 horizon if the WWTP exceeds its compliance capacity threshold.

Environment -. Upstream and downstream of Moycullen WWTP, the Ballycurke Canal is currently classified as failing to achieve Good Status under WFD standards for ammonia, BOD, and Ortho-P. Attainment of WFD Good Status in the Ballycurke Canal is contingent upon significant enhancements in upstream water quality. Given that the quality of the receiving water upstream of the WWTP already exceeds Environmental Quality Standards (EQS), there is insufficient assimilative capacity to determine an appropriate discharge quality. In such instances, a notionally clean upstream boundary has been adopted.

The water quality modelling (Appendix 4) conducted sensitivity testing, which demonstrated that downstream concentrations in the canal are highly sensitive to the flow rate in the canal, the flow rate of water discharged from the WWTP and the representation of the final effluent. Further modelling work is recommended to ensure the timing of any resilience upgrade, if required. It does not affect strategy recommendations to maintain the asset and keep treatment in-situ as any proposed standards are treatable with current technologies.

WWTP Primary Screening Considerations

Projected growth and assessment of treatment efficacy have identified no significant needs prior to 2055. Beyond 2055 we have identified the following options to be taken forward:

- **WWTP capacity upgrades and WWTP site expansion**
- **Enhanced Operational Maintenance Regimes**
- **Energy Efficiency Measures**

- **WWTP capacity upgrades and WWTP site expansion** are interventions carried forward. These will focus on meeting long-term hydraulic and biological loads emerging from local growth and adherence with ELV standards that require further detailed modelling. There is currently inadequate flow monitoring at the WWTP to assess hydraulic performance and the full performance of the WWTP. As growth is inherently uncertain, and the site capacity is small, the inlet flow should be monitored going forward so that accurate flow and load can be captured.

- **Enhanced Operational Maintenance Regimes** are taken forward, to target proactive operation and maintenance programmes. Asset performance monitoring warrants consideration, particularly regarding the existing reed bed that currently serves as part of the tertiary treatment process.

- **Energy Efficiency Measures:** Based on growth projections, the WWTP is not expected to exceed a load of 10,000 PE by 2080. As such, the implementation of energy neutrality by 2040, under the rUWWTD, does not apply. However, we have taken **Energy Efficiency Measures** forward to explore options for enhancing operational efficiency, which will support national and EU net-zero emissions.

Network Constraints

Moycullen is a low-risk catchment regarding network performance. There is one SWO within this agglomeration at the WWTP. Sewer network modelling demonstrates that the SWO discharges may require aesthetic screening, however, the frequency and volume of discharges can be considered negligible. There have also been no verified complaints in this area therefore it has been classified as low risk. For assessment under the rUWWTD, the assessment is currently low to negligible risk. Sewer network modelling indicates that the SWO spills for less than 1 percent of the year and remains at this level for all the growth scenarios. Spills are extremely infrequent and the impact can be considered as negligible.

As the only SWO is a terminal SWO at the WWTP, we discounted multiple interventions which would not constitute an effective intervention. We further discounted **Removal of tidal ingress flows** as the location is not tidal.

We have carried **inflow and infiltration management** forward as a viable intervention to manage capacity in the network over the future.

Network Primary Screening Considerations

We have not identified any material network risks in the agglomeration, however, upgrades to the network may be necessary to meet future capacity needs.

Sewer Capacity and Underground Storage are taken forward. Network upgrades will focus on enhancing the WWTPs ability to manage high-influent variability and peak flow events, ensuring that the SWO is monitored or mitigated to maintain strict environmental compliance. This can be used in combination with other carried interventions to manage future risk if it were to materialise.

Primary Screening Outcomes

After a comprehensive evaluation of the catchment’s performance, risks, and resilience, the following residual interventions were advanced to the subsequent stage for further integration within the Strategy. The discount register has been duly recorded in Annex E – Primary Screening Discount Register: Agglomeration Level – Moycullen.

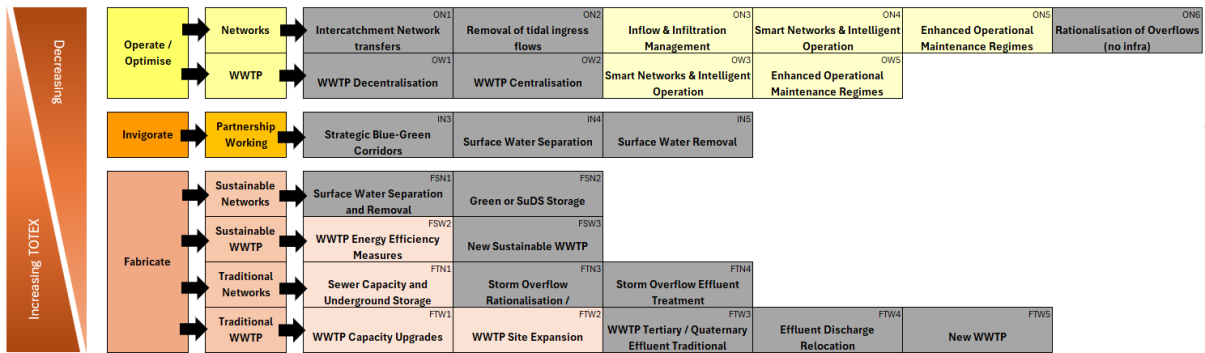


Figure 3-13: Residual effective interventions for Moycullen

4. Strategic Option Development

As identified at the strategic primary screening stage (section 3.1), there is a need for a new WWTP in the region. We identified three strategic locations to be considered for a new WWTP: a western regional WWTP, a northern regional WWTP or an eastern regional WWTP. These are shown in Figure 4-1 below.

Determining the precise location of a proposed WWTP is not required at this stage; a detailed site selection process will be undertaken following the completion of the Strategy. Instead, indicative locations were considered sufficient to support strategic scenario testing and benefit assessment.

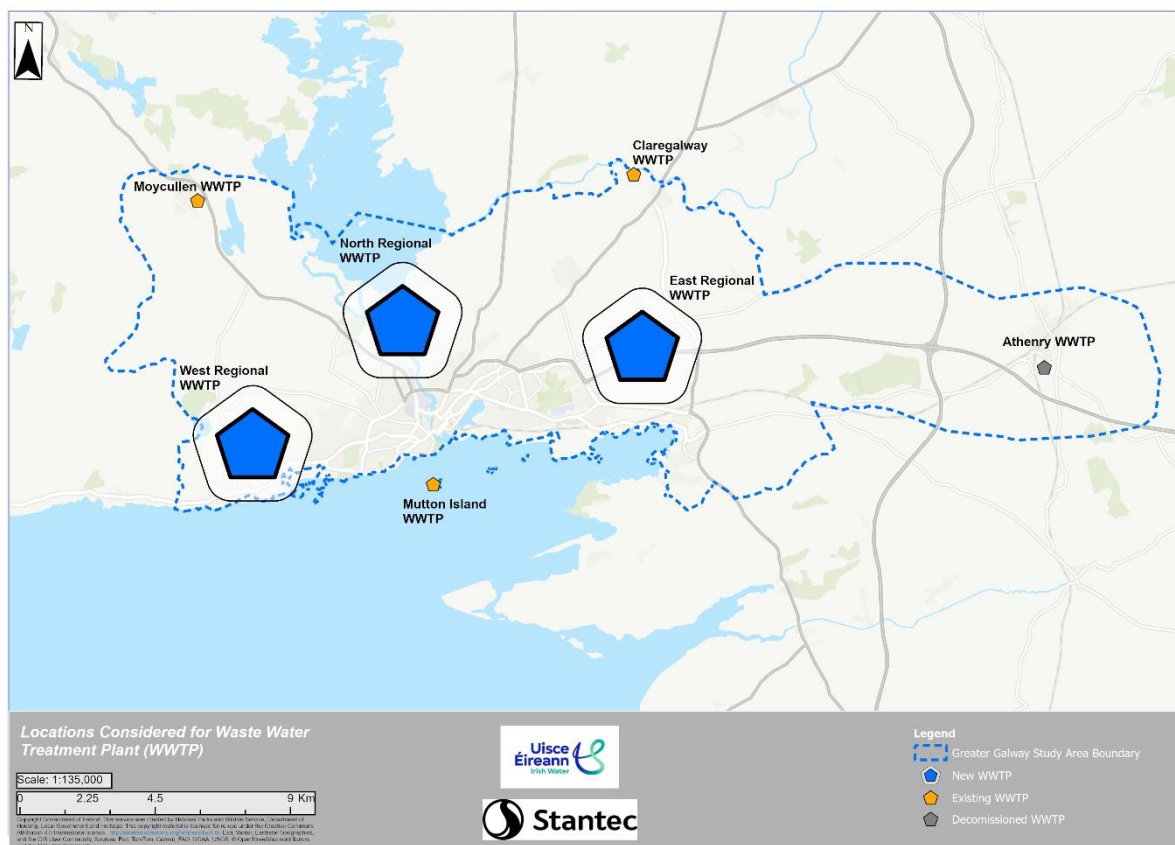


Figure 4-1 Three locations considered for future Wastewater Treatment Plant (WWTP)

4.1 Outfall Considerations

A key limiting factor in the selection of a WWTP location is the proximity of a suitable discharge point for treated effluent. Considered discharge options must include an assessment of the likely treatment standards that may apply, particularly with reference to the rUWWTd. For a WWTP of this scale, tertiary and quaternary treatment will be required by 2045.

For the study area, we considered both **marine outfalls** to the coastal environment and **freshwater outfalls** (rivers and lakes). Modelling was used to inform the suitability of potential discharge locations and their potential environmental performance (see *Appendix 4: Impact on Water Quality*).

Marine Outfalls

The strategic screening of marine outfalls focused on dilution performance, discharge depth, engineering complexity and regulatory and environmental constraints. The optimal outfall length and placement within broad zones to the east and west of Galway Bay were mapped to show proximity and positioning in relation to designated Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) (see Figure 4-1). Two potential locations – one east and one west – were taken forward for consideration.

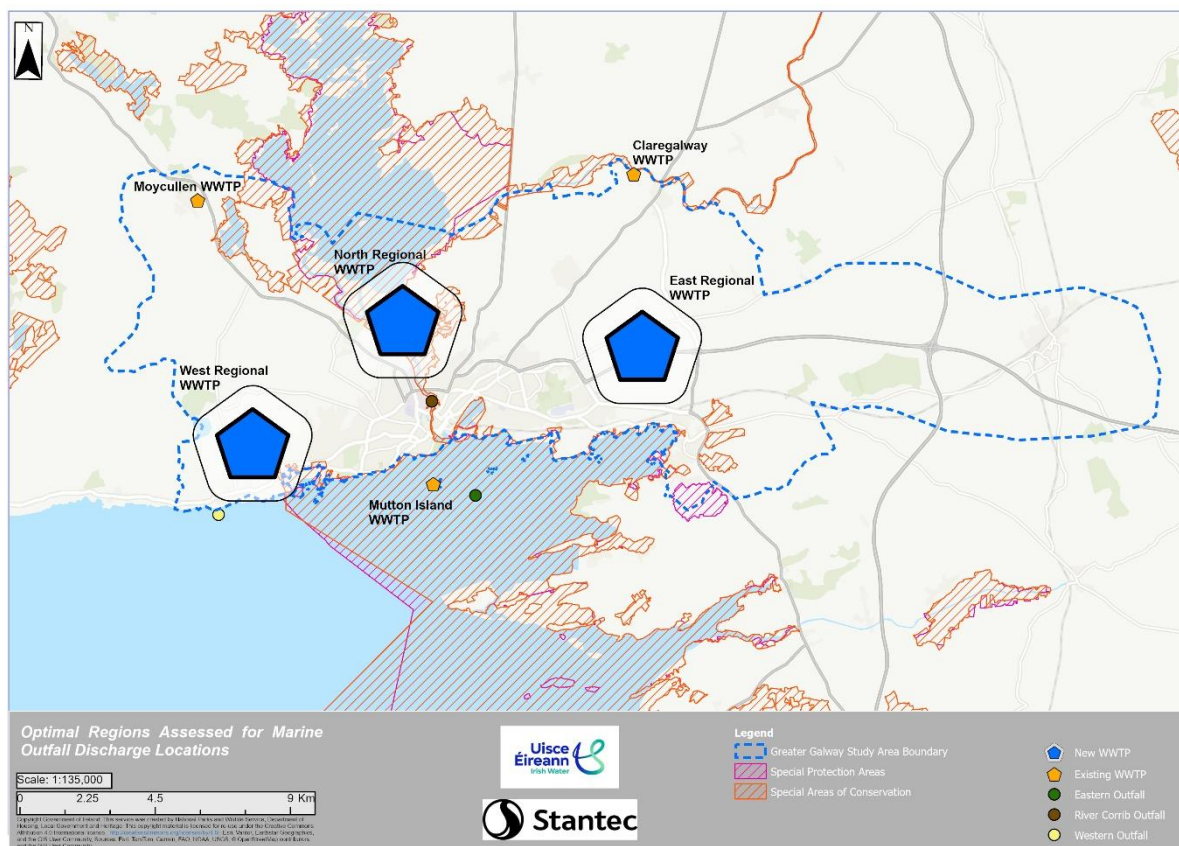


Figure 4-2: Optimal Regions Assessed for Marine Outfall discharge locations

Freshwater Outfalls

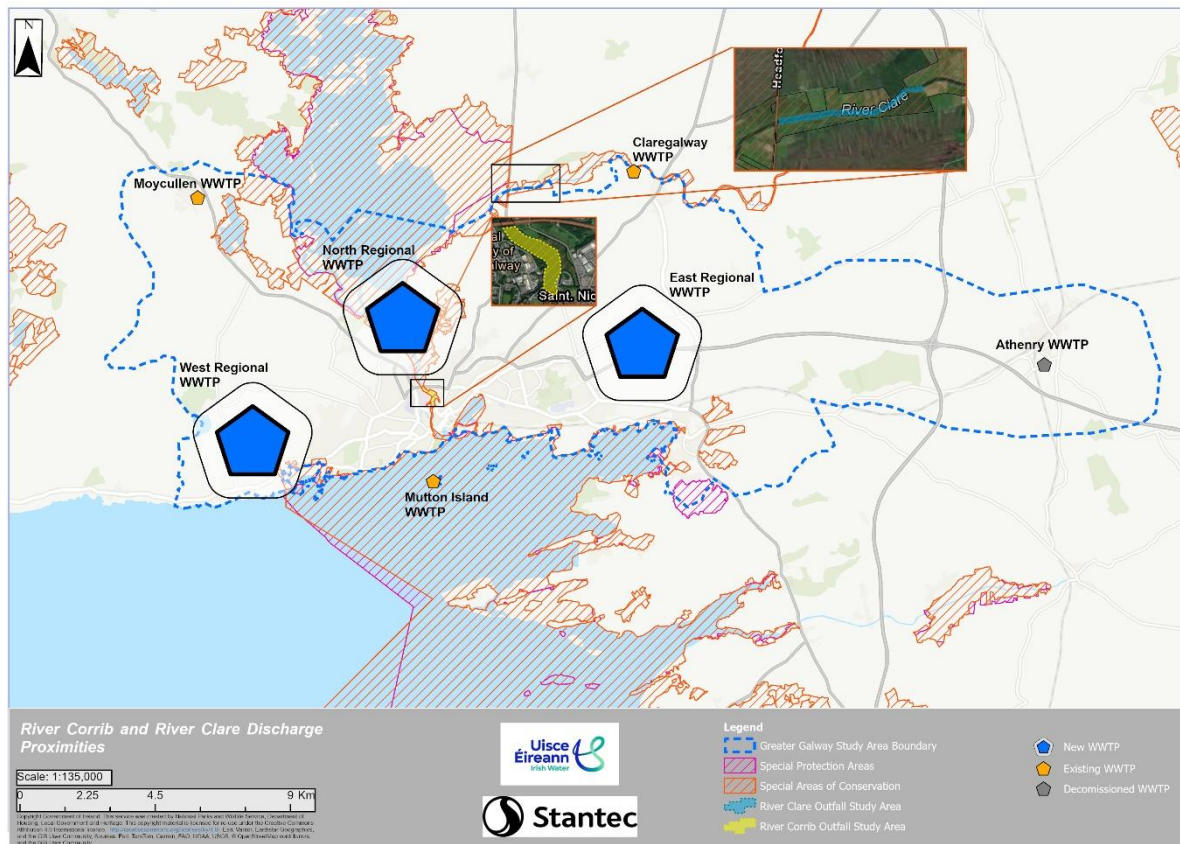
For the possible freshwater outfalls considered, there is limited assimilative capacity to receive effluent from large WWTPs within the study area. Three surface waters within the study area were identified as having notable flow volumes with the possibility to accommodate treated effluent:

1. The river Corrib,
2. The river Clare
3. Lough Corrib.

These surface waters (illustrated in Figure 4-3) were assessed and screened as new potential discharge locations for a new regional WWTPs (for screening results see (Annex G – Assessment of freshwater discharge point for new wastewater treatment plant (WWTP)). The strategic screening of freshwater outfalls focused on the feasibility of maintaining compliance with

regulatory standards, environmental risks and long-term resilience. Only the river Corrib was identified as a feasible freshwater outfall.

Figure 4-3: River Corrib and River Clare Discharge Proximities



Given the constraints of the receiving environments, coastal locations emerged as the most viable and sustainable discharge locations with the River Corrib offering the only feasible freshwater discharge location. Discharging via a marine outfall to either the east or west of the study area offers greater dilution capacity, reducing environmental pressures and improving resilience to future regulatory or environmental changes.

4.2 Regional Scenarios

Each regional WWTP was considered with the three identified discharge points to form a matrix of three agglomerations and three outfall variations, resulting in nine strategic options. We have summarised each of the scenarios in the section below, before taking each option through multi-criteria decision analysis (MCDA) (see section 5).

Common features to all options are that load from part of Galway City West, Galway City East, Oranmore, Furbough, Bearna and Athenry will be transferred to the new regional WWTP. A large proportion of Galway City West, approximately 80% remains for treatment at Mutton Island as illustrated. The existing WWTPs at Moycullen and Claregalway will be retained to serve their respective local populations up to 2080 with necessary capital interventions to uplift capacity as required.

Key Strategic Infrastructure Requirements

The selected location of the new WWTP will have a material impact on the strategy. As such, this is a fundamental decision which will shape the long-term strategy of the region. All strategic options will necessitate supporting strategic infrastructure. To support the optioneering process, we have identified the key characteristics of this infrastructure required for each option (*Annex H – Key Strategic Infrastructure assessed during MCDA*) that were assessed alongside the MCDA criteria.

4.2.1. Western Regional WWTP (Options 1-3)

This strategic option involves the consolidation of loads from key areas, specifically Athenry, Oranmore, and Galway City East. To facilitate this the existing Athenry Wastewater Treatment Plant (WWTP) should be converted into a terminal pumping station to manage flows from Athenry Village and the Athenry IDA, constituting a significant engineering challenge.

