
Chapter 27

Summary of Mitigation and Monitoring Measures

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27. SUMMARY OF MITIGATION AND MONITORING MEASURES

27.1 Introduction

Annex IV(7) of the amended EIA Directive (2014/52/EU) requires: *A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.*

This chapter presents a summary of the mitigation and monitoring measures identified as a result of undertaking the environmental impact assessments carried out in the preceding chapters of this EIAR.

From the inception of the design and environmental assessment process of the proposed DART+ West project (referred to hereafter as the 'proposed development/proposed project') the project team has strived to avoid, prevent and reduce adverse effects which are incorporated into the design drawings and specifications of the project that have been assessed as part of this EIAR.

Avoidance of impacts is most applicable at the earliest stages of a project, whilst prevention has taken place during the design and environmental assessments process between the design team and EIA team. Mitigation is a last resort and can include a remedy or offsetting adverse effects. For example, this can apply when projects cannot avoid significant effects due to their need to locate on a particular site, etc.

Where likely significant environmental effects have been identified during the environmental impact assessment process, measures have been proposed to mitigate these effects as much as reasonably possible, with any residual effects identified in the relevant chapters of this EIAR. The objective of this chapter is to provide a central location where all measures from the preceding chapters are presented together for both ease of reference and inclusion in the contract documents at a later stage of the project.

All of the mitigation and monitoring commitments detailed below are incorporated into the Construction Environmental Management Plan (CEMP) submitted as part of this Railway Order application.

27.2 General Mitigation and Monitoring Measures

The planning and design of the proposed development has been informed by key environmental constraints. Such design changes (referred to as 'mitigation by design') are extensive for the proposed development and are included Chapter 4 Description of the Proposed Development and Chapter 5 Construction Strategy of Volume 2 and the project plans, sections and elevations in Volume 3 of this EIAR.

The table below details the general environmental mitigation measures which have developed as part of the design and construction strategy identified in Chapter 5. These measures are considered to be applied by the other specialists in their assessments, as appropriate.

Table 27-1 General Mitigation and Monitoring Measures

Section Ref.	Description
5.12	<p>Construction Environmental Management Plan</p> <p>A Construction Environmental Management Plan (hereinafter referred to as CEMP) is available as an appendix in Volume 4 of this EIAR. It has been prepared by IDOM and ROD in conjunction with CIÉ/IE. It presents the approach and application of environmental management and mitigation for the construction of the proposed Project. It aims to ensure that adverse effects from the construction phase of the proposed</p>

Section Ref.	Description
	<p>Project, on the environment and the local communities, are avoided or minimised. It does not describe the separate mitigation measures relating to the operation and decommissioning of the proposed Project; these are provided in the mitigation sections of the individual chapters and in Volume 2 Chapter 27 'Summary of Mitigation and Monitoring measures' of this EIAR.</p> <p>The CEMP has been prepared in accordance with the IÉ Environmental Management Policy (EMP). The Construction Environmental Management Plan (CEMP) also includes the Environmental Operating Plan (EOP) and Construction and Demolition Waste Management Plan (CDWMP) as Appendices D and E, respectively.</p> <p>The sections below provide an outline of the contents that are included in the CEMP, CDWMP and EOP and will be used by the Contractor(s) to inform the development of the detailed construction plans.</p> <p>Prior to any demolition, excavation or construction, a Construction Environmental Management Plan (CEMP) will be produced by the successful Contractor. The CEMP will set out the Contractor's overall management and administration of the construction project. It will be prepared by the Contractor during the pre-construction phase to ensure commitments included in the statutory approvals are adhered to and that it integrates the requirements of the CEMP, Environmental Operating Plan (EOP) and the CDWMP. The Contractor will be required to include details under the following headings:</p> <ol style="list-style-type: none"> 1. Details of working hours and days. 2. Details of emergency plan - in the event of a fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services. 3. Details of chemical/fuel storage areas (including location and bunding to contain runoff of spillages and leakages). 4. Details of construction plant storage, temporary offices. 5. Traffic management plan (to be developed in conjunction with the WCCC Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements. 6. Truck wheel wash details (including measures to reduce and treat runoff). 7. Dust management to prevent nuisance (demolition and construction). 8. Site run-off management. 9. Noise and vibration management to prevent nuisance (demolition and construction). 10. Landscape management. 11. Management of demolition of all structures and assessment of risks for same. 12. Stockpiles. 13. Project procedures and method statements for: <ol style="list-style-type: none"> a) Demolition and removal of buildings, services, pipelines, ballast and other infrastructure (including risk assessment and disposal). b) Diversion of services. c) Excavation and blasting (through peat, soils and bedrock). d) Piling. e) Construction of pipelines. f) Temporary hoarding and lighting. g) Borrow pits and location of crushing plant. h) Storage and treatment of peat and soft soils. i) Disposal of surplus geological material (peat, soils, rock etc.). j) Earthworks material improvement. k) Protection of watercourses from contamination and silting during construction. 14. Site Compounds including the Main Distribution and Storage Compound (MSDC). <p>The production of the CEMP will also detail areas of concern with regards to health and safety and any environmental issues that require attention during the construction phase. Adoption of good management practices on-site during the construction and operation phases will also contribute to reducing environmental impacts.</p>
5.12.1	<p>Construction and Demolition Waste Management Plan (CDWMP)</p> <p>A Construction and Demolition Waste Management Plan (CDWMP) is included an appendix in Volume 4 of this EIAR. It sets out the Contractor's proposals regarding the treatment, storage and disposal of waste including demolition waste. The plan will be a live document that will be amended and updated to reflect</p>

Section Ref.	Description
	<p>current conditions on-site as the project progresses. The obligation to develop, maintain and operate a CDWMP will form part of the contract documents for the project. The CDWMP will include details such as:</p> <ol style="list-style-type: none"> 1. Details of waste storage to be provided for different waste. 2. Details of where and how materials are to be disposed of - landfill or other appropriately licensed waste management facility. 3. Details of storage areas for waste materials and containers. 4. Details of how unsuitable excess materials will be disposed of where necessary. 5. Details of how and where hazardous wastes such as oils, diesel and other hydrocarbon or other chemical waste are to be stored and disposed of in a suitable manner.
<p>5.12.2</p>	<p>Environmental Operating Plan</p> <p>An Environmental Operating Plan (EOP) is a project management tool and has been prepared as an appendix in Volume 4 of this EIAR. It outlines procedures for delivery of environmental mitigation measures and for addressing general day to day environmental issues that can arise during the construction phase of developments. The EOP, will be further developed and updated by the Contractor during the project construction stage.</p> <p>Before any works commence on site, the Contractor(s) will be required to prepare an EOP in accordance with the TII/National Roads Authority (NRA) Guidelines for the Creation and Maintenance of an Environmental Operating Plan. The EOP will set out the Contractor's approach to managing environmental issues associated with the construction of the scheme and provide a documented account of the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions. Details within the plan will include: All environmental commitments and mitigation measures included as part of the planning approval process and any requirements of statutory bodies such as the NPWS and IFI as well as a method documenting compliance with the measures.</p> <ol style="list-style-type: none"> 1. All environmental commitments and mitigation measures included as part of the planning approval process and any requirements of statutory bodies such as the NPWS and IFI as well as a method documenting compliance with the measures. 2. Iarnród Éireann operating procedure documents. 3. A list of all applicable environmental legislation requirements and a method of documenting compliance with these requirements. 4. Outline methods by which construction work will be managed to avoid, reduce or remedy potential adverse impacts on the environment. <p>To oversee the implementation of the EOP, the Contractor will be required to appoint a suitably competent Site Environmental Manager (SEM) to ensure that the mitigation measures included in the EIAR, the EOP and the statutory approvals are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly. The CEMP contains the Incident Response Plan (IRP) as Appendix F of Appendix A5.1 in Volume 4 of this EIAR, which describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and appropriate to particular circumstances. It will provide the information that each worker may need in order to respond to an emergency and to handle it effectively. The Incident Response Plan (IRP) will also contain a copy of the Contractor's Major Emergency Plan</p>
<p>5.12.3</p>	<p>Construction Traffic Management</p> <p>The purpose of the Traffic Management Plan (TMP) is to provide the basis for the management of traffic expected during construction and operation of the project on the basis of the designs shown in the planning documents. The Contractor will be required to prepare a Construction Traffic Management Plan (TMP) that maximises the safety of the workforce and the public and minimises traffic delays, disruption and maintain access to properties. The Traffic Management Plan will also address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points. The Contractor shall provide an appropriate information campaign for the duration of the construction works. An OTMP is included as an appendix in Volume 4 of this EIAR.</p> <p>The role of Project Supervisor Design Process (PSDP) will be taken over by the Contractor and as such a Traffic Management Plan for the proposed design must be prepared and agreed in consultation with the respective local authorities, Iarnród Éireann, transport operators, Waterways Ireland. The Contractor will be required to appoint a Temporary Traffic Management Designer who shall prepare detailed temporary traffic management designs for all locations where works are planned on, or impact on, any public road. Prior to commencing the works, the plan must be developed into an Operational Traffic Management Plan by the Project Supervisor Construction Stage (PSCS) and should not be implemented until it has been assessed and developed by the PSCS. The appointed PSCS/Contractor of the project is required to carry out the Safety Audit on Operational Traffic Management Plans prior to commencing the works. The PSCS shall co-ordinate the implementation of the developed Traffic Management Plan during construction of the works. The developed TMP requirements will be focused on keeping disruption to a minimum and will include the provision of facilities for the safe passage of pedestrian, cyclists, vehicular traffic, local communities, and road users.</p>

Section Ref.	Description
	<p>The Contractor shall comply with the requirements of:</p> <ol style="list-style-type: none"> 1. “Traffic Signs Manual – Chapter 8 – Temporary Traffic Measures and Signs for Roadworks” Department of Transport, November 2010. 2. Guidance for the Control and Management of Traffic at Roadworks – Department of Transport, N.R.A and Local Government Management Services Board, second edition 2010. 3. HSA document titled ‘Guidelines for Working on Roads; Guide to the Safety, Health and Welfare at Work (Construction)(Amendment) (No. 2) Regulations 2008 (S.I. No. 423 of 2008)’. 4. The respective local authority road closure guidelines in Dublin, Fingal, Meath and Kildare. <p>These Guideline documents shall be read in conjunction with primary Safety Health & Welfare at Work legislation including the 2005 Act, the Safety, Health and Welfare (Construction) Regulations 2013, and any amendment to them (the Construction Regulations).</p>

27.3 Mitigation and Monitoring Measures for Traffic and Transportation

The table below details the mitigation measures identified in Chapter 6 Traffic and Transportation.

Table 27-2 Mitigation and Monitoring Measures for Traffic and Transportation

Section Ref.	Description
6.6.1.1	<p>Mitigation Measures Embedded Mitigation <u>Construction Phase</u></p> <p>There are no embedded mitigation measures included in the assessment. All mitigation relating to construction is proposed and set out in the next section.</p>
6.6.1.2	<p><u>Operational Phase</u></p> <p>The mitigation proposed for the operational phase of the development is embedded into the operational assessment and includes the changes to the existing level crossings located at:</p> <ol style="list-style-type: none"> 1. Ashtown. 2. Coolmine. 3. Porterstown. 4. Clonsilla. 5. Blakestown. <p>A number of junctions which will experience an increase in traffic or change of traffic patterns due to the closure of Coolmine, Porterstown and Clonsilla level crossings have mitigation measures embedded into the design of the proposed development. The locations of proposed junction upgrades are shown in Figure 6-27.</p>

Section Ref.	Description
	 <p>Figure 6-27 Location of junction upgrades as part of Coolmine and Clonsilla Level crossing replacement works</p> <p>The changes to Coolmine, Porterstown and Clonsilla level crossings will result in changes in traffic flows occurring at other locations on the local road network due to re-routing. However, the changes will provide improved facilities for pedestrians and cyclists using these routes and the reduction of conflict with motorised vehicles. The removal of vehicular trips at these locations will provide further space for the increase in passenger numbers. Increased provision for pedestrians and cyclists at these locations will also likely ensure that the space is available for passengers when travelling to and from the stations.</p> <p>Further embedded mitigation includes the changes to the road network proposed as a result of the closure of the crossings, the change in mode share over the course of the assessment period, the increase in rail frequency and capacity. The embedded mitigation is considered sufficient to ensure that the proposed development has either a positive or negligible impact on the highway and sustainable transport network within the study area.</p>
6.6.2.1	<p>Proposed Mitigation</p> <p><u>Construction Phase</u></p> <p>Mitigation measures are proposed to be incorporated into the construction phase to minimise negative temporary effects. These are detailed in the TIA which sets out a number of mitigation measures which will be implemented during the construction period. The TIA is available in Appendix A6.2 Traffic Impact Assessment in Volume 4 of this EIAR. These will be implemented in order to mitigate any detrimental impact of construction vehicles on the surrounding highway network. Mitigation measures will include the following:</p> <ol style="list-style-type: none"> 1. Use of sufficient clear signage to ensure that construction vehicles use only designated routes. 2. Routing of HGVs on main roads away from sensitive areas such as schools, residential areas, and areas sensitive in terms of air quality. 3. Time slots for bulk deliveries to ensure that convoys of vehicles do not arrive simultaneously. 4. Provision of holding spaces to avoid congestion on the local road network by waiting vehicles. 5. Coordination of abnormal large loads. 6. Scheduling of deliveries / collections away from peak hours, either before the AM peak or during the inter-peak daytime period. 7. Encouraging construction hours to avoid the AM and PM peak traffic period for construction workers. 8. On-site recycling of materials to reduce export and import vehicle movements, including stockpiling topsoil for landscape works, or crushing existing hard standing material for engineering fill. 9. Keeping the access routes clear of mud using a road sweeper. 10. Implementation of wheel washing facilities to prevent debris being deposited on the highway network. 11. Implementation of appropriate traffic management to ensure that construction of the site access junctions does not give rise to undue disruption.

Section Ref.	Description
	<p>A Mobility Management Plan will also be implemented to manage staff, to promote use of sustainable modes of transport for travel to and from compounds, encourage car sharing and limiting the impact of staff vehicles on the road network. Monitoring of parking associated with staff at the compounds and the roads in the vicinity of the compounds will be undertaken to ensure that the impact on road users and residents local to the compounds is minimised throughout the construction phase.</p> <p>In addition, any impacts to the railway will be mitigated through reducing any shutdowns to outside of the peak travel, which will include temporary closures implemented at required locations overnight or over the weekends.</p> <p>To ensure that impact on parking does not exceed that set out and remains the case throughout the construction period, Iarnród Éireann will continue to monitor the level of parking at all station car parks, as part of its annual car park surveys, such that should any capacity issues or trends that arise can be identified early. If and when additional car parking capacity is required, Iarnród Éireann, working in collaboration with the National Transport Authority's Park and Ride Office, will implement a separate and site-specific car park project. Car parking spaces will be lost at M3 Parkway, Coolmine and Dunboyne for a short period during the construction programme, as construction compounds are proposed in these facilities.</p> <p>The Contractor will minimise the construction compound footprint throughout the construction programme and return the maximum number of car spaces back to public use.</p>
6.6.2.2	<p><u>Operational Phase</u></p> <p>The embedded mitigation identified for the operational phase and set out in the previous section is considered sufficient to mitigate the effects of the proposed development.</p>
6.7	<p>Monitoring</p> <p>Ongoing monitoring of the car and cycle parking provided at the stations will be undertaken to ensure that demand does not exceed capacity. Where demand for car parking exceeds capacity, a review of potential measures to encourage travel by alternative modes will be undertaken first and additional parking only provided where absolutely necessary. Additional parking is being considered by the NTA as part of their Park and Ride programme and an additional Park and Ride site at Collinstown or Maynooth is being considered. This would be brought forward in parallel to the Dart+ West Programme.</p> <p>Further details related to the specific locations impacted can be found in the TIA, see Appendix A6.2 Traffic Impact Assessment in Volume 4 of this EIAR.</p>

27.4 Mitigation and Monitoring Measures for Population

The table below details the mitigation measures identified in Chapter 7 Population.

Table 27-3 Mitigation and Monitoring Measures for Population

Section Ref.	Description
7.6.1	<p>Mitigation and Monitoring Measures</p> <p>Construction Phase</p> <p>As a result of this assessment the following mitigation measures are required to be implemented.</p> <ol style="list-style-type: none"> 1. Implementation of the Construction Strategy and all mitigation measures set out in Chapter 5 Construction Strategy of this EIAR and in the other chapters of this EIAR – particularly those directly impacting communities which include: Chapter 6 Traffic and Transportation, Chapter 10 Water, Chapter 12 Air Quality, Chapter 14 Noise and Vibration, Chapter 9 Land and Soils, Chapter 16 Material Assets: Agricultural Properties, Chapter 17 Material Assets; Non-Agricultural Properties and Chapter 23 Human Health. 2. A Construction Environmental Management Plan (CEMP) will be required to be developed and implemented by the Contractor(s) to address all environmental issues including noise emissions from both machinery and noise from the workforce, dust minimisation, lighting spill on neighbouring residential areas at night-time, etc. The CEMP will be agreed with Iarnród Éireann prior to the commencement of the construction phase. 3. A Construction Traffic Management Plan (CTMP) will be required to be developed and implemented by the Contractor(s) to address all modes of transport during the construction stage and will be agreed with Iarnród Éireann and the respective local authority prior to the commencement of the construction phase. <ol style="list-style-type: none"> a) The CTMP will be required to maximise the safety of the workforce and the public and to minimise traffic delays, disruption and maintain access to properties.

Section Ref.	Description
	<ul style="list-style-type: none"> b) The CTMP will also address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points, temporary disruption to rail traffic. It will also address the provision of appropriate temporary signage to direct road users to alternative car parking arrangements. c) The CTMP will be required to minimise disruption to economic amenities, Royal Canal/marine users, and residential properties. and will ensure access is maintained along haulage routes and in vicinity of the construction site(s) for vehicles, pedestrians, cyclists, and economic operators at all times. d) A Mobility Management Plan will be developed by the Contractor(s) as part of the CTMP and will address all modes of transport and travel required to deliver the project during the construction phase. This will include details regarding construction workers travelling to site, car-parking, haulage routes and construction compounds. e) . In the interest of maintaining car spaces for rail passengers construction staff shall not be permitted to use large sections of the same station car parks for parking site vehicles where construction compounds are in situ - . f) When railway services are planned to be disrupted for extended periods IÉ will provide suitable bus transfer services to replace the services affected. g) IÉ will be required to communicate disruption to rail passengers and the public in advance of all construction works that will impact service users and road-based users. The campaign should seek to communicate replacement services available and/ or alternative routes. The notification shall include the proposed planned closure period of station car parking including the number of spaces to be affected. <p>4. The Contractor will be required to develop and implement a Stakeholder Management and Communication Plan (SMCP) which will be agreed with Iarnród Éireann prior to the construction phase.</p> <ul style="list-style-type: none"> a) The Employer will appoint a Public Liaison Officer, or equivalent, who will be consulted in the preparation of the Plan as well as its maintenance and implementation. The SMCP will provide the means of the stakeholder and members of the public to communicate with the project team, and for the project team to communicate relevant information of the scheme. b) All stakeholders will be required to be agreed with Iarnród Éireann prior to construction commencing and reviewed periodically; and c) Details of general construction process/phasing will be communicated to the relevant stakeholders prior to implementation to ensure local residents and businesses are fully informed of the nature and duration of construction. <p>5. The Contractor will ensure that works within the Royal Canal requiring the closure of the canal will be limited to reduce potential impacts on the permitted navigational period and ensure appropriate licences and notifications are agreed with Waterways Ireland in advance of such closures.</p> <p>6. The Contractor will ensure that works within the Royal Canal requiring the closure of the canal and any boats/moored residential boats are notified well in advance and accommodated elsewhere on the Canal system.</p> <p>7. The Broombridge replacement pedestrian bridge shall be designed to be accessible to all users.</p> <p>8. The main construction works at St. Vincent's School shall take place during summer months and in agreement with the School operators so as to reduce disturbance and negative impacts to student populations and facilities.</p> <p>9. During the construction works at OBO11 Castleknock and OBO16 Louisa Bridge IÉ will facilitate replacement pedestrian access to the public through the existing station footbridges at Castleknock and Leixlip (Louisa Bridge) at all times.</p> <p>10. Pedestrian access will be maintained during the construction works associated with OBO16 Cope Bridge (including the bridge deck modification works).</p>
7.6.2	<p>Operation Phase</p> <p>The application of the mitigation measures identified throughout this EIAR will benefit the population in some form or another and are supported in this assessment. Specific mitigation measures associated with the population assessment for the operation phase include:</p> <ul style="list-style-type: none"> 1. Installation of 24/7 monitored CCTV cameras at suitable locations in and around the proposed underpass at Ashtown level crossing which will be determined in consultation with An Garda Síochána and Fingal County Council as part of detailed design stage. 2. Design and maintain landscaping and public realm infrastructure to complement other environmental mitigation in this EIAR that promotes safety for all users. 3. At detailed design stage the design team will ensure safety is integrated into the design and maintenance of public spaces with a focus on promoting a sense of safety and comfort for all users particularly the young, old and people with disabilities. The perspectives from trained professionals relating to safety concerns of female users shall be included as part of the design team.

Section Ref.	Description
	<p>4. The public realm designs shall encourage passive surveillance of public spaces and on transport infrastructure, e.g., through appropriate lighting, pleasant surroundings and design that discourages anti-social behaviour, graffiti, etc.</p> <p>5. Planned works including maintenance of the railway infrastructure shall be communicated to neighbouring properties as part of the CIÉ notification procedures.</p> <p>6. Iarnród Éireann will continue to progress and support the implementation of the Park and Ride facilities and improve and enhance sustainable mobility measures to enable future capacity enhancements in a planned and co-ordinated manner.</p> <p>7. All level crossing replacement bridges and footbridges shall be designed to integrate with existing and future transport networks and promote sustainable mobility in line with government transport and decarbonisation/climate policies.</p> <p>8. IÉ will consider community gain including biodiversity enhancement proposals along the proposed disused railway line in the vicinity of Jacksons Bridge– this mitigation measure will be subject to further investigation after IÉ determine if the railway line is surplus to requirements. IÉ will consult with Kildare County Council regarding any such future proposals.</p>

27.5 Mitigation and Monitoring Measures for Biodiversity

The table below details the mitigation measures identified in Chapter 8 Biodiversity.

