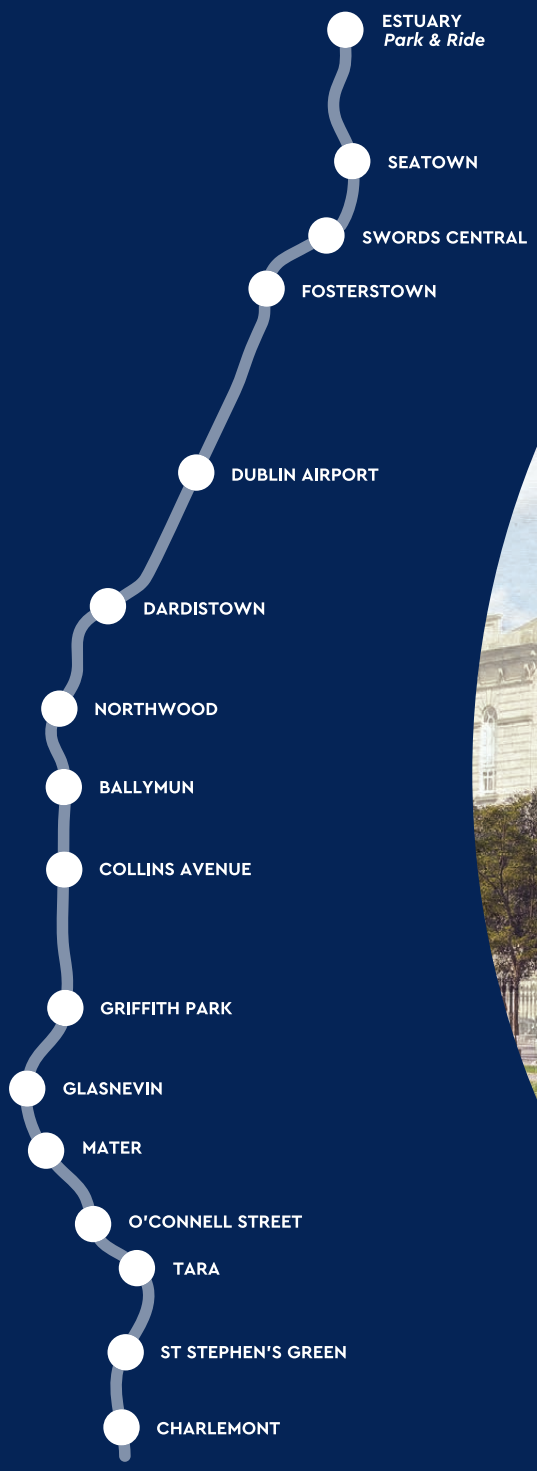

31 Summaries of the route wide mitigation and monitoring proposed

Contents

Table of Abbreviations

Acronym	Meaning
AEP	Annual Exceedance Probability
BoD/QTR	Base of drift / top of weathered rockhead
Bq/m3	Becquerels per cubic metre cubed – a measure of Radon concentrations in air
BRE	British Research Establishment
C&D	Construction and demolition
C&D WMP	Construction and demolition waste management plan
CCTV	Close circuit television
CEMP	Construction Environmental Management Plan
Ch	Chainage
CO2eq	Carbon dioxide equivalent
CRO	Community Relations Officer
DC	Direct Current
DCCAE	Department of Communications, Climate Action and Environment
DDA	Disability Discrimination Act
EC	Electrical Conductivity
EC	European Council
EIAR	Environmental Impact Assessment Report
EMWR	Eastern Midlands Waste Region
EPA	Environmental Protection Agency
EPB	Earth Pressure Balance
EU	European Union
GHG	Greenhouse Gas
GSWR	Great Southern and Western Railway
HGV	Heavy Goods Vehicle
IFI	Inland Fisheries Ireland
IGI	Institute of Geologists of Ireland
IH	Institute of Hydrology
kph	kilometres per hour
l/s	litres per second
m	metre
mm	millimetre
MGWR	Midland Great Western Railway
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
OPW	Office of Public Works
PCA	Project Conservation Architect
Pl	Unproductive aquifers except for local zones
PM	Particulate matter
RPA	Root protection area

Acronym	Meaning
SAC	Special Area of Conservation
STMP	Scheme Traffic Management Plan
SuDS	Sustainable Drainage Systems
TBM	Tunnel Boring Machine
TDS	Total Dissolved Solids
TII	Transport Infrastructure Ireland
TOC	Total Organic Carbon
TSS	Total Suspended Solids
UWR	Upper weathered rock
WEEE	Waste electrical and electronic equipment
ZOI	Zone of Influence

31. Summaries of the Route Wide Mitigation and Monitoring Proposed

31.1 Introduction

The purpose of this Chapter is to collate the mitigation and monitoring measures identified in the Environmental Impact Assessment Report (EIAR) that are considered necessary to protect the environment prior to the commencement of and during the Construction Phase and during the Operational Phase of the MetroLink (hereafter referred to as the proposed Project).

The design of the proposed Project has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the proposed Project are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process has been incorporated, where appropriate.

Mitigation and monitoring measures have been identified as environmental commitments and overarching requirements which shall avoid, reduce or offset potential impacts.

Section 39 of the 2001 Act (as amended by the Planning and Development (Strategic Infrastructure) Act 2006 and the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743/2021)) specifies the information that must be provided in the EIAR that accompanies an RO application.

Section 39(1)(b)(iv) of the 2001 Act requires the EIAR to contain *'a description of any features of the proposed railway works and of any measures envisaged to avoid, prevent or reduce and if possible offset likely significant adverse effects on the environment.'*

The requirement to describe mitigation measures in and EIAR is laid out in the EIA Directive. Article 5(1) of the 2011 Directive, as amended by the 2014 EIA Directive states that:

> *'…the developer shall include at least:*
>
> *(c) a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment'.*

Annex IV of the EIA directive states that the description of the project must include:

> *'7. A description of the measures envisaged to avoid, prevent, reduce, or if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparing of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.'*

The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022) outline four types of mitigation measures such as avoidance, prevention, reduction and mitigation by remedy or offsetting.

As described throughout this EIAR, the design of the proposed Project has been progressed taking account of environmental constraints and considerations that have been identified in assessments. This has enabled the avoidance of potential environmental impacts, wherever possible.

31.1.1 Outline Project Description

A full description of the proposed Project is provided in the following chapters of this EIAR:

- Chapter 4 (Description of the MetroLink Project);
- Chapter 5 (MetroLink Construction Phase); and
- Chapter 6 (MetroLink Operations & Maintenance).

Table 31.1 presents an outline description of the key proposed Project elements which are appraised in this Chapter. Diagram 31.1 presents an outline of the main elements of the proposed Construction Phase and Diagram 31.2 presents an outline of the main elements of the Operational Phase of the proposed Project.

Table 31.1: Outline Description of the Principal Project Elements

Project Elements	Outline Description
Permanent Project Elements	
Tunnels	It is proposed to construct two geographically separate, single-bore tunnels, using a Tunnel Boring Machine (TBM). Each section of tunnel will have a 9.2m outside diameter and will contain both northbound and southbound rail lines within the same tunnel. These tunnels will be located as follows: ▪ The Airport Tunnel: Running south from Dublin Airport North Portal (DANP) under Dublin Airport and surfacing south of the airport at Dublin Airport South Portal (DASP); and ▪ The City Tunnel: Running south from Northwood Portal and terminating underground south of Charlemont Station.
Cut Sections	The northern section of the alignment is characterised by a shallow excavated alignment whereby the alignment runs below the existing ground level. Part of the cut sections are open at the top, with fences along the alignment for safety and security. While other sections are "cut and cover", whereby the alignment is covered.
Tunnel Portals	The openings at the end of the tunnel are referred to as portals. They are concrete and steel structures designed to provide the commencement or termination of a tunnelled section of route and provide a transition to adjacent lengths of the route which may be in retained structures or at the surface. There are three proposed portals, which are: ▪ DANP; ▪ DASP; and ▪ Northwood Portal. This portal will be used during the Construction Phase to provide a launching position for the TBM. Following completion of this phase, it will be connected to Northwood Station. There will be no portal at the southern end of the proposed Project, as the southern termination and turnback would be underground.
Stations	There are three types of stations: surface stations, retained cut stations and underground stations: ▪ Estuary Station will be built at surface level, known as a 'surface station'. ▪ Seatown, Swords Central, Fosterstown Stations and the future Dardistown Station will be in retained cutting, known as 'retained cut stations'. ▪ Dublin Airport Station and all 10 stations along the City Tunnel would be underground.
Intervention Shaft	An intervention shaft will be required at Albert College Park to provide adequate emergency egress from the City Tunnel and to support tunnel ventilation. Following the European Standard for safety in railway tunnels TSI 1303/2014: Technical Specification for Interoperability relating to 'safety in railway tunnels' of the rail system of the European Union, it has been recommended that the maximum spacing between emergency exits is 1,000m. As the distance between Collins Avenue and Griffith Park is 1,494m, this intervention shaft is proposed to safely support evacuation/emergency service access in the event of an incident. This shaft will also function to provide ventilation to the tunnel. The shaft will require two 23m long connection tunnels extending from the shaft, connecting to the main tunnel. At other locations, emergency access will be incorporated into the stations and portals or intervention tunnels will be utilised at locations where there is no available space for a shaft to be constructed and located where required (see below).
Intervention Tunnel	In addition to the two main 'running' tunnels, there are three shorter, smaller diameter tunnels. These are the evacuation and ventilation tunnels (known as Intervention Tunnels): ▪ Airport Intervention Tunnels: parallel to the Airport Tunnel, there will also be two smaller diameter tunnels; on the west side, an evacuation tunnel running northwards from DASP for about 315m, and on the east side, a ventilation tunnel connected to the main tunnel and extending about 600m from DASP underneath Dublin Airport Lands. In the event of an incident in the main tunnel, the evacuation tunnel will enable passengers to walk out to a safe location outside the Dublin Airport Lands. Charlemont Intervention Tunnel: The City Tunnel will extend 360m south of Charlemont Station. A parallel evacuation and ventilation tunnel is required from the end of the City Tunnel back to Charlemont Station to support emergency evacuation of maintenance staff and ventilation for this section of tunnel.

Project Elements	Outline Description
Park and Ride Facility	The proposed Park and Ride Facility next to Estuary Station will include provision for up to 3,000 parking spaces.
Broadmeadow and Ward Viaduct	A 260m long viaduct is proposed between Estuary and Seatown Stations, in order to cross the Broadmeadow and Ward Rivers and their floodplains.
Grid Connections	Grid Connections will be provided via cable routes and new 110kV substations at DANP and Dardistown. (Approval for the proposed grid connections to be applied for separately, but are assessed in the EIAR)
Dardistown Depot	A maintenance depot will be located at Dardistown. It will house: ▪ Vehicle stabling; ▪ Maintenance workshops and pits; ▪ Automatic vehicle wash facilities; ▪ A test track; ▪ Sanding System for rolling stock; ▪ The Operations Control Centre for the proposed Project; ▪ A substation; and ▪ Other staff facilities and a carpark.
Operations Control Centre	The main OCC will be located at Dardistown Depot and a back-up OCC will be provided at Estuary.
M50 Viaduct	A 100m long viaduct to carry the proposed Project across the M50 between the Dardistown Depot and Northwood Station.
Temporary Project Elements	
Construction Compounds	There will be 34 Construction Compounds including 20 main Construction Compounds, 14 Satellite Construction Compounds required during the Construction Phase of the proposed Project. The main Construction Compounds will be located at each of the proposed station locations, the portal locations and the Dardistown Depot Location (also covering the Dardistown Station) with satellite compounds located at other locations along the alignment. Outside of the Construction Compounds there will be works areas and sites associated with the construction of all elements of the proposed Project including an easement strip along the surface sections.
Logistics Sites	The main logistics sites will be located at Estuary, near Pinnock Hill east of the R132 Swords Bypass and north of Saint Margaret's Road at the Northwood Compound.
Tunnel Boring Machine Launch Site	There will be two TBM launch sites. One will be located at DASP which will serve the TBM boring the Airport Tunnel and the second will be located at the Northwood Construction Compound which will serve the TBM boring the City Tunnel.

31.1.2 Construction Phase Overview

Construction of the proposed Project is expected to take place over approximately nine years. A detailed construction plan and schedule has been developed to ensure that the construction phasing allows for maximum efficiency while minimising the potential for environmental impact. A detailed description of the Construction Phase of the proposed Project is presented in Chapter 5 (MetroLink Construction Phase). The main construction elements of the proposed Project are summarised in ~~Error! Reference source not found.~~Error! Reference source not found.

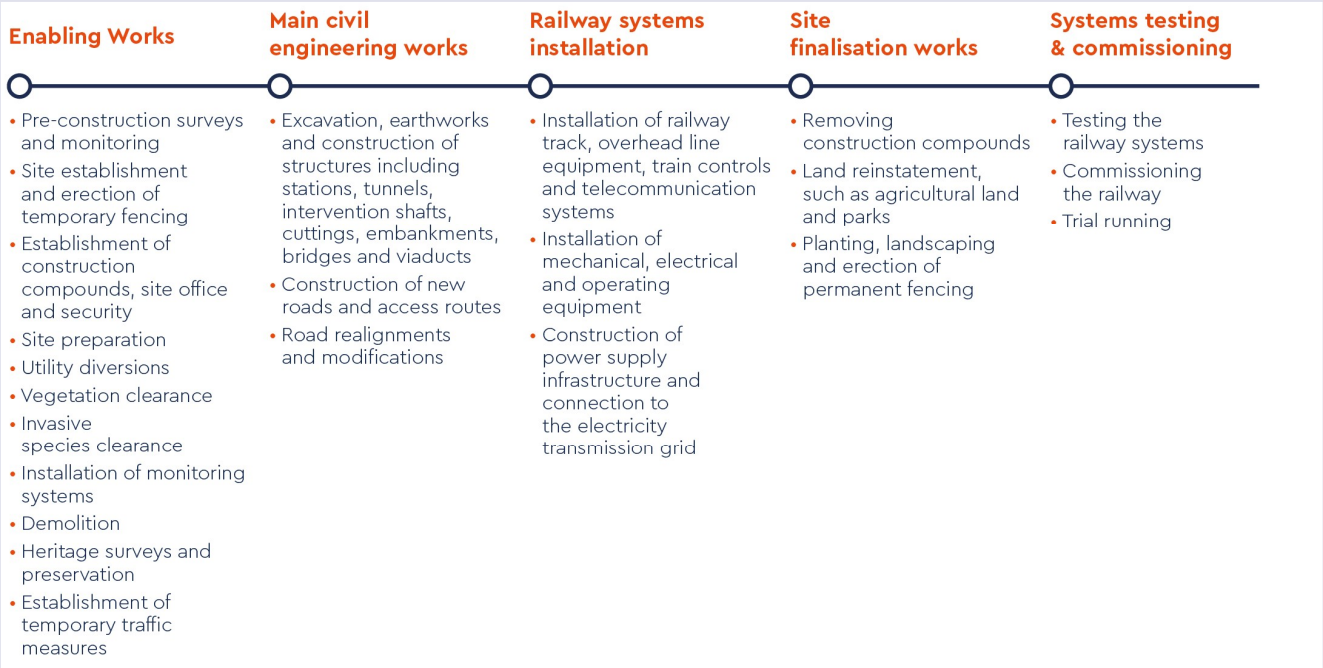

Diagram 31.1: Proposed Construction Phase Activities

31.1.3 Operational Phase Overview

The Operational Phase of the proposed Project will be based on the following operational elements:

- 16 new stations including interchange opportunities with:

- Dublin Airport at the new underground station of the same name;
- Interchange with the Western Commuter and the South Western Commuter Lines at Glasnevin;
- DART at Tara Station;
- Luas Green Line at O'Connell Street Station, St Stephen's Green and Charlemont Station;
- Park and Ride Facility at Estuary Station; and
- Existing Dublin Bus network and future proposed bus services (BusConnects).

- Dardistown Station will be for use by staff only arriving and leaving by train, until development in the area merits the opening of the station as a public station;
- Operating 19 hours per day, 365 days a year;
- In the opening year operations, there will be 20 trains operating per hour at a frequency of three minutes between trains;
- The proposed Project is designed for a maximum of 20,000 passengers per hour per direction (pphpd) in the peak hour;
- 64m long trains running up to every 100 seconds at peak demand;
- Approximately 25 minutes journey time between Swords and the City Centre and 20 minutes journey time from Dublin City Centre to Dublin Airport; and
- Fully automated high floor rolling stock.

Diagram 31.2: Summary of Key Activities during the Operation Phase of the Proposed Project

31.2 Mitigation and Monitoring Schedules

A significant proportion of mitigation is already incorporated into the design of the proposed Project through mitigation by prevention. Where an impact to the environment has been deemed as unacceptable, mitigation has been embedded in the design or the unacceptable option has been ruled out.

Mitigation measures have been proposed for all impacts resulting in a moderate significance or above. Furthermore, mitigation measures have also been proposed for some impacts with a lower significance where such measures are routinely applied (for example in the management of construction-related impacts) or where, based on professional judgement, there would be a material benefit to the receptor.

Mitigation and monitoring measures specified within the EIAR technical assessments are also provided in Chapters 9 to 28 of this EIAR.

The timing and implementation of the mitigation and monitoring measures are indicated within this Chapter as either during the:

- Enabling Works: Activities such as investigative surveys (e.g. bat surveys) that need to be undertaken in advance of the construction works;
- Construction Phase: The undertaking of physical works to construct elements of the proposed Project, as outlined in Chapter 5 (MetroLink Construction Phase); and
- Operational Phase: When the proposed Project commences operation, as well as any ongoing maintenance, as outlined in Chapter 6 (MetroLink Operations & Maintenance).

The following tables summarise the Construction and Operational Phase mitigation outlined in the relevant EIAR technical assessments but should be read in conjunction with the mitigation outlined in the specific chapter and also with the outline Construction Environmental Management Plan (CEMP) in Appendix A5.1. Where appropriate, the location to which the mitigation relates to is identified and where the mitigation measure is scheme wide the location is given as 'throughout (as required)'.

31.3 General Mitigation and Monitoring Requirements

Table 31.2: General Mitigation and Monitoring Measures

Mitigation No.	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of **Impact** (Construction and/or Operational Phase)
G1	▪ The construction phase mitigation strategy outlined in this chapter will be incorporated by the appointed contractor(s) into the future design proposals for the proposed Project. The environmental mitigation will be incorporated into the overall outline CEMP, by the appointed contractor(s) and approved by Transport Infrastructure Ireland (TII).	Construction Phase

31.4 Traffic and Transport

Table 31.3: Traffic and Transport Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
TT1	9.7.1	Throughout (as required)	Additional vehicular traffic	▪ While there will inevitably be additional vehicular traffic during the construction phase of the proposed Project, this will be managed through the outline CEMP and the Scheme Traffic Management Plan (STMP) for the proposed Project.	Construction phase
TT2	9.7.1.1	Throughout (as required)	Sustainable travel for construction staff	▪ A Construction Sustainable Mobility Plan will be prepared which supports and promotes sustainable travel for construction staff travelling to and from the proposed Project site. The mobility plan is a management tool to encourage construction staff to rethink their travel choices and requirements during construction in order to minimize the adverse impacts on the environment and on the operation of the transport network within the city. ▪ The Construction Sustainable Mobility Plan will be an active document that will require to be updated on a regular basis as construction activities take place and will present a series of measures to encourage travel to the constructions site(s) in a sustainable way.	Construction Phase
TT3	9.7.1.2	Throughout (as required)	Sustainable travel for construction staff	The Scheme Traffic Management Plan (Appendix A9.5) details mitigation techniques and the types of measures ~~to~~that will be employed to minimise the impacts generated by the proposed Project during the Construction Phase. There are two established strategies for impact mitigation which are identified in the STMP, namely traffic reduction measures and remedial measures. In general, strategic reduction mitigation occurs before the construction phase, while remedial measures are implemented during construction on an on-going basis. The reduction measures proposed~~, among others,~~ will include: ▪ A coordinated City Centre Traffic Management Plan, for all MetroLink stations; ▪ Establishment of a Project Construction Traffic Forum with representatives from key stakeholders; ▪ Construction vehicles will be strictly controlled in terms of the hours of operation, and by imposing restriction on vehicle size and weight; and	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ ~~Where practicable, construction~~Construction work requiring short term disruption and road closures will be carried out when traffic volumes are lower. The remedial measures proposed, ~~among others,~~will include updates to the Construction Mobility Plan to ensure that numbers of employee vehicles travelling to and from construction sites on a daily basis will be managed through transporting workers to site via buses/mini-buses from designated collection points (such as Luas and DART stations or other appropriate locations).	
TT4	9.7.1.2	Throughout (as required)	Traffic management	The STMP outlines general traffic congestion reduction measures. Further measures detailed in the outline CEMP will include the following: ▪ A coordinated City Centre Traffic Management Plan, for all Project stations; ▪ Establishment of a Project Construction Traffic Forum with representatives from key stakeholders; ▪ Construction vehicles will be controlled in terms of the hours of operation, and by imposing restriction on vehicle size and weight; ▪ ~~Where practicable, construction~~Construction work requiring short term disruption and road closures will be carried out when traffic volumes are lower, such as at night, at weekends and during school holidays; The remedial measures proposed~~, among others,~~ will include: ▪ Wheel wash facilities will be provided at ~~site specific locations if required~~each of the main construction compounds. The numbers of employee vehicles travelling to and from construction sites on a daily basis will be managed through: ▪ Car sharing; and ▪ Transporting workers to site via min-buses from designated collection points (such as Luas and DART stations or other appropriate locations) in line with the mobility management plan.	Construction phase
TT5	9.7.1.2.4	Throughout (as required)	Construction Phase Monitoring	Throughout the Construction Phase, ongoing monitoring will be ~~required~~undertaken of the specified HGV haul routes, particularly in relation to those affected by the HGV Restricted Zone within Dublin City Centre.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ As identified in Chapter 9 (Traffic & Transport) section 9.7.1.2, monitoring of hours of operation and vehicle size and weight will ~~also~~ be ~~required~~undertaken.	
TT6	9.7.1	Throughout (as required)	Construction traffic	The full list of Mitigation Measures in the Construction Phase are summarised in Chapter 9 (Traffic & Transport) Table 9.147~~.~~ and include:	Construction phase
TT7	Section 9.7.1 Table 9.147	AZ1 Northern Section	Impacts due to - Removal of bus lanes, closure of traffic lanes, loss of turning movements, realignment of junctions, reduced capacity, removal of cycle lanes and impacts on parking and loading	▪ Alternative routing has been identified for this section and will be encouraged throughout the construction phase to ~~potentially~~ reduce congestion by 30%. ▪ Monitor if ~~closure is~~road/lane closures are required at all points, or if it can be reinstated temporarily throughout the works. ▪ Appropriate signage will be provided. ▪ These impacts will be removed following completion of Construction Phase.	Construction phase
TT8	Section 9.7.1 Table 9.147	AZ2 Airport Section	Impact on pedestrians due to - Removal of footway however diversion provided	▪ Monitor if closure is required at all points, or if it can be reinstated temporarily throughout the works. ▪ This impact will be removed following completion of Construction Phase.	Construction phase
TT9	Section 9.7.1 Table 9.147	AZ3 Dardistown to Northwood Section	Impact on general traffic due to - Delays due to lane loss, speed restrictions, reduced capacity, routeing profile takes several stations worth of site vehicles on R108. Impact on cyclists due to reduction in cycle lanes	▪ Monitor if closure/speed ~~restriction is~~restrictions are required at all points, or if ~~it~~they can be reinstated temporarily throughout the works. Construction vehicles will be controlled in terms of the hours of operation (i.e. construction traffic may be prohibited during periods of very heavy traffic). ▪ Coordinate spoil removal to minimize cumulative impact of HGV routing. ▪ These impacts will be removed following completion of Construction Phase.	Construction phase
TT10	Section 9.7.1 Table 9.147	AZ4 Northwood to Charlemont Section	Impacts due to - Removal of bus lanes, closure of traffic lanes, closure of sections of Western Commuter Line, restricted traffic, reduced capacity, removal of cycle lanes, impacts on parking and loading and reduced access for pedestrians	▪ Alternative routing has been identified for this section and will be encouraged throughout the construction phase. ▪ Monitor if closure is required at all points, or if it can be reinstated temporarily throughout the works. ▪ Appropriate signage will be provided and have the level of service required to cater for the pedestrian demand. ▪ There will be controls at the entrance/exits of sites for construction vehicles in order to ensure the safety of other road users. ▪ These impacts will be removed following completion of Construction Phase.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
TT11	Section 9.7.2 Table 9.148	Fosterstown	Pedestrians – Comfort Levels	▪ ~~Consider placement~~Placement of street furniture to maximise available width, monitor to determine if footway width needs increased in future years- possibility of reallocation of space at this location. (By agreement with Local Authority)	Operational phase
TT12	Section 9.7.2 Table 9.148	Collins Avenue	Pedestrian Comfort Levels	▪ ~~Consider placement~~Placement of street furniture to maximise available width. Monitor impacts to determine if further width is required. (By agreement with Local Authority)	Operational Phase
TT13	Section 9.7.2 Table 9.148	Glasnevin	Pedestrian Crossing	▪ ~~If~~Widen pedestrian crossing ~~is widened~~ to 4m~~, the~~. The crossing will then operate with sufficient comfort levels for the anticipated demand.	Operational Phase
TT14	Section 9.7.2 Table 9.148	Mater Station	Pedestrian Comfort Levels	▪ ~~Consider placement~~Placement of street furniture to maximise available width. Monitor impacts to determine if further width is required. (By agreement with Local Authority)	Operational Phase
TT15	Section 9.7.2 Table 9.148	O'Connell Street	Pedestrians – Comfort Levels	▪ ~~Consider reallocation~~Reallocation of road space to widen the pedestrian area (By agreement with Local Authority).	Operational phase
TT16	Section 9.7.2 Table 9.148	Tara Station	Pedestrians – Comfort Levels	▪ ~~Consider placement~~Placement of street furniture to maximise available width. Monitor impacts to determine if further width is required. (By agreement with Local Authority)	Operational Phase
TT17	Section 9.7.2 Table 9.148	Tara Station	Pedestrian Crossing	▪ ~~If~~The provision of additional crossings ~~are implemented~~by others at Townsend Street/Tara Street~~, there~~ will ~~be~~provide sufficient capacity to accommodate the anticipated demand.	Operational Phase
TT18	Section 9.7.2	Charlemont	Pedestrians – Comfort Levels	▪ ~~Consider placement~~Placement of street furniture to maximise available width. Monitor impacts to determine if further width is required.	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
	Table 9.148				
TT19	9.7.2.1	Throughout (as required)	Monitoring	▪ The use of the Park and Ride Facility at Estuary Station will need to be monitored through the Operational Phase. Data on the origins and destinations of users, and their trips will be required to determine what impact the Park and Ride Facility is having on local and strategic level trips. Further demand management measures may be required in order to increase the number of spaces available to the wider catchment. ▪ The cycle parking provisions per station will be required to be monitored to ensure that the level of provisions is meeting the demand. Similarly, the type of cycle parking provisions required may change over the course of the Operational Phase due to the ongoing shift to shared and micro mobility solutions. ▪ Pedestrian comfort levels will be required to be monitored throughout the Operational Phase to ensure that the surrounding footways have the capacity to maintain acceptable comfort levels with increasing demand. 'Uncomfortable' and 'Acceptable' links identified in the assessment are to be monitored to ensure that maximum available width is provided through the monitoring of street furniture placement and total footpath width, where applicable.	Operational Phase

31.5 Human Health

The construction contractor and Metrolink operator will have to prepare and implement an Environmental Management Plan and a Health and Safety Plan to protect workers, control environmental pollution, and protect members of local communities from construction and operational activities. An Outline CEMP has been prepared for the EIAR and can be found in Appendix A5.1.

Detail on the mitigation measures that are linked to human health outcomes in both the Construction and Operational Phases are presented in the following EIAR chapters: Chapter 9: Traffic & Transport; Chapter 11: Population & Land Use; Chapter 12 (Electromagnetic Compatibility & Stray Current), Chapter 13 (Airborne Noise & Vibration); Chapter 14 (Groundborne Noise & Vibration), Chapter 16 (Air Quality);Chapter 18 (Hydrology); Chapter 19 (Hydrogeology); Chapter 20 (Soils & Geology) and Chapter 28 (Risk of Major Accidents & Disasters). For the purpose of clarity, the identified mitigation proposed in the above Chapters for the impacts relevant to the human health assessment are contained in Chapter 10 (Human Health) Table 10.16. No additional mitigation, over and above that outlined in the sections above, is proposed for Human Health.

31.6 Population and Land Use

Table 31.4: Population and Land Use Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
PL1	11.6.1.1	Throughout (as required)	Damage to property and land acquisition	▪ Implement a Property Owner Protection Scheme (POPS) comprising condition surveys of properties along the proposed Project to ascertain the condition of the properties before, during (if deemed necessary) and after the completion of the proposed Project to determine whether there has been any deterioration of any of the properties surveyed and whether the same may be attributable to the proposed Project and recommend repairs as appropriate and recommend repairs as appropriate. The POPS ~~would~~will be introduced by TII through public consultation and will be formally advised to eligible property owners by the Public Relations Department. ▪ All land acquisition will be undertaken in accordance with the Land Acquisition Strategy (LAS) prepared by TII which sets out the arrangements proposed for the provision of information and assistance to the residential owners / occupiers of land and property subject to compulsory purchase for the delivery of MetroLink.	Construction Phase
PL2	11.6.1.2	Throughout (as required)	Protection of construction area	▪ Full implementation of the range of dust minimisation measures detailed in the mitigation section of Chapter 16 (Air Quality). ▪ Full implementation of the range of noise minimisation measures detailed in mitigation section of Chapter 13 (Airborne Noise & Vibration) and Chapter 14 (Groundborne Noise & Vibration). ~~▪ Temporary relocation relates to buildings where isolated floors or façades are impacted by the works and will benefit from temporary relocation of any noise sensitive activities for the duration of the phase of works. Where this option is recommended, a consultation process will be established between TII, the contractor and the building occupants / owners.~~ ▪ Ensure all construction activities are appropriately located so as to limit impacts and reduce the footprint of construction activities where possible to avoid and/or minimise impacts. ▪ All construction areas will be suitably fenced, screened and monitored so that access to the sites will be limited to authorised personnel in the interest of public health and safety. ▪ Installation of the site hoarding/fencing ~~(2.4m~~2.4 m in height as a minimum) and gates to ensure that the sites are secure. An exception to the standard 2.4m hoarding or fencing will be at areas that need specific sound barriers or boundary treatment identified in Chapter 13 (Airborne Noise & Vibration) and as identified in the Landscape and Visual Impact Assessment discussed in Chapter 27 (Landscape & Visual). It is also set out in Chapter 13 (Airborne Noise & Vibration) that noise insulation or the reasonable costs thereof will be offered to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed Project. Implement and monitor safe	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				working practices, in accordance with the relevant legislation during construction to protect the workers and visitors to the construction sites.	
PL3	11.6.1.2	Throughout (as required)	Access arrangements	▪ Full implementation of the range of mobility and traffic management measures including STMP as detailed in mitigation section of Chapter 9 (Traffic & Transport). ▪ Alternative access arrangements (or diversions) will be put in place at the relevant locations and appropriate temporary signage will be put in place on roads, footpaths or cycleways that will be temporarily affected by the construction works. This signage will be monitored to ensure that it guides local residents, commercial activities and visitors to the temporary access arrangements in place that facilitate access to homes and businesses. ▪ Provide for safe pedestrian and cyclist access, egress and movement at points of entry and exit of construction vehicles at all sites. Tactile and audible signals for those with visual impairments will be integrated to ensure equitable access for all users.	Construction phase
PL4	11.6.1.2	Throughout (as required)	Informing stakeholders	▪ The contractor(s) will inform stakeholders of the general construction process/phasing in line with the TII Community Engagement Strategy to ensure local residents and businesses are fully informed on the nature and duration of construction works taking place in the vicinity. Where possible crime prevention through environmental design principles (e.g. adequate lighting in all areas, active and passive surveillance) would be incorporated given the duration of the construction period. ▪ Advance notice will be given to the owners of all residential, commercial and community properties (including social infrastructure) before construction starts and in advance of any major planned disruptions of services or localised traffic management measures noting in particular residents and businesses affected by temporary construction works crossing roads and those located within 250m of the construction works. ▪ A Community Relations Officer (CRO) shall be employed during the construction of the proposed Project and contact details will be provided on the proposed Project website so that stakeholders and communities can make contact as required. The CRO will be responsible for maintaining open, transparent and positive relationship with members of the public, local businesses, groups and organisations affected by the works. Specifically, the CRO will work closely with Transport Infrastructure Ireland and the appointed contractors to ensure that all effort to address public concerns are made, and to ensure that information on the nature and duration of all works is provided.	Construction phase
PL5	11.6.1.2	Throughout (as required)	Impact on stakeholders	▪ Avoid works that could involve high noise or visual intrusion during major social events (such as St Patrick's Day or New Year's Eve festivals in the city centre or local annual events).	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
PL6	11.6.1.2	Throughout (as required)	Impact on stakeholders properties	▪ Temporary adjustments will be made to the layout of affected playing pitches, the works with rehabilitation of its pitches to be carried out at the earliest ~~practicable~~ opportunity as detailed in Section 5.7.1, Section 5.9.1 and Section 5.10.5 of Chapter 5 (MetroLink Construction Phase), during following construction of the proposed Project. ▪ The permanent relocation of Whitehall Rangers FC from Dardistown will be accommodated at the earliest ~~practicable~~ opportunity. ▪ Re-provision of Markievicz Leisure Centre will be funded by TII upon selection of a suitable alternative site by Dublin City Council. ▪ ~~Reinstate~~Reinstatement of all land as quickly as possible following construction so as to expedite any local disruption and return to existing surface land uses that can be used by the surrounding residents, businesses and communities.	Construction phase
PL7	11.6.1.2	Throughout (as required)	Sustainability	Implementation of sustainable measures relevant to population for the proposed Project: ▪ Develop and implement an Apprenticeship and Trainee Programme, incorporating outreach programme with local schools and colleges; ▪ Provide an inclusive approach to recruitment, staff training and rotas to build community relationships and foster a sense of safety; ▪ Develop and implement a programme of community engagement to raise awareness of sustainability topics linked to the design, construction and operation of the proposed Project; ▪ Facilitate multidisciplinary workshops (including client, designers, technical specialists and contractor), encouraging collaboration to identify challenges and opportunities of delivering MetroLink; ▪ Incorporate skills and learning targets into MetroLink's construction contracts and measure and report progress on a monthly basis; ▪ Develop and maintain stakeholder and community engagement plan, including centralised complaint reporting line and minimum standards for resolution for construction and programme for virtual and face to face events during design and operation; ▪ Provide a dedicated and responsive helpline and social media channels (e.g. Twitter, Instagram) for the community before construction starts; ▪ Ongoing engagement and contingency planning with other transport agencies to maintain level of service during disruption events e.g. mass power outage and flooding; ▪ Use the universal design approach to design out safety issues in the construction and operational phases of the proposed Project; ▪ Establish a culture of everyone safe home at the end of their shift; ▪ Develop and include targets for the safe construction of the proposed Project; ▪ Implement and maintain an inclusive operational emergency response action plan;	Construction phase and Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Implement and maintain measures to reduce antisocial behaviour, including provision of real time CCTV and appropriate lighting; ▪ Establish Noise and Vibration baseline and implement and monitor mitigation measures to reduce impacts during construction and operation; ▪ Establish an air quality baseline and collaborate with others to deliver reductions in air pollution; ▪ Appraise and implement a programme that provides help and support to those directly affected by the construction of the proposed Project, in partnership with others; ▪ Deliver construction logistics plans that mitigate the impacts of construction traffic on the communities being worked in; ▪ Include targets for worker and community health and wellbeing in contracts; ▪ Maintain access for all to facilities, stations, trains and public spaces to promote independent mobility; ▪ Establish a construction productivity benchmark for the proposed Project and demonstrate gains against this benchmark; ▪ Identify innovative technologies and practices that provide value for money and additional benefits to MetroLink users; ▪ Investigate and incorporate future growth trends into MetroLink's design and operations to facilitate future expansion based on quantified data from equivalent metro systems; ▪ Space proofing during design to allow for expansion of the metro system; ▪ Collaborate with local planning authorities and developers to fully recognise the socio-economic benefits of MetroLink; ▪ Implement and review on an annual basis a sustainable procurement strategy, aligned with TII's procurement policies; ▪ Incorporate sustainability requirements into all tenders to ~~consider~~identify local and SME businesses and local employment; and ▪ Use 'meet the buyer' events to promote opportunities to supply MetroLink.	
PL8	11.6.2	Stations and across the Study area during the Operational Phase.		▪ No further mitigation measures other than those inherent in the design have been proposed with respect to Population and Land Use during the operation of the proposed Project. ▪ Monitoring will be undertaken ~~as appropriate~~ by the operator during the Operational Phase in relation to users and local communities and the key sustainability aims as detailed in Chapter 4 (Description of the MetroLink Project) and Section 11.6.2 will be implemented.	Operational Phase

