



Environmental Impact Assessment Report

Volume 1: Non-Technical Summary

February 2023



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1. Introduction

This Non-technical Summary (NTS) is prepared for the Environmental Impact Assessment Report (EIAR) for the DART+ South West Project (“the proposed Project”).

The DART+ South West Project is part of the wider DART+ Programme which is a key transportation improvement programme to form a high-quality and integrated public transport system in the Greater Dublin Area (GDA), bringing benefits for new and existing communities. It will assist in providing a sustainable transport system and a societal benefit for current and future generations.

The DART+ South West project will improve performance and increase train and passenger capacity on the route between Hazelhatch & Celbridge Station and Heuston Station, and through the Phoenix Park Tunnel Branch Line to the city centre, covering a distance of circa 20km. Figure 1-1 provides a schematic layout of the proposed DART+ South West Project.

The proposed Project is seeking to increase train capacity from the current 12 trains per hour per direction to 23 trains per hour per direction and increase passenger capacity from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction. This will be achieved through completion of four tracking between Park West & Cherry Orchard Station and Heuston Station (four tracking is already in place between Hazelhatch & Celbridge Station and Park West), in addition to re-signalling and electrification of the entire route from Hazelhatch & Celbridge Station to Heuston Station and on to Glasnevin Junction and the introduction of new electric trains similar to those currently operating on the Malahide/Howth to Bray/Greystones Line.

The completion of the four tracking to Heuston Station will remove a significant existing constraint on the line, which is currently limiting the number of train services that can operate on this route. DART+ South West will also deliver track improvements along the Phoenix Park Tunnel Branch Line, which will allow a greater number of trains to access the city centre.

The general arrangement drawings of the proposed Project are presented in Appendix A of this NTS.

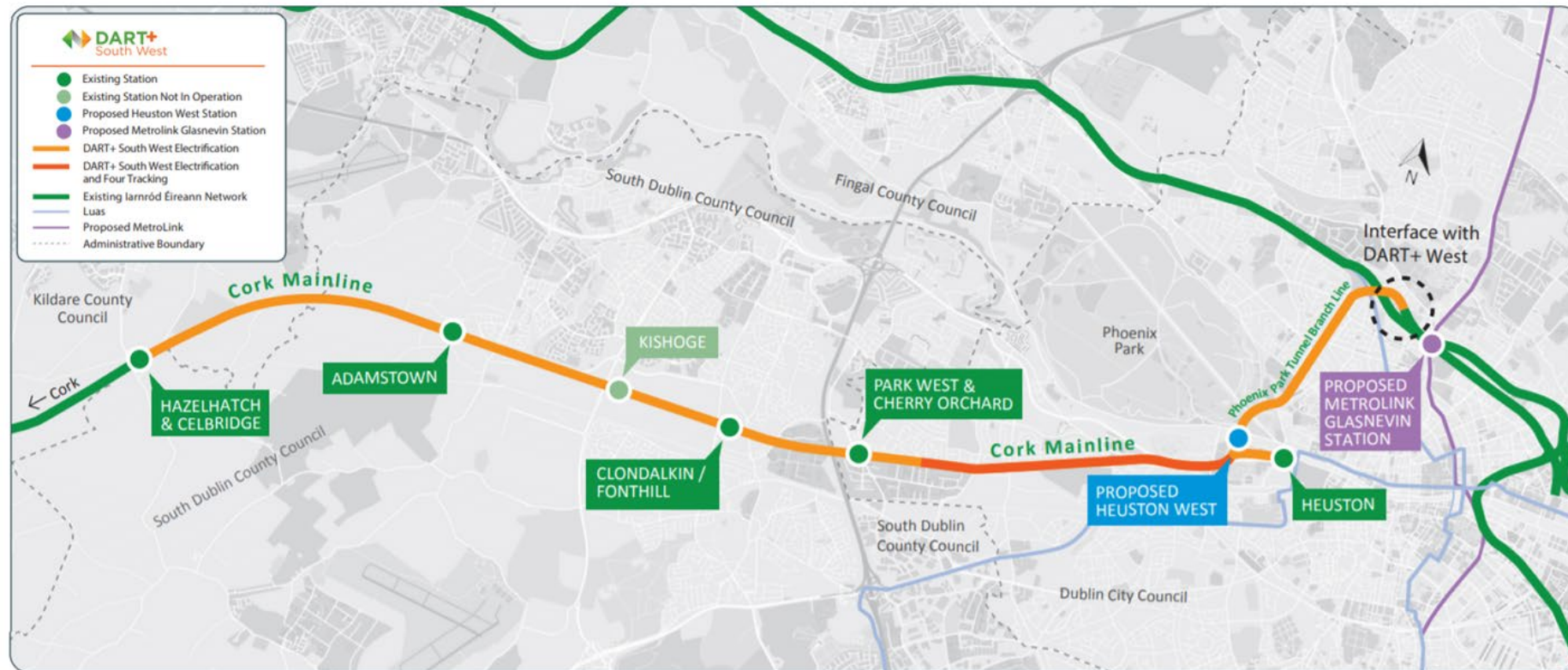


Figure 1-1 Schematic of the DART+ South West Project

1.1. Aims and Objectives

1.1.1. DART+ Programme Objectives

The DART+ Programme is a transformative programme of projects that aims to modernise and improve existing rail services in the GDA. It will see the DART network grow from its current 50 km in length to over 150 km.

The DART+ Programme primary objective is to support urban compact growth and contribute to reducing transport congestion and emissions in the Dublin region by enhancing the heavy rail network between Dublin City Centre and the areas of Drogheda, Maynooth, Dunboyne, Celbridge and Greystones. It will provide a sustainable, electrified, reliable and more frequent rail service, improving capacity along these corridors.

1.1.2. DART+ South West Programme Objectives

The primary objective of the DART+ South West project is to increase the carrying capacity on the route between Heuston Station and Hazelhatch & Celbridge Station and support the rapid transition required to deliver on a low carbon climate resilient transport system.

Sub-objectives include:

- To deliver a higher frequency, higher capacity, reliable, electrified rail service along the project route corridor to enable the provision of DART services between the City Centre and Hazelhatch & Celbridge Station;
- To deliver solutions to meet the Train Service Specification (TSS);
- To deliver a sustainable, low carbon and climate resilient design solution including making the maximum use of existing railway infrastructure together with targeted interventions to remove capacity constraints;
- To identify cost effective solutions from a capital, operations and maintenance perspective;
- To minimise adverse impacts on existing rail services, road users and landowners associated with the construction, operation and maintenance of the project;
- To minimise adverse impacts on the natural and built environment associated with the construction, operation and maintenance of the project;
- To deliver a sustainable, low carbon and climate resilient design solution including making use of existing infrastructure where possible with targeted improvement works; and
- To deliver an improved customer experience and service for customers along the project corridors.

1.2. Railway Order

The Transport (Railway Infrastructure) Act 2001 (as amended and substituted) (“the 2001 Act”) and as recently further amended by the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 in Statutory Instrument No. 743/2021 (“the 2021 Regulations”) provides for the application for a Railway Order (“RO”) by *inter alia* Coras Iompair Éireann (CIÉ) to An Bord Pleanála (“the Board”).

The Railway Order application is made pursuant to the provisions of section 37 of the 2001 Act. Section 37 of the 2001 Act requires, *inter alia*, that the application be made in writing and be accompanied by: (a) a draft of the proposed Railway Order; (b) a plan of the proposed railway works; (c) a book of reference to a plan describing the works which indicates the identity of the owners and of the occupiers of the lands described in the Plan; and (d) a statement of the likely effects on the environment of the proposed railway works (this Report).

A statement of the likely effects on the environment of the proposed railway works is addressed by the preparation of this Environmental Impact Assessment Report (EIAR) (previously referred to as an Environmental Impact Statement in section 39 of the 2001 Act).

A Railway Order is the statutory consent to an applicant providing authorisation to construct, maintain, improve and operate the railway or railway works. Railway works and the procedure for obtaining a Railway Order is governed by the Transport (Railway Infrastructure) Act 2001, as amended and substituted.

1.3. Requirement for an EIAR

This EIAR has been prepared in accordance with requirements of the EIA Directive (2011/92/EU *Assessment of the effects of certain public and private projects on the environment* as amended by Directive 2014/52/EU¹) and includes the information set out in section 39 of the 2001 Act and has had regard to relevant guidelines and guidance documents.

1.4. The EIA Process

Environmental Impact Assessment (EIA) is a process undertaken as per the European Directives² for the assessment of the effects of development projects on the environment. An Environmental Impact Assessment Report (EIAR) is a report prepared by the developer, providing information on the likely significant effects on the environment based on current knowledge and methods of assessment. It is carried out by competent experts, with appropriate expertise to provide informed assessment on the environmental factors as required under the EIA Directive which are as follows:

- Traffic and transportation;
- Population;

¹ The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) *inter alia* transposed the Directive.

² EU Directive 85/337/EEC as amended by Directive 2011/92/EU and Directive 2014/52/EU

- Biodiversity;
- Land and soils;
- Hydrology;
- Hydrogeology;
- Air quality;
- Climate;
- Noise and vibration;
- Landscape and visual;
- Material assets;
- Archaeology and cultural heritage;
- Architectural heritage;
- Electromagnetic compatibility and stray current;
- Human health;
- Major accidents and disasters; and
- Cumulative effects.

An Bord Pleanála is the competent authority for the purpose of carrying out an environmental impact assessment of the proposed Project.

1.4.1. Key Stages of the EIA Process

The key stages of the EIA process are illustrated in Figure 1-2.

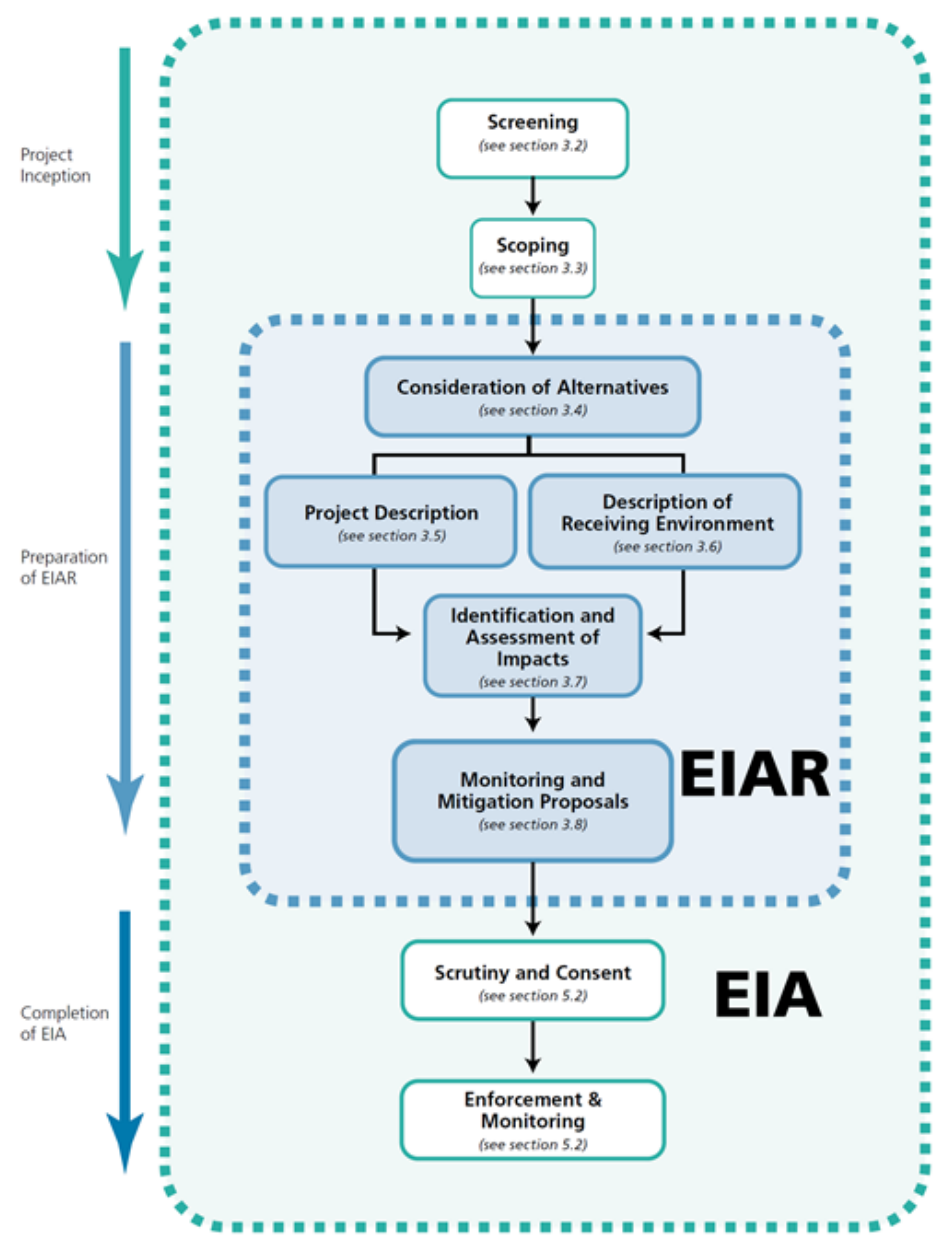


Figure 1-2 Key Stages of the EIA Process in Sequence (Source: EPA, 2022³)

1.5. Structure of the EIAR

This EIAR has been prepared on behalf of Córas Iompair Éireann / Iarnród Éireann (“the Applicant”) by TTA-JV (TYP SA, TUC RAIL and Atkins Design Joint Venture) supported by RPS and with the assistance of a team of competent experts. This EIAR is presented in five volumes:

³ From Figure 2.1 of EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, 2022

- **Volume 1:** Non-Technical Summary;
- **Volume 2:** Main Environmental Impact Assessment Report;
- **Volume 3A:** Technical Figures;
- **Volume 3B:** Photomontages; and
- **Volume 4:** Appendices.

1.6. Consultation

Consultation during the design development and the environmental impact assessment process is a key element of any project. Consultation can take many forms and have many functions over the course of a project of this type. The main consultation carried out over the course of the project have included:

- An Bord Pleanála Pre-application Consultation: Formal engagement with the Bord over nine meetings between April 2021 –September 2022.
- Public Consultation: undertaken at three key stages in the design process as follows:
 - Public Consultation 1 (PC 1) on the Emerging Preferred Option - Non-statutory public consultation (12th May 2021 to 23rd June 2021).
 - Public Consultation 2 (PC 2) on the Preferred Option - Non-statutory public consultation (10th November 2021 to 17th December 2021).
 - Public Consultation 2 follow up with potentially impacted property owners (throughout 2022).
- EIA Scoping Consultation: Informal EIA Scoping was undertaken in parallel with but separate to PC 2 consultation between 10th November 2021 and 17th December 2021.
- Technical Engagement with Stakeholders: Ongoing throughout the design development and EIA process to gather data, provide information and consult on emerging issues.
- Statutory consultation as part of the Railway Order application process.

2. Policy Context and Need for the Project

This section addresses the policy context and the need for the proposed DART+ South West project. In addition, a separate Planning Report with further detail has been prepared as part of the suite of documentation for the Railway Order application package. The Planning Report sets out the proposed project's compliance with the key planning policy outlined within this chapter.

2.1. Project Need and Strategic Fit

The rail network in Ireland and more particularly in the Dublin Metropolitan Area is a 19th century legacy, which represents a significant national asset in that it provides high-capacity public transport corridors into and through the city centre. The expansion of the heavy rail network has been a key long-term objective of CIÉ, Iarnród Éireann and statutory transport plans for a significant period. The expansion of the heavy rail network has been stop-start in nature and influenced by available Exchequer funding. The commissioning of the DART in the 1980's was a huge public transport success. Subsequent funding was provided in the 1990's and early 2000's to improve the rail network and increase capacity. However, due to the national economic downturn in 2008, capital investment was significantly constrained.

Project Ireland 2040 comprises the National Planning Framework (NPF) and the supporting investment package contained in the National Development Plan (NDP). The National Development Plan recommended that the DART+ Programme (previously termed DART Expansion) should proceed to deliver priority elements including investment in new train fleet, provision of new infrastructure and electrification of existing lines. The NPF and NDP state that the focus should be on non-underground tunnel elements of the programme using existing tracks (i.e., using the Phoenix Park Tunnel Branch Line). The National Development Plan 2021-2030 was published in October 2021 and it recognised the DART+ Programme as the “cornerstone of rail investment” within the lifetime of Project Ireland 2040.

Advancement of priority elements of DART+ Programme is now approved in principle under the National Development Plan 2021-2030 and DART+ South West will be the second of the DART+ Programme packages that will be lodged with An Bord Pleanála for the approval of a Railway Order application.

At an international level, the DART+ Programme supports Ireland's commitment to fulfil its obligation as an EU member state, regarding both the greenhouse gas emission reduction targets and the improved functionality of heavy rail services and integrated land use planning with sustainable mobility. DART+ South West is a cornerstone transport project and will assist with supporting both the European Green Deal, and the Sustainable and Smart Mobility Strategy and climate action commitments.

Notwithstanding the benefits of improving sustainable transport options, the project is fundamental to supporting the economic and social growth that has been highlighted by the National Planning Framework and county development plans. The DART + South West project

will facilitate different types of journeys through the improved integration with other means of transport including LUAS, the proposed MetroLink, proposed BusConnects, and other sustainable mobility infrastructure. The DART+ South West is aligned with the implementation of Project Ireland 2040 and the National Planning Framework.

All existing stations on the railway corridor between Heuston Station and Hazelhatch & Celbridge Station will be catered for by more sustainable electrical rail network allowing a shift towards a low carbon emission passenger service through the introduction of a modernised electrified fleet. The improved frequency and quality of service will provide a viable transport alternative to existing and future communities along the route and support a modal shift to help support a climate resilient low carbon economy.

2.2. Policy Context

The DART+ Programme is central to the delivery of planning and transportation policy objectives at EU, national, regional and local level. A review of the key planning and policy documents at national, regional and local level is presented in the following sections.

2.2.1. European Union Policy

2.2.1.1. EU White Paper on Transport: Roadmap to a Single European Transport Area - Towards a Competitive and Resource Efficient Transport System

In 2011, the European Commission adopted the White Paper Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system in the context of the Union's 2020 growth strategy. The vision of the White Paper spans four decades, up to 2050, but also sets earlier goals for 2020 and 2030. The Commission's vision for a competitive and sustainable transport system involves transport that uses cleaner energy, better exploitation of modern infrastructure and a reduction in its negative impact on the environment.

The White Paper defines ten goals designed to guide actions and measure progress to achieve a 60% reduction in CO₂ emissions and comparable reduction in oil dependency. Goals to which the DART+ Programme is aligned include the following:

- Goal 1. *Halve the use of 'conventionally fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO₂ free city logistics in major urban centres by 2030.*
- Goal 4. *By 2050, complete a European high-speed rail network. Triple the length of the existing highspeed rail network by 2030 and maintain a dense railway network in all Member States. By 2050 the majority of medium-distance passenger transport should go by rail.*

2.2.1.2. European Green Deal

The European Green Deal aims to transform the EU into a modern, resource-efficient and competitive economy, ensuring no net emissions of greenhouse gases by 2050 and decoupling of economic growth from resource use. Rail is one of the most environmentally positive choices with regards to public transport in this regard. It is considered that the

proposed DART+ South West Project is supported by the European Green Deal and will contribute to achieving its targets.

2.2.1.3. Trans-European Transport Network

The Trans-European Transport Network (Ten-T) policy supports the development of a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports and railroad terminals. The North Sea-Mediterranean Corridor includes the Dublin-Cork transport corridor. DART+ South West Project is identified as an Action under the TEN-T Connecting Europe Facility Programme (CEF) which acknowledges that the “*upgrading this railway line to four electrified tracks will bridge the missing link by connecting the Cork Line and the Belfast Line through two stations in Dublin (the Hazelhatch and Connolly stations)*”. It is considered that the proposed DART+ South West Project is supported by the Ten-T and will contribute to achieving its targets.

2.2.2. National Policy

2.2.2.1. Project Ireland 2040: The National Planning Framework and the National Development Plan 2021-2030

“Project Ireland 2040” was launched by the Government of Ireland in February 2018 and comprises the National Planning Framework (NPF) and the National Development Plan (NDP). Project Ireland 2040 is a long-term overarching strategy which for the first time aligns investment decisions with a clearly defined development strategy.

The NPF together with the NDP sets the context for each of the three regional assemblies to develop their Regional Spatial and Economic Strategies (RSES) taking account of and co-ordinating local authority Development Plans in a consistent manner to ensure national, regional and local plans align with each other.

2.2.2.1.1. National Planning Framework 2040

The NPF guides development and the exchequer investment up to 2040. It is a blueprint to guide public and private investments to promote and enhance opportunities and infrastructure for an increasing population and sets out the development principles that subsequent plans must follow.

The NPF predicts and plans for an increase in population of one million people from 2016 figures, bringing the total population to 5.7 million by 2040. It is estimated that 2.85 million people will be located within the Eastern and Midlands region. Planning for and delivering sustainable mobility projects is a key objective of the NPF and will help create a more integrated public transport system, enhance competitiveness, sustain economic progress and enable sustainable mobility choices for citizens.

There are ten National Strategic Outcomes (NSOs) identified within the framework, as shown in Figure 2-1. NSO 4: Sustainable Mobility is identified as being central to enhancing competitiveness, sustaining economic progress and enabling mobility choices for citizens. NSO 4 is supported by the delivery of the DART+ Programme whereby, the Framework aims to expand the range of public transport services available and to reduce congestion and

emissions. NSO 4 also commits to invest in key transport projects such as the DART+ Programme, BusConnects and MetroLink.

The DART+ Programme will also support other NSO identified within the Framework such as NSO 1: Compact Growth and NSO 8: Transition to a Low Carbon and Climate Resilient Society. NSO 1 identifies the need to deliver a greater proportion of residential development within existing built-up areas and the role that an integrated transport network will play in the regeneration and revitalization of urban areas while NSO 8 includes the electrification of transport fleets as a requirement to support a move away from polluting and carbon intensive propulsion systems.

The delivery of the DART+ programme is identified as a ‘key future growth enabler of Dublin’ along with the other rail projects set out in the Transport Strategy for the GDA including MetroLink, and Luas green line link to MetroLink. Delivery of the metropolitan cycle network and BusConnects project are also identified as enablers and will interact positively with DART+ South West project.



Figure 2-1 National Strategic Outcomes

2.2.2.1.2. National Development Plan 2021–2030

National Development Plan 2021–2030 (NDP) published in 2021 sets out the Government’s over-arching investment strategy and budget for the period 2021-2030. It is an ambitious plan that balances the significant demand for public investment across all sectors and regions of Ireland with a major focus on improving the delivery of infrastructure projects to ensure speed of delivery and value for money.

Public investment plays a significant role in addressing the opportunities and challenges faced by Ireland over the coming years such as Covid 19, Brexit, housing, health, climate action and population growth.

The NDP supports the delivery of Project Ireland 2040 through public capital investment over the next ten years and guides national, regional and local planning and investment decisions in Ireland. The NDP provides government departments with greater visibility of their investment capacity over the term. The NDP caters for an increase in population of over 1 million people by 2040 and identifies €165 billion for investment in capital projects targeted at enhancing regional development and driving economic growth. For the first time in Ireland, climate and environmental assessment of the NDP measures have been undertaken.

The NDP identifies the DART+ Programme as the cornerstone of rail investment within the lifetime of Project Ireland 2040 and represents the single biggest investment in the Irish rail network. The programme comprising a number of infrastructural projects, namely: DART+ West, DART+ South West, DART+ Coastal North to Drogheda via Balbriggan, and DART+ Coastal South. It also includes the expansion and modernisation of the rail fleet, including both battery-electric multiple units (BEMUs) and electric multiple units (EMUs). At the time of the NDP publication, a Preliminary Business Case had been submitted for analysis and approved by the Government as required under the *Public Spending Code* allowing the proposed project to move into the Railway Order application process.

DART+ programme will alleviate some of the constraints on the Dublin City Centre rail network and provide for additional intercity rail services. The NDP supports NSO 4 Sustainable Mobility and outlines the importance of investing in high quality sustainable mobility (active travel and public transport) networks if the NPF population growth targets are to be supported sustainably. It is recognised that the investment in high-quality sustainable mobility will improve citizens' quality of life, support Ireland's transition to a low carbon society and enhance the country's economic competitiveness. The NDP also highlights that the improved and expanded sustainable mobility services and infrastructure can also act as an enabler of the NPF's commitment toward compact growth of the cities, towns and villages within their existing urban footprint.

2.2.2.2. Smarter Travel – A Sustainable Transport Future

The Department of Transport (DoT)⁴ *Smarter Travel - A Sustainable Transport Future A New Transport Policy for Ireland 2009-2020* is a national policy document that set out five key goals including:

- “(i) to reduce overall travel demand;*
- (ii) to maximise the efficiency of the transport network;*
- (iii) to reduce reliance on fossil fuels;*
- (iv) to reduce transport emission; and*

⁴ It is noted that the DoT was previously known as Department of Transport, Tourism and Sport's (DTTAS)

(v) to improve accessibility to transport.”

The goals and targets of *Smarter Travel - A Sustainable Transport Future* align with and support the DART+ South West Project.

2.2.2.3. The National Investment Framework for Transport in Ireland

In December 2021, the Department of Transport published the National Investment Framework for Transport in Ireland (NIFTI) which replaces the Strategic Investment Framework for Land Transport (SFILT) following the launch of Project Ireland 2040 in February 2018. NIFTI provides a framework to guide transport investment and deliver the infrastructure and services, aligning with the NPF and its National Strategic Outcomes (NSOs) to provide a consistent approach to investment across Government. Through the transport investment priorities identified it will contribute to Ireland’s decarbonisation efforts, support vibrant and successful communities, deliver high performing transport systems, and promote a strong and balanced economy.

As part of the future network analysis completed to support investment priorities, NIFTI identifies consistent congestion as an issue in the five major cities in the country: Dublin, Cork, Galway, Limerick, and Waterford. It supports the development of new urban infrastructure supply across the five cities including the development of BusConnects and comprehensive cycle networks, while Dublin will also see heavy rail improvements in the form of DART+ and MetroLink among other things. The continued support of the DART+ Programme demonstrates the substantial investment in sustainable mobility being delivered under the National Development Plan 2021-2030.

The future network analysis undertaken to inform NIFTI has reiterated the importance of the DART+ Programme for the GDA as it will address existing congestion issues, cater for rising travel demand, and support sustainable public transport options across the GDA. The DART+ Programme will also encourage compact growth, transport-orientated development and the decarbonisation of the sector to include the purchasing of electric powered trains. The proposed Project also supports improvements and maximisation of existing transport infrastructure assets.

To address the transport challenges, NIFTI establishes four investment priorities namely:

1. Decarbonisation;
2. Protection and renewal;
3. Mobility of people and goods in urban areas; and
4. Enhanced regional and rural connectivity.

Projects must align with these priorities to be considered for funding. Moreover, as the NSOs are embedded in NIFTI future investment made in accordance with the priorities will support the delivery of the National Planning Framework over the coming decades. The DART+ Programme is fully aligned with these priorities and is supported under NIFTI.

NIFTI investment priorities are outlined in Figure 2-2.



Figure 2-2 National Investment Framework for Transport in Ireland – Investment Priorities

2.2.2.4. National Sustainable Mobility Policy

The Department of Transport's National Sustainable Mobility Policy (NSMP) sets out a strategic framework to 2030 for active travel and public transport to support Ireland's overall requirement to achieve a 51% reduction in carbon emissions by the end of this decade, targeting at least 500,000 additional daily active travel and public transport journeys by 2030.

The policy is guided by three key principles of safe and green mobility, people focussed mobility and better integrated mobility. The DART+ programme is identified as a key focus for the Greater Dublin Area (GDA), expanding the electric and battery electric fleet and rail network, with electrified services and also expanding and improving public transport services. The principles and goals of the National Sustainable Mobility Policy align with and support the DART+ South West project.

2.2.2.5. Climate Action and Low Carbon Development (Amendment) Act 2021

In July 2021, the Government signed the Climate Action and Low Carbon Development (Amendment) Act 2021 into law amending the 2015 Act. The 'Climate Act' provides for the first time, a governance framework setting out how Ireland will transition to 'Net Zero' and achieve a climate neutral economy by no later than 2050. The key features of the Amended Act are:

- Placing on a statutory basis a 'national climate objective', which commits to pursue and achieve, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy, by no later than 2050;
- Carbon budgets including a provision for setting sectoral targets;
- Actions for each sector to be included in an annually revised Climate Action Plan;
- Strengthened role for the Climate Change Advisory Council;
- New oversight and accountability by the Oireachtas; and

- Public bodies will be obliged to perform their functions in a manner consistent with national climate plans and strategies and furthering the achievement of the national climate objective.

Transport is one of the key sectors in which substantial emissions reductions are required in order for Ireland to achieve a climate neutral economy by no later than 2050. The DART+ Programme will contribute to achieving this objective.

2.2.2.6. Climate Action Plan 2023

In December 2022, the Government launched the Climate Action Plan 2023 (CAP23). It follows on from Climate Action Plans 2019 and 2021, setting out the action to deliver on Ireland’s climate ambition and aligning with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022. Of relevance to the DART+ South West Project are actions relating to transport targets, decarbonisation, land use integration and citizen engagement and participation. CAP23 includes update to the 2021 targets for Transport have been revised to meet a higher level of ambition including a 20% reduction in total vehicle kilometres, a reduction in fuel usage, and significant increases to sustainable transport trips and modal share. An Avoid-Shift-Improve approach underpins transport decarbonisation which encompasses a hierarchical framework prioritising actions to achieve the broad scale behavioural change needed. Action TR/23/37 specifically references the advance of the DART programme. The proposed DART+ South West Project is supported by the Climate Action Plan and will contribute to achieving its goals and targets.

2.2.2.7. The White Paper: Ireland’s Transition to a Low Carbon Energy Future 2015-2030

This White Paper provides a framework for transforming Ireland’s fossil fuel-based energy sector into a clean, low carbon system by 2050. The actions that support the proposed Project are:

- “Support initiatives to improve the energy efficiency of the rail network” (pg. 66).
- “Support further rail electrification” (pg.67).

2.2.3. National Rail Policy

2.2.3.1. 2030 Rail Network Strategy Review

In 2011, Iarnród Éireann carried out a review of future development requirements of the Iarnród Éireann InterCity Network (ICN) and regional services. The review stated that the Dublin – Cork corridor “remains the dominant corridor on the rail network, carrying a high level of passenger demand, ...”. Further, it proposed to electrify a portion of this corridor from Dublin to Hazelhatch & Celbridge Station. The implementation of the DART+ South West Project is supported by and aligns with the 2030 Rail Network Strategy Review which promotes electrification of the core rail network.

2.2.3.2. Iarnród Éireann Strategy 2027

Iarnród Éireann prepared the 2017 Strategy for its national railway network. The Strategy will aid Iarnród Éireann to deliver high-capacity sustainable public transport solutions to cater for the increase in travel resulting from the anticipated population and employment growth, and to facilitate Ireland in improving sustainable mobility options and reduce carbon emissions from the transport sector. The Strategy identifies the DART+ Programme as a priority investment. The implementation of the DART+ South West project is supported by and aligns with the Iarnród Éireann Strategy 2027.

2.2.3.3. All-Island Strategic Rail Review Consultation Paper

In November 2021, the Department of Transport launched and published an All-Island Strategic Rail Review Consultation Paper. The review considered how the rail network could promote sustainable connectivity into, and between, the major cities, enhance regional accessibility and support balanced regional development. The review outcomes are not yet published but it is noted that the DART+ South West Project will directly promote decarbonisation through electrification of the network, enhance connectivity, foster economic activity and sustainable mobility which aligns with the strategic goals of this review.

2.2.3.4. Rail Freight 2040 Strategy

The *Rail Freight 2040 Strategy* has been prepared by Iarnród Éireann to guide the development of an expanded rail freight sector which will reduce carbon emissions from transport while enabling sustainable growth. The strategy sets out 25 strategic initiatives with an estimated investment of €500 million over the next twenty years. The four tracking of the Dart+ South West project adds additional capacity and resilience to the rail network offering the potential for increase rail freight traffic.

2.2.4. Regional Policy

2.2.4.1. Eastern and Midland Regional Spatial and Economic Strategy 2019 – 2031

The *Regional Spatial & Economic Strategy 2019 – 2031* (RSES) for the Eastern and Midland Region including the Metropolitan Area Spatial Plan for Dublin was published in June 2019. The RSES is a strategic plan and investment framework to shape the future of the region to 2031 and beyond. The RSES addresses the implementation of Project Ireland 2040 at the regional level. It considers spatial and economic factors which relate to the future of the region and ensures that employment opportunities, services, ease of travel and the overall wellbeing of citizens is being addressed.

The RSES highlights the DART expansion programme and its role in the consolidation of Dublin City Centre and surrounding areas. It notes:

“The RSES supports a feasibility study for the provision of high-speed rail links between Dublin and Limerick/ Junction Cork and enhanced rail services including the extension of the DART to Celbridge/ Hazelhatch in north Kildare.”

The RSES identifies a Strategic Development Corridor to the south west of the city and notes the role that the DART expansion project plays in this regard:

“The consolidation of the western suburbs of Clonburris, Kilcarberry and Adamstown, linked to increased capacity and electrified services on the Kildare line, to be delivered by 2027”.

Policy Objective RPO 8.8 supports the DART+ South West with the following rail projects noted in the associated Table 8.2 of the RSES:

“DART Expansion Programme - new infrastructure and electrification of existing lines, including provision of electrified services to Drogheda or further north on the Northern Line, Celbridge-Hazelhatch or further south on the Kildare, Maynooth and M3 Parkway...”

“New stations to provide interchange with bus, LUAS and Metro network including Kishoge, Heuston West, Cabra, Glasnevin, Pelletstown and Woodbrook.”

2.2.4.1.1. Metropolitan Area Spatial Plan

The requirement for the development of MASP for Dublin City as part of the RSES is outlined in Project Ireland 2040. The objectives of the MASP include the management of sustainable and compact growth of Dublin City and better use of underused lands. Strategic development areas and corridors are identified in the MASP, including the DART expansion in the south-west corridor as shown in Figure 2-3. The MASP contains several objectives for the Dublin Metropolitan Area, including Sustainable Transport Objective to include:

RPO 5.2: *“Support the delivery of key sustainable transport projects including Metrolink, DART and LUAS expansion programmes, BusConnects and the Greater Dublin Metropolitan Cycle Network and ensure that future development maximises the efficiency and protects the strategic capacity of the metropolitan area transport network, existing and planned”.*

“To focus growth along existing and proposed high quality public transport corridors and nodes on the expanding public transport network and to support the delivery and integration of ‘BusConnects’, DART expansion and LUAS extension programmes, and Metro Link, while maintaining the capacity and safety of strategic transport networks”.

