Coirib go Cósta
Scéim Faoisimh Tuilte Chathair na Gaillimhe
Galway City Flood Relief Scheme

Constraints Study Report

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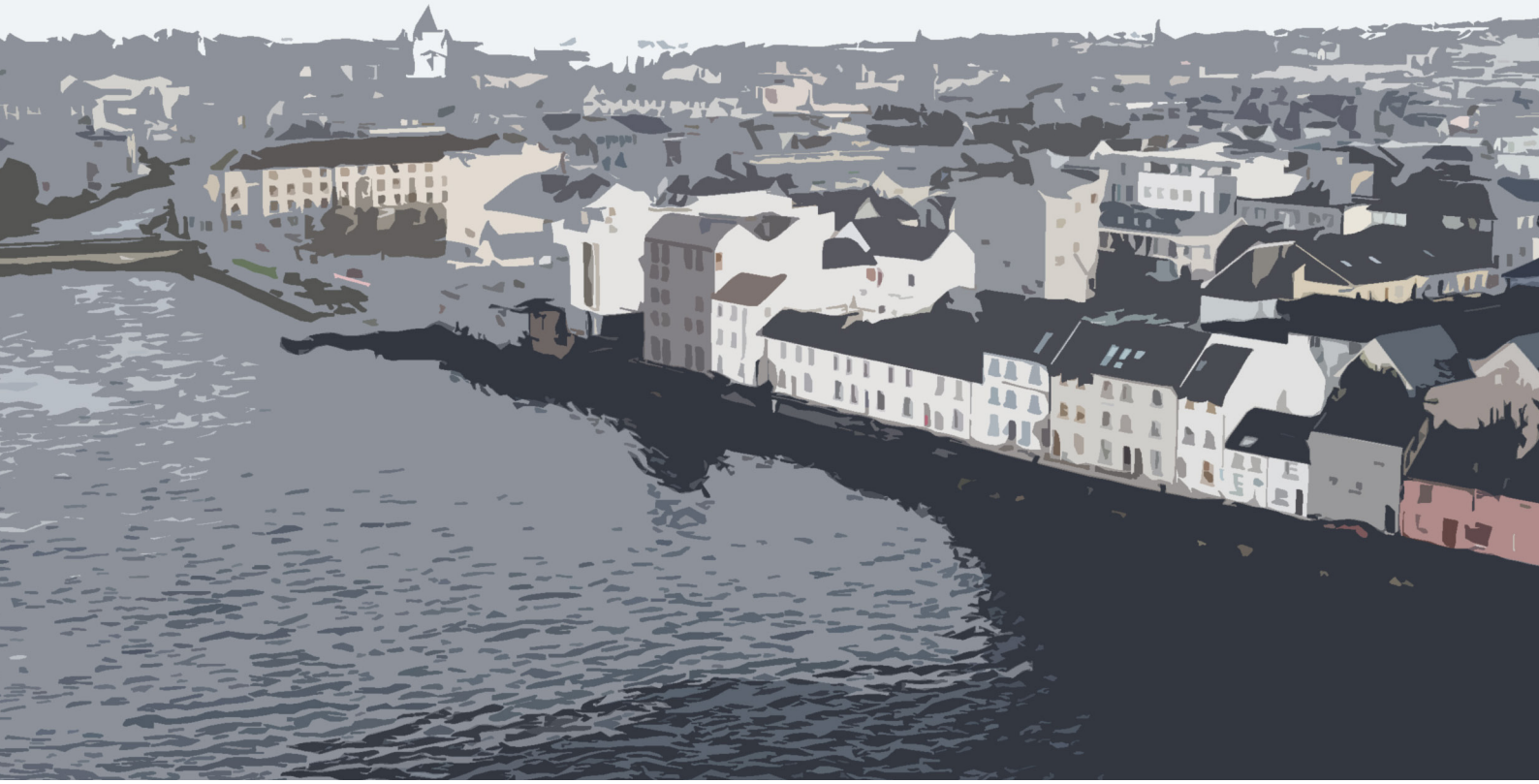

Tionscadal Éireann Project Ireland 2040

OPW Oifig na nOibreacha Poiblí Office of Public Works

Comhairle Cathrach na Gaillimhe Galway City Council

ARUP

Galway City Council

Coirib go Cósta -
Galway City Flood Relief Scheme

Constraints Study Report

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Glossary of Terms

0.5% AEP Flood Event	1 in 200-year flood event
1% AEP Flood Event	1 in 100-year flood event
AA	Appropriate Assessment – An assessment of the potential adverse effects of a plan or project (in combination with other plans or projects) on the Natura 2000 network of European designated sites for biodiversity as defined by the Habitats Directive
ACA	Architectural Conservation Area
AOD	Above Ordnance Datum
Aquifer	A geological unit that stores and transmits significant quantities of groundwater under normal hydraulic conditions
BH	Borehole
Birds Directive	European Council Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds
c.	circa
CFRAM	Catchment Flood Risk Assessment and Management
CMRC	Coastal Marine Resources Centre
COMAH	Control of Major Accident Hazards involving Dangerous Substances
CSO	Central Statistics Office
D/S	Downstream
DoAHG	Department of Arts, Heritage and the Gaeltacht
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
EU	European Union
EU-DEM	Digital Elevation Model over Europe
Excavation (Archaeology)	For archaeology, excavation means the manual and mechanical excavation by an archaeologist-led team with specific objectives as regards information, preservation, recording, etc. of archaeological information. Its purpose is to fully investigate archaeological deposits and features
Ex-situ	Outside, off-site, or away from its natural location

FRMP	Flood Risk Management Plan
FRS	Flood Relief Scheme
GCC	Galway City Council
GCDP	Galway City Development Plan
GCP	Galway City Partnership
GHG	Greenhouse Gas
GIS	Geographical Information Systems
Groundwater	Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material
GSI	Geological Survey of Ireland
ha	Hectares
Habitat	The dwelling place of a species or community which provides a particular set of environmental conditions
Habitats Directive	European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
IFI	Inland Fisheries Ireland
JKW	Japanese Knotweed
Natura 2000	the European network of nature conservation areas, including special areas of conservation, and special protection areas under the Birds Directive, provided for by Article 3(1) of the Habitats Directive
NbCM	Nature based Catchment Management
NDP	National Development Plan
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NMPF	National Marine Planning Framework
NMS	National Monuments Service
NPF	National Planning Framework
NPWS	National Parks and Wildlife Service
NUIG	National University of Ireland Galway
OD	Ordnance Datum
OPW	Office of Public Works
OSI	Ordnance Survey of Ireland
OU/m^3	Odour units per metre cubed
PED	Public Engagement Day
Pl	Poor Aquifer – Bedrock which is Generally Unproductive except for local Zones

pNHAs	Proposed Natural Heritage Areas
Q value	Biotic Index value to determine water quality
QI	Qualifying Interests
Rkc	Regionally Important Karst Aquifer
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SAC	Special Area of Conservation
SMR	Sites and Monuments Records
SPA	Special Protection Area
TII	Transport Infrastructure Ireland
ZoI	Zone of Influence

Executive Summary

Summary of Key Constraints

Population and Human Health

- The project team shall consider the recreational use and amenities that benefit the local population within the Scheme Area which may be impacted upon by the construction of possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.
- The scheme design shall ensure that the public amenity value of the Scheme Area is not diminished. Impacts on public amenity areas adjacent to the rivers such as riverside walks, parks and playgrounds shall be considered, with replacement mitigation proposed if necessary.
- The project team shall consider multiple aspects of tourism within the Scheme Area which may be impacted upon by the construction of possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.
- The project team shall consider the importance of the connectivity to the waterways that benefits the local population within the Scheme Area and which may be impacted upon by the construction of the possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.
- Any design proposals shall ensure that any bridges over watercourses are maintained so that temporary or permanent disruption on local transport links and access to homes and businesses in the Scheme Area are minimised.

Biodiversity

- Given the legal protection and conservation importance afforded to sites designated under the Habitats and Birds Directives, the most significant ecological constraints relate to the coastal zone and to those water courses with direct connectivity with those European sites located in the Scheme Area
- The results of the desktop review highlight the range of habitats and species and the ecological constraints in the Scheme Area and the connectivity of watercourses with areas of conservation concern and species of conservation concern which are likely to be affected by options being considered at the option selection stage.
- Potential localised loss of or disturbance to flora/fauna. Potential impacts on Fish (Salmonids, Lamprey, Eels) Otters and Bats will need to be mitigated. Suitable mitigation measures are technically feasible.
- Otters are an Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated.
- Medium to long-term alternation of fisheries habitat in sensitive water body due to proposed walls that will require excavation and restoration of banks.

Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated.

- Potential impacts on Birds in terms of disturbance need to be avoided. Suitable mitigation measures are technically feasible.

Land and Soil

- Within the Scheme Area, east of the River Corrib the underlying bedrock is dominated by pale grey clean skeletal limestone of the Burren Formation. West of the River Corrib the underlying bedrock is the Murvey Granite formation and undifferentiated Metagabbro and Orthogeniss Suite.
- The GSI quaternary sediment mapping indicates the presence of made ground in the urban area of Galway City; limestone derived tills in the western Scheme Area; and fen peat along the banks of the River Corrib (north of the Salmon Weir Bridge) and Terryland River.
- Particular attention shall be paid to karst features within the Scheme Area, and associated groundwater vulnerability. The karst aquifer includes features that are associated with groundwater dependent ecosystems such as springs and turloughs.
- A desk top review of historic and current site uses has identified areas with elevated risk of contaminated soil associated with land use. Where possible, excavation in these areas will be avoided.
- As the proposed scheme develops, it is recommended that a geotechnical investigation be carried out in order to identify local geology and ground conditions.

Water

- Any abstractions from the River Corrib which may be identified during the engineering study shall be protected in the scheme design. The River Corrib is designated under Article 7 Abstraction for Drinking Water of the EU Water Framework Directive (Directive 2000/60/EC) and listed under the Western River Basin District River Basin Management Plan 2009-2015 as being a Drinking Water River Water Body.
- The scheme design shall take into consideration the main objectives of the Western River Basin District Management Plan 2009-2015, by ensuring that any works proposed do not result in the deterioration of water quality.
- The scheme design shall ensure that any works proposed do not result in the deterioration of water quality in Galway Bay Complex SAC (Site Code 0000268) as well as protected water-dependent habitats and species identified.
- There are a number of bathing areas in Galway Bay, particularly in the Salthill area. The scheme design shall ensure that any proposed works do not deteriorate water quality in these locations,
- The River Corrib is listed under Salmonoid River Regulations (SI 293 of 1988) which are for the protection of waters to support fish life.

- The Terryland River is been designated for a number of sensitivities including hydromorphology pressures, urban run-off pressures and has a River waterbody risk class of 'At risk' under the Water Framework Directive.

Air and Climate

- It is not envisaged that a flood relief scheme will have a long term detrimental effect on air quality in the Study Area.
- There may be a temporary local impact during the construction works associated with the flood relief scheme, in particular due to the localised generation of dust during some construction operations.
- The proposed Scheme will be cognisant of the policy and legislative responsibilities regarding National climate change and adaptation.

Material Assets

- It is recommended that the existing and proposed locations of utilities and underground services in the vicinity of any proposed flood relief scheme be ascertained as part of the Engineering Study. It is recommended that Galway City Council and other utility providers with services in the Scheme Area be consulted regarding the location and priority of existing and proposed services. It is further recommended that the services be protected as part of any proposed flood relief scheme.
- It is recommended that Galway City Council and Transport Infrastructure Ireland (TII) be consulted in relation to any effects on the existing and proposed roads infrastructure in the Scheme Area from any proposed flood relief scheme.
- It is recommended that the requirements of the Galway City Development Plan be observed in relation to waste management assessments.
- It is recommended that the guidance of the EPA Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects (2021) is observed in relation to waste management.

Archaeological, Architectural and Cultural Heritage

- A total of 234 RMP/SMR sites or groups of sites have been identified within the Scheme Area, with a high number of these concentrated in Galway City Centre. Of the 234 recorded sites, three are designated as National Monuments and shall be considered as key constraints.
- Within the scheme area the most significant architectural heritage constraints are located adjacent to the canals and river channel, within areas (due to the nature of the scheme under consideration) that may be affected by future proposals.
- Twelve such structures/groups of structures have been identified, which are listed as Protected Structures or within the National Inventory of Architectural Heritage (NIAH) at this stage and should be considered as key architectural heritage constraints.

- The River Corrib is considered to represent an area of archaeological potential, along with Lough Atalia, smaller watercourses and the coastal margins. It is possible that the bodies of water contain underwater archaeological remains and/or artefacts. All water bodies (and their margins), as a whole, are considered to represent archaeological constraints.
- Architectural Conservation Areas (ACA) are subject to statutory protection and are a key constraint. There are 11 ACAs within the Scheme Area, which consist of various areas within Galway City Centre.

Landscape

- The key constraints for the Scheme Area will be the existing historic structures (quay walls/slipways/steps, buildings, bridges, street furniture), protection and preservation of existing mature trees and habitats, access for people and protection of key designated views.
- The main landscape constraints in the Scheme Area revolve around the diversity of ecological / landscape and cultural areas, comprising a matrix of coastal promenade, working/historic/amenity harbour areas, lake/water body edge at Lough Atalia, river/canal corridor with public walkways, historic stone walls/bollards/weirs/canal features, tree/scrub plantings, sports grounds, amenity areas and open spaces. These landscape constraints have a strong correlation to areas of ecological importance, which add to overall landscape diversity and interest.
- The main visual constraints revolve around protected views and panoramic views, residential, community and social amenities dispersed across urban, suburban and linear areas located within the Scheme Area. Visual constraints also apply to features of archaeological, architectural and cultural heritage, e.g. views along river corridors to built heritage within the city such as Galway Cathedral, St Nicholas' Church etc.

1 Introduction

1.1 Introduction

The purpose of the Constraints Study is to identify the key environmental issues associated with the development of the proposed Coirib go Cósta – Galway City Flood Relief Scheme, herein referred to as the "proposed scheme", which may be impacted upon by possible flood alleviation measures and may pose constraints on the viability and/or design of measures proposed.

The scope of the issues considered in the Constraints Study, reflect the scope of an Environmental Impact Assessment (EIA) in accordance with the requirements of the EIA Directive 2014/52/EU. In addition, particular focus has been given to the key environmental issues specifically associated with flood relief projects such as those set out in Project Types 12A and 12B of the Environmental Protection Agency (2015) Advice Notes for Preparing Environmental Impact Statements.

The Constraints Study also takes into account, at a high level, potential environmental enhancement opportunities which shall be considered throughout the development of scheme options.

As part of the Constraints Study, a series of desk studies, consultations with all relevant stakeholders including the public and preliminary field investigations have been carried out by competent experts in the relevant disciplines to identify the key issues that might be relevant to, or impose constraints on, the design and construction of the scheme.

The datasets collated as part of the Constraints Study have been incorporated into the project webmapper, which can be accessed by the public and the design team via the project website[1].

The majority of the datasets presented in the project webmapper are also publicly available to view and download on other online platforms (e.g. Environmental Protection Agency (EPA), Geological Survey of Ireland (GSI)). Certain datasets referenced as part of this study will only be available to the project team due to the ownership of the data (e.g. utilities) or it has not yet been validated by investigation (e.g. suspected contaminated ground). Such data will be held in the internal project webmapper at this stage of the project. Refer to **Appendix A** for a complete list of datasets available on the publicly accessible project webmapper.

This Constraints Study Report ("the Report") presents the findings of the constraints study including the key environmental issues associated with the proposed scheme (**Section 2**), feedback from Opening Public Engagement Day (PED) and a summary of the consultations held with the relevant stakeholders (**Section 4**). Potential environmental opportunities identified by the competent experts as part the first collaborative workshop are summarised in the relevant sections in **Section 2**.

[1] Project website: https://www.floodinfo.ie/frs/en/galway/home/

A review of planned projects and any known significant proposals has been undertaken to ensure the project team are cognisant of these other projects as the proposed scheme progresses (Section 3).

This Report is to be read in conjunction with the project webmapper, accessed from the project website2 to view the referenced datasets in the context of Scheme and Study Areas. Refer to a screenshot of the project website and link to the webmapper below in Figure 1.

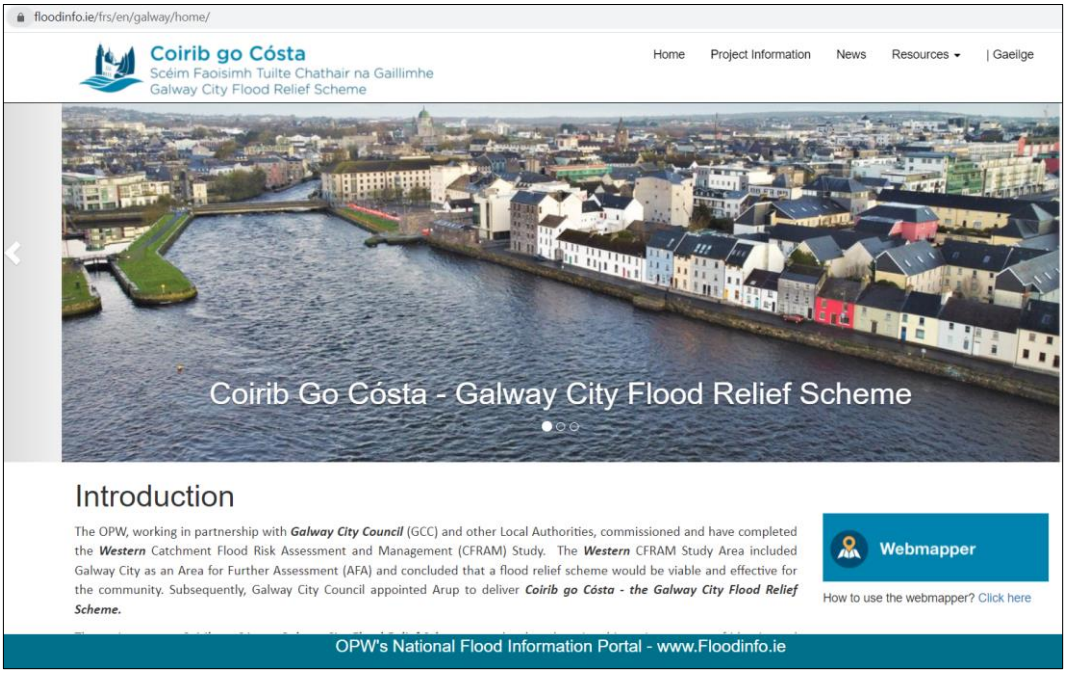

Figure 1: Coirib go Cósta – Galway City Flood Relief Scheme project website and link to the project webmapper (bottom right).

1.2 Scope and Approach

As part of the Constraints Study, a series of desk studies, preliminary field investigations and consultations with all relevant stakeholders including the public, and have been carried out by competent experts in the relevant disciplines to identify the key issues that might be relevant to, or impose constraints on, the design, construction, operation and maintenance of the scheme.

1.2.1 Environmental Factors

Section 2 of this Report addresses the keys constraints associated with environmental factors set out in Article 3 of the EIA Directive (2014/52/EU):

"*Article 3*

[2] Project website: https://www.floodinfo.ie/frs/en/galway/home/

1. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape;

(e) the interaction between the factors referred to in points (a) to (d).

2. The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.';"

1.2.2 Scheme Area and Study Area

The Scheme Area is the area where potential physical works to alleviate flood risk may be carried out. The identification of the key potential environmental issues (constraints) has been based on the assumption that physical works will be carried out within the Scheme Area only. The Scheme Area is shown in the project webmapper[3] and **Figure 2** below. Throughout most of this report, the Scheme Area will be referred to.

The Study Area is the area within which the competent experts in the relevant disciplines will assess potential impacts. The affected areas within the Study Area will vary for each of the environmental factors depending on the sensitivity of receptors and impact pathways. Therefore, as part of their assessment of the scheme each competent expert will define their study area as the project progresses.

