



Tionscaldal Éireann
Project Ireland
2040

OPW Oifig na
nOibreacha Poiblí
Office of Public Works



**Comhairle Contae
Dhún na nGall**
Donegal County Council

Raphoe Flood Relief Scheme

Environmental Impact
Assessment Report
Non-Technical Summary

February 2023

RYAN HANLEY

NON-TECHNICAL SUMMARY

Introduction to the Raphoe Flood Relief Scheme

This document is a Non-Technical Summary (NTS) of the Environmental Impact Assessment for the Raphoe Flood Relief Scheme (hereafter referred to as “the Scheme”). This NTS has been prepared by Ryan Hanley on behalf of the Office of Public Works (OPW) who propose to implement and maintain the Scheme. The EIAR forms an integral part of the applications for consent of the Scheme, acting as a basis for public consultation and informed comment. The OPW is the lead state agency for flood risk management in Ireland. The coordination and implementation of the Government's policy on the management of flood risk in Ireland, in conjunction with its responsibilities under the Arterial Drainage Acts, 1945-1995, form one of the core functions of the OPW.

The OPW in partnership with Donegal County Council (DCC) commissioned the Raphoe Flood Risk Assessment and Management (FRAM) Study in March 2013 to be incorporated into the North-West Neagh-Bann Catchment Flood Risk and Management Study. The aim of the Raphoe FRAM Study was to assess and develop measures to manage existing flood risk in Raphoe town comprising of a feasibility study and the preparation of a Flood Risk Management Plan. RPS was subsequently commissioned to complete the design of the proposed Scheme.

The overall objective of the project is to implement a Flood Relief Scheme (FRS) for Raphoe town that will ensure that properties and people are protected against the effects of the 1% Annual Exceedance Probability (AEP) flood event (otherwise known as the 1 in 100-year flood event) from the surface water run off caused by intense localised rainfall in the upper catchment area. The primary element of the proposed scheme is the construction of two diversion channels to the north and west of the town, which will redirect flood waters away from Raphoe, directly into the Swilly Burn river that is located south of the town.

The study area covers approximately 8.19 km² encompassing the channel, flood plains and surrounding lands of the Raphoe Stream, a tributary of the Swilly Burn, which has contributed to flooding in the area. The study area also includes a section of the main channel of the Swilly Burn and one additional tributary, herein referred to as the Magherasollus River, their flood plains and surrounding lands, due to the potential downstream effects during extreme flood conditions, in terms of existing hydrological link and flood extents, as shown on Figure 1.

The Swilly Burn River forms part of the Johnston Stream Water Framework Directive (WFD) Sub-Catchment which falls within the wider Foyle catchment.

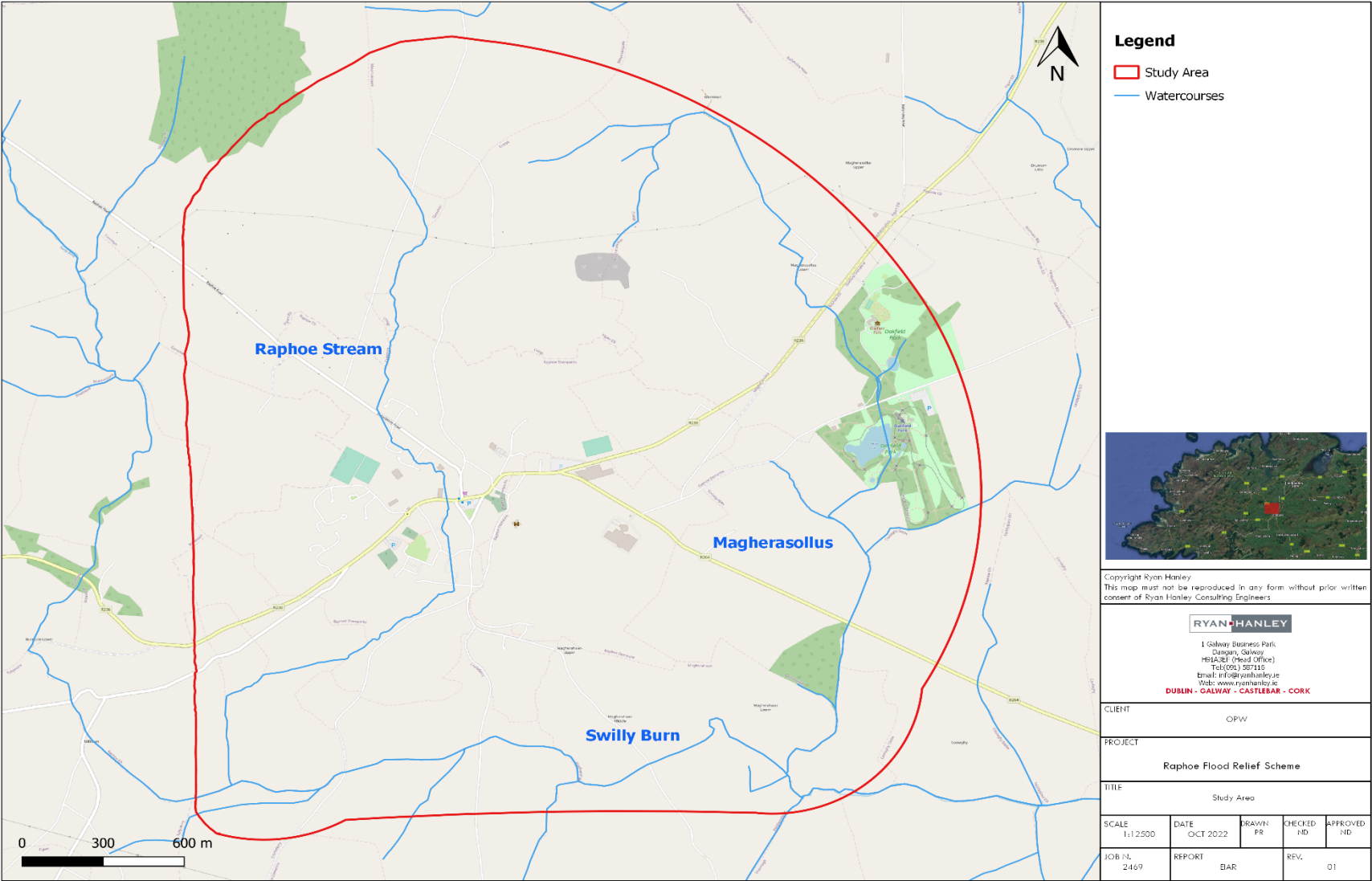


Figure 1 Study Area / Catchment Location

Alternatives

A comprehensive analysis of alternatives was undertaken which have been considered for meeting the objective of reducing flood risk in Raphoe as part of the scheme. This was undertaken in accordance with Article IV of the EIA Directive as amended 2014/52/EU. The consideration of alternatives is an effective means of avoiding, reducing or minimising environmental impacts. As set out in the *'Guidelines on The Information to be Contained in Environmental Impact Assessment Reports'* (Environmental Protection Agency, 2022), the presentation and consideration of reasonable alternatives investigated is an important part of the overall EIA process.