The Parkmore IDA would transfer directly into a newly proposed Galway City East terminal pumping station which would pump directly to the new West Regional WWTP. While Galway City West flows will continue to be treated at the Mutton Island facility, outlying areas such as Bearna will be redirected to the new regional plant. Additionally, a new rising main could be installed to transfer loads from Furbogh to the same facility, if required.

To support the expanded network, three strategic outfall points have been identified. These will be positioned west of Galway Bay (situated between Furbogh and Bearna), into the River Corrib, and east of Galway Bay, specifically south of Roscam Point.

For the remaining regional catchments, Moycullen and Claregalway will maintain decentralized treatment, with loads continuing to be processed within their respective existing WWTPs.

For a visual representation of the option and key infrastructure, please refer to Annex H – Key Strategic Infrastructure assessed during MCDA.

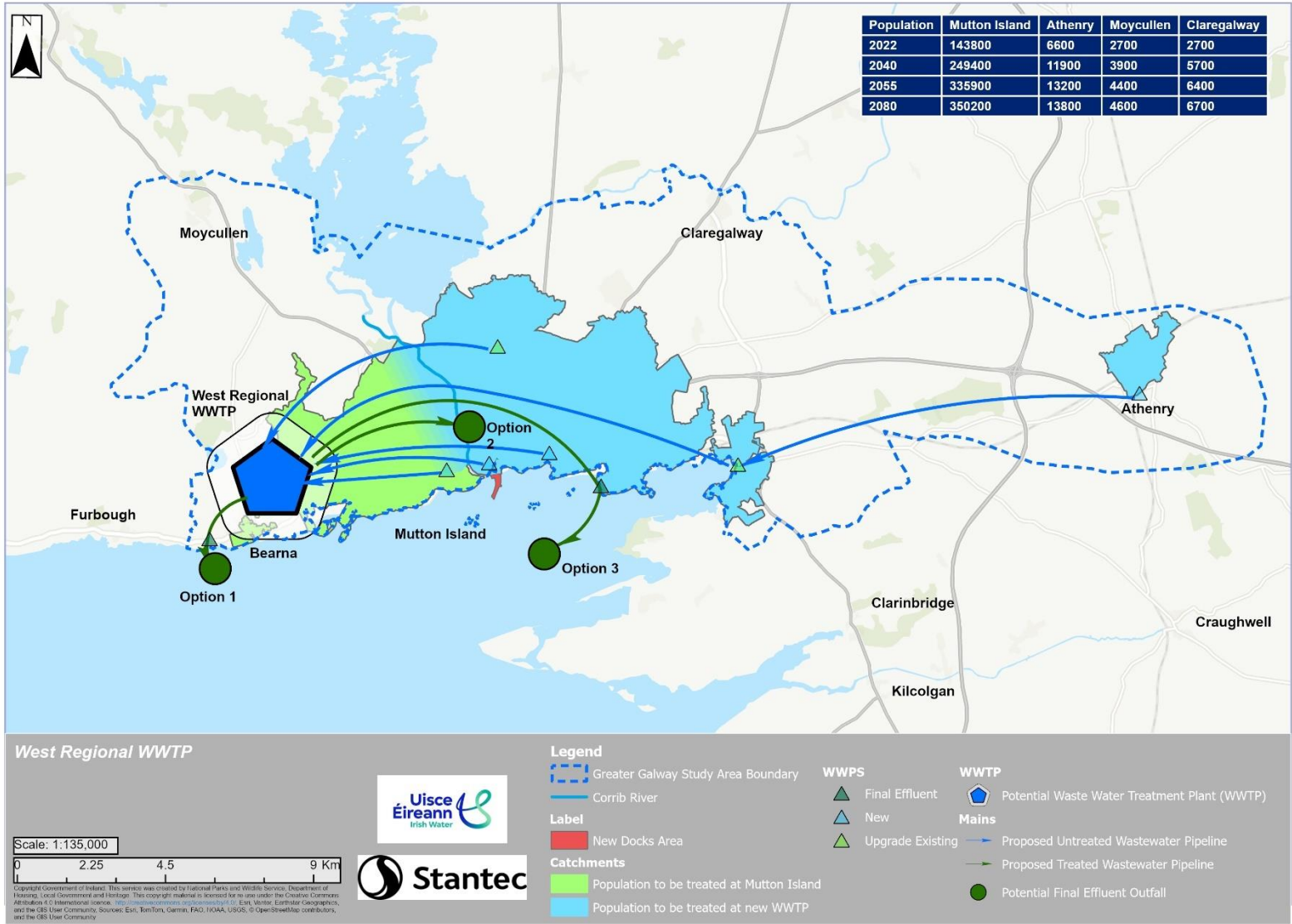


Figure 4-4: Western Regional WWTP

4.2.2. Northern Regional WWTP (Options 4-6)

These options consolidate wastewater flows to the north of Galway City. To facilitate this, several interventions are required. The existing wastewater pumping station (WWPS) at Oranmore will be upgraded to act as a primary hub and terminal pumping station for the eastern corridor. This station will manage loads from Oranmore village and the Oranmore IDA, while also facilitating the conversion of the existing Athenry Wastewater Treatment Plant (WWTP) to a terminal pumping station (TPS). This new facility will collect flows from Athenry village, the Athenry IDA and transfer the combined load directly to the upgraded Oranmore WWPS.

These combined loads will then be transferred from the Oranmore WWPS to the new Regional Northern WWTP. The Parkmore IDA and the Galway City East collection systems will be reconfigured to pump directly to the regional facility, necessitating a new Galway City East terminal pump station.

In contrast, the treatment strategy for the western corridors will continue to utilize the Mutton Island WWTP. Galway City West and Bearna will maintain their current flow paths toward Mutton Island. To expand service in this area, a new rising main will be installed to transfer loads from Furboagh into the Galway City West network, where they will ultimately be treated at the Mutton Island facility, if this was required in future.

For the remaining regional catchments, Moycullen and Claregalway will maintain decentralized treatment, with loads continuing to be processed within their respective existing WWTPs. For a visual representation of these connections and the location of key strategic infrastructure, please refer to Figure 4-5.

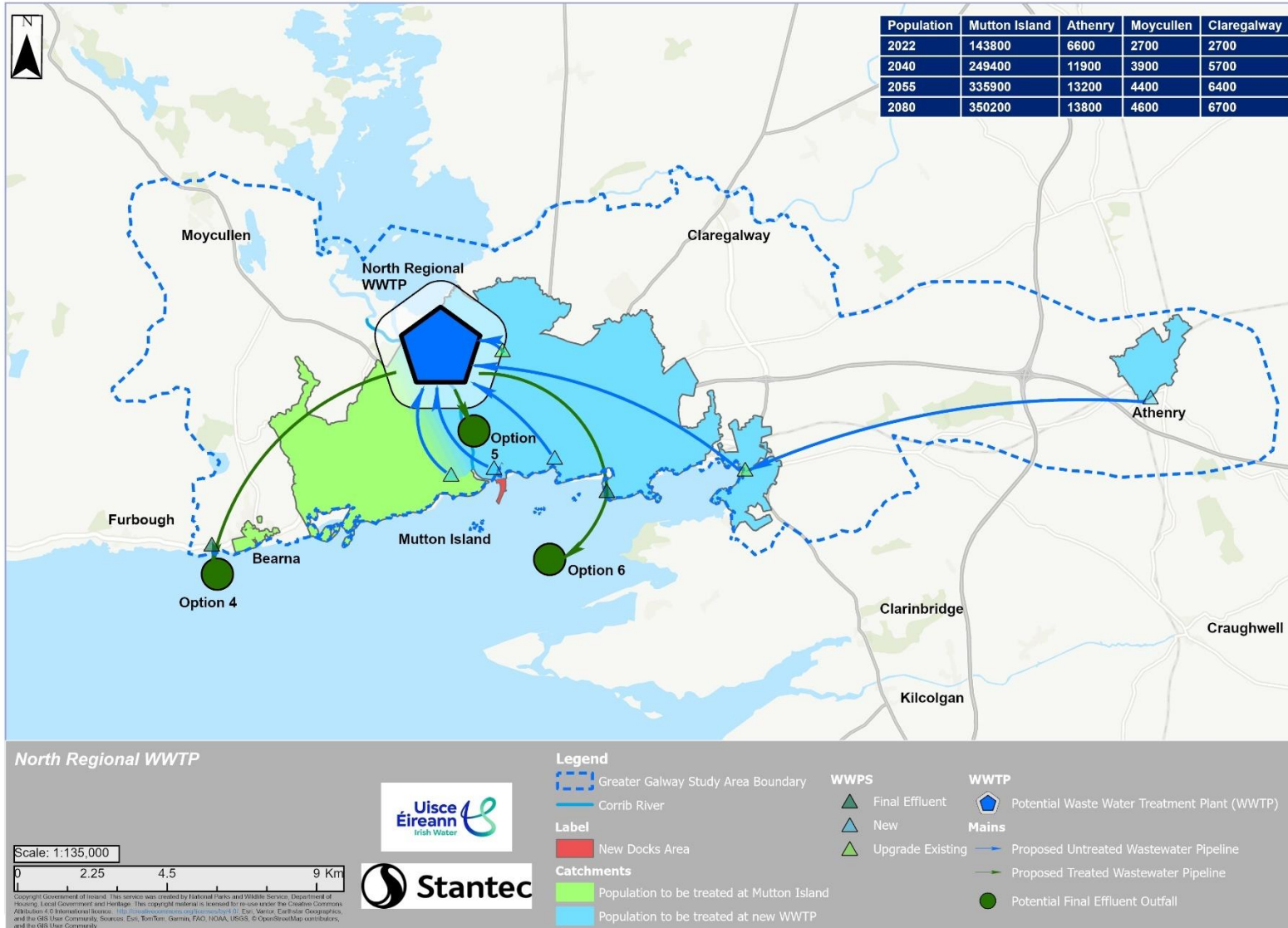


Figure 4-5: Northern Regional WWTP

4.2.3. Eastern Regional WWTP (Options 7-9)

These options consolidate wastewater flows to the east Galway City, in closest proximity to the growth planned for the region. The existing Athenry Wastewater Treatment Plant (WWTP) will be converted into a new terminal pumping station and transfer directly to the new regional WWTP. This facility will collect flows from Athenry village and the Athenry IDA.

Similarly, the eastern corridor will be reinforced through the upgrade of the existing wastewater pumping station (WWPS) at Oranmore. This station will serve as a primary collection hub for Oranmore village and the Oranmore IDA. These combined loads will then be transferred from the Oranmore WWPS to the new Regional WWTP. The Parkmore IDA and the Galway City East collection systems will be reconfigured to pump directly to the new regional facility, necessitating a new Galway City East terminal pump station.

In contrast, the treatment strategy for the western catchments remains centered on the Mutton Island WWTP. Galway City West and Bearna will maintain their current flow paths toward Mutton Island.

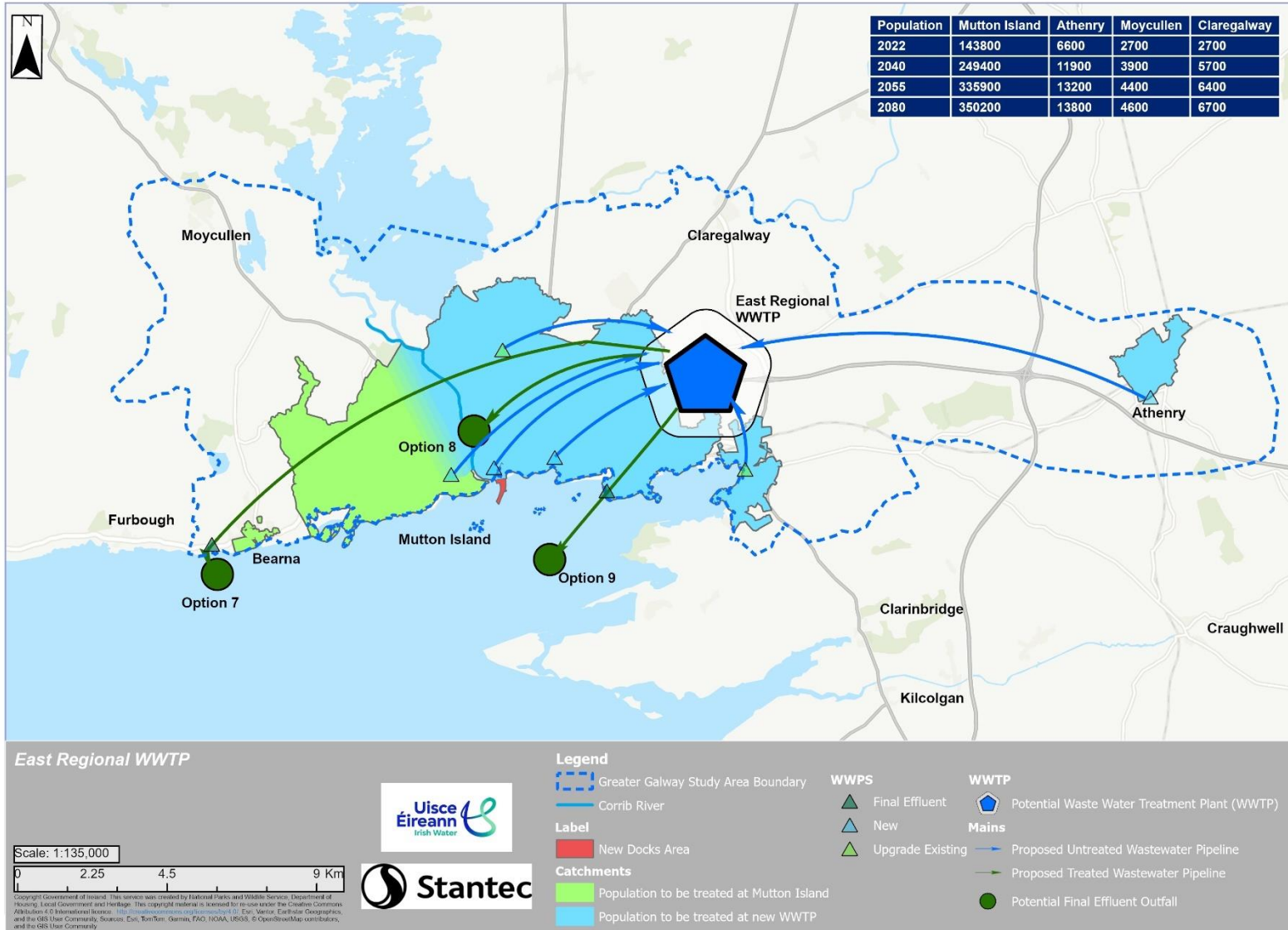


Figure 4-6: East Regional WWTP

5. Multi-Criteria Decision Analysis (MCDA)

Each scenario underwent a comparative assessment using MCDA to determine which offer the greatest benefits across a set of pre-defined criteria. Multi-Criteria Decision Analysis (MCDA) is a process which allows quantitative and qualitative criteria to be assessed on a common scale to facilitate comparison. The criteria were elected to align with both the primary screening themes and the strategy objectives. The following subsections detail figures to describe the options that were assessed at a strategic level for purposes of the MCDA.

5.1 MCDA Methodology: Identify Criteria and Assess Performance

The MCDA methodology was adopted from recent industry guidance^{11,12,13}, and was used to identify preferences where the perspective of multiple stakeholders need to be considered. The process is summarised in Figure 5-1. Decision matrices were employed during the shortlisting process at workshops to calculate the overall value of each option, enabling the summarisation and ranking of optimal options. Participants scored each option against the specific criterion in a stepwise fashion. This approach supported the development of a shared understanding and helped facilitate consensus among stakeholders and technical experts.

Figure 5-1: Summary of the MCDA process applied



¹¹ [Capital Spending: An Overview of Ireland's Infrastructure Guidelines](#), Parliamentary Budget Office, 2024.

¹² [Overview of Appraisal Methods and Techniques](#), Department of Public Expenditure and Reform, December 2019.

¹³ [Use of Multi-Criteria Decision Analysis in options appraisal of economic cases](#), Department for Energy Security & Net Zero, May 2024.

Example questions were posed to aid the workshops under key MCDA objectives and criteria relating to these objectives (Table 5-2). Responses were analysed using a 7-point Likert scale (see Table 5-1), categorizing each scenario as either beneficial or not beneficial. This standardized approach ensured consistent performance interpretation across all criteria and participants. This collaborative approach was designed to foster stakeholder buy-in, ensure transparency, and build confidence in the resulting outcomes.

Table 5-1 Likert Scale

Strongly non beneficial	Moderately non beneficial	Slightly non beneficial	Neutral	Slightly beneficial	Moderately beneficial	Strongly beneficial
Severe negative impacts or detriment.	Noticeable negative impact or detriment.	Minor negative impact or detriment.	Neither beneficial nor detrimental	Minor positive impact or benefit	Noticeable positive impact or benefits	Major positive impact or benefit
1	2	3	4	5	6	7

Table 5-2: MCDA objectives and criteria and example questions posed

MCDA Objective	Criteria	Example Questions Posed
Provide Resilience & Reduce Risk	Deliver Outcomes & Provide Long Term Resilience	How certain are we that the option will deliver the long-term outcome ?
		How resilient is the option to a change in future circumstance ? For example, a change in circumstances/legislation/or technology within the 50-year strategy horizon
		Is the option adaptable and does it increase resilience and reduce vulnerability ?
		Will the option help to address current operational issues associated with the catchment(s)?
Enhance Local Communities & Support	Enhance Local Communities & Support	Will the option gain widespread public support ?
		Does the option create any public or stakeholder concern in relation to odour, noise, traffic, air quality and/or aesthetics ?
		Does the option create any new community benefits ?
Deliverability & Flexibility	Planning & Regulatory	Are there any envisaged planning or regulatory barriers to option delivery?
	Growth & Population Receptors	Is the option minimising the distance to areas of high growth within the strategy horizon?
		Is the option proposing infrastructure in close proximity to populated areas ?
		Is the option proposing infrastructure in close proximity to tourist or amenity hotspots ?

MCDA Objective	Criteria	Example Questions Posed
		Would the option impact the local neighbourhood character ?
	Ease of Implementation and timeframe to deliver	In the comparison to other options : What level of confidence is there that the option can safety and feasibility be constructed ?
		Will extensive phasing be required to make the solution viable and can it be implemented quickly ?
		Are extensive land acquisition timeframes envisaged?
		Is there a requirement for extensive network infrastructure upgrades?
		Does the option provide benefits with regard to its proximity to critical national infrastructure ?
		Are the final effluent outfalls complex to design and construct ?
Environmental & Sustainability	Ecology & Biodiversity	Does the option have potential for direct and/or indirect impact on designated sites for nature conservation and other sensitive habitats with potential environmental, procedural, legislative and cost implications?
		Is there potential for direct loss or damage to habitats and species during site clearance and risk to Annex I Habitats and protected flora species and potential loss or damage to hedgerows and tree lines which are important wildlife corridors for numerous species?
		Does the option contribute to the objectives of the biodiversity action plan (BAP) ?
	Impact on Water Environment	Does the option contribute to the achievement of WFD Objectives in terms of water quantity and quality ?
		Does the option interact with multiple waterbodies enhancing the risk?
		Does the option increase flood risk downstream?
	Archaeology, Cultural & Architectural Heritage	Does the option minimise the potential impact on sites of archaeological, cultural and architectural heritage ?
	Energy Efficiency	Is there an option more or less efficient in the use of energy compared to other options ?
		Does the option create opportunities for cleaner, renewable, or recovered energy to offset any increase in energy?
	Net Zero	Does the option contribute to Uisce Éireann's ambition to realise a Net Zero water service by 2040 and wider energy neutrality objectives under the recast UWWTD ?