Table 27-4 Mitigation and Monitoring Measures for Biodiversity

Section Ref.	Description
8.9	<p>Mitigation</p> <p>This section describes the measures that are in place to mitigate any harmful or negative impacts associated with the proposed development and the identified Key Ecological Receptors, as described in the preceding sections. Construction phase mitigation measures are described first, followed by general mitigation measures which will apply during the construction and operational phases. Lastly, mitigation measures which relate specifically to the Key Ecological Receptors are described.</p> <p>The proposed development has been developed having regard to EU and Irish legislation and all relevant guidelines in relation to ecology and engineering best practice for the planning and construction. These guidelines provide practical measures that can be incorporated into the design to minimise impacts and protect the receiving environment. The design has followed the basic principles outlined above to eliminate the potential for ecological impacts, where possible, and to minimise such impacts where total elimination is not possible. The design has followed the TII Publications (Standards) and the TII Environmental Assessment and Construction Guidelines.</p>
8.9.1	<p>Construction Phase Mitigation</p> <p>The following general mitigation measures will be employed to minimise potential significant negative effects on biodiversity which might arise during the construction of the proposed development.</p> <ol style="list-style-type: none"> 1. Prior to any demolition, excavation, or construction, a Construction Environmental Management Plan (CEMP) will be produced by the successful Contractors for each element of the proposed development. The CEMP will set out the Contractor's overall management and administration of the construction phase see Appendix 5.1 in Volume 4 of this EIAR. An NIS has also been prepared as part of this CEMP. The CEMP will be developed by the Contractor during the pre-construction phase, to ensure commitments included in the statutory approvals are adhered to. 2. The Contractor will prepare a Site Specific Method Statements detailing how the works will be carried out. The Site Foreman shall read, sign and abide by each Site Specific Method Statement. The Works Team will be inducted on the ecological considerations listed in the Site Specific Method Statement by the Site Foreman. 3. An Ecological Clerk of Works (ECoW) shall be appointed by CIÉ prior to the commencement of works. It shall be their responsibility to supervise and provide recommendations on the execution of any and all works which have the potential to give rise to negative or positive effects on biodiversity. The ECoW will have at least five years' experience as an Ecological Clerk of Works on linear infrastructure projects. 4. The Contractor will appoint a Site Environmental Manager (SEM) prior to the commencement of works. This person shall be responsible for carrying out environmental monitoring of the works and ensuring that the mitigation measures proposed in this EIAR (as well as the CEMP and Site Specific Method Statements) are adhered to.

Section Ref.	Description
	<ol style="list-style-type: none"> 5. The construction envelopes for the depot, compounds, bridge and other ancillary infrastructure will be temporarily fenced off at the outset of the construction and will avoid the potential for un-necessary loss of habitat outside of the construction footprint. 6. The fencing for the compounds will be set inside existing hedgerow and treeline boundaries to avoid habitat loss. The set-back distance will be directed by the ECoW or the Arborist. 7. The mitigation measures presented in other chapters of this EIAR (Volume 2), including, but not limited to Chapter 10 'Water' and Chapter 15 'Landscape and Visual' will be implemented in full. 8. Fencing will be erected around trees which are to be retained and will include the Root Protection Area (RPA), as defined by a professionally qualified Arborist. An Arborist be retained as required by the Contractor to monitor and advise on any works within the RPA of retained trees to ensure successful tree retention and planning compliance. 9. The use of artificial lighting on site will be minimised in terms of the area required to be illuminated and the length of time for which any lighting is switched on. Light spillage will be prevented as far as reasonably practicable. Artificial lighting will be shut off at night when not in use or when works cease at the end of the day in order to minimise the effects of light pollution and disturbance to nocturnal species. Security lighting, if required, will be cowed, to prevent light spill outside the works areas. Direct or indirect lighting onto the Royal Canal will be avoided. The ECoW will ensure that light spill is reduced as much as possible. 10. A pre-construction survey will be undertaken 2-3 weeks prior to construction to ensure that protected species such as Otter and Badger have not taken up residence within the construction envelope and to record invasive species extent and distribution. Should any protected species shelters (e.g. holts, setts) be found, the ECoW will seek direction from the NPWS. The preconstruction survey will include a boat based otter survey between the Dublin/ Kildare border and Kilcock, and a floristic surveys of stone walls and bridges prior to any works. 11. Any excavations deeper than 1m will be either covered or have ramps fitted outside of working hours, which will allow badgers and other wildlife to escape. Similarly, any temporarily exposed open pipe system will be capped to prevent species such as Otter from gaining access when Contractors are off site. 12. Two new watercourse crossings are proposed as part of the railway realignment at Ch. 91+900 (UBG22C and UBG22A). The abutments will be set back from the banks and the natural riverbank will be retained to allow mammals to pass under the bridge. Should this not be possible, mammal ledges will be provided in these structures in accordance with TII (2008). The ledges will be at least 500 mm wide and at least 150 mm above the 1 in 5-year flood event and have at least 600 mm of headroom.
8.9.2	<p>Non-specific Mitigation Measures</p> <p>The following is an overview of the non-specific mitigation measures that will be employed to avoid or minimise significant impacts on the Key Ecological Receptors within the Zone of Influence.</p>
8.9.2.1	<p><u>Lighting</u></p> <ol style="list-style-type: none"> 1. The lighting plan has been designed to minimise impacts on biodiversity. The lighting requirements are summarised in Table 8-25 in Chapter 8 Biodiversity in Volume 2 of this EIAR. A lighting specialist will be engaged at detailed design stage to develop the lighting design. The design for outdoor lighting will be reviewed and signed off by the ECoW and by CIÉ. The design will include models illustrating the light spill with contours, e.g. 10 lux, 5 lux, 2 lux, 1 lux, 0.5 lux, 0.2 lux. As a minimum, the lighting design will comply with the following: <ol style="list-style-type: none"> a) Lighting outside the intended area of illumination will be minimised. Where light spill cannot be avoided, louvres, cowls or shields will be fitted to the columns. b) Horizontal light spill onto the Royal Canal and its banks will not exceed 0.5 lux. The lighting design model will illustrate this important requirement. c) Lighting will be LED and have no upward light spill and a sharp horizontal cut off. d) All outside lighting will be a warm-white colour of 3000K or less. e) Lux levels on roads will be set to the minimum required by BS 5489- Road Lighting.
8.9.2.2	<p><u>Landscaping and Fencing</u></p> <ol style="list-style-type: none"> 1. The landscaping plan includes the widespread planting of native Irish species of trees and shrubs and wildflower planting (see drawing: MAY-MDC-LAN-ROUT-DR-U-15100-D to 15141-D in Volume 3A of this EIAR). 2. Wetland habitats will be incorporated into the design of the flood compensatory storage areas. The wetlands will not affect the primary flood storage function of these areas. Further excavation below the 1 in 2 year flood level and the outlet levels will ensure that water is allowed to pool which will encourage wetland habitats to establish. Guidance on the construction of reed beds is available in: <ol style="list-style-type: none"> a) <i>Bringing Reedbeds to Life: Creating and Managing Reed Beds for Wildlife (RSPB, 2014); and,</i>

Section Ref.	Description
	<p><i>b) Reedbed Design and Establishment. Information and Advice Note. Version 4 (RSPB, 2004).</i></p> <ol style="list-style-type: none"> 3. The flood compensatory storage areas will include ponds, reed beds, and wet grassland, with wet grassland make up no more than 50% of the total flood compensatory storage areas. 4. Reseeding with commercially available grass seed or wildflower mixes will be avoided. Areas where vegetation has been removed will be allowed to revegetate naturally or alternatively use locally sourced seed or green hay. This includes the flood compensatory storage areas. 5. New fencing has been minimised to the areas where there is a greater risk of trespassing and/ or electrocution. In general, there is no fencing proposed between the Royal Canal and the railway line. The proposed fencing is illustrated in Volume 3A of this EIA, Drawing: MAY-MDC-TRK-ROUT-DR-C-0009-D. 6. The proposed new palisade and palladin perimeter fencing at the depot, compounds and along railway line will have 30 cm x 20 cm gaps located a minimum of every 50 m to allow wildlife such as badger and otter to cross the railway line, and to escape these areas should they become trapped inside. The exception to this will be along the boundary of private dwellings or housing estates, where there is a risk of dogs getting onto the railway line. 7. Where fencing is proposed on the boundary of Iarnród Éireann owned land, the existing hedgerows or treelines will be retained. The fence will be constructed on one side of the existing boundary, notwithstanding any technical requirements for vegetation removal associated with the proposed development. 8. Use of herbicides will be carefully controlled to treat invasive species, to keep the tracks clear of vegetation growth and in particular circumstances elsewhere where vegetation control measures are necessary. 9. Outside of urban areas, where trees are planted, for example around the depot, no herbicides or mulch will be applied, and native flora will be allowed to regenerate naturally.
<p>8.9.2.3</p>	<p><u><i>Water Quality – Construction Phase</i></u></p> <ol style="list-style-type: none"> 1. In order to attenuate flows and minimise sediment input into watercourses from site run-off, all surface water run-off from the construction site and compounds shall be intercepted and conveyed to a drainage network. The guidance of sustainable drainage systems (SuDS) from CIRIA C753 shall be used. 2. All works in and adjacent to watercourses will be carried out in accordance with <i>Guidelines for the crossing of Watercourses During Construction of National Road Schemes</i> (TII, 2008); and, <i>Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters</i> (IFI, 2016). In-stream works will only take place between the 1st July and 30th September, unless otherwise agreed with Inland Fisheries Ireland. The restrictions on in-stream works does not apply to works in the Royal Canal. 3. The proposed new bridges which cross the Lyreen River, and the Royal Canal and the Ballycaghan Stream will be clear span to avoid the need to in-stream excavations. 4. Dewatering of the Royal Canal is required at Ashtown to facilitate the construction of the underbridge and aqueduct, and at Porterstown and Clonsilla to facilitate the construction of the foundations for the pedestrian and cycle bridges. Dewatering will be carried out by first isolating the area to be dewatered using stop-logs or temporary dams. Electro-fishing will be carried out prior to dewatering. A water bypass system comprising 2 no. 300-450 mm diameter pipes to divert flows past the working area will be installed for the duration of the works. 5. The diversion of the Ballycaghan Stream will be undertaken as follows: <ol style="list-style-type: none"> a) The new channel will be completed in the dry. b) The banks will be constructed at a 1:2 slope and will be planted with locally sourced species. c) As the old channel is dewatered, any fish or white-clawed crayfish will be removed and placed in the stream below the works. d) Straw bales or similar will be placed downstream of the new section of the Ballycaghan Stream to minimise sediment transfer downstream. e) The new section of the Ballycaghan Stream will be fish passable and include riffles, pools and suitable benthic substrate. 6. The Contractor will ensure that all hazardous waste residuals are stored within temporary bunded storage areas prior to removal by an appropriate EPA-approved waste management Contractor for off-site treatment, recycling or disposal. 7. The Contractor will ensure that excess topsoil and inert soil which cannot be re-used on-site, and all hazardous soil waste will be separately removed off site to an appropriately licenced facility by a licensed Contractor. 8. Any stockpiled material shall be located as far from watercourses as practicable, covered and remain stockpiled for as short a time as possible.

Section Ref.	Description
	<p>9. All equipment including PPE which comes into contact with watercourses will be clean and will be disinfected prior to arrival and before leaving site each day using Virkon Aquatic or similar. Equipment will be disinfected at least 20m from the watercourse.</p> <p>10. The measures prescribed with regard to sedimentation and surface water run-off will also minimise the risk of any input of cementitious material into watercourses. However, the following additional measures shall also apply:</p> <ol style="list-style-type: none"> All shuttering shall be securely installed and inspected for leaks prior to cement being poured, and all pouring operations shall be supervised for spills and leaks at all times. In order to eliminate any remaining risk of input of cementitious material into watercourses, all pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc., for outfalls shall be completed in dry weather. In order to prevent input of cementitious materials into watercourses from the in-stream elements of the construction, or from works over water, concrete structural elements shall be pre-cast, wherever possible. In addition, at all locations where concrete or other wet materials are to be used, bunded steel decks will be used to capture any spilled concrete or other materials. <p>11. The measures prescribed with regard to surface water run-off will also minimise the risk of any input of hydrocarbons and other chemicals into the watercourses. However, the following additional measures shall also apply:</p> <ol style="list-style-type: none"> Vehicles and plant shall be refuelled off-site where possible and all fuelling of machinery shall be undertaken at least 30 m from the watercourses. All fuelling of vessels shall be undertaken on an impervious base in bunded areas and all fuelling equipment shall be regularly inspected and serviced. Standing plant and machinery shall be placed on drip-trays. All fuel, oils, chemicals, hydraulic fluids, on-site toilets, etc., shall be stored in the construction site compound, on an impervious base which shall be bunded to 110% capacity and appropriately secured. All plant and construction vehicles shall be inspected daily for oil leaks and a full-service record shall be kept for all plant and machinery. Spill kits shall be available on-site during construction. Paints containing organotin compounds, e.g. TBT, will not be used, during the construction or operation (e.g. maintenance) of the proposed development.
8.9.2.4	<p><u>Water Quality – Operational Phase</u></p> <ol style="list-style-type: none"> The flood compensatory storage areas will avoid changes to the flooding regime in the area of and downstream of the depot. The realignment of the Ballycaghan stream will be designed to closely match existing channel characteristics and will include an appropriately sized vegetated buffer. The drainage network will incorporate Sustainable Drainage Systems (SuDS), to be designed following the relevant sections of the Building Regulations, BS EN 752 and EN 12056, and the CIRIA SUDS Manual. This includes two attenuation ponds at the depot and two attenuation ponds at the Barberstown level crossing.
8.9.3	<p>Specific Mitigation Measures</p> <p>In addition to the construction phase and non-specific mitigation measures described above, specific measures are described in relation to individual Key Ecological Receptors (KER) in the following sections.</p>
8.9.3.1	<p><u>Royal Canal pNHA (KER1)</u></p> <p>Biodiversity enhancements including wetland creation, pond construction, tree and shrub planting, the construction of artificial holts and the provision of bat and bird boxes on existing trees will be provided at various locations along the route of the proposed development. The specific locations for each biodiversity enhancement element are provided in the following sections and in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D.</p> <p>Reseeding with commercially available grass seed or wildflower mixes will be avoided. Areas where vegetation has been removed will be allowed to revegetate naturally or alternatively use locally sourced seed or green hay. This includes the flood compensatory storage areas.</p> <p>Habitat enhancement works focussing on pond and wetland creation will be carried out on CIÉ owned land at Barberstown (70+500- 70+700), East of Leixlip (73+200- 73+900), between the new railway alignment at Jackson’s Bridge and the Royal Canal (91+300- 92+700) and east of the Navan Road Parkway (54+000 to 54+500).</p>

Section Ref.	Description
	<p>The railway line that is being decommissioned at Jackson's Bridge and the Royal Canal (91+300- 92+700) will be allowed to revegetate naturally. Native trees will also be planted in this area, outside of the flood compensatory storage areas.</p> <p>The compound at the Coolmine level crossing (CC-LC-S5-57900-B) will be set back at least 10m from the canal bank.</p> <p>The temporary pedestrian/ cycle bridge over the Royal Canal at Broombridge will not involve any instream work in the canal. A riparian zone of a least 0.5m will be left between the bridge abutments and the canal.</p> <p>In areas where the railway is in close proximity to the Royal Canal, double track cantilever catenary poles will be provided, where a single column on the side farthest from the canal supports the OHLE for both tracks, thereby reducing habitat loss and the risk of water quality impacts. This will apply to the following chainages:</p> <ol style="list-style-type: none"> 1. 41+750 to 42+500. 2. 52+600 to 53+500. 3. 71+100 to 72+500. 4. 74+000 to 75+500. 5. 76+500 to 82+100. 6. 90+400 to 91+100.
8.9.3.2	<p><u>Railway Line Ecological Corridor (KER 2)</u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 2 Railway Ecological Corridor:</p> <p>The removal of trees and shrubs to accommodate the OHLE along the railway line will be limited to the areas required in accordance with <i>Vegetation Clearance Requirements for Electrified Lines</i>. I-ETR-4006. Version 1.0 (Iarnród Éireann, 2021).</p> <p>Outside the footprint of the catenary poles, the railway verges will be allowed to flower and go to seed. This will be achieved by mowing in early spring and/ or late summer only.</p>
8.9.3.3	<p><u>Badger (KER 3)</u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 3 Badger:</p> <ol style="list-style-type: none"> 1. The mitigation measures with regards to badger will comply with <i>Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes</i> (TII, 2006c). 2. A 30 m buffer will be fenced off around Sett 1 to avoid disturbance while the compound is in operation. No works, or storage of materials will be permitted within 30m of the Sett 1. 3. The locations of the catenary poles will be positioned to maintain the greatest distance possible from Setts 2 and 3, which will minimise disturbance during construction. When the exact locations of the catenary poles relative to these setts is established, the EcoW will seek advice from the NPWS on whether a derogation licence is required. 4. Three main setts, one subsidiary sett and one outlier sett occur either within the footprint of the proposed development or within 10m of the proposed development. The locations of the setts are illustrated in a confidential set of drawings in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050- D to 80061-D. Due to their sensitivity to disturbance, locations where badger activity was recorded are not provided to the public. 5. Works within 50m of a badger sett have the potential to lead to sett abandonment including the abandonment of dependent young. The surveys undertaken to inform this EIAR indicate that two main setts, one subsidiary sett and one outlier sett occur within or close to the footprint of the proposed development and will be closed either temporarily or permanently to avoid injury or death to badgers. 6. Prior to construction, the setts will be surveyed by the EcoW to assess if they are active or inactive. Monitoring using camera traps may be required to ascertain whether a sett is active or inactive and whether it is being used for breeding. If required, setts will be closed in accordance with TII (2006c). Active setts will not be closed during the breeding season (December- June inclusive). 7. Should the preconstruction survey determine that a main sett will be closed, the presence of a viable alternative sett within the social group's territory must be identified. Where no alternative sett is identified, an artificial sett must be provided within the social group's territory. At the depot, there is land available to construct an artificial sett at the edge of the flood compensatory storage areas, if required.
8.9.3.4	<p><u>Otter (KER 4)</u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 4 Otter.</p> <p>Holts 2, 3, 4, 5 and Couches 1, 2 are located between the Royal Canal and the Railway Line (see Table 8-11 in Chapter 8 Volume 2 of this EIAR). Although Otter will have a certain level of tolerance to noise and vibration due to the proximity of railway traffic, boat traffic and the Royal Canal Greenway to these resting places, the construction of the catenary pole foundations could lead to damage and disturbance. In order to mitigate for</p>

Section Ref.	Description
	<p>this and avoid impacts on otter, the catenary poles will be located at the maximum allowable distance from these shelters. The catenary poles closest to each of these shelters will be Double Track Cantiver (DTC) i.e. a single pole supporting OHLE for both tracks, located on the opposite side of the railway to the holts/ couches.</p> <p>Holt 6 is located close to the section of the Royal Canal that will be dewatered at Ashtown. This holt was inactive at the time of the surveys will no evidence of current use. The preconstruction survey will assess the condition no more than six weeks before the dewatering of this section of the canal. If evidence of Otter is found, direction will be sought from the NPWS.</p> <p>The dewatered sections of the Royal Canal will have ramps fitted at each end for the duration of the dewatering to prevent Otter becoming trapped.</p> <p>Any additional mitigation measures prescribed following the preconstruction survey will comply with <i>Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes</i> (TII, 2008).</p> <p>One artificial otter holt will be constructed in each of the following areas:</p> <ol style="list-style-type: none"> Ch. 73+200- 73+900, east of Leixlip. Ch. 75+600- 75+950, north of the Rye Water crossing. <p>The holts will be constructed as a log pile, with a tunnel leading to a cavity in the centre. The holts should be seeded with otter spraint collected from a nearby watercourse, if available. The locations proposed for the artificial holts are shown in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D.</p>
<p>8.9.3.5</p>	<p><u><i>Bats (KER 5)</i></u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 5 Bats:</p> <p>A pre-construction bat survey will be undertaken no more than 3 weeks prior to the works to confirm roost absence at the structures and trees listed in Table 8-15. The preconstruction survey will adhere to <i>Guidelines for the Treatment of Bats during the Construction of National Road Schemes</i> (TII, 2006).</p> <p>Felling of trees and alterations to structures with bat potential will only take place in September, October, and March to avoid maternity roosts and hibernating bats.</p> <p>Trees classified as having low suitability including the treelines at the depot will be soft felled in the presence of an Ecologist who will be licensed to handle bats. Should bats be found during the soft felling, the bats will be taken into care and released at dusk.</p> <p>A variety of woodcrete bat boxes will be installed on suitable trees. The bat boxes will be located at a sufficient distance from the construction envelope to limit any disturbance and the type and location will be directed by the ECoW and in accordance with Kelleher & Marnell (2006). The boxes will be positioned at least 4 m above ground level and in areas that are not lit. In total, 30 no. bat boxes of varying types to accommodate different species and different types of roosts including the following, or equivalent:</p> <ol style="list-style-type: none"> Schwegler 1FN (Large Colony). Schwegler 1FD (Pipistrelles). Schwegler 2F (General Purpose). Schwegler 1FW (Hibernation Box). <p>The bat boxes will be installed in the following locations:</p> <ol style="list-style-type: none"> Ch. 70+500- 70+700, at Barberstown. Ch. 73+200- 73+900, east of Leixlip. Ch. 75+600- 75+950, north of the Rye Water crossing. <p>In addition, two bat boxes, Schwegler 2E wall mounted bat boxes or similar, will be erected on each of the following bridges:</p> <ol style="list-style-type: none"> The Barberstown level crossing replacement infrastructure. The new canal/ railway crossing at the depot. The Rye Water Bridge. Tolka (106+225). Tolka (106+750). Tolka (107+150). UBG22C. UBG22A. <p>Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D presents the locations for bat boxes.</p>
<p>8.9.3.6</p>	<p><u><i>Amphibians (KER 7)</i></u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, which includes the provision of an extensive area of wetland habitat in the flood compensatory storage areas at the depot, the following measures will be implemented to ensure the protection of KER 7 Amphibians:</p>

Section Ref.	Description
	<ol style="list-style-type: none"> 1. The pond at Broombridge (Ch. 51+650), illustrated in a confidential drawing in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050-D, will be retained. This pond will be clearly demarcated during the construction phase to prevent accidental damage. 2. The pond at the Navan Road Parkway compound (Ch. 54+700) and the ditch along the existing railway line at the depot (Ch. 92+600 - Bailey's Bridge) are within the footprint of the proposed development. 3. A pre-construction survey will be undertaken immediately prior to the works. The waterbodies will be thoroughly searched for adult frogs and newts as well as frog spawn. All frogs, newts and frog spawn will be translocated to nearby suitable habitat, outside the works area. Repeat surveys will continue until such a time as the waterbodies are drained. 4. The pond at the Navan Road Parkway compound will be fenced off, including a buffer of 20 m. 5. Terrestrial refugia will be created at edges of the flood compensatory storage areas which will consist of either log piles or clean inert material covered with topsoil. At least one refugia will be created in each discreet flood compensatory storage area unit. 6. The locations of the catenary poles will be positioned to maintain the greatest distance possible from the pond at Broombridge.
8.9.3.7	<p><u>Birds (KER 8)</u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 8 Birds:</p> <ol style="list-style-type: none"> 1. Site clearance including vegetation removal will take place between September and February inclusive to avoid nesting birds. If vegetation removal is required between March and August inclusive, the area shall be checked by the ECoW. If nesting birds are found, the works will be postponed until the chicks have fledged, or alternatively advice will be sought from the NPWS. 2. The new bridges over the railway line and the Royal Canal have been designed without cables to reduce the risk of bird collision. The new bridges will not be painted bright white. 3. Heightened parapets over the railway line will be of solid construction. 4. The construction of the ancillary infrastructure (substation, signalling equipment building and principal supply point) and the set-up, use and decommissioning of the construction compound at St. Vincent's Primary School, Glasnevin will take place between the months of May and September inclusive, to avoid disturbing wintering birds at this location. 5. To mitigate for the risk of disturbance to Brent Geese at feeding sites adjacent to the railway line, there will be no day-time OHLE construction shifts between October and April inclusive. 6. To mitigate for the risk of collision with OHLE, deflectors will be installed on wires parallel to the OHLE at a number of strategic locations, including the bridges over the Royal Canal in Cabra (Ch. 50+850) and the Rye Water (76+100), and along the boundaries of St. Vincent's Primary School, Martin Savage Park and Ashington Park. A meta-analysis of published literature and unpublished reports to date shows that deflectors significantly reduce bird collision (Barrientos et al, 2011). An example of bird deflectors on the Anne Devlin Bridge in Dublin is shown in Figure 8-5 below. The locations of the deflectors are illustrated in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D. 7. Bird deflectors will also be installed at the 15 locations where overhead lines which cross the canal are being heightened or lowered, and at the high voltage cable diversion at Jackson's Bridge.