It is important to acknowledge that although the consideration of alternatives is an effective means of avoiding environmental impacts, there are the existence of other non-environmental factors to consider when considering alternatives. These include hierarchy, non-environmental factors and site-specific issues as outlined below.

The Raphoe Flood Risk Management pre-feasibility Study (FRM pre-feasibility Study) was commissioned by OPW in conjunction with DCC and produced by Jacobs in 2009. The objective of this study was to identify potentially viable flood risk management measures for Raphoe town. This study was a high-level assessment of the initial flood risk management measures to determine those most suitable for Raphoe. It was concluded that a number of technically and economically viable flood risk management measures were identified by the pre-feasibility study for Raphoe capable of reducing flood risk during the 1% AEP event. An environmentally preferred flood risk management option did not emerge at the pre-feasibility stage. The outputs of the pre-feasibility study were reported at the same time as the outputs of the national Catchment Flood Risk Assessment and Management (CFRAM) programme and were incorporated into the CFRAM study.

Following on from the FRM pre-feasibility Study report a Flood Risk Assessment and Management Study (FRAM) for Raphoe was completed in 2017 by RPS. The aim of this FRAM study was to further assess and develop measures to manage the existing flood risk in Raphoe town and comprised of a feasibility study and preparation of the FRMP including Flood Risk Assessment, Damage Assessment and the Assessment of Flood Risk Management Measures. In order to deliver a project that was practical and cost effective, several options were proposed, considered and assessed in the FRAM study.

Using Multi Criteria Analysis (MCA), the options have been assessed against technical, social, environmental and economic criteria. The assessment has been structured around standard OPW flood risk management objectives and sub-objectives for each of the four criteria.

The full MCA for the Raphoe FRS including an assessment of Technical, Economic and Social parameters is included in Appendix D of the options report and is summarised in Table 1 below. This puts a numeric value on each of the criteria and the final outcome of the MCA is the option that scores the highest when taking into account Technical, Social Economic and Environmental criteria.

Table 1 Overall MCA Scores

Parameter	Option		
	1	2	3
Technical	800	600	200
Economic	210	210	180
Social	150	150	150
Environmental	60	55	30
MCA Benefit Score	1220	1015	560

In order to select the most sustainable option a decision was made on the appraisal of economic, social and environmental impacts, whole life cost, and consideration of the risk and uncertainty. The following questions were considered in this comparison and selection:

- Does the option meet the objectives?
- Does the option represent best value of money?
- What are the adverse impacts?
- What are the uncertainties and risks of implementation?

Option 1 was identified as the most sustainable solution and carried forward for assessment of residual flood risk in combination with the preferred primary defence. With both the primary and secondary preferred options in operation the flooding in Raphoe town is largely diminished, with the major flow paths removed and the flood risk across the town reduced.

Background to the Proposed Development

The preferred feasibility option identified in the FRAM Study is made up of two diversion channels to the west and north of Raphoe town to collect and divert overland flows away from the town in combination with additional flood alleviation measures consisting of a number of drainage upgrades and other works to be undertaken within Raphoe town. The preferred option was then progressed and developed in more detail to design the preferred flood risk management option for Raphoe.

Consultation is an important element of the design process. The objective of consultation is to ensure that the views and concerns of all stakeholders are taken into account and that information relevant to the project is made known and available.

Consultation with statutory and non-statutory bodies and the public in relation to the project was carried out on a number of occasions at various stages in the design process. These have included broad general consultation at the Constraints Study stage and an associated Public Information Event and Questionnaire to specific rounds of consultation with landowners affected by the proposed Scheme. After which, the emerging preferred option was presented to consultees as part of informal scoping of the Environmental Impact Assessment. The consultation and outcome of the assessments are also discussed within the various relevant EIA chapters.

A Constraints Study and Constraints Report were produced in 2018. The constraints study examined the key environmental constraints within the study area upon which any flood alleviation measures could have an impact. The purpose of the Constraints Study was to determine constraints that exist, which could affect the design of the scheme, delay the progress of the scheme and could influence the cost of the scheme. The report was based on consultation with statutory consultees, an Elected Members Briefing, a Public Information Day, and collection of a range of environmental and related data and information.

Stage 1- Presentation of Preferred Option

While the Scheme was generally met with a positive response from the Elected Members present during the briefing two main concerns were raised. The first concern raised was that there would be a strong resistance to the Scheme from landowners affected by the FRMs and the second concern was the impact that the Scheme would have on flooding downstream of Raphoe in the remaining catchment, particularly in the joint probability scenario of the Swilly Burn meeting high tide in the Foyle.

Stage 2- Emerging Preferred Flood Relief Scheme

The completion of stage one activities resulted in refinement of the diversion channel routes above Raphoe for both the northern and western diversion channels. The route refinements have minimised land severance and used field boundaries where technically feasible.

The activities in Stage 2 were undertaken with regards to recommendations from the Stage 1 conclusions including continued landowner consultation, mitigated the disruption to landowners where possible and to further consider the residual risk. The objectives of Stage 2 were to develop the primary defences and identify additional measures to produce a preferred Scheme and outline design of the preferred Scheme in preparation for Public Exhibition.

Activities undertaken in Stage 2 were data collection, landowner identification, consultation and engagement, development of the preferred Scheme, hydraulic model updates, additional measures optioneering, assessing downstream impacts and health and safety assessment.

As with Stage 1 of the project, consultation with landowners, members of the public and other stakeholders were considered. It was decided that no further general consultation was required until Public Exhibition. However, there were a number of significant changes to the Scheme and where these changes impacted landowners that had previously been consulted, these landowners were contacted. In addition, a presentation to representatives of the Raphoe Royal and Prior School was undertaken to give them an understanding of the Scheme and the process.

Consultation Feedback- Constraints Study Report

As part of the constraints study, information was gathered on engineering, socio-economic, environmental, cultural heritage and geotechnical constraints. Environmental constraints were investigated under the following headings:

- Population and Human Health;
- Ecology;

- Water;
- Soils and Geology;
- Archaeology, Architectural and Cultural Heritage;
- Landscape & Visual;
- Air and Climate; and
- Material Assets.

