METROLINK

Integrated Transport. Integrated Life.

A5.1

Outline CEMP

Contents

Appendices

List of Abbreviations

Acronym	Meaning
C&D	Construction & Demolition
CEMP	Construction Environmental Management Plan
CNTs	Construction Noise Thresholds
CNVMP	Construction Noise and Vibration Management Plan
DANP	Dublin Airport North Portal
DASP	Dublin Airport South Portal
DCC	Dublin City Council
DMP	Dust Minimisation Plan
DP	Demolition Plan
D-Walls	Diaphragm Walls
EIAR	Environmental Impact Assessment Report
EMS	Environmental Management System
EPB	Earth Pressure Balance
EPA	Environmental Protection Agency
ESBN	Electricity Supply Board Networks
EU	European Union
FCC	Fingal County Council
HGV	Heavy Goods Vehicles
IFI	Inland Fisheries Ireland
LOD	Limits of Deviation
M&E	Mechanical & Electrical
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Services
NSL	Noise Sensitive Locations
NTA	National Transport Authority
OCC	Operations Control Centre
OPW	Office of Public Works
PCA	Project Conservation Architect
RO	Railway Order
SAC	Special Area of Conservation
SPA	Special Protection Area
STMP	Scheme Traffic Management Plan
TBM	Tunnel Boring Machine
TII	Transport Infrastructure Ireland
WMP	Waste Management Plan
ZoI	Zone of Influence

1. Introduction

1.1 Purpose and Scope of the Outline Construction Environmental Management Plan

The purpose of this Outline Construction Environmental Management Plan (CEMP) is to provide a framework that outlines how contractor(s) working for TII and the NTA will manage and where practicable minimise potential negative environmental effects during the Construction Phase of the proposed Project. The Construction Phase will include all site preparation, enabling works, demolition, material delivery and storage, waste storage and removal, construction activities, line wide installation and commissioning, post project restoration and any associated engineering works.

This Outline CEMP identifies the minimum requirements with regards to the appropriate mitigation, monitoring, inspection and reporting mechanisms that need to be implemented throughout construction. Compliance with this Outline CEMP does not absolve the contractor(s) or their sub-contractor(s) from compliance with all legislation and byelaws relating to their construction activities.

This Outline CEMP has been produced as an appendix to the Environmental Impact Assessment Report which will accompany the Railway Order Application seeking consent for the proposed project.

This Outline CEMP provides a framework to:

- Describe the programme for environmental management during construction;
- Implement those monitoring and mitigation measures identified in the EIAR;
- Outline the principles and minimum standards required of the contractor(s) during the development of the detailed CEMP (and associated Method Statements) and throughout construction;
- Identify the relevant roles and responsibilities for developing, implementing, maintaining and monitoring environmental management; and
- Outline the procedures for the communication of and reporting on environmental aspects of the proposed development throughout the Construction Phase.

It is intended that this Outline CEMP will be a ‘live’ document, which will be subject to amendment including the revision and addition of content throughout the works. It will be expanded and updated prior to the commencement of any construction activities on site, including incorporating the requirements of conditions attached to statutory consents granted in respect of the proposed Project.

TII, in line with its policy, is likely to procure this proposed Project using Design and Build contract(s). Following appointment, the contractor(s) will be required to develop more specific Method Statements and submit an updated CEMP that is cognisant of the proposed construction activities, equipment and plant usage and environmental monitoring plan for the proposed Project.

This Outline CEMP should not be considered a detailed Construction Method Statement as it will be a requirement of the contractor(s) appointed to undertake the individual works, in association with TII, to implement appropriate procedures and progress this documentation prior to commencement of construction.

This Outline CEMP describes a range of construction sequences, methodologies and plant and equipment which are likely to be used in the construction of the proposed Project. It is however possible that subsequent design and build contractor(s) propose alternative sequencing and / or methodologies to the benefit of MetroLink and the wider community. The use of alternatives is not precluded so long as the overarching environmental

impact of the work is not greater than that assessed and it is accepted by TII. Contractor(s) would need to demonstrate to TII that no material change occurs with any such proposal.

This Outline CEMP should be read in conjunction with the following documents which have been included as part of the Railway Order Application:

- Dust Management Plan (Appendix A16.4 of the EIAR);
- Example Ecological Control Sheet (General) (Appendix A of this Outline CEMP);
- Non-Native Invasive Species Management Plan (Appendix A15.8of theEIAR);
- The MetroLink Natura Impact Assessment;
- The MetroLink Environmental Impact Assessment Report (EIAR);
- Construction programme Including Tunnel Elements (Appendix A5.2 of the EIAR);
- Construction Sequence Report (Appendix A5.3 of the EIAR);
- Employment Report & Spreadsheet (Appendix A5.4 of the EIAR);
- Glasnevin Construction Report (Appendix A5.5 of the EIAR);
- Construction Vehicles, Plant & Equipment (Appendix A5.7 of the EIAR);
- Demolition General (Appendix A5.8) and Demolition Tara St (Appendix A5.9 of the EIAR);
- Watercourse Diversion (Appendix A5.10 of the EIAR);
- Water Management (Appendix A5.11 of the EIAR);
- Piling (Appendix A5.12 of the EIAR);
- Tunnelling (Appendix A5.13 of the EIAR);
- TBM Consumables (Appendix A5.14 of the EIAR)
- Waste Management (Appendix A5.15 of the EIAR);
- Track Laying (Appendix A5.16 of the EIAR);
- Construction Lighting (Appendix A5.18 of the EIAR);
- Blasting Strategy (Appendix A5.20 of the EIAR);
- Scheme Traffic Management Plan (STMP) (Appendix A9.5 of the EIAR);
- Excavated Materials Management Strategy (Appendix A24.1 of the EIAR); and
- TII Cultural Heritage Strategy (Appendix A25.1 of the EIAR).

1.2 Structure of the Outline CEMP

This Outline CEMP has been structured as follows:

- Section 1 introduces the proposed Project and outlines the purpose of the Outline CEMP;
- Section 2 describes in detail the proposed Project;
- Section 3 sets out the framework and mechanisms through which environmental requirements would be managed;
- Section 4 outlines the procedures to be employed during construction to manage environmental aspects; and

- Section 5 and 6 describe the measures to be implemented to minimise the likely significant negative effects, as far as practicable, during the construction of the proposed Project.

1.3 Procurement and Detailed CEMP

TII, on behalf of the NTA, are currently planning to procure the detailed design and construction of the proposed Project using Design and Build contracts that will be divided up by geographical section and by geographical section and type of works. This will include:

- Multiple Enabling Works Contractor(s) to carry out the enabling works to facilitate the main construction works;
- Three main construction contracts by geographical area as part of the main civil structural works for the stations, shafts, portals, tunnels and cutting and associated works; and
- A further package or packages for architectural, mechanical, electrical and other services fit-outs, line-wide systems, rolling stock, commissioning and hand over.

One contractor(s) will be nominated as the main contractor(s) in each geographical location in order to ensure a coordinated approach to safety and environmental management. Under this form of contract the successful contractor(s) will utilimately be responsible for the final detailed design of the proposed Project, within the requirements and conditions as outlined in the EIAR and the Railway Order (RO).

The contractor(s) will be required to comply with all of the performance requirements set out in the tender documentation, including the Railway Order Approval and conditions as may be granted by An Bord Pleanála.

The contractor(s) will therefore update this Outline CEMP to prepare a more detailed CEMP for each specific package of works as required. The detailed CEMP(s) will be specific, targeted, and 'stand-alone' plan(s) developed to support the detailed design and construction methodologies established during the next phase of the proposed Project. The detailed CEMP(s) will be provided to Fingal County Council (FCC) and Dublin City Council (DCC) for consultation and approval in advance of any construction works on site.

The detailed CEMP will be developed by the contractor(s) to ensure that it:

- Is in accordance with the mitigation measures specified in the EIAR, Natura Impact Statement (NIS) and this Outline CEMP;
- Is in accordance with any conditions that may be prescribed as part of the RO approval for the proposed Project;
- Aligns with the design and construction impacts described in the EIAR and NIS and ensures there is no material change in terms of significant effects on the environment;
- Identifies opportunities for further reducing significant negative environmental effects, where practicable; and
- Implements best practice, having regard to relevant Construction Industry Research and Information Association (CIRIA), TII and regulatory publications.

The following documents will be provided by the contractor(s) and incorporated into the detailed CEMP. These documents will incorporate the environmental commitments set out in the EIAR and the conditions of the Railway Order. They will build upon and further develop the documents produced for the EIAR.

- Blasting Plan (including monitoring);
- Cultural Heritage Plan;
- Scheme Traffic Management Plan;
- Construction Mobility Management Plan;

- Construction Logistics Plan;
- Construction Noise and Vibration Management Plan;
- Lighting Management Plan;
- Site Lighting Plan;
- Ecology and Landscape Management Plan;
- Water Management Plan (including water quality);
- Sediment Erosion and Pollution Control Plan;
- Groundwater Monitoring Plan;
- Construction Flood Protection Plan;
- Severe Weather Management Plan;
- Air Quality Management Plan;
- Dust Management Plan;
- Aspergillus Prevention Plan;
- Demolition Plan;
- Construction and Demolition Waste Management Plan;
- Excavated Materials Management Plan;
- Carbon Management Plan;
- Stakeholder Communications Plan;
- Non-Native Invasive Species Management Plan;
- Emergency Response Plan;
- Spill Response Procedure; and
- Schedule of relevant permits, licences and consents.

The detailed CEMP(s) will be considered 'live' documents that will be reviewed and revised regularly as the construction progresses. The process for update, review and approval of the CEMP(s) must be documented in the detailed CEMP(s) to ensure that all revisions can be easily understood, applied and updated by TII and the contractor(s) throughout the Construction Phase.

It is expected that amendments to the CEMP(s) may be necessary to reflect inter alia changes in the project scope, contract scheduling, contractor(s) appointments, design development and construction methodologies, environmental management policies, practices or regulations, and developments on the site. These reviews and updates are necessary to ensure that environmental performance is subject to continual improvement and that best practice is implemented throughout construction.

2. Project Description

2.1 Project Overview

A full description of the proposed Project is provided in Chapter 4 (Description of the MetroLink Project) and a full description of the Construction Phase of the project is presented in Chapter 5 (MetroLink Construction Phase) of the Environmental Impact Assessment Report (EIAR). The location of the proposed site offices and construction compounds are illustrated in Figure 5.1 of Chapter 5 (MetroLink Construction Phase) of the EIAR. Table 2.1 provides an overview of the principal infrastructural elements of the proposed Project and their geographical extent and location.

Table 21: Outline Description of the Key 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 an 8.5m inside 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 will be approximately 2.3km in length; and The City Tunnel: running for 9.4 km 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. There will be no portal at the southern end of the proposed Project, as the southern termination and turnback will 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 proposed Dardistown Station will be in retained cutting, known as ‘retained cut stations’; and Dublin Airport Station and all 10 stations along the City Tunnel will be ‘underground stations’.

Project Elements	Outline Description
Permanent Project Elements	
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 Tunnels	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.
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 River Viaduct	A 260m long viaduct is proposed between Estuary and Seatown Stations, to cross the Broadmeadow and Ward Rivers and their floodplains.
Proposed Grid Connections	Grid connections will be provided via cable routes with the addition of 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 include: 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; A mast; and Other staff facilities and a carpark.
Operations Control Centre	The main Operations Control Centre (OCC) will be located at Dardistown Depot and a back-up OCC will be provided at Estuary.

Project Elements	Outline Description
Permanent Project Elements	
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. (These areas are included within the 14 Satellite Construction Compounds).
Tunnel Boring Machine Launch Site	There will be two main tunnel boring machine (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.

2.2 Construction Phasing

The programme for the construction of the proposed Project will allow for the shortest Construction Phase possible in order to minimise the duration of potential environmental impacts, while ensuring that the areas surrounding the works sites remain operational and functional. In general terms, the construction works will involve the activities laid out in Diagram 2.1:

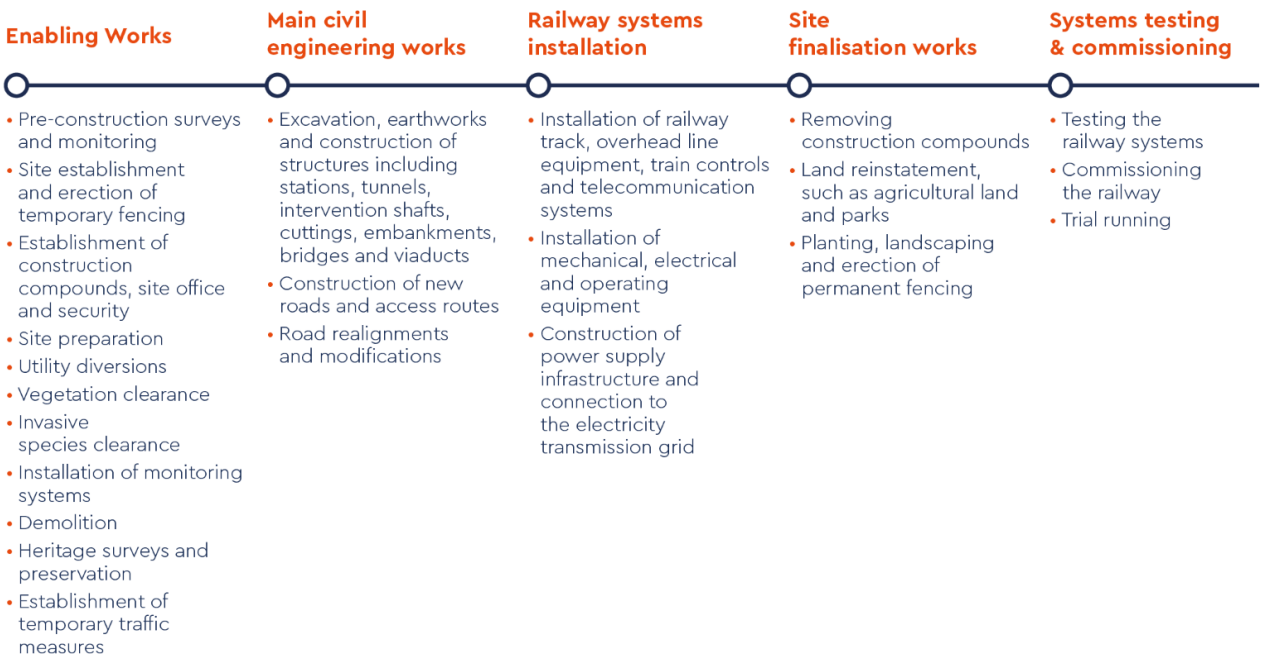


Diagram 2.1: Proposed Construction Phase Activities

A detailed programme and schedule of works will be developed prior to the commencement of work on-site by the appointed contractor(s) and will be dependent on the finalised detailed design in addition to the finalised works methodology to be developed by the appointed contractor(s).

2.2.1 Construction Programme

An indicative programme showing the duration and phasing for construction of the proposed stations is shown in Table 22Table 2.2. Please refer to Appendix A5.2 of the EIAR for a more detailed construction programme, including all of the main project elements. The indicative construction programme has been developed based on experience on similar major infrastructure projects such as High Speed 1 in the United Kingdom (UK), Crossrail (UK) and Madrid Metro in Spain. The achievement of the programme is based on some core assumptions which are as follows:

- Work will start simultaneously at several locations;
- The overall proposed Project construction duration (including testing and commissioning) will be over nine years with each station taking between three to six years to construct;
- The tunnelling will take approximately 30 months for the Airport Tunnel and 45 months for the City Tunnel;
- The construction of the Depot at Dardistown will take approximately five years and the Park and Ride Facility will be approximately three years;
- Rolling stock will be supplied during the Construction Phase; and
- A period of approximately one year for testing and commissioning the system is also required.

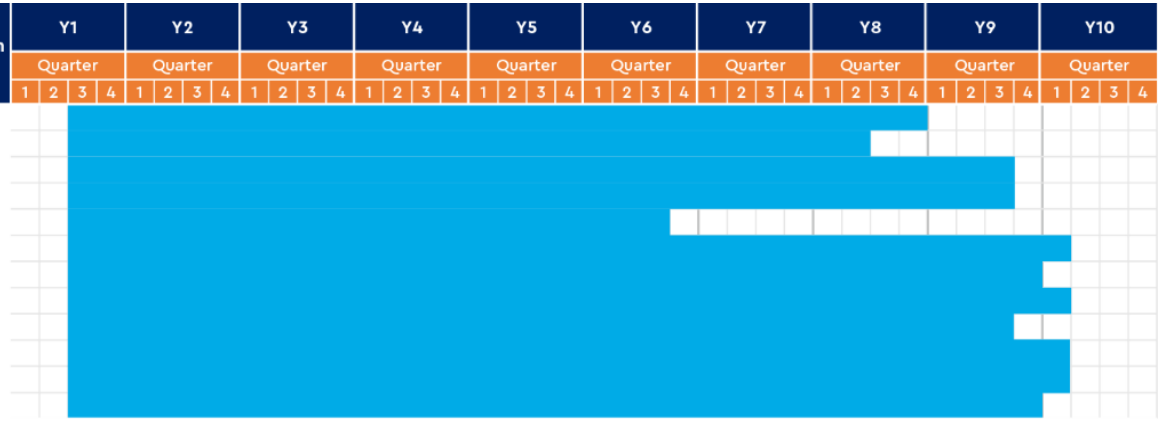
Table 22: Indicative Construction Programme

Description AZ1 Compounds / Logistics / Other Strucutres	Estimated Construction Programme (Months)	Y1				Y2				Y3				Y4				Y5				Y6				Y7				Y8				Y9				Y10			
		Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Start to Estuary Station																																									
Estuary Station Main Compound	33																																								
Estuary Railhead	60																																								
Broadmeadow and Ward Rivers Viaduct	21																																								
Pedestrian Underpass	6																																								
Estuary Station to the R132 Under-crossing																																									
Seatown West Satellite Site	33																																								
Estuary Court Satellite Site	36																																								
Woodie's Satellite Site	54																																								
Mantua Satellite Site (bridge demo)	54																																								
Fingallian's Satellite Site (bridge demo)	24																																								
Surface Station	48																																								
Cut and Cover	69																																								
Retaining Cut	51																																								
U Section	15																																								
Retaining Wall	6																																								
Seatown Station to Swords Central Station																																									
Seatown Station Compound	66																																								
North Dublin Corporate Business Park Compound Satellite Site	69																																								
Pavilion's Shopping Centre	69																																								
Surface Station	69																																								
Cut and Cover	63																																								
Retaining Cut	60																																								
Swords Central Station to Fostertown Station																																									
Swords Central Station Compound	60																																								
Pinnock Hill Roundabout Satellite Site	51																																								
Surface Station	63																																								
Cut and Cover	42																																								
Retaining Cut	30																																								
Fostertown to Airport North Portal																																									
Fostertown Station Compound	63																																								
Nevinstown Lane Satellite Site	51																																								
Boland Satellite Site	66																																								
Surface Station	66																																								
Cut and Cover	42																																								
Retaining Cut	51																																								
U Section	30																																								

Description AZ2 Compounds / Logistics / Other Strucutres	Estimated Construction Programme (Months)	Y1				Y2				Y3				Y4				Y5				Y6				Y7				Y8				Y9				Y10			
		Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Airport – Tunnels and Structures																																									
Dublin Airport Station Compound	99																																								
Dublin Airport North Portal Compound	60																																								
Dublin Airport South Portal Compound	90																																								
Deep Station	57																																								
Portal North	60																																								
Portal South	81																																								
U Section	15																																								

Description AZ3 Compounds / Logistics / Other Strucutres	Estimated Construction Programme (Months)	Y1				Y2				Y3				Y4				Y5				Y6				Y7				Y8				Y9				Y10			
		Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Airport South to Dardistown																																									
Cut and Cover	63																																								
U Section	72																																								
Dardistown Station, Depot and Access Works	21																																								
Stations Retaining Cuts	72																																								
Dardistown Station Compound	57																																								
Dardistown Depot	57																																								
Cut and Cover	60																																								
Dardistown Railhead	39																																								
M50 Viaduct and Approaches	54																																								
Central Section Surface Works at M50 Crossing	54																																								
M50 Viaduct	15																																								
St. Anne's South of M50 Crossin	69																																								
Northwood Station Compound	66																																								
Retained Cut	33																																								
Cut and Cover	30																																								

Description AZ4 Compounds / Logistics / Other Strucutres	Estimated Construction Programme (Months)
Northwood Portal	90
Northwood Station Compound/Deep Station	84
Ballymun Station Compound/Deep Station	99
Collins Avenue Station Compound/Deep Station	99
Albert College Park Shaft Compound/Deep Station	63
Griffith Park Station Compound/Deep Station	105
Glasnevin Station Compound/Deep Station	102
Mater Station Compound/Deep Station	105
O'Connell Street Station Compound/Deep Station	99
Tara Station Compound/Deep Station	105
St Stephens Green Station Compound/Deep Station	105
Charlemont Station Compound/Deep Station	102



3. Environmental Management Framework

3.1 Overview

The contract(s) awarded for the proposed Project will include a requirement for the contractor(s) to comply with relevant documentation, including the EIAR, planning (and other statutory consent) conditions received, this Outline CEMP and subsequent detailed CEMP(s).

As part of the environmental management framework, contractor(s) will comply with all relevant environmental legislation and take account of published standards, accepted industry practice, national guidelines and codes of practice appropriate to the proposed Project. Due regard will be given to the guidance and advice provided by the ISO 14001 Environmental Management Systems Standard and CIRIA guidance. Further, the National Roads Authority (NRA) Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan will be taken into account.

The contractor(s) will be required to develop and implement an Environmental Management System (EMS) that follows the principles of ISO 14001. Furthermore, the contractor(s)'s EMS will include an environmental policy, operational, monitoring and auditing procedures to ensure compliance with all environmental requirements and to monitor compliance with environmental legislation and the environmental management provisions outlined in the relevant documentation.

3.2 Responsibilities

3.2.1 Employer

TII will be the employer responsible for ensuring that competent parties are appointed to undertake construction and that sufficient resources are made available to facilitate the appropriate management of risks to the environment.

3.2.2 Employers Representative

TII and/or the Employer Representative (ER) appointed by TII will be responsible for monitoring compliance with the CEMP. The ER may be required to appoint temporary or permanent specialists with appropriate skills and experience as required to implement on-site procedures and monitor construction on behalf of TII, i.e. competent experts in biodiversity, architecture, archaeology and cultural heritage, noise and vibration, dust, waste, soils, land, ground movement, contamination and water.

3.2.3 The Contractor(s)

TII currently intend to procure the detailed design and construction of the proposed Project using Design and Build contracts that will be divided up by geographical section and by type of works. Under this form of contract the contractor(s) will ultimately be responsible for the final detailed design of the proposed Project and for preparing a more detailed CEMP for each specific package of works, as outlined in Section 1.3.

The contractor(s) appointed will be responsible for the organisation, direction and execution of environmental related activities during the detailed design and construction of the proposed Project. The contractor(s) is required to undertake all activities in accordance with the relevant environmental requirements including the consent documentation and other regulatory and contractual requirements.

3.2.4 Construction Manager

Construction Manager(s) will be appointed by the contractor(s) to oversee the day-to-day management of working areas within each site and ensure that effective, safe, planned construction activities are delivered on an ongoing basis to the highest standards. The Construction Manager(s) will be a suitably qualified, competent and experienced professional(s) that will oversee site logistics, communicate regularly with construction staff, accommodate project-specific inductions for staff on site and ensure that all work is compliant with the relevant design standards and health and safety legislation. The Construction Manager(s) will be familiar with the environmental commitments and requirements contained in the CEMP.

3.2.5 Environmental Manager

An Environmental Manager will be appointed by the contractor(s) to ensure that the CEMP(s) are effectively implemented. The Environmental Manager will be a suitably qualified, competent and experienced professional that would perform the necessary tasks, review environmental procedures and consult with the members of the construction team and stakeholders as required. The Environmental Manager will be responsible for:

- Preparing, maintaining and implementing the detailed CEMP;
- Establishing, implementing, and maintaining the EMS having regard to the requirements of ISO 14001:2015 (or the most current version available);
- Conducting regular environmental inspections and audits as specified in the contract and checking adherence to the CEMP;
- Ensuring that construction occurs in accordance with the relevant environmental requirements and that such compliance is adequately recorded and documented;
- Completing a site inspection and compiling an environmental compliance report on a monthly basis;
- Attending site and stakeholder meetings as required;
- Keeping up-to-date with relevant environmental best practice and legislative changes;
- Liaising with the relevant staff to prepare Method Statements and relevant plans for all activities where there is a risk of environmental damage;
- Having a detailed level of knowledge on all aspects of environmental information associated with the proposed Project;
- Ensuring all personnel have undertaken adequate environmental inductions, awareness briefings and training (including subcontractor(s));
- Dealing with environmental complaints;
- Managing and responding to environmental incidents and ensuring that all incidents are recorded and reported in an appropriate manner; and
- Interfacing with adjacent contracts to assure combined impacts are identified.

3.2.6 Environmental Specialists Engaged by the Contractor(s)

To fulfil its obligations under the CEMP and to support its Environmental Manager, the contractor(s) will engage suitably qualified and experienced professionals, including where necessary the following (i.e. depending on the scope of the contract) competent experts:

- Project Archaeologist (in consultation with TII's Project Archaeologist);
- Project Ecologist;
- Project Aquatic Ecologist;
- Noise and vibration specialist;
- Air quality and dust specialist;
- Land, soils and contamination specialist(s); and
- Water specialist.

3.3 Communication Procedures

3.3.1 External Communication with the Public and Key Stakeholders

TII and the contractor(s) will take all reasonable steps to engage with stakeholders in the local community, especially those who may be affected by the construction works including residents, businesses, community resources and specific vulnerable groups.