5.2 MCDA Results

In summary, of all the locations for a new Wastewater Treatment Plant (WWTP), the eastern regional WWTP was seen as a more favourable location due to its proximity to the areas identified for both commercial and domestic growth (82% of growth to the east of the study area). For the western and northern sites, flows would require substantial conveyancing across the urban centre from the areas of growth to the treatment centre. The conveyancing needs would be more costly to build but would also have higher operating costs due to pumping requirements.

The northern location was generally less favourable due to the need for it to be constructed close to a constrained urban area and proximity to protected environmental areas. The greater density of existing infrastructure, logistics and site access will have a greater impact on local connectivity and accessibility of surrounding areas with broader socio-economic impacts. The Northern site is the most convenient location for the River Corrib discharge location; however, this was the least favourable discharge location for each of the WWTPs appraised. There was a greater environmental risk identified here due to the proximity of a drinking water source, and concerns regarding public opinion due to it being a high-amenity area and recreational zone.

The scenarios with marine outfalls were identified as more beneficial than the River Corrib discharge locations. The greater dilution capacity was preferred as it provided more resilience to meet future potential discharge standards that cannot be reasonably foreseen and that may be difficult to achieve with a freshwater discharge. This meant that discharge options to the River Corrib were vulnerable to future uncertainty. The western outfall identified as the preferable option due to the shorter length required and that it was situated outside the Special Areas of Conservation (SAC) and Special Protection Area (SPA). The eastern outfall would need to be considerably longer than the western option, and there is a greater environmental risk due to its proximity to Special Areas of Conservation (SAC) and Special Protection Area (SPA) that would require mitigation.

5.2.1. Non-Weighted Decision Matrix

The results of the non-weighted decision matrix are presented in Table 5-3. A comprehensive overview of the rationale of each option assessed and against the criteria is detailed in Annex I.

From the MCDA analysis, a threshold score of 40 was identified, which represented a 'neutral' score, as offering no net benefit but no detriment. Only two of the options met this criterion. As the MCDA is primarily a comparative qualitative assessment, the absolute score should not be interpreted as quantitative evaluation.

From discussions at the workshops, stakeholders agreed that the top two scoring options would be shortlisted for feasible option development and further appraisal. To ensure robustness of this decision the criteria were weighted and sensitivity tested to ensure the rank of the shortlisted options were unaffected.

5.2.2. Weighting and Sensitivity Analysis

The MCDA allows for weighting and sensitivity analysis, which demonstrates how option preferences shift based on two key variables:

1. **Relative Importance:** The weight of one criterion compared to another.
2. **Performance Variance:** The significance of the "swing" between the best and worst-performing choices within a single criterion.

This process, known as swing weighting, allows decision-makers and subject matter experts to fully explore performance trade-offs. To derive accurate weights, the group must consider:

- The magnitude of the difference between the best and worst performers on each criterion.
- The perceived importance of that difference in achieving the desired outcome.

In this context, "benefit" always denotes desirability. It is critical to distinguish swing weighting from "simple weighting"; weights should not be assigned based solely on a vague perception of a criterion's importance. If the performance "swing" between the top and bottom options is negligible, that criterion becomes less effective at differentiating between choices and its weight should be reduced accordingly.

Finally, Sensitivity Analysis illustrates the robustness of the overall ranking. It provides a transparent platform to test areas of disagreement and determine whether those differences significantly impact the results. Once the group is satisfied that the weighting reflects their collective expertise and the data, the process concludes.

Refer to Table 5-4 for a breakdown of how the weighting and sensitivity analysis was applied to the non-weighted decision matrix.

Table 5-5 presents the revised preliminary ranking of scenarios, incorporating the results of the sensitivity analysis

5.2.3. Results Summary

The MCDA results indicate that the final ranking is not sensitive to different criteria weightings and sensitivity analysis and the stakeholder group reached a consensus that the MCDA was robust and that the two top ranked preferable options (as shown in Table 5-5) should progress to feasible option development as they are the only two options which have a net marginally beneficial score.

5.2.4. Cost Considerations

At the Strategy level, it is not possible to identify the exact locations of the Wastewater Treatment Plant (WWTP), marine outfall sites, or construction methods, as these aspects require detailed appraisal. Consequently, comprehensive assessments of whole life cost, energy, and carbon cannot be performed at this stage. Nevertheless, a strategic estimate was prepared to evaluate the capital expenditure necessary for the principal infrastructure elements of each option, aiming to determine their suitability for inclusion in the MCDA process. The analysis determined that

capital costs should not be considered within the benefits assessment, as the differences between options are not significant enough to influence strategic-level decision-making at this point.

Table 5-3: MCDA Non- Weighted Decision Matrix

Strategic Option Reference	WWTP Location	Outfall Location	Provide Resilience & Reduce Risk	Enhance Local Communities & Support	Deliverability & Flexibility			Environmental & Sustainability					MCDA Total Score
			Deliver Outcomes & Provide Long Term Resilience	Minimise impact and increase support, health, and wellbeing	Planning & Regulatory	Growth & Population Receptors	Ease of Implementation and	Ecology & Biodiversity	Impact on Water Environment	Archaeology, Cultural & Architectural	Energy Efficiency	Net Zero	
1	West	West	5	3	4	3	3	3	5	4	4	5	39
2	West	Corrib River	2	2	2	3	3	2	4	2	3	3	26
3	West	East	6	2	2	3	2	2	5	2	2	2	28
4	North	West	6	3	3	4	3	3	5	3	3	3	36
5	North	Corrib River	2	2	2	4	3	2	4	2	5	5	31
6	North	East	5	2	2	4	3	2	5	3	3	3	32
7	East	West	6	3	3	7	3	3	5	2	5	5	42
8	East	Corrib River	2	2	2	7	3	2	4	2	5	5	34
9	East	East	7	5	4	7	4	2	5	4	6	6	50

Table 5-4: Weighting and Sensitivity Matrix

	Provide Resilience & Reduce Risk	Enhance Local Communities & Support	Deliverability & Flexibility			Environmental & Sustainability				
	Deliver Outcomes & Provide Long Term Resilience	Minimise impact and increase support, health, and wellbeing	Planning & Regulatory	Growth & Population Receptors	Ease of Implementation and timeframe to deliver	Ecology & Biodiversity	Impact on Water Environment	Archaeology, Cultural & Architectural	Energy Efficiency	Net Zero
Minimum Score (Min)	2	2	2	3	2	2	4	2	2	2
Maximum Score (Max)	7	5	4	7	4	3	5	4	6	6
Range (Max - Min)	5	3	2	4	2	1	1	2	4	4
Criteria Swing Rank	1	5	6	2	6	8	8	6	2	2
Weights	1	0.7	0.6	0.9	0.6	0.5	0.5	0.6	0.8	0.8
Sensitivity 1 (+0.05)	1	0.75	0.65	0.95	0.65	0.55	0.55	0.65	0.85	0.85
Sensitivity 2 (-0.05)	1	0.65	0.55	0.85	0.55	0.45	0.45	0.55	0.75	0.75

Table 5-5: Scenario Rankings Post Weighting and Sensitivity Analysis

Strategic Option Reference	WWTP Location	Outfall Location	Non - Weighted Rank	Weighted Rank	Sensitivity Test 1	Sensitivity Test 2
1	West	West	3	3	3	3
2	West	Corrib River	9	9	9	9
3	West	East	8	8	8	8
4	North	West	4	4	4	4
5	North	Corrib River	7	7	7	7
6	North	East	6	6	6	6
7	East	West	2	2	2	2
8	East	Corrib River	5	5	5	5
9	East	East	1	1	1	1

6. Feasible Options Development

Two strategic options have been identified as viable solutions for addressing the projected regional growth through to 2080. The chosen strategic options are now considered alongside the identified feasible options for each agglomeration to ensure a final integrated strategy that delivers the region's needs in the short, medium and long term. The following section outlines those features which are common across both options, before examining both scenarios in more detail.

6.1 Common Option Features & Recommendations

Wastewater Treatment

Moycullen and Claregalway - The current WWTPs in Moycullen and Claregalway will continue to serve their local populations through 2080, with capital upgrades implemented as required to enhance capacity. The existing treatment technologies will remain in use at both sites unless advancements emerge during the Strategy's timeline that offer a more sustainable solution than the present systems. Ongoing monitoring of growth against forecasts will inform the timing of relevant upgrades and further modelling work is recommended at Moycullen to remove uncertainty around model inputs to evaluate appropriate ELVs to ascertain whether any potential upgrades are required to be implemented prior to 2055.



Figure 6-1: Moycullen & Claregalway Strategy Recommendations

Athenry - The Strategy considers transferring flow from the existing Athenry WWTP to the proposed new Eastern WWTP as the option most resilient to future regulatory or environmental changes. Decentralisation of the WWTP may result in either partial or complete decommissioning of the current Athenry facility, pending further detailed appraisal.

It is proposed that the Athenry WWTP be reconfigured as a Terminal Pumping Station, facilitating the transfer of flows to the new Eastern WWTP. A phased transfer of loads would be established, so the existing Athenry WWTP can continue operations until the new WWTP has progressed sufficiently to treat Athenry load. An option to transfer the treated effluent from the existing facility to the marine outfall location of the new WWTP should also be appraised.



Figure 6-2: Athenry Strategy Recommendations

Mutton Island / Galway City - Engineering evaluations concluded that transferring a proportion of load away from Mutton Island would effectively manage potential future regulatory risks and reduce the vulnerability of the existing asset. Given the limited potential for expansion at the current site, it is imperative to establish additional capacity through a new wastewater treatment plant (WWTP) to manage projected flow and load increases expected by 2040.

The recast UWWTD will require tertiary and quaternary treatment for a WWTP of this size by 2039 and 2045 respectively. Implementing a strategic phasing plan will be necessary to gradually transfer part of the existing load from the Galway City agglomeration to the new WWTP. Part of the Galway City West (defined as west of the River Corrib) will need to be transferred to the new WWTP to ensure that there is sufficient headroom within the retained Mutton Island WWTP (please see Appendix 3 for further details).



Figure 6-3: Mutton Island Recommendations

New WWTP – Under both options, the proposed new regional wastewater treatment plant is situated in the eastern part of the study area. This location was preferable due to its alignment with primary growth corridors and regional planning policies. The facility will be designed up to 400,000 PE, to meet projected load requirements through 2080. A modular design is proposed to allow for adaptable expansion amid population uncertainty. Furthermore, land acquisition should anticipate future expansion needs beyond the initial design capacity, enhancing long-term resilience and enabling adaptive planning.

Construction will follow a phased approach to systematically allow the diversion of load from Mutton Island WWTP and Athenry WWTP.



Figure 6-4: New Eastern WWTP

Network Interventions

Our optioneering has focused on agglomeration-specific network interventions, supported by models which have helped us to identify the underlying causes of localised challenges. An eastern plant focuses treatment closest to those areas of growth, which minimizes the need for conveying untreated loads over long distances. The key network interventions are summarised below:

Galway

Across Galway City, several interventions have been identified as offering effective solutions to managing network capacity. Operational efforts will focus on the separation of extraneous flows, specifically targeting the removal of tidal ingress in low-lying areas of the Galway City network where seawater enters the network.

Surface water separation will be explored alongside combined sewer separation. These will help us to manage the urban runoff generated from impermeable surfaces such as roads and roofs. The high concentration of roofs and roads in Galway City continues to direct significant runoff into the combined system that will need to be reduced to ensure adherence with the indicative non-binding objective in the rUWWTD. By collaborating with local authorities to implement SuDS and remediate stormwater to wastewater cross connections, we effectively "slow the flow." This removal of surface water creates the necessary hydraulic headroom at the existing Mutton Island WWTP and network to accommodate future population growth in the City to reduce the need for "grey" infrastructure storage. These measures may be supported by Smart Networks and Intelligent Operation to help monitor and control flows in the network and should be explored.

A heatmap showing the areas where impermeable area management is effective is shown in Figure 6-5. According to the model, there are 142 hectares of impermeable area within Galway City, 67 hectares are contributing in combined sewer areas and 75 hectares are contributing to partially separate areas. There are 8 hectares contributing via modelled surface water to foul / combined cross connections. All these opportunities should be explored at detailed appraisal level to test viability and cost / benefit.

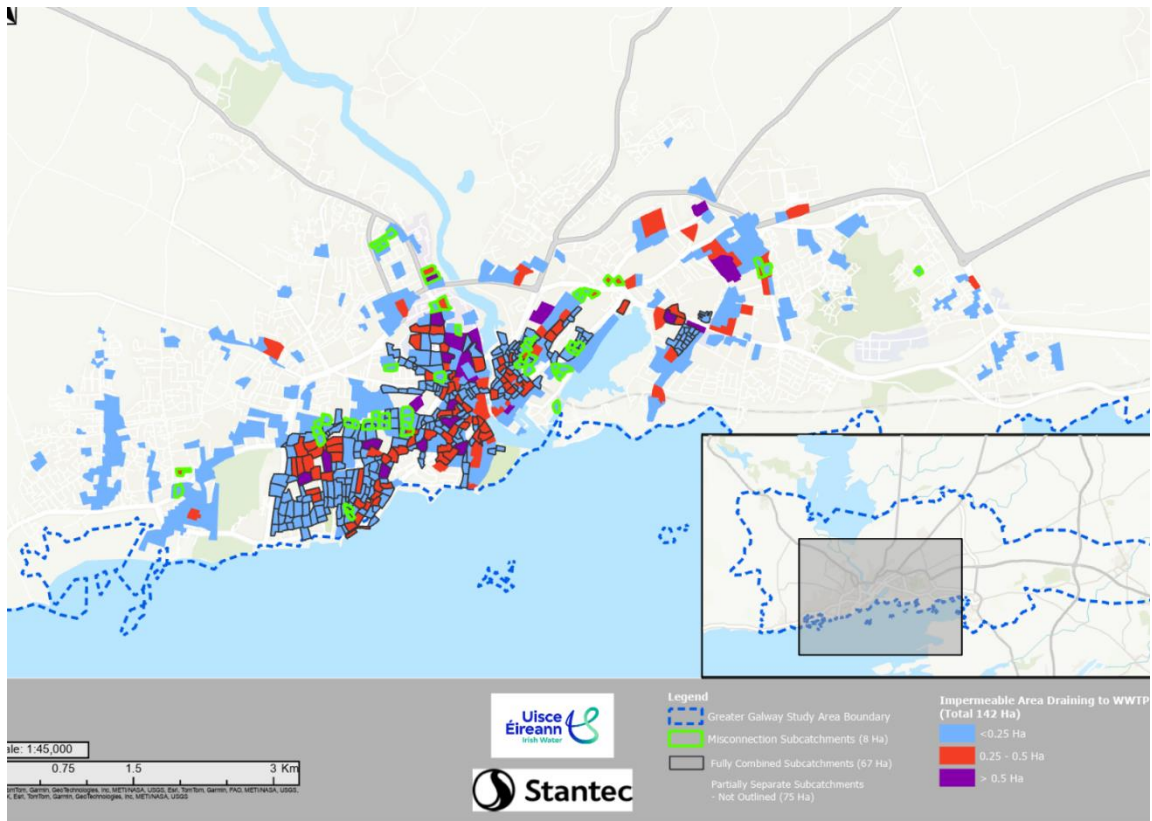


Figure 6-5: Mutton Island impermeable area heatmap

Athenry

As the WWTP will be converted into a new terminal pumping station. This facility will collect flows from Athenry village, the Athenry IDA, transferring the combined load directly to the new Regional WWTP.

Modelling has indicated that SWO performance may be improved by the removal of storm water to wastewater cross connection. Our approach to resolve misconnections is to work collaboratively with relevant parties to support them in identifying and remedying such connections. As the region develops and grows, we will identify opportunities to implement nature-based solutions to help manage surface water. Where space is limited, we will consider increasing sewer capacity and underground storage.

Moycullen and Claregalway

There are no immediate needs in terms of network risks for these agglomerations but should be monitored throughout the lifetime of the strategy.

Small Town integration

Other surrounding settlements - such as Furbogh, Kilcolgan, Clarinbridge, and Craughwell - where we do not currently operate any wastewater assets, can be incorporated within the modular capacity of the proposed WWTP. Their inclusion does not impact on the overall strategic direction or outcomes of the Galway Wastewater Strategy and should therefore be assessed through standard business-as-usual feasibility processes. Final decisions regarding their integration will be

based on site-specific appraisals and the outcomes of the Eastern WWTP site selection process, ensuring alignment with technical, environmental, and economic criteria.

6.2 Option Variables – Marine Outfalls

Two feasible options have been identified as potential outfall locations for the new WWTP. Each option was considered against several criteria to see support the identification of a single preferred option.

- **Environmental** – considers the potential impacts on protected areas during construction and operation,
- **Water Quality** – considers the potential impact of treated effluent discharge on the quality of receiving waters,
- **Public Perception and Visual Impacts** – considers the potential effects of the outfall location on public perception, including concerns related to aesthetics, recreation, and impacts on designated sites,
- **Treated Effluent Pumping and Design Complexity** – considers the complexity of construction, including factors such as pumping requirements, gradient and distance to discharge waterbody.
- **Construction, Buildability and Engineering Requirements** – assessed the feasibility of constructing the outfall, considering factors such as required outfall length and likely complexity of construction techniques.

Wastewater at the new WWTP would be treated to a standard that ensures minimal impacts on water quality. The size of the site (up to 400,000 PE) will require quaternary treatment by 2045 under the rUWWTd, and as such the effluent will be highly treated to stringent regulatory standards. Given the discharge location and effluent quality, direct impacts on public health at designated recreational or bathing waters within the area, as well as marine habitats, are considered unlikely. However, in the absence of a dispersion model at the time of strategy formulation, this assessment should be substantiated through comprehensive, detailed modelling studies.

Option 9 - Eastern Outfall

This option requires the construction of a new marine outfall extending considerable distance into Inner Galway Bay. The transfer of final effluent from the WWTP to the coastline is subject to further appraisal and is depicted for illustrative purposes only, as is the proposed alignment of the marine outfall. The diffuser heads are positioned illustratively, but since the water column here is relatively shallow, meeting initial dilution requirements would require an outfall length of about 3,500m from Roscam Point. The location of the diffuser heads are within the Inner Galway Bay SPA and Complex SAC. As such, detailed environmental assessments, construction techniques and route optimisation strategies will be needed to avoid and mitigate any disturbance and/or temporary or permanent loss of habitats as part of our mitigation strategy.