Under each heading, the assessment methodology was first outlined followed by a description of the defined Study Area or 'receiving environment'. This allowed a full assessment of the potential constraints and a comprehensive consideration of options. Finally, a summary of the key constraints and implications for the proposed Scheme was noted. The key constraints for each of the headings above were carefully considered in the early phases of the project to ensure that the design was developed in line with the constraints.

The Constraints Study was also the initial means of characterising the environment of the study area which would later inform the Scoping Report and the final EIAR. The scope of the Constraints Study was broad and looked at all environmental constraints, prior to the development of specific flood relief measures.

The design being submitted for planning consent and which has been assessed within the EIA includes changes to embankment locations following landowner and stakeholder consultation to incorporate landowner requirements where possible, without being detrimental to the Scheme. The changes to the Scheme have been largely instigated by the following factors:

- Updating the hydraulic model; and
- Review of embankment location and footprint following landowner liaison.

Public Exhibition

The Public Exhibition of the Raphoe FRS was opened on 12th of January 2021. Due to the ongoing Covid-19 pandemic the Public Exhibition was held virtually.

In accordance with the Arterial Drainage Acts of 1945 and 1995 interference notices were issued prior to the Exhibition to parties affected by the Scheme. Notices were issued to landowners, occupiers, reputed owners and reputed occupiers. The Notice described the proposed works relative to each party and invited them to make submissions in relation to the Scheme.

A feedback form on the virtual Exhibition was available for members of the public to submit their observations. Observations were also accepted via the project email and by post.

The observations allowed for adjustments to be made to the scheme, considering various factors including potential impacts to landowners, biodiversity and flood extent during extreme flood events, among others.

A list of observations received were compiled in the "Exhibition Report" written by RPS (September, 2022). The report collates responses to each of the observations received during the Public Exhibition period.

Description of the Scheme

The proposed works for the Raphoe Flood Relief Scheme (FRS) will comprise the following:

- Site investigation;
- Site clearance and set up of temporary working areas and site compounds; and
- Construction of temporary access roads within the temporary works boundary to facilitate construction of the diversion channels.
- Diversion Channels:
 - Construction of grass lined diversion channels to the west and north of Raphoe to collect and divert surface water flows away from Raphoe town to the existing watercourse to the south-west and south-east of the town. The northern and western channels (labelled NS and WE channels in the scheme drawing in Appendix 4A of the EIAR) are approximately 3.8 km (including the Magherasollus River until it reaches its confluence to the Swilly Burn) and 1.8 km in length, respectively. The channels will consist of the following elements:
 - 1,956 m of open channel ranging in depth from 0.9 m - 1.2 m (western channel) and 0.7 m – 1.1 m (northern channel)
 - 1,843 m of pipeline/ culvert sections and the construction of reinforced concrete headwalls and wingwalls at the inlet and outlets proposed culverts
 - Construction of 0.6 m high earth embankments running adjacent and parallel to the open channels to provide free board and prevent overtopping;
 - Construction of six bridges to facilitate local access routes;
 - Seven road crossings; and
 - Fencing and reinstatement.
- Additional Measures/ Upgrades:
 - Creation of drainage conduits to convey stormwater in Raphoe town through three new main drainage pipes / culverts to collect stormwater in the south and east of the town;
 - Road re-profiling and new kerbs to divert surface water from roads and paths to new or existing gullies;
 - Construction of a flow diversion structure to divert excess flow from the Raphoe Stream and to the northern diversion channel in flood events;
 - Sealing of manholes to prevent surcharging;
 - Clearance of existing ditches and construction of new drainage ditches;
 - Construction of earth embankment bund at Deelee College; and
 - Native woodland planting.
- Maintenance activities.

The proposed infrastructure has been designed in order to prevent flooding in Raphoe town during high flow events up to the 1% AEP flood event.

Flow in the Raphoe Stream will be regulated by a flow diversion structure to be constructed at the confluence of the Raphoe Stream and the inlet of the northern diversion channel. Flows in excess of $0.75\text{m}^3/\text{s}$ will be diverted over a spill weir to the northern diversion channel. Under low flow conditions, flow will continue down the Raphoe Stream.

The proposed diversion channels for the scheme will redirect pluvial flood waters from the hills to the west and north of the Raphoe away from the town, to the Raphoe Stream and Magherasollus River (a.k.a. Swilly Burn tributary). The additional measures/ upgrades to the drainage network will create drainage conduits to convey additional stormwater through the town to further reduce the residual flood risk in the town.

Maintenance activities will be carried out in order to ensure that the hydraulic characteristics of the Scheme will be maintained in order to ensure it operates as per the design.

Operational measures required will include regular scheduled maintenance of the western and northern diversion channels, the existing and new drainage ditches and open channel section in Raphoe town.

The construction works for the proposed scheme will last approximately 36 months. The estimated total project cost for Raphoe FRS is €12.39 m, excluding VAT.

Human Beings, Population & Human Health

In order to assess the population in the vicinity of the site, the Study Area for the Population section of this EIAR was defined in terms of the District Electoral Divisions (DEDs) where the proposed FRS is located, as well as nearby DEDs which may be affected by the proposed development. The site of the proposed scheme site lies predominantly within the Raphoe DED and the Figart DED. These two DEDS will be referred to as the Study Area for this chapter. This demographic area best reflects the population distribution of Raphoe town and rural hinterland which contains the target group of stakeholders affected by the proposed scheme, including town's people, enterprise owners and the farming community.

The Raphoe Study Area has a combined population of 2,497 persons, as of 2016 and comprises a total land area of 32.9 square kilometres (Source: CSO Census of the Population 2016).

If the proposed FRS were not undertaken, the existing river channel would remain as it is, resulting in continued flood risk and consequential impact on the population and human health as has occurred in the past.

If the proposed Flood Relief Scheme were not to proceed,

- The opportunity to protect Raphoe and the surrounding vicinity from future flooding events would be lost;
- The opportunity to protect existing businesses and properties from potential future flood damage;
- The opportunity to enable and enhance future development and economic growth by having appropriate flood protection measures in place;
- The opportunity to protect tourism and related assets;
- The opportunity to protect the population and particularly the older more vulnerable population from human health risks from potential future flooding would also be lost by not proceeding with the proposed FRS.

The OPW calculated the present value benefit from the Scheme is estimated to be approximately €36.02 m. The Scheme will prevent flooding and the cost associated with it. The estimated Cost Benefit Ratio (CBR)

is estimated as 2.91. Consequently, a positive impact is anticipated in terms of offsetting the local economic costs of flood events. The Scheme will ensure that local roads and at-risk commercial premises will be protected from flooding for events up to 1% AEP, representing a significant improvement on the existing situation.