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	 <p>Figure 8-5 Bird deflector/ flight diverters on the Anne Devlin Luas Bridge, Dublin.</p> <p>8. Dipper/ Grey Wagtail nest boxes will be installed inside the following bridges/ culverts, as shown in Table 8-26 below and illustrated in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D:</p> <p style="text-align: center;">Table 8-26 Locations for Dipper/ Grey Wagtail Nest Boxes</p> <table border="1"> <thead> <tr> <th style="background-color: #4CAF50; color: white;">Structure Number</th> <th style="background-color: #4CAF50; color: white;">Chainage</th> <th style="background-color: #4CAF50; color: white;">Watercourse</th> </tr> </thead> <tbody> <tr> <td>n/a</td> <td>71+300</td> <td>Rusk Stream</td> </tr> <tr> <td>n/a</td> <td>74+400</td> <td>Oranstown Stream</td> </tr> <tr> <td>n/a</td> <td>76+100</td> <td>Rye Water</td> </tr> <tr> <td>n/a</td> <td>78+650</td> <td>Blakestown Stream</td> </tr> <tr> <td>n/a</td> <td>91+800</td> <td>Lyreen</td> </tr> <tr> <td>UBG22A</td> <td>91+800</td> <td>Lyreen River</td> </tr> <tr> <td>UBG22C</td> <td>91+900</td> <td>Ballycaghan Stream</td> </tr> </tbody> </table> <p>9. Two no. triple cavity Swift boxes will be installed on the following bridges and buildings, as shown in Table 8-27 below and illustrated in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000- D. Guidance on the placement an installation of Swift boxes is available in Swift Conservation Ireland (2021).</p> <p style="text-align: center;">Table 8-27 Locations of Swift Boxes</p> <table border="1"> <thead> <tr> <th style="background-color: #4CAF50; color: white;">Structure Name/ Number</th> <th style="background-color: #4CAF50; color: white;">Chainage</th> <th style="background-color: #4CAF50; color: white;">Watercourse/ Road</th> </tr> </thead> <tbody> <tr> <td>Connolly Station</td> <td>10+000</td> <td>n/a</td> </tr> <tr> <td>Docklands Station</td> <td>20+000</td> <td>n/a</td> </tr> <tr> <td>n/a</td> <td>71+100</td> <td>Barberstown Replacement Level Crossing</td> </tr> <tr> <td>n/a</td> <td>91+800</td> <td>Lyreen River (OBG22A)</td> </tr> <tr> <td>n/a</td> <td>92+850</td> <td>Depot Canal/ Rail Bridge</td> </tr> <tr> <td>n/a</td> <td>104+600</td> <td>Dunboyne Stream</td> </tr> </tbody> </table> <p>10. Two no. Sand Martin walls will be constructed. Each wall will have at least 60 no. nest cavities. Guidance on the construction of Sand Martin Walls is available in Doran & Huxley (2022). The Sand Martin walls will be constructed at the following locations:</p> <ul style="list-style-type: none"> • Adjacent to an area of permanent standing water feature in the flood compensatory storage areas at the depot/ OBG22. • At the edge of one of the attenuation ponds at Barberstown. <p>11. The location of all bird nest boxes will be directed by the ECoW.</p>	Structure Number	Chainage	Watercourse	n/a	71+300	Rusk Stream	n/a	74+400	Oranstown Stream	n/a	76+100	Rye Water	n/a	78+650	Blakestown Stream	n/a	91+800	Lyreen	UBG22A	91+800	Lyreen River	UBG22C	91+900	Ballycaghan Stream	Structure Name/ Number	Chainage	Watercourse/ Road	Connolly Station	10+000	n/a	Docklands Station	20+000	n/a	n/a	71+100	Barberstown Replacement Level Crossing	n/a	91+800	Lyreen River (OBG22A)	n/a	92+850	Depot Canal/ Rail Bridge	n/a	104+600	Dunboyne Stream
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n/a	71+100	Barberstown Replacement Level Crossing																																												
n/a	91+800	Lyreen River (OBG22A)																																												
n/a	92+850	Depot Canal/ Rail Bridge																																												
n/a	104+600	Dunboyne Stream																																												

Section Ref.	Description
	12. Bird-friendly glass (e.g. www.ornilux.com or equivalent) or retrofitted measures such as tape and film, which will reduce the reflectivity of glass facades and windows, will be used on all buildings. This will not prevent all bird collisions but will reduce the risk of collisions significantly. These measures will be approved by the ECoW and will follow the guidance published by the American Birds Conservancy (ABC, undated).
8.9.3.8	<p><u><i>Invasive Species (KER 9)</i></u></p> <p>In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented with regards to KER 9 Invasive Species:</p> <ol style="list-style-type: none"> 1. The Contractor will prepare an invasive species management plan, detailing how the introduction and spread of invasive species will be prevented. The invasive species management plan will be approved by Iarnród Éireann. 2. Aquatic invasive species Canadian Pondweed and Nutall's Waterweed spread by fragmentation and are widespread in the Royal Canal. The invasive species management plan will include measures to prevent their spread to other waterbodies by thoroughly cleaning all equipment involved in working the watercourses. 3. Herbicides will be used in accordance with the European Communities (Plant Protection Products) Regulations, 2012 (S.I. No. 159 of 2012) and the (Sustainable Use of Pesticides) Regulations, 2012, (S.I. No. 155 of 2012) (as amended). 4. Landscaping of the proposed development shall use native species of plants of national provenance only and, insofar as possible, soil reused from on-site excavations. If soil/substrate needs to be imported to the site for the purposes of the proposed development, the Contractor shall ensure that the imported soil/substrate is free from invasive species. 5. During the operational phase, the locations of Japanese Knotweed will be communicated to Iarnród Éireann and treated in accordance with Guidance on Identification and Control of Japanese Knotweed (Iarnród Éireann, 2015).

27.6 Mitigation and Monitoring Measure for Land and Soils

The table below details the mitigation measures identified in Chapter 9 Land and Soils.

Table 27-5 Mitigation and Monitoring Measures for Land and Soils

Section Ref.	Description
9.6.1.1	<p>Mitigation by design</p> <p><u><i>Earthworks footprint and material demands</i></u></p> <p>The construction works will be carried out with the least feasible disturbance of soils, minimising the footprints and hence the amounts of excavated soils and fill materials as a core objective of minimising the demands of the project. Examples include the assessment of options where other nearby roads are available as alternative routes for vehicular traffic and the accessibility requirements of pedestrian, cyclists and other e.g., non-motorised users are proposed to be met by a local overbridge when the level crossing is closed.</p> <p>The inert excavated soil will be re-used on site insofar as possible. Assumptions on the likely quantities and potential material types have been informed by investigations along the route. The reuse of materials arising from excavations in other locations, mainly Ballast and made ground materials, can be specified including ground improvement and treatment techniques. In Zones C to F, the majority of soil conditions are generally reasonably good with some soft deposits in local areas. In Zones A and B, the soil profile is much deeper and requires deep foundations or removal for installation of other measures, including the provision of slabs and design against flotation due to tidal / groundwater levels.</p> <p>The quantities of imported backfill at and around concrete foundations, abutments, embankments and retaining walls will be provided from suitably licenced quarries and suppliers. The designs of such structures will be engineered to specific and efficient requirements. A preliminary assessment of the volumes of materials arising and estimated to suit reuse or potentially require disposal has been provided.</p> <p>A Construction Environmental Management Plan (CEMP) (see Appendix A5.1 in Volume 4 of this EIAR) will address the Contractors plans to manage the excavations, temporary stockpiling, haulage and placement of materials, particularly in respect of how the soils will be contained and transported to suitable locations during construction. This is likely to contain several constituent elements such as a Sediment and Erosion Control Plan (SECP) to manage aspects like the potential for soil pollution of watercourses and control of dust.</p>

Section Ref.	Description
9.6.1.2	<p><u><i>Geotechnical risk management</i></u></p> <p>Preliminary assessments of the geotechnical risks associated with the project will be developed further as the project evolves, aiding the identification of items for investigations and design mitigation. The various investigations conducted to date to characterise the site including the advance geophysical survey and ground investigation contract.</p> <p>Design mitigation measures are assumed to be required locally associated with geotechnical risks to demonstrate or maintain stability of existing structures or for settlements due to new construction.</p>
9.6.2.1	<p>Construction mitigation</p> <p><u><i>Availability of suitable materials</i></u></p> <p>It is assumed that the majority, if not all imported material will be sourced from the nearest possible and most economic locations by the Contractor. A number of suitable active quarries with all necessary permits meeting the required specifications are present in the region. The requirements of the specifications can be tailored to meet project requirements while maximising the potential to reuse acceptable materials arising on-site.</p> <p>For select materials, there are suitable sources such as quarries in the wider region that can supply suitable products in order to meet the demands of the project.</p> <p>Assessment of the presence of pyrite may be required in the area of excavations, particularly where works involve piling and deep cuttings, to account for potential swelling properties and environmental risks and to inform potential reuse options. This would have to be taken into consideration during the construction sequence and when considering the use of concrete and other materials. 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) and specification for concrete such as the Specification for Road Works Series 1700 – Structural Concrete (TII 2017).</p>
9.6.2.2	<p><u><i>Treatment of unacceptable earthworks and construction demolition materials for reuse</i></u></p> <p>The excavated soil arising on-site will be screened and re-used within the scheme where possible however this may be dependent on having suitable areas for the stockpiling and processing operations. Materials to be excavated where structures are to be demolished may also provide suitable sources subject to crushing and testing to meet specific requirements. There is also a likelihood that some materials requiring excavation could also contain excess contamination and thus require disposal or treatment of the offending elements prior to establishing criteria inside the contamination thresholds (to date mainly due to petroleum hydrocarbons).</p> <p>The reusability of a soil will depend upon both its physical or engineering behaviour as well as the chemical constituents and classifications harm. In accordance with the requirements specified by the design, a soil can be classified as environmentally acceptable where the criteria for individual the Generic Assessment Criteria or Suitable for Use Levels (S4ULs) are not exceeded. These are most forgiving where materials can be improved in-situ, do not require excavation and does not have inherent pollutant linkages via end-uses such as residential homegrown produce or allotments.</p> <p>Where the soil exceeds the threshold imposed and it is excavated it will have to be disposed as non-hazardous or hazardous waste and it will not be possible to improve it by treatment for re-assessment of suitability for re-use. This is also relevant where the end-use of an area could be affected by proximity to flood waters for example. Limitations on such uses and potentially specifications and detailing would be required in the detailed design to ensure such materials are only left in appropriate places.</p> <p>Whenever the excavated / potentially treated soils do not meet the requirements, it will have to be disposed of by the Contractor who will ensure that all subsurface materials excavated during the construction phase of the proposed development are managed in accordance with the relevant waste management legislation, including the Waste Management Act 1996 (as amended).</p> <p>The successful Contractor will have to ensure that all unsuitable materials are removed from the site and sent to authorised waste management facilities (i.e. which hold all relevant, valid permits / licences) which accept the corresponding types of waste.</p>
9.6.2.3	<p><u><i>Ground treatment to reduce excavations of soft ground</i></u></p> <p>Where it is feasible by design or specification, waste will be avoided particularly with alternatives to the excavation and replacement of soft material, considering ground improvement treatments such as surcharging to mitigate consolidation and settlements, or mixing in situ with lime or cement additions to manage the effects of moisture and plasticity and improve the compaction achieved.</p>
9.6.2.4	<p><u><i>Protection of materials from erosion and seepage</i></u></p> <p>The embankments and structures proposed to be built adjacent to the rivers and canal where high flood flows may be anticipated shall be protected from erosion by the provision of granular shoulders, separating materials and a basal drainage blanket to avoid the potential for the development of high pressures to either erode the soil materials present or cause piping through the embankment.</p>

Section Ref.	Description
9.6.2.5	<p><u>Potential transport of materials by rail</u></p> <p>There are several parts of the site that are separated by circuitous and heavily trafficked routes that are likely to be affected temporarily by the works. Trafficking of bulk earthworks materials by road is an effective process and often offers Contractors the optimal flexibility in how they arrange mass haulage. There are several discrete locations that are potentially suited to rail haulage in close proximity to the sources that could supply large quantities directly to the locations of earthworks deficit however there are significant operational issues and risks to implement this.</p>
9.6.2.6	<p><u>Potential pollution pathways due to piling at new Spencer Dock Station</u></p> <p>Subject to detailed design of the system for the structural foundations, the resulting specification can mitigate the potential to cause spreading of pollution during the secant wall construction. The selected system should either provide telescopic construction for the borings required to construct the piles, continuing through a sealed concrete plug at the base of the made ground to provide a suitable way of constructing the piles required to transfer the load through to the required level without encouraging flow. Refer to section 9.5.2.1.4.</p>
9.6.2.7	<p><u>Potential pollution pathways due to piling at Connolly Station</u></p> <p>Subject to detailed design of the system for the structural foundations, the resulting specification can mitigate the potential to cause spreading of pollution during the micropile construction. The selected system should either provide telescopic construction for the borings required to construct the micropiles, continuing through a sealed concrete plug at the base of the made ground or install an alternative type of micropile that provides a suitable way of transferring the load through to the required toe level without encouraging flow. Refer to section 9.5.2.1.6.</p>
9.7	<p>Monitoring</p> <p>Monitoring measures are subject to detailed design requirements and construction methodologies. Depending on the treatment or ground improvement options chosen later in the design and construction process, the suitability of materials and treatments may need to be controlled or limited to avoid local e.g., chemical interactions involving cement and pyrite or processing of materials in areas of the site susceptible to flooding for example.</p> <p>Monitoring of existing historic structures and earthworks to the activities during construction may also be required to ensure their stability and durability. The construction sequence and specifications to be followed must be sympathetic to the potential range in behaviour of these elements.</p> <p>There must also be monitoring of the geo-environmental criteria for materials to track what types of materials are being brought around the site and to exclude materials that could be harmful to the water environments, flora and fauna or human health for reuse at locations where the fill is, for example – to be placed within levels subjected to flooding or canalised, to be returned to agriculture, use in allotments or landscaping. The monitoring of materials movement is expected to ensure appropriate disposal sites are used.</p> <p>It would be expected the project construction material specifications would be developed to manage this and that other key project specific works documentation such as a Construction Environmental Management Plan and a Sediment and Erosion Control Plan.</p>

27.7 Mitigation and Monitoring for Water (including Hydrology & Flood Risk)

The table below details the mitigation measures identified in Chapter 10 Water (including Hydrology & Flood Risk).

Table 27-6 Mitigation and Monitoring Measures for Water (including Hydrology & Flood Risk)

Section Ref.	Description
10.7.1	<p>Mitigation measures</p> <p><u>Construction Mitigation</u></p> <p>As is normal practice with infrastructure projects, an Environmental Operating Plan (EOP) and Construction Environmental Management Plan (CEMP) will be prepared for the proposed development and are included in Appendix A5.1 Construction Environmental Management Plan in Volume 4 of this EIAR. These will be developed by the selected Contractor to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team. In doing so, the measures detailed in the appended reports will be considered minimum requirements to be considered and improved upon. The level of detail provided within</p>

Section Ref.	Description
	<p>the current drafts of the Plans is sufficient to allow an assessment of the anticipated impacts including residual impacts.</p> <p>The following will be implemented as part of this plan:</p> <ol style="list-style-type: none"> 1. An Incident Response Plan (see Appendix F of Appendix A5.1 in Volume 4 of this EIAR) will be finalised detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks. 2. All necessary permits and licenses for in stream construction work will be obtained prior to the commencement of construction. 3. Inform and consult with Inland Fisheries Ireland and Waterways Ireland. <p>During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water.</p> <ol style="list-style-type: none"> 1. <i>Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board).</i> 2. <i>Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.</i> 3. <i>CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors.</i> 4. <i>CIRIA C648 Control of Water Pollution from Constructional Sites.</i> 5. <i>Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2006).</i>
10.7.1	<p>Based on the above guidance documents concerning the control of construction impacts on the water environment, the following outlines the principal mitigation measures that will be adhered to for the construction phase, in order to protect all catchment, watercourse and ecologically protected areas from direct and indirect impacts:</p> <p>General Mitigation Measures</p> <ol style="list-style-type: none"> 1. Site works will be limited to the minimum required to undertake the necessary elements of the proposed development. 2. Surface water flowing onto the construction area will be minimised through the provision of berms, diversion channels or cut-off ditches. 3. Management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and bunding. 4. Protection of waterbodies from silt load will be carried out through the use of gully silt/sediment filters and shallow berms in hardstanding areas to provide adequate treatment of runoff to watercourses. 5. Settlement tanks, silt traps/bags and bunds will be used. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap. 6. The anticipated site compound/storage facility will be fenced off at a minimum distance of 5 m from the top of bank. Any works within the 10 m buffer zone will require measures to be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse. A CEMP has been drafted and will need to be finalised by the appointed Contractor. See the Environmental Operating Plan (EOP) and Construction Environmental Management Plan (CEMP) in Appendix A5.1 Construction Environmental Management Plan in Volume 4 of this EIAR for further detail. 7. 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”. All chemical and fuel filling locations will be contained within bunded areas and set back a minimum of 20 m from watercourses. 8. Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution. 9. The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses.
10.7.1	<p>Specific Mitigation Measures - Concrete Works</p> <p>The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage which has a deleterious effect on water chemistry and aquatic habitats and species. As the use of concrete cannot be avoided, the following control measures will be employed:</p> <ol style="list-style-type: none"> 1. Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water. 2. When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used.

Section Ref.	Description
	<ol style="list-style-type: none"> 3. Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters. 4. Placing of concrete in or near watercourses will be carried out only under the supervision of the Ecological Clerk of Works (ECoW). 5. The weather forecast will be consulted prior to commencing concrete pours. No such works will be undertaken if inclement weather is forecast such that precipitation may make it difficult to maintain a dry working area. 6. There will be no spills of concrete, cement, grout, or similar materials hosed into surface water drains. Such spills shall be contained immediately, and runoff prevented from entering the watercourse. 7. Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses. 8. On-site concrete batching and mixing activities will only be allowed at the identified construction compound areas. 9. Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the manufacturer); 10. Chute washout will be carried out at designated locations only. These locations will be signposted. The Concrete Plant and all Delivery Drivers will be informed of their location with the order information and on arrival to site. 11. Chute washout locations will be provided with an appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the Contractor's Waste Management Plan.
10.7.1.1	<p><u><i>Flooding</i></u> The Contractor will provide method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in the Liffey estuary and Lyreen River. The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles, and persons from flood zones in order to minimise the risk to persons working on the site as well as potential input of sediment or construction materials into the river during flood events.</p>
10.7.1.2	<p><u><i>Royal Canal Water Levels</i></u> The works required for the track lowering adjacent the canal will include measures to ensure the integrity of the canal liner is maintained during the construction phase and to limit the potential for water to leak from the canal. Thus, maintaining appropriate water levels for navigational and existing habitat provision.</p>
10.7.1.3	<p><u><i>Recreational and amenity waters</i></u> The construction phase will prohibit transit upstream or downstream of Ashtown for approximately 1 year while the underpass is constructed. No measures are proposed to mitigate this impact.</p>
10.7.2	<p>Monitoring Measures Water quality monitoring will be undertaken in the Royal Canal, Lyreen River and Ballycaghan Stream, with monthly samples being taken from at least 12 months prior to commencement of construction until at least 24 months post-completion. The final number and location of sampling points will be determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager and Ecological Clerk of Works on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken where this is deemed to be associated with the proposed development.</p>
10.7.3	<p>Operational Mitigation There are no mitigation measures proposed for the operational phase of the proposed development.</p>
10.8	<p>Monitoring Monitoring is not proposed for the operational phase.</p>

27.8 Mitigation and Monitoring for Hydrogeology

The table below details the mitigation measures identified in Chapter 11 Hydrogeology.