A summary of the key considerations regarding an eastern outfall are set out below that should be considered during the implementation phase of the Strategy (please refer to the Natura Impact Statement for further information):

Table 6-1: Key Criteria and considerations for eastern outfall

Criteria	Considerations
Environmental	<p>This option has the potential for impacts on Annex I habitats, as outlined below, that will have to be considered for avoidance and mitigation during the implementation phase of the Strategy:</p> <ul style="list-style-type: none"> • Reefs • Mudflats and Sandflats • Shallow Inlets and Bays: • Perennial Vegetation and Stony Banks <p>The outfall route should be optimised to avoid disturbance of habitats and mitigate for temporary and/or permanent loss of any designated habitats. Appropriate construction techniques and route selection should be explored as part of mitigation strategy.</p>
Water Quality	<p>As with all options, wastewater would be treated to a high standard that will ensure minimal impacts on water quality. As a result, it is not anticipated that this option would have any observable effect on water quality or WFD status. However, the WWTP is still adding a pollutant load to the environment therefore, in the absence of a dispersion model at the time of strategy formulation, this assessment should be substantiated through comprehensive, detailed modelling studies.</p>
Public Perception and Visual Impacts	<p>Although the discharge location would be within a SPA/SAC, it would only be visible to the public during construction and maintenance activities. During operation it would not be visible to the public and due to the high effluent quality is unlikely to impact on any bathing or recreational waters. The latter would also require substantiation through detailed modelling studies.</p>
Treated Effluent Pumping and Design Complexity	<p>Selection of an appropriate location for the WWTP must strike a balance between the requirements for pumping both untreated sewage to the WWTP and discharge of treated effluent to the marine outfall. Extensive conveyancing infrastructure will be needed throughout the study area. Consideration will be required to optimise the pump routes, complexity, OPEX and whole life carbon.</p>
Construction, Buildability and Engineering Requirements	<p>This outfall option would likely require specialised, complex construction methods to navigate Annex I habitats within the Inner Galway Bay SPA and Complex SAC. While technically feasible, this option is considered more challenging than the western outfall option from an engineering perspective.</p>

Scenario 7 - Western Outfall

In this option, the discharge point is located within the Outer Galway Bay coastal water body, along the land-to-coast boundary between Bearna and Furbogh. This placement is considered optimal, as it facilitates greater dilution by accessing deeper waters approximately 600 metres from the shoreline. Compared to the eastern outfall, this location offers distinct advantages regarding overall life-cycle costs and carbon footprint. Construction is also likely to be simpler, but this requires confirmation through further surveys and appraisal. Additionally, the diffuser heads are situated outside the Galway Bay Complex SAC, further enhancing its suitability by avoiding construction within designated habitats. Nonetheless, given the lack of a dispersion model during the development of the strategy, thorough and detailed modelling studies are necessary to confirm that no adverse impacts extend into protected areas.

This option involves the construction of a final effluent pipeline that spans the entire breadth of the city from the WWTP in the east to the proposed western discharge point. This would be subject to further appraisal and thorough site and route selection processes and will require optimisation to ensure that no protected habitats are disturbed within the Lough Corrib SAC and require consideration as part of our mitigation strategy.

A summary of the key considerations regarding a western outfall are set out below that should be considered during the implementation phase of the Strategy (please refer to the Natura Impact Statement for further information):

Table 6-2: Key Criteria and considerations for western outfall

Criteria	Considerations
Environmental	This option is expected to have the shortest outfall length and would avoid Galway Bay Complex SAC, reducing potential for impact on Annex I habitats. Nonetheless, given the lack of a dispersion model during the strategy's development, thorough and detailed modelling studies are necessary to confirm that no adverse impacts extend into protected areas.
Water Quality	As with all options, wastewater would be treated to a high standard that will ensure minimal impacts on water quality. As a result, it is not anticipated that this option would have any observable effect on water quality or WFD status. However, the WWTP is still adding a pollutant load to the environment therefore, in the absence of a dispersion model at the time of strategy formulation, this assessment should be substantiated through comprehensive, detailed modelling studies.
Public Perception and Visual Impacts	While the route for the treated effluent outfall may be situated in a relatively scenic area west of Galway City, it does not intersect any protected European sites, which presents a notable advantage compared to the eastern outfall. Furthermore, it would only be visible to the public during construction and maintenance activities. During operation it would not be visible to the public and due to the high effluent quality is unlikely to impact on any bathing or

	recreational waters. The latter would also require substantiation through detailed modelling studies.
Treated Effluent Pumping and Design Complexity	The treated effluent pipeline is much shorter than the eastern option, however this advantage is offset by the extensive terrestrial pump route from the Eastern WWTP to this location. Additionally, the natural gradient of the seabed slopes downward at quite a steep gradient that would need consideration at future appraisal.
Construction, Buildability and Engineering Requirements	<p>Since the outfall is located outside the Galway Bay SAC, it is unlikely that specialised or complex construction methods will be needed to navigate Annex I habitats. Instead, simpler techniques, such as straightforward float-and-sink or lay barge methods, are expected to be suitable.</p> <p>The overland terrestrial transfer main from the Eastern WWTP to the marine outfall is a complex engineering challenge. Thorough route and site selection needs to consider the elevation of the terrain, environmental constraints, whole life energy and carbon to optimise this route and reduce the need for interstage pumping and any emergency overflow arrangements that may be required.</p>

Summary

Both proposed outfall options are deemed feasible, as detailed in the comparative assessment above. Each option presents different constraints and challenges that must be addressed during the implementation of the Strategy. The eastern outfall requires a significantly longer pipeline to the discharge location in the Bay of Galway. The length requires more extensive construction, which must also consider potential harm to annex 1 habitats in the areas.

The western outfall requires a final effluent pipeline that spans the entire breadth of the city from the WWTP in the east to the proposed discharge point. The scale of construction required in Galway Bay is less, compared to the eastern option, which mitigates the impact on the marine environment. However, significant construction is required to convey final effluent from the WWTP to the discharge point.

While both options entail certain challenges, there is no clear preferred option currently. The evaluation presented here is based on our desktop assessment. Additional investigation and studies, combined with consultation responses, will support the identification of a preferred option.

7. Conclusion

Following our optioneering process, we have identified the key strategic decisions which will shape the future wastewater strategy for the Galway region. Our long list of 42 interventions has been constrained at both a strategic and agglomeration level to identify the most effective options for the region.

Projected growth in the region has highlighted the need for a significant increase in wastewater treatment capacity medium to long term. The two largest WWTP's in the region risk running out of capacity by 2040. As such we have identified the need for two immediate resilience upgrades at both Mutton Island WWTP and Athenry WWTP to ensure that short-term growth can be accommodated while a long-term solution is developed.

To accommodate long-term growth projections, the optioneering process identified the need for **a new regional WWTP in the region**, which discharges via a marine outfall. From 9 feasible options, a robust MCDA exercise has supported the identification of an **Eastern WWTP as the preferable location for the new regional WWTP**.

The new eastern wastewater treatment plant (WWTP) shall be designed with a modular capacity accommodating up to 400,000 Population Equivalent (PE), with the phased integration of process units aligned to the implementation plan. This modular configuration facilitates scalable expansion, supporting uncertain population growth. The new site offers significant resilience benefits over the next 55 years while offering economies of scale.

Beyond 2040 – when treatment capacity at Mutton Island becomes limiting - the new site will receive some of the load from Mutton Island enabling it to be downsized in the long-term. Similarly, beyond 2040, Athenry will also transfer its load to the new regional site to reduce the risk of environmental impact from the anticipated increase in discharge to the receiving water body. This will enable Athenry to be converted into a terminal pumping station for the area. A summary of this phasing is shown in Figure 7-1

The process has outlined two possibilities for the disposal of treated effluent: a marine outfall located either to the east or to the west of the study area. There are short term benefits to the western outfall, as the length of outfall is significantly shorter than that required in the east which makes construction simpler with less impact on the environment. However, the conveyance of effluent from the east to the west of the region represents challenging construction and long-term carbon and cost implications.

The proposed strategy for treatment at Moycullen and Claregalway will be to maintain treatment within their current agglomerations and will not be transferred to the new WWTP or retained Mutton Island agglomeration. No investment needs are anticipated for Claregalway prior to the 2055 horizon. It is further recommended that feasibility study reports be completed for all four WWTPs in the study area, allowing for a more detailed assessment of treatment plant capabilities to validate the findings of the strategic level of analysis already undertaken.

The results from this public consultation, in addition to further assessment of costs and benefits will support the identification of the chosen solution. The site selection will have a significant impact on conveyancing routes, pumping requirements, costs (operating and capital) and carbon.

As such, our optioneering process has considered these elements qualitatively (for example, as part of the MCDA), as quantitative estimates would not be robust at this stage.

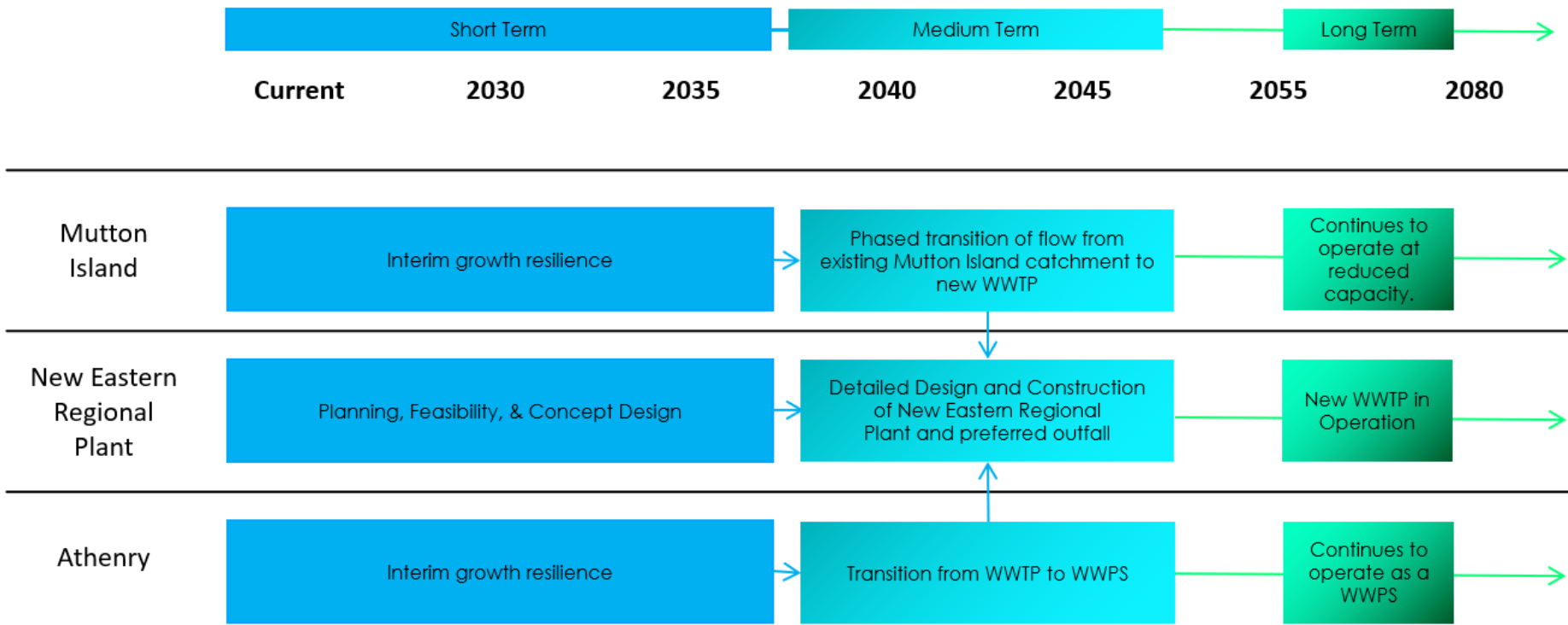


Figure 7-1: Mutton Island, Athenry & New WWTP Phasing

Annex A – Themed TOTEX Intervention Hierarchy

TOTEX Hierarchy	Themed Intervention Area	Ref	Intervention Title	Intervention Description
Eliminate	Indirect Options	ID1	Investigate and Monitor	Understand the underlying root cause and risk. Additional data required e.g. surveys, hydraulic modelling and / or WQ modelling.
		ID2	Influence Policy	Influencing policy on growth, planning, surface water connections to reduce inflow.
		ID3	Future Technologies	To await or develop new technology to support with meeting objectives.
		ID4	Modify Consents or Permits	Review the permit with the Environmental Protection Agency and meet new permit conditions.
Collaborate	Customer Behavioural	CB1	Water efficient appliances (domestic & non-domestic)	Water efficient appliances/measures to reduce domestic 'Per Capital Consumption' (PCC) and industrial / commercial usage. Effective in agglomerations with stress in DWF conditions.
		CB2	Rainwater Harvesting	Removing surface water from the system and making it available to re-use. By installing measures which collect and store the rainfall before it lands and is lost as runoff. Rainwater harvesting reduces the amount of flow that needs to be conveyed through the sewer network during a storm, thus reducing the likelihood of sewer flooding or spills to watercourse. Includes smart management of surface water before flow enters the system (e.g. smart water butts).
		CB3	Greywater / Blackwater treatment and reuse	Install systems to treat and re-use household greywater (excluding toilets) and Blackwater (including toilets) for flushing toilets and gardening use. Either at property level or larger scale to reduces both flow and load to the system. The treatment levels considered vary from treatment for potable use to pre-treatment for discharge into the combined or foul sewer network.
		CB4	Customer Incentives	Domestic and business customer education on Fats Oils and Grease (FOG), flushable items, water consumption and impermeable area reduction and creep (e.g. depaving incentivisation schemes to existing customers)
		CB5	Trade Flow Management	Pre-treatment of trade effluent 'at source' to reduce load at WWTP
		CB6	Collaboration with other customers and catchment stakeholders	Supporting schemes that are being, or planned to be, progressed by catchment partners.

TOTEX Hierarchy	Themed Intervention Area	Ref	Intervention Title	Intervention Description
Operate / Optimise	Networks	ON1	Intercatchment Network transfers	Divert flows / bifurcations from one drainage area into an adjacent area (in the same agglomeration).
		ON2	Removal of tidal ingress flows	Removing direct ingresses of seawater, reducing hydraulic burden on network and operational issues.
		ON3	Inflow & Infiltration Management	Managing groundwater ingress and rainwater induced direct inflows into the sewer network during wet weather and high ground water levels.
		ON4	Smart Networks & Intelligent Operation	Controlling flow movement in reaction to the current situation. Allows the system to be operated proactively, maximising the use of existing assets. These options cover a range of different approaches e.g. modifying the start-stop levels at strategic pumping stations, creation of new network control points which allow for flow to be temporarily held back in the catchment.
		ON5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes. E.g. 'Live' and predictive asset performance monitoring to proactively enhance performance, automated de-ragging and silt flushing, blockage reduction, siltation management.
		ON6	Rationalisation of Overflows (no infra)	Rationalisation of overflows within a catchment to improve management of SWO discharges without providing additional storage or increasing capacity
	WWTP	OW1	WWTP Decentralisation	Transferring of flows to a new WWTP to create headroom and optimise existing WWTP/network and/or build a new WWTP to accommodate new developments as part of a de-centralisation strategy.
		OW2	WWTP Centralisation	Centralisation of smaller WWTP to take advantage of economies of scale and operational practices.
		OW3	Smart Networks & Intelligent Operation	Intelligent/dynamic processes at WWTPs to optimise aeration, treatment capacity and operational capability.
		OW4	River Catchment Flexible Permitting	Looking at in river catchment flexible permitting and modify permits if appropriate (to include for trading of permit capacity where appropriate).
OW5		Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes	

TOTEX Hierarchy	Themed Intervention Area	Ref	Intervention Title	Intervention Description	
Invigorate	Partnership Working	IN1	Surface Water Source Control Measures	Managing surface water and maximising its potential for re-use. Opportunities for large-scale source control installation such as retrofitting in highways and around buildings.	
		IN2	Surface Water Exceedance Pathways	The need to provide safe conveyance (as opposed to storage) for floodwater during an extreme rainfall event (when the capacity of the sewer network is exceeded). Could, significantly mitigate the risk of considerable damage to public and private property and even loss of life that could result from an extreme rainfall event	
		IN3	Strategic Blue-Green Corridors	Combine the management of blue and green spaces in urban environments with a focus on place making.	
		IN4	Surface Water Separation	Separate surface water from combined systems by construction new surface water networks	
		IN5	Surface Water Removal	Removing existing surface water from discharging into the combined system by diverting to watercourses or other SW systems.	
Fabricate	Sustainable Options	WWTP Networks	FSN1	Surface Water Separation and Removal	1. Construction of new storm water sewers, in combined sewer areas, to create additional capacity 2. Remove existing surface water from discharging into the combined system by diverting to watercourses or other SW systems. 3. Laying new smaller foul sewers in combined sewer areas
			FSN2	Green or SuDS Storage	Managing surface water entering the sewer network through surface water separation and Sustainable Drainage Systems (SuDS) strategies (e.g. Ponds, basins, swales)
			FSN3	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of reed beds to improve Storm Overflow effluent water quality.
		WWTP	FSW1	WWTP Tertiary / Quaternary Effluent Green Treatment	Sustainable treatment streams to deal with emerging legislative targets.