The FRS will provide increased protection to residential and commercial premises and businesses in Raphoe and the surrounding areas. This is likely to encourage future inward investment in the area, creating further employment and a stronger local economy. The Scheme may also increase the value of properties in the area and the ability to obtain insurance. The proposed FRS will provide a long-term significant positive impact.

Materials will be sourced locally, thereby helping to sustain employment in the construction trade, and an increase in household spending and demand for goods and services in the local area. There will also be an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive impact on the local skills base. There is also the potential for short term moderate negative impact on economic activity due to the proposed construction activities. This would predominantly be as a result of traffic and access issues which could have the potential to reduce footfall into local businesses, with noise and dust from the works adding to this impact on local businesses. Potential increases in noise and dust levels, traffic issues and temporary impacts on visual amenity related to the works are likely to deter and/or disturb visitors during the construction phase.

A traffic management plan (such as rolling traffic management) will be prepared and implemented for the duration of the works in order to ensure that any impacts on traffic mobility are minimised. This will also result in a minimised potential impact on local businesses, as traffic management will only implement restrictions to local businesses only when necessary and only for the shortest possible time. In addition, works will be limited to normal working hours, and will account for peak business periods, such as the Christmas shopping period. Therefore, the residual impacts will be short term and slight.

There will be an increase in noise levels in the vicinity of the proposed development site during the construction phase, as a result of machinery and construction work. During the construction phase, noise impacts at all receptors will be temporary and localised. At most of these, impacts will be imperceptible. Construction noise at any given noise sensitive location will be variable throughout the construction project, depending on the activities underway and the distance from the main construction activities to the receiving properties. Best practice measures for noise control will be adhered to onsite during the construction phase of the proposed development in order to mitigate the potential temporary slight to significant negative impact associated with this phase of the development.

Should a natural disaster occur, the potential sources of pollution onsite during the construction and operational phases are limited. Sources of pollution that could possibly cause significant environmental pollution and associated negative effects on the environment and human health such as bulk storage of hazardous materials or wastes does not arise.

There is therefore limited potential for significant effects due to natural disasters to occur at the proposed development site.

Biodiversity

This chapter of the EIAR quantifies any potential direct and/or indirect significant effects relating to biodiversity and the identified Key Ecological Receptors (KERs). It identifies the measures required to avoid, reduce and mitigate likely significant effects and assesses any residual effects that remain following implementation of mitigation. Identification of effects and prescribed mitigation has been derived following a collaborative approach working with a multi-disciplinary team. The results of the ecological surveys were used to inform the ecological assessment which have been utilised to inform the design of the proposed development, thereby minimising potential effects on sensitive habitats and species of conservation interest.

None of the habitats within the proposed scheme study area corresponds to habitats listed on Annex I of the EU Habitats Directive. The banks of the Raphoe Stream at the discharge location and other watercourses in the study area do not provide suitable nesting habitat (vertical earthen banks) for the Annex I species Kingfisher (*Alcedo atthis*).

The hedgerows, treelines and scrub within the study area were assigned Local Importance (Higher Value). These features provide potential habitat for a range of protected fauna including bat species listed on IV of the EU Habitat Directive and those species protected under the Wildlife Acts 1976-2017 and provide semi-natural habitats with high biodiversity in a local context and provide connectivity to the wider area. Hedgerows and Treelines in the study area are classified as Key Ecological Receptors.

There are no large watercourses with significant ecological value within the study area. Drainage ditches form several of the field boundaries and are generally shallow and well vegetated. The Swilly Burn is currently assigned a 'Poor' WFD status, and as such is not considered suitable to support habitats of international or national ecological value in the study area or floral species of conservation concern. The Raphoe Stream and the Magherasollus River are currently assigned as "Poor" WFD status.

The bird species recorded during the walkover surveys of the scheme were typical of agricultural and urban habitats.

The study area was searched for signs of mammal activity with dedicated surveys undertaken for badger and otter. Other species that are likely to occur in the area but were not recorded include Fox (*Vulpes vulpes*), Eurasian Pygmy Shrew (*Sorex minutus*), Red Squirrel (*Sciurus vulgaris*), Red Deer (*Cervus elaphus*), European Hedgehog (*Erinaceus europaeus*), Rat (*Rattus norvegicus*) and Stoat (*Mustela erminea*). The recorded evidence does not suggest that the study area is utilized by populations of higher than local significance.

During the walkover surveys undertaken during 2018 and 2020 the study area watercourses were searched for signs of otter. The otter survey was undertaken up and downstream of the proposed discharge location on the western diversion channel along the Raphoe Stream. Both the Raphoe Stream and the Magherasollus River were considered to be of limited suitability for otter. During the walkover surveys the study area was also searched for signs of badger. One active sett was recorded within a hedgerow bordering Improved agricultural grassland (GA1). Badger as an ecological receptor have been assigned as Local Importance (Higher value) on the basis of a resident population within the study area

Further field surveys for otter and badger were carried out for the extended scheme area in March, April and June 2022 (as part of the multi-disciplinary survey effort). Evidence of otter was found in March and

April along the Magherasollus south of the R264 and along the Swilly Burn and included footprints in mud, spraint, path and slide. No further evidence was observed on 20th of June 2022. Potentially suitable habitat for badger in the extended scheme area included woodland, treelines, hedgerows and scrub adjacent to watercourses. A very large sett was found in April and August 2022.

No bat activity surveys were undertaken for the proposed diversion channels due to lack of suitable habitat within these areas. Walkover surveys identified areas of woodland, treelines and hedgerows as well as rivers and associated riparian habitat were assessed as having Moderate suitability for foraging and commuting bats. Vegetated drains and areas of scrub were assessed as having Low suitability, agricultural grassland habitats which dominate the study area were considered to offer Negligible suitability. No tree roosts were identified and most trees to be removed to facilitate the flood scheme are semi-mature and do not provide suitable roosting features for bats.

A (preliminary) survey to assess the activity of bats in the extended scheme area (along the Magherasollus River) was carried out in August 2022. The survey detected pipistrelle species along the course and wooded habitats of the Magherasollus River and Swilly Burn. Neither Daubenton's Bat, Natterer's Bat (*Myotis nattereri*) nor brown long-eared bats were confirmed or detected.

Based on the results of the desk study and walkover surveys and taking into consideration the small and limited nature of the watercourses within the study area, the habitat is regarded as unsuitable for most riverine fish species. Although the river habitat within the study area was assessed as unsuitable for Salmon during initial desktop study and surveys undertaken, it is acknowledged that Salmon is present in the downstream catchment and is one of the qualifying interests of the River Finn SAC and the River Foyle and Tributaries SAC. Salmon is listed on Annex II of the EU Habitats Directive.