The contractor(s) will be responsible for putting in place a Stakeholder Communications Plan which will be developed under the consent of a designated Public Liaison Officer (or equivalent officer) appointed by TII. This plan will provide a two-way mechanism for members of the public to communicate with a designated member of the contractor(s)'s staff and for the contractor(s) to communicate important information on various aspects of the proposed Project to the general public.

The principal component of a Stakeholder Communications Plan will include:

- Procedures to inform members of the community directly affected by the Construction Phase on schedules for any activity of a particularly disruptive nature which is likely to impinge on their person or property e.g. blasting, demolition, pile driving and any mitigating actions that are being taken (shielding, restriction on work hours) to minimise such disruption.
- For the tunnel boring, TII will establish a website to provide information on the forecast and actual passage of the tunnel boring machine. The contractor(s) will distribute leaflets to properties and affected parties, giving such notice along the tunnelling alignment, along with details of the first point of contact for any queries.
- The contractor(s) will coordinate preconstruction defect surveys for identified properties, liaising (in conjunction with the employer) with the building surveyor employed to carry out the surveys and maintaining a dialogue with the relevant property owners throughout the duration of the works.
- Details of contact names and number for any complaints that may arise during works.

TII and its appointed contractor(s) will ensure that local residents, occupiers, businesses, local authorities and all other stakeholders affected by the proposed construction works, as outlined in this EIAR, will be informed in advance of work taking place. The notifications will detail the estimated duration of the works, the working hours and the nature of the works. In the case of works required in response to an emergency, the local authority, local residents and businesses will be advised as soon as reasonably practicable. All notifications will include a local helpline number. In addition, information on the works will also be available on the proposed Project website.

TII will establish coordination and communication meetings with key stakeholders. The contractor(s) will attend these meetings as required and arrange other meetings where necessary. Any plans which have been approved by TII will be issued to the relevant stakeholders. This includes the Airborne and Ground-borne Noise Mitigation Policy (see Appendix A14.6 of the EIAR).

3.3.2 Internal Communication

The site management meeting(s) and weekly site safety meetings will include environmental issues (such as monitoring, complaints, incidents) on the agenda. The Environmental Manager will report on environmental issues to the site management meetings and attend weekly meetings.

On-site communications, such as daily shift and activity briefings, will be used to advise the site workforce of health, safety, environmental and community matters. This will include information obtained from liaising with the community regarding matters, such as noise generation and access issues, together with constraints detailed in the contracts (e.g. working hours) and other documents, such as the CEMP, regulating the proposed Project. This communication will be addressed to all relevant members of the workforce, including new starters and subcontractor(s), before the commence work. Further information can be found in the project's health and safety documentation. Toolbox talks will be used as a means to disseminate information to the workforce on a routine basis.

4. Environmental Management Procedures

4.1 Environmental Awareness, Training and Competence

The contractor(s) will be selected with due consideration of relevant qualifications and experience. The contractor(s) will be required to employ construction staff with appropriate skills, qualifications and experience appropriate to the needs of the works to be carried out during construction.

A site induction will be provided to all construction staff before they commence work on site. Where appropriate, the contractor(s) will identify specific training needs for the construction workforce and will ensure that appropriate training requirements are fulfilled.

The contractor(s) will establish an Environmental Awareness Training programme and ensure that all personnel receive adequate training prior to the commencement of construction activities. A baseline level of environmental awareness will be established through Environmental Induction Training provided by the Environmental Manager. Key environmental considerations and objectives will be incorporated into this induction. Without such training, those involved in constructing the proposed Project would not be aware of relevant Environmental Control Measures and, consequently, Environmental Commitments/Requirements would not be met. Specifically, site inductions will cover the following as a minimum:

- Introduction to the Environmental Manager;
- Description of the CEMP(s) and consequences of non-compliance;
- The requirements of due diligence and duty of care;
- Overview of conditions of consents, permits and licences, including environmental control measures and commitments;
- Requirements associated with community engagement and stakeholder consultation;
- Identification of environmental constraints and notable features within the site; and
- Procedures associated with incident notification and reporting including procedures for dealing with damage to the environment.

Nobody will work on site without first receiving environmental induction. Signed records of environmental training will be established, maintained and made available to the Employers Representative.

Site briefings and talks would be carried out on a regular basis to ensure that construction staff have an adequate level of knowledge on environmental topics and community relations and can effectively follow environmental control procedures throughout construction.

4.2 Inspections, Auditing and Monitoring Compliance

For the duration of the contract(s), the environmental performance of the contractor(s) will be monitored through site inspections and audits by the Environmental Manager. The programme for monitoring, inspections and audits will be specified in the contract and it is likely to be a combination of internal inspections and independent external audits that may be either random or routine.

Records of all inspections carried out will be recorded on standard forms and all actions will be closed out in a reasonable time. The detailed CEMP(s) would include further details of inspection procedures.

4.2.1 Inspections

The Environmental Manager will carry out environmental inspections of construction activities at appropriate intervals to ensure all necessary environmental measures relevant to the construction activities are being effectively implemented.

Where appropriate and when required, the Environmental Manager will arrange to be accompanied on these environmental inspections by qualified and accredited environmental professionals, whose knowledge and experience may cover the fields of landscape architecture, archaeology, biodiversity, noise, vibration and other environmental sciences. On request, relevant local authorities will be given access to the results of monitoring, along with the opportunity to attend site visits to ensure compliance with the controls of the CEMP.

The inspections will identify the following:

- Have all site personnel been inducted;
- Are site personal adhering to the relevant Environmental Control Measures outlined in the CEMP and performing all work activities with the relevant site-specific Method Statements;
- Are hazardous substances being stored appropriately; and
- Is waste being disposed of appropriately.

The results of the inspections will be discussed at the weekly site safety and environmental meetings.

4.2.2 Monitoring

Mitigation and monitoring will be carried out in accordance with the requirements of the EIAR and NIS so that construction activities are undertaken in a manner that does not give rise to significant negative effects. Suitable monitoring programmes will need to be developed, implemented, documented and assessed in accordance with the specification outline in the detailed CEMP(s).

The results of all environmental monitoring activities will be reviewed by the Environmental Manager on an ongoing basis to enable trends or exceedance of criteria to be identified and corrective actions to be implemented as necessary. The contractor(s) will be required to inform TII of any continuous exceedances of criteria.

4.2.3 Audits

The Environmental Manager, in conjunction with the Construction Manager, will carry out an annual audit of the CEMP to determine whether the CEMP is effective in ensuring that the contractor(s) are meeting all environmental commitments/requirements. Where required as a result of such audits, the Environmental Manager will make all necessary changes to the plan, with the approval of the Construction Manager, and bring them to the attention of all contractor(s). The CEMP may be revised, as appropriate between annual audits (for example, where Environmental Control Measures are updated).

The Environmental Manager will track environmental legislation on a six-monthly basis and all changes that could affect the plan will be brought to the attention of the Construction Manager and site managers.

Further, regulatory and statutory bodies may undertake site visits to monitor compliance with legislative and regulatory requirements. These site visits may occur randomly throughout the Construction Phase. The contractor(s) will facilitate these visits and the Environmental Manager will be available to provide information as required and deal with any issues that may arise during, or as a result of, these visits.

Planned and documented audits aimed at evaluating the conformance of the EMS would also be carried out by the Environmental Manager. As part of the detailed CEMP(s), the Environmental Manager will establish a schedule for internal audits.

The contractor(s) will be required to prepare standard forms for reporting and audit items will include but not be limited to the following activities:

- Review of environmental documentation to establish if relevant requirements are being achieved and if continual improvement is occurring;
- Site inspection and interviews with on-site personnel; and
- Reporting with recommendations.

For any environmental nonconformity found, the Environmental Manager will initiate and report on corrective actions that are required to be remedied by the contractor(s).

4.3 Incident Response

In response to an environmental incident, in the first instance, an investigation will be undertaken by the Environmental Manager to identify the cause of any non-conformances. Incident response would include the identification and implementation of appropriate remedial measures as soon as practicable to prevent further exceedances. If necessary, the appropriate statutory authority and stakeholders will be notified. Where new or amended measures are proposed, the relevant CEMP(s) will be updated accordingly by the Environmental Manager.

Incident response would generally include the following:

- **Corrective actions**: Corrective Action Reports (CAR) would be prepared following any environmental nonconformity during environmental monitoring, inspections and/or audits on site. The CAR will describe in detail the cause and effect of the nonconformity on site and describe the recommended corrective action required to remedy it, including a timeline, as well as arrangements for informing appropriate authorities and stakeholders.
- **Emergency incidents:** are incidents that give rise to significant negative environmental effects including any malfunction of mitigation measures and/or environmental protections system; any emission that does not comply with the environmental commitments and requirements of the contract and relevant licences; any circumstance that results in environmental pollution; extreme weather events such as flooding or any emergency that may give rise to environmental effects such as significant spillage in a water body or a fire outbreak. See Section 5.10 for further detail on emergency response plans. The contractor(s) will be required to maintain emergency access routes throughout the construction and identify site access points for each working area. Furthermore, this will be developed in consultation with the emergency services and documented as part of the detailed CEMP(s) and TII's MetroLink Major Incident Management Plan.
- **Unexpected discoveries:** excavation works will be monitored to check for unexpected or unusual materials with a contaminative potential or in the event of encountering unexpected archaeological or cultural heritage assets. The contractor(s) will be required to develop appropriate procedures as part of their detailed CEMP(s) and the Environmental Manager will ensure that specialists (such as archaeologists) are facilitated to ensure management in accordance with industry best practice and effective compliance with the relevant legislation. All unexpected discoveries will be reported to the appropriate authorities and documented in an appropriate manner.

4.4 Reporting and Environmental Records

The contractor(s) will be required to submit a monthly environmental compliance report to TII for review and approval. The report will address the following as a minimum:

- Interpretation of the results of ongoing monitoring;
- Summary of compliance with the CEMP(s) including identification of any non-conformances;
- Detailed description of any issues and/or non-conformances identified during inspections and/or audits;
- Record of incidents and corrective actions (including CARs as appropriate);
- Summary of any environmental complaints received and/queries raised by stakeholders; and
- Records of environmental training undertaken (as appropriate).

The contractor(s) will inform TII of all emergency incidents immediately and prepare an initial report within 24 hours setting out the details and cause (if known) of the incident. The contractor(s) will be required to complete an Environmental Incident Report and any further documentation requested by TII within seven days of the incident occurring. The report will define the scale and effects as well as required corrective actions and mitigation/remediation/compensation measures (as appropriate).

The contractor(s) will maintain appropriate environmental documentation including monitoring, test results, plans and method statements. All records will be kept up to date and be made available for audits, inspections and periodically reporting. The contractor(s) will maintain the following environmental records (as a minimum) that will be made available for inspection to TII and the relevant authorities, if required:

- Management Plans;
- Environmental reports;
- Records of environmental incidents;
- Records of environmental training;
- Corrective Action Reports;
- Register of environmental complaints;
- All monitoring data;
- Environmental inspection and audit reports;
- Waste and chemical inventories; and
- Health and safety records.

5. General Site Operations

5.1 Construction Process

The construction of the proposed Project will extend from north of Swords to south of Dublin City centre and will require 34 construction compound locations. This will also include an easement strip along areas where the track is on the surface or in cut sections. The proposed Project is a major construction project and it will include many types of construction activities such as utility works, demolition, site clearance, earthworks, tunnelling, bridge works and railway works. The following sections outline the general construction site operations.

5.2 Working Hours

5.2.1 Standard Working Hours

The timing of construction activities, standard working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects. The contractor(s) will require their staff and sub-contractor(s) to adhere to the standard construction working hours.

This includes a half hour period for start-up and shut down of activities. The activities to be undertaken during this period may include: deliveries to and from site;; arrival and departure of workforce and staff at site and movement to and from place of work; general refuelling; site inspections and safety checks prior to commencing works; site meetings; site maintenance; site clean-up; maintenance and checking of plant and machinery; but not including operation of plant or machinery giving rise to noise impacts.

Any restrictions to working hours associated with major events in the area of works will be agreed with the Local Authorities . In addition, a Construction Noise and Vibration Management Plan will be included as part of the final CEMP, and this will include for specific working hour measures at sensitive locations. For example, works outside churches will need to take into consideration mass or funeral events.

Table 51 Standard Working & Delivery Hours (5.5 days)

Days	Hours
Monday to Friday:	07:00hrs to 19:00hrs (this includes a half hour to prepare site at each end, giving 11 hours working: 07:30hrs to 18:30hrs)
Saturday:	07:00hrs to 13:00hrs (this includes a half hour to prepare site at each end, giving 5 hours working: 07:30hrs to 12:30hrs)
Sunday / Public Holidays, including annual and extraordinary events:	None (only by exception, with those activities listed below under additional working hours)

The appointed contractor(s) will require staff and sub-contractor(s) to adhere to these standard working hours for each site, insofar as reasonably practicable, unless otherwise permitted by the relevant Local Authority.

5.2.2 Additional Working Hours

Most construction activities will be undertaken during the proposed standard working hours. However there will be a number of activities that require working outside of these standard hours. These will include:

- Tunnelling: the passage of the Tunnel Boring Machine (TBM) through the station and associated activities will be carried out on a 24 hour a day, seven days a week basis;
- Excavation in rock: at some stations excavation of rock will be carried out during standard hours, but on a 7 day a week basis and for all intervention tunnels (drilling and moving rock underground) will be carried out on a 24 hour a day basis for seven days per week;
- Some large concrete pours: may require working outside of standard hours;
- Dewatering excavations: the pumping of groundwater will be continuous (24 hours a day, seven days a week) for the duration required for construction at each location;
- Track bed and track laying: and associated concrete batching will be continuous (24 hours a day, seven days a week) from the locations detailed in Section 5.5.10;
- MEP (Mechanical Electrical & Plumbing) fit out at the stations: will be carried out on a 24 hour a day, seven days a week basis;
- Utilities and roadworks (as directed by the relevant authorities): may be extended to working outside of standard hours; and
- 'Special/abnormal' deliveries: may require extended hours or overnight deliveries.

For those activities that require working outside of the standard hours, the proposed schedule of hours is set out in Table 5.2.

Table 5.2 Working & Delivery Hours Outside of Standard Hours

7-Day Working (Day Shift Only)	Hours
Monday to Sunday:	07:00hrs to 19:00hrs (this includes a half hour to prepare site at each end, giving 11 hours working: 07:30hrs to 18:30hrs)
Public Holidays, including annual and extraordinary events:	None (apart from the exceptions listed below)
7-Day Working (24 Hours)	**Hours**
Monday to Sunday:	24 hours per day
Public Holidays, including annual and extraordinary events:	24 hours per day
Deliveries	**Hours**
Abnormal deliveries	These are deliveries specific to activities requiring abnormal loads where 'out of hours' transport is required. These are to be agreed with An Garda Síochána and the Local Authority.
Overnight / weekend	These are deliveries required for large concrete pours, roadworks and works done during weekend possessions. Overnight and weekend delivery hours are to be defined with the Local Authority.

Table 5.3 details where activities require working outside of the standard hours at each construction compound location.

Tunnelling and activities directly associated with it (such as removal of excavated material, supply of materials and maintenance of tunnelling equipment on site) will be carried out on a 24 hour a day, seven days a week basis from each of the tunnel launch sites. Where reasonably practicable, material will be stockpiled within the relevant main construction compound for removal during standard working hours.

Station construction will predominantly be undertaken during standard working hours (with the exceptions detailed in Table 5.3). Glasnevin Interchange requires a different working day schedule due to the complexity of this site and the requirement to work in the vicinity of the existing railway.

Occasional night-time works may be required for specific activities such as traffic management, abnormal deliveries, footbridge installation inter-alia. If night works are required timings/activities are to be planned in advance and agreed with the Local Authority, taking sensitive receptors into consideration, particularly local residents.

If activities require work outside the hours set out in Table 5.2, an approval will be sought from the relevant Local Authority for these on a case-by-case basis. For example, the contractor(s) may seek to extend the working hours for a particular activity, to take advantage of daylight hours during the summer at a location where standard 7am to 7pm working hours (5.5 days) are scheduled.

Table 5.3: Schedule of Working Hours at each Construction Compound

Construction Compound	Local Authority	Standard Working 5.5 days	7- days working (Dayshift only)	7- days working (24 hours)
Estuary Station & Logistics Site	Fingal CC	√	-	Supply site for: • Track Installation (from Estuary railhead to DANP) • 2nd stage concrete (Estuary railhead to DANP) • Systemwide fit- out for surface line (Estuary Station to DANP)
Fingallian's Footbridge	Fingal CC	√	-	-
Seatown West	Fingal CC	√	-	-
Estuary Court	Fingal CC	√	-	-
Woodie's	Fingal CC	√	-	-
Mantua Park	Fingal CC	√	-	-
Seatown Station	Fingal CC	√	-	-
North Dublin Corporate Park (NDC)	Fingal CC	√	-	-
Chapel Lane	Fingal CC	√	-	-
Pavilion's Shopping Centre	Fingal CC	√	-	-

Construction Compound	Local Authority	Standard Working 5.5 days	7- days working (Dayshift only)	7- days working (24 hours)
Swords Central Station	Fingal CC	√	-	-
Pinnock Hill Roundabout	Fingal CC	√	-	-
Fosterstown Station	Fingal CC	√	-	-
Nevinstown Lane	Fingal CC	√	-	-
Boland	Fingal CC	√	-	-
North Portal (North section)	Fingal CC	√	-	-
Dublin Airport North Portal (DANP)	Fingal CC	√	-	• TBM removal
Dublin Airport Station	Fingal CC	√	-	• TBM traverse through station
Dublin Airport South Portal (DASP)	Fingal CC	√	-	• TBM launch shaft • TBM assembly • Supply site for all TBM tunnel works and 1st stage concrete track bed. • Evacuation and Ventilation Tunnels
Dardistown Station and Depot	Fingal CC	√	-	• Supply site for: • Track installation • 2nd stage concrete • MEP fit out
Central Section Surface Works at M50 Viaduct	Fingal CC	√	-	• Several overnight (including weekend) possessions required for M50 Viaduct works
St Anne's South of M50 Viaduct	Fingal CC	√	-	• Several overnight (including weekend) possessions required for M50 Viaduct works
Northwood Station and Portal	Fingal CC	√	• Pre TBM drive	• TBM launch shaft • TBM assembly • Supply site for all TBM tunnel works and 1st stage concrete track bed from Griffith Park to Northwood • MEP station works
Northwood Logistics Site	Fingal CC	√	-	-

Construction Compound	Local Authority	Standard Working 5.5 days	7- days working (Dayshift only)	7- days working (24 hours)
Ballymun Station	Dublin City	√	• Works at the station during TBM stoppages	• MEP station works • TBM traverse (if required)
Collins Avenue Station	Dublin City	√	• Works at the station during TBM stoppages	• MEP station works • TBM traverse (if required)
Albert College Park Intervention Shaft	Dublin City	√		• SCL tunnel and main tunnel connection
Griffith Park Station	Dublin City	√	• Works at the station during TBM stoppages	• Strip and clean tunnel • 1st stage concrete track bed from Charlemont South to Griffith Park Station • MEP station works
Glasnevin Station	Dublin City	√	• Works at the station during TBM stoppages • Station south end construction • Station critical civil works • Station architectural fit out	• Sliding new rail bridge into position • MEP station works • Blockades or weekend possession work required with Irish railway (GSWR & MGWR)
Mater Station	Dublin City	√		• TBM traverse through station • MEP station works
O'Connell Street Station	Dublin City	√	• Subway and vent shafts • Station civils and architectural works	• TBM traverse through station • Post TBM final civils and construction • MEP station works
Tara Station	Dublin City	√		• TBM traverse through station • MEP station works
St Stephen's Green Station	Dublin City	√		• TBM traverse through station • MEP station works
Charlemont Station	Dublin City	√	• Station construction • Civils and architectural works • Clear site and reinstate	• TBM traverse through station • SCL Evacuation & Ventilation Tunnels • MEP station works
Key		Satellite construction compound		
		Main construction compound		

5.3 Construction Elements and Compounds

Thirty-four compounds will be required for the construction and commissioning of the proposed Project. A temporary working strip of land will also be required along areas where the track is on the surface or in cut/cut-and-cover. Please refer to the following documents for more information:

- Figure 5.1 (Construction Compound Locations) in Chapter 5 (MetroLink Construction Phase) of the EIAR; and

Figure 5.2 (Haul Routes) in Chapter 5 (MetroLink Construction Phase) of the EIAR. The Construction Compounds will support the Enabling Works and main civil engineering works, two of the key stages of the principal construction works for the proposed Project. They will therefore be established as a requirement of the Enabling Works, such that they support and remain in place until the conclusion of the main civil engineering works.

5.3.1 Classification of Site Offices and Construction Compounds

Construction site offices and compounds will generally be situated along, or near, the elements of the proposed Project that they are intended to support. Construction compounds, including any areas used for access, will be returned to the most appropriate use as soon as reasonably practicable after completion of the works (apart from areas used for permanent land-take, listed in Chapter 21: Land Take).

The proposed construction compounds have been classified into four broad categories, namely:

- Main construction compounds;
- Satellite construction compounds;
- Linear working areas along the railway track alignment; and
- Logistics areas.

The main construction compounds will act as strategic hubs for core project management activities (i.e. engineering, planning and construction delivery) and for office-based construction personnel. They will include:

- Offices and welfare facilities;
- Workshops and stores;
- Storage and laydown areas for materials and equipment (e.g. aggregates, structural steel, steel reinforcement); and
- Limited parking for construction vehicles.

Satellite construction compounds will generally be smaller and may provide:

- Local office and welfare facilities;
- Local storage for plant and materials; and
- Limited parking for construction vehicles .

Lorry holding areas have been allocated within the main and satellite construction compounds as space allows.

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.

Finally, temporary working areas located along the proposed railway alignment will be provided to aid the construction of retained cut, cut and cover, elevated track and surface track sections. These strips of land range from 10m to 25m wide on either side of the alignment and will be used for logistics and access along the route. A portion of these strips will remain a permanent easement feature for MetroLink maintenance purposes.

The location of the proposed main construction compounds, satellite compounds, logistics areas and temporary working areas along the alignment are depicted in Diagram 5.1.

Detail on the temporary and permanent land-take boundaries for the proposed Project are detailed in Chapter 21 (Land Take) of the EIAR and in the property drawings and schedules. Land parcels to be impacted by the proposed Project are identified using a unique reference number, as indicated on the property drawings.

Diagram 5.1 Proposed Construction Compound Locations

5.3.2 Haul Routes

Haul routes will be required for the transport of excavated material and movement of construction materials, equipment and plant to and from the Construction Compounds. The haul routes have been determined based on a review of all potential road crossings/access points for traffic to and from the construction sites/compounds and

based on the identification of those road crossings/access points with the potential capacity to accept a large number of vehicle movements. Furthermore, the haul routes have been developed in line with the Dublin City Council (DCC) Heavy Goods Vehicles Management Strategy (DCC 2007) which aims to enhance Dublin City Centre through banning 5+ axle vehicles during the hours of 07:00hrs – 19:00hrs seven days a week, unless a valid permit is obtained.

Regional roads, primary roads and sections of the M50 Motorway will be used wherever practical in order to reduce traffic impacts to local roads with reduced capacity. Haul routes to and from the construction compounds are illustrated in Figure 5.2 in Chapter 5 (MetroLink Construction Phase) of the EIAR. Haul routes have been discussed further in the Scheme Traffic Management Plan (STMP) in Appendix A9.5 of the EIAR and Chapter 9 (Traffic & Transport).

5.3.2.1 Abnormal Loads

As outlined in S.I. No. 5/2003 – Road Traffic (Construction and Use of Vehicles) Regulations 2003 and in addition with the Road Safety Authority (RSA) Guidelines on Maximum Weights and Dimensions of Mechanically Propelled Vehicles and Trailers, Including Manoeuvrability Criteria (RSA 2020), the movement of abnormal loads required during the Construction Phase of the proposed Project will require an Abnormal Load Permit to be issued by An Garda Síochána and the Local Authority. Also, for exceptional abnormal loading (e.g. greater than 180 tonnes) on bridges and other structures, pre and post transit structural inspections will be required and carried out. Each vehicle operating under this system will have escort vehicles and a 'Wide Load' sign visibly displayed. An abnormal load is classified as any vehicle and associated load that is:

- Over 16.5m in length;
- Over 2.9m in width
- Over 4.65m in height; or
- Over 46 tonnes in weight.

Abnormal Loads will be required in order to facilitate the movement of the following type of plant during the Construction Phase:

- TBM components (cutter head, shields, screw conveyor, drive module);
- Water cooling plant, silos and gantry crane;
- Construction Phase equipment such as D-wall grabs, cranes and excavation plant;
- Precast concrete segments (e.g. for viaduct);
- Substation parts including the transformer and switch gear; and
- MetroLink rolling stock.

An analysis for identification of likely routes that could be utilized to transport the most onerous abnormal loads (e.g. TBM front shield component and bentonite silo) to the various construction sites has been undertaken by a specialist transport and lifting company as part of the EIAR (see Appendix A5.6 of the EIAR).

The Contractor(s) must further refine the abnormal loads transportation routes in agreement with local authorities and must be aware of any route/transportation limitations in advance of any abnormal loads transportation activities.

The Contractor(s) must ensure/adapt abnormal loads characteristics to allow the transport to comply with any size/height limitations.

Any tree trimming activity needed to be undertaken prior to the abnormal loads, transportation must be planned in advance as to ensure that such activity occur outside of specific periods such as bird nesting season.

The Contractor(s) must ensure that construction site entrances bell mouth dimensions allow for the delivery vehicles to turn onto the site. If this requirement cannot be permanently achieved, then temporary works may need to be planned in around the arrival/departure dates of the delivery vehicle at site to allow for the necessary space to be available for access/egress.