TOTEX Hierarchy	Themed Intervention Area	Ref	Intervention Title	Intervention Description	
			FSW2	WWTP Energy Efficiency Measures	Energy Efficiency measures to offset increase to treatment capacity
			FSW3	New WWTP	New Sustainable WWTP
			FTN1	Sewer Capacity and Underground Storage Upgrades	Traditional capacity upgrades including building new sewers, WWPS and attenuation tanks to increase capacity.
		Networks	FTN2	New SWO	Construction of a new SWO with overflow to receiving waterbody.
	FTN3		Storm Overflow Rationalisation / Abandonment	Identify opportunities to combine multiple storm overflows into a single asset designed to improved modern design standards.	
	FTN4		Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of settlement and UV Treatment.	
	FTW1		WWTP Capacity Upgrades	Traditional capacity upgrades including building new treatment units considering land availability and environmental capacity of the receiving watercourse.	
		WWTP	FTW2	WWTP Site Expansion	To allow for new process units to meet permit conditions.
	FTW3		WWTP Tertiary / Quaternary Effluent Traditional Treatment	Traditional treatment streams to deal with emerging legislative targets.	
	FTW4		Effluent Discharge Relocation	Move/pump WWTP discharge to a larger waterbody with greater dilution	
	FTW5		New WWTP	New Sustainable WWTP	

Annex B –Primary Screening Discount Register: Study Area Level

TOTEX Hierarchy	Ref.	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Eliminate	ID1	Investigate and Monitor	Understand the underlying root cause and risk. Additional data required e.g. surveys, hydraulic modelling and / or WQ modelling.	Carried (at appraisal level)	Does not resolve the issues on its own but may form part of overall strategy
	ID2	Influence Policy	Influencing policy on growth, planning, surface water connections to reduce inflow.	Carried (Ubiquitous)	
	ID3	Future Technologies	To await or develop new technology to support with meeting objectives.	Carried (Ubiquitous)	
	ID4	Modify Consents or Permits	Review the permit with the Environmental Protection Agency and meet new permit conditions.	Discounted	Unlikely to be accepted by regulator and wouldn't address underlying issues.
Collaborate	CB1	Water efficient appliances	Water efficient appliances/measures to reduce domestic 'Per Capital Consumption' (PCC) and industrial / commercial usage. Effective in catchments with stress in DWF conditions.	Discounted	Technically feasible but the application of domestic water reduction is unlikely to be sufficient on its own and may require legislative change and higher-level intervention to enforce.
	CB2	Rainwater Harvesting	Removing surface water from the system and making it available to re-use. By installing measures which collect and store the rainfall before it lands and is lost as runoff. Rainwater harvesting reduces the amount of flow that needs to be conveyed through the sewer network during a storm, thus reducing the likelihood of sewer flooding or spills to watercourse. Includes smart management of surface water before flow enters the system (e.g. smart water butts).	Carried (Ubiquitous)	Removing surface water from the system and making it available to re-use. Rainwater harvesting reduces the amount of flow that needs to be conveyed through the sewer network during a storm, thus reducing the likelihood of sewer flooding or spills to watercourse.
	CB3	Greywater / Blackwater treatment and reuse	Install systems to treat and re-use household greywater (excluding toilets) and Blackwater (including toilets) for flushing toilets and gardening use. Either at property level or larger scale to reduces both flow and load to the system. The treatment levels considered vary from treatment for potable use to pre-treatment for discharge into the combined or foul sewer network.	Discounted	Significantly complex to implement and benefits may not be realised.
	CB4	Customer Incentives	Domestic and business customer education on Fats Oils and Grease (FOG), flushable items, water consumption and impermeable area reduction and creep (e.g. depaving incentivisation schemes to existing customers)	Discounted	Unlikely to have significant impact on catchment issues and implementation of de-paving schemes at the scale required may not be cost-beneficial.
	CB5	Trade Flow Management	Pre-treatment of trade effluent 'at source' to reduce load at WWTP	Carried (Ubiquitous)	Would require significant investment and would be highly effective biologically but hydraulic constraints would prevail.
	CB6	Collaboration with other customers and catchment stakeholders	Supporting schemes that are being, or planned to be, progressed by catchment partners.	Carried (Ubiquitous)	
Operate / Optimise Networks	ON1	Intercatchment Network transfers	Divert flows / bifurcations from one drainage area into an adjacent area (in the same catchment).	Carried	Optimizes existing infrastructure by balancing flows across the catchment, potentially deferring the need for expensive storage tanks or upsizing.
	ON2	Removal of tidal ingress flows	Removing direct ingresses of seawater, reducing hydraulic burden on network and operational issues.	Carried	Limited and localised effect but carried as seawater has adverse impact on the sewer network and treatment processes.
	ON3	Inflow & Infiltration Management	Managing groundwater ingress and rainwater induced direct inflows into the sewer network during wet weather and high ground water levels.	Carried	Opportunities are present in several subcatchments within the study area.
	ON4	Smart Networks & Intelligent Operation	Controlling flow movement in reaction to the current situation. Allows the system to be operated proactively, maximising the use of existing assets. These options cover a range of different approaches e.g. modifying the start-stop levels at strategic pumping stations, creation of new network control points which allow for flow to be temporarily held back in the catchment.	Carried	
	ON5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes. E.g. 'Live' and predictive asset performance monitoring to proactively enhance performance, automated de-ragging and silt flushing, blockage reduction, siltation management.	Carried	

TOTEX Hierarchy	Ref.	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
	ON6	Rationalisation of Overflows (no infra)	Rationalization of overflows within a catchment to improve management of spills <i>without providing</i> additional storage or increasing capacity	Carried	Simplifies network management by reducing the number of spill points, allowing for more targeted monitoring and maintenance of high-priority assets.
Operate / Optimise WWTP	OW1	WWTP Decentralisation	Transferring of flows to a new WWTP to create headroom and optimise existing WWTP/network and/or build a new WWTP to accommodate new developments as part of a de-centralisation strategy.	Carried	Likely to be significant capital cost but would resolve current issues
	OW2	WWTP Centralisation	Centralisation of smaller WWTP to take advantage of economies of scale and operational practices.	Carried	
	OW3	Smart Networks & Intelligent Operation	Intelligent/dynamic processes at WWTPs to optimise aeration, treatment capacity and operational capability.	Carried	
	OW4	River Catchment Flexible Permitting	Looking at in river catchment flexible permitting and modify permits if appropriate (to include for trading of permit capacity where appropriate)	Discounted	Unlikely to be accepted by regulator and wouldn't address underlying issues
	OW5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes	Carried	
Invigorate Partnership Working	IN1	Surface Water Source Control Measures	Managing surface water and maximising its potential for re-use. Opportunities for large-scale source control installation such as retrofitting in highways and around buildings.	Discounted	Difficult to implement to the level required to see the benefit and other interventions may be more effective.
	IN2	Surface Water Exceedance Pathways	The need to provide safe conveyance (as opposed to storage) for floodwater during an extreme rainfall event (when the capacity of the sewer network is exceeded). Could, significantly mitigate the risk of considerable damage to public and private property and even loss of life that could result from an extreme rainfall event.	Discounted	Significant investment required and insufficient space to carry this out within Galway City.
	IN3	Strategic Blue-Green Corridors	Combine the management of blue and green spaces in urban environments with a focus on place making.	Carried	Requirement under rUWWTD.
	IN4	Surface Water Separation	Separate surface water from combined systems by construction new surface water networks	Carried	Already largely separated, however may be potential for other areas to reduce discharge volumes.
	IN5	Surface Water Removal	Removing existing surface water from discharging into the combined system by diverting to watercourses or other SW systems.	Carried	Already largely separated, however may be potential for other areas to reduce discharge volumes.
Fabricate Sustainable Networks	FSN1	Surface Water Separation and Removal	1. Construction of new storm water sewers, in combined sewer areas, to create additional capacity 2. Remove existing surface water from discharging into the combined system by diverting to watercourses or other SW systems. 3. Laying new smaller foul sewers in combined sewer areas	Carried	
	FSN2	Green or SuDS Storage	Managing surface water entering the sewer network through surface water separation and Sustainable Drainage Systems (SuDS) strategies (e.g. Ponds, basins, swales)	Carried	
	FSN3	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of reed beds to improve Storm Overflow effluent water quality.	Discounted	Would require significant areas of land within Galway City
	FSW1	WWTP Tertiary / Quaternary Effluent Green Treatment	Sustainable treatment streams to deal with emerging legislative targets.	Discounted	Unlikely to deliver outcomes needed at the scale required.
Fabricate Sustainable WWTP	FSW2	WWTP Energy Efficiency Measures	Energy Efficiency measures to offset increase to treatment capacity	Carried	Unlikely to deliver outcomes in isolation.
	FSW3	New WWTP	Construction of a new sustainable WWTP	Carried	
Fabricate Traditional	FTN1	Sewer Capacity and Underground Storage Upgrades	Traditional capacity upgrades including building new sewers, WWPS and attenuation tanks to increase capacity.	Carried	

TOTEX Hierarchy	Ref.	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
	FTN2	New SWO	Construction of a new SWO with overflow to receiving waterbody.	Discounted	This is unlikely to address the strategic needs within the Study Area.
	FTN3	Storm Overflow Rationalisation / Abandonment	Identify opportunities to combine multiple storm overflows into a single asset designed to improved modern design standards.	Carried	Potential in certain areas
	FTN4	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of settlement and UV Treatment.	Carried	Smaller footprint than sustainable options
Fabricate Traditional WWTP	FTW1	WWTP Capacity Upgrades	Traditional capacity upgrades including building new treatment units considering land availability and environmental capacity of the receiving watercourse.	Carried	
	FTW2	WWTP Site Expansion	To allow for new process units to meet permit conditions.	Carried	
	FTW3	WWTP Tertiary / Quaternary Effluent Traditional Treatment	Traditional treatment streams to deal with emerging legislative targets.	Carried	
	FTW4	Effluent Discharge Relocation	Move/pump WWTP discharge to a larger waterbody with greater dilution	Carried	
	FTW5	New WWTP	Construction of a new Traditional WWTP	Carried	

Annex C – Primary Screening Discount Register: Agglomeration Level – Mutton Island

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Operate / Optimise	ON1	Intercatchment Network transfers	Divert flows / bifurcations from one drainage area into an adjacent area (in the same agglomeration).	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration.
	ON2	Removal of tidal ingress flows	Removing direct ingresses of seawater, reducing hydraulic burden on network and operational issues.	Carried	Tidal ingress is prevalent within the Mutton Island agglomeration and is required to be addressed to improve hydraulic capacity and WWTP performance.
	ON3	Inflow & Infiltration Management	Managing groundwater ingress and rainwater induced direct inflows into the sewer network during wet weather and high ground water levels.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration.
	ON4	Smart Networks & Intelligent Operation	Controlling flow movement in reaction to the current situation. Allows the system to be operated proactively, maximising the use of existing assets. These options cover a range of different approaches e.g. modifying the start-stop levels at strategic pumping stations, creation of new network control points which allow for flow to be temporarily held back in the catchment.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration.
	ON5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes. E.g. 'Live' and predictive asset performance monitoring to proactively enhance performance, automated de-ragging and silt flushing, blockage reduction, siltation management.	Carried	To maintain maximum hydraulic capacity pro-active technologies should be explored to improve environmental and flooding performance.
	ON6	Rationalisation of Overflows (no infra)	Rationalisation of overflows within a catchment to improve management of spills without providing additional storage or increasing capacity	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration.
	OW1	WWTP Decentralisation	Transferring of flows to a new WWTP to create headroom and optimise existing WWTP/network and/or build a new WWTP to accommodate new developments as part of a de-centralisation strategy.	Carried	A new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion.
	OW2	WWTP Centralisation	Centralisation of smaller WWTP to take advantage of economies of scale and operational practices.	Discounted	Discounted as a new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion.
	OW3	Smart Networks & Intelligent Operation	Intelligent/dynamic processes at WWTPs to optimise aeration, treatment capacity and operational capability.	Discounted	This may be an option in the short term, however, in the long term it is not an appropriate intervention to address the infrastructure deficit.

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
	OW5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes	Carried	This would assist the efficiency of the existing plant

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Invigorate	IN3	Strategic Blue-Green Corridors	Combine the management of blue and green spaces in urban environments with a focus on place making.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration in partnership with Local Authorities.
	IN4	Surface Water Separation	Separate surface water from combined systems by construction new surface water networks	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration in partnership with Local Authorities.
	IN5	Surface Water Removal	Removing existing surface water from discharging into the combined system by diverting to watercourses or other SW systems.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration in partnership with Local Authorities.

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Fabricate	FSN1	Surface Water Separation and Removal	1. Construction of new storm water sewers, in combined sewer areas, to create additional capacity 2. Remove existing surface water from discharging into the combined system by diverting to watercourses or other SW systems. 3. Laying new smaller foul sewers in combined sewer areas	Carried	Sensitivity tests concluded that this may be an effective intervention in this agglomeration so should be carried and explored at detailed appraisal stage.
	FSN2	Green or SuDS Storage	Managing surface water entering the sewer network through surface water separation and Sustainable Drainage Systems (SuDS) strategies (e.g. Ponds, basins, swales)	Carried	Sensitivity tests concluded that this may be an effective intervention in this agglomeration so should be carried and explored at detailed appraisal stage.
	FSW2	WWTP Energy Efficiency Measures	Energy Efficiency measures to offset increase to treatment capacity	Carried	It is not proposed to increase capacity but energy efficiency measures should be explored.
	FSW3	New Sustainable WWTP	Construction of a new sustainable WWTP	Discounted	Discounted as a new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion.
	FTN1	Sewer Capacity and Underground Storage Upgrades	Traditional capacity upgrades including building new sewers, WWPS and attenuation tanks to increase capacity.	Carried	Traditional capacity upgrades may be required alongside more sustainable measures to reduce the load discharged to the environment. This intervention type should be assessed alongside other measures as part of detailed appraisals.
	FTN3	Storm Overflow Rationalisation / Abandonment	Identify opportunities to combine multiple storm overflows into a single asset designed to improved modern design standards.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration.

FTN4	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of settlement and UV Treatment.	Carried	This remains a viable intervention to reduce the load discharged to the environment, however would take space to implement. Should be considered on a site-by-site basis at detailed appraisal stage.
FTW1	WWTP Capacity Upgrades	Traditional capacity upgrades including building new treatment units considering land availability and environmental capacity of the receiving watercourse.	Discounted	Discounted as a new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion. Planning and environmental concerns limit the capacity to expand beyond the existing site boundary and limits technology choices.
FTW2	WWTP Site Expansion	To allow for new process units to meet permit conditions.	Discounted	Discounted as a new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion. Planning and environmental concerns limit the capacity to expand beyond the existing site boundary and limits technology choices.
FTW3	WWTP Tertiary / Quaternary Effluent Traditional Treatment	Traditional treatment streams to deal with emerging legislative targets.	Discounted	Discounted as a new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion. Planning and environmental concerns limit the capacity to expand beyond the existing site boundary and limits technology choices.
FTW4	Effluent Discharge Relocation	Move/pump WWTP discharge to a larger waterbody with greater dilution	Discounted	Discounted as a new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion. Planning and environmental concerns limit the capacity to expand beyond the existing site boundary and limits technology choices.
FTW5	New WWTP	Construction of a new Traditional WWTP	Carried	A new regional facility is proposed to intercept city flows, addressing the forecasted capacity deficit of the existing WWTP due to Galway's expansion.

Annex D – Primary Screening Discount Register: Agglomeration Level – Athenry

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Operate / Optimise	ON1	Intercatchment Network transfers	Divert flows / bifurcations from one drainage area into an adjacent area (in the same agglomeration).	Discounted	There are only two terminal SWOs at the WWTP within this agglomeration therefore there is no opportunity for this intervention.
	ON2	Removal of tidal ingress flows	Removing direct ingresses of seawater, reducing hydraulic burden on network and operational issues.	Discounted	Not a tidal location.
	ON3	Inflow & Infiltration Management	Managing groundwater ingress and rainwater induced direct inflows into the sewer network during wet weather and high ground water levels.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Athenry agglomeration.
	ON4	Smart Networks & Intelligent Operation	Controlling flow movement in reaction to the current situation. Allows the system to be operated proactively, maximising the use of existing assets. These options cover a range of different approaches e.g. modifying the start-stop levels at strategic pumping stations, creation of new network control points which allow for flow to be temporarily held back in the catchment.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Athenry agglomeration.
	ON5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes. E.g. 'Live' and predictive asset performance monitoring to proactively enhance performance, automated de-ragging and silt flushing, blockage reduction, siltation management.	Carried	To maintain maximum hydraulic capacity pro-active technologies should be explored to improve environmental and flooding performance.
	ON6	Rationalisation of Overflows (no infra)	Rationalisation of overflows within a catchment to improve management of spills without providing additional storage or increasing capacity.	Discounted	There are only two terminal SWOs at the WWTP within this agglomeration therefore there is no opportunity for further rationalisation.
	OW1	WWTP Decentralisation	Transferring of flows to a new WWTP to create headroom and optimise existing WWTP/network and/or build a new WWTP to accommodate new developments as part of a de-centralisation strategy.	Carried	This remains a viable intervention as the treatment standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.
	OW2	WWTP Centralisation	Centralisation of smaller WWTP to take advantage of economies of scale and operational practices.	Discounted	The standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable. Adding additional load to this location would not be technically viable.
	OW3	Smart Networks & Intelligent Operation	Intelligent/dynamic processes at WWTPs to optimise aeration, treatment capacity and operational capability.	Discounted	This remains a viable intervention in the short term but in the long term the treatment standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
	OW5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes	Discounted	This remains a viable intervention in the short term but in the long term the treatment standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Invigorate	IN3	Strategic Blue-Green Corridors	Combine the management of blue and green spaces in urban environments with a focus on place making.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration in partnership with Local Authorities.
	IN4	Surface Water Separation	Separate surface water from combined systems by construction new surface water networks	Discounted	Sensitivity tests concluded that this may not be an effective intervention in this agglomeration so is discounted at this stage.
	IN5	Surface Water Removal	Removing existing surface water from discharging into the combined system by diverting to watercourses or other SW systems.	Carried	This remains a viable intervention to create additional capacity to be assessed as part of detailed appraisals of the Mutton Island agglomeration in partnership with Local Authorities.

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Fabricate	FSN1	Surface Water Separation and Removal	1. Construction of new storm water sewers, in combined sewer areas, to create additional capacity 2. Remove existing surface water from discharging into the combined system by diverting to watercourses or other SW systems. 3. Laying new smaller foul sewers in combined sewer areas	Carried	Sensitivity tests concluded that this may be an effective intervention in this agglomeration so should be carried and explored at detailed appraisal stage.
	FSN2	Green or SuDS Storage	Managing surface water entering the sewer network through surface water separation and Sustainable Drainage Systems (SuDS) strategies (e.g. Ponds, basins, swales)	Carried	Sensitivity tests concluded that this may be an effective intervention in this agglomeration so should be carried and explored at detailed appraisal stage.
	FSW2	WWTP Energy Efficiency Measures	Energy Efficiency measures to offset increase to treatment capacity	Discounted	This remains a viable intervention in the short term but in the long term the treatment standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.
	FSW3	New Sustainable WWTP	Construction of a new sustainable WWTP	Discounted	The standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.
	FTN1	Sewer Capacity and Underground Storage Upgrades	Traditional capacity upgrades including building new sewers, WWPS and attenuation tanks to increase capacity.	Carried	Traditional capacity upgrades may be required alongside more sustainable measures to reduce the load discharged to the environment. This intervention type should be assessed alongside other measures as part of detailed appraisals.
	FTN3	Storm Overflow Rationalisation / Abandonment	Identify opportunities to combine multiple storm overflows into a single asset designed to improved modern design standards.	Discounted	There are only two terminal SWOs at the WWTP within this agglomeration therefore there is no opportunity for further rationalisation.

FTN4	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of settlement and UV Treatment.	Discounted	There are only two terminal SWOs at the WWTP within this agglomeration therefore there is no opportunity for further rationalisation.
FTW1	WWTP Capacity Upgrades	Traditional capacity upgrades including building new treatment units considering land availability and environmental capacity of the receiving watercourse.	Discounted	The standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.
FTW2	WWTP Site Expansion	To allow for new process units to meet permit conditions.	Discounted	The standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.
FTW3	WWTP Tertiary / Quaternary Effluent Traditional Treatment	Traditional treatment streams to deal with emerging legislative targets.	Discounted	The standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.
FTW4	Effluent Discharge Relocation	Move/pump WWTP discharge to a larger waterbody with greater dilution	Carried	Carried for further consideration within optioneering process.
FTW5	New WWTP	Construction of a new Traditional WWTP	Discounted	The standard to treat flows at Athenry and discharge to its current location up to the 2080 planning horizon would be technically unviable.