[3] Project webmapper access from here: https://www.floodinfo.ie/frs/en/galway/home/

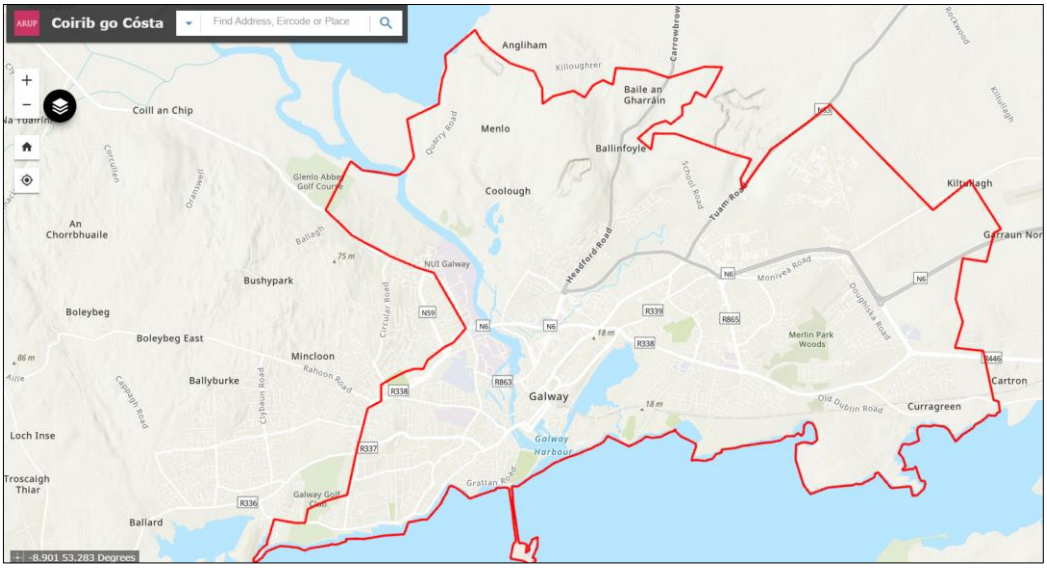

Figure 2: Scheme Area of the proposed scheme (Coirib go Cósta – Galway City Flood Relief Scheme). Source Coirib go Cósta[4] – Galway City Flood Relief Scheme project webmapper.

1.2.3 Identification of Key Environmental Constraints

The scope of the issues considered in the Constraints Study need to reflect the scope of an Environmental Impact Assessment (EIA) in accordance with the requirements of the EIA Directive 2014/52/EU. However, not all environmental factors will be impacted to the same extent.

The Constraints Study is of most value to the design of the proposed scheme when the key constraints are clearly and concisely identified by the competent experts so they can be considered by the project team during the options stage.

There are a number of potential environmental issues commonly associated with the construction, operation and maintenance of flood relief schemes. On most flood relief schemes, some potential environmental effects are unavoidable due to the nature of construction works for example:

- noise and air emissions (dust and exhaust) from construction activities,
- temporary/short-term traffic diversions and/or disruption to traffic, services and access to local amenities.

These are constraints that are likely to be common to all design options put forward and for the most part, can be mitigated during the design and construction phases. Given the unavoidable nature of these potential issues and the opportunities to mitigate these effects, describing these potential effects in great detail at this stage does not serve to bring value to this Constraints Study.

The focus of the Constraints Study was therefore to concentrate on the key environmental issues that are relevant to this proposed scheme.

[4] Project website: https://www.floodinfo.ie/frs/en/galway/home/

Key environmental constraints are those where there is the potential for significant effects on the environment and/or where there is likely limited opportunity for effective mitigation measures. These environmental effects are typically the key environmental constraints on projects and the effects must be carefully considered during the design phase and avoided where feasible.

The approach, therefore as presented in in **Table 1** below, was to review all of the potential environmental factors as listed in the EIA Directive. Particular focus was then given to the key environmental issues specifically associated with flood relief projects such as those set out in Project Types 12A and 12B of the EPA Advice Notes for Preparing EISs (2015).

This exercise served to identify the key environmental constraints which will be relevant in the context of this particular flood relief scheme and which are described in further detail **Section 2** below.

1.2.4 Project Webmapper

Flood relief schemes are significantly complex infrastructure projects that require project teams to take a holistic view of the multiple environmental constraints that have the potential to interact with the proposed scheme.

The webmapper developed for the project is one of the most effective tools to visualise and consider multiple constraints simultaneously across the Scheme Area and facilitate this holistic approach when considering the potential constraints on the proposed scheme at this stage of the project.

This Constraints Report has been designed to accompany the webmapper and provide the project team with background information on the key constraints identified and context with regard to the nature and significance of the constraints, for example, information regarding relevant legislation or protections afforded to certain environmental factors.

The webmapper can be accessed by the public as well as the project team via the project website[5].As previously noted, the majority of the datasets presented in the project webmapper are also publicly available to view and download on other online platforms (e.g. Environmental Protection Agency (EPA), Geological Survey of Ireland (GSI)).

Certain datasets referenced as part of this study will only be available to the project team due to the ownership of the data (e.g. utilities) or it has not yet been validated by investigation (e.g. suspected contaminated ground). Such data will be held in the internal project webmapper at this stage of the project. Refer to **Appendix A** for a complete list of datasets available on the publicly accessible project webmapper.

The following datasets described in this report are not included in the public project webmapper:

- Invasive species survey 2021 (**Section 2.2**)

[5] Project website: https://www.floodinfo.ie/frs/en/galway/home/

- Historical and current land use desk study (**Section 2.3** *Land and Soil*)
- Utility and underground services network mapping (**Section 2.6** *Material Assets*)
- Interacting Projects (**Section 3** *Interacting Projects*)

Appendix A1 presents a list of the datasets available to review on the project webmapper.

1.2.5 Guidance

The following guidance was referred to in the preparation of this Constraints Report:

- Environmental Protection Agency (2015) Advice Notes for Preparing Environmental Impact Statements, Draft, September 2015.
- European Commission (2017) Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Impact Assessment Report.
- European Commission (2017) Environmental Impact Assessment of Projects, Guidance on Screening.
- European Commission (2017) Environmental Impact Assessment of Projects, Guidance on Scoping.

1.2.6 Glossary of Terms

A glossary of technical terms and abbreviations is presented at the beginning of this report.

1.3 Review of Environmental Factors

Table 1 below sets out the environmental factors which at a minimum represent the scope of an EIA in accordance with the requirements of the amended EIA Directive (i.e. Directive 2014/52/EU) which amends and updates the previous EIA Directive (2011/92/EU).

The potential environmental issues commonly associated with the nature of flood relief schemes have been identified and are presented for each factor and categorised under sub-factors. For example, under the environmental factor ‘water’, sub-factors include water quality, hydrogeomorphology, groundwater and flood risk and the potential environmental issues for each sub-factor are presented.

These environmental issues provide the basis for identifying key environmental constraints presented in **Section 2**.

It should be noted that the purpose of the proposed flood relief scheme is to provide significant flood protection to residents and businesses in Galway City therefore for environmental factors such as population and human health, significant positive effects are likely.

However, for the purposes of the Constraints Report, **Table 1** below and **Section 2** *Key Environmental Constraints*, only potential environmental issues or constraints are addressed at this stage of the report.

Table 1: Review of Environmental Factors (as per EIA Directive), sub-factors and potential environmental issues commonly associated with flood relief schemes for the construction and operation/maintenance project phases.

Environmental Factor	**Sub-factors**	**Potential issues – Construction phase (non-exhaustive)**	**Potential issues – Operation/maintenance phase**
Population and human health	Tourism	• Touristic value of a location / amenity may be diminished due to visual and nuisances associated with construction works, hoarding, machinery, etc., in proximity.	• Touristic value of a location / amenity changed due to effect of the flood defence structures.
	Recreational use and amenities	• Restricted access to recreational areas associated with the river / canal ways / public amenities due to works, areas for site access, set-downs, construction compounds, etc. • Recreational activities impacted by changes in water quality.	• Flood alleviation measures improve / reduce amenity value of waterways and surrounding environment e.g. fishing.
	Connectivity to the waterways	• Restricted access to waterways during the construction phase.	• Flood alleviation measures alter connectivity to waterways.
	Employment	• Increased local employment directly and indirectly from the scheme. • Potential impacts due to disruption	• No issues identified at this stage - Positive effect on long-term employment likely. For example, enhancement measures create business / employment opportunities associated with waterways and areas previously affected by flood events.
	Social / socio-economic	• Disruption to livelihoods (temporary to short-term).	• No issues identified at this stage - Overall effects are likely to be significantly positive for local residences and business and future development by providing flood protection.
	Safety	• *Disruption to pedestrian facilities.* • Flood risk during construction phase.	• Improved public safety associated with reduced effects of flooding.
	Traffic and public transport	• *Traffic disruption / delays due to diversions and additional construction traffic.*	• Flooding on roads reduced and reduced delays/disruption as a result.
	Air quality	• Dust – see environmental factor A*ir* below.	• No specific issues identified during the operation phase of flood relief schemes for this environmental sub-factor.
	Noise	• Noise emissions associated with the operation of plant, noisy activities e.g. excavation works, pilling (if required).	• Noise generated from pumping stations (if required) during operation and testing.
	Odour	• Potential odour generation where dredging required. • Excavation of historic landfills.	• Flood alleviation measures may reduce flooding and overflowing of foul / combined sewers and therefore odours.

Environmental Factor	Sub-factors	Potential issues – Construction phase (non-exhaustive)	Potential issues – Operation/maintenance phase
	Sensitive receptors	• See potential effects from noise, dust (air quality), odour impacting schools, health care facilities, crèches, nursing homes and some businesses/industry/universities for example with sensitive instrumentation.	• Pumping stations (if required) generate noise emissions when in operation.
Biodiversity	Designated sites	• Impacts on the integrity of Natura 2000 sites (SACs/SPAs).	• Maintenance activities disturbing Natura 2000 sites.
	Biodiversity loss	• Disturbance to sensitive species e.g. birds, otters, bats. • Habitat loss due to site clearing. • Riparian habitats impacted. • Fragmentation of habitats. • Vegetation removal to be outside the nesting bird season.	• *Disruption to fauna during maintenance activities (e.g. clearing grates and trash screens).* • Habitat enhancement measures e.g., bat boxes, and land managed for pollinators. • Impacts of lighting on bats.
	Water quality	• See *Water* below.	• See *Water* below.
	Fisheries	• Disturbance to fisheries due to suspended sediments, changes to river flow rates, etc., as a result of construction works including in-stream works. • Salmonoid spawning season (November to March inclusive).	• Changes to physical regime of the river or waterways impact fisheries e.g., fish migration. • Enhancement measures for fisheries.
	Invasive species	• Invasive plant species within works areas may cause the spread of species.	• Long-term management of invasive species in proximity to flood alleviation structures. • Reduced invasive species enhances local biodiversity.
	Hydromorphology	• Changes to physical regime of the river or waterways impact alter existing habitats and fish migration.	• Changes to physical regime of the river or waterways impact alter existing habitats.
Land and Soils	Geology	• Rock outcrops • Geological heritage sites.	• No specific issues identified during the operation phase of flood relief schemes for this environmental sub-factor.
	Soil	• Potential impacts on soil from leaks or spills of fuel from construction plant or machinery. • Exposed soils risk erosion and generating sediment run-off. • Soil containing invasive species material disturbed.	• No specific issues identified during the operation phase of flood relief schemes for this environmental sub-factor.
	Land take	• Land use for flood alleviation structures.	• No specific issues identified during the operation phase of flood relief schemes for this environmental sub-factor.

Environmental Factor	Sub-factors	Potential issues – Construction phase (non-exhaustive)	Potential issues – Operation/maintenance phase
	Contaminated land	• Excavation of contaminated lands or historic landfills.	• No specific issues identified during the operation phase of flood relief schemes for this environmental sub-factor.
	Geomorphology	• Excavation works expose riverbanks, increased sediment transport.	• Sediment transport altered and impact downstream habitats. • Sediment deposition patterns changed.
Water	Water quality	• Pollution pathways from source (exposed soils, leaking plant or machinery) to receptor (waterbody). • Deterioration of water quality due to run-off of suspended solids from exposed soils from excavation works or from excavation of river bed (dredging). • Accidental release of cement or other contaminating materials.	• Reduced flood events reduce potential pollution events. • Water quality improvements due to works on surface water drainage network.
	Hydromorphology	• Changes to physical regime of the river or waterways (e.g. due to in-stream works) impact river flow rates. • Indirect impacts to flora and fauna, see *Biodiversity* above.	• Changes to physical regime of the river or waterways impact river flow rates. • Indirect impacts to flora and fauna, see *Biodiversity* above.
	Groundwater (or hydrogeology)	• Groundwater flow impacted. • Groundwater contamination risk through spills or leaks from construction plant or materials.	• Groundwater flow regime altered.
	Flood risk	• Flood events during construction.	• Reduced effects from flooding as a result of the scheme.
Air	Air quality	• Dust generated from works activities such as excavation and site clearance activities (if required) during dry weather. • Emissions (pollutants) from exhausts of construction plant / machinery, diesel generators, etc. • Dust from dry surfaces and stockpiles.	• Exhaust fumes from pumping stations (if diesel generators used).
Climate	Greenhouse gas (GHG) emissions	• GHG emissions generated from construction machinery. • Embodied carbon associated with construction materials e.g., steel and concrete.	• GHG emissions associated with maintenance activities.
	Flood risk	• Climate change impacts on extreme weather events including flooding.	• Climate change impacts on extreme weather events including flooding.
Material Assets	Services	• Services in proximity to works requiring diversion	• Access to services for maintenance.

Environmental Factor	Sub-factors	Potential issues – Construction phase (non-exhaustive)	Potential issues – Operation/maintenance phase
		• Disruption to services	• Likely positive effects for the protection of utilities and key services from disruption from flood events
	Site won material	• Excavation works generate excess material suitable for reuse. • Excavation works generate excess material unsuitable for reuse. •	• Management of material generated during maintenance activities e.g. clearing trash screens.
	Power	• Requirements for on-site power generation.	• Power requirements for pumping stations.
	Traffic	• See traffic on *Population and human health* above.	• See traffic on *Population and human health* above.
	Private properties	• Accessibility to private properties.	• Property protection from flood alleviation measures.
	Drainage network	• Diversions required during works.	• Reduced overflowing of surface water drainage network. • Permanent diversions post-works may be required.
Cultural Heritage	Protected archaeological sites and architectural and cultural structures	• Potential for disturbance of unknown archaeological artefacts during site clearing and excavation works. • Protected structures in proximity to works areas affected by works e.g., vibration effects from pilling. • Accessibility to protected sites disrupted due to works areas. • Visual context of protected sites impacted by construction works in proximity. • Maintain zone of avoidance around protected structures. • Effects on Architectural Conservation Areas (ACAs)	• Visual context of archaeological features impacted due to flood alleviation structures. • Maintenance activities in proximity to protected structures. • Protected structures protected from damage / deterioration caused by flood events.
	Underwater archaeology	• Disturbance to riverbed potentially impacting underwater archaeological artefacts. •	• Disturbances associated with dredging (if required).
Landscape	Protected views	• Visual quality of waterways and built heritage impacted.	• Visual quality of waterways and built heritage impacted. •
	Townscape / landscape character	• Views from recreational areas, amenities and important tourist locations including riverbanks and river/waterway adjacent areas.	• Views from residential and commercial properties

Environmental Factor	Sub-factors	Potential issues – Construction phase (non-exhaustive)	Potential issues – Operation/maintenance phase
		• Views from sites of cultural heritage value. • Views from residential and commercial properties	• Views from recreational areas, amenities and important tourist locations including riverbanks and river/waterway adjacent areas. • Views from sites with cultural heritage. • Finishes and design of structures with regard to Galway Public Realm Strategy 2019.
Major accidents and/or disasters	Flood event	• Potential risk of a flood event during the construction phase. In-stream works vulnerable to rapidly changing water levels.	• No operational or maintenance phase issues identified at this stage. The project will be designed to protect the population and properties in Galway City from the effects of flooding.
Interacting Factors	Noise effects interacting with population and biodiversity	• Construction noise and vibration on population and biodiversity.	
	Vibration effects interacting with archaeological, architectural and cultural heritage	• Construction vibrational impacts may also potentially impact archaeological, architectural and cultural heritage.	
	Air quality effects interacting with human health, biodiversity and local climatic effects	• Potential air quality impacts from dust and emissions generated during the construction phase of the drainage scheme may interact with population and human health, biodiversity and local climate	
	Visual effects interacting with population	• The construction activities have the potential generate temporary visual impacts and these impacts will interact with human beings.	• Visual impact of the as-built flood relief measures and the potential interaction with the local population.
	Roads and traffic effects interacting with air quality, noise, vibration and population	• The construction phase of the drainage scheme may potentially impact the local traffic in the surrounding area.	

Environmental Factor	Sub-factors	Potential issues – Construction phase (non-exhaustive)	Potential issues – Operation/maintenance phase
		This construction traffic impact may potentially interact with the local air quality, noise and vibration from truck movements and population due to (potential) traffic diversions in the area. • Landscaping works for the construction of alleviation measures may impact people through the transport of material on and off site.	
	Hydrology effects interacting with material assets	• Flood alleviation measures have the potential to change the local hydrology during a flood event. These hydrological impacts have the potential to interact with people by reducing the flooding risk and material assets through the greater flood protection for roads, services and properties.	
	Visual effects interacting with archaeological, architectural and cultural heritage	• The proposed scheme measures may be in proximity to protected structures which may potentially result in cumulative archaeological, architectural and cultural heritage impacts and visual impacts.	• Visual impact of the as-built flood relief measures and the potential interaction with built heritage of Galway City.
	Noise and vibration effects interacting with biodiversity	• The proposed scheme works will potentially impact the biodiversity of the local area. The construction impacts from noise and vibration may also impact biodiversity of the local area.	• Potential interaction between noise disturbance from required maintenance activities and habitats or species.
	Soils and geology effects interacting with biodiversity	• Construction that requires work to the soils and geology may potentially impact the biodiversity.	• Hydromorphological changes to the terrestrial environment (e.g. as a result of altered river or coastal processes) may interact with the integrity of habitats.

2 Key Environmental Constraints

Based on a review pf environmental sub-factors and issues identified in **Table 1**, **Section 2** presents the key environmental constraints relevant to the proposed scheme.

As described in **Section 1.2**, some potential environmental effects presented in **Table 1** are unavoidable due to the nature of construction works and can be adequately mitigated. Such environmental effects are not considered key environmental constraints to the proposed scheme and therefore further detail then presented here on these environmental effects is not required at this stage, for example noise and traffic.

In addition, opportunities for potential enhancement measures that could be integrated into the proposed scheme where feasible have also been identified at this stage where possible and are presented for consideration by the project team.

The environmental factors described here are shown on the project webmapper, where possible, to allow the project team to simultaneously see the key constraints identified across the Scheme Area. For that reason, reference is made to the webmapper throughout.

2.1 Population and Human Health

Galway City has seen steady growth over the last two decades as shown from CSO Census data in **Table 2** below. On completion, the proposed scheme is likely to have a positive impact on the increasing local population and businesses with regard to protection to properties and services from future flood events.

Table 2: Review of population growth in Galway City (CSO)

Census Year	Population	% Growth since last Census
2016	79,934	4.1%
2011	76,778	6.6%
2006	71,983	9.3%
2002	65,832	n/a

2.1.1 Data Sources

The following sources of information and data were utilised in the preparation of this report section and the accompanying project webmapper.

- Galway City Development Plan 2017-2023[6]
- National Statistics Office (NSO), Census population data

[6] Galway City Council (2017) Galway City Development Plan 2017-2023. Available at: https://www.galwaycity.ie/uploads/downloads/development_plan/2017-2023/Galway_City_Council_dev_plan_2017_2023.pdf

A full list of the datasets uploaded to the project webmapper are listed in **Appendix A1**.

2.1.2 Key Constraints – Construction Phase

Depending on the location of the works for the proposed scheme, the construction phase has the potential to have a significant temporary effect on population and human health. This section sets out the potential constraints that tourism, recreation and amenity, connectivity to the waterways and other related factors may have on the proposed scheme.

2.1.2.1 Tourism

The Galway City Development Plan 2017-2017 notes that,

"*Tourism makes a major contribution to the economy and the prosperity of Galway City. The city has a distinctive cultural heritage, vibrancy, intimate urban fabric and also has the attraction of being a traditional seaside resort. Tourist revenue contributes greatly to the hospitality industry as well as support for many festivals and attractions in the city.*"

As set out in **Table 1** above, construction activities associated with flood alleviation works have the potential to temporarily diminish the touristic value of a location or an amenity for example, due to reduced access, visual constraints, noise and/or dust emissions, and other nuisances associated with construction works such as hoarding, machinery, etc., in proximity to key locations.

The project team shall consider multiple aspects of tourism within the Scheme Area which may be impacted upon by the construction of possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.