Table 27-7 Mitigation and Monitoring Measures for Hydrogeology

Section Ref.	Description
11.6.1	<p>Mitigation in Construction Phase</p> <p>Mitigation required to protect the groundwater environment from potential sources of pollution during the construction phase is detailed in Chapter 9 Land and Soils and in Chapter 10 Water (including Hydrology & Flood Risk). The main elements of this mitigation that are particular to protecting the groundwater environment are reiterated in this section.</p> <p>A Construction Environmental Management Plan (CEMP) will be prepared for the proposed development (see Appendix A5.1 in Volume 4 of this EIAR) along with an Environmental Operating Plan (EOP) (see Appendix D of Appendix A5.1 in Volume 4 of this EIAR). These will be developed by the selected Contractor to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team. In doing so, the measures detailed in the appended CEMP and EOP will be considered minimum requirements to be considered and improved upon. The level of detail provided within the current drafts of the Plans is sufficient to allow an assessment of the anticipated impacts including residual impacts. An Incident Response Plan (see Appendix F of Appendix A5.1 in Volume 4 of this EIAR) will be finalised detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.</p> <p>The following outlines the principal mitigation measures that will be adhered to for the construction phase the groundwater environments is not affected from direct and indirect impacts. The source of groundwater pollution can be through migration of pollutants offsite via surface water pathways and then infiltration to ground, therefore a number of the mitigation measures focus on that potential pathway.</p> <p><i>Groundwater Quality Mitigation Measures</i></p> <ol style="list-style-type: none"> 1. Site works will be limited to the minimum required to undertake the necessary elements of the project. 2. Surface water flowing onto the construction area will be minimised through the provision of berms, diversion channels or cut-off ditches. 3. Management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and bunding. 4. Protection of waterbodies from silt load will be carried out through the use of gully silt/sediment filters and shallow berms in hardstanding areas to provide adequate treatment of runoff to watercourses. 5. Settlement tanks, silt traps/bags and bunds will be used. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap. 6. The anticipated site compound/storage facility will be fenced off at a minimum distance of 5 m from the top of bank. Any works within the 10 m buffer zone will require measures to be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse. A CEMP has been drafted and will need to be finalised by the appointed Contractor. See the Environmental Operating Plan (EOP) and Construction Environmental Management Plan (CEMP) in Appendix A5.1 in Volume 4 of this EIAR for further detail. 7. 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". All chemical and fuel filling locations will be contained within bunded areas and set back a minimum of 20 m from watercourses. 8. Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution. 9. The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses. 10. Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses. 11. On-site concrete batching and mixing activities will only be allowed at the identified construction compound areas. <p><i>Contaminated Land Mitigation Measures</i></p> <ol style="list-style-type: none"> 1. The excavated soil arising on-site will be screened and re-used within the proposed development where possible however this may be dependent on having suitable areas for the stockpiling and processing operations. Materials to be excavated where structures are to be demolished may also provide suitable sources subject to crushing and testing to meet specific requirements. There is also a likelihood that some materials requiring excavation could also contain excess contamination and thus require disposal

Section Ref.	Description											
	<p>or treatment of the offending elements prior to establishing criteria inside the contamination thresholds (to date mainly due to petroleum hydrocarbons).</p> <ol style="list-style-type: none"> The reusability of a soil will depend upon both its physical or engineering behaviour as well as the chemical constituents and classifications harm. In accordance with the requirements specified by the design, a soil can be classified as environmentally acceptable where the criteria for individual the Generic Assessment Criteria or Suitable for Use Levels (S4ULs) are not exceeded. Where the soil exceeds the threshold imposed and it is excavated it will have to be disposed as non-hazardous or hazardous waste and it will not be possible to improve it by treatment for re-assessment of suitability for re-use. Whenever the excavated / potentially treated soils do not meet the requirements, it will have to be disposed of by the Contractor who will ensure that all subsurface materials excavated during the construction phase of the proposed development are managed in accordance with the relevant waste management legislation, including the Waste Management Act 1996 (as amended). The successful Contractor will have to ensure that all unsuitable materials are removed from the site and sent to authorised waste management facilities (i.e. which hold all relevant, valid permits / licences) which accept the corresponding types of waste. <p>Additional mitigation required for Spencer Docks is reiterated in the table below.</p> <p style="text-align: center;">Table 11-30 Spencer Dock Station Construction Mitigation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #4CAF50; color: white;">Effects</th> <th style="background-color: #4CAF50; color: white;">Mitigation</th> </tr> </thead> <tbody> <tr> <td>Dewatering operations have the potential to mobilise fine grained materials from the surrounding soils</td> <td> <p>A dewatering strategy for construction will be developed to:</p> <ol style="list-style-type: none"> Quantifying dewatering volumes. Assessing groundwater drawdown impacts. Upwelling pressure on the concrete pad. Develop a treatment strategy for the pumped water. Evaluate potential long term changes in groundwater levels and mitigation to prevent possible future flooding through changes in flow patterns. <p>The strategy will be based upon the development of a groundwater model of the planned works.</p> </td> </tr> <tr> <td>Generation and disposal of contaminated water from dewatering</td> <td>Water will be monitored, pre-treated where necessary and disposed of in accordance with a discharge licence content issued by the Drainage Division Pollution Control Section of Dublin CC.</td> </tr> </tbody> </table>	Effects	Mitigation	Dewatering operations have the potential to mobilise fine grained materials from the surrounding soils	<p>A dewatering strategy for construction will be developed to:</p> <ol style="list-style-type: none"> Quantifying dewatering volumes. Assessing groundwater drawdown impacts. Upwelling pressure on the concrete pad. Develop a treatment strategy for the pumped water. Evaluate potential long term changes in groundwater levels and mitigation to prevent possible future flooding through changes in flow patterns. <p>The strategy will be based upon the development of a groundwater model of the planned works.</p>	Generation and disposal of contaminated water from dewatering	Water will be monitored, pre-treated where necessary and disposed of in accordance with a discharge licence content issued by the Drainage Division Pollution Control Section of Dublin CC.					
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Generation and disposal of contaminated water from dewatering	Water will be monitored, pre-treated where necessary and disposed of in accordance with a discharge licence content issued by the Drainage Division Pollution Control Section of Dublin CC.											
11.6.2	<p>Mitigation measures</p> <p>Mitigation by design/ Operational Phase Mitigation</p> <p>Mitigation for the proposed Spencer Dock Station and the proposed depot are outlined in Section 11.5.3.1.1 and 11.5.3.6 and are reiterated in the table below.</p> <p style="text-align: center;">Table 11-29 Mitigation by design/ Operational Phase Mitigation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #4CAF50; color: white;">Location</th> <th style="background-color: #4CAF50; color: white;">Effects</th> <th style="background-color: #4CAF50; color: white;">Mitigation</th> </tr> </thead> <tbody> <tr> <td>Spencer Dock</td> <td>Changes to groundwater flow patterns and relief of groundwater flooding impacts</td> <td>Additional data collection and analysis will be undertaken at detailed design stage to assess the impact of the piling and slab work on groundwater flow patterns. This may require the development of a groundwater model. If this identifies that the works will result in higher groundwater levels, that will cause potential groundwater flooding impacts, additional mitigation such as the incorporating use of drainage systems such as shallow relief boreholes will be incorporated into the design. It should be possible to incorporate such mitigation within the existing footprint of the design. The surrounding area has a number of similarly scaled basements for which impacts have successfully been mitigated. Depending on the solution, additional discharge consents may be required to dispose of the water.</td> </tr> <tr> <td rowspan="2">Depot and Zone F</td> <td>Pollution from all activities on site including washing and maintenance.</td> <td>The discharges from site will be routed through a treatment pond. This has been designed and sized in accordance with the CIRIA manual. The pond will act as a location for the settling of silts and suspended material and will offer a level of biological treatment. Hardstanding and a system of soil separates will be used to contain potential spillages on site.</td> </tr> <tr> <td>Reduced recharge to underlying bedrock aquifer (Lucan Formation) from increased areas of impermeable hard standing.</td> <td>Currently recharge through the till derived from limestone on site is relatively low based upon GSI information. Increasing the hardstanding on site will reduce recharge to the aquifer immediately below the footprint of the hardstanding. However, the drainage design will incorporate infiltration strips and other SUDs measures. The attenuation basins will also act to mimic inputs in the River Lyreen system through high rainfall events.</td> </tr> </tbody> </table>	Location	Effects	Mitigation	Spencer Dock	Changes to groundwater flow patterns and relief of groundwater flooding impacts	Additional data collection and analysis will be undertaken at detailed design stage to assess the impact of the piling and slab work on groundwater flow patterns. This may require the development of a groundwater model. If this identifies that the works will result in higher groundwater levels, that will cause potential groundwater flooding impacts, additional mitigation such as the incorporating use of drainage systems such as shallow relief boreholes will be incorporated into the design. It should be possible to incorporate such mitigation within the existing footprint of the design. The surrounding area has a number of similarly scaled basements for which impacts have successfully been mitigated. Depending on the solution, additional discharge consents may be required to dispose of the water.	Depot and Zone F	Pollution from all activities on site including washing and maintenance.	The discharges from site will be routed through a treatment pond. This has been designed and sized in accordance with the CIRIA manual. The pond will act as a location for the settling of silts and suspended material and will offer a level of biological treatment. Hardstanding and a system of soil separates will be used to contain potential spillages on site.	Reduced recharge to underlying bedrock aquifer (Lucan Formation) from increased areas of impermeable hard standing.	Currently recharge through the till derived from limestone on site is relatively low based upon GSI information. Increasing the hardstanding on site will reduce recharge to the aquifer immediately below the footprint of the hardstanding. However, the drainage design will incorporate infiltration strips and other SUDs measures. The attenuation basins will also act to mimic inputs in the River Lyreen system through high rainfall events.
Location	Effects	Mitigation										
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Section Ref.	Description		
	Location	Effects	Mitigation
		Increased vulnerability of the aquifer through the construction of regrading of the site.	The regrading of the site has the potential to increase the vulnerability of the aquifer to pollution, through reducing the thickness of the till covering parts of the site. The areas of excavation on site are limited to approximately 18% of the depot area with a maximum depth of cut of 1m with and average of 0.54m. The areas of cut are limited to high ground where groundwater monitoring shown the surrounding water table to be circa 1m below ground level at its highest. This will be mitigated through the use of pollution containment systems detailed within this table. Increased groundwater vulnerability through the depot area will therefore be effectively mitigated.
		Increased vulnerability of the bedrock aquifer through the construction of the flood compensation area.	The flood compensation areas, especially the one neighbouring the River Lyreen has the potential to increase groundwater vulnerability through the removal of the overlying till and excavation into the Lucan Formation. Wetland habitats will be incorporated into the design of the flood compensatory storage areas.
11.7	Monitoring No ongoing groundwater monitoring requirements have been identified through the assessment process.		

27.9 Mitigation and Monitoring for Air Quality

The table below details the mitigation measures identified in Chapter 12 Air Quality.

Table 27-8 Mitigation and Monitoring Measures for Air Quality

Section Ref.	Description
12.6	Mitigation Measures To sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operational phases associated with the proposed development.
12.6.1.1	<p>Construction Phase <u>Construction Phase Dust Mitigation Measures</u></p> <p>The potential risk from dust emissions has been reviewed in Appendix A12.2 Potential Dust Generating Activities in Volume 4 of the EIAR for the most important activities. Further details on construction methods can be found in Chapter 5 of the EIAR which contains an overview of the typical activities and methods that are anticipated to be used during construction and commissioning of the proposed development. In addition, the mitigation measures documented in this section and Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR will be implemented in parallel with the Construction Environmental Management Plan (CEMP). Before commencing relevant works, an air quality management plan shall be prepared by the Contractor and submitted for approval to the relevant planning authority. The plan must include all appropriate dust and emissions mitigation measures, applicable to the circumstances of the relevant site, based on the local authority requirements and industry best practices. Dublin City Council (DCC) guidance document titled Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (DCC 2018) will be taken into consideration with respect to mitigation dust measures.</p> <p>The plan will be developed by the Contractor and for each worksite shall include:</p> <ol style="list-style-type: none"> 1. An inventory and timetable of activities which may give rise to emissions or dust. 2. Alert levels. 3. Alert system to be used (including notification process). 4. Details of control measures. 5. Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used. 6. Details of the air quality reporting requirements. <p>A pre-construction dilapidation survey of all buildings will be required prior to commencement of the construction phase. There are no buildings which have shown potential for asbestos containing material, however, a fully intrusive asbestos containing materials survey will be completed if asbestos potential is indicated in the pre-construction dilapidation survey. Prior to commencement of the demolition works, all</p>

Section Ref.	Description
	<p>asbestos containing materials identified by the Management Asbestos Survey and Refurbishment and Demolition Survey will be removed by a suitably trained and competent person. Asbestos-containing materials will only be removed from site by a suitably permitted/licensed waste Contractor and will be brought to a suitably licensed facility. The Health and Safety Authority will be contacted where needed in relation to the handling of asbestos and material will be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, as amended and associated approved Codes of Practice.</p> <p>The mitigation measures put in place to control construction dust will be implemented as mitigation measures with respect to aspergillus as they will minimise the potential for spread of the fungal spores.</p> <p>To ensure that no dust nuisance occurs, a series of measures will be implemented, these have been detailed in Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR. In summary, the measures which will be implemented will include:</p> <ol style="list-style-type: none"> 1. 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. 2. Liaison with local authorities and community groups. 3. Hoarding will be provided around the construction compounds. 4. It is anticipated that methods of collecting rainwater and recycling for general site use, will be adopted where practical. <p>Strict dust prevention will always be in place, to minimise any potential emissions and these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.</p> <p>Monitoring of construction dust deposition at nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2 m above ground level. The TA Luft limit value is 350 mg/(m²·day) during the monitoring period between 28 - 32 days.</p> <p>Consistent implementation of good dust minimisation practices will ensure that the likely effects from construction dust is short-term, localised, reversible and not significant when considered with respect to the EPA description of effects (EPA 2022).</p>
12.6.1.2	<p><u>Construction Phase Traffic Mitigation Measures</u></p> <p>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:</p> <ol style="list-style-type: none"> 1. Implement a policy which prevents idling of vehicles both on and off-site including HGV holding sites. 2. Construction phase traffic should be monitored to ensure construction vehicles are using the designated haul routes. 3. The Contractor must adhere to defined traffic routes as noted in the Construction Traffic Management Plan. 4. Efficient scheduling of deliveries to minimise number of truck movements. 5. Construction vehicles should 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. This will ensure emissions on haul routes are minimised. <p>Mitigation measures are required for the control of dust with respect to HGV movements onsite with the site and deliveries to/from the site:</p> <ol style="list-style-type: none"> 1. HGV traffic leaving site will pass through a wheel wash. 2. 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 to access spaces around cars and other street furniture more effectively. 3. During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
12.6.2	<p>Operational Phase</p> <p>As all ambient air pollutants will remain in compliance with the ambient air quality standards and the proposed development has negligible impacts at all modelled receptors with respect to TII Guidance (TII 2011), no specific operation phase mitigation measures are required.</p>

27.10 Mitigation and Monitoring for Climate

The table below details the mitigation measures identified in Chapter 13 Climate.

Table 27-9 Mitigation and Monitoring Measures for Climate

Section Ref.	Description
13.6	<p>Mitigation Measures</p> <p>The proposed development sets out mitigation measures with respect to the construction and operational phases in order to reduce its impact on climate related GHG emissions by implementing low-carbon energy options. The IEMA GHG Management Hierarchy (IEMA 2020b) should be following as an overarching strategy for impact minimisation. The Hierarchy is as follows:</p> <ol style="list-style-type: none"> 1. First Eliminate <ol style="list-style-type: none"> a) Influence business decisions/use to prevent GHG emissions across the lifecycle. b) Potential exists when organisations change, expand, rationalise or move business. c) Transition to new business model, alternative operation or new product/service. 2. Then Reduce <ol style="list-style-type: none"> a) Real and relative (per unit) reductions in carbon and energy. b) Efficiency in operations, processes, fleet and energy management. c) Optimise approaches (e.g. technology) and digital as enablers. 3. If you can't eliminate or reduce, then Substitute <ol style="list-style-type: none"> a) Adopt renewables/low-carbon technologies (on site, transport etc). b) Reduce carbon (GHG) intensity of energy use and of energy purchased. c) Purchase inputs and services with lower embodied/embedded emissions. 4. The final option is to Compensate <ol style="list-style-type: none"> a) Compensate 'unavoidable' residual emissions (removals, offsets etc). b) Investigate land management, value chain, asset sharing, carbon credits. c) Support climate action and developing markets (beyond carbon neutral). <p>IE will actively purchase materials and services with lower embodied/embedded emissions. Where possible the aim is to design out and eliminate potential impacts completely. Where this is not possible impacts should be reduced/substituted to reduce impacts. Finally, if impacts cannot be eliminated by design or reduced/substituted then the IEMA GHG Management Hierarchy final mitigation measure that should be considered is compensation, this includes the use of carbon offsets.</p> <p>IEMA Guidance (IEMA 2022) states that the crux of significance regarding impact on climate is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050. The proposed development's sustainability aims align with the project being net zero by 2050 and the mitigation measures below will be implemented in order to ensure that this aim is met.</p>
13.6.1	<p>Construction Phase</p> <p>Construction traffic and the embodied energy of construction materials will be the dominant source of greenhouse gas emissions as a result of the Construction phase of the proposed development. Construction vehicles, generators etc., may give rise to some CO₂ and N₂O emissions.</p>
13.6.1.2	<p><i>Construction Phase Embodied Carbon Mitigation</i></p> <p><u><i>Embodied Carbon Mitigation Measures</i></u></p> <p>A series of mitigation measures have been incorporated into the construction design with the goal of reducing the embodied carbon associated with the Construction phase of the proposed development. These mitigation measures include:</p> <ol style="list-style-type: none"> 1. The replacement, where feasible, of concrete with concrete containing 30% fly ash replacement. The majority (80%) of concrete is assumed to be RC 32/40MPa which has an embodied carbon of 298 kgCO₂e per m³ with 30% fly ash replacement compared to a standard embodied carbon of 359 kgCO₂e per m³, a 17% reduction. The remaining 20% is assumed to be a mixture of other strengths, with an assumption of 10% being a lower grade RC 20/25 MPA (290 kgCO₂e per m³ reduces to 235 kgCO₂e per m³) and 10% being a higher strength RC 45/50 MPA (413 kgCO₂e per m³ reduces to 338 kgCO₂e per m³). This measure has been included in the calculations within Section 13.3.3.1 and resulted in a saving of 13,719 tonnes CO₂e. 2. Steel will be sourced from continental Europe where a high proportion of it is made from recycled materials. Discussions with a potential supplier confirmed that reinforcement for concrete is always produced using recycled material at no additional financial cost, structural steel is produced using recycled

Section Ref.	Description
	<p>materials at no additional financial cost and steel for cladding can have the recycled content stipulated in contracts for a small (5-7%) additional cost. Iarnród Éireann will pursue procurement of the highest recycled steel content that is available for the particular steel usage. This may vary depending on engineering constraints.</p> <ol style="list-style-type: none"> 3. The proposed development will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the site. 4. Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy set out in the Waste Framework Directive (2008/98/EC), which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill. As reuse and recycling capacity is unknown for the construction year a conservative approach has been taken during the assessment. This assumes all waste that is not guaranteed to be reused onsite will be sent to landfill. 5. Detailed design will investigate the use of tapial blocks made of rammed earth which can replace the concrete piles and a concrete wall as the interior finishing face within the Spencer Dock excavation. <p>The significance criteria for impacts (IEMA 2022) states that the impact significance must be taken from the project as a whole over its lifecycle rather than individual elements and therefore will be discussed in the residual impacts section.</p>
13.6.1.3	<p><u>Construction Phase Road Traffic Mitigation</u></p> <p>Some site-specific mitigation measures will be implemented during the Construction phase of the proposed development to ensure construction traffic emissions are reduced. A Construction Traffic Management Plan (CTMP) (See Appendix A6.3 in Volume 4 of this EIAR) and a Mobility Management Plan (MMP) will be implemented throughout the construction stage to avoid congestion and thus reduce GHG emissions. All plant and machinery will be maintained and serviced regularly.</p> <p>Construction vehicles, generators etc., will give rise to some GHG emissions, however the proposed development impact on climate due to traffic (Section 13.5.1.1) will be minimised through mitigation measures. The following mitigation measures will be put in place to minimise emissions:</p> <ol style="list-style-type: none"> 1. Implement a policy which prevents idling of vehicles both on and off-site including HGV holding sites. 2. Construction phase traffic should be monitored to ensure construction vehicles are using the designated haul routes. 3. All plant and machinery will be maintained and serviced regularly. 4. Efficient scheduling of deliveries to minimise number of road trips required. 5. Construction vehicles will conform to the current EU emissions standards and where reasonably practicable, their emissions should meet upcoming standards prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised. <p>In addition, as part of the proposed development a Construction Traffic Management Plan (CTMP) will be put in place for the construction phases, see Appendix A6.3 in Volume 4 of this EIAR. The CTMP will be put in place for the construction phase following consultation with local authorities. Regional roads, primary roads and sections of the 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 proposed to minimize construction impacts on pedestrians, cyclists and on the operation of bus services which will ensure public transport remains a priority.</p> <p>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 development 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 works. 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.</p>
13.6.2.1	<p>Operational Phase</p> <p><u>Maintenance Phase Embodied Carbon Mitigation</u></p> <p>The maintenance phase GHG emissions will primarily consist of the maintenance of materials which were used in construction. No specific mitigation is set out however where possible, materials should be replaced in the most sustainable manner available. This may mean different materials used in replacement during the operational phase.</p>
13.6.2.2	<p><u>Operational Phase Rail Mitigation</u></p> <p>During the impact assessment it was assumed that the DN and DS achieved the CAP target of 80% renewables.</p> <p>Iarnród Éireann have agreed to purchase up to 80% of its operational demand from certified low or zero carbon electricity for operations. A Corporate Power Purchase Agreement (CPPA) is a financial contract with a renewable generator that will allow for a guaranteed source of renewable power for the operation of the</p>

Section Ref.	Description
	<p>proposed development in future. This will ensure that should the CAP target of 80% renewables not be achieved the project will still achieve the target within itself. Should the national grid not achieve its target of 80% renewables by 2030 then the CPPA will further the beneficial impact of the proposed development.</p> <p>Over 80% of Iarnród Éireann (Iarnród Éireann 2021) energy consumption is diesel fuel. In addition to changing the rail corridor to facilitate a change from DMUs to EMUs, further mitigation through the improvements in fuel efficiency for the remaining DMUs will be implemented. These include using timetable optimisation and driver training, fuel consumption telematics for older rolling stock, Auto-Shut down for a significant portion of the fleet, matching train sizes to customer demand and elimination of Temporary Speed Restrictions (TSRs) arising from infrastructure renewals.</p> <p>In addition a number of fuel efficiency programs are currently in progress / on-trial (Iarnród Éireann 2021) . These include the trial replacement of ICR gearboxes, replacement of ICR diesel engines with hybrid drives, Envirox fuel additive to increase fuel efficiency and to keep diesel engine DP filters clean and replacement of diesel vans with electric road vehicles supported by charging points at depots and stations.</p>
13.6.2.3	<p><u>Operational Phase Demand</u></p> <p>The proposed development also aims to reduce the energy demand with passive architectural strategies, reducing energy consumption with energy-efficient equipment and producing energy with renewable technologies. Energy is also related to CO₂ emissions and IÉ's future Carbon Neutrality goal. The use of building design to maximise natural lighting and solar gain, use of motion-controlled lighting systems and LEDs will reduce building energy requirements.</p> <p>Potable water consumption will be minimised using low consumption fixtures and recycling and reuse of greywater. In addition, Iarnród Éireann will prioritise the use of environmentally friendly materials and the use of recycled and recyclable materials during the operation of the proposed development.</p> <p>A Depot Sustainability Strategy has been produced with an objective to design a functional, efficient and comfortable building with a minimum environmental impact, being an nZEB, Nearly Zero Energy Building and achieving EXEED certification. This will mitigate operational phase energy demand and ensure it is minimised.</p> <p>The Iarnród Éireann Sustainability strategy (Iarnród Éireann 2021 and 2022) notes the following key mitigation measures for reduction in their carbon footprint:</p> <ol style="list-style-type: none"> 1. Compliance with relevant ISO and national NSAI energy and environmental standards. 2. Contributing to transport sector decarbonisation including improving fleet and buildings fuel / energy performance, fleet hybridisation, phased network electrification and promoting and facilitating a shift to rail. 3. Recycling of 70% of all waste. 4. Near Zero Energy Building standard in all new buildings, and upgrades of 140 existing buildings to minimum BER B. 5. Reduction in overall carbon emissions by 51% between 2021 to 2030. 6. Improving operations, infrastructure and fleet climate change resilience including partnership approach to emergency responses and wide-ranging mitigation measures including coastal protection. 7. Reducing environmental impacts including LEAN management, waste and water management, green procurement in support of the circular economy and site decontamination. 8. Protecting habitats and promoting biodiversity in a partnership approach. <p>The above actions and others within the Iarnród Éireann Sustainability strategy will be implemented as part of Iarnród Éireann's future mitigation and this includes the proposed development mitigation.</p>
13.6.2.4	<p><u>Operational Phase Road Traffic Mitigation</u></p> <p>The impact of the Operational phase road traffic from the proposed development on national greenhouse gas emissions will be insignificant in terms of Ireland's obligations under the EU 2030 Target (Government of Ireland, 2021b). The proposed development aims to facilitate a modal shift away from private road transport to electrified public transport. The increased frequency and capacity of the railway corridor will provide a more attractive alternative to private car travel, encouraging more passenger travel by more sustainable modes while providing a better quality of life for citizens. Total trip demand is increasing into the future in line with population, employment and jobs growth. A greater share of the demand will be by sustainable modes (public transport, walking and cycling) and move away from private transport.</p> <p>Iarnród Éireann (2022) in their 2021 to 2030 sustainability plan have committed to 100% electric or hybrid road vehicles by 2030.</p>
13.7	<p>Monitoring</p> <p>No monitoring measures are proposed for the operational phase.</p>

27.11 Mitigation and Monitoring for Noise and Vibration

The table below details the mitigation measures identified in Chapter 14 Noise and Vibration