31.7 Electromagnetic Compatibility and Stray Current

Table 31.5: Electromagnetic Compatibility and Stray Current Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
EM1	12.11	Trinity College, the Rotunda and the Mater	DC magnetic fields impacts on sensitive medical and scanning equipment	▪ With regards to DC magnetic field impacts on sensitive medical and scanning equipment such as those located in TCD, the Rotunda and the Mater the following mitigation measures are available will be implemented as agreed with affected properties where sensitive equipment is identified as effected: - Relocation of affected equipment; - Installation of an active-cancellation system; and - Shielding of the labs/rooms using specialised material design to attenuate magnetic fields.	Operational Phase
EM2	12.11	Trinity College	AC magnetic fields impacts on sensitive scanning equipment	~~A~~Active cancelation is proposed as an appropriate solution. Where this is not the case, a final solution would be the installation of fixed shielding, a solution some of the departments and institutes at TCD are already familiar with. Any unexpected impacts in relation to AC fields should be addressed in a number of ways if necessary, including Shielding and Filtering.	Operational Phase
EM3	12.11	Dublin Airport	DC magnetic fields impacts	For DC magnetic fields at Dublin Airport, while there will be no impact for some airlines, and it is unlikely to manifest itself to a notable level for others that utilise Flux Valve compass systems, it was agreed with the DAA that they would implement one of the following measures: ▪ Update their Aerodrome Notification Package; or ▪ Utilise another form of standard notification to the airlines. The nature of this update or notification ~~would~~will be of a form that outlines the proposed Project alignment through the airport, with a corridor width of 20m, within which magnetic compass systems may experience momentary fluctuations as they pass through.	Operational Phase

31.8 Airborne Noise and Vibration

Table 31.6: Airborne Noise and Vibration Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
ANV1	13.6.1.1	Construction sites	Construction noise - General	▪ The appointed contractor(s) will be responsible for updating the outline CEMP prior to the commencement of construction, in order to incorporate any conditions imposed as part of the Railway Order (RO). This responsibility will be included in the Works Requirements of the Contract. The outline CEMP will be maintained and updated regularly as the proposed Project progresses. In addition to the various measures detailed in the outline CEMP, the following sections outline the noise mitigation measures required across the proposed Project to control airborne noise impacts during the Construction Phase.	Construction Phase
ANV2	13.6.1.2	Construction sites	Construction noise – General	▪ The Contractor undertaking the construction of the works will be required to take specific noise abatement measures to the extent required and comply with the recommendations of BS 5228–1 (BSI 2014a). ▪ The selection of plant items will be required to comply and European Communities Noise Emissions by Equipment for Use Outdoors (Amendment) Regulations 2006 (S.I. No 241/2006); - The outline CEMP will encompass a Noise and Vibration Management Plan (CNVMP) which will be formulated for the construction phase and used by all contractors based on the mitigation measures outlined in this chapter, in Chapter 14 (Groundborne Noise & Vibration) and the outline CEMP (Appendix A5.1). The CNVMP will be a live document. This will involve a detailed investigation of potential noise and vibration impacts associated with each construction compound. The assessment will identify through modelling and calculation, predicted construction noise levels, identification of potential exceedance of CNTs, identification of required noise mitigation measures specific to each work area to minimise noise and vibration impacts so far as is reasonably practicable. ▪ As part of the CNVMP a baseline noise study will be undertaken prior to the commencement of construction works to characterise the prevailing noise environment at impacted NSLs. This information will be used to inform the relevant CNTs. ▪ The key principals relating to noise mitigation will be applied across all construction areas for the proposed Project: - Noise control at Source: Selection of quiet plant, site layout, attenuation at source, operational control (hours, periods etc.); - Noise Control along Pathway: Localised screening to plant items on site, enclosures, site buildings, site hoarding and noise barriers; and	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- Noise Control at Receiver: Noise Insulation (NI) and Temporary Rehousing (TRH). ▪ The impact assessment has identified that mitigation measures are required across the proposed Project to control construction noise impacts. The approach for mitigation will follow the construction noise control hierarchy as above. BS 5228–1 (BSI 2014a) includes guidance on these measures which are set out briefly in the following paragraphs.	
ANV3	13.6.1.2.1	Throughout	13.6.1.2.1 Selection of Quiet Plant	▪ The potential for any item of plant to result in exceedance of construction noise thresholds will be assessed prior to the item being brought onto the site. ~~The least noisy item of plant~~Plant will be selected ~~wherever practicable~~ (e.g. plant items with sound attenuation incorporated) to assist in the mitigation of noise effects. Should a particular item of plant already on the site be found to exceed the construction noise thresholds, the first action will be to identify whether the item can be replaced with a quieter alternative. ▪ The contractor(s) will evaluate the choice of piling, excavation, breaking or other working method taking into account various ground conditions and site constraints. Where alternative lower noise generating equipment that would economically achieve, in the given ground conditions, equivalent structural / excavation / breaking results, these will be selected to control noise emissions~~, where deemed feasible~~. ▪ For the proposed Project, the following low noise and or noise vibration construction methodologies will be used: - The use of non-percussive piling methodologies will be used across the proposed Project to control noise and vibration impacts from construction compounds. - Rock breaking will be undertaken using milling equipment and peckers will be avoided in station and shaft compounds to reduce overall noise and vibration impacts. - Blasting will be undertaken at sites where it has been demonstrated the related vibration thresholds for building damage will not be exceeded. Whilst this methodology results in high intermittent audible noise and vibration, the effects are momentary during each blast compared a more prolonged the overall process using manual rock breaking; the net result being that the overall disturbance to the community will not necessarily be reduced.	
ANV4	13.6.1.2.2	Construction Sites	Construction noise - Noise Control at Source	If replacing a noisy item of plant is not a viable or practical option, noise control “at source” will be followed. This refers to the modification of an item of plant, or the application of improved sound reduction methods in consultation with the supplier or the best practice use of equipment and materials handling to reduce noise. Proposed techniques will also be evaluated in light of their potential effect on occupational health and safety. The following outline guidance relates to practical noise control at source techniques which relate to specific site considerations:	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ For static plant such as compressors, generators, motors, pumps and ventilation fans within each construction compounds the units will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation, as required to ensure CNTs are not exceeded~~, particularly when operational at night~~. Further details relating to control of temporary ventilation fans is included in Chapter 5 (MetroLink Construction Phase) and the outline CEMP; ▪ ~~Where practicable, equipment~~Equipment powered by mains electricity ~~shall~~will be used in preference to equipment powered by internal combustion engines or locally generated electricity; ▪ For mobile plant items such as dump trucks, cranes, excavators and loaders, the installation of an acoustic exhaust, utilizing an acoustic canopy to replace the normal engine cover and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB; ▪ Reverse alarms from mobile plant within construction compounds, will be broadband to reduce tonal elements from this source; ▪ For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover; ▪ For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum; ▪ Mobile and stationary plant will be switched off or throttled back to a minimum when not in use (engines, motors, generators etc). Lorries, trucks and concrete vehicles will not be permitted to queue outside site compounds with engines left idling. Construction vehicles in lorry holding areas will be required to switch engines off when stationary; ▪ For percussive tools such as pneumatic concrete breakers and tools used for utility diversion works and surface level ground breaking for compounds, a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed; ▪ For all materials handling within compounds, the contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials. This is an important consideration for site compounds where materials are loaded and unloaded; ▪ Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact;	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ All items of plant will be subject to regular maintenance. All vehicles and mechanical plant will be maintained in good working order for the duration of the contract. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures; and ▪ Noise levels associated with additional surface construction works including utility diversions and ESBN routing will be restricted to the fixed noise limits set for the proposed Project. The impact from works outside of construction site hoarding boundaries will be controlled using the best practicable means set out above and restricting significant noise and vibration generating activities to daytime hours where possible. Localised screening of noisy plant items will also be required to sufficiently reduce noise from these works when operating at distances of up to 30m from NSLs.	
ANV5	13.6.1.2.3	Construction Sites	Construction noise - Construction Working Hours	▪ One of the key principals relating to control of noise impacts from construction relates to the periods and hours during which the construction works will take place. The construction working hours for the proposed Project are set out in Section ~~**Error! Reference source not found.**~~**Error! Reference source not found.**. Standard working hours will be: - 07:00 – 23:00 Monday – Friday; - 07:00 – 13:00 Saturdays. ▪ The proposed construction working hours are for the majority limited to daytime hours only Monday to Friday and Saturday morning periods. This approach assists with limiting the duration over which NSLs are exposed to construction noise impacts. ▪ It will be necessary to work overtime (including weekends) and night shifts at certain critical stages during the project at surface level e.g. during concrete pours, batching plants, SCL, tracklaying and MEP fit out, track lowering etc at the locations and compounds ~~discussed throughout Section **Error! Reference source not found.** The compounds~~identified in Chapter 5 (MetroLink Construction Phase).. Compounds where scheduled 24/7 work ~~and~~is identified, the likely out of hours work are set out in ~~**Error! Reference source not found.**~~Chapter 5 (MetroLink Construction Phase and are assessed ~~in Section **Error! Reference source not found.** of this chapter~~within Chapter 13 (Airborne Noise & Vibration). Activities will be scheduled in a manner that reflects the location of the site and the nature of NSLs. Construction activities / plant items will be considered with respect to their potential to exceed CNTs at NSLs and will be scheduled according their noise level, proximity to sensitive locations and possible options for noise control. ▪ For compounds and work areas where night-time activities will be required at surface level during track lowering, track laying, MEP fit out, SCL etc., as far as practicable, activities with highest noise emissions will be scheduled during day time periods and / or daytime shifts will	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				set up the relevant sites for night-time periods to avoid unnecessary use of mobile plant, cranes, and material handling to occur during night-time periods.	
ANV 6	13.6.1.2.4	Construction Sites	Construction noise - Screening	▪ Typically screening is an effective method of reducing the noise level from construction work areas and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver. The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen will be wrapped around the source. ▪ BS 5228–1 (BSI 2014a) states that on level sites the screen would be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material. ▪ The use of a standard 2.4m high construction site hoarding will be used as standard around all construction compounds including linear work areas along the R132 during the construction of the above ground rail and retained cut stations. ▪ The use of enhanced construction hoarding, acoustic screening or enclosures will be required at a number of construction compounds across the proposed Project. The use of enhanced construction hoarding, acoustic screening or enclosures will be required at a number of construction compounds across the proposed Project. Table 13.85 of Chapter 13 of the EIAR includes locations where the requirement for enhanced hoarding heights have been identified based on the assessment undertaken using the proposed construction site layouts, plant items and construction sequencing. ▪ Prior to the commencement of the construction works at each compound, the Contractor will conduct an individual site assessment as part of the CNVMP to verify the height and position of screening to control noise impacts based on the most up to date construction methodologies and input data. ▪ The following locations will require an enclosed working area to reduce night-time noise impacts. ▪ At DANP Northwood Portal, an enclosed structure will be constructed around the surface working area prior to the operation of the TBM. The structure will achieve a minimum weighted sound reduction index (Rw) of 24dB Rw with acoustic internal lining of the structure to reduce reverberant noise build up. The enclosure design will be such that openings are sited away from NSL boundaries. ▪ At Albert College Park, during SCL night-time support works, surface activities will be enclosed within an acoustically clad steel framed building to control airborne noise breakout to surrounding sensitive properties. The structure will achieve a minimum sound reduction	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				index of 24dB Rw with acoustic internal lining of the structure to reduce reverberant noise build up. The enclosure design will be such that openings are sited away from NSL boundaries ~~as far as practicable.~~ . - At Griffith Park, during track laying first fit concrete works, the batching plant operations will be enclosed within an acoustically clad steel framed building will be used within the compound to control airborne noise breakout to surrounding sensitive properties. The structure will achieve a minimum sound reduction index of 24dB Rw with acoustic internal lining of the structure to reduce reverberant noise build up. The enclosure design will be such that openings are sited away from NSL boundaries ~~as far as practicable~~. - ~~▪~~ At Charlemont, during SCL night-time support works, surface activities will be enclosed within an acoustically clad steel framed building to control airborne noise breakout to surrounding sensitive properties. The structure will achieve a minimum sound reduction index of 24dB Rw with acoustic internal lining of the structure to reduce reverberant noise build up. The enclosure design will be such that openings are sited away from NSL boundaries ~~as far as practicable.~~ . - Within construction compounds, the use of temporary and mobile acoustic screens, sheds and enclosures will be required around items of plant and equipment with high noise emissions which have the potential to result in exceedance of the CNTs. ▪ Annex B of BS 5228–1 (BSI 2014a) (Figures B1, B2 and B3) ~~provide~~provides typical details for temporary and mobile acoustic screens, sheds and enclosures that should be constructed on site from standard materials. These items are recommended for locations where construction activities are identified to exceed construction noise thresholds at NSLs. A well placed mobile temporary screen around a breaker or excavation should effectively reduce noise emissions by 10dB(A). These will be required around plant items including handheld pneumatic breakers and breakers mounted on excavators and drill bits when operating at ground level. ▪ Demountable enclosures ~~should~~will also be used to screen operatives using hand tools and ~~may~~will be moved around site as necessary. ▪ Within each construction compound, the placement of site buildings such as offices and stores between the site and NSLs ~~should~~will assist with breaking the line of sight between source and receiver and contribute to the overall level of noise reduction from a site. A detailed review of each site compound will be undertaken as part of the CNVMP.	
ANV7	13.6.1.2.5	Construction sites	Construction noise - Liaison with the public	▪ The Contractor ~~to~~will provide proactive community relations and will notify the public and vibration sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ The Contractor ~~to~~will distribute information circulars informing people of progress and any likely periods of significant noise and vibration. ▪ The Contractor ~~to~~will appoint a noise liaison officer to site. All noise complaints will be logged and followed up in a prompt fashion by the liaison officer.	
ANV8	13.6.1.2.6	Construction sites	Construction noise - Monitoring	▪ During the Construction Phase the contractor will be required to carry out noise and vibration monitoring at representative NSLs to evaluate and inform the requirement and / or implementation of noise and or vibration management measures. ▪ A full monitoring and auditing programme will form part of the CNVMP which will be agreed with the Local Authorities prior to the commencement of the Construction Phase. As a minimum, the monitoring programme will include an alert system for threshold exceedances, remote access and a platform for sharing monitoring results between the contractor, TII, DCC and FCC.	Construction Phase
ANV9	13.6.1.2.7	Construction sites	Construction noise - Noise insultation, temporary rehousing and temporary relocation	▪ Where all reasonable measures have been taken to reduce noise levels using the above-mentioned mitigation measures through source and pathway control, but residual levels are such that widespread community disturbance or interference with sleep is likely to occur, TII will consider whether the provision of further Noise Insulation (NI) or Temporary Rehousing (TRH) will be appropriate at locations where eligibility for either has been established. The document Transport Infrastructure Ireland (TII) Airborne and Groundborne Noise Mitigation Policy (Appendix A14.6) sets out the further mitigation measures and supports which will be available to those who meet the eligibility criteria. As the NI option will only control internal noise levels, noise levels at external areas will remain impacted by construction noise. In addition, this option will also result in indirect impacts to residents (alternative ventilation systems, or temporary relocation etc). On this basis, this option would only be considered where all other reasonably practicable measures have been implemented. ▪ Where TRH is recommended, a consultation process will be established between TII, the contractor and the building occupants / owners. ~~▪ Temporary relocation relates to buildings where isolated floors or façades are impacted by the works and will benefit from temporary relocation of any noise sensitive activities for the duration of the phase of works. Where this option is recommended, a consultation process will be established between TII, the contractor and the building occupants / owners.~~ ▪ The CNVMP will set out a detailed analysis of each construction compound relating to noise levels, durations and number of properties impacted and the planned approach for managing same. Prior to any construction work commencing on any of the main work sites a detailed acoustic impact assessment will be undertaken which will involve a baseline noise study, model	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				of the contractors final site layout, plant and equipment models, numbers and on-site location and the inclusion of all available on-site noise control measures.	
ANV10	13.6.1.3	Construction traffic	Construction Traffic	▪ Restrict speed limits, maintain road surfaces, ensure all vehicles are properly maintained and secure all coverings on construction vehicles before leaving site to avoid excessive 'rattling'.	Construction Phase
ANV11	13.6.1.4	Construction sites	Construction vibration	▪ Chapter 14 (Groundborne Noise & Vibration) includes the specific control measures across the proposed Project to control vibration sources with potential to result in disturbance to building occupants or building damage.	Construction Phase
ANV12	13.6.2.1	Estuary and Northwood	Rail and road noise sources	Two areas have been identified that require noise mitigation to reduce airborne rail noise, at Lissenhall and east and west of the viaduct south of the M50. The following mitigation measures will be included to reduce airborne noise at the identified NSLs in these areas: ▪ Estuary: A 2m high barrier will be installed north-east of the Emmaus Retreat centre along the boundary of the realigned Ennis ~~lane~~Lane between Chainage 1+150 and 1+480. The barriers will provide noise screening from rail activities in addition to road traffic and vehicle activity from the park and ride facility. The barrier is illustrated in the General Arrangement drawing for Estuary (Ref: ML1-JA1-ARD-ROUT_XX_DRY-03003). ▪ Northwood: A noise barrier will be installed along the east of rail embankment south of the M50 between chainage 9+770 to 9+900. The barrier will be constructed along the rail edge at the top of the embankment. A barrier will be installed along the west of rail embankment south of the M50 between chainage 9+800 to 9+940. The barrier will be constructed from the ground level at base of embankment to achieve a height of 1.8m above the rail level. A barrier will be installed along the west of rail embankment south of the M50 between chainage 9+970 to 9+980. The barrier will be constructed from the ground level at base of embankment to achieve a height of 1.8m above the rail level. The barrier is illustrated in the General Arrangement drawing for Estuary (Ref: ML1-JA1-ARD-ROUT_XX_DRY-0300xx). The range of allowable noise levels from each fixed source set will ensure that any impact will not be significant. The best practice measures outlined below will be considered during the detailed design.	Operational Phase
ANV13	16.6.2.2	Railway	Railway Maintenance	Where rail maintenance activities are scheduled over night-time periods along above ground sections of the alignment in AZ1 and AZ3, advance notice will be provided to affected residents providing notification of the dates and durations of the planned works.	Operational Phase
ANV14	16.6.2.3	Stations	Noise from fixed noise sources –	The following options will be considered when selecting suitable mitigation for tunnel ventilation systems (in order of priority): ▪ Selection of low noise rated equipment. ▪ Reduction of induct flow rates.	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			Ventilation systems	▪ Reduction of elements in the airflow. ▪ In duct attenuators. ▪ Orientation of grilles and louvres away from sensitive receptors. ▪ Acoustic louvres. ▪ Anti-vibration mountings and couplings will be incorporated into the design to control vibration.	
ANV15	13.6.2.4	Stations	Noise from public address systems	The majority of station structures for the proposed Project scheme will be fully underground. Any breakout of noise from the station areas is likely to be via the access stairwells and escalators to ground surface. At ~~estuary~~Estuary, the proposed station will be at ground level. The following options will be considered when selecting suitable mitigation for station public address systems: ▪ Minimising the operational period of the system; ▪ Careful selection and location of speakers; ▪ Speaker zoning, so that announcements are made to the required location only; ▪ Reducing broadcast levels; ▪ Installation ambient noise sensing equipment; ▪ Staff training to ensure correct microphone usage; ▪ Centralised recording of announcements (to control output levels); and ▪ Screening of speakers using station features.	Operational Phase

31.9 Ground-borne Noise and Vibration

Table 31.7: Ground-borne Noise and Vibration Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
GNV1	15.5.1.1	Tunnels	Tunnel boring impacts	The principal mitigation measures aimed at minimising impacts are as follows: ▪ Advance public consultation and stakeholder engagement will be undertaken. These measures can greatly reduce the significance of groundborne noise effects, as building occupants would be prepared for the passage of the TBM and resultant elevated noise and vibration levels. ▪ TII will accept and consider applications for additional measures on a case-by case basis, in accordance with its Noise and Vibration Mitigation Policy (see Appendix A14.6: Airborne Noise and Groundborne Mitigation Policy). ▪ With regard to vibration effects on the use of sensitive equipment, there is potential to plan the passage of the TBM during weeks when critical use of the equipment can be avoided. The programme for the TBM will be planned by the contractor. Consultation will be undertaken with TCD as soon as this programme is available to ensure that sensitive research operations on the campus do not coincide with the passage of the TBM.	Construction Phase
GNV2	14.5.1.2	Tunnels	Blasting impacts	Mitigation measures to reduce the impact of blasting entail the following: ▪ Prepare a correct blast design based on a survey of the rock face profile prior to design. ▪ Minimisation of the explosive charge per delay. This could involve the following: - Reducing the drilling diameter of the hole for explosives. - Shortening the length of the holes for explosives; - Initiating charges at different times; and - Using the maximum number of detonators possible. ▪ ~~Choose an~~An effective delay time between holes and rows will be chosen which would avoid wave interaction and give good rock displacement. ▪ ~~Set the explosive~~Explosive initiation sequence will be set in a way that it progresses away from the structures to be protected. ▪ ~~Use an~~An adequate powder factor (weight of explosives per volume of excavated material) will be used. When the powder factor is lower than what is needed, the increase in charge confinement leads to an increase in intensity of vibrations. Excessive consumption will create an unnecessary overload, accompanied by great disturbing effects. ▪ Create shields or discontinuities between the structures to be protected and the blasting. ▪ Monitoring of blasting and re-optimising the blast design considering the results, changing conditions and experience ~~would~~will be carried out as standard.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Increase confinement of the explosive charges with a long stemming height (more than 25 times the hole diameter, but not excessive) and use adequate, inert material. ▪ Place barriers between blasting area and sensitive receptors if required. ▪ Cover the blasting area carefully with a blast mat or similar. ▪ Cover the voids and use acoustic sheds, if required. It should be noted that the impact of air overpressure as an effect of blasting accompanying ground vibration is strongly dependent on the degree of confinement of the blast. In the assessment carried out, "total confinement" as defined in the IEEE Blaster's Handbook 18th edition has been assumed, and that represents the maximum available mitigation for air overpressure. Notwithstanding the implementation of the above measures, potential significant impacts have been identified at six receptors where preconstruction condition surveys will be undertaken, and any required pre-construction repair work identified and undertaken. The receptors identified in Chapter 14 (Groundborne Noise & Vibration) Section 14.4 ~~are listed:~~. ~~▪ Our Lady Queen of Heaven Church;~~ ~~▪ St Joseph's Church;~~ ~~▪ 42 O'Connell Street; and~~ ~~▪ Dublin Fire Brigade HQ; and Charlemont station new oversite development.~~ Should the above-mentioned mitigation measures not result in a significantly reduced noise and vibration levels such that they are still above the criteria set, then alternative non-explosive excavation methods will be used such as the following: ▪ ~~–~~Use of non-explosive blasting techniques, such as expanding grout or rock sawing; and ▪ ~~–~~Use of Mechanical excavation instead of blasting. However, avoidance of blasting would mean extended periods of groundborne noise and vibration impact as alternatives such as mechanical excavation would result in protracted effects throughout the working times over a long period. However, the use of expanding grout and sawing as a means of rock breaking may mitigate the effect at the expense of a protracted programme.	
GNV3	14.5.1.3	Throughout (as required)	Mechanical Excavation	▪ Rock excavation by means other than blasting ~~may~~will be carried out using a road header, in which case no mitigation measures other than controls on times of working are available. During the construction phase, where a contractor has no option but to use plant and equipment such as hydraulic breakers or percussive piling rigs, these can be used as a last resort, but only with the prior agreement with the local authority. The contractor ~~would~~will be required to comply with all limits and restrictions required by the local authority to allow the work to proceed. ▪ The amount of rock to be removed using such a machine may be reduced by first breaking the rock using techniques such as expanding grout (in which case the main source of groundborne	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				noise and vibration is drilling holes for the grout) or sawing, which causes relatively low levels of groundborne noise and vibration.	
GNV4	14.5.2	Throughout (as required)	Operational Phase Noise/Vibration	▪ With regard to all but a limited number of sensitive receptors, no significant effects are predicted during the Operational Phase. There are some locations where an enhanced track support system will be required. ▪ In the case of buildings that are sensitive to groundborne noise, including buildings containing particularly sensitive equipment as well as large auditoria and studios, mitigation in the form of floating slab track will be incorporated into the design to remove any significant effects during the operational phase. The sections of the tunnel where mitigation in the form of floating slab track, or other track support measures are required are summarised in Chapter 14 (Groundborne Noise & Vibration) Table 14 .47. ▪ With regard to sensitive laboratory equipment, detailed building-specific numerical modelling will be required to establish the likely exceedance of equipment specifications, and to find the optimum specification for the track support system to minimise exceedances. Mitigation at the receptor for specific rooms within sensitive buildings in the form of the installation of base-isolated foundation slabs to support the equipment may also be required. ▪ As the specific sensitive equipment in use at TCD is expected to change between the time of ~~this~~the assessment and the opening of the proposed Project~~.~~, close consultation ~~should~~will be undertaken between TII and TCD in relation to the specifically sensitive rooms. ▪ ~~The sections of the tunnel where mitigation in the form of floating slab track, or other track support measures are required are summarised in Chapter 14 (Groundborne Noise & Vibration) Table 14 .47.~~	Operational Phase
GNV5	14.5.2	Throughout (as required)	Operational Phase Noise/Vibration	▪ In the case of buildings that are sensitive to groundborne noise, including buildings containing particularly sensitive equipment as well as large auditoria and studios, mitigation in the form of floating slab track will be incorporated into the design to remove any significant effects during the operational phase. ▪ With regard to sensitive laboratory equipment at TCD, detailed building-specific numerical modelling will be required to establish the likely exceedance of equipment specifications, and to find the optimum specification for the track support system to minimise exceedances.	Operational Phase