5.3.3 Construction Vehicles, Plant and Equipment

Depending on the site activities, typical plant and equipment will include:

- Excavators, dumpers, rollers, bulldozers and graders;
- Pile boring rigs;
- Mechanical rock excavators (road header);
- Hydraulic grabs;
- Hydraulic breakers and hammers;
- Dust suppression equipment;
- Concrete pumps and water pumps;
- Bentonite plant;
- Jet washers;
- Wastewater treatment plants;
- Generators and compressors;
- Road sweepers;
- Site lighting;
- Skip wagons;
- General site loaders;
- Diaphragm wall (D-wall) hydrofraise and D-wall rigs;
- Crane-mounted augers;
- Slurry treatment plants;
- Batching plants;
- Silos;
- Wheel washers;
- Well drilling rigs; and
- Crane and telehandlers.

5.4 Good Housekeeping

The contractor(s) will always ensure good housekeeping practices on site to prevent negative visual impacts, accidents and/or complaints from the public. This will include, but not be limited to, the following requirements:

- General maintenance of working areas and cleanliness of welfare facilities and storage areas;

- All contractor(s) will be made aware of material storage arrangements at induction and through toolbox talks. Materials will be stored in a designated area in an organised manner so as to protect them from damage, deterioration and loss;
- Provision of a site layout map showing key areas such as first aid posts, material storage, spill kits, material and waste storage and welfare facilities;
- Weekly environmental inspections to identify any evidence of poor housekeeping practices;
- Maintenance of all construction plant, material and equipment and ensure these are in good order, clean and tidy;
- Keep construction compounds, access routes and designated parking areas free and clear of excess dirt, scrap wood, rubbish piles at all times;
- Details of site managers contact numbers and public information signs (including warning signs) will be provided at the boundaries of the working areas. Any complaints from the public regarding waste and housekeeping will be entered in the complaints register and actioned as required;
- Provision of appropriate welfare facilities for site personnel at all main compounds. The facilities will include canteens, toilets, showers, locker rooms and first aid posts. The facilities will be connected to the mains services and drainage, where reasonably practicable;
- Installation of appropriate security, lighting, fencing and hoarding at each working area;
- Keep hoarding and fencing free of graffiti or posters;
- Effective prevention of oil, grease or other objectionable matter being discharged from any working area;
- Provision of appropriate waste management facilities at each working area and regular collections to be arranged;
- Maintenance of wheel washing facilities and other contaminant measures as required in each working area;
- Effective prevention of infestation from pests and vermin, including arrangements for regular disposal of food and material attractive to pests;
- No discharge of site runoff or water discharge without agreements of the relevant authorities;
- Installation of fencing and signage around any known invasive species;
- Protection of any historical heritage on site;
- Maintenance of public rights of way, diversions and entry/exit areas around working areas for pedestrians and cyclists where practicable; and
- Material handling and/or stockpiling of materials/spoil, where permitted, will be appropriately located 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 (as detailed in Section 6.3 below).

5.5 Worksite Layout

The contractor(s) will ensure, as far as reasonably practicable and appropriate, that the site layout and appearance will be designed using the following principles:

- Sites at prominent locations will be screened by hoarding;
- All sites will be fully secured via fencing and/or hoarding, secure gates, site security and CCTV;
- Existing features will screen the sites where appropriate;
- Storage sites, fixed plant and machinery equipment and temporary offices will be located to limit environmental impacts, as far as reasonably practicable, and having due regard to neighbouring receptors, as far as allowed by the constraints of each site;
- Site lighting will be located and directed so as not to intrude into occupied residential properties or sensitive areas identified in the EIAR, or constitute a road, air or rail hazard;
- Security cameras will be sited and directed so that they do not intrude into occupied residential properties; and
- Site plant and facilities will be powered from mains electrical sources.

The contractor(s) will ensure, as far as reasonably practicable, that the visual impacts of construction sites on nearby residents and users of local facilities and amenities is limited. The contractor(s) will ensure that, where appropriate, construction activities will be screened to protect nature conservation sites and the amenity value of recreational facilities.

The type of hoarding or fencing used will vary from location to location but will accord with the following principles:

- The standard hoarding will be 2.4m in height as a minimum, plywood faced, timber framed and suitably painted;
- An exception to the standard 2.4m hoarding or fencing would be at areas that need specific acoustic barriers identified under the environmental measures in Section 6;
- Suitable measures will be required for tree protection;
- Where reasonably practicable, existing walls, fences, hedges and earth banks will be retained;
- Notices will be displayed on all site boundaries, where appropriate, to warn of hazards on site such as deep excavations, construction access and out of hours contact details, telephone helpline number and information on the works;
- Appropriate site lines/visibility splays will be maintained to ensure safety of both vehicles and pedestrians; and
- Temporary fences will be used in certain areas, such as for short term occupation of sites or at more remote locations (such as on agricultural land), where hoarding is not required.

The extent and height of hoarding or fencing at a particular location will be selected to maintain effective security and achieve appropriate noise attenuation, dust minimisation and visual screening. Hoarding will be painted and may include a MetroLink logo and/or that of the contractor(s). Hoarding will be maintained in good condition.

All access and egress points will have gates positioned such that no gate will be permitted to open out onto a road or pathway. Where provided, for noise and dust control, gates will be of a similar material and construction to the boundary in which they are situated and will be closed except when being used for access/egress.

The contractor(s) will ensure the development of suitable site haul roads and material storage areas. The route through the site should ideally be one-way and avoid reversing wherever possible.

5.6 Cranes

Crane arcs will be confined within the site boundary unless agreed otherwise with the relevant local authorities and property owners/occupiers who are affected. The contractor(s) will obtain the relevant permissions from the appropriate authority for cranes located adjacent to railways, roads or rivers. Cranes will be operated in accordance with the requirements of I.S. 360:2019 - Code of Practice: Safe Use of Cranes in the Construction Industry (or most current revision). Where there is potential for crane arcs to impact on trees and associated ecology, suitable protection measures will be implemented.

Furthermore, height restrictions will be in place for all works at Dublin Airport South Portal where alternative size cranes will be required to avoid the airport approach safety zones.

5.7 Site Lighting

The general approach that will be taken to construction lighting is set out in Appendix A5.18 of the EIAR. A Lighting Management Plan will be included within the detailed CEMP(s) and a Site Lighting Plan will be prepared for each construction site. The Plans will provide design layouts and demonstrate how the following controls are met by the design.

The Construction Lighting Plan will establish and accomplish the following objectives:

- Provide a consistent and safe approach to site lighting;
- Provide the appropriate level of lighting that allows construction work to be completed safely and effectively;
- Provide the most appropriate type of lighting that minimises carbon footprint and is energy efficient;
- Adopt a proactive approach to reduce light pollution and trespass; and
- Improve the overall safety of the workers and travelling public.

The Contractor(s) must ensure that every construction site is provided with adequate power supply and distribution on site, suitable and sufficient temporary lighting, natural light as far as is reasonably practical, and suitable and efficient specific task and emergency lighting/routes where needed.

The following main measures will be applied in relation to site lighting:

- Site lighting will be provided to ensure safe working conditions and to maintain security on construction sites, having regard to sensitive ecological receptors or occupied residential properties in proximity to the site;
- Temporary site lighting will be arranged such that any visual intrusion and light spillage is avoided, and it should be frequently monitored for compliance as the main civil works progresses. This is particularly important near residential properties and busy roads where it may cause significant nuisance or distraction to road users (e.g., when working on or near the R132);
- Where necessary, semi-permanent site lighting will be provided to all site boundaries/hoardings, temporary bridges, haul routes, site entrances and exits to ensure the safety of passing pedestrians and other road users.
- Additional or strategically placed lighting around the construction site can help illuminate any areas and mitigate any risk of any injuries due to obscuring hazards on construction sites (e.g. construction plant and vehicle movements, blind spots, and nails);
- Field observations of the work zone lighting must be performed by driving and walking through the site and inspecting the work zones. In addition, regular measurements must also be taken to verify that the necessary lighting levels are met in the general works access routes and areas, including in particular where works are undertaken adjacent to private or commercial properties, and during offline works e.g., temporary road diversions, utility works or road/junction crossings. Once the field check is complete and the work area has

been reviewed, any necessary modifications or adjustments would be agreed and implemented, and the work zone plan or inspection report would show that deficiencies were identified and remediated. As with any modification or adjustment to a plan that puts the work zone in greater compliance with standards and policies, complete and thorough records must be maintained;

- Recommended illuminance and lighting levels based on available guidance, information and established good practice will be ensured at each working zone;
- Positioning of site lighting must find the right balance between creating the best possible or fit for purpose lighting scenario for the site as well as protecting the residents, drivers and the general public from unnecessary light pollution and distractions. The site lighting will be arranged to light up the job site safely, but not blind or obstruct workers, pedestrians, cyclists, motorists, or traffic, nor impact environmentally sensitive areas, e.g., bats roosts and watercourses;
- The requirements pertaining to site lighting in BS 6164 would be followed for tunnel temporary lighting;
- To ensure the safety of everyone on site, emergency lighting will be provided for emergency escape routes (having regard to tunnelling and underground works as per BS 6164:2019 Health and Safety in Tunnelling in the Construction Industry);
- Where required, and in agreement with the local authority, lighting will be provided at site boundaries and with the minimum luminosity sufficient to create a safe route for passing members of the public;
- Motion sensor lighting and low energy consumption fittings will be installed to reduce usage and energy consumption where practical.

The lighting provided to light up each construction site would be designed by the Contractor or their representative to suit the construction methodology and equipment used at that site/location. It would provide a safe working environment within the construction site, without blinding or obstructing traffic, pedestrian, cyclists nor impact environmentally sensitive areas around the site.

The lighting towers and equipment would be designed and positioned to illuminate within the working area only and with minimum impact on surrounding receptors.

5.8 River Works

The contractor(s) will use the appropriate methodology as set out by the following guidelines:

- TII Publication – Design of Outfall and Culvert Details (Doc Ref. DN-DNG-03071).
- A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945.
- CIRIA Report 689 – Culvert Design and Operation Guide.
- NRA Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.
- Inland Fisheries Ireland – Guidelines on protection of fisheries during construction works in and adjacent to waters, 2016.
- NRA Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (2008).
- TII Publications - Drainage of Runoff from Natural Catchments (DN-DNG-03064).

A Water Management Plan will be prepared by the contractor(s) that will outline the mitigation, compensation and/or monitoring that will be used, where required. This will be based on Appendix A5.11 of the EIAR. Approval and consultation with IFI will be obtained in advance for all crossings, diversions and work affecting watercourses. Watercourses (including land and/or road drainage) within the construction sites will always be maintained in order to provide effective working conditions. All practicable measures will be taken throughout the Construction Phase to prevent the deposition of silt, or other material arising from works, in any existing watercourse, canal, lake, reservoir, borehole, aquifer or catchment area.

Watercourse culverts are subject to regulation under Section 50 of the Arterial Drainage Act 1945, as amended. Compliance is managed by the Office of Public Works (OPW). Requirements for watercourse culverts are stipulated by the OPW and will take precedence to requirements outlined in this standard.

5.9 Security

Security will be the responsibility of the contractor(s), who will provide adequate security to prevent unauthorised entry to or exit from any working areas. The following measures may be used to prevent unauthorised access:

- Fencing around the sites to minimise the risk of vandalism and unauthorised access. This process will be made easier by all operatives possessing an ID card. ID Cards will only be issued to operatives that have attended the site induction and (if relevant) a medical examination;
- Installation of CCTV and alarm systems, where required;
- When there is no site activity, close and lock site gates and set appropriate site security provisions in motion;
- Consult with neighbouring properties and local crime prevention officers including DCC, FCC and An Garda Síochána on site security matters as required; and
- Prevent access to restricted areas and neighbouring properties by securing equipment on site such as scaffolding and ladders.

Where construction work is carried out within operational railway infrastructure, security arrangements will be discussed and agreed with the organisation in control of the premises (i.e. Iarnród Eireann). Security surveillance, monitoring and incident reporting will be managed in conjunction with Iarnród Eireann.

5.10 Emergency Response Plan

A set of standard emergency response procedures will govern the management of emergency incidents. The contractor(s) will be required to detail emergency incident response procedures in the detailed CEMP and to develop an Emergency Response Plan.

Site specific emergency preparedness and response plans will be developed and issued for use for all construction site activities. The standard plan will encompass the following environmental aspects:

- Leakages and spills of fuel and other toxic substances;
- Fire, smoke and other emissions to air;
- Water leakage/contamination of groundwater;
- Contamination of natural water sources;
- Electrical emergencies;
- Gas leakages; and
- Breakage or damage to existing sewers and accidents which could compromise the integrity of adjacent structures.

The Emergency Response Plan will contain emergency phone numbers and the method of notifying local authorities, statutory authorities and stakeholders. Contact numbers for key personnel will also be included therein. Contractor(s) will be required to adhere to and implement these procedures and ensure that all staff and personnel on site are familiar with the emergency arrangements. In addition, designated staff will be trained in spill management, minor firefighting and first aid.

The contractor(s) will consult with the relevant statutory authorities, stakeholders and other parties, such as the Health and Safety Authority (HSA), the EPA, Dublin Fire Brigade, the Ambulance Service, utility companies, FCC and DCC, when preparing and developing response measures. Further, if any sensitive receptor is impacted, the appropriate environmental specialists will be informed and consulted with accordingly.

All environmental incidents (including emergency situations and accidents that can have an impact on the environment) are to be managed in accordance with the Emergency Response Plan. In the event of an incident, the contractor(s) will:

- Carry out an investigation to identify the nature, source and cause of the incident and any emission arising there from;
- Isolate the source of any such emission;
- Evaluate the environmental pollution, if any, caused by the incident;
- Identify and execute measures to minimise the emissions/malfunction and the effect thereof;
- Identify the date, time and place of the incident;
- Notify all relevant authorities; and
- Notify TII within 24 hours of the incident occurring.

In addition to the Emergency Response Plan the contractor(s) will prepare a Spill Response Procedure and implement this procedure if such an incident occurs (refer to Section 5.10.1 below).

Furthermore, the contractor(s) will implement a process within 48 hours of the incident occurring or as otherwise agreed by TII to:

- Identify and put in place measures to avoid reoccurrence of the incident;
- Identify and put in place any other appropriate remedial action; and
- Carry out environmental monitoring where required.

Details of close-out of all incidents will be submitted to the TII in the monthly environmental report.

5.10.1 Spill Response

The contractor(s) will develop and implement a procedure for Spill Response. This procedure will detail the practical measures to be implemented in order to respond to pollution incidents and shall have regard to best practice measures and guidance. The procedure will apply to all site personnel, including subcontractor(s) and consultants. The plan will detail the procedure to deal with any spill incident that may occur, including response procedures, timescales and notification procedures that would be implemented in order to minimise the effects.

The plan will include the following steps to be followed on the event of an uncontained spillage/leak:

1. Immediately report the occurrence to the site foreman or Environmental Manager;
2. Assess the health and safety risk and necessary personal protective equipment (PPE) required before taking any action;
3. Every effort must be made to prevent the spillage causing pollution to watercourses and leaving the site boundary and entering neighbouring land;
4. Any spill/leak will be contained and the material recovered (if practicable) by the most appropriate means (plant, absorbent material, inert material);

5. In the event where a flood or spillage cannot be contained, the Fire Brigade will be called;

6. Access to the immediate area should be restricted;

7. As soon as reasonably practicable, after the emergency, the relevant authority will be notified by the Site Environmental Manager to agree any further action which may be required; and

8. The incident will be recorded and submitted in the TII monthly environmental report.

5.11 Electromagnetic Interference

The contractor(s) will consider the impacts of electromagnetic interference on wireless telecommunication systems during construction of the proposed Project, which will include site specific impacts from the demolition of buildings and the installation of tower cranes, and where appropriate will employ best practice technology to ensure that levels of radio frequency interference (RFI) associated with the proposed Project are low and at acceptable levels.

5.12 Unexploded Ordnances

Where required, a risk assessment will be completed by the contractor(s) for the possibility of unexploded ordnance being found during their construction works. The Emergency Response Plan will include procedures to respond to the discovery of a suspect unexploded ordnance item, including site evacuation and communication procedures.

5.13 Utility Works

Prior to the beginning of any demolition or construction activities, the contractor(s) will review the drawing locations of all utilities that have been identified via surveys and consultation with the relevant service provider. The Enabling Works Contractor(s) will plan, agree with the relevant utility stakeholders (and relevant agencies) and manage utility diversions, protection measures and the installation of new utilities. This will be carried out in consultation with the utility provider who has ownership of the proposed utility.

The nominated contractor(s) will be required to submit diversion and connection proposals to the relevant utility company for their approval prior to works being carried out. As part of the planning process, preliminary agreements have already been made with the relevant stakeholders.

During demolition and construction activities, the following basic utilities will be required to support a safe and healthy working environment:

- A temporary water supply for staff welfare facilities, dust suppression, wheel washing and construction activities such as concrete mixing, grout and bentonite mixing;
- A temporary telecommunications link for both security and communication reasons; and
- A temporary electricity supply for offices, welfare facilities, lighting and construction activities.

5.14 Worker Access

All staff and workforce will be encouraged to make their way to site and home from site by public transport, by project specific transport (e.g. minibuses), by bicycle or on foot. Limited parking spaces will be provided for vehicles required for the construction activity and for employees. The nominated contractor(s) may provide a transfer pick-up and drop off service from suitable public transport hubs.

5.15 Construction Mobility Plan

A Construction Mobility Plan will be prepared for the proposed Project by the contractor(s) to outline access arrangements to construction sites by sustainable travel modes. Each site will need a specific plan for project personnel mobility. The following measures will need to be considered within the final Construction Mobility Plan:

- The provision of showers/changing rooms for construction staff;
- The provision of cycle parking for staff;
- Ensuring safe and segregated pedestrian access to site; and
- Provision of site-specific transportation (minibuses) where frequent movements are going to be occurring e.g. between different work sites.

5.16 Site Clearance on Completion of Activities

The contractor(s) will clear and clean all working areas and accesses as work proceeds and when no longer required for works. The contractor(s) will reinstate all working areas and access routes as work proceeds during construction. All plant, equipment, materials, temporary infrastructure and vehicles will be removed at the earliest opportunity. All land, including roads, footpaths, public open spaces, river embankments/waterways, loading facilities or other land occupied temporarily will be made good to the satisfaction of TII and the landowner.

6. Environmental Management

This section describes the specific environmental measures identified in the EIAR and NIS that will need to be adhered to by the contractor(s). The Environmental Commitments are included in Chapter 31 of the EIAR. The mitigation and monitoring commitments in Chapter 31 (Summaries of the Route Wide Mitigation and Monitoring Proposed) have been assigned an alphanumeric reference and these have been replicated in the commitments tables in this section.

It should be noted that Section 6.1 to Section 6.12 provides a summary of the environmental commitments that will be built upon by the contractor(s) when developing the finalised version of the CEMP(s). These will be based on the requirements and conditions of the Railway Order in addition to any additional requirements identified in the tendering process. It is intended that the measures set out herein will be discussed in more detail with relevant stakeholders where required, in order to support the identification of any additional measures to be taken account of during construction.

6.1 Traffic and Transport

The contractor(s) are required to implement the measures outlined in Table 6.1 in relation to traffic and transportation during construction. The contract specific CEMP will detail all measures to be employed in relation to all potential impacts on traffic and transport and how the following mitigation measures will be implemented. Chapter 9 (Traffic & Transport) of the EIAR outlines the baseline traffic and transport environment and proposed mitigation measures.

The STMP (Scheme Traffic Management Plan), provided as Appendix A9.5 of the EIAR, describes the impact assessment methodology used to assess the impact of the construction of the Scheme on all transport users and details mitigation techniques and the types of measures to be employed to minimise the impacts generated by the scheme during the Construction Phase. Traffic management plans for the construction of the MetroLink have been developed to minimise the impact of the Scheme on road users, and to maintain access to businesses and other premises. A hierarchical approach to traffic management has been adopted with pedestrian/cyclists, public transport and commercial needs provision taking preference over private car usage.

Table 6.1: Traffic and Transport Measures

Topic & Mitigation No.	Environmental Control Measure
Mobility Management Plans **TT1**	A Mobility Management 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 designed 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 Mobility Management 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 designed to encourage travel to the constructions site(s) in a sustainable way.
Scheme Traffic Management Plan (STMP) **TT2**	The Scheme Traffic Management Plan (Appendix A9.5 of the EIAR) details mitigation techniques and the types of measures to 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 used for the assessment in the STMP, namely reduction and remedial measures. In general, strategic reduction mitigation occurs before construction, while remedial measures are implemented during construction on an on-going basis.

Topic & Mitigation No.	Environmental Control Measure
General Measures **TT3**	**General reduction measures:** • Prior to the commencement of each Construction Phase, the necessary enabling works will be implemented; • Prior to the commencement of the Construction Phase, a comprehensive publicity and information campaign will take place; • The possibility of partial possession of roads and streets (i.e., working in two halves) will be considered; • To ensure a coordinated response to the construction activities, there will be frequent communication with, and information exchanged between interested parties (i.e. Local Authorities, National Roads Authority, Local Chamber of Commerce); • Establishment of a Project Construction Traffic Forum with representatives from key stakeholders; • A coordinated City Centre Traffic Management Plan, for all MetroLink stations; and • Construction vehicles will be strictly controlled in terms of the hours of operation, and by imposing restriction on vehicle size and weight. **General remedial measures:** • Alternative arrangements will be provided if road closures are unavoidable i.e. diversions, signage strategies for access traffic and through traffic; • The Dublin City Council urban traffic signal control system will be used to optimise the flow of traffic along the diversion routes to mitigate queuing and delay which would otherwise be expected during peak periods. This may affect the level of green time afforded to pedestrians; • Stricter speed limits will be imposed on roads adjacent to construction sites in order to ensure the safety of all road users: – 50kph speed limit in the city centre will be reduced to 30kph; and – 80kph on all other routes will be reduced to 50kph. • The public will be provided with advanced warning of any proposed diversions and disruption: – Signage on site; – Continuous updates on construction progress on the project website. • The reinstatement of road surfaces that are disturbed as part of the construction process will be carried out where practical throughout the construction period. This is of particular importance to pedestrians and cyclists; • There will be safety procedures and fencing around trenches at all times in order to ensure the safety of road users; and • Where practical and appropriate, there will be a nightly reinstatement of trenches.
Construction Traffic **TT4**	**Reduction measures:** • Construction vehicles will be strictly controlled in terms of the hours of operation (i.e. construction traffic may be prohibited during periods of very heavy traffic) and by imposing restriction on vehicle size and weight; • Suitable spoil removal routes have been identified in order to direct construction traffic onto suitable roads, and to minimise the negative effects of increased HGV traffic on the environment; and • There will be strict controls and regulations at the entrance/exits of sites for construction vehicles in order to ensure the safety of other road users. **Remedial measures:** • Spoil removal vehicles will not be filled to a level that will cause the overflow of material or sediment during transportation; • Wheel wash facilities will be provided at site specific locations if required; and • The numbers of employee vehicles travelling to and from construction sites on a daily basis will be limited through:

Topic & Mitigation No.	Environmental Control Measure
	– The development of a Mobility Management Plan; – Promotion of the use public transport usage; and – If feasible the transport of workers to site using mini-buses from designated collection points (such as Luas and DART stations or other appropriate locations);
Heavy Goods Vehicles (HGVs) **TT5**	HGVs will be transporting equipment, materials, and spoil to and from construction sites. The spoil material generated during the construction period will be transferred to a disposal site. Some of the material will be transferred directly to the disposal site, and some of the material may be brought to a spoil transfer site (proposed for Northwood, north of St Margaret's Road), where it would be temporarily stored and then transferred to a disposal site. The current preferred location for the disposal site is the Huntstown Quarry near Coldwinters. The HGV routeing options are described and illustrated in the STMP. Refer to Section 31.6 for further information on the Excavated Material Management Strategy. There is an HGV restriction zone in place which forms a cordon around Dublin city centre as part of the Dublin City Council HGV Management Strategy; this cordon begins immediately south of the proposed Glasnevin station. To enter the cordon, permits need to be arranged and specific routeing must be followed, impacting on HGV routeing from stations south of Glasnevin. Within the HGV restriction zone, 5+ axle HGVs which are routeing to and from Mater, O'Connell Street, Tara, St Stephen's Green and Charlemont stations are subject to restrictions. HGVs with 5+ axles are allowed to enter the restriction zone between 19:00-07:00 and HGVs with 4 axles or less are allowed to enter the restricted zone at any time but must stick to the designated HGV routes. The HGV routes and restrictions are illustrated in the STMP.
General Traffic **TT6**	**Reduction measures:** • Where practicable, 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. • Temporary ramps across trenches may be provided to facilitate the movements of diverted traffic; and • A minimum of one general traffic lane in each direction will be retained wherever possible. This will maintain traffic access, although capacity may be reduced. **Remedial measures**: • Bus lanes may be temporarily converted to general traffic lanes in order to optimise the flow of traffic on the network during the Construction Phase; and • To maintain traffic flow and minimise delay, turning movements at affected junctions may be restricted, as follows: – Introduce straight through lanes only; – Prohibit U-turns; – Prohibit right turns; and – Operate left in-left out only access arrangements.
Pedestrians and Cyclists **TT7**	**Reduction measures:** • Pedestrian routes will be maintained throughout the construction period, either around or through the construction site, where safety risks to the general public will not increase as a result of construction activity; and • In very sensitive areas, such as the City Centre, the designated access and pedestrian routes around the construction sites, particularly at and/or along the hording lines, must not be perceived as uninviting by pedestrians. The environment around the sites, therefore, will be designed to ensure that pedestrians and cyclists feel they are entering a safe and accessible environment. This will ensure that impact to businesses and shops adjacent to the works areas is minimised. **Remedial measures:**

Topic & Mitigation No.	Environmental Control Measure
	• Temporary pathways and cycle ways will be installed where appropriate and provision will be made to ensure access for the mobility impaired is maintained; and • Where the existing level of service cannot be maintained in the vicinity of the construction sites, an alternative route will be designated, be clearly visible, be safe and be signed and have the level of service required to cater for the pedestrian demand.
Public Transport Vehicles **TT8**	**Remedial measures:** • Additional buses will be temporarily assigned to affected routes to maintain headways similar to the existing schedule; • Bus stops and shelters, affected by the construction of the scheme, will be temporarily relocated in order to ensure the safety of passengers and the continued operation of services; and • Buses may be allowed to stop in general traffic lanes, though where possible, buses will stop in bus lanes or bus lay-bys in order to reduce the impact of stopping buses on general road traffic capacity.