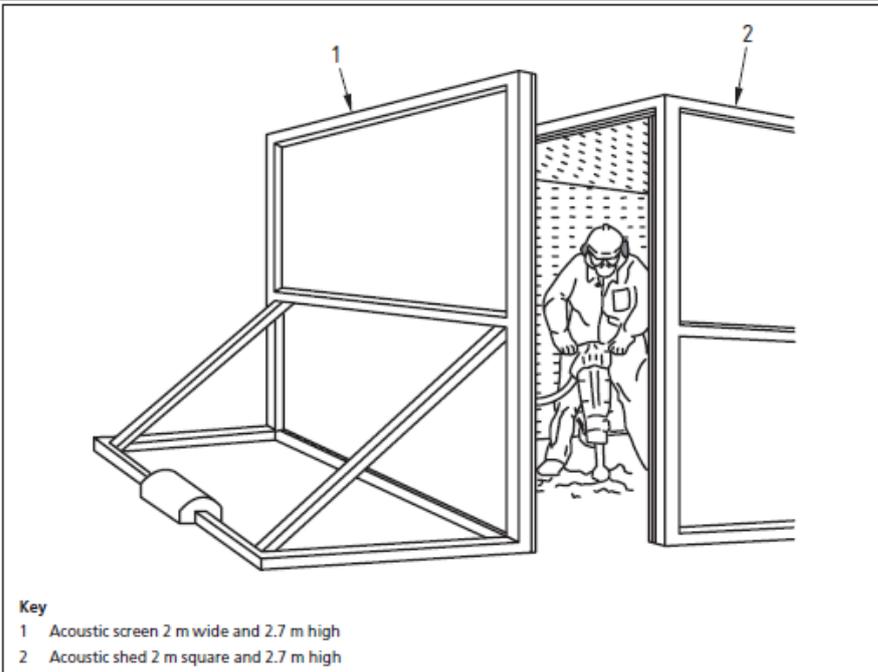
Table 27-10 Mitigation and Monitoring Measures for Noise and Vibration

Section Ref.	Description
14.6.1	<p>Mitigation measures</p> <p>Construction Stage</p> <p>During the course of construction the procedures outlined in Iarnród Éireann operation procedure CCE-QMS-008-002 Noise Management – CCE Activities will be implemented. This document outlines the following noise mitigation measures:</p> <ol style="list-style-type: none"> 1. The Community Liaison Officer (or other nominated person) will notify affected residents in advance of any planned works commencing with a letter drop in the relevant area. 2. Where planned work occurs over a 72hr weekend shutdown there will be a noise management plan submitted to the local authority. 3. All attempts to avoid, prevent or reduce the harmful effects of exposure to environmental noise arising from work activities must be practical and appropriately risk assessed before implementation. 4. The following measures should be implemented where feasible during construction activities: <ol style="list-style-type: none"> a) Carry out as much preparatory work in daylight as possible (sawing or drilling rails). b) Inspect the worksite in daylight if possible and look for the best location to position generators. c) Position generators and lighting away from residential dwellings. d) Take advantage of natural barriers such as vegetation, walls or embankments that can offer noise screening to adjacent neighbours. e) Where necessary, use noise attenuation screens. The screens must be located as close to the receiver or source as possible. f) Consider using additional supply cables and structures so that the generators can be positioned as far away from housing as practicable. g) Where possible, use low-noise plant. Any unsuitable plant should be replaced by higher quality low noise plant, or contained by the use of mufflers/silencers. h) Do not leave equipment or vehicles running/idling unnecessarily. i) Do not shout work instructions when working in residential areas at night unless absolutely necessary. j) Plan effectively to ensure timely deliveries of materials. <p>The following sections outline additional detail with regards noise and vibration mitigation during construction.</p>
14.6.1.1	<p><u><i>Communication with Neighbours</i></u></p> <p>The Contractor should be proactive in engaging with the occupants of neighbouring properties and should notify them of any works forecast to generate appreciable levels of noise, explaining the nature and duration of the works.</p> <p>A designated noise liaison should be appointed by the Contractor for the duration of the construction works. This person should log any issues and follow up in a prompt fashion.</p> <p>Night-works in particular have the potential to generate the most significant noise effects. All affected sensitive locations should be notified of planned works in advance of the works progressing. The notification should include a description of the works, the expected duration and details of how to contact the Contractor to log complaints.</p>
14.6.1.2	<p><u><i>Noise & Vibration Monitoring</i></u></p> <p>The following ongoing noise monitoring programme is recommended for the site in relation to demolition and construction activities.</p> <p>Noise Monitoring Terminals (NMT), number and locations to be agreed, to be installed with the following specifications (or similar approved):</p> <ol style="list-style-type: none"> 1. Logging of two concurrent periods, e.g. 15-minute & hourly. 2. Daily CIC automated calibrations. 3. E-mail alert on threshold exceedance. 4. E-mail alert on low battery and low memory. 5. Remote access to measured data. 6. Live display of noise levels.

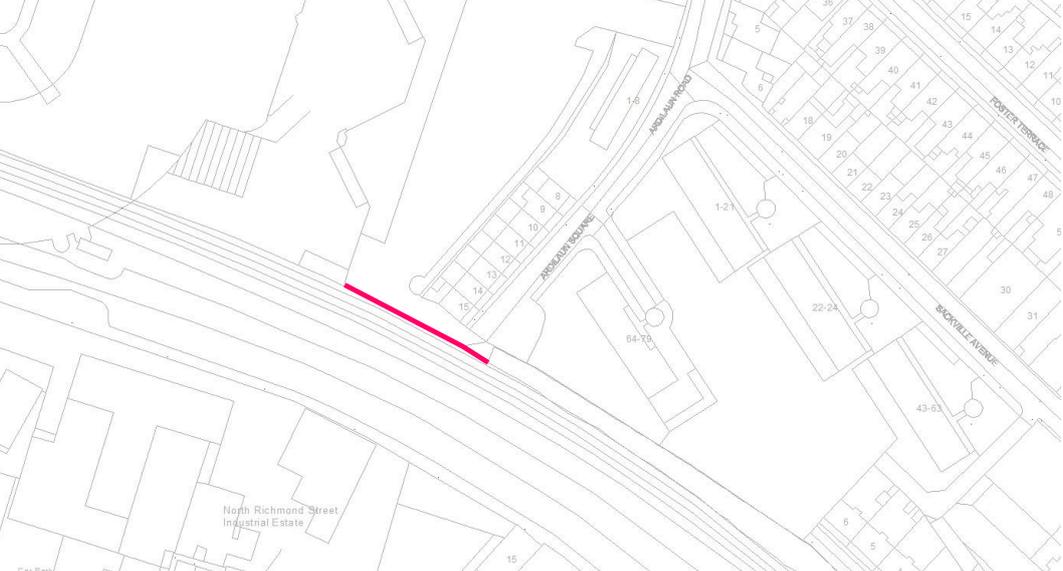
Section Ref.	Description
	<p>Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with BS ISO 4866: 2010: Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures.</p> <p>The mounting of the transducer to the vibrating structure will need to comply with BS ISO 5348: 1998: Mechanical vibration and shock – Mechanical mounting of accelerometers. In summary, the following ideal mounting conditions apply:</p> <ol style="list-style-type: none"> 1. The transducer and its mountings should be as rigid as possible. 2. The mounting surfaces should be as clean and flat as possible. 3. Simple symmetric mountings are best. 4. The mass of the mounting should be small in comparison to that of the structure under test. 5. The monitoring equipment should be set to monitor vibration in 5 minute periods. 6. E-mail alert on threshold exceedance. 7. E-mail alert on low battery and low memory. 8. Remote access to measured data. 9. Live display of vibration levels. <p>In addition, it is recommended that spot check noise & vibration measurements are conducted on a monthly basis. These spot checks can be organized to coincide with works that have potential to generate high levels of noise or vibration on site in order to confirm the potential extent of effect.</p> <p>A monthly noise and vibration monitoring report should be prepared by the Contractor. Reports should identify any exceedances above nominal limit values and attempts to clarify the causes etc. Where remedial measures are required and identifiable, these should also be clearly stated.</p>
<p>14.6.1.3</p>	<p><u>Noise Control Audits</u></p> <p>It is recommended that noise control audits be conducted at regular intervals throughout the construction programme.</p> <p>The purpose of the audits will be to ensure that all appropriate steps are being taken to control construction noise emissions. To this end, consideration should be given to issues such as the following (note that this list is not intended to be exhaustive):</p> <ol style="list-style-type: none"> 1. Hours of operation being correctly observed. 2. Opportunities for noise control “at source”. 3. Optimum siting of plant items. 4. Plant items being left to run unnecessarily. 5. Correct use of proprietary noise control measures. 6. Materials handling. 7. Poor maintenance. 8. Correct use of screening provided and opportunities for provision of additional screening.
<p>14.6.1.4</p>	<p><u>Hours of Work</u></p> <p>In order to maintain services during the day, the majority of on track construction works along the railway line itself will take place at night. Works outside of the live railway corridor can progress during the day (i.e., construction of bridges associated with level crossing replacements, the construction of the depot, substations, construction compounds). Every effort will be made to avoid, reduce, and/or mitigate negative effects, however, there is likely to be some disturbance experienced for those in close proximity to the railway line caused by noise, lighting or fencing/hoarding erected associated with the construction activities.</p> <p>Consideration should be given to the scheduling of activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity should be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control.</p> <p>Depending on the noise emission levels experienced and associated noise effects, the Contractor should be flexible and able to conduct certain works at hours which reflect periods when the neighbouring properties have lower sensitivities to noise. Furthermore, every effort will be made to schedule the noisiest works to take place during the less sensitive daytime working hours.</p>
<p>14.6.1.5</p>	<p><u>Selection of Quiet Plant</u></p> <p>Careful consideration must be given to the noise emission levels of plant items when they are being considered for use on the site. This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers’ proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of</p>

Section Ref.	Description
	<p>plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.</p>
<p>14.6.1.6</p>	<p><u>Control of Noise Sources</u></p> <p>If the use of low noise plant or replacing a noisy item of plant are not viable or practicable options, consideration should be given to noise control “at source”. This refers to the modification of an item of plant or the application of improved sound reduction methods, often in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.</p> <p>BS5228 states that “as far as reasonably practicable sources of significant noise should be enclosed”. In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures that could be moved around site as necessary may also be used to screen operatives using hand tools such as angle grinders.</p> <p>In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. It is therefore proposed to adopt the concept of “Best Available Techniques” (BAT).</p> <p>BAT is defined as follows in EC Directive 96/61:</p> <p><i>“...the most effective and advanced stage in the development of an activity and its methods of operation which indicate the practical suitability of particular techniques for providing, in principle, the basis for emission limit values designed to prevent or eliminate or, where that is not practicable, generally to reduce an emission and its impact on the environment as a whole.”</i></p> <p>In this context “best” means “the most effective in achieving a high general level of protection of the environment as a whole”.</p> <p>The expression “available techniques” means “those techniques developed on a scale which allows implementation...., under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced within the State, as long as they are reasonably accessible to the operator carrying on the activity”.</p> <p>The term “techniques” includes “both the technology used and the way in which the installation is designed, built, managed, maintained, operated and decommissioned”.</p> <p>In specifying or otherwise determining BAT, consideration should be given to a specified list of considerations and also to “the likely costs and advantages of measures” as well as “the principles of precaution and prevention”.</p> <p>Thus, the concept of BAT requires a degree of balance between the attainment of environmental benefits and the likely cost implications. In the identification of BAT, regard should be had to a wide range of factors, however, emphasis should be given to “practical suitability” and the need “to reduce an emission and its impact on the environment as a whole”.</p> <p>Proposed techniques should also be evaluated in light of their potential effect on occupational health and safety. BS5228 makes a number of recommendations in relation to “use and siting of equipment”. These are relevant and hence are reproduced below. These recommendations should be implemented on the site.</p> <p><i>“Plant should always be used in accordance with manufacturers’ instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas.</i></p> <p><i>Circumstances can arise when night-time working is unavoidable. Bearing in mind the special constraints under which such work has to be carried out, steps should be taken to minimise disturbance to occupants of nearby premises.</i></p> <p><i>Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.</i></p> <p><i>Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.</i></p> <p><i>Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.</i></p> <p><i>Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material.”</i></p> <p>We would also offer the following outline guidance in relation to specific considerations.</p> <ol style="list-style-type: none"> 1. For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling. 2. 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 may be possible to reduce the

Section Ref.	Description
	<p>noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.</p> <ol style="list-style-type: none"> 3. For percussive tools such as pneumatic concrete breakers, rock drills and tools 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. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries. 4. For all materials handling ensure that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials. 5. For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation. 6. Demountable enclosures can also be used to screen operatives using hand tools and may be moved around site as necessary. 7. All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures. 8. Where practicable, metal on metal or rock on metal impacts should be avoided during night works. This can be achieved through the use of rubber mallets or impact linings etc. on site. 9. White noise reverse alarms should be utilised on vehicles where practicable to reduce potential annoyance of tonal noise emissions from site.
14.6.1.7	<p><u>Screening</u></p> <p>The use of screens can be effective in reducing the noise level at a receiver location and should be employed as a complementary measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver. The height and length of any screen should, where practicable, be such that there is no direct line of sight between the source and the receiver.</p> <p>BS5228 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the screen should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the barrier rather than the transmission through the barrier itself. Screens constructed of materials with a surface mass greater than 10 kg/m typically offer adequate sound insulation performance.</p> <p>Annex B of BS5228 (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. BS5228 Figure B2 is included here for information purposes.</p>

Section Ref.	Description																			
	<div style="text-align: center;">  <p>Key 1 Acoustic screen 2 m wide and 2.7 m high 2 Acoustic shed 2 m square and 2.7 m high</p> </div> <p>Table B.4 Measured sound reduction given by types of partial enclosure</p> <table border="1"> <thead> <tr> <th rowspan="2">Type of enclosure (see Figure B.3)</th> <th colspan="3">Reduction dB(A)</th> </tr> <tr> <th>Facing the opening(s)</th> <th>Sideways</th> <th>Facing rear of shed</th> </tr> </thead> <tbody> <tr> <td>Open-sided shed lined with absorbent material; no screen</td> <td>1</td> <td>9</td> <td>14</td> </tr> <tr> <td>Open-sided shed lined with absorbent material; with reflecting screen in front</td> <td>10</td> <td>6</td> <td>8</td> </tr> <tr> <td>Open-sided shed lined with absorbent material; with absorbent screen in front</td> <td>10</td> <td>10</td> <td>10</td> </tr> </tbody> </table> <p style="text-align: center;">Figure 14.13 Typical acoustic screen/shed detail</p> <p>It is acknowledged that for some worksites it will not be practicable to install localised screens due to the constrained nature of the work area. However, where practicable screens will be installed by the Contractor.</p>	Type of enclosure (see Figure B.3)	Reduction dB(A)			Facing the opening(s)	Sideways	Facing rear of shed	Open-sided shed lined with absorbent material; no screen	1	9	14	Open-sided shed lined with absorbent material; with reflecting screen in front	10	6	8	Open-sided shed lined with absorbent material; with absorbent screen in front	10	10	10
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14.6.1.8	<p>Vibration</p> <p>The vibration from construction activities will be limited to the values set out within Section 14.5.3.4. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Limit values have been provided for the following building types:</p> <ol style="list-style-type: none"> 1. Soundly constructed residential and commercial properties; 2. Protected structures and sensitive buildings such as those with no or minimal foundations; <p>It is understood that bored piling is to be used in this instance which is a piling method which generates relatively low levels of vibration. Notwithstanding this, considerations should be given to the following methods to further mitigate the vibration levels:</p> <ol style="list-style-type: none"> 1. Minimise obstructions between the vibration source and the sensitive receiver, e.g. old basement floors, old foundations etc., which exacerbate the transmission of vibration. 2. Reduce the resistance to bored piles by “mudding in”. This technique involves lubricating the borehole with a small amount of bentonite slurry. 																			
14.6.1.9	<p>Piling</p> <p>Piling programmes should be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity.</p> <p>During the construction planning stage the Contractor and Engineer, as well as the Client, should be made aware of the proposed method of working of the Piling Contractor. The Piling Contractor should in turn have evaluated any practicable and more acceptable alternatives that would economically achieve, in the given ground conditions, equivalent structural results.</p> <p>It should be remembered that a decision regarding the type of pile to be used on a site will normally be governed by such criteria as loads to be carried, strata to be penetrated and the economics of the system, for example the time it will take to complete the installation and other associated operations such as soil removal. It may not be possible for technical reasons to replace a noisy process by one of the ‘quieter piling’ alternatives. Even</p>																			

Section Ref.	Description																																	
	<p>if it is possible, the adoption of a quieter method may prolong the piling operation; the net result being that the overall disturbance to the community will not necessarily be reduced.</p> <p>On typical piling sites, the major sources of noise are essentially mobile and the noise received at any control points will therefore vary from day to day as work proceeds. The duration of piling works is usually short in relation to the length of construction work as a whole, and the amount of time spent working near to noise sensitive areas can represent only a part of the piling period.</p> <p>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 may be 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.</p> <p>Screening by barriers and hoardings is less effective than total enclosure but can be a useful adjunct to other noise control measures. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken in location, having due regard also for access routes. When appropriate, screens or enclosures should be provided for such equipment.</p> <p>Contributions to the total site noise can also be anticipated from mobile ancillary equipment, such as handling cranes, dumpers, front end loaders etc. These machines may only have to work intermittently, and when safety permits, their engines should be switched off (or during short breaks from duty reduced to idling speed) when not in use.</p> <p>All mechanical plant should be well maintained throughout the duration of the piling works.</p>																																	
14.6.2.1	<p>Operational Stage</p> <p><u>Noise Barriers</u></p> <p>Noise barriers are required to reduce the noise effects at the most impacted properties. Table 14-49 details the extent of the barriers.</p> <p style="text-align: center;">Table 27-11 Noise Barrier Extents</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #4F81BD; color: white;">Location</th> <th style="background-color: #4F81BD; color: white;">Height</th> <th style="background-color: #4F81BD; color: white;">Start Chainage</th> <th style="background-color: #4F81BD; color: white;">End Chainage</th> <th style="background-color: #4F81BD; color: white;">Total Length</th> </tr> </thead> <tbody> <tr> <td>Ossory Road (MGWR Up Track Side)</td> <td>3m</td> <td>40+840</td> <td>41+015</td> <td>175m</td> </tr> <tr> <td>Ardilaun Square (MGWR Up Track Side)</td> <td>3m</td> <td>41+465</td> <td>41+515</td> <td>50m</td> </tr> <tr> <td rowspan="2">Drumcondra Park (MGWR Up Track Side)</td> <td rowspan="2">3m</td> <td>41+820</td> <td>41+930</td> <td>110m</td> </tr> <tr> <td>41+960</td> <td>42+090</td> <td>130m</td> </tr> <tr> <td>Drumcondra Park / Portland Lock (MGWR Down Track Side)</td> <td>3m</td> <td>41+900</td> <td>42+185</td> <td>285m</td> </tr> <tr> <td>Maynooth</td> <td>3.5m</td> <td>90+180</td> <td>91+440</td> <td>1,260m</td> </tr> </tbody> </table> <p>1. Ossory Road – 3 m high barrier relative to road surface height between OBD 227A and OBD226 on the MGWR up track side as shown on Figure 14.14.</p>	Location	Height	Start Chainage	End Chainage	Total Length	Ossory Road (MGWR Up Track Side)	3m	40+840	41+015	175m	Ardilaun Square (MGWR Up Track Side)	3m	41+465	41+515	50m	Drumcondra Park (MGWR Up Track Side)	3m	41+820	41+930	110m	41+960	42+090	130m	Drumcondra Park / Portland Lock (MGWR Down Track Side)	3m	41+900	42+185	285m	Maynooth	3.5m	90+180	91+440	1,260m
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Section Ref.	Description
	 <p style="text-align: center;">Figure 14.14 Ossory Road Noise Barrier Extent</p>
2.	<p>Ardilaun Square – 3 m high noise barrier relative to road surface height on the MGWR up track side as shown in Figure 14.15.</p>
	 <p style="text-align: center;">Figure 14.15 Ardilaun Square Noise Barrier Extent</p>
3.	<p>Drumcondra Park/Portland Lock – 3 m high barrier from OBD224 to OBD223 on both up and down sides of the track. Note that as these barriers are parallel to one another each should be specified to have an absorptive face on the rail side to avoid reflecting noise back towards the opposite side as shown in Figure 14.16.</p>

Section Ref.	Description
	<div data-bbox="357 271 1426 958" data-label="Image"> </div> <p data-bbox="453 965 1273 994">Figure 14.16 Drumcondra Park / Portland Lock Noise Barrier Extent</p> <p data-bbox="277 1003 1449 1059">4. Maynooth to Maynooth Depot - 3.5 m high barrier along the fence line between OBG21 and chainage 91+500 on the westbound track edge as shown on Figure 14.17.</p> <div data-bbox="360 1077 1422 1704" data-label="Image"> </div> <p data-bbox="587 1713 1139 1742">Figure 14.17 Maynooth Noise Barrier Extent</p> <p data-bbox="277 1749 1449 1861">Barriers will be specified to achieve a noise reduction class B4 when tested in accordance with EN 16272-2 : 2012 Railway Applications - Track - Noise Barriers and Related Devices Acting on Airborne Sound Propagation - Test Method for Determining the Acoustic Performance - Part 2: Intrinsic Characteristics - Airborne Sound Insulation in the Laboratory Under Diffuse Sound Field Conditions.</p> <p data-bbox="277 1868 1449 1924">The barriers at Drumcondra Park/Portland Lock will be specified to also achieve a noise absorption rating to avoid reflections.</p>
14.6.2.2	<p data-bbox="277 1937 517 1966"><u>Ongoing Maintenance</u></p> <p data-bbox="277 1973 1449 2056">During the course of ongoing maintenance the procedures outlines in Iarnród Éireann operation procedure CCE-QMS-008-002 Noise Management – CCE Activities will be implemented. This document outlines the following noise mitigation measures:</p>

Section Ref.	Description
	<ol style="list-style-type: none"> 1. The Community Liaison Officer (or other nominated person) will notify affected residents in advance of any planned works commencing with a letter drop in the relevant area. 2. Where planned work occurs over a 72hr weekend shutdown there will be a noise management plan submitted to the local authority. 3. All attempts to avoid, prevent or reduce the harmful effects of exposure to environmental noise arising from CCE work activities must be practical and appropriately risk assessed before implementation. 4. The following measures should be implemented where feasible during maintenance activities: <ol style="list-style-type: none"> a) Carry out as much preparatory work in daylight as possible (sawing or drilling rails). b) Inspect the worksite in daylight if possible and look for the best location to position generators. c) Position generators and lighting away from residential dwellings. d) Take advantage of natural barriers such as vegetation, walls or embankments that can offer noise screening to adjacent neighbours. e) Where necessary, use noise attenuation screens. The screens must be located as close to the receiver or source as possible. f) Consider using additional supply cables and structures so that the generators can be positioned as far away from housing as practicable. g) Where possible, use low-noise plant. Any unsuitable plant should be replaced by higher quality low noise plant, or contained by the use of mufflers/silencers. h) Do not leave equipment or vehicles running/idling unnecessarily. i) Do not shout work instructions when working in residential areas at night unless absolutely necessary. j) Plan effectively to ensure timely deliveries of materials.
14.6.2.3	<p><u>PA Systems</u></p> <p>In this instance, Iarnród Éireann (IÉ) have a standard procedure for the design of station services which includes a procedure for the design of PA systems. Section 5 of Iarnród Éireann Standard I-TEL-3930 Station Services – Design, Install and Commission details the following measures with regards to the noise emission from PA systems,</p> <ol style="list-style-type: none"> 1. 1 Ambient Noise Sensor (ANS) must be located per platform. 2. The PA system must be commissioned, tested, and certified to current TSI standards by an external nominated body prior to handover to IÉ for acceptance testing. 3. dB(A) background sound level reading must be recorded at each platform between 2 pairs of speakers. This must be recorded during normal operating hours but without a train in the station. 4. Recorded test announcement must be played from the outstation and the volume levels on the amplifiers must be adjusted until the normal output volume is an average of 10dB(A) above recorded background levels. 5. Microphone, MRA and VOIP levels must be adjusted to correspond to normal volume levels. 6. Reduced volume must be adjusted to ensure the output volume does not exceed recorded background levels. 7. The system must not exceed an average SPL over 8 hours of 85dB(A) and a maximum of 90dB(A). 8. The system must have a minimum 0.5 STI indoors and a 0.045 STI outdoors. 9. GA CAD drawing to show all speakers in the station and labelled as per zone must be provided and include cable routes. TSI test locations must also be noted on the drawing. <p>These measures will be implemented throughout the DART+ West project to minimise any noise effects from PA systems.</p>
14.6.2.4	<p><u>Substations & Fixed Plant</u></p> <p>Substations should be selected and designed to ensure no tonal noise emissions are audible at the nearest sensitive locations and overall noise emissions do not exceed 55 dB(A) when measured 2 m from any point around the substation building. For all other fixed plant serving the development the assessment outlined previously has specified noise limits at the nearest noise sensitive properties that must be achieved in order to ensure the impact is acceptable. To achieve these noise limits consideration will be given, at the detailed design stage, to a variety of mitigation measures and forms of noise control techniques. Some example of these measures are as follows:</p> <ol style="list-style-type: none"> 1. duct mounted attenuators on the atmosphere side of air moving plant. 2. splitter attenuators or acoustic louvres providing free ventilation to internal plant areas. 3. solid barriers screening any external plant. 4. anti-vibration mounts on reciprocating plant.