Annex E – Primary Screening Discount Register: Agglomeration Level – Moycullen

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Operate / Optimise	ON1	Intercatchment Network transfers	Divert flows / bifurcations from one drainage area into an adjacent area (in the same agglomeration).	Discounted	There is only one terminal SWO at the WWTP within this agglomeration therefore there is no opportunity for this intervention.
	ON2	Removal of tidal ingress flows	Removing direct ingresses of seawater, reducing hydraulic burden on network and operational issues.	Discounted	Not a tidal location.
	ON3	Inflow & Infiltration Management	Managing groundwater ingress and rainwater induced direct inflows into the sewer network during wet weather and high ground water levels.	Carried	The single SWO at Moycullen is low risk however this intervention type should be carried as viable.
	ON4	Smart Networks & Intelligent Operation	Controlling flow movement in reaction to the current situation. Allows the system to be operated proactively, maximising the use of existing assets. These options cover a range of different approaches e.g. modifying the start-stop levels at strategic pumping stations, creation of new network control points which allow for flow to be temporarily held back in the catchment.	Carried	The single SWO at Moycullen is low risk however this intervention type should be carried as viable.
	ON5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes. E.g. 'Live' and predictive asset performance monitoring to proactively enhance performance, automated de-ragging and silt flushing, blockage reduction, siltation management.	Carried	The single SWO at Moycullen is low risk however this intervention type should be carried as viable.
	ON6	Rationalisation of Overflows (no infra)	Rationalisation of overflows within a catchment to improve management of spills without providing additional storage or increasing capacity.	Discounted	There is only one terminal SWO at the WWTP within this agglomeration therefore there is no opportunity for this intervention.
	OW1	WWTP Decentralisation	Transferring of flows to a new WWTP to create headroom and optimise existing WWTP/network and/or build a new WWTP to accommodate new developments as part of a de-centralisation strategy.	Discounted	The Moycullen WWTP is a relatively modern asset and has sufficient headroom well into the future. Re-use of the existing asset is the most sustainable course of action.
	OW2	WWTP Centralisation	Centralisation of smaller WWTP to take advantage of economies of scale and operational practices.	Discounted	There are no other agglomerations within the study area within a reasonable distance to make this intervention viable. Although the receiving watercourse has capacity for future Moycullen loads it would not be recommended to increase loading beyond those projected. However, the model is of low confidence and further assessment is recommended.
	OW3	Smart Networks & Intelligent Operation	Intelligent/dynamic processes at WWTPs to optimise aeration, treatment capacity and operational capability.	Carried	This would assist the efficiency of the existing plant

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
	OW5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes	Carried	This would assist the efficiency of the existing plant

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Invigorate	IN3	Strategic Blue-Green Corridors	Combine the management of blue and green spaces in urban environments with a focus on place making.	Discounted	Within this agglomeration, the WWTP has a single terminal SWO, and addressing this low-risk SWO would not constitute an effective intervention.
	IN4	Surface Water Separation	Separate surface water from combined systems by construction new surface water networks	Discounted	Within this agglomeration, the WWTP has a single terminal SWO, and addressing this low-risk SWO would not constitute an effective intervention.
	IN5	Surface Water Removal	Removing existing surface water from discharging into the combined system by diverting to watercourses or other SW systems.	Discounted	Within this agglomeration, the WWTP has a single terminal SWO, and addressing this low-risk SWO would not constitute an effective intervention.

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Fabricate	FSN1	Surface Water Separation and Removal	1. Construction of new storm water sewers, in combined sewer areas, to create additional capacity 2. Remove existing surface water from discharging into the combined system by diverting to watercourses or other SW systems. 3. Laying new smaller foul sewers in combined sewer areas	Discounted	Within this agglomeration, the WWTP has a single terminal SWO, and addressing this low-risk SWO would not constitute an effective intervention.
	FSN2	Green or SuDS Storage	Managing surface water entering the sewer network through surface water separation and Sustainable Drainage Systems (SuDS) strategies (e.g. Ponds, basins, swales)	Discounted	Within this agglomeration, the WWTP has a single terminal SWO, and addressing this low-risk SWO would not constitute an effective intervention.
	FSW2	WWTP Energy Efficiency Measures	Energy Efficiency measures to offset increase to treatment capacity	Carried	This remains a viable intervention to be considered during future appraisals of the WWTP.
	FSW3	New Sustainable WWTP	Construction of a new sustainable WWTP	Discounted	The Moycullen WWTP is a relatively modern asset and has sufficient headroom well into the future. Re-use of the existing asset is the most sustainable course of action.
	FTN1	Sewer Capacity and Underground Storage Upgrades	Traditional capacity upgrades including building new sewers, WWPS and attenuation tanks to increase capacity.	Carried	The single SWO at Moycullen is low risk however this intervention type should be carried as viable.
	FTN3	Storm Overflow Rationalisation / Abandonment	Identify opportunities to combine multiple storm overflows into a single asset designed to improved modern design standards.	Discounted	There is only one terminal SWO at the WWTP within this agglomeration therefore there is no opportunity for this intervention.

FTN4	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of settlement and UV Treatment.	Discounted	There is already a wetland at the WWTP.
FTW1	WWTP Capacity Upgrades	Traditional capacity upgrades including building new treatment units considering land availability and environmental capacity of the receiving watercourse.	Carried	This remains a viable intervention to be considered during future appraisals of the WWTP
FTW2	WWTP Site Expansion	To allow for new process units to meet permit conditions.	Carried	This remains a viable intervention to be considered during future appraisals of the WWTP.
FTW3	WWTP Tertiary / Quaternary Effluent Traditional Treatment	Traditional treatment streams to deal with emerging legislative targets.	Discounted	Not applicable
FTW4	Effluent Discharge Relocation	Move/pump WWTP discharge to a larger waterbody with greater dilution	Discounted	The existing discharge location has sufficient dilution up to 2080 to meet water quality targets. However, the model is of low confidence and further assessment is recommended.
FTW5	New WWTP	Construction of a new Traditional WWTP	Discounted	The Moycullen WWTP is a relatively modern asset and has sufficient headroom well into the future. Re-use of the existing assets is the most sustainable course of action.

Annex F – Primary Screening Discount Register: Agglomeration Level – Claregalway

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Operate / Optimise	ON1	Intercatchment Network transfers	Divert flows / bifurcations from one drainage area into an adjacent area (in the same agglomeration).	Discounted	There are no SWOs within this catchment
	ON2	Removal of tidal ingress flows	Removing direct ingresses of seawater, reducing hydraulic burden on network and operational issues.	Discounted	Not a tidal location.
	ON3	Inflow & Infiltration Management	Managing groundwater ingress and rainwater induced direct inflows into the sewer network during wet weather and high ground water levels.	Carried	There are no SWOs within this catchment, however there is a direct inflow related to river ingress which should be investigated.
	ON4	Smart Networks & Intelligent Operation	Controlling flow movement in reaction to the current situation. Allows the system to be operated proactively, maximising the use of existing assets. These options cover a range of different approaches e.g. modifying the start-stop levels at strategic pumping stations, creation of new network control points which allow for flow to be temporarily held back in the catchment.	Discounted	There are no SWOs within this catchment
	ON5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes. E.g. 'Live' and predictive asset performance monitoring to proactively enhance performance, automated de-ragging and silt flushing, blockage reduction, siltation management.	Carried	To maintain maximum hydraulic capacity this should be considered as part of ongoing operation regimes.
	ON6	Rationalisation of Overflows (no infra)	Rationalisation of overflows within a catchment to improve management of spills without providing additional storage or increasing capacity	Discounted	There are no SWOs within this catchment
	OW1	WWTP Decentralisation	Transferring of flows to a new WWTP to create headroom and optimise existing WWTP/network and/or build a new WWTP to accommodate new developments as part of a de-centralisation strategy.	Discounted	The Claregalway WWTP is a modern asset and has sufficient headroom well into the future. Re-use of the existing assets is the most sustainable course of action.
	OW2	WWTP Centralisation	Centralisation of smaller WWTP to take advantage of economies of scale and operational practices.	Discounted	There are no other agglomerations within the study area within a reasonable distance to make this intervention viable.
	OW3	Smart Networks & Intelligent Operation	Intelligent/dynamic processes at WWTPs to optimise aeration, treatment capacity and operational capability.	Carried	This would assist the efficiency of the existing plant

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
	OW5	Enhanced Operational Maintenance Regimes	Pro-active rather than reactive maintenance. Targeting operation and maintenance rehab programmes	Carried	This would assist the efficiency of the existing plant

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Invigorate	IN3	Strategic Blue-Green Corridors	Combine the management of blue and green spaces in urban environments with a focus on place making.	Discounted	There are no SWOs within this catchment
	IN4	Surface Water Separation	Separate surface water from combined systems by construction new surface water networks	Discounted	There are no SWOs within this catchment
	IN5	Surface Water Removal	Removing existing surface water from discharging into the combined system by diverting to watercourses or other SW systems.	Discounted	There are no SWOs within this catchment

TOTEX Hierarchy	Ref	Intervention Title	Intervention Description	Decision (Carried / Discounted)	Comments / Reason for Discounting
Fabricate	FSN1	Surface Water Separation and Removal	1. Construction of new storm water sewers, in combined sewer areas, to create additional capacity 2. Remove existing surface water from discharging into the combined system by diverting to watercourses or other SW systems. 3. Laying new smaller foul sewers in combined sewer areas	Discounted	There are no SWOs within this catchment
	FSN2	Green or SuDS Storage	Managing surface water entering the sewer network through surface water separation and Sustainable Drainage Systems (SuDS) strategies (e.g. Ponds, basins, swales)	Discounted	There are no SWOs within this catchment
	FSW2	WWTP Energy Efficiency Measures	Energy Efficiency measures to offset increase to treatment capacity	Carried	This remains a viable intervention to be considered during future appraisals of the WWTP.
	FSW3	New Sustainable WWTP	Construction of a new sustainable WWTP	Discounted	The Claregalway WWTP is a modern asset and has sufficient headroom well into the future. Re-use of the existing assets is the most sustainable course of action.
	FTN1	Sewer Capacity and Underground Storage Upgrades	Traditional capacity upgrades including building new sewers, WWPS and attenuation tanks to increase capacity.	Discounted	There are no SWOs within this catchment
	FTN3	Storm Overflow Rationalisation / Abandonment	Identify opportunities to combine multiple storm overflows into a single asset designed to improved modern design standards.	Discounted	There are no SWOs within this catchment

FTN4	Storm Overflow Effluent Treatment	Intermittent post-spill discharge treatment. For example, use of settlement and UV Treatment.	Discounted	There are no SWOs within this catchment
FTW1	WWTP Capacity Upgrades	Traditional capacity upgrades including building new treatment units considering land availability and environmental capacity of the receiving watercourse.	Carried	This remains a viable intervention to be considered during future appraisals of the WWTP.
FTW2	WWTP Site Expansion	To allow for new process units to meet permit conditions.	Carried	This remains a viable intervention to be considered during future appraisals of the WWTP.
FTW3	WWTP Tertiary / Quaternary Effluent Traditional Treatment	Traditional treatment streams to deal with emerging legislative targets.	Discounted	Not applicable
FTW4	Effluent Discharge Relocation	Move/pump WWTP discharge to a larger waterbody with greater dilution	Discounted	The existing discharge location has sufficient dilution up to 2080 to meet water quality targets.
FTW5	New WWTP	Construction of a new Traditional WWTP	Discounted	Claregalway WWTP is a modern asset and has sufficient headroom well into the future. Re-use of the existing assets is the most sustainable course of action.

Annex G – Assessment of freshwater discharge point for new wastewater treatment plant (WWTP)

Freshwater Discharge Option	Assessment	Summary Conclusion
<p>River Corrib</p>	<p>Modelling of the River Corrib demonstrated that achieving “Good” Ecological Status under the Water Framework Directive (WFD) would necessitate stringent and technically complex treatment standards, particularly under projected 2080 loading scenarios for a large WWTP. The discharge was modelled downstream of the drinking water abstraction point close to the rowing club. The discharge point is an area of high amenity and recreational use, and the downstream reach of the river flows directly through Galway City, an area of high amenity, tourism value and recreational water use, raising significant concerns regarding public health, environmental protection, and stakeholder acceptance.</p>	<p>This option is retained with the expectation that with quaternary treatment provision may mitigate the risk of ecological harm with projected future loadings and achievable effluent standards. It was carried for further assessment.</p>
<p>River Clare</p>	<p>The River Clare possesses a lower assimilative capacity compared to the River Corrib and was therefore excluded due to concerns related to deliverability, resilience, environmental impact, and stakeholder support. and presented significant challenges in achieving treatment standards. This option offers limited flexibility and resilience, particularly in scenarios involving a population increase beyond strategy projections or the implementation of stricter EU Surface Water Regulations during the strategy's timeframe. In such instances, the viability of the WWTP may be compromised, necessitating substantial operational upgrades and increased demand, potentially resulting in the relocation of the outfall. Additionally, the River Clare is situated within a karst environment with significant groundwater interaction, raising further environmental concerns regarding effluent discharge to this waterbody. The river drains to Lough Corrib which is an Article 7 Abstraction for drinking water.</p>	<p>River Clare was discounted as a result of concerns regarding the ability to maintain regulatory and statutory compliance, as well as the possible effects on local groundwater resources and drinking water zones.</p>

Lough Corrib

For similar reasons outlined, discharging to Lough Corrib (directly or via tributaries) was not considered as a viable location due to environmental sensitivities and its designation as a critical drinking water source for the local population. Protecting this resource from additional nutrient or contaminant loading was deemed essential, reinforcing its exclusion based on both environmental protection and public health considerations. The River Clare and Lough Corrib are both situated within environmentally designated areas, specifically Special Areas of Conservation (SAC) and Special Protection Areas (SPA). Consequently, any discharge to these water bodies would have compounded impacts on ecologically sensitive European sites. Moreover, the ultimate discharge point - the Galway Estuary - carries the same environmental designations, further amplifying the potential ecological risks associated with this option.

Lough Corrib (directly or via tributaries) was **discounted** as an unviable location due to environmental sensitivities and its designation as a critical drinking water source for the local population.

Annex H – Key Strategic Infrastructure assessed during MCDA

Strategic Option Reference	WWTP Location	Outfall Location	Option Key Features (Estimates) ¹⁴	
1	West	West	Length of Crude Sewage Transfer Mains (km)	70-75
			Length of Final Effluent Transfer Main (km)	0-5
			Treated Final Effluent WWPS Storage (m ³) ¹⁵	30,000
			Marine Outfall Length (m)	600
2	West	Corrib River	Length of Crude Sewage Transfer Mains (km)	70-75
			Length of Final Effluent Transfer Main (km)	5-10
			Treated Final Effluent WWPS Storage (m ³)	-
			Marine Outfall Length (m)	-
3	West	East	Length of Crude Sewage Transfer Mains (km)	70-75
			Length of Final Effluent Transfer Main (km)	10-15
			Treated Final Effluent WWPS Storage (m ³)	30,000
			Marine Outfall Length (m)	2,500
4	North	West	Length of Crude Sewage Transfer Mains (km)	70-75
			Length of Final Effluent Transfer Main (km)	10-15
			Treated Final Effluent WWPS Storage (m ³)	30,000
			Marine Outfall Length (m)	600
5	North	Corrib River	Length of Crude Sewage Transfer Mains (km)	70-75
			Length of Final Effluent Transfer Main (km)	0-5
			Treated Final Effluent WWPS Storage (m ³)	30,000
			Marine Outfall Length (m)	-
6	North	East	Length of Crude Sewage Transfer Mains (km)	70-75
			Length of Final Effluent Transfer Main (km)	10-15
			Treated Final Effluent WWPS Storage (m ³)	30,000
			Marine Outfall Length (m)	2,500
7	East	West	Length of Crude Sewage Transfer Mains (km)	55-60
			Length of Final Effluent Transfer Main (km)	30-35
			Treated Final Effluent WWPS Storage (m ³)	30,000
			Marine Outfall Length (m)	600
8	East	Corrib River	Length of Crude Sewage Transfer Mains (km)	55-60
			Length of Final Effluent Transfer Main (km)	15-20

¹⁴ The network storage provision for each option is consistent amongst options so is not a defining variable assessed during MCDA. Only key strategic differences between options were assessed.

¹⁵ Without detailed hydraulic assessment at a strategy level it has been assumed that interstage pumping will be required for all marine outfalls.

Strategic Option Reference	WWTP Location	Outfall Location	Option Key Features (Estimates) ¹⁴	
			Treated Final Effluent WWPS Storage (m ³)	-
			Marine Outfall Length (m)	-
9	East	East	Length of Crude Sewage Transfer Mains (km)	55-60
			Length of Final Effluent Transfer Main (km)	5-10
			Treated Final Effluent WWPS Storage (m ³)	30,000
			Marine Outfall Length (m)	2,500

Annex I – MCDA Scoring Rationale

MCDA Objective:
Criteria:

Enhance Local Communities & Support
Minimise impact and increase support, health, and wellbeing

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Slightly Disbeneficial [3]	2	This option is assessed as being slightly disbeneficial in terms of minimising impact and increasing support, health and wellbeing in Galway (in conjunction with Option 4 and Option 7). While both the WWTP and marine outfall are positioned west of the study area, substantial infrastructure delivery challenges remain, with potential disruption anticipated during construction. Construction within a densely populated urban area will likely result in considerable community impact, which must be thoroughly evaluated for this alternative. Additionally, transferring the wastewater load away from areas experiencing growth to the east could be viewed as counterintuitive and may encounter resistance. The marine outfall's location outside the SAC/SPA has been acknowledged as a benefit and could be viewed positively by the community; however, it is situated within a region of high amenity.
2	West	Corrib River	Moderately Disbeneficial [2]	5	This option is evaluated as being moderately disbeneficial when considered against the other options under this criterion. The proposal to discharge into the River Corrib, an area designated for high amenity and recreational use, may adversely affect the local community. Furthermore, opposition may arise from key statutory and regulatory stakeholders. The WWTP location would be closer to residential areas than the other two alternatives, and the discharge location is into a river that is highly utilized by the community for health and recreational pursuits so local support would be expected to be limited.
3	West	East	Moderately Disbeneficial [2]	5	This option is evaluated as being moderately disbeneficial when considered alongside the other options under this criterion. The criteria for this option are unlikely to garner broad community support due to the separation of the Wastewater Treatment Plant (WWTP) from its marine outfall location. The proposed discharge is within the Special Area of Conservation (SAC) and Special Protection Area (SPA) to the east of the city which is also likely to foster stakeholder concern.
4	North	West	Slightly Disbeneficial [3]	2	This option is assessed as being slightly disbeneficial in conjunction with Option 1 and Option 7. The location of the WWTP and marine outfall are in high amenity areas and adjacent to protected environmental areas. The marine outfall's location outside the SAC/SPA has been acknowledged as a benefit and could be viewed positively by the community; however, it is situated within a region of high amenity. There is also likely to involve considerable community impact arising from the construction of the key strategic infrastructure required.
5	North	Corrib River	Moderately Disbeneficial [2]	5	This option is evaluated as being moderately disbeneficial when considered alongside the other options under this criterion. The proposal to discharge into the River Corrib, an area designated for high amenity and recreational use, may adversely affect the local community. Furthermore, opposition may arise from key statutory and regulatory stakeholders. The location of the proposed Northern WWTP is also adjacent to sensitive environmental areas. The discharge location is into a river that is highly utilized by the community for health and recreational pursuits so it is anticipated that local support would be expected to be limited.
6	North	East	Moderately Disbeneficial [2]	5	This option is evaluated as being moderately disbeneficial when considered alongside the other options under this criterion. The location of the WWTP is in close proximity to protected environmental areas and the discharge location is within the SAC / SPA. In combination, there are few benefits relating to minimizing impact for communities and increasing support, health and wellbeing in Galway for this option.