6.2 Noise and Vibration

Chapter 13 (Airborne Noise and Vibration) and Chapter 14 (Groundborne Noise & Vibration) of the EIAR outline the baseline noise and vibration levels and proposed mitigation measures. In addition, the contractor(s) will prepare a Construction Noise and Vibration Management Plan (CNVMP) for the proposed Project which will be a live document.

There are no statutory standards in Ireland relating to noise and vibration limit values for construction works. The contractor(s) will work within the noise and vibration significance threshold levels identified in the EIAR for both airborne and groundborne noise and vibration and the limits contained in the Railway Order approval.

Table 6.2: Noise and Vibration Measures

Topic	Environmental Control Measure
Compliance and Best Practice **ANV1**	The contractor(s) will adhere to best practice noise measures for construction activities including but not limited to: • British Standard Institute (BSI) (2014a) British Standard (BS) 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to as BS 5228 – 1) (BSI 2009 +A1 2014a); • British Standard Institute (BSI) (2014b) BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2) (BSI 2009 +A1 2014b); • British Standard Institute (BSI) (1993) BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385 – 2). (BSI 1993); • British Standard Institute (BSI) (2008) BS 6472 (2008) Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472 – 1). (BSI 2008); • British Standard Institute (BSI) (2014) BS 8233:2014 Sound Insulation and Noise Reduction for Buildings (hereafter referred to as BS 8233 (BSI 2014); • British Standard Institute (BSI) (2019) BS 4142 (2014+A1 2019) Methods for rating and assessing industrial and commercial sound (hereafter referred to as BS 4142) (BSI 2014 +A1 2019); • German Standard DIN 4150-3:2016 “Vibrations in buildings – Part 3: Effects on structures • Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (hereafter referred to as the TII Noise Guidelines 2004) (TII 2004); • Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes (hereafter referred to as the TII Noise Guidelines 2014) (TII 2014);

Topic	Environmental Control Measure
	• European Communities (EC) (Environmental Noise) Regulations 2018 (S.I. No. 549 / 2018); • EC (Environmental Noise) Regulations 2006 (S.I. No. 140/2006); • EC Noise Emission by Equipment for Use Outdoors (Amendment) Regulations (S.I. No. 241 / 2006).
Method Statements **ANV2 & ANV3**	The contractor(s) will prepare a CNVMP. 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 Construction Noise Thresholds (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 noise sensitive locations (NSLs). This information will be used to inform the relevant CNTs. Given the extensive nature of the proposed Project and the number of construction sites and sensitive receptors, the CNT will vary across the project on a site by site and receptor by receptor basis.
Working Hours (and unscheduled overruns) **ANV4**	Regulating working hours is a fundamental means of controlling noise and vibration. The contractor(s) will carry out the works in such a way as to minimise adverse noise and vibration impacts from construction activities. Therefore, as far as practicable, works will be carried out during standard working hours. However, for certain activities such as tunnelling it will be necessary to work 24 hours per day, 7 days per week. The Contractor(s) will schedule activities 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 to 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 as far as practicable, activities with highest noise emissions will be scheduled during day time periods and / or daytime shifts will 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. In situations where an activity with potential for exceedance of construction noise thresholds is scheduled, other construction activities will be scheduled to not results in significant cumulative noise levels. In the event that planned works extend beyond approved working hours and continue due to unforeseen circumstances that would affect safety or engineering practicability, the contractor(s) will notify the nature, time, location and reasons for the overrun to the relevant local authority (FCC/DCC) and the employer as soon as reasonably practicable. The site management will keep appropriate records of such overruns. The local authority will be requested to provide a point of contact and nominate an officer to receive such notifications. Overruns and the reasons for these will be reviewed by the contractor(s), employer and relevant local authority, with the aim of reducing the potential for further unplanned overruns. In the case of work required in response to an emergency (or to avoid damage or unsafe conditions), the contractor(s) will advise the relevant local authority as soon as is reasonably practicable of the reasons for, and likely duration of, such works.
Noise Control at Source **ANV5**	The Contractor(s) will ensure practical noise control measures are implemented at source, relative to specific site considerations. Such measures will include: • 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; • Where practicable, equipment powered by mains electricity 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;

Topic	Environmental Control Measure
	• 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). 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(s) 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; • 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 MetroLink Grid Connections 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.
Vehicle / Plant / Equipment Noise and Vibration **ANV6& ANV7**	The contractor(s) will implement the following measures in relation to site plant, machinery, and construction vehicles: • 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 will be selected wherever practicable (e.g. plant items with sound attenuation incorporated). 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: o The use of non-percussive piling methodologies will be used across the proposed Project to control noise and vibration impacts from construction compounds. o 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.

Topic	Environmental Control Measure
	○ 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. • Careful selection of equipment, construction methods and programming with the objective of reducing noise and vibration where possible. The selection of plant items will be required to comply with European Communities Noise Emissions by Equipment for Use Outdoors (Amendment) Regulations 2006 (S.I. No 241/2006); • Selecting electrically powered plant that is quieter than diesel or petrol-driven plant, if interchangeable; • Locating plant, as far as is reasonably practicable, away from receptors or as close as possible to noise barriers or hoardings where these are located between the source and receptor; • Generators will be located away from sensitive receptors and will be enclosed; • Unnecessary revving of engines will be avoided, and equipment will be switched off when not required; • Plant and vehicles will be started sequentially rather than all together; • Rubber linings will be used in chutes and dumpers in order to reduce noise where necessary; • Fitting suitable anti-vibration mountings where practicable, to rotating and/or impacting equipment; • Using noise control equipment such as shrouds, hoods, jackets, and doors, and ensuring they are closed; • In the case of impact piling or demolition works, a reduction in the input energy per blow will be considered where required; • Appropriate vibration isolation will be applied to plant, where feasible; • Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery; • Ensuring that all plant is shut down when not in use; • Designing all audible warning systems and alarms to minimise noise. Nonaudible warning systems can be used in preference, i.e. cab-mounted CCTV or the use of banksmen. If required, ensure that audible warning systems are switched to the minimum setting required by the Health and Safety Authority and where practicable use 'white noise' reversing alarms in place of the usual 'siren' style reversing alert; • Rotary drills and bursters actuated by hydraulic or electrical power will be used for excavating hard material; • Handling all materials, particularly steelwork, in a manner that minimises noise. For example, storing materials as far as possible away from sensitive receptors and using resilient mats around steel handling areas; • Regular inspections will be undertaken during construction to ensure that the noise and vibration minimising methods, plant and mitigation identified in the detailed design stage are adopted on site and are working effectively; • The following items of fixed plant will be contained within suitable noise enclosures: pumps, generators, compressors, concrete batching plant, water settlement and wastewater plant, and grout plant. This measure will only be required where plant does not already have sufficient built-in noise attenuation: ○ **Conveyors:** the mounting of underground conveyors used to remove excavated material from the tunnel face will be designed and installed so as to ensure that ground-borne noise and vibration to buildings above the tunnel are minimised. Furthermore, a maintenance programme will be implemented to ensure that the noise generated by the conveyor does not increase over time. ○ **Temporary tunnel ventilation**: all tunnel ventilation plant with connections to the atmosphere in any noise-sensitive location will be subject to mitigation measures appropriate to the local environment, including enclosures or screening.
Construction Materials	Design of haul routes will minimise the requirement for vehicle reversing.

Topic	Environmental Control Measure
ANV8	
Acoustic Barriers **ANV8**	The contractor(s) will provide and install acoustic barriers/screens where required at sensitive receptor locations, as identified in the EIAR. 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 boarding or acoustic screening will be required at a number of construction compounds across the proposed Project. Table 13.85: Construction Site Hoarding of EIAR Chapter 13 (Airborne Noise & Vibration) 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. The following locations will require an enclosed working area to reduce night-time noise impacts: • At 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 weighted sound reduction index (Rw) of 24dB 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 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 typical details for temporary and mobile acoustic screens, sheds and enclosures that can 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 and designed mobile temporary screen around a breaker or excavation can effectively reduce noise emissions by 10dB(A). These will be required around plant items including handheld pneumatic breakers and breaker mounted on excavators and drill bits when operating at ground level. • Demountable enclosures can also be used to screen operatives using hand tools and may be moved around site as necessary; and • Within each construction compound, the placement of site buildings such as offices and stores between the site and NSLs can 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. Prior to the commencement of the construction works at each compound, the Contractor(s) 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.

Topic	Environmental Control Measure
Liaison with the Public **ANV 9 & ANV10**	The Contractor(s) 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. The Contractor(s) will distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration. A designated Noise Liaison Officer will be appointed to site during construction works. All noise complaints will be logged and followed up in a prompt fashion by the Liaison Officer. A clear communication programme will be established by the contractor(s) to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to result in significant effects. The nature and duration of the works will be clearly set out in all communication circulars as necessary.
Monitoring Programme **ANV 11**	The contractor(s) will be required to carry out noise and vibration monitoring at representative noise sensitive locations (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(s), TII, DCC and FCC. The contractor(s) will adhere to any site-specific noise and vibration monitoring-related conditions imposed by the local authority. Monitoring data will be made available to the local authorities at an agreed frequency. Noise and vibration measures will include the following: • Noise monitoring will be conducted in accordance with International Organization for Standardisation (ISO) (2016) ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016) and International Organization for Standardisation (ISO) (2017) ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017); The selection of monitoring locations will be based on the nearest representative NSLs to the work compounds. • Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with BS ISO 4866: 2010: Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures. • The mounting of the transducer to the vibrating structure will need to comply with BS ISO 5348: 2021: Mechanical vibration and shock – Mechanical mounting of accelerometers. • Noise and vibration control audits will be conducted at regular intervals throughout the construction programme in conjunction with noise monitoring. The purpose of the audits will be to ensure that all appropriate steps are being taken to control construction noise and vibration levels and to identify opportunities for improvement, where required. • Noise monitoring will be undertaken only by suitably-trained and experienced staff. • Consent will be required from landowners for the erection of any monitoring equipment. The contractor(s) will develop, agree as part of the Noise and Vibration Management Plan and then implement a monitoring and reporting methodology to: • Allow monitoring results to be easily compared to forecast noise in the relevant RO consents and the EIAR; • Provide all necessary information to demonstrate compliance with the CEMP, RO requirements and agreed limits; • Disaggregate the contractor(s)'s noise from other project contractor(s)' noise and from all ambient noise sources; and

Topic	Environmental Control Measure
	• Enable unusually high noise events to be identified.
Off-site mitigation, including noise insultation and temporary re-location/ re-housing **ANV 12 & ANV13**	Where all reasonable measures have been taken to reduce noise levels using the 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 (see Appendix A14.6 of the EIAR) sets out the further mitigation measures and supports which will be available to those who meet the eligibility criteria. 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 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.
Construction Traffic Noise **ANV14**	Mitigation measures to reduce noise from construction traffic are limited to restricting speed limits, maintaining road surfaces and ensuring all vehicles are properly maintained. In addition, any coverings on construction vehicles will be securely fastened before leaving site to avoid excessive 'rattling'.
Construction Vibration **ANV15**	General Control Measures: • The Contractor(s) undertaking the construction of the works will be required to take specific vibration abatement measures to the extent required and comply with the recommendations of BS 5228–2 (BSI 2014b). • The contractor(s) will prepare a CNVMP for the proposed Project which 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 locations where potential exceedance of building response vibration limit values, identification of required vibration mitigation measures specific to each work area to minimise impacts so far as is reasonably practicable. • Alternative less intensive working methods and/or plant items will be employed, where feasible. • In the case of impact piling or demolition works for instance, a reduction in the input energy per blow will be considered where required. • Appropriate vibration isolation will be applied to plant, where feasible. • Cut off trenches to isolate the vibration transmission path will be installed where required.
Vibration affecting structures **ANV16**	Property condition surveys will be undertaken at protected or identified vulnerable buildings and structures within 50m of the proposed surface working compounds. Property condition surveys will also be carried out at buildings and structures considered appropriate relative to their proximity to the works depending on their vulnerability to vibration. Such property condition surveys will be carried out by a Chartered Surveyor or Chartered Structural Engineer. Such property condition surveys, subject to the written agreement of relevant property owners, will be carried out in two stages as the follows: • The first stage will consist of pre-construction condition surveys including photographic records which will be carried out prior to the commencement of construction • The second stage will consist of post-construction condition surveys which will include photographic records. Monitoring will be undertaken at identified sensitive structures or buildings, where proposed works have the potential to be at or exceed the vibration limit values for building response.

Topic	Environmental Control Measure
Tunnel Boring **GNV1**	The assessment of ground-borne noise and vibration impacts resulting from the advancement of the TBM for the EIAR (refer to Chapter 14: Ground-borne Noise & Vibration) has identified potential for significant effects. However, it is recognised that the impacts identified arising from the advancement of the TBM at any single location will occur for a very short period of days as the TBM passes beneath a location. Unfortunately, there are no effective methods are available to reduce ground-borne noise or vibration from TBMs at source. The principal mitigation measures aimed at minimising impacts are as follows: • Advance public consultation and stakeholder engagement to prepare building occupants for the passage of the TBM and resultant elevated noise and vibration levels. 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(s). 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.
Blasting – Ground Vibration **GNV2**	The contractor(s) are required to implement the measures in relation to the Blasting Strategy outlined in the EIAR (Appendix A5.20). On this basis, the he contractor(s) will prepare a detailed Blasting Strategy that will set out measures to minimise disturbance by ground vibration. Monitoring of blasting and re-optimising the blast design (minimising the explosive charge in light of the results) will be carried out as standard.
Blasting - Air Over-pressure (air blast) **GNV3**	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. The contractor will prepare a detailed Blasting Strategy that will set out measures to minimise noise and vibration disturbance by air blast by consideration of the following: Minimising the explosive charge per delay. Choosing delay times so that the blast progresses along the face at a velocity lower than that of sound in the air; Increasing confinement of the explosive charges and using adequate, inert material; Always taking into account ambient wind speed at the time of blasting; Selecting patterns and sequences that avoid cooperative wave interaction; Inspecting the state of the faces before blasting, in order to ensure the correct charges are placed in the blastholes with burdens that are under the nominal; Place barriers between blasting area and sensitive receptors as required; Cover the blasting area carefully with blast mat or similar; and Cover the voids and use acoustic sheds as required.
Blasting – Flyrock (also called rock throw) **GNV4**	The contractor(s) will prepare a detailed Blasting Strategy as outlined above that will set out measures to control flyrock Mitigation measures to reduce the impact of blasting entail the following: • Minimisation of the explosive charge per delay. • Choose an effective delay time between holes and rows which would avoid wave interaction and give good rock displacement; • Set the explosive initiation sequence in a way that it progresses away from the structures to be protected; • Use an adequate powder factor (weight of explosives per volume of excavated material). • Create shields or discontinuities between the structures to be protected and the blasting; • Increase confinement of the explosive charges 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; and • Cover the voids and use acoustic sheds, as required.

6.3 Air Quality and Climate

The contractor(s) are required to implement the measures, as a minimum, outlined in Table 6.3 in relation to air quality and climate during construction. Potential sources and sensitive receptors will be identified, and appropriate control measures applied before commencing relevant works. An Air Quality Management Plan and a Dust Management Plan will be submitted for approval to the relevant planning authority. Chapter 16 (Air Quality) and Chapter 17 (Climate) of the EIAR outline the baseline air quality and climate environment together with proposed mitigation measures. Further dust mitigations are outlined in Appendix A16.2 (Site Specific Potential for Construction Phase Dust Impacts) and Appendix A16.4 (Dust Management Plan) of the EIAR.

Table 6.3: Air Quality and Climate Measures

Topic	Environmental Control Measure
Compliance and Best Practice **AQ1**	The contractor(s) will adhere to best practice air quality measures for construction activities including but not limited to: • Guidelines for the Treatment of Air Quality during the Planning and Construction of National Roads Schemes (NRA, 2011); • IAQM's Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014); • Dublin City Councils Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (DCC, 2018); • Compliance with the Air Quality Standards Regulations 2002 (S.I. No. 271/2002). In addition to the limit values specified in these Regulations, account will be taken of any more onerous project specific controls specified within the EIAR or imposed by An Bord Pleanála.
Dust Management Plan **AQ2**	Before commencing relevant works, a detailed Dust Management Plan (DMP) will be prepared by the contractor(s) and submitted for approval to the relevant planning authority. The Plan will be based on the draft Dust Management Plan (in Appendix A16.4 of the EIAR) and must 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 for each worksite 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; • The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections; • Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used; and • Details of the air quality reporting requirements. The plan must include all appropriate dust and emissions mitigation measures such as those outlined in Appendix 16.4 of the EIAR, applicable to the circumstances of the relevant site. The plan must be approved by the Local Authority. Before commencing relevant works, an Air Quality Management Plan will be prepared and submitted for approval to the relevant planning authority. The plan must 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(s) and for each worksite 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);

Topic	Environmental Control Measure
	• Details of control measures; • Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used; and • Details of the air quality reporting requirements.
Dust Mitigation Measures **AQ3**	In order to ensure that no dust nuisance occurs, a series of measures will be implemented by the contractor(s), as detailed in Appendix A16.4 of the EIAR. The measures to 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 contractor(s) with a specific Blasting Dust Management Plan; • Liaison with local authorities and community groups; • Hoarding will be provided around the construction compounds; and • 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. 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. 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 EPA description of effects (EPA 2022).
Asbestos Mitigation Measures **AQ4**	A Demolition Survey of all buildings to be demolished will be required 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(s) 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.
Aspergillus Mitigation Measures **AQ5**	In relation to aspergillus, survey and prevention works will take place before construction commences by a competent contractor(s) in proximity to any sensitive buildings and in particular in proximity to the Mater Hospital site which utilises passive ventilation on Eccles Street. The National Guidelines for the Prevention of Nosocomial Aspergillosis (HSE 2018) provide a risk assessment for aspergillus and preventative dust mitigation measures and in Appendix B of the document pre-project planning and contractor(s) advice. The Guidance also provides information that will be included as part of tender documents for the construction contractor(s). 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. The potential risk from aspergillus is also considered in Chapter 10 (Human Health) of the EIAR. These works will form part of an Aspergillus Prevention Plan to be completed by a specialist and will ensure the prevention of Aspergillus spores spreading. 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(s) as a source for the Aspergillus Prevention Plan. 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.

Topic	Environmental Control Measure
Traffic Mitigation Measures **AQ6 & AQ7**	The modelling of road traffic for impacts on human and ecological receptors has found no significant impacts that require mitigation measures with respect to the modelling of emissions. However, some mitigation measures can be put in place to minimise emissions: • Implement 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; • 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) of the EIAR; • Efficient scheduling of deliveries to minimise number of deliveries required, and in turn their emissions; • Construction vehicles will conform to the current EU emissions standards and where reasonably practicable, their emissions will meet upcoming standards prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised; • Construction vehicles will be strictly controlled in terms of the hours of operation (i.e. construction traffic may be prohibited during periods of very heavy traffic) and by imposing restriction on vehicle size and weight; • Suitable spoil removal routes have been identified in order to direct construction traffic onto suitable roads, and to minimise the negative effects of increased HGV traffic on the environment; and • The numbers of employee vehicles travelling to and from construction sites on a daily basis will be limited through: - The development of a Mobility Management Plan; - Promotion of the use public transport usage; and - If feasible the transport of workers to site using mini-buses from designated collection points (such as Luas and DART stations or other appropriate locations); Mitigation measures are required for the control of dust with respect to HGV movements onsite and deliveries to/from the site: • HGV traffic leaving site will pass through a wheel wash; • Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary. If public roads are deemed to require additional cleaning where possible a suction device for road cleaning will be utilised can access spaces around cars and other street furniture more effectively; • During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions; and • Spoil removal vehicles will not be filled to a level that will cause the overflow of material or sediment during transportation.
Communication with Stakeholders **AQ8**	• Develop and implement a Stakeholder Communications Plan that includes community engagement before work commences on site; • Display the name and contact details of person accountable for air quality and dust issues on the site boundary; and • Display the head or regional office contact information.
Site Management **AQ9**	• Regular inspections of the site and boundary will be carried out to monitor dust, records and notes on these inspections will be logged; • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken; • Make the complaints log available to the local authority when asked;

Topic	Environmental Control Measure
	• Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book; • Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes; • Plan site layout: machinery and dust causing activities will be located away from sensitive receptors; • Site access points will be designed to minimise queuing traffic adjacent to access points; • Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site; • Stockpiles and mounds will be kept away from sensitive receptors, watercourses and surface drains where reasonably practicable, and sited to take into account the predominant wind direction relative to sensitive receptors; • Full enclosure of site or specific operations where there is a high potential for dust production and the site is active for an extensive period; • Avoid site runoff of water or mud; • The number of handling operations for materials will be kept to the minimum reasonably practicable; • Keep site fencing, barriers and scaffolding clean using wet methods; • Remove materials from site as soon as possible; • Cover, seed or fence stockpiles to prevent wind whipping; • Carry out regular dust soiling checks of buildings within 100m of site boundary and cleaning to be provided if necessary; • Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust; • Where possible, commence baseline monitoring at least three months before Construction Phase begins; and • Put in place real-time dust and air quality pollutant monitors across the site and ensure they are checked regularly.
Demolition Activities **AQ10 & AQ11**	• Building appraisal and demolition plan: prior to carrying out any building demolition, a detailed pre-demolition and building appraisal by means of surveys, including for asbestos, and appropriate assessments will be required. This will include the surveys listed in the following point. Based on the findings of these surveys, a demolition plan and report will be prepared. • Building survey: this will cover items such as existing building construction materials and fabric, existing and past use, presence of wastewater and hazardous materials, potentially dangerous areas, adjoining areas and site conditions, drainage conditions, any shared facilities with adjoining buildings, hoarding and covered walkway requirements, adjoining pedestrian and vehicular conditions, available space for sorting debris, local sensitive receptors with respect to noise, dust, vibration and traffic impact, and street furniture. • Minimising drop heights from conveyors, hoppers and use fine water sprays on equipment when appropriate. • Rubble chutes will be shielded or enclosed or use water to suppress dust emissions from such equipment. • Ensure all cutting, grinding or sawing equipment on site is fitted with or used in conjunction with dust suppression techniques e.g., water sprays or local extraction. • Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). • Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.

Topic	Environmental Control Measure
	• Avoid explosive blasting, using appropriate manual or mechanical alternatives. • Bag and remove any biological debris or damp down such material before demolition.
Monitoring **AQ12**	• Undertake daily on-site and off-site inspection, where sensitive receptors (human or ecological) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This will include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary. • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. • Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction. • Real time monitoring is proposed for PM10 and PM2.5. Should particulate concentrations be deemed to be at a concentration which has the potential to cause an impact to the SAC or human receptors, additional mitigation can be put in place immediately. • Inspection and maintenance schedules for construction vehicles, plant and machinery must be kept up to date. • Where there are potentially dust-emitting activities on site, as a minimum, a daily visual inspection will be made, and a yes/no record kept of whether there is a risk of dust emissions that day. • There will be a nominated person on each site who will investigate, as quickly as reasonably practicable, activities on site that cause exceedances of limit values recorded by the real time monitoring for dust to ascertain if any visible dust is emanating from the site or if any activities are occurring on site that are not in line with the dust control measures. • Any identified causes of limit value exceedances will be rectified where practicable and actions recorded in the site logbook. • If the source of the incident cannot be identified as originating from the site operations, operations of other nearby construction sites and other activities will be investigated for potential causes of exceedances.
Preparing and Maintaining the Site **AQ13**	• Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Fully enclose specific operations where there is a high potential for dust production and the site is active for an extensive period. • Avoid site runoff of water or mud. • Direct dust control by damping down or water mist system such be used when dust generating activities are occurring including earthworks during dry conditions. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. • Cover, seed or fence stockpiles to prevent wind whipping.
Operating Vehicles / Machinery and	• Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned • Ensure all vehicles switch off engines when stationary - no idling vehicles;

Topic	Environmental Control Measure
Sustainable Travel **AQ14**	• Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable; • Impose and signpost a maximum-speed-limit of 20 kph for haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate); • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; • Implement a Mobility Management Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing); • Measures will be implemented to limit emissions from construction plant and vehicles, which will include the following, as appropriate: – Operation of construction plant in accordance with the manufacturer's written recommendations; – Construction vehicles to 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; – Vehicle and construction plant exhausts to be directed away from the ground and positioned at a height to facilitate appropriate dispersal of exhaust emissions; – Devices such as dust extractors, filters and collectors on drilling rigs and silos will be used; – Movement of construction traffic around the site will be kept to the minimum reasonable for the effective and efficient operation of the site and construction of the project; – Use of tower cranes to reduce vehicle movements (if practicable); – The use of diesel or petrol-powered generators will be reduced by using mains electricity or battery-powered equipment where reasonably practicable; – Cutting and grinding operations will be conducted using equipment and techniques that reduce emissions and incorporate appropriate dust suppression measures; – Damping down of dust-generating equipment and vehicles within the site and the provision of dust suppression in all areas of the site that are likely to generate dust; – Vehicle, plant and equipment maintenance records will be kept on site and reviewed regularly.
Operations **AQ15**	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. • Use enclosed chutes and conveyors and covered skips. • Mixing of grout or cement-based materials will be undertaken using appropriate techniques/mitigation suitable for the prevention of dust emissions; • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; • Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management **AQ16**	• Avoid bonfires and burning of waste materials; • Skips will be segregated, covered and secured; • Avoidance of the prolonged storage of waste materials on site.
Measures Specific to Earthworks **AQ17**	• Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable; • Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; • Only remove the cover in small areas during work and not all at once;

Topic	Environmental Control Measure
	• Materials will be compacted after deposition, with the exception of topsoil and subsoil on land to be restored for agriculture, forestry, landscaping and wildlife habitats; • All dusty activities will be damped down, especially during dry weather; • The area surrounding the blasting for rock excavation will be thoroughly sprayed with water beforehand; • Blasting area will be covered with blasting mat; • Appropriate methods of stemming will be used to minimise dust of blasting; • Water sprinkling methods will be used after blasting where necessary; • Drop heights from excavators to vehicles involved in the transport of excavated material will be kept to the reasonably practicable minimum; • Topsoil will be stripped as close as reasonably practicable to the period of excavation or other earthworks activities to avoid risks associated with runoff or dust generation; • During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.
Measures Specific to Construction **AQ18**	• Avoid scabbling (roughening of concrete surfaces) if practicable; • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place; • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; • Concrete batching plants will have dust collectors fitted and properly maintained. The plants will also install burst bag detectors, which are connected to the automatic silo overfill protection circuit to stop the flow of cement if a filter bag bursts, in all batching plants; • Concrete batching plants will be maintained on a regular and documented schedule by a competent individual; • The mixing of grout or cement-based materials will be undertaken using a process suitable for the prevention, as far as reasonably practicable, of dust emissions; • For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Measures Specific to Trackout **AQ19**	• A speed restriction of 15km/hr will be applied as an effective control measure for dust for on-site vehicles. • Use water-assisted dust sweeper(s) or ideally a suction device for road cleaning will be utilised. Suction devices can access spaces around cars and other street furniture more effectively than traditional dust sweepers, on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. • Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. • Record all inspections of haul routes and any subsequent action in a site log book. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. • Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). • Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. • Access gates to be located at least 10m from receptors where possible.