The objectives of the Eastern and Midland RSES and MASP align with and support the DART+ South West Project.



Figure 2-3 Dublin Metropolitan Area Strategic Plan

Source: Eastern and Midland Regional Spatial & Economic Strategy 2019-2031

2.2.4.2. Transport Strategy for the Greater Dublin Area 2016 – 2035 and Draft Transport Strategy for the Greater Dublin Area 2022 – 2042

The Transport Strategy for the Greater Dublin Area 2016 – 2035 is a policy framework document published by the National Transport Authority which outlines the delivery and planning of transport infrastructure for the GDA, which comprises of Counties Dublin, Meath, Wicklow, and Kildare. This document integrates short, medium, and long-term plans for rail, bus, cycling, walking and roads with the aim to ‘contribute to the economic, social and cultural progress of the GDA by providing for the efficient, effective and sustainable movement of people and goods’.

The Strategy recognises the many benefits metropolitan rail services would bring to areas due to increased use of the existing asset of the Kildare Line stating it would help facilitate “the planned for population growth in the areas of Adamstown, Kishoge and Clonburris.”

Some of the heavy rail infrastructure provision identified in the Strategy 2016 – 2035 includes the following:

- “Reopen the Phoenix Park Tunnel Link for passenger services, which will link the Kildare/Cork line to the city centre;

- *Complete the City Centre Re-signalling programme, which will provide additional train paths through the city centre section of the rail network;*
- *Implement the DART Expansion Programme, which will provide DART services as far north as Drogheda; to Hazelhatch on the Kildare Line (including a tunnel connection from the Kildare Line to link with the Northern / South-Eastern Line); to Maynooth in the west and to the M3 Parkway;*
- *Develop a new train control centre to manage the operation of the rail network;*
- *Construct additional train stations in developing areas with sufficient demand;*
- *Implement a programme of station upgrades and enhancement; and*
- *Ensure an appropriate level of train fleet, of an appropriate standard, to operate on the rail network.”*

The draft Strategy 2022 – 2042 also outlines its objectives for transport services and integration, including bus and rail services. In relation to rail service, the Strategy proposes the following:

“The DART services will operate to a high frequency with adequate capacity to cater for the passenger demand. It is anticipated that DART services in the city centre section of the network will operate to a regular ten minute service frequency in the peak hours from 2016 and will transition to a five minute service frequency following the completion of the DART Expansion Programme.”

The DART+ South West project supports the delivery of the Transport Strategy for the GDA. It is noted that the NTA published its Draft Transport Strategy for the Greater Dublin Area 2022 – 2042 in November 2021. The Transport Strategy once finalised and published will replace the previous framework, the Transport Strategy for the Greater Dublin Area 2016 – 2035. The updated draft Strategy has been developed which sets out the framework for investment in transport infrastructure and services over the next two decades to 2042. The new Strategy commits fully to the existing transformative projects in development – BusConnects, DART+ and MetroLink, as well as other projects.

2.2.4.3. Greater Dublin Area Cycle Network Plan

The Greater Dublin Area Cycle Network Plan sets out a ten year strategy to expand the urban cycle network from 500 km to 2,480 km. The overarching ambition of the scheme is, by 2021, to increase the numbers who commute by bike to be the same amount as those who commute by bus.

The network will consist of a series of primary, secondary and feeder routes as well as greenways routes. These routes will comprise of a mix of cycle tracks and lanes, cycleways and infrastructure-free cycle routes in low traffic environments. To compliment the investment in the cycle network, the cycle network plans also provide for:

“Sufficient on and off-street public cycle parking at key urban destinations such as bus/rail stations, schools and large workplaces.

The expansion of the bike share scheme in Dublin City and the introduction of similar schemes across the Greater Dublin Area.

The implementation of a comprehensive cycle route signage programme in conjunction with the development of the cycle network.”

The proposed network of primary, secondary and greenway cycle routes include several crossings of the DART+ South West Project corridor.

It is noted that the NTA has updated the GDA Cycle Network Plan which accompanies the recently published Draft GDA Transport Strategy (November 2021). The 2021 draft GDA Cycle Network Plan provides a substantial update and expanse of the 2013 GDA Cycle Network Plan. The update of the plan is key in supporting NTA’s cycling progression.

2.2.4.4. Integrated Implementation Plan 2019 – 2024

The National Transport Authority’s Integrated Implementation Plan 2019 – 2024 (the Implementation Plan) supports the delivery of the Transport Strategy and is aligned with the objectives of the NDP. The Implementation Plan sets out the central infrastructure investment programme and overall funding provision over the six-year period. It identifies the key investment areas with respect to bus, light rail, heavy rail and integration and sustainable transport investment.

The Implementation Plan provides further detail on the sequencing and allocation of the €4.6b available to the NTA across Bus, Light Rail, Metro and Heavy Rail projects up to 2024. It also notes that the *“integrated rail network will provide a core, high-capacity transit system for the region and will deliver a very substantial increase in peak-hour capacity on all lines from Drogheda, Maynooth, Celbridge/Hazelhatch and Greystones.”*

The investment programme and overall funding provision of the Implementation Plan align with and support the DART+ South West Project.

2.2.5. Local Policy

2.2.5.1. Dublin City Development Plan 2022 – 2028

The Dublin City Development Plan (DCDP) is a local level policy document prepared by Dublin City Council (DCC). The DCDP provides an integrated, coherent spatial framework to ensure Dublin City is developed in an inclusive way which improves the quality of life for its citizens, while also being a more attractive place to visit and work over the 2022 – 2028 period and beyond. The DART+ South West project aligns with key policies and objectives from the CDP relating to:

- Monitoring transition to more sustainable travel modes including walking, cycling and public transport over the lifetime of the development plan, in line with the city mode share targets;
- Managing city centre road-space to address the needs of pedestrians and cyclists, public transport, shared modes and the private car;
- Promoting and seeking additional stations as part of the DART+ projects;

- Supporting the delivery of key sustainable transport projects including Metrolink, Bus Connects, DART+ and LUAS expansion programme; and
- Working with Iarnród Éireann/Irish Rail, the NTA, TII and other operators to progress a coordinated approach to improving the rail network, integrated with other public transport modes.

The policy review confirms that the DART+ South West project is consistent with the policy provisions of the Development Plan core strategy and will support existing and projected population and economic growth. It will also deliver improved sustainable mobility and support reductions in emissions from the transport sector. The project facilitates the integration and interchange with existing and planned transportation projects such as Luas, bus services and active travel modes.

The Park West - Cherry Orchard Local Area Plan 2019, the City Edge Project and the Heuston Masterplan (non-statutory) are also relevant policy documents for the DART+ South West project in Dublin City.

2.2.5.2. South Dublin County Council Development Plan 2022 – 2028

The South Dublin County Development Plan (SDCDP) is a local level policy document prepared by South Dublin County Council (SDCC). The plan sets out “*the framework to guide future development with the focus placed on the places we live, the places we work, and how we interact and move between these places while protecting our environment.*” In the context of DART+ South West, the SDCDP relates to the area from Park West/Cherry Orchard station extending west past Adamstown Station to the Kildare/Dublin border. The DART+ South West project aligns with the following policies and objectives from the County Development Plan:

SM1 Objective 3: “*To support the delivery of key sustainable transport projects including DART and Luas expansion programmes, BusConnects and the Greater Dublin Metropolitan Cycle Network in accordance with RPO 5.2 of the RSES/MASP.*”

SM3 Objective 2: “*To facilitate and secure the implementation of major public transport projects as identified within the NTA Transport Strategy for the Greater Dublin Area (2016-2035), or any superseding document, including BusConnects, the DART expansion programme along the Kildare route, the opening of the new rail station at Kishoge and the Luas to Lucan.*”

The Adamstown 2014 and Clonburris 2019 Strategic Development Zones are also relevant policy for the DART+ South West project in South Dublin.

2.2.5.3. Kildare County Development Plan 2017 – 2023

The Kildare County Development Plan (KCDP) is a local level policy document prepared by Kildare County Council (KCC). The plan sets out an overall strategy for the proper planning and sustainable development of the functional area of County Kildare, over the 2017-2023 period and beyond. In the context of DART+ South West, the western portion of the route runs through the administrative area of Kildare County Council (KCC) and terminates at

Hazelhatch. The DART+ South West project aligns with the following policies and objectives from the County Development Plan:

MT 1: *“Promote the sustainable development of the county through the creation of an appropriately phased integrated transport network that services the needs of communities and businesses.”*

MT 2: *“Support sustainable modes of transport by spatially arranging activities around existing and planned high quality public transport systems.”*

MT 3: *“Influence people’s travel behaviour and choices towards more sustainable options by working closely with relevant organisations in improving and accessing public transport facilities.”*

MT 8: *“Seek to address urban congestion with particular emphasis on facilitating improved bus transport movement and reliability and improved links to bus and railway stations.”*

PT 1: *“Promote the sustainable development of the county by supporting and guiding national agencies including the National Transport Authority in delivering major improvements to the public transport network and to encourage public transport providers to provide an attractive and convenient alternative to the car”.*

PT 2: *“Generate additional demand for public transport services by strengthening development around existing and planned high capacity transport routes and interchanges throughout the county”.*

PT 3: *“Support the delivery of the NTA’s Greater Dublin Area Transport Strategy (2016-2035) in Kildare”.*

PT 5: *“Investigate, in co-operation with Iarnród Éireann and the National Transport Authority, the provision of new railway stations in the county and the upgrading/relocation of existing stations, to rectify existing constraints in the network”.*

PT 7: *“Promote and support the upgrading of the Maynooth rail line and the Kildare rail line, in accordance with the Transport Strategy for the Greater Dublin Area 2016-2035 and in co-operation with the NTA”.*

The Celbridge Local Area Plan 2017-2023 is also relevant policy for the DART+ South West project in Kildare.

3. Alternatives

This section presents an overview of the reasonable alternatives studied during the development of the proposed Project which have been informed by relevant policy/ plans, previous studies and developed and refined as part of the ongoing design development and EIA process.

3.1. Option Selection Process

The Multi-Criteria Analysis (MCA) technique has been applied to inform the option selection process to determine the end to end preferred option for the proposed Project. The MCA was informed by the Common Appraisal Framework (CAF) for Transport Projects and Programmes (Department of Transport Tourism and Sport, March 2016 and updated October 2020). The CAF Guidelines require projects to undergo a MCA under a common set of six CAF criteria referred to as parameters. These include:

- **Economy** relates to impacts of a transport investment on economic growth and competitiveness which are assessed under the economic impact and economic efficiency criteria;
- **Integration** considers the extent to which the project being evaluated promotes integration of transport networks and is compatible with Government policies, including national spatial and planning policy;
- **Environment** embraces a range of impacts, such as emissions to air, noise, and ecological and architectural impacts;
- **Accessibility and Social Inclusion** embraces the notion that some priority should be given to benefits that accrue to those suffering from social deprivation, geographic isolation and mobility and sensory deprivation;
- **Safety** is concerned with the impact of the investment on the number of transport related accidents; and
- **Physical Activity** relates to the health benefits derived from using different transport modes.

3.1.1. Criteria

The criteria and sub-criteria are the measures of performance by which the options were assessed. It is appropriate that the approach should reflect the project objectives and the infrastructural element under consideration. The CAF was used as a basis to inform the development of the respective sub-criteria which were adapted based on the individual infrastructural components under examination. For example, construction compound sub-criteria may be different to the substations sub-criteria etc. and were amended in the respective MCA methodology as appropriate.

This approach allows for consistency but also appropriate flexibility in the approach to the options assessment process. In some cases, some criteria were scoped out – if they were not deemed relevant to the option assessment under examination.

3.1.2. Comparative Assessment

The assessment undertaken is of a comparative nature (options compared against each other). This is based on the CAF criteria and based on professional judgement in respect of the items to be qualitatively evaluated, and comprehensively assessed against the key relevant criteria in accordance with CAF Guidelines and good industry practice.

The assessment compared the relevant options, identifying and summarising the comparative merits and disadvantages of each alternative under all the applicable criteria and sub-criteria leading to a Preferred Option.

A comparative assessment was undertaken for each option developed, where in general, for each positively scored option there must be an opposing negatively scored option. Table 3-1 provides an overview of the comparative colour coded scale for assessing the criteria and sub-criterion. For illustrative purposes, this scale is colour coded with advantageous options graded to ‘dark green’ and disadvantaged options graded to ‘orange’.

Table 3.1 Comparative Colour Coded Scale for Assessing the CAF Criteria and Sub-criteria.

Colour Coding and Description
Significant comparative advantage over all other options
Some comparative advantage over all other options
Comparable to all other options
Some comparative disadvantage over all other options
Significant comparative disadvantage over all other options

Stage 1

Stage 1 was a Preliminary Appraisal (Sifting) carried out by the Project Design Team. It involved identifying a long list of high-level options for the key elements of the scheme including Do-Nothing, Do Minimum Option and Do Something Option(s).

The options were assessed against Engineering, Environment and Economy criteria. The Engineering criterion was judged as a ‘pass’ or ‘fail’ criterion in terms of whether an option was considered feasible and met the Project objectives and requirements or not. A pass/fail approach was not applied for Environment or Economy at the sifting stage.

For some design elements of the proposed project a Stage 1 assessment was sufficient and resulted in arriving at a preferred option.

Stage 2

In some cases, a more detailed multi-criteria analysis (MCA) was required. This is called a Stage 2 MCA. The Stage 2 MCA examined the shortlisted options from Stage 1 sifting in greater detail to determine a preferred option. The same general selection process was followed for both Stage 1 and Stage 2 MCAs. However, in the Stage 2 MCA additional design development / further studies and subsequently more detailed analysis / assessment was undertaken.

3.2. Overview of Alternatives Considered

The reasonable alternatives considered at option selection stage were framed within the following scenarios for each significant intervention required.

3.2.1. Do-Nothing

The Do Nothing scenario wherein the proposed interventions do not go ahead and therefore the capacity and potential of the public transport system remain restricted and the project objectives are not met.

3.2.2. Do-Minimum

The Do Minimum scenario wherein the proposed interventions go ahead but only those which can generally be met within the existing rail corridor. The Do Minimum scenario in this context is not passive, as some level of works and intervention is necessary to meet the Project objectives and requirements, albeit the least burdensome in terms of lands outside the rail corridor.

3.2.3. Do-Something

The Do Something scenario(s) wherein the proposed interventions go ahead but interventions are required beyond the existing railway corridor impacting on 3rd party / private lands at some locations

3.2.4. Preferred Option

The Preferred Option is that option which best provides for the proposed development to go ahead and for the project objectives to be met while also minimising the impacts outside the rail corridor. The passenger capacity and frequency of trains is increased. The frequency and quality of service that will be provided will provide a viable transport alternative to communities along the route and help encourage people from private car use. Sustainable economic development and population growth is supported through the delivery of an efficient, sustainable, low carbon and climate resilient heavy rail network. Ireland's advancement towards a low emissions transport system and emission reduction targets are achieved.

3.2.5. Scope of Options Selection

Multiple options were considered and assessed using the methodology outlined above under each of the following key infrastructural elements of the proposed Project:



- Track-widening including bridge modifications;
- Electrification;
- Sub-Stations;
- Track drainage;
- Stations; and
- Construction compounds.

Detailed assessment of alternatives led to the identification of the “Preferred Option” which was brought forward and developed and has been the subject of Environmental Impact Assessment.

4. Project Description

4.1. Description of Proposed DART+ South West Project

4.1.1. Overview

The proposed DART+ South West Project will consist of electrification of the existing Great Southern and Western Railway (GSWR) from Hazelhatch & Celbridge Station to Heuston Station (approximately 16 km) on the Cork Mainline, and from Heuston Station to Glasnevin Junction via the Phoenix Park Tunnel Branch Line (approximately 4 km). The works extend across the three administrative areas/local authority areas of Kildare, South Dublin and Dublin City. The total length of the proposed Project is approximately 20 km.

The DART+ South West Project will complete four tracking between Park West & Cherry Orchard Station and Heuston Station and will also re-signal and electrify the route from Hazelhatch & Celbridge Station to Heuston Station and on to Glasnevin Junction. The completion of the four tracking will remove a significant existing constraint on the line (i.e., where four tracks reduce to two), which is currently limiting the number of train services that can operate on this route. DART+ South West will also deliver track improvements along the Phoenix Park Tunnel Branch Line, which will allow a greater number of trains to access the city centre. Upon completion of DART+ South West electrification, new electric DART trains will be used on this.

The proposed Project is described from west to east along the railway corridor. For the purposes of this description, the project description has been divided into four zones as follows and as shown on Figure 4-1:

- **Zone A:** Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station;
- **Zone B:** Park West & Cherry Orchard Station to Heuston Station incorporating Inchicore Works);
- **Zone C:** Heuston Yard & Station (incorporating New Heuston West Station); and
- **Zone D:** Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line).

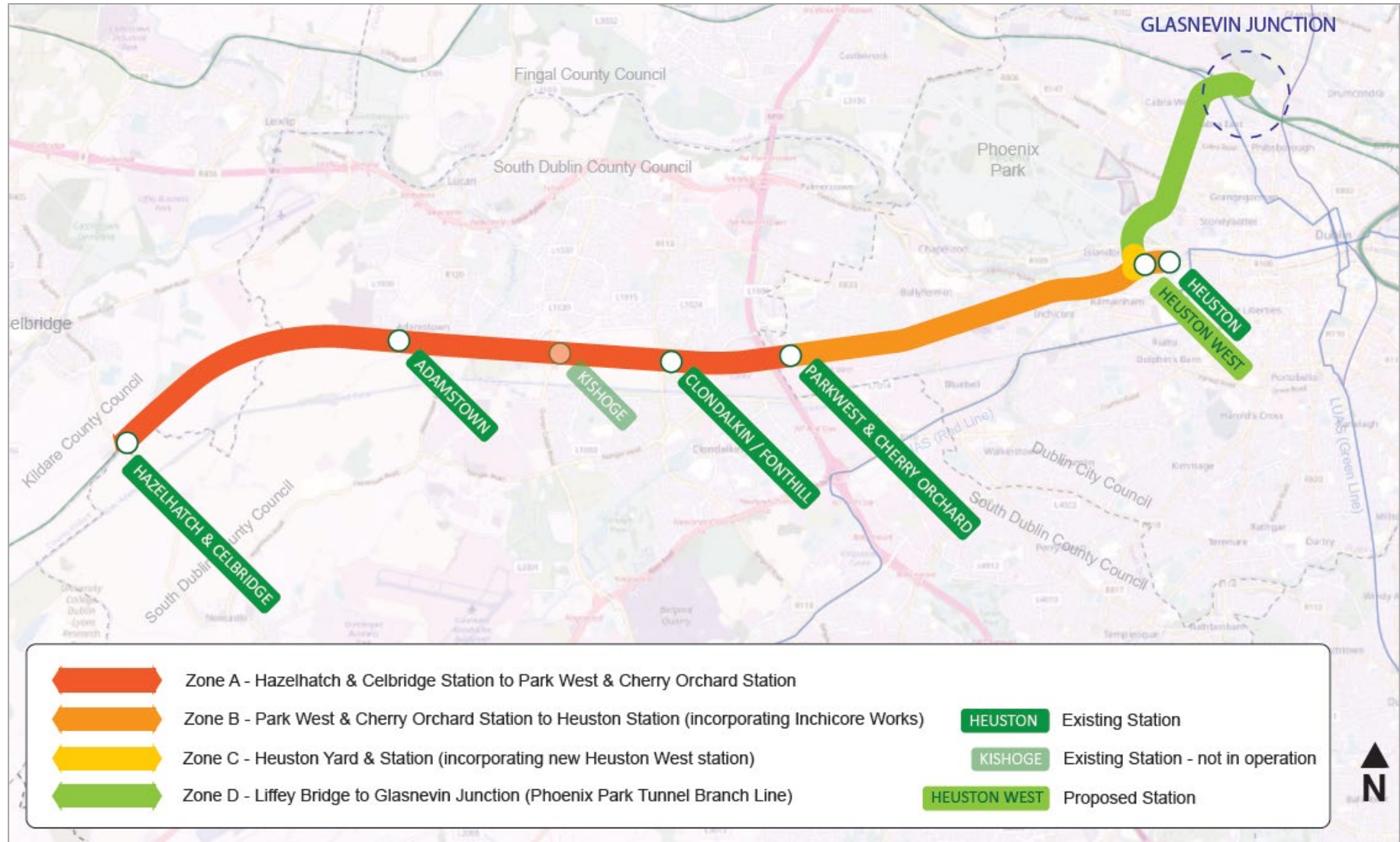


Figure 4-1 DART+ South West Zones

4.2. DART+ South West Design Elements

The Project will require modernisation and modifications to the existing railway line. A range of design elements, general linear works and ancillary works (drainage and utility diversions for example) are required along the entire length of the railway corridor to facilitate the electrification of the line and the upgrade of the existing network. Additionally, specific elements are required at specific locations along the route such as electrical substations to provide power to the network.

4.2.1. Track (Permanent Way)

The Permanent Way (PW) is a term used to describe the track or railway corridor and includes all ancillary installations such as rails, sleepers, ballast as well as lineside retaining walls, fencing and signage.

The DART+ South West Project requires alterations to the track as follows:

- Widening of the railway corridor and completion of four-tracking between Park West & Cherry Orchard Station and Heuston Station. This will provide a continuous four track layout along the Cork Mainline from Hazelhatch to Heuston, comprising two Slow electrified lines (northern tracks) and two Fast non-electrified lines (southern tracks). There are currently no electrified lines in the area;
- Track lowering to achieve the required vertical clearance under bridges to accommodate the Overhead Line Equipment (OHLE);
- New / additional crossovers (when a train switches from one track to another across points) to accommodate the new operational model;
- Sidings modifications at Inchicore Works, to allow continuity of the operations;
- Track geometry improvements (within the current corridor's limits) to remove existing speed restrictions; and
- Suitable and safe access for the rail maintenance teams is required to be provided.

4.2.2. Bridges

There are a total of 38 existing bridges which cross the existing railway line along the project route. These comprise a mix of overbridges and underbridges. Where any bridge crosses over the railway, it is necessary to ensure that the proposed OHLE will pass safely below the bridge. Where existing bridges do not provide the necessary clearance for overhead electrification of the lines or horizontal clearance for four tracking, a range of options have been considered on a case-by-case basis in the design development. The options considered in design development included the following (either standalone or in combination):

- Provision of specialist electrical solutions for the OHLE with reduced clearance;
- Lowering the rail track under the bridge;
- Modification of the existing bridge structure; and

- Removal of the existing structure and provision of a replacement structure.

In most cases, the existing bridges have the necessary vertical and horizontal clearance, but some will require modifications. Six bridges will be replaced / upgraded along the length of the proposed Project. Four overbridges will be fully replaced to meet the vertical and horizontal clearance requirements. These bridges are Le Fanu Road Bridge, Kylemore Road Bridge, Khyber Pass Footbridge and Memorial Road Bridge. Additionally, the Sarsfield Road Under-Bridge and Glasnevin Cemetery Road Bridge will require a replacement deck. In addition to the bridges, a new cut and cover buried portal structure will also be constructed under the South Circular Road Bridge. Further details on modifications to bridges is provided within the relevant zone descriptions.

The electrification of line requires special interventions to maintain the safe operation of the railway. The existing bridges along the route were originally designed as structures over non-electrified lines. The existing bridges along the route must comply with necessary safety requirements by providing suitable protection for the general public to prevent accidental contact with the OHLE. To achieve the necessary level of safety protection, works are required to some bridge parapets to increase their height to minimum 1.8 m in height and include measures to prevent climbing or walking across the top of them as shown in the figures below. A number of existing bridges require changes to parapets to ensure that there is an adequate protection provided. These changes are described in further detail in each of the relevant zones.



Figure 4-2 Typical Parapet Extension

4.2.3. Retaining Walls

A variety of retaining wall types are required along the length of the rail corridor to accommodate track widening. The retaining wall types vary in accordance with soil conditions, proximity to buildings and height of required retention. These include bored secant pile wall,

gabion basket wall and king post retaining wall solutions. In some instances, ground anchors or soil nails will be required to provide additional stability.

4.2.4. Stations

The project includes for a new station, located within CIÉ lands at Heuston (at the location of the existing Platform 10 of Heston Station). The design of the DART+ South West Project makes passive provision for potential future stations at Kylemore and Cabra including track alignments and other infrastructure which would provide for the delivery of these stations in the future. Iarnród Éireann has committed to developing these stations in the future to provide improved public transport.

Current capacity review studies have concluded that the sizing of the existing stations along the project route will be adequate to accommodate forecasted future passenger demand. As such no works are proposed to the existing stations apart from modifications to parapets on structures above tracks (e.g. public footbridges, pedestrian decks and maintenance platforms). These will be upgraded to meet the safety requirements of electrified tracks as part of this project.

4.2.5. Roads

The urban nature of the existing road networks poses significant constraints in terms of achieving completion of four-tracking between Park West & Cherry Orchard Station and Heuston Station. Where bridge reconstructions are necessary as part of the Project, associated roadworks will be also be required (including footpaths or cycle track reinstatement or enhancements).

The DART+ South West Project will replace or enhance (where practicable) pedestrian and cycle facilities in the immediate vicinity of bridge reconstruction works.

The proposed road works are typically confined to the new bridge crossings, approaches to these crossings and localised works to the adjacent road network. Road reinstatement works are also required to facilitate the diversion of existing utilities and also the installation of new utility connections, including the installation of the new electricity supplies to the traction power substations along the route (6 no. substations).

4.2.6. Boundary Treatments

Security of the electrified railway from both a health and safety perspective and against trespassing is a design requirement of the project, upgrading of existing fencing is required in areas where existing fences does not fulfil the necessary security requirements against electrocution and possible trespassing.

There are a number of locations, particularly within Zone B (the four-tracking section) where reconstruction of existing boundary walls is required. The majority of the reconstruction is as a consequence of the railway widening works requiring demolition of the existing walls and in some cases adjoining structures.

4.2.7. OHLE System

Overhead Line Equipment (OHLE) generally refers to the mechanical and electrical equipment items used to carry and deliver electrical power to the trains. The DART+ wide programme will adopt a 1,500V Direct Current (DC) OHLE system to provide electrical power to the network’s new electric train fleet. While functionally similar to the OHLE on the existing DART network, modern design is being considered to maximise reliability and safety on the route.

Electrical energy is supplied to the train through contact between the equipment mounted on the top of the train (called a pantograph) and an electrically live overhead cable. This cable is supported by a series of support structures and steel masts measuring 6m – 8.5m in height which will be installed at intervals along the line. The OHLE masts will carry support frameworks for the OHLE system over each of the electrified tracks. Vertical hangers will support and separate the upper and lower wires; additional feeder cables, insulators and earth wire. The live overhead cable is fed electrically from individual substations which are located along the route.

The support structures are generally supported from one side of the track (known as cantilever) or from both sides (known as portal) depending on the permanent way layout. Where there are adjacent walls, the support structure can be fixed to the walls removing the need for vertical supports. The vegetation clearance and management for the safe operation of the OHLE shall be greater than 1.5 m from the rear of the OHLE mast or 1.5 m from any wire running between masts.

4.2.7.1. OHLE Arrangement

The OHLE arrangement will vary at different sections along the route depending on the track configuration, clearance to structures and local site conditions.

Single Track Cantilevers (STC) are placed on either side of the line and are used to support the OHLE over one track. Twin Track Cantilevers (TTC) are generally placed on one side of the line, to support the OHLE on the two tracks. TTC will be the predominant OHLE arrangement from Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station. The figures below shows typical arrangements.

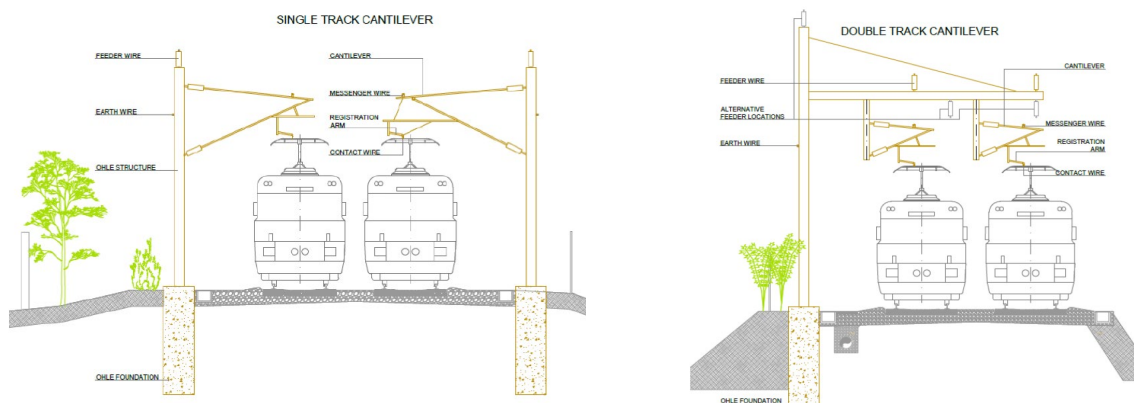


Figure 4-3 Single Track Cantilevers and Twin Track Cantilevers in 2-Track Section

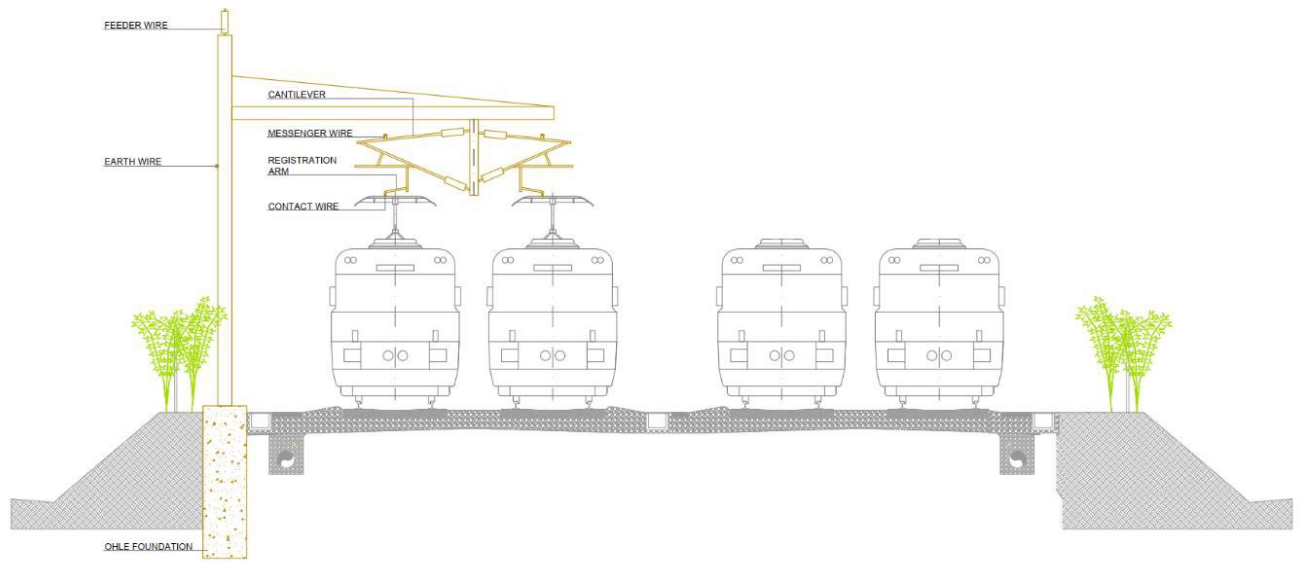


Figure 4-4 Typical OHLE TTC Arrangement in 2-Track Section

Depending on the site constraints, the OHLE system through the stations will be supported with TTC or Portals on the platform as shown on the figure below. OHLE foundations are required to support the OHLE system and the foundation options include steel pile driven, concrete bored pile and concrete pad foundations.

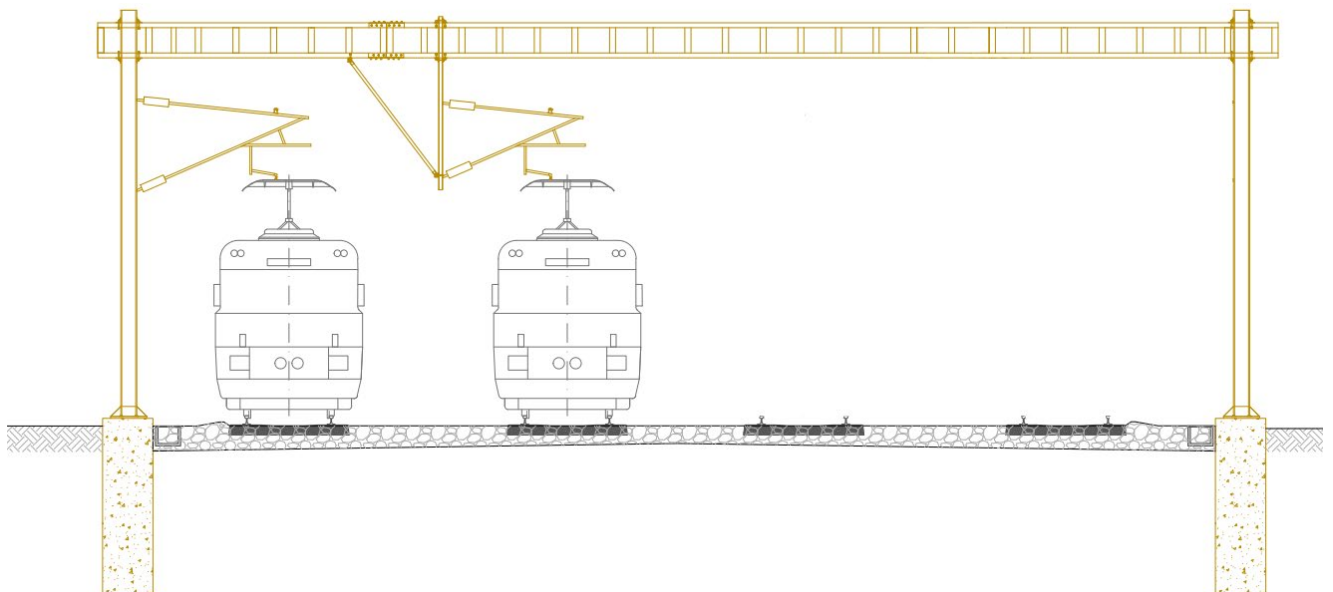


Figure 4-5 Typical OHLE Portal Arrangement

4.2.8. HV Power and Substations

The OHLE system will be supplied with electrical power from the ESB distribution network at regular intervals, at locations known as substations. These substations will be supplied with power from the local power distribution network and transform this into the required 1,500V DC for operation of the OHLE system.