Section Ref.	Description
	<p>In addition to the above, IÉ will adopt the following measures to minimise potential noise disturbance for neighbours.</p> <ol style="list-style-type: none"> All mechanical plant items e.g. motors, pumps etc. shall be regularly maintained to ensure that excessive noise generated by any worn or rattling components is minimised. Any new or replacement mechanical plant items, including plant located inside new or existing buildings, shall be designed so that all noise emissions from site do not exceed the noise limits outlined in this document.

27.12 Mitigation and Monitoring for Landscape and Visual Amenity

The table below details the mitigation measures identified in Chapter 15 Landscape and Visual Amenity.

Table 27-12 Mitigation and Monitoring Measures for Landscape and Visual Amenity

Section Ref.	Description
15.6.1	<p>Mitigation Measures</p> <p>Introduction</p> <p>This section describes mitigation and monitoring measures which are proposed to ameliorate, remediate or reduce significant landscape (townscape) and visual impacts from the construction and operational phases wherever possible.</p>
15.6.2	<p>Construction Phase</p> <p>A series of mitigation and management measures are proposed to avoid, reduce or remediate, wherever practicable significant negative landscape (townscape) and visual effects of the construction phase of the proposed development. These measures are to be applied across the scheme wherever necessary to avoid disturbance of landscape features or characteristics to be retained. Generally, the effect rating post-mitigation will be the same as pre-mitigation, however the measures proposed should still be applied as necessary to manage the potential effects of construction activities. A summary of predicted Construction Phase effects following the implementation of mitigation and monitoring measures is listed in Table 15-8.</p> <ol style="list-style-type: none"> Prior to commencement of the works an Arboricultural Impact Assessment will be produced for the area of the proposed development, as well as for any adjoining areas where tree are likely to be impacted by the works, in accordance with British Standard Institution (BSI) British Standard (BS) 5837:2012 'Trees in relation to in relation to design, demolition and construction - Recommendations' (BSI 2012); All trees and vegetation to be retained within and adjoining the works area will be protected in accordance with the British Standard Institution (BSI) British Standard (BS) 5837:2012 'Trees in relation to in relation to design, demolition and construction - Recommendations' (BSI 2012). Works required within the root protection area (RPA) of trees to be retained will follow a project-specific arboricultural methodology for such works, which will be prepared by a professional qualified arborist; Wherever possible, trees and vegetation will be retained within the proposed development. Trees and vegetation identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work – Recommendations' (BSI 2010) and best arboricultural practices as detailed and monitored by a professional qualified arborist. Details of trees and vegetation to be removed will be included in the Arboricultural Impact Assessment Report (and associated Tree Protection Plans) as set out above; The Arboricultural Assessment to be prepared as part of mitigation for the proposed development will be fully updated at the end of the construction chase and made available, with any recommendations for on-going monitoring of retained trees during the operational phase; Where properties are subject to permanent and / or temporary acquisition (as noted in Sections 15.1.1.10.8 and 15.1.1.12.8), an inventory of existing boundary details and accesses, planting, paving, and other features that may be disturbed or removed will be prepared prior to commencement of construction works; and Where properties are subject to permanent and / or temporary acquisition (as noted in Sections 15.1.1.10.8 and 15.1.1.12.8), appropriate measures will be put in place to provide for protection of features, trees and vegetation to be retained, and for continued access during construction, for adequate security and screening of construction works. All temporary acquisition areas will be decommissioned and reinstated at the end of the construction phase. <p>In addition to the above measures, construction works will be managed by the implementation of a Construction Environmental Management Plan (CEMP) - refer to Appendix A5.1 in Volume 4 of the EIAR). This provides the environmental management framework to be adhered during construction of the proposed development.</p>

Section Ref.	Description
	<p>It is acknowledged that in some cases mitigation of effects on townscape and visual characteristics is neither possible nor practicable – for example, it is not practicable to provide landscape mitigation for the loss of land from private properties, or to provide mitigation for loss of mature trees in the short / medium-term, and these effects are residual. While not considered to be a landscape-specific mitigation measure, all land acquisition will be the subject of compensation. This is detailed further in Chapter 16 and Chapter 17 of this EIAR.</p>
<p>15.6.3</p>	<p>Operational Phase</p> <p>Mitigation measures are proposed to avoid, reduce or remediate, wherever possible significant negative landscape and visual effects of the operation phase of the proposed development. A detailed description of the proposed development is provided in Chapter 4 Description of the Proposed Development in Volume 2 of this EIAR</p> <p>In addition to the management of all operation phases works in accordance with best methodologies and practice, that following general measures are proposed for the mitigation of landscape / townscape and visual impacts:</p> <ol style="list-style-type: none"> 1. Where existing trees, hedges, and/or plantings are removed, new planting will be provided in replacement of those removed. In general, unless not feasible or practicable, new plant species will match those removed. Replacement plant sizes will be those that are readily available and therefore, are unlikely to match the maturity of plants removed (especially in the case of trees or larger plants). However, being of the same or similar species, maturity similar to that of the existing can be achieved in time. 2. The proposed development will provide for the planting of new trees and shrubs both for mitigation of tree removal and for overall enhancement of the environment. Where proposals intrude on public space there shall be ample provision of bands of screening trees and other vegetation. Species selected shall be appropriate to the characteristics of the specific location. 3. Proposals for the treatment of the public realm within the streetscape effected by the proposed development will have regard to the existing character of the street or location, to emerging policies, objectives and proposals for the public realm and to opportunities for enhancement of the public realm and the streetscape. Proposals will have regard to historic details and features, to the quality of existing and proposed materials, to the reduction of clutter, ease of legibility, and management and maintenance requirements. 4. Landscape proposals will have regard to the recommendations of Chapter 8 Biodiversity in relation to opportunities for enhancement of biodiversity and of Chapter 10 Water in relation to opportunities for incorporation of Sustainable Urban Drainage Systems (SuDS). 5. Maintenance and monitoring of reinstatement works in public areas will ensure that any defective materials or workmanship will be made good within a period of 12 months from completion of all construction works in any given area. Thereafter, responsibility for maintenance and monitoring of the area will revert to the landowner (e.g. local authority). 6. All aspects of the proposed development within public areas will revert to on-going management and maintenance in according with normal operational practices by the landowner / tenant. This will include hard and soft landscape works and townscape measures, new and reinstated tree and other planting, new and reinstated surfacing and paving, etc. 7. Unless otherwise requested by the property owner, maintenance and monitoring of reinstatement and hard and soft landscape works and reinstated and new boundaries in private areas (i.e. temporary acquisition areas) will ensure that any defective materials or workmanship will be made good within a period of 12 months following completion of the works in property. Thereafter, responsibility for maintenance and monitoring of private areas will revert to the landowner. <p>In addition to the above general landscape mitigation measure, the following specific landscape mitigation measures will be implemented.</p> <ol style="list-style-type: none"> 1. At Connolly Station there will be enhancements to the urban realm at Preston Street with the introduction of new granite pavement and kerbs, replacing the current asphalt and sidewalks and the provision of street furniture (benches and bins), street lighting and street trees. 2. At the proposed Glasnevin substation there will be the reinstatement of boundary tree / shrub planting to the boundary with Clareville Court, and establishment of native tree, shrub and hedgerow planting to the boundaries with the open space of St. Vincent's Secondary School to provide screening and further discourage access. 3. At Ashtown, where practicable, there will be the establishment, of new tree, shrub and hedgerow planting to replace trees lost during construction, and to screen and integrate the substation and bridge structures into the landscape. There will provision of an enhanced public realm in the proposed pedestrian and cycle accessible areas around the station, including new high-quality paving to Longford Bridge over the Royal Canal. 4. At Ashton House, the existing entrance gates, railings, piers and boundary wall will be reinstated at a setback location. New tree planting will be provided where existing planting is removed or disturbed on the boundary.

Section Ref.	Description
	<p>5. Temporary land acquisition areas at Ashleigh Green will be reinstated and replacement trees will be provided to the northern boundary to replace those removed during construction.</p> <p>6. At the proposed Castleknock substation (Laurel Lodge) there will be establishment of new tree, shrub and hedgerow planting to the boundaries with the open space to integrate the structures into the landscape and compensate for trees removed during construction. Provision of tree groups within the adjacent open space will help to further screen the proposals and add to the landscape amenity.</p> <p>7. At the proposed Coolmine substation (Sycamore Green) there will be establishment of new tree, shrub and hedgerow planting to the boundaries with the open space to integrate the structures into the landscape and compensate for trees removed during construction. Provision of tree groups within the adjacent open space will help to further screen the proposals and add to the landscape amenity.</p> <p>8. At Coolmine Station there will be the provision of a high-quality urban realm with block paving to shared pedestrian / cycle access, new seating, street furniture, street tree planting, raised planters, ornamental planting, native trees / shrub planting, and species-rich grassland. Water management will be integrated into the landscape with planted bioswales taking runoff from the car park and road.</p> <p>9. At Porterstown, the new bridge structure will be better integrated into the landscape through provision of screening native trees / and shrubs where feasible.</p> <p>10. At Clonsilla there will be the provision of high-quality urban realm to the junction of Hansfield Road and Clonsilla Road, with block paving to shared pedestrian / cycle access and pedestrian crossings, new seating, street furniture, street tree planting, raised planters, ornamental planting, native trees / shrub planting. There will be native tree / shrub planting to the area surrounding the southern ramp of the proposed bridge to aid in integrating the structure into the landscape, and to aid in compensating for trees removed during construction.</p> <p>11. At the proposed Hansfield substation there will be native hedgerow planting to the boundaries with the surrounding agricultural area to aid in integrating the structure into the landscape.</p> <p>12. At the proposed Dunboyne substation there will be native tree and shrub planting to the boundaries with the surrounding areas to aid in integrating the structure into the landscape.</p> <p>13. At the M3 Parkway Substation there will be hedgerow planting to the boundaries with the surrounding areas to aid in integrating the structure into the landscape.</p> <p>14. At the proposed link road at Barberstown there will be substantial native tree and shrub planting to the proposed embankments and other roadside areas, to provide screening of road, aid integration into the surrounding landscape, reconnect severed hedgerows and replace hedgerows removed during construction. Bands of planting to have a minimum width of 3 m and to join adjacent field boundaries.</p> <p>15. There will be establishment of new hedgerow and tree planting to the northern boundary with the railway in lands east of St. Catherine's Park to replace the vegetation removed during the works.</p> <p>16. At Leixlip Confey substation there will be establishment of new tree, shrub and hedgerow planting to the boundaries with the surrounding open space to aid in integrating the structures into the landscape, and compensate for trees removed during construction. A green roof will be provided to the substation building to reduce visual impacts on overlooking receptors on Cope Bridge.</p> <p>17. At Confey GAA Club the existing pitch will be adjusted, safety net reinstated and the permanent boundary established at the new boundary line.</p> <p>18. At the proposed Blakestown substation there will be native hedgerow planting to the boundaries with the surrounding agricultural area to aid in integrating the structure into the landscape.</p> <p>19. There will be establishment of new native tree, shrub and hedgerow planting to the boundaries of the proposed double track connecting to the depot to aid in screening of the tracks, aid in integration into the surrounding landscape, reconnect severed hedgerows and replace hedgerows removed during construction.</p> <p>20. There will be establishment of new native tree, shrub and hedgerow planting to the boundaries of the proposed Maynooth depot / CCE Compound to aid in screening of the operational areas, buildings and fencing, as well as aiding integration into the surrounding landscape, reconnect severed hedgerows and compensate for loss of hedgerows during construction. A 4 m band of tree / shrub planting is proposed as standard to all the boundaries, with the exception of overhead powerline wayleaves and access points. Wider bands of planting will be provided to the northern boundary of the depot where possible to provide maximum screening from the adjacent canal. Tree planting, including fastigate trees with a narrow habit are proposed within the compound area to further screen the proposals.</p> <p>21. There will be hedgerows proposed to the perimeters of the attenuation ponds, adjacent to the depot, to aid in integration into the surrounding landscape, reconnect severed hedgerows and replace hedgerows removed during construction.</p>

27.13 Mitigation and Monitoring for Material Assets: Agricultural Properties

The table below details the mitigation measures identified in Chapter 16 Material Assets: Agricultural Properties.

Table 27-13 Mitigation and Monitoring Measures for Material Assets: Agricultural Properties

Section Ref.	Description								
16.6	<p>Mitigation measures</p> <p>This section describes the measures that when implemented will mitigate the adverse impact on agricultural land. At this stage measures such as compensation for land acquisition and disturbance are not considered. These matters will be agreed, if possible, with landowners or their representative(s) once approval for the proposed development has been granted. If agreement is not possible, such compensation will be decided upon by an arbitrator.</p>								
16.6.1.1	<p>Construction Mitigation</p> <p><u>Temporary landtake</u></p> <p>Following the completion of relevant construction works, lands temporarily acquired will be reinstated to existing agricultural condition. Measures will be considered on a site-by-site basis, subject to proposed construction works. Where construction compounds will involve installing a hard-core surface it will be necessary for topsoil to be removed and stored. Where new access is proposed affecting existing property boundaries these will be reinstated on a like for like basis. This may require storage of stone wall material during construction or replanting of hedgerow / trees, as required.</p>								
16.6.1.2	<p><u>Construction noise</u></p> <p>Measures to mitigate noise impacts on sensitive receptors are detailed in Chapter 14 (Noise and Vibration). In addition, construction stage mitigation has been included for a number of agricultural properties which is detailed in Table 16.6. Good communication between the Contractor and adjacent landowners during the construction phase, especially when excessively loud activities are programmed, will prevent undue disturbance to farm animals due to noise. It will also facilitate farm enterprises so that livestock can be moved away from the construction work during critical times.</p>								
16.6.1.3	<p><u>Dust</u></p> <p>Measures to control the production of dust will be put in place by the Contractor (refer Chapter 12 Air Quality which presents a series of measures to control dust). Good communication between the Contractor and the farmers in the proximity of construction activities will facilitate on-going farm enterprises so that livestock may be kept as far as possible from the construction work during critical times.</p>								
16.6.1.4	<p><u>Restricted access to land</u></p> <p>Access will be restored, as soon as possible, to lands where it is removed or restricted by the proposed development. The location of such access will be at a suitable location and, where possible, with the agreement of the landowner. Good communication between individual farmers and the Contractor will minimise difficulties caused by the restriction of access to land. Temporary fencing will be erected as required to delineate the site boundary and to minimise disturbance to adjacent lands. Temporary access gates may be required until such time as permanent access arrangements are in place.</p>								
16.6.1.5	<p><u>Disturbance of field drainage</u></p> <p>In cases where drainage is impeded during construction and causes obvious difficulty to a particular landowner, temporary measures will be considered on a site-specific basis. This may include allowing waters to drain to less critical areas, so as to minimise the impact.</p>								
16.6.1.6	<p><u>Disturbance of services</u></p> <p>Where required, an alternative source of water / electricity will be provided to ensure that disruption to farming is minimised during the construction phase.</p>								
16.6.2	<p>Operation Mitigation</p> <p>The following general mitigation measures will be provided:</p> <ol style="list-style-type: none"> Access will be restored to lands where it is removed or restricted. Details of proposed access structures to lands are presented in Table 16-8. Access will also be provided to lands via accommodation access tracks and the replacement of field access gates. The location of such field access gates will be at a suitable location and, where possible, with the agreement of the landowner. <p style="text-align: center;">Table 16-8 Access accommodation structures</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4CAF50; color: white;"> <th>Chainage</th> <th>Reference</th> <th>Location</th> <th>Type & Size</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">71+100</td> <td style="text-align: center;">UP01</td> <td style="text-align: center;">Barberstown</td> <td style="text-align: center;">Farm Underpass: 4.5m wide x 4.5m high</td> </tr> </tbody> </table>	Chainage	Reference	Location	Type & Size	71+100	UP01	Barberstown	Farm Underpass: 4.5m wide x 4.5m high
Chainage	Reference	Location	Type & Size						
71+100	UP01	Barberstown	Farm Underpass: 4.5m wide x 4.5m high						

Section Ref.	Description
	<p>2. Permanent boundary treatment along agricultural lands will consist of a stockproof boundary that is comprised of one of the following:</p> <ol style="list-style-type: none"> a) Concrete post and wire. b) Timber post and wire. c) 2.4m Security Purpose (SP) Palisade fencing. d) Open mesh steel pane for general purposes. e) Horse fencing. f) Acoustic barriers. <p>Further details of each of the above boundary treatments are presented in Chapter 4 Description of the Proposed Development.</p> <p>3. The new drainage system will be designed to ensure that there will be no increased risk of flooding as a consequence of the proposed development.</p> <p>4. Any services that are interfered with as a result of the proposed development will be repaired / replaced without unreasonable delay.</p> <p>5. Ducting for the restoration of water and power supply services will be provided, as necessary.</p> <p>6. Screening will be provided, where required, to mitigate the noise and visual effects of construction works and operational traffic.</p>
16.7	<p>Monitoring measures Not applicable.</p>

27.14 Mitigation and Monitoring for Material Assets: Non-agricultural Properties

The table below details the mitigation measures identified in Chapter 17 Material Assets: Non-agricultural Properties.

Table 27-14 Mitigation and Monitoring Measures for Material Assets: Non-agricultural Properties

Section Ref.	Description
17.6	<p>Mitigation measures</p> <p>This section describes the measures that when implemented will mitigate the adverse impact on non-agricultural property. At this stage measures such as compensation for land acquisition and disturbance are not considered. These matters will be agreed, if possible, with landowners or their representative(s) once approval for the proposed development has been granted. If agreement is not possible, such compensation will be decided upon by an arbitrator.</p>
17.6.1.1	<p>Construction Mitigation <i>Temporary landtake</i></p> <p>Following the completion of relevant construction works, lands temporarily acquired will be reinstated where necessary.</p>
17.6.1.2	<p><i>Access to property</i></p> <p>Access will be maintained to all affected property as much as possible and if interrupted will be restored without unreasonable delay. Traffic management measures will be put in place during construction where temporary or minor diversions are required.</p>
17.6.1.3	<p><i>Noise and vibration</i></p> <p>Timing of works and noise and vibration limit values are amongst the main measures to mitigate noise impacts on sensitive receptors. These measures are detailed within Chapter 14 Noise and Vibration in Volume 2 of this EIAR.</p> <p>Prior to construction and subject to written agreement with the relevant property owners, property condition surveys will be undertaken in relation to all buildings / structures in use located within 50 metres of the extents of the landtake boundary. Good communication between the Contractor and property owners during the construction phase will prevent undue disturbance due to noise.</p>

Section Ref.	Description
17.6.1.4	<u>Dust</u> Dust suppression measures to mitigate the production of dust are detailed within Chapter 12 Air Quality in Volume 2 of this EIAR. Good communication between the Contractor and property owners during the construction phase will prevent undue disturbance due to dust.
17.6.1.5	<u>Disturbance of field drainage</u> In cases where drainage is impeded during construction and causes obvious difficulty to a particular property owner, temporary measures will be considered on a site-specific basis. This may include allowing waters to drain to less critical areas, so as to minimise the impact.
17.6.1.6	<u>Disturbance of services</u> Where required, an alternative source of water / electricity will be provided to ensure that disruption is minimised during the construction phase.
17.6.2	Operation mitigation The following general mitigation measures will be provided: <ol style="list-style-type: none"> 1. Access will be maintained to all affected property as much as possible and if interrupted will be restored without unreasonable delay. 2. Where part of the curtilage of a property is to be permanently acquired, the acquiring authority will hold discussions with the property owner and generally agree to replace boundaries on a like-for-like basis where possible, subject to safety considerations. Permanent boundary treatment will consist of a boundary that is comprised of one of the following: <ol style="list-style-type: none"> a) Replacement boundary on a like-for-like basis. b) Concrete post and wire. c) Timber post and wire. d) 2.4 m Security Purpose (SP) Palisade fencing. e) Open mesh steel pane for general purposes. f) Acoustic barriers. 3. Any services that are interfered with as a result of the proposed development will be repaired / replaced without unreasonable delay. 4. The new drainage system will be designed to ensure that there will be no increased risk of flooding as a consequence of the proposed development.
17.7	Monitoring measures Not applicable.

27.15 Mitigation and Monitoring for Material Assets: Utilities

The table below details the mitigation measures identified in Chapter 18 Material Assets: Utilities.

Table 27-15 Mitigation and Monitoring Measures for Material Assets: Utilities

Section Ref.	Description
18.8	Mitigation Measures The potential for the proposed project to impact or interrupt utility supply has been assessed. All potential utility clashes with the temporary or proposed works have been identified. Consultations have been undertaken with all known service providers and their requirements have been identified and incorporated into the design. All designs have been identified to limit the disruption caused by the works. Where diversions are required in bridge deck reconstructions, the utilities will undergo decommissioning, temporary commissioning through the scaffolding structure for the duration of the works, and later permanently recommissioned through the reconstructed bridge. Design refinement, at later design stages, will be subject to further consultation with the utility providers. Construction works required to divert utilities have been detailed in Chapter 5 Section 5.3.5. 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. All utilities that cross the alignment will have appropriate protection measures installed if necessary, as agreed with utility owners.

Section Ref.	Description
	In some cases, planned service disruptions will be required to facilitate the connection of existing services to the newly diverted services and the connection of new services required for the proposed development. 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 two to three hours.

27.16 Mitigation and Monitoring for Material Assets: Resources and Waste Management

The table below details the mitigation measures identified in Chapter 19 Material Assets: Resources and Waste Management.