Overall construction phase impacts are largely short to medium term where habitat loss is offset by reinstatement or creation of new habitat associated with the planting of additional hedgerows and treelines. Habitat loss and degradation are assessed as a Permanent Slight Negative Impact. Indirect water pollution is assessed as a Short-term Moderate Negative effect on a receptor of Local Importance higher value.

Following the implementation of appropriate mitigation, there is no potential for the proposed works to result in significant effects on fauna species in terms of their disturbance or displacement.

During field surveys, observations of Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011) were recorded. There were two invasive species identified within the study area during the 2018 and 2020 surveys, Japanese knotweed (*F. japonica*) and Himalayan balsam (*I. glandulifera*). These stands of invasive species will be managed as per the Invasive Species Management Plan (ISMP) to avoid their spread.

An Appropriate Assessment Screening report has been prepared for the proposed scheme in compliance with Article 6(3) of the Habitats Directive European Union (Bird and Natural Habitats) Regulations 2011 and the Planning and Development Act 2000 which considered SACs and SPAs within the Raphoe catchment, especially those located downstream of the proposed scheme.

The proposed scheme is not located within or adjacent to any European sites. The potential for the scheme to result in adverse effects on European sites was ruled out at the Screening stage and a Natura Impact Statement was not required. The locations of these European sites are detailed within the Chapter 6 - Biodiversity.

The proposed scheme has been designed to achieve its aim of alleviating flooding in Raphoe town whilst also minimising effects on the sensitive ecological receptors including the Swilly Burn and its tributaries; Hedgerows, Scrub and Treelines.

A reasoned conclusion has been reached based on the assessment of the potential direct and indirect impacts, that the proposed scheme will not result in significant effects on biodiversity, flora and fauna either on its own or in combination with other plans and projects.

Land Use, Soils and Geology

This chapter provides an assessment of the baseline for land use, soils and geology in the Study Area and investigates how the proposed Raphoe FRS may impact on the existing soil and geological environment and land use during the construction and operational phases of the Scheme. A desktop study was carried out in order to ascertain a comprehensive baseline for the Study Area and give a description of the existing environment. A roadside survey, landowner consultation and detailed surveys on a number of farm holdings were conducted.

The Study Area is underlain by three bedrock units assigned to the Dalradian Period.

- Dalradian Termon Formation Schist; Banded semi-pelitic & psammitic schist;
- Dalradian Killeter Formation Quartzite; Slightly impure quartzite; and
- Aghyaran & Killygordon Limestone Formation; Marble, quartzite, psammite; graphitic.

The characteristics of the strata that were encountered during the site investigation are as follows:

The bedrock in the Study Area is primarily overlain by Made ground, Peat, Alluvium, Glacial Till derived from Metamorphic Rocks. There are no active quarries within the Study Area.

The General Soil Map of Ireland classifies the land to the north and west of the Study Area as 'Mountain and Hill' and 'Rolling Lowland' within the Study Area. Soils of this association type are found in 1.41% of the country.

These lands generally have a slope ranging between 2 and 6° and are generally occur at elevations below 150 m. The Study Area comprises principally Brown Podzolics (60%). Associated soil classifications are defined as Acid Brown Earths (20%) and Gleys (20%). These soils are mainly derived from Mica schist glacial till. Made Ground from the surface was recorded in a number of locations as part of the site investigation contract.

The works will involve excavation of approximately 10,850 m³, however the permanent impacts on the above soils and geology are considered imperceptible to slight.

Potential impacts on agricultural lands are predicted during the construction and operation of the proposed scheme. This will result in land severance on several agricultural properties. During the construction period, there will be a temporary impact on access to both severed and remaining lands while a permanent acquisition is expected during the operational phase associated with the open channel and embankments. Extensive landowner consultation was carried out throughout the different stages of the scheme to apply

specific and appropriate mitigation measures, resulting in adjusting the layout the scheme in sections were deemed necessary.

There are a number of potentially negative environmental impacts associated with the handling of excavated materials. These impacts can arise directly as a result of on-site excavation and construction activities or indirectly, due to placement of excess unsuitable materials at off-site locations. Mitigation measures include the reuse of excavated material when suitable and the correct disposal of surplus material to the closes suitably licensed facility.

Any loss of soil, or other potential impacts will be during the construction phase and likely to be associated with excavation, handling, storage, processing and transport of earthworks materials associated with the diversion channels. Impacts on soil will be mitigated through measures that include safe storage of soil, keeping vegetation in place for as long as possible, use of granular material over bare soil especially in the vicinity of watercourses.

Contaminated soil is a potential effect that could arise during the construction phase as a result of an accident, spill or leak. In addition two invasive species were identified within the Study Area during initial surveys carried out in 2018 and 2020; namely Japanese knotweed (*F. japonica*) and Himalayan balsam (*I. glandulifera*), that could result in the spread or regrowth of the species in the area without appropriate management. In order to reduce the risk of soil contamination the proposed measures include the suitable storage of all types of waste; refuelling will not be permitted near exposed bedrock or rock cuttings; regular inspections for leaks; provision of spill kits; stockpiling of soils will be greater than 10 meters away from any surface waters; any contaminated soil if encountered will be stored and treated separately as per appropriate guidelines; provision of an emergency response plan detailed in the Construction Environmental Management Plan. An Invasive Species Management Plan will include the suitable treatment for invasive species.

It is considered that the design of the proposed Raphoe FRS, the scale of the works and the implementation of effective mitigation and best practice will ensure that the proposed Scheme, when considered on its own, will minimise as much as possible significant effects on land, soils and geology. Overall, the reduced risk of flooding will have a positive effect on land in the Raphoe area.

Water, Hydrology and Hydrogeology

The Study Area, for the purposes of this chapter, comprises flow path including fluvial flows across land and extends along the rivers, flood plains, groundwater and surrounding areas of the Swilly Burn, Raphoe Stream and Magherasollus River (also known as the Swilly Burn Tributary) as shown on Figure 2.