A total of 6 no. substations are necessary along the project extents. The substations will be located in the following locations:

- Hazelhatch;
- Adamstown;
- Kishoge;
- Park West;
- Kylemore (Inchicore Depot); and
- Islandbridge/Heuston.

The substations will comprise a secured, fenced compound surrounding a building which will house all the necessary electrical equipment. Electrical substation buildings are approximately 45m (length) x 10m (width) and 6m (height). The substations will be located within a secure compound measuring approximately 60m x 20m, secured by a 3.6 m high palisade / security fence, or similar fencing for security purposes as shown in the figure below. Where practicable, the project has sought to locate the substations within CIÉ owned lands. To ensure reliability of supply to the OHLE, each substation will be supplied from two independent 38kV circuits.



Figure 4-6 Sample Traction Power Substation

4.2.9. Signalling System

The signalling system is used to safely control and monitor train movement on the Iarnród Éireann network. The existing railway incorporates signalling infrastructure along its length in the form of underground cables, track level sensors and switches, and visible signals on posts or gantries that communicate instructions to the train drivers along the route.

In order to achieve the necessary capacity enhancements and performance required for the DART+ Programme, it will be necessary to upgrade the existing signalling system as well as replacing some of the legacy signalling system. This will include the provision of Signalling Equipment Buildings/Rooms (SEB/SER) and Location Cases (LOC) where required along the route in order to accommodate signalling equipment and associated power supplies and backup. Examples of signalling infrastructure are shown in the figure below.



Figure 4-7 Typical Existing Signalling Infrastructure

4.2.10. Telecommunications System

One of the key elements of DART+ South West Project is to modernise lineside telecommunications based on DART+ Programme-wide specifications. Telecom Equipment Rooms (TER) are used to house the necessary telecommunications equipment, TER will typically be located within or adjacent to stations on CIÉ owned land. A typical building is shown in the figure below.



Figure 4-8 Typical Telecom Equipment Building

4.3. Zone A: Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station

4.3.1. Overview of Zone A

Hazelhatch, on the border between County Kildare and South Dublin, marks the western extent of the DART+ South West Project. Zone A commences approx. 750m to the west of Hazelhatch & Celbridge Station and extends eastwards under a series of existing road bridges, foot bridges and station structures to Park West & Cherry Orchard Station. The rail corridor is predominantly at grade (i.e., the rail level is at the surrounding ground level). The rail corridor comprises four existing tracks.

The existing railway line extends east through a farmed landscape from Hazelhatch & Celbridge Station and passes through the townland of Stacumny and onwards towards Adamstown Station. North of the railway has witnessed significant residential development at Adamstown and west of the R120 (Newcastle Road, also known as Twelfth Lock Road and Adamstown Road). The area south of the railway at Adamstown features a rural farmed landscape. Continuing east, the line heads towards Kishoge Station (currently not in operation) and onwards to Clondalkin / Fonthill Station with residential areas located further to the north and south of the railway however straddling the railway are the lands associated with Clonburris Strategic Development Zone (SDZ), where significant future development is envisaged, focused on the two railway stations. As the line continues east, the landscape changes from a more open farmland and transitional farmland to built-up industrial areas east of Clondalkin. The line then passes under the M50 and heads into Park West & Cherry Orchard Station.

4.3.2. Permanent Way

The proposed track work in this area involves the reconfiguration of the existing four running lines to convert them to Up Slow, Down Slow, Up Fast, Down Fast with provision for the electrification of the two tracks on the north side (Slow tracks) for the DART services. All of these works will fit within the existing CIÉ property boundary.

At Hazelhatch & Celbridge Station there will be significant modifications to the track layout commencing approximately 750 m to the west of the station, the works include track realignment and the provision of a new siding to facilitate the DART services on the electrified Slow lines to the north side of the corridor. Localised track lowering will be required at Stacumny Bridge and at Finnstown R120 Road Bridge. At Adamstown Station, the proposed track works include minor modifications to the existing track layout.

4.3.3. Bridge Modifications

There are no bridge replacements proposed in this zone. The bridges in this section have sufficient vertical clearance with the exception of Stacumny Bridge and Finnstown Road Bridge where localised track lowering is required to ensure the necessary bridge clearances are achieved.

Minor modifications to the parapets of existing bridges will be required where they fall short of the required design standards set out by Iarnród Éireann. The parapets at the Finnstown Road Bridge and M50 Motorway Bridge do not meet the required design standards in terms of protection for electrification. Modifications to the height of the parapets are also required to the New Hazelhatch Footbridge.

The existing stations between Hazelhatch & Celbridge and Park West & Cherry Orchard have a number of structures with parapets above tracks for different purposes: public footbridges; other pedestrian decks; stair cases; and maintenance platforms. These parapets will be upgraded to meet the safety requirements associated with electrified tracks.

4.3.4. OHLE Arrangement

In Zone A the electrification equipment will be predominantly supported by Twin Track Cantilever (TTC) structures. Twin Track Cantilevers will generally be placed on the north side of the line to support the OHLE. The proposed OHLE arrangement at the stations at Hazelhatch & Celbridge, Adamstown, Kishoge, Clondalkin/Fonthill and Park West & Cherry Orchard Stations will be Two Track Cantilevers, Portals or Single Track Cantilevers on the platforms.

4.3.5. Substations

A total of four substations are proposed to be located in Zone A. These will be located at:

- Hazelhatch;
- Adamstown;
- Kishoge; and
- Park West.

4.3.5.1. Hazelhatch Substation

The proposed location of the substation at Hazelhatch is within a brownfield site located to the north of the railway, adjacent to the Hazelhatch & Celbridge station car park. The site is predominantly surrounded by agricultural land with the exception of Hazelhatch & Celbridge train station and a number of adjacent private dwellings located on Loughlinstown Road and Railway Cottages to the southeast of the station on the opposite side of the railway.

The site is in the ownership of CIÉ. There are currently three disused residential dwellings on the site and following examination of options for substation design, it was found that all three of these buildings will need to be demolished to facilitate the construction of the new substation. To facilitate vehicle access to the substation site, the existing vehicle access track will be utilised, the existing track enters the site from Loughlinstown Road.

Each substation will be supplied from two independent 38kV circuits, the Hazelhatch substation will be connected to the ESB supply grid via two circuits. It is expected these connections will be made at the existing ESB Celbridge substation, located approximately 2km to the northwest.

4.3.5.2. Adamstown

The location of the proposed Adamstown Substation is south of the railway on a greenfield site and adjacent to an existing access road which joins the public road network at Stacumny Bridge. Currently this track does not have any physical separation (i.e. a fence) from the live railway.

This track will require the installation of fencing along the access track to effectively separate it from the permanent way and thus permit access by ESB Networks personnel.

The proposed 38 kV supply connections will be made in the vicinity of the existing Balgaddy Substation, located approximately 3.2 km to the northeast, connecting into the 38 kV Balgaddy

– Grange Castle Circuit. A horizontal direction drill to cross below the railway would be required to complete the route into the substation.

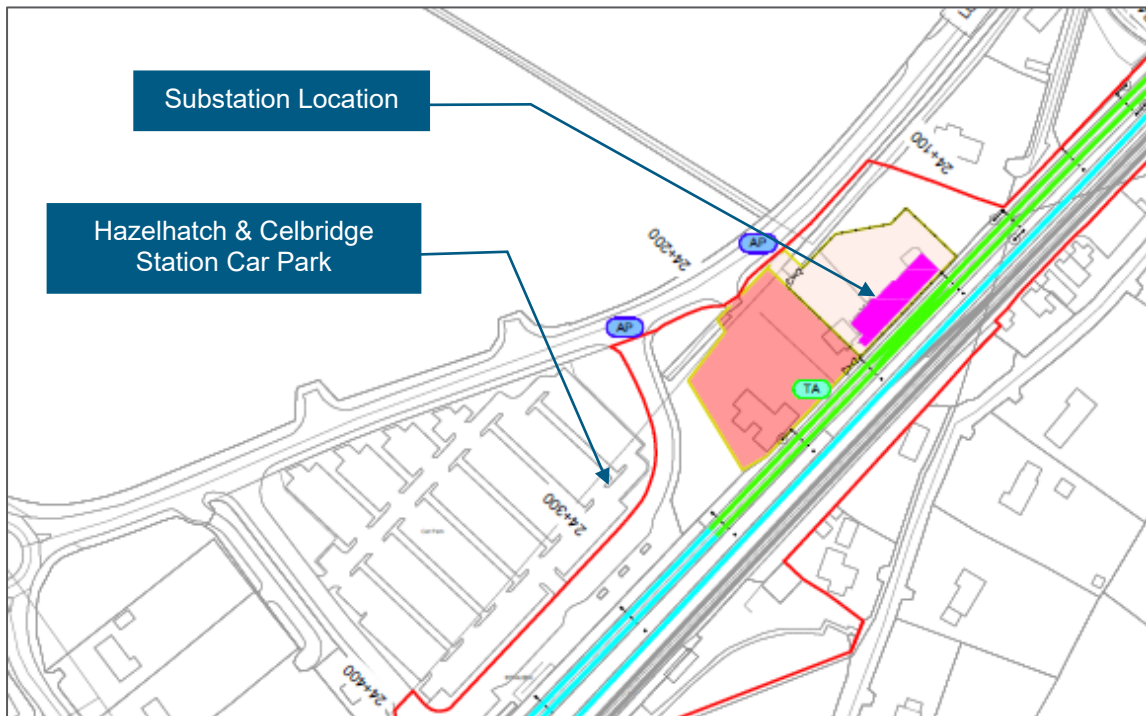


Figure 4-9 Hazelhatch Substation Layout - Indicative

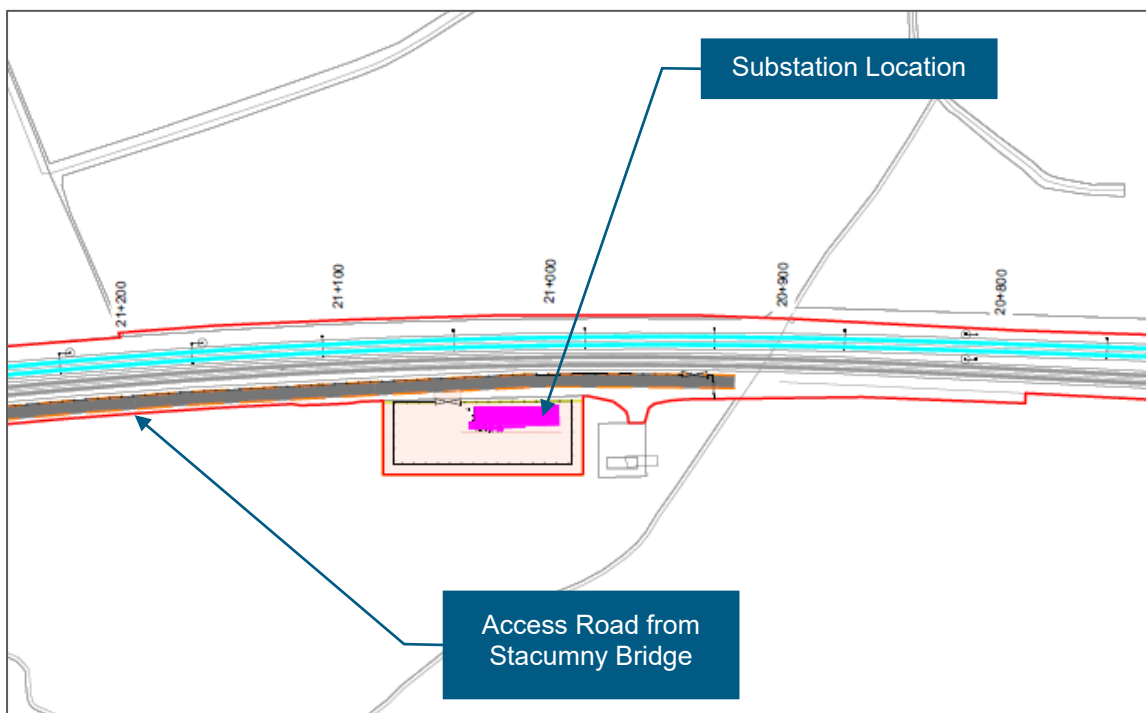


Figure 4-10 Adamstown Substation Location- Indicative

4.3.5.3. Kishoge

Kishoge is located in west Co Dublin. There is an existing station at this location which is currently not in use but expected to be opened in the near future. The location for the

substation is on the northern boundary of the railway corridor approximately 350 m west of the R138 road bridge, between the existing road (Adamstown Avenue) and the railway, on a brown field site. The substation site is located within the proposed 280 hectares Clonburris Strategic Development Zone in an area west of the proposed Kishoge Urban Centre.

It is proposed that connections will be made by intercepting existing 38 kV circuits at the road entrance to the Grange Castle Business Park development, i.e. at the roundabout junction on the R136, located approximately 800 m to the southeast.

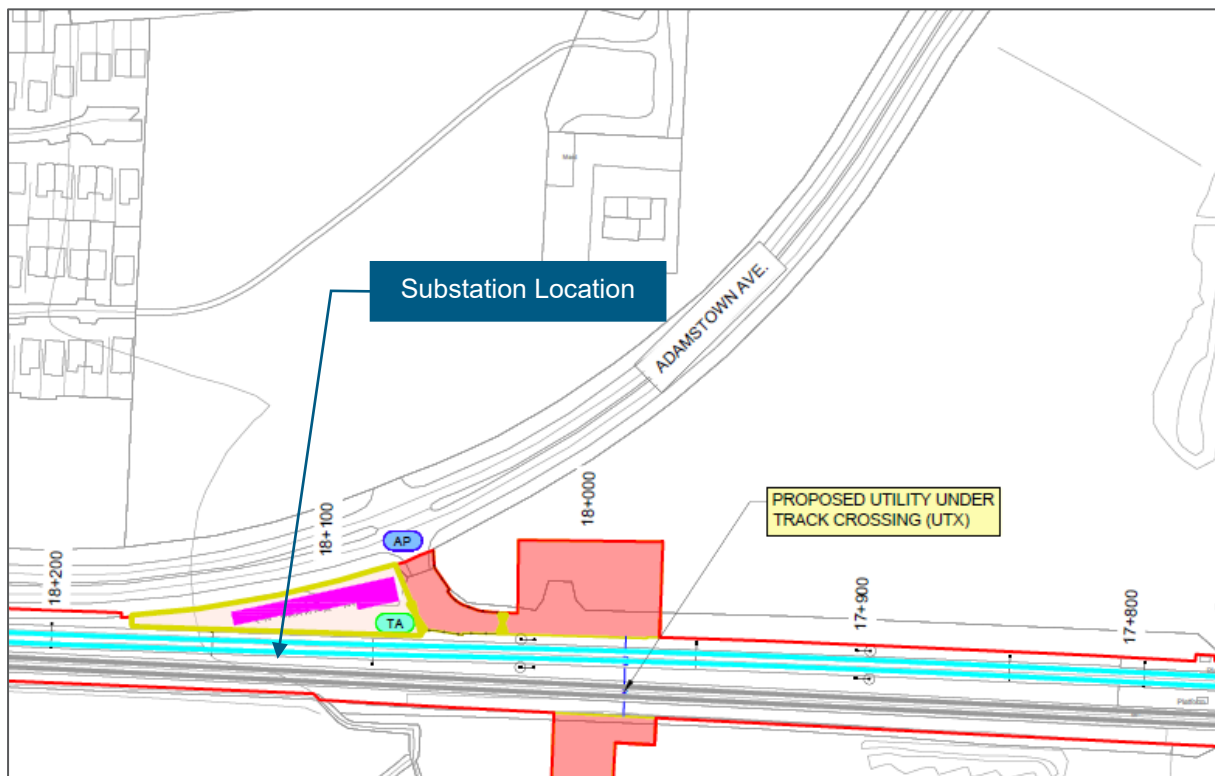


Figure 4-11 Kishoge Substation Location - Indicative

4.3.5.4. Park West

The location for the proposed substation at Park West is to the north of the railway and immediately east of the M50 motorway. This is a brownfield site in the ownership of Dublin City Council. Direct road access is via Park West Avenue to the east. The existing Park West Station is located to the east, existing housing developments in the Cherry Orchard area are located further east of Park West Avenue.

The area around the proposed location is identified within the Dublin City Development Plan as a Strategic Development Regeneration Area (SDRA 4) and is zoned Z14: “to seek the social, economic and physical development and/or rejuvenation of an area with mixed use, of which residential and Z6 (employment/enterprise uses) would be the prominent uses”.

It is proposed that the required 38kV connections will be made by connecting to the Inchicore North – Clondalkin circuits within the Park West development, located approximately 500m to the south.

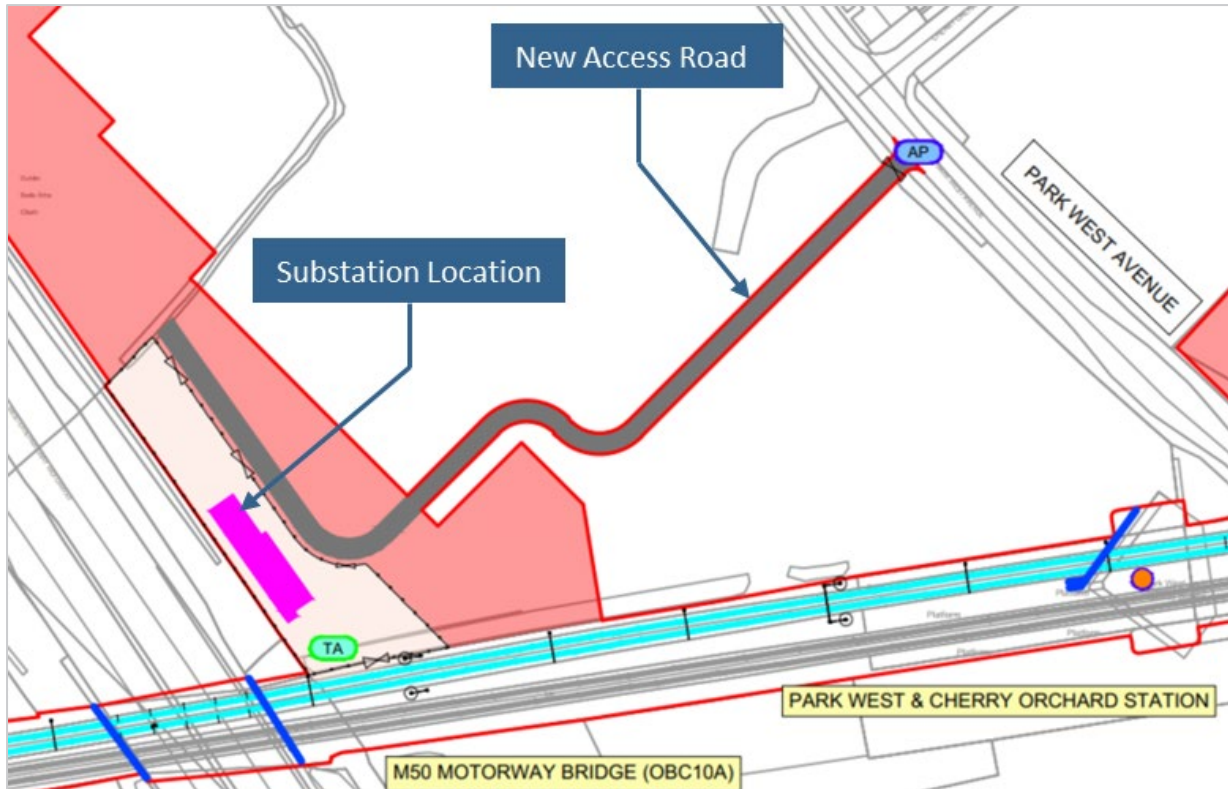


Figure 4-12 Park West Substation Location - Indicative

4.3.6. Signalling and Telecommunications

New physical signalling and low voltage infrastructure comprising of a network of signalling and LV elements including localised control cabinets and cabins will be installed along this section of the route, all within CIÉ owned property. No new signalling cantilevers or gantries are proposed in this section. New telecom equipment rooms are proposed at Adamstown and Park West & Cherry Orchard Stations.

4.4. Zone B: Park West & Cherry Orchard Station to Heuston Station

4.4.1. Overview of Zone B

The western end of this section begins at Park West & Cherry Orchard Station and runs east, under Cherry Orchard Footbridge and continues to Le Fanu Road Bridge and Kylemore Road Bridge. The rail corridor is primarily in a cutting (i.e., the rail level is below the surrounding ground level). The rail corridor initially comprises four existing rail tracks, which narrow to two tracks at Le Fanu Road Bridge.

To the east of Kylemore Road Bridge, south of the rail line, is the Inchicore Depot complex. The Inchicore Depot fronts onto the railway line for approximately 1km. The area to the north of the railway corridor is broadly residential in nature (e.g. the properties along Landen Road). Currently the rear gardens of these properties back onto the rail corridor with a retaining wall providing separation. A retaining wall also sits behind the cutting slope on the southern boundary between Kylemore and Inchicore Depot and terminates at the sidings where the

railway reaches ground level. The railway along this section comprises two main line tracks which are joined by two sidings (used to access the depot and for train storage).

From here, the rail line continues east and passes under Khyber Pass Footbridge. This is a private footbridge for Iarnród Éireann employees to access the Inchicore Depot from the north of the railway. The railway in this area currently consists of three tracks. The rail is at grade and approximately the same level as the surrounding ground. There is a masonry boundary wall along the north side of the rail corridor at this location. There is also a masonry wall on the south side of the track between Inchicore and Sarsfield.

The rail line continues over Sarsfield Road Under-Bridge and under Memorial Road Bridge where the line runs parallel to Con Colbert Road and Chapelizod Bypass. The railway along this section comprises three tracks in a cutting below ground level. The line then approaches the South Circular Road junction with two bridges carrying traffic over the railway – South Circular Road Bridge and St John’s Road Bridge. The line then takes a more northerly direction as it approaches the area where the Phoenix Park Tunnel Branch Line merges with lines into/out of the existing Heuston Station i.e. Zone C.

4.4.2. Permanent Way

At the beginning of the zone, the Slow (northern) tracks are subject to minor realignment where the new tracks tie-in to the existing tracks. Heading east, the track will be lowered at Le Fanu Road Bridge in order to achieve the required clearance under the bridge.

The proposed four-track layout comprises the realignment of the two existing tracks on the south side of the rail corridor to become the Fast lines. Two new Slow tracks– will be situated on the north side of the corridor.

The track alignment on the approach to Kylemore Road Bridge will accommodate the bridge abutments of the proposed new two-span structure, which also has been designed to provide adequate room for a future Kylemore Station.

At Inchicore Depot, two new tracks (the Slow lines) will be situated on the north side of the corridor and multiple crossovers provide the necessary train pathways to access Inchicore Depot. The rail corridor in this section will be widened to accommodate the additional tracks, in some instances this will impact on third party properties.

Continuing east over Sarsfield Road Under-Bridge (UBC4) and on the approach to Memorial Road Bridge and onwards to the South Circular Road Bridge, the rail corridor runs in a cutting and will be widened to the north of the corridor to accommodate the additional tracks.

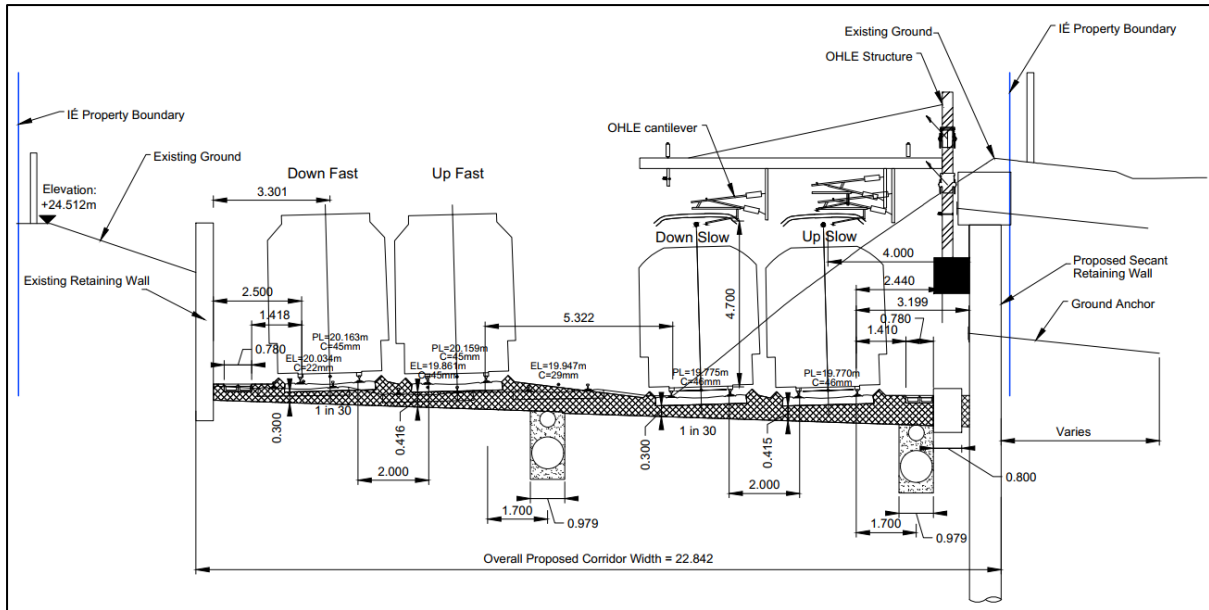


Figure 4-13 Cross Section West of Memorial Road Bridge - Facing West

On the approach from Memorial Road Bridge to the South Circular Road, the respective pairs of Slow and Fast tracks diverge, the new Slow tracks pass through the new cut and cover structure at South Circular Road Bridge, whilst the Fast tracks pass under the existing South Circular Road Bridge before entering the Heuston Station environ.

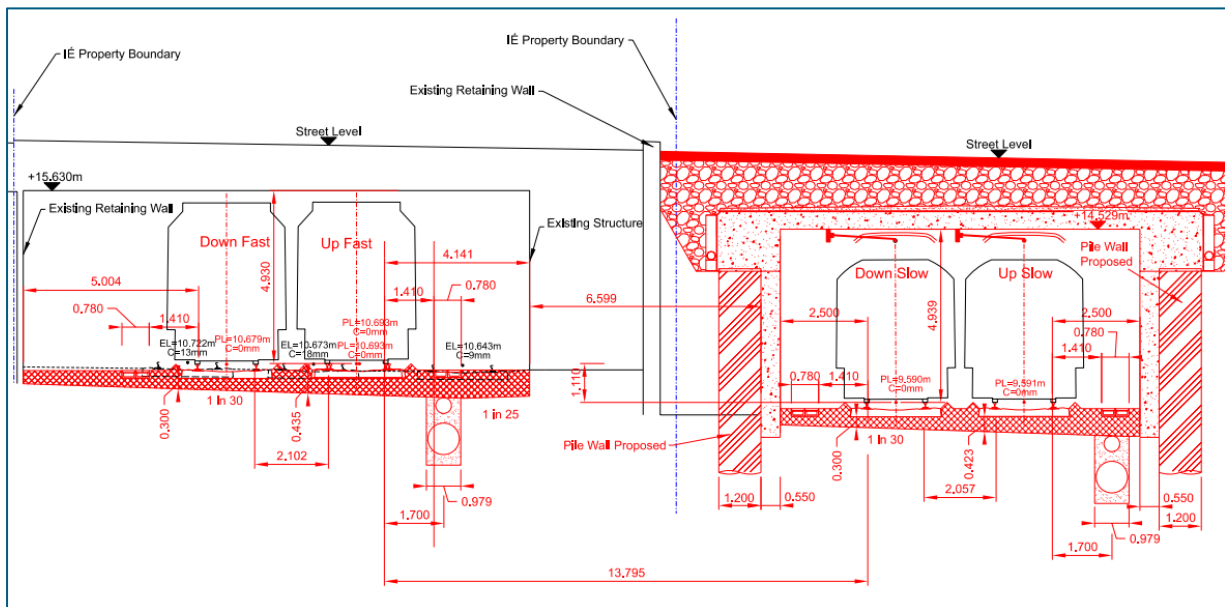


Figure 4-14 South Circular Road Bridge and New Cut and Cover Structure – Cross Section, View Facing West

4.4.3. Bridge Modifications

Zone B requires works at different bridges in order to achieve the necessary vertical clearance for OHLE, provide protection against electrocution and enough railway corridor width to accommodate four tracks. The modifications to bridges comprise bridge replacement, structural interventions, track realignment and track lowering. A summary of the bridge modifications is outlined below:

- Le Fanu Road Bridge – Bridge Replacement (including track lowering and road raising);
- Kylemore Road Bridge – Bridge Replacement including track lowering and road raising);
- Khyber Pass Footbridge – Bridge Replacement;
- Sarsfield Road Under-Bridge – Bridge Deck Replacement;
- Memorial Road Bridge – Bridge Replacement (including nominal track lowering and road raising); and
- South Circular Road – New Cut and Cover Structure (Buried Portal) including track lowering.

4.4.3.1. Le Fanu Road Bridge

The existing single arch masonry Le Fanu Road Bridge will be replaced at the same location by a new structure with a longer span to facilitate the additional width required for the additional tracks and to carry Le Fanu Road traffic over the rail corridor. The proposed bridge will be a single span bridge with prestressed beams and in-situ deck seated with abutments supported on a pile foundation.

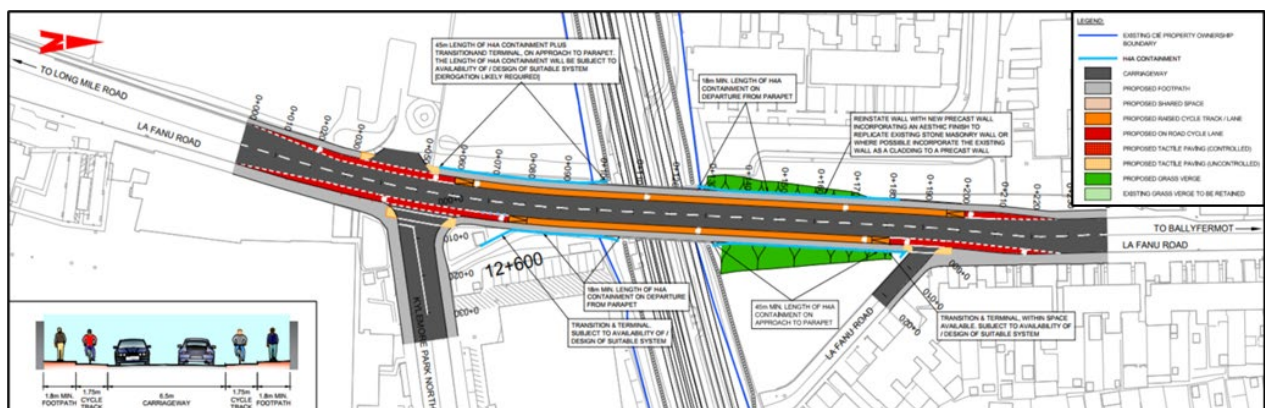


Figure 4-15 Le Fanu Road Bridge Plan

The proposed arrangement for both sides of the road over the bridge, and on all departures and approaches to the bridge is:

- 1.75 m wide cycle track (approximately);
- 1.8 m wide footpath (minimum) with 75mm kerb height to the cycle track adjacent; separating it from the cycle track; and
- 6.5 m carriageway (approximately).

Off-road segregated cycle tracks are provided except where the geometry of the road dictates reverting to on-road cycle lanes i.e. mainly on approach and departure to junctions.

A temporary pedestrian footbridge will be provided during the construction stage. As there is insufficient space to accommodate a temporary road bridge, traffic will be diverted to Kylemore Road Bridge during the temporary closure.

4.4.3.2. Kylemore Road Bridge

The existing single span reinforced concrete Kylemore Road Bridge will be replaced by a new structure with a longer span to facilitate the additional tracks and to carry Kylemore Road traffic over the rail corridor. The bridge has also been designed to include a potential road and rail load combination to accommodate future Luas loading. Additionally, the bridge has been designed in such a way that space provision is made available for future platforms under the bridge associated with a potential future station at this location.

The proposed carriageway arrangement for both sides of the road over the bridge, and on departures and approaches to the bridge, are:

- 1.75 m wide cycle track segregated from the carriageway with a 50 mm kerb height;
- 1.9 m wide footpath (minimum) with 75 mm kerb height to the cycle track adjacent, separating it from the cycle track; and
- 9 m carriageway (approximate lane widths of 4.5m as per existing).

The southern entrance to the residential service road (northwest of the bridge) will be closed permanently and the road converted to operate as a cul-de-sac. The figure below shows the roadway plan and section at Kylemore Road over the area reinstated to accommodate the bridge raising.

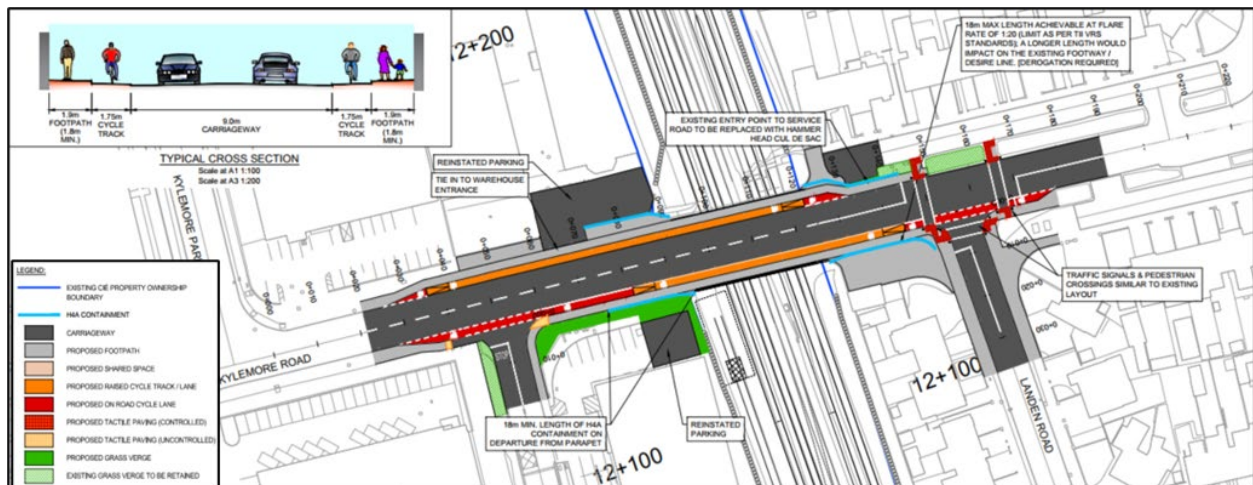


Figure 4-16 Kylemore Road Bridge - Plan and Section

A temporary vehicle bridge and a separate pedestrian bridge will be provided during construction. The works will be staged to ensure that Le Fanu Bridge and Kylemore Road Bridge are not closed at the same time.