Table 27-16 Mitigation and Monitoring Measures for Material Assets: Resources and Waste Management

Section Ref.	Description
19.5.5	<p>Mitigation and monitoring measures</p> <p>All materials consumed and waste generated by the proposed development will be managed in accordance with circular economy principles and the waste management hierarchy, with prevention, reuse, recycling and other recovery methods favored over disposal. The following are the mitigation measures to be implemented to avoid, reduce and mitigate potential impacts to the environment.</p> <ol style="list-style-type: none"> 1. Throughout the design and construction of the proposed development, solutions will be required to be considered to minimise the consumption of materials and the generation of waste throughout the lifecycle of the proposed project. (Refer to the CEMP, Designing for a Circular Economy). 2. Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill. 3. All waste removed from the site will be required to be collected by only valid waste collection permit holders. All facilities to which waste will be taken will have appropriate waste licenses or permits, under the Waste Management Act 1996, as amended, and the regulations thereunder. 4. Prior to the start of any construction/demolition works, an asbestos survey and detailed site investigation campaign and a Remediation Strategy will be developed prior to site clearance works and the subsequent construction of the site. The Asbestos Surveys and a Remediation Strategy will inform the site clearance strategy and removal of asbestos from the associated site(s). 5. For all site clearance works and excavation works, suitably qualified, experienced, licensed and trained personnel will be required to undertake this specialist work such as those specified in accordance with the 'measures for working with asbestos'. Any Asbestos Containing Materials (ACMs) discovered in areas required for excavation, will be required to be disposed of by a licensed Contractor to a licensed waste facility in accordance with waste management legislation, as appropriate. 6. A CEMP will be prepared by the Successful Contractor during the construction phase to ensure commitments included in the statutory approvals are adhered to, and that it integrates the requirements of the EOP and the CDWMP and incident response plan during all construction works. See Appendix A5.1 Construction Environmental Management Plan in Volume 4 of this EIAR and its appendices for details of these plans. 7. It will be the responsibility of the Principal Contractor to appoint a Waste Management Co-Ordinator (WMC) to assume responsibility for the further development of the CDWMP and the management and treatment of all waste materials generated during the construction phase of the proposed project.

27.17 Mitigation and Monitoring for Archaeology and Cultural Heritage

The table below details the mitigation measures identified in Chapter 20 Archaeology and Cultural Heritage.

Table 27-17 Mitigation and Monitoring Measures for Archaeology and Cultural Heritage

Section Ref.	Description				
20.5.1	Cosntruction Phase Mitigation Measures				
	Constraint No	Description	Zone	Location	Mitigation Measures
	AAP01	Reclaimed land potentially sealing prehistoric archaeological remains along the former foreshore of the River Liffey at the southern end of the proposed development	A/B 28+000 – 41+000	Various at eastern end of proposed project	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.
	AH01	Historic City of Dublin	A/B	Existing railway line	N/A
	IH006	Site of Glass works	A/B East of 28+000	North Wall Freight Depot	N/A
	CH001	Site of Fort William	A/B East of 28+000	North Wall Freight Depot	N/A
	CH002/3	G.S. & W.R. (Amiens Street & North Wall Branch) Railway	A/B East of 28+000	North Wall Freight Depot	N/A
	CH012	Site of North Wall Station	A/B 40+000	Mayor Street Upper	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.
	CH024	Site of Rail yard with cranes, goods sheds, engine sheds with turn tables, oil tanks, sidings to the Amiens Street Terminus / Connolly Station	A/B 30+000	Connolly Station	N/A
	IH32	Site of Footbridge	A/B 32+500	Lindsay Road	N/A
	IH35	Site of Lock House	A/B 43+200	Royal Canal Way	N/A
	AAP02	Small previously undisturbed greenfield area	C 43+400	Clareville Court	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.
	AAP03	Greenfield area possibly subject to previous disturbance	C 50+400	Royal Canal Way	N/A
TB08	Townland boundary between Grangegorman North / Slutsend located within AAP03	C 50+400	Royal Canal Way	N/A	

Section Ref.	Description				
	Constraint No	Description	Zone	Location	Mitigation Measures
	IH42	Chemical Manure Works	C 50+800	Royal Canal Way	N/A
	CH033	Water tower associated with the Midland Great Western Railway	C 50+800	Royal Canal Way	N/A
	IH44	Signal House	C 51+000	Royal Canal Way	N/A
	AAP04	Greenfield area possibly subject to previous disturbance	C 51+500	Broom-bridge Road	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.
	TB12	Townland boundary between Pelletstown / Cabragh (Castleknock)	C 53+200	Ashington Park	N/A
	AAP05	Small area of greenfield possibly landscaped as a park	C 53+600	Martin Savage Park	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.
	IH46	Ashtown Station (site of)	C 53+600	Ashtown Road	N/A
	AAP06	Area of greenfield subject to previous disturbance	C 53+700	Ashtown Road	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.
	TB13	Townland boundary between Pelletstown / (Castleknock) / Ashtown	C 53+700	Ashtown Road	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.
	CH042	Site of a mill pond	C 53+800	Ashtown Road	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.
	AAP07	Previously undisturbed greenfield area	C 53+800	Ashtown Road	Archaeological test excavations to be carried out 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.
	AAP08	Greenfield area possibly subject to previous disturbance	C 54+700	Navan Road	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.

Section Ref.	Description				
	Constraint No	Description	Zone	Location	Mitigation Measures
	AAP09	Previously undisturbed greenfield area	C 56+500	Laurel Lodge Green	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.
	AAP10	Previously undisturbed greenfield area	C 57+500	Maple Green	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.
	CH60	Cluster of structures depicted on OS First Edition 6" Map to south side of Royal Canal	C 57+900	Carpenterstown Road	N/A
	AAP11	Greenfield area with some previous disturbance.	C 58+800	Diswellstown Road	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.
	AAP13	Previously undisturbed greenfield area	C 58+900	Porterstown Road	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.
	AH04	Barrow - ring-barrow	C 60+000	Clonsilla Road	The buffer on site will be actively managed to ensure its efficiency. No mitigation required for the indirect impact as the construction is temporary and the site will be returned to greenfield following decommissioning of the compound.
	AAP14	Previously undisturbed greenfield containing AH04	C 60+000	Clonsilla Road	Archaeological test excavations to be carried out 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.
	AAP15	Previously undisturbed greenfield area	C 60+100	Clonsilla Road	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.
	AAP17	Greenfield area possibly subject to previous disturbance	E 70+600	Miles-town Road	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.

Section Ref.	Description				
	Constraint No	Description	Zone	Location	Mitigation Measures
	AAP18	Previously undisturbed greenfield area	E 71+100	Milestown Road / Barberstown Lane South	Archaeological test excavations 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.
	AAP19	Previously undisturbed greenfield area	D 101+100	Barberstown Lane North	Archaeological test excavations 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.
	AAP20	Previously undisturbed greenfield area	D 101+700	Barnhill Road	Archaeological test excavations 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.
	AAP28	Greenfield area possibly subject to previous disturbance	D 106+700	M3 Parkway	N/A
	CH071	Aqueduct allowing the Royal Canal and railway to pass over a small local stream that flows into the Luttrellstown Castle Estate.	E 71+300	Royal Canal Way	N/A
	CH073	Site of Goods Stores to Lucan Station	E 72+300	Royal Canal Way	N/A
	AAP21	Previously undisturbed greenfield area	E 72+800	St Catherine's Park	Archaeological test excavations 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.
	AAP22	Greenfield area possibly subject to previous disturbance	E 73+300	St Catherine's Park	N/A
	TB66	Townland boundary between Ballyhack / Suralstown South	MSDC	R122	N/A
	TB67	Townland boundary between Ballyhack/Kilcoskan	MSDC	R122	N/A
	TB39	Townland boundary between St. Catherine's (Kildare)/St. Catherine's (Dublin)	E 73+800	St Catherine's Park	N/A
	AAP23	Previously undisturbed greenfield area although landscaping may have occurred.	E 74+700	Captain's Hill	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.

Section Ref.	Description				
Constraint No	Description	Zone	Location	Mitigation Measures	
AAP24	Previously undisturbed greenfield area	E 75+900	Royal Canal Way	N/A	
TB042	Townland boundary between Confey/Leixlip	E 76+100	Royal Canal Way	N/A	
AAP25	Previously undisturbed greenfield area	E 78+200	Blakes-town	Archaeological test excavations 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.	
CH080	Tunnel marked on 6-inch OS	E 78+700	Blakestown	N/A	
AAP26	Previously undisturbed greenfield area close to an early medieval ecclesiastical enclosure (AH31)	E 79+900	Donaghmore	Archaeological test excavations 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.	
CH083	Site of vernacular structure, located within AAP26	E 80+000	Donaghmore	To be covered by archaeological testing to be carried out within AAP26.	
CH084	Site of vernacular structure, located within AAP26	E 80+000	Donaghmore	To be covered by archaeological testing to be carried out within AAP26.	
AAP27	Large previously undisturbed greenfield area which contains a number of known archaeological sites including AH37 and AH39 and potential sites CH86 and CH88.	F 91+300	Branganstown / Gragadder / Maws / Laraghbryan East / Treadstown / Maynooth South	Geophysical survey will be undertaken in lands that were not previously accessible and additional lands added to the development following completion of survey work. Archaeological test excavations will be carried out 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.	
CH086	Relict field system located within AAP27	F West of 93+000	Maws	To be covered by investigations in AAP27	
CH085	Possible ring ditch located within AAP027	F North-west of 93+000	Branganstown	To be covered by investigations in AAP27	
AH37	Barrow - unclassified	F North-west of 93+000	Maws	To be covered by investigations in AAP27	
AH39	Ring-ditch	F Northwest of 93+000	Branganstown	To be covered by investigations in AAP27	
TB53	Townland boundary between Maynooth South / Laraghbryan East	F 91+400	Maynooth South / Laraghbryan East	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).	

Section Ref.	Description				
	Constraint No	Description	Zone	Location	Mitigation Measures
	TB54	Townland boundary between Newtown / Laraghbryan East	F 91+600	Newtown / Laraghbryan East	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB55	Townland boundary between Crinstown / Treadstown	F 91+800	Newtown / Laraghbryan East	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB56	Townland boundary between Treadstown / Newtown	F 91+700	Newtown / Laraghbryan East	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB57	Townland boundary between Treadstown / Laraghbryan East	F 91+800	Crinstown / Treadstown	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate). Small stream to be subject to wade survey, under licence from the NMS of the DoHLGH.
	TB59	Townland boundary between Treadstown / Maws	F 91+900	Treadstown / Maws	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB60	Townland boundary Ballycurraghan / Laraghbryan West / Maws	F 92+200	Ballycurraghan / Laraghbryan West / Maws	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB61	Townland boundary between Maws / Roestown / Gragadder	F 92+400	Maws / Roestown / Gragadder	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB62	Townland boundary between Branganstown / Maws	F 92+500	Branganstown / Maws	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	TB63	Townland boundary between Branganstown / Gragadder	F Northwest of 93+000	Branganstown / Gragadder	Extant section of Townland Boundary subject to a detailed written and photographic survey (to include test excavations where appropriate).
	AAP29	Previously undisturbed greenfield area	F 91+800	Laraghbryan East	Archaeological test excavations will be carried out 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.
20.5.2	Operation Phase Mitigation Measures No direct or indirect impacts to the archaeological and cultural heritage resource would occur during the operational phase of the proposed development and therefore, no mitigation measures are required.				
20.6	General Mitigation measures Mitigation measures will seek to preserve in situ (in the first instance) any archaeological or cultural heritage assets that may be impacted by the proposed development. Where this is not possible a range of mitigation measures will be implemented in advance of, and during construction, which will reduce all impacts. All mitigation measures will be carried out in line with the Code of Practice for Archaeology (2012) between the Minister Housing, Local Government and Heritage and Iarnród Éireann. Mitigation of impacts on the archaeological and cultural heritage resource that would occur during the construction phase of the proposed development will be a staged approach that will be carried out during the pre-construction, enabling and main infrastructure works phases. The mitigation measures will be managed and overseen by a Project Archaeologist appointed by Iarnród Éireann.				

Section Ref.	Description
	<p>Mitigation measures that will be undertaken prior to and during the construction phase include:</p> <ol style="list-style-type: none"> 1. Additional geophysical surveys; 2. Archaeological test excavations; 3. Archaeological waste assessments; 4. Preservation by record (Archaeological excavation); and 5. Archaeological monitoring. <p>Details relating to these investigations are given in Appendix A20.5 Mitigation Measures and the Cultural Heritage Resource in Volume 4 of this EIAR.</p>
20.7	<p>Monitoring</p> <p>The mitigation measures that will be carried out will also function as a monitoring system to allow the further assessment of the scale of the predicted impacts and the effectiveness of the recommended mitigation measures. For example, if archaeological remains are identified during archaeological test trenching, mitigation such as preservation by record or in-situ will be required.</p>

27.18 Mitigation and Monitoring for Architectural Heritage

The table below details the mitigation measures identified in Chapter 21 Material Assets: Architectural Heritage.

Table 27-18 Mitigation and Monitoring Measures for Material Assets: Architectural Heritage

Section Ref.	Description						
21.6	<p>Mitigation measures</p> <p>In most cases where architectural heritage is impacted as a result of the proposed development there will be no requirement or no opportunity for mitigation. In some instances, such as the lowering of the track at certain locations along the MGWR railway and the GSWR railway the impacts will be so small as to be imperceptible provided the adjacent retaining walls and bridges are not undermined. Structural surveys will be carried out wherever appropriate to determine the condition of retaining walls and bridges and to determine the depth of foundations. In the case of the erection of cables and structures for the OHLE there are no mitigation measures that could be implemented that would reduce or eliminate the impacts and this would also be the case where the raising of the parapets on railway bridges would affect the settings of the adjacent canal bridges and where the erection of footbridges would affect the settings of canal bridges and other structures in the vicinity. In many cases mitigation has been achieved to a greater or lesser extent through design, such as the choice of means of raising the parapets of bridges.</p> <p>Mitigation will also include monitoring of the masonry of the canal bridges where it is proposed to remove the arches from adjacent railway bridges, to ensure that no damage occurs to the canal bridge through vibration or settlement during construction, or through the removal of support for the canal abutment adjacent to the railway bridge. Works to the vaults at Connolly Station will also need to be monitored to ensure that cutting into parts of the vaults during construction does not cause damage to other parts of the vaults.</p> <p>Mitigation measures for each affected structure are listed in Table 21-16, below and include protection of the structure from damage during construction and recording of those structures that are to be removed prior to works commencing. Where masonry arch bridges are to have their arches removed and replaced with concrete arches the geometry and design of the concrete arch should be prepared in consultation with a Grade 1 conservation architect. Where the road is to be raised over the canal bridges due to the raising of the decks of the adjacent railway bridges the choice of fill needs to be selected carefully in order to prevent consequential damage to the bridges.</p> <p style="text-align: center;">Table 21-16 Mitigation of direct impacts during construction</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #4F81BD; color: white;">BH No.</th> <th style="background-color: #4F81BD; color: white;">Location</th> <th style="background-color: #4F81BD; color: white;">Mitigation</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">BH-6</td> <td style="text-align: center;">Sheriff Street bridge</td> <td>Bridge is to be recorded by photographs, written description and measured drawings prior to demolition. The brick in the piers and parapets and the granite are to be removed and reused in the reconstructed bridge, which is to be carried out to best conservation practice in accordance with a method statement to be prepared by the Grade 1 conservation architect.</td> </tr> </tbody> </table>	BH No.	Location	Mitigation	BH-6	Sheriff Street bridge	Bridge is to be recorded by photographs, written description and measured drawings prior to demolition. The brick in the piers and parapets and the granite are to be removed and reused in the reconstructed bridge, which is to be carried out to best conservation practice in accordance with a method statement to be prepared by the Grade 1 conservation architect.
BH No.	Location	Mitigation					
BH-6	Sheriff Street bridge	Bridge is to be recorded by photographs, written description and measured drawings prior to demolition. The brick in the piers and parapets and the granite are to be removed and reused in the reconstructed bridge, which is to be carried out to best conservation practice in accordance with a method statement to be prepared by the Grade 1 conservation architect.					

Section Ref.	Description		
	BH No.	Location	Mitigation
	BH-9	Signal box to the north of Sheriff Street	The signal box is to be recorded by measured drawings, photographs and written description prior to its removal and is to be offered to heritage parks, museums and other appropriate bodies for re-erection and display.
	BH-23	Connolly vaults	Vaults are to be recorded by photographs and written description prior to the works. The alterations to the vaults and the historic station canopy are to be carried out in accordance with a method statement to be prepared by a Grade 1 conservation architect.
	BH-44	Former parcels office, Amiens Street	Retain stone setts at entrances to parcels office and setts in rainwater channels, with repairs to the areas of setts at the entrances using salvaged setts of similar stone and similar colour.
	BH-60	MGWR railway	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the retaining walls are not undermined.
	BH-61	GSWR railway	No mitigation necessary.
	BH-62	Bridge at Ossory Road	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-73	Railway overbridge at North Strand Road	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-87	Railway overbridge at Ballybough Road	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-99	Railway underbridge, North Strand Road	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-101	Railway underbridge, Ballybough Road	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-102	Railway underbridge, Clonliffe avenue	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-103	Railway underbridge, St James's Avenue	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-104	Railway underbridge, St Joseph's Avenue	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-106	Railway underbridge, Jones's road	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-107	Railway underbridge, Mabel Street	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-109	Railway overbridge at Jones's Road	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-110	Railway underbridge, St George's Avenue	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-111	Railway overbridge at Drumcondra Road	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-124	Cross Guns tunnel	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the tunnel are not undermined.
	BH-126	Accommodation bridge	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.

Section Ref.	Description		
	BH No.	Location	Mitigation
	BH-139	Broome Bridge	Replacement arch is to be designed and built to a high quality in association with a Grade 1 conservation architect. The works to raise the deck level of the canal bridge should utilise a light flexible fill to minimise the possibility of damage to the bridge structure.
	BH-144	Ashtown level crossing	The level crossing is to be recorded by photographs and written description prior to its removal.
	BH-146	Royal Canal	The works to build the footbridge and the underpass are to be carried out in conjunction with Waterways Ireland to ensure that there is no long-term impact on the canal.
	BH-148	Disused mill at Mill Lane	No opportunity for mitigation other than to produce a written and photographic record of the structure that is to be demolished prior to the commencement of the works
	BH-149, DL 3	Ashton House, demesne, gates and gate lodge	The gateway and demesne wall are to be recorded by photographs, written description and measured drawings prior to removal; the wall and gateway are to be taken down carefully in accordance with a conservation method statement and reinstated using a lime-based mortar.
	BH-154	Old Navan Road railway bridge	No mitigation necessary.
	BH-156	Granard Bridge	The works to raise the deck level should utilise a light flexible fill to minimise the possibility of damage to the bridge structure.
	BH-157	Railway bridge at Castleknock Road	The replacement arch is to be designed and built to a high quality in association with a Grade 1 conservation architect.
	BH-159	Coolmine level crossing	The level crossing is to be recorded by photographs and written description prior to its removal.
	BH-161	Porterstown level crossing	The level crossing is to be recorded by photographs and written description prior to its removal.
	BH-166	Clonsilla pedestrian bridge	No opportunity for mitigation other than to produce a photographic record of the bridge prior to the installation of the OHLE.
	BH-168	Clonsilla level crossing	The level crossing is to be recorded by photographs and written description prior to its removal.
	BH-170	Barnhill Bridge	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-172	Barberstown level crossing	The level crossing is to be recorded by photographs and written description prior to its removal.
	BH-175	Railway bridge adjacent to Collins Bridge	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-177	Dunboyne Bridge	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
	BH-179	Cope Bridge	The replacement arch is to be designed and built to a high quality in association with a Grade 1 conservation architect. The works to raise the deck level of the canal bridge should utilise a light flexible fill to minimise the possibility of damage to the bridge structure. The impact of the pedestrian/cycle bridges has been minimised through design.
	BH-185	Louisa Bridge	The works to raise the deck level should utilise a light flexible fill to minimise the possibility of damage to the bridge structure.
	BH-186	Railway bridge adjacent to Louisa Bridge	No mitigation necessary.
	BH-188	Blakestown level crossing	The level crossing is to be recorded by photographs and written description prior to its removal.

Section Ref.	Description		
	BH No.	Location	Mitigation
	BH-189	Pike Bridge	Excavations to lower track bed are to be designed and carried out in accordance with a method statement prepared by the Grade 1 conservation architect to ensure that the foundations of the bridge are not undermined.
Table 21-17 Mitigation of indirect impacts during construction			
	BH No.	Location	Mitigation
	BH-7	Water tower, Sheriff Street Upper	Erect hoardings around water tower to protect it from impact during construction.
	BH-40	1 Preston Street	Protect front railings from damage during construction.
	BH-41	2 Preston Street	Protect front railings from damage during construction.
	BH-42	3 Preston Street	Protect front railings from damage during construction.
	BH-43	4 Preston Street	Protect front railings from damage during construction.
	BH-44	Former parcels office, Amiens Street	Protect front railings from damage during construction.
	BH-148	Disused mill at Mill Lane	No opportunity for mitigation other than to produce a written and photographic record of the structure that is to be demolished prior to the commencement of the works
	BH-158	Kirkpatrick Bridge, Carpenterstown Road	Protect parapets of bridge from damage and set load limits consistent with the bearing capacity of the bridge.
	BH-160	Kennan Bridge, Porterstown Road	Protect parapets of bridge from damage and set load limits consistent with the bearing capacity of the bridge.
	BH-162	Crossing keeper's house, Porterstown Road	Erect hoardings to protect house from damage.
	BH-163	Clonsilla School, Porterstown Road	Erect hoardings to protect school from damage. The impact on the setting has been mitigated as far as possible by design.
	BH-166	Signal box and footbridge, Clonsilla Station	Erect hoardings to protect signal box from damage.
	BH-169	Callaghan Bridge, Clonsilla Road	Protect parapets of bridge from damage and set load limits consistent with the bearing capacity of the bridge.
	BH-171	Pakenham Bridge, Barberstown Lane	Protect parapets of bridge from damage and set load limits consistent with the bearing capacity of the bridge.
	BH-195	Jackson Bridge	No opportunity for mitigation.
	BH-196	Chambers Bridge and 15 th lock	No opportunity for mitigation.
Table 21-18 Mitigation of impacts operation			
	BH No.	Location	Mitigation
	BH-23	Connolly vaults	No mitigation necessary.
	BH-40	1 Preston Street	No mitigation necessary.
	BH-41	2 Preston Street	No mitigation necessary.
	BH-42	3 Preston Street	No mitigation necessary.
	BH-43	4 Preston Street	No mitigation necessary.
	BH-44	Former parcels office, Amiens Street	No mitigation necessary.
	BH-63	Railway underbridge on GNR North Wall Extension, West road	No opportunity for mitigation.
	BH-72	Newcomen Bridge	No opportunity for mitigation.
	BH-86	Clarke Bridge	No opportunity for mitigation.
	BH-99	Railway underbridge, North Strand Road	No opportunity for mitigation.
	BH-101	Railway underbridge, Ballybough Road	No opportunity for mitigation.
	BH-102	Railway underbridge, Clonliffe avenue	No opportunity for mitigation.