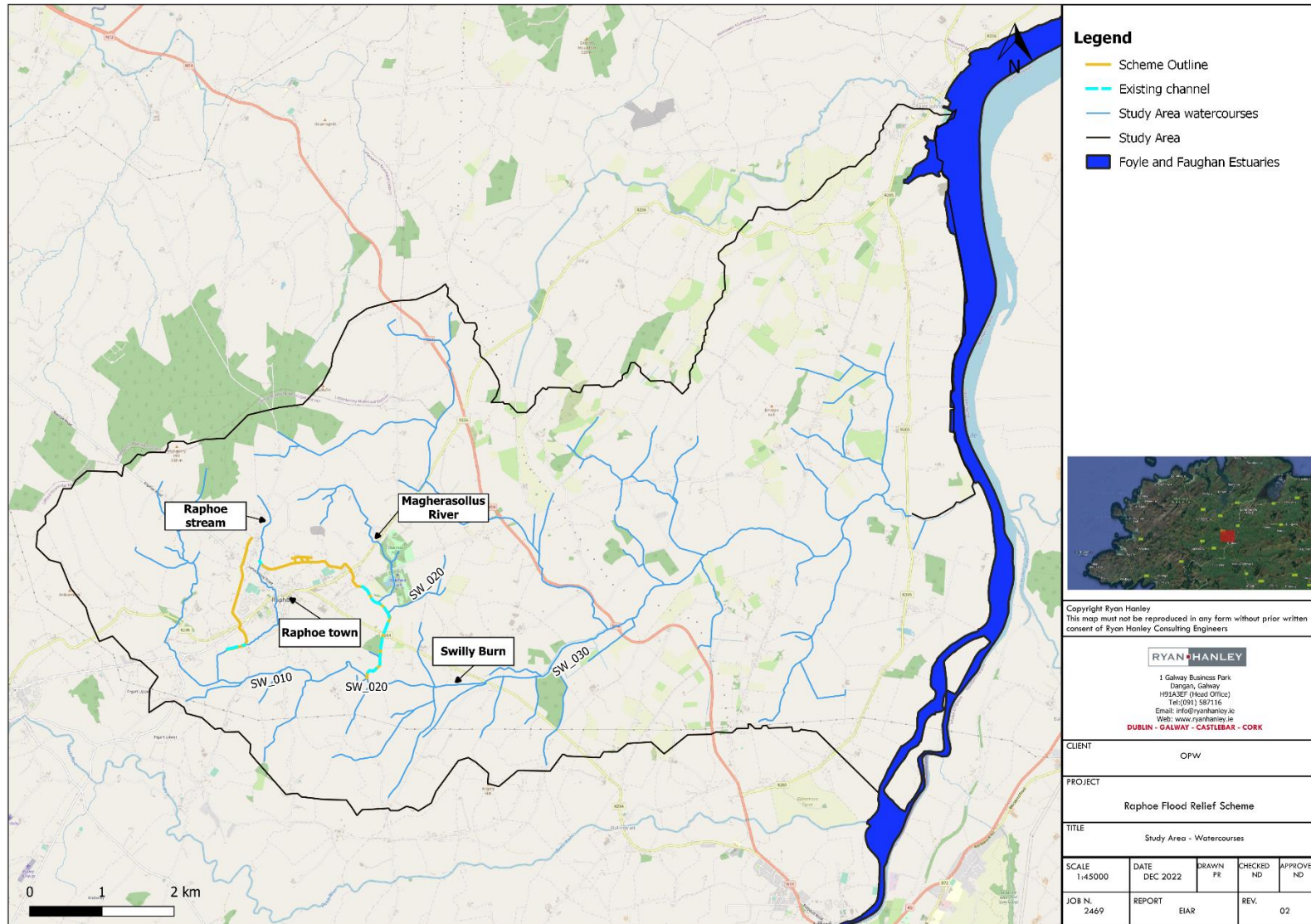


Figure 2 Study Area

The Raphoe Stream flows through Raphoe from north to south before flowing into the Swilly Burn to the southwest of the town. The Magherasollus River (also known as the Swilly Burn Tributary) runs from north to south on the east side of Raphoe town. It also flows into the Swilly Burn to the southeast of Raphoe as shown in Figure 2. The Swilly Burn discharges to the River Foyle approximately 6 km north of Lifford/Strabane.

Raphoe town is surrounded to the north and west by steep sided hills which lead to significant surface water run off following extreme pluvial events. With little chance of ground permeation due to steep slopes and bedrock type, flooding can result, affecting Raphoe. The main watercourses and rivers that have the potential to be affected by construction of the Scheme are the Raphoe Stream, the Swilly Burn Tributary and the Swilly Burn. These river bodies have been classified as having poor WFD water quality by the EPA.

The Study Area is located in the Foyle 01 catchment and within the JohnstonStream_SC_010 sub-catchment area. The Raphoe Stream is culverted through Raphoe town and flows from north to south. The Raphoe Stream joins the SwillyBurn_010 [01S030200] to the south of Raphoe town. The SwillyBurn_010 flows in an easterly direction towards the River Foyle. The SwillyBurn_020 [01S030250] flows from north to south to the east of Raphoe town where it meets the SwillyBurn_010 and forms the SwillyBurn_030 [01S030500].

The Raphoe Stream, has a catchment area of 4.4 km². The JohnstonStream_SC_010 sub catchment is 146.26 km² in area with a wide range of topography both anthropogenic and natural. Biological status of water bodies is poor throughout the sub catchment with limited chemistry data available. The SwillyBurn_010 is at risk status with the SwillyBurn_020 and the SwillyBurn_030 are currently unassigned.

The main pressures to the water bodies have been identified in the sub catchment assessment as originating from agricultural and from wastewater treatment facilities.

Arterial drainage also exists throughout the water body and may contribute to the alteration of habitat conditions. The OPW Donegal Drainage Maintenance Programme includes the Raphoe Stream, approximately 200 m downstream of the proposed western diversion channel outfall, and the Swilly Burn downstream of the Raphoe Stream. OPW complete drainage maintenance operations on the lower reaches of the Swilly Burn as part of their obligation under the 1945 Arterial Drainage Act.

Pasture may be a significant pressure for both Swilly Burn_020 and _030. Channelization and embankment are present and may impact both hydrological and morphological conditions, and therefore alter habitat within the waterbody. River and lake water quality within the entire sub catchment has been described as bad – moderate.

The Works Area is in poor bedrock aquifer which is generally unproductive except for local zones and locally important bedrock aquifer which is moderately productive in local zones. A locally important sand/gravel aquifer is located outside the Works Area to the southeast of Raphoe town. There are no records of groundwater abstractions being used for potable supply.

Raphoe town has flooded repeatedly over the last 30 years. The source of flood events in the town are due to intense convective rainfall (RPS, 2014). Due to the topography of Raphoe and the surrounding hills to the north and west of the town, surface water is conveyed towards the town with little chance for infiltration or loss to the drainage network in the town. This accumulation of overland flow results in pluvial flooding. In addition, the Raphoe Stream which is largely culverted through the town, presents a fluvial flood risk due to conveyance capacity issues (RPS, 2014). The existing drainage network in the town also experiences capacity issues following periods of intense rainfall which contributes to overland flooding through Raphoe.

During periods of high rainfall, surface waters have the potential to transport runoff from the construction works area to surface water bodies which presents a short term moderate negative impact to surface waters in the Study Area in terms of increase in suspended solids resulting from silt laden run off. The proposed works are underlain by poor bedrock aquifer and bedrock which is moderately projective only in local zones, therefore constituting a slight negative risk to groundwaters in terms of increase in suspended sediment. However, mitigation and monitoring measures will be put in place to protect the ground and surface waters in the Study Area and will ensure no leaching of sediment to enter localised groundwater or surface water.