Topic	Environmental Control Measure
Emission of Greenhouse Gasses (GHG) **C1**	Construction vehicles, generators will give rise to some GHG emissions, however the proposed Project's impact on climate due to traffic can be minimised through following mitigation measures: • Implement 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; • All plant and machinery will be maintained and serviced regularly; • Efficient scheduling of deliveries will be undertaken to minimise emissions; and • Construction vehicles will conform to the current EU emissions standards and where reasonably practicable, their emissions 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) of the EIAR. The Scheme Traffic Management Plan (STMP) 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 to local roads with reduced capacity which may result in traffic congestion and increased emissions. In addition, the CTMP will minimise 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 for eliminating barriers preventing travel by 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.
Embodied Carbon Emissions **C2**	Measures to reduce GHG emissions for the proposed Project include: • Implement a whole-life Carbon Management Plan aligned to PAS 2080 (Green Construction Board 2016) to inform the detailed design, build and operation of MetroLink; • 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 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; • Undertake lifecycle assessments for major asset components and implement recommendations to influence procurement of low carbon / sustainable materials and equipment; • Procure materials for major asset components that have verified Environmental Product Declarations (EPD). • Specify the use of low carbon materials with a minimum of 20% secondary and recycled content e.g. concrete or steel. The replacement, where technically feasible, of concrete containing ordinary Portland cement with concrete containing ground granulated blast furnace slag (GGBFS). The replacement, where feasible, of concrete with concrete containing up to 50% GGBFS. The majority of concrete is assumed to be RC 32/40Mpa which has an embodied carbon of 211 kgCO_2e per m^3 with 50% GGBFS replacement compared to a standard embodied carbon of 359kgCO_2e per m^3, a 41% reduction; • Achieve a 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;

Topic	Environmental Control Measure
	• 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. • 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; and • 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.
Climate Change Vulnerability **C3**	• The contractor(s) will pay due consideration to the impacts of extreme weather events during the Construction Phase; • The contractor(s) 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, site safety and impact mitigation measures; • A Severe Weather Management Plan wll be considered 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; • 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 contractor(s); • A Construction Flood Protection Plan will form part of the Final CEMP. Impacts from flooding and potential mitigation measures are further detailed in Section 6.4. • 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 systems such as attenuation barriers around shaft and tunnel entrance

6.4 Water

The contractor(s) are required to implement at a minimum the measures listed in Table 6.4 in relation to water during construction. This will require the development of a Water Management Plan, Sediment Erosion and Pollution Control Plan, Groundwater Monitoring Plan and Construction Flood Protection Plan. Chapter 18 (Hydrology) and Chapter 19 (Hydrogeology) of the EIAR outline the baseline water environment in addition with proposed mitigation measures.

Table 6.4: Water Measures

Topic	Environmental Control Measure
Compliance and Best Practice **H1**	The contractor(s) will implement suitable control measures 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). The contractor(s) will adhere to best practices including, but not limited to:

Topic	Environmental Control Measure
	• Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes published by National Roads Authority, (NRA 2009); • Transport Infrastructure Ireland - Road Drainage and the Water Environment (TII, 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 (CIRIA, 2006a) and C649: Control of water pollution from linear construction projects: site guide guide (CIRIA, 2006b); • Office of Public Works (OPW) Guidelines for Planning Authorities: The Planning System and Flood Risk Management (November, 2009). • Further guidance is outlined in Section 5.8.
Water Management Plan **H2**	The contractor(s) will produce a Water Management Plan that includes, at a minimum, the objectives outlined in this table and in Appendix A5.11 (Water Management) of the EIAR, namely: • 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.
Sediment Erosion and Pollution Control Plan **H3**	A Sediment Erosion and Pollution Control Plan will be implemented for all construction works. This will include 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). The plan will include relevant control measures detailed in other sections of this table.
Management of Run-Off and Water Quality **H4**	• 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-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. 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. • 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 , prior to discharging through a series of treatment tanks with storage (i.e., typically 900m3 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

Topic	Environmental Control Measure
	features (for example 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 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(s) 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 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 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 necessary bunding or 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 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 will 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 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(s) will ensure acceptability of the material for reuse for the Proposed Project with appropriate handling, processing and segregation of the material. This material would 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, will 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 A9.5 of the 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.

Topic	Environmental Control Measure
	• 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 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 water' from site works will be collected and prior assessed for potential re-use, requiring appropriate cleaning and storage tanks.
Spillages of Oils, Chemicals and Polluting Materials **H5**	• The design of each treatment train will depend on the activity at each construction compound. 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 watercourse without adequate attenuation and discharge will be controlled by a hydrobrake to mimic greenfield runoff rates as per Surface Water Drainage & Flood Risk Assessment Report (Jacobs/IDOM, 2021). • 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 6-9 pH 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. • 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(s) 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), TSS (Total Suspended Solids), TDS (Total Dissolved Solids) 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, for example 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.
Water Quality Management – excavation and contamination **H5**	• Temporary stockpiles are required during the proposed Project works and these will be located outside of specific buffer zones. Leachate generation from the stockpiles 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 be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication

Topic	Environmental Control Measure
	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 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 covered by, medium to heavy gauge polythene sheeting 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. • All excavated material will, where possible, be reused within the proposed 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 will 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 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 contractor(s) will ensure acceptability of the material for reuse for the proposed Project with appropriate handling, processing and segregation of the material. This material would have to be shown to be suitable for such use and subject to appropriate control and testing according to the 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, will be used for other projects where possible, subject to appropriate approvals/notifications. • Earthworks haulage will be along agreed predetermined routes along existing national, regional and local routes (outlined in the STMP). 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.
Management of Discharges **H6**	• Prior to commencement of construction, the contractor(s) 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(s). • The design of each treatment train will depend on the activity at each construction compound. 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 watercourse without adequate attenuation and discharge will be controlled by a hydrobrake to mimic greenfield runoff rates as per Surface Water Drainage & Flood Risk Assessment Report (Jacobs/IDOM, 2021). • 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 6-9 pH units is either re-circulated for further treatment,

Topic	Environmental Control Measure
	removed off site for appropriate treatment and disposal, or treated on site and discharged into the foul sewer, with due permission from Irish Water. • 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(s) 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), TSS (Total Suspended Solids), TDS (Total Dissolved Solids) 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, for example 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.
Management of Flood Risk **H7**	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). • All watercourses within compound areas will be fenced off at a minimum distance of 5m, unless there is direct construction within the watercourse i.e., for construction of culverts. The following responsibilities will apply to the contractor(s): • Obtaining updated modelled water levels from the OPW as well as updated information on the required standard of protection for flood defences; • The contractor(s) will 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 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 will be employed to mitigate the risk of flooding to structures on a construction site. These can be installed for the duration of the works or at time where flood risk has increased; • Sheet piling and cofferdams: will be required at the piers situated adjacent the Broadmeadow and Ward Rivers and anywhere where construction activities are to occur on or near flood zones; • Sandbags: used for temporary flood protection typically a short-term measure; • Mobile and inflatable barriers; • Existing flood defences will be monitored for stability for surface construction, tunnelling, dewatering, filtration, and river works. • Materials on a construction site are a significant risk to the environment and should be managed for flood events. Materials carried away may also come into contact with structures, causing them damage. The flood risk for materials can be mitigated by:

Topic	Environmental Control Measure
	– Keep materials on site in a flood barriered area or at higher levels, such as raised ground or platforms. – Keep materials away from flood plains and flood risk areas. – Only bring materials onto site when needed. – Keep onsite material storage to a minimum, such as daily requirement, with larger quantities kept off site. – Only remove existing ground and topsoil when work requires. – Remove materials offsite prior to a forecasted flood event. – Keep materials in watertight containers where possible. – Anchor down materials that may float away. – Ensure site hoarding can 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 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 should 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 should be situated in areas that are easily accessible and protected from flood waters. In the event of a flood, utilities should 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 can remain operational. • Plant and equipment should be relocated during a flood event. The plant and equipment should be moved to areas that are protected through barriers or elevated above the flood waters. Plant and equipment should be isolated from their connections and if they hold significant fluids and hazardous materials, such as water treatment plants, they should 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 should 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 should be stocked on site. This will provide sufficient protection to workers whenin the event of dealing with flood clean-up.

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	Suitable and sufficient procedures should 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. • The start of the 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; – 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 can be mitigated through the construction of an upstand wall and material mitigation. • Retained cut and cover structures can 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 can be mitigated against through the use of material mitigation and inflatable barriers.
Management of Fire Water **H8**	• In the event of an emergency contaminated water will be tankered 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 final CEMP.
Groundwater Inflow into Tunnel Section **H9**	• Where there is no pressurised tunnel front, then the potential for groundwater inflow during tunnelling works increases in the context of both superficial and bedrock source groundwater. To counteract groundwater pressure and avoid this potential risk of ingress and settlement impacts, the TBM will be advanced in a pressurized earth pressure balance (EPB) or slurry mode. This tunnelling technique will maintain stability in the tunnel and avoid/ limit the degree of groundwater inflow i.e., the choice of a closed face TBM mitigates the risk of groundwater ingress to the bored tunnel during tunnelling irrespective of the volume of water encountered. 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/UWR units. The tunnel lining itself is designed to cater the prevailing ground and water pressures and will incorporate seals to prevent the ingress of water both during and post tunnelling. • For SCL tunnelling, advance probing will be used to ascertain ground conditions in advance as required. 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.

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	• Groundwater ingress control measures for tunnelling will also include ground treatment to 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 ground treatment 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 and the UWR in the case of O'Connell Street, ground treatment will be required including the interface between the diaphragm wall and the ground. Typically, the ground treatment (e.g., grouting, slurry panels or ground replacement) 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. Ground treatment will typically be undertaken from surface (vertical drilling) or subsurface (horizontal drilling) or a combination of both.
Groundwater Inflow into Cut Sections and Within Deep Station Excavations **H10**	• To manage the risk of settlement, the excavation of the cut sections and deep stations must avoid affecting the phreatic water levels as much as possible. In order to maintain the existing phreatic levels during excavation 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, sealed enclosure which will be formed by employing the use of either secant pile (for example 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 • D-walls or secant piles will be extended deep enough to lengthen the groundwater flow path in order to minimise ingress beneath the toe. This approach will be augmented, where necessary, by permeation/fissure grouting around the toe of the d-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 the 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. The dewatering will be designed, so far as is reasonably practicable, to minimise any drawdown outside the boundaries of the site. • To control the possible variations in the phreatic level a perimeter of vertical bored holes can 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 performed for the cut sections and stations on the proposed Project. Periphery borehole spacing, liner diameter and depth, and screened geology will be specifically designed (where required) 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 to ensure that no excessive external drawdown is likely to occur. 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 ground treatment will be undertaken. This may involve drilling of additional grout injection holes within or outside the box

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	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 will 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 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.
Drawdown Effects and Zone of Influence (ZOI) **H11**	• Dewatering of the [LI, PI] bedrock aquifer will be necessary and the ZOI has been determined by modelling (following outputs of [Plaxis2D and MODFLOW] modelling) undertaken for the proposed Project. • It is planned to undertake 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 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. 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. • 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 local reinjection to ground around the station for example and there is sufficient surface area available for the new re-injection and monitoring wells in addition to the necessary cleaning plant required to treat the water to permitted discharge standards prior to any re-injection in that area. In general, it is noted that re-injection within Dublin is feasible and on-going in places for example of 20 no. active dewatering sites five no. (i.e., 25%) involve recharging to ground (with the highest re-injection volume being 15l/sec). This mitigation, where required for example in order to control the variation of the local water table in anticipation is considered very feasible once new wells are carefully positioned, designed, installed, operated, monitored and maintained. In the event where high volumes of groundwater enter the excavation and which will need pumping out, then this dewatering will be mainly directed to sewer as mentioned and following the necessary treatment.

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Substantial Water Inflows Under Pressure **H12**	• To mitigate impacts of dewatering of highly pressurised groundwaters during deep excavation that will be undertaken in the Boulder Clay and also within BoD and UWR units, the groundwater control measures will consist of D-wall / secant pile wall, ground treatment as required and internal and perimeter pumping wells which will assist in maintaining dry working conditions during construction. • There is also a risk of significant inflows at the contact of the CWA and CTO limestone and fracture zones, for example at chainage: 7+150 to chainage: 7+450 and tunnel depth to TOR at 22m-24mBGL. Existing faults for example at chainage: 12+200 to chainage: 12+400 may increase water inflows, locally. The use of a variable mode boring machine (i.e., EPB and Slurry TBM type) will eliminate the risk of high pressurized groundwaters (which relate to both hydrogeological and geotechnical 'hot spots') in the Boulder Clay/BoD/UWR or rock units. To further mitigate the effects, works will include for advance probing and grouting for open faced SCL tunnels as required.
Wells Intercepted by / or in the Vicinity of the Tunnel Excavation **H13**	• Other general risks related to tunnelling along the alignment will be duly addressed in the detailed 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 encountered along the full alignment (i.e., not just the tunnelling sections). • In addition, 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 a 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 contractor(s) TBM Management Plan. • In advance of Detailed Design (and despite the low probability of encountering groundwater supply wells in an urban setting as indicated in this assessment), the assessed risks associated with 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, GPR [Ground Penetrating Radar]) will be considered in areas where the likelihood of unknown wells is high. • 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, 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. • 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 civil construction is completed. If the level monitoring indicates that the proposed Project has impacted on a supply or geothermal well (for example wells within Trinity College Dublin grounds) then appropriate mitigation will be applied such as replacement well installation or deepening of wells as appropriate. • To ensure the protection of quality of identified groundwater potable supplies, all abstraction wells identified as lying within 150m of the proposed Project boundary will be monitored for water quality on

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	a monthly basis. This will include for standard drinking water quality parameters on a monthly basis for 12 months before construction, during construction and for a nominal period of 12 months after civil construction. If the monitoring indicates that the proposed Project has negatively impacted on a water supply source, then appropriate further mitigation measures will be applied such as well replacement or connection to public supply mains.

6.5 Soils and Geology

The contractor(s) are required to implement the measures in Table 6.5 in relation to land and soils during construction. This will require the development of an Excavated Materials Management Strategy (refer to the Excavated Material Management Strategy in Appendix A24.1 of the EIAR). Chapter 20 (Soils & Geology) of the EIAR outlines the baseline geological environment in addition with proposed mitigation measures.

Table 6.5: Soils and Geology Measures

Topic	Environmental Control Measure
Compliance and Best Practice for Soils and Superficial Geology **SG1**	The contractor(s) will comply with the requirements of relevant statutory bodies (including FCC, DCC, EPA, EU). Management of excess soil will be managed in line with the Excavated Materials Management Strategy, which has been developed for the proposed Project based on the Preliminary Design (see EIAR Appendix A24.1). This strategy includes the application of the Waste Hierarchy and highlights potential methods and sites for reuse, recovery, recycling and disposal of the excavated material with the aim of minimising disposal as waste. The contractor(s) will develop this strategy to provide an Excavated Material Management Plan for the proposed Project. A Sediment Erosion and Pollution Control Plan will be developed and implemented for all construction works. This will include measures to manage soil and silt-laden water on site.
Radon and Ground Gas **SG2 & SG3**	• 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 300Bq/m3 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 (RPE) and working time restrictions. • 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 (PPE) and RPE as a last resort.
Contaminated Land **SG4 to SG5**	• Prior to construction, and to inform the detailed design, further ground investigations and ground gas/groundwater monitoring will be undertaken and will be 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. The additional investigations will also be used to inform the materials management strategy and beneficial reuse of suitable soils. • 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 appointed contractor(s) 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. • 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 produce the necessary risk assessments for construction within potentially

Topic	Environmental Control Measure
	asbestos contaminated ground. They 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) of the EIAR. • Risks to construction and maintenance staff working with/near land contamination and neighbouring site users will be mitigated by the implementation of appropriate health and safety procedures in combination with the adoption of appropriate systems of work, including the use of PPE as a last resort. In the event that unrecorded contamination is encountered, works will be stopped, and the working procedures re-assessed to confirm the working methods remain appropriate. • 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. Will the monitoring programme indicate a change in baseline conditions and/or unacceptable risk further mitigation may be required. • Development of an Excavated Materials Management Plan as part of the final CEMP with measures including but not limited to construction of stockpile bunds and covers to reduce potentially contaminated runoff and generation of leachate, isolating from open excavations and drainage points, damping down to prevent wind-blown dust and monitoring of stockpile emissions. • 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 (e.g., bunds around storage containers and drainage interceptors). A site specific plan will be developed by the appointed contractor(s) detailing the procedures to be implemented 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. • 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 (BS) BS8500' will be followed to ensure that ground conditions are appropriate for the use of concrete at each given location. • Prior to reuse and placement of any excavated material within the proposed Project, location 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). • Specific assessment of the presence of pyrite within the project 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 comply with an appropriate specification for earthworks such as the NRA Specification for Road Works Series 600 – Earthworks (TII 2013). • Piling risk assessments will be undertaken to inform appropriate piling techniques and designs. These assessments should 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).

6.6 Materials and Waste Management

The contractor(s) are required to implement at a minimum the measures listed in Table 6.6 in relation to resource and waste management during construction. This will require the development of a Construction and Demolition Waste Management Plan. Chapter 24 (Materials & Waste Management) of the EIAR outlines the baseline waste environment in addition with proposed mitigation measures.

Table 6.6: Materials and Waste Management

Topic	Environmental Control Measure
Compliance and Best Practice **MWM1**	The overall approach to waste management will be in accordance with the Eastern-Midlands Region Waste Management Plan for 2015-2021 (ENWR 2015) as well as the County Council Development Plans. These development plans require implementation of EU and national waste and environmental policy including the application of the Waste Hierarchy to reduce quantities of waste produced and the associated impacts. Key guidance documentation of relevance includes: • Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects (EPA 2021); and • TII guidance on The Management of Waste from National Road Construction Projects, 2017 (Standard GE-ENV-01101).
Designing for Circular Economy **MWM2**	Construction of the proposed Project will be in line with the Circular Economy principles. 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. These are: • Design for reuse and recovery: identifying, securing and using materials that already exist on-site, or can be sourced from other projects (e.g., by considering reusing materials where possible). The proposed Project will recycle/ recover at least 95% of construction and demolition (C&D) 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 prefabricated structure and components, encouraging a process of assembly rather than construction; • Design for waste efficient procurement: identifying and specifying materials that can 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); and • Design for the future (deconstruction and flexibility): identifying how materials can be designed 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.

Topic	Environmental Control Measure
Applying the Waste Hierarchy as a Priority Order to the Management of Waste **MWM3**	• All waste will be managed in accordance with the waste hierarchy, 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. The primary objective in the construction of the proposed Project will be at the top of the waste hierarchy on zero avoidable waste, i.e., preventing waste and reusing waste wherever possible. As such the aim will be not to focus on lower value recycling and other recovery, and in any case most construction and demolition waste is already 'recovered' in some form. • 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 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). • Main contractor(s) will work with all sub-contractor(s) to identify waste minimisation and encourage all sub-contractor(s) 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).
Demolition Plan **MWM4**	• A pre-demolition audit will be undertaken in order to facilitate selective demolition. The audit will include the identification of any hazardous materials such as asbestos containing materials, oils, chemicals and gas cylinders. • 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. The EU Construction and Demolition Waste Protocol and Guidelines (European Commission 2018) provides guidance on best practice for the assessment of C&D waste streams prior to demolition or renovation of buildings and infrastructures, called a 'waste audit'. • The general approach to be adopted for the demolition of private and commercial properties located along the route of the proposed Project is set out in Demolition General (see Appendix A5.8 of the EIAR). A Demolition Plan (DP) will be prepared by the contractor(s) 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 offsite and a methodology for recording the materials generated and disposed of.

Topic	Environmental Control Measure
	• The DP 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 DP will also set out requirements for the handling of debris, including the following: – Debris waste and other materials will not be thrown, tipped or shot down from a height where they are liable to cause injury to any person on or near the site. – Existing lift shaft, light well and openings may be used to convey debris down the building floors. Areas adjacent to the openings of these features used as a chute will be barricaded when they are not in use. Warning signs will be posted to prevent workers from entering the area. As an option, plastic chutes may be used inside the floor openings and lift wells to minimise noise and confine the falling debris. – Openings on the floor may be used to convey debris. If openings are created on the floor, the total openings will be less than 25% of the total aggregate floor area. Each opening will not be larger than 900mm × 900mm unless demonstrated with justifications having regard to the safety of the remaining structure and minimising the possible risks arising from the impact force induced. Openings will not cut through structural support elements that may affect the stability of any structural components. – No demolition materials will be allowed to fall freely outside the building unless it is confined within a chute. If exterior chutes are used, adequate clear spaces will be provided for their operation. Temporary refuse chutes assembled from old metal barrels will not be used. The chutes will not cause any obstruction to the public. A dust barrier will be provided if the chute outlet is near public access. The chute will be designed and constructed with adequate strength and support to allow safe conveyance of debris. • The DP will detail procedures for effective site management to prevent the mixing of the inert portion together with the non-inert portion of construction and demolition waste and allow on-site sorting and separation at source. – Any hazardous materials will be removed as a priority. – Domestic wastes (e.g., furniture and household appliances), metal components (e.g., window frames and pipes), timber components (e.g. doors and wooden floors), and other wastes (e.g. tiles, asphaltic materials and ceramic products) will be removed prior to demolition commencing. – Concrete and/or brick debris will be broken down into smaller sizes and separated from reinforced steel for disposal. – Crushing demolition arisings on-site using mobile concrete crushing equipment offers a range of environmental and logistical benefits. Crushing will be considered on a site-by-site basis and subject to regulatory approval. – Old bricks will be salvaged for reuse as architectural features or other uses where possible. • All demolition waste will be properly managed in accordance with the Contractor(s)'s Construction & Demolition Waste Management Plan (see RWM5) in order to ensure that the site is kept tidy and safe, and that cross contamination of waste streams is prevented.
Construction & Demolition Waste Management Plan (C&D WMP) **MWM5**	• The contractor(s) will develop a Construction and Demolition Waste Management Plan (C&D WMP), which incorporates all the measures outlined in this Outline CEMP and the Excavated Material Management Strategy. The C&D WMP will identify 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. The C&D WMP will be written in accordance with the best practice guidance (DoEHLG 2006).

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	• The C&D WMP 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.
	• 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; and
	  – 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 will 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.
	• 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 WFD) 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 therefore no longer falls under the jurisdiction of any waste management legislation. The material can therefore 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.
	• Should 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 for the disposal of demolition waste will 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)'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.

Topic	Environmental Control Measure
Excavated Materials Management Strategy **MWM6**	• 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. • An Excavated Materials Management Strategy has been prepared for the proposed Project and included as Appendix A24.1 of the EIAR. This Strategy is to be used by the Contractor(s) to develop an Excavated Material Management Plan to be followed during the excavation phases of the proposed Project.
Excavated Material Management **MWM7**	• Nearly 3 million cubic metres (m3) of excavated material is forecast to be generated by the proposed Project. Of that approximately 99,931m3 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 m3 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 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 94,775m3 (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 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 will be stored separately to any material which is classified as a waste. • Any contaminated land will be stockpiled separately from all other material in order to minimise the risk of cross contamination. • 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 for disposal as a waste at a waste management facility. • Stockpiling will be strictly controlled so as to ensure that impacts to the environment surrounding the Northwood site are kept to a minimum.
Excavated Material Management **MWM8**	• All waste excavated material will be subject to laboratory testing in order to classify the material in accordance with soil recovery facility acceptance criteria or landfill acceptance criteria. • The waste will be sent to a suitably licensed, permitted or registered waste facility for compliant handling and recovery or disposal. Material removed from site will be transported by vehicles in possession of a valid Waste Collection Permit. • Material arising from the TBM in Earth Pressure B mode will not require separation treatment as with the Slurry TBM mode, as the foam conditioning additives which are mixed within the spoil are highly biodegradable with 95% biodegraded. Spoil which arises from the TBM during operation in EPB mode maybe stored in a bunded area before transportation to an off-site destination.