Section Ref.	Description		
	BH No.	Location	Mitigation
	BH-103	Railway underbridge, St James's Avenue	No opportunity for mitigation.
	BH-104	Railway underbridge, St Joseph's Avenue	No opportunity for mitigation.
	BH-106	Railway underbridge, Jones's road	No opportunity for mitigation.
	BH-107	Railway underbridge, Mabel Street	No opportunity for mitigation.
	BH-108	Clonliffe Bridge, Russell Street	No opportunity for mitigation.
	BH-110	Railway underbridge, St George's Avenue	No opportunity for mitigation.
	BH-115	Binns Bridge	No opportunity for mitigation.
	BH-139	Broome Bridge, Broombridge Road	No opportunity for mitigation.
	BH-145	Longford Bridge, Ashtown	No mitigation necessary.
	BH-148	Disused mill at Mill Lane	Landscaping should be undertaken to screen the mill from the road.
	BH-149	Ashton House, Ashtown Road	No opportunity for mitigation.
	BH-156	Granard Bridge, Castleknock Road	No opportunity for mitigation.
	BH-158	Kirkpatrick Bridge, Carpenterstown Road	No opportunity for mitigation.
	BH-158	Kirkpatrick Bridge, Carpenterstown Road	No mitigation necessary.
	BH-160	Kennan Bridge, Porterstown Road	No opportunity for mitigation.
	BH-160	Kennan Bridge, Porterstown Road	No mitigation necessary.
	BH-162	Crossing keeper's house, Porterstown Road	No opportunity for mitigation.
	BH-163	Porterstown School House	No opportunity for mitigation.
	BH-166	Signal box and footbridge, Clonsilla Station	No opportunity for mitigation.
	BH-169	Callaghan Bridge, Clonsilla Road	No mitigation necessary.
	BH-169	Callaghan Bridge, Clonsilla Road	No mitigation necessary.
	BH-171	Pakenham Bridge, Barberstown Lane	No opportunity for mitigation.
	BH-173	Former Coldblow & Lucan Station	No mitigation necessary.
	BH-174	Collins Bridge, Westmanstown	No opportunity for mitigation.
	BH-176	Water tower to the south of Dunboyne Station	No mitigation necessary.
	BH-179	Cope Bridge, Leixlip Confey	No opportunity for mitigation.
	BH-185	Louisa Bridge	No opportunity for mitigation.
	BH-187	Deey Bridge and 13th Lock, Blakestown	No mitigation necessary.
	BH-189	Pike Bridge, Royal Canal	No opportunity for mitigation.
	BH-192	Signal box at Maynooth Station	No mitigation necessary.
	BH-193	Station Master's House, Maynooth Station	No mitigation necessary.
	BH-195	Jackson Bridge	No mitigation necessary in relation to the closure of the bridge to traffic.
	BH-195	Jackson Bridge	Screen planting in the vicinity of the depot will reduce the impact on the setting of the bridge.
	BH-196	Chambers Bridge and 15 th lock	Screen planting in the vicinity of the depot will reduce the impact on the setting of the bridge.
21.7	<p>Monitoring</p> <p>It will be necessary to monitor the masonry of the stone bridges where works have been carried out to ensure that no settlement or damage occurs over a period of a year following the completion of the works to allow for curing of the mortars used in the construction. Works to the vaults at Connolly Station will also need to be monitored after the completion of the works where the integrity of any of the vaults has been disturbed to ensure that no undue settlement or movement of the masonry occurs.</p>		

27.19 Mitigation and Monitoring for Electromagnetic Effects and Stray Current

The table below details the mitigation measures identified in Chapter 22 Electromagnetic Effects and Stray Current.

Table 27-19 Mitigation and Monitoring Measures for Electromagnetic Effects and Stray Current

Section Ref.	Description
<p>22.6</p>	<p>Mitigation measures</p> <p>Where the significance of effects for a stakeholder has been classed as moderate or higher mitigation measures are available for consideration. While no equipment was identified that will be impacted by DC and Quasi DC magnetic field interference from the proposed development, should any impacts manifest themselves during operation the following mitigation measures are available:</p> <ol style="list-style-type: none"> 1. Relocation of the affected equipment. 2. Installation of an active cancellation system. 3. Shielding of the labs/rooms using specialized material designed to attenuate DC magnetic field perturbations. 4. The embedded mitigation measure discussed in 22.6.1. <p>Active cancellation systems operate on the basis of responding to a changing magnetic field, whereby the system generates a counter field to cancel out fluctuations as they occur.</p> <p>Any impacts in relation to AC fields can be addressed in a number of ways if necessary, including –</p> <ol style="list-style-type: none"> 1. Relocation of the affected equipment. 2. Shielding. 3. Filtering.
<p>22.6.1</p>	<p>Embedded mitigation specific to Intel</p> <p>Figure 22-10 depicts the standard Overhead Line Equipment (OHLE) configuration with the messenger wire, contact wire and feeder wire (yellow ellipse) all running above the train line. The feed current is distributed amongst these three conductors with the return current passing through the rails. Figure 22-11 the feeder wires (yellow ellipse) for both lines have been buried as a cable beside the downline (which is the furthest line from the Intel campus in this case). The effect of running this cable closer to the rail lines is to take advantage of the natural cancellation that will occur from their closer proximity.</p> <p>Figure 22-10 Standard OHLE layout</p>

Section Ref.	Description
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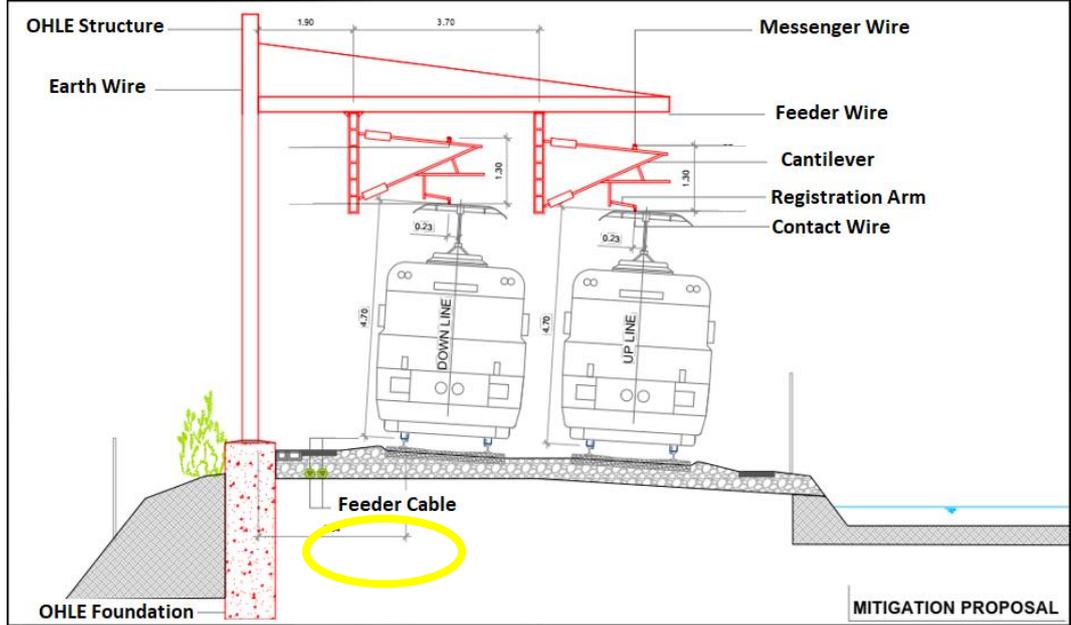


Figure 22-11 Mitigated OHLE layout

The result of this mitigation measure is depicted in Figure 22-12 where the overall effect can be seen to reduce the levels. Laterally, the distance at which the levels fall below 1 μT has been moved by 50 m closer to the line.

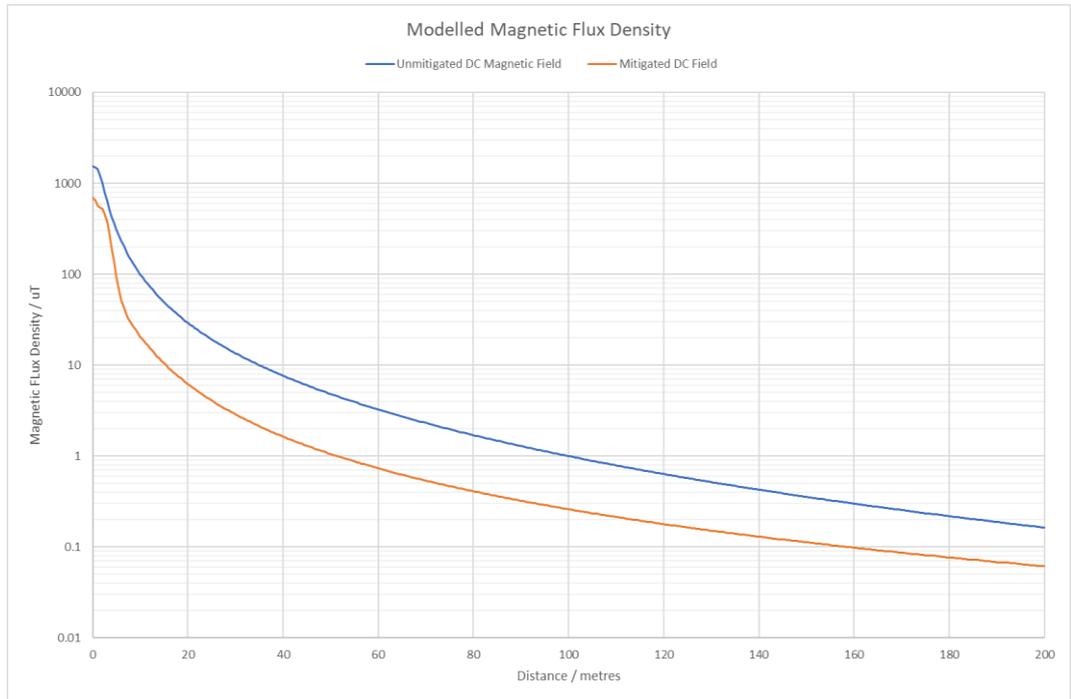


Figure 22-12 Unmitigated Vs mitigated DC Magnetic Field profile

22.7	Monitoring Not applicable.
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27.20 Mitigation and Monitoring for Human Health

The table below details the mitigation measures identified in Chapter 23 Human Health.

Table 27-20 Mitigation and Monitoring Measures for Human Health

Section Ref.	Description
23.6	<p>Mitigation and Monitoring Measures</p> <p>This EIA has evolved together with the design process, site visits and public consultation which has allowed for the inclusion of a number of mitigation measures as part of the Design and the Construction Strategy detailed in Chapter 4 and Chapter 5 respectively. A number of the construction and operation stage mitigation measures relating to human health are defined in the respective specialist's EIAR chapter, to avoid unnecessary repetition, the mitigation measures are summarised below and should be cross-referenced in the respective Chapter as appropriate. Chapter 27 of this EIAR collates all mitigation measures contained in this EIAR.</p>
23.6.1.	<p>Construction Stage Mitigation</p> <p>The following mitigation measures will be implemented to mitigate potential impacts on human health during the construction phase:</p> <ol style="list-style-type: none"> 1. To address potential air quality impacts during the construction phase, the mitigation measures detailed in Chapter 12 Section 12.6.1 of this EIAR shall be implemented in full including the development of air quality management plan (AQMP) before commencing construction works which shall be submitted for approval to the relevant planning authorities. 2. To address noise and vibration effects the mitigation and monitoring measures detailed in Chapter 14 (Noise and Vibration) Section 14.6.1 of this EIAR shall be implemented in full. Some of the key mitigation measures relevant for human health are listed below: <ol style="list-style-type: none"> a. The implementation of the noise monitoring programme proposed in Chapter 14 Noise and Vibration of this EIAR in relation to demolition and construction activities shall be implemented in full. b. Piling programmes will be planned so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. Noise reduction shall be achieved by implementing the mitigation measures detailed in Section 14.6.1 in Chapter 14 of this EIAR. c. The Contractor will be required to be proactive in engaging with the occupants of neighbouring properties and is required to notify occupiers of any works forecast to generate appreciable levels of noise, explaining the nature and duration of the works. Night-works and piling works have the potential to generate the most significant noise impacts. All affected sensitive locations should be notified of planned works in advance of the works progressing. The notification will be required to include a description of the works, the expected duration and details of how to contact the Contractor to log complaints. d. Hours of Work: consideration should be given to the scheduling of activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity should be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control. e. Undertake noise control audits including reports on monitoring at regular intervals throughout the construction programme particularly close to sensitive residential properties. 3. To address potential flood risk and water quality impacts to human health the mitigation and monitoring measures detailed in Chapter 10 of this EIAR shall be implemented in full. 4. Appropriate signage and safety barriers shall be erected along the Royal Canal in advance and during the canal dewatering works. 5. Hydrogeology mitigation and monitoring measures detailed in Chapter 11 of this EIAR shall be implemented in full including the mitigation measures for protecting the groundwater quality resource. 6. To address potential impacts from contaminated land or materials, the land and soils mitigation and monitoring measures detailed in Chapter 9 of this EIAR shall be implemented in full. Furthermore, the Contractor(s) will ensure appropriate education, training and licences are in place to handle all waste materials including all hazardous waste materials to ensure the safety of workforce and the surrounding population. 7. Traffic/collisions/ safety: <ol style="list-style-type: none"> a. Construction Environmental Management Plan: Prior to any demolition, excavation or construction, a Construction Environmental Management Plan (CEMP) will be produced by the successful Contractor. The CEMP will set out the Contractor's overall management and administration of the construction project. The CEMP will be prepared by the Contractor during the pre-construction phase to ensure commitments included in the statutory approvals are adhered to, and that it integrates the requirements of the CEMP, Environmental Operating Plan (EOP) and the Construction and Demolition Waste Management Plan (CDWMP). These shall include measures to

Section Ref.	Description
	<p>address working on an active railway, working in water, working from heights and working with electricity.</p> <p>b. Construction Traffic Management Plan (CTMP): The successful Contractor will be required to prepare a Construction Traffic Management Plan (CTMP) in advance of the commencement of works, to ensure the safety of site personnel and members of the public and minimise construction phase-related traffic delays and disruptions.</p> <p>c. Implement all mitigation measures specified in Chapter 6 Traffic and Transportation</p> <p>8. Stakeholder Communication Plan: CIÉ will develop and maintain a stakeholders list and agree on the communication strategy with residents/landowners/occupiers in advance of construction works commencing.</p>
23.6.2	<p>Operation Stage Mitigation</p> <p>The following mitigation measures will be implemented to mitigate potential impacts on human health during the operation stage:</p> <ol style="list-style-type: none"> To address potential air quality impacts, should any of the maintenance compounds require storage of materials or other activities that have the potential to generate dust, the dust mitigation measures set out in Chapter 12 and Appendix A12.4 Dust Mitigation in Volume 4 of this EIAR will be utilised. These will ensure operational phase impacts with respect to dust nuisance, health impacts are not significant in the long term. In addition, any maintenance activities on the rail line will also implement the dust mitigation measures set out in Chapter 12. To address operational noise impacts the mitigation and monitoring measures shall be implemented in full as detailed in Chapter 14 (Noise and Vibration) Section 14.6.2 of this EIAR. To address potential hydrogeological impacts the design and operational stage mitigation proposed in Chapter 11 will be implemented in full at detailed design stage. Detailed design will integrate public safety design measures to reduce opportunities of anti-social behaviour and loitering at Spencer Dock Station, Connolly/ Preston Street, existing stations, Ashtown underpass and will utilise attractive design measures, lighting and public realm enhancements particularly as part the level crossing replacements works. As far as practicable these measures shall include: <ol style="list-style-type: none"> The use of active and passive surveillance measures. CIÉ/the design team shall consult with An Garda Síochana and the respective local authority at the detailed design stage. Appropriate safety lighting on bridges and cul-de-sac at closed level crossings to ensure safety of all road users. Stakeholder Management Plan: Notification of routine maintenance works to properties in vicinity of the railway corridor that are likely to be affected by the works. Ongoing monitoring of noise and vibration levels along the corridor to fully understand effects and take corrective action to reduce effects and ameliorate exceedances of limits impacting neighbouring properties. Preparation and implementation of the Docklands Station flood emergency response plan.

27.21 Mitigation and Monitoring for Major Accidents and Disasters

The table below details the mitigation measures identified in Chapter 24 Major Accidents and Disasters.

Table 27-21 Mitigation and Monitoring Measures for Major Accidents and Disasters

Section Ref.	Description
24.4.3 Table 24-7	<p>C1 - Major Road Traffic Accidents</p> <ol style="list-style-type: none"> A Construction Traffic Management Plan (CTMP) will be prepared and implemented during the construction phase to be agreed with Iarnród Éireann and the respective local authority prior to the commencement of the construction phase. A Mobility Management Plan will be developed as part of the CTMP and will address all modes of transport and travel required to deliver the project during the construction phase. This will include details regarding construction workers travelling to site, car-parking, haulage routes and construction compounds to reduce potential effects (incl. traffic accidents) caused due to construction traffic and residential neighbourhoods. All accesses to the worksite and the compounds will be signposted, and anyone outside the work will be prohibited, installing the necessary perimeter fences and the necessary warning signs.

Section Ref.	Description
	<ol style="list-style-type: none"> 4. The necessary traffic signs will be placed outside the work to warn pedestrian and vehicle traffic of the risks involved in the work. Similarly, the necessary protections and notices will be placed, in specific cases in which the circulation through the annexed streets is affected. 5. All HGV drivers will be provided with appropriate safety awareness training.
24.4.3 Table 24-7	C5- Collapse / Damage to structures <ol style="list-style-type: none"> 1. Groundwater extraction will be required prior to construction works, specifically to enable the construction of the underground station at Spencer Dock. Continuous monitoring of groundwater levels, earthworks. Pump tests will be carried out prior to pumping of the groundwater. 2. Stakeholder consultations with owners of sensitive structures / buildings. 3. Monitoring of existing historic / sensitive structures during construction to ensure their stability and durability. 4. Where appropriate, sensitive structures at risk from construction works will be protected. 5. A CEMP and an Incident Response Plan (IRP) will be prepared to manage the risk of collapse / damage to structures. 6. Mitigation measures in relation to vibration identified in EIAR Chapter 14 Noise and Vibration will be adhered to.
24.4.3 Table 24-7	C6 - Ground Collapse <ol style="list-style-type: none"> 1. Groundwater extraction will be required prior to construction works, specifically to enable the construction of the underground station at Spencer Dock and the underpass at Ashtown. Continuous monitoring of groundwater levels and earthworks will be carried out. 2. A CEMP and an Incident Response Plan (IRP) will be prepared to manage the risk of collapse / damage to structures.
24.4.3 Table 24-7	C8 - Fire / explosion <ol style="list-style-type: none"> 1. The risk is managed through the CEMP, Environmental Operating Plan (EOP) and IRP. 2. Hot Work Permit procedure will be followed. 3. All construction compounds and construction sites will have 24/7 security. 4. Explosive materials will not be stored on construction site / compounds overnight. 5. Transportation of explosives will be subject to prior agreement. When transportation of these materials is required, appropriate security measures will be implemented such as escort by An Garda Síochána.
24.4.3 Table 24-7	C10 - Industrial Accidents (works near Seveso site) <ol style="list-style-type: none"> 1. The proposed development cannot provide offsite mitigation measures however, TII's protocols for the management of major accidents will be followed in an event there is an incident at a nearby Seveso sites.
24.4.3 Table 24-7	C11 - Extreme Weather (Flooding) Events <ol style="list-style-type: none"> 1. As is normal practice with infrastructure projects, an Environmental Operating Plan (EOP) and Construction Environmental Management Plan (CEMP) will be prepared for the proposed development. An Incident Response Plan (see Appendix F of Appendix A5.1 in Volume 4 of this EIAR) will be prepared as part of the CEMP detailing the procedures to be undertaken in the event of flood risks that can lead to pollution events. 2. Monitoring of weather forecasts to ensure that necessary actions will be implemented in time at construction sites prior to prolonged / extreme weather events. 3. Continuous monitoring of water levels in the Liffey Estuary and Lyreen Stream.
24.4.3 Table 24-7	C13 - Spillage or long-term seepage of pollutants into a watercourse <ol style="list-style-type: none"> 1. As is normal practice with infrastructure projects, an EOP and CEMP will be prepared for the proposed development. An Incident Response Plan (see Appendix F of Appendix A5.1 in Volume 4 of this EIAR) will be prepared as part of the CEMP detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks. 2. The Environmental Manager will prepare Method Statements for construction works as detailed in the EOP to be undertaken on, over or near water in consultation with Inland Fisheries Ireland (IFI) and other relevant authorities. 3. Implementation of mitigation measures identified in Chapter 8 Biodiversity, Chapter 10 Water (including Hydrology & Flood Risk), and Chapter 11 Hydrogeology in EIAR Volume 2. 4. During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water: <ol style="list-style-type: none"> a) <i>Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites</i> (Eastern Regional Fisheries Board).

Section Ref.	Description
	<ul style="list-style-type: none"> b) <i>Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.</i> c) <i>CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors.</i> d) <i>CIRIA C648 Control of Water Pollution from Constructional Sites.</i> e) <i>Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2006).</i>
24.4.3 Table 24-7	C14 - Human disease <ol style="list-style-type: none"> 1. The Contractor will provide site operatives with appropriate first aid material. All site operatives will be advised to wear steel toe cap boots with trousers to be tucked inside along with appropriate PPE such as gloves and headwear. All site operatives should be advised of the importance of washing hands before eating to avoid the risk of contracting weils disease and other water borne diseases. 2. Government and HSE health and safety guidelines will be adhered to in relation to Covid-19 in work places to reduce the spread of the virus amongst the construction workers.
24.4.3 Table 24-7	O2 - Train Derailment <ol style="list-style-type: none"> 1. Appropriate training will be provided to all relevant staff members for operation of the electrified train fleet. 2. All relevant staff members shall familiarise themselves with Section Z Electrified Lines of the IÉ Rule Book prior to operating the fleet. 3. Operation and maintenance manuals will be made available to staff as early as possible. 4. A dedicated Major Incident Response Plan has been developed by Iarnród Éireann for the DART+ West project to identify the appropriate emergency response plans in event of an incident. 5. Appropriate back up procedures will be prepared and implemented in an event of an incident. 6. Periodic inspections and maintenance (as required) of the rail line in accordance with Iarnród Éireann (IÉ) Standards which include, but not limited to, the following: <ul style="list-style-type: none"> a) IÉ CCE-TMS-363 Requirements for the Rail Testing Vehicle. b) IÉ CCE-TMS-360 Track and Structures Inspection Requirements. c) IÉ CCE-TMS-320 Track Quality Standard. d) International Union of Railways (UIC) Code 712 R Rail Defects 7. Design measures for the DART+ West project have been accepted by the Commission for Railway Regulation (CRR) in order for licence to be granted.
24.4.3 Table 24-7	O5 - Building Failure / Fire <ol style="list-style-type: none"> 1. A Fire Strategy has been prepared for the Spencer Dock Station and Connolly Station. The Fire Strategies for both buildings have been approved by the Dublin Fire Brigade the measures in which will be implemented in event of a fire. 2. A Fire and Evaluation Performance Based Design was prepared for the proposed depot. The design was approved by the Kildare Chief Fire Officer, the measures in which will be implemented in event of a fire.
24.4.3 Table 24-7	O9 - Extreme weather (flood) events <ol style="list-style-type: none"> 1. Ongoing consultation and cooperation with local authorities and the Office of Public Works (OPW). 2. Inspections and maintenance (as applicable) of the drainage system and the compensatory storage areas. 3. A dedicated Major Incident Response Plan has been developed by Iarnród Éireann for the DART+ West project to identify the appropriate emergency response plans in event of flooding.
24.4.3 Table 24-7	O12 - Industrial Accidents – Seveso sites <ol style="list-style-type: none"> 1. The proposed development cannot provide offsite mitigation measures however, TII's protocols for the management of major accidents will be followed in an event there is an incident at a nearby Seveso sites.