4.4.3.3. Khyber Pass Footbridge

The existing Khyber Pass Footbridge will be replaced at the same location by a new structure with a longer span to facilitate the additional tracks. The proposed bridge will be an Iarnród Éireann owned and managed bridge for the daily use of Inchicore Depot operational personnel. The proposed bridge will comprise pre-stressed beams and a precast U-Deck with integrated parapets founded onto a piled base at the abutments. A steel mesh enclosure will be placed over the deck to provide full containment in line with the existing bridge.

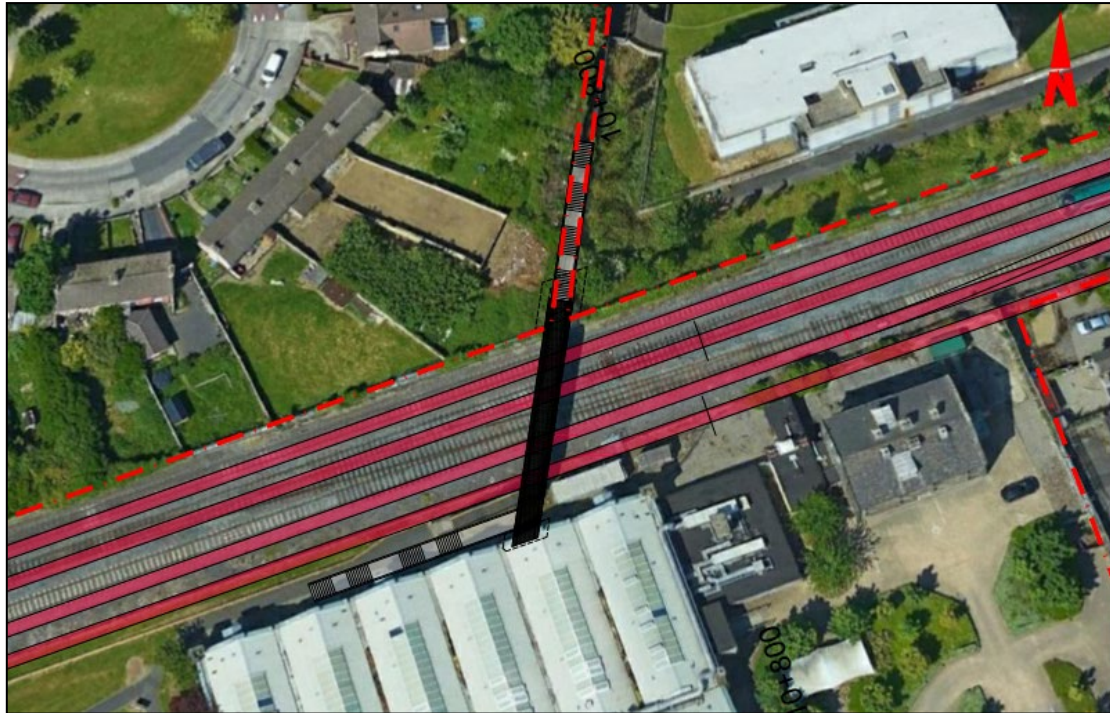


Figure 4-17 Khyber Pass Footbridge General Arrangement

4.4.3.4. Sarsfield Road Bridge

The existing Sarsfield Road Under-Bridge will be replaced at the same location by two new structures to carry four rail tracks. The northern bridge will be positioned at the existing abutment location, while the southern bridge will be positioned to extend past the south of the existing abutments.

The southern bridge decks will be supported on piled abutments positioned behind the existing abutments and retaining walls, while the northern bridge deck will be supported on a new curtain wall extension to the existing seating beam.

While the railway bridge reconstruction does not require vertical road alignment changes; associated temporary utility diversion works, will result in the need to reinstate road surfaces, footpaths and in addition kerb lines.

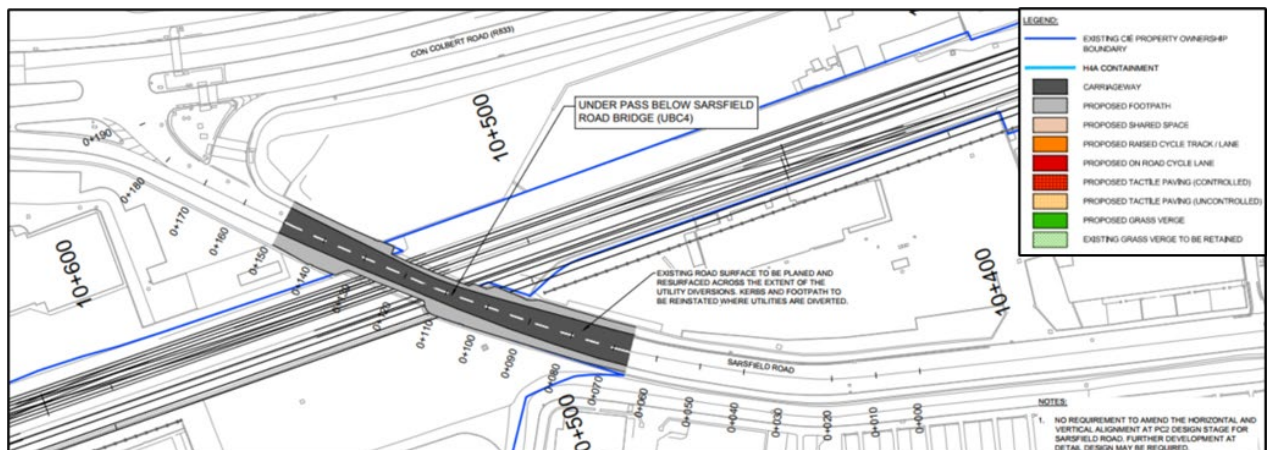


Figure 4-18 Sarsfield Road – Area of Road and Footpath

4.4.3.5. Memorial Road Bridge

The existing single span bridge connecting the Chapelizod Bypass to Inchicore Road will be replaced at the same location by a new structure with a longer span to facilitate the additional tracks.

The proposed new structure will be widened and lengthened but will maintain the existing horizontal and vertical alignment as the existing structure. Track lowering of the electrified tracks will be used to achieve the required vertical clearances.

The bridge design solution follows consultation with BusConnects, as BusConnects' proposals for both the Liffey and Lucan Schemes, cover the area around the bridge. The BusConnects' proposals include changing Memorial Road from a one-way system to provide bi-directional flow. This will include a dedicated right turn slip lane being provided on the eastbound carriageway of the Chapelizod Bypass (R148) to facilitate southbound turns into Memorial Road (R839).

The proposal as part of this Project, will involve a widened carriageway (removing) the existing carriageway narrowing that exists over the bridge and aligning the new cycle lane kerb line over the bridge with existing kerb line along the remainder of Memorial Road to the south. The carriageway lane widths will be increased to approximately 3.65m.

Memorial Road will remain unidirectional (northbound traffic only) with the eastern lane being a right turn only and the western lane being left and right turn; until such time that the approved BusConnects Schemes are implemented. The cycle lanes will tie in with the existing lanes running west along Con Colbert Road.

The proposed carriage way arrangement for both sides of the road over the bridge, and on departures and approaches to the bridge includes:

- 2 m wide cycle track segregated from the carriageway with a 50mm kerb height;
- 2 m wide footpath (minimum) with 75mm kerb height providing separation from the adjacent cycle track; and
- 7.3m carriageway.

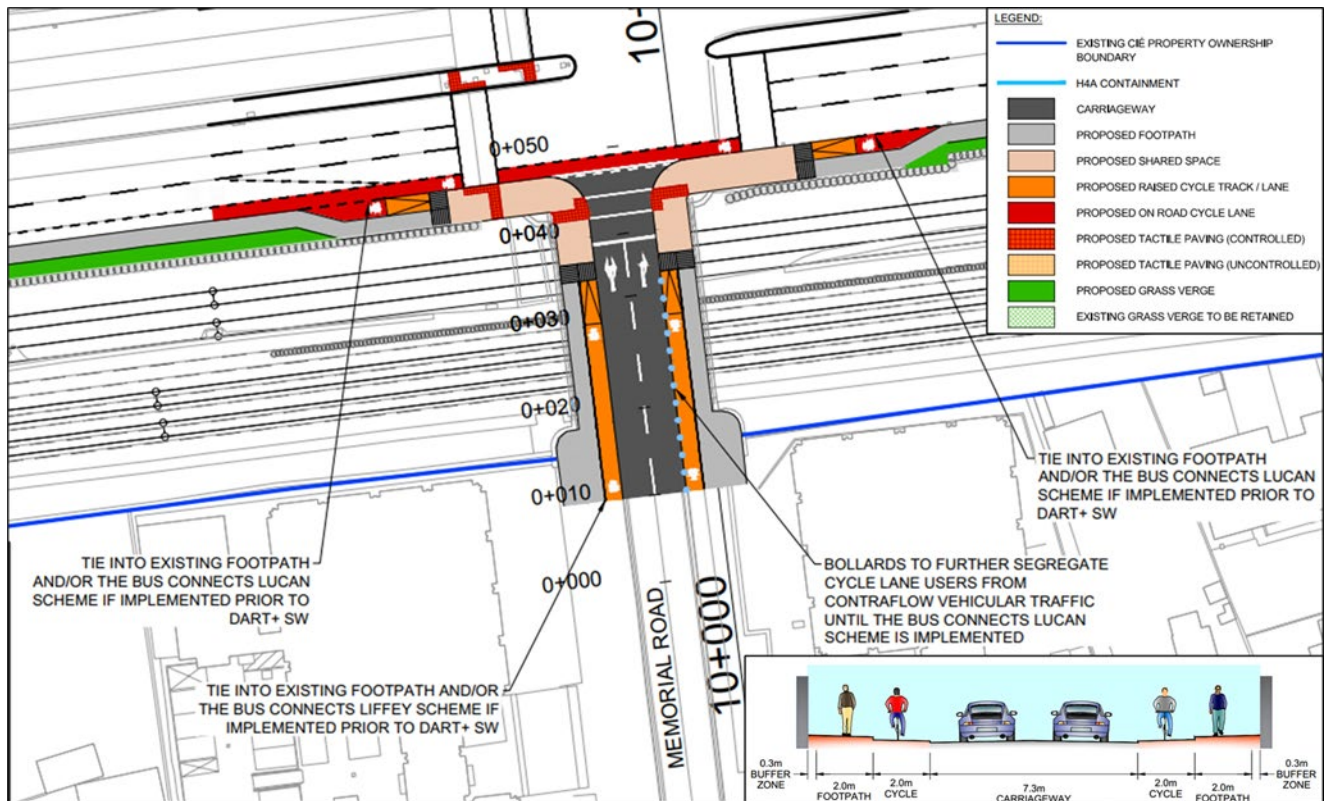


Figure 4-19 Memorial Road Plan and Section

4.4.3.6. New Cut and Cover Structure (Buried Portal) South Circular Road

A new portal box structure is proposed within the railway corridor on the north side of the existing bridge which would provide space for two (2 no.) of electrified tracks. This structure will facilitate new tracks at a lower level to that of the existing tracks to achieve the required vertical clearance for the electrification along the new structure. As the track levels will be different, a retaining wall will be required between the Fast and Slow tracks.

The buried portal would be approximately 120m long and have a clear span of approximately 10m. It is proposed that both abutments of the buried structure would be piled from the existing road level. The end supports will be secant pile abutments, constructed of in-situ reinforced concrete.

The foundation design will comprise a row of one hundred and thirty-one (131) 900mm diameter bored piles on stiff to very stiff Black Boulder Clay to support each of the bridge abutments.

The road layout of the South Circular Road Bridge will not be altered significantly and the works will be phased to avoid the requirement for road closures. The existing southbound cycle lane currently shares the same space as a vehicular lane. However, the proposed new cut and cover structure at South Circular Road has been provided with additional space to the east which allows for segregation of southbound cycle traffic from vehicular traffic without impacting the vehicular lane widths across the junction. This has resulted in a new 2m cycle track and 2m footpath. The existing northbound bound cycle lane currently shares the same

space as a vehicular lane and will remain as such; subject to the BusConnects Scheme amendment finalisation.

4.4.4. Retaining Walls

New retaining walls are required along sections of both the north and south sides of the rail corridor in Zone B in order to form the Slow (northern) and Fast (southern) tracks, and to retain the slopes as the rail corridor enters cutting, the walls vary in height up to 10m.

Secant pile and king post retaining wall structures are proposed specifically for Zone B, the location type and height of proposed new retaining wall structures, including extent of substratum wall anchors, vary along this section of the route. The soil anchors are required in some cases to provide for stability of the retaining walls. The depth and length of the anchor will vary depending on the factors including the height of the retaining wall and the ground conditions.

The design of the permanent way has proceeded so as to minimise the need for permanent land-take outside the current CIÉ ownership boundary, but there are a small number of locations where new boundary walls are required, which will impinge on residential rear garden plots. In some cases, the existing boundary between the railway and the garden will have to be demolished to enable a new retaining wall and boundary to be built.

4.4.5. Demolition / Removal

Within this zone, several buildings and structures will need to be demolished and / removed in their entirety. Several of the structures are within the Inchicore Depot.

Part of Inchicore Depot, on the northern side of the rail tracks, is the Old Signal Box building. This structure is listed in the NIAH, in Dublin City Development Plan it is included on the Record of Protected Structures. It is located approximately 1.6m to the nearest rail and will have to be removed as part of the rail corridor widening in this area.



Figure 4-20 Old Signal Box - Inchicore Depot

The Maintenance Shed at Inchicore Depot is where the regular maintenance of rail vehicles is carried out. An extension on the north side has been added to the building. In the extension

there are offices, toilets, lockers and plant rooms which houses tanks and pumps for the train wash. As part of the proposed works, the extension to the Maintenance Shed will be removed to provide room for a new train siding.

A small section of the northern railway corridor boundary wall to the Inchicore Depot complex will have to be removed to facilitate the construction of the Khyber Pass Footbridge. The wall will be reinstated to match the existing walls. Sections of the boundary wall along the southern railway corridor between Sarsfield Road and Khyber Pass Footbridge will also need to be removed, this will impact the boundary wall of No. 4 St George's Villas.

The Dan Ryan Truck Rental site which is located on the south side of the corridor, adjacent to Sarsfield Road Under-Bridge (UBC4) and will be impacted by the works in this area, primarily due to the widening of the rail corridor. The extent of works in this area cannot be carried out without the demolition of the existing structure on site.

4.4.6. Track Drainage

A new drainage system is proposed for the zone in order to meet the increased runoff volumes generated by the new four-tracking layout. The system includes for the installation of 3 no. new underground attenuation tanks, one located within Inchicore Depot and one located under the car park at the entrance to the works. The final underground attenuation tank will be installed adjacent to the proposed new Heuston West Station.

4.4.7. OHLE Arrangement - General

In the four-track area for Zone B, the electrification equipment will be supported by TTC structures and STC structures. The OHLE will be terminated with an anchor arrangement, when required, in areas with limited space.

4.4.8. Substations

One substation is required for this section of the route, the proposed location for the substation is within Iarnród Éireann's Inchicore Depot on the southern side of the railway as shown below. Access to the site is from Jamestown Road via an existing access gate to the Inchicore Depot. A dedicated and segregated vehicle access route will be provided within the depot from the site entrance to the substation to provide safe and unfettered access for ESB staff.

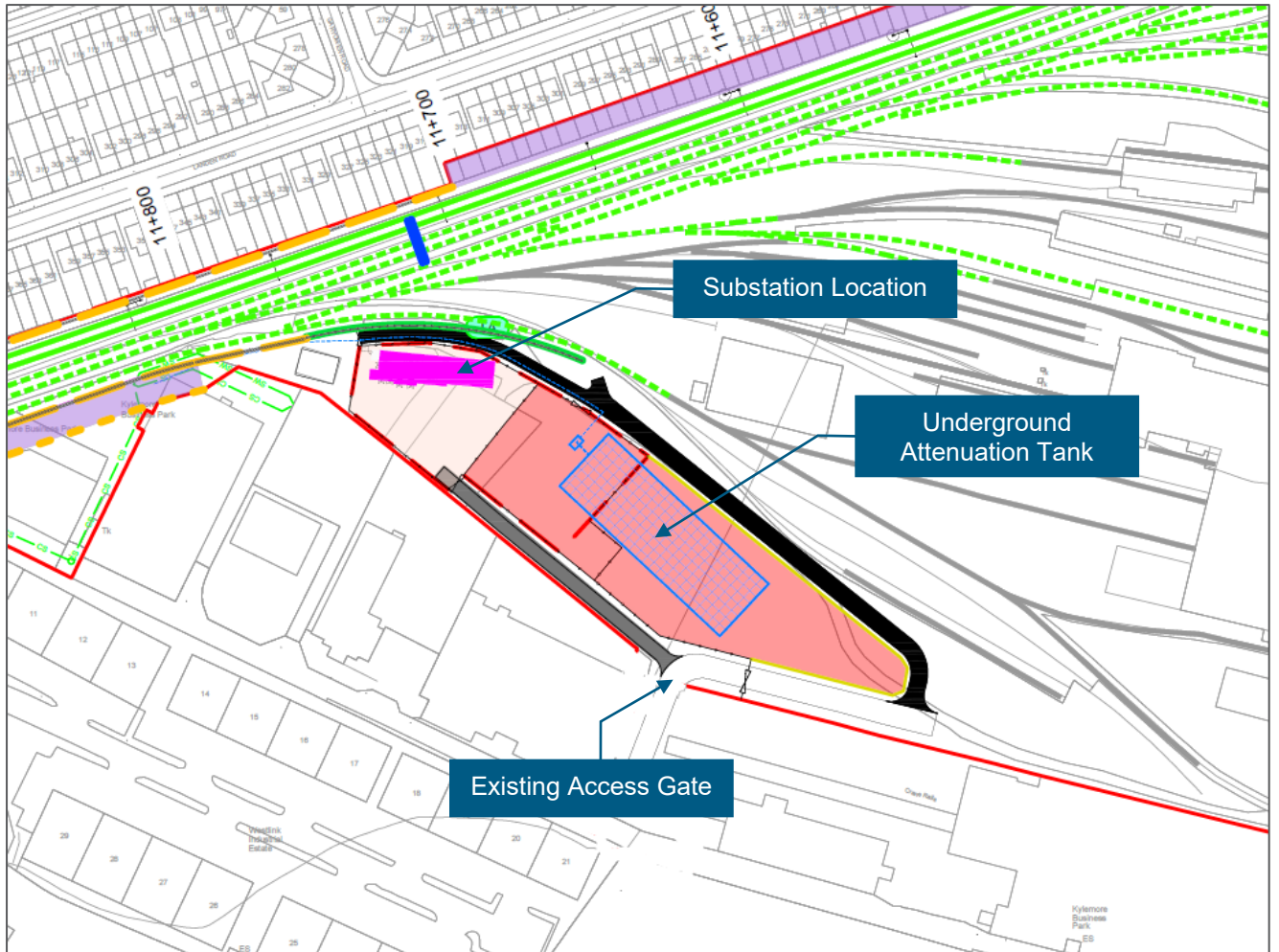


Figure 4-21 Kylemore (Inchicore) Substation Location

The proposed connection to the existing ESB 38kV network is an existing underground circuit located within the ESB yard on the Kylemore Way. The approximate length for each electrical circuit is 520m.

4.4.9. Signalling and Telecommunications

New physical signalling and low voltage infrastructure comprising of a network of signalling and LV elements including localised control cabinets and cabins will be installed along this section of the route. The physical signalling infrastructure will be located within the existing CIÉ property boundary. New signalling cantilevers are proposed on track between Memorial Road Bridge and the South Circular Road Bridge.

4.5. Zone C: Heuston Yard and Station Incorporating New Heuston West Station

4.5.1. Overview of Zone C

This zone includes Heuston Station and Heuston Yard including the site for the proposed Heuston West Station. The area extends west to east from St John's Road Bridge eastwards

to include the existing Heuston Station and from the CIÉ boundary along the Chapelizod Bypass northwards to the CIÉ boundary on the banks of the River Liffey.

This zone features the main Heuston Station building and an extensive railway yard area located to the west of this building. The station and yard area features various ancillary buildings, platforms, track areas, car parks and maintenance facilities. The site for the proposed new Heuston West Station is located in the north western part of this zone, adjacent to the existing Clancy Quay Development and the new National Train Control Centre (NTCC) site which is currently under construction.

4.5.2. Stations

Within the Heuston Station area, platforms 6, 7 and 8, as well as existing carriage sidings 3 to 6 to the north are to be electrified to receive the DART+ rolling stock. One of the sidings (Siding 6) will need to be extended, whilst retaining the existing functionality of Heuston Station Yard. The extension of carriage Sidings 6 will impact the parking area located at the north of the existing sidings.

In addition, the proposed Project includes for the provision of a new station at Heuston West, located to the west of the main Heuston Station. The new station will provide connectivity to other transport modes in the Heuston area. The station will occupy the former Platform 10 area and will have two platforms serving Up and Down directions of the line. A new pedestrian and cycle access route to be provided between Clancy Quay development and the new station, a new segregated pedestrian/ cycle bridge will provide access to both platforms and the public areas to east and west of the station. A public Right of Way is proposed to be registered along the entirety of Waterloo Avenue; as it is most direct route between South Circular Road (SCR) and the boundary between Clancy Quay Development and CIÉ lands at Heuston West. This right of way will include the existing footpaths as well as the vehicular paved areas between SCR and Heuston West for use by cyclists. Access to the bridge will be via stairs and ramps in accordance with accessibility requirements. The station is to be accessible by road, including a bus set-down area, short term parking bays for disability user set-down, access is also to be provided for emergency services vehicles. The existing road and roundabout layout will be modified to accommodate the new station, bridge and ramps.



Figure 4-22 Proposed Heuston West Station Location

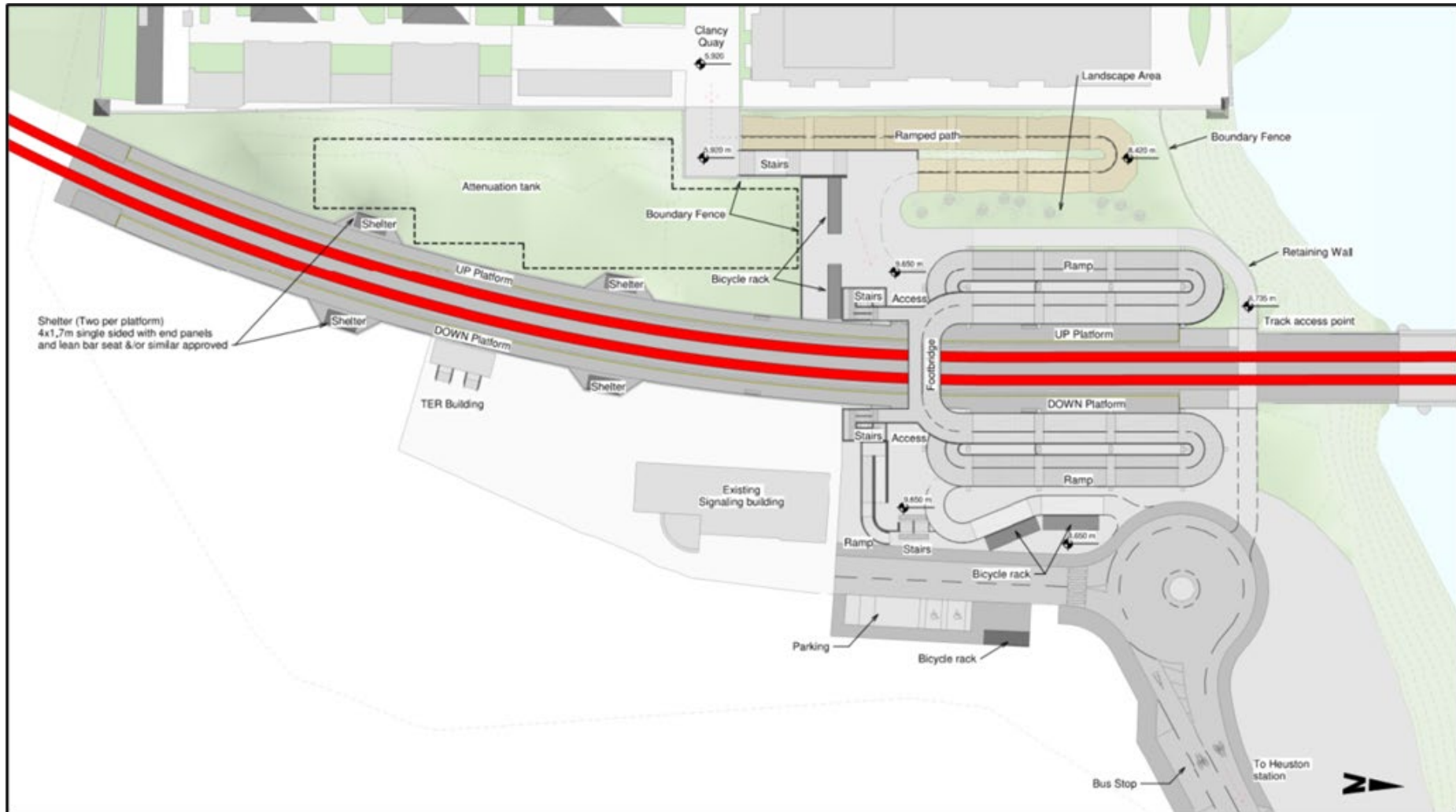


Figure 4-23 Proposed Heuston West Station Plan

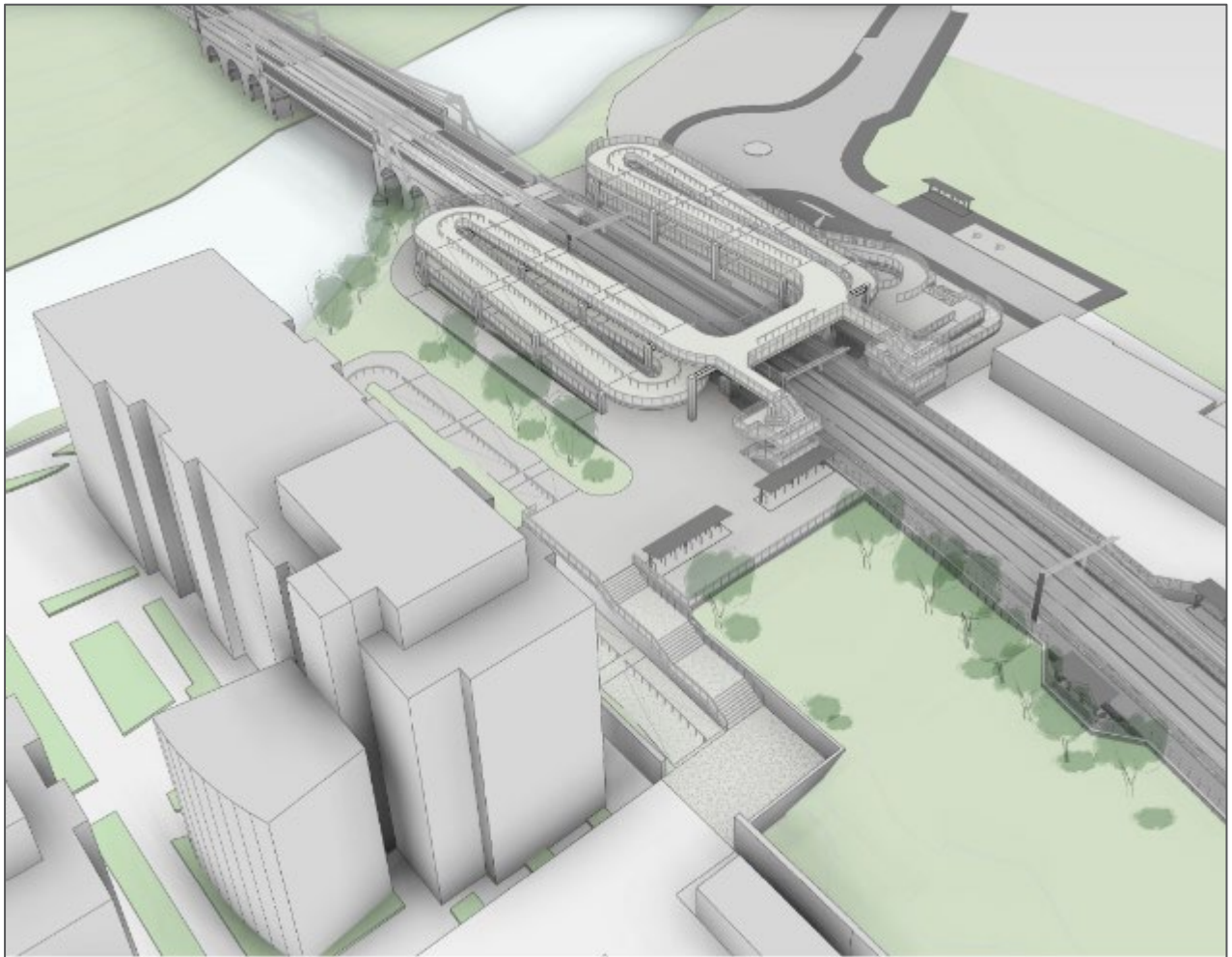


Figure 4-24 Proposed Heuston West Station

The access route to the proposed Heuston West Station will be via the existing access road serving the Heuston Station main carpark and Platform 10. The road layout and roundabout adjacent to the new station will be modified to accommodate the new station. Most of the existing central median traffic calming, along the non-pedestrianised sections of the route will also remain as is or be reinstated in a like manner. Pedestrian access routes to the main station will be upgraded to enable interchange with mainline rail, LUAS and bus services at Heuston.

4.5.3. Permanent Way

The proposed layout comprises four tracks at the start of the section to the east of St John's Road Bridge - the existing three tracks on the south side of the corridor will be realigned and works include the addition of a new track on the north side and track modifications within the Heuston Station area. Works also include modification to the existing sidings adjacent to the station car park.

4.5.4. Drainage

An underground attenuation tank will be installed adjacent to the proposed new Heuston West Station. The drainage network downstream of the attenuation tank will discharge by gravity to an outfall at the River Liffey which will include a flow control unit to restrict outgoing flows to the agreed rate. The outfall level shall be located above the 1 in 100-year water level of Liffey River, which is set at level 3.5m. The proposed track drainage system includes filter drains to collect ballast and surrounding areas runoff. The proposed filter drains discharge into the collector pipes through manholes, which are to be spaced between 30 to 50 metres apart which in turn, convey the runoff to the proposed attenuation structure.

A proposed outfall for the new attenuation tank is to be located between Heuston West Station and Clancy Quay. The attenuated flows will, discharge to the River Liffey, at controlled discharge rates.

4.5.4.1. OHLE Arrangement

There is a requirement to electrify Platform 6, 7 and 8 and Carriage Sidings 3 to 6 (4 no.). The area through Heuston station to Platforms 6, 7 and 8 and the sidings will be provided with Twin Track Cantilever (TTC) or portals over the platforms and the sidings. The OHLE structures shall be positioned in the space between the line side equipment. It is proposed that portal structures shall be positioned on the platforms through the canopy to support the OHLE wires with 30-50m spacing.

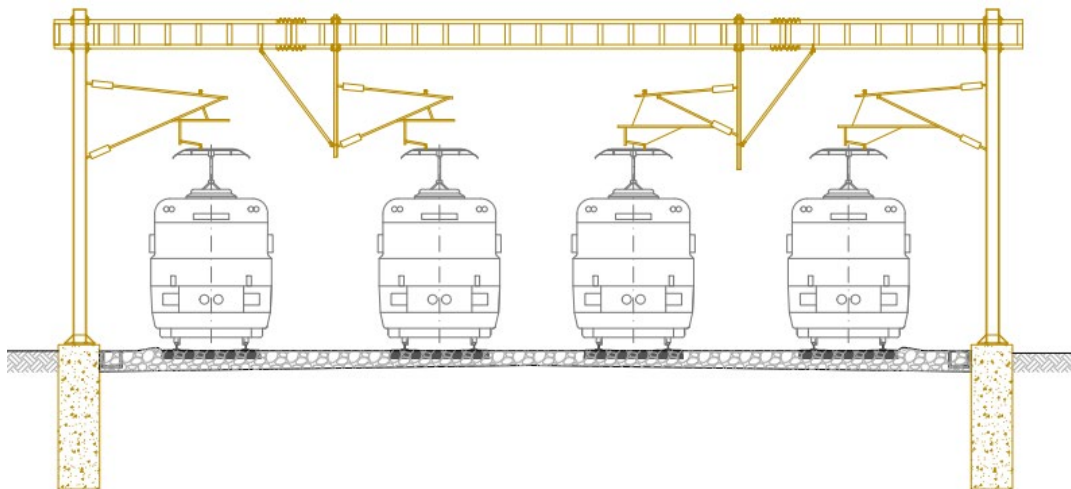


Figure 4-25 Typical OHLE Portal Arrangement in Station Area

In the area between the station and main route, new OHLE structures shall be positioned in the space between the track and railway boundary. The type of structures will typically be Single Track Cantilevers (STC) or Two Track Cantilevers (TTC) depending on the space between the tracks.

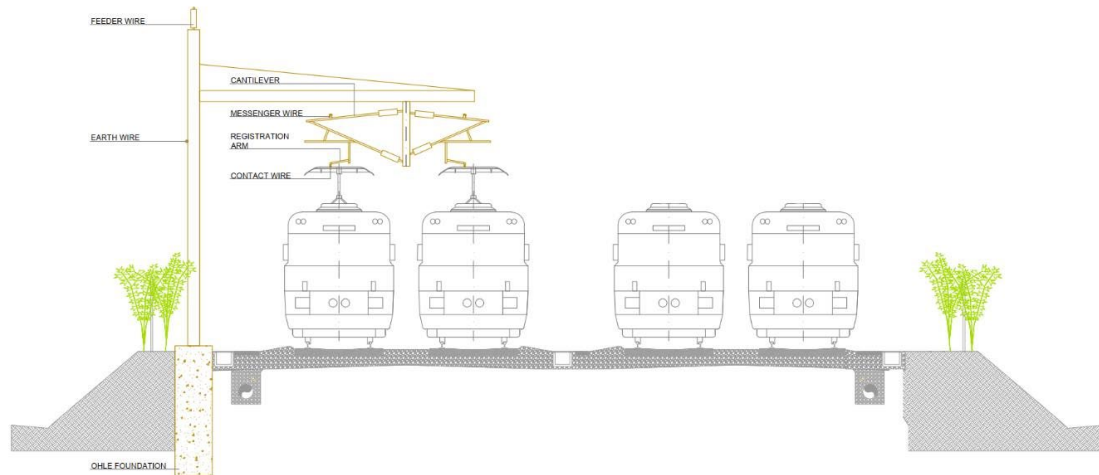


Figure 4-26 Typical OHLE Arrangement in Four-Track Open Route

Localised platform canopy modifications will be required to accommodate the OHLE masts but only if further design development finds it necessary to position some masts on the platforms. The canopy structure in such instances poses no impediment to the platform line electrification.