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
7	East	West	Slightly Disbeneficial [3]	2	This option is assessed as being slightly disbeneficial in conjunction with Option 1 and Option 4. The criteria for this option are unlikely to garner broad community support due to the separation of the Wastewater Treatment Plant (WWTP) from its marine outfall location; however, this concern may be alleviated by its placement outside the Special Area of Conservation (SAC) and Special Protection Area (SPA). Significant challenges regarding infrastructure delivery and associated disruption during construction are anticipated. Constructing pipelines through a densely populated urban area will likely result in considerable disturbance to the community, which must be carefully evaluated. While the marine outfall's location outside the SAC/SPA is noted as an advantage and may attract positive community perception, it is also being developed within an area of high amenity.
8	East	Corrib River	Moderately Disbeneficial [2]	5	This option is evaluated as being moderately disbeneficial when considered alongside the other options under this criterion. The proposal to discharge into the River Corrib, an area designated for high amenity and recreational use, may adversely affect the local community. Furthermore, opposition may arise from key statutory and regulatory stakeholders. There is unlikely to be widespread support for transferring the effluent to the Corrib River from any of the options.
9	East	East	Slightly Beneficial [5]	1	Most options evaluated under this criterion were found to be disadvantageous, except for this option, which was considered moderately beneficial. The primary advantage of this option is the localisation of both the wastewater treatment plant (WWTP) and final effluent pipelines within the same area, thereby minimising disruption associated with large-scale infrastructure required by alternative options crisscrossing the city. Additionally, the WWTP's proximity to forecasted growth areas will support new housing developments, business establishments, and broader economic expansion in the city. This may further facilitate job creation and community development through the support of emerging businesses. The primary disbenefit of this option were associated with the marine outfall and whether this may gain widespread support amongst the community.

MCD Objective:

Criteria:

**Deliverability & Flexibility
Planning & Regulatory Risks**

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Neutral [4]	1	Overall, this option was considered neutral, because the benefits and disbenefits associated with planning and regulatory risks were determined to offset each other and was regarded as equivalent to Option 9. From a planning and regulatory standpoint, provided that a comprehensive route and site selection process is implemented, locating a wastewater treatment plant (WWTP) to the west of the city would be feasible. The site could be strategically selected to mitigate potential impacts on Special Protection Areas (SPA) and Special Areas of Conservation (SACs) in both marine and terrestrial environments. Additionally, the marine outfall in the western location would be shorter than the outfall in the east, thereby reducing planning and regulatory risks. Positioning the facility away from high-growth areas promotes long-term land-use compatibility concerns and minimizes potential future conflicts with urban expansion. Furthermore, constructing a WWTP in a high-amenity area may lead to planning objections that must be addressed, and the development of large-scale infrastructure through an urbanized and historic city could present additional planning challenges.
2	West	Corrib River	Moderately Disbeneficial [2]	5	The proposed WWTP would be located at a considerable distance from areas anticipated for population growth, which may present challenges for future infrastructure development. Additionally, its location within a High Amenity Area raises planning concerns, because the proposed facility does not align with the established character of the neighbourhood. The proximity to existing tourist destinations also heightens the likelihood of negative public perception. Furthermore, the discharge to the River Corrib raises further planning risks which make this option more disadvantageous
3	West	East	Moderately Disbeneficial [2]	5	The proposed WWTP would be located at a considerable distance from areas anticipated for population growth, which may present challenges for future infrastructure development. Additionally, its placement within a High Amenity Area raises planning concerns, as the proposed facility does not align with the established character of the neighbourhood. The proximity to existing tourist destinations also heightens the likelihood of negative public perception. Furthermore, the discharge to the Eastern Marine outfall and its associated cross-city construction need gives rise to further planning risks which makes this option more disadvantageous.
4	North	West	Slightly Disbeneficial [3]	3	The primary disadvantage of this option is that the WWTP would be located away from land that has been strategically zoned and would be adjacent to unzoned areas that may not be suitable for future urban expansion. Land to the east of Galway city has been identified as a priority for growth and development, making a plant situated to the north less advantageous than the east. A marine outfall to the west is deemed preferable to an outfall to the River Corrib or to the East due to the interaction with designated protected areas.
5	North	Corrib River	Moderately Disbeneficial [2]	5	The primary disadvantage of this option is that the WWTP would be located away from land that has been strategically zoned and would be adjacent to unzoned areas that may not be suitable for future urban expansion. Land to the east of Galway city has been identified as a priority for growth and development, making a plant situated to the north less advantageous. An outfall to the River Corrib would be less preferable than marine outfalls to the west or east.
6	North	East	Moderately Disbeneficial [2]	5	The primary disadvantage of this option is that the WWTP would be located away from land that has been strategically zoned and would be adjacent to unzoned areas that may not be suitable for future urban expansion. Land to the east of Galway city has been identified as a priority for growth and development, making a plant situated to the north less advantageous than the east. A marine outfall to the east is less preferable than an outfall to the West due to the interaction with designated protected areas. A marine outfall to the east is deemed slightly preferable to an outfall to the River Corrib because of the likelihood of future tightening of legislation for discharges and treatment quality.

7	East	West	Slightly Disbeneficial [3]	3	Although the WWTP in this option would be situated on zone lands expected to accommodate growth and development, there are disadvantages associated with transferring the final effluent westward across the city. Its potential route through urbanized and historically significant areas of the city would introduce planning and regulatory risks.
8	East	Corrib River	Moderately Disbeneficial [2]	5	Although the WWTP in this option would be situated on zone lands expected to accommodate growth and development, there are disadvantages associated with transferring the final effluent to the River Corrib. Its potential route through urbanized and historically significant areas of the city introduces additional planning and regulatory risks. Furthermore, the discharge to the River Corrib raises further regulatory risks associated with future capacity and treatment legislation which make this option more disadvantageous.
9	East	East	Neutral [4]	1	Overall, this option was considered neutral, because its benefits and disbenefits were determined to offset each other and was regarded as equivalent to Option 1. From a planning and regulatory standpoint, provided a thorough route and site selection process is undertaken, the feasibility of locating a WWTP to the east of the city is supported by alignment with local land use zoning. This option also reduces intercity network transfers, potentially lowering anticipated planning risks. However, the principal disadvantage is the length of the marine outfall and its placement within the SAC / SPA, which introduces substantial and immediate planning and regulatory concerns that preclude this option from being considered beneficial overall.

MCDA Objective:

Criteria:

**Deliverability & Flexibility
Growth & Population Receptors**

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Slightly Disbeneficial [3]	7	The WWTP location would be located at a considerable distance from areas of anticipated population growth, which may present challenges for future infrastructure development. Its location within a high amenity area raises important considerations regarding both visual and population receptors. Additionally, the proposed facility does not correspond with the established character of the surrounding neighbourhood, and its proximity to existing tourist destinations may heighten public concern and attract increased planning scrutiny.
2	West	Corrib River	Slightly Disbeneficial [3]	7	
3	West	East	Slightly Disbeneficial [3]	7	
4	North	West	Neutral [4]	4	The WWTP would be strategically located to service both east and west growth regions, forming an efficient central hub for wastewater collection and treatment. The facility's placement would allow it to provide equitable and effective service to all designated expansion corridors. Since much of the projected growth is expected in the east, the northern WWTP location would be less preferable to the eastern WWTP under this criterion. Additionally, the northern region's proximity to significant tourist and amenity sites is considered less advantageous in this context. A WWTP in this area would represent a significant departure from the existing local environment and may alter the residential and community nature of the area. The presence of the WWTP would constitute a substantial industrial addition and has the potential to create visual impacts and concerns, which would not align with area's character.
5	North	Corrib River	Neutral [4]	4	
6	North	East	Neutral [4]	4	
7	East	West	Strongly Beneficial [7]	1	The proposed WWTP location offers significant benefits in comparison to the Northern and Western WWTP options. It could be located a considerable distance from high-amenity areas but optimized to minimise the infrastructure requirements. Furthermore, its strategic placement closer to the rapidly expanding corridors of Athenry and Oranmore promotes effective infrastructure integration aligned with projected population growth, thereby reducing transfer distances. Thoughtful route and site selection can further alleviate impacts on populated areas and support the preservation of local neighbourhood character.
8	East	Corrib River	Strongly Beneficial [7]	1	
9	East	East	Strongly Beneficial [7]	1	

MCD Objective:

Criteria:

Deliverability & Flexibility

Ease of implementation and timeline to deliver

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Slightly Disbeneficial [3]	2	The disbenefits of this option in terms of ease of implementation and timeline to deliver include the placement of the WWTP to the west of the region, which is the farthest away location from critical infrastructure to the east creating extensive construction and phasing challenges. The resultant strategic network infrastructure would also be more significant than other options. It also represents a challenge in being the farthest WWTP option from national transport infrastructure. However, the benefits of this option are with the marine outfall and the WWTP would be located close to the marine outfall in this option providing benefits from a deliverability perspective. The marine outfall is also the shortest of the options, providing additional implementation and timeline benefits.
2	West	Corrib River	Slightly Disbeneficial [3]	2	The disbenefits of this option include the placement of the WWTP to the west of the region, which is the farthest away location from critical infrastructure to the east creating extensive construction and phasing challenges. The resultant strategic network infrastructure would also be more significant with this option. It also represents a challenge in being the farthest WWTP option to national infrastructure. The outfall in this option is seen as neutral in terms of deliverability because it would still require a considerable distance to pump and the outfall complexity would also need to be considered given its potential location. The length of the outfall in this option is seen as a major benefit in terms of deliverability because it would be the shortest length of the three outfalls to construct, but the outfall complexity would also need to be considered given its potential location in a high amenity and tourist area.
3	West	East	Moderately Disbeneficial [2]	2	The disbenefits of this option in terms of ease of implementation and timeline to deliver include the placement of the WWTP to the west of the region, which is the farthest away location from critical infrastructure to the east creating extensive construction and phasing challenges. The resultant strategic network infrastructure would also be more significant with this option. It also represents a challenge in being the farthest WWTP option to critical national infrastructure. The marine outfall in this option is also a disbenefit in terms of deliverability because it would be longer than the other two outfalls, potentially requiring specialist techniques, and the terrestrial distance to the marine discharge location is a further disadvantage and would be a significant engineering challenge.
4	North	West	Slightly Disbeneficial [3]	9	In terms of transferring foul sewage to a potential WWTP in the north of the region, this option is less preferable to a WWTP in the east but preferable to a WWTP in the west. Depending on the placement of the WWTP, the timeframes envisaged to acquire land and obtain planning are seen as a disbenefit. Another disbenefit is that it is also not the closest WWTP site to critical national infrastructure but closer than a WWTP in the west. The marine outfall in this option is preferable to an eastern outfall due to its shorter length but there are disbenefits associated with crossing the River Corrib which would need to be considered.
5	North	Corrib River	Slightly Disbeneficial [3]	2	The placement of the WWTP to the north of the region, in terms of transferring foul sewage to it, is less preferable to a WWTP in the east but preferable to a WWTP in the west. Depending on the placement of the WWTP, the timeframes envisaged to acquire land and obtain planning are seen as a disbenefit. Another disbenefit is that it is also not in close proximity to critical national infrastructure but closer than a WWTP to the west. The length of the outfall in this option is seen as a major benefit in terms of deliverability because it would be the shortest length of the three outfalls to construct. , However, the outfall complexity would also need to be considered given its potential location in a high amenity and tourist area and this may require specialist outfall requirements and may result in elongated planning and delivery timelines representing a significant disbenefit.
6	North	East	Slightly Disbeneficial [3]	2	In terms of transferring foul sewage to a potential WWTP in the north of the region, this option is less preferable to a WWTP in the east but preferable to a WWTP in the west. Depending on the placement of the WWTP, the timeframes envisaged to acquire land and obtain planning are seen as a disbenefit. Another disbenefit is that it is also not the closest WWTP site to critical national infrastructure and would be further away than a WWTP in the east. The marine outfall in this option

					is also a disbenefit in terms of deliverability because it would be longer than the other two outfalls, potentially requiring specialist techniques, and the terrestrial distance to the marine discharge location is a disadvantage although not as long as transferring from a WWTP in the west.
7	East	West	Slightly Disbeneficial [3]	2	The benefits of this option in terms of ease of implementation and timeline to deliver include the placement of the WWTP on appropriately zoned land within the region, which is likely to support an efficient delivery timeline. There is a further benefit in that it is close to existing infrastructure therefore transferring existing load to the new WWTP could be seen as another benefit and its proximity to critical national infrastructure. However, the disbenefit of this option is the western discharge location, where even though a shorter marine outfall is required, the terrestrial pipeline to transfer the final effluent east to west is foreseen as a major engineering challenge. Although not insurmountable, it does present a major disbenefit with this option.
8	East	Corrib River	Slightly Disbeneficial [3]	2	The benefits of this option include the placement of the WWTP on appropriately zoned land within the region, which is likely to support an efficient delivery timeline. There is a further benefit in that it is close to existing infrastructure which would make it easier to transfer existing load to the new WWTP. Another benefit is its proximity to critical national infrastructure. The length of the outfall in this option is seen as a major benefit in terms of deliverability because it would be the shortest length of the three outfalls to construct. However, the outfall complexity would also need to be considered given its potential location in a high amenity and tourist area and this may require specialist outfall requirements and may result in elongated planning and delivery timelines representing a significant disbenefit
9	East	East	Neutral [4]	1	The benefits of this option include the placement of the WWTP on appropriately zoned land within the region, which is likely to support an efficient delivery timeline. Additionally, this option, in comparison to others, has the least extensive network infrastructure upgrades, and its proximity to critical national infrastructure represents a further benefit. However, construction of the marine outfall may necessitate specialist techniques to safeguard the environmental area, and additional surveys could be required to mitigate potential impacts. These factors may extend the project timeline, potentially offsetting some of the key benefits associated with this option.

**MCDA Objective:
Criteria:**

**Environmental & Sustainability
Ecology & Biodiversity**

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Slightly Disbeneficial [3]	1	All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. Under this option, the selection of the potential WWTP location using UÉ's required site and route selection process should avoid direct intrusion into the boundaries of Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Nevertheless, strategic-level impacts must still be evaluated. Although the marine outfall is situated immediately outside the SPA/SAC, which may be considered advantageous, additional dispersion modelling is required to confirm that further effects do not occur.
2	West	Corrib River	Moderately Disbeneficial [2]	4	All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. Under this option, the selection of the potential WWTP location using UÉ's required site and route selection process should avoid direct intrusion into the boundaries of Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Nevertheless, strategic-level impacts must still be evaluated. The discharge into the River Corrib is considered a significant drawback from an ecological and biodiversity perspective, particularly given its proximity to a drinking water abstraction point and the potential for downstream impacts. Future legislation associated with discharge volumes and treatment quality may provide future ecological and biodiversity benefits.
3	West	East	Moderately Disbeneficial [2]	4	All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. Under this option, the selection of the potential WWTP location using UÉ's required site and route selection process should avoid direct intrusion into the boundaries of Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Nevertheless, strategic-level impacts must still be evaluated. The marine outfall in this option, located within an SPA and SAC is a major disbenefit so consideration to protection of the area shall be considered as part of the optioneering process. Furthermore, the option necessitates infrastructure which traverses the SAC twice. This intrusion may cause significant and unavoidable construction disruption, habitat fragmentation, and long-term risk within a critically sensitive zone. The proposed long outfall length presents a heightened risk of potential environmental effects over an extended area with a longer footprint compared to shorter outfall options.
4	North	West	Slightly Disbeneficial [3]	1	All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. Under this option, the selection of the potential WWTP location using UÉ's required site and route selection process should avoid direct intrusion into the boundaries of Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Nevertheless, strategic-level impacts must still be evaluated. Although the marine outfall is situated immediately outside the SPA/SAC, which may be considered advantageous, additional dispersion modelling is required to confirm that further effects do not occur.
5	North	Corrib River	Moderately Disbeneficial [2]	4	All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. Under this option, the selection of the potential WWTP location using UÉ's required site and route selection process should avoid direct intrusion into the boundaries of Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Nevertheless, strategic-level impacts must still be evaluated.

					The discharge into the River Corrib is considered a significant drawback from an ecological and biodiversity perspective, particularly given its proximity to a drinking water abstraction point and the potential for downstream impacts. Future legislation associated with discharge volumes and treatment quality may provide future ecological and biodiversity benefits.
6	North	East	Moderately Disbeneficial [2]	4	<p>All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. Under this option, the selection of the potential WWTP location using UÉ's required site and route selection process should avoid direct intrusion into the boundaries of Special Protection Areas (SPA) and Special Areas of Conservation (SAC). Nevertheless, strategic-level impacts must still be evaluated.</p> <p>The marine outfall in this option, located within an SPA and SAC is a major disbenefit so consideration to protection of the area shall be considered as part of the optioneering process. Furthermore, the option necessitates infrastructure which traverses the SAC twice. This intrusion may cause significant and unavoidable construction disruption, habitat fragmentation, and long-term risk within a critically sensitive zone. The proposed long outfall length presents a heightened risk of potential environmental effects over an extended area with a longer footprint compared to shorter outfall options.</p>
7	East	West	Slightly Disbeneficial [3]	1	<p>All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. The placement of the WWTP ensures maximum physical separation from both the Special Protection Area (SPA) and the Special Area of Conservation (SAC). This approach reduces the potential for direct physical impacts and strengthens the project's compliance justification.</p> <p>Although the marine outfall is situated immediately outside the SPA/SAC, which may be considered advantageous, additional dispersion modelling is required to confirm that further effects do not occur. This option still necessitates the need to cross the SAC/SPA to get the final effluent to the west, this intrusion may cause significant and unavoidable construction disruption, habitat fragmentation, and long-term risk within a critically sensitive zone.</p>
8	East	Corrib River	Moderately Disbeneficial [2]	4	<p>All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. The placement of the WWTP ensures maximum physical separation from both the Special Protection Area (SPA) and the Special Area of Conservation (SAC). This approach reduces the potential for direct physical impacts and strengthens the project's compliance justification.</p> <p>The discharge into the River Corrib is considered a significant drawback from an ecological and biodiversity perspective, particularly given its proximity to a drinking water abstraction point and the potential for downstream impacts. Future legislation associated with discharge volumes and treatment quality may provide future ecological and biodiversity benefits.</p>
9	East	East	Moderately Disbeneficial [2]	4	<p>All options are assessed as having low scores from an ecological and biodiversity standpoint. Each option includes pipelines that cross the study area to varying extents; therefore, at this strategic stage, their impact on ecology and biodiversity should be considered a disadvantage. The placement of the WWTP ensures maximum physical separation from both the Special Protection Area (SPA) and the Special Area of Conservation (SAC). This approach reduces the potential for direct physical impacts and strengthens the project's compliance justification.</p> <p>The marine outfall in this option, located within an SPA and SAC is a major disbenefit so consideration to protection of the area shall be considered as part of the optioneering process. Furthermore, the option necessitates infrastructure which traverses the SAC twice. This intrusion may cause significant and unavoidable construction disruption, habitat fragmentation, and long-term risk within a critically sensitive zone. The proposed long outfall length presents a heightened risk of potential environmental effects over an extended area with a longer footprint compared to shorter outfall options.</p>

MCDA Objective:

Criteria:

**Environmental & Sustainability
Impact on Water Environment**

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Slightly Beneficial [5]	1	For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits. From a water quantity perspective, this option is seen as not contributing significantly to flooding risks. The installation of a marine outfall and diffuser head creates a navigational impact which needs consideration and the maintenance of diffuser heads requires consideration during the operational phase of the strategy to ensure adequate dilution at the point of discharge.
2	West	Corrib River	Neutral [4]	7	For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits. From a water quantity perspective, as this option discharges to the River Corrib it may increase the risk of flooding, particularly in high tidal events so is regarded as a potential disbenefit associated with this discharge location. Further modelling assessments would be required if this outfall location is to be considered in more detail.
3	West	East	Slightly Beneficial [5]	1	For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits. From a water quantity perspective, this option is seen as not contributing significantly to flooding risks. The installation of a marine outfall and diffuser head creates a navigational impact which needs considered. The installation of a marine outfall and diffuser head creates a navigational impact which needs consideration and the maintenance of diffuser heads requires consideration during the operational phase of the strategy to ensure adequate dilution at the point of discharge.
4	North	West	Slightly Beneficial [5]	1	For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits. The WWTP location is in a potential flood zone, indicating a high probability of flooding making it vulnerable to inundation risking operational failure and environmental contamination during a flood event with prolonged service disruption. From a water quantity perspective, this option is seen as not contributing significantly to flooding risks. The installation of a marine outfall and diffuser head creates a navigational impact which needs considered. The installation of a marine outfall and diffuser head creates a navigational impact which needs consideration and the maintenance of diffuser heads requires consideration during the operational phase of the strategy to ensure adequate dilution at the point of discharge.
5	North	Corrib River	Neutral [4]	7	For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits. The WWTP location is in a potential flood zone, indicating a high probability of flooding making it vulnerable to inundation risking operational failure and environmental contamination during a flood event with prolonged service disruption. From a water quantity perspective, as this option discharges to the River Corrib it may increase the risk of flooding, particularly in high tidal events so is regarding as a potential disbenefit associated with this discharge location. If it were to progress further modelling assessments would be required.