Table 3 lists features of touristic value within the Scheme Areas that have been identified to date. Where possible, datasets for these constraints have been sourced and are shown in the project webmapper.

Table 3: Key constraints - Tourism

Feature	**Sub-features to consider**
Cultural heritage	Refer to **Section 2.7** *Cultural Heritage* for further detail.
Landscape and visual	Refer to **Section 2.8** *Landscape* for further detail.
Other local attractions	Including but not limited to: • Town Hall • Galway City Cathedral • Galway City Museum • National University of Ireland, Galway • Shop Street and wider area – key retail and restaurant area • Traditional music (across the city) • Medieval city walls • Galway City market

Feature	Sub-features to consider
	• Salthill Promenade and Blackrock diving boards • Boat trips on the River Corrib • Food and restaurant scene (8 restaurants listed on the Michelin Guide within Galway City) • Galway Arts Festival (annually in July) • Galway Race Festival (annually in July) • Wild Atlantic Way coastal route • Links to other key attractions including Connemara, Aran Islands, the Burren, Cliffs of Moher

2.1.2.2 Recreational Use and Amenities

The project team shall consider the recreational use and amenities that benefit the local population within the Scheme Area which may be impacted upon by the construction of possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.

The scheme design shall ensure that the public amenity value of the Study Area is not diminished. Impacts on public amenity areas adjacent to the rivers such as riverside walks, parks and playgrounds should be considered, with replacement mitigation proposed if necessary.

Table 4 lists the amenities and recreational uses across the Scheme Areas that have been identified. Where possible, datasets for these constraints have been sourced and are shown in the project webmapper.

Table 4: Key constraints – Recreational Use and Amenities

Feature	Sub-features
Amenities	• Sports Pitches • City Parks • Sports Facilities
Recreation	• Greenway Cycle Network (indicative as per Galway City Development Plan 2017-2023) • Primary Cycle Network • Public Amenities (general) • Public Visitor Facilities • Walks • Boating Sites • Fishing Sites • Places to Sit • Urban Forest • Beaches • Bathing Locations

2.1.2.3 Connectivity to the Waterways

The River Corrib and associated canals are a key feature of the city that provide value for tourism as well as recreation and amenities to the local population and visitors to Galway City.

The project team should consider the importance of the connectivity to the waterways that benefits the local population within the Scheme Area and which may be impacted upon by the construction of the possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.

Any design proposals should ensure that any bridges over watercourses are maintained so that temporary or permanent disruption on local transport links and access to homes and businesses in the Scheme Area are minimised.

The webmapper shall be used by the project team to identify where features listed in **Table 3** and **Table 4** are closely tied to the waterways.

2.1.2.4 Other Constraints

The project team shall consider the other features of the city that service the local population within the Scheme Area which may be impacted upon by the construction of possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures.

The scheme design shall take into account the value (both cultural and economic) of any buildings (residential, retail, etc.) close to the rivers' edges or likely to be adversely affected by the scheme.

Any noise/vibration sensitive receptors (e.g. schools, crèches, medical facilities) located in proximity to works associated with the flood relief scheme. These shall be taken into consideration during design of the flood relief measures.

Table 5 lists the other features across the Scheme Area that have been identified as potentially being impacted by the proposed scheme during the construction phase. Where possible, datasets for these constraints have been sourced and are shown in the project webmapper.

Table 5: Key constraints – Recreational Use and Amenities.

Feature	Sub-features to consider
Industry, retail, commercial and employment	• Disruption to access to businesses for employees, customers and deliveries. • Nuisance effects associated with noise, dust and visual impacts. • Disruption to services, for example utilities.
Traffic and public transport	• Disruption to pedestrian, cycling infrastructure or public transport infrastructure. • Disruption to traffic flow due to the need for diversions, road closures, etc.
Education	• Crèches and Montessori • Primary schools

Feature	Sub-features to consider
	• Post primary schools • Third-level educational facilities
Sensitive receptors	• Residential areas, dwellings • Educational facilities • Creches, childcare facilities • Hospitals, medical centres • Elderly care centres • Emergency services (Fire Brigade/Gardaí)

2.1.3 Key Constraints - Operation and Maintenance Phase

There are Health and safety risks associated with extreme flooding, such as increased risk of drowning or flood related injuries, and increased potential for infectious diseases (e.g. through contaminated flood water). Increased risk of flooding can also result in significant anxiety and stress for affected populations.

It is envisaged that the proposed scheme will have a significant positive effect on population and human health by protecting dwellings, businesses and infrastructure associated with tourism, services, education, health, etc., from the effects of flooding.

The proposed scheme has the potential to change the touristic value of key areas of the city and amenities as a result of flood defence structures and designs. The project team shall consider the long-term impact of the proposed alleviation infrastructure will have on the local population and in particular:

- Tourism – including access to popular tourist attractions.
- Cultural heritage – refer to **Section 2.7** below.
- Landscape – refer to **Section 2.8.6** below.
- Recreation and amenities – for example river-based sports clubs and activities.
- Emergency services and educational facilities and institutions.

2.1.4 Enhancement Opportunities

There are a number of enhancement opportunities associated with the proposed scheme that could enhance Galway City for the benefit of the local population and human health.

- Improving local access to the river for enhanced amenity value.
- Refer to **Section 2.8.7** for enhancement opportunities for landscape that will indirectly benefit the local population and tourism.
- Refer to **Section 2.7** for enhancement opportunities for cultural heritage that will indirectly benefit the local population and tourism.

2.2 Biodiversity

2.2.1 Data Sources

A desktop study approach was used to collate information from readily available sources that will be used to inform the later stages of the assessment of proposed flood defences.

The study has been carried out in accordance with best practice guidelines. Refer to **Section 5** for a full list of guidelines referenced.

Sources of information that were used to collect data on Biodiversity and the Natura 2000 network of sites within which they are located, are listed below:

The following mapping and Geographical Information Systems (GIS) data sources was required:

- National Parks & Wildlife (NPWS) protected site boundary data;
- Ordnance Survey of Ireland (OSI) mapping and aerial photography;
- OSI/Environmental Protection Agency (EPA) rivers and streams, and catchments;
- Open Street Maps;
- Digital Elevation Model over Europe (EU-DEM);
- Google Earth and Bing aerial photography 1995-2022;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:
    - Natura 2000 - Standard Data Form;
    - Conservation Objectives;
    - Site Synopses;
- National Biodiversity Data Centre records;
    - Online database of rare, threatened and protected species;
    - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2019); and
- Relevant Development Plans;
    - Galway City Development Plan 2017-2023
    - Galway County Development Plan 2015-2021

Once all designated sites had been identified during the initial research, the sites were added to the webmapper.

In addition, further constraints, which may not be subject to statutory protection, but should nonetheless be considered as ecological constraints, were also added. These include sites of National Heritage importance and proposed Natural Heritage Areas.

Other factors that are also relevant to ecology due to their interactions, e.g. hydrology, hydrogeology and population and human health, are detailed in the relevant sections of this report.

Site walkovers have been carried out of key areas within the Scheme Area and site visits were conducted as part of the invasive species survey (August-September 2021).

2.2.2 Key Constraints - Construction Phase

2.2.2.1 Natura 2000 Sites and Ecological Network Supporting Natura 2000 Sites

The Department of Housing, Planning and Local Government (previously DoEHLG)'s Guidance on Appropriate Assessment (2009) recommends an assessment of European sites within a Zone of Influence (ZoI) of 15km. However, this distance is a guidance only and a zone of influence of a proposed development is the geographical area over which it could affect the receiving environment in a way that could have significant effects on the Qualifying Interests of a European site. In accordance with the OPR Practice Note, PN01, the ZoI should be established on a case-by-case basis using the Source- Pathway-Receptor framework and not by arbitrary distances (such as 15km).

The Zone of Influence may be determined by connectivity to the Proposed Development in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The potential for source pathway receptor connectivity is firstly identified through GIS interrogation and detailed information is then provided on sites with connectivity. European sites that are located within a potential Zone of Influence of the Proposed Development are listed in **Table 6** and can be viewed on the webmapper. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 18 January 2022.

Table 6: European Sites located within the potential Zone of Influence[7] of the proposed scheme.

Site Code	Site name	Distance (km)[8]
000268	Galway Bay Complex SAC	0.00
000297	Lough Corrib SAC	0.00

[7] All European sites potentially connected irrespective of the nature or scale of the proposed development.
[8] Distances indicated are the closest geographical distance between the proposed development and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

Site Code	Site name	Distance (km)[8]
004031	Inner Galway Bay SPA	0.00
004042	Lough Corrib SPA	2.27

Given the nature and scale of the proposed scheme and the distance from the Study Area, adverse effects on the following European sites located in the wider vicinity of the proposed development are highly unlikely:

- 000020 Black Head-Poulsallagh Complex SAC
- 000054 Moneen Mountain SAC
- 000606 Lough Fingall Complex SAC
- 001312 Ross Lake And Woods SAC
- 001926 East Burren Complex SAC
- 002034 Connemara Bog Complex SAC

In light of this, it is considered that there will be no potential for significant effects on these European sites.

The primary freshwater course in Galway City is the River Corrib.

There are seven main watercourses associated with the River Corrib adjacent to the potential works areas travelling from west to east across Galway City: the Eglinton Canal, St. Claire's River, Parkavera/Madeira River; the Gaol River, Persse's Distillery River (formerly called Mill Race), the River Corrib and Friar's River (formerly called Waterside canal).

Persse's Distillery River is fed from both the upper reaches of the Eglinton Canal and a mill race that extends under the Concourse of NUIG which is culverted under the Eglinton Canal where it emerges to flow alongside the western boundary of the lower River Corrib. This mill race is fed by the Sruffnacashlaun stream which originates in the area of University Hospital Galway and Shantalla.

The Terryland River is included in the study area but is an unusual feature in that it flows away from the main channel of the upper River Corrib upstream of the Quincentenary Bridge to the north Terryland Castle. From here it flows east meandering through Terryland to two swallow holes located on the north side of the N6-Bóthar na dTreabh and via subterranean conduits may discharge to the Inner Galway Bay SPA (Site Code 004031) and Galway Bay Complex SAC (Site Code 000268).

The main channel of the River Corrib is designated as part of the Lough Corrib SAC (Site Code 000297) and on the south side of Wolf Tone Bridge, the river is designated as part of Galway Bay Complex SAC (Site Code 000268).

The Eglinton Canal and associated mill races, St. Claire's River, Parkavera River, Persse's Distillery River and Gaol River are not designated for nature conservation but both discharge to the River Corrib downstream as does Friar's River on the east side of the lower River Corrib and thus join with the Lough Corrib SAC, the Galway Bay Complex SAC and the Inner Galway Bay SPA (Site Code 004042) downstream.

The coastline of Galway City from the area of Silverstrand beach at Barna to the western suburb of Salthill Village to the estuarine section of the River Corrib adjacent to the Docks and extending into the coastal lagoon of Lough Atalia are designated as part of the Galway Bay Complex SAC and the Inner Galway Bay SPA depending on the line of the mean high water mark and NPWS mapping.

The River Corrib and Lough Corrib SAC interacts directly with the Galway Bay Complex SAC with implications for common species such as Otter, Lamprey and Salmon. The Inner Galway Bay SPA is designated for 20 species of Annex birds that are Special Conservation Interests.

Lough Corrib SPA is included for consideration as there are five species of Annexed birds common to both the lake and the inner bay SPAs:

[A056] Shoveler (*Anas clypeata*)

[A140] Golden Plover (*Pluvialis apricaria*)

[A179] Black-headed Gull (*Chroicocephalus ridibundus*)

[A182] Common Gull (*Larus canus*)

[A193] Common Tern (*Sterna hirundo*)

2.2.2.2 Annexed Habitats

The following Annexed Habitats intersect the Study Area:

[1140] Mudflats and sandflats not covered by seawater at low tide

[1150]*Coastal lagoons

[1160] Large shallow inlets and bays

[1170] Reefs

[1220] Perennial vegetation of stony banks

[1310] *Salicornia* and other annuals colonizing mud and sand

[1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

[1410] Mediterranean salt meadows (Juncetalia maritimi)

2.2.2.3 Annexed Species

[1095] Sea Lamprey *Petromyzon marinus*

[1096] Brook Lamprey *Lampetra planeri*

[1106] Salmon *Salmo salar*

[1355] Otter *Lutra lutra*

[1365] Harbour seal *Phoca vitulina*

2.2.2.4 Article 17 Species

The following Article 17 Species are found in or in the vicinity of the Study Area:

[1309] Common pipistrelle (*Pipistrellus pipistrellus*)

[1314] Daubenton's bat (*Myotis daubentonii*)

[1326] Brown long-eared bat (*Plecotus auritus*)

[1331] Leisler's bat (*Nyctalus leisleri*)

[5009] Soprano pipistrelle (*Pipistrellus pygmaeus*)

Other aquatic faunal species located in habitats that are hydrologically connected to the proposed Study Area include occasional cetaceans in inner Galway Bay. A regularly occurring Bottlenose Dolphin (*Tursiops truncatus*) has been observed feeding on salmon at the tip of Nimmo's Pier.

2.2.2.5 Marine Environment

By far the greatest constraint for the Galway City Flood Relief Scheme is the fact that that part of Galway Bay is designated as a Special Area of Conservation (Galway Bay Complex SAC 000268) and a Special Protection Area (Inner Galway Bay SPA 004031) for birds.

The relevant Qualifying Interest (QI) habitats for the SAC within the potential works area are;

- Coastal Lagoon = Lough Atalia (listed as a Priority Habitat in the Habitats Directive)
- Mudflats and sandflats that dry out at Low Water and
- Stony Banks with perennial vegetation (not mapped by NPW but present).

Qualifying Interest species include Salmon, Sea Lamprey, Harbour seal and Otter.

There are 20 species of Annex birds that are Special Conservation Interests for the Inner Galway Bay SPA.

As mentioned above, five species of birds are common to the Lough Corrib SPA located c. 2.3km to the north.

Of the five, it is likely that the gull and tern species listed move between the coast and the lake, thus there are *ex situ* considerations for these species.

Wetlands [A999] are also listed a Special Conservation interest for the Inner Galway Bay SPA and the Lough Corrib SPA.

2.2.2.6 Invasive Species

Given the scale of the Study Area, the survey focused within the Scheme Area for Invasive Species concentrated on areas in proximity to the River Corrib, canals, Lough Atalia, the Terryland River and coastal areas from Nimmo's Pier to Salthill.

There are four Third Schedule species recorded in the study area:

- Japanese Knotweed (*Reynoutria japonica*)
- Himalayan balsam (*Impatiens glandulifera*)
- Giant Rhubarb (*Gunnera tinctoria*)
- Sea buckthorn (*Hippophae rhamnoides*) (cultivar)

Galway City Council have an existing management plan and database for Japanese Knotweed (JKW) treatment within the city Borough. There are nine records of Japanese Knotweed (*Reynoutria japonica*) known to GCC within the survey area which have been treated or undergoing treatment at the time of reporting and a further 11 areas where additional records were made during the present survey. At least five records of JKW in NUIG near the River Corrib and are known to the University and marked for treatment.

There are two records of Himalayan balsam (*Impatiens glandulifera*) in the grounds of NUIG located in the feeder water course running under the main concourse building.

A single record of Giant Rhubarb (*Gunnera tinctoria*) is located at the end of the Eglinton Canal close to the Fisheries Tower.

Sea buckthorn (*Hippophae rhamnoides*) is a Third Schedule listed species known as an invasive of sandy beaches and dunes. The present survey noted three areas where a cultivar[9] of this plant was recorded; at Galway Harbour Enterprise Park along Renmore Point and at inner Lough Atalia.

Winter Heliotrope (*Petasites hybridus*) was present along the mill race referred to as the Madeira River adjacent to the Mill Street Council Car Park along with Montbretia (*Crocosmia X crocosmiflora*). Winter Heliotrope is also present at the inner eastern extent of Lough Atalia where it's occurs in disturbed ground to the rear of the Huntsman buildings and under the billboard adjacent to the old Dublin Road and along the inside of the wall in this area.

Butterfly bush (*Buddleia davidii*), considered invasive but not of major concern, is frequent in disturbed areas throughout the survey area and is not mapped.

These species are not Third schedule listed species and are of moderate to low concern and are therefore not mapped.

[9] In early 1970, a breeding station in Berlin began with the selection of high yielding sea buckthorn clones suitable for commercial cultivation. The starting materials were used for breeding purposes were mainly wild species of *Hippophae rhamnoides* L. found in coastal areas of northern Germany. This work resulted in 5 standard female varieties which have been successful around the world. The subspecies recoded in the present survey is thought to be 'Asko' developed in 1990.

The size and extent of cover of JKW extends from one plant to relatively large stands up to c. 65m in length. The locations of records of Invasive Species are presented in **Figure 3** (only[10]) below and **Appendix B** and the location details of each record are presented in **Table 7** below. These records will be updated as the project progresses.

Table 7: Outlining the locations of Invasive species recorded in the survey area *(T) indicates species treated or undergoing treatment.

Site Ref	Species	General Location	ITM_X	ITM_Y
JKW 01	Japanese Knotweed	Réalt na Mara	528366	724059
JKW 02	Japanese Knotweed	Celia Griffin Memorial Park	529108	724131
JKW 03	Japanese Knotweed (T)*	Celia Griffin Memorial Park	529107	724171
JKW 04	Japanese Knotweed	Eglington Canal – Nun's Island the Cloister Appts	529439	725159
JKW 05	Japanese Knotweed (T)	Eglington Canal – Millennium Children's Park	529268	725500
JKW 06	Japanese Knotweed (T)	Eglington Canal – Nun's Island South of Beggar's Bridge	529364	725553
JKW 07	Japanese Knotweed (T)	Persse's Distillery River at JH School of Film NUIG	529407	725677
JKW 08	Japanese Knotweed (T)	NUIG	529548	726006
JKW 09	Japanese Knotweed	NUIG	529562	726038
JKW 10	Japanese Knotweed	NUIG	529497	726085
JKW 11	Japanese Knotweed	NUIG	529414	726139
JKW 12	Japanese Knotweed	NUIG	529385	726154
JKW 13	Japanese Knotweed	Terryland 1940s Water Works	529545	726429
JKW 14	Japanese Knotweed	Terryland 1940s Water Works	529524	726446
JKW 15	Japanese Knotweed	Terryland 1940s Water Works	529485	726473
JKW 16	Japanese Knotweed	Lough Atalia Road, South of Railway Bridge	530365	725174
JKW 17	Japanese Knotweed (T)	Terryland River S of Dunnes Stores, Headford Road	530190	726343
JKW 18	Japanese Knotweed (T)	Terryland River north of Sandy Road	530486	726609
JKW 19	Japanese Knotweed (T)	Lough Atalia Road Playground	530937	726022
JKW 20	Japanese Knotweed (T)	Lakeshore Drive, Renmore	531335	725632

[10] These records are not available on the public webmapper at this stage of the project.

Site Ref	Species	General Location	ITM_X	ITM_Y
JKW 21	Japanese Knotweed	Galway Harbour Enterprise Park	530711	725012
HB 01	Himalayan Balsam	NUIG	529224	726129
HB 02	Himalayan Balsam	NUIG	529169	726249
GT 01	Giant Rhubarb	Eglington Canal - Wolfe Tone Bridge	529543	724929
SB 01	Sea-Buckthorn	Galway Harbour Enterprise Park	530322	724744
SB 02	Sea-Buckthorn	Lakeshore Drive, Renmore	531193	725389
SB 03	Sea-Buckthorn	Dep. of Defence Offices, Lakeshore Drive, Renmore	531074	725204

There are 11 additional records of Japanese Knotweed (*Reynoutria japonica*) in the survey area which are previously unrecorded and not treated by GCC. The size and extent of cover extends from two plants to relatively large stands up to c. 60 m in length. Two areas correspond to known records referred by the OPW at the Terryland River which are undergoing treatment.

In terms of proximity and interaction with the Galway City FRS, the spread of JKW at the Cloisters Apartments at Nuns Island, the spread at Lough Atalia Railway Bridge and the two bushes in the Galway Harbour Enterprise Park are additional locations where treatment may be required.

The spreads of JKW at the former Water Works site are located away from the Scheme Area.

All other areas of known JKW recorded in the survey area and elsewhere in the city will be added to the city Invasive Species Database for consideration of treatment.