In the twin track area at Heuston West Station, the electrification equipment will be supported by TTC structures at north side of the lines to support OHLE on both tracks. TTC type OHLE masts shall be positioned through station area to minimise the OHLE masts on one platform. The OHLE masts shall be placed to avoid clashing with station footbridge and shelter.

4.5.4.2. Substations

One substation will be provided in the Heuston Station / Islandbridge area. It is a brown field site in the possession of CIÉ on the southern side of the railway yard. To facilitate vehicle access to the substation a new vehicle access route will be required. The site will be accessed from St Johns Road West, due to site constraints, access gates are proposed either side of the proposed substation location to enable vehicles to traverse the site without turning.

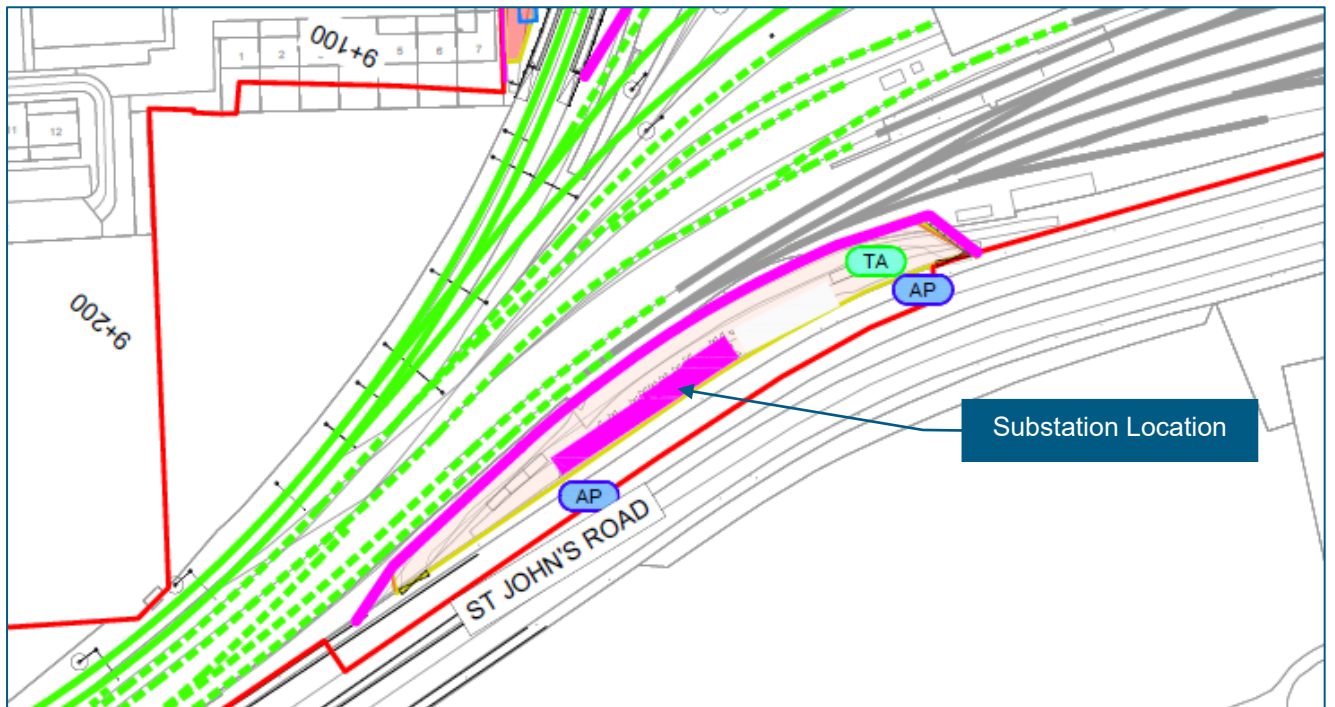


Figure 4-27 Islandbridge Substation Location

The nearest ESB 38kV network from the proposed substation is the existing Knightsbridge – Inchicore North 38kV underground circuit located on the westbound verge of St John’s Road (Approx. 30m) and running parallel along it.

4.5.5. Signalling and Telecommunications

New physical signalling and low voltage infrastructure comprising of a network of signalling and LV elements including localised control cabinets (LOC) and Signalling Equipment Buildings (SEB) will be installed along this section of the route.

The location of the Signalling Equipment Building (SEB) and Location Cases/Cabinets (LOCs) for LV equipment are within Heuston Station environ, adjacent to the new Heuston West Station.

A new Telecom Equipment Building/Room (TER) is required within this zone and it will be located adjacent to the new Heuston West Station.

4.6. Zone D: River Liffey Bridge to Glasnevin Junction

4.6.1. Overview of Zone D

Zone D commences on the south bank of the River Liffey (adjacent to the northern boundary of the Heuston Yard) and extends north east terminating at Glasnevin Junction. The route extends northwards over the River Liffey via the Liffey Bridge (UBO1) and under Conyngham Road Overbridge (OBO2) after which, it enters the existing Phoenix Park Tunnel.

The Phoenix Park Tunnel has a length of approximately 700m and has two ballasted tracks through the tunnel. The tunnel was originally built by the Great Southern and Western Railway

company to connect Heuston Station to the Dublin Docklands and was primarily used for freight. It reopened to regular passenger traffic in 2016.

The route emerges on the north side of the tunnel, thereafter, extending north east under a series of bridges along the Phoenix Park Tunnel Branch Line where the DART+ South West Project extent ties in to the existing track at Glasnevin Junction and interfaces with the DART+ West Project, where the route then continues to the Dublin Docklands area (Spencer Dock and Grand Canal Dock).

The rail corridor north of the Phoenix Park Tunnel is primarily in cutting (i.e. the rail level is below the surrounding ground level), the corridor is formed mainly by earth embankments, the track passes under a number of overbridges. The northern boundary of this section of the line is approx. 10m east of Glasnevin Cemetery Road Bridge (OBO10).

4.6.2. Permanent Way

At Liffey Bridge (UBO1) the existing fixed track system on the bridge deck will be retained. There is no track work proposed here. On the approach to Conyngham Road Bridge (OBO2) the Branch lines will be lowered to achieve the necessary vertical clearance to install OHLE equipment.

The track alignment through Phoenix Park Tunnel will be realigned horizontally and vertically to ensure that structural and passing clearances are achieved, whilst providing the necessary vertical clearance for the installation of OHLE required to electrify the lines. It is proposed to install slab track from Conyngham Road Bridge (OBO2) through the Phoenix Park Tunnel, in order to provide improved restraint and positioning of the rails and maintain structure and passing clearances.

Track lowering is proposed at certain sections along the Phoenix Park Tunnel Branch Line between the Phoenix Park Tunnel and Glasnevin Junction in order to achieve the required vertical clearances beneath a number of the existing bridges. A new track bed and modifications to the drainage system are required in these sections to facilitate the track lowering.

4.6.3. Bridge Modifications

Currently there are 10 no. existing bridges which will cross the newly electrified track on the Phoenix Park Tunnel Branch Line. No major structural modifications are currently proposed to these bridges, with the exception of the Glasnevin Cemetery Road Bridge (OBO10) where a new replacement bridge deck will be installed on this structure's existing abutments to provide the required clearances to OHLE. The proposed modifications at the remaining bridges include track realignment, track lowering and in some instances parapet height adjustments.

Summary of the proposed bridge modifications:

- Conyngham Road Overbridge (OBO2) - Track lowering and parapet modifications;
- McKee Barracks Bridge (OBO3) - Parapet modifications;
- Blackhorse Avenue Road Bridge (OBO4) - Parapet modifications;

- Old Cabra Road Bridge (OBO5) - Parapet modifications;
- Cabra Road Bridge (OBO6) - Track lowering and parapet modifications;
- Faussagh Road Bridge (OBO7) - Track lowering and parapet modifications;
- Royal Canal and Luas Twin Arches (OBO8) - Track lowering;
- Maynooth Line Twin Arch (OBO9) - Track lowering; and
- Glasnevin Cemetery Road Bridge (OBO10) - Replace existing bridge deck.

4.6.3.1. Glasnevin Cemetery Road Bridge (OBO10)

A new deck to replace the existing will be required at Glasnevin Cemetery Road Bridge (OBO10). The new deck will be of the same span and width as the existing bridge, the new bridge will include 1.8m high parapets with an H4a containment classification.

The proposed structure will be supported on the existing masonry abutments. A temporary pedestrian bridge will be provided for the duration of the closure of the existing bridge during construction.

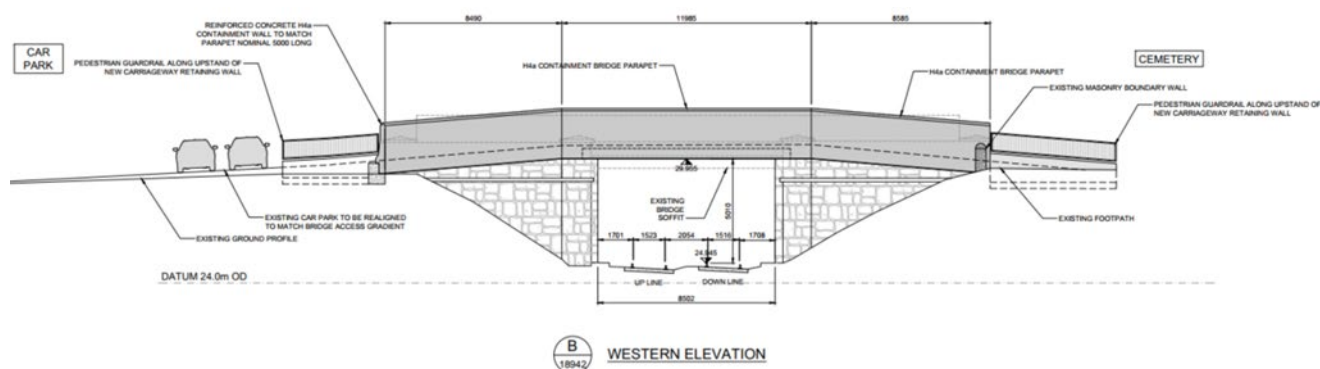


Figure 4-28 Glasnevin Cemetery Road Bridge (OBO10) Section – Facing East

4.6.4. Retaining Walls and Soil Anchors

New retaining walls are required at various sections along both sides of the rail corridor, specifically the section north of the Phoenix Park Tunnel to Glasnevin Junction. These are required to retain the slopes of the two-track corridor within the existing cutting, only in the areas where track modifications are proposed. The retaining walls will be located at the toe of the slopes adjacent to the tracks and will typically consist of gabion basket and king post walls with heights typically ranging from 0.5 to 1.5 m in height.

Additional soil anchors will be installed on the slopes above the new retaining wall locations to complement the existing soil nails previously installed, to provide greater stability of the cutting slopes and to ensure the long term safety and stability of the rail operations. The new soil nails and mesh facing system, will extend along the entire slope face and will typically extend 10 to 15m into the slopes. In some instances, the soil anchors will extend beyond the CIÉ property boundary and under third party properties.

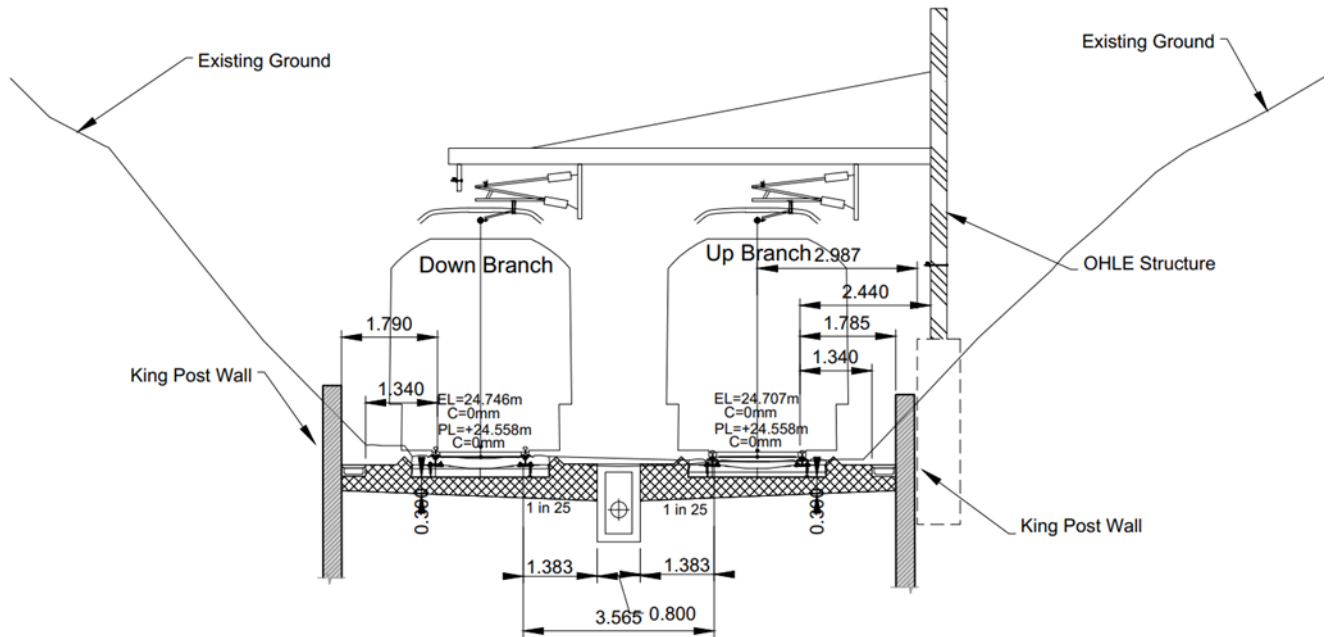


Figure 4-29 Cross Section Showing Typical Retaining Wall Structures



Figure 4-30 Typical Soil Anchor Installation

4.6.5. Drainage

The current ballasted track will be replaced with slab track in the Phoenix Park Tunnel, which will require a dedicated drainage system. The current catchment area at the tunnel and its portals will not be modified by the proposed track works and therefore, the generated runoff volumes will not increase. The existing collection system (perforated pipe) will be replaced by an in situ concrete channel drain placed between tracks, to collect any surface water runoff on the track and convey flows to the existing outfall at the River Liffey.

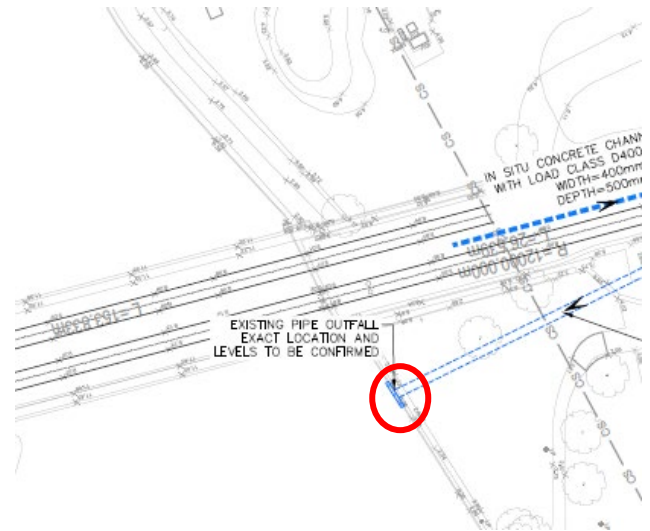


Figure 4-31 Existing Outfall for Phoenix Park Tunnel Drainage Network

The People's Park pond (within Phoenix Park) is located directly above the tunnel. There is an existing pond overflow pipe which enters the Phoenix Park Tunnel structure and discharges into the existing track drainage. As part of the slab track works within the tunnel, a new connection manhole and pipework is proposed within the tunnel. This then will direct the overflow flow into a channel, located within the structure of the proposed slab track. The channel will transport storm water runoff from the track drainage catchment north of the tunnel and continue to accommodate the existing pond overflow discharge. The channel will have removable covers along its length, for safety and ease of maintenance.

The existing drainage catchment between the Phoenix Park Tunnel and Royal Canal and Luas Twin Arch (OBO8) and Maynooth Line Twin Arch (OBO9) will remain as existing, and therefore, runoff flows will not be increased as result of the proposed works. There is no requirement for additional attenuation structures and the existing drainage strategy will be retained in the area. Therefore, the only drainage works for this track section include reinstating the existing drainage elements according to the new track levels.

There is an existing pumping station located between the Royal Canal and Luas Twin Arch (OBO8) and Maynooth Line Twin Arch (OBO9). The existing pumping station drains the excess of water from the cutting located immediately to the west of the Royal Canal and Luas Twin Arch (OBO8) (Twin Arch Bridge). This facility directs the inflows to the attenuation tank located to the northwest.

Track lowering is proposed for this area which will require modifications to the existing pumped drainage system. Proposed works involve increasing the dimensions of the existing wet well chamber. The proposed wet well will deal with the extra volume collected by the system whilst maintaining current pumping flows.

4.6.6. OHLE Arrangement

The proposed two electrified Slow lines will continue through the Phoenix Park Tunnel Branch Line at Islandbridge Junction, extending to Glasnevin Cemetery Road Bridge (OBO10).

For the Liffey Bridge (UBO1), the electrification equipment will be supported by Single Track Cantilevers (STC) type OHLE masts and one Twin Track Cantilevers (TTC). These structures will be attached to the Liffey Bridge (UBO1).

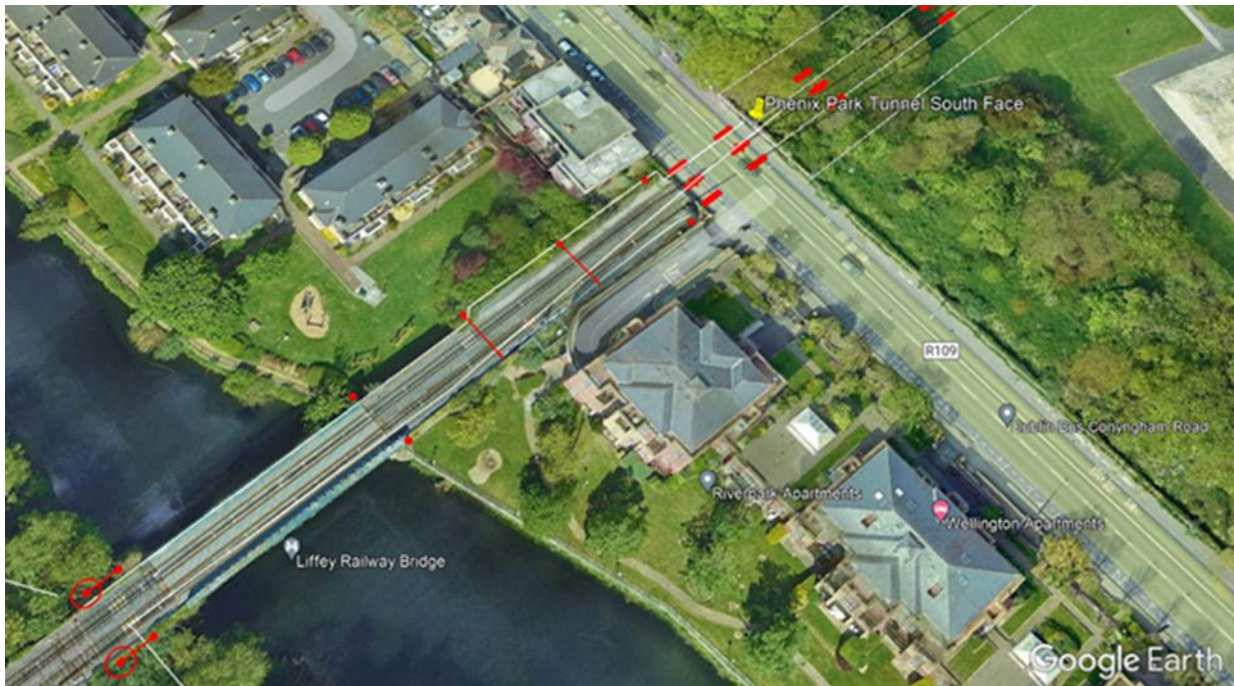


Figure 4-32 OHLE Mast Position for Liffey Bridge (UBO1) and Conyngham Road Bridge (OBO2)

The Phoenix Park Tunnel is sufficiently high that the OHLE can pass through the tunnel, but due to its length the OHLE will be connected to the tunnel at multiple locations. This option provides a continuation of the flexible OHLE arrangement through the tunnel. The length of the tunnel is 700m.

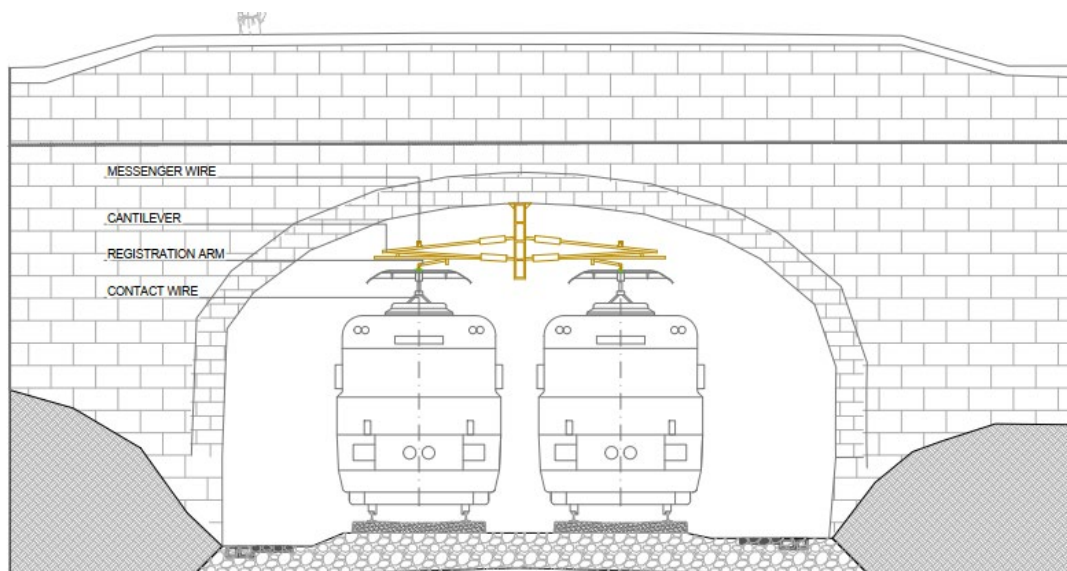


Figure 4-33 Typical OHLE Tunnel Cantilever Arrangement

On section north of the Phoenix Park Tunnel, the electrification equipment will be supported by TTC structures on the north side of the lines, and STC structures where the OHLE to be terminated with an anchor arrangement were required.

4.6.7. Signalling and Telecommunications

On Phoenix Park Tunnel Branch Line track, north of the Phoenix Park the proposed physical signalling infrastructure includes the installation of a Location Case (LOC) for LV equipment.

4.6.8. Additional Infrastructure

On the Phoenix Park Branch Line, it is proposed to add to two new emergency track access and egress points. One access/egress point will be adjacent to the Phoenix Park Tunnel northern portal, it is proposed to install new stairway along the existing embankment, which will exit onto the North Circular Road adjacent to the entrance to the Phoenix Park.

The second access/egress point will be at McKee Barracks Bridge (OBO3) on the eastern side of the rail corridor, it is proposed to install a new stairway along the existing embankment, the exist will be onto Marlborough Road.

5. Construction Strategy

5.1. Construction Programme

The overall construction programme is expected to take 50 months, construction and the current expectation is that construction will commence in mid-2025, subject to the necessary approvals. Figure 5-1 provides an indicative programme for construction phase of the proposed Project.

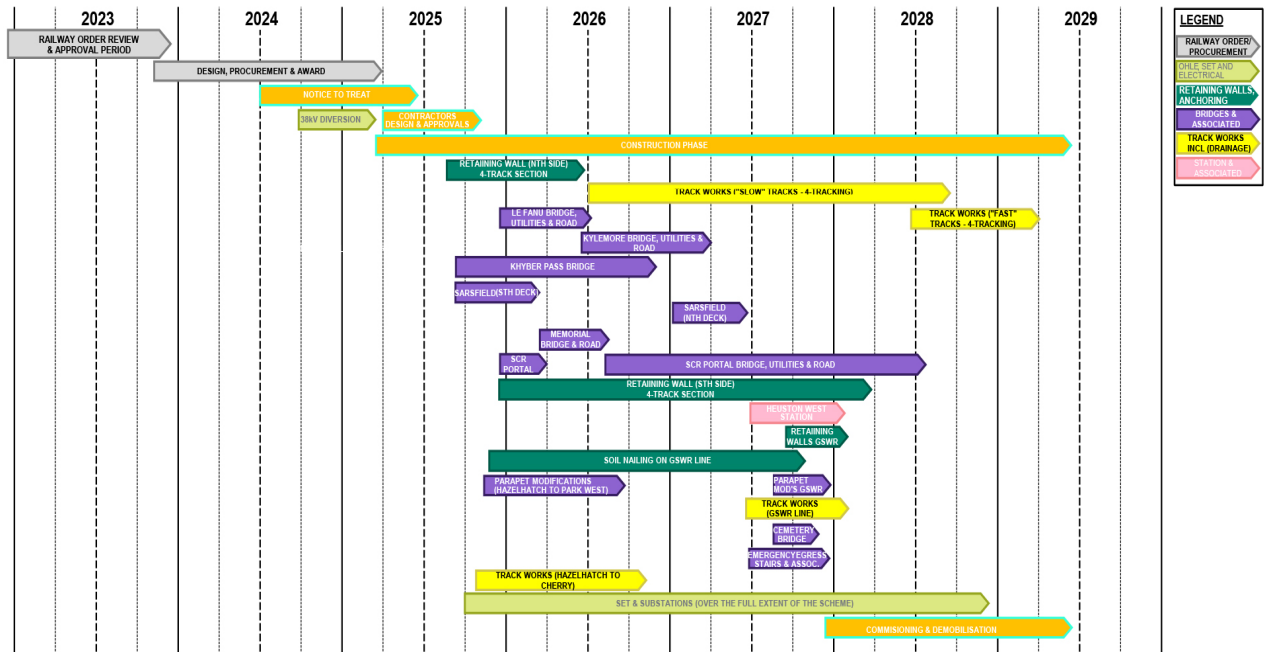


Figure 5-1: Indicative Construction Programme

5.2. Construction Working Hours

The proposed construction working hours for the project are as follows:

Daytime

- Monday to Friday: 10 hours: From 08:00 to 18:00:
 - Piling works will take place from 08:00 to 18:00; and
 - Large volume haulage and deliveries will be restricted in general to 09:00 to 15:00 (off-peak).

Night-time and weekend possessions⁵

- Night-time track possession (weekdays) - 4-hours: From 01:00 to 05:00;
- Night-time track possession (Saturday nights) - 6-hours: From 01:00 to 07:00;

⁵ Hours indicate times when track is physically closed to allow for the works, but there will be additional time for mobilisation/demobilisation activities outside of the hours listed

- Full weekend track possession - 52 hours: Saturday 01:00 to Monday 05:00;
- Bank holiday weekend track possession - 76 hours; Saturday 01:00 to Tuesday 05:00; and
- Total closure - 24 hours per day for a specified duration.

Longer shutdown activities may take place over public holidays (e.g. Easter or Christmas). The Phoenix Park Tunnel and GSWR Line will be closed for a period of 6 months.

5.3. Preparatory Phase

Should the Railway Order be confirmed, a number of advanced works contracts will be required to facilitate construction. These include:

- Ground Investigations for Detailed Design: Preliminary ground investigation works have been undertaken to inform the design of the works to date. Further intrusive ground investigation will be required to advance the design for construction;
- Pre-construction Ecological Surveys: This phase of the construction stage will address any required pre-construction surveys including bat surveys and bird nesting surveys;
- Invasive Species Treatment and Management: Invasive species have been identified within and adjacent to the rail corridor and a further invasive species survey will be undertaken within the lands made available and all stands will be tapped off to prevent accidental spread;
- Archaeological Monitoring: Pre-construction archaeological surveys will be undertaken under Licence by the Department of Housing Local Government and Heritage prior to construction works commencing;
- Site Clearance: Prior to works commencing vegetation such as trees, climbing plants, shrubs or vines will be removed. Site clearance to remove any unwanted materials and equipment will also be required; and
- Condition Surveys: These surveys will be carried out for engineering, property and conservation purposes.

5.4. Construction Phasing

Phasing of works through the widening area from Park West & Cherry Orchard Station to Heuston Station is a critical part of the construction of the works. As the corridor is narrow and full closure of the line cannot be permitted, the works will need to be phased so that only one side will be worked on at a time. A phase comprising one side of the works over a certain length will be completed in its entirety, including all track works and SET infrastructure before the opposite side can be commenced. All rail operations will be diverted to the newly widened section to enable works to be continued on the other side. This phasing will be evolved during the development of the construction stage programming for the proposed Project.

5.5. Construction Compounds

Construction compounds will be required along the length of the scheme at specific locations. The sites will variously be used to accommodate offices for the contractor and client teams, storage facilities, recycling facilities, parking for cars and plant and potentially fabrication areas. The compounds vary in size and are located as close as possible to the rail corridor and areas where significant works are to be undertaken i.e. bridge reconstruction where up to four small compounds may be needed at the four corners of the bridge. The compounds will typically consist of areas of hardstanding for vehicles and materials and the main sites will be fully serviced with electricity, water, sewerage and telecoms.

The compounds will be used to support earthworks, ecological clearances, enabling works, site clearance, utility diversions work, civil works, the demolition of bridges, OHLE, track installation, signalling and telecoms equipment and all ancillary works.

The potential environmental effects are linked to the compound's location, the activities to be carried out inside the facility and the construction traffic that the compound generates. The potential impacts range from direct, such as the temporary land take or vegetation removal to indirect effects (noise, impact on air quality, lighting, etc.).

5.6. Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) has been prepared, presenting the approach and application of environmental management and mitigation for the proposed Project's construction. The CEMP collates the construction stage mitigation from this EIAR and identifies the tasks and roles to deliver that mitigation. The appointed contractor(s) will take ownership of the CEMP once appointed and will have responsibility to deliver on the stated mitigation in this EIAR.

The implementation of the requirements of the CEMP will ensure that the construction phase of the proposed Project is carried out following the commitments made by CIÉ/IÉ in the Railway Order application process for the proposed Project and as required under the Railway Order. Once commenced, the CEMP is considered a living document that will be updated according to the project's changing circumstances and reflect current construction activities while ensuring delivery of the mitigation measures conditioned as part of any Railway Order approval. The CEMP will be reviewed on an ongoing basis during the construction process and include information on the review procedures.

6. Traffic & Transportation

6.1. Introduction

The traffic and transportation assessment identifies and assesses the likely significant effects that the construction and operation phases of the proposed Project will have on all traffic and transport modes in the study area. The assessment considers the projected changes arising from the DART+ South West project against a baseline in both the construction and operation phase and draws conclusions about the relevance and significance of those changes in the context of current environmental guidance and policy. Potential effects are discussed, and mitigation measures are presented as appropriate.

The study area for the assessment relates to the areas along the extent of the proposed Project route and covers the extents likely to be impacted by traffic and transportation during the construction and operational phases of the proposed Project. The direct and indirect impacts of the proposed Project have been considered with reference to the following study area extents:

- A direct study area which includes the works areas adjacent to and/or crossing the railway corridor as well as the junctions along proposed bridge closure temporary traffic management diversion routes; and
- An indirect study area which addresses the impact on transport options and mode split across a wider study area.

6.2. Receiving Environment

The proposed DART+ South West project benefits from being located in a corridor of high population density. Those stations located along the proposed project capture those travelling from the wider area enabling much-needed modal shift from the private car by providing a high-quality frequent alternative mode.

There are a number of vehicular and pedestrian crossings along the length of the railway line which are generally provided in the form of bridges / underpass. There are no 'at grade' crossings of the railway line along the extent of the proposed Project i.e. no level crossings.

There is a comprehensive road network in the study area and in the immediate vicinity of the railway line, particularly within the city centre where there is an extremely dense road network; and the railway line passes beneath a number of regional roads.

There are existing pedestrian and cyclist routes located within the study area which link to the wider network and facilitate pedestrian and bicycle movement. Dedicated cycle / pedestrian facilities are generally not provided on more rural roads in Zone A, while in more urban areas such facilities are provided although dedicated lanes are not always available e.g. Le Fanu Road Bridge.

There are a large number of bus services operating within the study area and many bus stops within a short walking distance of a train station. The train station with the largest volume of bus connectivity, along the Project route, is Heuston Station.

The existing railway line forms part of the mainline rail network connecting Dublin to Westport / Ballina, Galway, Limerick, Cork and Waterford. Diesel powered intercity and commuter services currently operate on these routes. There are currently 6 no. existing stations located along the length of the proposed Project with connections to the Luas Red line at Heuston Station. Car parking / Park and Ride facilities are provided at a number of the train stations along the line.

In the absence of the Project it is anticipated that there will continue to be a high level of dependence on private motor vehicle transport and there will be no significant increase in rail transport. Any increase in private motor vehicle transport will further increase road congestion and can be expected to impact negatively on journey time for private and public road transport.

6.3. Potential Impacts and Mitigation Measures

The proposed Project will increase rail capacity, provide a new Heuston West Station, help grow frequency of rail services and improve public transport connections for passengers. The impact of this will be positive with more train services and more passengers able to use rail which will allow a reduction in the volume of vehicles on the local road networks.

All existing bridges / underpasses along the route will be kept or replaced by bridges / underpasses at the same locations. In most cases the replacement bridges will allow the same traffic as now but at Le Fanu Road and Kylemore Road improvements will be made for pedestrian / cyclists using those bridges.

Based on the pedestrian and cycle counts and the limited options for crossing over the railway corridor; temporary pedestrian / cyclist bridges will be provided where closures are expected to last more than 3 weeks Temporary bridge closures / diversions will impact on pedestrians, cyclists and mobility impaired by making journey times longer (in most cases 2-5 minutes but slightly longer at Sarsfield Road), and in some cases increasing the number of road crossings required.

During construction, thirty-three (33 no.) bus routes will be affected by the bridge works and road diversions. This will also lead to longer journey times of between 5-8 minutes as a result of longer routes, more junctions and higher levels of traffic using all surrounding roads when diversions are in place. The most significant effects will be at Kylemore Road, Memorial Road Bridge and South Circular Interchange.