The Magherasollus River is anticipated to experience increases in velocities in a number of locations as a result of increased flow entering the watercourse from the northern diversion channel, as a result of flood potential events. In the absence of mitigation, increase in water velocities could lead to localised erosion of the bed and banks of the Raphoe Stream and Swilly Burn Tributary and a subsequent increase in suspended sediment. No significant effects are anticipated in relation to increased water volumes in the Swilly Burn, Raphoe Watercourse or Swilly Burn Tributary or increased flood risk downstream of the diversion channel outfalls as a result of the proposed Scheme. An occasional slight negative impact is predicted in terms of localised increase in velocities during flood conditions.

Air Quality & Climate / Noise & Vibration

The proposed works will not impact on air quality and climate or noise and vibration during the operational phase, therefore it is only considered necessary to assess the potential impacts during the construction phase of the Scheme. The scheme has an indefinite operational duration; therefore, it is not considered necessary to assess the impacts of decommissioning.

During the construction phase, noise impacts at all receptors will be temporary and localised. At most of these, impacts will be imperceptible. At a number of dwellings, particularly those immediately adjacent to construction works, impacts will range from temporary slight negative to moderate negative. Furthermore, the application of binding noise limits and hours of operation, along with implementation of appropriate noise control measures such as screening will ensure that noise impact is kept to a minimum. The residual impact will be a temporary imperceptible to moderate negative impact.

The majority of the construction activities which will be employed during the construction phase of the proposed scheme, are unlikely to generate perceptible vibrations at the sensitive locations, with the exception of rock breaking, concrete breaking and vibratory compaction. In order to sufficiently ameliorate any likely vibration impacts from the proposed works, a schedule of noise and vibration control measures has been formulated for the construction phase. Works will be conducted in accordance to BS 5228-1: 2009: Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 2: Vibration, which offers detailed guidance on the control of vibration from demolition and construction activities. Vibration monitoring will be conducted in accordance with either BS 7385-1 (1990) Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings or BS 6841 (1987) Guide to Measurement and Evaluation of Human Exposure to Whole-Body Mechanical Vibration and Repeated Shock as appropriate. With the implementation of the above mitigation measures and monitoring, the likely impact of vibration from the proposed construction works on the local environment will be a short-term imperceptible impact.

Construction activities may lead to the emission of dust. The generation of dust is dependent on the construction activity being carried out. Environmental factors such as rainfall, wind speed and wind direction will also affect dust emissions. In order to ensure that no dust nuisance occurs, a series of measures will be implemented which include: cleaning, washing/watering and maintaining roads as appropriate, restricting speeds on hard surfaces and covering any vehicles delivering materials with tarpaulin at all times to restrict the escape of dust. Construction related traffic will give rise to emissions of nitrogen dioxide, sulphur dioxide, benzene and carbon monoxide within the site boundary and along the anticipated transport routes. This has the potential to impact on health and the environment. Measures in relation to exhaust emissions include, switching off machinery when not in use, maintaining vehicles in good operational order and sourcing materials locally.

Landscape

The proposed FRS is located in and around the town of Raphoe. The primary measures are in a predominantly rural location to the north and west of the town which is defined by large fields bounded by hedgerows. The additional measures are located in and around the town, which has an urban and suburban residential character, but do not directly affect the centre of the town, The Diamond, or any areas of significance in terms of culture and heritage. The rural landscape has High Scenic Amenity value, while the more urban areas which are affected are generally low quality.

The proposed works are relatively small-scale in the context of this landscape and do not generate substantial impacts in general terms. The works will result in the clearance of existing ditches and hedgerows, inclusive of vegetation, in construction routes and site setup areas. The proposals include for re-planting of hedgerows and vegetation that will be removed, and many of the proposed measures will become part of the landscape over time, as the channels and ditches will be covered with grass and vegetation and the hedgerows and trees removed will grow back. There will be localised impacts where large trees are removed or large areas of hedgerow vegetation are cleared. Removal of native mature trees is considered a very significant long-term negative impact and occurs primarily to the east of the town, in the Magheraboy townland, where approximately 30-50 no. mature trees, mostly ash, are to be removed. Removal of non-native, mixed and coniferous trees also occur in this area, generating a moderate impact. In most locations where vegetation is removed and replaced, it will grow back to its current state within approximately 15 years.

Visual impacts occur where people have views of the changes above, and also where they have views of construction activity. For most of the receptors within the urban and peri-urban areas, the works will resemble typical road works and will be temporary, so this is considered a slight visual impact for these receptors. For receptors with views of construction activity in the rural areas and particularly of the primary works, such as dwellings in the Habbittstown and Common townlands to the northwest of the town, where they have elevated views of the works, this may be a moderate negative impact, as it will not dominate views but will form an unpleasant element in the view for a temporary or short-term period. Moderate negative impact may also occur for the dwellings at Castlegrove estate and Craigs Road. For local residential receptors with views of the eastern compound at the junction of the Derry Road and the Racecourse Road, , the temporary or short-term visual impact will be significant and negative. The western compound is not visible from the adjacent residential receptors and there will be no visibility to visitors to the town.

In the longer term, the only visual impacts likely to persist are those from dwellings at Beechwood Avenue and adjacent which will experience moderate medium-term impacts to the views and visual environment due to the removal of the existing mature trees to enable the construction of the northern channel. This is a medium-term visual impact because the hedgerow and tree line will begin to grow back and the backdrop which is revealed after the trees are initially removed is of similar rural and pastoral scenery, which will become normalised for viewers in time. As time passes and the replacement trees grow to maturity, the view will return to its current state.

It should be noted that if the above works were not carried out, it is predicted that the effects on the landscape and townscape of Raphoe could be much more negative. If flooding of the urban area continues, the economic life of the town would be negatively impacted which would ultimately lead to depopulation and dereliction of the important buildings and associated heritage townscape. Similarly, some of the housing could become derelict and unsightly. These impacts would be much greater to the important landscape assets of the area than the proposed scheme will be.

Cultural Heritage

Raphoe is one of the five heritage towns in Donegal. It is also known by its Irish name Ráth Bhoth which translates as 'Ringfort of the Huts'. The town of Raphoe is a typical seventeenth century plantation town, with original central triangular-plan marketplace 'The Diamond' still intact. There are many structures of architectural heritage merit located in and around the town including the Masonic Hall (1900), The Second Raphoe Presbyterian Church (1860), and the Diamond itself is bordered by many fine Georgian Houses, particularly on the western side.