6	North	East	Slightly Beneficial [5]	1	<p>For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits. The WWTP location is in a potential flood zone, indicating a high probability of flooding making it vulnerable to inundation risking operational failure and environmental contamination during a flood event with prolonged service disruption.</p> <p>From a water quantity perspective, this option is seen as not contributing significantly to flooding risks. The installation of a marine outfall and diffuser head creates a navigational impact which needs considered. The installation of a marine outfall and diffuser head creates a navigational impact which needs consideration and the maintenance of diffuser heads requires consideration during the operational phase of the strategy to ensure adequate dilution at the point of discharge.</p>
7	East	West	Slightly Beneficial [5]	1	<p>For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits.</p> <p>From a water quantity perspective, this option is seen as not contributing significantly to flooding risks. The installation of a marine outfall and diffuser head creates a navigational impact which needs considered. The installation of a marine outfall and diffuser head creates a navigational impact which needs consideration and the maintenance of diffuser heads requires consideration during the operational phase of the strategy to ensure adequate dilution at the point of discharge.</p>
8	East	Corrib River	Neutral [4]	7	<p>For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits.</p> <p>From a water quantity perspective, as this option discharges to the River Corrib it may increase the risk of flooding, particularly in high tidal events so is regarding as a potential disbenefit associated with this discharge location. If it were to progress further modelling assessments would be required.</p>
9	East	East	Slightly Beneficial [5]	1	<p>For all options, the proposed wastewater treatment plant will deliver quaternary treatment, representing the most advanced treatment available. As a result, the quality of the treated effluent and its reduced environmental impact and compliance with WFD objectives are regarded as significant benefits.</p> <p>From a water quantity perspective, this option is seen as not contributing significantly to flooding risks. The installation of a marine outfall and diffuser head creates a navigational impact which needs considered. The installation of a marine outfall and diffuser head creates a navigational impact which needs consideration and the maintenance of diffuser heads requires consideration during the operational phase of the strategy to ensure adequate dilution at the point of discharge.</p>

**MCD Objective:
Criteria:**

**Environmental & Sustainability
Archaeology, Cultural & Architectural Heritage**

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Neutral [4]	1	Given the historical significance of Galway City, there is considerable potential for encountering buried artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the WWTP and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion. This option was preferable to others due to the western location of the WWTP and the final effluent transfer mains would not traverse high-density and archaeologically significant areas.
2	West	Corrib River	Moderately Disbeneficial [2]	5	Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the WWTP and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion. This option was deemed to have further disbenefits due to the high probability for underwater archaeological investigation due to the outfall location in the River Corrib and the potential impact on existing Cultural Heritage sites located along the river corridor.
3	West	East	Moderately Disbeneficial [2]	5	Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the wastewater treatment plant (WWTP) and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion. The potential discovery of archaeological finds during excavation carries a high risk of major construction delays and requires additional costs and programme delays for investigation, mitigation, and preservation by record. The necessity of extended construction footprint and periods along the pipeline route introduces an element of uncertainty into the project timeline, because archaeological finds are unpredictable and subject to statutory requirements for investigation. The risk of this option is increased due to the traversing of pipelines across the study area and Galway City area.
4	North	West	Slightly Disbeneficial [3]	3	Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the WWTP and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion. This option was deemed to have further disbenefits due to the high risk of encountering previously unidentified or unrecorded archaeological sites during excavation at the WWTP location and for pipelines traversing and crossing the Corrib River to facilitate the strategic infrastructure required.

5	North	Corrib River	Moderately Disbeneficial [2]	5	<p>Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the wastewater treatment plant (WWTP) and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion.</p> <p>This option was deemed to have further disbenefits due to the high risk of incurring requirements for underwater archaeological investigation due to the outfall location in the River Corrib and the potential impact on existing Cultural Heritage sites located along the river corridor.</p>
6	North	East	Slightly Disbeneficial [3]	3	<p>Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the wastewater treatment plant (WWTP) and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion.</p> <p>This option was deemed to have further disbenefits due to the high risk of encountering previously unidentified or unrecorded archaeological sites during excavation at the WWTP location and for pipelines traversing the Corrib River to facilitate the strategic infrastructure required.</p>
7	East	West	Moderately Disbeneficial [2]	5	<p>Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the wastewater treatment plant (WWTP) and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion.</p> <p>The potential discovery of archaeological finds during excavation carries a high risk of major construction delays and requires additional costs and programme delays for investigation, mitigation, and preservation by record. The necessity of extended construction periods along the pipeline route introduces an element of uncertainty into the project timeline, as archaeological finds are unpredictable and subject to statutory requirements for investigation. The risk of this option is increased due to the traversing of pipelines across the study area and Galway City area.</p>
8	East	Corrib River	Moderately Disbeneficial [2]	5	<p>Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the wastewater treatment plant (WWTP) and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion.</p> <p>This option was deemed to have further disbenefits due to the high probability for underwater archaeological investigation due to the outfall location in the River Corrib and the potential impact on existing Cultural Heritage sites located along the river corridor.</p>
9	East	East	Neutral [4]	1	<p>Given the historical significance of Galway City, there is considerable potential for encountering historical artefacts. The Site and Route Selection (S&RS) process will be employed to determine the most suitable location, with the aim of avoiding cultural and archaeological heritage sites. Nevertheless, desktop assessments indicate that interaction with such sites remains a risk for both the wastewater treatment plant (WWTP) and transfer main selection. The final site and route selection must ensure the avoidance of all recorded sites listed on the Survey of Monuments and Records (SMR) and the National Inventory of Architectural Heritage (NIAH). As a result, none of the options received a beneficial score according to this criterion.</p> <p>This option was preferable to others due to the location of the WWTP and the final effluent transfer main would not traverse the high-density area.</p>

**MCD Objective:
Criteria:**

**Environmental & Sustainability
Energy Efficiency**

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Neutral [4]	5	Locating a WWTP in the west creates a balance of benefits and disbenefits in terms of energy efficiency. The potential location of the western WWTP is the furthest away from projected growth centers so it is therefore not optimizing the total dynamic head and is likely to result in increased energy consumption throughout the strategy's implementation. Additionally, its proximity to residential and tourism areas may stymie opportunities for energy generation. Over the asset's life cycle, transportation energy will be increased due to the WWTP distance to major transport routes. The main benefits of this option are the proximity to its discharge location and the shorter marine outfall length which will result in lower energy costs in comparison to other WWTP and outfall combinations.
2	West	Corrib River	Slightly Disbeneficial [3]	6	Locating a WWTP in the west creates a balance of benefits and disbenefits in terms of energy efficiency. The potential location of the western WWTP is the option furthest away from projected growth centers so it is not optimizing the total dynamic head and is likely to result in increased energy consumption throughout the strategy's implementation. Additionally, its proximity to residential and tourism areas would not promote opportunities for energy generation. Over the asset's life cycle, transportation energy will be increased due to the WWTP distance to major transport routes. A further disbenefit with this option is the requirement to continuously pump treated wastewater to reach the final outfall location within the River Corrib.
3	West	East	Moderately Disbeneficial [2]	9	Locating a WWTP in the west creates a balance of benefits and disbenefits in terms of energy efficiency. The potential location of the western WWTP is the furthest away from the growth centers so it is therefore not optimising the total dynamic head and is likely to result in increased energy consumption throughout the strategy's implementation. Additionally, its proximity to trade centers does not promote opportunities for energy generation. Over the asset's life cycle, transportation energy will be increased due to the WWTP distance to major transport routes. A further drawback with this option is the requirement to continuously pump treated wastewater to reach the marine outfall location to the east of Galway City, which is a considerable distance and would generate high energy costs. There is a further disbenefit with pumping a major load centre from the Oranmore and Athenry areas all the way westward to pump the treated effluent back towards the area where the foul load was generated.
4	North	West	Slightly Disbeneficial [3]	6	Locating a WWTP in the North offers significant advantages regarding energy efficiency because it has the potential to optimize transfer routes. By minimizing transfer routes for both domestic and industrial flows, the Northern WWTP site is expected to require lower total dynamic head and reduced energy consumption throughout the strategy's implementation. The final effluent location is regarded as an energy efficiency disbenefit because foul wastewater loads from Athenry and Oranmore would need to be pumped North for treatment and then westward for discharge which is not optimal. Furthermore, the load from Bearna and Furbough (if connected) would also be transferred back to the location in which the foul flow was generated. This option is further away than the Eastern WWTP to trade centers, which adds a constraint to opportunities for energy generation. Over the asset's life cycle, transportation energy will increase in comparison to the Eastern WWTP due to the site's further distance to major transport routes.
5	North	Corrib River	Slightly Beneficial [5]	2	Locating a WWTP in the North offers significant advantages regarding energy efficiency as it has the potential to optimize transfer routes. By minimizing transfer routes for both domestic and industrial flows, the Northern WWTP site is expected to require lower total dynamic head and reduced energy consumption throughout the strategy's implementation. The final effluent location is also highly advantageous due to its proximity to the River Corrib and may gravitate to that location (instead of requiring pumping with associated energy costs) depending on site selection criteria. Disbenefits with this option are that it is further away than the Eastern WWTP to trade centers which adds a constraint to opportunities for energy generation. Over the asset's life cycle, transportation energy will increase in comparison to the Eastern WWTP due to the site's further distance to major transport routes.

6	North	East	Slightly Disbeneficial [3]	6	Locating a WWTP in the North offers significant advantages regarding energy efficiency as it has the potential to optimize transfer routes. By minimizing transfer routes for both domestic and industrial flows, the Northern WWTP site is expected to require lower total dynamic head and reduced energy consumption throughout the strategy's implementation. The final effluent location is regarded as an energy efficiency disbenefit as foul wastewater load from Oranmore would be pumped North for treatment and the Eastward for discharge which is not seen as an optimal option. This option is further away than the Eastern WWTP to trade centers which adds a constraint to opportunities for energy generation. Over the asset's life cycle, transportation energy will increase in comparison to the Eastern WWTP due to the site's further distance to major transport routes.
7	East	West	Slightly Beneficial [5]	2	Locating a WWTP in the east offers significant advantages regarding energy efficiency. By minimizing transfer routes for both domestic and industrial flows, the eastern WWTP site is expected to require lower total dynamic head and reduced energy consumption throughout the strategy's implementation. Additionally, its proximity to trade centers enhances opportunities for energy generation. Over the asset's life cycle, transportation energy will be reduced due to the WWTP distance to major transport routes. The drawback with this option is the requirement to continuously pump treated wastewater across the city to reach the final outfall location.
8	East	Corrib River	Slightly Beneficial [5]	2	Locating a WWTP in the east offers significant advantages regarding energy efficiency. By minimizing transfer routes for both domestic and industrial flows, the eastern WWTP site is expected to require lower total dynamic head and reduced energy consumption throughout the strategy's implementation. Additionally, its proximity to trade centers enhances opportunities for energy generation. Over the asset's life cycle, transportation energy will be reduced due to the WWTP distance to major transport routes. The drawback with this option is the requirement to continuously pump treated wastewater to reach the final outfall location within the River Corrib.
9	East	East	Moderately Beneficial [6]	1	Locating a WWTP in the east offers significant advantages regarding energy efficiency. By minimizing transfer routes for both domestic and industrial flows, the eastern WWTP site is expected to require lower total dynamic head and reduced energy consumption throughout the strategy's implementation. Additionally, its proximity to trade centers enhances opportunities for energy generation. Over the asset's life cycle, transportation energy will be reduced due to the WWTP distance to major transport routes. The drawback with this option is the requirement to continuously pump treated wastewater via a long marine outfall. No option scored a strongly beneficial rating due to the scale and scope of the infrastructure required meaning that substantial energy will be required to transfer and treat the wastewater.

MCDA Objective:

**Environmental & Sustainability
Net Zero**

Criteria:

Note: The energy efficiency criteria serve as a benchmark for certain operational carbon considerations in this assessment. However, the evaluation takes a comprehensive approach by addressing whole life carbon, principles of circular economy, minimising waste, and optimising natural resource efficiency.

New WWTP Option Reference Number	WWTP Location	Outfall Location	Score	Option Rank	Scoring Rationale
1	West	West	Slightly Beneficial [5]	2	The location of the WWTP is furthest away from the growth centers so requires an extensive amount of wastewater collection infrastructure to transfer the load from east to west at high whole life carbon cost. Additionally, its proximity to trade centers does not promote opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, transportation whole life carbon costs will be increased due to the WWTP distance to major transport routes. The main benefits of this option are the proximity to its discharge location and the shorter marine outfall length which will result in lower whole life carbon costs in comparison to other outfall option combinations.
2	West	Corrib River	Slightly Disbeneficial [3]	6	The location of the WWTP is the furthest away from the growth centers so the whole life carbon associated with this option is extensive in both wastewater collection infrastructure and the final effluent infrastructure. Additionally, its proximity to trade centers does not promote opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, transportation whole life carbon costs will be increased due to the WWTP's distance to major transport routes. A further drawback with this option is the requirement to continuously pump treated wastewater to reach the final outfall location within the River Corrib, which will have high embodied and operational carbon cost.
3	West	East	Moderately Disbeneficial [2]	9	The location of the WWTP is the furthest away from the growth centers so the whole life carbon associated with this option is extensive in both wastewater collection infrastructure and the final effluent infrastructure. Additionally, its proximity to trade centers does not promote opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, transportation whole life carbon costs will be increased due to the WWTP distance to major transport routes. A further drawback with this option is the requirement to continuously pump treated wastewater to reach the marine outfall location to the east of Galway City, which is a considerable distance and will have the highest carbon costs of all options.
4	North	West	Slightly Disbeneficial [3]	6	Although the central location of the WWTP may have some benefits from an embodied and operational carbon perspective, this is offset by the long pipelines required to transfer the final effluent. This WWTP option is further away from projected high growth areas than the Eastern WWTP and further away from trade centers which adds a constraint to opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, whole life transportation costs will increase in comparison to the Eastern WWTP due to the site's further distance to major transport routes.
5	North	Corrib River	Slightly Beneficial [5]	2	The central location of the WWTP provides significant benefits from an embodied and operational carbon perspective in terms of both the wastewater collection and final effluent pipelines under this option. The disbenefits of this Northern WWTP option is that when in comparison to the Eastern WWTP option, it is further away from projected high growth areas and from trade centers which adds a constraint to opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, whole life transportation costs will increase in comparison to the Eastern WWTP due to the site's further distance to major transport routes.
6	North	East	Slightly Disbeneficial [3]	6	Although the central location of the WWTP may have some benefits from an embodied and operational carbon perspective, this is offset by the long pipelines required to transfer the final effluent. This WWTP option is further away from projected high growth areas than the Eastern WWTP and further away from trade

					centers which adds a constraint to opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, whole life transportation costs will increase in comparison to the Eastern WWTP due to the site's further distance to major transport routes.
7	East	West	Slightly Beneficial [5]	2	Locating a WWTP in the east offers significant whole life carbon advantages with regards to the wastewater collection infrastructure. By minimizing transfer routes for both domestic and industrial flows, the eastern WWTP site is expected to have a much lower carbon cost in comparison to other options. Additionally, its proximity to trade centers enhances opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, whole life transportation costs will be less than the other options due to the WWTP distance to major transport routes. The drawback with this option is the requirement to continuously pump treated wastewater across the city to reach the final outfall location which will have a significant whole life carbon aspect which resulted in its score.
8	East	Corrib River	Slightly Beneficial [5]	5	Locating a WWTP in the east offers significant whole life carbon advantages with regards to the wastewater collection infrastructure. By minimizing transfer routes for both domestic and industrial flows, the eastern WWTP site is expected to have a much lower carbon cost in comparison to other options. Additionally, its proximity to trade centers enhances opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, whole life transportation costs will be less than the other options due to the WWTP distance to major transport routes. The drawback with this option is the requirement to continuously pump treated wastewater to reach the final outfall location within the River Corrib.
9	East	East	Moderately Beneficial [6]	1	<p>Locating a WWTP in the east offers significant whole life carbon advantages with regards to the wastewater collection infrastructure. By minimizing transfer routes for both domestic and industrial flows, the eastern WWTP site is expected to have a much lower carbon cost in comparison to other options. Additionally, its proximity to trade centers enhances opportunities for energy generation and the adoption of circular approaches. Over the asset's life cycle, whole life transportation costs will be less than the other options due to the WWTP distance to major transport routes. The drawback with this option is the requirement to continuously pump treated wastewater via a long marine outfall.</p> <p>No option scored a strongly beneficial rating due to the scale and scope of the infrastructure required meaning that substantial whole life carbon costs are envisaged but on balance this option would provide the most beneficial outcome under this criterion.</p>

-End of Report-