The existing railway lines between Hazelhatch and Celbridge Station and Heuston Station will be kept operational in the peak hours in the morning and evening. Works requiring shut down of the lines will be scheduled for night-time and weekends where possible and off-peak periods. Train speeds may be affected outside these peak hours to allow construction work to be carried out safely. The Phoenix Park Tunnel Branch Line will have to be closed for a period of approximately 6 months. The impact on passenger rail transport will be short term, negative and moderate. The impact on freight rail transport is considered to be short term, negative and significant.

Construction traffic will be present along the length of the route on the local road network. There will be several temporary construction compounds provided along the length of the line

and HGV, trucks and cars will access these to deliver and collect materials, and for staff access. The increase in traffic from construction vehicles accessing work sites or compounds is predicted to be less than 10% for all compounds / access locations.

Bridge closures will have greater impact on traffic. The closure of the Le Fanu Road Bridge is anticipated to result in significant congestion on the immediate road network to the bridge. Temporary signals are recommended at Kylemore Avenue - Kylemore Road junction and Kylemore Road - Kylemore Park North junction.

The closure of the Kylemore Road Bridge is also anticipated to result in significant congestion on the road network immediately proximate to the bridge. Temporary signals are recommended at Le Fanu Road - Kylemore Park North junction and Kylemore Road - Kylemore Park North junction. Also, reconstruction and re-opening of Le Fanu Road Bridge will be completed before works on the reconstruction of Kylemore Road Bridge can commence

The closure of the Memorial Road Bridge is anticipated to result in congestion on the road network in the immediate proximity of the bridge. It is anticipated that the closure will result in significant short-term delays (first few days) after which vehicles will avoid the area and reduce congestion for the remainder of the closure. Also Memorial Road will not be closed at the same time as either the South Circular Road main traffic diversion or with Sarsfield Road closures.

Mitigation measures will be required to reduce the impact on traffic during the construction phase. This will include construction traffic management and mobility management to manage both construction vehicles and workers and will be subject to agreement with the local authorities. Work on the railway line will take place where possible at night and on weekends to reduce the impact on all modes of transport especially during the peak periods.

Where road closures are required, alternative routes have been identified for all users and where possible, the facilities for pedestrians and cyclists will be reopened as quickly as possible to reduce the impact. Temporary footpaths will be provided where necessary.

As a result of the temporary road closures during construction, there will be an impact on some bus routes. Diversions for these routes will be agreed with the service providers. During the construction phase, it is considered likely that traffic will choose alternative routes and avoid those locations where construction is ongoing.

The construction staging has considered the principle of keeping 2 no. tracks in operation for the majority of the construction period where feasible to limit the impact on passenger rail services.

During operation the main effect anticipated is a shift from road traffic to public transport. Transport modelling carried out for the whole DART+ Programme shows a shift towards greater use of public transport along the rail line east and west of the M50 by 2028 and an even shift by 2043.

DART+ South West will increase train capacity by keeping the existing 12 trains per hour per direction and adding 11 more trains per hour per direction. This will increase the number of people that can take the DART from 5,000 passengers per hour per direction to approximately

20,000 passengers per hour per direction. The impact on passenger rail transport is considered to be long term, positive and significant.

There are no new roads proposed and no permanent interruptions e.g. road closures, arising from the operation of the proposed Project. A number of existing bridges are to be upgraded but the road traffic capacity of the network will be maintained / increased. The impact on road traffic is considered to be long term, positive and slight. Existing bus routes will not be impacted by the proposed Project in operational stage. All routes and bus lanes will be kept and there will be no requirement to re-locate bus stops. The proposed Project in the operational phase has no impact on the Luas network. The increased usage of DART services and increased passenger numbers at Heuston and Connolly Stations, both of which are served by Luas, can be expected to promote increased Luas ridership although there may be a slight shift from Luas toward DART for some passengers. The impact on Luas public transport is considered to be long term and negative, but so marginal as to be negligible.

The proposed Project provides additional walking / cycling facilities at 2 bridge crossings, Le Fanu Road Bridge and Kylemore Road Bridge. A walking / cycling route is to be provided to Heuston West Station. The impact on walking / cycling is considered to be long term, positive and slight in the wider study area. In the immediate vicinity of the train stations the impact will be long term, positive and significant.

The overall impact is considered to be positive and therefore no specific operational mitigation measures are required.

6.4. Residual Effects

The construction phase of the proposed Project has been developed to minimise the impact on rail, road, pedestrian and cyclist users in its vicinity. The roads required to be temporarily closed and their alternative diversion routes are already considered congested during the AM and PM peaks. The overall impact for each of the diversions is considered to be temporary but significant.

Following opening, the proposed Project will provide more frequent and better levels of service with greater capacity to cater for the additional demand provided for those within walking, cycling and public transport distance of the DART+ South West project, while also capturing those who travel from the wider catchment into the city. The overall impact is therefore considered to be positive.

Rail capacity and frequency of service will be enhanced. The impact on passenger rail transport is considered to be long term, positive and significant. The impact on vehicular traffic is considered to be long term, positive and slight. The impact on bus public transport is considered to be long term and neutral. The impact on Luas public transport is considered to be long term and negative but negligible.

7. Population

7.1. Introduction

The population assessment identifies and assesses the likely significant effects that the construction and operation phases of the proposed Project will have on the population. The assessment includes the examination of land use change; impact on journey characteristics and journey amenity; community infrastructure; severance; and economic activity, including tourism and employment. The assessment is informed by desktop studies, walkover surveys, and feedback from consultations. The criteria used to describe the potential population effects are in accordance with the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022). The study areas to inform the population assessment comprise:

- Land uses within 500m either side of the track and 1km from existing and proposed railway stations; and
- Demographic data based on the Electoral Divisions (EDs) pertaining to the proposed Project which is further informed by the relevant county level demographic data for Dublin City, South Dublin County and Kildare.

7.2. Receiving Environment

The proposed Project commences in Kildare, where the character of the area is suburban in nature, with agricultural or zoned greenfield sites present along both side of the rail corridor. It travels east toward Adamstown, Ronanstown and Ballyfermot which are well established suburban neighbourhoods with infill/brownfield development taking place in certain areas. It then travels through Dublin City which can be categorised as a high density established/developing urban, mixed-use area.

Population Density

The population density for Dublin City and South Dublin largely exceeds the population density for County Kildare. A large part of County Kildare is comprised of open countryside, primarily used for agricultural purposes, with clusters of residential development based around existing urban areas including Celbridge. South Dublin and Dublin City also have much higher densities than the State average. Within the Study Area, the population density increases towards the centre of Dublin. Increases occur within Kilmainham A, Inns Quay A, Arran Quay A and Ushers D as might be expected for EDs within the city centre location. Lower densities are typically seen in open space areas in the EDs of Donaghcumper, Newcastle and Phoenix Park and in some industrial areas along the route.

Land Use Change and Settlement Patterns

The study area can be split into three main existing land uses categorisations, comprising:

- CIÉ railway corridor and supporting infrastructure associated with the Great Southern & Western Railway (GSWR) lines running from Celbridge & Hazelhatch Station in

Kildare running into Dublin City centre through Heuston Station and northwards to Glasnevin;

- The developed urbanised areas of Dublin City and its suburbs, and the town of Celbridge; and
- Existing agricultural and/or greenfield sites, either zoned or un-zoned along the railway line located in South Dublin County and Kildare.

The three relevant development plans for Kildare 2017-2023, South Dublin 2022-2028 and Dublin City 2022-2028 provide a spatial and planning framework for land use and future settlement patterns along the railway corridor.

Journey Characteristics and Journey Amenity

According to the Central Statistics Office (CSO) for those in employment or students at either school or college, the state average for commuting by car is 37.2%. The average is higher in Kildare (41.5%) and gradually decreases towards the city centre where 35.7% of commuters travel by car in South Dublin and 20.4% in Dublin City. Dublin City has the highest average of commuters using public transport (14.2%), walking (16.4%) and cycling (6.2%). This is expected in the city centre where there is a range of public transport services including Dublin Bus services, Bus Éireann services, Luas, DART and other rail services, and well-established pedestrian and cycling infrastructure. The Electoral Division (ED) of Donaghcumper in County Kildare is the furthest ED from Dublin City with 46.1% of commuters travelling by car and only 1.4% by bicycle.

Community Infrastructure (including Local Services and Amenity)

There is a wide range of local services and amenities (social infrastructure) within the neighbouring communities along the railway corridor including: primary and secondary schools and other education facilities; creches and other childcare facilities; community and youth centres; sports clubs, playing pitches, public parks and other outdoor recreational facilities; hospitals, clinics, GPs, pharmacies and other healthcare services; Garda stations and other emergency services; and places of worship.

Economic Activity (including Tourism and Employment)

The key areas of employment within the Study Area are primarily focused around urban areas and are located in the more compacted counties of South Dublin and Dublin City including Clondalkin Industrial Estate, Park West Business Park, Park West Industrial Estate, CIÉ lands and Dublin City Centre. A total of 422,404 workers resided in Dublin City Centre and suburbs as recorded in April 2016 with Kildare being one of the top local authority administrative areas in which workers commute into Dublin City and suburbs. The average unemployment rate throughout the State was 11.5% in 2016. This is higher in Kildare at 13.1% and lower than both South Dublin (10.5%) and Dublin City (5.4%).

It was estimated by the Irish Tourism Industry Confederation that in 2019 approximately 265,000 people in Ireland were employed in the tourism and hospitality sector. In 2019, Dublin welcomed 6.6m overseas tourists, 1.8m domestic trips generating €2.4bn in revenue and supporting 65,000 jobs. Tourism displays is highly dependent on public transport for its

successful operation. Key tourist attractions within the study area include Guinness Storehouse; Phoenix Park and Dublin Zoo among others.

In the absence of the Project, it is anticipated that achievement of the National Planning Framework objectives for compact growth will be curtailed. Journey characteristics / amenity will continue to be sub-optimal, with existing train services becoming more overcrowded. Continued reliance on private car based journeys to access the city and surrounding areas will lead to continued and increased congestion of roads and the opportunities to move toward to more sustainable public transport options may be limited.

7.3. Potential Impacts and Mitigation Measures

The main population effects are influenced by the nature, location and characteristics of the works taking place during both the construction and operational phases. The key land use and population effects of the proposed Project are:

- Project-wide effects associated with the signalling, electrification and modifications required to the railway line as well as the impacts due to the temporary construction compounds;
- Construction of a new station at Heuston West; and
- Modifications / reconstruction of existing bridges, modifications to roads, modifications to walls and other structures.

Construction Phase Impacts

The project is a linear project taking place predominantly within the existing CIÉ boundary with localised construction works taking place outside of the boundary at various locations on private lands and/or public open spaces which can be located in proximity to residential areas. Many of the effects will be transient and dispersed during the construction period.

The assessment determined that the potential impacts that will occur during the construction phase throughout the study area include the following:

- Impacts on land use change and settlement patterns during the construction phase will be negative, direct, slight and temporary to short-term;
- Impacts on journey characteristics and journey amenity during construction will result in negative, slight, and temporary to short-term impacts close to construction sites and compounds from noise and dust nuisance and also in relation to footpath closures and diversions for pedestrian and cyclists, increasing to slight to moderate, temporary impact for rail users impacted by works such as closure of the Phoenix Park Tunnel (PPT) to facilitate works;
- The increase in traffic, day-time and night-time construction works on community infrastructure is negative, indirect, slight to moderate, temporary to short-term. Construction compounds may also have a negative, indirect, slight to moderate, temporary to short-term effect on these areas depending on the nature and duration of construction activities within and / or near the sites;

- There is potential for negative, slight, temporary to short-term impacts to businesses including tourism as a result of increased traffic, nuisance, noise particularly during night time works and general disruptions;
- The proposed Project will create direct skilled and unskilled jobs during the construction phase and is likely to have a positive, direct and indirect, moderate to significant, short-term effect on employment; and
- Local expenditure, hospitality and retail sales are also likely to increase due to expenditure from construction workers at these sites which is likely to be positive, direct and indirect, slight to moderate short-term effects to the local economy.

Inter-related construction impacts from traffic and transport (section 6), air quality (section 12) noise (section 14), and human health (section 21) are presented in the relevant sections of this NTS.

Operational Phase Impacts

The proposed Project aims to increase train capacity and will take the service from the current 12 trains per hour per direction to 23 trains per hour per direction. The potential impacts during the operational phase include the following:

- Positive, direct, significant, long-term impacts on rail passenger travel due to the increased frequency in train services;
- Positive, direct and indirect, moderate, long-term impacts on the overall economic activity of the region by providing enhanced reliable transport network;
- Positive, indirect, slight to moderate, long-term effect on the tourism sector and recreational resources within Dublin and the wider region;
- Positive, direct, moderate, long-term effect on the societal response required to combat unsustainable transport and travel patterns;
- Positive, indirect, moderate, long-term effect on the population due to the long-term investment in sustainable travel and infrastructure; and
- Positive, direct and indirect, moderate to significant, long-term effect on other roads users notably cyclists and pedestrians from improved surface road conditions at junctions and from improved cyclist and pedestrian infrastructure.

Overall, the proposed Project will support economic development and competitiveness of the region over the long-term.

A series of mitigation measures have been proposed in Chapter 7 in Volume 2 of this EIAR to avoid, reduce or remediate, wherever practicable significant negative effects on population for construction and operation phase of the proposed Project.

Construction Phase Mitigation

As a result of the assessment of construction works, the following mitigation measures are recommended:

- 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 and 17 Material Assets – Agricultural and Non-agricultural Properties; and Chapter 23 Human Health;
- A Construction Environmental Management Plan (CEMP) has been prepared as outlined in Volume 4, Appendix 5.1, and will be updated by the successful Main Contractor to address all environmental issues and mitigation including noise emissions from both machinery and noise from the workforce, dust minimisation, lighting spill on neighbouring residential areas at night-time, etc.;
- Construction traffic management will be developed and implemented by the Contractor(s) via a construction traffic management plan (CTMP) to address all modes of transport during the construction stage and will be agreed with the respective local authorities prior to the commencement of the construction phase. Construction traffic management will maximise the safety of the workforce and the public and to minimise traffic delays, disruption and maintain access to properties. It 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. The CTMP will be required to minimise disruption to economic amenities 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;
- A Mobility Management Plan (MMP) 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. Construction staff shall not be permitted to use the same station car parks for parking site vehicles where construction compounds are in situ;
- When railway services are planned to be disrupted for extended periods Iarnród Éireann will provide suitable bus transfer services to replace the services affected. Iarnród Éireann 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 will communicate alternative routes and appropriate signage including the proposed planned closure of station car parking spaces/access;
- The Contractor will appoint a Community Liaison Officer and will be required to develop and implement a Community Liaison Plan (CLP) prior to the construction phase;

- Iarnród Éireann will appoint a Community Engagement Manager, or equivalent, who will be consulted in the preparation of the Plan as well as its maintenance and implementation. The CEM 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; and
- 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.

Operational Phase Mitigation

As a result of the assessment of the operational phase of the Dart+ South West, the following mitigation measures are recommended:

- Design and maintain landscaping and public realm infrastructure to complement other environmental mitigation that promotes safety for all users;
- At detailed design stage the design team will continue to 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 public realm designs shall encourage passive security of public spaces and on transport infrastructure, e.g., through appropriate lighting, pleasant surroundings and design that discourages anti-social behaviour, graffiti, etc.;
- Planned works including maintenance of the railway infrastructure shall be communicated to neighbouring properties as part of the CIÉ notification procedures;
- Iarnród Éireann will continue to improve and enhance sustainable mobility measures to enable future capacity enhancements in a planned and co-ordinated manner; and
- All replacement and modifications to bridges and footbridges shall be designed to integrate with existing and future transport networks and promote sustainable mobility in line with government transport and climate policies.

No project specific monitoring is proposed in relation to the Population effects.

7.4. Residual Effects

After the implementation of mitigation measures during the construction and operation phases no significant negative effects will occur to the population. There is likely to significant positive residual and cumulative effects as a result of the proposed Project.

8. Biodiversity

8.1. Introduction

The biodiversity assessment identifies and assesses the likely significant effects that the construction and operation phases of the proposed Project will have on Biodiversity, i.e. habitats, species and designated sites. The process of identifying, analysing and evaluating the potential impacts of the proposed Project on the topic of Biodiversity, was undertaken in accordance with guidance on ecological and environmental survey and assessment. These guidelines informed the planning and conducting of field survey work, and the analysis and evaluation of the potential impacts of the proposed Project on Biodiversity.

8.2. Receiving Environment

The closest European site to the proposed Project is the Rye Water Valley/Carton SAC (site code 001398), located c. 2.9 km north of proposed Project. South Dublin Bay SAC (site code 000210), South Dublin Bay and River Tolka Estuary SPA (site code 004024), and North Dublin Bay SAC (site code 00020) are located c. 5.6 km, c. 5.6 km and c. 6.3 km east of the proposed Project, respectively.

Other internationally designated sites including the Dublin Bay UNESCO Biosphere Reserve and the Sandymount Strand/Tolka Estuary Wetland of International Importance (WII) have connectivity to the proposed Project. Several nationally designated sites also occur within the study area including the Royal Canal proposed Natural Heritage Area (pNHA), the South Dublin Bay pNHA and the North Dublin Bay pNHA

Important Ecological Features (IEFs) were identified from desk and field based studies. These are features of ecological significance at the local (higher level) scale or above and are a material consideration in the assessment process. IEF identified within the study area included: internationally designated sites; nationally designated sites; habitat types in the railway line ecological corridor, a number of watercourses, as well as bats, badger, and bird species. Each IEF was evaluated in terms of its conservation value on a geographical scale.

In the absence of the Project it is anticipated that the pressures and threats affecting biodiversity and the IEF within the study area would continue into the medium-term future.

8.3. Potential Impacts and Mitigation Measures

The key potential impact categories associated with the proposed Project include pollution to water, air, and soil, disturbance from noise, vibration, lighting, and human presence, biodiversity loss, fragmentation, and alteration and the spread of invasive alien species. The biodiversity impact assessment analysed the effect pathways and potential impacts of the proposed Project on IEF by completing an ecological valuation on the relevant impact categories. The unmitigated impacts were characterised in terms of their extent, magnitude, duration, frequency and timing, and reversibility thereby evaluating their significance on a geographical scale.

Various elements of the proposed Project will give rise to the pollution of water, air and/or soil including earthworks, building demolitions and construction of Heuston West Station. Disturbance during both construction and operation is largely associated with bats, birds and badgers. Habitat loss, fragmentation and alteration is expected where four tracking is proposed and land take is required to facilitate temporary construction compounds and permanent substation locations. The potential for the spread of invasive alien species has been considered during the construction phase as a result of the movement of machinery, materials and personnel.

The impact assessment determined that, in the absence of mitigation, the construction and operation of the proposed Project had the potential to have significant adverse effects on the identified IEFs. In light of this finding, appropriate mitigation measures were proposed, aimed at eliminating and/or minimising these effects. Mitigation measures proposed include IEF specific mitigation for both the construction and operational phases, in addition to general non-IEF mitigation.

A key mitigation is the appointment of both a Project Ecologist and Site Environmental Manager / Clerk of Works prior to commencement of construction.

Key IEF-specific mitigation measures include pollution prevention measures for watercourses, measures to prevent the spread of invasive alien plant species, air pollution management measures such as control of dust, alternative roosting and hibernation requirements for bats, habitat enhancement measures, timing of works so as to avoid the birds nesting season and pre-construction ecology surveys.

Key non-IEF mitigation measures include habitat protection and retention measures, pollution prevention measures for watercourses (i.e. for fish and white-clawed crayfish), species protection measures, timing of works to avoid the birds nesting season, and artificial light control measures.

8.4. Residual Effects

In the case of all IEF, it was found that any residual effects following the application of the proposed mitigation measures would not be significant at any geographical level. With the implementation of the proposed mitigation measures described in the EIAR, there will be no significant residual effects on biodiversity in the Zone of Influence.

9. Land and Soils

9.1. Introduction

The land and soils assessment considers the likely significant impacts with regards to land and soils associated with both the construction and operational phases of the proposed Project. 'Land' in the context of this chapter refers to the existing soil and geological characteristics of the receiving environment.

The assessment has been carried out in accordance with the Institute of Geologists of Ireland (IGI) Guidelines and the 2009 Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (commonly referred to as the NRA Guidelines). The study area for the assessment of land and soils extends outside of the proposed Project boundaries, to include a 1 kilometre (km) buffer zone, enabling an examination of potential impacts on the surrounding receiving environment.

Existing information such as Geological Survey Ireland (GSI) mapping and Ordnance Survey Ireland (OSi) geospatial data were used to inform an initial desktop study and to plan the ground investigations. Sources of historical information including geological maps, GSI borehole logs, and soil quality characteristics were established during the desktop study of the Project area. A comprehensive review of historic site investigation reports completed within the Iarnród Éireann rail corridor was also carried out.

Site-specific ground investigations (GI) were carried out along the full length of the proposed Project corridor between June 2021 and February 2022, at both trackside and off-track locations. The GI phase consisted of both non-intrusive geophysical surveys, in combination with extensive intrusive methods e.g. drilling of boreholes, dynamic probing and sampling, and trial pit excavations. The results of the GI works provide current, detailed site-specific information concerning soils and bedrock geology within the study area and has been utilised throughout this assessment.

9.2. Receiving Environment

The majority of the soils within the study area, particularly within the M50 Motorway are classified as 'Made Ground', reflecting the urban setting of much of the proposed Project. At its south-western extent the proposed Project route transverses a region of shallow poorly-drained soils.

Subsoils within the study area are mainly composed of urban ground, alluvium sediment, till derived from limestones and gravels derived from limestones. Isolated regions where bedrock is at or close to the surface i.e. no/shallow soils, are present within the western extent of the route including around Adamstown station. Alluvium deposits are mainly associated with the River Liffey and are present at Islandbridge (e.g. the Phoenix Park Tunnel). There are no karst features within the proposed Project boundary.

Review of historic Ground Investigation (GI) records in combination with environmental sampling and testing undertaken as part of the proposed Project GI works have identified a number of areas where ground contamination (of shallow soils) is likely present within the

proposed Project boundary. Elevated levels of contaminants e.g., hydrocarbons (typically associated with historic railway and industrial activity) were identified at Heuston Station and Inchicore Depot.

The Phoenix Park Geological Heritage Site is traversed by the proposed Project (via the Phoenix Park Tunnel) and is considered of high value on a local scale.

In the absence of the Project it is anticipated that the baseline condition of land and soils (soils and geology) will remain unaltered under such a scenario other than natural variation in these parameters with time.

9.3. Potential Impacts and Mitigation Measures

The majority of potential impacts are associated with the construction phase of the proposed Project, which involves significant civil engineering works including earthworks, excavations, construction of retaining structures, concrete piling and bridge reconstructions. Construction phase effects considered for the assessment of potential impacts to land and soils includes (i) Excavation and Removal of Soils, Subsoils and Bedrock, (ii) Erosion of Exposed Subsoils during Earthworks and Construction Activity, and (iii) Accidental Emissions and Release of Potentially Hazardous Substances.

Large-scale and widespread excavation and removal of topsoil, subsoil and bedrock throughout the proposed Project area will result in a permanent loss of soil resource within the study area. Excavations include at top or base of cut slopes, around bridge abutments, and significant volumes of material are to be removed via the piling rigs during installation of bored piled walls. The majority of material to be removed will be from within the pre-existing rail corridor i.e., there is no significant land-take required, and soils to be removed originate predominantly from brownfield, highly developed areas. The effect of this loss of soil resources is considered of moderate adverse significance without mitigation.

Potential exists for erosion of soils due to the linear nature of the project, extensive areas being excavated and proposed significant stockpiling of material. In addition, prolonged haulage and tracked machinery movements are planned within, or adjacent to, the various worksites or compounds. The effect has been assessed to be of slight adverse significance without mitigation.

Accidental spillages of fuels, chemicals or other contaminants during construction works may result in localised contamination of soils/subsoils underlying the site, if materials are not stored and used in an environmentally safe manner. For example, there is potential for accidental spillage of diesel fuel and/or hydraulic oil from on-site machinery during the construction phase. The significance of a fuel release or similar is considered of moderate adverse significance without mitigation.

A number of construction phase mitigation measures have been proposed to manage and reduce the effect of these potential impacts. These include mitigation by design, a core strategy of the Project, which will limit the volume of soils to be removed from the site, retaining excess material to retain and recycle within the works where possible.

To reduce potential erosion and runoff impacts mitigation measures include the installation of drainage and runoff controls prior to start of site clearance/earthworks, sequencing of works in order to minimise areas of exposed ground, and establishment of vegetation/landscaping as soon as practicable following reinstatement.

A Construction and Environmental Management Plan (CEMP) has been prepared as part of this EIA and is presented in Volume 4, Appendix 5.1. This includes all of the mitigation proposed in the EIA and will be updated by the the appointed Main Contractor. The CEMP will set out the Contractor's overall management and administration of the construction project including management of construction and demolition waste, sediment and erosion control and general site housekeeping.

9.4. Residual Effects

During the construction phase, the magnitude of impact from excavation and removal of soils, subsoils and bedrock is considered to be moderate, and therefore the effect will be of moderate adverse significance. Through the implementation of a range of mitigation measures the magnitude of impact will be reduced to small, reducing the significance to slight adverse, which is not considered significant in EIA terms.

10. Water (including Hydrology and Flood Risk)

10.1. Introduction

The hydrological assessment identifies and assesses the likely significant effects that the construction and operation phases of the proposed Project will have on the water environment including hydrology and flood risk. The assessment includes a review of published literature available and web-based search for relevant material. Site-specific information and aerial photography has been reviewed to locate any potential features of interest, and these have been investigated during field survey. The primary study area includes lands within 250m of the proposed Project. Consideration is also given to the surface waterbodies that potentially interact with the study area, this includes the Royal Canal, the River Liffey and its tributaries.

The assessment has been undertaken following guidance and criteria outlined in the ‘Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes’ (NRA, 2009) and the ‘Guidelines on the Information to be contained in Environmental Impact Assessment Reports’ (EPA, 2022). Surveys and modelling were undertaken to inform the assessment.

10.2. Receiving Environment

The proposed Project is located within the lower section of the River Liffey catchment (closer to the sea) and crosses seven (7 no.) sub-catchments: Hazelhatch Stream; Shinkeen Stream; Coneyburrow Stream; Lucan Stream; Griffeen River; Blackditch Stream; and River Camac, which is culverted or piped beneath Heuston Station. The River Liffey catchment drains an area of approximately 1340.5 km² from the Wicklow & Dublin Mountains releasing into the Irish Sea.

The key pressures within these sub-catchments as identified in the 3rd cycle of the draft River Basin Management Plan are diverse and include agriculture, urban runoff and wastewater, hydromorphology and industry. The status of the watercourses as reported under the 3rd cycle draft RBMP range from Poor (Camac) to Moderate (Lucan Stream and Griffeen) and Good (e.g. Hazelhatch, Coneyburrow and Liffey). The Shinkeen and Blackditch Streams are both currently unassigned. The Royal Canal, an artificial waterbody, is located between Heuston Station and Glasnevin Junction and has previously achieved “Good Ecological Potential”.⁶

Zone A was identified as at risk from fluvial (river) flooding particularly at Hazelhatch and Adamstown. Zone B was not identified as at risk from fluvial (river) flooding but was considered at risk from pluvial (rainfall) flooding. Zone C was noted as at risk from fluvial (river) flooding associated with the Camac River and Zone D was identified as at risk from extreme rainfall events associated with the Royal Canal if coupled with any blockages at the

⁶ The risk status is currently under review for the 3rd WFD cycle but for all monitoring periods up to the present (recorded “Good Ecological Potential”).

downstream lock gates. In such as case flood water would overtop this embankment and cause flooding on to the surrounding lands and railway tracks.

In the absence of the Project, the current hydrological regime within the study area is not expected to change significantly.

10.3. Potential Impacts and Mitigation Measures

Flood Risk: Increased Flood Risk during construction stage may result from:

- Potential floods at Hazelhatch Station and along the railway between the Royal Canal and LUAS Twin Arch Bridge and the Maynooth Line Twin Arch Bridge leading to flooding to the tracks and construction works areas;
- Blockage to overland flow paths;
- Flooding adjacent lands and properties from inadequately sized flow diversion channels and over pumping equipment;
- Increased runoff from temporary paved surfaces or roofed areas of site compounds;
- Altered runoff or flooding flow paths from temporary bunding or material stockpiles; and
- Increased rate of discharge runoff in large areas stripped of vegetation.

Flood events during the construction phase have the potential to have a negative, temporary, moderate to significant impact on hydrological receptors.

During operational phase, the widening and lowering of the tracks can alter the surface water drainage and flood relief measures for the proposed Project. This may result in:

- An increase in flood levels along the track due to ponding;
- The amount of runoff can increase as a greater area is hardstanding, and without attenuation, there will be an increase in the rate at which runoff reaches the receiving water bodies; and
- Widening of tracks into a potential floodplain area can reduce the available flood storage and have impacts locally as well upstream and downstream.

The project specific flood risk assessment found that the vast majority of the proposed Project is located in Flood Zone C where the probability of flooding from rivers and the sea is low. Hydraulic models were built to investigate flooding at Hazelhatch, Adamstown and Heuston Station. Overall, with the proposed control actions and mitigation measures in place the size of the impact is deemed to be slight to moderate.

Potable Water: Construction activities could lead to increased runoff of pollutants entering the Coneyburrow Stream which is a protected drinking water stream which feeds the Leixlip Reservoir and subsequently the Leixlip water treatment plant. Additional strain on the WTP during construction has potential to have a negative, temporary, slight to moderate impact.

While the status of the Coneyburrow Stream is noted as being Poor, operational activities are unlikely to alter the existing drainage from the railway that could enter the stream. These events have the potential to have a negative, temporary, imperceptible impact.

Water Quality: Construction activities within or adjacent to watercourses can cause contaminated surface water runoff to enter them thus potentially impacting the water quality of the watercourses. Such activities could include earthworks, sheet piling, concreting, fuel/lubricant spillages, pollution from human and nonhuman waste materials and temporary watercourse diversions. In the absence of mitigation measures, the potential impact is negative, temporary, moderate to significant.

For the longer term operation of the proposed Project, a surface water strategy has been designed which either maintains existing drainage networks or includes mitigation measures to improve surface water treatment for runoff from the railway. Runoff treatment measures include attenuation tanks which will limit the potential for impacts to the water quality and has the potential to have a positive, long term, not significant to slight impact. Stormwater, foul and combined sewer diversions are required in several locations (Le Fanu Bridge, Inchicore Works, Blackhorse Avenue Bridge, Cabra Road Bridge). These works will be designed and constructed using Irish Water Standards, with little risk to the water environment.

The proposed Project will have negligible impact on waterbody status.

During the construction stage, mitigation measures proposed to mitigate the potential for sediment or other pollutants to enter watercourses and drainage systems are based on the CIRIA Guideline Document C532 Control of Water Pollution from Construction Sites (CIRIA, 2001) and Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016), which the contractor shall be required to adhere to during the construction phase. During the operational stage the designed in measures included as part of the drainage strategy and infrastructure for the proposed Project will limit the risk to watercourses and the hydrological environment from flooding and runoff contamination.

To manage potential future flood risk along the railway track and at Hazelhatch and Heuston stations during operation, Iarnród Éireann will follow and implement its flood risk management operational procedures which assist in managing flood risk for rolling stock during inclement weather and flooding events. These procedures specify how Iarnród Éireann monitors and disseminates weather warning from Met Éireann; prepares and implements local weather management; sets out recommended flood level limits for their rolling stock passing over flooded tracks; and sets out actions when high water alerts are issued.

Water quality monitoring will be undertaken in the Royal Canal and all watercourses within the Study Area.

10.4. Residual Effects

During the construction and operational stages the drainage strategies, mitigation measures and proposed infrastructure will limit the water quality and flooding risks to watercourses and the hydrological environment from flooding and runoff contamination. Therefore any residual effects will be a limited to negative, slight and temporary.

11. Hydrogeology

11.1. Introduction

The hydrogeology (groundwater) assessment considers the likely significant effects of the construction and operational phase for the proposed Project with regards to the existing hydrogeological environment. The assessment has been completed in accordance with relevant EU and National legislation and guidelines including the Institute of Geologists of Ireland (IGI) 2013 Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

The study area relevant to consideration of hydrogeology extends outside of the proposed Project boundary to include a 250m buffer zone from the centre of the rail corridor, within the wider groundwater catchment area in which the site is located.

The primary hydrogeological features considered within this assessment include public groundwater supplies (e.g. Source Protection Areas) and private groundwater supplies (e.g. private abstraction wells), significant natural groundwater wells and springs, bedrock and gravel aquifers and Water Framework Directive groundwater bodies. In addition, potential effects on groundwater dependent habitats and the potential for groundwater related flooding have been assessed. Hydrogeologic characteristics within the study area have been identified through both desk-based review of available data sources (e.g., EPA maps and datasets) and from the site-specific Ground Investigation (GI) undertaken between June 2021 and February 2022.

11.2. Receiving Environment

The entire route of the proposed Project is underlain by the Dublin Groundwater Body (GWB), a poorly productive bedrock aquifer, extending over a wide area spanning much of Dublin City and County. The area of this GWB beneath Dublin City will have different recharge processes (i.e. when water moves from the surface to the ground to refill underground aquifers) than rural/greenfield areas as urban areas are considered to act as an impermeable (water resistant) surface overlying aquifers present, significantly limiting available recharge. The Dublin GWB is nutrient sensitive and flows are generally towards the River Liffey and Liffey Estuary, both of which are surface waters in nutrient sensitive areas. The Dublin GWB is currently of 'Good' Water Framework Directive Status (WFD), based on the 2013 – 2018 monitoring round.

Zone A of the proposed Project, to the west between Hazelhatch & Celbridge Station and the M50, traverses' regions of High and Extreme groundwater vulnerability classifications with bedrock at or close to the surface in some areas. The eastern portion of the proposed Project (Zones C and D) generally traverses regions of Low to Moderate groundwater vulnerability.

Based upon recent site-specific data from the GI, groundwater seepage was most frequently observed in the Dublin Boulder Clay (Zones B, C and D) at depths of between 4.1 and 13.8 metres below ground level. Groundwater levels within the study area, reported as part of the GI, ranged from 2.05 to 9.45 metres below ground level.

One gravel aquifer has been identified within the study area (Zones C and D), the Liffey, extending east from Islandbridge to the coast, over an area of seven (7) square kilometres (km²). This aquifer is classified as a locally important gravel aquifer. The underlying Lucan Formation is classified as a Locally Important bedrock aquifer which is moderately productive only in local zones.

Review of Geological Survey Ireland (GSI) database records identified two historic mapped groundwater wells within the study area of the proposed Project. There are no GSI listed Public Supply Source Protection Areas or Group Scheme Preliminary Source Protection Areas in the vicinity of the study area. There is some limited potential for private wells to exist within the study area which are not listed by the GSI.