There are no National Monuments located within the study area, although it is notable that Beltany Stone Circle (Nat. Mon. Ref. 463) is located c. 2.2 km to the south, in Tops townland. This is a significant site in both scale and context, given there are few examples in the county, and it comprises a large platform, delimited by a circle of 64 (remaining) stones, several of which are decorated with cupmarks, and which may have astronomical alignments relating to May cross-quarter day (Bealtaine). This site will not be impacted by the scheme.

There are a total of 23. no. recorded archaeological sites/features located within the Study Area. Within the town core area of Raphoe, these include the ruined fortified house the 'Bishop's Palace' and a number of wall-mounted armorial plaques, which is also the site of an earlier round tower associated with the early medieval monastic remains at the COI Cathedral and graveyard site. There is a carved medieval stone lintel still retained at the Cathedral in two parts – one in the vestibule and another set in the external face of the north wall of the nave; whilst two other carved architectural fragments are also recorded from the site. Within the surrounding environs of the town, there is a holy well (modernised, no longer venerated) and an enclosure site sited on higher ground to the north, whilst there is a large quantity (9 no.) of standing stone sites. Four of the standing stones have been removed without further record.

Findings from field survey revealed that overall, the majority of the greenfield areas are of moderate/high archaeological potential. The well-drained pasture on south-facing slopes (and close to an important early ecclesiastical centre) can be considered favourable conditions for previous early human habitation/settlement. As such, at the greenfield areas, there is potential for negative direct high magnitude

impact on hitherto unrecorded sub-surface archaeological remains of potential medium value, resulting in a potential moderate significance of effect.

The historic town of Raphoe is an area of high archaeological potential as well as retaining many fine structures of built heritage significance. Proposed culverting along Sheep Lane and proposed open channels parallel to Castle Road traverse through the Zone of Notification relative to the COI cathedral and graveyard as well as the Bishop's Palace and associated demesne grounds. The proposed measures at these locations may potentially have negative direct impact of high magnitude on archaeological finds/features of medium value, resulting in a potential significant significance of effect.

The archaeological site investigations will be licensed by the National Monuments Service (NMS) and the obligatory processes to be undertaken for such licence applications will allow for successful implementation of the mitigation measures in advance of construction stage. Reporting will be compiled for all site investigations which will clearly present the results in written, drawn and photographic formats and copies will be submitted to the NMS, the Planning Authority and the National Museum of Ireland. There shall also be a requirement to conduct on-site archaeological monitoring of proposed additional measure culverting works during construction stage, within the Zone of Notification and urban environs of Raphoe town at Sheep Lane, Castle Road, and Irish Row, as well as the re-planting area at Raphoe Townparks. In the event of an archaeological find or feature being discovered during the construction phase works, the archaeologist shall evaluate, characterise and determine the extent of the remains. Thereafter an agreed mitigation framework including a Method Statement and Programme of Works shall be required in order to adequately preserve and/or record the archaeological resource, with consultation from the NMS.

Material Assets

Material Assets are generally considered to be the physical resources in the environment, which may be of man-made or natural origin and have intrinsic value to an area. These resources can be assigned economic value based on their significance within the overall socio-economics of an area. The impact and the direct and indirect likely significant effects of the proposed Scheme on transport infrastructure, traffic, sub-surface infrastructure and management of waste are assessed in this chapter of the EIAR. The Scheme location is set within both an urban and rural high population area. The town has numerous amenities as one of the main market towns of East Donegal.

The proposed Scheme will have potential to impact on the following:

- Transport infrastructure - including roads and traffic;
- Waste management;
- Water distribution network;
- Drainage network; including foul and storm water;
- Electricity network - including public services, street lighting, etc;
- Broadband network - fibre and satellite; and
- Telecommunications network - including cable & mobile.

Road and transportation infrastructure in Raphoe and environs comprise Regional, Local Primary, Local Secondary and Local Tertiary roads. All roads in the Study Area are maintained by Donegal County Council.

The primary haulage routes are anticipated to be: N14, Upper and Lower Convoy Roads, Montgorry Road, Derry Road, Craigs Road and Guesthouse End.

Within Raphoe town; the anticipated additional measures are proposed on the following routes:

Derry Road, William Street, McBride Street, Guesthouse End, St Eunan's Terrace, Irish Row/ Montgorry Road and Castle Road.

The construction phase of the proposed scheme will have a temporary impact on traffic volumes in the Raphoe area and their environs. Temporary effects will arise during the construction stage of the scheme, particularly associated with the full and partial road closures that will be required to enable some construction activities. These impacts will be primarily associated with restriction on access to certain portions of the existing road network during ongoing works. However, access to private properties will be maintained at all times or alternative temporary access will be provided when needed. The proposals will not result in any residual changes to the existing traffic networks once completed.

Following implementation of mitigation measures, the permanent impact on existing underground and overground utilities (including drainage networks, water distribution networks, electricity supply networks among other utilities) and from waste generated during the construction and operation phases will be imperceptible.

Interactions

All of the potential impacts of the proposed development and the measures proposed to mitigate them have been outlined under the preceding headings above. However, for any development with the potential for significant environmental impact there is also the potential for cumulative impacts and interaction amongst these. The assessment includes the likely significant effects of the proposed scheme on the environment resulting from the cumulation of effects with other existing/approved projects within the area, as well as the interaction or likely significant effects between environmental factors.

There was found to be an interaction between Human Beings and Biodiversity, Soils and Geology, Air Quality and Climate, Traffic, Noise and Vibration, Landscape and Material Assets. Any potential impacts and the receiving environments are mitigated against in their respective chapters to ensure that these are suitably mitigated against.

There was found to be an interaction between Biodiversity and Soils and Geology, Water, Air Quality and Climate, Noise and Vibration. Any potential impacts and the receiving environments are mitigated against in their respective chapters to ensure that these are suitably mitigated against.

There was found to be an interaction between Soils and Geology, Water, Landscape and Biodiversity. Any potential impacts and the receiving environments are mitigated against in their respective chapters to ensure that these are suitably mitigated against.

There was found to be an interaction between Water and Soils and Geology, Biodiversity and Landscape. Any potential impacts and the receiving environments are mitigated against in their respective chapters to ensure that these are suitably mitigated against.

There was found to be an interaction between Air Quality and Climate and Traffic, Biodiversity and Population and Human Health. Any potential impacts and the receiving environments are mitigated against in their respective chapters to ensure that these are suitably mitigated against.

There was found to be an interaction between Traffic and Noise and Vibration, Landscape, Population and Human Health, Air Quality and Climate and Traffic, and Biodiversity Any potential impacts and the receiving environments are mitigated against in their respective chapters to ensure that these are suitably mitigated against.