31.10 Biodiversity

Table 31.8: Biodiversity Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
B1	NIS Chapter 6	European designated sites	European designated sites: No significant air quality impacts to ecological receptors. Mitigation measures are recommended to minimise emissions.	▪ Implementation of an outline CEMP (Appendix A5.1) to protect the environment from construction-related activities, to include: - Measures to control surface water runoff from the construction site to prevent an accidental pollution event affecting sensitive habitats – see also Table 31.11 and Section 18.6 of Chapter 18 (Hydrology); - Measures to manage and treat groundwater discharges to surface water during construction – see also Table 31.12 and Section 19.6 of Chapter 19 (Hydrogeology); - Measures to control dust emissions during construction to prevent impacts to vegetation / habitats – see also Table 31.9 and Section 14.6 of Chapter 16 (Air Quality); and - Measures to avoid the introduction or spread of non-native invasive plant species in the Non-native Invasive Species Management Plan (Appendix A15.8) in the outline CEMP.	Construction phase
B2	15.5.2.1.1, NIS Section 6	European designated sites	European designated sites: Habitat degradation as a result of hydrological impacts Habitat degradation as a result of hydrogeological impacts Habitat degradation as a result of the introduction and / or spread of non-native invasive plant species.	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology). ▪ As outlined in the Non-native Invasive Species Management Plan (Appendix A15.8), ongoing operational monitoring will be undertaken for the presence and/or absence of non-native invasive species identified within the ZOI of proposed Project. ▪ If any non-native species are confirmed to be present, they will be treated accordingly to ensure they are eradicated and do not spread.	Operation phase
B3	15.5.1.1.2 and NIS Chapter 6	Natural Heritage Areas and proposed Natural Heritage Areas	NHAs and pNHAs:	▪ Mitigation measures as described above for European designated sites. ▪ Mitigation measures for the Sluice River Marsh pNHA, Santry Demesne pNHA, Royal Canal pNHA and Grand Canal pNHA: ▪ Measures to control dust emissions during construction to prevent impacts to vegetation / habitats within these pNHAs. ▪ Measures to avoid the introduction or spread of non-native invasive plant species to these pNHA during construction. These are detailed in	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				the Non-native Invasive Species Management Plan (Appendix A15.8) which forms part of the outline CEMP (Appendix A5.1). ▪ Measures to control surface water runoff from the construction site to prevent an accidental pollution event affecting sensitive habitats within these pNHA – see Table 31.11 and Section 18.6 of Chapter 18 (Hydrology); and, ▪ Measures to manage and treat groundwater discharges to surface water during construction – see Table 31.12 and Section 19.6 of Chapter 19 (Hydrogeology).	
B4	15.5.2.1.2.	Natural Heritage Areas and Proposed Natural Heritage Areas	NHAs and pNHAs: Non-native invasive species, Habitat degradation, Water quality	▪ Measures to avoid the introduction or spread of non-native invasive plant species to these pNHA during operation; ▪ Measures to control surface water runoff during operation to prevent an accidental pollution event affecting sensitive habitats within these pNHA – see Table 31.11 and Section 18.6 of Chapter 18 (Hydrology); and, ▪ Measures to manage and treat groundwater discharges to surface water during operation – see Table 31.12 and Section 19.6 of Chapter 19 (Hydrogeology).	Operational phase
B5	15.5.1.2.1 and Figure 15.14	Throughout (as required): Above ground construction sites	Habitats: Loss of habitats	▪ To minimise the loss of ecologically valuable habitats, areas of these habitat types within the proposed Project boundary but which are required to construct the Project ~~would~~will be retained and fenced off for the duration of construction. These areas ~~would~~will also not be directly impacted during the operation of the proposed Project. ▪ To minimise the loss of habitat associated with the proposed Project, there are also areas within the proposed Project boundary which are included for mitigation planting where general construction works ~~would~~will not be undertaken. ▪ Woodland, scrub, treelines and hedgerows which lie within, or along the proposed Project boundary that are not directly impacted by the proposed Project alignment or drainage will be retained. These areas will be protected for the duration of construction works and fenced off at an appropriate distance. ▪ Areas of river channel and bankside vegetation which lie within or along the boundary of the proposed Project, but which will not be directly impacted by the proposed Project alignment or drainage, will	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				be retained. These areas will be protected for the duration of construction works and fenced off at a distance of c. 5m from the stream/riverbank.	
B6	15.5.1.2.2	General: Above ground construction sites	Habitats: Vegetation to be retained	▪ Any vegetation (including trees, hedgerows or scrub adjacent to, or within, the proposed Project) which is to be retained shall be afforded adequate protection during the construction phase in accordance with the *Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes* (NRA, 2006c). ▪ All trees along the proposed Project that are to be retained, both within and adjacent to the proposed Project boundary (where the root protection area (RPA) of the tree extends into the proposed Project red line boundary), will be fenced off at the outset of works and for the duration of construction to avoid structural damage to the trunk, branches or root systems of the trees. Temporary fencing will be erected at a sufficient distance from the tree so as to enclose the RPA of the tree. The RPA will be defined based upon the recommendation of a qualified arborist. ▪ Where fencing is not feasible due to insufficient space, protection for the tree/hedgerow will be afforded by wrapping hessian sacking (or suitable equivalent) around the trunk of the tree and strapping stout buffer timbers around it. ▪ The area within the RPA will not be used for vehicle parking or the storage of materials (including soils, oils and chemicals). The storage of hazardous materials (e.g. hydrocarbons) or concrete washout areas will not be undertaken within 10m of any retained trees, hedgerows and treelines. ▪ A qualified arborist shall assess the condition of, and advise on any repair works necessary to, any trees which are to be retained or that lie outside of the proposed Project boundary but whose RPA is impacted by the works. Any remedial works required will be carried out by a qualified arborist. ▪ A buffer zone of at least 5m will be maintained between construction works and retained hedgerows to ensure that the root protection areas are not damaged.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
B7	15.5.1.2.3	General: Above ground construction sites	Habitats: Air Quality – dust emissions	▪ To control dust emissions during construction works standard mitigation measures will be undertaken which are outlined in Table 31.9 and detailed in Section 16.6 in Chapter 16 (Air Quality). ▪ Any blasting will be completed by specialised contractors with a specific Blasting Dust Management Plan; Hoarding will be provided around the construction compounds. ▪ In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations. ▪ A Demolition Dust Management Plan will be prepared by the contractor outlining measures to ensure that dust pollution from demolition activities will be limited. A Pollution Prevention Plan will also be prepared by the contractor to management any potential sources of pollution.	Construction phase
B8	15.5.1.2.4 and 15.5.1.2.5	Water bodies	Habitats: Water Quality in surface waters Groundwater Quantity and Quality	▪ The mitigation measures to protect surface water and groundwater during construction are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology). ▪ An Emergency Incident Response Plan will be implemented detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, logging of non-compliance incidents and any such risks that could lead to a pollution incident, including flood risks (refer to Section 4.3 and 5.9 of the outline CEMP in Appendix A5.1). ▪ A Sediment Erosion and Pollution Control Plan shall be implemented (refer to Section 6.4 of the outline CEMP in Appendix A5.1). This shall include water quality monitoring and method statements to ensure compliance with environmental quality standards specified in the relevant legislation (i.e. surface water regulations and Salmonid Regulations 1988). ▪ A Pollution Prevention Plan, Groundwater Monitoring Plan and Pollution Incident Control Plan will be prepared by the contractor outlining measures to ensure protection of ground water during construction.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
B9	15.5.1.2.6	General	Habitats: Spreading of non-native invasive plant species	▪ A Non-native Invasive Species Management Plan has been prepared (Appendix A15.8) and included in the outline CEMP (Appendix A5.1) and will be implemented sufficiently far in advance of the proposed construction works commencing so as to allow time to control adequately all target non-native invasive plant species populations within the ZOI of the proposed Project, having regard to the specific timing/seasonal constraints that apply in relation to each individual species. ▪ As species may have spread, or their distribution may have changed, between the habitat surveys carried out for this EIAR and the commencement of construction works, the implementation of the Non-native Invasive Species Management Plan will include a pre-construction re-survey within the proposed Project boundary. ▪ Noxious weed or non-native invasive plant species material arises, will be disposed of in accordance with good practice to avoid unintentional spread. ▪ Care will be taken near watercourses as water is a fast medium for the dispersal of plant fragments and seeds. ▪ Material that contains flower heads or seeds will be disposed of either by composting or burial at a depth of no less than 0.5m in the case of noxious weeds, or by incineration (at a licensed facility having regard to relevant legislation) or disposal to licensed landfill in the case of non-native invasive plant species. ▪ Taproots of docks and roots of creeping thistle will require disposal to landfill, incineration or burying at a depth of no less than 1.5m (practical only during the construction phase), as they are not suitable for composting or shallow burial. ▪ Where burial is being used to dispose of Japanese knotweed, the material will be buried to a depth of 5m and overlain with a suitable geotextile membrane. ▪ All disposals will be carried out in accordance with the Waste Management Acts 1996-2011. ▪ In relation to aquatic non-native invasive plant species, all construction works and any aquatic survey work that may be carried out (e.g.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				electrofishing), will comply with best practice biosecurity protocols for aquatic work.	
B10	15.5.2.2.2	Throughout (as required)	Habitats: Control and prevent the spread of non-native invasive plant species	▪ As outlined in the Non-native Invasive Species Management Plan (Appendix A15.8), ongoing operational monitoring will be undertaken for the presence and/or absence of non-native invasive species identified within the ZOI of proposed Project. ▪ If any non-native species are confirmed to be present, they will be treated accordingly to ensure they are eradicated and do not spread.	Operational phase
B11	15.5.1.3.1 and 15.5.2.3.1	Throughout (as required)	Rare and protected plant species: Habitat Degradation	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction and operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Construction and operational phases
B12	15.5.1.4.1	Watercourses	Otters: Habitat degradation – water quality	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined in Tables 31.11 and 31.12 and detailed in section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Construction phase
B13	15.5.1.4.	Throughout (as required)	Otters: Loss of breeding and resting sites for otters	▪ Based on the findings of the field surveys carried out, as there were no otter breeding or resting places, holt or couch sites present within the footprint of the proposed Project boundary, there will be no loss of such sites as a result of construction works. ▪ As otter could potentially establish new holt or couch sites within the ZOI of the proposed Project in the future, a pre-construction check of all suitable otter habitat will be required within 12 months of any construction works commencing. The presence of any new holt/couch sites will be treated and/or protected in accordance with the *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes* (NRA 2008c).	Construction phase
B14	15.5.1.4	Royal Canal Basin	Otters: Habitat Severance / Barrier effect for otters	▪ As the Royal Canal Basin located between Lock 5 and Lock 6 will be dewatered for a period of six months, temporary mammal-resistant fencing will be erected at the dewatered basin in order to provide a safe path for commuting otter, guiding them from west of Lock 6 towards Lock 5, where they would be expected to navigate around the lock gate (given their current known commuting behaviour along the	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				canal), under the Cross Guns Bridge over Prospect Road and move towards Lock 4. ▪ The location and design of this temporary fencing/path will be agreed by the contractor in consultation with a suitably qualified ecologist. It will be installed in accordance with the specification outlined in *Guidelines for the Treatment of Otters prior to the Construction of the National Road Schemes* (NRA 2008c) and TII's mammal resistant fencing specification. It will also be regularly inspected by an ecologist over the six-month period to ensure its effectiveness and if necessary, adjustments will be made to maintain functioning.	
B15	15.5.2.4.1	Water bodies	Otters: Habitat degradation – water quality	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Operational phase
B16	15.5.2.4.2	Sluice River Throughout (as required)	Otters: Otter habitat fragmentation and disturbance on migration paths	▪ The two proposed permanent culverts on the Sluice River and one of its tributaries, at Ch. 5+963 and Ch. 5+762, have the potential to create a permanent barrier to otter movement in the locality. In order to maintain connectivity, these culverts include a raised mammal ledge suitable for otter to move along and allowing them to access the watercourse both upstream and downstream of the proposed crossing point.	Operational phase
B18	15.5.1.5	Throughout (as required)	Bats: Impacts on bats – buildings to be demolished	Two buildings with potential bat presence were not surveyed for bats as access was not permitted by the owner. As a precaution the following actions will be implemented at these buildings prior to demolition works taking place in order to ensure no impacts on any roosting bats: ▪ Any suitable roosting space within the buildings are examined by a suitably qualified ecologist for the presence/absences of bats. ▪ Post-emergence and/or re-entry surveys are undertaken by a suitably qualified ecologist at the buildings to confirm presence/absences of bats (as per guidelines set out in Bat Conservation Trust, 2016). ▪ Depending on the results of these surveys, suitable mitigation measures may be devised by a suitably qualified ecology and implemented to ensure no potential impacts on bats.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
B19	15.5.1.5.1	Throughout (as required)	Bats: Impact of the proposed felling on potential tree bat roosts	The following mitigation procedures will be implemented. ▪ Felling of confirmed and potential tree roosts will be undertaken during the period September – October as during this period bats are capable of flight and may avoid the risks from tree felling if proper measures are undertaken, but also are neither breeding nor in hibernation. ▪ Prior to felling of confirmed and potential tree roosts, an emergence survey using infra-red illumination and video camera(s) and bat detectors will be carried out on the night immediately preceding the felling operation to determine if bats are present. ▪ Where it is safe and appropriate to do so for both bats and humans, such trees ~~may~~will be felled using heavy plant to push over the tree. In order to ensure the optimum warning for any roosting bats that may still be present, the tree will be pushed lightly two to three times, with a pause of approximately 30 seconds between each nudge to allow bats to become active. The tree would then be pushed to the ground slowly and would remain in place until it is inspected by a bat specialist. ▪ Trees would only be felled "*in section*" or "*soft felled*" where the sections should be rigged to avoid sudden movements or jarring of the sections. ▪ Where remedial works (e.g. pruning of limbs) is to be undertaken to trees deemed to be suitable for bats, the affected sections of the tree will be checked by a bat specialist (using an endoscope under a separate derogation licence held by that individual) for potential roost features before removal. For limbs containing potential roost features high in the tree canopy, this will necessitate the rigging and lowering of the limb to the ground (with the potential roost feature intact) for inspection by the bat specialist before it is cut up or mulched. If bats are found to be present, they will be removed by a bat specialist licensed to handle bats and released in the area in the evening following capture. ▪ As part of the landscape design of the proposed Project, woodland and treelines will be created across the study area. In order to mitigate for the loss of trees that may be potential bat roosts due to the presence of potential bat roost features, a total of 30 of 2F Schwegler bat boxes	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				will be erected on retained trees that are located within close proximity to the trees being felled.	
B20	15.5.1.5.2	Throughout (as required)	Bats: Roost Loss – Hibernating bats	▪ Where possible the demolition of suitable buildings/structures for hibernating bats would be avoided during the hibernation period (i.e. optimal period November to March) (Bat Conservation Trust 2016). Where this is not an option, suitable buildings/structures will be checked by a suitably qualified ecologist for the presence of hibernating bats prior to demolition and if encountered bats will be moved to a suitable bat hibernation box.	Construction phase
B21	15.5.1.5.3	Throughout (as required)	Bats: Disturbance/displacement related to the lighting	▪ Any lighting required during construction will be positioned and directed away from any sensitive ecological features located beyond the construction compound (such as per sensitive bat areas), to avoid unnecessary light spill and disturbance. ▪ A Lighting Management Plan will be prepared by the contractor for each relevant location and this will include details on how the lighting will be managed to avoid light spill and potential impacts. A suitably qualified bat ecologist will review and input into this Lighting Management Plan.	Construction phase
B22	15.5.2.5	Throughout (as required)	Bats: Disturbance/displacement of bats due to lightning	▪ A detailed operational lighting design will be prepared for each relevant location and this will include details on how the lighting will be managed to avoid light spill and potential impacts. A suitably qualified bat ecologist will review and input into this detailed lighting design. ▪ The following of elements of the operational lighting design will ensure minimal impacts on bats from light disturbance: - All proposed lighting will be from a LED light source, which is a more bat-friendly light source as it contains very little/no UV frequency lighting that bats are particularly sensitive to (BCI, 2010); - Lighting will include an automatic dimming and switching off mechanism in order to reduce the duration of light disturbance as much as possible; - Lighting will be directional, i.e. there will be no upward light projection and lighting will not be projected behind lighting columns in order to reduce any backward lighting and any obtrusive lighting into adjacent areas; and	Operational phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- Where possible, the shortest lighting columns will be used to further reduce any light spill.	
B23	15.5.1.6	Throughout (as required)	Badger	▪ As the usage of setts by badgers should change over time, a pre-construction check of the activity status of all setts will be required within 12 months of any constructions works commencing, including a pre-construction survey for the presence of any new setts located within the ZoI.	Construction phase
B24	15.5.1.6.1	Throughout (as required)	Badger: Badger disturbance / displacement	▪ In order to prevent any disturbance to badger setts not directly affected by the proposed Project, no heavy machinery ~~shall~~will be used within 30m of badger setts at any time. The only exception to this may be the proposed ESBN works proposed north of the R139 located within c. 24m of a badger sett. ▪ No works ~~shall~~will be undertaken within 50m of active setts during the breeding season (December to June inclusive). ▪ Lighter machinery (generally wheeled vehicles) ~~shall~~will not be used within 20m of a sett entrance. ▪ Neither blasting nor pile driving ~~shall~~will be undertaken within 150m of active setts during the breeding season (December to June inclusive). ▪ Prior to works commencing, a non-interference zone of 30m will be established around each of the Badger setts within the ZOI of the proposed Project. If the sett is active, a non-interference zone will be extended to 50m during the breeding season (December to June inclusive). The fencing ~~shall~~will be of a sufficient durability to maintain the exclusion zone throughout the construction period or, if required, until such time as the sett in question is excluded/removed. ▪ A suitably qualified ecologist will inspect the excavation of the trenches required to lay the ESBN cable, located north of the R139, to ensure that there are no impacts on the badger sett, locate c. 24m west of the proposed Project.	Construction phase
B26	15.5.1.7.1 and 15.5.2.61	Water bodies	Other Mammal species Habitat Degradation – Water Quality	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction and operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Construction and operation phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
B27	15.5.1.8.1 and 15.5.2.7.1	Water bodies	Freshwater molluscs Habitat Degradation – Water Quality	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction and operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Construction and Operational phases
B28	15.5.1.9.1	Throughout (as required)	Breeding birds Habitat, Loss, Disturbance and Destruction of Breeding Bird Habitat	▪ ~~Where feasible, vegetation~~Vegetation (e.g. hedgerows, treelines, parkland, woodland, scrub and grassland) will not be removed, between 1 March and 31 August, to avoid direct impacts on nesting birds. Where the construction programme does not allow this seasonal restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. ▪ Areas found not to contain nests will be cleared within three days of the nest survey, otherwise repeat surveys will be required until the chicks have fledged.	Construction phase
B29	15.5.1.9.2 and 15.5.1.10.1	Water bodies	Breeding Birds / Wintering Birds Habitat Degradation – Water Quality	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Construction and Operational phase
B30	15.5.2.8.1	Throughout (as required)	Birds: Impact on breeding birds	▪ Planting of woodland, hedgerow and grassland habitats within the proposed Project boundary as detailed in the photomontages in Chapter 27 (Landscape and Visual) and will provide suitable compensatory habitat for the breeding bird species recorded within the study area. ▪ Many species may not nest in close proximity to the above-ground sections of the railway due to disturbance (e.g. drowning out of bird song by train noise). Whilst the planting is not likely to fully offset the loss of breeding habitat (due to the proximity of train traffic disturbance on the operational road) it is likely to provide additional foraging habitat for some species. ▪ To further minimise the effects of breeding-habitat loss, a total of 250 nest boxes will be erected under the guidance of a qualified ecologist in suitable locations away from the above ground sections of the proposed Project. The siting and type of nest boxes will be decided on	Operational phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				by an ecologist at locations where trees will be planted or retained along the proposed Project.	
B31	15.5.2.8.2 and 15.5.2.9.1	Water bodies	Breeding birds – Water Quality Wintering birds – Habitat Degradation – Surface Water	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Operational phase
B32	15.5.1.11.1	Throughout (as required)	Amphibians: Amphibian habitat loss, disturbance and mortality risk	▪ If works to clear any of the habitat features suitable to support amphibian species are to begin during the season where frogspawn or tadpoles may be present (i.e. February to mid-summer), or where breeding adult newts, their eggs or larvae may be present (i.e. mid-March to September), a pre-construction survey will be undertaken to determine whether breeding amphibians are present. ▪ In the case of common frog, any frog spawn, tadpoles, juvenile or adult frogs present will be captured and removed from affected habitat by hand net and translocated to the nearest area of available suitable habitat, beyond the ZOI of the proposed Project. ▪ In the case of smooth newt, individuals will be captured and removed from affected habitat either by hand net or by trapping and translocated to the nearest area of available suitable habitat, beyond the ZOI of the Project. If used, the type and design of traps ~~shall~~will be approved by the National Parks and Wildlife Service (NPWS). This is a standard and proven method of catching and translocating smooth nest. ▪ If the size or depth of the water feature is such that it cannot be determined whether all amphibians have been captured, it will be drained under the supervision of a suitably experienced ecologist to confirm that no amphibian species remain before it is destroyed or infilled. Any mechanical pumps used to drain the water feature will have a screen fitted, and be sited, such that no amphibian species should be sucked into the pump mechanism. ▪ Any capture and translocation works ~~shall~~will be undertaken immediately in advance of site clearance/construction works commencing.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
B33	15.5.1.11.2 and 15.5.2.10	Water bodies	Amphibians: Habitat Degradation – Surface Water Quality	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology).	Construction phase and Operational Phase
B34	15.5.1.12.1	Throughout (as required)	Reptiles: Reptile habitat loss, disturbance and mortality risk	▪ In order to minimise the risk of site clearance and construction works disturbing, or causing the mortality of, common lizard, the following schedule of site clearance works will be followed in the areas, where the presence of common lizard has been confirmed: - Grass or scrub vegetation will be removed during the winter period, where possible, avoiding potential common lizard hibernacula sites (dry sites which provide frost-free conditions e.g. stone walls, underground small mammal burrows, piles of dead wood or rubble). - Where this is not possible and clearance will be undertaken during the active season (i.e. March through to September, inclusive), vegetation will be cut first to c. 15cm, and then to the ground, under supervision of an ecologist. This will allow the opportunity for lizards to be displaced by the disturbance and leave the affected area. - Potential hibernacula sites (e.g. areas of rubble, wood and/or soil located close to vegetated areas) will be removed during the active season (i.e. March through to September, inclusive) under the supervision of an ecologist, when they are less likely to be in use by torpid lizards.	Construction phase
B35	15.5.1.13.1-4	Water bodies	Fish: Fish habitat loss, habitat degradation – water quality, mortality risk and disturbance / displacement	▪ To minimise the effects of habitat loss on fish species, all sections of river/stream channel within the proposed Project boundary, but not within the footprint of the proposed Project and associated infrastructure, will be protected from site clearance and construction works. Rivers/streams will be fenced off at a minimum distance of 5m from the riverbank and within this zone the natural riparian vegetation will be retained. ▪ The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology). ▪ To minimise the potential effects of construction works on fish mortality risk and disturbance / displacement:	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- No instream works will be carried out between the months of October and June (inclusive) to avoid the most sensitive time for fish species and fish species movements. - Immediately prior to rivers/streams being diverted into a newly constructed river channel or culvert, they will be electro-fished (if required) to capture and transfer fish from the original channel to the new one. Once the watercourse has been diverted this will be followed by a manual search of the original watercourse to transfer any remaining fish to the new river/stream channel. - Any water abstraction points required for dust suppression will be agreed with IFI and the suction head shall be screened to ensure that fish are not removed during the abstraction process. ▪ To address habitat severance / barrier effect, all temporary crossing structures used to cross watercourses during construction will be in accordance with the *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016) and *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes* (NRA 2008d) to maintain fish passage, and to prevent sedimentation and erosion.	
B36	15.5.2.11.1	Water bodies	Fish: Fish Habitat Degradation – Surface Water	▪ The mitigation measures relating to the protection of water quality in receiving watercourses during operation are outlined in Tables 31.11 and 31.12 and detailed in Section 18.6 of Chapter 18 (Hydrology) and Section 19.6 of Chapter 19 (Hydrogeology).	Operational phase
B37	15.5.2.11.2	Water bodies	Fish: Fish habitat severance and barrier effect	▪ All structures at water crossings will be further developed in consultation with IFI and the design criteria set out in *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes* (NRA, 2008d) and the *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016). This will maintain fish passage during the proposed Project and result in a neutral impact to fish species.	Operational phase

31.11 Air Quality

Table 31.9: Air Quality Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
AQ1	16.6.1	Throughout (as required)	Dust emissions	▪ Preparation, approval to the relevant planning authority and implementation of an air quality management plan as part of the outline CEMP. The plan ~~must~~will include all appropriate dust and emissions mitigation measures including for asbestos and aspergillus, applicable to the circumstances of the relevant site, based on the local authority requirements and industry best practices. The plan will be developed by the contractor and for each worksite ~~shall~~ and will include: - ~~▪~~ An inventory and timetable of activities which may give rise to emissions or dust; - ~~▪~~ Alert levels; - ~~▪~~ Alert system to be used (including notification process); - ~~▪~~ Details of control measures; - ~~▪~~ Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used; - ~~▪~~ Details of the air quality reporting requirements~~;~~. - ~~▪~~ In order to ensure that no dust nuisance occurs, a series of measures will be implemented, these have been detailed in Appendix A16.4. In summary, the measures which will be implemented will include: Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; - ~~▪~~ Any blasting will be completed by specialised contractors with a specific blasting dust management plan; - ~~▪~~ Liaison with local authorities and community groups; - ~~▪~~ Hoarding will be provided around the construction compounds; - ~~▪ It is anticipated that methods~~Methods of collecting rainwater and recycling for general site use, will be adopted where practical. Requirements for dewatering installations at deep station and tunnel portals can also provide a valuable source of water for general site use; - ~~▪~~ Strict dust prevention will be in place at all times, to minimise any potential emissions and these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations; and	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- ~~▪~~ Consistent Implementation of good dust minimisation practices will ensure that the impact from construction dust is long-term, localised, reversible and not significant when considered with respect to the Environmental Protection Agency description of effects (EPA 2022).	
AQ2	16.6.1	Throughout (as required)	Asbestos from the buildings to be demolished	▪ A Demolition Survey of all buildings to be demolished will be ~~required~~undertaken prior to commencement of the demolition works. This will include a fully intrusive asbestos containing materials survey which will involve destructive inspection. ▪ Prior to commencement of the demolition works, all asbestos containing materials identified by the Management Asbestos Survey and Refurbishment and Demolition Survey will be removed by a suitably trained and competent person. ▪ Asbestos containing materials will only be removed from site by a suitably permitted/licensed waste contractor and will be brought to a suitably licensed facility. ▪ The Health and Safety Authority will be contacted where needed in relation to the handling of asbestos and material will be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, as amended and associated approved Codes of Practice.	Construction phase
AQ3	16.6.1	Throughout (as required)	Aspergillus emissions	▪ In relation to Aspergillus, survey and prevention works will take place before construction commences by a competent contractor in proximity to any sensitive buildings and in particular in proximity to the Mater Hospital site which utilises passive ventilation on Eccles Street. ▪ The prevention works will involve sealing the windows to the facades that are in close proximity to the hospital. These measures will also prevent fugitive dust entering the hospital through windows. These works will form part of an Aspergillus Prevention Plan to be completed by a specialist with the aim of preventing the spread of Aspergillus spores. ▪ The mitigation measures put in place to control construction dust will also be considered as mitigation measures with respect to Aspergillus as they will minimise the potential for spread of the fungal spores. ▪ The National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities (National Disease Surveillance Centre 2002) and National Guidelines for the Prevention of Nosocomial Aspergillosis (HSE 2018) will be taken into consideration by the competent contractor as a source for the Aspergillus Prevention Plan.	Construction phase
AQ4	16.6.1	Throughout (as required)	Road traffic impacting human and ecological receptors	▪ ~~Implement a policy which prevents idling~~Idling of vehicles both on and off-site including HGV holding sites will not be permitted. ▪ Construction phase traffic will be monitored to ensure construction vehicles are using the designated haul routes.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Additional vehicular traffic will be managed through the Construction Environmental Management Plan and Temporary Traffic Management Plans for the proposed Project and stations as per Chapter 9 (Traffic & Transport). ▪ Efficient scheduling of deliveries to minimise number of deliveries will be required, and in turn their emissions. ▪ Construction ~~vehicles~~vehicle emissions will conform to the current EU emissions standards and ~~where reasonably practicable,~~ their emissions should meet upcoming standards prior to the legal requirement date for the new standard.	
AQ5	16.6.1	Throughout (as required)	Dust from HGV deliveries to/from the site	▪ HGV traffic leaving ~~site~~the main construction compounds will pass through a wheel wash. ▪ Public roads outside the site will be regularly inspected for cleanliness and cleaned ~~as necessary~~regularly. If public roads are deemed to require additional cleaning ~~where possible~~, a suction device for road cleaning will be utilised should access spaces around cars and other street furniture more effectively. ▪ During movement of materials both on and off-site, trucks will be covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.	Construction phase

31.12 Climate

Table 31.10: Climate Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
C1	17.6.2	Throughout (as required)	Traffic mitigation measures Emission of GHG	▪ The proposed Project sets out mitigation measures with respect to the Construction and Operational Phases in order to reduce its impact on climate related GHG emissions by implementing low-carbon energy options. The IEMA GHG Management Hierarchy (IEMA 2020b) has been followed for impact minimisation. The Hierarchy is as follows: First Eliminate - Influence business decisions/use to prevent GHG emissions across the lifecycle - Potential exists when organisations change, expand, rationalise or move business - Transition to new business model, alternative operation or new product/service Then Reduce - Real and relative (per unit) reductions in carbon and energy - Efficiency in operations, processes, fleet and energy management - Optimise approaches (e.g. technology) and digital as enablers - If you can't eliminate or reduce, then Substitute - Adopt renewables/low-carbon technologies (on site, transport etc) - Reduce carbon (GHG) intensity of energy use and of energy purchased - Purchase inputs and services with lower embodied/embedded emissions The final option is to Compensate - Compensate 'unavoidable' residual emissions (removals, offsets etc) - Investigate land management, value chain, asset sharing, carbon credits - Support climate action and developing markets (beyond carbon neutral) ▪ The hierarchy states where possible the aim is to design out and eliminate potential impacts completely. Where this is not possible impacts should be reduced/substituted to reduce impacts. Finally, if impacts cannot be eliminated by design or reduced/substituted then the IEMA GHG Management Hierarchy final mitigation measure that should be considered is compensation, this includes the use of carbon offsets. ▪ Construction vehicles, generators etc., will give rise to some greenhouse gas (GHG) emissions however the proposed Project's impact on climate due to traffic can be minimised through mitigation measures. ▪ The following mitigation measures will be put in place to minimise emissions:	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ ~~Implement~~Implementation of a policy which prevents idling of vehicles both on and off-site including HGV holding sites. ▪ Construction phase traffic will be monitored to ensure construction vehicles are using the designated haul routes in order to minimise unnecessary vehicle movements. ▪ All plant and machinery will be maintained and serviced regularly. ▪ Efficient scheduling of deliveries will be undertaken to minimise emissions. ▪ Construction vehicles ~~should~~will conform to the current EU emissions standards and ~~where reasonably practicable,~~ their emissions ~~should~~will meet upcoming standards prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised. ▪ In addition, as part of the proposed Project a scheme traffic management plan will be put in place for the construction and Operational Phases, see Scheme Traffic Management Plan (STMP) which is included in Appendix A9.5 to Chapter 9 (Traffic & Transport). The Construction Traffic Management Plan (CTMP) will be put in place for the Construction Phase following consultation with local authorities. Regional roads, primary roads and sections of the M50 Motorway will be used at every opportunity in order to reduce traffic impacts on local roads with reduced capacity which may result in traffic congestion and associated increased emissions. In addition, the CTMP will minimize construction impacts on pedestrians, cyclists and on the operation of bus services which will ensure public transport remains a priority. ▪ A Mobility Management Plan (MMP) will also be put in place for the Construction Phase. This plan will support and promote sustainable travel for construction staff travelling to and from the proposed Project site. This will be achieved by setting out a strategy to eliminate barriers to sustainable travel modes, improving travel choices and significantly reducing single occupancy car trips. Parking will not be available at construction sites for workers. The MMP would be an active document that will require to be updated on a regular basis as construction activities take place and will present a series of measures designed to encourage travel to the constructions site(s) in a sustainable way.	
C2	17.6.2.1	Throughout (as required)	Embodied carbon mitigation measures	Elements that will mitigate construction carbon include: ▪ Implementation of a whole-life Carbon Management Plan aligned to PAS 2080 to inform the design, build and operation of MetroLink utilising TII's Carbon Assessment Tool.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Deliver a reduction in capital and embodied carbon against baseline produced in this chapter during detailed design. ▪ Integrate and maintain measures to manage construction and operational surface water and stormwater runoff. ▪ Undertake an updated Climate Change Risk Assessments for all assets and implement measures to mitigate identified impacts during detailed design and prior to the commencement of operation. ▪ Implement a Waste Management Plan for Construction and Demolition Waste to facilitate a maximum of 5% construction and demolition waste (non-hazardous) and 5% of operational waste (by weight / volume) disposed in landfill. ▪ Waste generated during the Construction Phase will be carefully managed according to the accepted waste hierarchy set out in the Waste Framework Directive (2008/98/EC), which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill. ▪ Undertake lifecycle assessments for major asset components and implement recommendations to influence procurement of low carbon/ sustainable materials and equipment. ▪ ~~Procure~~Procurement materials for major asset components that have verified Environmental Product Declarations. ▪ Specify the use of low carbon materials with a minimum of ~~20~~50% secondary and recycled content e.g. concrete or steel. ▪ Achieve a 25% reduction in mains water use during construction through the use of rainwater harvesting, water re-use and efficiency systems and devices at all work sites, stations and buildings. ▪ Materials will be reused as much as possible within the extent of the sites, in addition, materials will be sourced locally where possible to reduce the embodied carbon emissions associated with transport. ▪ Requiring operations to achieve high recycling rates with an aspiration to achieve zero waste directly to landfill. This will also include audits prior to any demolition/excavation to review for material that can be reused on site. The above mitigation measures will reduce the estimated embodied carbon associated with the construction phase. Further reductions should be achieved by the following:	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ The replacement, ~~where feasible,~~ of concrete with concrete containing up to 50% ground granulated blast furnace slag. ▪ Rainwater and pumped water from excavations will be collected and reused on site. This will account for at least 25% of the water required during the construction phase. ▪ The diversion of waste materials from landfill / incineration to re-use onsite or offsite or recycling of material. ▪ ▪ Corporate Power Purchase Agreement (CPPA) to use electricity generated from renewables for 100% of construction stage power which includes the energy to power the tunnel boring machine; ▪ CPPA to use electricity generated from renewables for 100% of operational power (the EIAR committed to 90%); ▪ The use, where practicable, during construction of low carbon concrete with an embodied carbon equivalent to a 50% GGBS replacement; ▪ The use in construction plant and equipment of sustainably sourced Hydrotreated Vegetable Oil (HVO) as a 100% replacement of fossil fuels; ▪ Procurement only from suppliers that meet the industry reduction requirements within the CAP for 10% reduction in embodied carbon by 2025. ▪ ~~Where generators are expected to be the only option for power supply at satellite compounds, the use of portable solar panels with battery packs, and (potentially) wind generators will be considered as alternatives to diesel power.~~ In addition to the commitment to use HVO rather than fossil fuels, TII will also, where feasible, mandate the use of electric construction plant and equipment so as to increase the potential saving.	
C3	17.6.2.2	Throughout (as required)	Climate Change Vulnerability Mitigation	▪ The proposed Project's vulnerability to the impact of climate change has been considered for the Construction Phase. The majority of mitigation measures with respect to the proposed Project's vulnerability to climate change are set out through management plans or assessments by other experts within the EIAR. Risk to the project due to climate change vulnerability and the potential mitigation measures are also set out in Chapter 29 (Interactions Between the Various Environmental Aspects). Mitigation measures such as those to manage flood risk and extreme weather events are incorporated in the Outline CEMP (Appendix A5.1), these mitigation measures include:	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ The Contractor will pay due consideration to the impacts of extreme weather events during the Construction Phase. The contractors will utilise available meteorological forecast data from Met Eireann or other approved provider of meteorological data to inform short to medium-term program management, environmental control and impact mitigation measures. A Severe Weather Management Plan will be ~~considered~~developed in order to ensure mechanisms are in place should this impact arise. The documents should contain plans and mitigation to prevent future impacts due to increasingly severe weather events. Further measures to reduce the Construction Phase risk are included in the Outline CEMP (Appendix A5.1); ▪ The Electricity & Gas Networks Sector Climate Change Adaptation Plan Prepared under the National Adaptation Framework has been prepared by the Department of Communications, Climate Action and Environment (DCCAE 2019b) which considers future climate change impacts on energy infrastructure and aims to reduce vulnerability by building resilience in the energy sector. Resilience built in the energy sector will assist with ensuring the availability of a stable electrical supply for the MetroLink; ▪ A Water Management Plan, Sediment Erosion and Pollution Control Plan, Groundwater Monitoring Plan and Construction Flood Protection Plan will be developed by the appointed contractor. Further measures to reduce the Construction Phase risk are included in the outline CEMP (Appendix A5.1).and Appendix A5.11 (Water Management); and ▪ Excavations will be waterproofed by using watertight retaining walls (diaphragm walls) to prevent water inflow into the station and the risk of settlement. In addition, flood protection barriers around sites with deep excavation such as underground stations and portals will be put in place. ~~Use robust~~Robust systems such as attenuation barriers around shaft and tunnel ~~entrance. Construction Flood Protection will form part of the Outline CEMP~~entrances. Impacts from flooding and potential mitigation measures are further detailed in Chapter 18 (Hydrology) Section 18.6.1 (Mitigation Measures) and Chapter 28 (Risk of Major Accidents and Disasters).	
C4	17.6.3.1	Throughout (as required)	Maintenance Phase Embodied Carbon Mitigation	▪ The maintenance phase GHG emissions will primarily consist of replacement of bitumen, cables, fence posts and lighting columns containing material as these materials have a lifespan that is shorter than the ~~60~~80-year lifespan assessed for the Operational Phase. In addition, there are ~~also~~ other consumables that require replacement for the MetroLink rail stock parts such as steel tyres, windows, seats, bogie parts. These materials will be	Operational phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				sourced based on the IEMA GHG Management Hierarchy principles (IEMA 2020b) and old parts will be reused or recycled, in as far as practicable reducing the amount of waste which will be disposed of to landfill.	
C5	17.6.3.2	Throughout (as required)	Operation of the Proposed Project	Elements that will mitigate operational carbon include: ▪ ~~Implement~~The implementation of a whole-life Carbon Management Plan aligned to PAS 2080 (Green Construction Board 2016) to inform the design, build and operation of MetroLink utilising TII's Carbon Assessment Tool; ▪ ~~Achieve Net Zero for operational energy by the design year of (2045) with a stretch aspiration to be close (>80%) to~~Achievement of Net Zero at start of operation (~~2030~~2035) through energy efficiency, innovation, green power purchases and offsetting residual emissions; ▪ Maintain measures to support Metrolink's resilience for a 1 in 1000-year flood event +40% for climate change; ▪ Regular maintenance to ensure drainage systems are not blocked by debris during heavy storms, this will ensure any allowances made for climate change related increases in the intensity of rainfall events and will be maintained; ▪ ~~Achieve a reduction~~Reduction in mains water use during operation through the use of rainwater harvesting, water re-use and efficiency systems and devices at all work sites~~, stations~~ and the Depot buildings. Wastewater from the vehicle washing plant will be treated and recycled in-situ to reduce water usage; ▪ ~~Requiring operations~~Operations to achieve high recycling rates with an aspiration to achieve zero waste directly to landfill; ▪ Within the proposed Project there is the ambition to achieve net zero carbon for operational energy by the ~~design year of (2045). Prior to this TII is exploring the purchase of up to 80% of its operational demand from certified low or zero carbon electricity for operations and, additionally, to research the feasibility of offsetting any residual emissions. A~~operational year of 2035. This will be through a Corporate Power Purchase Agreement (CPPA) is a financial contract with a renewable generator ~~that~~which will allow for a guaranteed source of renewable power for the operation of the Proposed Project in future. In addition, up to 10% of the power requirement will come from on-site generation of power (Solar PV) as shown in Table 17.20. Should there be a period where the on-site generation is not operating to full capacity, the shortfall to ensure 10% is met	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				can be made through Green Tariffs etc. ~~The remaining 10% of power will be required to be sourced from the National Grid~~; and ▪ Mitigation measures can also be applied to the power operational demand as metro systems offer an immediate opportunity for reducing energy requirements. This will be achieved on the proposed Project by the recycling of braking energy. When vehicles brake, their kinetic energy is converted into electricity and returned to the traction power line. The installation of reverse substations on the proposed Project system will offer the opportunity to reuse a portion of braking energy. Based on the inclusion of two reverse substations (at Dardistown and Charlemont) it is estimated that the system could potentially regenerate 0.119MW. This recovery equates to 0.6% of the energy needed to run the stations (19.58MW).	
C6	17.6.3.3	Throughout (as required)	Climate Change Vulnerability Mitigation	Examples of the designed in measures that mitigate the proposed Project's vulnerability to climate change are: ▪ The proposed Project is designed to ensure the pluvial flood (+ climate change) risk is ~~reduced to~~does not exceed 1 in 100 years with the risk of flooding from river/sea being ~~lower~~not exceeding at 1 in 1000 years; ▪ The proposed Project surface channel drainage for the track is designed to convey 1 in 100 years plus climate change design storm; ▪ The size of the channel is oversized by 20% is to allow for potential uncertainty in the runoff calculations and to mitigate the impact of an over-design event on the track drainage. The ~~Viaducts are also designed~~Viaduct was designed with respect to the Flood Risk Management Guidelines and Section 50 of the Arterial Drainage Act. The viaduct is designed to ensure no net change in flooding for a 1000-year flood event + 20% climate change ~~design~~ flow ~~conditions~~; ▪ Surface water runoff rates for the design storm for each track catchment were calculated in Section 3.5 of the MetroLink FRA Report (Chapter 18: Hydrology – Appendix A18.9). The design storm is taken as the 1 in 100-year storm plus 20% for climate change although the track drainage design was checked for the 1 in 1000 year plus climate change storm. Sustainable Drainage Measures including attenuation storage for each catchment was sized to contain the 1 in 100-year storm plus 20% for climate change plus 300mm freeboard allowance; ▪ The Electricity & Gas Networks Sector Climate Change Adaptation Plan Prepared under the National Adaptation Framework has been prepared by the Department of	Operational phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				Communications, Climate Action and Environment (DCCAE 2019b) which considers future climate change impacts on energy infrastructure and aims to reduce vulnerability by building resilience in the energy sector. This resilience will in turn provide indirect resilience to the proposed Projects power supply; ▪ The risk due to changing temperatures with respect to heat or cold during operation ~~can be~~willbe mitigated through the use of a HVAC system which will ensure comfort and fresh air for passengers and staff and prevent over-heating of sensitive equipment; ▪ TII will prepare a Major Incident Management and Severe Weather Team Plan to ensure critical MetroLink infrastructure is protected during operation from the impacts of severe weather; and ▪ ▪ Wind speeds are taken into account when setting the max distance between posts and foundations. In addition, the OHLE system are subject to regular maintenance and replacement cycles in accordance with European Design standards (Design Life for new civil engineering structures (IE Standard CCE-TMS-410 (2019)). Wind loads on bridge structures will be determined as defined in I.S. EN 1991: Eurocode 1, Action on structures, Part 1-4 General actions – Wind actions, and the associated Irish National Annex, or otherwise as detailed in the TII Standards. Buildings are designed to be robustly assembled, using building techniques designed to withstand wind loading, with reduced vulnerability to building elements becoming detached from facades in extreme wind events. ▪ Increased temperatures have the potential to cause the temperature of materials, such as tracks / OHLE / asphalt / bitumen, to increase resulting in thermal movements. The design of these elements includes an allowance for expansion/thermal movements. The inclusion of the thermal joints prevents track buckling during extreme heat events. ▪ The overhead line equipment will be designed to take into account a range of minimum and maximum temperatures (-20oC to +40oC) and loads under current and future climate conditions. The contact and messenger overhead wires will be automatically tensioned which will adjust for additional loading from ice, snow or wind. Ice loading has been considered within the design and a 9.5 mm radial thickness of ice coating has been applied for protection. The mechanical tension in the contact and messenger wires will be maintained within the system design parameters.	