No areas of historic groundwater flooding have been identified within the study area boundary based upon review of the GSI's historic flood maps. The nearest identified historic groundwater flooding location to the study area was west of Hazelhatch & Celbridge Station (Zone A), with localised groundwater flooding recorded during winter of 2015/2016.

In the absence of the Project, baseline condition of hydrogeology will remain unaltered other than natural variation in these parameters with time.

11.3. Potential Impacts and Mitigation Measures

The primary construction phase works which may have potential temporary impacts on hydrogeology include significant earthworks and excavations e.g. at top or base of cut slopes and for topsoil stripping; track drainage works and upgrades including three new underground tanks; excavations required for track lowering and widening through the four-tracking section of the proposed Project; and significant sections of bored piled walls with piling rigs, soil nailing and retaining walls. The construction activities have the potential to affect hydrogeology through:

- Infiltration of Surface Water Runoff - Surface water run-off containing large amounts of silt could migrate into the groundwater which can cause significant pollution of water through the generation of suspended solids. This runoff also has the potential to pick up additional contaminants. The size of impact from this is considered to be negligible and the effects upon groundwater receptors will be of imperceptible significance;
- Permanent Alteration to Groundwater Levels and Flows - Groundwater pumping/dewatering particularly in deeper excavations and new bridge construction works have the potential to impact groundwater levels and flows, for example pumping may generate localised drawdown effects. The size of the impact from permanent alteration of groundwater levels/flows is considered to be negligible, with the likely effects assessed as imperceptible significance; and
- Accidental Emissions and Release of Potentially Hazardous Substances - Accidental spillages of fuels, chemicals or other contaminants during construction works may

result in localised contamination of groundwater (via migration through soil). This includes the disturbance of areas of potential soil contamination. A potential release could lead to reduced groundwater quality, however the existing low permeability subsoil is likely to reduce the size of any localised impacts. The identified bedrock and gravel aquifers may have some value in the local area for private abstraction purposes and therefore, are somewhat susceptible to potential contamination. The effect upon locally important aquifers has been assessed as of Slight significance.

A Construction Environmental Management Plan (CEMP) has been prepared and is included in Volume 4, Appendix 5.1 of this EIAR. The CEMP includes the mitigation measures from the EIAR and will be implemented by the appointed Contractor. The CEMP is intended to be a live document which will be updated by the appointed contractor throughout the pre-construction and construction stages to ensure delivery of all commitments in the EIAR including those identified as part of any statutory approvals.

The best practice measures and the site-specific mitigation measures as they relate to hydrogeology include good site housekeeping, good material management planning to prevent run-off of suspended solids following excavations, stockpiling, etc.; implementation of height restrictions on stockpiles to reduce run-off risk, control of dewatering or pumping rates to limit the volumes removed and the impacts on receiving drainage network and no extracted or pumped groundwater discharge directly to surface waters. Accidental emissions and hazardous materials will be stored in bunded areas with spill kits and an emergency response plan in place.

No operational phase mitigation measures are proposed beyond those contained within the existing Iarnród Éireann Environmental Management Policies and Processes. No specific monitoring is proposed. The CEMP will include a schedule of environmental audits throughout the construction period.

11.4. Residual Effects

The significance of all identified potential impacts to hydrogeology within the study area will be reduced to imperceptible with the implementation of the mitigation measures.

12. Air Quality

12.1. Introduction

This assessment considers the potential air quality impacts as a result of emissions to air associated with the construction and operational phases of the proposed Project. The assessment involved a review of available published data, a review of applicable guidelines, air quality monitoring at sensitive locations along the proposed Project and calculations to assess air quality impacts that may occur as a result of the proposed Project.

The statutory ambient air quality standards in Ireland are outlined in S.I. No. 180 of 2011 Air Quality Standards Regulations 2011 (hereafter referred to as the Air Quality Regulations), which incorporate the ambient air quality limits set out in Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (hereafter referred to as the CAFE Directive), for a range of air pollutants. National and European Union air quality standards are set for the protection of human and ecological health.

For the proposed Project, the main air emissions of concern are PM₁₀, PM_{2.5} and NO₂ concentrations, reflective of the road and rail transport related emissions and construction dust emissions as these pollutants are most likely to exceed limit values.

12.2. Receiving Environment

As part of the implementation of the Air Quality Standards Regulations 2011, Ireland has designated four air quality zones (Zones A-D) in Ireland for the purpose of air quality management and assessment. The proposed Project is located within air quality Zone A (Dublin conurbation) and air quality Zone C (large towns including Celbridge).

The baseline ambient air quality environment has been characterised through a desk study of publicly available published data sources and baseline ambient monitoring surveys undertaken in the area. This included air quality monitoring programmes operated by both the EPA and Local Authorities in the Dublin region; the EPA Annual Air Quality in Ireland Reporting; the EPA 2020 Nitrogen Dioxide levels in Dublin Report; the Clear Air Together Project led by the EPA and the Environmental Education Unit of An Taisce; relevant monitoring data from other transport projects in the Dublin Area (DART+ West, MetroLink and BusConnects). All of this information has also been collated and used to inform the spatial baseline trends in the area.

Results for levels of nitrogen dioxide (NO₂) from EPA continuous monitoring stations show that the concentration at the city centre location represented by St. John's Road, near Heuston Station, were in exceedance of the limits for 2018 / 2019 and these high levels are largely associated with the levels of road traffic and congestion in the area. Results at other monitoring stations close to the proposed Project at Davitt Road and Ballyfermot were found to be in compliance with the statutory limit and are lower than St. John's Road given the more suburban nature of these locations, however all levels recorded were above the WHO Guidelines. This was broadly supported by other studies carried out in the area.

Continuous particulate monitoring (PM₁₀ and PM_{2.5}) is carried out by the EPA at St. John's Road, Davitt Road and Ballyfermot. The PM₁₀ data shows levels in the range of 10-19µg/m³ with an average of 14µg/m³. These levels are largely stable in recent years and while well below the limit for the protection of human health, levels fluctuate above and below the WHO Guideline in the period 2015 to 2019. Similarly, PM_{2.5} data is largely stable, well below the limit but in this case consistently above the WHO Guideline. A number of locations were also identified as high sensitivity to dust soiling based on the nature of the work proposed and the number and proximity of sensitive receptors. The receptors adjacent to bridge replacements / upgrades in particular were noted.

In the absence of the Project, it is considered that there is a broad mix of EU and national policy and legislation directed at reducing transport, industrial and space heating emissions to improve air quality. It is expected that national and ambient levels of air quality pollutants will decrease in future years with the successful implementation of the above policy and regulation.

12.3. Potential Impacts and Mitigation Measures

As part of the construction phase of the proposed Project, three major bridge demolition and reconstructions are planned at Le Fanu Road Bridge, Kylemore Road Bridge and Memorial Road Bridge. This will result in the temporary closure of these roads and the need for diversions and traffic management with potential impact on emissions and the total vehicular emissions on the road network. The results indicate that emissions from road traffic on the surrounding road network will increase but the impact is minimal over the existing traffic emissions and increases range from imperceptible to small but remaining well below the limit value results in a 'negligible' impact.

There are also potential emissions from construction traffic delivering personnel and materials to each of the works' areas. Construction traffic for all work areas shows an increase in localised air pollution ranging from 'imperceptible' in the areas where construction traffic need is lower (Hazelhatch and Heuston West) to 'small' for the more intense work areas. The impacts associated with construction phase dust emissions are considered short term 'slight adverse' impacts.

To reduce dust nuisance, a series of measures will be implemented including:

- An air quality management plan shall be prepared by the appointed main contractor to deliver the appropriate dust and emissions mitigation measures, applicable to the specific circumstances along the corridor, based on the mitigation in this EIAR, any planning conditions and local authority requirements as well as industry best practice;
- 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;
- Liaison with local authorities and community groups will be ongoing throughout the pre-construction and construction phase; and

- Hoarding will be provided around the construction compounds.

With the proposed Project in place, electrical units will be able to operate providing additional services for commuters. It will also allow for an increase in diesel units increasing intercity services on the rail line. While tailpipe emissions are very low from the electric trains the analysis shows that with increased diesel units on the proposed rail network there will be a corresponding increase in rail emissions and properties adjacent to the rail network may experience a resultant increase in exposure from these additional diesel emissions.

In terms of road traffic changes during the operation phase, there are no station car parks, level crossings, depots or other infrastructure that will significantly alter the traffic patterns and natural growth on the road network.

There is also potential for positive impacts if the proposed increase in rail services results in a meaningful modal shift from road traffic to rail traffic. Road transport is one of the principal sources of emissions to atmosphere for pollutants such as NO_x. Reducing the number of car kilometres travelled through modal shift will reduce emissions from road transport.

No mitigation measures will be required during the operational phase as all ambient air pollutant levels are predicted to comply with air quality standards. The assessment identifies a generally neutral, long-term and not significant effects on air quality as a result of the proposed Project.

12.4. Residual Effects

Overall, it is considered that the residual effects relating to construction phase traffic emissions are *short-term* and *not significant*. Once the dust mitigation measures are implemented there will be no residual construction phase dust impacts.

Despite the introduction of electric trains, diesel trains will remain on the line and numbers of diesel trains will increase on Do Nothing numbers. Ireland has exceeded its emission ceilings for NO_x by 50% in 2019 and has exceeded the ceiling for all years since 2010 and the small increase in rail emissions associated with the proposed Project must be viewed in this regard. Residual positive impacts are also possible where the proposed increase in rail services results in a meaningful modal shift from road traffic to rail traffic. Reducing the number of car kilometres travelled through modal shift will reduce emissions from road transport. The scale of any modal shift may not be fully quantified but even a moderate modal shift from road to rail transport on the proposed Project may result in a long term indirect slight positive impact for air quality.

13. Climate

13.1. Introduction

This assessment considers the potential climate impacts associated with the proposed Project. Climate is defined as the average weather over a period of time. Climate change is a significant change to the average weather, and while climate change is a natural phenomenon, human activities in recent years have negatively impacted on the climate, through the release of greenhouse gases. The assessment involved a review of greenhouse gas emissions, a review of applicable guidelines and predictive calculations to assess climate impacts. The proposed Project was also assessed in terms of its vulnerability to climate change.

13.2. Receiving Environment

The EPA published the provisional 1990-2021 GHG inventory in July 2022 and the provisional national GHG emissions are estimated to be 61.53 million tonnes carbon dioxide equivalent (Mt CO₂eq). Transport accounted for 18% of national emissions, second only to agriculture (38%). Of the transport emissions, rail only accounts for approximately 1% of national transport emissions while road transport accounts for approximately 94%. The EPA publishes GHG emission projections to 2030 and has predicted that Ireland will not achieve its legally binding climate target of 51% reduction by 2030 unless additional measures are implemented nationally, including in the transport sector.

In addition to the proposed Project's impact on climate change, the vulnerability of the proposed Project to climate change has also been considered. Vulnerabilities include increases in temperatures, increases in the number of rainfall days per year, more intense storms and rainfall events and increased likelihood and extent of river and coastal flooding.

In the absence of the Project it is anticipated that the existing railway line will continue to operate, albeit with the constraints on capacity and frequency in the short to medium term curtailing modal shift from private car to public transport use. The potential GHG reductions with regard to modal shift from road traffic to rail traffic will not occur and achievement of climate targets may be curtailed as a result.

13.3. Potential Impacts and Mitigation Measures

The impacts assessed during the construction phase included emissions from activities such as site clearance, embodied carbon from construction materials and their transport, waste materials and excavation works (where required), water and fuel usage. The results indicate that the total GHG emissions generated as a result of the construction of the proposed Project are equivalent to an annualised total of 0.017% of Ireland's 2030 target under non-emissions trading scheme (ETS).

Construction traffic has also been assessed particularly for the three significant bridge reconstructions at Le Fanu, Kylemore and Memorial Road. The results indicate that emissions on the surrounding road network will increase but the impact is minimal (circa 1-2%) over the

existing traffic emissions. The climate impact as a result of diversions is considered to be a short term 'slight adverse' impact.

Fossil fuel powered trains have the potential to have direct GHG emissions. The proposed Project will introduce electrification to the rail line between Hazelhatch & Celbridge Station, and Heuston Station and on to Glasnevin Junction and this will see a shift towards electric multiple units (EMUs). The electric units will have no localised tailpipe emissions. However diesel multiple units (DMUs) i.e. current intercity trains, will remain on the line and will increase in number and unlike the electric units, diesel units do have localised tailpipe emissions. The increase in the rail numbers (in particular the DMU increase) will lead to an overall net increase of 72% in GHG emissions relative to the Do Nothing scenario. While this increase is very low nationally, given the ongoing challenge for the State to meet climate targets any increase is considered negative and are predicted to be overall slight adverse in the long term.

In terms of road traffic changes during the operation phase, there are no station car parks, level crossings, depots or other infrastructure that will significantly alter the traffic patterns and natural growth on the road network. There is potential for indirect positive impact to climate from modal shift from road traffic to rail traffic. Road transport is one of the principal sources of GHG emissions in Ireland and reducing the number of car kilometres travelled through modal shift will reduce emissions from road transport. This may result in a long term indirect slight positive impact for air quality. As noted in the Water chapter, there is also potential for increased flood risk to the tracks and surrounding area.

Climate mitigation measures to be implemented during the construction phase will relate to purchase of materials and services with lower embodied/embedded emissions; optimisation cut/fill balance; regular scheduled maintenance of construction plant machinery; use of hydrogen generators or electrified plant over traditional diesel generators and mobility strategy will be prepared to reduce the need for private vehicles to get to site. In addition to changing the rail corridor to facilitate a shift to electric trains, further mitigation through the improvements in fuel efficiency for the remaining diesel trains shall be implemented including timetable optimisation and driver training; consumption telematics for older rolling stock and matching of train sizes to customer demand; and continued fuel efficiency programs in progress / on-trial by Iarnród Éireann such as use of fuel additive to increase fuel efficiency and replacement of diesel vans with electric road vehicles supported by charging points at depots and stations.

The Iarnród Éireann Sustainability Strategy 2021-2030 (Iarnród Éireann 2021) will be implemented to ensure reduction in the carbon footprint through measures such as relevant ISO and national NSAI energy and environmental standards; recycling of 70% of all wastes; and implementation of efficiency programmes for waste and water management and green procurement.

13.4. Residual Effects

The overall residual effect of the proposed Project is considered 'slight adverse' in the long term as a result on the ongoing / increased use of diesel trains on the line.

14. Noise and Vibration

14.1. Introduction

An assessment has been made of the noise and vibration impacts relating to the proposed DART+ South West project. The assessment focused on the existing noise and vibration environment in the vicinity of the proposed Project; the identification of appropriate noise and vibration criteria for the assessment; prediction and assessment of the likely noise and vibration impacts and identification of noise mitigation measures.

Impacts arising from rail noise on the proposed alignment once operational as well as noise emissions during construction have been considered. The assessment of construction noise considers noise sensitive locations up to 250m from construction noise sources. The sources of noise associated with the operation of the railway line have also considered noise sensitive locations within 250m of the railway line.

14.2. Receiving Environment

The existing environment through which the rail line passes is predominately urban to semi urban in nature. The existing line serves a frequent intercity, regional and sub-urban rail service. Noise and vibration from the existing operational rail line forms part of the existing environment at the nearest residential properties.

Baseline noise measurements were undertaken at 18 no. locations. Measurements consisted of unattended measurements over a period of 24-hours. The noise levels measured were found to be typical of the environment under assessment, with passing trains contributing to the overall baseline noise levels in addition to road traffic, local estate traffic, industrial sources and activities within residential gardens.

Attended ground vibration measurements were measured at three key locations including a variety of train types and speeds along with transmission characteristics at the sites. For two of the areas, horizontal and vertical measurement were monitored simultaneously. Low levels of vibration were measured and the vibration levels were found to be within guidance of acceptable levels of continuous vibration for humans.

In the absence of the Project it is anticipated that there would be continued use of diesel fuelled units only as no electrification infrastructure exists. The frequency of services and speeds on the line may be altered, as it has been historically, to accommodate the constraint of the two tracks. This change in frequency and operation would be anticipated to give rise to an increase in railway noise levels. A requirement for additional maintenance of the tracks due to wear and tear would also be anticipated, including night-time works.

14.3. Potential Impacts and Mitigation Measures

Short-term increases in noise impacts will occur during the construction phase of the proposed Project due to the requirement to use heavy plant and machinery during both daytime and night-time hours. There is potential for significant noise impacts to occur during activities such as site clearance, ground investigations, earthworks, piling and wall / soil anchoring as well as

track lowering and bridge construction. A range of mitigation measures will be implemented during construction works to mitigate the noise impacts. This includes provision of temporary noise barriers and screens, phasing of works to minimise noise or decrease the time where significant noise impacts are occurring, engagement with the local community to inform them of activities in advance and good site management of machinery and equipment in line with good practice. However, in some instances it may not be possible to fully mitigate the noise impact and where this occurs, property specific measures will be discussed with the impacted residents.

There is potential for short-term moderate vibration impacts during piling and ground / soil anchoring works. Prior to carrying out such activities suitable warning and explanation shall be given to residents. Condition surveys shall be carried out in advance of these works also.

During the operational phase the key noise and vibration impacts associated with the proposed project are increased rail traffic; fixed plant items; and PA announcements associated with the new Heuston West Station. The proposed DART+ South West Project will result in electrification of the northern tracks. Diesel commuter trains will be replaced with electric DART trains and the frequency of service significantly increased. Increased Intercity capacity and freight traffic will operate on the dedicated non-electrified lines. Peak hour passenger capacity will increase and the number and length (number of carriages) of the trains will increase along with the speed of the service to achieve this. This will result in an increase in cumulative daytime and night-time noise resulting in a significant impact at noise sensitive locations adjacent to the proposed Project. Although there will be an increase in the cumulative noise levels, the introduction of EMUs will not increase the peak noise level experienced at noise sensitive locations when trains pass by.

Mitigation measures have been identified and include installation of noise barriers and in some limited cases noise insulation. The proposed Heuston West station will be provided with PA systems. The design will ensure that PA announcements do not result in extraneous noise outside the station boundary.

There will be no significant vibration arising from the proposed Project in the operational phase and no mitigation measures are proposed.

14.4. Residual Effects

During the construction phase of the proposed Project, there is potential for very significant and profound negative residual effects at a small number of locations. These are likely to be brief at some locations but short-term at other locations and typically are related to piling works.

During the operational phase, mitigation measures reduce the overall impact of the proposed Project. However, a limited number of properties will experience a residual noise impact as a result of the proposed Project, however this will be of low impact. Four noise sensitive locations were identified as having a significant, negative, long term residual effect. For these in the absence of an engineering solution to mitigate the noise impact, noise insulation, or the reasonable costs thereof, will be offered to eligible owners.



The residual impact of vibration during construction will be negative, slight to moderate and brief to temporary depending on location. There will be no significant vibration effect arising from the proposed Project in the operational phase. The residual effects are negative, not significant, and long-term.

15. Landscape and Visual

15.1. Introduction

An assessment has been made of the landscape and visual impacts of the proposed Dart + South West Project. This assessment methodology has been informed by a range of guidance documents specific to landscape and visual assessment from both TII and the Landscape Institute.

The assessment has also been informed by desktop study with particular consideration given to the County Development Plans for the three Local Authority jurisdictions the proposed Project crosses – Kildare, South Dublin and Dublin City. Field survey work was undertaken to inform the baseline and assessment.

15.2. Receiving Environment

The landscape surrounding the railway corridor is subdivided into nine Local Landscape Character Areas (LLCAs) as described below.

Local Landscape Character Area 1 (LLCA 1) – Hazelhatch to Adamstown

The existing railway line passes through a rural farmed landscape featuring mature hedgerows. Minor roads cross the landscape and the railway line, featuring bridges, and are usually lined with mature hedgerows. The settlement of Hazelhatch is located adjacent to the railway line and the station of the same name. The Grand Canal crosses this landscape running broadly parallel and south of the existing railway line and is a designated Area of High Amenity in the Kildare County Development Plan.

Local Landscape Character Area 2 (LLCA 2) – Adamstown to Clondalkin

This landscape comprises a mixture of built up residential areas of Adamstown and Ronanstown located north of the railway line and a rural farmed landscape south of the railway line with a field pattern bounded by mature hedgerows. Three existing stations are located along the railway line at Adamstown, Kishoge (currently not operating) and Clondalkin / Fonthill. The Griffeen Valley linear park is located immediately east of Adamstown and extends close to the existing rail line at Adamstown Avenue. The Grand Canal crosses the landscape, south of the railway line, following an east west direction and is lined with mature hedgerow vegetation.

Local Landscape Character Area 3A (LLCA 3A) – Clondalkin to Inchicore Residential Area

This landscape comprises the residential built up areas of Cherry Orchard and Ballyfermot. These built up areas are interspersed with public open spaces of varying size. Street tree planting features in some of the residential areas and within the public open spaces. The railway line is primarily in a cutting and passes underneath 3 existing road bridges at Parkwest Avenue, Le Fanu Road and Kylemore Road. It also passes beneath the Khyber Pass pedestrian bridge.

Local Landscape Character Area 3B (LLCA 3B) – Clondalkin to Inchicore Industrial and Commercial Area

This landscape is almost entirely comprised of the built up industrial estates in the vicinity of Clondalkin, Fox and Geese, Bluebell and Kylemore. The M50 Motorway crosses this landscape and the railway line at the western end of this industrialised landscape which also features some residential built up areas in the vicinity of Park West. The Grand Canal extends from west to east broadly parallel and south of the railway line with existing Industrial estates located between this canal and the railway line. The Inchicore Depot occupies an extensive area of land located to the east of Kylemore Road Bridge south of the railway line. The Grand Canal is a designated Landscape Conservation Area in the Dublin City Development Plan.

Local Landscape Character Area 4 (LLCA 4) – Kilmainham

This landscape comprises the residential built up areas of Inchicore and Kilmainham, located south of the existing rail line along with the residential area of Islandbridge, located north of the existing rail line. The railway line crosses the urban landscape in an east west direction. The railway crosses three bridges and extends under the busy South Circular Road Junction. The area is built up featuring a mix of residential and commercial developments some of which are of multiple storeys in height. Extensive areas of open space are located within the LLCA including important historic sites such as the National War Memorial Gardens and The Gardens at The Royal Hospital. These along with a part of The Phoenix Park are designated Landscape Conservation Areas in the Dublin City Development Plan. The River Liffey extends in an east west direction broadly parallel and north of the existing railway line, specifically north of The National War Memorial Gardens and is a designated Landscape Conservation Area in the Dublin City Development Plan.

Local Landscape Character Area 5 (LLCA 5) – Heuston Yard

This landscape comprises the existing Heuston railway yard and station platforms west of the existing Heuston Station Building. The yard is overlooked from the west by residential areas at Clancy Quay. The Phoenix Park Tunnel Branch Line and tunnel portal to the Phoenix Park is located in the north western corner of this LLCA. The northern boundary of Heuston Yard adjoins the bank of the River Liffey and features mature wooded vegetation. Heuston Yard is an expansive and visually open area dominated by railway infrastructure. It is overlooked from the west by the multi storey residences at Clancy Quay. The yard is also overlooked from the south east by a mixed multistorey residential and commercial development on Military Road (Heuston South Quarter).

Local Landscape Character Area 6 (LLCA 6) – River Liffey

This landscape comprises The River Liffey and adjacent open spaces along its banks along with the existing Heuston Station Building. The river follows a sinuous course and is lined with mature wooded vegetation and is a designated Landscape Conservation Area in the Dublin City Development Plan. The existing railway line crosses the river at the River Liffey Bridge, a wrought iron structure. The river corridor is overlooked by residential areas.

Local Landscape Character Area 7 (LLCA 7) – Phoenix Park

This landscape is comprised entirely of The Phoenix Park which is a designated Landscape Conservation Area in the Dublin City Development Plan. The park features a main avenue road route (Chesterfield Avenue) which bisects the open space extending south east to north west. Extensive areas of informal woodland planting are interspersed with large open spaces. The existing railway line crosses under the eastern part of the Phoenix Park in a tunnel below ground. The southern boundary of the park features mature woodland through which glimpse views are available of the busy Conyngham Road and part of the existing railway line including part of the Liffey Bridge amongst modern residential development in the foreground.

Local Landscape Character Area 8 (LLCA 8) – Cabra and Glasnevin

This landscape features the established Victorian residential areas of Cabra and Glasnevin and features streetscapes built predominantly in red brick and following broadly a rectilinear pattern. The Royal Canal crosses this landscape extending north east and is a designated Landscape Conservation Area in the Dublin City Development Plan. Mc Kee Barracks, also a designated Conservation Area overlooks the existing railway line from the western side, north of Blackhorse Avenue Bridge. The existing rail line emerges from the Phoenix Park Tunnel and extends across this landscape in a cutting following a north easterly direction, thereafter, following a curved alignment heading east terminating at the site of Glasnevin Cemetery. A number of roads cross the existing railway line and some of these crossings feature bridges with limestone parapets and black painted railings.

Baseline Visual Amenity

As outlined in the Landscape Institute 2013 Guidelines for Landscape and Visual Impact Assessment, visual receptors comprise *‘the different groups of people who may experience views of the development’*. The baseline includes the *‘View North towards The Phoenix Park from the grounds of The Royal Hospital Kilmainham’* documented in the Dublin City Development Plan together with a selection of viewpoints chosen to represent a range of viewer types at different locations who may be affected by the Project.

In the absence of the Project it is anticipated that there would be no material alteration to the existing landscape or visual baseline other than localised alterations to the landscape and visual resource as a consequence of residential, commercial or other developments and construction works being implemented through time.

15.3. Potential Impacts and Mitigation Measures

Assessment of potential landscape and visual impacts are separate but linked processes. An assessment is made of the sensitivity of the baseline landscape and the level of impact resulting from the proposed change to arrive at a significance of effect. Similarly the sensitivity of the visual receptor is assessed along with the magnitude of visual impact (change to existing view) to arrive at a significance of effect. Visual effects on designated views and also viewers at selected viewpoint locations are assessed.

The Project will result in adverse impacts and effects on landscape and visual amenity during construction however many of these will be of short term duration and reversible.

Adverse impacts and effects on landscape and visual amenity during year 1 of operation will arise in the context of an existing railway line or railway yard at Inchicore and Heuston. These will result from the introduction of new infrastructure including retaining walls, bridge replacements and associated road works into the receiving landscape. In some cases, direct impacts on individual dwellings will arise. Some beneficial effects will be associated with the reinstatement of public open spaces, where these mature over time, such as that at Le Fanu Road along with some of the replacement bridges which will be designed to be sympathetic to the baseline landscape. In addition, boundary walls, including that along Chapelizod Bypass / Con Colbert Road will be of superior finish (stone) which will bring about a beneficial change compared with that existing.

A series of mitigation and management measures are proposed to avoid, reduce or remediate, wherever practical significant negative landscape (townscape) and visual effects of the construction and operation of the proposed Project. Many of the mitigation measures are an integral part of the project design including refurbishment of public open spaces, choice of materials for walls and parapets that are sympathetic to the landscape baseline along with general improvements to the public realm. The proposed Project includes for replacement of disturbed boundaries, reinstatement of the construction compound areas and return of temporary acquisition areas. Mitigation planting will however be in a juvenile stage and will have limited effect during the early years of operation.

Significant adverse effects will not arise to any landscape receptors during year 1 of operation. This is often due to the scale of the proposed change which will have limited influence over a built up landscape or indeed a landscape with wooded vegetation screens. This is also due to the context for the Project, located within an existing railway corridor, parts of which are in cutting. Significant adverse visual effects will arise to viewers at viewpoint 7, Le Fanu Road due to the Project, including proposed walls and the new Le Fanu Road Bridge. Significant adverse visual effects are estimated to also arise to residents of groups of dwellings located adjacent to the existing railway line, a small number of which will be directly affected. These significant adverse visual effects will result from short range views of the Project, including noise barriers, retaining walls and the OHLE.

15.4. Residual Effects

The maturing mitigation planting along the alignment will, at year-15 contribute towards increased screening of project components thereby reducing adverse effects compared with year-1 of operation. Upon maturing of mitigation planting and having regard for mitigation measures in the engineering design, no landscape receptors are assessed as experiencing significant adverse effects at year-15.

At year-15, significant adverse visual effects are estimated to arise for residents of groups of dwellings located adjacent to the existing railway line.

16. Material Assets – Agricultural Properties

16.1. Introduction

The Material Assets – Agricultural Properties assessment considers the impact of the proposed DART+ South West project on agricultural property during the construction and operation phases. The study area for this assessment comprises of the agricultural property directly impacted by the proposed Project.

16.2. Receiving Environment

Within Zone A Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station, the existing railway line passes through areas of rural farmed landscape featuring mature hedgerows before moving into the peri-urban and urban landscape seen in Zones B-D. Farming enterprises in Zone A include tillage and tillage / drystock.

In the absence of the Project it is anticipated that current trends in agriculture will continue, notably the decrease in area farmed in Dublin and Kildare and decrease in the number of farms also. This relates to improved science and technologies but also socio economics and policy. The CSO has reported that the large decrease in the number of farms in Dublin is linked to the geographical spread of the urban area in Dublin over the last 100 years.

16.3. Potential Impacts and Mitigation Measures

The proposed Project will involve a total agricultural landtake of 0.348 ha from agricultural holdings, located in Zone A Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station. This includes temporary land-take and easements to facilitate the proposed Project.

This temporary acquisition of agricultural land is not significant on a national or county level. The significance of the effect on those agricultural properties directly impacted ranges from very low to low and the impact on the two agricultural holdings will not be significant. The permanent acquisition relates to easements only.

Mitigation measures are proposed for the construction phase of the proposed Project including the appointment of a landowner liaison officer to coordinate landowner engagement and ensure matters are agreed and addressed in a timely manner; the reinstatement of land to existing condition post construction; maintenance and restoration of accesses, and maintenance / replacement of services (water, electricity) prior to any disruption. Measures to prevent the spread of pests and disease will be adhered to for all machinery and personnel.

16.4. Residual Effects

Following the implementation of these measures, the likely residual effects of the proposed Project has been assessed. There are no agricultural properties on which the residual effect is predicted to be significant. On the two agricultural holdings affected; the residual effects are rated as not significant and imperceptible.

17. Material Assets – Non Agricultural Properties

17.1. Introduction

The Material Assets: Non-agricultural properties assessment considers the impact of the proposed DART+ South West project on non-agricultural property during the construction and operation phases. The study area comprises non-agricultural properties directly impacted by the proposed Project. Non-agricultural property includes the following: Residential property; Commercial property; Community property – Public park, open space or lands that are used for recreation amenity; Development land – Lands zoned for development (with or without planning permission) and sites with planning permission and Non-agricultural land – lands not zoned for development, non-amenity lands, waterbodies, public road, rights of way etc.

17.2. Receiving Environment

The proposed Project is located in the three administrative areas of Dublin City Council, South Dublin County Council and Kildare County Council. The receiving environment along the corridor ranges from a more rural setting in Zone A to peri-urban and dense urban setting in Zones B- D. While the majority of works proposed will be accommodated within the existing rail corridor and on CIÉ owned lands some of the works will take place outside the existing railway corridor e.g. for the provision of substations, construction compounds etc. and will require temporary and / or permanent land take from third party / private lands.

The non-agricultural property types along the proposed Project include residential properties including apartments, public infrastructure, commercial properties, community facilities and, development lands. Each property type has been assigned a baseline rating from low to high.

In the absence of the Project it is anticipated that land and properties required for the proposed Project will remain in existing use albeit with some general improvements/ changes in the area driven by legislative and local policy. In the wider area there are a number of SDZ e.g. Clonburris, which will alter the wider land use patterns in the longer term.

17.3. Potential Impacts and Mitigation Measures

The main construction activities that will give rise to direct impacts on non-agricultural property include temporary landtake for construction compounds and works areas for retaining walls and track widening. Other activities with potential for impact include demolitions (boundary walls, sheds etc.) and access to substratum (soil) for soil nailing. Indirect impacts to non-agricultural properties will arise from disturbance from noise, dust, construction traffic, reduced access and disruption of utility services. These issues are mitigated through the relevant sections for air, noise and traffic.

The proposed Project will involve a total non-agricultural landtake of 24.15 ha of which temporary land-take will be 15.23 ha (including temporary road and right of way closures).

Permanent landtake will be required to provide sub-stations, some overhead line infrastructure, retaining walls, track widening, bridges and soil nailing for anchors. The proposed Project will involve a permanent land-take of 8.92 ha consisting of non-agricultural residential and commercial land, public road, substratum land-take and rights of way.

At this stage of the planning process compensation for land acquisition and disturbance are not considered. These matters will be agreed with landowners or their representative(s) as part of the land acquisition process (compulsory purchase order or CPO) should approval for the proposed Project be granted.

Other key mitigation measures include the reinstatement of lands temporarily acquired. 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. 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.

17.4. Residual Effects

There is predicted to be a residual significant effect on a number of properties however the majority will achieve slight impact post mitigation.

18. Material Assets – Utilities

18.1. Introduction

The Material Assets – Utilities assessment considers the impact of the proposed DART+ South West project on the different utilities present in the vicinity of the proposed works, and sets out the baseline conditions, impacts and proposed works to be carried out to the utility assets.

Utilities refer to the services provided to consumers including gas transmission and distribution pipework, potable water mains, foul or combined sewers, surface water sewers, electricity transmission and distribution networks (underground cables and overhead lines) and fibre telecommunications.

Following the data collection, impacts of the works on existing utilities were identified including cases where diversions were considered necessary (e.g. where road bridges are to be reconstructed) and where utility protections were considered sufficient. For the purposes of this assessment, the magnitude of impact for infrastructure and utilities has been considered in terms of the importance of the utility and the duration of service interruption (outage).

18.2. Receiving Environment

The baseline infrastructure and utilities environment has been defined through a desktop study, consultation with relevant interested parties and field inspections. For the purposes of this chapter, the importance of infrastructure and utilities has been based on their functionality.

The utilities that cross the existing rail corridor are generally concentrated in road bridges and at train stations. There are also several utilities that cross underneath the tracks or run parallel to the tracks, such as Irish Water pipes (including both water supply and wastewater) and electricity cables. The main issue with overhead cables is the required clearance for rail electrification and any electrical interference that may occur.

Most services are located within existing streets and railway line bridge crossings. Hence, where modifications are required to existing bridges and/or to the road network in the immediate vicinity of existing structures, impacts on utilities are inevitable.

In the absence of the Project it is anticipated that there would be no significant change to the existing utilities baseline other than local changes to the utilities because of residential, commercial or other developments and construction works being implemented through time.

18.3. Potential Impacts and Mitigation Measures

The impacts will occur predominately during the construction phase. As well as utility diversions and alternations, the proposed project also requires the provision of new connections to services.