Topic	Environmental Control Measure
By-product Material **MWM9**	• In so far as is possible, options for beneficial reuse of the clean, suitable soil and stone material in accordance with Article 27 of the Waste Management Act[1] is being progressed. This will prevent the need to classify all of the 2.9 million m3 of excavated material as a waste. It has been predicted that approximately 89.6% of the excavated material could be classified under Article 27 and the remaining 10.4% would be classified as waste (inert, non-hazardous or hazardous). • Huntstown Quarry in County Dublin has been identified as the preferred location due to its ability to take all by-product material as forecasted to be produced by the proposed Project. Huntstown Quarry is operated by Roadstone and is located just outside the M50 Motorway near Junction 5, approximately 5.5km from the Northwood Portal location. Roadstone currently have a Waste Licence (No. W0277-03) for a Soil Recovery Facility which permits recovery of 1,500,000 tonnes of soil and stones per annum at the facility, with a total backfilling capacity of 9,450,000 tonnes of backfilling capacity over the life of the facility, of which approximately 2,600,000 tonnes are remaining. The waste licence only covers soil recovery activities in the North and West Quarry, however Roadstone has planning permission in place for development of the wider Huntstown Quarry, including provision for ultimate backfilling and restoration of the North, West and South Quarries and planned Central Quarry to the original ground level. • 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 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.
Hazardous Waste **MWM9**	• 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. • Hazardous wastes will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor(s) for recycling or disposal if recycling is not possible. • All hazardous waste including asbestos will be disposed of through a suitably permitted waste contractor(s) for disposal or processing at a suitably licensed/permitted/ registered facility which can 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 (WTF), 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 Scheme 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). This legislation is supplemented by S.I. No. 419/2007 - Waste Management

[1] Article 27 of the European Communities (Waste Directive) Regulations 2011 allows an economic operator to decide, under certain circumstances, that material is a by-product and not a waste, and therefore may be used by third parties without the requirements associated with managing material as a waste.

Topic	Environmental Control Measure
	(Shipments of Waste) Regulations 2007, as amended, which makes Dublin City Council responsible for the enforcement of this regulatory system throughout Ireland. Export of hazardous waste from the site outside of Ireland will comply with the procedures set out in this legislation.

6.7 Biodiversity

The contractor(s) are required to implement the measures in Table 6.7 in relation to biodiversity during construction. This will require the development of a site-specific Ecology and Landscape Management Plan, and a Non-Native Invasive Species Management Plan (see Appendix A15.8 of the EIAR). The contractor(s) will ensure that procedures are implemented to control and minimise disturbance and damage to areas of conservation interest and legally protected and notable species, in accordance with the control measures set out below and relevant legislation. The existing biodiversity baseline and mitigation measures have been discussed further in the NIS and Chapter 15 (Biodiversity) of the EIAR.

Table 6.7: Biodiversity Measures

Topic	Environmental Control Measure
Compliance and Best Practice B1	Control measures will be developed in accordance with standard best international practice including guidance from the Construction Industry Research and Information Association (CIRIA), the NRA and IFI. Key guidance includes the following: • NRA Guidance for the Crossing of Watercourses during the Construction of National Road Schemes; • NRA Guidelines for the Protection and Preservation of Trees Hedgerows and Scrub (NRA, 2006); • Guidelines for the Treatment of Badgers prior to the Construction of a National Road Scheme (NRA 2005); • Guidelines for the Treatment of Bats during the Construction of a National Road Scheme (NRA 2005); • Guidelines for the Treatment of otters prior to the Construction of a National Road Scheme (NRA 2006); • NRA guidance on the Management of Noxious Weeds and Non-Native Invasive Plants Species on National Road Schemes (2010); and • Inland Fisheries Ireland (IFI) Guidelines on the Protection of Fisheries During Construction Works and Adjacent to Waters 2016.
Habitat Loss **B2**	To minimise the loss of ecologically valuable habitats, areas of these habitat types within the proposed Project boundary but which are not required to construct the Project will be retained and fenced off for the duration of construction. This will prevent damage to these habitats as a result of construction vehicles/works. These areas 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 will not be undertaken. • Woodland, scrub, tree lines 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 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 a distance of c. 5m from the stream/riverbank.
Vegetation to be Retained **B3**	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). Additional details on the measures required to protect specific trees are provided in the Arboricultural Impact Report accompanying this application (CMK Horticulture & Arboriculture Ltd., 2022). The mitigation measures are as follows:

Topic	Environmental Control Measure
	• 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 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. Where feasible, 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 to protect the vegetation from machinery strikes. • 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. • Where feasible, a buffer zone of at least 5m will be maintained between construction works and retained hedgerows and trees to ensure that the root protection areas are not damaged.
Air Quality impacts on habitats **B4**	To control dust emissions during construction works standard mitigation measures shall 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; Hoarding will be provided around the construction compounds; • It is anticipated that 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; and, • At all times, 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. In addition, 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. Refer to Air Quality mitigation measures AQ1, AQ4, AQ5, AQ9 -12 and AQ16-19.
Spreading of Non-native Invasive Plant Species **B5**	The mitigation strategy in relation to non-native invasive plant species is based on the The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020) with the objectives of managing non-native invasive plant species within the working area and preventing the spread of any established populations present with the boundary of the proposed Project (a legal requirement for species such as Canadian pondweed, giant hogweed, Japanese knotweed, New Zealand pigmyweed, Nuttall's pondweed and three-cornered leek). The mitigation measures include: • A Non-Native Invasive Species Management Plan has been prepared (see Appendix A15.8 in the EIAR) and will be implemented sufficiently far in advance of the proposed construction works commencing so as to allow time to adequately control 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. The Non-native Invasive Species Management Plan will direct the construction contractor in implementing the specific mitigation measures required in relation to individual non-native invasive plant 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. This survey will

Topic	Environmental Control Measure
	include accurate 1:5,000 scale mapping for the precise location of non-native invasive plant species. The pre-construction surveys will be undertaken by suitable experts with competence in identifying the species concerned. • In accordance with the TII, 2020 guidelines, where cut, pulled or mown noxious weed or non-native invasive plant species material arises, its disposal will not lead to a risk of further spread of the plants. 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 licenced facility having regard to relevant legislation) or disposal to licensed landfill in the case of non-native invasive plant species. • The taproots of docks and roots of creeping thistle are not suitable for composting or shallow burial, requiring disposal to landfill, incineration or burying at a depth of no less than 1.5m (practical only during the Construction Phase). 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. electrofishing), will comply with best practice biosecurity protocols for aquatic work – for example IFI Biosecurity Protocol for Field Survey Work (IFI, 2010).
Loss of Breeding and Resting Sites for Otters **B6**	• 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 not be any loss of holt or couch 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 constructions 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).
Barrier Effect for Otters **B7**	• During construction of the proposed Project, the Royal Canal basin located between Lock 6 and Lock 5 will be dewatered for a period of six months to facilitate the installation and removal of a temporary working platform. These proposed works could potentially result in a temporary barrier effect on the local otter population that regularly use the canal. In order to mitigate any potential impacts and to maintain connectivity during the dewatering period, it is proposed that temporary mammal-resistant fencing is erected at the dewatered basin, which will 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 canal), under the Cross Guns Bridge over Prospect Road and move towards Lock 4. • This 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.
Impacts on Bats – Buildings to be Demolished **B8**	Two buildings to be demolished (i.e. BS06 and BS16) were not surveyed for bats as access was not permitted by the owner. On a precautionary basis, it is recommended that the following actions are 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 BCT, 2016); and • 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.

Topic	Environmental Control Measure
Impact on Bats – Loss of Tree Roosts **B9**	The following mitigation measures are proposed in relation to those trees identified as having potential to support roosting bats as they contain potential bat roost features. Bats could occupy suitable roosting features at any time prior to the commencement of works. Therefore, there is an inherent risk that bats could be affected by the proposed felling works. The following mitigation procedures will be followed: • Felling of confirmed trees containing potential roost features 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; • Use of detectors alone may not be sufficient to record bat emergence and re-entry in darkness. Therefore, prior to felling of confirmed and potential trees containing potential roost features, a dusk emergence and/or dawn re-entry survey using infra-red illumination and video camera(s) or thermal imaging units, 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 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 should then be pushed to the ground slowly and should remain in place until it is inspected by a bat specialist; • Trees will only be felled "in section" where the sections can be rigged to avoid sudden movements or jarring of the sections; and, • 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 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 licenced 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 will be erected on retained trees that are located within close proximity to the trees being felled. These bat boxes should be installed in groups of three per tree and it is preferable that each faces a slightly different aspect from south-east to south-west facing, to provide a range of slightly differing temperature regimes. They should also be located at least 3m above ground level to minimise the risk of interference by humans or predation. *Roost Loss – Hibernating bats* It is possible that hibernating bats may utilise buildings/structures that will be demolished as part of the proposed Project. In order to avoid any potential impacts, it is recommended that where possible the demolition of suitable buildings/structures for hibernating bats is avoided during the hibernation period (i.e. optimal period November to March) (BCT, 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 and during demolition and if encountered bats are moved to a suitable bat hibernation box.
Impact on Bats – Disturbance Related to the Lighting **B10**	• Any lighting required during construction will be designed in such a way that it is positioned and directed away from any sensitive ecological features located beyond the construction compound, therefore avoiding any unnecessary light spill and disturbance. • Lux levels at suitable habitats for bats will not be increased above baseline levels as a result of the construction of the proposed Project. • A Construction Lighting plan (see Appendix A5.18 of the EIAR) will be prepared by the contractor(s) 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, which will be designed in accordance with best practice guidance with regards to bats and lighting.

Topic	Environmental Control Measure
Badger Disturbance **B11**	There is only one badger sett located within the ZoI of the proposed Project (i.e. c. 24m west of the proposed MetroLink grid connections route, north of the R139). Whilst there will be no direct loss of this sett as a result of the proposed Project, potential impacts could still occur as a result of disturbance (as described in relevant section below). The mitigation measures described below follow the recommendations set out in the Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006a). These guidelines set out the best practice approach in considering and mitigating impacts on badger during construction works. As the usage of setts by badgers can 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 within the ZoI of the setts discussed below. This will include a pre-construction survey for the presence of any new setts located within the ZoI of the proposed Project for potential impacts on badger. The presence of any sett will be treated and/or protected in accordance with the Guidelines for the Treatment of Badgers during the Construction of National Road Schemes (NRA, 2006c). This document provides guidance on the following: • Exclusion of badgers from development sites; • Badger evacuation procedures; • Badger sett destruction; • Artificial setts; • Badger underpasses; • Badger resistant fencing; • Guidelines for site works in the vicinity of badger setts; and, • Post-construction monitoring and mitigation. In order to prevent any disturbance to badger setts not directly affected by the proposed Project, no heavy machinery shall be used within 30m of badger setts at any time. The only exception to this may be the proposed MetroLink Grid Connections works proposed north of the R139 located within c. 24m of a badger sett. No works shall be undertaken within 50m of active setts during the breeding season. Lighter machinery (generally wheeled vehicles) shall not be used within 20m of a sett entrance. Neither blasting nor pile driving shall be undertaken within 150m of active setts during the breeding season (December to June inclusive). Prior to works commencing, a non-interference zone of a minimum of 20m 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 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 MetroLink grid connections, located north of the R139, to ensure that there are no impacts on the badger sett, locate c. 24m west of the proposed Project.
Breeding Birds **B12**	• Where feasible, 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.
Amphibian Habitat Loss and Disturbance **B13**	Mitigation measures include: • 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.

Topic	Environmental Control Measure
	• 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 proposed Project. If used, the type and design of traps shall be approved by the NPWS. This is a standard and proven method of catching and translocating smooth nest. • If the size or depth of the habitat feature is such that it cannot be determined whether all amphibians have been captured, it will be drained under the supervision of a suitably qualified ecologist to confirm that no amphibian species remain before it is destroyed or infilled. Any mechanical pumps used to drain the habitat feature will have a screen fitted, and be sited, such that no amphibian species can be sucked into the pump mechanism. • Any capture and translocation works shall be undertaken immediately in advance of site clearance/construction works commencing.
Reptiles Habitat Loss and Disturbance **B14**	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 highlighted on Figure 15.12, Chapter 15 (Biodiversity) of the EIAR, where there is suitability for common lizard: • 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 September, inclusive) under the supervision of an ecologist, when they are less likely to be in use by torpid lizards.
Fish Habitat Loss and Disturbance **B15**	*Fish habitat loss* 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. *Mortality Risk and Disturbance/Displacement* To minimise the potential effects of construction works on fish species the following mitigation measures will be implemented: • 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; and • 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. *Habitat Severance/Barrier Effect* • All temporary crossing structures used to cross watercourses during construction and the proposed diversion of the Mayne River will be designed 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.

6.8 Archaeology, Architectural and Cultural Heritage

The contractor(s) are required to implement the measures in Table 6.8 to 6.10 in relation to cultural heritage during construction. A TII Cultural Heritage Strategy has been prepared by TII's Project Archaeologist and Conservation Architect and must be implemented during the Construction Phase (refer to Appendix A25.1 of the EIAR). Chapter 25 (Archaeology & Cultural Heritage) and Chapter 26 (Architectural Heritage) of the EIAR outline the baseline historic environment and proposed mitigation measures.

Archaeological investigation and resolution of archaeological constraints in greenfield land and parklands (where feasible) will be required at various locations and these have been included in the Enabling Works programme. These works will comprise a variety of techniques dependent on: 1) the nature of the receiving archaeological constraint; and 2) archaeological works already undertaken at the location to date, either as a component of MetroLink, old Metro North or as a component of an oversite development.

The archaeological techniques likely to be used 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 Contractor(s) or Archaeological Consultants appointed by the Enabling Works Contractor(s) (e.g., for Utility Works, Demolition Works or Heritage Works). During Main Construction Works archaeological monitoring and preservation by record (excavation) will be required in areas previously not accessible (e.g., parks or carriageway), or those not fully resolved during the Enabling Works (e.g. utility works), and for which preservation in situ is not possible. These works will be undertaken by the Contractor(s)'s Archaeological Consultants.

The MetroLink Project Conservation Architect (PCA) will undertake Structural and Condition Surveys of built and cultural heritage constraints that will require removal to secure storage (followed by conservation and reinstatement) or protection in situ. The MetroLink PCA will also prepare specifications for these works. A specialist Heritage Works Contractor(s) will be appointed to remove, store and conserve these constraints. The contractor(s) will appoint Consultant Conservation Architects to implement required preservation in situ works.

The MetroLink Cultural Heritage Strategy will be maintained as a live document throughout the Construction Phase of the project and will be updated in response to new information received from the above described archaeological investigations, the PCA surveys, ongoing stakeholder engagement and in response to changes in the receiving baseline environment.

Table 6.8: Archaeology, Architectural and Cultural Heritage – General Measures

Topic	Environmental Control Measure
General - MetroLink Cultural Heritage Strategy **CH1**	The contractor(s) will be required to submit a Cultural Heritage Plan as part of the detailed CEMP. This will detail the measures to be taken to implement the investigation, monitoring and preservation requirements of the TII Cultural Heritage Strategy (see Appendix A25.1 of the EIAR). The MetroLink Cultural Heritage Strategy addresses the known nature, sequence, location and extent of cultural heritage mitigation measures required for effective delivery of the proposed Project outlining the likely heritage requirements for each contract package based on best available information.
General - TII Code of Practice for Archaeology **CH2**	TII has agreed a Code of Practice for Archaeology (2017) with the Minister of Arts, Heritage, Regional, Rural and Gaeltacht Affairs (now Minister of HLGH). All Archaeological Consultant(s) appointed to the proposed Project, either by TII or appointed contractor(s), will comply with the Code of Practice and will liaise with the TII Project Archaeologist in relation to all archaeological requirements.
General - Identification of unknown	Mitigation measures which may be undertaken prior to and during the Construction Phase include: • Full measured, written, drawn and photographic surveys;

Topic	Environmental Control Measure
archaeological material **CH3**	• Development of 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)); • Archaeological test excavations; • Preservation by record (Archaeological excavation); and • Archaeological monitoring. 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 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 proposed.
General - Archaeological Excavation Works **CH4**	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 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. All ground excavation associated with proposed Project will be monitored by a suitably qualified archaeologist (to a suitable depth). This will enable the identification of any previously unrecorded features / deposits of archaeological significance. Full provision will be made to ensure the preservation by record of any such features, should that be deemed the most appropriate manner in which to proceed, following consultation with the Department of Culture, Heritage and the Gaeltacht (DCHG). All archaeological works will be carried out under the supervision of a project archaeologist, appointed on behalf of TII's Project Archaeologist, to ensure all mitigation measures are implemented. This work will require licence approval from the National Monuments Service. The TII Project Archaeologist will be responsible for managing all heritage issues on the project. If archaeological remains are found the following process must be followed: • Trial testing and archaeological excavation; • A detailed written and photographic record of all remains; and • The National Monuments Service must be informed. If any human remains are identified, the Guards will also be notified.
General - National Monuments and Protect Structures CH5	An Architectural Strategy has been developed by the Project Conservation Architect (PCA) in consultation with relevant stakeholders and has been incorporate into the Metrolink Cultural Heritage Strategy. The PCA will be required to prepare condition surveys and specifications for the removal, storage, conservation and reinstatement of heritage constraints, in addition to impact assessments and proposals for the preservation *in situ* of sensitive heritage constraints (e.g. plasterwork, stained glass windows, National Monuments) within or adjacent to the proposed Projects construction environment. Appropriate licences or consents, in accordance with the National Monuments Act 1930 (as amended) will be applied for, and no archaeological works or works relating to a National Monument may take place in advance of receipt of such licences or consents from the Minister for Housing, Local Government and Heritage. All works will take place in strict compliance with the Code of Practice for Archaeology as agreed between TII and the Minister.

Topic	Environmental Control Measure
	Any works directly affecting listed architectural heritage buildings and structures will be carried out in accordance with an approved and detailed method statement after obtaining the required consents from the DHCG. In certain areas, the protected structure will be removed during construction, stored securely and reinstated where possible.
General - Protection Measures **CH6**	The following general protection measures will be employed by the contractor(s): • Protective measures such as temporary support, hoardings, barriers, screening and buffer zones around heritage buildings and structures and archaeological heritage areas within and adjacent to worksites; • Consideration to the type of plant and working methods for use when in close proximity to heritage sites; • Separation of any elements to be demolished that are attached to listed structures being retained, where practicable, prior to demolition, using non-vibratory techniques such as diamond sawing; • Care in operating piling or borehole rigs, mechanical excavators or other plant over areas of known/potential archaeological features; • Condition surveys to define settlement and vibration limits for heritage sites potentially affected by the works; • Where buildings are to be demolished to facilitate the Project and these buildings are of architectural heritage significance, a record of the building will be made for posterity; • Procedures for the emergency repair of damage to listed buildings; • Secure procedures to prevent unauthorised access to heritage assets and archaeological investigations and damage to or theft from them; and • Procedure in the event of the discovery of human remains.

Mitigation of impacts on the archaeological, architectural and cultural heritage resource will be a staged approach that will be carried out during the pre-construction, enabling and main infrastructure works phases of the proposed project. Specific mitigation measures are detailed in Table 6.9 and Table 6.10 below.

Table 6.9: Archaeology and Cultural Heritage – Specific Measures

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH7	National Monuments Lissenhall Bridge (ACH020) and St Stephen's Green (ACH211)	• Apply for Ministerial Consent in line with the requirements of Section 5 and 14 of the National Monuments Act 1930 (as amended).
CH8	ACH001 Area of Archaeological Potential	• 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. Should, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH9	ACH003 Archaeological site /monument Ring ditch	• Archaeological preservation by record (excavation) to be carried out in advance of construction.
CH10	ACH004 Area of Archaeological Potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction supported as necessary by archaeological monitoring. Should, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH11	ACH009 Archaeological site/monument - Enclosure	• Archaeological preservation by record (excavation) to be carried out in advance of construction.
CH12	ACH010 Cultural Heritage - Townland boundary	• Archaeological monitoring to be carried out during enabling and construction works and a full written and photographic record of any features associated with the townland boundary made if found. Should any additional archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) may be required.
CH13	ACH011 Cultural Heritage - Townland boundary	• 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).
CH14	ACH012 Cultural Heritage - Traveler community area	• Relocation of the community area to an alternative location.
CH15	ACH019 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH16 & CH17	ACH020 Archaeological site/monument – 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 measured by means of vibration monitors fixed to the bridge and constantly monitored to ensure that vibration threshold limits agreed with MHLGH are not exceeded. Should 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. • 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 considered landscape design inclusive of planting of trees similar to those found at present in the vicinity.
CH18	ACH021 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH19	ACH026 Cultural Heritage - Site of 20th century structure	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH20	ACH028 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH21	ACH029 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH22	ACH033 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH23	ACH035 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH24	ACH043 Cultural Heritage – Townland boundary	• 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).
CH25	ACH044 Cultural Heritage – Site of three 20th century structures	• Archaeological monitoring to be carried out during enabling and construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH26	ACH046 Cultural Heritage – Statue	• A full photographic, condition and written survey of the statue will be undertaken by MetroLink PCA prior to construction. PCA to prepare draft specifications for removal, storage and relocation. Revised location to be agreed with LA.
CH27	ACH047 Cultural Heritage – Townland Boundary	• 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).
CH28	ACH049 Cultural Heritage – Townland Boundary	• 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).
CH29	ACH051 Area of Archaeological Potential	• A programme of geophysical survey and archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		situ or full archaeological preservation by record (excavation) will be required.
CH30	ACH053 Cultural Heritage – Shrine	• A full photographic, condition and written survey of the shrine will be undertaken by MetroLink PCA prior to the construction of the proposed Project. PCA to prepare draft specifications for removal, storage and relocation. Revised location to be agreed with LA and property owner.
CH31	ACH059 Archaeological site/monument – Structure	• Archaeological preservation by record (excavation) to be carried out in advance of construction.
CH32	ACH067 Cultural Heritage – Townland Boundary	• 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).
CH33	ACH068 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH34	ACH069 Cultural Heritage – Townland Boundary	• 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).
CH35	ACH071 Cultural Heritage – Site of 19th century structure	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH36	ACH073 Archaeological site/monument – Burnt mound	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH37	ACH074 Archaeological site/monument – Field system	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH38	ACH075 Archaeological site/monument – Enclosure	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH39	ACH077 Area of Archaeological Potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH40	ACH080 Archaeological site/ monument – Enclosure	• Archaeological preservation by record (excavation) will be carried out in advance of construction.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH41	ACH081 Area of Archaeological Potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH42	ACH085 Cultural Heritage – Townland boundary	• 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. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH43	ACH086 Area of Archaeological Potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH44	ACH093 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should, archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required. • An archaeological wade survey will be carried out along the section of the stream to be impacted. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH45	ACH095 Archaeological site/monument – Curvilinear ditch and pits	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH46	ACH096 Archaeological site/monument – Enclosure	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH47	ACH097 Archaeological site/monument – Fire pit	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH48	ACH099 Cultural Heritage – Townland Boundary	• Townland boundaries will be preserved in situ where possible. If this is not possible, 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).