There are two spreads of Himalayan balsam (*Impatiens glandulifera*) in the mill race at NUIG. These are located within the Scheme Area as presently mapped.

The spread of *Gunnera tinctoria*, at the Atlanta Apartments on the bank of the Eglinton Canal is not of immediate concern and can be treaded over time if required.

The spreads of Sea Buckthorn are of medium concern and do not pose an immediate threat to the Scheme. They are ear-marked in terms of proximity to the Scheme and potential access to works areas. Only high impact species are shown on the location drawing.

Figure 3: Locations of invasive plant species identified during the 2021 survey. Not to scale.

2.2.2.7 Summary

Given the legal protection and conservation importance afforded to sites designated under the Habitats and Birds Directives, the most significant ecological constraints relate to the coastal zone and to those watercourses with direct connectivity with those European sites located in the Study Area.

The results of the desktop review highlight the range of habitats and species and the ecological constraints in the study area and the connectivity of watercourses with areas of conservation concern and species of conservation concern which are likely to be affected by options being considered at the option selection stage.

Potential localised loss of or disturbance to flora/fauna. Potential Impacts on Fish (Salmonids, Lamprey, Eels) Otters and Bats will need to be mitigated. Suitable mitigation measures are technically feasible.

Otters are an Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated.

Medium to long-term alternation of fisheries habitat in sensitive water body due to proposed walls that will require excavation and restoration of banks. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated.

Potential Impacts on Birds in terms of disturbance need to be avoided. Suitable mitigation measures are technically feasible.

2.2.3 Key Constraints - Operation and Maintenance Phase

The key constraints for the operational phase of the proposed scheme remain the same as construction with more emphasis on the aquatic and marine environment in terms of hydrological links and aquatic habitats and species. In addition, any ex situ effects will be considered in the assessment process.

The relevant Qualifying Interest (QI) habitats for the Galway Bay Complex SAC within the Scheme Area are:

- Coastal Lagoon (L. Atalia)
- Mudflats and sandflats that dry out at Low Water and
- Stony Banks with perennial vegetation.

Potential effects on Qualifying Interest species including Salmon, Sea Lamprey, Seal and Otter.

As mentioned, there are 20 species of Annex birds that are Special Conservation Interests for the Inner Galway Bay SPA.

2.2.4 Enhancement Opportunities

The proposed scheme should seek to integrate measures that will enhance quality of habitats within the Scheme Area. Below are a number of enhancement measure and benefits that the proposed scheme could bring to biodiversity:

- Integrate measures to improve fish migration along the River Corrib, for example the protection of migrating salmon in terms of water quality and the exclusion of barriers to movement; weirs are a barrier to lamprey moving upstream in the River Corrib.
- Improve connectivity for bat species using the canals and riverside by improving vegetation and lighting environment.
- Improvements to water quality particularly in Lough Atalia and the Terryland River as a result of storm water flows, for example.
- Improvements to the ecological condition of the Terryland River through integrated flood alleviation measures.
- Potential for dual benefits from nature based catchment management (NbCM) and habitat creation.
- Further investigation will be carried out as the scheme develops to identify specific enhancement opportunities to fulfil this objective.

2.3 Land and Soil

This section on land and soils also includes the key constraints in relation to hydrogeology and groundwater quality.

2.3.1 Data Sources

Sources of information consulted include the following:

- Ordnance Survey of Ireland (OSI), GeoHive Historical Map Viewer, (www.geohive.ie) (for historical mapping):
  - Historic Map 6 inch, First Edition, 1831-1846
  - Historic Map 6 inch, Last Edition, 1831-1846
  - Historic Map 25 inch, 1888-1913
- OSI, National Townland and Historical Map Viewer
- Geological Society of Ireland (GSI), Spatial Resource (https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx)
- Health and Safety Authority, Control of Major Accident Hazards involving Dangerous Substances (COMHA), Notified Seveso Establishments[11]
- Galway City Development Plan 2017-2023
- Arup (2015) Karst Study, N6 Galway City Transport Project, Galway City Council, February 2015[12].

[11] Health and Safety Authority, Notified Seveso Establishments, available at: https://www.hsa.ie/eng/Your_Industry/Chemicals/Legislation_Enforcement/COMAH/List_of_Establishments/

[12] Arup (2015) Karst Study, N6 Galway City Transport Project, Galway City Council, February 2015. Available at: http://www.n6galwaycity.ie/wp-content/uploads/2016/Volume%203%20-%20Appendices/Volume%203B%20-%20Appendices%20Part%202/A.4.4%20Karst%20Study%20Report.pdf

- Irish Coastal Protection Strategy Study (2010-2014), OPW Flood Maps.

2.3.2 Key Constraints – Construction Phase

2.3.2.1 Local Geology

- Within the Scheme Area, east of the River Corrib the underlying bedrock is dominated by pale grey clean skeletal limestone of the Burren Formation. West of the River Corrib the underlying bedrock are the Murvey Granite, Galway Granite and undifferentiated Metagabbro and Orthogeniss Suite formations.
- The GSI quaternary sediment mapping indicates the presence of made ground dominating the urban area of Galway City. Limestone derived tills are present in the western Scheme Area and fen peat along the banks of the River Corrib (north of the Salmon Weir Bridge) and Terryland River.
- The GSI groundwater karst database identifies a number of karst features in the eastern areas of the Scheme Area. This includes swallow holes upstream of the Terryland River.
- There are a number of (audited) Geological Heritage Sites within the Scheme Area as can be viewed on the webmapper. These are sites or places of geology that have important scientific, educational, cultural or visual value.
- GSI landslide susceptibility mapping shows that the Scheme Area is largely a low risk to landslide susceptibility.
- Coastal erosion in known within the Scheme Area from the Irish Coastal Protection Strategy Study (2010-2014) and mapping which shows the predicted erosion lines for 2050 (OPW Flood Maps). Areas identified within the Scheme Area include Rusheen Bay where the coastal drumlins are Geological Heritage Sites (Site code GC007); and areas of Renmore, east of Ballyloughane Beach. The design team shall be cognisant of the potential hydromorphological impacts to these areas that proposed flood remediation measures could have.
- As the proposed scheme develops, it is recommended that a geotechnical investigation be carried out in order to identify local geology and ground conditions.
- Regarding economic geology, a list of mineral site locations within the Scheme Area are listed below in **Table 8** below and in the project webmapper. Within the Scheme Area, the nearest active quarry is Two Mile Ditch Quarry (Quarry No. G 019) located approximately 6km east of Galway City centre.

Table 8: List of mineral localities within Scheme Area. Source GSI.

Item No.	Key Mineral	Description	Mineral Location Ref.
1	Copper	Metallic	2,178.00
2	Granite	Non-Metallic	5,216.00
3	Limestone	Non-Metallic	2,165.00
4	Limestone	Non-Metallic	4,610.00
5	Limestone	Non-Metallic	2,164.00
6	Dimension Stone	Non-Metallic	3,001.00
7	Pyrite	Metallic	2,237.00

2.3.2.2 Local Hydrogeology

- Within Scheme Area and east of the River Corrib, the limestone bedrock is overlain by a Regionally Important Karst (Rkc) aquifer. West of the River Corrib, underlain by Galway granite, is classed by the GSI as a Poor Aquifer – Bedrock which is Generally Unproductive except for local Zones (Pl).
- Groundwater vulnerability across the Scheme Area from moderate to extreme with areas of karst or rock at/near the surface. Both categories are vulnerable to groundwater contamination during construction stages.
- The scheme design shall take into consideration the impact that any proposed flood relief scheme will have on the yields of existing groundwater abstractions from the Study Area groundwater bodies, taking into account the vulnerability rating of the local aquifer.
- The karst aquifer includes ecological features that are associated with groundwater dependent ecosystems such as springs and turloughs (Arup, 2015). Arup (2015) noted water dependent habitats of significance that are within the Scheme Area, refer to **Figure 4** below:
    - Coolagh Lakes – Annex I and non-Annex I wetland habitat Lough Corrib SAC
    - Terryland River – Annex I wetland habitat ecological sites.

Figure 4: Water dependent habitats identified during ecological surveys for the N6 Galway City Transport Project. Source Arup (2015).

2.3.2.3 Groundwater Quality

The proposed scheme has the potential to impact groundwater and groundwater quality. The following should be considered with regard to groundwater quality within the Scheme Area:

- All groundwater bodies within the Scheme Area are of 'Good' status under the WFD Groundwater Status for 2013-2018 (EPA).
- The Clare-Corrib groundwater body (European Code IE_WE_G0020) is designated as having pressures from agricultural activities.
- Groundwater drinking water abstraction - None of the groundwater bodies within the Scheme Area are designated for Groundwater Abstraction Pressures however the potential for local groundwater drinking abstraction will be considered.

2.3.2.4 Suspected Contaminated Ground

The Scheme Area is largely an urban environment with historical industrial activity and extensive made ground, therefore there is the potential that the scheme design may require disturbance or excavation to areas that overlap with suspected contaminated ground. This is deemed a potential environmental constraint on the proposed scheme for a number of reasons:

- Disturbing contaminated material from site activities such as excavation may provide a pathway for contaminated material to other sensitive receptors e.g. groundwater, surface waterbodies.
- There are limited re-use or disposal options for contaminated material that must be excavated. Contaminated material must be disposed of appropriately at suitably permitted or licensed facility.
- There is potentially a significant cost associated with the disposal of contaminated material depending on the nature of contamination and the type of facility to which it must be disposed.

At the constraints stage, a desk study was deemed the most appropriate approach to identifying areas of suspected ground contamination.

Further detailed desk and site-based investigations will be conducted during the following stages of this proposed scheme and where deemed necessary environmental testing may be carried out.

Suspected contaminated ground[13]. was identified by reviewing historical and current land use activities that have an elevated risk for ground contamination due to the nature of site activity or land use. The scope of the land use activities identified are listed below:

- Historical industrial activities e.g. gas works, hospitals, foundries, metal works, factories, military facilities, as identified from historical mapping.
- Historic landfills and waste facilities
- Waste and industrial facilities licensed by the Environmental Protection Agency (EPA).
- Sites listed under the Control of Major Accident Hazards involving Dangerous Substances (COMHA), commonly referred to as ‘Upper Tier’ or ‘Lower Tier’ Seveso sites.
- Historical quarries and mines (included .
- Facilities which identified as potentially having significant chemical and/or fuel storage.
- Transport activities associated with heavy fuels i.e. train stations, freight, shipping.

It is noted that apart from sites where there is reported contamination, ground contamination has not been confirmed at the locations identified but rather the nature of the historical or current land use poses an elevated risk to contamination occurring at that location.

Given the scale of the Study Area, the Scheme Area for this desk study focused on areas in proximity to the River Corrib, canals, Lough Atalia, the Terryland River and coastal areas from Nimmo’s Pier to Salthill.

[13] As it is not possible to confirm ground contamination at this stage of the project, this dataset is not available on the publicly accessible project webmapper.

Those licensed EI and IPC sites listed by the EPA within the Scheme Area are included in **Table 9** below. Additional information may be found on the webmapper.

Table 9: List of EPA licenced activities within the Scheme Area. Source EPA.

Item No.	Site Name	Licence No.	Location
1	Trane Technologies International Ltd.	P0994-01 (IE)	Monivea Road
2	Nellcor Puritan Bennett Ireland Ltd.	P0285-01 (IE)	Michael Collins Road
3	Boston Scientific Ltd	P0725-02 (IPC)	Ballybrit Business Park
4	Irish Fishing Technologies	P0279-01 (IE)	Riverside Industrial Estate
5	Medtronic Vascular Galway Unlimited Company	P0264-02 (IPC)	Parkmore Industrial Estate

Any locations where historical or current land use activities with the potential for contamination were recorded and included in the project webmapper to be considered by the design team. These locations are not shown on the public webmapper at this stage of the project.

Historical Site Activities 1831-1913

Historical land uses identified from the historic mapping where there is the potential for ground contamination associated with the nature of the historic land use activity, are shown in **Figure 5** and listed in Table 10 below.

These historical land uses are summarised in **Table 10** below and the 'Item No.' corresponds to numbering in **Figure 9**.

Table 10: Historical land uses as numbered (Item No.) in Figure 9.

Item No.	Land Use	Location (present day)	Source
1.	Gas works	Queen Street	Historic 6 inch mapping, First edition, 1831-1846 Historic 25 inch mapping, 1888-1913
2	Foundry	Dock Road/ Saint Nicholas Street	Historic 6 inch mapping, First edition
3	New Dock	Port of Galway	Historic 6 inch mapping, First edition, 1831-1846 Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913
4	Distillery/ Factory	Altenagh House, Nuns Island	Historic 6 inch mapping, First edition, 1831-1846 Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913

Item No.	Land Use	Location (present day)	Source
5	Distillery	Saint Vincent's Convent of Mercy, Newtownsmith	Historic 6 inch mapping, First edition, 1831-1846
6	Brewery	Eglington Canal	Historic 6 inch mapping, First edition, 1831-1846
7	Fever Hospital	Earl's Island, West of Fisheries Field	Historic 6 inch mapping, First edition, 1831-1846 Historic 25 inch mapping, 1888-1913
8	Hospital (part of the County Gaol)	Nun's Island	Historic 6 inch mapping, First edition, 1831-1846
9	Bleach Mill/ Metal industries/ Bag Factory	Áras Uí Chathail, NUIG	Historic 6 inch mapping, First edition, 1831-1846 Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913
10	Train station including coach factory, engine shed, tank	Eyre Square	Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913
11	Port Sanitary Intercepting Hospital/ Cholera Hospital	Rinnmore Point	Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913
12	Gas Testing Chamber/ Marker's Sheds and Target	Rennmore Barracks	Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913
13	Factory / Marble Works	Earl's Island	Historic 6 inch mapping Last edition, 1831-1846 Historic 25 inch mapping, 1888-1913

Recent Land Use (c.1950's to Present Day)

A desktop review of current and recent land uses in proximity to the indicative works was carried out. A number of sites were identified where the nature of the land use is considered a ground contamination risk. As the proposed scheme develops, further site-specific assessments will be carried out to assess and validate the contamination risk at proposed works areas. For this reason, this dataset is only available to the project team however the sites are described in **Table 11** and shown in **Figure 5** below.

Table 11: Recent land uses as numbered in Figure 5 below.

Item No.	Site Name	Land Use
14	Former bulk oil storage tank farm at Dock Road	There is no known contamination at this location on Dock Road. Google Earth imagery suggests the tanks were removed between 2012 and 2020. The site is identified as there is typically a contamination risk associated with bulk storage of oil.
15	Bus Eireann Galway Depot	There is no known contamination at this location in the Galway Harbour Enterprise Park. The site is identified as there is a contamination risk associated with the maintenance of vehicles and storage of fuels.
16	Circle K Galway Terminal at Galway Harbour Enterprise Park	There is no known contamination at this location in the Galway Harbour Enterprise Park. The site is identified as there is a contamination risk associated with the bulk storage of oil. The site is an Upper Tier[14] COMAH establishment. Site operations are subject to oversight by the Health and Safety Authority (HSA) under the Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the "COMAH Regulations"), which implement the Seveso III Directive (2012/18/EU). The purpose of the COMAH Regulations is to lay down rules for the prevention of major accidents involving dangerous substances, and to seek to limit as far as possible the consequences for human health and the environment of such accidents, with the overall objective of providing a high level of protection in a consistent and effective manner.
17	Colas Bitumen Emulsion West	There is no known contamination at this location in the Galway Harbour Enterprise Park. The site is identified as there is a contamination risk associated with the bulk storage of bitumen emulsions (hydrocarbons). The site is an Upper Tier[15] COMAH establishment. The site operations are subject to oversight by the HSA under the COMAH Regulations.
18	South Park, Nimmo's Pier	There is known historical contaminated ground at the sports grounds at Nimmo's Pier, referred to as South Park.

[14] Health and Safety Authority, Control of Major Accident Hazards involving Dangerous Substances (COMAH)
[15] Health and Safety Authority, Control of Major Accident Hazards involving Dangerous Substances (COMAH)

Item No.	Site Name	Land Use
		The area is a former landfill and dumping site. Dao[16] et al. (2013) found highest levels of metals (including lead, copper and zinc) were mainly located in the west, north-east and south-east portions of the area studied and where a thin layer of topsoil was reported at the time of the study.
19	Former bulk oil storage tank farm at Bonham Quay	There is no known contamination at this location on Dock Road. Tanks were removed in 2009. The site is identified as there is typically a contamination risk associated with bulk storage of oil. Site has undergone significant development over the past two years and is nearing completion.
20	P&O Maritime / Marine Institute	There is no known contamination at this location in the Galway Harbour Enterprise Park. The site is identified as there is typically a contamination risk associated with commercial maritime and fuel storage on site (tanks were noted from aerial imagery of the site).
21	City Direct Bus Depot	There is no known contamination at this location in the Galway Harbour Enterprise Park. The site is identified as there is a contamination risk associated with the maintenance of vehicles and storage of fuels, however no tanks were noted from imagery. Location behind the Texaco petrol station on Lough Atalia Road.
22	Ceannt Train Station	There is no known contamination at this location. The site is identified as there is typically a contamination risk associated with activities at train station (diesel trains and associated maintenance works). The train station is also listed in the historic land use list above in Table 10.

[16] Dao, L., Morrison, L., Kiely, G., Zhang, C (2013) Spatial distribution of potentially bioavailable metals in surface soils of a contaminated sports ground in Galway, Ireland. Environmental Geochemistry and Health, 35:227-238.

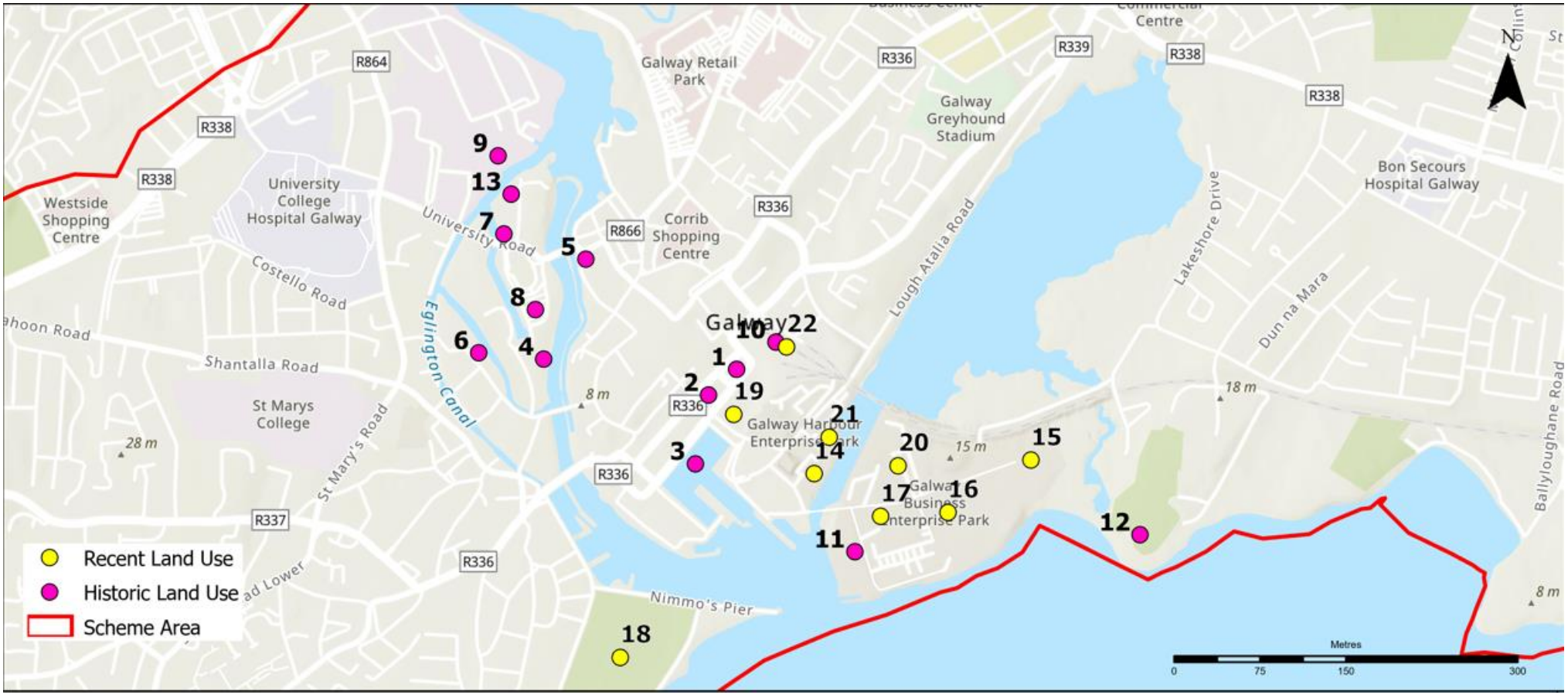

Figure 5: Location of sites with historical or recent land use identified as having a ground contamination risk. Refer to Table 10 (historical land use) and Table 11 (recent land use).