31.13 Hydrology

Table 31.11: Hydrological Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
H1	18.6.1.1	Throughout (as required)	General Management of Run-Off Quality	▪ The contractor will be required to operate in compliance with the outline CEMP (Appendix A5.1) and is required to produce a Water Management Plan that includes detail on the following: - The activities requiring water and the anticipated peak water demand for each site; - Where the water for each site will be sourced; - Strategies for minimising water use; - Strategies for conserving water; - Treatment of wastewater; and - Means of disposal of wastewater. ▪ A Sediment Erosion and Pollution Control Plan will be implemented for all construction works. This includes measures to manage soil and silt-laden water on site, accidental leaks/ spills to ground and water quality monitoring to ensure compliance with environmental quality standards specified in the relevant legislation (i.e., *European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments), and the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988).* As part of the outline CEMP, the plan for erosion and sediment control also deals specifically with the potential impacts of the material deposition areas included for the construction phase of the project. ▪ All construction staff will be suitably trained to respond to accidental discharge/ leaks and appropriate spill management kits will be in place to allow rapid response on site. An Emergency Incident Response Plan will be in place detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous substances or wastes, logging of non-compliance incidents and any such risks that could lead to a pollution incident at any point along the proposed alignment. ▪ Site-specific constructability reports prepared for the Project will clearly specify how water emanating from site activities will be managed from source to final approved discharge point (to sewer). Under no circumstances will treated water be discharged to a water course without the respective water quality meeting the statutory limits as set under the relevant EU Environmental Objectives for surface water.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ As with any below ground construction, pumping will be required to manage both stormwater collection and/ or any inflows of groundwater into the cut section/ station box within each site boundary. Water will be pumped through a temporary construction site attenuation tank/ Siltbuster or equivalent, prior to discharging through a series of treatment tanks with storage (i.e., typically 900m^3 attenuation volume equivalent to one day's discharge where a conservative inflow of ~10l/sec is assumed) as required. There will be regular checks on the treatment system as well as continuous monitoring equipment to measure, but not limited to, pH, temperature, conductivity, Total Suspended Solids and Totals Dissolved Solids. All treated water will be discharged to the nearby sewer. ▪ Under no circumstances will treated water be discharged to a watercourse without the respective water quality meeting the statutory limits as set under the relevant EU Environmental Objectives for surface water. ▪ The provision of boundary treatments such as silt fencing and berms will be installed prior to the commencement of any construction works in order to enhance the protection of identified water features (i.e. Broadmeadow River, Ward River and Santry River) during the full construction phase. A silt fence along the relevant boundary line of the construction works area in the context of the identified surface water feature will be required, this will be constructed of a suitable geotextile membrane to ensure water can pass through, but that silt will be retained. Typically, an interceptor trench will be required in front of this silt fence. The silt fence ~~would~~will be capable of preventing 425micron and above sediment from passing through. It ~~would~~will also be resistant to damage during deformation resulting from loading by entrapped sediment and repaired/ replaced as necessary by the contractor as part of the on-going monitoring programme. ▪ Temporary stockpiles are required during the Proposed Project works and these will be located outside of the buffer zone~~; leachate~~ around rivers/streams. Leachate generation will be prohibited. Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated and controlled area away the buffer zone(s) applied. On-going consultation with IFI and NPWS will be undertaken prior to and during these works. Furthermore, temporary stockpiles of excavated material will be managed on a site-per-site basis and designated areas will be suitably sized and isolated from open excavations as well as identified [storm/ combined] sewers in the area. ▪ If any potentially contaminated material is encountered, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled 'Waste Classification: List of Waste & Determining if Waste is	

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				Hazardous or Non-Hazardous' using the HazWasteOnline application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills. ▪ If it is not possible to immediately remove contaminated material, then it will be stored ~~on, and ensure~~onsite, with necessary bunding ~~or~~and containment ~~is~~ in place around stockpiles or storage. The time frame between excavation and removal of all [natural or contaminated] excavated material will be recorded and kept to an absolute minimum. ▪ ~~All excavated~~Excavated material will, where possible, be reused within the project for the construction of embankments, in backfill, for bunding and landscaping requirements (such as Dardistown Depot, viaduct embankments). The overall approach to spoil management shall be in accordance with the Eastern-Midlands Region Waste Management Plan for 2015-2021 (EMWR 2015) as well as the County ~~Council~~ Development Plans. This plan ~~shall~~will include the application of the Waste Hierarchy and highlight potential methods and sites for reuse, recovery, recycling and disposal of the excavated material with the aim of minimising disposal as waste. ▪ The appointed contractor will ensure acceptability of the material for reuse for the Proposed Project with appropriate handling, processing and segregation of the material. This material ~~would~~will have to be shown to be suitable for such use and subject to appropriate control and testing according to the appropriate earthworks specification(s). These excavated soil materials will be stockpiled using an appropriate method to minimise the impacts of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. ▪ Excavated contaminated soils will be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure no cross-contamination with clean soils elsewhere throughout the site. ▪ Surplus suitable material excavated that is not required elsewhere for the Proposed Project, shall be used for other projects where possible, subject to appropriate approvals/notifications. ▪ Earthwork's haulage will be along agreed predetermined routes along existing national, regional and local routes (outlined in the STMP, Appendix A9.4 of this EIAR). Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to its original condition. ▪ Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				document '*Guidelines for the crossing of watercourses during the construction of National Road Schemes', (NRA, 2008)*. All chemical and fuel refilling locations will be contained within effectively bunded areas and set back a minimum of 10m from water courses. ▪ Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent pollution or alternatively discharged to foul sewer in agreement with Irish Water. Some construction work areas will need temporary site connections to foul sewer (for office and welfare facilities) or in some cases this will be collected on site and disposed of appropriately. ~~It is likely that any 'grey~~Grey water~~'~~ from site works will be collected and prior assessed for potential re-use, requiring appropriate cleaning and storage tanks.	
H2	18.6.1.1	Throughout (as required)	Management of discharges	▪ Prior to commencement of construction, the contractor will prepare method statements for discharge of construction water discharges. Further discussions will take place with the relevant authority to determine the required permit licence agreements to permit the discharge of water during the construction phase to either sewer or to ground. Where applicable, it is proposed that all water will be discharged to sewer. A treatment train and monitoring will be undertaken to meet the requirements of the permit licence operation. The monitoring program will be set by the Local Authority and will be abided by the works Contractor. ▪ The design of each treatment train will depend on the activity at each construction compound (as illustrated in Diagram 18.14 in Chapter 18: Hydrology). Stormwater and any dewatering will be collected and stored (if required) prior to discharge to the site-specific treatment plant. There will be no direct discharge to any identified water course without adequate attenuation and discharge will be controlled by a hydrobrake to mimic greenfield runoff rates as per *as per Appendix A18.5 - Surface Water Drainage & Flood Impact Assessment Report* (Jacobs/IDOM, 2021) & *MetroLink Swords to Charlemont Flood Risk Assessment Report* Jacobs/IDOM 2022. ▪ Where excavations include significant placement of concrete and/or bentonite, there is potential for alkaline discharges to occur. When this concreting is being carried out, the discharge water will require additional treatment including pH neutralisation. A continuous pH monitor will be installed on the discharged water from the treatment plant. It is proposed that discharge water pumped out during the concrete works where it exceeds a pH of 6-9pH units is either re-circulated for further treatment, removed off site for appropriate treatment and disposal, or treated on site and discharged into the foul sewer, with due permission from Irish Water.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Where used, any sedimentation system and/or pond capacity and treatment plant will allow adequate settlement of suspended sediment. However, daily visual inspection will be undertaken by the contractor at the outfall(s) to ensure adequate internal settlement is occurring. Where the visual assessment highlights elevated suspended sediments higher than expected, the water will be re-circulated for further treatment. Samples will be taken at regular intervals and suspended solid levels checked and recorded for inspection. ▪ Detailed monitoring requirements will depend on discharge permit agreements put in place prior to any works commencing. The installation of continuous monitoring equipment may be required as part of the temporary discharge permit and/or licence. This would include the installation field monitoring probes connected to telemetry system to continuously monitor parameters such as temperature, pH, TOC (Total Organic Carbon), total suspended solids (TSS), total dissolved solids (TDS) and EC (Electrical Conductivity). ▪ The use and management of concrete in or close to identified watercourses will be carefully controlled to avoid spillage potential. Where on-site batching is proposed, i.e. at the north of the development at Estuary, this activity will be carried out at a significant safe distance from the nearby watercourses. Washout from such mixing plants will be carried out only in a designated contained and impermeable area and washing out of associated vehicles will only be authorised in designated contained areas.	
H3	18.6.1.3	Throughout (as required)	Management of Flood Risk	In terms of managing the potential for flood risk, the following will apply: ▪ Construction compounds will not be set up on lands designated as Flood Zone A or B in accordance with the OPW '*Planning System and Flood Risk Management Guidelines'* (November 2009). ▪ The flood risk on a construction site can be mitigated through the design, land use, methodology, attenuation, drainage and programming of construction activities. This can be done through alternations to the permanent design, methodologies used for construction, changing the construction sequence, site layout and use during construction and programming high risk activities during specific periods of the year. ▪ The design of all sites during construction must take into account the flood risk of the site and mitigate any increase in risk of harm. Every site will be unique due to the factors listed above and a specific assessment is needed to determine what level of mitigation is needed. Below are general factors to be considered in planning, designing and operating the site during construction.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Minimise areas of open ground or stockpiles of soil: exposed ground increases the sediment content of flood waters which can cause environmental damage and clog drainage networks. This can be done through minimizing topsoil removal, covering haul road with tarmac etc. ▪ Drainage: All areas of site ~~should~~will have an appropriate drainage system with sufficient capacity. Drainage should discharge to a controlled location following necessary settlement or treatment. ▪ ~~Attenuation: Construction sites tend to have less attenuation of water than its previous use and have contents that pollute. In some cases, it may~~It will be necessary to have capacity to attenuate a flood event and to treat flood waters before discharge from site. This ~~can~~will be done using features such as settlement lagoons or tanks. ▪ Water Treatment: Where the water leaving site is contaminated it ~~may be necessary to treat the water~~will be treated prior to ~~discharging~~dischargee. This treatment system ~~must~~will have capacity to ensure drainage and/or attenuation is not overrun during storm events. ▪ The following responsibilities shall apply to the contractor: - Obtaining updated modelled water levels from the OPW as well as updated information on the required standard of protection for flood defences. - The contractor shall ensure that flood risk is managed safely throughout the construction period and that all designs comply with the flood risk assessed in the EIAR and include provision of a safe refuge for flood events. - A flood risk compliance procedure will be included in the water quality management plan/flood protection plan. This will take a risk-based precautionary approach, using the source-pathway-receptor concept, and will apply to temporary and permanent works. - Temporary mitigation measures shall be employed to mitigate the risk of flooding to structures on a construction site. These should be installed for the duration of the works or at time where flood risk has increased. - Sheet piling and cofferdams: shall be required at the bridge piers situated adjacent the Broadmeadow and Ward Rivers and anywhere where construction activities are to occur on or near flood zones. - Sandbags~~:~~ will be used for temporary flood protection typically a short-term measure. - Mobile and inflatable barriers will be available on site for use when needed. - Existing flood defences ~~shall~~will be monitored for stability for surface construction, tunnelling, dewatering, filtration and river works.	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- Materials on a construction site are a significant risk to the environment and ~~would~~will be managed for flood events. ~~Materials carried away may also come into contact with structures, causing them damage.~~ The flood risk for materials ~~should~~will be mitigated by: - ~~Keep~~Keeping materials on site in a flood barriered area or at higher levels, such as raised ground or platforms. - ~~Keep~~Keeping materials away from flood plains and flood risk areas. - Only ~~bring~~bringing materials onto site when needed. - ~~Keep~~Keeping onsite material storage to a minimum, such as daily requirement, with larger quantities kept off-site. - Only ~~remove~~removing existing ground and topsoil when work requires. - ~~Remove~~Removing materials offsite prior to a forecasted flood event. - ~~Keep~~Keeping materials in watertight containers where possible. - ~~Anchor~~Anchoring down materials that may float away. - ~~Ensure~~Ensuring site hoarding should contain materials that may float away. - Covering of storage areas for material which has been stockpiled, to prevent silt runoff. ▪ Flood protection and mitigation measures set out in the pre-construction works need to be supported in the construction phase to be effective. This is done by monitoring the Environmental Protection Agency alerts and guidance, monitoring weather and monitoring water levels of nearby watercourses. This is particularly important for sites located on or near flood plains, such as Broadmeadow Viaduct and the nearby Broadmeadow River and Ward Rivers. The monitoring will give advance warning allowing for temporary flood protection to be deployed and material mitigation measures to be adopted. ▪ If a flood event during construction occurs, safety and mitigation measures ~~need to~~will be in place to allow for a response. These measures will add to the protection of structures, workforce and responders. ▪ Drainage, silt and water management is to be inspected during a flood event. Site fencing ~~would~~will be secured, and any access points closed. This will prevent buoyant materials and equipment from being washed away from the site causing damage to the environment. It will also prevent items being carried into the site and impacting construction works. ▪ Site utilities and isolations points ~~would~~will be situated in areas that are easily accessible and protected from flood waters. In the event of a flood, utilities ~~would~~will be isolated, particularly generators and mains connections, to reduce the dangers. If utilities and conduits are sufficiently protected and not impacted by flood waters, they should remain operational.	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Plant and equipment ~~would~~will be relocated during a flood event. The plant and equipment ~~would~~will be moved to areas that are protected through barriers or elevated above the flood waters. Plant and equipment ~~would~~will be isolated from their connections and if they hold significant fluids and hazardous materials, such as Silt Busters and Water Treatment plants, they ~~would~~will be sealed and emptied where possible. ▪ Implementing the necessary measures will reduce the impact of the flood on the site and the impact that the site has on the local environment. ▪ If flood waters only partially impact the site, construction activities may be able to continue. The continuation of works would consider that waters may rise further and ensure safe access and egress. ▪ If a flood event occurs during construction, the correct procedures and legislation need to be followed during site clean-up and reinstatement. ▪ Flood waters carry germs, bacteria and diseases that are hazardous to health and environment and may be further contaminated by sewage or materials and chemicals during the flood event. ▪ PPE that provides adequate protection for dealing with contaminated waters ~~would~~will be stocked on site. This will provide sufficient protection to workers when dealing with flood clean-up. Suitable and sufficient procedures would also be in place, such as method statements and risk assessments, to further protect the workforce carrying out clean-up works. ▪ Any flood waters that have collected on site will ~~also need to~~ be suitably and sufficiently managed. Due to their contaminated nature, they may not be able to be discharge without further settlement or treatment. Any discharge into a sewer will require a discharge permit from the Local Authority. The permit will stipulate that the water achieves specific quality standards. It may also refuse discharge, resulting in water being treated and removed offsite for further treatment or disposal. If disposed of via the usual methods, it is important to ensure that any additional treatment is given as the water on site may be of a different quality than that usual treated and may not achieve the quality standards for discharge with the usual treatment. There are no discharges of water during the construction phase to any watercourses. Overall, the Project is susceptible to flooding during the construction phase. Start of Route to Seatown crosses the Broadmeadow and Ward Rivers and their flood plains. These sections will need to make use of: ▪ Heights of sheet piles extended for sheet piles excavations; ▪ Raised capping beam for retained cuttings;	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Permanent flood mitigation measures programmed to be done in advance; ▪ The use of sheet piles and cofferdams for protection of viaduct piers; ▪ Inflatable barriers to protect haul roads; and ▪ Plant and materials not to be left on the flood plain. Shafts and box structures are exposed to unexpected flood events through burst watermains and surface water flooding. The flood risk to these structures should be mitigated through the construction of an upstand wall and material mitigation. Retained cut and cover structures should mitigate their flood risk through the use a raised capping beam and material mitigation. Earthworks structures such as open cuts and embankments have a flood risk from surface water flooding. This should be mitigated against through the use of material mitigation and inflatable barriers. Although flood mitigation measures have an upfront cost and should increase the duration of the works through their installation time or resequencing, the measures should avoid the penalties of a flood event.	
H4	18.6.1.4	Throughout (as required)	Management of Fire Water	In terms of managing the firewater, the following will apply: ▪ In the event of an emergency tankering of contaminated water from each site to an approved facility for disposal~~. The management of the potential water that is contaminated with fire products will be detailed in the project-specific CEMP~~ will occur.	Construction Phase
H5	18.6.2.1	Throughout (as required)	Water Quality	~~▪ The potential for impact on water quality as a result of stormwater discharge is low during operation. The vehicles are electrically operated so limited potential for contaminated run-off along the rail link as a result of minimal use of lubricants and chemical for operational maintenance. There is also limited requirement for bulk chemical storage;~~ ▪ Measures included in the design to protect water quality are outlined in Section 18.2.1 Project Description. There are no further mitigation measures required. Due to the size and type of development, it is envisaged that the Dardistown Depot will discharge storm water~~/ or~~ to a nearby ~~watercourse and to~~ sewer, subject to licence from Irish Water (IW); and ▪ A programme of regular inspection of operational design discharges will be undertaken as part of the long-term operation and maintenance programme.	Operational Phase
H6	18.6.2.3	Throughout (as required)	Management of Fire Water	▪ In the case of fire in the above ground structures, any water contaminated by firefighting operations will be contained within a fit-for-purpose attenuation pond and discharged safely in agreement with the EPA, Irish Water and any other relevant stakeholders;	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ In the case that a fire breaks out in an underground station or along the track, the drainage system will be further developed with an automatic shut off valve. This shut off valve will be activated in the event of a fire. The firewater will then be contained within the system prior to pumping it out for appropriate disposal off-site; ▪ ~~Apply measures~~Measures to prevent fire from occurring will be implemented through removing or reducing the cause including measures to respond and manage an outbreak of fire, and measures to mitigate the impact of the response activities; ▪ A fire detection system will be installed and will include public announcements and video analytics; ▪ A Fire Safety Strategy prepared for tunnels will be drawn up in line with best practice specifications; and ▪ Inspection and maintenance of drainage will be carried.	
H7	18.2.2.2	Throughout (as required) l	Management of Flood Risk Management	The project design incorporates specific measures to ensure that the project will not be impacted by flooding or result in any off-site flooding as a result of the construction (see section 18.2.2). No further mitigation measures are required.	Operational phase
~~**H8**~~	~~Number required~~	~~Throughout (as required)~~	~~Management of Fire Water~~	~~In terms of managing potential firewater, the following will apply:~~ ~~▪ In the case of fire in the above ground structures, any water contaminated by firefighting operations will be contained within a fit-for-purpose attenuation pond/ tank (for example Park & Ride and Dardistown Depot) discharged safely in agreement with the EPA, Irish Water and any other relevant stakeholders;~~ ~~▪ In the case that a fire breaks out in an underground station or along the track, the drainage system will be designed with an automatic shut off valve. This shut off valve will be activated in the event of a fire. The firewater will then be contained within the drainage system prior to pumping it out for appropriate disposal off-site;~~ ~~▪ Apply measures to prevent fire from occurring through removing or reducing the cause including measures to respond and manage an outbreak of fire, and measures to mitigate the impact of the response activities;~~ ~~▪ A fire detection system will be installed and will include public announcements and video analytics;~~ ~~▪ A Fire Safety Strategy prepared for tunnels will be drawn up in line with best practice specifications; and~~ ▪ ~~Inspection and maintenance of drainage.~~	~~Operational Phase~~

31.14 Hydrogeology

Table 31.12: Hydrogeological Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
HG1	19.6.2.1	Throughout (as required)	Groundwater inflow into Tunnel Section tunnel eyes.	▪ Where there is no pressurised tunnel front, then the potential for groundwater inflow during tunnelling works increases. To counteract and avoid this potential risk, the TBM will be advanced in a pressurized earth pressure balance (EPB) form. This tunnelling technique will maintain stability in the tunnel and avoid/limit the degree of groundwater inflow. The use of EPB and Slurry TBM modes will therefore minimise the negative impact on tunnel excavation associated with dewatering of high pressurized groundwaters in the Boulder Clay/BoD/QTR/UWR units. ▪ For SCL tunnelling, advance probing will be used to ascertain ground conditions in advance. If groundwater is encountered it can either be drained if perched and of limited volume, or if wider connectivity is determined then permeation/fissure grouting would be undertaken through the face to control inflow to manageable levels. This will all be subject to daily review and planning prior to each advance to ensure the safety and security of the works. ▪ Groundwater ingress control measures for tunnelling also include grouting of the tunnel eyes before/ after the passage of the TBM. Prior to the TBM passing through the station, the area outside the two tunnel eyes normally requires grouting to prevent ground or groundwater flowing into the station when the TBM breaks in or out. As the tunnel eye is within the boulder clay and interface between the BoD/QTR and the UWR in the case of O'Connell Street, grouting will be required including the interface between the diaphragm wall and the ground. Typically, the grouting (if required) would form a zone approximately 20m x 20m centred on tunnel axis for a distance of 15m back from the D-wall to safeguard TBM entry / exit. Grouting will typically be undertaken from surface (vertical drilling) or subsurface (horizontal drilling) or a combination of both. ▪ If grouting is required, this will consist of the permeation or fissure grouting of a block/area of sufficient size such that: - On TBM breaking into the station - that a tunnel ring is fully grouted within this block before the TBM cutterhead breaks the D-wall and enters the station box; and - On TBM breaking out of the station - that a tunnel ring is fully grouted within the D-wall before the TBM cutterhead leaves this block and exists the station box.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Following the passage of the TBM past this section of the alignment, the tunnel eyes will be re-grouted with bentonite/concrete mix as backfill. This methodology will vary according to each station.	
HG2	19.6.2.1	Throughout (as required)	Groundwater inflow into Tunnel Section - Settlement Risk	▪ Settlement risk analysis comprising building damage assessment and the potential issues with regard to ground settlement is discussed in detail in Appendix A19.10 (GDR) as well as within Chapter 20 (Soils & Geology), Appendix A20.8.	Construction Phase
HG4	19.6.2.2	Throughout (as required)	Groundwater Inflow into Cut Sections and Within Deep Station Excavations	▪ To manage the risk of settlement, the excavation of the cut sections and deep stations for the proposed Project must avoid affecting the phreatic water levels as much as possible. ▪ In order to maintain the existing phreatic levels during such excavation stations it will be necessary to excavate within a water-resistant 'closed box', i.e. the excavation of the cuts/underground stations is designed with a water retaining (if not waterproofed), sealed enclosure which will be formed by employing the use of either secant pile (e.g. at cuts) or D-wall (at deep station boxes). This methodology will allow any inflow of groundwater into the excavation to be managed by pumping [dewatering] or other appropriate and effective means. ▪ The vertical height of the perimeter secant pile/D-wall will be calculated to avoid pressurised flow. ▪ D-walls or secant piles will be extended deep enough to lengthen the groundwater flow path in order to minimise ingress. This approach will be augmented, where necessary, by permeation/fissure grouting around the toe of the walls to further extend this groundwater flow path. ▪ The thickness of the wall and the number and position of the anchors and/or other retaining systems will be calculated according to details collated on geotechnical ground parameters, depth of the excavation and size of the station box. Dewatering will be internal to the station box in advance of excavation works. Dewatering will be undertaken to below base slab formation and maintained until the base slab is cast, fully cured and there is sufficient weight in the box to negate the risk of 'flotation' effects. ▪ To control the possible variations in the phreatic level a perimeter of vertical bored holes will be used with two principal functions, namely; (1) to monitor the piezometric level outside the excavation footprint, and (2) to maintain and stabilise the phreatic level by injecting pressurised water where deemed feasible. ▪ The perimeter boreholes will be designed according to pumping test analysis and hydraulic modelling (Plaxis-2D) already performed for the cut sections and stations on the proposed Project.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Periphery borehole spacing, liner diameter and depth, and screened geology will be specifically designed for each works area with boreholes extending to a minimum depth of 5m below the lowest level of the cut/ station excavation. ▪ The main geological layer for groundwater transmission is recognised as the interface between the Boulder Clay and the bedrock, i.e. BoD/QTR and UWR. To restrict flow from this layer into the base of the excavation beneath the toes of the D-walls along fissures in the rock, permeation grouting will be undertaken at the toe of the D-walls. The permeation grouting consists of the drilling of holes through reservation tubes cast into the D-walls during construction. ▪ In order to confirm the adequacy of the cut-off achieved by toe grouting, one or more pumping tests will be carried out in advance of excavation. Deep wells will be installed as discussed above to lower the groundwater level within the footprint of the box, and piezometers inside and outside the footprint will be monitored to determine the drawdown of the groundwater level and hence the adequacy of the cut-off. ▪ In the event of an inadequate cut-off being achieved, then further permeation grouting will be undertaken. This may involve drilling of additional grout injection holes within or outside the box footprint. The results of further grouting activities will be checked by further deep well pumping checks. ▪ Should karst features be encountered during construction works, for example within the Waulsortian (CWA) limestone near Dublin Airport, these will be assessed by a suitably qualified hydrogeologist and an engineering geologist. It will be necessary to delineate fully the extent of these features and characterise them at the relevant chainage of the proposed Project, i.e. identify the structural control of the karstic porosity, the size of the voids and the potential water inflow in the karstic system. ▪ In the case of excavations (cuts, stations, portals, shafts, bridge abutment excavations) the karst feature shall be excavated and backfilled with clean coarse, non-calcareous, fill material to ensure a continued high permeable zone and effectively sealed over this if required. If encountered during diaphragm walling, then the bentonite support fluid will control the temporary impacts and the concreting of the panel would fill any void. This will prevent runoff draining into the feature and therefore protect against accidental construction site spillages. On this basis, construction run-off will not discharge to a potential karst pathway and will receive natural attenuation and dilution within the aquifer. ▪ With specific regard to karst features being intercepted in excavations for earthworks and infiltration basins/soakaways it is vital to ensure the hydraulic connectivity of the feature using	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				imported, clean granular material as engineered fill and then seal the feature from the excavation using a liner (geotextile and/or concrete depending on the site specifics). This will ultimately prevent any pollutant linkage between the excavation and the karst feature/bedrock aquifer. In the event that the feature cannot be excavated for whatever reason, the main mitigation measure will then be to fill the karstic tube(s) and the ground porosity with grouting and/or aqua-reactive foam. Note: No evidence of karst had been observed in Metro North and AGI boreholes even if, according to available bibliography, the Waulsortian Formation may be 'prone to karstification processes'. ▪ With specific regard to retained cuts and cut & cover sections, where the secant piled wall solution is adopted, this will ensure the impermeability of the excavation during the construction period [and during the Operational Phase]. The construction method comprises a first series of non-structural piles (non-reinforced) to be drilled and cast. Then, a second phase of structural piles (reinforced) intersecting the previous series produces continuity of the wall and provides enough structural resistance to applied loads and mitigates against groundwater ingress potential. As part of the Preliminary Design, a number of combinations of geological units [case scenarios] are considered and representative of more 'onerous' ground conditions including determination of the superficial deposit thickness/ type overlying weathered/ more competent rock, water levels and pile embedment length with depths of up to approx. 15m below existing ground level considered (refer also Jacobs IDOM, 2021h, Section 3, and Tables 3-5 for retained cut and cut & cover locations). The structural function of the bottom slab at any cut section will be, in addition to transmitting the loads from the track to the natural rock or ground, to resist the associated water pressures at that location. Finally, two lining walls will be placed in the inner faces of the piled walls to improve the finishing of the structure and to protect the finished work against possible leaks i.e. water ingress from the surrounding natural ground.	
HG5	19.6.2.3	Throughout (as required)	Drawdown Effects and ZOI	▪ ~~Dewatering~~In the absence of mitigation, dewatering of the locally important, unproductive [Ll, Pl] bedrock aquifer will be necessary and the zone of influence (ZOI) has been determined by modelling (following outputs of [Plaxis2D and MODFLOW] modelling) undertaken for the proposed Project. ▪ It is planned to ~~undertake~~install additional ~~further site-specific data collection prior to commencement of works to allow site specific additional mitigation measures (such as monitoring) if required. As such, further [advance]~~monitoring wells around deep station sites. These will be installed up to 1 year ahead of station works commencement to facilitate local	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				groundwater level monitoring ~~will be undertaken in NBH boreholes installed as part of the current proposed Project to define the contemporary groundwater levels in the area of interest at the time of construction and allow monitoring of groundwater levels~~ pre, during and post construction. ▪ Where other periphery wells may need to be installed (for example where previously access to drilling sites was not feasible) these will be drilled before commencement of construction/during the Construction Phase and will be monitored for a nominal period of 12 months. ~~These~~This data will be added to the current database ~~for hydraulic testing completed to date for the proposed Project in areas of cuts and deep excavation boxes in particular~~to provide pre, during and post construction data. ▪ ~~Mitigation of the conservatively modelled impacts associated with interpreted ZOI may include re-injection to ground through existing boreholes or newly drilled re-injection well points strategically placed and designed for the purpose of mitigating against localised geotechnical issues for example settlement, rather than as wider area recharge to ground wells. This is achievable where the local ground conditions have been assessed as suitable for effective recharge to ground and there is sufficient surface area available for the re-injection and monitoring wells in addition to the necessary cleaning plant required to treat the water to permitted discharge standards prior to re-injection in that area.~~	
HG6	19.6.2.4	Throughout (as required)	Substantial Water Inflows Under Pressure	~~▪ Dewatering of highly pressurised groundwaters both during deep excavation and during TBM advance works that will be undertaken in the Boulder Clay and also within base of drift and upper weathered rock (UWR) units.~~ ▪ ~~The groundwater~~Groundwater control measures will consist of D-wall / secant pile wall ~~perimeter pumping wells~~ which will ~~assist in maintaining~~maintain dry working conditions during construction, and advance probing ahead of the tunnel face using Best Practice guidelines and methodologies including appropriate risk assessments in order to ensure identification of potential groundwater volumes and pressures as well as prevention of any flooding potential at the TBM with depth. ▪ To minimise this negative impact on the tunnel excavation, it will be essential to maintain a pressurized front, with a pressure higher than the interpreted groundwater flow pressure at the TBM front. ▪ ~~There is also a risk of significant~~ Existing faults may increase water inflows, locally including at the contact of the CWA and CTO limestone and fracture zones. ~~Existing faults may increase water inflows, locally.~~ The use of a variable mode boring machine (i.e. EPB and Slurry TBM	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				type) will aid in ~~minimizing~~minimising the negative impact on tunnel excavation from dewatering of high pressurized groundwaters in the Boulder Clay/BoD/UWR or rock units. ▪ ~~To further mitigate the effects, works will include for advance probing and other field assessment techniques ahead of the TBM tunnel face in these areas.~~	
HG7	19.6.2.5	Throughout (as required)	Wells Intercepted by/ or in Vicinity of the Tunnel Excavation	▪ Other general risks related to tunnelling along the route will be duly addressed in the outline CEMP procedures and emergency and contingency plans for the proposed Project. These include mitigating against historical (i.e. unknown or unrecorded groundwater abstraction and/ or monitoring wells, disused wells as well as unknown shafts etc) encountered along the full alignment (i.e. not just the tunnelling sections). ~~In addition, mitigation~~Mitigation measures ~~will be in place~~ for identified un-grouted and poorly grouted/ backfilled boreholes such as the Well Drilling Guidelines produced by the Institute of Geologists of Ireland (IGI 2007) for effective borehole decommissioning. ▪ With regard to the tunnel boring with an variable density machine and the potential risk of significant water/mud release at ground level if the pressurized tunnel front cuts through an unknown well, this will be managed through TBM design and TBM operating parameters designed to suit the prevailing hydrogeological conditions. Furthermore, this will all be detailed in the contractors TBM Management Plan. ▪ ~~The interception of unknown wells by the tunnelling works (but also during works at grade) will be further considered through more in-depth studies into the prevalence of historical/active wells (however few in number) within the study area. The use of surface geophysics (electrical tomography and ground penetrating radar) will be considered in areas where the likelihood of unknown wells is foreseen. There is also the possibility of installing some 'geophysical tools' within the cutter head of the TBM which could be precise enough to detect wells at the tunnel face and indicate same in advance of contact.~~ ▪ With regard to known groundwater well locations, where these are intercepted by the proposed Project they will be duly recorded by an experienced Hydrogeologist ~~and tested to confirm existing yield rates~~ in advance of being decommissioned which will follow good practice IGI guidelines as mentioned. ~~Subsequently~~Where operational, yield testing will be undertaken and, a replacement supply well will be sited accordingly, designed, drilled, installed and tested prior to follow-on commissioning or the supply replaced by a connection to public supply.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ ~~Specific regard is made to groundwater supply wells identified as lying outside of the proposed Project boundary/alignment but within the drawdown ZOI which may be impacted by reduced groundwater levels during construction dewatering activities at station boxes/cut sections.~~ ▪ All identified operational wells within 150m of the proposed Project boundary ~~(or 50m from the calculated drawdown ZOI, if greater)~~ will be monitored for water level on a monthly basis for 12 months before construction, during construction and for a nominal period of 12 months after construction is completed. If the level monitoring indicates that the proposed Project has impacted on a supply or geothermal well (refer Section 19.4.7) then appropriate mitigation will be applied such as supply or replacement well installation or deepening of wells as appropriate. ▪ To ensure the protection of quality of identified groundwater potable supplies, all abstraction wells, where identified as lying within 150m of the proposed Project boundary, will be monitored for water quality. This will include standard drinking water quality parameters monitored on a monthly basis for 12 months before construction, during construction, and for a nominal period of 12 months after construction. If the monitoring indicates that the proposed Project has negatively impacted a water supply source, then appropriate further mitigation measures will be applied such as well replacement or connection to public supply mains.	
HG8	19.6.2.6	Throughout (as required)	Water Quality Management	▪ A Sediment Erosion and Pollution Control Plan will be implemented for all Construction Phase works. This includes measures to manage soil and silt-laden water on site, accidental leaks/spills to ground and water quality monitoring to ensure compliance with environmental quality standards specified in the relevant legislation ~~cited under Section 20.2.1 above~~ with regard to groundwater and surface waters. The European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments), and the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988) will also apply. As part of the outline CEMP, the Sediment Erosion and Control Plan will also deal specifically with the potential impacts of the material deposition areas included for the Construction Phase of the proposed Project. ▪ All construction staff will be suitably trained to respond to accidental discharge/leaks and appropriate spill management kits will be in place to allow rapid response on site. ▪ An Incident Response Plan will be in place detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous substances or wastes, logging of non-	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				compliance incidents and any such risks that could lead to a pollution incident at any point along the proposed alignment. ▪ The provision of boundary treatments such as silt fencing and berms will be installed prior to the commencement of any construction works in order to enhance the protection of identified water features (for example Broadmeadow River, Ward River and Santry River) during the full Construction Phase, this relates primarily to Hydrology but is also of relevance here. A silt fence along the relevant boundary line of the construction works area in the context of the identified surface water feature will be required, this will be constructed of a suitable geotextile membrane to ensure water can pass through, but that silt will be retained. Typically, an interceptor trench will be required in front of this silt fence. The silt fence should be capable of preventing 425micron and above sediment from passing through. It should also be resistant to damage during deformation resulting from loading by entrapped sediment and repaired/replaced as necessary by the contractor as part of the on-going monitoring programme. ▪ Temporary stockpiles are required during the proposed Project works and these will be located outside of specific buffer zones; leachate generation will be prohibited. Stockpiling of excavated material will be managed on a site-per-site basis and designated areas will be suitably sized and isolated from open excavations as well as identified storm/combined sewers in the area. If any potentially contaminated material is encountered, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled 'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous' using the HazWasteOnline application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the European Communities Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills. ▪ If it is not possible to immediately remove contaminated material, then it will be stored on, and covered by, to prevent rainwater infiltrating through the material. The time frame between excavation and removal of all natural or contaminated excavated material will be recorded, and volumes kept to an absolute minimum. ▪ Specific to AZ2, Chapter 20 (Soils & Geology) presents a number of mitigation measures which will be in place to counteract the following with regard to contaminated land:	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ The presence of unknown contaminants within the subsurface leading to impact potential on the hydrogeological environment (i.e. apply measure SG5 and SG6 reducing the significance criteria from Medium to Low residual impact). ▪ Potential impacts of water pollution through the disturbance of made ground material (i.e. apply measure SG9 reducing the significance criteria from Mild to Negligible residual impact). ▪ Potential impacts of water pollution through run-off from stockpiled material and mobilising of contaminants (i.e. measure SG10 reducing the significance criteria from Medium to Low residual impact). Guidance on water pollution controls will also follow CIRIA documents (refer Section 19.10). With regard to TBM consumables and management thereof including negating/limiting any impacts of the hydrogeological environment, the following is of note: ▪ Annulus grouting: No grout will be lost to the ground, all grout will remain in the annulus between the cut ground and the outside diameter of the tunnel lining. ▪ Spoil conditioning additives (liquid foam) including polymers: The foam has a life of a few hours to a few days and breaks down in the spoil pile. While there are many different brands of soil conditioning foam agent all brands used will be biodegradable with no harmful residual chemicals. ▪ Main bearing grease –Grease used in the lubrication process and labyrinth seal will be 'lost' in the spoil and removed with the arisings; both greases are biodegradable. ▪ Tail seal grease – This grease does not come into contact with the ground when the TBM is mining. As the TBM pushes forward, the tunnel rings are exposed at the end of the tail can but are immediately covered by the annulus grout. ▪ Bentonite - This is blended from naturally occurring materials and is non-hazardous. As with the slurry itself, very little is left in the ground as it is continuously re-cycled and mixed with fresh slurry as the tunnel and pipelines are extended. Under Irish regulations it is classified as a non–hazardous waste. With regard to the Southern section TBM (City drive) proposals to bury the machine south of Charlemont Station, the following measures are proposed to mitigate against any potential water (or soil) quality impacts on the hydrogeological (and hydrological) environment: ▪ Once the TBM has built and grouted the last ring, the TBM grouting system will be modified by adding additional pipes to pump grout into the cutter head and around the shield. At the same time, temporary power and ventilation will be installed to the back of the gantries, the main electrical power disconnected and cable and service pipes removed from the tunnel wall. All pipes will be blown clean before removing to ensure prevention of slurry spillage in the tunnel	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				invert. HV cable will be rolled onto drums using the reverse of the process to install them. Communication and low voltage cables will be left in place until the work is complete. ▪ All pipelines, for example tail seal grease, main bearing grease, water lines, grout lines and foam lines on the backup gantries will be blown out to clean any material from them. Hydraulic connections will be blanked off after pumping the oil into tanks for removal from the tunnel. The gantries will be split and each one towed back to the portal where it can be lifted out. ▪ After all gantries have been removed, the main section of the TBM shield will be dismantled. Hydraulic oil will be pumped from all the rams including those on the erector into tanks which will be taken to the portal. Electric drive motors, electrical switches, cables, grout lines, grease line and all hydraulic hose will be removed from the machine and loaded onto flat beds for transport to the portal. Any valves that can be removed will also be taken off at this stage. ▪ With all the major and minor parts removed, the TBM will be de-greased and cleaned with all de-greaser solution contained and pumped into bunded containers. Following final checks, the TBM will be signed off as ready to be concreted. A bulkhead with concrete injection ports and breather pipes will be assembled as per a temporary works design. Concrete will be pumped into the chamber and air will be displaced through the breather pipes. Once concrete is seen flowing from the breathers, concreting will stop with the TBM now encased in concrete. ▪ Site-specific constructability reports prepared for the proposed Project will clearly specify how water emanating from site activities will be managed from source to final approved discharge point -this includes details on effective attenuation and suitable land take to accommodate the respective attenuation and treatment systems proposed. Under no circumstances will treated water be discharged to ground or public sewer without the respective water quality meeting the statutory limits as set under the relevant EU Environmental Objectives for groundwater and surface water (see also Section 19.3.1). As with any underground construction, pumping will be required to manage both stormwater collection and/or any inflows of groundwater into the cut section/station box within each site boundary. Water will be pumped through a temporary construction site attenuation tank/siltbuster, prior to discharging through a series of treatment tanks with storage (i.e. typically 900m^3 attenuation volume equivalent to one day's discharge where a 'conservative inflow' of ~10l/sec is assumed) as required. ▪ Final discharged volumes will occur in a controlled manner following appropriate Local Authority discharge permit criteria and irrespective of whether this discharge is to sewer (as proposed) or watercourse (in the event of accidental release). Monitoring (to include for pH, electrical conductivity and suspended solids associated with construction type water) will be undertaken on a daily basis to confirm suitability for discharge as pre-defined under the Water	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				Quality Management Plan within the outline CEMP. In the event that monitored discharge water exceeds approved discharge limits this will be re-circulated at the site and treated accordingly or will be disposed of offsite to an appropriate disposal facility. There will be no direct discharge to any identified water feature. In terms of managing any firewater that may arise during the Construction Phase, the following will apply: ▪ In the event of an emergency, the response will involve tankering of contaminated water from the respective site to an approved facility for disposal. The management of water potentially contaminated with fire-related products will be detailed in the project-specific appropriately detailed CEMP. ▪ Where excavations include significant placement of concrete and/or bentonite (typically inert component of grout material), there is potential for alkaline discharges to occur. When this concreting is being carried out, the discharge water will require additional treatment including for pH neutralisation. As mentioned, a continuous pH monitor will be installed on the discharged water from the treatment plant. It is proposed that discharge water pumped out during the concrete works where it exceeds the range of 6-9pH units is either re-circulated for further treatment, removed off site for appropriate treatment and disposal, or treated on site and discharged into pre-identified foul sewer, with due permission from Irish Water. There will be no direct discharge to any identified water feature. ▪ To minimise the potential for [accidental] discharge of silt-laden water or contaminated water entering identified storm drains or water courses, a 'treatment train' will be incorporated in the construction design. This is further discussed in Chapter 18 (Hydrology), Section 18.5.1. The design of each treatment train will depend on the activity at each construction compound and be made 'fit for purpose'. ▪ Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in a designated and controlled area away the buffer zone(s) applied for each site. Prior consultation with IFI and NPWS will be undertaken ahead of commencing any Construction Phase works near watercourses or in areas where groundwater is interpreted to provide baseflow to downstream water features; such consultation will be on-going process and form part of the Water Quality Management Plan within the outline CEMP for the proposed Project during all relevant site works. ▪ Protection measures will be put in place to ensure that all hydrocarbons used during the Construction Phase are appropriately handled, stored and disposed of in accordance with the TII document 'Guidelines for the crossing of watercourses during the construction of National	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				Road Schemes', (TII/NRA, 2008). All chemical, oil storage tank(s) and associated refilling locations will be contained within effectively bunded areas to conform to the current Best Practice Guide BPGCS005 - Oil Storage Guidelines (published by Enterprise Ireland) and set back a minimum of 10m from water courses (rivers, streams, field drains). Construction works will follow the afore-mentioned site-specific Water Quality Management Plan as part of the CEMP for the proposed Project - Note: this will apply to all works areas, logistics sites and storage compounds. ▪ As per site constructability reports for the proposed Project, the majority of construction works areas will need temporary site connections to foul drains (for office and welfare foul discharge) which may include discharge to foul sewer in agreement with Irish Water, or in some cases this water will be collected on site and appropriately disposed of offsite. It is likely that any 'grey water' from site works will be collected and prior assessed for potential re-use, requiring appropriate cleaning and storage tanks. There will be no direct discharge of grey water to any identified water feature. ▪ All design measures set out in the ESB Advanced Work Package (DN0566) will be implemented during the installation of underground cables (typically <3m depth) which cross waterbodies and/or drainage ditches including where potential groundwater baseflow exists. Where the open trench (with 'damming and fluming' or 'damming and pumping') method is used for the crossing of streams and rivers this approach will be implemented only with the approval of IFI prior to the commencement of any construction works. Where applicable, the construction will take place outside the salmon spawning period from October to April unless otherwise agreed with IFI. ▪ Construction compounds will not be constructed on lands designated as Flood Zone A or B in accordance with the OPW 'Planning System and Flood Risk Management Guidelines' (OPW, 2009). All watercourses within compound areas will be fenced off at a minimum distance of 5m.	
HG9	▪ 19.6.2.7		Water Use Management	▪ All contractors will prepare a Water Management Plan in terms of water usage. This plan will apply commitments made within the proposed Project contract towards the minimisation of water use, conservation of water and water efficiency measures on the proposed Project work sites. To ensure that the Water Management Plan remains relevant, adequate and effective as the works progress it will be reviewed and updated as necessary: - Following any change that has a significant impact on water usage; - As instructed by the proposed Project Manager, and	Construction

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- At least every six months. ▪ The Water Management Plan will set out a number of key objectives and targets towards conserving and minimising water use as set out in section 19.6.2.7. Minimisation of the use of water will be considered during planning for each stage of the works, incorporated into relevant procedures and method statements, and with steps to eliminate or minimise water usage incorporated and utilised where possible. Mains water connections will be fitted with meters such that potable water usage is monitored and managed. ~~Where practical and possible, water~~Water will be reused on-site as a preference. Construction activities on the proposed Project identified as having the potential for high water use will be specifically targeted against opportunities to reduce water use, utilising the hierarchy of objectives listed above. Appendix A5.11 presents additional details on minimisation of water consumption and specific examples for the construction of piling and diaphragm walls, tunnelling and dust suppression.	
HG10	19.6.3.1	Throughout (as required)	Management of Discharge Water Quality	▪ The potential for impact on groundwater quality as a result of stormwater discharge to ground is low during operation based on the minimal use of lubricants and chemical for operational maintenance and presence of hardstanding. ▪ There is no requirement for bulk chemical storage other than oil storage at maintenance compounds. All chemicals will be stored on impermeable hardstanding and under cover within maintenance compounds. ▪ A programme of regular inspection of operational design discharges will be undertaken as part of the long-term operation and maintenance programme. ▪ Oil and petrol interceptors will be included prior to outfalls for water collected at the Dardistown Depot, the Park & Ride area, maintenance areas, track drainage and along surface water routes. As such there is no likely discharge to ground. ▪ All wastewater arising from the tunnel alignment (including from the tunnel itself, emergency access and ventilation shafts, portals) and foul water from Station boxes will ultimately be discharged to public foul sewer under formal consent by Irish Water. No wastewater will be discharged to ground during operation. ▪ Chapter 18 (Hydrology) Section 18.6.2.3 discusses the management of firewater during the operational phase of the proposed Project with emphasis on fire detection and automatic shut off systems including containment and subsequent off-site disposal. The procedures with regard to firewater management are also applicable to the hydrogeological environment and are specified with the fire safety strategies for the MetroLink project.	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ During the Operational Phase of the proposed Project, on-going inspection (at a minimum three- to five-year frequency) and maintenance will occur to ensure that the swales/wetland ponds/infiltration basins continue to operate as intended for the design life of the proposed development, with particular emphasis on areas AZ1 to AZ3. A number of measures were incorporated into the design of the proposed Project to minimise their impact (refer also Chapter 4 (Description of the MetroLink Project)). Essentially, design of all attenuation features will include for specific catchment and containment area, hydrocarbon interceptor and hydrobrake to mitigate any impact on receiving water features, including where these potentially interact with groundwater and downstream sites of ecological significance. ▪ Care will be taken in reworking acceptable and certified as suitable for re-use excavated subsoil material post Construction Phase. Where this occurs for example during landscaping works, in order to minimise the potential for groundwater infiltration and generation of runoff to ground.	
HG11	19.6.3.2	Throughout (as required)	Mitigation of the Barrier Effect	▪ Specific hydrogeological modelling has been carried out in order to assess the potential 'Barrier Effect'. The outputs of the modelling completed to date have significantly assisted in determining the actual effects of the hydrogeological barriers that might be caused by the underground infrastructure of the proposed Project. ~~.~~Appendix A19.10 presents the hydrogeological ~~plan~~regime which ~~also~~ indicates areas where groundwater flow paths run parallel to MetroLink alignment ~~(for example near chainage: 2+160)~~ which indicates that the barrier effect will not occur. ▪ ~~As a mitigation measure~~Where a barrier effect has been identified, it is proposed to install drainage wells on each side of the cut section and station box locations ~~based on the results of modelling of groundwater flow patterns and the impacts of the proposed Project on this regional/local flow regime~~ with a by-pass system. For example, ~~as mentioned~~ within AZ1 Northern Section, modelling of the potential interaction between natural groundwater flow patterns and the proposed piled-walls within the Seatown - Fosterstown area (i.e. between chainage: 2+800 and chainage: 4+800) indicates there is a possibility of the barrier effect occurring which will require ~~effective~~ mitigation ~~measures~~with drainage wells spaced 100 m apart. ~~▪ In the Seatown - Fosterstown sector an upstream mean elevation in the head within observation wells of 0.60m was modelled (refer Appendix A19.8 and Appendix A19.10), reaching at some points an elevation equal to 1.20m. For this reason, in order to avoid the potential barrier effect, it may be necessary to incorporate a by-pass system approximately~~	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				~~between the chainage references 2+800 to 4+800. To incorporate a by-pass, a collection and diffusion system based on pairs of drainage wells located every 100m along the alignment and connected to each other by means of a pipe through the cross-section of the alignment there.~~ The pipe will rest on the intermediate slab or be set into the bottom slab. Assuming the placement of a by-pass through a 200mm diameter pipe placed every 100m, then a pipe flow equal to 1.13 x 10-3 m^3/s can be considered for the section calculation. ▪ ~~In general, as part of mitigating the barrier effect, the use of drainage wells would typically be located hydraulically up-gradient and down-gradient of the structure and the inclusion of a design 'drainage blanket' below the ground slab may also be considered where feasible. This version of a by-pass blanket would serve to hydraulically connect both sides of the cut/station retaining walls which will allow groundwater to pass freely under the cut/station box feature thereby maintaining flows with depth and alleviating up-gradient pressures.~~	

31.15 Soils and Geology

Table 31.13: Soils and Geology Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
SG1	20.6.1.1	Throughout (as required)	Soils and Superficial Geology – Construction Environmental Management Plan	▪ While permanent loss of soil during construction is unavoidable, the Outline CEMP in Appendix A5.1 (refer to mitigation item RMW4 in Section ~~Error! Reference source not found.~~Error! Reference source not found.) will include a strategy and methods for addressing impacts associated with excavation, movement, temporary storage and removal of topsoil. Mitigation measures associated with the excavation, disposal and reuse of material are outlined in Mitigation Items RWM4, RWM5, RWM6 and RWM7 in Section ~~Error! Reference source not found.~~Error! Reference source not found.. ▪ RWM4: The Principal Contractor will be responsible for the compliant management of all waste generated by construction activities and will be responsible for preparing and implementing a CEMP, identifying construction methodologies for the proposed Project and standard operating procedures that will be implemented to minimise the impact. The CEMP	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				will include all mitigation measures as outlined in this EIAR. A draft CEMP has been prepared as part of this EIAR and can be found in Appendix A5.1. ▪ RWM5: The CEMP will include a Construction and Demolition Waste Management Plan (C&D WMP), which will incorporate all of the measures outlined in the Spoil Management Strategy (Mitigation WM6). The C&D WMP will identify roles and responsibilities and how waste arisings are to be controlled and managed during the course of the proposed Project, in particular how waste prevention principles will be applied and how on-site waste will be minimised. ▪ RWM6: An Excavated Material Management Strategy has been prepared for the proposed Project and included within the EIAR as Appendix A27.1. The overall objective of which is to provide an initial summary of excavated material arisings that will be generated during construction of the proposed Project according to the Preliminary Design and highlight potential methods and sites for reuse, recovery, recycling and disposal with the aim of minimising disposal as waste. This Excavated Material Management Strategy is to be used by the Contractor(s) to develop an Excavated Materials Management Plan to be followed during the excavation phases of the project. ▪ RWM7: ~~In so far as is possible, options~~Options for beneficial reuse of clean, suitable soil and stone material in accordance with Article 27 of the Waste Management Act will be sought., Alternatively compliant materials will be sent to Soil Recovery Facilities (SRF). This will prevent the need to classify all of the 2.9 million m^3 of excess excavated material as a waste. Locations and projects which identify a deficit of soil and stone material will be identified. Where it is deemed that the clean excavated material from the proposed Project is suitable for use in another identified project (i.e. complies with the Article 27 criteria), agreements will be put in place for a defined amount of by-product material to be sent to that project and a notification will be made to the EPA. Material not included within the A27 application or suitable for SRF would be classified as waste and require disposal. ~~Should an A27 application be unsuccessful for any reason then secondary mitigation would involve consignment of suitable excavated material to Soil Recovery Facilities (SRFs).~~ ▪ The following mitigation item included in Chapter ~~24~~19 (Hydrogeology) relates to the management and control of discharges to ground and water: Sediment Erosion and Pollution Control Plan - This plan will form part of the CEMP and include measures to manage soil and silt-laden water on site as well as accidental leaks spills to ground and water monitoring to ensure compliance with relevant environmental quality standards. ▪ The following mitigation items are included in Chapter 23 (Agronomy) relate to management of dust and loss of agricultural land: Dust Management Plan - A Dust Management Plan will be	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				formulated to ensure that construction activities are managed to minimise dust emissions, including ensuring that material loads leaving site will be assessed and covered where necessary to reduce dust impacts. Appropriate mitigation measures will be taken to reduce levels of dust generation, including wheel washing and road sweeping. These measures are described in the CEMP and further mitigation and monitoring requirements are detailed in Chapter ~~18~~ 16(Air Quality) of this EIAR. ▪ Loss of Agricultural Land: The loss of agricultural land as a result of the construction of the proposed Project is a permanent loss which will be addressed in the statutory compensation process. The proposed Project has been designed to minimise the land take so that only lands required for the proposed Project are acquired. Land acquired on a temporary basis during the Construction Phase will be reinstated by agreement and returned to the landowner.	
SG2	20.6.1.2	General Post Office St. Stephen's Green	Irish Geological Heritage Sites	▪ Phase 2b of the settlement analysis will require completion during development of the detailed design, post Railway Order application which will inform the requirement for any mitigation measures to protect the heritage value of the General Post Office and 51 St. Stephen's Green.	Construction phase
SG3	20.6.1.3.1	Throughout (as required)	Radon and Ground Gas	▪ To mitigate potential risks from radon migration into tunnels, excavations and other enclosed spaces during construction an occupational monitoring programme will be implemented to identify whether radon migration and build up is occurring. The monitoring will be undertaken in accordance with the EPA Protocol for the Measurement of Radon in Homes and Workplaces (EPA 2019b). If the workplace reference level of 300 Bq/m^3 (becquerels per metre cubed, a measured of Radon concentration in air) is exceeded (EPA 2019a) mitigation measures will be required during construction, such as the development of safe systems of work to ensure protection of construction personnel, potentially including measures such as use of respiratory equipment and working time restrictions.	Construction phase
SG4	20.6.1.3.2	Throughout (as required)	Radon and Ground Gas	▪ Risks to construction workers from ground gas when working within confined spaces will be mitigated by the development and adoption of safe systems of work, including use of personal protective equipment and respiratory protective equipment as a last resort.	Construction phase
SG5	20.6.1.4.1	Throughout (as required)	Contaminated Land – ground investigations	▪ Prior to construction, and to inform the detailed design, further ground investigations and ground gas/groundwater monitoring will be undertaken sufficient to allow detailed risk assessments and selection of appropriate construction procedures, as well as any additional mitigation or remedial design that may be required.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ The additional investigations will also be used to inform the materials management strategy and beneficial reuse of suitable soils (refer to mitigation items RWM6 and RWM7).	
SG6	20.6.1.4.2	Throughout (as required)	Contaminated Land - ground investigations	▪ During additional ground investigation and construction works a watching brief is to be implemented to identify the potential presence of previously unidentified contamination. Personnel appointed by the Contractor are to be appropriately trained if involved in earthworks activities. Such instances of previously unidentified contamination will be recorded and the associated risks assessed and a remedial strategy developed to manage the identified risks as appropriate.	Construction phase
SG7	20.6.1.4.3	Throughout (as required)	Contaminated Land	▪ Prior to construction, appropriate health and safety and waste management procedures for working with potentially contaminated soils (including asbestos) and water will be established. In respect of potential risks to construction workers associated with the presence of asbestos fibres and dust, ~~it is recommended that~~ the appointed contractor(s) ~~should~~will produce the necessary risk assessments for construction within potentially asbestos contaminated ground. They ~~should~~will develop appropriate method statements and procedures to manage the potential risks in accordance with The Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 and 2010, the Safety and the Health and Welfare at work (Construction) Regulation, 2013 (S.I. No. 291 of 2013). ▪ Waste management procedures including material containing asbestos will take into account the provisions of the Waste Management Act (as amended). Refer also to mitigations for airborne dust in Chapter 16 (Air Quality).	Construction phase
SG8	20.6.1.4.4	Throughout (as required)	Contaminated Land	▪ Risks to construction and maintenance staff working with/near land contamination and neighbouring site users will be mitigated by the implementation of Mitigation Item SG7 in combination with the adoption of appropriate systems of work, including the use of personal protective equipment as a last resort. ▪ In the event that unrecorded contamination is encountered, works ~~should~~will be stopped, and the working procedures re-assessed to confirm the working methods remain appropriate.	Construction phase
SG9	20.6.1.4.5	Throughout (as required)	Contaminated Land	▪ Development of a monitoring programme to be followed during construction works to determine whether construction activities are affecting the groundwater and surface water quality in areas of high receptor vulnerability. Should the monitoring programme indicate a change in baseline conditions and/or unacceptable risk further mitigation ~~may~~will be required (refer also to mitigation in Chapter 18 (Hydrology) and Chapter 19 (Hydrogeology).	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
SG10	20.6.1.4.6	Throughout (as required)	Contaminated Land	▪ Development of a stockpile and materials movement management plan as part of the outline CEMP with measures including but not limited to construction of stockpile bunds and covers to reduce potentially contaminated run off and generation of leachate, isolating from open excavations and drainage points, damping down to prevent wind-blown dust and monitoring of stockpile emissions (refer also to mitigations for airborne dust in Chapter 16 (Air Quality)).	Construction phase
SG11	20.6.1.4.7	Throughout (as required)	Contaminated Land	▪ Fuelling and maintenance of construction vehicles will be undertaken in designated and controlled zones with measures incorporated to prevent the spread of potential spillages from storage and transfer (e.g. bunds around storage containers and drainage interceptors). ▪ An incident response plan will be developed detailing the procedures to be implemented by the contractor in the event of spillage of fuel, lubricant or other potentially hazardous substance. The response plan will include requirements for staff training, equipment requirements (e.g. spill kits), response plans for likely incident scenarios and methods for logging incidents as well as non-compliance with procedures which could result in pollution events.	Construction phase
SG12	20.6.1.4.8	Throughout (as required)	Contaminated Land	▪ Prior to construction, a detailed assessment will be undertaken to determine the most appropriate building material is used for construction with respect to the existing ground conditions and the potential for chemical attack via direct contact with contaminants in soil and groundwater. ▪ Where concrete materials are proposed to be used, appropriate guidance such as 'Building Research Establishment (BRE) SD1:2005' and 'British Standard BS8500' ~~should~~will be followed to ensure that ground conditions are appropriate for the use of concrete at each given location.	Construction phase
SG13	20.6.1.4.9	Throughout (as required)	Contaminated Land	▪ Prior to reuse and placement of any excavated material within the proposed Project locations specific risk assessment will be required to demonstrate that it will take into account the provisions of the Waste Management Act (as amended) and relevant guidance such as The Management of Waste from National Road Construction Projects (TII 2017) and that it is suitable for reuse (i.e. does not pose a risk to human health or the environment).	Construction phase
SG14	20.6.1.4.10	Throughout (as required)	Contaminated Land	▪ Specific assessment of the presence of pyrite will be required for the Lucan Formation which will be excavated during construction to account for potential swelling properties and environmental risks and to inform potential reuse options applies to reuse of material within the project only, assessment conducted under A27 for use as by-product external to the proposed Project takes into account geochemical properties). Material will be required to	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				comply with an appropriate specification for earthworks such as the NRA Specification for Road Works Series 600 – Earthworks (TII 2013).	
SG15	20.6.1.4.11	Throughout (as required)	Contaminated Land	▪ While the risks associated with introduction of new pollution pathways for the option of piling in some areas of the route are considered to be low, where piling is proposed at detailed design piling risk assessments will be undertaken to inform appropriate piling techniques and designs. These assessments ~~should~~will adhere to appropriate guidance including the 'Piling and Penetrative Ground Improvement on Land Affected by Contamination: Guidance on Pollution Prevention, national Groundwater and Contaminated Land Centre Report NC/99/73' (Environment Agency 2001).	Construction phase
SG16	20.6.1.4.12	Throughout (as required)	Contaminated Land - ground investigations	▪ Investigation of ground conditions for the MetroLink cable route options to determine whether the risks assessed in this report are appropriate and determine any requirements for additional mitigation as necessary.	Construction phase

31.16 Land Take

Table 31.14: Land Take Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
LT1	21.6.1.2	Throughout (as required)	Compensation for Compulsory Purchase	▪ TII will offer compensation to property owners that is deemed to be acquired land in accordance with the general compulsory purchase code. Appropriate compensation will also be payable to owners of properties that are subject to short-term and or temporary acquisition. Compensation will be provided through the Compulsory Purchase Order (CPO) process. Further information can be obtained from the MetroLink Compulsory Purchase Order Guideline document (September 2020) which can be found on-line at: https://www.metrolink.ie/assets/downloads/MetroLink_CPOGuideline_Doc_FinApp_310820.pdf ▪ In recognition of the impact on residential cases where properties are to be acquired and given the unique circumstances surrounding the proposed impacts to the College Gate apartment complex, TII will engage the services of a property advisory company to engage directly with property owners. Property owners will be invited to participate in a Discretionary Scheme.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Likewise, TII recognises the importance for existing businesses of being able to plan their relocations with as much advance information as is reasonably practicable in order to ensure a smooth transition of their operations from one location to another. TII's aim will be to provide as long a period as possible to allow businesses to relocate than the normal statutory process, commensurate with the co-ordinated progress of the MetroLink works. ▪ Land required for construction activities has been minimised wherever possible and boundaries adjusted to avoid and/or minimise impacts as far as possible. Mitigation measures to minimise the loss of habitat associated with the proposed Project are presented in Chapter 15 (Biodiversity). Mitigation measures to be employed during the Construction Phase are described in more detail in Chapter 5 (MetroLink Construction Phase).	
LT2	21.6.1.3	Throughout (as required)	Land Acquisition Strategy	▪ A Land Acquisition Strategy (LAS) has been prepared by TII. The strategy sets out the approach that MetroLink will take in order to acquire property from a freeholder/leaseholder or qualifying tenants/occupiers, together with all other land-based interests and rights for the purpose of delivering the MetroLink scheme. ▪ It provides the affected parties with a clear understanding of the general approach to be adopted on compensation and sets out practical guidance together with the support that MetroLink can provide. The strategy provides information on the acquisition process for residential and commercial property owners and establishes the arrangements for communication and engagement with all affected parties.	Construction phase
LT3	21.6.1.4	Throughout (as required)	Property Protection	▪ TII is committed to having a Property Owner Protection Scheme (POPS) in place prior to construction works commencing. The scheme allows residential property owners to register with TII if the property is within thirty metres of the edge of the MetroLink alignment or fifty metres of station structures. The POPS comprises of condition surveys of private properties and other selected properties along the route of the proposed Project. The purpose of the condition surveys ~~would~~will be to ascertain the condition of the properties before, during (if deemed necessary), and after the completion of the proposed Project to determine whether there has been any deterioration of any of the properties surveyed and whether the same may be attributable to the proposed Project and recommend repairs as appropriate. ▪ In cases where parts of properties are occupied, access to the remaining unoccupied parts will be maintained, where it is possible and safe to do so. Protection such as hoarding will be used to ensure that the boundary of any construction site will be maintained and damage would not occur outside of this boundary. Where damage could not be avoided, it ~~would~~will be repaired. A programme of ground movement monitoring will be implemented, with the monitoring locations informed by	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				further analysis to be undertaken during the detailed design stage. The Airborne Noise and Groundborne Noise Mitigation Policy (Appendix A14.6) sets out the construction mitigation measures to be implemented. ▪ Further information on POPS is available in Chapter 11 (Population & Land Use). Useful information on POPS can also be found in the MetroLink Frequently Asked Questions document which can be found on-line at: https://www.metrolink.ie/assets/downloads/MetroLink_FAQ.pdf	
LT4	21.6.1.5	Throughout (as required)	Protection of Sports and Leisure Facilities	▪ Construction work requiring temporary land take will take place in Balheary Park, Swords, which is currently used as a public park with playing pitches. There will also be some permanent land take along the boundary of the alignment. The park is currently occupied by two sport clubs: Fingallians GAA and Swords Celtic FC. Minor alterations are proposed to the soccer pitches used by Swords Celtic. Both pitches are to be reduced in size with a minimum intervention in playing surface which will involve goalpost relocation, relining and localised grass treatment. It is proposed to alter the pitches used by Fingallians GAA in two phases: Phase 1 (during utility diversions) when a small reduction in the full-size pitch will be required, while the training pitch will remain unaffected and Phase 2 will involve installation of an artificial training pitch. ▪ At the proposed Dardistown Depot, some preparatory (enabling) works will be required to realign and reinstate the playing fields used by Ballymun Kickhams, Starlights GAA and Na Fianna GAA located north of the proposed construction compound. Works will include the installation of flood light foundations, parking area, relocation of club's changing facilities, resurfacing of pitches and installation of ball netting as required. The pitches will be reinstated, with some pitches including artificial grass using an all-weather/ third generation design. For full details of the proposals refer to Chapter 4 (Description of the MetroLink Project). The timing of the works will be discussed with the sports clubs and organised to suit i.e., off season. ▪ The construction works at the proposed Dardistown Depot will also require the acquisition of a playing field utilised by Whitehall Rangers Football Club and the demolition of the club house. It is proposed that Whitehall Rangers Football Club will be relocated to Dublin City Council lands adjacent to the Whitehall GAA club grounds where the new facilities will comprise two full sized grass playing pitches, a similar amount of car parking spaces, and new changing facilities. ▪ The main Griffith Park Station construction site will be on the east side of R108 St Mobhi Road on lands in the ownership of the Office of Public Works and leased to Home Farm Football Club. TII have agreed to provide alternative playing facilities for Home Farm FC during the construction period. Two pitches will be available at the AUL complex to the east of the M1, off Stockhole Lane for the	**LT4**

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				duration of the construction period. The existing pitch will be fully reinstated on completion of the works. ▪ Temporary and permanent land take at the proposed Albert College Park Intervention Shaft will result in the loss of two 5 a-side soccer pitches and a small portion of one full sized pitch situated in Albert College Park and currently utilised by a local football club. In mitigation, it is proposed to rotate the existing full-sized pitches 90 degrees and locate them side-by-side to the east of the park, resulting in slightly reduced dimensions. Sufficient area will be available to increase the dimensions of both 5 a-side pitches. Sufficient area will also be available for circulation around the pitches while they are occupied. ▪ At the proposed Tara Station, the Markievicz Leisure Centre will need to be demolished prior to works commencing. Given the loss of the leisure centre, TII and DCC will provide alternative leisure facilities during construction. TII have committed to fund the re-provision of this centre upon selection of a suitable alternative site by Dublin City Council.	
LT5	21.6.1.6	Throughout (as required)	Protection of Architectural Heritage	▪ The need for mitigation has been identified in a number of instances where there are predicted effects on architectural heritage. These are detailed in Chapter 26 (Architectural Heritage). ▪ A number of different forms of mitigation are specified, the most common of which relates to the carrying out of condition surveys of buildings and other structures of architectural constraints. This will be undertaken through the Property Owner Protection Scheme (POPS), which will undertake condition surveys of private properties and other selected properties along the route of the proposed Project. ▪ The properties to be demolished are generally of low to medium architectural heritage merit value. In a relatively small number of instances where these buildings are of architectural heritage significance, the mitigation involves making a record of the building for posterity. ▪ In a number of instances, such as at the sites of Griffith Park, Mater Station and St Stephen's Green Station, architectural constraints are to be removed on a temporary basis during construction and are to be reinstated on completion. Mitigation in these cases involves the removal into secure storage of those items and their return and re-erection and in each case the dismantling, transportation, storage, conservation or repairs and reinstatement are to be carried out in accordance with specifications to be compiled by the Metrolink Project Conservation Architect (PCA) and the works supervised by suitably qualified professionals. ▪ At the proposed O'Connell Street Station, a number of buildings are to be taken down while leaving their façades standing (their protection status extends to the upper parts of the façades only). In these instances, the structures will need to be propped in such a way as to ensure that they remain	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				stable during construction while at the same time allowing space for the construction work to proceed. In some instances, buildings being retained in the vicinity of the works will need to be propped to protect them from damage during construction. The protected structures at 43, 44, 52-54, 57 and 58 O'Connell Street Upper would be demolished except for the façades, which are to be retained in situ. Numbers 45 and 55-56, which are not protected structures, would also be demolished with the facades of 55-56 retained by the proposed Project in the absence of the over-site development (Dublin Central Site 2 Project). ▪ The construction of Glasnevin Station will necessitate the closure of the Royal Canal and dewatering and infilling of a section of the canal during construction, with reinstatement on completion. Depending on condition, part or all of the quay wall on the northern side of the canal will be removed and reinstated at the end of the works in this area. The architectural and industrial heritage value of the canal is high. Architectural heritage impacts on the canal are assessed in Chapter 26 (Architectural Heritage) of the EIAR.	
LT6	21.6.1.7		Protection of Archaeology and Cultural Heritage	▪ Chapter 25 (Archaeology and Cultural Heritage) of this EIAR, sets out the approach to archaeological investigation and resolution of archaeological constraints in greenfield areas and parklands (where feasible) will be required. ▪ The archaeological techniques likely to be used (where not already undertaken) will include archaeological geophysical surveys, underwater and detection surveys, archaeological test excavations, archaeological monitoring and, where necessary, preservation by record (excavation). This work will be carried out by specialist Archaeological Contractors (for bespoke Archaeological Contracts) or Archaeological Consultants. During the main construction works, archaeological monitoring and preservation by record (excavation) will be required in areas previously not accessible (e.g. parks or carriageway).	
LT7	21.6.1.8		Protection of Public Buildings, Health Facilities and Churches	▪ Permanent and temporary acquisition of land will be required at Our Lady of Victories Church for the construction of the proposed Collins Avenue Station. The land take will necessitate loss of the church garden, pathways, car park entrance, and car parking to the front of the church. Access will be maintained at all times for church services and alternative car parking will be provided. The forecourt of the church is to be reinstated in a modified/reduced footprint and provided with new landscaping as part of the works, though the access, emergency stairway and intervention shaft will remain within the forecourt. ~~-~~ Architectural heritage impacts on the church are Landscape and visual impacts are assessed in Chapter 27 (Landscape & Visual) of the EIAR. ▪ A grave is present in front of Our Lady of Victories Church; this will remain in-situ and will require protection during the construction works.	~~LT7~~Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ The site for Mater Station encroaches into the grounds of St Joseph's Church and the station box will be less than five metres from the western wall of the church. Works within the grounds of St Joseph's Church will necessitate the removal of a grotto, a stone pier, a pedestrian gate and approximately 18m of plinth wall and wrought-iron railing. As the church is a protected structure, these will require removal into safe storage by a specialist heritage contractor prior to the construction of the station. The railings and church grounds will be reinstated on completion of the works. Access will be maintained to the church throughout construction of the Mater Station. Architectural Heritage impacts on the church are assessed in Chapter 26 (Architectural Heritage) of the EIAR. ▪ There is no permanent land take of public buildings and no specific mitigation required for temporary land take, beyond the general construction mitigation measures detailed in Chapter 5 (MetroLink Construction Phase). The construction of Griffith Park Station will affect the setting of Whitehall College, owned by the Office of Public Works, but will not impact the college building. Impacts on the architectural heritage value of the college is assessed in Chapter 26 (Architectural Heritage). ▪ There is no permanent land take of health facilities however, there is a counselling service occupying one of the buildings at Glasnevin that will need to be relocated prior to demolition of the building. ▪ Excavation to construct Mater Station will involve deep excavation to within 8.5m of the Mater Hospital boundary and 14m from the hospital building. Potential impacts on the occupants' health are assessed in Chapter 10 (Human Health).	
LT8	21.6.1.9	Sections of retained cuts, Cut and cover sections and at underground stations	Reinstatement of Temporary Construction Areas	▪ Following the final construction works, the construction compounds will be removed and landscaping and reinstatement of temporary land take areas will commence. ▪ Soft landscaping directly associated with the proposed Project will generally be confined to extensive landscaping along the above ground sections of the proposed Project and at station locations. Hard landscaping will include the track bed and the completion of the civil works around station entrances, substations, Dardistown Depot and Park and Ride Facility. Landscaping will commence on completion of the track laying, stations and erection of the overhead catenary system. The urban design principles are detailed in Chapter 4 (Description of the MetroLink Project). ▪ The impact of the proposed Project on the landscape and visual amenity during the Construction Phase and Operational Phase is assessed in Chapter 27 (Landscape & Visual).	
LT9	21.6.2	Throughout (as required)		▪ No mitigation measures are required with respect to the Operational Phase of the proposed Project.	Operational Phase

31.17 Infrastructure and Utilities

Table 31.15: Infrastructure and Utilities Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
IU1	22.6.1	AZ1 Northern Section: Estuary Station to Dublin Airport North Portal	Interfaces with utilities	▪ The majority of the proposed Project through Section AZ1 progresses in a cut section where there are significant clashes with existing utilities. In order to mitigate the impacts in this area, utility diversions will be undertaken in advance of the main Construction Phase for the proposed Project. This includes diverting an existing water main crossing over the Broadmeadow and Ward Rivers below ground at the site of the proposed Broadmeadow and Ward River Viaduct. The diverted utility will pass under both rivers using Horizontal Directional Drilling technology, thereby removing the requirement to impact the waterbody during the Construction Phase. Relevant approvals will be obtained from the Office of Public Works (OPW) for this crossing as required under the Section 50 of the Arterial Drainage Act, 1945. ▪ Where existing sewers require diversion to facilitate the route of the Metrolink line in Swords along the R132 roadway, these will be facilitated by proposed interceptor sewers which pick up existing wastewater connections where they cross the proposed alignment. To support the reconfiguration of the existing wastewater collection system, a new pumping station is proposed at Seatown West (south-west of the Estuary Roundabout) which will pump through twin 450mm diameter rising mains and join a 1,600mm gravity sewer on the eastern side of the alignment which in turn travels via gravity to the Swords Wastewater Treatment Plant. ~~Construction of the pumping station will include holding tanks for storm water.~~ ▪ At ~~Fostertown~~Fosterstown Station the decommissioning and relocation of two electrical sub-stations serving the Airside Retail Park will be required. ▪ Telecommunication cables will be either decommissioned and replaced, diverted outside the alignment or permanently decommissioned, depending upon each situation. An Eir fibre route from Swords to the airport will be diverted outside of the alignment. A Vodafone telecommunications mast at Fosterstown will be relocated slightly north of its current location, away from the alignment.	Construction and Operational Phase
IU2	22.6.1	AZ2 Airport Section: Dublin Airport North Portal to Dublin	Interfaces with utilities	▪ Most of the proposed land for the Dublin Airport North Portal construction site and the Dublin Airport South Portal main compound is currently unoccupied farmland and as a result there is limited potential for clashes with utilities. However, where these occur, utility diversions will be undertaken in advance of the main Construction Phase for the proposed Project in order to mitigate any significant impacts on these utilities. ▪ A small number of clashes with electricity and telecommunications cables owned by DAA have been identified in this area. These will be diverted outside the alignment.	Construction and Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
		Airport South Portal		▪ Several medium voltage electricity cables owned by ESB and a medium pressure gas main owned by GNI are to be decommissioned.	
IU3	22.6.1	AZ3 Dardistown to Northwood: Dublin Airport South Portal to Northwood	Interfaces with utilities	▪ Works proposed in Area AZ3 will include the construction of the proposed maintenance depot at Dardistown, the future Dardistown Station, the M50 Crossing, Northwood Station and the City Tunnel portal. Potential impacts on utilities in this area will be mitigated by way of utility diversions. ▪ The alignment crosses a 1,800mm diameter sewer proposed as part of the Greater Dublin Drainage scheme at Dardistown Depot. A 900mm sewer clashes with the alignment at Northwood Station. This would be decommissioned and diverted. A private foul rising main, owned by DAA, would need to be diverted for an approximate 200m section south of the M50 Viaduct and 100m section north of the M50 Viaduct. A second privately owned foul sewer would need to be decommissioned and diverted at Dardistown Depot. ▪ Medium voltage electricity cables where they clash with the alignment will be either decommissioned and replaced, or diverted outside the alignment, depending upon each situation. A high voltage electricity cable will be diverted at Northwood Station. ▪ A small number of clashes with telecommunications cables owned by Eir have been identified in this area. These will be diverted outside the alignment. At Northwood a telecoms mast will be relocated to the north of its current location, away from the proposed alignment.	Construction and Operational Phase
IU4	22.6.1	AZ4 Northwood to Charlemont: City Section	Interfaces with utilities	▪ The design of the proposed O'Connell Street Station will be integrated with a planned commercial development for the site. Dublin Central GP Ltd (DCGP) has submitted a planning application to Dublin City Council to develop the location known as Dublin Central for a mixed-use development. Under this scenario the MetroLink station will be housed within a structural box provided by the Developer (Hammerson). Once the structural box is in place, and completed to the levels agreed with TII, the oversite development can be constructed over and around the station. However, if the Dublin Central scheme does not obtain planning consent, the station development will proceed with the station box being constructed by the appointed MetroLink contractor(s). No utility clashes have been identified within the O'Connell Street station box. The only locations where utilities cross the alignment are tunnelled sections, where there is no impact. ▪ Around twenty clashes with telecommunications cables, owned by Eir and Virgin Media, have been identified at Collins Avenue, Glasnevin, Mater, Tara Street and Charlemont Stations. These telecommunication cables will be either decommissioned and replaced, reinstated post station box construction, diverted outside the alignment or permanently decommissioned, depending upon each situation. At Ballymun Station there are two traffic fibre cables owned by DCC that	Construction and Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				clash with the station alignment. These will be decommissioned and replaced outside of the station alignment. ▪ Foul water sewers owned by Irish Water clash with the alignment at Collins Avenue, Glasnevin, Mater, Tara Street and Charlemont Stations. These will need to be decommissioned and diverted outside the station alignments. There are also water mains at each of the stations that will need to be decommissioned and diverted. ▪ At Ballymun, Collins Avenue and Tara Stations there are sections of surface water sewers owned by DCC that require diversion. ▪ With respect to electricity cables, the alignment clashes with high voltage underground cables at Collins Avenue, St Stephen's Green and Charlemont Stations and with medium voltage underground cables at Glasnevin and Tara Stations. These will require diversions. ▪ There is a requirement to modify the Iarnród Éireann track layout and alignment at Glasnevin Station as part of the Project works. This will involves lowering a large section of the track by circa 2m and modification to the existing junction. The proposed construction site is very constrained and in order to carry out the works, multiple phasing of activities will be undertaken. In preparing the construction sequence, a coordinated approach to the track lowering is proposed to avoid closing both railways at the same time for the station construction works. Following consultation with Iarnród Éireann, closure of the Western Commuter Line for a period of 21 months is proposed, re-opening, and then closure of the South Western Commuter Line for 5 months. The overall sequence of works in the Glasnevin Station area has been linked with planned Iarnród Éireann infrastructure works. ▪ There is a requirement for a temporary electrical substation at Glasnevin to facilitate delivery of the DART+ and MetroLink projects. The Iarnród Éireann temporary substation must be in place before the permanent traction substation is incorporated into the future station. The installation of a 38kV power supply will be within the MetroLink construction area. It is anticipated that the cable route will directly conflict with multiple temporary and permanent structures during the construction period and will need to be managed and protected. Options for the location of the substation within the construction area are under review with Iarnród Éireann. ▪ Enabling works will require the demolition of existing railway infrastructure, including existing tunnels and retaining walls. There will be a requirement for possession to be taken of the existing railway lines. ▪ The construction of Glasnevin Station will also temporarily affect the Royal Canal with the temporary closure of the canal and the northern towpath, which also provides vehicular access to the residential Coke Oven Cottages.	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ To construct the MGWR side platform and access stairs, a new secant pile retaining wall is necessary in the towpath behind and south of the existing masonry retaining wall over at least the length of the platform (174m). Additionally, temporary infilling of part of the canal basin is likely to be needed for construction access. ▪ During construction, vehicular access along Royal Canal Way to Coke Oven Cottages will be severed by the piling works for the station. In mitigation, Enabling Works will include the construction of a temporary bridge crossing the Royal Canal to maintain access into the Coke Oven Cottages and to allow for connectivity along the Royal Canal Way. This will involve the construction of a temporary bridge crossing that will allow vehicular access to Coke Oven Cottages and pedestrians/cyclists to cross the canal and continue along the southern canal towpath to Prospect Road. The bridge will have sufficient clearance to allow canal traffic to operate and pedestrians on the tow path to pass underneath. ▪ On the south side of the proposed station there is an existing water main owned by Irish Water, which runs in an east west orientation. It is proposed that this main is diverted along the canal tow path to facilitate station construction. ▪ Following the completion of the Construction Phase the canal towpath will be fully reinstated on its existing alignment. In order to maintain the existing width along the towpath a permanent cantilever structure will be provided to carry the towpath over the proposed Iarnród Éireann platform serving the Western Commuter Down Line. ▪ The maximum duration of time that the Royal Canal will be impacted by the works is predicted to be 34 months. However, subject to further consultation and agreement with Waterways Ireland, it is considered that the duration of full closure could be limited to approximately 5-6 months, with the canal remaining operational but with restricted width for the remaining time. It will only be necessary to close the canal towpath for a period of 4 weeks while the temporary road bridge is installed. ▪ At the proposed Tara Station there are also a large number of existing utilities both within the footprint of the proposed station, and in the areas immediately surrounding the proposed works. The utilities currently located within the footprint of the station must be decommissioned during the course of the works, as it will not be possible to retain these utilities during the construction works. These utilities will be moved to their final permanent position in advance of the works ~~where possible~~. Where this is not possible, diversions will be provided to ensure continuity of service/maintenance of network connections for the various utilities, and on completion of the station, the utilities will be relocated to their final, permanent position. ▪ Of the existing utilities to be retained during the course of the works, a 2.4m internal diameter (8' 00") 100-year-old, brick-lined sewer (commonly referred to as the 8-foot sewer) is of	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				particular concern, as this is a critical piece of network infrastructure for the drainage of municipal waste in Dublin City. The 8-foot sewer is located beneath Townsend Street, running in an east-west direction, directly to the south of the proposed Tara Station. As a result of the proposed works, and the proximity of the 8-foot sewer to Tara Station, the sewer may be subjected to ground movements and vibration arising from construction of the station and TBM driven tunnel. A geotechnical settlement assessment has been undertaken for the sewer and other utilities at Tara Street and is included within the RO application. ▪ The geotechnical assessment concludes that while the works related to the proposed construction of Tara Station and the associated tunnelling will introduce risks to adjacent utilities, it will be possible to implement geotechnical mitigation measures and associated monitoring and control measures to protect against these risks. This will ensure that the Townsend Street sewer can remain in operation during the construction of the station and tunnel and subsequent operation of MetroLink, with no impact on the capacity of the sewer.	
IU5	22.6.2	Throughout (as required)	Settlement-Existing Utilities	▪ Protective measures will be undertaken to keep the risk of utilities settlement to a minimum. It is intended that the primary form of mitigation will be to use good tunnelling practice, including continuous working, erecting linings immediately after excavation and providing tight control of the tunnelling process to reduce the magnitude of settlement. For the majority of utilities, they would be monitored, inspected on completion of the works and any damage repaired. ▪ Where this approach is deemed insufficient to mitigate the risk of damage to utilities, then intrusive mitigation measures will need to be considered in conjunction with the utility owner. These may include direct works on the utilities. These three categories are described in more detail below: - At-source measures - these include all actions taken from within the tunnel, that will be detailed in the TBM Management Plan, requiring no additional land take: during its construction to reduce the magnitude of ground movements generated at source such as TBM closed face operation; and increased tunnel face pressure. - Ground treatment measures - these comprise methods of reducing or modifying the ground movements generated by tunnelling/shaft/station box excavation by improving or changing the engineering response of the ground immediately surrounding the station box or shaft. Categories of ground treatment include: permeation or jet grouting which involves the creation of stiffer ground to reduce settlement; and control of groundwater to avoid changes which could potentially cause ground movement. - Structural measures - these methods reduce the impact of ground movements by increasing the capacity of a utility to resist movement. Available measures would include: support;	Construction and/or Operational phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				repairs; isolation from the moving ground; relining; and replacement or diversion (in the most significant cases). ▪ These measures would require works to the utility similar to those regularly undertaken by utility providers to maintain or upgrade existing assets. They would be undertaken either by the utility provider or by MetroLink contractors in conjunction with the utility provider under their existing powers. The approach to intrusive mitigation measures will be further developed during the detailed design process in cooperation with the contractor. ▪ Any required mitigations will be designed and agreed with the asset owner. The contractors will prepare, *inter alia*: Ground Movement Management Plans; Groundwater Monitoring Plans; and Instrumentation and Monitoring Plans. ▪ Ground movements will be monitored against specific asset triggers to ensure critical damage is avoided.	
IU6	22.6.2	Throughout (as required)	Settlement-Existing Infrastructure	▪ A settlement impact assessment has been carried out for the existing bridges and other assets within the potential impact zone of the MetroLink scheme (Appendix A5.17). Appropriate Instrumentation and Monitoring will be designed and installed on these assets as required. ▪ The Luas line crosses the MetroLink route however, no intervention is anticipated to be required at these. ▪ Some intervention to adjust the Iarnród Éireann rail levels is anticipated during the construction of Tara Station. ▪ An appropriate instrumentation and monitoring strategy will be developed and agreed with Iarnród Éireann /Luas operators to verify the actual settlements on site and ensure the safe operations of these services. ▪ There is potential for the MetroLink construction to impact the Cross Guns Quay Canal Lock and further assessment will therefore be undertaken. If required, appropriate protective measures will be implemented to ensure that the lock gates remain operational and meet the performance requirements. ▪ Any settlement impact to the airport infrastructure is anticipated to be minimal. The monitoring of the airfield and any control measures will be agreed with the Airport Authorities. ▪ Only minimal impact is anticipated on roads crossing the proposed Project route. However, there is some risk of surface cracking which ~~might require~~would result in resurfacing works at the end of construction at station locations and will be addressed during the completion works.	Construction and/or Operational phase

31.18 Agronomy

Table 31.16: Agronomy Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
AG1	23.5.1	Throughout (as required)	Fencing	▪ Boundary fencing will be erected to prevent disruption to adjacent land.	Construction Phase
AG2	23.5.1	Throughout (as required)	Farm operations	▪ Measures will be employed to minimise the impacts on farms and allow the continuous operation of all affected holdings. ▪ Crossing points will be agreed and suitable access arrangements will be provided which will accommodate the landowner / occupier while at the same time facilitating the construction of the proposed Project. ▪ Access to LO1 PR1, LO2, PR1, LO2 PR2, LO7 PR1, LO8 PR1, LO10 PR, LO10 PR2 and LO11 PR1 land will be required during the Construction Phase. Access to LO6 PR1 is not affected during the construction phase. The remaining land parcels LO3 PR1, LO4 PR1, LO4 PR2, LO5 PR1 and LO9 PR1 will be used for the construction phase with only some of the land returned post construction. The areas not taken up by construction are likely to be too small to continue farming during the construction period. Existing services (i.e. water and power supplies) will be maintained during the construction period. Land holding LO1 PR1, LO2 PR2 and LO6 PR1 will require (if interrupted) the provision of water and power services which, where possible, will be maintained during the Construction Phase.	Construction Phase
AG3	23.5.1	Throughout (as required)	Reinstatement	▪ All reinstatement work will be undertaken in accordance with the requirements in the outline CEMP and the Landscape Plans devised for the proposed Project. Refer to Chapter 27 (Landscape & Visual).	Construction Phase
AG4	23.5.1	Throughout (as required)	Noticing	▪ Individual landowner/occupiers shall be given notice in advance of construction works so they can arrange their farming activities on lands held adjacent to the proposed Project construction sites to reduce any potential impacts to their overall farming operations. This is particularly important for LO1 PR1, LO2 PR2, LO7, PR1 and LO6 PR1 where livestock are present.	Construction Phase
AG5	23.5.1	Throughout (as required)	Engagement	▪ A key liaison person will be appointed during the Construction Phase and will liaise with landowner / occupiers throughout the construction, reinstatement and handover phases to address any queries that landowner / occupiers and stakeholders may have throughout the proposed Project, as outlined in the outline CEMP in Appendix A5.1. They will facilitate communications between affected landowner / occupiers to facilitate the reorganisation of	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				farm enterprises during critical times during the Construction Phase. They will also consult with landowner/occupiers to identify any special management requirements such as specific on farm biosecurity measures and or disease status of farms affected.	
AG6	23.5.1.1	Throughout (as required)	Land Take (Permanent and Short-Term)	▪ Land acquired on a temporary basis during the construction phase will be reinstated by agreement and returned to the landowner / occupier and compensation is payable under the Statutory process. ▪ The permanent loss of agricultural land as a result of the construction of the proposed Project will be mitigated through the statutory compensation process.	Construction phase
AG7	23.5.1.2	Throughout (as required)	Temporary Loss of Services (Water and Electricity)	▪ Where existing water and power supplies are disrupted during the Construction Phase an alternative water source and electricity supply will be made available such as a water tanker or electric cable ducting. ▪ If permanent access to ~~surface~~ water sources is disrupted, alternative water supplies will be provided (or compensation will be provided to allow the landowner/occupier to drill their own well).	Construction phase
AG8	23.5.1.3	Throughout (as required)	Nuisance Caused by Increased Traffic Volume	▪ A Traffic Management Plan will be put in place for the Construction Phase to reduce nuisance to landowners and other road users, refer to Scheme Traffic Management Plan. The STMP sets out management and mitigation measures to minimise the transport impact during the Construction Phase of the proposed Project.	Construction phase
AG9	23.5.1.4	Throughout (as required)	Nuisance Caused by Noise Emanating	▪ Mitigation measures will be designed to address specific issues raised by landowners/ occupiers. ▪ In recognition of the need to work with landowner / occupiers specific requirements, the mitigation measures most suitable to individual farm situations will be developed. This will involve continued dialogue with landowners to determine the most appropriate mitigation measures for each agricultural holding. ▪ Mitigation measures to limit noise and vibration levels are detailed in the outline CEMP in Appendix A5.1 and further mitigation and monitoring requirements are detailed in Chapter 14 (Groundborne Noise & Vibration).	Construction phase
AG11	23.5.1.5	Throughout (as required)	Nuisance Caused by Dust Emanating	▪ A stockpile and materials movement management plan as part of the CEMP has been formulated to ensure measures including but not limited to construction of stockpiles bunds and covers to reduce potentially contaminated run-off and generation of leachate, damping down to prevent wind-blown dust and monitoring of stockpile emissions.	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Appropriate mitigation measures will be taken to reduce levels of dust generation, including wheel washing and road sweeping. These measures are described in the outline CEMP in Appendix A5.1 and further mitigation and monitoring requirements are detailed in Chapter 16 (Air Quality).	
AG12	23.5.1.6	Throughout (as required)	Impact on Shelter	▪ Any shelter removed will be reinstated. ▪ Re-planting of hedgerows will reflect the original species mix (refer to Chapter 27 (Landscape & Visual) for further details). ▪ Where loss of shelter causes disturbance during regrowth period, compensation ~~may~~will be payable under the Statutory Process. ▪ Temporary loss of shelter may reduce the protection of livestock from hot and sunny and/or cold and windy weather. Only a small proportion of shelter available to livestock will be impacted in the short-term. The impact to livestock along the proposed Project is minor.	Construction Phase
AG13	23.5.1.7	Throughout (as required)	Disturbance to Farm Operations	▪ Consultation and liaison between the landowners / occupiers and the appointed contractor(s) during the Construction Phase ~~shall~~will ensure that appropriate measures are taken to minimise disruption and to enable proposed Project activities to occur, in as far as practicable, in conjunction with farming operations. ▪ Appropriate measures include notification of works and commencement of specific works, access arrangements and access to severed lands.	Construction Phase
AG14	23.5.1.8	Throughout (as required)	Interruption to Drainage Systems	▪ Consultations between project team and the landowner / occupiers will be held to agree the extent of existing land drainage systems that will be impacted by the Construction Phase and to agree the nature and extent of replacement drains required. A detailed record of the locations of land drains intercepted during the Construction Phase will be kept. Drainage systems impacted by the proposed Project will be reinstated. These measures are described in the outline CEMP in Appendix A5.1.	Construction Phase
AG15	23.5.1.9	Throughout (as required)	Spread of Noxious Weeds and Invasive Species when Soil is Exposed	▪ All plant and equipment used during the Construction Phase will be thoroughly cleaned down using a power washer unit prior to arrival on site, and prior to leaving site, to prevent the spread of invasive species. ▪ A sign-off sheet will be maintained to confirm cleaning. Staff involved in the works will be informed of the specific locations of any invasive species in the area. ▪ The mitigation strategy in relation to non-native invasive plant species is based on the Guidelines on the Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (National Roads Authority, 2010) and The Management of Invasive Alien Plant	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				Species on National Roads (TII, December 2020). A Non-Native Invasive Species Management Plan has been prepared and included in the outline CEMP in Appendix A5.1. This will be implemented in advance of the proposed construction works. This plan includes measures with the objective of managing noxious weeds and non-native invasive plant species within the working area and preventing the spread of any established population present within the boundary of the proposed Project (refer to Chapter 15 (Biodiversity) for further information).	
AG16	23.5.1.10	Throughout (as required)	Spread of Animal Diseases	▪ Disease protocols and farm biosecurity measures will be identified and complied with to protect and prevent the spread of pests and diseases from one holding to another. ▪ The appointed contractor(s) will comply with the Department of Agriculture, Food and the Marine (DAFM) regulations in relation to crops and livestock diseases. ▪ During the detailed design phase, fencing requirements will be discussed with landowner / occupiers to ensure that boundaries remain stockproof to prevent the mixing of livestock. Livestock are present for LO1 PR1, LO2 PR2, LO7, PR1 all of which are directly impacted by the proposed Project. LO6 PR1 is a grassland and specialist equine farm, and maybe indirectly impacted by the proposed Project. ▪ Disease protocols and farm biosecurity measures include appropriate fencing off of the proposed Project working area to prevent livestock breaking out. Appropriate fencing off and spraying water for dust from the proposed Project working area will take place within a tillage area to prevent accidental mixing of soils or other materials arising from the Construction Phase. ▪ Procedures during the Construction Phase, as detailed in the outline CEMP in Appendix A5.1, will be undertaken to limit the spread of any disease such as the use of appropriate fencing to prevent livestock from straying, and isolating and separately storing the topsoil and subsoil layers, reinstating all drains and ensuring that there is no cross contamination between different land holdings. This risk will be reduced significantly by ensuring that soil is always stockpiled close to origin and on the same land holding.	Construction Phase
AG17	23.5.1.11	Throughout (as required)	Spread of Soil-Borne Diseases	▪ All construction equipment will arrive on site clean and free of weeds, soil and debris. ▪ Wash-down facilities will be developed to ensure a full clean down of all appointed contractor(s) equipment, machinery, vehicles and footwear before entering farm premises. ▪ Biosecurity measures will be implemented to minimise the spread of soil borne diseases and weeds during the Construction Phase of the proposed Project. These measures are described in the outline CEMP in Appendix A5.1.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
AG18	23.5.2	Throughout (as required)	Impacts on the agronomy during operational phase	▪ Measures to address the Operational Phase impacts of the proposed Project will be implemented as part of the Construction Phase (refer to Chapter 27 (Landscape & Visual)). ▪ The mitigation measures during the Operational Phase will be the on-going maintenance and upkeep of the boundary fences for the proposed Project.	Operational Phase

31.19 Materials and Waste Management

Table 31.17: Materials and Waste Management Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
RWM1	24.6.1	Throughout (as required)	Designing for Circular Economy	There are five construction principles that will be implemented throughout the construction to ensure that consumption of materials and the generation of waste is minimised throughout the lifecycle of the proposed Project. The five key principles are: ▪ Design for reuse and recovery: identifying, securing and using materials that already exist on-site, or should be sourced from other projects. The proposed Project will recycle/ recover at least 95% of construction and demolition waste. ▪ Design for materials optimisation: simplifying layout and form to minimise material use, using standard design parameters, balancing cut and fill, maximising the use of renewable materials and materials with recycled content (e.g. using material from low-carbon or sustainable sources). ▪ Design for off-site construction: maximising the use of pre-fabricated structures and components, encouraging a process of assembly rather than construction. ▪ Design for waste efficient procurement: identifying and specifying materials that ~~should~~will be acquired responsibly, in accordance with a recognised industry standard (e.g. consider opportunities for materials to be returned to the supplier for future reuse (e.g. steel and concrete elements)). ▪ Design for the future (deconstruction and flexibility): identifying how materials should be further developed to be more easily adapted over an asset lifetime and how deconstruction and demounting of elements can be maximised at the end of their 'first life'.	Construction Phase
RWM2	24.6.2	Throughout (as required)	Applying the Waste Hierarchy as a Priority Order to the Management of Waste	▪ All waste will be managed in accordance with the waste hierarchy (see ~~**Error! Reference source not found.**~~Error! Reference source not found.), as set out in the Waste Framework Directive (2008/98/EC), in such a way as to prevent harm to human health, amenity and the environment. ▪ Standard sizes for most items will be used to avoid specials and cutting on-site. Materials will be ordered to size with minimum waste (BRE 2012). ▪ Off-site construction, prefabricated products / modules and pre-cast units will be used where possible (BRE 2012; EPA 2015b). ▪ Take-back scheme arrangement with suppliers will be used. All packaging, cable drums and pallets will be collected by suppliers and not broken up (BRE 2012). ▪ Materials will be reused (i.e. all excavated materials) on-site where possible. (BRE 2012).	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Main contractors will work with all sub-contractors to identify waste minimisation and encourage all sub-contractors to reuse or recycle their own waste materials in particular packaging (BRE 2012). ▪ Packaging requirements in materials procurement will be reduced and recycled content specified (EPA 2015b). ▪ Hoarding posts will be reused and shuttering systems used where these are required (EPA 2015b).	
RWM3	24.6.3	Route wide	Demolition Plan	▪ A pre-demolition audit will be undertaken in order to facilitate selective demolition. ▪ Selective demolition will be undertaken in order to enable removal and safe handling of hazardous substances and to facilitate reuse and high quality recycling. ▪ The EU Construction and Demolition Waste Protocol and Guidelines (European Commission 2018) will be used to inform the demolition audit of the proposed Project. ▪ A demolition plan will be prepared for each building and structure to be demolished which will include the following information: - The location of the building to be demolished and a detailed topography of the site and its surrounds together with ground level contours and sections of the slopes and ground supported by the building where appropriate; - Details of ground removal and/or backfilling; - The distances from the building to be demolished to its adjacent buildings, street, structures and significant street furniture; - Layout of all floors of the building to be demolished, details of the principal materials of construction and the building condition; - The procedures for the demolition of the building, with a detailed sequence of demolition; - Protection and control measures; and - Methods for the handling and disposal of waste such as the means of transport of waste material from the site, time and frequency of waste material movement off site and a methodology for recording the materials generated and disposed of. ▪ The Demolition Plan will stipulate the procedure for the demolition of the building; detailing sequence and method of demolition to be adopted including any restrictions. The plan will specify all precautionary measures to be applied for the protection of the public including hoardings, covered walkways, catch platforms, catch-fans, scaffolding, protective screens and safety nets. The Demolition Plan will also set out requirements for the handling of debris and method of waste disposal to a licensed facility.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
RWM4	24.6.4	Route wide	Construction Environmental Management Plan	▪ During the Construction Phase of the proposed Project the Contractor(s) will ensure the compliant management of all waste generated by the construction activities. Circular economy principles will be incorporated within the management of materials during the Construction Phase in order to reduce the amount of materials used and waste generated by the proposed Project. ▪ A draft outline CEMP has been prepared and is presented in Appendix A5.1, Volume 5. The Contractor(s) will prepare and finalise the CEMP and specific method statements based on the outline CEMP adopted to take account of the conditions of any Railway Order granted. ▪ The Contractor(s) will prepare and implement a CEMP, identifying construction methodologies for the proposed Project and standard operating procedures that will be implemented to minimise the impact. ▪ The Contractor(s) will ensure that any facilities to which waste is brought are licensed / permitted / registered in compliance with waste management legislation. Similarly, the transportation of waste away from any of the construction sites or compounds will be carried out by vehicles in possession of Waste Collection Permits in compliance with legislation. ▪ The Contractor(s) will also be responsible for management of the ordering of supplies, ensuring that supplies are ordered as needed to avoid over-ordering or the requirement for long-term storage of materials, thus reducing the potential for damage or expiration of supplies while being stored on site. ▪ The CEMP (Appendix A5.1, Volume 5) will include a Construction and Demolition Waste Management Plan.	Construction Phase
RWM5	24.6.4	Throughout (as required)	Construction and Demolition Waste Management Plan	The Contractor is required to develop a Construction and Demolition Waste Management Plan, which incorporates all of the measures outlined in Chapter 20 (Soils & Geology) and the Excavated Material Management Strategy, written in accordance with the best practice guidance (Department of the Environment, Heritage and Local Government, 2006). The Construction and Demolition Waste Management Plan will include: ▪ Roles and responsibilities with regards to waste management; ▪ An analysis of the likely waste arisings; ▪ Specific waste management objectives for the proposed Project; ▪ Methods proposed for recycling / reuse of waste; ▪ Material handling procedures; ▪ Procedures for keeping records of all waste and materials which are removed from site; and ▪ Proposals for training of the workforce in waste management procedures and requirements.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			~~Construction and Demolition Waste Management Plan~~	▪ A number of waste management practices will be implemented by the Contractor(s) in order to manage waste arisings in an orderly fashion to minimise the impact~~ in so far as is possible~~: - A regular programme of site tidying will be established to ensure a safe and orderly site. - Debris netting will be erected to prevent materials being scattered by the wind. - Food waste will be strictly controlled on all parts of the site in order to minimise the attraction of vermin and other pests. - In the event of any litter or debris escaping the site, it will be collected immediately and removed to storage on site, and subsequently recovered / disposed of in the normal manner. - Waste receptacles such as skips will be secured so as to minimise impact from fly-tipping. - Waste will be collected in a timely fashion so as to prevent overly large volumes of waste accumulating. ▪ Waste arising from the demolition of buildings and structures will be a mixture of different materials. This material shall be sorted and segregated on site in so far as is practical. The majority of the demolition waste will be concrete and mixed C&D waste. It is anticipated that where possible a soft strip approach to demolition activities would be undertaken which means demolition waste such as concrete, steel and bricks would have a higher potential to be recycled and that any wood generated through demolition activities would be recoverable for ~~use as fuel~~reuse. ~~▪ If material from the proposed Project is categorised as a waste as opposed to a by-product, Article 28 of the European Communities (Waste Directive) Regulations 2011 (Article 6 of the Water Framework Directive) allows for waste materials to be given End-of-Waste status following recovery or recycling process, as long as it meets a set of criteria as outlined in the legislation. This means that the material is no longer classified as a waste but is rather a product and no longer falls under the jurisdiction of any waste management legislation. The material should re-enter the supply chain.~~ ▪ Following consultations with a number of waste management facilities, Integrated Materials Solutions, located in north County Dublin, approximately 25km from the Northwood Portal site, has been identified as a potential location for management and disposal of the bulk of the demolition waste (there is currently no contractual arrangements in place). Integrated Materials Solutions operate under Waste Licence W0129-02 and are licensed to accept 500,000 tonnes of inert C&D waste per annum. ▪ In the event, that there be issues with using the Integrated Materials Solutions facility when construction commences, a suitable alternative facility will be identified. Any facility to be used	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				for the disposal of demolition waste shall be suitably licensed, permitted or certified to accept such waste, and the waste will be transported by vehicles operating under a valid Waste Collection Permit. ▪ All demolition waste will be properly managed while on site and in accordance with the Principal Contractor's C&D WMP in order to ensure that the site is kept tidy and safe, and that cross contamination of waste streams is prevented.	
RWM6	24.6.6	Throughout (as required)	Excavated Materials Management Strategy	**Excavated material:** ▪ Nearly 3 million m^3 of excavated material is forecast to be generated by the proposed Project. Of that approximately 99,931m^3 of excavated material will be reused within the proposed Project for the construction of embankments, in backfill, and for bunding and landscaping requirements. The remaining approximately 2.9 million m^3 of surplus excavated material will not be reusable within the proposed Project. This material will therefore require management off site, either as a by-product,through recovery at soils recovery facilities or as a waste. ▪ In accordance with the waste hierarchy, finding a beneficial reuse for as much of the surplus excavated material as possible, and therefore preventing the material from being categorised as a waste, will be the preferred choice for management of the excavated material. Approximately 94,775m^3 (170,595 tonnes) of the total excavated material is predicted to be contaminated (this equates to 3% of the overall total of excavated material) and thus classified as hazardous. If required, the construction compound site at Northwood will be the temporary storage location for excavated material throughout the Construction Phase of the proposed Project. However, where possible excavated material will be placed directly into tipper-type HGVs for transport to its final destination. ▪ The Excavated Material Management Strategy is to be used by the Contractor(s) to develop an Excavated Materials Management Plan to be followed during the excavation phases of the proposed Project. ▪ In accordance with the waste hierarchy, finding a beneficial reuse for as much of the surplus excavated material as possible, will be the preferred choice for management of the excavated material. ▪ The construction compound site at Northwood will be the temporary storage location for all excavated material throughout the Construction Phase of the proposed Project. **Tunnel Boring Material** ▪ Drilling material and waste during the Construction Phase of the proposed Project will be managed by the Contractor(s).	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ During operation of the TBM, the bentonite slurry will be reused within the system. Once it is no longer required, the spoil and residual slurry from the tunnel boring will be disposed of off-site to a suitable authorised waste facility through an appropriate waste contractor. ▪ All tanks for storage of slurry will be bunded to ensure that any leakages are contained and are not allowed to enter the groundwater and/or nearby surface waters. ▪ All bentonite usage will be monitored through materials balance calculations, pressure monitoring in the lines and visual assessment of the works to ensure that, would breakout occur the volume is minimised. ▪ In the event, that leakages or breakouts occur, they will be responded to immediately with repairs and clean-up of any slurry which has spilled. ▪ As with all the waste the materials arising from the TBM will be managed in accordance with the waste hierarchy with consideration for re-use, recycling, recovery and as a last resort disposal.	
RWM7	24.6.7	Throughout (as required)	Waste Excavated Material management	▪ All remaining balance of surplus excavated material will be classified as 'waste'. ▪ The waste will be sent to a suitably licensed, permitted or registered waste facility for compliant handling and recovery or disposal. ▪ Any material to be removed from site will be transported by vehicles in possession of a valid Waste Collection Permit. ▪ In the event of any issues with the use of Huntstown Quarry by the time construction commences, suitable alternatives will be identified. ▪ Where practical the closest suitable facilities will be used to minimise the impacts associated with transporting the material, such as air and noise emissions from vehicle movements. ▪ It is intended that in so far as is possible, the surplus excavated material will be managed within Ireland in order to minimise impacts associated with the transport of the material. ▪ While being retained on-site, the excavated material will be properly managed and stored in order to reduce impacts associated with storage of soil and stone. ▪ Different types of excavated material will be stored separately, i.e. where applicable made ground will be stockpiled separate to soils and subsoils, which will be stockpiled separate to rock. ▪ Any material which has been classified as a by-product in accordance with Article 27 ~~shall~~will be stored separately to any material which is classified as a waste. Where possible, excavated material will be placed directly into tipper-type HGVs for transport to its final destination. ▪ Any contaminated land will be stockpiled separately from all other material in order to minimise the risk of cross contamination.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Stockpiling shall be strictly controlled so as to ensure that impacts to the environment surrounding the Northwood site are kept to a minimum. There will be three separate stockpile storage areas, namely an area for the storage of material to be reused within the proposed Project, an area for storage of by-product material, and an area for excavated material which is to be removed from site.	
RWM8	24.6.6.1	Throughout (as required)	By-Product Material/Soil Recovery Facility	▪ ~~In so far as is possible, options~~Options for beneficial reuse of the clean, suitable soil and stone material in accordance with Article 27 or suitable for SRF of the Waste Management Act is being progressed. This will prevent the need to classify all of the 2.9 million m^3 of excavated material as a waste. It has been predicted that approximately ~~89.4~~80%-90% of the excavated material could be classified under Article 27 and the remaining ~~10.6~~10%-20% would be classified as waste (inert, non-hazardous or hazardous). ▪ Locations and projects with a deficit of soil and stone material will be identified for the ~~89.4% of~~ excavated material classified under Article 27. ▪ Additional locations which may be suitable to accept such by-product soil and stone may also become available by the time construction commences and a further review and consultations with suitable facilities will be undertaken as needed in advance of the commencement of the Construction Phase. ▪ Should there be any issues with the use of Huntstown Quarry by the time construction commences, suitable alternatives will be found. ~~Where practical the~~The closest suitable facilities will be used to minimise the impacts associated with transporting the material, such as air and noise emissions from vehicle movements. It is intended that in so far as is possible, the surplus excavated material will be managed within Ireland in order to minimise impacts associated with the transport of the material. ▪ It is proposed to use soil recovery facilities to manage surplus excavated material in the event Article 27 notification is not successful. It is predicted that 80% of the excavated material could be classified as suitable for SRF and the remaining 20% would be classified as waste (inert, non-hazardous or hazardous).	Construction Phase
RWM9	24.6.5	Throughout (as required)	Hazardous waste	▪ Any hazardous waste anticipated to arise as a result of the construction of the proposed Project will be managed as per the Waste Management (Hazardous Waste) Regulations (S.I. No. 163 of 1998) as amended and other applicable legislation. ▪ Any hazardous waste will be stored separately to non-hazardous waste, with individual hazardous waste streams segregated from each other. ▪ Appropriate signage will be put in place to denote any hazardous waste storage locations.	Construction and Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ As fuels and oils are classed as hazardous materials, if there is any on site storage of fuel/oil, all storage tanks and draw-off points will be bunded and located in a dedicated, secure area of the site. Provided that these requirements are adhered to, and the site Contractor(s) are trained in the appropriate techniques, no fuel/oil wastage is predicted during construction. ▪ Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. ▪ Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor. In addition, small volumes of WEEE (waste electrical and electronic equipment) containing hazardous components, printer toner/cartridges, batteries (containing lead, nickel-cadmium or mercury) and/or fluorescent tubes and other mercury containing waste will be generated during C&D activities or temporary site offices. These wastes will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor for recycling or disposal if recycling is not possible. ▪ As hazardous wastes are typically unsuitable for disposal to landfill, these will be instead managed in a closed-loop system, where suppliers will typically take back the materials they supply for recycling or special disposal. ▪ All hazardous waste including asbestos will be disposed of through a suitably permitted waste contractor for disposal or processing at a suitably licensed/permitted/ registered facility which should accept the type of hazardous waste being managed. ▪ As per legislative requirements, records of all hazardous waste generated and removed from site will be retained for a minimum period of three years by the Contractor(s). This includes documentation such as waste transfer forms, any applicable transfrontier shipment records in the event that waste has to be exported, and any records on the treatment and ultimate disposal of the hazardous waste. ▪ Export of hazardous waste from the proposed Project outside of the State is subject to a Europe-wide control system founded on Regulation (EC) No. 1013/2006 of the European Parliament and of the Council of 14 June 2006 on Shipments of Waste (hereafter referred to as the Transfrontier Shipment Regulations) and S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007, as amended.	
RWM10	24.6.8	Throughout (as required)	Stations	▪ Operational Phase impacts associated with material and waste management at stations and during maintenance are predicted to not be significant in the context of the proposed Project. ▪ All wastes generated during the will be managed in accordance with the waste hierarchy.	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Operational waste plans will be prepared by the Project operator in order to ensure that the aims of the Project Sustainability Plan are met. The future Operator will be required to have a Sustainability Plan which will be linked to the ISO 14001 accreditation (or similar). ▪ The assessment of any environmental impacts and effects associated with materials and waste during maintenance or any large-scale future renewal or improvement works, will be undertaken by the future Operator in accordance with all legal and other necessary requirements. The future Operator will be required to be accredited to ISO 14001 Environmental Management Systems (or similar) for the operation and maintenance of the proposed Project.	

31.20 Archaeology and Cultural Heritage

Table 31.31.18 Archaeology and Cultural Heritage Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH1	25.6	Throughout (as required)	Archaeological supervision	▪ In accordance with the Code of Practice TII has appointed a Project Archaeologist to the proposed Project to oversee and manage the archaeological elements of the proposed Project. ▪ All Archaeological Consultants appointed to the proposed Project ~~shall~~will comply with the Code of Practice and ~~shall~~will liaise directly with the TII Project Archaeologist in relation to all archaeological requirements. ▪ The MetroLink Project Conservation Architect will act on behalf of TII with reference to built heritage constraints.	Construction phase
CH2	25.6	Throughout (as required)	Known archaeological material	▪ Mitigation measures will seek to preserve in situ any archaeological or cultural heritage constraints. ▪ Where this is not possible a range of mitigation measures will be implemented in advance of and during construction which will aim to ameliorate all impacts. ▪ All construction phase mitigation measures will be carried out by the appropriate contractor appointed to each phase of the works and as specified in the most up to date version of the ~~Draft~~ MetroLink Cultural Heritage Strategy (~~2021~~2022). ▪ The MetroLink Cultural Heritage Strategy will be maintained as a live document throughout the Construction Phase of the proposed Project and will be updated in response to new information received from archaeological investigations, the Project Conservation Architect surveys, ongoing stakeholder liaison and in response to changes in the receiving baseline environment inclusive of adjacent developments. ▪ Mitigation measures which ~~may~~will be undertaken prior to and during the Construction Phase include: - Full measured, written, drawn and photographic surveys; - Detailed construction methodology (demolition, removal, storage, relocation/reinstatement, rebuilding, repair and rehabilitation of archaeological and cultural heritage monuments; appropriate screening; monitoring of vibration); - Dive, underwater and wade surveys (including metal detecting); - Geophysical surveys (including Ground Penetrating Radar (GPR));	Construction phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- Archaeological test excavations; - Archaeological monitoring; and - Preservation by record (Archaeological excavation). ▪ Where a constraint has been subject to extensive archaeological test excavations either as a component of OMN works or the proposed Project, no further test excavations ~~will be~~is proposed. Where extensive test excavations have taken place and no sub-surface archaeological stratigraphy has been identified, or where a constraint has been fully preserved by record within the proposed Project boundary, no further mitigation measures ~~will be~~is proposed.	
CH3	25.6.1.2	Throughout (as required)	Archaeological Licence Requirements	▪ Archaeological excavation and the use of detection devices are subject to strict control under the National Monuments Act 1930 (as amended). All archaeological investigations, including test excavations, preservation by record (excavation) and archaeological monitoring, will be undertaken by a suitably qualified archaeologist in accordance with Section 26 (2) Excavation Licence. ▪ All dive, underwater and wade surveys ~~shall~~will be carried out pursuant to a Section 3 (5) Dive Survey Licence. All detection surveys shall be carried out pursuant to a Section 2 (2) Detection Survey Licence. Consent to use a detection device or to undertake an underwater, dive or wade survey does not include permission to excavate for archaeological objects. If excavation or recovery of archaeological objects is required, a separate Section 26 (2) Excavation Licence or Section 14 (2) Ministerial Consent must be applied for.	Construction phase
CH4	25.6.1.3	Throughout (as required)	Reporting	▪ In order to fulfil licence conditions, a preliminary report and a final report on the findings are required. Details of the reporting requirements are contained within the ~~Draft~~ MetroLink Cultural Heritage Strategy (~~2021~~2022) provided in Appendix A25.1 and further detail as to the content required for each report will be outlined in the individual contract documentation, as produced by the TII Project Archaeologist. All reports will be produced in accordance with government guidelines.	Construction phase
CH5	25.6.1.4	Throughout (as required)	Operation Impact Mitigation Measures ▪ Lissenhall Bridge National Monument (ACH020)	▪ The visual impact on the setting of Lissenhall Bridge National Monument (ACH020) will be mitigated by preparing a full written and photographic record of the setting of the bridge prior to the start of construction. The new Broadmeadow and Ward	Operational phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			▪ St Stephen's Green Park National Monument (ACH211)	Viaduct will be screened where possible through the planting of trees, similar to species growing nearby. ▪ At St Stephen's Green Park National Monument (ACH211) the trees, railings and other park features that have to be removed prior to construction would be replanted or reinstated following completion of construction. New structures will be further developed to cause minimal visual impact on the Park and all final landscaping, conservation and reinstatement requirements will be agreed in direct consultation with the MHLGH and OPW (and TII Project Archaeologist and Project Conservation Architect (PCA)). The Contractor appointed for the Operation Phase of the proposed Project will be required to keep all stations and their associated infrastructure well maintained and clean and to replace any failed planting above the station box.	
CH6	Table 25.9	▪ ACH001	▪ Potential impact resulting from ground disturbances to facilitate construction of Estuary station, park and ride facility, construction compound and associated infrastructure and landscaping.	▪ Archaeological preservation by record (excavation) of the D-shaped enclosure to be carried out in advance of construction. ▪ Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. In the event, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH7	Table 25.9	▪	▪ Potential impact resulting from ground disturbances to facilitate construction of Estuary station, park and ride facility, construction compound and associated infrastructure and landscaping.	▪ Archaeological preservation by record (excavation) to be carried out in advance of construction.	Construction Phase
CH8	Table 25.9	▪ ACH004	▪ Potential impact resulting from ground disturbances to facilitate construction	▪ Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. In the event, archaeological remains be	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			of Estuary station, park and ride facility, construction compound and associated infrastructure and landscaping	confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	
CH9	Table 25.9	▪ ACH009	▪ Potential impact resulting from ground disturbances to facilitate construction of Estuary station, park and ride facility, construction compound and associated infrastructure and landscaping	▪ Archaeological preservation by record (excavation) to be carried out in advance of construction.	Construction Phase
CH10	Table 25.9	▪ ACH010	▪ Potential impact resulting from the construction of a pedestrian and cyclist underpass where the proposed Project crosses Ennis Lane	▪ Archaeological monitoring to be carried out during construction and a full written and photographic record of any features associated with the townland boundary made if identified. In the event, any additional archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) may be required.	Construction Phase
CH11	Table 25.9	▪ ACH011	▪ Potential impact resulting from ground disturbances to facilitate construction of Estuary station, park and ride facility, utilities, track works, construction compound and associated infrastructure and landscaping.	▪ Any extant section of Townland Boundary to be directly impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH12	Table 25.9	▪ ACH012	▪ Potential impact located within area required for station and park and ride	▪ Relocation of the community area to an alternative location. ▪ Archaeological test excavations to be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			facility, impacts resulting the removal of the community area to facilitate construction	~~would~~will be carried out during enabling and construction works. In the event archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	
CH13	Table 25.9	▪ ACH019	▪ Potential impact resulting from ground disturbances to facilitate construction of viaduct including the construction of temporary bailey bridges.	▪ Archaeological test excavations to be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH14	Table 25.9	▪ ACH020	▪ The construction of the viaduct for the Metro will take place in proximity to the bridge and will have the potential to have a high direct impact on the bridge through accidental damage or use by construction vehicles and machinery. ▪ Potential impact to a small area within the 30m proximity zone resulting from excavations required for the construction of the viaduct. ▪ Potential high direct impact to the bridge as a result of the construction of piles as part of the works which may cause damage to the bridge	▪ The bridge is to be protected by hoardings to prevent plant and machinery from approaching close to it. Obstructions are to be placed on the approach to the bridge close to, but not on, the bridge deck to prevent access by vehicles and machinery. ▪ The extent of vibrations is to be monitored by means of vibration monitors fixed to the bridge and constantly monitored to ensure that vibration limits are not exceeded. In the event that limits be exceeded work in the vicinity of the bridge is to cease until the source of vibration is identified and measures to reduce vibration are introduced. ▪ Archaeological test excavations to be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required. ▪ A full written and photographic record of the setting of the bridge will be made prior to construction.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			through vibration or settlement. ▪ Indirect Impacts: ▪ The construction of the viaduct will be visually intrusive on the setting of the bridge; however, this would be temporary		
CH15	Table 25.9	▪ ACH020	▪ The finished project will result in a raised viaduct running in proximity to the bridge, which is a National Monument, and with high overhead line electricity (OHLE) pylons and cables.	▪ A full written and photographic record of the setting of the bridge will be made prior to construction. The viaduct will be screened ~~where possible~~ through the planting of trees similar to those identified at present in the vicinity.	Operational Phase
CH16	Table 25.9	▪ ACH021	▪ Potential impact resulting from excavations associated with the construction of the viaduct at the northern end of the AAP and the proposed Project within a retained cut along the remainder of this area. ▪ Potential impact also resulting from the installation of infrastructure for the proposed Project inclusive of compound establishment, utilities, pitch realignment and track works.	▪ Archaeological test excavations to be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH17	Table 25.9	▪ ACH026	▪ Potential impact resulting from excavations associated with the establishment of Seatown West satellite compound and associated infrastructure and utilities and the construction of the proposed Project within a cut and cover in this area.	▪ Archaeological monitoring ~~to~~twill be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH18	Table 25.9	▪ ACH028	▪ Potential impact resulting from excavations associated with establishment of Seatown West satellite compound and associated infrastructure and utilities and the construction of the proposed Project within a cut and cover in this area.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH19	Table 25.9	▪ ACH029	▪ Potential impact resulting from excavations associated with the establishment of Estuary Court satellite compound and associated infrastructure and utilities and the construction of the proposed Project within a cut and cover in this area.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH20	Table 25.9	▪ ACH033	▪ Potential impact resulting from excavations associated with the establishment of Seatown Station compound, NDC compound and associated infrastructure and utilities and the construction of the proposed Project within a cut and cover in this area.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH21	Table 25.9	▪ ACH035	▪ Potential impact resulting from the establishment of Chapel Lane compound and excavations associated with the construction of a replacement footbridge in this area.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH22	Table 25.9	▪ ACH043	▪ Potential impact resulting from excavations associated with the establishment of Swords Central Station compound, associated infrastructure and utilities and the construction of the proposed Project within a cut and cover and retained cut in this area.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH23	Table 25.9	▪ ACH044	▪ Potential impact resulting from excavations associated with the establishment of Pavillions	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			compound and associated infrastructure and utilities.	preservation in situ or full archaeological preservation by record (excavation) will be required.	
CH24	Table 25.9	▪ ACH047	▪ Potential impact resulting from ground disturbances associated with the establishment of Swords Central Station compound and associated infrastructure and utilities, the construction of the Swords Central Station and the proposed Project within a cut and cover and retained cut in this area.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH25	Table 25.9	▪ ACH049	▪ Potential impact resulting from ground disturbances associated with the establishment of Swords Central Station compound and associated utilities, the construction of the Swords Central Station and the proposed Project within a cut and cover and retained cut in this area.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH26	Table 25.9	▪ ACH051	▪ Potential impact resulting from excavations associated with the establishment of Pinnock Hill compound and associated infrastructure and utilities and the construction of the	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			proposed Project within a retained cut and cut and cover in this area.		
CH27	Table 25.9	▪ ACH053	▪ Potential impact resulting from excavations associated with construction of the proposed Project within a retained cut in this area.	▪ A full photographic, condition and written survey of the shrine will be undertaken by MetroLink PCA prior to the construction of the proposed Project. The PCA ~~to~~will prepare draft specifications for removal, storage and relocation. Revised location ~~to~~will be agreed with LA and property owner.	Construction Phase
CH28	Table 25.9	▪ ACH059	▪ Potential impact resulting from ground disturbances to facilitate construction of Fosterstown Station and the proposed Project within a cut and cover in this area.	▪ Archaeological preservation by record (excavation) ~~to~~will be carried out in advance of construction.	Construction Phase
CH29	Table 25.9	▪ ACH067	▪ Potential impact resulting from ground disturbances to facilitate construction the proposed Project within a cut and cover in this area.	▪ Any extant section of Townland Boundary ~~to~~will be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH30	Table 25.9	▪ ACH068	▪ Potential impact resulting from ground disturbances to facilitate construction of Bolands compound and associated infrastructure and utilities and the proposed Project in retained cut in this area.	▪ Archaeological test excavations to be carried out ~~where feasible~~ in areas of direct impact in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH31	Table 25.9	▪ ACH069	▪ Potential impact impact resulting from ground disturbances to facilitate construction of Bolands	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			compound and associated infrastructure and utilities and the proposed Project in retained cut in this area.		
CH32	Table 25.9	▪ ACH071	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project within a retained cut in this area.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH33	Table 25.9	▪ ACH073	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project within a retained cut in this area.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH34	Table 25.9	▪ ACH074	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project within a retained cut in this area.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH35	Table 25.9	▪ ACH075	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project within a retained cut in this area.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH36	Table 25.9	▪ ACH077	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			within a retained cut in this area.		
CH37	Table 25.9	▪ ACH080	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project within a retained cut in this area.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH38	Table 25.9	▪ ACH081	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project in this area.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH39	Table 25.9	▪ ACH085	▪ Potential impact resulting from ground disturbances to facilitate construction of the proposed Project in this area. This includes the construction of a box culvert and farm underpass where the proposed Project crosses the stream. Construction of these elements will require the stream to be temporarily diverted.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate). ▪ An archaeological wade survey will be carried out along the section of the stream to be impacted.	Construction Phase
CH340	Table 25.9	▪ ACH086	▪ Potential impact resulting from ground disturbances to facilitate construction of the ESBN substation, MetroLink substation and associated transformers.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH41	Table 25.9	▪ ACH093	▪ Potential impact resulting from the construction of Dardistown Depot at the southern end of this AAP and from the realignment or relocation of the sports pitches and associated facilities located along the northern side of the AAP.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH42	Table 25.9	▪ ACH095	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH43	Table 25.9	▪ ACH096	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH44	Table 25.9	▪ ACH097	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH45	Table 25.9	▪ ACH099	▪ Potential impact resulting from removal of the townland boundary in order to facilitate the insertion of new boundary treatments in this area.	▪ ~~Townland boundaries will be preserved in situ where possible. If this is not possible, any~~Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate). ~~▪~~	Construction Phase
CH46	Table 25.9	▪ ACH102	▪ Potential impact resulting from removal of the townland boundary in order to facilitate the construction of Dardistown Depot.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate). ▪ An archaeological wade survey will be carried out in advance of construction along the section of the stream to be impacted.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH47	Table 25.9	▪ ACH103	▪ Potential impact resulting from removal of the townland boundary in order to facilitate the construction of Dardistown Depot.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH48	Table 25.9	▪ ACH104	▪ Potential impact resulting from removal of the townland boundary in order to facilitate the construction of Dardistown Depot.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH49	Table 25.9	▪ ACH105	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH50	Table 25.9	▪ ACH106	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH51	Table 25.9	▪ ACH107	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase
CH52	Table 25.9	▪ ACH108	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH53	Table 25.9	▪ ACH109	▪ Potential impact resulting from ground disturbances to facilitate construction of Dardistown Depot.	▪ Archaeological preservation by record (excavation) will be carried out in advance of construction.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH54	Table 25.9	▪ ACH110	▪ Potential impact resulting from ground disturbances to facilitate construction of the M50 Viaduct, the Northwood Station and Portal main compound, associated infrastructure and utilities and the proposed Project in retained cut and cut and cover.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH55	Table 25.9	▪ ACH112	▪ Potential impact resulting from ground disturbances to facilitate construction of the Northwood Station and Portal main compound, associated infrastructure and utilities and the proposed Project in retained cut and cut and cover. ▪ Potential impact also resulting from minor alterations to the Santry river including straightening of the channel and addition of scour protection immediately downstream of the culvert outlet.	▪ An archaeological wade survey will be carried out in advance of construction along the section of the River to be impacted. ▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that the route of the townland boundary be identified, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.	Construction Phase
CH56	Table 25.9	▪ ACH113	▪ Potential impact resulting from removal of the townland boundary in order to facilitate the	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			construction of Northwood Logistics Yard.		
CH57	Table 25.9	▪ ACH115	▪ Potential impact resulting from ground disturbances to facilitate construction of the M50 Viaduct, the Northwood Station and Portal and associated infrastructure and utilities.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact Service in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH58	Table 25.9	▪ ACH116	▪ Potential impact resulting from ground disturbances to facilitate construction of the Northwood Station and Portal and associated infrastructure and utilities.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH59	Table 25.9	▪ ACH127	▪ Potential impact resulting from ground disturbances to facilitate construction of Collins Avenue Station, compound and associated utility diversions and infrastructure works.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction ~~If this is not possible, archaeological monitoring would be carried out during enabling and construction works~~. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Memorial to be removed and stored during construction and reinstated following completion of the Construction Phase.	Construction Phase
CH60	Table 25.9	▪ ACH131	Potential impact resulting from the reorientation of the existing playing fields in this area.	▪ The existing playing fields will be realigned to allow for the construction of the intervention and escape shaft. Impacts to potential below ground archaeology are addressed under ACH132.	Construction Phase
CH61	Table 25.9	▪ ACH132	▪ Potential impact resulting from ground disturbances to facilitate construction of Albert College Park Intervention and Escape	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction. If this is not possible, archaeological monitoring ~~would~~will be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			Shaft and associated infrastructure and utilities.		
CH62	Table 25.9	▪ ACH136	▪ Potential impact resulting from ground disturbances to facilitate construction of Griffith Park Station.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact ~~Service~~ in advance of construction. In the event that additional archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH63	Table 25.9	▪ ACH143	▪ Potential impact resulting from demolition of the structure to allow for the construction of Glasnevin Station and compound.	▪ Any extant section of Townland Boundary to be impacted upon will be subject to a detailed written and photographic survey (to include test excavations where appropriate).	Construction Phase
CH64	Table 25.9	▪ ACH145	▪ Potential impact resulting from demolition of the structure to allow for the construction of Glasnevin Station and compound.	▪ The licensed premises ~~are to~~will be recorded by means of photography and written description to English Heritage level 3 prior to demolition.	Construction Phase
CH65	Table 25.9	▪ ACH146	▪ Potential impact resulting from ground disturbances to allow for the construction of Glasnevin Station and compound and associated infrastructure and utilities.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH66	Table 25.9	▪ ACH147	▪ Potential impact resulting from construction works to facilitate the regrading of the railway as part of the works to construct the interchange at Glasnevin Station, affecting approximately 750m of the track.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Where ~~knotweed~~Japanese Knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH67	Table 25.9	▪ ACH147.1	▪ Potential impact resulting from construction works to facilitate the lowering of the level of the existing railway tracks to allow for the construction of the proposed Project.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Where ~~knotweed~~Japanese Knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.	Construction Phase
CH68	Table 25.9	▪ ACH147.2	▪ Potential impact resulting from construction works to facilitate the lowering of the level of the existing railway tracks to allow for the construction of the proposed Project.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Where ~~knotweed~~Japanese Knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.	Construction Phase
CH69	Table 25.9	▪ ACH147.3	▪ Potential impact resulting from construction works to facilitate the lowering of the level of the existing railway tracks to allow for the construction of the proposed Project.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Where ~~knotweed~~Japanese Knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.	Construction Phase
CH70	Table 25.9	▪ ACH147.4	▪ Potential impact resulting from construction works to facilitate the lowering of the level of the existing railway tracks to allow for the construction of the proposed Project.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Where ~~knotweed~~Japanese Knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.	Construction Phase
CH71	Table 25.9	▪ ACH147.5	▪ Potential impact resulting from construction works to facilitate the lowering of the level of the existing railway tracks to allow for	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			the construction of the proposed Project.	▪ Where ~~knotweed~~Japanese Knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.	
CH72	Table 25.9	▪ ACH148	▪ Potential impact resulting from construction works to facilitate the construction of Glasnevin station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH73	Table 25.9	▪ ACH149	▪ Potential impact resulting from construction works to facilitate the construction of Glasnevin station, construction compound and associated utilities and infrastructure. The construction of the station will necessitate the closure of the Royal Canal and dewatering and infilling of a section of the canal during construction, with reinstatement on completion. The top of the quay wall on the northern side of the canal will be removed and reinstated at the end of the works in this area. Southern tow path to be upgraded to allow access (Royal Canal Way) and abutments of	▪ Underwater archaeological survey ~~to~~will be carried out along the canal basin in advance of construction. ▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ at the rear of the ~~town~~tow path in order to determine the support structure. In the event that additional archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required. ▪ ~~Underwater archaeological survey to be carried out along the canal basin in advance of construction.~~	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			bridge used for new structure.		
CH74	Table 25.9	▪ ACH149.1	▪ Potential impact resulting from construction works to facilitate construction works to facilitate the construction of Glasnevin station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH75	Table 25.9	▪ ACH149.2	▪ Potential impact resulting from construction works to facilitate construction works to facilitate the construction of Glasnevin station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH76	Table 25.9	▪ ACH151	▪ Potential impact resulting from construction works to facilitate the lowering of the level of the existing railway tracks to allow for the construction of the proposed Project.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH77	Table 25.9	▪ ACH166	▪ Potential impact resulting from ground disturbances to allow for the construction of Mater Station and compound and associated utility diversions works.	▪ Archaeological test excavations ~~to~~will be carried out ~~where feasible~~ in areas of direct impact Service in advance of construction. If this is not possible, archaeological monitoring would be carried out during enabling and construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH78	Table 25.9	▪ ACH167	▪ Potential impact resulting from ground disturbances to allow for the construction of Mater Station and compound and associated infrastructure and utilities.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH79	Table 25.9	▪ ACH169	▪ Potential impact resulting from ground disturbances associated with the construction of the proposed Project including utilities diversions, landscaping, installation of proposed scheme.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH80	Table 25.9	▪ ACH177	▪ Potential impact resulting from construction works to facilitate construction of O'Connell Street Station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. Monitoring will be carried out to the base of the formation level of the construction compound and station. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH81	Table 25.9	▪ ACH178	▪ Potential impact resulting from construction works to facilitate construction of O'Connell Street Station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. Monitoring will be carried out to the base of the formation level of the construction compound and station. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH82	Table 25.9	▪ ACH179	▪ Potential impact resulting from construction works to facilitate construction of O'Connell Street	▪ Archaeological monitoring ~~to~~will be carried out during construction. Monitoring will be carried out to the base of the formation level of the construction compound and station. In the event that archaeological remains be confirmed, further	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			Station, construction compound and associated utilities and infrastructure.	archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	
CH83	Table 25.9	▪ ACH180	▪ 14-17 Moore Street are located about 60m from the deep excavation for the construction of O'Connell Street Station, while 8-9 Moore Lane are located 35m from the deep 3excavation. There is potential for damage to the buildings from vibration, which is considered to be a medium indirect impact.	▪ Any works to be undertaken within 50m of the edge of the National Monument must be undertaken under Ministerial Consent. ▪ Vibration monitoring equipment ~~is to~~will be installed at the buildings and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment ~~is to~~will be monitored ~~and in~~. In the event of limits being exceeded, all work in the vicinity ~~is~~will to stop until the cause of the issue is identified and resolved.	Construction Phase
CH84	Table 25.9	▪ ACH194	▪ Potential impact resulting from construction works to facilitate construction of Tara Street Station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH85	Table 25.9	▪ ACH196	▪ Potential impact resulting from construction works to facilitate construction of Tara Street Station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation ~~may~~will be required.	Construction Phase
CH86	Table 25.9	▪ ACH197	▪ Potential impact resulting from construction works to facilitate construction of Tara Street Station,	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			construction compound and associated utilities and infrastructure.		
CH87	Table 25.9	▪ ACH198	▪ Potential impact resulting from construction works to facilitate construction of Tara Station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during ~~enabling and~~ construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.	Construction Phase
CH88	Table 25.9	▪ ACH053	▪ Potential impact resulting from removal of the statue from within the Tara Station.	▪ A full photographic, condition and written survey of the statue will be undertaken by MetroLink PCA prior to the construction of the proposed Project. The PCA ~~to~~will prepare draft specifications for removal, storage and relocation. Revised location ~~to~~will be agreed with Local Authority.	Construction Phase
CH89	Table 25.9	▪ ACH211	▪ Potential impact from construction works to facilitate construction of St Stephen's Green station, construction compound, landscaping and associated utilities and infrastructure. Works will include the removal of paths, railings alongside paths, vegetation and other works. ▪ Potential impact resulting from temporary changes to the setting of the Park during construction, removal of sculptures located within the red line	▪ All works carried out in this area must be undertaken in accordance with Ministerial Direction. ▪ Archaeological monitoring ~~to~~will be carried out during all construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			boundary to facilitate construction.		
CH90		▪ ACH211	▪ Potential impact to the form of the Park through the permanent addition of new structures associated with the operation of the station.	▪ Tree, railings and other park features ~~to~~will be replanted/reinstated following completion of construction. New structures will be designed to cause minimal visual impact on the Park.	Construction Phase
CH91	Table 25.9	▪ ACH211	▪ Potential impact to the form of the Park through the permanent addition of new structures associated with the operation of the station.	▪ Tree, railings and other park features ~~to~~will be replanted/reinstated following completion of construction. New structures have been ~~further developed~~designed to cause minimal visual impact on the Park and its setting.	Operational Phase
CH92	Table 25.9	▪ ACH211.1	▪ Potential impact resulting from construction works to facilitate construction of St Stephen's Green station, construction compound, landscaping and associated utilities and infrastructure.	▪ All works carried out in this area must be undertaken in accordance with Ministerial Direction. ▪ Archaeological monitoring ~~to~~will be carried out during all construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.	Construction Phase
CH93	Table 25.9	▪ ACH211.2	▪ Potential impact resulting from construction works to facilitate construction of St Stephen's Green station, construction compound, landscaping and associated utilities and infrastructure.	▪ All works carried out in this area must be undertaken in accordance with Ministerial Direction. ▪ Archaeological monitoring ~~to~~will be carried out during all construction works. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.	Construction Phase
CH94	Table 25.9	▪ ACH204	▪ Potential impact from ground borne noise and vibration during tunnelling	▪ Vibration monitoring subject to ongoing assessment.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
CH95	Table 25.9	▪ ACH205	▪ Potential impact from ground borne noise and vibration during tunnelling	▪ Vibration monitoring subject to ongoing assessment.	Construction Phase
CH96	Table 25.9	▪ ACH206	▪ Potential impact from ground borne noise and vibration during tunnelling	▪ Vibration monitoring subject to ongoing assessment.	Construction Phase
CH97	Table 25.9	▪ ACH207	▪ Potential impact from ground borne noise and vibration during tunnelling	▪ Vibration monitoring subject to ongoing assessment.	Construction Phase
CH98	Table 25.9	▪ ACH208	▪ Potential impact from ground borne noise and vibration during tunnelling	▪ Vibration monitoring subject to ongoing assessment.	Construction Phase
CH99	Table 25.9	▪ ACH212	▪ Potential impact from ground borne noise and vibration during tunnelling	▪ Vibration monitoring subject to ongoing assessment.	Construction Phase
CH100	Table 25.9	▪ ACH225	▪ Potential impact resulting from construction works to facilitate construction of Charlemont station, construction compound and associated utilities and infrastructure.	▪ Archaeological monitoring ~~to~~will be carried out during construction. In the event that archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.	Construction Phase

31.21 Architectural Heritage

Table 31.19: Architectural Heritage Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref	Location	Pre-mitigation Issue	Description of Mitigation and/or Monitoring Measures	Stage of Impact (Construction and/or Operational Phase)
AH1	26.7	Throughout (as required)	Affected heritage features along the alignment	▪ A Project Conservation Architect (PCA) has been engaged to oversee the implementation of the Project. Prior to the establishment of construction compounds, the Project Conservation Architect (PCA) will undertake Structural and Condition Surveys of any built and cultural heritage constraints that will require removal to secure storage (followed by conservation and reinstatement) or protection in-situ. The PCA will also prepare specifications for these works. A specialist Heritage Works Contractor will be appointed to remove, store and conserve these constraints. The Main Construction Works Contractors will appoint Consultant Conservation Architects to implement required preservation of in situ works. ▪ It may occur that sites of architectural heritage significance not identified to date will be discovered during the works, such as cellars surviving from buildings that have otherwise disappeared. Equally, it may at construction stage be deemed safer to remove items of historic street furniture and paving currently identified for protection in situ to secure storage, to ensure no inadvertent damage may arise (e.g. from construction traffic). In such a case the mitigation measures to be adopted will be the same as those that have been identified in ~~this~~ Chapter 26 Architectural Heritage inclusive of the protection of underlying cellars where present. Any such changes will be reflected in forthcoming iterations of the TII Cultural Heritage Strategy (2022) provided as Appendix A25.1.	Construction and Operational Phase
AH2	26.7	Throughout (as required)	Affected heritage features along the alignment	▪ A number of different forms of mitigation are specified, the most common of which, given the length of the tunnels to be bored, relates to the carrying out of condition surveys of buildings and other structures of architectural constraints in the proximity of the tunnel prior to and following the completion of the tunnels. ▪ This will be undertaken through a Property Owner Protection Scheme (POPS) which will undertake condition surveys of private	Construction and Operational Phase

Mitigation No.	EIAR Section Ref	Location	Pre-mitigation Issue	Description of Mitigation and/or Monitoring Measures	Stage of Impact (Construction and/or Operational Phase)
				properties and other selected properties along the route of the proposed Project. The purpose of the condition surveys ~~would~~will be to ascertain the condition of the properties before, during (if deemed necessary), and after the completion of the proposed Project to determine whether there has been any deterioration of any of the properties surveyed and whether the same may be attributable to the proposed Project and it will recommend repairs as appropriate. ▪ At station locations mitigation measures for extant architectural heritage constraints directly impacted by the works will ~~generally~~ be carried out be the Project Conservation Architect (PCA). The role of the PCA, and the condition surveys and specifications they are required to undertake, is outlined listed in the ~~Draft~~ MetroLink Cultural Heritage Strategy (2022).	
AH3	26.7	Throughout (as required)	Affected heritage features along the alignment	In a relatively small number of instances buildings are to be demolished or cellars are to be acquired and infilled to facilitate the proposed Project and where these buildings are of architectural heritage significance the mitigation involves making a record of the building for posterity. For those of minor interest the level of detail in the record is to English Heritage level 2, while those of higher significance the detail is to be to English Heritage level 3. These levels are defined as follows: ▪ Level 2: This is a descriptive record, made in similar circumstances to Level 1 but when more information is needed. It may be made of a building which is judged not to require a more detailed record, or it may serve to gather data for a wider project. Both the exterior and interior of the building will be seen, described and photographed. The examination of the building will produce an analysis of its development and use, and the record will include the conclusions reached, but it will not discuss in detail the evidence on which this analysis is based. A plan and sometimes other drawings may be made but the drawn record will normally not be comprehensive and may be tailored to the scope of a wider project.	Construction and Operational Phase

Mitigation No.	EIAR Section Ref	Location	Pre-mitigation Issue	Description of Mitigation and/or Monitoring Measures	Stage of Impact (Construction and/or Operational Phase)
				▪ Level 3: Level 3 is an analytical record and will comprise an introductory description followed by a systematic account of the building's origins, development and use. The record will include an account of the evidence on which the analysis has been based, allowing the validity of the record to be re-examined in detail. It will also include all drawn and photographic records that may be required to illustrate the building's appearance and structure and to support an historical analysis.	
AH4	26.7	Throughout (as required)	Affected heritage features along the alignment	▪ In a number of instances, such as at the sites of Mater Station and St Stephen's Green Station, architectural constraints are to be removed on a temporary basis during construction and ~~are to~~will be reinstated on completion. Mitigation in these cases involves the removal into secure storage of those items and their return and re-erection and in each case the dismantling, transportation, storage, conservation or repairs and reinstatement are to be carried out in accordance with specifications to be compiled by the Metrolink Project Conservation Architect (PCA) and the works supervised by suitably qualified professionals. ▪ Mitigation ~~in appropriate locations~~ includes protection against damage during construction and this will include, ~~where appropriate,~~ suitable barriers such as hoardings and monitoring of vibration and settlement to ensure that vibration or settlement at the building or other structure does not exceed defined threshold limits. The hoardings ~~are to~~will be decorated with appropriate images to mitigate visual impacts and ~~are to~~will be well maintained at all times. Dust mitigation measures ~~are to~~will be implemented ~~and under~~.Under no circumstances should a constraint protected in situ be power washed by any contractor. Should cleaning be required as a consequence of the works, the methodology ~~must~~will be submitted to and approved by the Metrolink PCA in advance. At the proposed O'Connell Street Station, a number of buildings are to be taken down while leaving their façades standing and in these instances the structures will need to be propped in such a way as to ensure	Construction and Operational Phase

Mitigation No.	EIAR Section Ref	Location	Pre-mitigation Issue	Description of Mitigation and/or Monitoring Measures	Stage of Impact (Construction and/or Operational Phase)
				that they remain stable during construction while at the same time allowing space for the construction work to proceed. ▪ In some instances, buildings, bridges, railway and canal elements being retained/protected in situ in the vicinity of the works, will need to be propped and underpinned to protect them from damage during construction.	
AH5	26.7	Throughout (as required)	Affected heritage features along the alignment	Where method statements are called for in the mitigation set out in ~~this~~ Chapter 26 (Architectural Heritage), they should be informed by recognised conservation principles, including, but not restricted to: ▪ The International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter), ICOMOS, 1964. ▪ The Charter for the Conservation of Historic Towns and Urban Areas (The Washington Charter), ICOMOS, 1987. ▪ Principles for the Recording of Monuments, Groups of Buildings and Sites, ICOMOS, 1996. ▪ The Charter for the Conservation of Places of Cultural Significance (The Burra Charter), ICOMOS Australia, 1999. ▪ Joint ICOMOS-TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures and Landscapes (The Dublin Principles), ICOMOS, 2011. ▪ Understanding Historic Buildings – a guide to good recording practice, Historic England, 2016. ▪ Energy Efficiency and Historic Buildings – secondary glazing for windows, Historic England, 2016. In particular, ~~where appropriate,~~ the following conservation principles ~~should~~will be adhered to: ▪ The recording of buildings by means of photographs, written descriptions and, where appropriate, measured drawings, prior to, during and at the completion of works. ▪ The use of materials consistent with those used in the original construction of the building or other structure on which the works are to be carried out. ▪ Works carried out on a historic building should be reversible. ▪ New works should respect the character of the historic building while being distinguishable from the original works.	Construction and Operational Phase

Mitigation No.	EIAR Section Ref	Location	Pre-mitigation Issue	Description of Mitigation and/or Monitoring Measures	Stage of Impact (Construction and/or Operational Phase)
AH6	26.7.1	Throughout	Affected heritage features along the alignment	▪ Proposed mitigation along the route alignment are outlined in detail in Table 26.66 Chapter 26 (Architectural Heritage).	Construction and Operational Phase

31.22 Landscape & Visual

Table 31.20: The Landscape Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
L1	27.6.1	Throughout (as required)	Deterioration in landscape quality and views due to the construction works, demolition of built features and loss of existing planting.	The inclusion of primary mitigation measures to avoid, reduce and offset significant adverse landscape and visual effects forms an inherent part of the brief and design thinking of the various disciplines involved in the development of the design for the proposed Project. A major part of the landscape design for the project has therefore involved the identification and retention of valuable landscape assets ~~where possible and feasible~~, across the proposed Project. This includes existing mature trees, historic ~~pavings~~paving's, railings and street furniture elements. It has also involved the preparation of outline landscape proposals for the hard and soft landscape required to integrate the various constituent parts of the proposed Project, to integrate the project appropriately with adjacent lands and land uses, and to provide such solutions with appropriate functional, sustainable, and aesthetic characteristics which address both the current and the planned circumstances of the relevant area. The following primary mitigation measures will be implemented, details of which will be agreed with the local authority: - Identification and retention of existing mature trees of good quality, through further minor adjustment ~~of the alignment, location of structures/buildings and the outline design~~ of the proposed Project construction areas; - Comprehensive proposals for hard and soft landscape works, including tree and hedgerow planting to offset the effects ~~of net~~tree and vegetation loss due to the proposed Project; - Where cut and cover sections of track and/or station boxes underground are to be planted over, the inclusion of sufficient appropriate substrate and adequate drainage to allow tree planting and growth for posterity. There is a general requirement for a minimum depth of 1.5m growing medium in such circumstances; - The inclusion of species-rich planting and wildflower meadows of primarily native species (and pollinator friendly plant species where deemed appropriate) as part of the planting strategy; - Design of an integrated relationship between the proposed development and the broader landscape beyond, incorporating as appropriate, aspects of historic, current and emerging trends in terms of form, scale, texturing, colour and materials; - The insertion, positioning and detail of the various elements of the proposed Project, in order to create a unified and harmonious whole for each Local Landscape	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				Character Area and to assist in appropriate visual assimilation within the fabric of the respective subject sites; - Rationalisation of all services elements and any other potential visual clutter and its incorporation underground, in ducts (as far as practically possible) in order to reduce visual clutter and to prevent/reduce the potential for disruption of surface finishes in the future; - Simplification, rationalisation and legibility of the proposed routes and ground patterns within the outline design; - The proposed external surfaces are finished in materials complimentary to the historic, traditional and the prevalent materials already featuring in the respective areas; - The provision of appropriate public open space incorporating green spaces, meeting places and/or play spaces which are designed to meet the modern needs of the adjacent local communities, whilst being respectful of any historic significance of the relevant areas; - The provision of public uses within the development, in order to facilitate public access and permeability and to assist in activating public spaces. This includes the creation of a considered relationship between the buildings/structures and the adjacent proposed external spaces; - Incorporation of high-quality designed station structures (including canopies, lift housing, cycle parking structures etc) which are low key, small scale, and of simple design, finished in appropriate materials and where possible with a high proportion of glazing; - Incorporation of appropriate OHLE structures e.g., at ground level (and near ground level) sections, the use of OCS (as opposed to OCR) which uses upright structures 45m apart and finished to minimise visual impact; - Incorporation of pedestrian and cycle facilities and linkage as integral features throughout the proposed Project; - Incorporation of sustainable urban drainage systems, incorporating associated biodiverse planting as a strategic approach to draining finished ground surfaces; and - Incorporation of appropriate lighting to ensure public safety and to accentuate as appropriate, in a manner that is respectful of ecological priorities and the need to minimise energy consumption.	
L2	27.6.2	Throughout (as required)	Deterioration in landscape quality and	The following secondary mitigation measures will be implemented, details of which will be agreed with the local authority:	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			views due to the construction works, demolition of built features and loss of existing planting.	- The specific proposals to ensure the effective retention of existing mature trees, where such is included within the proposed Project. These would normally contain specific measures relating to the protection and maintenance of tree root zones during construction (robust protective fencing, supplementary watering etc), which may need to be specific to individual trees and relate to the characteristics of the relevant tree species. They also generally require features incorporated within adjacent proposed hard landscape works areas to ensure protection and continued development of tree root systems; - Details of the substrate and drainage provision over cut and cover sections of track and underground station boxes which are to be planted over. There is a general requirement for a minimum depth of 1.5m growing medium/substrate in such circumstances and adequate surface/subsurface drainage and/or permeability of soil substrates must be provided and maintained; - Incorporated biodiverse planting in the proposed Project, which would be developed in collaboration with the project ecologist and employ considered applied ecological techniques, safeguards and future management strategies; - Details of all soft landscape proposals, including planting and seeding works. These would include detailed proposals (and schedules as appropriate) in respect of all ground preparation (including any soil ameliorants etc), plant species/cultivars, numbers/densities, sizes, presentation/rootball preparation, planting methods and initial maintenance for each softworks area; - In sensitive locations, residual landscape and visual effects may be significantly reduced through the inclusion in the proposed planting of relatively mature specimen trees. Where considered appropriate and feasible, details of such planting proposals need to be provided for agreement with the relevant authority. This would include: details of the tree species mix, numbers, density and sizes proposed; the tree preparation, presentation, transportation, lifting and placement techniques proposed, as well as; the proposed ground preparation, rootball securing technique, backfill materials and methods, and the specific establishment maintenance proposals for each. These are required to minimise risk to tree establishment and maximise their viability and future rates of growth; - Details of the arrangements for taking-in-charge of all the external works, including open/green/planted areas to be maintained by the relevant maintaining authority. This would include drawings defining areas to be handed over/taken-in-charge and a schedule/programme for inspection and hand over/taking-in-charge, naming the appropriate authority;	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- Details of the proposed maintenance and management strategy for all planting, which would include the proposed initial period of establishment for which the Contractor/Contracting authority will be responsible. This would also include appropriate/agreed parameters for monitoring performance in terms of expected growth and/or rates of cover over the initial establishment period, details of the maintenance operations proposed over the period for each type of planting proposed and a schedule of suggested maintenance operations required in the first five years after handover to the maintaining authority; - Details of landscape hardworks proposed for the public realm associated with each station, to include: paving materials, edgings and kerbs, street furniture and signage; - Details of how existing conserved elements are to be incorporated within the proposed design; - Details of fencing, mesh netting etc used within the project which includes the use of dark-toned, neutral colours (dark grey/black) and non-reflective finishes (if appropriate/practical) in order to ensure these elements are visually recessive. This assists significantly in reducing visual impact; and - The lighting strategy proposed for the public realm, particularly in respect of lighting intensity, timing control/periodicity, colour temperature and control of light spillage. This would include details of the lighting elements within the public realm associated with each station, particularly in respect of luminaire and column type, height, finish etc.	

31.23 Risk of Major Accidents and Natural Disasters

Table 31.21: Risk of Major Accidents and Natural Disasters Mitigation and Monitoring Measures

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
R1	Chapter 28, Table 28.9	Tunnelled sections	Ground / building / structure collapse as a result of	▪ Tunnel design and construction methods include risk assessment for overlying structures and monitoring or mitigation if required. ▪ Stakeholder consultation with potentially sensitive building/structures owners. ▪ Early intervention (pre-tunnelling) such as the use of ground treatments in the areas which are expected to give rise to settlement reference the Building Damage Report	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
			significant soil settlement	Appendix ~~5.17 to the~~ A5.17 to Chapter 5 (Construction ~~chapter~~Phase), Chapter 20 (Soils & Geology) and Chapter 21 (Land Take). ▪ Groundwater extraction will be used as required prior to construction works of station. This will require detailed monitoring of excavation, groundwater levels, surface and building monitoring, and pumping tests. ▪ Appropriate mitigation measures will be put in place to secure buildings at risk during construction including buildings props, reinforcement and monitoring. Settlement analysis has been completed for buildings and utilities along the alignment, reference ~~Appendix 5.17 to the Construction chapter~~ the Building Damage Report Appendix A5.17 to Chapter 5 (Construction Phase), and Chapter 20 (Soils & Geology) and Chapter 21 (Land Take). ▪ Waterproof excavations by using watertight retaining walls (diaphragm walls) to prevent water inflow into the station and the risk of settlement. The Contractor will manage the risk and if the risk was too great at a specific location, they could: - Pre-treat the ground to prevent loss of "loose" ground; - Increase the density of bentonite support fluid; - Shorten the length of the panel so that there is less ground open and for a shorter time, which leads to reduce risk of movement or collapse; and/or - Use secants or sheets to minimise risk of excessive ground movement. ▪ Risk will be managed via the outline CEMP and Emergency Response Plans. ▪ Enhanced monitoring of TBM control parameters. For example, when the TBM is in slurry mode, TBM drives require monitoring of the TBM face pressure which can be adjusted as necessary to resist water inflow and movement of the ground immediately adjacent to the drive face and before the tunnel lining rings are installed and the cavity around them grouted. This is standard practice to reduce settlement risks. In locations where there is more risk of settlement issues, either due to driving through less sound material, water bearing material or where there are buildings nearby that are more susceptible to settlement, then there ~~would~~will be increased monitoring and adjustment of the TBM face pressures to ensure least impact on settlement. Where tunnel drives are in more competent material or settlement is less of an issue (e.g., open fields) then it is not necessary to be constantly checking and balancing the face pressure. ▪ Increase frequency of surface monitoring. These are monitored via survey instruments to monitor for movement associated with the tunnelling nearby. As the TBM passes by the building, the frequency of monitoring for movement of the building increases. Limits on the amount of settlement/movement expected will have been calculated beforehand	

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				and the survey can provide a continuous monitoring of the building to provide early warning of potential unexpected settlement issues allowing mitigation action to be taken if required. Reference the Building Damage Report Appendix 5.17 to ~~the~~ Chapter 5 (Construction ~~chapter~~Phase). ▪ Carry out works in accordance with A Code of Practice for Risk Management of Tunnel Works (The International Tunnelling Insurance Group 2012).	
R2	Chapter 28, Table 28.9	Throughout (as required)	Impact on Critical Infrastructure	▪ Best practice measures for the protection of 3rd party assets will be specified by TII and implemented by the contractors on site. Where the works would directly impact on an asset, diversion strategies have been developed and agreed with asset owners. Where the works could potentially impact on assets through ground movements associated with the works ground movement assessments have been prepared and will be developed further by the contractors prior to construction. Any required mitigations will be designed and agreed with the asset owner. ▪ The contractors will prepare, inter alia: Ground Movement Management Plans; Groundwater Monitoring Plans; and Instrumentation and Monitoring Plans. ▪ Protective measures will be undertaken to keep the risk of utilities settlement to a minimum. It is intended that the primary form of mitigation will be to use good tunnelling practice, including continuous working, erecting linings immediately after excavation and providing tight control of the tunnelling process to reduce the magnitude of settlement. For the majority of utilities, they ~~would~~will be monitored, inspected on completion of the works and any damage repaired. ▪ Where this approach is deemed insufficient to mitigate the risk of damage to utilities, then intrusive mitigation measures will need to be considered in conjunction with the utility owner. These ~~may~~could include direct works on the utilities and possibly ground treatment measures around and beneath and structural measures. These measures would require works to the utility similar to those regularly undertaken by utility providers to maintain or upgrade existing assets. They would be undertaken either by the utility provider or by the proposed Project contractors in conjunction with the utility provider under their existing powers. Refer to Chapter 22 (Infrastructure & Utilities). ▪ The settlement for each tunnel section and station/portal excavation along the alignment was determined using the methodology described in Appendix ~~22.1~~A22.1, Volume 5 of the EIAR.	
R3	Chapter 28, Table 28.9	Accesses and haul routes	Major road traffic accident	▪ Managed via Traffic Management Plans and the Scheme Traffic Management Plan.	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ Safety awareness training will be undertaken for all HGV drivers on sites including compliance with CC-GSW-01500- TII Guidance on Specification for Traffic Control and Communications. ▪ Designated haul routes defined in the STMP ~~to~~will be followed. ▪ Blind spot detection will be compulsory for HGVs in order to identify vulnerable road users. ▪ All HGV loads will be covered or tied securely before leaving and coming to site. ▪ Industry standards including but not limited to: - EN 1991-2:2003: Traffic Loads on Bridges; - EN 1991-3:2006: Actions Induced by Cranes and Machinery; - AM-STR-06024- TII General Principles for the Design and Construction of Bridges - Use of BS 5400 : Part 1 : 1988; and - EN 1998-2:2005: Bridges. ▪ Refer to on the Scheme Traffic Management Plan.	
R4	Chapter 28, Table 28.9	Sections of route at grade, on embankment and in retained cut which drain naturally or where drainage water will be pumped to a watercourse. Construction haul routes near watercourses.	Spillage or long-term seepage of pollutants into watercourse	Refer to mitigation and management measures outlined in Risk ID C4 and Chapter 18 (Hydrology). These measures and others will be included in a ~~water management plan~~Water Quality Management Plan and CEMP to be developed by the contractor having regard to best practice guidance including the following: ▪ Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2009); ▪ Road Drainage and the Water Environment (TII, 2015); ▪ Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control, TII, March 2015; ▪ Use of temporary construction methods from the following CIRIA publications (including C532: Control of water pollution from construction sites, C648: Control of water pollution from linear construction projects: technical guidance and C649: Control of water pollution from linear construction projects: site guide); ▪ Office of Public Works (OPW) Guidelines for Planning Authorities: The Planning System and Flood Risk Management (OPW and DoEHLG 2009). ▪ Inland Fisheries Ireland (IFI) Guidelines on the Protection of Fisheries During Construction Works and Adjacent to Waters 2016; ▪ IFI Biosecurity Protocol for Field Survey Work 2010; ▪ NRA's Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes; and	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				▪ NRA's Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes. For further detail refer to the outline CEMP, Water Quality Management Plan.	
R5	Chapter 28, Table 28.10	MetroLink route. Access to and within Dardistown Depot.	MetroLink train derailment	▪ Measures accepted by the regulator (CRR) to manage risks to be ALARP in order for licence to be granted including: - CRR-G-033C Guideline for Application for Acceptance of New Light Rail Works; - CRR-G-016-C Guideline for Application for Acceptance of New Light Rail Rolling Stock; and - CRR-G-032-B Guideline for Application for Acceptance of New Light Rail Works or New Light Rail Rolling Stock. ▪ All equipment will be compliant with Electromagnetic Compatibility and Interference (EMC and EMI) standards as required under the relevant EU standards. ▪ Mitigate by design and periodic inspections and maintenance as part of the Operational Strategy. ▪ Operation and maintenance manuals communicated early, robust, maintained, complete, etc. ▪ Training ~~to~~will be provided, sufficient resources to be in place and compliance with best practice guidelines and procedures including compliance with EN 1991-1-7:2006: General Actions: Accidental Action and Road Drainage and the Water Environment (TII, 2015). ▪ Safe system of working will be implemented. ▪ ~~Comply~~Compliance with appropriate environmental parameters (wind, water, etc.) will be required. ▪ Design of line side features (bridge supports, etc.) in line with code of practice including but not limited to: - EN 1990: Basis of Structural Design; - EN 1998-2:2005: Bridges; and - CIRIA report C750: Groundwater control design and practice. ▪ The power system has several levels of redundancy, with several substations, a ring network, standby transformers, batteries and UPS for the most critical elements. Equipment failure will be corrected as quickly as possible and the action taken dependent on the nature of the failure. Critical on-board and lineside systems needed to ensure evacuation will be powered for at least 90 minutes through back-up supplies. This includes emergency lighting, PSDs, the PAVA system, CCTV, dynamic signage, doors	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				unlocking and opening, emergency communication, and on-board smoke exhaust. The only exception is the ventilation in the tunnels which will be ensured through equipment redundancy. ▪ Appropriate back up procedures will be required. ▪ Application of current regulations specific to cybersecurity and security software installed. Strict software control, no external connections and robust testing at commissioning. ▪ CCTV installation at tunnel portals, tunnels and cut and cover sections, front of cab of rolling stock monitoring open section lines for real time monitoring. ▪ High integrity of safety critical functions required. ▪ Reinforcement of the passenger visual signalling and the security in the fencing surrounding the metro access and the operational line. ▪ Crossover and turnbacks will be controlled by an interlocking device guaranteeing safety in movements. The software that manages the interlocking will be sufficiently tested. This will be regularly checked and included as part of the maintenance regime. ▪ Adequate breaking specification will be required. ▪ Provision of a secure boundary, security and CCTV will be required. ▪ A dedicated MetroLink Major Incident Management Plan will be developed by TII that will identify the appropriate Emergency Response Plans.	
R6	Chapter 28, Table 28.10	Project-wide	Fire and, or explosion causing direct or indirect harm	▪ All construction materials used will be required to meet the requirements of BS EN 13501-1 Fire Classification of Construction Products and Building Elements; ▪ The constructed elements will be subject to fire testing in line with the requirements of Fire Resistance Test – General Requirements (BS EN 1363-1:2020 and EN 1992-1-2:2004 General Rules. Structural Fire Design; ▪ Ongoing consultation with Dublin Fire Brigade was undertaken to develop the Fire Safety Strategy for the proposed Project. The fire strategy includes the following details: - Safety features at stations to minimise the risk of fire; - Safety lineside features within tunnels and other sections such as, but not limited, to ventilation, CCTV, signage, lighting, firefighting water supply systems; - Proposed emergency evacuation protocols to be adopted for emergency events along the railway line and at stations; - Station specific information including drawings and evacuation calculations; - Safety systems and features to be adopted as part of the formal tender requirements for rolling stock;	Construction Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
				- Fire safety information relating to the depot at Dardistown and the park and ride at Estuary; - Justification for the maximum distance between evacuation / intervention shafts in the single-bore tunnel sections. This includes a risk assessment in accordance with NFPA 130; - Findings from Computational Fluid Dynamics (CFD) for smoke simulations and passenger evacuations; and - A comprehensive list of design standards which have been used in the development of the design. This includes Irish, European an American standards and guidelines; and Information relating to the rationale for the Heat Release Rate (HRR) to be adopted for the project. ▪ The proposed Project design is in compliance with best practice, International, National and TII guidance. The tunnel design and station or intervention shaft spacing have taken regard to the European Commission Implementing Regulation 402/2013 (as amended) on the common safety method on risk evaluation and assessment and the European Railway Agency guidance and the EU Technical Specifications for Interoperability Regulation of Safety in Railway Tunnels. These documents specifically address fire and emergency evacuation needs for passengers should there be an incident in the tunnel to ensure that evacuation to a place of safety can be achieved within required timelines.	
R7	Chapter 28, Table 28.10	Sections of route on embankment, eg approaches to Broadmeadow and Ward River Viaduct and M40 Viaduct or breach of the Royal Canal wall at Glasnevin with potential risk of	Collapse of embankment	Embankment design has included an allowance for extreme weather and climate change. Design is in compliance with best practice and International, National and TII guidance including: ▪ DN-STR-03001: Specification for Road Works Series 600 - Earthworks (including Erratum No. 1, dated June 2013). ▪ Road Drainage and the Water Environment (TII, 2015). ▪ Office of Public Works (OPW) Guidelines for Planning Authorities: The Planning System and Flood Risk Management (OPW and DoEHLG 2009). ▪ NRA's Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes. ▪ Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013). ▪ Designed to accommodate 1 in 100 annual probability floods plus climate change and remain safe during a 1:1000 annual probability flood. ▪ Drainage design including track drainage to comply with standards which includes climate change.	Operational Phase

Mitigation No.	EIAR Section Ref.	Location	Pre-mitigation issue	Description of Mitigation and/or Monitoring Measures / Environmental Commitments	Stage of Impact (Construction and/or Operational Phase)
		flooding of Irish Rail lines.		▪ Regular inspections and maintenance in accordance with best practice International, National and TII guidelines.	
R8	Chapter 28, Table 28.10	Throughout (as required)	Infectious disease	▪ A dedicated MetroLink Major Incident Management Plan will be developed by TII that will identify the appropriate Emergency Response Plans prior to the start of the Operational Phase. ▪ The operator prior to start of operations will develop and follow strict biosecurity measures as part of the final CEMP. ▪ All guidance, standard operating procedures and control measures issued by the Government will be strictly adhered to.	Operational Phase
R9	Chapter 28, Table 28.10	Surface section of the proposed Project.	Hydrological event – heavy and prolonged rainfall entering tunnel, portal and stations and adjacent lands and watercourses	▪ A dedicated MetroLink Major Incident Management Plan will be developed by TII that will identify the appropriate Emergency Response Plans. ▪ The proposed Project drainage includes allowances for climate change ensuring that MetroLink is protected from significant flood events. Refer to the Chapter 18 (Hydrology). ▪ Cooperation with the relevant authorities, such as the local authorities and the OPW will be undertaken. ▪ Regular inspections and maintenance of drainage system and attenuation ponds will be undertaken.	Operational Phase

31.24 Cumulative Impacts

Table 31.22: Cumulative Impacts Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
CI&EI1	Throughout (as required)	Throughout (as required)	Other major infrastructure projects could directly interface with the construction of the proposed Project. Interface liaison will take place on a case-by-case basis through TII, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the proposed Project works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.	Pre-Construction / Construction

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