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH49	ACH102 Cultural Heritage – Townland Boundary	• 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. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH05	ACH103 Cultural Heritage – Townland Boundary	• 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).
CH451	ACH104 Cultural Heritage – Townland Boundary	• 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).
CH52	ACH105 Archaeological site/monument – Pits with burnt material	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH53	ACH106 Archaeological site/monument – Pits with burnt material	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH54	ACH107 Archaeological site/monument – Burnt mound	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH60	ACH108 Area of Archaeological Potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact Service in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH61	ACH109 Archaeological site/ monument – Kiln	• Archaeological preservation by record (excavation) will be carried out in advance of construction.
CH62	ACH110 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH63	ACH112 Cultural Heritage – Townland Boundary	• An archaeological wade survey will be carried out in advance of construction along the section of the river to be impacted. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required. • Archaeological monitoring to be carried out during construction. Should the route of the townland boundary be identified, further

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH64	ACH113 Cultural Heritage – Townland Boundary	• 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).
CH65	ACH115 Area of archaeological potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH66	ACH116 Area of archaeological potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH67	ACH127 Area of archaeological potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Memorial to be removed and stored during construction and reinstated following completion of the Construction Phase. Priests grave to be protected in situ.
CH68	ACH131 Cultural Heritage – Albert College Park and GAA Pitches	• 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.
CH69	ACH132 Area of archaeological potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH70	ACH136 Area of archaeological potential	• Archaeological test excavations to be carried out where feasible in areas of direct impact in advance of construction. Should additional archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH71	ACH143 Cultural Heritage – Townland Boundary	• 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).
CH72	ACH145 Cultural Heritage – Brian Boru Pub	• The licensed premises are to be recorded by means of photography and written description to English Heritage level 3 prior to demolition.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH73	ACH146 Cultural Heritage – Site of group of 19th century structures	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH74	ACH147 Area of Industrial Heritage – Railways	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Where Japanese knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.
CH75	ACH147.1 Cultural Heritage – Signal House	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Where Japanese knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.
CH76	ACH147.2 Cultural Heritage – Site of 19th century structures	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Where Japanese knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.
CH77	ACH147.3 Cultural Heritage – Railway sidings	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Where Japanese knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.
CH78	ACH147.4 Cultural Heritage – Railway sidings	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Where Japanese knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.
CH79	ACH147.5 Cultural Heritage – Former railway platform	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		• Where Japanese knotweed removal is required, the Knotweed Specialist will liaise with archaeology specialist to determine agreeable means of implementing the means of mitigation.
CH80	ACH148 Cultural Heritage – Site of 19th century structure	• Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH81	ACH149 Area of Industrial Heritage – Canals	• Underwater archaeological survey to be carried out along the canal basin in advance of construction. • GPR Survey of area between 5th/6th Lock to be carried out for the purpose of identifying external buttress and built infrastructure that may remain buried. • Archaeological test excavations to be carried out where feasible at the rear of the town path in order to determine the support structure. Should additional archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • Archaeological monitoring to be carried out during construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH82	ACH149.1 Cultural Heritage – Site of Lock House	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH83	ACH149.2 Cultural Heritage – Site of industrial building	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH84	ACH151 Cultural Heritage – Site of post medieval structure	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH85	ACH166 Area of Archaeological Potential	• 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 should be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH86	ACH167 Cultural Heritage – Tramway	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH87	ACH169	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed,

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
	Archaeological site/monument – Historic town of Dublin	further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH88	ACH177 Area of Archaeological Potential	• Archaeological monitoring to be carried out during enabling and construction works and supported by further archaeological test excavations where feasible. Monitoring will be carried out to the base of the formation level of the construction compound and station. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH89	ACH178 Cultural Heritage – Elements of 1916 streetscape	• Archaeological monitoring to be carried out during enabling and construction works. Monitoring will be carried out to the base of the formation level of the construction compound and station. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required. • All historic street surfaces on Moore Lane/Henry Place (where directly impacted) will be removed under archaeological supervision to secure storage. Process of removal, storage and reinstatement will be undertaken by specialist heritage contractor(s) to PCA specifications.
CH90	ACH179 Archaeological site/monument – Brickworks	• Archaeological monitoring to be carried out during enabling and construction works. Monitoring will be carried out to the base of the formation level of the construction compound and station. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH91	ACH180 Archaeological site/monument – 14-17 Moore Street and 8-9 Moore Lane	• Any works to be undertaken within the defined proximity zone of the National Monument must be undertaken under Ministerial Consent. • Vibration and settlement monitoring equipment is to be installed at the buildings. The equipment is to be monitored and in the event of threshold limits agreed with the MHLGH being exceeded, all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH92	ACH194 Area of Archaeological Potential	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH93	ACH197 Archaeological site/monument – Church	• Archaeological monitoring to be carried out during enabling and construction. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation may be required.
CH94	ACH198 Archaeological site/monument – Hospital	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
CH95	ACH204 Cultural Heritage – National Gallery of Ireland Collection	• Vibration monitoring equipment is to be installed. The equipment is to be monitored and in the event of threshold limits being exceeded, all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH96	ACH205 Cultural Heritage – Royal College of Physicians of Ireland Heritage Centre and Archives	• Vibration monitoring equipment is to be installed. The equipment is to be monitored and in the event of threshold limits being exceeded, all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH97	ACH206 Cultural Heritage – National Library of Ireland Collection	• Vibration monitoring equipment is to be installed. The equipment is to be monitored and in the event of threshold limits being exceeded, all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH98	ACH207 Cultural Heritage – The Oireachtas Library at Leinster House	• Vibration monitoring equipment is to be installed. The equipment is to be monitored and in the event of threshold limits being exceeded, all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH99	ACH208 Cultural Heritage – National Museum of Ireland – Archaeology	• Vibration monitoring equipment is to be installed. The equipment is to be monitored and in the event of threshold limits being exceeded, all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH100 & CH101	ACH211 Archaeological site/monument – St Stephen's Green Park	• All works carried out within or in proximity to the National Monument must be undertaken in accordance with Ministerial Consent. • Archaeological monitoring to be carried out during all enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required. • Railings, statues, bollards, lamp standards and other park features to be conserved and reinstated, hard and soft landscaping to be carried out to MHLGH/OPW agreement following completion of construction.
CH102 & CH103	ACH211.1 Archaeological site/monument – 17th century boundary ditch of St Stephen's Green Park	• All works carried out within or in proximity to the National Monument must be undertaken in accordance with Ministerial Consent. • Archaeological monitoring to be carried out during all enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.
CH104 & CH1055	ACH211.2 Archaeological site/monument – 17th century boundary wall of St Stephen's Green Park	• All works carried out within or in proximity to the National Monument must be undertaken in accordance with Ministerial Consent. • Archaeological monitoring and metal detection of spoil to be carried out during all enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.
CH106	ACH212	• Vibration monitoring equipment is to be installed. The equipment is to be monitored and in the event of threshold limits being exceeded

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
	Cultural Heritage – Royal Hibernian Academy	all work in the vicinity is to stop until the cause of the issue is identified and resolved.
CH107	ACH225 Area of Archaeological Potential	• Archaeological monitoring to be carried out during enabling and construction works. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological excavation will be required.
CH108	ACH227.1 Archaeological site/monument – Church	• Cross to be hoarded off from construction works in order to prevent inadvertent impacts. Process will be undertaken to PCA specifications.
CH109	ACH227.3 Archaeological site/monument – Ecclesiastical enclosure	• Archaeological monitoring to be carried out during enabling and construction works. Should any archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) may be required.
CH110 & CH111	ACH228 Area of Archaeological Potential	• Archaeological monitoring to be carried out during enabling and construction works. Should any archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) may be required. • An archaeological wade survey will be carried out along the section of the stream to be impacted. Should archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) will be required.
CH112	ACH232 Area of Archaeological Potential	• Archaeological monitoring to be carried out during enabling and construction works. Should any archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) may be required.
CH113	ACH233 Area of Archaeological Potential	• Archaeological monitoring to be carried out during enabling and construction works Should any archaeological remains be confirmed, further archaeological mitigation such as preservation in situ or full archaeological preservation by record (excavation) may be required.

Table 6.10: Architectural Heritage – Specific Measures

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
AH1	BH-2: Demesne of Lissenhall Little.	• The wall is to be recorded by means of photography and written description prior to demolition.
AH2	BH-3: Balheary demesne	• The wall is to be recorded by means of photography and written description prior to demolition and is to be reinstated on a new alignment, where practicable using stone salvaged from original.
AHI3, AHI-8, AHI-10	BH-4: Lissenhall 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. Hoardings will be placed around the works area in such a way as to avoid any opening of the surface of the bridge deck so as to avoid damage to the fabric of the bridge. Pedestrian access will be maintained. • 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. Should 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. • The potential visual impact is to be addressed by means of landscaping in the area between the bridge and the Metrolink viaduct.
AHI-7, AHI-9, AHI-11	BH-3: Balheary 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. Hoardings will be placed around the works area in such a way as to avoid any opening of the surface of the bridge deck so as to avoid damage to the fabric of the bridge. Pedestrian access will be maintained. • 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. Should 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. • The potential impact is to be addressed by means of landscaping in the area between the bridge and the Metrolink viaduct.
AH-12	BH-9: Houses at Nevinstown West	• The houses are to be recorded by means of photography and written description prior to demolition.
AH-13	BH-10: Houses at Nevinstown West	• The houses are to be recorded by means of photography and written description prior to demolition.
AHI-14	BH-11: Church of Our Lady Queen of Heaven	• The PCA is to carry out a condition survey to determine whether the stained glass may remain in situ during the works. The extent of vibrations is to be monitored by means of vibration monitors fixed to the church and constantly monitored to ensure that vibration limits are not exceeded. Should limits be exceeded work in the vicinity of

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		the church is to cease until the source of vibration is identified and measures to reduce vibration are introduced.
AHI-16	BH-13: House on Old Ballymun Road to the north of gate lodge of Santry Lodge	• The house is to be recorded by means of photography and written description to English Heritage level 2 prior to demolition.
AH-17	BH-15: Gate lodge, gates and walls at Santry Lodge	• The gate lodge is to be recorded by the PCA by means of photography and written description to English Heritage level 2 prior to demolition. The walls and gates are to be reinstated on a new alignment in accordance with a specification, inclusive of conservation works, to be provided by the PCA.
AHI-18	BH-16: House on Old Ballymun Road to the south of gateway to Santry Lodge	• The house is to be recorded by means of photography and written description prior to demolition.
AHI-20	BH-14: Santry Lodge	• The impact on the setting of Santry Lodge is to be minimised by means of boundary treatment and landscaping and landscaping including the reinstatement of the walls and gateway.
AHI-21	BH-17: Pillar letter box at Albert College Drive	• The pillar letter box will be reinstated on completion of the works.
AHI-22 and AHI-24	BH-18: Church of Our Lady of Victories	• 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.
AHI-23	BH-18: Church of Our Lady of Victories	• The methodology for the piling for the construction of the station box to the front of the church is to be devised in conjunction with the Metrolink PCA and is to take into account the nature of the construction of the church, including the stained glass. The PCA is to carry out a condition survey to ensure that the stained glass may remain in situ as per the Cultural Heritage Strategy. Vibration monitors are to be provided in the church in the vicinity of the works with alarms to identify any vibration that exceeds acceptable levels. In the event of the alarms being triggered works are to cease until the cause of the vibration is identified and systems modified to prevent recurrence.
AHI-25, AHI-26, AHI-27	BH-21: Whitehall College	• The grounds at the entrance to the college will be reinstated in so far as possible with new landscaping and planting provided. • Prior to any works the gates, piers and railings are to be recorded by means of photography and written description. The features are to be removed in accordance with the specification to be prepared by the PCA and any required conservation works will take place and are to be stored in a secure store pending returning to the site and being reinstated. • The grounds at the entrance to the college will be reinstated in so far as possible with new landscaping and planting provided.
AHI- 30	BH-23: Dean Swift Bridge	• A detailed assessment is to be carried out at detailed design stage to determine the extent of predicted settlement and a solution devised

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		and implemented to obviate the impacts in line with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI-31	BH-29: Railings and gates at Dalcassian Downs	• The railings and their plinth walls are to be recorded by photography and written description prior to its removal. The railings and walls are to be taken down in accordance with a specification to be prepared by the PCA and the materials removed into secure storage pending reinstatement. At the appropriate stage of construction, the materials are to be returned to site and the railings and walls reinstated in accordance with a conservation method statement to be prepared by the PCA. All works of dismantling, protection, transportation and reconstruction are to be carried out by a dedicated heritage contractor.
AHI-32	BH-31: Brian Boru, 5 Prospect Road	• The licensed premises are to be recorded by means of photography and written description to English Heritage level 3 prior to demolition.
AHI-33	BH-32: Commercial property at 1 to 3 Prospect Road	• The commercial two storey property is to be recorded by means of photography and written description to English Heritage level 2 prior to demolition.
AHI-34	BH-36: Railway tunnel at Cross Guns	• The tunnel is to be recorded by means of photography and written description to English Heritage level 2 prior to demolition. The section of the tunnel that is to be retained is to be made good following removal of the demolished section using the stones from the arch ring at the western end of the tunnel. The walls on either side of the MGWR railway cutting are to be taken down and the facing stones stored in a safe location during construction. Following construction of the new retaining wall on the southern side of the Irish Rail station the wall is to be faced with stone salvaged from the walls of the railway cutting. This work is to be carried out under the supervision of a suitably qualified architectural conservation specialist and in accordance with a conservation method statement prepared by the PCA.
AHI-35	BH-41: Disused railway bridge	• The bridge is to be recorded by means of photography and written description to English Heritage level 2 prior to demolition.
AHI-36	BH-38: Fifth Lock, Royal Canal	• A detailed assessment of the canal lock should be carried out during the detailed design stage and appropriate protective or control measure implemented to ensure they remain operational and meet the performance requirements.
AHI-37, AHI- 38	BH-39: Royal Canal	• If following the draining of the canal basin a survey indicates that the canal walls are deemed to be susceptible to damage the north will be removed in whole or in part; this may extend to the entire wall of the canal basin or just the copings. The south wall should be repaired in situ to accommodate the pedestrian/cycle way. Any damaged coursing exposed on draining of the canal should be made good, if the north wall is in very poor condition, it may be deemed best to be removed entirely and reinstate post construction – the PCA and TII will consult with and take direction from Waterways

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		Ireland on this issue, though preference will be given to protection in situ. The form of the protection for the canal bed and repair/removal of canal walls is to be in accordance with a method statement to be prepared by the PCA in consultation with Waterways Ireland. A good quality hoarding with sensitive images is to be erected. • The retaining wall on the northern side of the canal is to be recorded by photography and written description prior to its removal. The wall is to be taken down in accordance with a conservation method statement to be prepared by the PCA and the materials removed into secure storage pending reinstatement. At the appropriate stage of construction, the materials are to be returned to site and the wall reconstructed in accordance with a conservation method statement to be prepared by the PCA. All works of dismantling, protection, transportation and reconstruction are to be carried out under the supervision of a suitably qualified architectural conservation specialist.
AHI-39	BH-42: Abutments of former railway bridge	• The abutments of the former railway bridge are to be recorded by photography and written description and all loose masonry is to be repaired prior to the erection of the temporary bridge. The repair works, the erection of the temporary bridge and its subsequent removal are to be carried out in accordance with a conservation method statement to be prepared by the PCA. All works of dismantling, protection, transportation and reconstruction are to be carried out under the supervision of a suitably qualified architectural conservation specialist.
AHI-40	South-Western Commuter Line	• The works to regrade the railway line are to be carried out in accordance with a method statement to be prepared by a conservation engineer/architect to ensure that the works do not result in any adverse impact on the retaining walls of the cuttings and on the bridges and tunnel adjacent to the track.
AHI-41	Western Commuter Line	• The works to regrade the railway line are to be carried out in accordance with a method statement to be prepared by a conservation engineer/architect to ensure that the works do not result in any adverse impact on the retaining walls of the cuttings and on the bridges and tunnel adjacent to the track.
AHI-42	BH-29: Railings and gates at Dalcassian Downs	• During the works a good quality hoarding with sensitive/historic imagery replicating the railings should be erected on the site frontage. At the completion of the works the railings are to be reinstated in accordance with a specification prepared by the Metrolink PCA and ground in the vicinity of the gates and railings is to be landscaped.
AHI-43	BH-37: Prospect Lodge	• The site offices are to be located as far as practicable from the house, given the constraints of the working site.
AHI-44	BH-69: Mater Hospital	• The methodology for the construction of the D-wall for the station box to the front of the Mater Hospital is to be devised in conjunction with the Metrolink PCA and is to take into account the nature of the construction of the retaining wall and boundary wall at the front of

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		the hospital and the nature of the hospital building. Vibration and settlement monitors are to be provided in the hospital building in the vicinity of the works with alarms to identify any vibration that exceeds acceptable levels. In the event of the alarms being triggered works is to cease until the cause of the vibration is identified and systems modified to prevent recurrence. The boundary walls are to be protected by means of hoardings to be erected prior to the commencement of construction. Following the PCA condition surveys of the windows a hierarchy of mitigation measures for necessary interventions will be agreed with the property owner and noise and air quality specialists to safeguard building occupants.
AHI-45	BH-70: Four Masters Park	• A good hoarding with images of the park or images sensitive to the receiving environment is to be erected and to be in place for the duration of the works. The park is to be reinstated following completion of the construction of the station, though the park site will now incorporate an access to the station, ventilation shafts and other structures related to the station and a revised layout to the park and railings will be implemented.
AHI-46	BH-71: Four Masters Cross	• The cross is to be lifted and removed to a place of secure storage in accordance with a conservation method statement to be provided by the PCA and it is to receive necessary conservation and repairs. On completion of the construction of the station the cross is to be returned to the park and re-erected in a place to be agreed as part of the landscaping design of the park and this is to be carried out in accordance with a conservation method statement to be prepared by the PCA.
AHI-47	BH-70: Railings, gates and plinth walls at Four Masters Park.	• The gates, railings and plinth walls are to be removed in accordance with a conservation method statement to be prepared by the PCA and are to be brought to a place of secure storage during the works. Following construction of the station box the gates, railings and plinth walls are to be reinstated on a revised alignment in accordance with a conservation method statement to be prepared by the PCA.
AHI-48	BH-73: Healing Hands sculpture	• The sculpture is to be lifted and removed to a place of secure storage in accordance with a conservation method statement to be provided by the PCA. On completion of the construction of the station the sculpture is to be returned to the park and re-erected in a place to be agreed with the park owners as part of the landscaping design of the park and this is to be carried out in accordance with a conservation method statement to be prepared by the PCA.
AHI-49	BH-74: Granite kerbing adjacent to Four Masters Park on Eccles Street and Berkeley Road.	• The kerbing is to be lifted and removed to a place of secure storage in accordance with a conservation method statement to be provided by the PCA. On completion of the construction of the station the kerbing is to be returned to the site and re-used as part of the paving scheme in Eccles Street and Berkeley Road and this is to be carried out in accordance with a conservation method statement to be prepared by the PCA.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
AHI-50	BH-75: Historic lamp standards on Eccles Street	• The removal of the lamp standards is to be carried out by the specialist heritage contractors to the specifications of the PCA and re-erected on or close to their original locations by that section as part of the reinstatement of the street surfaces and street furniture.
AHI-51, AHI-52	BH-76: St Joseph's Church, Berkeley Road	• The methodology for the construction of the D-wall for the station box to the side of St Joseph's Church is to be devised in conjunction with the Metrolink PCA and is to take into account the nature of the construction of the church. Vibration monitors are to be provided in the church in the vicinity of the works with alarms to identify any vibration that exceeds acceptable levels. In the event of the alarms being triggered works is to cease until the cause of the vibration is identified and systems modified to prevent recurrence. • The stone pier, gate, railings and plinth wall are to be removed in accordance with a conservation method statement to be prepared by the PCA and are to be brought to a place of secure storage during the works. The grotto is to be relocated within the grounds of the church on a short-term basis and in modified format in accordance with a method statement to be prepared by the PCA and in consultation with the church authorities. Following construction of the station box the stone pier, gate, railings and plinth wall and grotto are to be reinstated to original locations in accordance with a conservation method statement to be prepared by the PCA.
AHI-53	BH-77: Stone setts at access to St Joseph's Church on Eccles Street	• No excavation is to take place in such proximity to the setts that would damage them and the programme for traffic management and the design for upgrading the paving in Eccles Street is to accommodate this area of stone setts without disturbing them.
AHI-54	BH-78: Granite kerbing on both sides of Berkeley Road to the west of the Mater Hospital	• The kerbing is to be lifted and removed to a place of secure storage in accordance with a conservation method statement to be provided by the PCA. On completion of the construction of the station the kerbing is to be returned to the site and re-used as part of the paving scheme in the northern section of Berkeley Road and this is to be carried out in accordance with a conservation method statement to be prepared by the PCA.
AHI-57	BH-69: Mater Hospital	• Setting of protected structure to be reinstated on completion of works and no further mitigation is necessary.
AHI-58	BH-76: St Joseph's Church, Berkeley Road	• The provision of landscaping within the Four Masters Park will reduce the impact of the Project on the setting of the church.
AHI-59	BH-63 and BH-64: 20 and 21 Berkeley Road	• The impact of the works has been reduced as much as possible at design stage and no further mitigation is possible.
AHI-60	BH-70: Four Masters Park	• The impact of the works on the park has been mitigated through design of the station and of the landscaping.
AHI-61	BH-76: St Joseph's Church, Berkeley Road	• This has been mitigated through the sensitive design of the scheme and hence no further mitigation is necessary.
AHI-62	BH-274: 42 O'Connell Street Upper	• The demolition of number 43 O'Connell Street Upper and the structures to the rear and the propping of number 42 O'Connell Street Upper are to be carried out in accordance with a method

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		statement compiled by the PCA or by the appointed contractor's conservation architect and approved by the PCA and vibration and settlement monitoring equipment is to be installed in number 42 and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-63	BH-275: O'Connell Hall, O'Connell Street Upper	• The demolition of number 43 O'Connell Street Upper and the structures to the rear and the propping of the O'Connell Hall are to be carried out in accordance with a method statement compiled by the PCA or by the appointed contractor's conservation architect and approved by the PCA and vibration and settlement monitoring equipment is to be installed in the O'Connell Hall and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-64	BH-276: 43 O'Connell Street Upper	• Prior to the demolition of number 43 O'Connell Street Upper the building is to be recorded to English Heritage level 3. The recording of associated coal cellars to facilitate propping of the facades, the demolition and the propping of the façade are to be carried out in accordance with a method statement compiled by the PCA or by the appointed contractor's conservation architect and approved by the PCA and vibration and settlement monitoring equipment is to be installed in the retained façade and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-65	BH-277: 44 O'Connell Street Upper	• Prior to the demolition of number 44 O'Connell Street Upper the building is to be recorded to English Heritage level 3. The recording of associated coal cellars to facilitate propping of the facades, the demolition and the propping of the façade are to be carried out in accordance with a method statement compiled by the PCA or by the appointed contractor's conservation architect and approved by the PCA and vibration and settlement monitoring equipment is to be installed in the retained façade and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-66 ÷ AHI-70	BH-278: 45 O'Connell Street Upper BH-279: 52-54 O'Connell Street Upper BH-280: 55-56 O'Connell Street Upper	• Prior to demolition, each building is to be recorded to English Heritage level 3. The recording of associated coal cellars to facilitate propping of the facades, the demolition and the propping of the building façades are to be carried out in accordance with a method statement compiled by the PCA or by the appointed contractor's conservation architect and approved by the PCA and vibration and settlement monitoring equipment is to be installed in the retained façade and monitored to ensure that at no time do vibrations or

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
	BH-281: 57 O'Connell Street Upper BH-282: 58 O'Connell Street Upper	settlement exceed given limits. The equipment is to be monitored and in the event of limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-71	BH-283: 59 O'Connell Street Upper	• The demolition of number 58 O'Connell Street Upper and the structures to the rear and the propping of number 59 O'Connell Street Upper are to be carried out in accordance with a method statement compiled by the PCA or by the appointed contractor's conservation architect and approved by the PCA and vibration and settlement monitoring equipment is to be installed in number 59 and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-72	BH-283: 59 O'Connell Street Upper	• Prior to clearance of the site at the rear of number 59 O'Connell Street Upper to facilitate the works the proposed work area is to be recorded by photographs and written description, following which the buildings to be retained are to be protected against any incursion or damage arising from the construction. Vibration and settlement monitoring equipment is to be installed in the buildings at the rear of number 59 and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-73	BH-284: 60 O'Connell Street Upper	• Prior to the demolition of 60a O'Connell Street Upper (BH-285) and the wall at the rear of number 60 O'Connell Street Upper to facilitate the works the proposed work area is to be recorded by photographs and written description, following which the buildings to be retained are to be protected against any incursion or damage arising from the construction. Vibration monitoring equipment is to be installed in number 60 and monitored to ensure that at no time do vibrations or settlement exceed given limits. The equipment is to be monitored and in the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved.
AHI-74	BH-285: 60a O'Connell Street Upper/19 Henry Place	• The building is to be recorded by means of measured drawings, photographs and written description prior to its demolition and the results lodged in Dublin City Library and in the Irish Architectural Archive.
AHI-75	BH-294: Historical paving in Moore Lane	• Prior to the commencement of works in the Moore Lane area the street surface is to be recorded by photographs and written description and the presence of surviving historical paving beneath the surface is to be determined by means of ground-penetrating radar. A conservation method statement is to be prepared by the PCA for the lifting of the stone setts and their removal into safe storage and their reinstatement on completion of the works,

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		augmented by compatible setts as necessary, in consultation with the relevant statutory authorities.
AHI- 76	BH-304: 14 Moore Street	• The exclusion zone established by the Ministers office is to be maintained at all times and settlement and vibration monitoring is to be carried out as a precautionary measure. The threshold limits are to be agreed with the Ministers office. In the event of threshold limits being exceeded all work in the vicinity is to stop until the cause of the issue is identified and resolved are to be protected from potential damage by means of strong hoardings during construction.
AHI-77, AHI-78, AHI-79	BH-305: 15 Moore Street BH-306: 16 Moore Street BH-307: 17 Moore Street	• An exclusion zone is to be provided around numbers 14 to 17 Moore Street, extending to Moore Lane, and the structures adjacent to the haul route are to be protected from potential damage by means of strong hoardings during construction.
AHI-81	BH-274, BH-275: 42 O'Connell Street Upper and O'Connell Hall	• The identified architectural constraints within this section of the study area are to be surveyed prior to the commencement of works to ascertain their condition and surveyed again on completion of the works to ensure that no damage has occurred as a result of the works. Any damage to architectural heritage receptors is to be repaired in accordance with a method statement to be prepared by the PCA or by the appointed contractor's conservation architect and approved by the PCA.
AHI- 82	BH-283 to BH-284: 59 to 60 O'Connell Street Upper	• The identified architectural constraints within this section of the study area are to be surveyed prior to the commencement of works to ascertain their condition and surveyed again on completion of the works to ensure that no damage has occurred as a result of the works. Any damage to architectural heritage receptors is to be repaired in accordance with a method statement to be prepared by the PCA or by the appointed contractor's conservation architect and approved by the PCA.
AHI- 83	BH-409: Tara Station and Loop Line railway	• An appropriate instrument monitoring strategy is to be development and implemented during construction in accordance with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI- 84, AHI- 85	BH-410: Luke Street railway bridge BH-411: Townsend Street railway bridge	• A detailed assessment is to be carried out at detailed design stage to determine the extent of predicted settlement and a solution devised and implemented to obviate the impacts in line with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI- 86, AHI- 87	BH-413: 22 Luke Street BH-414: 24 Townsend Street	• The buildings are to be recorded by the PCA by means of photography and written description to English Heritage level 2 prior to demolition.
AHI-88	BH-502: St Stephen's Green Park.	• At the completion of the construction of the station the park layout will be reinstated as near to the original layout as possible given that there will be structures associated with the station within the park. The revised entrance arrangement and infrastructure facilities in the north-eastern corner are to be provided with landscaping. The site

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
		management and hoardings to be erected are to be agreed with the OPW and the Minister's office (Housing) prior to the commencement of development on this site.
AHI-89	BH-503: St Stephen's Green Park: railings, gates and plinth walls of perimeter boundary.	• The railings, gates and plinth walls are to be removed by a specialist heritage contractor in accordance with a method statement to be prepared by the PCA, brought into secure storage for the duration of the works and conserved as necessary. At the completion of the construction of the station the railings, plinth wall and gates will be reinstated in their original locations in accordance with a method statement prepared by the PCA. All works of removal, transportation, storage and reinstatement are to be supervised by the PCA and agreed with the OPW and the Minister's office (Housing).
AHI-90	BH-504: St Stephen's Green Park: surrounding bollards and traditional-style lamp posts	• The bollards and lamp standards are to be removed by a specialist heritage contractor in accordance with a method statement to he prepared by the PCA, brought into secure storage for the duration of the works and conserved as necessary. At the completion of the construction of the station the bollards and lamp standards will be reinstated in their original locations in accordance with a method statement prepared by the PCA. All works of removal, transportation, storage and reinstatement are to be supervised by the PCA and agreed with the OPW and the Minister's office (Housing).
AHI-91	BH-505: St Stephen's Green Park: Wolfe Tone monument, including Famine sculpture	• The Wolfe Tone monument, granite columns and Famine sculpture are to be removed in accordance with a method statement to he prepared by the PCA and brought into secure storage for the duration of the works. At the completion of the construction of the station the monument will be re-erected in its revised location in accordance with a method statement prepared by the PCA. All works of removal, transportation, storage and re-erection are to be supervised by the PCA and agreed with the OPW and the Minister's office (Housing).
AHI-92	BH-522: Historical paving in Hume Street	• The design of the widening of the footway is to allow for the retention in situ of the historical paving, coalhole covers and kerbing, and all works to the paving are to be carried out in a way that will ensure the protection of the cellars beneath.
AHI-93	BH-499 to BH-517: 39 to 56 St Stephen's Green	• Works to provide or divert utilities in the area to the front of these houses will be carried out in accordance with a method statement to be prepared by the PCA in order to minimise the impact on cellars.
AHI- 94	BH-534 to BH-536: 15 to 17 Hume Street	• Works to provide or divert utilities in the area to the front of these houses will be carried out in accordance with a method statement to be prepared by the PCA in order to minimise the impact on cellars.
AHI-95	BH-495 to BH-501 and BH-509 to BH-517: Buildings on northern and eastern sides of St Stephen's Green	• Settings of protected structures will be reinstated on completion of works.