2.3.3 Key Constraints – Operation and Maintenance Phase

- Potential disturbance of river banks and soil during channel maintenance activities are required, for example: in-stream works – with channel maintenance removing the build-up of sediment; and removal of overgrowth and fallen trees along the riverbanks.
- Potential groundwater contamination due to maintenance related activities could affect areas along the scheme where maintenance works and vehicle access is required (i.e. due to accidental spillages or leaks of fuel etc.).

2.3.4 Enhancement Opportunities

The proposed scheme should seek to integrate measures that will enhance quality of the geological and hydrogeological environment within the Scheme Area, including ground-water dependent habitats.

The sustainable use, rese and off-site disposal of soils will be considered from the project outset to incorporate circular economy principles into the project strategy.

Further investigation will be carried out as the scheme develops to identified specific enhancement opportunities to full this objective.

2.4 Water

This section of the constraints study presents the existing hydrological environment within the Scheme Area.

2.4.1 Data Sources

The sources of information consulted in order to identify possible hydrological constraints within the Study Area, included:

- EPA water quality database and maps (http://www.catchments.ie/)
- Geological Survey of Ireland, (GSI), online groundwater well data www.gsi.ie
- EPA online database and mapping of Hydrometric Stations
- Western River Basin District River Basin Management Plan 2009-2015[17]
- Department of Housing, Local Government and Heritage (2018) River Basin Management Plan for Ireland 2018-2021[18]
- Corrib Catchment Report (HA 30), 3rd Cycle Draft, August 2021. Catchment Science and Management nit, Environmental Protection Agency

[17] https://www.catchments.ie/download/western-river-basin-district-river-basin-management-plan-2009-2015/

[18] Department of Housing, Local Government and Heritage (2018) River Basin Management Plan for Ireland 2018-2021. Available at:

2.4.2 Key Constraints – Construction Phase

2.4.2.1 Water Abstraction

- Any abstractions from the River Corrib which may be identified during the engineering study shall be protected in the scheme design.
- The River Corrib is designated under Article 7 of the Abstraction for Drinking Water of the EU Water Framework Directive (Directive 2000/60/EC) and listed under the Western River Basin District River Basin Management Plan 2009-2015 as being a Drinking Water River Water Body, refer to **Figure 6**.

Figure 6: Extent of the River Corrib designated under Article 7 of the EU WFD (Directive 2000/60/EC), Waters used for the abstraction of drinking water. Source EPA.

2.4.2.2 River Basin District Management Plan

- The scheme design shall take into consideration the main objectives of the Western River Basin District Management Plan 2009-2015, by ensuring that any works proposed do not result in the deterioration of water quality.

2.4.2.3 Water Quality

There are a number of sensitivities that relate to the water quality of the waterbodies within the Scheme Area. The design team will consider the following:

- The scheme design shall ensure that any works proposed do not result in the deterioration of water quality in Galway Bay Complex SAC (Site Code 0000268), refer to **Section 2.2.2.1** for further detail on the Natura 2000 sites.
- There are a number of bathing areas in Galway Bay, particularly in the Salthill area. The scheme design shall ensure that any proposed works do not deteriorate water quality in these locations, refer to the webmapper.
- Nutrient Sensitive Areas – no nutrient sensitive areas were identified within the Scheme Area.
- Drinking water protected areas – see above in **Section 2.4.2.1**.
- Shellfish Waters – nearest designated areas are Clarnbridge/Kinvara Bay.
- Protected Water-Dependent Habitats and Species – refer to **Sections 2.2** and **Section 2.3.2.2.**
- Salmonid River Regulations (SI 293 of 1988) – The River Corrib is listed under these Regulations which are for the protection of waters to support fish life.
- The Terryland River (European Code IE_WE_30T010500) is designated for a number of sensitivities including:
    - Hydromorphology pressures
    - Urban run-off pressures
    - River waterbody risk (‘At risk’) under the Water Framework Directive
- Hydromorphology is the study of physical form, condition and processes within a surface water body that create and maintain habitat. Hydromorphology is one of the significant pressures affecting the greatest number of waterbodies in the Corrib Catchment according to the Corrib Catchment Report (EPA, 2021). It is recommended that all flood alleviation options considered, have regard to the impact on the hydromorphology of the River Corrib and wider Galway Bay.
- Disturbances to the exiting hydromorphological elements have the potential to impact the habitats and species (including fish migration) which depend on the current hydrological regime. **Section 2.2** *Biodiversity*, highlight habitats within the Scheme Area such as the mudflats, coastal lagoons, and shallow inlets and bays which are sensitive to any hydromorphological pressures.
- Refer to **Section 2.3.2.2** for groundwater quality.
- The water quality of the watercourses within the Scheme Area are summarised in **Table 12** below.

Table 12: Quality of Watercourses Within Scheme Area. Source EPA.

Name of Waterbody	Code	WFD Status (2013-2018)	Q-Value (Year)	Station Code and Name
Corrib River	CORRIB_020	Good	4 (2018)	RS30C020600 Salmon Weir Bridge
Terryland River	TERRYLAND_010	Moderate	3 (2000)	RS30T010200 Bridge on Galway-Headford Rd
		Poor	2-3 (1997)	RS30T010400 TERRYLAND - 400 m d/s Terryland Bridge
		Moderate	3-4 (2018)	RS30T010500 Br d/s Terryland Br on ring road

2.4.3 Key Constraints – Operation and Maintenance Phase

The design team shall be cognisant of any proposed maintenance or operational activities that may have the potential to impact the integrity of the watercourses.

2.4.4 Enhancement Opportunities

Natural based catchment management (NbCM) shall be considered as part of the flood alleviation measures to provide potential dual benefits to flood alleviation and habitats.

2.5 Air and Climate

2.5.1 Data Sources

- EPA Licensed Sites (https://gis.epa.ie/EPAMaps/)
- Office of Public Works (2019) Flood Risk Management, Climate Change Sectoral Adaptation Plan[19], Prepared under the National Adaptation Framework.
- Government of Ireland (2021) Climate Action Plan 2021, Securing Our Future[20].
- Office of Public Works (2012) Sustainability Policy of the Office of Public Works.
- Galway City Council (2019) Galway City Climate Adaptation Strategy[21]

2.5.2 Key Constraints - Air

- It is not envisaged that a flood relief scheme will have a long term detrimental effect on air quality in the Study Area.

[19] https://www.gov.ie/en/publication/97984b-climate-change-and-sectoral-adaptation-plan/
[20] https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/
[21] https://www.galwaycity.ie/climate-adaptation

There may be a temporary local impact within the Scheme Area during the construction works associated with the flood relief scheme, in particular due to the localised generation of dust during some construction operations.

- It is not envisaged that a flood relief scheme will increase the volume of traffic within either the Study or Scheme Areas in the long term.
- The entirety of the Scheme Area is classified as an Air Zone 3 (Other Cities and Large Towns) as per the European Directive on Air Quality (2008/50/EC). Within the Scheme Area, there are two air monitoring stations: Galway (GY2) and Bodkin Roundabout (GY1).

2.5.3 Key Constraints - Climate

The nearest synoptic station to Galway City is located at the Teagasc Galway Area Advisory Office in Athenry, approximately 19km east of Galway City. Climatic data shall be monitored for rainfall and temperature datasets to inform on climate changes. The current rainfall readings at the station for the past three years are seen in **Table 13** below.

Table 13: Annual and winter rainfall from Athenry Synoptic Station. Source: Met.ie.

Year	Annual rainfall (mm)	Winter rainfall (Oct-Mar)	% of Annual Rainfall
2021	1124.2	740.4	65.86%
2020	1481.8	943.1	63.65%
2019	1426.8	689.7	48.34%

Key Climate Policy and Legislation

The proposed scheme shall consider the following key legislative and policy documents regarding climate impacts on flood risk and flood risk management:

- Government of Ireland[22] (2019) Flood Risk Management - Climate Change Sectoral Adaptation Plan, Prepared under the National Adaptation Framework. Prepared by the Office of Public Works.
- Climate Action and Low Carbon Development Act[23] 2015.
- Department of the Environment, Climate and Communications (2018) National Adaptation Framework[24].
- Galway City Council (2019) Climate Adaptation Strategy[25] 2019-2024.

[22] https://www.gov.ie/en/publication/97984b-climate-change-and-sectoral-adaptation-plan/
[23] https://www.irishstatutebook.ie/eli/2015/act/46/enacted/en/html
[24] https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/
[25] https://www.galwaycity.ie/climate-adaptation#:~:text=Climate%20Adaptation%20Strategy%202019%2D2024,under%20the%20National%20Adaptation%20Framework.&text=On%20Monday%209th%20of%20September,Climate%20Adaptation%20Strategy%202019%2D2024.

- The OPW CFRAM River and Costal Flood Extents (Mid-Range Future Scenario) mapping[26] has been included in the project webmapper for consideration by the design team.
- This mapping gives modelled extents of climate change for river and costal extents under a mid-range future scenario where there is an increase rainfall of 20% and sea level rise of 500mm (or 20 inches).
- The proposed scheme shall consider the four priorities of the OPW's sustainability policy (2012) for the Engineering Services business unit is the protection of public health threats, use of non-renewable material sources, loss of biodiversity and lifestyle related and chronic disease.
- The proposed scheme will be cognisant of the actions within The Climate Action Plan[27] 2021 that directly relate to flood relief schemes, including:
    - Action 440 - Undertake a Scheme Adaptation Plan during the detailed development of new flood relief schemes, setting out how climate change has been taken into account during the design and construction, and what adaptation measures might be needed into the future.
    - Action 441 - Provide for the inclusion of potential increases in flood damages as part of the economic cost-benefit analysis for future flood relief schemes.
    - Action 443 - Continue to enhance knowledge and capacity with regards to Nature-based Catchment Management Solutions and assess their potential to be part of future flood relief schemes.

2.5.4 Enhancement Opportunities

The proposed Scheme will be cognisant of the policy and legislative responsibilities regarding National climate change and adaptation.

2.6 Material Assets

2.6.1 Data Sources

Utility mapping[28] within the Scheme Area has been sought from the following providers:

- ESB Networks (EBSN)
- Gas Networks Ireland (GNI)
- Irish Water (IW)
- BT Telecoms

[26] Available to the public from https://www.floodinfo.ie/map/floodmaps/
[27] https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/
[28] Due to the sensitive nature and publication restraints on utility network mapping, this data will only be available to the project team and will not be made available to view on the public project webmapper.

It is recommended that throughout the project, Irish Water shall be consulted during the construction phases as there may be impacts to IW assets including an increase or decrease of overburden, diverting assets, changes to access, changes in water levels - resulting in an impact on outfalls, impacts to the assimilative capacity of waterbodies etc. The only wastewater treatment plant (>500pe) within the Scheme Area is on Mutton Island (D0050-01).

The following guidance was reviewed as part of this constraints Report:

- Government of Ireland (2020) Waste Action Plan for a Circular Economy.
- Environmental Protection Agency (2021) Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.

2.6.2 Key Constraints - Construction Phase

- It is recommended that the existing and proposed location of utilities and underground services in the vicinity of any proposed flood relief scheme be ascertained as part of the Engineering Study. It is recommended that Galway City Council and other utility providers with services in the Study Area be consulted regarding the location and priority of existing and proposed services. It is further recommended that the services be protected as part of any proposed flood relief scheme.
- It is recommended that Galway City Council and the Transport Infrastructure Ireland (TII) be consulted in relation to any effects on the existing and proposed roads infrastructure in the Scheme Area from any proposed flood relief scheme.
- It is recommended that the requirements of the Galway City Development Plan 2017-2023 and future plans, be observed in relation to waste management assessments.
- It is recommended that the guidance of the EPA Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects (2021) is observed in relation to waste management.
- The design team shall be cognisant of water utility assets within the Scheme Area and the potential constraints they may pose. This includes:
    - Galway Urban Waste Water Treatment Plant (UWWTP) (EPA Registration Code D0050- 01) is the primary UWTWP in the city and has an agglomeration PE of 102,558 (in 2020) with a design PE of 170,000 (EPA). The plant provides secondary treatment to the city.
    - Wastewater pumping stations that discharge to watercourses within the scheme area via PS emergency overflows.
    - Storm Water Overflows (SWOs, formerly known as Combined Sewer Overflows (CSOs).
    - Existing twin siphons traversing the River Corrib, these are critical sewers serving the east of the city.

- The design team have sought detailed network mapping information from Irish Water which shall be closely reviewed as a potential constraint on future proposed works. For example, the existing twin siphons (critical sewers) traversing the River Corrib are noted as being a constraint to any proposed excavation works.
- The project team will consult with Irish Water throughout the project to ensure any potential impacts on their services can be avoided or mitigated.

2.6.3 Key Constraints – Operation and Maintenance

The design team shall ensure that any proposed maintenance activities have minimal impact on services throughout the lifecycle of the flood scheme.

2.6.4 Enhancement Opportunities

There is an opportunity to implement circular economy principles from the project outset that would benefit the environment. In 2020, the Government of Ireland published the Waste Action Plan for a Circular Economy[29]. The Action Plan included key actions relevant to the flood relief schemes including:

- Shift the focus away from waste disposal and treatment to ensure that materials and products remain in productive use for longer;
- Plan for construction and demolition waste management at the earliest possible stage in a construction and demolition project, ideally at concept stage.
- Ensure that measures support sustainable economic models (for example by supporting the use of recycled over virgin materials).

2.7 Archaeological, Architectural and Cultural Heritage

This section describes the archaeological, architectural and cultural heritage constraints identified within the Scheme Area for the Galway City Flood Relief Scheme. All known archaeological, architectural and cultural heritage constraints are available to view on the project webmapper.

Cultural heritage is addressed through the description of the archaeological and architectural heritage aspects of the Scheme Area below as well as aspects of the landscape as described in **Section 2.8** *Landscape* below.

2.7.1 Data Sources

Research for this constraints study was undertaken as a desktop exercise. The following sources were consulted in order to identify the key archaeological and architectural heritage constraints:

[29] Government of Ireland (2020) Waste Action Plan for a Circular Economy. Available at: https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/

- Record of Monuments and Places (RMP) for County Galway[30];
- Sites and Monuments Record (SMR) for Galway[31];
- Monuments in State Care Database[32];
- Preservation Orders[33];
- Register of Historic Monuments[34];
- National Monuments Service: Wreck Viewer[35];
- Record of Protected Structures contained within the Galway City Development Plan 2017-2023[36];
- National Inventory of Architectural Heritage (NIAH): Architectural[37] & Garden[38] Survey, County Galway

It is noted that there are no World Heritage Sites (WHS) nor sites included within the Tentative WHS List for Ireland, located within the Scheme Area.

2.7.2 Key Constraints

2.7.2.1 Archaeological Heritage

A total of 234 RMP/SMR sites or groups of sites have been identified within the Scheme Area, with a high number of these concentrated in Galway City Centre

Of the 234 recorded sites, three are designated as National Monuments and should be considered as key constraints. A national monument receives statutory protection and is described as 'a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto' (National Monuments Act, 1930, Section 2).

National Monuments within the Scheme Area are shown in Table 14 below.

[30] Record of Monuments and Place: Maps and Manual, Co. Galway (1998)
[31] Sites and Monuments Record – https://maps.archaeology.ie/HistoricEnvironment/ (accessed 15.06.22)
[32] https://archaeology.ie/national-monuments/search-by-county (accessed 15.06.22)
[33] National Monuments Service, Preservation Orders (June 2019)
[34] National Monuments Service, Register of Historic Monuments (December 2009)
[35] Wreck viewer - https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640 (accessed 15.06.22)
[36] https://www.galwaycity.ie/publications/?filter=Record%20of%20Protected%20Structures (accessed 15.06.22)
[37] NIAH Built Heritage – https://maps.archaeology.ie/HistoricEnvironment/ (accessed 15.06.22)
[38] NIAH Gardens - https://www.buildingsofireland.ie/buildings-search/ (accessed 15.06.22)

Table 14: National Monuments within the Scheme Area. Source National Monuments Service.

RMP No	National Monument Number	RPS No	Description
GA094-100001	GA094-100001	1901; 3903; 4001	Galway City Town Defences
GA094-023	609	5901	Merlinpark Castle
GA094-072001 and GA094-072004	46	8802	Early Medieval Ecclesiastical Enclosure at Roscam

One group of archaeological sites are also subject to a Preservation Order and should be considered as key constraints. Preservation Orders and/or Temporary Preservation Orders, can be assigned to a site or sites that are deemed to be in danger of injury or destruction. These are allocated under the 1930 Act. Preservation Orders make any interference with the site illegal. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister (DHLGH), refer to **Table 15** below for sites within the Scheme Area with a preservation Order.

Table 15: Sites with Preservation Orders within the Scheme Area. Source National Monuments Service.

RMP No	Preservation Order Number	RPS No.	Description
GA082-12001-002, GA082-013, 103001 and GA082-014	14/1977	701	An old field system, two ringforts and a castle at Ballybrit

Of the 234 sites, 49 are also classed as Protected Structures within the Galway City Development Plan (2017 - 2023). As such, these sites are also subject to statutory protection under the Planning and Development Act, 2000, as amended.

Of the 234 archaeological sites recorded within the Scheme Area, 160 are RMP sites which are subject to statutory protection under the National Monuments Act (as amended) 1930-2014. A number of sites listed on the SMR are proposed for inclusion in the next revision of the RMP and as such should be treated equal to those which are subject to statutory protection. Other SMR sites represent archaeological remains identified during archaeological excavation which have been preserved by record and are no longer extant. There are also 22 redundant records listed on the RMP/SMR which are not subject to statutory protection. Refer to **Figure 7** below.

There are no recorded shipwrecks located with Scheme Area; however, the River Corrib is considered to represent an area of archaeological potential, along with Lough Atalia, smaller watercourses and the coastal margins. It is possible that the bodies of water contain underwater archaeological remains and/or artefacts. All water bodies (and their margins), as a whole, are considered to represent archaeological constraints.

2.7.2.2 Architectural Heritage

A total of 675 structures or groups of structures of architectural heritage significance have been identified within the Scheme Area.

These are either listed within the Record of Protected Structures (RPS) (Galway City Development Plan 2017-2023) or have been identified as part of the architecture survey carried out by the National Inventory of Architectural Heritage (NIAH).

Structures of architectural, cultural, scientific, historical or archaeological interest are protected under the Planning and Development Act, 2000, where the conditions relating to the protection of the architectural heritage are set out in Part IV of this Act. The Act defines a protected structure as '(a) a structure, or (b) a specified part of a structure which is included in a Record of Protected Structures (RPS), and, where that record so indicates, includes any specified feature which is in the attendant grounds of the structure and which would not otherwise be included in this definition.' Protection of the structure or part thereof, includes conservation, preservation, and improvement compatible with maintaining its character and interest'.

Buildings recorded in the RPS can include Recorded Monuments, structures listed in the NIAH or buildings deemed to be of architectural, archaeological or artistic importance by the Minister of Housing, Local Government and Heritage. It is noted that inclusion within the NIAH survey does not afford statutory protection. However, the structure may be added to the RPS by the relevant Local Authority in the future. As such the buildings should be considered to be constraints.

There are 49 structures/sites that are included within the RMP and RPS, which are subject to statutory protection under both the National Monuments Act 1930-2014 and Planning and Development Act 2000.

Within the scheme area and due to the very nature of 'Flood Relief Works' it is probable that structures and infrastructure associated with the canals and river channel may represent particularly significant heritage constraints. Twelve such structures/groups of structures have been identified at this stage and are considered as key architectural heritage constraints. These are presented in **Table 16** and shown on **Figure 8**. The 'Rivers and Waterways of Galway City' are shaded in blue on **Figure 8** to show the extents of the RPS.

Table 16: Key Architectural Heritage Structures within the Scheme Area. Source Galway City Development Plan 2017-2023.

RPS / NIAH Number	RMP	Description
8501	GA094-100031, 32, 56, 57, 59, 60	Rivers and Waterways of Galway City including bridges, walling, embankments, piers and other associated infrastructure
10507	N/A	Free standing elm-wood sculpture of a leaping salmon at Salmon Weir Bridge, Waterside
2206	N/A	Mid and late nineteenth century quays, piers and locks at Claddagh Quays
3501	N/A	c.1867 Waterworks Building & 1930's Electricity Generating Station, Dyke Road

RPS / NIAH Number	RMP	Description
3603	N/A	Early C19th Bridge Salmon Weir Bridge, Earl's Island
3607	N/A	Fisheries Offices, Earl's Island
5202	N/A	Nineteenth century Relief Work Stone Ashlar Pier, Lough Atalia
6201	N/A	Late eighteenth century/ early nineteenth century Stone Ruxtan Bridge, Mill Street
6202	GA094-102002	23 Mill Street (Former CYMS Building) including site water course, elements of mill buildings, doorcase and original fireplace
7406	GA094-100033	Former Mill, Nun's Island Street including original industrial machinery, water inlet under building and 2 IHS carvings
7408	N/A	Formerly Hygeia Building, Nun's Island Street
30408210	N/A	Single arch road bridge

2.7.2.3 Architectural Conservation Areas

An Architectural Conservation Area is defined as 'A place, area, group of structures or townscape, taking account of building lines and heights, that is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or that contributes to the appreciation of a protected structure, and whose character it is an objective of a development plan to preserve.' (Architectural Heritage Protection Guidelines, 40, 2011, DoAHG).

Chapter II of Part IV of the Planning and Development Act 2000 states that all development plans must now include objectives for preserving the character of ACAs. As such ACAs are subject to statutory protection and is a key constraint.

There is 11 ACAs within the Scheme Area which consist of various areas within Galway City Centre, refer to **Table 17** and **Figure 8** below.

Table 17: Architectural Conservation Areas within the Scheme Area. Source Galway City Development Plan 2017-2023).

Name	Description
City Core	The medieval core of Galway is a mix of streetscape and buildings of many periods. The layout and the scale of some of the streets reflect the medieval street pattern. The City Core is the most important area of built heritage in Galway. Its designation is beneficial in ensuring the area's character is enhanced and protected.
Nos. 7-14 Presentation Road	Number 7 – 14 Presentation Road are a group of eight semidetached dwellings. They date to the early 20th century and were constructed by local builders (McDonaghs) to house staff of the company.

Name	Description
	The dwellings are attractive, modestly scaled houses which provide a pleasant setting opposite St. Joseph's Church which dates from 1886. The intact, unified character of these buildings gives distinction to the streetscape.
Nos. 34-38 St Mary's Road	Number 34-38 St. Mary's Road comprises a terrace of three dwellings and two detached dwellings dating to the early 20th century. This group of houses retain their historic fabric, with rendered facades, decorative quoins and panelled front boundary walls. They have a setback address and are elevated above St. Mary's Road giving an intact, unified character to the streetscape.
St Mary's Terrace	St. Mary's Terrace consists of two 19th century uniform terraces of attractive, well maintained, rendered, Tudor style houses flanking St. Mary's Avenue. This group of buildings is of architectural interest retaining many original decorative features including red brick detailing and bay windows at ground floor level and front gardens
The Crescent Road / Sea Road	The Crescent is a very pleasant sweep of late Georgian style houses with gardens to the front and with further gardens and ancillary buildings and mews buildings to the rear. Most of the houses on Sea Road date from the mid and late 19th century. This is an area of distinctive urban form and visual richness
Lower Dominick Street	Lower Dominick Street contains some of the best 18th and 19th century buildings, facades, shop fronts and original features to survive in long uninterrupted stretches in the city. It is an area of distinct urban form and streetscape. It has a unique setting bounded by the River Corrib and the Eglinton Canal.
The Long Walk	The Long Walk has a particularly attractive setting, with views towards the sea and the Claddagh. The area characterises a distinct urban form, which reflects Galway's historic relationship with the sea and is a landmark area for the city.
St Nicholas Street	St. Nicholas Street is a terrace of 19th century artisan's dwellings and is one of the few such groups of this extent and completeness, which survive in the city, and therefore merits preservation from a social and architectural interest
Nos. 1-6 Dock Road	Number 1-6 Dock Road consists of a terrace of Victorian buildings on a prominent position overlooking the commercial dock and forms part of a terrace of the few remaining 19th century buildings on the street. Number 1 Dock Road has historical significance as it was the birthplace of Pádraic Ó Conaire
Eyre Square	Eyre Square is a significant historical civic space within the city, the green area (Kennedy Park) itself dates back to the mid-17th Century. The square comprises both historic and modern buildings with varying styles ranging from late Georgian to Victorian and modern. While significant intervention has taken place, it still retains the original form with a unified streetscape
Nos. 11-18 University Road	Number 11 – 18 University Road comprises a mid to late 19th century terrace of attractive rendered facades with front gardens, boundary walls and railings. This distinctive terrace was built by the Catholic Church, primarily to house academic staff of NUI Galway. This ACA is of social and architectural interest and is a strong and defining element of the streetscape.

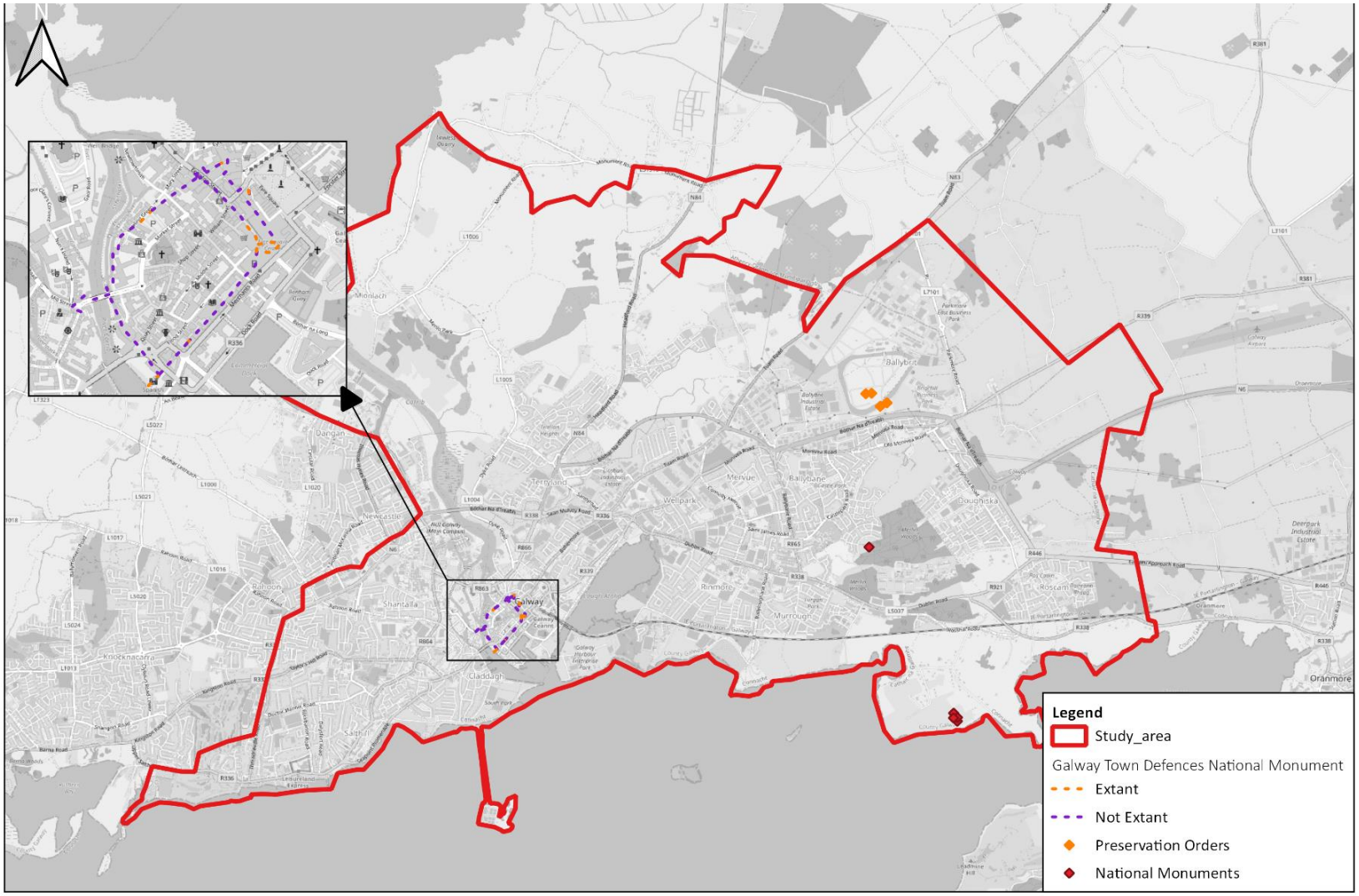

Figure 7: National Monuments and Monuments subject to Preservation Orders. Source National Monuments Service.

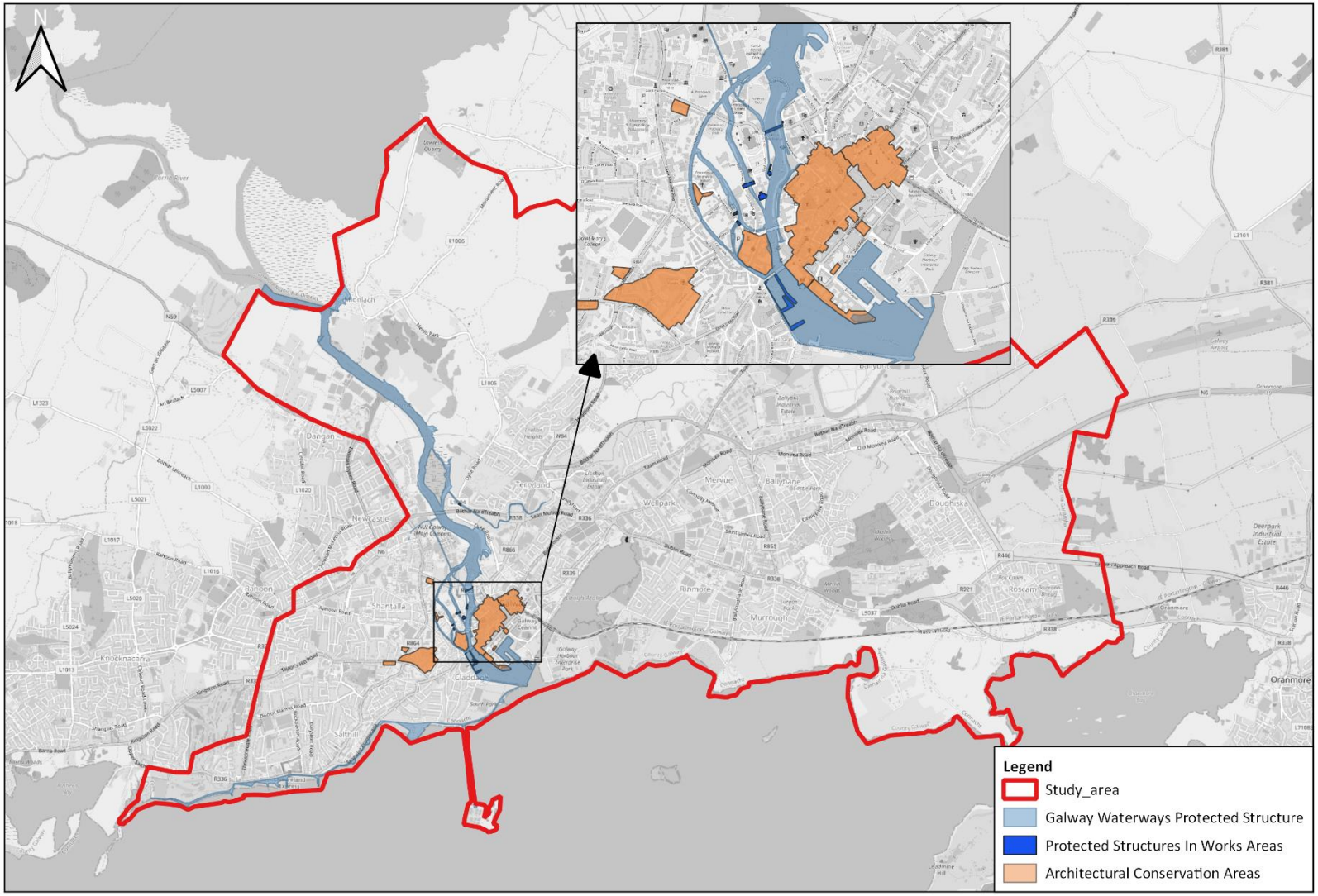

Figure 8: Protected Structures along indicative works area and Architectural Conservation Areas. Source Galway City Council.

2.8 Landscape

Galway City Council are seeking to develop a flood relief scheme for Galway City, with the project name '*Coirib go Cósta*', focused on designing and delivering the sustainable and effective management of flood risk with the city.

This section examines the significant existing baseline landscape and visual features and issues for consideration in the design and assessment of the project. The landscape and visual section identifies the significant features in the townscape / landscape, which determine its character, with particular reference to the river and the adjacent spaces /areas/ banks.

In addition to addressing flood risk management, opportunities to enhance the urban landscape, public realm and amenity, whilst integrating with other advancing projects are noted.

2.8.1 Data Sources

The assessment has regard to the relevant guidelines for landscape and visual assessment, including:-

- Galway City Development Plan 2017-2023 (Galway City Council, 2017)
- Galway Public Realm Strategy (Galway City Council, 2019)
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2017)
- Guidelines for Landscape and Visual Impact Assessment. (LI/IEMA, 2013)
- Landscape Character Assessment Technical Information Note (LI, 2016)
- Technical Information Note 05/2017 (Revised 2018) on Townscape Character Assessment (LI, 2018)
- Landscape Character Assessment and Landscape and Visual Impact Assessment of Specified Infrastructure Projects (TII, 2020)

And from the experience of the author in carrying out landscape and visual assessments for over 26 years in Ireland.

The methodology used for the landscape and visual assessment entailed:

- A desktop study and site visit (October 2021) of the study area and review of all statutory documents and plans pertaining to the study area, including:-
    - Galway City Development Plan 2017-2023
    - Galway Public Realm Strategy 2019
    - National Inventory of Architectural Heritage;
    - Ordnance Survey Mapping and Aerial Photography;
    - Online local information.

In **Section 2.8.2**, the context of the study area is briefly outlined. In **Sections 2.8.3** and **2.8.4**, the Landscape and Visual Constraints are respectively considered under:

- Landscapes: *i.e*. coastal promenade, walks, trees, woodlands, natural landscapes; designated or protected landscapes; parks, open spaces, sports, recreational and amenity areas, and;
- Visual, *i.e*. residential and community land use receptors; designated views and prospects; scenic walks; views to from protected built heritage/cultural features.

2.8.2 Scheme Area Context

The Scheme Area covers Galway City as per the Scheme Area in **Figure 9** below and extends from Salthill through Galway City Centre and Galway Waterways including the River Corrib, tributaries and canal, Lough Atalia and Terryland river valley.

Also known as 'City of the Tribes', Galway/Gallimh is a city characterised by stone and water, with Galway Bay, the River Corrib, the various historic canals and Lough Atalia strongly defining the character of the city Centre. The City has been shaped by previous generations of people leaving a rich built and natural heritage. The city waterways provide connectivity, amenity and biodiversity corridors, and are a strong and important connection between people and the place.

Galway's landscape provides distinctiveness and continuity and is an important contributor to quality of life for people in the city and the economy. The city's heritage and sites covered by ecological designations form important components of the city's landscape.

Figure 9: Study Area Map. Source Project Webmapper.

Located on the Wild Atlantic Way, the city is bounded by Galway Bay to the south and Lough Corrib to the north. The Lower Corrib River and a number of parallel rivers, mill races and canal run from north to south through its centre. It has a unique townscape character which has developed over many centuries.

Galway takes its name from Gallimh meaning ‘stony river’, which continues to exert a strong influence on the character and identity of the city.

The landscape within the city and north along the River Corrib corridor is low-lying generally being lower than 30m above ordnance datum (AOD). Within the extended city, the landscape rises gradually to the east to circa 70m AOD at Briar Hill where the local high point is topped by a reservoir. To the northeast, the landscape undulates gently westward over shallow valleys at between circa 20 to 30m AOD and across low ridges (up to circa 60m+ AOD) to the River Corrib / Lough Corrib, including Terryland river valley.

The historic city and the city core are both centred on the southern end (mouth) of the River Corrib but the city has also extended significantly both east towards Oranmore and westwards towards Bearna. Development has also extended along the corridors of the various national, regional and local roads that radiate out east, north and west from the city centre.

Within the city there are distinctive areas, which have specific functions or characteristics that contribute to the diversity, economic vibrancy and character of the city. The city centre area is particularly important, as it reflects to a large extent the unique and vibrant image of Galway, with a medieval townscape, a waterways setting, hosting a strong arts and cultural heritage. The city is an important tourist destination and is known for hosting numerous festivals, celebrations and events.

The flood defence works will extend to the following landscape character types and areas, requiring different design responses to the context and sensitivity of each, including the following locations described in **Sections 2.8.2.1 to 2.8.2.4** below.

2.8.2.1 Salthill

Located on the edge of Galway Bay with views south to north County Clare and the Burren, the coastal edge and promenade are key features of Salthill. The coastal character of Salthill has changed over time but still retains its distinctive character and amenity value. In recent years it has re-established itself as an urban village with many of the former hotels and nightclubs replaced by apartments, cafes and restaurants.

Salthill Promenade is a major recreational facility for city residents, a strong tourist attraction and key city landmark culminating with the iconic Blackrock diving tower, where it was tradition for walkers to ‘kick the wall’ to show you had complete the length of the promenade walk. It is an important active and passive amenity space with significant pedestrian footfall. The various beaches, seating areas, Wild Atlantic Way destination point and small pavilion buildings are well used by residents and visitors. Salthill Slí na Sláinte which is c. 5km long extends from Tobermaconry/Upper Salthill Road in the west to the Fishmarket in the city Centre, along the coastal promenade.

Salthill has both natural and built heritage assets. It has secured Blue Flag status for a succession of years, which is a significant asset in promoting a clean image of the City and in developing water based recreation and amenity activities along the seafront.

Toft Park, Celia Griffin Park, Salthill Park and the Circle of Life Park also contribute greatly to important elements of the green network in Salthill.

Along the promenade the shelters, seating areas, kiosks and Blackrock diving tower are unique and hallmark features of social, architectural and technical interest and contribute to the resort character of the area.

The surrounding area at Salthill has evolved from seaside holiday resort in recent decades to urban village with a mix of residential, commercial and amenity uses.

Figure 10: Salthill Promenade.

The promenade connects the Claddagh area and City Centre via Grattan Road, South Park (with a number of sports pitches), with access to Mutton Island and Nimmo's Pier, Claddagh Basin and City Centre.

As well as providing important recreational amenity, Nimmo's Pier and the Claddagh Basin and their features (cut stone walls, bollards, steps etc.) are protected structures, with a rich history and heritage. Other features of note include sculptures, seating areas, railings and tree planting.

Figure 11: Claddagh.

2.8.2.2 Galway Harbour, Docks and Lough Atalia

Galway Harbour and Docks are located in the southern side of the city Centre where the Lower River Corrib reaches the sea.

The area around the River Corrib and Claddagh is very distinctive with fine cut stone quay walls, with Nimmo's Pier and Claddagh Docks on the west side and Fishmarket, Spanish Arch and Long Walk on the east side of the river.

Figure 12: Spanish Arch and Fishmarket.

Galway Inner Docks consist of stone quay walls and tidal-gate water basin, with a mixture of working docks, visiting ships and recreation watercrafts.

Figure 13: Galway Docks.

To the east of Galway Harbour, Lough Atalia is a tidal lake flanked by the city Centre to northwest and Renmore to the east, and measures c.1.1kn long x c.300m wide. The Galway/Dublin rail line traverses the southern section on embankment with adjacent pedestrian route known as ‘The Line’. There a number of busy thoroughfares around the lake including the Old Dublin Road to the north, Lough Atalia road to the northwest and quieter residential roads in Renmore. Surrounding land uses are primarily residential with a number of commercial properties including hotels, B&Bs and bar/restaurant. An amenity path and primarily grassland with occasional trees/scrub vegetation follows the lake shore. On Lough Atalia road there are a number of Holy Wells along the shoreline. The elevated railway viaduct (listed NIAH) is a prominent visual feature in the area with ashlar stone piers and cutwater bases. Ceannt Rail Station is located immediately west of the viaduct.

Figure 14: Lough Atalia

Lough Atalia is connected to Galway Harbour via a c.500m long x c.50m wide channel with the elevated railway line crossing it at the northern end and Galway Docks/Galway Harbour Enterprise Park on both sides to the south of the rail line. These are primarily industrial in character.

Both Ceannt Station and Galway Inner Docks are identified as important opportunity sites for brownfield regeneration within the Galway City Development Plan. Plans for mixed use regeneration are provided for in a recently published vision document of the area prepared by the Galway Harbour Company.

2.8.2.3 City Centre, Waterways and Canal

The city centre is strong influenced by its grid/block-like street structure aligned in a southwest to northeast direction, taking their direction from the original medieval town structure which entered Galway from the northeast. This part of Galway city centre is strongly influenced by its waterside environments of the Lower Corrib River and connected canals and millraces. Historically, the waterways supported its economy as an important trading port and fishing town.

Within the city centre, the Lower Corrib River is a key feature of the city. The river is tidal in nature up to the Salmon Weir Bridge and flows rapidly. Parallel to the Corrib, there are a number of rivers (Distillery, Friar's, Gaol, St Clare, Slaughterhouse, Middle, Parkavera and Madeira rivers) managed and harnesses for power in previous centuries with numerous historic mills, distilleries and breweries. The Eglinton Canal and Nimmo's Pier were constructed in the 19th Century to assist with boat navigation. The various small islands located within the city Centre area are each distinctive in their own right with Galway Cathedral, Nun's Island and Earls Island.

Figure 15: Galway Waterways Amenity Path.

The waterways have a valuable role in terms of visual amenity, recreation, leisure, pedestrian and cycle networks, with a rich natural and built heritage environment and green spaces with direct access to nature, the sea, the River Corrib and canal system. The fast flowing Lower Corrib River is contrasted with the slow flowing mill races and canal. Along much of the river courses, there is extensive stone quay walls, vegetation and trees which are important features of the landscape and visual environment.

Figure 16: Millennium Park with Galway Cathedral in background.

There are a number of bridge crossings of the River Corrib including:-

- Wolf Tone Bridge which is the southernmost bridge next to the Fishmarket, Spanish Arch and Claddagh Docks.
- O'Brien's Bridge, connecting Bridge Street to Mill Street.
- Salmon Weir Bridge connecting St. Vincent's Avenue to Galway Cathedral and University Road. A pedestrian/cycle bridge is also being proposed just south of the Salmon Weir bridge. Just north of the Salmon Weir, the bridge abutments remain of the former Corrib Viaduct Bridge. A new combined walking and cycling bridge is planned connecting the city Centre through NUIG campus and westwards connecting to Connemara Greenway which will extend to Clifden along the old rail line.
- Quincentennial Bridge, north of the city centre, is part of the N6/Bothar na dTreabh road which is a busy vehicular thoroughfare, crossing the River Corrib. The remains of Terryland Castle lie to the north of the bridge and form part of Terryland Forest Park, which is linked to the city centre along Dyke Road.

At Waterside/above the Salmon Weir Bridge, there are a number of boat clubs and boat launch slipways along the river for leisure, fishing and rowing boats.

2.8.2.4 Terryland River Valley

The Terryland River connects with the Lower Corrib River at Jordan's Islands north of Terryland Castle and Quincentennial Bridge. The river is c.3.8km long and extends eastwards to Castlegar, where there are a number of sink holes including Cooper's Cave in the underlying karstic limestone bedrock.

Terryland Forest Park follows much of its length and was developed in the early 2000 as a new urban forest woodland and riverine park with c.100,000 native trees planted along its length, providing an enclosed and vegetated character. Within the park there are a series of trails, seating areas, exercise trail and connecting paths to surrounding areas, which consist of residential, commercial, retail park areas and a number of heavily trafficked roads including the N6/Bothar na dTreabh and Headford Roads.

Figure 17: Terryland Forest Park.

The Terryland River continues to the north of the N6 (Bothar na dTreabh) Road to Castlegar, where the landscape is more open as a broad shallow valley and is used for grazing, with overlooking surrounding residential areas to the north.

2.8.3 Landscape Constraints

The Scheme Area is located fully within the boundary of Galway City planning authority, and most of these aspects are highlighted within the Galway City Development Plan 2017-2023, hereinafter noted as GCDP.

2.8.3.1 Green Network

Chapter 4 of the Galway City Development Plan sets out the policies and objectives in relation to Natural Heritage, Recreation and Amenity.

The importance of the landscape is noted in Section 4.1 of the GCDP, it is stated that *'it is widely recognised that protecting and enhancing the natural assets and open spaces of Galway City has significant economic and social value. These spaces are a vital part of everyday urban life and a high quality environment within a city improves the health and well-being of the community, helps to attract visitors and economic investment. The landscape setting of the city, at the foothills of Connemara where the River Corrib meets Galway Bay creates a distinctive place and influences the culture and image of the city.*

The city has a diversity of natural resources including coastline, woodlands, river, canal system and protected habitats. A fifth of the total land area of the city is designated as protected habitats, recreational amenity open space and agricultural land. In order to protect the quality of the city's natural resources, to reflect its multi-functional aspect and to provide for its sustainable management and protection, these natural resources have been linked together into a green network.'

Policy 4.1 sets out the objectives in relation to the protection, conservation and enhancement of the city's Green Network. states *'A key aim is to provide a green network that allows for the sustainable use, management and protection of natural heritage, recreation amenity areas, parks and open spaces'*.

The network includes:

- protected spaces (i.e. SACs, SPAs, NHAs, pNHAs and local biodiversity areas);
- blue spaces (Coastal area, River Corrib, canals and other waterways etc.);
- green spaces (citywide and city centre parks and neighbourhood parks);
- community spaces (greenways, recreational facilities and playgrounds, and protected views of special amenity value and interest); and
- open spaces (which includes institutional open space, recreation and amenity zoned lands and agricultural and high amenity lands).

Table 4.2 of the GCDP lists the open spaces in the Green Network, which are summarised in **Table 18** below as they relate to the study area:-

Table 18: Open Spaces within Galway's Green Network within Study Area.

Open Space Type	**Location**
City Park	Terryland Forest Park
Neighbourhood Parks	Renmore Park, South Park
City Centre Park	Millennium Children's Park, Riverside Walk, Celia Griffin Memorial Park, Woodquay Park (Waterside)
Enclosed Marine/Wetland and Coastal Areas	Lough Atalia
Rivers, Waterways and Lakes	River Corrib, canal systems, Sandy/Terryland River
Civic Spaces	Fishmarket Square
Greenways	Greenways including coastal, river, canal and woodland walk and cycle ways.

2.8.3.2 Natural Heritage and Biodiversity

Natural and semi-natural habitats located in the city include the coastline, waterways, riparian trees and urban woodland, wet meadows, and grassland. Other natural features such as views and prospects of amenity value, trees and features of geological interest also contribute to this resource. Refer also to **Section 2.2** *Biodiversity* of this report.

This resource includes a wide range of SACs (Lough Corrib, Natural Heritage Areas (pNHAs / NHAs); Sites of Geological Importance; Local Biodiversity Areas; as well as Other Areas/Features of Local Importance in the city. These include key landscape areas such as River Corrib and adjoining waterways/wetlands, Galway Bay, Lough Atalia shoreline, Terryland Forest Park/Terryland River/Cooper's Cave.

In the GCDP 2017-2023, *Policy 4.2* outlines how these habitats and landscape features will be protected and conserved as sites of European, National and Local Ecological Importance.

2.8.3.3 Coastal Areas, Canals and Waterways

Section 4.3, of the GCDP notes that *'Galway City has an unparalleled water environment with an extensive coastline, Lough Corrib, River Corrib, waterways and canals. These important natural resources, blue spaces' in the city bring considerable benefits for people and the environment, from improving health and wellbeing by creating an attractive landscape and ensuring a thriving ecosystem. These assets contribute significantly to the positive image of the city and have socio-economic value.'*

In Section 4.3.1, Galway Bay and coastline is recognised as *'an integral part of the aesthetic landscape and culture of the city.*

The ties between the city and the sea are exhibited in its strong maritime history and the traditions of areas such as The Claddagh, Fishmarket, The Docks and Salthill, a traditional seaside village, which attracts visitors throughout the year. The coastline is an important tourist and recreation attraction stimulating economic activity, providing local amenity and related socio-economic and health benefits.'

Section 4.3.2, the River Corrib and waterways are recognised for their importance to the city, noting that the:-

'*river and waterways including the Eglinton Canal, the River Corrib system, the lesser waterways of the Cathedral River, the West River and the many headraces, tailraces and minor canals form the aesthetic landscape and structure of the city centre. These waterways, rivers and coastline are significant linear wildlife and biodiversity corridors within the urban environment. The River Corrib is designated a Salmonid River.*

The canal system is an important architectural feature of the industrial past and economic and physical evolution of the city.

The canal system requires special consideration in order to respect its setting and to ensure any developments abutting the canal do not disproportionately affect its amenity and aesthetic quality.

Public accessibility to the canal will be encouraged in the design of developments, where feasible. Outside of the city centre the banks of the River Corrib are semi-natural in character and development is restricted in order to protect water quality, ecology and the semi-natural character of the river.'

Policy 4.3 seeks to protect, maintain and conserve these 'blue spaces' of the city.

2.8.3.4 Urban Woodland Parks and Trees

Section 4.4.1 *Urban Woodland Parks and Trees* are recognised and noted as important natural landscape features of the city, important to the health and wellbeing of communities.

Policy 4.4 seeks to manage, develop and integrate existing trees, woodlands and hedgerows where appropriate and require new tree planting as part of new development.

2.8.3.5 Community Spaces

Section 4.5.1 *Greenways and Public Rights of Way* promotes the development of such linkages. With coastal and riverside paths along Galway Bay, Lough Atalia, Corrib River and waterways and Terryland Forest Park, these greenways provide important linkages and connectivity with the city.

Policy 4.5.1 seeks to protect and continue to develop these greenways, linked with other City projects such as the Galway Transport Study and Connemara Greenway.

2.8.3.6 Built Heritage

Galway has a rich and varied historic built environment and a distinctive landscape/townscape character. The historic city centre with its grid-like street pattern, narrow streets, contrasting buildings, canals/millraces and relationship with the River Corrib and Sea combining to create a unique and highly sensitive urban environment.

Chapter 8 of the Galway City Development Plan sets out the policies and objectives in relation to *Built Heritage and Urban Design*.

The rich architectural heritage of the surrounding city is notable with a number of architectural conservation areas (ACA) adjoining/overlapping the indicative flood relief works including the 'City Core', 'Lower Dominic Street', 'Long Walk', and 'Presentation Road'.

Details on the architectural and archaeological heritage are outlined in further detail in **Section 2.7** *Archaeological, Architectural and Cultural Heritage* of this report.

There are a number of prominent and distinctive visual features along the alignment of the indicative flood relief scheme, including:-

- The network of Galway Waterways flowing at varying speeds from a north to south direction and its network of islands and bridges. Galway Waterways (including bridges, walling, embankments, piers and other associated infrastructure) are all Protected Structures (RPS 8501). This includes Terryland/Sandy River, Galway Docks, Claddagh (RPS 2206), Nimmo's Pier and Salthill coastal promenade from South Park to west of Galway Golf Club;
- Salmon Weir Bridge (RPS 3603) and Lough Atalia Viaduct (RPS 10002);
- Numerous city centre buildings such as Galway Cathedral (Protected Structure (RPS 3602); Terryland Castle (RPS 3503); Terryland Waterworks (RPS 3502); NUIG Campus Buildings (RPS 7001, 7003, 10307, 10310); Courthouse (RPS 2601); Franciscan Friary, Mercy Convent, Fr. Daly Chapel (Protected Structure (RPS. 7201); former mills/distillery's (e.g. Persse's Distillery (RPS 7403); Country Club (RPS 3604) and Fisheries Office (RPS 3607).

Both sides of the river corridor are lined with a variety of stone quay walls and other features (weirs, bridges, lock gates, railings, bollards etc.), mature and semi-mature trees and riparian vegetation, riverside walkways, streets and buildings, which all combine to form the unique and sensitive character of the city.

2.8.4 Visual Constraints

2.8.4.1 Protected Views

Within Section 4.5.3 of the GCDP, Views of Special Amenity Value and Interest, are identified under panoramic and linear protected views, with relevant views listed in Table 19 below.

Table 19: Selected Panoramic Protected Views and Linear Protected Views. Source Galway City Development Plan 2017-2023.

Panoramic Protected Views	
V.1	Panoramic views of the city and the River Corrib from Circular Road.
V.2	Views from Dyke Road and Coolagh Road encompassing the River Corrib and Coolagh fen.
V.3	Seascape views of Lough Atalia from Lough Atalia Road, College Road, Dublin Road and Lakeshore Drive
V.4	Seascape views of Galway Bay from Grattan Road, Seapoint, the Salthill Promenade and the coast seascape views of Galway Bay from Grattan Road, Seapoint, the Salthill Promenade and the coast road to the western boundary of the golf course.
V.6	Panoramic views of the city, and the Terryland Valley from parts of the Castlegar-Ballindooley Road.
Linear Protected Views	
V.11	Views from Waterside of the River Corrib.

Panoramic Protected Views	
V.16	Views from Quincentenary Bridge Road southwards over Terryland Forest Park and River Corrib.
V.17	Seascape views from Military Walk, Renmore.

2.8.4.2 Visual Receptors

Located within the city, there are a wide range of residential, institutional/educational, commercial, retail, tourist/amenity/recreation, transportation and industrial uses along the indicative flood relief works.

Residential development either in the form of residential estates, linear roadside development or as standalone properties represent the most prominent and significant visual sensitivity, followed by education, tourism, amenity and recreation users.

2.8.5 Key Constraints - Construction Phase

The key constraints for the area will be the existing historic structures (quay walls/slipways/steps, buildings, bridges, street furniture), protection and preservation of existing mature trees and habitats, access for people and protection of key designated views.

2.8.6 Key Constraints - Operation and Maintenance Phase

The main landscape constraints in the Scheme Area revolve around the diversity of ecological / landscape and cultural areas, comprising a matrix of coastal promenade, working/historic/amenity harbour areas, lake/water body edge at Lough Atalia, river/canal corridor with public walkways, historic stone walls/bollards/weirs/canal features, tree/scrub plantings, sports grounds, amenity areas and open spaces. These landscape constraints have a strong correlation to areas of ecological importance, which add to overall landscape diversity and interest.

The main visual constraints revolve around protected views and panoramic views, residential, community and social amenities dispersed across urban, suburban and linear areas located within the Scheme Area. Visual constraints also apply to features of archaeological, architectural and cultural heritage, e.g. views along river corridors to built heritage within the city such as Galway Cathedral, St Nicholas' Church etc.

2.8.7 Enhancement Opportunities

As well as enhancing the flood resilience within the city centre, harbour and coastal areas, the development of the Galway City Flood Relief Scheme offers the potential of a number of enhancement opportunities within the city, including:

- Maintaining and enhancing the quality of the city centre public realm and enhance accessibility and connectivity to and within the city centre through implementation of measures included in the Galway Transport Strategy, Public Realm Strategy, Connemara Greenway, and future regeneration projects at Ceannt Station and Galway Docks.
- Reinforcing and enhancing the character of the seafront, harbour, city centre and Terryland Forest Park areas with finishes and design of the flood defence measures, sensitive to the townscape/landscape context and taking regard of the Galway Public Realm Strategy 2019 to provide a consistent, legible, safe, attractive and high quality public realm and green/blue network for the city.
- Encourage the use of innovative and sensitive landscape architecture/public realm design, including urban greening, enhancing biodiversity and amenity value, and incorporating SuDS where appropriate, which respond to the city's unique character and continue to create a strong identity for these areas.

2.9 Major Accidents and Disasters

Site-specific risk assessments shall identify and quantify risks focusing on unplanned, but possible and plausible events occurring during the construction (and operation) of the proposed scheme. This section identifies risks typically associated with flood relief schemes that the design team shall be cognisant of.

2.9.1 Key Constrains – Construction Phase

The design team shall be cognisant of the potential for accidents and disasters during the construction of the proposed scheme.

The following potential (non-exhaustive) risks, associated with flood relief scheme shall be taken into account:

- Flooding of the construction site or works area. In-stream works are particularly vulnerable.
- Traffic accidents associated with temporary traffic measures
- Contamination of the groundwater / surface water due to spill or leakage of oils/hydrocarbons from construction machinery and vehicles.
- Falling debris from construction vehicles/scaffolding/hydraulic platforms.
- Sinking/flooding of plant machinery in the waterways.

2.9.2 Key Constrains – Operation and Maintenance Phase

The proposed scheme will be designed to protect the population and properties in Galway City from the effects of flooding, however the design team shall be cognisant of the potential for major accidents and disasters during the operation and maintenance phase.

The following potential (non-exhaustive) risks associated with flood relief scheme shall be taken into account:

- Public safety along walkways/cycleways adjacent to the River Corrib, canals and other waterways.

2.9.3 Enhancement Opportunities

The nature of the scheme will mean that public safety will be improved for the population of Galway City. Opportunities to enhance public safety with regard to Galway's waterways are integral to the design of the scheme.

2.10 Interaction of Factors

Given the nature of flood relief schemes, there is the potential for interaction between the following environmental factors:

- Construction noise and vibration on population and biodiversity.
- Construction vibrational impacts may also potentially impact archaeological, architectural and cultural heritage.
- Potential air quality impacts from dust and emissions generated during the construction phase of the drainage scheme may interact with population and human health, biodiversity and local climate.
- The construction activities have the potential generate temporary visual impacts and these impacts will interact with human beings.
- The construction phase of the drainage scheme may potentially impact the local traffic in the surrounding area. This construction traffic impact may potentially interact with the local air quality, noise and vibration from truck movements and population due to (potential) traffic diversions in the area.
- Flood alleviation measures have the potential to change the local hydrology during a flood event. These hydrological impacts have the potential to interact with people by reducing the flooding risk and material assets through the greater flood protection for roads, services and properties.
- Many of the receptors identified above are of importance for numerous environmental factors (for example the canals are important for biodiversity, heritage, landscape and as a recreational amenity) and it will be important that the sensitivity of these receptors are carefully considered during the design process.
- The proposed scheme measures may be in proximity to protected structures which may potentially result in cumulative archaeological, architectural and cultural heritage impacts and visual impacts.
- The proposed scheme works will potentially impact the biodiversity of the local area. The construction impacts from noise and vibration may also impact biodiversity of the local area.
- By reducing the risk of flooding, the material assets of the area will be protected and thus flooding events will have less of an impact on people in terms of property, roads and services.

- Construction that requires work to the soils and geology may potentially impact the biodiversity.
- Landscaping works for the construction of alleviation measures may impact people through the transport of material on and off site.

3 Interacting Projects

There are a number of planned projects in the Scheme Area that have the potential to interact with the proposed scheme. A review of planned projects and any known significant proposals has been undertaken to ensure the project team are cognisant of these other projects.

This list of projects will be constantly under review throughout the project and updated as new projects become known.

The following projects have been identified during the preparation of the Constraints Report as show in **Table 20** below and **Figure 18**

Table 20: Potentially interacting projects identified to date.

Project Name	**Owner**	**Status**
Galway Public Realm Strategy*	GCC	Complete
Galway City Council Development Plan*	GCC	Complete
Galway Transport Strategy*	GCC	Complete
Nun's Island Masterplan*	NUIG/GCC	Conceptual
Connemara Greenway / Galway Clifden Greenway	GCC	Conceptual
Galway to Bearna Greenway	GCC	Conceptual
Salthill Cycleway Scheme*	GCC	Conceptual
Salmon Weir Pedestrian and Cycle Bridge	GCC	Design stage
Galway City Museum Expansion and Enhancement Project	GCC	Ongoing
NUIG Masterplan	NUIG	Ongoing
Irish Water - Drainage Area Plan (DAP)*	Irish Water	Ongoing
Salmon Weir Maintenance Gate installation*	OPW	Ongoing
Port of Galway Redevelopment	Port of Galway	Ongoing
BusConnects Galway - Cross City Link	GCC	Planning stage
N6 - Galway City Ring Road	GCC	Planning Approved
Terryland Park - Framework Plan	GCC	Preliminary design
Dyke Road Embankment Footpath Upgrade Project	GCC	Pre-planning
Pedestrian bridge downstream of Wolfe Tone Bridge	GCC	Pre-planning
Active Travel Scheme along Eglinton Canal	GCC	Pre-planning
*Not shown in Figure 18.		

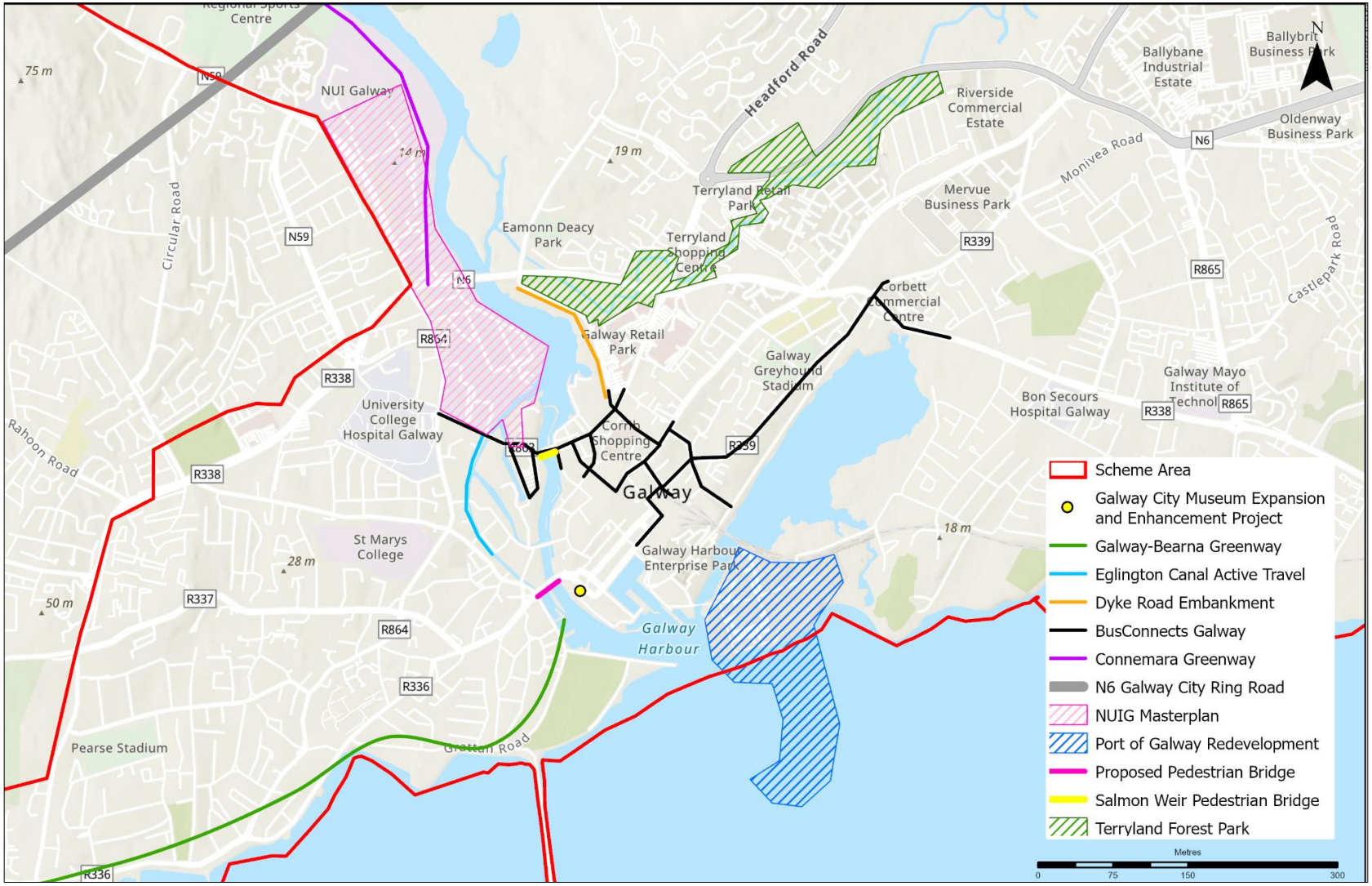

Figure 18: Projects potentially interacting with scheme in the wider Galway City area. Not to scale.

4 Stakeholder Consultation

To date the following stakeholder consultation activities have taken place:

- Public Engagement Day, 1 June – 7 July 2021
- Collaborative Workshop, 27 September 2021

All consultation currently undertaken with stakeholders was carried out in connection to these events.

4.1 Summary of Public Engagement Day Feedback

The first Public Engagement Day (PED) was held online on the 1st June 2021. The period for submissions following the event extended to 7th July 2021 and summarised below:

- The first PED was held on Tuesday 1st June 2021 online through a Virtual Engagement Room (https://www.virtualengage.arup.com/coiribgocosta/), accessed via the scheme website through a direct link (www.coiribgocosta.ie).
- The purpose of the PED was to present the scheme, the objectives of the scheme, the Constraints and Opportunities Study, the project timeline, and future opportunities for public engagement.
- Advertising of the Public Engagement Day was undertaken in various online news outlets and on social media two weeks preceding the event. In addition, notices were placed in the local newspaper and regular radio announcements on Galway Bay FM for the two weeks preceding the event and throughout the five weeks submission period.
- Galway City Council's social media platforms were used to promote information about the Coirib go Cósta Public Engagement Day.
- A project newsletter, information posters and a questionnaire were available at the virtual PED between the 1st of June and the 7th of July 2021.
- The interactive web-mapper is linked in the project website and was linked to the Virtual Engagement Room for the duration of the public engagement period.
- A live chat option was available on the 1st of June between 9am and 6pm where members of the project team from Arup and Galway City Council were available to respond to queries live. An Irish speaking member of the project team was available throughout the day also.
- A questionnaire was available in the virtual PED room and on the project website for direct on-line submission or download and submission by email/post.
- Consultation letters were issued to key stakeholders. The contacted stakeholders are listed below:
    - An Taisce

- Bat Conservation Ireland
- Birdwatch Ireland
- Coastal Marine Resources Centre (CMRC)
- Department of Housing, Planning, Community and Local Government
- Environmental Protection Agency Regional Inspectorate
- Fáilte Ireland
- Galway Archaeological & Historical Society
- Galway Chamber of Commerce
- Galway City Council
- Galway City Museum
- Galway City Partnership (GSCP)
- Galway Environmental Network
- Galway Tourism
- Heritage Council
- Inland Fisheries Ireland
- Irish Water
- Irish Wildlife Trust
- Local Authority Waters Programme (LAWaters)
- Local Environmental Network(s) (IEN)
- Lough Corrib Navigation Trustees
- Marine Institute
- National Monuments Service
- National Parks & Wildlife Service
- National Inventory of Architectural Heritage (NIAH)
- Transport Infrastructure Ireland
- Western Development Commission
- Waterways Ireland

- In Question 9 of the questionnaire, the respondents were given six environmental topics and asked to rank their opinion on the importance of each constraint, from very important to unimportant:
  - The majority of the respondents considered “Water Quality” as being of most importance with 56% (9) of the respondents indicating both “Water Quality” and “Biodiversity, Flora and Fauna” as “very important”. “Biodiversity, Flora and Fauna” was considered the second most important constraint with 44% (7) of respondents indicating it “very important”.
  - “Angling, Tourism & Recreation” come in third with 31% (5) of respondents reporting this constraint as “very important”.
  - “Landscape and Visual Amenity” and “Architectural & Cultural Heritage” come in joint forth with 25% (4) of respondents indicating them “very important” while “Land use and Agriculture” was indicated as of the least importance with only 13% (2) of respondents indicating it to be “very important”.

- It was noted that numbers of submissions and public engagement with the project team were low and may have been due to the fact the public engagement day was held solely online due to Covid-19 restrictions in relation to public gatherings. However, page visits and number of visitors are aligned with the numbers of public engagement days for similar projects.

4.2 First Collaborative Workshop

As part of the scope for identifying potential environmental enhancement opportunities, the first collaborative workshop took place virtually on 27th September 2021.

The goal of the workshop was to engage with stakeholders from key statutory bodies and others, presenting Coirib go Cósta and the project team, and to collaboratively identify and discuss particular issues, constraints and opportunities of the proposed scheme and any potential features that could be considered to create and/or support multiple benefits and/or meet objectives in addition to flood risk management. A key action following workshop is to maintain a list of projects potentially interacting with the Scheme.

Attendees at the virtual workshop included:

- Number of departments within Galway City Council
- Heritage Officer, Galway County Council
- Irish Water
- Port of Galway (Harbour Authority)
- National Monuments Service (NMS)
- National Parks and Wildlife Service (NPWS)
- Inland Fisheries Ireland (IFI)

5 References

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Appendix A

Webmapper Data Sources

A1 Webmapper Data Sources

List of data available on the project and public webmapper at the time of preparing this report (January 2022). The project and public webmapper will continue to be updated throughout the project.

Category	Layer Name	Source	Link	Available to view on Public Webmapper (Y/N)
Population and Human Health	Amenity Paths	Brady Shipman Martin	Not public data	Yes
	Sports Pitches	Brady Shipman Martin	Not public data	Yes
	Beaches	Brady Shipman Martin	Not public data	Yes
	City Parks	Brady Shipman Martin	Not public data	Yes
	Indicative Greenway Cycle Network	Brady Shipman Martin	Not public data	Yes
	Key Place Names	Brady Shipman Martin	Not public data	Yes
	Primary Cycle Network	Brady Shipman Martin	Not public data	Yes
	Public Amenities	Brady Shipman Martin	Not public data	Yes
	Public Visitor Facilities	Brady Shipman Martin	Not public data	Yes
	Sports Facilities	Brady Shipman Martin	Not public data	Yes
	Parks	Brady Shipman Martin	Not public data	Yes
	Bathing Locations	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Primary schools	Government of Ireland	www.Data.gov.ie	Yes
	Secondary schools	Government of Ireland	www.Data.gov.ie	Yes
	Walks	Gmap by Galway City Council (2013)	As requested: GIS@galwaycity.ie	Yes
	Boating Sites	Gmap by Galway City Council (2013)	As requested: GIS@galwaycity.ie	Yes
	Fishing Sites	Gmap by Galway City Council (2013)	As requested: GIS@galwaycity.ie	Yes
	Places to Sit	Gmap by Galway City Council (2013)	As requested: GIS@galwaycity.ie	Yes
	Urban Forest	Gmap by Galway City Council (2013)	As requested: GIS@galwaycity.ie	Yes
Biodiversity	Special Protection Areas	National Parks and Wildlife Service	https://www.npws.ie/maps-and-data/designated-site-data	Yes

Category	Layer Name	Source	Link	Available to view on Public Webmapper (Y/N)
	Special Area of Conservation	National Parks and Wildlife Service	https://www.npws.ie/maps-and-data/designated-site-data	Yes
	Proposed Natural Heritage Areas	National Parks and Wildlife Service	https://www.npws.ie/maps-and-data/designated-site-data	Yes
	Offshore Special Area of Conservation	National Parks and Wildlife Service	https://www.npws.ie/maps-and-data/designated-site-data	Yes
	Natural Heritage Area	National Parks and Wildlife Service	https://www.npws.ie/maps-and-data/designated-site-data	Yes
	Salmonoid Waters	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Nature Reserves	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Invasive species survey 2021	Moore Group	Project data	No
Land and Soil	Geological Heritage Sites	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Bedrock outcrops	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Bedrock Geology 100k	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Quaternary Sediments	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Soils	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Karst landforms	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Aquifers - bedrock	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Aquifers - sand and gravel	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Groundwater vulnerability	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Groundwater Quality Status (2013-2018)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Protected Drinking Water - Groundwater	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Ground Waterbodies Risk (WFD 3rd Cycle)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Groundwater Agriculture Pressures	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Industrial Emissions (IE) Facility	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Integrated Pollution Control (IPC) Site	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Licensed Waste Facility	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Pit and Quarry Areas	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Active Quarries	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes

Category	Layer Name	Source	Link	Available to view on Public Webmapper (Y/N)
	Mineral Localities	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Potential Granular Aggregate	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Historic Pit & Quarry Locations	Geological Survey of Ireland	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx	Yes
	Land Use Risk (historic and recent)	Arup	Project data.	No
	National Coastal 2050 Erosion Lines (ICPSS 2010-2014)	Office of Public Works	https://www.floodinfo.ie/geowebcache/demo	Yes
Water	Blue Line Network (EPA)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Waterbodies in Galway	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Coastal Waterbodies (Status)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Lake Waterbodies (Status)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	River Waterbodies (Status)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Transitional Waterbodies (Status WFD Cycle 3)	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Drinking Water - Rivers	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Drinking water - Surface water	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	River Waterbodies Risk (WFD Cycle 3)	Environmental Protection Agency	As requested gis@edenireland.ie	Yes
	River Hydromorphology Pressures	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	River Urban Run Off Pressures	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
Material Assets	Water Treatment Plant	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	Waste Water Treatment Plants	Environmental Protection Agency	https://gis.epa.ie/GetData/Download	Yes
	ESB	ESB	As requested	No
	Eir	Eir	As requested	No
	GNI	GNI	As requested	No
	BT	BT	As requested	No
	Water, sewer and storm water	Irish Water	As requested	No
Cultural Heritage	Protected Structures	Galway City Council	As requested: GIS@galwaycity.ie	Yes

Category	Layer Name	Source	Link	Available to view on Public Webmapper (Y/N)
	Architectural Conservation Areas in Galway City	National Monuments Service	https://maps.archaeology.ie/HistoricEnvironment/	Yes
	Record of Monuments and Places (RMP)	National Monuments Service	https://maps.archaeology.ie/HistoricEnvironment/	Yes
	National Inventory of Architectural Heritage	National Monuments Service	https://maps.archaeology.ie/HistoricEnvironment/	Yes
	Zones of Notification (Section 12)	National Monuments Service	https://maps.archaeology.ie/HistoricEnvironment/	Yes
Landscape	Indicative Tree Locations	Brady Shipman Martin	Not public data	Yes
	Natural Features	Brady Shipman Martin	Not public data	Yes
	Open Water Features	Brady Shipman Martin	Not public data	Yes
	River Features	Brady Shipman Martin	Not public data	Yes
	Protected Panoramic View	Galway City Council	As requested: GIS@galwaycity.ie	Yes
	Protected View	Galway City Council	As requested: GIS@galwaycity.ie	Yes
	Protected View	Galway City Council	As requested: GIS@galwaycity.ie	Yes
	Great Sunset Views	Brady Shipman Martin	Not public data	Yes
	Great View	Brady Shipman Martin	Not public data	Yes
	Landscape Character Areas	Galway City Council	As requested: GIS@galwaycity.ie	Yes
Interacting Projects	Planned Projects	Arup	Project data	No
Flooding	High Probability (10% chance of coastal flooding)	Office of Public Works	As requested	Yes
	Medium Probability (0.5% chance of coastal flooding)	Office of Public Works	As requested	Yes
	Low probability (0.01% chance of coastal flooding)	Office of Public Works	As requested	Yes
	Mid-End Future Scenario (Potential Effects of Climate Change (increase in rainfall of 20% and sea level rise of 500mm (20 inches))	Office of Public Works	As requested	Yes

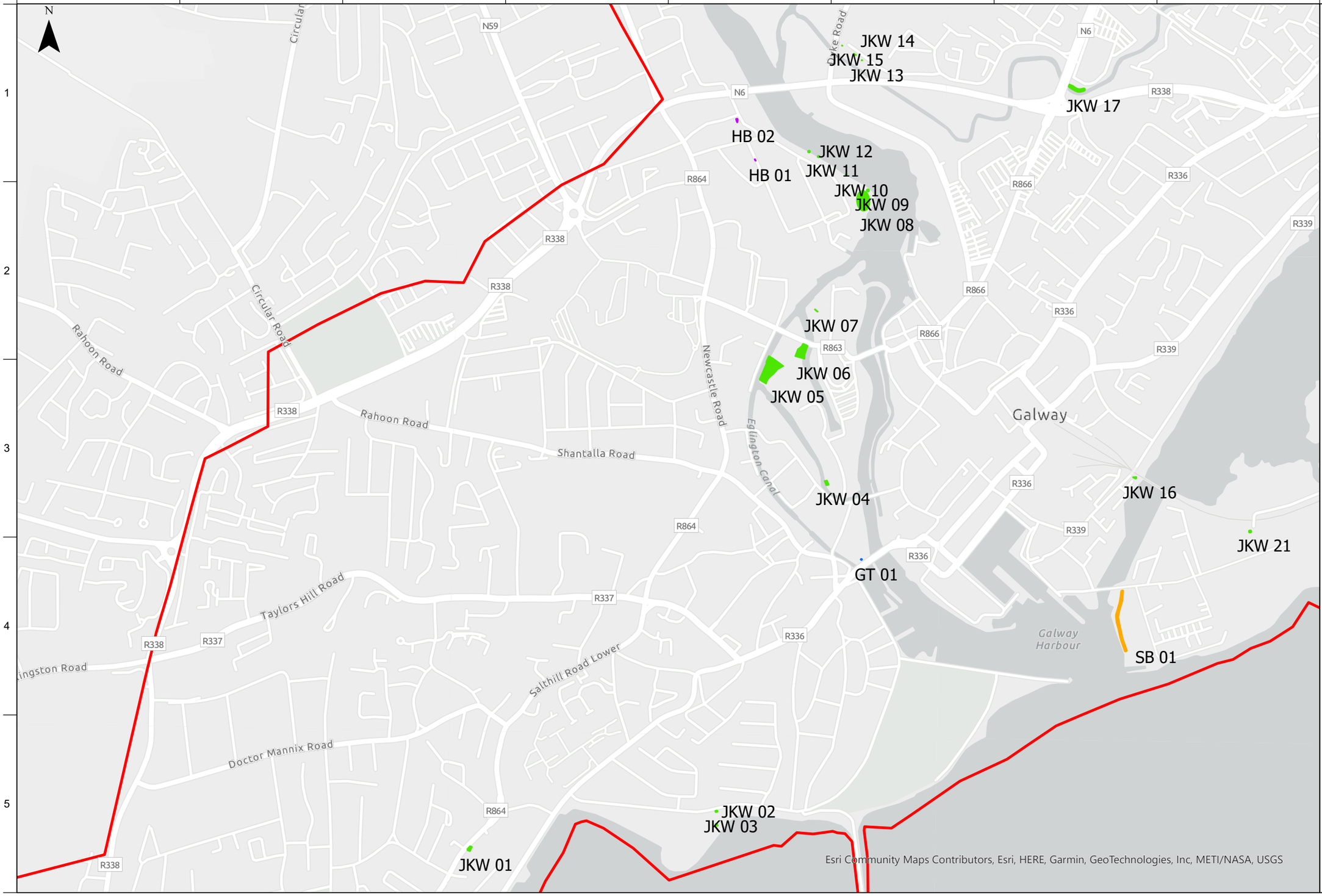
Category	Layer Name	Source	Link	Available to view on Public Webmapper (Y/N)
	High Probability (10% chance of coastal flooding)	Office of Public Works	As requested	Yes
	Medium Probability (0.5% chance of coastal flooding)	Office of Public Works	As requested	Yes
	Low probability (0.01% chance of coastal flooding)	Office of Public Works	As requested	Yes
	Mid-Range Future Scenario (Potential Effects of Climate Change (increase in rainfall of 20% and sea level rise of 500mm (20 inches))	Office of Public Works	As requested	Yes
	Western CFRAM Indicative Options	Office of Public Works	As requested	No

Appendix B

Invasive Species Survey 2021

B1 Invasive Species Survey

See overleaf for the Drawing No. 279365-MAE-01-DB-SU-YEBIO-000001.



Clients

Comhairle Cathrach na Gaillimhe
Galway City Council

Project Ireland 2040
Building Ireland's Future

OPW
Oifig na nOibreacha Poiblí
Office of Public Works

N

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Irish Transverse Mercator

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Job Title
Galway City Flood Relief Scheme

Scale 1 : 50,000 @A3

Role General

Date March 2022

P01	30/03/2022	A.F.	B.O'B.	B.O'B.
Issued for Information				
Issue	Date	By	Chkd	Appd

Drawing Title
Invasive Species Survey 2021

Suitability
For information

Job No 279365

Figure ID

Rev. P01

Drawing No
279365-MAE-01-DB-SU-YEBIO-000001

Do not scale