A conflict analysis was undertaken by the project team to determine potential utility conflicts. Potential diversions or alterations were discussed and agreed in principle with the utility providers during consultations. While the majority of impacts were assessed as slight to

moderate, four were assessed as significant. These included three 38kV ESB overhead lines and one underground combined sewer pipe. Three of the four relate to work to Le Fanu Bridge and one with Park West & Cherry Orchard Station.

Mitigation measures are proposed for both construction and operational phases. Best practice measures will be put in place during construction. This will include further discussions with utility providers, scheduling of outages, pre-notification of outages to affected homeowners and businesses. Outages will be kept to as short as necessary and will be reconnected without delay. Best practice measures will also be applied for protection of existing utility assets and procedures will be put in place to minimise the risk to utility provider personnel and the general public during works on services.

During operation, substations providing power to the OHLE will need to be maintained to ensure the new DART line remains operational.

18.4. Residual Effects

Provided the mitigation measures described are put in place, the residual effect of the proposed Project on infrastructure and utilities is considered to be Not Significant.

19. Material Assets – Resource and Waste Management

19.1. Introduction

The Material Assets –Resource and Waste Management assessment considers the impact of the proposed DART+ South West project on use of resources and generation and management of waste arising.

This assessment was informed by a desk study and included identifying the types of waste typically generated in a project of this nature , a review of existing and proposed waste management facilities as well as the potential reuse of materials. Additionally, the resource use required for the construction and operation of the proposed Project was identified.

Key elements that are likely to result in potential impacts on waste and resources include materials required for use during the construction and operational phase, demolition works and earthworks.

Estimates of waste generation during the construction (including demolitions) and operational phases of the proposed Project have been calculated by the design team based on the current design information. Similarly, the estimates of resource use in terms of reusability and other materials required, have been calculated by the design team and have been used to inform the assessment.

19.2. Receiving Environment

The proposed Project from Hazelhatch & Celbridge Station toward Park West & Cherry Orchard Station is broadly rural and suburban in nature and will not require significant earthworks for the proposed Project as the earlier Kildare Route Project delivered four-tracking along this section. From Park West eastwards toward Heuston Station, the proposed Project passes through a more densely urban and industrial setting, including the Inchicore Depot which is an area where some soil deposits have been contaminated from historic uses. This section will require significant earthworks associated with the required four tracking.

The proposed Project is located within the administrative area of Dublin City Council, South Dublin County Council and Kildare County Council, which are part of the Eastern-Midlands Waste Region. The regional waste management is guided by the Eastern Midlands Region Waste Management Plan 2015-2021 which was published in 2015 (a replacement waste plan is in preparation). There are over 80 licensed waste facilities within Eastern Midlands Region that are capable of the disposal of materials arising. This includes soil recovery facilities, integrated waste management facilities, waste to energy facilities and landfills.

In the absence of the Project it is anticipated that available capacity in waste management facilities will continue to be used by new development and refurbishment works in line with national planning commitments under the National Development Plan and related sectoral plans but guided by the National Waste Management Plan (in preparation).

19.3. Potential Impacts and Mitigation Measures

It is estimated that over 465,000 m³ of surplus material in the form of soil and stone (topsoil/soil/track ballast) will be generated from the proposed Project. A small amount of this will be reused on site, e.g., track ballast. Off-site re-use options for surplus clean material include reuse as a by-product on other construction sites and recovery at suitable authorised waste facilities.

A number of structures will require demolition along the route including boundary walls, bridge decks and abutments, buildings and retaining walls. The non-hazardous demolition waste will be segregated for recycling or recovery purposes. If asbestos or other hazardous materials are identified, they will be segregated and stored in accordance with best practice for onward processing at a facility licensed to treat hazardous materials.

Operational impacts associated with waste management relate to the ongoing waste stream from passengers accessing the train services however this is anticipated to be limited in quantity and dealt with by existing waste management practices operated by Iarnród Éireann.

Mitigation measures will be implemented to avoid or reduce negative impacts on waste and resources during the construction and operational phases. All materials consumed and waste generated by the proposed Project will be managed in accordance with circular economy principles and the waste management hierarchy, with prevention, reuse and recycling and other recovery methods favoured over disposal. This will be managed by implementing the mitigation measures included within the EIAR and in accordance with the Construction Environmental Management Plan (CEMP).

19.4. Residual Effects

Following implementation of the mitigation measures most waste materials generated during the construction phase will be re-used either within the proposed Project or will be sent for recovery / recycling at authorised waste facilities. The residual effects following the implementation of mitigation measures, are therefore considered to be minor, negative, and short term. The waste generated during operation and maintenance of the proposed Project will not be significant as it will mainly be associated with occasional maintenance works. The residual effect on resource and waste management is expected to be negligible.

20. Archaeology and Cultural Heritage

20.1. Introduction

The archaeology and cultural heritage assessment identifies and assesses the likely significant effects that the construction and operation phases of the proposed Project will have on archaeology and cultural heritage.

The assessment of the archaeological and cultural heritage of the proposed Project is based on a desk study of published and unpublished written and mapping sources. A review of existing documents and other research and field surveys has taken place where necessary in order to understand the archaeological and cultural heritage issues in terms of measures to avoid and reduce the impact. The area examined included a corridor 250m on either side of the existing rail line.

20.2. Receiving Environment

In total 23 no. recorded archaeological sites (RMP Sites) were identified within the corridor 250m on either side of the existing rail line.

There are two national monuments (NM) in the ownership of the state recorded within the study area; Kilmainham Gaol (DU018-125, NM Ref:675) 105m south of the railway line and Phoenix Park (DU018-007001). Zone D of the Project of runs through the tunnel beneath Phoenix Park (DU018-007001).

The eastern end of Zone B, and the full extent of Zone C of the Project are within the Zone of Archaeological Potential (ZAP) for Dublin City (DU018-020). This includes the Kilmainham – Islandbridge area, which is characterised by a gravel ridge that runs on an east to west axis, sloping down to the River Liffey to the north and the River Camac to the south i.e. at Heuston Bridge to the western edge of the War Memorial Park at Islandbridge. The gravel ridge originally rose to a height of approximately 23m OD prior to its development 19th and 20th century for the construction of the railway line and Kingsbridge (now Heuston station) in the 1840s, gravel quarrying and the creation of the Memorial Park in the 1930s (O'Brien 1998). Along this ridge the spread of burials recorded from the 19th century was extensive, stretching intermittently from at least the Memorial Park/ Islandbridge in the west as far as Heuston Station to the east.

The evidence for two separate Viking cemeteries that existed concurrently was identified. One cemetery was located in the vicinity of the early monastic foundation in Kilmainham, the second further west in the vicinity of the War Memorial Park at Islandbridge. Neither of these cemeteries was Viking in origin, the native Christian cemetery associated with the monastic foundation of Kilmainham was reused by the Vikings, as was a native secular cemetery at Islandbridge.

There is one recorded archaeological site along the path of the proposed Project, the site of a burial on St. Johns Road (RMP DU018-032) which was discovered in 1960 during construction work at St. John's Road. There is a potential that the burial is either associated with these burials or perhaps to the monastic site at Kilmainham.

Three sites are in proximity to the rail line (within 50m) are located outside the railway construction works, these include an enclosure site (RMP KD011-068) in Stacumny Cottage, the site of a castle in Adamstown (RMP DU017-029) and an enclosure site at Cappagh (DU017-036). None of these sites have upstanding remains.

In the absence of the Project it is anticipated that there would be no potential for disturbance of as yet undiscovered subsurface archaeological deposits, features or finds, or features of architectural heritage, cultural heritage or historic interest along the corridor.

20.3. Potential Impacts and Mitigation Measures

The impacts to archaeology and cultural heritage are broadly confined to the construction stage. Within Zone A, no RMP sites will be impacted. Eight areas of archaeological potential have been identified, all of which have been identified as having a general greenfield archaeological potential.

Within Zone B, there will be an impact on the site of a burial that was discovered on St. Johns Road (RMP DU018-020284). Zone B also includes the ZAP for the Historic City of Dublin (RMP DU018-020). This area incorporates the potential site of an early medieval cemetery. There are also two areas of general archaeological potential in Zone B.

Zone C runs through the ZAP for the Historic City of Dublin (RMP DU018-020). Where it crosses the river to the Conyngham Road, Zone D also runs through the ZAP for the Historic City of Dublin (RMP DU018-020) and via the Phoenix Park Tunnel which runs beneath the Phoenix Park recorded Deer Park (DU018-007001).

No operational impacts are envisioned in relation to archaeology during the operational phase of the Project.

The measures proposed to avoid or reduce negative impacts on archaeological and cultural heritage during the Construction Phase will include the following:

- An experienced and suitably qualified archaeologist will be appointed to advise the project team and appointed contractor on archaeological and cultural heritage matters during construction; and
- In the areas of archaeological potential where earthmoving works will occur archaeological monitoring by a suitably qualified archaeologist will be carried out under licence to ensure that any archaeological finds during excavation works are properly identified and recorded.

Archaeological monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage (DHLGH) and the National Museum of Ireland (NMI), and will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface.



20.4. Residual Effects

All archaeological and cultural heritage issues will be resolved by mitigation during the pre-construction phase or construction phase, in advance of the operational phase, therefore there will be no significant residual effects upon the archaeological and cultural heritage resource.

No significant residual impacts have been identified either in the construction or operational phases of the proposed Project.

21. Architectural Heritage

21.1. Introduction

The architectural heritage assessment identifies and assesses the likely significant effects that the construction and operational phases of the proposed Project will have on architectural heritage. The assessment is based on a desk study of published and unpublished documentary and cartographic sources. A review of existing documentation and supplementary research and field surveys has taken place where necessary in order to evaluate the architectural heritage constraints in terms of avoidance and mitigation measures. The area examined included 50m around the proposed development boundary.

21.2. Receiving Environment

The project is largely, but not entirely, confined to the existing railway corridor. The Great Southern and Western Railway had its origins in 1842. This evolution of the railway can be seen in the historic OS mapping of the proposed Project area. In the first edition OS map of Dublin, published in 1843, the GSWR railway has yet to be constructed. By the second edition of the OS six-inch maps of Dublin and Kildare in the 1870s the railway has been constructed and is labelled the Great Southern & Western Railway. The fourth edition OS maps of 1930s, show the railway as the Great Southern Railways. The maps also show the evolution of the rail yard at Heuston Station and the works at Inchicore.

The proposed Project lies within the administrative areas of Kildare County Council, South Dublin County Council and Dublin City Council. Within each of these areas there are buildings and other structures of architectural heritage significance, and these have been divided into four categories for the purpose of this assessment.

- Buildings and other structures that have been included in the record of protected structures for the relevant planning authority or where they are proposed protected structures, and these have legal protection under the planning acts;
- National Inventory of Architectural Heritage (NIAH) includes a number of other buildings and structures that are not protected but have been identified as being of architectural heritage significance, with a presumption that they may become protected structures;
- Surveys of industrial heritage carried out by the planning authorities have identified structures of industrial heritage significance that are not included in either of the previous two categories; and
- Some structures have been identified as being of potential architectural heritage significance that are not included elsewhere.

The architectural heritage assessment has identified 116 structures / features of architectural heritage significance, or potential significance and eleven historic gardens or demesnes within an area that extends to 50 metres beyond the boundary of the proposed Project.

In the absence of the Project it is anticipated that the architectural heritage that forms part of the railway system would continue in use.

21.3. Potential Impacts and Mitigation Measures

The direct effects of the proposals includes the dismantling of one protected structure, which is a signal box at the Inchicore railway works and it is intended that this be stored for possible re-erection on another site. The perimeter wall of the Inchicore Depot is also a protected structure and part of this will need to be removed to facilitate the widening of the track. Reuse of this material will be considered for finishes on new / reconstructed walls, bridges etc. subject to health and safety considerations.

Many of the bridges crossing over the railway will need to have their parapets raised to ensure that it is not possible to reach the overhead power cables from the bridge and this work will affect the bridge at Cabra Road, which is a protected structure. Several other bridges that are included in the NIAH would also be affected by this requirement to raise the parapets. One original railway bridge at Le Fanu Road would need to be demolished to facilitate the widening of the track; this is not a protected structure and is not included in the NIAH.

The erection of the overhead line equipment (OHLE) will have a direct effect on some of the bridges, including the railway bridge that crosses the River Liffey, while in many cases the equipment will need to be attached to the undersides of bridges that cross over the railway. The OHLE will also have an indirect effect on a number of structures of architectural heritage significance through the change to the settings of the structure resulting from its presence. This will be the principal indirect effect on architectural heritage arising from the Project and it will be an ongoing effect, continuing beyond the construction stage into the period of operation of the railway. The other ongoing effect during the operation of the electrified railway is the permanent alteration to the parapets of bridges.

For the construction phase, in some cases a certain amount of mitigation can be achieved through design, such as the selection of an appropriate means of raising bridge parapets (which will be informed by a conservation architect), and the recording of structures that are to be demolished, while not preserving the structures, can ensure that knowledge of their existence and character is preserved for the future. For the operational phase, there is no scope for mitigating the indirect effects of the project on architectural heritage, as the effects all arise from the ongoing presence of the OHLE and its impact on the character or setting of each structure of architectural heritage significance.

There is no requirement for monitoring in relation to the effects on architectural heritage either at construction stage or operational stage.

21.4. Residual Effects

The residual effect of the proposed Project will be the effect of the OHLE on the character and settings of a number of structures of architectural heritage significance.

22. Electromagnetic Compatibility and Stray Current

22.1. Introduction

The electromagnetic compatibility and stray current assessment identifies and assesses the likely significant effects of Electromagnetic Fields (EMF) as a result of the proposed Project. The proposed Project will be an electrified Direct Current (DC) rail system. Upon completion of DART+ South West electrification, new electric DART trains will be used on this railway corridor, similar to those currently operating on the Malahide / Howth to Bray / Greystones Line.

Electromagnetic Fields are generated wherever electricity is produced, distributed and consumed; including by railway electric traction systems, power lines and electrical and electronic equipment. EMF are also generated intentionally by radiocommunication systems. The trains and infrastructure introduced by DART+ South West will contribute to the overall level of EMFs which are already established by the multitude of man-made sources in the area. Common types of electromagnetic radiation include radio waves, microwaves, infra-red radiation, visible light, and X-rays as shown in the figure below.

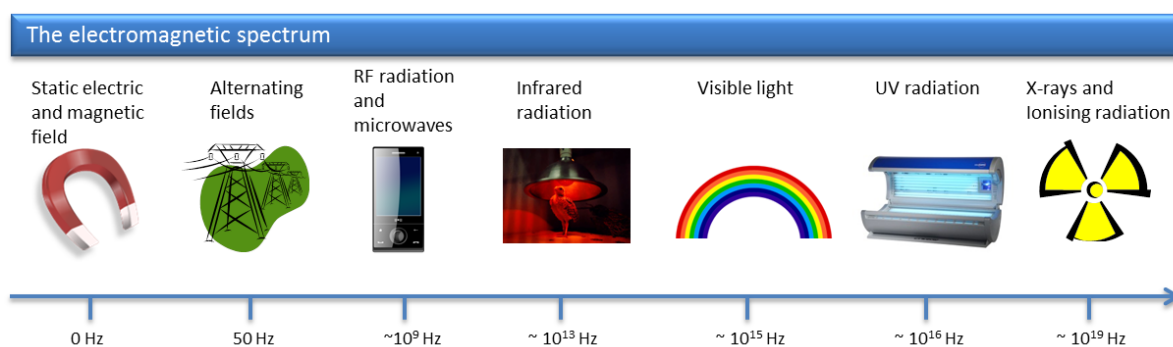


Figure 22-1 Electromagnetic Spectrum

The assessment is focused primarily on the impact of EMF on members of the public and the impact of Electromagnetic Interference on third party equipment. The study area for the assessment was 100m either side of the railway centreline.

22.2. Receiving Environment

A desk survey of potential sensitive receptors within 100m of the railway centreline was undertaken for all zones. Potential sensitive receptors include medical, dental and veterinary clinics, schools and educational facilities, childcare facilities, community facilities, places of worship, emergency departments and hospitals, sports facilities and parks, and industrial data centres. The various receptors were given a baseline rating with respect to sensitivity to EMF and Stray Current. Two medical facilities, a veterinary clinic and a data centre were assigned a baseline rating of high for sensitivity to EMF based on the typical equipment used. No receptors were recorded as high sensitivity to stray current.

In the absence of the Project it is anticipated that there would be continued use of the existing railway line and the existing train service. There would be no introduction of Overhead 1500V DC electrification, including power supply and therefore no source to generate potential electric and magnetic fields in the vicinity of the railway line.

22.3. Potential Impacts and Mitigation Measures

There are no radiation and stray current impacts anticipated for the construction of the proposed Project. Therefore, there are no specific mitigation measures required during the construction phase of the proposed Project.

Potential levels of electromagnetic radiation and stray current during the testing and commissioning of the trains and traction power supply system are expected to be within applicable standard limits.

Prior to construction, third parties with potentially sensitive equipment will be consulted to ensure that the risk to any receptors from the new electrified railway is sufficiently low or in the event that a particularly sensitive receptor of concern is identified then further suitable and appropriate mitigation measures will be applied e.g. relocation of the sensitive equipment, shielding etc.

22.4. Residual Effects

Despite applied mitigation measures to minimise the magnitude of stray current, it is an inevitable phenomenon associated with direct current (DC) rail systems.

23. Human Health

23.1. Introduction

This assessment considers potential impacts on human health as a result of construction and operation of the proposed Project. Health and wellbeing are influenced by a range of factors, termed the ‘wider determinants of health’ and these span environmental, social, behavioural, economic and institutional factors. The proposed Project has the potential to change determinants of health, with beneficial and adverse effects, either directly, indirectly or cumulatively.

The methodology for assessing human health in EIA follows best practice. The methods follow the general EIA guidelines set out by the Environmental Protection Agency and the specifics of considering health in the context of EIA set out by the Institute of Public Health in Ireland.

The health assessment is informed by the findings of other EIAR topics including traffic and transportation; population; air quality; climate; noise and vibration and electromagnetic fields. The health assessment has also been informed by a review of relevant public health evidence sources, including scientific literature, baseline data, health policy, local health priorities and health protection standards.

23.2. Receiving Environment

The health assessment looks at the potential effects for both the general population and for vulnerable groups. Vulnerability relates to experiencing effects differently due to age, income level, health status, degree of social disadvantage or ability to access services or resources. The health assessment considers localised effects for the population close to the works within Zones A to D, as well as effects to the wider community in the local authority areas of Dublin City (most relevant to Zones B, C and D), South Dublin (Zone A) and Kildare (Zone A). The assessment also considers the wider effects at the regional level of Leinster and nationally.

Broadly the local study area population is more youthful than the national average, with a higher proportion of 20 – 39 year olds. The majority (55%) of people living with the study area have rated their health as “very good”, which is slightly lower than the national average (59%).

Deprivation within the study area Electoral Divisions is relatively low, with the majority (45%) of the population categorised as “marginally above average”. However, it is worth noting that 29% of the study area population are categorised as “disadvantaged”.

Mortality from circulatory and respiratory diseases have both also been consistently lower than the national average, with the former being mostly static, and the latter showing an increasing trend overall since 2013. Hospital admissions for respiratory disease has also been increasing since 2011, with figures very similar to the national average and following a similar trend.

Local health priorities for Dublin South and Kildare as reported by the HSE include implementation of the Healthy Ireland Plan which outlines actions to be taken locally to improve the health and wellbeing of service users, staff and local communities and to continue

to improve services offered within primary care, mental health, disability services and older person services.

In the absence of the Project it is anticipated that health and social care, public health initiatives and government policies will aim to reduce inequalities and improve quality of life. Other issues are likely to impact future baseline including the longer term implications of COVID-19 and climate change.

23.3. Potential Impacts and Mitigation Measures

Construction Phase Health Determinants

- **Transport:** The potential health effect from changes to traffic nature and flow rate (active travel behaviour, access to services and road safety). The significance of the population health effect for this determinant of health is moderate adverse (significant). There may be a small, albeit temporary, change in the health baseline due to some localised effects around: active travel discouragement, particularly at the Kyberpass bridge; healthcare journey time delays, including for hospitals; and road safety, including at South Circular Road interchange.
- **Air quality:** The potential health effect from changes in air quality (including PM₁₀, NO₂ and nuisance from dust). The significance of the population health effect during construction is minor adverse (not significant). This reflects the *slight* change from baseline air quality conditions well within the limits of the Air Quality Regulations.
- **Noise:** The potential health effect from changes in noise and vibration exposure. Construction noise impacts of the proposed Project are considered to result in a minor adverse (not significant) effect on population health. This assessment conclusion reflects that for a small population the levels of exposure will cross or approach standards set for health protection. This is further addressed in Chapter 14 where localised construction noise and vibration is mitigated.
- **Socio-economic status:** The potential health benefits from changes to socio-economic factors (income and employment). The significance of the population health effect for this determinant of health is minor positive (not significant). There would be a slight increase in good quality employment and factors that promote health or are protective against poor health, particularly mental health.

During the construction phase, mitigations will include open communication with the local community, Dublin City Council, South Dublin City Council, Kildare County Council and other relevant stakeholders, including early notice on road closures and interruptions and other significant disruptions, advice on active travel opportunities and support of educational and employment opportunities locally.

Operational Phase Health Determinants

- **Transport:** The potential health effect due to improved operating capacity of rail services and improved active travel infrastructure. The significance of the population health effect for this determinant of health is moderate positive (significant). There may be a small

sustained beneficial change in the health baseline due to improved accessibility and less reliance on private cars. Such changes have the potential to narrow inequalities, particularly for deprived populations with existing poor access or fewer resources.

- **Air Quality:** The potential health effect from changes in air quality associated with electrification of a large proportion of the rail fleet and additional rail movements. Despite the benefits associated with electrification, the significance of the population health effect is minor adverse (not significant) for air quality which reflects the slight adverse change in the health baseline linked to the increase in the number of diesel trains using the rail corridor. The changes are likely to disproportionately affect those closest to the railway line, which may marginally widen health inequalities.
- **Noise:** The potential health effect from changes in noise and vibration exposure. Operational noise impacts of the proposed Project are considered to result in a minor adverse (not significant) effect on population. reflects a *very limited* effect on the health baseline for the site-specific populations driven by rail noise increases. The conclusion has regard to scientific literature indicating a *clear association* between long-term exposure to transport noise and health outcomes.
- **Socio-economic status:** The potential health benefits due to socio-economic factors (income and employment). The significance of the population health effect is minor positive (not significant). The professional judgment is that there would be a slight beneficial change in the health baseline for the local and regional population. This conclusion reflects a modest increase in employment.
- **Electro-magnetic fields:** The potential health effect due to EMF exposure. The assessment of EMF and stray current indicates that there are no radiation and stray current impacts anticipated for the construction of the proposed Project and that potential levels during operation are expected to be within applicable standard limits. However the significance of the population health effect is minor adverse (not significant). The professional judgment is that there could be a slight adverse mental health effect for the local population if concern about EMF exposures from electrification of the line are widespread. This conclusion reflects scientific understanding of the impact of uncertainty or concern about environmental risks on mental health. It also reflects that the actual risks would be well within regulatory standards for EMF and that most members of the public would expect this to be the case.

In addition to the mitigation already presented under the related topics of air quality, noise and vibration, population, traffic and transport, additional measures relating to education and awareness for EMF, stakeholder engagement, training and employment opportunities for local communities are proposed.

23.4. Residual Effects

Construction Phase Health Determinants

- **Transport:** With proposed mitigation adopted the residual effect would be minor adverse (not significant).

- Air quality: No change from minor adverse (not significant).
- Noise and Vibration: The residual health assessment significance for population health is minor adverse (not significant).
- Socio-economic status: With proposed mitigation adopted the residual effect would be moderate positive (significant). This score reflects active enhancement of the proposed Project's employment opportunities, with these opportunities targeted to vulnerable groups.

Operation Phase Health Determinants

- Transport: The significance of the population health effect for this determinant of health is moderate positive (significant).
- Air Quality: The significance of the population health effect is minor beneficial (not significant).
- Noise: The residual health assessment significance for population health is minor adverse (not significant).
- Socio-economic status: With proposed mitigation adopted the residual effect would be moderate positive (significant). This score reflects active enhancement of the proposed Project's employment opportunities, with these opportunities targeted to vulnerable groups.
- Electro-magnetic fields: With proposed mitigation adopted the residual effect would be negligible (not significant).

24. Major Accidents and Disasters

24.1. Introduction

Major Accidents and Disasters considers the potential for the proposed Project to cause major accidents and disasters, and also the proposed Projects vulnerability to negative impacts of potential major accidents and disasters e.g. flooding during its construction and operation.

This assessment differs from the other specialist chapters in that it does not deal with likely significant effects but is instead focussed on sudden events of low likelihood, which may conceivably occur, and which would result in major negative impacts on infrastructure, human health, cultural heritage and/or the environment (events of “low likelihood but potentially high consequence”).

24.2. Potential Impacts and Mitigation Measures

From examining all potential risk events associated with the proposed DART+ South West project, scenarios that were considered to be of the highest risk in terms of project vulnerability and its potential to cause such an event include but are not limited to the following: Major road traffic events, events leading to structural collapse / damage, water pollution events, extreme weather flooding events, train derailment events and events leading to building fire / failure.

In the first instance the assessment considered mitigation by design (where appropriate) to reduce risk to as low as reasonably practicable. Where mitigation by design was not sufficient to reduce the risk to acceptable levels, secondary mitigation measures have been specified. These include emergency response planning, traffic management, training, implementation of technical design and operating standards and inspections.

24.3. Residual Effects

Significant residual effects are not likely to occur during construction or operational phases of the proposed Project once the identified design measures and secondary measures are applied.

25. Interactions

In addition to the assessment of impacts on individual environmental topics, the potential interactions between these factors have also been considered as part of the assessments. Table 25.1 shows the principal interactions / interrelationships identified for the proposed Project. The nature and magnitude of all identified interactions / interrelationships was assessed under the inter-related environmental topics and mitigation measures applied where required.

Table 25.1 Interactions Matrix of Environmental Factors

	Traffic & Transport		Pop*		Bio*		Land & Soils		Water		Hydrog*		Air Quality & Climate		Noise & Vibration		Landscape & Visual		Ag & Non-ag*		Utilities, Resource & Waste		Built Heritage		EMF		Human Health		
	C ⁷	O ⁸	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	C	O	
Traffic & Transport																													
Pop*	✓	✓																											
Bio*	✓	✓	⊗	⊗																									
Land & Soils	⊗	⊗	⊗	⊗	⊗	⊗																							
Water	✓	✓	⊗	⊗	✓	✓	✓	✓																					
Hydrog*	⊗	⊗	⊗	⊗	✓	✓	✓	✓	✓	✓																			
Air Quality & Climate	✓	✓	✓	✓	✓	✓	⊗	⊗	⊗	⊗	⊗	⊗																	
Noise & Vibration	✓	✓	✓	✓	✓	✓	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗															
Landscape & Visual	✓	✓	⊗	⊗	✓	✓	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗														

⁷ C = Construction

⁸ O = Operation

	Traffic & Transport		Pop*		Bio*		Land & Soils		Water		Hydrog*		Air Quality & Climate		Noise & Vibration		Landscape & Visual		Ag & Non-ag*		Utilities, Resource & Waste		Built Heritage		EMF		Human Health	
Ag & Non-ag *	☒	☒	☒	☒	✓	✓	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	✓	✓										
Utilities, Resource & Waste	✓	✓	☒	☒	☒	☒	✓	☒	☒	☒	☒	☒	☒	☒	☒	☒	✓	☒	☒	☒								
Built Heritage	☒	☒	☒	☒	✓	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	✓	✓	☒	☒	☒	☒						
EMF	☒	☒	☒	☒	☒	✓	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	✓	☒	☒				
Human Health	✓	✓	✓	✓	☒	☒	☒	☒	☒	☒	☒	☒	✓	✓	✓	✓	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	✓	✓


Key: POP – Population; Bio – Biodiversity; Hydrog – Hydrogeology; Ag and non-ag – Agricultural and Non-agricultural Property

26. Cumulative Effects

Cumulative effects result from the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. Additional cumulative effects can be caused due to incremental changes by other past, present or reasonably foreseeable projects together with the proposed Project.

There is no established study area for the assessment of cumulative effects. The study area for the cumulative assessment takes into consideration the previously defined study areas for each environmental factor which have been informed by appropriate guidance documents, best practice and professional judgement and having regard to the location, nature, characteristics and stage of planning of the other projects and plans relative to the proposed Dart South West Project. Four types of potential cumulative effects have been considered as shown in Table 26-1 below.

Table 26.1 Tiered Approach to Identifying and Assessing Potential Cumulative Effects

Tier	Description	Level of Detail
Tier 1	Cumulative effects of many minor or significant effects resulting from the entirety of the project. (Assessed under each environmental factor as appropriate).	<p>Decreasing level of detail likely to be available</p> 
Tier 2	Development that is functionally or legally interdependent on further development(s) not included in the application for consent approval	
Tier 3	Existing or approved projects (Staged approach) – Plans or programmes to include relevant land use, planning and transport plans/strategies relevant to the project.	
Tier 4	‘Other’ identified projects including NTA projects that are in the public domain/at preliminary design i.e. not active/granted but have the potential for cumulative effects with the project	

Tier 1 Cumulative Assessment

The ‘Tier 1’ cumulative assessment deals with the combined impact of proposed development on each environmental factor. For example, for architectural heritage, the cumulative assessment considers the total impact of interventions across the heritage asset. These assessments are presented in the respective chapters of this EIAR.

Tier 2 Cumulative Assessment

The ‘Tier 2’ cumulative assessment deals with other development that is functionally or legally relevant for the proposed Project but is not included in the application for consent approval as it is not under the jurisdiction of CIÉ. The main Tier 2 projects relevant to the proposed DART+ South West project are the ESB electricity supply connections required to operate the proposed Project and a diversion of the Le Fanu / Park West ESB infrastructure.

Both these elements will be progressed separately by EirGrid as part of a separate planning process. However is recognised that the infrastructure is functionally related to the proposed

Project and as such a tailored assessment based on best available information has been undertaken. Close consultation with the DART+ South West Design team and ESB networks has ensured the required electricity will be available to the proposed Project.

Tier 3 Cumulative Assessment

The Tier 3 includes the assessment of existing and/ or approved plans or projects.

Identification of plans

A list of relevant national, regional and local plans and programmes identified as having the potential to have a cumulative effect with the proposed Project was collated. The assessment of plans and programmes is detailed in Chapter 26 Cumulative Effects in Volume 2 of this EIAR.

Identification of Existing and/ or Approved Projects

To identify and assess the likely significant cumulative effects with existing and/or approved projects, a four-staged approach was adopted as summarised in Table 26.1.

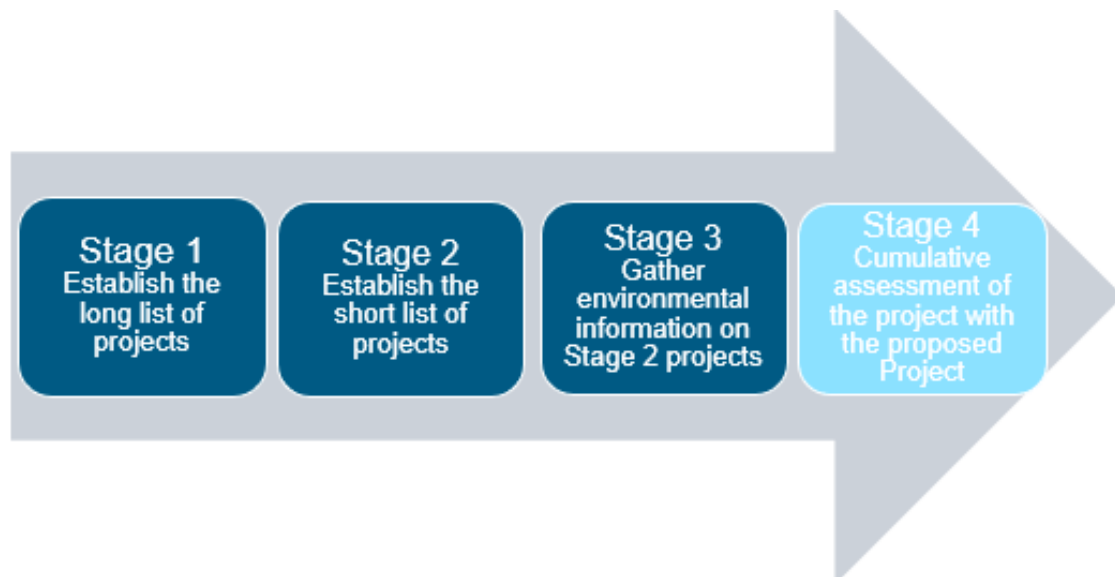


Figure 26-1 Staged Approach for Tier 3 Cumulative Assessment

Tier 4 Cumulative Assessment

‘Other’ identified projects that are in the public domain/at preliminary design (i.e. not in the planning system or granted) but have the potential for cumulative effects with the project are also assessed as part of the CEA. This includes other projects such as other DART+ Programme projects and other NTA projects. The project team have been in close consultation with several of the other NTA funded projects that are currently at public consultation and/or are in the public domain. As such it was deemed prudent to include these planned NTA transportation projects that are reasonably foreseeable and are likely to have cumulative effects with the DART+ South West Project and therefore are included as part of the CEA.

For these other projects, the CEA has taken a precautionary but pragmatic approach based on the best available information where baseline data is not available or is incomplete. Therefore, publicly available information or information made available by the delivery agents of the individual projects has informed the respective Tier 4 assessments. The Tier 4 projects include the following:

- DART+ Coastal North;
- DART+ Coastal South;
- BusConnects Projects;
- Luas Lucan;
- Celbridge to Hazelhatch Link Road Scheme;
- Grand Canal Greenway;
- Camac Greenway;
- Camac Flood Alleviation Study; and
- Hazelhatch Flood Relief Scheme.

The cumulative assessments undertaken under each of the four tiers is presented in Chapter 26 Cumulative Effects in Volume 2 of this EIAR.

27. Schedule of Environmental Commitments

The Schedule of Environmental Commitments presents a summary of the mitigation and monitoring measures identified as a result of undertaking the environmental impact assessments, as well as the mitigation measures detailed in the Natura Impact Statement which has been carried out to inform the Appropriate Assessment Process.

From the inception of the design and environmental assessment process of the proposed Project, the project team has strived to avoid, prevent and reduce adverse effects through thoughtful design development and this is 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 the Schedule of Commitments is to provide a central location where all measures from the EIAR and NIS 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 in Chapter 27 in Volume 2 of this EIAR are incorporated into the Construction Environmental Management Plan (CEMP) submitted as part of the Railway Order application.