Mitigation No.	Location	Description of Mitigation and/or Monitoring Measures
AHI-96	BH-495: St Stephen's Green Park	• The works to the park have been mitigated by design.
AH-97	BH-579: Carroll's Building, Grand Parade	• A detailed assessment is to be carried out at detailed design stage to determine the extent of predicted settlement and a solution devised and implemented to obviate the impacts in line with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI-98	BH-580: Viaduct of former Harcourt Street railway line	• An appropriate instrument monitoring strategy is to be development and implemented during construction in accordance with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI-99	BH-581 and BH-582: Dartmouth Square ACA and granite kerbing in Dartmouth Square	• Works to provide or divert utilities within the Dartmouth Square ACA will be carried out in accordance with a method statement to be prepared by the PCA in order to minimise the impact historic granite steps, kerbing and lamp standards.
AH-100	BH-620: 19 and 19a Dartmouth Road	• The buildings are to be recorded by means of photography and written description to English Heritage level 2 prior to demolition.
AHI-101	BH-618: Railway bridge at Dartmouth Road	• A detailed assessment is to be carried out at detailed design stage to determine the extent of predicted settlement and a solution devised and implemented to obviate the impacts in line with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI-102, **AHI-103,** **AH-104**	BH-579: Carroll's Building, Grand Parade	• The lift and staircase are to be kept as small as possible and impinge on the frontage of the protected structure to the least possible extent and the design is to be such as to compliment that of the protected structure and is to be reversible, not being tied into the building. • The works area to the front of protected structure will be reinstated on completion of works and no further mitigation is necessary. • The provision of a lift, stairs and a widened pavement will be mitigated by design to reduce the impact on the protected structure.
AHI-105	BH-663: Railway bridge at Northumberland Road	• A detailed assessment is to be carried out at detailed design stage to determine the extent of predicted settlement and a solution devised and implemented to obviate the impacts in line with the recommendations in the Building Damage Report (see Appendix A5.17 of the EIAR).
AHI-106	BH-702: St Doolough's Bridge	• The trench for the cable is to be dug in accordance with a method statement to be prepared by the PCA to ensure that no damage occurs to the structure of the bridge.

6.9 Population and Human Health

The contractor(s) are required to implement the measures in Table 6.11 in relation to population and human health during construction. Chapter 11 (Population) and Chapter 10 (Human Health) of the EIAR outline the baseline population environment in addition with proposed mitigation measures.

Table 6.11: Population and Human Health Measures

Topic	Environmental Control Measure
General Measures to Mitigate Construction Impacts **PL1**	• 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. • Where practicable, use short sections of transparent hoarding or include viewing windows in the hoarding at locations popular for amenity such as along the Royal Canal and Grand Canal, at St Stephen's Green. Further, works should be staggered wherever possible and remove hoarding as soon as it is no longer needed to mitigate against severance. • Implement and monitor safe working practices, in accordance with the relevant legislation during construction to protect the workers and visitors to the construction sites.
Access arrangements **PL2**	• 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. • Full implementation of the range of dust minimisation measures detailed in the mitigation section of Chapter 16 (Air Quality) of the EIAR. • Full implementation of the range of noise minimisation measures detailed in mitigation section of Chapter 13 (Airborne Noise & Vibration) and Chapter 14 (Ground-borne Noise & Vibration) of the EIAR. • 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(s) and the building occupants / owners. • Installation of the site hoarding/fencing (2.4m 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 (The Landscape) of the EIAR. 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. Further, works should be staggered wherever possible, and hoarding removed as soon as it is no longer needed to mitigate against severance. • Full implementation of the range of mobility and traffic management measures including Scheme Traffic Management Plan 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.

Topic	Environmental Control Measure
Informing Stakeholders **PL3**	• 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) will 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. • Any 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) will be avoided. • Community Relations Officers (CRO's) will 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's 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's will work closely with Transport Infrastructure Ireland and the appointed contractor(s) 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. • Reinstate 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.
Human health mitigation measures	• No specific mitigation, over and above that outlined in the relevant chapters, is proposed for human health.

6.10 Agronomy

Temporary land occupation and permanent land take of agricultural land will be required for the proposed Project. The contractor(s) are required to implement the measures in Table 6.12 in relation to agronomy during construction. Refer to Chapter 23 (Agronomy) of the EIAR for a list of existing farms along the proposed Project.

Table 6.12: Agronomy Measures

Topic	Environmental Control Measure
General Measures **AG1**	• Boundary fencing will be erected to prevent disruption to adjacent land. • Mitigation measures will be employed to minimise the impacts on farms and allow the continuous operation of all affected holdings.
Farm operations **AG2**	• 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. • All requisite measures will be employed to minimise the impacts on farms and allow the continuous operation of all affected holdings during the Construction Phase. 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

Topic	Environmental Control Measure
	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 Phase. 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.
Reinstatement **AG3**	• All reinstatement work will be undertaken in accordance with the requirements outlined in this Outline CEMP and the Landscape Plans devised for the proposed Project (refer to Chapter 27: The Landscape of the EIAR).
Noticing **AG4**	• Individual landowners/occupiers will 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.
Engagement **AG5**	• A key liaison person will be appointed during the Construction Phase and will liaise with landowners / occupiers throughout the construction, reinstatement and handover phases to address any queries that landowners / occupiers and stakeholders may have throughout the proposed Project. They will facilitate communications between affected landowners / occupiers to facilitate the reorganisation of farm enterprises during critical times during the Construction Phase. They will also consult with landowners / occupiers to identify any special management requirements such as specific on farm biosecurity measures and or disease status of farms affected.
Land Take (Permanent and Short-Term) **AG6**	• Temporary land occupation and permanent land take will be required for the proposed Project. Land acquired on a temporary basis during the Construction Phase will be reinstated by agreement and returned to the landowner / occupier and compensation will be payable under the statuary 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.
Temporary Loss of Services (Water and Electricity) **AG7**	• 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).
Nuisance Caused by Increased Traffic Volume due to Construction Traffic **AG8**	• A traffic management plan will be put in place for the Construction Phase to reduce nuisance to landowners / occupiers and other road users, refer to Scheme Traffic Management Plan (STMP) located in Appendix A9.5 of the EIAR. The STMP sets out management and mitigation measures to minimise the transport impact during the Construction Phase of the proposed Project.
Nuisance Caused by Noise Emanating from the Construction Phase Works **AG9**	• Mitigation measures will be designed to address specific issues raised by landowners / occupiers. In recognition of the need to work with landowners / occupiers, specific mitigation measures most suitable to individual farm situations will be developed (see Section 6.2 and Chapter 13:Airborne Noise & Vibration and Chapter 14: Ground-borne Noise & Vibration of the EIAR). This will involve continued dialogue with landowners to determine the most appropriate mitigation measures for each agricultural holding.

Topic	Environmental Control Measure
Nuisance Caused by Dust Emanating from Construction Phase Works **AG10**	Refer to Air Quality mitigation measures AQ1, AQ4, AQ5, AQ9 -12 and AQ16-19.
Impact on Shelter **AG11**	• Any shelter removed will be reinstated. • Re-planting of hedgerows will reflect the original species mix. Refer to Chapter 27 (The Landscape) of the EIAR for further details. • Where loss of shelter causes disturbance during the regrowth period, compensation may be payable under the statutory process.
Disturbance to Farm Operations **AG12**	• Consultation and liaison between the landowners / occupiers and the contractor(s) during the Construction Phase 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.
Interruption to Drainage Systems **AG13**	• 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.
Spread of Noxious Weeds and Invasive Species when Soil is Exposed **AG14**	• 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 Species on National Roads (TII, December 2020). A Non-Native Invasive Species Management Plan has been prepared and included in in Appendix A15.8 of the EIAR. 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 of the EIAR for further information).
Spread of Animal Diseases **AG15**	• Prior to the start of construction, any disease protocols and farm biosecurity measures will be identified and complied with to protect and prevent the spread of pests and diseases. • During the detailed design phase, fencing requirements will be discussed with landowners / occupiers to ensure that boundaries remain stockproof to prevent mixing of livestock. Livestock are present for LO1 PR1, LO2 PR2, LO7, PR1all 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. • The appointed contractor(s) will comply with the Department of Agriculture Food and the Marine (DAFM) regulations in relation to crops and livestock diseases. • 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.

Topic	Environmental Control Measure
	• Procedures during the Construction Phase 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.
Spread of Soil-Borne Diseases **AG16**	• 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.

6.11 Landscape

The mitigation measures proposed in relation to the landscape during the Construction Phase revolve primarily around the implementation of appropriate site management procedures during the construction works – such as the placement of compounds, storage of materials, control of vehicular access, control of site/compound lighting and effective dust and dirt control measures. A key specific measure to reducing landscape and visual impact is the siting of construction compounds and tunnel launch sites in locations where a minimum of advance clearing is required, i.e., generally large flatter areas of low-quality landscape and low visual sensitivity.

The contractor(s) are required to implement the measures in Table 6.13 in relation to the landscape during construction. Chapter 27 (The Landscape) of the EIAR outlines the baseline landscape environment and proposed mitigation measures.

Table 6.13: Landscape and Visual Measures

Topic	Environmental Control Measure
Trees **L1**	• Where specific proposals to ensure the effective retention of existing mature trees are included within the proposed Project, these will contain specific measures relating to the protection and maintenance of tree root zones during construction (robust protective fencing, supplementary watering). Where necessary these will be specific to individual trees and relate to the characteristics of the relevant tree species. The contractor(s) will adhere to the tree protection measures set out in the Arboricultural Impact Assessment. • The contractor(s) will adhere to the planting scheme to be agreed with the relevant authority for the proposed Project. This planting scheme will include: the tree species mix, numbers, density and sizes; tree preparation, presentation, transportation, lifting and placement techniques, as well as; the ground preparation, rootball securing technique, backfill materials and methods, and the specific establishment maintenance for each. These measures are required to minimise the risk to tree establishment and maximise their viability and future rates of growth.
Drainage **L2**	• The contractor(s) will adhere to the agreed design details for 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.
Soft Landscaping	• The contractor(s) will adhere to the soft landscape designs to be agreed with the local authorities for the proposed Project, including planting and seeding works. These will include details of all ground preparation works (including

Topic	Environmental Control Measure
L3	any soil ameliorants), plant species/cultivars, numbers/densities, sizes, presentation/root ball preparation, planting methods and initial maintenance for each softworks area. • Details of the proposed maintenance and management strategy for all planting, will include the proposed initial period of establishment for which the Contractor(s)/Contracting authority will be responsible. This will also include 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.
Public Realm **L4**	• The contractor(s) will adhere to the details of the landscape hardworks design to be agreed with the local authorities for the public realm associated with each station, including paving materials, edgings and kerbs, street furniture and signage. • A Construction Lighting Plan will be prepared by the appointed contactor(s) for each site, based upon the principles set out in the Construction Lighting document (see Appendix A5.18 of the EIAR). Temporary site lighting will be arranged such that visual intrusion and light spillage is minimised. • 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 should include details of the lighting elements within the public realm associated with each station, particularly in respect of luminaire and column type, height, finish.
Fencing **L5**	• Details of fencing, mesh netting 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.

6.12 Infrastructure and Utilities

The contractor(s) are required to implement the measures in Table 6.14 in relation to infrastructure and utilities during construction. Chapter 22 (Infrastructure & Utilities) of the EIAR outlines the baseline environment in addition with proposed mitigation measures.

Table 6.14: Infrastructure and Utilities Measures

Topic	Environmental Control Measure
Utility Diversions **IU1**	• To ensure that the operation of the proposed Project is not affected by future utility maintenance or diversions activities, utility services will generally be diverted away from the alignment where necessary. • In some cases, planned service disruptions will be required to facilitate the connection of existing services to the newly diverted services. In such cases, cognisance of the requirements of those premises served by the utility will be taken in determining the type, duration and phasing of the planned disruption. The duration of service interruption will be agreed with the relevant utility provider, in accordance with their service level/business interruption requirements, however in most cases the duration of disruption should be no more than a number of hours. • The contractor(s) will plan, agree with the relevant utility stakeholders (and relevant agencies) and manage utility diversions, protection measures and the installation of new utilities. This will be carried out in consultation with the utility provider who has ownership of the proposed utility. • The nominated contractor(s) will be required to submit diversion and connection proposals to the relevant utility company for their approval prior to works being carried out. As part of the planning process, preliminary agreements have already been made with the relevant stakeholders. • Relevant approvals will be in place prior to any work commencing on a utility or service.

Topic	Environmental Control Measure
	• Where planned service disruptions are required to facilitate the connection of existing services to newly diverted services, the contractor(s) will have cognisance of the requirements of those premises served by the utility. The duration of service interruption will be agreed with the relevant utility provider, in accordance with their service level/business interruption requirements.
Demolition of Buildings and Structures **IU2**	• The contractor(s) will undertake a detailed pre-demolition appraisal of all buildings and structures to be demolished by means of surveys and appropriate assessments. • Pre-demolition surveys will be undertaken to confirm the proposed demolition methodology and provide sufficient detail to allow the full management of the demolition and resulting materials. Pre-demolition surveys will include appropriate hazardous materials surveys to identify all asbestos containing materials and other hazardous materials that may be present. • Based on the findings of these surveys, a Demolition Plan will then be prepared by the contractor(s) and submitted for approval by TII prior to commencement of demolition activities. The requirements of the Demolition Plan are set out in The Demolition General document (see Appendix A5.8 of the EIAR). • The Demolition Plan would also be accompanied by a structural report assessing the stability of the building to be demolished and all affected buildings, structures, streets, land and services.
Stakeholder Engagement **IU3**	• The contractor(s) will inform members of the community and businesses directly affected by any construction activity of a particularly disruptive nature which is likely to impinge on their property or business activities, in line with the TII Community Engagement Strategy. This will include interruption of utility services.
Settlement **IU4**	• Analysis of the potential for ground settlement on utilities, buildings, bridges and other infrastructure has been undertaken. Some locations will need further investigation and refinement of the analysis, as defined in the technical study reports (refer to Appendix A5.17: Building Damage Report and Appendix A22.1: Summary of Utilities Settlement Analysis Study). This will be undertaken by the contractor(s). • 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. Any required mitigations will be designed and agreed with the asset owner. • Each building identified as requiring further settlement assessment will be considered individually. A detailed structural survey will be carried out to provide additional information in order to determine the structural form and condition of each building. This will be followed by a detailed analysis of how individual elements of the building would be affected by the predicted ground movements. The method and extent of the detailed analysis will be determined on a case-by-case basis. Following this, the requirement for any structural protection works or ground treatment works shall be considered. Depending on the level of risk, either no action will be required, buildings will be monitored during construction, or mitigation measures will be implemented. Mitigation measures will be applied in order to ensure that any residual impacts of settlement on all buildings will be at an acceptable level and will include, as appropriate: – Enhanced at source means (reduced face loss due to TBM excavation or ground treatment adjacent to shafts and station boxes) – underpinning of the building; – lateral support systems for excavations; and – post-construction repair work. • Depending on the level of risk, buildings and structures will be monitored during construction. Ground movements will be monitored against specific trigger values to ensure critical damage is avoided. • The contractors will prepare, inter alia: – Ground Movement Management Plans;

Topic	Environmental Control Measure
	– Groundwater Monitoring Plans; and – Instrumentation and Monitoring Plans. • The contractor(s) will employ appropriate techniques to control and limit, insofar as reasonably practicable, the impacts of settlement.

7. References

Legislation

- Air Quality Standards Regulations 2000 (S.I. No. 271 of 2002)
- Arterial Drainage Act 1945
- Road Traffic (Construction and Use of Vehicles) Regulations 2003, S.I. No. 5/2003
- European Communities Noise Emission by Equipment for Use Outdoors Regulations, 2001 as amended in 2006
- European Communities (Environmental Noise) Regulations 2006 (S.I. No. 140/2006)
- European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments)
- European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988)
- European Communities EC Council Decision 2003/33/EC of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC
- European Communities (Waste Directive) Regulations 2011, Article 27
- European Communities (Birds and Natural Habitats) Regulations, 2011
- European Communities (Environmental Noise) Regulations 2018 (S.I. No. 549 / 2018)
- European Parliament and of the Council Directive Waste Framework Directive 2008/98/EC
- National Monuments Act 1930 (as amended)
- Regulation (EC) No. 1013/2006 of the European Parliament and of the Council of 14 June 2006 on Shipments of Waste.
- Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, S. I. No. 386/2006
- Safety, Health and Welfare at Work (Exposure to Asbestos - Amendment) Regulations 2010, S.I. No. 589/2010
- Safety, Health and Welfare at Work (Construction) Regulation, 2013 (S.I. No. 291 of 2013)
- Waste Management Act, 1996
- Waste Management (Hazardous Waste) Regulations 1998 - S.I. No. 163 of 1998
- Waste Management (Shipments of Waste) Regulations 2007 – S.I. No. 419 of 2007
- Wildlife Acts 1976-2012

Standards

- British Standard (BS) 6164:2019 Health and Safety in Tunnelling in the Construction Industry. Code of practice. British Standard Institute
- British Standard (BS) 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (BSI 2009 +A1 2014a)
- British Standard BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 - 2) (BSI 2009 +A1 2014b)

- British Standard BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385 - 2). (BSI 1993)
- British Standard BS 6472 (2008) Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472 - 1). (BSI 2008)
- British Standard BS ISO 4866: 2010: Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures
- British Standard BS 8233:2014 Sound Insulation and Noise Reduction for Buildings (hereafter referred to as BS 8233 (BSI 2014)
- British Standard BS 4142 (2014+A1 2019) Methods for rating and assessing industrial and commercial sound (hereafter referred to as BS 4142) (BSI 2014 +A1 2019)
- British Standard BS 8500-1:2015+A2:2019 Concrete. Complementary British Standard to BS EN 206 - Method of specifying and guidance for the specifier
- British Standards Institute PAS 2080: 2016 Carbon management in infrastructure
- Environmental Protection Agency (EPA) Protocol for The Measurement of Radon In Homes & Workplaces, May 2019
- EPA Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects (EPA 2021)
- EPA '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).
- German Standard DIN 4150-3:2016 "Vibrations in buildings - Part 3: Effects on structures
- International Organisation for Standardisation (ISO) 14001: 2015 Environmental Management Systems
- International Organisation for Standardisation (ISO) (2016) ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016)
- International Organisation for Standardisation (ISO) (2017) ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017)
- International Organisation for Standardisation (ISO) 5348: 2021: Mechanical vibration and shock - Mechanical mounting of accelerometers
- National Standards Authority of Ireland (NSAI) I.S. 360:2019 - Code of Practice: Safe Use of Cranes in the Construction Industry

Guidance

- Bat Conservation Ireland, Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers, 2010
- Bat Conservation Trust, Bats and Lighting in the UK – Bats and the Built Environment Series, 2008
- Building Research Establishment (BRE) Special Digest 1, Concrete in Aggressive Ground (SD1:2005)
- Construction Industry Research and Information Association (CIRIA) Report 689 – Culvert Design and Operation Guide
- Construction Industry Research and Information Association (CIRIA) publications 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

- Dublin City Councils Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (DCC, 2018)
- DEHLG[2] Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, 2006
- EPA Publication ''Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous'
- EU Construction and Demolition Waste Protocol and Guidelines (European Commission 2018)
- Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan - The National Roads Authority (NRA), 2007
- Health Services Executive (HSE), National Guidelines for the Prevention of Nosocomial Aspergillosis, 2018
- Inland Fisheries Ireland (IFI) Guidelines on the Protection of Fisheries During Construction Works and Adjacent to Waters 2016
- Inland Fisheries Ireland (IFI) Biosecurity Protocol for Field Survey Work, 2010
- Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction 2014
- Institute of Lighting Professionals, Guidance Notes for the Reduction of Obtrusive Light, GN01 2011
- Institute of Geologists of Ireland, Guidelines for Drilling Wells for Private Water Supplies (2007)
- National Roads Authority (NRA) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes, 2008
- National Roads Authority (NRA) Guidelines for the Protection and Preservation of Trees Hedgerows and Scrub, 2006
- National Roads Authority (NRA) Guidelines for the Treatment of Badgers prior to the Construction of a National Road Scheme, 2005
- National Roads Authority (NRA) Guidelines for the Treatment of Bats during the Construction of a National Road Scheme, 2005
- National Roads Authority (NRA) Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes, 2008
- National Roads Authority (NRA) Guidance on the Management of Noxious Weeds and Non-Native Invasive Plants Species on National Road Schemes, 2010
- National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, 2009
- National Roads Authority (NRA) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Roads Schemes, 2011
- National Roads Authority (NRA) Specification for Road Works Series 600 – Earthworks (TII 2013)
- National Disease Surveillance Centre, National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities, 2002

[2] Now Department of Communications, Climate Action and Environment

- National Guidelines for the Prevention of Nosocomial Aspergillosis (HSE 2018)
- Office of Public Works (OPW) Guidelines for Planning Authorities: The Planning System and Flood Risk Management (OPW and DoEHLG 2009)
- Road Safety Authority (RSA) Guidelines on Maximum Weights and Dimensions of Mechanically Propelled Vehicles and Trailers, Including Manoeuvrability Criteria (RSA 2020)
- Surface Water Drainage & Flood Risk Assessment Report, Jacobs/IDOM, 2021
- Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (TII 2004)
- Transport Infrastructure Ireland (TII) Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes (TII 2014)
- Transport Infrastructure Ireland (TII) Road Drainage and the Water Environment (TII, 2015)
- Transport Infrastructure Ireland (TII), The Management of Waste from National Road Construction Projects GE-ENV-01101 (TII, 2017)
- Transport Infrastructure Ireland (TII), Code of Practice for Archaeology (2017)
- Transport Infrastructure Ireland (TII), The Management of Invasive Alien Plant Species on National Roads – Technical Guidance, GE-ENV-01105, 2020
- Transport Infrastructure Ireland (TII) Airborne and Groundborne Noise Mitigation Policy
- Transport Infrastructure Ireland (TII) Publication – Design of Outfall and Culvert Details (Doc Ref. DN-DNG-03071)
- Transport Infrastructure Ireland (TII) Publications - Drainage of Runoff from Natural Catchments (Doc Ref. DN-DNG-03064).

Strategy

- Dublin City Council Heavy Goods Vehicle (HGV) Management Strategy (DCC, 2007)
- Eastern-Midlands Region Waste Management Plan for 2015-2021 (EMWR, 2015)
- TII Community Engagement Strategy

Appendix A. Example Ecological Control Sheet (General)

Examples Ecological Control Measure Sheet – Wildlife (General)
Environmental Control Measures – Pre-Construction Ecological Walkover
The Reference Documents will identify animals, plants and/or habitats that require special treatment during the Construction Phase. However, because there is usually a time lag between the carrying out of fieldwork for the EIAR and the actual commencement of ground clearance, an ecological walkover by competent ecologists will take place immediately before any clearance work begins. The Environmental Manager will arrange for the ecological walkover to take place and is responsible for reporting to the Construction Manager and Site Agents any findings that warrant alterations in the planned clearance. During the walkover the ecologist(s) will identify the areas specified in the EIAR that require special treatment. The Environmental Manager will ensure that these areas are clearly identified (initially using spray paint) and appropriately fenced off.
Environmental Control Measures – Clearance Authorisation
Clearance work in an area will not commence until the Environmental Manager has given authorisation for clearance within approved chainages. A suggested Clearance Authorisation Form is presented in the next page.
Responsibilities
The Environmental Manager will arrange for an ecological walkover. He/she will issue clearance authorisation to the Site Agent or Foreperson. The Site Agent will not commence clearance until he/she has signed the clearance authorization and has agreed to any special conditions.
References
Examples of Environmental Control Measure Sheets for Bats, Badgers and Tress and Hedgerows can be found in: Guidelines for the Creation and Maintenance of an Environmental Operating Plan (NRA, 2007)

Authorisation for Clearance

Form 2

Title:	Authorisation for Clearance			
Page:		Ref. No.:		Issue No.:
Issued by:		Approved by:		Date:

The area between chainage _____ and chainage _____ has been surveyed by _____(Ecologist's name) o

ready for clearance.

Signed:	_____ Environmental Manager or Designate	
Authorisation Received by:	_____ Site Agent or Foreperson	D

Special Instructions: